

Delivering the Nuclear Promise

Top Innovative Practice



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Implementation of GNF GREAT Nuclear Design Option to Improve BWR Fuel Cycle Efficiency

2022 Top Innovative Practice Winner

Summary

Southern Nuclear's BWR Fuel Engineering team (SNC) and Constellation's Nuclear Fuels Department partnered with Global Nuclear Fuel (GNF) to deploy GNF's latest fuel cycle cost saving innovation feature called GREAT.¹ The GREAT feature is a new design option that improves gadolinia and uranium enrichment loading in a GNF3 fuel bundle. Application of the GREAT feature enables a reduction in fuel cycle costs through an overall enrichment reduction while maintaining a consistent core axial power shape as compared to prior core designs without GREAT. The GREAT design feature is an evolutionary improvement that reduces fuel costs for BWR units with fuel supplied by GNF. SNC and Constellation have implemented GREAT with fuel cycles in 2022.

Innovation

The GREAT feature balances improved fuel cycle economics and manufacturing complexity while maintaining regulatory margin to simplify implementation. The development of GREAT was also innovative in using a highly collaborative approach of two utilities (SNC, and Constellation), and GNF. The collaborative development process included early joint challenge meetings and risk assessments to capture utility perspectives. This resulted in a substantially streamlined product rollout that reduced costs for both the fuel supplier and the utilities. Further, the GREAT feature improves uranium utilization.

Safety

GREAT features can be implemented on the GNF3 product without any adverse consequence to operating margins or fuel performance. GREAT demonstrates that rapid innovations in fuel technology enabling stronger economic performance can be implemented without erosion of existing safety margins. Fuel cycle cost reductions also benefit plant safety and reliability by enabling those savings to be applied to other plant improvements.

Cost Savings

SNC and Constellation saw immediate cost reductions with GREAT, driven primarily by increased uranium utilization. GREAT enabled meeting fuel cycle energy goals with a lower uranium enrichment. This will reduce recurring fuel costs for future Hatch and Constellation reloads which leverage GREAT. It is estimated that use

¹ GREAT is a trade secret of Global Nuclear Fuel.

of GREAT could reduce fuel costs by approximately \$0.5 million per reload per unit. When fully implemented by both SNC and Constellation, a fuel cost reduction of several million dollars annually is expected. Since this initiative is directly transferable to all GNF-fuel BWRs, the cost savings across the BWR industry could be significant if GREAT is widely used.

Productivity/Efficiency

Implementation of GREAT resulted in improved uranium utilization while meeting fuel cycle energy requirements. Further, the rapid deployment of GREAT demonstrates the productivity and efficiency gains when utilities collaborate with their fuel suppliers in new product introductions.

Transferability

The GNF3 GREAT fuel design feature is directly transferable to any GNF-fueled BWR. The innovative way in which GREAT was developed and implemented is transferable to other new fuel products, enabling substantially streamlined product rollout.

Team Members

- Randy Dunavant, BWR Fuel Engineering Manager, (SNC)
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- Tim Collart, Senior Engineer, (SNC)
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- Kelly Stevens, Engineer, (SNC)
- Robert Rowan, Engineer, (SNC)
- Jacqueline Golabek, Engineer, (SNC)
- Patty McCumbee, Customer Project Manager, (GNF)
- Jason Ingraham, Fuel Cycle Principal Engineer, (GNF)
- John Hannah, Methods Principal Engineer, (GNF)
- John McHale, Sr. Staff Fuels Engineer, (Constellation)
- James Tusar, Senior Manager BWR Design, (Constellation)