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NUCLEAR SAFETY

NUCLEAR POWER PLANT SITE SELECTION: A CASE STUDY

Yaakov Lugasi
Abraham Mehrez
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Yaakov Lugasi (top) (BS and MS, industrial engineering and management, Ben-Gurion University of the Negev, Beer Sheva, Israel) is a PhD candidate in the Department of Industrial Engineering and Management, Ben-Gurion University. His master's thesis was on nuclear power plant site selection. **Abraham Mehrez** (center) (BA, economics and statistics, and MA, statistics, The Hebrew University of Jerusalem; MS, mathematical science, and PhD, systems analysis, Johns Hopkins University) is a senior lecturer on system analysis in the Department of Industrial Engineering and Management, Ben-Gurion University. **Zilla Sinuany-Stern** (bottom) [BA, economics and statistics, and MA, statistics, Tel Aviv University; PhD, operations research, Case Western Reserve University (CWRU), 1978] is an assistant professor of operations research in the Department of Industrial Engineering and Management, Ben-Gurion University. She has lectured at CWRU and Bar-Ilan University and was a consultant for Cleveland Trust Bank (Ohio) and the Indiana Commission for Higher Education. Her research interests include decision analysis, forecasting, budgeting, location, and energy applications.

IMPROVEMENTS IN COMPARTMENT FIRE MODELING AND SIMULATION OF EXPERIMENTS

Gary Chung
Nathan Siu
George Apostolakis

Gary Chung (top) (BS, nuclear engineering, University of California, Santa Barbara, 1982) is a graduate student at the University of California at Los Angeles (UCLA) doing research in risk analysis. **Nathan Siu** (bottom) (BS, engineering, 1977, and MS, nuclear engineering, 1980, UCLA) is a graduate student at

UCLA doing research in risk analysis. **George Apostolakis** (right) (Diploma, electrical engineering, National Technical University, Athens, Greece, 1969; MS, 1970, and PhD, 1973, engineering science and applied mathematics, California Institute of Technology) is a professor of engineering and applied science at UCLA. His research interests are in risk analysis.

SENSITIVITY AND UNCERTAINTY ANALYSES FOR THE ACCIDENT SEQUENCE PRECURSOR STUDY

Mohammad Modarres
Theodore W. Cadman
Erasmia Lois
Alan R. Gardner

Mohammad Modarres (top right) (MS and PhD, nuclear engineering, Massachusetts Institute of Technology) is an assistant professor of nuclear engineering, Department of Chemical and Nuclear Engineering, University of Maryland. His interests are in the areas of probabilistic risk assessment (PRA) and reactor safety technology. He has been involved in several PRA-related studies and has served as a consultant to various government and private agencies. **Theodore W. Cadman** (top left) (BS, MS, and PhD, chemical engineering, Carnegie-Mellon University) is chairman and professor, Department of Chemical and Nuclear Engineering, University of Maryland. He has 18 years of academic experience and has served as a consultant on various private and governmental projects. His areas of expertise include process analysis, process simulation, process control, mathematical modeling of systems, and computer applications. **Erasmia Lois** (bottom right) is a PhD candidate in the nuclear engineering program at the University of Maryland. Her research is in the area of PRA. Specifically, she is involved in the modeling and analysis of nuclear power plant operational data. **Alan R. Gardner** (bottom left) (BS, chemical engineering, University of Maryland, 1982) is an MS candidate in the chemical engineering program at the University of Maryland. His research is centered on the dynamic simulation of chemical processes. Additionally, he is involved in computer modeling for other applications, including those used in sensitivity and uncertainty analysis.

FUEL CYCLES

RADIOACTIVE SOURCE TERM MODELS IN A COMPARTMENT FIRE CODE

Marcel Y. Ballinger
Peter C. Owczarski

Marcel Y. Ballinger (top) (BS, chemical engineering, Oregon State University, 1975) has been developing methods for estimating radioactive source term releases from accidents in nonreactor fuel cycle facilities for the past four years. Most of this work supports an effort to develop a fuel cycle facility accident analysis handbook. She is currently a research engineer in the Atmospheric Processes and Exposure Assessment Section at Battelle Pacific Northwest Laboratory. **Peter C. Owczarski** (BS, University of Wisconsin, 1962, and PhD, University of Minnesota, 1967, chemical engineering) has been modeling various aspects of aerosol physics for the last 16 years. These areas include aerosol formation in accidents and the dynamic behavior of aerosols during their transport and deposition in nuclear reactors following postulated severe accidents. He is presently a technical leader and senior research engineer at Battelle Pacific Northwest Laboratory.

STATUS OF QUALIFICATION OF HIGH-TEMPERATURE REACTOR FUEL ELEMENTS SPHERES

Werner Heit
Hans Huschka
Wilhelm Rind
Günter G. Kaiser

Werner Heit (top right) (Dr. rer. nat., University of Saarbrücken, 1972) joined NUKEM in 1972. He is head of the development department for high-temperature reactor (HTR) fuel elements at NUKEM/HOBEG. His current interests focus mainly on the development of procedures and components for the HTR fuel element fabrication. **Hans Huschka** (top left) (PhD, University of Vienna, 1958) is head of the research and development (R&D) department at NUKEM. He has over 20 years of experience in the nuclear industry, particularly with regard to fuel cycle requirements. His current responsibilities include fuel element development for high-temperature reactors, liquid-metal fast breeder reactors, and materials test reactors as well as high-, medium-, and low-activity waste management. **Wilhelm Rind** (bottom right) (Dipl.-Phys., 1967, and Dr. phil. nat., 1972, University of Frankfurt/Main) is responsible for design, specification, and qualification of HTR fuel elements within the R&D department at NUKEM/HOBEG. He joined NUKEM in 1972 and has been working in the fields of evaluation of irradiation results and correlation with fuel element properties, development of appropriate quality control procedures, and interim and final storage of HTR fuel elements. **Günter G. Kaiser** (bottom left) (Dipl.-Chem., 1963, and Dr. rer. nat., 1965, University of Erlangen) has been engaged in HTR fuel cycle work for 20 years. He joined the Jülich Nuclear Research Center (Kernforschungsanlage-Jülich) in 1965 and first worked in the Institute for Chemical Technology, where he performed HTR fuel reprocessing R&D. In 1977 he was made responsible for all activities associated with the construction of the Jülich Pilot Plant for Thorium Element Reprocessing (JUPITER). Since 1981 he has been manager of the High-Temperature Reactor Fuel Cycle (Hochtemperaturreaktor-Brennstoff-Kreislauf) Project of the Entwicklungsgemeinschaft HTR. This project is responsible for all R&D work on the manufacture and qualification of HTR fuels, fabrication and performance characterization of graphites, and development of processes and equipment for treatment of spent HTR fuel.

BEHAVIOR OF BREACHED LIGHT WATER REACTOR SPENT FUEL RODS IN AIR AND INERT ATMOSPHERES AT 229°C

Robert E. Einziger
James A. Cook

Robert E. Einziger (top) (BS, physics, Georgia Institute of Technology, 1967; MS and PhD, physics, Rensselaer Polytechnic Institute, 1973) is currently a senior scientist at the Westinghouse Hanford Company where he is studying breach mechanisms, oxidation kinetics, and performance of light water reactor (LWR) spent fuel during dry interim storage and geologic disposal. **James A. Cook** (BS, chemistry, College of Great Falls) is an engineering specialist at the Idaho National Engineering Laboratory. He is responsible for coordinating the receipt and storage of test fuel modules and managing parts of the thermal fuels behavior program. He was previously employed at the Vallecitos Nuclear Center.

MEASUREMENT OF CLADDING TEMPERATURES WITH LOSS-OF-FLUID-TEST THERMOCOUPLES IN THE COSIMA BLOWDOWN TEST FACILITY

Gottfried Class
Klaus Hain
Rainer Meyder

Gottfried Class (top) [Diplom, mechanical engineering, Universität Stuttgart, Federal Republic of Germany (FRG), 1959; Dr., mechanical engineering, Universität Stuttgart, FRG, 1963] is a section manager at the Institute for Reactor Development at the Karlsruhe Nuclear Research Center, FRG. After working in the field of feedwater chemistry and corrosion in conventional power plants, he has been engaged in liquid-metal fast breeder and light water reactor safety for the last 17 years. **Klaus Hain** (center) [Diplom Ingenieur (FH), mechanical engineering, Fachhochschule Karlsruhe, FRG, 1956] is a project leader in the Hauptabteilung Ingenieurtechnik at the Karlsruhe Research Center, FRG; this group is working on the design and construction of experimental facilities investigating reactor safety. He has been engaged in the design of low-temperature radiation facilities and high-temperature pressurized water loops for more than 20 years. **Rainer Meyder** (bottom) (Diplom, mechanical engineering, Universität Stuttgart, FRG, 1969; Dr., mechanical engineering, Universität Karlsruhe, FRG, 1974) has developed computer codes for fuel rod analysis under loss-of-coolant-accident conditions at the Institute for Reactor Development at Kernforschungszentrum Karlsruhe, FRG.

AN EXPERIMENTAL STUDY OF ROD BUNDLE DISPERSED-FLOW FILM BOILING WITH HIGH-PRESSURE WATER

David G. Morris
Charles B. Mullins
Graydon L. Yoder, Jr.

David G. Morris (top) (BS, 1978, and MS, 1979, nuclear engineering, University of Florida) is interested in the area of post-critical heat flux heat transfer. **Charles B. Mullins** (center) (BS, physics, 1975, and MS, mechanical engineering, 1977, University of Texas, Austin) is interested in boiling heat transfer. **Graydon L. Yoder, Jr.** (bottom) (BS, mechanical engineering, The Pennsylvania State University, 1973; MS, mechanical engineering, University of California, Berkeley, 1975; PhD, mechanical engineering, Massachusetts Institute of Technology, 1980) is currently interested in multiphase heat transfer.

AN EMPIRICAL MIXING MODEL FOR PRESSURIZED THERMAL SHOCK APPLICATIONS

V. K. (Bindi) Chexal
Jason Chao
Robert E. Nickell
Timothy J. Griesbach

V. K. (Bindi) Chexal (right) (MS, mechanical engineering, Georgia Institute of Technology, 1972) has worked on the system design, thermal hydraulics, stress analysis, heat balance, and safety analysis of light and heavy water (Canada deuterium uranium) reactors for the past 12 years. Before joining the Electric Power Research Institute (EPRI), he worked at Quadrex Corporation and at Atomic Energy of Canada, Ltd. He has been a lecturer in the mechanical engineering department at San Jose State University and is currently working on various generic safety issues as well as serving as the matrix manager coordinating

EPRI's Emergency Core-Cooling Systems Methodology Program. **Jason Chao** (top) [PhD, nuclear engineering, Massachusetts Institute of Technology (MIT), 1979; MA, physics, University of Texas at Austin, 1974] is currently a project manager at EPRI. He has participated in plant analyses related to issues of pressurized thermal shock, steam generator tube rupture, anticipated transients without scram, and scram reduction at the Nuclear Safety Analysis Center. His past experience includes design studies of reduced enrichment fuel for research reactors at Science Applications, Inc. for Argonne National Laboratory, a design study of the tokamak fusion reactor blanket at MIT, and experimental investigations on the nuclear structure of krypton isotopes with a Van de Graaff accelerator at the University of Texas at Austin. He is a registered professional engineer in mechanical engineering in the state of California. **Robert E. Nickell** (center) (PhD, engineering science, University of California, Berkeley, 1967) is a project manager in the Nuclear Power Division at EPRI. His interests include structural mechanics, structural dynamics, and computational methods in fluids and heat transfer. **Timothy J. Greisbach** (bottom) (MS, metallurgy and materials science, Case Western Reserve University, 1974) is a project manager in the Nuclear Power Division at EPRI. His interests in materials and structural mechanics have been especially concentrated in the evaluation of pressure boundary integrity for nuclear components. Prior to joining EPRI, he was a principal nuclear engineer in the plant engineering department at Combustion Engineering.

ASSESSMENT OF TRAC CODES WITH DARTMOUTH COLLEGE COUNTERCURRENT FLOW TESTS

U. S. Rohatgi

U. S. Rohatgi (BS, mechanical engineering, Indian Institute of Technology, Kanpur, 1970; MS, 1972, and PhD, 1975, fluids and thermal sciences, Case Western Reserve University) has been a mechanical engineer in the Department of Nuclear Engineering at Brookhaven National Laboratory since 1975. His main areas of interest are two-phase flow in nuclear reactors and turbomachinery. Currently he is involved in assessing various advanced thermohydraulic codes for the Nuclear Regulatory Commission.

TECHNIQUES

DEVELOPMENT OF A NEW MEASUREMENT METHOD FOR FAST BREEDER REACTOR FUEL BURNUP USING A SHIELDED ION MICROPROBE ANALYZER

Mineo Mizuno
Yuji Enokido
Ichiro Unno
Keiichi Kono
Sadamu Yamanouchi
Toshiyuki Itaki

Mineo Mizuno (top) (BS, nuclear engineering, Hokkaido University, 1973) joined Power Reactor and Nuclear Fuel Development Corporation (PNC) in 1981 after working at Mitsubishi Atomic Power Industry and is engaged in the instrumental analysis of spent fast breeder reactor (FBR) fuels in the Analysis and Evaluation Section (AES) of the Fuel and Materials Division in Oarai Engineering Center as a research engineer. His technical interests are in the design and irradiation characteristics of FBR fuel. **Yuji Enokido** (bottom) (MS, physical metallurgy, Nagoya University, 1969; Dr. Eng., mechanical engineering, Technical University Hannover, 1973) is a deputy manager of the Fuel Monitoring

Section of the Fuel and Materials Division. He is interested in the chemical and physical behavior of FBR fuels and cladding during irradiation. **Ichiro Unno** (top right) (electronics, Mito Technical School, 1971) is an engineer in the AES at Oarai in the field of instrumental analysis. His current interests are fuel cladding chemical interaction and its prevention for FBR fuel development. **Keiichi Kono** (top left) (BS, metallurgy, Tokyo University, 1958) is a manager of the AES at Oarai. After working in uranium fuel fabrication at Hitachi Ltd., he was engaged in the fabrication of plutonium fuel and in construction of the plutonium fuel facility at the Tokai Works of PNC. His current technical interest is in fast reactor fuel performance through postirradiation examination. **Sadamu Yamanouchi** (bottom right) (BS, mechanical engineering, Kogakuin University, Tokyo, 1953) is a manager of the Alpha Gamma Facility of the Fuel and Materials Division at Oarai. He joined the National Research Institute of Metals in 1967. For the past 14 years he has worked on irradiation effects on metals and fuels for the FBR development program. **Toshiyuki Itaki** (bottom left) (BS, metallurgy, Waseda University, 1955) has been engaged in plutonium fuel fabrication and its quality control at the Tokai Works of PNC since 1967. He is currently a director of the Fuel and Materials Division of Oarai Engineering Center. His current interests include the study and evaluation of fuel performance in fast reactors through postirradiation examination.

RADIOACTIVE WASTE MANAGEMENT

INITIAL RESULTS FOR THE EXPERIMENTAL EVALUATION OF A NUCLEAR WASTE REPOSITORY SOURCE TERM MODEL

B. P. McGrail
L. A. Chick
G. L. McVay

B. P. McGrail (top) (BS, nuclear engineering, 1981, and MS, nuclear engineering, 1983, University of Missouri-Rolla) is a research scientist in the materials department at Pacific Northwest Laboratory (PNL). His current areas of interest are the corrosion behavior of nuclear waste package materials and groundwater transport of radionuclides. **L. A. Chick** (center) (BS, ceramic engineering, University of Washington, 1974) is a senior scientist in the materials department at PNL where he is involved in development and characterization of nuclear waste forms. **G. L. McVay** (bottom) (BS, metallurgical engineering, 1965; MS, ceramic engineering, 1967; and PhD, ceramic engineering, 1970, University of Missouri-Rolla) is a staff scientist and technical leader in the materials department at PNL. His current interests and activities include the near-field performance assessment of nuclear waste repositories and the corrosion modeling of glass and ceramic interactions with aqueous solutions.