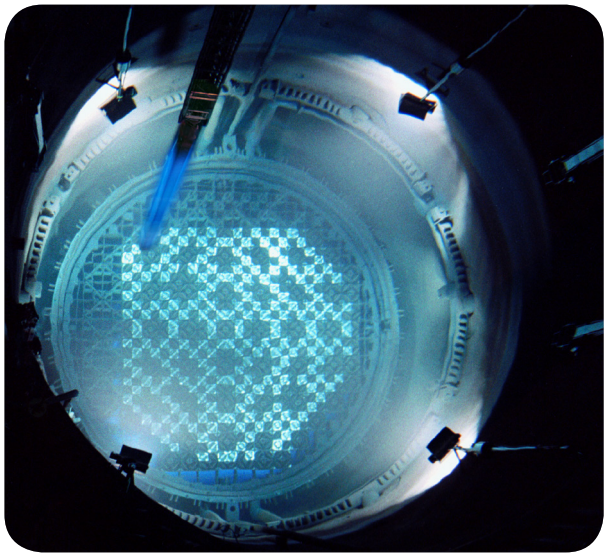
BWR Fuel Engineering Services



A Full Scope of Solutions

AREVA provides innovative solutions for every possible fuel performance challenge, including BWR power uprates. With more than 40 years of experience, we are knowledgeable in the application of fuel- and core-related NRC and ASME requirements. Plus, we maintain and develop codes and methods for the design and analysis of BWR fuel. As a result, our team can provide the full scope of engineering design, licensing and operational support for reload cores. We also use NRC-approved codes to develop innovative in-core fuel management plans and perform fuel cycle licensing analyses. We are able to fully support reactor operating cycle lengths ranging from 12 to 24 months as well as extended power uprates.

Open, Honest, and Timely Communications

AREVA prides itself in being fully transparent in all of our communications and activities with our customers. We believe that a strong technical solution is strengthened by understanding our customer's needs and in developing a positive rapport between us. Our focus on relationships means freely sharing information needed by our customers. From preliminary fuel designs and calculation plans, through final analysis reports and operational follow, we maintain close communication every step of the way.

Advanced Fuel Designs

Mechanical Systems Design — AREVA's robust and efficient fuel assembly mechanical design delivers economic and failure-free in-reactor performance. AREVA applies advanced analytical and testing methods to support our mechanical designs. We use innovative computer-aided design and manufacturing (CAD/CAM) methods to fabricate the fuel assembly components. AREVA also invests considerably each year in advancing the state-of-the-art fuel design and analyses techniques through our global R&D programs.

Fuel Rod and Fuel Cycle Designs — We develop our fuel rod and fuel cycle designs using our innovative analytical tools, including those for thermal mechanical analyses, reactor core simulation, thermal hydraulics performance, and operational fuel maneuvering. We develop our fuel cycle designs to maximize uranium utilization while meeting all licensing limits for AREVA and other vendor co-resident fuel. We use axially-and radially-zoned enrichments plus gadolinia to maximize economic performance. Our capabilities include the following:

- Lattice and fuel assembly nuclear design
- Core design and projected control rod patterns
- Multi-cycle projection to postulated future cycles
- Benchmarking and reload design with mixed vendor cores

Features & Benefits

- Advanced fuel designs
- A variety of licensing options
- Broad operational support experience
- A real-time view of reactor conditions via our unique POWERPLEX III or POWERPLEX-XD Core Monitoring Software System
- Substantial investment in BWR methods development
- Unmatched fuel vendor transition support maximizes reactor operations
- Technology transfer packages tailored to your specific needs
- Unrivaled stability protection support

AREVA
forward-looking energy

A Variety of Licensing Options

Mechanical Systems Design — AREVA can perform a wide variety of fuel licensing analyses to support both normal steady-state operation as well as off-rated condition operation. Events analyzed include anticipated operational occurrences and postulated accidents. Our analysis capabilities include the following:

- Fuel rod thermal mechanics analyses
- Fuel channel bow predictive analyses
- Fuel rod and fuel assembly stress analyses
- MCPR Safety limit and operating limit analyses
- Thermal hydraulic compatibility for mixed vendor cores
- LOCA analyses and Non-LOCA accident analyses
- Support for new LOCA requirements under 10 CFR 50.46c
- Structural dynamics analyses
- Transient and nuclear safety analyses
- Stability analyses
- Fuel storage criticality safety and radiological analyses
- Appendix R evaluations
- Emergency Procedure Guidelines evaluations
- Extended Power Uprate analyses
- Preparation of FSAR and Technical Specifications updates
- Support for ATWSi

Our analyses have enabled our customers to obtain the most cost-effective designs and favorable licensing limits for full power operation as well as reactor power uprates. Plus, they have been accepted by licensing authorities around the world.

Count on Our Team Every Step of the Way

Operational Support – We have broad experience providing core physics information needed for reactor startups. For BWRs, this includes highly accurate core reactivity predictions and core monitoring system input for the cycle. We also support your plan in changing operating strategies during your fuel conditions.

We can also provide the hardware, software and installation support needed to monitor fuel supplied by any fuel vendor. POWERPLEX III coupled with our proven REMACCX or XEDOR maneuvering tools is one of the most advanced core monitoring systems in the industry.

BWR Methods Development — We regularly invest in fuel design and analytical methodology development to keep pace with evolving plant operational needs as well as advances in fuel designs. AREVA has a worldwide staff of experts available to develop competitive methodologies to support your plant as well as to provide technical support and consulting.

Fuel Vendor Transition Support — Transitioning a reactor to a new fuel supplier can provide substantial benefits for utility customers – such as more competitive prices and better fuel performance. No other fuel supplier has performed more fuel transitions than AREVA. That's why our support maximizes benefits and minimizes the utility's effort, while preventing surprises. This flexible process accounts for the unique characteristics of each plant, while allowing you to choose the specific level of responsibility you desire. When your plant transitions to AREVA for BWR fuel fabrication and engineering services, you get a highly capable, committed and experienced partner dedicated to meeting and exceeding your fuel supply expectations.

Collaboration and Technology Transfer — AREVA is a strong advocate of collaboration with and technology transfer to electric utilities. We accommodate a variety of collaborative fuel design and licensing working arrangements to best meet the needs of your plant. Most of our fuel-related analysis technology is available to utilities who wish to develop or enhance their own in-house capabilities. We can tailor technology transfer packages to meet all of your specific needs, including installation on mainframe or personal computer workstations, as well as customized training in the use and application of the transferred technology. AREVA also fully supports international technology programs and organizations such as EPRI and INPO, and is an active participant in international programs such as NFIR and SCIP.

AREVA Inc.
7207 IBM Drive
Charlotte, NC 28262

To learn more,
contact: fuelsalesna@areva.com
us.areva.com

7/16 **ANP:U-275-V4-16-ENG**