

ANNOUNCEMENT

U. S. DEPARTMENT OF ENERGY DIVISION OF GEOTHERMAL ENERGY



USER COUPLED CONFIRMATION DRILLING PROGRAM

a new program to provide

FEDERAL COST SHARING

for

**EXPLORATION, DRILLING,
AND TESTING**

to confirm

HYDROTHERMAL RESERVOIRS

for

DIRECT HEAT APPLICATIONS

Overview of User Coupled Confirmation Drilling Program



INEL-S-25 258

Postulate

Hydrothermal resources can be used economically once reservoir has been confirmed

i.e. lack of use results from lack of confirmed reservoirs

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Reservoir Confirmation to Ensure Adequate Supply of Hydrothermal Energy

Requires:

- **Drilling to intersect resource**
- **Flow testing to determine**
 - **Temperature**
 - **Flow rate**
 - **Longevity**

INEL-S-25 260

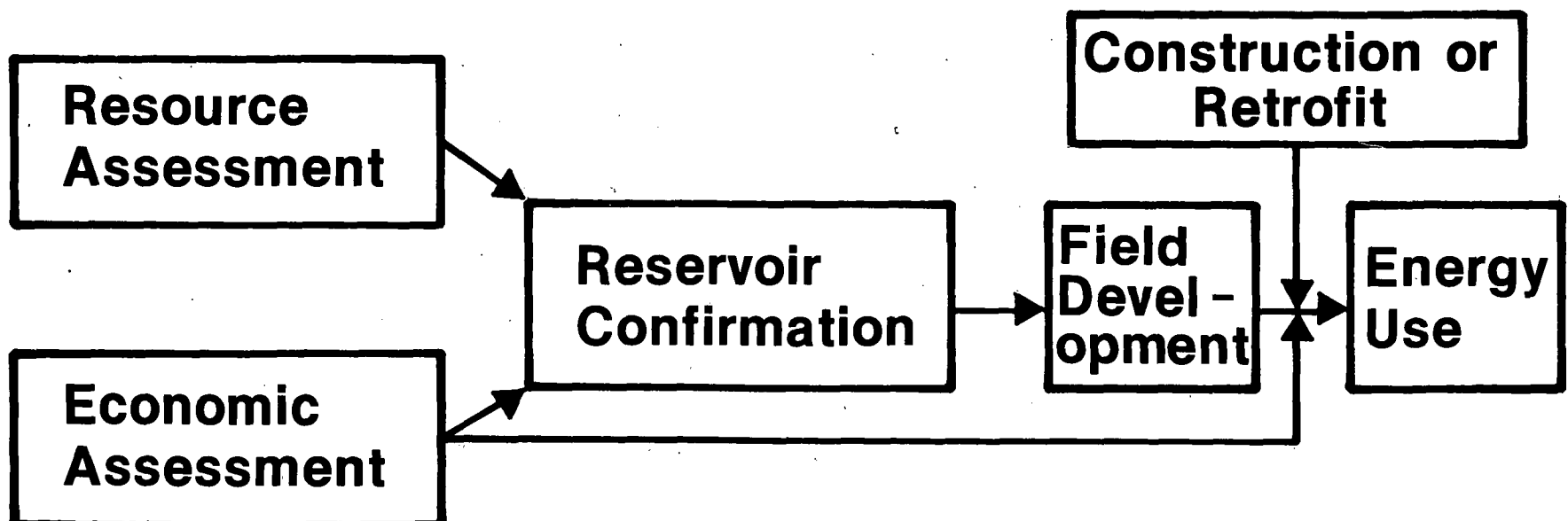
Reservoir Confirmation

A high risk portion of commercialization sequence

- Risk of drilling unproductive well
- Drilling and testing costs are significant

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Commercialization Sequence



INEL-S-25 583

Reservoir Confirmation Lags

Because of :

- **Inability of many users to spread high risks and costs**
- **Inability of some users to get risk money**
- **Lack of experienced infrastructure**
- **Lack of economic data**

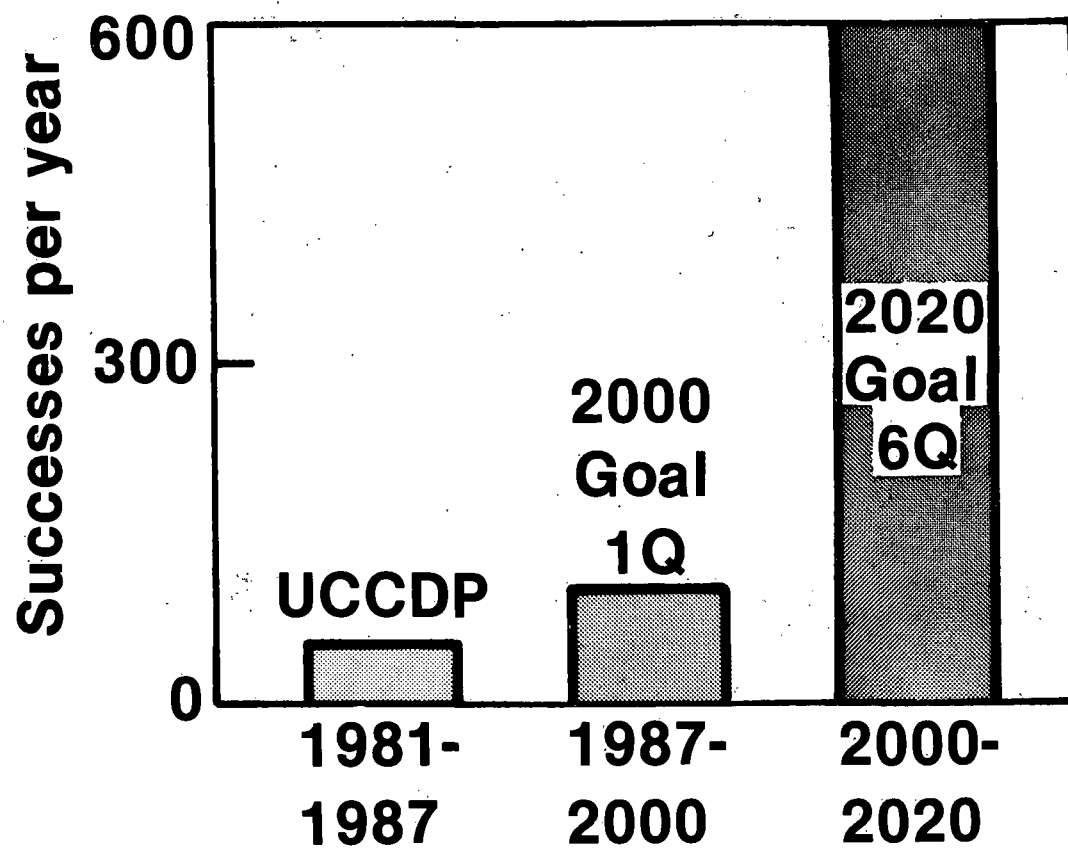
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To Reach Year 2000 Goal of 1 Quad

- **Reservoir confirmation needed at 125 sites/yr**
— **Requires exploration at 500 sites/yr**
25% success rate
- **Cost: \$500 million/yr**

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Rate of Direct Heat Development



INEL-S-25 244

Development of this Magnitude Requires

- Private sector manpower and financing
- Federal stimulation

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Program Objectives

- **Develop experienced infrastructure in private sector**
 - **To reduce risks and costs of reservoir confirmation**
 - **To continue high rate of development after Federal program phases out**
- **Demonstrate viability of direct heat utilization**

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Program Elements

- **DOE competitive procurement**
 - **Proposals from private sector, state & local governments**
- **Cost-share contract with user or developer**
 - Specifies - Exploration, drilling, testing program**
 - **Criteria to determine degree of success**
 - **Cost-share formula (based on degree of success)**

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Program Elements (Cont.)

- **Project Financing**
 - **Internal Financing**
 - **Loan from commercial institution**

- **When well is drilled and tested**
 - **Degree of success determined**
 - **DOE pays share of costs**

INEL-S-25 266

Proposers must Demonstrate

- **Intent to use resource**
- **Access to or ownership of lands**
- **Geothermal use rights**
- **Ability to obtain permits**

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Items for DOE Cost Share

- **Exploration for drill site selection**
- **Site preparation**
- **Drilling**
- **Flow testing**
- **Fluid disposal**
- **Well completion**
- **Injection well (if needed)**

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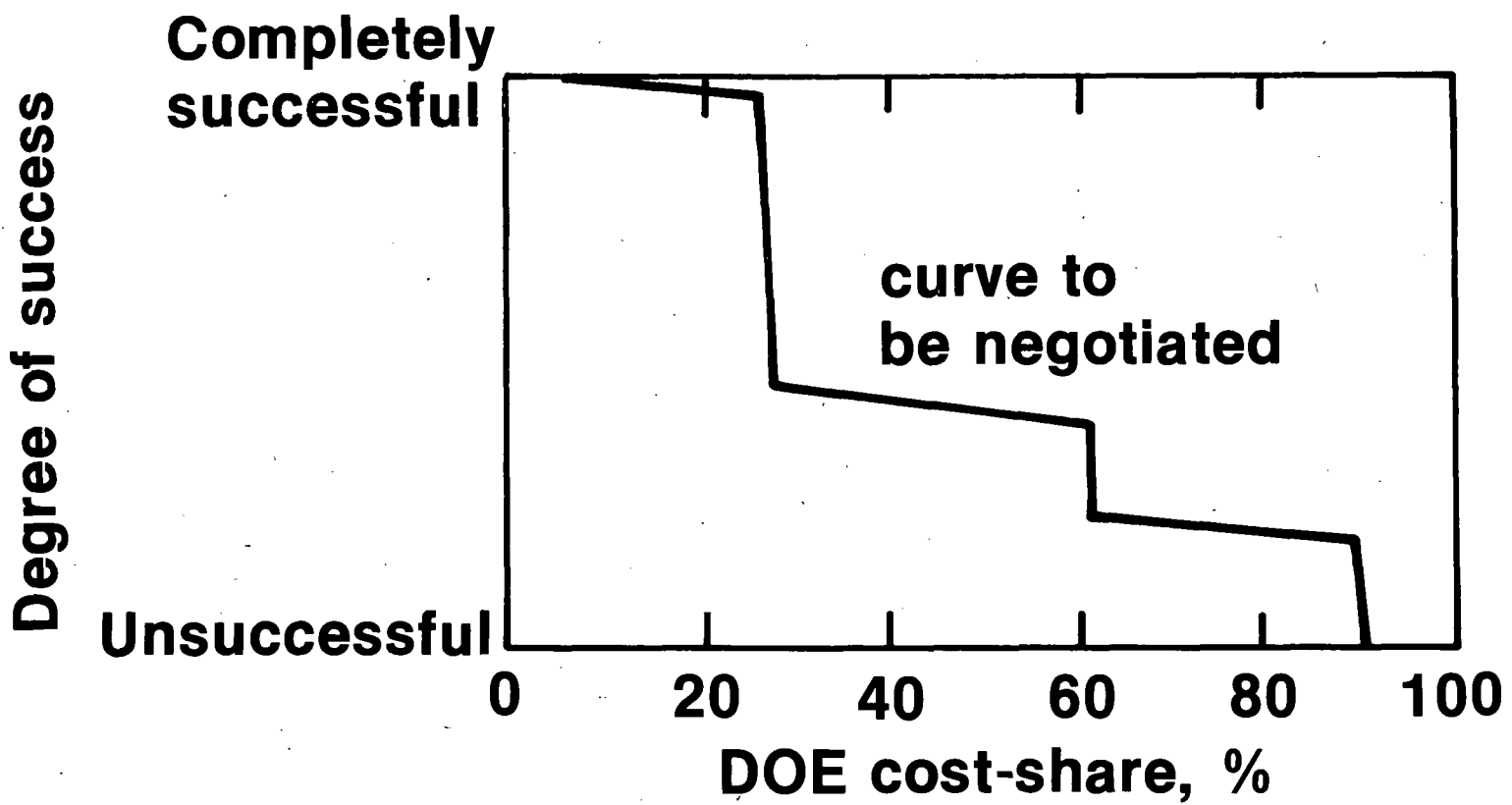
Criteria to Define Degree of Success

Based On

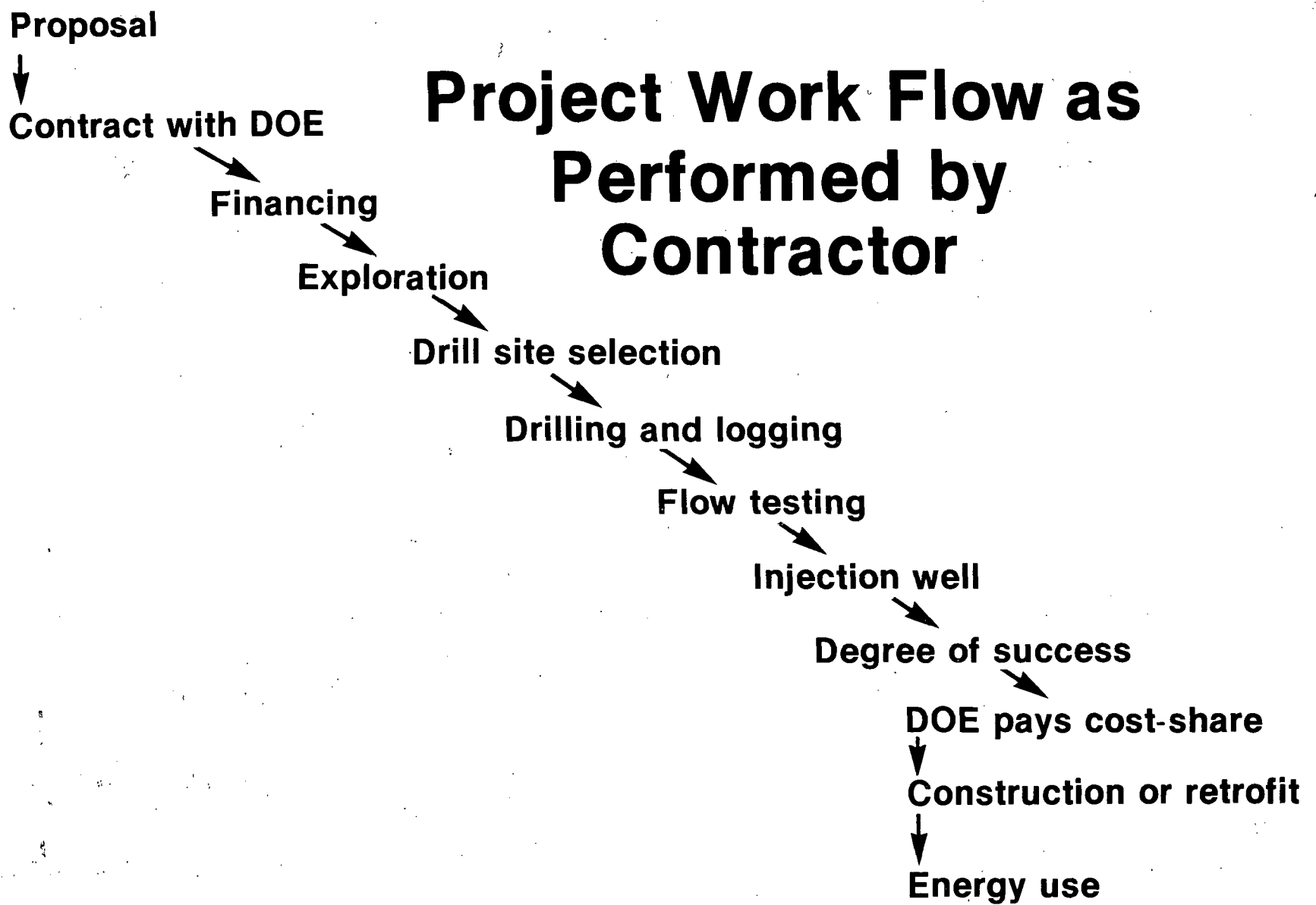
- **Temperature, productivity, longevity of reservoir (energy available)**
- **Intended use (engineering considerations)**

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Variable Cost-Share



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INEL-S-25 253

Proposal

↓
Contract with DOE

↘
Financing

↘
Exploration → Data to DOE

↘
Drill site selection → Data to DOE

↘
Drilling and logging → Data to DOE

↘
Flow testing → Data to DOE

↘
Injection well → Data to DOE

↘
Degree of success

↘
DOE pays cost-share

↓
Construction or retrofit

↓
Energy use → Data to DOE

Contract Monitoring – Data to DOE

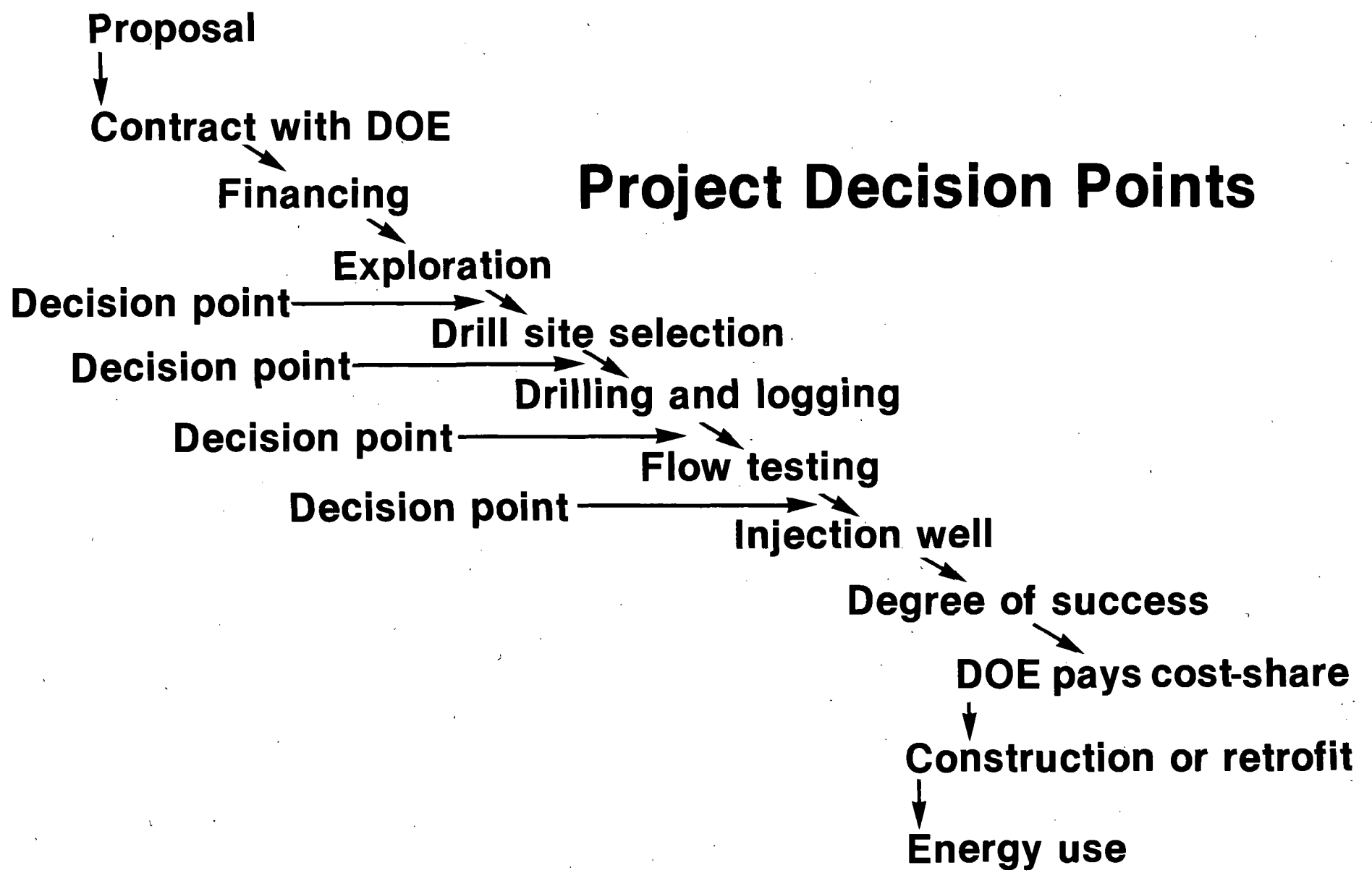
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Contract Monitoring/Data Analysis

DOE will:

- Monitor contractor's progress
- Acquire data generated by contractor
- Perform independent analyses, evaluations

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Technology Transfer

DOE will publish:

- **Data generated by project**
- **End case studies of selected projects**

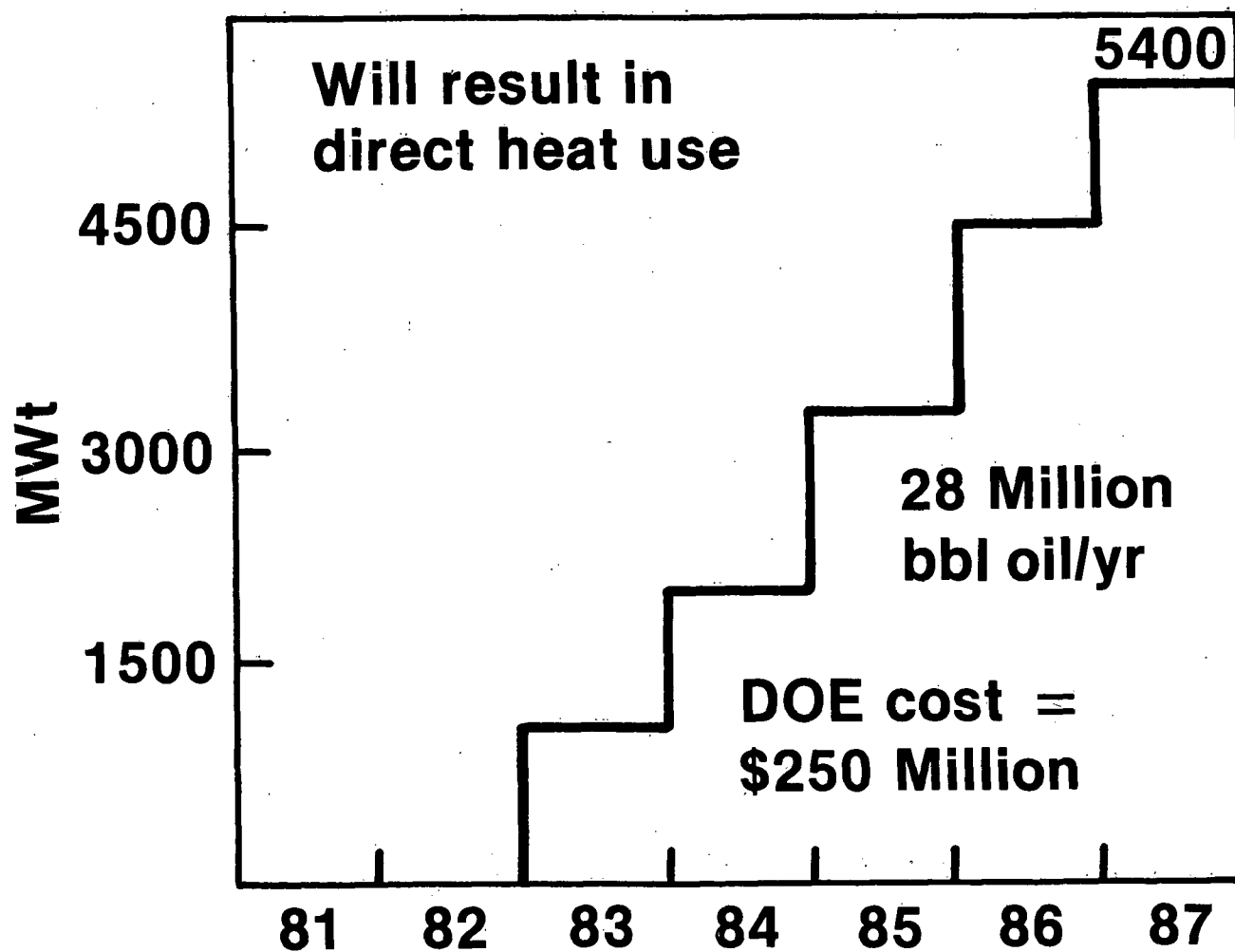
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Some Unproductive Wells Expected

- Reservoir confirmation is risky
 - Well sited incorrectly
 - Reservoir does not exist
- Long-term success ratio 25%
- Solutions
 - Develop exploration experience
 - Develop new technology

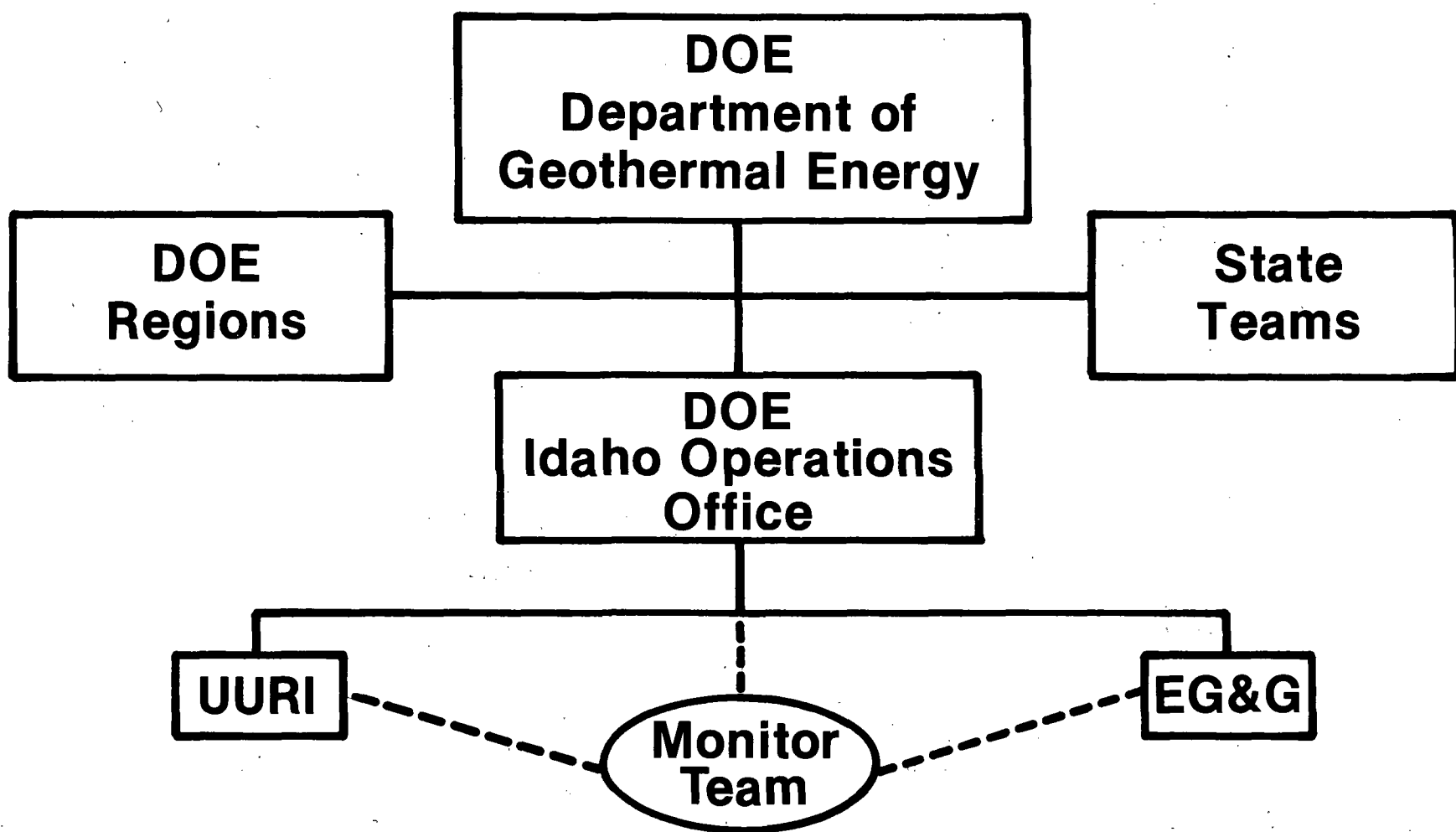
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User Coupled Confirmation Drilling Program



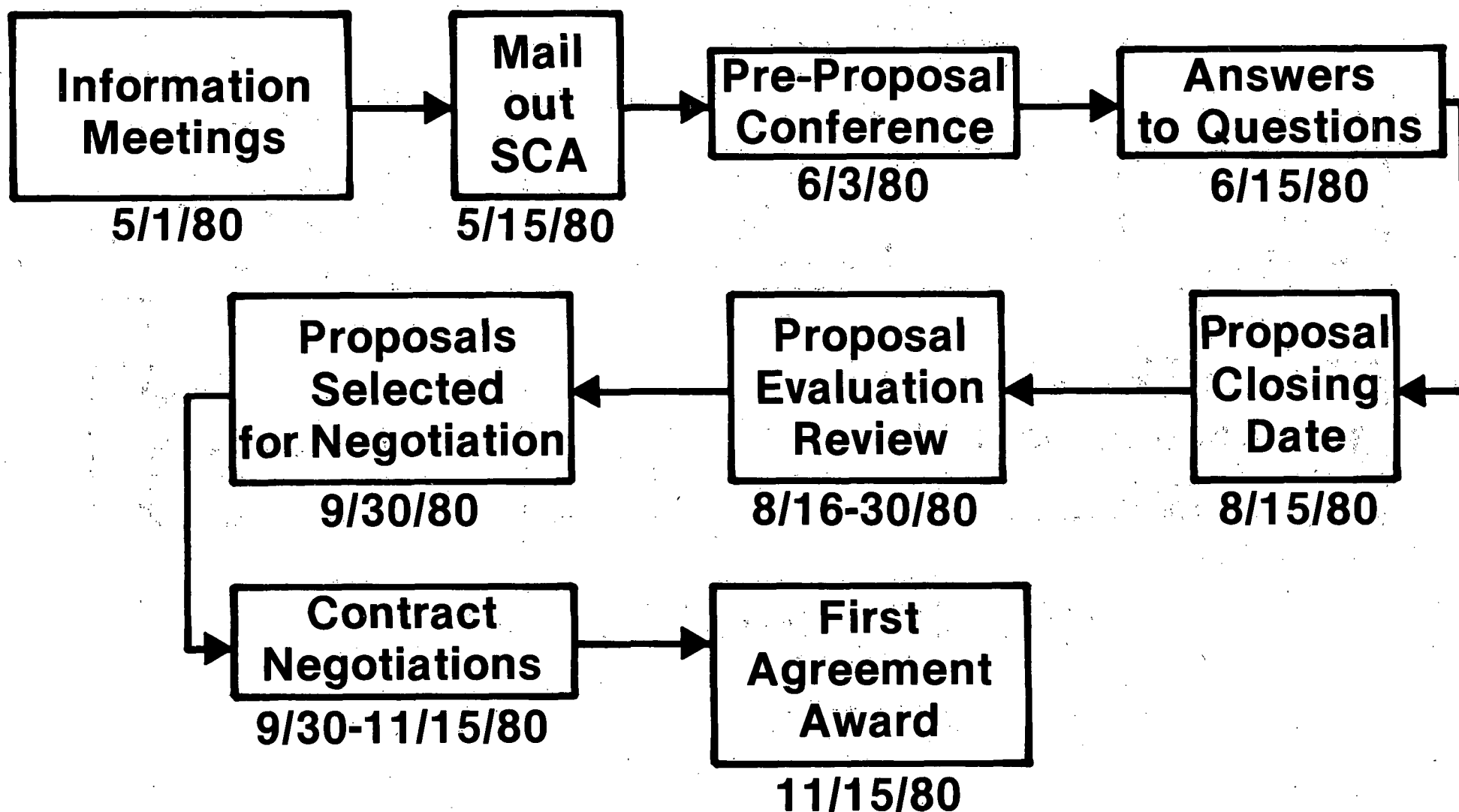
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Management



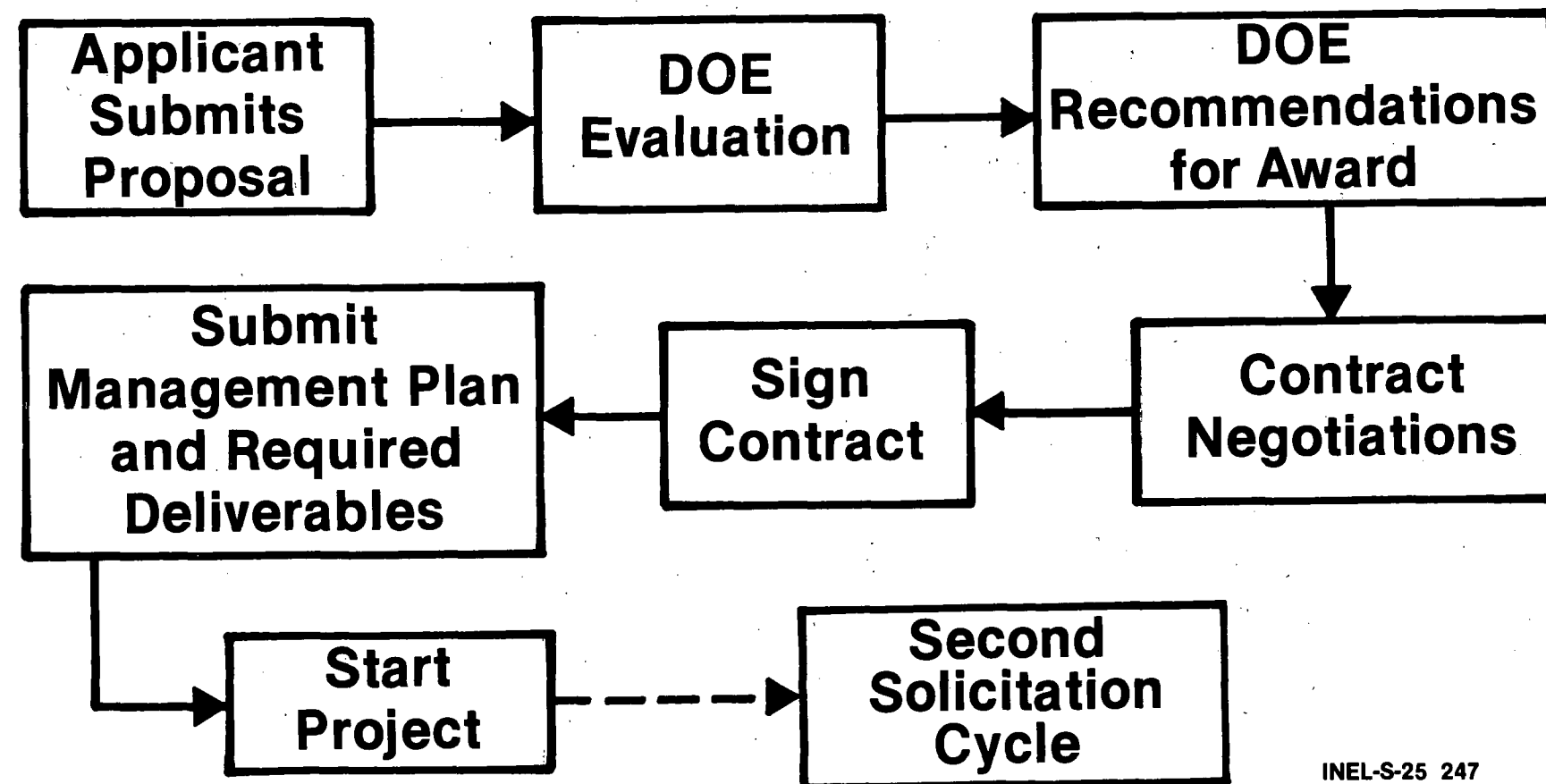
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Schedule



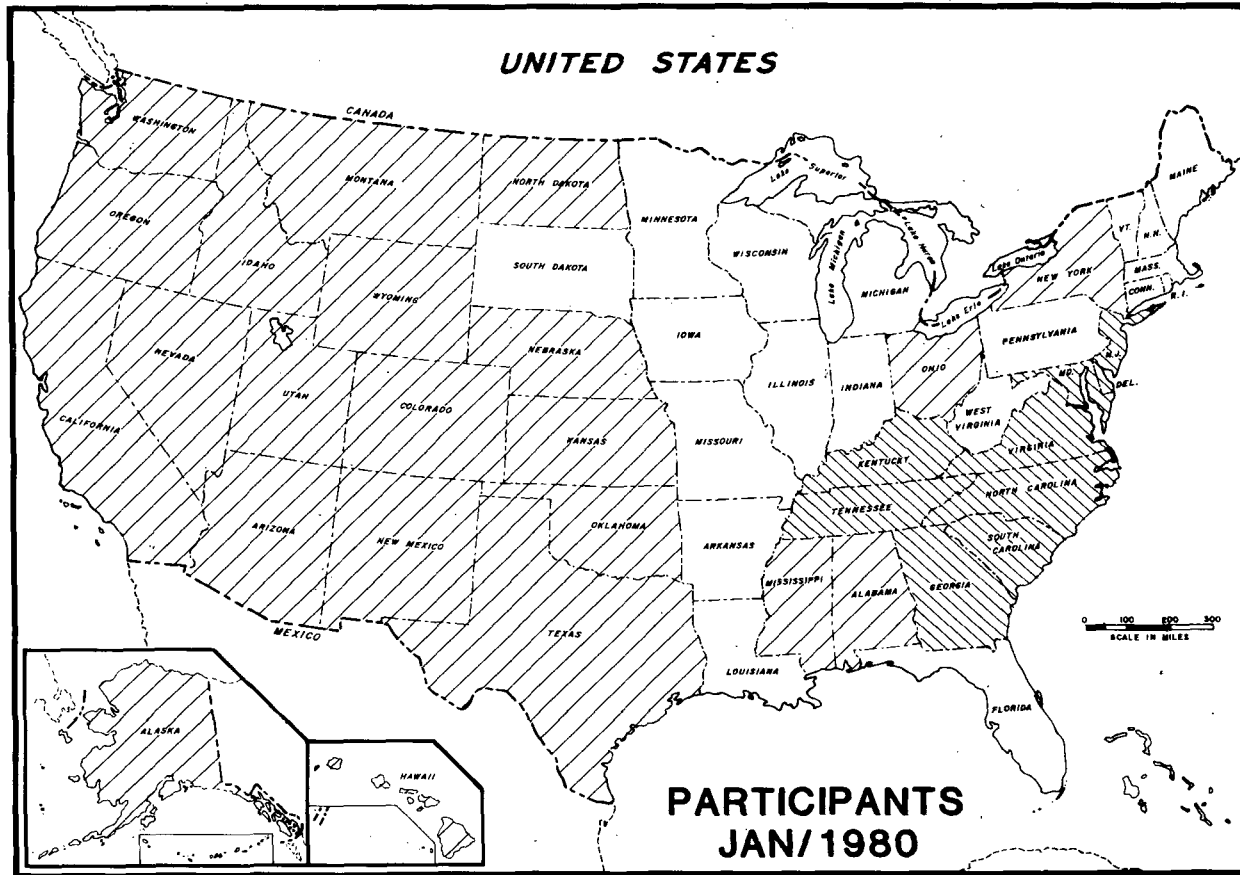
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Procurement Process



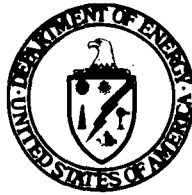
THE STATE COUPLED PROGRAM

LOW- AND MODERATE-TEMPERATURE GEOHERMAL RESOURCES



-  Individual State Contracts
-  University Contracts Covering Several States

U.S. DEPARTMENT OF ENERGY
DIVISION OF GEOTHERMAL ENERGY



THE STATE COUPLED TEAM

DOE-HEADQUARTERS (Washington) - Gerald P. Brophy (202-633-9491)
Program planning, guidance, priorities.

DOE-IDAHO FALLS OPERATIONS - Leland L. Mink (208-526-0638)
Program implementation, contracting, management.

STATE CONTRACTORS
Performance of state project.

UNIVERSITY OF UTAH RESEARCH INSTITUTE (UURI) - Duncan Foley (801-581-5283)
LOS ALAMOS SCIENTIFIC LABORATORY (LASL) - A. William Laughlin (505-667-6711)
GRUY FEDERAL - Joel L. Renner (703-892-2700)
Management assistance to DOE.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY (VPI) - John K. Costain (703-961-5096)
Exploration and technology development for Atlantic Coastal Plain.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) - Paul J. Grim (303-499-1000)
Publishing state resource maps.

U. S. GEOLOGICAL SURVEY (USGS) - Marshall J. Reed, James R. Swanson (415-323-8111)
Assessment of U. S. Geothermal resources and computer storage of geothermal data.

PARTICIPATING STATES

Alabama	Gary V. Wilson	205-349-2852
Alaska	Donald L. Turner	907-479-7198
	Ross G. Schaff	907-277-6615
Arizona	W. Richard Hahman, Sr.	602-884-2733
California	Roger C. Martin	916-323-0967
Colorado	Richard H. Pearl	303-839-2611
Hawaii	Charles E. Helsley	808-948-8760
Idaho	John C. Mitchell	208-334-4477
Kansas	Don W. Steeples	913-864-3965
Mississippi	Alvin R. Bicker	601-354-6228
Montana	John Sonderegger	406-792-8321
Nebraska	William D. Gosnold	402-554-2457
	Duane A. Eversoll	402-472-3471
Nevada	Dennis T. Trexler	702-784-6691
New Mexico	Chandler A. Swanberg	505-646-1920
New York	Burton Krakow	518-465-6251
	James R. Dunn	518-783-8102
North Dakota	Kenneth L. Harris	701-777-2231
Ohio	Frank L. Majchszak	614-466-5344
Oklahoma	William E. Harrison	405-325-3032
Oregon	Donald A. Hull	503-229-5580
Texas	Charles M. Woodruff	512-474-5994
	David M. White	512-475-5588
	Robert F. Roy	915-747-5501
Utah	J. Wallace Gwynn	801-581-6831
Washington	J. Eric Schuster	206-753-5327
Wyoming	Edward R. Decker	307-766-3278

PROGRAM JUSTIFICATION

Until the recent energy crisis there has been very little interest in direct uses of geothermal energy. Therefore, little geothermal exploration has been done to date. Present data indicate that the total geothermal resource base in the U.S. is very large (U. S. Geological Survey Circular 790 -- Assessment of United States Geothermal Resources - 1978). Many geothermal resources remain to be discovered and developed.

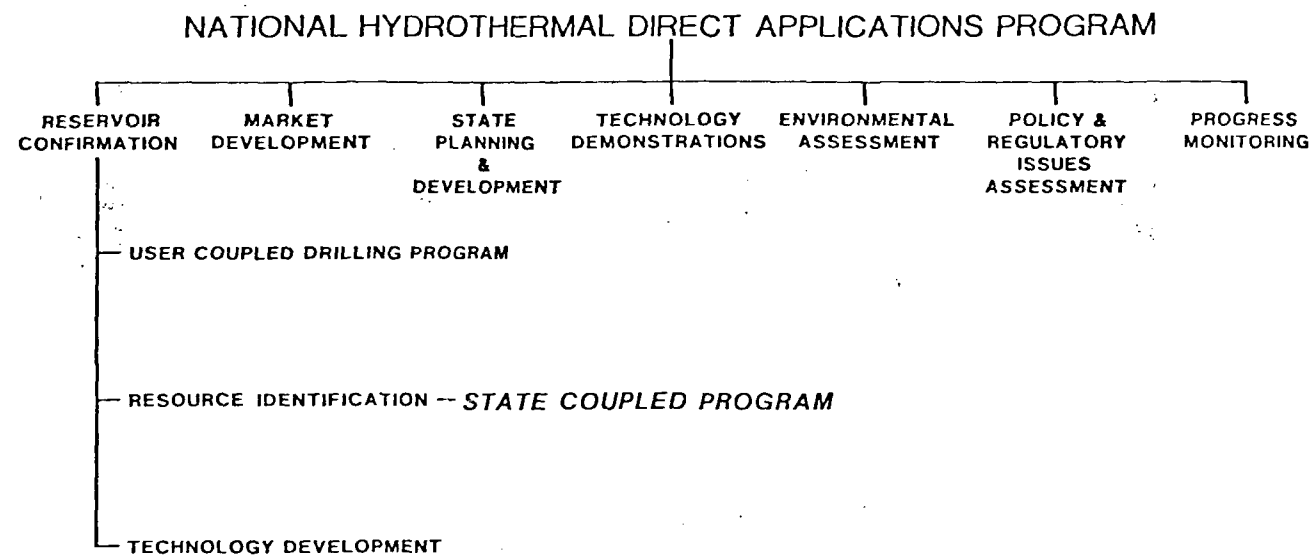
OBJECTIVE

The objective of DOE's State Coupled Program is IDENTIFICATION OF GEOTHERMAL RESOURCE AREAS. The data generated by this program are:

1. Published as maps and reports for the benefit of prospective users, and;
2. Transmitted to the U. S. Geological Survey for their analysis in assessing geothermal resources in the United States.

RELATIONSHIP TO NATIONAL DIRECT APPLICATIONS PROGRAM

The State Coupled Program is an integral component of the



State Resource Teams work closely with State Commercialization Planning Teams, whose job is to facilitate development of geothermal resources (under State Planning and Development).

PHASE I
(IMMEDIATE PRIORITY)

DIRECT DETECTION OF THERMAL WATERS IS EMPHASIZED

Direct detection is quick and inexpensive. Simple techniques such as analyzing available temperature data and collecting new temperature data from springs and wells are effective in discovering resources. Many reported temperature measurements are inaccurate. Many wells lack measured temperature.

BASIC TASKS ARE:

Compilation of Available Data & New Measurements

- temperature of springs
- temperature in wells
- temperature gradients
- water quality
- aquifer productivity
- related geology

Publication of Maps & Reports
 -for use by the general public
 -to facilitate geothermal development

PHASE II
(SUBSEQUENT PRIORITY)

INDIRECT DETECTION OF THERMAL WATERS IS EMPHASIZED

Indirect detection is more expensive and more risky. Although indirect indicators are needed to find hidden resources, exploration for hidden resources is pursued only after direct detection of more obvious resources is substantially complete.

BASIC TASKS ARE:

Performance & Analysis (as appropriate)

- heat flow
- chemical geothermometry
- geology
- geophysics
- geochemistry
- hydrology

Publication of Maps & Reports
 -for use by the general public and by earth scientists
 -to facilitate geothermal development.

USER COUPLED CONFIRMATION DRILLING PROGRAM

PUBLIC INFORMATION MEETING

REGISTRATION

NAME _____

AFFILIATION _____

ADDRESS _____

TELEPHONE _____

I am a

- Prospective User
- Prospective Developer
- Prospective Financier
- Contractor/Consultant
- State or Local Government Employee
- Regulatory Agency Employee
- DOE Contractor
- Other: _____

Area(s) of Expertise

- Exploration
- Drilling
- Reservoir Testing
- Architecture/Engineering
- Equipment Manufacturing
- Application
- Financing
- Institutional
- Environmental
- Other: _____

YES NO

I want to be on the mailing list for the User Coupled Confirmation Drilling Program

CONSULTANTS AND CONTRACTORS QUESTIONNAIRE

Place an "X" in each box that identifies one of your activities.

By filling out and returning this questionnaire, you will be added to our list of consultants and contractors. This list will be furnished to those interested in using or developing geothermal energy.

	<u>Consulting</u>	<u>Contracting</u>
Geophysical Studies	<input type="checkbox"/>	<input type="checkbox"/>
Geochemical Studies	<input type="checkbox"/>	<input type="checkbox"/>
Geological Studies	<input type="checkbox"/>	<input type="checkbox"/>
Hydrological Studies	<input type="checkbox"/>	<input type="checkbox"/>
Reservoir Engineering	<input type="checkbox"/>	<input type="checkbox"/>
Well Logging	<input type="checkbox"/>	<input type="checkbox"/>
Well Stimulation	<input type="checkbox"/>	<input type="checkbox"/>
Subsidence	<input type="checkbox"/>	<input type="checkbox"/>
Induced Seismicity	<input type="checkbox"/>	<input type="checkbox"/>
Thermal Gradient Drilling	<input type="checkbox"/>	<input type="checkbox"/>
Deep Drilling (over 5000 ft.)	<input type="checkbox"/>	<input type="checkbox"/>
Shallow Drilling (under 5000 ft.)	<input type="checkbox"/>	<input type="checkbox"/>
Environmental Studies	<input type="checkbox"/>	<input type="checkbox"/>
	<u>Yes</u>	<u>No</u>
Geothermal Experience	<input type="checkbox"/>	<input type="checkbox"/>
Oil & Gas Experience	<input type="checkbox"/>	<input type="checkbox"/>
Mining Experience	<input type="checkbox"/>	<input type="checkbox"/>
Geotechnical Experience	<input type="checkbox"/>	<input type="checkbox"/>

Name _____

Return to:

Company _____

Earth Science Laboratory
 University of Utah Research Institute
 420 Chipeta Way, Suite 120
 Salt Lake City, UT 84108
 Attn: Sue Moore

Address _____

Telephone () _____