Orientation for the IAEA Net Enabled Waste Management Database

John Kinker
NEWMDB Version 3 Workshop
Overview

- What is NEWMDB?
- Current Participation
- Introduction to Version 3 improvements
- Guidance on Waste Matrix Development
Net-Enabled Waste Management Database

- Evolution from text-based and then disk-based survey system to interactive direct-collection mechanism
- From 35 to 45 MS’s contribute (about 40 last year)
- ANNUAL Data collection
- ~90% of NPP generation represented
Basic Components

1. MS Waste Class Matrices

2. Framework
   • Actual or “Virtual” sites & facilities

3. Waste Data

4. MS General Info
   • Laws & Regs, Policies, Regulators, Trends, Etc.
Simplified NEWMDB Logical Data Model

Data
- Submission Year
  - Member States
    - Survey Answers
    - Publications
    - Users
- Reporting Groups
  - Table
    - Waste Matrix
    - Definition
- Sites
- Facilities

Framework
- Processed Waste
- Un-processed Waste

NEWMDB
Waste Matrix Definition

key to comparability is the Waste Class Matrix

**Waste Class Matrix:** USDOE

<table>
<thead>
<tr>
<th>Waste Class Name</th>
<th>LILW_SL%</th>
<th>LILW_LL%</th>
<th>HLW%</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLW</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>TRU</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>LLW</td>
<td>99.5</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>11e2</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


**Waste Class Matrix:** USNRC

<table>
<thead>
<tr>
<th>Waste Class Name</th>
<th>LILW_SL%</th>
<th>LILW_LL%</th>
<th>HLW%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A LLW</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Class B LLW</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Class C LLW</td>
<td>75</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Greater than Class C LLW</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>HLW</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

NRC waste classes defined in Title 10, Code of Federal Regulations, Part 61, Subpart 55. Class C split based on analysis of actual data
then compare them to the IAEA classes
### Waste Class System Translation

<table>
<thead>
<tr>
<th>Matrix Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>NRC waste classification system. Subpart 55. Class C splits into LLW and HLW.</td>
</tr>
<tr>
<td>Hungary</td>
<td>PURAM waste classification system. LLW, MLW, HLW.</td>
</tr>
<tr>
<td>Mexico</td>
<td>NOM-4-NUCL waste classification system. NB A, NB B, NB C, INTERMEDIO, ALTO NIVEL.</td>
</tr>
</tbody>
</table>

### Table

<table>
<thead>
<tr>
<th>Waste Class</th>
<th>USA LLW</th>
<th>USA HLW</th>
<th>Hungary LLW</th>
<th>Hungary HLW</th>
<th>Mexico LLW</th>
<th>Mexico HLW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>100</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class B</td>
<td>0</td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than Class C</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLW</td>
<td>0</td>
<td>100</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>LLW: low level waste. MLW: medium level waste. HLW: high level waste.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**IAEA**
Data Detail

• Data are not “fine”
  • Not container/package-specific
  • Not highly detailed
  • No “characterisation” data
  • Only broad class data – “rollups”
    • “Consolidated Waste Inventory”

• Data are:
  • Site/Facility specific
  • Form specific (solid or liquid)
  • End-form (conditioned or raw)
Current Data includes

- Waste in Storage and Disposal
  (including historical disposal no longer practiced)
- Treatment/Conditioning Capabilities
- Current policies, laws & regulations
- Regulatory authorities
- Major milestones in programme development
- DSRS
NEWMDB does not currently contain:

- **Spent Fuel**
  (Generally SF ≠ waste ... and can be found elsewhere)

- **NORM**
  (from activities other than uranium production)
New information

- Uranium Mine and Mill Tailings (UMMT)
- Radionuclide inventories
  - Site specific
  - Waste-class specific
- More details on Repositories
- Country “Profile”
  - Text-based Summary information
• What is NEWMDB?
• Current Participation
• Introduction to Version 3 improvements
• Guidance on Waste Matrix Development
Who is reporting to NEWMDB?
• What is NEWMDB?
• Current Participation
• Introduction to Version 3 improvements
• Guidance on Waste Matrix Development
The IAEA Online Information Resource for Radioactive Waste Management

The NEWMDB contains information on national radioactive waste management programmes, radioactive waste inventories, radioactive waste disposal, relevant laws and regulations, waste management policies, and plans and activities. The first NEWMDB data collection cycle was conducted in March 2002 (for year 2000 data). Subsequent collections have been performed annually from 2003 onward. NEWMDB is now in Version 3, with a new interface.
NEWMDB Administration

Welcome, John KINKER

If you are creating a new submission to NEWMDB, start with Step 2. Framework.

If you only need to update a submission, then please start with Step 3. Data Submission.

NEWCOMERS: Version 3 contains some changes to Facility Information, so check to see if you can update these new fields for your facilities. See Help topic Facility Information for a list of these important changes.

As of 2010, the IAEA has released a new default schema for Waste Classes, referenced in Classification of Radioactive Waste. Click here to update Waste Class Schemes of your Country to comply with the new standard.

Go to conversion page.
Basics of Admin System

1. Login & language selection
2. User Management
3. Work Flow
4. Waste Classes
5. Framework
6. Waste Data Entry
7. Report acceptance and publishing
8. Tools and extras
Login, Languages, User Management

- Login
- Main Screen
- Language Selection
- User Management
  - Edit self
  - Add User
  - Delete User
NEWMDB has 2 kinds of Work Flows:

1) Related to Database Structure

2) Related to Review and Approval
Work Flow - Data

- Work flow is important
- Database is relational – hierarchy dictates work flow

Waste Matrix
Group Definition
Site Definition
Facility Definition
Waste Data Input

Each element is required before the next can be entered/approved
Simplified NEWMDB Logical Data Model

Submission Year

Member States

Survey Answers
Publications
Users

Waste Matrix
Definition

Reporting Groups

Sites

Facilities

Processed Waste
Un-processed Waste

Data

Framework
1. Admin (me) sets up Submission Year
2. CC (you) enter Information
3. CC approve
4. Admin reviews and approve (or correct)
5. CC decides to publish

- CC can always “go back” by unlocking after approval
Defining Waste Matrix

- **Very Important** to read GSG-1, GSG-1 Conversion Guidance, and make a determination in advance
- Can have more than one Waste Matrix
  - E.g., Government, Commercial (NPP waste), Institutional waste, etc.
- Required before CC can assign the types of waste managed at a particular Site and Facility
Define Framework

1. Define Groups
   - Assign a Waste Matrix to each Group

2. Define Sites
   - Sites are subordinate to Groups

3. Define Facilities
   - Facilities are subordinate to Sites

- Once Framework is complete and approved, Waste Data may be entered
Important Framework changes

• Disposal facilities have additional data fields
• Status of all Framework elements is on a single page
• UMMT Waste “Class” reportable as tonnes
Waste Data

- Waste Data is entered for each Site
- May also be entered for each Facility
  - Can vary by Site (i.e., some sites reported by facility and some not)
  - Determined at time of data entry
Important Changes to Waste Data

- Radionuclide Inventories now reportable
  - For a Site and for an entire Waste Class
- UMMT waste class
- XML Template-based data upload
  - Schema defined by Framework
  - “One button upload” of all data at one time
  - Useful for CC’s with a good database of their information
Report Review and Publishing

- Most interface changes are here
- Status of report development shown on status bar at top
- CC’s do not need to wait for Admin to run reports
- Reports will now generate immediately after approval by CC
- Admin approval is NOT needed to publish
Tools for CC’s now include:

1. Data Presentation Tool for flexible report production
2. Audit
3. Library
4. All Comments
5. All Attachments
6. XML one-button upload
• What is NEWMDB?
• Current Participation
• Introduction to Version 3 improvements
• Guidance on Waste Matrix Development
Translation of National Classes Matrix

- “translation” is only for the purpose of NEWMDB reporting
- It is part of the core function of NEWMDB
- Without the Waste Class Matrix, there is no comparability
### Waste Class System Translation

#### USA

<table>
<thead>
<tr>
<th>Matrix Name</th>
<th>USNRC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USNRC Class</td>
<td></td>
<td>NRC waste classification system: Subpart 55, Class A, B, C and greater than Class A LLW.</td>
</tr>
</tbody>
</table>

#### Hungary

<table>
<thead>
<tr>
<th>Matrix Name</th>
<th>PURAM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PURAM Class</td>
<td></td>
<td>LLW: low level waste; MLW: medium level waste; HLW: high level waste; INTERMEDIO: intermediate level waste; ALTO NIVEL: high level waste.</td>
</tr>
</tbody>
</table>

#### Mexico

<table>
<thead>
<tr>
<th>Matrix Name</th>
<th>NOM-4-NUCL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM-4-NUCL Class</td>
<td></td>
<td>Mexican Official Norm NOM-004-NUCL-1994 Classification of Radioactive Waste</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>LILW-SL%</th>
<th>LILW-LL%</th>
<th>HLW%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A LLW</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Class B LLW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class C LLW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than Class A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LLW</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MLW</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HLW</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NB A</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NB B</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NB C</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>INTERMEDIO</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>ALTO NIVEL</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
Two main questions:

1. How is your waste classified?

2. Do you already have a disposal facility with defined Waste Acceptance Criteria?
4 basic situations re: classification

1. Country Classes = New IAEA Classes
   • E.g., France

2. Country Classes = Old IAEA Classes
   • E.g., Sweden

3. Country Classes are unique

4. Country has no pre-defined classes
   • And/or only manages DSRS/Medical waste (VSLW)
From the guidance …

• Case 1: Member state waste classes are substantially the same as the new classes now in the NEWMDB, i.e., those described in GSG-1. In this case, the CC does not need to do further analysis to prepare data for input into the NEWMDB. However, some basic, written descriptions of the National classification scheme are appreciated.

• Case 2: Member state waste classes are the same (or very similar) to the classes initially in the NEWMDB, i.e., those embodied in superseded IAEA SS 111-G-1.1.

• Case 3: There is no similarity between member state waste classes and those now in the NEWMDB, i.e., those described in GSG-1. See Section 3.2, below.

• Case 4: There is no legislated classification scheme and/or the member state only has disused sealed radioactive sources and medical waste. If this is the case, then no analysis is necessary.
GSG-1 Classes for NEWMDB Reporting

Figure 1. Conceptual Illustration of IAEA Waste Classification Scheme

- HLW: high level waste (deep geologic disposal)
- ILW: intermediate level waste (intermediate depth disposal)
- LLW: low level waste (near surface disposal)
- VLLW: very low level waste (landfill disposal)
- VSLW: very short lived waste (decay storage)
- EW: exempt waste (exemption/clearance)

Classes Excluded from NEWMDB Reporting
Uranium Mine and Mill Tailings

- UMMT is a type of NORM-containing waste
- UMMT is a unique “class” for reporting within NEWMDB (only)
- Therefore, do not include UMMT in the analysis of classes. It can simply be reported directly.
Status of Disposal

• Some MS have active/planned disposal facilities
• Many do not
• May or may not have WAC
• WAC should be based on site-specific Safety Case
• WAC should form basis for translation into GSG-1 classes
NEWMDB guidance

- Defines suggested boundary limits
- ONLY necessary if other means of comparison are not possible
- NOT intended to replace risk-based approach of GSG-1
- NOT recommendations of IAEA for determining waste classification schemes
- Only necessary for purpose of comparison
### Table 1. Definition of NEWMDB Waste Classes for Translation of National Waste Classes

<table>
<thead>
<tr>
<th>NEWMDB Waste Class</th>
<th>Minimum Disposal Option&lt;sup&gt;5&lt;/sup&gt;</th>
<th>Suggested&lt;sup&gt;2&lt;/sup&gt; Waste Class Boundary Conditions for NEWMDB Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower limit</td>
</tr>
<tr>
<td>HLW</td>
<td>Geologic repository</td>
<td>$10^6$ Bq/g total activity; heat generation of 2 kW/m² (See footnote&lt;sup&gt;3&lt;/sup&gt;)</td>
</tr>
<tr>
<td>ILW</td>
<td>Intermediate depth repository</td>
<td>Long-lived alpha emitters 4,000 Bq/g (maximum single package) or 400 Bq/g average over packages (See footnote&lt;sup&gt;3&lt;/sup&gt;)</td>
</tr>
<tr>
<td>LLW</td>
<td>Near-surface</td>
<td>$\sim$100 times the BSS exemption levels. [For waste not containing alpha activity a limit of 100 Bq/g average activity may be used] (See footnote&lt;sup&gt;9&lt;/sup&gt;)</td>
</tr>
<tr>
<td>VLLW</td>
<td>Landfill</td>
<td>Long-lived alpha emitters 4,000 Bq/g (maximum single package) or 400 Bq/g average over packages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$100$ Bq/g total activity (See footnote&lt;sup&gt;2&lt;/sup&gt;)</td>
</tr>
</tbody>
</table>
Suggested reference values to help define transitions between classes

**Figure 2. Typical Boundaries for Determining Waste Class for NEWMDB Reporting**

- **HLW**
- **ILW**
- **LLW**
- **NAT**
- **AAT**
- **ATIA**

- Heat Generating (>2 kW/m³)
- Non-Heat Generating

- $10^7 - 10^8$ TBq/m³

- 4000 Bq/g maximum $\alpha$
- 400 Bq/g average $\alpha$

- $T_{1/\alpha} > 30$ years
- $T_{1/\alpha} < 30$ years

- ~100 times exemption levels**
  maximum

- Conservative example
  0.1 Bq/g
  Co-60, Cs-137

- Exempt Waste

**For waste not containing alpha activity a limit of 100 Bq/g average activity may be used.**
1. Compare your waste classes to the GSG-1 classes in a qualitative way
   - Look for similarities in the way each class is managed in disposal
   - Specific quantitative differences are not important
2. If that is not possible, analyse waste in inventory using recommended boundary values
Additional clarification

- GSG-1 concepts apply to “disposable” waste or waste in disposal.
- Therefore, suggested boundary values also must be applied only to conditioned waste forms.
- If current inventories are not conditioned, consider the “conditioned form” the waste will take in future for calculation.
  - E.g., a LLW which will be incinerated and the ash solidified. Final form is the solidified ash.
Case specific guidance

- Case 1 (Classes = GSG-1) is trivial
- Case 2 …
Case 2: SS-111 Classes to GSG-1 Classes

- Fairly simple relationship:

1. LILW-SL $\rightarrow$ $x\%$ VLLW + $y\%$ LLW

2. LILW-LL = 100% ILW

3. HLW = 100% HLW
## Table 2. Translation of Standard IAEA Waste Classes for NEWMDB

<table>
<thead>
<tr>
<th>New NEWMDB Waste Class</th>
<th>Previous NEWMDB Waste Class</th>
<th>LILW-SL</th>
<th>LILW-LL</th>
<th>HLW</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLLW</td>
<td></td>
<td>X%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>LLW</td>
<td></td>
<td>(100- X)%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>ILW</td>
<td></td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>HLW</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Determining VLLW

- VLLW is waste that is adequately protected in a surface landfill and does not require extensive institutional controls
- Suggested boundary value for determining equivalence
- Only for waste not containing alpha emitters
- Upper limit of 100 Bq/g total average activity
Determining LLW

- LLW requires longer institutional control
  - Half-lives < 30 years for majority of nuclides
  - < 400 Bq/g average alpha/transuranics
  - < 4000 Bq/g maximum alpha/transuranics
- Requires more stringent management, but near-surface disposal is adequate based on risk
Case 3: Unique Classes to GSG-1 Classes

- MS has unique classification scheme that does not easily “map” to the IAEA recommended classes
  - E.g., Germany
- MS has operational classifications that do not relate to disposal or which are source-dependant
  - E.g., Switzerland
Case 3: Unique Classes to New Classes

• More difficult to determine

• Each National class needs to be defined either as:
  1. Qualitatively = GSG-1 Class
     or
  2. Quantitatively = percentage of one or more GSG-1 Classes

• National Classes may be partially in one GSG-1 Class and partially in another
  • E.g., USA LLW classes
### Conversion Table for Unique Classes

#### Table 3. Translation of Unique National Classes into IAEA Waste Classes for NEWMDB

<table>
<thead>
<tr>
<th>National Classes</th>
<th>NEWMDB Waste Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VLLW</td>
</tr>
<tr>
<td>Class 1 (Lowest)</td>
<td>((VLLW%)_1)</td>
</tr>
<tr>
<td>Class 2</td>
<td>((VLLW%)_2)</td>
</tr>
<tr>
<td>Class n-1</td>
<td>-</td>
</tr>
<tr>
<td>Class n (Highest)</td>
<td>-</td>
</tr>
</tbody>
</table>
Case 4: No National Classes

- Frequently when MS manages only DSRS and medical waste (VSLW)
- Matrix is therefore not really necessary
- However, a matrix must be selected.
- In this case, simply select IAEA Matrix.
- Can be changed later if situation changes
Case 4 options

- If no waste other than DSRS and/or VSLW (like medical waste), no analysis is needed.
- CC can use the GSG-1 classes for reporting purposes
Matrix conversion tool

- Should only be used after following the guidance:
  1. From the main screen in NEWMDB
  2. Click “go to conversion tool” in the message box
  3. Convert each year’s matrix according to new scheme
  4. NEWMDB will apply all changes automatically
  5. Needs to be performed only once