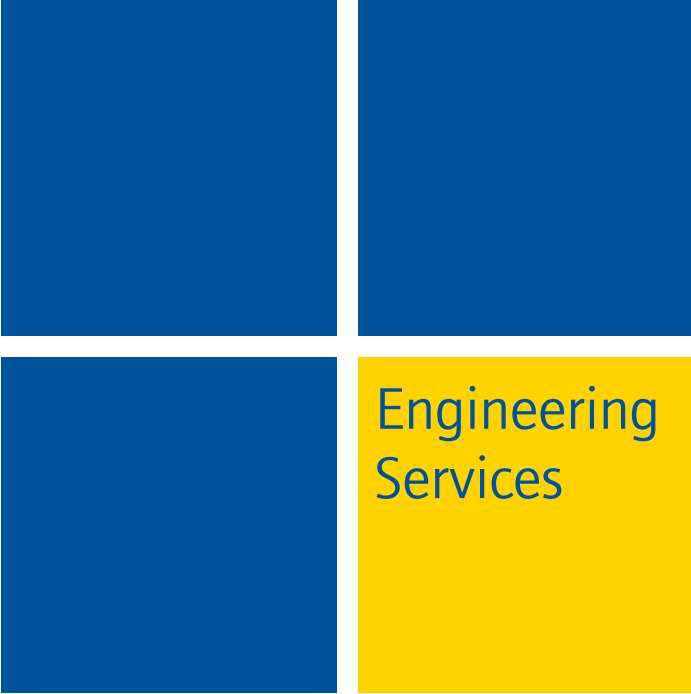


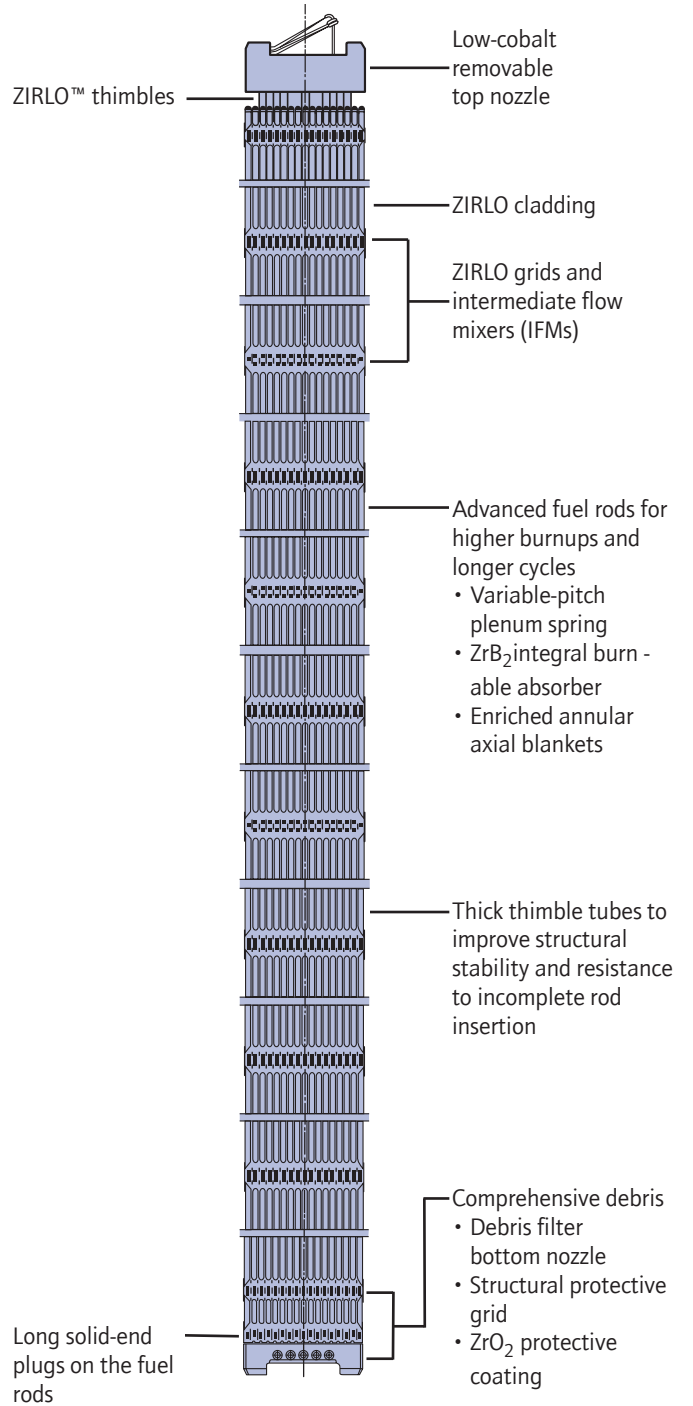
Westinghouse RFA-2 Design



Engineering
Services

Background

The Westinghouse nuclear fuel business has more than 30 years of experience in the design of nuclear fuel assemblies that help utilities achieve exceptional fuel reliability and performance in today's operating and commercial environment. Our newest design, the 17x17 robust fuel assembly (RFA-2), builds on that history.



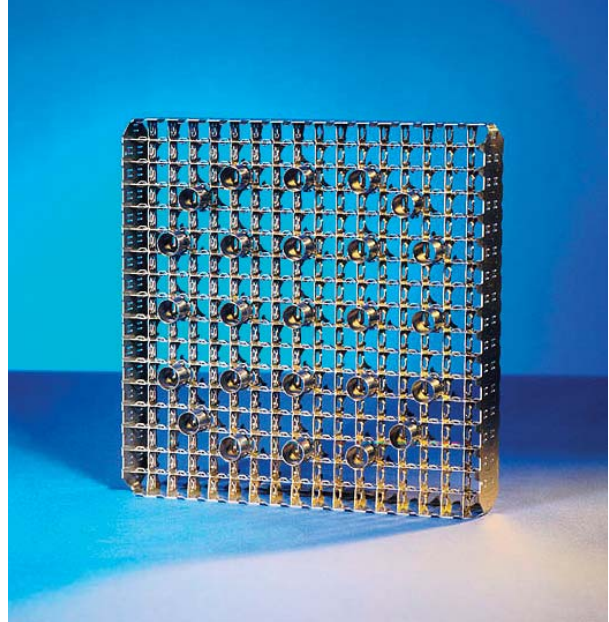
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Benefits

The RFA-2 fuel design is built on the proven experience and world-class leadership of Westinghouse in the design and manufacture of nuclear fuel. It provides the following benefits:

- Stiff structure for margin-against-fuel-assembly distortion
- High-contact-area mid grids for significantly increased margins-to-fuel-rod fretting
- IFM grids that provide significant departure from nucleate boiling (DNB) margin
- High-performance mixing vane grids
- High-burnup advanced materials - ZIRLO
- Multiple layers of defense against debris
- Industry's best integral fuel burnable absorber (IFBA)
- Axial blankets for optimum fuel cycle economics



Westinghouse RFA-2 Design Features

Fretting Margin

The increased contact area with the rod is RFA-2's primary method to significantly improve grid-to-rod fretting performance. In addition, the springs have less stiffness to reduce static and dynamic loads, and the edge geometry of the springs and dimples has been improved to reduce edge hardness. Endurance testing has shown the RFA-2 mid grid to improve grid-to-rod fretting performance by four times over previous designs.

Heat Transfer Improvements

The RFA-2 mid grid incorporates a high-performance mixing vane to optimize coolant mixing. This enhanced mixing improves DNB performance and reduces fuel rod hot spots, which are known to contribute to crud buildup on fuel rods and power shifts in the core. This heat transfer is further enhanced by using high-performance IFMs. The use of three IFMs provides additional coolant mixing, improves thermal margin, and reduces fuel rod surface temperatures for reduced oxidation and crud disposition.

WIN Nozzle

The Westinghouse integral nozzle (WIN) is an industry-leading design with proven performance. Spring reactive loads are restrained completely by the nozzle castings—there are no screws, ensuring trouble-free operation. This concept has been used successfully in Europe since the early 1990s. The WIN meets all Westinghouse and industry requirements and is directly interchangeable with the former design for those utilities that seek superior performance.

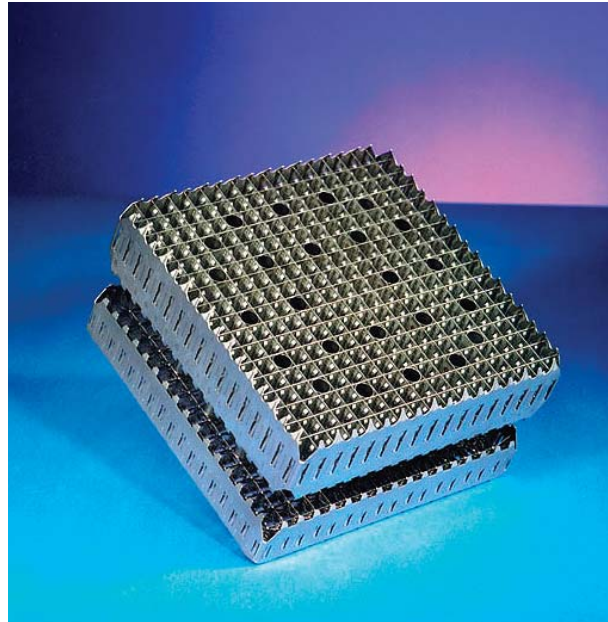
ZrB₂ IFBAs

Fuel cycle economics are important to any utility, and Westinghouse's zirconium diboride (ZrB₂) IFBA is a key element in achieving superior fuel cycle costs (FCCs). ZrB₂ was specifically designed to allow utilities to achieve optimum uranium utilization over a multitude of loading patterns and operating schemes. IFBA rods enhance power distribution with no residual poison penalty. The benefits are increased neutron economy and flexibility, increased margins-to-peak-ing-factor limits, and lower FCCs and spent fuel costs. No burnable absorber worldwide offers the superior predictability and economics of the Westinghouse ZrB₂ IFBA.

Enhanced Debris Mitigation

No one surpasses Westinghouse's proven multi-layer debris protection. RFA-2 uses three layers of protection, including a debris filter bottom nozzle (DFBN) protective grid and long solid-fuel-rod-bottom end plug, and optional fuel rod oxide coating.

The DFBN provides the first level of defense against debris. Designed to mitigate debris-induced fuel rod fretting failures, the DFBN has proven effective in enhancing reliability and reducing costs that could result from repair and replacement.



Located atop the DFBN is the protective grid (P-grid). The P-grid provides an additional debris barrier, resulting in increased fuel reliability. Any debris that passes through the DFBN will tend to be trapped in the P-grid against the elongated solid-fuel-rod-bottom end plug.

The final level of debris protection is provided by applying an oxide coating that shields the bottom 6 inches of each fuel rod, thus increasing wear resistance over uncoated cladding.

Put it all together, and you've got a level of debris mitigation that is unsurpassed.

Axial Blankets

Axial blankets provide improved fuel cycle economics by reducing neutron leakage from the core. The enhanced neutron economy of the blankets means that more neutrons are available to support longer cycle lengths (18 to 24 months). The use of 6-to 8-inch axial blankets at the top and bottom of the fuel stack provides an optimum uranium resource benefit that satisfies a broad range of operating conditions.

Field-Proven Performance

Westinghouse Electric Company, part of Nuclear Utilities Business Group of British Nuclear Fuels (BNFL), has a long-standing commitment to excellence in commercial nuclear reactor technology.

The RFA-2 fuel assembly can provide the lower cycle costs you need in today's competitive market. With advanced features like fretting margin, heat transfer improvements, the WIN, and enhanced debris mitigation, you can feel confident about your fuel's performance.

Westinghouse provides fuel, services, technology, plant design, components, and equipment to utility customers in the global commercial nuclear power industry.

Nearly 50% of the nuclear power plants in operation worldwide are based on Westinghouse technology. Westinghouse continues to pioneer advanced nuclear plant technology, value-added products, engineering, and services that create success for customers in increasingly demanding markets.

We work with customers to help produce safe, competitive, reliable, and environmentally sound electricity by enhancing plant safety, availability, and reliability, and by reducing operating and maintenance costs. With an uncompromising commitment to quality and value, Westinghouse is working hard to become the global supplier of choice for utility customers.

Westinghouse Nuclear Fuel—Your Value Provider

At Westinghouse Nuclear Fuel, we believe the key to mutual success is working with our customers to achieve continuous improvement. Our priority is to develop, design, and deliver products and services that meet utilities' needs for reduced FCCs and excellent reliability in the most timely manner. The RFA-2 is just one example. However, we don't just provide products, we also provide valuable services to help our customers achieve safe, reliable operation with good economic return. Coupled with Westinghouse's global service organization, you can be sure we'll be there when you need us.

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