

Nuclear Fuel Next-Generation Rod Cluster Control Assembly (NG-RCCA™)

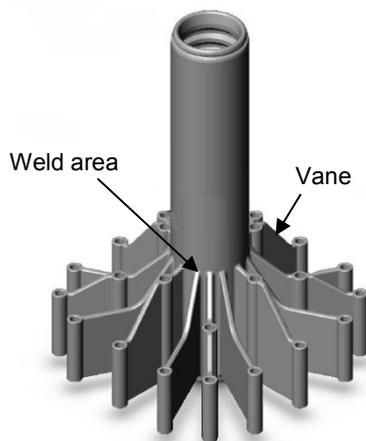
Background

The Westinghouse Next-Generation Rod Cluster Control Assembly (NG-RCCA™) has been developed to provide further performance enhancements and increased longevity of the control rod assembly. The NG-RCCA builds upon our long-established, highly successful and reliable Enhanced-Performance Rod Cluster Control Assembly (EP-RCCA™) design, which has had a service history of more than 30 years with more than 3,000 assemblies delivered globally to a wide variety of 14x14, 15x15, 16x16 and 17x17 plants.

The NG-RCCA design is the direct result of applying Westinghouse knowledge of the reactor system and functional relationships between RCCAs and the system as a whole, providing an integrated solution that is compatible with the reactor; and in particular, the internals and the fuel assemblies.

Description

The NG-RCCA design maintains the basic RCCA configuration of a spider assembly and absorber rods that are composed of absorber material, rodlet cladding, end plugs and chrome plating. Improvements have been made to the spider, absorber rod connections and the absorber geometry to improve the overall strength and lifetime of the NG-RCCAs.



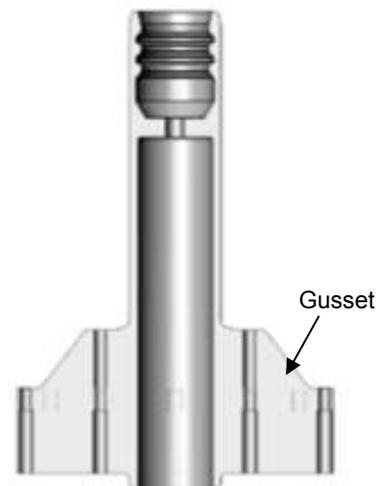
Production spider body

Westinghouse has incorporated a new spider design that reduces the number of welded subcomponents from 41 pieces to two pieces that are held together with a single weld. This was achieved using an innovative material cutting method that achieves a high degree of precision and reproducibility. The spider vanes have an enhanced gusset to increase the overall fatigue strength of the product.

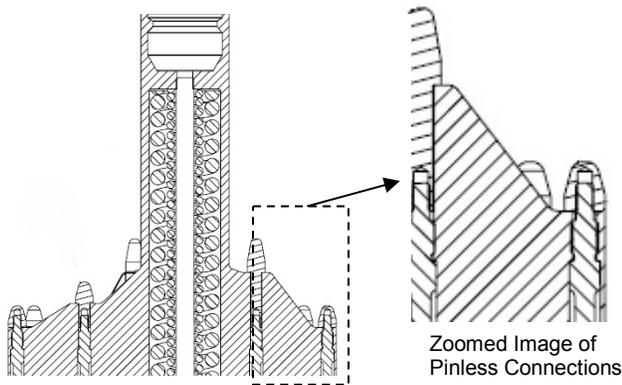
Westinghouse also has incorporated an innovative rodlet connection design that eliminates the need for pinned connections. There are new top-end plug extensions with flexure joints to allow for opposite thread pinless connections with lock welds.

The pinless absorber rod connection to the spider reduces the risk of a dropped absorber rodlet when compared to other RCCA pinned connection designs, even though these events are rare.

The NG-RCCA design continues to use industrial hard-chrome plating on the surface of the absorber rod cladding. Based upon years of successful operating performance of in-service Westinghouse RCCAs, this plating provides robust wear resistance for both the RCCA rodlets and the upper internals guide cards.



Production spider body section view



Spider assembly

Westinghouse has also incorporated additional design changes aimed at increasing the integrity and longevity of the NG- RCCA such as:

- Changes have been made to the lower absorber region geometry to further mitigate irradiation-assisted stress corrosion cracking in this region.
- Changes have been made to the upper absorber region to facilitate ease of manufacturing as it relates to insertion of the absorber material into the control rod cladding tube.

Benefits

The NG-RCCA offers the following benefits:

- Engineered for an extended operational design life.
- Increase in fatigue margin and vane buckling load resistance due to spider design and manufacturing method, which is expected to increase component lifetimes.
- Engineered for a lower overall drag force as compared to other RCCA designs to improve control rod drop times.
- Pinless connection makes the remote possibility of a dropped rodlet even more unlikely.
- Improved quality and manufacturability – can hold tight dimensional tolerances, especially in spider-to-rodlet connections.
- Minimal to no impact on operations and handling; existing guide combs and tooling remain applicable.

- Designed for compatibility with existing RCCA and fuel hardware – no expected impacts on nuclear design, thermo-hydraulic design, safety analyses and technical specifications.
- The transition to the NG-RCCA design can be accomplished by customers via a basic 10CFR50.59 evaluation and Westinghouse is prepared to provide any needed assistance to streamline transition activities.

Experience

Westinghouse has been delivering our previous EP-RCCA design since 1987. The EP-RCCAs have been used by more than 25 customers worldwide in over 70 plants. Westinghouse EP-RCCAs have a proven performance track record. Over 3,000 EP-RCCAs of a wide variety of designs (14x14, 15x15, 16x16 and 17x17) remain in operation.

Based upon our knowledge gained from many years of manufacturing control rod assemblies and from our significant collection of RCCA in-reactor performance data, Westinghouse has developed the next-generation product as an evolution to our EP-RCCA design.

Many of the NG-RCCA design features have been used on our AP1000® plant 17x17 RCCAs and enhanced gray rod control assemblies.

Availability

Our initial product offering is available for our 17x17 Westinghouse nuclear steam supply system (W-NSSS) customer base. Westinghouse is ready to support interested 17x17 W-NSSS customers with purchase and delivery of these NG-RCCAs.

Other Lattice Configurations

Westinghouse is generating development plans for deployment of the NG-RCCA design features to other W-NSSS lattice configurations. Customer feedback and interest in support of our planning is welcome. Please provide your feedback to your assigned Westinghouse Customer Account Manager.

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