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Compensating for severe nuclear accidents: An expert elucidation

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ABSTRACT

We present the results of a structured discussion held in London in July 2014 involving a panel of experts drawn from three communities: specialists on aspects of risk and insurance; lawyers concerned with issues of nuclear law; and safety and environmental regulators. The discussions were held on the basis of participant anonymity. The process emphasised three considerations: conceptions of loss arising from a severe nuclear accident; the specifics of the Fukushima-Daiichi accident and what it means for policy and strategy going forward; and the future of liability regimes. We observe some stoicism from those closest to implementation of policies and procedures associated with nuclear risks, but a lower level of certainty and confidence among those concerned with nuclear energy regulation.

1. Introduction

On Friday 11 March 2011, a magnitude 9 earthquake occurred in the Pacific Ocean approximately 70 km from the eastern coast of Japan's main island Honshu. The resulting tsunami overwhelmed the defences protecting four of the reactors of the Fukushima-Daiichi nuclear power station. One of these four reactors was undergoing maintenance at the time. Unable to maintain post-shutdown reactor cooling for the three operational reactors, core overheating occurred and when nuclear fuel cladding reacted with high temperature steam hydrogen was formed which accumulated and exploded. As a result of various structural problems, some exacerbated by the explosions, radioactive contamination was propelled into the atmosphere forming a plume that travelled primarily to the northwest overland before being deposited. As a precaution a large programme of immediate evacuation and extended population relocation was undertaken (Ranghieri and Ishiwatari, 2014). The Fukushima-Daiichi disaster was the second time that such an approach has been adopted. The first arose in 1986 following the even more severe nuclear power accident at Chernobyl in the Ukraine (Smith and Beresford, 2005).

The events that gave rise to the hydrogen explosions (namely loss of effective core cooling and high temperature fuel-cladding steam interactions) at Fukushima-Daiichi are well-known within the nuclear industry and were not dissimilar to the problems encountered at Three Mile Island nuclear power station in Pennsylvania USA in 1979, although in that case the release of radioactive contamination was far smaller, verging on negligible (Kemeny, 1979).

Given prior related experiences at Chernobyl and Three Mile Island one might take the view that fundamentally there is little to be learned from considering policy and strategy responses to the Fukushima-Daiichi disaster. The *Nuclear Risks: Environmental, Financial, and Safety* (NREFS) research consortium took the view that there are indeed fresh lessons to be learned. Much of the work of NREFS has concerned quantitative assessments to examine the logical basis for population relocation policies following a severe accident. Other considerations have related to nuclear power plant siting (Grimston et al., 2014),

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nuclear liability regimes post Fukushima-Daiichi (Heffron et al., 2016), off-site emergency procedures and responses to nuclear accidents (Ashley et al., 2017a), the economic consequences of a hypothetical nuclear accident in the UK (Ashley et al., 2017b), and policy responses and strategies to restore and adjust electricity systems following dramatic capacity reduction, as has occurred in Japan since March 2011 (Haarscher et al., 2014).

This paper presents a synthesis of a round table discussion panel which was held to elicit the lessons learnt from Fukushima-Daiichi and to identify questions that may become relevant in a future nuclear accident from the perspective of insurance and risk, an area where attitudes have also evolved since the accident at Fukushima-Daiichi. The event comprised eleven UK-based experts within the fields of nuclear insurance and risk, nuclear law, and nuclear regulation.

In the title of this paper we refer to an expert elucidation. We concede this is reminiscent of a more established phrase: expert elicitation. We hope that the distinction serves a beneficial purpose. Our approach is similar to an expert elicitation, but unlike most such exercises we had no intention to uncover new data or to refine quantitative estimates of established parameters. Rather we sought entirely qualitative insights that would add clarity to existing understanding of a complex topic, i.e. to elucidate.

2. Material damage and third-party liability

Our expert elucidation centred on issues surrounding insurance and risk which have evolved since the accident at Fukushima-Daiichi. Insurance and risk associated with the energy sector can be broadly divided between on-site risks and insurance (termed 'material damage') and off-site risks and insurance (termed 'third-party liability'). Three themes were identified in the area of material damage and third-party liability insurance in the nuclear energy sector and were used to guide the discussion of the expert elucidation that is further detailed in Section 3. These themes are:

2.1. *'Loss' arising from a nuclear accident*

Loss may be defined by various legal conventions for various jurisdictions, however, exactly defining what the losses would be following a nuclear accident, and determining and providing adequate recompense for those who have suffered loss are all far from straight-forward. The potential for such a loss affects our aversion to today's and tomorrow's risks, and our ability to disentangle the rational and emotional response to a hypothetical event as distinct from an actual event. Therefore, the main question here was to ascertain what does 'loss' mean in the context of a nuclear accident for those with a practitioner perspective?

2.2. *Claims management*

After a nuclear accident, two actions need to begin as soon as possible: (1) an efficient and effective emergency management response; and (2) a claims management process. This is not only of benefit for the victims, but also part of the justice system, where victims should be returned to their pre-accident position as much as it is possible. However, from an industry perspective there will be a desire to restore public trust, and the public reputation of the industry in the country where the accident occurs and also crucially at an international level. There are several questions that arose here. In reflecting on the Fukushima accident in Japan in 2011, what is the practitioner perspective on the emergency management response and claims management process following the accident? How did the international community respond to that event? What would be the important issues for the UK to consider regarding the claims management process and in particular if there were transboundary issues (for example, with Ireland, Denmark, and/or Continental Europe)? What role will 'timeliness' play in the process, and what institution could process the potential high volume of claims?

2.3. *Liability regimes*

The ability to compensate victims is certain to be a prominent issue after any nuclear accident. This is not just a nuclear specific problem, for example, at the time of writing, BP is still aiming to reduce its liability for the Deepwater Horizon spill in the Gulf of Mexico in 2010. However, a nuclear accident may result in different set of issues, in particular due to the dispersion and dissemination of radioactive materials. This is an area where there were many questions. How will losses be classified for different communities affected by a nuclear accident? For those within an exclusion zone it may be more straight-forward to compensate (as they would have suffered a 'direct' loss) but what will happen to nearby communities who after a nuclear accident suffer loss of income or livelihood in areas where there was no radiological damage and no enforced evacuation (and as such could have suffered only an 'indirect' loss)? Do today's liability regimes sufficiently address and recompense those who have suffered direct and indirect losses? Do these liability regimes lead to a better or worse set of policies for the governance and regulation of future nuclear power plants?

3. The expert elucidation

On 17 July, 2014 the authors gathered a community of experts to London for a round-table discussion on the effect of the accident at Fukushima-Daiichi on insurance and risk. Experts were drawn from three principal communities: specialists on aspects of risk and insurance; lawyers concerned with issues of nuclear law; and safety and environmental regulators. The discussions were held on the basis that those speaking would not be identified nor would organisations and affiliations be disclosed. For that reason this paper will not disclose the precise sources of the ideas presented. While there may be benefit to be gained from a greater level of transparency it was felt that this would be outweighed by the self-imposed constraints that would inevitably arise if the discussions were to be attributed. A decision was made in favour of a less restrained sharing of ideas and concerns.

The discussions covered broadly three related areas of concern:

(1) The loss arising from a severe nuclear accident;
(2) The specifics of the Fukushima-Daiichi accident and what it means for policy and strategy going forward; an
(3) The future of liability regimes.

The discussion was such that in each case the moderator (Professor Nuttall) invited a named individual to speak before opening up the discussion to everybody for further comment. In each case, the named individual was not obliged to make any comment. Verbatim extracts from the expert elucidation are presented in Appendix A.