REAC/TS

Lessons Learned from the Japan Response: REAC/TS Perspective

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REAC/TS

REAC/TS Missions – 24/7

- Radiation Medicine advice and consultation
- Health Physics radiation dose assessments
- Deployable Emergency Response Teams (ERT 1 & 2) for on-scene assistance

Physician
Health Physicist
Nurse/Paramedic

Domestic & International Deployment Capability

CONUS – deploy w/in 4 hours OCONUS – deploy w/in 6 hours

International Collaboration:

- World Health Organization (WHO) Collaboration Center and member of the Radiation Emergency Medical Preparedness and Assistance Network (REMPAN)
- Member of International Atomic Energy Agency (IAEA) Response and Assistance Network (RANET)

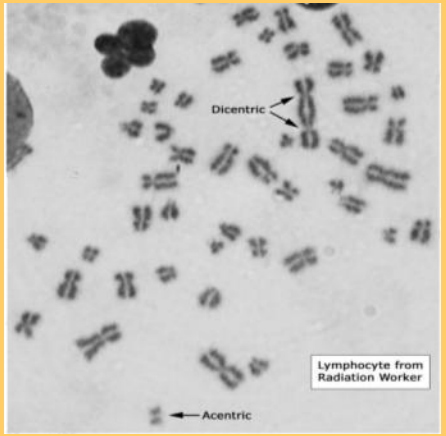
Education Related to the Medical Management of Radiological Incidents (Typical Year)

- 8 REM 3.5 day courses
- 2 ARM 4.5 day courses
- 3 HP 4.5 day courses
- 2 Pre-hospital 1.5 day courses
- 3 specially designed courses provided locally (3.5–4.5 days)
- 3 offsite courses for DOE facilities (1-2 days)
- 10 offsite courses for private entities
- Multiple invited presentations/lectures
- Multiple international courses

Cytogenetic Biodosimetry Capability

- "Gold" standard for acute whole body radiation dose assessments
- A national emergency response asset: Utilizes metaphase spreads of lymphocytes to search for chromosome aberrations (dicentrics) specific to radiation exposures

Old



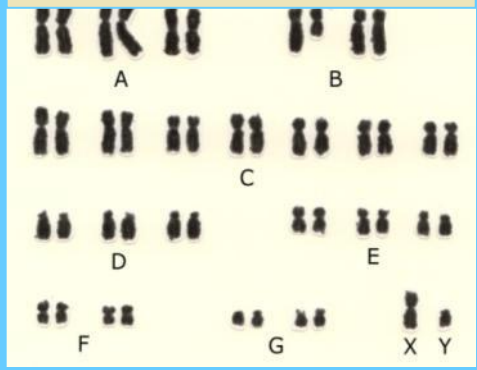
Labor Intensive

New

Automated Cytogenetics Workstation

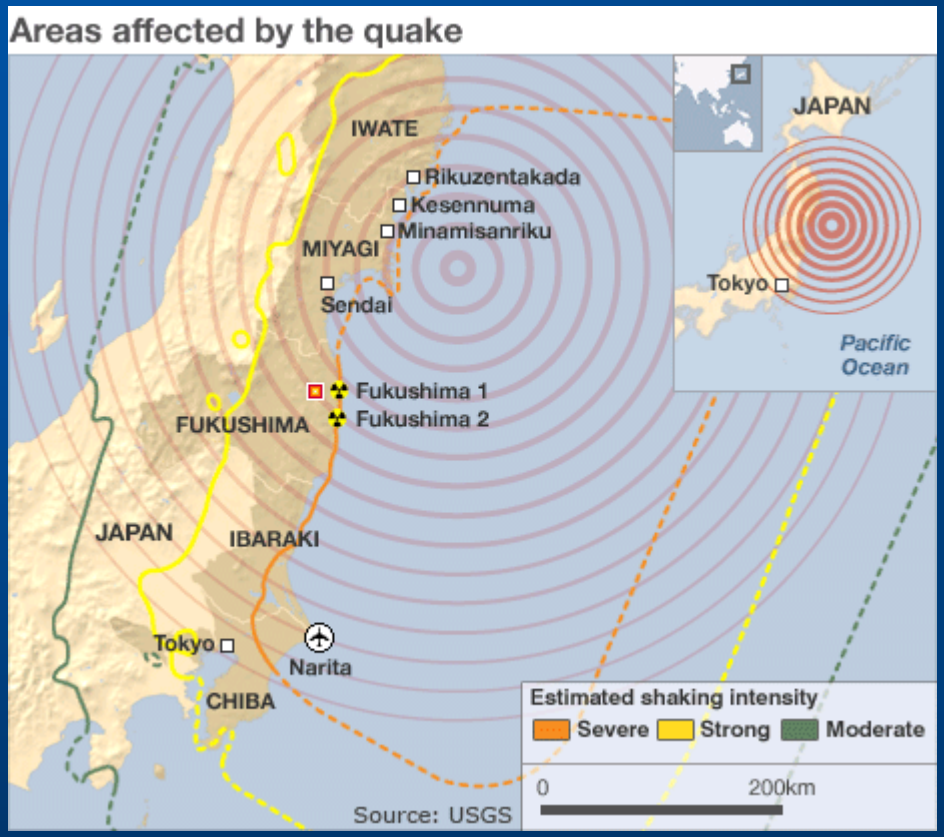
Output

Karyotype

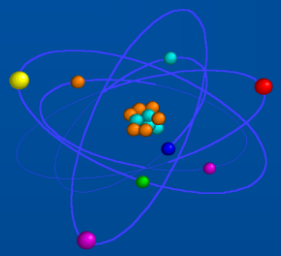


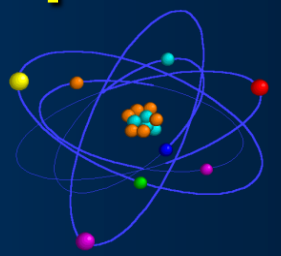
Earthquake and Tsunami

- March 11, 2011 a magnitude 9 earthquake struck – epicenter near the island of Honshu
- 13-15 meter (~ 43’-50’) wave hit the retaining walls of the NPP (~ 6m/20’)
- 6 units at plant
  - Units 1, 2, and 3 were operational
  - Units 4, 5, and 6 were down for maintenance
- Operating reactors shut down
- High water affected auxiliary power systems


Areas affected by the quake
JAPAN
IWATE
Rikuzentakada
Kesennuma
Minamisanriku
MIYAGI
Sendai
Tokyo
Pacific Ocean
Fukushima 1
Fukushima 2
FUKUSHIMA
JAPAN
IBARAKI
Tokyo
Narita
CHIBA
Estimated shaking intensity
Severe
Strong
Moderate
0
200km
Source: USGS

REAC/TS Fukushima Response (Mar – Apr, 2011)

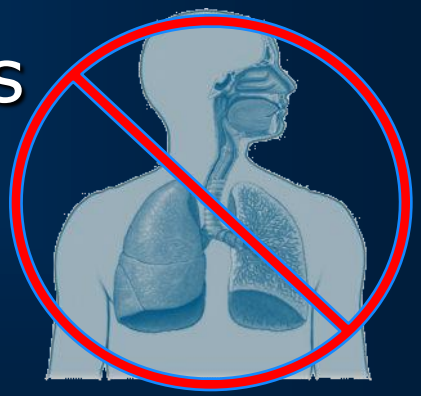




- REAC/TS received the first call on 11 March 2011
- REAC/TS was available 24/7 and responded to over 200 calls for assistance/information from government, public, and media within the first few weeks
- Over 500 emails generated early on in the response

REAC/TS Provided Assistance/Advice to:

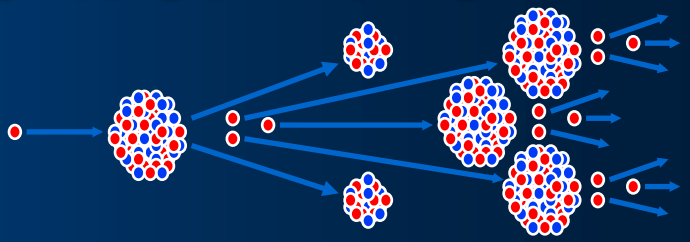
- Members of the general public and media
- Occupational health physicians
- Corporate management
- DOD, DOE, DOS, DHHS, NRC, various state government officials
- Japanese gov't public health officials
- Domestically and internationally



Questions /Assistance Provided US Government Officials

- Assistance on radionuclide contamination screening methods
- Assistance in development of screening criteria and action/triage levels
- Many questions on medical use of KI, ie: when/how to use KI…if it's needed
- Questions on medical use/availability of Prussian Blue for intakes of cesium

Typical Questions from the Public



- Is it safe for me to be in Japan?
- Is it safe for my family/friends in Japan?
- Do I need to take potassium iodide (KI) and when should I take it (from people in US and in Japan)?
- I just took a KI pill—when should I take another one? (a US citizen in Texas, for example).
- Where do I get KI?
- Does my company need to evacuate employees?
- Where/how can I, or my employees, be screened to rule out contamination?

Typical Guidance Provided by REAC/TS

- Follow local public health guidance from media
- Provided diagnosis/treatment guidelines per IAEA, NCRP,CDC,FDA,NRC and the REAC/TS pocket guide, website.
- No real or significant potential for acute health effects outside of exclusion area
- Consult with a physician before doing anything not advised by public health officials

Observations/Lessons Learned

- Calls were received at all hours due to the time difference between Japan (and other locations) and Oak Ridge, TN (EST)
- Not surprisingly, there was a general fear of radiation among the public and within the medical response community
- There is a need for education on medical response to radiological incidents within the medical community and within all federal and state government offices

Observations/Lessons Learned

- The media plays a major role, not only in dissemination of information, but in shaping public opinion
- Various communication skills are essential in relaying accurate information to the media, the public, and medical personnel in language that is understandable to the intended audience


reac/ts
Thank You!

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

Steven M. Johnson
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RAP Region 2
U.S. Department of Energy
National Nuclear Security Administration

Statement of Problem

- Occurred 14:46 March 11, 2011
- Magnitude:9.0 Mw
- Epicenter location: 38° 6''N and 142° 51''E, and 24km in depth
- It is said that the height of tsunami attacked Fukushima NPP was more than 14m

Source: Nuclear and Industrial Safety Agency (NISA)

Partners

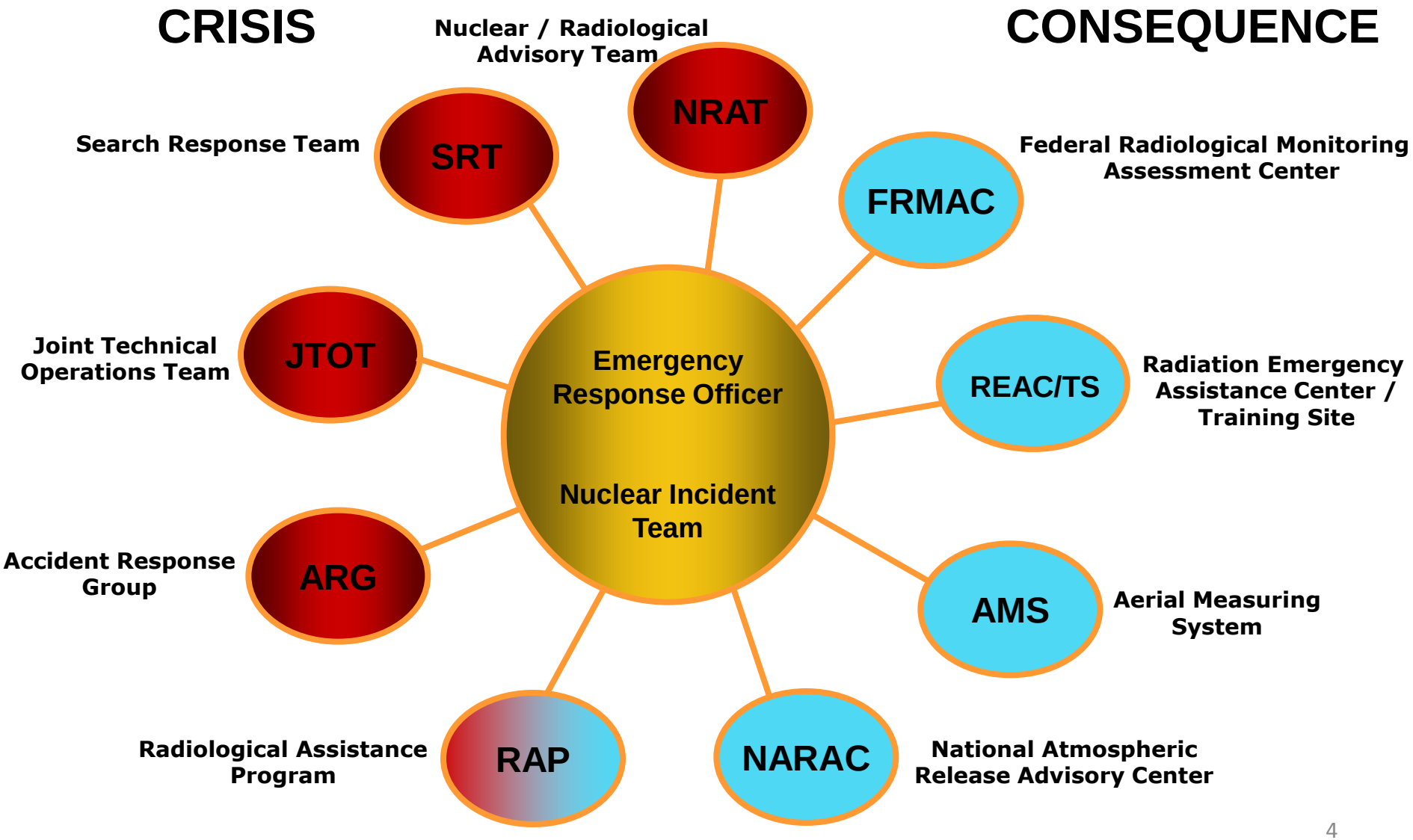
United States

- Department of State
- Department of Defense
- 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 (MHLW)

Office of Emergency Operations



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U.S. DEPARTMENT OF ENERGY

NNSA

Operation Tomodachi
DOE Objectives

- Assist the State Department mission to advise American citizens on protective action and evacuation guidelines

- Assist DoD mission to safely conduct humanitarian assistance/disaster relief operations and provide advice on departure/return of military dependents

- Partner with the Government of Japan (GOJ) through the State Department to aid in developing guidelines for protection of the public potentially affected by the releases

U.S. DEPARTMENT OF ENERGY

NNSA

•Distribution of Responsibilities

- **Field**
  - monitoring and sampling
  - preliminary data assessment
  - product development
- **CMHT**
  - detailed assessment
  - coordination of sample analysis
  - predictive modeling
  - 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

All NNSA consequence management assets…and then some

Coordination & Advice

- Partnership with United States Forces Japan (USFJ) for AMS
- Radiological consequence management advice for US Ambassador and USFJ
- Planning, operations, and assessment with several ministries of the government of Japan
- Field expedient early warning system to be used while reactors were considered unstable

These activities aided key leaders in decision-making and informed DOE monitoring and assessment efforts

DOE Timeline

- March 11:
  - DOE/NNSA activated the following assets
    - Nuclear Incident Team (NIT) in Washington, DC
    - DOE/NNSA Consequence Management expertise on the US Agency for International Development (USAID) Disaster Assistance Response Team (DART) in Tokyo
    - National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore National Laboratory (LLNL)
    - Consequence Management Home Team (CMHT) at Remote Sensing Laboratory (RSL) with outreach to Sandia National Laboratory (SNL), LLNL, and Los Alamos National Laboratory (LANL)
    - The Radiation Emergency Assistance Center/Training Site (REAC/TS) in Oak Ridge, TN

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 20: LNO deployed to PACOM in Honolulu
- March 22: Initial data published on DOE website

Aerial Monitoring

What was done

- Fixed wing and helicopter
- Up to 3 aircraft per day
- DOE & GOJ data

Why it was done

- Map ground deposition out to 80 km from FDNPP
- Support evacuation, relocation, agricultural decisions

Ground Monitoring

What was done

- Mobile mapping
- In-situ & exposure rate
- Air & soil sampling
- Contamination swipes
- DOE, DoD, GOJ data

Why it was done

- Mobile, in situ, exposure rate, soil, swipe
- Calibrate aerial measurements
- Define Isotopic mix
- Characterize the inhalation component of integrated dose
- Assess vertical and horizontal migration of deposited material

Assessment

Assessments of measurements gathered showed:

- Radiation levels decreasing
- No measurable deposit of radiological material after March 19
- US bases and facilities all measured dose rates below 32 microrem/hr (32 millionths of a REM)** – a level with no known health risks
- 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

** Note: 1 milliRem (mRem) = 10 μ(micro)Sieverts;
1 milliRem (mRem) = 1000 μ(micro)rem

Field Activity Summary

- Daily AMS missions over US military 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

Joint US-Japan AMS Data

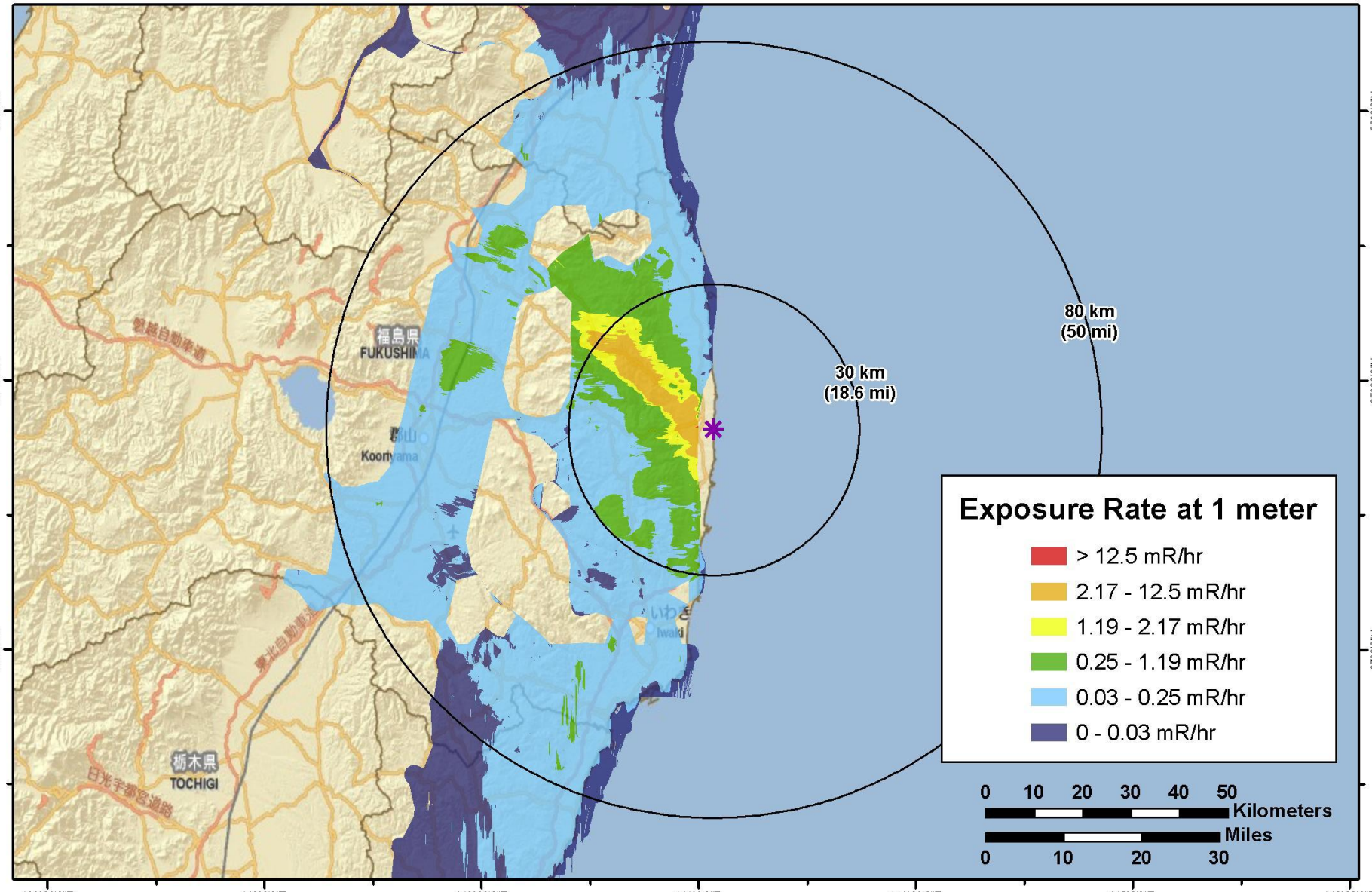
- These results are from a joint MEXT, DOE/NNSA and USFJ survey
- Data based on 42 fixed wing and helicopter survey flights at altitudes ranging from 150 to 700 meters between April 6 and April 29
- Exposure rates are averaged over areas 300 m to 1500 m in diameter
- There is no data near the town of Inawashiro because it is mountainous and not easily accessible by low-flying aircraft
- The cesium deposition was determined from aerial and ground-based measurements
- The ratio of the amount of Cs-137 to Cs-134 was uniform across the survey region
- No aerial survey data taken directly over the nuclear power plant
- The survey boundary was chosen based on many preliminary measurements that showed the extent of the deposition

National Nuclear Security Administration

Aerial Monitoring Survey Area

Overview of Aerial Monitoring Contoured Results (3/26-03/28 2011)

FUKUSHIMA DAIICHI
JAPAN



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UNCLASSIFIED

Nuclear Incident Team DOE NIT
Contact (202) 586 - 8100

National Nuclear Security Administration

Aerial Monitoring Survey Area

Overview of Aerial Monitoring Contoured Results (4/02-04/07 2011)

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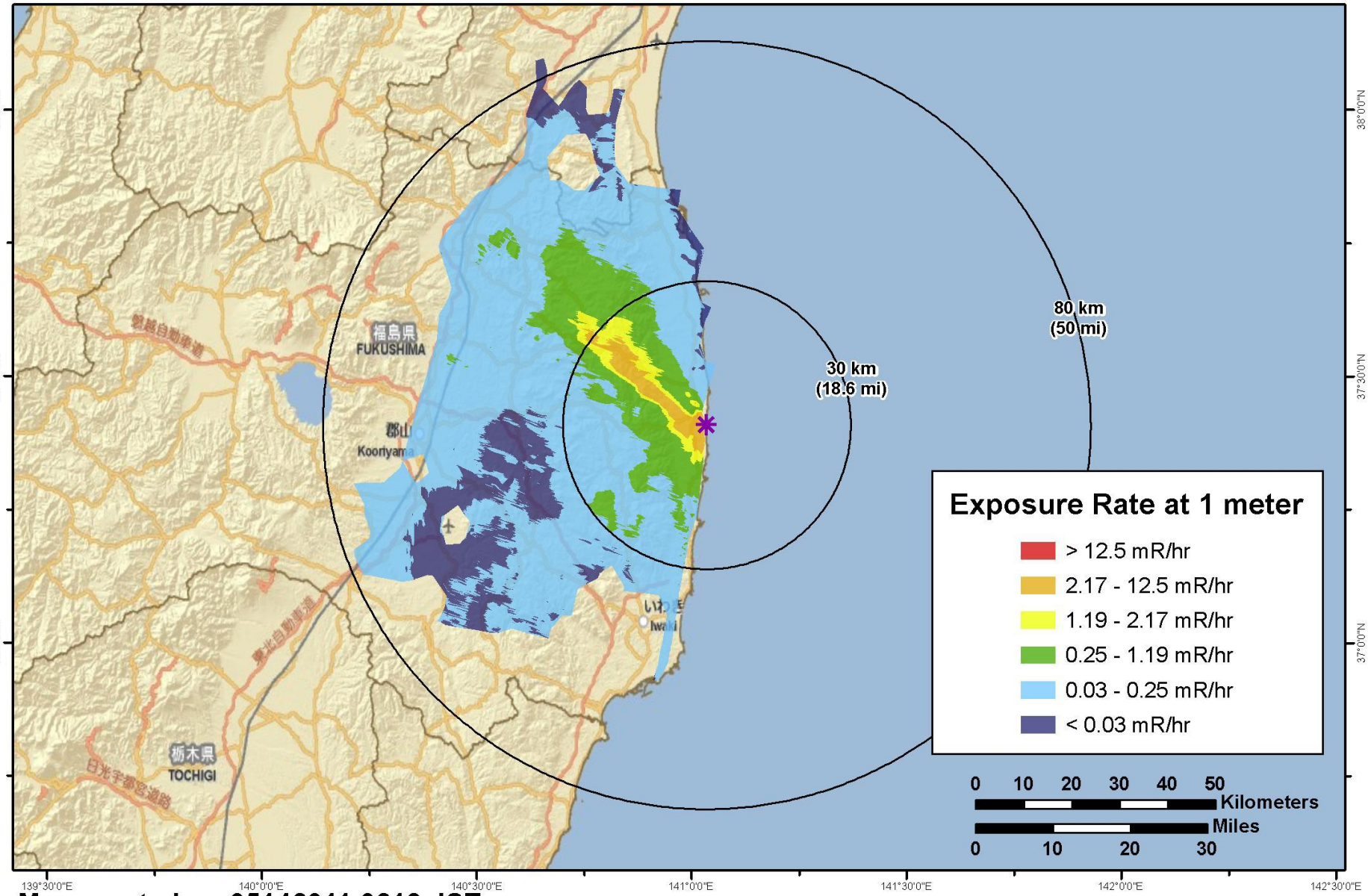
JAPAN



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National Nuclear Security Administration

Aerial Monitoring Survey Area

Overview of Aerial Monitoring Contoured Results (4/06-04/17 2011)

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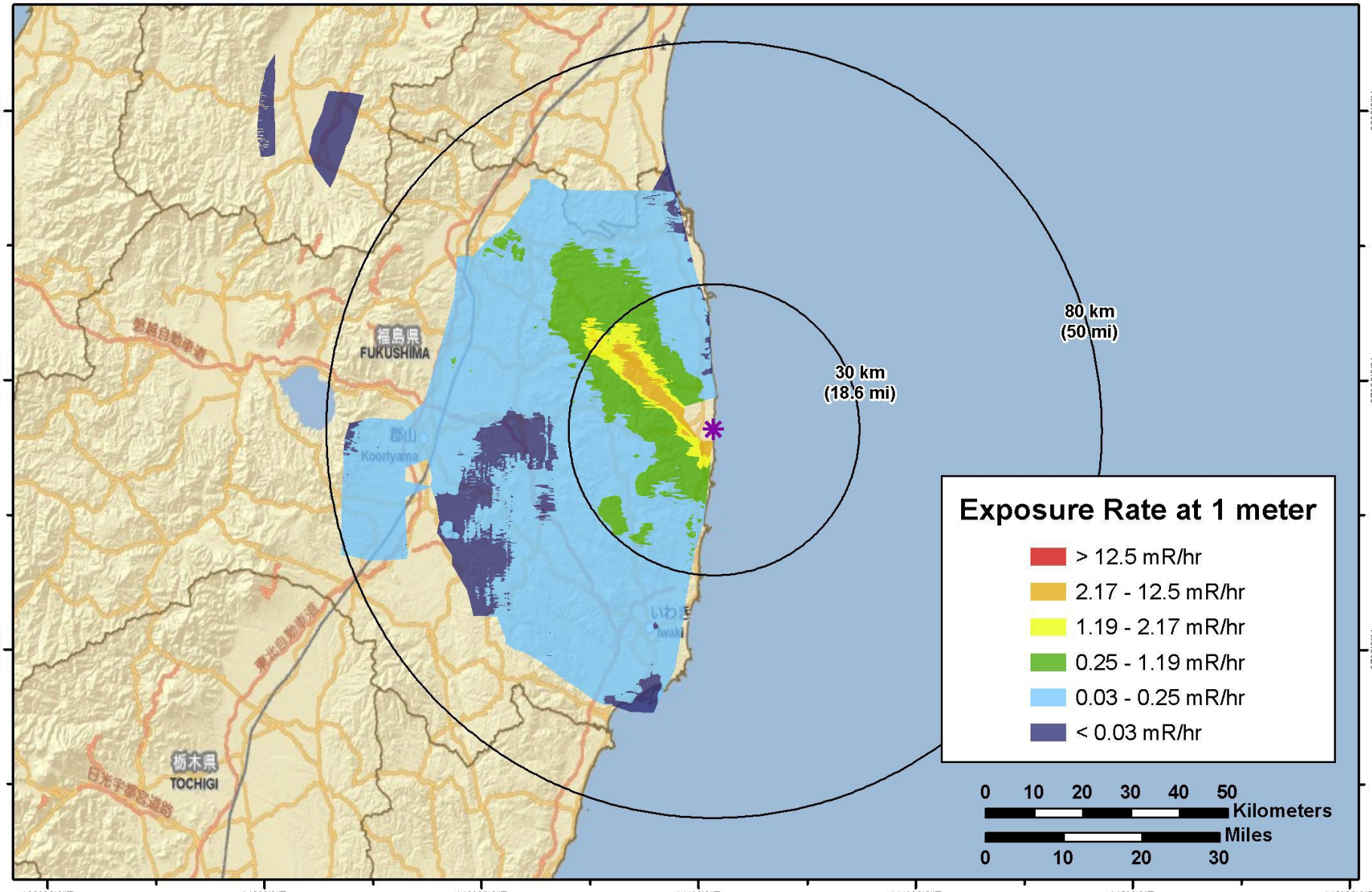
JAPAN



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National Nuclear Security Administration

Aerial Monitoring Survey Area

Overview of Aerial Monitoring Contoured Results (4/18-04/29 2011)

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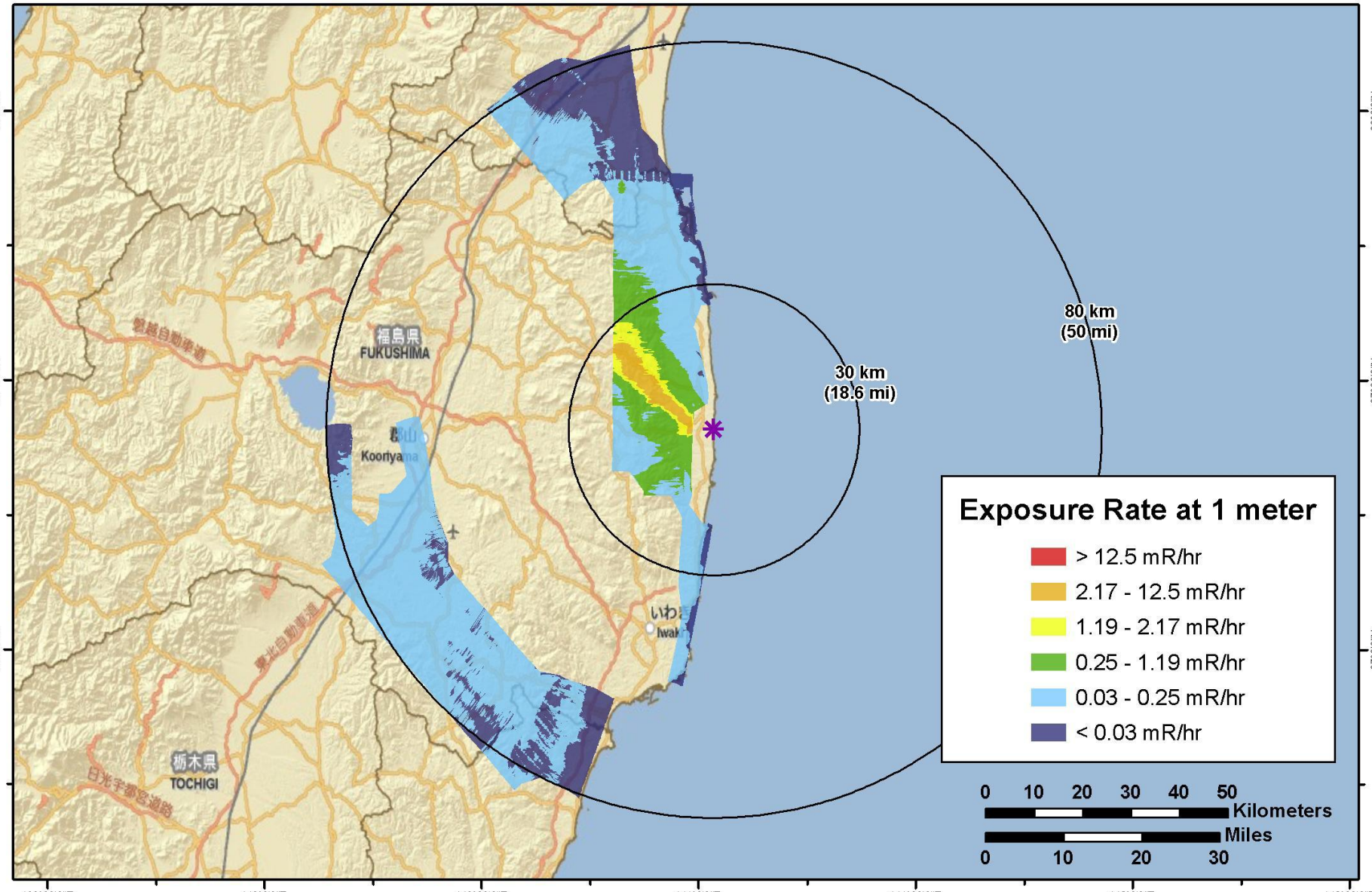

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Nuclear Incident Team DOE NIT
Contact (202) 586 - 8100

End State

- USFJ and GOJ to continue monitoring activities as needed
  - Japanese trained & equipped to fly DOE AMS
  - Japanese equipped with an enhanced laboratory analysis capability
  - DOE continues to support Japanese and USFJ from Consequence Management Home Team

Successes

- First time full compliment of DOE/NNSA CM capabilities deployed to a large scale nuclear emergency
- 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. Forged new relationships in a time of crisis.

Successes (cont'd)

- Liaison Officers proved important for information sharing and communication
- First time DOE/NNSA Nuclear Incident Team coordinated with White House and Senior DOE/NNSA Mgmt during a rad/nuc emergency.
- Using same vehicles each day allowed for some equipment to be stored overnight

U.S. DEPARTMENT OF ENERGY

NNSA

Challenges

- Unknown reactor status, source term along with chronic reactor releases
- Extended operations challenged several resource components
- Information tracking, data management and product prioritization proved challenging
- No mechanism to fund a Foreign Consequence Management mission

Challenges (cont'd)

- No formal policy for coordination of interagency roles and responsibilities concerning monitoring, assessment and product development
- Poor expectation for quality and timeliness of data products development and delivery
- Reevaluate process for packaging, shipping and tracking samples
- Situational awareness within DOE/NNSA

Challenges (cont'd)

- DOE/NNSA was considered DOE and the NIT was considered the one-stop shop without total knowledge
- Resource coordination by private sector with the Inter-agency and Intra-agency