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## JAMES B. KOENIG

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### **PRESENT POSITION**

Independent consultant in geothermal energy development

### **EXPERTISE**

- Mr. Koenig has been active in geothermal exploration and field development continuously since 1964. His specialties include:
- Design and management of geothermal exploration, drilling and field development projects
- Selection of drilling targets based on the synthesis of geologic, geophysical and hydrochemical data into conceptual field models
- Reconnaissance evaluation of geothermal and volcanic regions
- Economic evaluation and geothermal reservoir assessment from exploration, drilling and testing data
- Calculation of reserves of geothermal energy
- Contract negotiation for development and utilization of geothermal resources

### **EDUCATION**

B.S. in Geology, Brooklyn College, 1954

M.A. in Geology, Indiana University, 1956

Graduate Diploma in Meteorology, U.S. Naval Post Graduate School, 1958

Ph.D. Candidate in Geology-Seismology, University of Nevada, 1967

## **RECENT EXPERIENCE**

### ***Independent Consultant, 1995-present***

- Selection of prospects for exploration, and design of exploration program, Eurasian Minerals Inc., 2009-2011.
- Evaluation of exploration and well-test data, Makushin Volcano, Alaska, and selection and drilling sites, KSLP Inc., 2010.
- Assessment of geothermal leaseholds, Pandawa Energy, Indonesia, and selection of acreage for acquisition, 2010.
- Advisor to Kenya Electricity Generating Company (KenGen) on continued development of the Olkaria geothermal field, as Chairman of Board of Consultants, 2005-2010.
- Analysis of Abroad Geothermal Field, Oregon, USA for Starlight Investment Group, 2008.
- Advisor to French Aid Agency AFD on drilling requirements and drill rig specifications, Kenya, 2009.
- Participated in preparation of geothermal investment handbook, Turkey, for World Bank, 2009.
- Participant in preparation of risk analysis methodology for use by Government of Indonesia, for World Bank, 2008.

### ***GeothermEx, Inc., 1973 - 1995***

- Founder, President and Chairman of Board of Directors, GeothermEx, Inc.
- Management and on-site supervision of geothermal exploration projects in the United States, Costa Rica, the Philippines, Papua New Guinea, Honduras, Indonesia, and elsewhere, involving surface exploration, data analysis, drilling of geothermal wells, well logging and testing, and analysis of reserves.
- Discovery of Miravalles Geothermal Field, Costa Rica, Dixie Valley Field, Nevada, USA; Batong Buhay Field, the Philippines; Lihir Island Field, Papua New Guinea.
- Direction of work by technical staff of GeothermEx in exploration, drilling and logging of wells, reservoir analysis and economic assessment.
- Consultant to World Bank, United Nations, Asian Development Bank, OPEC Fund, USAID and other multilateral agencies on project selection, financing, quality control and operations: El Salvador, Bolivia, Kenya, Ethiopia, Mozambique, Uganda, Indonesia, Vietnam, Djibouti, Honduras, Yemen, Georgia, Peru, St. Lucia.
- Consultant to numerous electric utilities and energy agencies, including Los Angeles Department of Water and Power, Sacramento Municipal Utility District, Southern

California Edison, Northern California Power Agency, Sierra Pacific Power Company, Pacific Power and Light Company, United States Department of Energy, New Energy Development Organization (Japan), National Power Corporation of the Philippines, Instituto Costarricense de Electricidad (Costa Rica), Comisión Federal de Electricidad (Mexico), Uganda Electricity Board, and Comisión Ejecutiva Hidroeléctrica del Río Lempa de El Salvador, on aspects of development and utilization of geothermal electricity.

- Consultant to numerous geothermal field developers and operators regarding program design, exploration, drilling, budget management, permitting, regulatory compliance, environmental protection, and interpretation of field exploration data.

## **California Division of Mines and Geology, 1956 - 1972**

- Geothermal specialist. Responsible for evaluation of geothermal resources in California via geologic and geochemical exploration, and logging of geothermal wells. 1964 - 1972.
- Chairman of Technical Advisory Committee to Geothermal Resources Board of California, 1971-1972.
- Specialist in geology and seismology for the California Power Plant Siting Committee, 1969-1971.
- Geothermal field studies at The Geysers, Coso Hot Springs, Cascade-Modoc region, and Calistoga, 1964-1970.
- Assisted in preparation of California State law on geothermal resources, 1967-1968, and in design of geothermal operating regulations.

## **United States Navy, 1957 – 1960**

*Meteorologist, rank of Lieutenant.*

## **U.S. Geological Survey, 1955 - 1956**

*Groundwater Geologist, Minnesota.*

## **Howe Sound Corporation, 1953**

*Mining Geologist, Manitoba, Canada*

## **EXAMPLES OF PERTINENT GEOTHERMAL PROJECTS FOR GEOTHERMEX, INC.**

- Management of geothermal drilling, logging and testing program, Lihir Island, Papua New Guinea. For Kennecott, 1986 - 1992.
- Analysis of exploration data and design of conceptual model of the Chipilapa geothermal field, El Salvador. For CEL (national electric utility), 1991 - 1992.

- Advisor to World Bank on geothermal loans in Kenya, Djibouti, Yemen and Macedonia (Yugoslavia), involving field appraisals, performance reviews, data modeling and budget design. Various times during 1983 – 1993.
- Design and implementation of methodology for calculating reserves of geothermal energy from surface exploration data at four geothermal fields in Japan. For New Energy Development Organization (NEDO) of Japan and Japanese government electric utility EPDC; 1985 - 1987.
- Negotiations with national oil company of Indonesia, Pertamina, regarding contracts for private development of geothermal energy at several sites. On behalf of private consortium, 1991 – 1993.
- Management of field exploration and drilling operations at Batong Buhay geothermal field, northern Luzon, Philippines. For Caltex, 1982 - 1983.
- Management of exploration in Guanacaste Province, Costa Rica; project resulted in discovery of Miravalles field in 1980. For ICE (national electrical utility), with financing from IDB (Interamerican Development Bank), 1975 - 1981.
- Analysis of drilling results and modeling of geothermal fields, leading to calculation of reserves of geothermal energy at numerous geothermal areas in the United States and Central America. For private development companies and national electrical utilities, 1980 - 1985.
- Assessment of the geothermal energy reserves at Dieng geothermal field in Indonesia from drilling and surface exploration data. For Asian Development Bank, 1983.
- Analysis of drilling data and seismic profiles, regional geothermal modeling and calculations of recoverable hot water for use in secondary oil recovery at the Duri field, Indonesia. On behalf of private oil company, 1982 - 1983.
- Analysis of exploration data, selection of sites for deep drilling, and management of project operations at several geothermal areas in United States. For private companies, agencies of local government and electrical utilities, 1979 - 1990.
- Reconnaissance evaluation of geothermal prospects of Mozambique, Vietnam and Kenya. For the United Nations, 1980 - 1981.
- Supervision of nationwide geochemical survey programs in Nicaragua and Honduras. For the national electrical utilities, with financing from World Bank and United Nations, 1978 - 1980.
- Organization and implementation of a geothermal exploration program covering one-half million acres of south-central Oregon, culminated in drilling of exploratory wells. For a major landowner and electric utility, 1972 - 1975.
- Economic evaluation of geothermal resources in several areas of the western United States. For financing institutions and private developers, 1983 - 1985.

- Reconnaissance evaluation and field studies of geothermal resources in the Afar region of Ethiopia. For United Nations, 1971.
- Evaluation of reservoir conditions at several geothermal fields in the western United States and overseas from unpublished well test data. For use by electrical utilities in planning field development, 1977 - 1981.
- Preparation of exploration and drilling budgets in numerous areas of the western United States. For several private developers, 1977 - 1993.
- Selection of drilling and geophysical contractors at several projects in California and Nevada. For private developers, 1977 - 1980.
- Reservoir testing and analysis at The Geysers geothermal field as part of field development and operations program. For field operators and electrical utilities, 1979 - 1989.
- Evaluation of results of deep drilling in Utah, Idaho and Nevada, 1978 - 1982.
- Geologic mapping in thermal areas of Nevada, California and Idaho. For numerous private companies, 1973 - 1974.
- Field analyses of water chemistry in thermal areas of six western states, 1973.
- Field surveys of mercury distribution in thermal areas in El Salvador (for United Nations) and in the United States (for agency of U.S. government), 1968 - 1970.
- Synthesis of geologic and geophysical data, geothermal areas in Idaho and Utah, 1976 - 1977.
- In several geothermal areas in the western United States, selection of sites for hundreds of temperature-gradient drill holes, and management of drilling and logging operations for gradient holes ranging from 300-1,000 m in depth. For numerous private companies, 1977 - 1981.
- Analysis of value of Known Geothermal Resource Areas (KGRAs) for competitive bids, 1978 - 1981.
- Preparation and presentation of environmental impact reports for The Geysers and several other sites in California and Oregon, 1974 - 1983.
- Preparation and presentation of environmental impact report for Olkaria geothermal field in Kenya, 1990.
- Preparation of geologic cross-sections and structure-contour maps for several geothermal areas in Nevada, California, Utah and Oregon, 1974 - 1977.
- Testimony in litigation and in regulatory hearings as expert witness, 1977, 1981, 1982, 1984, 1985 and 1987.
- Petrographic analysis of well cuttings; preparation of lithologic logs, deep drill holes, 1976 - 1983.

- Lectures in geothermal exploration at short courses for Geothermal Resources Council as well as various private and governmental organizations, 1977 - 1980; 1982; 1984; 1987; 1990 - 1992.
- Gravity surveys in two geothermal areas of California, 1963 and 1968.
- Evaluation of the relationship between climate and the discharge from thermal springs, Ahuachapán, El Salvador, 1971.

## **MEMBERSHIPS AND AWARDS**

- President, Geothermal Resources Council (1989-1991)
- Director, Geothermal Resources Council (1975-1993)
- Director, International Geothermal Association (1989-1993; 1998-present)
- Chairman, Finance Committee, World Geothermal Congress, 1995, 2000 and 2005
- General Chairman, World Geothermal Congress, 2005
- Chairman, Fellowships Committee, World Geothermal Congress, 2010
- Fellow, Geological Society of America (1962-present)
- Member, American Geophysical Union
- Member, International Association of Volcanology (1965-1974)
- Recipient, Aidlin Medals from Geothermal Resources Council, 1986

## **SELECTED NON-CONFIDENTIAL PUBLICATIONS**

Geothermal Exploration in Vietnam: Geothermal Resources Council, Bulletin, Vol. 10, p. 7-9, 1981.

Geothermal Power Development in the Third World: Geothermal Resources Council Transactions, Vol. 5, p. 23-28, with M.C. Gardner and J.R. McNitt, 1981.

Heat Flow and Geothermal Gradient Exploration of Geothermal Areas in Cordillera de Guanacaste of Costa Rica: Geothermal Resources Council Transactions, Vol. 1, p. 17-18, with D.D. Blackwell and E.E. Granados, May, 1977.

Well-Site Evaluation of Logs from a Deep Geothermal Well, Ontario, Oregon: Geothermal Resources Council, Transaction, Vol. 4, p. 471-475, with S.K. Sanyal, M.C. Gardner and J.R. McIntyre, 1980.

Exploration and Development of Geothermal Resources, in "Geothermal Energy: Resources, Production, Stimulation," P. Kruger and C. Otte, eds., Stanford Press, 1973, pp.

15-58.

Remote Sensing at the Coso Geothermal Field: U.S. Navy NWC TP 5233, p. 31, 1972.

Speculations on the Geothermal System at The Geysers: Sacramento Geol. Soc. Annual Field Trip Guidebook, pp. 29-37, 1971.

Geothermal Exploration in the Western United States: Geothermics, Spec. Vol. 2, part 1, pp. 1-13 (paper given at the United Nations Symposium on Development of Geothermal Resources, Pisa, 1970).

The Geysers, California, Geothermal Field: Calif. Div. Mines & Geol. Mineral Info. Service, v. 22, no. 8, pp. 123-128, 1969.

Mercury Distribution at Two Geothermal Fields: Coso Hot Springs, California and Ahuachapán, El Salvador (abs.): Geol. Soc. America Abstracts with Programs, v. 1, part 3, p. 33, 1969.

Geothermal Steam Potential of Mount Lassen: Sacramento Geol. Soc. Annual Field Trip Guidebook, pp. 43-51, 1969.

The Salton-Mexicali Geothermal Province: Calif. Div. Mines & Geol. Mineral Info Service, v. 20, no. 7, pp. 75-81, 1967.

Santa Rosa Sheet: California Div. Mines & Geol. Geologic Map of California, 1:250,000, 1963.

## **SELECTED UNPUBLISHED REPORTS (Most Reports are confidential and property of clients)**

Geothermal Energy Risk in Indonesia; report to World Bank for Government of Indonesia, 2009.

Regulatory Requirements Governing The Location and Safety of Geothermal Wells in the United States (including Draft, Geothermal Well Drilling and Completion Regulations in the United States and Selected Case Histories of Well Blowouts), for New Zealand Ministry of Energy, Taupo New Zealand, 1989.

Environmental factors at the Ahuachapán, El Salvador, geothermal field; report to the United National-Government of El Salvador, 1971.

The geology, geochemistry, and hydrology of hot springs in the East African rift system in Ethiopia; report to the United Nations-Government of Ethiopia, 1971; co-author.

Prefeasibility Report, Guanacaste Geothermal Project; report to Instituto Costarricense de Electricidad, San Jose, Costa Rica, 1977.

## **CITIZENSHIP**

USA

## **LANGUAGES**

English – Native tongue

Spanish – Fluent in speaking, reading

French – Capability in reading