HOUSE OF LORDS

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The Select Committee on Science and Technology

Inquiry on

NUCLEAR RESEARCH AND DEVELOPMENT CAPABILITIES

Evidence Session No. 9. Heard in Public. Questions 256 - 293

TUESDAY 21 JUNE 2011

10.40 am

Witnesses: Adrian Simper, Professor Peter Styles, Professor William Lee and Joe McHugh

Members present

Lord Krebs (Chairman)
Lord Crickhowell
Lord Cunningham of Felling
Baroness Hilton of Eggardon
Lord Jenkin of Roding
Baroness Neuberger
Lord Oxburgh
Lord Patel
Baroness Perry of Southwark
Lord Rees of Ludlow
The Earl of Selborne
Lord Warner

Examination of Witnesses

Adrian Simper [Director of Strategy, Nuclear Decommissioning Authority], **Professor Peter Styles** [Professor in Applied and Environmental Geophysics, Keele University], **Professor William Lee** [Deputy Chair, Committee on Radioactive Waste Management], and **Joe McHugh**, [Head of Radioactive Substances Regulation, Environment Agency].

Q256 The Chairman: Good morning. I would like to welcome the members of our first witness panel, noting that Professor Peter Styles is delayed in his journey. We hope he will join us shortly. I also welcome members of the audience. You should find on the seats a note describing the purpose of the inquiry and the declared interests of Members of the Select Committee. I begin by reminding our witnesses and Members of the Committee that proceedings are being webcast and any comments, sotto voce or otherwise, will be recorded for the public to observe. In a moment I would like to invite the three witnesses who are present to introduce themselves. I understand that Adrian Simper would like to make a brief opening comment about the NDA.

Adrian Simper: I believe that will not be necessary, given the first question.

The Chairman: Fine. So perhaps I could invite you all to introduce yourselves.

Joe McHugh: Thank you, Lord Chairman. My name is Joe McHugh. I am head of radioactive substances regulation in the Environment Agency. As we indicated in our written evidence to the Committee, the agency regulates radioactive discharges and radioactive waste disposals from nuclear and non-nuclear sites in England and Wales. We will also regulate any disposals of radioactive waste into a future geological repository. We work closely with our regulatory colleagues in the HSE's Office of Nuclear Regulation to ensure that the overall nuclear regulatory framework is comprehensive and coherent. We also have a duty to follow developments in technology and techniques for preventing or minimising the effects of pollution of the environment. That is a statutory duty under the Environment Act. We can also require the nuclear industry to undertake R&D to support the environmental safety of its operations. We work more broadly with the NDA, research councils and academia to provide advice on nuclear R&D related to our regulatory requirements.

Professor William Lee: I am a professor in ceramic engineering in materials at Imperial College. I am also director of a national centre for advanced structural ceramics, but in this context I am deputy chair of the DECC advisory Committee on Radioactive Waste Management—CoRWM—which provides independent scrutiny and advice to the UK Government and the devolved administrations on long-term management, including storage and disposal, of radioactive waste. In this context, I lead the R&D group of CoRWM and I played a leading role in the preparation of our report to Government in 2009 on R&D needs in this sphere. I would like to point out that, while I am here representing CoRWM, there may be occasions when I swing off into my own personal perspective and viewpoint. I hope to be able to remember to say that this is a personal perspective at those times.

Adrian Simper: I am Adrian Simper. I am the director of strategy and technology for the Nuclear Decommissioning Authority.

Professor Peter Styles: I am sorry to arrive so abruptly. I am Professor Peter Styles, professor of geophysics at Keele and past president of the Geological Society. I chaired the committee on geological criteria for waste disposal.

Q257 The Chairman: Thank you very much. I would like to kick off with a very general question. Joe McHugh has partly answered it from his perspective, but I think the Committee would like to hear what is the remit of both the NDA and the Environment Agency. Adrian Simper, as you start off perhaps you could bear in mind some particular points that we would like to understand. What is the NDA's responsibility within its remit for managing uranium and plutonium stockpiles? Does the NDA have any remit for considering the research requirements or options for handling new build waste? Similarly for fuel reprocessing, including advanced separation technology for reprocessing spent fuel. Could you bear those questions in mind as you kick off with your answer?

Adrian Simper: I will do my best. The NDA has a clearly defined remit, laid out in the Energy Act 2004, to decommission and clean up the nuclear legacy left by BNFL and UKAEA from the early defence and civil power programmes. In doing so, we have additional obligations. Those most pertinent today are in relation to skills and R&D. We need to maintain the skills and R&D necessary to deliver our mission.

We also have a number of additional responsibilities, one of which is particularly pertinent, which is the implementation of geological disposal for radioactive waste in England and Wales, Scottish policy being different once a site has been selected, which is not NDA's accountability. We also own the active facilities that the National Nuclear Laboratory operates, which they lease from us. We are the owner, but not the operator.

R&D is one of our critical enablers. As such, we take it very importantly, but we are a consumer of R&D rather than a supplier, and we are very needs-driven in that regard. We think that the focus and clarity that we have are beneficial to us -whatever you believe about

the future of nuclear power, I think there is general agreement that cleaning up the legacy is a good and responsible thing to do. Because of that focus, we do not believe that a wholesale broadening of our accountabilities is appropriate. I say that because I have read transcripts and other evidence that has been submitted, so I thought it was appropriate to comment.

There are a number of things that the evidence submitted posits should be done. In many cases, the NDA clearly has the ability to do those things, but it does not necessarily follow that because they should be done and the NDA could do them, that NDA should in fact do them. There may be other ways of meeting those needs.

We are the owner of significant amounts of uranium and plutonium. Its safe management is our accountability, which is carried out for us by our site licensed companies within the regulatory framework. Uranium is a commodity. To the extent that there is a market for that, we will resell the material into the market. The nature of our uranium means that it is not particularly attractive to the market at the moment, given the current price of uranium, so it sits there. Our strategy therefore is to convert it into a more appropriate form for its long-term storage. At the moment, some of it is held as uranium hexafluoride, which is not the most pleasant material, but once we have it in a stable form the approach is to wait and see what happens to the market. We have the beginnings of a change in the nuclear programme globally, and it would be rash to make decisions on uranium at the moment.

Plutonium is a different matter altogether. It is not a commodity. There is not a global market for it. It is not possible to buy and sell it in quite the same way. In the UK we have more separated plutonium than is held by all other countries added together, I believe. You will be aware that DECC has recently completed a public consultation on the forward plan for plutonium management, with a presumption that the right thing to do is reuse it as MOX fuel. NDA has been supporting DECC in that, but it is a DECC policy decision, not an NDA

decision. Having said that, we are supportive of that general approach. It seems to us that on balance, reuse as MOX is an appropriate way to take that stockpile forward.

With regard to fuel reprocessing, we own the reprocessing facilities in the UK at Sellafield. Our strategy is to complete the current contracted work and at the end of that, unless the work changes, the plant will be closing. That is not an idealistic position of NDA. We are not opposed to reprocessing for idealistic reasons. It merely reflects the state of the asset and the market for reprocessing, which is not buoyant, despite the large quantities of spent fuel held in ponds around the world. At the moment, there is not a buoyant market for reprocessing services. In the absence of either a buoyant market or a prompt need for a plutonium programme, the significant capital investment needed to produce a new generation of reprocessing plants is simply not justified on commercial grounds.

I will finish by saying that broadly we believe we are centrally balanced around a clearly defined purpose, which is of benefit to the nation, and we have the capabilities and skills to deliver that mission. There are some edges, however—these things are never black and white—and I would pull out particularly the matter of responsibility for national nuclear infrastructure, which largely we own but we have a remit that somewhat constrains us in the broader application of that, and the question of spent fuel management for new build materials. NDA has a lot of capability and I am not sure we quite have the right balance yet on how that is made available into new build. Having said that, it is early days in the new build programme. We are not looking at advanced reprocessing techniques. Everything I have spoken about in reprocessing is based on the existing PUREX process. We are supporting R&D into advanced separations technology, we fund the NNL's participation in that, that is largely done for reasons of skills maintenance to support the current programme rather than a perceived need for additional reprocessing technology.

Q258 The Chairman: So whose responsibility are, or should be, the things you are not doing in relation to reprocessing?

Adrian Simper: The first question is to determine the need, and then you can determine whether the R&D is sufficient to deliver on that. First comes the vision, and then comes the capability to deliver the vision. In a way I do not know how to answer your question. It would depend on what the vision was for reprocessing in the UK. That is clearly not a matter for NDA.

The Chairman: Joe, I do not know whether you would like to add anything regarding the Environment Agency. You gave us a very clear statement in your introduction.

Joe McHugh: I am happy to move on if that is okay with the Committee.

Q259 The Chairman: Would any other members of the panel like to comment on Adrian Simper's response about the NDA's responsibilities?

Professor William Lee: From a CoRWM perspective, we feel that the responsibility for new build waste should fall with the NDA. We do not think it is appropriate for the Government to rely so heavily on the NDA and the potential new build operators to make arrangements between themselves to do the R&D on long-term management of new build spent fuels. As we know, the Government has responsibility to ensure that effective arrangements are in place for management of new build waste. Part of this responsibility is to ensure that the NDA and the potential new build operators must do sufficient R&D.

One of the other aspects we will cover today is that if the UK opts for a large new build programme, of the order of 38 gigawatts, let us say, the amount of high-level waste generated will become a significant proportion of the total inventory. That could impact on the size and design of any GDF. So it is again appropriate for the NDA and RWMD in particular to be involved in that.

Q260 Lord Oxburgh: Just for clarification, Dr Simper, you said that you are not responsible for site identification for disposal, but you are likely to take a site that has been identified by another agency and then implement disposal on that site.

Adrian Simper: That is correct.

Q261 Lord Oxburgh: With what degree of specificity is that site likely to be identified? Of a depth of precise location, for example?

Adrian Simper: The managing radioactive waste safely process—a voluntarist process that DECC is accountable for on site selection—will identify a general area and then characterisation will be carried out. From that process there will be a funnelling down to the selection of the appropriate geology. At some point that moves from being a voluntarist approach to being a technical, science-driven approach.

Q262 Lord Oxburgh: A policy decision has to be made about depth, for example. Where will that decision be made? Is it CoRWM?

Adrian Simper: That is a technical decision, once you have decided on the area where your repository will be, in your voluntarist process. The geology that you have in that area and the science will determine the depth.

Q263 Lord Crickhowell: Adrian Simper used the phrase "maintaining skills". That is interesting from the point of view of the Environment Agency as well. Perhaps you might comment on the adequacy of existing skills and any anxieties about the maintenance of an adequate pool of skills in the future.

Adrian Simper: I have done a lot of talking. Joe, do you want to go first?

Lord Crickhowell: Are they there and are you satisfied you will continue to have enough skills available?

Joe McHugh: It is certainly on our list of concerns that we need to think about not only whether we have enough in the shorter term, but also in the medium term. The work that

NDA is leading with the Nuclear Skills Academy is looking at that. I am stealing your thunder, Adrian, but there is an NDA graduates scheme looking at graduates for the future as well as the more technical skills that will be needed to keep not only the current nuclear facilities going, but any future ones.

Part of the issue is getting enough young people to study the appropriate science, technology, engineering and mathematics subjects so that there is the foundation material that can be grown into the nuclear engineers of the future. We are involved in a small programme to take some environmental graduates and grow them into potential people who could work in the nuclear industry, with an organisation called EMpower and a company called Viridian, to take people at Masters degree level who could develop in that way. Adrian, I think you probably want to build on that.

Adrian Simper: There is little more to say. Thank you very much, Joe. The maintenance of the skills that you need is best done by doing the work that you need. As we continue to have technical challenges, we will continue to place work into the technical community to address those challenges. That will be the primary means by which we maintain the skills. At the moment we are content, but we recognise that that is not the whole story, so we put some money into, for example, PhD studentships, bursaries, sponsorships and working with the bodies that Joe has mentioned to ensure a broader approach to skills maintenance.

Professor William Lee: In the geological disposal area, CoRWM has some concerns about developing the skills base. We are talking about the need for a skills base over a rather lengthy period—decades, if not longer. In the geological area, there has been a decline in the university sector. There is also a lot of competition from the oil and gas industries, with carbon capture and storage. So we feel that there is more of a strategic need for a push in this area, and perhaps better co-ordination. I am aware that Cogent and the National Skills

Academy for Nuclear are looking at this and CoRWM has been in discussion with them. It is an area that we have to develop further.

Professor Peter Styles: I agree with a lot of what Professor Lee has said. This is a very long timescale. Academia, particularly research assessment exercises, tend to make academics rather flibbertigibbets and we have to follow where the funding comes. There has not been a great deal of funding for this kind of work, which has meant a decline in research groups. I am pleased to say that there are some. Five PhDs have just been announced in Strathclyde. But a lot of this need is geological. NERC particularly has been remarkably reticent to fund any kind of work in this area for a long time. It needs a long focus. These will flare and go to something else. As we know, the oil industry and CO2 sequestration is snapping up good geoscientists. I have been at meetings of the Geosphere Characterisation Panel of the NDA where opinions have been expressed that the market will take care of it and when you need them, these things will appear as if by magic out of the ether. I doubt that to be the case, because there will not be sufficient research groups actively working on this unless there is a strategic overview of how this funding continues.

Q264 Lord Cunningham of Felling: I would like to ask Professor Lee what is the purpose of the division of responsibilities between CoRWM and the NDA and what advantages to the ultimate solution to these problems does that division of responsibilities bring?

Professor William Lee: Division of responsibilities in what sense?

Lord Cunningham of Felling: In the sense of dealing with the solution to finding some geological storage of long-term safety of high-level nuclear waste? It seems to me that every time we come round to this subject, the date by which we are going to have a solution has gone backwards by a decade. Where is the division of these responsibilities getting us? What advantage do we have from that division of these responsibilities?

Professor William Lee: CoRWM's remit is to scrutinise the process and to advise Government on progress and plans. I guess Adrian is able to comment on the NDA's remit.

Adrian Simper: The global experience has shown that where a single body has been charged with selecting a site and implementing geological disposal no matter what, that has run into difficulties. Countries that have had a more voluntarist approach to the site selection appear to have been more successful. On that basis, the UK decided that it was appropriate to split the responsibilities for selecting the site, which is a voluntarist approach, and the responsibility for implementing the geological disposal facility once a site has been selected. That decision was taken some time ago and we are implementing it now. We appear to be making good progress. It is slow progress, inevitably. Voluntarist programmes, by their nature, will take longer in the early stages than a decide, announce, defend approach, but I see no reason to believe that ultimately this will not be successful.

Professor William Lee: I think we have to be wary about trying to rush the MRWS process. I understand the concerns about the length of time that people perceive this will take, but we have to ensure that the volunteer community have time to consider all the issues. We also need to ensure that we have time to do the relevant R&D to underpin the safety case. Without a volunteer community and a suitable geology, nothing is going to happen, so we have to be a little careful not to rush.

Q265 Lord Cunningham of Felling: Would you describe the last 30 years of consideration and looking for a solution to this problem as a rush?

Professor William Lee: I have only been involved in the last five years.

Q266 Lord Jenkin of Roding: I would like to come back to R&D on the question of waste. We have had evidence that at some stage there will need to be an underground laboratory. The question is who is going to pay for that. The waste consists of two elements: there is the legacy waste and the new build waste. So far as the new build is concerned, we

have the arrangements now being finalised for a funded decommissioning programme, where the investors are going to have to set aside sums to deal with their decommissioning and waste. How is the other part of an underground laboratory going to be financed? Adrian, will it be in your budget?

Adrian Simper: Yes. The underground laboratory, if one is required, will be part of making the safety case and demonstrating the appropriateness of the repository, so it will be as part of the repository programme.

Q267 Lord Jenkin of Roding: Have you got that in your forward programme?

Adrian Simper: Yes, that is included in the estimates and the programme going forward. It is an intrinsic part of the implementation of the repository. Exactly what form it takes will depend on where the repository is and the geology.

Lord Jenkin of Roding: Of course, but following up Lord Cunningham's question, one is encouraged by the response of the local communities and Cumbria County Council. They have approached this in a very responsible manner. The question is what price they are going to demand for hosting a repository. My own view has been put very clearly on a number of occasions. It needs roads to west Cumbria. We are going to visit Sellafield, and it will be a long journey from Carlisle.

Q268 Lord Oxburgh: This may be for Professor Lee or Mr McHugh, but could you confirm that the Government view is now that spent fuel is a waste to be put out of the way rather than a potential resource for some time in the future?

Joe McHugh: I think the current policy is that that is a matter for the utilities that own the spent fuel, whether it is regarded as waste or not. None of the new build utilities have expressed an interest to us in reprocessing the fuel. They are planning on a once-through fuel cycle, with the fuel being regarded as waste at the end. The question is when that

decision needs to be made and when we decide that we are absolutely not going to reprocess the fuel.

Q269 Lord Oxburgh: It ultimately comes back on the NDA how this material is to be managed. Do you think that that decision, on whether this is a resource or a waste to be got out of the way, is a matter for individual companies, or is it a Government decision?

Joe McHugh: The utilities own the fuel. They are overseas utilities, probably, that will be developing future nuclear power stations in the UK. Some of them are owned by overseas Governments. I expect that their owners will have a big stake in that decision.

Q270 The Earl of Selborne: Our inquiry is on nuclear research and development capabilities, so I ask whether the United Kingdom has adequate research and development capabilities to meet its current and future obligations for the safe and secure storage and disposal of both legacy and new build radioactive waste. Perhaps you could tell us what you think the main gaps in capabilities are that might need addressing.

Professor Peter Styles: We have some large gaps now. We have lost our expertise in exploring and monitoring underground cavities for a whole range of reasons, partly to do with the decline of other industries that still exist partly. My research group still does work there. We have lost a lot of expertise in geophysics of that kind. There are new areas that are emerging. We are not really supporting geomicrobiology, which is to do with how biological organisms can help to immobilise waste. That is an area that is rather sparsely supported.

Across Europe, there are skills gaps; it is not just the UK. I have a letter from the chairman of the school of underground waste storage and disposal in Switzerland, clearly saying that it is rather difficult. We need some people, we do not need thousands of them, but we need them really very dearly. It is how we train people without a facility here. People who are doing these PhDs should be visiting other facilities which are further progressed, in

Switzerland, Sweden and Finland. They should be seeing real experiments going on. We need to make sure that is the case. We do not have any facilities in the UK that you could train people in. We have to take an international view. We have a youth skills gap, particularly in site investigation in these new areas—probably more so than in nuclear engineering, to be honest.

Q271 The Chairman: Adrian Simper, do you have anything to add to that?

Adrian Simper: I think our position slightly differs from that, in that we believe that at the moment we are able to access the skills, facilities and capabilities necessary to allow us to discharge our mission. As our needs and demands change, the supply side changes in response. There are needs in the future that we do not have at the moment, but there is no reason in principle to believe that the technical supply side will not respond to that. There are some issues around national nuclear infrastructure. Some of the facilities that support this work, particularly the active ones, are aged. In the fullness of time we might need to think about that, but at the moment we have a very competent UK and global technical supply side, which the NDA is able to take advantage of. We are a consumer of R&D and at the moment we are content that we get what we need.

Q272 Lord Oxburgh: Are you talking about the same pool that Professor Styles is talking of, or are you talking of a different skill set?

Adrian Simper: We may be talking about a slightly different skill set. There is a difference between technical underpinning for delivering a specified programme of work and the breadth of the general science basis of the UK.

Professor Peter Styles: And you source it internationally as well, don't you?

Adrian Simper: Yes, we do source it internationally.

Q273 The Earl of Selborne: I wanted to come back on Professor Styles' point about the lack of facilities. Do you think, for example, that the NDA facilities could be used better by the research community? Is there an opportunity there for better use?

Professor Peter Styles: I think there is good liaison with the NDA, but some of the things like underground rock laboratories—Canada closed theirs, so there are fewer of those than there were. To investigate the long-term behaviour of rock, the propagation of fluids and entrapment, we need to have that kind of facility. We do not have that at the minute; we decided in 1996 that we could not have that. Other countries do. I would like to see that affiliation with other programmes that are further on than ours. We need to have people training in the UK, but it needs to be in the context of a research field that has advanced much further elsewhere than it has here.

Professor William Lee: CoRWM separates two areas: R&D on treatment, packaging, storage and transport, which is managing radioactive waste if you like; and R&D on geological disposal. If I could comment on each of those in turn, it may clarify what we are describing here. CoRWM states that the UK capabilities for R&D in treatment, packaging, storage and transport of radioactive waste are adequate, apart from the facilities for examination of highly radioactive material. We think they are less adequate for R&D on geological disposal, both from the facilities perspective, which is global, and from skills, which we have discussed previously.

Describing the gaps, we think there is a problem with facilities to examine highly active materials. The NNL central lab is not fully commissioned, so the hot cells are not opened and access is proving a little difficult for outside users. We recognise that there needs to be a business case—it is expensive to open these facilities—but we do not see that with the current arrangements there is a business case going to evolve that would enable such facilities to be opened or new ones to be funded.

On geological disposal, we have talked about skills, but the UK has a particularly complex waste inventory—a cornucopia, if you like, of different wastes—and potentially a quite complex geology as well. So we believe there is a gap in the geological skills and the geological research that we need to pursue, and now is the time to start doing so. Historically, the Nuclear National Lab has not done geological disposal-related research. It is just developing its skills base and capability in that field and needs to work with the British Geological Survey in the universities and others in that field.

An area we have not talked about is Scottish Government policy, and its near-surface, near-site plans. That is going to require its own R&D on designs of the stores and durability of waste forms in those environments. It is not clear how, when and by whom that is going to be done, so that is a bit of a gap, too.

Q274 The Earl of Selborne: I would like to come back on the role of the research councils. Professor Styles touched on NERC's lacuna in this respect. In the written evidence from NDA and CoRWM, you have drawn attention to the lack of some of the fundamental research on waste materials and new build waste. What are the gaps that need filling by the research councils here in fundamental research?

Professor Peter Styles: These engineering PhDs are funded by EPSRC, but no matter how good we make the engineering and the encapsulation eventually, it will be the geology that is the final containment. We need to understand in some detail the properties of rocks in the UK, which has every kind of geology apart from the Miocene, which has been formed and glaciated. They are very variable, so we need to have an understanding of specific sites. We need to understand the long-term glacial history of the UK. NERC has done a great job of looking at the problem of global warming. I do not think they have done such a good job of looking for solutions to how we deal with energy and other things to do with that. I have

taken this up several levels, but we need better co-ordination between the research councils and how they tackle this—and not just between the research councils, but with the EU.

Q275 The Chairman: Would other panel members wish to comment on that? Are there any additional points?

Professor William Lee: Can I comment on the fundamental R&D? I think there is a need to get the balance right—CoRWM have commented in the past on this in their R&D report—between the industry needs-driven R&D, which is entirely appropriate for their needs, and fundamental independent R&D, if you like. The nuclear field is particularly sensitive. People like to see independent research being done. A lot of what is being done with the research councils at the moment is guided by linking with the NDA on managed calls. Much less is fundamental and independent R&D, which would help to convince the public. It is the sort of R&D that the regulators need to be supporting, to underpin the safety case.

Q276 Lord Jenkin of Roding: This comes back to what Professor Styles was saying about understanding the geology. In 1996 there was a planning inquiry, which held against the Nirex application, so the rock characterisation facility was then abandoned. That was followed by a change of Government. I mentioned an underground laboratory a few moments ago. Do you envisage that an underground laboratory would have the characteristics of what was proposed in the Nirex planning application—a deep hole? Or when we talk about an underground laboratory, are we talking about something different?

Professor Peter Styles: We are talking about much more than just a deep hole. We need chambers and lateral excavation so you can understand how rock damage takes place and how long-term fluids propagate. They exist in other countries, but we need one in our own geology. We can analogise with other countries, and we should and have to. There are similar geologies, but the UK will have special problems and we will need at some stage to investigate them in some detail.

Q277 Lord Jenkin of Roding: And there is not enough R&D being done on that. Is that your point?

Professor Peter Styles: No, there is not.

Q278 The Chairman: Could I just come back to Adrian Simper? I thought I heard you say in response to Lord Selborne's question that you thought the provision of skills was adequate at the moment. Was that specifically in your area, or was that across the piece?

Adrian Simper: That is specifically for NDA's delivery of its mission and the capabilities that we require to deliver our mission, which includes where we have got to on GDF.

Q279 Lord Cunningham of Felling: This question is for Professor Styles. Forgive me if it is already in your submission and I have missed it. Could you give us a nudge on the situation in other countries on research in rock characterisation laboratories?

Professor Peter Styles: Sweden and Finland, particularly, are very advanced in hard rock terrains. Switzerland—perhaps not quite as much as it was—and France are very advanced in investigations in what we would call mud rock terrains. There are various geological scenarios. In hard rock scenarios, you look for generally strong granite. There are salts, which are self-healing—there is a repository called WIPP in New Mexico. Then there are mud rocks and clays, which have very low rates of propagation of radioactive transport. All those three are possible scenarios. All of those are still held as possibilities for the UK. It depends eventually where the volunteer community arrives from. We have all those different types of environment to investigate. Germany has done a lot of work on salt. France has done a lot of work in some areas and Scandinavia has done a lot of work on hard rock. We can learn from those and there are generic lessons, but eventually we will come down to one of those types of environment and we will have to consider that in some detail. So we had better have some fingers in quite a few pies to make sure that we are not left out from having expertise. These are very different geological scenarios.

Q280 Lord Cunningham of Felling: You did not mention Yucca Mountain.

Professor Peter Styles: I did not mention Yucca Mountain. Nobody talks about that much. Perhaps it was not the ideal place to start from, if you know what I mean.

Q281 Baroness Neuberger: This follows neatly, because Professor Styles and Professor Lee have been saying that we need to work more internationally and have better international links. You are obviously saying that PhD students need to be going abroad. Can you perhaps comment on what R&D capabilities would be best achieved by international collaboration and the extent to which you feel that the UK is sufficiently involved in international programmes? Some of the suggestion at the moment is that perhaps it is not enough.

Professor Peter Styles: To some extent, the fact that the British Geological Survey—I served on its board for two sessions—still has some nuclear capabilities and not particularly because we have done the work in the UK. By virtue of their overseas contracts, they have carried out a lot of work internationally, particularly on gas migration in repositories. They have carried out a lot of tests with the Scandinavians. The fact is that we need them now; it is quite handy that they have kept their hand in at someone else's expense, but there has been a big period of decline. I started doing this work when I was a young lecturer. I am no longer a young lecturer. I am only just young enough to be still doing some of it. We had a gap of more or less 20 years, which was filled by other people paying for research. There is still significant expertise, but it is not particularly because it is being supported by UK funding.

Professor William Lee: I would like to make two or three points. First, the UK's participation in international programmes has not been helped by Government decisions, for example to withdraw from the NEA and Generation IV. That has lowered our standing internationally and undermined our ability to play a major role. While international

programmes are important and we have to participate more and learn, we really need our own credible core capabilities in the UK. The R&D that we are planning will go on for decades. We need the security of supply of people and abilities over long periods. We cannot really rely on research done in other countries.

Q282 Baroness Neuberger: Can I pick that up and tease that out a bit? Could you do that kind of long-term stuff in collaboration with one or two other countries? Does it have to be purely the UK?

Professor William Lee: You can learn basic skills and you can train people in collaboration with overseas, but we have our own wastes, which are quite complicated. We will have our own geology, and it is unlikely to be identical to the geologies seen overseas. Participation is important for training, but we then have to bring it back. It is important that we participate in these international programmes. It is also important—and something that perhaps we have not done—that we influence these international programmes and get involved in the high-level committees in the European Community and push framework 8, or whatever it is, in the appropriate direction for the benefit of the UK. It has not happened in the past, I do not think.

Adrian Simper: I agree. The NDA believes that international collaboration is very important, and for more than just training. We collaborate internationally on R&D, not just in the geological disposal area, where we are participating in various framework 7 programmes, implementing geological disposal. We have relationships with other organisations at an EU level, but we also have a number of bilaterals that cover the range of our mission with, for example, the US Department of Energy or with EDF in France. We have bilateral agreements with probably all our counterpart organisations around the world, which include technical exchange. We get a lot of good information from that, and we have specific R&D projects that we run jointly and we share information. There are some things

we do well and some things that others do well. There is much more than training. It is an important part of being efficient in getting the technical underpinning that enables us to deliver our mission.

Professor William Lee: One of the things we need to do is make sure we are a credible partner for overseas institutions. So we need to have the hot cells open and make those available to European partners so they can come in. We then become a player in the game. At the moment we are at rather a low level.

Q283 Baroness Neuberger: And it is an absence of political leadership, with a small p, in a way, wanting to have a presence and make a difference to the UK. Is that right?

Professor William Lee: Yes.

Q284 Lord Rees of Ludlow: Is there any overlap at all between the R&D needed in this enterprise and what is needed for carbon capture and storage?

Professor Peter Styles: Yes, because we are looking at the integrity of rock and its capability to contain fluids over very long periods of geological time. Perhaps not quite as long a time, but there are significant overlaps. In many cases, a lot of the technologies we need have been developed significantly in the hydrocarbon industry. We also need to be able to tap into those very rapidly and learn from them. They are not completely there yet. We do not have huge experience of sequestration of CO_2 and its monitoring and we are still learning. Some countries would have us believe that they are, but there are remarkably few—only a few million—tonnes of CO_2 stored round the globe, out of 30 gigatonnes per year. That is not a very big proportion.

Q285 Baroness Perry of Southwark: I wanted to come back on what Adrian said about international co-operation. The message that you seemed to be giving was that it was absolutely wonderful and we have sufficient links and programmes and there is no reason to worry. That goes very much against most of the other evidence that we have had, which has

indicated that our international reputation is no longer very good and we are seen as a bit player in international programmes, with our proposed withdrawal from the Nuclear Energy Agency. We only have observer status in some international programmes. Could you clarify? Are you saying that we are involved in a lot of sub-zero level work that does not appear above the radar, or are you happy with the way things are?

Adrian Simper: I think we start with a question of what kind of nuclear country the UK wants to be. From that follows the R&D that needs to be in place and the international relationships to achieve that vision. All I can comment on is the NDA's mission, which it is appropriate for me to comment on. At the moment we are internationally and domestically able to access the technical underpinning that we require to deliver our mission. If we found that that was not the case, then we have the remit to, and would, take steps to fill those gaps, whether that was by funding, by sponsorship or by participation. It is from that perspective that I made my comments. There is one area that we definitely regret, which is the decision to withdraw from the OECD's NEA programme, because we were getting good information from that. More generally, for example on Generation IV reactors, that is not a matter on which NDA can comment.

Q286 Baroness Hilton of Eggardon: To follow up that point, clearly your approach is an instrumental one, that you get sufficient for your needs. Do you get the feeling that our status in international fora has diminished, or do you feel that you are respected by your international partners?

Adrian Simper: I think we are still respected by our international partners and we are still doing a lot of nuclear things, but we are quite backward-looking rather than forward-looking. My personal observation of the conversations that I have in the international community is that we no longer have the breadth of activity that we once had, so the conversations are less interesting for others to participate in.

Q287 Baroness Hilton of Eggardon: My question is about the collaboration and co-ordination between various bits of the nuclear world. We understand that research councils now co-ordinate their activity rather better than they used to, in that they have set up a co-ordination group, but it still does not include all the research councils. Would you like to say whether more should be done on this front to draw everything together into some strategic whole? Perhaps Professor Lee has some views about that.

Professor William Lee: I am happy to comment. Certainly some good things have happened fairly recently on the strategic co-ordination of the UK's R&D in the radioactive waste sphere. The expansion of the NDA's research board, including members from Government and overseas and the research councils, is a move in the right direction. That has only just happened, and perhaps it is a little early to judge whether that has been successful. Another thing that will help to define the R&D requirements is a road map. I understand there is one in preparation. Perhaps co-ordination is not so good, because I did not know that it was in preparation until I started reading the papers for this meeting. That will also be useful in enabling co-ordination of the infrastructure needed to deliver the R&D programme.

At a more general level, CoRWM feel that there is a need for a hierarchy of co-ordination. I think we agree with Government on that. There is a need for a very high-level top nuclear research board that covers the whole nuclear sphere, including waste and decommissioning, but also security, safety and non-proliferation issues. Then perhaps under that is the NDA research board, with its key remit on decommissioning and cleanup. Then under that are the two streams on the management side—the treatment, packaging, storage and transportation research board and one on the geological disposal side. There needs to be a hierarchy of research co-ordination across the piece.

Q288 Baroness Hilton of Eggardon: That implies that there should be somebody at the top driving the strategy. Do you think that is a role for Government?

Professor William Lee: Yes.

Joe McHugh: Professor Lee has indicated that there are a range of players and they have different interests. What is missing is some kind of umbrella over the top to exercise a degree of oversight to make sure that, as we indicated before, there is some overlap between the respective interests of geological disposal and the new build and the packaging and transport for the geological disposal. We would think the obvious body to look at that would be Government, particularly the Department of Energy and Climate Change.

Q289 The Chairman: I wonder whether Adrian Simper has anything to add to Professor Lee's summary of co-ordination.

Adrian Simper: Maybe a little more detail on some of the areas for NDA. I think I broadly agree. The most important thing, when you are thinking about co-ordination, is to work out what you want. I will always start from a consumer rather than a supplier requirement. We have our technology maps and understand where our deficiencies are. That helps to guide where we should work. Within that, we have the Nuclear Waste Research Forum, which works very well with us and the other waste producers. We have AWE there and EDF. We then input into the Technology Strategy Board and the Nuclear Research Co-ordination Group. I believe that input is welcome in helping to shape those agendas. I can see the appeal of an overarching umbrella responsibility. I am not so sure whether it is absolutely necessary. Maybe the system can be self-organising.

Q290 The Chairman: Can I also just pick up on the point that Professor Lee made about the road maps? One piece of evidence we have had said that we have generated various reviews, policy initiatives and road maps, but the policy position has been largely unaffected by these. Is there a danger that there will be just another document that is carefully filed away and a group of civil servants or others tick a box and that is the end of it? If we have a road map or a strategy, how do we implement it, as opposed to filing it away?

Professor William Lee: Clearly, there have been road maps in the past, but my belief is that this one looks as though it may have legs and the Government will respond to it. It is important that we as a country make a decision on where we are going with nuclear and act on that decision.

Q291 The Chairman: Professor Styles, do you have anything to add to that?

Professor Peter Styles: Yes. I have a certain scepticism sometimes of high-level umbrella organisations and how they deliver. There have been cases where there has been real disconnect between various areas. I appreciate that Adrian sees that the research that he needs is well served, but sometimes we take a different view on what the nature of research is. Some of the things that we do not even know that we do not know are still out there to be discovered. We have to have it, because we have lost our way. We have not got a concerted effort without an overall organisation. Perhaps it is worth trying with some kind of steerage, which will help. We might look at other countries that have got more successfully down this line and see quite how they manage it. I do not know too much about that, to be honest. Perhaps I should know more. The have made better strides and are much closer to achieving solutions than we are.

Q292 The Chairman: Which countries in particular would you point to?

Professor Peter Styles: The Scandinavian countries particularly—Sweden and Finland—and France to some extent, because it has a large initiative towards this and so much more nuclear than we do. Switzerland has always had it. They have organisations that have perhaps been better connected.

Professor William Lee: It is worth mentioning China, which has large plans for nuclear power. They also have a very clear plan for geological disposal. It has a location in very nice granite in the Gobi Desert. They do not have as much waste as we do, so we are well

behind the Chinese in that respect. Of course, they do not have an issue about volunteer communities, either.

Professor Peter Styles: You can either save the planet or you can save democracy, but you cannot do both.

Q293 Lord Jenkin of Roding: You produced a table at the back of the paper that you and three colleagues wrote. The table showed the proportion spent on fission research in 20 different countries. The UK came out with a very low figure indeed on that. It has been questioned by one or two of our witnesses and I wonder whether we could perhaps have a note of the sources.

Adrian Simper: It came from the IAEA's website. It reflects information that was submitted to the IAEA by nation states. It is an interesting data point. I would not claim that it represents the truth. I am not sure that the truth is even well defined on a question like that, but I would be delighted to supply the reference so that Members could have a look for themselves.

Lord Jenkin of Roding: It was a very impressive paper. Thank you.

The Chairman: Thank you very much. If any of the witnesses have further points that they wish they had been asked about and would like to have a chance to comment on, please feel free to write in with any supplementary points that will be taken into account by the inquiry. In the mean time, I thank all four of you very much indeed for a very interesting and helpful session. You will receive a transcript of this session within the next couple of weeks or so and there will be a chance for you to comment on any minor editorial or factual points that you wish to correct. With that, I thank you all very much.