Nuclear Free Local Authorities

new nuclear monitor

Number 26, December 2011

SUBMISSION TO ENVIROMENT AGENCY RADIOACTIVE WASTE PERMIT FOR THE PROPOSED HINKLEY POINT NUCLEAR REACTOR, SOMERSET

SUBMISSION 2/2 –AERIAL GASEOUS DISCHARGES

Ref: EPR/ZP3690SY

1. Introduction

The Nuclear Free Local Authorities (NFLA) has co-sponsored two submission responses with the Stop Hinkley Campaign, Friends of the Earth Cymru and CND Cymru to the Environment Agency's radioactive waste permit for the proposed Hinkley Point nuclear reactor, Somerset.

The co-sponsored submission is also supported by the following MPs and MEPs – Caroline Lucas MP, Martin Caton MP, Paul Flynn MP and Jill Evans MEP.

It has been developed for the supporting organisations by the independent consultant on radiation in the environment, Ian Fairlie. A separate submission on marine discharges from a proposed new nuclear reactor at Hinkley has also been developed for the same supporting organisations by the independent marine pollution consultant, Tim Deere-Jones. This can be found within New Nuclear Monitor 25.

2. The Environment Agency consultation

The Environment Agency are seeking comments on **applications** it has received from EDF Energy's and Centrica's joint venture company, **NNB Generation Company Limited** (NNB GenCo), for their proposed new nuclear power station development at **Hinkley Point**.

The company has applied to:

- make disposals and discharges of radioactive wastes
- operate combustion processes (standby generators)
- discharge cooling water and liquid effluent into the Severn estuary.

The application can be found at EDF's website:
http://hinkleypoint.edfenergyconsultation.info/public-documents/nuclear-site-licence-and-environmental-permit-applications/construction/

The co-sponsored submission was emailed to the Environment Agency: NNB@environment-agency.gov.uk prior to the closing date, 15th December.

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EA Consultation:
Comments on NNB Genco document
"Radioactive Substances Regulation Submission Hinkley Point C"
Re: Radioactive Aerial Emissions from the proposed PWR at Hinkley Point

1. This report examines gaseous emissions from the proposed PWR at Hinkley Point. A separate response discusses liquid discharges.

2. According to the Environment Agency's EPR Assessment Report in 2009, it is expected that each year the proposed EPR-type reactor would emit to air 500 GBq[1] of tritium; 350 GBq of carbon-14; 800 GBq of radioactive noble gases and 50 MBq of radioiodines. https://consult.environment-agency.gov.uk/portal/ho/nuclear/gda?pointId=1276871034848). These are relatively large amounts of radioactivity. If these releases were to occur, they would increase Hinkley B's current gaseous emissions by 20% (H-3) to 30% (C-14).

3. In the assessment of radiation risks to local people, aerial emissions from nuclear reactors are more important than liquid discharges for two reasons.

4. First, the key parameter in estimating radiation doses to local people from radioactive matter is their **concentration** in environmental materials. Contrary to popular perceptions, air emissions result in much higher environmental concentrations than sea discharges. The reason is dilution: a cubic metre of sea water contains a million grams of water which dilutes radioactive contaminants far more effectively than a cubic metre of air with a mass of less than 100 grams. About >10,000 times more effectively. This is not to accept that dilution is the solution to pollution: it isn't. It merely reflects the fact of current (ill-advised) methods of disposing nuclear wastes.

5. Second, individual and collective doses from the aerial emissions are much larger than from the sea discharges. People living near Nuclear Power Plants (NPPs) receive doses from

   a. eating contaminated food
   b. drinking contaminated water
   c. breathing contaminated air, and
   d. skin absorption (especially of tritiated water vapour)

[1] A becquerel (Bq) is a unit of radioactivity: it means one nuclear disintegration (or decay) per second. Each disintegration results in the emission of radiation. One GBq means one billion disintegrations per second, and one MBq means one million disintegrations per second.

6. All of these pathways are affected by aerial emissions – almost alone. For example, the contamination of local foods occurs by air emissions - particularly tritium and carbon-14 emissions. The only exception is contaminated seafoods. But these concentrations are very low[2]. People who elect to live near discharge sites can largely avoid eating contaminated seafoods but, by and large, they cannot avoid breathing contaminated air from aerial emissions.

7. It is for these reasons that NPP operators go to considerable lengths to divert radioactive releases away from aerial emissions towards sea discharges. The tritium discharges to sea for example from the EPR type of reactor are many thousands of times larger than tritium air emissions.

Tritium

8. The largest aerial emissions are usually of tritium in the form of tritiated water vapour, i.e. radioactive water. In recent years, many official reports have discussed the hazards of tritium - the radioactive form of hydrogen. In the past, this isotope had been regarded as only weakly radiotoxic: this view is gradually changing among governments and international agencies concerned with radiation exposures.

9. For example, recent reports have been published by radiation safety agencies in the UK (AGIR, 2008), Canada (CNSC, 2010a; 2010b) and France, where the French Nuclear Safety Authority has published a comprehensive White Paper on tritium (ASN, 2010) and the French Institute de Radioprotection and Nuclear Safety has published six major reports on tritium (IRSN, 2010a; 2010b; 2010c; 2010d; 2010e; 2010f). These reports draw attention to the hazardous properties of tritium including its extremely rapid distribution in the environment, its heterogeneous distribution within tissues, its ability to bind with organic molecules resulting in higher doses, and its high biological effectiveness compared with gamma radiation.

Increased Incidences of Cancer Near NPPs

10. In the late 1980s and early 1990s, several studies revealed increased incidences of childhood leukemia near UK nuclear facilities. However official estimated doses from released nuclides were too low by 2 to 3 orders of magnitude to explain the increased

[2] This does not include discharges of organically bound tritium (OBT) to sea. It has been shown e.g. at Cardiff Bay, that these sea discharges are taken up and concentrated by bottom feeders e.g. flounders which were in fact eaten by local people. However NPPs discharge tritiated water not OBT.

leukaemias. Recent epidemiological studies have reopened the child leukemia debate, including the 60 studies examined by Laurier D et al (2008)[3] and Laurier and Bard (1999)[4]. In 2007, Baker and Hoel (2007) carried out a meta-analysis of 136 nuclear sites in the UK, Canada, France, US, Germany, Japan and Spain. They found cancer death rates for children were elevated by 5 to 24 per cent depending on proximity to nuclear facilities. Hoffmann et al (2007) found 14 leukemia cases between 1990 and 2005 in children living within 5 km of the Krümmel nuclear plant in Germany, significantly exceeding the 0.45 predicted cases.

11. Most important is the KiKK study (Kinderkrebs in der Umgebung von Kernkraftwerken = Childhood Cancer in the Vicinity of Nuclear Power Plants): see Spix et al. (2007) and Kaatsch et al (2008). The main findings were a 60% increase in solid cancer risk in embryonal cancers and a 120% increase in leukemia risk among young children living within 5 km of all German nuclear reactors. The KiKK findings are significant because it was a large, well-conducted study; because it was scientifically rigorous; because its evidence was very strong; and because the German Government, which had commissioned the study, confirmed its findings.

12. The KiKK findings are presently the subject of much discussion throughout the world, and it is too early to provide an explanation for the increased cancers, although radiation exposures are implicated. One hypothesis (Fairlie, 2009) proposes that infant leukaemias are a teratogenic effect resulting due to in utero exposures to radiation from intakes of radionuclides during pregnancy. It suggests that doses from environmental emissions from nuclear reactors to embryos/foetuses in pregnant women near reactors may be much larger than currently estimated, and that haematopoietic (blood-forming) tissues may be considerably more radiosensitive in embryos/foetuses than in babies. Whatever the explanation(s) the KiKK study provides strong evidence that living near nuclear reactors carries grave health risks for nearby babies and children.

13. Official organizations, e.g. COMARE in the UK and SSK in Germany, have found it difficult to accept that these cancer increases near NPPs may be due to radioactive emissions. This is mainly because the official doses estimated from NPP emissions are a factor of 100 to 1000 times too low to explain the observed increases in risks. This of course assumes that the official dose estimates and risk models used are correct and without uncertainties. The UK Government CERRIE Committee (www.cerrie.org) concluded in 2004 that official

[3] who reviewed 26 multi-site studies of increased cancers near NPPs worldwide

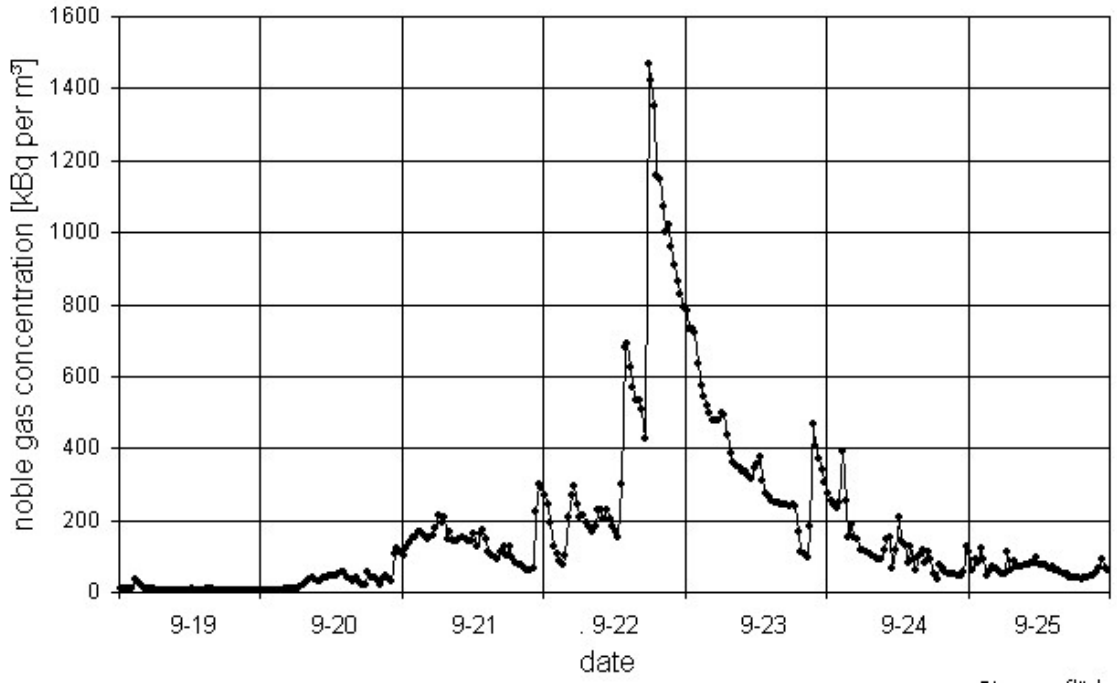
[4] who listed 50 studies (36 single and 14 multi-site) of increased cancers near NPPs world-wide

dose estimates of internal exposures (the main source of exposures from NPPs)) in fact contained large uncertainties. Apart from the Cerrie report, there have also been other more fundamental challenges to the dose-risk model used to assess the health effects of NPP discharges. However, very recent information has come to light which appears to explain the discrepancy between official dose estimates and observed risks.

Recent revelation of nuclide spikes from NPPs

14. In November 2011, German data revealed large spikes in radioactive gas releases during the refuelling of NPPs. The Gundremmingen NPP in Southern Germany (a boiling water reactor) emitted much larger amounts of radioactive noble gases during refuelling than were emitted during normal power operation throughout the rest of the year. See graph 1. According to the International Physicians for the Prevention of Nuclear War (IPPNW) in Germany[5], the normal emission concentration during the rest of the year is about 3 kBq/m^3 but during inspection/refuelling this concentration increased to ~700 kBq/m^3 with a peak of 1,470 kBq/m^3. Nuclide emissions during the period of refuelling were about 65% of total annual releases. It's likely that noble gas concentrations can be used as a proxy for other gaseous emissions, including tritium and iodine releases.

Graph 1. Noble gas concentrations from Gundremmingen C. 1/2 hourly values. Sept 19 to 25



[5] Credit goes to Christine Kamm MP in Munich, and the Green Party in Germany for obtaining this data. And to Dr Alfred Korblein in Nuremburg and scientists in IPPNW Germany for analyzing it.

15. The explanation is that, in order to refuel, the pressure vessels of all nuclear reactors are opened up about once a year. This releases large volumes of radioactive gases and vapours, including noble gases, H-3 (tritium), carbon-14 and iodine-131, to the environment. Until now, these nuclide releases had been published only as annual data throughout the world. After repeated requests by the new SPD-Green Party Government in the Bavaria, half-hourly data were made available for scientific evaluation for the first time[6].

16. Brief exposures to high concentrations are more hazardous to residents near NPPs than chronic exposures to low concentrations. This is partly due to environmental factors (e.g. wind direction) and partly to metabolic factors: exposures to high concentrations result in higher internal doses due to the labelling of dividing cells and cell proteins at high levels particularly with radioactive H and C inhaled/ingested from NPP emissions.

17. Recently the UK National Dose Assessment Working Group published its guidance on "Short Term Releases to the Atmosphere" http://www.ndawg.org/documents/NDAWG-2-2011_000.pdf. This states that "...doses from the assessment of a single realistic short-term release are a factor of about 20 greater than doses from the continuous release assessment." An older German study (Hinrichsen, 2001) indicated that these doses could be a factor of 100 greater.

18. Higher doses from these nuclide spikes go a long way to explaining the increased incidences of child leukaemias near NPPs shown by the KiKK findings. In the light of this German data, it is recommended half-hourly emissions data from all UK reactors should be disclosed and that the issue of childhood cancer increases near NPPs be re-examined.

19. It is also recommended that NPP operators should be required (via their Authorisations) to inform nuclear regulators of the precise dates and times when they propose to open up their reactors for refuelling. And NPP operators should indicate to regulators whether they can restrict their depressurisations to night-time (when most people are in their homes) or to times when the wind is blowing out to sea. The NDAWG guidance, (para 4.4) currently

[6] IPPNW Germany warned of the probable health impacts of such large emission spikes. "Especially at risk are unborn children. When reactors are opened to release these gases, pregnant women can incorporate much higher concentrations of radionuclides than at other times via respiration" said Reinhold Thiel, member of the German IPPNW Board. "The result is that the embryo/ foetus are contaminated ('labelled') by radioactive isotopes, including the blood-forming cells in bone marrow. This is a plausible explanation for the KiKK findings that under-fives near NPPs are considerably more at risk of cancer, particularly leukaemia, than children living further away. Up to now, supervisory authorities and NPPs have kept these spikes secret by only providing annual figures, despite our repeated requests for disaggregated data. We need half-hourly data of the releases of each radioactive nuclide from all NPPs for scientific evaluation. This is necessary for the protection of unborn children near nuclear reactors". The same is true for UK reactors as well.

states "…this requirement is not imposed because it could result in undue constraints on operational practice". This is unfortunate: public health considerations should be considered more important than operational convenience.

IF Dec 12

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