NUCLEAR SAFETY

INTERNATIONAL NUCLEAR SERVICES PUTTING BUISNESS BEFORE SAFETY AND OTHER ESSAYS ON NUCLEAR SAFETY

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Rev 1.0 22nd October 2012.

Abstract

This paper serves to document essays contributed by this author to the Lifeboat Foundation forums [1] and subsequent assertions on the topic of safety concerns in operations within the nuclear industry.

1. Introduction: Wildlife Sanctuaries in Eco-Disaster Areas

It was with great satisfaction that I watched a recent Horizon documentary on the wildlife, wolf population and introduced endangered species flourishing in the Chernobyl district in the abandonment of the area by mankind 25 years ago — with most not willing to hunt in the area for fear of contracting radiation poisoning. One wonders if this will be the template for the future, that eco-disaster areas will be abandoned to become our new wildlife sanctuaries. Or is it morally wrong to designate such areas as wildlife sanctuaries and wilfully expose the animal kingdom to such levels of radiation? After the Fukushima disaster of 2011, the world was reawakened to the real danger of fault tolerance at nuclear power plants — but as a relatively clean technology it is surely here to stay. One must ask the question: Is there a need for a more inclusive debate on the location of such reactors to areas that are a) less likely to suffer natural disasters but b) also provide a suitable follow-on purpose in the event of area abandonment due to excessive radiation leak due to an accident at such a reactor.

Whilst this is largely a socio-political question, and one I will leave unanswered in this short collection of essays, I herein highlight some of the other concerns raised in Lifeboat essays.

2. UNIX/IBM Control Systems – Potential Time-Bombs in Industry

It may be a point of little attention, as the millennium bug came with a lot of hoo-ha and went out with a whimper, but the impact it had on business was small because of all the hoo-ha, not in spite of it. And so it is with some concern that I consider operating system rollover dates as a potential hazard by software malfunction at major industrial operations such as nuclear power stations and warhead controls, which in worst case scenario, could of course have disastrous implications due to out-dated control systems.

The main dates of interest are 19 January 2038 by when all 32-bit UNIX operating systems need to have been replaced by at least their 64-bit equivalents, and 17 Sept 2042 when IBM mainframes that use a 64-bit count need to be phased out [4].

Scare mongering? Perhaps not. While all modern facilities will have the superior time representation, I question if facilities built in the 70s and 80s, in particular those behind the old iron curtain were or ever will be upgraded. This raises a concern that for example the old soviet nuclear arsenal could become a major global threat within a few decades by malfunction if not decommissioned or control systems upgraded. It is one thing for a bank statement to print the date wrong on your latest bill due to millennium bug type issues, but if automated fault tolerance procedures have coding such as 'if(time1 > time2+N) then initiate counter-measures' then that is quite a different matter entirely.

I believe this is a topic which warrants higher profile lest it be forgot. Fortunately the global community has a few decades on its hands to handle this particular issue, though all it takes is just one un-cooperative facility to take such a risk rather than perform the upgrades necessary to ensure no such 'meltdowns' occur. Whilst it has been suggested that computer malfunction would more likely render a weapon control temporarily inoperable than pose any graver risk (and yes in the general case of weapons control would surely involve a certain level of manual control also) and this mainly owes not due to such clock-wrap bugs not being present (they are most certainly — as the scenarios are naturally untested) but due to classic control

system design being always 'fail safe' — so there may be weakness in the operating systems, but the applications on which they run would have been designed to military standards.

However, as the perceived risk on such issues occurring is quite low, this leads to reduced initiative in ensuring that no-such weaknesses could be exposed within such control systems. It is imperative that such 32-bit and 64-bit control systems are upgraded and/or phased out.

3. International Nuclear Services: Putting Business Before Safety

Whilst I was checking up on C.O.R.E. [2] (Cumbrians Opposed to a Radioactive Environment) this weekend in September 2012, I read of latest plans to ship plutonium MOX fuel assemblies from Sellafield to the small German port of Nordenham near Bremerhaven on the NDA's (Nuclear Decommissioning Authority) ageing ship Atlantic Osprey.

The Atlantic Osprey, built in 1986, is a roll-on roll-off ferry purchased third hand by British Nuclear Fuels plc (BNFL) in 2001 and converted to carry radioactive materials. It is the only ship not to be custom-built of the UK's designated nuclear cargo ships, and so is not double-hulled, and has only a single engine, among other short-comings.

According to CORE it has a chequered history as a nuclear carrier that includes an engine-room fire and breakdowns at sea, and equivalent sister ships have historically been retired at or before a standard 25 years of service. Whilst the ship is soon to finally brought to the scrapyard, it is due to be replaced by a 25-year old ship Oceanic Pintail recently saved from the scrap yard itself — and one would get the impression that the Nuclear Decommissioning Authority are cutting corners on safety to save on expenditure.

CORE spokesman Martin Forwood has pointed out that INS (International Nuclear Services — a subsidiary of the NDA) appears hell-bent on shipping this MOX fuel to Germany on a third-hand ship with second class safety and kept afloat on first class INS PR alone" and on learning about the current state of affairs, one would be inclined to agree. "The shipment of such highly dangerous nuclear material should never be entrusted to a ship not only past its sell-by date but also described recently in the press as a rust-bucket. Given its known safety and security weaknesses which now include the apparent lack of the vital sonardyne sunken vessel location system, using the Atlantic Osprey for the German MOX is a prime example of the nuclear industry putting business before safety. Common sense dictates that these plans should be abandoned immediately".

Although the CORE concern is quite specific in this case, it raises the broader question — on what are acceptable safety standards for the nuclear industry as a whole — and to what extent such businesses cut corners for financial reasons — at the expense of public safety.

4. Liquor & Glass: Sellafield/BNFL Keeping a Lid on It.

Fukushima reawakened the world to the dangers of nuclear power, and reading back over Fearing Sellafield [3] (2003) by Colum Kenny recently, I reflect back on how deflective and dishonest industry can be to steer clear of critical opinion. Seeing parallels suggested in other industries today, I wonder if much has really changed.

Highly Active Liquor (HAL) produced by the reprocessing of irradiated nuclear fuel at Sellafield, reached a level of 1,500 cubic meters in storage at its peak circa 2001, the capacity of a 50 meter Olympic swimming pool. Particularly unstable, a disruption to electricity & water coolant could result in such liquor boiling, overloading the ventilation filtration systems and leading to a nuclear accident. Containing about 80 times the amount released during the 1986 Chernobyl accident according to a report for the European Parliament at that time, we are rather fortunate such a serious accident never occurred. This analysis was provided by what became known as The WISE Report — so called due to associated with the World Information Service on Energy (WISE) in Paris. In response BNFL set out to reduce this liquor to a solid form known as 'glass' — borosilicate glass — much safer than when kept in liquid form, and put in storage — though much of it still remains to be vitrified.

In 2000/2001, the Nuclear Installations Inspectorate (NII) of the HSE published a number of reports on aspects of Sellafield that led to causes of concern.

One report in particular entitled 'an investigation into the falsification of pellet diameter data in the MOX demonstration facility at the BNFL Sellafield site and the effect of this on the safety of MOX fuel in use' suggested deliberate dishonesty in keeping records. BNFL subsequently complied with most of these recommendations.

Authors of the WISE report however still had concerns regarding increases in levels in certain sea discharges and aerial releases, and inconsistent with the UK's obligations under the OSPAR Convention. It stated that the deposition of plutonium within 20km of Sellafield attributable to aerial emissions has been estimated at $160 - 280$ billion becquerels — several times the plutonium fallout from all atmospheric nuclear weapons testing, and that 250kg-500kg of plutonium from Sellafield has been absorbed as sediments on the bed of the Irish sea 'representing a long-term regional hazard of largely unknown proportions'. The report had been treated with caution by the European Commission and conveniently dismissed by the National Radiological Protection Board in the UK by claiming that some of the conclusions drawn in the report were based on 'lacking objectivity'.

It seems that governments are often over-obliged towards safeguarding industry first, leaving environmental concerns and the health of our Mother Ship as a secondary issue.

2. Conclusions

Herein essays illustrate some of the shortcomings in the nuclear industry as regards safety procedures – a history of falsification of data, and cost-cutting in the transport of dangerous substances – though all perhaps overshadowed by the most foreboding risk of all – the UNIX 2038 issue – a 'millennium bug' style weakness hidden within old industrial control systems.

REFERENCES:

[1] Essays to Lifeboat Foundation (http://lifeboat.com/blog/author/tom-kerwick) – Thomas B Kerwick, 2012.

[2] C.O.R.E - Cumbrians Opposed to a Radioactive Environment: http://corecumbria.co.uk/

[3] Fearing Sellafield (Paperback) – Colum Kenny. March 2003.

[4] Year 2038 Problem – No Universal Solution (http://en.wikipedia.org/wiki/Year_2038_problem) - Wikipedia.