Gesellschaft für Anlagen-
und Reaktorsicherheit
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ATHLET
Mod 2.2 Cycle A

Program Updates since
Mod 2.1 Cycle A

July 2009

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Program Updates since Mod 2.1 Cycle A

This document lists the major program modifications of the current ATHLET version since the last general release version Mod 2.1 Cycle A. It provides information not only for the ATHLET users but also for the developers, i.e. it contains details which are not relevant for normal code users.

Further information on program modifications relevant for ATHLET applications can be found under *Document Updates* of the User's Manual as well as under *Input Data Updates* of the ATHLET Input Data Description.

Bold face indicates that user's action may be required even for existing input decks.

1 Thermo-Fluiddynamics

- Simulation of supercritical water and transition between sub- and supercritical states improved (program extensions are not yet validated and may be applied only for R&D projects).
- New model for the simulation of diffusion of steam and non-condensable gases (diffusion constant to be input; model is not yet validated and may be applied only for R&D projects).
- The `COPY` command enables to copy `JUNTYPES` data, too.
- Time lag for the determination of the donor void fractions used for the calculation of the relative velocity (improves stability).
- Reduction of inertia term of horizontal junctions dep. on void fraction and phase density ratio to improve stability of 1M model for low coolant pressure.
- **CW `EVAPORATE`: New input variable `IGAM`**
- Subcooled nucleate boiling model: local condensation model added.
- Clogging model:
  - **Flow loss coefficient defined by GCSM signal**
  - Relative velocity is forced to zero if the deposited mass approaches 0.1 kg/m^2

2 HECU

- Consideration of fuel burnup for fuel heat conductivity
  CW `ROD`: New input variable `IBURN`

- **New HECU materials `UO2` and `MOX`; HECU material `FUEL` not longer available**
- Minimum critical power ratio method (MASL) included
- New heat transfer correlation for supercritical coolant
  (New HTC selection keys under PW `HTCCORR`!)
- Printer plot of HCOs not longer available.

3 Neutron Kinetics

- No significant modifications.

4 FEBE/FTRIX

- The generation of the FTRIX links caused by the MF term of the 2M junctions can be suspended **(s. `I2MFTRX` of CW `INTEGRAT`)**. This may significantly speed-up calculations with highly intermeshed simulation networks (e.g. multi-dimensional vessel simulations).
- CPU time for fill-in optimization significantly reduced.

5 Component Models

- A complete pipe with several CVs may be a p-h boundary object, where all single CVs have identical states.
- A new heat generation model copies local heat source data from a given rod (e.g. simulated with any neutron kinetics model) to another rod.
- Dimensionless form loss coefficient of nearly closed valve limited to
  10^{-3} < `ZETAVV` < 10^{6} (based on `FV`)
- Check valve: automatic switching off of drift model or switching from 2M to 1M model without drift (required for stability reasons)

6 GCSM

- **The stationary states of SWITCHes and the logical controllers AND, OR, NOT are assumed to be set infinite time ago (i.e. all time lags and delays are over)**
- Sub-CVs above mixture level considered for process signals `LIQMASS`, `VAPMASS`, `POWERFLUID`
- New process signal `DPCLG`: pressure loss due to clogging
- New post processing options:
  - H_2 generation rate in TFOs due to oxidation
  - Total NC gas mass in TFOs

7 General

- Control words have to be input only if corresponding data shall be input.
- New `REDEFINE` variable `TOPD`
- Algebraic operations on `PARAMETERS` extended
- Temperature units of input and/or output can be chosen (ºC or K; s. CW `CONTROL`, PW `UNITS`)
- Parallel processing of ATHLET on computers with shared memory architecture
- **Input checks extended.**