

## **NOTICE CONCERNING COPYRIGHT RESTRICTIONS**

This document may contain copyrighted materials. These materials have been made available for use in research, teaching, and private study, but may not be used for any commercial purpose. Users may not otherwise copy, reproduce, retransmit, distribute, publish, commercially exploit or otherwise transfer any material.

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted material.

Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specific conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

This institution reserves the right to refuse to accept a copying order if, in its judgment, fulfillment of the order would involve violation of copyright law.

THE STATE COUPLED PROGRAM - A NEW EMPHASIS

Duncan Foley, Gerald P. Brophy\*, Leland L. Mink\*\*, Robert E. Blackett

Earth Science Lab/Univ. Utah Research Inst., Salt Lake City, UT 84108

\*DOE/DGE Headquarters, Washington, DC 20461

\*\*DOE/Idaho Operations Office, Idaho Falls, ID 83401

ABSTRACT

A slight redirection of state resource assessment team tasks is taking place with the initiation of the User Coupled Confirmation Drilling Program in federal FY '81. State resource teams will conduct statewide inventories of hydrothermal resources in order to prioritize regions for additional work. Regional analysis of information will be done to refine target model concepts of selected areas and generate state resource maps for public use. Direct temperature measurements and indirect geological, geophysical, and geochemical studies will be employed for more detailed area exploration to produce technical maps and reports. Confirmation of specific hydrothermal reservoirs will be accomplished as part of the User Coupled Confirmation Drilling Program.

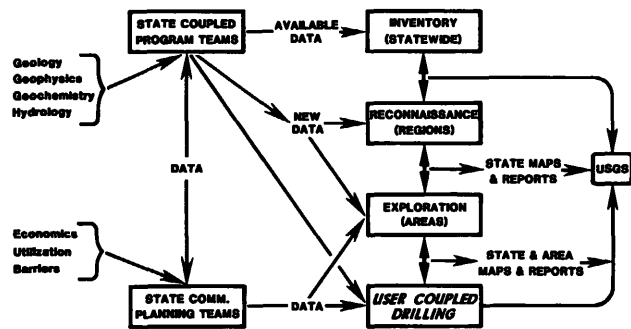
The Department of Energy/Division of Geothermal Energy funds state agencies to assess low- and moderate-temperature geothermal resources within 20 states. A list of participants in the program, and a brief discussion of their roles, is contained in Foley and others (1979). As initially conceived (Wright and others, 1978), the program was separated into Phase I, compilation and publication of regional geothermal data, and Phase II, confirmation of specific reservoirs. With the initiation of the User Coupled Confirmation Drilling Program in federal FY '81, a slight redirection of state resource assessment team tasks is taking place.

Figure 1 is a flow diagram of specific tasks depicting activities in the State Coupled Program. The resource assessment teams coordinate their compilation of geoscience data with the state Commercialization Planning teams, who are charged with evaluation of institutional and utilization parameters.

The inventory of statewide geothermal data is done to obtain an overview of the hydrothermal resources. This state emphasizes compilation of available data on well and spring temperatures, geologic settings, temperature gradients and heat flow, water chemistry and geothermometry, aquifer

Figure 1

STATE COUPLED PROGRAM



productivity where available, and other appropriate information. The goal of the statewide inventory is to define and prioritize regions for reconnaissance study. Initial concepts for target models of resources are developed at this stage.

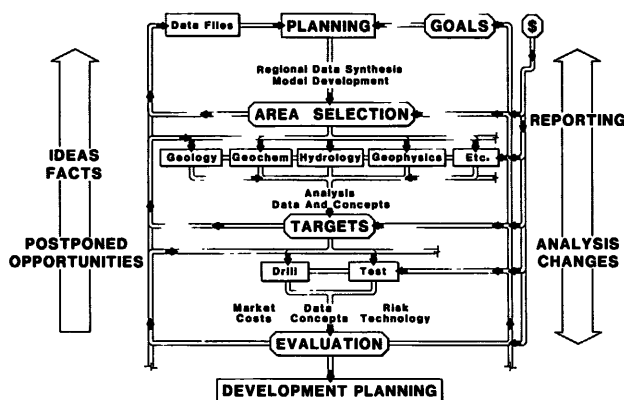
Regional studies involve more detailed investigation of geothermal data to locate good geothermal environments. Collection of new data becomes important at this stage to refine thoughts on target models generated during the statewide assessment. A map depicting geothermal resources in each state is being produced as a product of the reconnaissance stage. The selection, after reconnaissance, of smaller areas for more detailed study is made in coordination with the Commercialization Planning teams in the states.

Area exploration is designed to enable users and developers to identify favorable sites for drilling either with their own funding or as part of the User Coupled Confirmation Drilling Program or other federal programs. Area studies concentrate on direct measurement of well and spring temperatures, and application of indirect techniques to identify geological settings, geochemical signatures, or geophysical anomalies that might be related to hydrothermal resources. Results of area studies will contribute data to

the preparation of technical geothermal maps and to reports that will enable users to select favorable sites for further testing.

Figure 2 is a flow diagram that depicts an exploration philosophy. The goal setting, data compilation synthesis, model development, area selection analysis of study results, and general recognition of targets are roles for the State Coupled Program Resource Assessment teams. The drilling and testing of targets will generally be done under other programs.

Figure 2  
**EXPLORATION**



It is anticipated that confirmation of specific reservoirs, in areas where interest in direct application of hydrothermal resources exists, will be accomplished as part of the User Coupled Confirmation Drilling Program. This is a first hole, federal cost-shared program which is intended to demonstrate the viability of direct applications of hydrothermal energy and to stimulate the development of a broadly-based private sector infrastructure of geothermal professionals.

The inclusion of state Resource Assessment team expertise in determining low- and moderate-temperature geothermal resources is crucial for the success of the User Coupled Program. In addition to providing local resource expertise to program proposers and DOE, it is expected that state teams will participate with other state agencies in submitting reservoir confirmation proposals for selected state facilities.

The production of maps depicting geothermal resources is an important product of the State Coupled Program (Grim and others, 1978). State agencies are coordinating with the National Oceanic and Atmospheric Administration on the production of new maps. Within the next year, maps oriented toward the general public will be available from the western states participating in the program. Technical maps for a few states will also be available in the year; more will be published in subsequent years. Table 1

summarizes the data that will be contained on the public map. Each thermal spring or well will depict available data in the format shown on the lower left corner of Table 1. Final selection of data sets to be shown on technical maps will be resolved with each state team; Table 2 lists the types of data which might be depicted.

Coordination of Resource Assessment and data transfer with the U.S. Geological Survey continues to receive emphasis in the State Coupled Program. State team participation in the compilation of the data base for U.S.G.S. Circular 790 (Muffler, 1979) is expected to be followed with contributions to a planned update of the Circular, which will concentrate on lower temperature resources.

State Coupled Program resource assessment teams are contributing to the knowledge base concerning the nature of fault-controlled, deep stratigraphic, and volcanic hydrothermal resources. Emphasis on data compilation, exploration model development, and coordination with other DOE programs is enhancing the opportunity for near-term commercialization of low- and moderate-temperature hydrothermal resources.

REFERENCES

Foley, Duncan, P. M. Wright, D. W. Struhsacker, C. R. Nichols, L. L. Mink, G. P. Brophy, P. J. Grim, and G. W. Berry, 1979, State Coupled Resource Assessment Program - An Update: Geothermal Resources Council Transactions, Vol. 3, p. 217-219.

Grim, P. J., C. R. Nichols, P. M. Wright, G. W. Berry, J. Swanson, 1978, State Maps of Low-Temperature Geothermal Resources: Geothermal Resources Council Transactions, Vol. 2, 0. 233-4.

Muffler, L. J. P., ed., 1979, Assessment Geothermal Resources of the United States - 1978: U.S. Geological Survey Circular 790, 163 p.

Wright, P. M., Duncan Foley, C. R. Nichols, P. J. Grim, 1978, Western States Cooperative Direct Heat Geothermal Program of DOE: Geothermal Resources Council Transactions, Vol. 2, p. 739-741.

Table I  
**PUBLIC MAPS**

<p>◇ SPRING</p> <p>○ WELL</p> <p>RED &gt; 50 °C</p> <p>BLUE &lt; 50 °C</p> <p>TEMP / FLOW TDS / DEPTH</p>	<p><u>BASE DATA</u></p> <p>TOPO., DRAINAGE</p> <p>CULTURE, POLITICAL BOUND.,</p> <p>TOWNSHIP, RANGE, SECTION,</p> <p>FOREST, WILDERNESS,</p> <p>INDIAN, MILITARY</p> <p><u>GEOHERMAL DATA</u></p> <p>THERMAL SPRINGS AND WELLS</p> <p>TEMP., FLOW, DEPTH, TDS</p> <p>FAVORABLE AREAS</p> <p>FEDERAL, STATE KGRAs</p> <p>SQUIBS</p>
---	--

Table II  
**TECHNICAL MAP DATA**

<p>BASE DATA - AS ON PUBLIC MAP</p> <p>GEOHERMAL DATA - AS ON PUBLIC MAP</p> <p>OTHER DATA SETS: (SHOPPING LIST)</p> <p>HEAT FLOW</p> <p>SPRING DEPOSITS</p> <p>FAULTS/LINEAMENTS</p> <p>EARTHQUAKE EPICENTERS</p> <p>Hg, As, U, S DEPOSITS/PROSPECTS</p> <p>WATER QUALITY</p> <p>AQUIFER PRODUCTIVITY</p> <p>GEOCHEMICAL THERMOMETRY</p> <p>HIGH T</p> <p>MODERATE T</p> <p>LOW T</p> <p>IGNEOUS SYSTEMS</p> <p>VOLCANIC CENTERS AND FLOWS (YOUNG)</p> <p>THERMAL GRADIENTS</p> <p>OTHER SELECTED GEOLOGY AND GEOPHYSICS</p> <p>AREAS OF PRESENT USE</p> <p>HEAT CONTENTS</p> <p>DEPTH TO RESOURCES</p> <p>SQUIBS</p>	<p>} AREAS AND INTERPRETATIONS (INCLUDE BUT DISTINGUISH POTENTIAL AREAS)</p>
--	--