10 MANAGING THE CONSEQUENCES OF PAST PRACTICES

In recent years, many Agency Member States increased their efforts to improve upon past radioactive waste management practices and to remediate contaminated sites. This Section of the Status and Trends report provides some examples to illustrate the diversity of the problems faced and the solutions implemented. Some programmes dealing with nuclear legacies, while nationally based, involve intensive international co-operation.

10.1 Russian Federation - Dismantling Nuclear Powered Submarines and Management of Associated Spent Fuel and Radioactive Waste

The end of the Cold War left the Russian Federation with a significant legacy of radioactive waste and spent nuclear fuel (SF) as well as numerous retired nuclear submarines and nuclear service ships. The Russian Federation is experiencing major problems related to the remediation of this nuclear legacy, which currently constitutes a major concern of the whole world community both in terms of environmental safety and the non-proliferation of nuclear materials. A number of problems require urgent actions to solve them, however resources of the Russian Federation are limited and effective international assistance is required. Upon the initiative of the Nordic countries, a Contact Expert Group (CEG) was established in 1996 under Agency auspice (see subsection 12.3) to effectively promote such international cooperation.

A special Federal programme “Nuclear and Radiation Safety of Russia” for 2000-2006 was developed in the Russian Federation and is being implemented in order to solve radioactive waste management and SF problems. The Russian Government assigned Minatom as the main coordinator of this programme. The main objective of the programme is to provide nuclear and radiation safety to reduce the radiological and environmental risk from nuclear facilities and radiation sources to an acceptable level [10.1].

A comprehensive programme for dismantling of nuclear submarines has been elaborated [10.2]. The programme covers:

- dismantling of nuclear submarines and nuclear technical service ships retired from the Navy,
- provision for the safe storage of nuclear submarines afloat,
- establishment of the infrastructure for vessel dismantling and for radioactive waste and SF management, and
- environmental remediation of existing SF and radioactive waste storage sites.

Additionally, the “Concept for Comprehensive Dismantling of Nuclear Powered Submarines and Surface Vessels with Nuclear Power Installations” was developed. This concept defines the main problems and the technical policy of Minatom. The concept has passed environmental review and was endorsed by all authorities involved, including the Russian Ministry of Defence and the State Nuclear Regulator (Gosatomnadzor) [10.3]. The concept is based on the following general principles:

- unconditional provision of nuclear and environmental safety on the basis of current legislation at all stages of Programme implementation,
The number of nuclear submarines built in the former Soviet Union is greater than in the rest of the world, however, the majority of them has been withdrawn from operation within a relatively short period of time. The Russian Federation was not prepared for such a major challenge. The existing infrastructure was inadequate to address nuclear submarine decommissioning within a reasonable time frame. Additionally, financial resources from the Russian Federation budget were insufficient.

Minatom and Russian organizations have made substantial progress in the last 5 years. A total of 190 nuclear submarines were retired by the beginning of 2002, 97 of them were defuelled, and 68 were dismantled up to the reactor compartments. These compartments are stored afloat. A total of 122 nuclear submarines await dismantling and 93 of them still have SF on board. According to the Dismantling Concept, main resources were concentrated on defuelling. In 2000 and 2001, the defuelling rate was 18 nuclear submarines a year, while before 2000 only 3 to 5 nuclear submarines were defuelled annually.

Starting in 2001, Minatom allocated about $USD 70 million annually for implementation of the dismantling programme; however, this funding is insufficient. According to Russian Federation estimates, about $USD 3.9 billion would be required for completing the whole programme within the next 10 years [10.3].

A substantial number of nuclear submarines have awaited decommissioning for 10 years or more and their physical conditions do not ensure their safe floating without additional means. This creates a substantial risk of sinking with further radiological consequences for the environment. Multi-purpose nuclear submarines of the first and second generations belong to this category. These submarines were built in a much greater number than the strategic submarines [10.4].

Currently, dismantling is being conducted at the ship repair yards Zvezdochka and Sevmash in Severodvinsk, Zvezda in the Primorsky Territory, at Nerpa and at the Navy shipyards at Kamchatka in the Kola Peninsula and in the Primorsky Territory. SF discharge from nuclear submarines is being conducted at the sites by floating technical bases that belong to the Navy and by the floating technical base Imandra that belongs to the Murmansk Shipping Company.

In 2002, two coastal complexes for defuelling were commissioned. These complexes were built under the Russian-US Common Thread Reduction (CTR) Programme at the Zvezdochka and Zvezda shipyards. Each complex can defuel 6 or more submarines a year. In addition, about 10 to 15 submarines can be defuelled by floating technical bases in a year. The
defuelling rate can be increased but it would require substantial additional funding both for
defuelling and for further SF transportation and reprocessing at the Mayak plant.

Minatom plans to maintain the defuelling rate at the same level of about 18 submarines
annually and to dismantle approximately the same number of submarines annually, which
allows complete defuelling by 2007 and dismantling by 2010. In order to reach these goals,
substantial foreign assistance is needed.

The most significant Western assistance in the area of dismantling has been provided so far in
the framework of the CTR Programme. The main objectives of this Programme are supply of
equipment, reconstruction of the infrastructure, and finance of activities to dismantle up to 41
strategic nuclear submarines. For the period 1998-2002, $USD 340 million were allocated for
these activities, and during this time 23 strategic submarines were dismantled. In addition to
direct financing of the nuclear submarine dismantling work, the CTR Programme paid for
substantial upgrading and repair of the equipment and the infrastructure used at the
enterprises, which conducted the dismantling, including repair of the floating technical base
that performs the defuelling.

According to the Russian Decommissioning Concept, all SF discharged from submarines is to
be reprocessed. SF transfer to casks is conducted at transhipment bases, where the casks are
loaded onto railcars and then transported to the Mayak plant for reprocessing. At the Mayak
plant, SF is transferred into the buffer storage from which SF goes to the reprocessing line.

A new 40-tonne metal-concrete SF cask TUK-108 has been developed, produced and tested
under the AMEC Programme (Arctic Military Environmental Cooperation between Russia,
Norway and USA). This cask is intended for SF transportation and temporary storage. Later,
48 such casks were produced under Russian finance. These casks, together with older SF
casks type TUK-18, provide SF transportation to the Mayak plant from the Far East and the
Northwest regions. A further 25 TUK-108 casks will be produced shortly under finance of the
CTR Programme. The new casks allow maintenance of the dismantling rate that has been
established.

Storage pads for SF casks were built at the Zvezdochka and Zvezda shipyards (under
CTR Programme) and at the Atomflot enterprise in Murmansk (under the AMEC Programme)
in order to provide stable SF transportation. Two special trains are currently in use. Each train
is able to transport 12 SF casks (which corresponds to SF from more than one submarine).
One train was built and commissioned in 2002 under finance of the Norwegian Government.
This substantially increased the rate of SF transportation. These two SF trains are being used
very intensively; therefore, in order to have some stand-by capacity a new SF train will be
built under the CTR Programme.

SF reprocessing is being conducted at the Mayak plant in Chelyabinsk region. Before 2000,
the reprocessing capacity was not sufficient and created a bottleneck. In 2000, the capacity
was substantially upgraded, including the installation of a new vitrification plant. Currently,
the Mayak plant could reprocess SF from up to 20 submarines a year. A weak link in the
whole SF management chain is the SF buffer storage at the Mayak plant, which is nearly
filled. Therefore, in many cases SF delivered to Mayak plant goes directly to reprocessing. In
order to accept fuel during unplanned shutdowns of the reprocessing line or in the case of
planned maintenance, it is necessary to accumulate the SF casks at the plant site.
This problem is being solved now. An agreement was reached with the USA that dry SF storage for 154 40-tonne casks would be constructed within the framework of the CTR Programme. This will provide the opportunity for uninterrupted defuelling and SF transportation to the Mayak plant.

In addition to nuclear submarines waiting for dismantling, SF is stored at the coastal technical bases at Andreeva Bay and in Gremikha, in north-western Russia, and at the Sysoeva Bay in the Primorsky Territory. All these coastal bases belong to Minatom’s organizations - SevRAO and DalRAO respectively. In addition, a substantial amount of SF (including SF from icebreakers) is stored for quite a long time on board the Lepse, Lotta and Imandra ships, which belong to the Murmansk Shipping Company and are located in the Kola fiord near Murmansk. Total amounts of the accumulated fuel are given in Table 10-1. The majority of nuclear submarines have two reactors with approximately 455 spent fuel assemblies per submarine.

A relatively small amount of radioactive waste is generated during dismantling operations: about 50m³ of liquid radioactive waste and about 30m³ of solid radioactive waste per submarine. Liquid waste is solidified and solid waste is mainly loaded into the emptied reactor compartments. The necessary capacities for liquid waste management were recently created in both the Primorsky Territory (the floating treatment plant “Landysh”, built under Japanese assistance) and in north western Russia facilities at the Zvezdochka shipyard (under the CTR Programme) and at the Atomflot enterprise (under the AMEC Programme). As such, the problem of sea dumping LLW at the Minatom facilities was practically solved.

Table 10-1: Amount of Stored SF from Nuclear Powered Submarines (Russian Fed.)

<table>
<thead>
<tr>
<th>Storage location</th>
<th>Amount of SF</th>
<th>SF type [9]</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>North-West Russia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andreeva Bay</td>
<td>~ 100 cores.</td>
<td>PWR</td>
<td>SF is stored in the dry storage units and in 52 old-design casks located at the open pad.</td>
</tr>
<tr>
<td>Gremikha</td>
<td>6 cores</td>
<td>LMC</td>
<td>It is planned to accept 3 more cores.</td>
</tr>
<tr>
<td>Gremikha</td>
<td>~ 2 cores</td>
<td>PWR</td>
<td>SF is stored in the old-design casks located on the open pad.</td>
</tr>
<tr>
<td>MSC ships:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lepse</td>
<td>~ 1.5 cores</td>
<td>PWR</td>
<td>SF is damaged but Mayak plant agreed to reprocess it.</td>
</tr>
<tr>
<td>Lotta</td>
<td>~ 8 cores</td>
<td>PWR</td>
<td>Including ~ 6 cores of not repressible Zirconium fuel.</td>
</tr>
<tr>
<td>Imandra</td>
<td>~ 2.5 cores</td>
<td>PWR</td>
<td>Including ~ 0.5 core of not repressible Zirconium fuel.</td>
</tr>
<tr>
<td>Total in the region</td>
<td>~ 120 cores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Far East</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sysoeva Bay</td>
<td>~ 20 cores</td>
<td>PWR</td>
<td></td>
</tr>
<tr>
<td>Total in the Russian Federation</td>
<td>~ 140 cores</td>
<td></td>
<td>Including ~ 6.5 cores of not repressible icebreakers’ fuel.</td>
</tr>
</tbody>
</table>

Solid waste is temporarily stored at point of accumulation – at ship yards and naval coastal bases. Initial plans assumed that all solid waste in the Northern region will be transferred to

[9] SF type depends on type of the reactor: PWR-pressurized water reactor; LMC-reactor cooled by liquid metal coolant.
the regional centre in Polyarninsky, where it will be conditioned, compacted and packed in licensed containers for further transportation to the regional repository planned at Novaya Zemlya. A mobile solid waste treatment plant was developed and produced under the AMEC Programme. This plant will be used at Polyarninsky centre. Russian organizations have developed technical design and feasibility studies for construction of the solid radioactive waste (SRW) repository at Novaya Zemlya. This design was endorsed by all authorities involved and passed an international peer review, which confirmed acceptability of the engineering decisions.

By 2003, Western countries had pledged more than €160 million towards the clean-up operations. Work can begin on the clean up of both nuclear waste and SF now that the Multilateral Nuclear Environmental Program in the Russian Federation (MNEPR) has been signed. This agreement was a precondition for the work. The pledges were initiated at a Northern Dimension Environmental Partnership (NDEP) donor conference July 9, 2002 in Brussels. The European Union pledged €50 million, Sweden, Norway, Denmark, Finland, Netherlands and Russia each pledged €10 million. Recently, France contributed €40 million and the United Kingdom has joined the fund as well.

10.2 Environmental Management of the Nuclear Legacy in the USA

based on input from D. Tonkay,
United States Department of Energy
Office of Environmental Management

Over fifty years of nuclear weapons production and nuclear energy research produced large volumes of nuclear materials, spent nuclear fuel, radioactive waste, and chemically hazardous waste resulting in contaminated facilities, soil, and ground waste at 114 geographic sites around the United States. The US Department of Energy’s (DOE) Environmental Management (EM) Program was created in 1989 to clean up this environmental legacy. The United States government has a fundamental obligation to clean up this legacy. The contaminated waste, materials and facilities managed by the EM program must be addressed and resolved. Some of these pose short term public, worker, or environmental risk. Left unaddressed, virtually all of them pose eventual risk.

In February 2002, the EM Program completed a “top-to-bottom” review to find ways to achieve greater cleanup and risk reduction, more efficiently and cost effectively. Emphasis is now being placed on risk reduction to workers, the public, and the environment, rather than just managing risk. The cleanup program is refocused to save $USD 50 billion and complete cleanup 35 years ahead of the previous schedule, completing most high risk reduction work by 2012.

The EM Program has responsibility for cleanup of 114 geographic sites in over 30 states within the nation and one territory - over 2x10^6 acres (1 acre = 0.405 hectare). The EM continues to work towards the goal of cleaning up as many of its sites as possible by the year 2006. As of October 2002 (the beginning of Fiscal Year 2003), cleanup had been completed at 75 of these sites, leaving 39 to be completed. Three DOE sites, Rocky Flats Environmental Technology Site (RFETS), Colorado; Fernald Environmental Management Project, Ohio; and Miamisburg Environmental Management Project, Ohio, are pilot sites for accelerated closure.

The number of sites and facilities managed under the EM Program has grown as projects have been transferred from other government (in particular DOE) programs, such as Defense Programs and Nuclear Energy, Science, and Technology. The EM Program now manages
over two hundred high level radioactive waste tanks and thousands of contaminated buildings that remain to be deactivated and decommissioned. The volume of waste and contaminated media managed by DOE is enormous – $36 \times 10^6$ m$^3$, containing about $4 \times 10^{19}$ Bq ($10^9$ Ci) of radioactivity.

In addition to managing the existing legacy of waste, nuclear materials, and contaminated sites and structures, the prevention of further waste generation and pollution is important to the DOE. In 1996, and again in 1999, the DOE issued aggressive pollution prevention goals in order to reduce generation of hazardous, radioactive, and sanitary wastes by at least 80 percent by 2010 or earlier (using 1993 as a baseline).

Key aspects of the EM Program are summarized below.

**WASTE MANAGEMENT**

An important part of the EM Program’s mission is to protect people and the environment from the hazards of DOE waste by providing an effective and efficient system that minimizes, stores, treats, and disposes of waste as soon as possible. These wastes include HLW, transuranic (TRU) waste and low level waste (LLW). Note, TRU and LLW are classifications used in the USA, see subsection 3.2.

**High Level Waste**

The focus of EM Program activities for managing HLW is on completing treatment so that it can be disposed in a geologic repository. Disposal of this waste, along with spent nuclear fuel (SF), is the responsibility of DOE’s Office of Civilian Radioactive Waste Management. The DOE currently manages about $350 \times 10^3$ m$^3$ of HLW generated from the past reprocessing of SF at four DOE sites: Hanford in Washington State, Idaho National Engineering and Environmental Laboratory (INEEL), Savannah River Site (SRS) in South Carolina, and West Valley Demonstration Project (WVDP) in New York. Most of this inventory is in the form of sludge, liquids, salts, and calcine. The strategy for preparing this waste for disposal is to vitrify it into glass logs. Treatment began in 1996 at vitrification facilities at SRS and WVDP. To date, 1 575 canisters have been produced (less than 10% of the total number of canisters to be produced at the four sites over their life cycle). Vitrification at WVDP was completed in 2002. Construction of the vitrification facility at Hanford is now underway. An environmental assessment for treatment of HLW and associated wastes and the disposition of HLW facilities has been completed at INEEL, with a decision on treatment approaches to be made in 2003. Once treated, the canisters of HLW will remain in storage at the sites that generated the waste until a repository is available.

**Transuranic Waste**

The DOE is currently managing more than $100 \times 10^3$ m$^3$ of TRU waste, the bulk of which is at six major sites: Hanford, INEEL, Los Alamos National Laboratory (LANL), Oak Ridge National Laboratory (ORNL), RFETS, and SRS. The strategy for managing TRU waste is to dispose it in the Waste Isolation Pilot Plant (WIPP) repository (see subsection 8.2). As of February 10, 2003, WIPP had received 1 500 shipments (9 906 m$^3$) of TRU waste from five of the six major sites with TRU waste from past activities – Hanford (13 shipments), INEEL (564 shipments), LANL (32 shipments), RFETS (825 shipments), and SRS (66 shipments). The DOE filled the first of the 8 disposal panels in March 2003 and began disposing of waste in the second panel. Each panel consists of 7 disposal rooms and each room is designed to hold up to 12 000 standard 55-gallon drums of TRU waste. Waste shipments are being received currently at a rate of up to 25 shipments per week.
Future goals for WIPP and TRU waste management include:

- ensuring the disposal of all TRU waste from 23 waste sites,
- requesting a modification to the WIPP hazardous waste permit to begin disposal of remote-handled (RH) TRU waste,
  The start of disposal is dependent on completion of regulatory action. This will allow the sixth major site, Oak Ridge, to begin waste shipments to WIPP.
- certifying small-quantity TRU waste sites to allow shipment of their TRU wastes to WIPP for disposal through use of mobile/modular systems employed under a Central Characterization Project, and
- commencing operation, in 2003, of the Advanced Mixed Waste Treatment Project at INEEL for characterization and treatment of TRU waste at INEEL where the majority of legacy transuranic waste is currently located.

The DOE must submit documentation of continued compliance (re-certification application) to the US Environmental Protection Agency by March 2004 for a compliance determination (five years after the first receipt of TRU waste) and every five years thereafter.

**Low Level and Mixed Low Level Waste**

Approximately 1.3 million m$^3$ of LLW and mixed[^10] LLW (classification used in the USA, see subsection 3.2) will require disposal over the life of the EM program. Between October 2001 and September 2002, 105 800 m$^3$ of LLW and mixed LLW were disposed by the EM program. Currently, the DOE has seven LLW disposal sites: Fernald, Hanford, INEEL, LANL, Nevada Test Site (NTS), ORNL, and SRS. Waste generators without an on-site LLW disposal facility ship waste to one of the operating sites for disposal and, in some instances, to commercial facilities when practical and economical. The DOE continues regulatory efforts to allow sites to dispose of mixed LLW at NTS and Hanford, where facilities have already been constructed but, to date, used only for on-site generated waste.

**Cleanup of Release Sites and Facilities**

Another key part of the EM Program’s mission is cleanup of release sites and facilities – remedial action and management of contaminated environmental media (e.g., soil, groundwater, and sediment) and the decommissioning of facilities and structures at some 114 geographic sites. Cleanup progress at environmental restoration sites takes the actions needed to identify and contain or remove soil and groundwater contamination to prevent it from spreading, to decommission and dismantle facilities, and to clean up contaminated structures. Decommissioning operations range from small cleanup activities involving portions of buildings to complete structural dismantlement.

This work is intended to reduce risks and cleanup the environment for future beneficial reuse of restored land and facilities. Through the end of September 2002, 75 of the 114 geographic sites have been cleaned up, and two more sites are scheduled to be complete by September 2003. At each geographic site, there may be numerous individual waste sites (referred to as

[^10]: mixed waste: waste that contains both hazardous waste, as defined under the Resource Conservation and Recovery Act, and source, special nuclear, or by-product material subject to the Atomic Energy Act
“release sites”) and contaminated facilities whose cleanup ultimately leads to completion of an entire geographic site.

Through September 2002, the EM Program completed cleanup actions at about half of the known individual release sites (5051 out of a total inventory of 10,082 release sites). Decommissioning is complete at about 14% of the facilities (529 out of a total inventory of over 3,748 facilities). In addition, the EM program is continuing multiple environmental restoration activities and groundwater cleanup efforts at all major EM sites.

After completing cleanup, the DOE will maintain long term stewardship presence at most sites to monitor, maintain and provide information on any contained residual contamination. These activities are designed to ensure long term protection of human health and the environment. Such stewardship activities will include passive or active institutional controls and, often, treatment of contaminated groundwater over a long period of time. The extent of long term stewardship required at a site will depend on the desired end-state to be reached at that particular site. A new Office of Legacy Management was created in 2003 to manage stewardship activities for the DOE.

POLLUTION PREVENTION

The DOE’s respect for the environment has lead to an aggressive pollution prevention program, which focuses on reducing or eliminating the creation of pollutants or waste at its source. In 1996, the DOE outlined specific goals for reducing waste generation and the use and release of toxic chemicals and for increasing recycling and the purchase of environmentally preferable products. In 1999, more aggressive waste and pollutant reduction goals were issued. By 2005, the goals require the DOE to reduce generation of waste from routine operations by: 90 percent for hazardous waste; 80 percent for LLW; 80 percent for mixed LLW; and 80 percent for TRU waste compared to a 1993 baseline. In addition, the goals require a reduction of 75 percent by 2005 and 80 percent by 2010 for sanitary waste from routine operations compared to a 1993 baseline. Releases of toxic chemicals subject to Toxic Chemical Release Inventory reporting (or TRI chemicals) are to be reduced by 90 percent by 2005 using a 1993 baseline. Beginning with 1999, DOE set an aggressive goal for a 10 percent annual reduction in waste generation from cleanup/stabilization activities.

In 2001, DOE sites implemented hundreds of pollution prevention projects and were able to avoid producing almost 200,000 m³ of waste, for a reported cost savings/avoidance of $USD 123 million. Sites are recognized for their achievements in pollution prevention through the annual DOE Pollution Prevention Awards program. In addition, four DOE sites received White House “Closing the Circle” Awards in June 2002 for their outstanding pollution prevention efforts in 2001.

10.3 United Kingdom - Management of Low Level Legacy Waste at Dounreay

Solid low level waste (LLW, classification used in the UK, see subsection 3.2) has been generated and disposed of at the Dounreay nuclear site for over 40 years. The methods and techniques for managing this category of radioactive waste have been progressively improved over the period to enhance safety and deal with the waste in a more environmentally responsible manner [10.5].

The nuclear site at Dounreay on the north coast of Scotland was established during the mid-1950’s as Britain’s centre for the development of fast breeder reactor technology. By the late
1960’s, sufficient experience had been gained from its operation to justify taking the next step in developing a power station based on fast reactor technology. A 250 MW Prototype Fast Reactor was constructed and commenced operating in 1974. The associated reprocessing plant and support facilities were also modified and updated to deal with the plutonium based fuel. In 1988, a Government review of the future for nuclear power resulted in the withdrawal of funding for the UK fast reactor programme. The reactor was closed in 1994. Reprocessing work continued until the late 1990’s to allow reduction of the site’s nuclear inventory, at which time operational problems resulted in shutdown of the reprocessing plant. Currently, the decommissioning and environmental restoration of the Dounreay site presents a major challenge for the UKAEA.

Dounreay is unique within the British nuclear industry in that it has always had its own authorized facilities for the disposal of solid LLW. Nationwide, other solid LLW is sent to the British Nuclear Fuels Limited (BNFL) Drigg facility, near Sellafield. Disposal was conducted in a series of six shallow land burial disposal ‘Pits’ since the start of the site in the late 1950’s. The Pits were excavated out of the existing bedrock which is covered with a thin layer (~0.5 metres) of clay/soil. The first four Pits were all dug to a nominal depth of 7 m by 36.5 m long by 14 m wide giving a finished volume of ~3 500 m$^3$. These were filled during the period 1959 to 1977. The waste, consisting mainly of non-combustible ‘hard’ materials, was contained within a polythene wrapping or bag and ‘tumble-tipped’ into the excavated Pit. The Pits were ‘closed-off’ by covering the waste with ~1m of clean soil as required by the Authorizing body at the time.

By the late 1970’s, the need for improved containment of the waste, to enhance safety during handling and disposal operations, was recognized. Where appropriate, waste was packaged into mild steel drums with a nominal 200 litre capacity while larger bulk items continued to be wrapped and emplaced directly into the pit. Pit 5 was excavated in a similar manner to Pits 1-4, but also included a concrete floor slab and a ramp to facilitate fork-lift access for waste emplacement. Pit 6, with a nominal capacity of ~14 000 m$^3$, was excavated shortly afterwards to utilize the common vehicle ramp access and was consequently filled before Pit 5. The site reviewed its arrangements for the management of solid LLW in the late 1980’s, resulting in the decision to invest in volume reduction equipment to minimize the volume of waste disposed of as LLW. Supercompaction of drummed arisings commenced in 1991, with compacted pucks being disposed of directly to Pit 5.
Proposals during the mid 1990’s, to further extend the disposal capacity for LLW on the site, attracted a lot of media interest (as part of the statutory planning process) and incurred some adverse publicity. As a result, plans for an extension were abandoned and the strategy for managing LLW was revised to include the use of specialized ISO containers for storage and/or disposal. The containers referred to as ‘half-height’ ISOs (HISOs) had become recognized as the ‘standard’ for handling LLW in the UK nuclear industry.

The profile, and consequently the attention given to the management of LLW, rose significantly in the early 1990’s with increasing scrutiny by regulators. A decision was taken to invest in modern non-destructive assay (NDA) and inspection equipment to assist in the demonstration of compliance with authorization limits and conditions. These were to be used in conjunction with quality assured systems for the management of LLW at Dounreay which were introduced by 1992. Systems for real-time radiography (RTR), beta-gamma assay and alpha assay were procured and a fully integrated system, including supercompaction and hygienic loading of HISO disposal containers, was installed in a new plant.

Combustible wastes were incinerated in a small custom built unit with ash residues drummed prior to disposal. The incinerator plant was successfully operated from 1959 until 1998, when it was closed due to its inability to meet the operating and emission standards expected for a modern system. The significant economic investment required to install a new unit could not be justified for the relatively low throughput of waste and incineration of solid LLW was halted in 1998. Combustible materials are now consigned for supercompaction in conjunction with other types of arisings.

The UKAEA’s principal mission for the Dounreay site has been revised during the last few years and is now focused towards environmental restoration of the site through a programme of decommissioning and waste management. The UKAEA believes that there is merit in integrating its strategies for decommissioning and waste management and has consequently issued a combined policy statement dealing with both areas. The policy statements with particular relevance to radioactive waste management are:

- to ensure that wastes are not created unnecessarily and are characterized and segregated at source, subject to consideration of cost and dose to workers,
- to make proper use of available authorized waste disposal routes,
- to provide adequate storage capacity of an appropriate standard for existing and expected arisings of wastes for which there is currently no disposal route,
- to condition and package radioactive wastes in compliance with agreed national standards on timescales consistent with safety, environmental, dose uptake and value for money considerations, and
- to retain knowledge and records of redundant radioactive facilities and wastes.

The systems for LLW management have been progressively developed over the last ten years to provide a comprehensive but flexible service for the production and processing of waste into a form suitable for storage and/or disposal, as appropriate. The current rate of annual arisings is approximately 700 m$^3$ per year of drummed waste, with a further 100 m$^3$ of bulk materials.

During the development of the waste handling and processing systems, due cognisance was given to potential exposure to the operators to radiation from the waste, with the ALARA principle applied wherever possible. The collection and handling of all LLW has been mechanized and automated in order to minimize radiation exposure to the operators. The systems have been designed such that once the drums have been filled/sealed there is no further requirement for the operator to actually handle the package. The improved operating practices have significantly reduced the average annual whole body dose to an operator from 3.1 mSv in 1991 to 0.13 mSv in 2001.

A Waste Receipt, Assay, Characterization, and Supercompaction (WRACS) plant was constructed to provide a fully integrated facility for the inspection, supercompaction and hygienic loading of drummed LLW into HISO containers.

![Figure 10-3: Processing of Drummed LLW in WRACS](image)

The three main items of inspection and assay equipment, RTR, beta-gamma assay (NDA 19) and alpha assay (NDA 20), are all located at the “front end” of the process. These systems were designed with the capability of verifying a consignors’ declaration of the physical and
radiological content of the waste by selecting drums on an appropriate frequency depending upon the key waste characteristics. The systems are not intended to provide a measurement for the declared activity content of the waste per se: the onus remains with the consignor to fully characterize the waste before it is received in the WRACS. The systems are also occasionally used to assist consignors in assessing and characterizing their waste.

The WRACS plant was designed to process up to 100 drums per week operating on normal day hours only. In practice, the throughput is defined by the alpha assay system which can take up to 30 minutes to check a drum. Clearly, higher throughputs are achievable depending upon the sampling frequency for checking the consignors’ data.

The WRACS operating philosophy following initial start-up has been to inspect the majority of the waste processed through the facility in order to gain confidence in consignors’ characterization and the ability to provide a reasonably accurate activity content estimates. Review of the data collated to date will allow reduction in the sampling frequencies, depending upon the origins and characteristics of the waste. To date, only 0.3% of the drums processed through WRACS have required return to the consignor due to non-compliance with the acceptance criteria in WRACS.

To date, a total of almost 7 000 drums have been processed through the plant since start-up in August 2001, with an average throughput of almost 170 drums per week. The systems for the management of LLW are an essential component of the strategy for implementing any decommissioning programme, particularly one as large as environmental restoration of the Dounreay site.

10.4 Norway - Retrieval of a Near Surface LILW Repository and Environmental Cleanup at Kjeller

As a result of the discussions preceding the construction of the new Himdalén disposal facility, the Norwegian Parliament decided that a shallow ground repository at the premises of Institute for Energy Technology (IFE) at Kjeller should be retrieved and its contents transferred to Himdalén [10.6]. The repository contained 997 drums and 19 other items with LILW buried in clay in 1970. The retrieval started in August 2001 and was finished after only 11 weeks of work. The entire process was very transparent; the Norwegian Radiation Protection Authority (NRPA), as well as the local community and media, was kept informed throughout.

The drums were in remarkably good condition and handling them caused no problems. They were cemented into slightly larger drums before storage and subsequent transport to Himdalén. Radiological control of the remaining clay in the hole showed contamination far below the clearance levels given by the NRPA. The total dose received by personnel involved was less than 2.1 mSv. The total cost of retrieval, repacking, internal transport and radiological and environmental control was 3.6 million Norwegian Kroner, NOK (about €460 000). The Himdalén related costs (transport and disposal/storage) are not included.

One hundred sixty six of the drums contain a total of 30 grams of plutonium-239/240 originating from the former Uranium Reprocessing Pilot Plant's treatment of spent fuel from the first JEEP reactor (commissioned in 1951). These drums shall, according to the same Parliamentary decision, be placed in the storage hall of the Himdalén disposal facility (currently, the Himdalén facility is a combined storage / disposal facility).
In the early spring 2000, the IFE at Kjeller removed about 180 m$^3$ of sediment contaminated by plutonium from liquid waste discharges in the years 1967-70 from the bed of the nearby Nitelva River (see Figure 10-4). Later that year, the IFE decided to retrieve a 900 m long section of the liquid waste discharge pipeline buried in the bed of the Nitelva River and not in use any longer. It was replaced in 2000 by a new, shorter pipeline leading to a new discharge point about 800 m upstream of the old one. The cleanup operation was performed in March 2001. The retrieved pipeline was cut in 2 m long pieces and brought to the Radioactive Waste Treatment Plant at IFE. At one location, plutonium contaminated sediment was detected. The spot wise concentrations exceeded the NRPA's clearance levels given for the Nitelva River sediment. About 40 m$^3$ of sediment were therefore removed and transported to IFE for treatment and subsequent disposal in the Himdalen facility. The costs of this second cleanup operation were about 0.8 million NOK (about €100 000). Significant effort was made to provide information to media and the local community throughout the process.

![Figure 10-4: Clean-up of the Nitelva River in 2000
(Source: IFE, Health and Safety Department, NO-2027 Kjeller, Norway)](image)

10.5 Belgium - Remediation of the Olen Site

In 1915, while looking for extractable copper ore, a mining engineer of “Union Minière du Haut Katanga” found an important pitchblende deposit in the area of Shinkolobwe in the Katanga district of the former Belgian Congo. The first very high grade ore (averaging about 50 % uranium oxide) arrived in the port of Antwerp on 5 December 1921 and production at the Olen facility began in July 1922. Because of the exceptional uranium content, less than 10 tonnes of ore were needed to produce one gram of radium. Belgium dominated the world market for radium until the mid-1930’s when comparable high grade ore was discovered along the shores of the Great Bear Lake in north western Canada and an extraction plant was built at Port Hope, Ontario. Because of the development of particle accelerators and nuclear reactors, starting in 1952 other radioactive substances could be developed with shorter half lives, which gradually reduced the use of radium. In Olen, a stock of pure radium remained behind in its “users packaging”.

Page 143 of 185
The storage of primary materials, by-products and waste products, and the emission of treated waste water gave rise to a dispersed pollution inside and outside the plant. In the middle of the 1950’s, a central storehouse was built for all final products, intermediate products and wastes. In the 1970’s, a start was made on dismantling the production installations, which put an end to production. However, the storehouse and the local contamination on the plant grounds and outside the plant remained. Between 1980 and 1982, about 3 000 tonnes were disposed by sea dumping.

Today, the “Olen radioactivity file” (abbreviated OLERA) consists of 3 sub files as schematically presented below [10.7].

![Figure 10-5: The Olen Radioactivity File](image)

- The UMTRAP file relates to the authorized storehouse built on the plant grounds for radioactive waste from the production activity.
- The BRAEM file relates to the radioactive pollution dispersed outside the plant grounds.
- The SIM file deals with the residual pollution within the plant grounds.

In November 2001, a joint position was issued by the Federal Agency for Nuclear Control (FANC) and the Belgian national radioactive waste management organization (NIRAS/ONDRAF) concerning the radiological aspects of the clean up of the radioactive contamination on the Olen facility (currently owned by Umicore) and in the vicinity. The document highlights the general approach for the remediation of the Olen site and presents a strategy for long term management of the resulting radioactive waste, in coherence with other waste categories dealt with by NIRAS/ONDRAF.

The general strategy to be followed for remediation comprises:

- establishing the **inventory** (radiological and non-radiological, quantities, specific activities, ...),
- identifying the remediation **options**, including the technical installations necessary for the remediation, the storage and/or disposal of materials coming from the remediation, a final disposal for non-conditioned materials is not excluded,
- selection of an option, considering the radiological and non-radiological impact, socio-economical aspects, technical feasibility and required legal security,
- development and approval of the remediation **project**,  
- authorization aspects,
remediation, and
surveillance and control.

In this strategy the principle that any clean up should be justified from a radiation protection point of view is of prime importance.

To deal with large volumes of waste resulting from remediation, NIRAS/ONDRAF and FANC introduced a new category of waste, very low level waste (VLLW), with the aim of constructing a surface disposal facility on the remediation site to receive this waste. By only accepting long lived VLLW waste and by placing strict limits on the radioactivity (in Bq) and activity concentration (in Bq/g), the long term monitoring and control program can be kept to a minimum. A permanent and passive institutional control, such as restriction on the land use, becomes an additional element of long term safety. The consequence of this position is that during remediation, measurements will be required with a two-fold purpose: 1) verification of the inventory and 2) removal of “hot spots” that represent too high a risk for a surface disposal of long lived VLLW. A limit of 40 Bq/g, commonly taken as the upper limit for surface disposal [3.1], will have to be confirmed by a site specific and design specific safety assessment.

References for Section 10

10.3 Presentations at the International Conference "Ecological Problems in Nuclear-Powered Submarines Decommissioning and the Development of the Nuclear Power in the Region". Vladivostok, Russia, September 2002.
10.6 Stranden, E., Norwegian Radiation Protection Authority, “Current Situation in Norway”, presentation at the 2nd WATEC meeting, IAEA, Vienna September 30 to October 4, 2002.(see subsection 12.2 for more information)
11 DATA COLLECTION AND REPORTING

The Agency attaches a high importance to the dissemination of information that can assist Member States with the development, implementation, maintenance and continuous improvement of systems, programmes and activities that support the nuclear fuel cycle and nuclear applications. The main purpose of this Status and Trends report is to support the Agency’s strategy. This third issue of the report also represents the continuation of a process to improve the reporting of status and trends in radioactive waste management.

The structure of this Status and Trends report was derived with the intent of developing a formal framework for the assembly of information in radioactive waste management. The objectives were:

1. to identify subject areas deemed to be of interest to Member States and the Agency,
2. to report the status of and trends in radioactive waste management according to these subject areas, and
3. to base this reporting, to the greatest extent practicable, on quantitative data.

Objectives 1 and 2 were achieved with the first issue of this report. However, currently, quantitative data are not available at a sufficient level to achieve objective 3. This issue is addressed within this Section of the Status and Trends report. Over time as more quantitative data are available, the intent of this report is provide information in the format that appears within the current issue and, additionally, in the form of tabular, statistical and graphical format to facilitate decision making.

In the current issue, updates of three subject areas covered in the previous issue of this report are presented, namely:

- update on Net Enabled Waste Management Database (NEWMDB) Data Collection and Reporting,
- update on the Directory of Radioactively Contaminated Sites (DRCS), and
- update on Guidance for Record Keeping and Records Management.

11.1 Update - NEWMDB Data Collection and Reporting (including the Consolidated Radioactive Waste Inventory Report)

The NEWMDB is the Agency’s principal mechanism for the collection and dissemination of information about radioactive waste management programmes and activities and radioactive waste inventories in its Member States. The dissemination of information is carried out both inside and outside of the Agency.

The principal objectives for developing the NEWMDB were to:

- support the routine reporting of status and trends in radioactive waste management based, to the greatest extent practicable, on quantitative data rather than anecdotal information [11.1], [11.2],
- support the compilation of the inventory of radioactive waste in Agency Member States based on a unified waste classification scheme [11.3],
• support the development, implementation and use of an indicator of sustainable development for radioactive waste management [11.4],

• provide the means to assess the development and implementation of national systems for radioactive waste management in Agency Member States (see subsection 2.3) [11.5], and

• conform, to the greatest extent practicable, with the reporting requirements of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) [2.1].

The NEWMDB is an Internet-based application that was developed between mid-1999 and mid-2001. In October 2000, the Agency issued a Note Verbale asking each of its Member States to nominate a single point of contact, known as a Country Co-ordinator (CC), who would interact directly with the NEWMDB’s Programme Officer during data collection cycles. CCs are responsible for the completeness and accuracy of information submitted to the NEWMDB.

The first data collection cycle with the NEWMDB took place from July 6, 2001 to March 15, 2002. During the first data collection cycle, 51 Agency Member States appointed CCs (about 40% of Member States) and 22 submissions were received. Due to the low participation in the first data collection cycle, Member States that had not yet made a submission to the NEWMDB were asked to participate in an extension of the first cycle. This “second” data collection was held July 1, 2002 to February 14, 2003. While the number of CCs had increased to 60, only 14 new submissions were received. However, these submissions included contributions from several Member States with significant nuclear power and/or radioactive waste management programmes.

In addition to the new submissions, 3 submissions from the first data collection cycle were revised.

Although the total number of submissions (36) from the first two data collection cycles was low (representing only about one fourth of Agency Member States), the Member States contributing to the NEWMDB had, at the time this report was written, 71% of the operating nuclear power plants in the world. If only 6 more Member States (Canada, China, India, the Russian Federation, the Republic of Korea and the United Kingdom) were to make submissions, NEWMDB participants would have 95% of the operating reactors world wide.

Even with the low participation rate (in terms of the number of Member States), progress was made towards achieving the cited NEWMDB objectives. Please see Table 11-1. Please note, Table 11-2 and Table 11-3 are referenced by Table 11-1.
Table 11-1: Comparison of NEWMDB Development Objectives with Results Achieved

|-----------------------|---------------------------------------------------------------------------------------------------------------|
| support the routine reporting of status and trends in radioactive waste management | The first volume of the series of reports entitled “Radioactive Waste Management Status and Trends” was issued in 2001 to support the Agency’s information strategy [3.8]. The first volume states:  
*The objectives were:*  
1. to identify subject areas deemed to be of interest to Member States and the Agency,  
2. to report the status of and trends in radioactive waste management according to these subject areas, and  
3. to base this reporting, to the greatest extent practicable, on quantitative data.  
*Objectives 1 and 2 have been met by the current report. However, currently, quantitative data are not available at a sufficient level to achieve objective 3.*  
One of the principal objectives for developing the NEWMDB was to achieve objective 3. Volumes 2 and 3 of the status and trends report benefited from information collected during the NEWMDB’s first data collection cycle, which demonstrated that the NEWMDB can become an important source of quantitative information for assessing the status and trends of various aspects of radioactive waste management in Agency Member States [11.5]. However, to achieve objective 3, full and effective co-operation of Member States is required during future NEWMDB data collection cycles. The low participation rate and the small number of submissions resulted in too few data to draw any significant conclusions; however, this situation will change as more data are collected in future data collection cycles. |
| support the compilation of the inventory of radioactive waste in Agency Member States based on a unified waste classification scheme | One of the fundamental features of the NEWMDB is that it allows Member States to report their waste inventories according to the waste classification scheme(s) used in their own countries. However, the NEWMDB requires Member States to describe how their waste classification scheme(s) compare with the one proposed by the Agency [3.1]. Member States use the NEWMDB’s waste class matrix tool to make this comparison.  
The Agency uses the waste class matrices to transpose waste inventories reported according to a wide variety of national classification schemes into a consolidated inventory reported according to the Agency’s proposed waste classes.  
An assessment of the information collected during the NEWMDB’s first data collection cycle indicated that the compilation of a comprehensive inventory is, for the foreseeable future, extremely difficult, if not impossible, to achieve. The use of the NEWMDB to compile a partial inventory in Agency Member States was restricted due to the limited participation by Member States in the first data collection cycle and the scope of the NEWMDB’s data collection [3.4].  
The second consolidated radioactive waste inventory, based on NEWMDB data, is provided in Reference [11.3]. The report states the following:  
*Note: The information in the following tables is subject to all the limitations and caveats discussed previously. As such, it should be interpreted solely as an indicator of what the Agency can prepare for dissemination if it obtains the full and effective co-operation of its Member States and when consistent, traceable radioactive waste information is submitted to the NEWMDB by Agency Member States.* |
<table>
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<tr>
<td>support the development, implementation and use of an indicator of sustainable</td>
<td>As a follow up to the United Nations (UN) Conference on Environment and Development in 1992 [11.6], the UN’s Department of Economic and Social Affairs (DESA) invited the Agency to develop one or more indicators of sustainable development (ISD) for the management of radioactive waste (RW). Responsibility for this task was given to the Agency’s Division of Nuclear Fuel Cycle and Waste Technology (NEFW) within the Department of Nuclear Energy. In late 2001, a single ISD-RW was developed and then refined in early 2002. The ISD-RW was tested in September 2002 and it was submitted to DESA in November 2002 for inclusion in its list of core indicators [11.7]. The ISD-RW uses the definition that sustainability is the point at which the amount of radioactive waste awaiting disposal is not increasing, the waste is in the final form required for disposal and it is being safely stored. Note, since currently there is an international debate about whether or not disposal is the endpoint for waste management (some have proposed alternatives such as indefinite storage), the use of the term disposal in the context of the ISD-RW implies any internationally acknowledged alternative to disposal. The ISD-RW was developed after UN activities on capacity building, training and country testing in support of indicators of sustainable development. However, the NEWMDB’s first data collection cycle was used to collect and compile some of the same nationally-based information that would be needed by countries to compute the ISD-RW. A conclusion from the September 2002 testing was that countries that prepare NEWMDB submissions should be able to calculate the ISD-RW based on those submissions plus supplemental information that is likely to be available. A further conclusion was that capacity building for using the ISD-RW is still required, notably in the context of waste classification.</td>
</tr>
<tr>
<td>development for radioactive waste management</td>
<td></td>
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<tr>
<td>provide the means to assess the development and implementation of national systems</td>
<td>A number of mechanisms have been used to document national radioactive waste management programmes [3.6], [3.7], [11.8], and [11.9]. While these mechanisms provide extensive detail on national systems for radioactive waste management, they do not provide information in a concise manner that would be easy to digest by policy and decision makers. This issue has been addressed by the NEWMDB [11.10]. The NEWMDB provides a simple, easy-to-use method for Member States to indicate the status of the development and implementation of their national systems for radioactive waste management. The General Information section of the NEWMDB contains a “policy questionnaire”. Instead of free-form text, Member State representatives simply point-and-click to select the appropriate answers to policy questions. The intent of the questions is to assess the status of and the trends for various aspects of national systems for managing radioactive waste. With the low response rate for the first data collection cycle, too few data have been collected to date to draw conclusions. The results obtained were not rigorously assessed because a “lessons learned” process is required to clarify some of the questions and responses. The results are described in subsection 2.3.</td>
</tr>
<tr>
<td>for radioactive waste management in Agency Member States</td>
<td></td>
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<tr>
<td>conform, to the greatest extent practicable, with the reporting requirements of the</td>
<td>The use of an international database, like the NEWMDB, to collect the full scope of information required under Joint Convention reporting requirements is currently not feasible. Member States would have to expend a great deal of effort to provide the full scope of information to the NEWMDB and in many cases they may not be able (or may be unwilling) to report this information within the requirements of NEWMDB data collection cycles. The objective set out was “to conform, to the greatest extent practicable, with the reporting requirements of the Joint Convention”. Table 11-2 and Table 11-3 summarize how the initial version of the NEWMDB meets the objective related to the Joint Convention.</td>
</tr>
<tr>
<td>Joint Convention</td>
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</table>
The first data collection cycles showed that the NEWMDB can be used to collect some of the information required for Contracting Party reports under the Joint Convention. As such, Member States that are Contracting Parties and that also participate in NEWMDB data collection cycles could include information from NEWMDB reports in their Contracting Party reports to minimize the costs and efforts for reporting.

Table 11-2: Joint Convention Reporting Requirements versus Information to be Collected with the NEWMDB

<table>
<thead>
<tr>
<th>NEWMDB Objective</th>
<th>Joint Convention Reporting Requirement / Is the NEWMDB data collection compatible with the identified requirement?</th>
</tr>
</thead>
<tbody>
<tr>
<td>take into account, to the greatest extent practicable, reporting requirements stipulated in the Joint Convention</td>
<td>spent fuel management policy&lt;br&gt;spent fuel management practices&lt;br&gt;radioactive waste management policy&lt;br&gt;radioactive waste management practices&lt;br&gt;criteria used to define and categorize radioactive waste&lt;br&gt;a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features&lt;br&gt;an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of&lt;br&gt;a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features&lt;br&gt;an inventory of radioactive waste that is subject to this Convention that&lt;br&gt;- is being held in storage at radioactive waste management and nuclear fuel cycle facilities&lt;br&gt;- has been disposed&lt;br&gt;- has resulted from past practices&lt;br&gt;this inventory shall contain a description of the material&lt;br&gt;and other appropriate information available, such as: volume or mass, activity&lt;br&gt;specific radionuclides&lt;br&gt;a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities</td>
</tr>
</tbody>
</table>
Table 11-3: Waste to be Included/Excluded from Initial NEWMDB Data Collection Cycles

<table>
<thead>
<tr>
<th>waste</th>
<th>excluded</th>
<th>included</th>
</tr>
</thead>
<tbody>
<tr>
<td>low specific activity (LSA) waste</td>
<td>in situ</td>
<td>moved (1)</td>
</tr>
<tr>
<td>abandoned/contaminated sites</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>exempt/clearance waste</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>spent fuel</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>UMMIT/TE-NORM waste</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>discharges to the environment</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>special fissible materials that are considered a resource (e.g. Pu)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>remediation waste</td>
<td>in situ</td>
<td>moved (2)</td>
</tr>
<tr>
<td>waste awaiting transfer to “disposition option” that is available</td>
<td>X (3)</td>
<td></td>
</tr>
<tr>
<td>HLW at processing facilities</td>
<td>X (4)</td>
<td></td>
</tr>
</tbody>
</table>

(1) LSA waste that is moved to a “licensed waste management facility”, i.e., storage/disposal, will be included.

(2) waste generated during remediation of a site and moved to a “licensed waste management facility” is included - waste that remains in situ is excluded (the former may be accurately quantified, the latter may not).

(3) to avoid the possibility of double accounting, waste that is awaiting transfer to an available “disposition option” is excluded from the NEWMDB. Examples are hospitals & research centres carrying out what is often referred to as “interim storage” prior to transfer of the waste to a central facility (either storage or disposal). Waste that is being held because there is no disposition option, e.g., greater than class C waste held at reactor sites in the US, would be included in the NEWMDB as inventory because a disposition option is not available.

(4) HLW at processing facilities (vitrified, cemented) should be reported by the owner of the waste as of the “reporting date” for the NEWMDB. While this waste may be considered as part of (3), they should be reported to avoid missing “significant” waste in any given reporting cycle.

Please refer to reference [11.3] for a detailed discussion on the scope of data collection for the NEWMDB and deviations from that scope during the first two data collection cycles.

NEWMDB reports

Figure 11-1 and Figure 11-2 illustrate how to obtain NEWMDB reports, which are available cost free. The online reports provide access to NEWMDB data on a country-by-country, reporting year-by-reporting year basis. This is useful for someone seeking information about a specific country. In addition, compilations of reports are provided in what are known as “profiles reports”. These compilations are available on CD ROM or in a single archive file that can be downloaded (the archives are large and can take a long time to download if the user does not have broadband Internet service).

The profiles reports also contain assessments of the information collected during a data collection cycle and detailed guidance for reading NEWMDB reports.

The way forward

Various reviews of the NEWMDB were conducted in 2002 and early 2003. For example, in the course of three international workshops funded by the Government of Japan, representatives from 37 Member States provided feedback on the NEWMDB. This feedback identified opportunities for improving and enhancing the NEWMDB. It also identified important issues concerning inconsistencies in reporting national waste management
programmes at the international level. An additional workshop, under regular Agency budget, was help for May 2003 for the purpose of compiling specifications for upgrading the NEWMDB to version 2. The workshop was attended by experienced NEWMDB users from the following Member States / organizations: Estonia/ALARA, Finland/STUK, Germany/BfS, Japan/RWMC, Mexico/CNSNS, Spain/ENRESA, and USA/DOE.

At the time of writing of this Status and Trends report, version 2 of the NEWMDB was under development. The plan was to launch version 2 in late 2003, to conduct the third data collection cycle ending in early 2004 and to publish the next NEWMDB reports by the second quarter of 2004. It is worth noting that NEWMDB version 2 will only have minor changes to the scope and nature of information collected – the principal changes will be to make the NEWMDB much more user friendly.

Figure 11-1: Screen Capture Showing Access to Publicly Accessible NEWMDB Reports
the screen above is accessed via http://www-newmdb.iaea.org/reports.asp
11.2 Update - the Directory of Radioactively Contaminated Sites

As reported in the previous issue of this Status and Trends report, the Agency is in the process of developing and implementing a worldwide Directory of Radioactively Contaminated Sites (DRCS) for sites that have been contaminated by radioactivity as a result of past practices and accidents [11.11]. The DRCS will not be merely a listing of contaminated sites – it will also serve as a clearing house for information on relevant abatement measures. Additionally, it could serve as a role model for similar undertakings in a national context and could provide users with examples of contamination situations and the remediation measures taken. Uranium mining and milling sites and sites contaminated with NORM (see subsection 4.2) will also be included.

The software to input data and to manage the DRCS has been developed as an Internet based application. It is currently under review by designated reviewers in Agency Member States. The Agency is currently in the process of establishing a system of Country Contacts, through whom submissions to the DRCS would be co-ordinated (analogous to the system of Country Co-ordinators for the NEWMDB (see page 26). These Country Contacts would also review submissions to see whether or not they are in line with their Country’s information policy on contaminated sites.

11.3 Update - Guidance for Record Keeping and Record Management

The previous issue of this Status and Trends report stated that the Agency has initiatives in place to address the harmonization and sharing of waste management information at both the national and international levels. The following is an update of those initiatives:

Radioactive Waste Management Registry (RWM Registry) [11.12]: The RWM Registry is a software tool to assist (primarily) developing Agency Member States
in recording and managing their national inventories of radioactive waste from nuclear applications.

The RWM Registry deals with solid, liquid waste and sealed sources (SRS) that are generated on a routine or non-routine basis and covers waste processing steps. The RWM Registry is also able to track the history of waste records. The quality control of the waste product and the quality assurance programme involved are addressed by the Registry. Additionally, the RWM Registry records information on status of the waste.

The RWM Registry is structured to allow a high degree of flexibility. There is a set of customized tables that are prepared by users according to their requirements and needs.

The RWM Registry is also a managerial tool and offers an immediate overview of the various waste management steps and needs. This would facilitate planning, optimizing resources, monitoring of related data, disseminating of information, taking actions and making decisions. The RWM Registry is structured taking into account different sizes and complexity of waste management organizations in different countries.

Outputs from the RWM Registry can form part of a national waste management report, as requested by the regulatory body, by the Joint Convention [2.1] or by the NEWMDB. The RWM Registry is designed primarily to assist Member States with waste generated from nuclear applications, however in it could be also used for keeping inventory for waste generated from nuclear power plants and nuclear industries.

The first version of the RWM registry has been completed and has been available since November 2002. The user manual had also been produced as working material and a final version is expected in about a year time. The terms of distribution are being reviewed and a mechanism to provide the required training for proper, efficient and easy use of the software is being considered.

To obtain information on the RWM Registry, please contact the Agency via e-mail using the address RWMR@iaea.org.

“Primary Level Information (PLI) Set” TECDOC: The “PLI” TECDOC is being developed as a follow up to two TECDOCs published previously by the Agency:


Briefly, the previous TECDOCs described hierarchical record management systems consisting of primary level information (PLI), intermediate level information (ILI) and high level information (HLI).

TECDOC 1097 states "...This report discusses information gathering and maintenance of records. It does not give advice on specific details of what these records will cover which may be governed by applicable national regulations..." TECDOC 1222, states "...pre-closure records comprise the PLI set... ... A WIRKS represents a subset of the PLI... ...While this report provides technical
advice about the development and implementation of a WIRKS, it does not cover any other aspects of the PLI, which could be the area where most Member State data are compiled and which represents a significant cost to those Member States with large nuclear programmes. The participants at the third Consultants meeting recommended that technical advice on the development and implementation of a comprehensive PLI should be provided...". The PLI TECDOC is being developed to meet the cited recommendation.

A second draft of the PLI TECDOC was prepared in an Agency consultancy held September 2002. A Technical Meeting is scheduled for September 2003 to prepare a final version suitable for submission to the Agency’s Publications Committee. Publication is expected in 2004.

References for Section 11


11.10 International Atomic Energy Agency, “Radioactive Waste Management Profiles Number 5 – Compilation of Data from the Net Enabled Waste Management
