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Title: Real-Time MELCOR 1.8.6 Desktop Simulator of the PWR

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Abstract:

A model of the Dutch nuclear power plant Borssele has been developed in MELCOR 1.8.6. Output of the simulation has been connected to the in-house developed visualization program VISOR. With the addition of a shell program, the MELCOR model (computational tool) and VISOR visualization file (graphical user interface) are used as a desktop simulator of the power plant.

The simulator can be used in auto or interactive mode. In the auto run mode the simulator uses pre-calculated MELCOR plot files in combination with a corresponding VISOR visualization. In the interactive mode MELCOR and VISOR are running simultaneously and MELCOR uses the information provided by VISOR as an additional input for the calculation. With that, the simulator enables the user to interact with the simulator during the operation, interfere with the transient, at any time change the normal plant's response by manually tripping the reactor or the pumps, opening and closing the valves, and analyse the response of the simulator to the interference.

The simulator is capable of simulating various transients in real or close to real time. In order to achieve that, care needed to be taken when building the model. When possible, small control volumes were combined into larger volumes without compromising model's accuracy too much. Furthermore, connection pipes like pressurizer surge line, accumulator pipes or containment spray lines were modelled as flow paths only. In addition, efficient communication between the MELCOR and VISOR needed to be established.

The simulator is used by the Dutch nuclear regulatory body for training of the accident response. MELCOR 1.8.6 proved to be a competent computational tool for the simulator and a post-processing tool VISOR, a user friendly graphical user interface.