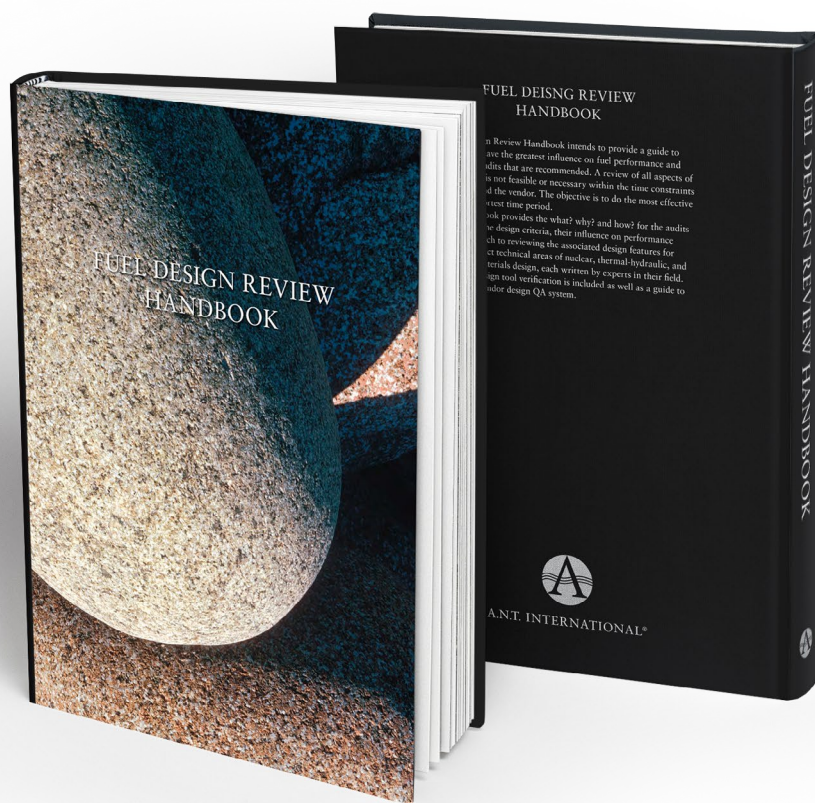




HANDBOOKS & REPORTS

FUEL DESIGN REVIEW HANDBOOK (FDRH)



Objective

The reliable, safe and economical performance of nuclear fuel depends on its design, the processes used for its fabrication and the environment for its operation. Each of these three areas requires strict quality control (QC) and quality assurance (QA) to assure that those performance goals are achieved. The factors that control the quality are quite different in each of these areas, nevertheless they are interactive and the plant operator as well as the fuel vendor has to be aware of all of them. This Handbook provides a guide for reviewing and auditing the fuel design to assist in the assurance that it will perform its design functions adequately. The trend to more demanding performance parameters and the competitive reload fuel market have resulted in a design evolution that could outpace experience. This has produced a renewed need for design reviews and associated audits to assure reliable fuel performance and maximise plant availability.

The overall objective of the design review is to assure that the fuel assembly or fuel reload will perform reliably at or above the contracted conditions with adequate margins to design limits and licensing limits for its intended exposure in the reactor. Some detailed objectives include:

- To determine whether the design provides the best balance between meeting operating flexibility, reliability, licensing and economic goals,
- Evaluate whether the core can be operated for the intended cycle with adequate margins to provide sufficient flexibility and manoeuvrability,
- Determine compatibility with existing fuel in the core,
- Evaluate whether the design has eliminated past problems,
- Audit the vendor design QA system to assure that it is adequate and has been applied correctly, thereby also satisfying the requirements of 10CFR50, Appendix B,
- Familiarize utility personnel with the vendor's design and its performance capabilities.

This is accomplished in several steps:

- Compare the design to the contractual and operating requirements,
- Review the nuclear, thermal-hydraulic, mechanical and materials designs and their interaction,
- Review the experience base and testing programs that provide the design bases,
- Review the drawings, materials and fabrication process specifications,
- Do independent analyses of specific areas for design verification.

A review of all aspects of the fuel design is not feasible or necessary within the time constraints of the utility and the vendor. This Handbook intends to provide a guide to the items that have the greatest influence on fuel performance and prioritise the audits that are recommended. The objective is to do the most effective audit in the shortest time period.

The Handbook provides the what? why? and how? for the audits by describing the design criteria, their influence on performance and the approach to reviewing the associated design features for the three distinct technical areas of nuclear, thermal-hydraulic, and mechanical/materials design, each written by experts in their field. A guide for design tool verification is included as well as a guide to auditing the vendor design QA system. Additional chapters include a description of the LOCA, RIA, ATWS and seismic design base accidents, their licensing criteria and their potential effects on the design. Applicable standards and guides for normal operation as well as for transients and accidents are described.

The Handbook provides guidance for the important aspects of setting up and conducting an effective audit and for handling deviations from the design or design procedures when they occur.

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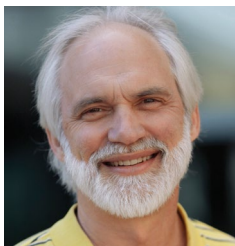
The Authors

The lead author and chief editor of the Handbook was Mr. Alfred Strasser



Mr. Alfred Strasser, a material scientist, has more than 50 years of experience in core technology, in the design, fabrication and irradiation of nuclear fuels for LWRS, FBRs and test reactors, for 18 years at NDA and United Nuclear, for 22 years at S.M. Stoller and currently as President of Aquarius Services Corp. His activities since 1954 have included for clients worldwide:

- Design and design reviews of nuclear fuels
- Fabrication and audits of fabrication of UO₂ and MOX fuels
- Irradiation testing of advanced fuels
- Failure analyses of fuels and other core and plant components
- Materials technology evaluations
- Effects of water chemistry on fuel and core component performance
- Management of R&D programmes
- Specifications and evaluation of commercial bids for fuel and other core components



Mr. Kenny Epperson has been working in the commercial nuclear industry since 1984. He began his career with Virginia Power at North Anna Power Station as a reactor engineer and then a licensed Senior Reactor Operator (SRO) shift technical advisor (STA). In 1989, he began a career with Duke Energy in the corporate office supporting fuel design and analyses. The work involved development, approval, and implementation of NRC licensed methodology for thermal-hydraulic and fuel rod mechanical analyses of reload fuel cycles for seven PWRs. He coauthored two topical reports on statistical DNB analysis methodology and fuel assembly reconstitution. In addition, he assisted two vendors in the development and initial Duke analyses of four new fuel assembly designs and managed the implementation of two Lead Test Assembly (LTA) programs.



Mr. Jerald Holm, independent consultant, previously Manager, Product Licensing and Manager, PWR Nuclear Engineering with AREVA NP Inc. Involved in licensing, with the NRC, topical reports related to mechanical design, reactor physics, thermal-hydraulics, transient analysis, and LOCA analysis in both BWR and PWR areas. Managed activities related to reload support work in the areas of reactor physics, thermal-hydraulics, transient analysis, and LOCA analysis for six PWRs.



Mr. Sten Lundberg, independant consultant, previously with Sydkraft/Barsebäck and Studsvik in Sweden, NPP Leibstadt in Switzerland and Stoller Energietechnik in Germany as a nuclear engineer. His area of expertise is within the nuclear, thermal hydraulic and dynamic area of the fuel cycle. At Leibstadt he was the lead station nuclear engineer.

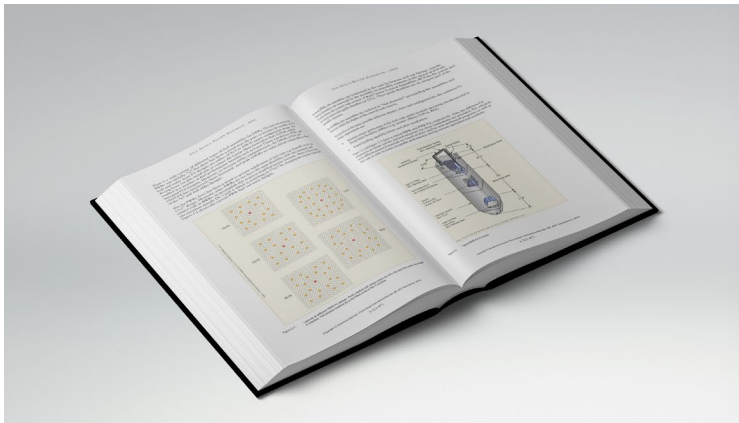


Mr. Peter Rudling is the President of ANT International, managing the ZIRAT/IZNA/LCC Programmes as well as providing seminars and Handbooks on various fuel related topics to the nuclear industry. Peter was a senior consulting scientist at Vattenfall, the largest Swedish power company. Earlier he has also been a Specialist of Fuel Materials at ABB Atom (now Westinghouse) and a Project Manager at EPRI.

Reviewers:

Robert Rand - GNF (retired), Wilmington, NC, USA

George Rorke, Port Washington, New York



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Contact

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Office Address: Advanced Nuclear Technology International, Spinnerivägen 1, Fack 5035, SE-448 50, Tollerød, Sweden.
Phone: +46 (0)31-88 16 00. Fax: +46 (0)31-88 16 01. info@antinternational.com www.antinternational.com