

GE Healthcare Ltd. Report on ENSREG “Stress Tests”

Introduction:

This document summarises the assessment by GE Healthcare Limited (GEHC) for its Nuclear Licensed sites in the UK against the requirements of the ENSREG stress testing for Nuclear Power Plants (NPP) as additionally requested of Licensees other than NPP by the ONR Chief Inspector.

The document has been prepared by the Safety Director with input from the relevant site leadership. There has been a degree of benchmarking via the Safety Directors Forum (SDF) and via informal discussions with certain other non-NPP Licensees closest in nature to GEHC operations. It is issued under the authority of the Licensee Board. It was not considered necessary to obtain advice from the GEHC Nuclear Safety Committee (NSC) on this report before issue, given the nature of GEHC operations and the consequential limited applicability of many of the stress testing requirements. However, and as discussed with NSC, the report will be presented at the next routine meeting (Q1 2012) and any comments or advice considered.

The analyses carried out previously in response to the recommendations in the interim report on the lessons from the events at Fukushima by the ONR Chief Inspector have also been used, given that there is significant overlap between those and the ENSREG stress tests. In fact the outcomes from the stress tests documented here are considered to meet the actions identified by GEHC in response to Recommendations 13 (and 11) of that report.

The review is a qualitative rather than quantitative one and when considering the impact of the relevant events or failures, consideration has been specifically limited to off-site radiological impact. Contingency planning in relation to business interruption, impact to on-site staff safety and compliance obligations (e.g. routine discharge monitoring capability) are scrutinised routinely via other mechanisms and are *not* included here.

Overview of GE Healthcare Licensed sites:

The review has been performed within the context of the following key generic features relating to GEHC operations:

- None of GEHC sites trigger the requirement for an off-site emergency plan under REPPiR.
- There are no nuclear reactors (power, research or other) at the sites.
- There is no handling of reactor fuel (either spent or new).
- There are no cooling ponds.
- There is no requirement for heat sink capability.
- There are no materials requiring criticality control.
- There are no processes in routine or accident conditions involving temperature or pressure excursions sufficient to drive materials off-site.

- Hydrogen (or other combustible gas) generation or accumulation is not relevant for GEHC operations.
- There are no processes involving control of reactivity.
- Systems for the control of off-site safety or environmental impact are passive.
- Availability of those systems is not time-critical.

There are currently three GEHC nuclear licensed sites in the UK:

- The Grove Centre at Amersham (Site Licence 32A)
- The Maynard Centre at Cardiff (Site Licence 38B)
- Building 443.26 at Harwell (Site Licence 33A)

The **Grove Centre** is located in Amersham, (ordinance grid reference SU 985 975) with operations centring on the management of legacy waste and plant and the manufacture of radiopharmaceutical products. The latter involves radionuclides of short (days) or very short (hours) half-lives. This manufacturing base will reduce significantly over the next three years as 80% of the current manufacturing is to be transferred to various sites outside the UK.

The Grove Centre has a long and varying history of handling radioactive materials within numerous facilities since around 1940. Many of these facilities have been decommissioned with ILW generated from this process being stored within a purpose built store in accordance with the national strategy for ILW management. The site is currently implementing its decommissioning plan which will see the remaining liabilities decommissioned resulting in the further generation of ILW for on-site storage pending ultimate disposal options.

The **Maynard Centre** is located near Cardiff (ordinance grid reference ST133 812) and was opened in 1980. It was used to manufacture radiochemical products based on C-14 and tritium which are relatively low hazard/low radiotoxicity. Manufacturing operations ceased in 2010 and the associated facilities have been substantially decommissioned and removed with completion of that expected by the end of 2012. There is no intention to reintroduce radiochemical manufacturing.

The site will continue to manage and store ILW radioactive waste (C-14 and tritium) but will make use of disposal routes to reduce the inventory on site over the coming years.

The site is preparing for a variation to the nuclear licensed site. The revised nuclear licensed site is expected to encompass the waste facilities only – approximately 10% of the current Licensed site.

At **Harwell** GEHC operated on a Licensed enclave within the larger RSRL Licensed campus (ordinance grid reference SU 484 872). There were, until Q1 2011, two operating units in a single building:

- A waste drum repackaging plant that was used for opening and repackaging waste drums prior to the waste being transferred to the Grove Centre for disposal/storage.
- A facility used to manufacture sealed sources.

Both these facilities have now been decommissioned. The waste drum packaging plant has been completely removed and all associated waste removed.

The facility used to manufacture sealed sources has been decommissioned with all sources having been removed and disposed of. The remaining concrete shielding structure remains with only low level fixed contamination in some areas. This structure will be demolished as part of the building demolition by the landlord. Having completed this decommissioning work GEHC expect to bring their licence obligations to an end in Q1 2012.

The Harwell site is therefore not considered further in this report.

Current knowledge:

GEHC is highly confident of its position in respect of currency of knowledge of plant and process, the level of hazard and the validity of its safety cases at the UK sites. This position is achieved by *inter alia*:

- Current, continuous and demonstrably successful decommissioning programme which is delivering significant and known reductions in the level of hazard from legacy operations and is ensuring up-to-date safety cases and facility knowledge relating to those.
- Preparation for the Periodic Review of Safety (PRS), due for submission to ONR in 2012, which required reviews of operational safety cases and facilities against modern standards via walk-downs and document reviews.
- A deterministic review, as part of the PRS activities, of the likely seismic challenge at the Grove Centre site and the likely level of damage to buildings (2010/2011)
- Re-analysis of reasonably foreseeable accidents and their causes as required under REPPiR (submitted to ONR in April 2011) which has confirmed the accident scenarios of relevance and that their potential impact does not require an off-site plan under those regulations.
- Routine GE-wide review process (Enterprise Risk Management process) for all of its sites to identify those with highest potential for significant business interruption, on site risk or adverse off site impact (latest review was Q2 2011).
- Site Inspections and the associated report by Nuclear Risk Insurers relating to 3rd party liability insurance (Q4 2011)
- Inspection and report by GE's facilities insurance group (FM Global –Q1 2011)
- Specific inspections by ONR on Fire risk (latest in Q4 2011)

Stress Testing:

The issues as identified in the Annex I EU “Stress Tests” Specifications are reproduced in Appendix 1.

Earthquake, Flooding, Loss of Safety functions (from loss of Power) and Severe Accident Management (in respect of loss of containment integrity) are the only considerations relevant to GEHC operations. These have been assessed for both the Grove Centre and the Maynard Centre and the results are summarised below.

Earthquake:

General:

Local seismicity around the sites is well understood (and is low) as is the extent of damage to the buildings which could be expected from that (relatively minor). None of the buildings are designed specifically against more extensive seismic activity, being typically of standard industrial construction.

Seismic collapse is routinely considered within the potential accident scenarios examined under REPPiR. The consequences fall below the requirement for off-site emergency planning and are less than those related to fire scenarios.

The nature of the site safety systems are such that their loss through seismic activity (or other routes) is not time-critical in respect of off-site impact.

Grove Centre:

Manufacturing operations are limited to short lived radionuclides and the consequences of seismic collapse in those areas are at the lower end of the spectrum of accident scenarios considered under REPPiR, with significant margins between those and the need for an off-site emergency plan.

Legacy manufacturing facilities, where there are longer lived nuclides from historical operations at the site, are subject to an active and successful decommissioning programme broadly driven by hazard ranking. There are demonstrable and continuous reductions in inventory and hazard, upgrading of safety systems, the removal of individual plants and enclosures and in some cases the removal of the building itself. On-going elimination of the potential hazard presented by these older buildings is considered to be the most appropriate use of resources rather than analysing or enhancing the ability of these facilities to withstand exceptional seismic activity.

Facilities used for waste management (segregation, decay, disposal, storage etc) are mainly passive facilities with the bulk of the inventory held in “packages within packages” in sealed stainless steel drums or within small concrete shielded trenches/vaults . It is judged that containment integrity is sufficient that, in the absence of any motive force (other than the seismic forces) to drive material off-site, there would not be a significant release of materials to the public or environment. Similarly, shielding degradation following seismic damage to these facilities is not considered to be significant in respect of off-site impact. The few specific enclosures of relevance are well known, and relatively simple localised contingencies are available.

Maynard Centre:

Manufacturing operations have ceased and the associated decommissioning is essentially complete other than specific building shell/infrastructure items.

Facilities used for waste management (segregation, decay, disposal, storage etc) are mainly passive facilities with the bulk of the inventory held in “packages within packages” in sealed stainless steel drums. The inventory is limited to relatively low hazard nuclides (Carbon 14 and Tritium). It is judged that containment integrity is sufficient that, in the absence of any motive force (other than the seismic forces) to drive material off-site, there would not be a significant release of materials to the public or environment. Shielding degradation is not a relevant consideration for these materials.

Flooding:

Grove Centre:

The site is sufficiently inland that tidal surges do not present a credible risk to the site. It is not located within flood warning zones on the EA Flood Warning map. The site is also situated some 50m above the groundwater at an AOD of 130m. Historically there have been no recorded flooding episodes and no records of any flash flooding. Even in the event of very extreme weather and failure of all drainage capability such that there is water ingress to facilities, the nature of operations is such that containment integrity remains adequate to protect the public and environment from significant release of materials.

Maynard Centre:

The site is 4 miles away from the coast, 30 metres above sea level which, with the presence of the Cardiff Bay barrage, puts the site at such low risk from tidal surges that that aspect of flooding is not considered further. The site is adjacent to the River Taff but is raised above the river level. There are flood defence banks to protect the site and neighbouring industrial units from significant floods. The area where the radioactive materials are held is at the furthest and highest point of the site in relation to the river. Even in the event of a cliff-edge effect such that the flood defence is breached and there is water ingress to facilities, the

nature of operations is such that containment integrity remains adequate to protect the public and environment from significant release of materials.

Loss of safety functions (e.g. from loss of power):

As noted previously the nature of the safety systems at the sites are such that their unavailability through loss of power (or other cause) is not time-critical in respect of off-site impact. Further, the nature of GEHC operations is such that the control of process parameters (e.g. temperature or pressure) are not critical to off-site safety.

Both the Grove Centre and Maynard centre sites would remain in a state of passive safety without reliance on off-site infrastructure (grid supply) in the immediate or medium term. It is also noted that the parent company GE is a commercial supplier of electrical power generating units.

Severe Accident management:

The systematic consideration of accident scenarios via safety cases, periodic safety reviews, emergency planning exercises and assessments required under REPPiR has consistently shown that the credible mechanism for potential off-site impact is limited to fire scenarios. Fire management (i.e. avoidance, detection and suppression) is considered to be highly effective. It is and will remain a focus in terms of accident management.

No specific scenarios within the scope of the Stress Tests have been identified where there is a loss of emergency response capability concurrent with an accident with severe off-site consequences. Nevertheless GEHC is aware that the nuclear industry is considering the lessons learned from events in Fukushima specifically in relation to emergency response resilience. GEHC will remain fully engaged with the various forums on this issue to ensure that any appropriate improvements can be identified and implemented where practicable.

Summary:

GEHC operations at its Licensed sites are relatively low hazard with low potential for off-site impact.

GEHC sites are not dependent on active control systems for the avoidance of significant off-site impact.

Routine business processes ensure up to date information on operational status, hazards and facilities condition.

Resilience and margins for safety against earthquake, flooding, other extreme weather and loss of power are considered to be adequate and appropriate given the location of sites, the nature of GEHC operations and the types of safety systems employed.

The review has confirmed that GEHC historical and effective focus on accident management arrangements based on fire as the potential motive force remains appropriate. Fire management arrangements will continue to be scrutinised under normal business processes.

The review has also confirmed that GEHC active programme of decommissioning remains an appropriate and effective priority for reducing the hazards on site. Decommissioning progress and prioritisation will continue to be scrutinised under normal business processes.

GEHC emergency response capability remains fit for purpose. However GEHC will remain fully engaged with colleagues across the nuclear sector in the various forums which will be focussing on emergency response resilience in the light of the events in Japan.

J D MacHardy
Safety Director
23/12/11

Appendix 1

a) Initiating events

- Earthquake
- Flooding

b) Consequence of loss of safety functions from any initiating event conceivable at the plant site

- Loss of electrical power, including station black out (SBO)
- Loss of the ultimate heat sink (UHS)
- Combination of both

c) Severe accident management issues

- Means to protect from and to manage loss of core cooling function
- Means to protect from and to manage loss of cooling function in the fuel storage pool
- Means to protect from and to manage loss of containment integrity