

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

2nd Opinion and Statement of JOHN H LARGE

TRAINING

MTRG

FORMER EMPLOYEE

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The authoritative version of this statement is the English language version.

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PLANT, AOMORI**

2ND STATEMENT OF JOHN LARGE

- 1 I have been asked by Yuichi Kaido to provide further explanation of the topics referred to in paragraphs 12 and 13 of my 1st Statement R3234-E1, dated 15 December 2016.
- 2 Underlying both of these topics is my opinion that past and present Japanese regulatory approaches do not share a consistent theme or approach that effectively brings together the various elements necessary to achieve and demonstrate a satisfactory nuclear safety case for the Ōma nuclear power plant (NPP).
- 3 More specifically, the greater part of the design and regulatory approval enabling the Ōma NPP to commence construction in or around May 2010 was undertaken, obviously, before the *Great East Japan Earthquake* and its accompanying tsunami of 11 March 2011 that struck the NPPs with such devastating consequences.
- 4 The direct outcome of the earthquake and tsunami on the nuclear plants of Fukushima Daiichi was and continues to be consequences of an unprecedented radiological scale, defined as the highest category of 7 on the International Atomic Energy Agency (IAEA) International Nuclear Events Scale (INES).
- 5 The root cause of the damage and meltdown of the nuclear fuel cores of Fukushima Daiichi Units 1, 2 and 3 was the inability of these units to maintain the fuel cool following the loss of off-site electricity supplies and failure of the emergency diesel generator sets when inundated by the tsunami; Unit 4 although defueled at the time, sustained complete containment failure as a result of deflagration of hydrogen gas liberated either from Unit 3 and/or generated in the Unit 4 overheating spent fuel pond; and Units 5 and 6, although in a state of cold-shutdown at the time, together with the central spent fuel pond, were prevented from overheating by judiciously rigged emergency power supplies.
- 6 Other nuclear power plants in the region of the earthquake (Higashidori, Onagawa, Fukushima Daini and Tokai Daini) were also (part or wholly) isolated from grid electricity supplies. Each of these plants is believed to have sustained elements of seismically induced damage and of those in operation (all except Higashidori) some experienced difficulties with emergency diesel generators and loss of the seawater cooling pumps which is the main source of emergency fuel core cooling.

- 7 At the time of the *Great East Japan Earthquake* and tsunami the then Japanese regulatory authority, the Nuclear and Industry Safety Agency (NISA), left it to the NPP operator to develop and implement severe accident management strategies on a voluntary basis. This offered the operator opportunity to either further reduce the risk of accident by engineering-in additional safety systems, containment resilience, etc., and/or alternatively demonstrate that the possibility of severe accident was already sufficiently low, to the extent that such severe accidents could not (credibly) occur within the then regulatory framework. In other words, under the past regulatory regime the preferred option for the operator, clearly in terms of time, effort and cost, would have been to demonstrate that the risk of severe accident was so incredibly low that it and its radiological consequences could be disregarded.
- 8 My point here is that at the time of the design of Ōma NPP the regulatory framework of Japan did not adequately provide:-
- physical and procedural safeguards against design-basis natural events such as earthquakes and tsunami;
 - engineered measures to mitigate against, for example, failure of the ultimate heat sink, loss off-site and on-site generated emergency electrical power, and breakdown of containment resilience; and
 - prepared, sufficiently resourced and practised severe accident management in both on-site and off-site domains.
- 9 Following the Fukushima Daiichi radiological catastrophe, the then Japanese nuclear safety regulatory framework, essentially comprising a hierarchal arrangement between NISA overseen by the Nuclear Safety Commission (NSC), was abandoned and replaced by the Nuclear Regulatory Authority (NRA) in 2012.
- 10 In other words, it is now universally acknowledged that, in the time leading up to *Great East Japan Earthquake* and its accompanying tsunami of March 2011, shortfalls in the Japanese nuclear regulatory system critically contributed to the failures at Fukushima Daiichi. It is axiomatic that these same shortfalls applied to other nuclear installations in Japan at the time, including plants such as the Ōma NPP, whose design had been set and which was under construction at the time.
- 11 My second point is that from my examination of the NRA's post-Fukushima Daiichi nuclear safety regulatory framework, I intend to demonstrate that the design of the Ōma NPP remains deeply entrenched in the '*old ways*' that were practised by the now discredited NISA, so much so that it

has not been possible for the NRA to substantially revise the original, pre-Fukushima Daiichi design (which is embedded by its partial construction) of the Ōma NPP.

- 12 In paragraph 12 of my 1st Statement I ventured a comparison between the United Kingdom's approach of *Acceptable Risk vs Tolerable Consequences* that is enshrined in its *Safety Assessment Principles* – fundamentally, this leads to a *risk-averse* approach. By setting *tolerable consequences* against *acceptable risk* to individual members of the public communities in situ beyond the NPP site boundary, it is the radiological risk to the public that sets the design-basis of the NPP in the UK.
- 13 Put simply, in the UK and most other western nuclear regulatory schemes, it is the (radiological) dose assessment to individual members of public during abnormal (accident) operating conditions that is used to determine and evaluate the adequacy of the NPP design, particularly the performance of the nuclear island containment, the outcome of an unplanned for loss of power supplies, loss of the ultimate heat sink, etc..
- 14 For my demonstration I shall also refer to the French system of regulatory conformity, as overseen by the *Autorité de Sûreté Nucléaire* (ASN) and, separately, the *Nuclear Regulatory Commission* (NRC) of the United States.
- 15 In Japan the '*old ways*' that I refer to in paragraph 11 above persist in the NRA's Safety Guides underpinning the technical requirements of its New Nuclear Regulations that require, essentially, two types of safety assessments of i) *safety design assessment* and, separately, ii) *site assessment*, neither of which draws from a *risk-averse* basis.
- 16 Even though NRA's New Regulatory Requirements provide improvements, in both range of factors and circumstances considered, these cannot be practicably applied to the design and existing physical constructions of the Ōma NPP. In other words, even though NRA's new Safety Guides are a much needed improvement, albeit in a somewhat non-prescriptive form, these cannot be retrospectively and practicably applied to Ōma NPP.
- 17 Now I move on to clarify paragraph 13 of my 1st Statement.
- 18 In the wake of events at Fukushima Daiichi, in late March 2011 the European Council (EC) requested a review of the safety at all European NPPs following a specification produced by the European Nuclear Safety Regulators Group (ENSREG) based on preliminary work carried out by the Western European Nuclear Regulators Association (WENRA).
- 19 The EC ENSREG reviews are commonly referred to as 'stress tests'.

- 20 The results and practicable application of the stress tests undertaken in the UK are particularly pertinent to the Ōma NPP because at that time the UK government was in the early stages of considering a request for permission to construct a new Hitachi-GE designed ABWR NPP – this request was formalised in January 2013 with the UK Crown Minister instructing the ONR to commence the 4 to 5 year long Generic Design Assessment (GDA).
- 21 This UK ABWR, similar in design and output capacity to the Ōma ABWR, is the first ABWR worldwide to commence the design process in the post-Fukushima Daiichi period. However, unlike the Ōma NPP with its design firmly and, I will argue, irretrievably set in the pre-Fukushima Daiichi era, the UK ABWR design and nuclear safety case will incorporate all of the lessons learnt from the ENSREG stress tests and, importantly, it will include these features from the onset of its design and as it passes through its regulatory approval stages.
- 22 I shall also be examining just how the Electric Power Development Company (J-Power) has set about demonstrating its claim that Ōma NPP meets all of the post-Fukushima requirements of the NRA and, moreover, that it is acceptably safe to operate on a risk-averse basis – my preliminary judgment is that J-Power will not satisfy these common-sense prerequisites.
- 23 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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