Hitachi-GE Nuclear Energy, Ltd.
UK ABWR GENERIC DESIGN ASSESSMENT
Resolution Plan for RO-ABWR-0070
(Discharges to Surface Waters)

RO TITLE:	Discharges to Surface Waters	
REVISION :	0	
Overall RO Closure Date (Planned):		2nd September 2016
REFERENCE DOCUMENTATION RELATED TO REGULATORY OBSERVATION		
Regulatory Queries	-	
Linked ROs	-	
Other Documentation	-	

Scope of work: To provide further information on the management and discharge of specific non-radioactive liquid effluents.

BACKGROUND (From EA RO-ABWR-0070)

Non-radioactive discharges to surface waters from the UK ABWR are covered in the Other Environmental Regulations submission. The Process and Information Document (P&ID) requires Requesting Parties to:

"*Provide a description of how aqueous waste streams will arise, be managed and disposed of...*" and "*include*", (amongst other things):

- *"sources and quantities of contaminants (including biocides and disinfectants), highlighting priority substances;*
- *potential options and associated environmental impact for disposal of each individual effluent stream*"

The purpose of the detailed assessment of proposed discharges from the UK ABWR to surface waters is to establish whether sufficient information has been provided during GDA to enable a decision to be made, in principle, on the likelihood of granting a water discharge permit at the site-specific stage. This relies on sufficient information being available to characterise the UK ABWR aqueous effluent streams and assess their potential impact.

The detailed assessment of the discharges to surface waters has been based on the information included in Revision E of the Other Environmental Regulations submission (Document GA91-9901-0027-00001). The individual aqueous effluent streams have been identified in this document; however, there is only limited information on contaminants and their quantities in the different aqueous effluent streams. There are also certain aqueous waste streams where there is no information provided on the expected volumes to be discharged.

Based on the information provided in Revision E of the Other Environmental Regulations it is not possible to make an assessment on the likelihood of granting a water discharge permit.

In order to progress with the Generic Design Assessment of the UK ABWR further information is required as specified in the Regulatory Observation.

Scope of Work

The RO consists of five questions. This Resolution Plan shows how each question will be addressed and the timeframe for the project plan and delivery of the work to provide further information on the discharges to surface waters.

Description of work:

Actions identified below.

RO-ABWR-0070.A1

Requirement - Provide information on the likely biocides to be used in the Cooling Water systems (CW, TSW & RSW) and the quantities/concentrations to be released. Use the information to carry out an assessment on the environmental impact of biocide discharges. No information has been provided on the expected biocides to be used or the quantities to be released as the submission states that biocide dosing is a site-specific issue. We accept that the final choice of biocides and dosing levels cannot be decided until the environmental conditions of the particular site are known; however we would expect that Hitachi-GE would be able to provide any future operator with information on the biocides that are compatible with the design of Cooling Water systems, and typical dosing levels expected.

Resolution proposed – The existing section on biocide dosing in E9 (section 5.3.1.2) will be updated to identify sodium hypochlorite as a possible biocide chemical which is compatible for use with the cooling water system of the UK-ABWR. Section 5.3.1.2 will re-iterate that the dosing strategy (quantify of biocide dosing, and frequency of dosing) will be site specific as it is affected by the types of marine organisms present and the temperature of the seawater. Text will be added to Section 5.3.1.2 stating that the biocide will be dosed into the cooling water system at a level that is both sufficient to achieve the required management of biofouling, and to ensure that following discharge of the cooling water to the sea the environmental quality standard (EQS) for total residual oxidant (TRO) of 0.01 mg/l is not exceeded at the edge of the mixing zone. Text will be added to the E9 report providing a qualitative assessment of the potential impact posed by the biocide and biocide degradation products following discharge from the cooling water outfall. As agreed with the EA, a qualititative assessment of the potential impact will be undertaken.

The outputs from this stage will be presented in the Discharge to Surface Waters Topic Report, and E9 will be updated accordingly.

Timeframe to address resolution –Topic report to be submitted and E9 to be updated by 8th July.

RO-ABWR-0070.A2

Requirement – Provide information on the chemical contaminants and their quantities for the High Chemical Impurities Waste (HCW) aqueous effluent stream. Use the information to carry out an assessment on the environmental impact of this discharge. No information has been provided on any potential contaminants or quantities/concentrations expected in the HCW aqueous effluent stream. Although the principle is to recycle water treated from the HCW back into the process, discharges to sea do occur. It is noted that there are no direct discharges to the environment from the LCW as this aqueous effluent is treated in the HCW. Any contaminants arising from the generation of LCW should be considered as part of the HCW discharge.

Resolution proposed – Details will be added to the E9 report on the generic groups of chemicals discharged from the laboratory into the HCW system. Comment will then be made on the effectiveness of the treatment systems within the HCW system to remove those groups of chemicals from the liquid effluent. Text will be added confirming that the HCW (and LCW) systems are systems for the treatment of radioactively contaminated liquid effluent. Text will also be added to the E9 report reiterating that discharge from the LCW system directly to the environment does not occur. Any effluent that cannot be treated to the required standard within the LCW system will be transferred for treatment through the HCW system. Text will be added to the E9 report confirming that effluent that has been treated through the HCW system is transferred to the condensate storage tank (CST) for re-use within the UK-ABWR. Therefore the HCW (and LCW) systems are designed to be able to treat effluent so that it meets the acceptance criteria for the CST. Details of these acceptance criteria will be provided as a table in E9. A qualitative assessment of the potential impact to the marine environment will be made on this basis; noting that any discharge from the HCW system will be very clean.

The outputs from this stage will be presented in the Discharge to Surface Waters Topic Report, and E9 will be updated accordingly.

Timeframe to address resolution – Topic report to be submitted and E9 to be updated by 8th July.

RO-ABWR-0070.A3

Requirement - Provide information on the expected levels/concentrations of contaminants and volume to be discharged of:

1. Boiler Blowdown
2. Demineraliser Plant Regeneration Effluent

Use the information to carry out an assessment of the environmental impact of these discharges. No information has been provided on the volumes of boiler blowdown or demineraliser plant regeneration plant effluent discharged to sea. Contaminants in the boiler blowdown have been identified as ammonia, as a degradation product from the use of hydrazine as deoxidiser and phosphate, used for pH control. No information has been provided on the quantities/concentrations expected to be released. Sulphuric acid and sodium hydroxide have been identified as being used in the regeneration process of the ion exchange resins and will be present in the effluent discharged to sea. No information has been provided on the quantities/ concentrations expected to be released.

Resolution proposed – Demineralised water plant – The technology used in the demineraliser plant has changed from that presented in the February 2016 submission of E9. The description of the demineraliser plant technology in the E9 report will therefore be updated to describe the demineraliser plant as using reverse osmosis followed by electrodeionisation; rather than ion exchange. Information of chemicals from the demineraliser plant will be updated reflecting the change of plant type. A specification for a UK drinking water supply will be used to determine the characteristics of the feedwater into the demineraliser plant. It is noted that the use of sulphuric acid and sodium hydroxide is not required with the reverse osmosis/electrodeionisation technology. A qualitative assessment of the potential impact of the effluent from the demineraliser plant will be made.

Boiler blowdown – Text will be added to the E9 report on the expected volume of boiler blowdown. The use of demineralised water as the feedwater into the boiler system will reduce the level of blowdown required to maintain the quality of the boiler water. Phosphate and hydrazine are dosed into the boiler water to maintain water quality within the boiler. A qualitative assessment of the potential impact of the boiler blowdown effluent will be made.

The outputs from this stage will be presented in the Discharge to Surface Waters Topic Report, and E9 will be updated accordingly.

Timeframe to address resolution – Topic report to be submitted and E9 to be updated by 8th July.

RO-ABWR-0070.A4

Requirement - Provide information on the likely detergents to be used in the Laundry and the expected levels/concentration of contaminants that will be discharged. Use the information to carry out an assessment of the environmental impact of these discharges. Information has been provided on the volumes of detergent to be used and the expected volumes of effluent to be discharged to sea but no information has been provided on the types of detergents likely to be used. Although the final detergent choice will be a site-specific issue, information on the active ingredients should enable an assessment of the concentrations in the final effluent, and their potential impacts.

Resolution proposed – Text will be added to the E9 report identifying Manoxol OT as a typical commercially available detergent. Manoxol OT is an anionic-based surfactant, with a likely concentration in the effluent of 50 mg/l. A qualitative assessment of the potential impact of the effluent from the laundry containing this effluent will be made.

The outputs from this stage will be presented in the Discharge to Surface Waters Topic Report, and E9 will be updated accordingly.

Timeframe to address resolution – Topic report to be submitted and E9 to be updated by 8th July.

RO-ABWR-0070.A5

Requirement - Provide more detailed information on the treatment for the following waste streams:

1. High Chemical Impurities Waste (HCW)
2. Low Chemical Impurities Waste (LCW)
3. Laundry Drain Waste (LD)

The information included in the submission including that referenced in the Preliminary Safety Report on Radioactive Waste Management System Revision B (Document GA-9901-00420-00001) is very generic in terms of the treatment processes. More detailed information is required to demonstrate or explain why these treatment processes are suitable for the non radiological contaminants of the various aqueous waste streams.

Resolution proposed – Text will be added to the E9 report on the treatment undertaken in each of the three waste streams. Simple justification to be provided as to why the treatment processes have been selected. Information presented in other sections of the GEP submission will be used to undertake this task.

The outputs from this stage will be presented in the Discharge to Surface Waters Topic Report, and E9 will be updated accordingly.

Timeframe to address resolution – Topic report to be submitted and E9 to be updated by 8th July.

Summary of impact on GDA submissions:

Related RO Actions	GDA Submission Document Title	Document ID (Document No.)	Submission Date to the Regulators
A1 to 5	Other Environmental Regulations	GA91-9901-0027-00001 (XE-GD-098)	Rev. F, 8th July 2016
	Chemical discharges to surface waters	GA91-9201-0004-00054 (SE-GD-0457)	Rev. 0, 8th July 2016

Programme Milestones / Schedule:

Refer to the attached Gantt-chart for the programmed activities and the schedule for the resolution of the RO.

Detail Gantt-Chart is not provided separately since full activity is shown in the Table 1.

Reference:

[Ref-1] Hitachi-GE Nuclear Energy, Ltd., *"Preliminary Safety Report on Radioactive Waste Management System"*, GA91-9901-0042-00001 (XE-GD-0153) Rev.B, Mar 2014.

Table 1 RO-ABWR-0070 Gantt Chart

Resolution Plan for RO-ABWR-0070				June				July				August				
Action		Start	Finish	w/c 6	w/c 13	w/c 20	w/c 27	w/c 4	w/c 11	w/c 18	w/c 25	w/c 1	w/c 8	w/c 15	w/c 22	w/c 29
1	Information on biocide	3/6/16	8/7/16													
2	Chemicals in HCW and LCW	3/6/16	8/7/16													
3	Chemicals in boiler blowdown and effluent from demineralizer plant	3/6/16	8/7/16													
4	Information on detergents	3/6/16	8/7/16													
5	Information on treatment in HCW, LCW and LD systems	3/6/16	8/7/16													
-	Produce Topic Report for Actions 1-5	13/6/16	8/7/16													
-	EA Assessment	11/7/16	2/9/16													
-	RO Closure	2/9/16	2/9/16													