Idaho Cleanup Project

Impacts on ICP Dose Consequence Analyses as a Result of the Switch from the RSAC-6 to MACCS2 Computer

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Introduction

- RSAC-6 is the dispersion and dose computer code that has been used in the past to support the documented safety analyses at the Idaho National Laboratory.
- In the summer of 2006 CH2M-WGI, Idaho was instructed by DOE-ID to use the MACCS2 computer code for all new consequence analysis calculations.
- All consequence analysis calculations for existing SARs were redone during the annual updates.

DOE Tool Box

- **MACCS2 is one of six codes currently designated for the DOE Safety Software Toolbox**
- **Safety analysis software was designated for the DOE "toolbox" by the DOE in March 2003**
- **Other codes, including RSAC-6, were screened out in the initial consideration because of two primary reasons:**
  - Multiple site use
  - Meets applicable requirements
- **The primary reason for not including RSAC-6 in the initial toolbox designation process was that it was not used for safety basis purposes outside of the Idaho National Laboratory**

RSAC-6 Input Parameters

- **Gaussian Plume Model, using Hilsmeier-Gifford or Markee dispersion models**
  - Hilsmeier-Gifford for releases < 15 min
  - Markee for release > 15 min
- **Assumed a wind speed of 1.04 m/s and stability class F (from Einerson 1994)**
- **Assumed dry deposition (0.1 m/s)**
- **No surface roughness calculation included in RSAC-6**
- **RSAC-6 uses FGR-11/-12 dose conversion factors**

MACCS2 Input Parameters

- Gaussian Plume Model using Tadmor-Gur fit to the Pasquill-Gifford curves for dispersion modelling
- Assumed various releases (3 min to 1 hour)
- Used 2005 hourly weather data to statistically determine the 95% confidence value
- Assumed dry deposition (1 m/s)
- A surface roughness of 10 cm was used for offsite calculations
- ICRP 68/72 dose conversion factors

Shared Input Parameters

- Non-bouyant ground release
- No building wake effects
- Assumed rate of 3.33 x 10-4 cubic meters per second
- No shielding is assumed
- Downwind receptors at 100 meters and nearest site boundary to the RWMC (6 km)

Results

- **100 m Dose***
  - RSAC-6 Hilsmeier-Gifford (<15 min release), 1.0
  - RSAC-6 Markee (> 10 min release), 0.13
  - MACCS2 (3 min release), 0.18
  - MACCS2 (15 min release), 0.17
  - MACCS2 (60 min release), 0.13

* Doses normalized to highest numerical value obtained

Results (continued)

- **Nearest Site Boundary Dose***
  - RSAC-6 Hilsmeier-Gifford (<15 min release), 1.0
  - RSAC-6 Markee (> 10 min release), 0.73
  - MACCS2 (3 min release), 0.09
  - MACCS2 (15 min release), 0.08
  - MACCS2 (60 min release), 0.06

* Doses normalized to highest numerical value obtained

Summary

- For the co-located worker, the calculated doses for longer term releases using either program result in approximately the same dose
- The use of a more conservative deposition velocity and dose conversion factors in the RSAC-6 code runs is counteracted by the more conservative dispersion coefficients generated by the MACCS2 program
- For co-located worker short term releases and for all NSB releases, all doses calculated with RSAC-6 are conservative compared to those obtained with MACCS2