Large and ASSOCIATES

INTERNATIONAL CONFERENCE ON THE SAFETY OF TRANSPORT OF RADIOACTIVE MATERIALS

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OF
LARGE & ASSOCIATES
TO
GREENPEACE INTERNATIONAL

ATTENDING THE CONFERENCE AS OBSERVERS

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BRIEFING ON THE CONFERENCE PAPERS AND DISCUSSIONS

The compositions of the delegations to this conference essentially comprise the *'haves'* and the *'have-nots'*.

The *haves* are the nuclear power states, more particularly, those states that have interests in fuel enrichment, manufacture and post-irradiation processing or reprocessing of irradiated or spent fuel and, for some, these fuel cycle interests extend to the manufacture and distribution of fuel derivatives, such as mixed oxide of fuel. For these states to maintain these activities, to preserve their nuclear-based industries and, to some extent, to intervene in and control the means by which the *have-nots* procure their present and future energy supplies they assume it essential to dominate regulatory proceedings such as these.

On the other hand, the *have nots* obtain little if any benefit from the nuclear fuel cycle, that is the nuclear power and nuclear fuel industries, operated by the *haves*. Whereas the *have-nots*, along with the remainder of the global community, benefit from the diagnostic, medical and pharmaceutical application of radio-isotopes which are now produced largely independently of the nuclear fuel cycle, for the *have-nots* there is little, no or negative benefit from the activities of the *haves* in pursuing the nuclear fuel cycle. In fact, the disbenefit or detriment borne by the *have-nots* sharing a border, a common sea of regional atmosphere with an adjacent or nearby nuclear *haves* has been demonstrated beyond refute, relating to radioactive discharges in the past, now and in the future.

Perhaps, certainly as ventured by this conference, the detriments arising from transportation of radioactive materials necessitated by the fuel cycle are not so obvious. Although the *haves* assert that the fifty or so years of accident-free transportation activities has not resulted in any human health detriment, or so it claims in the absence of any quantitative substantiation, reliance upon the past is no portend to the future risk – the claim that its flasks will not fail, that its ships will never sink nor founder by fire, and that its emergency plans and consequence management plans are infallible has yet to be demonstrated.

On the Issue of Liability:

For example, in the event of and in the aftermath of an accident at sea it may be, by chance and as wind and weather would have it, that the ship, its cargo and/or the radioactive plume emanating from the incident centre could impact upon communities of *have-not* states. Although a need for advanced assessment of such an event and its impact, both in environmental and human health terms, is desirable (cf Boyle – Edinburgh), there is no willingness by shipping states for this, although Peru (CN-101/6 & 11) urged for such assessments to be carried out in order for flag and coastal *have-not* states might adequately prepare and coordinate emergency and contingency plans.

Both the UK and US (CN-101/3) expressed a desire for more of the *have* states to join to existing liability conventions, the revised Vienna Convention and the CSC, on the basis that the present level of 57% of the operational nuclear power reactors (442 in total) would ease the complicated legal wrangling in the event of a claim. The Republic Ireland considered the framing of liability redress to be most unsatisfactory (CN-101/2), suggesting that the liability should be unlimited, that a *have-not* state falling victim to nuclear transportation accident would be severely disadvantaged by having to pursue any claim in the courts of the contracting (*have*) party, and that the definition and scope of nuclear damage fell far short of the economic losses arising from public perception or *'rumour'* damage over which the victim state would have little control. New Zealand (CN-101-4) agreed with this, adding that the smaller Pacific states would find it difficult to pursue proceedings and in meeting the costs associated with becoming a party and maintaining membership.

On Communication and Transparency:

On communicating the safety and, somewhat tacitly, the risks and hazards of nuclear transportation, the US went so far as to proclaim *"The idea that the public has a right to know and to have a voice in the actions of the government* *is not a new concept."*(CN-101/13), although much of the ensuing papers and discussion assumed this to be (at most) one-way traffic from the regulatory and operating regimes to the public. The *World Nuclear Transport Institute* (WNTI), which seems to be little more than an industry sponsored promotion group, identified *'User Friendly Instruments for Enhancing Communications'* (CN – 101/14) putting much emphasis on where the communication was from what it generally termed *'anti-nuclear groups'* and that this was deliberately inaccurate information advancing fears regarding transport risk.

However, WNTI itself is not adverse to over-emphasising the inherent safety of nuclear transportation systems, particularly in referring to the much publicised railway train-Magnox flask crash demonstration of 1984, claiming that the stresses sustained in the flask structure during the 100 mph crash were less than those incurred in the IAEA regulatory drop test (CN-101/21 and CN-101/44). Indeed, there is a great deal of misunderstanding and, possibly, misrepresentation about the 1984 UK Magnox demonstration, particularly with regard to the free flight terminal velocity of the flask following impact – the flask tumbled at a velocity of 65^{+}mph, over twice the regulatory test impact velocity, at which if it had impacted against a hard and massively backed surface such as a tunnel portal or bridge abutment, it would have catastrophically failed (as shown by some other scale model tests completed in preparation for the 1984 demonstration crash).

The UK radioactive materials transportation regulator robustly proclaimed (CN-101/17) that it, for the purposes of communication and consultation, did not differentiate between environmental and industry pressure groups but, much to the contrary, during conference it intervened to express strong support for the claims of WNTI, it did not voice any support whatsoever for the Greenpeace International delegation to be released from its status, being barred from any direct involvement in the conference proceedings.

The Radiation Protection Programme:

Conference contributions relating to the radiation protection programme (RRP) now required by the IAEA regulations (TS-R-1) were both detailed and varied. That said, the present regulatory annual radiation dose exposure levels are 20mSv and 1mSv for registered radiation workers and members of the public respectively, noting that the principle of ALARP has been adopted and applies to most regulatory radiological management regimes – for fixed (land sited) nuclear plants in the leading nuclear states, stringent radiological controls result in much lower actual radiation exposures at, on average, between 2 to 5mSv or thereabouts. The UK National Radiological Protection Board (CN-101/28) noted that, for transportation workers etc., projected annual radiation exposures of less that 1mSv should require very little action, apart from optimisation (ie ALARP) to ensure that the RRP in control exposures.

Compared to fixed nuclear plants, radiation exposure of workers involved in the transportation or radioactive materials are relatively high. Non-incident radiation exposures to workers, transit drivers and couriers, and members of the public varied considerably with, for example, drivers and distributors of radiopharmaceuticals in Cuba (CN-101/18) were reported to be about 5mSv per year; Canadian workers received higher annual exposures (CN-101/19) at 3.7mSv, but with those in the radiopharmaceuticals area exposures greater than 5mSv applied, particularly couriers who may, time after time, handle small, lightweight radioactive packages; and a limited number of radiopharmaceutical handlers and delivery drivers in Germany (CN-101/22) were reported to be high, between 10 to 14 mSv annually.

Relating to nuclear fuel cycle transports, non-incident annual exposures for sea transport workers were reported to be low (CN-101/25) at between 0.2 to 0.3mSv with a number of contributions endeavouring to establish the incident/accident risk to members of public, although the basis of risk comparison from paper to paper is weak. However, the movement of large quantities of spent fuel could involve the public in not insignificant levels of risk with, in the United States, the future rail movement of about 300 nuclear powered submarine fuel cores (CN-101/35) generating 11 to 12 and 2 to 3 latent (additional over natural incidence) cancer fatalities in the worker and public groups respectively over the 24 year period of operation. For a credible and what seem to be very limited accident release scenarios (excluding terrorist attack and similar malicious action) the total exposure is reckoned to be 5 person-mSv, applied to a 10 million population group fanning out 50 miles each side of the transportation route – the accident frequency is projected at 66 incidents over the 24 year transhipment period. Although no details are provided, the radiological consequences generated from a single terrorist type attack on a US spent fuel flask results in the maximum exposed individual member of the public receiving a dose equivalent to 1.1Sv lifetime, which corresponds to an increase of developing a fatal cancer of about one-third over all other causes.

Bulgaria (CN-101/33) gives a revealing insight into its confidence about the ex-Soviet TUK-13 flask, used to convey irradiated WW1000 fuel by barge along the Danube, by citing a *Level 3* accident that leads to a breach of the flask containment and a 10% release fraction of the fuel contents. This accident is assumed to exceed the IAEA defined emergency limits and result in contamination of the Danube and the necessity for radiological countermeasures, etc., in the adjacent state of Romania, although no details of inter-state cooperation for the emergency planning response is given.

Cask and Package Designs and IAEA Compliance:

A number of new and modified packaging designs for both radiopharmaceuticals and nuclear fuel cycle transportation are given. These include some very complex fuel flasks (CN-101/37 & 39) taken from rigorous computer finite-element aided design through to practicable testing; virtual designs of flasks that have not been prototype manufactured (CN-101/39 & 40), seemingly for lack of funding; and flasks that are presently being utilised but the design of which would be unlikely to comply with the IAEA drop, thermal and spike penetration tests (CN-101/38) – a disturbing example of this is the Indian irradiated fuel transport flask which has not been drop tested because *"the facilities for experimentally performing 9m drop test on shipping cask and thereby investigating the design modification for improvement are very expensive and time consuming task (sic)."* and that *"most of the earlier drop tests were done in a make shift (sic) manner."*. Similarly, the Kazakhstan flask design for transporting the fuel from the BN-350 fast reactor (CN-101/40) cannot satisfy the IAEA Type B requirement, with a thermal test performance up to only 350^{o}C (not 800^{0}C) and impact loads associated with a free drop from 4m (not 9m).

Incidents, Accidents and Losses:

Adopting the term 'unusual' incidents, India (CN-101/47) lists 35 events that involved non-nuclear fuel cycles sources through the period 1973 to 2002, many of which included for temporary and total loss of the package.

Orphan and Abandoned Radioactive Sources:

Papers from Georgia and Lithuania (CN-101/51 & 52) illustrate the extent of the chaos that followed the collapse of the Soviet Union – in Georgia over 200 unregistered and abandoned sources have been found, six of which were thermal generators, each of about 130TBq of Strontium-90 – these required the fabrication of custom shielded containers prior to recovery and transport to a secure location. In Lithuania, once it had declared independence from the Soviet Union it, itself, had to enact legislation to register and safeguard about 47,000 sealed radioactive sources and it continues to maintain vigilance at its borders for the illegal (or unintended) movement of unaccounted for sources (particularly in scrap metal).

The position relating to the accountability of abandoned radioactive sources in the other territories and republics of the former Soviet Union has not been accounted for at this conference, although the Czech Republic reports (CN-101/71) that on average 30 or so cases or radioactivity are detected at its steelworks each year.

Adequacy of Package and Flask Designs:

Although the robustness and serviceability of the package and flask designs are robustly defended in a number of papers (and by intervention on CN-101/17 – see earlier), none of the papers or interventions related to the origins of the IAEA tests, these being originally established in 1964. Seen in the context that the impact test velocity derives from the mean of an averaging the carriage modes (rail and road) of the UK and US and, intriguingly, that the thermal test derives directly from a British standard for Money Safes (ie the internal temperature of a paper money safe when subject to a kerosene based fire would, after 30 minutes or thereabouts, attain the self-ignition temperature of bank notes), there can be little 'scientific' basis when these are applied to modern radioactive transportation conditions – any adequacies of the IAEA tests to represent real incident conditions are, surely, fortuitous ? This is particularly so when applied to ship fires, involving ship fuel spread throughout the cargo holds, and tunnel fires that, in recent years, have by far exceeded both the IAEA thermal test temperature and duration.

Four papers relate specifically to the hazards of radioactive transport at sea: The Japanese (CN101/56) considers a shipboard fire confined to the engine room compartment. The UK, via Pacific Nuclear Transport (CN-101/58 & 101/62) reckons that its ships are unsinkable in all realistic scenarios, seemingly unaware that previous unsinkable ships have actually sunk (ie Titanic). The US presented quite comprehensive statistical data (CN101/59) giving recent Lloyds statistics, for both impacts and ramming and, separately, fires at sea. The scenarios did not include for a ramming against a ship at berth, those providing no compensation via roll and heel of the rammed vessel, and the fire scenarios, although applied to the cargo hold, were limited to periods under the IAEA thermal test 30 minute period, whereas many real fires on ships are known to burn for periods of 20 or more hours.

Acts of Terrorism and/or the Unexpected:

Surprisingly, just 20 months from the tragic events of 11 September 2001, there is very little reference to the terrorist action, the defence of transportation packages and flasks against such, and what measures have been implemented for post-incident consequence management.

For example, in the United States training operatives for radioactive transport (CN-101/84), because apparently there is nothing is related to this in the paper on terrorism, gives no consideration to countering hostile and malicious acts. Similarly, the UK regulator chose not to address (CN-101/109 & 110) this security topic even though, through the British Isles, all radioactive road transportation and all Type B flask movements are exempted from the emergency planning requirements of the *Radiation (Public Information & Emergency Preparedness) Regulations* (REPPIR). Interestingly, where REPPIR applies to transportation of radioactive materials, there is no need for the emergency planner to include specifically for terrorist act because, or so the UK claims, acts or terrorism and similar are *'not reasonably foreseeable and therefore cannot be prepared for'*.

British Nuclear Fuels addresses (CN-102/111) emergency response arrangements for its Pacific class radioactive materials carrying ships when at sea, making much of its past record of safety as a portend for the future but, surprisingly, with only passing reference to recent terrorist events. Norway (CN-101/116) raises a number of doubts about the effectiveness of international cooperation in the aftermath of a radiological emergency, calling for further improvements in international regulations, cooperation although it does not support unilateral actions by states to keep nuclear shipments out of territorial waters and exclusive economic zones.

Not surprisingly, the United States adopts a pragmatic approach to terrorism (CN-101/113) and now implements what it refers to as TEPP and MERRTT but, other than outline that these programs exist there is nothing meaningful on their implementation and effectiveness – CN-101/114, although strictly applied to *accidents*, shows that considerable human and equipment resource could be called upon in the event of a radioactive spill, irrespective of the cause, being accidental or intentional.

The United States (CN101/04) seeks out and remodels past, major catastrophic events such as bridge collapse and fires following rail derailments, although it excludes the severe tunnel fires of recent years (Summit, UK – Channel Tunnel, UK-France, Mont Blanc – France-Switzerland), all of which were very severe and by far beyond the temperature and duration limits of the IAEA thermal test.

Environmental Assessment:

Just one paper (CN101/93) relates to environmental assessments and transportation risk, but this is devoted entirely to land-based studies in the United States, there being nothing relating the risks and impacts of accidents and incidents in the nuclear fuel cycle sea movements (irradiated fuel, vitrified HAL, plutonium oxide and MOX). This assumption of a perfect accident record and absence of any discussion of the consequences of an accident or incident means the conference is missing an essential element of safety, that is accident scenarios, environmental impact assessments and emergency response planning.