

*DOE Operational User Requirements and Dispersion  
Modeling Capabilities*

*DOE Chemical & Biological Nonproliferation Program:  
Modeling and Prediction*

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Workshop on  
Multi-scale Atmospheric Dispersion Modeling  
within the Federal Community

June 6–8, 2000

## DOE Dispersion Modeling Operational Activities

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- **Facility Safety Analysis**
  - Determine potential consequences of a facility before construction or modification; use during operation for risk assessment
  
- **Facility Emergency Preparedness and Response**
  - Develop hazard assessments, emergency action levels, and modeling systems to use in emergency response
  
- **Deployable Assets for Emergency Response (ARG, FRMAC, NEST, JTOT)**
  - Resources to protect public from major radiological accidents and terrorist events
  
- **Facility Annual Environmental Reporting**
  - Document exposure to public from routine operations

## DOE Dispersion Modeling Operational Activities

Activity - Description	Authority or Requirement	Guidance	Dispersion Modeling Approach
Facility Safety Analysis	DCE Order 548.0.23 (1997), NRC NUREG-1320 (1988) & CFR-64.10 (1998)	DOE-STD-1027-92 & 3009-94, DOE-HDBK-3010-94, NRC Reg. Guide 1.145 (1983), Accident Analysis Guidebook (2000), Accident Phenomenology & Consequence (APAC) Working Group Reports (1997-2000)	Graded approach – Model complexity commensurate with complexity or scale of effect, i.e., simple Gaussian to complex 3-D numerical codes
Facility Emergency Preparedness & Response	DCE Order 151.1 (1997, currently under revision)	DCE Guide 151.1 (1997, currently under revision), DCE Modeling Resources (1995)	Graded approach – Model complexity commensurate with complexity or scale of effect, i.e., simple Gaussian to complex 3-D numerical codes
Deployable Assets for Emergency Response (ARG, FFMAC, NEST, JTOT)	Federal Response Plan (FRP, 1995), Presidential Decision Directive 39 (PDD 39, 1995)	Federal Radiological Emergency Response Plan (FRERP, 1996), Overview of FFMAC Operations (2000), DoD Nuclear Weapons Accident Response Procedures (NAFP, 1995)	Graded approach – Deployed teams use local models in the field and reach back to NARAC models
Facility Annual Environmental Reporting	DCE Orders 540.0.1 & 231.1, CERCLA, SARA Title III, Nat'l. Emission Stds. for Haz. Air Pollutants (NESHAPS) 40 CFR 61	EPA Model Guideline	EPA annual model

## DOE Dispersion Models Used Within DOE

Activity	Technical Forums	Dispersion Models Used	
Facility Safety Analysis	DCE Energy Facility Contractors Group Safety Analysis Working Group (EFCOG SAWG) <a href="http://www.sawg2000.org">www.sawg2000.org</a>	Radiological models: AI-RISK AXAIR89Q BNLGPM COSYMA ERAD ETMOD GENII	Chemical models: ADAM ALOHA CALPUFF CASRAM FEM3 HGSyst em INPUFF SLAB SCIFUFF TSCREEN
Facility Emergency Preparedness & Response	DCE Emergency Management Issues Special Interest Group (EMI SIG) <a href="http://www.orau.gov/emi/">http://www.orau.gov/emi/</a>  DCE Subcommittee on Consequence Assessment and Protective Actions (SCAPA) <a href="http://www.scapa.bnl.gov/">http://www.scapa.bnl.gov/</a>	ALOHA (NOAA; National Safety Council) CAPARS (Hodgin, AlphaTrac) Epicode (Homann Associates) ERAD (Boughton, Sandia Natl Lab) HOTSPOT (Homann, LLNL) MDIF-VIS (NOAA ARL, INEEL) MIDAS (PLG) NARAC - ADAPT/LODI (Sugiyama & Nasstrom, LLNL) PGEMS (Allwine, PNNL) WINDS (Savannah River Lab)	
Deployable Assets for Emergency Response (ARG, FRMAC, NEST, JTOT)	ARG, FRMAC, NEST, JTOT Working Groups <a href="http://www.dp.doe.gov/emergencyresponse/">http://www.dp.doe.gov/emergencyresponse/</a> <a href="http://www.nv.doe.gov/programs/frmac/">http://www.nv.doe.gov/programs/frmac/</a>	Local models used in the field: HOTSPOT, ERAD Reach back to NARAC models: ADAPT/LODI	
Facility Annual Environmental Reporting	EPA SCRAM & Modeling Conferences <a href="http://www.epa.gov/scram001/">http://www.epa.gov/scram001/</a>	CAP-88	

# DOE Dispersion Modeling Capabilities Graded Approach

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## Hotspot Health Physics Codes

Deployed to emergency response personnel

## SNL Atmospheric Dispersion and Consequence Prediction Capability

Deployed with expert atmospheric dispersion scientist

## LLNL National Atmospheric Release Advisory Center (NARAC)

Reach-back to national center with expert assessment staff

**DOE CBNP**  
**Modeling and Prediction**

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**Chem-Bio Transport and Fate  
in Urban Environments**

Argonne National Laboratory  
Lawrence Berkeley National Laboratory  
Lawrence Livermore National Laboratory  
Los Alamos National Laboratory  
Pacific Northwest National Laboratory  
Sandia National Laboratories

Department of Energy  
Chemical & Biological Nonproliferation Program



# Goal Modeling and Prediction

**Building  
Interiors**



**Subway**



“...to accurately predict the dispersion and ultimate fate of chemical and biological agents released into the urban environment...”

**Multiple Interacting Scales**

**Urban-Regional**



**Exterior Building**



Counterterrorism Incident Response in  
Urban Areas and at Special Events