S3R

CYCLE-SPECIFIC TRAINING SIMULATOR CORE MODEL

S3R enables cycle-specific core modeling on the training simulator in an easy-to-use, easy-to-update manner. S3R meets all industry and regulatory requirements for cycle-specific training applications.

" **S3R provides engineering grade, cycle specific core models with real-time performance.**"

High-Fidelity, Engineering-Grade Model

Modern training simulators require engineering grade, cycle-specific core models and real-time performance in a training environment.

S3R meets these needs by providing:

- High-fidelity to plant response due to tightly linked core design models
- Automatic transfer of cycle-specific data to the simulator model allowing the training simulator to be easily updated to the current cycle
- Engineering-grade core models as the same core design numerical methods used in SIMULATE are used in S3R
- Quick and stable step convergence for real-time response
- Easily integrated software
- Direct comparison to core design results and straightforward core physics testing
- Experience with more than 60 S3R installations for training at reactor sites

Superior Operator Training

S3R uses the same high-precision methods as the Studsvik core modeling and transient analysis software, increasing fidelity to the plant response and decreasing the risk of unphysical results.

Because S3R models each fuel assembly and all instrumentation explicitly in three dimensions, operators can train on a model that exactly matches the plant conditions. It is now possible for an operator to go through reactivity manipulations on the simulator, instead of the plant, during initial licensing training.

Plug-and-Play

S3R easily integrates into most simulators. It has been successfully integrated with the executive systems, instructor stations, and thermal-hydraulic models of vendors like CORYS Thunder Simulation, RNI Technology, GSE Systems, CAE, L-3 MAPPS, DS&S, SAIC, and Western Services.

S3R performs as a module under the control of an executive system and responds to instructor station actions like init/run/freeze, snapshot/backtrack, and fast-time.

The S3R module resides in an interface wrapper that communicates with the database. The inbound portion of the wrapper routinely gathers all the data needed to take a step (rod position, T/H variables, etc.). The outbound portion of the wrapper scatters all the S3R results (power, flux, detectors, etc.) back into the database.

Cycle Updating

Performing cycle updates using older generation core models can be tedious and time consuming because of the data manipulation and initial condition maintenance.

S3R provides a solution to both challenges, reducing the effort required to keep the simulator up-to-date. Each time the core model is updated by the core designers, S3R acquires all needed data directly from the output of SIMULATE with no intermediate steps or linking tools. No tuning or normalization is required to get accurate results. Since S3R reads the same restart and library files used by SIMULATE, updating the simulator does not significantly increase the workload on the core analysis or fuels organization.

S3R also maintains a set of predefined initial conditions that can be reused from cycle-to-cycle, without having to maneuver the simulator each time. The cycle conversion algorithm converts all equilibrium initial conditions to the new cycle, drastically reducing simulator maintenance time.

Performance

One major performance hurdle in typical simulator core models is cross-section interpolation. S3R prebuilds its cross-section library, keeping only the data it actually needs for the current core life, resulting in a fast interpolation scheme.

S3R executes with a time-step and fixed iteration count to provide a stable and repeatable convergence, usually in under 250ms.

Validation

Because all the nuclear data is in the format of the core design methodology, validity assessment is straightforward.

A series of reactor physics tests are executed with both the best-estimate models and the real-time options.

A physics report is provided with the initial S3R delivery and can be easily redone by the customer for future cycles, to ensure that the simulator model is still performing at a high level.

S3R provides cycle-specific training simulator models designed to give your operators the most accurate training possible.

Experience

Studsvik has more than 30 years of experience in modeling commercial nuclear reactors. Studsvik software has been licensed for many applications by the United States Nuclear Regulatory Commission and other international regulatory authorities.

S3R has been installed at more than 60 PWR and BWR sites throughout the world and conforms to the modern performance expectations specified in ANSI 3.5, INPO SOER 96/02, and 10 CFR 55.46.

Requirements for S3R

S3R runs on most modern personal computing hardware. The platform of choice is usually determined by the customer, in collaboration with a major simulator vendor.

S3R can be implemented on Windows, Linux and Unix operating systems.

S3R uses the compilers recommended by the simulator vendor.

Unparalleled Customer Support

Studsvik's customer support is second to none. Our nuclear engineering staff are here to help.

For further information please contact:
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