

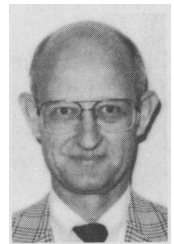
AUTHORS — JULY 1990

SAFETY OF NEXT GENERATION POWER REACTORS

NEXT-GENERATION POWER REACTOR INFORMATION SYSTEM

Emil E. Leitz

Emil E. Leitz (BS, mechanical engineering, Washington State University, 1953; MA, business administration, University of Washington, 1973) has worked in the nuclear industry for the past 33 years. At General Electric Company, he served in the nuclear safety area and had major responsibility for the testing program in support of the start-up of the N Reactor. He has been manager of N Reactor operations, manager of N Reactor training, and manager of nuclear safety, in addition to a number of technical and program management positions. Recent responsibilities have been in the area of performance and safety assessment including providing assistance in the development of a level I probabilistic reliability assessment for the N Reactor and upgrading the safety assessments of the Hanford chemical processing plants.



CONCEPTUAL DESIGN AND SAFETY CHARACTERISTICS OF A NATURAL-CIRCULATION BOILING WATER REACTOR

Yoshiyuki Kataoka

Hiroaki Suzuki

Sigeo Hatamiya

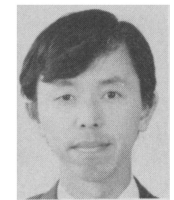
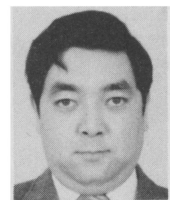
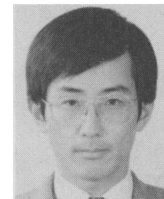
Michio Murase

Isao Sumida

Tetsuo Horiuchi

Minoru Miki

Yoshiyuki Kataoka (top right) (MS, mechanical engineering, Keio University, Japan, 1977) is a researcher at Energy Research Laboratory (ERL), Hitachi, Ltd. He is interested in the thermal hydraulics of boiling water reactors (BWRs). **Hiroaki Suzuki** (top left) (MS, energy science, Tokyo Institute of Technology, Japan, 1979) is a researcher at ERL, dealing with safety analyses of BWRs. **Sigeo Hatamiya** (bottom right) (PhD, mechanical engineering, Tokyo University, Japan, 1985) is a researcher at ERL, dealing with the thermal hydraulics of BWRs. **Michio Murase** (bottom left) (MS, mechanical engineering, Kyoto University, Japan, 1971; PhD, mechanical engineering, Kyoto University, Japan, 1989) is a senior researcher at ERL. He is responsible for research and development (R&D) of next-generation reactors.



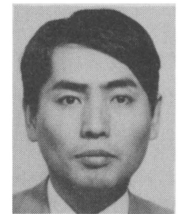
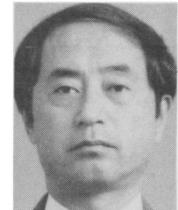
Isao Sumida (top) (BS, physics, Tokyo University, Japan, 1963; PhD, engineering, Tokyo University, Japan, 1982) is a chief researcher at ERL. He is responsible for R&D of nuclear power and alternative energy. **Tetsuo Horiuchi** (center) (BS, physics, Osaka University, Japan, 1967) is a senior engineer at Hitachi Works, Hitachi, Ltd. He has been a project manager for the development of the advanced BWR since 1985 and is a member of the Small and Medium-Sized Reactor Committee. **Minoru Miki** (bottom) (BS, mechanical engineering, Tokyo University, Japan, 1953) has been an auditor of Japan Nuclear Fuel Company since 1988. He was a senior chief engineer at Hitachi Works, Hitachi, Ltd., until 1988 and was responsible for research, development, and system improvement of BWRs.



CONCEPTUAL DESIGN OF THE INTEGRATED REACTOR WITH INHERENT SAFETY

Yoshiro Asahi (top) (PhD, nuclear engineering, University of Michigan, 1972) is a senior engineer at the Japan Atomic Energy Research Institute, where he was in charge of development of the THYDE computer code series. His current interests center mainly on the design of inherently safe reactors. **Ichiro Sugawara** (center) (Dr., nuclear engineering, University of Tokyo, Japan, 1976) has been engaged in development of nuclear waste management technology at the JGC Corporation. His current interests focus on inherently safe reactors and environmental problems. **Toshiki Kobayashi** (bottom) (MS, mechanical engineering, Nagoya University, Japan, 1976) is a mechanical engineer and a group leader of the nuclear department at Nippon Kokan K.K. His interests are stress analysis and aseismatic design.

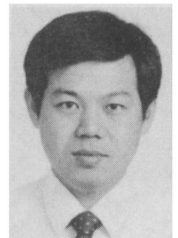
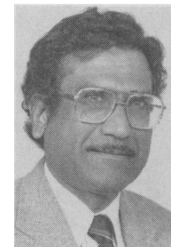
*Yoshiro Asahi
Ichiro Sugawara
Toshiki Kobayashi*



DECAY HEAT REMOVAL IN THE SODIUM ADVANCED FAST REACTOR WITH THE MDSNP CODE

T. C. Hung (top) [BS, 1980, and MS, 1982, nuclear engineering, National Tsing-Hua University, Taiwan; PhD, mechanical engineering, University of California, Los Angeles (UCLA), 1989] is a scientist at Argonne National Laboratory. His current interests are in thermal hydraulics, heat transfer, reactor safety analysis, system modeling, and simulation of advanced reactors. **V. K. Dhir** (PhD, mechanical engineering, University of Kentucky, 1972) is a professor of engineering and applied science at UCLA. His research interests are in phase change heat transfer, heat transfer enhancement, and nuclear reactor thermal hydraulics and safety.

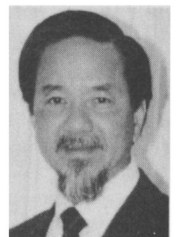
*T. C. Hung
V. K. Dhir*



ROLE OF FEEDBACK REACTIVITIES IN THE PASSIVE SAFETY OF NUCLEAR REACTORS: THE CASE OF THE FAST FLUX TEST FACILITY

Dong H. Nguyen (PhD, nuclear engineering, University of California, Berkeley, 1965) is a physicist at the Lawrence Livermore National Laboratory. His past 25 years have been divided between academic institutions and national laboratories. His earlier work was in space-time kinetics and direct energy conversion.

Dong H. Nguyen



His recent activities are in the areas of fast reactor safety, radioactive material transport, probabilistic risk assessment, and criticality safety analysis.

PASSIVE CONTAINMENT COOLING FOR AN ADVANCED SMALL PRESSURIZED WATER REACTOR

Brett J. Menaker (top) (BS, mechanical engineering, Pennsylvania State University, 1969) is a mechanical engineer in the advanced energy department of United Engineers & Constructors (UE&C). Since 1983, he has been the task leader for the technical update of the U.S. Department of Energy (DOE) Energy Economic Data Base Program. Prior to that he was a mechanical engineer in the Power Division of UE&C, where he was engaged in the design of nuclear and fossil-fueled power generating stations. His current areas of professional interest are advanced energy concepts and comparative evaluation of energy options. **Russell E. Allen** (center) (BSEE, Drexel University, 1959) is a senior consulting engineer in the advanced energy department of UE&C. His current areas of interest are technical and economic evaluations and comparisons of conventional power generation options and advanced power plant concepts. Additionally, he has been project manager of the U.S. DOE Energy Economic Data Base Program since 1978. **Harry E. Painter** (bottom) (BS, 1969, and MS, 1971, civil engineering, Drexel University) is a structural engineer with UE&C. His current areas of interest include modifications to upgrade production reactor plants, economic evaluations of power generation alternatives, and the next generation of nuclear power plants with inherently safe passive features.

*Brett J. Menaker
Russell E. Allen
Harry E. Painter*



THE PIUS PRESSURIZED WATER REACTOR: ASPECTS OF PLANT OPERATION AND AVAILABILITY

Kåre Hannerz (top right) (PhD, physical chemistry, Royal Institute of Technology, Stockholm, Sweden, 1955) has been an engineer with ABB Atom since 1956. He has been active in the fields of fuel engineering, high-level waste disposal, and reactor design. His primary interest is the design of "inherently safe" light water reactors. **Lars Nilsson** (top left) (MS, mechanical engineering, Royal Institute of Technology, Stockholm, Sweden, 1963) has been an engineer with ABB Atom since 1963. He has been manager for core thermohydraulic design, for process system engineering and design, and for the Ringhals-1 nuclear power plant start-up team and is now manager of engineering for the PIUS project. **Tor Pedersen** (bottom right) (MS, electrical engineering, Norwegian Institute of Technology, Trondheim, Norway, 1960) has been an engineer with ABB Atom since 1972 (with the ABB group since 1962). He has had experience in the design and analyses of electrical systems for nuclear power plants, overall plant design analyses, documentation, and market development. His present activities cover documentation and marketing related to the PIUS project. **Christen Pind** (bottom left) (MS, mechanical engineering, Royal Technical University of Denmark, 1953) has been an engineer with ABB Atom since 1959. He has been manager of the systems group and manager of the start-up team for the Oskarshamn-1 nuclear power plant. His present activities cover safety, design, and dynamics in the PIUS project.

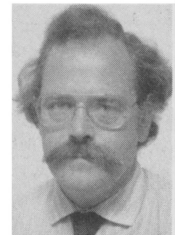
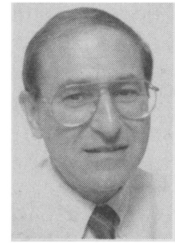
*Kåre Hannerz
Lars Nilsson
Tor Pedersen
Christen Pind*



LOSS-OF-COOLANT ACCIDENT ASPECTS OF THE COMBUSTION ENGINEERING ADVANCED LIGHT WATER REACTOR—SYSTEM 80+™

Stanley Rosen (top right) (MS, nuclear engineering, New York University, 1958) has been with Combustion Engineering (C-E) since 1965. His principal activities have been in thermal-hydraulic design and safety analysis. He is currently a consulting engineer in the transient methods and loss-of-coolant (LOCA) group. **Richard D. Ivany** (top left) (PhD, nuclear engineering, University of Michigan, 1965) has been with C-E since 1965. He has been involved in all aspects of thermal and hydraulic analyses for C-E nuclear steam supply systems from design conception through routine reload performance. **John F. Kapinos** (bottom right) (BSE, 1972, and MSE, 1982, mechanical engineering, University of Connecticut) is a consulting engineer in the transient methods and LOCA group at C-E. He has been involved in the development, verification, and application of safety analysis computer codes for LOCA, non-LOCA, and anticipated transient without scram events. His current responsibilities include the evaluation of LOCA transients in the C-E advanced light water reactor design. **Suk K. Sim** (bottom left) (PhD, nuclear engineering, Rensselaer Polytechnic Institute, 1986) has had experience in nuclear safety analysis, transient methods development, and nuclear reactor thermal hydraulics at C-E, where he is currently a consulting nuclear engineer in nuclear simulations.

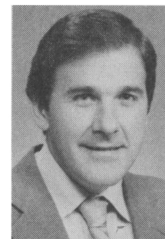
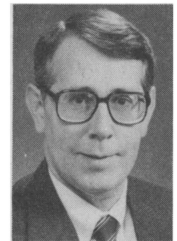
*Stanley Rosen
Richard D. Ivany
John F. Kapinos
Suk K. Sim*



SAFETY: EVOLVING TECHNOLOGIES FOR TOMORROW'S POWER REACTORS

Howard J. Bruschi (top) (BS, electrical engineering, Cornell University, 1964; MBA, University of Pittsburgh, 1968; PMD, Harvard University, 1976) is director of nuclear plant and AP600 programs at the Westinghouse Electric Corporation and is responsible for the development and commercialization of nuclear plant designs for Westinghouse. He has been associated with the nuclear energy field for Westinghouse for 25 years. His recent focus has been the development of the AP600—an advanced pressurized light water reactor employing passive safety features. **Ronald P. Vijuk** (MS, mechanical engineering, Carnegie Institute of Technology, 1966; MBA, University of Pittsburgh, 1979) is manager of plant engineering programs at Westinghouse and has more than 22 years of engineering and management experience with Westinghouse. He has managed design and analysis activities for 50 plant projects employing pressurized water reactor (PWR) nuclear steam supply systems and has managed design and evaluation of nuclear systems for an advanced PWR 1300-MW(electric) program. He has also coordinated systems development for other nuclear projects and has been responsible for developing advanced safety analysis methods to support plant licensing.

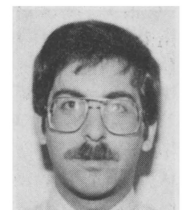
*Howard J. Bruschi
Ronald P. Vijuk*



PROBABILISTIC ANALYSIS FOR CONCEPTUAL DESIGN OF THE BABCOCK & WILCOX ADVANCED LIGHT WATER REACTOR

Stanley H. Levinson (right) (BS, 1978; ME, 1979; and PhD, 1982, nuclear engineering, Rensselaer Polytechnic Institute) is a reliability/probabilistic risk assessment (PRA) engineer in the Engineering and Plant Services Division of Babcock & Wilcox (B&W) Nuclear Technologies. His responsibilities include identifying and performing a variety of PRA and reliability analyses

*Stanley H. Levinson
Robert S. Enzinna*



with varying objectives of safety, design enhancement, performance improvement, and licensing issues. He is currently working to apply expert system techniques to engineering problems. **Robert S. Enzinna** (right) (BS, 1978, and ME, 1979, nuclear engineering, Rensselaer Polytechnic Institute) is a reliability/PRA engineer in the Engineering and Plant Services Division of B&W Nuclear Technologies. His responsibilities include identifying and performing a variety of PRA and reliability analyses with varying objectives of safety, design enhancement, performance improvement, and licensing issues. He is currently applying probabilistic techniques toward the relaxation of technical specifications.



PROBABILISTIC RISK ASSESSMENT INSIGHTS FROM NEW WESTINGHOUSE PRESSURIZED WATER REACTOR DESIGNS STUDIED IN 1982-1987

Selim Sancaktar (top) (PhD, physics, Virginia Polytechnic Institute and State University, 1975) is a fellow engineer in the nuclear safety department at Westinghouse Electric Corporation. He has worked in risk assessment technology for the last 9 years. **T. van de Venne** (MS, aeronautics and astronautics, University of Washington; Ing., mechanical engineering, Delft Technological University, The Netherlands) has been the engineering manager of advanced pressurized water development at Westinghouse since 1985.

*Selim Sancaktar
T. van de Venne*



LOSS-OF-COOLANT ACCIDENT PERFORMANCE OF THE WESTINGHOUSE 600-MW(electric) ADVANCED PRESSURIZED WATER REACTOR

Robert M. Kemper (top) (BS, 1965, and MS, 1966, chemical engineering, Massachusetts Institute of Technology) is a senior engineer in the Westinghouse Electric Corporation Nuclear and Advanced Technology Division. For the last 18 years, he has been involved in loss-of-coolant accident and postaccident containment modeling and analysis. **Christine M. Vertes** (BS, mechanical engineering, Northwestern University, 1983; MSE, mechanical engineering, University of Michigan, 1987) is an engineer in the Westinghouse Electric Corporation Nuclear and Advanced Technology Division. She has been involved in the modeling and safety analyses of Westinghouse advanced reactor designs.

*Robert M. Kemper
Christine M. Vertes*



NUCLEAR POWER—A PATH TO THE FUTURE

John J. Taylor (top) (BS, mathematics, St. John's University, 1942; MS, mathematics, University of Notre Dame, 1946) is vice president of the Nuclear Power Division at the Electric Power Research Institute (EPRI). He is responsible for research and development of nuclear power for the generation of electricity. Prior to joining EPRI in 1981, he was engaged in nuclear power development for naval propulsion and electricity generation for Westinghouse Electric Corporation. **Karl E. Stahlkopf** (BS, electrical engineering and naval science, University of Wisconsin; MS and PhD, nuclear engineering, University of California, Berkeley) is director of the Department of Nuclear Systems and Materials, Nuclear Power Division, EPRI. Before joining EPRI in 1973, he was a research fellow in the Department of Engineering at the University of California, Berkeley, and also served as a technical consultant on nuclear submarine propulsion for the Chief of Naval Operations, Washington, D.C.

*John J. Taylor
Karl E. Stahlkopf*

