



Select Committee on Economic Affairs

Corrected oral evidence: The Economics of UK Energy Policy

Tuesday 29 November 2016

3.35 pm

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Members present: Lord Hollick (Chairman); Lord Burns; Lord Forsyth of Drumlean; Lord Kerr of Kinlochard; Lord Lamont of Lerwick; Lord Layard; Lord Sharkey; Lord Turnbull; Baroness Wheatcroft.

Evidence Session No. 9

Heard in Public

Questions 144 - 157

Witnesses

I: Mr Ashley Ibbett, Director of Clean Electricity, Department for Business, Energy and Industrial Strategy; Mr Dan Monzani, Head of Energy Security, Department for Business, Energy and Industrial Strategy; Ms Paro Konar-Thakkar, Head of Energy Economics and Analysis, Department for Business, Energy and Industrial Strategy.

Examination of witnesses

Mr Ashley Ibbett, Mr Dan Monzani and Ms Paro Konar-Thakkar.

Q144 The Chairman: Lady and gentlemen, welcome to the Economic Affairs Committee. As you know, we have been taking evidence on UK energy policy. We are very much looking forward to your contribution this afternoon. Your boss is giving evidence next week. Not that this session is in any way a warm-up act, but I am sure it will be very helpful in informing the direction of questions that we will raise next week. One issue that we have been struggling with is working out the pricing, how it is made up and what it includes, in particular the amounts included to reflect low-carbon policies and for accessing the grid. How is all that made up? How does it compare with prices in other countries? Frankly, we have struggled to get a clear answer on that, so this is an opportunity for you to help us navigate through the fog and get to a clear answer on what proportion of bills, not only domestic but for business, is accounted for by low-carbon policies. Lord Turner in evidence gave us an estimate of how that might evolve over the next two decades or so. It would be helpful if you could share with us the department's thinking on those issues. Who would like to respond?

Paro Konar-Thakkar: I would like to respond to that, if I may. According to the latest estimates published by Ofgem, the proportion of a dual-fuel household energy bill made up by low-carbon policies is approximately 7%, which is about £51 on dual-fuel bills. For business bills, it is slightly more complicated, because it depends on the size of the business, but it ranges from between 5% and 25%. Over the next decade, we expect the costs of low-carbon policies as encapsulated by the levy control framework to be approximately 11% of a dual-fuel bill, which is approximately £110. However, I would like to make two additional points. A substantial proportion of an energy bill is covered by wholesale costs. Those are the costs that energy suppliers are faced with when they buy wholesale energy from the wholesale energy markets. That is approximately 40% to 50% of bills. The proportion represented by low-carbon policies should be viewed in relation to that.

Low-carbon policies as encapsulated by the levy control framework are not the only element of energy and climate policies. Such policies are made up of a whole suite of measures, including on energy efficiency. Energy and climate policies have an impact on price, as I have just put forward to you, and on consumption. Energy and climate policies such as energy efficiency policies that impact on consumption would have a net effect on reducing the amount of energy consumed. That would lead to a reduction in bills to approximately £38.

The Chairman: Has this information been gathered by Ofgem, or is it your own department's assessments?

Paro Konar-Thakkar: It is a combination of both: information published by Ofgem as well as our own assessment, which was published by the NAO in November last year.

The Chairman: Do you update these figures annually to show the impact of low-carbon policies, and exactly how it is built up from the wholesale price so that policies on all these matters are transparent to the consumer?

Paro Konar-Thakkar: For any policy update that we make, we put alongside it an impact assessment that presents the costs and the benefits to the UK as a whole. In those impact assessments, we present an updated estimate of the cost of the particular policy on consumer and business bills.

The Chairman: How reliable have your forecasts proved to be based on those impact assessments? I ask that because we have heard from a number of users, particularly energy-intensive users, that the proportion of their bills resulting from low-carbon policies was almost double the estimates made by the Committee on Climate Change.

Paro Konar-Thakkar: Forecasts by their very nature incorporate a certain degree of uncertainty. We try to present that uncertainty by considering a wide range of assumptions—they could be on underlying fossil fuel prices, because, as you note, they continue to be quite volatile—as well as by providing an underlying sensitivity analysis on a wide range of individual policy costs. As a result of presenting this uncertainty, we are able to capture volatility.

The Chairman: I entirely accept your point about the difficulty of forecasting. However, do you recognise the assertion that the cost of low-carbon policies is almost double the estimates made by the Committee on Climate Change? Would you expect that to be within the range of acceptability for forecasting?

Paro Konar-Thakkar: I will start and perhaps my colleagues will want to jump in here. Forecasts of fossil fuel prices have moved quite significantly during the past few years. There have been a lot of changes, where gas prices have fallen considerably, as a result of which forecasting is quite difficult right now. However, because of the range that we present of high, medium and low, we should be able to capture the uncertainty effectively.

The Chairman: Have you done so? If you look back three, four, five years, have the forecasts been within that range of acceptability? Presumably you publish at the outset.

Paro Konar-Thakkar: We publish our fossil fuel prices annually, and we publish our annual projections of energy.

The Chairman: Do you do what the OBR does and show a fan?

Paro Konar-Thakkar: Yes.

The Chairman: Have they been within the range of that fan?

Paro Konar-Thakkar: I would stress that the uncertainty of fossil fuel prices can be quite key. Over time, broadly, we have managed to be reasonably close to the range that we put out.

Ashley Ibbett: Certainly we subject all our fossil fuel price estimates and forecasts to peer review, and we compare them with what other forecasters are saying in the market. The forecasts that we have come up with are consistent with the forecasts of the vast majority of people who make such forecasts.

Paro Konar-Thakkar: For the recent set of fossil fuel prices, they have also been verified by an independent expert panel.

Q145 **The Chairman:** Let me come to the next point, which is about the comparison between prices here and prices in other countries. I am thinking particularly of industrial energy prices. It is clear from the information that we have received that we are very much at the higher end of cost. Does that surprise you? Is that consistent with the aims of government policy, or has that happened under its own steam—if I can mix metaphors?

Ashley Ibbett: There is a difference between the electricity prices that energy-intensive industries face in the UK and gas prices. Gas prices in the UK are among the lowest in the European Union, whilst our electricity prices, according to the data, are the highest in the EU. As you are aware, we run a number of compensation schemes for certain energy-intensive users to compensate them for the costs of the EU ETS, carbon price support, the cost of the renewables obligation and the feed-in tariff.

The Chairman: We are seeing a lot of energy-intensive users going abroad, so is the compensation generous enough?

Ashley Ibbett: The evidence base for whether it is energy prices that are driving locational decisions by energy-intensive industries is not very well developed. They take a range of considerations into account: labour-market costs, quality of life and so on. We know that certain energy-intensive industries whose energy costs are a particularly high proportion of their costs say that they suffer a competitive disadvantage in the UK compared with other countries. That is indeed one reason why we have introduced these compensation schemes.

The Chairman: Finally, when wholesale energy prices move up or down significantly—more, possibly, than the amount you anticipated when you constructed the original pricing design to pay for some kind of climate change intervention—can you change that retrospectively, or midstream, because presumably the pricing architecture is set for a number of years? If the facts change quite significantly, as they have with the price of oil or gas or whatever, do you have the power to change that to get some equilibrium so that the overall price to the heavy-energy user, the consumer, remains competitive?

Ashley Ibbett: The schemes that we run for compensation in the case of the renewables obligation and the feed-in tariff look at the historical

energy use of the companies involved, and the compensation is based on that methodology. One thing that we consulted on is the renewables obligation and feed-in tariff moving to exemption from those costs rather than to compensation. In that case, as energy prices and the cost of the low-carbon policy moved, the exemption would be applied directly to the bill. There would be a translation on to the energy user.

The Chairman: So you think you have enough flexibility to take account of significant changes in energy costs?

Dan Monzani: To some extent your example highlights the natural buffers in this anyway. One reason why you might show a growth in the proportion of some bills over a period of time is because the wholesale price has fallen and therefore obviously makes itself a much smaller proportion of the bill. As a fraction, you will find that the fixed cost of low-carbon energy is slightly higher. That is particularly the case where you are generating power at a fixed price; the bit that counts as the top-up will obviously be higher in periods when the wholesale price is low, and the top-up will be much lower in periods when the wholesale price has risen.

Lord Forsyth of Drumlean: I am struggling with this. Leaving forecasting aside, witnesses to the Committee made the point that the proportion of their bills that resulted from low-carbon policies was almost double the estimates that have been made by the Committee on Climate Change. I understand the point about variation. The Committee on Climate Change said that the proportion of the bills that resulted from low-carbon policies was 26% for commercial users and 22% for industrial users. Jeremy Nicholson from the Energy Intensive Users Group suggested, however, that the proportion was closer to 40% for industrial users. He based that on the wholesale price of £50 per megawatt hour, the combined cost of renewables subsidies of around £20 per megawatt hour, and the carbon price floor of around £13 per megawatt hour—so £33 out of the £83 relates to low-carbon policies. Who is right about this?

Paro Konar-Thakkar: There is a wide range of business users.

Lord Forsyth of Drumlean: You have already said all this. These are numbers, and they are saying, "This is our actual experience". Is that right?

Dan Monzani: I do not think that we recognise these numbers.

Lord Forsyth of Drumlean: Are they correct?

Dan Monzani: We would need to check them. The point about fractions of bills that we are trying to get across is that, yes, we certainly have some error, some variation, in our forecasting—

Lord Forsyth of Drumlean: This is not a forecast. As I understand it, these are the actual costs, and they are saying, "We are paying twice as much effectively as the climate change committee is saying that we are paying".

Dan Monzani: Proportionately to their bill, because over that period there will also be some falls in gas prices.

Lord Forsyth of Drumlean: Right. So who is right?

Paro Konar-Thakkar: As Mr Monzani said, we would like to take these numbers away and explore them further. The other important point I would like to stress is that there are a lot of climate policies that lead to a reduction in consumption, and I am not sure that these numbers capture the reduction in consumption.

Lord Forsyth of Drumlean: But that is like me saying that if I charge you twice as much for a bottle of whisky you will drink a lot less of it and therefore it is not a problem.

Paro Konar-Thakkar: What you are describing is a price elasticity of demand. However, this is more in relation to measures that are targeted directly at reducing consumption by consumers as well as by the energy-intensive sectors.

Lord Forsyth of Drumlean: Yes, but the net effect is that their bills and their costs of production are higher.

Paro Konar-Thakkar: Energy-efficiency policies tend to reduce the cost of climate policies and bills.

Lord Forsyth of Drumlean: The Chairman mentioned that we seem to have very high industrial energy prices. I thought that you were going to say, "Well, actually, so does Germany". Germany has a very high industrial electricity price, but it gets almost 100% exemptions on renewables costs and a discount of between 80% and 85% on transmission and network costs. Are our people not at a great competitive disadvantage?

Ashley Ibbett: We are compensating certain energy-intensive industries for the costs of EU ETS carbon price support. We are also compensating them for the cost of their renewables obligation and the feed-in tariff. I have heard that network costs are exempted for certain energy-intensive industries in Germany; we do not do that here in the UK.

Lord Forsyth of Drumlean: Right. Can you explain how the compensation schemes for industrial users operate, who is eligible and to what extent that compensation mitigates low-carbon policy costs? The Energy Intensive Users Group said that there was partial compensation for a number of energy-intensive sectors but not all. On the face of it, if you compare what we are doing with what other people with high electricity costs in Europe are doing, you see that our people are at a disadvantage. It would seem that, as a result, energy-intensive industries are leaving us.

Ashley Ibbett: I can talk about the two schemes that we have in operation at the moment. We have also said that we will exempt energy-intensive industries from the costs of contracts for difference. No

contracts for difference of any substance are being paid at the moment; they will deliver in the second half of this Parliament. We will bring forward the appropriate legislation to enable that scheme to be put in place in due course.

Turning to the other compensation schemes, there are two separate schemes. There is a scheme that exempts companies from the cost of the carbon price support mechanism in the EU Emissions Trading Scheme. There is a second scheme that compensates businesses for the costs of the renewables obligation and the feed-in tariff. The two schemes have slightly different coverage. That coverage is determined on one level by the list of eligible sectors, which is drawn up by the European Commission and set out as part of the state aid guidelines. The list of sectors for compensation for the ETS and carbon price support is different from the list of sectors for compensation for the renewables obligation and the feed-in tariff as a consequence of the differences in the list of eligible sectors set at the European level. To be eligible for compensation for carbon price support under ETS, first, you need to be within one of the eligible codes—the NACE codes, which are a statistical classification; secondly, you must pass a 5% filter test whereby you have to show that your indirect carbon cost in 2020 will amount to 5% of your gross value added. It is defined as earnings before interest, taxes, depreciation and amortisation, and staff costs including employer's pension and national insurance contributions. In line with European Commission guidance, we pay a maximum of 85% of those costs under the compensation scheme. So far, we have paid around £220 million.

Lord Forsyth of Drumlean: So it is really quite straightforward.

Q146 **Lord Turnbull:** Can I come back to this 7% increase? I have a chart here given to us by our staff. The source is the Committee on Climate Change from December 2014. It sets out average gas and electricity prices—let us deal just with the electricity prices. In a bar graph displaying pence per kilowatt hour, the red area represents wholesale, transmission, distribution and metering. There is then a whole series of things, which I will leave out. The wholesale bit is 12p, and all the other things take it up to about 14.5p. That is a 21% surcharge on the price rather than your 7%. When you calculate the 7%, what is the counterfactual? If you are saying, "This is paying 7% over the wholesale price", are you including the fact that we have chased out of the system large amounts of very cheap coal generation? Therefore, are you comparing it with what we would otherwise do if we had no climate change ambition, or are you comparing it with the price that has emerged given the amount of change we have already brought into effect already? I would say that forgoing coal is one of the costs of the policy. Is that in these numbers?

Dan Monzani: To some extent it is in the numbers in the sense—I am talking not specifically about coal—that these are proportions of the dual-fuel bill, so if the wholesale price falls, as we were just discussing, it means that the other numbers look proportionately bigger. By deploying low carbon, which is generally high capital costs and low marginal costs,

it means that the wholesale price is lower. That proportion of the bill shrinks a little bit, just as you are adding something to pay off the infrastructure cost of building.

Lord Turnbull: The wholesale price is surely higher than it would otherwise have been had we not withdrawn coal generation.

Dan Monzani: That depends. Generally speaking, coal, if you do not account for its carbon costs, is cheaper than some other forms of generation. If you incorporate its carbon costs, which we should do if we are going to be serious about our carbon—

Lord Turnbull: What we are trying to calculate here is—

Lord Lamont of Lerwick: The low-carbon cost.

Lord Turnbull: We are trying to calculate what we are paying for the policy as a whole and whether it is worth it given all the other objectives that we have. I contend that the baseline should be: what would happen if we had a free market that did not have all the various decarbonisation policies? You could then add all the bits, which would include the early closure of a large amount of coal, as part of the cost of the policy. I do not think that is 7%; I think that it is a much higher number.

Ashley Ibbett: I think that Ms Konar-Thakkar will talk a bit about how we derive the counterfactual. The challenge for us is that we have a legally binding decarbonisation target for 2050. That is, in a way, a given. We look at how we can minimise the burden and cost to the consumer and to business of achieving that 2050 objective and commitment. That is how we build our policy framework. The closure of coal is a function of the age of plant—most coal plant was built several decades ago and has come to the end of its natural life—as well as the more challenging economics of coal generation because of moves in coal and gas prices. A combination of factors is leading to coal coming off the system. We could not envisage a world, even absent our climate policies, where the existing fleet of coal-fired power stations would continue for ever.

Q147 **Lord Sharkey:** In evidence to the Committee, Dieter Helm remarked that wholesale prices had fallen 35% since Ed Miliband announced that he would freeze energy prices. Retail electricity prices have gone down not one iota since that massive cost fall. Why is that? Why have domestic energy bills not fallen in line with wholesale prices in the past few years? In fact, how strong is the relationship? What is the relationship between wholesale prices and retail prices?

Dan Monzani: You are certainly right that you would expect some correlation. About half of the bill is from wholesale costs, and if there are sustained changes in those prices, we tend to see them passing through. I have some numbers here comparing this summer with last summer, for example, and the two winters. Between June 2015 and June 2016, gas fell 21% and electricity 10%, but between the two winters—between October 2015 and October 2016—gas rose by 8% and electricity 40%. Over that combined period, we saw falls in the residential retail prices of

about 7% on gas, and it was roughly static on electricity. So, as you can see, it is not a simple relationship; there was a movement up and a movement down, and a more gradual decline, particularly on the gas side, for residential retail.

There are two reasons for that, notwithstanding a long-term linkage between wholesale and retail prices, which is because not all the bill is variable. First, suppliers will generally hedge their exposure to wholesale costs, be that six, 12 or 18 months in advance. The forward price last year for this winter, for example, was somewhat lower than some of the spot prices have been this winter, so someone who locked in a proportion of their consumers' wholesale costs 12 months ago would now continue to offer the consumer a lower price than if they had bought it in the spot market this winter. Consumers get some softening in both directions because of that hedging.

The second reason is that quite a large proportion of the bill is fixed costs, as we have just discussed. For example, fixed costs of networks account for 25% or so of the dual-fuel bill. Those are very long-term assets that are amortised over more than 40 years, and obviously those do not fluctuate with wholesale prices. That again dampens the relationship between the wholesale price movement that you described and the retail markets.

Similarly, we might see some of those fixed prices coming through as the changing technology mix comes through. Again, we talked about low carbon having high fixed costs and a lower marginal cost, which is less exposed to wholesale prices. You also tend to see that weakening relationship over time.

Lord Sharkey: I make two points in response to that. First, having a situation in which there is volatility, at the very least, in consumer prices, which is hard to explain to people who are paying the bill, when they see that wholesale prices are falling, does not seem a very satisfactory outcome in the provision of a stable and reasonably affordable supply. If the importance of the wholesale price is declining, what implications does that have in future for consumers and for people who want to invest in energy systems?

Dan Monzani: Retail prices are much less volatile than the wholesale market.

Lord Sharkey: That is the point of my question.

Dan Monzani: However, you could look at that two ways. Some consumers will certainly value that stability in pricing. Equally, it may well be useful for the system to give clearer signals to consumers of different times when it is most expensive to use power. We and Ofgem are looking at a number of things in that space that might allow some of those signals to be communicated a bit better. For example, half-hourly metering is something that consumers do not have at the moment. In fact, it is only just coming in to the commercial and industrial sectors.

That would allow consumers to realise that it is cheaper to run your washing machine at midnight than it is at seven o'clock in the evening. That is something that we would want to think about as we roll out smart meters and we have appliances that can communicate with the grid and understand those kinds of signals and be able to respond according to the customer's pre-set preferences about time of use versus cost. You are absolutely right to draw out the fact that there is some value on both sides in a degree of stability for consumers, and we are looking at ways in which we can put some of those signals into the system as the system gets smarter.

Lord Sharkey: We can return in a while to the issue of consumer behaviour as characterised by Ofgem and the CMA and discuss whether proposals to launch websites and smart meters will actually be taken up. We can talk about the success in banks in persuading people to switch accounts on the same basis.

My final question is: did the Government anticipate the fall in energy prices in the last two years? The reason for asking the question, of course, is that it would be nice to know whether a government policy has been based on an assumption of a steady rise in both oil and gas prices.

Dan Monzani: We can look at a range of scenarios—

Lord Sharkey: I understood your previous answer. My question is simpler than that. Did you in fact base your policy on an assumption essentially of rising oil and gas prices?

Dan Monzani: The forward market certainly did not anticipate the drop in prices that have happened over the same period. We look at a range of possible different scenarios on which we base our policy; we do not assume that a central scenario will come true.

Q148 **Lord Turnbull:** The written evidence that you submitted to us back in October refers to the tripartite nature of policy: reliable, affordable, clean. A number of witnesses have argued that the "clean" has tended to dominate the other two and that not enough attention has been paid to "affordable", whether in industry or in relation to household fuel poverty. As for "reliable", Dieter Helm has described the margin of capacity that we have to spare as having been neglected. Now that you are all together in the same department, instead of maximising the performance on one objective, which is how it appears to me, is there some way in which you could make a great effort to optimise the outcome between these three objectives?

Ashley Ibbett: Policies that we have been taking forward over the past few years have been designed to strike the appropriate balance between those three objectives. Mr Monzani will talk about security of supply in the capacity market.

It is true that we have been successful in deploying clean electricity. Last year about one-fifth to one-quarter of our electricity came from renewable sources. Of course, that still leaves three-quarters to four-

fifths coming from different sources. The drive for renewable deployment was to an extent driven by the legally binding renewables target that we have at the European level, as well as our overall ambitions for 2050. But it is not a trade-off between clean, secure and affordable. All those three are related to each other, and striking the appropriate balance is something that Ministers have constantly sought to do through the policies that they have introduced.

Dan Monzani: That is absolutely right. I might just say a word on security, not least to look at the electricity capacity margins, although we should not forget flexibility in the system either. The National Grid capacity margin forecast for this winter is 6.6%, which is well within the statutory reliability standard, which is set against a different metric. In that metric, which is called loss of load expectation, we aim to hit a three-hour loss of load expectation. That is three hours in which the National Grid has to use one of its non-market measures to balance the system. With a 6.6% margin, we should achieve half an hour or less, which is well within three hours. That three hours is at the front end of the queue certainly in European, and we think in global, security standards.

On your point about historical capacity margins, the capacity margin that we have had over the last three winters has been around 5% and above. In the three winters immediately preceding the financial crisis, they averaged around 3%. So we can pick a point comparison in the middle of the financial crisis where we saw a big erosion of demand and therefore a lot of surplus capacity left in the system. But I would argue that the comparison either side is probably more valid. In any case, what we really want to do is to get back to the actual risks that the system faces, rather than looking at the numbers. That is how we come up with these numbers and the amount that we need.

The first thing we do when considering the level of capacity that we need in the system is to look at the peak half hour of demand in a given year. Then we look at how much supply we have on top of that. We tend to take off about a quarter of that supply just on the assumption that not everything will be available. So immediately that is derating; you are taking quite a large chunk away from the nameplate capacity.

We also add a bit to demand; we assume that our demand will be higher than we are actually forecasting for that half hour, because we make provision for something breaking at the last minute. We have an operating reserve, which is like having a spare or two in case something breaks at very short notice, and we add that to our demand requirement.

In the middle, you have the extra margin: the 6.6% that we are talking about. We test that against a number of scenarios and sensitivities on the supply side—so we might look at a year in which we had much higher levels of unavailability, type faults in particular parts of the system or a coincidence of our highest day of demand with low wind. Similarly, we look at stress on the demand side itself and test it against a very cold winter. We tested it against the coldest December for 100 years, which

was in 2010. Those are robust tests of whether that residual margin, once you have taken off a chunk of the supply and added an extra bit to the demand, is sufficient to deal with the risks. Both historically and internationally and, we think, on measures against the actual risks, we are operating at margins that are reasonable.

Lord Turnbull: Have you changed the nature in which the safeguard is provided? Previously, it would involve power stations that were not fully used, but a lot of them have been closed, and now you have capacity agreements. That may be a safer way, but is it as cheap a way as the spare margin provided in the past?

Dan Monzani: We are definitely in transition. Over the last couple of winters, we have a system whereby we have had a reserve called the contingency balancing reserve, which has had two elements. The larger one is the supplemental balancing reserve, which is for the power stations. There is also a demand-side balancing reserve for demand-side balancing. To stick with the power reserve for the moment, it is exactly as you describe. This year, it involves 3.5 gigawatts of old power stations that would have retired from the market but which are held in reserve and can be used to support our margin only once everything on the market has been called and we still need to increase the margin.

We are moving to a capacity market. The Government decided earlier this year to move forward that market, which will now begin next year, in 2017-18. That is a system whereby we will auction capacity agreements, and everybody who receives a capacity agreement is paid a flat rate and can operate in the energy markets. You move back to a system where all your capacity is in the energy market rather than held in a structural reserve. There are some clear advantages to doing that. One is that you have a slippery slope risk if you have a reserve; people have an incentive to say that they were about to close and ask whether they could be put into the reserve, which might be financially advantageous to them.

Secondly, when we are describing the capacity margin to people, they often comment that this winter there will be tight periods in the market because the amount of our margin in the market is less than the total margin. So there will be periods when the market gets tight before we call the reserve. We think it would be preferable to have all the reserve in the market. What you will see that is one of those shifts that we have been talking about across the Energy Bill, with an increase in payments for the capacity but a fall in the wholesale price because there will be tighter margins less often.

Lord Layard: I am not sure that I completely understood what the 6.6% was. Did you take almost the worst possible case that you can imagine, and the 6.6% is what is left over when you have discharged that?

Dan Monzani: You take the expected peak demand in a typical winter, which is not quite the worst case but the worst half an hour in a normal winter, and you add a bit for the operational reserve. Then you deduct a

bit from the supply to give you a de-rated margin. It is the 6.6% left there that is the de-rated supply over the increased demand.

Lord Layard: Is the number of hours that you mentioned per year?

Dan Monzani: Yes, that is right. Loss of load is exactly that, so in a typical year you would expect the system operator to have to use its other actions three hours of the year in order to balance the system, if we are bang on the reliability standard.

Q149 **Lord Kerr of Kinlochard:** I would like to probe Mr Monzani's very reassuring presentation. Sticking with electricity for the moment, how long is the time required if you have a grid failure and you are starting with black start? It is now more vulnerable than it used to be when you had a few of the big 1960s and 1970s generators, which would be the first that you got going.

Secondly, if 17 French nuclear plants are out and we are now selling power to France through the interconnector, does that in any way affect our judgments about safety margins in this country? If it does not, and if you can turn the French off, does that apply the other way around? Are our interconnector agreements with the French such that they could turn us off if they wanted to?

Leaving electricity—because I think you stuck with electricity and did not talk about gas—in paragraph 58 of your written evidence paper you say that a shortage in gas supply could have a "critical impact" as it is the main fuel for heating buildings and one of the most flexible and reliable sources of power generation. Please tell us how many days' storage we now have for gas in the UK, and how that compares with, say, the Netherlands, France and Germany?

Dan Monzani: I shall start with black start, which as the name suggests is where we have had a catastrophic failure of the system and need to restart it. Most power stations need electricity to start, so the system operator maintains a plan on a regional basis for restarting the system in islands of power, if we ever got into this catastrophic situation, which I hasten to add we never have and never intend to. It is true that one way to do that is to use some of the old coal plants, but there are other ways. The system operator maintains its black-start requirements regionally throughout the UK. As time progresses, it will look at a range of other technologies alongside the existing thermal fleets.

Lord Kerr of Kinlochard: I agree that it has never happened, but it is not inconceivable that there might be, given a cyberattack or some kind of terrorist attack. How many days would it take us to get the grid back up and running if we had a complete black start?

Dan Monzani: It varies regionally, and I do not have the regional data I am afraid.

Lord Kerr of Kinlochard: Are we talking a week, 10 days?

Dan Monzani: It is low numbers of days. Let us be clear: this is a catastrophic situation in which the power system has gone down completely, which has never happened in this country. We are looking to maintain the system well above those kinds of levels.

Ashley Ibbett: It is also worth saying that although it is not in our area of responsibility we do a lot of work with generators on resilience against the sorts of actions that you have described. We work closely with GCHQ and others to make sure that the system that we have is secure against threats of the kind that you describe.

Dan Monzani: Can I turn to interconnectors? They are a very valuable source of flexibility and the capacity to provide power. We currently de-rate them quite heavily. We do not just assume that an interconnector can fail technically, in the same way as a gas power station can fail technically; we also look at the likely price differentials. You would expect an interconnector to flow from a low-price area to a high-price area, because it is essentially an arbitrage. The markets are coupled, which is reflected in the comparison with the flows and the price differentials. So we do some modelling that looks at the likely differentials. Next year, for example, we will de-rate the French interconnector to 59%, the Dutch interconnector to 74% and the Irish interconnectors to 30%, which reflects the likely difference in prices.

This winter has been quite interesting. As you point out, the French have had a number of unexpected outages on their nuclear fleet, which has meant that their power prices have risen. They have actually tended to import more from all their interconnected countries, which has changed the power flows from the United Kingdom.

Interestingly, there have been several days during the early part of this winter when we have exported at full capacity to the French, except during our peak hours. Then the interconnector has reversed, precisely because our power price has risen. In some senses, you might regard this as having more expensive French power plant or French industrial in our merit order. While it is cheaper for a UK power station to produce that power, it produces it and exports some of it, and when it becomes cheaper to bring it in from France, as it often has been in the peak half-hour, the flow is reversed. So they are actually very valuable as a source of flexibility and of capacity in security of supply.

Lord Burns: Is their peak half-hour the same as our peak half-hour?

Dan Monzani: No, it is not, but it varies according to the time of year. France has more of a north-south distribution of population, so it is not exactly correlated. Some of the swings that we have seen have been flowing out during their peak and back during ours, and prices tend to move together when they are both at the same peak.

On gas, again we should look across a number of dimensions—I shall talk mostly about capacity because that is what you have asked about. Again, diversity is an important form of security here as is flexibility. We have a

very diverse infrastructure in gas. We obviously have some UK continental shelf and some storage. We also have six international import pipelines and four liquefied natural gas terminals. We have a diverse range of ways of getting gas into the country. Combined, that gives us sufficient capacity to deliver up to 602 million cubic metres of gas per day. It is the daily deliverability that is crucial to our security of supply: can we get enough gas in on a given day? That equates to a margin of around 130 million cubic metres, or more than a third. That is over the peak demand in a one in 20 week winter, so it is already quite a stressed sensitivity.

You are right to observe that we have less storage than our continental neighbours. That is mostly because we have a diversity of other forms of capacity that we can rely on, whereas if you are a landlocked country in eastern Europe, for example, you have a pipeline coming through from Russia and you have your storage. That is your diversity.

Lord Kerr of Kinlochard: We actually asked about the comparison with the Netherlands, France and Germany.

Dan Monzani: Yes, some of those have high levels of storage.

Lord Kerr of Kinlochard: How many days do we have compared to them?

Dan Monzani: I do not have the figure in days, partly because it is daily deliverability that is most important. For example, our largest storage unit at Rough can release some 30 million to 35 million cubic metres per day.

Lord Kerr of Kinlochard: Are we not closing Rough?

Dan Monzani: Centrica has not decided yet, although it is an ageing asset. The point is that it is quite large, but it does not necessarily have the ability to release all our daily requirements into the market at once. It is more of an inter-seasonal play between buying gas in the summer and releasing it during the winter.

Lord Kerr of Kinlochard: Chairman, could we get a note on that?

The Chairman: Yes. We would welcome a note on that.

Q150 **Lord Burns:** Could I return to the impact of low-carbon policies on high-energy industrial users? The Chairman raised this earlier, but I am not quite sure that you responded to it. Are we clear that those prices are higher in this country than they typically are in our competitor countries?

Paro Konar-Thakkar: As was mentioned before, there are two components—gas and electricity—when we think about energy bills. The UK has one of the lowest gas prices to our business and industrial users. For electricity, we are among the highest in the range. As my colleague, Mr Ibbett, has pointed out, we are taking a number of measures to reduce the impact of climate policies, through exemptions and

compensation, as well as directing energy efficiency policies at business and industrial users to help them reduce energy consumption and thereby their bills.

Lord Burns: Do you have any view on the extent of the impact that this has had on the location of various kinds of industry? I understand your point, but it does not seem to prevent the complaints that one receives from industries and the argument that this has been a factor in some high-energy industries moving overseas. What has been the sector impact of this balance of electricity prices versus gas prices?

Ashley Ibbett: For the majority of businesses, energy costs are a small driver of competitiveness. For an average business, it is around 2% of GVA or 3% of operating costs. It is a driver of competitiveness for the most energy-intensive industries, where energy can account for up to 40% of their gross value added or at least 10% of their operating costs. That is why we have taken measures to introduce compensation schemes for those most energy-intensive industries.

On locational decisions being driven by energy costs, there is no well-established international evidence base to prove or to show that businesses are taking locational decisions because of their energy costs. As I said, they take a range of factors into consideration, including employment costs, closeness to customers, quality of life and access to infrastructure. Energy costs are among a range of issues that those industries consider.

Lord Burns: Are you denying that this has had any significant effect on the locational policies of some high energy-using industries?

Ashley Ibbett: I am saying that we do not have a huge evidence base to show that locational decisions by energy-intensive industries are driven by their energy costs.

Lord Burns: So why did you introduce the compensation scheme? Is it a case of your having introduced the compensation scheme after the industries had moved?

Ashley Ibbett: Not at all. We recognise that for certain energy-intensive industries the costs of climate policies on their energy bills can erode their competitiveness compared to their European neighbours. That is why we have introduced the measures that we have.

Lord Burns: Some of the evidence that we have had suggests that we have exported some of our emissions to other countries in effect by creating energy prices in this country that are so much higher than elsewhere. Therefore, we are being flattered when we look at what has happened with our own emissions, because we have in effect moved the industries to somewhere where it is cheaper. So the emissions, in a way, still take place. Do you think there is any force in this argument?

Ashley Ibbett: There are studies that have suggested that emissions in other economies are displaced emissions from ours. Our emissions have

fallen significantly. In the electricity sector alone, we have seen a fall in emissions of around 50% since 1990. That is driven in large part by coal to gas switching but also by the introduction of renewables into the system. In the context of a challenging 2050 target, that is a good news. By the middle of the next decade, we estimate that we could have reduced emissions in the electricity sector by around 70% to 75% compared with where they were in 1990.

Our efforts are concentrated on reducing emissions in the most cost-effective way. Across the economy as a whole, we have seen a fall in emissions. We have managed to decouple emissions intensity from economic growth, where the orthodoxy had always been that emissions intensity and economic growth would go hand in hand. We have found, and other countries around the world have found, that we have been able to decouple those two issues. If we believe that ambitious global action on climate change is necessary to limit global temperature increases to two degrees or below, that has to be a good thing. We can enjoy reduced emissions and increased economic growth.

Lord Burns: I have one other question. Who pays the costs of the compensation payments, to the extent that we have used electricity, which is a low-carbon fuel?

Ashley Ibbett: The compensation schemes that I have mentioned have been funded through what is now the Department for Business, Energy and Industrial Strategy's budget—

Lord Burns: You mean that taxation pays for it, in effect?

Ashley Ibbett: So from taxation. If we were to move to an exemption scheme, as we have said we will for contracts for difference for example, costs that are not paid by the energy-intensive users will be smeared across the rest of the energy consumer base—both business and household.

The Chairman: Including low-income households?

Dan Monzani: They have some measures that counteract that, such as the warm homes discount.

Lord Forsyth of Drumlean: It goes on to the bills of people who are just managing, then?

Ashley Ibbett: It goes across the electricity consumer base.

Q151 **Lord Forsyth of Drumlean:** I am still on the point that Lord Burns has made, because I cannot get my head around this. Mr Nicholson from the Energy Intensive Users Group told us in response to the point that you have just made: "you will hear that the UK has successfully decarbonised power generation as a result of the unilateral carbon price floor. I am sorry, but while it may have reduced the emissions on our books, it has allowed further increases or smaller reductions elsewhere in Europe, and it has increased the cost to UK consumers into the bargain. I do not think

that it is intellectually honest for the Government to pursue such policies and claim that it is a decarbonisation effort; it is a redistribution of costs and of emissions". Why is that wrong?

Ashley Ibbett: I read the exchange with Mr Nicholson ahead of today's hearing. It is a more complicated picture than he describes. As I said, we and other countries around the world are finding that we can reduce emissions at the same time as increasing economic growth. I think you challenged him, as part of your session with him, on evidence to support some of these claims. Again, as I said earlier, we have found little evidence developed internationally that can support some of these assertions, but we absolutely recognise that energy-intensive industries can face competitive disadvantage versus their European counterparts because of some of the measures in support of our own climate policies. That is why we are giving them compensation from those schemes.

Lord Forsyth of Drumlean: Yes, but just to pursue the point a little further, if you have read the evidence I do not need to read it out to you. You said earlier in response to Lord Burns that there was no evidence that people were moving their industries. I assume that the people who are the Energy Intensive Users Group are speaking for what is going on among energy-intensive users; they are describing what is happening in their business. He told us, "It is fair to say that it is rare for energy prices to be the only factor in a closure decision or decision to divert investment to another part of the business or another part of the world in which the business is operating, but it has increasingly become the dominant factor, particularly for energy-intensive industries that are also worried about their own carbon costs in the long run". In the face of that statement by the people who are on the receiving end of the department's policy, why did you say in response to Lord Burns that there is no evidence?

Ashley Ibbett: What he says there is the very reason why we set up the compensation schemes: to compensate them for the costs of low-carbon policies. I am saying that there is some evidence, but not a very well-developed evidence base, to support the factors that energy-intensive industries are considering in making locational decisions.

Lord Forsyth of Drumlean: So you think they are closing their businesses because they do not understand what is going on.

Ashley Ibbett: I think there is a range of factors that affect energy-intensive industries: labour costs and other issues, as well as energy costs.

Lord Forsyth of Drumlean: He says that it is the dominant factor in deciding whether to close or to move.

Ashley Ibbett: Mr Nicholson, I know, has strong views on this which he expressed to the Committee. What I would say is that the measures that we are taking to compensate energy-intensive industries are designed directly to address his concerns.

Q152 **Lord Lamont of Lerwick:** Amber Rudd, when she was Secretary of

State for Energy, laid a lot of emphasis on having a competitive electricity market, with government out of the way. At the moment it does not seem to resemble that; there is massive government intervention and Governments choosing to support particular technologies. One of our witnesses, Rupert Darwall, said that in order to achieve Ms Rudd's aim the first step would have to be "to make the subsidies transparent" and to make sure that technologies that create a cost bear the cost of that. Do you think that we are getting to this greater transparency—it does not look much like it to me—and what about this move towards a much more consumer-driven electricity market? It seems very much to be arbitrary intervention by government.

Ashley Ibbett: In the policies that we have taken forward in recent years, we have tried to move to schemes that are driven by competition, because that is the best way to deliver value for the consumer. We have, for example, moved from a renewables obligation for large-scale generation that was demand-led to contracts for difference. A couple of weeks ago we announced our plans for the next auction of contracts for difference, which will be worth £290 million for what we call less-established technologies. We ran a contract for difference auction at the start of 2015, and found through that auction that we could bring down the costs of offshore wind, for example. We said at that auction that we would pay a maximum of £140 per megawatt hour; the cheapest offshore wind project is £119.

Across Europe, the costs of renewable technologies are falling quite dramatically. In quite a recent auction run by one of our European counterparts, the costs of offshore wind were €50 a megawatt hour. You cannot create a like-for-like comparison with what that would be in the UK because the model is slightly different, but that is a very dramatic reduction in the costs of offshore wind through the use of competition. We have been trying to drive down, and continue to drive down, the costs of renewables through competition. The capacity mechanism, again, is a competitive auction to reveal the cheapest price for the security of supply that we want to achieve. We are very much driven by trying to use market mechanisms to drive down the costs to the consumer.

Lord Lamont of Lerwick: It is market mechanisms plus subsidies to drive it in any particular direction. Professor Helm said that he used to ask people in DECC if they could name all the current instruments. Do you think that you could name all of them?

Dan Monzani: Not during the course of this session.

The Chairman: A yes or no will suffice. I do not think we need to dwell on the list.

Lord Lamont of Lerwick: His point was that, with every problem that came along, a new instrument would be added to it. You have an energy efficiency problem, so you have the Green Deal. You have a problem with a particular kind of technology, so you add another mechanism or another subsidy. Dermot Nolan from Ofgem told us that it would be much

better just to have a single fixed-carbon price, and then, with the abated price, have an auction afterwards, with one carbon reduction mechanism alone.

Dan Monzani: That is certainly a model that people have looked at. One reason why we have a different structure for the different types of capacity that we are building—the CFDs and the capacity market—is that we are valuing slightly different things. The CFDs are priced according to terawatt hours—or per unit of output, to put it that way—whereas the capacity market pays for availability, for the capacity to generate, rather than caring very much about how much someone produces. That is a matter for the wholesale market, in that case.

We have the slightly different structures because we are valuing slightly different functions in the market. It is always possible to design different systems. We think that the current design of the capacity market, as amended earlier this year, has some real strengths to it. One is precisely that it is technology-neutral and allows people to compete against each other: new versus existing, different technologies versus each other, supply side versus demand side. We think that is a strength, and there is a strong case for regulatory stability, notwithstanding some of the minor changes that we made earlier.

Lord Sharkey: Amber Rudd also said in November last year, “We want a consumer-led, competition-focused energy system”. What does consumer led mean in that context?

Dan Monzani: I can give you one example. Clearly it is important that in the retail market people can switch, and Ofgem calculates that switching suppliers can save those switching from standard variable tariffs £300. The department and Ofgem have done a lot to encourage that and to make it quicker and easier to switch suppliers. The time that it takes to do that has reduced considerably, and we are aiming for reliable next-day switching.

It is important—and the Secretary of State has made this point—that energy companies treat all their customers fairly. He has said that he is concerned that some customers on standard variable tariffs are not being rewarded appropriately for their loyalty—possibly the reverse—so he is challenging the industry to address that. The Chancellor said in the Autumn Statement that we would look carefully at the functioning of all key markets, including the retail energy market, to make sure that it is functioning fairly for consumers. That is an example of how we are trying to look very much through the lens of the consumer and how the market is set up.

Ashley Ibbett: I would just add that the smart meters programme is designed to enable consumers to make informed choices about their energy use. Rolling out smart meters to every home will mean, first, better more accurate bills and, secondly, more informed choices about how and when consumers use their energy.

Q153 Baroness Wheatcroft: I would like to ask about the true cost of renewables if we were to include their route to the grid and the times when they are not functioning, when we have to make that up elsewhere. When you are working out the relative cost, do you have a calculation as to how you get there and how you apportion the costs?

Paro Konar-Thakkar: The Committee has received a lot of evidence in this area, and a lot of it has highlighted the wide range of costs and the uncertainty of costs in this area. I would like to pick up on that. For example, the recent work that Imperial College has done on the integration costs of renewables highlights the wide variation of those costs and the point that the system itself is not static. It is evolving over time, with different technologies integrating into the system and the costs of that.

Baroness Wheatcroft: How do you estimate it?

Paro Konar-Thakkar: For the department, the system costs as well as the benefits of different technologies are a very important factor in determining future energy policy. In order to continue to improve our evidence base, we commissioned an external consultant, Frontier Economics, to help the department in creating a framework and a methodology for assessing system costs, recognising the lack of consensus in this area. We are in the process of finalising this evidence base, but in the meantime we have started to improve our existing evidence base to take into account different scenarios of different penetration of technologies and therefore the impact on balancing network and other system costs. We have done so, for example, in the value for money case that we undertook for the Hinkley project.

Baroness Wheatcroft: So the fact that you got Frontier Economics in to do it now means that presumably you have no way of calculating it at the moment. Is that right?

Paro Konar-Thakkar: Frontier Economics is helping us to improve the evidence base and to systematise the evidence in this area. However, as I mentioned before, we are continuing to do that by improving our modelling techniques to capture the system costs as well as the benefits of different scenarios of penetration of different technologies.

Baroness Wheatcroft: At the moment, when you are weighing up the relative costs of renewables and non-renewables and putting numbers of that, can you give us an indication of how you calculate the cost of intermittency and where you apportion that, as well as the cost of getting it on to the grid. I am sure that you can improve the system—that is always possible, and no doubt Frontier will come up with something interesting—but how do you get to the numbers that you use at the moment?

Paro Konar-Thakkar: Again, I think the Committee has received a lot of evidence in this area that points to a lot of uncertainty in apportioning the cost of back-up, for want of a better word, to intermittency. It is very hard to assign a particular pounds-per-megawatt-hour impact to

renewable generation, or indeed to intermittent generation. Intermittency is a slightly misleading term because, over time, renewable generators as well as other intermittent generators such as solar have got better at forecasting and estimating when they are going to generate.

The point that is often raised is about uncertainty, which is limited not just to renewable generators but can be applied to all technologies. You can have a failure on a gas plant, for example, because there is an unplanned outage. So it is not just that we should insure the system against intermittency or renewables but that the demand for power as a whole should be covered by an appropriate generation mix, and the system should be ensured against that.

Baroness Wheatcroft: On the last point, could ask you in particular, Mr Monzani, what the mix is between renewables and non-renewables that would give you the ability to sleep at night, given your responsibility for security?

Dan Monzani: Regrettably, that is a very complicated question. Clearly, to take a very crude example, if you have a system with a lot of gas on it that is relatively underutilised and you add a wind farm to it, the intermittency issue is not an issue at all because you have a lot of unutilised capacity on that system. So one uncertainty with trying to estimate these costs is to do with the dynamic mix of the system as a whole.

There are many different combinations of low-carbon technologies that you can envisage, in combination with other reliable or emerging technologies, particularly battery or other forms of storage, demand-side response and so forth. When you look at those combinations, you can see perfectly secure systems, so it is not quite as straightforward as there being a maximum amount of renewables, say, or a maximum amount of nuclear—and nuclear has its own costs, because they are quite large, and so on. To sound a little technocratic, it is more about the functions that the system needs. In a system where you might have a high amount of wind, for example, you might need a high amount of fairly rapid response on the system, which might well be provided for by a peaking gas plant—we have started to see a few of them in the capacity market—or by a battery.

Just to break down this distinction between reliable and non-reliable a little bit further, it might be really poorly dealt with by an old coal power station that cannot respond very quickly. It is that mixture of functions that you need, rather than it being a simple split.

Baroness Wheatcroft: I understand that, but if you are endeavouring to construct something that will be the ideal by, say, 2030, do you have a blueprint for what that might look like?

Dan Monzani: Generally, our approach in decarbonisation is not to put all eggs in one basket; you want a mixture of technologies. That is driven

partly by cost, because you do not know the cost-reduction pathways that you will have.

Equally, we want some technology-neutral policies that allow the market to respond to that mix as it develops. That is what the capacity market does. We have seen some innovations come through there. As I mentioned, gas peak is coming through, rather more than some people expected. This year, we have seen some batteries prequalify for the auction—at 0.5 gigawatt—for the first time. You get the optimum mix by allowing the market to innovate in the technologies that it needs to complement the low carbon coming through and by making sure that we have a basket of different technologies on the low-carbon side competing against one another.

Paro Konar-Thakkar: To pick up on the innovation point, Imperial College recently published a report in which it said that the system, as it develops, will continue to bring forward new and innovative measures. Mr Monzani talked about storage, but there are also other flexibilities in the system, such as those that are provided by interconnection or, indeed, by demand-side response. Even with increased intermittency, when you increase flexibility in a system, the costs of the system will go down over time. The estimates that have been put forward include about £40 billion up to 2050.

Lord Kerr of Kinlochard: That all sounds great, but what you are doing is paying businesses to switch off and you are encouraging hospitals and economic operators to have little farms with diesel generators outside. This does not feel as if there is a great plan. However, we can postpone no longer the moment when you tell us that Hinkley Point is very good value for money. Could you do that now?

Dan Monzani: Could I have half a second rebutting that point about diesel, please? First, demand-side response is voluntary, so industry is not forced to turn off. A lot of what we see is things like people being able to turn off a very well-insulated freezer for half an hour with no temperature change and getting an economic benefit from that.

Secondly, on diesel, we have taken some action over the last year to make sure that it is not getting an unfair advantage in the market. Ofgem is looking at what are called embedded benefits, which are potentially creating an advantage, and Defra has just consulted on increasing the regulation on NOx emissions from diesel in order to avoid them unduly coming in. I just wanted to make those points first.

Q154 **Lord Kerr of Kinlochard:** On Hinkley Point and value for money, the National Audit Office tells us that “the projected value of the top-up payments has increased from £6.1 billion when the deal was agreed to almost £30 billion today”. That is our text for your sermon on why it is good value for money.

Ashley Ibbett: I will let Ms Konar-Thakkar talk about the value-for-money assessment that we undertook in the Hinkley Point C decision. I

will just make two points before I hand over. First, all the modelling that we and others—the Energy Technologies Institute and so on—do shows that having more than one scalable low technology available to you reduces the overall cost to consumers of reaching the 2050 target. Nuclear is an important building block in that sort of modelling.

Secondly, this deal has been scrutinised and approved by DG Competition in the European Commission. It judged that we are not overcompensating the developer and that it is a good deal for the consumers. That in itself is an important fact, but I will let Ms Konar-Thakkar talk about the value-for-money assessment.

Paro Konar-Thakkar: Thank you. I will talk first about the value-for-money assessment and then come to the point about the NAO. As part of the value-for-money assessment, four tests were conducted to give the Secretary of State confidence that this project was indeed value for money. I will attempt to describe the tests and tell you how Hinkley performed against those tests.

The first test is the fair-rate-of-return test. As my colleague Mr Ibbett pointed out, this was scrutinised in depth by the European Commission. Under this test, we considered whether Hinkley Point C was adequately compensated through the strike price offered without being overcompensated in relation to the true cost that the project faced as well as the risk that it faced. This was scrutinised internally as well as externally by several independent auditors, which considered whether any overcompensation was involved. Through this scrutiny, it was put that the compensation was adequate and was not overcompensation.

The second test looks at cost comparators for Hinkley in relation to other scalable technologies that can deploy around the same time, in 2025. To do that test, we compared the strike price for Hinkley against a strike price comparator for other technologies that could deploy at that period. Those include a combined-cycle gas turbine, CCS, offshore wind, onshore wind and solar. As part of this test, we found that Hinkley was cost-competitive against most of these technologies. I raise that point because, as I am sure you will have seen, with solar and onshore wind, Hinkley Point C is at the top end of the strike price comparator range. To that I would make the point that the amount of solar and onshore wind that you would need to deploy to compensate for the generation as provided by Hinkley would need to be substantial. That has been done and is theoretically possible, but the network costs and the balancing costs of those impacts would be large.

The third test that we undertook to look at value for money at Hinkley was a scenario analysis. We could either go forward with Hinkley or delay Hinkley and fill the generation gap with other scenarios of technologies—either gas or other low-carbon technologies, such as offshore wind and CCS or onshore wind and solar. Again, in this test, apart from the gas counterfactual, Hinkley Point C performed quite well. There were net present benefits to delivering Hinkley as opposed to any of the counterfactual scenarios. It was in this counterfactual that we used our

estimations of system costs and system impacts. The point about the gas counterfactual, where Hinkley performed marginally less well, is to note that, if we delayed Hinkley and introduced a lot of gas into the system, the ability to meet our legally binding decarbonisation targets would be significantly undermined.

The last test is affordability. Under that test, we considered the total support cost of Hinkley. That ranges from £11 billion to £21 billion, which is the comparator that I will use against the NAO's £30 billion. I will come in more detail to why we differ from the NAO. We also looked at the impact on bills, which between 2025 and 2030 would be on average approximately £12. You may say that that is quite a large impact, but we have to look at the counterfactual scenarios of what you would get if you did not put forward Hinkley. In a counterfactual scenario that brought forward offshore wind and CCS, the comparative impact on bills would be approximately £24 in 2030 and, in a scenario that brought forward onshore wind and solar, it would be approximately £21.

The other benefits of Hinkley that have not been fully brought out through this NPV assessment is that fact that once Hinkley is generating it will contribute to 7% of the UK's energy needs. It will give rise to 26,000 jobs in the construction period, of which 1,000 are apprentices. It will also lead to 900 jobs during the operation of the plant itself. It will also give reliable baseload power.

On your second question about how this compares with the NAO estimates of £30 billion, first, the NAO in its accounting treatment has used a different discount rate from what we have used. We have used the social discount rate as put forward by the Green Book, whereas the NAO's accounting treatment uses a lower discount rate as used to measure public accounts. As a result, we have a different estimate.

The other point to note is that the scenario used by the NAO used a very low projection of wholesale energy prices, whereas we have tried to give a range of wholesale energy prices between the low and the high; hence the £11 billion to the £21 billion.

Lord Kerr of Kinlochard: That is a wonderful sermon. If you want to change your vocation, the Church beckons. As an agnostic, I merely note in relation to your first point that I was trying to think of an example of DG Competition in Brussels acting against a Government for subsidising a company in another country. I cannot think of a precedent at the moment. Normally one is in trouble for subsidising one's own companies.

The interesting thing about your analysis of competition compared with other sources was gas. You admitted that the price of Hinkley Point is right at the top end of the strike price compared with your estimates of likely combined-cycle gas turbine generation. Your estimates are based on your assumption about the future of the wholesale gas price, which, if one takes your track record over the last 10 years, has not been fantastic. I think it is likely, if you take a balance of probabilities, that the Hinkley Point strike price will be approximately double the price of

combined-cycle gas turbine production. You would say that you need a bit of everything, and I understand that argument, but this is quite a big bit. Of course, there are other arguments about unproven technology and all that, but we might come on to those later.

Do you want to add a small canticle about why it would not have been more sensible over the last five years to have a programme of building combined-cycle gas turbines, half of which, if we had started five years ago, would be operating now?

Paro Konar-Thakkar: I would like to add a bit more on your first point about the strike price at Hinkley as compared with a combined-cycle gas turbine. You are right that Hinkley is at the top end of the range. The range that we consider for a combined-cycle gas turbine is between £47 a megawatt hour and £96 a megawatt hour. At £92.50, Hinkley Point C is at the top end of the range.

I would like to add another point about why we did not go for a large number of gas turbines as opposed to Hinkley. It comes out in this test as well as the following test that having a large degree of combined-cycle gas turbine as an alternative to Hinkley would mean two things. One is that it would significantly undermine our efforts to meet the legally binding decarbonisation target. Secondly, if we chose to go with a large number of gas turbines and then brought Hinkley along, we would have stranded assets.

Q155 The Chairman: We heard evidence from two other nuclear power station builders who claimed that they could build the same capacity, taken together, using proven technology at a lower capital cost before Hinkley C is likely to be built and at a contract for difference price of less than £80. Was their interest taken into account in your calculations?

Paro Konar-Thakkar: The first thing to note is that the Hinkley negotiation has been a long affair, with a large number of processes built in, and the process involved having an open-book discussion with EDF, the owners and operators of Hinkley, in which we verified the costs and the risks facing the project. For any further new nuclear project that we choose to do, we will need to go through a similar process.

Secondly, the negotiation with Hinkley started in 2011 when the then Department for Energy and Climate Change put forward the electricity market reform White Paper in which it put forward that it would be willing to enter negotiations for a CfD with any low-carbon generators. At that point, in 2012, only NNBG—a subsidiary of EDF—came forward to propose a new nuclear power station at Hinkley Point in Somerset.

The Chairman: Given the huge burden that you are going to drop on to the next generation, or the generation after that, to pay for this, would it not have been sensible to look carefully and in detail at the other options in the nuclear industry?

Paro Konar-Thakkar: At the point at which we entered into negotiations with Hinkley, only NNBG had come forward.

The Chairman: But as we saw from the Prime Minister, it is possible to hit the pause button on those things in order to look at something that might be more attractive and less of a burden on future generations.

Paro Konar-Thakkar: As a department, and as the Secretary of State pointed out, we should not put all our eggs in one basket, so nuclear should be part of a wider low-carbon portfolio.

The Chairman: I am talking about other nuclear options. It does not alter the diversity argument; it just comes in more quickly and at a lower capital cost, and imposes a lower burden on consumers.

Paro Konar-Thakkar: Hinkley, as one of the first nuclear power stations in 20 years to be built in the UK, is unlocking future potential improvements in the supply chain as well as—

The Chairman: Would the other suppliers not have offered that?

Lord Sharkey: Assuming it works, of course.

Ashley Ibbett: We are confident that they will be able to deliver Hinkley Point C on time and that it will work; it is in their commercial interests to do so.

Q156 **Lord Sharkey:** Could I ask a question about costs, then? You spoke about the tests that Hinkley, being the project, had to go through. Did any of the tests consider whether the costs of the project could have been reduced if the Government themselves had provided part of the capital? The state cost of borrowing is extremely low by historical standards. Would it not have made sense for the state to fund Hinkley Point C directly, or part of it?

Ashley Ibbett: I think the deal with EDF, or NNBG, for Hinkley Point C was the culmination, as Ms Konar-Thakkar says, of four years of negotiation on contracts for difference. We introduced contracts for difference to bring forward new low-carbon generation; nuclear is an example of low-carbon generation. We have proved that the instrument works to bring forward new nuclear power.

Lord Sharkey: I understand that, but I am asking about costs. Would it not have been better and cheaper for the Government to supply some of the capital needed?

Dan Monzani: The reason why the Government borrow cheaply is because they are a reliable lender. The costs of a project need to factor in the risk of that project and, as Mr Ibbett just pointed out, there are some construction risks to this project. If the Government were to invest in it, they would be exposed to the risk that it is not constructed on time, whereas the builders are the ones that bear other risk.

Lord Sharkey: The risk that the Government are exposed to if these things manifest themselves is that of not having an electricity supply from Hinkley Point. I come back to my question: would it not have made

more sense for the Government to reduce the cost substantially by providing a large part of the capital themselves? To put the question another way: why did they not?

Ashley Ibbett: The negotiations with Hinkley and the contract for difference mean that the risks in this project are borne by EDF; the consumer does not pay for a single electron until it is produced by EDF. If the Government were investing capital in the project, they would share the costs of any potential construction risk, which would ultimately be passed through to the taxpayer. The consumer is protected against construction risk. EDF has a strong incentive to deliver the project on time and to budget, because, until the electricity is flowing, it receives no income. After a certain amount of time, if the project were late, the term of the contract for difference would reduce.

Lord Burns: The focus here is on the third of the costs being met by Chinese investors and whether it would have been cheaper if that had been provided by the British Government rather than by Chinese investors. It seems that on the one hand you are arguing that you are confident that this project will get to the end and be delivered on time and to budget, while at the same time you seek to argue that there would have been undue risk for the Government to have taken on the cost of it themselves. There is such a gap between how much it is costing to go down a particular route and what it would have been had it been funded by the Government. That must imply a very different risk assessment of the chances of it not being delivered compared to the argument that you are making to us about the operational side of it.

Ashley Ibbett: The model that we set out in the electricity market reform White Paper in 2011 was for contracts for difference. EDF approached us and asked whether it could negotiate a contract for difference with us through that regime. We have proved that the contract for difference has worked for the Hinkley Point C project. So the instruments that we designed to bring forward low-carbon generation are the ones that we have used.

Lord Burns: But would we not have got a different price had we been funding it in a different way?

Ashley Ibbett: I do not have an assessment of what a different route would have cost.

Lord Burns: So are you saying that at no stage did you do an examination of another option that included our own Government substituting for the Chinese investment?

Ashley Ibbett: I think that Ms Konar-Thakkar has already talked through the value-for-money assessment that we undertook on Hinkley Point C and the tests that we applied.

Lord Burns: My question was: did you at any stage look at an option which included some government money going into this rather than more

expensive overseas money?

Paro Konar-Thakkar: As Mr Ibbett pointed out, the tool that we had on offer was the CFD as proposed through the electricity market reform project. That was the tool that we used to fund this project.

Lord Forsyth of Drumlean: Is that a no?

Lord Burns: That sounds like no.

Lord Turnbull: I was very pleased, Mr Monzani, that you did not fall into the fallacy, as thousands of people do, that because the Government can borrow for next to nothing they can lend for next to nothing. They bear the risk. The question is whether, because their balance sheet is so much bigger—ultimately, they have the power of taxation—they can afford, quite logically, to charge a lower-risk premium than a commercial company, particularly one like EDF, which is straining its balance sheet to the absolute limit. I suspect the answer is that this could have been done more cheaply, even taking some risk into account. I give you an example. When the Channel Tunnel Rail Link got into difficulties, it was rescued by the Government—this was John Prescott’s time—offering a guarantee. In other words, the Government were at risk in the construction, but they lowered the cost of construction sufficiently to see the project through and it was then built on time. The use of the Government’s balance sheet can in my view significantly reduce the cost of capital in projects of this kind, but it seems that we started off with Chris Huhne saying, “Well, we’ll go for nuclear power, but with absolutely no subsidies, no nothing”, and missed an opportunity to have got this thing at a substantially lower price.

Dan Monzani: The Government have offered some guarantees over the past few years for particular projects. You probably need a different set of witnesses to look at the exact macroeconomic pricing on whether it was a good idea to leverage the balance sheet in 2011 for this particular project. They have used their balance sheet at times, but I am not sure that we can help you further with the exact pricing of that risk.

Q157 **Lord Layard:** Could I ask you about clean energy R&D, which obviously could be a major instrument for reducing the cost of clean energy? We have the pledge in the spending review to double publicly-funded R&D on clean energy by 2020, which is a lot of money—we are talking about an extra £250 million, something of that order of magnitude—so it is extraordinarily important that that is done in a cost-effective way. How is the department about thinking about how to organise the spending of that money, to co-ordinate it and to have mechanisms that generate the best possible outcome? Who in the department or elsewhere is leading on this? Is there a plan now as to how this all to be done?

Ashley Ibbett: As you say, we pledged to double spending on research and development in energy technologies such that by 2021 it will have doubled to over £400 million per year. Part of that will come from the approximately £500 million for the department’s energy innovation

programme running between 2016 and 2021. We will look at smart systems, nuclear and other cross-cutting initiatives. Indeed, we have committed £9 million for the Energy Entrepreneurs Fund, phase 5, which the Minister, Nick Hurd, announced on 31 October. We have also committed about £20 million to support innovation in the nuclear sector and we have a new Energy Innovation Board, which my Secretary of State launched on 10 November, to provide strategic oversight of the public programmes on energy innovation. I would also point to the announcement in the last Autumn Statement of an additional £2 billion going into research and development more generally between now and 2021.

So we are working both internally and across government, working with the Energy Innovation Board, which is chaired by Sir Mark Walport, the Government's Chief Scientific Adviser, and with all the different delivery bodies there are, such as Innovate UK, and all the different catapults, in particular the Offshore Renewable Energy Catapult in Glasgow and the Energy Systems Catapult in Birmingham. We are also looking the opportunities for international collaboration, in particular through Mission Innovation, which is a global low-carbon research and development initiative. So the plans are developing.

As I say, a substantial increase has been announced in research and development funding as part of the Autumn Statement, and we will continue to work hard to ensure that we meet the commitment that we have made.

Lord Layard: I am encouraged to hear about the innovation board. That sounds like something that could bring a bit more order into a pretty chaotic situation. Could we have a statement from you about the existing budget, where all the extra money will go to and who it will go through? Some of it will go through Research Councils and some of it through your department and some of through DfID. Could you set all that out for us and tell us whether all of it comes under the one innovation board, or is there again a parcelling out?

Ashley Ibbett: It might be most helpful if we were to write to you about that, as it is not our particular area of expertise.

The Chairman: So you have two pieces of homework. That is one. The other is on the security side, particularly on the number of days of gas available. I wonder if I could give you a third. I would be grateful if we could get this later this week so that we can address anything arising with the Secretary of State. If Hinkley has the delays that other similar facilities have, which range from three or four years to nine years—so let us say five or six years—what are the back-up plans to fill the gap? You can write to us to set that out and explain how you would do that.

Lord Forsyth of Drumlean: Earlier, on Hinkley, when you were asked about the top-up payments having been increased by the NAO from £6 billion to £30 billion, I think you said that it had used a different discount rate. Were you arguing that the £30 billion arose because of a different

discount rate, or were you just making the point that they had used a different discount rate and not dealing with the fact that the payments had gone up? I thought they had gone up not because of the discount rate but because wholesale electricity prices had fallen.

Paro Konar-Thakkar: There are two points to respond to on that. First, I was comparing our projection as published through the value for money case in Hinkley of £11 billion to £21 billion as compared to the NAO estimate of £30 billion. There, the two differences are the discount rate and the fossil fuel prices as assumed by the NAO are at a much lower rate. We use a range of fossil fuel prices, which is why we put the range out.

On your second point, the increase from £6 billion to £30 billion is due primarily, as you point out, to the reduction in—

Lord Forsyth of Drumlean: So you challenge the £30 billion figure. What is your figure?

Paro Konar-Thakkar: Our figure is a range of £11 billion to £21 billion.

Lord Forsyth of Drumlean: So it has gone up by £10 billion, according to you, on your discount rate and assumptions, and on theirs at £24 billion. So there is only £11 billion between you.

The Chairman: Thank you very much.