



Welsh Affairs Committee

Oral evidence: [Nuclear energy in Wales](#), HC 240

Wednesday 19 October 2022

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Members present: Stephen Crabb (Chair); Virginia Crosbie; Wayne David; Ruth Jones; Ben Lake and Beth Winter.

Questions 1 - 22

Witnesses

I: Professor Adrian Bull, Associate Director of Dalton Nuclear Institute, Manchester University; Dr William Bodel, Research Associate at Dalton Nuclear Institute, Manchester University and Dr Michael Bluck, Director of Centre for Nuclear Engineering, Imperial College London.

Written evidence from witnesses:

- [Dalton Nuclear Institute, University of Manchester](#)
- [Dr Michael Bluck, Director of Centre for Nuclear Engineering, Imperial College London](#)



Examination of witnesses

Witnesses: Professor Adrian Bull, Dr William Bodel and Dr Michael Bluck.

Chair: Welcome to this session of the Welsh Affairs Committee, where we are beginning our short inquiry into nuclear energy in Wales.

We are delighted to be joined this morning by the first of two panels. Our panellist Professor Adrian Bull, who is the associate director of Dalton Nuclear Institute at Manchester University and his colleague, Dr William Bodel, research associate at the Institute at Manchester University. We are also joined by Dr Michael Bluck, who is the director of the Centre for Nuclear Engineering at Imperial College London. Welcome to all three of you. Thank you very much for giving us your time and expertise this morning.

We will go straight into it. I am going to ask my colleague Wayne David to begin the questions.

Q1 **Wayne David:** Thank you very much, Chair. Good morning, gentlemen. Two general, but quite fundamental, questions to start with.

The commitment to net zero is a pretty firm commitment, and I was wondering how you saw the nuclear industry generally being able to help fulfil that commitment but fulfil it in the context of what is happening as we sit here today and see the situation in Ukraine. That has an obvious bearing on the debate, not just in this country but worldwide, in terms of energy production and protection and sustainability. I was just wondering in that context, particularly, how you saw the development of a nuclear industry in Britain and in Wales, especially.

Professor Bull: Maybe if I start off and then colleagues can say a little bit more as well. First of all, thank you for the opportunity to come in and give evidence today.

The answer to your question is it simply ratchets up the importance of a nuclear programme even more than was already the case. As you say, the commitment to net zero is in place and is an incredibly challenging target, particularly when you think of the power generation that is on the grid today. Only Sizewell B is likely to still be operating when we get to 2050. We are looking at a wholesale replacement and a scaling up of Britain's energy and electricity production network.

Nuclear obviously is one of the low-carbon options, and is valuable for that, but it also provides valuable energy security—energy independence. We are not reliant on some of those countries in the world that are historically less politically stable sources of uranium. In places like Australia, Canada there are good political relationships in place and there are many of those sources.

It is also perhaps worth bearing in mind, even if there were some interruption to the supplies of uranium into this country, that the time



scales between that happening and an impact on electricity production would be far longer than is the case for gas. We have a much longer process for making fuel, fuel getting to reactors, being in store at the reactors, being loaded into the reactors. Then, even if there was something that delayed a delivery of new fuel to the reactor, the reactor could still carry on operating for many months but would simply operate on a gradually declining level of power output. The resilience to geopolitical or any other logistical disruption to fuel supplies is far lower with nuclear than with gas. That is particularly the case when we are looking at gas from overseas.

Dr Bluck: If I can just chip in, on the achieving net zero. If you look across, countries which have made tangible achievements to get to net zero are unsurprisingly few and far between, but they are dominated by countries with either lots of hydro or substantial amounts of nuclear.

There are lessons that we take from that. If we really do want to achieve net zero, this is one of the few mechanisms that we have that has a proven track record in delivering it. That is really important and, as Adrian has pointed out, we have a history of nuclear. That provides us with the security that recent events have shown us. That also relates to price and cost. A renewables-heavy grid is cheap when the thing that you use to make up for intermittency is cheap. Gas was cheap and helped make electricity from renewables cheap. Gas is not cheap anymore. The reason why historically we left nuclear was because of cheap gas. The world has changed, I would say.

Dr Bodel: I would add that one of the biggest challenges to getting towards net zero is less to do with electricity now. There is a broader discussion to be had, more on energy rather than simply electricity. Since 1990, we have done quite well as a country in reducing emissions from the electricity sector. However, that only makes up a small proportion of the total energy demand for the United Kingdom.

The two biggest things that are going to need to be addressed will be provision of heat for warming buildings and commercial properties, etc, heat provision for industry, and also decarbonising the vehicle fleet, whether that be surface transport, aviation, or shipping; those two things are going to be far more difficult than what we have had to do so far in decarbonising electricity generation.

The reason why nuclear is relevant here is that nuclear has got particularly useful application for those non-power industries as well. We can use electrolysis to get things from renewables. However, the high temperature of nuclear offers plenty of opportunities to produce hydrogen and use direct heat for industry, beyond that, essentially.

Q2 **Wayne David:** Following on from what you have said, particularly on the unattractiveness now of gas, does that imply not just a bigger emphasis on non-carbon forms of energy generation but a different balance between those alternatives? Do you see, as a consequence therefore,



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nuclear becoming proportionally more important than other forms of power generation?

Dr Bodel: I think so. As Adrian mentioned in his earlier answer, before we start adding new nuclear to the grid, we have got to offset the nuclear that is coming off the grid in quite a short period of time.

With regard to the balance of different energy supplies, gas is not just there as a method for producing power on a large scale. It is also the essential technology that is used to fill in the gaps when there is intermittency with renewables. Gas can be turned on quite quickly and responds quite quickly to being powered up.

As we move towards net zero, we are expecting, because of the extra provision that can come from things like nuclear energy beyond power, that we will remove the limitation on nuclear to what used to be known as just the base load provider of electricity. It will be able to produce other useful things, which gives nuclear the flexibility it never used to have.

It may well be, as gas becomes more expensive and a less useful fuel for the future, that nuclear will have a broader application than it used to. One thing we can be certain of is that the renewable generation is going to continue to increase. As that increases, we require more technology to fill in the gaps of intermittency.

Dr Bluck: If I could just pick up Will's point, the truth is that most nuclear reactors, for every kilowatt they generate, generate two kilowatts of heat, which we currently just dissipate into the atmosphere or into the sea. That is heat that has real value, as Will has pointed out. This is process heat for industries, this is district heating.

We talk about one of the biggest problems with decarbonising being the decarbonising of our heating, but when we generate heat at the moment, we throw it away. This is not new technology for nuclear. Many states in the east have got district heating schemes connected to nuclear power stations, which would otherwise be wasted. It is an additional revenue stream, again, that changes the cost.

You are right to point out that there is some uncertainty in what it will look like, but some strategic decisions about how we are going to heat homes, industry and supply energy, not just electricity, will dictate the levels at which this comes out.

Chair: Thank you. Virginia Crosbie has a supplementary question.

Q3 **Virginia Crosbie:** Yes, thank you. Bore da, gentlemen. Thank you so much for coming out this morning.

Dr Bodel, you mentioned the transport sector. We all remember when the wind did not blow and the sun did not shine this time last year, cars queuing up at fuel stations to fuel up, but you specifically mentioned the



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transport sector and the benefits that nuclear, particularly with electrolysis to form hydrogen and other fuels. Is your understanding that we simply could not decarbonise the transport sector without nuclear? Thank you.

Dr Bodel: Not possible is a pretty binary term. It probably would be possible, I just think it would be extremely difficult. The reason why nuclear has got an advantage over renewables, well, first of all, let us consider what the future of the surface fleet is going to look like. The future of the surface fleet is likely to be either electric vehicles or hydrogen-powered vehicles. Either of those can be produced from any sort of power supply.

The benefit of nuclear is that it allows for generation of hydrogen at a much more efficient rate, mainly because, as the temperature goes up, the greater the efficiency of the hydrogen that is going to be produced. That is why the HTGRs—the high temperature gas-cooled reactors—are looking to be the future technology that is going to be rolled out in the early 2030s. The higher temperature of those reactors compared to the existing reactors that we have got, and the small module reactors, for example, will be much lower in temperature. If we can raise the temperature, that makes generation of hydrogen much more efficient. It depends on what the future of the fleet looks like, really. If it is going to be electric vehicle fleet, obviously nuclear produces electricity as well. It is useful for either one of those. If you were to do the same thing from renewables, it is possible, but you would need an awful lot of renewables given all the intermittency and space that is required, and that could prove difficult. So nuclear has got an essential role to play.

Q4 **Beth Winter:** I am surprised that none of you have mentioned wind or solar. There is evidence from people like University College London and Imperial College Energy Futures Lab that shows that there is no need for nuclear. We can have a 100% clean energy renewable alternative. Can any of you comment on some of that counter evidence, please?

Dr Bluck: I am aware of the work, and it is not the only example of that work globally—studies that suggest the 100% renewable scenario, the most famous being perhaps Mark Jacobson from Stanford. All of these involve technologies that don't exist. They currently do not exist. They may exist tomorrow. They may be sitting in a lab, but they do not exist right now. So that is relying upon hope, and hope is not a strategy, I do not think. The potential for a renewables-only one is always there. I do not know what is sitting in everyone's lab, but where has it been done?

Beth Winter: It can be done.

Dr Bluck: But something that has never been done. I am not too sure we are on safe ground if we are going to assert that it can be done, because I can cite many studies that say it cannot be done.

Beth Winter: But likewise, there is evidence that it could be done.



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Dr Bluck: Well, one evidence is the actual case of, "It is done", and the other one is, "It could be done, but has never been done." It is for people like you to choose.

Chair: Just very briefly, we are just going to have to pick up the pace of questions and answers if that is okay.

Professor Bull: As academics, we are unlikely to say that very much is totally impossible. We have to look at the pragmatic approaches to reaching net zero, and it is going to be incredibly challenging to reach net zero using all the tools in the toolbox. The question is, would we take one out without having very strong confidence that both technically and economically it was feasible to deliver net zero purely with renewables? It would imply either massive over capacity to cope with those times when the wind is not blowing very much and it is dark, or else huge investment in storage technology which, as Michael said, is not really proven at the moment.

Chair: Thank you very much. I am going to bring in Virginia Crosbie now, who will be a model of brevity and succinctness—thank you.

Q5 **Virginia Crosbie:** Yeah, thank you. There are 33 submissions here and something that comes through loud and clear is that one of the concerns for nuclear is that people believe that it will mean that it will not be focused on renewables. I am interested in your views on that. That seems to be a concern. Is that a real concern?

Professor Bull: It is important that we have nuclear and renewables and it is important we have the methods in place and the financing models in place to deliver both. For the reason we have talked about, excluding one of those from the overall landscape would make achievement of net zero far, far more challenging.

I see plans in place at the moment to encourage the development of various forms of renewables, both onshore and offshore wind and solar. We obviously see investment and proposals in place and financing models to bring forward new nuclear. It is important that we have both and that we get as much of both as we can.

Then to come back to the initial question of what the ideal mix looks like is perhaps something we should be looking at in 20 years' time when we have got over-capacity in sight, and we are looking at how we get the optimum mix rather than thinking now about things that we might not need.

Q6 **Virginia Crosbie:** Thank you. In terms of the UK Government, has the Government actually done enough to support the nuclear industry? We had The Ten Point Plan for a Green Industrial Revolution. We have had the Nuclear Energy (Financing) Bill. We have had the £120 million Future Nuclear Enabling Fund, which I am pleased to say was launched on Anglesey. Do you believe the Government have done enough or could



they do more?

Dr Bluck: These are all welcome and necessary for us to exist where we are. I do not think so, but that is not a criticism, particularly. What transforms the rollout of nuclear is ambition and commitment. These are significant sums of money that have been invested in various aspects of it.

You have to look at this as an ambition and you have to support that, and Governments probably have not. I think it is fairly safe to say, to the degree that is necessary, if we want to deploy a reactor a year for however many years, we are not quite there. That is reflected in the financing arrangements that rely upon quite a lot of private investment, and they feed off—obviously you know this much better than I do—the confidence given to them by Governments.

Wayne David: Or do not.

Dr Bluck: Or do not, yes.

Q7 **Virginia Crosbie:** My last question, just regarding Great British Nuclear, which I am pleased to say is headed up by Simon Bowen from Swansea, a Welshman. We should hear soon from Great British Nuclear, I am hoping to hear soon regarding green taxonomy for nuclear. Do you believe those two things will make a significant difference to the sector?

Dr Bluck: I think they do. We have to see what Great British Nuclear really is. Is it the old UK Atomic Energy Authority, one end of the spectrum, or is it an umbrella sort of tag for funding? It needs to be much more than that end, because this is a major national ambition. An ambition certainly potentially for the Welsh Government, certainly for the UK.

As regards a UK green taxonomy, it should sit in that. It should really be a fundamental part of that. I would not like to go through the tawdry machinations that the EU has gone through for its taxonomy, where it is sort of this political decision to, “Okay, we will include nuclear, but you have to have gas”, that sort of thing. GTAG, which is advising it and is going to provide oversight and direction to this, has to have a nuclear component. At the moment they are publishing. They are technology agnostic, as I understand it. That is important. It is what technology does the job, without making an ideological decision at this point.

Q8 **Chair:** Okay, thank you. I am going to come to Beth Winter in a moment, but one of Boris Johnson's last big pronouncements, or statements, before he left office earlier this year was to go nuclear and go large. Does this feel like a Government that is going nuclear and going large?

Professor Bull: It feels like a Government who could do that anytime soon but have not yet done it. Thinking, when Virginia asked her question, we have had Governments in power of different colours since 2006 that were supportive of nuclear. Tony Blair said nuclear was back



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on the agenda with a vengeance in 2006. I suspect he did not foresee that in 2022 we would not yet have finished building the first one. That is not necessarily a reflection on any individual policy, but we have seen a lot of words and less action from Government.

What we would love to see either from Government directly or through Great British Nuclear, is a clear plan of what they would see the future looking like, what they are going to do to help get there, and what they expect industry and others to do.

Q9 Chair: A new nuclear power station at Wylfa, which is the principal interest of our Committee, I would suggest, has been talked about for a long time now. I remember David Cameron's Government making all kinds of positive noises about this, various Ministers being sent to Japan to talk to the relevant companies there about the supply chain, investment and all of that. Does it feel to you that we are closer to getting a new nuclear power station at the Wylfa site than we were a few years ago?

Professor Bull: I would say we are in the best position as a starting point than we have been at any time in the last 10 or so years. I worked for Westinghouse and I spent a lot of years of my life trying to sell AP1000s to be built in Wylfa the first time around. Nothing would please me more than to see that project come around again. We are working with Westinghouse, working with Bechtel, but it could all have happened quicker than it has happened so far. In terms of the commentary we are hearing from Government and the various funding mechanisms that are being put in place, all of that is positive, it just needs a wrapper to bring confidence to the investors that they can come in and play their part as well and they know where we are going.

Q10 Chair: Thank you. Dr Bluck, just a few moments ago you referred to support from UK Government, Welsh Government. Is it not the truth that if a new station is to be built at Wylfa, it is going to require a lot of engagement with UK Government from the Welsh actors as well?

Dr Bluck: Yes, it is. If for nothing else, you play into the same grid as the UK, there is not a Welsh-only grid, so it impacts the rest of it. These are big endeavours. There is potential, both within Wales and within the UK, certainly in my opinion. We have a history of nuclear, we build nuclear reactors in the UK; Wales has a proud history of steel production. These are the sorts of things that can regenerate. If you talk about growth, there are opportunities for growth here for right across the UK. I feel it would be a bit unfortunate if Wales missed out on that.

Chair: Thank you very much. Beth Winter, please.

Q11 Beth Winter: Thank you and thank you for your time today. I wanted to focus on the financing because one of the main criticisms is about the expense of nuclear. How is the risk to the consumer and taxpayer managed under the Regulated Asset Base model, and is that the best



model for nuclear projects? Who wants to answer that?

Dr Bodel: I can kick off on that. As I understand it, the recent consultation, I suppose, which ran from June to August, is still being analysed. I would be as interested as everybody else to see what comes out of that with the detail. The RAB, as I understand it, passed with support from both Labour and Conservatives, so it seems to be rather well supported across the board.

The RAB probably is the best option that is going to be available at present. The Contract For Difference model that was used for Hinkley Point C, while it has been successful in getting Hinkley Point C over the line in terms of financing, it is a rather inefficient way of financing such a large project. We have seen that CfDs have been quite effective with renewables. Back in 2012, when this was all signed off, the renewables and nuclear were of similar levels of expense. Since then, the price of renewables has come down because of the auction process of CfDs, but because of the size of nuclear projects, that has not really been the case. In order to get the CfD process to work it has locked people into paying a fixed fee for 35 years and it also limits Hinkley Point C to powering into the grid, essentially, and does not open up the ability to sell elsewhere into heat and other such things.

The RAB, by reducing the financing costs, makes Sizewell C a much cheaper thing on the whole, after all the costs are considered, even though the capital expenditure might be very similar, the whole thing is going to be a lot cheaper and a lot better for the consumer. Seeing as it is one that is in a relatively advanced state now, I would be surprised if an alternative financing model was suggested instead of the RAB. I am looking forward to seeing the details come out as to exactly how much and exactly how the RAB is going to be operated.

Q12 **Beth Winter:** Do you want to add to that?

Professor Bull: I would just echo Will's point that one of the strongest features of the RAB is that it has been developed with consultation from the investors and industry and Government over a significant period. We saw the strike price contract for difference model for Hinkley. We saw a different funding model that was put forward for Wylfa for Hitachi Horizon the first time around. This is a different model again.

Investors look for certainty and confidence in not just the operation of the reactor but political stability and also the financing model. They would love to be following in well-trodden footsteps and using a model that had been used several times before. Since we do not have that, the RAB model is a good starting point. It has been subject to a huge amount of consultation and discussion with those who would need to be part of it and need to play their part in making things happen.

Q13 **Beth Winter:** Just a supplementary. My understanding is that the RAB model would require a lot of private investment and that there are



concerns about the ability to encourage those investments, given the notoriety of cost overruns and the likelihood—there are modellings showing this—that there will be a significant cost implication for the public and the public purse. People have talked about a nuclear tax. Has anybody got any comments on those concerns that the public will be picking up the cost of this?

Dr Bluck: That is implicit in the model, whereas the contract for difference was meant to insulate the taxpayer from any potential liabilities. The result of that is that it is unattractive to investors who then have to enter a strike price that is quite ambitious. RAB is meant to put some of that liability back with the taxpayer, and in doing that, makes it more attractive. There is a judgment call. There is a spectrum of possibilities. We cannot say that they are not going to be saddled with some money. A year ago, we would not have forecast that the price of electricity would have gone through the roof. There are things that can happen.

The challenge for nuclear is that it has this very big upfront cost. Running it for 60 years, pretty cheap. Big upfront cost. That saddles it with the need to borrow money, or get investment, for that period of build. That is what makes it unique. Broadly speaking, the more the Government can convince private investors that they are backing this, and they are serious about it, the more likely they are to invest. I would have said that a large portion of public investment—everyone is asking for public money—helps with that. I would always say that Governments can borrow more cheaply than the private sector, but that maybe is not so true. It has been.

Confidence. This is 60 to 80 years of generation of low-carbon clean electricity. It has to be viewed like that. It has this big hurdle at the start and RAB is a better model than the contract for difference in the sense that it is more likely to attract investment that is cost effective to the investors so they are not having to borrow.

Q14 **Beth Winter:** The other question I have is, what difference will it make to the viability of new construction to include nuclear energy in the UK taxonomy and green financing framework?

Professor Bull: The main thing is that including nuclear within a green taxonomy gives the confidence to investors that they are investing in something that is supported and recognised as being in the national interest as a clean electricity generating technology. As we have said before, they want confidence in the model and they want to be reassured that there will not be issues cropping up further down the line that will make their investment look less attractive to them. The taxonomy framework is a part of it.

Dr Bluck: I would agree. This is really important. It sounds like a bit of a technical issue, whether it is in some taxonomy or otherwise. This allows people to have access to funds at better rates. As I have said, in a



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problem where you have got to borrow a lot of money up front, that interest rate is key. It changes a lot of the numbers. If nuclear sat out at the side of that green taxonomy and it was just treated like oil, coal, fossil fuels, it does not make sense. What is your definition of green? Apart from the colour, what do you mean by that? In this context, it should mean low carbon.

I do not see that the UK green tax, or GTAG, have advised particularly that anything is in or out. As I said before, I would want to see that encompass the whole range of technologies that are low carbon.

Dr Bodel: If I could just come in there, the taxonomy from the EU was a rather flawed process to begin with and we had to go through the process with the JRC to revise it before nuclear was considered and then to deserve transition technology. The important thing that needs to be done is that all these technologies have to be judged fairly. They all have to be judged on a level playing field so I would just be keen for nuclear not to be subject to arbitrary restrictions. I would like it to be judged on sustainability versus all the other technologies that are available.

Chair: Thank you very much. Interventions now from Virginia and then Wayne, please.

Q15 **Virginia Crosbie:** Hinkley C is with a strike price of £92.50 under CfD and that will come down to below £90 once Sizewell is online. If we look at what CfD has done with the wind sector, we started at 170 megawatt an hour coming down to now 40 to 50 megawatts an hour because that allowed more and more entries to come into the market. If we have RAB for Sizewell C, we are looking at a strike price of around £70. What does that mean to people's energy bills? It probably means, initially, an additional £2. Then, during the key build time, it would be around £12 a year. The key thing here is the wholesale cost of gas and how that 70 megawatt strike price compares to the wholesale cost of gas. Once we can get more entrance into the nuclear market and have a fleet mentality, we are going to see that strike price coming down.

Professor Bull: To your last point, certainly the more nuclear we can get and deliver through a fleet approach, we will see the benefits of replication which is partly what we have seen in the renewables sector, where that large-scale rollout gives confidence to manufacturers to invest and to scale up to bring down the unit costs. It is also about having that visibility that there is a programme and a fleet coming and that they can invest to do that. One of the most frustrating situations we could end up with would be to almost build a fleet by stealth and end up with a series of almost identical units, but we only ever build them one at a time so the supply chain never knows it can invest and skill up to deliver against a fleet programme rather than against a single unit.

The benefits of replication rolled out through a fleet approach, whether that is large scale, and potentially for SMRs and HTGRs in the future, is clearly going to help to bring prices down. In terms of how prices



compare, the Hinkley strike price, as we will all remember, was widely criticised at the time for being significantly more than the then price of electricity. I do not need to tell anybody in this room what energy prices have done since then, and that price looks very attractive as a large slab of stable low-carbon generation for, as Michael said, 60, maybe more, years into the future as one of the cornerstones of our future electricity generating. Nobody knows whether the prices are going to come down again, go up or stay where they are, but having some big slabs of confidence in an uncertain world, particularly when that confidence is low carbon, can only be a good thing.

Q16 **Wayne David:** Gentlemen, there is a general feeling in the country that one of the lessons this country learnt is that we should be far more self-sufficient in terms of our energy generation in the future. I was just wondering what the implications of that mindset are in terms of finance for the nuclear industry, the use of technology from abroad in the nuclear industry, and the uranium supplies which are obviously dependent upon inputs from other countries, most of which are likely to be stable, but nothing is certain in this world. What comment do you have to make on that?

Professor Bull: In terms of that self-sufficiency, we do not have a gigawatt scale nuclear reactor with a Union Jack design on it—we could look at why that is—so we have to buy something from abroad and build technology in the UK which is tried and tested elsewhere in the world. The challenge is to get as much UK content into the supply chain to deliver those projects like Hinkley and Sizewell, and hopefully Wylfa B in the future. For longer term, the sort of second and third waves, the SMR programme, we have the Rolls-Royce SMR which has significant UK content obviously, and it is good to see that that is receiving support and could be the model for an SMR fleet.

Going back to your question about the fuel supplies, we do not mine uranium in this country. I would love it if somebody did dig down because we have every other part of the nuclear fuel cycle in Britain apart from the uranium mine, and it would be great to find one. But, as I mentioned at the beginning, the supplies of uranium are so stable and well understood and secure that it is almost a sort of UK pedigree fuel and the timescales and the risks to disruption of that supply in terms of impacting operation of reactors are massively lower than if we had to rely on buying in fossil fuel supplies from abroad. It gives us great energy, independence and energy sovereignty, even though the actual fuel stock itself, the uranium, comes from overseas.

Dr Bodel: On the uranium topic, the uranium, which is not homegrown, the price of uranium and the availability of uranium makes up a very, very small proportion of the overall cost of nuclear's total electricity and energy output. If the price of uranium doubles, it is not going to have as much of an impact on the price of nuclear energy as the price of gas doubling would, for example.



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Professor Bull: That is a really important point because at the moment we are seeing the gas price going up and the electricity price going up hand in hand, and, if the uranium price, for whatever reason, went up on the global market in a similar way, the costs of electricity production from nuclear would not be impacted anything like as much. The cost is in the capital of building the reactors in the first place and the operational cost is much smaller.

Q17 **Chair:** The cost of the electricity being produced by nuclear plants is the same as what is coming from a gas-fired power station, the wholesale market price, is it not?

Dr Bodel: That would depend on how the electricity is bought and sold.

Chair: Right now, a unit of electricity—wherever it is produced—is sold at the market price.

Dr Bodel: Yes.

Q18 **Chair:** Yes. I know we are running slightly short of time, and I do want to bring Ruth in, but just explain your point that nuclear energy gives you cheap energy when, at the moment, it does not. Is it not that all the electricity is being sold at very high prices because the marginal price is driven by the global gas prices?

Professor Bull: Society pays for the cost of building power stations, operating power stations, fuelling them and all the rest of it, and once we have built nuclear, then, as others have said, they are relatively low cost to operate far into the future. We are seeing lifetime extensions around the world of 10, 20 years above and beyond planned designed lifetimes, which is adding to improving the economics even further. The market itself will not charge a customer a different price for a unit of electricity from gas, wind, solar, nuclear or any other form, but the more stable cost of generation we have in the market the more it helps to minimise the volatility of the market.

Dr Bodel: One of benefits of firm energy suppliers is that the contracts can be signed many months or a year in advance, whereas when the National Grid comes to balance the demand and supply, it is going to have to make up the gaps with whatever tends to be available at the time, which is generally going to be gas. Nuclear, because it is hard to turn off and on, is designed for continuous operation and tends to sell its electricity a year ahead of schedule so there are some complications in exactly how the stuff is sold into the market. For example, if I have a load of nuclear contracts from a year ago, that makes my costs internally lower than they would be if I was buying it for tomorrow from the gas market.

Dr Bluck: If, tomorrow, we want to replace gas, the point is gas is really expensive at the moment, it is volatile, and we should be about replacing gas. If we replace gas with something stable, then we can look forward to stable pricings.



Chair: Thank you very much. Ruth, you have been very patient.

Q19 **Ruth Jones:** Thank you, gentlemen, for your time this morning. I appreciate your detailed, expert answers. I want to look at the bigger picture in terms of the economic impact of nuclear, especially specifically in Ynys Môn. There is lots of talk about thousands of construction workers, but we know they are temporary. For instance, we know that in Hinkley C, they come, they go, and they will move on to Sizewell and all the rest of it, so I want to look at the actual numbers of jobs. I know you can only give approximate answers, but in terms of the jobs that would be provided for the 60 years or whatever and what skills would be needed. Also, what does the UK and the Welsh Government need to be doing to actually make sure those skills are there in that area, bearing in mind north Wales is an area losing young people and skills at the moment? Sorry, it is a very long question. Perhaps if I start off with Professor Bull.

Professor Bull: Thank you. It is a really good question, and I would perhaps start with the end of it about the skills loss. It comes to the importance of having clarity and confidence over a new programme on Ynys Môn as soon as possible because, as you quite rightly say, there is a workforce on the island already which is very skilled and experienced and respected in nuclear. As we start to see nuclear projects happening elsewhere in the country, there is a strong temptation for those people to take their skills and experience to work elsewhere, whether it is Hinkley or Sizewell, and not return to north Wales. Giving them the confidence to stay on the island and plan to use their skill, knowledge and experience to help bring forward a new plant and then potentially work on that new plant is vital to avoid that.

Losing those skills in a—no offence—slightly remote part of the country potentially, geographically at least, it is far easier to retain than to lose and then replenish that skill base and far better for the local economy as well because we want to keep the families there, not just those individuals. It all comes down to the confidence and having that timeline of when things are going to happen to encourage, not just people to stay who have those skills already but to encourage the supply chain to move itself into north Wales to support that plant with, potentially, a view to then also supporting future plants of the same design that might be built elsewhere in the UK and internationally.

If we take the AP1000 reactor for instance, which is the one that is currently, and hopefully, the one that will be built on the island, there is not one of those reactors currently under construction anywhere in Europe, which means companies could move to north Wales to establish a base there to support that design and become the European base for supporting that technology wherever it might be rolled out across Europe. That is the virtuous circle. The vicious circle is that nobody quite knows what is happening until it has already nearly happened and then, in order to provide that confidence, investors and developers look to an existing



global supply chain which does not bring as much socioeconomic benefit to the UK and north Wales as we could do.

In terms of skills, bodies like Coleg Menai and all of the authorities in north Wales are actively working to plan what skills will be needed and when, but they have been there before, as there were plans for nuclear on Anglesey 10-plus years ago which did not come to fruition, so people are wary about being bitten twice. They will want to invest only when they know there is the confidence not to raise expectations and then dash them for the young people on the island who would have hoped to skill up and develop a trade and work there either directly on the plant or work in all the supply chain, infrastructure and indirect jobs that come with a massive infrastructure project like that as well which we must remember comes to an area in these circumstances.

Q20 **Ruth Jones:** Thank you. Dr Bluck, do you have anything to say?

Dr Bluck: You asked what sort of numbers we are talking about. On a functioning site, you are looking at about 1,000 employees of very highly skilled jobs, but, of course, you have the roll-out of nuclear intended as a drumbeat of regular stations and those are much bigger numbers. Obviously, you are redeveloping a site and building a reactor which is tens of thousands of people. The problem we have is if we build one and wait a few years then we want to build another, we have forgotten that. The drumbeat at a reasonable pace is really important and you will think—what happens to them at the end? If you are doing this for long enough, you start them again because you do not do what the French did which is to do a fantastic job of building 50 reactors in 20 years and then sit back and not do anything and now they have an ageing fleet. It is not a criticism of them as they picked up the ball and ran with it, but they have slightly lost it again. They are looking to pick it up.

There are a lot of potential skills and very high-quality jobs in an industry with all the associated supply chains required. I mentioned the steel sector in Wales—very high-quality steel as well, get yourself out of the cheap steel game—and I mentioned before that it is not just about producing electricity; it is about producing power. If you are going to take into account all that waste heat, you can use it for a whole lot of other industries and develop industries that now get really cheap heat because we would not have charged for it before. That gives them a competitive advantage across a whole bunch of sectors just requiring heat.

Q21 **Ruth Jones:** You talk about construction workers, but I know, because my constituents in Newport West work at Hinkley C, that they are then looking to work at Sizewell. They are a mobile, flexible workforce. They do not stay, they go back to wherever, so I am looking at actual jobs for the next 60 years. Dr Bodel, do you have a comment on that?

Dr Bodel: There have been comprehensive answers so far, so I do not have anything more to add on that issue.



Professor Bull: The one thing I would add to what I said before when I focused on a large-scale reactor on Ynys Môn is that there is also Trawsfynydd and the opportunity for a smaller reactor there which could bring significant investment in the kind of technologies which would benefit from the heat and potential hydrogen generation almost as a “first of a kind” to start to demonstrate the interconnection of low-carbon energy from smaller reactors into the future which could really see that part of north Wales established as a prototype for the rest of the UK and indeed internationally. There is a huge opportunity there as well as on the island of Anglesey.

Wayne David: That is an interesting point.

Chair: Thank you very much. Virginia, you need to be very quick.

Q22 **Virginia Crosbie:** I will be. The Welsh Labour Government has a co-operation agreement with Plaid. The leader of Plaid, Adam Price, says that they are a party that does not believe in nuclear. “We do not support nuclear power.” You mentioned earlier that a large capital expenditure project like a new build in Wales would tie Wales with the rest of the Union and Plaid are, obviously, nationalists. In your view, is there political support for new nuclear in Cardiff?

Professor Bull: It is not my specialist subject, but I understand there is strong support for new nuclear in Cardiff because they can see the socioeconomic benefits it brings and they also recognise the connection between the energy sector in Wales and England because, as I am sure you are familiar with, there is not, as somebody said earlier, a Welsh energy grid. There is a spur in the north and a spur in the south, so electricity generated in north Wales, if it finds its way into industry in south Wales is going to pass through England along the way. We have to see that bigger picture, but I believe there is strong political support in both Westminster and Cardiff.

Dr Bluck: I would like to reiterate that. I was involved in the original relationship with GE Hitachi when they were looking to develop a site, and I was also involved in the setting up of the Nuclear Futures laboratory in Bangor which was all in response to this potential. Certainly, back then, there was real strength of will to develop nuclear for the Welsh Government to position itself. I am surprised and disappointed if that has changed, given the current circumstances.

Wayne David: I think in fairness it is not for me to speak for Plaid Cymru, but I think they face both ways at the same time.

Chair: Okay, on that note, we will bring this first panel of this morning’s session to an end. Professor Bull, Dr Bluck, Dr Bodell, thank you very much for your time and your answers this morning. We are going to move as seamlessly as we can to our second panel.