

**ON ASPECTS RELATING TO THE OPERATIONAL NUCLEAR SAFETY OF THE
ŌMA NUCLEAR POWER PLANT, AOMORI**

Opinion and Statement of JOHN H LARGE

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PLANT, AOMORI**

STATEMENT OF JOHN LARGE

- 1 I am John H Large of the Gatehouse, 1 Repository Road, Ha Ha Road, London, United Kingdom SE18 4BQ.
- 2 I am a Consulting Engineer, Chartered Engineer, Fellow of the Institution of Mechanical Engineers, Learned Member of the Nuclear Institute, Graduate Member of the Institution Civil Engineers, and a Fellow of the Royal Society of Arts.
- 3 I first became involved professionally in nuclear engineering matters from the mid 1960s when I undertook postgraduate research on behalf of the United Kingdom Atomic Energy Authority (UKAEA) as a full time research fellow, remaining in post as a member of the academic research and tutoring staff of the School of Engineering, Brunel University until the early 1990s. In the late 1980s I established the firm of Consulting Engineers Large & Associates specialising in, along with other disciplines, analysis and advice in nuclear related activities, including assessment of the response of nuclear plants during abnormal operation and when confronted with internal and external challenges.
- 4 I continue to act in the professional capacity of Consulting Engineer. My most recent and present project involvement includes assessment of and advice on the inclusion of substandard components in the French and in, potentially, the Japanese nuclear equipment supply chains; I advise a banking concern on technical issues influencing the energy supply market; and I am involved in provide expert opinion in a number of legal actions underway in the UK and Europe.
- 5 My experience and qualification for providing opinion in relation to this matter is given in ITEM 2 that I refer to later in the Statement I am scheduled to submit in February 2017
- 6 I consider myself to be sufficiently qualified, experienced and practised in the topics relating to this matter to provide authoritative and independent advice relating thereto.
- 7 I am instructed to prepare this by the City Authority of Hakodate via intermediaries of the legal team, represented by Yuichi Kaido, and also via Shaun Burnie of Greenpeace Germany.
- 8 I am not, and have never been, a member or active participant of any national or international environment and/or anti-nuclear lobbying non-governmental organisation, such as Greenpeace. I

state this here to impress upon the Court that the opinion that I shall give will be wholly independent, free of bias and not prejudiced by other interests.

- 9 First before I outline the opinion that I wish to present, I apologise to the Court for the lateness of this preliminary Statement.
- 10 In part, this is because of my failure to recognize that, unlike its western counterparts, the Japanese Nuclear Regulation Authority (NRA) has not openly published a plethora of technical standards and guidance notes and, indeed, of those standards, etc., that have been published certain are not available in English language forms. This absence of open literature has much delayed and caused alteration to my strategic approach to the composition and detailed content of my forthcoming Statement to the Court.
- 11 In the 1st ITEM of my forthcoming Statement I shall demonstrate in general terms my judgment that the Japanese regulatory approach does not have a consistent theme or approach that effectively brings together the various elements necessary for a satisfactory nuclear safety case.
- 12 For this I will draw comparisons with the United Kingdom nuclear safety regulator, the Office of Nuclear Regulation (ONR), and its development and use of an *Acceptable Risk vs Tolerable Consequences* composite that is enshrined in its *Safety Assessment Principles* that are uniformly applied to UK nuclear power, chemical reprocessing and radioactive waste facilities.
- 13 Also, I will review how the ONR and the UK Environmental Agency have each separately undertaken a Generic Design Assessment (GDA) of a marque of Advanced Boiling Water Reactor (ABWR) proposed for construction and commissioning in the UK. This UK ABWR, which is similar in design and output capacity to the Ōma ABWR, will provide a comparison of not just the plants themselves but, importantly, between the pre- and post-2011 design safeguards incorporated into each plant as a result of the lessons learnt from the 2011 Fukushima Daiichi catastrophe.
- 14 With this 1st ITEM of evidence in the Statement I am scheduled to submit I shall demonstrate that it neither desirable nor practicable to satisfactorily upgrade a pre-Fukushima Daiichi design, the Ōma NPP, to the post-Fukushima Daiichi standards that now require a greater resilience and reliability of operation.
- 15 For my 2nd ITEM of evidence in the Statement I am scheduled to submit I shall return to the opinion entitled *'Implications Of Tephra (Volcanic Ash) Fallout on the Operational Safety of the Sendai Nuclear Power Plant'* (Plaintiff submission B 121) that I prepared for

the Sendai District Court of January 2015. In this submission, which also applies to Ōma NPP albeit in account of some local and regional variations, I compared the NRA's 'Assessment *Guide of Volcanic Effects to the Nuclear power Plant*' relating to the dispersion and deposition of atmospheric borne tephra (volcanic ash), to the recommendations of the International Atomic Energy Agency's (IAEA).

- 16 I shall apply this existing evidence to the Ōma NPP design, site circumstances and local volcanic proximity and, in doing so, demonstrate that future operation of the Ōma NPP will not have, as it is presently designed and part-constructed, sufficient and proven resilience against the very tangible risk of severe volcanic activity in the region.
- 17 The next topic of evidence also contributed to my failure to meet the Court's timescales. This is because earlier this year I was instructed to urgently provide expert advice to clients on the emerging situation in France relating to metallurgical flaws in major and key components of the nuclear reactor pressurised circuit – because of the seriousness of the developing situation in France, I prioritized this work over my Ōma preparations.
- 18 In France, today, under the instruction of the nuclear safety regulator, Autorité de Sûreté Nucléaire (ASN), a total of about 30% of France's NPPs are operating under very restrictive conditions (6 NPPs) and others (12 NPPs) are in enforced outage (shutdown). All of the NPPs that are presently in enforced outage (shutdown) in France have installed large, forged steel components supplied by the Japanese Casting and Forging Corporation (JCFC) and it is suspected that the Japan Steel Works (JSW) has also supplied other similar components to France. The JCFC-sourced components are acknowledged to be below the specified standard of material heterogeneity and, as a result, considerably weakened in material toughness. I have also reported on the potential for the Japanese nuclear equipment supply chain also, like France, to have resident within operational NPPs (like Sendai Units 1 and 2 and Ikata 3) previously supplied and installed flawed JCFC components – the final part of my report on this important topic was released into the public domain on 13 December 2016.
- 19 This brings me to my 3rd ITEM of my evidence in the Statement I am scheduled to submit being, first, if there can be sufficient confidence in the Ōma NPP reactor pressure vessel (RPV) that was supplied by JSW and which is already installed into the nuclear island primary containment or, if in light of the recent revelations over the quality controls of sections of the Japanese heavy steel forging industry, it is reasonably warranted to carry out post-installation and in situ examination and non-destructive testing of the Ōma RPV.

- 20 Second, my 3rd ITEM will examine the roles of the past and present of the Japanese nuclear regulatory authorities, both the now much discredited Nuclear and Industry Safety Agency (NISA) and present incumbent NRA, seeking to explain how it was possible, and tolerable, for a key part of the nuclear manufacturing sector to proceed with very little oversight of its quality control procedures, particularly for Class 1, break-preclusion qualified, nuclear safety critical components such as the Ōma RPV.
- 21 The present situations relating to this important nuclear safety issue in both France and Japan are very fluid at this time, so much so that I expect more information to become publicly available as we move into the new year and through 2017.
- 22 The 2nd and 3rd ITEMS of my evidence will both relate, so far as I am able to ascertain from publicly available information, to the certainty and resilience of operation of the Ōma NPP when encountering abnormal fault conditions, both external and internal, such as volcanic activity, component failure, etc).
- 23 The radiological consequences of abnormal operation fall in both the on-site and off-site domains so, for my 4th ITEM of evidence I shall review how the post-Fukushima amendments to national off-site emergency planning measures might reasonably be expected to play out in a reasonably foreseeable abnormal operation incident (ie accident) at the Ōma NPP. Importantly, I understand that the Ōma NPP is designed to be fuelled with a mixed plutonium oxide (MOX) from the onset of commercial operations, so included in my 4th ITEM of evidence will be account of the potentially significant radiological consequences (over and above that of uranium oxide fuelled reactor) that can arise from an atmospheric release of MOX fuel particles into the off-site area.
- 24 I state here that I confirm that I have made clear which facts and matters referred to in this Statement that are within my own knowledge and those which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.



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