HOW TO LEARN MORE

Visit the NRC Research Activities Web site: http://www.nrc.gov/about-nrc/regulatory/research.html

Read NUREG-1925, Revision 3, *Research Activities FY 2015–FY2017.*

For more information on the CSARP program, please contact the NRC's Office of Public Affairs at 301–415–8200 or OPA.Resource@nrc.gov

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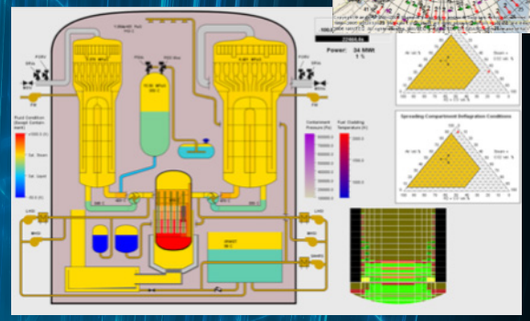
Cooperative Severe Accident Research Program **(CSARP)**



Using cooperative research to improve safety codes

COOPERATIVE SEVERE ACCIDENT RESEARCH PROGRAM (CSARP)

What is CSARP?

CSARP is an international program on severe accident phenomenological research and code development activities organized by the NRC since 1988. The objective of CSARP is the exchange of data and analyses on experimental and analytical research on severe accidents. The NRC coordinates CSARP activities with participation from more than 25 member nations that focus on the analysis of severe accidents and their consequences using state-of-the-art computer models. The NRC developed the MELCOR code for modeling accident progression, and the MELCOR Accident Consequence Code System (MACCS) to evaluate offsite consequences from a hypothetical release of radioactive material into the atmosphere.

How do the NRC and members benefit?

CSARP provides a venue for members to develop and share knowledge about severe accident research. The user community benefits from recent advances in severe accident research programs such as:

- Latest information and analysis from the Fukushima accident and status of code modeling
- Phebus Fission Products (Phebus FP), French Institute for Radiological Protection and Nuclear Safety (IRSN, France)
- Nuclear Energy Agency (NEA), Committee on the Safety of Nuclear Installations (CSNI) Behavior of Iodine Project (BIP)
- MOX and high burnup fuel fission product release experiments (IRSN, France)
- QUENCH experiments investigating overheated fuel (KIT, Germany)
- OECD MCCI (debris coolability, ANL, USA)

As each user organization independently assesses the various codes and models, feedback will lead to the improvement of a high-quality, state-of-the-art severe accident code. This feedback is provided through presentation and discussion of the user experience, in particular (1) assessment using integral and separate-effect tests, (2) model development efforts, and (3) code application for plant safety studies, including probabilistic risk analysis.

CSARP Program Meetings

The NRC supports and hosts a number of meetings annually to share progress in severe accident research and to report code development and assessment status.

CSARP Technical Review Meeting

The NRC hosts an annual forum in September to exchange technical information on severe accident research and to gain insight into regulatory and safety issues. This meeting provides an overview of the research at various international organizations.

MELCOR Code Assessment Program (MCAP)

This program focuses on the MELCOR code development and assessment, and provides a forum for the presentation and discussion of the user experience. MCAP follows the CSARP meeting.

European MELCOR User Group (EMUG)

This group was founded to facilitate collective discussion and exchange of experience between European MELCOR users and with the NRC and Sandia National Laboratories and to support the training of new MELCOR users. The host organization is part of the European MELCOR community and from a country that is a member of CSARP

Asian MELCOR User Group (AMUG)

The focus of this group is similar to EMUG, but participation is restricted to Asian countries that are CSARP members.

International MACCS User Group (IMUG)

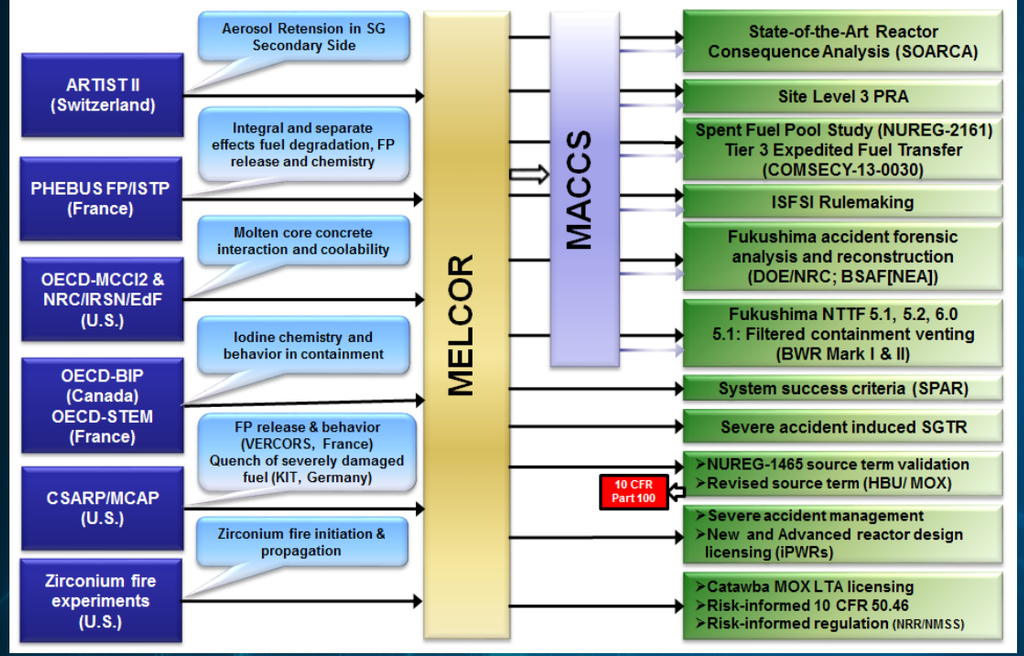
The International MACCS User Group (IMUG) meeting is a forum for the exchange of information and research experience among users of the MACCS consequence code. IMUG also works to provide user support as needed in obtaining and executing the code and interpreting its results, in facilitating exchange between MACCS code users in various countries, and sharing experience between users of different consequence codes.

COMPUTER CODES DEVELOPED AND MAINTAINED BY NRC

MELCOR

MELCOR is a fully integrated, engineering-level computer code whose primary purpose is to model the progression of postulated severe accidents in light-water reactors and in non-reactor systems (e.g., spent fuel pool). MELCOR can run under both Windows and Linux environments and has extensive capabilities for sensitivity and parametric analysis. Code development meets the following criteria:

- Prediction of phenomena is in qualitative agreement with current understanding of physics and uncertainties are in quantitative agreement with experiments.
- Focus is on mechanistic models where feasible with adequate flexibility for parametric models.
- Code is portable, robust, and relatively fast running, and the code maintenance follows established Software Quality Assurance (SQA) standards.
- Detailed code documentation is available.



MACCS SUITE OF CODES

MACCS is a severe accident consequence computer code developed to analyze the offsite consequences of a hypothetical release of radioactive material. The code models atmospheric transport and deposition, emergency response, and long-term remediation. It evaluates doses through a complete set of pathways, resulting early and latent health effects, and land contamination.

MelMACCS

MelMACCS is a preprocessor code that provides an interface utility between MELCOR and MACCS to extract and evaluate the required source term data for a consequence analysis.

WinMACCS

The WinMACCS graphical user interface facilitates the routine use of MACCS. And the evaluation of uncertainties. WinMACCS network evacuation graphical interface allows more realistic modeling of protective actions.

SecPop

SecPop is a computer program used to generate site data for consequence calculations. SecPop accesses population, land use, and economic value databases and uses algorithms to map the data onto a user-defined computational grid.

The MACCS code suite also includes COMIDA2 for the food-chain pathway, LHS (Latin Hypercube Sampling) to sample uncertain inputs, and Combine_Source to perform multi-unit consequence analyses.