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Nuclear Regulatory Commission Headquarters
Office of Nuclear Security and Incident Response
Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

To Whom It May Concern:

Enclosed is the final After Action Report/Improvement Plan for the Limerick Generating Station (LGS) Medical Services (MS-1) Drill that was held on May 11, 2016. The Bally Community Ambulance Company and Reading Hospital participated in the drill.

There were no Level 1 Findings, Level 2 Findings, or Planning Issues identified during the drill.

Based on the results of the exercise and a review of the offsite radiological emergency response plans and procedures submitted, FEMA Region III has determined they are adequate (meet the planning and preparedness standards of NUREG-0654/FEMA-REP-1, Revision 1, November 1980, as referenced in 44 CFR 350.5) and there is reasonable assurance they can be implemented, as demonstrated during this exercise.

If you have any questions, please contact Thomas Scardino at (215) 931-5546.

Sincerely,

MaryAnn Tierney
Regional Administrator

Enclosure

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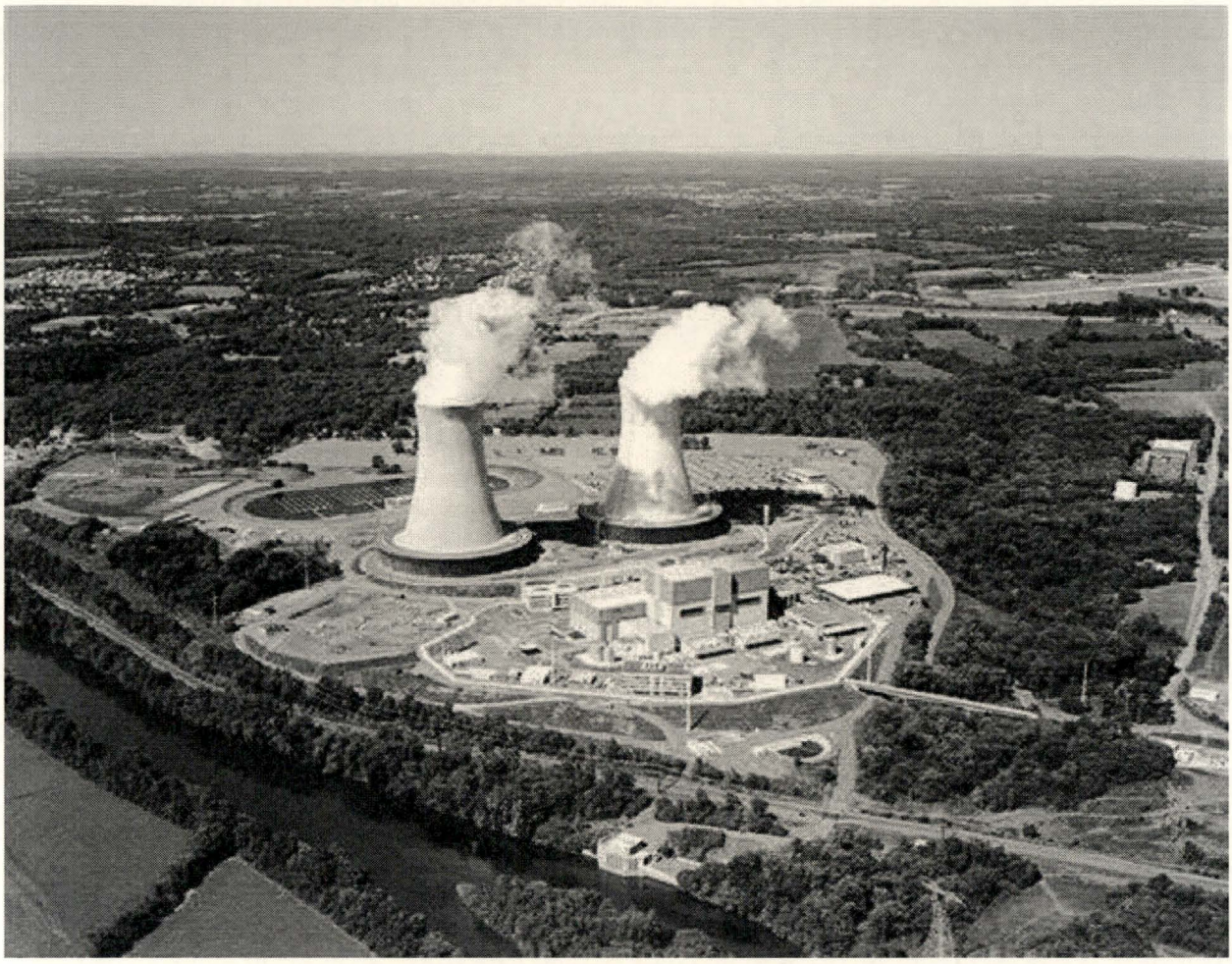

# Limerick Generating Station
# After Action Report/
# Improvement Plan

**Drill Date – May 11, 2016**

**Radiological Emergency Preparedness (REP) Program**

FEMA

**Published May 23, 2016**

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After Action Report/Improvement Plan

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## EXECUTIVE SUMMARY

On May 11, 2016, a Medical Services (MS-1) Drill was evaluated for the 10-mile Plume Exposure Pathway, Emergency Planning Zone (EPZ) around the Limerick Generating Station (LGS) by the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region III. The most recent prior MS-1 drill for this site was conducted on June 12, 2013 (Commonwealth of Pennsylvania).

The purpose of the Limerick MS-1 drill was to assess the State and local offsite response organization preparedness in responding to a radiological medical emergency. The drill was held in accordance with FEMA's policies and guidance concerning the exercise of State and local Radiological Emergency Response Plans (RERP) and procedures.

FEMA wishes to acknowledge the efforts of the many individuals in the Commonwealth of Pennsylvania, Berks County Office of Emergency Operations, Reading Hospital and the Bally Community Ambulance who were evaluated during this exercise.

Protecting the public health and safety is the full-time job of some of the exercise participants and an additional assigned responsibility for others. Still others have willingly sought this responsibility as volunteers providing vital emergency services twenty four (24) hours a day to the communities in which they live. Cooperation and teamwork among all the participants was observed during this drill.

This report contains the final evaluation of the MS-1 drill. The Commonwealth of Pennsylvania and local organizations demonstrated knowledge of their emergency response plans and procedures and adequately implemented them. There were no Level 1 or Level 2 Findings or Plan issues.

# SECTION 1: EXERCISE OVERVIEW

## 1.1 Exercise Details

**Exercise Name**
Limerick Generating Station (LGS) Medical Services (MS-1) Drill

**Type of Exercise**
Medical Services (MS-1) Drill

**Exercise Date**
May 11, 2016

**Program**
Department of Homeland Security/FEMA Radiological Emergency Preparedness Program

**Scenario Type**
Not Applicable

## 1.2 Exercise Planning Team Leadership

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## 1.3 Participating Organizations

Agencies and organizations of the following jurisdictions participated in the Limerick Generating Station drill:

Support Jurisdictions

Reading Hospital
Bally Community Ambulance

# SECTION 2: EXERCISE DESIGN SUMMARY

## 2.1 Exercise Purpose and Design

On December 7, 1979, the President directed the Federal Emergency Management Agency (FEMA) to assume the lead responsibility for all off-site radiological planning and response. FEMA's activities were conducted pursuant to 44 Code of Federal Regulations (CFR) Parts 350, 351 and 352. These regulations are a key element in the Radiological Emergency Preparedness (REP) Program that was established following the Three Mile Island Nuclear Station accident in March 1979.

44 CFR 350 establishes the policies and procedures for FEMA's initial and continued approval of State and local governments' radiological emergency planning and preparedness for commercial nuclear power plants. This approval is contingent, in part, on State and local government participation in joint exercises with licensees. FEMA's responsibilities in radiological emergency planning for fixed nuclear facilities include the following:

A. Taking the lead in offsite emergency planning and in the review and evaluation of Radiological Emergency Response Plans (RERPs) and procedures developed by State and local governments;

B. Determining whether such plans and procedures can be implemented on the basis of observation and evaluation of exercises of the plans and procedures conducted by State and local governments;

C. Responding to requests by the U.S. Nuclear Regulatory Commission (NRC) pursuant to the Memorandum of Understanding between the NRC and FEMA dated June 17, 1993 (Federal Register, Vol. 58, No. 176, September 14, 1993; and

D. Coordinating the activities of the following Federal agencies with responsibilities in the radiological emergency planning process:

- U.S. Department of Commerce,
- U.S. Nuclear Regulatory Commission,
- U.S. Environmental Protection Agency,
- U.S. Department of Energy,
- U.S. Department of Health and Human Services,
- U.S. Department of Transportation,
- U.S. Department of Agriculture,
- U.S. Department of the Interior, and
- U.S. Food and Drug Administration.

Representatives of these agencies serve on the Region III Radiological Assistance Committee (RAC), which is chaired by FEMA. A Radiological Emergency Preparedness Medical Services (MS-1) Drill was conducted May 11, 2016, to assess the capabilities of State and local emergency preparedness organizations in implementing their RERPs and procedures to protect the public health and safety during a radiological emergency involving Limerick Generating Station. The purpose of this exercise report is to present the drill results and findings on the

performance of the off-site response organizations (OROs) during a simulated radiological emergency involving a contaminated injured individual.

The findings presented in this report are based on the evaluations of the Federal evaluator team, with final determinations made by the FEMA Region III Radiological Assistance Committee (RAC) Chairperson and approved by FEMA Headquarters. These reports are provided to the NRC and participating States. State and local governments utilize the findings contained in these reports for the purposes of planning, training, and improving emergency response capabilities.

The criteria utilized in the FEMA evaluation process are contained in the following:

- NUREG-0654/FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," November 1980;
- Radiological Emergency Preparedness Program Manual, January 2016

  Section 1 of this report, entitled "Exercise Overview", presents the "Exercise Planning Team" and the "Participating Organizations".

  Section 2 of this report, entitled "Exercise Design Summary", and includes the "Purpose and Design", "Exercise Objectives, Capabilities, and Activities", and the "Scenario Summary".

  Section 3 of this report, entitled "Analysis of Capabilities", presents detailed "Drill Evaluation and Results" information on the demonstration for each jurisdiction or functional entity evaluated in a jurisdiction-based, issue-only format (Criteria Evaluation Summaries).

  Section 4 of this report, entitled "Conclusion", is a description of the Region's overall assessment of the capabilities of the participating organizations. It also presents information on planning issues if any were identified.

Emergency Planning Zone Description:

Limerick Generating Station (LGS) is located in southeastern Pennsylvania on the Schuylkill River about 1.7 miles southeast of Pottstown Borough. The river passes through the site, separating the western portion, which is in East Coventry Township in Chester County, from the eastern portion, which is in Limerick and Lower Pottsgrove Townships in Montgomery County. The plant is owned and operated by Exelon Nuclear. Two boiling water reactors each generate an electrical output of 1,050 megawatts (MW). Unit 1 was issued a full-power license in May 1985; commercial operations began in February 1986. Unit 2 was issued a full-power license in May 1989 with commercial operations beginning in January 1990.

The site encompasses 595 acres and is divided into three (3) parts. The principal portion, where the major operating equipment and buildings are located, is on the east bank of the Schuylkill River. This portion is separated from the second segment, where the cooling water intake is located, near the main line of the Reading Railroad. The third portion lies on the west bank of

the river, adjacent to Conrail railroad tracks. The site coordinates are approximately 40°13'27"N and 75°35'15"W.

The minimum exclusion distance for the LGS is 2,500 feet from the center of each reactor. The utility owns all the land within the exclusion area. No private residences are located within the exclusion area; however, some farming may be permitted.

There are 165 sirens installed to cover the 10-mile plume exposure pathway EPZ. These sirens are activated three (3) minutes before the Emergency Alert System (EAS) messages issued by the Commonwealth of Pennsylvania are broadcast. Soils in this area are of the Reaville-Penn-Klinesville Association and are characteristic of rolling uplands. They are underlain by sedimentary rocks of the Brunswick Formation, consisting mostly of red shale with some fine-grained sandstone interbedding. The normal pool elevation of the Schuylkill River in this area is 200 feet above mean sea level (msl). The topography of the area is hilly, with elevations ranging from 100-300 feet above msl within five (5) miles of the site. The plant is approximately 217 feet above msl.

The climate in this area is dominated by prevailing westerly winds that produce humid, continental-type weather characterized by warm summers and moderately cold winters. Montgomery County is the warmest part of Pennsylvania, with an average annual temperature of 57°F. Annual precipitation is approximately 42 inches. The area in the immediate vicinity of the plant is made up mostly of agricultural and other open land. The Pottstown Borough in Montgomery County is the nearest community. The nearest major population center (more than 25,000 people) is Philadelphia that lies 25 miles to the southeast of the site.

Two major industries employ a total of 850 persons within two (2) miles of the plant. Two small airfields are also located nearby. A small private airfield is about one (1) mile to the northeast, but its runway is oriented so that the flight path does not pass over the plant. The Pottstown Municipal Airport is 4.3 miles northwest of the site. The LGS does not lie in the approach pattern for this airport. No major thoroughfares are located in the immediate vicinity of the plant. The main line of the Reading Railroad runs along the north bank of the Schuylkill River and traverses the site about 500 feet from the plant.

## 2.2 Exercise Objectives, Capabilities and Activities

The Limerick Generating Station MS-1 Drill evaluated by the Federal Emergency Management Agency was designed to demonstrate the capabilities of State and local emergency management agencies to technically assess the extent of the radiological impact from a contaminated injured individual, including transport and receipt at a hospital. The demonstration included the ability to:

A. Respond to a radiation medical emergency following the procedures of Berks County Department of Emergency Services, Bally Community Ambulance, and Reading Hospital.

B. Implement timely and accurate communications between the hospital and offsite response agencies. (Telephones will be used in lieu of radios whenever possible to limit the potential misinterpretation of the drill as an actual event.)

C. Establish correct priorities and appropriate techniques in EMS, transportation of patients and pre-hospital and hospital emergency care of radioactively contaminated patients.

D. Initiate inter-agency cooperation between Bally Community Ambulance Company, and Reading Hospital

## 2.3 Scenario Summary

The exercise scenario for this MS-1 Drill consisted of simulated notifications of escalating emergency classification levels (ECL) at the Limerick Generating Station (LGS) from Site Area Emergency (SAE) to General Emergency (GE), declared following an airborne release of radiological material.

During the incident an emergency worker tripped over a fire hose landing hard on his hands and knees. The victim was conscious and complaining of pain in his right wrist. The victim had a small laceration on both knees and hands Bally Community Ambulance Company was dispatched to the scene to provide medical support and transport to the nearest MS-1 Hospital.

Upon arrival at Reading Hospital, the medical treatment team and a radiation safety representative met the Emergency Medical Services (EMS) team at the exterior entrance to the Radiological Emergency Area (REA). The hospital's medical team assessed the patient's condition and surveyed the victim for radiological contamination. Initial contamination levels were 1100 counts per minute (cpm) on both the right and left palms.

# SECTION 3: ANALYSIS OF CAPABILITIES

## 3.1 Exercise Evaluation and Results

Contained in this section are the results and findings of the evaluations of all jurisdictions and locations that participated in the May 11, 2016, Medical Services Radiological Emergency Preparedness (REP) Drill. The drill was conducted to demonstrate the ability of the Offsite Response Organizations to respond to potentially contaminated injured patients during incidents associated with the Limerick Generating Station.

Each jurisdiction and functional entity was evaluated on the basis of its demonstration of the appropriate Exercise Evaluation Area Criteria contained in the REP Program Manual. Detailed information on the exercise evaluation area criteria and the Extent-of-Play agreement are found in Appendix C.

The drill was conducted and evaluated in accordance with the Radiological Emergency Preparedness Program Manual and NUREG 0654. The Evaluation Criteria included:

1.e.1 Equipment and supplies to support operations
3.a.1 Implementation of emergency worker exposure control
6.d.1 Transportation and treatment of contaminated injured individuals

The drill successfully demonstrated the response capabilities of all participants.

## 3.2 Summary Results of Exercise Evaluation

The matrix presented in Table 3.1, on the following pages, presents the status of the exercise evaluation area criteria from the REP Program Manual that was scheduled for demonstration during this drill by all participating jurisdictions and functional entities. Drill evaluation area criteria are listed by number and the demonstration status of the criteria is indicated by the use of the following letters:

(D) Demonstrated Strength: an observed action, behavior, procedure, and/or practice that is worthy of special notice and positive recognition, Note: this is already a common practice that many Regions employ when identifying demonstrated strengths.

(L1) Level 1 Finding: an observed or identified inadequacy or organizational performance in an exercise that could cause a determination that offsite emergency preparedness is not adequate to provide reasonable assurance that appropriate protective measures can be taken in event of a radiological emergency to protect the health and safety of the public living in the vicinity of a Nuclear Power Plant (NPP).

(L2) Level 2 Finding: an observed or identified inadequacy of organizational performance in an exercise that is not considered, by itself, to adversely impact public health and safety.

(P) Plan Issue: an observed or identified inadequacy of organizational in the offsite response organizations' (OROs) emergency plan/implementation procedures, rather than that of the ORO"s performance.

(N) Not Demonstrated: term applied to the status of a REP exercise Evaluation Area Criterion indicating that the ORO, for a justifiable reason, did not demonstrate the Evaluation Area Criterion, as required in the extent-of-play agreement or at the two -year or eight-year interval required in the FEMA REP Program Manual.

(M) Met: status of a REP exercise Evaluation Area Criterion indicating that the participating ORO demonstrated all demonstration criteria for the Evaluation Area Criterion to the level required in the extent of-play agreement with no Findings assessed in the current exercise and no unresolved prior Findings.

Table 3.1 – Summary of Drill/Exercise Evaluation

| Date: 05-11-2016<br>Site: Limerick Generating Station<br><br>(M) Met, (1) Level 1 Finding, (2) Level 2 Finding, (P) Planning Issue | | BCRH | BCBCA |
|---|---|---|---|
| Emergency Operations Management | | | |
| Mobilization | 1a1 | | |
| Facilities | 1b1 | | |
| Direction and Control | 1c1 | | |
| Communications | 1d1 | | |
| Equipment and Supplies to Support Operations | 1e1 | M | M |
| Protective Action Decision Making | | | |
| Emergency Worker Exposure Control | 2a1 | | |
| Accident Assessment and Pars for the Emergency Event | 2b1 | | |
| PAD decision-making process and coordination for the General Public | 2b2 | | |
| PADs for disabilities & access/functional needs people | 2c1 | | |
| Radiological Assessment & Decision making for the Ingestion Pathway | 2e1 | | |
| Radiological Assessment & Decision making for Relocation/Reentry/Return | 2d1 | | |
| Protective Action Implementation | | | |
| Implementation of Emergency Worker Exposure Control | 3a1 | M | M |
| Implementation of KI PAD for Institutionalized Individuals/Public | 3b2 | | |
| Implementation of PADs for disabilities & access/functional needs people | 3c1 | | |
| Implementation of PADS for Schools | 3c2 | | |
| Implementation of Traffic and Access Control | 3d1 | | |
| Impediments to Evacuation | 3d2 | | |
| Implementation of Relocation/Reentry/Return Decisions | 3f1 | | |
| Field Measurements and Analysis | | | |
| RESERVED | 4a1 | | |
| Field Team Management | 4a2 | | |
| Plume Phase Field Measurement, Handling, & Analyses | 4a3 | | |
| Post Plume Phase Field Measurements & Sampling | 4b1 | | |
| Emergency Notification and Public Information | | | |
| Activation of the Prompt Alert & Notification System (ANS) | 5a1 | | |
| RESERVED | 5a2 | | |
| Activation of the Back-up ANS | 5a3 | | |
| Activation of the Exception Area ANS | 5a4 | | |
| Emergency Information & Instructions to the Public/Media | 5b1 | | |
| Support Operations/Facilities | | | |
| Monitoring, Decontamination, & Registration of Evacuees | 6a1 | | |
| Monitoring/Decontamination of Emergency Workers and Equipment | 6b1 | | |
| Temporary Care of Evacuees | 6c1 | | |
| Transportation/Treatment of Contaminated Injured Individuals | 6d1 | M | M |

## 3.3 Criteria Evaluation Summaries

### 3.3.1 Risk Jurisdictions

In summary, the status of DHS/FEMA criteria for the State jurisdiction is as follows:

#### 3.3.1.1 Berks County, Reading Hospital

In summary, the status of DHS/FEMA criteria for this location is as follows:

a. MET: 1.e.1, 3.a.1, 6.d.1

b. LEVEL 1 FINDINGS: NONE

c. LEVEL 2 FINDINGS: NONE

d. PLAN ISSUES: NONE

e. PRIOR ISSUES – RESOLVED: NONE

f. PRIOR ISSUES – UNRESOLVED: NONE

**1.e.1 Berks County, Reading Hospital**

The Reading Hospital (RH) successfully demonstrated the capability to provide necessary equipment and supplies to support emergency operations, treatment, and decontamination of radiological contaminated patient. The demonstration was conducted as part of a Medical Services (MS-1) Drill conducted on Wednesday, May 11, 2016, from approximately 0900 to 1200, at the Reading Hospital located at 629 Parkside Drive North in West Reading, Pennsylvania.

At 0847, the Emergency Department (ED) Charge Nurse was asked to describe the necessary equipment to set-up the decontamination room in preparation for an injured contaminated patient. The Charge Nurse stated that there was a storage area off of the ambulance bay that contained necessary equipment and supplies for emergency operations.

The storage area was a locked closet labeled "Radiological Equipment Room." The contents of this room included numerous barrier ropes with radiological contamination signage, multiple cones, set-up procedures and signal lights which could be mounted on top of the cones for night operations. The hallway leading to the Radiation Emergency Area (REA) had temporary markings on the floor to designate the buffer zone for transfer of the patient from the ambulance gurney to the hospital bed. There were multiple rolling trash cans with yellow plastic liners.

The storage area contained a six foot locking roller cabinet. The contents of this cabinet included 11 Personal Protective Equipment (PPE) Kits, which contained a gown, surgical mask with an eye shield, surgical booties and yellow rubber outer boots. There were two Canberra/RMC kits for body sampling and decontamination which contained several bottles of

saline, eight packages of sterile 4x4 gauze, red duct tape, cotton swabs, multiple boxes and sizes of latex gloves, beta dyne, hydrogen peroxide, scissors and bioassay sample containment bags. There were instructions on required bioassay samples and decontamination techniques also contained in the kits.

On the outside of the cabinet there was a poster which detailed the PPE donning sequence and on the inside of the cabinet door there was 8x10 laminated sheet outlining the Pennsylvania Emergency Management Agency (PEMA) Emergency Worker (EW) Dose Limit of 5 REM, and actions to follow when the limits were exceeded. Additionally there was a book of standard operating procedures, administrative supplies and recording forms. There was barrier tape for marking off the decontamination room and step-off pads to use in the buffer zone.

In addition to the radiological emergency supplies, there were two radiation survey meters. The meters were LUDLUM Model 14C radiation survey meters with pancake GM probes. Each of the meters have a range of 0 - 50,000 cpm, and had calibration due dates of December 22, 2016. The cabinet also contained a Model 510, electronic dosimeter charger and a portable air sampler. The cabinet was checked and restocked on a monthly basis, and after every use.

The RH staff members working in the Radiation Emergency Area (REA) were issued dosimetry by the PEMA. The dosimetry issued to each hospital staff member consisted of one ARROWTECH Model 730 Direct Reading Dosimeter (DRD) with a range of 0 to 20R (Calibration due date of June 30, 2016), and a thermoluminescent (TLD) permanent record dosimeter (PRD) that was changed out on January 1, 2016 (annual basis). Each staff member was also issued a card with radiation exposure limits for EWs.

According to an interview with the Berks County Emergency Management Coordinator, PEMA exchanges all 100 old TLDS with 100 new TLDs annually in Berks County. This ensures Berks County has up-to-date TLDs for use by County personnel for LGS incidents.

All activities described in the demonstration criterion were carried out in accordance with the plan, procedures and extent-of-play agreement.

### 3.a.1 Berks County, Reading Hospital

The Reading Hospital (RH) successfully demonstrated the capability to issue appropriate dosimetry and procedures, and manage radiological exposure to emergency workers in accordance with the plans and procedures. Emergency workers periodically and at the end of each mission read their dosimeters and recorded the readings on the appropriate exposure record or chart. The demonstration was conducted as part of a Medical Services (MS-1) Drill conducted on Wednesday, May 11, 2016, from approximately 0900 to 1200, at the Reading Hospital located, at 629 Parkside Drive North in West Reading, Pennsylvania.

The RH staff members working in the Radiation Emergency Area (REA) were issued dosimetry by the Pennsylvania Emergency Management Agency (PEMA). The dosimetry issued to each hospital staff member consisted of one ARROWTECH Model 730 Direct Reading Dosimeter (DRD) with a range of 0 to 20 R (Calibration due date of June 30, 2016), and a thermoluminescent (TLD) permanent record dosimeter (PRD) that was changed out on January 1, 2016 (annual basis). Each staff member was also issued a card with radiation exposure limits for Emergency Workers.

A briefing was conducted by a Reading Hospital Nuclear Medicine Technician and Buffer Zone Nurse while the REA was being set up by non-medical staff. The briefing included the proper wear of dosimetry (placed at or near chest level to the front); the prescribed exposure limit of 5 R; the requirement to read DRDs every 30 minutes and to report readings to the Buffer Zone Nurse; and turn in of the dosimetry to the Buffer Zone Nurse upon completion of REA activities. The Nuclear Medicine Technician also emphasized their responsibilities in the REA, including monitoring patients and REA medical staff on a recurring basis, tracking DRD reading periodicity, and performing area monitoring and decontamination upon completion of REA activities.

Through interview, the Reading Hospital staff in the REA were knowledgeable on the use of dosimetry, including frequency of reading and reporting requirements. Additionally, the hospital provided a Nuclear Medicine Technician in the REA serving as a technical advisor to the medical staff on radiological issues. The Nuclear Medicine Technician and Buffer Zone Nurse kept track of the time and every 30 minutes, instructed the REA staff to read their DRDs and report their readings to the Buffer Zone Nurse. Readings were recorded on the Personnel Dosimetry Log.

All dosimetry used by the hospital staff would be returned to PEMA at the conclusion of the incident.

All activities described in the demonstration criterion were carried out in accordance with the plan, procedures, and extent-of-play agreement.

### 6.d.1 Berks County, Reading Hospital

The Reading Hospital (RH) successfully demonstrated the appropriate space, adequate resources, and trained personnel to provide transport, monitoring, decontamination, and medical services to contaminated injured individuals. The demonstration was conducted as part of a Medical Services (MS-1) Drill conducted on Wednesday, May 11, 2016, from approximately 0900 to 1200, at the Reading Hospital located at 629 Parkside Drive North in West Reading, Pennsylvania.

At 0900, the Emergency Department (ED) Charge Nurse was asked to describe the necessary equipment to set-up the decontamination room in preparation for an injured contaminated patient. The Charge Nurse stated that there was a storage area off of the ambulance bay that contained necessary equipment and supplies for emergency operations.

The storage area was a locked closet was labeled "Radiological Equipment Room." The contents of this room included numerous barrier ropes with radiological contamination signage, multiple cones, set-up procedures, and signal lights which could be mounted on top of the cones for a night operations. The hallway leading to the Radiation Emergency Area (REA) had temporary markings on the floor to designate the buffer zone for transfer of the patient from the ambulance gurney to the hospital bed. There were multiple rolling trash cans with yellow plastic liners.

The storage area contained a six foot, locking, roller cabinet. The contents of this cabinet included 11 Personal Protective Equipment Kits (PPE), which contained a gown, surgical mask with an eye shield, surgical booties and yellow rubber outer boots. There were two Canberra/RMC kits for body sampling and decontamination which contained several bottles of saline, eight packages of sterile 4x4 gauze, red duct tape, cotton swabs, multiple boxes and sizes of latex gloves, beta dyne, hydrogen peroxide, scissors and bioassay sample containment bags. There were instructions on required bioassay samples and decontamination techniques also contained in the kits.

On the outside of the cabinet there was a poster which detailed the PPE donning sequence and on the inside of the cabinet door there was 8x10 laminated sheet outlining the Pennsylvania Emergency Management Agency (PEMA) Emergency Worker (EW) 5R limit and actions to follow when the limits were read. Additionally there was a book of standard operating procedures, administrative supplies and recording forms. There was barrier tape for marking off the decontamination room and step-off pads to use in the buffer zone.

In addition to the radiological emergency supplies, there were two radiation survey meters. The meters were LUDLUM Model 14C radiation survey meters with pancake Geiger-Muller (GM) probes. The meters have a range of 0 - 50,000 Counts Per Minute (CPM), and had calibration due dates of December 22, 2016. The cabinet also contained a Model 510, electronic dosimeter charger and a portable air sampler. The cabinet was checked and restocked on a monthly basis, and after every use.

The RH staff members working in the REA were issued dosimetry by PEMA. The dosimetry issued to each hospital staff member consisted of one ARROWTECH Model 730 Direct Reading Dosimeter (DRD) with a range of 0 to 20R (Calibration due date of June 30, 2016), and a

thermoluminescent (TLD) permanent record dosimeter (PRD) that was changed out on January 1, 2016 (annual basis). Each staff member was also issued a card with radiation exposure limits for Emergency Workers.

At approximately 0945, the Nuclear Medicine Technician described the radiation survey kit contents which included; two survey meters with pancake probes; check source coin; dosimetry kit and a Canberra Electronic Personal Dosimeter (EPD) which was worn appropriately by the Nuclear Medicine Technician member and was last calibrated in August 2015. The Nuclear Medicine Technician also had a Landauer Luxel Optically Stimulated Luminescence (OSL) PRD.

The two survey meters were LUDLUM Model 14C; both calibrated on December 22, 2015 and with stickers indicating the operational check source reading ranges that read 0 mR/hr to 2000 mR/hr or 0 CPM to 240,000 CPM and Correction Factor (CF) for (pancake) probes. The RH Nuclear Medicine Technician also had a Cesium-137 check source for performing operability checks on the survey instruments. The RH Nuclear Medicine Technician performed an operability check on both instruments prior to placing them in use. The instruments were also source-checked using the 1 microcurie Cs-137 check source; both detectors responded within the range of readings on the label affixed to the side of the LUDLUM instruments.

At approximately 0950, the Nuclear Medicine Technician donned the same protective ensemble worn by the REA medical staff, including a surgical mask, and once the REA was activated the Nuclear Medicine Technician remained in the REA the entire time the REA was in use. The report from the Bally Community Ambulance crew was disseminated to REA Staff. The report detailed the patient's fall and preliminary report of a cut on the left elbow with a possible fracture. Initial contamination levels reported were 600 CPM on outside clothing and both hands. Vital signs reported were Blood Pressure 150/84, Heart Rate 80, Respiratory Rate 16 and Pulse Oxygen at 97%. The patient had fallen in a contaminated area of approximately 1000 CPM.

The REA was established at approximately 1007 hours.

After the Bally Community Ambulance arrived at RH, initial medical evaluation was performed by the REA physician at approximately 1009. The patient was transferred to the REA in Trauma Bay Number 1.

At approximately 1010, the Nuclear Medicine Technician monitored the injured and contaminated patient using a LUDLUM Model 14C survey instrument with pancake GM probe. The probe was covered in plastic to prevent the potential for the spread of contamination to the probe surface. The following contamination levels were obtained: 600 CPM on the outside of the clothing and shoes. Survey results on both left and right hands were 600 CPM. With concurrence of the Nuclear Medicine Technician, the physician decided to remove the outer garments of the patient prior to performing decontamination of the wound. Once the outer garments were removed, the Nuclear Medicine Technician directed the REA medical staff to replace the outer surgical gloves.

At approximately 1020, after the initial decontamination attempt was completed, the Nuclear Medicine Technician re-monitored the patient, and the following contamination levels were

found: 40 CPM on the left and right hands, and 1700 CPM on the cut on the left elbow. The Nuclear Medicine Technician then instructed the REA medical staff to replace their outer surgical gloves. Vital signs reported were Blood Pressure 150/84, Heart Rate 80, Respiratory Rate 16 and Pulse Oxygen at 97%.

At approximately 1022, the Doctor in the REA requested an X-ray of the possible left elbow injury. The REA Doctor and Nuclear Medicine Technician discussed the procedures for transfer of the patient to a gurney across the REA boundary, placing covers over the X-ray platform during procedures, and posting the Nuclear Medicine Technician outside of the REA to escort the patient and ensure the X-ray equipment was not contaminated.

The patient returned from X-ray at approximately 1025 and a second decontamination on the cut of the left elbow was attempted. After the second decontamination attempt was completed, the Nuclear Medicine Technician re-monitored the patient's wound, and the following contamination levels were found: 25 CPM on the left elbow. Vital signs reported were Blood Pressure 150/84, Heart Rate 80, Respiratory Rate 16 and Pulse Oxygen at 97%.

At approximately 1028, the Nuclear Medicine Technician instructed the REA medical staff to replace the outer surgical gloves.

At approximately 1030, the Buffer Zone Nurse and Nuclear Medicine Technician instructed the REA medical staff to read their DRDs and report the readings to the Buffer Zone Nurse. None of the DRDs indicated any radiation exposure. Vital signs reported were Blood Pressure 150/84, Heart Rate 80, Respiratory Rate 16 and Pulse Oxygen at 97%.

At approximately 1040, the Nuclear Medicine Technician and REA Staff discussed procedures for the transfer of the patient onto a clean gurney. The Nuclear Medicine Technician monitored the wheels of the clean gurney, and found no contamination. The gurney and patient were released from the REA at 1046.

The Nuclear Medicine Technician then provided instructions to the REA medical staff for doffing their protective clothing and equipment, including reading their DRDs for the second time and reporting the readings to the Buffer Zone Nurse for recording before the dosimetry was turned over to the Buffer Zone Nurse. The Nuclear Medicine Technician stayed in the REA after the medical staff departed to perform area contamination surveys. No contamination was found, and Trauma Room Number 1, which served as the REA, could be released for general use again. The exercise was terminated at approximately 1050.

All activities described in the demonstration criterion were carried out in accordance with the plan, procedures, and extent-of-play agreement.

### 3.3.1.1 Berks County, Bally Community Ambulance

a. MET: 1.e.1, 3.a.1, 6.d.1

b. LEVEL 1 FINDINGS: NONE

c. LEVEL 2 FINDINGS: NONE

d. PLAN ISSUES: NONE

e. PRIOR ISSUES – RESOLVED: NONE

f. PRIOR ISSUES – UNRESOLVED: NONE

### 1.e.1 Berks County, Bally Community Ambulance

The Bally Community Ambulance successfully demonstrated sufficient equipment and supplies to support emergency operations during the Limerick Generating Station Medical Service Drill conducted on May 11, 2016.

Prior to the commencement of the exercise, a review and verification was conducted for the equipment inventory carried on the Bally Community Ambulance.

No dosimetry was required for the Emergency Medical Service crews, because the Bally Community Ambulance and the Reading Hospital were both located outside of the Emergency Planning Zone (EPZ). Personal Protective Equipment (PPE) including Tyvek suits and gloves, along with the required paperwork were on-hand. Per the negotiated extent-of-play, personnel were allowed to conduct response actions in normal dress, with only required PPE being sufficient layers of gloves to demonstrate changes.

Upon arrival at the hospital, the hospital staff used a Ludlum Model 14C survey meter for monitoring the patient. The meter's calibration sticker stated a calibration date of November 15, 2015 and due date of November 15, 2016. Following patient monitoring, the ambulance crew used the same survey meter to monitor on the Emergency Medical Service staff and the ambulance.

All activities were based on the plans and procedures and completed as they would have been in an actual emergency except as noted in the extent-of-play agreement.

### 3.a.1 Berks County, Bally Community Ambulance

The Bally Community Ambulance successfully demonstrated implementation of Emergency Worker control during the Limerick Generating Station Medical Service Drill conducted on May 11, 2016.

The drill's patient pick up location was the Seventh Avenue parking lot across the street from the Reading Hospital. At 0815, the Emergency Medical Services (EMS) from Bally Ambulance received a call from the Berks County 911 Dispatch Center informing them of the injured person, his condition, and requesting pick up.

According to the Pennsylvania Emergency Management Plans and Procedures, the ambulance crew is considered to be "Category C" emergency workers because their primary duties are performed outside the 10 mile Emergency Planning Zone. "Category C" Emergency Workers are not issued dosimetry or Potassium Iodide (KI) due to the low probability of exposure to minimal direct radiological contamination. For this drill survey meters were simulated.

The Emergency Medical Technicians (EMS) each wore two sets of gloves in order to demonstrate changing gloves after physical contact with the contaminated patient. The EMS team was aware of the patient's previously determined contamination and injury. The EMS asked the patient about her medical condition. The patient's TYVEK outer garment was cut away and left in the Hot Zone. A sheet was spread out next to the patient to provide a clean area for the rescue personnel to work. The patient's wounds were dressed and the patient was prepared for transportation to the hospital. The patient was laid on the back-board and "cocooned" in a thermal blanket wrap, secured to the back-board, and placed in the ambulance. On the way to the hospital the EMS completed the EMS transfer of Care Form that included the patient's medical information.

Upon arrival at Reading Hospital, the EMS team was instructed to remain in the designated area until surveyed and cleared, and instructed not to eat, smoke, drink, or touch their mouths with their hands. A thorough survey of two members was demonstrated, and a survey of the ambulance was described. All participating personnel were aware of required contamination reports to Berks County if they determined to be contaminated.

The ambulance arrived at Reading Hospital Emergency Department at 0958.

The EMS were monitored by hospital personnel at Reading Hospital after the patient had been transferred for decontamination and treatment. Hospital personnel also monitored the ambulance for contamination.

All activities were based on the plans and procedures and completed as they would have been in an actual emergency except as noted in the extent-of-play agreement.

### 6.d.1 Berks County, Bally Community Ambulance

The Bally Community Ambulance successfully demonstrated the Transportation and Treatment of Contaminated Injured Individuals during the Limerick Generating Station Medical Service Drill conducted on May 11, 2016.

Within five minutes of receiving a call from the Berks County 911 dispatcher that a "radioactive patient" needed assistance, the Bally Community Ambulance Emergency Medical Service (EMS) arrived on-scene. For this drill, the incident patient scene was setup at the Seventh Avenue parking lot across the street from the Reading Hospital. Upon arrival, the EMS called out to the victim to determine what happened, the possible extent of injuries. Per the patients responses, it was determined she had a possible left elbow fracture indicated by bruising a swelling of the left arm, but not readily able to be verified without X-rays. The EMS cut away the patient's outer clothing and explained that this was a method of gross decontamination that would rapidly eliminate a substantial amount of exterior contamination. For this drill survey meters were simulated. The EMS assumed that they were handing a contaminated patient. According to the Pennsylvania Emergency Management Plans and Procedures, the ambulance crew is considered to be "Category C" Emergency Workers because their primary duties are performed outside the 10 mile Emergency Planning Zone. "Category C" Emergency Workers are not issued dosimetry or Potassium Iodide (KI) due to the low probability of exposure to minimal direct radiological contamination.

Vital signs were taken, along with other critical personal information – age, medication allergies, etc on the EMS Transfer of Care Form. No life threatening concerns were identified and the EMS ensured that contamination control was carefully implemented.

Upon departure from the scene, the patient's condition was clearly communicated to Reading Hospital Emergency Department, along with their expected estimated time arrival. Normally the Bally Community Ambulance took approximately 20 minutes to arrive at the hospital. Upon arrival, vital signs were verified again, pain level was diagnosed and treated, and the crew updated the hospital on any significant changes to the patient's previously reported condition.

All activities were based on the plans and procedures and completed as they would have been in an actual emergency except as noted in the extent-of-play agreement.

## SECTION 4: CONCLUSION

The Commonwealth of Pennsylvania and local jurisdictions, except where noted in this report demonstrated knowledge of their Radiological Emergency Response Plans (RERP) and procedures were adequately implemented during the Limerick Generating Station, Medical Services Drill evaluated on May 11, 2016.

Two (2) Federal Emergency Management Agency (FEMA) evaluators provided analyses of six evaluation criteria. There were no Level 1 Findings, Level 2 Findings, or Planning Issues identified during the drill.

The Bally Community Ambulance successfully demonstrated that necessary equipment and supplies were available to support the treatment of an injured/contaminated victim. EMS personnel prioritized life-saving medical practices over contamination concerns, implemented protective measures through the use of Personal Protective Equipment (PPE), regular glove changes, and control of cross contamination. Appropriate patient assessments were demonstrated as well as regular and ongoing communications with Reading Hospital.

The Reading Hospital successfully demonstrated the mobilization of staff, staffing assignments, issue of dosimetry and monitoring equipment, and effective use of Personal Protective Equipment (PPE) during the exercise. The hospital staff effectively responded to communications from the Bally Community Ambulance, initiated the set-up and management of a Radiation Emergency Area (REA), and accepted and successfully treated an injured/contaminated victim while administering life-threatening medical attention over contamination concerns. In addition, the medical facility provided security control of the facility including the drop off bay for the patient and overall protective measures for contamination control and prevention of cross contamination.

Based on the results of the exercise and a review of the offsite Radiological Emergency Response Plans and procedures submitted, FEMA Region III has determined they are adequate (meet the planning and preparedness standards of NUREG-0654/FEMA-REP-1, Revision 1, November 1980, as referenced in 44 CFR 350.5) and there is reasonable assurance they can be implemented, as demonstrated during this exercise.

An After Action Implementation Plan (IP) will not be developed as part of this report.

## APPENDIX A: EXERCISE EVALUATORS AND TEAM LEADERS

The following is the list of Evaluators and Team Leader for the Limerick Generation Station 2016 Medical Services (MS-1) Exercise evaluated on May 11, 2016. The following constitutes the managing staff for the Exercise Evaluation:

- Thomas Scardino, DHS/FEMA, Regional Assistance Committee (RAC) Chairman
- Tina Lai Thomas, DHS/FEMA, Emergency Management Specialist, Team Leader & Evaluator
- Kenneth Wierman, DHS/FEMA, Emergency Management Specialist, Evaluator

DATE: 5/11/2016, SITE: Limerick Generating Station

| LOCATION | EVALUATOR | AGENCY |
|---|---|---|
| Berks County, Reading Hospital | Kenneth Wierman | FEMA HQ |
| Berks County, Bally Community Ambulance | Tina Lai Thomas | FEMA RIII |

# APPENDIX B: ACRONYMS AND ABBREVIATIONS

| Acronym | Meaning |
|---|---|
| CFR | Code of Federal Regulations |
| CPM | Count Per Minute |
| DHS | Department of Homeland Security |
| EAS | Emergency Alert System |
| EMS | Emergency Medical Services |
| EOP | Extent-of-play |
| EPZ | Emergency Planning Zone |
| FEMA | Federal Emergency Management Agency |
| GE | General Emergency |
| IP | Improvement Plan |
| KI | Potassium Iodide |
| LGS | Limerick Generating Station |
| MSL | Mean Sea Level |
| MS-1 | Medical Services |
| MW | Megawatts |
| NPP | Nuclear Power Plant |
| NRC | Nuclear Regulatory Commission |
| ORO | Offsite Response Organization |
| PEMA | Pennsylvania Emergency Management Agency |
| PRD | Permeant Record Dosimeter |
| PPE | Personal Protection Equipment |
| RAC | Regional Assistance Committee |
| SAE | Site Area Emergency |
| SAV | Site Area Visit |
| REA | Radiation Emergency Area |
| REP | Radiological Emergency Preparedness |
| RERP | Radiological Emergency Response Plans |

# APPENDIX C: EXTENT-OF-PLAY
# LIMERICK GENERATING STATION
# READING HOSPITAL MEDICAL SERVICES EXERCISE
# May 11, 2016

## Method of Operation

1. The power station and its personnel will not play as active role in the facilitation of this exercise. The plant's simulated events, radiation releases, and emergency classifications will be injected by off-site Controllers. A pre-approved scenario will be used.

2. The Pennsylvania Emergency Management Agency (PEMA), Area Office (Eastern Area) will not be activated as part of this drill. The Exercise Coordinator will provide pre-exercise coordination and observe exercise activities.

3. Exelon Corporation will participate as a Controller in this exercise.

4. Berks County Department of Emergency Services will participate in this exercise.

5. Controllers will be supplied by PEMA. Controllers are not players and will provide injects and information to initiate and stimulate drill play by providing radiological readings during the monitoring of personnel. Live radioactive sources will only be used to perform operational checks of radiological monitoring instruments.

6. PEMA staff and qualified county emergency management personnel will be assigned to key locations for the purpose of observing, noting response actions and conditions, and recording observations for future use. Observers will not take an active part in the proceedings, but will interact with staff members to the extent necessary to fulfill their observer responsibilities. Coaching of players is not permitted, except as appropriate to provide training to participants awaiting a re-demonstration.

7. Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), Radiological Emergency Preparedness Program (REPP) Evaluators: FEMA Evaluators will be present at designated demonstration locations.

8. Exercise activities are scheduled to commence on or about 9:00 a.m., May 11, 2016 and continue until the participants have completed the exercise objectives and demonstrated the Exercise Evaluation Criteria.

9. Participants and agencies will Stand Down when the Controllers have confirmed with the Evaluators that all evaluation criteria have been demonstrated and when the State and County Observers are satisfied that the Objectives have been met.

10. An emergency plan is drafted to address the generally expected conditions of an emergency. Not everything in the emergency plan may be applicable for a given scenario. The main purpose of an emergency plan is to assemble sufficient expertise and officials so as to properly react to the events as they occur. The responders should not be so tied to a plan that they cannot take actions that are more protective of the public. Therefore, if, by not following the plan, the responders protect the public equally, as well

as provided in the plan, it should be noted for possible modification of the plan, but not classified as a negative incident. Furthermore, if, by following the plan there is a failure to protect the public health and safety, it should be noted so that the plan can be modified and the appropriate negative assessment corrected.

11. During the exercise any activity that is not satisfactorily demonstrated may be re-demonstrated by the participants during the exercise, provided it does not negatively interfere with the exercise. Refresher training may be provided by the players, observers, and/or Controllers. Evaluators are not permitted to provide refresher training. Re-demonstrations will be negotiated between the Players, Observers, Controllers, and Evaluators. PEMA may advise the Regional Assistance Committee Chair prior to initiating any re-demonstrations. It is permissible to extend the demonstration window, within reason, to accommodate the re-demonstration. Activities corrected from a re-demonstration will be so noted.

## Objectives

A. Demonstrate the ability to respond to a radiation medical emergency following the procedures of Berks County Department of Emergency Services, Bally Community Ambulance and Reading Hospital.

B. Demonstrate timely and accurate communications between the hospital and offsite response agencies. (Telephones will be used in lieu of radios whenever possible to limit the potential misinterpretation of the exercise as an actual event.)

C. Demonstrate correct priorities and appropriate techniques in EMS, transportation of patients and pre-hospital and hospital emergency care of radioactively contaminated patients.

D. Demonstrate inter-agency cooperation between the ambulance company/EMS and the hospital.

## Extent-of-play

**Evaluation Area 1—Emergency Operations Management**
**Sub-Element 1.e—Equipment and Supplies to Support Operations**

**Intent**

This sub-element is derived from NUREG–0654/FEMA-REP-1, which requires that Offsite Response Organizations (ORO) have emergency equipment and supplies adequate to support the emergency response.

**Criterion 1.e.1: Equipment, maps, displays, monitoring instruments, dosimetry, potassium iodide (KI), and other supplies are sufficient to support emergency operations. (NUREG–0654/FEMA-REP-1, H.7, 10; I.7, 8, 9; J.10.a, b, e, J.11, 12; K.3.a; K.5.b).**

**Assessment/Extent-of-play**

Assessment of this Demonstration Criterion is accomplished primarily through a baseline evaluation and subsequent periodic inspections.

A particular facility's equipment and supplies must be sufficient and consistent with that facility's assigned role in the ORO's emergency operations plans. Use of maps and other displays is encouraged. For non-facility based operations, the equipment and supplies must be sufficient and consistent with the assigned operational role. At locations where traffic and access control personnel are deployed, appropriate equipment (e.g., vehicles, barriers, traffic cones, and signs) must be available, or their availability described.

Specific equipment and supplies that must be demonstrated under this criterion include KI inventories, dosimetry, and monitoring equipment, as follows:

**KI:** Responsible OROs must demonstrate the capability to maintain inventories of KI sufficient for use by: (1) emergency workers; (2) institutionalized individuals, as indicated in capacity lists for facilities; and (3) where stipulated by the plans/procedures, members of the general public (including transients) within the plume pathway EPZ. In addition, OROs must demonstrate provisions to make KI available to specialized response teams (e.g., civil support team, Special Weapons and Tactics Teams, urban search and rescue, bomb squads, HAZMAT, or other ancillary groups) as identified in plans/procedures). The plans/procedures must include the forms to be used for documenting emergency worker ingestion of KI, as well as a mechanism for identifying emergency workers that have declined KI in advance. Consider carefully the placement of emergency workers that have declined KI in advance.

ORO quantities of dosimetry and KI available and storage locations(s) will be confirmed by physical inspection at the storage location(s) or through documentation of current inventory submitted during the exercise, provided in the ALC submission, and/or verified during an SAV. Available supplies of KI must be within the expiration date indicated on KI bottles or blister packs. As an alternative, the ORO may produce a letter from a certified private or State laboratory indicating that the KI supply remains potent, in accordance with U.S. Pharmacopoeia standards.

**Dosimetry:** Sufficient quantities of appropriate direct-reading and permanent record dosimetry and dosimeter chargers must be available for issuance to all emergency workers who will be dispatched to perform an ORO mission. In addition, OROs must demonstrate provisions to make dosimetry available to specialized response teams (e.g., civil support team, Special Weapons and Tactics Teams, urban search and rescue, bomb squads, HAZMAT, or other ancillary groups) as identified in plans/procedures.

Appropriate direct-reading dosimetry must allow an individual(s) to read the administrative reporting limits and maximum exposure limits contained in the ORO's plans/procedures.

Direct-reading dosimeters must be zeroed or operationally checked prior to issuance. The dosimeters must be inspected for electrical leakage at least annually and replaced when necessary. Civil Defense Victoreen Model 138s (CD V-138s) (0-200 mR), due to their documented history of electrical leakage problems, must be inspected for electrical leakage at least quarterly and replaced when necessary. This leakage testing will be verified during the exercise, through documentation submitted in the ALC and/or through an SAV.

Operational checks and testing of electronic dosimeters must be in accordance with the manufacturer's instructions and be verified during the exercise, through documentation submitted in the ALC and/or through an SAV.

**Monitoring Instruments:** All instruments must be inspected, inventoried, and operationally checked before each use. Instruments must be calibrated in accordance with the manufacturer's recommendations. Unmodified CDV-700 series instruments and other instruments without a manufacturer's recommendation must be calibrated annually. Modified CDV-700 instruments must be calibrated in accordance with the recommendation of the modification manufacturer. A label indicating such calibration must be on each instrument or calibrated frequency can be verified by other means. In addition, instruments being used to measure activity must have a sticker-affixed to their sides indicating the effective range of the readings. The range of readings documentation specifies the acceptable range of readings that the meter should indicate when it is response-checked using a standard test source.

For FMTs, the instruments must be capable of measuring gamma exposure rates and detecting beta radiation. These instruments must be capable of measuring a range of activity and exposure, including radiological protection/exposure control of team members and detection of activity on air sample collection media, consistent with the intended use of the instrument and the ORO's plans/procedures. An appropriate radioactive check source must be used to verify proper operational response for each low-range radiation measurement instrument (less than 1R/hr) and for high-range instruments when available. If a source is not available for a high-range instrument, a procedure must exist to operationally test the instrument before entering an area where only a high-range instrument can make useful readings.

In areas where portal monitors are used, the OROs must set up and operationally check the monitor(s). The monitor(s) must conform to the standards set forth in the Contamination Monitoring Standard for a Portal Monitor Used for Emergency Response, FEMA-REP-21 (March 1995) or in accordance with the manufacturer's recommendations.

**Mutual Aid Resources:** If the incoming resources arrive with their own equipment (i.e., monitors and/or dosimetry), they will be evaluated by REP Program standards. FEMA will not inventory equipment that is not part of the REP Program. If an agency has a defined role in the REP Plan, they are subject to the planning process and standards, as well as the guidance of this Manual.

All activities must be based on the ORO's plans/procedures and completed as they would be in an actual emergency, unless noted above or otherwise specified in the Extent-of- Play Agreement.

**State Negotiated Extent-of-play:**

Ambulance crews are not trained or equipped to operate or carry radiological monitoring equipment. In accordance with PEMA standard operating procedures ambulance crews operating outside the 10 mile Emergency Planning Zone are considered "Category C" emergency workers; therefore, they are only required to implement protective measures consistent with protection against blood-borne pathogens; i.e., long sleeved garments, trousers, impermeable gloves, and surgical masks. "Category C" emergency worker dosimetry issue consists of one permanent reading dosimeter per worker.

Hospital personnel are also considered "Category C" emergency workers and will conform to PEMA SOP protective measures at minimum. Direct Reading Dosimeters may be issued individually; however, an Area Kit will be established in the Radiation Emergency Area (REA). Individual PRDs will be issued by the hospital. Radiological Survey Instruments are calibrated per manufactures recommendations.

**Outstanding Issues:**

None

## Evaluation Area 3—Protective Action Implementation
## Sub-Element 3.a—Implementation of Emergency Worker Exposure Control

**Intent**

This Sub-element is derived from NUREG0654/FEMA-REP-1, which requires that OROs have the capability to provide for the following: distribution, use, collection, and processing of direct-reading dosimetry and permanent record dosimetry; reading of direct-reading dosimetry by emergency workers at appropriate frequencies; maintaining a radiation dose record for each emergency worker; establishing a decision chain or authorization procedure for emergency workers to incur radiation exposures in excess of the PAGs, and the capability to provide KI for emergency workers, always applying the "as low as is reasonably achievable" principle as appropriate.

**Criterion 3.a.1: The OROs issue appropriate dosimetry, KI, and procedures, and manage radiological exposure to emergency workers in accordance with the plans/procedures. Emergency workers periodically and at the end of each mission read their dosimeters and record the readings on the appropriate exposure record or chart. OROs maintain appropriate record-keeping of the administration of KI to emergency workers. (NUREG-0654/FEMA-REP-1, K.3.a, b; K.4)**

**Assessment/Extent-of-play**

Assessment of this Demonstration Criterion may be accomplished during a biennial or tabletop exercise. Other means may include drills, seminars or training activities that would fully demonstrate technical proficiency.

OROs must demonstrate the capability to provide emergency workers (including supplemental resources) with the appropriate direct-reading and permanent record dosimetry, dosimeter chargers, KI, and instructions on the use of these items. For evaluation purposes, appropriate direct-reading dosimetry is defined as dosimetry that allows an individual(s) to read the administrative reporting limits that are pre-established at a level low enough to consider subsequent calculation of TEDE and maximum exposure limits, for those emergency workers involved in lifesaving activities, contained in the ORO's plans/procedures.

Each emergency worker must have basic knowledge of radiation exposure limits as specified in the ORO's plans/procedures. If supplemental resources are used, they must be provided with just-in-time training to ensure basic knowledge of radiation exposure control. Emergency workers must demonstrate procedures to monitor and record dosimeter readings and manage radiological exposure control.

During a plume phase exercise, emergency workers must demonstrate the procedures to be followed when administrative exposure limits and turn-back values are reached. The emergency worker must report accumulated exposures during the exercise as indicated in the plans/procedures. OROs must demonstrate the actions described in the plans/procedures by determining whether to replace the worker, authorize the worker to incur additional exposures, or take other actions. If exercise play does not require emergency workers to seek authorizations for additional exposure, evaluators must interview at least two workers to determine their knowledge of whom to contact in case authorization is needed, and at what exposure levels.

Workers may use any available resources (e.g., written procedures and/or co-workers) in providing responses.

Although it is desirable for all emergency workers to each have a direct-reading dosimeter, there may be situations where team members will be in close proximity to each other during the entire mission. In such cases, adequate control of exposure can be achieved for all team members using one direct-reading dosimeter worn by the team leader. Emergency workers assigned to low-exposure rate fixed facilities (e.g., EOCs and communications center within the EPZ, reception centers, and counting laboratories) may have individual direct-reading dosimeters or they may be monitored using group dosimetry (i.e., direct-reading dosimeters strategically placed in the work area). Each team member must still have his or her own permanent record dosimetry. Individuals authorized by the ORO to re-enter an evacuated area during the plume (emergency) phase, must be limited to the lowest radiological exposure commensurate with completing their missions.

OROs may have administrative limits lower than EPA- 400-R-92-001 dose limits for emergency workers performing various services (e.g., lifesaving, protection of valuable property, all activities). OROs must ensure that the process used to seek authorization for exceeding dose limits does not negatively impact the capability to respond to an incident where lifesaving and/or protection of valuable property may require an urgent response.

OROs must demonstrate the capability to accomplish distribution of KI to emergency workers consistent with decisions made. OROs must have the capability to develop and maintain lists of emergency workers who have ingested KI, including documentation of the date(s) and time(s) they did so. Ingestion of KI recommended by the designated ORO health official is voluntary. For evaluation purposes, the actual ingestion of KI shall not be performed. OROs must demonstrate the capability to formulate and disseminate instructions on using KI for those advised to take it. Emergency workers must demonstrate basic knowledge of procedures for using KI whether or not the scenario drives the implementation of KI use. This can be accomplished by an interview with the evaluator.

All activities must be based on the ORO's plans/procedures and completed as they would be in an actual emergency, unless noted above or otherwise specified in the Extent-of-Play Agreement.

**State Negotiated Extent-of-play:**

- Demonstrate appropriate procedures and equipment to manage radiological exposure to staff.
- Demonstrate the ability to transport contaminated/injured individuals while using ALARA principles.
- Demonstrate the ability to utilize dosimetry, equipment and procedures to manage radiological exposure to emergency workers as required by plans.

Radiological briefings will be provided to address exposure limits and procedures to replace personnel approaching limits and how permission to exceed limits is obtained. At any time, players may ask other players or supervisors to clarify radiological information. In Pennsylvania, emergency workers outside the EPZ do not have turn-back values. Standard issue of dosimetry and potassium iodide for each category of emergency worker is as follows:

Category A: 1 PRD, 1 DRD, and 1 unit of KI
Category B: 1 PRD and 1 unit of KI
Category C: 1 PRD

All locations that have dosimetry equipment indicated within their Radiological Emergency Response Plan (RERP) will make the dosimetry equipment (and KI, as appropriate) available for inspection by the Federal Evaluator. Simulation PRDs with mock serial numbers may be used.

**Outstanding Issues:**

None

## Evaluation Area 6—Support Operation/Facilities
## Sub-Element 6.d—Transportation and Treatment of Contaminated Injured Individuals

### Intent

This Sub-element is derived from NUREG0654/FEMA-REP-1, which requires that OROs have the capability to transport contaminated injured individuals to medical facilities with the capability to provide medical services.

**Criterion 6.d.1: The facility/ORO has the appropriate space, adequate resources, and trained personnel to provide transport, monitoring, decontamination, and medical services to contaminated injured individuals.**
**(NUREG0654/FEMA-REP-1, F.2; H.10; K.5.a, b; L.1, 4)**

### Assessment/Extent-of-play

Assessment of this Demonstration Criterion may be accomplished during a biennial exercise, an actual event, or drills. FEMA has determined that these capabilities have been enhanced and consistently demonstrated as adequate; therefore, offsite medical services drills need only be evaluated biennially. FEMA will, at the request of the ORO, continue to evaluate the drills on an annual basis. All hospitals listed in the plan as medical services hospitals must be evaluated, with a transportation provider, every 2 years. Additional transportation providers will be rotated through the drills in the 8-year exercise cycle. For the ambulance providers who do not participate in an evaluated drill during the two year cycle, training will be provided. This training will be documented in the ALC.

Monitoring, decontamination, and contamination control efforts must not delay urgent medical care for the victim.

OROs must demonstrate the capability to monitor/decontaminate and transport contaminated injured individuals to medical facilities.

An ambulance must be used for response to the victim. However, to avoid taking an ambulance out of service for an extended time, OROs may use any vehicle (e.g., car, truck, or van) to transport the victim to the medical facility. It is allowable for an ambulance to demonstrate up to the point of departure for the medical facility and then have a non-specialized vehicle transport the "victim(s)" to the medical facility. This option is used in areas where removing an ambulance from service to drive a great distance (over an hour) for a drill would not be in the best interests of the community.

Normal communications between the ambulance/dispatcher and the receiving medical facility must be demonstrated. If a substitute vehicle is used for transport to the medical facility, this communication must occur before releasing the ambulance from the drill. This communication would include reporting radiation monitoring results, if available. In addition, the ambulance crew must demonstrate, by interview, knowledge of where the ambulance and crew would be monitored and decontaminated, if required, or whom to contact for such information.

Monitoring of the victim may be performed before transport or en route, or may be deferred to the medical facility. Contaminated injured individuals transported to medical facilities are

monitored as soon as possible to assure that everyone (ambulance and medical facility) is aware of the medical and radiological status of the individual(s). However, if an ambulance defers monitoring to the medical facility, then the ambulance crew presumes that the patient(s) is contaminated and demonstrate appropriate contamination controls until the patient(s) is monitored. Before using monitoring instruments, the monitor(s) must demonstrate the process of checking the instrument(s) for proper operation. All monitoring activities must be completed as they would be in an actual emergency. Appropriate contamination control measures must be demonstrated before and during transport and at the receiving medical facility.

The medical facility must demonstrate the capability to activate and set up a radiological emergency area for treatment. Medical facilities are expected to have at least one trained physician and one trained nurse to perform and supervise treatment of contaminated injured individuals. Equipment and supplies must be available for treatment of contaminated injured individuals.

The medical facility must demonstrate the capability to make decisions on the need for decontamination of the individual, follow appropriate decontamination procedures, and maintain records of all survey measurements and samples taken. All procedures for collection and analysis of samples and decontamination of the individual must be demonstrated or described to the evaluator. Waste water from decontamination operations must be handled according to facility plans/procedures.

All activities must be based on the ORO's plans/procedures and completed as they would be in an actual emergency, unless noted above or otherwise specified in the Extent-of- Play Agreement.

**State Negotiated Extent-of-play:**

- Demonstrate that the facility has the appropriate space, adequate resources and trained personnel to provide monitoring, decontamination and medical services to contaminated/injured individuals.
- Demonstrate the ability to transport contaminated/injured individuals while using ALARA principles.

Bally Community Ambulance will pick-up a pre-staged simulated contaminated/injured victim.

**Outstanding Issues:**

None