Collaborative delivery of complex multi modal transport solutions

Authors –

Colin Turner BEng CEng IMechE

Senior Transport Operations Manager - International Nuclear Services (INS)

Tony Hewitson

Head of Production Planning - Direct Rail Services (DRS)

ABSTRACT

As wholly owned subsidiary companies of the Nuclear Decommissioning Authority (NDA), both Direct Rail Services (DRS) and International Nuclear Services (INS) have extensive and proven experience and expertise in the transportation of nuclear materials both in the UK and around the world.

DRS has safely transported nuclear material over 5 million miles by rail on behalf of the entire UK nuclear industry, whilst INS and it's subsidiary, Pacific Nuclear Transport Limited (PNTL), are recognised as the world's most experienced nuclear shipping company having delivered over 180 shipments of new & spent fuel, active waste and specialist nuclear material over their 40 year history.

This paper explains how DRS and INS have worked together extensively to successfully develop and deliver innovative multi-modal transport solutions for spent fuel, high level waste, MOX fuel and other special nuclear materials both domestically and for import / export. The long standing partnership between INS and DRS has resulted in the establishment of effective working relationships providing a high level of familiarity; enabling a valuable awareness of their respective policies, procedures, processes and expectations. These relations have proven crucial in challenging circumstances.

The paper will provide examples of how this affiliation has supported the ability to adopt a proactive, standardised and effective approach to enable reliable, safe and secure delivery and will include –

- How sharing of best practice supports planning, process improvements, interfaces and alignment.
- Sharing of resources supporting efficient working during peak demand.
- Good levels of communication supporting effective working practices.
- Focus on 'right first time' principles.
- Development of capabilities supporting improved asset efficiency.
- Maintaining and advancing a high performing, flexible and diverse workforce.

1. INTRODUCTION

Nuclear material transports happen on a daily basis across the world without significant incident, which in part is as a result of compliance with stringent regulatory requirements. Having significant experience in the industry, INS and DRS specialise in the movement of quantities of nuclear material to include Spent Fuel, MOX Fuel and High Level Wastes which are classified within security categories I, II & III.

The safety and security of the public, environment and hazardous materials are paramount throughout each stage of the nuclear fuel cycle however it is recognised that radiological material is most susceptible during transportation in the public domain, outside the confines of site boundaries where a number of permanent layers of security and safety measures exist. The key objectives of all involved during a transport are to protect the public and environment from radiological release, unauthorised material removal and sabotage, focusing on transporting the cargo from origin to destination without delay. As a result the planning and implementation of nuclear cargo transports are complex operations completed by highly trained individuals conforming to the requirements of statutory regulatory bodies in the UK such as the Office of Nuclear Regulation (ONR), Civil Nuclear Security (ONR-CNS), Department for Transport (DfT), Office of Rail and Road (ORR) and international regulations to include:

(a) IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6)
(b) IMO International Maritime Dangerous Goods Code (IMDG Code)
(c) International Code for the Safe Carriage of Packaged Nuclear Fuel, Plutonium and High-level Radioactive Wastes on Board Ships (INF Code)
(d) United Nations Convention on the Law of the Sea (UNCLOS)
(e) OTIF Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID)
(f) IAEA Security in the Transport of radioactive Material (Nuclear Security Series No. 9)
(g) IAEA Security of Nuclear Material in Transport (Nuclear Security Series No 26-G)

The physical movement of nuclear materials are highly visible events however transports, whether by road, rail or sea form only a small element of an overall project that in a number of instances are the culminations of years of planning. One key strategy aim of any nuclear shipment is to minimise the length of time the material is in transit due to the potential hazards involved, therefore the focus is on the requirement to complete each task safely, effectively and efficiently to schedule.

This paper will discuss the end to end process supporting the successful delivery of multi modal nuclear material transports and how the two companies are constantly developing improvements to working practices via simplification and standardisation through an established collaborative partnership, as illustrated in Fig.1. As sister companies, INS and DRS explore opportunities to work together supporting the continued development and improvement of their respective business approaches in order to adapt to changing circumstances in the commercial, political and regulatory landscapes.

Fig 1 – INS/DRS Combined Logo

2. EXPERIENCE

DRS was established in 1995 as a lynch pin supplier of transport and associated services to the nuclear industry. Recognised as the first choice provider for specialist rail transport solutions, demonstrating industry-leading expertise in the movement of Spent Nuclear Fuel, Decommissioning Waste and Nuclear Construction support, the company is the only operator in the UK to have achieved approval to carry nuclear material by rail.

Based in Carlisle, DRS have in excess of 30 operational depots and offices throughout the country responsible for the operation and maintenance of their fleet of locomotives and rolling stock.

Fig 2 - DRS Locomotive (Class 68)

INS has extensive and proven expertise in irradiated fuel management and transporting nuclear materials. Offering world-leading solutions to global nuclear transport challenges, INS began life as the Spent Fuel Services and Transport Division of British Nuclear Fuels (BNFL) and following the companies formation in 2008, with offices in the UK, France and Japan, in addition to a dedicated secure marine terminal at Barrow-in-Furness has developed into the recognised and respected brand

for the safe and reliable transport of nuclear material where high level nuclear security and/or political focus is a priority.

Established in 1975, PNTL has been a subsidiary of INS since 2008 and is acknowledged as the world's most experienced nuclear shipping company with assets consisting of three purpose-built specialist nuclear transport vessels classified by International Maritime Organisation (IMO) at the highest level of INF-3, with two of the vessels being equipped with permanent armament for secure nuclear transports.

Transporting nuclear materials provides complex and often controversial challenges which require huge expertise and meticulous preparation. INS and DRS have over 20 years experience of working together developing and delivering complex multi-modal transports globally in support of NDA Strategic objectives, whilst completing significant shipments assisting foreign governments efforts to reduce global threats associated with certain materials.

Fig 3 - PNTL INF3 Vessel – Pacific Egret

Both companies have unrivalled expertise in developing tailor-made transport solutions as a result of the continued delivery of both established contracted business and unique opportunities that meet the stringent safety and security demands of the nuclear industry.

3. WORKING TOGETHER – THE PROCESS

Each shipment opportunity is planned meticulously, with the transports broken down into three key phases (Fig 4) providing assurance of compliance with applicable requirements of transport, safety and security regulations in addition to certified and approved and ISO accredited company Quality Management Systems (QMS).

The lead time for a transport is dependent upon a number of factors, which can include stakeholder input, alignment with client requirements, asset availability, location(s) and the proposed transport schedule. Less onerous transports can be implemented within 3 months, with the low lead time being attributed in part to a number of factors to include; low security categorisation, repeat business, regulatory approvals and existence of assets. For more complicated transports, planning can be a minimum of 12 months and sometimes in excess of 2 years in the making.

During an examination of associated working practices, INS & DRS identified a common approach to the management, development and delivery of transports, supporting the alignment of key tasks.

3.1. Planning

Developing an opportunity ahead of shipment planning may involve the undertaking of feasibility studies by the subject matter experts. These consist of appropriate individuals from commercial and operational sections developing transport solutions as necessary ensuring that all delivery options are appropriately assessed, considered and developed, culminating in an agreed transport scope. From this, the contractual terms & conditions are approved with the client and sub-contracting agencies.

From a transport perspective, the planning phase is crucial in setting the foundation for the delivery of a successful project. Scope, costings, schedules, responsibilities and deliverables form part of the contract deliverables, which are agreed with the customer and relevant stakeholders, culminating in the generation of work packages which are delivered during the subsequent phases following completion of assurance reviews in the form of Quality Gate assessments.

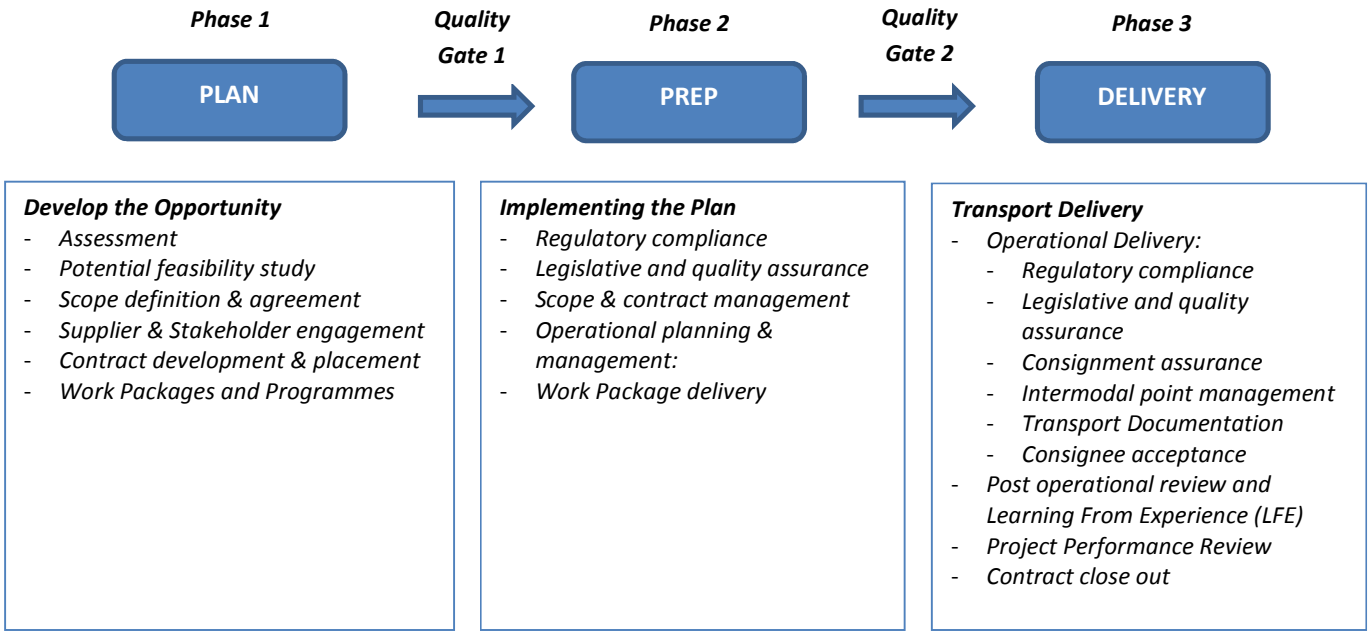

Fig 4 - INS Transport Process

3.2. Preparation

The transport preparation phase sees the implementation of the project plan by the delivery functions. As key members of these departments have been previously involved in the transport planning phase, this continuity supports the ability to deliver the product efficiently and effectively. Transport delivery proceeds following the completion of a quality assurance review where key elements relating to safety aspects of nuclear transports, including all transport modes and multi-modal transfer points are assessed and approved.

A number of projects rely upon the usage of existing systems, assets and infrastructure that form part of INS & DRS primary business. Both companies have endeavoured to continually improve these elements with the aim of reducing associated costs, risks and liabilities.

3.3. Delivery

Delivery is the final element of a transport and consists of the physical movement of the cargo from the consigning site to the final destination. This phase often involves international export, passing through numerous intermodal transfer points (Fig 5). As previously discussed, radiological material is susceptible during transportation within the public domain therefore the delivery plan must be robust and agreed between relevant parties as authorisation to proceed with a shipment is only granted following the completion of compliance, quality and safety status reviews.

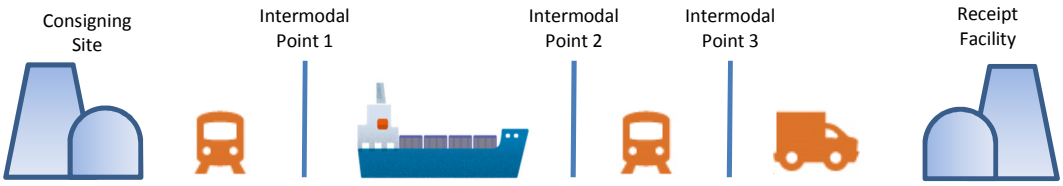

Fig 5 - Multimodal Transport example

Once the physical transfer of material has been completed, a thorough review of the overall shipment is performed. Involving each individual stakeholder the overall process is evaluated to determine areas of good practice and identification of potential improvements going forward. INS & DRS incorporate the relevant key outputs into their respective working practices as part of continual improvement in accordance with Plan, Do, Check, Act (PDCA) principles.

Fig 6 - Multimodal Transfer (INS, DRS & PNTL)

4. DEVELOPING BEST PRACTICE

As part of the NDA family, INS and DRS are actively encouraged to maximise any opportunities that come from working together effectively, adding value through standardisation, simplification and collaboration whilst utilising expertise across the group. In support of this, the two companies have formed a strategic partnership, enabling both organisations to profit from the knowledge and expertise gained through their respective experience within the nuclear transport industry.

In support of the transport of nuclear cargoes, INS & DRS operational departments undertook a review of some key areas of their respective organisations to include; structures, systems, policies and procedures. The objective was to identify best practice, synergies, transferable efficiencies and productivity improvements within each company, enhancing quality, cost, safety and delivery. A key output from this review supported a full process mapping exercise and structural change within DRS, building on processes and systems currently implemented by INS.

4.1. Management of Commercial Opportunities

A key benefit of the long standing partnership between the two companies has been the development of strong working relationships at both the commercial and operational levels. Through trust and mutual respect, DRS and INS support a pro-active approach in the development and delivery of improvements throughout their respective businesses.

As previously highlighted in section 3, lead-times associated with a transport can vary, with a significant factor being project scope and complexity. Novel elements of a transport to include location, conveyance, asset availability and security requirements in addition to the political climate and public perception all have the potential to impact the work content and delivery of a shipment. In order to reduce lead-times, INS and DRS have focused on streamlining and standardising their front end working practices. Examples of improvements include:

- Functional teams and subject matter experts are engaged at the outset forming part of the contract working group ensuring a consistent and transparent approach to delivery. The implementation of a graded approach to project management, involving key personnel appropriately results in effective resourcing whilst members benefit from a holistic view of project requirements.
- Contract development, scope and approval involve all members of the contract working group, ensuring legislative and regulatory compliance, whilst promoting ownership through defined responsibilities.
- Opportunities are assessed against standard criteria, supporting the business strategy.
- Utilisation of existing agreements.
- Long standing relationships supports good communication and knowledge of expectations.

4.2. Asset Management

As a transport company, INS is responsible for a number of rail related assets which have historically been managed by third party suppliers. This resulted in INS becoming dependent upon external companies for the maintenance and inspection of key assets to include rail infrastructure at their Barrow Marine Terminal (BMT) adding both risk and cost to their asset management programme.

Collaborative working has provided INS in particular with a number of opportunities to realise the advantages associated with the utilisation of skills and expertise within the partnership. As a result, DRS have provided support to INS on a number of key improvements activities supporting asset management.

- As subject matter experts, DRS provided support to INS in the development and implementation of a lifetime extension plan for BMT. The ability for INS to seek an impartial professional view from within the NDA family based on a wealth of knowledge and

experience of previous projects ensured that the lifetime extension plan and associated spend forecast was realistic and commercially unbiased ensuring improved budget forecasting whilst supporting best value for the customer and the taxpaying public.

- DRS' expertise on rail infrastructure resulted in the ability for INS to develop employee skills by bringing the maintenance of the BMT railway system in-house. DRS supported INS during the improvement process through the provision of training and sharing of best practice, relating in particular to the development of maintenance and inspection procedures. DRS now complete competent body assessments of the INS rail system, verifying compliance.

  Overall this improvement will result in cost savings of between £45k-£90k over the asset lifetime, with the added benefits of developing INS members and utilising spare resource capacity.

- During the system review, an opportunity for collaborative working in the development and implementation of respective Asset Management Systems (AMS') was identified. As both companies were in the process of specifying AMS', it was agreed that there were potential benefits in working together with a focus on delivering appropriate and effective systems through shared learning in support of reliable and cost effective asset lifetime performance.

4.3. Operational Planning

As previously discussed, the physical transportations of nuclear materials within the public domain are highly visible and complex operations requiring substantially qualified personnel to develop, approve and put into action a series of meticulously planned events without delay.

Through the development of long standing relationships, DRS and INS have worked together to refine their respective systems, focusing on the delivery of compliant transports for stakeholders safely and securely ensuring each element is completed on a right first time basis.

INS and DRS have benefitted from combining areas of the planning process in preparation for the efficient delivery of a number of transports. Examples include pre-transport trials and advanced infrastructure inspections examining asset performance at each intermodal transfer point whilst verifying logistical and operational plans. Comprehensive reviews of systems and procedures in the form of table-top assessments support operational readiness in addition to emergency response exercises concentrating on the testing of agreed contingency plans.

This approach has ensured a focus on continued improvement in each organisation gaining an understanding and awareness of the constraints and impacts which may affect each element of a transport.

In addition to these steps, a number of improvements have been developed in support of the effective delivery of a multi modal transport.

- Established operational teams – designated key personnel promoting good communication, working relationships, clear expectations, trust and respect. Each party being familiar with key points and associated constraints enabling active risk management and mitigation.
- Standardised practices – a series of standard documents and procedures have been developed between both parties, in accordance with legislative requirements and best practice which

have supported improvements in compliance, quality, communication and delivery. The Work Packages include scheduling, lifting and loading plans, locomotive configuration plans, defined roles and responsibilities to include inspection and transference procedures.

- Shared working environments – offices and infrastructure are shared as required with personnel security cleared appropriately. This allows controlled but unrestricted access which would not normally be experienced with two separate nuclear transport organisations. Again this simplification and standardisation supports good communication and working practices in addition to reducing restrictions which under normal circumstances can result in increased costs to the customer.
- Stakeholder engagement and management – each organisation actively engages with local, national and international stakeholders, to include institutions, organisations, anti-nuclear groups, regulators and governments demonstrating their commitment to providing and continually improving their high level of services resulting in increasing stakeholder confidence.
- Collaborative planning – INS and DRS have created and implemented agreed planning protocol resulting in the development and delivery of a single cohesive contingency and mitigation plan. Recent operations have seen DRS and INS create a combined command and control structure which monitors operational transfer from start to finish. Developed further this has also offered the opportunity to present such plans and measures to the regulator as a single offering. The regulator view is one which recognises one plan, developed and delivered by one team. The client view is one of a cost effective and collaborative approach by multiple stakeholders with the clients' needs being the priority.

The examples given within this paper demonstrate the benefits achieved to date as a result of a proactive approach to collaborative working between two organisations focused on delivering safe, secure and compliant transports on behalf of their customers and stakeholders. DRS and INS are committed to the continual development of these services and are actively progressing towards the next phase in their strategic partnership.

5. MOVING FORWARD

In September 2017 the NDA signalled a desire to bring its transport capabilities closer together as part of a wider simplification of business units across the group. 'Moving Forward' comprised of members from DRS and INS and aspired to explore options for simplifying governance arrangements between the two organisations focusing on key areas to include improving collaboration, the sharing of resources & good practice in addition to identifying opportunities for the utilisation of both organisations extensive expertise improving our UK and international offering.

Through Moving Forward it is envisaged that an effective strategic partnership can be created to offer:

- Value to the organisations through resource sharing in principle areas such as safety, security, quality and operations
- World leading experience in the transportation of radioactive materials
- Simplification of governance to further enhance collaborative working
- Joint consultancy offering combined expertise to the international marketplace

5.1. Strategic Partnership

The recommended outcome of the Moving Forward project was to introduce a 'Strategic Partnership' between the two transport units within the NDA, this involves the implementation of a partial integration allowing both DRS and INS to benefit from the advantages associated with closer working.

The Strategic Partnership will provide employees of both organisations the opportunities to work within each company, learning about the business, supporting personal development, and enhancing business offerings whilst working together to identify efficiencies and maximise commercial opportunities where it is appropriate to do so.

Some great examples of this include roles within our Legal, Procurement, Health and Safety and Project Management departments. HR teams in both organisations are working together to share best practice and to provide advice and guidance on issues where specific expertise is required, therefore it's become clear that this sharing of resources and expertise is having significant benefits for individual employees, and for both organisations.

5.2 Simplification of Governance

NDA, DRS and INS agreed to simplify current governance arrangements to ensure clear lines of accountability to the NDA, and support the development of an NDA Group-wide Transport Strategy.

This has led to the DRS and INS boards working more closely together resulting in a shared Chair and Non-Executive Director in addition to the respective Managing Directors attending each company's Board meetings as observers.

5.3 Consultancy

Due to the unique skill sets, extensive experience and capabilities present within INS and DRS, as a result of the 'Moving Forward' review, both organisations will work together to develop new business and deliver a world-leading consultancy service to domestic and overseas companies operating within the nuclear industry. Product offerings and service will include:

- Concept design and package licensing
- Training and competences
- Cyber security and information management
- Security planning and emergency response
- Multi-modal transport solutions

6. REFERENCES

Nuclear Decommissioning Authority (NDA) Strategy – effective from April 2016

Direct Rail Services (DRS) website – www.directrailsrevices.com

International Nuclear Services (INS) website – www.innuserv.com