RASCAL Change Log: Version v4.2

Released Date October 31, 2011

- **Reactor Events (Source Term to Dose Model, STDose):**
  - The STDose Startup Options menu has been renamed to Settings. Then, the capability to set the default analyst name and ICRP inhalation dose factor option were added to this settings screen.
  - Resolved a problem where the calculations could not be started in STDose. This was limited to cases where an error in meteorology had occurred first (such as a time mismatch) and was limited to the following source term types: material in a fire, U fire, and U explosion.
  - Added code to prevent spray release events from occurring before the start of core damage.

- **Spent Fuel Pool Events (Source Term to Dose Model, STDose):**
  - Resolved an issue where the spent fuel uncovered source term did not correctly terminate at 24 hours as designed. The code was not correctly tracking the duration of the release and failed to recognize that it should terminate.
  - Added a description of the end of release to the atmosphere and the leak rate to the case summary for the spent fuel pool drained release pathway definition.
  - Resolved the problem where spent fuel pool uncovered exactly 2 hour generated a source term (should be no source term).

- **UF6 Events (Source Term to Dose Model, STDose):**
  - Updated the ERPG levels for HF used with UF6 releases to match the AIHA 2011 guidance.
  - Resolved the issue of missing headers in UF6Plume model footprint displays.
  - Added pressure and humidity to the met summary for UF6 releases.
  - Resolved the problem that could cause a crash when trying to use zero amount of UF6 as release inventory.

- **Atmospheric Transport and Dispersion Models:**
  - Resolved an issue where plume model doses beyond ~ 4 miles were dropping off too quickly. In cases large releases where PAGs were exceeded to 50 miles, the plume values were seen to drop below the PAG. The plume thickness used for the uniformly mixed plume was too low, resulting in rapid depletion of the plume when the plume became uniformly mixed.
  - Resolved an issue where the model crashed when trying to do very long calculations (e.g. 48 hours) with large release rates (e.g. total containment failure). The source term model was not setting the isotopic source terms to zero when the containment inventory became extremely small (<10**-20 Ci). This caused the transport and diffusion puff model that calculates to the longer distances (10/25/50 mi) to have numerical underflow problems with the long calculation durations for isotopes that have small initial inventories, decay rapidly, or are all released before the end of the simulation.
  - Resolved an issue where the results from the UF6 plume calculation were changing with no change in inputs. An initialization problem in the UF6 plume model in some conditions has been corrected.

- **Meteorological Data Handling:**
  - Resolved the issue where a problem where meteorological datasets for sites not in the RASCAL facility database could not be modified. For sites not in the RASCAL database (e.g. Fukushima), a user could create but not edit meteorological datasets.
  - Resolved the issues related to the use of climatological and default temperature and humidity in preparing meteorological data files for UF6 plume modeling.
  - The dose conversion factors used in RASCAL have been updated with values from DCFPAK2 (Eckerman, ORNL). This package provides updates to the DCFs in FGR-11 and FGR-12. In addition, the half-life data used in RASCAL has been updated from DCFPAK2 as well.
  - Resolved a problem where an incorrect deposition pattern was seen when following a run using calm conditions with one using windy conditions.
  - Resolved the issue with UTC offset display and usage in the meteorological data processor.
  - Corrected the code used for estimating mixing heights from climatological data.
  - Resolved the problem where meteorological data processor reversed the labels for air pressure units when using “in Hg” (were shown as “mm Hg”).
  - Displays a warning to the user when calculations will be using calm conditions.
  - Displays a warning to the user when a wind shift greater than 90 degrees in one step is encountered.
  - Updated the mixing heights in the predefined met datasets for the 4 unstable cases to reflect newer methods.
  - Resolved a problem where an incorrect deposition pattern could be seen when following a run using calm conditions with one using windy conditions. There were initialization problems in the plume model section dealing with calms.
  - Limits the met data shown in the STDose case summary to only what is used in the calculations.
  - Resolved an issue where the user could not edit the meteorology when trying to load a v4.2 case that used actual meteorology.

- **Calculations Results (Source Term to Dose, Field Measurements to Dose):**
  - Both the Source Term to Dose and the Field Measurement to Dose models now include an option to allow the use of ICRP-60 dose conversion factors in the calculation of the effective inhalation and thyroid doses. The default setting is to use ICRP-26, the current NRC standard.
  - The Field Measurement to Dose model has been updated in several areas. For the intermediate phase calculations, the improved re-suspension model from Maxwell/Anspaugh has been added. Also, a TEDE remainder dose based on a delay before return has been added. The DRL calculations have been expanded to include a delay before return up to 40 years. The early-phase dose calculations have been expanded to cover a 96 hour period with both plume passage and the post-plume components.
  - Changed the initial resuspension factor in FMDose to 1.00e-5 to support the new Maxwell/Anspaugh model.
  - Resolved an issue where the source term reported went longer than the calculations. The doses were being calculated correctly. If the calculations ended before the release, the source term displayed and exported could be too long.
  - The options for the display of the radionuclide mix on the ground surface have been updated. First, there is no longer a cutoff based on activity concentration. Now all the radionuclides can be seen. The option to display sorted by contribution to groundshine has been changed to show up to 20

nuclides (up from 10). Finally, the option that previous just showed only the top 10 by activity concentration now sorts by contribution to inhalation CEDE and displays up to 20 radionuclides.
- Fixed the decay chain data files to correct errors in decay chains for some isotopes that are not found in reactor source terms.
- Updated the DCFs in the nuclide database to show a blank if there is no value in the source material rather than showing a zero. Still use 0.0 in the calculations.
- Updated the nuclide names in the database to eliminate the 'a' and 'b' versions. They are replaced by the appropriate nuclide names from DCFPAK2.
- Removed the SI Wall - 4day Inh dose conversion factors from the nuclide database; they were not being used.
- The model user interfaces have been updated to gather and display more information about the scenarios being modeled. Both the STDose and FMDose models have a field for capturing the analyst name. STDose also includes a field where up to 600 characters can be used to describe the scenario.

- **Updates to RASCAL Facility Database and Site Data:**
  - Incorporated the power uprates approved since the release of RASCAL 4.2: Calvert Cliffs 1 & 2, LaSalle 1 & 2, Harris, Limerick 1 & 2, Nine Mile Point 2, North Anna 1 & 2, Point Beach 1 & 2, Prairie Island 1 & 2, and Surry 1 & 2.
  - Updated functions that load and save parameters for sites not in database.
  - Resolved the issue with ORNL and INEEL sites not working with precipitation.
  - Added over 80 new weather stations to the facility database.
  - Updated the population data in the facility database to 2010 Census values.
  - Corrected typos and updated values in the facility help file and facility database.

- **Other Fixes and Updates:**
  - Corrected an issue with units labeling when printing the source term details using SI units.
  - Modified all the help files to fix a problem with the "search" function not working.
  - Fixed a problem where the detailed results numeric displays could lose their distance labels.
  - Updated the validation of user inputs to correctly handle cases where the user tries to proceed with a needed input field blank.
  - Removed the Print Setup option from the File menu. No longer needed.
  - When printing the STDose maximum dose values, only outputs one set of notes, saving on space.