

AUTHORS – MID-APRIL 1978

LOW-TEMPERATURE NUCLEAR HEAT

CANDU REACTOR OPERATION FOR ELECTRICITY PRODUCTION AND DISTRICT HEATING

J. T. Rogers (top) (BEng, 1948, MEng, 1950, and PhD, 1953, mechanical engineering, McGill University, Montreal) did graduate work in combustion and heat transfer. He has been involved in the nuclear field since 1955 in both Canada and the U.S., including ten years as the leader of a specialist group in heat transfer and fluid dynamics in the Atomic Power Department of Canadian General Electric at Peterborough, Ontario. Since 1970, he has been a professor in the Department of Mechanical and Aeronautical Engineering at Carleton University in Ottawa, Ontario, where he is also coordinator of the Energy Research Group. He is presently a consultant to the Atomic Energy Control Board and a member of its Reactor Safety Advisory Committees. His current major technical interests include reactor heat transfer (mixing and CHF in fuel bundles), reactor safety, thermodynamic optimization of power plants, and effective utilization of energy. **Abdelkerim E. Abdelkerim** (center) (BS, University of Cairo, 1971; MEng, mechanical engineering, Carleton University, Ottawa, 1976) wrote his master's thesis on the integration of nuclear plants into district heating systems. Since graduation, he has been involved in the thermal analysis and design of satellites and space-borne electronic equipment, first at Canadian Astronautics Ltd. in Ottawa and now at SPAR Aerospace Products Ltd. in Toronto, Canada. **M. C. Swinton** (bottom) (BS, Loyola of Montreal, 1972; MEng, mechanical engineering, Carleton University, Ottawa, 1974) is a research associate in the Energy Research Group of Carleton University. He has been involved in policy-related research in the field of energy conservation. He has investigated the energy use characteristics of a range of energy systems, such as the CANDU reactor in combined-generation role, electric and conventional automobiles, Canadian residential and commercial buildings, and district heating systems.

*J. T. Rogers
A. E. Abdelkerim
M. C. Swinton*



ATOMIC CENTRAL HEATING-AND-POWER PLANTS AND ATOMIC BOILER HOUSES

*I. N. Sokolov
S. A. Skvortsov*

No photographs or biographies are available.

SURVEY OF EXISTING DISTRICT HEATING SYSTEMS

*Volker Scholten
Manfred Timm*

Volker Scholten (top) (Dipl. Ing., Aachen University, 1956) joined the AEG-Telefunken Company in Frankfurt and was in the Nuclear Engineering Project Management Group until 1968, when he left to join the Multipurpose Reactor Group at the Karlsruhe Reactor Research Center. He returned to Frankfurt in 1970 to join Kraftwerk Union AG, where he was project manager for the Brunsbüttel and Krümmel Nuclear Power Stations and was responsible for the acquisition of both conventional and nuclear power station contracts in both Europe and Africa. He was appointed to his present position of subdivision manager in the Nuclear Power Plant Division in 1977. **Manfred Timm** (MS, mechanical engineering, Technical University of Karlsruhe, 1963; Doctor, mechanical engineering, Technical University of Munich, 1969) was with Allgemeine Elektrizitäts-Gesellschaft from 1963 to 1970 and worked in the Turbine Department and the Nuclear Power Plant Start-Up Group. Since 1971, he has been manager for the nuclear fuel cycle, superintendent of a nuclear power station under construction, and is now head of the Basic Planning Department with Hamburgische Electricitäts-Werke AG, Hamburg, Federal Republic of Germany.



EXPERIENCE IN OPERATION OF THE EXPERIMENTAL ATOMIC POWER PLANT "ARBUS" WITH THE HIGH-BOILING ORGANIC COOLANT-MODERATOR DITOLYL-METHANE

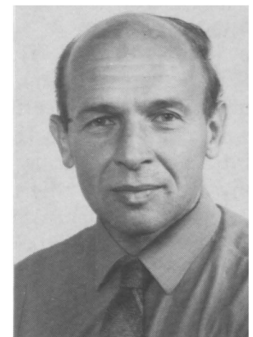
*V. A. Tzikanov
Yu. N. Aleksenko
V. D. Tetyukov
V. A. Kuprienko
I. G. Kobzar
V. A. Khrumchenkov
M. P. Mexcheryakov
V. I. Zinoviev*

No photographs or biographies are available.

ECONOMICS OF LONG-DISTANCE TRANSMISSION, STORAGE, AND DISTRIBUTION OF HEAT FROM NUCLEAR PLANTS WITH EXISTING AND NEWER TECHNIQUES

Peter H. Margen

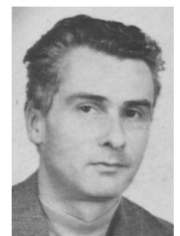
Peter H. Margen (BSc, engineering) worked for Kennedy & Donkin as a power station consultant in the U.K. from 1944 to 1955, and then joined AB Atomenergi, Sweden, to become project leader of the Ågesta district heating reactor in the late 1950's, head of the Nuclear Technology Division in the 1960's, and in recent years, head of the Energy Technology Division, which was set up to widen company profile to energy issues other than nuclear. Systems for transporting, storing, and distributing low-grade energy more cheaply than with existent systems has been one of the focal points of his interest.



HERA—A HIGH-TEMPERATURE REACTOR FOR USE IN A REFINERY

*P. H. Chaubernard
G. Lelarge d'Ervau
R. Pfterzel*

Paul-Henri Chaubernard (top) (graduate engineer, Ecole Nationale Supérieure de l'Aéronautique, 1949, and Ecole Nationale Supérieure du Pétrole, 1951) is a process engineer in Campagnie Francaise de Raffinage, where he spent 25 years in oil refining and petrochemistry. **Guy Lelarge d'Ervau** (bottom) (graduate engineer, Ecole Nationale Supérieure de Mécanique de Nantes, 1956) has worked since 1958 at the Commissariat à l'Energie Atomique (CEA), first on heat transport and fluid dynamics on uranium natural graphite gas reactors and then on heat transport, thermodynamic cycle, and operating conditions



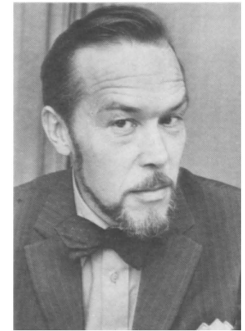
in high-temperature reactors cooled by helium. **Roger Pfortzel** (right) (graduate engineer, Ecole Supérieure de Chimie Industrielle de Lyon, 1950) was first involved in experimental research and engineering in isotopic enrichment at CEA. Then he joined Société Technique pour l'Energie Atomique (Technicatome), where his current business is circuit and process engineering.



DESALINATION BY VERY LOW-TEMPERATURE NUCLEAR HEAT

Risto Saari (Dipl. Ing., technical physics, Institute of Technology, Helsinki, 1956) since 1968 has been president of Nord-Aqua Oy, Helsinki, Finland, an engineering firm specializing in developing water distillation methods. One of these methods has been widely used in the pharmaceutical industry under the name Finn-Aqua. Saari's special interest is seawater distillation at ambient temperatures with small temperature differences, utilizing waste heat or tropical thermocline as the energy source.

Risto Saari



A DUAL-PURPOSE LIGHT WATER REACTOR SUPPLYING HEAT FOR DESALINATION

Geoffrey Waplington (top) (BSc, mechanical engineering, University of Surrey, England, 1966) is a consulting engineer with Electrowatt Engineering Services (Switzerland). Having worked in the European nuclear industry for 11 years, he has been involved in a number of nuclear power projects at both planning and engineering levels. **Hannes Fichtner** (MA, economics, Heidelberg University, 1976) has worked on power markets, load forecasts, cost allocation problems, and tariff studies.

*Geoffrey Waplington
Hannes Fichtner*



A BOILING WATER REACTOR IN A PRESTRESSED REINFORCED CONCRETE VESSEL FOR AN ATOMIC CENTRAL HEATING-AND-POWER PLANT

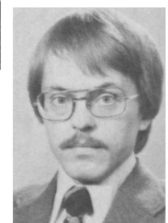
No photographs or biographies are available.

*Yu. I. Tokarev
I. N. Sokolov
S. A. Skvortsov
A. M. Sidorov
L. V. Krauze*

SECURE NUCLEAR DISTRICT HEATING PLANT

Lars Nilsson (top) (MS, mechanical engineering, Royal Institute of Technology, Stockholm, 1963) is manager of Process System Development in the Power Plant Engineering Department at ASEA-ATOM, Västerås. He is currently working as project manager of the joint Finnish-Swedish project study of a nuclear district heating plant, SECURE. His interests lie primarily in the engineering aspects of nuclear plant design and safety analysis. **M. Hannus** (MS, civil engineering, Technical University of Helsinki, 1973) is a research engineer at the Technical Research Centre of Finland. He has been involved in the Scandinavian project on prestressed concrete reactor vessels for boiling water reactors and is currently working as vice-manager in the SECURE study as a consult to FINNATOM.

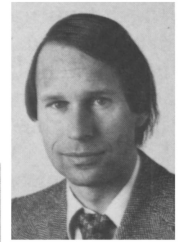
*L. Nilsson
M. Hannus*



APPLICATION OF THE INTEGRATED PRESSURIZED WATER REACTOR TO DISTRICT HEATING AND DESALINATION

Friedrich K. Boese (top) (Dipl. Phys., Dr. rer. nat., Universities of Stuttgart and München, 1969) has worked on theoretical physics (solid-state physics, nonlinear optics) and on energy systems. Since 1975, he has been involved in systems analysis of high-temperature reactor and fast breeder reactor systems. **Hilmar Kadella** (Dipl. Ing., mechanical engineering, 1962, and economics, 1975, Technical University of Berlin) worked in the fields of thermodynamics and strength calculations of fossil-fired and nuclear power plants. Since 1975, he has worked at INTERATOM on technico-economical studies, with special emphasis on the application of nuclear power.

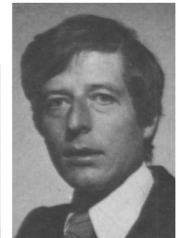
*F. K. Boese
H. Kadella*



THERMOS REACTORS

Michel Labrousse (top right) (Ingénieur des Arts et Métiers, Angers-Paris, 1964) has worked for the Commissariat à l'Énergie Atomique (CEA) since 1966. As a physicist, he has been involved in the field of research reactors. He has been working on the THERMOS project for two years. **Bernard Lerouge** (top left) (reactor physics, Ecole Polytechnique, Paris, 1952) worked at CEA from 1955 to 1975 in the fields of research reactor design and utilization and power reactors. He was head of the Reactor Physics Department before entering Technicatome, where he is in charge of small and medium-size power reactors. **Gérard Dupuy** (bottom right) (Ingénieur des Arts et Manufacture, Paris, 1945) has worked at CEA since 1949. As a mechanics engineer, he has been involved mainly in the field of experimental and research reactors. **Jean-Pierre Schwartz** (bottom left) (Ingénieur civil des Mines, Paris, 1959) has worked at CEA since 1962. As a reactor physicist engineer, he has been involved in the concept and realization of CEA research reactors; he is now also involved in power water reactor studies.

*M. Labrousse
B. Lerouge
G. Dupuy
J. P. Schwartz*



THE LOW-TEMPERATURE WATER REACTOR FOR THE DISTRICT HEATING ATOMIC POWER PLANT

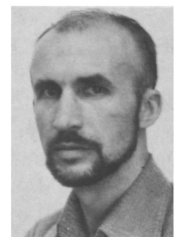
No photographs or biographies are available.

*S. A. Skvortsov
I. N. Sokolov
L. V. Krauze
Yu. G. Nikiporetz
Yu. V. Philimonov*

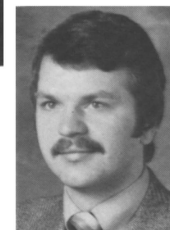
LOW-TEMPERATURE HEAT FROM HIGH-TEMPERATURE REACTORS BY MEANS OF NUCLEAR LONG-DISTANCE ENERGY

Ralf E. Harth (top) (Dipl. Ing., chemical engineering, Technische Hochschule Aachen, Germany, 1964) was, until 1975, leader of the division for experimental investigations on nuclear process heat application in the Institut für Reaktorbau-elemente of the Kernforschungsanlage Jülich GmbH (KFA). Since 1975, he has been head of the management of the common project for nuclear long-distance energy, wherein the KFA Jülich and the Rheinische Braunkohlenwerke AG, Cologne, are working together. **Kurt Kugeler** (bottom) (Dipl. Phys., 1965; Dr. rer. nat., nuclear reactor technology, 1968, Technische Hochschule Aachen, Germany) is a member of the Institut für Reaktorentwicklung of KFA, involved in all aspects of

*Ralf Harth
Kurt Kugeler
Hans F. Niessen
Udo Boltendahl
Karl A. Theis*



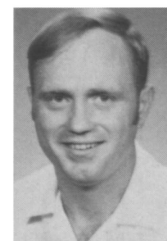
high-temperature gas-cooled reactor applications. **Hans F. Niessen** (top) (Dipl. Ing., chemical engineering, 1970; Dr. Ing., nuclear reactor technology, 1974, Technische Hochschule Aachen, Germany) is leader of the group for process heat application in the Institut für Reaktorentwicklung of KFA. **Udo Boltendahl** (center) (Dipl. Ing., chemical engineering, 1970; Dr. Ing., 1974, Technische Hochschule Aachen, Germany) has, since 1975, been a member of the Research and Development Division of Rheinische Braunkohlenwerke AG (RBW), Köln, presently involved with theoretical research in design and optimization of plants for using nuclear heat from high-temperature reactors, especially in connection with the long-distance energy circuit. **Karl A. Theis** (bottom) (Dipl. Ing., technical thermodynamics, 1970; Dipl. Wirtschaftsingenieur, economics and management, 1972; Dr. Ing., 1974, Technische Hochschule Aachen, Germany) has, since 1974, been a member of the Research and Development Division of RBW. Since 1977, he has been chief of the division for "nuclear process heat," which is involved in theoretical and practical works in the field of using high-temperature nuclear heat for coal gasification and such processes as nuclear long-distance energy.



NUCLEAR WASTES AS A HEAT SOURCE

Warren F. Witzig (top) (BS, electrical engineering, Rensselaer Polytechnic Institute, 1942; MS, electrical engineering, 1944; PhD, physics, University of Pittsburgh, 1952) is currently professor and head of the Nuclear Engineering Department at The Pennsylvania State University. His special interests include fuel management, reactor design, nuclear safety and licensing, and environmental problems associated with radiation waste and thermal effects. **Michael E. Foster** (BS, chemical engineering, Louisiana Tech University, 1968) completed one term of graduate study in chemical engineering at Clemson University and worked for three months at Texaco's Port Arthur refinery before entering the U.S. Navy in 1969. Currently a lieutenant in the Civil Engineer Corps of the Navy, he is completing his final term at The Pennsylvania State University, where he is working toward a master's degree in nuclear engineering.

*Warren F. Witzig
Michael E. Foster*



DUAL-PURPOSE NUCLEAR POWER PLANTS FOR MILITARY INSTALLATIONS

Gary S. Stewart (top) (BS, physics, 1971, and MS, nuclear engineering, 1972, Georgia Institute of Technology) joined the U.S. Army Facilities Engineering Support Agency in 1974 as a nuclear engineer after a tour of duty in the U.S. Army. He worked on numerous projects designed to determine the feasibility of new energy sources at military fixed facilities. He is now employed by the General Services Administration in Washington, D.C. **George T. Story** (MS, nuclear engineering, Virginia Polytechnic Institute and State University, 1975) is a nuclear engineer for the U.S. Army Corps of Engineers at Fort Belvoir, Virginia. He is currently engaged in research on the application of nuclear power systems to meet the electrical and process energy requirements of the U.S. Department of Defense.

*Gary S. Stewart
George T. Story*



AN ENERGY ALTERNATIVE FOR INDUSTRY—THE HIGH-TEMPERATURE GAS-COOLED REACTOR STEAMER

Albert T. McMMain, Jr. (top) (BS, engineering physics, Auburn University, 1955; MS, nuclear engineering, North Carolina State University, 1957) was with Ingalls Shipbuilding Corporation from 1955 to 1959 as project nuclear engineer on the American Explorer Nuclear Tanker Project and project coordinator for nuclear submarine construction. From 1959 to the present, he has been with General Atomic Company, working initially with the TRIGA Reactor Project as application engineer and later as program marketing manager for TRIGA pulse reactor applications and neutron activation analysis service. Subsequently, he was involved in high-temperature gas-cooled reactor (HTGR) advanced concepts applications and marketing, focusing on HTGR program development and applications for industrial process heat. Currently, he is manager of cogeneration applications, directing HTGR Steamer design studies for industrial cogeneration. **Franz J. Blok** (MS, chemical technology, Technical University of Delft, 1967) worked for Shell International Petroleum Company in various countries and in various oil marketing and general management positions prior to joining General Atomic in 1974. At General Atomic, he has worked on HTGR program strategy, including studies of the HTGR Steamer Project. Currently, he is with General Atomic Europe, focusing on strategic studies for the Benelux area.

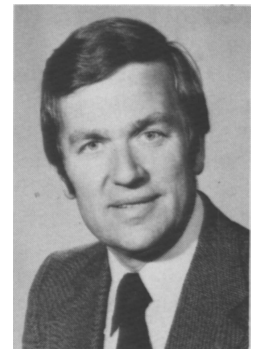
*A. T. McMMain, Jr.
Franz J. Blok*



THE ECONOMICS OF NUCLEAR DISTRICT HEATING FROM THE UTILITY'S POINT OF VIEW

Manfred Timm (MS, mechanical engineering, Technical University of Karlsruhe, 1963; Doctor, mechanical engineering, Technical University of Munich, 1969) was with Allgemeine Elektrizitäts-Gesellschaft from 1963 to 1970 and worked in the Turbine Department and the Nuclear Power Plant Start-Up Group. Since 1971, he has been manager for the nuclear fuel cycle, superintendent of a nuclear power station under construction, and is now head of the Basic Planning Department with Hamburgische Electricitäts-Werke AG, Hamburg, Federal Republic of Germany.

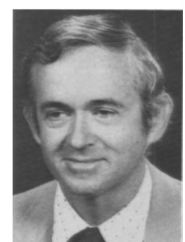
Manfred Timm



ESTIMATES OF THE COSTS OF STEAM DERIVED FROM NUCLEAR AND FOSSIL FUELS

Irving Spiewak (top) (MS, chemical engineering, Massachusetts Institute of Technology, 1949) has been employed at Oak Ridge National Laboratory (ORNL) in nuclear energy development since 1949. He is head of the Engineering Analysis Section of the Engineering Technology Division, and has recently been appointed manager of the Nuclear Energy Assessments (NEA) Program to coordinate assessment programs sponsored by the U.S. Department of Energy. The NEA will include technical support to the Nonproliferation Alternative Systems Assessment Program. Other major activities at ORNL under the NEA Program are studies and evaluations, cogeneration studies, power park studies, desalting, and waste heat utilization. **Otto H. Klepper** (MS, engineering science, University of Tennessee, 1970) is employed at ORNL, where he has been engaged in heat transfer analysis, reactor siting, and reactor evaluation studies. His current interests include the application of nuclear and alternative power sources to industrial energy. Presently, he is managing the Thermal Energy Program in the Engineering Technology Division at ORNL.

*I. Spiewak
O. H. Klepper*



A NUCLEAR DISTRICT HEATING SYSTEM WITH A HIGH-TEMPERATURE REACTOR

Günter Schroeder (top) (Dipl. Phys., physics, Rhein.-Westf. Technische Hochschule Aachen, 1966; Dr. Ing., nuclear engineering, Kernforschungsanlage Jülich, 1969) is a nuclear engineer in the Nuclear Energy Department of Steag Aktiengesellschaft at Essen, Federal Republic of Germany. His interests include development of the high-temperature reactor (HTR), use of nuclear energy for district heating and process heating purposes, and the safety of nuclear plants in the nuclear fuel cycle. **Heiko Barnert** (center) (Dipl. Ing., nuclear engineering, 1967; Guest Scientist at Massachusetts Institute of Technology, Department of Chemical Engineering, 1968; Dr. Ing., Technical University of Aachen, 1970) is a scientific co-worker in the Institute of Reactor Development of the Nuclear Research Center, Jülich. His interests include nuclear reactor design, safety analysis, and process heat applications of nuclear energy. **Rainer Wischnewski** (bottom) (Dipl. Ing., engineering, Rhein.-Westf. Technische Hochschule Aachen, 1966; Dr. Ing., nuclear engineering, RWTH Aachen, 1974) is a staff member of the AVR High-Temperature Reactor Jülich, Federal Republic of Germany. His interests include construction of test facilities at the AVR for HTR development and safety and current use of nuclear energy for process heat purposes.

*G. Schroeder
H. Barnert
R. Wischnewski*



COST COMPARISON OF LOW-TEMPERATURE HEAT PRODUCTION AND SUPPLY TO THE INDUSTRIAL AND DOMESTIC SECTOR BY MEANS OF NUCLEAR ENERGY

Friedrich K. Boese (top) (Dipl. Phys., Dr. rer. nat., Universities of Stuttgart and München, 1969) has worked on theoretical physics (solid-state physics and nonlinear optics) and on energy systems. Since 1975, he has been involved in systems analysis of high-temperature reactor and fast breeder reactor systems. **Wolfgang Breyer** (center) (Dipl. Ing., electrical engineering, Technische Universität Berlin, 1967) joined INTERATOM in 1969. He worked on systems analysis and economics of nuclear power applications. Since 1973, he has headed the Department of Technico-Economical Studies. **Rudolf Pruscheck** (bottom) (Dr. Ing., University of Stuttgart, 1962; associate professor, University of Stuttgart) has been a mechanical engineer since 1953 and has worked since 1958 in the fields of nuclear engineering, energy conversion, and power engineering at University Institutes and in industry. Since 1976, he has been president of GHT, Gesellschaft für Hochtemperaturreaktor-Technik mbH.

*F. K. Boese
W. Breyer
R. Pruscheck*



UTILITY OPTIMIZATION MODEL OF FUEL CYCLE BACK-END SERVICES

Hannu Kaikkonen (top) (Dipl. Ing., technical physics, Helsinki University of Technology, 1975) is a research engineer in the Nuclear Engineering Laboratory at the Technical Research Centre of Finland. His current responsibilities include evaluation of fuel cycle alternatives. **Jukka-Pekka Salo** (bottom) (Dipl. Ing., technical physics, Helsinki University of Technology, 1977) is working on the development of methods for optimization of fuel strategies at the Technical Research

*H. Kaikkonen
J.-P. Salo
P. Silvennoinen*



Centre of Finland. **Pekka Silvennoinen** (right) (PhD, nuclear science and engineering, Virginia Polytechnic Institute and State University, 1971) is currently the head of the Nuclear Engineering Laboratory at the Technical Research Centre of Finland. With his major interest in nuclear fuel management, his present research activities cover optimization of the in-core fueling as well as out-of-core fuel strategies.



SUMMARY—LOW-TEMPERATURE NUCLEAR HEAT

Peter Margen

Peter H. Margen (BSc, engineering) worked for Kennedy & Donkin as a power station consultant in the U.K. from 1944 to 1955, and then joined AB Atomenergi, Sweden, to become project leader of the Ågesta district heating reactor in the late 1950's, head of the Nuclear Technology Division in the 1960's, and in recent years, head of the Energy Technology Division, which was set up to widen company profile to energy issues other than nuclear. Systems for transporting, storing, and distributing low-grade energy more cheaply than with existent systems has been one of the focal points of his interest.

