DOE Response to the Radiological Release from the Fukushima Dai-ichi Nuclear Power Plant

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Topics

• Aerial Measuring System (AMS) activities
• Field monitoring activities
• Assessment activities
• Representative results
DOE Support to Operation Tomodachi

Mission:
Assess the consequences of releases from the Fukushima Dai-ichi Nuclear Power Plant (FDNPP)
DOE Timeline (cont’d)

- March 14, 2011
  - At White House direction, DOE deployed a tailored CMRT and AMS capability via military airlift to Yokota Air Base
DOE Timeline (cont’d)

- March 16: CM Assets arrive at Yokota AB and fly first AMS Test flight
- March 17: First aerial measurement activities over plant conducted; first field monitoring mission completed
- March 22: Initial data published on DOE website
Hangar 1503: DOE’s home at Yokota AB

Tent in background is AFRAT’s lab
Distribution of responsibilities

• **Field**
  - monitoring and sampling
  - preliminary data assessment
  - product development

• **CMHT**
  - detailed assessment
  - coordination of sample analysis
  - response to requests for information/assistance

• **NIT**
  - initial command and control of deploying assets
  - coordination and communication for field assets and headquarters elements

• **Embassy**
  - assessment interpretation for Ambassador
  - coordination of bilateral monitoring and assessment activities
BILATERAL ACTIVITIES
Partners

United States
- Department of State
  - American Embassy
- Department of Defense
  - US Forces Japan (USFJ)
- Department of Energy (DOE)
- National Nuclear Security Administration (NNSA)
- Nuclear Regulatory Commission
- Advisory Team for Environment, Food and Health

Japan
- Japan Atomic Energy Agency (JAEA)
- Nuclear Safety Commission
- Ministry of Defense (MOD)
- Ministry of Economy, Trade and Industry (METI)
  - Nuclear and Industrial Safety Agency (NISA)
- Ministry of Education, Culture, Sports, Science & Technology (MEXT)
  - Nuclear Safety Technology Center (NUSTEC)
- Ministry of Agriculture, Forestry and Fisheries (MAFF)
- Ministry of Health, Labor & Welfare (MLHW)
Coordination & Advisory Activities

- DOE aviation support requirements with USFJ
- Radiological consequence management advice for US Ambassador
- Planning, operations, and assessment with applicable Ministries and agencies of the government of Japan
- Field expedient early warning system for US Embassy and USFJ to be used while reactors were considered unstable

These activities aided key leaders in decision-making and informed DOE monitoring and assessment efforts
AERIAL MEASURING SYSTEM ACTIVITIES
Aerial Monitoring

What was done
• Fixed wing and helicopter
• Up to 3 aircraft per day
• Surveys over US bases
• Joint DOE & GOJ survey

Why it was done
• Map ground deposition out to 80 km from FDNPP
• Support evacuation, relocation, agricultural decisions
AMS

Fixed Wing C12

Rotor Wing UH-1
Typical Results

Aerial Monitoring Results
UH-1 Flight (April 10, 2011)

Aerial Monitoring Results
C-12 Flight (April 10, 2011)

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Derived Response Levels based on US Assumptions
Cs-134 Deposition: Surveys April 06 - April 29, 2011

FUKUSHIMA DAIICHI
JAPAN

Cs-134 Deposition (μCi/m²)
- < 4.57: Below relocation limits for Cs-134 Deposition
- > 4.57: Exceeds Cs-134 Deposition Guidance for 50-Year Relocation
- > 12.8: Exceeds Cs-134 Deposition Guidance for 1st Year Relocation

Map created on 05242011 0225 JST
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Vision – Service – Partnership
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Time Evolution…

Aerial Monitoring Survey Areas
Overview of Aerial Monitoring Contoured Results (3/17 - 04/29/2011)

Data from 3/17 - 3/19/2011
Data from 3/26 - 3/28/2011
Data from 4/02 - 4/07/2011
Data from 4/06 - 4/17/2011
Data from 4/18 - 4/29/2011

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Exposure Rate at 1 Meter
- > 12.5 mR/hr
- 2.17 - 12.5 mR/hr
- 1.19 - 2.17 mR/hr
- 0.25 - 1.19 mR/hr
- 0.03 - 0.25 mR/hr
- < 0.03 mR/hr

Nuclear Incident Team DOE NIT
Contact (202) 586 - 8100
This map was produced by the Geographic Information Systems department of NNA'S Remote Sensing Laboratory (RSL) at Nellis AFB, Las Vegas, Nevada. ESRI World Street Map and CSIR databases were used for map generation.
FIELD MONITORING ACTIVITIES
Ground monitoring

What was done
- Mobile monitoring
- In-situ measurements
- Exposure rate measurements
- Air sampling
- Soil samples
- Swipes

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
Soil core sample + in situ

In situ + AMS overhead
ASSESSMENT ACTIVITIES
Assessment

An assessment of measurements gathered through May continues to show:

- Radiation levels continue to decrease
- No measurable deposit of radiological material since March 19
- US bases and facilities all measure dose rates below 32 µR/h (32 millionths of a REM) – a level with no known health risks
- No previous comprehensive background measurements were available for comparison
- Agricultural monitoring and possible intervention will be required for several hundred square kilometers surrounding the site:
  - Soil and water samples are the only definitive method to determine agricultural countermeasures
  - Ground monitoring can give better fidelity to identify areas that require agricultural sampling
Assessment Activities

• Field
  – Preliminary evaluation of raw data
    • Ground level exposure rate from aerial measurement
    • Deposited activity by isotope
    • Activity concentration in air
  – Referenced to protective action measures
  – Inform future mission planning

• CMHT
  – Detailed analysis of raw monitoring and sampling data
  – Trend analysis and quality control
  – Integrated dose assessment
  – Analysis of postulated scenarios to inform future planning
REPRESENTATIVE RESULTS

Ground Based and Aerial Monitoring Results
Data from (March 30 - April 03)

Highest monitoring reading at Fukushima Daiichi Power Plant control center:
106 mR/hr (3/31/2011 2:00 AM JST)
Past 24 hour high reading:
84 mR/hr (4/03/2011 7:00 PM JST)

Map created on 04032011 2340 JST
Nevada National Security Site
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Nevada National Security Site
Managed and Operated by National Security Technologies, LLC
Exposure Rate Trends
From Fukushima South to the U.S. Embassy

Main Gate after March 22

MEXT Monitoring Point 30 km South of Fukushima Daiichi

Embassy

* Monitoring support at Embassy discontinued 21 April

Map created on 05192011 0220 JST
Name: CMHT MonitoringTrend 19May2011

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Nuclear Incident Team DOE NIT
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Summary of Activity to Date

- Daily aerial measuring system missions over US installations and in the area around the FDNPS
  - >85 flights
  - >500 flight hours
- Daily monitoring activities at the U.S. Embassy, U.S. military installations, and in support of “ground truth” measurements for AMS.
  - 620 air samples
  - 117 in situ spectra
  - 141 soil samples
Field Team Activity Successes

• DOE was able to perform on-the-fly analysis to deal with multiple ongoing releases, unknown source terms, challenging terrain as well as non-technical pressures.
• DOE Scientists developed customized products for U.S. military (data products, InField Monitoring System).
• DOE scientists embedded with Japanese scientists to create joint data products.
Lessons Learned

- Volume of data is large.
- Information demand is immense.
- Contamination is a really big issue.
  - Personnel Decon and Monitoring
  - Equipment Decon and Monitoring
  - Decon of water, water supplies, food, etc.
- Background surveys are invaluable!