Nuclear Plant Emergency Response

NPP Function and Malfunction: Historical Overview

Module 1

Why is this training program important to you?

- The Fukushima Daiichi nuclear power plant (NPP) crisis impacted countries located thousands of miles away.
- Several medical questions and issues became evident as the events unraveled.

Why are you here?

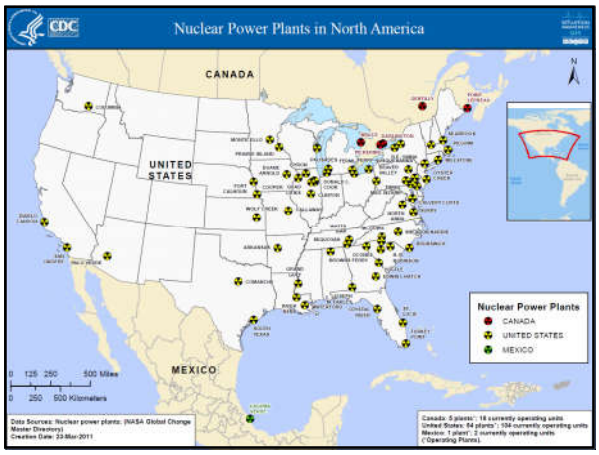
- These issues included decontamination and monitoring, medical evaluation, and the use of drugs like potassium iodide (KI).
- Emergency responders will be involved at each one of these steps.

At the end of this presentation you will be able to:

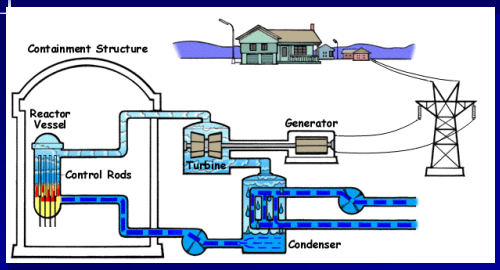
- Describe a spectrum of nuclear power plant (NPP) accidents that can occur and their health and environmental impacts.

Introduction

- Over 400 NPP worldwide.
- Over 100 reactors in the United States.

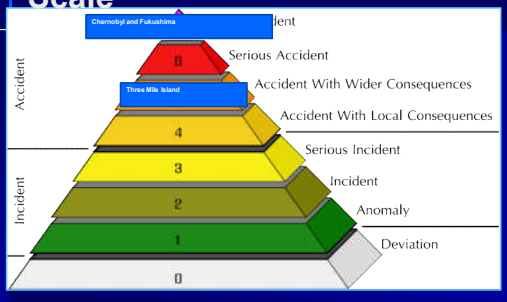


Boiling Water Reactor



Nuclear Plant Emergency Response

International Nuclear Event Scale



Nuclear Plant Emergency Response

JAPAN

March 11, 2011

- The Japan earthquake resulted in the automatic shutdown of 11 NPPs at 4 sites along the northeast coast of Japan including Fukushima Dai-ichi 1, 2, & 3.

Fukushima Dai-ichi NPP

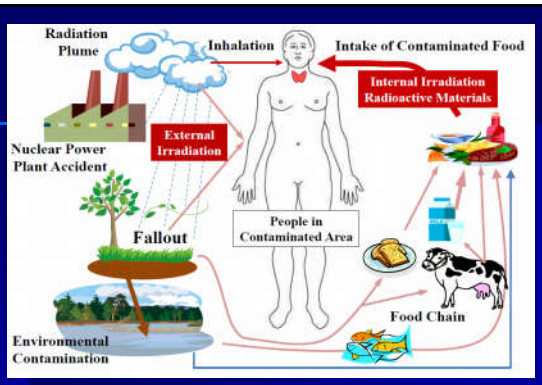
- Units 1-3 shut down.
- Diesel generators started.
- 40 minutes later the tsunami wave caused loss of electrical power.

Fukushima Dai-ichi NPP

- Meltdown risk
- Hydrogen explosions in units 1-4
- Venting of steam
- Pumping of sea water

Radionuclides Released

- Iodine-131 (8 d half-life)
- Cesium-137 (30 y)
- Cesium-134 (2 y)
- Others



Source WHO

Protective Action Measures in Japan

March 11	Evacuation of residents within 3 Km (1.9 miles). Shelter-in-place within 10 Km (6.2 miles)
March 12	Evacuation of residents within 20 Km (12.4 miles)
March 15	Evacuation of residents within 30 Km (18.6 miles)
April 11	Planned evacuation areas and Evacuation-prepared area established in areas beyond 20 Km (12.4 miles)
April 21	Restricted area within 20 km established to allow temporary access and exclusion area of 3 Km for members of the public

Evacuation

Other Protective Measures

- I-131and other radionuclides (e.g., Cs-137)
- KI deemed unnecessary
- Food, agricultural, dairy product, and water safety

Food Safety

Long Term Clean Up

Source NY Times

RUSSIA

Nuclear Power Plant Accident-Chernobyl

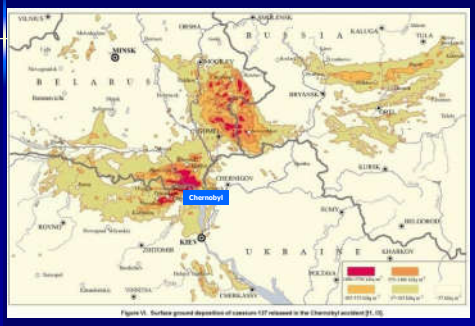
Chernobyl

10 km radius uninhabitable - indefinitely

30 km radius controlled entry - indefinitely

April 1986

Chernobyl Contamination



Firefighters in Chernobyl

- 137 emergency workers had acute radiation syndrome (ARS).
- ARS was identified as cause of death for 28 people within the first few months after the disaster.

Source Wikkipedia

Chernobyl (cont.)

- Principal radionuclide: Iodine-131
  - About 90% of dose
  - Inhaled and ingested
- Thyroid cancer

JAPAN

Criticality Accident-Tokai Mura Japan in 1999

- Irradiation accident resulting from human error.
- Uranium mixing error.
- 119 workers exposed. The range is believed to be 0.1 to 1 mSv.
- 3 workers received very high doses.

Source IAEA and Health Physics

U.S.

Three Mile Island- 03/28/1979

- Worse nuclear accident in the US.
- Evacuation of children and pregnant women in a 5-mile radius on March 30, lifted April 9.
- Potassium iodide was shipped in.

Source Time Magazine

Public Health Impacts

- No deaths or injuries among employees or the public.
- Nuclear industry safety enhancement.
- Psychological impact.

Source Time Magazine


Source Dr. Harold Denton

Questions?

Summary Points

- NPP accidents occur rarely but can have grave consequences.
- Radionuclides that are released can contaminate the environment.
- Radionuclides can contaminate people directly or indirectly.
- Impacts on public health can be significant.