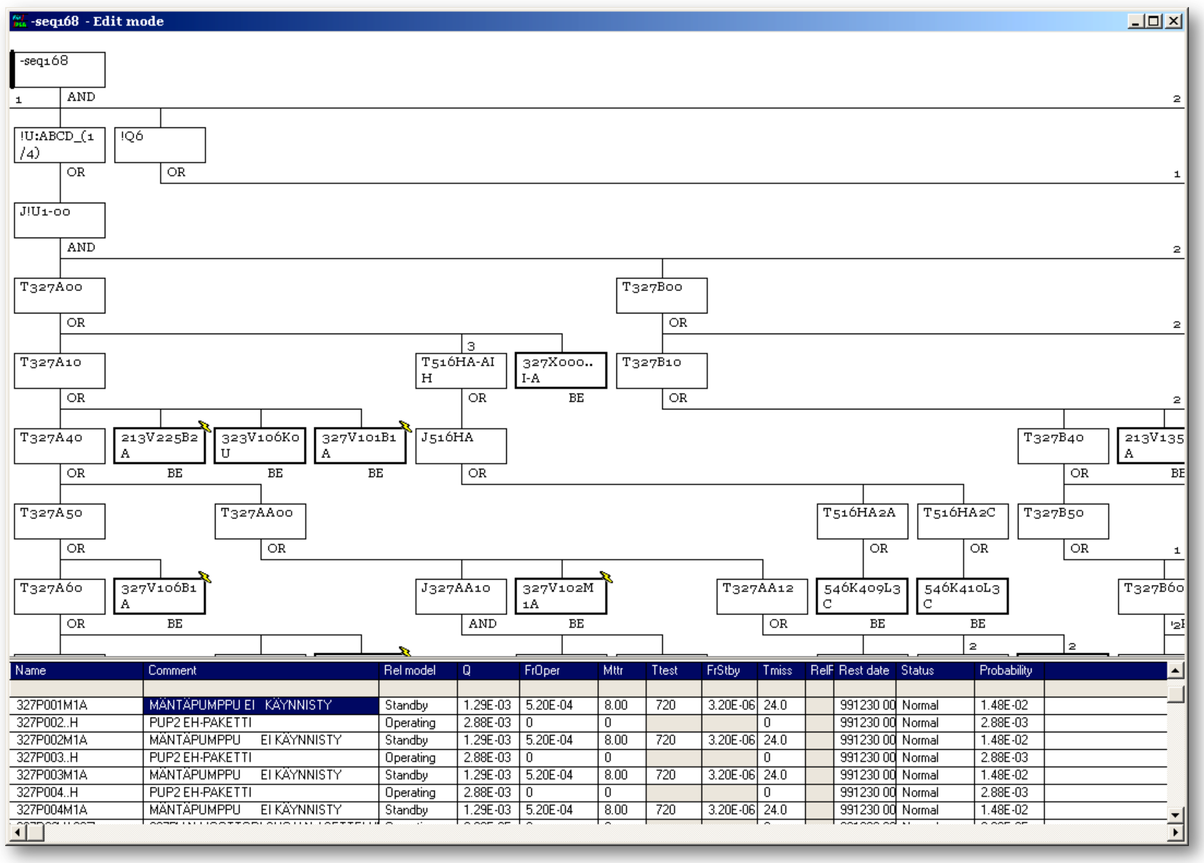
FinPSA — tool for professional living PSA



FinPSA is a comprehensive risk and reliability analysis tool intended for full scope PSA/PRA modelling. The tool has been developed and maintained since 1988 by Radiation and Nuclear Safety Authority of Finland (STUK). The tool is designed to support the main activities related to PSA/PRA by easy model creation, efficient and versatile analysis, good traceability, flexible reporting and information exchange capabilities. All these features make your work comfortable in living PSA, plant assessment and operational modifications. From the beginning of 2012, STUK and VTT Technical Research Centre of Finland have initiated a project to develop the tool ahead and to train new ***FinPSA*** experts.

Enhanced modelling capabilities

- **Hazard table** lists external events and their dependencies and maps them automatically to fault trees during cut set search
- **Asymmetric CCF models** allow new flexibility in modelling partial diversity.
- **Task-oriented model for control systems,** using communication vector representation, makes the modelling of large distributed control systems compact and convenient.
- **Dynamical containment event trees** for level 2 modelling with a special modelling language allows dynamic modelling of severe accident, where time dependencies are important. (not yet available in ***FinPSA*** but implemented in SPSA which is the predecessor of ***FinPSA***)

Interface to other programmes

FinPSA works together with common Windows programmes for importing and exporting data base tables, fault trees, events trees, and almost every item in the model. Results are available in several formats to Windows clipboard, printer and files. The features support the creation of models, analysis and reporting of risk information.

Developed for teamwork

PSA models can be shared or private models. Shared models reside in a server, and can be accessed and edited simultaneously by several users. A locking mechanism prevents two users from editing the same part of the PSA model at the same time. PSA models can be copied between shared and private locations.

Efficient analysis of results

Calculations with already searched minimal cut sets are quick and versatile. They can be performed for one cut set file, or automatically for all accident sequences in one event tree or the whole PSA model. Results are always up-to-date. ***FinPSA*** automatically detects the modified parts of model and performs related update calculations.

FinPSA searches for cut sets for each event tree sequence. After the search, the cut sets of individual sequences are automatically combined and grouped according to user-defined hierarchy of consequences. On the top level, ***FinPSA*** produces cut set files classified by consequence only. Any number of intermediate levels can be defined.

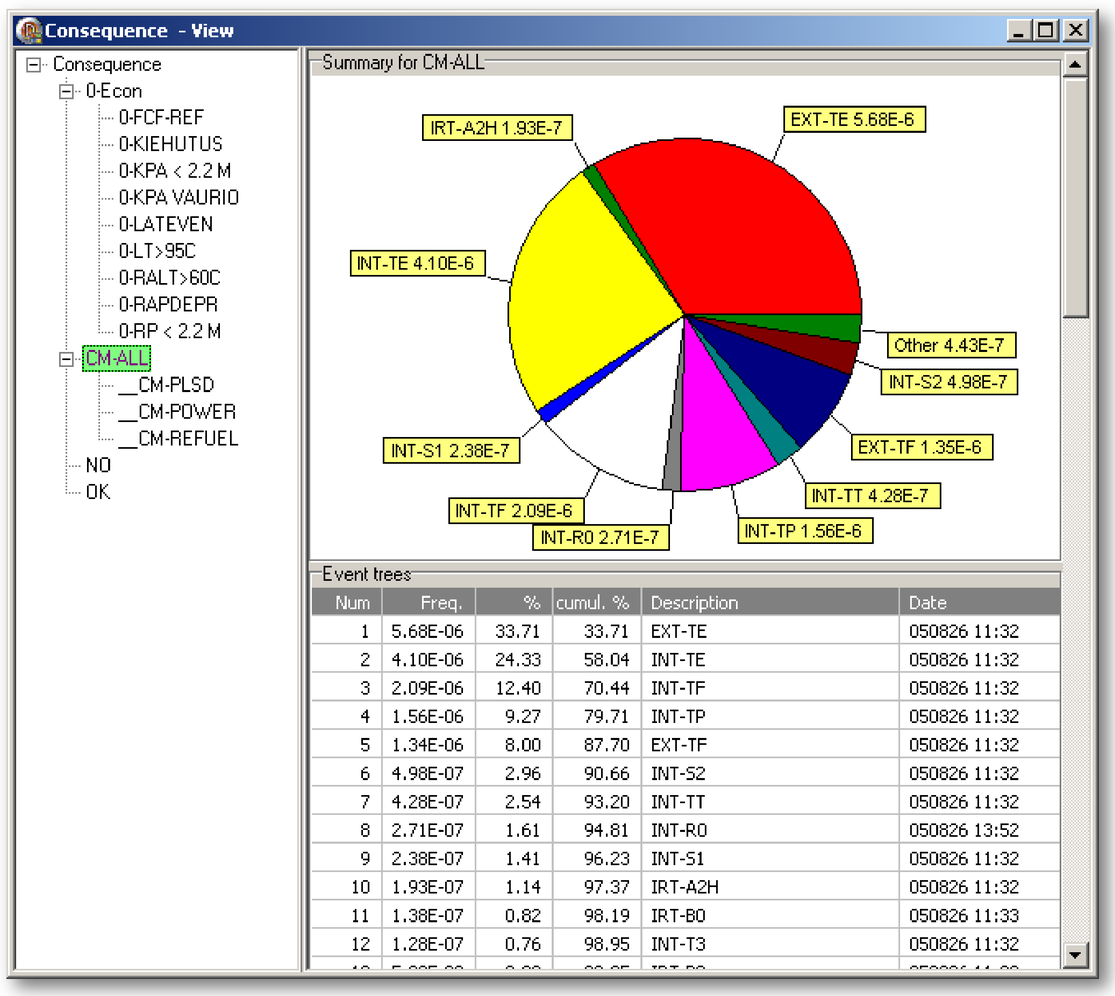
Each minimal cut set can be traced back to the event tree and accident sequence, and visualized in the automatically generated sequence fault tree — with one mouse click.

Importance map is an interactive tool for risk-informed applications. It displays basic event probability, safety margin, F-V and RIF importances for all or selected basic events.

Powerful computing

FinPSA uses multithreading to fully utilize the computing power of computers. When minimal cut set search for a PSA projects is started, each core performs its own cut set search. Several multi-core computers can be connected together with a dedicated network to build powerful PSA clusters.

The PSA team can solve minimal cut sets together with several computers utilizing parallel computation. Users can join or quit the parallel computation on the fly. Idle computers can be defined as calculation resources, which are automatically utilized in shared projects. Calculations are fail-safe: an interrupted calculation can be resumed later. The already calculated parts are available for analysis even before restart.



Additional information

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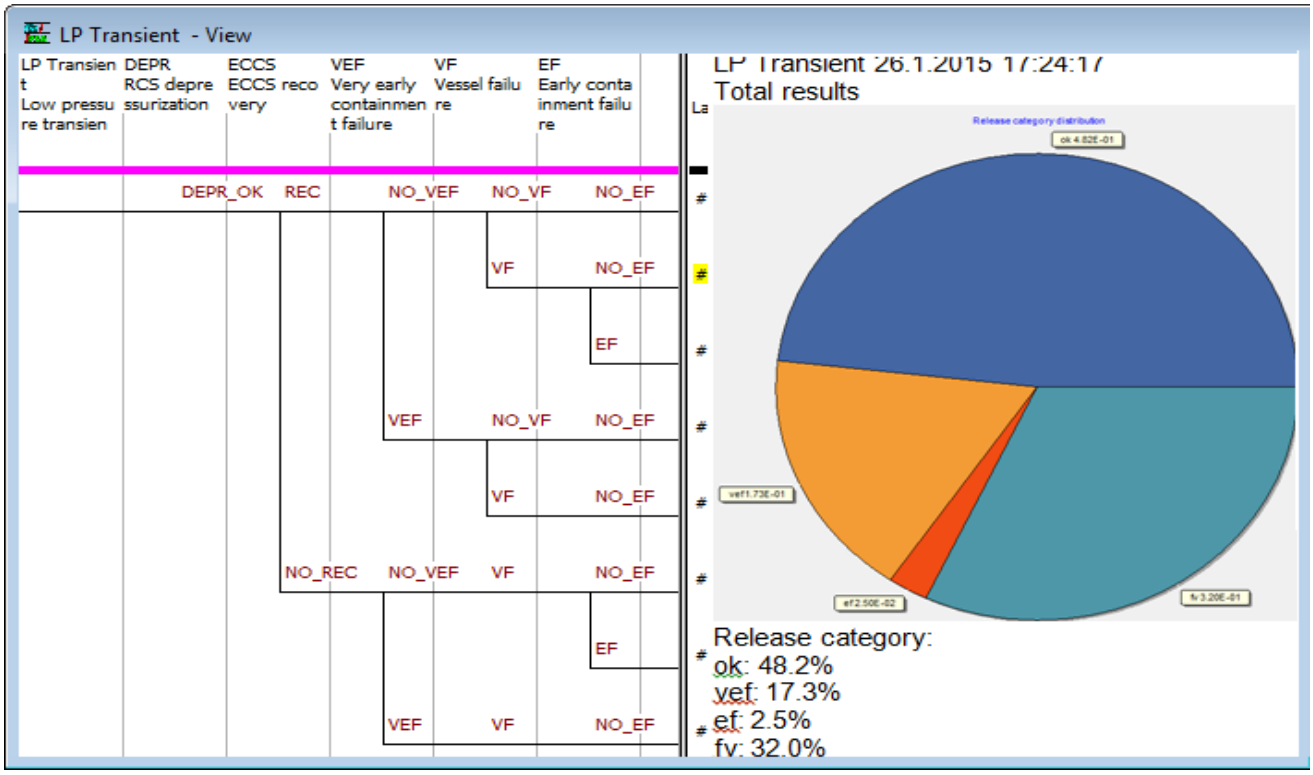
FinPSA — Level 2

Level 2 probabilistic risk analysis is carried out in order to identify the accident sequences that lead to challenges to the containment and releases of radioactive material to the environment. The objective of the analysis is to define accident progression, fission product evolution, retention and transport through each of the major barriers to the environment after the core damage.

The level 2 prototype tool is based on the a containment event tree (CET) modelling methodology. It links together parametric models describing plant behavior, fission product evolution and probabilistic computations. The CET model consists of a graphical event tree which represents the progression of an accident sequence and associated models that are described in specialized CET programming language (CETL).



The level 2 tool allows high flexibility in modelling. Different modelling abstractions are possible according to nuclear power plant needs. A CET can contain either fixed probability values or computed probability values based on modelled events and processes occur during severe accidents. Additionally, the level 2 models can be chained with level 1 models.

Currently, the tool calculates correct results for well defined models. The functionality has been validated with pre-existing models. In addition, a preliminary user guide has been prepared. The tool is implemented modularly with modern technologies. The maintainability of the tool allows it to support the PRA modelling and analysis of a plant during the whole life cycle of the plant.

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