

Improving Nuclear Fuel Reliability:

MODULE NO. 3

PLANT FUEL RELIABILITY PROGRAMS

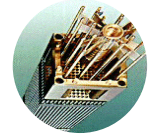
The reliable operation of nuclear fuel in-core is as much a consequence of factors directly under the control of the utility (e.g., foreign material exclusion) as the ability of the fuel design to meet its intended operational requirements. This is equally true for BWR and PWR fuel as evidenced by recent mid-cycle outages to remove failed fuel in BWR plants and significant power derates and/or operational restrictions in PWR plants. The economic impacts on the utility operator will be significant if the nuclear plant is operating at less than full power due to fuel failures or fuel-related operational restrictions.

Establishment and implementation of a comprehensive, effective fuel reliability program is a critical element in achieving top decile fuel performance.

This module addresses the basic principles and key features of a modern fuel reliability program.

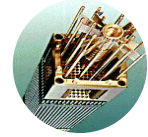
The objectives for the standard Manufacturing and Quality Assurance Module are as follows, but the training sessions may be customized to meet your specific needs. This module can be conducted in one to two days.

- ◆ Describe and Discuss the Key Components of a Fuel Reliability Program
 - Design change evaluation program
 - New fuel inspection program
 - Foreign material exclusion program
 - Failed fuel action plan
- ◆ Describe and Discuss the Design Change Evaluation Program
 - Bases for design changes offered by supplier/sub-suppliers
 - Remedy performance problems (e.g., enhanced corrosion, IRI, grid-to-rod fretting)
 - Enhance operating margins and performance
 - Combination of features from multiple fuel designs
 - Requirements of program
 - Independent utility evaluation capability
 - Strong supplier and sub-supplier oversight program
 - Independent utility evaluation capability
 - Independent evaluation of benefits, risks and costs of proposed or implemented changes against utility's specific operational experience and strategies; identification of characteristics outside utility experience base; evaluation of potential risks to reliable operation
 - Requires fundamental understanding of basic phenomena, performance limitations and analytical techniques in the areas of fuel materials, coolant chemistry, and core design and operation



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- Independent review of the supplier's design control program
 - Participation in supplier's design review meetings
 - Review test reports, design record files, review committee minutes, etc.
 - Ensure issues of critical importance to the utility are explicitly addressed: ensure that an issue has not been inadvertently missed
- ◆ Describe and Discuss the New Fuel Inspection Program
 - Increases opportunity for identification of anomalous condition at plant site before fuel is loaded into the core for operation
 - Condition may have been missed at fabrication plant or introduced during packing and shipping activities
 - Inspector training and qualification
 - Supplier-provided training
 - In-house training
 - Relationship of inspection results to performance requirements
 - Conducting receipt inspections
 - Development of inspection criteria
 - Participation of supplier
 - Shipping container inspection
 - Visual inspection of fuel assemblies
 - Use of tools and gages
 - Reporting and resolution of discrepancies
 - Review of supplier QA records
 - Examples from NAC Stoller's experience
- ◆ Describe and Discuss the Foreign Material Exclusion Program (FME)
 - FME program bases and objectives
 - Minimize introduction of foreign materials in-core (e.g., debris, EHC fluids)
 - Key features
 - Management emphasis and oversight
 - Operator and contractor training programs
 - Personal accountability



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- Management emphasis and oversight
 - Expressed commitment by plant/utility management
 - Procedures for all levels (e.g., high level administrative to maintenance working level); allows critical system to be explicitly identified
 - Appointment and responsibilities of plant/utility FME coordinator to establish and implement FME program at all sites
 - Communications (newsletters, posters, etc.) to emphasize FME awareness
- FME training programs
 - Identification/description of good practices
 - Hands-on training with mockups (i.e., 'error' lab) to work through FME practices without risk of introducing foreign material into reactor system
 - Contractors training
- ◆ Describe and Discuss the Failed Fuel Action Plan
 - Establishment of failure indicator levels
 - Actions taken at each indicator level
 - Plant personnel assignments at each indicator level
 - Notifications
 - Role of the fuel supplier
- ◆ Describe and Discuss Best Practices Assessments (for multi-site utilities)
 - Historical differences among sites
 - Review of individual site programs
 - Evaluation of each element from each site
 - Investigation of industry best practices
 - Development of "best practices" fuel reliability program for all sites
 - Implementation and administration of program