



Select Committee on Science and Technology

Corrected oral evidence: Priorities for Nuclear Research and Technologies

Tuesday 28 February 2017

10.40 am

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Members present: Earl of Selborne (The Chairman); Lord Broers; Lord Hennessy of Nympsfield; Lord Hunt of Chesterton; Lord Mair; Lord Maxton; Baroness Morgan of Huyton; Lord Oxburgh; Viscount Ridley; Lord Vallance of Tummel; Baroness Young of Old Scone.

Evidence Session No. 3

Heard in Public

Questions 20 - 30

Witnesses

Dr Adrian Simper OBE, Technology and Strategy Director, Nuclear Decommissioning Authority (NDA); Dr Richard Savage, Chief Nuclear Inspector, Office for Nuclear Regulation (ONR); John Donald, Superintending Inspector, ONR; Xavier Mamo, Director R&D UK Centre, EDF Energy.

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of witnesses

Dr Adrian Simper OBE, Dr Richard Savage, John Donald and Xavier Mamo.

Q20 **The Chairman:** Welcome to the second day and third evidence session in our inquiry on nuclear research and technologies. I alert you to the fact we are being broadcast. Would you, please, for the record, introduce yourselves, starting with Mr John Donald? If you would like to make an introductory statement, please feel free to do so.

John Donald: My name is John Donald from the Office for Nuclear Regulation. I am a superintending inspector and lead the team that co-ordinates regulatory research for ONR and interacts with the wider UK nuclear research teams. I have no opening statement.

Dr Richard Savage: Richard Savage; I am the chief nuclear inspector with the Office for Nuclear Regulation. I am the regulatory head of ONR.

Dr Adrian Simper: I am Adrian Simper; I am the strategy and technology director for the Nuclear Decommissioning Authority. The Nuclear Decommissioning Authority is the non-departmental public body accountable for cleaning up the UK's nuclear legacy, on which we spend about £3 billion a year of public money. We have a programme of 120 years in duration, and about £120 billion of total liability. So R&D is critical to us. We do not believe that we would be able to complete the mission cost-effectively without the innovations that R&D are able to bring, so R&D is a key part of our strategy. We are very focused, however, on our mission—decommissioning and clean-up. And because we are focused on our outcomes, in that regard, we are also needs-driven in our R&D approach rather than speculative. That colours the approach we take.

Xavier Mamo: My name is Xavier Mamo. I am with EDF Energy and director of research and development. Research and development within EDF Energy is a very important aspect. We are investing around £40 million a year, obviously a big part of it targeted towards nuclear research but also covering the whole range of our activities from renewables to customer services.

The Chairman: We are particularly grateful to Mr Mamo. At the last session we identified a need to hear more about the experience in France on nuclear research and we thought that EDF Energy might be able to help us at short notice. I am most grateful to you for joining the panel at, indeed, a few days' notice. Thank you very much.

I am going to start with a general question. You may well know that this Committee has looked at nuclear research over the years with increasing concern about the lack of continuity in our research base. Indeed, I think the NIRAB committee was, in part, a response to our 2011 Committee report. We were asking for a coherent and consistent long-term policy. Do the Government have such a policy at the moment in the United Kingdom? Who would like to answer that?

Dr Richard Savage: Shall I make a start and then the others can chip in? I think, first, from a regulator's perspective, we are an independent regulator so our focus is on ensuring the safety and security of the nuclear industry. In doing that, we support government policy and have a role in advising government as well, but it is worth being clear that it is not for ONR to set policy. From my perspective, I see policy in government set in a number of areas, with a number of departments that have an interest. Perhaps there is merit in a single government department providing an overall strategic policy co-ordination role that would provide the coherent focus that might be helpful. There is something to be had here and maybe a focus on a lead government department in this area would have some merit. That is my opening thought.

Dr Adrian Simper: Government aspires to have a policy in this area and I think many of the component parts are, in fact, in place. We look to BEIS as the lead department to co-ordinate nuclear across government. In putting together a policy for nuclear, however, in some ways it feels slightly strange. Nuclear is not an outcome in and of itself; it is a means. Is the policy an energy policy with nuclear as a component part? Is it an industrial capacity capability—a supply chain capability—with nuclear as a part of it? Is it about the maintenance of a strategic capability? Is it about the UK's position on the global stage and wanting to be seen as a full-scope global player? To say that we should have a nuclear policy first begs the question of what that policy is to achieve in terms of those outcomes. There is opportunity for further clarity and co-ordination between those potential outcomes. They are not exclusive, but I think a policy needs to be clear on what it is trying to achieve at the end of the day.

The Chairman: We will probably come back to the issue as to what should happen after NIRAB to provide some of this long-term policy advice.

Baroness Young of Old Scone: Does Mr Mamo want to comment on how his experience of that particular issue has differed here in the UK from other places where he has worked?

Xavier Mamo: I can probably give a bit of a sense of the way it is organised in France—coming back to the introductory question. I think the difference with the way research for nuclear in France is organised is that, first, there is important involvement from the French Government, on one side, and, on the other side, there is a slightly limited number of actors and players delivering this research and development programme. On one side you have the strategic governance. That is led by a nuclear policy council, which is chaired by the French President of State and brings in Ministers and representatives from the industry, with the clear objective of setting out strategic orientation and priorities for the nuclear sector as a whole. In support of this council there is a nuclear sector strategic committee which brings together all the players and actors in the nuclear sector. It is also chaired by French Ministers, with missions around employment, activity, how to structure the nuclear sector,

innovation, research and development and skills, through working groups to build up the agenda and priorities on that.

In terms of the operational organisation of the research programme in France, the overall budget for research is roughly €1 billion. Half of it is funded directly through government funds and the other half through private funds, so obviously EDF, AREVA and others are funding this. It is then delivered with one central actor, the CEA—the Centre for Atomic Energy, which manages half of this €1 billion in delivering research and building up skills. There are about 4,000 people working within the CEA. There are then four other actors supporting the delivery of the research programme: EDF, as a research programme managing on its own; AREVA as well; and then some other public players, including IRSN, the technical arm of the nuclear safety body, and ANDRA, which looks more at waste and decommissioning and is running part of the research on that as well. CNRS is a public body linking with academic partners as well, so there is a big difference there; it relies less than the UK on academia and existing partnerships but CNRS is providing that. That is the whole very high-level picture of the way it is organised in France.

Lord Oxburgh: Do those different groups performing research interact with each other and, if you like, informally divide up the research responsibilities?

Xavier Mamo: They do. First there is a road map that identifies key milestones.

Lord Oxburgh: Whose road map?

Xavier Mamo: It is the road map owned by the strategic body.

Lord Oxburgh: A government road map?

Xavier Mamo: Exactly—a government road map that identifies areas for investment in experimental reactors, including gen IV investment. The players position themselves and then there is some co-ordination. One of them is the tripartite institute that brings together CEA, EDF and AREVA to have an operational co-ordination of how the research is delivered and meets those milestones as part of the road map.

Q21 **Lord Hennessy of Nympsfield:** I have a question for the British colleagues. It is nearly 72 years since Clem Attlee, at the beginning of his Government in August 1945, set up a Cabinet committee to do exactly what we are talking about: long-term consistent policy. What is it about us Brits that makes it so difficult for us to do it, even now, after 72 years of practice?

Dr Adrian Simper: That is a big question. My immediate response is, compared to my colleagues in France, about the view on the extent to which the state needs to be involved in these kinds of activities. When you look at very long-term projects, they are very capital intensive and pose manageable but, none the less, significant risks that need to be properly managed. There is a whole bunch of features which, unavoidably, means that if you want to have a co-ordinated approach to be successful, the state has to have not insignificant involvement. The UK

went through a period of believing that the market could solve all ills, and I do not believe the market could particularly solve the ills of strategic coherence within the nuclear sector. That would be my personal response.

Lord Hunt of Chesterton: I have interests in that I am a fellow of the Royal Society and a consultant at Tokamak Energy. Mr Mamo said that there was one agency which was, as it were, supreme above all others, the CEA. If you look back—and Lord Hennessy knows about this—there used to be some very large organisations such as the UK Atomic Energy Authority, and that has been wound down. Do you think, in your recommendations or thoughts for the future, that there will be an attempt to reinvent or marshal a UKAEA approach?

Dr Adrian Simper: I would cite some of the work by Gordon Mackerron, for example, or others. There are differences of opinion as to the extent to which the UKAEA focused on building that domestic capability, as opposed to taking what was available on the market, was successful. There has been a big debate about why we ended up with AGRs versus PWRs in the UK—I will not rehearse that here. I do not think we are in a position to make recommendations in that regard. It is a really hard balance to take all the good things that the market and competition, et cetera, provide and balance it with the stability and coherence that state intervention can provide, and get that right so that you are able to take big decisions and have coherence, but you also do not end up drinking your own bathwater and ending up in a parochial cul-de-sac in some of these areas. I think that is very hard. I am glad that it is not my decision.

Q22 **Lord Oxburgh:** In a way, that discussion moves us into the next topic. We have quite limited co-ordination between the varied performers of nuclear research in the UK. Do you think that it would be advantageous to have more co-ordination there? If so, how might that be achieved?

Dr Richard Savage: It runs on from the previous conversation quite nicely, I think. I would sum up the discussion we have just had as the balance between competitive drivers and state stability, for me—which goes back to your 70 years and why we have not got it? It is that sort of thing; competing drivers have caused us difficulty in engendering that strategic stability and co-ordination. ONR very much needs research to support our independent regulatory decision-making, and I suppose we are quite small players in our demands. My observation of where we are supports the conversation in that we have pockets of some really good, tactical co-ordination of research, but we start to have difficulties in terms of their strategic co-ordination—and that is where the real benefits are. We could probably all look at the benefits in terms of driving efficiencies, ensuring we do not have overlaps and covering gaps. You could look at the benefits of strategic co-ordination and intuitively we would recognise that they are there. In our own small way, as a regulator, we co-ordinate our research activities with industry and academia, and there is open disclosure about what that is and what the outputs are. Individual organisations will be behaving in a similar way and in a much more significant way than ONR is able to, but it does not

give that overarching, strategic co-ordination which I think is what you are driving at.

John Donald: From what we can see, there is a lot of good, competent co-ordination at a tactical level. If you look at the NDA Research Board, the Nuclear Waste and Decommissioning Research Forum, the Nuclear Universities Consortium and the national nuclear users' forum, there are lots of pockets of co-ordination. Collectively, the only place they ever met to co-ordinate or collaborate was, effectively, NIRAB in the last three years. They could work in the same areas and not know about it, or there could be gaps between them and they would not know about them, either. It is also very hard for a small player like we are to try and identify research projects and check that they are not being done somewhere else. It is quite inefficient for us right now having to go round and chase everybody to make sure they are not doing something that we think needs to be done before we then let contracts.

You can see the same thing in the way the money flows as well. If you think about research following the money, you have the NDA pot of money, you have the research councils' pots of money, you have EDF and some of the other nuclear utilities each doing research as well; there is quite a lot of funding for different bodies. They tend, again, to co-ordinate at a tactical level what they are doing but there is no overarching view of it all. Of course, you have the recent BEIS initiative with Innovate UK. There are lots of different strands of money coming in and local co-ordination for each, but the overarching piece does not seem to be there. In our written evidence we thought that it would be a cost to produce and provide that but the benefit from it would probably overplay the cost involved in creating that collaborative environment.

Lord Oxburgh: I guess you are saying that NIRAB, while it was still extant, was doing a useful job in this respect.

John Donald: Within its terms of reference it was doing what it could, but its terms of reference did not include to fully co-ordinate UK research. It helped produce collaboration but it was not constituted to really develop co-ordination or international co-ordination. It did not do either of those things. It did them to the extent that it could, but it was not driving that agenda; that was not its primary function. Its primary function was more about generating forward tracts of work that needed to be done and advising government where that funding should go and how that should be achieved—which it has done very well.

Q23 **Lord Mair:** Can I ask you about skills? What do you think the Government should be doing? Is there sufficient support for training for future skills? Is there a potential problem here because of the lack of continuity on our nuclear programmes over the last few decades? Is there a difficulty with skills? What should be done about that?

Dr Richard Savage: I will make a start. I am sure Adrian will make a comment. It is fair to recognise that capacity and capability in the nuclear sector is a challenge. We have, if you like, a resurgent nuclear programme and that is a challenge for the regulator as well as for the

industry. I see some real movement over recent years. With the National Skills Academy for Nuclear and collaborations with industry, the supply chain and ourselves, there has been real movement and innovative approaches to bringing skills through. As a regulator, we know it is only small in terms of the sector, but we now take on and train graduates and apprentices—which has not been our traditional way of building the capability of the organisation. But it is proving very effective in building the capacity and capability of the organisation.

These activities support the expansion in the nuclear programme. Today, the initiatives that you see ongoing are addressing the demographic challenge. The question for me is: would it be sufficient to support major growth? If you look at the aspirations, potentially, for new build, there is significant growth in that area. Are the initiatives showing some real progress? Are they sufficient? That is a question mark for me, I guess.

Lord Mair: Are you, in fact, saying that there is a problem?

Dr Richard Savage: There is a lot of initiative there and the active collaborations, particularly through NSAN and advanced manufacturing facilities, are bearing fruit, but there is potentially a significant expansion in the nuclear sector in the UK and our efforts in this area need to be redoubled, I suppose. It is good but more is needed—that is how I would sum up what I am saying.

Dr Adrian Simper: If I could add to that, from the NDA's perspective of a 120-year mission—and in nuclear, which is relatively specialised—we cannot rely upon the market to supply the skills that we will need. NDA believes that interventions are required and is supportive of all the things Richard has spoken about, and we participate in them. If nuclear develops as some of the projections have it, we will have a significant skills shortage. The Nuclear Industry Association and others have analysed that and the numbers are available. Therefore, we need to have continual attention on this matter and look at our interventions and whether they are succeeding or not. I am pleased to see the increasing number of apprenticeships. All those things are good; the direction of travel is good; but we will have to see how it develops and be prepared to make future interventions.

One observation I would make, though, is that, when we talk about R&D and the higher end of science of technology, there is no doubt that R&D is very useful for skills development. Doing R&D, is nothing like being involved at the bench doing the science, to really understand the underpinning of the sector you are working in. It is no surprise, I do not think, that in a technical area such as nuclear many of the senior players in the industry started in R&D. The NDA's chief executive started, as I did, in the R&D department with BNFL. But we need to be clear about whether the primary purpose of R&D is to produce skills or produce technological advancement. At times I worry that too much of the conversation about R&D focuses on the skills output, which is important, at the expense of focusing on the technical advancement, which of course is equally important.

The Chairman: Would you like to comment specifically on an

observation in the NIRAB report that came out this month, which says that the number of people in industry, national laboratories and universities working on research into advanced reactor systems and fuel fabrication remains very low?

Dr Adrian Simper: I think that would go exactly to my point, which is that probably that level of work is the right level of work, to produce people out of the back end of it who have skills and knowledge in those areas and are technically aware in those areas. It is not sufficient to produce a new technology.

Lord Hunt of Chesterton: One aspect of the question of skills, and so on, is high prestige. If I may say, there are not very many universities which have the high prestige that, let us say, aerospace has, or some other areas. In France, CEA has a very big presence which, as it were, enables programmes and professors; it is just up there. As you say, it requires skills, high research and, also, high prestige. I used to be head of the Met Office and all universities were scrambling to, as it were, raise that aspect of their work. I wonder whether Mr Mamo could comment on how you could contribute to raising the whole profile.

Xavier Mamo: It is about playing to strengths. The systems are different but there is strong expertise in the UK, and it is about how we leverage that and make it visible. I guess further co-ordination could probably help identify clearly where the strengths are. We have seen some moves in that area with the creation of hubs, such as the South West Nuclear Hub. We have a very good experience with the University of Manchester, where we have a modelling and simulation centre where we bring in some of our staff and the PhD students as well—leveraging the university as well. There are different sets of good examples in a co-ordinated way. UKRI may have a role in providing some co-ordination in that regard which will raise that visibility and attractiveness overall.

Viscount Ridley: I want to press Dr Simper on his distinction between R&D producing skills versus R&D producing breakthroughs, if you like. I think quite an important issue is whether or not the work on existing technologies inevitably comes at the expense of training people who are good at the next technologies. In other words, if we were to get excited about generation IV technologies—and this is trespassing on a later question, I know—would we not have to tear up the rulebook and stop training people in PWR technologies? Do we not have to think afresh if we are going to leapfrog in some of these areas? We cannot do both.

Dr Adrian Simper: These thoughts are barely formed, so I reserve the right to change my mind later! I would say that, in terms of skills development, in many ways it almost does not matter what you are working on as long as it is broadly relevant. Producing people who understand how these systems work in a deep, fundamental way—understand the science of these things—whether you are working on a PWR or a BWR or a next generation reactor. If you are doing a PhD you are looking down a straw at it anyway; you have such a narrow focus that it does not really make that much difference. From a skills point of view, I do not think it matters. However, if you want to develop a new

technology, you need to set out your vision that you are going to develop a new technology, and that is your focus. The outcome of that new technology rather than, "We understand a bit more about material science; we understand a little bit more about this or that"—that is all good stuff, but I do not think that it produces breakthrough technology.

Viscount Ridley: At the end, Kodak was doing wonderful research on the next generation of film when it should have been thinking about digital. Are we at risk of doing that?

Dr Adrian Simper: Quite.

John Donald: I would probably answer it slightly differently, in that when you look at some of the innovation projects that NDA has launched recently where they are challenging people to put a machine inside a cell, decommission it with artificial intelligence on board and put it into three boxes, high, medium and low, walk away and leave it to do it for a couple of years, come back and it is all done—that is the conceptual challenge. That really tests and challenges innovation across all of the engineering disciplines, and that is the kind of area where we are getting a lot of good value right now. That is technology independent. It does not really matter what technology we go for, whether it is gen IV, BWR, PWR or any other form of reactor technology or chemical engineering system. It does not really matter in terms of those integrating all the disciplines and getting something good, new and innovative.

Dr Adrian Simper: Thank you very much, John. That is exactly my point, made much better than I did. It is the focus on the outcome which drives that innovation. Everybody uses the space programme, but nobody said, "Let's develop new rocket technologies"; people said, "Let's put a man on the moon". That pull creates the development of the technology, in the same way as our competition that John referred to. The vision is that you put the autonomous systems into the radioactive facility and it sends you a text when it is all decommissioned and in the boxes. That is what drives the technical innovation, rather than saying, "Invent me a better robot or a better camera—or a better whatever".

Dr Richard Savage: Just to add another dimension, building on the point about prestige earlier, part of this is also about the motivation of young people. The work Adrian is talking about, the clarity on where we are going and what the output will be and having the structure and funding to work on that, is very motivational for young scientists and engineers. In the work we are doing, bringing young graduates into the sector and into the organisations, it is interesting talking to the young people about their motivations. They are not intuitively what I might expect. A recent example for me was about green energy. "Why are you interested in working in the nuclear sector?" "Because it is green energy and I see a future for that". A significant majority of individuals respond with that answer. It would not be my intuitive response; it is not what I was thinking when I started in R&D many, many tens of years ago. It is that prestige, that motivation and having the programmes that draw individuals through that provide the skills you need for whatever they are needed for in the future.

Q24 Baroness Morgan of Huyton: I have a more detailed question on a particular set of relationships for Dr Simper. Can you talk to us briefly about the relationship between the NDA, Sellafield and the NNL; how well or not that works at the moment and how it could be improved? In particular, is it value for money? Are we right that, in a sense, there is a management feed between NDA and Sellafield and the same between Sellafield and NNL? Is that sensible? Is it good value for the taxpayer? What are your views on how that could be improved?

Dr Adrian Simper: A very large proportion of NNL's turnover—I think it is about 65%—is supplying support into the NDA estate, and a very significant proportion of that is on what I will call technical services rather than R&D per se. Sellafield depends very critically on the technical support provided by the National Nuclear Laboratory. We have fairly recently considered whether it makes sense to separate out the R&D functionality of the National Nuclear Laboratory from the technical services organisation, and the conclusion was very clearly that in order to build a sustainable, critical mass within the National Nuclear Laboratory it was right to keep the technical services organisation with the R&D organisation, so we had that continuity of the bluer-skies stuff at one end down to fairly routine analytical services at the other end. We are in the process of putting the relationships and the contracts in place there that will manage those things.

There are areas of improvement. I think it is important we have a national nuclear laboratory. A little digression: there are things about nuclear that require mass to be able to be carried out. You cannot do experiments on plutonium in your garage—Richard would have something to say about that, I am sure. You need big infrastructure; big infrastructure is important and expensive. An NNL is really important. There is an imbalance because, although 65% of the work is for the NDA in decommission clean-up, if you listen to NNL, it talks about more exciting things such as space batteries or SMRs, or what-have-you. That is natural. I think we need to get a balance about the focus of the organisation on the various things for which it is accountable. I do think it is value for money. The investment of public funds that goes into that technical support organisation going into the National Nuclear Laboratory helps build mass and helps build competence—and that enables the National Nuclear Laboratory to be more effective.

The management fees that get paid are a good way of metricating the system and seeing how well you are performing. It is a simple measure of performance. Since it is all public money anyway through that system, there is no loss from the system. We use those fees in order to incentivise and drive the right behaviours because the evidence is that organisations respond to these drivers. We would be in a much poorer value-for-money position if we had not made the decisions that we would rely upon the National Nuclear Laboratory for these things. I am happy with the direction of travel. For sure, there are some improvements that need to be made and NNL has had a difficult journey to where it is now from its formation and the transition from GOCO to GOGO, and all those things that no doubt the Committee has discussed at great length. That

has made life hard for NNL but I am happy we are in the right place now and we will settle these things down.

Q25 Lord Hunt of Chesterton: On this question of R&D and getting a connection with France or other countries, do you see an expansion of collaboration between what we are doing in the UK, in government laboratories, and what you are doing in France and across Europe? I know there is going to be a question on Euratom but I just wondered whether there is duplication taking place or is there complementarity between the programmes of, particularly, the British and French institutions?

Xavier Mamo: First, I think international collaboration is powerful, especially in nuclear. As mentioned in the introduction, EDF Energy is investing in the UK but it is also part of the EDF group's broader investment in France, so obviously there is a lot of co-ordination internally in order to play to our strengths.

Lord Hunt of Chesterton: Is there some complementarity in the question of dealing with nuclear waste? As I understand it, that has been a big programme with Sellafield, and France has not invested so strongly in that area. Will there be some future greater collaboration in that area? On your comment about nuclear, one of the problems about "greenness" is the question of waste and how we are dealing with that. Is that now seen in the UK as an acceptable solution going forward?

Dr Adrian Simper: If I can briefly interrupt on that specific point, NDA and AREVA are working very closely together and, increasingly closely—we have very similar facilities in the UK and in France—working on a waste management approach, developing technologies together and sharing that experience. In waste disposal, the French entity ANDRA and Radioactive Waste Management in the UK—equivalent organisations charged with geological disposal—have very close relationships. Indeed, RWM has an arrangement with ANDRA.

Lord Hunt of Chesterton: I am sorry; RWM is?

John Donald: Radioactive Waste Management Ltd, the UK body, a subsidiary of the NDA accountable for geological disposal, has an arrangement by which it shares research facilities with ANDRA in France. Those relationships are very close.

Dr Richard Savage: I can give you a regulatory perspective as well. ONR has a number of bilateral agreements with overseas regulators and, of course, ASN in France is one of them. We formally meet with ASN on a six-monthly basis. The important aspect is that we share research themes. We have a number of mutually beneficial research themes. Going exactly to your point, two I would mention are around package design for disposal and geological disposal and design, and a number of aspects associated with geological disposal. So, from a regulatory perspective, we have those interfaces. John, you can probably unpack that a little bit more.

John Donald: There is not an awful lot more to say, but certainly we have had interactions with ASN's research team and they are interested in sharing our experiences across those two areas specifically. We went through all of their eight current themes, and that is the one where we mapped that we had the most interest and most to share, so that is the one we are going to be working with them on in the next 12 months.

Lord Oxburgh: I think Dr Simper has some experience of working in Japan with the nuclear industry. Is that correct?

Dr Adrian Simper: Sir, I have been deeply honoured to have been working with the nuclear industry in Japan, particularly in the aftermath of the accident at Fukushima and how we clean that up.

Lord Oxburgh: My question was, in the general context of our discussion, are there relevant observations from there?

Dr Adrian Simper: Probably not, in the sense that the Fukushima accident was such an extreme and unique event. The social response, the governmental response, the investment and R&D focused on that is such an outlier on any kind of normal distribution that I would not want to draw too many conclusions from it, to be frank.

Lord Oxburgh: Okay. Thank you.

Lord Vallance of Tummel: While we are on international comparisons, leaving aside the legacies of the past, if you like, decommissioning and waste, which have to be done, I am not getting a real sense as to how important the future is to the UK economy and UK industry. If one looked at, say, the Germans, who have turned their back on this virtually, have they made an immense strategic mistake for German industry or the economy? How important is it to the UK? Obviously, Germany does not think it is that important. Is it that important to us, and why?

Dr Adrian Simper: I am not an energy policy specialist; I merely clean up the mess afterwards.

Q26 **Lord Broers:** Should the Government be focusing heavily on SMRs? Are the criteria set out by the Government for the SMR competition appropriate? If not, what should the criteria be? I might add that perhaps SMRs can be the "landing men on the moon motivation" to get us going. My worry about SMRs, following on from this discussion, is whether we can mount enough enthusiasm to enter the race in a real way. When we look at the Government's enthusiasm for NIRAB, we learned in our evidence that the Government was so enthusiastic it would not even pay the expenses of the members to attend the meetings. What about SMRs? Can we mount a realistic effort? How much effort should we put there?

Dr Richard Savage: I will make a start but I am sure the other members of the panel will have something to say. SMR policy and the route forward for SMRs is for government. As a regulator, we have a role advising government and, through this process, have been doing so with a focus on safety, security and regulation. Undoubtedly, I look at this and there is a plethora of options and approaches, and we can discuss those, but there are also, potentially, regulatory challenges as well, so it is

incumbent on me to be cognisant of those and to ensure we have a framework that is sufficiently agile to be able to accept future SMR designs.

I would say that in the UK it is worth reflecting on the fact that our regulatory framework is technology neutral—it is not focused or based on specific design—and so is fundamentally agile in terms of its non-prescriptive, goal-setting approach. It is agile and provides me with the agility to be able to examine a range of designs. In moving forward, you see a significant range of options, ranging from light-water reactors that you might argue are more proven or akin to our larger light-water reactors, to more novel technology that, potentially, has safety benefits—passive inherent safety benefits—but is less proven and most definitely novel technology. Standing back and looking at that, I see a picture where there is a balance to be had in what would be an appropriate route forward, but it needs to be trodden with caution. There are commercial drivers here, and we can understand those. We have a regulatory framework that can interface with this development, but it needs to be approached with caution, recognising all the challenges associated with the technology. I have given a fairly top-level view, John, but you might want to add something.

John Donald: With a goal-setting, non-prescriptive approach for nuclear safety and an outcome-focused approach for nuclear security, we are flexible and agile enough to be able to respond to pretty much any technology, whatever that would look like. We have plenty of experience of looking at fast reactors historically and small reactors and research reactors historically, so the size and the scale will not pose too many problems for us. Sure, there will be learning to be done about the specific technologies in the nuclear core of the machine, but the rest of the engineering is just engineering. We understand that. We understand reliability and security. All those issues can be regulated properly and authoritatively by ourselves. We need to narrow down the field, and until that is done we cannot really commit in terms of doing research in support of an SMR programme because it is not clear to us what direction that is going to go. We could put an awful lot of effort into doing regulatory research into fields that are not relevant or will never come to fruition. We need government policy to be a bit clearer. Once we have narrowed it down to one or a few technologies we can start thinking about what research we need to do. Right now it would be wrong for us to divert ourselves from our core job.

Lord Broers: Who is going to do that job? Who is going to develop the competence to choose which SMR to go with, if we were to do it?

John Donald: BEIS is taking advice from a number of different organisations, including NIRO and ourselves. Obviously, we would push more on the safety, security, transport and safeguards lines. That is what we are interested in and that is the area where we want to make sure the decision-making is balanced to account for those things. There are other areas—around export, commercial returns and finances—where we are not competent and other players have to advise. So it needs a co-

ordinated team, which I believe BEIS is putting together. It needs our input and BEIS has our input on that.

Lord Broers: Is this competition going to provide a clear winner so that the Government can throw the weight of everybody behind it?

John Donald: I am sorry; I do not know.

Dr Richard Savage: I think you need a government response to that question.

The Chairman: We had better keep that question for the second session.

Q27 **Lord Hennessy of Nympsfield:** A specific question first and then a general one for all of you. Are there specific proliferation worries about the SMRs because of the numbers of sites that have been occupied by them, and so on? Is that a worry? The other question is: your industry has been littered with false dawns. Is this another one? People tend to collapse into this wishful thinking that we can put right all the ills that have gone wrong since 1957, when a Minister in the House of Commons said, in the aftermath of Suez, "If we can't boast about our civil nuclear programme, what can we boast about?" Is this a psychological compensation for the litany of cul-de-sacs?

Dr Richard Savage: I can give you a short answer. I go back to my earlier comment about "proceed with caution". What I am hinting at is: do not be fooled; it is not necessarily the panacea for all evils. It needs to be approached with caution. In terms of proliferation, I am a safety and security regulator; I have obligations for safeguards, accounting for nuclear materials. Those standards remain unchanged and I will regulate in accordance with UK law as a sovereign regulator and I have an expectation that those standards will be met. A small modular reactor might be small but that does not necessarily equal easier in terms of meeting of the right security requirements and obligations under safeguards.

Viscount Ridley: Can I ask a follow-up on that?

The Chairman: Could you do both at the same time?

Viscount Ridley: I want to press the question of agility and technological neutrality a bit further. While, of course, it is clear that you are very open-minded, obviously, about any design, none the less there are practical considerations that mean that, in effect, you can only do a generic design assessment on one or a few technologies at any one time, and a GDA is a three to four-year process that costs £200 million or so, which is possibly too top-heavy for a technology that might be small and might have a small market. Is there any way to simplify or speed up the GDA process without compromising safety?

Dr Richard Savage: Generic design assessment is exactly that—an assessment of a generic design. At the top level the importance, for me, is to recognise it as a de-risking approach or process. It de-risks project time and cost. It takes that all-important design assessment off the

critical path before you get to the point of considering construction. It is an important de-risking process. It is a voluntary process; it is not a mandated process in the UK. Vendors in the UK recognise the value in having that engagement of the regulator early: understanding the regulatory issues and the regulatory approaches so that they can be declared early. Again, it is a de-risking, enabling approach.

I would also ask, cutting across that: where better to build in safety than in design? It is a really important part of the process to get that examination of design early because that is where you improve safety and security. On your tease at the robustness of the process—four years' worth and how many million pounds—we are running through a number of generic design assessments now, two of which are due to conclude this year. We have put considerable efforts into learning the lessons as we have gone through the process. The process has been adopted and adapted as we run through, but that is not to say there are not developments still to be had. We could talk about what those might be, but there are options for refinement of the process, perhaps to make it slightly quicker than you have seen in the past. We should take the lessons of what we have already done and use those.

For small modular reactors, I would say, intuitively, it is the right process. Where is the commercial benefit in small modular reactors? It is that modular design, manufactured in a factory and deployed in many stations. With a generic design assessment of a particular design, there would be site-specific aspects but very much at a lower level. Intuitively, it is a robust and effective regulatory approach—albeit we can perhaps refine a bit from what we have done in the past.

Q28 Viscount Ridley: Can I follow on with the main question about generation IV? I have mentioned already the possibility that, given we have missed a few boats in pressurised water reactors, we should be leapfrogging our efforts into molten salt, liquid metal, pebble bed—these kinds of things—and trying to get ahead of 2030. In particular, we are members of the Generation IV International Forum through Euratom. That was the reason why, I think, when this Committee pressed on that issue in 2011, we were told, “Don’t worry, we’re doing it through Euratom”. That is off the table now, at least temporarily, and therefore should we be stepping up our efforts to rejoin the Generation IV International Forum? In particular, should we be developing test reactors here? The last one closed in 2015.

Dr Richard Savage: I will make a start. This is a difficult question for me to answer because we are straying into government policy and where government focus should be and I am not in a position to be able to answer that. As a regulator, I would say that I need to be in a position to regulate said technologies effectively. My understanding of the policy direction is important so that I can generate the right capacity and capability to regulate effectively. The focus through this, for me, as a regulator, has to be the safety and security of those designs and operation in the UK. I cannot give you a steer on policy and focus.

The Chairman: Would Mr Mamo like to comment on that?

Xavier Mamo: First, from an EDF Energy perspective, we do not have much contribution towards gen IV, but I think it makes sense to play to strengths, especially coming back to the discussion on where the UK can bring value. In a way, in the field of high temperature materials, there is a strong expertise in existing UK laboratories, so those are probably ways to join existing international collaboration while also clearly leading the way in specific areas. That would be my comment.

The Chairman: We are running out of time. We have two quick questions to ask. Could Baroness Young ask the first?

Q29 **Baroness Young of Old Scone:** This is really a question for ONR, and I suspect you may answer it in the same way that you answered the last one. What are your thoughts on trying to develop additional commercial outputs from nuclear plants, particularly from SMRs, in terms of something beyond electricity—combined heat and power or chemicals production? Do you see any regulatory difficulties in that?

Dr Richard Savage: The output requirements are a matter for the licensee and government. It is nuclear technology and nuclear activity that ONR would need to regulate, but my focus is on the safety and security of the use of that technology. If it is for energy production or combined heat and power per se, that is not a consideration for me; my focus is on the standards of the design, construction and operation to maintain it safe and secure.

Lord Oxburgh: The question is whether doing those extra things immediately brings to mind regulatory problems.

John Donald: I was going to say no, I do not think so. Obviously, you have a potential for them to be a lot closer to conurbations, et cetera, but we have the regulations for radiation emergency preparedness, et cetera, so we have a framework for regulating throughout, wherever they are and whatever they are doing. Even if you think about getting into the food chain or radionuclide crossover, it is still about the risk to the public, and so our regulatory framework would be flexible and agile enough to accommodate that. I do not think we would have any problems.

The Chairman: Finally, Lord Hunt.

Q30 **Lord Hunt of Chesterton:** Euratom had a programme which was for transmutation, and one aspect of that is connecting fusion and fission so you then have a method of using neutrons from fusion to reprocess your nuclear fission waste. Of course, the UK has great strength in dealing with the neutron aspects of fusion in the JET programme, which is also in danger for the future. In your vision of the future, do you see this idea of connecting fusion and fission and reprocessing as one of the things you should be looking at?

Dr Adrian Simper: I heard the words “false dawn” mentioned earlier. One of the things that strikes me is that the nuclear technologies we are using today and are planning to build are evolutionary from technologies we have been using for many, many decades. Even something as accessible, from a science point of view, as liquid metal cooled fast

reactors, have failed, despite being in just everybody's energy policy, to make their way into commercial operations around the world. I do not know what the future holds—if I did I would not be sitting here; I would be at the bookies—but I do know that nuclear has demonstrated that it is very, very hard to bring technologies which work well from a physics point of view on the drawing board into commercial reality, operating day by day.

Lord Hunt of Chesterton: There is quite significant investment going on in this area, as you know.

Dr Adrian Simper: Yes.

Lord Hunt of Chesterton: We have not talked about investment in the other areas.

The Chairman: We have run out of time and we have a Minister and others waiting outside, so I have to bring this session to a conclusion. We could have gone on a lot longer. You have helped us a lot. We have another day of discussion on this. Thank you very much for your help today. We are most grateful, particularly to Mr Mamo for coming at short notice. It was very helpful. Thank you to all four of you.