CGN EDF General Nuclear System	REGULATORY OBSERVATION RESOLUTION PLAN RO-UKHPR1000-0049	Rev.: 0	Page: **1 / 15**
		GDA-REC-GNSL-007911	

REGULATORY OBSERVATION Resolution Plan	
RO Unique No.:	RO-UKHPR1000-0049
RO Title:	Generation, Transport and Behaviour of Tritium During Normal Operations
Technical Area(s)	Reactor Chemistry
Revision:	0
Overall RO Closure Date (Planned):	2021-04-30
Linked RQ(s)	RQ-UKHPR1000-0814
Linked RO(s)	RO-UKHPR1000-0026;RO-UKHPR1000-0031
Related Technical Area(s)	Radiological Protection,Radwaste, Decommissioning & Spent Fuel Management,Environmental
Other Related Documentation	
Scope of Work	

Background

Tritium is a radioactive isotope of hydrogen; it is a low energy beta emitter with a half-life of approximately twelve years. Once generated in a PWR, tritium cannot be eliminated or removed by treatment/abatement systems, so it must be safely managed and ultimately discharged to the environment, preferably as liquid waste (to minimise impact on the environment). For the UK HPR1000, the Requesting Party (RP) has identified various measures to minimise the generation of tritium, which include: the selection of an appropriate fuel cladding material, optimisation of the lithium and boron concentrations in the primary circuit (e.g. via the use of burnable poison and the use of enriched lithium), and optimisation of both the use of secondary neutron sources and their materials selection, Reference [1], [2] and [3]. However, ONR has identified that the RP have presented to date a very narrow set of limits and conditions necessary in the interests of safety, associated with tritium control.

Regulatory Observation (RO) RO-UKHPR1000-0049 has therefore been raised by ONR to clarify their expectations and to seek evidence and gain confidence from the RP that the relevant safety risks associated with tritium management in UK HPR1000 have been identified and reduced SFAIRP. This RO requires the RP to:

a) *Provide suitable and sufficient analysis to underpin the claimed generation, transport and behaviour of tritium in the primary circuit and associated systems, and of tritium “leaving” the primary circuit, considering plant-specific aspects of the UK HPR1000 design, such as the use of Enriched Boric Acid and primary coolant recycling. This analysis should quantify and justify* *the levels of tritium entering other systems in the nuclear island, such as the Spent Fuel Pool and the in-containment refuelling water storage tank (IRWST).*

b) *The analysis should include a consideration of how any operator actions may affect the transport of tritium, and if this results in any additional operating constraints. This analysis should also identify if the generic design imparts any specific constraints on future operators, with respect to the implementation of future tritium management strategies.*

c) *Using the analysis described above; identify any relevant controls, including any limits and conditions necessary in the interests of safety, required to safely manage tritium throughout the plant.*

d) *Based upon the above analysis, make an appropriate overall demonstration that relevant risks associated with the management of tritium in UK HPR1000, have been reduced SFAIRP.*

Scope of Work

To respond to this RO, the following work will be carried out, commensurately to GDA scope and stage:

a) Clarifying the route map of tritium whole life cycle in UK HPR1000, e.g. generation, transport and discharge, and the levels of tritium in key SSCs.

b) Clarifying the potential safety risks associated with tritium management and corresponding prevention/minimisation measures including any limits and conditions necessary in the interests of safety

c) Enhancing the demonstration that the relevant risks associated with the management of tritium in UK HPR1000, have been reduced SFAIRP.

Deliverable Description

General Introduction

Tritium is a low energy pure beta emitter radioisotope with a half-life of about 12.3 years. Tritium is produced in Nuclear Power Plants (NPPs) from the fission of heavy nuclei, the neutron activation of primary coolant constituents, such as boron, lithium, deuterium and the neutron activation of specific material constituents, e.g. beryllium.

As shown in below figure Fig. 1, the majority of the tritium produced in PWRs is retained in the fuel rods (① and ⑥) and part of it will be produced directly in the primary coolant or will transfer to it (①). Once in the coolant, tritium will be transferred to various SSCs via water and fuel movements (① & ② & ⑥), evaporation / degasing ④ or leaks (③).

Since there is currently no effective means to treat the tritium in LWRs, Reference [4], tritium generated will accumulate in SSCs and / or be discharged to the environment (marine environment and atmosphere) (⑤).

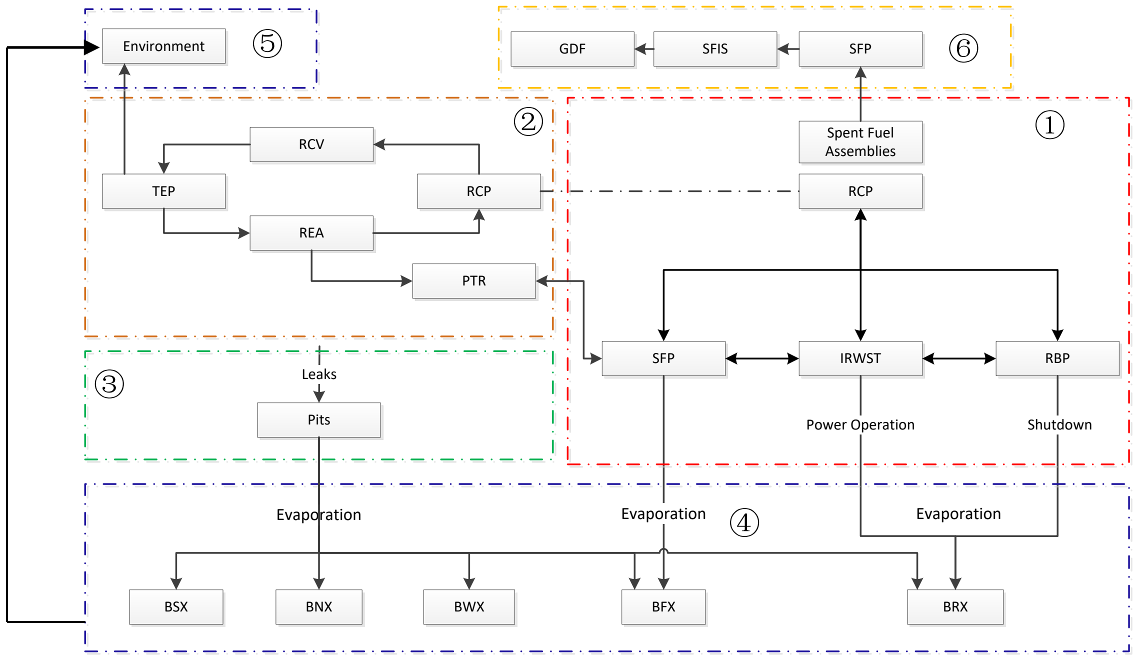

Fig 1 The Diagram of the Whole Process of Tritium Transport

There are two different tritium management strategies widely adopted within PWRs:

a) End-cycle dilution strategy. It consists in recycling all TEP distillates (apart if their quality prevents it, i.e. if a chemical limit is exceeded or a too high activity concentration for specific RNs other than tritium). With this strategy, tritium accumulates continuously (proportionately to the production rate) in the primary circuit and connected systems during power operation, and is discharged before shutdown (before RPV head lift) to ensure the head lift criteria are met;

b) Continuous dilution strategy based on a target value of tritium activity concentration in the RCP [RCS]. It consists in transferring to TER [NLWDS] the TEP distillates if the tritium concentration in RCP [RCS] exceeds the target value, and recycling them if not (except if any other parameter exceeds its limit value). Before entering into shutdown, tritium concentration in RCP [RCS] is also to be lower than the target value, otherwise the primary coolant will be diluted via TEP [CSTS] until the target value is reached. If necessary, a further dilution can take place before RPV head lift to reach the relevant head lift criterion if any.

   A variant of this strategy consists in transferring to TER [NLWDS] all the TEP distillates whatever the tritium activity concentration in the RCP [RCS] during power operation. If necessary a further dilution can take place before RPV head lift to reach the relevant head lift criteria if any.

RO-UKHPR1000-0049.A1 – Demonstrate that the behaviour of tritium in the UK HPR1000, during normal operations, is adequately understood and controlled:

ROA1.1: *Provide suitable and sufficient analysis to underpin the claimed generation, transport and behaviour of tritium in the primary circuit and associated systems, and of tritium "leaving" the primary circuit, considering plant-specific aspects of the UK HPR1000 design, such as the use of Enriched Boric Acid and primary coolant recycling. This analysis should quantify and justify the levels of tritium entering other systems in the nuclear island, such as the Spent Fuel Pool and the in-containment refuelling water storage tank (IRWST).*

ROA1.2: *The analysis should include a consideration of how any operator actions may affect the transport of tritium, and if this results in any additional operating constraints. This analysis should also identify if the generic design imparts any specific constraints on future operators, with respect to the implementation of future tritium management strategies.*

ROA1.3: *Using the analysis described above; identify any relevant controls, including any limits and conditions necessary in the interests of safety, required to safely manage tritium throughout the plant.*

ROA1.4: *Based upon the above analysis, make an appropriate overall demonstration that relevant risks associated with the management of tritium in UK HPR1000, have been reduced SFAIRP.*

Resolution Plan

ROA1.1:

Summary for this query

ROA1.1 queries for the quantification and justification of tritium source term within the plant (generation and migration).

Resolution plan for this query

The explanation and diagram provided in the General Introduction above summarises how tritium is generated and transported within a PWR. The reports mentioned in the following sub-sections that outline the generation and transport of tritium, contain or will be updated to contain further information requested by ROA1.1:

a) Generation of tritium in the primary coolant.

The relevant information on tritium generation and associated production rate is provided in the existing version of ***Primary Coolant Source Term Calculation Report***, Reference [5]. An OPEX data based method using CGN fleet OPEX is applied for the quantification of the annual production quantity of tritium and international available OPEX from other similar units is collected and used to carry out the justification of the estimated annual production quantity. To further support the OPEX led quantification of tritium, further theoretical quantification will be undertaken to supplement the work already carried out and reflected in *Minimisation of the*

Discharge and Environment Impact of Tritium, Reference [2]. This work will include calculation of tritium production from the various sources in the primary circuit of the UK HPR1000, mainly focusing on boron and lithium activation (B-10, B-11, Li-6, Li-7). The calculation will use the neutron flux for the UK HPR1000 and capture cross-sections of the relevant target nuclides as the key inputs. The SNS are a significant source of tritium in NPPs that use them, including in the UK HPR1000. The tritium in primary coolant from this source will not be theoretically calculated due to the likely inaccurate values such calculation will result in considering the various factors that have to be taken into account that are not accurately known, e.g. the stainless steel permeability, the location of the SNS and the burn-up of the fuel assemblies in which they are inserted (the locations of the secondary source assemblies may change each cycle, as does the relative burnup of each assembly. Each fuel assembly hosting a secondary source has a different relative burnup, which changes cycle to cycle). Therefore, only OPEX data based results are given for this tritium source. The overall analysis/explanations will be included in Reference [5].

The following sub-sections provide an initial summary of tritium transport in the UK HPR1000, summarise different management strategies that can be adopted, and explain where additional work identified will be included in the safety case.

b) Transport of tritium within relevant systems/components.

Once generated in the primary coolant or transferred from fuel rod to primary coolant, the tritium is transported through the RCP and relevant connected and downstream SSCs.

i. Transport within RCP

Fig 2 and Fig 3 respectively correspond to variations of the tritium concentration in the primary coolant for the two tritium management strategies mentioned above. The concentration during power operation is the concentration in RCP while the concentration during shutdown, corresponds to concentration within the Reactor Building Pool (RBP).

It is noted that these graphs provide trends of tritium concentration evolution in the primary coolant during a cycle. Tritium concentration evolution during the first half of the power operation in Fig 2 is actually not strictly linear.

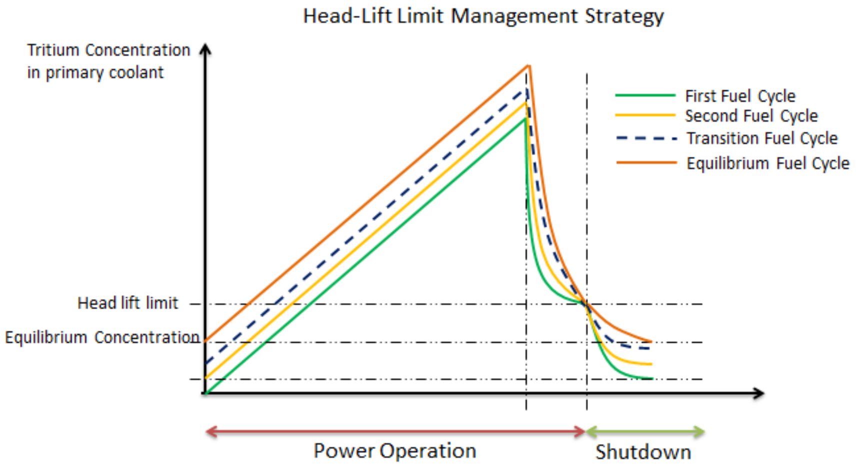

Fig 2 Variation of Tritium Concentration in Primary Coolant with Head-lift Limit Management Strategy

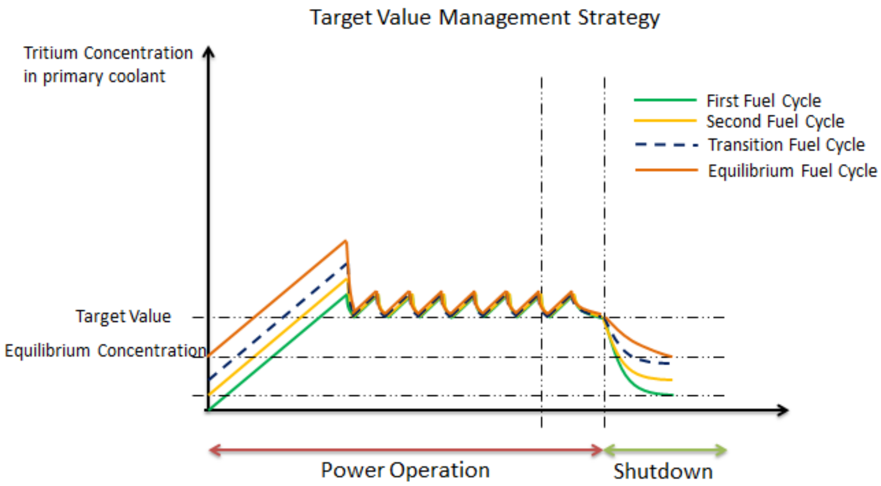

Fig 3 Variation of Tritium Concentration in Primary Coolant with Target Value Management Strategy

As shown in Fig 2 and Fig 3, the end-cycle dilution strategy will result in a conservative assessment of the tritium activity concentration in the primary coolant, thus the tritium concentration in the primary coolant for such a strategy will be quantified and justified, considering UK HPR1000 specificities, e.g. use of EBA. The analysis will be added in the updated version of the ***Primary Coolant Source Term Calculation Report***, Reference [5].

ii. Transport to/within SFP, IRWST

Fig 4 presents the variation of tritium concentration within the IRWST or SFP. The tritium concentration within these SSCs depends mainly on that of the primary coolant at the time of head lift. The tritium concentration within the IRWST or SFP can be calculated by modeling the transport process taking the primary coolant tritium concentration at the time of head lift as the main input. It is noted that contribution to tritium concentration in the IRWST or SFP from REA [RWBMS] (during boron adjustment) is considered negligible due primarily to the volumes involved (very low volume of REA fluid injected into a very large volume of SFP/IRWST) and also considering the low concentration of tritium in REA [RWBMS] despite the increased boron recycling for the UK HPR1000. The analysis will be added in the updated version of the ***Derived Source Term Supporting Report***, Reference [6].

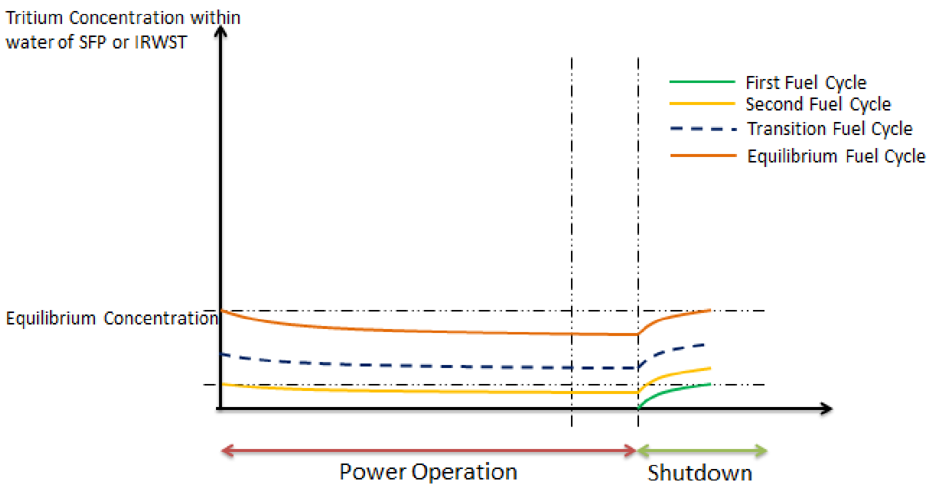

Fig 4 Variation of Tritium Concentration within Water of IRWST or SFP

iii. Transport to/within other SSCs

Based on the tritium concentration in the primary coolant, SFP and IRWST, the tritium concentration within the connected/downstream SSCs is theoretically derived. The analysis will be added in the updated version of the ***Derived Source Term Supporting Report***, Reference [6].

c) Activity concentration of tritium within buildings atmosphere.

The buildings of interest here are BRX, BFX, BNX, BWX and BSX.

The BPX, BQF, BQZ and conventional island are expected to contain negligible airborne tritium (if any at all) during normal operation and are therefore excluded.

With respect to the tritium source within buildings atmosphere, the first main source in BRX and BFX atmosphere is evaporation of tritium contained in the IRWST and RBP (during shutdown only), and in the SFP (respectively).

The evaporation of tritium contained in systems' leaks is the second main source of tritium airborne activity in BRX and BFX, and the first main source in BSX, BNX and BWX.

The activity concentration of tritium in the buildings atmosphere from these two sources is provided in the existing version of the ***Airborne Activity Supporting Report***, Reference [7]. It is based on FCG3 input and will be updated to reflect outcome from analysis carried out under bullet point b) above, as relevant.

d) The discharges of tritium have been analysed in the ***Estimation of Radioactive Gaseous and Liquid Discharges and Limits for UK HPR1000***, Reference [8]. The relevant quantification and justification information is provided in the existing version of this report.

ROA1.2

Summary for this query

ROA1.2 queries to identify the operator actions that may affect the transport of tritium.

Resolution plan for this query

The whole process of tritium transport/distribution is illustrated in Fig 1. Based on it, the operational factors that affect the transport of tritium are identified as follows:

a) Tritium transport in RCP and relevant connected systems (excluding SFP, IRWST and RBP) (②), is affected by **the tritium management strategy, the boron recycling strategy** and to a lesser extent to **the failed fuel management strategy**;

b) For tritium transported to SFP, IRWST and RBP (①), **the head-lift limit or target value** affects the amount of tritium entering into these pools. Other operational factors, e.g. the boron recycling strategy, have a minor impact on tritium concentration in these water bodies.

c) With respect to tritium transport to building atmosphere (③ and ④), the **strategy for managing leaks** (which influences leak rate and duration), the tritium concentration in the leaking system and the water bodies (cf. bullet points a) and b) above), the **SFP temperature management strategy** can affect the amount of tritium entering into the buildings' atmosphere.

d) With respect to discharges (⑤), the **buffer storage time** of liquid waste before discharge can affect the discharge of liquid tritium. However, since tritium has a relative long half-life, this influence is negligible. For gaseous discharges, everything that can affect tritium concentration in the building atmosphere will affect gaseous discharges of tritium.

e) With respect to the tritium retained in spent fuel assemblies, t**he failed fuel management strategy** can affect the amount of tritium leaked from failed fuel. However, fuel failure being minimised by design (material selection, chemistry regime, etc.), it is expected that failed management will have negligible impact on the overall tritium inventory in spent fuel assemblies.

For these operator related factors (marked in bold in the above bullet points), the need to optimise or control these depends on their potential to lead to a safety risk or not. It is analysed in ROA1.3.

The above analysis will be appropriately captured in relevant safety case document as outlined in the section of "Summary for the whole RO" below.

ROA1.3:

<u>Summary for this query</u>

ROA1.3 queries to identify relevant controls, including any Limits and Conditions (LCOs) necessary in the interests of safety, required to safely manage tritium throughout the plant.

<u>Resolution plan for this query</u>

Based on the analysis in ROA1.2, the operator actions that may affect the transport of tritium are:

a) the selected tritium management strategy;
b) the boron recycling strategy;
c) the failed fuel management strategy;
d) the head-lift tritium concentration limit or target value;
e) the strategy for managing leaks;
f) the SFP temperature management strategy;
g) the buffer storage time in discharge tanks.

To address this specific query, the work is divided into two steps:

a) Analyse the safety risks caused by tritium;
b) Identify the controls (including LCOs if needed) that can minimise the tritium-related safety risks among the above identified operator actions.

Analysis of the safety risks caused by tritium

Since tritium is a beta emitter, only the contributions to the workers internal exposure in relevant buildings is to be considered. The methodology of expected effective doses evaluation from inhalation of gaseous tritium in the atmosphere of relevant buildings, during normal operation, is provided in the ***Airborne Activity Supporting Report***, Reference [7].

Identification of the controls (including LCOs if needed)

There is no specific tritium related control value in terms of internal exposure contribution.

For FCG3, the reference unit of UK HPR1000, only an integrated control value for radionuclides other than tritium in relevant buildings is defined for internal exposure. For FCG3, this integrated control value is 0.1 DAC.

This is in line with what is done for AP1000 and American nuclear industry (cf. 10 CFR 835). Sizewell B is also using 0.1 DAC for airborne contamination control for known radionuclides mixtures.

For UK HPR1000, the determination of this integrated control value will be carried out at site licensing stage. This commitment will be captured under the UK HPR1000 commitment management process. As it is not a LCO on or related to tritium, it is out of the scope of this RO.

Although there is no specific tritium related control value in terms of internal exposure contribution, the contribution of tritium to the total internal exposure still needs to be evaluated and limited so as to demonstrate the tritium related safety risk has been minimised ALARP. Based on the identified operator actions, the specific considerations are as follows:

a) For BRX and BFX, the airborne tritium is mainly due to the evaporation of the tritiated water within the RBP (during shutdown only) and SFP, as presented in Fig 1. Therefore, the tritium activity concentration in these pools is a key input for the internal exposure assessment. As analysed above, this concentration is closely linked to the tritium activity concentration in the RCP [RCS] at the time of RPV head lift. Therefore, a head-lift criterion might have to be set for tritium to ensure dose rate from internal exposure in BRX and BFX is reduced ALARP. The SFP temperature management is another important factor to ensure reduction of tritium entering into the buildings' atmosphere.

b) For BNX, BSX and BWX, airborne tritium is mainly due to the evaporation of the relevant systems' leaks that contain tritiated water, as presented in Fig 1. Therefore, the tritium activity concentration in these systems is a key input for the internal exposure assessment. This concentration is closely linked to the tritium activity concentration in the primary coolant (cf. Fig. 1 and bullet point b) of ROA1.1 proposed resolution plan). Therefore, a criterion or target value might have to be set for tritium activity concentration in the primary coolant so as to ensure the dose rate from internal exposure in buildings is reduced ALARP. However, considering leaks have been minimised SFAIRP, Reference [9] and optimised management provisions are in place to detect, finish, collect and manage any unavoidable leaks, Reference [10], [11], it is not anticipated that there will be a need to set such a criterion or limit. This is supported by worldwide practice and OPEX.

With respect to the strategies for boron recycling, failed fuel management, leaks management, decay time in discharge tanks, which also influence the tritium activity level in the buildings atmosphere, their contributions to the tritium related safety risk are limited, as analysed in ROA1.2. Therefore, they are not deemed as key factors and therefore no control is expected to be needed for these. Based on the above analysis, it is anticipated that the following controls might have to be set:

a) Tritium concentration in RCP;
b) Head lift tritium criteria;
c) Number of PTR cooling train in service.

The analysis related to these potential controls are to be captured in relevant safety case documents, e.g. LCO document, SDM. The information will be presented in the safety as outlined in the section of "Summary for the whole RO" below.

<u>ROA1.4:</u>

<u>Summary for this query</u>

ROA1.4 queries to demonstrate the safety risk caused by tritium is reduced SFAIRP

<u>Resolution plan for this query</u>

In line with the methodology for demonstrating radioactivity levels have been minimised SFAIRP presented in RO-0026 Resolution plan, Reference [12], the demonstration that the safety risk caused by tritium is reduced SFAIRP is divided into three parts:

a) Demonstration that the tritium generation has been reduced SFAIRP;

b) Demonstration that the tritium transport throughout the plant has been optimised SFAIRP;

c) Demonstration that the impact of tritium discharge to environment has been minimised SFAIRP.

For part a), the demonstration that the tritium generation has been reduced SFAIRP, has been provided in the ***Minimisation of the Discharge and Environment Impact of Tritium***, Reference [4]. (cf. Chapter 4.1 Minimising the Generation of Tritium). The factors affecting the tritium generation, e.g. material selection of fuel rod cladding, use of burnable poisons, optimising the boron concentration and lithium concentration have been collated and analysed comprehensively in this report.

For part c), the demonstration that the impact of tritium discharge to environment has been minimised SFAIRP, is also presented in Reference [4]. (cf. Chapter 4.2.3 Minimising Tritium Discharged to the Gaseous Atmosphere).

For part b), the demonstration that the tritium transport throughout the plant has been optimised SFAIRP, and that the tritium related safety risk to workers in NPP has been reduced SFAIRP is currently not fully and clearly documented in the safety case. As outlined in resolution plan for ROA1.3 above, the internal exposure to workers is largely due to evaporation from the pools (SFP and RBP) which is mainly influenced by the head-lift tritium criterion and the SFP temperature. In principle, the lower the head-lift tritium criterion, the less tritium will evaporate to the building atmosphere from the pools. However, a too low criterion will increase significantly the burden on the operator and potentially the doses from operation needed to achieve this criterion (sampling and monitoring, management of the waste, etc.) for little benefits in terms of reduction of worker doses from tritium evaporated from the pools:

a) If end-cycle dilution strategy is selected for tritium management, the TEP end of cycle dilution should be initiated sufficiently in advance of the head lift to meet the criterion (about a month in advance in some instances, depending on the criterion value);

b) If continuous dilution strategy is selected for tritium management, the frequency of the TEP dilution increases during power operation and less time (if any) will be needed to reach the criterion.

Also as detailed in Reference [4], the lower the SFP temperature, the lower the evaporative losses from the SFP. However a too low temperature in SFP will increase the risk of boron crystallisation and/or will threaten the safety function of PTR cooling trains as it will not be able to perform EMIT in accordance with the safety rules. Any modification of the PTR cooling train will induce significant cost for little benefits in terms of worker doses reduction.

Therefore, a balance between the reduction of worker dose from tritium evaporated from the pools and worker burden, worker doses from tritium dilution operations, safety of the PTR system, risk of crystallisation and economic benefits should be achieved. This balance is to be established at site licensing stage by the operators and can change over the course of operational phase. Nevertheless, the methodology to evaluate the level of the internal exposure for an assumed head-lift criterion needs to be established at GDA stage so as to provide confidence that the design does not unduly constrain the future operators. As mentioned in ROA1.3 resolution plan, this is provided in the ***Airborne Activity Supporting Report,*** which will be updated to reflect the outcome from analysis carried out under this RO, if relevant.

<u>Summary for the whole RO</u>

A new report ***Identification and Minimisation Demonstration of Tritium Related Safety Risk*** is planned to issue to more clearly demonstrate that the safety risk caused by tritium management is minimised ALARP. This report will compile the above analysis together. Specially, the scope of this report includes:

a) Provide the route map of tritium whole life cycle in UK HPR1000, e.g. generation, transport and discharge, and provide the reference to those documents where the levels of tritium are quantified;
b) Present the identification process and its outcomes for the operator actions that may affect the transport of tritium;
c) Present the identification process and its outcomes for the key controls (including LCO) as well as the reference to where they are captured in safety case documents;
d) Present the demonstration that the safety risk caused by tritium management is reduced SFAIRP. Since the demonstration that the tritium generation and discharges have been reduced SFAIRP has been completed (commensurately to GDA stage and scope) and presented (with post GDA work being captured in FAP on future licensee that are clearly identified) in ***Minimisation of the Discharge and Environment Impact of Tritium***, Reference [4], this part will be summarised in this new report to avoid the overlap analysis in safety case.
   For the demonstration that tritium transport throughout the plant has been optimised SFAIRP, as explained in above ROA1.4 resolution plan, the GDA relevant information will be presented into the new report. The operator actions and related controls/LCOs will be identified in the report but specific values or actions that need to be considered during the demonstration process are to be determined by the operator, thus the demonstration cannot be completely carried out during GDA stage. Hence the demonstration provided in this new report will be limited to GDA scope and stage; and
e) Present a clear picture of what will be done at GDA stage and what will be left to site licensing phase around this safety case.

Impact on the GDA Submissions

The submission planning for the deliverables to address this RO is as follows:

Title of Submission	Related ROAs	Planned Submission Date
Primary Coolant Source Term Calculation Report	ROA1.1	2020.12.31
Derived Source Term Supporting Report	ROA1.1	2020.12.31
Airborne Activity Supporting Report	ROA1.1 ROA 1.3	2021.1.31*
Estimation of Radioactive Gaseous and Liquid Discharges and Limits for UK HPR1000	ROA1.1	NA **
Minimisation of the Discharge and Environment Impact of Tritium	ROA1.4	NA **
Identification and Minimisation Demonstration of Tritium Related Safety Risk	ROA1.1 ROA1.2 ROA 1.3 ROA1.4	2021.1.31

Note：

* This report will be updated to reflect the outcome from analysis carried out under this RO, if relevant. If it needs to be updated after analysis, it will be submitted by end of January 2021.

* *NA: it means the report is associated with this RO, but it does not need to be updated since the content required in this RO has been implemented in its latest version.

Timetable and Milestone Programme Leading to the Deliverables

A Gantt chart presenting the timetable and milestones of this RO resolution is provided in APPENDIX A.

Reference

[1] Pre-Construction Safety Report, Chapter 21, Reactor Chemistry, HPR/GDA/PCSR/0021, Rev. 000, GNS, November 2018. www.ukhpr1000.co.uk/wp-content/uploads/2018/11/HPR-GDA-PCSR-0021-Pre-Construction-Safety-Report-Chapter-21-Reactor-Chemistry.pdf.

[2] Minimisation of the Discharge and Environment Impact of Tritium, GHX00100004DOHB00GN, Rev C, CGN, November 2019. CM9 Ref: 2019/357768.

[3] Minimisation of Radioactivity Route Map Report, GHX00100002DNHS03GN, Rev C, CGN, May 2020. CM9 Ref: 2020/130809.

[4] CGN, Minimisation of the Discharge and Environment Impact of Tritium, GHX00100004DOHB00GN, Rev D, July 2020.

[5] CGN, Primary Coolant Source Term Calculation Report, GHX00800006DRDG03GN, Rev C,

October 2019.

[6] CGN, Derived Source Term Supporting Report, GHX00530001DNFP03GN, Rev B, August 2019.

[7] CGN, Airborne Activity Supporting Report, GHX00530003DNFP03GN, Rev B, August 2019.

[8] CGN, Estimation of Radioactive Gaseous and Liquid Discharges and Limits for UK HPR1000, GHX35000002DNFP03GN, Rev E, December 2019.

[9] CGN, Topic Report on Radioactive Waste Minimisation for Mechanical Engineering, GHX00100055DNHX03GN, Rev C, April 2020.

[10] CGN, SRE-Sewage Recovery System Design Manual Chapter 3 System and Component Design, GH917SRE003DNFF45GN, Rev D, June 2019.

[11] CGN, RPE-Nuclear Island Vent and Drain System Design Manual Chapter 3 System and Component Design, GHX17RPE003DNFF45GN, Rev E, September 2020.

[12] CGN, Resolution Plan - Demonstration that radioactivity has been reduced So Far As Is Reasonably Practicable (SFAIRP), March 2020.

APPENDIX A RO-UKHPR1000-0049 Gantt Chart

Task and Schedule		2020					2021			
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
RO Action 1										
1	Development of deliverable - [Primary Coolant Source Term Calculation Report, Rev D]									
2	Submission of deliverable - [Primary Coolant Source Term Calculation Report, Rev D]									
3	Development of deliverable - [Derived Source Term Supporting Report, Rev C]									
4	Submission of deliverable - [Derived Source Term Supporting Report, Rev C]									
5	Development of deliverable - [Airborne Activity Supporting Report]*									
6	Development of deliverable - [Airborne Activity Supporting Report]*									
7	Development of deliverable - [Identification and Minimisation Demonstration of Tritium Related Safety Risk]									
8	Development of deliverable - [Identification and Minimisation Demonstration of Tritium Related Safety Risk]									
Assessment										
9	Regulatory Assessment									
10	Target RO Closure Date									

* This report will be updated to reflect the outcome from analysis carried out under this RO, if relevant. If it needs to be updated after analysis, it will be submitted by end of January 2021.