

Fuel Reliability Program

Fuel reliability is central to nuclear plant operations and critical to the economic viability of a nuclear plant. Fuel failures are expensive and have been increasing. With an impending renaissance of nuclear power around the world, maintaining the public's perception of nuclear generation as safe, efficient, and reliable is more important than ever.

Fuel failures have increased as higher fuel duties, longer fuel cycles, and new water chemistry environments have been used to increase plant efficiency. Although overall fuel reliability today is much better than it was in the early years of the industry, it does not fit the industry's vision of "excellence." In response, the Institute of Nuclear Power Operations (INPO) has set a goal for the industry to have zero failures by 2010.

The challenge is substantial since 30%–40% of U.S. plants are operating with fuel failures at any one time. Nuclear fuel is a highly engineered product and experiences the highest temperatures, stresses, and radiation fields of any reactor component. A typical reactor might have 50,000 fuel rods, and each one needs to operate flawlessly. Manufacturing processes must be near perfect, and the operating conditions and margins must be well understood.

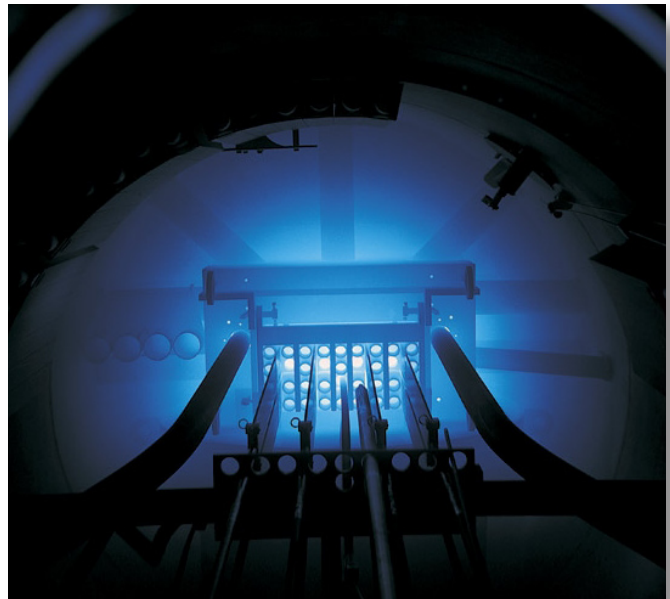
Another challenge is timing. Nuclear fuel has a lifetime of three to eight years in the core. When one factors in the time to design, build, test, and demonstrate the fuel, it is clear that it takes well over a decade before the full benefits of any new design are realized. The industry has a relatively long journey ahead and little time to get there.

Technology Advancements

The industry's "Fuel Integrity Improvement Initiative" was developed immediately following the announcement of the zero failures goal. A substantial focus of this effort is the development of guidelines that outline strategies to avoid each of the known failure mechanisms and to ensure the appropriate "routine" fuel inspections are being conducted on unfailed fuel to avoid surprises. In many cases, technical gaps in our understanding prevent us from issuing guidance with the desired level of detail, and a number of R&D activities are underway to address these gaps.

Collaboration

EPRI's Fuel Reliability Program includes all U.S. nuclear plant operators and a number of international utilities. There is also close collaboration with all major fuel vendors, INPO, and NEI. While the technical guideline effort is led by EPRI, INPO has taken the lead on providing an initial set of guidelines, collecting and summarizing the best of the currently available guidance.



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