



**Office for
Nuclear Regulation**

OFFICIAL

Civil Nuclear Reactor Build - Generic Design Assessment

**Step 2 Assessment of the Security Aspects of Hitachi GE's UK Advanced Boiling Water
Reactor (UK ABWR)**

Assessment Report ONR-GDA-AR--4-016
Revision 0
28 August 2014

OFFICIAL

© Office for Nuclear Regulation, 2014

If you wish to reuse this information visit www.onr.org.uk/copyright for details.

Published 08/2014

For published documents, the electronic copy on the ONR website remains the most current publicly available version and copying or printing renders this document uncontrolled.

OFFICIAL

EXECUTIVE SUMMARY

This report presents the results of my engagement with Hitachi-GE Nuclear Energy Ltd (Hitachi-GE), henceforth referred to as the Requesting Party (RP), regarding the security aspects of UK Advanced Boiling Water Reactor (UK ABWR) undertaken as part of Step 2 of the Office for Nuclear Regulation's (ONR) Generic Design Assessment (GDA).

The GDA process calls for a step-wise assessment of the Requesting Party's (RP) security submission with the assessments becoming increasingly detailed as the project progresses. Step 2 of GDA is an overview of the acceptability, in accordance with the regulatory regime of Great Britain, of the design fundamentals, including review of key nuclear safety, nuclear security and environmental safety claims with the aim of identifying any fundamental safety or security shortfalls that could prevent the proposed design from being licensed in Great Britain.

The primary focus of the engagement during Step 2 was to ensure that the RP had a clear understanding of ONR's expectations for submissions relating to security and the methodology required to undertake Vital Area Identification work. In addition, GDA Step 2 provided the opportunity to for the RP to describe a high-level overview of the UK ABWR design, systems and general layout.

Throughout GDA Step 2, ONR has continued to engage with the RP to progress with those areas identified in Step 1 regarding the protection of Sensitive Nuclear Information (SNI) to ensure that the RP has the necessary security arrangements in place to comply with the security requirements detailed in the HMG Security Policy Framework. To this end, the RP has engaged with ONR Nuclear Security Inspectors on personnel and information security issues on a regular basis in order to ensure compliance with UK legislation.

An important aspect of my work was an assessment of the RP's framework allowing it to undertake Vital Area Identification (VAI) using the UK Design Basis Threat (DBT) referred to as the Nuclear Industries Malicious Capabilities (Planning) Assumptions (NIMCA). The framework needed to allow for the fact that the document bears a national caveat and cannot be released to non-UK citizens. The RP has put in place an effective mechanism, using UK contractors, to allow this important work to be undertaken.

During Step 2, my work has focussed on acquainting myself with the UK ABWR technology, general design, philosophy for plant control and redundancy. A key area has also been assessing the RP's methodology for Vital Area Identification to ensure the adoption of robust approach that can effectively identify those structures, systems and components that need protecting from potential acts of sabotage.

The standards I have used to judge the adequacy of the RP's submissions in the area of security have been primarily ONR's Technical Assessment Guides CNS-TAST-GD-007 – Guidance on the Security Assessment on Generic New Nuclear Reactor Designs and CNS-TAST-GD-005 – Guidance on How to Assess the Adequacy of a Vital Area Identification Submission.

My GDA Step 2 assessment work has involved continuous engagement with the RP in the form of technical exchange workshops and progress meetings. There has been an increasing focus on VAI methodology with a number of exchanges of information and review of methodology submissions. The result of Step 2 will be the production of a Preliminary Security Report, which is due to be submitted at the end of Step 2 and before the start of Step 3. This should contain an agreed VAI methodology, which is acceptable to ONR.

During my GDA Step 2 assessment of the UK ABWR I have found the RP's response to the feedback provided, very encouraging and its efforts to ensure compliance with UK security

OFFICIAL

requirements to be exemplary, particularly in view that UK security procedures are a relatively new area to the RP. The RP has adopted a pragmatic approach to ensuring objectives are met and have been understanding in terms of the limitations of the availability of some nationally sensitive information.

Overall, I see no reason, on security grounds, why the UK ABWR should not proceed to Step 3 of the GDA process.

OFFICIAL

LIST OF ABBREVIATIONS

| | |
|------------|--|
| ABWR | Advanced Boiling Water Reactor |
| CNS | ONR Civil Nuclear Security (Programme) |
| DAC | Design Acceptance Confirmation |
| DBT | Design Basis Threat |
| GDA | Generic Design Assessment |
| Hitachi-GE | Hitachi-GE Nuclear Energy Ltd |
| IAEA | International Atomic Energy Agency |
| JPO | (Regulators') Joint Programme Office |
| NISR | Nuclear Industries Security Regulations |
| NIMCA | Nuclear Industries Malicious Capabilities (Planning) Assumptions |
| NORMS | Nuclear Industries Security Regulations |
| NPP | Nuclear Power Plant |
| ONR | Office for Nuclear Regulation |
| PSecR | Preliminary Security Report |
| RI | Regulatory Issue |
| RIA | Regulatory Issue Action |
| RO | Regulatory Observation |
| ROA | Regulatory Observation Action |
| RP | Requesting Party |
| RQ | Regulatory Query |
| SINS | Security Informed Nuclear Safety |
| SME | Subject Matter Expert |
| SNI | Sensitive Nuclear Information |
| TAG | Technical Assessment Guide(s) |
| TSC | Technical Support Contractor |
| VA | Vital Area |
| VAI | Vital Area Identification |

OFFICIAL

TABLE OF CONTENTS

| | | |
|-----|---|----|
| 1 | INTRODUCTION | 7 |
| 1.1 | Background..... | 7 |
| 2 | ASSESSMENT STRATEGY..... | 7 |
| 2.1 | Scope of the Step 2 Security Assessment..... | 8 |
| 2.2 | Standards and Criteria..... | 8 |
| 2.3 | Use of Technical Support Contractors..... | 9 |
| 2.4 | Integration with Other Assessment Topics | 9 |
| 3 | REQUESTING PARTY SECURITY SUBMISSIONS..... | 9 |
| 3.1 | Summary of the RP's Engagement on Security..... | 9 |
| 4 | ONR ASSESSMENT | 9 |
| 4.1 | Description of methodology, which will be used to identify potential Vital Areas and the concept for their protection | 10 |
| 4.2 | Technical Exchange Workshops..... | 10 |
| 4.3 | Strengths | 10 |
| 4.4 | Comparison with Standards, Guidance and Relevant Good Practice | 11 |
| 4.5 | Interactions with Other Regulators..... | 11 |
| 5 | CONCLUSIONS AND RECOMMENDATIONS | 11 |
| 5.1 | Conclusions | 11 |
| 6 | REFERENCES | 12 |

OFFICIAL

1 INTRODUCTION

1.1 Background

1. The Office for Nuclear Regulation's (ONR) Generic Design Assessment (GDA) process calls for a step-wise assessment of the Requesting Party's (RP) security submission with the assessments increasing in detail as the project progresses and culminating in the submission of a Conceptual Security Arrangements (CSA) document at the end of Step 4. Hitachi-GE Nuclear Energy Ltd (Hitachi-GE) is the RP for the GDA of the UK Advanced Boiling Water Reactor (UK ABWR).

2. During Step 1 of GDA, which is the preparatory part of the design assessment process, the RP established its project management and technical teams and made arrangements for the GDA of its ABWR design. Also during Step 1, the RP developed its understanding of UK security requirements and those procedures and processes needed to ensure the protection of Sensitive Nuclear Information (SNI) to the appropriate standards. The development of processes, procedures and arrangements for the protection of SNI has continued throughout Step 2 with accreditation of the RP's IT systems, vetting of necessary staff and contractors and arrangements for the handling of UK national caveated material.

3. Step 2 of GDA is an overview of the acceptability, in accordance with the regulatory regime of Great Britain, of the design fundamentals, including review of key nuclear safety, nuclear security and environmental safety claims with the aim of identifying any fundamental safety or security shortfalls that could prevent the proposed licensing of the design in Great Britain.

4. This report presents the results of my assessment of the Security of the RP's UK ABWR as presented in workshops and meetings held throughout the GDA Step 2 process. Please note that the aim of GDA Step 2 was to provide a high-level overview of ABWR technology and essentially confirm that the RP has adopted an acceptable VAI methodology. I will undertake detailed security assessment during GDA Steps 3 and 4 when the RP has identified those areas that require protection.

5. I have undertaken the security assessment in accordance with the requirements of the Office for Nuclear Regulation (ONR) Guidance Document for Generic Design Assessment Activities (Ref 1). I have used the ONR Technical Assessment Guides (TAGs): Guidance on how to Assess the Adequacy of a Vital Area Identification Submission (Ref 2) and Guidance on the Security Assessment of Generic New Nuclear Reactor Designs, (Ref 3) as the basis for my assessment.

6. My assessment has followed my GDA Step 2 Assessment Plan for Security (Ref 4) prepared in December 2013 and shared with the RP to maximise openness and transparency. Paragraph 17 of my GDA Step 2 Assessment Plan for Security is a proposed list of timescales for activity. I acknowledge that there has been a departure from the timescales detailed in my plan. This departure was for two reasons firstly due to further engagement on VAI methodology and secondly to allow time for the RP's contractors to have the appropriate procedures in place to allow for the release of SNI. I do not consider that the departure from proposed timescales has affected the delivery of a GDA Step 2 assessment.

2 ASSESSMENT STRATEGY

7. This section presents my strategy for the GDA Step 2 assessment of the Security of the UK ABWR. It also includes the scope of the assessment and the standards and criteria that I have applied.

OFFICIAL

2.1 Scope of the Step 2 Security Assessment

8. The objective of the GDA Step 2 security assessment for the UK ABWR focussed on acquainting myself with the UK ABWR technology, general design, philosophy for plant control and redundancy. A key area has also been my assessment of the RP's methodology for Vital Area Identification to ensure the adoption of a robust approach that can effectively identify those structures, systems and components that need protecting from potential acts of sabotage.

9. For security, the RP has:

- Described the methodology, which will be used to identify potential Vital Areas.
- Listed equipment, SSC's and devices.
- Provided generic plant layouts.
- Provided descriptions of technology.
- Provided an overview of the philosophy for plant control and physical layout for control systems.
- Provided details of emergency back-up systems

10. Finally, during GDA Step 2, I have reviewed ONR expectations and timelines for GDA Step 3 assessment work.

2.2 Standards and Criteria

11. The goal of the GDA Step 2 assessment is to reach an independent and informed judgment on the adequacy of a nuclear safety, security and environmental case. For this purpose, within ONR, assessment is undertaken in line with the requirements of the Nuclear Industries Security Regulations (NISR) 2003 National Objectives Requirements and Model Standards (NORMS) for the Protective Security of Nuclear Civil Licensed Sites (Ref 5)

12. The relevant IAEA standards are embodied and enlarged in the Technical Assessment Guides on security. These guides provide the principal means for assessing the security aspects in practice.

2.2.1 Technical Assessment Guides

13. The following Technical Assessment Guides have been used as part of this assessment:

- CNS/TAST/GD-007 - Guidance on the Security Assessment of Generic New Nuclear Reactor Designs.
- CNS/TAST/GD/005 - Guidance on How to Assess the Adequacy of a Vital Area Identification Submission.

2.2.2 National and International Standards and Guidance

14. The National Objectives, Requirements and Model Standards (NORMS) for the Protective Security of Civil Licensed Nuclear Sites, Other Nuclear Premises and Nuclear Material in Transit were used in this assessment in addition to the following international standards:

- Relevant IAEA standards (Ref 6):

OFFICIAL

- IAEA Nuclear Security Series No.13 - Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (Infirc/225/Revision 5).
- IAEA Nuclear Security Series No.16 Identification of Vital Areas at Nuclear Facilities.

2.3 Use of Technical Support Contractors

15. No Technical Support Contractors (TSCs) were used during Step 2.

2.4 Integration with Other Assessment Topics

16. Early in GDA, I recognised that during the project there would be a need to consult with other assessors as part of the security assessment process. Similarly, other assessors will seek input from my assessment of the Security for the UK ABWR. I consider these interactions very important to ensure the prevention of assessment gaps and duplications, and, therefore, are key to the success of the project. Thus, from the start of the project, I made every effort to identify as many potential interactions as possible between security and other technical areas, with the understanding that this position would evolve throughout the UK ABWR GDA.

17. In addition to the above, during GDA Step 2 there have been important interactions with ONR's Security Informed Nuclear Safety (SINS) team particularly on assessing Vital Area Identification methodology, and also with GDA Engineering and System Leads. These interactions will continue through GDA, and are considered essential to ensure consistency across the technical assessment areas and provide technical expertise on any claims made by the RP.

3 REQUESTING PARTY SECURITY SUBMISSIONS

18. This section presents a summary of the RP's delivery of information and material in the area of Security. It also identifies the documents submitted by the RP, which have formed the basis of my assessment of the UK ABWR Security during GDA Step 2.

3.1 Summary of the RP's Engagement on Security

19. The RP has provided the following information during the Step 2 engagement:

- Description of methodology, which will be used to identify potential Vital Areas and the concept for their protection.
- List of equipments, SSCs and devices.
- Generic Plant layouts.
- Design information relating to the fabric of buildings, internal walls, floors and ceilings.
- Process and descriptions of technology, including fuel storage and their relationship to the physical plant layout.
- Philosophy for plant control, IT systems, physical layouts for control systems.
- Emergency backup systems layouts and description, and philosophy for redundancy.

4 ONR ASSESSMENT

20. My Step 2 assessment work has involved continuous engagement with the RP's Security Subject Matter Experts (SME) through two Technical Exchange Workshops in the UK and progress meetings. I have also visited Shimane Unit 3 ABWR where I toured the facility.

21. At this stage of the process, my GDA Step 2 assessment has been primarily based on the presentations provided by the RP over the course of two technical workshops and the feedback provided by ONR safety assessors. Please note that the aim of GDA Step 2, in

OFFICIAL

terms of security, was for the RP to provide a high-level overview of the design and technology and to propose an acceptable methodology for the identification of Vital Areas.

4.1 Description of methodology, which will be used to identify potential Vital Areas and the concept for their protection

4.1.1 Assessment

22. I have attended a number of meetings with the RP and its UK contractors to ensure the adoption of a robust methodology for the identification of Vital Areas. One of the challenges of this process was to establish an effective mechanism for using the UK DBT, referred to as NIMCA, in the VAI process, recognising that the document bears a UK national caveat and not releasable to non-UK nationals. The RP has adopted an effective and pragmatic approach, using UK contractors to use the NIMCA to inform the VAI process. For the RP to retain full oversight and ownership of the process the RP will employ a UK national within the company to oversee the production of the Conceptual Security Arrangements document in GDA Steps 3 and 4 and be in a position to validate the VAI work being carried out by UK contractors on the RP's behalf.

23. A number of draft VAI methodologies have been submitted for comment and the ONR Security Informed Nuclear Safety (SINS) team have provided feedback and advice. One of the main areas addressed was the need to consider introducing the UK DBT later in the VAI process. This would allow the RP design team and engineers to have far more input into the identification of areas that could cause an unacceptable radiological consequence if they failed. This has been recognised and the VAI methodology has been amended to reflect this approach. The VAI methodology will form part of the Preliminary Security Report.

4.2 Technical Exchange Workshops

4.2.1 Assessment

24. Over the course of two workshops, held on 8/9 April 2014 and 2/3 July 2014, the RP gave the following presentations:

- Safety Systems (1) - Shutdown Systems
- Safety Systems (2) - Emergency Core Cooling Systems
- Safety Systems (3) - Containment Systems
- Approach on the Identification of safety Significant SSCs
- Plant Layout and Arrangement Design
- Arrangements for Radiation Protection
- Control Building layout Over View
- Spent Fuel Pool
- Potential Options for Spent Fuel Interim Storage
- Back-up Building Concept
- C&I System Security

25. The GDA Step 2 presentations by the RP have provided a good overview of the ABWR technology and the opportunity to question the RP on safety systems and plant redundancy. During the workshops, the RP has also provided updates on the enhancements to its security infrastructure in order to comply with UK regulations for the protection of SNI.

4.3 Strengths

26. At this stage of the security assessment, the priority is for the security assessors to get a high-level overview of the UK ABWR technology and ensure the RP has a

OFFICIAL

comprehensive understanding of the VAI process and has formulated a robust VAI methodology. The RP has provided a good overview of ABWR technology, pitched at the right level. They have, in turn, been responsive to comments and suggestions regarding VAI methodology and have reviewed and updated their methodology where required to do so.

4.4 Comparison with Standards, Guidance and Relevant Good Practice

27. The RP has recognised the value of the TAGs on the Assessment of Generic New Nuclear Reactor Designs and the Assessment of the Adequacy of a VAI submission and used the information to start to formulate its Preliminary Security Report. In addition, it has considered advice provided by safety advisors to formulate the VAI methodology.

4.5 Interactions with Other Regulators

28. Throughout GDA Step 2, engineering leads have been involved in workshops and dialogue to ensure consistency and to validate the technical information provided. This engagement will increase through GDA Step 3, as more detailed and complex information is provided. It is also recognised that a great deal of work, particularly with regards to the identification and protection of CBSIS and Control and Instrumentation systems will be dependant on the results of safety assessment work in these particular areas.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

29. Overall, I see no reason, on Security grounds, why the UK ABWR should not proceed to Step 3 of the GDA process. The GDA Step 2 security assessment is primarily about defining VAI methodology, for security assessors to get a basic understanding of ABWR technology, and for the RP to start to demonstrate an understanding of the UK physical security requirements. In addition, the RP has continued to demonstrate a commitment to understand and meet UK regulations for the protection of Sensitive Nuclear Information.

30. I recommend that the UK ABWR should proceed to Step 3 of the GDA process.

OFFICIAL

6 REFERENCES

- 1 New Nuclear Reactors: Generic Design Assessment Guidance to Requesting Parties (ONR-GDA-001 Rev 0) August 2013.
- 2 TAG: Guidance on How to Assess the Adequacy of a Vital Area Identification Submission (CNS-TAST-GD-005 Rev 0)
www.onr.gov.uk/operational/tech_asst_guides/index.htm
- 3 TAG: Guidance on the Security Assessment of Generic Nuclear Reactor Designs (CNS-TAST-GD-007 Rev 0) Trim Ref: 2013/84262
www.onr.gov.uk/operational/tech_asst_guides/index.htm
- 4 Step 2 Assessment Plan: ONR-GDA-AP-13-014 Trim Ref: 2013/436251
- 5 National Objectives, Requirements and Model Standards (NORMS) for the Protection of Civil Licensed Nuclear Sites, Other Nuclear Premises and Nuclear Material in Transit
- 6 IAEA Standards and Guidance.
Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear facilities (INFCIRC/225/Rev 5) www.iaea.org.
Engineering Safety Aspects of the Protection of Nuclear Power Plants Against Sabotage www.iaea.org.