January 15, 2003

MEMORANDUM TO: Gary Holahan, Director
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

FROM: Farouk Eltawila, Director ***Original signed by F. Eltawila***
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

SUBJECT: TRANSMITTAL OF SYMBOLIC NUCLEAR ANALYSIS PACKAGE (SNAP)

RES is making available a new version of the SNAP software. This version supports graphical construction of both RELAP5 and TRAC-M decks and subsequent export and use of such decks. A detailed summary of SNAP and its current capabilities is attached. Use of the software is expected to improve agency efficiency. The SNAP suite includes a powerful graphical user interface (GUI) that allows analysts running the RELAP5 and TRAC-M thermal-hydraulics codes to build models, submit codes runs, and view the output of code runs within a convenient graphical environment. We believe that by using SNAP the staff will be able to perform these common analysis tasks in significantly less time then before. A future version of SNAP expected to be released in March 2003, will support conversion of RELAP5 decks to TRAC-M decks.

SNAP is being made available through a password protected web-based distribution system allowing user to easily check for and receive code updates.

If you have any questions or suggestions regarding the SNAP code, please contact Chester Gingrich of my staff at 301-415-6780 or e-mail CGG.

Attachment: As stated

January 15, 2003

MEMORANDUM TO: Gary Holahan, Director
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

FROM: Farouk Eltawila, Director ***Original signed by F. Eltawila***
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

SUBJECT: TRANSMITTAL OF SYMBOLIC NUCLEAR ANALYSIS PACKAGE (SNAP)

SUBJECT: TRANSMITTAL OF SYMBOLIC NUCLEAR ANALYSIS PACKAGE (SNAP)

RES is making available a new version of the SNAP software. This version supports graphical construction of both RELAP5 and TRAC-M decks and subsequent export and use of such decks. A detailed summary of SNAP and its current capabilities is attached. Use of the software is expected to improve agency efficiency. The SNAP suite includes a powerful graphical user interface (GUI) that allows analysts running the RELAP5 and TRAC-M thermal-hydraulics codes to build models, submit codes runs, and view the output of code runs within a convenient graphical environment. We believe that by using SNAP the staff will be able to perform these common analysis tasks in significantly less time then before. A future version of SNAP expected to be released in March 2003, will support conversion of RELAP5 decks to TRAC-M decks.

SNAP is being made available through a password protected web-based distribution system allowing user to easily check for and receive code updates.

If you have any questions or suggestions regarding the SNAP code, please contact Chester Gingrich of my staff at 301-415-6780 or e-mail CGG.

Attachment: As stated

Distribution: SMSAB R/F DSARE R/F CAder PNorian

C:\ORPCheckout\FileNET\ML030150575.wpd

OAR in ADAMS? (Y or N) Y ADAMS ACCESSION NO.: ML030150575 TEMPLATE NO. RES-006
Publicly Available? (Y or N) Y DATE OF RELEASE TO PUBLIC _____ SENSITIVE? N
To receive a copy of this document, indicate in the box: "C" = Copy without enclosures **"E"** = Copy with enclosures **"N"** = No copy

OFFICE	SMSAB		C:SMSAB		D:DSARE	
NAME	CGingrich:mb		JRosenthal		FEltawila	
DATE	1/15/03*		1/15/03*		1/15/03*	

SNAP Overview and Current Capabilities

The SNAP (Symbolic Nuclear Analysis Package) is a graphical user interface system designed to support nuclear analysis codes. SNAP includes pre- and post- processor components allowing code specific models to be built, exported, submitted to the analysis code, then receiving the output from the analysis code and displaying the results in a user friendly fashion. SNAP is written primarily in JAVA, although some aspects of the post-processor component are written in C. SNAP is designed to be object oriented and extensible. Currently, SNAP supports the following NRC developed analytical codes: TRAC-M, RELAP5, and in part, CONTAIN. TRAC-M and RELAP5 are system level thermal hydraulic codes. CONTAIN is a code used to predict containment response and associated phenomena.

The following component applications make up SNAP:

1 Model Editor

The purpose of this application is to allow the analyst to create an input model (deck) using graphical tools. The Model Editor currently also has the ability to read and write RELAP5 ASCII decks and to read TRAC-M TPR decks, and write TRAC-M ASCII decks. A deck that is read in (imported) will be parsed into model editor component objects and displayed on the Model Editor's canvas. The analyst may then edit the model using the model editor graphical tools and export it for use later. Over the last year development on the Model Editor application includes:

- implementation of support for TRAC-M
- added undo/redo framework to support component editing
- re-work of all component dialogs and re-nodalization routines to support revised architecture
- added 3-D VEDA mask generator
- developed a vessel conversion wizard to assist in conversion of 1-D RELAP5 vessel models to 3-D TRAC-M vessel models

2 Execution Monitor

Application that manages the running of the analytical codes. A "wrapper" for the analytical codes that permits the other SNAP applications such as the model editor and VEDA to access and interact with the analytical codes as they are running. "Runtime" plugins (JAR files) are used to encapsulate this functionality for each code.

3 Configuration Tool

This tool is used to configure global options for the SNAP client applications. The Calculation and Database servers can also be configured and launched using this tool. This tool contains a separate panel for Global Options, the Calculation Server, and the Database Server. The Calculation Servers configuration allows the user to set up any number of analytical codes running locally or on remote servers. Database servers

configuration allows the user to specify connectivity to databases of results or experimental data.

4 Job status Tool

This tool is used to allow the user to see the current status of running analytical codes. Limited control over the running codes is also provided by this application.

5 VEDA - Visual Engineering Data Analysis Tool

This is the primary application for viewing the results of an analytical code run. Using this application the analyst may prepare a graphical "mask" that it can then use to display the results of the analytical code in a user friendly fashion. Both 2-D and 3-D masks are supported.

6 Crackle

This application is used to automatically generate a 3-D graphical mask suitable for use by VEDA. Currently this is only useful for the RELAP5 code. The SNAP Model Editor currently has a beta version of a 3-D VEDA mask generator that will soon replace the functionality of Crackle at which point Crackle will be removed from the SNAP suite of codes.

7 AcGrace

Currently, this is the only application in SNAP that is not written in JAVA. AcGrace is actually an open source application that was modified to read and plot data for several NRC sponsored analytical codes. AcGrace reads the files produced by the analytical codes and produces plots that can be saved as PDF, SVG, MIF, Postscript and several other formats suitable for publication applications.

8 SNAP Database Server

The SNAP Database Server provides a platform independent persistent store for models and system configuration information. The SNAP Database Server encapsulates a commercial relational database management system (RDBMS). This approach eliminates the dependence on a specific database vendor allowing the system to be easily tailored to site-specific requirements. The server has been tested with PostgreSQL, Oracle and Sybase RDBMS but can be easily adapted to most multi-user SQL-based relational database systems.

9 Admin. Tool

The SNAP system administrator manages the system configuration information contained in the database using an administrative tool. The tool provides the ability to create users, manage projects, assign privileges and manage system tables.

10 NRC Databank Server

The NRC Databank Server is similar in function to the Execution Monitor in that it provides a source of data to the post-processor with the difference being that it works with experimental data as opposed to calculations. The post-processor applications connect to the server to obtain the list of all experimental facilities, the list of experiments available for a given facility, and the list of data channels available for a given experiment. Multiplexed or de-multiplexed data sets can then be retrieved for a selected set of data channels and time ranges.

11 Calculation Archive Server

Calculations run on an Execution Monitor may be archived to the SNAP Archive server for long-term retention using the Job Status Tool. The post-processor applications may connect to this server to access archived data sets.

The TPR (Thermal-hydraulic Portable Restart) file format is used by TRAC-M to save snapshots of the model state during the numerical simulation. The SNAP model editor can read, display, and edit TRAC-M TPR files. The TPR file format is defined in an XML definition file. The XML definition for the TPR file format is used to automatically generate the TPR access method code for both the JAVA (SNAP model editor) and FORTRAN (TRAC-M) languages through the use of PibTool (PIB = platform independent binary, TPR files are readable on any computer platform). Therefore, to make a change to the TPR file format, one changes only the TPR XML definition file and uses PibTool to generate the JAVA and FORTRAN access libraries used by the SNAP model editor and the TRAC-M codes, respectively.

This version of SNAP is fully functional for the RELAP5 code allowing the user to:

(1) create or edit a RELAP5 model using a drag-n-drop approach,

(2) submit the RELAP5 model to a execution server (which may or may not reside on the users own machine),

(3) collect and display the output of the RELAP5 code in either a animated predefined graphical ‘mask’ or as simple plots suitable for inclusion in publications,

(4) use full restart capability of RELAP5, allowing the user to run sets of predefined sensitivity (or ‘restart’) scenarios on different base case models,

(5) save RELAP5 models in the new TRAC-M thermal-hydraulic portable restart (TPR) file format readable by the TRAC-M code (TRAC-M will eventually be able to run RELAP5 models).

This version of SNAP currently partially supports the TRAC-M code in that it allows the user to:

(1) create or edit a TRAC-M model using a drag-n-drop approach,

(2) submit the TRAC-M model to a execution server (which may or may not reside on the users own machine),

(3) collect and display the output of the TRAC-M code in either a animated predefined graphical ‘mask’ or as simple plots suitable for inclusion in publications,

(4) read the new TRAC-M thermal-hydraulic portable restart (TPR) file format