



U.S. Department
of Transportation

Pipeline and
Hazardous Materials
Safety Administration

East Building, PHH-23
1200 New Jersey Ave, SE
Washington, D.C. 20590

**COMPETENT AUTHORITY CERTIFICATION FOR A
TYPE FISSILE
RADIOACTIVE MATERIALS PACKAGE DESIGN
CERTIFICATE USA/0854/AF, REVISION 0**

**REVALIDATION OF SWEDISH COMPETENT AUTHORITY
CERTIFICATE S/50/AF**

The Competent Authority of the United States certifies that the radioactive material package design described in this certificate satisfies the regulatory requirements for a Type AF package as prescribed in the regulations of the International Atomic Energy Agency¹ and the United States of America². The package design is approved for use within the United States for import and export shipments made in accordance with applicable international and domestic transport regulations.

1. Package Identification - Embrace.
2. Package Description and Authorized Radioactive Contents - as described in Swedish Certificate of Competent Authority S/50/AF, Revision 0 (attached).
3. Criticality - The minimum criticality safety index is 0.5. The maximum number of packages per conveyance is determined in accordance with Table 11 of the IAEA regulations cited in this certificate.
4. General Conditions -
 - a. Each user of this certificate must have in his possession a copy of this certificate and all documents necessary to properly prepare the package for transportation. The user shall prepare the package for shipment in accordance with the documentation and applicable regulations.
 - b. Each user of this certificate, other than the original petitioner, shall register his identity in writing to the Office of Engineering and Research, (PHH-23), Pipeline and Hazardous

¹ "Regulations for the Safe Transport of Radioactive Material, 2018 Edition, No. SSR-6 (Rev. 1)" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

² Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

CERTIFICATE USA/0854/AF, REVISION 0

Materials Safety Administration, U.S. Department of
Transportation, Washington D.C. 20590-0001.

- c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.
- d. Records of Management System activities required by Paragraph 306 of the IAEA regulations¹ shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the applicable requirements of Subpart H of 10 CFR 71.

5. Marking and Labeling - The package shall bear the marking USA/0854/AF in addition to other required markings and labeling.

6. Expiration Date - This certificate expires on December 25, 2025.

This certificate is issued in accordance with paragraph(s) 816 of the IAEA Regulations and Section 173.472 and 173.473 of Title 49 of the Code of Federal Regulations, in response to the April 2, 2025 petition by Westinghouse, Columbia, SC, and in consideration of other information on file in this Office.

Certified By:



William Schoonover
Associate Administrator for Hazardous
Materials Safety

April 08, 2025

(DATE)

Revision 0 - Issued to endorse Swedish Certificate of Competent Authority No. S/50/AF, Revision 0, to 2018 edition of the IAEA Regulations for the Safe Transport of Radioactive Materials, SSR 6 (Rev. 1).



Strålsäkerhetsmyndigheten

Swedish Radiation Safety Authority

Westinghouse Electric Sweden AB

SE-721 63 Västerås

S/50/AF (Rev. 0)

Date: 2025-03-27

Your Reference: LTR-LCPT-24-46

Registration No.: SSM2024-14914

Document No.: SSM2024-14914-10

Administrator: Thomas Nilsson

Telephone: +46 (0)8 799 43 80

Approval of package design for the transport of radioactive substances, S/50/AF (Rev. 0)

Decision by the Swedish Radiation Safety Authority

The Swedish Radiation Safety Authority (SSM) approves a package design for transport by road, rail, and sea under Swedish jurisdiction.

The approval has been performed by way of an evaluation of the reporting according to references [1-4].

The identity designation of the package design:	S/50/AF
Type of package:	Type A for fissile material
Criticality Safety Index:	0.5
Name:	EMBRACE

Description of the package and conditions for its use are given in Appendix 1.

This certificate does not exempt the sender from complying with all possible regulations in the countries through or into which the package is transported.

This certificate is valid until December 31, 2028.

Case

On December 9, 2024, Westinghouse Electric Company LLC, USA, in collaboration with Westinghouse Electric Sweden AB (WSE), submitted an application for approval of a package design with the EMBRACE packaging [5]. Supplementary information in the case was received from Westinghouse Electric Company LLC on February 18, 2025 [6].

Reasons for the decision

The transport provisions in ADR-S, RID-S and the IMDG Code state that for transportation of class 7 substances, a competent authority must issue a certificate of approval of

package designs which require approval by the authorities. The Swedish Radiation Safety Authority examines such cases based on sections 7 and 8 of the ordinance (2006:311) on transport of dangerous goods.

SSM assesses that the prerequisites are met, with the limitations and conditions that appear in Appendix 1, for approving the package design to which the application relates [7].



Charge

The activity covered by this approval is subject to a charge of SEK 110,000 in accordance with section 5 (15) of the Regulation (2008:463) on certain fees to the Swedish Radiation Safety Authority. SSM will invoice WSE for the charge.

Other

Further provisions relating to transportation are provided in references [1-4] below.

How to appeal the decision

Appendix 2 includes a description of how to appeal this decision.

This case was decided by head of unit Rasa Engstedt. Investigator Thomas Nilsson provided a report.

THE SWEDISH RADIATION SAFETY AUTHORITY

/signed/
Rasa Engstedt

Round seal:
SWEDISH
RADIATION
SAFETY
AUTHORITY

/signed/
Thomas Nilsson



References

Transport provisions

1. IAEA Safety Standard Series No. SSR-6 (Rev. 1). *Regulations for the Safe Transport of Radioactive Material*, 2018 Edition.
2. *Swedish Civil Contingencies Agency regulations on the transportation of dangerous goods by road and off-road*, ADR-S 2025 (MSBFS 2024:10).
3. *Swedish Civil Contingencies Agency regulations on the transportation of dangerous goods by rail*, RID-S 2025 (MSBFS 2024:11).
4. Swedish Transport Agency regulations on transportation by sea of packaged dangerous goods (the IMDG Code) (TSFS 2022:52).

Technical documentation

5. Westinghouse Electric Company, Application for Package Design Approval for Package-Type Transport Packaging, SSM2024-14914-1, 2024-12-09.
6. Westinghouse Electric Company, Information, SSM2024-14914-4, 2025-02-18.
7. SSM – *Review report SSM*, SSM2024-14914-8, 2025-03-27.

Appendices

1. Scope, restrictions and conditions for use of the package.
2. How to appeal the decision.



Appendix 1

I. Description of the package

The packaging is a modified variant of RA-2/3, intended for nuclear fuel assemblies (fuel cartridges) and nuclear fuel rods (fuel rods) of BWR type. It consists of an outer packaging part made from wood and an inner packaging part made from stainless steel with a rectangular cross section, separated by shock-absorbing material. The package must be constructed in accordance with Drawing Westinghouse Atom AA 281255 Revision 5 and those detailed drawings specified in this drawing. Drawing AAP 10901 describes the inner packaging part ("transport box") for loose fuel elements. (UAM 06-23, rev 8) [5]

Figure 1 shows an overview drawing of the packaging.

The packaging has the following specifications:

Length outer container	5290 mm
Width outer container	885 mm
Height outer container	886 mm
Tare weight inner container	370 kg
Tare weight outer container	555 kg
Tare weight complete packaging	925 kg
Gross weight complete packaging	max 1570 kg

The confinement system¹ is made up of the complete package (reference 1, section 209).
The containment system² is made up of the packaging and the casing of each respective fuel rod (reference 1, section 213).

II. Description of permitted content

Content permitted 1

The contents may consist of a maximum of two non-irradiated and complete BWR fuel assemblies³ of the SVEA 96 type, containing fuel elements (fuel rods) with sintered pellets made from uranium oxide, with or without gadolinium oxide.

The casing of the fuel rods must be made from a zirconium alloy. Tubular pellets are not permitted.

The transported material must meet the requirements for Type A packages, according to references 1–4.

Any plastic sleeves (tube made of soft plastic) intended to protect the fuel assemblies must be open at both ends and must not extend beyond the ends of the fuel assemblies. The plastic sleeve must not be folded or taped in such a way that it can prevent a free flow of water into or out of the fuel assembly.

¹ Confinement system.

² Containment system.

³ Fuel elements arranged in a matrix with spreaders to fuel assemblies, placed in a fuel box, as intended to be used in the reactor core.



Each individual package must not contain more than 10 kg of plastic or rubber material in the inner package part (the "metal box").

The maximum enrichment permitted of uranium-235 is shown in Table 1 below.
The contents of the package must meet the specifications in Tables 1, 2, and 3 below.

Table 1

	Fuel bundle without BA rods ⁴ (wt%)	Fuel bundle with BA rods (wt%)
Enrichment uranium-235 in pellet, max	5.0%	5.0%
Enrichment uranium-235 in node ⁵ , max	3.50%	5.0%
Gd ₂ O ₃ content in pellet, min	-	1.95%

Table 2

Maximum mean enrichment in node (wt%)	Minimum number of BA rods per fuel assembly ⁶
5.00%	9 x 1.95% Gd ₂ O ₃
4.85%	8 x 1.95% Gd ₂ O ₃
4.65%	7 x 1.95% Gd ₂ O ₃
4.45%	6 x 1.95% Gd ₂ O ₃
3.50%	0

⁴ By "BA rods" is meant fuel elements with burnable absorber

⁵ By node is meant an approx. 16 cm axial length (a cross-section) of the fuel element, with a certain enrichment distribution and a certain number of BA rods.

⁶ If two BA rods are directly adjacent to each other, only one of them may be credited as a BA rod. Any BA rods placed in the outermost rod positions may not be credited. The BA rods must be symmetrically placed in relation to a diagonal. A part-length BA rod may not be credited as a BA rod (part-length means that the BA rod is shorter than standard length).



Table 3

Amount of uranium per fuel assembly, max	209.5 kg
Number of fuel rods per assembly, max	96 pieces
Width rod lattice, max	134.2 x 134.2 mm
Center distance between rods, max	13.3 mm
Active length, maximum	4000 mm
Density in UO ₂ pellet (max)	10.96 g/cm ³
Density in pellet with Gd ₂ O ₃ , min	9.0 g/cm ³
Rod radius, min	4.87 mm
Pellet radius, max	4.25 mm
Pellet radius in pellet with Gd ₂ O ₃ , min	4.23 mm
Material thickness of casing, min	0.56 mm

Content permitted 2

The contents may consist of a maximum of two non-irradiated and complete BWR fuel assemblies⁷ of the TRITON11 type (generation 1 or generation 2), containing fuel elements (fuel rods) with sintered pellets made from uranium oxide, with or without gadolinium oxide. TRITON 11 is based on the fuel elements being arranged in an 11x11 lattice including three circular "water rods".

The casing of the fuel rods must be made from a zirconium alloy. Tubular pellets are not permitted.

The transported materials must meet the requirements for Type A packages, according to references 1–4.

Any plastic sleeves (tube made of soft plastic) intended to protect the fuel assemblies must be open at both ends and must not extend beyond the ends of the fuel assemblies. The plastic sleeve must not be folded or taped in such a way that it can prevent a free flow of water into or out of the fuel assembly.

Each individual package must not contain more than 10 kg of plastic or rubber material in the inner package part (the "metal box").

The maximum enrichment permitted of uranium-235 is shown in Table 4 below. The contents of the package must meet the specifications in Tables 4, 5, and 6 below.

⁷ Fuel elements arranged in a matrix with spreaders to fuel assemblies, placed in a fuel box, as intended to be used in the reactor core.



Table 4

	Fuel bundle without BA rods ⁸ (wt%)	Fuel bundle with BA rods (wt%)
Enrichment uranium-235 in pellet, max	5.0%	5.0%
Enrichment uranium-235 in node ⁹ , max	3.50%	5.0%
Gd2O3 content in pellet, min		1.95%

Table 5

Maximum mean enrichment in node (wt%)	Minimum number of BA rods per fuel assembly ¹⁰
5.00%	9 x 1.95% Gd2O3
4.85%	8 x 1.95% Gd2O3
4.65%	7 x 1.95% Gd2O3
4.45%	6 x 1.95% Gd2O3
3.50%	0

Table 6

Amount of uranium per fuel assembly, max	206 kg
Number of fuel rods per assembly, max	109 pieces
Width rod lattice, max	134.2 x 134.2 mm
Center distance between rods, max	12.47 mm
Active length, maximum	4000 mm
Density in UO2 pellet (max)	10.96 g/cm ³
Density in pellet with Gd2O3, min	9.0 g/cm ³
Rod radius, min	4.72 mm
Pellet radius, max	4.115 mm
Pellet radius in pellet with Gd2O3, min	4.095 mm
Material thickness of casing, min	0.52 mm

⁸ By "BA rods" is meant fuel elements with burnable absorber

⁹ By node is meant an approx. 16 cm axial length (a cross-section) of the fuel element, with a certain enrichment distribution and a certain number of BA rods.

¹⁰ If two BA rods are directly adjacent to each other, only one of them may be credited as a BA rod. Any BA rods placed in the outermost rod positions may not be credited. The BA rods must be symmetrically placed in relation to a diagonal. A part-length BA rod may not be credited as a BA rod (part-length means that the BA rod is shorter than standard length).



Content permitted 3

The contents of a package may consist of loose fuel rods (fuel rods), either intended for BWR fuel assemblies of the SVEA 96 type or of the TRITON11 type, containing sintered pellets from uranium oxide, with or without gadolinium oxide. The casing of the fuel rods must be made from a zirconium alloy. Tubular pellets are not permitted.

The fuel rods must be placed in a maximum of two stainless steel inner transport boxes intended for the purpose. The boxes must be in accordance with Drawing Westinghouse Atom AAP 10901 Revision 4. If any such box is not completely filled with fuel rods, the remaining space shall be filled with zirconium alloy tubes so that a tightly packed lattice is obtained.

The transported materials must meet the requirements for Type A packages, according to references 1–4.

Each individual package must not contain more than 10 kg of plastic or rubber material in the inner package part (the "metal box").

The content must meet the specifications in Table 7 below.

Table 7

Enrichment uranium-235 in pellet, max	5.0 % ¹¹
Amount of uranium per box, fuel rods SVEA 96, at a maximum	209.5 kg
Amount of uranium per box, fuel rods TRITON11, at a maximum	206 kg
Number of rods per box, max	96 (maximum of 192 rods per package)
Rod radius	4.45–6.25 mm
Pellet radius	3.77–5.57 mm
Material thickness of casing SVEA 96, min	0.56 mm
Material thickness of casing TRITON11, min	0.52 mm

III. Transport conditions

All applicable parts of references 2–4 must be observed.

Applicable instructions for handling and recurring inspection must be followed.

IV. Quality assurance

Governing documents for quality assurance of the package with regard to design, manufacture, testing, documentation, use, maintenance, and inspection must be kept up to date.

¹¹ Weight percent (wt%)



V. Accident preparedness

In the event of an accident on Swedish territory, immediately contact the duty officer (TiB) at SSM, via SOS alarm by phone (+46 8 454 24 66), or 112 (national emergency number). A written report of the accident must be submitted to SSM as soon as possible, but no later than two (2) weeks from the accident.

In the event of other incidents that are significant from a nuclear safety or radiation protection standpoint, a report in writing on the incident must be submitted to SSM within two (2) weeks of the incident.

VI. Use of this certificate

This certificate may also be used by the person who, with the consent of the original applicant, has received a copy of the certificate.

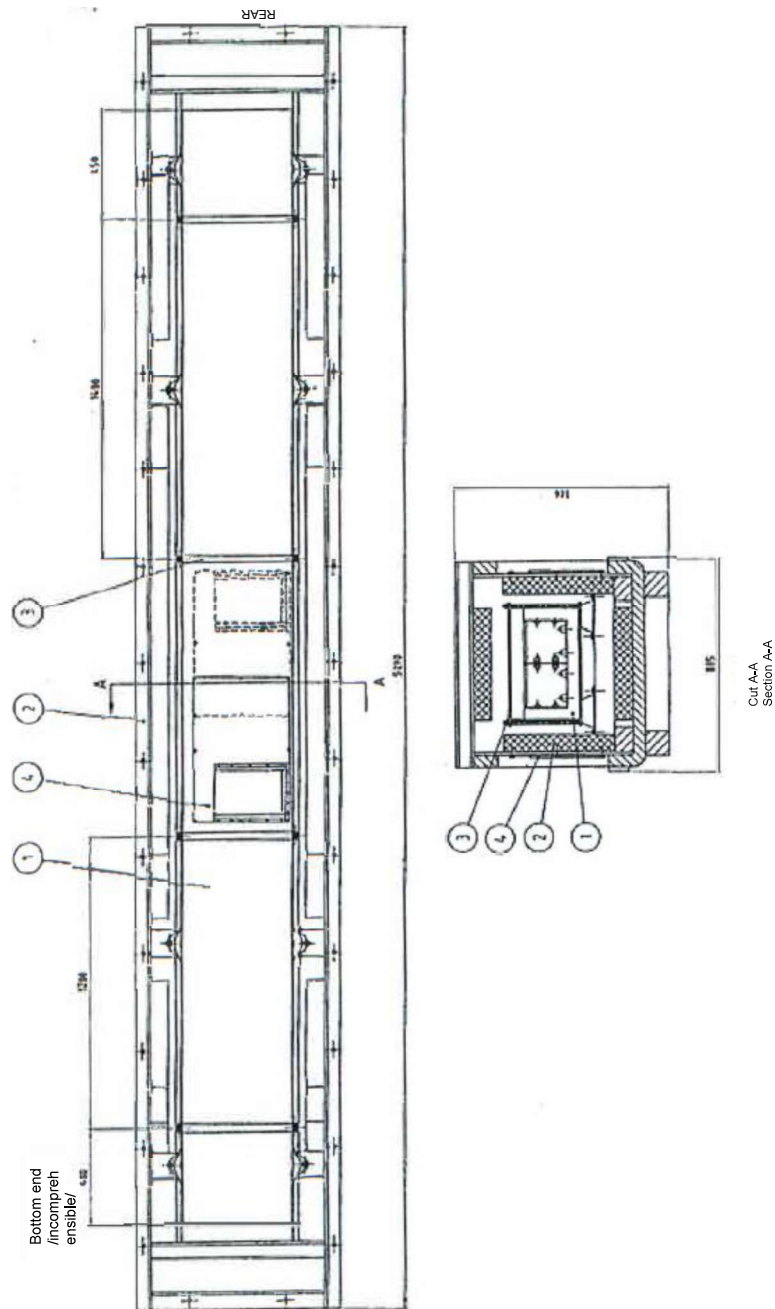


Figure 1. Overview of the EMBRACE transport packaging.



Revision list

Revision No.	Issue date	Comment
0	2025-03-27	First version as a package of Type A fissile, otherwise based on the package design S/50/IF (Rev. 15).



Appendix 2

How to appeal the decision

The decision can be appealed to the government.

The appeal must be submitted in writing to the Swedish Radiation Safety Authority (SSM).

The appeal must state:

- Which decision is being appealed (SSM registration number)
- How the decision is to be amended, and why You may attach any documents you believe are relevant to why the decision should be amended.
- Contact details for the appellant. If you hire an agent, contact details for the agent must be included.

Appeal deadline

The appeal must be submitted to the SSM within three (3) weeks from the date you received the decision. This applies to both private individuals and companies.

If the appellant represents the public authorities, the appeal must be received within three (3) weeks from the date of notification of the decision.

If the deadline for an appeal falls on a Saturday, Sunday, or holiday, on Midsummer, Christmas Eve, or New Year's Eve, it is sufficient for the letter to arrive on the next business day.



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1200 New Jersey Ave, SE
Washington, D.C. 20590

CERTIFICATE NUMBER: USA/0854/AF-96

ORIGINAL REGISTRANT(S) :

Westinghouse
Westinghouse Electric Company - Nuclear Fuel
Columbia Fuel Fabrication Facility
5801 Bluff Road
Hopkins, SC, 29061
USA