

LOW TEMPERATURE GEOTHERMAL
RESERVOIR SITE EVALUATION
IN ARIZONA

QUARTERLY PROGRESS REPORT
FOR PERIOD MAY 1, 1977 - JULY 31, 1977

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ABSTRACT

ERDA, Division of Geothermal Energy has charged the Bureau of Geology and Mineral Technology, Geological Survey Branch, University of Arizona, Tucson, with the responsibility of developing a cost effective exploration program for low to moderate temperature geothermal energy. This program encompasses the exploration for geothermal resources in the State of Arizona. It is anticipated that several low to moderate temperature geothermal energy targets will be developed and brought on stream as demonstration projects. To facilitate this program and demonstration projects area and regional studies have been initiated using Landsat imagery, geophysics and geochemistry.

Currently, three areas on the east side of the state have been designated for more detailed work. These areas are the St. Johns-Springerville area, the Clifton-Morenci-Safford area and the San Bernardino valley area. The detailed investigations in these areas have commenced. The reconnaissance exploration is also continuing.

A comprehensive geothermal energy reference library is being compiled. This library is for use by industry and the public at the Geological Survey Branch in Tucson, Arizona.

RESEARCH OBJECTIVES

The research objective of this program is the exploration for the location, evaluation and development of low to moderate temperature geothermal resources for use by the general public and private industry. The development of an efficient cost effective exploration program for the location and evaluation of low and moderate temperature geothermal resources will require the close cooperation and coordination of three geoscience disciplines, geology, geophysics and geochemistry.

For immediate utilization, these low to moderate hydrothermal energy resources, to be economic, must be located near the user whether it be space heating or cooling or industrial processing. Current plans call for two demonstration projects, utilizing low to moderate temperature hydrothermal geothermal energy, to be brought on stream. These two projects will be the training and testing ground for development of the economical exploration program. The third demonstration project must be brought on stream through utilization of a cost effective exploration and development program.

While the detailed or site-specific exploration, evaluation and development program is in progress, the reconnaissance exploration program will continue in an attempt to locate additional areas of interest. Current thinking is that the reconnaissance program will cover the entire State of Arizona. At present, however, most of the available data is in the Basin and Range physiographic province.

Another object of this program is the compiling of a special library on geothermal energy. This comprehensive geothermal library will be for public use at the Geological Survey Branch of the Bureau of Geology and Mineral Technology in Tucson, Arizona.

INTRODUCTION

This exploration and development program for low to moderate geothermal energy (to 140° - 150° C) was initiated after evaluation of prior geothermal research and reconnaissance programs conducted by the U. S. Geological Survey and ERDA, Division of Geothermal Energy. These cursory investigations indicated that the State of Arizona had excellent potential for the development of geothermal energy.

Numerous thermal springs and wells occur throughout the Basin and Range physiographic province of Arizona (Wright 1971, Tellier 1973, Norton et al 1975). Many of these wells and springs are situated near cities and towns. These favorably situated springs and wells present interesting target areas for exploration for low to moderate temperature geothermal energy sources that would have a ready market for space and process heating/cooling. Therefore, it was decided that the major thrust of this program would be to devise an efficient, cost effective exploration, evaluation and development procedure for low to moderate temperature geothermal energy resources.

Another phase of the program will be the exploration for and evaluation of moderate to high temperature geothermal resources, including hot dry rock, suitable for electrical generation. As these high temperature targets materialize in the exploration program, they will be noted and given a cursory evaluation. No detailed evaluation nor development of these high temperature geothermal resources is contemplated under the scope of the current program.

Finally, in an attempt to assist the general public and private

industry. ERDA, Division of Geothermal Energy decided that the Bureau of Geology and Mineral Technology. Geological Survey Branch would establish a comprehensive library on geothermal energy. These texts, papers, open-file maps and reports will be available for public inspection and use, on the premises, in Tucson, Arizona.

PERSONNEL OF PROGRAM

Principal Investigator

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COMPLIANCE WITH CONTRACTUAL REQUIREMENTS

The principal investigator, W. Richard Hahman, Sr., in accordance with Article I and Article A-I of Appendix A of ERDA contract EG-77-S-02-4362 has devoted his full time, from May 1, 1977 through July 31, 1977, to the contract work. He plans to devote his full time to the contract work during the next quarter, August 1, 1977 through October 31, 1977. The principal investigator and the program are in compliance with the requirements of the contract.

W. Richard Hahman, Sr.

The major accomplishments during the first quarter of the program involved a revision of goals, projects and budget. During this time the program evolved into a broad, multifaceted exploration project for geothermal energy with emphasis on the location and development of low to moderate temperature hydrothermal resources.

Several projects have been initiated to supply background or regional data to the exploration program. One of these projects is a Landsat lineament map of Arizona, scale 1:1,000,000, with optical Fourier analysis and text. In this study emphasis will be placed on Quaternary fractures and their relationship to probable and/or potential sources of geothermal energy.

Another project will be a geophysical study of the Basin and Range physiographic province of Arizona. Geophysical models of geothermal targets will be constructed and computer searches will be conducted, using currently available gravity and magnetic data to determine favorable areas for exploration. Additional phases of this project will be studies to determine depth to "basement" in the alluvial filled valleys and regional, geophysical structural analysis of the Basin and Range province of Arizona.

A third project will be a study of over 10,000 spring and water well analyses in Arizona, to determine target areas for low to moderate temperature geothermal resource exploration. High temperature targets will not be ignored but the data will be obtained from earlier studies. An anomalous temperature in the low to moderate temperature geothermal target study will be ten degrees centegrade above mean air temperature

or water table temperature which should be about the same.

It was decided that the Arizona program would have the responsibility of developing a cost effective exploration program for low to moderate temperature geothermal energy. To facilitate this study, heat flow measuring capabilities are to be added to the program. Also, cooperation and information exchanges are being negotiated between the various exploration and research groups operating in Arizona.

Negotiations have commenced with the White Mountain Apache Indian tribe to obtain permission to conduct geothermal energy exploration on their reservation. Studies have been undertaken to determine the type and availability of water well information on the Indian and military reservations in Arizona.

Three areas on the east side of the state have been designated for more detailed work. These areas are the St. Johns-Springerville area, the Clifton-Morenci-Safford area and the San Bernardino valley area. Compilation of waterwell data in these three areas has commenced. The field investigations are scheduled to commence in the middle of August 1977.

Finally, work continues on the compilation of the geothermal energy reference library. Considerable literature is now available for study by industry and the public.

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