GL00941

SOUTHWEST TECHNOLOGY DEVELOPMENT INSTITUTE

Office of the Director
Box 30001/Dept. 3SOL/Las Cruces, New Mexico 88003-0001
Telephone: (505) 646-2639
Telefax: (505) 646-2960

December 19, 1990

Rec 12/27/90 HPR

Mr. Howard P. Ross
University of Utah Research Institute
319 Chipeta Way, Suite C
Salt Lake City, UT 84108

Re: DOE Grant DE-FG07-88ID12794

Dear Mr. Ross:

Enclosed is a copy of the final technical report for the above referenced project. The report is entitled "Time - Integrated Radon Soil - Gas Surveys in Geothermal Exploration in the Southern Rio Grande Rift, New Mexico". The work performed under this grant resulted in two major accomplishments:

1. The viability of radon soil gas surveys as an exploration tool was shown, and;
2. Three previously unknown resource areas were identified and delineated, one a shallow intermediate temperature geothermal system.

It is anticipated, results from this work will lead to further exploration and resource development.

Please feel free to submit comments and suggestions you may have in regard to this work.

Sincerely,

R. Schoenmackers

Dr. Rudi Schoenmackers,
Director

Enclosure

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108—1295
TELEPHONE 801-524-3422

December 17, 1990

Mr. James Witcher
Dr. Rudi Schoenmackers
Southwest Technology Development Institute
New Mexico State University
Box 30001/Dept. 3 SOL
Las Cruces, New Mexico 88003-0001

Dear Jim and Rudi:

Thank you for the opportunity to review your draft final report "Time Integrated Radon Soil-Gas Surveys in Geothermal Exploration in the Southern Rio Grande Rift, New Mexico". This is a very well written, carefully documented and referenced report of a very successful geothermal research project. The text, illustrations, and tables are excellent.

I am returning one copy of the text with review comments and notations in the text. Essentially all of my comments note minor problems such as typos, spellings, punctuation, and a few suggested word changes. A few additional items to note as you complete these revisions and finalize the report follow.

Please include the standard DOE Disclaimer statement regarding use of product names, usefulness of the report information, etc.
It would also be appropriate to acknowledge DOE funding support in the Acknowledgments.
Would it be appropriate to introduce the New Mexico Township and Range Location System as Figure 1-1 and introduce it on page 3 of the text? It would be acceptable to either leave the page unnumbered or call it page 3a to avoid changes in pagination. Perhaps you could expand the Discussion on page 79, adding another paragraph to summarize noise levels in the data or some of the many comparisons with other data made in this section of the report.

I have just reviewed the DOE distribution requirements with Ken Taylor of DOE\ID. The required distribution is:

Elizabeth Bowhan, DOE\ID	1 copy
Kenneth Taylor, DOE\ID	3 copies,+ 1 camera ready copy
Marshall Reed, DOE\GTD	1 copy
Howard Ross, UURI	1 copy

Final reports should be submitted to DOE before the grant expiration date, December 31, 1990. If you are unable to do this because of your Christmas-to-New Year shutdown, NMERDI should write Ms. Elizabeth Bowhan, Contracts Manager, DOE\ID stating that they are awarding

themselves another one month no cost time extension to complete report revisions and printing.

Jim and Rudi, you have done an excellent job with this research grant - I really enjoyed reading the final report. I hope we can continue to cooperate on geothermal energy projects.

Best Regards,

Howard

Howard P. Ross
Project Manager, SCP

encl.

cc: P. M. Ferraraccio, NMRDI
P. Rodriguez, NMRDI
K. Taylor, DOE\ID

New Mexico Research and Development Institute

ACTING DIRECTOR
Ponziano M. Ferraraccio

September 19, 1990

Ms. Elizabeth Bowhan, Contracts Director
U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83402

Re: No-Cost Extension, Department of Energy Grant No. DE-FG07-88ID12794

The Department of Energy Federal Regulations have changed to allow the recipients of research awards to extend the expiration date of the project periods. Therefore, the New Mexico Research and Development Institute has awarded itself a three month time extension, to December 31, 1990 as provided for in 10 CFR Part 600, Section 600.31(d) as amended by FR doc. 89-24243, filed 10/12/89. No additional Federal funds are requested for this extension.

The reason for this extension is that the work on the grant is in the draft report stage and more time is required for the preparation of illustrations to be included in the draft.

If you have any questions please do not hesitate to contact me.

Sincerely yours,

PONZIANO M. FERRARACCIO
Acting Director

PMF:rjm

xc: Howard Ross
Kenneth Osborne
File DE-FG07-88ID12794

SOUTHWEST TECHNOLOGY DEVELOPMENT INSTITUTE

Office of the Director
Box 30001/Dept. 3SOL/Las Cruces, New Mexico 88003-0001
Telephone: (505) 646-2639
Telefax: (505) 646-2960

November 17, 1989

Mr. Howard Ross
University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite C
Salt Lake City, UT 84108-1295

Dear Howard:

I would like to confirm our meeting with you at URRI on December 7 and 8, 1989. Jim Witcher, Larry Icerman, and I will be traveling to Salt Lake City on the 7th and plan to visit with you in the afternoon. On the 8th we would like to get together with your people and DOE representatives to talk about our Radon work.

I am looking forward to visiting with you.

Sincerely,

R. Schoenmackers

Rudi Schoenmackers
Director

RS/jm

xc: Larry Icerman

DOE F 4600.1
(7-81)

U.S. DEPARTMENT OF ENERGY

NOTICE OF FINANCIAL ASSISTANCE AWARD

(See Instructions on Reverse)

Under the authority of Public Law PL 93-410 and subject to legislation, regulations and policies applicable to *(cite legislative program title)*:
Geothermal Energy Research, Development, and Demonstration Act of 1974

1. PROJECT TITLE
Time-Integrated Radon Soil-Gas Surveys in the Southern Rio Grande Rift

2. INSTRUMENT TYPE
☒ GRANT ☐ COOPERATIVE AGREEMENT

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*
New Mexico Research and Development Institute
1220 South St. Francis Drive, Suite 358
Santa Fe, NM 87501

4. INSTRUMENT NO.
DE-FG07-88ID12794

5. AMENDMENT NO.
A000

6. BUDGET PERIOD
FROM: 9/1/88 THRU 3/1/90

7. PROJECT PERIOD
FROM: 9/1/88 THRU: 3/1/90

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*
Larry Icerman (505)827-5886

10. TYPE OF AWARD
☒ NEW ☐ CONTINUATION ☐ RENEWAL
☐ REVISION ☐ SUPPLEMENT

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*
Ed Quintana (505)827-5886

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*
Trudy A. Thorne (208) 526-9519
U.S. Department of Energy
Idaho Operations Office
785 DOE Place
Idaho Falls, ID 83402

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*
Kenneth J. Taylor (208) 526-9063
U.S. DOE, Idaho Operations Office
785 DOE Place, Idaho Falls, ID 83402

13. RECIPIENT TYPE
☒ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☐ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/AFP/OC	d. CFA Number
89x0224.91	AM 1510000	YA 410	

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION

(1) DOE Funds Obligated This Action	$ 126,267
(2) DOE Funds Authorized for Carry Over	$ -0-
(3) DOE Funds Previously Obligated in this Budget Period	$ -0-
(4) DOE Share of Total Approved Budget	$ 126,267
(5) Recipient Share of Total Approved Budget	$ 28,040
(6) Total Approved Budget	$ 154,307

b. CUMULATIVE DOE OBLIGATIONS

(1) This Budget Period *[Total of lines a.(1) and a.(3)]*	$ 126,267
(2) Prior Budget Periods	$ -0-
(3) Project Period to Date *[Total of lines b. (1) and b. (2)]*	$ 126,267

17. TOTAL ESTIMATED COST OF PROJECT $ 154,307
(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* _____ *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☐ B (Grants) or ☐ C (Cooperative Agreements).

d. Application/proposal dated June 17, 1987, ☐ as submitted ☒ with changes as negotiated Revised Proposal 10/16/87

19. REMARKS This Grant consists of this NFAA (DOE F 4600.1), Part I - Budget Plan, Part II - Special Conditions, Part III - General Conditions, Part IV - Statement of Work, and Part V - Reporting Requirements. DOE Financial Assistance Rules (10 CFR Part 600), OMB Circular A-102, OMB A-87, and OMB Circular A-128 "Audits of State and Local Governments" are hereby incorporated by reference.

20. EVIDENCE OF RECIPIENT ACCEPTANCE

Larry Icerman 9/2/88
(Signature of Authorized Recipient Official) *(Date)*

Larry Icerman
(Name)

Director
(Title)

21. AWARDED BY

J. P. Anderson 8/29/88
(Signature) *(Date)*

J. P. Anderson, Contracting Officer
(Name)

Chief, R&D Contracts Branch
(Title)

FEDERAL ASSISTANCE BUDGET INFORMATION FORM

FORM EIA-459C
(10/80)

FORM APPROVED
OMB No. 1900-0127

1. Program/Project Identification No.	2. Program/Project Title
DE-FG07-88ID12794	Time Integrated Radon Soil-Gas Surveys in S. Rio Grande Rift
3 Name and Address New Mexico Research and Development Inst. 1220 South St., Francis Drive, Suite 358 Santa Fe, NM 87501	4. Program/Project Start Date: September 1, 1988 5. Completion Date: March 1, 1990

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No. (b)	Estimated Unobligated Funds: Federal (c)	Estimated Unobligated Funds: Non-Federal (d)	New or Revised Budget: Federal (e)	New or Revised Budget: Non-Federal (f)	New or Revised Budget: Total (g)
1. 12693	81.087	$	$	$ 126,267	$ 28,040	$ 154,307
2.						
3.						
4.						
5. TOTALS		$	$	$ 126,267	$ 28,040	$ 154,307

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity (1) DOE	(2)	(3) N. Mexico	(4)	Total (5)
a. Personnel	$ -0-	$	$ 8,018	$	$ 8,018
b. Fringe Benefits (19%)	-0-		1,522		1,522
c. Travel	-0-		500		500
d. Equipment	-0-		-0-		-0-
e. Supplies	-0-		400		400
f. Contractual	126,267		15,600		141,867
g. Construction	-0-		-0-		-0-
h. Other	-0-		2,000		2,000
i. Total Direct Charges	126,267		28,040		154,307
j. Indirect Charges	-0-		-0-		-0-
k. TOTALS	$ 126,267	$	$ 28,040	$	$ 154,307
7. Program Income	$	$	$	$	$

Special Terms and Conditions for Research Grants

The requirements of this attachment take precedence over all other requirements of this grant found in regulations, the general terms and conditions, DOE orders, etc. except requirements of statutory law. Any apparent contradiction of statutory law stated herein should be presumed to be in error until the Grantee has sought and received clarification from the Contracting Officer, whose signature appears on the face page of this award.

1. Payments and Cost-Share

   a. The Grantee may request advance payment of cost to be incurred. Such requests should not exceed the expected outlays by the Grantee in the succeeding 30-day period.

   b. Cost-Share Arrangement - The cost-share will be in accordance with Part I - Budget Plan. Invoices must include in-kind contributions and DOE's reimbursed costs. To be an invoiced cost, a cash or in-kind contribution must be allowable under the terms and conditions of the award and meet the applicable cost principle tests of allowability in 10 CFR 600.103.

      New Mexico Research and Development Institute will pay for all salaries, fringe benefits, travel, supplies, report editing/publications, and the first $15,600 of the subcontract effort. The remaining subcontract costs will be paid by the Department of Energy. Indirect costs associated with New Mexico Research and Development Institute's cost-share will not be billed to DOE nor be considered an allowable cost for this grant.

   c. Payments to the Grantee shall equal the Federal share of actual allowable costs of performance of this grant, provided however, and notwithstanding any other provision of this grant, that the Government's monetary liability under this grant shall not exceed the Government share of the total approved budget or an amount equal to the Federal share of actual allowable costs, whichever is less. The Grantee shall be obligated to perform under this grant throughout the agreed-upon period of performance, and to bear all costs which DOE has not agreed to pay. However, the Grantee shall have the right to cease to perform when or after the Federal share of actual allowable costs equals or exceeds the Government share of the total approved budget and if prior written notice to that effect has been provided to DOE.

   d. The Government obligations may be increased unilaterally by DOE by written notice to the Grantee and may be increased or decreased by written agreement of the parties.

   e. Upon termination or expiration of the total period of performance, the Grantee shall promptly refund to DOE (or make such disposition as DOE may in writing direct) any sums paid by DOE to the Grantee under this grant in excess of the cumulative Government allowable cost incurred in performance under the grant.

f. Method of Payment - Payments due for amounts properly invoiced in accordance with the terms and conditions specified elsewhere in the grant shall be made either by Treasury check(s) payable to the Grantee or designee or by electronic funds transfer(s) to a financial institution designated by the Grantee for that purpose. The method of payment shall be determined by the Government at the time of payment in accordance with applicable Treasury Department requirements.

After award but no later than fourteen (14) days before an invoice or bill is submitted for payment, the Grantee shall designate a financial institution for the receipt of electronic funds transfer payments hereunder; and provide the appropriate Government representative (contracting officer or finance official as determined by the Government) with the name of the designated financial institution, financial institution's or correspondent financial institution's 9-digit American Bankers Association identifying number, telegraphic abbreviation of such financial institution, and account number at the designated financial institution to be credited with funds.

In the event the Grantee during the performance of this grant elects to designate a different financial institution for the receipt of any payment made using electronic funds transfer procedures, notification of such change and the information as specified in paragraph (b) above must be received by the appropriate Government representative thirty (30) days prior to the date such change is to become effective.

The document furnishing the information required above must be dated and contain the signature, title, and telephone number of the Grantee official authorized to provide it, as well as the Grantee's name and grant number.

Grantee failure to properly designate a financial institution or to provide appropriate payee bank account information may delay payments of amounts otherwise properly due.

g. Applicable Credits. The Grantee agrees that any refunds, rebates, credits, or other amounts (including any interest thereon) accruing to or received by the Grantee or any assignee under this grant shall be paid by the Grantee to the Government, to the extent that they are properly allocable to costs for which the Grantee has been reimbursed by the Government under this grant. Reasonable expenses incurred by the Grantee for the purpose of securing such refund, rebates, credits, or other amounts shall be allowable costs hereunder when approved by the Contracting Officer.

h. Audit Adjustments. The Contracting Officer may have invoices or vouchers and statements of cost submitted under this grant audited at any time prior to the end of the required retention period for the grant records. Each payment made shall be subject to reduction for amounts included in the related invoice or voucher which are

found by the Contracting Officer, on the basis of audit, not to constitute allowable cost. If a final audit of costs has not been performed prior to closeout of the grant, DOE or its successor agency, shall have the right to recover an appropriate amount after fully considering the recommendations on disallowed costs resulting from the final audit when conducted.

i. Cognizant Office. Invoices should be sent to the individual designated in Block 12. of the Notice of Financial Assistance Award Form (NFAA). In addition to the initial supply of forms made available with this award, appropriate payment forms and instructions will be provided by this office upon request.

2. Reporting Program Technical Performance

a. Copies. Copies of reports and all other related data and information generated under this grant shall be submitted in accordance with the attached Federal Assistance Reporting Checklist (DOE Form EIA-459A).

b. Publication of Results. The Grantee may publish the results of its work. However, publications and reports prepared under this grant shall contain the following acknowledgment statement, "This (material) was prepared with the support of the U.S. Department of Energy (DOE) Grant No. DE-FG07-88ID12794. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of DOE."

c. Reporting Requirements. The Federal assistance recipient shall prepare and submit (postage prepaid) the plans and reports indicated on the Federal Assistance Reporting Distribution List. Preparation of the specified plans and reports shall be in accordance with DOE Order 1332.2. The level of detail the recipient provides in the plans and reports shall be commensurate with the scope and complexity of the task and shall be as delineated in Block 4 - Reporting Requirements and Block 5 - Special Instructions.

All reports delivered to DOE shall be the sole property of the DOE. The Grantee shall not claim that any report contains any trade secrets or commercial or financial information deemed by the Grantee to be privileged or confidential, or that the Grantee has any proprietary interest in any report.

3. Designated Key Personnel

The following individual is designated key personnel in accordance with General Condition No. 14:

Larry Icerman

4. Project Completion Date

The project completion date identified in Block 7. of the Notice of Financial Assistance Award includes an additional 90 days for completion of the final report. All R&D effort must be completed 90 days prior to the project completion date. Only costs associated with preparation of the final report will be allowed during the 90 days prior to the project completion date.

5. Technical Data

Except for technical data contained in pages N/A of the recipient's application, dated N/A, which are asserted by the Grantee as being proprietary data, it is agreed that as a condition of this award, and notwithstanding the provisions of any notice appearing on the application, the Government shall have the right to use, duplicate, disclose and have others do so for any purpose whatsoever the technical data not identified in the above blanks contained in the application upon which this award is based.

6. Prior Approval

The following actions or costs specified in the application require prior approval of DOE and are specifically disapproved in accordance with General Condition No. 3:

None

7. General Procurement Prior Approval

Article 17 of the General Terms and Conditions for Research Grants is hereby revoked. Approval to enter into a sole source contract with New Mexico State University is hereby given.

8. Patent Clauses

The following patent clauses and technical data requirements are applicable to this grant award:

600.118(b)(2) "Patent Rights (Short Form)"

600.118(b)(3) "Rights in Technical Data (Short Form)"

600.118(b)(5) "Authorization and Consent"

600.118(b)(6) "Notice and Assistance"

600.118(c) "Reporting of Royalties"

9. Title to Equipment

a. Title to the following items of equipment shall vest with the Grantee upon completion of this grant:

None

b. Title to the following items of equipment shall vest with the Government at the end of the grant project period:

None

10. Audit Requirements

In addition to the terms and conditions identified in blocks 18.b. and 18.c. of the Notice of Financial Assistance Award and those attached to this award, if any, the recipient shall comply with the audit requirements contained in the DOE Financial Assistance Rules, 10 CFR 600, Subpart D, Audits of State and Local Governments.

General Terms and Conditions for Research Grants

Table of Contents

General Terms and Conditions for Research Grants

1. Explanation

These general terms and conditions do not restate all the provisions of applicable statutes and regulations nor do they represent an exhaustive listing of all requirements applicable to this grant. Rather they highlight and are consistent with those requirements which are especially pertinent to research grants in general. They are being emphasized by inclusion here either because they are invoked with high frequency, their violation is a matter of especially serious concern (e.g., use of human subjects), and/or they have been restated in the research context to be more easily understood by the research community.

In addition to these general terms and conditions, the grantee must comply with all governing requirements, including those identified in Block 18 of the Notice of Financial Assistance Award and those included in the Special Terms and Conditions attached to this grant award.

2. Grantee Adherence to Grant Terms and Conditions

The grantee's signature on the application and on the Notice of Financial Assistance Award signifies the grantee's agreement to the terms and conditions of award. Should the grantee believe modification of any of the terms and conditions of this award is necessary, an authorized official of the grantee organization or, in the case of an individual, the grantee, must submit a written request on its own behalf or on behalf of any subgrant recipient or applicant to the Contracting Officer named on the face page of this award.

Following this procedure is very important because many of the terms and conditions of this grant are required by statute and must be enforced by the Department of Energy.

3. Definitions

Principal Investigator

As used herein, the scientist or other programmatic expert named in Block 8 of the Notice of Financial Assistance Award designated by the grantee organization to direct the scientific/technical efforts being supported (also called program director or project director/leader).

Prior Approval

A statement in writing, signed by the DOE Contracting Officer, that a cost may be incurred or an action may be taken. The approval may take the form of a letter or of a revision to the grant. If actions or costs requiring prior approval are specified in the application and are not expressly disapproved by DOE in the attached Special Terms and Conditions, the award of the grant constitutes such prior approval.

4. Authorized Grantee Signatures for Prior Approval Requests

All requests for prior approval must be signed by an individual who is authorized to act for the grantee organization. The signature of the Principal Investigator (unless also a corporate officer or otherwise authorized) is insufficient to obtain action on a prior approval request, although countersignature by the Principal Investigator is not discouraged. Requests for budget revisions shall be made on the same budget format as used in applying for this grant and must be supported by a narrative justification. Other prior approval requests may be made by letter. Prior approval requests should be addressed to the Contracting Officer named on the face page of this award.

5. Allowable Costs/Applicable Cost Principles

In accordance with the applicable cost principles cited below and up to the amount shown on the face page of this award for the total approved budget for the current budget period (line 16.a.(6)), the allowable costs of this grant shall consist of the actual allowable direct costs incident to performance of this project plus the allocable portion of the allowable indirect costs, if any, of the organization less applicable credits.

The allowability of costs for work performed under this grant and any subsequent subaward will be determined in accordance with the Federal cost principles applicable to the grantee or subrecipient in effect on the date of award or, for any subaward, in effect as of the date of that subaward, except as modified by other provisions of this grant or the subaward.

The Federal cost principles applicable to specific types of grantees and subrecipients are:

1. Institutions of Higher Education. OMB Circular A-21, Cost Principles Applicable to Grants, Contracts and Other Agreements with Institutions of Higher Education, is applicable to both public and private colleges and universities.

2. State and local governments and Indian tribal governments. OMB Circular A-87, Cost Principles Applicable to Grants, Contracts and other Agreements With State and Local Governments, is applicable to state, local, and Indian tribal governments (and shall also be used to the extent appropriate for foreign governments).

3. Hospitals. 45 CFR Part 74, Appendix E, Principles for Determining Costs Applicable to Research and Development under Grants and Contracts with Hospitals, applies to nonprofit and for-profit hospitals.

4. Other nonprofit organizations and individuals. OMB Circular A-122, Cost Principles Applicable to Grants, Contracts, and other Agreements with Nonprofit Organizations, applies to nonprofit organizations and individuals except for nonprofits specifically exempted by the terms of the circular or those nonprofits covered by the cost principles cited in items 1.- 3. above.

5. Commercial firms and certain nonprofit organizations. 48 CFR Subpart 31.2, Contracts with Commercial Organizations, as supplemented by 48 CFR Subpart 931.2, applies to those nonprofit organizations not covered by OMB Circular A-122, as specified by the terms of that circular, and to all commercial organizations other than those covered by the cost principles in item 3. above.

6. Payment

Payments under this award will be made by an advance payment method unless DOE determines that the grantee's financial management system does not meet the requirements of 10 CFR 600.109 or the grantee has not maintained, or demonstrated the willingness and ability to maintain, procedures that will minimize the time elapsing between transfer of funds from the U.S. Treasury and their disbursement for grant-related purposes.

The appropriate advance payment method or the reimbursement method and the cognizant finance office are specified in the attached Special Terms and Conditions.

Advances by the grantee to subgrantee and contractor organizations must conform substantially to the same standards of timing and amount that govern advances made by the Federal Government to the grantee. Excess cash advances erroneously withdrawn from the U.S. Treasury shall be promptly refunded to DOE unless the funds will be disbursed within seven calendar days or the amount is less than $10,000 and will be disbursed within 30 calendar days.

Interest earned on advance payments to other than state governments or their subgrantees shall be reported on the Report of Federal Cash Transactions (SF-272) and promptly remitted to the cognizant finance office (unless otherwise specified in the attached Special Terms and Conditions) by check payable to the Department of Energy.

7. Preaward Costs

Costs incurred prior to the beginning date of a new or renewal award are allowable only if they were approved in writing, prior to incurrence, by a DOE Contracting Officer. (Note - this provision does not apply to such bid and proposal costs as may be recovered through an indirect cost rate negotiated in accordance with the applicable Federal cost principles.)

8. Reporting Requirements

Attached to this grant award is EIA 459A, a checklist of the reports required under this grant.

The grantee shall submit a technical progress report (also called a performance report) as part of any application for continuation or renewal of DOE grant support. This report shall be in lieu of a separate annual performance report. Upon completion or termination of the project, the final technical report shall be prepared in accordance with the applicable program rule cited on the face page of this award or, in the absence of such program rule coverage, with the technical reporting format specified in the Uniform Reporting System for Federal Assistance (Grants and Cooperative Agreements) (DOE/MA-001).

The grantee shall submit an annual Financial Status Report (SF-269) within 90 days after the close of the budget period shown on the face page of this award. The grantee shall submit a final Financial Status Report within 90 days after the completion or termination of the project period shown on the face page of this award unless the project period is extended. In the latter case, the report for the last budget period of the existing project period shall be considered an annual report.

Instructions concerning reports to be submitted in conjunction with payment under this award are specified in the attached Special Terms and Conditions.

9. Cost-Sharing

Any cost-sharing as shown on the face page of this award shall defray allowable costs of the project only. Allowability of such costs shall be determined in accordance with the statutes, regulations, applicable cost principles, and other terms and conditions governing this award.

Cost-sharing contributions may be in the form of direct or indirect costs, including cash or in-kind contributions, incurred by the grantee, its subgrantees, or contractors. The cost sharing may be in any allowable budget category or combination of categories. When a direct cost item represents some or all of the non-Federal contribution, any associated indirect costs may not be charged to Federal funds but may be counted as part of the cost-sharing. The treatment of a contributed cost as direct or indirect must be consistent with the classification of similar items charged to DOE funds.

Valuation of in-kind contributions and documentation of cost-sharing shall be in accordance with 10 CFR 600.107.

10. Continuations, Renewals, and Extensions

Grantees are responsible for assuring that properly completed applications for continuation awards are received no later than 4 months prior to the expiration date of the current budget period shown on the Notice of Financial Assistance Award.

If a grantee wishes to apply for a renewal award in order to receive funding beyond the scheduled expiration of the existing project period, a properly completed application must be submitted to DOE no later than four months prior to the scheduled expiration date of the project period as shown on the Notice of Financial Assistance Award.

Grantee requests for extensions (modifications extending an existing project period by 18 months or less in order to complete a project) must be submitted prior to the expiration date of the project period as shown on the face page of this award, and must include a budget for the use of any remaining funds or any additional funds requested. Any request for an extension, which includes a request for additional funds and any request for an extension of more than 90 days, should be submitted to DOE no later than four months prior to the scheduled expiration date of the project period.

11. Maximum DOE Obligation

This grant is subject to the requirement that the maximum DOE obligation to the recipient is the amount shown on the Notice of Financial Assistance Award as the amount of DOE funds obligated. DOE shall not be obligated to make any additional, supplemental, continuation, renewal or other award for the same or any other purpose.

12. Transfers of Funds Between Grants

Transfers of funds between DOE grants, and transfers of funds from a DOE grant to a project (or portion of a project) not supported by that grant require the prior approval of DOE. Transfer of funds into a DOE grant-supported project from a grant awarded by another Federal agency does not require DOE prior approval but may, of course, require the approval of the other Federal agency. Funds so transferred from the grant of another Federal agency may not be used to satisfy any cost-sharing requirement on a DOE grant.

13. Property

Real and Tangible Personal Property

No real property may be acquired under this award.

Title to any equipment (an article of tangible personal property that has a useful life of more than 2 years and an acquisition cost of $500 or more) or supplies acquired by a nonprofit institution of higher education or a nonprofit organization whose primary purpose is the conduct of scientific research shall vest in the grantee and such equipment shall be exempt from accountability except that DOE has the right to transfer ownership of any item of equipment having a unit acquisition cost of $1,000 or more under the conditions specified in 10 CFR 600.117(d)(2). This exemption is derived from Public Law 95-224. The Federal Grant and Cooperative Agreement Act of 1977, as amended.

Title to equipment and supplies acquired by all other grantees shall vest in the grantee. However, such grantees shall be accountable for equipment with a unit acquisition cost of $1,000 or more acquired under this grant as specified in 10 CFR 600.117(d)(2), (3) and (4). For such grantees, supplies need only be accounted for at closeout and then only if they are unused and exceed $1,000 in total aggregate current fair market value. In this case accountability requires that DOE be compensated in an amount computed in accordance with Section 600.117(e) if the supplies are retained for use on non-Federal activities.

All grantees shall follow property management policies and procedures which provide for adequate control of the acquisition and use of assets acquired under the grant.

Intangible Property

Treatment, including reporting, of patent and data rights and copyrights shall be as specified in the Special Terms and Conditions of this grant.

14. Change or Absence of the Principal Investigator or Designated Key Personnel

Since the DOE decision to fund a project is based, to a significant extent, on the qualifications and level of participation of the Principal Investigator, a change of Principal Investigator or of the level of effort of the Principal Investigator is considered a change in the approved project. The approval of DOE must be obtained prior to any change of the Principal Investigator or, in certain cases, other key personnel who have been identified as key personnel in the Special Terms and Conditions of this grant. In addition, any continuous absence of the Principal Investigator in excess of three months or plans for the Principal Investigator to become substantially less involved in the project than was indicated in the approved grant application requires DOE prior approval. Grantee is encouraged to contact DOE immediately upon becoming aware that any of these changes are likely to be proposed, but in any event must do so and receive DOE prior approval before effecting any such change.

15. Changes in Objectives or Scope

Any change in the objectives or scope of a grant-supported project requires the prior approval of DOE. Such changes include changes in the phenomenon or phenomena under study and in the methodology or experiment if they are a specific objective of the research work as stated in the application approved by DOE.

16. Transfer of Substantive Programmatic Effort

None of the substantive effort of this project may be transferred by contract or subgrant to another organization or person without the prior approval of DOE. This provision does not apply to the procurement of

equipment, supplies, materials, or general support services which may, however, be subject to other prior approval requirements as found, for example, in the applicable cost principles or procurement standards.

17. General Procurement Prior Approval Requirements

A grantee must receive prior approval from DOE before entering into any sole source contract or a contract where only one bid or proposal is received when the value of the contract in the aggregate is expected to exceed 1) $10,000 and the grantee is a state, local, or Indian tribal government or 2) $5,000 for all other grantees.

18. Equipment and Other Capital Expenditures

Expenditures for equipment and other capital assets having a unit acquisition cost of $500 or more require the prior approval of DOE with one exception. For special purpose equipment, prior approval is required only when the unit acquisition cost is $1,000 or more. (Special purpose equipment means equipment which is used only for research, medical, scientific, or other technical activities.)

19. Travel

Foreign Travel - DOE prior approval is required for each separate foreign trip. Foreign travel must be directly related to the project objectives. Foreign travel is any travel outside Canada and the United States and its territories and possessions or, for grantees located in another country, travel outside that country.

Domestic Travel - Such costs are allowable to the extent provided in the approved budget. In addition, grantees may exceed the approved budget amount for domestic travel by up to 25% or $500 whichever is greater, without DOE prior approval. All other expenditures for domestic travel beyond these limits require prior approval.

20. Consultant Services

Costs of consultant services are allowable subject to satisfaction of the requirements of the applicable cost principles, including the requirement that the consultant not be an employee of the grantee organization. There is one exception to the requirement that the consultant not be an employee of the grantee organization which applies to colleges and universities only. For colleges and universities, in unusual cases, and only with the prior approval of DOE, intra-organizational consultation may be permitted where consultation is across departmental lines or involves a separate or remote operation.

21. Paperwork Reduction

This award is subject to the requirements of the Paperwork Reduction Act of 1980 as implemented by the Office of Management and Budget rules,

"Controlling Paperwork Burdens on the Public," published at 5 CFR 1320 (48 FR 13666, 3/31/83) if the grantee will collect information from ten or more respondents either:

A. At the specific request of DOE, or

B. If the award requires specific DOE approval of the information collection or the collection procedures.

Any proposed sponsored information collection under item 21 B. above shall be submitted by the grantee to the Contracting Officer named on the face page of this award at least 90 days prior to the intended date of information collection. DOE will seek the requisite approval from the Office of Management and Budget and will promptly notify the grantee of the disposition of the request.

22. Generally Applicable Requirements

In accordance with 10 CFR 600.12, this grant is subject to a number of statutory and other generally applicable requirements. Those requirements most pertinent to research projects are highlighted below:

Animal Welfare

Any grantee performing research on warm-blooded animals shall comply with the Laboratory Animal Welfare Act of 1966 (Public Law 89-544, as amended) and the regulations promulgated thereunder by the Secretary of Agriculture at 9 CFR Chapter 1, Subchapter A, pertaining to the care, handling, and treatment of warm-blooded animals held or used for research, teaching, or other activities supported by Federal awards. The grantee is expected to ensure that the guidelines described in Department of Health and Human Services (DHHS) Publication No. [NIH] 78-23, "Guide for the Care and Use of Laboratory Animals," are followed (Copies are available from the Superintendent of Documents, Government Printing Office, Washington, DC 20024, Stock No. 017-040-00427-3).

Research Involving Recombinant DNA Modecules

Any grantee performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules agrees by acceptance of this grant to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," June 1983 (48 FR 24556) or such later revision of those guidelines as may be published in the Federal Register.

Use of Human Subjects in Research, Development, and Related Activities

Any DOE grantee performing research, development, or related activities involving any use of human subjects must comply with DOE regulations

found at 10 CFR Part 74S "Protection of Human Subjects" and any additional Provisions which may be included in the Special Terms and Conditions of this grant. Such provisions are intended to safeguard the rights and welfare of human subjects at risk of possible physical, psychological, or social injury as a consequence of their participation.

23. Nondiscrimination

This grant is subject to the provisions of 10 CFR Part 1040 "Nondiscrimination in Federally Assisted Programs."

24. Public Access to Information

The Freedom of Information Act, as amended, and the DOE implementing regulations (10 CFR Part 1004) require the release by DOE of certain documents and records regarding grants upon written request by any member of the public. The intended use of the information will not be a criterion for release. These requirements apply to information held by DOE, and do not require grantees, their subgrantees, or their contractors to permit public access to their records.

Records maintained by DOE with respect to grants are subject to the provisions of the Privacy Act and the DOE implementing regulations (10 CFR Part 1008) if those records constitute a "system of records" as defined in the Act and the regulations. Generally, records maintained by *grantees, their subgrantees, or their contractors are not subject to* these requirements.

25. Acknowledgement of Support

Publication of the results of this grant, subject to any applicable restrictions in 10 CFR 600.118 ("Patents, data, and copyrights"), is encouraged. Any article which is published shall include an acknowledgement that the research was supported, in whole or in part, by a DOE grant (including the grant number), but that such support does not constitute an endorsement by DOE of the views expressed in the article.

26. National Security

It is not expected that activities under this grant will generate or otherwise involve classified information (i.e., Restricted Data, Formerly Restricted Data, National Security Information).

However, if in the opinion of the grantee or DOE such involvement becomes expected prior to the closeout of the grant, the grantee or DOE shall notify the other in writing immediately. If the grantee believes any information developed or acquired may be classifiable, the grantee shall not provide the potentially classifiable information to anyone, including the DOE officials with whom the grantee normally communicates, except the Director of Classification, and shall protect such information

as if it were classified until notified by DOE that a determination has been made that it does not require such handling. Correspondence which includes the specific information in question shall be sent by registered mail to U.S. Department of Energy, Attn: Director of Classification, DP-32, Washington, DC 20545. If the information is determined to be classified the grantee may wish to discontinue the project, in which case the grantee and DOE shall terminate the grant by mutual agreement. If the grant is to be terminated, all material deemed by DOE to be classified shall be forwarded to DOE, in a manner specified by DOE, for proper disposition. If the grantee and DOE wish to continue the grant, even though classified information is involved, the grantee shall be required to obtain both personnel and facility security clearances through the Office of Safeguards and Security. Costs associated with handling and protecting any such classified information shall be negotiated at the time the determination to proceed is made.

27. Liabilities and Losses

DOE assumes no liability with respect to any damages or loss arising out of any activities undertaken with the financial support of this grant.

28. Contracting Officer's Technical Representative (COTR)

The individual identified in Block 11. of the Notice of Financial Assistance Award as the DOE Project Officer is the Contracting Officer's Technical Representative (COTR). The COTR is responsible for 1) monitoring the research efforts being conducted by the Grantee under the scope of this award; 2) advising the Contracting Officer on technical matters related to administration of the grant, including progress and status of the Grantee's research; and 3) providing technical advice and guidance to the Grantee in order to assist both the research efforts of the Grantee and the Grantee's adherence to the grant terms and conditions.

The COTR does not have the authority to:

Cause an increase or decrease in the total estimated cost of, or the time required for, the research effort being supported;

Cause any change in the express terms and conditions of the grant;

Cause any change in the objectives or scope of the effort being supported;

Act in the capacity of the Contracting Officer by issuing any approval or disapproval required by the terms and conditions of the grant;

Interfere with the Grantee's right to perform under the terms and conditions of the grant.

29. Interest

(a) Notwithstanding any other term or conditions of this grant, all amounts that become payable by the recipient to the Government under this grant shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of Treasury (Secretary) as provided in Section 11 of the Debt Collection Act of 1982 (31 U.S.C. 3717), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this provision, and then at the rate applicable for each three-month period as fixed by the Secretary until the amount is paid.

(b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this grant.

(2) The date of the first written demand for payment consistent with this grant, including any demand resulting from a termination.

(3) The date the Government transmits to the recipient a proposed agreement to confirm completed negotiations establishing the amount of debt.

(c) The interest charge made under this provision may be reduced in accordance with the procedures prescribed in 4 CFR 102.13 or in accordance with agency regulations in effect on the date of original award of this grant.

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support cost-shared research in resource assessment in the Rio Grande rift geothermal province. Several geothermal systems have been identified within the Rio Grande rift, and the U. S. Geological Survey has calculated an accessible thermal energy resource base of 5.4 x 10^18 Joules for the province in Circular 892. Radon gas soil surveys have been used in the exploration for and delineation of high-temperature systems in the Basin and Range province, and high radon-222 discharges have been documented at Radium Springs and Faywood Hot Springs in New Mexico. The general applicability of time-integrated radon-222 soil-gas surveys to define low-to-intermediate temperature geothermal resources is not established however. The purpose of this research is threefold: 1) to test the use of time-integrated radon-222 soil-gas surveys for low-to-intermediate temperature geothermal resource delineation; 2) to test a geologic model for shallow geothermal resource occurrence; and 3) to characterize and delineate additional geothermal resources.

Previous DOE cost-shared and state-coupled resource assessment programs have played an important role in geothermal resource discovery, characterization, and utilization in New Mexico. The proposed research will provide a test of the radon-222 soil-gas survey method as a cost-effective exploration technique for geothermal resources in the Rio Grande rift environment and will accomplish a preliminary resource assessment of three areas.

2.0 SCOPE

The technical objectives of this research are to conduct resource assessment in the southern Rio Grande rift geothermal area of New Mexico. The testing of a new and previously untried exploration technique for low-to-intermediate temperature geothermal resources is a part of the resource assessment work. Radon-222 surveys will be conducted using Track-Etch radon detectors and established survey techniques at the Tortugas Mountain, Radium Springs, and Rincon areas. The survey results will be used to test a proposed geologic model for shallow low-to-moderate temperature geothermal resource occurrence in the southern Rio Grande rift, and to characterize and delineate additional resource areas. The survey and research results will be documented, evaluated, and presented in a final report. All project work will be completed and a final report submitted within an 18 month period.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from a proposal titled, "Evaluation of Time-Integrated Radon Soil-Gas Surveys in the Southern Rio Grande Rift", dated June 17, 1987, as amended October 16, 1987. This proposal was submitted by the New Mexico Research and Development Institute in response to a DOE/ID Program Research and Development Announcement (PRDA) for State Geothermal Research and Development - PRDA No. DE-PR07-87ID12662.

4.0 TECHNICAL TASKS

The following tasks will be accomplished under this Grant.

4.1 Complete two soil-depth, radon gas surveys to determine radon concentrations as a function of soil depth and type, and to determine the preferred burial depth for the time-integrated radon detectors. One survey will profile radon soil gas over a young geomorphic surface with little or no caliche development. The other depth profile will detail radon soil gas over an old geomorphic surface with well-developed caliche. A total of 15 soil background concentration measurements and 15 time-integrated field measurements will be made.

4.2 Tortugas Mountain Survey. Complete one reconnaissance radon soil-gas profile eight miles in length and two detailed radon profiles with a total length of nine miles in the Tortugas Mountain area. The reconnaissance profile will include 40 pairs of soil background and time-integrated field measurements. the detailed profiles will include 270 pairs of soil background and time-integrated field measurements. Evaluate and interpret these data using known Hg soil-gas, U-234 and U-238 disequilibrium data, temperature gradient information, and electrical resistivity and seismic reflection data.

4.3 Radium Springs Survey. Complete one radon soil-gas grid survey of seven square miles, three detailed radon profiles with a total line length of two miles, and two temperature-gradient holes in the Radium Springs survey area. The radon grid survey will include 175 pairs of soil background and time-integrated field measurements. The detailed profiles will include 60 pairs of soil background and time-integrated field measurements. Evaluate and interpret these data. The temperature gradient holes will be drilled to a maximum depth of 300 feet (91 m) and completed with PVC pipe in a manner suitable for accurate temperature measurements. Temperatures will be measured at 2-meter intervals with a thermistor temperature measurement tool. A minimum of two logs will be completed for each hole, one shortly after drilling and one at least two weeks later.

4.4 Rincon Survey. Complete one radon soil-gas grid survey, two and one-half square miles in area, one detailed radon profile totaling one mile in length, and two temperature-gradient holes. The grid survey will include 60 pairs of soil background and time-integrated field measurements. The detailed profiles will include 30 pairs of soil background and time-integrated field measurements. The temperature gradient holes will be drilled to a maximum depth of 300 feet (91 m) and completed with PVC pipe in a manner suitable for accurate temperature measurements. Temperatures will be measured at 2-meter intervals with a thermistor temperature measurement tool. A minimum of two logs will be collected for each hole, one shortly after drilling and one at least two weeks later.

4.5 Complete an evaluation and interpretation of all the radon soil-gas and temperature gradient data. Prepare a final report which will include a description of the proposed model for shallow geothermal resource areas in the study area, a description of the research methodology and radon field surveys, a description of the temperature-gradient data summaries, and qualitative and quantitative interpretation of the research results. Complete an evaluation of the use of radon soil-gas surveys for low-to-moderate temperature geothermal resource exploration, and recommendations for future work.

5.0 REPORTS, DATA, AND OTHER DELIVERABLES

5.1 Management Records

Reports will be due as indicated on the Federal Assistance Reporting Checklist and the Report Distribution List.

5.2 Final Report

A detailed final technical report will be prepared which will describe the radon soil-gas field studies, the observed data, and the evaluation and interpretation of the radon soil-gas temperature gradient data. The locations of field samples and drill holes will be included, and all data will be tabulated, in appendices. A draft final report will be submitted for review and comment not less than 45 days prior to the scheduled delivery of the final report.

6.0 SPECIAL CONSIDERATIONS

None

REPORT DISTRIBUTION LIST

Grant No. DE-FG07-88ID12794

Report/Plan	Form No.	Frequency	No. of Copies	Address
Federal Assistnace Management Summary Report	EIA-459E	Q	1,1,1	A,B,C F
Notice of Energy RD&D	DOE 538	Q	1,1	A,E
Technical Progress Report	N/A	Q	1,1,1	A,B,D F
Topical Report	N/A	A	1,1,1	A,B,D F
Final Technical Report	N/A	F	1,1,1	A,B,D F
Financial Status Report	SF 269	A	1,1,1	A,B,C

LIST OF ADDRESSEES

a. U. S. Department of Energy
785 DOE Place
Idaho Falls, ID 83402
Attn: Trudy A. Thorne

b. Same as above
Attn: Kenneth J. Taylor

c. Same as Above
Attn: Earl Jones

d. University of Utah Research Institute
Earth Science Laboratory
391 Chipeta Way, Suite C
Salt Lake City, UT 84108-1295
Attn: Howard Ross

e. U.S. Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tn 37830

+ U.S. Dept. of Energy
Forrestal Bldg, CW-342
1000 Independence Ave, SW
Washington, D.C. 20585
Attn: Marshall Land

U.S. DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA-459A (10-90)

FORM APPROVED OMB NO 1900-0127

1. Identification Number: DE-FG07-88ID12794	2. Program/Project Title: Evaluation of Time-Integrated Radon Soil-Gas Surveys in the Southern Rio Grande Rift
3. Recipient: New Mexico Research and Development Institute	

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
☐ Federal Assistance Milestone Plan			
☐ Federal Assistance Budget Information Form			
☒ Federal Assistance Management Summary Report	Q	1,1,1	A,B,C
☐ Federal Assistance Program/Project Status Report			
☒ Financial Status Report, OMB Form 269	A	1,1,1	A,B,C
TECHNICAL INFORMATION REPORTING			
☒ Notice of Energy RD&D	O	1,1	A,E
☒ Technical Progress Report	Q	1,1,1	A,B,D
☒ Topical Report	A	1,1*,1	A,B,D
☒ Final Technical Report	F	1,1*,1	A,B,D

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.
F - Final; 90 calendar days after the performance of the effort ends.
O - Quarterly; within 30 days after end of calendar quarter or portion thereof.
O - One time after project starts; within 30 days after award.
X - Required with proposals or with the application or with significant planning changes.
Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

* A camera-ready copy

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)
Jan Taylor 8/10/88	Judy Thone 8/10/88

New Mexico Research and Development Institute
Grant No. DE-FG07-88ID_____

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support cost-shared research in resource assessment in the Rio Grande rift geothermal province. Several geothermal systems have been identified within the Rio Grande rift, and the U. S. Geological Survey has calculated an acccessible thermal energy resource base of 5.4 x 10^18 Joules for the province in Circular 892. Radon gas soil surveys have been used in the exploration for and delineation of high-temperature systems in the Basin and Range province, and high radon-222 discharges have been documented at Radium Springs and Faywood Hot Springs in New Mexico. The general applicability of time-integrated radon-222 soil-gas surveys to define low-intermediate temperature geothermal resources is not established, however. The purpose of this research is threefold: 1) to test the use of time-integrated radon-222 soil-gas surveys for low-intermediate temperature geothermal resource delineation; 2) to test a geologic model for shallow geothermal resource occurrence; and 3) to characterize and delineate additional geothermal resources.

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2.0 SCOPE

The technical objectives of this research are to conduct resource assessment in the southern Rio Grande rift geothermal area of New Mexico. The testing of a new and previously untried exploration technique for low-to-intermediate temperature geothermal resources is a part of the resource assessment work. Radon-222 surveys will be conducted using Track-Etch radon detectors and established survey techniques at the Tortugas Mountain, Radium Springs, and Rincon areas. The survey results will be used to test a proposed geologic model for shallow low-to-moderate temperature geothermal resource occurrence in the southern Rio Grande rift, and to characterize and delineate additional resource areas. The survey and research results will be documented and evaluated, and presented in a final report. All project work will be completed and a final report submitted within an 18 month period.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from a proposal titled "Evaluation of Time-Integrated Radon Soil-Gas Surveys in the Southern Rio Grande Rift", dated June 17, 1987 as amended October 16, 1987. This proposal was submitted by the New Mexico Research and Development Institute in response to a DOE/ID Program Research and Development Announcement (PRDA) for State Geothermal Research and Development - PRDA No. DE-PR07-87ID12662.

4.0 TECHNICAL TASKS

The following tasks will be accomplished under this Grant.

4.1 Complete two soil-depth, radon gas surveys to determine radon concentrations as a function of soil depth and type, and to determine the preferred burial depth for the time-integrated radon detectors. One survey will profile radon soil gas over a young geomorphic surface with little or no caliche development. The other depth profile will detail radon soil gas over an old geomorphic surface with well-developed caliche. A total of 15 soil background concentration measurements and 15 time-integrated field measurements will be made.

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of two logs will be completed for each hole, one shortly after drilling and one at least two weeks later.

4.4 Rincon Survey. Complete one radon soil-gas grid survey, two and one-half square miles in area, one detailed radon profile totaling one mile in length, and two temperature-gradient holes. The grid survey will include 60 pairs of soil background and time-integrated field measurements. The detailed profiles will include 30 pairs of soil background and time-integrated field measurements. The temperature gradient holes will be drilled to a maximum depth of 300 feet (91 m) and completed with PVC pipe in a manner suitable for accurate temperature measurements. Temperatures will be measured at 2-meter intervals with a thermistor temperature measurement tool. A minimum of two logs will be collected for each hole, one shortly after drilling and one at least two weeks later.

4.5 Complete an evaluation and interpretation of all the radon soil-gas and temperature gradient data. Prepare a final report which will include a description of the proposed model for shallow geothermal resource areas in the study area, a description of the research methodology and radon field surveys, a description of the temperature-gradient data summaries, and qualitative and quantitative interpretation of the research results. Complete an evaluation of the use of radon soil-gas surveys for low-to-moderate temperature geothermal resource exploration, and recommendations for future work.

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6.0 SPECIAL CONSIDERATIONS

The State of New Mexico will contribute direct monetary and administrative (in kind) support to this project as a state cost share.

California Energy Commission
Grant No. DE-FG07-88ID_____

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support cost-shared research in resource assessment which will study the suitability of moderate-temperature geothermal resources in Northern California for well-head power generation. Site-specific resource assessment will be conducted at the Wilbur Hot Springs area to determine resource characteristics which will be used as a model to test the applicability of several well-head generation technologies. An atlas and matrix of resource characteristics versus well-head generation technology will be developed for other moderate-temperature geothermal resources in northern California. The results of this analysis is expected to benefit utilities, energy planners and small power producers by demonstrating geothermal resource availability, resource characteristics, and the associated geothermal power cycles suitable for each site.

2.0 SCOPE

The technical objectives of this research are twofold. An extensive geochemical survey will be completed in the area defined by a negative gravity anomaly, centered approximately 1.5 km south of Wilbur Hot Springs, to better delineate and characterize this moderate-temperature geothermal resource. The geochemical survey will include a radon soil-gas survey and trace-metal investigation, and sampling of all surface and hot spring waters which can be located. The results of these studies, integrated with existing data, will be used to site an eventual production well to support a well-head power generation system. Based on the information derived from the power generation assessment of the Wilbur Hot Springs area, an evaluation of resource characteristics and optimum geothermal power generation systems will be completed for other potential moderate temperature geothermal areas in northern California. A geothermal atlas for the northern California area will be completed which will include graphs showing economical geothermal capacity in megawatts as a function of system power costs in dollars per kilowattt-hour, using estimated resource temperatures and production rates. All project work will be completed, and a final report submitted, within a 12 month period following California legislature approval of cost share funding.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from a proposal titled "Resource Assessment of the Wilbur Hot Springs Area", dated June 19, 1987 as revised October 7, 1987. This proposal was submitted by the California Energy Commission in response to a DOE-ID Program Research and Development Announcement (PRDA) for

State Geothermal Research and Development - PRDA No. DE-PR07-87ID12662.

4.0 TECHNICAL TASKS

The following tasks will be accomplished under this Grant.

4.1 Wilbur Hot Springs Site-Specific Study

4.1.1 Conduct a literature search for all pertinent geologic and geothermal information concerning the Wilbur Hot Springs area including the published literature, geologic maps, geophysical data, unpublished reports, dissertations, theses, well logs, open file reports, water information and subsurface logs. Complete an analysis and evaluation of these data.

4.1.2 Complete a geologic field reconnaissance of the Wilbur Hot Springs area and the adjacent negative gravity anomaly area. Acquire stereo aerial photographic coverage and interpret this photography for fault intersections, lineaments, spring locations, surface manifestations of hot spring activity, leaching, mineralization, and other significant geologic features. Complete reconnaissance-level field mapping to document structural features and hot and cold springs identified from aerial photos, and establish a grid system for the soil geochemical survey.

4.1.3 Complete soil geochemical surveys and the sampling of all surface and spring waters in the area including the negative gravity anomaly and Wilbur Hot Springs. The geochemical surveys will include radon soil-gas observations using Terra-Tech radon detectors, and analyses of soil samples for trace metals characteristic of the gold-mercury-geothermal association. Surface and spring waters will be sampled and analyzed to determine chemical characteristics and subsurface temperatures. Complete a draft technical report summarizing the results of all geochemical studies and recommending a location for the drilling of a production or exploration well.

4.2 Optimum Geothermal Power Cycles Study

4.2.1 Complete technical data collection for optimum geothermal power cycle determinations from sources such as the Electric Power Research Institute (EPRI), Geothermal Resources Council (GRC), the Heber binary-cycle demonstration plant, and various equipment manufactures.

4.2.2 Evaluate the technical data obtained in Task 4.2.1 for consistancy and completeness and compile available data on costs and performance. Update technical data, efficiencies, and cost data to the present day. Obtain relevant experience data from existing wellhead power plant operators.

4.2.3 Develop a validated technical database for relevant capital equipment costs, operating and maintenance costs, and performance and operating characteristics based on the data and analysis of task 4.2.2.

4.3 Site-Specific Geothermal Technology Characterization for Potential Resource Areas in Northern California.

4.3.1 Complete a study of constructing a utility-scale power plant at Wilbur Hot Springs and evaluate the economic potential of the well-head modular systems.

4.3.2 Develop a geothermal atlas for the northern California area to show the potentials of geothermal resource availability, resource characterics, and the associated types of geothermal power cycles for these resources. Prepare graphs which show economical geothermal capacity in megawatts as a function of system power costs in dollars per kilowatt-hour. Evaluate the implications of these data with respect to future power costs, priorities for future development and the time frame when well-head geothermal resources will be economical.

4.4 Prepare a final report which summarizes the results of the Wilbur Hot Springs assessment and the integration of the site-specific Wilbur Hot Springs resource data with the technology assessment data. The Geothermal Atlas for northern California moderate-temperature geothermal resources will be completed as a separate document but is included as a part of the final report.

5.0 REPORTS, DATA, AND OTHER DELIVERABLES

5.1 Management Records

Reports will be due as indicated on the Federal Assistance Reporting Checklist and the Report Distribution List.

5.2 Deliverables

The deliverables for this grant will include a detailed final technical report for the Wilbur Hot Springs site-specific study, and the Geothermal Atlas for northern California moderate-temperature geothermal resources. The final report for the site-specific study will discuss in detail the relevant results of the literature search, the aerial photo and field reconnaissance study, and the soil and fluid geochemical surveys. Sample locations and analytical results will be fully documented in the text or in appendicies, as is appropriate. The Geothermal Atlas for northern California will include a stand-alone summary of the technology database developed in the study and the tabulation and discussions of northern California resources and well-head power generation potential. A draft final report for each document will be submitted for review and comment not less than 45 days prior to the scheduled delivery of the final report.

6.0 SPECIAL CONSIDERATIONS

The California Energy Comission will contribute a portion of administrative and technical salaries and fringe benefits as the state cost share for this project.

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1 From: P.WRIGHT (DOE4433) Delivered: Wed 25-May-88 12:08 EDT Sys 164 (0)
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Off At 12:11 05/25/88 EDT
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