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Licensing Procedures for a Dedicated Ship for Carrying Spent Nuclear Fuel and Radioactive Waste

Report from workshop held at GOSATOMNADZOR, Moscow 2 – 3 July 2001

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SWEDISH INTERNATIONAL PROJECT
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Emneord:
Myndighetssamarbeid om sikkerhetsvurderinger for sjøtransport av radioaktive materialer. Lisensieringsprosedyrer for sjøtransport av brukt kjernebrensel og radioaktivt avfall i Russland.

Resymé:
Informasjonsutveksling og diskusjon om prinsipper og prosedyrer for lisensiering av sjøtransport av brukt brensel og radioaktiv avfall. Russiske helse, miljø- og sikkerhetskrav angående sikkerheten ved skipstransport av avfall.

Reference:
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Key words:
Authority cooperation on safety management for transport by see of radioactive materials. Licensing procedures for spent nuclear fuel and radioactive waste transportation by see in Russian Federation.

Abstract:
Information exchange and discussion about the licensing principles and procedures for spent nuclear fuel and radioactive waste transportation by see. Russian health, environment and safety requirements for transportation of waste by ships.

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Preface

The Norwegian and Swedish governments have allocated special funds to support upgrading of nuclear safety in the Russian Federation.

In Norway, the Ministry of Foreign Affairs administrates the funds of this support program. The Norwegian Radiation Protection Authority (NRPA) is involved in the implementation of this programme as an adviser for the Ministry on technical aspects and as a manager of some of the projects. Especially NRPA acts as project manager for the implementation of many of the regulatory projects developed within the support program.

In Sweden, the Government, through its Ministry of Foreign Affairs, has delegated the responsibility to implement the program to the Swedish Nuclear Power Inspectorate (SKI). The SKI is then, in co-operation with the Swedish Radiation Protection Institute (SSI) responsible for planning, implementing and follow up of individual projects. For that work a special department at the SKI, the Swedish International Project Nuclear Safety (SIP), has been established. At the SSI the corresponding department is called SSI International Development Co-operation (SIUS).

There is a need for efficient and safe transport of spent nuclear fuel and radioactive waste in the Northwest Russia. It is planned to build a dedicated ship for transport of spent nuclear fuel (SNF) and radioactive waste with funding from Norway and the UK. To promote the timely implementation of appropriate licensing procedures in Russia, Norway and Sweden have initiated a project to support the Russian authorities. The first activity within this project was a workshop held in Moscow 2-3 July 2001 together with the concerned Russian authorities.

There is a mutual interest of all parties (Russian and foreign authorities, and sponsoring organisations) to implement technical projects for enhancing nuclear safety and radiation protection.

The regulatory process, including licensing of activities of enterprises involved in the international technical projects by RF Gosatomnadzor, is an effective tool to promote nuclear safety and radiation protection and mitigate possible negative consequences of implementation of the technical projects.

This report summarises the results of the workshop. It does not necessarily reflect the official position of the organisations represented at the workshop.

Malgorzata Sneve	Curt Bergman	Valentin Markarov
NRPA	SIP Nuclear Safety	Gosatomnadzor

Content

1. Introduction……9
2. Objectives of the workshop 9
3. Industry project 10
4. Licensing requirements……..11
5. International requirements and experience ……12
6. Discussions and conclusions……..13

Annex:

1. Agenda……..15
2. Participants list……..17
3. Copy of Principal Ships Design from Kværner Maritime a.s.……..19
4. General Principles and Requirements of Russian Normative Documents for the Building and Operation of Vessel for SNF Transportation - Mr. M.K. Aturin, Ministry of Transportation, RF.....21
5. Regulation of Nuclear and Radiation Safety in Implementation of the Industrial Project "Design, Construction and Commissioning of the Special Self-propelled Ship for Transport of Casks with Spent Nuclear Fuel (SNF) - V. Markarov, Gosatomnadzor, RF.....23
6. a) Presentation of the Department for Environment Protection and Ecological Safety of Ministry of Natural Resources of Russian Federation. b) Requirements for EIA and Terms of its Implementation - Mr A. Gubin, Ministry of Natural Resources, RF……...37
7. International Requirements for the Transport of Spent Nuclear Fuel and Radioactive Waste with special emphasis on Transport at Sea with Dedicated Ship – E. Häggblom, SKI, Sweden……..45
8. Experiences of Sea Transport of Spent Fuel with Dedicated Ship – M. Westerlind, SKI, Sweden……..51
9. Regulation and Licensing in the UK of Radioactive Waste Transport by Sea – G. Smith, E. Kerrigan, Enviros QuantiSci, UK……..55
10. Regulatory Support Project – M.K.Sneve, NRPA, Norway…….71

1. Introduction

In the Russian Federation, especially in the Northwest region, there is a very large concentration of nuclear activities, both military and civilian, which has generated and still generates large quantities of SNF and radioactive waste. In order to support the Russian efforts to properly take care of the old SNF and radioactive waste, and to upgrade waste management procedures and facilities, there is a large number of bilateral and multilateral co-operation projects established and under discussion.

The Norwegian and Swedish Governments are concerned about many aspects of nuclear activities in the region. Norway has initiated urgent actions in order to reduce the potential for serious accidents and the negative health or environmental consequences in the event of an accident. To achieve this, substantial funds to support concrete projects are allocated. Norway and Sweden both stress the need for practical co-operation in cleanup operations in relation to past practices and measures to improve safety standards for continuing operations. One of the measures is to provide support for construction of a dedicated ship for transporting spent nuclear fuel and radioactive waste from decommissioned nuclear submarines. The UK Department of Trade and Industry has expressed positive interest in co-financing the project and there are reasonably good possibilities for the initiation of the industry project in the near future.

Within the Norwegian and Swedish co-operation with Russian authorities, especially Gosatomnadzor, support on licensing/approval of industry projects is a prioritised task. Support on licensing issues for the dedicated ship for transport of spent fuel is an example of such a prioritised authority project.

At the closing meeting for the Phase 1 of the Regulatory Lepse Project in Moscow on March 29-30, 2001, it was agreed to continue co-operation along the same line as during the Regulatory Lepse Project since it was considered successful by all parties. It was further agreed that preparatory work for "Licensing Procedures for the Special Ship for Carrying Spent Nuclear Fuel and Radioactive Waste" was timely and the first task should be to arrange a workshop early July 2001.

2. Objectives of the workshop

The objectives of the workshop were the following:

- To provide information and develop common understanding of the licensing requirements of regulatory, normative and legal documents of the Russian Federation concerning the licensing of a special ship for transport of SNF and radioactive waste;
- To provide information about the international safety requirements for transport and relevant Western experiences of sea transport of spent nuclear fuel and radioactive waste.

Norway is interested in efficient implementation of the project "Construction of the special vessel for SNF and radioactive waste transportation". Different Norwegian authorities and organisations will contribute to the project depending of the situation and needs. The

workshop was thus also important for obtaining information relevant for the industry project development.

The Swedish contribution to the regulatory support project is related to the nuclear safety and radiation protection aspects.

Gosatomnadzor arranged the workshop in Moscow 2-3 July 2001 after consultation with other Russian authorities, NRPA and SIP. The agenda and list of participants can be found in Annex 1 and 2, respectively.

3. Industry project

The Ministry of Foreign Affairs of Norway provided the current information about the plans and latest actions connected to the project "Construction of the special vessel for SNF and radioactive waste transportation".

The presentation can be summarised as follows:

- Discussions about the ship between Norway and Minatom started already in 1995
- A pre-feasibility study is completed (by Kværner Maritime AS). There is a detailed specification available "Frame Specification for Special Container Vessel For Transportation of Spent Nuclear Fuel, KMAR Proj. 22131 UD 211. (Annex 3)
- One of the main reasons for the delay of the project is that Minatom suggested to rebuild the old ship "Amur" instead of building a new ship
- Minatom has requested that in addition to transporting SNF and radioactive waste in licensed packages, the new ship shall also have tanks for transport of liquid waste and it shall be possible to load SNF into packages onboard the ship
- The expected cost for the ship is $15M and the contract will be made after open bidding. Tendering for a project management function is in preparation.
- It is necessary to have the ship built in accordance with Russian and international requirements.
- Preliminary agreement on cost sharing between Norway (MFA) and UK (DTI) has been achieved.

Minatom confirmed the information provided by MFA of Norway and gave some additional information. During this year the spent fuel from 18 submarines will be removed and Minatom has plans to unload up to 22 submarines per year in the future. Because of the conditions of the submarines and location of their bases a ship for transport of the SNF is needed since there is no other way to transport the SNF from the many places where submarines are stored to where the fuel and waste is to be held prior to further management operations.

According to the Russian system Gosatomnadzor must license all enterprises manufacturing equipment or providing services in the nuclear field.

The Russian shipbuilding organization "Rossudostroenije" confirmed that it already has licenses from Gosatomnadzor for the construction and building of ships and therefore believes that there should not be problems to obtain the necessary licenses to build the new ship. It has also experience from working with the Maritime Register to get ships approved. "Rossudostroenije" presented the procedure for competition used in Russia based on a special

committee and confirmed that the Russian system is in compliance with a Western "open bidding" procedure.

4. Licensing requirements

The Russian Maritime Register

The responsibility for transport safety in general in Russian Federation is within the Ministry of Transportation. The Ministry of Transportation is responsible for the Russian Maritime Register, who is responsible for giving the certification for ships. The certification process follows the Code of Trade and Transport by Ship and the international requirements on ships like the IMDG Code and the INF Code. There are 19 obligatory documents, which are required according to the Russian code and rules. More detailed description of the requirements is given in the Annex 4 and in the report prepared by Gosatomnadzor (Annex 5).

Gosatomnadzor

Licensing procedures for nuclear and radiation safety of the dedicated ship for SNF and RW transportation has been prepared and presented by Mr. Markarov from Gosatomnadzor. Mr. Markarov made a thorough review of his report to the workshop on regulations of nuclear and radiation safety for the implementation of a special ship (full report in Annex 5). In addition he also presented a detailed step-by-step procedure for licensing of design and licensing of construction (Annex 5). Mr. Markarov informed that there is no special licence issued by Gosatomnadzor for "Amur" (because this vessel was operated by the Navy), but the MSCo has licences from Gosatomnadzor for four ships with special functions, including "Lepse" and "Lotta".

Gosatomnadzor declared that those existing ships, which meet the relevant IMDG Code and INF Code requirements, could be used for transport of SNF and radioactive waste. Gosatomnadzor, however, has to approve each individual transport before it can be made.

The Ministry of Natural Resources

The Ministry of Natural Resources presented the requirements for the Environmental Impact Assessment in general and time limits for its development. Since the function of the ship is not defined it is not possible to state whether there is a need for an Environmental Impact Assessment (EIA) and a State Ecological Review (SER). If the ship will only transport SNF and radioactive waste in approved packages it will probably not need an EIA and SER. However, if some "nuclear activities" are planned on board (storage of radioactive material or loading of SNF into packages) EIA and SER will probably be needed. Also the operation of the ship, even if limited to transport, may yet require assessments. The Ministry of Natural Resources expressed as its opinion that it is better to carry out the EIA. (Annex 6).

The Ministry of Health

A short presentation was given by Ministry of Health – Gossanepidnadzor, about theirs role in the licensing and approval process.

The basis for the involvement of Gossanepidnadzor within the project is "Law for Protection of health of population, including workers". The concern is both about workers and about people living near hazardous places. In 2000, Order 554 widened the scope of the law giving an authority for "Sanitary and Epidemiology Overview Office" of Gossanepidnadzor. Gossanepidnadzor is involved in the civil and defence industry programs. In brief the Ministry of Health considers the ship project as a chain of events:

1. Design
2. Loading
3. Transportation
4. Unloading

Gossanepidnadzor works in co-operation with other agencies of Russia. Gossanepidnadzor has quite clear standards. In 2000 new dose limits, in line with ICRP 60, were established in Russia. There is now a transition period for developing new regulatory guidance documents, e.g. applicable also to transportation of SNF. The transition from implementation of basic standards or new international recommendations is common to all countries and may be substantial.

5. International requirements and experience

SKI presented the international requirements based on the IAEA recommendations, the IMDG code, which mainly gives requirements on the packages to be transported and INF code, which gives requirements on the ship. (Annex 7)

The main factors for ensuring safe transport are:
- Containment of the radioactive waste
- Control of external radiation levels
- Prevention of criticality
- Prevention of damage caused by heat

SKI also presented the Swedish experiences of sea transport of SNF and conditioned radioactive waste from the nuclear power plants with the dedicated ship "Sigyn", which has been in operation for 15 years. The SKI and SSI approve the shipments and packages but the maritime safety is the responsibility of the Swedish Maritime Administration. SKI stressed the importance of good communication between the different authorities involved, as well as with the consignor, shipper and receiver. In SKI's opinion and experience shipping should be kept as simple as possible and handling onboard the ship should be kept to a minimum. (Annex 8)

British experience with transportation and regulation of radioactive material by ship, including spent fuel and HLW from reprocessing to and from countries in Europe and Japan was also presented. A key factor is that there is a well-founded international basis for regulating radioactive waste transport by ship as well as significant operational experience. (Annex 9)

6. Discussions and conclusions

There are great similarities between the Russian and Western basis for regulating sea-transport of SNF and radioactive waste, since both are in accordance with international recommendations. There is however limited experience in the Russian Federation for licensing/approving new dedicated ships for transport of SNF and radioactive waste.

From the presentations and the discussions, it is clear that a dedicated ship with handling of SNF onboard will be much more complicated regarding nuclear safety and radiation protection. There will thus be a significant difference in complexity of the licensing procedure in Russia if the ship will be used only for transport of SNF and radioactive waste in licensed/approved packages as compared to if there should also be handling and storage of SNF on board. It was also recognised that there is limited, if any, experiences of licensing a ship with handling onboard in accordance with current international recommendations.

The discussions regarding the need for loading facilities (of SNF into packages) on board the ship did not give any conclusive results since it will require a careful analysis of the infrastructure at the places on-shore where the SNF shall be loaded and unloaded.

It is thus important that the industry project not only focuses on the ship itself but also carefully considers the feasibility of loading and unloading operations.

The discussions revealed that it is vital to ensure that the industry project is aware of the higher degree of complexity from a licensing point of view if spent fuel and waste handling onboard the ship is deemed necessary, and that this must be carefully justified. It was concluded important to communicate this to the industry project and it was believed that this report would be useful in this respect.

It was clear from the discussions that there is a general agreement between the Russian authorities about main steps in the licensing but there is need for further elaboration in order to timely implement an efficient procedure.

Further actions on the regulatory support to Russian authorities on approval and licensing issues of the new ship are strongly dependent upon the further development within the industry project the next level of detailed specification of the functions for the ship. The planning of the future regulatory support must wait for this input but is clear that there will be a need to continue the dialogue between the different Russian authorities and also with the Western partners in order to develop a firm and transparent licensing procedure. Mechanisms for interaction between the authorities and the industry project must also be explored in order to ensure that the industry project is fully aware of regulatory requirements and the licensing procedure. It might be necessary to review and possibly amend the Russian regulations but this cannot be decided until the industry project has been specified in more detail.

The co-ordinators of the regulatory project are Ms. M. Sneve, NRPA for the Western side and Mr. V. Markarov, Gosatomnadzor for the Russian side.

Program for the meeting on Regulatory Support Project — Annex 1

Licensing procedures for the special career for SNF

Moscow 2-3 July 2001

First day 02.07.01

09.00 - 09.30	Short presentation of the purpose of the meeting, the experience from the Regulatory Lepse Project what is relevant to the future plans - GAN / NRPA
09.30 – 10.00	Brief presentation of the plans for related industry project – MoFA, Norway
10.00 – 10.30	General principles and requirements of Russian safety regulations for transportation of SNF, which will be realized in technical project of carrier - Ministry of Transport, RF.
10.30 – 11.00	
Coffee break	
11.00 – 12.30	Presentation of the report "Licensing procedures for nuclear and radiation safety of the special career for SNF transportation" – Gosatomnadzor
12.30 – 13.00	The requirements of other Russian authorities regulating the safety - Rossudostroenije, RF
13.00 - 14.30	
Lunch	
14.30 – 15.00	The requirements to the EIA and time limits of its development - Ministry of Natural Resources, RF
15.00 – 15.30	International Requirements for transport of spent fuel and waste with special emphasis on transport at sea with a dedicated ship – SKI, Sweden
15.30 – 16.00	Swedish experience from transport, and associated handling, of spent fuel and radioactive waste with a dedicated ship – SKI, Sweden
16.00 – 16.30	
Coffee break	
16.30 – 17.00	British experience with transportation of radioactive waste by ship – QuantiSci, UK
17.00 – 18.00	Discussions on licensing procedures.

Second day 03.07.01

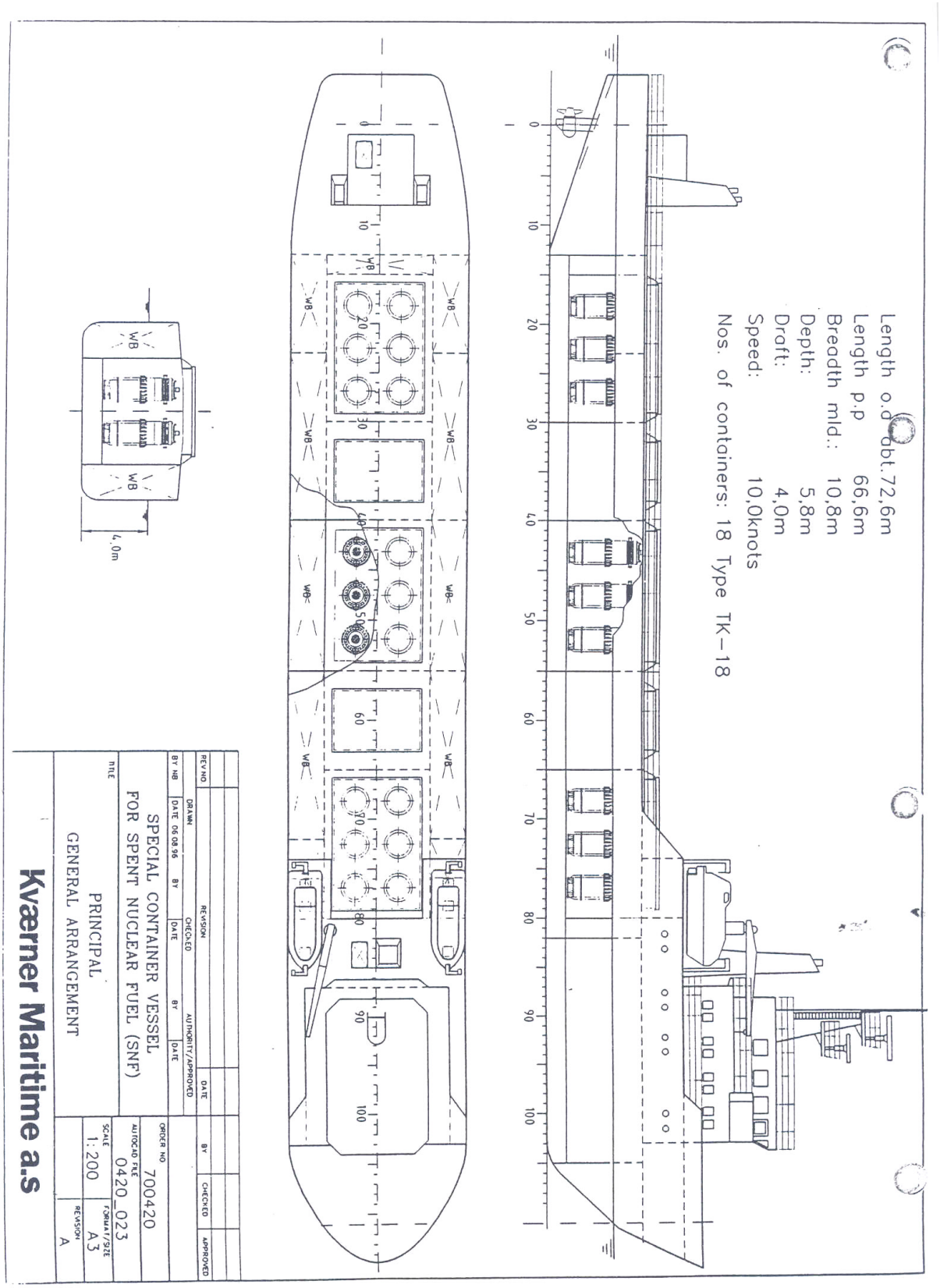
09.00-11.30	Conclusions and recommendations concerning the results of the discussion
11.30 - 13.00	Plans for future activities. End of the meeting
13.00 - 14.30	
Lunch	

Annex 2

List of participants

1.	V. Kovalenko,	Minatom, Dept. Ecology and Nuclear Facilities Decommissioning
2.	A. Anisimov,	Rossudostroyenje, Dept of Ecology and Safety in Manufacturing
3.	A. Gubin,	Ministry of Natural Resources,Head of Dept of Economical Safety
4.	V. Fedin,	Ministry of Health, Dept of Extreme Medicine
5.	S. Igorevich,	Ministry of Health
6.	M. Aturin,	Ministry of Transport, Dept of Navigation Safety
7.	I. Pluzhnikov,	Gosatomnadzor
8.	V. Markarov,	Gosatomnadzor
9.	A. Kalesnikov	Gosatomnadzor
10.	A. Shoulgin,	SEC-NRS Gosatomnadzor
11.	V. Shempelev,	SEC-NRS Gosatomnadzor
12.	N. Koulikova,	SEC-NRS Gosatomnadzor
13.	I. Spivakova,	SEC-NRS Gosatomnadzor
14.	T. Norendal,	Norwegian Ministry of Foreign Affairs, Norway
15.	M. Sneve,	NPRA, Norway
16.	I. Amundsen,	NRPA, Norway
17.	O. Reistad,	NRPA, Norway
18.	C. Bergman,	SIP/SKI, Sweden
19.	M. Westerlind,	SKI, Sweden
20.	E. Häggblom,	SKI, Sweden
21.	G. Smith,	QuantiSci, UK

Annex 3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Length p.p 66,6m
Breadth mld.: 10,8m
Depth: 5,8m
Draft: 4,0m
Speed: 10,0knots
Nos. of containers: 18 Type TK-18
WB
4,0m
REVISION
DRAWN
CHECKED
AUTHORITY/APPROVED
SPECIAL CONTAINER VESSEL
FOR SPENT NUCLEAR FUEL (SNF)
PRINCIPAL
GENERAL ARRANGEMENT
Kværner Maritime a.s
ORDER NO 700420
AUTOCAD FILE 0420_023
SCALE 1:200
FORMAT/SIZE A3
REVISION A

Annex 4

General Principles and Requirements of Russian Normative Documents for the Building and Operation of Vessel for SNF Transportation

Mr. M.K. Aturin, Mintrans RF

Total number of normative documents regulating designing, building, operation and decommissioning is approximately equal to 50 according to my assessment.
For the phases of design and operation of vessels the documents of legislative level are as follows:

- Federal Law "On Use of Nuclear Energy";
- "Code of Trade Navigation".

The Federal Law "On Use of Nuclear Energy" defines the order of siting and construction of an object, principles of and requirements for nuclear and radiation safety, physical protection, licensing and issuing the permits for personnel at all stages of design and operation of vessels for SNF transportation.
As the Federal Law "On Use of Nuclear Energy" is a law of indirect action, in elaboration thereof, the 7 legislative acts and 18 resolutions of RF Government were issued or are prepared for issuing in accordance with the RF Government Decree # 367-r dated from the 12th of March, 1996. The above all to some or a certain extent concerns the vessels with NPI or vessels transporting the SNF.

The Code of Trade Navigation (CTN) regulates the relations arising from trade navigation of all the civil vessels, including ships with NPI and hazardous cargos.
The CTN determines the authorities of state management in the sphere of trade navigation, functions thereof and the order of carrying out the state supervision of trade navigation and, particularly, protection of human life on the sea.
Then the CTN defines the bodies of technical supervision, functions thereof, and determines a list of basic ship documents that a ship sailing under the RF state flag should possess. It also defines the types of an agreement on overseas cargo transportation and its content, the responsibility of shipping company, consignor and freighter. It determines the type and content of local insurance agreement.

Federal norms and rules developed by supervisory authorities proceed further within the system of normative documents. In accordance with the Ordinance of the President of RF the above authorities are as follows:

- Gosatomnadzor of Russia (shall approve and put into effect norms with regard to nuclear and radiation safety);
- Minzdrav of Russia (shall develop and approve sanitary norms and rules, hygienic standards);
- MVD of Russia (the state fire protection service; shall set fire protection requirements).

The departmental and interdepartmental normative documents follow then.
The Russian Marine Register of Shipping (MRS) within the infrastructure of Mintrans of Russia that shall develop and approve engineering normative documents, in accordance with which requirements the building and technical supervision of civil marine vessels and classification thereof are carried out, is absent in the Ordinance of the President of RF, but

refers to the same group of supervisory authorities by the character of its powers. The ship transporting SNF and being a vessel of ATO /a support-ship/ is covered by the "Rules of Classification and Building of ATO Vessels" that determine the general principles of safety, requirements for a ship vessel, for stability and unsinking, fire protection and signalling, requirements for mechanical installation, radiation monitoring systems, as well as recommended content of information on safety developed on the basis of IMO Code on safety of nuclear trade ships.

The MRS carries out the observance of designing, building and operation of vessels and issues a relevant document – a certificate on suitability for sailing, if the vessels conform to the requirements of Register Regulations. In case of non-fulfillment of the above rules the MRS has the right to prohibit the operation of vessels and technical means and to withdraw documents permitting the operation.
As for transportation of RM, NF and RW as a cargo (a cargo of class 7) aboard the non-special ships used, as a rule, for transportation of such cargo, a principal possibility of usage of the above ships is determined by the requirements of IMS Code, International Code of Hazardous Cargo Overseas Transportation, MOPOG /IMDG-Code/ Regulations, approved by the Order of Marine Minister in 1986.
Note should be taken that the putting into effect of NRB-99 shall require correction of the abovementioned documents. In this context CNIIMF develops an Addendum to MOPOG /IMDG-Code/ Regulations.

The above shall contain a list of materials that may be transported aboard the non-special ships in special casks, shall determine a list of required documentation of consignor and its content, a list of competent authorities, shall set requirements to all the participants of transport process. As a basic document ensuring safety of cargo location and transportation aboard the ship a new document shall be introduced – a technological chart of materials location aboard the ship, in elaboration of which all recent requirements of NRB-99, Rules of Radioactive Material Safe Transportation (IAEA-96), Basic Sanitary Rules of Radiation Safety Ensuring (OSPORB-99) should be taken into consideration in addition to the current requirements.

Technological chart of location shall be developed by the consignor for the certain ship and consignment, taking into account the peculiarities of the whole system ship-cargo, design characteristics and equipment of the ship, on the basis of special methods of calculation of equivalent dose rate of ionising radiation, the impact of the latter on the crew and environment.

Annex 5

Regulation of Nuclear and Radiation Safety in Implementation of the Industrial Project "Design, Construction and Commissioning of the Special Self-propelled Ship for Transport of Casks with Spent Nuclear Fuel (SNF)

V. Markarov, Gosatomnadzor

I. Introduction.

1. State of nuclear and radiation safety in the northwest region of the Russian Federation is closely connected with accumulation of spent nuclear fuel and radioactive waste generated in operation and decommissioning of nuclear rower installations and nuclear fleet. The Russian Federation takes all possible measures to improve environmental safety in this region. New infrastructures are created with financial support of the foreign investors at enterprises dealing with decommissioning and dismantling of nuclear submarines. Facilities for storage and treatment of radioactive waste, SNF interim storage facilities and transfer-process models for SNF removal from reactors and its transport from the region for further reprocessing are under construction.

A large number of Projects within bilateral and multilateral co-operation has been established or is under discussion with a purpose to support Russia's efforts aimed at the proper management of SNF and radioactive waste (RAW), modernisation of procedures and facilities for SNF and RAW treatment.

Agreement between the Government of the Kingdom of Norway and the Government of the Russian Federation on environmental co-operation in connection with the dismantling of Russian nuclear powered submarines withdrawn from the Navy's service in the northern region, and enhancement of nuclear and radiation safety was signed on 26 May 1998. According to this Agreement the Parties agreed to co-operate under a number of Project, including:

- Design, construction and commissioning of a special self-propelled ship for transport of casks with SNF;
- Construction and commissioning of four special railway cars for transport of casks with SNF;
- Modernisation and commissioning of the interim storage facility for liquid radioactive waste at "Zvezdochka" shipyard;
- Modernisation of the facility for treatment of for liquid radioactive waste at the state repair and technical enterprise "Atomflot";
- Decommissioning and dismantling of Lepse depot ship.

Some projects were completed, others are at different stages of implementation. All this allowed resolving positively some problems concerning with management of SNF and RAW, improving the situation relevant to ensuring of ecological safety of the Arctic region.

Thus completion of a Project for construction and commissioning of four special railway cars increased an amount of SNF transported to "Mayak" facility for reprocessing.

Modernisation of the facility for treatment of Liquid RAW at "Atomflot" and modernisation and commissioning of the interim storage facility for liquid RAW at "Zvezdochka" will allow resolving a problem of treatment of liquid RAW in the northern region.

The first phase of Regulatory Lepse Project inseparably connected with the Industrial Lepse Project was completed. Three new regulatory documents have been developed and enacted from the beginning of the second half of this year. These documents regulate interactions

between the Operator and organisations rendering their service from the one side and safety regulatory authorities of the Russian Federation from the other side in licensing of activities of organisations involved in implementation of the international Lepse Project.
Positive decision on implementation of Project "Design, Construction and Commissioning of the Special Self-propelled Ship for transport of casks with SNF" will allow to resolve a problem of management of SNF of Russian nuclear submarines withdrawn from the Navy service and improve nuclear and radiation safety in the North region.
An issue of co-operation between NRPA, SIP, SSI under the individual project concerning with safety regulation in implementation of the Industrial Project "Design, Construction and Commissioning of the Special Self-propelled Ship for Transport of Casks with SNF" was discussed during the meeting in Stockholm.
Agreement between NRPA and Gosatomnadzor of Russia and Agreement between the Russian Federation and Kingdom of Sweden are a basis for co-operation in this area.
The main goal of the Regulatory Project is to ensure that Industrial Project "Design, Construction and Commissioning of the Special Self-propelled Ship for transport of casks with SNF" and treatment of SNF and RAW as sources of nuclear and radiation hazards are implemented in compliance with the existing Russian rules and regulations, licensing procedures and accepted international practise. A supplementary goal of the co-operation is to improve understanding of the work done between Russian and Western safety regulatory authorities.
Implementation of the Industrial Project requires timely licensing process. Activities for creation of the ship for transport of casks with SNF by sea are unique. It is caused by the need of:

- Comprehensive approach to solving of tasks concerning with implementation of the Industrial Project;
- Creation of the installation for unloading of Spent Fuel Assemblies (SFA);
- Development of technology for loading of casks with SNF aboard the ship taking into consideration features of places for loading;
- Creation of casks for storage and transport of SNF;
- Construction of the interim storage facility for casks with SNF;
- Involvement of enterprises and institutions with different functions working within the legal field of the Federal Law "On the Use of Nuclear Energy" to the Project implementation;
- Licensing of their activities taking into consideration that the ship with SNF onboard is a facility with the increased nuclear and radiation hazard;
- Ensuring of nuclear and radiation safety, protection of the environment and personnel in case of implementation of transfer-process operations with SNF casks under abnormal conditions;
- Development of documents substantiating nuclear and radiation safety ensuring for SNF management in implementation of transfer-process operations;
- Development of a document defining stages of the ship preparedness for carrying out of the transfer-process operations with SNF casks;
- Development of requirements for the Report justifying ship's nuclear and radiation safety ensuring (SAR of the ship).

II. Brief Description of the Established Procedure for Making a Decision on Location and Construction of a Ship.

2. Federal Law "On the Use of Nuclear Energy" establishes the legal basis and principles of regulation of relations arising from the use of nuclear energy for civil and defence

applications, creation of nuclear installations, ships with nuclear reactors, storage facilities, ships for transport of SNF. This Federal Law also defines interrelations arising in management of nuclear materials, radioactive substances and RAW.
At the same time other Federal Laws also regulate relations arising from the use of nuclear energy. Thus:

- Federal Law "On the Health Well-being of Population" establishes that management of nuclear materials, radioactive substances and other sources of ionising radiation is allowed only if a permission for these activities issued by the State Health Service of the Russian Federation is available.
- Federal Law "On Radiation Safety of Population" defines legal basis for ensuring of radiation safety of population with a purpose to protect its health. Radiation safety is defined as a state of protection of the current and future human generations against harmful effect of ionising radiation. This Law introduces definitions of principles of rationing, justification and optimisation for radiation safety ensuring and sets up the main health standards of exposure in the territory of Russia caused by the use of ionising radiation sources.
- Federal Law "On the Environmental Protection" provides for the obligatory implementation of the State Ecological Review for all types of economical activity "that can negatively affect the environment".
- Federal Law "On Ecological Review" defines requirements for the process of establishing compliance of economical or other activity with ecological criteria.

3. Legal document "Rules for decision making with regard to placement and construction of nuclear facilities, radiation source and storage facilities" sets up procedures for regulation of relations arising in making a decision on location and construction of the ship for SNF transport. This document was approved by Ordinance of the Government of the Russian Federation number 306 dated 14 March 1997.
4. A preliminary decision on construction of nuclear facility is to be taken either by the Federal Government or executive body of the subject of Federation or local authorities depending on a dimensions and significance of this facility. A preliminary decision on design, construction and commissioning of the special self-propelled ship for transport of casks with SNF is to be made by the Government of the Russian Federation.
5. An Application of Indention worked out by the Customer is an initial document for construction of a ship. The Application of Intention contains necessary information on purpose, sources and possibilities of investments, options of location, terms of construction and commissioning of the ship, technical and economic indexes, nuclear, radiation and technical safety of the ship and safety of activities implemented by the organisation and relevant to nuclear fuel management in a course of transfer-process operations and transport of SNF.
6. The Customer should send the Application of Intention for its consideration to the executive authority having a competence to make a decision on construction of the ship and to the executive authority of the subject of Federation in which territory the ship is intended to be located. In case of positive results of this consideration the Customer makes a decision on working out of investment justification.
7. Investment justification together with necessary documents on co-ordination and a decision on the preliminary place of the ship location and buffer area are to be submitted by the Customer to the executive authority of the subject of Federation with a purpose to draw up of an act on selection of the ground area according to the land laws of the Russian Federation and other legal documents of the Russian Federation. This act is approved by a decision of the executive authority of the subject of Federation for a facility (ship) of the federal significance.

8. The Customer makes a decision on development of feasibility study for construction of the ship on the basis of the approved investment justification.
Feasibility study should pass necessary approvals and reviews including the State Ecological Review implemented according to the Federal Law "On Ecological Review" and is to be approved by the respective executive authority. A procedure for carrying out of the state ecological review requires availability of RF Gosatomnadzor's opinion submitted for the review among other documents. Thus there can not be a positive opinion of the state ecological review without positive opinion of Gosatomnadzor of Russia. Moreover, Report "On Environmental Impact Assessment" (EIA) is to be worked out.
9. Construction of the ship can be started only in case of positive opinion of the state ecological review.
The approved feasibility study and materials necessary for making a decision on construction of the ship are submitted to the Federal executive authority.
The Government of the Russian Federation makes a final decision on construction of the ship on the basis of a suggestion of the Federal executive authority. After a decision on construction of the ship being made, an executive authority controlling the use of nuclear energy makes recommendations on Designers that could take part in designing of the ship. The designer of the ship should be selected on the basis of competition.
10. Only a specialised organisation recommended by the executive authority controlling the use of nuclear energy can carry out design of the ship. The Designer must have a licence for the relevant type of activities issued by Gosatomnadzor of Russia.
The design of the ship should pass an independent (of Designer and Customer) review in order to consider nuclear and radiation safety ensuring. A special document regulates an order of arrangements for and implementation of this review. The review is to be carried out by an organisation having a licence of Gosatomnadzor of Russia. According to the Statute on Gosatomnadzor of Russia Scientific and Engineering Centre for Nuclear and Radiation Safety (SEC NRS) can act as such an independent expert organisation.
11. Construction of the ship can start only if there are positive opinions of the state ecological review and review of the ship's design with regard to nuclear and radiation safety. An organisation building the ship should receive a licence from Gosatomnadzor of Russia for the corresponding type of activities. Construction of the ship is to be carried out under control of the Customer, Russian Marine Register of Shipping and under state supervision of Gosatomnadzor of Russia over compliance with the licence conditions for construction of the ship and nuclear and radiation safety rules.
12. Dockside trials, comprehensive dockside, factory and sea trials are fulfilled according to programs co-ordinated with organisations concerned. Completion of the ship construction is registered officially by the special report on the acceptance of the ship for operation.
13. The Operator who needs to get a licence from Gosatomnadzor of Russia for the corresponding type of activities carries out operation of the ship.

III. Brief description of the established procedure for licensing of types of activities concerned with implementation of the Project on design, construction and commissioning of the ship for SNF transport.

14. Any activity connected with the use of nuclear energy is a subject of licensing by the authorised state body regulating safety in the use of nuclear energy.
The President of the Russian Federation appointed four bodies of the state safety regulation in the use of nuclear energy: Gosatomnadzor of Russia, Russian Ministry of Health, State mining and technical supervisory body (Gosgortechnadzor) and Russian Ministry of Interior

(Decree “On the Federal Executive Bodies Authorised to Implement State Safety Regulation in the Use of Nuclear Energy” dated 21 January 1997).
Federal Law “On the Use of Nuclear Energy” determines an obligation for licensing of activities in the field of nuclear energy use.
A legal document “Provisions for licensing of activities in the field of nuclear energy use” approved by Ordinance of the RF Government number 865 of 14 July 1997 fixes a list of activities for which implementation organisations must obtain a licence of Gosatomnadzor of Russia.
15. Activities of organisations concerned with creation of the ship for SNF transport are under the jurisdiction of the Federal Law “On the Use of Nuclear Energy” and other Federal Laws (their parts relevant to the use of nuclear energy), namely:

- On the Environmental Protection;
- On the Health Well-being of Population;
- On Radiation Safety of Population;
- On Ecological Review.

Activities of organisations in implementation of the industrial project on ship’s building are subject to the obligatory licensing.
16. “Provisions for licensing of activities in the field of nuclear energy use” determine a procedure (an order) for issuing of Gosatomnadzor’s licences for activities in the nuclear energy use.
Licences are issued to Operators and organisations implementing works and rendering services in the field of nuclear energy use (Applicants).
17. Below is a list of specific activities that are to be licensed in implementation of the international project on creation of the ship for SNF transport:

- Designing of the ship;
- Manufacture of equipment for the ship;
- Construction of the ship;
- Operation of the ship;
- SNF management during its storage and transport.

18. With a purpose to obtain a licence the Applicant should submit to Gosatomnadzor of Russia the following:

- Licence application;
- Justifying documents, including:
- Copies of the constitute (establishing) documents;
- A copy of the certificate on the state registration;
- Reference document on the registration from the rating authority;
- A copy of a document confirming a right of the Applicant to own or use nuclear materials;
- Copies of decisions concerning with location, construction of the ship made by the federal executive authorities;
- Conclusion of the state ecological review;
- A copy of the medical certificate for the right to work with sources of ionising radiation;
- A document confirming availability of the Applicant financial provision of liability for damage caused by radiation impact, including insurance policy;
- A document confirming a possibility for the transfer of generated or stored RAW for their further disposal;
- A document confirming that the Applicant has financial sources for decommissioning of the ship;

- A set of documents justifying nuclear and radiation safety ensuring (Gosatomnadzor of Russia establishes requirements for a set and content of such documents).

19. Gosatomnadzor of Russia develops requirements for a set and content of documents justifying nuclear and radiation safety ensuring depending on a specific type of activities and a facility itself.
20. The licence application and documents submitted to Gosatomnadzor of Russia with a purpose to get a licence are forwarded to Scientific and Engineering Department where the Application is registered.
21. Scientific and Engineering Department considers an Application, check a list of documents submitted together with the licence application, rules for their formatting established by "Provisions for licensing of activities in the field of nuclear energy use". Duration of consideration of the Application and checking of the documents should not exceed 15 days. Decision on acceptance of documents for further consideration is made on the basis of consideration of the justifying documents. Scientific and Engineering Department prepares this decision.
22. A Head of Scientific and Engineering Department approves the decision on acceptability of documents submitted with a purpose to get a licence on the basis of preliminary examination of these documents.
23. A letter of Scientific and Engineering Department notifies the Applicant on the decision made on the results of preliminary consideration. A copy of this letter is forwarded to the structural unit in charge and to the respective Regional Office of Gosatomnadzor of Russia. In case of rejection to review documents submitted with a purpose to get a licence well-grounded reasons for the dismissal must be indicated.
24. In case of acceptance of documents submitted with a purpose to get a licence for further consideration Scientific and Engineering Department forwards submitted documents to the structural unit in charge together with a covering letter indicating a registration number.
25. While considering documents submitted with a purpose to get a licence, the structural unit in charge:

- Determines a need to get opinions of the structural units of Gosatomnadzor's HQ and Regional Offices on documents justifying nuclear and radiation safety ensuring with regard to issues within their competence;
- Determines subjects for review of documents justifying nuclear and radiation safety ensuring;
- Arranges inspections of the Applicant.

26. SEC NRS carries our review of documents justifying nuclear and radiation safety ensuring. Arrangements for and implementation of review both independently and with involvement of expert organisations and/or experts are within the functions of SEC NRS. In some cases an expert organisation having a licence of Gosatomnadzor of Russia for the relevant type of activities can be charged to carry out review.
27. Representatives of expert organisations and/or experts who participate in design, construction and operation of a facility (the ship) can not be involved into review.
28. The structural unit in charge prepares a decision on issuing of a licence or on rejection to issue it (in duplicate) within 30 days after receiving the results of review of documents justifying nuclear and radiation safety ensuring. The Head of the structural unit in charge signs this decision.
29. A draft licence and licence conditions are prepared by the structural unit in charge.
30. The structural unit in charge submits the decision on issuing of a licence or on rejection to issue it to a Deputy Chairman of Gosatomnadzor of Russia who directly co-ordinates and controls activities of the structural unit in charge for his approval. A draft licence and licence

conditions, results of review and inspection are submitted to the Deputy Chairman of Gosatomnadzor of Russia for his consideration together with the decision on licence issuing.
31. A letter of the structural unit in charge notifies the Applicant on the decision made within three days after approval of the decision.
If a decision was made to refuse to issue a licence the letter must specify well-grounded reasons for this dismissal.
32. After approval of the decision on issuing of the licence the structural unit in charge submits this decision, the licence together with licence conditions for the signature of the Chairman of Gosatomnadzor of Russia.
33. The licence (with the licence conditions enclosed) can be given to the Applicant after presenting by him a document confirming payment for the licence issuing.

IV. Requirements for a set and content of documents justifying nuclear and radiation safety ensuring

34. Annexes 1-3 present requirements for a set and content of documents justifying nuclear and radiation safety ensuring to be submitted by the Applicant o Gosatomnadzor of Russia with a purpose to obtain licences for the following types of activities:

- Designing of the ship;
- Designing, engineering and manufacture of the ship's equipment (see paragraphs 35 and 36);
- Construction of the ship;
- Operation of the ship;
- SNF management during its storage and transport.

34.1. Designing of the ship (Annex 1).
34.2. Construction of the ship (Annex 2).
34.3. Operation of the ship and management of nuclear materials during storage and transport (Annex 3).
35. The guiding document of Gosatomnadzor of Russia "Requirements for a set of documents justifying an ability to assure quality, ensure safety in design and manufacture of equipment for nuclear facilities, radiation sources, storage facilities for nuclear materials and radioactive substances and storage facilities for radioactive waste" (RD-03-41-97) defines requirements for a set and content of documents justifying nuclear and radiation safety ensuring in design, engineering and manufacture of equipment for the ship and to be submitted by the Applicant to get a licence.
36. The guiding document of Gosatomnadzor of Russia "Requirements for a set of documents justifying nuclear and radiation safety ensuring of the licensed types of activities of fuel cycle facilities and organisations implementing works and rendering services for fuel cycle facilities" (RD-05-15-97) defines requirements for a set and content of documents justifying nuclear and radiation safety ensuring in design, engineering and manufacture of casks used for interim storage and transport of SNF and to be submitted by the Applicant to get a licence.

V. Conclusions and Suggestions

We consider that the following issues represent a mutual interest:

- Regulation of nuclear and radiation safety;
- Methodology for safety assessment with special consideration of SNF and RAW management;
- Decommissioning of marine nuclear installations;
- Inspection practice.

From our point of view and taking into consideration the current situation co-operation in the area of environmental protection in connection with dismantling of nuclear submarines withdrawn from the Navy's service and transferred to the civil enterprises for decommissioning represents the highest mutual interest.
Experience of co-operation within the Lepse project gives us a basis to state that it was useful for all project participants. Therefore its principles can serve as a basis for the further co-operation in the area of the environmental protection.
It would be appropriate to arrange a regulatory project "The ship for transport of casks with SNF" and a number of the following sub-projects within the industrial project "Design, construction and commissioning of the special self-propelled ship for transport of casks with SNF":
1.Development of regulatory documents:
Requirements for SAR of the ship for transport of casks with SNF.
Documents are to be developed in compliance with provisions of the legislative and legal documents of the Russian Federation, Federal Rules and Regulations, International Agreements and Conventions, IAEA recommendations and guiding documents of Gosatomnadzor of Russia, state standards and other administrative documents in the area of nuclear energy use.
2. Joint inspections and joint safety evaluation.
3. Topical workshops.

Annex 1

Requirements for a set and content of documents justifying nuclear and radiation safety ensuring and submitted by the Applicant with a purpose to get a licence of Gosatomnadzor of Russia for designing of the ship for transport of casks with SNF

The following documents are to be included into this documentation set:
1. Technical justification of selection of the ship's type for transport of casks with SNF and its safety containing description and assessment of different options.
2. Reference information that contains data on activities carried out by the organisation before and characterising experience in design of ships for similar application.
3. Quality Assurance Program for design and engineering activities, which in particular includes the following information:

- On arrangements for development, approval and enactment of the design and engineering documentation, and for its updating; on software used in design and engineering and on establishment of the service unit that controls compliance with the design standards;
- On a system of interactions with organisations used the developed design and engineering documentation in construction of the ship; on a system of registration and analysis of deficiencies of this documentation and taking measures for their elimination.

4. Reference information on availability of the experimental bench facilities and pilot production within the organisation.
5. Reference information on hardware and verified software which allow to implement the planned scope of design and engineering activities and to carry out necessary computational and experimental validation.
6. Reference information on staffing of the Applicant with skilled personnel indicating its level of education, professional skills and special training passed.
7. Reference information containing a list of regulatory and technical safety documentation, which requirements are to be met by the developed design of the ship.

Annex 2

Requirements for a set and content of documents justifying nuclear and radiation safety ensuring and submitted by the Applicant with a purpose to get a licence of Gosatomnadzor of Russia for construction of the ship for transport of casks with SNF

The following documents are to be included into this documentation set:
1. Safety Analysis Report for the ship for transport of casks with SNF containing in particular the following data:
Preliminary review of safety problems concerned with handling transfer operations including:

- A list of initiating events for each of the main handling-transfer operations;
- Analysis of causes of the possible transport of radioactive substances;
- Accidents in SNF handling caused by a failure of casks or extreme weather conditions;
- Equipment failures;
- Description of protective means and means reducing radiation impact used for preservation of protective barriers in case of accident during SNF handling.

1.2. Estimation of probability of accident occurrences and their radiological impact on workers (personnel), population and the environment. Compliance of radiation safety level with international and federal rules and regulations in the use of nuclear energy, absorbed doses, dose equivalents, anticipated internal effective (equivalent) doses, Annual effective (equivalent) doses, collective effective doses, preventable doses.
1.3. Ensuring of radiation protection

- Methods and techniques for optimisation of exposure doses and other standards of radiation safety during the working shift and in a course of implementation of all operations;
- Calculations of individual and collective effective doses in case of the planned normal work; measures provided for a case of the planned exceeding and/or emergency (accident) exposure;
- Effective collective dose;
- Working places (sectors) where the highest radiation effect on workers (personnel) is possible during implementation of process operations on handling of casks with SNF and their transport;
- Arrangements for implementation of radiation monitoring and instrumentation used for this purpose;
- Arrangements for the use of protective shields for reduction of effect of gamma-radiation;
- Treatment of materials and articles contaminated or containing radionuclides, as well as RAW management;
- Determination of the controlled parameters;
- Conditions for storage of casks with SNF and SNF itself.

1.4. Accidents during load-lifting operations:

- Estimation of a probability for such accidents;
- Changes of safety parameters caused by accidents during load-lifting operations.

1.5. Estimation of the degree of fire hazard. Description of fire protection means.
1.6. Estimation of effect of extreme weather conditions on safety.
1.7. Assessment of initiating events connected with the use of electric power. Consequences that can be caused by loss of power supply.

1.8. Information on manufacture of equipment and components for SFA unloading installation (should meet requirements of RD-03-41-07).
2. Expert opinion on the review of design documentation for the ship.
3. Design and engineering documentation and operational documentation (documents are submitted to Gosatomnadzor of Russia upon its request).
4. Reference information that contains data on activities carried out by the organisation before and characterising experience in construction of similar ships.
5. Quality Assurance Program for implementation of construction activities which in particular includes the following information:

- On availability of conditions within the organisation that ensure construction of the ship in a full compliance with requirements of the design and engineering documentation, federal rules and regulations in the use of nuclear energy;
- Reference information on equipping of the organisation with necessary test means, accessories, and tools, laboratory devices and measuring instrumentation;
- On a procedure for acceptance control, storage and use of materials and component parts in the production process;
- On a list of current reporting and registering documentation including that for the control of operations and also information on the procedure for drawing up of this documentation;
- On providing for the process measuring equipment (metrological provision);
- On a procedure for registration of quality claims and on a procedure for elimination of defects revealed in course of tests and operation;

6. Reference information on staffing of the Applicant with skilled personnel indicating its level of education, professional skills and special training passed. Information on examination of personnel involved in construction of SFA unloading installation with regard to its knowledge of requirements set up by federal rules and regulations in the use of nuclear energy is also to be presented.
7. Test programs (documents are submitted to Gosatomnadzor of Russia upon its request).
8. Copies of certificates for equipment being a subject to the obligatory certification according to the legislation of the Russian Federation.
9. Data on estimation of a possibility of RAW generation in operation of the ship.
10. Data on decommissioning of the ship.

Annex 3

Requirements for a set and content of documents justifying nuclear and radiation safety ensuring and submitted by the Applicant with a purpose to get licences of Gosatomnadzor of Russia for operation of the ship and management of SNF during its transport inside casks

The following documents are to be included into this documentation set:
1. Safety Analysis Report for operation of the ship. This Report should in particular include the following information:

- Conditions for nuclear and radiation safety ensuring;
- A list of premises where casks with SNF can be stored;
- Characterisation of process safety within the applied activities with indication of availability of conclusions on safety and titles of organisations issued corresponding conclusions;
- Description of a process of storage and transfer of casks with SNF;
- Rules establishing a periodicity of cask's integrity tests.

2. Description of equipment (casks) for loading of SNF into it, including packages, with indication of a number of equipment's position, number of drawing, type of equipment, safe (authorised) parameters.
3. Description and assessment of nuclear and radiation safety status in implementation of the individual activities (management of nuclear materials).
4. A list of the considered initiating events, violations and failures that can result in exceeding of the safe (authorised) values of parameters; results of analysis of their consequence impact on personnel and population. Emergency response plan.
5. A copy of the certificate of acceptance of the ship for operation, including the results of tests.
6. Quality Assurance Program for operation of the ship and for management of nuclear materials, including information on:

- Availability of conditions within the organisation ensuring operation of the ship and management of nuclear materials in a full compliance with requirements of the operational documentation and federal rules and regulations in the field of nuclear energy use;
- Establishment of nuclear and radiation safety service unit;
- Equipping of the organisation with necessary device for monitoring of nuclear, radiation and fire safety;
- A nomenclature of the current reporting and registering documentation used within the organisation, including that relevant to monitoring of storage and transfer process for casks with SNF; and a procedure for drawing up of this documentation.

7. Reference information on staffing of the Applicant with skilled personnel indicating its level of education, professional skills and special training passed. Information on availability of permissions for work issued by Gosatomnadzor of Russia to the personnel.
8. Design and operational documentation including design documentation for safety important systems (is to be submitted to Gosatomnadzor of Russia upon its request).
9. Reference information on ensuring of physical protection of SNF and the ship, including information on compliance with requirements of Rules for Physical Protection of Nuclear Materials. Copies of permissions issued to officials and confirming their right to implement activities relevant to physical protection and data on certification of hardware used for creation of the physical protection system are also to be provided.

10. Analysis of compliance of conditions for implementation of the applied activities with requirements of the current regulations on nuclear and radiation safety with indication of the existing deviations and compensation measures.
11. Arrangements for accounting for individual occupational doses, analysis of doses received by the separate groups of workers (personnel).
12. Acceptance report on the readiness of the ship to receive casks with SNF. Readiness of the corresponding service units and equipment for receiving of casks with SNF and providing for their interim storage is to be indicated in this report.
14. Copies of documents of the Russian Marine Register of Shipping.

Annex 6

Presentation of the Department for Environment Protection and Ecological Safety of Ministry of Natural Resources of Russian Federation – *A. Gubin*

1. The Ministry of Natural Resources /MPR/ of the Russian Federation is a specially authorized federal body of power in the field of protection of the environment. The functions of state ecological expertise and state ecological control in regard to any types of activity, including the activity on nuclear energy use, are laid on the Ministry. The Ministry approves norms on maximum permissible releases and effluents of contaminants, including radioactive ones, in the environment.
Within the frameworks of ecological control of sources of environment contamination the Ministry Department for Environment Protection and Ecological Safety carries out the issuing, suspension and annulment of licensees (permits) on releases and effluents. In particular, the Department settles maximum radionuclide releases into the atmosphere and radionuclide effluents in reservoirs for potential radiation hazardous objects that are under the operation.

2. In Russia any project, which realization may likely lead to significant impact on the environment, are a subject of *state ecological expertise*.
The state ecological expertise is the process of establishing the conformity of intended economic or another activity to ecological requirements and determination of admissibility of realization of ecological expertise object just at the stage of planning of this activity.
The purpose of ecological expertise is prevention from possible unfavorable impacts of intended activity on the environment and related social, economic and other consequences of realization of ecological expertise object.
Mr.Markarov's presentation highlighted the necessity of conducting the state ecological expertise at different phases of realization of project for design of the vessel for spent nuclear fuel transportation. Though at present the question either the given project is a subject of state ecological expertise have not a single answer. This question is far from being so simple as it seems at first sight.
Indeed, if observing the letter of Federal Law "On Use of Nuclear Energy", in accordance with the definition of "nuclear facilities" term specified in article 3 of the law the vessel intended for spent nuclear fuel transportation should refer to the category of nuclear facilities. According to article 3 of the law any structures, complexes, facilities for production, usage, reprocessing and *transportation* of nuclear fuel and nuclear material refer to the above category. Therefore all the requirements laid to nuclear facilities should apply to the vessel that is under design within the project. Article 30 of the above law sets that in solution of problems concerning nuclear facility sitting and construction the documents on assessment of its radiation impact on the environment jointly with the other required design documents should be submitted to the state ecological expertise.
On the other hand, it is obvious that the activity itself on building the vessel for SNF transportation can represent no severe hazard for the environment and public. Technology of ship-building and issues of environment protection therein are quite enough developed and tested. Hazard may only appear in the process of vessel operation according to its direct purpose related to spent nuclear fuel or radioactive waste aboard the ship. Thus the project of SNF (or any radioactive cargo) transportation aboard the ship, i.e. all the transport-

technological scheme from the loading aboard in shipment point up to overland trans-shipment point, should be a subject of ecological expertise.
The scope of radiation hazard related to vessel operation shall depend on the tasks that are to be solved involving the vessel. For the present it is not known either the vessel should only ship the SNF placed in special casks till the loading aboard or it should be also used for the unloading of SNF from NS, transportation of non-packed radioactive material, intermediate storage of radioactive waste and SNF or for another operations related to RW and SNF management. If the vessel is built as a multifunctional one intended for realization of the above mentioned operations with SNF and RW, then a possibility of occurrence of severe radiation accidents, which consequences may affect more than two subjects of the Russian Federation or the interests of adjacent states, can not be excluded in its operation. Therefore in accordance with article 11 of the Federal Law "On Ecological Expertise" the state ecological expertise of such project should be carried out at federal level.
Thus the questions either the state ecological expertise is required for given project and, if it is required, then for what stages and at what level it should be made, may be clarified only after approval of technical task for vessel design. Though with the purpose of elimination of possible additional obstacles in project realization, at the initial phase of work on preparation of documents concerning the project it shall be expedient to proceed from the assumption that the state ecological expertise of given project is obligatory.

3. It is appropriate to mention here that the *documentation* related to intended activity, which basic components are documents on *environmental impact assessment of this activity*, is subject to ecological expertise. *Environmental Impact assessment (EIA)* is a process of determination of possible unfavorable impacts of intended activity on the environment and evaluation of ecological and other unfavorable consequences thereof, as well development of measures on their mitigation and prevention. *The purpose of EIA* is prevention from or mitigation of impact of the activity on the environment and social, economic and other consequences concerned.
The degree of working out in detail and completeness of conducting the EIA is defined proceeding from the peculiarities of intended economic or other activity. EIA materials should be sufficient for detection and assessment of possible ecological and related to thereof social, economic and other consequences of realization of intended activity. If available information required for achievement of EIA target is not sufficient and its replenishment is not possible, then the Customer (Executive) shall be obliged to develop a relevant *programme of ecological monitoring and control* ensuring early detection of negative changes appeared in the environment. Typical content of materials on environmental impact assessment of intended economic activity in investment designing is shown in the Annex.
The legal basis for EIA conducting is the legislation of the Russian Federation (see below) and the subjects of the Russian Federation, international contracts and agreements involved the Russian Federation as a Party thereof, as well as solutions adopted by the public at referendums and as a result of realization of other forms of democracy. Basic normative legal documents regulating the matters of conducting the state ecological expertise and EIA, are as follows:

- RSFSR Law "On Environment Protection" of 1991;
- Federal Law "On Ecological Expertize" of 1994;
- Ordinance # 698 of RF Government dated from 11.06.96 "On Approval of the Provisions for the Order of Carrying out the State Ecological Expertise";
- Order # 280 of Goskomecologiya of Russia dated from the 17th of June 1997 "On Approval of Regulations for Carrying out the State Ecological Expertise";

- Ordinance # 372 of Goskomecologiya of Russia dated from the16 th of May 2000 "On Approval of the Provisions for the Environmental Impact Assessment of Intended Economic and other Activity in the Russian Federation".

4. Materials submitted for the state ecological expertise (GEE) to the MPR of Russia shall be registered and handed over for execution to the Department for the State Ecological Expertise to verify completeness and sufficiency of submitted materials. The Department for GEE shall notify the Customer within 7 days from the date of registration of materials as follows:

- in case of conformity of submitted materials to the set requirements – about necessity of payment for GEE conducting in accordance with attached cost estimate and invoice. Payment should be carried out within 30 days from the date of notice receipt;
- in case of non-conformity of the materials to the set requirements - about terms for submission of materials in full scope.

The beginning of GEE conducting shall be set within 30 days after receipt of payment acknowledge. During this period the GEE Department shall have to do as follows:

- to prepare offers on candidatures of the leader and executive secretary of expert commission, as well as on terms for carrying out the ecological expertise;
- jointly with the Leader of Expert Commission to prepare offers on membership of expert commission and to develop technical task for GEE conducting;
- to prepare a draft of order on GEE conducting and to submit it to top management of the ministry.

Duration of expertise is determined by a number of factors (labour-intensiveness of expert work, natural peculiarities of the territory, ecological situation in the region of intended activity, peculiarities of intended activity impact on the environment, etc.).
Terms for carrying out the GEE are as follows:

- for simple objects – up to 30 days;
- for objects of average complication - up to 60 days;
- for complicated objects – up to 120 days.

Prolongation of the terms for carrying out the GEE is admitted as necessary. Though in any case the total term for carrying out the GEE should not exceed 6 months.
The conclusion of expert commission shall come into force after its approval by top management of MPR of Russia.
The conclusion of GEE shall be sent to the Customer within 5 days after its approval.

5. Till the beginning of vessel operation the operating organization should obtain permits on yearly releases and effluents of radionuclides in the environment. Numerical values of releases and effluents should be justified in the project. Application on granting the permit shall be submitted by the operating organization to the MPR of Russia or to the relevant territorial body of MPR of Russia. Permits for nuclear facilities that are under federal jurisdiction shall be issued by the Department for Environment Protection and Ecological Safety of MPR of Russia in co-ordination with the federal Department for Biomedical and Extreme Problems of the Minzdrav of Russia.

Annex

Typical Content of Materials on Environmental Impact Assessment of Intended Economic Activity in Investment Designing (from the Order # 372 of Goskomecologya of Russia dated 16th of May, 2000)

Materials on environmental impact assessment of intended economic and other activity in investment designing should contain the following, as minimum:

1. General data.

1.1 The Customer of activity with indication of official name of organization (juridical, physical person), address, telephone, fax.

1.2 Name of an object of investment designing and supposed place of its realization.

1.3 Surname, first name, second name, telephone of an employee – a contact person.

1.4 Characteristics of a type of justifying documentation: petition (Declaration) on intentions, justification of investment, feasibility study (a draft), working project (approved part thereof).

2. Explanatory memory on justifying documentation.

3. Purpose of and needs in realization of intended economic and other activity.

4. Description of alternative options for achievement of the target of intended economic and other activity (various locations of the object, technologies and other alternatives within the competence of the Customer), including the proposed and "zero version" (waiver of activity).

5. Description of possible types of impact of intended economic and other activity on the environment by alternative versions.

6. Description of the environment that may be affected by intended economic and other activity as a result of realization of the latter (by alternative versions).

7. Environmental impact assessment of intended economic and other activity by alternative versions, including assessment of trustworthiness of predicted consequences of intended investment activity.

8. Measures on prevention from and/or decreasing of possible negative impact of intended economic and other activity.

9. Uncertainties detected during assessment implementation in determination of impact of intended economic and other activity on the environment.

10. Brief content of programs for monitoring and post-design analysis.

11. Substantiation of option selection of intended economic and other activity among all considered alternative versions.

12. Materials of public discussions carried out in conducting the studies and preparation of documents on environmental impact assessment of intended economic and other activity, which reflect the following:

12.1 Method of informing the public about place, date and type of realization of public discussion;

12.2 List of participants of public discussion with indication of their surnames, first names, second names and names of organizations (if they represent an organization), as well as addresses and telephones of the above organizations or participants of the discussion.

12.3 Issues considered by participants of discussions; theses of presentations in case of their availability; protocol (protocols) of public hearings (in case of their availability).

12.4 All remarks and offers suggested in the course of public discussions with indication of their authors, including the above on matters of possible disagreements between public, local self-management bodies and customer.

12.5 Conclusions on outcomes of public discussion as regards ecological aspects of intended economic and other activity.

12.6 Summary of remarks and offers by public with indication which of the above were taken into account by the customer and in what kind, which of the above were not taken into account and substantiation for waiver.
12.7 Lists of distribution of relevant information submitted to the public at all phases of environmental impact assessment.
13. Resume of non-engineering character.

Requirements for EIA and Terms of its Implementation

Mr A. Gubin, Ministry of Natural Resources of Russia.

In accordance with the Russian legislation any project, which realization may likely lead to significant impact on the environment, are a subject of *state ecological expertise*.
The ecological expertise is the process of establishing the conformity of intended economic or other activity to ecological requirements and determination of admissibility of realization of ecological expertise object just at the stage of planning of this activity.
The purpose of ecological expertise is prevention from possible unfavorable impacts of intended activity on the environment and related social, economic and other consequences of realization of ecological expertise object.
Mr. Markarov's presentation highlighted the necessity of GEE implementation. Though the question either the state ecological expertise of the project for vessel building is obligatory or not, is far from being so simple as it seems at first sight.
On the one hand, according to article 3 of the law "On Use of Nuclear Energy" any structures, complexes, facilities for production, usage, reprocessing and transportation of nuclear fuel and nuclear material refer to the category of nuclear facilities. Spent nuclear fuel that is to be transported aboard the vessel that should be built, contains nuclear material. Therefore all the requirements laid to nuclear facilities should apply to the vessel that is under design within the project. According to article 20 of the above law the documents on environmental radiation impact assessment of nuclear facility jointly with other required design documents shall be submitted for the state ecological expertise. On the other hand, the activity itself on building the vessel for SNF transportation can represent no severe hazard for the environment and public.
At the same time it is obvious that such hazard shall exist in the process of operation of the vessel to its direct purpose. Thus the project of SNF transportation aboard the ship should be a subject of ecological expertise. In principle, in course of transportation the accidents and incidents, which consequences may affect more than two subjects of the Federation or the interests of adjacent states, are probable. In accordance with article 11 of the Federal Law "On Ecological Expertise" the state ecological expertise of such project should be carried out at federal level.

Documentation related to intended activity, which basic components are materials on *Environmental Impact Assessment (EIA*), is a subject of ecological expertise.
Environmental impact assessment of intended economic and other activity (hereinafter referred to as environmental impact assessment) is a process of determination of possible unfavorable impacts of intended activity on the environment and evaluation of ecological and other unfavorable consequences thereof, as well development of measures on their mitigation and prevention.
The purpose of EIA is prevention from or mitigation of impact of the above activity on the environment and social, economic and other consequences concerned.

EIA results shall be documented in *the materials on impact assessment* that are a part of the documentation on activity, which is submitted for ecological expertise and also used in course of adoption of other administrative solutions related to the above activity.
The order and content of work on EIA and a set of EIA materials are defined by the current legislation of the Russian Federation in accordance with the types and (or) certain characteristics of intended activity.
The legal basis for environmental impact assessment implementation is the legislation of the Russian Federation, the subjects of the Russian Federation, international contracts and agreements involved the Russian Federation as a Party thereof, as well as solutions adopted by the public at referendums and as a result of realization of other forms of democracy.
The degree of working out in detail and completeness of conducting the EIA is defined proceeding from the peculiarities of intended economic or other activity. EIA materials should be sufficient for detection and assessment of possible ecological and related social, economic and other consequences of realization of intended activity.
If available information required for achievement of EIA target is not sufficient, then the Customer (Executive) shall be obliged to implement additional studies and to develop a relevant *programme of ecological monitoring and control.*
The outcomes of EIA are as follows:
information about character and scope of impact of intended activity on the environment, alternatives of its realization, assessment of ecological and related social-economic and other consequences of the above impact and its significance, possibility of minimum decreasing of impacts;
detection and accountancy of public preferences in adoption of solutions by the customer with regard to intended activity;
customer's solutions on definition of alternative options for realization of intended activity (including those related to location of the object, selection of technologies, etc.) or waiver of the above, taking into consideration the results of implemented environmental impact assessment.

Materials submitted for the state ecological expertise (GEE) to the MPR of Russia shall be registered and handed over for execution to the Department for the State Ecological Expertise to verify completeness and sufficiency of submitted materials. The Department for GEE shall notify the Customer within 7 days from the date of registration of materials as follows:

- in case of conformity of submitted materials to the set requirements – about necessity of payment for GEE conducting in accordance with attached cost estimate and invoice. Payment should be carried out within 30 days from the date of notice receipt;
- in case of non-conformity of the materials to the set requirements - about terms for submission of materials in full scope.

The beginning of GEE conducting shall be set within 30 days after receipt of payment acknowledge. During this period the GEE Department shall have to do as follows:

- to prepare offers on candidatures of the leader and executive secretary of expert commission, as well as on terms for carrying out the ecological expertise;
- jointly with the Leader of Expert Commission to prepare offers on membership of expert commission and to develop technical task for GEE conducting;
- to prepare a draft of order on GEE conducting and to submit it to top management of the ministry.

Duration of expertise is determined by a number of factors (labour-intensiveness of expert work, natural peculiarities of the territory, ecological situation in the region of intended activity, peculiarities of intended activity impact on the environment, etc.).
Terms for carrying out the GEE are as follows:

- for simple objects – up to 30 days;
- for objects of average complication - up to 60 days;
- for complicated objects – up to 120 days.

Prolongation of the terms for carrying out the GEE is admitted as necessary. Though in any case the total term for carrying out the GEE should not exceed 6 months.
The conclusion of expert commission shall come into force after its approval by top management of MPR of Russia.
The conclusion of GEE shall be sent to the Customer within 5 days after its approval.

- Ordinance # 698 of RF Government dated from 11.06.96 "On Approval of the Provisions for the Order of Carrying out the State Ecological Expertise";
- Order # 280 of Goskomecologiya of Russia dated from the 17th of June 1997 "On Approval of Regulations for Carrying out the State Ecological Expertise";
- Ordinance # 372 of Goskomecologiya of Russia dated from the16th of May 2000 "On Approval of the Provisions for the Environmental Impact Assessment of Intended Economic and other Activity in the Russian Federation".

Annex 7

International Requirements for the Transport of Spent Nuclear Fuel and Radioactive Waste with special emphasis on Transport at Sea with a Dedicated Ship

Eric Häggblom
Swedish Nuclear Power Inspectorate
Office of Nuclear Non-Proliferation

SKi

Contents

1) International transport regulations issued by - IAEA
- IMO

2) Contents of the regulations:
How to maintain safety
- IMDG Code
- INF Code

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1) Regulations

IAEA "Regulations for the Safe Transport of Radioactive Material" 1996 Edition, No TS-R-1.

These recommendations are applied by the international organizations for the different modes of transport.

Sea transport:
Requirements given by IMO (International Maritime Organization)

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IMO issues the "International Maritime Dangerous Goods Code" (the IMDG Code)

- All kinds of dangerous goods
- Covers the IAEA TS-R-1 (Class 7)
- Adds sea mode specific administrative requirements
- Supplement cover vessel requirements
- Amendment 30-00 (2000 edition) in force since 1 January 2001

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In the supplement to the IMDG Code, particularly relevant for (some kind of) radioactive material:

The INF Code
"International code for the safe carriage of packed irradiated nuclear fuel, plutonium and high level radioactive wastes on board ships"

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The IMDG Code is an IMO recommendation, but undertakings are being made to make the code mandatory by 1 January 2004, by an amendment to the SOLAS and MARPOL conventions.

Most relevant countries have made the IMDG Code to national law or regulation.

The INF Code is already mandatory from 1 January 2001.

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The IMDG Code sets the package requirements and the consignors responsibilities. Regulating body, *the competent authority*, is the transport safety authority or the nuclear safety authority.

The INF Code sets the ship requirements. The regulating body is the maritime administration.

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2) Maintain safety – IMDG Code, Class 7

Protect persons, property and the environment from the effects of radiation.

Achieved by

- Containment of the radioactive contents
- Control of external radiation levels
- Prevention of criticality
- Prevention of damage caused by heat

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Package requirements differs with respect to the radioactive contents.

Package = packaging + content

Type IP, A, B(M), B(U), C (Graded approach)

Packages with fissile material always require competent authority approval in each country.

Spent fuel: Type B(M)F or B(U)F

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The package requirements guarantees the transport safety if the package is properly prepared for transport.

- A radiation protection programme shall be established
- Workers shall receive appropriate training
- Competent authority shall arrange for periodic assessments of the radiation doses to persons

The package should be safe during *routine conditions* (incident free), *normal conditions* (minor mishaps) and *accident conditions* of transport.

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***Normal conditions* tests for B(U)F packages**

- Water spray test
- Free drop 0.3 m (if package mass > 15 tons)
- Stacking test (load of 5 times the package mass)
- Penetration test (drop of bar 6 kg unto the package)

Loss of radioactive contents after the tests of not more than 10^{-6} A2 per hour.

5 times the allowed number of packages to be transported shall be subcritical.

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***Accident conditions* tests for B(U)F packages**

- 9 m drop test onto a flat unyielding surface
- 1 m drop onto a rigid bar
- 30 min fire test at 800°C flame temperature
- Water immersion test at 15 m depth

Max 10 mSv/h at 1 m distance, restrictions on loss of the radioactive content.

2 times the allowed number of packages shall be subcritical.

No rupture of the containment system at 200 m.

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Dedicated ship:

Exclusive use means no limit on the TI (Transport Index) aboard a single conveyance. No limit of the amount of activity to be sent.

Special arrangement:

The competent authority may approve special arrangement transport operations if conformity with the IMDG Code is impracticable. The overall level of safety shall be at least equivalent. Rarely used for INF shipments.

2) Maintain safety (continued) – INF Code

Requirements are defined for

- Damage stability
- Fire safety measures
- Temperature control of cargo spaces
- Structural consideration
- Cargo securing arrangements
- Radiological protection
- Management and training
- Shipboard emergency plan
- Notification in the event of an incident

Conclusions

International requirements specific for SNF and RAW transport at sea:

- The IMDG Code sets the requirements for the package and for the preparation, consigning, loading, carriage, in-transit storage, unloading and receipt. Regulated by the transport safety authority or the nuclear safety authority.
- The INF Code sets the requirements on the ship. Regulated by the maritime administration.

Международные требования по транспортированию отработавшего ядерного топлива и радиоактивных отходов с уделением особого внимания транспортированию по морю на специально предназначенном судне

Эрик Хэггблум
Шведский инспекторат по атомной энергии
Отдел по ядерному нераспространению

Содержание

1) Международные транспортные предписания выпущенные
   - МАГАТЭ
   - IMO
2) Содержание предписаний:
   Как поддерживать безопасность
   - Код IMDG
   - Код INF

1) Предписания

«Предписания по безопасной транспортировке радиоактивных материалов» МАГАТЭ, издание 1996 года, № TS-R-1.

Эти рекомендации применяются международными организациями для различных видов транспортировки.

Транспортировка морем:
Требования выдвигаемые IMO (Международной Морской Организацией)

IMO издает «Международный морской код опасных грузов» (Код IMDG)

- Все виды опасных грузов
- Охватывает TS-R-1 (Класс 7) МАГАТЭ
- Дополняет определенные административные требования по морским перевозкам
- Приложение охватывает требования к судну
- Поправка 30-00 (выпуск 2000 года) в силе с 1 января 2001 года

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В приложении к коду IMDG, особенно касающемуся (некоторых видов) радиоактивных материалов:

Код INF

«Международный код для безопасной перевозки запакованного облученного ядерного топлива, плутония и высокоактивных радиоактивных отходов на бортах судов»

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Код IMDG является рекомендацией IMO, хотя предпринимаются меры для того, чтобы сделать код обязательным к 1 января 2004 года, путем введения поправки к конвенциям SOLAS (международная конвенция по безопасности жизни в море) и MARPOL (международная конвенция по предотвращению загрязнения от морских судов).

Большинство стран, имеющих морской транспорт используют код IMDG как государственный закон или предписание.

Код INF уже является обязательным с 1 января 2001 года.

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Код IMDG устанавливает требования к упаковке и ответственность отправителя. Регулирующим органом, *компетентным властями*, являются власти по регулированию безопасной транспортировки или надзорные власти по ядерной безопасности.

Код INF устанавливает требования к судам. Регулирующим органом является морская администрация.

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2) Поддерживать безопасность – Код IMDG, класс 7

Защищать людей, имущество и окружающую среду от воздействия радиации.

Достигается путем

- Использования защитной оболочки радиоактивных веществ
- Контроля за внешними уровнями радиации
- Предотвращения критичности
- Предотвращения повреждений, в результате разогрева

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Требования к упаковке отличаются в отношении радиоактивного содержания.

Пакет = упаковка + содержание

Тип IP, A, B(M), B(U), C (поэтапный подход)

Упаковки с делящимися материалами всегда должны получить одобрение компетентных органов в каждой стране.

Отработавшее топливо: Тип B(M)F или B(U)F

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Требования к упаковке гарантируют безопасность транспортировки если упаковка как следует подготовлена для перевозки.

- Программа по радиационной защите должна быть установлена
- Рабочие должны получить соответствующее обучение
- Компетентные органы должны периодически проводить оценку доз радиационной нагрузки людей

Упаковка должна быть безопасной при *обычных условиях* (без инцидентов), *нормальных условиях* (незначительных событиях) и *аварийных условиях* во время транспортировки.

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Испытания при *нормальных условиях* для упаковок B(U)F

- Испытания распылением водой
- Свободное падение с высоты 0.3 м (если масса упаковки > 15 тонн)
- Испытание кладкой (грузом в 5 раз превышающим массу упаковки)
- Испытания на проницаемость (падение бруска в 6 кг на упаковку)

Потеря радиоактивного содержания после испытаний не более чем 10^{-6} A2 в час.

Количество упаковок в 5 раз превышающее дозволенное для транспортировки должно быть подкритичным.

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Испытания при *аварийных условиях* для упаковок B(U)F

- Испытание падением с 9 м высоты на плоскую твердую поверхность
- Падение с 1 м высоты на жесткий брусок
- Испытание огнем в течение 30 мин при температуре 800°C
- Испытание на погружение в воду на глубину 15 м

Максимально 10 mSv/h на расстоянии 1 м, ограничения на отсутствие радиоактивного содержания.

Количество упаковок в 2 раза превышающее дозволенное для транспортировки должно быть подкритичным.

Отсутствие разрыва защитной оболочки системы при 200 м.

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Специальное судно:

Исключительное использование означает отсутствие ограничений на TI (транспортный индекс) на борту отдельного транспортного средства. Нет ограничений объема отправляемой активности.

Специальные условия:

Компетентные власти могут одобрить специально подготовленную транспортную операцию если соответствие с кодом IMDG невыполнимо. Общий уровень безопасности должен быть по крайней мере эквивалентным. Редко используется для перевозок INF.

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2) Поддерживать безопасность (продолжение) – Код INF

Требования определены для

- Стабильности повреждения
- Мер пожарной безопасности
- Температурного контроля грузовых помещений
- Структурных соображений
- Безопасного расположения груза
- Радиологической защиты
- Руководства и обучения
- Аварийного плана судна
- Оповещения в случае аварии

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Выводы

Международные требования, специфичные для транспортировки морем ОЯТ и радиоактивных отходов :

- Код IMDG устанавливает требования к упаковке и подготовке, отправке, погрузке, перевозке, межтранзитному хранению, разгрузке и приемке. Регулируется властями по регулированию безопасной транспортировки или надзорными власти по ядерной безопасности.
- Код INF устанавливает требования к судну. Регулируется морской администрацией.

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Experiences of sea transport of spen nuclear fuel with a dedicated ship

Magnus Westerlind
Office of Nuclear Waste Safety
Swedish Nuclear Power Inspectorate

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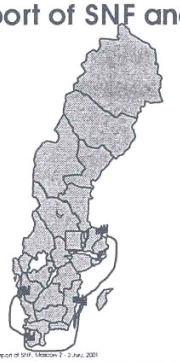
Transport of SNF and nuclear waste



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Purpose of the Swedish system

Spent nuclear fuel and reactor core components

- Transfer from power plants to the central interim storage, CLAB

Nuclear waste

- Transfer of conditioned LILW to the SFR-repository

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System for transport of SNF and wa

- Dedicated ship, M/S Sigyn
  - No handling of waste or SNF on the ship (ro/ro)
- Transport containers
  - Solid nuclear waste
  - Spent nuclear fuel
  - Reactor core components
- Special vehicles for loading and unloading

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Some facts about M/S Sigyn

Length/breadth:	90/18 m
Deadweight:	2044 tonnes
Gross tonnage:	4170 tonnes
Capacity:	10 containers
Annual volumes:	300 tonnes SNF to CLAB
	1500 m^3 waste to SFR
Ice breaking:	Finnish/Swedish standard
Days at sea per year:	ca. 80
Crew:	2 × 12

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Swedish requirements

Shipments and packages

- Swedish Nuclear Power Inspectorate, SKI
- Swedish Radiation Protection Institute, SSI

The ship

- Swedish Maritime Administration
  - International commitments
  - INF-certified in 2001
  - SKI/SSI provides assistance

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Nuclear and radiation safety requirements for shipments

- Organisation and responsibilities
- Physical protection
- Control programme for transport containers
  - contamination control, radiation levels...
- Planning and notification of shipments
  - documentation, reporting routines...
- Emergency preparedness
- Nuclear liability insurance

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Approval of the transport system (1)

Conditioned and packaged SNF and waste

- Specification of cargo
  - SNF and waste characteristics
  - Transport containers
- Transport route conditions
  - Harbours
  - Ice conditions
- Description of the ship
- Loading/unloading routines

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Approval of the transport system (2)

- Normal operation
- Shipping accidents
  - Sinking, collision, fire...
- Damage to cargo
  - Impact damage, fire, corrosion in sea water...
- Radiation protection
  - Doses during normal operation
  - Activity release and doses due to accidents

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Experiences and conclusions

- Safe and successful operation since 1982
- Shipping of packaged SNF and waste proved viable
  - Ro/ro practical principle
- Clear allocation of responsibilities
  - Consignor, shipper and receiver
  - Ship crew and loading/unloading staff
- Clear responsibilities for authorities
  - SKI/SSI focusing on packaging and contents
  - Maritime Administration focusing on maritime safety

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History of M/S Sigyn

1978 - 1982

- Design and construction, including safety analysis
- Joint French - Swedish project
  - Industry
  - Licensing authorities

1982-1985

- Operated under French flag

1985

- Licensed also for shipping nuclear waste
- Operation under Swedish flag

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Опыт транспортировки морским путем отработавшего ядерного топлива на специально предназначенном судне

Магнус Вестерлинд
Отдел по безопасности ядерных отходов
Шведский инспекторат по атомной энергии

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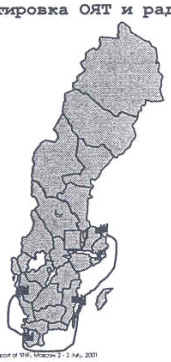
Транспортировка ОЯТ и радиоактивных отходов



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Назначение шведской системы

Отработавшее ядерное топливо и части активной зоны реактора

- Перевозка с атомных электростанций в центральное промежуточное хранилище, CLAB

Ядерные отходы

- Перевозка кондиционированных отходов низкого и среднего уровня в хранилище SFR

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Система транспортировки ОЯТ и отходов

- Специально предназначенное судно, Сигюн
  - На борту судна ОЯТ и отходы не обрабатываются (принцип перевозки на пароме)
- Транспортные контейнеры
  - Твердые ядерные отходы
  - Отработавшее ядерное топливо
  - Части активной зоны реактора
- Специальные устройства для загрузки и разгрузки

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Некоторые факты о судне Сигюн

Длина/ширина:	90/18 м
Полная грузоподъёмность:	2044 тонн
Брутто тоннаж:	4170 тонн
Вместимость:	10 контейнеров
Годовой объём:	300 тонн ОЯТ в CLAB 1500 $м^3$ отходов в SFR
Ледокольные характеристики:	по Финскому /Шведскому стандарту
Дней в году в море:	прибл. 80
Команда:	2 × 12

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Шведские требования

Перевозки и упаковки

- Шведский инспекторат по атомной энергии, SKI
- Шведский институт по радиационной защите, SSI

Судно

- Шведская морская администрация
  - Международные обязательства
  - Получило удостоверение INF в 2001 году
  - SKI/SSI предоставляет помощь

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Требования по ядерной и радиационной безопасности для перевозок

- Организация и ответственности
- Физическая защита
- Контрольные программы для транспортных контейнеров
  - Контроль загрязнения, радиационные уровни...
- Планирование и оповещение о перевозках
  - Документация, порядок отчетности...
- Аварийная готовность
- Страхование по нанесению ядерного ущерба

SKi

Одобрение транспортной системы (1)

Кондиционированные и упакованные ОЯТ и отходы

- Спецификация груза
  - Особенности ОЯТ и отходов
  - Транспортные контейнеры
- Условия маршрута транспортирования
  - Порты
  - Ледовые условия
- Описание судна
- Процедуры погрузки /разгрузки

SKi

Одобрение транспортной системы (2)

- Нормальная эксплуатация
- Судовые аварии
  - Потопление, столкновение, пожар…
- Повреждение груза
  - Повреждение от удара, пожара, коррозии в морской воде…
- Радиационная защита
  - Дозовые нагрузки при нормальной эксплуатации
  - Выброс радиоактивности и дозовые нагрузки в результате аварий

SKi

Опыт и выводы

- Безопасная и успешная эксплуатация с 1982 года
- Перевозка упакованных ОЯТ и отходов доказала свою жизнеспособность
  - Практический принцип (принцип перевозки на пароме)
- Четкое распределение обязанностей
  - Грузоотправитель, перевозчик и получатель
  - Команда судна и погрузочно /разгрузочный персонал
- Четкая ответственность властей
  - SKI/SSI сосредотачивает свое внимание на упаковке и содержании
  - Морская администрация сосредотачивает свое внимание на безопасности в море

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История судна Сигюн

1978 - 1982

- Проект и конструкция, включая анализ безопасности
- Совместный франко – шведский проект
  - Промышленность
  - Лицензирующие власти

1982-1985

- Эксплуатировался под французским флагом

1985

- Лицензирован также для перевозки ядерных отходов
- Эксплуатация под шведским флагом

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Annex 9

Regulation and Licensing in the UK of Radioactive Waste Transport by Sea

Graham Smith
& Emma Kerrigan
Enviros QuantiSci

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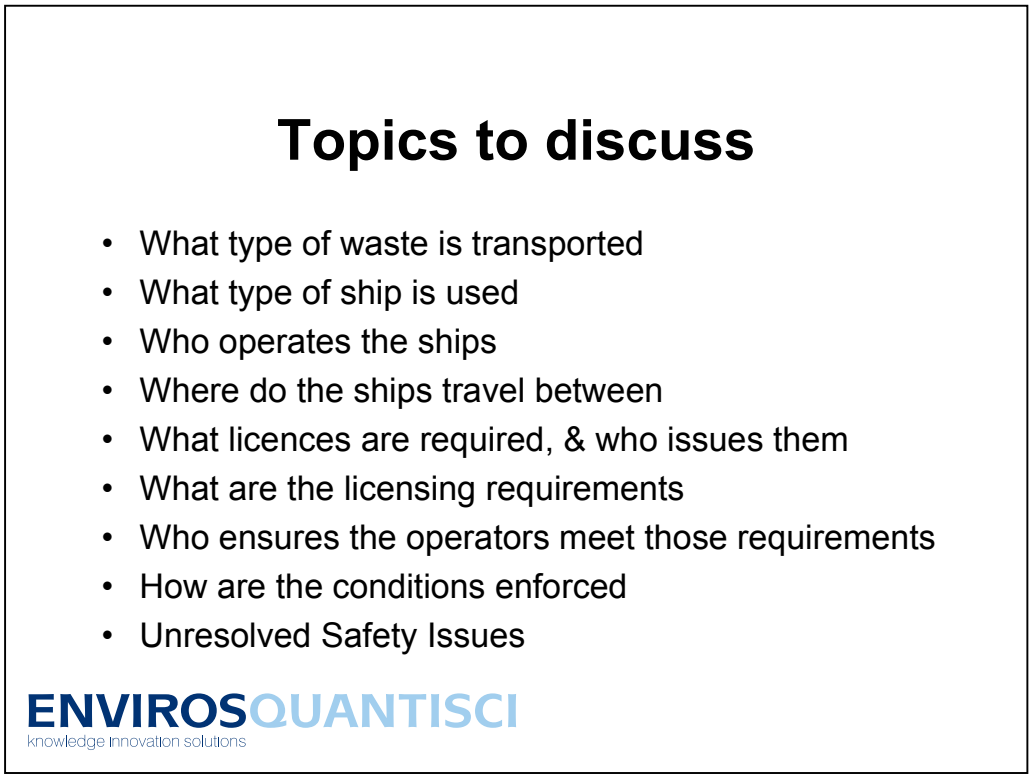
Transport of radioactive materials and other dangerous goods is regulated to prevent injury to people and the environment, or damage to ships and their cargo.

There are a number of international standards, EU directives and regulations that form UK legislation for packaging, containment and transport of fuel, radioactive waste, or spent fuel. IAEA advisory safety standards are the basis of UK regulations.

The IAEA regulations were updated in December 1996 (came into force on 1 January 2001). The new regulations make it a requirement to establish a *radiation protection programme*, which includes information about the implementation responsibilities, dose assessments, limits and constraints, emergency response, training and quality assurance. The UK has not yet established a radiation protection programme, however many aspects of the programme are already covered by current regulations.



The topics to be discussed are:

What type of waste is transported

What type of ship is used

Who operates the ships

Where do the ships travel between

What licenses are required, & who issues them

What are the licensing requirements

Who ensures the operators meet those requirements

How are the conditions enforced

Unresolved Safety Issues

BNFL and other nuclear operators believe spent nuclear fuel is a commodity not a waste, because it can be reprocessed and the useful products extracted from it. Spent fuel is reprocessed commercially at La Hague, France and Sellafield in Cumbria; therefore it needs to be transported from the country of origin to France or the UK. This is the first type of 'waste' transported by sea.

Once the spent fuel has been reprocessed, the small amount of high level waste produced is stored as a liquid in water cooled tanks until the volume is reduced further using minimisation techniques. The waste is then conditioned (normally vitrification) to convert it into a stable form to allow for long-term storage. The conditioned waste is then packaged in steel or concrete containers and stored in air cooled buildings. Once the waste has cooled sufficiently it is to be transported back to the country of origin in line with current UK export policy. This is the second type of waste transported by sea. The UK has not yet returned any vitrified waste, but PNTL have successfully returned 1 shipment from France to Japan.

Some reprocessing contracts at Sellafield specify that the plutonium product from reprocessing must be returned to the country of origin as MOX fuel as opposed to vitrified waste. To date only Japan has received shipments of MOX fuel from Sellafield. The shipments are made under very similar conditions to high level waste.

The background image is of the Pacific Pintail, one of five PNTL vessels designed to transport nuclear materials. Class 7 materials refers to the highest rating on the International Nuclear Event Scale (INES) would result in a significant accident, involving a major release of radioactivity, and/ or widespread health/ environmental effects if involved in an accident.

Who Operates the Ships

- Pacific Nuclear Transport Limited (PNTL), a subsidiary of BNFL
- Fleet of 5 ships: Pacific Pintail, Pacific Swan, Pacific Teal, Pacific Crane, Pacific Sandpiper.
- BNFL own a 6th ship, the European Shearwater

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Pacific Nuclear Transport Limited (PNTL) is a subsidiary of BNFL with stakeholders in Europe, Japan and the UK. PNTL is the largest operator transporting radioactive materials between Europe and Japan.

PNTL own 5 purpose-built boats, they are the Pacific Pintail, the Pacific Teal, the Pacific Swan, the Pacific Crane and the Pacific Sandpiper. BNFL also own another ship, the European Shearwater, which is currently used only within European waters.

The PNTL fleet have been certified to Environmental Management Systems ISO 14001 standard by the International Organisation for Standardisation. This is an internationally recognised environmental standard.

The crew on board are all qualified to a higher rank than they serve and are trained in radiation protection, maritime security and firefighting in case of emergency. There is a larger crew on PNTL vessels than ships of a similar size because of the nature of the cargo.

The small image is of Cogema (French operator) loading fuel onto a PNTL ship at the port of Cherbourg, France.

What Type of Ship is Used

- Purpose-built to International Maritime Organisation standards by BAE Systems
- UK Maritime and Coastguard Agency authorised
- Enhanced Safety Features:
  - Enhanced buoyancy
  - Double hull
  - Dual navigation and tracking
  - Twin engines and propellers
  - Additional fire fighting equipment

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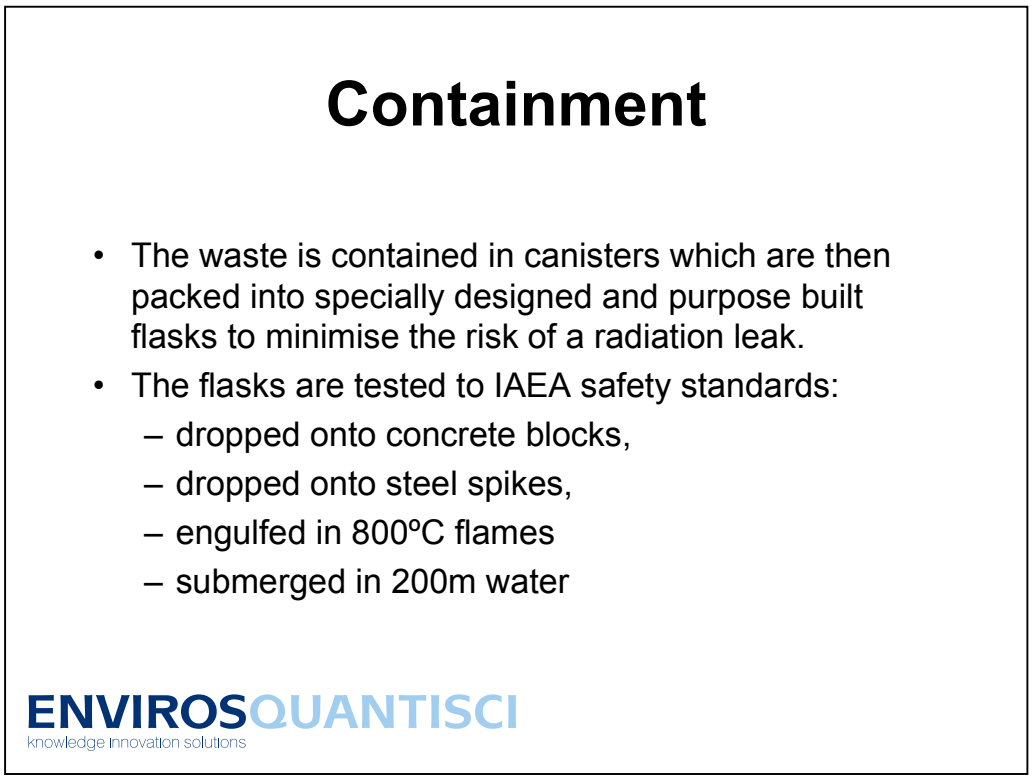
The PNTL vessels are purpose-built to a high standard developed by the International Maritime Organisation (IMO) and authorised and regulated by the Maritime and Coastguard Agency (MCA) for the UK. All the ships have INF3 ratings, the highest safety rating for any ship carrying radioactive materials.

The ships have been designed and built by BAE Systems, an engineering contractor with the largest shipbuilding capabilities in the UK and leading technology and defence knowledge utilised by a number of navies across the world.

The ships must be approved by the competent authority, in the UK, the Maritime and Coastguard Agency. The ships have a number of enhanced safety features to cope with highly radioactive cargo and the risks it poses, for example:
(i) double hulls to withstand collision damage, (ii) enhanced buoyancy to maintain the ship afloat even in extreme circumstances, (iii) dual navigation, monitoring and tracking systems, (iv) twin engines and propellers, (v) separate cargo holds with radiation shielding, (vii) additional fire fighting equipment, including a hold flooding system, (viii) radiation monitoring devices.

Physical protection of the cargo is important because of the concern over the risk of proliferation. The IAEA recommend that nuclear material should be accompanied during transport by an armed security escort, which, for the PNTL fleet, is provided by officers of the UKAEA constabulary. As an alternative, or for added protection, 2 ships will travel together.

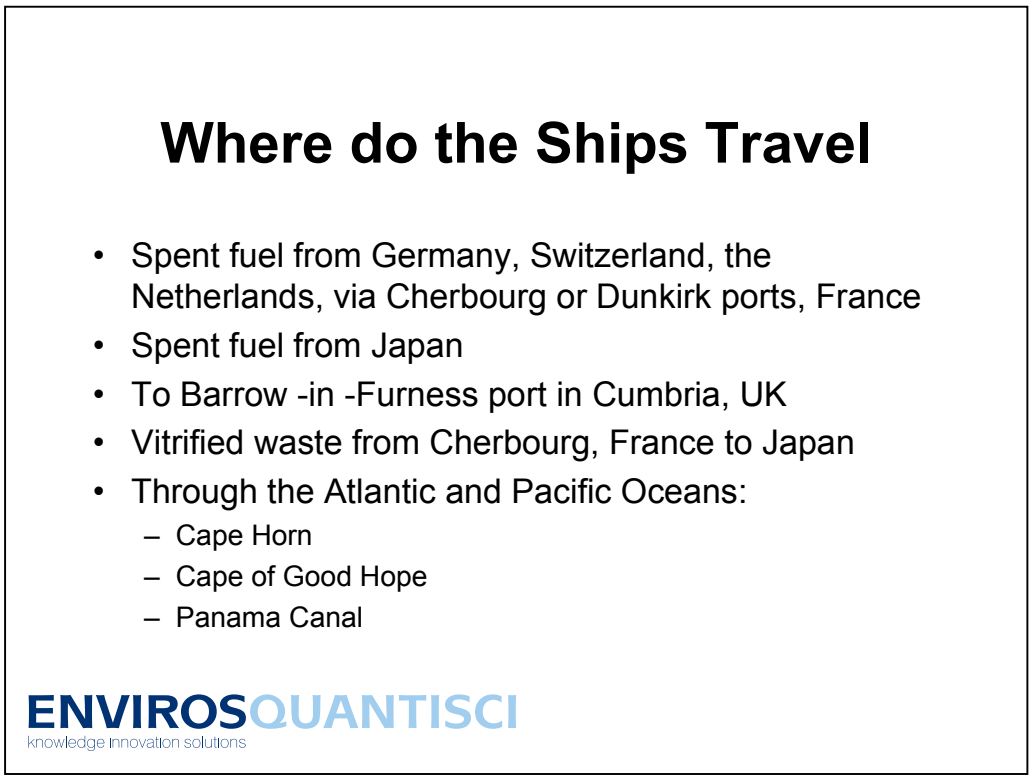


Both Spent Nuclear Fuel for reprocessing and Vitrifed High Level Waste to return to the country of origin are transported in specially designed and constructed flasks made of lead or lead and steel. The flasks do not have specific features depending on the method of transportation.

The package design requires approval from the competent authority (the Radioactive Materials Transport Division, RMTD of the Department of the Environment, Transport and the Regions). Approval can either be done directly by RMTD (for UK based designs) or by RMTD validating an approval issued by the competent authority of the country of origin of the design. Approval is given if the design meets the criteria set out in the UK regulations which are based on IAEA safety standards. There are several different designs of packages used by BNFL, on average they contain 21 canisters each with a heat output of up to 2.5 kw. BNFL are allowed a combined heat output of 52 kw in total.

The flasks are tested to ensure they are robust enough to survive severe conditions, regardless of the transportation method. The test is again based on IAEA safety standards and includes:

- dropping the flask onto a thick concrete block from 9 m,
- dropping the flask onto steel spikes from 9 m,
- engulfing the flask in 800°C flames for 30 minutes
- submerging the flask in 200 metres of water for 8 hours



Spent fuel is transported to Sellafield from the Meuhleberg power station in Switzerland, the Neckarwestheim and Biblis power stations in Germany, the Dodewaard reactor in the Netherlands, and several power stations in Japan.

European wastes are transported by rail to a port in France, either at Dunkirk or Cherbourg, and then transported by sea to Barrow-in-Furness in Cumbria. Japanese material is loaded at a number of ports and again unloaded at Barrow.

There have been several shipments of spent fuel to the UK for reprocessing at Thorp, Sellafield, but only 1 shipment of vitrifed high level waste has been transported back to the customer, from La Hague in France to Japan using PNTL.

At Barrow-in-Furness port, BNFL have a dedicated marine terminal, managed by BAE systems, for loading and unloading of radioactive materials and wastes. The terminal has a specialised land-based heavy lift crane (200t) which will transfer the flasks from ships to trains and vice versa.

The following slide shows the 3 most common routes travelled by ships between Europe and Japan.

The route between Europe and Japan is very long, approximately 17, 000 miles.

The ships can either travel via the Cape of Good Hope, Cape Horn or the Panama Canal. The routes are not publicised before the journey begins to limit the risk of terrorist action.

The Radioactive Materials Transport Division of DETR was until recently the lead department and the Competent Authority in the UK giving regulatory approval for the shipment to go ahead. Approval is needed for the design of the packages, the content of the shipment and the route that will be taken. UK based package designs can be approved directly by RMTD. If the package is designed in another country the DETR will validate an approval certificate by the Competent Authority of that country. Approval from coastal countries en route is not required, although their attitude towards the UK and nuclear power will be taken into account. The Maritime and Coastguard Agency (MCA) approve the vessel and ensure it meets international standards.

The Nuclear Installations Inspectorate (NII) of the Health and Safety Executive (HSE) issue licences for the movement of the waste on site before it is loaded onto a train and taken to the terminal. At the port a licence is not required to handle radioactive substances, but the Dangerous Substances in Harbour Areas Regulations 1987 do apply. A licence is required from the HSE for the transfer of radioactive waste to another operator within the UK because licenses are not transferable. A licence is also required for the storage, disposal or use of the material/ waste.

The DETR has been divided since the UK General Election in June, and now Transport and Environment matters are the responsibility of 2 Secretary of States (See below). This may affect regulation in future.

The Office of Civil Nuclear Security, part of the Department of Trade and Industry (DTI) approve the security measures.

What are the Licensing Requirements?

- Approval of the package design
- Approval of the vessel
- Environmental Impact Assessment
- A Safety Analysis Report

- Results in a Certificate of Fitness for the ship (not operator)

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The applicant must demonstrate in detail that they can operate safely, and within International Regulations and this must be able to be reviewed and assessed by the regulatory body in accordance with defined procedures.

The requirements are:
•An Environmental Impact Assessment which will include: Description of project; Description of measures introduced to avoid, or reduce adverse effects; Data to identify and assess the main effects on the environment, Outline of alternatives, and reasoning behind the chosen methods; Comprehensive list of the characteristics of the radionuclides/ waste being transported; Review of social, economic, and legal issues.
•Safety Analysis Report

Maritime and Coastguard Agency (MCA) approve the vessel, but a licence is not issued to the operator. They issue a Certificate of Fitness once all documentation is completed, which allows the cargo to be loaded and the vessel can proceed to its destination. Once a Certificate of Fitness has been issued to a vessel for the carriage of nuclear products then, subject to regular surveys, the MCA is content for the ship to sail whenever it wants to. However, Government approval for each shipment is still required.

The regulator will issue guidance notes to accompany any licence applications, so the operator knows what is expected of them before and after a licence is issued, and what the consequences will be if they do not comply with the conditions.

Local authorities may have additional requirements that operators need to meet as well as national and international regulations.

The regulators will oversee the shipments and ensure the operator is meeting all International, EU and National regulations.

The Maritime and Coastguard Agency conduct regular surveys of the ships to ensure that all aspects of the Certificate of Fitness are still satisfied. If not the Certificate will be revoked and the vessel will not be allowed to travel until regulator confidence is restored and new approval granted.

The DETR regulates the packaging of nuclear cargoes, and the route travelled. Effectively the operator cannot travel without Government approval of the cargo and the route.

The EA will be involved when shipments of vitrified waste are returned from Sellafield to Japan because it will be regulated under the Transfrontier Shipment of Radioactive Waste Regulations 1993, which implement Directive 92/3 Euratom in the UK. The EA is not involved if the cargo is fuel and not waste. RMTD would still be involved to regulate the standards for transport containers, shipment etc.

The Office of Civil Nuclear Security, part of the DTI is the security regulator that sets standards and enforces compliance.

The NII will regulate the initial movement on site.

How are the Conditions Enforced?

- Penalties are commensurate with the possible magnitude and nature of the hazard
- Planned and unannounced inspections
- Threat of penalties if licence conditions are breached, resulting in a written warning, monetary fine, suspension or withdrawal of the license, and a plan for remedial action

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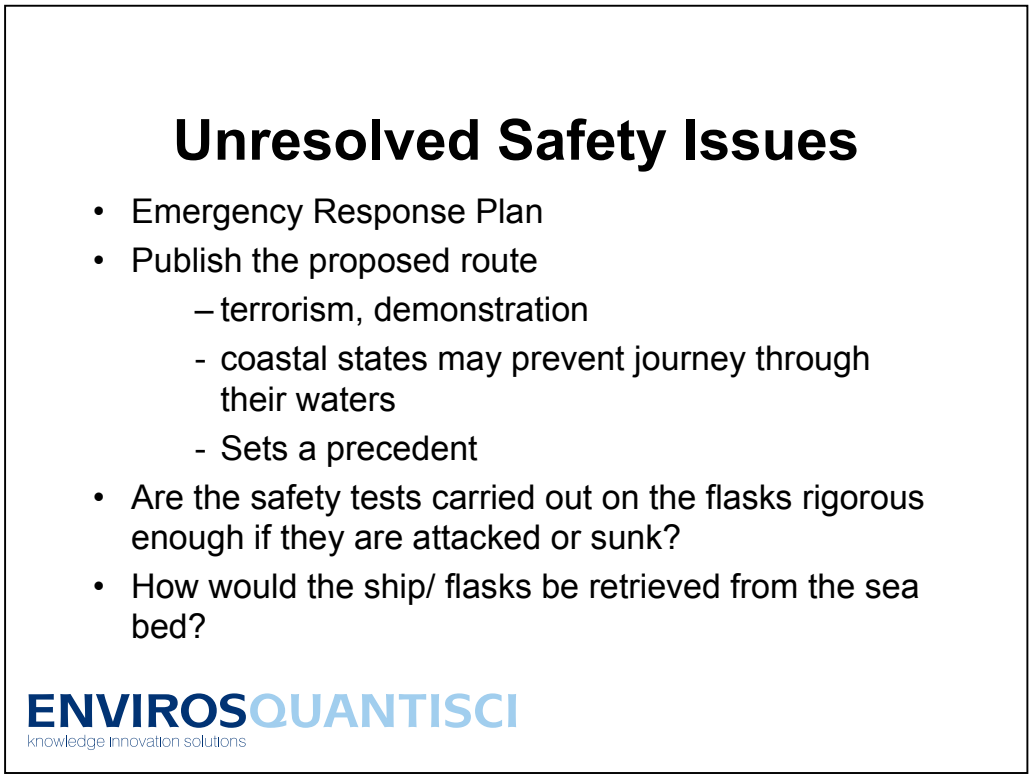
Control is commensurate with the activity being regulated due to the possible magnitude and nature of the hazard. E.g. transport of spent fuel is more rigorously controlled than an x-ray machine because the danger involved is greater.

Licences are issued subject to a number of conditions or limitations which must not be breached to ensure the risk to worker and public safety is kept to a minimum.

Regulators will carry out planned and unannounced inspections, and if the operator does breach a licence condition, it has the threat of penalties, from written warnings to suspension or withdrawal of licences. Continual or serious non-compliance resulting in the release of radioactivity will of course result in more severe penalties.



There is some disagreement over whether a severe accident at sea would be detrimental to the marine environment, and as a consequence, health problems for consumers of marine products.

Operators and some commentators believe that the risk of such an event occurring is so small and the effect of that event would be negligible that it is not something that requires in depth thought, and others believe that these claims are totally false.

The authorising State must have an Emergency Response Plan that is approved by the Government. In the UK, the Office of Civil Nuclear Safety (part of the Department of Trade and Industry) is responsible for security.

There is disagreement as to whether the proposed route should be made available to those States through whose waters the vessel will travel. It is thought that prior notification could endanger the physical protection of the ship, coastal States may veto or prevent entry of the ship through territorial waters, establish a precedent. Accident consequences and retrieval operations would strongly depend on where the accident occurs and the depth to which the ship or waste containers sink.

There are a lot of regulations that apply to UK operators and regulators of radioactive waste transport, such as:

•IAEA Safety Series No 6 Regulations for the Safe Transport of Radioactive Materials 1985 Edition (As Amended 1990)

•"The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form – Amendment 30-00 to the International Maritime Dangerous Goods (IMDG) Code".

•International Maritime Organisation (IMO) International Maritime Dangerous Goods Code (IMDG Code) (Class 7 included) and Supplement.

•The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 (SI 1997 No 2367)

•The Merchant Shipping (Carriage of Packaged Irradiated Nuclear Fuel etc.) (INF Code) Regulations 2000 (SI 2000 No 3216).

•The Dangerous Substances in Harbour Areas Regulations 1987 (SI 1987 No 37).

•The Ionising Radiation Regulations 1999 (SI 1999 No 3232) and Approved Code of Practice and Guidance

Annex 10

Regulatory Support Project

Malgorzata K. Sneve

Norwegian Radiation Protection Authority

Norwegian Radiation Protection Authority

Objectives for the meeting

- Phase I of the Regulatory Lepse Project (RLP)
  - Status on three guidance documents
  - Implementation of the Lepse project
  - Final report and future cooperation in RLP
- Regulatory Support Project
  - Connection to planned industry activities like:
    - new storage facilities for RW
    - decommission of old "Radon" facilities
    - new transport ship for SNF
    - other?

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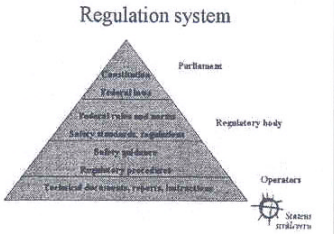
Basic Documents

- Russian legislation and regulations:
  - Standards
  - Guidance
  - Procedures



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Work Programme in RSP

- Review of existing applicable procedures
- Development of missing licensing procedures
- Interaction between regulators and operators
- Procedures for verification of the operators` submission
- Cooperation with other involved parts

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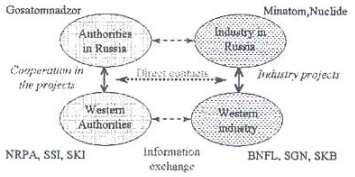
First step

- Regulatory basis needed for the licensing of the special ship for transportation of SNF

Model for cooperation between authorities and industry



Protection Authority

Licensing Process For The Establishment Of A Combined Repository And Storage For Low And Intermediate Radioactive Waste In Norway

Malgorzata K. Sneve

Norwegian Radiation Protection Authority

Norwegian Radiation Protection Authority

Legal Basis

- Act on construction activities
- Act 12 May 1972 on Atomic Energy Activities
- Act 12 May 2000 on Radiation Protection and Use of Radiation
- International Recommendations

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Localization Process

- Map survey – 52 possible sites
- Air photos, geological maps – reduced to 28 possible sites
- Geological assessment and site inspection – reduced to 13 possible sites
- Municipality plans – reduced to 2 sites in the area and one remote site

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Environmental Impact Assessment

- Description of the site
  - Geology
  - Water
  - Fauna
  - Flora
  - Buildings – ownership
  - Cultural monuments
  - Protected areas
- Utilization of the area
  - Business activities
  - Recreation
  - Roads – transport capacities
  - Military use
- Plans for the area
  - Public plans
  - Private plans

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License For Construction

- Application to the Ministry
- The Ministry handles it to the NRPA for assessment
- The NRPA gives its assessment to the Ministry
- Decision by the Government

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Documents

- Safety Analysis Report
- Analysis of Release Scenarios
- Numeric Groundwater Flow Analysis
- Calculations of Design Basis Earthquake
- Calculations of Dynamic Response to Earthquake Loads
- Geological Investigations on Engineering Geology and Hydrogeology
- Waste Inventory Descriptions

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License For Operation

Licensing Procedure as for Construction
Requires Procedures for:

- Transportation
- Stacking
- Encapsulation with Concrete
- Control of Releases
- Dosimetry
- Routines for Visitors

Norwegian Radiation Protection Authority