Office for Nuclear Regulation

UK HPR1000 Generic Design Assessment (GDA)

Assessment of the readiness of the GDA Requesting Party (RP) and ONR to commence GDA

Project Assessment Report ONR-NR-PAR-16-005
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EXECUTIVE SUMMARY

On 13 October 2016 General Nuclear System Ltd (GNS) wrote to ONR and the Environment Agency (EA) requesting entry to the Generic Design Assessment (GDA) process for the UK HPR1000 reactor design (Hualong technology). The request was accompanied by a report providing evidence of the Requesting Party's readiness to enter into the process ("GDA Step 1 Entry Readiness Evidence Pack").

ONR, jointly with the Environment Agency, have assessed the evidence provided. In undertaking the review, a number of key factors have been considered, including:

- Who the Requesting Party (RP) of the GDA for the UK HPR1000 is, its ownership structure, and who holds authority for decision making in GDA.
- RP's finances for GDA and whether the RP's budget aligns with the regulators' expectations.
- RP's resourcing strategy for GDA.
- Availability to regulators of information relevant to the HPR1000 design owned by third parties.
- Reference Plant for the UK HPR1000 design being proposed.
- RP's acceptance of legal responsibilities regarding security of sensitive information and agreement to comply with the guidance issued by the regulators.

We have carefully considered the information in "GDA Step 1 Entry Readiness Evidence Pack" and judge that it is sufficient to demonstrate that GNS is ready to commence step 1 of GDA. GNS have put in place arrangements that should help ensure an effective and efficient start to a GDA of the UK HPR1000 reactor design and is committing resources consistent with our expectations. We therefore judge that the project appears viable and warrants the deployment of regulatory resource.

We have considered ONR's readiness to begin GDA of the UK HPR1000 and judge that we are prepared to begin step 1, subject to a request being made from BEIS' Ministers and approval being granted by ONR's senior management.

Based on the above, we recommend that ONR writes to BEIS' Secretary of State confirming GNS' and ONR's readiness to commence the UK HPR1000 GDA.

LIST OF ABBREVIATIONS

BEIS	Department of Business, Energy and Industrial Strategy
CGN	China General Nuclear Power Corporation
CNS	Civil Nuclear Security
EA	Environment Agency
EMT	Executive Management Team
GDA	Generic Design Assessment
GNI	General Nuclear International Ltd
GNS	General Nuclear System Ltd
NIMCA	Nuclear Industries Malicious Capabilities Planning Assumptions
NPP	Nuclear Power Plant
ONR	Office for Nuclear Regulation
RP	Requesting Party
SHA	Shareholder Agreement
SNI	Sensitive Nuclear Information

TABLE OF CONTENTS

PERMISSION REQUESTED 6
BACKGROUND 6
INTRODUCTION 6
ASSESSMENT OF "GDA STEP 1 ENTRY READINESS EVIDENCE PACK" 7
ONR'S READINESS TO COMMENCE THE UK HPR1000 GDA.....11
CONCLUSIONS.....12
REFERENCES 13

Annexes

1 - Proposed protocol for early notification by the RP to ONR and EA of proposed changes that may impact GDA

PERMISSION REQUESTED

1. On 13 October 2016 General Nuclear System Ltd (GNS) wrote to ONR and the Environment Agency (EA) requesting entry to the Generic Design Assessment (GDA) process for the UK HPR1000 reactor design (Hualong technology). The request was accompanied by a report providing evidence of the Requesting Party's readiness to enter into the process.

2. Noting that the regulators will only start a new GDA following a formal request from BEIS' Ministers, GNS's request is, effectively, a request to the regulators to inform BEIS' Secretary of State that GNS is ready to commence GDA.

BACKGROUND

3. In October 2015 China formally agreed to invest in EDF's Hinkley Point C project and two further Nuclear Power Plants (NPPs). Under this deal China General Nuclear (CGN) would invest in the UK through its new subsidiary called General Nuclear International Ltd (GNI), a UK registered company. At that time EDF and CGN agreed the Heads of Terms of a wider UK partnership for the development of NPPs at Sizewell and Bradwell. Among these, the two companies would form a joint venture to seek regulatory approval, through the GDA process, for a UK version of the Chinese-designed Hualong One reactor, with the intention of building it at Bradwell.

4. Commencement of a GDA by the nuclear regulators, ONR and Environment Agency (EA) (and Natural Resources Wales, where appropriate) requires a formal Ministerial request. The Department of Business, Energy and Industrial Strategy (BEIS) advised that any request for ONR and EA to commence GDA of the UK Hualong Technology (UK HPR1000) would be made after the Hinkley Point C deal had been signed. Final agreements between the UK Government, EDF and CGN enabling the construction of two EPRs at Hinkley Point C were signed on 29th September 2016. In recent discussions with BEIS the department has advised that the SoS would only write to the regulators requesting that we begin a GDA of the UK HPR1000, after we have written to him advising that the requesting party and regulators are ready to begin step 1 of GDA.

5. In parallel to the formal negotiations addressed in the previous paragraphs, ONR and EA have maintained an open dialogue with EDF and CGN, of an informal nature, which opened with an inaugural meeting in July 2015 to introduce CGN to our nuclear regulatory regime. A three day workshop was held in China in December 2015 during which further detail on specific aspects of GB nuclear regulation and expectations for GDA where discussed; this was the first introduction to HPR1000 technology for the regulators (Ref. 1). Subsequent meetings throughout 2016 have focused on GDA readiness and step 1 activities (Refs 2, 3 and 4).

INTRODUCTION

6. ONR's document "New nuclear reactors: Generic Design Assessment Guidance to Requesting Parties" revised in 2016 includes a new section on "Preliminaries" (Ref. 5). This establishes that it is appropriate for ONR to seek certain information and assurances from the GDA requesting party (RP) prior to the start of step 1 to ensure that the project appears viable from the outset and warrants the deployment of regulatory resource. This approach is consistent with the readiness reviews that the regulators have introduced for the other steps within the GDA process arising from

leaning from past GDAs. The preliminaries are equally relevant for and have been adopted by the EA. Typical matters for preliminary discussion listed in Ref. 5 are:

- RP's organisational structure.
- RP's decision-making authority including budgetary control.
- RP's resourcing strategy for duration of GDA.
- Clarity of the design being proposed and its ownership.
- Assurance of the timely availability to regulators of all design and safety and environment case related information (including that owned by third parties).
- RP's plans for a UK regulatory interface office.
- Acknowledgement that the RP understands and will comply with relevant expectations and legal obligations in the UK.

7. On 13 October 2016 General Nuclear System Ltd (GNS) wrote to ONR and EA providing evidence of their readiness to commence GDA with their UK HPR1000 reactor design (Ref. 6). A report entitled "GDA Step 1 Entry Readiness Evidence Pack" is attached to the letter (Refs 7 and 8).

8. Ref. 7 advises that GNS is appointed, and empowered, by the companies requesting the GDA (EDF S.A., CGN and GNI) to manage and deliver the GDA of the UK HPR1000 and is the company with whom GDA agreements with the regulators will be made. For all practical purposes we refer to GNS as the UK HPR1000 RP.

9. ONR and EA have considered and discussed the evidence pack (Ref 7) with GNS, and provided appropriate feedback.(Refs 9 and 10). We can confirm that Rev. 5 of the evidence pack (Ref. 7) captures the feedback provided by the regulators.

10. The objectives of this Assessment Report are:

- To document the work undertaken by the regulators ONR and EA to establish whether GNS is ready to enter the GDA for its UK HPR1000 reactor.
- To summarise the work undertaken by ONR in preparation to start the UK HPR1000 GDA.
- To outline the steps from now to formal start of step 1 of GDA.
- To provide a judgement on whether both GNS and ONR are ready to commence the UK HPR1000 GDA.

ASSESSMENT OF "GDA STEP 1 ENTRY READINESS EVIDENCE PACK"

11. The GDA entry readiness evidence pack provided by GNS (Ref. 7) is authored and signed by CGN and EDF. The information has been structured according to a template provided by the regulators (TRIM 2016/219932). The scope of the document covers: governance, finance, programme, resources for GDA, intellectual property (IP) and legal and procedural matters. A key source of material for the Readiness Evidence Pack is the Final Shareholder Agreement (SHA) signed by the two companies. As would be expected this is a major legal document covering many matters outside the regulators' remit and our approach has been, with the assistance of the companies, to confirm that key matters are reflected in the SHA. Our assessment of the information provided and conclusions reached is described in the following paragraphs.

12. Governance

- Section 2.1.1 of the evidence pack (Ref. 7) indicates that General Nuclear System Ltd (GNS) is appointed and empowered by the companies jointly requesting the GDA (EDF S.A., CGN and GNI) to manage and deliver the GDA of the UK HPR1000, including the discharge of decisions and all responsibilities of the RP. Ref. 7 states that this is in line with the GNS Shareholder Agreement (SHA); on 21st October 2016 GNS demonstrated this via presentation of the final SHA (Ref.12). Ref. 7 also confirms that GNS is the company with whom our GDA agreements would be made. We are therefore satisfied that we understand who the RP for the HPR1000 GDA is and, if requested to carry out a GDA, we will work with GNS as the RP for the UK HPR1000 GDA
- Section 2.1.2 of the evidence pack (Ref. 7) indicates that GNS is currently owned by EDF (33.5%) and GNI (66.5%). GNI is currently 100% owned by CGN. In response to a challenge by ONR/EA, Ref. 7 now states that CGN will retain the majority shareholding and controlling mind of GNI if the proportion of shares held by CGN changes in the future. It also states that GNS will discuss with the regulators, in advance, any change in shareholding structure. Nevertheless, we understand the sensitivities around this matter and are strengthening our strategy by putting in place a formal protocol for early notification by the RP to the regulators of proposed changes that may affect GDA (including any proposed changes in shareholding in GNS or GNI). See Annex 1. Furthermore we understand that BEIS may issue a Direction to ONR with regard to changes of shareholding in GNI/GNS that would also strengthen this requirement.
- Section 2.1.2 of the evidence pack (Ref. 7) states that the SHA specifies that GNS is authorised to manage and make key decisions for the purpose of GDA; this was evidenced in the final SHA presented during a meeting with GNS on 21st October 2016. Section 2.1.2 of Ref. 7 also covers the GNS Board (with 2 members from EDF and 5 from GNI) and states that it is responsible for decision-making in key matters such as appointment of executive members and approving work plans and budgets (in line with SHA); we can confirm that on 21st October 2016 we have seen this in the final SHA (Ref.12). The GNS Executive Committee (under the GNS Board) is responsible for managing the GNS' GDA activities, as illustrated in Figure 2.1.1-3 of Ref. 7. The GNS organisation is defined in the SHA; on 21st October 2016 GNS demonstrated this via presentation of the final SHA.
- Section 2.1.3 of the evidence pack (Ref. 7) describes who holds authority for decision making. It states that, according to the SHA, GNS has the authority to make decisions for the UK HPR1000 GDA work plan, procedures, budget and costs associated with GDA. In relation to decision-making for technical matters of significance, the Chief Technology Officer (a member of GNS Executive Committee) chairs the Technical Committee. The Technical Committee is composed of 7 members, 5 from GNI and 2 from EDF; this was evidenced in the final SHA presented during a meeting with GNS on 21st October 2016 (Ref.12). The input from independent and highly experienced specialists in matters under discussion will be called upon if unanimous decisions cannot be made. This is covered by the SHA; we saw this in the final SHA presented on 21st October 2016.
- Based on the information assessed, and summarised in the paragraphs above, we are satisfied that we understand the ownership structure of the RP for the

UK HPR1000 GDA and who holds the authority for decision making. We judge these to be adequate to enter GDA.

- Section 2.1.4 of the evidence pack (Ref. 7) describes the RP's plans for the UK regulatory interface office. The RP is currently using CGN's offices in London and plans to expand as the GDA project develops. The role and responsibilities of GNS' UK office are summarised in Ref. 7. We consider that GNS understands the roles of the interface office.

13. Finance

Section 2.2 of the evidence pack (Ref. 7) states that a GDA budget of £35m to cover ONR's costs associated with GDA has been defined in the SHA. It also states that this is only a small part of the total funding for the UK HPR1000 GDA and that a budget allocation for the total cost of GDA, and a contingency to allow for unforeseen circumstances are in place. A total GDA budget of c. £183m including c. £35m to cover ONR's costs are evidenced in the final SHA presented during a meeting with GNS on 21st October 2016 (Ref.12). We are satisfied that CGN has put in place a budget for the UK HPR1000 GDA aligned with our expectations.

14. Programme

Section 2.3 of the evidence pack (Ref. 7) provides an indicative schedule for the UK HPR1000 GDA. It also confirms that GNS is planning to align with the existing 4-step GDA process. A conservative schedule of 60 months from step 1 entry to issuing of the DAC is being planned consisting of a 7-month step 1, 9-month step 2, 13-month step 3, and 31-month step 4. This is aligned with our current expectations and experience (although we note that the proposed schedule adds some small contingencies). We also note the RP's intention to formally define the programme in Step 1 as outlined in the Guidance to Requesting Parties (Ref. 5).

15. Resource

Section 2.4 of the evidence pack (Ref. 7) provides information on the resources being deployed / aligned for the UK HPR1000 GDA. The resources planned appear reasonable. However, more important is the stated commitment to keep the resource level under continual review by the Executive and refined as required. Resources are being secured via secondments from, and service contracts with, EDF and CGN. In addition a supply chain strategy is proposed which is based on framework contracts providing a supply chain pool. We consider that GNS' resource strategy and plans for GDA are reasonable.

16. Intellectual Property (IP)

Section 2.5 of the evidence pack (Ref. 7) states that GNS will have access and be able to share the necessary and required information with the regulators. It confirms that for the majority of the 3rd party IPs on HPR1000 CGN has signed agreements already in place to share information without restriction. There is a small number of contracts still pending negotiation (once GDA starts formally) to release IP with export controls; section 2.5 provides confidence that GNS does not expect to encounter problems in this area as it states that to date they have received positive responses from all suppliers. We consider this to be an acceptable position ahead of GDA.

17. Legal and Procedural

- Section 2.6 of the evidence pack (Ref. 7) states that GNS will comply with all guidance issued by regulators and all legal and regulatory requirements related to information exchanged in GDA. It also confirms that the security lead within GNS is a UK security specialist in an acknowledgement of their legal responsibilities in relation to UK nuclear security.
- During the progress meeting held on 10th August (Ref. 4) GNS confirmed that both EDF and CGN will each have a UK national to deal with security in GDA. It was also stated that GNS considers it a priority to have an effective security regime in place. Access to UK Sensitive Nuclear Information (SNI) including the Nuclear Industries Malicious Capabilities Planning Assumptions (NIMCA) was recognised and has underpinned the recruitment of UK nationals into key Project Correspondent posts. Generally, GNS provided confidence of their security awareness.
- Based on the information provided in Refs 4 and 7, and in discussions with our Civil Nuclear Security (CNS) members of the GDA team, we consider that in terms of security, GNS shows good awareness of their legal obligations and is in a good position ahead of GDA.

18. Design Reference Plant

- In 2012 central planners in Beijing directed CNNC and CGN to rationalise their reactor programmes and merge their competing reactor designs CNNC's ACP1000 and CGN's ACPR1000 into a standardised third generation reactor called Hualong One. CNNC and CGN agreed in December 2015 (and launched in March 2016) a joint venture Hualong International Nuclear Power Technology to develop and export the Hualong One design overseas (http://www.world-nuclear-news.org/C-Chinese-firms-join-forces-to-market-Hualong-One-abroad-31121502.html and http://www.world-nuclear-news.org/C-Hualong-One-joint-venture-officially-launched-1703164.html). According to media reports in August 2016 (http://www.bloomberg.com/news/articles/2016-08-03/cnnc-says-its-plan-to-merge-hualong-one-reactor-designs-favored) CNNC said that its plans to merge Hualong One reactor designs had been favoured (vs. a competing proposal by CGN).
- In May 2015 CNNC started construction of its first Hualong One reactor at the Fuqing plant (http://www.world-nuclear-news.org/NN-Fuqing-5-foundation-in-place-1205155.html), and in December 2015 CGN started construction of its first Hualong One reactor at the Fangchenggang plant (http://www.world-nuclear-news.org/NN-China-launches-Phase-II-of-Fangchenggang-and-Tianwan-projects-30121501.html). It is believed that CNNC's and CGN's versions of the Hualong One are different.
- During our progress meeting of 10 August 2016, EDF members of GNS confirmed that to avoid confusion in the reference design for the UK HPR1000, they had requested that the SHA should specifically state that the Fangchenggang Unit 3 (Hualong technology), majority owned and designed by CGN, is the Reference Plant for the UK HPR1000. This was evidenced in the final SHA presented to the regulators on 21 October 2016 (Ref.12). This provides us with clarity, at this point, about the reference plant for the proposed UK HPR1000 design to be submitted for GDA.
- It should be noted, that our GDA Guidance to RPs (Ref. 5) only requires the Reference Design to be declared together with the step 2 submissions.

Nevertheless, we understand the sensitivities around this matter and are strengthening our strategy by putting in place a formal protocol for early notification by the RP to the regulators of proposed changes that may affect GDA (including design changes). See Annex 1.

19. The paragraphs above show that we have carefully considered the information included in the evidence pack (Ref. 7) and judge that it is sufficient to demonstrate that GNS is ready to commence step 1 of GDA. GNS have put in place arrangements that should help ensure an effective and efficient start to a GDA of the UK HPR1000 reactor design and is committing resources consistent with our expectations.

ONR'S READINESS TO COMMENCE THE UK HPR1000 GDA

20. Cost Recovery

ONR will be able to recover all costs associated with the UK HPR1000 GDA, including resource, travel & subsistence and technical support contracts. ONR's charging agreement with GNS (Ref. 11) has been drafted in consultation with ONR's Policy Team and reviewed by the Government's Legal Team. It is now in a position to be shared with GNS. This matter is therefore significantly further developed than in previous GDA's.

21. Assessment Team

- An ONR Superintending Inspector has been nominated to take the role of ONR's head of the UK HPR1000 GDA, which will be managed as a separate sub-programme within the New Reactor Programme. An ONR staff member to lead on programme management has also been identified.
- We have prepared a team model for the UK HPR1000 GDA which will evolve according to the needs of the project and will make best use of available inspector resource upon completion of the AP1000 and UK ABWR GDAs, in particular for delivery management group lead roles.
- During step 1 we need an average of 2 days per week of effort of individual inspectors (across 21 technical disciplines). The effort required from each specialist inspector will be dedicated to:
  - Project induction.
  - Gathering of lessons learnt from the previous and ongoing GDAs specific for each technical area.
  - Preparation of, and participation in, the first major technical engagement with GNS' technical team to ensure that specific regulatory expectations are well understood by GNS and determine the strategy to be followed in the assessment of each technical topic. This is likely to be held in January or February 2017 in China to ensure maximum reach to GNS technical staff.
  - Review the scope of the safety and security submissions for step 2 assessment and confirm whether they are sufficient for ONR to commence step 2.
  - Preparation of step 2 Assessment Plans.

22. The next steps to formal start of the UK HPR1000 GDA are:

- Acknowledgement letter from regulators to GNS accepting the evidence pack and advising of proposed protocol for early notification by the RP to ONR and EA of proposed changes that may impact GDA (appendix 1), and asking GNS to accept that they will be able to comply.
- A letter from the regulators to BEIS' Secretary of State confirming GNS' readiness to commence the UK HPR1000 GDA, and confirming the regulators' readiness to commence GDA including availability of resources without impacting on any other ONR or EA strategic priorities.
- A letter from BEIS to the regulators formally requesting commencement of the GDA for UK HPR1000.
- A letter from regulators to GNS confirming start of step 1 of GDA.
- Throughout the milestones listed above, ONR will seek the approval of ONR's Executive Management Team (EMT) and Board to undertake the UK HPR1000 GDA and commit the required resources and funds.

23. We have considered ONR's readiness to begin GDA of the UK HPR1000 and judge that we are prepared to begin step 1, subject to a request being made from BEIS' Ministers and approval being granted by ONR's senior management.

CONCLUSIONS

24. We have carefully considered the information provided in CGN's and EDF's report entitled "GDA Step 1 Entry Readiness Evidence Pack" (Ref. 7) and judge that it is sufficient to demonstrate that GNS is ready to commence step 1. GNS have put in place arrangements that should help ensure an effective and efficient start to a GDA of the UK HPR1000 reactor design and is committing resources consistent with our expectations. We therefore judge that the project appears viable and warrants the deployment of regulatory resource.

25. We have considered ONR's readiness to begin GDA of the UK HPR1000 and judge that we are prepared to begin step 1, subject to a request being made from BEIS' Ministers and approval being granted by ONR's senior management.

26. Based on the above, we recommend that ONR writes to BEIS' Secretary of State confirming GNS' and ONR's readiness to commence the UK HPR1000 GDA.

27. The steps prior to formal commencement of step 1 of the UK HPR1000 GDA are clear and include:

- Approval granted by ONR's EMT and Board to commence the UK HPR1000 GDA.
- A letter from the regulators to BEIS' Secretary of State confirming GNS' readiness to commence the UK HPR1000 GDA, and confirming the regulators' readiness to commence GDA including availability of resources without impact on any other ONR or EA strategic priorities.
- Formal request from BEIS' Ministers to the regulators to commence the UK HPR1000 GDA.
- Signing by GNS and ONR of the GDA charging agreement.
- Letter from the regulators to GNS and BEIS confirming start date for the UK HPR1000 GDA.

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Annex 1

Proposed protocol for early notification by the RP to ONR and EA of proposed changes that may impact GDA(*)

This protocol covers matters relating to the nature of the RP and the Design Reference Plant. It is our intention to have an acceptance of this protocol by GNS prior to commencement of GDA. Ultimately, this protocol will be integrated in the formal Interface Arrangements for GDA (to be prepared during step 1). The proposed text is as follows:

Instances in which the regulators must be notified at least 20 working days in advance:

- *Any proposed changes in shareholding in GNS or GNI.*
- *Any proposed changes to the membership of the GNS Board.*
- *Any proposed change of the Design Reference Plant from the Fangchenggang Hualong One prior to the Design Reference Point.*

Our interest in the above arises from potential impact on:

- *Programme.*
- *Resources including technical staffing, third party contractors.*
- *Design.*
- *Decision making.*
- *Governance.*
- *Access to intellectual property.*
- *GNS management.*
- *Security arrangements.*

The RP must advise regulators of the impact of any proposed changes on the above so that the regulators can consider what the overall impact might be on the GDA process for the UK HPR1000.

(*) Similar arrangements will be applied in all future GDAs