Science and Technology Committee

Oral evidence: Science in emergencies: chemical, biological, radiological or nuclear incidents, HC 163

Tuesday 7 June 2016

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Written evidence from witnesses:

- The Emergency Planning Society
- National Physical Laboratory
- Staffordshire Civil Contingencies Unit
- Met Office
- Science Media Centre

Watch the meeting

Members present: Nicola Blackwood (Chair); Victoria Borwick; Stella Creasy; Jim Dowd; Chris Green; Dr Tania Mathias; Carol Monaghan; Graham Stringer; Matt Warman

Questions 1-102

Witnesses: **Christopher Abbott,** Chairman, Emergency Planning Society CBRN Professional Working Group, **Professor Patrick Regan,** Science Area Leader for Radioactivity, National Physical Laboratory, **James Webster,** Civil Contingencies Officer, Staffordshire Civil Contingencies Unit, and **Andy Bell,** Deputy CBRN(E) Lead, Chief Fire Officers' Association, gave evidence.

Q1 Chair: I welcome the panel to our second emergencies inquiry, focusing on civil emergencies. Thank you for waiting outside. We had some Committee business we had to take care of, and it is very kind of you to be so patient. Can I start by asking you, Mr Abbott, what input, if any, you have had to the national risk assessment process and national planning for CBRN incidents?

Christopher Abbott: In actual input directly as the Emergency Planning Society, none at all.

Professor Regan: Not in the planning, just in terms of the written evidence submitted by the National Physical Laboratory.

James Webster: We have limited input through our local risk assessment working group on which the Department for Communities and Local Government sits. If we have anything, we feed it up and it can come back down to that group.

Chair: Do you get much response?

James Webster: I personally do not sit on the group, so you would have to check that with them.

Andy Bell: Not direct input to the development of the risk assessment and planning assumptions themselves. Obviously, we use the outputs from the national risk assessment and planning assumptions to inform our response, but we do not have input to the risk assessment process.

Q2 Chair: Obviously, the national risk assessment and the higher-level Home Office document for CBRN scenarios is classified. How confident are you that the best science is available to you at your level of response, Mr Abbott?

Christopher Abbott: If we are focusing on the cascading down of detailed information to the local resilience forum, which includes the scientific aspect of it, we believe that works quite well. It works at a classified level to the police, but to broaden it out from the police to the other cat 1 responders, particularly local authorities, a lot of work needs to go on. They do not necessarily have access to the detail that perhaps they need to be able to do local planning based on the national level guidance and the scientific advice that goes with it. That has been a perceived problem, if not an actual one. I say perceived, but some of our members have actually faced a problem in being able to do it.

Q3 Chair: How do you overcome that problem?

Christopher Abbott: It is trying to work with the local police, who chair the LRFs, and equally gaining access by sitting in police headquarters and working with the documents, rather than being able to sit and work in the normal work environment. Of course, then it all starts to become a bit disconnected.

Q4 Chair: Professor Regan, do you think that the level of classification of the NRA runs the risk of creating a difference between the science that informs national planning and the science that informs local planning?

Professor Regan: There is probably a lack of broad education as to the real biological risks of radiation or radiological hazards. As we have seen with Fukushima and with the Litvinenko scenario, a large amount of public fear can spread over things that may have no real health risk for the public. The cascade of scientific knowledge from the top levels down to first responders and people on the ground is probably an area that could be improved and strengthened.

Q5 Chair: In practical terms, have you had any experience of that not working?

Professor Regan: A very simple example is the NHS hotline set up after the Litvinenko inquiry. They said, "If you are worried that you might have had exposure to polonium 210, call the NHS hotline." They had 10,000 phone calls, which presumably blocked the NHS hotline for everything else. The reality is that the radiological risk to almost any other individual from that was zero—minimal—so the fear of radiation rather than the scientific underpinning of it probably needs to be dealt with. As I was saying earlier to colleagues here, if you are a first responder—a fireman or a policeman who has to go into an incident like that—it would be better to be educated and pre-warned as to the real biological hazards, and that requires education.

Q6 Chair: Mr Webster, in your experience do you think there is a difference in the quality of science advice available at local level compared with national level?

James Webster: At local level it sometimes comes down to us asking for advice if we do not feel we are getting the right advice. One of the issues we potentially have with things like the national risk assessment is that they are very set scenarios. The Emergency Planning Society evidence suggested there were potentially 40 million chemicals for which we could have spills, for whatever reason, so it is important that, as well as relying on what is in the NRA in terms of those specific risks, we are able to get advice on things that are not in the national risk assessment that we can come back to almost while the first response is going on.

Q7 Chair: If you find yourself facing an incident that is not played out in a scenario already in the NRA, how easy is it for you to access scientific advice quickly in the timeframe in which you need to get it?

James Webster: We have procedures in place. We talk to Public Health England, and our emergency services colleagues go through their own controls. Andy is probably better placed than me to talk about what the emergency services would do. The police have their own CBRN centre. It would be helpful to have a road map that sets out what information is available on a national level, how we go about accessing it and where we get it in an emergency.

Q8 Chair: Mr Bell, do you feel that you have access to the scientific advice that you need, and do you think there is a disparity between local and national level?

Andy Bell: I do not think there is a disparity. It is a staged process. Nationally, fire services across the country have their own arrangements for scientific advice to support their statutory duty to respond to incidents involving hazardous materials. They are able to access that local scientific advice. Local scientific advisers are able to access national bodies, such as DSTL and the Atomic Weapons Establishment as and when required. We are probably lacking a little in robust testing to make sure that is delivered in the way we anticipate. We do a lot of live play and table-top exercises, and the scientific advice bit probably has not been as well tested as it could be.

Q9 Chair: Mr Abbott, you raised some concerns in your written evidence about preparedness for less defined CBRN scenarios. Can you give us an example, and why do you think we are less prepared for them?

Christopher Abbott: It really comes down to the whole definition of CBRN. It is of note that in around 2002-03 the police and the Home Office came up with a very precise definition of CBRN related to the terrorist use of CBRN materials, primarily CBR materials, whereas, at the same time, the Ministry of Defence and NATO were changing from the traditional nuclear, biological, chemical—NBC—definition to a much broader use of CBRN covering any exposure to CBRN materials. There was a dichotomy in understanding what it was. Part of it was driven from the police point of view, which was that CBRN terrorism was a crime and therefore it was different, whereas other incidents were Hazmat and COBR-type incidents, which were very much traditionally a fire service lead, but at the end of the day, a hazard is a hazard is a hazard, and in many ways how that hazard is responded to and dealt with varies little. Having that narrow definition means that other things fall off the edge. For less well-defined Hazmat incidents and the like, in terms of the availability of scientific advice, it is often left at local level rather than being all-embracing scientific advice. In the fire service their scientific advice individually covers it, but it reaches into different areas for back-up. DSTL and AWE very much focus on scientific advice around CBRN terrorism and the use of CBRN materials in that sort of way, because that is what their business is about.

Q10 Chair: For the benefit of the Committee and our process through this inquiry, could you be a little more specific? What sort of incident would fall through the cracks?

Christopher Abbott: More localised incidents potentially fall through the cracks. One of the issues is ensuring that scientific advice is consistent and transparent. Often, the scientific advice on, say, a COMAH incident or a Hazmat incident will come from the operator, because it is there. That does not necessarily tie in with being consistent and particularly transparent, and there is no national infrastructure to make sure that it is one source of scientific advice and that it is consistent.

Q11 Chair: Chief Fire Officer Bell, as I understand it, you were involved in assessing national CBRN policy recently. What was your conclusion about the quality of the latest science that was called on and how it was used in the process to inform policy?

Andy Bell: To be clear, I do not set Government policy. We have recently looked at the fire and rescue services CBRN capability, particularly its decontamination capabilities, and we have reviewed and revised what that capability looks like on the back of the national risk assessment from 2014 and the planning assumptions that underpin it. Those planning assumptions changed and enabled us to reduce our capability. The scientific evidence behind the NRA and the planning assumptions are supplied by Government, and we have no reason to assume that the scientific advice that helped develop the NRA is not completely appropriate. We know where the information comes from; it comes from DSTL and AWE. They are agencies we engage with on a fairly regular basis anyway. We trust their judgment and we trust that the information that has gone in to develop the NRA is correct, and therefore we build our capability around those planning assumptions.

Q12 Chair: The Home Office told us that the assessment of CBRN policy undertaken last year was "in line with value for money principles," which led to "reductions in Mass Decontamination resources and trained and equipped police, without reducing the effectiveness of the response." Based on the process you have just been through, do you feel confident that the science behind decreasing resources available for decontamination was sound?

Andy Bell: Yes. I cannot speak for the police capability, but in terms of the decontamination capability we have left, yes. There was a financial saving, but there will be if you reduce the capability. I am confident that what we have left is more than adequate to meet the type of incident addressed within the planning assumptions.

Q13 Victoria Borwick: We talk about chemical, biological, radiological and nuclear incidents in a sense that encapsulates them, and therefore we shorten it to CBRN. Do you think that is meaningful? Is it too broad? Should we be amending that? What is the common link between them all? Is there a better group name or descriptor? I think the point is that we are all in the communication business, and one of our roles is to make science and the role you are performing more understandable to people. Does anybody have a view on the communication side?

Andy Bell: As my colleague said earlier, the fire service sticks to the original classification back in 2002-03. For us, a CBRN incident means that a material, whether it be C, B or R, has been released deliberately and maliciously to cause harm. The same material might well be released accidentally. From our perspective, that is a Hazmat incident. While the hazards within the area may well be the same, for CBRN there are additional hazards around the perpetrator and information on what that hazard is may not be as clear as it would be with an accidental release.

Q14 Victoria Borwick: It affects the way you respond.

Andy Bell: Yes. An accidental release—a Hazmat incident, as we call it—would generally take place where the material was stored or worked with and that would be known to us. Information can be provided by the supplier. That is the complete opposite of a CBRN incident where the perpetrator has released a material and is not in the business of helping us identify what the chemical is. Those are the differences in response. The response to a deliberate CBRN-type release is much more difficult and high risk.

Q15 Victoria Borwick: Does anybody else have a view on how we communicate to the public? Does it matter, and should we do so?

Christopher Abbott: For professionals in the business to have a differential between CBRN, Hazmat and everything is fine, because it is understood exactly as has been explained, but when it comes to communicating to the public the risks, hazards and potential measures, they are not interested in whether it is CBRN or Hazmat. It needs to be clear and simple. Informing the public about CBRN risks is something that as a nation we have not got our head around yet pre-emptively. There are lots of plans associated with

how we do it in response to something, but in terms of educating the public now for the event, we are quite a way behind other countries in the world. The level of advice is very inconsistent across the country. You will remember the "Preparing for Emergencies" booklet that was active from about 2003 to 2010. Now if you look for that, it does not exist. You go to the Government website, which asks you to put in your postcode and it directs you to your local authority. That in itself is mixed. If you go to one local authority, it takes you to the emergency division or the emergency planning section of that local authority and you get real information. If you go to another one, it takes you to the local authority planning page and you have to try to find your way, and if it has anything to do with emergency planning, it is very basic information. It is not even as detailed as the booklet, which said, "Go in, stay in and listen in."

Q16 Victoria Borwick: I am going to play devil's advocate slightly. Do you think that is reassuring because, fortunately, these things are relatively rare, although sometimes on the streets of London they are not?

Christopher Abbott: As a personal comment, I believe in educating the public.

Q17 Victoria Borwick: That is fine. That is the point of this Committee; we are trying to ascertain how complex we are making this.

Andy Bell: While I do not disagree, probably the Committee should recognise that over the past couple of years, as we have developed the initial operational response, we have done a significant amount of work with communications experts and behavioural scientists to develop communications advice we would use immediately at scene. While we are not doing pre-emptive education of the public—that is obviously a Government policy decision that was considered previously and not taken forward—we have worked hard to make sure that we can provide appropriate advice at scene quickly so that it is easier for the emergency services to manage the incident and demonstrate to people how they can help themselves, to protect both the responders and other members of the public.

Q18 Victoria Borwick: Professor Regan, do you want to respond to that?

Professor Regan: With regard to the nuclear side, people have an obvious fear. If they hear a Geiger counter clicking more than it does normally, it is an unseen hazard and people are scared of it. The public in general are not educated or well versed in the units of measurement and what these things are actually measuring. For example, the UK's radioactive incident monitoring network—RIMNET—around the coast is a series of Geiger counters that measure the total air dose. It does not tell the public the type of radioactive material. In order to do that, you need spectroscopic or other types of detectors, which are common. There are lots of them. There are 300 gamma scanners in hospitals up and down the UK; lots of radiation labs have that information.

Going back to the Fukushima incident, I remember lots and lots of phone calls from the press, because particle radiation had been measured in Oxford and Glasgow. Were we all going to die from radiation? There were front page headlines in the *Daily Mail* about it. What that tells you is just how accurate and sensitive these radiation monitoring

measurements are. If you can educate the public about the units of measurement and how those detectors characterise the individual types of radionuclides present, so that it is not just badged together as a nuclear incident but the release of this or that particular radioisotope, the dangers are much easier to evaluate.

Christopher Abbott: To back up what my colleague from CFOA said, an EU project under FP7, called PRACTICE, which was led by King's College and Public Health England, did a lot of work on the human dimensions of CBRN incidents. It ran workshops and engaged with people with limitations—blind, deaf and wheelchair-bound people—on how they would respond. It was absolutely fascinating for us as professionals to compare our perception of what their worries would be with what their worries were. For deaf people, everybody assumed that just providing pictograms of what to do would suffice. They said, "No. We want people to sign to us. When we are under stress we communicate best with people who sign to us, and just having pictures and being told to follow them isn't really a way of helping us." For the young mum, the biggest worry was having her mobile phone taken off her, because she could not ring the school to make sure the children were being looked after. At the end of that project King's College produced a booklet, which is a very useful guide, but it does not appear to have been taken up. That was two years ago. It is a very useful guide as to how to react for members of the public. I am happy to share that information with the Committee, if it wishes to have it.

Q19 Victoria Borwick: For the benefit of time, I have just a couple of other quick questions. Is it better to classify risks in terms of their causes—terrorism, accidents and natural disasters—which is a bit like what you were talking about, or the effects, such as the potential spread or spillage of material?

James Webster: From our point of view, it is the effects. Obviously, the first response differs according to whether it is deliberate or accidental, but after that, particularly for local authorities dealing with clean-up and long-term health effects, the majority of that does not change whether it is CBRN, Hazmat or the grey area in between. For me, it is the causes we need to focus on.

Q20 Victoria Borwick: Do you think it is better for a single agency to have expertise about the whole, or realistically is it better to have specialists dealing with each incident as it arises?

James Webster: It would make our life easier if it was effectively a one-stop shop. If, as a local planner doing our CBRN and Hazmat plan, we can go to a single agency that has all the suites of guidance documents, sits across government and has all the specialists and everything in one place, we can say, "We have this particular chemical. What do we do?" If we are planning for a chemical site that has just come online, we can say, "What do we do with this?" or "We have a biological risk. Where do we go?" If it is one place, it makes our life much easier and more efficient.

Q21 Victoria Borwick: Do the rest of you think that is right, or is it important to have specialists dealing with it?

Professor Regan: Public confidence probably relies on having some specialists. When people start quoting units and quantities, for those not used to hearing them it is gobbledegook. They do not know whether a gigabecquerel is a big number or a small number. There is a lot of unfamiliarity, and it is particularly evident in planning for rare incidents.

Q22 Victoria Borwick: Finally, does it matter that the national risk register contains relatively few references to CBRN as a distinct category, other than in the context of terrorism? Is there any comment you want to make about that?

Professor Regan: It definitely does matter, but it only matters when it matters. The classic example is that, if you have one big incident every 50 years, it is the one people write about in the history books, so we should be prepared for that.

Victoria Borwick: On this Committee we are very keen to make sure that we communicate clearly. That is very much our objective, so we would welcome any information. If you think of anything afterwards, we would be happy to hear from you.

Q23 Stella Creasy: I think the witnesses have covered some of the things I was concerned about. You are distinguishing intent, which, from a professional point of view, makes perfect sense because it is about your ability to respond very quickly. From the public perspective, it relies on intent being obvious early on in the process—to be confident that you have chosen the right course of action. For example, let's say it is the hostile user of a substance versus an inadvertent leak.

Andy Bell: Absolutely.

Stella Creasy: It would be helpful to us to understand the process by which you come to that analysis.

Andy Bell: Quite often, and fairly simply, it is where that material has been released. If you are on an industrial estate and there is a release of a grey-green cloud, or whatever, you might assume it is from a chemical production facility or that a road tanker is involved in an accident. You would almost expect that material to be there. The difference would be that, if the same thing became obvious in a crowded shopping centre and you saw people suffering, you would not expect that material or those effects to be shown. That would be almost the first step.

Q24 Stella Creasy: It is the location.

Andy Bell: Yes.

Q25 Stella Creasy: That opens up the risks of professional judgment. If somebody chose to target a nuclear reactor, it would be very serious for everyone concerned. That could be accidental; it could be intentional.

Andy Bell: Yes.

Q26 Stella Creasy: What I am struggling with is the point Mr Webster makes. If you have two separate formats for dealing with CBRN as opposed to a Hazmat scenario, but location, and perhaps substance, is the issue that makes a difference, why the division over CBRN and Hazmat, not location and substance?

Andy Bell: Some of the difference between whether it is CBRN or Hazmat comes down to the later investigative phase, the police investigation and things around forensic integrity. In terms of what that response looks like in both those incidents, it is very similar. We use many of the same individuals within the service and much of the same equipment. Broadly, the response looks very much the same. We use the same risk assessment processes and the same command and control structures. While there is a distinction in how we plan for those events, they are very similar in terms of the equipment, skills and processes people use, whether it is CBRN or Hazmat.

Q27 Stella Creasy: But there is a behavioural intent differential underneath that. I assume your presumption is that with a CBRN incident there may be further risks, because whoever has released the substance has a malicious intent.

Andy Bell: Yes.

Q28 Stella Creasy: Therefore, when it comes to the public's involvement in all of this, as Victoria's questions suggested, do we tell people about it, because clearly their presumptions about intent will also impact their ability to work with you in those situations?

Andy Bell: You are absolutely right. There are almost two schools of thought. We can try to educate the public further. There has always been Government concern that that raises concerns among the public that do not need to be there. We can do it that way, but then you are open to how people interpret that information and how well they understand it. I would much rather give the information at scene to the affected people, because then it is clear, consistent advice to them based on the situation they find themselves in. There is obviously some value in the pre-emptive thing, but there are some dangers as well, in that pre-education can be misinterpreted. I would much rather give clear advice at scene, based on the information we can see in front of us at the time.

Q29 Stella Creasy: It would be helpful if you clarified what distinction you are making there, because to me both sound very similar. If you tell me that I am living near a nuclear site and one of the things you have assessed is that it might be subject to an attack, as well as the possibility of a reactor problem like the one at Fukushima, as a member of the public what do I have to know to deal with it under the two different scenarios you are talking about?

Andy Bell: I probably cannot answer that. I do not work in an area where we have nuclear facilities. I suspect that Cumbria FRS and members of the public in Cumbria who live around the Sellafield plant get some form of pre-education.

Christopher Abbott: Anywhere close to a licensed nuclear site they are pre-informed. There are other areas where briefings are given and the public are kept informed that they are in the immediate counter-measure zones. That side of it is well established, and is checked through the Office for Nuclear Regulation.

If I may just pick up a couple of other points, location is obviously a key aspect, but there is an assessment phase. The first responders are responding to an incident, whether it is Hazmat or CBRN, and there is a hazard. That whole assessment process very rapidly involves the fire and police services in particular as to what actually it is. One example I often use is a tanker of chlorine going off the elevated section in Birmingham. It could be a Hazmat, because it could be an accident.

Q30 Stella Creasy: I know we are going to find a spaghetti junction.

Christopher Abbott: Exactly, or it could be a CBRN incident. There is a grey area, but it relies on assessment at the time and the judgment, exactly as you say, of those who are responding to it. One of the key issues about the scientific advice in potentially a grey area is timely access. A number of fire services have their own scientific teams, as has been touched on, which reach back into DSTL and AWE, but there are other areas.

Q31 Stella Creasy: I understand that from a professional point of view. I am just trying to tease out what it means from the public's point of view. What studies do you have, for example, about how the public react if they are told something is intentional versus accidental? Does that affect your ability to control the situation?

Christopher Abbott: My slightly more personal view is that we do not inform or educate the public enough in advance. Therefore, they are relying on information at the time, which may not be timely because the advice may not be there. On the face of it, the immediate response would be, "Go in, stay in and listen in." That may not be the right response. If you have the windows open or you close the window and have the air-conditioning on, you've taken the hazard inside, so that may not be the best advice. It is very difficult to know how that is dealt with at the time. It is very dynamic, and there is no simple answer.

Q32 Jim Dowd: Professor Regan, when you were talking about people understanding things, I remember a statement in this building a few years ago by a Minister, who is no longer a Member of this House, about the leak at Windscale. That shows how long ago it was.

Professor Regan: I was just going to mention that. It was 1957.

Q33 Jim Dowd: No, it was in the early 1990s. I cannot remember whether they measured it in becquerels or sieverts, but the Minister confused mega with micro, and most people in the Chamber did not bat an eyelid. It is a question of people understanding what they are talking about.

Can I look at local access to scientific expertise? I think this is for Mr Abbott, but I am not sure. Does it vary according to the nature of the incident, or is there a reliable background of people one can refer to regardless of the incident? I was thinking of, say, a small industrial fire compared with a major incident.

Christopher Abbott: The key issue is the nature of the incident. If it is a small industrial fire or a Hazmat incident, local advice is available through the established routes the fire service has, through the operators of sites and through the Hazmat reporting chain on the transportation side. When it comes to CBRN incidents, the authoritative advice comes out of the DSTL or AWE. It takes time to get access to that, because they need information to be able to assess and give advice. To my knowledge, for the past 12 or 13 years how they establish rapid advice based on accurate information gathered at the scene has been a challenge. There have been a couple of Home Office programmes to try to improve how the details of an incident are gathered and passed back. Unfortunately, they fell in about 2010-11 for financial reasons.

Q34 Jim Dowd: Is that because of lack of clarity about where to go or, as Mr Webster was complaining—the lack of a one-stop shop, as I think he called it, or certainly of a single point of reference where you can get authoritative advice? If so, does the field need rationalising in terms of the sources of information?

Christopher Abbott: Personally, I think there needs to be a formalised, recognised system and there is not one as such as far as I am concerned. There is an acknowledgement of where you can get it, but not necessarily who to ring when you pick up the phone. In terms of pure CBRN terrorist incidents, you call the well-advertised police national CBRN centre helpline. That gives advice, but it is only the first stage. They then go to the DSTL or AWE. It takes time to establish all these things.

Q35 Jim Dowd: As the local responder or co-ordinator, surely you need to contact only one person. They then know who they need to go to for the advice you need.

Christopher Abbott: Yes. The emergency services regularly practise these things, but for the cat 1 responders—local authorities and some of the others—contact is not as regular, because it is not necessarily high up their priority list. It is something they need to know, but it is not well laid down and described.

Andy Bell: As regards a formalised arrangement for fast harm advice, there is now a system in place called ECOSA, which is emergency co-ordination of scientific advice. That means that Public Health England, DSTL and AWE are able to work together quickly to produce clear and concise practical advice. As my colleague said, it is accessed through the national CBRN centre, which can then make that request to ECOSA. That process is there to give fast harm advice. As I said earlier, it is not as well tested as it should be. We should focus a little bit more when we are doing these types of exercises on testing the scientific advice, but that provides the first advice, before the scientific and advisory cells can be set up with strategic co-ordinating groups, and before SAGE itself can be set up to support COBRA. There is a three-layer system. While it is as timely as it can be, because it takes time to gather the information—you are right that there needs to be a call to the national CBRN centre and they need to access the ECOSA system—I do not think we will

ever get to a position where we have clear, consistent advice within 15 minutes. That is just not practicable; it will never happen, but we have got ourselves a process that will work in the future. We just need to test it and refine it a little more.

Q36 Jim Dowd: To take a major incident like Buncefield, I imagine it exposed various flaws in the current planning, or did it vindicate the planning for major CBRN incidents before that?

Andy Bell: Buncefield itself would not have been categorised as a CBRN incident, because it was an accidental major incident, but even in that case the local fire and rescue service in Hertfordshire would have had arrangements for local scientific advice, which I think would be through Bureau Veritas. They would have used Bureau Veritas as their initial source of advice to support that major incident. If Bureau Veritas needed further advice, they would access Public Health England and various other experts around the country.

Q37 Jim Dowd: Mr Webster, you indicated that you thought the equivalent of the national arrangements for incidents involving radiation should be established to provide chemical and biological advice. Where would that be located? Who would be responsible for such an entity?

James Webster: Ideally, whoever is best placed to run it.

Q38 Jim Dowd: Who would that be?

James Webster: You are asking me about what Government agencies offer. AWE would be one; UKAEA or NPL—wherever that science advice sits at present. The difference between the NAIR scheme and the way the advice works at the moment is that this is a very specific scheme we can access through the police to talk about getting rid of a substance from an area where it should not be. It comes back to the definition of CBRN and Hazmat, and accessing that sort of capability, if it is available, in other areas. If we had a one-stop shop for chemical situations, it could be a private contractor. There are plenty of private contractors around, and potentially it could be arranged nationally. It is one phone number. As a local responder we can say, "We have a flat and an illicit drug laboratory has been built in there." It is not CBRN; at this point it is not Hazmat potentially, though it is a risk. We have one phone number that the local authority can go to and say, "Get rid of it." It goes away. They pay the bill. The risk is removed.

Christopher Abbott: There is in fact a chemical helpline based on a company at Harwell. I am desperately trying to remember its name, but I cannot. I will find out. They are contracted to run a chemical helpline, but subscribers have to pay for it, which of course becomes a problem for the local authority.

Q39 Victoria Borwick: Is that 24 hours?

Christopher Abbott: It is 24/7.

Q40 Jim Dowd: It would be as well if people knew who it was.

Christopher Abbott: Of course, NAIR is a group of nuclear-related companies operating on a mutual basis. It is a formalised process, but it is operated on a mutual basis by the companies. They may not turn out to assist somebody.

Professor Regan: A very recent development may be of interest to the Committee. It is a joint project between the National Physical Laboratory and the University of Surrey and a few others. It has commissioned a mobile radiation laboratory, or lab in a van if you want to call it that. If there is a radiological incident, or something goes up on RIMNET that gives a signal and you do not know what the radiation is, rather than having to go up there, take samples and take them back to the laboratory, there is a fast response laboratory with spectrometric detectors and state-of-the-art radio chemical separation devices in it. The idea is that you drive it up there and it takes hours, not four weeks, to get radiological measurements and numbers from such an incident.

Q41 Jim Dowd: But there is only one of them.

Professor Regan: At the moment. It was driven to Sellafield a couple of weeks ago for its first commissioning. There is only one at the moment, but it can be used routinely.

Q42 Jim Dowd: It sounds expensive—it might be a perfectly justifiable expense.

Professor Regan: The cost of the equipment is of the order of £500,000. It is a specialist piece of equipment, and I think it is pretty good value for money. You only need it when you need it.

Q43 Jim Dowd: Indeed. Mr Abbott, the Home Office guidance about CBRN dates back to 2003. It strikes me that it might be in need of review and improvement. If you agree with that, in what areas does it need improvement?

Christopher Abbott: I think it does, and that touches on some of the work that has gone on related to the national operational response to CBRN, which is not necessarily reflected in it. It still reflects mass decontamination rather than focused decontamination. It could look at what has been going on in a number of areas. I touched on one EU project. That and other projects have produced information and data on personal decontamination, which partly drove the review—project ORCHIDS. That was one of the drivers to change the approach to decontamination. I think there are a number of bits of updating. In fairness to the Home Office, it is being considered; it is just a case of capacity and everything else, as always with these things.

Andy Bell: As my colleague said, the review has been going on; there has been a capability assessment. Lots of reports, like ORCHIDS and Edictus, have contributed to the changes in CBRN over the past couple of years, which we are still developing in some cases and implementing in others. The guidance is changing. The CBRN joint operating principles for all emergency services will be published in the next couple of weeks. Service-specific guidance, like the fire and rescue services national operational guidance

for Hazmat and CBRN incidents, will be republished within the next few months. We are just building up to a point where you will see a plethora of new guidance come out to replace what came out in 2003. I assure the Committee that while the guidance is not out there, the processes and procedures have changed and have been communicated and trained in across all the emergency services, so the response looks very different from when it was originally envisaged in 2003.

Christopher Abbott: Therein lies one of the problems. That is fine for the emergency services, but not the other cat 1 responders who are supporting the emergency services. I do not believe their understanding of the new or changed arrangements is as great as for the emergency services.

Q44 Chris Green: Mr Webster, there is increasing appreciation of the importance of CBRN incidents. It is not only a technical procedure but a social relationship between the responders and the public. To what extent do you make use of social science in developing CBRN emergency response plans?

James Webster: Very limited at the moment. That is the simple answer to that question. I am not aware of much research that has been done in this area. We use social media, but we also do impact assessments for all the emergency plans we do, to look at whether any of the planning would cause problems for any particular social group.

Q45 Chris Green: Wouldn't this be a key area? You spend a great deal of money on kit, but if when responders arrive on the scene they do not handle the crowds properly, how can they effectively decontaminate people or get casualties to the right locations?

James Webster: I would probably look to my emergency service colleague.

Q46 Chris Green: Let's turn first to Mr Abbott.

Christopher Abbott: As I said earlier, there has been work done in this area trying to understand and how better to inform. I do not necessarily think that work has been cascaded down properly, or necessarily taken on since it was published.

Q47 Chris Green: The pamphlet, for example.

Christopher Abbott: A major piece of work in this area has been done by King's and PHE. I am not sure it has been taken forward. In fairness, they may not even be aware of it because often you have a stovepipe piece of work going on and it does not necessarily percolate out, although some of us try to do that in dealings like these.

Q48 Chris Green: It is good to bring people together in that regard. Are you aware of this pamphlet? It seems like an important piece of information.

Andy Bell: Yes, we are. We are involved in the ORCHIDS research, which looks at the efficacy of mass decontamination processes, but aligned with and part of that we have

done a significant amount of work with the behavioural science unit within Public Health England. The fire and rescue service and CFOA have supported Dr Holly Carter in her PhD thesis, which looked at the impact of communication for people involved in decontamination-type scenarios. Her evidence and the work in her thesis has been built into the initial operational response programme.

Q49 Chris Green: In that sense, the information has been cascaded right down.

Andy Bell: Yes. When we train first responders, all of them have an aide-mémoire about the initial operational response. That tells you what you should communicate to the public and how you should do it. Emergency service control room staff across all three agencies now have our clear guidance on what they should communicate to the casualties on the scene in order that they can help themselves. They walk into the wind and take off their outer clothing. That research has been done and incorporated in the changes that are taking place in CBRN now.

Q50 Chris Green: Can you give me an example of when understanding from the social sciences could have been used better in an actual incident?

Andy Bell: In terms of CBRN, which is my area of responsibility, not really, because we do not have those types of incident, but in all the live tests we did to support Dr Carter's work—we used the initial guidance and different layers in terms of how much we communicated with those casualties—it was clear that the decontamination processes were much slicker and effective the more we communicated with the casualties, and gave us indications about the type of information. It made the casualties much more compliant, which meant that the decontamination process was faster and we could put people through it more quickly.

Q51 Chris Green: In that sense, the compliance between responders and civilians in the vicinity is incredibly important, because if you get compliance early on, you can start to work with people immediately.

Andy Bell: Absolutely. One of the key things we want to do is make sure we are able to decontaminate people affected on scene as quickly as possible, but we also want to make sure that those people stay on scene so that we do not have cross-contamination. The last thing we want is potentially contaminated people leaving the scene and turning up at a medical facility, like a hospital, because that then shuts down the hospital. The more information we can give them, the more inclined they are to stay on scene and we can deal with them there and avoid cross-contamination issues.

Q52 Chris Green: As was picked up earlier, the understanding of emergency services and everything else is there; it is pretty comprehensive. What is your understanding of the perception of the wider general public in how to respond if there is an accident?

Andy Bell: In terms of pre-education, there has not been a great deal of information put out there around what you should do in the type of incident where you are affected by a chemical. That has not happened.

Q53 Chris Green: Is it necessary, or should the natural confidence that we hope people would have in the emergency services come through, so they respond in the right way to the emergency services? Is it more about that kind of perception of the emergency services, as opposed to knowing the details? I appreciate that if you live in certain parts of Cumbria it would be different, but on the whole is that so?

Andy Bell: We would hope that the view of the emergency services by the public generally is that they are trusted to do the right thing for people affected at the scene. We would hope they would take their advice. As to whether the Government should be giving out advice about what you should do if you are caught up in a chemical release scenario, that is a Government policy decision. As I said earlier, there are dangers in doing that, in that it may be misinterpreted. If it is misinterpreted, it may conflict with the information that we give during the incident at scene, but there are scenarios in which that pre-education—for example, where you have large production facilities or nuclear sites—may be slightly different.

Q54 Chris Green: Is anyone aware of any studies showing that giving too much information may cause confusion or misinterpretation of that information?

Professor Regan: It depends where it comes from, doesn't it? Where do the public go if there is an incident? They go to the BBC website. If they knew about it, they might go to Public Health England—what was the Health Protection Agency—or the National Radiological Protection Board, and that would be trusted. In the modern era, that is the first place they will go; they will do it instantly. I do not think they will take reams of paper from a booklet and read what the plan is as long as that information is there, remains trusted and is given by a reliable source. It can be updated. Things change. You do not know the size of a radiological or chemical spill. Information changes quite rapidly, and often people who are asked to comment on it are not on the scene but can give a broad overview as to the general situation. That real-time change on the internet is important.

Chris Green: We are pressed for time.

Q55 Dr Mathias: We have a vote coming up. Professor Regan, I love the idea of lab in a van and spectroscopic measurement. I declare an interest. Obviously, I am a big fan of NPL; it is in my constituency, but my question is about RIMNET. RIMNET is Geiger-Müller measurement. It sounds as though that system is not sophisticated enough to monitor radiation. Would you agree that at the moment it is a bit of a yes/no?

Professor Regan: RIMNET is not an early warning system. There are about 90 detectors around the country. It is an alert system.

Q56 Dr Mathias: Excellent. It has some use.

Professor Regan: Yes. It is a huge national resource, but it should be updated and upgraded to have spectroscopic information that will tell you not just that there is an increase in radiation but what that is. You need the spectroscopy that goes with it.

Christopher Abbott: It is crucial to remember that RIMNET was set up for offshore, not onshore, incidents. Therefore, it is now used where it fits the gaps, but with only 96 sensors it does not give enough information.

Q57 Dr Mathias: I very much like the lab in a van. I know about NPL's international expertise. I believe you are top of the league in metrology. Is there a problem of equivalence between RIMNET and other countries?

Professor Regan: Yes, there is. It is attempting to be addressed. There is a group called MetroERM comprising all the major national measurement institutes and bodies within Europe. NPL and PTB, which is the large German equivalent of it, are doing a joint project to try to evaluate the best types of radiation detectors for exactly that sort of monitoring.

Q58 Dr Mathias: What is the German one?

Professor Regan: PTB; it is in Braunschweig.

Q59 Dr Mathias: There are not many in Europe. We have NPL and the German one.

Professor Regan: We would consider NPL and PTB to be the premier league, if I can blow my own trumpet.

Q60 Dr Mathias: Absolutely. You are on your own in that league.

Professor Regan: But that framework, or group, is to look at the best types. Radiation detection knowledge improves as time goes by. We can now have things with GPS; we can have digitised systems and we can transport information directly back over wireless to counting centres. The amount of information that could be available is vastly more significant than it is just using the RIMNET alert systems, which are the Geiger-Müller tubes, but the more measurement you have, the more confidence the public have that what you are measuring is correct, and therefore the advice you can give as to safety levels or risk factors has much more validity.

James Webster: The important point is how scaleable it is for us as a local area. If we have a big or small incident, are we going to get enough support from it?

Professor Regan: We would hope so. This is a science Committee; yesterday a paper was published in the *Journal of Radiological Protection* by a couple of my colleagues at Surrey, James Scuffham and David Bradley, looking specifically at the idea of adopting the more than 300 gamma cameras in hospitals in the UK. There are more gamma cameras than there are RIMNET detectors.

Q61 Dr Mathias: Those are publicly accessible.

Professor Regan: Yes. If there was a wide-range radiological contamination incident, those things could go online immediately. You could have queues of people going in there to get a quick scan—a yes or no whether you are safe or not. That could go into the database, and I will happily give your Clerk the reference to that paper.

Q62 Dr Mathias: Is there an equivalent to RIMNET for chemical and biological monitoring?

Professor Regan: I am sure there is, but I am not familiar with it.

Q63 Dr Mathias: Is that scientifically possible?

Christopher Abbott: It is different and is based on what RIMNET was established for, which is why there are only 96 sites. Those 96 sites, because they are on Government facilities—military bases, airports and the like, where the public sector can control them—are not in places where you would necessarily expect a chemical incident. There are local systems around high-risk sites, chemical and nuclear. They are not networked beyond those sites, or within the operators' organisation, and it becomes very difficult, particularly with biological incidents. Biological detectors and sensors are very expensive anyway. Even for the Olympics, it was an air-sampling system. The samples were analysed at Porton Down and there was a 24-hour target to identify if there was something. There was an ongoing routine process in the Olympic park throughout the whole time. With biological incidents, you identify something. What do you do about that information? It is understanding what you do with the information, because you are damned if you do and damned if you don't. If you tell the public, what are they going to do? Do you have the vaccines, if appropriate? Are people going to mass evacuate, and from where? If you do not tell them, we know the consequences of that. It is a very difficult conundrum.

James Webster: Again, that needs local input to tell people to evacuate and where to go, and where to get vaccines from if they need them. All of that needs to fit in with whatever science advice is coming down and potentially coming up and one coherent message we can put out.

Q64 Carol Monaghan: We are not sure when the bell is going to start ringing, so I may or may not get to ask some questions. There has been an awful lot of talk about how we communicate with the public and when. You have just mentioned a biological incident. Do we give the public that information? We have had several incidents in the past. We had Chernobyl and Fukushima, and close to my constituency we have Faslane naval base, all of which have had nuclear hazards associated with them and none of which gave the public great information at the start. That leads to suspicion of the regime and to the public always assuming the worst. We have got ourselves into a situation. You are talking about millisieverts or microsieverts. People do not know what that means; they do not know how much background they can be exposed to. There are all sorts of issues about how we communicate responsibly with the public. When you are doing training exercises for CBRN incidents, do they include communication with the public?

Professor Regan: We run an MSc course at the University of Surrey on radiation and environmental protection that trains health physicists. That is their job. Part of that training is to give public seminars to try to explain to the general public. I think the general public are much cleverer than we give them credit for. You can make useful scientific statements. Often, scientists do not trust the public enough to use scientific words. They have to be better trained in using analogies, in terms of scales or sizes of things. Following Fukushima, there was a wonderful little cartoon that showed the radiation dose people would get compared with the radiation dose from the background. It was just a dot. Ten of those dots made a big dot. That was 10 times as big, and it had to be 100 times bigger. It put into context the numbers, which looked like very big ones—megabecquerel—and showed that they were similar to having 100 people standing around together with the radioactivity coming from themselves.

Q65 Carol Monaghan: Eating bananas.

Professor Regan: Yes, or humans themselves with 10,000 radioactive decays a second in your own body. It is putting that into context. That information has to be accessible quickly, and part of the issue in the radiological area is that the knowledge should be given in schools. It is an education issue. People are not scared of water, but you can drown in water.

Q66 Carol Monaghan: As a former physics teacher, I did give that information in schools.

Professor Regan: We are grateful.

Q67 Carol Monaghan: Unfortunately, schoolchildren forget things. They are quite good at remembering things for exams.

Professor Regan: People are very happy to have an X-ray, a CT scan, a medical procedure or radiotherapy, or to take an aeroplane. Putting into context the relative risks from those radiation levels can be done very quickly on a website, saying, for example, "This is the equivalent dose you would get from moving to Finland for a year, or a 1,000% increase in your background dose." That sounds much worse; moving to Finland does not sound as bad.

James Webster: To go back to your original question, we exercise our comms and media planning, not just around CBRN; it works with everything. We have a separate group that sits on the LRF, which has a specific plan for how it would look at putting together the communications message in an emergency, whether it is CBRN or otherwise, and the science advice will feed into giving that clearer message.

Q68 Carol Monaghan: To educate is one thing, but to give information in the event of an incident is another. In Faslane naval base, freedom of information requests have shown that there have been incidents that the public were never told about. When you have that sort of situation, there is great suspicion by the public. How do we communicate in the event of an

incident that something has happened and give full information to people? Who is responsible, and how do they do it?

Christopher Abbott: If I may say so, as an ex-MOD staff officer in the directorate of nuclear policy, with a vested interest, although I have been out of that job for many years, it is a question best directed to them—around Faslane. Around the other sites, they communicate, as they do around Faslane because it is a licensed site. It is licensed within the MOD, but it follows exactly the same rules as laid down by the Office for Nuclear Regulation in terms of informing the public. There are categories as to what an incident is, what an accident is and when you are required to inform the public. I am not up to date about the trigger as to when they do and when they don't.

Q69 Carol Monaghan: This is my final question, because the bell will go at any point. In areas of high risk—we can look at Faslane, Hunterston nuclear power station on the west coast of Scotland and other nuclear power stations—is there a need to have those conversations with the public beforehand, before there is any incident, rather than deal with it in a reactionary way?

Christopher Abbott: I firmly believe that we should be educating the public more across the whole spectrum, starting with schools. I take your point; as with any training, skills fade unless people are reminded. There are a number of ways across the whole spectrum of hazards and risks that people may face, not just CBRN. We need to educate the public better, because a well-educated public will respond better. I draw attention to Fukushima and the mass evacuation from Fukushima. That worked, because the Japanese educate the public and the public responded and behaved in that way. I do not think it would have worked as successfully in western society. That is a very personal opinion, but one that is backed up by Japanese colleagues.

Professor Regan: A very simple thing is that outside Faslane, you could just have a dose meter. They have these around Japan all the time. You can look on the web. If it spikes or drops, people can see it. If there is a serious radiological incident, which we hope there will not be, there may be an evacuation and then it is a totally different scenario. But people can see online the dose that is measured, and that is what RIMNET does; the data is available from the Met Office. You can go to the Met Office website, pick your RIMNET measuring system and see what the daily dose is.

Q70 Carol Monaghan: I think something like that would reassure the public. Unfortunately, some of the leaks were into the loch, and that is more difficult.

Professor Regan: I agree. People try to hide things. Sometimes, in an operational matter maybe they are too low down in the hierarchy of the particular institution and they do not feel confident to make a statement that it is safe: "We've poured a gigabecquerel of iodine 131 into the loch. Sorry, but don't worry; it will have gone away in eight days," which is the half-life of it, rather than, "Oh, God, I've made a mistake. I'd better ask my boss at the top." That is what leads to suspicion. I do not think people are trying to hide it; it is who takes responsibility for giving out the information.

Chair: I would like to thank all of you for taking the time to come in today. For all of us, this has been an illuminating and helpful start to our inquiry. We are expecting a vote imminently. We expected it a few minutes ago, but there we go; this is the House of Commons and it is always unexpected. We will continue with a number of other witnesses, but we may have some more questions we would like to throw your way, and we would appreciate it if you could come back to us with some email responses. I hope you will be kind and respond to those questions. In the meantime, we will suspend the Committee until we are quorate after the vote.

Sitting suspended for a Division in the House.

On resuming—

Examination of Witnesses

Witnesses: **Phil Evans,** Government Services Director, Met Office, **Dr Dame Sue Ion FREng FRS,** Chairman, Nuclear Innovation Research Advisory Board, and **Dr Edward Sykes,** Senior Media Manager, Science Media Centre, gave evidence.

Q71 Chair: I welcome the second panel to our hearing. Thank you for being so patient and waiting for us while we voted. I am sorry. We expected the vote to be a little earlier, but you are very kind to have taken the time. Can I jump right in by asking you, Dr Ion, what involvement your organisation has had with either SAGE or the scientific and technical advice cells? Is that something with which you on the advisory board would be engaging directly?

Dr Ion: SAGE tends to work with independent experts allocated to whatever the SAGE emergency is. Any member of the Nuclear Innovation Research Advisory Board who is on SAGE would be there as an independent expert because of their own personal expertise.

As for myself, I served on the SAGE that followed Fukushima, which predated the days of the Nuclear Innovation Research Advisory Board. NIRAB is just a board that advises Departments of State about the requirements for research to underpin the national nuclear strategy, so it does not have a formal relationship in SAGE space. As an individual, I have also served on a number of emergency exercises at civil nuclear power plants and sites like Sellafield when I worked within the sector. I have been part of and run emergency exercises with local authorities, fire and police services and other emergency services in the past.

Q72 Chair: That is very helpful. We are just trying to understand the architecture of scientific advice. Mr Evans, how would the Met Office and the different organs of scientific advice in the context of an emergency interrelate?

Phil Evans: We do if it is relevant, and their expert scientists are relevant to the particular issue. It is broader than just CBRN. We will be a member of SAGE; we will be involved in STAC and very often COBRA as well, so we are quite involved in the process.

Q73 Chair: I am starting to feel that I need to ban acronyms.

Dr Ion: Perhaps, hopefully, I can be more helpful. Most of the Departments of State have scientific advisory groups of one sort or another. They are not all constituted in the same way, but, generally speaking, they are deemed to have experts who are nationally or internally recognised as such. GO-Science maintains a register of members of those committees who have agreed to be on call should a SAGE be required, and that is how some of the scientific advice is tapped into in so far as they are constituting a SAGE specifically for a radiological, chemical or biological incident.

Q74 Chair: That leads neatly to my next question. In your experience, do you think the right people are being tapped into quickly enough for SAGE in CBRN scenarios? The second part of that question is: do you think there is a need for a better connection, not just with obvious scientific experts from the academic and research environments but from industry?

Dr Ion: I can only give you the experience from the role I had in the post-Fukushima SAGE. At that time all the right people were drawn in very quickly from our National Nuclear Lab, our regulator, the ONR, the Health Protection Agency, as it was then, the Met Office and known key individual experts and UK academics like Robin Grimes, who subsequently became CSA Foreign Office, and Professor Andrew Sherry. The right experts were all drawn together to enable the advice to be discussed with the chief scientific adviser—at the time Sir John Beddington—and passed onward to COBRA.

Q75 Chair: Would you share that view, Mr Evans?

Phil Evans: I would.

Dr Ion: The setting up of the SAGE at the time and drilling into the right expertise was very fast. The benefit of having the presence of the national labs on it is that they have the reach-back into their organisations to get a very fast response and analytical work done to back up opinions being formed by the SAGE as events evolve. I suspect the Met Office would be in the same positon as the National Nuclear Lab.

Q76 Chair: One of the issues that arose during our Ebola inquiry was a degree of confusion about the route in for advice from various advisory groups and committees, and essentially how it was going to filter up the system. You guys have been in the system, so you know the structure, but do you think scientists in different parts of the structure are really aware of the differences—I am going to use acronyms now—between SACs, STACs and SAGEs, and how they interrelate and where they fit into it? Do you think the awareness level is really there?

Dr Ion: Perhaps it is not always as good as it could be, but generally people are aware of how things fit together and what is relevant at local level, and by the time you get to SAGE, it is constituted as needed for national and international events.

One of the important issues is to get our national labs working together. In the previous session we talked a lot about DSTL, AWE, the Met Office and Health Protection England as it is now and the Health Protection Agency as it was. Within the civil sector, the National Nuclear Lab has important expertise to offer, as well as that provided by AWE; the Health and Safety Executive's health and safety labs have an enormous amount to offer, as indeed does NPL. Getting the collective might of the UK's national labs together to co-ordinate and share information could be an important improvement.

Q77 Chair: Dr Sykes, obviously getting the communications right is essential. We heard that consistently throughout the previous panel, and there are obvious improvements that can be made throughout the pipeline. What is your view about how well SAGEs and STACs communicate with personnel on the ground responding to an incident, but also with the media?

Dr Sykes: I do not know anything about communicating with people on the ground and that side of things. The bit I know about is the media side of things. The Government have a very difficult issue to deal with and essentially they go at it really well in getting together the right experts. They are all on call, as it were, to have them available as quickly as possible. Then they try to get that advice and feed it into different Government Departments, central Government and so on, so that everyone knows what information is to be shared through STAC and the others.

There are a few issues with that. One is that, inevitably, when those scientists are brought into SAGE and so on, the chairs of SAGEs and the people running them are not explicitly giving them permission to go and do media work, or encouraging and supporting them to do so. As a result, you end up having a top level of scientific expertise carved off and lost to the public, because understandably they are having meetings but not sharing that information with anyone apart from Government. That in itself is not necessarily entirely problematic, but the information from them is not then coming out elsewhere. It would be fantastic if, as we have proposed, there was a press officer or, for example, someone with scientific expertise on SAGEs. They would be drawn from similar organisations to where the science is coming from and would go through the same process. In the case of flooding, it could be a senior press officer from the Centre for Ecology and Hydrology who is involved in the science and works on the issues. That individual gets involved in one of the panels and, as the information is coming through and a decision is being made, is thinking not only about how to advise Government but about how to advise the media and get the information out there. Journalists have to run the stories. If there are things the public need to know about, they will be running the story, and if they do not have top scientists to speak to and get information from, they will go to someone else who has less expertise, all the way down until eventually they are asking people on the street, "What do you think about the floods and what should be done about it?"

If we have that information and expertise together, it can be used by more scientists from the organisations who are doing the work—the arm's-length bodies and Government-run organisations where there are hundreds of thousands of scientists who are top specialists in

these areas, often ones you will not find in industry, or even in academia and the universities in quite the same way. We can get more of those people trained and able to give out some of the background information: for example, providing mosquito experts during the Zika outbreak and experts on water systems during flooding. If there is no possibility to train up more people, they could at least get the information coming from SAGE that is not confidential and is not a matter of national security and share it with other third-party scientists, so that they can do the media interviews and explain to the public why a simple solution such as dredging may not be all that it sounds like it will be.

Q78 Chair: I am from Oxford and am very familiar with the dredging debate.

Dr Ion: Chair, I apologise that I did not fully answer the question you asked about the role of industry within SAGE. One matter to try to get across is the importance of nuclear engineering expertise and know-how, not just the scientific elements. In many instances, engineering is key to understanding how events might unfold in the case of a problem with a facility, and I suspect that would be true of chemical and biological facilities as well as nuclear facilities. It is not just about the science; it is about engineering barriers and general facility engineering and understanding the hazards and risks as events unfold. One of the benefits at Fukushima was having access to people who understood how those types of reactors in Japan worked and what the consequences were likely to be. Having access to industry in a SAGE environment, as well as academic expertise, is important and potentially could be improved.

Chair: That is very helpful.

Q79 Victoria Borwick: I want to turn to the Met Office involvement. How does the Met Office contribute to responding to CBRN incidents? You probably heard that this was briefly referred to earlier.

Phil Evans: It depends a little bit on exactly what we mean by CBRN. We do not particularly care about the nuances of that because we provide the advice and services we do whether or not it is the consequence of malicious intent. The definition does not matter to us, although clearly it does to others in a range of areas. Our pivotal expertise relevant to CBRN is in dispersion modelling. If there is an incident before malicious intent is established, we will start to run dispersion modelling and provide indications of plume extent for a range of users. We run operational services. As we have already touched on, we provide scientific advice, if relevant, through SAGE. Excluding our dispersion modelling expertise, weather events also have particular relevance to response and recovery. We have a network of civil contingency advisers who work across the country and interface with local responders, so we contribute in multiple ways.

Q80 Victoria Borwick: One of the things we have been talking about over and over again is the communication of science and what is happening. For example, in the volcanic ash incident there was not a direct life or death threat, but it had implications for people. How would you have demonstrated your involvement?

Phil Evans: That was an interesting issue for us as one of the world's volcanic advisory centres. We went from having very little experience to having the most experience in a period of two weeks. It is a good example, because we were involved through multiple channels. We were sitting on COBRA; we were on the SAGE; we were also working on various groups established with industry, such as engine manufacturers. We were dealing with the Civil Aviation Authority and ICAO, the international organisation. Our civil contingency advisers, who are specialists not in particular areas of science but in high-impact events, whether that is weather or volcanic ash, were engaging with emergency responders—fire, police and ambulance.

Q81 Victoria Borwick: Is that expertise now catalogued or kept in some way such that it could be built on for another time?

Phil Evans: The Met Office is fortunate in some respects because there is a breadth to what we do. High-impact weather events happen very regularly, so to an extent we are always exercising our response capability and very regularly providing scientific advice and expertise to Government. We do that on a regular basis. Taking the particular example of volcanic ash—there have been two other minor incidents since Eyjafjallajökull—we have improved our capability and modelling, and established observing networks that better support that activity.

Q82 Victoria Borwick: That slightly leads on to my next question, which is about feeding into the dry runs. We heard briefly about your numerical atmospheric dispersion modelling environment, or NAME—another acronym of the day. Do you use that to feed into dry runs for emergencies or to inform training exercises? Are you involved in that mix at all?

Phil Evans: Yes, we are. We often provide weather scenarios for training events and the like. If required, we can run example dispersion models to inform events. Aside from the wider community exercises, we also run exercises internally to make sure that the various parts of the organisation join up and respond effectively.

Q83 Victoria Borwick: You think that there is sufficient recognition given and value added to what you are contributing to general knowledge.

Phil Evans: I think so. High-impact weather events happen on a fairly regular basis, so we are familiar in the broader terrain of emergency response, but there are a lot of other issues like volcanic ash and flooding, as opposed to heavy rainfall, where we are involved, so our expertise is quite widely recognised.

Q84 Victoria Borwick: We always go back to Michael Fish. Inevitably, as far as communication with the public is concerned, that is played and played again, which I am sure slightly downplays your current expertise. Is it possible that you could get it wrong again? How are you going to continue to reassure the public about your forecasting in incidents of CBRN, for example? They could be right or wrong.

Phil Evans: To echo comments made previously about the communication of science, effectively providing a forecast is a communication of science and is incredibly important. Since those days, we have invested an awful lot of effort in improving our ability there. We do not train our scientists in CBRN, because we do not have a public-facing role, but we train them in other areas and make them available to help communication.

In terms of general forecast accuracy and quality, it has improved dramatically over the past decades, and we have been supported by significant investment from Government in super-computing to do that. As part and parcel of what we do, we track the general public's level of trust in what we do. Why do we do that? Because if they do not trust what we say, they do not respond. Generally, trust levels for us are very high. Because there is always uncertainty in forecasting, there will probably be an occasion when we do not do as well as we should have done and it becomes quite visible, but that is just the nature of forecasting. We are thinking increasingly about how to communicate uncertainty in forecasts, whether or not they are weather forecasts, and to manage that, which is also relevant to CBRN.

Dr Ion: One thing that has certainly improved in the radiation and nuclear field since Fukushima is what is called joint agency modelling, or JAM, building together models like those run by the Met Office and Public Health England with other scientific models to help gain an understanding of how events might unfold. There is much better interplay between agencies and the models they may be using individually for their own purposes to try to get the best of all worlds.

Dr Sykes: The issue of uncertainty in communicating models and that kind of thing is one that will pop up time and time again. Earlier, I think Paddy gave the example of the cartoon that gave levels of radiation from different areas. A huge amount of work has gone into understanding and conveying risk, uncertainty and so on. Professor David Spiegelhalter is one of the people on the SAGE register. I am sure he would be too busy to be on it every time, but having someone with that kind of expertise involved with SAGE and organisations like that to think about how this complex information is conveyed, not just in terms of information to give journalists but how to package it up so that people understand it and take it, is key. As I think Paddy said, saying something is 1,000% higher sounds massively different when there is a very small absolute risk, so having that context is vital. Having someone involved in SAGE, STACs and so on who can convey that and work out how to put it together would be a really important step.

Q85 Jim Dowd: Dame Sue, many aspects of emergency response and planning are devolved. In your experience of the Fukushima SAGE did you feel you were acting in a UK role or just representing England?

Dr Ion: UK. Absolutely and definitely.

Q86 Jim Dowd: That doesn't take much follow-up, does it? What general relationships do you have in SAGE with the devolved Administrations?

Dr Ion: With the devolved Administrations, with respect to SAGE, personally I haven't, but my understanding is that depending on what is being run on SAGE as an exercise, or

hopefully not in reality, the relevant devolved Administrations are present and communicated with. I think you would have to ask one of those who drive SAGE, like the CSA Foreign Office or one of those running the emergency exercises.

Q87 Jim Dowd: The Royal Society of Edinburgh is concerned that if there were several CBRN incidents, or a series emanating from an original event, we would not have adequate planning for that across the UK. Is that your view, or is that series of events so unlikely as to be not worth wasting time and effort on?

Dr Ion: They may be right in that events are not normally run in that way; they are run on the basis of a nuclear, chemical or biological issue. Certainly, there could be an examination of what would happen if a collective CBRN issue arose, to get the entities involved so that you can share the information and scientific advice that would go to them. In those, there are common entities in any event, like the Met Office, Public Health England, Transport and their counterparts in the devolved Administrations. There would be a lot of commonality across the piece. Pulling it all together to see the differences and what commonalities could be done better would be helpful.

Q88 Chris Green: Dr Ion, what are the research gaps in planning for and responding to CBRN incidents? I appreciate this might be sensitive information, but perhaps you can give as much detail as possible.

Dr Ion: It is not a research gap per se in terms of response, because until it happens you do not know what you have got. It is more about having the national capability to be up to speed at cutting-edge level in most aspects of chemical, biological and nuclear hazard and having an expertise base of subject-matter experts able to give you advice at the time on that particular issue. It is important that the UK maintains the capability to train subject-matter experts. In the nuclear world, many of the subject-matter experts available for Fukushima had their genesis in research 20 or 30 years ago when we had much bigger national labs in that area, so one of the things we need to be careful about going forward is not to diminish that national capability so that you actually can have subject-matter experts.

Q89 Chris Green: On having a subject-matter expert, if you have an industry in that area you develop the expertise, which can then be applied elsewhere.

Dr Ion: Correct.

Q90 Chris Green: If you do not have the industry in the first place, it is very difficult to have home-grown expertise.

Dr Ion: That's right, and it is not just direct industry like, say, the generation industry; it is everything that used to go around that—the fuel cycle facilities, fuel manufacturing, reprocessing and recycling, and waste management activities. It is having the full life-cycle capability and the ability to understand and respond, not just to what is going on in the UK but generally. Those sorts of incidents are trans-national issues, so the ability to

comment on something happening elsewhere is as important as something happening here in the UK.

Q91 Chris Green: An organisation dealing with nuclear materials will have to plan seriously how it would deal with an accident in the UK. Therefore, if there is some kind of attack, many of the same processes would be applied as well.

Dr Ion: Yes, but maintaining capability to understand things we may not have here in the UK but that exist elsewhere, in terms of reactor types and systems, is also important. We may not deploy them here. We did not deploy BWRs here until Hitachi started its journey with BWRs at Wylfa and Oldbury. It was the BWR that gave rise to the issue at Fukushima, so having people who understood BWRs, even though we had never deployed one here at that time, was important.

Similarly, whatever the outcome on 23 June, it is really important that the UK remains involved in European projects in the area of severe accident research. All of them have acronyms, as they always do, like SARNET, ERMSAR, the European review meetings on severe accident research, and SAFEST, or severe accident facilities for Europe safety targets. They all have the usual acronyms, but the bottom line is that it is important for the UK to have people who are involved in those and understand how things are evolving in our closest neighbours, irrespective of what we do on 23 June.

Phil Evans: This is very much about our area of activity and expertise, which is around dispersion modelling. Although there is not a particular area of research that I would say is lacking and where significant improvements could be made if we invested in it, there are some potential issues about the availability of people with the right skills and expertise. We have to do an awful lot of in-house training for people who work in this area. It is quite demanding. Some of these scientists are world leading in their own right, but they also have to act in quite a high-pressure operational environment. We have to work quite hard to train people up. It is a broader point about capability.

Dr Ion: Because it is not just about the science base but about the applications and the understanding of them, the research sponsorship would not necessarily fall within the preserve of the research councils; it would definitely fall within the preserve of the Departments of State that have the relevant relationships with their national lab or agencies. The knowledge and understanding do not exist in a vacuum; they are there when you need them, but in order for them to be there you have to invest in them going forward.

Q92 Chris Green: As a particular example of that, ADS highlighted that more research needs to be done on decontamination and showering. Do you see a problem there and that the Government need to ensure that money is available for that research?

Dr Ion: Certainly, review and examination of whether we have thought sufficiently about a post-event clean-up and decontamination is a fair challenge—planning for that and what we would do with it, and the research that might be needed to underpin it further. Decontamination and clean-up may have a significant time horizon, so a lot of social science and public communication issues would be associated with that, as well as the

basics of how you decontaminate anybody who may have been contaminated, or land or assets.

Q93 Carol Monaghan: The Science Media Centre says that the Government have a "huge" role to play during a CBRN emergency, and that "the public will get most of their information about the crisis from the mass media. If they are not hearing from scientific experts then this is a missed opportunity." Dr Sykes, have the Government communicated well during CBRN events such as Fukushima?

Dr Sykes: Each individual case has to be taken separately, and there have been some really good examples and some less good ones. For example, during swine flu Liam Donaldson was giving briefings every week—almost every couple of days—and every time he put packages of information together on what SAGE were doing, it was shared with lots of people. Journalists had lots of opportunities to speak to experts and the information was coming out. It did not necessarily happen straight away and it took a little while to get going, but because it was an issue that went on for so long everyone was learning as the process happened. That was one example where it went very well, and Public Health England said that they are going to do the same, when they can; they will try to share information with us and the third-party experts we work with, for example.

When it comes to things such as Fukushima, it is more difficult. I believe the Government were basically asking the experts to advise them as a priority, and not to think about advising the public. The problem with that was that while it makes perfect sense for Government to have all that advice so that they know what to do, where to put resources and everything else, the public get their information from the media. Estelle Morris said that she learned more about nuclear during the Fukushima incident than she ever did at school.

Carol Monaghan: That will be the teachers.

Dr Sykes: In the UK, there was something known as the Fukushima bounce where support for nuclear power went up as a result, whereas in other countries it was going down because the media were getting even less evidence into their stories and the public were being misinformed. In Fukushima, we were relying very heavily on people like Paddy Regan. There were about 40 or 50 scientists we were working with day in, day out to try to get their voices heard, but there was not as much information coming out from Government Departments as we would have hoped, and hopefully that is something we can learn from.

Q94 Carol Monaghan: With that in mind, do scientists need to be supported during incidents so that they can communicate well?

Dr Sykes: There are different aspects to that. There are scientists who are fundamentally within Whitehall, the chief scientific adviser and so on. Their conversations need to be totally behind closed doors and they are completely Government-owned, as it were. That is fine. But there are also scientists at all the arm's-length or Government-run bodies who have a wealth of expertise. It is quite a complicated process and depends on each organisation and how it chooses to operate, but what normally happens is that they tend to

decide the message they need to get out there and they work out what they want to say, and then they might train up one person, or just a handful of people. Inevitably, if you have an incident such as Ebola, swine flu or Fukushima, where it is rolling on for days, weeks and months, you cannot fill all the media with just a handful of people. It is 24-hour rolling news; you need experts all the time. We get Sky on the phone and every single hour they want a new expert to talk about the same issue, what is developing and what is going on here and there; they are always looking for a new angle. If you can get scientists at arm's length or Government-run bodies to talk about the background issues, such as the difference between millisieverts and microsieverts and the different types of mosquito that could be transmitting Zika—not necessarily talking about the planning or things like that; there can certainly be things that are off limits—and filling the vacuum with all that information, the public will be much better served.

The people running SAGE and so on could get their experts together and say, "Look, you are the top experts. There are certain things you can't talk about because it is a matter of national security, but for everything else you have permission to speak. We're encouraging you to speak to the media because you are the key people." If they cannot do that—or as well as doing that—they could be getting the information out to the next layer of scientists who are key people, to whom journalists will be going anyway. Journalists will have to run the story; their editors will be pushing them to do it. They are not just going to say, "Well, the Government's not saying anything." It will take time. When SAGE or COBRA is pulled together, they work as fast as they can to get their decisions made, but for the first couple of days there will be no information coming out. One key example was polonium 210 when the issue was what the poison was. What caused the issue? At the very beginning, it was considered to be thallium, so we had experts who could talk about it and say, "Well if it is thallium, and we don't know that it is, it will mean this, that and so on." Then it was thought that it might be radioactive thallium, which apparently has different properties, so they talked about that.

Having experts talk about the background issues makes it so much better than the air waves being filled with campaigners, or people who do not know what they are talking about but just want to use it as an opportunity to bring up their pet issues, or the vox pop—the person on the street who is concerned about an issue but does not have any background knowledge and is just worried about it. If that reverberates and reverberates, everyone suffers.

Q95 Carol Monaghan: Dr Ion, first, were you approached during the Fukushima incident to speak, and, secondly, did you feel comfortable speaking to the press while also providing Government advice through SAGE?

Dr Ion: For the first three or four days of SAGE, my advice was provided down a mobile phone from the ski slopes because that's the way it worked; Sir John Beddington wanted access to the people he wanted access to, irrespective of where they happened to be on the globe at the time.

As far as speaking to the press was concerned, the advice we got at the time was, "Provided you do not relate what you are saying to SAGE, and you are giving your professional opinion, please respond to what the media are asking for"; otherwise, if you have taken out those the media know to be your top experts and there is radio silence,

suspicion builds. It is possible to give dispassionate advice and talk to the media without compromising your position on SAGE, and in the post-Fukushima era, talking to print journalists or radio—I did not do TV for Fukushima but I have for other nuclear incidents—it was possible to do that.

Q96 Carol Monaghan: Dr Sykes, you recommended that SAGE has an independent press officer. Do you think they would have expertise in science, journalism or possibly both?

Dr Sykes: It would have to be a science—health and environment—press officer, and they have expertise in understanding the media and what they need and how they operate and what will and will not work for them, and in understanding the needs of scientists and how they operate and being able to help them through it. There are lots of examples of press officers who would be great at doing this kind of thing. Barnaby Smith from the CEH during flooding would have been fantastic. He has spent umpteen years working with all the experts there talking about the issues and understanding them. He knows who the scientists are and can guide everyone through it, and he knows what is likely to crop up. You could have a press officer from one of the national academies, say Bill Hartnett from the Royal Society, or someone from the funding organisations like Carmel Turner, chief press officer at the MRC. They are all press officers who understand the scientific issues and how the media work. They understand that if you say one thing it will be reported in one way, and if you say it in a different way and do not give the caveats, limitations and subtleties and the relative risks as well as absolute risks, it will be misreported. If there is someone thinking about the media at the same time as lots of people are thinking about how to advise Government, the information will get out in a much better way. Obviously, the SMC would be happy to step in.

Q97 Carol Monaghan: Dr Ion, do you think it would have been useful to have such a press officer during the Fukushima incident?

Dr Ion: Maybe, but I think a pretty good job was done at the time of Fukushima, both by the SAGE advice to Government and by the independent scientists, some of whom sat on SAGE and some of whom did not. They gave accurate information on a very rapid basis to the media. Our Prime Minister was able to give advice to the embassy in Japan not to evacuate anybody from Japan who was a UK national. Our ambassador stood in front of Japanese television and said he was staying put and so was his family, because it was safe to do so. That was a huge thing. Some other nations did not take the scientific advice they were given, and evacuated, although the scientific advice, whether it was in France, the United States or here, was common; it was that there was no need to evacuate.

Q98 Carol Monaghan: You think that having a proper scientist providing this advice gives it more credibility and currency.

Dr Ion: Yes. The chief scientific adviser of the day, Sir John Beddington, was confident that the advice he had been given by the collective was correct and the right thing to do, and passed it on to COBRA, which then passed it out through the Foreign Office to our nationals based overseas. It also meant that here the reaction to Fukushima was very different from, say, the reaction in Germany. Most people in the UK could understand that

tsunamis and earthquakes are not things that, thankfully, we see every day, and that that had been the trigger, so we would not see that sort of situation here in the UK. Their reaction to nuclear power generally was not extreme, and, as Ed indicated, it showed the bounce that it did.

Dr Sykes: Sue is someone who has done lots of media work and is very confident and knows her way around things. Some of the scientists being brought into SAGE are not as aware. We know of scientists who said they felt they could not speak to the media because they had signed the confidentiality provision of the Official Secrets Act and so on and were worried about what they could and could not say. They would rather not say anything in case they got themselves into trouble inadvertently.

While there were some really good aspects, more could be done. Certainly, at the SMC we had journalists coming to us saying, "We're not getting some of the information we need; we could get more. We know that more information was coming out during swine flu, so perhaps there would be a way to do that." Having an extra press officer to view that side of things could help change the culture of everything in terms of thinking about what to do with the media and the public as well as the Government.

Q99 Chair: You have compared swine flu with Fukushima. I know the SMC has views about Ebola as well. Do you think that there are differences in the way various Departments respond? Is it departmental culture, or is it something else?

Dr Sykes: Yes, there is definitely difference between departmental cultures. There is massive difference between various arm's-length bodies and so on. Depending on the individuals you speak to, you get different responses. If there was a culture shift, where it was written down somewhere that, where possible, scientists should have explicit permission to speak and should be encouraged and supported, and helped through it so that the more nervous ones who are concerned about saying the wrong thing have support and advice, and there was someone to think about how to get that information out to the next tier of people, it would circumvent some of the more individual issues Departments might have. Sometimes you have what we class as anti-press officers who have come from a sector where they have been trained almost to keep stuff out of the news, and it is about saying no to everything. If you end up having those in certain places, it puts the plug on everything, and everything becomes extremely difficult. It is part of the culture; if you have a scientist who has to make a statement, they have to get it checked by, say, their departmental press officer, and that departmental press officer has to get it checked by the senior departmental press officer and so on, and sometimes it goes three or four steps up to central Government. When journalists are working in a time span where they need the answer in 40 minutes or an hour, because they have to go to print and that is when the next bulletin goes out, it may not even be that the Government are stopping the information coming out, but they are not working in a timeframe that would enable the media to work with it, so in effect they are not getting the information out there.

All we are asking for is a tweak to the system and a bit of a nod to thinking about the media and having that thought. That is why we think that having someone just to push and prod and having a few of these things set down in writing, effectively, to say that this is what they should be doing could help encourage that.

Q100 Chair: Dr Sykes, I've got your key recommendation. Mr Evans, what would be your key recommendation to the Committee?

Phil Evans: It was not a key recommendation. I was just going to emphasise a point in that discussion. If you see the communications role in events like this as SAGE or others synthesising pieces of information that may come from all sorts of organisations into a common, coherent view and then communicating it in a common, coherent way, making sure there are no vacuums in the sense the media are not going to other sources, you get a consistent message. If you do not get a consistent message—this has come out in research to do with weather events—but you get inconsistency and incoherence, pretty much immediately the general public lose trust in what is being said. If you want the public to respond, lack of trust inhibits response. There is a very practical element to this.

Q101 Chair: Do you have a message to leave with the Committee?

Phil Evans: I do not know about the particular mechanisms, but I think a culture change is the important thing. SAGE and others recognise the importance of communicating skilfully, and that it is a valuable and important skillset.

Q102 Chair: Dr Ion, it does not have to be about communication. Is there a key part of the system that you think needs improvement?

Dr Ion: One thing that happened after Fukushima was the communications initiative of the Nuclear Industry Council that existed at the time—it has not sat in this Parliament—and a review of how the collective civil side communicates with the rest of the world, whether it be industry, the supply chain, the National Nuclear Lab or key academic enterprises, but it was mainly about nuclear power. There is no reason why that sort of initiative could not be broadened to look at how we would approach better public communications appropriate to emergencies of a CBRN nature, and to run the communications side of CBRN within SAGE exercises to look specifically at how you would communicate that particular event had it been real.

Chair: I thank all of you for the time you have taken, especially for your patience at the beginning while we were voting. You have been very kind. It has been a very insightful afternoon and a good way for us to kick off this inquiry. We might have a few questions to follow up, not least so that we can make sure we get all our acronyms right. With that, I bring this session to a close.