Group 2: Response

Co-chairs: *Dr. Walter Bach, Army Research Office*

Mr. Paul Bryant, Insurance and Mitigation Division, FEMA

Rapporteurs: *Mr. Thomas Fraim, Office of the Federal Coordinator for Meteorology*

Dr. Jason Ching, Air Quality Modeling Group, EPA

Introduction

Breakout Group 1 considered what is required during the response phase of a crisis involving four scenarios. These are not only actions to be taken but also modeling requirements. The scenarios were a surface release of Sarin in an urban setting, explosion of a "dirty nuke", aircraft impact with a nuclear power plant facility, and the airborne release of anthrax. The timeframe for the response phase was defined to start at the time of the incident and extend through thirty-six hours. The actions and requirements for each scenario were prioritized as high, medium, or low.

Results

Scenario 1 – Urban Sarin Release

It was noted that this is really a multi-scale problem and although a CFD type model may be required initially, as time goes on it will also become a regional scale problem requiring a different type model.

Criterion	Priority
Model the source characteristics correctly.	H
Trained personnel in source mitigation.	H
Model must be capable of handling a pooled surface source and account for various surface characteristics affecting evaporation, etc.	H
Model must incorporate micrometeorology in its interaction with the geometry and physical properties of the surface.	H
CFD type model with space resolution on the order of a meter or less and time resolution on the order of 60 seconds or less.	H
Capable of modeling the hazard to 10 km and the meteorology to 100 km.	H
Need for trained response personnel.	M

Scenario 2 – Dirty Nuke

The group felt that this would be a short-term problem given fairly large particulate matter that deposits fairly quickly, although resuspension may be a consideration. The emphasis will likely be on now-casting and immediate evacuation. It was noted that a probabilistic approach might be more appropriate than a binary yes/no approach.

Criterion	Priority
Source location and characterization.	H
Wind speed and direction.	H
Deposition (knowledge of particle size required).	H
Current and forecast precipitation and resulting spread of material by hydrologic processes.	H
Model must run quickly; i.e., fairly simple model with basic inputs.	H
Knowledge of wind variability.	M
Model should account for resuspension.	M
Building morphology and terrain	L

Scenario 3 – Nuclear Power Plant Attack

Criterion	Priority
May not have an immediate release of radioactive material, so the model should be fairly fast. This would allow running "what if" scenarios before an actual release.	H
Model should account for a time variant source term.	H
Event will be long range and long duration so model must be capable of handling out to continental scale and larger.	H
Model should be able to ingest observed and forecast weather on almost a continuous basis.	H
Model should account for radiological decay and wet/dry deposition.	H
Need a good GIS mapping capability.	H
Buoyancy/plume rise.	M
Land use.	M
Building wake effects.	L

Other issues brought up deal with coastal/lake effects and the re-circulation problem; installation of meso-nets around power plants; and the capability to run different dispersion modules similar to an ensemble approach.

Scenario 4 – Crop Duster - Anthrax

Criterion	Priority
Source characterization; e.g., release time and height, virility of material, UV interaction.	H
Model must handle small mesoscale resolution and ranges out to 100+ km.	H
Good GIS mapping capability.	H
Model must handle multiple time scales.	H
Should be able to quantify uncertainty.	H
Model should be capable of continual updating and reanalysis.	H

Common themes across all four scenarios deal were source characterization, multiple time and space scales, and multiple scales for observed and forecast meteorology inputs. A point brought up during the plenary session was that a probabilistic approach (quantify the uncertainty) may be more beneficial to the decision-maker than strictly a binary yes/no approach. Also, given the multiple time and space scales involved with the dispersion problem, we should take a systems approach. Rather than considering just a dispersion model, consider a system that may in fact have several dispersion modules each capable of dealing with different scales, sources, types of dispersion, etc.