BLUE WAVE AI LABS

Eigenvalue.ai

Next-Gen visibility into Eigenvalue prediction for BWRs

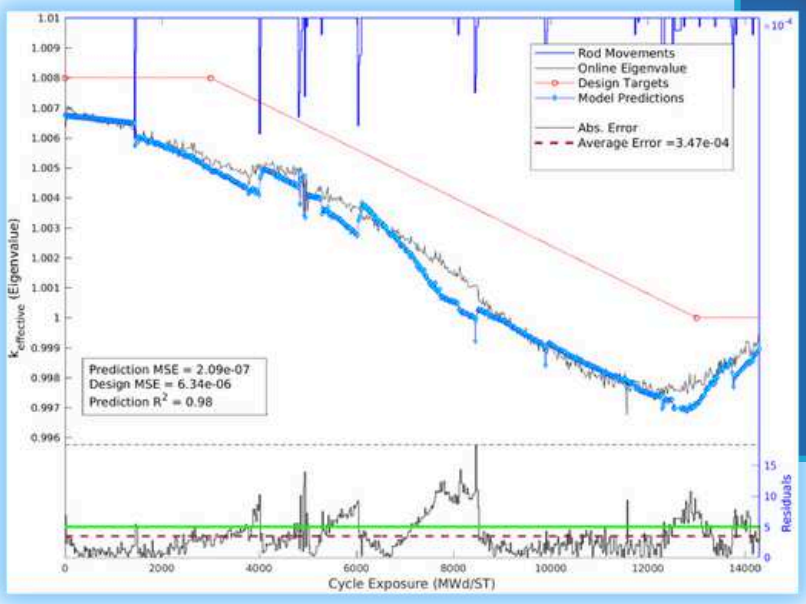
Predict with Precision, Operate with Confidence

Eigenvalue.ai pioneers powerful predictive capability of one of the most fundamental parameters in nuclear engineering, eigenvalue. Precise predictions result in a more accurate reload batch size and coast-down length reducing your reload fuel costs while meeting your fuel cycle energy requirements.

The Underlying Problem

The hot reactivity parameter of the core (known as k-effective or simply, the eigenvalue) is one of the **most fundamental parameters** in nuclear engineering and has been notoriously difficult to predict accurately in boiling water reactors (BWRs).

Its trend directly impacts the energy capability of the reload core, and an inaccurate eigenvalue projection can be costly.



A Sophisticated Approach

Our proprietary tool uses AI coupled with machine learning (ML) to leverage historical fuel cycle data, outputs from core simulators, and past eigenvalue behavior.

By transforming reactor data into convolutional neural network, we retain tens of thousands of parameters, hundreds of thousands of pin-by-pin fuel attributes, and dozens of other reactor variables to develop unparalleled high-fidelity models.

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Applications:

- ✓ Reload Core Design
- ✓ Cycle Management

High Value Results

The Eigenvalue.ai model is successfully proven and implemented across the Constellation BWR fleet.

The predictive power of eigenvalue.ai was recently proven on a 24-month BWR fuel cycle. The model performance demonstrated a greater than 4-fold (x4) reduction in prediction uncertainty when compared against the current methods (conventional design targets).

Moreover, this level of performance is transferrable across US BWRs, with recent advancements in model architecture demonstrating remarkable resilience when new fuel types and product lines are introduced into the core.

Comparable levels of accuracy have been obtained at several other BWRs that have adopted this next-gen technology.

Features:

Interface with the tool via web browser, available for all standard computing platforms with a high-speed Internet connection, running most modern operating systems.

Compatible with outputs from most nuclear fuel analysis software (e.g., core simulators).

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