

FILE DETAILS

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START OF TRANSCRIPT

[Aside discussion]

Facilitator: Thank you, great you've made it into this space. This is all relatively new to me, jumping between spaces in this way, so I'm glad it's worked and I'm glad it worked for you. The first thing, just to reiterate what I just said in the previous bit, for those that may have missed it as they have been in this space waiting, we'll start by having a conversation beginning with examining some of the historical questions around the geology of Copeland and geological disposal.

First of all, I'm going to start by saying I'm delighted to be joined by Councillor David Moore, who's a member of the working group and will be also co-facilitating alongside myself on this. I'm not going to ask you to speak just yet, David, but what I am going to ask you to do is if you can also keep an eye on those raised hands for questions, if any come through, just in case I miss anyone, then we make sure we don't miss.

So first thing then I'm going to say is this is attempting to be a conversation. Now, there's a large number of us in this space, but hopefully we'll still manage to make this as conversational as possible. There are two ways of interacting with us, one way, I'm assuming we can all raise our hands and we all know how to do that. If not, I believe there is a hand icon, a smiley face which we can click and that will give you the opportunity to raise your hand and I'll come to you.

[Unclear] words are denoted in square brackets and time stamps may be used to indicate their location within the audio.

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If that doesn't work and we miss you and you can see the chat box and the conversation box, please type your questions into that if you don't feel confident to ask them. If you do feel confident and for whatever reason you're still feeling ignored, then type your question, say you're still ignoring me and we'll come across to you and allow you to ask that question. Of course, the other way of doing it as well is there is a webinar chat box, you can ask your questions and I'll get them as well. So there are a number of ways for you to interact with us and hopefully we'll be able to pick that up.

I'm going to start by introducing our speakers and hopefully everybody's on mute, so there's not too much background noise. I'm going to start by introducing Cherry Tweed and also Richard Griffin. We're also joined, as I said, by Candida Lean as well. I'm going to ask you to say hello and that's it to begin with, so people can see you. Then I'm going to move to Councillor Moore and then we'll move into the conversation. So Cherry, do you want to start by saying hello to everyone so they can see where you are?

Cherry Tweed: Hello, everybody. I'm Cherry Tweed, I'm RWM's chief scientist. My background was that I was a natural scientist and I've been working on geological disposal in the UK since 1985. Initially I worked in the supply chain, providing technical support and I've been RWM's chief scientist since 2011. So as regards answering your questions on history, I've been part of the UK programme during most of the recent history of geological disposal in the UK.

Facilitator: Thanks, Cherry, that's great. The previous session was brilliant as well you were on, so I'm glad you can join us. The next person on my list is Richard Griffin.

Richard Griffin: Good morning, my name's Richard Griffin. I'm senior policy advisor with RWM. Previous to joining in RWM in February, I worked with both Allerdale Borough Council and Cumbria County Council on nuclear matters. I don't go back quite as far as Cherry, but part of the way.

Facilitator: Great, thank you. Lastly, we've got Candida.

Candida Lean: Good afternoon. My name's Candida Lean and I'm a nuclear waste assessor with the Environment Agency. I currently lead our support to the geological disposal facility siting work. I'm a geoscientist by background and I've worked in the industry for about 24 years now. It's worth mentioning at the start that as an independent regulator the Environment Agency is not part of the working group and we do not formally get involved in the decisions to select a potential site for the geological disposal facility. However, we are available to support discussions with communities, local authorities and other interested people with regards our role in regulating a future geological disposal facility.

Facilitator: Thanks, Candida, that's great, thank you very much. So what we won't do, we won't add up the number of years people have been involved with this, but already I've started to run out of fingers. So let's hope that we have a good, informed conversation about the historical perspective. But before we do, I'm going to come to Councillor Moore. There's a lot of conversation happening and when I've been talking to people, just like you do, it's the third time, we've been here before. You've been involved in previous attempts and it would just be good to understand from your perspective why again you're involved and why you feel it's slightly different this time.

[Aside discussion]

David Moore: Good morning, everybody, I'm Councillor David Moore. As Nick said, when we're talking about the history I've kind of lived the history of attempts on geological disposal in the area. I've been a local councillor for 37 years, sitting on both Seascale Parish Council - I still do - and on Copeland Borough Council, where I hold the nuclear portfolio and lead on the working group for Copeland. With that in mind, talking about the history, my first involvement was obviously with the Nirex process when it came forward and was suggested as a way forward for disposing of nuclear waste. It does impact on Copeland however we look at it and has done for a great number of years.

I think the process at that point was just finding if there was any suitable geology. I think people may well remember that it wasn't a geological disposal facility they wanted to build; it was a rock characterisation facility to ensure if the geology was even suitable to take forward further. That ended up in a public inquiry which the Government Secretary of State eventually stopped. He stopped that process and it disappeared for a number of years. We worked away and it is a big interest to us in Copeland.

The MRWS process was then started, the managing radioactive waste safely, a partnership was set up which had wide involvement from both community and the local authorities. It moved through some stages of gathering information and looking at evidence presented to us. At each stage, the three councils were asked if they wished to progress and what it said in the process at the start of the partnership was it had to have three green lights at every step forward to continue down the process.

Eventually on moving forward to the next step, that decision by the three councils had to be taken. The decision was that Copeland wanted to move forward, Allerdale wanted to move forward in the process, but the County Council did not. The way the process was set up, that process had to end at that point. Without three going forward, it couldn't go. I think we still pressed on at Copeland and we did press the Government, could we still continue as the two local authorities most impacted with the waste already on our site, but no, it had to stop.

We've spent many years now looking at setting up where we are today with the RWM process, working with communities document. I think I am comfortable with that document. I think the reason why I say I'm comfortable with that document is that we had a lot of input into the consultation on that document being put together. Because we've recognised from the work we've done what didn't work and where were the failing points of the previous experiences. Why do we want that to work? Why do I want it to work?

I live in Seascale, I live a mile from the Sellafield site and as most of you are aware, 75 per cent of the ILW, intermediate active waste that's sitting on that site currently, some of it in ageing stores, I don't believe that we need to keep passing this down the road. At some point, we have to look at finding the best solution for this and the safest solution. That might be a mile down the road from Copeland, it might be 200 miles away, but the process is right to start that conversation to see if this is the right place. That is the start of the process that we're currently on. I don't think we can keep passing this down the road, we have to grasp this.

We have tried in Copeland over the period of those last 30 years to try and develop a process. I think we've got a good start now, it's a community-led process and I think that's the great thing about it. We've looked at some of the things that went wrong last time, we've opened up new areas to look at. I think in the previous experiences we clearly say - we talked about hard rocks and it was all about - I'm no geologist, but I've learned an awful lot about geology over these years. We've fetched some new areas of play in.

The council took that decision that it wanted initially to remove the National Park and felt that that wasn't the appropriate place to do this work. But we opened up the inshore area, out to 22 kilometres, that's new area. So there is new search area within this process. It has got community at the heart of it and I think that's why the council were really happy to get involved and do as much work as we can and get our communities as fully involved. I think that's probably enough from me for the start, to set the stall out.

Facilitator: Thank you very much. I'm going to move from yourself to Cherry. So Cherry, from your perspective, what's different?

Cherry Tweed: Thank you, David, I think it's really encouraging that you've actually picked out the two things that I was actually going to mention and to answer what was different. I think the first one is around the process and the openness. That's certainly the intent of the new process and it's really encouraging to hear that from your side, you feel that it's different and that this really is this time a

community-led process. That's very different, I think, from both of the previous siting processes. Then I think in terms of the other big change I would highlight in terms of the geology, it's about information and how much information is out there for people to look at and make their own judgements.

If you look back as far as the 1990s, Nirex decided on the site that they were going to investigate. A very small part of Copeland geology and at Longlands Farm and they arrived and did their investigations by drilling boreholes. Under the MRWS process, I remember observing some of the early conversations. David, you picked up the word stages and I think that was very much of a key of that MRWS process. It had some very prescribed stages with dates that were closed and the community had to say yes to progress to the next stage. Also what would be done at each stage was very much prescribed.

So there were discussions about geology, when I can remember communities saying we'd like to understand about this. The response was oh well, you'll find out that if you stay on and you're part of stage 4 of the process. Communities were saying but we need to know in order to decide whether we want to be part of stage 4. One of the things that's tried to be different this time is actually to make all of the information available as soon as possible. Particularly the work that was done in the period after the end of MRWS, to produce national geological screening. To set out early what is known and what isn't known at the moment about the geology of Cumbria, really is a way to start to have an open conversation and joint delivery of the project.

Facilitator:

Brilliant, thank you, Cherry. That's helpful to everyone. I will start the conversation, if that's okay. Just to share with people, there were a lot of questions that were raised with me prior to these calls. I've not seen any questions coming through, but if anyone can correct me on that, that would be great. I've not seen any questions come through just yet, to get the ball rolling from the participants, no hands raised.

One of the things that came up in conversation with myself is that actually there was a change in legislation, a change in law around this - this might be better for Richard to answer - which removed the council's power of veto. Is that correct? It would suggest from that that some of us tried, failed, didn't work, so we just changed the law to make it happen. So how has it changed in that regard? Has the power of veto disappeared?

Richard Griffin: No, it's changed. As David said previously, there was a requirement for the so-called three green lights, one at the national government level and then at the county level and at the district level in Cumbria. But this time around there is still a right of withdrawal, that right of withdrawal is in the hands of the principal local authority, or principal local authorities if there are more than one.

So the difference being this time that that decision will be based on the conversation that the community's having with the community partnership. The timing of the decision, if it's taken, will be dictated by the feedback that the partnership's receiving. It's still there, you can call it veto, you can call it right of withdrawal, whichever terminology suits you, but it hasn't been changed. Obviously it's a slightly different process this time round, but it still requires the principal local authorities to continue to be involved, otherwise the process will stop in the area concerns.

Facilitator: Thanks, Richard. Councillor Moore, from our perspective, for the Copeland working group, the principal local authority in this case is Copeland Borough Council, that's correct?

David Moore: Yes, thanks for that. Copeland is the principal authority. When the working group was first put together, when we first started the initial work that Copeland was invited to join and also is there as an interested party as well, because we put forward part of Copeland. So we sit there with almost two hats on, if you like. The County Council was also invited to join as a principal authority as well. The local area committee actually wished to join, but the senior management at the Cumbria County Council decided they didn't want to get involved in the process at this stage. I think their

position is that they would get involved at any planning stage that was to come forward.

But I can confirm that the local area committee did want to get involved very much in the process. So Copeland's there as the principal authority, but also were there as an interested party. We took a decision at the council that we put some conditions that we would join a working group, should RWM be happy to meet those. Those were around removing the National Park from the area of investigation, both above and below ground. We also wanted the independent chair, which we duly got and we also looked at things like the council shouldn't be out of pocket by being involved in this process. Those were met and so, therefore, the council's position is that we're happy to be a principal authority involved in this.

Facilitator: Thank you very much. I'm conscious we've got to move through three different topics on today's call. I just want to pull back one other thing which came up to me, which was - I'm glad we've got Cherry and yourself on this call - under the Nirex programme, high level waste was not going to be stored underground. They talk about the 300 years to get the waste to intermediate level so it can be stored. Why can high level waste be stored this time around and what is the risk in a few thousand years? I think first of all, why can it be stored this time around?

Cherry Tweed: Well I think one thing you've picked up, first of all, is a really important point, that the waste exists. That even back in the early processes of the late 1980s and 1990s, it was recognised that there was high level waste that would eventually need to be managed. But at that early stage - and geological disposal was relatively new then - the UK took the approach it would sort the ILW first and come back and then look at the higher level waste. I think this time around it's been recognised it's probably part of that again trying to be much more open, upfront about this.

We've been clear about exactly what the envelope of waste that the UK has and that will need to be managed through geological disposal. So that's one point, I think, is openness and recognising the whole of the problem, rather than this creeping of the challenge

that we've got to deal with, rather than this creeping, let's do this bit first and then go back to the rest.

The other question that you asked is actually around safety. High level waste is more radioactive than the intermediate level waste. It is so radioactive that it does generate heat. What that means is that we need to manage it in a slightly different way. Particularly we need to make sure that when it is disposed of, it will be spread out so that that heat is managed. But the radioactive hazard in high level waste does actually decay away relatively quickly. Certainly if we look at the inventory as a whole, then more than 90 per cent of the radioactivity will decay away in less than 1000 years.

Facilitator: Thanks, Cherry. What I'm delighted to say now is we've got someone else's hand up. So it means I can stop asking the questions and we can go straight to people. So David Wood, your hand is up, so I'm going to come straight to you, if that's okay.

David Wood: Morning, everyone. It's just a comment I'm making on the history from the MRWS process. In the documents there, any council could be the principal authority. Following the withdrawal of Cumbria County Council, the whole process was reviewed by central government and there was a change made that eliminated county councils as being the principal authority and essentially leaving it to the borough councils. So I'm only making the observation that whilst Copeland is taking up this role, we did enter into an MRWS process with three green lights and the Government's changed the rules so now you only need one green light.

Facilitator: Thank you, David. Can any of our panellists respond to that?

[Aside discussion]

Richard Griffin: He's right in the sense that the number of lights, if we carry on using the green lights analogy, is less this time. But the County Council is more than welcome to join the process, it hasn't been excluded, no county councils have. They at this stage decided not to join the working group. It still remains, as David Moore alluded,

a very important stakeholder for the process going forward. Who knows, if the process does go forward we may change from our current two tier system to a unitary authority-based system and it will all be different again. Just to clarify though, the three green lights, one of those was government and in this case it's the equivalent of RWM.

If RWM isn't happy about the process in a particular area, then it would stop as well, because we won't take it forward in an area where we're not happy, or if the regulators aren't happy. So it's not a simple oh, the County Council are excluded and it's all down to Allerdale or in this case Copeland. They are the principal local authority as defined in the policy, but the County Council - the invitation is still there if they wish to join the party. But as I say, even if they don't, they are a key stakeholder with many responsibilities that are relevant to the process should it go forward.

Facilitator: Thank you, Richard. Thank you for that and hopefully, David, that helps to clarify a few things. I'm going to move us on to the next part of this session, so looking at the suitability of geology. So as you can imagine, one of the key things that people spoke about on the phone with me was around the suitability of geology. What classifies as being suitable? What is it? I think Nick Smith has just put a comment in the chat box, which is a neat segue, I think, into some of this. So before we move on, I'm going to introduce our next set of speakers as well and hopefully we can still draw on Cherry and Richard if we need to. I'll introduce Jonathan Turner, do you want to say hello?

Jonathan Turner: Hello, everyone. I'm Jonathan Turner, I'm chief geologist for RWM. I've been with the company and indeed in this industry for about four and a half years now, but the whole of my career has been spent before RWM working in oil and gas. So I've got a lot of experience in subsurface, drilling boreholes, geophysics and linking up rocks that you can see on the surface to what you can see in the deep underground.

Facilitator: Thank you, Jonathan. The other person speaking is Kirsty.



- Kirsty Simpson: Hello, everybody. My name's Kirsty Simpson, I'm the geological technical integrator in the site characterisation team at RWM. Like Jonathan, a large part of my previous career has been based in the oil and gas industry, which means again I've spent a lot of my time characterising rocks in the deep subsurface using geophysical and geological techniques.
- Facilitator: Brilliant, thank you, Kirsty. I'm delighted that we're also joined by both Jonathan Ford and David Schofield, who if I get my acronyms right are from the British Geological Society. So Jonathan Ford.
- Jonathan Ford: Good morning, on behalf of the British Geological Survey I'm very pleased to be part of the discussions this morning. My role at the British Geological Survey is chief geologist for England. I have a background in mining, mineral exploration and much of my career while I've been at BGS has involved a combination of geological mapping and characterisation of the subsurface.
- Facilitator: Thank you, Jonathan. I got my acronyms wrong, so it's Survey not Society, apologies for that. David Schofield as well.
- David Schofield: Good morning, everybody. Like Jon, I'm a survey geologist with British Geological Survey. I've got 20-odd years under my belt making geological maps for BGS. I've been involved with RWM, helping to develop the information for this process for a number of years now. Again, we are an independent organisation, our role is to provide advice where we can, both to organisations such as RWM and also to yourselves, the members of the public as well.
- Facilitator: I'm going to move on to this question by Nick then. So maybe Jonathan or whoever wants to answer. Nirex gathered some very useful geological data, often utilising techniques that would now be considered old or even obsolete. How is RWM - so that one maybe is for Jonathan Turner and Kirsty - going to use these data? Will it be reprocessed using current processing techniques and, in the interests of transparency, will the resulting geological data set plus new data be made freely available to researchers and indeed the general public? I love these questions because I don't have a clue what they mean, but I hope you do, so I'm going to come to yourselves.

Jonathan Turner: Why don't I start then? Maybe if we differentiate between other Jonathan and me, I think, Jon, you tend to call yourself Jon and I tend to be Jonathan. That works fine for me. So there's a lot to that question. As Councillor Moore discussed earlier, RWM or its predecessor organisation has investigated the Cumbria area, the Copeland area in the 1990s. Those investigations involved two main types of data, two main types of information that were used to describe the rocks deep underground. Firstly, geophysics and specifically seismic data, which we're planning to return and use again, more modern, up-to-date seismic data. Then secondly, the drilling of deep boreholes.

Both of these methods have been widely used and developed and refined, particularly by the oil and gas industry. Clearly over the last 25 years, something like that, since the investigations took place at Longlands Farm for the rock characterisation facility that Councillor Moore described, clearly there's been a lot of advances both in geophysics and in how to drill deep boreholes and the sorts of information you can get from those deep boreholes. So we will be using up-to-date methods and really make certain that we squeeze the maximum amount of information and understanding out of the investment that goes into the drilling of deep boreholes and geophysics.

The second part of the question, Nick, I think, was to do with looking at data available and indeed, as happened in the 1990s, the geophysics and the borehole data will be made available once RWM and the British Geological Survey and its other partners have had the opportunity to interpret those data and bring the data together in an overarching model.

Facilitator: Thanks, Jonathan. I was on a call yesterday with someone who was - and I know, Councillor Moore, you've shared a bit about this stuff as well, but people were talking to me about aquifers and salt and rock salt and all these different things and volcanic things. What type of rock are we looking for?

Jonathan Turner: Kirsty, do you want to have a go at that?

- Kirsty Simpson: Yes, absolutely. That's a very good question. There are there different types of rocks which have been considered as potential host rocks. As you say, there's the high strength rocks which are rocks like granite, then there are the lower strength sedimentary rocks which are rocks like clay stones. Then there are evaporite rocks which would be the rock salt and the halite.
- Copeland has got really interesting geology, so it actually has rocks within it which potentially fit into all three of those groups. The halite and the lower strength sedimentary rocks like the clay stones, they're in the inshore area in Copeland. Then the higher strength rocks are onshore in Copeland. Because we're not considering the area of the Lake District National Park, the higher strength rocks are constrained more to the north of Copeland. The rest of the question was how do we tell the difference between those rocks, was that it?
- Facilitator: About that and what is the best one you're looking for?
- Kirsty Simpson: There isn't a best one, they're very different and they require different engineering design for the GDF facility. That's one of the reasons that our whole programme that we're looking to do is very much about investigating and characterising the rocks that are available. So that we can try and engineer our GDF to parcel the really high requirements that the regulators, some of whom are sitting in the meeting with us today, have in order for us to be able to get permission to build a GDF in the area. So I wouldn't say any one is better than another, they're very different.
- One of the big differences, as you pointed out in the question, is about the way the groundwater will flow through them. So in a high strength rock, the groundwater tends to pass through it much quicker, so high strength rocks need to be very well isolated. Whereas in the lower strength sedimentary rock the groundwater flows through them diffusively, so it's very, very slow. So it's about making sure that the time period that any groundwater that might pick up nuclear waste flowing through them is a very long time period before they get into any situation like into the sea or

something like that. So at that point the nuclear waste is well below background levels that naturally occur in seawater.

Facilitator: Thanks, Kirsty. There was another question about the area to sea being ruled out or not, what you're suggesting is it hasn't been. There was another question that came up about actually what are the depths, how deep is all this stuff? What are the depths at which we'll be looking for suitable rocks and why we need to carry out investigations? I think you've clarified the second part, but what are the depths?

Jonathan Turner: Shall I start with that, Nick and actually I just want out of the way you asked the question there, something that's really important. You used the word suitable, in other words by way of distinction to best or a rank list. What we don't have locked in a safe in the chief executive's office is a rank list of best to worst geology in the UK. The term that we use, exactly as you used then, Nick, is suitable. Suitable can sound a bit underwhelming, but this means suitable in terms of a fully engineered facility that will pass muster, if you like, with the regulators who Candida was very careful to say earlier are completely independent of the process. So we're not looking for best; we're looking for suitable, but the bar is extremely high.

As regards depth, what we talk about on the website is the depth range of interest that we're looking at is between 200 and 1000 metres. The facility certainly wouldn't and couldn't be constructed shallower than 200 metres, particularly because deep glacial valleys in the future could interfere with it, 1000 metres at a deepest level cut-off is rather arbitrary. The point is that we're most unlikely to need to go deeper than that and when you look at other facilities around the world, they tend to be constructed or designed for between 400 and 600 metres.

Facilitator: Brilliant, thank you, Jonathan. A quick question that came up, I don't know if this is an easy one to answer or indeed a difficult one. How long does all this assessment stuff take? How long does it actually take?

Jonathan Turner: How about British Geological Survey colleagues? Shall I pass that over to Jon or David? I don't mind which. I can answer the

question, I'm just trying to distribute the questions among the four of us. Shall I start and then maybe Jon or David can chip in?

David Schofield: Jonathan, I think that's one for you to answer. Is the question not about the RWM process and the length of time which that might last over?

Jonathan Turner: Yes, okay, I'm perfectly happy to handle that. So Nick, the question is how long does it take?

Facilitator: How long does assessment of geology take, yes.

Jonathan Turner: Okay, well actually the assessment of the geology has already started, in that through the national geological screening documents that were carried out for the whole of England and Wales and now the initial evaluation reports that are being prepared, we in collaboration with the British Geological Survey are looking at publicly available, so currently available information to gather together our best understanding of the geology of Copeland. Of course, the idea is that as we go forward, as the working group progresses to a community partnership, we will begin to gear up for acquiring our own bespoke data.

So in the first place, seismic data that will be acquired, looking at the mudstones beneath the inshore area that Kirsty talked about. Then subsequently those seismic data, if things continue to look encouraging in terms of the geology deep underground, we will prepare for the drilling of deep boreholes.

How long does it take? Probably the best estimate is something like 10 to 15 years, but it really depends what the seismic data and the deep boreholes tell us. But the point is that we will need to continue to acquire data and consolidate that data into a detailed description of the rocks deep underground, up to the point where we and the regulators are happy that the understanding of the deep underground geology is sufficient. In other words, the way in which we've characterised the deep underground geology is sufficient for us to be able to move forward with detailed designs and plans for the facility itself. But 10 to 15 years is a reasonable rule of thumb.

Facilitator: Thank you. Jonathan Ford and David Schofield, is there anything to add to that, Jon and David? No? Thank you. I'm looking at the time, we may be able to just squeeze in also in the conversation, sites that are more geologically suitable, using that phrase, so this person clearly used that phrase, can be found in the south-east, but these have been discounted because of the cost of transportation of the waste and movement of nuclear waste needs to be constrained. Is this true? That was something they were saying, that the south-east is more geologically suitable, but we can't shift the waste around.

Jonathan Turner: Again, why don't I start with that and then see if Kirsty or British Geological Survey colleagues want to add to that. We've emphasised throughout this meeting and all of our publications that the siting for a geological disposal facility is a consent-based process through the initial discussions, working groups and community partnerships. Therefore, like I say, we don't have a rank list of best to worst geology. RWM's job, in collaboration with its partners like the British Geological Survey, is to evaluate the suitability of the geology that's effectively presented to us by the communities that come forward.

Kirsty described the three principal categories of host rock in which a GDF could be constructed and indeed, some of those exist beneath the south-east, some of them exist in Copeland. Actually when you look at the map of England and Wales, there are patches of at least one of those three potential host rock categories all over the country. But there's nothing about the south-east that's ever led us to think that it's more or indeed less suitable than the Copeland area. We'll evaluate what we're given by the communities who work with us through the siting process. Kirsty, I don't know if you want to add anything.

Kirsty Simpson: No, I think that's very clear. I completely agree, looking at the results of the national geological screening that the BGS did, there are potential host rocks over, as you say, most of England and Wales and Northern Ireland that were reviewed. We are evaluating the rocks that are brought forward to us that process specifically

does not allow us to choose the places that we want to go and look.

Facilitator: Thank you very much. David's hand is up as well, so David, I'm going to come to yourself.

David Wood: Is there not a minimum standard of what would be suitable for each of the three potential host geologies?

Jonathan Turner: Shall I start off with that again, Nick?

Facilitator: Please do.

Jonathan Turner: The question was about minimum standards for the three host geologies. I think, David, the really important point to realise about the three host geologies that Kirsty described is that they're real bucket terms. There's a hugely rich diversity of different rock types that you can find across England and Wales and indeed the UK. To lump all the different sorts of mudstones, for example, that we have in the UK into what we call lower strength sedimentary rock, that's quite a generalisation. Even more so for higher strength rocks, higher strength rocks could consist of granite, could consist of volcanic rocks like the Borrowdale volcanics that you have at the Old Man of Coniston and that area.

It could consist of slates, like you have further to the north in Cumbria. So we don't have minimum standards for each of those host rock categories, but what we do have is what we call requirements, which is a sort of engineer's jargonistic term for the characteristics that suitable rocks will need to show in order for them to indeed be suitable for constructing a GDF in. But they're such bucket terms that at this point, when we're just using those three very high level terms, it would be difficult to have minimum requirements at this stage.

David Wood: I don't know whether you can hear me, I'd just like to come back on that. You spoke about there are requirements, are those requirements published and where could I access them?

Jonathan Turner: They're published at a high level and the requirements - this is something that I can chase up and we will definitely revert to you after this meeting. Because everything that we do is published, but

again they'll be fairly generalised, those requirements, because they'll relate to these broad bucket host rock categories, as I've described. It's only once, for example, we begin to focus on specific rock types that we'll really be able to nail down the detailed requirements. But I have made a note of that and I will revert to you through the working group.

Facilitator: There's one that we'll definitely be taking offline to get back to you on, David, so thank you. I'm looking at the time, I'm going to move us into the third section of this now. Please keep the questions coming in the chat box and other places, it's great to be able to interact with people. The third bit that came up is around ensuring the safety of a GDF. Now, obviously that related to geology, we heard all sorts of different things around cracking underground, et cetera, movements. So I think there are going to be a few questions being asked around this, but I want to just move us on to introduce the speakers like I've done previously. So I'll start with Rob Winsley, Rob Winsley, are you there?

Robert Winsley: I am, Nick, yes, thank you. Hello, everybody. I'm Robert Winsley, I'm the senior scientific advisor at Radioactive Waste Management. I've been working on the UK GDF programme and a number of international GDF programmes since about 2007, I think it was, so about 14 years or so. I'm a scientific advisor, so my expertise is in the science and technology area. Really pleased to be involved and look forward to hopefully making some useful contributions to your working group discussions.

Facilitator: Thank you, Robert. We've got Liam Payne as well, Liam?

Liam Payne: Yes, hello, everyone. Liam Payne, I'm research manager at RWM, where my day job is in the technical directorate to build and maintain evidence, that's the contribution towards our safety case and our claims and arguments. So probably less experienced than Rob, I'm probably pushing about 10 years now, both in academia and industry and continue to be involved in international WMOs as well.

Facilitator: Thank you, Liam. We've also got Peter Howden from the ONR.

Peter Howden: Yes, hello, everyone. I'm Peter Howden, a nuclear safety inspector at ONR. I've worked at ONR for well over 10 years now. I work primarily in the team specialising in radioactive waste management and decommissioning, management of nuclear legacies. I'm leading ONR's work providing support to the GDF siting process. So I'll just reiterate what Candida said earlier, that ONR provides advice on regulatory requirements about GDF siting, but we're not actually part of the GDF siting process and we're not part of the decision-making on selecting an actual GDF site. Thank you.

Facilitator: Thank you, Peter. As Peter explained, we've got Candida here as well. I'm going to start us off with a question that actually came up in our first question really, one of the first ones I heard. Is subterranean burial of radioactive waste safe? Can you ever engineer something to last for these timeframes? Certainly one of the things I hear, anything that's made these days doesn't last very long but it used to. So how do you actually make things that last for that length of time and can we please tell Dyson? But anyway, that's my personal issues coming to the fore. Who answers that one?

Robert Winsley: I can try and kick us off on that one, if you like, Nick, then others please do feel free to contribute. I think it's a really good question actually, because I think it gets right to the heart of why geological disposal is the internationally favoured solution for the management of these more challenging radioactive wastes. I guess the first thing to say, as we've already mentioned, some of our inventory for disposal is going to be hazardous for a long time, so we're talking tens of thousands of years. So that's a fact and that's the challenge we need to deal with. I think it's also fair to say that containing something of a single material or single barrier for tens of thousands of years plus is a very difficult challenge.

So I can see where the person raising this question is coming from. What I would say is geological disposal isn't about developing one incredibly high integrity barrier that does that job on itself. So we're not trying to develop a single barrier that contains the waste for that kind of timeframe. What geological

disposal does is it uses a range of manmade or engineered barriers that work together with the very thick, a few hundred metres of natural host rock, so where we build the facility. Collectively those barriers, what we call a multiple barrier system, work together to contain the waste for that timeframe. No one part does the job for 100,000 years plus.

I think the other thing that's really important for me to mention in response to this question is we're going to be using materials that haven't been in existence for that long. So it's the totality of the multiple barrier system that does the job. But we should also remember that the geological barrier becomes more and more important the further through time we go. So we increasingly rely on the natural geology and less so on the engineered barriers as we go out really long timeframes.

Then final point is that in the UK we have geology that we know is tens of millions of years old and we know has been stable for that kind of timeframe. So whilst we can't rely on manmade barriers necessarily for that timeframe, we know the geology has been stable in certain parts of the country for tens of millions of years. So we take good confidence from that, that that geology will remain stable for the type of timeframes we need it to, which is tens of thousands, hundreds of thousands of years.

Facilitator: Thank you, Robert. There was a number of other questions which hopefully your colleagues as well will be able to answer. I'm just trying to pick one out, I'll just check the chat box, there's nothing coming through. Someone was talking to me about how off the coast there are windfarms and when they were drilling they felt tremors in their property. First of all, when drilling takes place around this stuff will there be tremors across the ground? Secondly, in the future if drilling takes place, how do we make sure that it doesn't impact on the containment?

Robert Winsley: I can certainly kick us off on that and then I might look to some of my colleagues with a bit more of the hands-on drilling experience to comment on what sort of vibrations or noise community members might expect to experience.

I don't know about the specific windfarm instances being referred to, obviously that's a local situation that I'm not that knowledgeable on, so I won't comment on that. But in terms of things like that interfering with the containment and the safety of our facility, we've already spoken about how we would site the GDF at a depth of at least 200 metres if not probably quite a bit deeper. So part of that reason for siting it at that kind of depth is, of course, to make sure that its integrity is maintained and that events happening on the surface don't impact on the multiple barrier system and therefore impact on the containment of the facility.

The other thing I think is probably worth mentioning is we'll be operating the facility, building and eventually filling it for a long duration. So probably 100 to 150 years and during that timeframe, of course, there will be very careful controls around the site to make sure that no other activities like windfarm construction, for example, would impact on our facility. So we wouldn't be constructing things on the surface that would impact on our multiple barrier system.

In terms of the noise and vibrations, I must be honest with the group, it's not my area of expertise. So rather than hazard a half informed answer, I don't know if any other RWM colleagues on the drilling side of things might be better placed to comment, or perhaps our regulatory colleagues, on what - I think the question was what vibration and what noise might community members experience. Is anyone else able to contribute?

Jonathan Turner: I can say a few words about that, if you'd like, Nick, just a very few words. I think the question related to tremors that were felt during windfarm construction. There are two aspects to it, are they going to damage property, but also presumably are they going to damage the rocks that we want to contain and work for us as part of the multi-barrier for the geological disposal facility. The answer to that is no, the sorts of tremors - the sorts of vibrations, let's put it that way, that would be associated with drilling would be very similar to what you might experience if you're near a building site when various heavy plant is being used.

However, what I would say is looking at other programmes around the world, what they have put in place is what's called micro-seismic monitoring. In other words, extremely sensitive instrumentation, such as the British Geological Survey, for example, are using at an experimental site that they have down in Cheshire, in north-west England, micro-seismic monitoring that can detect very small tremors and earthquakes far below what can be felt by humans. They will be monitored such that we can be very open and transparent about any shaking associated with drilling with heavy plant and any other activities that we're doing.

Facilitator: Brilliant, thank you, Jonathan. I'm seeing a question coming in on the chat box from Kevin. I don't know if Kevin is with us, but it actually relates to another question.

Kevin: I can just repeat it. It was just a question of once the waste is loaded into the potential GDF, what happens after? Is there any form of monitoring, in the form of sensors or environmental studies, as time goes on really? That would be it.

Robert Winsley: I'm happy to respond to that one, Nick, if you'd like. Thanks for the question, Kevin. Monitoring, I think, is an important area. What I would say is the long-term safety of a geological disposal facility, so after it's been filled and closed up, the very long term, will not rely on a monitoring programme. So the long-term safety of the facility will be designed to be passively safe, it will not require a monitoring programme to demonstrate safety in the long term.

Having said that, as I've already mentioned, the construction and operational phase of the project will last for 100-150 years while we build and fill the facility. So during that long operational window I would imagine we absolutely would be monitoring the facility and the decision-making process, for example, for closing the facility, et cetera, will definitely be informed by a monitoring programme during that operation phase.

Then one last point if we've got time and you'll allow me, Nick, I think we should keep in mind this is a community consent-based process, so obviously the needs of a community are central to it. So whilst we may not require a monitoring programme for long-

term safety, it is a possibility that a community may decide that they would like certain monitoring to be conducted in order to build their confidence and therefore, ultimately we would like as an implementer to gain their support. So whilst we don't necessarily need the monitoring, we do recognise that communities may express an interest in it and therefore, it is something that we'd of course discuss and incorporate as appropriate to the community needs.

Facilitator: Thanks, Robert, that's a really important point actually. Thank you for raising that one. I'm going to move on to a question now which I think might be more for the regulators. Who decides on the criteria for the site as being both suitable and safe? Peter, maybe that's one for you, I don't know.

Peter Howden: No, as I said at the beginning, ONR and EA have no role in the decision-making process for selection of a GDF site. That would be down to RWM's process. We do provide advice on regulatory requirements and process to RWM and that helps inform their considerations of suitable GDF locations and suitable GDF designs and so on. But they will decide where the GDF should be sited. Eventually in the regulatory process they will apply for a nuclear site licence and an environmental permit. That's when the regulators will judge the adequacy of the case they put forward. From ONR's point of view, we will then assess whether the GDF design, which includes the siting of it, meet the high standards of UK regulation.

Facilitator: Brilliant. I think maybe I didn't make my question clear, because the question I had here is who decides on the criteria for the site as being both suitable and safe? Your answer there suggests that it is actually the ONR and EA.

Peter Howden: Well, ONR will assess the GDF according to regulatory standards. ONR publishes its standards that it assesses safety cases against. These are in documents such as the ONR safety assessment principles, SAPs and our technical assessment guides. They do provide the criteria that our specialist assessors do assess safety cases against as well as other good practice guidance that's

available, international standards from IAA and other learned bodies, et cetera.

Facilitator: Thank you, Peter. One other final question, I'm conscious we've got a couple of minutes left, so we may as well ask this final one. I think it might be just a yes/no one, I don't know who it goes to though. Is the waste retrievable?

Robert Winsley: I'm happy to have a go at answering that, Nick. I think that the headline message, the simple answer, I suppose, is that a geological disposal facility is for permanent disposal. So there's no intention to retrieve the waste. That's what you would see if you read the policy. The intention is to put it in there and to not take it out again, in simple terms.

Having said that, that doesn't mean it isn't possible to get it out. I've already mentioned it'll be operational for 100-150 years, so clearly in that timeframe it is possible to retrieve waste if you had a compelling reason to do so. As that times gets further and further it gets more challenging, but it's still possible and of course as it gets more challenging it gets more expensive. But yes, you can retrieve waste, but the intention is to dispose of it and not retrieve it.

Facilitator: Great, I think that question came out of somebody who has knowledge about something in the States, where they were trying to make it retrievable in the US. I think that was where that question came from, but I might be wrong. Brilliant, well we're at 12:40 and we said we're going to move back now to the main session. So I just want to say a big thank you to everyone on the panel, everyone who contributed. Councillor Moore, have you got anything you want to add before we move back to the main session, while we've got people here?

David Moore: No, I think there was just one point before, when somebody asked about why not in the south-east and things. I think one of the things that we actually did do, we asked for a transport study to be done so that we can understand here in Copeland what are the implications of moving the waste. I think a lot of people think it would have to be here, because transporting it isn't possible.

I think what is available is a transport plan that shows that it could be moved to anywhere within the UK, if that was decided that that was the best location. It's not a case of it can't be transported; there is a transport plan in place. I just wanted to pick that one up. It wasn't appropriate for me to cut in, but I just felt we should mention that it's not something that we didn't not consider. I'd just thank everybody for their questions.

Facilitator: Feel free to cut in, it's absolutely fine to do that, no problem. Right, I will see everyone back in the other space very shortly. So I'm going to leave this one and join the next room.

END OF TRANSCRIPT