

Business, Energy and Industrial Strategy Committee

Oral evidence: Decarbonisation of the power sector, HC 283

Tuesday 1 November 2022

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Members present: Darren Jones (Chair); Alan Brown; Ruth Edwards; Andy McDonald; Mark Pawsey; Alexander Stafford.

Questions 1 - 38

Witnesses

I: James Richardson, Chief Economist, National Infrastructure Commission; Guy Newey, Chief Executive, Energy Systems Catapult; Robert Buckley, Head of Relationship Development, Cornwall Insight; Dr David Joffe, Head of Net Zero, Climate Change Committee.

Examination of witnesses

Witnesses: James Richardson, Guy Newey, Robert Buckley and Dr David Joffe.

Chair: Welcome to this morning's session of the Business, Energy and Industrial Strategy Select Committee for our first hearing on our decarbonisation of the power sector inquiry. We have two panels today. First, we are going to be taking a look at the electricity system in the mix generally and then we will be having a specific focus, in panel two, on renewable energy generation. Before we get started, I need to make a number of declarations, primarily about panel two. For a period of time a couple of years ago—it was more than a couple of years ago now, actually—I was an in-house lawyer at RWE Npower, working on renewable energy contracts. I am pretty sure that my wife worked with Dan McGrail on setting up the Heat Trust a couple of years ago as well. Are there any other declarations that colleagues need to make?

Ruth Edwards: I need to declare that I had the great pleasure of working with one of our witnesses, Guy Newey, when we were both at Policy Exchange many years ago.

Q1 **Chair:** On our first panel, we have David Joffe, head of net zero at the



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Climate Change Committee; Robert Buckley, head of relationship development at Cornwall Insight; Guy Newey, chief executive in the Energy Systems Catapult; and James Richardson, the chief economist from the National Infrastructure Commission. Good morning to all of you.

The Government have set the target of decarbonising the power system by 2035 and then making us a net exporter of energy by 2040. What needs to change in order to deliver that target?

James Richardson: It is an incredibly ambitious target, but it is absolutely central to the whole of net zero. Electricity will then allow you to decarbonise other, wide areas of the economy. There are four things that I would point to as key priorities. First, we need a lot of investment in order to expand the electricity grids to bring that power from where it will be generated, predominantly in the sea and in the north of Scotland, to where demand is, and to upgrade the local grids, so that people can connect electric vehicles and electric heat pumps in their houses. There is a lot to be done there. Progress currently is very slow.

Secondly, we need to accelerate the process of consenting, of planning permission, for all these infrastructures at the moment. It can take 10 years to get planning permission for an offshore wind farm now. The Government have committed to shortening that through BEIS, through the security strategy, but we need to see action on that. We are still waiting for the national policy statement on which this Committee wrote a report a year ago. We need to get a move on in simplifying the planning system so we can bring forward these very large amounts of infrastructure on shorter timescales.

Thirdly, we need solutions to the issue of long-term interseasonal flexibility, storage and different technologies there. While we have quite a range of technologies available for short-term storage, intra-day or for a day or two, there is much less developed in terms of interseasonal storage, summer to winter, which is, in total energy terms, by far the biggest energy transfer that we need within the system. We need to accelerate the process of bringing forward technologies in that space and to ensure that they can earn a living. At the moment, there is no mechanism for that to happen.

Finally, there are a lot of reforms that were in the Energy Bill before this House: the system operator, onshore transmission, competition and business models around things like hydrogen. Those need to happen and I am not sure what the current Government stance on that is. The Truss Government paused progress on that. That needs to get un-paused.

Q2 Chair: We are waiting to find out as well. Guy Newey, James just mentioned grids, planning consents, regulatory reform and storage. What about generation? Are we happy with everything we have, or does that need to change as well?

Guy Newey: I do not think James was ignoring the need for generation. That is my guess. If you think about what needs to happen, we need to



build a lot more stuff. It is likely that the electricity system is going to double, not necessarily by 2035, but certainly over the next 20 to 30 years. It is going to be a very different system. It is really important to stress that. A system with a very high penetration of renewables in it is a very different system to the one we have been used to over the last 20 to 30 years.

That does not mean that it will not work. There is absolutely no reason at all for that, but it has to be much more flexible. It has to be able to respond. You need to build a lot more generation, but the thing has to work. People are not going to get comfortable with the idea of interruptions locally or nationally—of course not. That would be ridiculous, so you have to think about storage, both short term and long term.

You have to think about market design as well. How do we get those price signals right that reflect this new physics of a new system, where we have millions of different actors, rather than a relatively simple consumer base that turns on the TV, the heating and so on at the same time we predicted. When you put EV—electric vehicles—into that mix, that is a very different system. When you put heat pumps into that mix, that is a different system. All of that has to balance in real time, because it is electricity. That creates huge new challenges.

I would double down on the points James raised. Planning is a real barrier to the likelihood of success of meeting 2035. It is incredibly slow at the moment for all types of assets, not just offshore wind but almost everything, particularly networks. The state of the networks is going to become an increasing barrier to that growth. We need a period of investment if we are to be serious about net zero. We need to have solutions that work for consumers as well, things that are going to make life better for consumers, if we want them to make the changes that we are going to need on the way to net zero.

Q3 Chair: Robert Buckley, I want to check something. I have said this as well, but there is an assumption that we need to double the size of electricity generation. How confident are we that doubling it is enough?

Robert Buckley: We are confident that it would be enough and that we could do it with the right institutional framework, the right stability for the investment to come through, and all the points my colleagues have made around the legal and the planning framework.

I would add that consumer engagement will be key for this. It is very feasible that we are going to be in a high energy price environment for a number of years. We have some pretty radical measures in place to protect consumers at the moment. The incentives for people to use energy will change, some for the better, some for a lot worse. Keeping the consumer engagement and consent as we make these changes will be absolutely key. That ties into what Guy was saying around flexibility. Drawing the consumer in to be an integral part of these market



arrangements will be key if we want them to consent to paying all the huge amounts of money that we will need to decarbonise the power system.

Q4 Chair: On that point, I imagine lots of customers will be very alarmed at the idea that they are going to be paying lots of money. They are paying lots of money already just to keep the electricity and gas on. Are you suggesting that they are going to need to be paying more in order to decarbonise the system?

Robert Buckley: I am suggesting that the fossil-based market price is going to be high for several years to come, which changes a number of the fundamental assumptions we have made about decarbonising power. It obviously changes the macro balance of energy anyway, in terms of security and wider questions. Energy is now a front and centre political domestic issue. If the prices stay as they are, it is not going to go away. What we do to change the system, to move away from fossil, will get a lot more scrutiny than perhaps it otherwise would have done.

Q5 Chair: David Joffe, in terms of the energy mix itself, do we just need a bit more of everything? Do we need to be thinking about radical change around the sources of generation?

Dr Joffe: That is an important question and there are some choices there. We have said, and I think that it is now a consensus, that offshore wind will be the backbone of the net-zero transition. We will need a huge amount of that. The question is what else we have alongside that. There is a very clear case, particularly now, for onshore wind and solar, because we can build them quickly, alongside the offshore wind. There is a question about nuclear and I am sure we will come on to that later on.

We need a huge amount of zero-carbon generation, so I do not think we should be ruling out too many of the options there. There are clearly some choices around what costs least. On the other hand, do we want diversity of generation? Do we want nuclear in the mix even if we think it is a bit more expensive than a mix that is more dominated by renewables? Do we also want to give nuclear the chance to come down in cost from the, frankly, pretty high costs at the moment compared to the cost of offshore wind? How can we achieve that.

There are some choices there. Fundamentally, we need to get on and build as much zero-carbon capacity as we can this decade, get off unabated gas generation as quickly as we can and support the decarbonisation of other sectors as well through electric vehicles and heat pumps.

Q6 Chair: That is the main headache for us at the moment, is it not? Too much of our electricity is generated by gas power plants.

Dr Joffe: Yes, absolutely. That was never going to be solved overnight. We have had a huge ramp-up of renewable generation over the last decade, but that has effectively been displacing coal, as we phased out



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coal. Gas has stayed largely stable. That was always the idea. It was not necessarily the idea to have a massive gas price spike during the middle of that transition.

The idea—we have been saying this since 2008—is that, by 2030, electricity generation in the UK should be almost completely decarbonised. We are most of the way through that transition and it has been going very well. Hopefully we will look back and see this as a bump in the road, rather than anything more serious. Getting off unabated gas generation in the electricity system is very important, but we also need to pay attention to the other sectors. I know we are focusing on electricity generation this morning, but it is really important to support the decarbonisation of buildings heating, for example, with heat pumps, and to support electric vehicles as well.

Chair: I know you know this, but for anybody else let me say that we have already done a report on heat decarbonisation, which is why we are now looking at electricity decarbonisation.

Q7 Mark Pawsey: We have had a very good opening from all our witnesses about the scale of the Government's ambition and some of the things that we need to do to get there. I want to ask David about the report that you presented to Parliament in June 2022. I think, essentially, it said that it is all very well Government having this very ambitious target, but there needs to be some plan as to how we are going to get there. Can you elaborate a little more on what the Government should do to set perhaps staged targets in order to get to where we want to be in 2035?

Dr Joffe: Talking to officials in BEIS and so on, there seems to be an acceptance that how the CCC talks about decarbonising the sector is broadly sensible. They are focusing on different bits of that puzzle and pushing them forward, broadly, in a sensible way.

We, particularly stakeholders outside, do not see the overall plan. How does it all fit together? What does the system look like in 2035? That is really important. If you are an investor, you want to know not just, "Can I get a contract?" but, "What is the system into which my technology is going to be playing? Where are the risks for me?" Clearly, there are some risks around investment at the moment that have not been there in recent years. That is the thing that is missing. It is not necessarily even that the plan does not exist, but the statement in public of that plan, so that everyone understands broadly where we are heading, where the choices are, when they might be made and so on.

Q8 Mark Pawsey: Do you think there is a plan that we do not know about, or has it not yet been drawn up?

Dr Joffe: I think there is an understanding within BEIS, or at least parts of BEIS. I know that they do not always talk to each other as well as they might. I think there is an understanding within parts of BEIS about roughly what this thing is going to look like. It would help if they said that in public.



Q9 Mark Pawsey: In your view, what should the plan contain? What should it look like?

Dr Joffe: It is very well understood, and we saw it in the energy security strategy: the huge ambition on zero-carbon generation, the increase in ambition on offshore wind, solar etc. It is the bits around the margin. We think that the 2035 decarbonised system is probably around 85% bulk low-carbon generation from renewables but also nuclear and other things.

The last 15% is really important. That is your decarbonised back-up generation, the flexibility, the storage and so on. It is that bit that people are most uncertain about. We need to be developing those solutions this decade—the hydrogen power plants, the hydrogen storage, possibly gas with carbon capture, although obviously it is difficult when gas prices are so high. We cannot get to 2030 and think, “We have done the generation bit in terms of renewables. How do we do the last bit?” If we wait until 2030 to think about that, we are not going to get there by 2035. We need to start growing those solutions now.

Q10 Mark Pawsey: David, in your report you picked on a number of areas. I am going to ask your colleagues to deal with that and to start with James. That is the bit about infrastructure. If we do not get the infrastructure in place, we can do what we like with generation. How do we move the dial on accelerating delivery of the infrastructure we need?

James Richardson: It comes in several stages. We need a strategic plan. For the transmission system, we are heading towards that. We have the holistic network review, which has been produced by the system operator, still part of National Grid but heading towards being an independent body. That fits into processes from both the Government and Ofgem.

We are promised in the security strategy that, by the end of this year, there will be an agreed central plan for the transmission network to connect up principally offshore wind and bring that power to where it is needed. That involves some quite difficult decisions. You have to decide, for example, where you are going to land those resources on the coast. Communities will have strong views on that, albeit that the central plan means fewer landing points than the existing system, but you still have to land it somewhere and build more power lines across the country. That is not always popular either.

We need to make those decisions. We need to decide where we are going to reinforce the network and where we are going to land the power. Then we need to shorten the planning permission.

Q11 Mark Pawsey: That is critical, but how do we do that? We have an established planning procedure. It has built up over many years and everybody wants to have their say. How are we going to persuade stakeholders, and that may be communities, that their concerns have to



be put on one side for the greater good?

James Richardson: We cannot radically transform this. You are not going to bring it down to six months.

Q12 **Mark Pawsey:** Is getting it from four years to one year a reasonable proposition?

James Richardson: That is pretty punchy, but there are lots of things in the process that can individually be addressed to help shorten that. Simply having a strategic plan, having a national policy statement, having a clear statement of need cuts through the first question of whether this is the right thing to be building. There are then questions around resourcing some of the bodies that are involved, statutory consultees and so on, so that decisions can be made quickly and timetables can be compressed, simply because processes that we have to go through and that are very difficult to avoid can be done in less time.

Also, we are going to have to make some choices about whether we compensate differently. Do we accept in some cases that a more expensive solution may be needed to get consent? At the moment, those debates can often go on for a long time, as communities ask for more expensive things, developers want to avoid them, the regulator does not want to pay for them and the ball bounces between them. We need to be able to make some decisions.

In the end, Government are going to have to set out a framework for those decisions. They are obviously not going to make individual decisions. For example, how willing are we to accept that some parts of this might be a bit more expensive than the cheapest available option in order to expedite getting things through communities? That means everybody has to pay, so it is a trade-off between the interests of the local people and national interests. If you are clearer on those things, rather than everything being decentralised, you can make these decisions more quickly.

The same is true for other environmental issues, so on the seabed use for example. There are going to be impacts on the seabed, but there should be a strategic approach to that, which says, "We are going to look at where we should site. We are going to take into account the environmental impacts of that and we will have a strategy for offsets where that is required, for what needs to be done to minimise the impacts where there are impacts," rather than everything being decentralised and argued out through the planning system.

You can do all these things. None of them is easy, and none of them will transform the system, but each of them can shorten it. We need to get behind these things and get on with it. The national policy statement is a classic example. Why has it taken a year? If that is the kind of approach that we have, we are going to miss these targets. Conversely, if you say, "We need this thing; we are going to have a proper consultation and



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debate, and then we will make a decision and move forward," you can act.

Q13 Mark Pawsey: Robert, you spoke about consumer engagement. James has just spoken about the need to change the planning system and do things more quickly. Do you think consumers understand that? Do the general public understand the magnitude of the change that needs to take place?

Robert Buckley: I am not sure that the general public do. I do not think that enough has been done to engage the general public on this. If you look at the way that energy is projected through the media, it is through a prism of costs and people who are ripping you off. That is not conducive to getting people into the sector to spend money in order to invest in new equipment.

That is another area that I would like to pick out. We have talked about the potential changes to the institutional framework, the market rules and so forth. They may come through. They may be very important, but, while they do come through, we run the risk of sitting on our hands from the investment perspective and of things not being taken forward perhaps as quickly as we would like.

To also pick up on what David was saying on his committee's work and the Government framework, a lot of people in the sector infer policy choices from what the CCC puts out. It would be useful if the Government followed through with the ambition and maybe, if they believed that CCC was going in the right direction, flagged up some of the choices that it should be making at different points in the future from that.

We are in a funny situation. To go back to your original question, more should be done to engage the consumer side. There is a lot that is positive that can be done. Guy has spoken about electric vehicles and flexibility within the home. That is a good thing. On the other hand, there is also a little bit of a danger that we demonise people who cannot afford to decarbonise, who cannot afford an EV or batteries. They should be encouraged along as well. There are big choices on the consumer side and a lot to do.

Q14 Mark Pawsey: Robert, in your remarks to the Chair, you reminded us that we are in an era of high energy prices and that they are going to stay for some time. If the war in Ukraine continues for some period yet, is that likely to derail the objectives that we have set?

Robert Buckley: It is an interesting one. It will have a profound effect on consumption, on the demand side. It will have a profound effect on people's incomes. You might think that it would trigger a pushback against the drive to decarbonise. That is why explaining the purpose of decarbonisation to the public and putting the right context on why bills have gone up would be a good thing. Bills have gone up because of the rising wholesale prices, driven by the formulas in the Ofgem cap.



- Q15 Alan Brown:** James, I have some nuclear-related questions. Imperial College London researchers have suggested that building new nuclear can only be justified if much lower cost than Hinkley Point C. Is that a concept you would agree with? If so, what would much lower look like, given that Hinkley is already the most expensive power station in the world?

James Richardson: Our view is that you need to keep the nuclear option on the table. You need to have more options than you might, ultimately, need, because you cannot rely on everything working. You ought to be cautious about it. It is important to state that, for 2035, the only nuclear that is realistically going to be delivered on that timetable is Hinkley itself and possibly Sizewell C, because that is quite advanced. You are not going to start a site elsewhere in the country and get that delivered in 13 years. That is not possible.

If you want to look at the maximum amount of nuclear you are going to have by 2035, it is the existing Sizewell B that will still be going, Hinkley C and, potentially, Sizewell C. If you were really lucky, you might get one small modular reactor functioning by then, but we have to be pretty cautious on new nuclear technology. The idea that it is going to turn up on time is quite optimistic, given the track record.

Nuclear, inevitably, is only going to play a relatively small role between here and 2035. It might play a bigger role out to 2050, because you can build more on those longer timescales. As David said, it is a very expensive technology, but it brings some system benefits. We are perhaps at the somewhat more sceptical end that the value of the system benefits is high enough to offset the costs, but we do not entirely know at this stage, because the alternative ways of delivering those system benefits, particularly the ability to keep the lights on when it is not very windy, rely on technologies that look easier to develop than, say, a new nuclear power station.

- Q16 Alan Brown:** Can I come in on that? The national infrastructure assessment was published a few years back now—four years back I think. On page 32, there is a note that modelling undertaken by the National Infrastructure Commission estimates that an electricity system powered mainly by renewables would cost no more than relying on new nuclear after Hinkley. Does that modelling still stand up—that, effectively, building a system on renewables is not going to be any more expensive than relying on nuclear?

James Richardson: That modelling still stands up. It comes through in more recent modelling that we have done and in other modelling. Of course, modelling is subject to uncertainties. A lot of this depends, for example, on the costs of long-term flexibility options to move power from summer to winter, and from periods when the wind is blowing to periods when it is not.

There are good reasons to suppose that those technologies can come through at relatively low costs, but I do not have one that I can go out



and build right now. In some senses, building a further nuclear station, which is what we recommended in the NIA, is an insurance policy. You do not want to go out and build a whole fleet of them; that is our view, because then you are locking into a very expensive technology and you may well find that that is a mistake. Taking it off the table completely, which is what would happen if you just built Hinkley, so you would not be able to recreate those supply chains, is also a risk. There is value in keeping it on the table. At some point in the future you might say, "Actually, no, we are not going to build a third one beyond Hinkley and what, inevitably now, is Sizewell C."

- Q17 **Alan Brown:** Keeping it on the table is also a very expensive back-up, is it not? The Government's own figures in the nuclear financing Bill show that the capital costs and the borrowing costs associated with a new nuclear station, such as Sizewell, are £63 billion. Is that not a very expensive commitment just to keep a supply chain going and to keep an alternative on the table? The Government have also committed to spend £1.7 billion directly just to take Sizewell to a final investment decision. Could that £1.7 billion not be spent buying and paying for capital investment in other alternatives?

James Richardson: To take those two halves, the overall system cost is what matters. Nuclear is extremely capital intensive, so you get very large costs. It also produces a great deal of electricity over its lifetime.

Our modelling, the modelling that you referred to, and most other people's modelling, suggests that the system costs do not vary that much between systems that have a bit more nuclear and a bit less nuclear. Obviously if you completely changed the amount of nuclear, if you tried to build a system with 50% nuclear or whatever, you would end up with something very different. With a bit more or a bit less, the overall system costs do not seem to vary very much.

We have to understand that that is partly because the uncertainty around this modelling is very great, so we should not put too much emphasis on any one figure. Our view is that there is not enough evidence at this stage to say that having nuclear in the system pushes up whole system costs so much. Some of the other costs are lower if you have nuclear. You do not have to build so much in the transmission system, for example.

- Q18 **Alan Brown:** Your modelling still shows that having a system based on renewables rather than nuclear is not more expensive.

James Richardson: It is not more expensive, but, conversely, it is not more expensive to build a little bit more nuclear and a little bit less renewables. It is about the same within the estimates.

In terms of whether this is displacing other activity, I do not think that is particularly true at the moment. There is always a risk and one should always be aware of that risk, but there is a great deal of private capital



ready and willing to move into the renewables sector. With things like contracts for difference, we have a stable, long-term funding regime. That is working very well. There are always some risks that, if you put too many eggs in one basket, you are displacing somewhere else. I do not think that is immediately the risk of going down the line of having one more nuclear.

- Q19 Alan Brown:** Dr Joffe, in the Climate Change Committee's balanced pathway, you have allowed for 8 GW of new nuclear capacity by 2035. Given what James said—that, at best, Sizewell, on top of Hinkley C, will come in by then—should that balanced pathway be revisited? Realistically, we know how far behind Hinkley Point C is, because in EDF's latest programme it could be as late as September 2028 before unit 1 comes on and 2029 for unit 2. That is from 2016, so you are looking at a 13-year evolution. Quite clearly, we will be lucky to get Sizewell delivered by 2035.

Dr Joffe: In terms of what is in our balanced pathway, I am slightly rusty. It is a couple of years since we did it. From my memory, we just have Hinkley and Sizewell by 2035 and maybe we have some post 2035. If we have any others, it will be in the mid-2030s. As you say, the tendency is for those to be delivered later. I do not think we are in a very different space to what you discussed with James.

James Richardson: Eight is essentially Sizewell B, which is the existing one, and Sizewell C plus Hinkley. That is basically eight.

- Q20 Alan Brown:** The Climate Change Committee report said that it was 8 GW of new build capacity by 2035. I can come back to you outwith this. Should the Government not be investing much more in energy efficiency to reduce demand?

Dr Joffe: Yes, absolutely. We need to do energy efficiency, the demand side, and the generation side. They are not mutually exclusive. We should be doing both, absolutely.

Chair: Everyone, presumably, agrees with that. I think everybody agrees with that apart from the Government.

- Q21 Andy McDonald:** Could I ask about the transition from fossil fuels as we make that transition to a decarbonised power system? Can I ask an open question? What role should fossil fuels play during that transition period?

Dr Joffe: We see 2035 as very largely non-fossil by the time you get there. There is a transition of renewables pushing out unabated fossil generation over that period. For those peaks where it is the coldest day of the year and we need the most electricity generation, or where the wind is not blowing as much, we will need the back-up generation. That needs to be decarbonised as well.

There are solutions for decarbonising that back-up, as well as batteries. We will have batteries on the system, but we need things that have a



longer duration. The solutions look like fossil gas with carbon capture and storage. Of course that looks expensive at the moment, because gas is very expensive, but that can change over time.

The other one is hydrogen turbines. The hydrogen can be produced from surplus renewable generation at times when it is very windy. We do not think that there will be a huge amount of hydrogen from that source, so we will probably need some of the hydrogen also to come from fossil fuels with carbon capture. That is our latest modelling. We do not think we can move to 2035 and be entirely free of fossil fuels in there, unless we are importing green hydrogen from other countries.

Q22 Andy McDonald: On the carbon capture, a lot of technologies are being dangled in front of us. How confident are you that we will have a really deployable CCS facility at scale in sufficient time?

Dr Joffe: That is a question. I do not think we know.

Q23 Chair: What is the answer?

Dr Joffe: It is a question we have given a lot of thought to. The technology exists. There are challenges around the business model and challenges particularly at the moment around the funding. Gas generation, even without CCS, is expensive. Gas with CCS is even more expensive, so there are challenges. In terms of the technology, I have some confidence but not full confidence. That is why we need to get on with doing it to check that it works and, if it does not work, we have other solutions as well.

Guy Newey: It all comes down to how serious the Government are about wanting to develop this technology. We often say, "CCUS has not made the progress that renewables have made," but renewables have had 10 billion quid a year of support over the last 10 years. Guess what? They have come down in cost. It has been a remarkable success story. These are scale technologies. You have to be really committed to do it, and that applies to the nuclear side. The Government have had a couple, or three maybe, false starts over the last 10 years on CCS, and it has not made the progress that it needs to. There is no technological reason it cannot do that. It is political will and the financing costs.

Q24 Andy McDonald: You took me down that path because you mentioned it, but I want to concentrate on the fossil fuels side of things. The Climate Minister has argued that new licences for North sea oil and gas are compatible with net zero, because North sea fossil fuel will replace imported fuel and so has a lower carbon footprint. He has also stated that the overall oil and gas production in UK waters will decline at a faster rate than in the global 1.5° C scenarios. Is awarding 100 new licences compatible with our commitment to the Paris agreement?.

Dr Joffe: I have not looked at whether 100 licences is compatible. I suspect it is not. The most important thing for our climate targets is what



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happens to fossil fuel consumption. If we get fossil fuel consumption on the right path, going down very quickly, fossil fuel supply will follow.

The question of where the fossil fuels come from, whether it is produced in the UK, or whether it is produced abroad and we import it, is very much secondary. There are advantages that people talk about, in terms of UK security of supply and having a smaller emissions footprint of oil and gas production if you produce it in the UK. There are disadvantages as well. There is the risk that we overproduce fossil fuels globally and therefore the extra production feeds into consumption. There are arguments on both sides. I think 100 new licences is probably too much, but I could not tell you what the right number is.

Q25 Andy McDonald: You mentioned issues of security of supply. The whole strategy, the target of low-carbon sources by 2035, is subject to security of supply. How do you think that caveat should be better defined, so we can be better informed?

Dr Joffe: That caveat was ours originally, when we made the recommendation for the 2035 target. I will explain what we meant by it, and of course the Government might mean something slightly different. In 2035, in a normal year, when the wind is blowing as we would expect and so on, we should be aiming for all generation to be decarbonised; it might be only 99%, but that should be what we are aiming for.

It is subject to security of supply in the sense that we do not want the lights to go out as a result of decarbonisation policy. That probably means that we need to keep a reserve of unabated fossil plants there, just in case it is an extremely cold year or we have outages, whether it is nuclear, low wind generation and so on, to ensure that the lights stay on, even though we are decarbonising. That is what we mean by "subject to security of supply". It is going as close as you can to full decarbonisation, but not at the expense of the lights going out.

Q26 Alexander Stafford: We have already talked about the higher costs. The panel already mentioned that there are going to be higher costs for energy over the next few years. What is the best way to pay for this level of energy? Do you have any ideas? What do you suggest?

James Richardson: You have to separate out the temporary effects of the war in Ukraine from the long-term effects of decarbonisation. The Government have made choices on the short-term impacts. They are going to come back and make further choices. I do not really have much to say on that.

On the long-term costs of decarbonisation, in the end, this will predominantly be paid for by consumers. The reason for that, fundamentally, is that it is not clear that the unit cost of electricity is going to be significantly higher in a decarbonised world than it was—I need to stop saying "today"—in, say, 2020 or 2019. The system as a whole is much bigger, because consumers are no longer paying for



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petrol. They are no longer paying for natural gas for their home heating. Electricity is playing those roles, so of course the electricity bill goes up, but other bills fall. If you look at the unit cost of electricity, it probably gives you the best idea.

The mix will be very different. We know that the generation costs for things like offshore wind are now below those of gas, even at normal gas costs. Some of these costs around the transmission network and so on will be higher, because we have to invest. There is a lot of uncertainty around this, but, broadly speaking, it looks like you are in the same kind of ballpark as you were before the Ukraine shock.

A lot of that comes about because of the efficiency gains from electric vehicles. An electric motor is three times as efficient as an internal combustion engine, so there is a big saving there for households in terms of how much energy they need to power their cars. Heating is a bit the other way round. There are losses and gains.

It will be important to think about the distributional consequences of this. It is one thing to say the average price is roughly stable, but it will not be true for every household. We will have to take a lot of care about that, particularly in the heating area. I do not think that there is, in the power generation and distribution/transmission sector, massive need for taxpayer subsidy or whatever, because those unit costs look reasonably flat. Elsewhere, you may need more interventions.

Guy Newey: The likely low-carbon technologies that we are going to have, particularly in the power sector, but also more broadly across the economy, are going to be more expensive to build, but much cheaper to run. What does that logic lead you to? You want to build as few of them as you need to, so you need to make your overall system as efficient as possible. That is where flexibility comes in, so you are making the most out of every turn of that wind turbine, of every time the nuclear power station comes on and so on.

That means that you have a lot of up-front cost to deliver and that really is a choice about how you reduce the cost of capital as well as thinking about the system, but also who pays that up-front cost. That is a political choice really. It could absolutely be, "Everything gets paid for by the market. Everyone can pay for their EVs. Everyone can pay for their heat pumps and so on." That will be a very difficult political choice. It is a case of how you balance that and spread those costs over a longer period of time.

Robert Buckley: Can I pick up the point of fairness I think you are raising, Guy? At the moment, we have a definition of fairness, which is that everybody pays the same unit price. There are many other definitions of fairness that are available: rights to heat, light and comfort may be. There are big choices implicit there.



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On the cost of capital, the Energy Prices Act has not really helped there, with all the powers that came and went for the Secretary of State, and the revenue cap. It is symptomatic of a series of short-term interventions over very many years that have been quite destabilising.

Q27 Alexander Stafford: You mentioned the Energy Prices Act. You are clearly not a big fan of it. Why has it not worked?

Robert Buckley: It is not that it has not worked. Clearly, a legislative framework is necessary for the support schemes for consumers, businesses and households. We have tacked on some bits at the end in terms of the generator revenue cap. What came out in the initial draft was really quite profound in terms of powers for the Secretary of State to determine pretty much anything at any time. I know that the Act as it has gone on the statute book is a little different, but that same direction of travel, in terms of the revenue cap, is there.

There is a lot of uncertainty about what that cap level will be, or whether it will be a windfall tax. I do not know. The media says different things. The one thing it has done is given a jolt to the investor view of the UK compared with other places around the world where capital can be deployed.

Q28 Alexander Stafford: Is that sending the right signals to the private sector?

Robert Buckley: Not necessarily.

Q29 Alexander Stafford: That is a no then. Why not?

Robert Buckley: Essentially, it is intervening in investments that have already been made, assumptions that have been made many years ago, and trying to redefine the rules. There is clearly a debate to be had about what a windfall is and who is earning it. Good luck with trying to sort that out. That debate needs to be had, but the way that it has come through very quickly into an Act of Parliament has given a lot of people a bit of a shock.

Q30 Alexander Stafford: Do the rest of the panel agree about that—the signal it sends the private sector and the shock to people?

Guy Newey: It increases political risk, to Robert's point. Investors and innovators that we work with find that very hard to work out. The political system is not a stable system that you can model, sadly. They ideally want decisions to be made in the market, with rules they understand, where they can invest long term. If they do well, they can make a profit. If they do badly, they understand they take the risk. Every time you add in that the Government can make some choices maybe around particular technologies or what the right rate of return is, that includes risk.

That said, windfalls have been made in recent periods. There is a reasonableness in Government intervening in that way. Indeed, most investors would understand that. I think Robert is talking about the



extras: "While we are here, we will take a few more powers." That is what gets people nervous.

Dr Joffe: To emphasise, the increased risk feeds through into increased cost of capital, as we have heard. In the context of the major investment programme that we need in the sector over the next three decades, but particularly this decade, we could be losing billions of pounds because of increased cost of capital as a result of trying to claw back billions of pounds from the windfall tax. There are swings and roundabouts there, but ideally it would have been done in a way that gets the windfalls out without increasing the risk.

Q31 **Ruth Edwards:** James and Guy, in your opening remarks you set out the essential challenge we have. We are going to see a huge surge in demand for electricity at the same time as we see a fundamental change, in that we are moving from a small number of very large, predictable power generators to a huge number of small-scale, rather unpredictable power generators. Could you set out for us what some of those challenges are for the grid, its functioning and its resilience; where we are now, in terms of readiness for that; and what needs to happen to make sure that we can get there, along the decarbonisation route, with everything staying on and working for consumers?

Guy Newey: I will have a first go at that. James, you can correct me where I get things wrong. The first point is that you have to balance electricity in real time. Otherwise you are going to get interruptions locally or problems on the grid. It also needs to happen at different parts of the grid at different times. When you have on the system many more renewables at different locations on the grid and, at the same time, lots of people getting electric vehicles and more getting electrified heating, that creates a much more complex challenge just by the sheer numbers of different actors. At a national scale, if you get that wrong, you get blackouts. At a local scale, you also get blackouts. You get, basically, your local substation tripping and your particular area going out.

That needs a profoundly different approach to how we get that balancing in real time. Yes, we could just build a bigger and bigger grid, with more and more capacity, dig up everyone's roads, put in bigger wires and so on, but that is potentially quite expensive. It is disruptive and we have already talked about how difficult it is to do planning. In addition to that, you also need to think about how you use that system as efficiently as possible. A lot of that is about market signals, so you can have local trading of electricity going on. You could have a battery facility for a particular area, which others can draw on at different times. Your electric vehicle works and talks to next door's solar panel.

That system can work at that local level, but that is a very different system to the one we have, which is quite dumb. I do not mean that in a pejorative way. We do not really know how much spare capacity there is at local level, because we have not had to worry about it for a long time. We have built it with redundancy. In addition to all the planning things



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that need to happen, you need to get the market design right, so that people have incentives to do it at local level.

I would characterise the current situation as our grid starting to creak. That is probably the way I would describe it. You see that at national level. The system operator has to, as it calls it, redispatch more and more power. It is meant to redispatch around 5% to 10% every half an hour. Sometimes it is having to do 70% because there are strange things happening on the grid. At local level, it is quite an old system. Lots of the hardware is 60 or 70 years old down there. It is not set up for this smart world that we talk about. It is creaking at both national level and local level. We have time. We have 10 or 15 years to start thinking about that. If you start doubling the size of the electricity system at the same time, things will need reform; otherwise that creaking will get louder.

James Richardson: I do not disagree with any of that. While some aspects of the challenge are definitely much harder in the new system, not everything is much harder. That is partly because we have some of these smart technologies that we did not have when we built the system before, so there are big opportunities to be got there.

It is also that some aspects of the way the new system will work actually reduce some of these challenges. For example, it is windier in winter than it is in summer. That is pretty helpful when you have a lot more demand in winter than you have in summer. Something like a nuclear power station does not adjust very easily over the year. At the moment, we have gas power stations that fire up half the year, if you like, and sit around idle the other half of the year. A wind turbine does that automatically.

At the moment, if a large power station trips and goes offline, the system loses a lot of power very quickly and has to try to recover from that. If a single wind turbine or solar panel goes offline, it is a much smaller effect. There are some swings and roundabouts in this that are important to capture.

Some parts of the solution set here are easier than others. We need to manage things like instantaneous millisecond response—what is called operability. There is a whole range of technologies that do that. There are new ones coming through that are hopefully cheaper than the existing ones, but the existing ones are not that expensive. Yes, somebody needs to do it; it is really important, but it is not as big a challenge, say, as interseasonal storage, where there are technologies, but they are much less well developed.

Some parts of this are harder than others. Making sure that we charge our electric vehicles at night, when the system is not being used and we have spare capacity on it, rather than at 7 pm, is really important. There are very smart ways of doing that, and there are slightly less smart ways of doing that and really dumb ways of doing that. You probably want to make sure that the first thing you do is avoid the really dumb ways of



doing it. As you roll the thing out, obviously you want to get to the smarter and smarter solutions. Some of this is pros as well as cons. Some of this is easier because we have technologies we did not have before, particularly the smart technologies.

Guy Newey: To emphasise that point, this is a massive innovation opportunity. The companies that we work with as the catapult and help all the time in this smart space are using the potential of digital technology to make the system more flexible. The UK is a really great place to do that. We are going to have to do this everywhere in the world. The UK and the other leading markets—California and some of the European markets—are all dealing with the same challenges of a more renewables-heavy system, which is, as James said, a massive innovation opportunity. You can see investment starting to pour in, as people understand the potential of digital technology to transform the energy sector, as it has loads of other sectors.

Q32 Ruth Edwards: Do you think that the UK Government are doing enough to encourage investors investing in those types of technology in the UK? Is there more that we could be doing, or learning from Governments overseas?

Guy Newey: The most important thing the Government could be doing, which has started, is thinking about how the future electricity system is designed. Lots of these guys do not want to play the subsidy game. They do not want to be knocking on the door. They want real markets that they can play in. The review of electricity market arrangements, which the Government started a few months ago, is an absolutely essential part of driving the kind of innovation we need. It is great to see that happen. Could it have happened more quickly? Of course it could, but it is happening now and it is a really big issue for us in the energy industry and probably for your Committee to think about as well.

Q33 Ruth Edwards: Robert, talking about the REMA, what are your views on the proposals in that for splitting renewable and gas or fossil fuel wholesale markets and introducing locational pricing?

Robert Buckley: It depends on what you want to achieve. If you do not like the link between high gas prices and power prices, simply, you could start by looking at the way that the existing cash-out rules calculate the imbalance price, under the balancing and settlement code. That is where the link comes in. You could make that a lot less marginal. If that is what you want to achieve, you could probably get a fair way along the track quite quickly.

If you are looking to change the institutional arrangements so that you can bring in a more diverse, active and smaller market, maybe a more fundamental review of the arrangements is helpful. Be careful what you wish for with locational marginal pricing. I know that some people like it quite a lot, but it will open up an awful lot of winners and losers, certainly on the generation side.



I would question whether you would even need to do it on the demand side and whether you would want to unpick the value of a single, GB-wide consumer price. You will be zoning and there will be volatility there as you define those zones. You would have to work out the link into network charges, which provide a degree of regional signal. From our point of view, be careful what you wish for and make sure that you have the purpose right for what you are looking for. If you are simply looking to lessen the impact of the gas price on the wholesale power price, there are things you can do in the existing regime, which might blunt it quite a lot.

Q34 Ruth Edwards: David, I could see you nodding there when we were talking about locational pricing. I understand that there are two options being looked at, zonal and nodal. What are your views of the advantages and disadvantages of each? Do you think it is a road down which we should be going?

Dr Joffe: It is quite a complex subject to deal with in a short period of time. It is really important, as Robert said, that we do not rip up the system and start again, introduce lots of signals but also introduce a lot of risk. We have a huge amount of investment required this decade and, by changing the rules dramatically, we could endanger that.

On the other hand, the rules as they exist are probably not perfect for the transition that we need. We think that probably the most sensible solution is to take what we have now and tweak the bits that are not working very well. We can improve locational signals within the market, in terms of both the capacity market and contracts for difference. Moving wholesale to locational marginal pricing feels like a big risk at this stage. It is something that maybe we should keep on the table for the next decade. At the moment, I do not think we understand well enough how that will play out in the investment climate that we have.

There is a lot of modelling out there on the particular merits of zonal versus other ways of doing it. It is based on a lot of assumptions. If you believe the modelling, there is potentially a huge prize from the most granular version of locational marginal pricing. It is also a question of, "Yes, but there are alternatives" and it is really hard to work out exactly what the costs and benefits of these things are. It remains to be seen exactly what the right solution is. BEIS is doing the right thing in reviewing it. I cannot give you a full answer, but "steady as she goes" is broadly the right thing—an incremental approach, tweaking what we have for now and keeping bigger changes later down the track on the table.

Q35 Ruth Edwards: I wanted to ask one very quick question about hydrogen. I read an article in the *Financial Times* yesterday. They ran something by the chief executive of Johnson Matthey, which said that the UK has lost its leading position in the global race to develop hydrogen power and that they would be focused more on the US in the future. I wanted to find out whether this corresponds with your view. What do you think the UK could be doing to encourage more investment in hydrogen?



Dr Joffe: We are going to need hydrogen across a range of sectors, including the power sector, but not only. There is going to be a challenge with hydrogen supply. Previously at least, in our modelling, we had a mixture of supply from renewable generation, but also from fossil gas with carbon capture and storage. That is now very expensive, so there is a question of how we can we get enough hydrogen to use not only in the power sector, but in the other sectors.

If I was an investor in hydrogen generation, I would be asking, "Where is the hydrogen going to come from?" There are challenges there in terms of hydrogen production. We also need the hydrogen storage and we think the lead times for hydrogen storage are pretty long. It could be five years; it could be a bit longer. We need to start getting going on that if we want investors to invest there.

On the hydrogen production side, we have companies that make electrolyzers to make the green hydrogen. We need to recognise as well that we are not going to have an inexhaustible amount of clean electricity, certainly on a 2035 timescale, to get as much green hydrogen as we want. We need to be looking at hydrogen imports, as well as producing our own hydrogen in this country. Otherwise we probably cannot do all the things that we want to do with hydrogen.

Q36 **Mark Pawsey:** I just have a quick one about the role of the customer and the consumer in this. The consumer could be accused of being taken for granted. We have tried to get them to have smart meters. That has not been terribly successful. We have persuaded them to do it because it was better for their billing; it is better for them to use energy out of peak time.

We have tried to persuade people to insulate their homes, but I have a constituent who sprayed insulation in her loft and is now paying more money to take it out because it does not work. I have constituents who are now buying pretty substantial batteries to make sure they have security of supply. Are we taking the consumer for granted in all this?

Guy Newey: We absolutely cannot. Consumers, voters and people have a total veto over net zero. If they do not like the technological solutions, they will just not accept them. We have seen the difficulties with smart meters.

You have to think about it. The best innovators, the best SMEs and the best companies in this space are thinking about low-carbon options that are better for consumers, are more desirable and just happen to be low-carbon. That is quite a profound change.

The energy industry—I am probably being totally unfair—has not really been fully consumer-focused. As long as you pay your bill and you do not phone us up too many times, we are happy with you. It needs to get to a very different relationship where they are holding the hands of consumers to net-zero technologies, whether that is electric vehicles,



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low-carbon heating, heat networks or anything like that. That is a profound change. Again, it is a massive opportunity for whichever companies can help consumers and get their trust

Q37 Mark Pawsey: Robert, who should be doing this communication? Should it be Government? Should it be the energy generators?

Robert Buckley: The Government should set the framework, but they should allow a market arrangement where suppliers or parties can go out, engage consumers and bring the lifestyle improvements that, as Guy says, coincide with low-carbon products. We have collectively, through the cap, stifled innovation in the retail market for more years than I care to remember, because we have not debated what this question of fairness is.

Until we address that, the retail market arrangements will continue to hinder the kind of progress that is out there. You will make it an accidental lifestyle choice for your constituents and others to invest in batteries. They will go off-grid and they will gradually degrade the need for a grid in their areas, which will then have further implications in terms of other costs. We have to get the retail market arrangements right. Do not forget the retail market.

Q38 Mark Pawsey: David, some of my constituents are very aware of what you are doing, but most of them do not even know the Climate Change Committee exists. What are you doing to engage with consumers about your work and the conclusions you are coming to?

Dr Joffe: That is really important. I recognise that most people have not heard of us. It is not within our remit to engage the public. On the other hand, we do recognise that it is really important. We are trying to do as much as we can in terms of improving our website and making things as accessible as possible. It is really for Government to set a framework for public engagement and to start this process.

It is hugely important, and it is not just important on the electricity side of things. People need to understand how they can contribute to net zero. Net zero itself is hugely popular, but people just do not have a conception of all the things they need to do. It is really important, but it is not a role we have been given.

James Richardson: Even fewer of the public, no doubt, have heard of us than of the CCC, but we try to engage directly through things like social research, focus groups and so on, and indirectly through engaging with organisations like Citizens Advice, which has a huge amount of experience here.

We need to make things simple for consumers. It is all very well to build a beautifully complicated electricity market with all the right incentives, but if consumers do not understand it, they will not engage in it. We need trust, and we need trusted sources of advice. That may be the Government giving clear messaging on some things, telling people that



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they are going to have to move off gas for central heating, and that the causes of the current crisis are not renewables but gas.

A lot of that messaging can come from other actors: from electricity companies, from Citizens Advice or from local authorities, which might be better placed to advise on insulation. It is something that Government really need to grip at all levels. As others have said, if you do not take the consumers with you, it is not going to happen.

Chair: Thank you to all four of you. We are now going to move swiftly on to panel two.