 OPERATING EXPERIENCE IN NUCLEAR TRANSPORT
FOR THE FRONT END OF THE FUEL CYCLE

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ABSTRACT

The fuel and enrichment divisions within BNFL are involved in some 4,000 lorry journeys per year covering the transport of non-irradiated fuel elements as well as the feed materials and intermediate products of the front end of the nuclear fuel cycle. The range of materials being carried means that a variety of methods of carrying and containment are required.

Further, the number of receipt and delivery points means that the facilities need to be simple and the techniques employed chosen to give maximum flexibility. There is thus much scope for improvement or optimisation of routine transport.

For the non-routine, simple statistics imply that traffic incidents, involving front end nuclear materials, will occur during transport operations. Because of the public perception of risks, it is necessary for operators to improve upon the law of averages by careful procedures and the training of operators, including sub-contractors. Contingency plans have to be laid to cover the cases where even these procedures prove inadequate. These plans require international collaboration since the consequences of an incident will not be restricted to carrier.

The record of transport for the front end of the nuclear fuel cycle is a good one, but the scale of operations and the quality of the achievement are not necessarily appreciated by the general public. There needs to be a constant striving for excellence in procedures and a willingness for international collaboration if the nuclear transport industry is to build upon its good record, and retain the public confidence necessary for continued operations.

INTRODUCTION

Transportation for the front end of the nuclear fuel cycle can often seem to be the poor relation of irradiated fuel transport. Crashing a train to demonstrate the safety of the movement of irradiated fuel is an
event which can catch the imagination of the media since the design and construction of the containers required sets challenges for engineers and the existence of fleets of ships designed specifically for their movement give it a touch of glamour. In contrast the movements of materials at the front end of the fuel cycle can seem dull and routine. The unhindered movement of uranium in all the forms necessary for the front end is however a vital part of the fuel cycle. Ensuring that it remains dull and routine is a demanding challenge which must be met by all the fuel manufacturers and enrichers throughout the world. This paper reflects upon how one operator, BNFL, has met those challenges.

FUEL CYCLE OPERATIONS

BNFL offers a complete fuel cycle service. Through its operating divisions it covers all aspects of the fuel cycle from the receipt of uranium ore· concentrate (UOC) through to the production of metal or ceramic oxide fuel elements including the enrichment processes required for such elements. It also encompasses the reprocessing of elements after irradiation and the return of the products of reprocessing into the fuel cycle. Two of its divisions, the Fuel Division and the Enrichment Division cover the front end of the fuel cycle. The Fuel Division is centred at Springfields, near Preston, where UOC is converted to either the metal fuel elements required for the Magnox reactors or ceramic oxide elements for a variety of reactors. The site also exports natural uranium hexafluoride as an intermediate product for enrichment plants as well as enriched uranium dioxide powder and pellets as intermediate products in the enriched cycle. The Enrichment Division is centred on Capenhurst, near Chester. BNFL is a partner in the URENCO enrichment organisation and the site at Capenhurst houses one of that company's three centrifuge enrichment facilities.

The UK has no commercially mined uranium deposits and therefore BNFL relies entirely on imported uranium which it receives from sources worldwide. The majority of the uranium hexafluoride (hex) conversion is for export and the material is transported to enrichment facilities in the United States, France and Russia as well as to the URENCO factories. URENCO itself is an international partnership with world wide contracts. The conversion of enriched hex to powder is achieved at Springfields through the integrated dry route (IDR) process. Half of the material from this facility, some 3,500 tes, has been exported to destinations throughout Europe for use in BWR and PWR facilities. BNFL have also supplied pellets as an intermediate product. In addition to the Magnox and AGR fuel elements distributed to reactors throughout the UK, BNFL have supplied magnox elements to Italy and Japan, fuel elements to the Fast Reactor Station at Dounreay in Scotland, PWR assemblies to the United States, BWR assemblies to Europe, as well as the SGHWR fuel elements to the reactor at Winfrith.

To cover these activities at the front end of the fuel cycle BNFL is a transporter in its own right with its own prime movers and a variety of standard and purpose designed containers. It also makes extensive use of transport sub-contractors. It delivers to the majority of European countries as well as to the United States, Russia and Japan. It makes use of road, air and sea transport, both load-on/load-off and roll-on/roll-off. In all, the front end transport movements involve some 4,000 lorry journeys per year, carrying total receipts and despatches from the Springfields and Capenhurst sites of over 15,000 tes of uranic products per annum.