NUCLEAR POWER PLANTS

U.S. Operating Commercial Nuclear Power Reactors

Licensed to Operate (97)
**AVERAGE ANNUAL RADIATION DOSE PER U.S. CITIZEN**

- 620 MREM/YEAR
- ~310 MREM FROM NATURAL RADIATION
- ~310 MREM FROM MAN-MADE RADIATION
- <1 MREM FROM NUCLEAR POWER GENERATION

**SOURCES AND USES OF RADIOACTIVE MATERIAL**

**SOURCES**
- INDUSTRIAL SOURCES
- RADIOPHARMACEUTICALS
- CONSUMER PRODUCTS
- NUCLEAR FUELS
- RADIOACTIVE WASTE

**USES**

**MEDICAL**
- DIAGNOSTIC TESTING
- THERAPY
- RESEARCH

**INDUSTRIAL**
- RADIOGRAPHY
- OIL AND GAS WELL-LOGGING
- THICKNESS AND LEVEL GAUGES

**FIXED NUCLEAR FACILITIES**
- NUCLEAR POWER PLANTS
ALABAMA RADIOLOGICAL EMERGENCY RESPONSE PLAN

• PLAN FOR OFF-SITE EMERGENCY RESPONSE AND RECOVERY.

• UTILITY IS RESPONSIBLE FOR ON-SITE RESPONSE AND RECOVERY.

EMERGENCY CLASSIFICATIONS

• NOTIFICATION OF UNUSUAL EVENT
• ALERT

• SITE AREA EMERGENCY
• GENERAL EMERGENCY
TYPES OF RADIATION

- NON-IONIZING
  - RADIO WAVES
  - TV WAVES
  - INFRARED WAVES
  - MICROWAVES

- IONIZING
  - ULTRAVIOLET WAVES
  - GAMMA RAYS
  - X-RAYS
  - COSMIC RAYS
  - ALPHA & BETA PARTICLES

TYPES OF IONIZING RADIATION

- **ALPHA**
  - TRAVELS A FEW INCHES IN AIR
  - INTERNAL HAZARD
  - SHIELDED BY PAPER

- **BETA**
  - TRAVELS A FEW FEET IN AIR
  - INTERNAL/EXTERNAL HAZARD
  - SHIELDED BY PLASTIC OR SKIN

- **GAMMA**
  - TRAVELS A FEW HUNDRED FEET IN AIR
  - INTERNAL/EXTERNAL HAZARD
  - SHIELDED BY LEAD OR THICK CONCRETE
ALWAYS USE THIS!

• ALARA
• AS LOW AS REASONABLY ACHIEVABLE

CONTROLLING EXPOSURE

TIME

DISTANCE

SHIELDING

Less time spent near source: less radiation received.

Greater the distance from source: less radiation received.

Behind shielding from source: less radiation received.
EXPOSURE VS. CONTAMINATION AND DECONTAMINATION

- Effects from low doses of radiation are predicted based on studies of individuals and groups that received large doses of radiation over 100 years of study focusing on 4 groups:
  - Early radiation workers
  - Survivors of Hiroshima and Nagasaki
  - People involved in radiation accidents at nuclear facilities
  - Cancer patients
RADIATION PATHWAYS
• Biological pathways that can introduce internal contamination include the following:
  • Inhalation
  • Ingestion
  • Absorption
  • Injection

RADIATION & OUR FIVE SENSES
• We are aware of our environment through our five senses.
• But, we must rely on instruments to detect the presence of radiation.
**REM (ROENTGEN EQUIVALENT IN MAN)**

1,000 mR = 1 R

1R = 1 Rad = 1 rem

**UNIT OF BIOLOGICAL DAMAGE CAUSED BY DIFFERENT TYPES OF IONIZING RADIATION.**

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**RADIATION EXPOSURE**

- **DOSIMETER = ODOMETER**
- **ACCUMULATED EXPOSURE**
DIRECT-READ DOSIMETERS (DRD) A.K.A. POCKET DOSIMETERS

- Records radiation immediately
- Measures in...
  - Low range (MR)
  - Or
  - High range (R)

READING A POCKET DOSIMETER

- Look through the dosimeter toward a light source.
CDV 750 DOSIMETER CHARGER

- Clamp
- Clamp Trigger
- Discharge Button
- Generator Lever

THERMOLUMINESCENT DOSIMETER

- RECORDS RADIATION DOSE FOR LEGAL/PERMANENT EXPOSURE RECORDS
- RESULTS NOT IMMEDIATELY AVAILABLE

Lithium Fluoride Chips

Always wear your badge at work no matter who you are.
TEDE
(TOTAL EFFECTIVE DOSE EQUIVALENT)

- TOTAL DOSE
  - = EXTERNAL DOSE + INTERNAL DOSE
  - = 2 X EXTERNAL DOSE

- TEDE = 2 X POCKET DOSIMETER READING

RADIATION DOSAGE LIMITS FOR EMERGENCY WORKERS

<table>
<thead>
<tr>
<th>EMERGENCY WORKERS (EW) PERSONNEL/EQUIPMENT MONITORS (PEM)</th>
<th>RADIATION DOSAGE LIMITS</th>
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</table>
| EW: Protecting Property, Patrolling Evacuated Areas, and 
  Making Check Points | TEDE (Total Effective Dose Equivalent) |
| Seek Relief | Dosimeter |
| 200 mrem | 100 mR |
| Daily Maximum | 1 rem | 500 mR |
| MAXIMUM for ACCIDENT | 5 rem | 2.5 R |
| Evacuating Known Residents | 10 rem | 5 R |
| Fighting Residence Fires | 10 rem | 5 R |
| Life Saving | 25 rem | 12.5 R |

Alabama Radiation Control

FOR EWs and PEMs

- All emergency workers are advised to make a reasonable effort to limit their total dose, while at the same time accomplishing their emergency responsibilities.
- Read dosimeters and record at least every 30 minutes.
- Do not take Potassium iodide (KI) until instructed by your county EMA.
- Control your exposure to radiation by your time, distance and shielding.

FOR PEMs ONLY

- Contamination level in Alabama is 60 times background (open window) and will warrant decontamination.
- Monitoring technique: 1 inch away and move 1-2 inches per second.
- On lowest scale (d1), the Ludlum 14C meter scale will read 0-600 cpm.
- Do a response check and calibration verification, cover probe, and obtain background.
- Use CPM scale when monitoring for contamination.

Alabama Radiation Control
KI (POTASSIUM IODIDE)

- THYROID BLOCKING AGENT
- SATURATES THE THYROID GLAND WITH NONRADIOACTIVE IODINE (I-127)
- HELPS PREVENT RADIOACTIVE IODINE (I-131) FROM BEING ABSORBED INTO THE THYROID

CONTACT US ANYTIME!

RADIOLOGICAL EMERGENCY ASSISTANCE CONTACTS
USE FOR INCIDENTS INVOLVING RADIOACTIVE MATERIAL

24-hour State EOC Communication Center
(205) 290-2210
(800) 943-0999

If contact is not established, please call:
Alabama Radiation Control Duty Officer
(334) 324-0076

For additional contacts, please call the following:
Radiation Control Office (334) 206-5391

NAME: Beverly M. Myatt
Office: Radiation Control
Phone: (334) 206-5391
Mobile: (334) 206-5391

Additional Contacts:

Hospitals
- East Alabama Medical Center
- Russell Regional Hospital
- Tallapoosa Regional Hospital
- Wakulla Medical Center
- Cherokee Regional Hospital

Emergency Management Agency
- Regional Council of Ala.
- Alabama Department of Public Safety
- Alabama Division of Emergency Management
- Alabama Emergency Management Agency

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THANK YOU!

"ANY QUESTIONS?"