Recent Developments in Field Response for Mitigation of Radiological Incidents

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RECOVERY CONTINUUM – DESCRIPTION OF ACTIVITIES BY PHASE

- PREPAREDNESS
  - ONGOING

- DISASTER

- SHORT-TERM
  - DAYS

- INTERMEDIATE
  - WEEKS-MONTHS

- LONG-TERM
  - MONTHS-YEARS

NATIONAL RESPONSE FRAMEWORK (NRF)
NATIONAL DISASTER RECOVERY FRAMEWORK (NDRF)

SIZE AND SCOPE OF DISASTER AND RECOVERY EFFORTS
Aftermath of an incident with an RDD
The Intermediate and Late Phase

• What is the next step for cleanup and recovery after immediate phase of an RDD incident?
• When can the public get back to their homes or place of business?
• When can you open critical infrastructures (i.e., hospitals, healthcare facilities)
• Transportation and Access routes. What roads, bridges or side walks can be used? When can they be released?
• Personal property and waste management
• Food consumption at the different phases of an event.
• Can we develop a series of operational guidelines that can help us answer the questions above.
• Determine at what point we can say contamination levels from an RDD are lower than the PAG limits.
Role of Operational Guidelines

• **Protective Actions**  Activities that should be conducted in response to an RDD to reduce or eliminate exposure of the public to radiation or other hazards.

• **Protective Action Guides (PAGs)**  A projected dose to a reference individual, from an accidental or deliberate release of radioactive material, at which a specific protective action to reduce or avoid that dose is recommended.

• **Operational Guidelines**  Pre-derived levels of radiation that can be compared to field radiation measurements to quickly determine if PAGs are exceeded and actions for protection of the public need to be implemented.
The OGT Manual

History

- Fiscal Year 2003 appropriations language directed DOE “to develop standards for the cleanup of contamination resulting from a potential RDD event.”

- Operational Guidelines Task Group (OGT), established in 2003


  - OGT Manual was published in 2009 by DOE with technical support by Argonne National Labs

  - Used in numerous exercises within State and Federal Levels and real world scenarios (Fukushima).

  - Currently under revision by the OG Working Group established by DOE through the Interagency Steering Committee on Radiation Standards (ISCORS)

- OGT manual provides guidelines on which actions to take in order to protect responders and the public, based on field measurements, source and the DHS PAG values during the different phases of an emergency response to an RDD.
- OGT Manual is a complement to DHS/FEMA PAGs for RDDs/INDs published 2008
- Available for use and comment: February 2009

RESRAD-RDD software

- Companion assistance tool for implementing operational guidelines.
- Allows for calculation of incident-specific operational guidelines.
Development

- Eleven radionuclides (Am-241, Cf-252, Cm-244, Co-60, Cs-137, Ir-192, Po-210, Pu-238, Pu-239, Ra-226, and Sr-90)
- Calculates dose-to-source (DSRs) (e.g., mrem/yr per pCi/m²) to identify critical scenario
- DSRs for critical scenario applied to applicable DHS PAGS to obtain guidelines
- Produce operational guidelines in form of look-up tables
OGT Manual and RESRAD-RDD
- Are a planning tool
- Potential users should become familiar with the manual and software before an event
- Use in exercises to learn how the tool can be used to support decisions.

Products currently available through the OGT Web Site
## Protective Action Guides (PAGs)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Protective Action</th>
<th>Protective Action Guide (PAG)</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Interim EPA PAGs</strong></td>
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<tr>
<td>Early</td>
<td>Limit Worker Exposure</td>
<td>5 rem (50 mSv)</td>
</tr>
<tr>
<td></td>
<td>Shelter/evacuation of Public</td>
<td>1 to 5 rem (10 to 50 mSv)</td>
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<tr>
<td></td>
<td>Administration of Prophylactic Drugs (KI)</td>
<td>5 rem (50 mSv) projected Child Dose from radioactive radioiodine</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Limit Worker Exposure</td>
<td>5 rem (50 mSv)</td>
</tr>
<tr>
<td></td>
<td>Relocation of Public</td>
<td>2 rem (20 mSv) -1st Yr 0.5 rem (5 mSv)-Subsequent Yrs</td>
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<tr>
<td></td>
<td>Food Interdiction</td>
<td>0.5 rem (5 mSv) /yr or 5 rem(50 mSv)/yr to any organ</td>
</tr>
<tr>
<td></td>
<td>Drinking Water</td>
<td>Not Included yet</td>
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<tr>
<td></td>
<td>Reentry</td>
<td>Operational Guidelines (OGT)-Stay times and concentrations</td>
</tr>
<tr>
<td>Late</td>
<td>Cleanup Actions</td>
<td>Brief description of planning process</td>
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</tbody>
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## Operational Guideline Groups

### Early Phase

<table>
<thead>
<tr>
<th>Groups</th>
<th>Subgroups</th>
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</thead>
</table>
| A. Access Controls During Emergency Response | (1) Life and property-saving measures  
(2) Emergency worker demarcation  
(3) Stay time tables |
| B. Early Phase Protective Actions | (1) Evacuation  
(2) Sheltering |
## Operational Guideline Groups

### Intermediate Phase

<table>
<thead>
<tr>
<th>Groups</th>
<th>Subgroups</th>
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</table>
| C. Critical Infrastructure Utilization in Relocation Areas | (1) Residential areas  
(2) Commercial and industrial areas  
(3) Other areas such as parks & monuments  
(4) Hospitals and health care facilities  
(5) Critical transport facilities  
(6) Water and sewer facilities  
(7) Power and fuel facilities |
| D. Temporary Access to Relocation Areas for Essential Services | (1) Worker access to businesses for essential actions  
(2) Public access to residences for retrieval |
|                                                    | **Stay Times for Worker and Public Access** |
| E. Transportation and Access Routes                | (1) Bridges  
(2) Streets and thoroughfares  
(3) Sidewalks and walkways |
## Operational Guideline Groups

### Recovery Phase

<table>
<thead>
<tr>
<th>Groups</th>
<th>Subgroups</th>
</tr>
</thead>
</table>
| **F. Release of Property from Radiologically Controlled Areas** | (1) Personal property except wastes  
(2) Waste  
(3) Hazardous waste  
(4) Lands and buildings |
| **G. Food Consumption**                      | (1) Derived Intervention Levels (early phase)  
(2) Soil Concentrations for crops in place  
(3) Soil Concentrations (intermediate phase) for growing new crops  
(4) Soil Concentrations (recovery phase) for land use restrictions |
Additional Scenarios Not Included in RESRAD-RDD

• Vehicle Release
  – Personal vehicles
  – Public vehicles

• Street Flushing and Vehicle Cleaning
  – Three destinations for the flushed contaminants – POTW, detention pond, or river

• These scenarios along with calculated DSRs and screening values are included in the OGT Operational Guidelines Manual, but currently are not included in the RESRAD-RDD software
Contamination Pathways and Routes of Exposure

- Inhalation and air submersion
- External radiation
- Ingestion
Use of OGT Exercises

- **EMPIRE 09 RDD Exercise**: Successful application of Operational Guidelines during (June 2009; Albany, NY)
- **Liberty RADEX**, National Tier 2 Full-Scale Radiological Dispersion Device Exercise (April 2010, Philadelphia, PA)
Use of OGT (cont...) Fukushima

- Cultivating rice after incident
- Traveling on Tohoku Shinkansen Train and Highways
- Seafood Consumption
Surface contamination near 68th St (Hunter College) and 77 St metros

Cs-137
10-100 uCi/m² (1E7-1E8 pCi/m²) in outside perimeter (Light purple region)
Develop operational guidelines based on the new 2013 Interim PAGs (or Final PAGs)

Address comments and lessons learned from review and use (exercises and Fukushima).

Update to address INDs, nuclear incidents and RDDs

Increase number of radionuclides from 11 to 55+

Ensure consistency with methodologies from Federal Radiological Monitoring and Assessment Center (FRMAC)

Upgrade dose coefficients based on 2010 US Census

Apply current state of science in radiation protection, appropriate for addressing RDDs and INDs

Include additional scenarios currently not included in RESRAD-RDD: vehicle release, street flushing and vehicle cleaning, airports, shore ports, Etc

Project a final OG Manual within next 2 years
Questions