Office for Nuclear Regulation

Transport Permissioning (SVC4331135)

Validation of French Certificates of Approval for the TNF-XI Package F/381/AF 96 (Di) and F/381/IF 96 (Dj)

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EXECUTIVE SUMMARY

Assessment of Fissile Validation of Package Design F/381/AF-96 and F/381/IF-96

This report summarises the basis of the regulatory decision by the Office for Nuclear Regulation (ONR) as Great Britain (GB) Competent Authority (CA) for Class 7 (radioactive material) dangerous goods, to validate the certificates of approval issued by the French CA, F/381/AF-96 (Di) and F/381/IF-96 (Dj), for the TNF-XI transport package.

Permission Requested

The Applicant, AREVA TN International has written to ONR to request GB validation of the French CA certificates of approval, F/381/AF-96 (Di) and F/381/IF-96 (Dj), to permit transport of the TNF-XI transport package via road, rail, and sea within Great Britain. Transport by air has not been requested. This validation request was made under 'The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009' for road and rail. These regulations transpose into GB law the United Nations Economic Commission for Europe (UNECE) modal requirements ADR and RID for transport of dangerous goods by road and rail. For transport of dangerous goods by sea, the international requirements are given in the International Maritime Dangerous Goods (IMDG) Code and are implemented in the UK by The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997. The modal regulations are based on the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material, currently SSR-6 (2012 Edition) supported by advisory material in SSG-26.

Under these provisions, fissile material package designs to be used in different countries require multilateral approval. This may be by validation of the original certificate issued by the CA of the country of origin of the package design or shipment, or the issue of a separate certificate of approval.

Background

The French TNF-XI package design F/381/AF-96 and F/381/IF-96 will be used in GB to transport uranium oxides in the form of powder, pellets or scraps in support of fuel programmes or in the form of powder or scraps that may be contaminated by residues. The TNF-XI package has previously been validated in GB under earlier revisions of the French CA certificate, but previous validations expired on 31 December 2016. Since the last validations were issued, there has been a change to the package contents and the supporting safety justification, with the most significant changes to the criticality analysis. The latest safety justification for the transport package is contained in the Safety Analysis Report (SAR) for the TNF-XI Package DOS-06-00037028-000 Revision 7, dated July 2016. This has been submitted to and assessed by ONR.

Assessment and inspection work carried out by ONR in consideration of this request

ONR carried out a programme of assessment of the applicant's transport safety case, its claims, arguments, supporting documentation and evidence. ONR also assessed the mechanisms for implementation of the requirements of the transport safety case and certificate of approval via the relevant management systems. The assessment has been carried out by sampling a number of key areas of the transport safety case. These areas were chosen based on ONR inspector's judgement of their importance to safety, changes since the last validation and any findings and outcomes from previous ONR assessments.

The package designs under assessment are Type A and Industrial Package Type 2, both of which are fissile packages, hence the designations F/381/AF 96 and F/381/IF 96 respectively. In accordance with paragraph 802 and Annex I of SSR-6, CA approval is only required owing to the fissile aspects (potential criticality hazards) of the package. Consequently, an

assessment was performed which focused mainly on the criticality analysis and any engineering/administrative aspects which influence the criticality assessment.

No inspection work was conducted explicitly in support of this application. Regulatory confidence is drawn from recent inspection history of the GB based duty-holders (who act as both consigner and consignee), approval from the originating CA, and written correspondence from the applicant to establish specific details relevant to this application.

Matters arising from ONR's work

ONR identified two supplementary controls in addition to those on the certificates of approval issued by the French CA that are necessary to meet regulatory expectations for package criticality control within the UK. Accordingly, this multi-lateral approval is effected by the issue of a GB certificate of approval that lists these supplementary controls to highlight these safety requirements to users of the package. These two supplementary controls are summarised as follows:

- An underpinning assumption in the package criticality safety case relating to the maximum hydrogen density of package contents has not been captured on the certificate of approval issued by the French CA. In order to emphasise this to users of the package, it is considered necessary to explicitly capture this on the GB certificates of approval.

- The applicant has used a criticality safety criterion which, although accepted by the French CA, does not meet internationally recognised relevant good practice and is not acceptable to ONR without further justification. Therefore, ONR cannot approve the package design without further restriction. Consequently, the applicant has supplied supporting documentation which shows that by reducing the uranium oxide density of content n°2 and n°4, ONR's regulatory expectations are satisfied. It is therefore necessary to explicitly capture this additional density restriction on the GB certificates of approval.

Conclusions

Subject to the imposition of supplementary controls for use of the package design within the UK, the SAR together with supporting documentation provided to ONR is considered to be adequate to meet applicable regulatory requirements and the design is judged to be safe.

Recommendation

The application is approved under GB certificates GB/5108A/AF-96 (Rev.0) and GB/5108A/IF-96 (Rev.3) subject to inclusion of the supplementary controls as conditions of approval.

LIST OF ABBREVIATIONS

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ASN	Autorité De Sûreté Nucléaire
CA	Competent Authority
COP	Cross ONR Programme
DCI	Deputy Chief Inspector
DL	Delivery Lead
GB	Great Britain
HOW2	(Office for Nuclear Regulation) Business Management System
IAEA	The International Atomic Energy Agency
IMDG	International Maritime Dangerous Goods Code
IP2	Industrial Package Type 2
k_{eff}	Effective Neutron Multiplication Factor
LSA-II	Low Specific Activity Group II
MoU	Memorandum of Understanding
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
PD	Programme Director
PL	Professional Lead
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SAR	Safety Analysis Report
SFL	Springfields Fuels Ltd.
SI	Superintending Inspector
SSG	(IAEA) Specific Safety Guide
SSR	(IAEA) Specific Safety Requirements
TIE	Transport Inspection and Enforcement
UK	United Kingdom
UNECE	United Nations Economic Commission for Europe
σ	Standard Deviation

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1 PERMISSION REQUESTED

1. The Applicant AREVA TN International requested GB Competent Authority (CA) validation of the F/381/AF-96 and F/381/AF-96 package design (TNF-XI) for transport via road, rail and sea within Great Britain [1, 2]. Transport by air has not been requested. The TNF-XI package is shown in Figure 1.

2. This request for road and rail is made under 'The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009' [3]. These regulations transpose into GB law the United Nations Economic Commission for Europe (UNECE) modal requirements ADR [4] and RID [5] for transport of dangerous goods by road and rail. For transport of dangerous goods by sea, the international requirements are given in the International Maritime Dangerous Goods (IMDG) Code [6] and are implemented in the UK by The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 [7].

3. The modal regulations are based on the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material, currently SSR-6 (2012 Edition) supported by advisory material in SSG-26 [8]. Under these provisions, fissile material package designs to be used in different countries require multilateral approval. This may be by validation of the original certificate issued by the CA of the country of origin of the package design, or the issue of a separate certificate of approval.

2 BACKGROUND

4. AREVA TN International applied to ONR for validation of two French certificates of approval for the TNF-XI package, as a:

   - Type A package design for fissile material, F/381/AF-96;
   - Industrial package design for fissile material, F/381/IF-96.

5. This validation is required by relevant provisions of ADR, RID and the IMDG Code [4 - 6]. The application concerns transport by road, rail, and sea of the TNF-XI package loaded with uranium oxides. The uranium oxides will be in the form of powder, pellets or scraps and may be contaminated by residues. The maximum allowable mass of uranium oxide varies with the enrichment of the material. This package is intended to facilitate transfer of nuclear materials from the UK in support of fuel production programmes. It can also be used to facilitate transfer of nuclear materials to the UK to allow recovery of uranium from residues. Validation of the French approvals of the package design is requested to enable delivery of these programmes.

6. The package design was previously approved by the French CA for similar contents under certificates of approval F/381/AF-96 (Cf) and F/381/IF-96 (Cg) [9, 10] which were validated in GB under F/381/AF-96 Issue 5 and F/381/IF-96 Issue 3 [11, 12]. Those certificates of approval and validations expired on 31 December 2016. The French CA has since issued new certificates of approval, F/381/AF-96 (Di) and F/381/IF-96 (Dj) [13, 14], with an expiry date of 31 December 2021. The Applicant therefore requested renewal of the GB validation to enable transport operations from 2017. The latest safety justification for the transport package is contained in Safety Analysis Report (SAR) for the TNF-XI Package DOS-06-00037028-000 Revision 7, dated July 2016 [15].

7. Since the last validations were issued on 16 December 2011, there has been a change to package contents. There were previously four content types (n°1, n°2, n°3 and n°4). n°1 and n°3 are no longer required, n°2 and n°4 have been modified to reduce fissile mass limits and allow impurities and a new content, n°7, has been added. The contents are defined as follows:

- **n°2** - uranium oxides (UO_2, UO_3 or U_3O_8) in the form of powder, pellets or scraps compliant with the definition of “unirradiated uranium” according to SSR-6 [8]. The uranium oxides may now contain aluminium and carbon impurities;
- **n°4** - uranium oxides (UO_2, UO_3 or U_3O_8) in the form of powder, pellets or scraps compliant with the definition of “low specific activity group II for solids” (LSA-II) according to SSR-6 [8]. The uranium oxides may now contain aluminium and carbon impurities;
- **n°7** - uranium oxides (UO_2, UO_3 or U_3O_8) in the form of powder and scraps and mixed with residues. The radioactive content is compliant with the definition of “unirradiated uranium” according to SSR-6 [8].

8. Content n°2 and n°7 will be transported using F/381/AF-96, while content n°4 will be transported using F/381/IF-96.

9. Whilst the package design is structurally the same, the change to the contents has been accompanied by a significant update to the criticality safety analysis to consider:

- more pessimistic physical form of uranium oxides (pellets and scraps of pellets);
- more pessimistic positions of the pails and borated rings in the cavities;
- an increase of the foam crushing;
- impurities in the uranium oxides.

3 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST

10. This current application has been considered in accordance with ONR’s assessment processes [16]. ONR carried out a detailed programme of work [17 – 24] that involved the assessment of the applicant’s transport safety case, supporting documentation and evidence, and the mechanisms for its implementation via the relevant management systems.

11. The package designs under assessment are Type A and Industrial Package Type 2 (IP2), both of which are fissile packages, hence the designations F/381/AF-96 and F/381/IF-96 respectively. In accordance with para 802 and Annex I of SSR-6 [8], Competent Authority approval is only required owing to the fissile aspect of the package, i.e. Competent Authority approval is not required for Type A or IP 2 package designs containing non fissile material. Thus, multilateral approval is only required because the packages are fissile packages (potential criticality hazard).

12. In addition, in relation to validation of certificates of approval, para 840.1 of SSG-26 [8] states ‘Competent authorities, other than that of the country of origin, have the option of either performing a separate safety assessment and evaluation or making use of the assessment already made by the original competent authority, thus limiting the scope and extent of their own assessment’. Cognisance has been taken that the assessment has already been approved by the French CA (ASN). Additional confidence is gained from the applicant’s track record in producing transport safety cases, that the package is not novel or complex and that the package design has been previously approved in GB (albeit for slightly different content).

13. Therefore, an assessment approach was adopted which focused mainly on the criticality analysis and any engineering/administrative aspects which influence the criticality assessment, as well as changes since the last validation and any findings and outcomes from previous ONR assessments.

14. The ONR assessment involved four topic areas that are potentially significant in terms of transport safety: criticality, shielding, engineering and management systems. The key findings and conclusions of the assessment areas are summarised below.

3.1 CRITICALITY ASSESSMENT

15. The criticality assessment [21] focused on confirming that the applicant's modelling approach is suitably conservative and representative of the conditions expected in the relevant IAEA transport regulations, e.g. SSR-6. Particular scrutiny was applied to the new package contents requested for approval and the underpinning assumptions concerning the fissile material form and moderator/reflector content.

16. In addition, consideration of the effect of temperature on criticality calculations at low and elevated temperatures is an emergent issue in transport criticality assessment. Historically, criticality safety cases have used nuclear data at room temperature (~20°C). However, recent work has suggested that changes in temperature may have the potential to increase reactivity. Thus, specific attention was given to neutron multiplication variation over the temperature range specified in SSR-6 [8] (–40°C to +38°C, or the maximum package temperature resulting from the thermal tests if greater than +38°C). This was considered particularly important as the criticality safety criterion adopted ($k_{eff} + 3\sigma \leq 0.98$) is higher than normally adopted in the UK ($k_{eff} + 3\sigma \leq 0.95$). The acceptability of using a criticality safety criteria $k_{eff} + 3\sigma \leq 0.98$ has also been scrutinised.

17. The applicable regulations only require sub-criticality to be demonstrated ($k_{eff} + 3\sigma \leq 1.0$). However, the criticality safety criterion normally adopted in the UK follows relevant good practice consistent with paragraph VI.38 of SSG-26 [8] which suggests that typically a margin of sub-criticality of 0.05 (i.e. $k_{eff} + 3\sigma \leq 0.95$) should be used unless a justification can be made based on available validation, a demonstrated understanding of the system and effect of potential changes. Although the UK, United States, Germany, Japan and many other countries around the world use a strict margin of sub-criticality of 0.05, the French Competent Authority historically accept a smaller safety margin of 0.02 for systems they judge to be highly unlikely such as large arrays of damaged packages.

18. In ONR's opinion, the applicant has not presented an adequate justification for adopting a criticality safety criterion of $k_{eff} + 3\sigma \leq 0.98$ for arrays of TNF-XI packages. It was therefore judged to be unacceptable to approve the safety case without further justification. In lieu of a justification for adopting a criticality safety criterion of $k_{eff} + 3\sigma \leq 0.98$, the applicant has provided additional documentation that demonstrates that the criticality safety criterion of $k_{eff} + 3\sigma \leq 0.95$ is met if credit is taken for the fact that the uranium oxide for content n°2 and n°4 will be at a lower density than the value that was initially assumed and defined in the French certificates of approval. The applicant has been informed that all subsequent applications that adopt a criticality safety criterion in excess of the generally accepted worldwide criterion of $k_{eff} + 3\sigma \leq 0.95$ should include an appropriate justification. Therefore, before GB approval for higher density uranium oxide shipments of content n°2 and n°4 can be given, the applicant must both provide a justification for use of a criticality safety criterion that is acceptable to ONR, and demonstrate that that criterion is met.

19. In terms of the temperature effect on the neutron multiplication, the applicant has provided explicit calculations down to 0°C (the minimum range of applicability of the computer code) coupled with reasoned argument for temperatures from 0°C down to -40°C which demonstrate that the worst case is observed at 0°C and that at 0°C, the criticality safety criterion of $k_{eff} + 3\sigma \leq 0.95$ is met if credit is taken for the fact that the uranium oxide density of content n°2 and n°4 has a lower density than that initially assumed and defined in the French certificates of approval. For content n°7, the

safety criterion of $k_{eff} + 3\sigma \leq 0.95$ has been shown to be met without restricting the uranium oxide density.

20. On the basis of the assessment carried out and subsequent review of the additional modelling and evidence provided by the applicant, ONR judges that an adequate criticality safety case, with suitable conservatism and bounding content justification, for the TNF-XI package with the specified contents has been presented, assuming the uranium oxide density of content n°2 and n°4 has a lower density than that initially assumed and defined in the French certificates of approval. The defined fissile and moderator limits are adequately underpinned for the normal conditions of transport and accident conditions. The derived Criticality Safety Index value of 0 is appropriate for this package, subject to the defined package limits being met. Therefore, approval of the package for a further five years is recommended.

3.2 SHIELDING ASSESSMENT

21. The ONR shielding assessment [22] found that the applicant's shielding analysis is comprehensive and addresses all the necessary dose rate criteria and radiation types and has used appropriate codes to calculate the source terms/dose rates (significant dose rates are calculated only when irradiated UO_2 is present). The shielding assessment concluded that the application is acceptable from a shielding and dose rate perspective.

3.3 ENGINEERING ASSESSMENT

22. The ONR engineering assessment [23], started with an initial engineering overview which ensured that the case was complete, coherent and consistent. It found no aspects that required clarification and the safety case was considered to demonstrate compliance with the regulations. It then focused on consideration of the aspects that had been updated since the last GB validation [11, 12] and ensured the new content, n°7, was bounded by engineering substantiation previously performed. It was concluded that there were no engineering concerns and that the new content, n°7, was bounded by previous engineering assessment.

3.4 SAFETY CASE REQUIREMENTS ASSESSMENT

23. The ONR safety case requirements assessment [24] assessed the management system arrangements for implementation of the requirements of the transport package safety case. ONR focussed on the UK based consignor, Springfields Fuels Ltd (SFL), and established ongoing confidence in its capability to implement the requirements of the safety case and certificate of approval. The assessment is supported by recent transport inspections of the consignor that examined both general and specific management arrangements in the context of radioactive material transport operations [25]. The consignor's arrangements in respect of provision 1.7.3 of ADR [4] (and equivalent provisions in other modal texts) were considered adequate for the purposes of transporting radioactive material. No concerns were identified by ONR from these assessment and inspection activities that could detrimentally impact safe use of the package. Ongoing compliance with the requirements of the certificate of approval is examined through routine interactions with the consignor.

4 MATTERS ARISING FROM ONR'S WORK

24. As already discussed, an adequate justification for adopting a criticality safety criterion of $k_{eff} + 3\sigma \leq 0.98$ for arrays of TNF-XI packages has not been provided. As a consequence, it is necessary to reduce the permitted density of uranium oxide to a lower value than defined in the certificates of approval issued by the French CA [13, 14].

25. In addition, ONR's criticality safety assessment identified that the package safety case is based on a maximum hydrogen density of package contents. Although this is an underpinning assumption in the package safety case, it has not been captured on the certificate of approval issued by the French CA [13, 14]. In order to emphasise this to users of the package, it is considered necessary to explicitly capture this on the GB certificates of approval.

26. Accordingly, this multilateral approval is effected by the issue of GB certificates of approval, GB/5108A/AF-96 (Rev.0) and GB/5108A/IF-96 (Rev.3) [26, 27], which include supplementary controls which are not included on the French certificates of approval in relation to:

- the maximum permitted uranium oxide density for content n°2 and n°4, which is lower than the value defined in the French certificates of approval;
- the maximum hydrogen density of substances to be carried.

27. The applicant has been made aware and has accepted these additional restrictions. As these are new restrictions, it is not possible to check compliance. However, as stated in section 4, the consignor's management system arrangements are considered adequate and there is no reason to believe compliance will not be achieved. An intervention at SFL, which will focus on this package, is scheduled for March 2017 [28].

5 CONCLUSIONS

28. This report presents the findings and basis of ONR's regulatory decision following our assessment in relation to validation of the French certificates of approval, F/381/AF-96 (Di) and F/381/IF-96 (Dj), for the TNF-XI transport package.

29. ONR is satisfied with the claims, arguments and evidence presented within the original submission, as supported by subsequent correspondence/evidence provided by the applicant in response to our assessment findings. Subject to the imposition of the identified supplementary controls for use of the package design within GB, the design is judged to be safe and meets applicable regulatory requirements. Criticality safety is enhanced through emphasis of the safety case assumption relating to the maximum permitted uranium oxide density and maximum permitted hydrogen density of contents as supplementary controls on the GB certificates of approval to highlight these additional safety features to all users of the package.

6 RECOMMENDATIONS

30. The project assessment report recommends that the F/381/AF-96 and F/381/IF-96 (TNF-XI) package design be approved for use in GB by road, rail and sea. The GB certificates should include an additional control to limit the both the uranium density and hydrogen density of the contents in order to enhance clarification of package safety requirements during transport operations. Issue of GB certificates of approval GB/5108A/AF-96 (Rev.0) [26] and GB/5108A/IF-96 (Rev.3) [27] is recommended.

7 REFERENCES

1. CEX-16-00178947-000: 'Transport of Radioactive Material - Package model F/381/AF-96 and F/381/IF-96 – TNF-XI Package - Anticipated application for United Kingdom validation of French certificates of approval F/381/AF-96 (Di) and F/381/IF-96 (Dj)', AREVA TN International, 29 July 2016. TRIM Record: 2016/310226.
2. CEX-16-00178947-001: 'Transport of Radioactive Material - Package model F/381/AF-96 and F/381/IF-96 – TNF-XI Package - Anticipated application for United Kingdom validation of French certificates of approval F/381/AF-96 (Di) and F/381/IF-96 (Dj)', AREVA TN International, 14 September 2016. TRIM Record: 2016/363391.
3. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (CDG) 2009, (SI 2009 No. 1348). www.legislation.gov.uk
4. United Nations Economic Commission for Europe (UNECE), European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2015 Edition (until end of June 2017) or ADR 2017 Edition. www.unece.org
5. Intergovernmental Organisation for International Carriage by Rail (OTIF), Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2015 Edition (until end of June 2017) or RID 2017 Edition. www.otif.org
6. International Maritime Organization (IMO), International Maritime Dangerous Goods Code (IMDG) 2014 Edition incorporating Amendment 37-14 (until end of December 2017) or IMDG 2016 Edition incorporating Amendment 38-16.
7. The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997, (SI 1997 No. 2367). http://www.legislation.gov.uk
8. IAEA Safety Standards:
   SSR-6, 'Regulations for the Safe Transport of Radioactive Material (2012 Edition)', IAEA, Vienna, 2012.
   SSG-26, 'Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)', IAEA, Vienna, 2012.
   www.iaea.org.
9. F/381/AF 96 (Cf): 'Certificat D'Agrement D'Un Modele De Colis' Autorité De Sûreté Nucléaire, 10 October 2011.
10. F/381/IF-96 (Cg): 'Certificat D'Agrement D'Un Modele De Colis' Autorité De Sûreté Nucléaire, 10 October 2011.
11. F/381/AF-96 Issue 5: 'Validation of Approval of a Package Design for the Carriage of Radioactive Material', Health and Safety Executive (Office for Nuclear Regulation).
12. F/381/IF-96 Issue 3: 'Validation of Approval of a Package Design for the Carriage of Radioactive Material', Health and Safety Executive (Office for Nuclear Regulation).
13. F/381/AF-96 (Di): 'Certificat D'Agrement D'Un Modele De Colis' Autorité De Sûreté Nucléaire, 6 September 2016. Attachment to TRIM Record: 2016/363389.
14. F/381/IF-96 (Dj): 'Certificat D'Agrement D'Un Modele De Colis' Autorité De Sûreté Nucléaire, 6 September 2016. Attachment to TRIM Record: 2016/363389.
15. DOS-06-00037028-000 Revision 7: 'Safety Analysis Report TNF-XI', AREVA TN International, 21 July 2016. TRIM Record: 2016/446429.
16. ONR Transport Permissioning Process Guides:
    TRA-PER-GD-001 Revision 1, 'Transport Permissioning Assessment'.
    ONR Transport Permissioning Assessment Guides on How2
17. 'COP Transport Permissioning Sub-programme Q0 Application Completeness Check Form - TNF-XI Package - F/381 (SVC4331135)'. TRIM Record: 2016/310130.

18. COP Transport Permissioning Sub-programme Pre-Job Brief - TNF-XI Package - CoAs - F/381/AF-96 (Di) and F/381/IF-96 (Dj), 23 August 2016. TRIM Record 2016/310848.

19. ONR-TRA-DR-16-005 Revision 0: 'Transport Permissioning Assessment Scope Decision Record – TNF-XI Package - F/381 (SVC4331135)', 28 November 2016. TRIM Record: 2016/458343.

20. F/381 (SVC 4331135) Q1 Assessment Review Form, 9 January 2017. TRIM Record: 2016/337124.

21. ONR-COP-AR-16-019 Revision 0, Transport Permissioning Criticality Assessment Report - Application for the Validation of French Certificates of Approval F/381/AF-96(Di) and F/381/IF-96(Dj), 09 January 2017. TRIM Record: 2016/338695.

22. Transport Permissioning Shielding Assessment Record - Application for the Validation of French Certificates of Approval F/381/AF-96(Di) and F/381/IF-96(Dj), 12 December 2016. TRIM Record: 2016/487663.

23. Transport Permissioning Engineering Assessment Record - Application for the Validation of French Certificates of Approval F/381/AF-96(Di) and F/381/IF-96(Dj), 6 December 2016. TRIM Record: 2016/475840.

24. Transport Permissioning Safety Case Requirements Assessment Record - Application for the Validation of French Certificates of Approval F/381/AF-96(Di) and F/381/IF-96(Dj), 19 December 2016. TRIM Record: 2016/470346.

25. Transport Inspection and Enforcement Input to the Safety Case Requirement Assessment for Package Approval of the F/381/AF-96 and F/381/IF-96 (SVC4331135). TRIM record: 2016/492343.

26. GB/5108A/AF-96 (Rev.0), 'Certificate of Approval of Package Design for the Carriage of Radioactive Material', 17 January 2017. TRIM Record: 2016/465166.

27. GB/5108A/IF-96(Rev.3), 'Certificate of Approval of Package Design for the Carriage of Radioactive Material', 17 January 2017. TRIM Record: 2016/467120.

28. Transport Inspection and Enforcement Work Stream 2 Intervention Plan, Change Control Date 14 December 2017. TRIM Record: 2015/278025.

Figure 1

TNF-XI Package Design Illustration