Select Committee on Economic Affairs

Uncorrected oral evidence: Reforming the Electricity Market - Follow up

Tuesday 12 February 2019

4.30 pm

Watch the meeting

Members present: Lord Forsyth of Drumlean (The Chairman); Baroness Bowles of Berkhamsted; Lord Burns; Lord Darling of Roulanish; 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. 2 Heard in Public Questions 7 - 17

Witness

I: Professor Dieter Helm CBE, Professor of Energy Policy and Fellow in Economics, University of Oxford.

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Examination of witness

Professor Dieter Helm.

Q7 The Chairman: Welcome again to our Committee, Professor Helm. I do not know whether I need to declare an interest that we are fellow fly fishermen, but I do not think that it is relevant to the subject under discussion today.

I saw in a recent article that you said that the Government needed to make a choice on whether to proceed with nuclear. Will you tell the Committee what considerations they should take into account? Would a review into nuclear power alone not aid the decision?

Professor Helm: The choice that faces the Government on nuclear power is different from that for any other form of power generation. Given the longevity of the assets, the issues related to the waste and lots of technology and safety issues, it is not a decision that private markets can take. If you look around the world, you can see that there are, effectively, no purely private nuclear power stations anywhere; government is always involved in them.

The first thing is that it is for the Government. Secondly, there is a world of difference between doing nuclear properly and plodding along with it, if I can put it that way. A nuclear programme requires a supply chain and a lot of technical expertise, which needs to be sustained for a considerable period—and to do that is a major strategic decision to make. The countries that have really pushed nuclear, such as Japan and France, have made those very bold decisions. France has built about 58 of them, and in one year was constructing six at the same time.

By contrast, what we have in Britain is a policy that I would describe as trying to see which one works. We have chosen not a particular programme or technology, and not to commit to any particular kind of nuclear reactor; we have decided to try three different ones and see which one works. On top of that, we have decided to design three different financial packages and see which one is appropriate.

That will take us well into the mid-2030s, even if it works, by which time we might get around to thinking about a continuous supply chain. That strategy is likely to produce high costs and significant delays and will probably not deliver what Governments might want to get from a nuclear programme.

Q8 Lord Darling of Roulanish: I want to ask you about the funding of nuclear power stations. Let us assume for the sake of argument that you are going to build them—it is an open question, but let us assume that. You will be aware that the chairman of the would-be Wylfa project said that it would have been much better if the Government had been a joint or a bigger shareholder. I know that you have talked about changing the system of funding using a regulated asset base, which you say will reduce the cost of capital. You said earlier that nowhere in the world are these things being built other than with government support. Why do not the
Government just accept that and either build it themselves, as they might have done with a lot of the fleet that we have, or look at the system that you are advocating, which seems primarily aimed at reducing capital?

The one thing that is clear is that, given that nuclear needs some state intervention, the contracts for difference mechanism seems an elaborate way of concealing the fact that, actually, the state is subsidising it—it is opaque and not very efficient. I think you are advocating that the regulated asset base would be better than just going the whole hog and letting the state build it. I suppose that it used to be called nationalisation.

Professor Helm: There are quite a few dimensions to your question and I shall try to deal with them all. Contracts for difference were invented because the then Ministers believed that the wholesale price of electricity was going to go well above £100. Given a coalition agreement that said there should be no public subsidy for nuclear, by picking a CFD, which they knew would be cheaper than the wholesale price because they believed in peak oil and knew that the oil and gas prices were going to go up—I say all that in inverted commas—they thought they could get around the manifesto commitment and pretend that the station was not being subsidised. But it has no long-run basis; it is basically a fixed price for the output, regardless of what markets do. Indeed, over the long life of a nuclear power station, which may be 60 years, my guess is that there probably will not be a wholesale price at the end, because all the other technologies will be zero marginal cost. The CFD was a mistake that should not be repeated; it was done for political reasons, which are there to play their part but are not appropriate here.

What should the state’s role be in the project’s cost of capital and financing? The characteristic of a nuclear power station is that the cost of capital is not everything but almost everything when it comes to the cost. It is a large lump of concrete and materials laid down over a long period that is overwhelmingly capital in character. The difference between a 9% rate of return at Hinkley and a 4% to 5% return, which I have in mind under a regulatory asset base, is not quite half the total costs, but it is a huge proportion of them. If Hinkley was being financed at 4% to 5%, we would be having a completely different discussion about its economics. The cost of capital is central.

The textbook answer to who should bear the risk of the cost of capital is that it should be assigned to those best able to bear it. With a nuclear power station, a huge chunk of the risks are political and regulatory, and private sector management can do very little about them. Another Fukushima may come along, with a downing of tools for nuclear power stations and a rewriting of the regulatory rules, and management can do nothing about that. A huge part of the equity risk is really governmental risk, and it is wrong to assign that to the private sector. In the case of Hinkley, you see the consequences—it is 8% or 9% real for 35 years, which is an enormous amount.
The difference between the state just issuing government bonds and handing the money out and having the regulatory asset base is about the way in which the project will go forward. A regulatory asset base in the water industry, across the piece, has a government guarantee implicit in it, because regulators have a duty to ensure that the water companies can finance their functions. In principle, behind that statute stands the Government, and somebody could take judicial review at some extreme point. The reason private investors demand costs of capital that are very close on debt to the cost of government gilts on regulatory asset bases is that they basically rely on that guarantee.

The state’s standing behind these projects is true of the RAB and government bonds—but here is the distinction. The RAB is administered in the water industry by an independent regulator that adjudicates on the appropriate cost that can be passed to the RAB and the profile by which customers pay those out. If the state is the direct provider, as it was in nationalised industries, the scope for Ministers to decide from time to time how and when costs will be passed through for reasons other than purely project ones is not inconsiderable.

I like the clarity and cleanness of the RAB concept, but it will produce a cost of capital that is much lower. With the RAB model, it may well be private pension funds and others that bring forward the money to put into the project, but they are the people who would have put the money into government bonds anyway, so the distinction between the two is quite limited. You buy an index-linked bond in a regulated utility or buy one from the Government. The difference is a matter of a small amount to the total cost of capital.

That is why I think it would work. It is a cost-pass-through mechanism, and in my RAB model there are different ways of doing that cost pass through that assign different levels of risk to the developers. I prefer milestones: you have to deliver before you get the money; but other people want pure pay as you go, which means you get the money when you spend it. Those are different models, with different allocations of equity risk between the players.

**Lord Burns:** You may recall that I had quite a lot of involvement in the water industry with Welsh Water; we put together a scheme that we funded entirely by debt, largely by overseas bond holders. Under the water model, the regulator does not simply hand out a return on what is spent; it takes a view about what the project should cost and, therefore, overruns are a cost to the business. It is not a straight-through cost.

**Professor Helm:** That is my entire point about the difference in the RAB model, where there are milestones: you get the money when you have delivered certain capital expenditure, on the basis of an efficient delivery, as the water model does every five years, as opposed to just having costs that are passed through. Those are very distinct models, with different sets of incentives.
It is very important to realise that, even if it is a debt-only model, there is still equity risk, which is borne on the one hand by customers but, on the other, by the people who actually do the work—the contractors—bidding their price. They have equity risk; they bid X million pounds to deliver this amount of concrete, which is a fixed-price contract with risks associated with it that their shareholders bear. The cost of that equity capital comes through in the bid price, which goes into the construction. So there are no purely debt-only models; there are different ways of characterising the debt between the different players.

**Lord Layard:** May we come to the current situation? There are obviously doubts about whether Hinkley will be ready. The Government said in response to our report that they will not decide until 2020-21 what to do in the case of delay. What alternative plans should be made, and when, in response to the risks of delay in the nuclear programme?

**Professor Helm:** There are two kinds of risks here to the capacity of the system. One is the problem that nuclear power stations are very large generating plants. For example, if Hinkley turns up on a particular date, it will deliver X% of the total capacity, so, if I am investing through to that period, on that date I know that the market will be supplied by that extra capacity. My problem is that, if I think it is quite likely to happen, I am not going to invest in something else—but, if it does not turn up in time, you have a gap of 7% of total capacity, for example. You have to have stand-by investment to ensure that there is a smooth total capacity in the system in case the thing turns up on time or not.

Secondly, what happens if no more nuclear power stations turn up at all, putting aside whether there is a delay or an advance to the date on which Hinkley arrives? The issue here is not as stark as it is for nuclear, because the other technologies tend to be capable of being delivered faster and more flexibly than nuclear. It is a characteristic of nuclear that it is very inflexible. Nevertheless, there are important issues about supply chains. If, for example, you thought that the gap in capacity that was to be filled by 13 GW of total nuclear was going to be short by, say, 10 GW and if, by any chance, you thought—I am not advocating this—that you wanted to fill all that with offshore wind, that would be a huge expansion of that industry. It would require construction, manufacturing plants, networks and a whole characteristic to the system that would need to be delivered.

We are in a situation where we are not sure whether X is going to happen and we are not sure whether Y is going to happen, so we sit on the fence and think, “Let’s wait and see what happens”. What is certain is that it will be costlier than it would have been otherwise, and the system will struggle to fast-forward to one particular form of technology or another.

**Lord Layard:** Will you elaborate a little on how one would handle that, stage by stage, as the risk became more serious?

**Professor Helm:** In the *Cost of Energy* review, I proposed that we auction the required capacity, and run those auctions in a continuous
form, gradually filling the requirements. That is not to say that we auction today the required capacity in 2030, but we might auction today some of the capacity for 2030 to start building up the blocks to put those things in place. There are many reasons why one might want to do this, but one of them is that it does not require you to choose the technology, other than making the choice about nuclear power, which I think is a government choice to make.

The auctions that I propose are for equivalent firm power—they are for the capacity that you would require, placing on the intermittent technology the costs of the intermittency they cause. Therefore, very importantly, the incentive is on them to try to reduce their intermittency, firm up the capacity and make the security of supply better than it would otherwise have been.

I prefer a market route to doing those things. If you do not want a market route—if you think that government knows best, can pick the technologies and the winners and design an energy system that is better than the outcome of market decisions would have been—the Government have to say, “We’ll have that number of windmills and solar panels, that number of gas stations”, and so on. But again, they still have to get them built, and they will have to auction those to find the most competitive bidders. For the next 50 days or so, under European law, they have to auction them, because they have to pass the procurement requirements under the relevant directives. After that, we do not know.

Lord Tugendhat: May I ask a rather wild-card question about Hinkley? What would happen if the Hinkley decision was being taken now, given that the whole attitude towards Chinese involvement in our affairs is very different from what it was then? Do you think that, in the light of what is happening over Huawei, and the other unease about some Chinese activities that we see manifested particularly in Australia, New Zealand and, indeed, Canada, there is what might be termed an enhanced China risk in Hinkley?

Professor Helm: The first point to make about Chinese involvement in Hinkley is that it was not necessary—it was done because alternative finances dropped away, and the Treasury would not step in and provide the finance instead. You will recall that the project originally started with Centrica as part of the frame within British Energy. If you go back even further, you will remember that the reactor was Franco-German, with Siemens as part of it.

The reason we ended up late in the day with CGN as part of the Hinkley deal was that they were the only people who were bringing money to the table, given that the Treasury had ruled out direct investment—unlike what happened with subsequent plants. A choice could obviously have been made, which was for the state to take that investment. I would rather do the guarantee via a regulatory asset base and therefore have, essentially, the debt markets and so on providing this, instead of the Treasury doing it directly—but it was obvious and straightforward.
Secondly, it was always apparent what China’s strategic interest in Hinkley is and was, which is to develop their own nuclear industry and become a major global player in constructing nuclear power stations. To succeed in that, they wished to build their own nuclear reactor in Britain and get it through British nuclear regulators so that, rightly, they would then be able to say to the world, “Look—some of the toughest nuclear regulators in the world have said that our station is fine, so you should be content to have it too”. So it has always been about Bradwell. Whereas that may well be in China’s interest, we do not have any particular interest in China having a leading world nuclear industry—or perhaps not.

The other issue that you allude to is a security matter. That is not my area of expertise, but it always seemed to me rather odd that, for the sake of some Treasury bonds—given that the customers were going to finance those bonds by £92.50 per megawatt hour, or whatever—the Government would want to bring China into the core of the nuclear industry. There is virtually no military nuclear power in the world that does not have a civil nuclear industry. It is very hard to have Chinese walls—I was going to say—or clear separation between those two things. Why? The expertise in nuclear matters lies in universities, academics, research programmes, handling waste and the ability to handle the little nuclear reactors in nuclear submarines. It is a generic technology, so I find it very hard to imagine how those are going to be separated.

This is not my area of expertise, but we are sending a brand new aircraft carrier into the South China Sea to separate out, with the American navy, the protection of the sea lanes around those islands—and, at the same time, we are saying that, because we cannot raise some government money to invest in a nuclear power station, we would like to have that country at the heart of our nuclear industry. It is not a question that I know the answer to, but if I was on some security or defence commission it is a question that I would be really interested in and, when you find out the answer, I would be delighted to know what it is.

**Lord Tugendhat:** I am very glad that I asked you the question, and I am very interested in your answer. I am not a great expert on China, and you do not claim to be either, but it seems to me that, in the light of what is happening at the moment, epitomised by the Huawei incidents, there is some element of a question mark over China or a risk in this project.

**Professor Helm:** Let me put it slightly differently. If you buy the idea that, if you want to do nuclear, you should do it properly and you need a substantive nuclear programme to make this thing work, the prior question is who you want to do it with. What is the party? We once did it ourselves—we had BNFL. We could have an Anglo-French programme; that is a perfectly coherent programme that we could take forward. We could have an Anglo-Chinese programme, but that is a decision in principle about the programme.

This is a decision by accident of all the other options falling by the wayside and the Treasury not being prepared to step up to the line for
this station, even though it subsequently was prepared to step up to the line. That does not seem to me the right way around to think about something as profound as an industrial programme in nuclear power.

**The Chairman:** I think that you have given a pretty clear answer, Professor Helm.

**Q10 Lord Kerr of Kinlochard:** Do you think we will get an energy White Paper this summer and, if we do, do you think it will follow closely either of your models for power options in your *Cost of Energy* review?

**Professor Helm:** I have no idea what the government business and timetable is. When the Secretary of State made his speech towards the end of last year, he said that there would be a policy paper first, then there would be a White Paper, and then there would be legislation. I do not think that he actually said that there would be legislation, but it was clearly implied. The policy paper was supposed to appear before Christmas, but it has not. Obviously, there are other distractions around.

The White Paper would probably need to appear in the summer if there is to be substantial legislation in 2020, and there are lots of reasons other than nuclear power why an energy Act is needed. There are all sorts of things to tidy up concerning licences, regulatory structures and so on. It is one of those areas of policy where you pile up lots of items, and eventually someone announces that they are going to put a skip outside your drive, and everyone piles everything into it that they want to get into the frame. We are in one of those moments. I have no reason to doubt that there is going to be one, but I do not know.

As for content, lots of different components would go into an energy Act—this pile-up of issues about licences, nuclear and RABs, as well as other powers and duties in respect of Ofgem and other bodies.

In the *Cost of Energy* review, I think I set out a pretty clear framework, designed at its heart to cut away the immense complexity of interventions, one on top of another, that we have constructed. I am sure that you have better things to do than to read the *Cost of Energy* review, but in it you will find three pages listing our current interventions in the energy market. When they got to the bottom of those pages I said, “Stop—we'll just produce that and make the point with it”. There is virtually no official and nobody in the industry who could write down on a piece of paper all the main interventions in this sector. It is a huge mess, which is the cumulative effect of solving problem after problem with a new piece of sticking plaster as you go along.

I have a framework that is designed to let the state decide how much capacity it wants and sort out what level of carbon reductions it wants, but that uses markets and auctions within a system context to produce the most cost-effective ways of delivering those outcomes. The Secretary of State in his speech was kind enough to say that he understood the logic of the argument—and similarly in respect of the carbon-pricing
framework and the system operators, which are all part of the framework. Nothing in the speech says that he rejects any of those components; it was only the legacy cost argument that he effectively threw out.

It is there—and my own personal view is that we will have to get there anyway, because we will have to take powerful system choices and normalise renewables into the energy system. The market will become a capacity market, not an energy market, because nearly all the new technologies are zero marginal cost.

I think that stuff will happen, and at a regional level the licences for distribution, supply and generation are breaking down anyway. In any region, if you want security of supply, do you build a cable, put a little bit of embedded generation in place, do a bit of storage or do some smart demand management stuff? You do not know—the technology is moving so quickly. So, on the idea that you have these silos from the 1980s and 1990s, and you are going to persist with them, that is going to break down anyway.

I rather hope that the Bill will provide a framework to take these things forward, and I think that it possibly can, but I am not—thank goodness—the person making decisions. All I did was to produce a report with advice on how I thought it best to do it. It is, of course, for Ministers to decide if they want to take that up.

Q11 Lord Kerr of Kinlochard: Given what you have been saying to us this afternoon, did you resile a little from what you said in the Cost of Energy review, where you were—as we were in our 2017 report—in favour of an auction with all technologies involved, all competing against each other? From what you were saying today, it sounded a bit as if nuclear was to be taken out of that, because it was a political decision.

Professor Helm: I have always thought that nuclear was separate from this; I have always thought that it was special, different and a political choice, and something that private markets will never do on their own. If you run an auction, what is the auction that you are going to run for a nuclear power station? Will it be for a 60-year contract, which only a nuclear power station can fulfil? It is different, with different time horizons and different timeframes. No private sector company is going to bid into the auctions that I designed the risks associated with it, such as waste, regulation, security and a whole host of related features.

I have always thought that there is a normal energy market in which we normalise the renewables and all the technologies—a deep, liquid market, in which the intermittency is explicitly recognised in the equivalent firm power ratio—and then there is nuclear over here. That is the history of nuclear power in the world. France decided not to use anything other than a state-driven programme, and Japan is effectively the same, even though the companies are privately driven. In the United States, there is pure rate-of-return regulation for nuclear power. You can argue that that is an RAB with perfect costs passed through it, which is effectively what it
is, or a state guarantee. Actually, it has bankrupted lots of companies along the way, even in that rate-of-return framework, which is why you do not see much coming forward by way of nuclear power in America, and America is on a nuclear retreat.

**Lord Kerr of Kinlochard:** One thing that you are clearly frightened of, which might be in the policy paper or White Paper—if they ever appear—is the idea of another review. You keep writing ferociously that we have had enough reviews.

**Professor Helm:** Yes.

**Lord Kerr of Kinlochard:** So that is your position—that the last thing we need is another two years thinking about it all.

I have one last question. We envisaged an independent commission supervising the option process. We were trying to get the Government out of it a bit, partly because of the history of all these strange government interventions that have piled up—the sticking plasters, as you call them. I do not know what your view is on that independent commission approach.

**Professor Helm:** To go back to your point about the review, you always have to be clear about the question to which a review is supposed to be the answer. Most reviews start with Ministers knowing the answer that they want to get to, and it is a process of getting there. The worry with energy is that the purpose of a review is not to make a decision. That may be appropriate in certain circumstances, but, right now, I cannot think of any new facts that anyone is going to discover that will change the appropriate structure of the market. Indeed, the very thrust of my review and my recommendations is that it does not depend on precise facts. If you think that some fact was going to come along that would lead you to design the market differently, my response would be that you do not understand what markets are for. Markets are there because we are uncertain. We do not know what the opportunities are, and government certainly does not know better than the market; government is always vulnerable to capture and lobbying.

On the issue of the commission, and so on, I propose that we have system operators. We have a system operator for the national grid that currently runs the auctions, but these system operators should be in the public, not the private, sector, in my world, because they are taking decisions about the objectives and requirements of the system such as security of supply, carbon requirements, and so on. But then they auction them.

Whether you call them an agency or a special body, I would like to have regional system operators auctioning for the regions, as well as a national system operator. They would take over most of the functions of Ofgem. Indeed, in my review I propose that Ofgem be abolished, just as I think that, if you put catchment system operators in place, Ofwat could be abolished. We have created these huge artefacts of regulation, but
actually all we want to achieve is security of supply and the carbon targets at the lowest cost. That is what we are about—and we want to do it in a context in which there is rapid and massive technical change, so the traditional silos break down.

The problem with the commission—my system operator is in the public sector, too—is that it tends to be easier to capture than a clearly defined system operator with clear powers, duties and responsibilities. Indeed, I would argue that Ofgem has been harder to capture than a commission would have been. The precise detail of the institution is slightly less important than the precise remit of what you want in statute to tell those bodies to do. But I do not think that is a private sector matter.

Q12  The Chairman: What about accountability for security of supply? Does there not have to be some ministerial accountability?

Dieter Helm: We can make this immensely complicated or remarkably simple.

The Chairman: Let us keep it simple.

Dieter Helm: So what we need is a capacity margin, which means that we are always going to have excess supply in our energy system. We do not want the mean expected demand to equal the mean expected supply, because the cup final might produce a result that means that everyone goes and turns everything on suddenly and we have a blackout. We always want the comfort insurance—on our roads, railways and water systems.

No rational capitalist will ever produce excess supply in a market, which is why you have to have a capacity requirement. The question is: how much should that be? I would say that there is no right answer; you can have any economic model you like to come up with some sophisticated estimate that it is 8.672 of whatever it is. The answer is that you do not know whether there is going to be a recession around the corner or a boom. You do not know whether one of the nuclear power stations is going to fall over—so you just want a comfortable margin.

The economics of this are that the costs of not having enough capacity are vastly greater than the costs of having a bit too much. We do not complain about the fact that the roads are empty for quite a lot of the night; we complain that they are too congested when we want them.

That needs to be set—under the CEGB the Government set it, and the Government can set it right now. They can say, “This is our formal guidance. We Ministers decide and endorse that this is the requirement. You, as the system operator, go off and auction it. Your job is to let sufficient contracts to make sure that, within reason, we hit this target”. That is it. So the Minister is responsible for the total amount and the system operator is responsible for the auctions.

Of course, the system operator will worry about the following: what happens if I contract a wind farm? A wind farm improves security of
supply—you are better off with it than without—but the wind might not
blow, so you have to over-contract to meet any security of supply
requirement if you are bringing in intermittent power. That is fine—you
do that—but it is a technical exercise, and the national grid does it very
well at the moment. It is just that, at least in perception terms, there is a
potential conflict of interest, because it has grid assets, and where the
power stations are and how many there are could influence the potential
stranding of assets in the system. That is why I want it separated.

Lord Layard: I am not sure that I have completely understood how
competition works in the capacity market. Whoever is the supplier is paid
according to the RAB method, in some form or other. Then there is a
competition to become a supplier, which says how much energy it could
supply, how much carbon dioxide it would produce and so on. Is there a
price element in that competition? Does that price relate to the basis on
which they are going to be paid, according to the RAB?

Dieter Helm: Yes. There is no RAB in the capacity market. There is an
implicit contract, which pays you for having the capacity available. You
come forward and the system says that we need 10 GW, 5 GW or
whatever it is. There is an auction, and you bid to provide it. If you win a
contract at the clearing price, you get paid to deliver that capacity at
future points in time. If you are an intermittent supplier, you might say,
“Look, I cannot guarantee that I am going to provide all that, because I
might be intermittent, so you can derate my offer and give me less for
the available capacity to take into account the intermittency”. If I have an
intermittent wind farm, I then have a massive incentive to go and find a
storage supplier, or a set of customers who will have their supply
interrupted, to render that intermittency firmer and more certain,
because effectively I can guarantee that that power will provide the
system.

It is just a contract to provide power at a point in time. Of course, you
want to have some security about what happens if you do not—so you
have penal prices, whereby you have to make up the difference, you
have bonds, or you have overcapacity within the framework. But that is
for the system operator to manage, and it has always been true. You bid
your nuclear power station, or your AGR, and something goes wrong with
it—it falls over; things happen. So, the system operator has to have
contingencies in place, some of which will be additional short-term
capacity contracts, while some will be more flexible contracts and some
long term. That is for it to decide.

Lord Layard: Suppose that there are two competitors with identical
technology and capacity, and which are, in every technical respect,
offering the same thing. What is the difference in what they are offering?
Is it the rate of return that they are demanding?

Dieter Helm: It is price per unit of capacity—full stop.

Lord Layard: And then they get paid quite differently.
**Dieter Helm:** They get paid for having that capacity available.

**Lord Layard:** That is quite separate from how they are paid subsequently for their costs. They are covered by the RAB formula.

**Dieter Helm:** No, there is no RAB in this at all. They are just paid for having the capacity available at a point in time, which they contract to do. They can also earn money by selling the energy, so they get paid at the wholesale price. When you make a bid, you will have to take a view on whether you think the wholesale price is going to go up or down, and you will bid the net of those two for the unit price of the capacity available.

**Lord Layard:** You were saying that the wholesale price was not going to be the issue. I thought that you were advocating the RAB approach.

**Dieter Helm:** No—I did not even advocate that. I suggested that, if you are going to do nuclear power, the RAB model is one that should be sensibly considered, and I wrote a paper setting out how to do it.

**Lord Layard:** Oh, I see—for the nuclear, not for everybody else.

**Dieter Helm:** Not for anything else.

**Lord Layard:** I see—sorry.

**Q14 Lord Turnbull:** As I understand it, under the present offshore wind contract, people negotiate a price for the electricity that they supply—let us call it £100 per kilowatt hour. You are saying that they will bear the cost of intermittency, and provide for it themselves. In that case, they might have to bid £140 per kilowatt hour, because providing the protection against intermittency might cost them X amount. What do you think that X might be, compared with the price that they get under the present contract for what they supply and what they would have to bid if they were internalising the cost of intermittency?

**Dieter Helm:** We need to separate two things. When a generator comes to an electricity system, intermittent or not, they provide two things to the system. First, they provide the electricity that they generate, which has a price and goes through the wholesale market. They also provide the capacity insurance that, when you turn the switch, the lights will go on. The energy world at the moment is almost entirely about delivered energy. The world that we are going to with zero marginal cost is like broadband. You do not buy units of broadband—you buy a capacity contract. Wind farms, solar panels and so on are based on capacity, with zero marginal costs.

What we have is a hybrid whereby we know the energy market will not provide enough revenue to provide a capacity margin that is an excess margin—over and above the mean expected demand. So we have to pay for two things: we have to reward people for having that capacity available and we pay for the energy.
My proposal in the *Cost of Energy* review is for an equivalent firm power auction, which very much has in mind moving towards a world where most of the economic rents and returns to investors will come from having capacity available and very little will come from energy. That is why I think that the wholesale price of energy will very gradually wither away.

In the existing framework, which we set up for wind farms, solar panels, biomass and nuclear, we are paying them only for energy, not for capacity. The CFD is basically a way of saying, “We’ll pay you a fixed price, and, by the way, we think that will be lower than the price that the market will actually produce”. That is wrong, but that was what they thought.

If you ask me what an intermittent wind generator or solar panel should receive, my answer is, in the capacity market, they should receive a payment that represents the additional security that they provide to the system by existing as opposed to not existing. That depends on the portfolio of all the other stations on the system, just as if you buy a share in a particular company you do not look at the risk of that share—you look at the risk relative to the portfolio. One wind farm in a world where everything else is gas is a completely different security issue from one where there are lots of wind farms and very few gas stations, for example.

What you are trying to do is to work out how much you should derate its capacity relative to a guarantee of firm power. That is why it is not a firm power auction; it is an equivalent firm power auction. That already happens because national grid effectively derates all the renewables. They are paid in the existing subsidy world, and then the capacity market is what is left after you have subsidised those players.

**Lord Turnbull:** That is going to change the relative competitiveness of nuclear power, which has very little difficulty in providing capacity—because it is basically all capacity—as opposed to wind farms, which have quite a large requirement that is currently not being paid for or does not come into the calculation of the relative prices. So it will narrow the gap in favour of nuclear power as against renewables, given the way in which we currently fund renewables.

**Dieter Helm:** To unpack that—because there is an extraordinarily important point here—nuclear power offers firm power; it is base load, which is why in the past people have built base load coal and nuclear stations. Wind is not base load. Every time I read in the paper, when some journalist has copied out the press release from whoever the developer is, that the relative price of nuclear is, say, £75 in the case of the Welsh plant, or £92.50, and around £50 in the case of wind, that is comparing apples and pears, not apples and apples. The real question is what the equivalent firm power value is of those two different sets of plants. It is not around £50 to build a wind farm, as the system cost of the wind farm—it is all the other components, such as the back-up and support.
Lord Turnbull: Do you want to put a figure on that?

Dieter Helm: No—it is not known. What is more, the other reason I do not want to give a figure is that, if I knew the answer, I would not propose an equivalent firm power auction. The whole point of having a market is that I do not know the answer to your question, and neither does anybody else. That is the problem for the Government when they want to pick particular technologies, which is why a policy of picking winners is too often a policy of losers picking Governments. They are very good at it, and there is a long history of it. I am not saying that with respect to any existing technology.

If you know the answers to these questions, and you can find any number of experts who will tell you exactly the cost of each technology, who will build you a supply curve and say that you want so many wind farms, solar panels and gas stations—they know the answer; you do not need any markets. This has been repeatedly demonstrated to be a very dangerous and pernicious path to go down in energy policy. We have picked lots of losers in the past.

Wind farm and other renewables technology costs are falling extremely quickly. The scale of technological progress on the demand side and storage is fantastically fast and, whatever the answer is today, it will be different tomorrow. None of this demonstrates that nuclear is economic, but what is not valid is simply to say this number is £52, that is £75—tick; this is cheaper than that. That is not a proper way in which to do the calculation. You need markets to sort it out and auctions to find out what the relative costs really are.

Q15 Baroness Bowles of Berkhamsted: I have two questions. First, if you have an intermittent supply that is bidding, and within that bid there are the back-up costs and the arrangements that they would need, how do you check that they are not cheating? They may say, “Oh, we’ve got all these customers prepared to be switched off”.

Dieter Helm: But they are liable for delivering the capacity once they get paid in the auction. It is their liability. For example, say that I am an intermittent solar bidder. I know that I cannot generate any electricity at night, but I have a deal with a battery storage firm or someone else who says that they can do this. I say that I can guarantee to provide a continuous load to the following level; if I then do not deliver it because the battery does not work, I am liable for the consequence. That is the question where, in any of these auctions, you need to sort out the rules for the liability. We have that for travel firms, which have to bring people back from a holiday if they break down; there are ABTA bonds.

Baroness Bowles of Berkhamsted: Yes, but it is not quite the same with energy. If there is none about, you cannot just suddenly create it.

Dieter Helm: Absolutely. As I said earlier, things happen in energy. If tomorrow morning someone found a generic fault in the AGRs and they all had to close for safety reasons for the next six months, there would be
a real problem. That is why in the capacity margin that you put in place you have a contingency; you want to be on the safe side of that frame. If like France you have 80% PWR nuclear stations, what happens if there is a generic fault in the nuclear reactors and the whole lot goes offline? That is a huge security risk. Again, how diverse your system is will affect how much security capacity margin you need, and it is the system operators’ duty to ensure that that is in place. We would rather that they overdid it than underdid it, because the asymmetry is that not enough power is really bad news, whereas too much is a bit expensive.

Remember that in a digital economy the value of security of supply is rising all the time in electricity. If you think about the economy in 10, 15 or 20 years’ time, almost everything will be dependent on digital technologies, which are almost entirely electric. If you go to a bank and say that there may be an interruption of supply, you will find that they will be fitting their own generators. Indeed, many of them do, because they cannot take that risk.

That is part of the frame. It is an occupational hazard of the electricity industry that stuff happens. It is a requirement of a proper energy policy to make sure that you have taken out insurance.

**Baroness Bowles of Berkhamsted:** One thing we have not mentioned is small nuclear reactors. Where would they go? I know that you may not be a fan of them but, if some technology for that develops, would they be in with the government yes/no to nuclear in your scheme of things, or would they bid in the contracts among the renewables and others?

**Dieter Helm:** I am not in favour of or against any technology. My whole approach is to let the market make these determinations. But, as I say in the *Cost of Energy* review, the market will not sort out R&D; there are R&D choices that the Government have to make and, among those choices, it is inevitable that they have to take some views about technology. We have a considerable head of steam behind the idea that we should build smaller reactors. There is nothing new about smaller reactors; submarines have nuclear reactors in them, and Russia is building eight nuclear-powered ships as icebreakers for the melting Arctic.

There are plenty of small reactors around. The question is whether we can design them in a way whereby the costs are significantly lower. The jury is out. I have no idea, except to say that there are huge economies of scale within a reactor, and the history of nuclear reactors has been the drive to bigger and bigger reactors to drive unit costs down; that is part of the physics of these things.

On the other hand, it is argued that you can mass-produce small reactors on a manufacturing production basis. If that is true, you also have to make sure that you have demand for them. I mentioned to a previous Minister that I was looking forward to the proposal to have a small modular reactor in Oxford and one in Cambridge, and asked him whether he would like to come to the student demonstrations to deal with it. The
prerequisite is whether you think you will sell 150 or 200 reactor sites when you cannot even put waste incinerators up under planning rules. If you do not think that you have the demand, you are not going to get the bulk supply and manufacturing economies, and the economics may then not stack up.

You have to be very careful to distinguish between small modular reactors, because some of them are just little PWRs; those are the most common ones out there. The economics of that are difficult, because the big PWRs have inherent economies of scale. Other people propose quite different reactors based on much safer systems, and so on.

It is about public acceptability, whether you can have bulk manufacture and the costs. Why would you not do some R&D on this stuff? If they turn out to be really small and can be rolled out on a continuous basis, we can move away from the idea that nuclear is very special, drop it into the energy mix, think about it, and eventually it can come into the equivalent firm power auctions, alongside wind farms and all the other technologies.

**The Chairman:** I am conscious of time, and we have a couple more questions. You touched earlier on legacy issues, and I think that Lord Tugendhat has a question on that.

Q16 **Lord Tugendhat:** The only question left is on the extent to which you feel that the likelihood of future technological advances warrants reducing the required pace of emissions reductions in the supply of electricity.

**Dieter Helm:** My take on that is that I do not understand why you would do that. One reason technology is coming through so fast is that the emissions constraints are in place. The idea that you would relax the emissions path is really to say that you will just burn a lot more gas.

In the *Cost of Energy* review, I make it absolutely clear that the climate change committee did not properly consider the weighting between different sectors of the economy as to who should bear the emissions paths. I make two points in that review. The first is that it assumed a linear path of emissions reduction from now to 2050, which is odd, as you would think that the technologies are forthcoming. The second is that the committee leaves out agriculture, for example, almost entirely, yet the economic value of the production of agriculture is 0.7% of GDP, of which £3 billion is direct subsidies. Then there is red diesel and exemption from business rates—huge additional subsidies, so that the net economic value of the output of agriculture, which might be affected by doing things to reduce emissions, is very small. I would have spread this much more generally. To be fair, the climate change committee is now extending those frames.

The path is as the path in the Climate Change Act. It is a carbon production target and not a carbon consumption target, which in my view is a major flaw. But, given the Climate Change Act, if you want to spur technology along, screw down the ratchet of the emissions and that will enhance people’s willingness to invest in those areas.
**Q17**

**The Chairman:** On the legacy point, the Secretary of State said that recent progress in reducing the cost of renewables would be at risk if your auction system was introduced. Discuss.

**Dieter Helm:** I am deeply puzzled by that.

**The Chairman:** So am I.

**Dieter Helm:** If we think of the economics of—and let me stray into the politics of—decarbonisation, as we get rapid technological change, as the cost of renewables is falling very sharply, as digitalisation takes place on the demand side, as battery storage and so on comes forwards, the price of energy ought to be falling. In any rational market, you would reduce the price, reflecting the costs of the large investment coming forward. What we have is the price of energy going up, in significant measure because of the legacy costs of the earlier generations or vintages of this technology. When the recent price increase was announced, I was amazed at how little attention was paid to how much bills were going up in this round because of extra legacy costs. We will face that for another seven or eight years if Hinkley is not built; if Hinkley is built, the policy and legacy costs will continue increasing customers’ bills right through to 2030.

In a world where we have quite a lot of popular reaction against the costs of energy and against some of the climate change measures, not least in France at the moment, but generally across Europe and elsewhere, the idea that you should increase the price when the costs are falling is—to look to an economist on my left—a very odd thing to do. The legacy costs are like the bank costs; they should be in a legacy bank and should be socialised. We should get to a clean price of energy that is falling through time, whereby people can see the benefits that come from lower carbon technologies. Bygones are bygones—we cannot escape those costs, but they should be socialised.

I could not recommend that in the *Cost of Energy* review, because I was not allowed to make recommendations through the terms of reference on matters in respect of public expenditure. Perfectly properly and rightly, that restriction was there; but now that I have finished the review, I can tell you that that is what I think should have happened.

**The Chairman:** Thank you very much. You have been very clear and quite entertaining, actually. Do you fancy being the Energy Minister?

**Dieter Helm:** No. There is a huge difference between being an adviser and coming forward with ideas, and having the responsibility actually to decide. All that I have done is to try to bring forward some advice—full stop.

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