After Action Report

Sequoyah Nuclear Plant

Medical Services Drill for Tennova Healthcare

Drill Date: November 15, 2023

FEMA

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EXECUTIVE SUMMARY

On November 15, 2023, the offsite response organizations within the Sequoyah Nuclear Plant 10-mile emergency planning zone participated in a medical services drill. FEMA Region 4 Radiological Emergency Preparedness Program staff evaluated Bradley County Emergency Medical Services, Cleveland Fire Department, and Tennova Healthcare during this drill.

The purpose of the drill was to assess the level of local preparedness in responding to a contaminated, injured individual within the Sequoyah Nuclear Plant emergency planning zone. This drill was conducted in accordance with FEMA's policies and guidance concerning the implementation of local radiological emergency response plans and procedures.

Officials and representatives from participating agencies and organizations demonstrated knowledge of their emergency response plans and procedures, and successfully implemented them during the drill. All participating agencies and organizations met the drill objective and successfully demonstrated the corresponding core capability identified in Section 2.2 of this report. FEMA staff did not identify any level 1 or level 2 findings during this drill.

It was apparent that a great deal of training and practice was conducted by the offsite response organizations to successfully demonstrate the ability to protect the health and safety of the public. They provided the necessary support and resources to respond to an incident at the Sequoyah Nuclear Plant.

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SECTION 1: OVERVIEW

Drill Name	2023 Sequoyah Nuclear Plant Medical Services Drill	
Type of Drill	Medical Services Drill	
Drill Date	November 15, 2023	
Program	Radiological Emergency Preparedness Program	
Mission Area	Response	
Scenario Type	Medical Services	
Participating Organizations	See Appendix B	
Evaluated Function/Facility	Bradley County Emergency Medical Services Tennova Healthcare	
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SECTION 2: DESIGN SUMMARY

1. Purpose and Design

FEMA administers the Radiological Emergency Preparedness Program pursuant to the regulations found in Title 44 of the Code of Federal Regulations (44 CFR) Parts 350, 351, 352, 353 and 354. 44 CFR Pt. 350 codifies 16 planning standards that form the basis for radiological emergency response planning for the licensee, state, local, tribal and territorial governments impacted by the emergency planning zones established for each nuclear power plant site in the United States. United States Nuclear Regulatory Commission regulations also codify the 16 planning standards for the licensee. 44 CFR Pt. 350 sets forth the mechanisms for the formal review and approval of state, local, tribal and territorial government radiological emergency response plans and procedures by FEMA. One of the Radiological Emergency Preparedness Program cornerstones established by these regulations is the conduct of annual medical services drills at each medical facility designated in the emergency plans. In these drills, affected state, local, tribal and territorial governments demonstrate their abilities to implement their plans and procedures to protect the health and safety of the public in the event of a radiological incident at a nuclear plant.

Radiological Emergency Preparedness Program Planning Standards L (Medical and Public Health Support) and N.4.b (Medical Emergency Drills) list the criteria for establishing medical care for the general public and conducting drills to verify the arrangements. The medical services drill involves a contaminated, injured individual (simulated) and contains provisions for participation by local support service agencies (i.e., offsite ambulance and medical treatment facility). The focus of these drills is decontamination and contamination control measures, not medical protocols. The exception pertains to modification of contamination control procedures and decisions on transportation to a medical facility when the individual has an urgent medical condition.

This drill was held in accordance with FEMA's policies and guidance concerning the exercise of state and local radiological emergency response plans and procedures as detailed in the December 2019 Radiological Emergency Preparedness Program Manual. The evaluation team conducted this drill using the Homeland Security Exercise and Evaluation Program methodology.

2. Core Capabilities and Objectives

Using the Homeland Security Exercise and Evaluation Program methodology, core capabilities-based planning allowed the drill planning team to develop the objective and observe associated outcomes through a framework of specific action items. Additionally, the objective and capability target assessed met Radiological Emergency Preparedness Program Manual guidance. The core capability demonstrated during this drill was:

- **Public Health, Healthcare, and Emergency Medical Services:** Provide lifesaving medical treatment via Emergency Medical Services and related operations and avoid additional disease and injury by providing targeted public health, medical, and behavioral health support, and products to all affected populations.

This core capability, when successfully demonstrated, met the drill objective. The objective for this drill was:

- **Objective 5:** Operate

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SECTION 3: ANALYSIS OF CAPABILITIES

1. Evaluation and Results

Each jurisdiction and functional entity were evaluated based on the demonstration of core capabilities, Radiological Emergency Preparedness Program objectives, and capability targets as delineated in the FEMA Radiological Emergency Preparedness Program Manual dated December 2019. Capability targets are listed by number and the demonstration status of those capability targets are indicated by the use of the following terms:

- **Met (M):** The jurisdiction or functional entity performed all activities under the objective/capability target to the level required per the work plan and/or the extent-of-play agreement, with no level 1 or level 2 Findings evaluated under that objective/capability target during the current activity and no unresolved prior Level 2 Finding(s).
- **Level 1 Finding (L1):** An observed or identified inadequacy of organizational performance during an assessment activity that could cause a determination that offsite emergency preparedness is not adequate to provide reasonable assurance that appropriate protective measures can be taken in the event of a radiological emergency to protect the health and safety of the public living in the vicinity of a nuclear power plant.
- **Level 2 Finding (L2):** An observed or identified inadequacy of organizational performance during an assessment activity that is not considered, by itself, to adversely impact public health and safety.
- **Plan Issue (P):** An observed or identified inadequacy in the offsite response organizations' s emergency plan/implementing procedures, rather than in that of the offsite response organizations' s performance.
- **Not Demonstrated (N):** For a justifiable reason, the jurisdiction or functional entity did not perform assessment activities under the objective/capability target as specified in the extent-of-play agreement.

2. Summary Results of Evaluation

The Homeland Security Exercise and Evaluation Program methodology is an analytical process used to assess the demonstration of specific core capabilities during a drill. A core capability provides a means to perform one or more capability targets under specified conditions and to specific performance standards. Core capabilities form the foundation of the FEMA Region 4 Radiological Emergency Preparedness Program evaluations. The medical services drill capability summary is provided below.

3. Jurisdictional Summary Results of Evaluation

3.1. Risk Jurisdictions

3.1.1. Bradley County

Public Health, Healthcare, and Emergency Medical Services Capability Summary:

The Cleveland Fire Department HAZMAT Team and Bradley County Emergency Medical Services paramedics successfully demonstrated the public health, healthcare, and emergency medical services core capability in response to a simulated radiological incident at the Sequoyah Nuclear Plant.

A simulated call was received by emergency services dispatch, reporting an injured, potentially contaminated person. Dispatch contacted the fire department HAZMAT team and provided them this information and placed emergency services paramedics on standby. Prior to responding to the call, the HAZMAT team and paramedics received an emergency worker briefing from the radiological safety officer and were issued emergency worker kits. The kits contained a direct reading dosimeter, permanent record dosimeter, potassium iodide tablets, and an emergency worker exposure card. The radiological safety officer briefed the HAZMAT team and paramedics on how and when to use the kits contents and directed the emergency workers to report their direct reading dosimeter readings every 15 minutes to their supervisors. The radiological safety officer reminded the HAZMAT team that 300 counts per minute or greater was considered contaminated.

Both the HAZMAT team and paramedics donned personal protective equipment that included hooded coveralls, face masks, and 2 pairs of gloves. HAZMAT team members also wore over boots and eye protection. This differed slightly from the paramedics who wore booties over their shoes and face shields over their masks. Despite the differences in protective equipment, the equipment provided the emergency workers the same level of protection. The seams around the zippers, wrists, and boots were secured with tape for both HAZMAT team members and paramedics.

The HAZMAT team was dispatched first to establish the contaminated and non-contaminated zones. Signage was used to indicate the control line along a roadway. After establishing the zones and control line, the hazmat team located the injured patient. The patient explained they had injured their leg and possibly been in a contaminated area while outside. Sheets were positioned around the injured patient to provide non-contaminated area for the team to survey the patient using a handheld survey meter. Through controller inject an initial reading of 425 counts per minute was identified along injured leg. A team member cut off the patient's clothing, which reduced the reading along the injury to 400 counts per minute. A splint was secured to the injured leg to minimize movement. Glove changes were observed each time a team member contacted the patient.

The patient was moved to a covered stretcher and cocooned in two layers of sheets before being placed inside a fire rescue vehicle and driven to the control line. Team members communicated with supporting firefighters and the paramedics to ensure none of them crossed the control line during the patient transfer process. The HAZMAT team lead provided readings and a patient assessment to one of the paramedics. Following the patient transfer, the HAZMAT team radioed their supervisor and were instructed to report to the emergency worker decontamination site; the paramedics interviewed the patient to obtain additional medical information; and contacted the hospital to advise of an en route injured, potentially contaminated patient.

In accordance with the extent-of-play agreement, the outside portion of the radiological emergency area was set-up prior to the start of the drill. Hospital facility department staff members laid down tarps creating a designated area for the ambulance to park, unload the patient, and transfer the patient to awaiting hospital nurses. The tarped area was also coned off and barrier tape was used to further secure and identify the radiological emergency area.

After the area was set-up, security and facility department staff members, as well as a team of nurses were provided a radiological safety briefing. Each staff member and nurse was provided an emergency worker kit that included the same contents as outlined above. The staff members and nurses also received instructions on how to wear their dosimetry and when to ingest the potassium iodide tablets, if directed to ingest.

When advised that an injured, potentially contaminated patient was en route, security staff secured all three entrances to the emergency room. A team of four nurses waited outside the decontamination room for the arriving patient. The nurses waited with a stretcher on an elevated portion of the sidewalk which was designed to be a non-contaminated area.

When the ambulance arrived, a paramedic exited the ambulance and walked around the back to retrieve the patient. A second paramedic exited the back of the ambulance, and both paramedics worked to remove the patient from ambulance and rolled the patient on a stretcher to the elevated sidewalk where the team of nurses were waiting. The stretcher remained on the tarps, in the designated contaminated area, and the paramedics lifted the patient from the stretcher, transferring the patient onto a hospital stretcher. Neither the paramedics or nurses crossed from the contaminated area to the non-contaminated area or vise verse. Sound contamination control measures were used throughout the patient transfer process.

Following the patient transfer, the paramedics were instructed by Cleveland-Bradley County Emergency Management Agency staff to report to the emergency worker decontamination site for monitoring and decontamination. Additionally, their emergency worker kits would be processed at the site. Hospital facility department staff were responsible for monitoring and decontaminating the outside portion of the radiological emergency area.

The hospital had a dedicated decontamination room with a separate entrance from the ambulance bay. Additional supplies in the buffer zone were available for use by the decontamination room nurses. The room was equipped with several shower areas, a bed, and waste containers. After receiving radio notification from the Bradley County Emergency Medical Services that a potentially contaminated, injured patient was being transported to the hospital, a code “orange” radiological emergency was announced over the hospital intercom and the hospital emergency operations center was activated to provide incident command.

Team members from the radiology department acted as radiological safety officers and performed operational checks of the calibrated handheld survey meters and determined background radiation levels. One radiological safety officer was stationed in the inside radiological emergency area, while the other radiological safety officer remained in the buffer zone.

The decontamination room team consisted of three nurses, a nurse scribe, and a radiological safety officer, who all wore dosimetry, and a doctor and other support staff were available in the buffer zone. Dosimeter serial numbers and readings were maintained by the scribe on a dosimetry log sheet, and it was explained that this information would be added to their emergency worker exposure cards for each decontamination room team member.

The decontamination room radiological safety officer began surveying the patient and found contamination levels of 375 counts per minute on the right arm, and 400 counts per minute on a wound on the left leg. Radiation levels on the patient's arm decreased below 300 counts per minute when the patient's clothing was removed, and readings were confirmed with a survey by the radiological safety officer. Decontamination room team members consulted with the doctor in the buffer zone, and it was decided that decontamination of the patient's leg would be necessary to reduce contamination below the action level.

Staff initially attempted decontamination of the patient's leg by rinsing the wound with a saline solution. Wastewater from the first wash was not controlled, and saline runoff soaked the sheet beneath the patient. Staff recognized the sheet and mattress were potentially contaminated and changed the sheet in addition to placing a wash basin and absorbent pad beneath the patient's wound to collect wastewater. The patient's leg was rinsed two additional times before contamination was no longer above 300 counts per minute. The radiological safety officer confirmed by survey that all readings were below 300 counts per minute.

The patient was independently transferred to a clean bed in the buffer zone for further medical treatment. One team member demonstrated doffing of personal protective equipment, and a whole-body survey was completed by the radiological safety officer outside the decontamination room. No contamination survey of the hospital bed or floor was performed. It was explained that the decontamination room would be secured until a contractor could perform gross decontamination. Throughout the drill, staff verbalized frequent glove changes and dosimeter checks.

Observation: Strength: Multi-agency participation facilitated a more realistic drill and response effort.

References:

1. Radiological Emergency Preparedness Program Manual, December 2019
2. Multi-Jurisdictional Radiological Emergency Response Plan for the Sequoyah Nuclear Power Plant, June 2022

Analysis: A robust, realistic scenario was developed for the emergency medical services portion of the drill. In addition, both the fire department and emergency medical services had sufficient participation. Together, the scenario and level of participation facilitated a much more realistic drill and response effort. Players responded to the scenario like they would any other real-world emergency. They reduced simulation and drill artificiality which resulted in a more meaningful drill, as they were able to test their training and procedure to identify gaps in both.

Recommendation:

1. Consider sharing scenario development best practices with other county and state program partners to promote effective, realistic drills and exercises.

Observation: Area for Improvement: Patient transfer from the decontamination room to the buffer zone.

References:
1. Radiological Emergency Preparedness Program Manual, December 2019
2. Multi-Jurisdictional Radiological Emergency Response Plan for the Sequoyah Nuclear Power Plant, June 2022

Analysis: Transfer of the patient from the decontamination room to the buffer zone was disjointed due to the lack of space in the decontamination room and the positioning of the decontamination room bed in relation to the non-contaminated bed in the buffer zone. The two beds were arranged in a straight line, with the head of the contaminated bed abutting the foot of the non-contaminated bed. The patient was able to independently slide from one bed to the other, but this method of transfer may not be viable for patients with more severe injuries.

Recommendation:
1. Revise the procedure to include comprehensive steps for patient transfer from the decontamination room to the buffer zone.

For this core capability the following radiological emergency preparedness capability target was met: 5.3.

- **Level 1 Finding:** None
- **Level 2 Finding:** None
- **Not Demonstrated:** None
- **Prior Level 2 Findings – Resolved:** None
- **Prior Level 2 Findings – Unresolved:** None

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SECTION 4: CONCLUSION

FEMA assesses offsite response organization preparedness on an ongoing basis which meets the intent of the 44 CFR Pt. 350 planning standards and, through the assessment of selected core capabilities, the National Preparedness Goal. This report is used to document biennial demonstration-based assessment activities, such as a medical services drill, and will be used to inform the Biennial Preparedness Report in December 2024.

The analysis of capabilities above described the state of Tennessee and Sequoyah Nuclear Plant offsite response capabilities. Overall, the drill was a success. The demonstration-based assessment activities evaluated by core capabilities, objectives, and capability targets were successfully demonstrated, and no level 1 or level 2 findings were identified. All offsite response organizations demonstrated knowledge of their emergency response plans and procedures, and successfully demonstrated the ability to protect the health and safety of the public in the event of an incident involving the Sequoyah Nuclear Plant.

Despite other ongoing real-world response efforts, the professionalism and teamwork of the participants was evident throughout all phases of the drill. FEMA wishes to acknowledge the efforts of the many individuals who participated and made this drill a success.

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APPENDIX A: EVALUATOR ASSIGNMENTS

Location/Venue	Evaluation Team	Core Capability
Bradley County Emergency Medical Services	Randi Hendrix	Public Health, Healthcare, and Emergency Medical Services
Tennova Healthcare	Irvin Gibson Erica Houghton	Public Health, Healthcare, and Emergency Medical Services

APPENDIX B: PARTICIPATING ORGANIZATIONS

Participating Organizations
State of Tennessee
Tennessee Military Department, Tennessee Emergency Management Agency
Bradley County
Bradley County Emergency Medical Services
Cleveland Fire Department
Cleveland-Bradley County Emergency Management Agency
Private Sector
Tennova Healthcare
Federal
U.S. Department of Homeland Security, Federal Emergency Management Agency, Region 4