Reprocessing in the UK – the history, the present and the future

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Mark Jervis, Managing Director
International Nuclear Services Ltd

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Introduction (1) - International Nuclear Services

- International Nuclear Services (INS) is a subsidiary of the UK's Nuclear Decommissioning Authority (NDA).
- The NDA was established by UK Government in April 2005.
- NDA owns the UK assets/sites previously owned by British Nuclear Fuels plc (BNFL) and the UK Atomic Energy Authority (UKAEA).
- NDA has the following key roles:
  - Safe and cost effective decommissioning and clean up of UK civil public sector nuclear sites.
  - Optimising value from operation of its commercial assets (recycling and electricity generation).
- INS:
  - manages all of NDA's recycling and transport contracts with UK and international utility customers.
  - provides international transport services in support of recycling contracts, including operation of a fleet of INF2/3 ships, transport casks, etc.

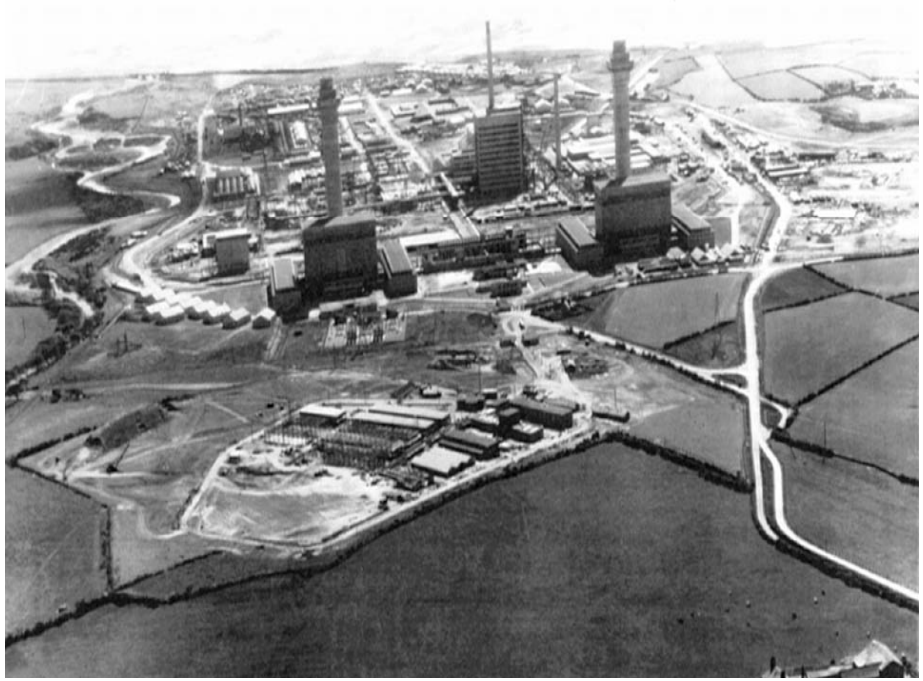
Introduction (2) - UK Reprocessing

- In the United Kingdom:
  - Over 40 years of reprocessing experience.
  - UK has continued to reprocess throughout this period notwithstanding the many political, regulatory, social and market developments in the UK and internationally.
  - Also, there has been substantial UK investment in infrastructure to support ongoing reprocessing operations.

History of Reprocessing in the UK (1/2)

- Reprocessing developments started in the UK in the 1940s, with large scale development during the 1950s.
- Subsequent industrialisation of reprocessing in the UK focused on support to the Magnox reactor programme.
- The current Magnox reprocessing facility started operation in 1964 and, with significant upgrade/refurbishment, continues to operate today.

Sellafield in the 1940s and 1950s



History of Reprocessing in the UK (2/2)

- In 1977, given the prevailing reactor developments, the then Sellafield site owner/operator, British Nuclear Fuels plc (BNFL), applied for planning permission to construct an oxide fuel reprocessing plant (Thorp).
- Significant investment in Thorp (£1.85Bn) and associated infrastructure (approx £1Bn) largely funded by UK and international utility customers.
- Thorp, which commenced active shearing on 27 March 1994, continues to operate at Sellafield.

Sellafield today

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Status of Reprocessing in the UK today

- The UK has the capability to store and reprocess Magnox, AGR and LWR spent fuel.
- The two reprocessing plants in the UK, Magnox and Thorp, continue to operate in support of UK and overseas recycling commitments.
- Over 50,000 tonnes of irradiated fuel has been reprocessed at Sellafield during the past 40 years.
- The recycle of uranium and plutonium products from UK reprocessing has been demonstrated and continues.
- Low, Intermediate and High Level Waste treatment and storage facilities also operate at Sellafield in support of reprocessing activities.
- Returns of High Level Waste to overseas customers, in accordance with UK Government policy, commence in 2009.
- UK offers simplified single form waste return through waste substitution. An additional quantity of radiologically equivalent high level waste is returned in lieu of low and intermediate level wastes.

Current UK Spent Fuel Management Strategy

- The current UK strategy for spent Magnox fuel is reprocessing.
- The Magnox reprocessing plant at Sellafield is planned to continue operations until around 2016.
- AGR fuel continues to be stored and reprocessed at Sellafield.
- Reprocessing of overseas LWR fuel also continues at Sellafield in line with existing contractual arrangements.
- Plans for later AGR spent fuel arisings currently involve the long term storage of AGR fuel, pending treatment and ultimate disposal.
- Fuel from the UK's only PWR is currently stored at reactor, with capacity for around 30 years of spent fuel arisings.

Future of Reprocessing in the UK (1/2)

- The future worldwide development of nuclear power and associated decisions for spent fuel and nuclear materials management will depend on a range of political, environmental, economic, resource and social considerations by utilities and governments around the world.
- In the UK, a “new build” reactor programme is gathering pace (eg. Recent land sales at and around existing licensed sites).
- UK planning assumption is that “new build” spent fuel arisings will not be reprocessed.
- However, the UK Government has stated that any proposals for new reprocessing would be “considered on their merits” and would be subject to public consultation.

Future of Reprocessing in the UK (2/2)

- The future of reprocessing in the UK beyond current plans could be influenced by many factors including:
  - **Economics**
    - value to UK
    - economics of recycle vs disposal option (including U price and availability)
  - **Political environment**
    - UK Government policy considerations (current policy to consider and consult on any proposals on their merits)
  - **Investment in existing and replacement infrastructure**
    - longer lead times/higher level of investment required if reprocessing services cannot utilise existing assets/infrastructure
  - **Public attitudes to nuclear recycling**
    - recycling provides greater energy security
    - recycling in non-nuclear applications (eg. Household waste) seen as environmentally friendly
    - key issues for opponents of nuclear recycling have been environmental impact and perceived proliferation risk
  - **Environmental impact**
    - Industry operates within strict regulatory limits
    - considerable steps taken to reduce discharges (e.g. Tc99)
  - **Security and safeguarding of separated nuclear materials**
    - UK and other reprocessing nations have demonstrated proliferation risks can be properly and effectively managed
  - **Continued availability of transport routes for spent fuel/nuclear material**
  - **Level of future international cooperation in developing nuclear recycling solutions**

Examples of recent investments in UK infrastructure

Thorp salt free evaporator

Pacific Heron INF3 class vessel

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Summary

- The UK has a long history of providing reprocessing services for UK and international utility customers.
- The current strategy in the UK continues to support reprocessing for existing spent fuel arisings and international contracts.
- The future of reprocessing beyond current plans will depend on many factors, including political, economic, environmental, regulatory and public acceptance factors.
- New reactor build programmes are gaining momentum in the UK and back end solutions will be needed for new spent fuel arisings. Current planning assumption is not to reprocess spent fuel from “new build” programme.
- However, reprocessing and recycling of spent fuel is one of the key spent fuel management options that is proven and currently available.