framatome

# Integrable High-Speed Data Processor

## Metamodel solutions for increased reactor performance

Framatome's Integrable High-Speed Data Processor provides unique real-time accuracy and faster, more precise monitoring that leads to greater operational efficiency and better margins.

## Challenge

Some phenomena in nuclear power plants cannot be directly measured, so operators must rely on indirect calculations from existing instrumentation, which can make precise monitoring challenging. Before analysis, the data must go through a very intricate procedure incorporating complex physical calculations that take advantage of existing instrumentation.

Examples of data affected by this include departure from nucleate boiling ratio (DNBR), pellet-cladding interaction (PCI) and linear power density (LPD).

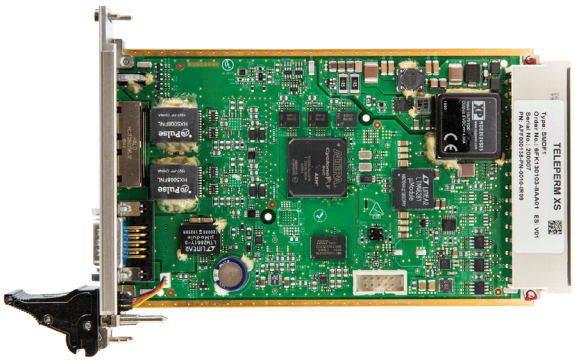
The complexity of these calculations makes it difficult to integrate them into traditional operational or safety related instrumentation and control (I&C), so assumptions are used to simplify them for easier integration. This could lead to reduced data precision, longer calculation time, decreased plant efficiency, margin loss and possible operational difficulties during plant startups or shutdowns.

## Solution

Framatome's Integrable High-Speed Data Processor is a plug-and-play super calculator with unique real-time accuracy that allows for more precise monitoring of processed plant data, providing increased profitability through additional power generation.

Useful in any industries that require high levels of precision in monitoring large amounts of data (e.g. nuclear, defense, rail, aeronautics, etc.), the Integrable High-Speed Data Processor uses new metamodel solutions that can be applied to any complex calculated values. In nuclear plant operations this innovation can be adapted to different use cases for plant performance optimization through power uprates, operational flexibility, fuel economy and more.

This Framatome solution leverages existing detectors, avoiding additional instrumentation while adapting to any calculated values for improved accuracy and speed.




## Customer benefits

- **Enhanced Safety:** Precise real-time assessments for surveillance and protection improve reactor safety by preventing boiling crises, fuel cladding interactions and other critical phenomenon.
- **Increased Efficiency:** Faster and more accurate predictions, leading to better operational efficiency and optimized performance.
- **Power Output Optimization: Allow power uprates without heavy modification to provide additional power for both baseload and peak demand.**
- **Extended Fuel Cycles:** Lengthens reactor cycles, allowing longer operational periods and enhancing productivity.
- **Seamless Integration:** Readily integrates with existing systems like TXS Compact, ensuring ease of implementation and compatibility.

## Technical information

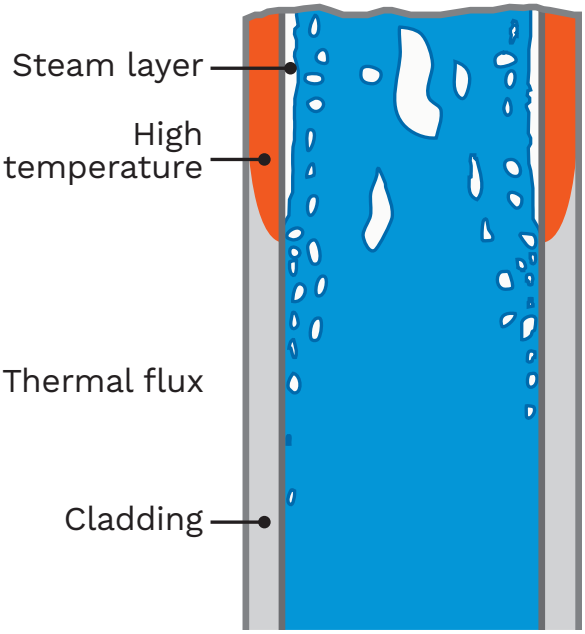
Customized for different use cases, the Integrable High-Speed Data Processor reduces calculated uncertainties so any complex calculation can be uploaded for accurate, real-time monitoring.

**Example of Integrable High-Speed Data Processor customized for DNBR:**

- **Function:** Assesses DNBR in PWR reactor core to predict thermal margin.
- **Current Method:** During 3D safety study simulations or online, DNBR is assessed using a simplified algorithm as the ratio between the critical heat flux (CHF) correlation and the local thermal heat flux.
- **Framatome Solution:** Using an Integrable High-speed Data Processor customized for DNBR, the data is assessed online, up to 1,000 times faster than existing systems and providing precision comparable to reference calculation codes.

**Example of Integrable High-Speed Data Processor customized for PCI:**

- **Function:** Evaluates interaction between fuel pellet and the rod cladding, crucial for safety analysis and operating performance.
- **Current Method:** PCI is assessed during 3D safety studies simulations but not online due to complexity.
- **Framatome Solution:** Using an Integrable High-Speed Data Processor customized for PCI, the data is assessed online instead of manually, providing precision comparable to reference calculation codes.



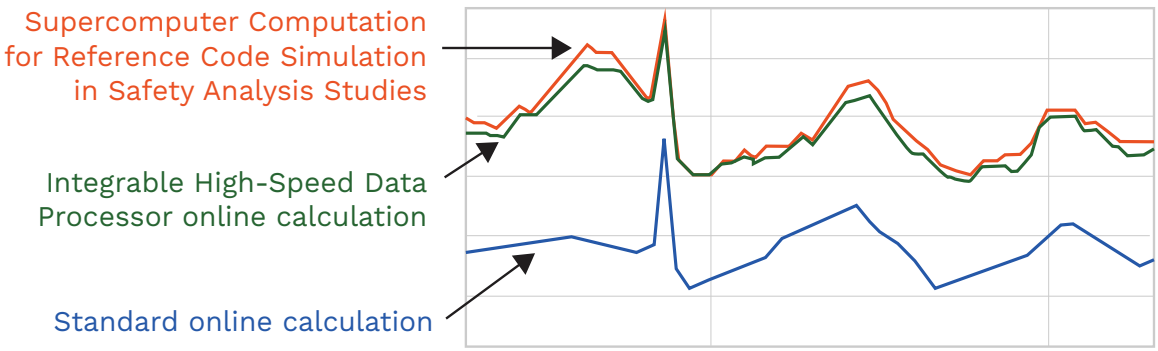

*Departure from Nucleate Boiling (DNB) in a reactor*

## Key Figures

Up to **1,000** times faster than the existing on-site system that uses a simplified physical algorithm.

Up to **100** times more precise data (comparable to supercomputer precalculated values).

### Integrable High-Speed Data Processor (Customized for DNBR) vs. Simplified Algorithm




Real-time plant data processing eliminates DNBR uncertainties

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