

From: David Brown *NMB*
To: Jay Henson; Richard Gibson
Date: Fri, Jan 30, 2004 11:40 AM
Subject: Fwd: Re: Release Calculations

Richard,

My analysis is attached. The RASCAL model results are in good agreement with the Illinois sampler results. Any difference should be attributed the uncertainty associated with this type of modeling. I have asked someone to peer review my results. I'll let you know if something changes.

Dave

Dave *12*

>>> Richard Gibson 01/30/04 08:24AM >>>

Bill and David

We are still interested in the numbers crunched by RASCAL. The State of Illinois provided us with some resonable data from two locations at the site. Station 1 at the Metropolis Airport 1 mile from the plant and Station 2 approximately 0.25 mile from the plant across US-45.

Their results were as such: Gross Alpha for Station 1 was 295 fCi/m3 and at Station 2 was 833fCi/m3. 1 E -12 uCi/ml is equal to 1000 fCi/m3.

They went on to say that in order to estimate the uranium concentration during the release, it is necessary to know the length of time that the uranium concentration was elevated. Lacking further information, they assumed the concentrations at Station 2 were elevated for 1 hour. Assume that the sample at Station 2 was exposed to the median concentration of 8.5 fCi/m3 for 139 hours and an unknown concentration, C for 1 hour. For the average of the 140 hours to be 833 fCi/m3 then, $C = 1.2 \text{ E } 5 \text{ fCi/m3}$. With the information you've got from Honeywell and this info, can you plug it into the RASCAL model for 7 pounds of UF6 release?

Contact Jay Henson or myself with the results.

Jay at 404-562-4731

Richard at 404-562-4718

Thanks

>>> David Brown 01/14/04 08:53AM >>>

Bill,

I find that the air sampler results may be consistent with the RASCAL model, assuming the samples were collected over a short duration within a few hours of the release. However, I would need the data validation package for each result, and the information I requested earlier, to complete the comparison. For an acute release like this, the sample results are dependent on the sample collection period and sampler flow rate.

However, assuming a 60 liter per minute sampler flow (2 cfm) and a 4 hour sample, the sample results are in good agreement with the model.

>>> W Troskoski 01/13/04 08:13AM >>>

Region II info on the Honeywell release. Please look at it and check their numbers.

Thanks,

D. L. NMB

Bill

CC: Merritt Baker; W Troskoski

NRC Staff Evaluation of Downwind Airborne Concentrations of Uranium Following the December 22, 2003 Event at the Honeywell Plant

Introduction

Staff used a radiological consequence assessment code, RASCAL 3.0.3, to estimate a probable 1-hour maximum downwind concentration of uranium following a release at the Honeywell Plant in Metropolis, IL on December 22, 2003. RASCAL does not directly provide a maximum 1-hour downwind concentration of uranium following a uranium hexafluoride release. The maximum 1-hour value must be hand-calculated from the "uranium exposure," a value which represents the total time-integrated concentration throughout the duration of the event.

Event description

On December 22, 2003, at 2:25 am CST, a release of 7 pounds (3 kilograms) of uranium hexafluoride occurred from a vent approximately 86 feet above the ground. The licensee has provided information that winds were from the SSE direction at approximately 6.2 mph at the time of the event. Staff evaluated weather data from the nearby Paducah, KY airport and find that this information supports the estimate of wind direction and intensity provided by the licensee. Staff also used the dew point measurements from the Paducah, KY airport to estimate downwind uranium concentrations during the event.

The licensee indicated that the event lasted approximately 45 minutes. Therefore, staff evaluated downwind concentrations assuming that the uranium hexafluoride source term was 3 kilograms in 2700 seconds, or about 0.001 kg/s. The uranium enrichment was assumed to be 0.7% ^{235}U .

Estimates of Downwind Uranium Concentration

At a distance of 0.25 mile NNE, which is the location of the Illinois Emergency Management Agency, Bureau of Environmental Safety, low-volume air sampler Station 02, RASCAL predicts a uranium exposure of 0.08 g-s/m³. For a 45 minute release, this corresponds to a maximum uranium air concentration of approximately 1.5×10^{-4} g/m³. For natural uranium (0.7% ^{235}U), this corresponds to approximately 20,000 fCi/m³ of gross alpha radioactivity.

The value predicted by the IEMA for an 1-hour maximum concentrations was approximately 120,000 fCi/m³ at Station 02. This is in good agreement with results predicted by RASCAL of 20,000 fCi/m³ of gross alpha radioactivity.

At a distance of 1 mile NNE, the location of the IEMA low-volume air sampler Station 01 at the airport, RASCAL predicts a uranium exposure of 0.12 g-s/m³. For a 45 minute release, this corresponds to a maximum air concentration of approximately 4.5×10^{-5} g/m³ of uranium. For natural uranium (0.7% ^{235}U), this corresponds to approximately 6,000 fCi/m³ of gross alpha radioactivity.

Though the IEMA did not explicitly provide the estimate for the 1-hour maximum concentrations at Station 01, the data provided by IEMA can be used to estimate a maximum 1-hour concentration of 40,000 fCi/m³. The value predicted by RASCAL of approximately 6,000 fCi/m³ of gross alpha radioactivity for Station 01 is in good agreement with the estimate based on measurements made by the IEMA.

Given the large amount of uncertainty associated with many of the factors which are used to calculate atmospheric dispersion of short term releases, differences of less than a factor of ten between sample results and model predictions represent good agreement between the two methods.