

FOR MORE INFORMATION

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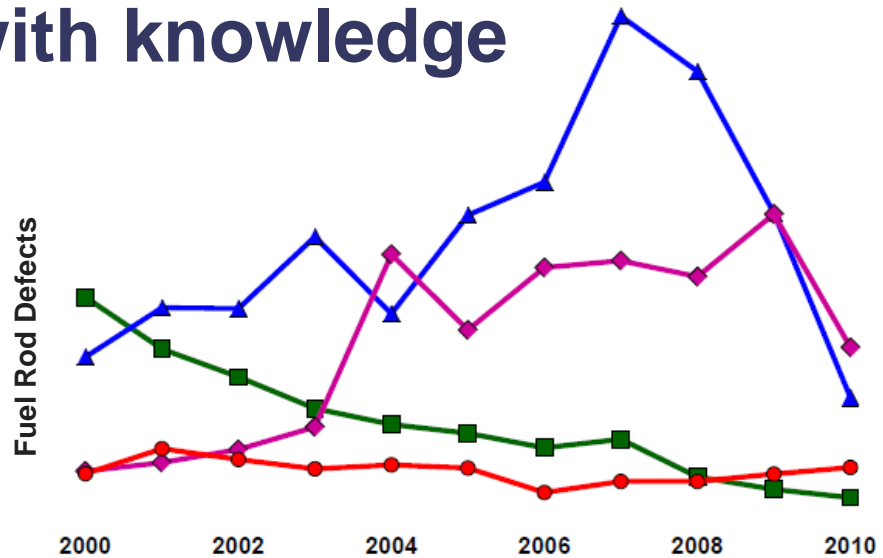
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The Foundation of Nuclear Fuel Knowledge

The NAC International Core Performance Assessment Group (COPAG), founded in 1975, is a group of nuclear utilities that sponsors independent analyses by NAC International of critical contemporary issues in nuclear fuel design, manufacturing, operation, performance and reliability. COPAG membership includes utilities that operate a diversity of reactor types and fuel designs in Asia, Europe, and the United States.

Fuel reliability begins with knowledge



It is imperative for utilities to have an efficient, effective, and objective means of staying informed on a timely basis about the **latest developments in fuel design, manufacture, operation, performance and reliability.**

Increased fuel burnup, higher energy cores, power uprates, and coolant chemistry excursions and program changes are just a few examples of continuing challenges to fuel reliability and performance. Fuel and core component **design changes are being introduced and adopted with increasing frequency**, often before new designs have accumulated significant operating experience. Risks and uncertainties are increasing and, at the same time, industry and management expectations for zero defect fuel operation have never been more clear.

COPAG addresses these challenges by providing members with highly organized vendor and industry information, plus **expert analysis on nuclear fuel and core components.** COPAG provides unparalleled content and value. With knowledge, achieving zero fuel defects can be a realistic goal. You provide the people...



COPAG provides the knowledge

Design

Materials

Manufacture

Operation

Performance

Reliability

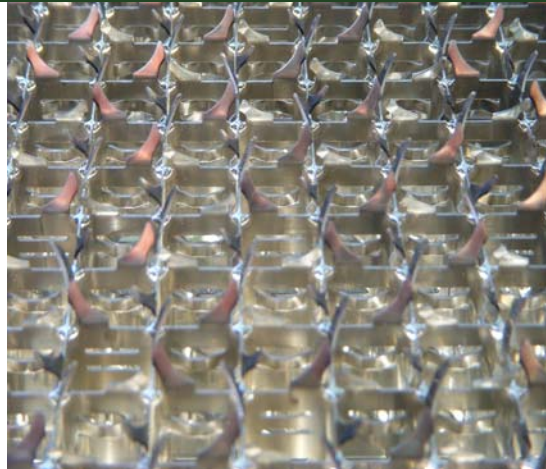
COPAG



Members benefit from a spectrum of BWR and PWR industry information, covering advancements in products, services, and operational experience

Benefits of Membership

- ◆ Members are kept up to date on current fuel related issues, experience, and operational implications – on a timely basis and at a very modest cost
- ◆ Membership contributions are combined to achieve unparalleled content and value that could not be attained individually
- ◆ COPAG provides a forum to discuss relevant fuel performance issues with other utilities and the NAC expert consultants
- ◆ Members with only one type of reactor in its portfolio (e.g., BWR vs. PWR) benefit by learning about potential generic and cross-cutting performance issues
- ◆ Members have access to NAC staff for follow-up questions, advice, and information

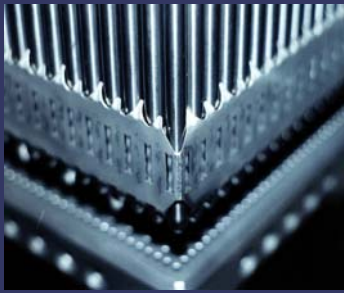


- ◆ Compact two- and three-day formats, makes efficient use of limited utility staff time and resources
- ◆ Free access to reports from prior years of membership. Reduced cost for other non-member years (Report and topic listings available upon request)
- ◆ Discounts on multiple year membership commitments

Incentive pricing for NEW MEMBERS makes joining COPAG an easy and affordable decision!

COPAG Annual Program

- A critical review of U.S. and European nuclear fuel vendors' technology, performance, failed fuel causes, statistics, and trends
- Special topics, selected by the membership, that focus on the most significant fuel and core-related issues of the day
- A balance of BWR and PWR topics, with NAC International's independent expert analysis and evaluation of each issue
- Annual seminars for COPAG members held in Asia, Europe, and the United States.
- Full electronic copies of reports and bound copies of the presentation slides



Core Performance Assessment Group

Additional Services

NAC International offers a wide variety of services and training to nuclear utilities around the world in procurement, design, manufacturing oversight, operation, performance and reliability of nuclear fuel and core components.

Meet the NAC International COPAG Staff and Expert Consultants:



Mr. John Rivera is NAC's Director of Fuel Performance Consulting and has more than 25 years of experience providing nuclear fuel design, materials, manufacturing oversight, performance, procurement, and quality assurance services to the nuclear utility industry. He has developed nuclear fuel mechanical design expert programs and software tools, and has developed fuel performance models for the assessment of ramp rates, growth and creep behavior, and corrosion. He has substantial on-site power plant experience that includes pool-side inspections, design of tooling, and repair of fuel and core components. He has authored numerous programs for performance-based oversight of BWR and PWR fuel manufacturing. He is Six Sigma and Lead QA Auditor certified. Mr. Rivera holds advanced degrees in Nuclear Engineering and Nuclear Materials. Prior to joining NAC, Mr. Rivera held management positions at Florida Power and Light, Duke Engineering and Services, and Yankee Atomic Electric Company.

Dr. Hans-Urs Zwicky has 30 years of experience in nuclear research and industry including 12 years in irradiated fuel and core component investigations, 7 years as a fuel performance specialist and head of nuclear engineering at KK Leibstadt in Switzerland, followed by 10 years in consulting roles, on an independent basis and with NAC. Dr. Zwicky also has served as a member of the Swiss Federal Commission for the Safety of Nuclear Installations (KSA). He has made major technical contributions to the COPAG program over many years.



Dr. John Harbottle is a physics and metallurgy graduate with over 40 years of experience in the nuclear industry. He is an expert in materials behavior, mechanical design and performance of fuel assemblies and core components. His consulting expertise includes fuel design evaluation, water chemistry, in-reactor fuel performance and reliability issues. He is a leading expert in the area of Zirconium alloy technology, where he has published widely over many years. He has played a major role in the coordination and technical management of COPAG since 1990. Although recently retired, he remains available to the COPAG program in an advisory capacity.

Mr. Sten Lundberg has more than 30 years experience in BWR operations and core analysis. His work experience includes nuclear analyses and operation roles in Barsebäck and KK Leibstadt, code development and testing in Studsvik, plus consulting on core and fuel analysis, including steady state and transient conditions. He is a licensed Station Nuclear Engineer, SNE. He has a license to run the CASMO SIMULATE code. Mr. Lundberg also is an experienced technical contributor to the COPAG program.



Mr. Chris Rusch is a Senior Consultant with NAC and has more than 35 years of experience in the nuclear industry. He has *been* involved with a wide range of consulting assignments, spanning all fuel cycle segments from the front end through waste management and decommissioning and including technical contributions to the COPAG program. Before joining NAC, Mr. Rusch was the manager of nuclear fuel at Portland General Electric, responsible for all nuclear fuel procurement and economic analysis, and management of major projects and technical professionals, including in-core fuel management and safety analysis personnel.