Table 1

Transport requirements for low-level waste of LWR nuclear fuel cycle without recycle (per 1 GW(e)y)

From	To	Quantity (m^3)	No of shipment
Conversion Plant	Burial Site	280	25 - 38
Fabrication Plant	Burial Site	180	19 - 25
Reactor	Burial Site	100 - 1000	60

[source: adapted from reference 4]

According to a report[5] issued in 1981, 264 million tons of hazardous wastes were generated each year in the USA, 96% of which were disposed of at the site where they were generated. Most of the quantity shipped offsite was transported by truck. By 1989, trucks traveling over public highways moved 98% of the hazardous waste that is treated offsite.[6] By 1993, rail transportation moved about 8% of the hazardous material shipped, but 57% of the ton-miles of the hazardous materials transported.[7] In that year, 1993, the U.S. EPA[7] estimated about 266,000 generators of which approximately 240,000 are small quantity generators whose objects are only transportation of hazardous waste offsite for ultimate disposal.

Estimated quantities of radioactive waste arising in the nuclear fuel cycle in 1990 are given in Table 2

detrimental effects on the environment and public safety. Because shipments to which radioactive materials are applicable depend on the type and amount of nuclides involved as well as on the kind of vehicle being utilized, the rules and regulations that govern transportation of radioactive materials are complex, more attention will, therefore, be given to radioactive waste transport.

INTRODUCTION

Hazardous materials (hazmat) transportation is a large essential segment of freight transportation. According to the United States regulations of hazardous materials transportation, the term "hazardous materials" includes -among others- hazardous substances and hazardous wastes (49 CFR 171.8). Thus, any hazardous waste, regardless of its physical or chemical hazard, is considered a hazardous material. In this paper, the term "hazardous material" is assumed to be synonymous with the term "hazardous waste".

Hazardous materials -including hazardous wastes- transportation is indispensable for many industrial sectors of vital economic importance. In the United States, for instance, there are about 500 billion shipments of all kinds each year, of which about 100 million involve hazardous materials that are either flammable, explosive, toxic, or radioactive. Of these, there are about 2 million radioactive shipments comprising about 2.8 million packages containing about 9 million curies, not including spent fuel.1-3

Table 1 summarizes the transport requirements for low level radioactive waste arising from nuclear fuel cycle of light water reactor (LWR) with no cycle (GW)e(y).

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Hazardous Wastes:
I - Transport of Hazardous Wastes

By

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Abstract

About 300 million tons of toxic wastes are generated in the Organization for Economic Cooperation and Development (OECD) countries each year. Of this quantity only 1% is radioactive, nevertheless, radioactive waste has received much more attention and major public worry than most other types of powerful hazardous wastes. The number of shipments which involve hazardous material of all kinds is roughly 100 million per year in the United States singly. Of these shipments about 2 million comprises nearly 2.8 million packages of radioactive material not including spent fuel. Activity associated with transportation of hazardous waste from the source to final disposition has been abounding in mismanagement of the waste and has frequently been involved in unpredictable dangerous incidents.

In this article, we will overview basic hazards of waste transport operations including the radioactive wastes, denote the pertinent regulatory requirements for safe transport, transport vehicles and containers and point some of the major episodes and their

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