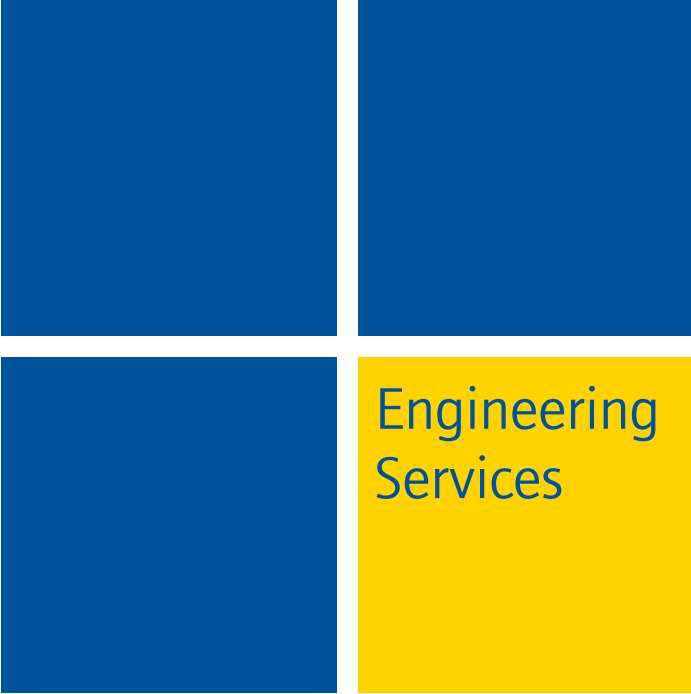


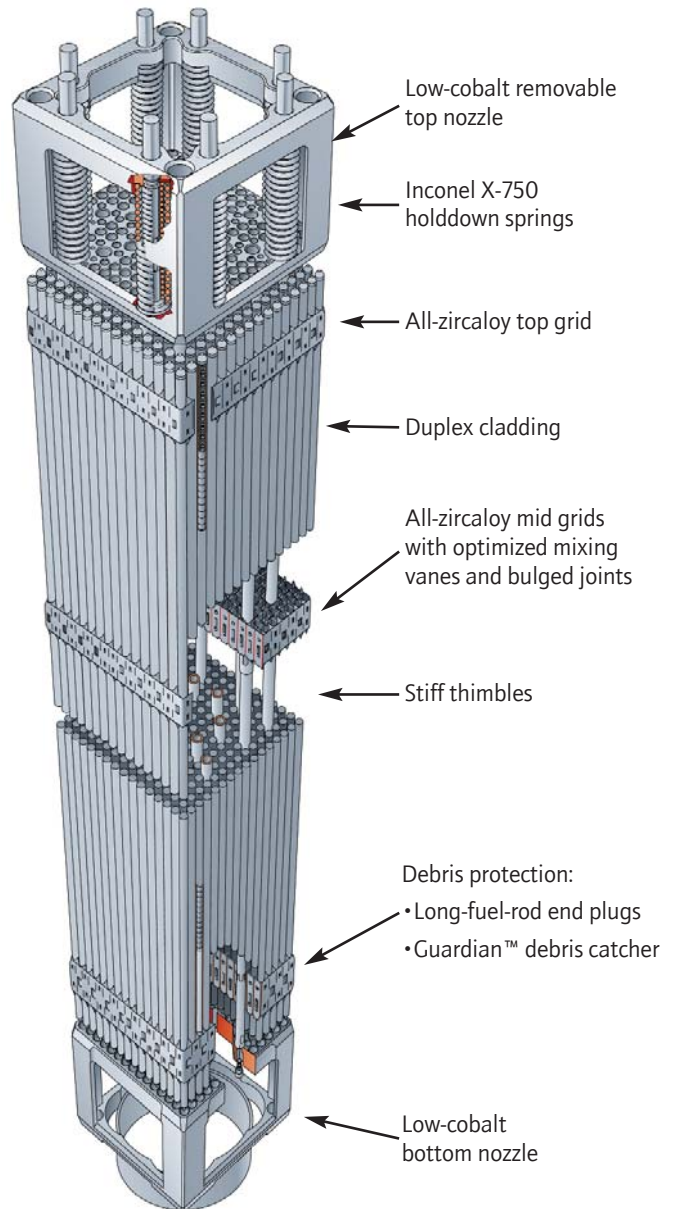
16x16 & 18x18 PWR Fuel Designs



Engineering
Services

Background

Westinghouse has more than 30 years of experience in the design of nuclear fuel assemblies that help power producers achieve exceptional fuel reliability and performance in today's operating and commercial environment. Two such field-tested and proven products are the Westinghouse 16x16 and 18x18 PWR fuel.



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Proven Reactor Performance

Westinghouse 16x16 and 18x18 PWR fuel is built on the proven experience and world-class leadership of Westinghouse in the design and manufacture of nuclear fuel. It provides the following features:

- Debris protection
 - Guardian debris catcher
 - Long fuel-rod end plugs
- Duplex cladding
 - Low corrosion and rod growth
- Structural stability
 - Stiff thimbles
 - Optimized rod loading
 - Flexible bulged joints
- Manufacturing excellence
 - No manufacturing related fuel failure
- Advanced neutronic designs
 - High-density pellets
 - Proven Gd fabrication
 - Axial blanket

Advanced Design and Manufacturing Features

Debris Protection

Westinghouse uses the Guardian debris catcher, which is an integrated part of the bottom grid. This feature was introduced in the U.S. in the mid 1980s and was incorporated for use in Europe in 1992. Since its introduction, the Guardian debris catcher has successfully eliminated debris-related failures.

The fuel rods are equipped with long end plugs that eliminate any fretting risk from debris caught in the Guardian debris catcher.

Duplex Cladding

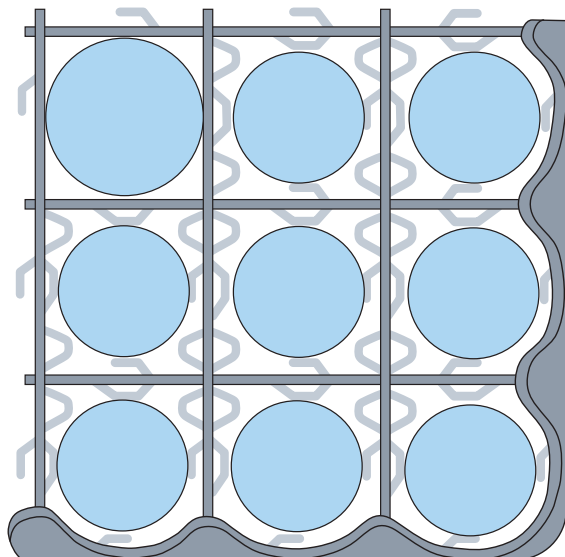
The Westinghouse Duplex 3b+ cladding was developed for use in hot, high-duty PWR fuel applications. The advanced material has shown excellent properties with regard to both corrosion and rod growth, up to high burnups.



Structural Stability

The skeleton is built by bulging guide tubes to the grid sleeves. This makes a connection that is slightly elastic in the axial direction, allowing the guide tubes to grow a little differently due to variation of the fast neutron fluency across the assembly, without causing any assembly bowing.

Fuel rod loading into the skeleton is facilitated by rod coating and performed in an optimized sequence that essentially frees the fuel assembly of internal stresses. This results in fuel assemblies with very little as-manufactured bowing, which significantly delays the lateral creep deformation caused by hold-down forces.



Guardian debris catcher



Thimbles with increased wall thickness have been introduced to further increase the fuel assembly lateral stiffness.

To date, fuel handling and operation have been problem-free.

Manufacturing Excellence

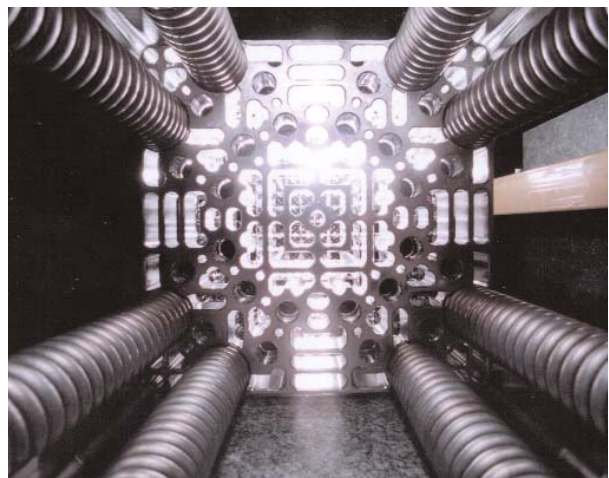
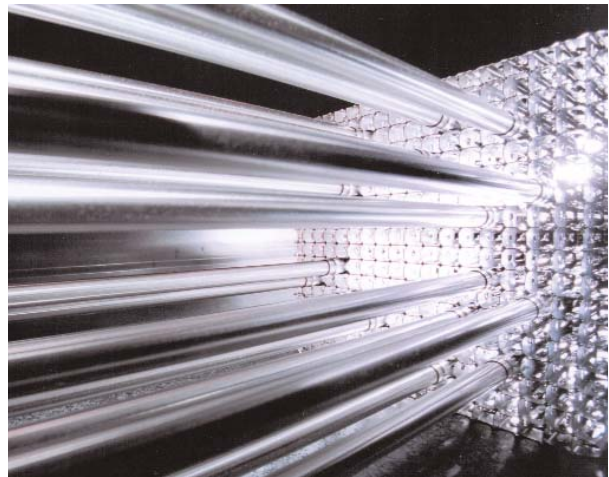
The pellet loading into the fuel tubes is performed in a very soft manner by letting the pellets slide by their own gravity force into tilted tubes.

The fuel rod fabrication and inspection steps are performed using qualified processes in an automatic manufacturing line. The rod coating process has been developed to eliminate any risk of material shavings at assembly.

There has never been a fuel rod leak caused by a manufacturing error in the Västerås manufacturing facility.

Advanced Neutronic Design

Pellet designs with 96% density and above are available to increase the uranium content of the assembly. Some fuel assemblies may contain burnable absorber rods that use gadolinia (Gd_2O_3) pellet additives. The Gd pellet manufacturing has an excellent track record, able to produce Gd_2O_3 contents up to and above 10%, covering today's and future European PWR applications. Axial blankets are available for the normal uranium as well as the Gd rods. Even more advanced axial design variations are possible within the automated rod line.



Proven Performance

The performance of the Westinghouse 16x16 and 18x18 PWR fuel products for German-type PWRs has been proven up to 70 MWd/kgU fuel rod average burnup range. The assembly can provide the reliability and lower fuel cycle costs that you need in today's competitive market. With advanced features like the Guardian debris catcher, the excellent Duplex cladding corrosion resistance, and enhanced structural stability, you can feel confident about your fuel's performance.

Field-Proven 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. 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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