Relocation,
Reentry,
Return,
Recovery

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AGENDA

- Introduction
- Relocation, Return, Reentry
- Recovery

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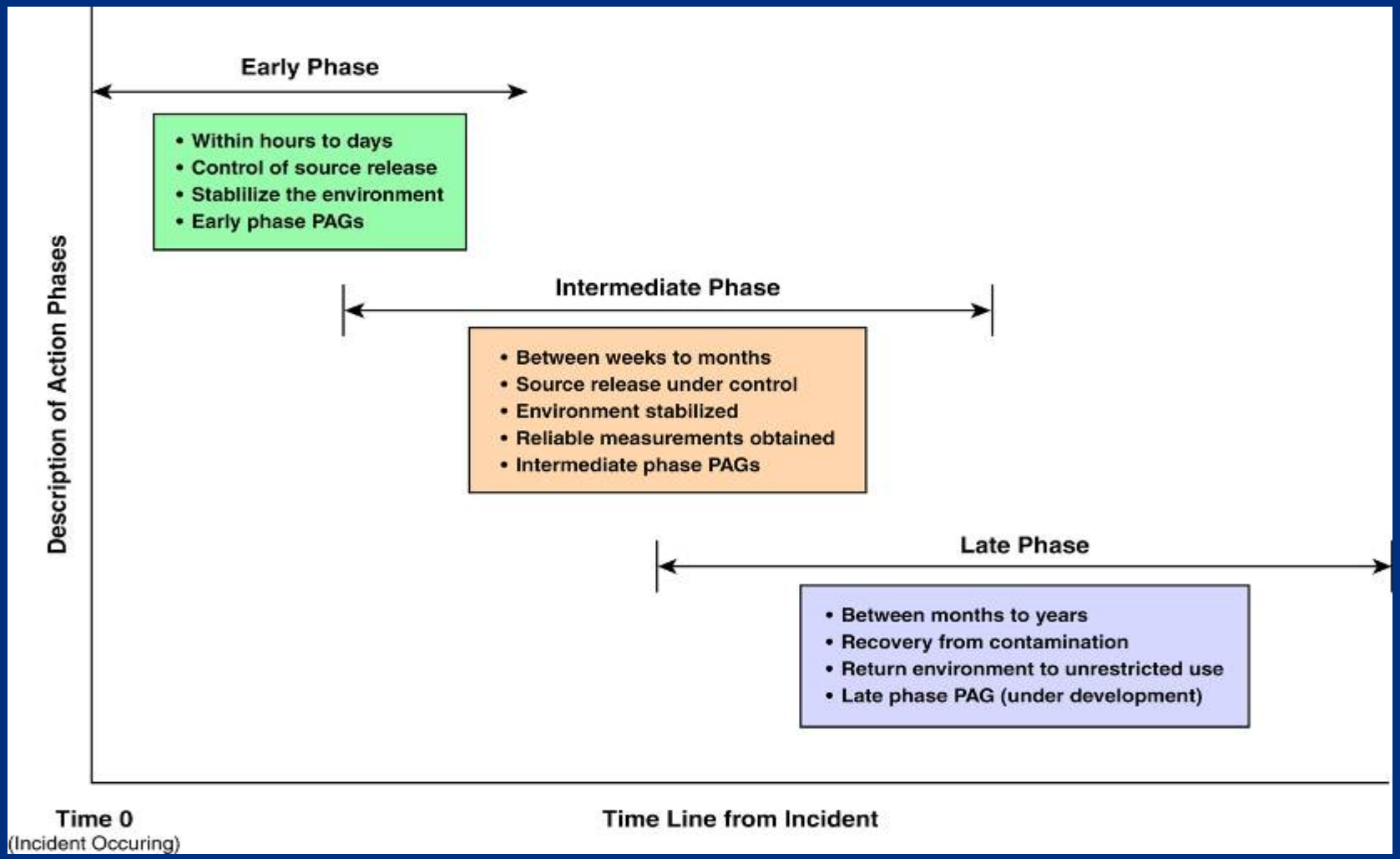
Phases in a Nuclear Power Plant Incident



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Plume / Early Phase

- Evacuation and Shelter-in-Place will be called upon for the zones and potential areas of the affected Emergency Pathway Zone (EPZ) counties.
- Based on meteorological conditions at the time of the release.
- Based on computer modeling from the Utility, State and NRC Dose Assessment Software. This software provides an estimate of the release impact.

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Potential Affects on Risk, Host, Ingestion Counties

- Traffic Re-routing
- Major Interstates closed
- Major local routes closed
- Evacuations clogging egress routes

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Other Potential Effects

- Short term housing needs
- Contamination Monitoring locations/re-entry points
- Hospitals overwhelmed
- Need for new Reception Centers

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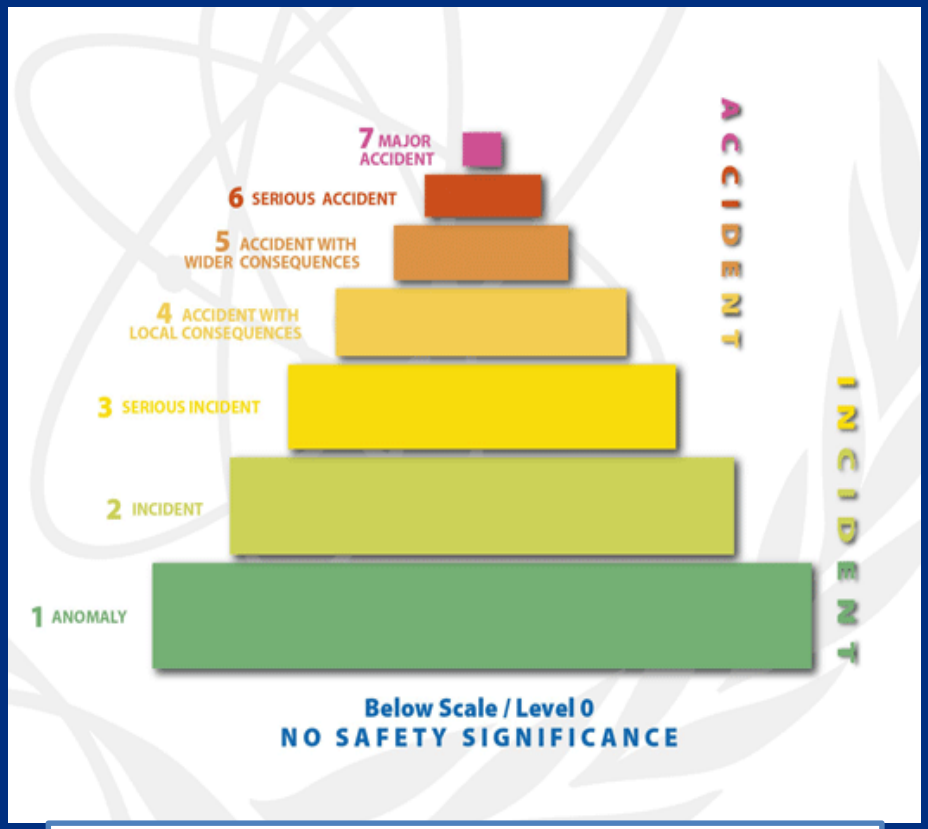
Past Experiences Offer Valuable Lessons



International Nuclear and Radiological Event Scale (INES) System

- Whole community approach
- Acceptance of a new 'normality'
- Clean up criteria for existing exposure situations may be different to planned exposures
- Pre-event planning needs to be more focused on recovery
- Continue R&D to enhance decontamination technologies
- Combat stigma through education and better communication

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Ingestion Pathway Actions

- Embargo
- Relocation
- Re-Entry
- Return
- Recovery

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Regulatory and Enforcement Actions

- **Quarantine**
- **Embargo**

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What do they mean?

- Embargo
- Not a seizure order – a “detention” order usually dealing with food; but can be carried to other products/animals
- Once embargoed, no one can remove or dispose of the food or drink without permission
- TRYING TO KEEP IT OUT OF THE FOOD CHAIN

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What do they mean?

- Quarantine
- Local isolation of the animals/persons due to an infectious disease (usually); follows a timeline for the disease itself.
- Limit access to and from the area to prevent spread of disease; contamination of others

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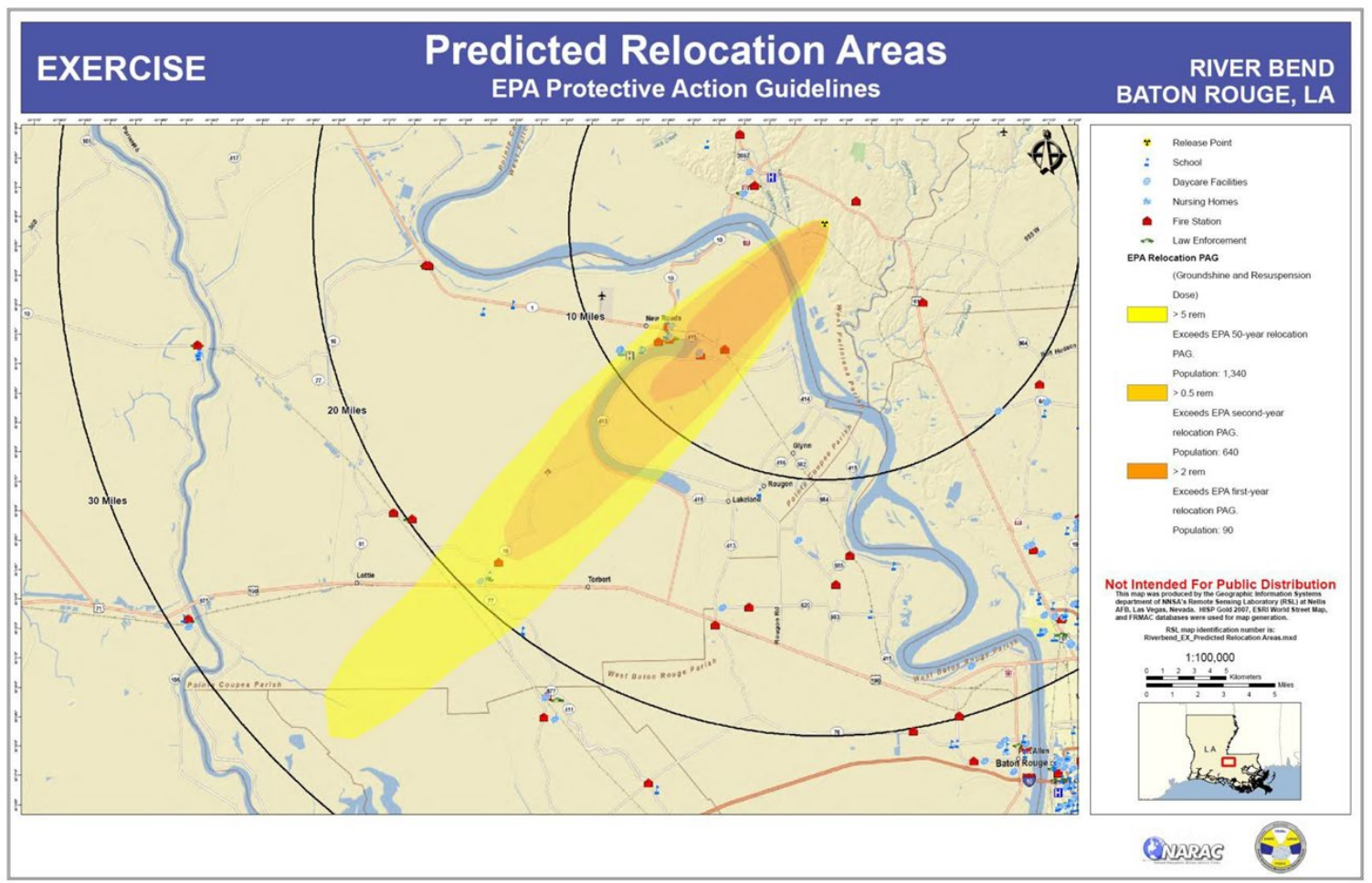
"Predicted Relocation Areas" (Sample NARAC Product)



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Support the Establishment of Relocation Areas

- The initial post-plume priority is to determine if there is contamination in areas outside of the initial evacuation areas that require additional measures to protect the public from long-term exposure to low-level radioactive material.
- Relocation is defined as the removal or continued exclusion of people from contaminated areas as needed to avoid long-term exposure from low level radiation.
- Relocation from an area is indicated when soil samples exceed EPA protective action guidelines for 1st -year, 2nd -year and subsequent years.

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Support the Establishment of Relocation Areas outside the 10-mile EPZ, as requested by the SEOC

- Relocation is a movement of people from their homes and farms to a location that does not present a danger from radiological exposure.
- Relocation is allowed to take place over a period of time, normally a few days, instead of an immediate evacuation as required during the plume phase.

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Support Establishment of Re-Entry into the Restricted Zone

- Re-entry is the approved, temporary access into a restricted zone for an essential purpose.
- Counties have the primary responsibility for coordinating and implementing a re-entry program, prioritizing and approving re-entry requests.
- Priority activities include life safety, incident stabilization, maintenance of critical infrastructure and services, and animal care.

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Support Establishment Return Areas

- This is the orderly return of people and reoccupation of areas cleared for unrestricted residence or use by previously evacuated or relocated populations.
- These areas no longer have contamination or they are below Federal limits and determined to be safe for return.

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(Intermediate) Phase – Ingestion Interventions

- The protection of the food supply from contamination of radioactive material is a top priority and actions taken to protect the food supply will be coordinated with the impacted counties during the incident.
- Protective Actions and guidelines for proper disposal of contaminated products may be coordinated through the State at the time of the incident.

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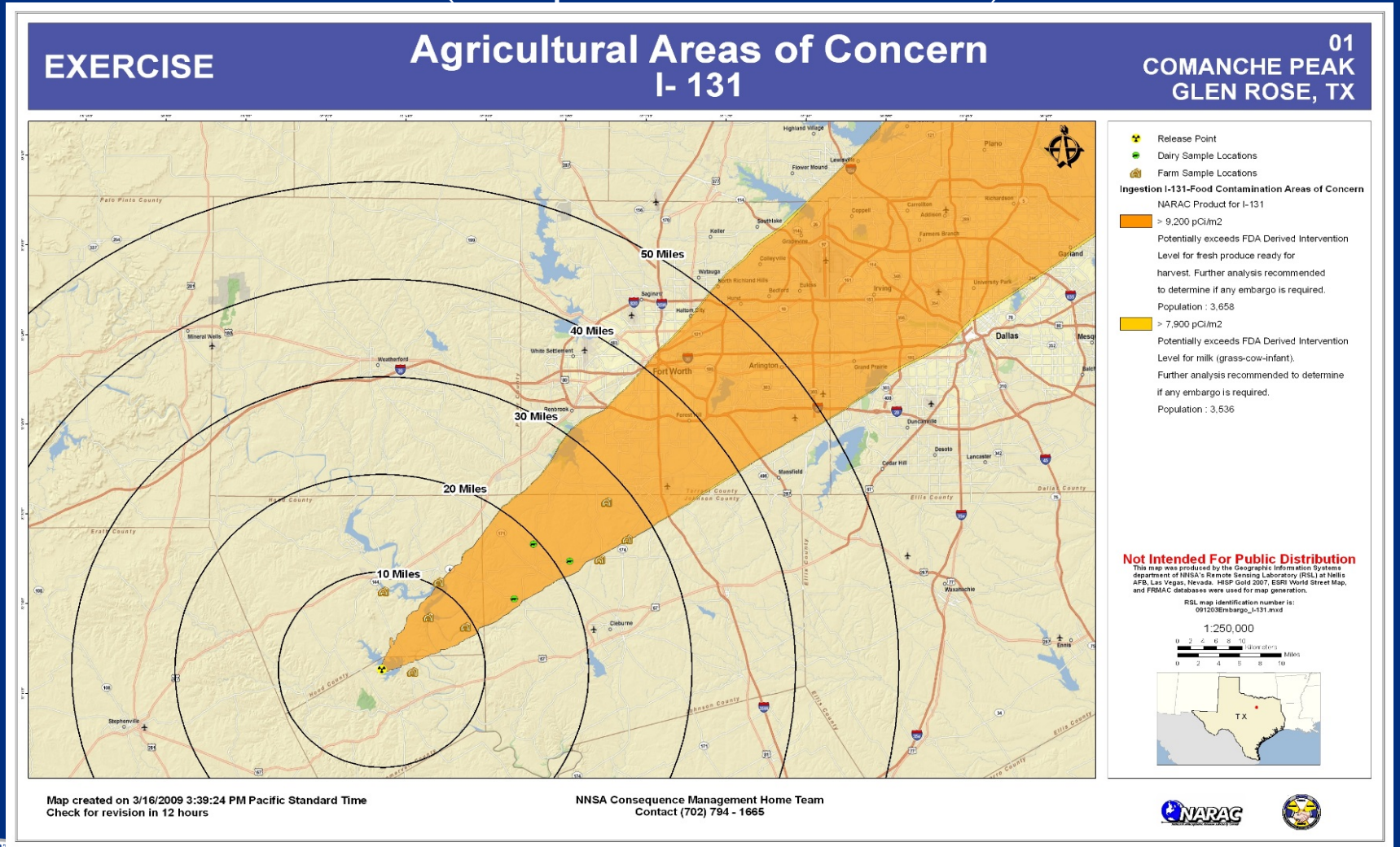
"Agricultural Areas of Concern"

(Sample NARAC Product)



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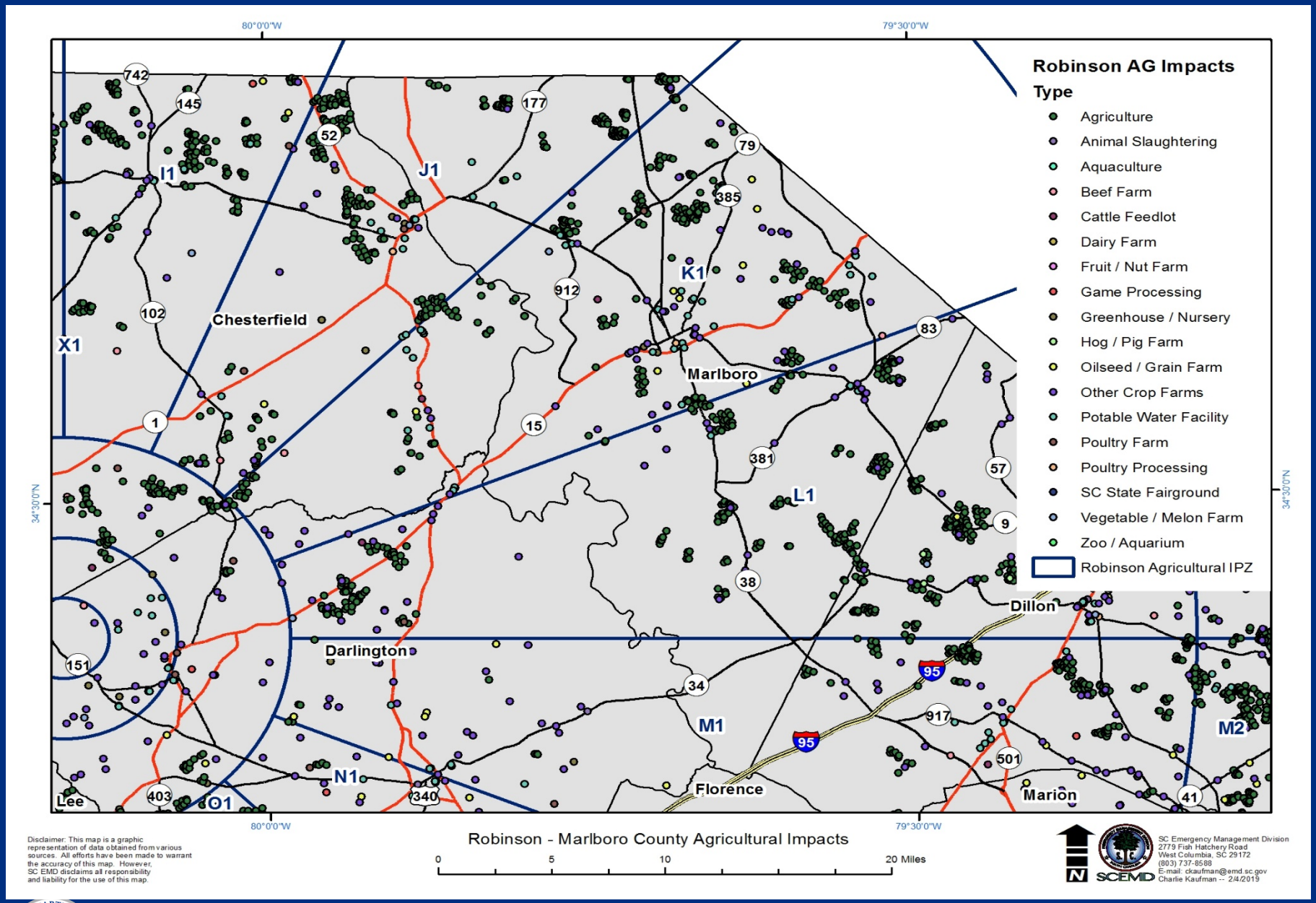

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Agricultural Protective Actions

- Protective actions to be taken for food and water, including livestock, poultry, fruits, vegetables and other crops are:
- Milk-Removing all lactating dairy animals from pasture and placing them on uncontaminated feed and water

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Agricultural Protective Actions (cont.)

- Vegetables and Fruits -Washing, brushing, scrubbing or peeling fruits and vegetables to remove surface contamination
- Poultry-Monitoring poultry if they are raised out-doors, and especially if they are used for egg production. If poultry live indoors and are fed stored rations, contamination is unlikely

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Agricultural Protective Actions

- Meat - If levels of radioactive cesium in milk approach the preventive PAG “response level”, surveillance and protective actions for meat should be taken, such as, placing meat animals on uncontaminated feed and water.

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Agricultural Protective Actions (cont.)

- Soil – If contaminated proper soil management procedures could be implemented to reduce contamination
- Idling – non use of the land
- Removal – removal and proper disposal of soil may be necessary

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Agricultural Protective Actions (cont.)

- Crop rotation – Alternating types of crops may be beneficial, such as cotton or flax
- Deep plowing may keep radioactive material below theplant root zone
- Liming to limit absorption of specific radioactive substances

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MILK PATHWAY PROTECTION

- Embargo
- Storage for Long Periods of Time will Allow for Decay of Radiation (Radioactive Iodine)
  - After 40-50 days Iodine will be gone (8 day half-life)
- Divert Raw Milk

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Late Phase - Recovery

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Recovery

- Recovery refers to the process of reducing radiation exposure rates and concentrations of radioactive materials in the environment to acceptable levels allowing for the return and unconditional occupancy and use by the general public.
- Recovery involves continued and extensive field sampling, damage/ impact assessments and the coordination of federal assistance and the nuclear insurance benefits.

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Emergency Protective Actions

- Emergency Instructions and Public Information
- Decontamination
- Food and Feed
- Exposure Control
- Disposal
- Regulatory and Enforcement Actions

LETS LOOK AT EACH ONE CLOSER….

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Emergency Instructions and Public Information

- Timely Press Releases
- Public Perception
- Involve Key Officials
- Exposure Prevention
- Control and Decontamination

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Emergency Instructions and Public Information (cont.)

- Positive and transparent
- Stay ahead of Socal Media
- Rumor Control
- Coordinated response between Federal, State, and locals

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Public Perception

- Public information and education is crucial
- The Public Information Officers must stay ahead of the rumors and false information being presented.
- Fukushima event brought out every “expert” providing misinformation throughout the event.
- General public’s distrust of industry
- Response organizations must be unified

Risk communication: gaining trust from stakeholders

- Follow IRPA's principles for effective communication that serves to foster a close partnership with stakeholders in every stage of the site-specific optimization decision process.
- The objective of communication is to address the important issues involved in decision making during the recovery process: transparency, inclusiveness, effectiveness, and shared accountability.

In Fukushima, Japan, members of the public were confused as to why they were allowed 1 mSv (100 mRem) per year living near the reactor, but after the accident they were allowed 20 (2000 mRem) mSv per year!

Key to Stakeholders Outreach: Risk Management and Communication

- Risk communication is as important as the risk assessment itself.
- Even when radiation doses are low, risk communication and outreach are essential to help the public, media, authorities.
- Scientists must be willing to communicate their work to other scientists, regulators, and the public.
- Be available
- Town meetings / Focus Groups
- Dialogues, Engage, Empower

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How much is too much contamination?

- FDA has guidance on pre-determined level
- Called “Derived Intervention Level” (DIL)
- Varies by isotope and food product
- If it’s below the DIL but above background…
- Political issue
- ANI reimbursement issue
- Two radioactive isotopes are of primary concern:
- Iodine 131 (half life of 8 days)
- Cesium 137 (half life of ~30 years)

Disposal
(EPA will direct this effort)

- Livestock
- General Food

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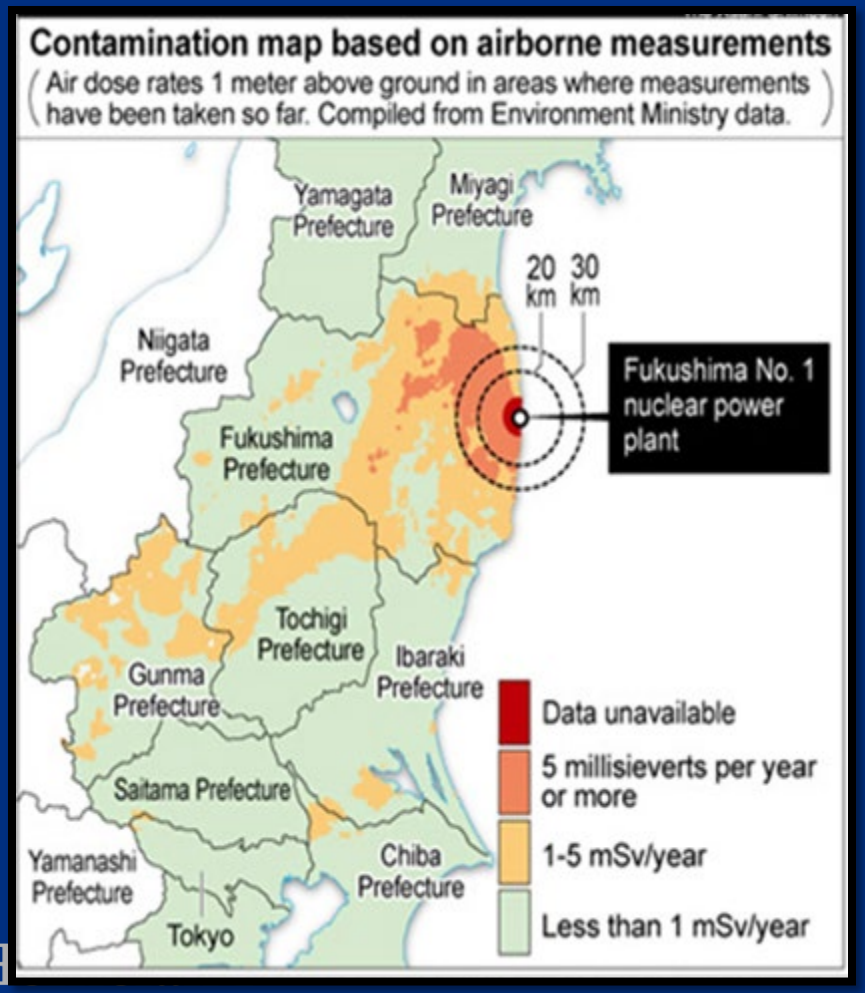
Addressing wide-area contamination: the unprecedented impact

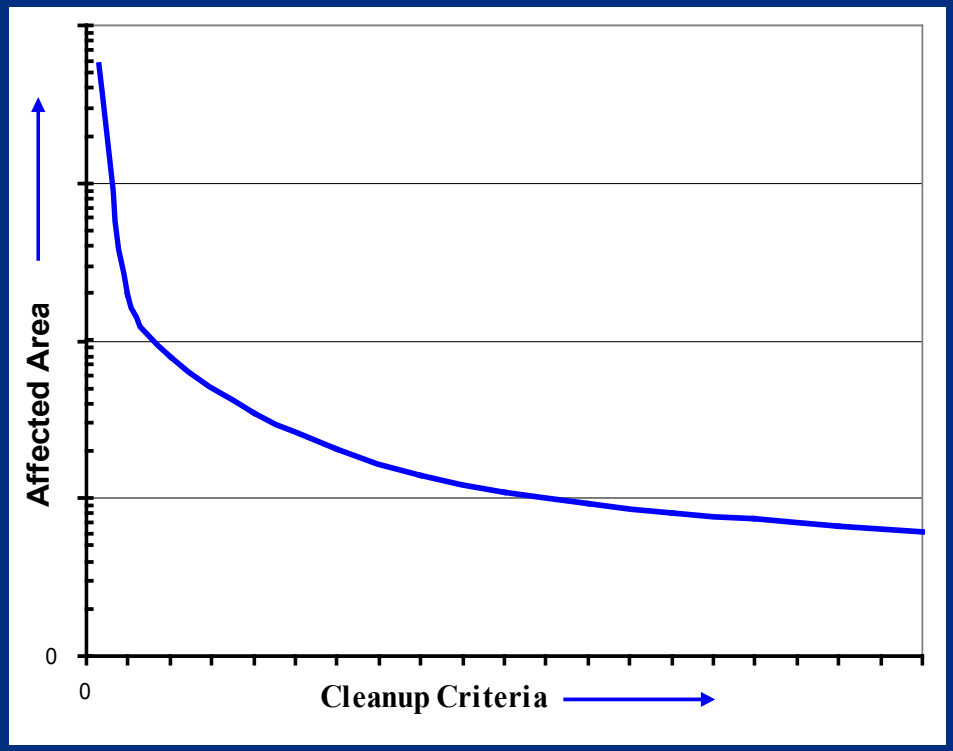


Cleanup level at 1 mSv/y:

- 13,000 km^2, or
- 3% of Japan's land mass, or
- About the size of Connecticut
- Costs at $15.6 B

Contaminated area is about the size of State of Connecticut

Major challenges from radioactive contamination: radioactive waste management



Estimated radioactive waste volume from cleanup of nearby prefectures surrounding Fukushima NPP is 29×10^6 m^3, or about 1 million ft^3. This has far exceeded the US commercial LLW disposal capabilities combined. Some adaptive management strategy is needed.

Consumer Confidence

- May not be based in reality:
- Use of DILs for decision making

- May be based on fear:
- “Its Radioactive, glowing green”, I’m not going to eat that!!

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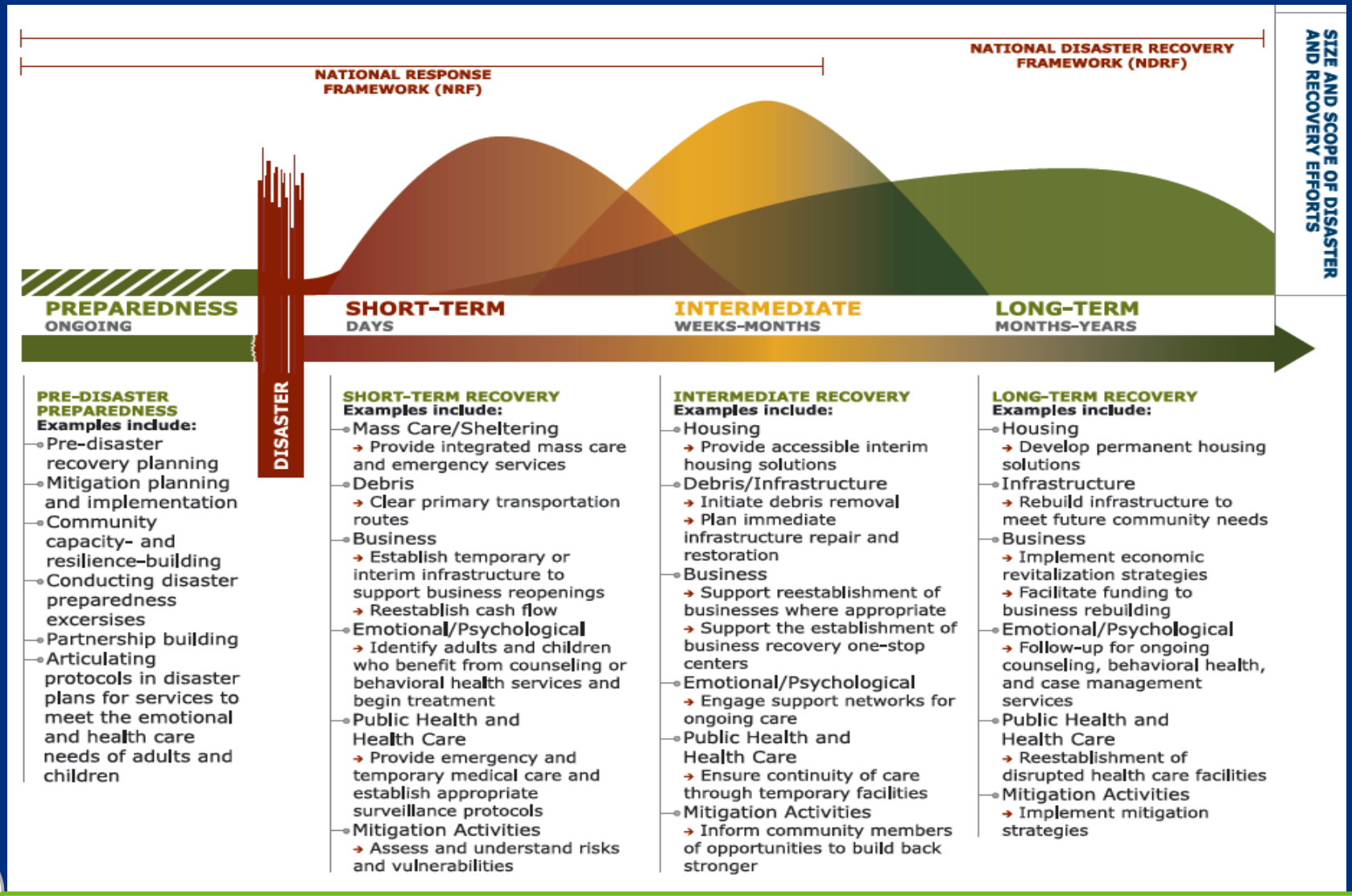
All Responses Culminate in the Long Term Recovery



Source: FEMA National Disaster Recovery Framework (2011)

Key Points of the Late Phase

- Numeric PAGs will not be used to guide restoration and recovery of areas impacted by a radiological incident; rather, planning activities should include a process to involve stakeholders in setting priorities and determining actions. Such a process should be flexible to adapt to a variety of situations.
- Reoccupying households and businesses should be considered in balance with progress made in reducing radiation risks through decontamination, radioactive decay, and managing contaminated waste.

Key Points of the Late Phase

- Incidents that result in large volumes of waste from a large-scale radiological incident would likely overwhelm existing radioactive waste disposal capacity in the U.S.
- Following a nuclear accident, the states bear primary responsibility to identify and provide waste management options, including disposal capacity.
- Safely managing and disposing of radioactive waste will require advance planning at all levels of government and careful coordination with stakeholders at all stages of the decision-making process.

Late-phase recovery issues

- DHS PAG Guidance (2008)
  - An “optimization” process in lieu of a pre-determined Protective Actions Guideline (PAG)
  - Existing statutory processes as starting point

- Further
  - Long-term potential health consequences are not the only consideration
  - Other priority issues include the local economy, employment, critical infrastructures, public services which demand urgent attentions
  - Decisions toward cleanup require careful deliberation through the optimization process for competing priorities of the society
  - Stakeholders an integral part

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American Nuclear Insurers (ANI)

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American Nuclear Insurers (ANI)…
Who Do They Insure?

ANI insures all U.S. nuclear power plants

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Order of Claims; Reimbursement available

Congress is required, under the Price-Andersen Act, to "take whatever action is determined to be necessary…to provide full and prompt compensation" for claims resulting in damages that exceed the $12.6 billion layer*

SECONDARY FINANCIAL PROTECTION LAYER

$12.22 Billion

($117.495 Million x 103 Reactors)

PRIMARY INSURANCE LAYER

ANI: $375 Million

*** Example:**
Hurricane Sandy

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Price Anderson Act (PAA) (1 of 2)

- The Price Anderson Act (PAA) provides…
- A framework for how financial protection will be dispersed to the public impacted by a nuclear event
- Legal requirements for financial protection to the public in the event of a nuclear incident

Price Anderson Act (PAA) (2 of 2)

- The Financial Protection Program:
- Aggregate Public Liability = $13.5* Billion
- Primary Financial Protection Layer = $450 Million
- Secondary Financial Protection Layer = $13.1 Billion
- Congress is required, under the Price-Anderson Act, to “take whatever action is determined to be necessary… to provide full and prompt compensation” for claims resulting in damages that exceed the aggregate public liability.
- *Effective September 10, 2013

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Response under Price Anderson Act (PAA)

ANI EFA (Immediate Assistance)

Evacuee financial assistance

- Food
- Lodging
- Travel
- Medical Expenses

ANI Post Emergency Claims

Intermediate Compensation to the public and businesses

- Evacuees
- Economic loss
- Other

Court Plan of Distribution

Court adoption and implementation of a plan for disposition of funds

- Personal injury claims
- Property damage claims
- Possible latent injury claims

Compensation Plan:

- Congress will take whatever action is determined necessary to ensure full and prompt compensation for all valid claims, including allocation or set asides for latent injury claims

SE-15 Findings NEMA

- Finding: Unified Coordination Group (UCG) membership and composition for a nuclear power plant incident is not clearly defined.
- Policies regarding Low Level Radioactive Waste (LLRW) remediation are not well defined.
- There are funding gaps related to reimbursement to individuals and government agencies during a nuclear power plant incident.

SE-15 Findings NEMA (cont.)

- State and local governments must be involved in the development of the Plan of Distribution developed at the local level to account for the needs of the population and communities and as a comprehensive Recovery Support Strategy for a nuclear power plant incident has not been developed.

- There is no central respository of federal agency uidelines, plans, or capabilities.

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QUESTIONS

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REFERENCES

- **NCRP and Scientific Committee 5-1 Report: Decision Making for Late-Phase Recovery from Nuclear or Radiological Incidents**

- **NCRP Report #175**

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