

**ANNEX 7**  
**(INGESTION EXPOSURE PATHWAY ZONE)**  
**TO THE SOUTH CAROLINA OPERATIONAL RADIOLOGICAL EMERGENCY**  
**RESPONSE PLAN**

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**I. INTRODUCTION**

- A. The Ingestion Exposure Pathway Zone (IPZ) is a geographical area, approximately 50 miles in radius surrounding a commercial Nuclear Power Plant (NPP), in which it has been estimated the health and safety of the general public could be adversely affected through the ingestion of water or food from that area which has been contaminated from the deposition of radioactive materials after a radiological accident. The duration of such exposures could range in length from hours to months.
- B. The IPZ is designed to mitigate contamination of the human food chain by a radiological accident at an NPP. The Ingestion Pathway is characterized by radionuclides being deposited potentially contaminating water supplies and foodstuffs (i.e., milk, meats, other livestock, poultry, fish, fruit, vegetation, eggs, tea, grains, honey, soft drinks, shellfish, mature produce, etc.).
- C. The IPZ is designed to protect all human food, animal feed, and agricultural products to mitigate the impacts to public health and the economy.

**II. PURPOSE**

- A. Identify the responsible agencies and actions taken to protect people and animals from ingesting contaminated foodstuffs and water resulting from a release of radioactive materials from a NPP within or in close proximity to the state of South Carolina.
- B. Address the responsibilities and processes taken to identify radioactive contaminated foodstuffs, water, and animals resulting from a release of radioactive materials from a NPP within or in close proximity to the state of South Carolina.
- C. Protect consumers from contact with contaminated food and agricultural products and mitigate impacts to the economy.

**III. SITUATION**

- A. Although the IPZ generally does not present the direct or immediate threat that is characterized in the 10-mile Plume Exposure Pathway Emergency Planning Zone (EPZ), preventive protective actions should be initiated as soon as a danger is recognized.
- B. Internal contamination through ingestion of contaminated materials presents a unique challenge from external contamination, in that radioactive materials can continue to expose individuals to unacceptable levels of radiation as long as it remains in the body. Once absorbed or taken up into human organs, radioactive materials can be difficult or impossible to eliminate in the short term.

- C. Ingestion of radionuclides is a longer-term problem than external exposure because radionuclides from the soil may continue to be taken up by vegetables, fruit trees, and grains contaminating future harvests. Thorough sampling and monitoring procedures are necessary to ensure that appropriate Protective Action Decisions (PADs) can be made.

#### **IV. ASSUMPTIONS**

- A. Most of the radiological particulate released to the environment from a significant NPP incident would be deposited within 50 miles.
- B. Food, feed, and agricultural commodities outside the IPZ may be impacted.
- C. Although ingesting foodstuffs imposes a risk, other nonfood agricultural commodities may be impacted and pose public health risks and a negative economic impact.

#### **V. CONCEPT OF OPERATIONS**

- A. General
  - 1. Health risk to the public will be minimized by limiting the radiation dose received as a result of consumption of accidentally contaminated food by:
    - a) Setting limits, called Derived Intervention Levels (DILs) on the radionuclide activity concentration permitted in food and on agricultural products, and
      - (1) DILs are established by the U.S. Food and Drug Administration (FDA) and provide a large margin of safety for the public because each DIL is set according to a conservatively safe scenario for the most vulnerable group of individuals. A DIL corresponds to the concentration in food present throughout the relevant period of time that, in the absence of any intervention, could lead to an individual receiving a radiation dose equal to the PAG, or in international terms, the intervention level of dose.
      - (2) Food with concentrations below the DILs is permitted to move in commerce without restriction. Food with concentrations at or above the DILs is not normally permitted into commerce. However, state officials have flexibility in whether to apply restrictions in special circumstances, such as permitting use of food by a population group with a unique dependency on certain food types. DILs will be continuously evaluated.

- (3) For further guidance see the FDA's Accidental Radioactive Contamination of Human Food and Animal Feeds: Recommendations for State and Local Agencies.
  - b) Taking protective actions to reduce the amount of contamination.
2. Operational response related to contamination risks to food and agriculture will involve the activation of the State Food and Agriculture Radiological Task Force (SFARTF) consisting of SC Department of Public Health (SCDPH), SC Department of Environmental Services (SCDES) SC Department of Agriculture, Clemson University Livestock Poultry Health, Clemson University Regulatory and Public Service Programs, Clemson University Cooperative Extension Services, SC Department of Natural Resources, and SC Forestry Commission working within ESF-3, ESF-8, ESF-10, and ESF-17.
- a) The SFARTF operates as a function of ESF-17.
  - b) The SFARTF includes state agency personnel with policy authority, technical expertise, and communications responsibility and will serve as the technical and policy unit for food, agriculture, animals, and water.
  - c) The SFARTF includes federal partners with food, agriculture, water, and public health authorities and technical expertise.
  - d) Responsible for drafting technical messaging related to food, agriculture, animals, and water and coordinates dissemination of those messages and all other communications operations with ESF-15.
  - e) Operates according to the State Food and Agriculture Radiological Task Force ESF-17 Standard Operating Guide for South Carolina Radiological Response.
  - f) Each respective agency identified will maintain staff rosters, which will be regularly submitted to ESF-17 and accessible to the SERT.
3. Preventive/precautionary protective actions are taken to either avoid or reduce the contamination of food, agricultural products, and water and to isolate contaminated food or any agricultural commodity to prevent its introduction into commerce.
4. Food and agricultural products, including water, will be sampled for radioactive contamination in the IPZ based on recommendations from the SFARTF.

- a) SCDES is responsible for conducting radiological field monitoring and sampling activities in South Carolina in accordance with procedures contained in the South Carolina Technical Radiological Emergency Response Plan (SCTRERP) and the South Carolina Standard Technical Radiological Operating Procedures (SCSTROP).
  - b) ESF-10 (Environmental and Hazardous Materials Operations) is responsible for coordination of all field monitoring and sampling activities in South Carolina, which includes staff from SCDES, augmented by staff from Southern Mutual Radiological Assistance Plan (SMRAP), the National Guard 43<sup>rd</sup> Civil Support Teams (CST), U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE) Radiological Assistance Program (RAP) Teams, and Federal Radiological Monitoring and Assessment Center (FRMAC) to accomplish this mission.
  - c) As part of ESF-8 (Health and Medical), the Designated Public Health Physician is responsible for making recommendations to protect the public health from consequences of radioactive contamination.
5. Following a radiological release, the impact on the IPZ will not be known until sample collection and analysis is completed. Once these samples have been analyzed, final protective measures will be determined and implemented.

**B. Actions by Phase**

- 1. Early Phase is the beginning of a radiological incident for which immediate decisions for effective use of protective actions are required and must therefore be based primarily on the status of the radiological incident and the prognosis for worsening conditions. This phase may last from hours to days.
  - a) Precautionary actions
    - (1) The following actions should only be considered prior to the arrival of contamination and only to avoid placing persons implementing the action in jeopardy. Actions to avoid or reduce the potential for contamination of food and animal feeds, including:
      - (a) If shelter in place order:
        - [1] Recommend providing shelter for livestock and poultry as appropriate and when possible.

- [2] Recommend activating premises emergency response plans.
  - (b) If evacuation order:
    - [1] Activate premises emergency response plan; prepare livestock and poultry for human evacuation of area; plan for at least 3 days.
    - [2] Consider evacuating valuable breeding stock and other livestock as appropriate and if possible; livestock owners are responsible for finding accommodations for those animals elsewhere.
- (2) The SFARTF will gather data as available anticipating further protective actions and decisions.
- (3) ESF-15 (Public Information) will coordinate the production and distribution of emergency information for the agricultural community.
- (4) Upon anticipated release of material into the environment, public messaging will include:
  - (a) Providing notice of possible impacts to food and agriculture and out of an abundance of caution, quarantines and embargoes may be implemented to ensure consumer protection.
  - (b) Advising against hunting, fishing, consuming any wild animal/plant, or harvesting/consuming any garden produce as appropriate and within the area determined by the SFARTF.
- 2. Intermediate Phase is the period beginning after the source and releases have been brought under control (has not necessarily stopped but is no longer growing) and reliable environmental measurements are available for use as a basis for decisions on protective actions and extending until these additional protective actions are no longer needed. This phase may overlap the early phase and late phase and may last from weeks to months.
  - a) Food and agriculture protective actions and PADs will be recommended by ESF-10 and implemented by state agencies within the SFARTF with regulatory authority.
  - b) ESF-10 will continually coordinate the evaluation of the impacted area.

## c) Radiological Assessment

- (1) The assessment of the IPZ is accomplished by the analysis of radiological monitoring data coordinated and collected from ESF-10 from samples of air, soil, vegetation, human food and animal feed, livestock and poultry, non-food animal products, non-food plant products, forestry and timber products, wildlife and fisheries, apiaries, water, and other commodities as appropriate and in accordance with sampling capabilities.
- (2) Ingestion estimate summed with whole body external dose calculations will be used for estimation of first and subsequent year whole body and inhalation exposures and skin beta dose conversion factors for a one-year exposure.
- (3) The SFARTF will:
  - (a) Coordinate the identification of long-term impacts on livestock, poultry, and related food products.
  - (b) Coordinate the identification of long-term impacts on the area's wildlife and fisheries and will develop an appropriate sampling plan as needed.
  - (c) Recommend and implement appropriate measures to protect public health from contamination of food and agricultural products.
  - (d) Recommend and implement appropriate measures to protect public health from contamination of water.
  - (e) Coordinate the investigation of long-term agricultural land management practices (e.g., soil removal, crop rotation, irrigation practices, tillage, etc.) that reduce future contamination of feed and food crops.

- d) The SFARTF will establish food and agricultural control measures to regulate the movement of impacted products in commerce. Based on initial modeling for impacted geographical areas:
  - (1) Livestock and poultry will be quarantined as appropriate.
  - (2) Human food and animal feed will be embargoed as appropriate.

- (3) A process will be established by which agribusiness can maintain business continuity.
  - e) At the time of the incident, the Governor or his designee may grant authorities needed for further protective actions to include the quarantine and management of non-food agricultural products, forestry, timber, wild fisheries, soil amendments, and agricultural chemical products.
  - f) Protective actions for food, water, and agricultural products will be incident-specific and determined by state and federal officials via the SFARTF based on DILs and other relevant subject matter expertise and data.
3. Late Phase is the period beginning when recovery actions designed to reduce radiation levels in the environment to acceptable levels are commenced and ending when all recovery actions have been completed. This phase may extend from months to years. A PAG level, or dose to avoid, is not appropriate for long-term cleanup.
- a) Protective actions will be a continuation of those established in Early and/or Intermediate Phases.
  - b) The SFARTF will continue to provide protective actions, decisions, and guidance for food, water, and agriculture.
    - (1) Discuss and implement long-term agricultural land management practices to reduce future contamination of food and agricultural commodities and water sources.
    - (2) Develop extensive public information and outreach materials related to food, agriculture, and water.
    - (3) As requested, provide technical guidance related to food and agriculture regarding potential decontamination and disposal planning.
    - (4) Identify criteria for final relaxation of PADs and other restrictions related to food, agriculture, animals, and water.
    - (5) Support private industry and commerce related to food and agriculture.
    - (6) Assess economic impacts on the food and agriculture sector and develop mitigation processes.
  - c) Dissemination of extensive public information by various media to provide recovery instructions to include, but not limited to, food and

agricultural messaging drafted by the SFARTF and personal precautions.

- d) Implementation of recommended long-term storage or disposal of contaminated commodities or materials.
- e) Development and implementation of a decontamination and restoration plan to include, but not limited to, food and agriculture.
- f) Identification of criteria for final relaxation of PADs and other restrictions in the affected area, monitoring those criteria, and relaxing or lifting PADs once criteria are satisfied.
- g) Assessment and implementation of mitigation plans for economic impacts.

## **VI. ORGANIZATION AND ASSIGNMENT OF RESPONSIBILITIES**

### **A. ESF-5 (Emergency Management)**

#### **1. SCEMD**

- a) Coordinate radiological emergency response operations to protect the public from the ingestion of contaminated food and water resulting from an NPP incident.
- b) Coordinate with the SFARTF for response actions, messaging, mitigation strategies, and other related emergency response and recovery operations.
- c) Participate in the PAD process.
- d) Conduct regular coordination calls with state and local officials to discuss the incident's impacts and protective actions.
- e) In consultation with appropriate State agencies, adjacent states, and federal agencies, where appropriate, coordinate the development and periodic revision of protective actions and mitigation techniques for humans, human food, livestock, poultry, animal feed, surface waters, public water supplies, fish and wildlife, and other nonfood agricultural products in the affected area throughout the term of the event.
- f) Coordinate with ESF-24 for the compilation of information on the physical and economic impact of the incident with local, state, and federal agencies.



- g) Coordinate with federal and state authorities to determine the criteria and time for final relaxation of PADs and other restrictions on the production, processing, distribution, and consumption of human food, animal feed, and water in the affected area and disseminate this information to the public.

**B. ESF-10 (Environmental and Hazardous Materials Operations)**

**1. SCDES**

- a) Participate in SFARTF and all operational activities according to the established operating framework.
- b) Direct the assessment of the radiological impact of an NPP incident within the IPZ as the Lead State agency.
- c) Participate in the PAD development and implementation process.
- d) Coordinate radiological monitoring, sample collection and analysis, and dose assessment.
- e) Coordinate IPZ assessment activities with the FRMAC when federal agencies arrive on the scene.
- f) Based upon dose assessment results and initial PARs, consult with ESF-17, the SFARTF, and federal authorities on the development and recommendation of protective actions for human food, livestock, poultry, animal feed, surface waters, public water supplies, fish, wildlife, and nonfood agricultural commodities in the affected area and their periodic revision throughout the term of the event.
- g) Identify the need for additional field monitoring, sample collection, and sample analysis resources; request assistance from the FRMAC and/or other states and utilities as needed; and coordinate all sampling activities.
- h) Develop and coordinate a sampling plan for collection, analysis, and evaluation of environmental samples.
- i) In coordination with ESF-17 and ESF-15, jointly develop instructions or advisories to local governments, businesses, and industries to protect the public in the affected area.
- j) Respond to inquiries from decision makers relating to ingestion hazards in coordination with ESF-8.

- k) Assist with the development of information for Public Information Officers and media contacts regarding the public health impacts of ingestion of contaminated food or water and anticipated long-term IPZ responsibilities and response efforts.
- l) Coordinate with ESF-17, federal, and state authorities to identify the criteria and time for final relaxation of PADs and other restrictions on the production, processing, distribution, and consumption of human food, animal feed, water, and nonfood agricultural products in the affected area.

**C. ESF-17 (Agriculture and Animals)**

**1. SC Department of Agriculture**

- a) Participate in the SFARTF and all operational activities according to the established operating framework.
- b) Participate in the PAD process related to human food and animal feed.
- c) Issue human food and animal feed embargoes as needed.
- d) Deploy personnel to verify ESF-10 approved disposal processes for regulated human food and animal feed products.
- e) During the planning phase, provide outreach and education to stakeholders related to the creation of individual/premises emergency response plans related to IPZ impacts.

**2. Clemson University Livestock Poultry Health**

- a) Provide coordination and leadership for the SFARTF and provide structure for coordination between ESF-17 personnel and the SFARTF.
- b) Participate in the SFARTF and all operational activities according to the established operating framework.
- c) Participate in the PAD process related to livestock, poultry, and meat processing and production.
- d) Issue animal and animal product quarantines as needed.
- e) During the planning phase, provide outreach and education to stakeholders related to the creation of individual/premises emergency response plans related to IPZ impacts.

3. Clemson University Regulatory and Public Service Programs
  - a) Participate in the SFARTF and all operational activities according to the established operating framework.
  - b) Participate in the PAD process as appropriate.
  - c) During the planning phase, provide outreach and education to stakeholders related to the creation of individual/premises emergency response plans related to IPZ impacts.
4. Clemson University Cooperative Extension Services
  - a) Participate in the SFARTF and all operational activities according to the established operating framework.
  - b) Liaise between agricultural stakeholders and the SERT; all ESFs.
  - c) Provide subject matter expertise and support to agricultural stakeholders and local governments as needed.
  - d) Participate in long-term environmental management deliberations.
  - e) During the planning phase, provide outreach and education to stakeholders related to the creation of individual/premises emergency response plans related to IPZ impacts.
5. SC Department of Natural Resources
  - a) Participate in the SFARTF and all operational activities according to the established operating framework.
  - b) Issue protective advisories related to wildlife and fisheries as needed.
  - c) During the planning phase, provide outreach and education to stakeholders related to the creation of individual/premises emergency response plans related to IPZ impacts.
6. SC Forestry Commission
  - a) Participate in the SFARTF and all operational activities according to the established operating framework.
  - b) Declare a Forest Disaster as needed to bring all industry together for mitigation and response actions.

- c) During the planning phase, provide outreach and education to stakeholders related to the creation of individual/premises emergency response plans related to IPZ impacts.

7. SCDES

- a) Participate in the SFARTF and all operational activities according to the established operating framework.
- b) During the planning phase, provide outreach and education to stakeholders related to the creation of individual/premises emergency response plans related to IPZ impacts.

D. ESF-3 (Public Works and Engineering)

1. SC National Guard

- a) Coordinate and support the provision of emergency power and response and recovery operations related to contaminated water and water systems.

2. SCDES

- a) Participate in SFARTF and all operational activities according to the established operating framework.
- b) Identify priorities regarding contaminated water.

3. South Carolina Water/Wastewater Agency Response Network

- a) Coordinate mutual aid between water and wastewater systems.

E. ESF-4 (Firefighting)

1. SC Forestry Commission

- a) Fire prevention measures around impacted geographical area.

F. ESF-8 (Health and Medical)

1. SCDPH

- a) The Designated Public Health Physician is to advise on the health effects of radiation exposure and recommendations for exposure avoidance.

G. ESF-13 (Law Enforcement)

1. Department of Natural Resources

- a) Upon request, manage restrictions of recreational surface waters.
- b) For those areas of agency responsibility, enforce the PADs by state and local government agencies, agricultural, business, industrial, and volunteer organizations, and the general public.
- c) Coordinate with the SERT to provide periodic information on the status of the incident and offsite response efforts to state and federal elected officials who represent the affected area.
- d) Initiate actions to protect the public from IPZ related exposures.
- e) Participate in the PAD making process for IPZ related activities.
- f) Assist in the enforcement of embargoes and quarantines.

**H. ESF-15 (Public Information)**

**1. SCEMD**

- a) In coordination with the SERT, jointly develop public information advisories to local governments concerning actions they should take to protect the public in the affected area.
- b) Coordinate the emergency printing and distribution of ingestion pathway public information brochures for the affected area.
- c) Coordinate the development of ingestion-related information from state agencies for use at the JIC and media center.
- d) Provide ingestion status updates through JIC news statements and/or directly to county emergency management officials for distribution to the local media.
- e) Coordinate with the SFARTF and all operational activities according to the established operating framework related to communications and messaging.

**I. ESF-16 (Emergency Traffic Management)**

**1. Department of Public Safety**

- a) Provide staffing for traffic and food control checkpoints.

**J. ESF-24 (Business and Industry)**

**1. Department of Commerce**

- a) Compilation of information on the physical and economic impact of the incident with local, state, and federal agencies.
- b) Coordinate with the SFARTF as needed.