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Radiological Response: Assessing Environmental and Clinical Laboratory Capabilities
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Mr. Chairman and members of the committee, thank you for the opportunity to testify here today as a subject matter expert about radioanalytical laboratory issues. I am a Certified Industrial Hygienist and Health Physicist from Lawrence Livermore National Laboratory (LLNL) with over 25 years in nuclear emergency response management and currently serve as the Chair of the Federal Radiological Monitoring and Assessment Center (FRMAC) Laboratory Analysis Working Group. The FRMAC was formally established in 1979 following Three Mile Island. The FRMAC is an interagency effort and normally includes representation from the Department of Energy (DOE), Environmental Protection Agency (EPA), the Department of Commerce, the National Communications System, Department of Defense (DOD)/US Army Corps of Engineers and other Federal agencies as needed. Response to a radiological event will require many highly skilled professionals ranging from surveillance to response operations and forensics. Although LLNL's extensive scientific and technical expertise in nuclear materials behavior is routinely called upon to support many phases of the response activity, my remarks today are confined to my role as part of the FRMAC.

Under the Homeland Security Act, DHS has the authority to activate the Nuclear Incident Response Team (NIRT), which consists of: (1) DOE entities that perform nuclear and/or radiological emergency support, and (2) EPA entities that perform such support functions (including radiological response functions) and related functions. The FRMAC is a NIRT asset maintained by DOE that is available on request to respond to nuclear/radiological incidents. The purpose of the FRMAC is to provide a clear operating picture of radiological conditions in the field to responders for decision-making and incident action planning; it provides radiation measurements, interpretations of radiation contamination distribution and overall characterization of the radiological conditions. DOE maintains the Aerial Measuring System as well as a land-based mobile

laboratory that can be established at or near the incident site to enable close coordination with DHS and other federal, state and local response agencies.

Upon activation, the FRMAC provides an operational framework for coordinating federal, state, local and tribal government radiological monitoring and assessment activities during a response to a radiological emergency. The support the FRMAC provides includes:

- Coordinating federal radiological monitoring and assessment activities
- Maintaining technical liaison with State and local agencies with monitoring and assessment responsibilities
- Maintaining a common set of all radiological monitoring data, in an accountable, secure, and retrievable form, and ensuring the integrity of the FRMAC data
- Providing monitoring data and interpretations including exposure rate contours, dose projections and any other requested radiological assessments to DHS and other federal, state and local response agencies
- Providing personnel and equipment needed to perform radiological monitoring and assessment activities

FRMAC assist the states, local and tribal governments in their mission to protect the health and well being of their citizens with verified radiation measurements, interpretations of radiation distributions based on federal and local guidelines, and characterization of overall radiological conditions. FRMAC data is critical for characterizing the exact nature of the contaminant and the extent of contamination, which, in turn, supports public health and safety efforts. Integration of measurements of radioactive contamination, airborne or on the ground, is particularly valuable in the early and intermediate phases of an event.

FRMAC measurements are utilized by the National Atmospheric Release Advisory Center (NARAC) to provide a complete picture of the radioactive footprint. This

technique can aid in helping guide crop and food field sampling teams to areas in which contamination might result in an ingestion pathway dose that exceeds regulatory limits.

Plans and procedures for sample collection and analysis have been developed and made available to all participating federal, State, and local agencies. FRMAC works closely with Center for Disease Control (CDC), EPA, and the Radiation Emergency Assistance Center/Training Site (REACS/TS) to assist in the dissemination of information pertaining to public health emergencies, training, and exercise opportunities. FRMAC also provides live classroom instruction and web-based training venues. National level and regional exercises have been used to evaluate the FRMAC response.

As an example of a National Level Exercise, I would like to explain how sample collection and laboratory analysis was exercised during the recent the TOPOFF-4 exercise, which was recently conducted. During this exercise, FRMAC participated in the full field exercise at the Portland, Oregon venue. I participated as the lead day-shift radiological data controller at the event scene. My responsibilities included providing radiological exposure and contamination measurements to Fire, Hazardous Materials (Hazmat), Radiological Assistance Program (RAP), Federal Bureau of Investigation (FBI), and all other responding teams.

During the first day, most radiological data involved direct reading instruments that provide immediate results. Air samples were collected for laboratory analysis to evaluate airborne radioactivity that responders and the public may be breathing into their bodies, and to determine (using spectral data) the particular radioisotopes that were present. The spectral data received initial evaluation from locally deployed DOE Radiological Assistance Teams and/or local HAMAT responders. Spectral data was also sent to DOE laboratories (usually LLNL, LANL or SNL) for confirmatory analysis. Air samples were sent to local environmental analysis laboratories (e.g., University of Oregon) for evaluation. Victims and casualties were evaluated for external contamination with direct reading instruments and then sent to hospitals for treatment and further clinical evaluation.

FRMAC capability arrived and became operational at TOPOFF-4 on Day 2 and stayed operational through the end of the exercise period. Additional air sampling instrumentation was deployed within and around the contaminated area and the collection of soil, water, and vegetation samples began. This data was used to determine the size of the contaminated area, whether occupants could return to their homes, and began addressing issues such as the safety of drinking water and local produce. FRMAC established a liaison at the Joint Field Office and products were provided to Oregon Emergency Managers and Incident Commander,s as well as Mayor of Portland and the city's incident commander. The FRMAC Web Portal was utilized to disseminate information to approved users at all levels of government, including DHS and DOE headquarters. The interagency FRMAC team was well-integrated and worked together to gather requirements and provide hazard information in a timely manner. Due to the short duration and field play for TOPOFF-4, only the mobile EPA laboratory from Las Vegas responded and the national radioanalytical laboratory infrastructure was not exercised. It is my understanding that remediation and recovery requirements were in notional play during the final week, including the hand-off of FRMAC leadership from DOE to EPA.

In June 2007, the FRMAC released a draft document titled "Mission Analysis – Emergency Phase, An Interagency Document for Implementing the National Response Plan Nuclear/Radiological Incident Annex." The purpose of this document was to define the overall federal radiological monitoring and dose assessment response to a nuclear or radiological incident as defined in the Nuclear Incident Annex to the National Response Plan in the "Emergency Phase", typically the first 3-7 days after the event. This is a critical period for addressing the health and safety of the public and responders.

This document focused on the federal resources activated to provide rapid support to the nuclear/radiological monitoring and dose assessment activities at an incident site. While the report provided an initial compilation of personnel and equipment requirements for the environmental and dose assessment component of the emergency response, it did not attempt to complete a comprehensive assessment of environmental and clinical laboratory

capabilities required for medical response and long term environmental restoration activities.

All scenarios were addressed as a single event. The following scenarios were considered:

- Domestic Nuclear Explosion (DNE) – A low technology, low yield nuclear device detonated near ground level in a major U.S. metropolitan area.
- Nuclear Power Plant Incident or Event Involving a Significant Release
- Alpha Radiological Dispersal Device/Failed Improvised Nuclear Device (IND)
- Beta Gamma Radiological Dispersal Device

Scenarios not included in this document, but identified for future consideration include multiple simultaneous events, combined radiation/chemical events, and combined radiation/biological events.

The key findings included:

- Improved processes for electronic data processing
- Standardized internal communications (voice & data)
- Established guidelines for public monitoring support and medical registry
- Additional personnel and equipment resources to address the DNE scenario

For the limited scope of this study, the document implies that current fixed radioanalytical laboratory infrastructure could handle short duration environmental monitoring and dose assessment missions, but these laboratories have not been integrated into an enduring national capability focused on the radiological contaminants.

In addition, mobile radioanalytical laboratories belonging to DOE, the Environmental Protection Agency (EPA), the Department of Defense (DoD), and the States also respond as part of the FRMAC to evaluate priority samples in support of decision-making. These laboratories must be driven or flown to the incident site and often arrive a couple of days

into the response. Plans and procedures have been developed for mobile response coordination. This planning and coordination was evaluated during the FRMAC Southern Crossing Exercise conducted in August 2006 in Dothan, Alabama.

Although the primary mission of the FRMAC is to evaluate environmental radiological data, FRMAC assets may be called on to assist the Department of Health and Human Services with human clinical data. Specifically, DOE has developed a cytogenetic dosimetry capability at REAC/TS in Oak Ridge, Tennessee, to evaluate the radiation dose received based on blood samples collected from victims or responders. This capability was demonstrated at the TOPOFF-4 Exercise. Similar capability exists in only a few other locations such as the Armed Force Radiobiology Research Institute (AFRRI) and sites in Canada and in France. The number of evaluations that can be simultaneously processed is limited. DOE maintains at its various sites the capability to evaluate internal ingestion or inhalation of radioisotopes using whole body counting, lung counting, and body fluid analyses. This capability is designed to handle situations involving DOE site activities and only a few individuals—not large public emergencies.

Thank you, again, for the opportunity to address this committee.