Chapter 2: EP Philosophy and Concepts

Introduction to Emergency Preparedness (H-107)

Topics:

- Defense-in-Depth
- Protective Action Guides
- Emergency Planning Zones
- Offsite EP concepts
- Emergency Operations Facility
- Onsite EP concepts
- Emergency Plans
- Emergency Classes
- Emergency Action Levels
- Example Emergency Sequence
  - Classification
  - Notification
  - Dose Assessment
  - Protective Action Recommendations

Defense-in-Depth Safety Philosophy

- Requires high quality design, construction, and operation
  - Reduces likelihood of malfunctions
  - Requires safety systems
    - Recognizes equipment can fail
    - Recognizes operators can make mistakes
  - Requires containment structures
  - Emergency Planning to provide public protective actions

Planning Philosophy

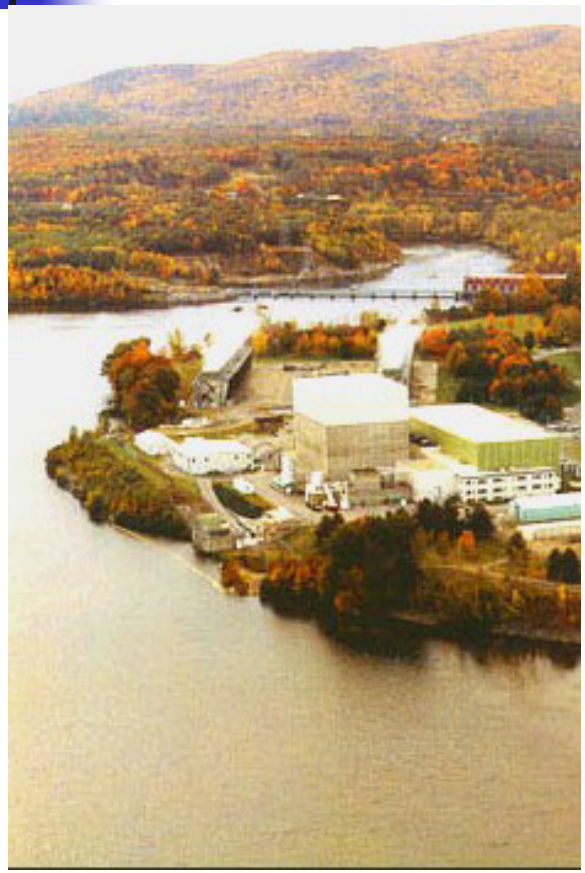
- Planning reduces the complexity of decisions required to effectively protect the public

- Planning simplifies the choice of possible responses so that judgment is required only for viable and useful alternatives

Protecting Public Health and Safety

- What radioactive exposure do we need to protect the public from?
  - Protective Action Guides
- What strategies do we use to do that?
  - Emergency Planning Zones
  - Emergency Plans
  - Emergency Action Levels
- What tools are at our disposal?
  - Facilities
  - Equipment
  - People

2 Pieces of Emergency Preparedness



Offsite

Onsite

EPA-400

- "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents"
- Provides radiological protection guidance to assist officials in creating emergency response plans and making decisions during emergencies
- Source of Protective Action Guidelines (PAGs) for specific exposure pathways
- Suggested protective actions based on dose assessment/PAGs

Protective Action Guide (PAG)

- A PAG is the projected dose to a reference individual from an unplanned release of radioactive material at which a specific protective action to reduce or avoid that dose is recommended
- To be used as guidance for triggering appropriate protective actions to minimize dose
- At the PAG levels, no health effects would be detectable, even for sensitive populations such as pregnant women

PAGs

- Established by the EPA and FDA
- Current guidance: EPA-400, October 1991
  - 1-5 rem warrants evacuation or sheltering
  - 25 rem to the thyroid warrants administration of stable iodine
- Based on *projected* dose
  - does not count dose already received

Emergency Planning Zones

- Plume Exposure Pathway
  - 10 mile radius
- Ingestion Exposure Pathway
  - 50 mile radius

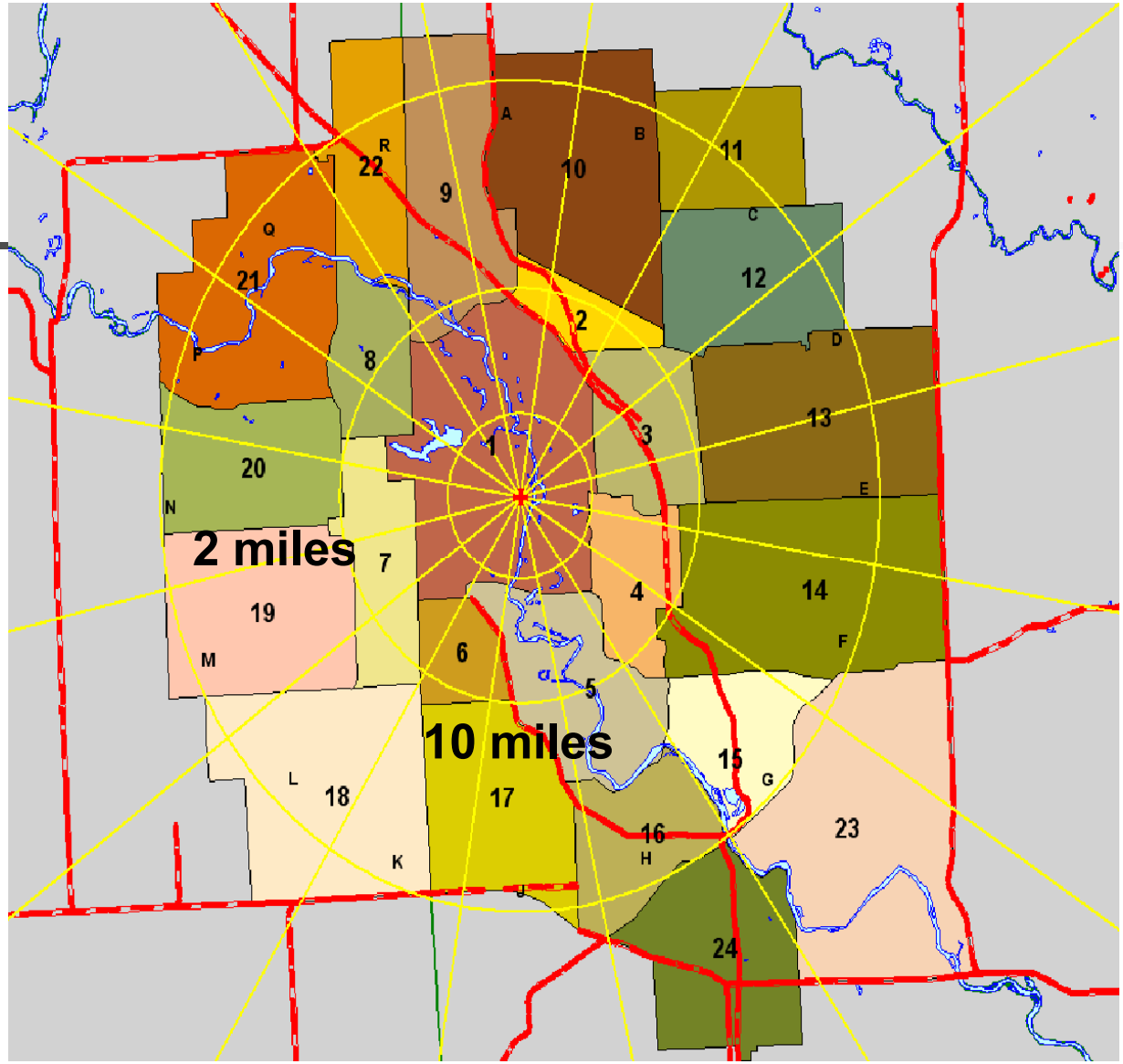
EPZs

- Plume Exposure Pathway
  - Area requiring possible immediate protective action to reduce public risk
  - Approximately 10 miles in radius
  - Sized based upon:
    - Projected doses from design basis accident (DBA) do not exceed EPA Protective Action Guide (PAG) levels outside the zone
    - Immediate life-threatening doses would generally not occur outside zone for worst-case core melt sequence
    - 10 mile EPZ provides base for expansion if necessary

EPZs

- Plume Exposure Pathway
  - Boundaries typically determined by topography and political jurisdictions
    - Roads, rivers, lakes, peninsulas
    - Municipal, County, State jurisdictions

This map directs motorists to corridors for prompt exit outside of the emergency planning zone.
For specific locations and directions to care centers, refer to evacuation descriptions for your municipality.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EPZs

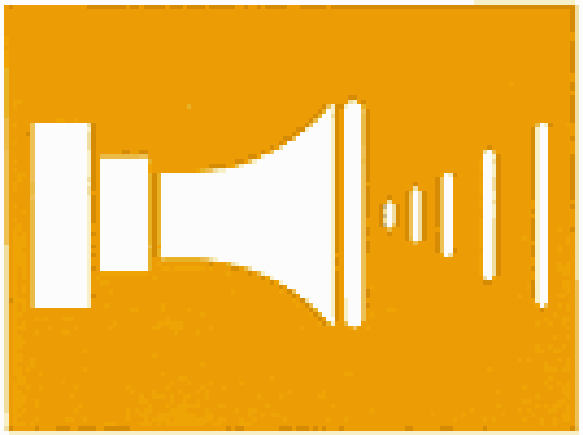
- Plume Exposure Pathway
  - Provisions for action within EPZ
    - Prompt decision making for public protective actions
    - Development of evacuation plans
    - Public information program
    - Prompt public alerting and notification protective actions
    - 24 hour communication capability between licensee and State/local officials
    - Monitoring of offsite radiological release
    - Activating & maintaining Emergency Operations Centers

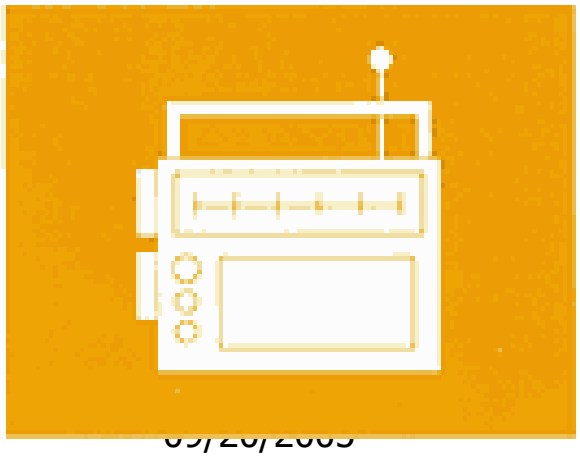
IMPORTANT EMERGENCY INFORMATION

FOR THESE COLUMBIANA COUNTY COMMUNITIES:

• EAST LIVERPOOL FIRST WARD • EAST LIVERPOOL SECOND WARD • EAST LIVERPOOL THIRD WARD
• EAST LIVERPOOL FOURTH WARD • LIVERPOOL TOWNSHIP EAST • LIVERPOOL TOWNSHIP WEST
• MIDDLETON TOWNSHIP (EAST OF 170 AND SOUTH OF TOWNSHIP ROAD 1026) • ST. CLAIR TOWNSHIP (EAST OF CANNON MILLS ROAD)

THIS INFORMATION IS IMPORTANT. DO NOT DISCARD. KEEP IN A HANDY PLACE, DISPLAY IT PROMINENTLY.





DO YOU KNOW WHAT TO DO WHEN THE ALERT SIREN* SOUNDS?

TURN ON YOUR RADIO OR TV!

*The Alert siren signal is a steady, three-minute tone. It will be used to alert of an impending natural emergency (such as a flood, tornado, or earthquake) or a man-made emergency (such as a chemical spill or a nuclear power plant emergency). If you hear the Alert signal . . . Turn on your radio or TV for instructions.

This brochure has been prepared and printed by Duquesne Light Company, in cooperation with the County of Columbiana Board of Commissioners and the Columbiana County Emergency Management Agency.

RECEPTION CENTERS

For Hospitals, Nursing Homes and Schools within ten miles of River Bend Station

Emergency Planning Background Information

FOR PLANNING PURPOSES, THERE ARE FOUR CLASSES OF EMERGENCIES AT NUCLEAR POWER PLANTS.

Local officials may use these terms:

Notification of Unusual Event

A minor problem has taken place. No release of radioactive matter is expected. Federal, state and parish officials will be told of this. You will not have to do anything.

Alert

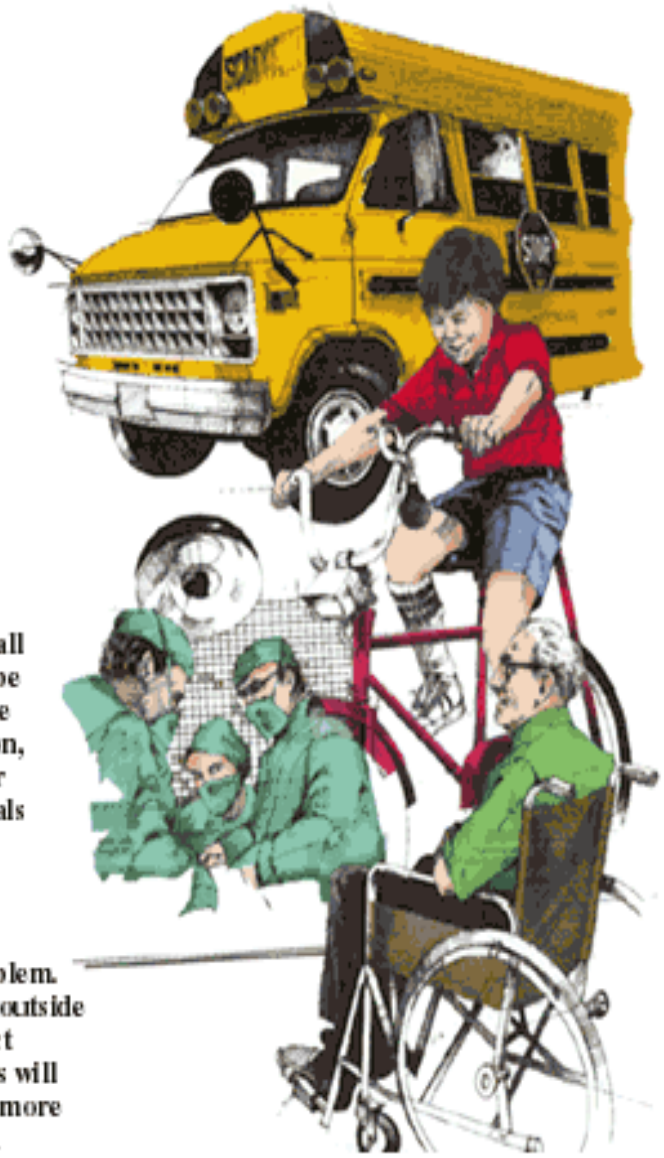
This is also a minor problem. No release of radioactive matter is expected. All the officials will be told of this and will be asked to stand by. It is not likely that you will have to do anything.

Site Area Emergency

This is a more serious problem. Small amounts of radioactive matter could be released into the area right around the plant. If you need to take special action, sirens will be turned on. Turn on your radio for more information. All officials will be ready to help you, if needed.

General Emergency

This is the most serious kind of problem. Radioactive matter could be released outside the plant site. You may have to protect yourself. If action is needed, the sirens will be turned on. Turn on your radio for more information. The officials will tell you what you need to do.



EPZs

- Ingestion Exposure Pathway
  - Area in which plans exist for protecting public from consumption of contaminated food
  - Considerable time to action (typically at State level)
  - Approximately 50 miles in radius
  - Sized based upon:
    - Contamination will not exceed PAGs beyond 50 miles due to wind shifts during release and travel periods
    - Particulate material would be deposited within 50 miles
    - Likelihood of exceeding PAGs at 50 miles is comparable to exceeding PAGs at 10 miles

Brief History of EPZs

- 1970s
  - Dilemma – federal government does not have statutory authority over offsite agencies
  - Accomplished on a cooperative basis
  - Growing concern over ability of State and local governments to respond to nuclear incident
  - NRC publishes NUREG-75/111, "Guide and Checklist for Development and Evaluation of State and Local Government Radiological Emergency Response Plans in Support of Fixed Nuclear Facilities" and NUREG-0396

Brief History of EPZs

- 1978 – Established concept of EPZs
  - Joint NRC/EPA task force findings
    - Major threat for DBA in range of 2-3 miles
    - Establishment of EPA PAGs and 10 mile EPZ appeared conservative approach
    - Response not necessary in entire 10 mile EPZ, but planning mechanisms would be in place

Relationship between PAGs and EPZs

- PAGs to be utilized as trigger for appropriate protective actions
  - Protect public health and safety
  - Minimize exposure to general public and emergency workers
  - It is not to be used as acceptable dose limits
  - PAGs and EPZs complement each other
    - Not to be used to determine EPZ size

Onsite EP

- Emergency Planning department
  - Every site has an EP department that handles the day-to-day EP workload
  - Oversees the licensee's emergency plan
  - Members of the EP staff will typically aid in the logistics of response during an emergency

Emergency Plans

- Part of the licensee's Final Safety Analysis Report (FSAR)
- Contains information needed to demonstrate compliance to all EP regulatory requirements
- Emergency Plan implementing procedures (EPIPs)
  - Most operations-level detail has been moved from the Emergency Plan to EPIPs

Onsite EP

- Technical Support Center (TSC)
  - Established because extra personnel in the Control Room can congest and confuse the situation
  - Diagnose and mitigate the event
    - Access to technical data
    - Responsible for engineering support
  - Staffing a TSC typically requires about 30 minutes during normal operating hours
  - Located close to Control room to allow for fast access

Onsite EP

- Operations Support Center (OSC)
  - Established to relieve the influx of emergency response personnel in the Control Room
  - A place for emergency response personnel to receive instruction and coordination by the operations support staff

Emergency Operations Facility

- Near-site*
- Primary responsibility for licensee response to severe accidents
- Receives turnover from TSC
- Organization
  - Emergency Director
  - Communications
  - Public information
  - Accident analysis
  - Dose assessment/offsite monitoring
  - Protective actions
  - State and county liaisons
  - Support

Offsite EP Interface

- State/local 24 hour communication
- 2 activity levels of interest at State level
  - Technical assessment of situation
    - Dose Assessment
  - Decision Makers

Offsite EP

- Joint Information Center (JIC)
  - Coordination point for licensee dissemination of public information
  - State/county liaisons
  - Media liaisons
  - Location for media briefings and news conferences

JIC

Offsite EP

- Alert and Notification Systems
  - Sirens
  - Tone Alert Radios (TARs)
  - Route Alerting
  - Emergency Alert System/Emergency Broadcast System

Event Classification

- Emergency Classes
  - Notification of Unusual Event (NOUE or UE)
  - Alert
  - Site Area Emergency (SAE)
  - General Emergency (GE)

Class definitions

- Unusual event
  - Events are in progress or have occurred which indicate a ***potential degradation of the level of safety of the plant***.
    - No release expected
- Alert
  - Events are in progress or have occurred which involve actual or potential ***substantial degradation of the level of safety of the plant.***
    - Any release is expected to be a small fraction of EPA PAG levels
- Site Area Emergency
  - Events are in progress or have occurred which involve actual or likely ***major failures of plant functions needed for protection of the public.***
    - Any release is not expected to exceed EPA PAG levels near the site boundary
- General Emergency
  - Events are in progress or have occurred which involve an actual or imminent ***substantial core degradation or melting with the potential for loss of containment integrity.***
    - Releases can be reasonably expected to exceed EPA PAG levels offsite
    - NOTE: a GE does **NOT NECESSARILY** mean that a release is in progress

Initiating Conditions

- One of a predetermined subset of nuclear power plant conditions where either the potential exists for a radiological emergency, or such an emergency has occurred.
  - For example:
    - Measurable parameter (RCS temperature)
    - Event (fire, flood)
    - Barrier breach (RCS pipe break)

Emergency Action Levels (EALs)

- A pre-determined, site-specific, observable threshold for a plant Initiating Condition that places the plant in a given emergency class.
  - An EAL can be:
    - Instrument reading
    - Equipment status indicator
    - Measurable parameter
    - Discrete, observable event
    - Results of analyses
    - Entry into emergency operations procedures

EAL Example

- Initiating Condition -- NOTIFICATION OF UNUSUAL EVENT
- Loss of All Offsite Power to Essential Busses for Greater Than 15 Minutes.
- Operating Mode Applicability:
  - Power Operation
  - Startup
  - Hot Standby
  - Hot Shutdown
- Example Emergency Action Level:
  - 1. Loss of power to (site-specific) transformers for greater than 15 minutes.

  AND
  - At least (site-specific) emergency generators are supplying power to emergency busses.
- Basis:
  - Prolonged loss of AC power reduces required redundancy and potentially degrades the level of safety of the plant by rendering the plant more vulnerable to a complete Loss of AC Power (e.g., Station Blackout). Fifteen minutes was selected as a threshold to exclude transient or momentary power losses. Plants that have the capability to cross-tie AC power from a companion unit may take credit for the redundant power source in the associated EAL for this IC. Inability to effect the cross-tie within 15 minutes warrants declaring a NOUE.

Example Scenario

- It was a dark and stormy night around the Rockville Pike nuclear power plant
- Rockville Pike is a single unit Westinghouse PWR reactor that is running at 100% power
- A tornado warning has just been issued for Montgomery County

Classification

- The control room staff recognizes that the tornado has struck the facility and the shift manager declares an Alert, based on their EALs
- Expectation
  - Declare the appropriate emergency within 15 minutes of indication being available to the operators
- Scenario note: The plant received the tornado warning 5 minutes before the strike. A tornado warning would have prompted an Unusual event classification, however, since the event escalated before the UE could be declared, only the Alert declaration was made.

Notification

- Damage assessment in progress
- Plant staff notifies State/locals and NRC of Alert declaration and plant status
- Requirements
  - Capability to notify State/locals within 15 minutes of emergency declaration
  - NRC notified within 1 hour

Augmentation

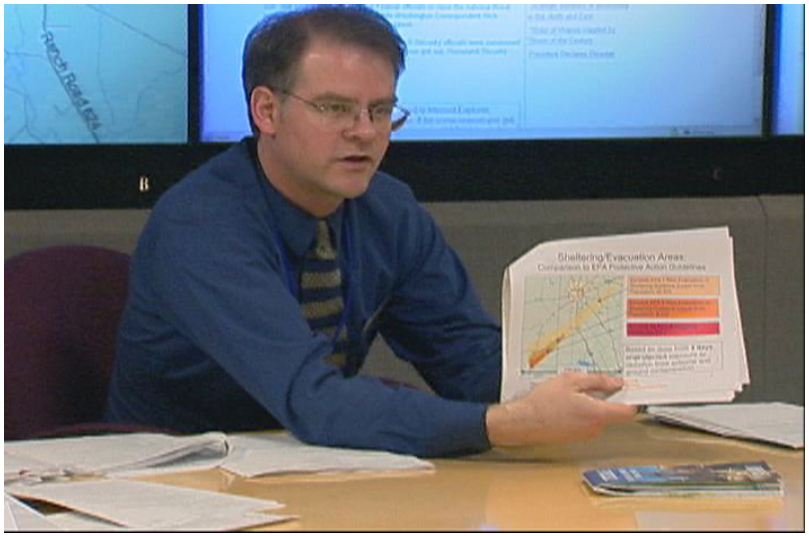
- Pager system alerts the emergency response organization (ERO) for the affected unit
- Licensee staffs TSC/OSC onsite and begins staffing EOF

Escalation

- Rock Creek, source of water supply to the Service Water system, exceeds 100 year flood levels. The intake structure screens are overloaded with debris and the suction for the pump is in peril.
- With EOF fully staffed, TSC turns over control to EOF
- Loss of offsite power occurs, diesels start
- As service water fails, diesels fail, resulting in loss of all AC power
- SAE declaration based on loss of all AC > 15 minutes

NRC Response

- NRC staffs Headquarters Operations Center and enters Activation mode
- Region I begins assembling a site team



Public Information

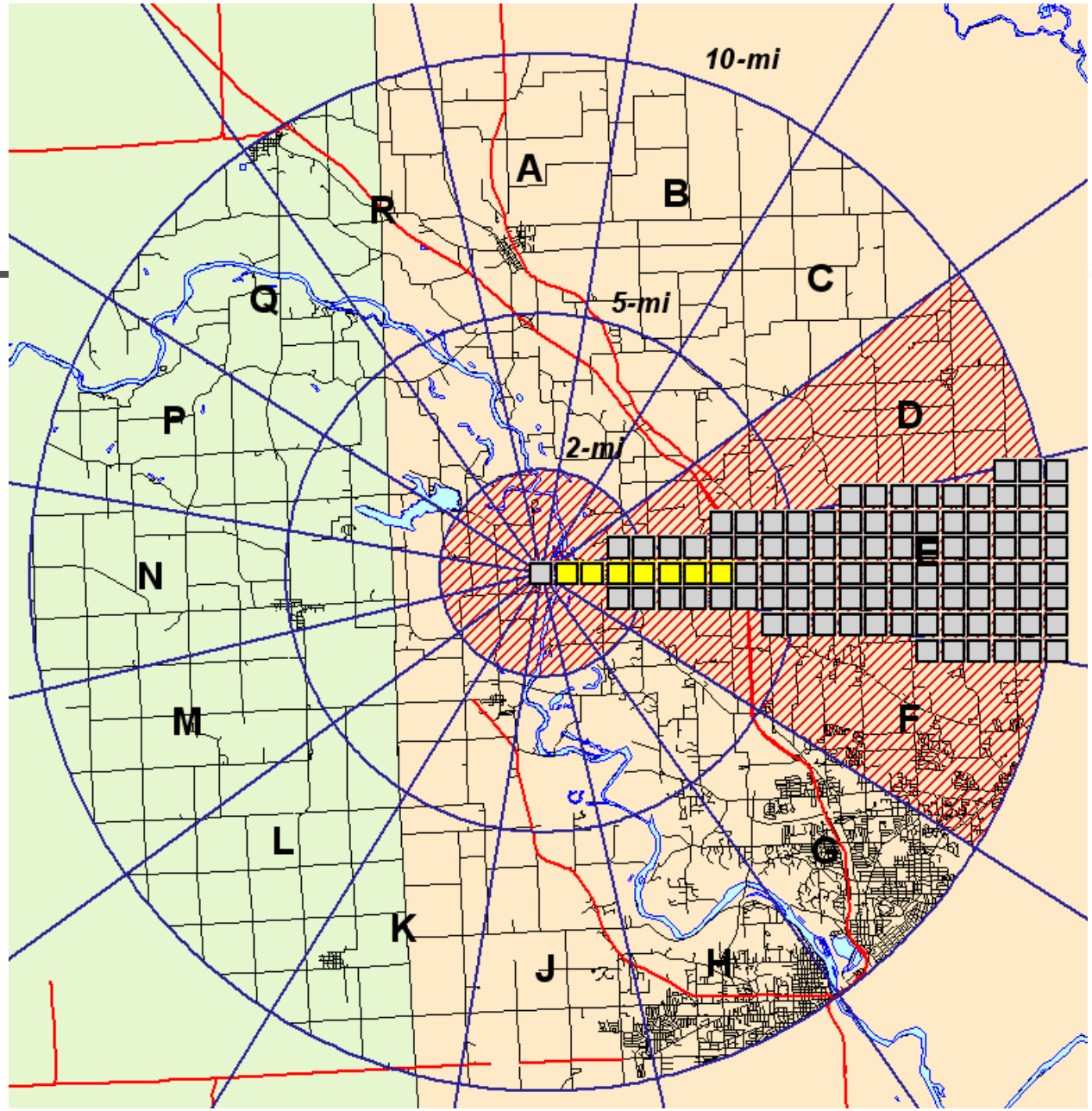
- Press Releases
- News Conferences
- Rumor Control

Dose Assessment

- Steam supply valve to the turbine-driven auxiliary feedwater pump malfunctions, causing the pump to trip
- Loss of all feedwater and AC prompts the EOF to declare a General Emergency
- EOF dose assessment staff begins running dose models for current weather conditions, however, no release is currently in progress
  - RASCAL

Protective Action Recommendations

- 2-5 keyhole evacuation for affected sectors
- Remainder of EPZ to go indoors and await further instructions
- No KI recommendation at this time
- Consideration – Sheltering vs. Evacuation
- Requirement: Create a PAR within 15 minutes of GE declaration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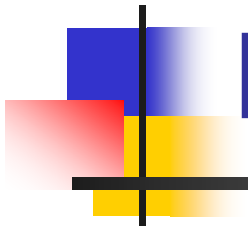
Summary

	UE	Alert	SAE	GE
ERO	On-shift staff	Augmented	Augmented	Augmented
Facility	Control Room	TSC/OSC/EOF (staffing)	TSC/OSC/EOF (turnover)	TSC/OSC/EOF (control)
ORO	Notified	Staffing	Preliminary Protective Actions	Protective Actions

What are the EP priorities?



End Chapter 2

Next up:

Chapter 3: EP Regulations and Guidance