

Develop and maintain analytical tools for staff risk applications
RES/DRA

The NRC has developed and maintains the SAPHIRE (Systems Analysis Programs for Hands-on Integrated Reliability Evaluation) computer code for performing probabilistic risk analyses (PRAs). SAPHIRE offers state-of-the-art capability for assessing the risk associated with core damage frequency (Level 1 PRA) and the risk from containment performance and radioactive releases (Level 2 PRA). SAPHIRE supports the agency's risk-informed activities, which include the Standardized Plant Analysis Risk (SPAR) model development plan, the risk assessment standardization project, the Significance Determination Process (SDP), risk-informing Part 50, vulnerability assessment, advanced reactors, operational experience, generic issues, and regulatory backfit.

The staff continues to maintain and improve the SAPHIRE version 8 software. The software is repeatedly reviewed and tested for the purposes of making it more efficient, bug free, and maintainable. Many of the software bug fixes and modifications are developed in response to user requests, and user feedback will continue to be addressed. All SAPHIRE version 8 maintenance activities, modifications and improvements are performed in accordance with the documented SAPHIRE software quality assurance practices. The NRC will perform periodic audits of the developers' implementation of these practices against the requirement of NUREG/BR-0167, *Software Quality Assurance Program and Guidelines*.

New features and capabilities have been implemented in SAPHIRE version 8 to better support NRC regulatory activities. SAPHIRE version 8 has been modified to run on multi-core (multiple processors internal to a single computer) computers. The effective use of multi-core computers has decreased the overall analysis time needed to quantify SPAR model results. SAPHIRE version 8 has also been modified to better support its use in SDP Phase 2 analyses and inspection planning activities. SAPHIRE version 8 now includes user-friendly links to SPAR model documentation and new risk insights reports, which summarize plants' risk information for NRC resident inspectors. The staff has also provided training on SAPHIRE version 8 to those resident inspectors that are participating in the piloting of a proposed new process for SDP Phase 2 analyses using SPAR models.

Companion documentation for the SAPHIRE version 8 software has been published as NUREG/CR-7039, Volumes 1 through 7. The documentation includes an overview of SAPHIRE version 8 features, a tutorial, a users' guide, and a technical reference. The completion of the SAPHIRE version 8 documentation provides a valuable resource for the users of the software.

Selected Major Milestones and Schedules				
Major Milestones	Original Target Date	Revised Date	Completion Date	NRC Responsibility
Complete SAPHIRE 8 for general release.	April 2010		April 2010	RES/DRA
Release an updated	January	May 2011	May 2011	RES/DRA

version of SAPHIRE 8	2011			
Provide SAPHIRE 8 training to resident inspectors supporting pilot of proposed new process for SDP Phase 2 evaluations.	June 2011		June 2011	RES/DRA
Publish companion documentation for SAPHIRE 8, NUREG/CR-7039, Volumes 1 through 7.	January 2011	July 2011	July 2011	RES/DRA
Perform audit of software quality assurance implementation for SAPHIRE 8	December 2011			RES/DRA