REGULATORY OBSERVATION

REGULATOR TO COMPLETE

RO unique no.:	RO-UKHPR1000-0028
Revision:	0
Date sent:	16/12/19
Acknowledgement required by:	13/01/20
Agreement of Resolution Plan Required by:	28/02/20
TRIM Ref:	2019/318591
Related RQ / RO No. and TRIM Ref: (if any)**:**	RQ-UKHPR1000-0246
Observation title:	Adequate Justification of Estimated Public Doses for UK HPR1000
Lead technical topic: 16. Radiological Protection	**Related technical topic:** 21. Environmental

Regulatory Observation

Background

As part of the Generic Design Assessment (GDA) of UK HPR1000, ONR raised Regulatory Query (RQ) RQ-UKHPR1000-0246 [1] asking the Requesting Party (RP) to provide off site dose measurements from a "representative reactor" (representative of the UK HPR1000). These measurements were requested because the public dose calculations the RP had presented in their submission, Public Dose Evaluation Topic Report Rev B [2], are based on data derived from computer modelling.

The RP's response [3] to RQ-UKHPR1000-0246 provided data from the Site Radiation and Monitoring System of what is described as a "*typical CGN power plant".* The instruments used were Geiger-Muller counters with a measurement range of 10^{-8} Gy~ 1 Gy/hr, showing doses at various points from the centre of the site over the period from 2006 – 2018.

These data showed variability in the dose rates at each individual point over this period; however, trends in dose rates were also apparent. For example, Point AS4 always had the lowest dose.

The dose rates provided seem to be related to the distance of the measurement point from the centre of the site. However, based on the calculations in the Public Dose Evaluation Topic Report [2], the proximity of the reactor should not make a measureable difference to the dose rates.

The RP states that these data are consistent with known background radiation measurements, but the background measurement data have not yet been supplied in sufficient detail to confirm this is the case, nor is a reference provided.

ONR requires the RP to undertake further work to demonstrate that measured data are within the measureable range of background radiation dose rates at representative locations. ONR needs to be satisfied that measured data are not affected by direct radiation shine from the plant.

It should be noted that Regulation 12(3) of the Ionising Radiations Regulations 2017 [5] requires employers to make an estimation of doses to members of the public from a relevant practice, which includes Nuclear Powers Plants. An accurate estimate of dose is also required to support the RP's claim in [3] that doses to members of the public from direct radiation shine have been reduced so far as is reasonably practicable (SFAIRP), in accordance with [5].

Without this information there is a gap in the UK HPR1000 generic safety case and so additional work is required by the RP to address this shortfall. This Regulatory Observation (RO) has therefore been raised to:

- Explain ONR's regulatory expectations;
- Ensure the RP provides a robust demonstration that public dose rates in proximity to a "representative power plant" are within the measureable range of natural background levels; and to
- Assist ONR's judgement of whether doses to members of the public from direct radiation shine from the UK HPR1000 will be reduced SFAIRP.

Relevant Legislation, Standards and Guidance

The Numerical Targets section of ONR's SAPs [4] contains Numerical Target 3:

Normal operation – any person off the site	Target 3
The target and a legal limit for effective dose in a calendar year for any person off the site from sources of ionising radiation originating on the site are: BSL(LL): 1 mSv BSO: 0.02 mSv *Note that there are other legal limits to tissues and parts of the body (IRR17).*	

The Ionising Radiations Regulations 2017, Approved Code of Practice (ACOP) and Guidance [5] contains the following requirements:

Regulation 12 (3) The steps taken by a relevant employer to comply with paragraph (1) in respect of members of the public must include an estimation of doses to members of the public from the relevant practice or practices carried out by the relevant employer in accordance with requirements regarding the estimation of doses as approved by the Executive from time to time.

Guidance paragraph 231 Employers must make sure that the exposures members of the public receive as a result of the employer's work with radiation are as low as reasonably practicable (ALARP) and below the dose limit for other persons. Employers must also make realistic estimates of the exposure to the representative person for comparison with the dose limit in Schedule 3.

Regulatory Expectations

ONR expect the claims and arguments presented in the Pre-construction Safety Report (PCSR) to be adequately substantiated by suitable and sufficient evidence. ONR therefore expects that the measured dose rates are consistent with the measureable range of background radiation dose rates near a representative operational reactor. This is necessary to support the claim that doses to members of the public from direct radiation shine have been reduced SFAIRP.

To be able to achieve this demonstration, as part of the resolution of this RO, the RP will need to undertake and document the following activities:

- Identify a comparable reactor and demonstrate that public doses from this reactor are comparable to UK HPR1000.
- Analyse and explain any differences
- Show that the measured dose rates are within the measureable range of background radiation dose rates near to the comparable reactor.
- Consider the impact of other facilities such as radioactive waste and spent nuclear fuel stores.
- Demonstrate that public dose rates support the assertion that doses to members of the public from direct radiation shine are acceptable and reduced SFAIRP.

References

[1] RQ-UKHPR1000-0246 Public Dose Measurements, 24/05/19, ONR, CM9 Ref: 2019/124148
[2] Public Dose Evaluation Topic Report Rev B, GH X 40200 064 DNFP 03 GN, CGN, 26/03/2019, CM9 Ref: 2019/96087
[3] RQ-UKHPR1000-0246 Public Dose Measurements – Full Response, 29/08/19, CGN, CM9 Ref: 2019/251132

[4] Safety Assessment Principles for Nuclear Facilities, 2014 Edition, Revision 0, Office for Nuclear Regulation, 2014. www.onr.org.uk/saps/saps2014.pdf
[5] Work with Ionising Radiation, Ionising Radiations Regulations 2017, Approved Code of Practice and Guidance, L121, HSE Books, 2018. http://www.hse.gov.uk/pubns/priced/l121.pdf

Regulatory Observation Actions

RO-UKHPR1000-0028.A1 – Comparison of data from comparable operational plants with background

In response to this action, the RP should:

- Identify a representative plant, or plants, to provide a meaningful comparison of the measured dose rates with the background radiation dose rates near the comparable reactor.
- Measure dose rates at a variety of distances whilst the plant is operating, in areas where background radiation levels are accuraetly known.
- Provide analysis of any differences between measurement and calculation, taking into account any differences between the operational reactor being measured and the UK HPR1000, such as reactor power and shielding design etc.
- Carry out a systematic determination of the background radiation dose rates using appropriate measurement devices stating what the errors are in any given data set and clearly stating what is included in background measurents and what has been subtracted. This may be by using data from prior to construction or using data obtained during outages. These data must be referenced.
- Provide a demonstration that the measured dose rates are within the measureable range of background radiation dose rates near the comparable reactor.
- Assess the impact of other buildings, such as radiactive waste and spent fuel stores on dose rates, drawing conclusions for UK HPR1000.
- Include this information in the UK HPR1000 generic safety case.

Resolution required by '*to be determined by General Nuclear System Resolution Plan*'

REQUESTING PARTY TO COMPLETE

Actual Acknowledgement date:	
RP stated Resolution Plan agreement date:	