Radioactive Waste Transport in The Netherlands

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INTRODUCTION

In the Netherlands radioactive waste is managed by COVRA, the Central Organisation for Radioactive Waste. This dedicated organisation has been set up as a joint venture between the major radwaste producers in the country and the government. Its only task is to execute the radwaste policy of the Dutch government[1,2].

In the government's policy paper with respect to environmental management of radioactive waste, it is stipulated that isolation of radioactive waste from the biosphere is required as well as the control of waste production by means of restrictive use of radioactive materials. Furthermore, surveillance of the waste-management system is needed.
This policy is executed as follows:
- all kinds and categories of radwaste generated in the next 50-100 years will be stored in a retrievable way, above ground, in an engineered structure,
- this long-term storage, together with a centralized treatment facility will be located at one single industrial site,
- research will be performed on final disposal possibilities within the Netherlands or within an international framework,
- COVRA will take care of all the wastes produced.

In the Netherlands two nuclear power plants are in operation; the total amount of waste generated is therefore relatively small. The volume of waste produced by other users of radioactive materials in research, medicine and industry is relatively important and equals the volume of waste produced by the nuclear power plants.
Low and medium-level waste consists of solid compactable waste, animal carcasses, organic liquids, scintillation vials, inorganic liquids, radiation sources and concrete-solidified sludges and spent ion-exchange resins. The latter are produced and treated

at the nuclear power plants. In table 1 an overview of the volume and the activity of the wastes generated by the users of radioactive materials is given.

	volume m^3/year	activity Bq/year	transportunit
- solid compactable waste	600	2.10^{12}	100 liter steel drums
- animal carcasses	5	1.10^{11}	60 liter coolingbox
- organic liquids	25	3.10^{11}	30 or 60 liter drums
- inorganic liquids	80	4.10^{11}	30 or 60 liter drums
- radiation sources and other uncompactable waste	1	8.10^{12}	various containers
- sludges and resins, solidified at the nuclear power plants	450	4.10^{13}	200 liter steel drums or 1000 liter concrete container

Table 1. Overview of the various low- and medium-level waste products

The spent fuel of the two nuclear power stations is sent to reprocessing facilities in France and the United Kingdom. Recently the French reprocessor has announced that the returning of the waste is aimed to start in 1994.

It is estimated that some 45 m^3 of vitrified heat-generating high-level waste, 500 m^3 of non-heat generating high-level waste and 2000 m^3 low and medium-level reprocessing waste will be returned. These volumes are related to some 25 years of operation of the two nuclear power plants.

WASTE TRANSFER TO COVRA

According to the Nuclear Energy Act waste producers can only dispose of their waste by transferring it to an authorized waste collecting organisation. Since COVRA is the only one authorized organisation all radwaste produced in the Netherlands will ultimately be transferred to COVRA.

The waste producer has to notify COVRA with special administrative forms about the nature, the volume, the activity and the radiation level of the waste to be transferred. COVRA then judges the acceptability and a date is fixed to collect the waste depending on the possibility to plan an economic route for the COVRA-truck.

All wastes are collected at the producers after control of dose rates, contamination level and verification of the administrative data. By loading the waste drums into COVRA's truck, COVRA takes over title of the waste.

ACCEPTANCE CRITERIA

Acceptance criteria were set up by COVRA with the aim to quarantee safe transport as well as safe treatment. In general there is not a clear cut distinction between criteria for transport and those for treatment.
Only those waste packages whose application forms were judged and accepted by COVRA can be transferred. The waste has to be collected in standardized packages as supplied by COVRA.
These packages must be clean and dry at the outside: they may not be rusty or deformed. The total weight may not exceed 75 kg. The packages must be securely closed. Metal drums older than two years will not be accepted.

The radiation level of the packages should not exceed 2 mSv/hour at the surface and 0,1 mSv/hour at 1 meter distance of the surface. Packages with a surface radiation level above 2 mSv/hour but below 10 mSv/hour can be accepted after separate consultation.

Surface contamination of the packages to be collected may not exceed the limits of IAEA Safety Series no. 6 i.e. for alpha-activity a limit of 0,4 Bq/cm^2 and for beta/gamma-activity a limit of 4 Bq/cm^2. As a maximum only 1% of the surface contamination may be wiped from the package in a smeartest.

Solid waste may not contain over 1% (volume) liquid. The total activity of a drum with solid waste is restricted to the A_2-level of IAEA Safety Series no. 6.

Liquids must have a pH larger than 5. The activity limits for liquids are for beta/gamma activity 5 MBq/liter and for alpha activity 50kBq/liter. Organic liquids with alpha activity can only be accepted after separate consultation.
Liquids with a specific activity in excess of the previously mentioned values can be accepted only if they are collected in a 30 liter standardized liquid waste drum and if the specific activity is less than 10^{-5} times the A_2-value per gram. For tritiated water this limit is 600 MBq per liter. These 30 liter liquid waste drums are to be transported in an overpack with absorbing material.

Animal carcasses and similar materials must be offered as deep-frozen parcels of about one liter at - 18°C. These parcels will be collected in cooling boxes of 60 liter.

Radiation sources of small size, such as Cs-needles must be fixed with an epoxy resin in aluminum capsule. Such capsules are available in three different sizes with a maximum of 0,5 liter.

PACKAGES

In table 1 the size of the various transportpackages is indicated for the various waste forms. Only standardized packages as supplied by COVRA may be used. In this way transport of waste always takes place with packages of guaranteed quality.
For solid waste 100 liter metal drums are used with a wall thickness of 0,75 mm or 1,00 mm if the waste is precompacted. These metal drums satisfy the A-type qualifications.
The cooling-boxes of 60 liter in which animal carcasses and the like are transported do fulfil the requirements for industrial packages (IP-2).
For liquids COVRA supplies the waste producers with metal drums of 30 or 60 liter in which a polyethylene inner container has been blown. These drums have an UN certificate and they do satisfy the spray, punch and stacking test for A-type packages but not the very severe drop-test of 9 meter. Liquids with a relatively high specific activity must therefore be offered by the waste producers in a 30-liter drum. This drum is for transport-safety placed in a metal 100 liter drum in which an interior is present of absorbent material (vermiculite). Such a combination package does not withstand a 9-meter droptest either, but in case of an accident and damage of the inner container any liquid will be absorbed.

Scintillation vials are collected in a polypropylene container of 60 liter which during transport is placed in a 100 liter metal drum. This combination satisfies the qualifications for industrial packages (IP-2).

The cemented sludges and spent ion-exchange resins that are conditioned at the nuclear power stations in 200 liter or 1000 liter packages do satisfy the requirements for type A-packages.

TRANSPORT VEHICLES

Two trucks are available for the transport of the wastes from producer to treatment c.q. storage facility. These trucks are of standard design. The smaller one can load 4 tonnes of cargo and

is used to collect waste at producers within the city where larger trucks cannot manoeuvre. The larger truck can load 8 tonnes of cargo and can be extended with a trailer to load in total 29 tonnes. This truck can optionally be equipped with a steel shield to be placed between the cargo and the drivers-cabin. This is to ensure that the radiation level in the cabin remains below the legal limit of 0,02 mSv/hour. This steel shield is 5 cm thick and is only needed when a full pay-load of containers with a suface dose rate of 2 mSv/hour is to be transported. Generally, enough packages with a lower dose rate are available to obtain shielding for the few packages with a higher radiation field.

TRANSPORT EXPERIENCE

Since 1986 all shipments of radwaste are done by COVRA personnel with COVRA vehicles. The shipment employees are specially trained, experienced drivers with additional education in radiation protection. Since these employees on behalf of COVRA take over title of the waste from the producers they must be capable to judge the radiological aspects of the waste.

On a yearly basis approximately 6000 packages are transported. This is done in some 130 shipments each year, with a total shipment distance of 45.000 km.

Shipments are performed in accordance with the Dutch transportation rules which follow ADR and IAEA Safety Series no. 6. As additonal precautional measure there is a double headed crew on each shipment. A mobile telephone unit in the trucks makes continious contact with the home-office possible. In case of bad-weather conditions shipments are postponed. Bad weather conditions are: gales with windforce eight or above, fog-situations with a sight of less than 200 meter, chances of snowfall, hail or glazed frost.

The personnel involved receives a collective dose between 2 and 4 manmSv per year, the highest individual dose is 2 mSv per year. Yearly fluctuations depend mainly on the amount of packages with higher dose rate, i.e. close to 2 mSv/hour.

FUTURE DEVELOPMENTS

As was indicated in the introduction the reprocessing waste will be returned in the nineties from France. After the year 2000 reprocessing waste will also be returned from the United Kingdom. Negotiations with the nuclear power stations, as the producers of the waste, and with the reprocessor will take place in the near future in order to organize the shipments in such a way that unloading at COVRA's can be managed in a proper way. As in the case of shipments within the Netherlands, it is intended to perform the shipments of reprocessing wastes with COVRA personnel and vehicles as well.

REFERENCES

1. Vrijen J. and Kleef R.M. van, "The Dutch waste Management system", Proceedings of the International Topical Meeting on Nuclear and Hazardous Waste Management, Spectrum '88, Pasco, Washington, September 11-15, pp. 454.

2. Codée H.D.K., "Licensing of a central treatment and longterm storage building", ibid, pp. 457.