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Sandia National Laboratories

Regional Radiation Monitoring & Technology

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International Nuclear Threat Reduction Department

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NNSA National Nuclear Security Administration

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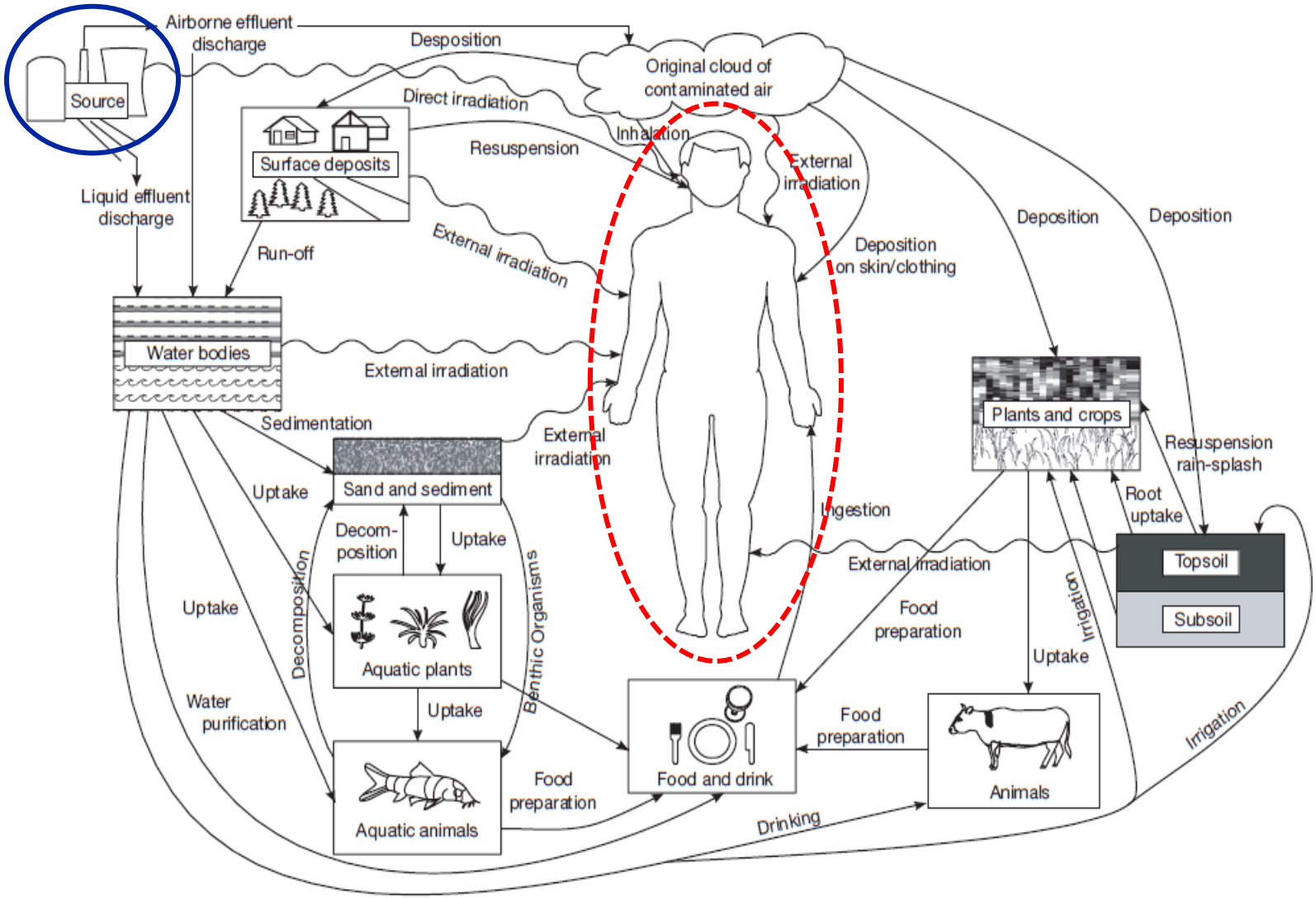
Radiation Release Exposure Pathways



Reference: IAEA Environmental and Source Monitoring for Purposes of Radiation Protection; Safety Guide No. RS-G-1.8

Environmental Radiological Monitoring Programs

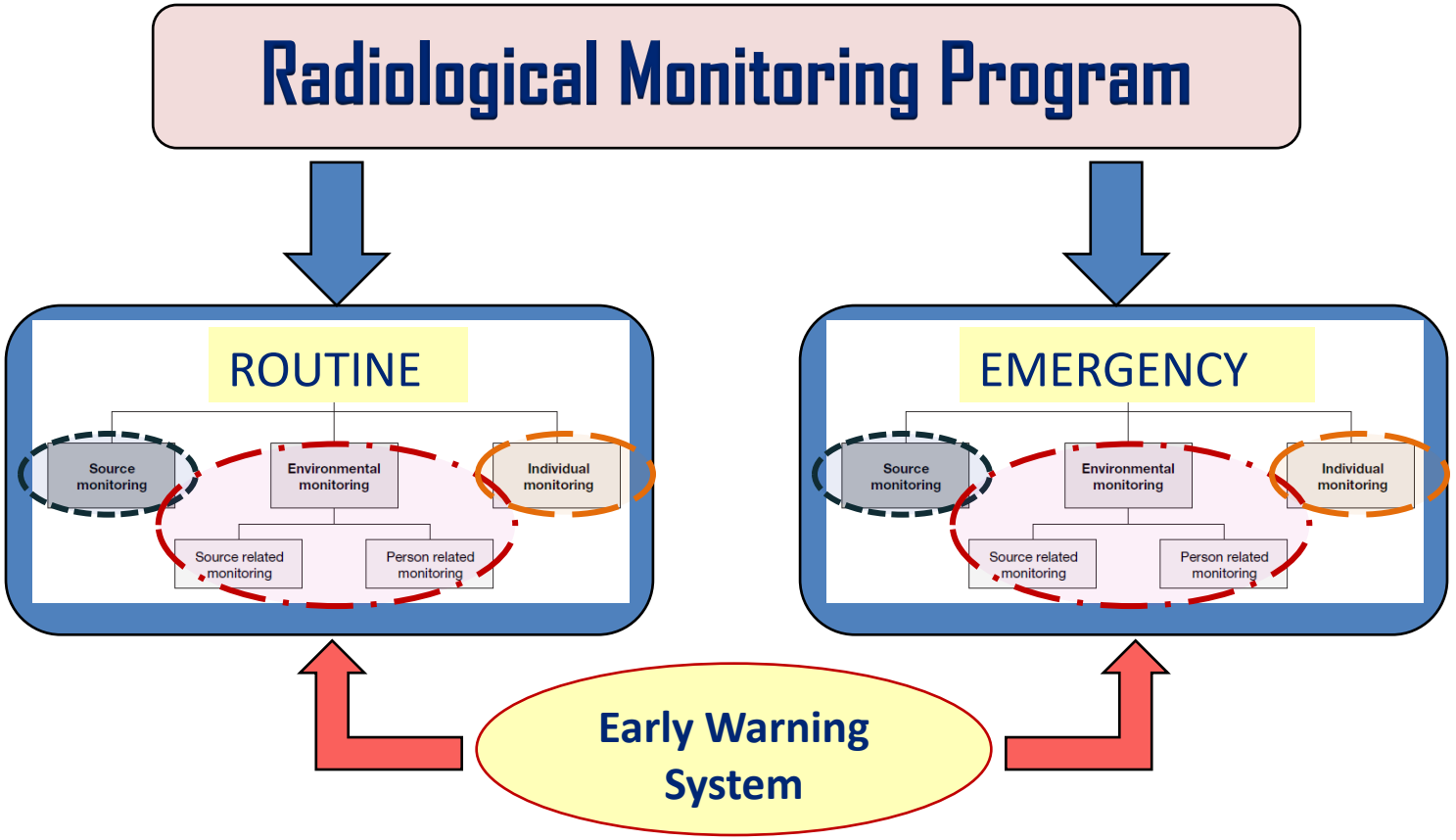
– General Objectives

- **Determine and Mitigate Radiological Impact of the Nuclear Plant Operation on the Public and the Environment**
  - **Establish baselines and characterize trends in the physical, chemical, and biological condition of effluent and environmental media;**
  - **Identify potential environmental problems and evaluate the need for remedial actions or measures to mitigate the problems;**
  - **Detect, characterize, and report unplanned releases;**
  - **Evaluate the effectiveness of effluent treatment and control, and pollution abatement programs**
- **Verify and support compliance with applicable federal, state, and local environmental laws, regulations, permits, etc**
- **Determine compliance with commitments made in environmental impact statements, environmental assessments, safety analysis reports, or other official documents**

Reference: IAEA Environmental and Source Monitoring for Purposes of Radiation Protection; Safety Guide No. RS-G-1.8

Elements of Radiological Monitoring Program

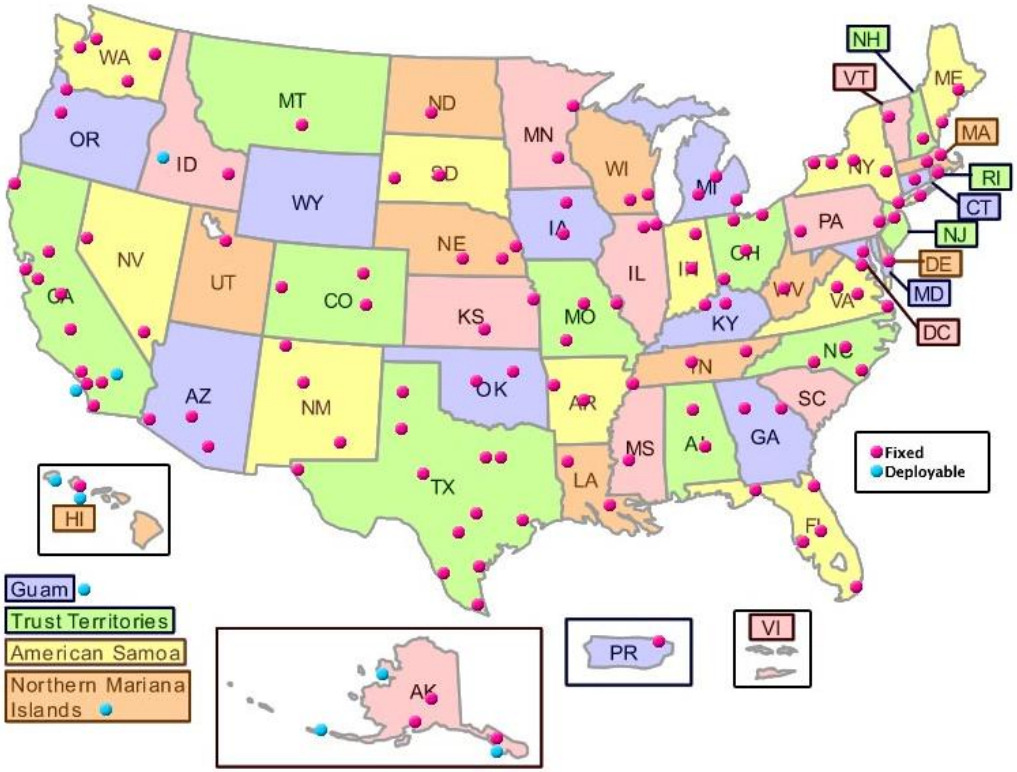
– and Early Warning Systems



Early Warning System Can Contribute to Both Routine and Emergency Monitoring Programs

Monitoring – RadNet

- **US EPA's Environmental Radiation Monitoring Program**
- **Program monitors**
  - Nationwide network of 124 "near real-time air monitors
  - On-line data
  - Also
    - Drinking water
    - Precipitation
    - Pasteurized milk



Source: http://www.epa.gov/radnet/

Consequence Management – How Does the U.S. Respond?

Response Timeline T = 0 to 1 Hour

- **Local Authority and/or Nuclear Facility implements Emergency Response Plans**
- **State and Local Officials notified**
  - **Local First Responders first to arrive on the scene**
  - **First Responders will begin responding to the emergency and evacuation, if needed, of local area based upon Emergency Response Plans**

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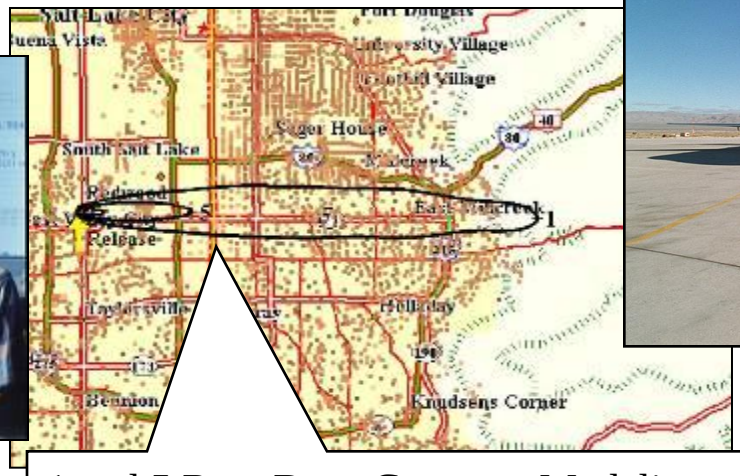
Consequence Management Resource Response

Timeline T = 1 to 6 Hours

- **DOE/NNSA Radiological Assistance Program Teams (RAP Teams) begin to arrive**
- **Department Of Energy activates National Consequence Management Assets upon request of state**
  - CM Home Team Activated and providing assessment within 2 hours of activation
  - CM Response Team assets in route within 4-hours of activation
- **NNSA's Plume Dispersion Modeling underway**



1 and 5 Rem Dose Contours Modeling

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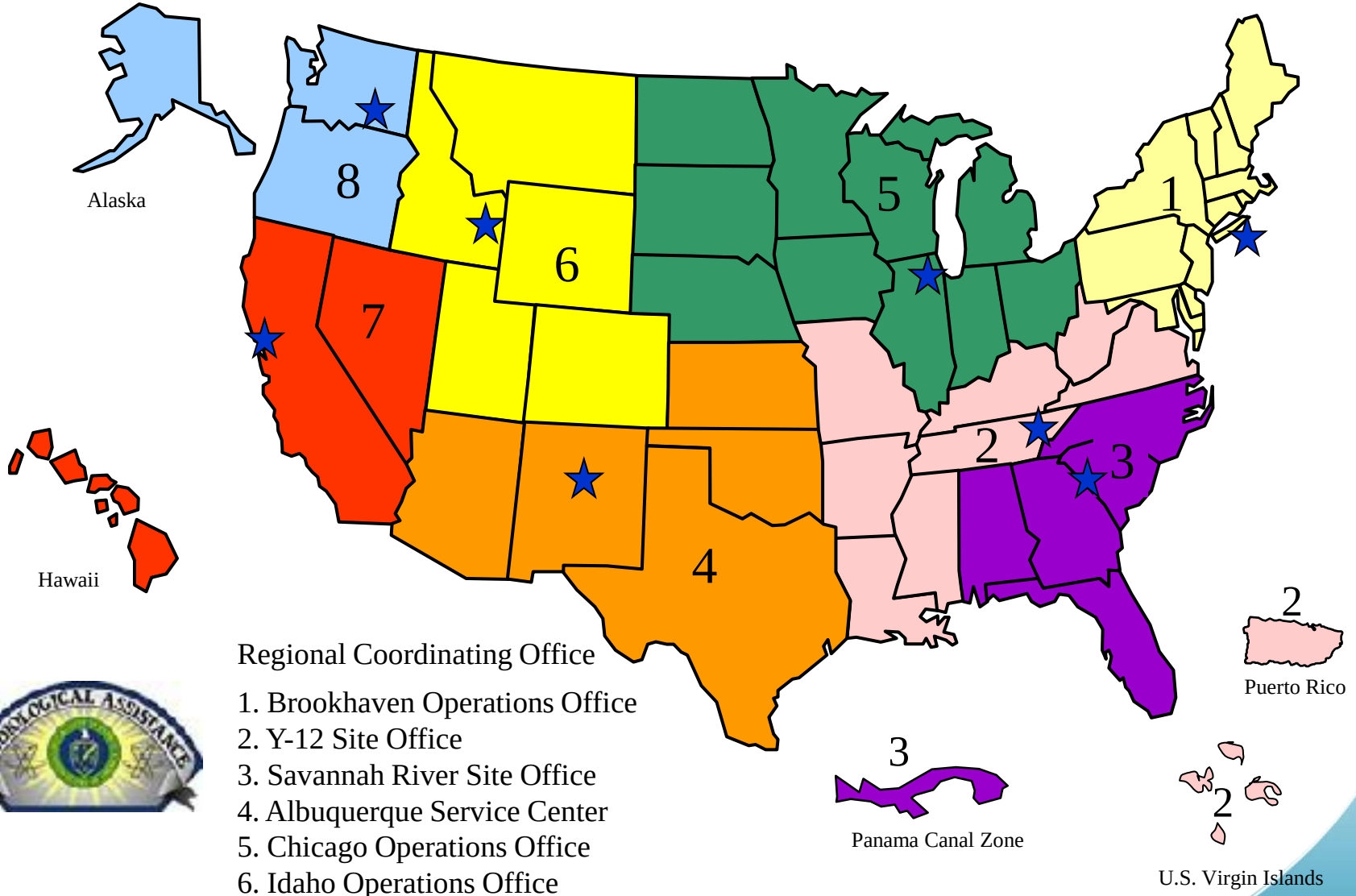
Regional RAP Team Coordinating Offices



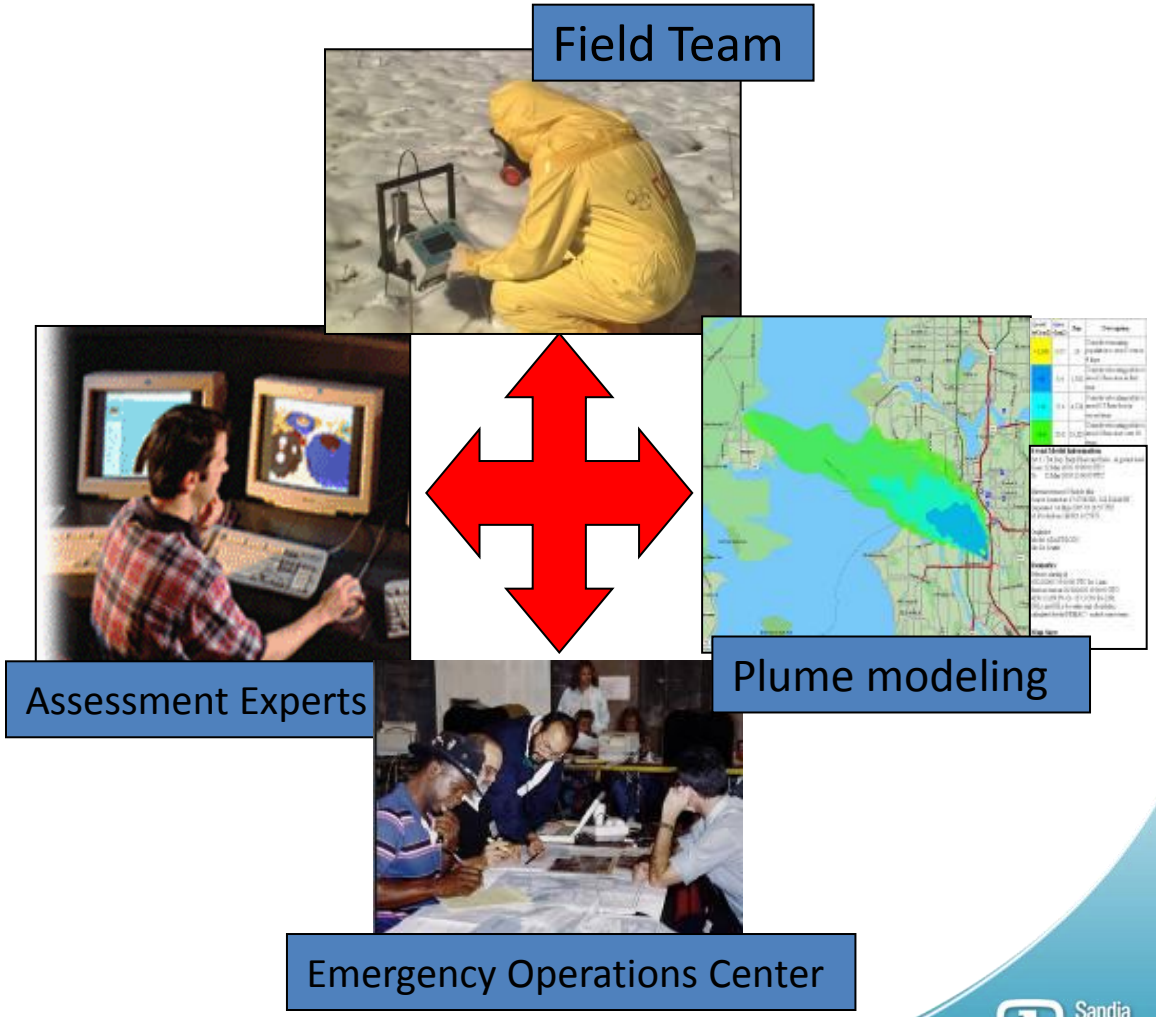
Regional Coordinating Office

1. Brookhaven Operations Office
2. Y-12 Site Office
3. Savannah River Site Office
4. Albuquerque Service Center
5. Chicago Operations Office
6. Idaho Operations Office
7. Livermore Site Office
8. Richland Operations Office

Consequence Management
– Home Team Activated

- Objectives:
  - Provide Technical Assessment and Plume Map support before CM response team assets arrive at the event site
  - Provide a resource for local authorities early in an event

- Resources
  - National Lab personnel
  - Assessment tools
  - Plume modeling

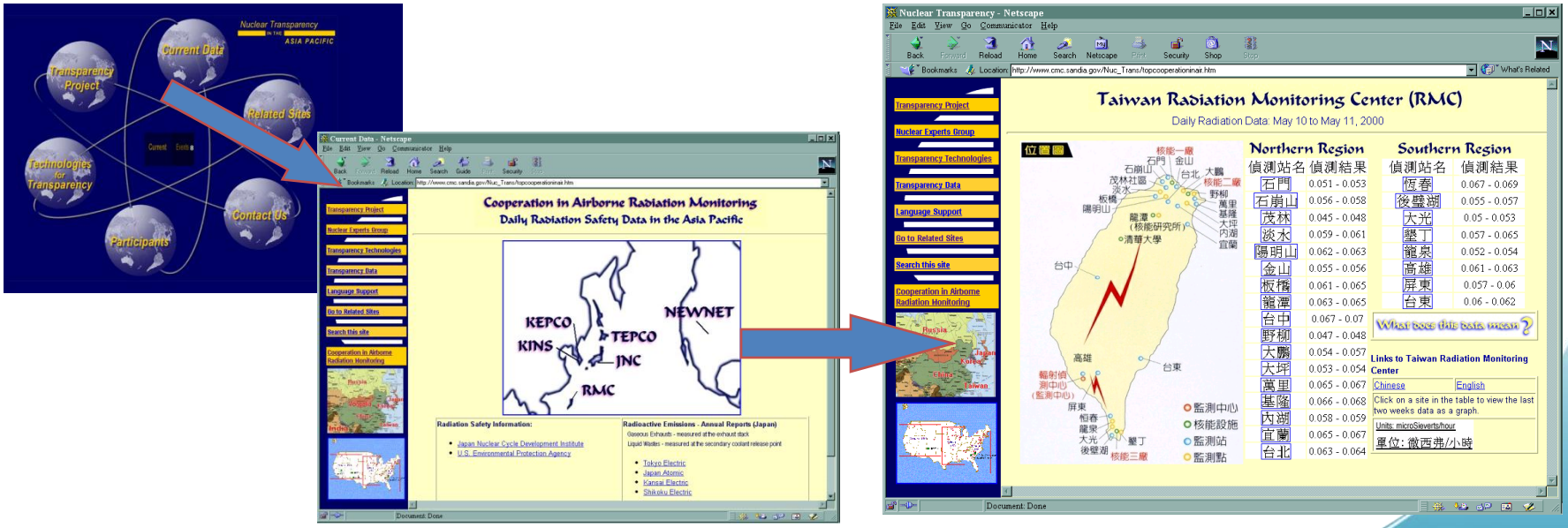


NE Asia Nuclear Airborne Radiation Monitoring

NucTrans Website

Japan, China, Taiwan, Russia, and South Korea cooperate to increase transparency in radiological safety & nonproliferation

- Facilitated by Sandia through NucTrans website
- Airborne radiation monitoring
- Links existing Public Information Sites



Source: SAND 2006-5868P

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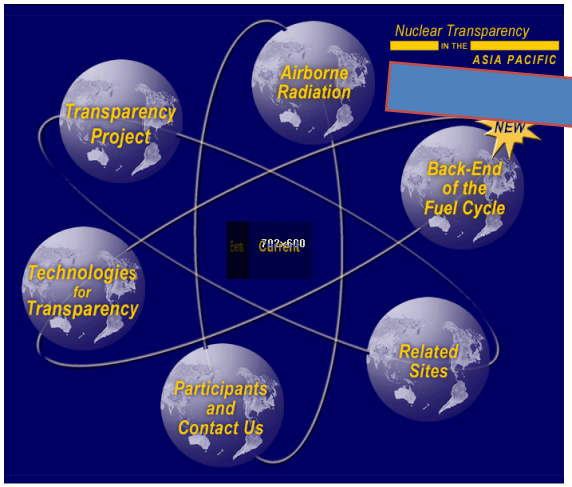
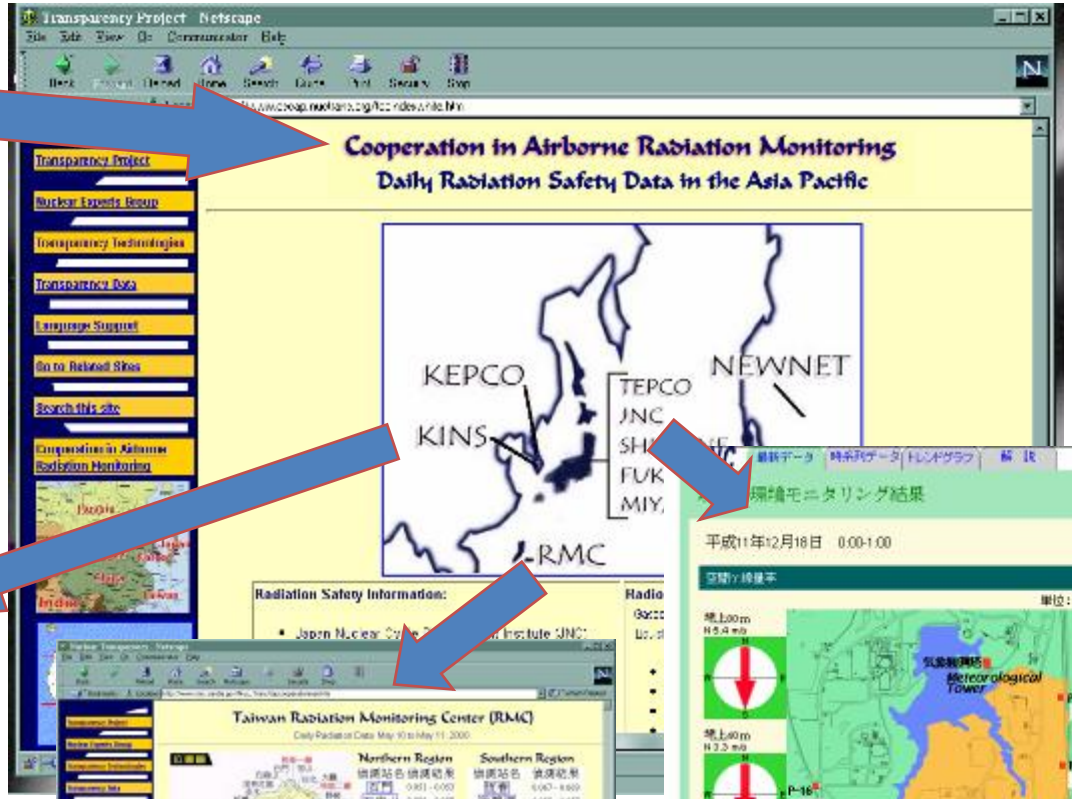
NE Asia Nuclear Transparency Website: Airborne Radiation Data – NucTrans

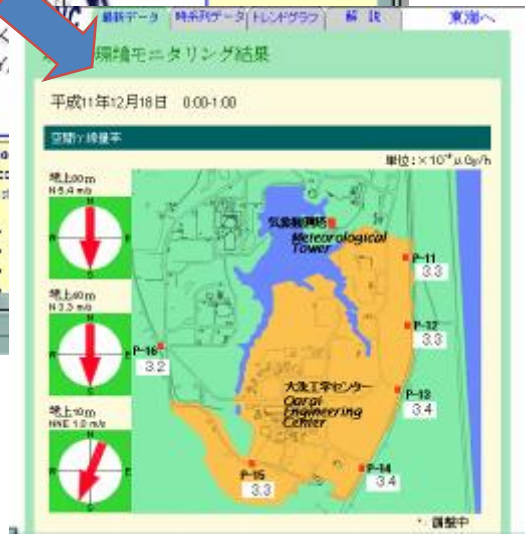
http://www.cscap.nuctrans.org





KINS in Korea

RMC in Taiwan



JAEA in Japan

Source: SAND 2006-5868P

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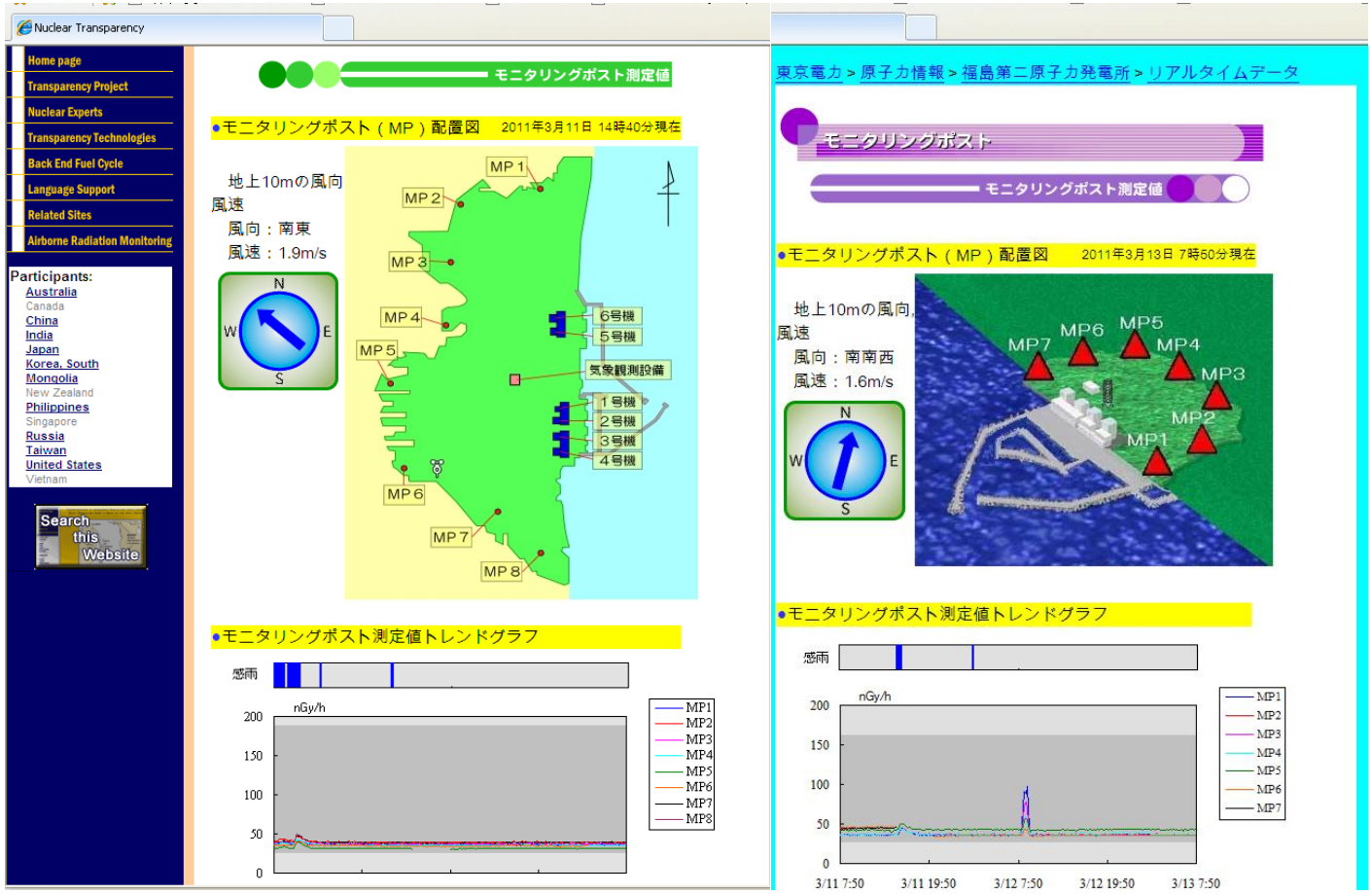
NucTrans Website – Recent Events

Fukushima – March 2011

Dai-ichi ***Dai-ni***



Source: SAND 2006-5868P

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NewNet – Los Alamos, NM: Community-Public Air Monitoring Program

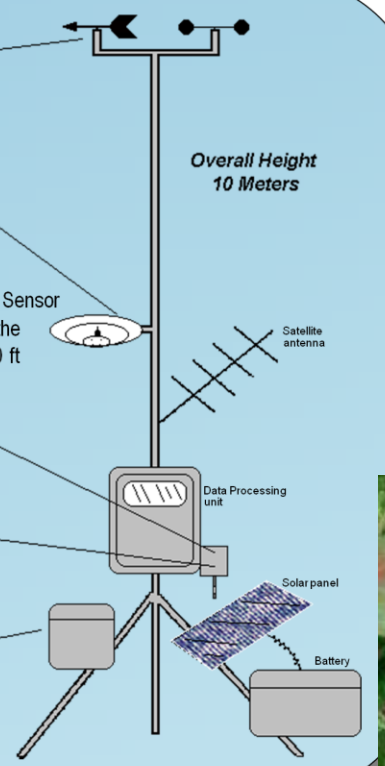
Wind data is measured by a Met One Wind Finder System, model 6266/037, which consists of a wind speed sensor (cup anemometer) and wind direction sensor (vane).

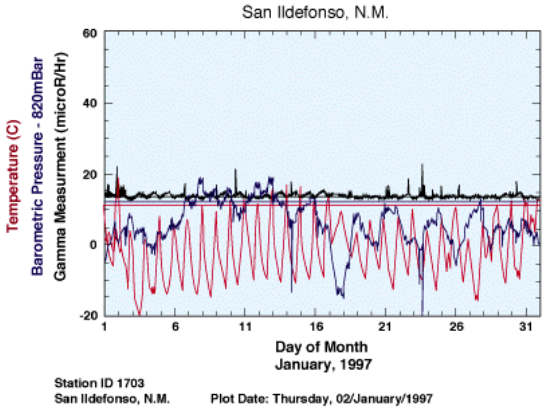
Temperature is measured by a Met One temperature sensor, model 064-2, mounted in an 075 radiation shield to reflect solar radiation.

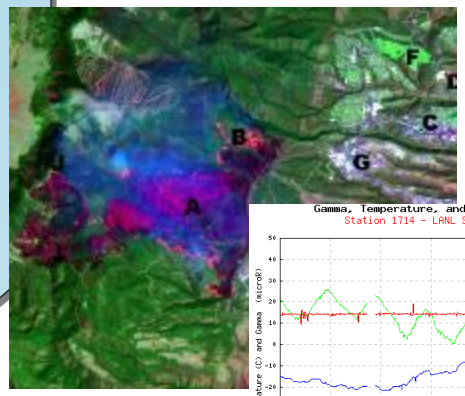
Barometric Pressure is measured by a Met One Barometric Pressure Sensor model 090C. This is available in a number of calibration ranges, determined by the elevation of the station. Barometric pressure decreases by about 1" Hg per 1000 ft of elevation. The value is converted to millibars of barometric pressure, and is reported unadjusted for elevation. (Values normally reported in weather reports have been adjusted to pressure at sea level.)

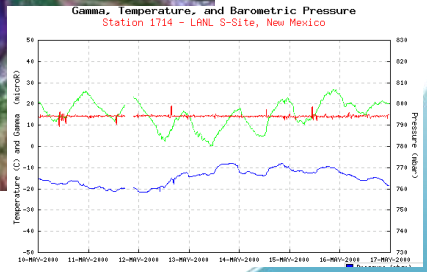
Humidity is measured by a Rotronic Hygrometer, model HT225W.

Gamma Radiation is measured by a Reuter-Stokes High Pressure Ionization Chamber, model RSS-120. This instrument has an ionization chamber filled with argon to a pressure of 25 atmospheres.









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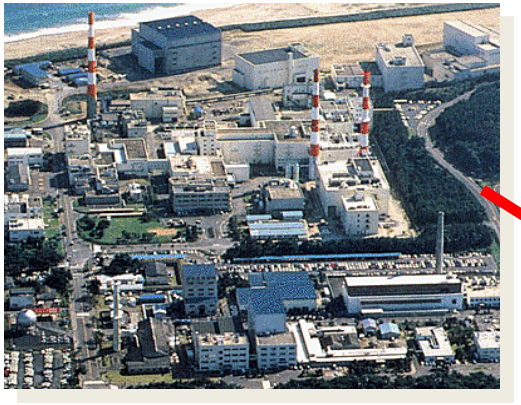
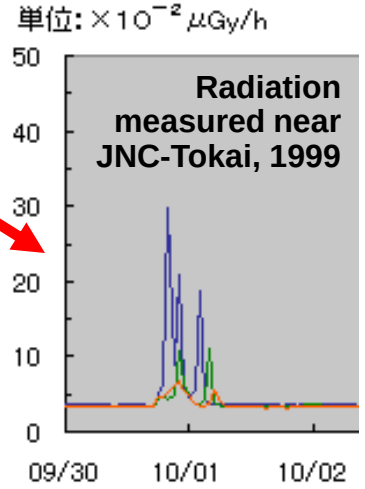
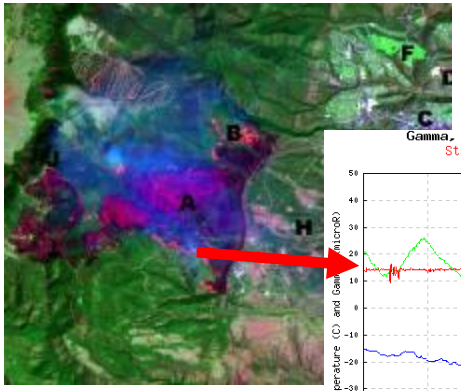
Airborne radionuclide monitoring proved particularly useful during past events addressing public fears

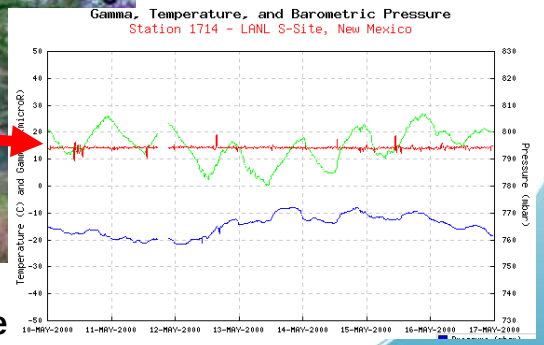
- **Tokai-mura criticality accident**
  - 240,000 people visited the JNC-Tokai website in one day
  - JNC credited with addressing public fears





- **Cerro Grande (LANL) forest fire**
  - Newspapers reported rumors of radiation in smoke
  - Los Alamos NEWNET data showed only minor releases



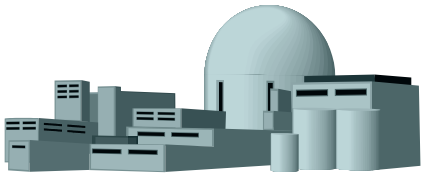


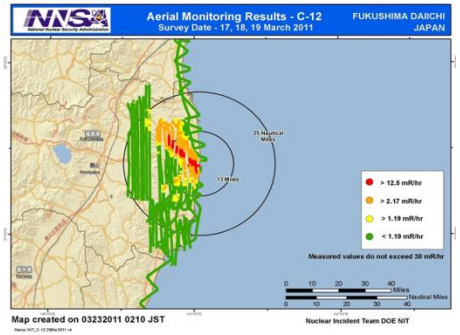
Radiation measured on fire edge at LANL, May 2000

Source: SAND 2006-5868P

Possible MENA Applications – Regional Airborne Radiation Monitoring Concept

- A number of countries in the Middle East currently possess nuclear and/or radiological research programs
- Many others are considering development of such programs, including expansion into the nuclear energy sector
- Risk of accidental (or even intentional) releases of potentially harmful radionuclides into the environment
- Suggests that the MENA Region could benefit from a comprehensive monitoring system that can detect and characterize such releases





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Initial Steps – Radiation Measurements Cross Calibration (RMCC) Project

- **All countries in the Middle East have radiation measurement capabilities associated with:**
  - Power and research reactors
  - Radioactive sources in medicine, commerce, industry
  - Responding to accidental or intentional radiation releases
  - Environment, health, and safety
  - Detecting the presence of radioactive sources
  - Preventing the illicit use of radiological materials
  - Disposing of radioactive sources

- **Improving and standardizing nuclear monitoring and measurement capabilities in the Middle East are key elements of developing an approach to such concerns**

RMCC Project Benefits

- **Increased confidence in data quality across the region**
- **Availability of a network of qualified labs for radiological measurements**
  - Build up the capacity in the region to produce reliable radiological data
- **Improved scientist-to-scientist communication**
  - Provides a mechanism for sharing of agreed upon information
  - Enables scientists in the region to work cooperatively to create indigenous solutions to the problems in the region
  - Fosters the development of a network of scientific experts in the region
- **Training Opportunities**
  - Austria – The IAEA Labs in Seibersdorf
  - Germany – Federal Bureau for Radiation Protection
  - USA – Sandia National Laboratories
  - Regional Opportunities

RMCC Workshops

- Began 2004 – 2011
- Have included Kuwait, Saudi Arabia, Qatar, UAE, Bahrain, Oman, Yemen, Iraq, Morocco, France, Tunisia, and Jordan
- Discuss MAPEP Results
- Lectures on radiochemistry techniques
- Review Radiological Issues, Laboratory Quality Assurance, and Quality Control
- Improved communications, email server, & web site
- Discuss regional radiaological technical cooperation

Concept – Comprehensive Regional Airborne Radiation Monitoring

- **As a first step, develop a set of internationally recognized standards for laboratory radiation measurements in the Middle East (RMCC)**

- **The RMCC project consists of:**
  - Participation in the DOE proficiency testing program (MAPEP)
  - Receive test samples
  - Analyze and report
  - Follow-up with regional workshops to discuss the results and identify technical assistance needs
  - Participate in targeted studies by the IAEA labs in Seibersdorf

- **Possible Next Steps:**
  - Environmental Monitoring Program for Nuclear Power Operation Activities
  - Emphasize Planning for Accident and Emergency Monitoring
  - Promote Development of Regional Radiological Early Warning System (EWS)
  - Your Ideas and Inputs

- **Future of Regional Airborne Radiation Monitoring includes:**
  - Advisory Council and Charter
  - Regional Leadership and Ownership
  - A Professional Society – Middle East Radiological Society?

Summary

- Technology cooperation can help enable international cooperation on regional security interests and concerns
- Sandia's International Nuclear Threat Reduction Department employs a number of capabilities to address a wide range of international issues
- Primary focus is regional security and nonproliferation issues in the Middle East, South Asia, and East Asia
- Promote & engage via cooperative, multinational approaches
- Encourage cooperation on nuclear waste management strategies
- Addressing nuclear energy, fuel-cycle supply, and demand help reduce proliferation risks
- Regional technical collaborations and information sharing promote understanding, trust, and stability

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