

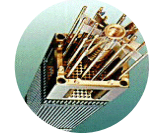
Fuel Characterization for Dry Storage

Each spent fuel assembly must be characterized as to its physical condition before being placed in dry storage. Such characterization activities can impose a significant economic burden on the plant operator. This burden can be minimized with a fundamental understanding of today's government regulations and guidelines and, more importantly, of how to proceed with the characterization in a strategically optimum fashion to minimize cost. This includes an understanding of how to determine the soundness of spent fuel slated for dry storage with high confidence in the minimum amount of time and at the lowest possible cost.

Stoller Nuclear Fuel Division of NAC Worldwide Consulting (NAC Stoller), has teamed with **Engineering Analytics LLC** to offer two training modules for utility personnel interested in expanding their knowledge of spent fuel characterization issues and procedures. These modules are designed to provide a sound foundation for developing the most effective and cost-efficient fuel characterization programs.

Each module is self-contained and can be conducted individually or in sequence. The first (one-and-a-half days) is titled *Characterization of Spent Fuel for Dry Storage* and describes the current regulatory climate and techniques for minimizing the number of physical inspections to be performed. The second, "Fuel Visual Inspection Techniques and Methods," addresses the circumstances in which physical inspection is unavoidable, as well as providing information that can guide utilities' decisions regarding returning potentially failed, partially burned fuel to service. Typical agendas for these two seminars are provided on the reverse side of this page. They can be modified to meet your specific requirements.

NAC is known worldwide for its spent fuel storage cask and transportation services. The team of Stoller Nuclear Fuel and Engineering Analytics LLC has broad experience in utility fuel performance and regulatory requirements, including current spent fuel characterization efforts to provide you with answers to your spent fuel questions.



MODULE OPTIONS

MODULE A:

CHARACTERIZATION OF SPENT FUEL FOR DRY STORAGE

- I. Introduction
- II. On-Site Dry Storage Overview
 - Background
 - Status
 - Regulatory Situation
- III. Engineering/Safety Considerations
 - Functional Requirements
 - Nuclear Fuel Parameters
 - Spent Fuel Physical Condition
- IV. Characterization of Fuel Condition (Fuel Classification)
 - Purpose
 - Regulatory Basis
 - Comparisons of Classification Protocols
- V. Unresolved Generic Issues
 - Clad Defects
 - High Burnup Fuel
 - Consistent Classification
 - “Licensed” Cans for Leakers
- VI. Characterization Strategies
 - Techniques for Optimizing Characterization Activities
 - Approaches that Minimize the Need for Inspection
 - Strategies Addressing Failed and Damaged Fuel
 - BWR Considerations
 - PWR Considerations
- VII. Fuel Inspection
 - Functional Requirements
 - Required Confidence Level
 - Interpreting NRC and DOE Guidance
- VIII. Cask Loading Strategies
 - Constraints
 - Selection and Sequencing of Fuel
 - Risk Considerations
- IX. Documenting the Characterization
 - Quality and Records Requirements
 - Database Opportunity
 - Long-Term Horizon
- X. Summary and General Discussion

MODULE B:

FUEL VISUAL INSPECTION TECHNIQUES & METHODS

- I. Introduction
- II. Fuel Damage Characteristics
 - Physical Mechanisms
 - Key Visual Indicators
 - Primary Failure Mechanisms (grid-to-rod fretting, accelerated corrosion, debris fretting, manufacturing, handling damage)
 - Secondary Degradation (blisters and bulges, large sunburst hydrides, hydrided end plug weld zones, long axial splits)
- III. Fuel Inspection Techniques
 - Equipment
 - Theory and Practice
 - Capabilities and Limitations
 - Visual
 - Ultrasonic Testing (UT)
 - Sipping
 - Eddy Current Testing (ECT)
- IV. Interpretation of Data
 - Videotape Reviews
 - Stoller Videotapes
 - Utility Videotapes
 - Identification of Fuel Failures from Various Causes
 - Unfailed Fuel Characteristics
- V. Summary and General Discussion