DOE/NNSA Response to Radiological Releases from the Fukushima Dai-ichi Nuclear Power Plant

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- Expert technical advice from the DOE/NNSA National Laboratories in response to:
  - Nuclear weapon accidents and incidents
  - Possible acts of nuclear terrorism
  - Lost or stolen radioactive materials
  - Radiological accidents
- Expertise in nuclear weapons design, nuclear/radiological materials characterization, and radiological detection and characterization
- Deployable capabilities, configured for a rapid response to any nuclear/radiological accident or incident
Fukushima Dai-ichi Damage & Deposition

Aerial Measuring Results
Joint US / Japan Survey Data

Unit 2
DOE Timeline

• March 11: Assets activated
• March 12: Technical Liaison deployed to Tokyo
• March 14, 2011: Field monitoring team deployed via military airlift to Yokota Air Base
DOE Timeline (cont’d)

• March 16: Assets arrive at Yokota AB and begin flights
• March 17: First aerial measurement activities near reactor; first ground measurements
• March 22: Initial data published on DOE website
• May 28: Last DOE personnel depart Yokota AB
Overview

• Many partners - US and Japanese

• DOE Role
  – Monitor environment through aerial and ground-based measurements
  – Perform dose assessments
  – Advise senior leaders (U.S. Embassy, U.S. Military)

• Division of labor among DOE teams
  – Field team: small, interdisciplinary, experienced, adaptable
  – Home team: multi-lab
  – Headquarters: handle political pressures
Aerial Monitoring

**What was done**
- Fixed wing and helicopter
  - US Military
- Up to 3 aircraft per day
- DOE & GOJ joint survey
- Map ground deposition out to 80 km from reactor

**Why it was done**
- Support Humanitarian and Disaster Relief Operations, evacuation, relocation, agricultural decisions
The Right Product for the Right Audience

Mission Interval Limits - PACOM Guidance (0.3 Rem)
Derived from Aerial Monitoring Results

Mission Time Limit
Total Dose < 0.3 Rem
- 1 Hour
- 6 Hours
- 12 Hours
- 24 Hours
- 1 Week
- 2 Weeks
- Insufficient Data

0.3 Rem = Average annual natural background.
Actions if 0.3 Rem exceeded:
- Medical Exams
- Administer KI
Ground monitoring

What was done
- Mobile mapping
- In-situ & exposure rate
- Air & soil sampling
- Contamination swipes
- DoD & GOJ data aggregation

Why it was done
- Calibrate aerial measurements
- Define isotopic mix
- Characterize the inhalation component of integrated dose
- Assess vertical and horizontal migration of deposited material
Ground monitoring
Assessment

• Evaluation of field measurement results (aerial and ground)
  – Referenced to protective action measures
  – Informed mission planning
• Trend analysis and quality control
• Analysis of possible scenarios to inform future planning
Transition

• DOE provided equipment and training to augment GOJ capabilities
  – Aerial measurements
  – Laboratory analysis

• Current Status
  – Japanese bought additional aerial and laboratory analysis systems; DOE equipment returned to U.S.
  – DOE continues to support GOJ, US Military, and US embassy remotely from the DOE Home Team.
Field Team Challenges & Successes

Challenges

- Mission parameters
  - Unclear scope
  - Changing dose guidance
- Coordination of monitoring activities
  - Unfamiliar with partner expertise
  - Unclear chain of command
- Availability of experts
- Data volume & variety
- Communications/messaging
  - Both inter- and intra-agency
  - Comprehensive data products

Successes

- Rapid response
  - delivered right information at right time to support decisions
- Planning and preparedness
  - able to adapt established processes and analysis techniques
  - developed customized products
- Forged new relationships in time of crisis
- Unprecedented data collection

It’s all about the planning, not the plan
Lessons Learned

• Before Response
  – Need to know available technical resources to avoid gaps and duplication in response capabilities
  – Need stable dose guidelines to avoid confusion on personnel safety

• During Response
  – Need clear mission objectives
  – Need stable chain of command and tasking process to accommodate unfamiliar assets and de-conflict and effectively employ similar capabilities
  – Not all existing organizational structures are applicable as is; need some specialization
  – Need timely, science-based, risk-informed decisions with incomplete information
    • Should not ignore the data in favor of political pressure; cannot wait for all the data
  – Need interagency strategy for intra-governmental and public affairs communication