

*These studies by
M. Dolan*

RECEIVED

JUN 22 1979

GEOTHERMAL ENERGY
BRANCH

PROPOSAL SUBMITTED TO
THE DEPARTMENT OF ENERGY
DIVISION OF GEOTHERMAL ENERGY
IDAHO OPERATIONS OFFICE
IDAHO FALLS, IDAHO

by

EARTH SCIENCE LABORATORY
UNIVERSITY OF UTAH RESEARCH INSTITUTE
420 Chipeta Way, Suite 120
Salt Lake City, Utah 84108

Author: Schulyer Schaff

Title: Seismic Baseline and Induction Studies at Raft River, Idaho

June, 1979

SEISMIC BASELINE AND INDUCTION STUDIES AT RAFT RIVER, IDAHO

1.0 INTRODUCTION

In recent years, a sizeable body of literature has accumulated on the subject of induced seismicity, i.e., earthquakes induced or triggered by human activity. Induced seismicity has been observed in association with surface reservoir filling activities, mining, underground nuclear testing, fluid withdrawal from the earth, and fluid injection into the earth. None of the above activities is thought to have produced earthquakes directly. Rather, it is thought that these activities have altered a previously existing stress field within the earth sufficiently to allow stress energy to be released in the form of earthquakes.

Most geothermal prospects in the United States are in areas of active faulting. Many geothermal prospects exhibit microearthquake activity as well as large-scale faulting with effects observable at the surface, both of which imply the existence of an active stress field at depth. Fluid withdrawal and (usually) reinjection are necessary for the production of electricity from geothermal fluids. Thus the development of geothermal energy carries with it a high probability of inducing earthquakes. This is a matter of concern from environmental and operational viewpoints.

This proposal addresses a program of seismic monitoring at the Raft River geothermal prospect in southern Idaho. Some testing of the Raft River reservoir has already been done; more production tests are planned. It is important that a baseline of seismological data be obtained prior to continued production. Therefore, it is important for seismic monitoring at Raft River to be resumed rapidly.

2.0 PRESENT MONITORING SYSTEM

A three-station seismic array was operated by EG&G personnel at Raft River from 1976 through 1978. Operation was halted in 1978 due to equipment problems, principally with the recording apparatus. On March 21, 1979, Sky Schaff and Alan Fidler of ESL/UURI visited the Raft River site to assess the quality of the seismograms and the state of the equipment.

The seismograms were found to be sufficient to give a qualitative evaluation of earthquake activity, but not suitable for detailed analysis. The recording equipment appeared functional; its failure was probably due to environmental causes. The electronics at two of the field stations were not available for inspection because they were buried in concrete vaults. Of the electronics that could be inspected, all appeared functional except the seismometers, which had been corroded as a result of burial without protection or maintenance, and the telemetry radios, which had not been licensed and which had had interference problems with the site communications radios.

3.0 SCOPE OF WORK

It is here proposed to rehabilitate the existing seismic network at Raft River by repairing the repairable components and replacing those that are beyond repair. A seismic noise survey will be conducted to find the most suitable sites; the stations will be installed at those sites to telemeter to a central recording site. At the receiving site, the seismic signals will be recorded on the existing drum-type recorders. A description of the tasks to be performed follows:

Task 1. Detailed Examination of Existing Equipment

The present equipment will be enhanced, examined, and tested. It will then be repaired, sent out for repair, or replacements will be ordered.

Task 2. Radio Permitting

Frequency permits for the telemetry radios will be obtained (by DOE or EG&G) and the radios will be ordered.

Task 3. Siting Study

An examination of potential sites will be conducted with portable seismographs, in order to optimize sites to be instrumented.

Task 4. Installation

Seismometer sites will be prepared. The recording site will be fabricated. Upon arrival of the equipment ordered and sent out for repair, the instruments will be installed.

Task 5. Recording

The recording facility will be on site at Raft River. The seismograms will be changed daily by EG&G personnel on site, and sent to ESL/UURi for analysis.

Task 6. Analysis

The analyst will identify and time events from the seismograms. From these, epicenters will be determined.

Task 7. Reporting

An annual summary of activity and report will be prepared; periodic reports of unusual or otherwise interesting activity will be issued.

4.0 PROPOSED BUDGET FOR FY80

A. Salaries		\$16,400
1. Seismologist		
2. Technician		
3. Analyst		
B. Employee Benefits		<u>\$ 3,936</u>
1. 24% of Wages and Salaries		
C. Total Salaries, wages, and benefits		<u>\$20,336</u>
D. Permanent Equipment		<u>\$ 4,245</u>
1. 3 Transmitters (Monitron T16F, 0.100W)		
@ \$410 ea	\$1230	
2. 3 Receivers (Monitron R16F) @ \$585 ea	1755	
3. 3 Seismometers (Geotech S-500) @ \$420 ea	1260	
E. Expendable Supplies and Equipment		<u>\$ 5,508</u>
1. 3 Seismometer vaults w/hardware @ \$75	\$ 225	
2. 15 Air Cell Batteries, @ \$65	975	
3. 1100 Sheets helicorder paper @ \$28/hundred	308	
4. Spare parts and electronic supplies	4000	
F. Travel (incident to site selection and installation)		<u>\$ 3,688</u>
1. Field Vehicle		
a. 4 mo lease @ \$247/mo	\$ 988	
b. 5,000 mi @ \$0.18/mi	900	
2. Per Diem (40 man-days @ \$35)	1,400	
3. Scientific Meetings (1)	400	
G. Report and Publication Costs		<u>\$ 700</u>
H. Computer Costs		<u>\$ 600</u>
I. Indirect Costs		<u>\$12,202</u>
1. 60% of Salaries, Wages, and Benefits		
J. Management Allowance @ 7%		<u>\$ 3,310</u>
K. Total Project Costs		<u>\$50,589</u>

UURI

EARTH SCIENCE LABORATORY
 420 CHIPETA WAY, SUITE 120
 SALT LAKE CITY, UTAH 84108
 TELEPHONE 801-581-5283

June 29, 1979

Mr. Wayne Knowles
 DOE/Idaho Falls
 550 Second Street
 Idaho Falls, Idaho 83401

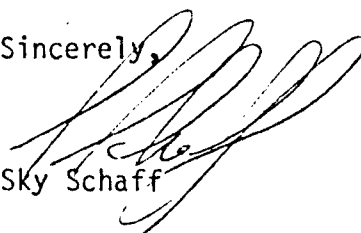
Dear Wayne:

The following is a breakdown into installation and operation cost categories of our June 1979 proposal for Seismic Studies at Raft River:

<u>BUDGET ITEM:</u>	<u>INSTALLATION</u>	<u>OPERATION</u>
C. Total salaries, wages and benefits	\$14,236	\$6,100
D. Permanent equipment	\$4,245	
E. Expendable supplies and equipment	\$2,225	\$3,283
F. Travel	\$2,466	\$1,222
G. Report and publication costs		\$700
H. Computer costs		\$600
I. Indirect costs	\$8,060	\$4,142
J. Management allowance	<u>\$2,184</u>	<u>\$1,126</u>
K. Total project costs	\$33,416	\$17,173

I hope this is sufficient for your needs; if not, please do not hesitate to call on me for clarification.

Sincerely,



Sky Schaff

SS/cw
 cc: M. Dolenc

Fig. Number

1/3/79

	Install	Oper	
c	14,236	6100	20336
d	4275	—	4275
e	2225	3283	222 5508
f	2466	1222	3688
g		700	700
k		600	600
i	8060	4142	12202
j)	2184	1126	3310
l	33416	17,173	50589

17173
 → 50,589

Surca
6-0639