Nuclear Free Local Authorities
briefing

**Date:** 4th February 2012 **No.94**

**Subject:** **OSPAR Commission Radaition Substances Committee 2012 – NFLA / KIMO joint reports on Floating Nuclear Power Plants, Fukushima and UK new nuclear build**

## 1. Introduction – NFLA / KIMO co-operation

Since 2010, the Nuclear Free Local Authorities (NFLA) have worked to an agreed Memorandum of Understanding with the local authority marine pollution group KIMO International. This agreement allows for NFLA to provide specialist nuclear policy advice to KIMO International and joint support for putting forward common areas of concern to appropriate forums, including the OSPAR Commission. This briefing outlines 3 reports to the 2012 OSPAR Radiation Substances Committee.

In 2011 the NFLA provided KIMO members with a detailed briefing and pro-active actions around concerns over a proposed transport of radioactively contaminated steam generators from Canada to Sweden, passing near to the shoreline of many KIMO members. This international campaign has proved, at least in the interim, successful, as the deadline for moving the generators has just expired and will now need to be reapplied for by the Canadian nuclear operator Bruce Power (see NFLA Policy Briefing 85).

The NFLA Secretary also provided KIMO members with a detailed presentation on the marine pollution effects of the Fukushima incident at the 2011 KIMO Conference.

In return, KIMO has funded the NFLA Secretary to attend the 2011 and 2012 OSPAR Radiation Substances Committee meetings. KIMO officers also spoke at NFLA meetings in Fingal and Newry around a KIMO study of the amount and type of radioactive material shipments across Northern Europe.

## 2. The OSPAR Commission Radiation Substances Committee

The OSPAR Commission was established in 1998 by 12 Western European states to seek to develop co-operation in the improvement of the marine environment of the North East Atlantic. Member states include the United Kingdom, the Republic of Ireland, France, Germany, Belgium, Netherlands, Norway, Sweden, Denmark, Spain, Portugal and Switzerland.

Amongst its sub-committees include the Radiation Substances Committee (RSC), which seeks to deal with all nuclear policy issues relating to the marine environment of the North East Atlantic, and to develop the Treaty commitment to reduce radioactive discharges in the region to ‘close to zero’ by 2020. International NGOs are entitled to ‘observer’ status at



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the OSPAR Commission meetings, and KIMO International has such official status.

## 3. OSPAR RSC 2012, IAEA offices, Vienna International Centre

The OSPAR RSC meets on an annual basis and the 2012 meeting was hosted in the International Atomic Energy Offices in Vienna on the 31st January – 2nd February 2012. The KIMO Secretary and the NFLA Secretary attended the meeting, representing KIMO International. The French NGO 'Robin de Bois' and the World Nuclear Association also observed the meeting.

The meeting included some detailed discussion on defining crucial concepts such as 'historic levels of legacy waste', 'close to zero' and 'background radiation' – it was agreed that an inter-governmental communications group would continue to define these concepts and report back to OSPAR 2013. A report of the meeting will be drafted for the next KIMO International Board meeting and the March 2012 NFLA Steering Committee meeting.

The rest of this briefing will outline three reports that KIMO / NFLA put forward for consideration to the OSPAR RSC on the following nuclear policy areas:

- The development by Russia of floating nuclear power plants, and initial developments of submerged nuclear power plants in France.
- Learning points for the OSPAR RSC to consider from the Fukushima incident.
- An overview of marine pollution issues from a proposed UK new nuclear build programme.

The reports follow as Appendix 1, 2 and 3 with an additional note on the action taken by the OSPAR RSC. It should be noted that, as KIMO International has only observer status at OSPAR RSC, it has to seek official support from one of the contracting parties (the 12 national government delegations) to endorse specific actions from each report (apart from providing a useful informative role to the Committee). Despite pre-lobbying this proved unsuccessful and so the actions to the reports are not as expansive as either the NFLA or KIMO would have liked. However, some useful actions did come out of the reports. KIMO and NFLA were also able to provide its comments and concerns to other parts of the OSPAR RSC policy agenda, as will be outlined in a separate report to its respective board meetings.

It should also be noted that two of the reports were provided with assistance from Greenpeace International, and both KIMO International and NFLA welcome this useful and valuable co-operation.

## 4. Acknowledgements

The NFLA Secretary would like to thank the KIMO Secretary, Harriet Bolt, for co-operation with the meeting. The NFLA Secretary would also like to thank Dr David Santillo, who provided useful assistance and background detail on behalf of Greenpeace International, with additional support from Greenpeace UK and Greenpeace Japan.

## 5. OSPAR RSC 2013

It was confirmed that the OSPAR RSC meeting in 2013 will take place in The Hague, the Netherlands. The NFLA will discuss later in the year with KIMO the level and type of co-operation it can provide to support KIMO at the meeting.

**Appendix 1**

# Concerns on Floating Nuclear Power Plants - Update

## Submitted by KIMO International, NFLA and Greenpeace International

Recent developments in nuclear energy technology are concerning for the integrity of the marine environment in the OSPAR region. At the last RSC meeting, recent activities were noted by KIMO International and Greenpeace International in Russia and France to develop technologies that would move nuclear energy production plants from their conventional, established land-based locations to offshore marine environments, greatly increasing risks to and through those environments. These developments have serious implications for the OSPAR area, and in this paper KIMO International and Greenpeace International seek to provide an update on these issues to the RSC.

### Background

1 As noted at the last OSPAR RSC, Russia is seeking to construct the first vessel in a new fleet being built to generate nuclear power in the Arctic Ocean. Work has been underway since contracts were drawn up in 2006 and the first floating nuclear power station (FNPS) (referred to by the IAEA as transportable nuclear power plants or TNPP's) was due for completion in early 2012. However, due to severe financial problems at the shipyard in St Petersburg - the shipyard's owner had gone bankrupt - construction has been delayed. The new Baltic Shipyard company that has been created from the assets of the bankrupt firm has been given a contract from the Russian nuclear energy company, Rosatom, to build a new FNPS, with support from the Russian Government (1).

2 The first $400M vessel is part of a planned seven-strong fleet to be located off Russia's northern coastline to supply energy to onshore consumers. Each FNPS is estimated to be capable of producing enough heat and electricity for 45,000 homes and will be capable of remaining at sea for up to 12 years at a time.

3 Although the risk of catastrophic impacts does not, in these cases, relate primarily to the transport of spent nuclear material, the fact that these are functioning nuclear reactors whose presence is intended to be for long-term deployment in remote and hostile environments means that, in the event of an accident, the scale of impacts could be widespread, severe and extremely difficult to contain and remediate.

4 At the end of November 2011, a round-table meeting was held in Chengu, Sichuan province between Rosenergoatom, designer OKBM Afrikantov and the China National Nuclear Corporation (CNNC), and its subsidiary the Nuclear Power Institute of China. The purpose of the meeting was to seek Chinese co-operation and investment in these plants. According to *World Nuclear News* (2), China is interested in deploying FNPS's for offshore oil and gas platforms and for servicing remote communities. China is also interested in the propulsion of large cargo ships carrying heavy goods like iron ore, powered by small nuclear reactors, a distinct issue though clearly one which raises many similar concerns.

5 The first vessel designed to carry a floating nuclear power plant, the *Academician Lomonosov* is now at an advanced level of construction in the Port of St Petersburg. The barge has been completed and is afloat, and main power systems have been fitted. Once completed, it will be manoeuvred along rivers and canals to the Arctic Sea and thence towed to the town of Vilyuchinsk on the Pacific coast (3). It would appear it will **not** now be floated through the Baltic Sea and via the North Sea to the city of Murmansk, as was originally proposed. Criticisms of the plan highlight that current energy supply in the Kamchatka region already outstrips demand. There is also a general lack of adequate infrastructure in the region, raising questions over the choice of location for the vessel, which may be due to it being in close proximity for marketing purposes to the booming Asian economy.

6 As noted in the KIMO International / Greenpeace International report to the last RSC meeting (4), should expansion of the fleet occur in the Arctic Ocean, considerable risks will be imposed on the OSPAR region. The transpolar ocean current moves south from the Arctic into the OSPAR region past the east coast of Greenland. If a nuclear accident involving an Arctic-based FNPS was to occur, it is clear that the OSPAR region would be at significant risk of pollution. Moreover the Port of St Petersburg, where the first of the FNPS is currently undergoing construction works; may subsequently be used by the vessels for maintenance and refuelling, thus raising the possibility that a FNPS is ultimately transported by sea through the OSPAR region.

7 The rate of accidents on-board nuclear vessels is a clear justification for being concerned about the development of FNPS. The reactors proposed so far are based on the KLT-40 naval propulsion reactors that are used in Russian icebreakers, and are similar to those used in Russian submarines, which have had 14 accidents involving the release of radiation (5).

8 Along with risks in the operation of this fleet of vessels, KIMO International and Greenpeace International are also gravely concerned about the potential for FNPS being produced for sale on the open market. If successful, these vessels may end up being exported to other nations throughout the world, with greater uncertainty and increased risk to marine environments, including the OSPAR region. The recent co-operation between Russia and China clearly suggests the preferred aim is for these to be a successful commercial activity with floating reactors and nuclear power ships in common use across the globe.

9 KIMO International and Greenpeace International understand that the IAEA has prepared a draft document entitled “Legal and Institutional Issues for Transportable Nuclear Power Plants” (which focuses on issues including ownership, contracts, practicalities relating to design and deployment and the implications for the infrastructure of recipient countries), and that this is currently undergoing internal review by the IAEA’s Office of Legal Affairs. We also note, however, that this work is being conducted under the IAEA’s remit to “identify key enabling technologies necessary to achieve competitiveness and reliable performance”, rather than with over-riding focus on the protection of the marine environment from the risks of such developments.

10 KIMO International and Greenpeace International also wish to take the opportunity to remind the RSC of its concerns raised at the last meeting on the DCNS / Areva concept of developing submerged nuclear power plants designed to be transported and positioned on the seabed in order to serve coastal communities and infrastructure. Since these proposals were made public in early 2011, and despite discussions at the last OSPAR RSC, little has since been reported about the concept.

**Risks, Security and Emissions**

11 The very fact that floating nuclear power plants are being developed is concerning. In the case of a catastrophic accident in which the core was exposed to seawater, the result would be a thermal explosion that would hugely increase the amount of radiation emitted both to the marine environment and the atmosphere. Furthermore, the huge damage to the Fukushima reactors from a tsunami is indicative of the catastrophic effects that could happen from a natural disaster occurring in an area in which one or more FNPS were stationed. A tsunami or a large storm event would also pose a threat to such facilities whether *in situ* or whilst being transported, especially in the particularly harsh environment of the Arctic Ocean.

12 By implication, the obvious problems in providing an effective emergency response in the event of a natural disaster or serious breach of such a facility need to be fully taken into account. It is clearly the aim of Rosenergatom to locate these developments in remote areas. In the event of an accident, it is foreseeable that it could take several days to reach the FNPS,

during which time serious marine pollution would have already taken place and opportunities for containment, mitigation and remediation may have been lost.

13 Transportation by river, canal or the open seas itself raises considerable safety issues about terrorism, piracy and accidents. As was noted at the last RSC, the reality of such threats was highlighted with the hijacking in the Baltic of the ship *Arctic Sea*, which was boarded and taken over by masked men posing as Swedish Police in 2009 (6).

14 According to proposals, floating nuclear power plants would be refuelled at sea every three years with highly enriched fuel, which, apart from being a major proliferation risk in and of itself, also increases the possibility of an accident. Then every 12 years the whole plant would need to be transported back to port, currently St Petersburg, for removal of radioactive waste.

**Action requested**

15 Given the increased risks to the marine environment from the operation, transport and refuelling of these types of transportable nuclear reactors, including risks to the maritime area covered by the OSPAR Convention, KIMO International and Greenpeace International request that the Radiation Substances Committee highlight the above concerns to the OSPAR Commission, to propose that parties to the OSPAR Convention consider a prohibition on their development and use within the OSPAR maritime area. The RSC is also requested through the OSPAR Commission to recommend that Parties to HELCOM do likewise.

16 In addition, and following on from discussions at the last meeting of RSC, KIMO International and Greenpeace International request an update from the delegation of France on whether any further research has been undertaken, or any decisions taken, regarding the DCNS / Areva concept of developing submerged nuclear power plants.

**References**


(1) Russia Today, 5th December 2011. http://rt.com/business/news/shipyard-bankruptcy-project-investment-067

(2) World Nuclear News, 8th December 2011. http://www.world-nuclear-news.org/newsarticle.apsx?id=31322&terms=floating%20nuclear%20power%20plants

(3) World Nuclear News, see reference (2).

(4) Joint KIMO International / Greenpeace International report to the 2011 OSPAR RSC.

(5) See Bellona.org website – http://www.bellona.org/articles/articles_2011/vaygach_fire

(6) See http://www.guardian.co.uk/world/2009/sep/24/artic-sea-russia-pirates


**OSPAR RSC 2012 discussion on this paper:**

- **OSPAR RSC agreed to keep this ongoing issue on its agenda and seek greater clarification from Russia on the development of floating nuclear power plants through the parallel HELCOM Forum (for eastern Europe).**
- **OSPAR RSC did not agree to recommend to the OSPAR Commission to prohibit development and use of such facilities in the OSPAR region.**
- **The French delegation reported that development of submerged nuclear power plants was only at a very early design stage and has not been considered yet for further development. OSPAR RSC agreed to keep this ongoing issue on its agenda.**

**Appendix 2**

# Fukushima Daiichi incident – potential learning points for OSPAR RSC to consider

**Submitted by KIMO International, NFLA and Greenpeace International**

The major radiation leak and destruction of a number of reactors at the Fukushima Daiichi nuclear power plant disaster, following the earthquake and tsunami that hit north eastern Japan on March 11th 2011 has had a considerable marine environmental impact into the Pacific Ocean. This joint paper seeks to provide OSPAR RSC members with independent information on the marine impact of the disaster and its implications for Europe. It also urges OSPAR RSC to consider what learning points need to be put into place for its own operations in order to protect the OSPAR marine region.

## Background

1. The Fukushima nuclear power plant disaster has been classified by the Japanese Nuclear and Industrial Safety Agency (NISA) as the worst nuclear incident since the Chernobyl disaster. Based on the amount of released radiation, both incidents have been officially recognized as International Nuclear Events Scale (INES) level 7, the highest and most severe category on the IAEA's international scale. What clearly differentiates the Fukushima nuclear disaster from the Chernobyl disaster is that, by being a coastal located nuclear facility, it has had a considerable negative effect on the marine environment of North East Japan and the Pacific Ocean. Researchers at the Japan Atomic Energy Agency, Kyoto University and other institutes estimated that about 15,000 trillion Bq of radioactivity (from iodine-131 and cesium-137) was released into the sea from late March through April, including substantial airborne fallout[1]. Another study, by France's Institut de Radioprotection et de Sûreté Nucléaire (IRSN), put the discharge of just caesium 137 at 27,000 trillion Bq [2].

2. According to the official reports of the IAEA and the Japanese Government, after substantial damage to the reactors by a 9.0 earthquake, four of Fukushima Daiichi's six reactors were extensively damaged by a 14 metre tsunami, which crashed over the coastal seawalls and smashed into the reactor buildings. The Fukushima facility had not been constructed to withstand a natural disaster of this magnitude, with coastal walls built for a maximum tsunami wave of 6.1 metres. Full meltdown of 3 of the reactors soon followed, leading to the largest peacetime evacuation in Japanese history. It is also important to note the wider catastrophic destruction that the earthquake and the tsunami also brought – 23,773 people died or remain missing, 88,873 houses were badly damaged or completely destroyed, 3,970 roads and 71 bridges were damaged or completely destroyed. In the 20 kilometres exclusion zone (also covering some outlying towns some 32 kilometres from the Fukushima facility) over 80,000 people have had to be evacuated – most may never be able to return home (see UK and Ireland Nuclear Free Local Authorities Policy Briefing 83, June 1st 2011) –

http://www.nuclearpolicy.info/docs/briefings/A197_(NB83)_Fukushima_and_Weightman_review.pdf).

3. Though there are a myriad of issues that arise from the Fukushima disaster, this report focuses on the marine pollution effects of the disaster and seeks to extrapolate some key areas of concern that the OSPAR RSC may wish to consider. A clear matter of concern from this incident is that radioactive materials have been both actively dumped as well as leaking into watercourses and the open ocean from the beginning of the disaster, with some leakages

[1] http://www.world-nuclear.org/info/fukushima_accident_inf129.html

[2] http://www.irsn.fr/FR/Actualites_presse/Actualites/Documents/IRSN-NI-Impact_accident_Fukushima_sur_milieu_marin_26102011.pdf

reported to be still ongoing. Though in early December the Japanese Government has claimed the site now is in a state of 'cold shutdown' it accepts that it may take up to 40 years before full clean-up of the site is achieved. Given that radioactivity continues to leak, including radioisotopes with long half lives (strontium-90 and cesium-137 both have half lives of about 30 years), contamination of the marine environment may be expected to persist for far longer.

**Marine pollution issues**

4. A study by the Tokyo-based Meteorological Research Institute claims that 80% of the radioactive Caesium fall-out from the Fukushima disaster has fallen on the Pacific Ocean and been spread much further on ocean currents. Other studies noted in Paragraph 1 above also emphasise the continued radioactive fall-out into the marine environment.

5. As part of its response to the disaster, Greenpeace International collected a number of samples of marine organisms (fish and seaweed) from around the Japanese coast on various occasions during the period May-July 2011. These were analysed in independent laboratories located in France (CRIIRAD - Commission de Recherche et d'Information Indépendantes sur la Radioactivité ; ACRO - Association pour le Controle de la Radioactivité). Appendix 1 of this paper summarises data for caesium (137 and 134) and iodine (131) for samples of fish and seaweed collected on July 22nd – 24th as an example. It notes some levels of Caesium 134 and Caesium 137 are above Japanese Government index values of 500 Bq/kg[3] in the flesh of a number of fish species; with equally alarming radiation levels found in the guts of the same fish species. Samples of seaweed showed similarly alarming radiation levels[4].

6. A related area of concern that has also become evident from the sampling of fish and seaweed is that there are no Japanese laws in place to trace the exact origin of fish and seafood, which means that potentially contaminated foodstuffs are being sent throughout Japan and exported to other countries. Between October 12 and November 8, Greenpeace collected seafood samples from the five supermarket chains - Aeon, Ito Yokado, Uny (Apita), Daiei and Seiyu - as featured in earlier rounds of research, taking 15 samples from each. Of the 75 samples, radioactive caesium 134 and 137 were detected in 27.[5] There was no company whose products were not contaminated. Although radiation levels reported for these samples were below Japanese Government 'safe' limits, many scientists – including ICRP and its internationally accepted recommendations for radiation regulatory principles - consider that there are no safe thresholds for exposure to radioactive substances and that even low levels may pose a health risk, particularly for children and pregnant women. It is also clear that radioactive contamination has entered Japan's food chain and is being spread by the country's food distribution system.

7. What has also been concerning is the relative lack of monitoring of the marine environment by Japanese Government authorities, which is a key area of concern when trying to apply the lessons learned to other regions, including the OSPAR region. Independent fieldwork designed to begin to address data gaps has, in some cases, been discouraged. For example, in early May 2011 Greenpeace was refused a request to take samples in Japanese territorial waters. Shortly afterwards, TEPCO announced it had sampled sediment on the coast around Fukushima. It announced radiation contamination levels which were between 100 and 1000 times higher than usual levels. [6]

[3] http://www.mhlw.go.jp/stf/houdou/2r9852000001558e-img/2r98520000015av4.pdf
[4] http://www.physorg.com/news/2011-05-greenpeace-radioactive-sea-life-japan.html
[5] http://www.greenpeace.org./japan/Global/japan/pdf/20111020_SUSEA_Result.pdf?report01 and http://www.greenpeace.org/international/en/campaigns/nuclear/safety/accidents/Fukushima-nuclear-disaster/Radiation-field-team/
[6] http://www.tepco.co.jp/en/press/corp-com/release/11050305-e.html and http://www.47news.jp/CN/201105/CN2011050301000837.html

**The European response to the Fukushima disaster**

8. The European Commission has taken the lead in determining the actions require of European civil nuclear facilities, initiating a list of 'stress tests' required to be undertaken on every civil nuclear reactor in the European Union. Individual EU countries also initiated their own nuclear regulators to analyse their own nuclear industry and potential impacts of the Fukushima disaster. In Germany, Switzerland, Belgium and Italy the wider political and ethical framework has seen their own governments take the long-term decision to completely phase-out nuclear power. In the UK and France, a fairly narrow analysis of the specific nuclear safety issues of the Fukushima disaster in comparison to UK and French reactors has taken place.

9. The UK and Ireland Nuclear Free Local Authorities (NFLA), who provide nuclear policy advice to KIMO International, have been particularly concerned that marine pollution issues were not being considered in detail by the UK authorities. In its detailed submission to the UK Office for Nuclear Regulation (ONR), prior to the publication of the ONR's report on 'Fukushima and potential impacts on the UK', the NFLA noted a long list of marine pollution concerns arising from the Fukushima disaster, which should have an impact on UK policy. These included:

    - All prior Japanese assessment of nuclear risks either did not foresee or did not initiate preparation for a disaster of such magnitude;
    - Large volumes of radioactive coolant leaked into the marine environment;
    - There needs to be a system of emergency secondary catchment systems put in place at nuclear reactors to seal them off from rainfall or flooding;
    - Such systems also need internal pumping systems for long-term safe storage;
    - Such systems also need radiation readers to analyse waste;
    - There is a major need for high volumes of emergency cooling water;
    - Site design and build process should involve bunding and site drainage systems;
    - There is a clear necessity to use freshwater and not seawater – have reservoirs on site and regional;
    - Post event radiological monitoring of marine environment was rushed and incoherent;
    - Post Fukushima monitoring regime has only looked at caesium and iodine, not at plutonium, americium, uranium and curium – all dangerous alpha emitters;
    - Unlike caesium and iodine these alpha emitters are insoluble in water and attach to sedimentary particles in the water column;
    - There was no monitoring by TEPCO of 'hot' particles of reactor fuel, used fuel or pieces of reactor into the marine environment as a result of the reactor explosions
    - There is a major need for a **CLEAR AND DETAILED POST EVENT MONITORING & ANALYTICAL PROGRAMME;**
    - Without this it is impossible to know the full marine environment issues from Fukushima or their implications for other countries.

KIMO International and Greenpeace International consider that these issues remain highly relevant and therefore encourage OSPAR RSC to consider developing its own analysis of the Fukushima incident and its impact on the OSPAR region by focusing on such issues.

The ONR's Fukushima report identified a number of ways in which the nuclear industry and the regulators could improve their operations in light of the Fukushima incident. It also contained some worrying comments including, for example, in relation to the potential flooding of nuclear sites. The ONR report notes that there is "potential for flooding to occur in the near vicinity of nuclear sites", but

goes on to say that the actual flooding risk is unknown “because the detailed specific likelihood and consequences of flooding have not been assessed” by the regulators. It is unclear, therefore, how the conclusion of the same report that: “Flooding risks are unlikely to prevent construction of new nuclear power stations at potential development sites in the UK over the next few years” can be supported. Overall, there is little consideration in the ONR report regarding marine pollution; indeed, in a meeting between the ONR and environmental groups in late November, the ONR acknowledged that this had been one of the main areas of concern raised of its reports.

10. The publication of the European civil nuclear reactor stress tests is due shortly and will provide an additional basis for further consideration of specific risks within the OSPAR region.

**Action requested**

11. KIMO International and Greenpeace International encourage OSPAR RSC to make its own thorough analysis of the Fukushima incident in terms of the damage to the marine environment and the potential impacts of a similar type of natural disaster affecting a nuclear reactor in the OSPAR region supported, if necessary, through the establishment of an international conference of experts on the matter.

12. KIMO International and Greenpeace International also encourage OSPAR RSC to recommend international discussion on improving the geographical labelling of the origin of marine foodstuffs, such that traceability of contaminated foods would be improved in the event of any such future accidents.

**<u>OSPAR RSC 2012 discussion on the paper:</u>**

- **The RSC had discussed the Fukushima incident and the European stress tests earlier in the meeting, and received some detailed information from the IAEA. It was felt that an international conference was not required due to separate IAEA Conferences on the matter.**
- **The OSPAR RSC noted that it was not in the remit of the OSPAR Commission to recommend geographical labelling of marine foodstuffs – this would have to be considered by the relevant Food Monitoring Agencies, such as the UK Food Standards Agency, and recommended this point is made through such international for a.**

13. **Annex 1**

**Greenpeace marine samples for the North East Japan coast**

**Source: Greenpeace International, 9th August 2011[7]**
**Caesium (137 and 134) and Iodine (131) concentrations in flesh and gut samples from various fish species (Bq/kg fresh weight)-**

| Type | Location | Sample | Sampling date | Laboratory | Cs137 (Bq/kg) | Cs134 (Bq/kg) | Cs137 + Cs134 | I131 (Bq/kg) | Cs137 | Cs134 | Cs137 + Cs134 | I131 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | FLESH | | | | GUTS | | | |
| FISH | Onahama | Fat greenling (*Hexagrammos otakii*) (adult) | 24 July | CRIIAD | 368±41 | 303±34 | 671 | <1.0 | 165±25 | 142±20 | 307 | <2.1 |
| | Onahama | Fat greenling (*Hexagrammos otakii*) (adult) | 24 July | CRIIAD | 336±41 | 289±35 | 625 | <1.4 | 172±33 | 132±25 | 304 | <3.6 |
| | Onahama | Rock fish (*Sebastes ventricosus*) | 24 July | CRIIAD | 226±38 | 182±30 | 408 | <3.5 | 201±27 | 165±22 | 366 | <1.9 |
| | Onahama | Fat greenling (*Hexagrammos otakii*) (juvenile) | 23 July | ACRO | 156±19 | 141±17 | 297 | <3.2 | 115±14 | 107±13 | 222 | <5.2 |
| | Onahama | Cherrysalmon | 23 July | ACRO | 92±10 | 80±9 | 172 | <3.1 | 53±7 | 47±6 | 100 | <1.8 |
| | Onahama | Rock fish (*Sebastes ventricosus*) | 23 July | ACRO | 556±66 | 497±59 | 1,053 | <6.2 | 221±30 | 195±26 | 416 | <4.8 |
| | Onahama | Fat greenling (*Hexagrammos otakii*) (adult) | 23 July | ACRO | 388±46 | 361±42 | 749 | <4.9 | 186±22 | 169±20 | 355 | <6.1 |
| | Onahama | Rock fish (*Sebastes ventricosus*) | 24 July | ACRO | 143±17 | 131±17 | 274 | <3.8 | 83±11 | 75±10 | 158 | <5.0 |

(Note: Onahama is 55 kms from Fukushima)

**2. Caesium (137 and 134) and Iodine (131) concentrations in samples of seaweed (Bq/kg fresh weight)–**

| SEAWEED | Location | Sample | Date | Laboratory | Cs137 (bq/kg) | Cs134 (bq/kg) | Cs137 + Cs134 | I131 |
|---|---|---|---|---|---|---|---|---|
| | Tsurishinhama | *Ulva arasakii* | 22 July | CRIIAD | 59±9 | 50±8 | 109.2 | <1.6 |
| | Hisanahoma | *Laminaria japonica* | 23 July | CRIIAD | 198±24 | 168±21 | 366.1 | 65±10 |
| | Yotsukura | *Laminaria japonica* | 23 July | CRIIAD | 82±11 | 69±10 | 151.1 | 21±5 |
| | Yotsukura | *Ulva arasakii* | 23 July | CRIIAD | 92±11 | 78±9 | 170 | <2.0 |
| | | | | | | | | |
| | Nakoso | *Laminaria japonica* | 23 July | CRIIAD | 51±8 | 45±7 | 95.7 | 5.5±4.1 |

(Note: the ports above are located around 50 kms from Fukushima

[7] http://www.greenpeace.org/japan/Global/japan/pdf/110809GP_MarineResearch_Data.pdf

**Appendix 3**

# UK proposed new nuclear build programme and marine radioactive discharges

**Submitted by KIMO International and NFLA**

In early 2011 the UK Government published a National Suite of Energy Policy Statements which explicitly includes a commitment to build new nuclear power stations at 8 sites across England and Wales – five sites on the Irish Sea coast and three sites on the North Sea coast. This paper, developed for KIMO International by the UK and Ireland Nuclear Free Local Authorities (NFLA), arises from the NFLA's recent submission to the Environment Agency of England and Wales over proposed radioactive discharge permits from the building of a new nuclear reactor(s) at Hinkley Point, Somerset, England. As the first proposed new nuclear reactor in the UK for two decades, this recent consultation gives an early guide to a potentially significant increase in radioactive discharges from the UK into the marine environment. In the view of KIMO International this programme is likely to contravene the UK Government's OSPAR policy commitment of 'close to zero' radioactive discharges by 2020.

## Background

1. In the UK Government's National Energy Policy Statement for Nuclear Power Generation (1) it advocates the need to produce as much as 16 GW from a new nuclear power programme, so as to provide for future UK energy needs by 2050. It formally designated the following sites for the development of new nuclear reactors in England and Wales – Sellafield, Heysham, Wylfa, Oldbury and Hinkley Point on or near the Irish Sea coast; and Hartlepool, Sizewell and Bradwell on the North Sea coast. It is also envisaged that more than one reactor could go on some of the sites, such as at Sellafield, Sizewell and Hinkley Point. No sites have been 'designated' in Scotland, where the Scottish Government has a policy fiercely opposed to the building of new nuclear reactors. This also comes at a time when in Western Europe, following the Fukushima incident, most OSPAR members, with the exception of France (and possibly Spain), have determined a long-term phase-out of civil nuclear power (most notably Germany, Switzerland and Belgium).

2. A number of parallel facilitative actions are being pursued by the UK Government and regulatory agencies as part of this policy. The UK Office for Nuclear Regulation and the Environment Agency are conducting a 'generic design assessment' (GDA) of the Areva European Pressurised Reactor (EPR) and the Westinghouse AP-1000 reactor designs (2). In mid December 2011 these were granted interim design acceptance. The UK Government is also developing a series of electricity market reforms to guarantee the carbon price and facilitate the financing regime for nuclear new build. A Waste Transfer Pricing Formula and Funded Decommissioning Programme consultations have been submitted and it is expected that the UK Government will bring forward further legislation on these matters in 2012 (3).

3. A number of consortiums are in place to take advantage of this policy. Electricite de France (EDF), in conjunction with Centrica / British Gas (under the title NNB Generation Company Ltd), are proposing to build new nuclear reactors at Hinkley Point, Sizewell, Bradwell, Heysham and Hartlepool. German utilities E-on and RWE Npower have established the 'Horizon' consortium to build new reactors at Wylfa and Oldbury. A consortium involving Spanish owned utility Iberdrola and French-owned GDF Suez also propose to build new reactor(s) at Sellafield under the title 'NuGen'.

4. The first major development of new nuclear reactors in the UK is currently taking place at Hinkley Point, Somerset on the Bristol Channel in South West England. NNB Ltd has received planning permission from local councils to commence initial preparation of the site for a new reactor, whilst the UK Infrastructure Planning Commission (IPC) has 'accepted' a 30,000 page planning application for consideration of development of a new nuclear reactor(s) at the site,

which will be dealt with in 2012. Meanwhile, the Environment Agency is currently considering an application for environmental permits from NNB at Hinkley Point - it is this consultation which the rest of this report seeks to highlight to the OSPAR RSC.

**Hinkley Point Environmental Permits**

5. NNB Generation Company Ltd has made a request to the Environment Agency for three environmental permits in reference to a new nuclear power station at Hinkley Point in the following areas:

   - to make disposals and discharges of radioactive wastes;
   - to operate combustion processed (standby generators);
   - to discharge cooling water and liquid effluent into the Severn Estuary.

   The closing date for public comments on this consultation ended on the 15th December 2011 (4).

6. KIMO International notes that a number of environmental / nuclear concerned NGOs, coordinated by the UK and Ireland Nuclear Free Local Authorities, and including the 'Stop Hinkley' Campaign, Friends of the Earth Cymru and CND Cymru, have joined together to commission two independent consultants to respond to the Environment Agency consultation – the marine pollution consultant Tim Deere-Jones (5) and a consultant of radioactivity in the environment, Dr Ian Fairlie (6). The consultation submission was also fully supported by a cross-party panel of MPs and MEPs (7).

7. Tim Deere-Jones provided a 62 page analysis of proposed marine radioactive discharges from the Hinkley Point new reactor, whilst Dr Fairlie provided an 8 page overview of key aerial gaseous discharges from such a reactor. The full responses can be found at the following web-links:

   http://nuclearpolicy.info/docs/nuclearmonitor/NFLA_New_Nuclear_Monitor_No25.pdf
   http://nuclearpolicy.info/docs/nuclearmonitor/NFLA_New_Nuclear_Monitor_No26.pdf

   OSPAR RSC members are strongly encouraged to read both submissions.

8 Some of the key points from Tim Deere-Jones's analysis of proposed marine discharges include:

   - There are a number of highly significant weaknesses and flaws in aspects of NNB Genco's understanding of the behaviour and fate of radioactive wastes, their proposed management of the discharges and their proposed sampling and monitoring programmes.
   - The submission further identifies a failure to address issues arising from climate change and the risks of severe flooding / inundation events.
   - The submission concludes that, as a result of these highly significant weaknesses, there are major data gaps about near field and far field radioactivity concentrations along the entirety of the Bristol Channel coast and about the potential impact of Hinkley C (and Oldbury B) proposed radioactive waste discharges on the populations' resident in English and Welsh coastal zones.
   - More consideration should be given to improving and making FULLY transparent the monitoring programme. It is definitely not enough that EDF propose to piggy back on the existing regime as that regime is inadequate and flawed. The status quo does not give the public an opportunity to protect their health through being informed on daily discharge levels nor does it allow the public to hold both site operators AND the regulators to account.

- In the context of these flaws this submission concludes that the proposed development in its current form should be rejected outright.

9. The key points of Dr Ian Fairlie's overview of the Hinkley environmental permits include:

   - 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 of tritium; 350 GBq of carbon-14; 800 GBq of radioactive noble gases and 50 MBq of radioiodines. (1 GBq = $10^9$Bq and 1 MBq = $10^6$Bq).These are 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).
   - 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.
   - In November 2011, German data revealed large spikes in radioactive gas releases during the refuelling of Nuclear Power Plants. The Gundremmingen reactor 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. According to the International Physicians for the Prevention of Nuclear War (IPPNW) in Germany, the normal emission concentration of noble gases during the rest of the year is about 3kBq/$m^3$ 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 is likely that these noble gas concentrations can be used as a proxy for other gaseous emissions, including tritium and iodine releases.
   - Higher doses from these nuclide spikes go a long way to explaining the increased incidences of child leukaemias near Nuclear Power Plants shown by the German Government's 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 Nuclear Power Plants be re-examined. The development of new nuclear reactors in the UK should be suspended until such research is undertaken.

10. In his submission Tim Deere-Jones makes the important point that NNB Genco has only named 14 radionuclides to be discharged in the liquid radioactive waste streams from Hinkley C, but his Report brings forward other documentation, which implies there may be as many as 65 nuclides in the waste stream. The Report also provides additional evidence to show that, among the approximately 50 nuclides not named by NNB Genco and the Environment Agency GDA documents, there may be 12 alpha-emitting actinides including 3 isotopes of uranium, 5 of plutonium, 2 of americium and 2 of curium. In addition to the radioactive wastes proposed for discharge to sea, the large number of radioactive wastes which will be discharged to the atmosphere in gaseous or condensate form and that, although an unknown percentage of these will enter the marine environment via fallout and washout, no attempt has been made to quantify these inputs.

11. The potential increase in radioactive discharges to sea could be considerable, including:

   - An increase in tritium by almost 50% (653 TBq to 983 TBq per annum). 1 TBq = $10^{12}$ Bq
   - A major potential impact of caesium-137 discharges to sea remains unquantified, with current and historical monitoring programmes notably failing to identify Bristol Channel fine grained sediments containing higher concentrations of Cs-137. These programmes

have therefore proved incapable of delivering precise and relevant data on Cs-137 in the Bristol Channel

- No detail is provided for expected quantities of alpha discharges at Hinkley Point. However, using published figures for the AP-1000, Tim Deere-Jones calculates that, over the 60 year timescale of operation of a new Hinkley reactor, it is possible that an output of 28 MBq of plutonium-241 and 0.9 MBq of americium-241 may be generated.
- Annual discharges of cobalt-60 from a new Hinkley reactor will be 3.37 times higher than current discharges.
- The Bristol Channel proposed discharges from a proposed new Hinkley Point reactor could also be argued as an immediate breach of both the "OSPAR Radioactive Substances Strategy" (Bremen 2003 statement) and the associated "OSPAR Programmes for More Detailed Implementation of the Strategy in order to achieve by 2020, the Commission's Aim" "that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero". This last point is particularly relevant in the case of:
- the large increases in tritium inputs, which go "against the grain" of recent declines of tritium input to the Bristol Channel;
- the input of very long-lived alpha / actinides, well understood to have a tendency to re-concentrate in estuarine, coastal, intertidal and sub-tidal fine sediment deposits (with which the Bristol Channel / Severn Estuary complex is very well endowed).

12. The NFLA submission relates to just one new nuclear reactor, and the UK Government policy is for around 10 – 14 new nuclear reactors. The obvious pattern will be for marine discharges to increase significantly, which can only be compounded by current increases in discharges from Sellafield reprocessing facilities (as noted at the OSPAR RSC meeting in 2011). How can the UK Government therefore meet its OSPAR Treaty commitment of ‘close to zero’ discharges by 2020 when such an ambitious nuclear programme is moving it in the opposite direction?

**Action requested**

13. This report has noted that the UK Government is intent on a major expansion of new civil nuclear reactors over the next decade, which is likely to see marine discharges increase significantly. OSPAR RSC is asked to investigate the potential increase in marine discharges from a UK new nuclear build programme and determine how it can be justified in terms of the OSPAR Treaty commitment of ‘close to zero’ discharges by 2020.

14. KIMO International requests that the OSPAR RSC consider the submissions made by NFLA and local nuclear concerned groups to the Hinkley Point environmental permits consultation, and provide a full response to it. KIMO International also requests that the authors of the NFLA submission should be invited to a future meeting to discuss their findings and conclusions.

**References**

(1) UK Department of Energy and Climate Change – Energy National Policy Statements, January 2011. Available from http://www.decc.gov.uk

(2) ONR and Environment Agency Joint Generic Design Assessment of the EPR and AP1000 – http://www.hse.gov.uk/newreactors

(3) See UK Department of Energy and Climate Change website – http://www.decc.gov.uk

(4) Environment Agency of England and Wales –

http://www.environment-agency.gov.uk/homeandleisure/127159.aspx

(5) Tim Deere-Jones is an independent marine pollution consultant who lives in Pembrokeshire. He has worked previously for Greenpeace International, Friends of the Earth, Marinet and the World Wildlife Fund. He has produced a number of reports and given presentations at NFLA events. He is a member of the Nuclear Consulting Group.

(6) Dr Ian Fairlie is an independent consultant on the effects of radioactivity in the environment who lives in London. He is the former scientific secretary to the UK Government's Committee Examining Radiation Risks from Internal Emitters (CERRIE). He has worked on occupational health hazards for the Trades Union Congress and has been a radiation advisor to Greenpeace Canada.

(7) The NFLA submission has been formally supported by Caroline Lucas MP, Paul Flynn MP, Martin Caton MP and Jill Evans MEP.

**OSPAR RSC 2012 discussion on the paper and actions requested:**

- **OSPAR RSC determined that this was a matter for more bilateral discussion between NFLA / KIMO and the UK Government. Such discussions to take place with quarterly DECC NGO Forum meetings.**
- **The UK Government delegation noted that the Environment Agency were considering the NFLA submission on Hinkley Point radioactive permits and would respond shortly. It was also noted that the Health Protection Agency and the Food Standards Agency would publish marine pollution figures in March 2012 and consider Fukushima issues through the Annual 'Radioactivity in the Environment' (RIFE) report for 2012.**