

# RECYCLING OF NUCLEAR FUEL CARRIERS

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## SUMMARY

Pacific Nuclear Transport Limited (PNTL), a subsidiary company of British Nuclear Fuels Plc (BNFL) have recently completed the recycling of one of its Nuclear Fuel carriers. This recycling operation was carried out in the Netherlands where Health, Safety and Environmental considerations are of a high standard.

The recycling operation was developed to satisfy the Industry Code of Practice for Ship Recycling as well as industry guidelines. The vessel was recycled in two stages. The first under a service contract where ownership of the vessel was maintained and all hazardous substances were removed, and tanks emptied, cleaned and made gas free. The second stage involved the vessel being sold for recycling where ownership was transferred and the ship was cut up.

To enable the vessel to be exported from the UK to continental Europe the ship was exported in accordance with the Transfrontier Shipment of Waste Regulations 1994 which implements Council Regulation (EEC) No 259/93 on the supervision and control of shipments of waste within, into and out of the European Community.

## 1. INTRODUCTION

Pacific Nuclear Transport owned and operated five nuclear fuel carriers. This fleet of vessels have safely and successfully transported nuclear fuel and waste between Europe, America and Japan since 1979. Nuclear material transported by sea must be transported on vessels that meet the Irradiated Nuclear Fuel (INF) code of the International Maritime Organisation (IMO). The INF code establishes three design and construction standards for vessels carrying nuclear cargoes. These purpose built dedicated vessels are designated as INF3 carriers, which is related to the amount of radioactivity carried and equates to the highest standard of safety and protection achievable for the transport of nuclear material.

The MV Pacific Crane was built in 1980 and used to transfer a variety of nuclear materials primarily between Japan and Europe. In 2002 she was withdrawn from service after completing all contractual obligations. After performing an optioning study into possible alternative uses for the vessel including conversion and decommissioning the decision was made to recycle the vessel.

BNFL having developed detailed specifications for ship decommissioning in conjunction with its ship management company tendered for interested Shipyards to carry out this recycling operation. After failing to find a suitable option within the UK to perform this work BNFL's preferred contractor was based in the Netherlands. Through consultation with the UK Environment Agency (EA) and the Marine Coastguard Agency (MCA) part of the UK Department for Transport (DfT), the decision was made to classify the vessel as 'waste' and export through the applicable waste regulations.

## 2. RECYCLING METHOD

### 2.1 BACKGROUND

The recycling method adopted by BNFL was for the vessel to be decommissioned within Northern Europe where health and safety issues, environmental considerations and quality assurance standards are established and can be monitored and controlled.

This approach is not necessarily accepted by all members of the shipping community where vessels can be sold to Third World countries in which standards of worker Health and Safety and environmental considerations are not a priority. Lack of awareness from such yards has led to increased attention from international environmental and workers' rights groups. PNTL and BNFL have determined that vessels will be recycled using the voluntary guidelines developed by the international shipping organisations in the form of the Industry Code of practice on Ship Recycling. This, in conjunction with contracting an established Shipyard with an appreciation of Environmental Health & Safety and Quality Assurance Standards, provided an effective, environmentally sound and publicly acceptable approach to disposal of the fleet of vessels.

### 1.2 SCOPE OF RECYCLING PROJECT

The scope of this project was to develop a strategy that ensured the vessel was as hazard free as practicable, when being sold to a Shipyard for disposal. This approach was adopted to allow a method that mirrors industry best practice as well as incorporating additional BNFL requirements to ensure that the needs of all internal and external stakeholders (customers, Environmental groups, local authorities, etc.) are satisfied.

The process of decommissioning the vessel was performed in three Phases.

## 2.2 (a) PHASE I

The removal of any potentially radiologically contaminated areas of the vessel was performed before the main project and did not involve the recycling contractor commissioned for the final breaking of the ship. Suitably qualified and experienced personnel performed this work in Barrow-in-Furness, Cumbria, prior to the main scope.

## 2.2 (b) PHASE II

The majority of the decommissioning process was separated into two distinct stages. The preliminary stage was the clean-up operation of the vessel being performed where identified hazards were removed. These hazards that cannot be recycled were disposed of in an appropriate manner.

## 2.2 (c) PHASE III

The final stage involved the vessel being sold for recycling where the contractor took ownership and title and was responsible for the physical 'breaking up' of the vessel.

## 2.3 DECOMMISSIONING PROJECT ACTIVITIES

The following activities were performed for the project:

- Identification of hazardous materials on board the vessel in line with those documented in the Industry Code of Practice Hazard List
- Identification of any potentially radiologically contaminated areas of the vessel.
- Develop decommissioning specifications for the removal of hazards and the controlled 'breaking up' of the vessel
- Identification of a suitable Shipyard/location for the associated work to be carried out.
- Removal of any potentially radiological contaminated areas under Health Physics supervision
- Removal of non-nuclear hazards at contracted Shipyard in line with the Industry Code of Practice
- Sell vessel under a Standard Ship recycling contract
- Ensure vessel is disposed of in a suitable manner with respect to EH&S

## 3. APPLICABLE STANDARDS AND REGULATIONS

The standards under which the Pacific Crane was to be decommissioned had to meet the criteria of the BNFL Corporate Policy for the Environment and Health and Safety. All activities undertaken by BNFL were in accordance with the ISO 9001:2000. Those activities undertaken by contractors of BNFL that did not meet the

above standards were performed under additional controls and supervision.

In addition to these controls the regulations applicable to the BNFL strategy for Ship Decommissioning were as follows:

### 3.1 INDUSTRY CODE OF PRACTICE [1]

The Industry Code of Practice for the recycling of ships provides guidelines to ship owners when disposing of vessels. The general overview of the Code is for owners to take responsibility for the impact of selling their vessel for recycling. This involves the removal of all hazardous materials where practicable prior to selling and the de-gassing of all tanks that are not essential for the final voyage. In the event that it would be unreasonable for the owner to remove a particular hazard it is to be clearly identified to the Shipyard accepting the vessel from the owner. The hazardous materials that a responsible ship owner is expected to identify and take responsibility for are outlined in the MARISEC Inventory of Potentially Hazardous Materials.

### 3.2 BALTIC AND INTERNATIONAL MARITIME COUNCIL (BIMCO) [2]

Once the criteria of the Industry Code of Practice have been met the vessels will be sold under a standard international contract for the recycling of ships. The BIMCO Demolishcon contract is used by the industry to sell end-of-life vessels. This contract was used for the sale of the MV Pacific Crane for recycling. The contract Terms and Conditions were amended and agreed to satisfy certain criteria of the waste regulations (see later) and to give BNFL additional control and supervision of recycling activities whilst the vessel is no longer the owner's asset.

### 3.3 IMO MARINE ENVIRONMENT PROTECTION COMMITTEE (MEPC) GUIDANCE [3]

The UN body, the International Maritime Organisation (IMO) has developed guidance literature for the recycling of vessels. This literature outlines the measures and controls necessary to ensure a vessel that has been sold for recycling is dealt with in an environmentally acceptable way whilst ensuring the safety and health of the workers involved in the recycling activities. The guidance is primarily tailored for the organisations based in non-OECD (Organisation for Economic Co-operation and Development) countries.

### 3.4 BASEL CONVENTION [4]

The Basel convention sets out the controls for the transboundary movement of hazardous wastes. Transboundary movements of hazardous wastes are only

permitted if prior written notification by the State of export is given to the competent authorities of the States of import and transit (if appropriate). Shipments of hazardous wastes must be accompanied by a movement document from the point of export to the point of disposal. Hazardous waste shipments made without such documents are illegal. In addition, there are outright bans on the export of these wastes to certain countries. Transboundary movements can take place, however, if the state of export does not have the capability of managing or disposing of the hazardous waste in an environmentally sound manner.

### 3.5 OECD DECISION ON THE CONTROL OF TRANSBOUNDARY MOVEMENTS OF WASTES [5]

The OECD (Organisation for Economic Co-operation and Development) Decision classifies wastes into three categories according to their hazard, green, amber and red. Green listed wastes are classified as non-hazardous and are not subject to controls under the OECD Decision. Red and amber wastes are classified as hazardous and are hence subject to the controls of the OECD Decision.

### 3.6 WASTE SHIPMENTS REGULATION (WSR) Council Regulation (EEC) No. 259/93 [6]

The WSR is the European Unions' regulations that satisfy the criteria of the international agreements and conventions governing the control of waste movements between boundaries including the Basel convention and the OECD Decision.

### 3.7 THE TRANSFRONTIER SHIPMENT OF WASTE (TFS) REGULATIONS 1994 [7]

The TFS Regulations 1994 is the UK Statutory Instrument that satisfies the provisions of the WSR. Although it is not commonly accepted that end of life vessels should be classified as waste, the TFS Regulations provide the legal framework that allows waste to be exported out of the UK for recycling only. It is illegal to export waste from the UK for disposal and therefore only genuine recycling operations are permitted. The TFS Regulations satisfies all the controls and recommendations made in the MEPC guidance.

## 4. EXPORTING AN END-OF-LIFE VESSEL THROUGH WASTE REGULATIONS

### 4.1 WASTE EXPORT APPLICATION

The application for permission to export the vessel under the Transfrontier Shipment of Waste Regulations 1994 can only be made once a legally binding contract for recycling of the waste is in place. BNFL also have a financial guarantee with the UK Environment Agency (EA) that allows the EA to draw upon funds in the event

that the waste needs to be retrieved. This bond is live from the day the waste leaves the Export State until it has been fully processed and the authorities of the Import State are satisfied with the completed work.

The waste export process involves six distinct stages:

#### 4.1 (a) STAGE 1 – PRE NOTIFICATION

The Notifier/Exporter (in this case BNFL) has to identify the Consignee (recycling contractor), the amount of waste, the classification of the waste including its European Waste Catalogue (EWC) number, its physical characteristics, its OECD Classification and Hazard type. In addition to the above the Exporter has to identify the mode of transport and the intended carrier, and the type of operation to be undertaken by the Consignee (i.e. Recycling – it is prohibited to export waste for disposal). The Notification is made up of a standard form containing the above data and the supporting information required by the competent authorities (as identified by the Secretariat of the Basel Convention). The Notification is made to the competent authorities of the Export and the Import State, including the financial guarantee, copies of the recycling contracts, evidence that “Genuine recovery” (i.e. the waste is to be recycled and the import country can make more use from the material than the cost of disposing of residue wastes) will take place. The Notification process incurs a nominal fee that has to be paid upon submission.

Once the competent authority of dispatch has reviewed the financial guarantee and accepted its value, they will issue a certificate of satisfaction to all parties. This certificate signifies to the competent authority of the receiving country that a suitable amount of funds in the form of the guarantee have been made available. Upon receipt of this certificate the competent authority of the receiving country will issue a formal acknowledgement of receipt for the Notification package. This signifies the start of a 30-day technical review of the waste export application.

#### 4.1 (b) STAGE 2 – 30-DAY CONSENT PERIOD

During the 30-day technical review of the waste application, the competent authorities can request any additional information they require at any time. This is to aid them in determining whether or not the waste is going to be processed in an environmentally acceptable manner and that there is clearly defined legal responsibility for the waste at all times. Primarily this process is to allow the competent authorities to investigate the licences of the parties involved ensuring that they have suitable waste management permits.

#### 4.1 (c) STAGE 3 – CONSENT

If the competent authorities are satisfied with the application that consent is given at the end of the

technical review allowing the waste transfer to take place.

#### 4.1 (d) STAGE 4 – MOVEMENT/TRACKING PRE-NOTIFICATION

To allow the competent authorities to track waste movements between states the Exporter submits a Movement/Tracking pre-notification. This identifies the waste and refers to the consented Notification Package; this has to give the authorities at least three days notice before the waste is transferred. The Movement/Tracking form also identifies the exact amount of waste and the carriers responsible and methods of transport for transferring the waste to the Import State. The Movement/Tracking form travels with the waste at all times.

#### 4.1 (e) STAGE 5 – ACCEPTANCE OF WASTE BY THE CONSIGNEE

Upon receipt of the waste, the Consignee completes the Movement/Tracking form and informs the competent authorities that they have taken responsibility for the waste.

#### 4.1 (f) STAGE 6 – CERTIFICATE OF COMPLETION

Once the recycling operation has been completed the Consignee submits a certificate of completion to the competent authorities informing them that the waste has been fully recycled. The certificate also releases the Exporter from the financial guarantee. In the case where steel is being exported for recycling there is a 180-day time limit to recycle the material from the day of arrival in the Import State.

#### 4.2 EXPERIENCE OF EXPORTING AN END-OF-LIFE VESSEL THROUGH TFS

BNFL located a contractor with experience in ship conversion and repair that had all applicable licenses for processing the wastes identified as being on the vessel. The contractor had also identified a licensed sub-contractor with demonstrated experience in recycling ships of various sizes and tonnage. Contracts were put in place and the process of exporting through the regulations as outlined in section 4.1 was carried out.

At the end of the Technical Review Period [4.1 (b)] BNFL's export application was rejected on the basis that the consignee (Dutch Shipyard) did not have a suitable license for a 4000te quantity of waste (i.e. the ship). The shipyard's licenses only covered the activities for ship repair/conversion and the wastes associated with such activities. BNFL jointly approached both the competent authorities of the UK and the Netherlands to ensure they were fully aware that the only wastes being processed at the shipyard were those that had been removed in larger

quantities during previous contracts at the yard and that the majority of the 'waste' (steel) was to be re-located to the subcontractor who had licenses to process up to 40,000tes of steel a year. This approach unfortunately failed and alternative options had to be developed.

To allow the project to continue and to enable the vessel to be exported in accordance with the waste regulations the contract structure for the decommissioning had to be modified. Through discussions with the Dutch contractor and sub-contractor it was agreed that BNFL would contract the sub-contractor (ship recycling facility) directly who would in turn sub-contract the cleaning/hazard removal work back to the main contractor (the shipyard). This then assured that the new consignee (the recycling contractor) had licenses to receive and process the wastes identified in the export application. The shipyard was then brought into the recycling contractor's facility to carry out the cleaning/hazard removal activities required by BNFL to satisfy the Industry Code of Practice before selling the vessel for recycling. Operationally this was not as ideal as the original system as the shipyard had to work away from its own yard without its own facilities.

A second application was made to the competent authorities using the above structure and this was granted to allow the export to take place through the TFS regulations. In total the process of making the applications to the competent authorities delayed the project by nine months. It also worth noting that once a vessel has been classified as 'waste' it is not necessarily possible for that vessel to be taken into a shipyard for any activities.

## 5 DECOMMISSIONING THE MV PACIFIC CRANE

Once export licenses had been granted the vessel was prepared and towed to the Netherlands. Upon arrival in the Netherlands the shipyard performed Phase II the cleaning/hazard removal activities in line with the decommissioning specifications. This was performed under a service contract to BNFL who maintained ownership and liability of the asset. All works carried out were performed under the supervision of BNFL's ship management company. As each identified waste was removed, quantities and type were documented and copies of all certificates and receipts from specialist waste contractors were provided to BNFL. This demonstrated that the wastes identified in the decommissioning specifications were all accounted for and could be shown to be going to licensed facilities, giving BNFL a suitable audit trail.

Upon completion of Phase II (an eight-week process) the vessel was sold for recycling to the ship-recycling contractor. At this point ownership of the vessel was transferred to the contractor, although BNFL still maintained the liability under the TFS regulations.

Although the asset was no longer BNFL's the Demolishcon contract allows for site visits by the 'owners' to ascertain that the recycling is being carried out in accordance with environmental legislation. This gave BNFL the confidence that the operation was being carried out in an appropriate manner and that the 180-day time limit for the export and recovery of steel would not be exceeded such that BNFL became liable to the EA for the financial guarantee. The recycling contractor cut the vessel into sections, using a combination of hydraulic pincers and oxy-acetylene torches, and transferred into a neighbouring steel mill for onward recycling.

Once the recycling operation was complete and the contractor fulfilled its obligations under the TFS regulations to provide the competent authorities with a certificate of completion [section 4.1 (f)], BNFL applied to the UK Environment Agency to be released from the financial guarantee and the associated liabilities for the 'waste'. Upon being released from these liabilities BNFL closed out the project on the decommissioning of the MV Pacific Crane.

## 6 CONCLUSIONS

To enable an end-of-life vessel to be exported through the waste regulations that implicitly satisfy the international conventions and agreements on handling waste is a time consuming and expensive process. It relies on being able to find interested facilities with suitable licences, which are rare within Europe. By exporting through this system it provides the owner of an end-of-life vessel, a legal framework with the backing of environmental competent authorities. Use of these regulations demonstrates that the operation has been fully reviewed and that no local, national nor international laws for waste management are being breached.

BNFL does not advocate that this is the 'correct' way to recycle an end-of-life vessel, merely that it provided BNFL with a solution to ship decommissioning that would be acceptable to a broad range of stakeholders. In addition in the absence of any definitive UK policy or international legislation on the recycling of ships it presented BNFL with a system that was successful and enabled the safe, environmentally considerate and quality controlled decommissioning of the MV Pacific Crane.

## 7. REFERENCE MATERIAL

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## 8. AUTHORS BIOGRAPHY

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