The Heiß-Dampf-Reaktor (HDR)-blowdown experiments have proved as excellent tools for the development and the verification of fluid-structure interaction computer codes for prediction of structural loads to a Lightwater Reactor (LWR) vessel during blowdown accidents. The DAISY computer code, under development during the last several years has matured to a satisfactory stage to be used as a reliable and fast running computational program for use in both assessment work in the licencing procedure and for risk studies.

In German licensing procedure, the upper bound for determination of structural loads on the reactor internals is taken as a break corresponding to a 0.1 of the pipe cross-sectional area (0.1 A), whereas the double-ended pipe rupture remains as the criterion for design loads for the support structure of the pressure vessel against the jet reaction forces. However, for risk analysis the double-ended pipe break still dominates the loads on the vessel internals. Therefore, an experiment with 0.25 A break size has been performed and future plans are to perform another test with 0.1 A break size in the HDR test facility.

Consequently also the codes have to follow these efforts and implement improved models for orifices working under two phase flow conditions for accurate predictions of the physical processes.

The DAISY computer code has been used to simulate blowdown transients for a spectrum of break sizes and comparisons are made with the available experimental data of the HDR facility for the double-ended and the 0.25 A break. The main results can be summarized as:

1 - A remarkable reduction of the mean loads under reduced break size conditions;

2 - Local loads and the local structure response are much less influenced by the reduction of the break size;

3 - Good agreement between experimental and computational results for pressure, pressuredifference, displacement and strain was observed;

4 - For small leak sizes (0.1 A), particularly combined with slow break opening times (15 ms) uncoupled calculations give similar results as the coupled fluid-structure computations.

The paper shows extensive calculations with variable break sizes and through comparison to experimental data conclusions are drawn to the adequacy of the DAISY code and future development needs shall be also addressed.