

RADIOACTIVE WASTE CLASSIFICATION. IAEA. NO. GSG – 1 [i].

It was found that one of the critical IAEA general safety guides (GSG) was not reported in the IAEA peer review, and is believed not deliberated in granting the operating license. The Radioactive Waste Classification. IAEA No. GSG-1, is to set out a general scheme for classifying radioactive waste that is based primarily on considerations of long term safety, and thus, by implication, disposal of the waste.

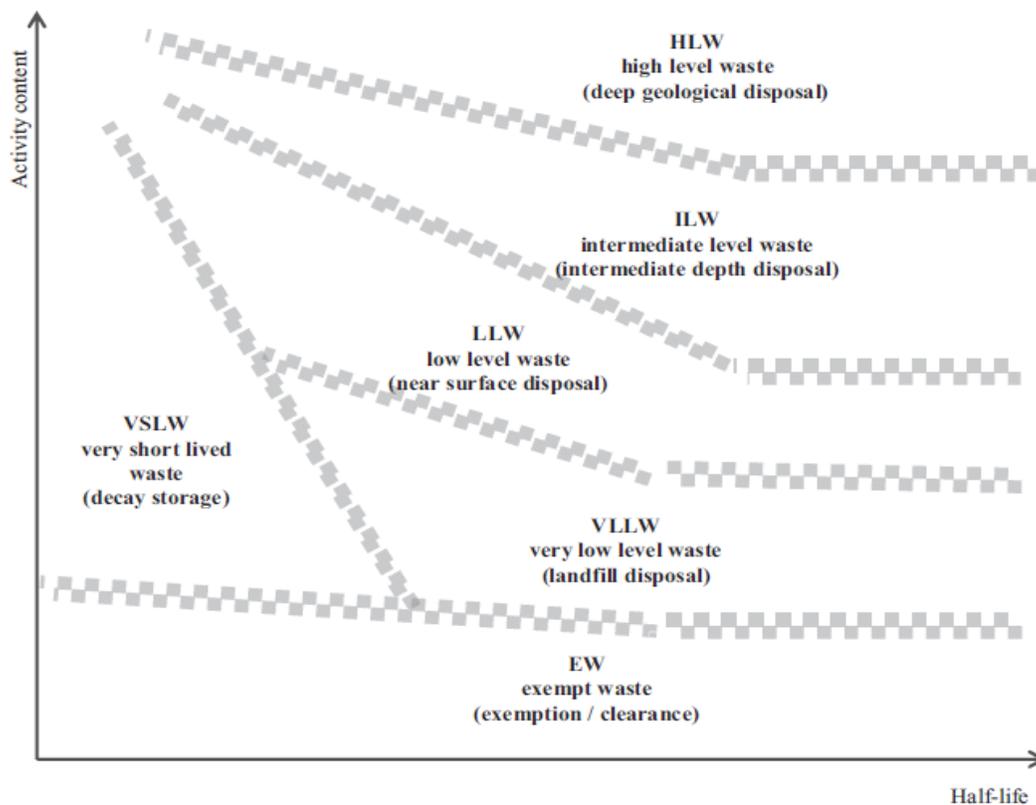


FIG. 1. Conceptual illustration of the waste classification scheme.

Figure 1 shows the illustration of the radioactive waste classification of this general guide, which defined by the radioactivity concentration and the half-life. It is noted that different class of radioactive waste requires various mean of safe disposal and storage. Nonetheless, this guide has not incorporated the distinctive numbers that define the boundary of each class. Instead, an international best practice was adopted to distinguish the waste classes for the purpose of this reporting.

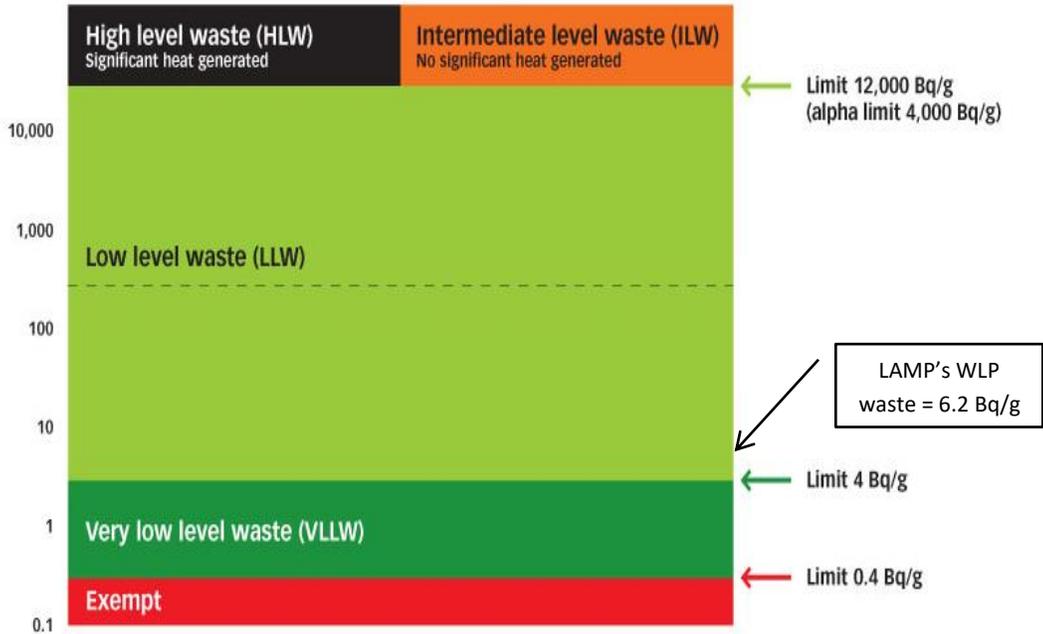


Figure 2 : Radioactive waste classification system used in the UK [ii,iii]

Figure 2 demonstrates the radioactive waste classification for different radioactivity level used in the UK. Most EU Member States, the Baltic and the Central European countries have the similar categorisation limits (if not more stringent) as per the UK's [iv] back in 1998, and is believed to be more rigorous to date. To comprehend the classification, the **Low Level Waste (LLW)** is termed as solid radioactive waste that contains up to 4,000 Bq/g alpha bearing nuclides and 12,000 Bq/g beta/gamma bearing nuclides; whilst **Very Low Level Waste (VLLW)** is a sub-category of LLW that comprises:

- Low Volume VLLW** ('dustbin loads') - is generated principally by so called "small users" and are wastes that can be safely disposed of to an unspecified destination with municipal, commercial or industrial waste, each 0.1 cubic metre of material containing less than 400,000Bq of total activity, or single items containing less than 40,000Bq of total activity.
- High Volume VLLW** (bulk disposals) – Most of this waste is produced by decommissioning nuclear licensed sites and are typically soils & rubble wastes with maximum concentrations of 4Bq/g of total activity that can be disposed of to specified landfill sites.

The radioactivity concentration of the water leach purification (WLP) solid waste is reportedly 6.2 Bq/g, this puts the LAMP's WLP waste in the Low Level Waste (LLW) category, bulk disposal. It is recommended by the IAEA GSG [i], this waste requires robust isolation and containment for periods of up to a few hundred years and is suitable for disposal in engineered near surface facilities. This class covers a very broad range of waste. LLW may include short lived radionuclides at higher levels of activity concentration, and also long lived radionuclides, but only at relatively low levels of activity concentration – the latter reflects the LAMP's WLP.

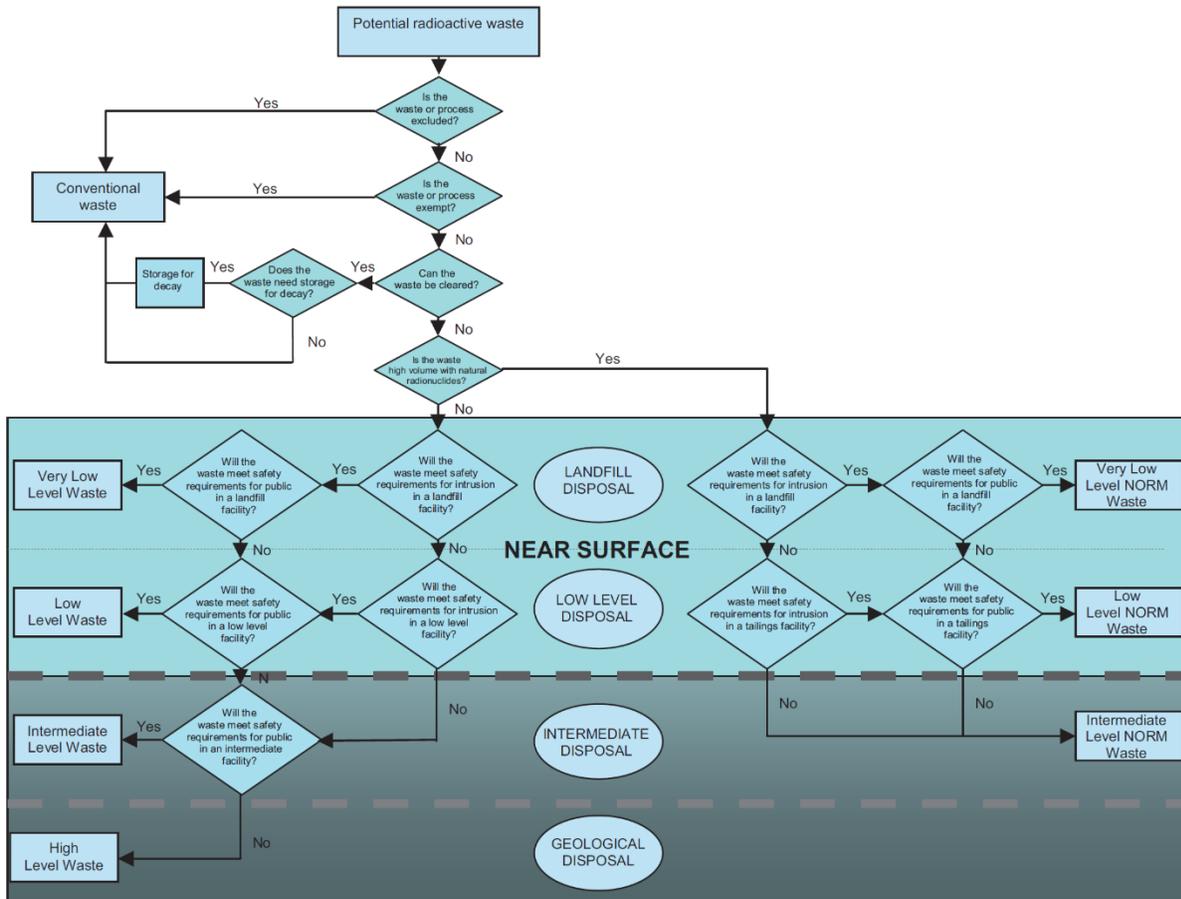


Figure 3 : An illustration of the use of the classification scheme

Figure 3 illustrates the use of the classification scheme for storage and disposal purposes, the LLW involves near surface disposal facilities at varying depths, typically from the surface down to 30 meter. The LLW may need for controls over time frames for which institutional control can be guaranteed and thus human intrusion into the waste can be prevented.

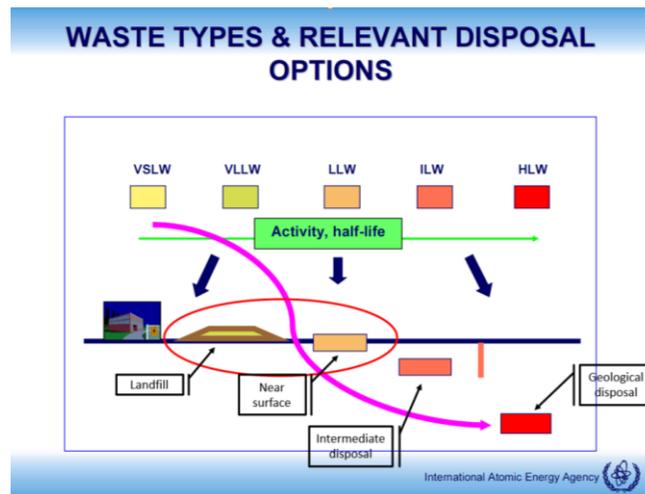


Figure 4 : Graphical presentation of different elevation/depth of disposal site as a function of waste classification

In many Member of States it is assumed that institutional controls can be relied upon for a period of up to around 300 years. A different situation arises for the WLP waste containing significant amounts of radionuclides, for which the activity content will not decrease significantly over such timescales. Since the management of such waste in near surface facilities is in many cases the only practicable option, longer periods of institutional control have to be postulated, with periodic safety review of the facility. All these will depend on safety assessments and on national practices, and are subject to approval by the regulatory body.

Lynas' intended WLP disposal and storage measures

The RIA and IAEA reports indicated that the WLP solid waste will be stored temporarily in Residue Storage Facilities (RSF) for several years, if the WLP residue cannot be recycled and reused; it will be eventually disposed at a permanent disposal facility in the country.

The design of the RSF as revealed by the RIA report [p46], will have a dual liner system consisting of a clay layer and a HDPE (High-density polyethylene) layer to prevent migration and leakage of radionuclides into the environment. The WLP residue will be covered with "special materials" to minimise infiltration of rainwater into the residue materials and spread of materials to the environment. The depositing of WLP residue will be conducted by dispersing the materials into the RSF site and this will build up height on the 24 000 m² RSF.

No details of the methodology, design and location of the permanent disposal site was disclosed by AELB/Lynas.

If the IAEA General Safety Guide. Classification of Radioactive Wastes. No GSG-1, was to be employed for the WLP residue, then the mean of RSF disposal proposed above will be violating the IAEA standards. Regrettably, this standard well as the possibly safety violation were not mentioned in the peer review report.

As far as the Malaysian Law is concerned, Lynas is allowed to accumulate and dispose the WLP residue onsite if they obtained a written authorisation from AELB. Given the relaxed nature of the Act 304, no disposal limits nor the method of safe disposal/storage was outlined in the Act and its subsidiary regulations. It is therefore, under the Act 304, up to the AELB's discretion to decide those exempted limits and methods for safe disposal and storage.

Summary of Act 304

- Primary legislation
- "radioactive material" means any nuclear fuel, radioactive product or radioactive waste;
- Section 26 - No person shall dispose of or cause to be disposed any radioactive waste
- Section 27 - No person shall accumulate or cause to be accumulated any radioactive waste on any premises
- Both (disposal and accumulation of radioactive wastes) are allowed if prior authorization in writing of the appropriate authority is attained

- Section 28 - If it appears to the appropriate authority that adequate facilities are not available for the safe accumulation, storage or disposal of any radioactive waste, the appropriate authority may direct the licensee to rectify the situation and the licensee shall give effect to such direction.
- "appropriate authority" means the Board, AELB
- To authorize disposal, storage and accumulation of radioactive wastes
- To establish values for the "clearance level", at or below which, the source of radiation may be released from the control of the Act
- Section 69 - The Minister can impose, exempt any person or class of persons from any or all of the provisions of this Act.

Remarks

- The RIA stated that the Act 304 is general in nature, no specific and details made on construction, handling and operation of RE plants. (RIA, p4, para2)
- No definition of radioactive materials in terms of activity concentration (RIA, p5, para1)
- No clear definition of "authorization". (IAEA, p9, para3)
- No regulation of NORM / TENORM activities (IAEA, p10, pt(c))

i. IAEA, "Radioactive Waste Classification". IAEA No. GSG-1 , Vienna, 2009

ii . DELFRA, "Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom" London, 2007

iii. RSA 93. UK Radioactive Substances Act 1993 Chapter 12.

iv. P. Vankerckhoven (Ed.), "Radioactive waste categories - current position (1998) in the EU Member States and in the Baltic and Central European countries, EUR 18324 EN, 1998

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