framatome

# ARCADIA Multiphysics Code Suite

Core design, core monitoring, and safety analysis

## ARCADIA provides state-of-the-art physics for efficient and flexible core design, ensuring the reliable operation of nuclear power plants

### Challenge

Safety, core design, fuel management, and operation of nuclear power plants are facing a more demanding environment than ever before. It is therefore vital to apply state-of-the art codes and methods to optimize margin management – either to face new regulatory challenges or gain more flexibility – in the operation of nuclear power plants.

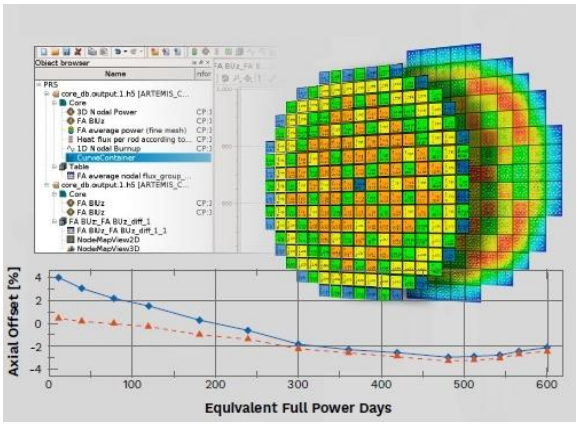


Fig 1: Example of the state-of-the-art GUI – an efficient and configurable tool

### Solution

ARCADIA, Framatome's code system for neutronic/thermal-hydraulic/thermo-mechanic analysis, combines the best technology from decades of expertise in code development for a wide range of reactors into a single coherent software suite.

While improving on the physics from previous code generations, ARCADIA has been developed for implementation in an industrial environment. It provides the best insight into the core while making use of modern computing possibilities, and offers a modern, ergonomic software design that empowers engineers to deliver – in everyday circumstances as well as under time pressure.

ARCADIA produces state-of-the-art results and predictability as a result of its generic approach, along with full consistency between steady state and transient calculations. The system's usability has been optimized so that Graphical User Interfaces (GUI) assist the user in every step of the analysis. Built-in automation and automatic report generation improve efficiency. ARCADIA enables a better insight into the physics of the reactor, as well as new functionality and the optional adoption of advanced methods that further increase reactor safety and economics. ARCADIA and its derived methods continue to be licensed by an increasingly large number of regulators. ARCADIA is applicable to PWR, BWR and SMR reactor designs.

### Customer benefits

ARCADIA meets YOUR requirements:

- Precision and reliability yield margin gains and extend operational flexibility
- ARCADIA provides state-of-the-art multi-physics methods and complies with current and emerging safety analysis requirements
- Fully consistent description of steady-state and transient application modes
- Framatome provides a plant-specific implementation of ARCADIA to match your exact needs

**Your performance**
is **our** everyday **commitment**

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# Technical Information

**ARCADIA Components and Connected Systems:**

- **ARTEMIS: Powerful core solver**
  - 3D multigroup nodal core simulation
  - Steady-state and transient neutronic and thermal-hydraulic analysis
  - Integrated coupling to COBRA-FLX and explicit fuel rod module

- **APOLLO2-A: Versatile spectral code**. Advanced 2D multi-assembly lattice physics for:
  - Nuclear fuel assembly design
  - Reflector modelling
  - Nuclear data for ARTEMIS

- **ARGOS: Connected core monitoring system.** Complete and consistent core surveillance and prediction:
  - Adaptable to specific customer needs
  - Designed for use with ARTEMIS, but other core simulators are also supported

- **LADON: Comprehensive user environment**. Management of complete analyses. Provides:
  - Input templates and automation - to increase efficiency and avoid input errors
  - Detailed result visualization - from tables to 3D core view

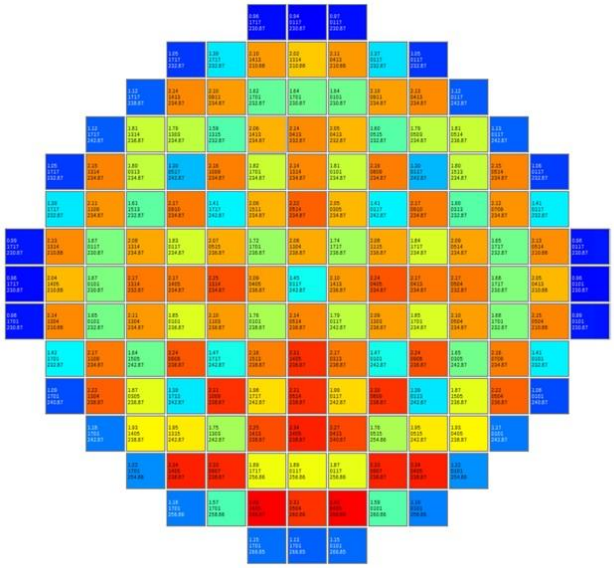

Fig 2: Max FQ assembly average core map

## Key figures

**10+** graphical User Interfaces (GUI)

**3** stat<e-of-the-art solvers

**1** coherent system

## Capabilities

- One code for a fully consistent description of steady-state and transient evaluations
- Full core pin-by-pin evaluation
- Core design and safety analyses
- Full core pin-by-pin and subchannel-wise thermal hydraulic and thermal mechanic analysis
- Modern software design for optimal use of modern computing, hardware, and future preparation
- Advanced multi-physics coupling based on modern software architecture and algorithms to enable industrial use of advanced methodologies

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