From: Jo M Brown  
Sent: Friday, March 30, 2012 5:08 PM  
To: Hinkley Point C  
Subject: IPC REF ENO10001 HINKLEY POINT C PCAH Registration No xxxxx RESPONSE TO IPC QUESTIONS

Registration No xxxxx Jo Brown for PCAH RESPONSES TO THE EXAMINING AUTHORITY’S FIRST WRITTEN QUESTIONS:

In ANNEX D, under Environmental Mitigation Measures the Examining Authority states: “Requirement PW9 in Schedule 11 of the draft DCO suggests that the applicant intends to prepare a detailed schedule of environmental mitigation measures...” 
This sentence implies that there is already a draft Development Consent Order for Hinkley C; if there is indeed already a draft consent order, will the IPC distribute it to all interested parties. Who prepared the draft consent order? If there is a draft DCO, what is the function of the IPC? Surely they were appointed to assess NNBGenCo’s Hinkley C planning application and advise the Secretary of State to grant or refuse planning approval? We would appreciate clarification.

PCAh’s objections to EDF’s application to build two EPR nuclear reactors on the Hinkley Point nuclear site are based on evidence of public health damage caused to residents in Somerset, Gloucester and South Wales throughout the lifetime of the existing Hinkley A and Hinkley B nuclear sites since 1965 when the two Hinkley A nuclear reactors became operational. We ask the examining authority to study carefully the attached nuclear reading list, noting that the earliest study, ‘Leukaemia Incidence in Somerset with Particular Reference to Hinkley Point Nuclear Power Station’ was first published by Somerset Health Authority in 1988, followed by ‘Incidence of Leukaemia in Young People in the Vicinity of Hinkley Point Nuclear Power Station 1959-1986’ published in the British Medical Journal in 1989, followed by ‘Cancer Mortality and Proximity to Oldbury Nuclear Power Station in Gloucestershire 1995-1999’ by Chris Busby PhD, Paul Dorfman BSc, Helen Rowe BA, and Bruce Kocjan BSc. If they read nothing else, ‘Nuclear Power is not the Answer’ by Dr Helen Caldicott, co-founder of Physicians for Social Responsibility is essential reading.

The reading list includes numerous other epidemiological studies published in the UK, Europe and America; many of which relate to nuclear accidents including Chernobyl, Three Mile Island and very early assessments of public health damage from the Fukushima catastrophe. We do not accept Mike Weightman’s risk assessment of UK nuclear sites, based on his premature and uncorroborated opinions on the effects of the Fukushima disaster on Japan at the present time and into the foreseeable future. The examining body and public confidence would benefit from commissioning independent nuclear consultants, John Large Associates to report on the implications of all aspects of the Fukushima meltdown on risks from the four existing Hinkley Point reactors and potential risks from the two proposed Hinkley C experimental EPR reactors. A propos, does the IPC examining body have funding to commission reports from nuclear engineering and health experts? And, incidentally, how is the IPC examining body funded?

Hinkley A decommissioning has brought new public health damage to Somerset and Wales communities. We attach the South West Publish Health Observatory’s briefing ‘Infant and Perinatal
Mortality in Somerset’ which includes Figure 1 showing perinatal deaths reaching 45 following an unauthorised release of radioactivity in 1994 and an unprecedented peak of 53 in 2009, following the installation of roof vents into the two Hinkley A defueled Magnox reactors in 2006, and a serious accident at one of the Hinkley B AGR reactors in 2009 when eight workers had to be referred to Harwell for treatment. Cardiovascular and central nervous system illnesses and fatalities have increased since 2006, as have many cancers including lung, liver, skin and kidney cancers all of which are known risks to nuclear decommissioning workers. (see large population studies of workers at Sellafield and South Carolina on our attached nuclear reading list.)

In its RIFE 16 report The Food Standards Agency has published data showing that marine discharges from the Hinkley site doubled between 2004 and 2008 and that levels of Caesium 137 and Tritium were very high in 2009 and 2010. Caesium 137 embeds in human muscle causing cardiovascular illnesses and premature deaths; Tritium crosses the placenta and causes infant and perinatal mortality. In Somerset the normal sex ratio of 105 boys to 100 girls has been reversed since 2006; this only happens when parents have been exposed to man-made radiation as recorded in Fallujah where depleted uranium was deployed in artillery. RIFE 16 is available from the Environment Agency and we attach an extract.

We hope the IPC panel will in future confine its examination to studying the actual planning application document submitted and published by NNGBENCO and commissioning expert advice as necessary. In view of past public health damage caused by discharges from existing Hinkley Point nuclear reactors, the IPC should recommend refusal of the Development Consent Order because routine, refuelling and waste gaseous and liquid discharges would increase the level of human health detriment beyond even what the NPS might consider justified by the unspecified and unidentifiable alleged ‘benefits’ of nuclear power. In 45 years, we have seen no benefits of the Hinkley Point nuclear experiment; electricity has not been too cheap to charge for; we are not happy to sacrifice even more of our lives and the lives of our children and now our grandchildren to subsidise profits for French and American companies who do not pay for public liability insurance, lifetime costs of spent fuel storage and disposal, on site waste storage, reprocessing and disposal. When there is another accident, and it’s very likely to be at the Hinkley B AGR reactors, the foreign companies will declare themselves bankrupt, leaving the UK taxpayer to pick up all the costs, just like TEPCO have left the Japanese government to pay for the Fukushima catastrophe; not that any amount of money will compensate the Japanese people who will be paying the price in premature deaths and uninhabitable towns and cities throughout Japan for thousands of years.

Jo Brown  PCAH (Parents Concerned About Hinkley)

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25/04/2012
Published scientific research papers (see list below) are available from Green Audit and at http://www.stophinkley.org/Health/ReadList.htm. These show that since 1965, when Hinkley Point nuclear reactors came on stream the following illnesses showed excess incidence:

- Childhood leukaemia
- Thyroid malfunction
- Breast Cancer
- Prostate cancer
- Lung and stomach cancer
- Immune system impairment
- Non-Hodgkin’s Lymphoma
- Adult leukaemia
- Endocrine disruption disorders
- Pregnancy and childbirth problems
- Infant and Perinatal Mortality
- Heritable genetic mutations

During decommissioning, reprocessing, storage and disposal of radioactive waste after nuclear plants close down, the following additional illnesses have been recorded at Sellafield in the UK and South Carolina in America:

- Heart attacks
- Strokes
- Brain tumours
- Rheumatoid Arthritis
- Pleural cancer
- Skin cancer
- Kidney cancer
- Arthritis

The two Hinkley A Magnox reactors have been defuelled. Vents were installed in the reactor roofs in 2006 releasing high level radionuclides into the atmosphere and the estuary. We are already seeing unexpected cardiovascular, kidney and skin problems among Somerset coast residents. Since 2006 the South West Public Health Observatory has recorded an exponential increase in levels of perinatal and infant mortality. After 5 years of exposure to decommissioning gases from the two Hinkley A Magnox reactors, a serious accident at one of the operational AGR reactors in 2009, plus an unplanned trip of the second AGR reactor, we are now seeing excess incidence of central nervous system illness and fatalities including Parkinson’s disease, Multiple Sclerosis and Motor Neurone Disease. Macular degeneration and other eye problems are also increasing.

Radioactive isotopes released from Hinkley decommissioning and waste include:
- Plutonium 241 – affects skin, bone, liver. Fatal dose 3mg
- Uranium – binds to DNA, affects kidneys
- Caesium 137 – affects muscle, heart, brain
- Strontium 90 – displaces bone calcium, causing injuries and cancer including leukaemia
- Tritium crosses placenta; birth defects
- Nickel
- Iron Fe-55
- Promethium-147
- Cobalt 60

Infant and Perinatal Mortality in Somerset 1995 to 2009
Published by South West Public Health Observatory
Contains charts showing a peak in mortality following the 1994 unauthorised release of radioactivity from Hinkley Point and a continuing rise following the 2006 installation of vents into the roofs of the two Hinkley Point Magnox reactors.

Study Finds that Childhood Leukemia Rates Double Near Nuclear Power Stations
By John Daly | Thu, 19 January 2012

The study by the Institut National de la Sante et de la Recherche Medicale (French Institute of Health and Medical Research, or INSERM) found a leukemia rate twice as high among children under the age of 15 living within a 3.1-mile radius of France’s 19 nuclear power plants.
Dr Ian Fairlie  An independent consultant on radioactivity in the environment.  20 January 2012

New French study on childhood leukemias near nuclear power plants
Geocap study confirms findings in Germany, Great Britain, and Switzerland

'The Madness of Nuclear Energy’ Volume 29 No 7 November 1999 - printed copy ‘The Ecologist’
on line at  http://www.theecologist.org/back_archive/19701999/
Best publication on all aspects of nuclear energy including health detriment, political cover-ups, new build
propaganda etc.

Westlakes Scientific Consulting: Professor Steve Jones.
This large study of 65,000 men employed at Sellafield reprocessing plant between 1946 and 2002 found the
risks of death from heart attacks and strokes increased with exposure to higher levels of radiation.

American Journal of Industrial Medicine, December 2007
Authors: Dr David B Richardson, University of North Carolina.
This study is of 19,000 employees of the Savannah River Site, South Carolina which has processed nuclear
materials since the 1950s. It found excess leukaemia and pleural cancers among men and elevated rates of
kidney and skin cancers in women.

Are Radiation Risks Overrated?  Should Radiation Dose Limits be Relaxed
Author: Dr Ian Fairlie An independent consultant on radioactivity in the environment.  24 November 2011

Infant and Perinatal Mortality and Stillbirths near Hinkley Point Nuclear Power Station 1993-2005
Authors: Chris Busby, Mireille de Messieres, Saoirse Morgan
Occasional Paper 2007/6 Publisher: Green Audit, Aberystwyth July 2007

Part 1 Breast Cancer’
Authors: Chris Busby PhD, Paul Dorfman BSc, Helen Rowe BA.

‘Cancer Mortality and Proximity to Oldbury Nuclear Power Station in Gloucestershire 1995-1999’
Authors: Chris Busby PhD, Paul Dorfman BSc, Helen Rowe BA, Bruce Kocjan BSc

‘Cancer Mortality and Proximity to Hinkley Point Nuclear Power Station in Somerset 1995-1998 Part
3 All Malignancies, Lung and Stomach Cancer. Summary’
Authors: Chris Busby PhD, Paul Dorfman BSc, Helen Rowe BA.

‘Leukaemia Incidence in Somerset with Particular Reference to Hinkley Point Nuclear Power
Station.’  Taunton: Somerset Health Authority: Bowie C and Ewings P C 1988
Also referred to in the above ‘All Malignancies…’ paper by Dr Busby.

‘Incidence of Leukaemia in Young People in the Vicinity of Hinkley Point Nuclear Power Station
1959-1986’  Authors: Ewings P D, Bowie C, Phillips M J, Johnson S A
British Medical Journal 1989;299(6694):289-93

‘Low Levels of Ionizing Radiation May Cause Harm’ Authors: Richard R Monson, James S Cleaver
The National Academy of Sciences, BEIR VII report June 29 2005
This source quoted in ‘Nuclear Power is not the Answer’ by Helen Caldicott links radiation exposure to
heart attacks and strokes.

This report provides strong biological and epidemiological evidence that current models of hazard from
radioactivity inside the human body underestimate risks by at least 100 and possibly up to 1000 times.
Doses to the Embryo and Foetus from Intakes of Radionucleides by the Mother

German Federal Office for Radiation Protection (BfS) 2007
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2696975/
BfS commissioned this University of Mainz study which found that between 1980-2003, 77 children developed cancer near 16 nuclear sites, against a statistical average of 48. The German Federal Minister for Environment, Sigmar Gabriel, has now asked the Radiation Protection Commission to undertake a follow up study into causalities between nuclear power plants and leukaemia in children.

‘Meta-Analysis of Standardized Incidence and Mortality Rates of Childhood Leukaemia in Proximity to Nuclear Facilities 2007’
Medical University of South Carolina, Charleston, SC, USA. © 2007 Blackwell Publishing Ltd.

Radiation and Health Science for Democratic Action August 2009
http://www.ieer.org/sdafiles/16-1.pdf
Nuclear power plants generate tritium in the course of their operation and release it both to the atmosphere and to water bodies. Releases of tritiated water vapor from the stacks of nuclear power plants can result in radioactive rainfall, which can contaminate surface water bodies as well as groundwater. As radioactive water, tritium can cross the placenta, posing some risk of birth defects and early pregnancy failures. In this article we will only discuss tritium in the form of radioactive water.

ISBN: 1 897761
‘ECRR 2003 Recommendations of the European Committee on Radiation Risk’
Health Effects of Ionising Radiation Exposure at Low Doses for Radiation Protection Purposes.
Covers the problems with using Hiroshima data to set current health risk levels now that we know internal exposure to low radiation levels by inhalation and ingestion disrupt cell replication cycles and interfere with human DNA.

‘ECRR Chernobyl: 20 Years On – Health Effects of the Chernobyl Accident’
Editors: C C Busby and A V Yablokov
An invaluable archive of contributions from Russian and European scientists on the true effects the Chernobyl accident had and continues to have on the exposed populations, including those in Scandinavia and the UK.

Evidence of Significant Enriched Uranium atomic fuel contamination of the Hinkley Point nuclear site in Somerset and its potential implications.
Authors: Dr Chris Busby, Cecily Collingridge
Occasional Paper 2011/1 Aberystwyth: Green Audit January 2011
‘Nuclear Power is Not the Answer’ by Helen Caldicott 2006 Price about £14

March 2012: Hinkley C: EDF have applied to the IPC for permission to build two new EPR (European Pressurised Water) Mox Burning Reactors at Hinkley Point, Somerset. Go to website http://largeassociates for extracts from John Large’s October 2008 lecture on dangers to Somerset communities from EPRs.

UK and European publications can be sourced from: Green Audit, Aberystwyth, SY23 1DZ, Wales or from The Low Level Radiation Campaign Bramhall@llrc

Nuclear Reading List compiled by PCAH (Parents Concerned About Hinkley) xxxx
REFERENCES FOR KIKK STUDY INTO CHILDHOOD CANCERS

32. Personal communication from Dr A Körblein.
34. Laurier D, Jacob S, Bernier MO, Leuraud K, Metz C, Samson E, Laloi P:
4

Figure Legends
Figure 1. Annual averages of tritium concentrations in air measured at distances from nuclear power stations in Canada, 1985–1999

Figure 2. Tritium concentrations in vegetation / food moisture near Canadian nuclear power stations

Figure 3. Quarterly 14C air concentrations near the Neckarwestheim 2 nuclear power station in Germany
Abstracted from Jahresbericht (Annual Yearbook) 2007: Bundesamt für Strahlenschutz, Berlin, Germany.

Tables
Table 1 Leukemia mortality risks Source: Baker and Hoel, 2007[31]
Table 2 KiKK odds ratios for leukemias in children < 5 years old
1.02
Source: continuous regression model used by Kaatsch et al, 2008[5]
Table 3 Summary of Bradford Hill test results
Age Groups
0-9 0-9 0-25 0-25
Distance from reactor - km Mean distance - km
>5
5 to <10 10 to <30 30 to <50 50 to <70 >70
Bradford Hill Guideline
1 Strength  2 Consistency  3 Specificity  4 Temporality
5 Biological gradient  6 Plausibility  7 Coherence
8 Experiment/animal studies other experimental evidence available similar evidence from other studies
9 Analogy
Proximity to nuclear facility Leukemia mortality
1.05 All distances
Under 16 km 1.24
1.02 All distances
Under 16 km 1.18
Odds ratio
1.76 3
8 1.26
1.10 18
37 1.05
1.03 57
74
Result Explanation
yes numbers large enough not to be chance observation
yes association observed by different persons, in different places and times
yes association limited to specific people/areas/effects
yes
yes
effects occur after exposure
association has biological gradient or
dose–response relationship
suspected causation fits biological no
knowledge of the day
suspected causation accords with natural no
history and biology
not available
yes
Figure 1
Figure 2
Figure 3
Infant and perinatal mortality in Somerset
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<td>Data source</td>
<td>Office for National Statistics death and birth registrations data</td>
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<td>Notes</td>
<td>Update to SWPHO Briefing 3 in response to ad hoc request</td>
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Infant and perinatal mortality in Somerset

- Somerset has a perinatal mortality rate (6.9 per 1,000 births in 2007-09), which is not significantly different from either the South West (6.5) or England (7.6).

- Somerset has an infant mortality rate (3.9 per 1,000 live births in 2007-09), which is not significantly different from either the South West (3.8) or England (4.5).

- Both perinatal and Infant mortality rates in Somerset and its constituent Local Authority Districts are not significantly different from either England or the South West. The two Districts closest to Hinkley Point – Sedgemoor and West Somerset- have perinatal and infant mortality rates which are no higher than the other Districts. As the number of infant deaths is small a chance event can give the impression of a meaningful increase.

Figure 1: Trends in the number of infant and perinatal deaths in Somerset, 1995-2009:

![Chart showing trends in infant and perinatal deaths in Somerset from 1995 to 2009.]

Table 1: The number of infant and perinatal deaths in Somerset, 1995-2009:

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Explaining annual variation:

- Single year’s data for events that are small in number can appear to show variation year on year which can be difficult to interpret.
• Figure 2 below shows the perinatal deaths for Somerset in the period from 1995 to 2009 with the median, lower quartile and upper quartile values.

• The chart shows only two individual years where the number of perinatal deaths has exceeded the variation we might expect. In 1997 there were 45 perinatal deaths in Somerset and in 2009 (53), both higher than the upper quartile value (42).

• The chart shows the number of deaths decreasing in the five years following the peak in 1997. The SWPHO will monitor this dataset to see whether in 2010 the number of perinatal deaths decreases from the 2009 peak.

**Figure 2: Trends in the number of perinatal deaths in Somerset, 1995-2009:**

Definitions:

• The perinatal mortality rate is the number of stillbirths plus the number of deaths at ages under one week per 1,000 live births and stillbirths.

• The infant mortality rate is the number of deaths at ages under one year, per 1,000 live births.

Source:

Office for National Statistics death and birth registrations data.
Spikes in Emissions from Nuclear Power Stations (NPPs)

Up until very recently, it had proved impossible to obtain information on the time patterns of radioactive emissions from NPPs. Despite requests, UK nuclear utilities and Government regulators repeatedly refuse to publish any time-related data: annual emissions, OK; but not monthly, weekly, daily, or hourly emissions.

Is this important? Yes. I’ve suspected for some time that most nuclide emissions from nuclear reactors are not spread evenly across the whole year but during short refuelling episodes which occur about once a year and which last a few days or so.

These short spikes could explain a matter which has puzzled radiation protection agencies for decades – the reason for the apparent increases in childhood leukemias near NPPs all over the world. Governments have insisted that these increased leukemias could not be caused by radioactive emissions from NPPs as their estimated radiation doses were 100-1000 times too low. But as I will show, these estimates are riddled with uncertainties and they don’t take the time patterns of radioactive emissions into account.

Gundremmingen NPP

In September 2011, International Physicians for the Prevention of Nuclear War (IPPNW) in Germany released a press notice which contained data on half-hourly releases of radioactive noble gases from an NPP for the very first time anywhere in the world.

This is shown in the chart below for 7 days in September 2011. These data were from Gundremmingen NPP – a BWR reactor in Bavaria in Southern Germany. The chart showed that the normal emission concentration (of noble gases) during the rest of the year was about 3 kBq/m³, but during refuelling on September 22 this sharply increased to ~700 kBq/m³ with a peak of 1,470 kBq/m³. In other words, a spike. This data shows that NPPs emit much larger amounts of radioactive noble gases during refuelling than during normal power operation. From the new data, Nuremberg physicist and statistician, Dr Alfred Körblein, estimates that, at its maximum value, the concentration of noble gas emissions during refueling was 500 times greater than during normal reactor operation. He also estimates that about two thirds of the NPP’s annual emissions occur during refuelling.
In May 2011, German Green MPs entered the Bavarian State Parliament (Landtag) for the first time where they formed the Government in coalition with the Socialist Party (SPD). After several requests, the new Bavarian Government insisted that the state nuclear regulator release non-averaged data on emissions. The (highly reluctant) nuclear regulator was compelled to respond. In other words, the Green MPs obtained the data because they had the political power to force its release: there is a lesson here for British environmentalists.

**Why is this data important?**

In order to refuel, reactor pressure vessels must be opened up: this releases large volumes of radioactive gases and vapours to the local environment. These include noble gases, H-3 (tritium), carbon-14, and iodine-131. Until now, nuclide amounts had only been published as annual averages throughout the world. Now, non-averaged values have been made available for scientific evaluation for the first time.

**Could these spikes explain leukemia increases near NPPs?**

Yes. People living near nuclear power stations and downwind from them will be exposed to high doses of radiation during these emissions spikes – much higher than from releases during the rest of the year. Estimates range from 20 to 100 times higher. Recently the UK National Dose Assessment Working Group published guidance on “Short Term Releases to the Atmosphere” [http://www.ndawg.org/documents/NDAWG-2-2011_000.pdf](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. The precise amount will depend on many factors, including source term, proximity to the reactor, wind speed, wind direction, and the diets and habits of local people.

The point is that even before the new data, we didn’t have a good handle on the doses to local people. Official estimates of radiation doses from NPPs contain many uncertainties. This is discussed in the 2004 CERRIE Report (www.cerrie.org) – a UK Government Committee which showed that dose estimates from environmental releases depended on many computer models and the assumptions they contained. The new information on radioactive spikes adds to the uncertainties.

Therefore higher doses from emission spikes could go a long way to explaining the increased incidences of child leukemias near NPPs shown by the KiKK findings. IPPNW Germany warns of the probable health impacts of such large emission spikes. “Especially at risk are unborn children. When reactors are open and releasing gases, pregnant women can incorporate much higher concentrations of radionuclides than at other times, mainly via respiration” said Reinhold Thiel, member of the German IPPNW Board. “Radioactive isotopes inhaled by the mother can reach the unborn child via the blood and placenta with the result that the embryo/ fetus is contaminated (‘labelled’) by radioactive isotopes. This contamination could affect blood-forming cells in the bone marrow later resulting in leukemia. This provides a plausible explanation for the findings of the KiKK study.
published in 2007 and 2008 that under-fives living near NPPs are considerably more at risk of cancer, particularly leukemia, than children living further away” Thiel added.

In the light of the new 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.

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\(^{a}\) Bq kg\(^{-1}\) radioactivity concentration
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obtained in 2008 (0.006 mSv). The decrease in dose in 2009 was due to lower concentrations of carbon-14 in milk and no detectable activity of caesium-137 in any foods. Assuming that high-rate vegetable consumers obtain all of their supplies from monitored plots near Hinkley, the dose in 2009 from the use of seaweeds as fertilisers and soil conditioners was estimated to be much less than 0.005 mSv.

The dose to local fishermen, who consume a large amount of seafood and are exposed to external radiation over intertidal areas, was 0.046 mSv, which was less than 5 per cent of the dose limit for members of the public of 1 mSv (Table 4.1). This estimate also includes the effects of discharges of tritium and carbon-14 from Cardiff and uses an increased tritium dose coefficient (see Appendix 1). The increase in dose, from 0.037 mSv (in 2008), was due to the enhanced gamma dose rates at Stolford. There is no site related reason to account for the variation in dose rates and the change may be due to variations in either or both of the type of substrate measured or natural radiation. Trends in doses in the area of the Severn Estuary are shown in Figure 6.5. The total dose at Hinkley, which includes contributions from all relevant sources including direct radiation, was 0.055 mSv (Table 4.1), or less than 6 per cent of the dose limit. Adult mollusc consumers were the most exposed people, although the bulk of their dose was via external gamma dose from spending a large amount of time on local beaches (Table A4.2). The increase in total dose from 0.045 mSv in 2008 was due to an increased gamma dose rate on beaches in the area, and continues the upward trend since 2007.

4.7 Sizewell, Suffolk

The two Sizewell Power Stations are located on the Suffolk coast, near Leiston. The A station has two Magnox reactors whilst the B station is the UK's only commercial PWR power station. The B station began operation in 1995 and it is estimated that it will end power generation by 2035. Sizewell A power station ceased to be an electricity generator in 2006 and is due to be decommissioned. Current plans are for Sizewell A to be de-licensed (released from regulatory control), with final closure to be completed by 2110. In September 2009, British Energy submitted an Environmental Scoping Report to DECC. The report outlined the nature and purpose of British Energy's proposed spent fuel management strategy, for Sizewell B, which options included on-site storage in a dry fuel store from 2015, when the current fuel ponds will reach capacity (British Energy, 2009). The most recent habits survey for Sizewell was undertaken in 2005 (Clyne et al., 2006).

Gaseous discharges and terrestrial monitoring

Gaseous wastes are discharged via separate stacks to the local environment. In 2009, discharges of tritium from Sizewell A were reduced in comparison to 2008; discharges of iodine-131 from Sizewell A increased. The results of the terrestrial monitoring in 2009 are shown in Table 4.8 (a). Gamma-ray spectrometry and analysis of tritium, carbon-14 and sulphur-35 in milk, crops and fruit generally showed very low concentrations of artificial radionuclides near the power stations in 2009. Tritium concentrations in local freshwater were all low. Gross alpha and beta activities in surface waters were less than the WHO screening levels for drinking water, except at the nature reserve. The gross beta activity at the reserve was not below the WHO recommended value 1.0 Bq l⁻¹, but is not known to be used as a source of drinking water. In October 2009, the site operators at Sizewell B reported that the quarterly notification levels for carbon-14 and iodine-131 had been exceeded. The Food Standards Agency carry out additional analyses for iodine-131 on weekly milk samples from routine monitoring. No elevated concentrations of carbon-14 were found in combined monthly samples, and iodine-131 activities were below the LoD during the period.

Liquid waste discharges and aquatic monitoring

Regulated discharges of radioactive liquid effluent are made via outfalls to the North Sea. In the aquatic programme, analysis of seafood, sediment, sand and seawater, and measurements of gamma dose rates in intertidal areas were conducted. Data for 2009 are given in Tables 4.8(a) and (b). Concentrations of artificial radionuclides were low and mainly due to the distant effects of Sellafield discharges and to weapons testing. Tritium concentrations in seafood were all below the limits of detection. Measured gamma dose rates in intertidal areas were difficult to distinguish from the natural background, including at Sizewell beach where direct radiation from the A station is known to have had a local effect in recent years.

Doses to the public

The estimated dose to people who consume locally grown foodstuffs at high-rates was less than 0.005 mSv. After making an allowance for non-food pathways, arising from discharges to air, (see Appendix 1), the dose in 2009 was the same at less than 0.005 mSv which is less than 0.5 per cent of the dose limit for members of the public of 1 mSv. In 2009, the radiation dose to people who consume large quantities of local fish and shellfish was less than 0.005 mSv, which was less than 0.5 per cent of the dose limit for members of the public of 1 mSv (Table 4.1). There has been no significant variation in doses to seafood consumers in recent years (Figure 4.2). They have remained consistently below 0.005 mSv. The total dose from all sources was assessed (using methods in Appendix 4) to be 0.026 mSv in 2009 (Table 4.1) or less than 3 percent of the dose limit, and a decrease from 0.031 mSv in 2008. The dominant contribution to total dose at this site is from direct
Doses to the public

The estimated dose for high-rate terrestrial food consumers was less than 0.005 mSv. After making an allowance for non-food pathways, arising from discharges to air (see Appendix 1), the dose was 0.005 mSv, which was 0.5 per cent of the dose limit for members of the public of 1 mSv (Table 4.1). This is similar to the value in 2008. The dose in 2009 to local fishermen, who consume a large amount of seafood and are exposed to external radiation over intertidal areas, was 0.041 mSv, which is approximately 4 per cent of the dose limit for members of the public of 1 mSv (Table 4.1). This is similar to the value in 2008 (0.042 mSv), however the contribution to dose from gamma dose rates increased whilst the contribution to dose from consumption of molluscs decreased. Trends in aquatic doses from power stations are shown in Figure 4.2. The total dose from all sources (using methods in Appendix 4) was assessed to have been 0.049 mSv in 2009 (Table 4.1), up from 0.046 mSv in 2008. This was approximately 5 per cent of the dose limit for members of the public. The most exposed people are those adults who spend a large amount of time on sand and sediments. The increase in dose in 2009 is due to higher gamma dose rates over local beaches.

4.6 Hinkley Point, Somerset

Hinkley Point Power Station is situated on the Somerset coast, west of the River Parrett estuary. There are two separate A and B nuclear power stations which comprise of two Magnox reactors and two AGRs, respectively. Hinkley Point A started electricity generation in 1965 and ceased in 2000. This station completed defueling in 2004 and is undergoing decommissioning. Current plans are for the site to be de-licensed (released from regulatory control), with final closure to be completed by 2104. It is estimated that Hinkley Point B will end power generation by 2016. Environmental monitoring covers the effects of the two power stations together. The most recent habits survey was undertaken in 2006 (Clyne et al., 2007).

Gaseous discharges and terrestrial monitoring

Gaseous radioactive waste is discharged via separate stacks to the local environment. Discharges of carbon-14 and sulphur-35 from Hinkley Point B decreased in 2009 in comparison to 2008, but remained higher than releases in 2007. Discharges of tritium from Hinkley Point B increased in 2009. Analyses of milk, crops and fruit were undertaken to measure activity concentrations of tritium, carbon-14, sulphur-35 and gamma emitters. Local reservoir water samples were also taken and analysed. The use of seaweeds as fertilisers and soil conditioners was assessed to investigate transfer of radionuclides from sea to land. Data for 2009 are given in Table 4.7(a). Activity concentrations of tritium and gamma emitters (including caesium-137) in terrestrial materials were below the limits of detection. Sulphur-35 from Hinkley Point B was detected at low concentrations in some of the food samples. A few of the carbon-14 concentrations were higher than the default values used to represent background levels (Appendix 1), but this did not include samples in milk in 2009. Reservoir water contained alpha and beta activities less than WHO screening levels for drinking water. Sea to land transfer data for vegetables and soil which had added seaweed (as compost) showed no evidence for uptake of activity concentrations in foodstuffs.

Liquid waste discharges and aquatic monitoring

Regulated discharges of radioactive liquid effluent from both power stations are made via separate outfalls into the Bristol Channel. Analyses of seafood and marine indicator materials and measurements of external radiation over intertidal areas were conducted. Measurements of tritium and carbon-14 are made primarily to establish the local effects of discharges from the GE Healthcare plant at Cardiff. The environmental results for 2008 are given in Tables 4.7(a) and (b). Where results can be compared, the concentrations observed in seafood and other materials from the Bristol Channel were generally similar to those in 2008 (see also Figure 4.1). Concentrations of tritium in fish and shellfish were slightly enhanced in comparison to recent years. Further information on tritium concentrations in seawater from the Bristol Channel is given in Section 8. Concentrations of other radionuclides in the aquatic environment represent the combined effect of releases from these stations, plus other establishments that discharge into the Bristol Channel. Other contributors to the aquatic environment are Sellafield, GE Healthcare at Cardiff, weapons tests and Chernobyl fallout. Apportionment is generally difficult at the low concentrations detected. However, the majority of tritium and carbon-14 in seafood was likely to have been due to disposals from GE Healthcare, Cardiff. The concentrations of transuranic nuclides in seafoods were of negligible radiological significance. Gamma radiation dose rates over intertidal sediment were generally similar to measurements in 2008, although some small differences (at the same locations) were noted because rates were measured on different types of substrate from one year to the next. For example, for this year, the overall rates at Stolford were marginally increased in comparison to 2008 (measurements all taken over mud and rock), due to the inclusion of a measurement over mud in 2009.

Doses to the public

In 2009, the estimated dose for high-rate terrestrial food consumers was less than 0.005 mSv, which included a component due to non-food pathways arising from discharges to air (see Appendix 1). This was 0.5 per cent of the dose limit for members of the public of 1 mSv (Table 4.1). This represents a small decrease in the dose in comparison to the value
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Read RIFE 16 Report (main text)
Read RIFE 16 Report (Appendix 1)
Data from 2010 Total Dose Assessments

View earlier reports

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Figure 12. Individual radiation exposures around nuclear power stations from aquatic pathways for artificial radionuclides (2004-2008) (Small doses less than or equal to 0.005 mSv are recorded as being 0.005 mSv)