

Advanced optimization tool for nuclear fuel management

COPERNICUS is a nuclear fuel optimization tool that integrates a fuel cycle cost calculator with a computational optimization engine and facilitates implicit coupling between in-core and out-of-core fuel management decisions.

About COPERNICUS

COPERNICUS is an advanced optimization code for nuclear fuel management developed by Studsvik Scandpower. It enables implicit coupling between in-core and out-of-core fuel management decisions, including fresh fuel region sizing, fuel design selection, exposed fuel reuse, and core loading pattern optimization.

The methodology is based on a parallel implementation of the Simulated Annealing algorithm, enhanced by the Mixing of States technique, allowing deployment in processor-scalable environments. COPERNICUS utilizes the 3D licensing-grade code SIMULATE to rigorously evaluate core loading pattern constraints, including reactivity and thermal margin requirements.

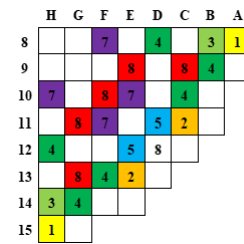


Figure 1: Fresh fuel LP for all cycles.

Seamless Integration with CMS5

COPERNICUS distinguishes itself by combining rigorous licensing-grade simulation with scalable optimization, enabling both single-cycle and multi-cycle design with a built-in fuel cycle cost calculator making it a powerful tool for both short-term design and long-term strategic planning. Its integration within the Core Management System 5 (CMS5) ecosystem allows seamless interaction with CASMO and SIMULATE, enhancing fidelity and reducing engineering effort.

COPERNICUS can be run through the CMSBuilder application

“COPERNICUS more efficiently optimizes nuclear fuel cycle designs”

Key Features

COPERNICUS supports both single-cycle and multi-cycle management strategies for PWRs. Key features are:

- Enhanced computational efficiency
- Expanded optimization capabilities
- Integration of SIMULATE5, Studsvik's licensing-grade 3D core simulator
- Utilizes simulated annealing optimization
- Can be run through the CMSBuilder application

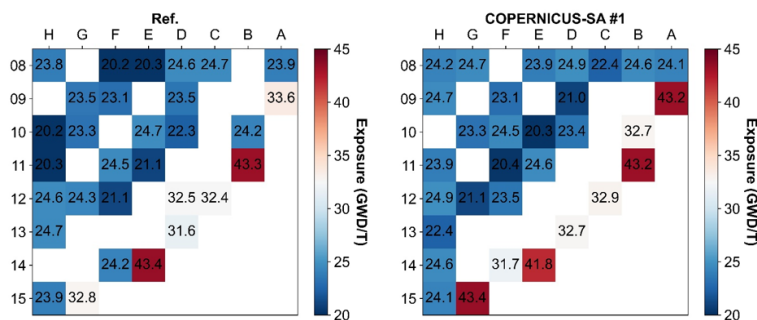


Figure 2: BOC burnup loading patterns from COPERNICUS

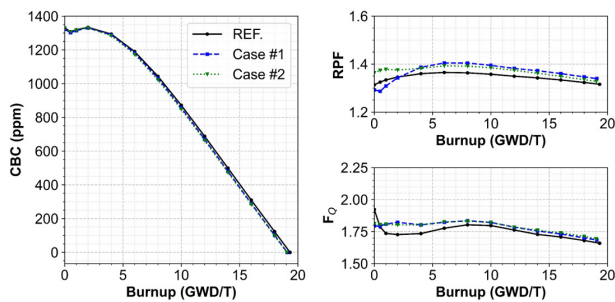


Figure 3: Boron let-down curve and peaking factors from COPERNICUS

Applications

COPERNICUS applications includes:

- Power upgrade evaluations for equilibrium cycles
- Cycle planning in preparation for shutdown
- Cycle design with limited batch availability during an outage-related emergency

Requirements

COPERNICUS is available for all standard computing platforms running most modern operating systems. Linux and Windows are typical environments for COPERNICUS.

Unparalleled Customer Support

Studsvik's technical support is built on putting the needs of its customers first.

- 24-hour response time
- Easy ticketing system
- On-line support portal
- Access to technical documentation
- Active and growing user communities of practice

For further information please contact:

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