Edlow International Company

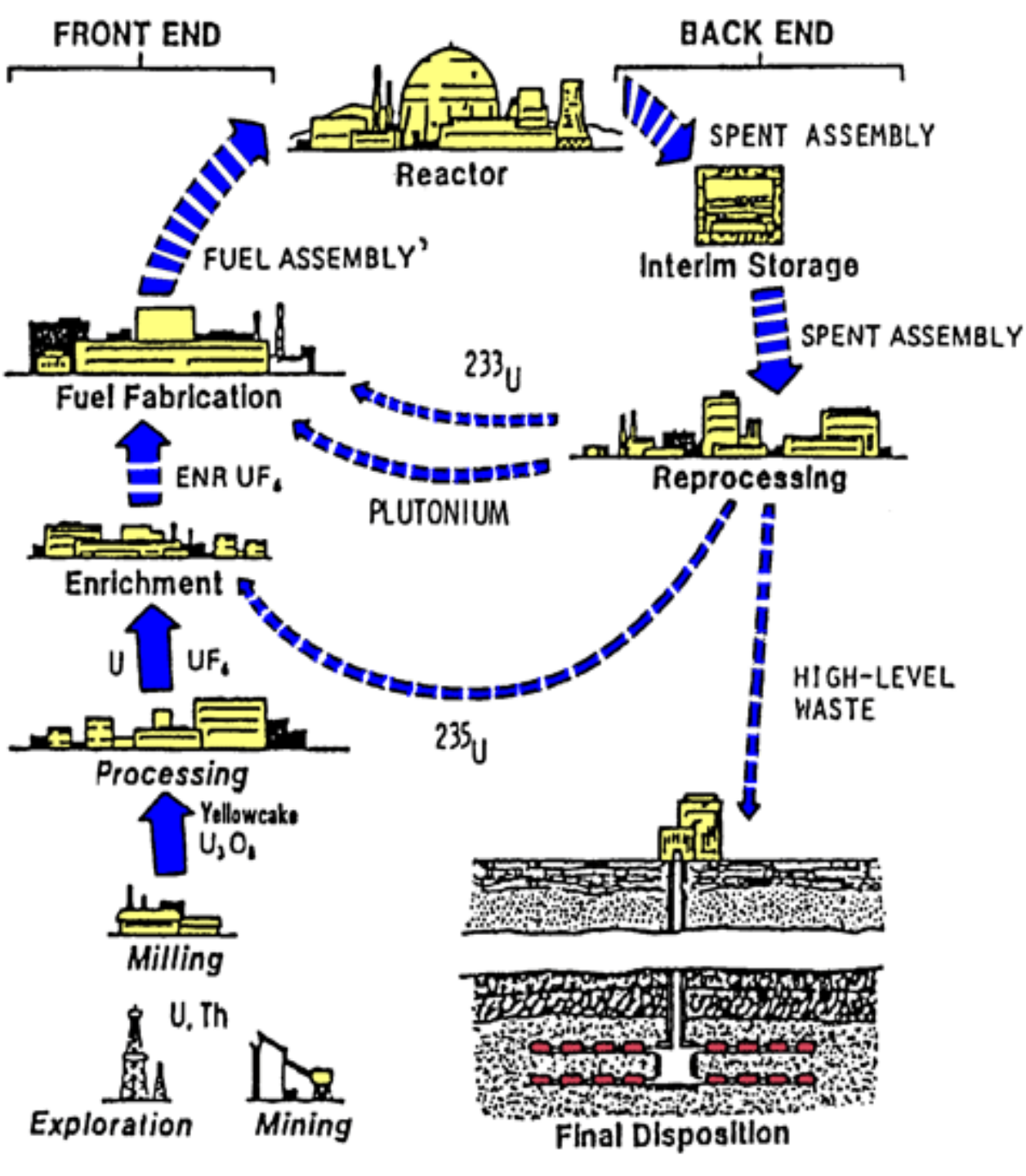
Russell Neely, Chief Operating Officer

Transportation of Nuclear Materials And Emergency Preparedness

TRANSPORTATION

- About 20 million shipments of radioactive material take place around the world each year, by road, rail, air and ocean.
- Only about 5% of these shipments are nuclear fuel cycle related; the rest are for medicine, agriculture, research, manufacturing and exploration for minerals.
- In the US, 1% (3 million) of the 300 million packages of hazardous materials shipped annually contain radioactive materials. Of this, about 250,000 shipments are related to the nuclear fuel cycle and nuclear power plants.
- Transport is an integral part of the nuclear fuel cycle. There are 430 nuclear power reactors in operation in 32 countries but uranium mining is viable only in a few areas.

Nuclear Fuel Cycle



Materials Being Transported in Fuel Cycle

- After 40 years of operation by the nuclear industry, specialized facilities have been developed in a few locations to provide fuel cycle services (conversion, enrichment, fuel fabrication).
- Nuclear materials must be transported to and from these facilities. Transport is frequently international and over long distances.
- Nuclear fuel cycle materials being transported are as follows:

  From Mine to Conversion Plant: Yellowcake (U_3O_8)

  From Conversion to Enrichment Plant: Uranium Hexafluoride

  From Enrichment Plant to Fuel Fabrication: Enriched UF_6

Materials Being Transported in Fuel Cycle

Fuel Fabrication to Power Plant: Fresh (Unused) Fuel Rods

Power Plant to Used Fuel Storage: Used (Spent) Fuel

- In the US, this is where the process stops. Each utility must store its used fuel on site as there is no general storage or reprocessing in the US. In some countries, such as France, used fuel is reprocessed and re-used until ultimately it is vitrified for long term storage.

Packaging

- Transport of nuclear materials has been carried out safely and routinely for over five decades, and during this period there has never been a transport incident in which a package with highly radioactive material has been breached or has leaked.
- The principal assurance of safety in the transport of nuclear materials is the design of the packaging. Many different packaging standards have been developed according to the potential hazard posed by the material being transported.
- For example, ordinary industrial packages (IP) are used for low-activity materials such as yellowcake. These are usually metal boxes or metal drums. They are designed to withstand normal conditions of transport.

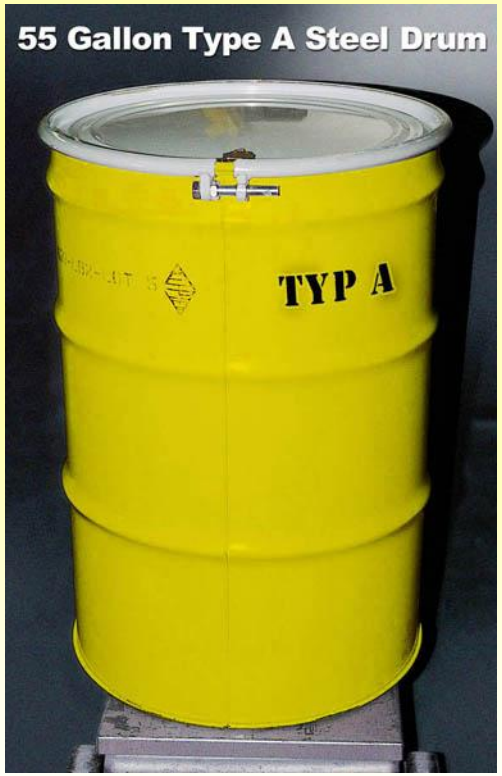
IP


UN 2912 RADIOACT.
LOW SPECIFIC ACTIVITY
TYPE IP-1
PERMISSIBLE GROSS MASS

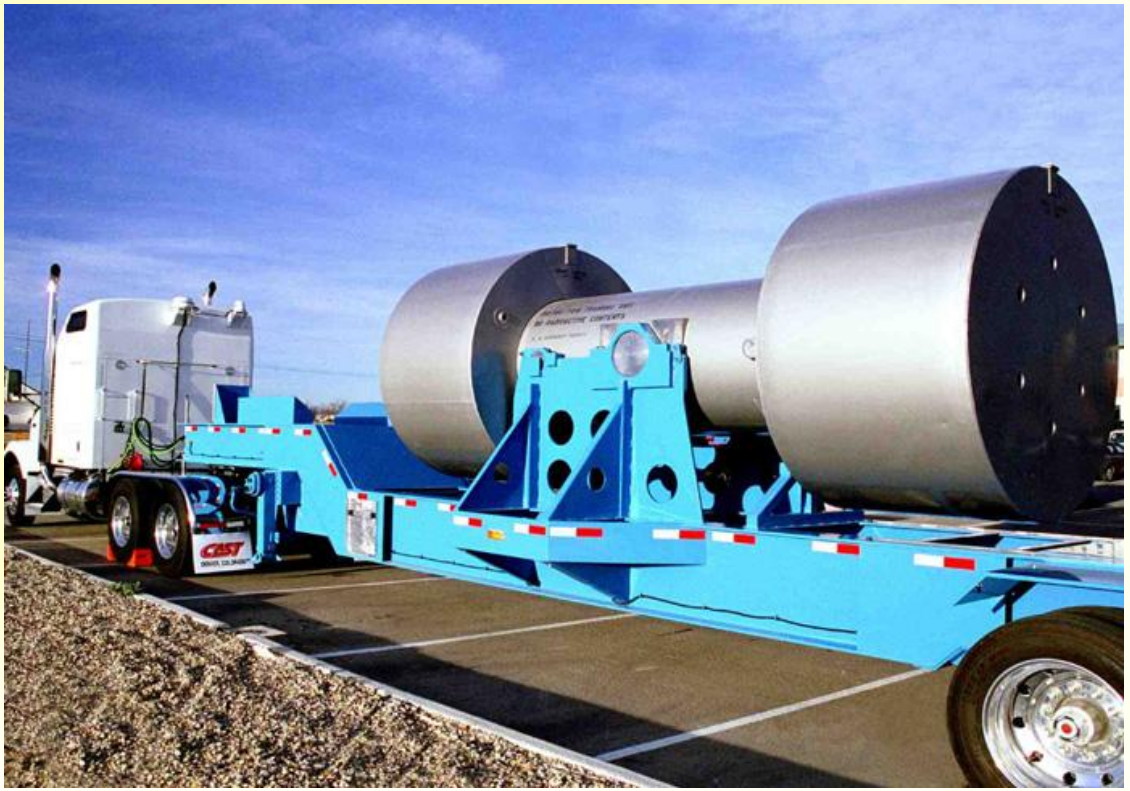
Packaging

- Type A packages are designed to withstand normal conditions of transport and minor accidents and are used for medium-activity materials such as medical or industrial radioisotopes, materials that would not result in significant health effects of they were released.
- Type B packages are designed for high activity materials such as used (spent) fuel and must be able to survive severe transport accidents. These are very robust and secure packages and they maintain shielding from gamma and neutron radiation even under extreme conditions. Type B packages must have a Certificate of Compliance from the US Nuclear Regulatory Commission or a Certificate of Competent Authority from the US Department of Transportation.

Type A



Type B



Regulation

- Regulating the safety of radioactive material shipments in the U.S. is the joint responsibility of the U.S. Nuclear Regulatory Commission (NRC) and U.S. Department of Transportation (DOT)
- The NRC generally establishes requirements for the design and manufacture of packages for radioactive materials under Chapter I of Title 10, Energy, of the U.S. Code of Federal Regulations.
- The DOT generally regulates the shipments while they are in transit and sets standards for labeling (Title 49, Transportation, of the U.S. Code of Federal Regulations).
- NRC and DOT regulations are based on international regulations issued by the International Atomic Energy Agency (IAEA).

Testing of Type B Packages

- The NRC requires that Type B packages by able to withstand a series of tests that simulate severe accident conditions. These tests are include:
  - Free Drop: A 30-foot free drop onto a flat, unyielding surface so that the package's weakest point is struck;
  - Puncture: A 40-inch free drop onto a 6-inch diameter steel rod at least 8 inches long, striking the package at its most vulnerable spot;
  - Thermal: Exposure of the entire package to 1475°F for 30 minutes; and
  - Immersion: Immersion of the package under 50 feet of water for at least 8 hours.

Severe Accident Test

- To demonstrate that Type B packages can withstand a severe accident, a tractor-trailer carrying a Type B package was crashed into a massive concrete wall at 84 miles per hour. The package was slightly dented, but it did not release its simulated radioactive material.

Type B Severe Accident Test Photo

Security During Transport

- LSA (low specific activity) material (yellowcake) must follow the same highway and tunnel procedures in the U.S.A. as other hazardous material. There is no requirement for a special route, and there is no requirement to report shipments to the NRC or to state authorities. There is no escort requirement (police or security guards).

- For high activity material, such as used (spent fuel), road and rail transports must follow an NRC pre-approved route. This pre-approval includes information about state and local police agencies, radiological response contacts, safe havens, and security protocols.

Security During Transport

- The transports are escorted entirely by armed guards, normally provided by state agencies. The numbers and methods of armed escorts is Safeguards information, but minimums are dictated in NRC regulations and guidelines. The used of armed escorts is a federal requirement, not a state requirement, although the states provide most of the services.

Edlow International – Who We Serve

We serve a customer base of over 100 companies in 50 countries

- Uranium mines in Australia, Namibia and Kazakhstan.
- Conversion facilities in Europe, the USA, and Canada.
- Enrichment and reprocessing companies in the USA, Europe and Asia.
- Fuel fabricators in the USA, Europe, Asia, South America.
- Government agencies world-wide, led by our largest single client, the US Department of Energy (under the GTRI Program).

US Ports We Use

New York/New Jersey

Philadelphia

Baltimore

Norfolk/Newport News

Wilmington

Charleston

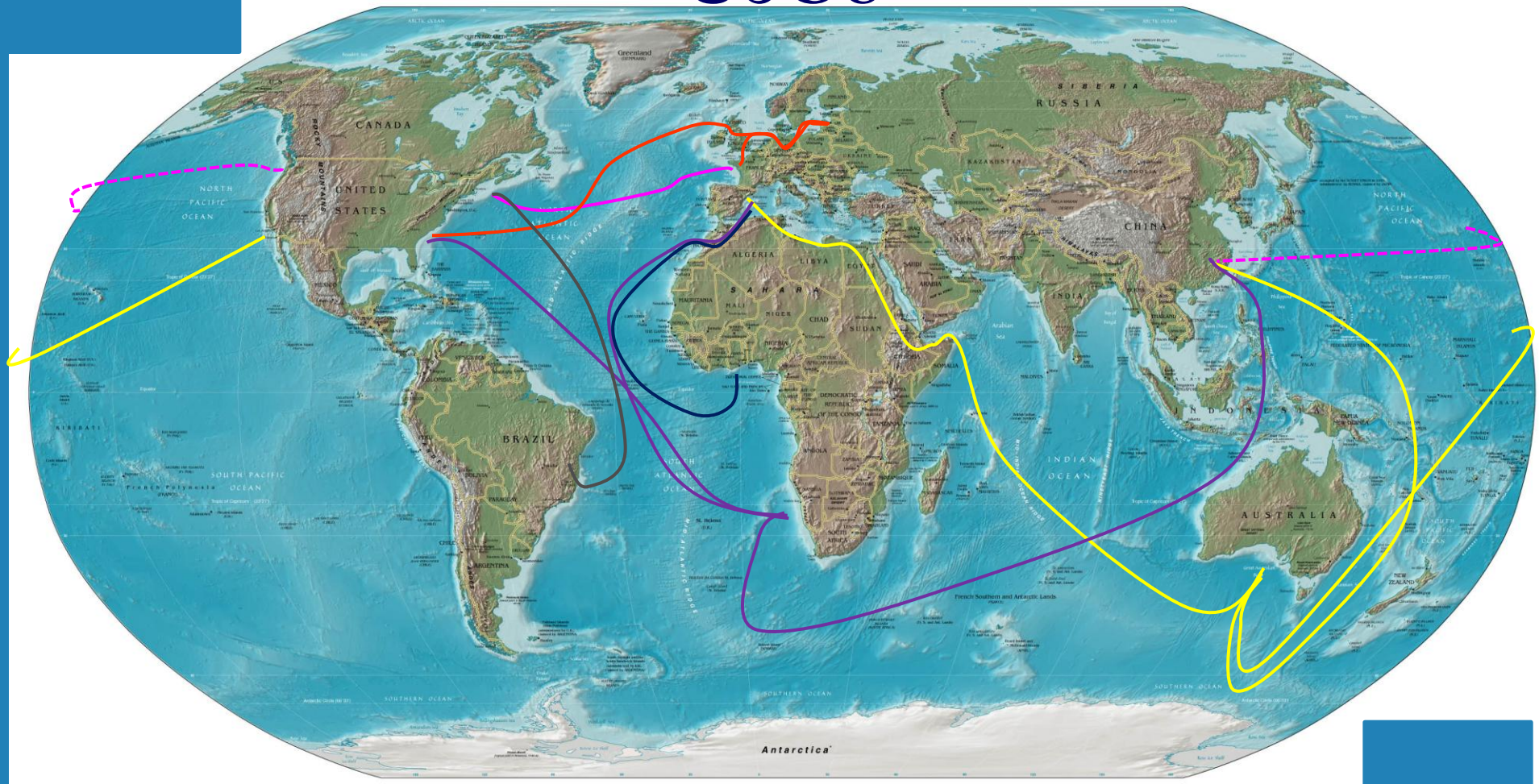
Savannah

New Orleans

Houston

Oakland

U3O8



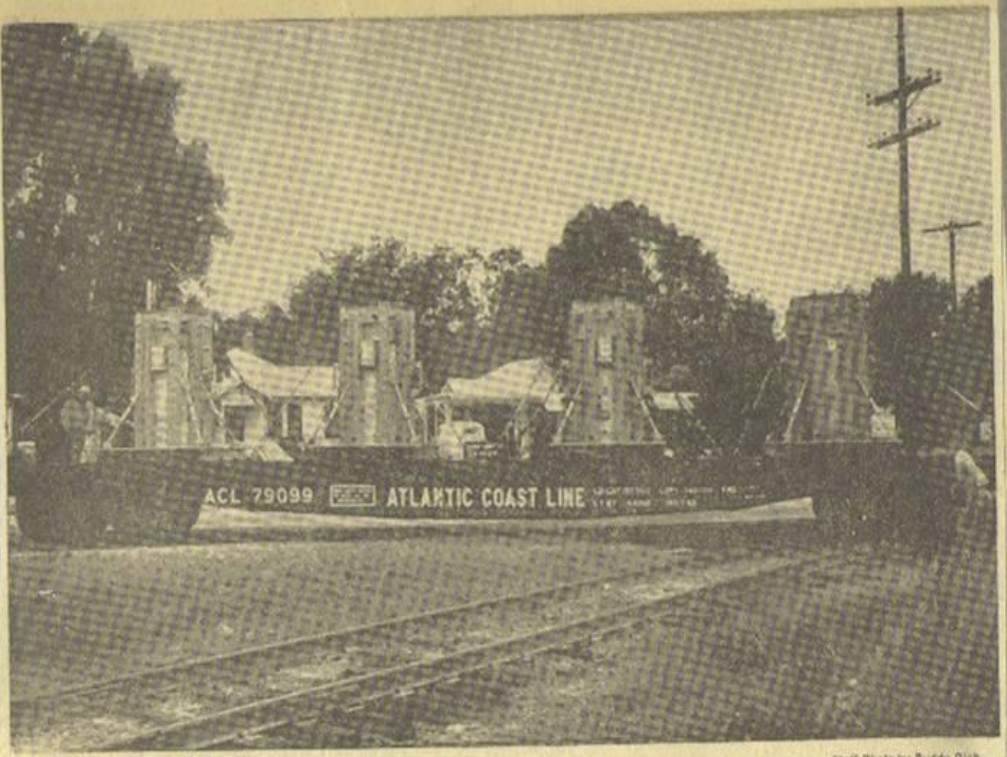
Australia
Kazakhstan
Namibia
Canada
Brazil
Niger

Savannah Morning News

TELEPHONES: Want Ads AD 4-2358 General AD 4-7511

SAVANNAH, GA., MONDAY,, JULY 22, 1963

24 PAGES, THREE SECTIONS



Staff Photo by Buddy Rich

Atomic Shipment Heads West

The first shipment of spent atomic reactor fuel to be returned to the U.S. under the Atoms for Peace program moves through Garden City on a specially [illegible] flat car. Enclosed in the four 12½-ton [illegible] —[illegible] unloaded from the Swedish freighter Ostens-holm here Sunday morning. It is being sent to an Atomic Energy Commission plant in Idaho for re-processing. (See story, other pictures on Page 8B.)

First shipment of FRR returns to the U.S. in 1963 and leaves Savannah

Edlow International Company

Effective Service

Dependability

Logistics Specialist

Outstanding Safety Record

World Wide Presence