

DECC Nuclear NGO Forum: Panel Discussion with COMARE

18th October 2012

Summary meeting report

Attendees

Panel members

Professor Alex Elliott	COMARE Panel
Dr. Ian Fairlie	NGO Panel
Dr. Alfred Körblein	NGO Panel
Mr Ian Robinson	COMARE Panel
Professor Richard Wakeford	COMARE Panel

Non-Governmental Organisation (NGO) representatives

Andy Blowers (NGO Chair)	Blackwater Against New Nuclear Group (BANNG)
Ruth Balogh	West Cumbria and North Lakes Friends of the Earth
Frank Boulton	Medact
Jo Brown	Parents Concerned About Hinkley (PCAH)
Nikki Clark	Stop Hinkley
Phil Davies	Nuclear Information Service
Rita Holmes	Ayrshire Radiation Monitoring Group (ARM)
Peter Lanyon	Shut Down Sizewell
David Lowry	Nuclear Waste Advisory Associates (NWAA)
Jill Sutcliffe	Low Level Radiation and Health Conference
Pete Wilkinson	Communities Against Nuclear Expansion (CANE)

Committee on Medical Aspects of Radiation in the Environment (COMARE) and Dept of Health representatives

Mr Stuart Conney	Dept. of Health
Mr. Steve Ebdon Jackson	COMARE
Dr. Chris Mitchell	COMARE
Dr. Emma Petty	COMARE

Department of Energy and Climate Change (DECC)

Hergen Haye	DECC
Jane Cantwell	DECC
Margaret McLaren	DECC

Facilitation team

Carl Reynolds	3KQ (facilitator)
Helen Fisher	3KQ (report writer)

Background

Purpose

This meeting was organised by the DECC Nuclear NGO Forum in light of COMARE's 14th Report. The purpose of the meeting was to:

1. Explore methodological differences and different approaches to assessing leukaemia clusters around nuclear power plants.
2. Identify whether NGOs and DECC have other related issues they want to discuss or put on the agenda in future.

Relevant documents

- COMARE 14th Report: Further consideration of the incidence of childhood leukaemia around nuclear power plants in Great Britain.
- COMARE statement on responses following publication of the 14th Report.
- Joint Paper for DECC meeting on COMARE 14th Report by Dr Ian Fairlie and Dr Alfred Körblein: October 18, 2012
- Cancer near nuclear reactors: a possible radiobiological explanation (Alfred Körblein).
- Letter to International Journal of Cancer (IJC): French geocap study confirms increased leukemia risks in young children near nuclear power plants (Alfred Körblein/Ian Fairlie).
- Kaatsch P, Spix C, Schulze-Rath R, Schmiedel S, Blettner M. Leukaemia in young children living in the vicinity of German nuclear power plants. *Int J Cancer*. 2008 Feb 15;122(4):721-6.
- Bithell JF, Keegan TJ, Kroll ME, Murphy MF, Vincent TJ. Childhood leukaemia near British nuclear installations: methodological issues and recent results. *Radiat Prot Dosimetry*. 2008;132(2):191-7. Epub 2008 Oct 20. Review.

Panel

The expert panel for the meeting consisted of three members of COMARE (Professor Alex Elliott (COMARE chair), Mr Ian Robinson, and Professor Richard Wakeford), alongside Dr. Ian Fairlie and Dr. Alfred Körblein for the NGO panel.

Meeting format

Carl Reynolds, the facilitator for the day, explained that the meeting would centre on a panel discussion, alongside questions and discussion from attendees. He suggested the meeting should be undertaken with a spirit of enquiry rather than interrogation.

The group agreed that notes from the meeting would be attributed, and it was confirmed there would be no audio or visual recording of the meeting.

Discussion

The notes below provide a summary of the key issues and responses raised throughout the meeting, in an attributed form as agreed by all attendees. Suggestions for future research or other activities are boxed out for ease of reference. The COMARE 14 report (http://www.comare.org.uk/press_releases/documents/COMARE14report.pdf) contains a glossary, which helps to explain some key words and phrases.

Introduction

Hergen Hays and Andy Blowers, co-chairs of the DECC Nuclear NGO Forum, were invited to open the meeting.

Andy Blowers reminded the group that there had been considerable discussion about health at the main forum and that, as a result it was felt it would be useful to try and establish a meeting with COMARE to discuss the KiKK report and the COMARE 14 report. He hoped for a constructive exchange and engagement, taking into account the different areas of the debate, and moving on to more general discussion about other related issues. He also asked that everyone participate fully and thanked the experts for attending.

Hergen Hays added his thanks to the panel for taking part. He pointed out that nuclear is a key part of policy for DECC, including decommissioning, operations of existing plants and new build. He added that the NGO forum has been running for two years and that DECC places a great deal of value on it. Finally, he added his wish that the meeting be approached with a spirit of enquiry.

Key areas of critique for COMARE 14

Critique. Discussions began with an invitation to Ian Fairlie and Alfred Körblein to talk about the key issues in their critique of the COMARE 14 report.

Ian Fairlie firstly congratulated the NGO forum for having this meeting, recognising the amount of work that had gone into it. He noted the importance of a spirit of enquiry and openness rather than confrontation, but also the need to acknowledge points of difference. He then summarised the key points of his joint paper with Alfred Körblein as follows:

1. **Data coverage and timescales:** Failure to update the data is a key methodological concern. After the KiKK study the Department of Health asked COMARE to get more data. COMARE did not, saying this would have entailed a delay in the analysis. After three years, another year would make little difference. It is understandable that later years are difficult to analyse satisfactorily, but it is not impossible. COMARE should have been able to overcome these difficulties and provide a more up to date study.
2. **Nature of the statistical test:** A two-sided (or two-tailed) rather than a one-sided (or single-tailed) test was used.
3. **Addition of lymphomas:** COMARE was asked to look at leukaemia, but other forms not in the original Bithell study, such as non-Hodgkin's lymphomas (NHL), were introduced, making analysis more difficult due to introduction of different end points.
4. **Categorical test:** COMARE should have carried out a categorical test.

Associations between nuclear power plant proximity and leukaemia. Alfred Körblein outlined four post-KiKK studies, including recent studies in France and Switzerland, together with a German study based on the same data as the KiKK study, and the data from COMARE 14. He stated a combined analysis of the four studies finds a highly significant increase in the 5km zone compared to the rest of the study region. He concluded that, although there is no commonly accepted explanation, this shows there is in fact an increase of leukaemias near nuclear power plants.

COMARE response to critique. Alex Elliott responded to the first issue regarding data with the following points, including some initial background about COMARE's work:

- COMARE was set up as a result of the Black Report (following a Yorkshire Television documentary in 1983 focussing on Windscale) and its first report was produced in around seven months. It has written a number of reports about leukaemia.
- Earlier than the KiKK study was COMARE's 11th report, which was concerned with the increase of leukaemia and other childhood cancers and looked at the pattern across the whole of the UK. Simultaneously, COMARE was looking at the situation around nuclear power plants through the publication of COMARE 10.
- In light of the KiKK study, COMARE was asked to look again and consider the KiKK report itself. This included a request to redo the analysis for COMARE 10 using extended data, but only data to 2004 were used as that was the last year for which reliable data existed.
- Compared to other European Cancer registries the UK Childhood Cancer Register is unique; it crosschecks against at least three sources rather than just one. The early German Cancer Register relied solely on notification from paediatric oncologists. In the UK it comes from the National Cancer Registry, Cancer Research and individual cancer registries, with the database being held in Oxford by the Childhood Cancer Research Group. A confirmed diagnosis comes from multiple sources, so there is reasonable confidence that all of the UK cases are captured. However, this means it takes longer to get data in the UK as it is so rigorously checked. COMARE could have waited a year to get the 2005 data crosschecked but that would have delayed the report.

Bithell data. Ian Fairlie questioned if the Bithell study, which came out in 2008, had data up to 2004, why COMARE 14 could not go up to 2008. Alex Elliott clarified that the COMARE 14 was written in 2010. He also stated that through the Department of Health COMARE has secured funding to ensure the database is still getting updated and that data are currently up to 2010.

Site-specific analysis. Alex Elliott also confirmed that COMARE is currently working on further analysis around the Dounreay and Sellafield sites. In response to a question from Rita Holmes (ARM), he also confirmed that this work would include analysis of the Dounreay cluster from the 1980s retrospectively based on validated cases.

Ruth Balogh (West Cumbria and North Lakes Friends of the Earth) asked why it has taken so long for the analysis of Dounreay and Sellafield data to be undertaken, given that it is a long gap between 1987 and 2012. In response to this, Alex Elliott agreed and outlined that there had been difficulties with the Data Protection Act. Specifically, discussions are underway with the National Information Governance Board and the Information Commissioner's Office over use of data from the 1987 Seascale school cohort study.

Do additional data matter? On the wider issue of extra data, Alfred Körblein suggested that whether or not more data were included would not change the main result, given the small number of additional cases. When asked why this had been one of the criticisms of the COMARE report if it would not make a difference, he responded that it would increase the power of the study but not the result. He added that practically all nuclear power plants in the UK are on the coast so only a semicircle of population can be investigated, whereas in Germany they tend to be inland, which gives more powerful results, so that in the UK you don't need to see the data to know that you would not get such significant results.

Why not delay the report? David Lowry (NWAA) noted that COMARE were asked to extend the time period but that COMARE says it "was judged that delay was undesirable". He asked whether the Secretary of State for Health was satisfied that time periods were not extended, and from who's point of view was the delay "undesirable"?

Alex Elliott clarified that COMARE was not asked to extend the time, rather to extend the analysis of COMARE 10, which they did. He confirmed that the Department of Health was very happy with the report technically, but that the objective was to provide a report to the Department of Health in the shortest possible time, so COMARE used the data available rather than waiting another year.

Stuart Conney (Department of Health) added that the Department was keen to understand if the KiKK study would be reflected in the UK.

Addition of lymphomas

COMARE response to critique. In response to this element of the critique, Alex Elliott pointed towards COMARE 14, which states that in earlier reports there were a couple of cases that turned out not to be leukaemia. He said that clinical diagnosis of leukaemia has changed over the years and that in COMARE 14 early cases of non-Hodgkin's lymphomas were sometimes classed as leukaemia, which means uncertainty over whether early cases were leukaemia or non-Hodgkin's lymphomas. In response to this COMARE undertook a combined analysis and also sub-divided the categories out in order to be more consistent, after receiving advice from two independent epidemiologists not connected to COMARE. This was consistent with COMARE 10.

Nature of the statistical test

COMARE response to critique. Richard Wakeford responded to the criticism that COMARE 14 should have used a one- rather than two-sided statistical test as follows:

- The equivalent to a one-sided test is a 95% confidence interval and two sided would be a 90% confidence interval, but people are tending to move away from tests of statistical significance and confidence intervals.
- It depends on the view you have of the test you are carrying out before you carry it out. If you were looking for an increase you would go for a one-sided test. If you were looking for a difference in either direction you would go for a two-sided test. But this should not make any material difference to any conclusion of substance.

Statistical confidence or public confidence? There followed a discussion between Nikki Clark (Stop Hinkley) and Richard Wakeford about the relative importance of statistical confidence and public confidence. Namely, the concern that health issues (particularly ones like this) arguably require a higher level of confidence and thus a tighter statistical test because of the potential implications, contrasted with the argument that statistical tests only give an indication of whether something is going on and that becoming more confident statistically does not necessarily mean there is really something going on.

Richard Wakeford acknowledged the point that public confidence is based on the data you put out, but also suggested this was only one aspect of judging confidence; for example data may have very high levels of confidence but the study itself may be flawed.

Choosing which test to use. In order to provide an example of why the KiKK study tested one- not two-sided, Alfred Körblein pointed towards a German study. An initial study, covering 1980-1990, found a significant effect: a threefold increase in leukaemia rates in under-fives in the 5km zone. This triggered a second study, which included five more years to 1995 but had no significant result (p-value was 0.06) as it used a two-sided not a one-sided test. If it was one-sided it would have been significant (p-value 0.03). Richard Wakeford challenged the idea that it makes a difference if the p-value is 0.03 or 0.06, pointing out that the KiKK study gives the same result whether you do a one sided or two sided test, but that there are more fundamental issues with the KiKK study than this.

Ian Fairlie recalled a number of incidents where the choice of test has led to a conclusion of 'no increase' when the conclusion should have been 'there is an increase but there is a less than 5% chance it is significant'. He added that he hoped after today that a one-tailed test would be used as a standard in future studies. Richard Wakeford again challenged this, stating that it depends on the question to be answered and that if a conclusion depends on whether a test is one-sided or two-sided there should not be much weight put on that conclusion.

Causal relationships

A large part of the day was spent discussing the issue of causal relationships – i.e. whether an association between nuclear power plants and increased leukaemia could be shown to have a causal relationship or not.

Visitor data. Jo Brown (PCAH) asked whether studies took into account, for example, the high numbers of visitors to Somerset each year and the potential for this to have a causal link with the high incidence of leukaemia in one part of Birmingham. Richard Wakeford responded that these are very intensive studies to conduct but that you can do them in theory. Jo Brown added that, in order to pick up on latency issues in cancer incidences, DNA tests to pick up heritable genetic mutations could be undertaken on everybody.

SUGGESTION: Consider looking at visitor data and its relationship to leukaemia incidence.

Causality or random distribution? Chris Mitchell (COMARE) recalled that, in over 30 years looking after children with leukaemia, many parents have asked about clusters. He suggested that clusters do occur randomly from time to time, but equally that if you threw a handful of rice onto a checked tablecloth you would be surprised to see one grain in each square. He stated that the reliability of the UK data made it difficult to compare it with that of other countries.

Nuclear power plant as cause or coincidence? Andy Blowers summarised the issue by stating that, although everyone in the room knew there was an association between nuclear power plant location and occurrence of leukaemia, the issue was whether we could rule out the nuclear power plant as a cause of these clusters. He pointed out the range of variables that needed to be taken into account, e.g. plant size, emission type/ timing, weather patterns, coastal locations of UK sites, population movements, and so on.

Emission spikes. Ian Fairlie talked attendees through the possibility that emission spikes from nuclear power plants could be a cause of increased leukaemia, summarising:

- None of the current theories on increased leukaemia cases near nuclear power plants have really addressed the central evidence of the KiKK study and other studies, that this has something to do with nuclear power plants.
- The main source of radiation from these plants is from the radioactive discharges. Recently released information in Bavaria shows that, contrary to previous thoughts that discharges were even, there were rather large spikes of emissions from nuclear power plants, for example up to half of annual discharge due to a refuelling episode.
- In Britain the National Dose Assessment Working Group prepared a guidance on this and their estimation was that doses from these spikes would increase by a factor of about 20 over 'normal' doses (other German studies show up to factor of 100), although this depends on a number of things such as weather and population patterns.
- Ian Fairlie's article in the Journal of International Journal on Occupational and Environmental Health hypothesises these leukaemias arise before the child is born from in utero exposures. This stems from the work of Alice Stewart; in a survey of childhood cancers she found women exposed to abdominal x-rays have a risk of childhood leukaemia when born.

Dose response curve. Alfred Körblein outlined his theory relating to the dose response curve, with key points as follows:

- When comparing the effects of radiation emitted from nuclear power plants to background radiation we think that the average dose reported by utilities is distributed evenly across the year. They usually report total annual emissions.
- Real data show spikes during refuelling up to 500 times the routine emissions, for example one third of the total annual emissions in only two days from one site.

- If the dose response curve were linear, it wouldn't matter if the doses were emitted in short periods of time or not. But if the dose response curve is non-linear or superlinear you cannot average that and you have to look at the emission pattern. That's the question – is dose response known or not known?
- Looking at data of perinatal mortality in Germany after the Chernobyl accident, a non-linear dose response was found – a steep increase with dose with approximately a power of dose of three. Also data of congenital malformations from Bavaria following Chernobyl showed a strongly upward curved dose response relationship.
- If the dose response rate is curvilinear then that could explain the observed increases. Dose estimates have a high uncertainty and there may be certain systematic underestimating of dose. Allowing for a systematic underestimation of dose by a factor of say 10 and allowing for a lognormal distribution for the form of the dose response, this would explain observed increases.

COMARE's remit and wider causative mechanisms. Alex Elliott suggested that all incidences of leukaemia rather than just those around nuclear power plants needed to be considered when looking at causes, pointing towards clusters of leukaemia nowhere near nuclear power plants across the world (for example in Nevada) or at sites where a nuclear power plant was planned but never built. He referenced the Gardner study, which also found associations with farming and the iron/steel industry, as well as other theories about infection, population mixing and so on. He stressed the need for COMARE to retain an open mind on causative mechanisms and pointed out that COMARE is currently continuing to study ionising radiation but that its remit is also extending to look at other potential causes. He also confirmed that COMARE has opened discussions with colleagues in France and Germany and will take forward a tri-national study.

Ian Fairlie argued that a clear association between nuclear power plants and leukaemia is beyond reasonable doubt, questioning why COMARE is not ready to accept this view. However Alex Elliott reiterated that COMARE has an open mind and is taking forward work on ionising radiation as well as considering non-radiation factors.

Concern about COMARE's extended remit was expressed by Nikki Clark (Stop Hinkley). Although not disagreeing that leukaemia needs to be studied as a disease, she was concerned about COMARE taking this on, suggesting that other work should be conducted by the Department of Health or other bodies. She also expressed concern that COMARE's position seemed to be defending the industry and that by deflecting the critiques of hypotheses put forward COMARE was not inspiring confidence in its own work.

Alex Elliott again stated that COMARE's primary remit is indeed to look at radiation and that they would not divert from that task, but that it could also expand to look at other aspects. It was confirmed that the Department of Health or the devolved administrations determine COMARE's work programme, with COMARE deciding only how to deliver it.

Views on causative mechanisms and dose response from COMARE. In response to discussions so far, Richard Wakeford talked about current evidence and the need to continue looking at the bigger picture. His key points were as follows:

- The Oxford Survey of Childhood Cancers data is an important set of data. Examining this and similar data from around the world is important in showing us that we aren't getting things drastically wrong in terms of dose and response.
- For example, atmospheric nuclear weapons testing put enormous quantities of radionuclides into the environment – much greater than Fukushima or Chernobyl. Studies of low level exposure to radiation – CT scans, natural background radiation – are coming out with risk per unit dose estimates compatible with Hiroshima and Chernobyl. If the bomb tests were in some way responsible for a high risk of childhood leukaemia you would expect to see a large signal of that in late 1960s – you do not.

- This evidence has been assessed by a lot of sceptical scientists over around 30 years and it is difficult to see how this can be put at the door of ionising radiation exposure, although Körblein and Fairlie's letter in the International Journal of Cancer is important.
- The bigger picture also needs to be borne in mind. The amount of evidence that infection is involved in child leukaemia is substantial. Deep genome sequencing is progressing, and a number of groups are looking for specific viruses in children with leukaemia. Looking at ionising radiation is important but we should not lose sight of other potential causes as this risks missing a large part of the causes.

Jo Brown (PCAH) commented that she was concerned incidences in perinatal mortality had not been taken into account.

Looking for a point source. Alfred Körblein pointed out that many hypotheses do not consider the fact that this effect is concentrated on the 5km zone and is not found beyond the 5km zone, which suggests the effects of a point source.

How much evidence is needed? Peter Lanyon (Shut Down Sizewell) questioned what evidence COMARE would need before the precautionary principle required it to declare that nuclear power plants were an issue. Alex Elliott responded that more evidence than COMARE currently has would be needed, and also mentioned the dangers of HARKING (hypothesising after the results are known). He confirmed COMARE would be looking for a study with more power than those currently undertaken.

Chris Mitchell (COMARE) added that the numbers show there were 20 cases of leukaemia in children under 5 around nuclear power plants in 1969 to 2004 – six above expected numbers – and in the same time period 6500 children in the rest of the UK had leukaemia. He commented that there are plenty of reasons for these cases other than radiation and, whilst it is important for COMARE to look at radiation, maintaining a sense of balance is also important.

Wider health detriment. Jo Brown (PCAH) raised the issue of wider health impacts of ionising radiation (for example immune system effects) and pointed out that the Justification and National Policy Statement (NPS) accept that nuclear power plants have a causal link to reduced health. Hergen Hays clarified that the National Policy Statement does not deal with this issue at all as it is a planning statement, but that the regulatory justification indeed looks at possible health detriment versus other benefits. He confirmed that the Secretary of State has taken the decision based on all the current evidence known confirming that the benefits outweighed any known health detriments which are effectively regulated.

Other participants commented that the consultation on Justification had focused on the health detriments which were assessed to be outweighed by the assumed benefits arising from nuclear energy, Andy Blowers recalled that the challenge BANNING put to the consultation was to look more critically at the benefits, which he believed to be minimal or non-existent. He agreed there was not a denial that there are health detriments, but suggested that if there are no benefits the justification should go the other way.

Further COMARE response on health detriment and earlier hypotheses. Ian Robinson confirmed that the International Standards for Radiological Protection and the UN Committee on the Effects of Radiation associate a dose of radiation with a detriment.

In response to the suggestion that emissions could be up to 500 times the average annual dose, he pointed out the differences between UK and German nuclear power plants: in Germany liquid discharges have to be restricted as plants tend to be inland so they choose to put more as aerial effluent; in the UK plants tend to be coastal so there is a big dilution of what goes into the sea and aerial discharges are far less than on the continent. In addition he pointed out refuelling spikes in the UK are minute. In response to this Jo Brown (PCAH) suggested that the RIFE 16 report recorded huge increases.

Further work

Follow-up contact with Ian Fairlie and Alfred Körblein. Ian Fairlie pointed out that both he and Alfred Körblein had PowerPoint presentations on their various theories about the causation of increased leukaemia, which they would be happy to provide for the report of the meeting, confirming that they would both be happy to be contacted with any questions.

Further debate of nuclear power plant proximity as a cause. Ian Fairlie went on to outline some outcomes that he and Alfred Körblein hoped would come out of the meeting:

1. An acknowledgement that the preponderance of evidence shows that there are increased leukaemias near nuclear power plants.
2. The preparation of a report which looks at radionuclide discharges as being a causative effect and publishing a report saying that.

He then suggested this may be too big an ask given the UK government is going ahead with building new nuclear power stations, quoting Dr Gordon Thompson at the Institute for Resource and Security Studies as saying that “political pressures from economic interests too often influence policy approaches to low-dose radiation”. He suggested that this was happening in the UK, and that it was inevitable to some extent but that we should try to look hard at where the evidence leads. He finished by saying he hoped COMARE would undertake work to look at possible causes, and that looking at nuclear power plant proximity as a cause would be the obvious thing to do. There was vocal opposition from one attendee about this.

SUGGESTION: Consider radionuclide discharge as a causative effect.
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Further data. Ian Fairlie went on to reference other studies coming out possibly in Belgium and Sweden about increased leukaemia near nuclear facilities, which he said would provide more evidence. He also looked forward to the publication of COMARE 15 looking at incidences of childhood leukaemia near Sellafield and Dounreay and asked for an indication of when the extended CCRG data would be available.

Richard Wakeford responded that he would fully expect the Childhood Cancer Research Group (CCRG) in Oxford to update these studies on a relatively regular basis, but that the accumulation of data is relatively low frequency so it would not be sensible to do that every year. He pointed out that the Bithell published paper was not an exercise on behalf of COMARE or the Department of Health but was a CCRG initiative and is the most recent in a series of studies by the CCRG, with a much wider area than just radiation. He suggested that, provided the CCRG continued to exist, he had no reason to believe they would not continue with that series of studies.

COMARE comment on research recommendations. Richard Wakeford commented that there had been a whole series of recommendations by COMARE and others in recent years. He suggested looking at the nature and amount of research recommended and asking whether COMARE had left anything uncovered or overlooked something as far as childhood leukaemia as a whole is concerned. He went on to say that it was time to ask whether COMARE had really missed something big as far as radiation is concerned or whether it was time to look at childhood leukaemia as a whole now.

He pointed out this was being taken on by the European Commission as a whole (for example the Melodi Programmes being considered) and that, in his view, it would be myopic to just focus on radiation unless COMARE has missed something. He stated that he sensed we were on the verge of a lot of progress as far as the big picture is concerned.

COMARE 15. Alex Elliott confirmed that what had been referenced earlier as COMARE 15 (further work on incidences of childhood leukaemia near Sellafield and Dounreay) may end up being COMARE 16 as the Department of Health has asked COMARE urgently to look at use of CT

scanning in the UK. But either way the expectation is to complete the work on Sellafield and Dounreay by the end of 2014.

Site data for the UK. In reference to an earlier comment from COMARE about there being no radiation spikes in UK, Alfred Körblein asked whether these data were available for independent scientists to look at. Ian Robinson responded that he did not know about the availability of data, that there are data to some extent in the Radioactivity in Food and Environment report, but that he was not sure whether sites would release it. He suggested the Environment Agency may be able to help.

Pete Wilkinson (CANE) added that Sizewell Site Stakeholder Group sent a letter to EDF some time ago to ask for the outage data to see if they could replicate the spike from the German plant. After nearly two years EDF finally provided the data, but it is not broken down into hourly or half hourly chunks, instead showing the average across the year.

Further data analysis: risks at variable distances. Alfred Körblein brought up another area of potential research, referencing some work he had done with German data:

- Normal modelling of risk with distance in the KiKK study (and COMARE/Bithell) assumes infinite risk at no distance. This is not reasonable as, with fallout, the risk is not highest nearest the plant, but is estimated at 2-4km depending on dispersion concentration, wind speed, stack height etc.
- Looking at the KiKK data, the cancer risk below 3km was lower than in the 3-5km zone. So this points to a decrease of risk from the 3-5 km zone towards the site.

He suggested that similar data are available in the UK, and that such an analysis could be undertaken in order to find out whether there is increased risk at 3-5 km, which would support the idea that increased leukaemia incidence has to do with emissions. If the data are there he suggested this would be easy to do.

SUGGESTION: Analysis of risk at variable distances from nuclear power plants in the UK.

In addition, he stated that a study of leukaemia near the La Hague reprocessing plant in France found a significantly increased risk for young males under 10 years but not for females, leading to the possibility that radiosensitivity of males may be higher than for females. He suggested that COMARE could also look at the data for a difference between males and females.

SUGGESTION: Consideration of possible variable impacts on males and females.

COMARE response to further data analysis. Richard Wakeford questioned whether doing the sort of modelling suggested with the sparseness of the data available would be useful, pointing out there would be a need to test again with an independent but equally sparse data set, and that data would only be available in wards rather than the degree of resolution required. He suggested it would be better to look for certain radionuclides like tritium and carbon-14 in the environment or even in people. He referenced a study on childhood leukaemia clusters for Seascale and Dounreay, which looked at the plutonium levels in them, siblings, relatives and children in Glasgow; the results showed background levels only. He suggested that by doing that sort of measurement you can look at whether certain radionuclides are being grossly underestimated.

Ian Fairlie agreed with the comments on radionuclide measurements but suggested that he and Alfred Körblein could do the analysis suggested if they could be given the data, and that data at ward level would be good enough.

Communications and working together

Giving communities a clearer message. Pete Wilkinson (CANE) related concerns over the feeling of disrespect between participants in the meeting to the wider issue of communities around

nuclear power plants and how they are communicated with, specifically the lack of clear, consistent information on topics such as this.

He suggested that the panel is united by the recognition of an association between nuclear power plants and leukaemia incidence, and that what was needed was a way to bring the two sides of the debate together and look towards a joint funded piece of work, rather than a polarised debate that leaves communities in the dark.

Joint working. There followed some discussion of the difficulties and considerations of joint working, with reference to various participants' previous experience with the European Committee on Radiation Risk (ECRR) and the Committee Examining Radiation Risks of Internal Emitters (CERRIE). The need to assimilate critical voices into the process was contrasted with the difficulty of reconciling polarised views.

SUGGESTION: Joint working, involving critical voices, on the degree to which there is or is not a causal link between nuclear power plants and leukaemia incidence.

Public communications. Frank Boulton (Medact) commented on the fact that radiation and leukaemia were both difficult to understand for the general public.

Jill Sutcliffe (Low Level Radiation and Health Conference) made the point that there are people on the ground who have a different and more direct experience of this topic but who don't want to follow this level of debate. She stressed the need to be careful at the end of these scientific exchanges that people on the ground understand why certain things are done in certain ways, perhaps through the development of a knowledge transfer interface to improve public understanding. She suggested that scientists are too quick to respond saying there is no problem and that this does not fill people with confidence.

SUGGESTION: Development of a common knowledge transfer interface to enable members of the public to keep up to speed with the debate in a non-technical manner.

Ongoing dialogue. A few participants express the desire to continue discussing this issue, perhaps through further meetings similar to this one. Ian Fairlie suggested that, whilst it may be unrealistic to expect COMARE to meet with the Forum regularly, there could be the option of sending out a draft report for comment in future.

SUGGESTION: Further meetings on this topic/of this type.

SUGGESTION: Drafts of COMARE reports for external review prior to publication.

Wider topics and further work

Risk models and sex ratios. Jo Brown (PCAH) suggested the relative merits of the risk models would be a useful topic for further discussion, as would consideration of possible sex ratio impacts of radiation

SUGGESTION: Future discussion of the relative merits of different risk models.

SUGGESTION: Investigation of possible sex ratio effects in communities close to nuclear power plants.

Risk estimates. Phil Davies (Nuclear Information Service) suggested that it might be useful to consider another paper written by Ian Fairlie looking at genomic instability. Ian Fairlie confirmed that this was a large study looking at a new range of effects of radiation called non-targetted effects, and that the jury is still out as to the overall significance of these effects. He suggested there is still a lot of research happening in this area.

Considering the range of hypotheses. Nikki Clark (Stop Hinkley) asked whether the range of different hypotheses put forward could be tested by COMARE. The process for COMARE's work was confirmed by Alex Elliott as follows:

- The first step is always to do the literature review. Anything in the literature will automatically go into consideration including hypotheses.
- A sub group is set up for each individual report, including people outside of COMARE (for example Ian Robinson was brought in for COMARE14). The sub group will decide the broad bones of the report then that will be taken forward.

Closing words

The co-chairs of the DECC / NGO Forum closed the meeting. Both thanked the panel for their input.

In addition Andy Blowers reflected on the aim to have a constructive debate founded on the science of the issues in an atmosphere of mutual respect, feeling that this had only been partially achieved. Although on the whole reasonably constructive, he felt the meeting had, at times fallen below the standard of mutual respect. He called for these kinds of discussions to be restrained, sceptical, and rational as far as possible, within the norms of what would be regarded as reasonable scientific discussion. He pointed out the need to be clear about the agenda and to try to avoid incoherence. Having said that, he felt it has been an interesting and invigorating discussion and expressed hope that discussions of this kind could be continued, ending with the challenge of how the work of committees like COMARE is communicated externally.

Hergen Haye followed this by saying that this had been an interesting discussion and that he had some sympathy regarding the question of how these issues can be coherently communicated to the wider public. He suggested that if there is the possibility of consensus we should strive for that but also recognise that it may not always be possible. A wider issue, he suggested, was that if people in one way or another are set on one particular outcome, the question of whether dialogue is possible is raised, nuclear issues being very challenging in that respect. He suggested that sometimes long standing convictions can stand in the way of enquiry and that all parties have to be willing to look for solutions or perhaps even be willing to move from what they believe, in order to ultimately have a successful outcome and one which is evidence-based.