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UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

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

MEMORANDUM

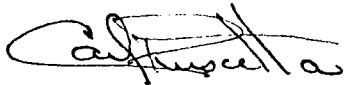
March 5, 1982

TO: Susan Prestwich, DOE/ID
FROM: Carl A. Ruscetta, Technical Program Coordinator
SUBJECT: Arizona State Coupled Contract #DE-FC07-79ID12009

At your request, I have reviewed the subject contract and summarized the modifications and deliverables status as shown on the enclosed summary documents. Per Mod 006, completion of this contract is scheduled for March 31, 1982.

Please note that overall supervision of the contract has been handled by W. Laughlin, et. al. at the Los Alamos National Laboratory. Except for participation on the Geothermal Map Final Review Committee, ESL's direct involvement in this contract has been minimal. We do not, therefore, have complete files of monthly progress reports or reports responding to specific deliverables. I assume that such reports would be available thru LANL.

I would suggest that if work remains to be accomplished on this contract, a no-cost time extension be considered. I would expect that final proof review and publication of the updated Geothermal Map for Arizona could be expected by the end of June, 1982.

Best regards,

Carl A. Ruscetta

CAR:nlr
Enclosure
cc D. Foley

ARIZONA

MAKE COPIES AS SHOWN.

THEN FILE IN A BLUE FOLDER

12/7

Need Mods 1, 4 & 6

~~1/1?~~

~~Original~~ LOOP AGREEMENT

FILE COMPLETE 1/27

10 FORM-182
(Rev. 10-77)

U. S. DEPARTMENT OF ENERGY

COOPERATIVE AGREEMENT

PURSUANT TO AUTHORITY OF PL 93-410, PL 93-438,
PL 93-473, PL 93-577, and PL 95-91

1.a. Agreement No.

DE-FC07-79ID12009

1.b. Modification No.

2. Agreement Period

From: Jan. 16, 1979 To: Jan. 15, 1980

3. Participant Name and Address **ARIZONA BOARD OF REGENTS**
University of Arizona
2045 N. Forbes, Suite 106
Tucson, Arizona 85705

4. Participant Type

Educational
 State or Local Government

Nonprofit
 Profit

5. Project Title

Low-to-Moderate Temperature
Geothermal Reservoir Site
Evaluation in Arizona

6. Project Will Be Conducted Per

See Article II & VI

7. Technical Reports Are Required

See Article VII

8. Principal Investigator(s) or Program Director(s) Name and Address

W. Richard Hahman, Sr.
Principal Investigator
Bureau of Geology & Mineral Technology
2045 N. Forbes, Suite 106
Tucson, Arizona 85705

9. DOE Program Officer (Name and Address)

Leland L. Mink
Idaho Operations Office, DOE
550 Second Street, Idaho Falls, ID 83401
Telephone No. (208) 526-0638

10. Accounting and Appropriation Data

11. Method of Payment

% At Award. % When Requested. 5% Upon Receipt of Final Report
 Letter of Credit Reimbursement
 Other (specify) See Article _____

12. Submit Vouchers, if any, to Agreements Officer Unless

Otherwise Specified in this Block Director, Contracts
Management Division, 550 Second Street
Idaho Falls, Idaho 83401

13. Funding Sources

Source	Amount
DOE:	\$ 312,515.00
Participant:	\$ -0-
Total Funding:	\$ 312,515.00

14. Remarks:

15. Amount Obligated By This Action: \$ 226,739.00

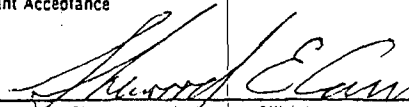
16. DOE Issuing Office (Name and Address)

Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

17. DOE Cooperative Agreements Officer

(Signature) _____ (Date) _____
Name (typed) R. E. Simonds
Title Director, Contracts Mgmt. Division
Telephone No. (208) 526-1347

18. Participant Acceptance

By 
Signature of Authorized Official
Name (typed) Sherwood E. Carr, Treasurer and
Contracting Officer
Title _____

COOPERATIVE AGREEMENT

THIS AGREEMENT, entered into the 26th day of February 1979 (effective as of the 16th day of January 1979), by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), acting through the DEPARTMENT OF ENERGY (hereinafter called "DOE") with its Idaho Operations Office located at 550 Second Street in Idaho Falls, Idaho 83401, and the UNIVERSITY OF ARIZONA (hereinafter called the "Participant") located at Tucson, Arizona;

ARIZONA BOARD OF REGENTS

WITNESSETH THAT:

WHEREAS, the Government is interested in the exploration, evaluation, and development of low-to-moderate temperature (to 150°C) geothermal energy institutional and economic assessments and outreach programs; and

WHEREAS, the Participant has proposed to undertake such a program and DOE desires to provide certain financial assistance for the accomplishment of such a program; and

WHEREAS, this Agreement is authorized by the Department of Energy Organization Act (Public Law 95-91), Sections 7(a)(2) and 8 of Public Law 93-577, and Sections 103(5) and 107(a) of Public Law 93-438;

NOW, THEREFORE, DOE and the Participant agree as follows:

ARTICLE I - STATEMENT OF JOINT OBJECTIVE

The direct application of geothermal energy at various sites located within Arizona can be a significant factor in the Government's efforts to achieve energy independence. The research provided for in this Agreement is important to both the Government and the Participant for estimating the potential of geothermal energy utilization and for fostering its use in Arizona.

ARTICLE II - DESCRIPTION OF RESPONSIBILITIES

The Participant is responsible to assure that the research is accomplished in a manner consistent with the provisions of this Agreement. The Participant's proposal identified as Low-to-Moderate Temperature Geothermal Resources Site Evaluation in Arizona, as it may have been amended, is made part of this Agreement by this reference; however, if there is any conflict between the content of the proposal and the content of this Agreement, the content of this Agreement governs. The tasks provided for in the proposal are to be accomplished, and are to result in, a final report which will include, as a minimum, the following information:

ARTICLE II - DESCRIPTION OF RESPONSIBILITIES (Cont'd)

The geothermal program in Arizona is one emphasizing the exploration, evaluation and development of low-to-moderate temperature geothermal resources. The FY-79 program will emphasize on area and site specific studies rather than regional reconnaissance geologic investigations. Specific objectives and task areas follow:

- (1) Development of a successful exploration technique for the location, evaluation and development of low-to-moderate temperature geothermal resources.
- (2) Conduct site specific investigations in areas defined through earlier reconnaissance surveys where a geothermal potential exists and near-term commercialization is evident. This work should include appropriate geologic, geochemical and geophysical investigations to better define the resource potential.
- (3) Compile and publish an energy resource map of Arizona through cooperation with the USGS and NOAA. Participate in the update of the Arizona section of the USGS Circular 726 update.

The Participant is also responsible for cost-sharing to the extent provided for in Article III, "Financial Support of the Project."

ARTICLE III - FINANCIAL SUPPORT OF THE PROJECT

A. The total estimated cost of performing the work under this Agreement is Three Hundred Twelve Thousand Five Hundred Fifteen Dollars (\$312,515.00). For performance of work under this Agreement, DOE agrees to pay 100% of total allowable costs. The Participant shall be reimbursed by DOE for the costs of the project determined to be allowable in accordance with Article A-I of the General Provisions entitled "Allowable Costs."

C. The amount of funds presently obligated under this Agreement by DOE is Two Hundred Twenty-Six Thousand Seven Hundred Thirty-Nine Dollars (\$226,739.00). The balance of Eighty-Five Thousand Seven Hundred Seventy-Six Dollars (\$85,776.00) shall be funded if progress on the project warrants it, when and if funds are available.

ARTICLE IV - METHOD AND BASIS OF PAYMENT

A. The Participant shall receive 25% of DOE's share, Fifty-Six Thousand Six Hundred Eighty-Five Dollars (\$56,685.00), at the time this Agreement is executed. The balance becomes payable in periodic installments as requested by the Participant and approved by DOE. The advance of funds hereunder shall not exceed the amount required by the Participant to meet anticipated current expenditures. Requests for payment shall not be more frequent than monthly, and the request should contain a cost breakdown showing the amount requested, the total amount requested to date, and the total cost of the project to date, including the value of the Participant's cost-sharing as provided for in Article III of this Agreement. The total amount paid by DOE will not exceed the amount specified in Article III.

B. Final payment will not be made until the Final Report is received and accepted by the Contracting Officer. In no event will the final 5% of the amount of obligated funds be paid to the Participant until DOE has received the Final Report and the Final Cost Report described in Article VII.A.1 of this Cooperative Agreement.

ARTICLE V - TERM OF AGREEMENT

Work under this Agreement shall be accomplished during the period from January 16, 1979 through January 15, 1980. The period of this Agreement may be extended as mutually agreed upon by DOE and the Participant.

ARTICLE VI - PROJECT MANAGEMENT

A. In addition to DOE personnel, the Participant agrees to permit non-DOE personnel who are under contract with DOE, and identified from time to time by the Contracting Officer, to assist the DOE representative in performance of his duties and to have necessary access to the Participant's and major subcontractors' records pertaining to the project. DOE correspondence, if any, with subcontractors shall be routed through the Participant.

B.1. DOE's Program Officer on this project and the person who shall be the Participant's contact for all matters pertaining to this Agreement shall be the following-named person or such other person(s) as may be designated by the Contracting Officer:

ARTICLE VI - PROJECT MANAGEMENT (Cont'd)

Leland L. Mink
Energy and Technology Division
Idaho Operations Office, DOE
550 Second Street
Idaho Falls, Idaho 83401
Telephone (208) 526-0638

2. The Participant's Project Director for the work under this Agreement will be the following person or such other person(s) as may be mutually acceptable to the parties:

Mr. W. Richard Hahman, Sr.
Senior Geologist
Bureau of Geology and Mineral Technology
2045 N. Forbes, Suite 106
Tucson, Arizona 85705
Telephone (602) 626-4391

C. The term "DOE" means the United States Department of Energy or any duly authorized representative thereof, including the Contracting Officer except for the purpose of deciding an appeal under the article entitled "Disputes."

D. The term "Contracting Officer" means the person executing this Agreement on behalf of DOE, and includes his successors or any duly authorized representative of such person.

ARTICLE VII - PROJECT INFORMATION

A. The following reports, as required by DOE Uniform Contractor Reporting System, Volume 1, February 1978, and as indicated on the attached DOE Form CR-537, January 1978, shall be submitted to the DOE Program Officer in accordance with the Special Instructions. One camera-ready copy of the Technical Progress and Final Technical Reports shall be mailed to Technical Information Center (TIC) after approval of the draft by the DOE Program Officer.

B. Quarterly progress meetings will be held which the Participant is required to attend. DOE will fund travel expenses for one member of the Participant's team.

ARTICLE VIII - CHANGES AND MODIFICATIONS

Any changes or modifications to this Agreement or in the scope of work to be performed shall be made by mutual written agreement of the parties. A change may be initiated by either party to this Agreement. The Contracting Officer shall have the authority to determine what constitutes a change.

ARTICLE IX - TERMINATION

A. It is the express intent of DOE to fund 100% of the allowable cost for this project.

B. Notwithstanding the foregoing, it is understood that the Participant may at any time upon giving sixty (60) days prior written notice to DOE terminate this Agreement for its convenience for any reason.

C. In the event of termination, it is expected that the parties will cooperate with each other to reasonably phase out all costs and cost commitments, including cost liabilities to third parties; provided, however, that the total amount obligated by the Government under this Agreement shall not be exceeded. Moreover, upon any such termination the Participant agrees to promptly, upon DOE's request, transfer to DOE all information resulting from the work performed to the date of the termination notice.

D. In the event of termination, the Government agrees to pay the Participant 100% of all allowable costs incurred prior to termination, not to exceed the ceiling set forth in Article III, and the Participant shall:

(1) Place no further orders or subcontracts for materials, services, or facilities intended to be invoiced to the Government for its contribution.

(2) Cancel all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination and intended to be invoiced to the Government for its contribution.

(3) Notwithstanding (1) and (2) above, the Participant has the right to proceed with such orders and subcontracts should it decide to continue performance of the work at its expense only.

E. After a termination, the Participant shall submit to the Contracting Officer its termination claim. Such claim shall be submitted promptly but in no event later than one (1) year from the effective date of termination unless one or more extensions in writing are granted by the Contracting Officer. Upon failure of the Participant to submit its termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the Participant by reason of the termination and shall thereupon pay to the Participant the amount so determined.

F. Costs claimed, agreed to, or determined pursuant to this article must constitute allowable costs as defined in Article A-1 of the Appendix A of this Agreement.

ARTICLE IX - TERMINATION (Cont'd)

G. Any termination notice rendered by either DOE or the Participant shall be sent by registered mail with return receipt requested.

H. If in the opinion of the Contracting Officer, the Participant fails to substantially perform under this Agreement, and does not cure such failure within a reasonable time, after written notice of such failure by the Contracting Officer, DOE may by written notice to the Participant terminate this Agreement. Such termination notice, signed by the Contracting Officer, shall be effective upon receipt by the Participant. The Government shall not be liable for the incurrence of any obligations under this Agreement from the date of the receipt of such termination notice. Upon any such termination, the Participant agrees to promptly, upon DOE's request, transfer to DOE all information resulting from the work performed to the date of the termination notice.

I. Except with respect to defaults of subcontractors, the Participant shall not be in default by reason of failure to substantially perform under this Agreement if such failure arises out of causes beyond the control and without the fault or negligence of the Participant. Such causes may include, but are not restricted to, acts of God or of the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather, but in every case the failure to perform must be beyond the control and without the fault or negligence of the Participant. If the failure to substantially perform is caused by the failure of a subcontractor to perform or make progress, and if such failure arises out of causes beyond the control of both the Participant and a subcontractor, and without the fault or negligence of either of them, the Participant shall not be deemed to be in default unless the supplies or services to be furnished by the subcontractor were reasonably obtainable from other sources. Upon request of the Participant, if the Contracting Officer shall determine that failure to perform was occasioned by any one or more of the said causes, this Agreement shall be revised accordingly, subject to the rights of DOE.

ARTICLE X - LIABILITY AND INDEMNIFICATION

The Government will not be liable for payment of damages for injuries to any person, or loss of life or personal property, or loss suffered or sustained and arising from the work performed under this Agreement. The Participant agrees to indemnify and save the Government harmless from any and all claims, demands, damages, actions, costs, or charges against the Government arising as the result of the above-mentioned injuries, damages, or loss, except for any such damages or claims arising out of the negligent act of the Government or its employees in the course of their official duties.

ARTICLE XI - USE OF INFORMATION

All data and information generated, derived or obtained from the activities provided for herein, and this Agreement, will be public information.

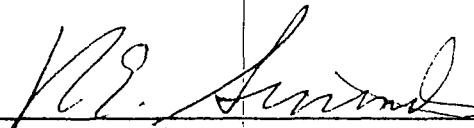
ARTICLE XII - ADDITIONAL CONTRACT PROVISIONS

Appendix A, attached hereto and made a part hereof, sets forth additional general provisions of this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this document as of the day and year first above written.


THE UNITED STATES OF AMERICA

BY THE DEPARTMENT OF ENERGY

By 
R. E. Simonds, Director
Contracts Management Division
Idaho Operations Office
Contracting Officer


ARIZONA BOARD OF REGENTS
UNIVERSITY OF ARIZONA

Witnesses as to signature of Participant:


(Signature)

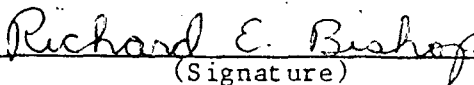
Jane S. Darrow
Name (typed)

University of Arizona
(Address)

By 
~~Sherwood E. Carr, Treasurer and~~
Contracting Officer

Name (typed)

Title
2045 N. Forbes, Suite 106
Tucson, Arizona 85705
(Business Address)


(Signature)

Richard E. Bishop
Name (typed)

University of Arizona
(Address)

I, James T. Wheeler, certify that I am the Director of Sponsored Projects Serv. of the Participant named under this document, that Sherwood E. Carr, who signed this document on behalf of the Participant, was then Treasurer and Contracting Officer of said Participant; that said document was duly signed for and in behalf of said Participant by authority of its governing body, and is within the scope of its legal powers.


James T. Wheeler, Director
Sponsored Projects Services

(SEAL)

APPENDIX A
GENERAL PROVISIONS
COOPERATIVE AGREEMENTS

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APPENDIX A

GENERAL PROVISIONS

COOPERATIVE AGREEMENTS

ARTICLE A-I - ALLOWABLE COST

Costs shall constitute allowable costs as specified in Title 41, Code of Federal Regulations Part 1-15 of the Code of Federal Regulations in effect on the date of this Agreement.

ARTICLE A-II - APPROVAL OF SUBCONTRACTS

All subcontracts and purchase orders in excess of \$10,000 shall require the written approval of the Contracting Officer.

ARTICLE A-III - PUBLIC INFORMATION RELEASES

The parties agree that public disclosure or dissemination of new data or information arising out of the feasibility assessment will be coordinated by the parties, it being understood that the intent of both the Participant and DOE is to release all data and information to the greatest practicable extent in order to achieve the objective of obtaining maximum public value from the results of this project. It is understood that the foregoing is not intended to afford either party the right to prevent a public release by the other; however, nothing in this article shall impair the rights of the parties set forth elsewhere in this Agreement, including but not necessarily limited to the article entitled "Patent Rights."

ARTICLE A-IV - AUDIT

A. The Participant shall maintain, and the Contracting Officer or his representative shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this Agreement. Such right of examination shall include inspection at all reasonable times of the Participant's plants, or such parts thereof, as may be engaged in the performance of this Agreement.

B. The materials described above, shall be made available at the office of the Participant, at all reasonable times, for inspection, audit or reproduction, until the expiration of three (3) years from the date of final payment under this Agreement or such lesser time specified in Title 41, Code of Federal Regulations Part 1-20 and for such lesser period, if any, as is required by applicable statute, or by other articles of this Agreement, or by (1) and (2) below:

ARTICLE A-IV - AUDIT (Cont'd)

(1) If this Agreement is completely or partially terminated, the records relating to the work terminated shall be made available for a period of three (3) years from the date of any resulting final settlement.

(2) Records which relate to appeals under the "Disputes" article of this Agreement, or litigation or the settlement of claims arising out of the performance of this Agreement, shall be made available until such appeals, litigation, or claims have been disposed of.

ARTICLE A-V - OFFICIALS NOT TO BENEFIT

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

ARTICLE A-VI - COVENANT AGAINST CONTINGENT FEES

The Participant warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, percentage brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Participant for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this Agreement without liability or in its discretion to deduct from the Agreement price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE A-VII - EXAMINATION OF RECORDS BY COMPTROLLER GENERAL

A. The Participant agrees that the Comptroller General of the United States or any of his duly authorized Government employees shall, until the expiration of three (3) years after final payment under this Agreement, unless DOE authorizes their prior disposition, have access to and the right to examine any directly pertinent books, documents, papers, and records of the Participant involving transactions related to this Agreement.

ARTICLE A-VII - EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (Cont'd)

B. The Participant further agrees to include in all its subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized Government employees shall, until the expiration of three (3) years after final payment under the subcontract, or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this article excludes (1) purchase orders not exceeding \$10,000 and (2) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

C. The periods of access and examination described in A. and B., above, for records which relate to (1) appeals under the "Disputes" article of this Agreement, (2) litigation or the settlement of claims arising out of the performance of this Agreement, or (3) costs and expenses of this Agreement as to which exception has been taken by the Comptroller General or any of his duly authorized representatives, shall continue until such appeals, litigation, claims or exceptions have been disposed of.

ARTICLE A-VIII - ASSIGNMENT OF CLAIMS

Pursuant to the provisions of the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), claims for moneys due or to become due the Participant from the Government under this Agreement may be assigned to a bank, trust company, or other financing institution, including any Federal lending agency, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment shall cover all amounts payable under this Agreement and not already paid, and shall not be made to more than one party, except that any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Unless otherwise provided in this Agreement, payments to assignee of any moneys due or to become due under this Agreement shall not, to the extent provided in said Act, as amended, be subject to reduction or setoff.

ARTICLE A-IX - PERMITS

Except as otherwise directed by the Contracting Officer, the Participant shall procure all necessary permits or licenses and abide by all applicable laws, regulations, and ordinances of the United States and of the State, territory, and political subdivision in which the work under this Agreement is performed.

ARTICLE A-X - DISPUTES

A. Except as otherwise provided in this Agreement, any dispute concerning a question of fact arising under this Agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Participant. The decision of the Contracting Officer shall be final and conclusive unless within thirty (30) days from the date of receipt of such copy, the Participant mails or otherwise furnishes to the Contracting Officer a written appeal addressed to DOE. The decision of DOE or its duly authorized representative for the determination of such appeals shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. In connection with any appeal proceeding under this article, the Participant shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Participant shall proceed diligently with the performance of this Agreement and in accordance with the Contracting Officer's decision.

B. This "Disputes" article does not preclude consideration of law questions in connection with decisions provided for in paragraph A, above: Provided, That nothing in this Agreement shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

ARTICLE A-XI - PAYMENT OF INTEREST ON PARTICIPANT'S CLAIMS

A. If an appeal is filed by the Participant from a final decision of the Contracting Officer under the "Disputes" article of this Agreement, denying a claim arising under the Agreement, simple interest on the amount of the claim finally determined owed by the Government shall be payable to the Participant. Such interest shall be at the rate determined by the Secretary of the Treasury pursuant to Public Law 92-41, 85 Stat. 97, from the date the Participant furnishes to the Contracting Officer its written appeal under the "Disputes" article of this Agreement, to the date of (1) a

ARTICLE A-XI - PAYMENT OF INTEREST ON PARTICIPANT'S CLAIMS (Cont'd)

final judgment by a court of competent jurisdiction, or (2) mailing to the Participant of a supplemental agreement for execution either confirming completed negotiations between the parties or carrying out a decision of a board of contract appeals.

B. Notwithstanding A., above, (1) interest shall be applied only from the date payment was due, if such date is later than the filing of appeal, and (2) interest shall not be paid for any period of time that the Contracting Officer determines the Participant has unduly delayed in pursuing its remedies before a board of contract appeals or a court of competent jurisdiction.

ARTICLE A-XII - SEX DISCRIMINATION PROHIBITED

No person shall on the ground of sex be excluded from participation in, be denied a license under, be denied the benefits of, or be subjected under any program or activity carried on or receiving Federal assistance under any title of this Act (P. L. 93-438).

ARTICLE A-XIII - CIVIL RIGHTS

The Participant agrees that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity for which the Participant receives Federal financial assistance from DOE.

ARTICLE A-XIV - DISCRIMINATION AGAINST HANDICAPPED PROHIBITED

The Participant agrees that no otherwise qualified handicapped individual in the United States [as defined in Section 7(6) of the Act], shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

ARTICLE A-XV - SMALL AND MINORITY BUSINESS PARTICIPATION

It is the policy of DOE to ensure that small and minority businesses have a reasonable opportunity to participate in the projects which it supports. In accordance with this policy, the Participant will make a reasonable effort to ensure fair consideration and utilization of small and minority businesses in purchases and subcontracts awarded by the Participant under this Agreement.

ARTICLE A-XVI - PREFERENCE FOR U. S. FLAG AIR CARRIERS

A. It is the policy of the United States that all Federal agencies and Government contractors and subcontractors utilize U. S. flag air carriers for international air transportation of personnel and cargo.

B. The Participant agrees to utilize U. S. flag air carriers to the maximum extent practicable in connection with the performance of this Agreement in the transportation by air of any personnel and cargo between the United States and a foreign country, or between foreign countries.

C. The terms used in this article have the following meanings:

(1) "International air transportation" means transportation by air of personnel and cargo from the United States to a foreign country, between two or more foreign countries, and between a foreign country and the United States.

(2) "U. S. flag air carrier" means one of a class of air carriers holding a certificate of public convenience and necessity issued by the Civil Aeronautics Board, approved by the President, authorizing operations between the United States and/or its territories and one or more foreign countries.

(3) The term "United States" includes the fifty States, Commonwealth of Puerto Rico, possessions of the United States and the District of Columbia.

(4) "Practicable" includes (i) satisfactory servicing of agency programs, and (ii) timely deliveries at fair and reasonable prices.

D. The Participant shall include the substance of this article, including this paragraph D. in each subcontract or purchase order hereunder which may involve air transportation between the United States and a foreign country, or between foreign countries.

ARTICLE A-XVII - CLEAN AIR AND WATER

A. The Participant agrees as follows:

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by P. L. 91-604) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251, et seq., as amended by P. L. 92-500), respectively, relating to inspection, monitoring, entry, reports and information, as

ARTICLE A-XVII - CLEAN AIR AND WATER (Cont'd)

well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this Agreement.

(2) That no portion of the work required by this Agreement will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this Agreement was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.

(3) To use its best efforts to comply with clean air standards and clean water standards at the facility in which the Agreement is being performed.

(4) To insert the substance of the provisions of this article into any nonexempt contract, including this subparagraph A.(4).

B. The terms used in this article have the following meanings:

(1) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by P. L. 91-604).

(2) The term "Water Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by P. L. 92-500).

(3) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110(d) of the Clean Air Act [42 U.S.C. 1857c-5(d)], an approved implementation procedure or plan under section 111(c) or section 111(d), respectively, of the Air Act (42 U.S.C. 1157(c)-6(c) or (d), or an approved implementation procedure under section 112(d) of the Air Act [42 U.S.C. 1857c-7(d)].

(4) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or

ARTICLE A-XVII - CLEAN AIR AND WATER (Cont'd)

by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

(5) The term "compliance" means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency or an air or water pollution control agency in accordance with the requirements of the Air Act or Water Act and regulations issued pursuant thereto.

(6) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA

A. Definitions

(1) "Technical Data" means recorded information regardless of form or characteristic, of a scientific or technical nature. It may, for example, document research, experimental, developmental, or demonstration, or engineering work, or be usable or used to define a design or process, or to procure, produce, support, maintain, or operate materiel. The data may be graphic or pictorial delineations in media such as drawings or photographs, text in specifications or related performance or design type documents or computer software (including computer programs, computer software data bases, and computer software documentation). Examples of technical data include research and engineering data, engineering drawings and associated lists, specifications, standards, process sheets, manuals, technical reports, catalog item identification, and related information. Technical data as used herein does not include financial reports, cost analyses, and other information incidental to contract administration.

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA (Cont'd)

(2) "Proprietary Data" means technical data which embody trade secrets developed at private expense, such as design procedures or techniques, chemical composition of materials, or manufacturing methods, processes, or treatments, including minor modifications thereof, provided that such data:

(i) Are not generally known or available from other sources without obligation concerning their confidentiality.

(ii) Have not been made available by the owner to others without obligation concerning its confidentiality, and

(iii) Are not already available to the Government without obligation concerning their confidentiality.

(3) "Contract Data" means technical data first produced in the performance of the Agreement, technical data which are specified to be delivered in the Agreement, technical data that may be called for under the "Additional Technical Data Requirements" article of the Agreement, if any, or technical data actually delivered in connection with the Agreement.

(4) "Unlimited Rights" means rights to use, duplicate, or disclose technical data, in whole or in part, in any manner and for any purpose whatsoever, and to permit others to do so.

B. Allocation of Rights

(1) The Government shall have:

(i) Unlimited rights in contract data except as otherwise provided below with respect to proprietary data.

(ii) The right to remove, cancel, correct or ignore any marking not authorized by the terms of this Agreement on any technical data furnished hereunder, if in response to a written inquiry by DOE concerning the propriety of the markings, the Participant fails to respond thereto within 60 days or fails to substantiate the propriety of the markings. In either case DOE will notify the Participant of the action taken.

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA (Cont'd)

(iii) No rights under this Agreement in any technical data which are not contract data.

(2) The Participant shall have:

(i) The right to withhold proprietary data in accordance with the provisions of this article.

(ii) The right to use for its private purposes, subject to patent, security or other provisions of this Agreement, contract data it first produces in the performance of this Agreement provided the data requirements of this Agreement have been met as of the date of the private use of such data. The Participant agrees that to the extent it receives or is given access to proprietary data or other technical, business or financial data in the form of recorded information from DOE or a DOE contractor or subcontractor, the Participant shall treat such data in accordance with any restrictive legend contained thereon, unless use is specifically authorized by prior written approval of the Contracting Officer.

(3) Nothing contained in this "Rights in Technical Data" article shall imply a license to the Government under any patent or be construed as affecting the scope of any licenses or other rights otherwise granted to the Government under any patent.

C. Copyrighted Material

(1) The Participant shall not, without prior written authorization of the Contracting Officer, establish a claim to statutory copyright in any contract data first produced in the performance of the Agreement. To the extent such authorization is granted, the Government reserves for itself and others acting on its behalf a royalty-free, non-exclusive, irrevocable, world-wide license for Governmental purposes to publish, distribute, translate, duplicate, exhibit and perform any such data copyrighted by the Participant.

(2) The Participant agrees not to include in the technical data delivered under the Agreement any material copyrighted by the Participant and not to knowingly include any material copyrighted by others without first granting or obtaining at

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA (Cont'd)

no cost a license therein for the benefit of the Government of the same scope as set forth in paragraph C.(1) above. If such royalty-free license is unavailable and the Participant nevertheless determines that such copyrighted material must be included in the technical data to be delivered, rather than merely incorporated therein by reference, the Participant shall request the written authorization of the Contracting Officer to include such copyrighted material in the technical data without a license.

D. Subcontracting. It is the responsibility of the Participant to obtain from its subcontractors technical data and rights therein, on behalf of the Government, necessary to fulfill the Participant's obligations to the Government with respect to such data. In the event of refusal by a subcontractor to accept an article affording the Government such rights, the Participant shall:

(1) Promptly submit written notice to the Contracting Officer setting forth reasons for the subcontractor refusal and other pertinent information which may expedite disposition of the matter; and

(2) Not proceed with the subcontract without the written authorization of the Contracting Officer.

E. Withholding of Proprietary Data. Notwithstanding the inclusion of the "Additional Technical Data Requirements" article in this Agreement or any provision of this Agreement specifying the delivery of technical data, the Participant may withhold proprietary data from delivery, provided that the Participant furnishes in lieu of any such proprietary data, so withheld technical data disclosing the source, size, configuration, mating and attachment characteristics, functional characteristics and performance requirements ("Form, Fit and Function" data, e.g., specification control drawings, catalog sheets, envelope drawings, etc.) or a general description of such proprietary data where "Form Fit and Function" data are not applicable. The Government shall acquire no rights to any proprietary data so withheld except that such data shall be subject to the "Inspection Rights" provisions of paragraph F., and if included, the "Limited Rights in Proprietary Data" provisions of paragraph G. and the "Contractor Licensing" provisions of paragraph H.

F. Inspection Rights. Except as may be otherwise specified in this Agreement for specific items of proprietary data which are not subject to this paragraph, the Contracting Officer's representatives, at all reasonable times up to three (3) years after final payment under this Agreement,

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA (Cont'd)

may inspect at the Participant's facility any proprietary data withheld under paragraph E. and not furnished under paragraph G. for the purposes of verifying that such data properly fell within the withholding provision of paragraph E., or for evaluating work performance.

ARTICLE A-XIX - REPORTING OF ROYALTIES

If this contract is in an amount which exceeds \$10,000 and if any royalty payments are directly involved in the contract or are reflected in the contract price to the Government, the Contractor agrees to report in writing to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) during the performance of this contract and prior to its completion or final settlement the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this contract together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as will permit identification of the patents or other basis on which the royalties are to be paid. The approval of DOE of any individual payments or royalties shall not stop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

ARTICLE XX - PATENT RIGHTS

A. Definitions

(1) "Subject Invention" means any invention or discovery of the Participant conceived or first actually reduced to practice in the course of or under this Agreement, and includes any art, method process, machine, manufacture, design, or composition of matter, or any new and useful improvement thereof, or any variety of plants, whether patented or unpatented under the Patent Laws of the United States of America or any foreign country.

(2) "Contract" means any contract, grant, agreement, understanding or other arrangement, which includes research, development, or demonstration work, and includes any assignment or substitution of parties.

(3) "States and domestic municipal governments" means the States of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, and any political subdivision and agencies thereof.

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

(4) "Government agency" includes an executive department, independent commission, board, office, agency, administration, authority, Government corporation, or other Government establishment of the Executive Branch of the Government of the United States of America.

(5) "To the point of practical application" means to manufacture in the case of a composition or product, to practice in the case of a process, or to operate in the case of a machine and under such conditions as to establish that the invention is being worked and that its benefits are reasonably accessible to the public.

(6) "Patent Counsel" means the DOE Patent Counsel assisting the procuring activity.

B. Allocation of Principal Rights

(1) Assignment to the Government. The Participant agrees to assign to the Government the entire right, title, and interest throughout the world in and to each Subject Invention except to the extent that rights are retained by the Participant under paragraphs B.(2) and C. of this article.

(2) Greater Rights Determinations. The Participant or the employee-inventor with authorization of the Participant may request greater rights than the nonexclusive license and the foreign patent rights provided in paragraph C. of this article on identified inventions, in accordance with 41 CFR 9-9.109-6. Such requests must be submitted to Patent Counsel (with notification by Patent Counsel to the Contracting Officer) at the time of the first disclosure pursuant to paragraph E.(2) of this article, or not later than 9 months after conception or first actual reduction to practice, whichever occurs first, or such longer period as may be authorized by Patent Counsel (with notification by Patent Counsel to the Contracting Officer) for good cause shown in writing by the Participant.

C. Minimum Rights to the Participant

(1) Participant License. The Participant reserves a revocable, nonexclusive, paid-up license in each patent application filed in any country on a Subject Invention and any resulting patent in which the Government acquires title. The license shall extend to the Participant's domestic subsidiaries and affiliates, if any,

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

within the corporate structure of which the Participant is a part and shall include the right to grant sublicenses of the same scope to the extent the Participant was legally obligated to do so at the time the Agreement was awarded. The license shall be transferable only with approval of DOE except when transferred to the successor of that part of the Participant's business to which the invention pertains.

(2) Revocation Limitations. The Participant's nonexclusive license retained pursuant to subparagraph C.(1) of this article and sublicenses granted thereunder may be revoked or modified by DOE, either in whole or in part, only to the extent necessary to achieve expeditious practical application of the Subject Invention under DOE's published licensing regulations (10 CFR 781), and only to the extent an exclusive license is actually granted. This license shall not be revoked in that field of use and/or the geographical areas in which the Participant, or its sublicensee, has brought the invention to the point of practical application and continues to make the benefits of the invention reasonably accessible to the public, or is expected to do so within a reasonable time.

(3) Revocation Procedures. Before modification or revocation of the license or sublicense, pursuant to subparagraph C.(2) of this article, DOE shall furnish the Participant a written notice of its intention to modify or revoke the license and any sublicense thereunder, and the Participant shall be allowed 30 days, or such longer period as may be authorized by the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) for good cause shown in writing by the Participant, after such notice to show cause why the license or any sublicense should not be modified or revoked. The Participant shall have the right to appeal in accordance with 10 CFR 781, any decision concerning the modification or revocation of its license or any sublicense.

(4) Foreign Patent Rights. Upon written request to Patent Counsel (with notification by Patent Counsel to the Contracting Officer), in accordance with subparagraph E.(2)(i) of this article, and subject to DOE security regulations and requirements, there shall be reserved to the Participant, or the employee-inventor with authorization of the Participant, the patent rights to a Subject Invention in any foreign country where the Government has elected not to secure such rights provided:

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

(i) The recipient of such rights, when specifically requested by DOE and three years after issuance of a foreign patent disclosing said Subject Invention, shall furnish DOE a report setting forth:

(a) The commercial use that is being made, or is intended to be made, of said invention, and

(b) The steps taken to bring the invention to the point of practical application or to make the invention available for licensing.

(ii) The Government shall retain at least an irrevocable, nonexclusive, paid-up license to make, use, and sell the invention throughout the world by or on behalf of the Government (including any Government agency) and States and domestic municipal governments, unless the Administrator or his designee determines that it would not be in the public interest to acquire the license for the States and domestic municipal governments.

(iii) Subject to the rights granted in C.(1), (2), and (3) of this article, the Secretary of DOE or his designee shall have the right to terminate the foreign patent rights granted in this subparagraph C.(4) in whole or in part unless the recipient of such rights demonstrates to the satisfaction of the Secretary of DOE or his designee that effective steps necessary to accomplish substantial utilization of the invention have been taken or within a reasonable time will be taken.

(iv) Subject to the rights granted in C.(1), (2), and (3) of this article, the Secretary of DOE or his designee shall have the right, commencing four years after foreign patent rights are accorded under this subparagraph C.(4), to acquire the granting of a nonexclusive or partially exclusive license to a responsible applicant or applicants, upon terms reasonable under the circumstances and in appropriate circumstances to terminate said foreign patent rights in whole or in part, following a hearing upon notice thereof to the public, upon a petition by an interested person justifying such hearing:

(a) If the Secretary of DOE or his designee determines, upon review of such material as he deems relevant, and after the recipient of such rights, or other interested person, has had the

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

opportunity to provide such relevant and material information as the Secretary of DOE or his designee may require that such foreign patent rights have tended substantially to lessen competition or to result in undue market concentration in any section of the United States in any line of commerce to which the technology relates; or

(b) Unless the recipient of such rights demonstrates to the satisfaction of the Secretary of DOE or his designee at such hearing that the recipient has taken effective steps or within a reasonable time thereafter is expected to take such steps, necessary to accomplish substantial utilization of the invention.

D. Filing of Patent Applications

(1) With respect to each Subject Invention in which the Participant or the inventor requests foreign patent rights in accordance with subparagraph C.(4) of this article, a request may also be made for the right to file and prosecute the U. S. application on behalf of the U. S. Government. If such request is granted the Participant or inventor shall file a domestic patent application on the invention within six (6) months after the request for foreign patent rights is granted, or such longer period of time as may be approved by the Patent Counsel for good cause shown in writing by the requester. With respect to the invention the requester shall promptly notify the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) of any decision not to file an application.

(2) For each Subject Invention on which a domestic patent application is filed by the Participant or inventor the Participant or inventor shall:

(i) Within two (2) months after the filing or within two (2) months after submission of the invention disclosure if the patent application previously has been filed, deliver to the Patent Counsel a copy of the application as filed including the filing date and serial number:

(ii) Within six (6) months after filing the application or within six (6) months after submitting the invention disclosure if the application has been filed previously, deliver

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

to the Patent Counsel a duly executed and approved Assignment to the Government, on a form specified by the Government;

(iii) Provide the Patent Counsel with the original patent grant promptly after a patent is issued on the application; and

(iv) Not less than 30 days before the expiration of the response period for any action required by the Patent and Trademark Office, notify the Patent Counsel of any decision not to continue prosecution of the application.

(3) With respect to each Subject Invention in which the Participant or inventor has requested foreign patent rights, the Participant or inventor shall file a patent application on the invention in each foreign country in which such request is granted in accordance with applicable statutes and regulations and within one of the following periods:

(i) Eight months from the date of filing a corresponding United States application, or if such an application is not filed, six months from the date the request was granted;

(ii) Six months from the date a license is granted by the Commissioner of Patents and Trademarks to file the foreign patent application where such filing has been prohibited by security reasons; or

(iii) Such longer periods as may be approved by the Patent Counsel for good cause shown in writing by the Participant or inventor.

(4) Subject to the license specified in subparagraphs C.(1), (2) and (3) of this article, the Participant or inventor agrees to convey to the Government upon request the entire right, title, and interest in any foreign country in which the Participant or inventor fails to have a patent application filed in accordance with subparagraph D.(3) of this article, or decides not to continue prosecution or to pay any maintenance fees covering the invention. To avoid forfeiture of the patent application or patent the Participant or inventor shall not less than 60 days before the expiration period for any action required by any Patent Office notify the Patent Counsel of such failure or decision and deliver to the Patent Counsel the executed instruments necessary for the conveyance specified in this paragraph.

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

E. Invention Identification, Disclosures and Reports.

(1) The Participant shall establish and maintain active and effective procedures to ensure that Subject Inventions are promptly identified and timely disclosed. These procedures shall include the maintenance of laboratory notebooks or equivalent records and any other records that are reasonably necessary to document the conception and/or the first actual reduction to practice of Subject Inventions, and records which show that the procedures for identifying and disclosing the inventions are followed. Upon request, the Participant shall furnish the Contracting Officer a description of these procedures so that he may evaluate and determine their effectiveness.

(2) The Participant shall furnish the Patent Counsel (with notification by Patent Counsel to the Contractor Officer) on a DOE-approved form:

(i) A written report containing full and complete technical information concerning each subject Invention within six (6) months after conception or first actual reduction to practice whichever occurs first in the course of or under this Agreement, but in any event prior to any on sale, public use or public disclosure of such invention known to the Participant. The report shall identify the Agreement and inventor and shall be sufficiently complete in technical detail and appropriately illustrated by sketch or diagram to convey to one skilled in the art to which the invention pertains a clear understanding of the nature, purpose, operation, and to the extent known, the physical, chemical, biological, or electrical characteristics of the invention. The report should also include any request for foreign patent rights under subparagraph C.(4) of this article and any request to file a domestic patent application under D.(1) of this article. However, such requests shall be made within the period set forth in subparagraph B.(2) of this article. When an invention is reported under this subparagraph E.(2)(i), it shall be presumed to have been made in the manner specified in Section 9(a)(1) and (2) of 42 U.S.C. 5908 unless the Participant contends it was not so made in accordance with subparagraph G.(2)(ii) of this article.

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

(ii) Upon request, but not more than annually, interim reports on an DOE-approved form listing Subject Inventions and subcontracts awarded containing a Patent Rights article for that period and certifying that:

(a) The Participant's procedures for identifying and disclosing Subject Inventions as required by this paragraph E. have been followed throughout the reporting period;

(b) All subject inventions have been disclosed or that there are no such inventions; and

(c) All subcontracts containing a Patent Rights article have been reported or that no such subcontracts have been awarded.

(iii) A final report on an DOE-approved form within three (3) months after completion of the Agreement work listing all Subject Inventions and all subcontracts awarded containing a Patent Rights article and certifying that:

(a) All Subject Inventions have been disclosed or that there were no such inventions; and

(b) All subcontracts containing a Patent Rights article have been reported or that no such subcontracts have been awarded.

(3) The Participant shall obtain patent agreements to effectuate the provisions of this article from all persons in its employ who perform any part of the work under this Agreement except nontechnical personnel, such as clerical employees and manual laborers.

(4) The Participant agrees that the Government may duplicate and disclose Subject Invention disclosures and all other reports and papers furnished or required to be furnished pursuant to this article. If the Participant is to file a foreign patent application on a Subject Invention, the Government agrees, upon written request, to use its best efforts to withhold publication of such invention disclosures until the expiration of the time period specified in subparagraph D.(1) of this article, but in no event shall the Government or its employees be liable for any publication thereof.

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

F. Publication. It is recognized that during the course of the work under this Agreement the Participant or its employees may from time to time desire to release or publish information regarding scientific or technical developments conceived or first actually reduced to practice in the course of or under this Agreement. In order that public disclosure of such information will not adversely affect the patent interests of DOE or the Participant, patent approval for release or publication shall be secured from Patent Counsel prior to any such release or publication.

G. Forfeiture of Rights in Unreported Subject Inventions.

(1) The Participant shall forfeit to the Government, at the request of the Secretary of DOE or his designee, all rights in any Subject Invention which the Participant fails to report to Patent Counsel (with notification by Patent Counsel to the Contracting Officer) within 6 months after the time the Participant:

(i) Files or causes to be filed a United States or foreign patent application thereon; or

(ii) Submits the final report required by subparagraph E.(2)(iii) of this article whichever is later.

(2) However, the Participant shall not forfeit rights in a Subject Invention if, within the time specified in (1)(i) or (1)(ii) of this paragraph G., the Participant:

(i) Prepared a written decision based upon a review of the record that the invention was neither conceived nor first actually reduced to practice in the course of or under the Agreement and delivers the same to Patent Counsel (with notification by Patent Counsel to the Contracting Officer); or

(ii) Contending that the invention is not a Subject Invention the Participant nevertheless discloses the invention and all facts pertinent to this contention to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer); or

(iii) Establishes that the failure to disclose did not result from the Participant's fault or negligence.

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

(3) Pending written assignment of the patent applications and patents on a Subject Invention determined by the Secretary of DOE or his designee to be forfeited (such determination to be a final decision under the "Disputes" article of this Agreement); the Participant shall be deemed to hold the invention and the patent applications and patents pertaining thereto in trust for the Government. The forfeiture provision of this paragraph G. shall be in addition to and shall not supersede other rights and remedies which the Government may have with respect to Subject Inventions.

H. Examination of Records Relating to Inventions.

(1) The Contracting Officer or his authorized representative, until the expiration of three (3) years after final payment under this Agreement, shall have the right to examine any books (including laboratory notebooks) records, documents, and other supporting data of the Participant which the Contracting Officer or his authorized representative, reasonably deem pertinent to the discovery or identification of Subject Inventions or to determine compliance with the requirements of this article.

(2) The Contracting Officer or his authorized representative shall have the right to examine all books (including laboratory notebooks) records and documents of the Participant relating to the conception on first actual reduction to practice of inventions in the same field of technology as the work under this Agreement to determine whether any such inventions are Subject Inventions. If the Participant refuses or fails to:

(i) Establish the procedures of paragraph E.(1) of this article; or

(ii) Maintain and follow such procedures; or

(iii) Correct or eliminate any material deficiency in the procedures within thirty (30) days after the Contracting Officer notifies the Participant of such a deficiency.

I. Withholding of Payment (Not Applicable to Subcontracts)

(1) Any time before final payment of the amount of this Agreement the Contracting Officer may, if he deems such action warranted, withhold payment until a reserve not exceeding \$50,000 or 5 percent of the amount of this Agreement, whichever is less, shall have been set aside if in his opinion, the Participant fails to:

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

(i) Establish, maintain and follow effective procedures for identifying and disclosing subject inventions pursuant to subparagraph E.(1) of this article; or

(ii) Disclose any Subject Invention pursuant to paragraph E.(2)(i) of this article; or

(iii) Deliver the interim reports pursuant to subparagraph E.(2)(ii) of this article; or

(iv) Provide the information regarding subcontracts pursuant to subparagraph J.(5) of this article; or

(v) Convey to the Government in a DOE-approved form the title and/or rights of the Government in each subject invention as required by this article.

The reserve or balance shall be withheld until the Contracting Officer has determined that the Participant has rectified whatever deficiencies exist and has delivered all reports, disclosures and other information required by the article.

(2) Final payment under this Agreement shall not be made by the Contracting Officer before the Participant delivers to Patent Counsel all disclosures of Subject Inventions and other information required by E.(2)(i) of this article, the final report required by E.(2)(iii) of this article, and Patent Counsel has issued a patent clearance certification to the Contracting Officer.

(3) The Contracting Officer may, in his discretion, decrease or increase the sums withheld up to the maximum authorized above. If the Participant is a nonprofit organization, the maximum amount that may be withheld under this paragraph shall not exceed \$50,000 or one percent (1%) of the amount of this Agreement, whichever is less. No amount shall be withheld under this paragraph while the amount specified by this paragraph is being withheld under other provisions of the Agreement. The withholding of any amount or subsequent payment thereof shall not be construed as a waiver of any rights accruing to the Government under this Agreement.

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

J. Subcontracts.

(1) For the purpose of this paragraph the term "Participant" means the party awarding a subcontract and the term "subcontractor" means the party being awarded a subcontract regardless of tier.

(2) Unless otherwise authorized or directed by the Contracting Officer, the Participant shall include the Patent Rights article of 41 CFR 9-9.107-5(a) or 41 CFR 9-9.107-6 as appropriate, modified to identify the parties in any subcontract hereunder having as a purpose the conduct of research, development, or demonstration work. In the event of refusal by a subcontractor to accept this article, or if in the opinion of the Participant this article is inconsistent with DOE's patent policies, the Participant:

(i) Shall promptly submit written notice to the Contracting Officer setting forth reasons for the subcontractor's refusal and other pertinent information which may expedite disposition of the matter; and

(ii) Shall not proceed with the subcontract without the written authorization of the Contracting Officer.

(3) Except as may be otherwise provided in this article, the Participant shall not, in any subcontract or by using a subcontract as consideration therefor, acquire any rights in its subcontractor's Subject Invention for the Participant's own use (as distinguished from such rights as may be required solely to fulfill the Participant's Agreement obligations to the Government in the performance of this Agreement).

(4) All invention disclosures, reports, instruments, and other information required to be furnished by the subcontractor to DOE, under the provisions of a Patent Rights article in any subcontract hereunder may, in the discretion of the Contracting Officer, be furnished to the Participant for transmission to DOE.

(5) The Participant shall promptly notify the Contracting Officer in writing upon the award of any subcontract containing a Patent Rights article by identifying the subcontractor, the work to be performed under the subcontract, and the dates of award and estimated completion. Upon the request of the Contracting Officer the Participant shall furnish him a copy of the subcontract.

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

(6) The Participant shall identify all Subject Inventions of the subcontractor of which it acquires knowledge in the performance of this Agreement and shall notify the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) promptly upon the identification of the inventions.

(7) It is understood that the Government is a third party beneficiary of any subcontract article granting rights to the Government in subject inventions, and the Participant hereby assigns to the Government all rights that the Participant would have to enforce the subcontractor's obligations for the benefit of the Government with respect to Subject Inventions. The Participant shall not be obligated to enforce the agreements of any subcontractor hereunder relating to the obligations of the subcontractor to the Government regarding Subject Inventions.

K. Background Patents.

(1) "Background Patent" means a domestic patent covering an invention or discovery which is not a Subject Invention and which is owned or controlled by the Participant at any time through the completion of this Agreement:

(i) Which the Participant but not the Government, has the right to license to others without obligation to pay royalties thereon, and

(ii) Infringement of which cannot reasonably be avoided upon the practice of any specific process, method, machine, manufacture or composition of matter (including relatively minor modifications thereof) which is a subject of the research, development, or demonstration work performed under this Agreement.

(2) The Participant agrees to and does hereby grant to the Government a royalty-free, nonexclusive, license under any Background Patent for purposes of practicing a subject of this Agreement by or for the Government in research, development and demonstration work only.

(3) The Participant also agrees that upon written application by DOE, it will grant to responsible parties for purposes of practicing a subject of this Agreement, nonexclusive licenses under any

ARTICLE A-XX - PATENT RIGHTS (Cont'd)

Background Patent on terms that are reasonable under the circumstances. If however, the Participant believes that exclusive or partially exclusive rights are necessary to achieve expeditious commercial development or utilization, then a request may be made to DOE for DOE approval of such licensing by the Participant.

(4) Notwithstanding the foregoing subparagraph K.(3), the Participant shall not be obligated to license any Background Patent if the Participant demonstrates to the satisfaction of the Secretary of DOE or or his designee that:

(i) A competitive alternative to the subject matter covered by said Background Patent is commercially available or readily introducible from one or more other sources; or

(ii) The Participant or its licensees are supplying the subject matter covered by said Background Patent in sufficient quantity and at reasonable prices to satisfy market needs, or have taken effective steps or within a reasonable time are expected to take effective steps to so supply the subject matter.

L. Atomic Energy.

(1) No claim for pecuniary award or compensation under the provisions of the Atomic Energy Act of 1954, as amended, shall be asserted by the Participant or its employees with respect to any invention or discovery made or conceived in the course of or under this Agreement.

(2) Except as otherwise authorized in writing by the Contracting Officer, the Participant will obtain patent agreements to effectuate the provisions of subparagraph L.(1) of this article from all persons who perform any part of the work under this Agreement, except nontechnical personnel, such as clerical employees and manual laborers.

M. Limitation of Rights. Nothing contained in this Patent Rights article shall be deemed to give the Government any rights with respect to any invention other than a subject invention except as set forth in the Patent Rights article of this Agreement with respect to Background Patents and the Facilities License.

ARTICLE A-XXI - NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT
INFRINGEMENT

(The provisions of this article shall be applicable only if the amount of this Agreement exceeds \$10,000.)

A. The Participant shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Agreement of which the Participant has knowledge.

B. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this Agreement or out of the use of any supplies furnished or work or services performed hereunder, the Participant shall furnish to the Government when requested by the Contracting Officer, all evidence and information in possession of the Participant pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Participant has agreed to indemnify the Government.

C. This article shall be included in all subcontracts.

U. S. DEPARTMENT OF ENERGY

REPORTING REQUIREMENTS CHECKLIST

Form CR-537
(1-78)

(See Instructions on Reverse)

FORM APPROVED
OMB NO. 38R-0190

1. IDENTIFICATION Low-To-Moderate Temperature Geothermal Reservoir Site Evaluation in Arizona
2. OBLIGATION INSTRUMENT: Cooperative Agreement

REPORTING REQUIREMENTS

PROJECT MANAGEMENT	Frequency	B. TECHNICAL INFORMATION REPORTING	Frequency
1. <input type="checkbox"/> Management Plan		1. <input type="checkbox"/> Notice of Energy RD&D Project (SSIE)	
2. <input type="checkbox"/> Milestone Schedule & Status Report		2. <input checked="" type="checkbox"/> Technical Progress Report 10	S
3. <input type="checkbox"/> Cost Plan		3. <input type="checkbox"/> Topical Report	
4. <input type="checkbox"/> Manpower Plan		4. <input checked="" type="checkbox"/> Final Technical Report 10	F
5. <input checked="" type="checkbox"/> Contract Management Summary Report 5	M	C. PMS/MINI-PMS	
1. <input checked="" type="checkbox"/> Project Status Report		1. Cost Performance Report	
2. <input type="checkbox"/> Cost Management Report		<input type="checkbox"/> Format 1 WBS	
1. <input type="checkbox"/> Manpower Management Report		<input type="checkbox"/> Format 2 Functional	
1. <input checked="" type="checkbox"/> Conference Record 5	M	<input type="checkbox"/> Format 3 Baseline	
1. <input checked="" type="checkbox"/> Hot Line Report	A	<input type="checkbox"/> Format 5 Problem Analysis	
		2. <input type="checkbox"/> Cost/Schedule Status Report	
		3. <input type="checkbox"/> Management Control System Description	
		4. <input type="checkbox"/> Summary System Description	
		5. <input type="checkbox"/> WBS Dictionary	

FREQUENCY CODES: A - As Required Q - Quarterly
C - Contract Change S - Semi-Annually
F - Final (End of Contract) X - Mandatory for Delivery with Proposals/Bid
M - Monthly Y - Yearly or Upon Contract Renewal
O - One Time (Soon After Contract Award)

SPECIAL INSTRUCTIONS

Freq. Code	Definition	Due Date at DOE-ID
A - As Required		5 days after the event that initiates the report.
C - Contract Change		15 days after receipt of contract modification.
F - Final		45 days prior to the end (completion date) of the contract, submit in draft. Allow 30 days for DOE/ID comment, then submit in final format.
M - Monthly		Must be received at the Idaho Operations Office by the 15th calendar day after the end of the calendar month.
O - One Time		15 days after contract award.
S - Semi-Annually		Mail (draft format) not later than 10 working days after the end of each six months period measured from the contract start date. Allow 15 days for DOE/ID comment and then submit in final form.
X - Mandatory		With delivery of Proposals/Bid.
Y - Yearly		Within 30 days after the end of each Government fiscal year or upon contract renewal.
Q - Quarterly		Within 20 calendar days after end of calendar quarter.

ATTACHED HEREWITH:

Report Distribution List
 WBS/Reporting Category

PREPARED BY (Signature and date): *L. Mink by S. Brown 1/31/79*
7. REVIEWED BY (Signature and date): *Arthur G. Dixon R. Van 3/1/79*

U. S. DEPARTMENT OF ENERGY

PROCUREMENT/FINANCIAL ASSISTANCE REQUEST-AUTHORIZATION

1. TO Contract Negotiation Branch - ID

2. FROM INITIATING OFFICE Energy and Technology Division
Office of Geothermal Energy

3. INITIAL: [] UPDATE: [] 4. PROCUREMENT: [] FINANCIAL ASSISTANCE: []

5. PR NUMBER: _____ 6. PR CORRECTION LETTER: _____ 7. RELATED PR NUMBER: _____

ACTION IDENTIFICATION

8. TITLE: Low to Medium Temperature Geothermal Reservoir
Site Evaluation in Arizona

9. UNSOLICITED PROPOSAL NO: _____ 10. PROJECT NO: _____ 11. CFDA NO: _____

12. PRODUCT OR SERVICE: * AG3X 13. SUPPORT SERVICES: YES [] NO [X] 14. CONSULTANT AWARD: YES [] NO [X]

15. CONTROLLED DELIVERABLE: * AGY 16. REPORT/DRAWING REQ: YES [X] NO [] IF YES, ATTACH DETAILS.

17. CLASSIFICATION OF MATERIALS/WORK: U U-UNCLASSIFIED C-CONFIDENTIAL S-SECRET T-TOP SECRET

18. GOVERNMENT PROPERTY: E F-FURNISHED P-PURCHASED N-NOT INVOLVED IF CODE F OR P, ATTACH DETAILS.

AWARD PLANNING

19. AWARD AS ORDER UNDER BIN: _____ IF CODE T, _____

20. DESIRED AWARD DATE: 05 14 79 21. KIND OF AWARD ACTION: * 1Q 22. TYPE OF AWARD: * _____ ATTACH DETAILS.

23. IF MULTI-YEAR AWARD, INDICATE NUMBER OF YEARS: _____ 24. TYPE SOLICITATION INSTRUMENT: * _____

25. EXTENT OF COMPETITION: * _____ IF COMPETITIVE, ATTACH TECHNICAL EVALUATION PLAN. IF NON-COMPETITIVE, ATTACH JUSTIFICATION. REF: DOE-PR 9-3,305.51 or 9-4,909(1).

26. SOURCE SELECTION PROCEDURE: _____ 1-A-E 2-SEB 3-OTHER 4-NONE

27. FOR A-E, SHOW ESTIMATED CONSTRUCTION COST IN DOLLARS: _____

AWARDEE

IF COMPETITIVE, HAS LIST OF SOURCES BEEN ATTACHED? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28-31.

28. NAME: University of Arizona 29. ADDRESS: 2045 N. Forbes, Suite 106

30. DIVISION: AZ Bureau of Geology & Min. Tech. Tucson, AZ 85701

31. GOCO/LAB: _____ A-GOCO/LAB B-GOCO/NON-LAB C-NON-GOCO/LAB D-NOT APPLICABLE

FINANCIAL

AWARD VALUE

32. GOV'T SHARE \$129,455.00

33. TOTAL _____

34. CONSIDERATION IN KIND, LOAN, OR LOAN _____

GUARANTEE DATA REPORTED ON PR-799C: []

35. PROJECT PERIOD: FROM _____ THRU _____

36. B&R NUMBER	37. FUND CLASS	38. DOLLAR AMOUNT
<u>35-AE-10</u>	<u>X</u>	<u>\$ 34,795.00</u>
<u>AE10-02-02</u>		<u>\$ 95,000.00</u>
		<u>\$129,795.00</u>

39. FROM PR-799B (PART A) _____

40. TOTAL THIS PR _____

41. FUNDING PERIOD: FROM 01 16 79 THRU 01 16 80

42. APPROPRIATION SYMBOL: _____

43. ALLOTMENT SYMBOL: _____

44. OBJECT CLASS: _____

PROJECT MANAGER

45. NAME: Leland L. Mink

46. SIGNATURE: Leland L. Mink

47. DATE: _____ 48. OFFICE CODE: _____

49. FTS TELEPHONE NUMBER: 583-0638

PROGRAM OFFICIAL

50. NAME: R. E. Wood

51. SIGNATURE: R. E. Wood

52. DATE: _____

CERTIFYING OFFICIAL

53. NAME: F. S. Smith

I HEREBY CERTIFY THAT THE FUNDS CITED IN ITEM 40 ARE AVAILABLE.

54. SIGNATURE: _____

55. DATE: _____

* SEE BACK OF FORM FOR CODES

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. AMENDMENT/MODIFICATION NO. A001	2. EFFECTIVE DATE 7/1/79	3. REQUISITION/PURCHASE REQUEST NO. 07-79ID12009.501	4. PROJECT NO. (If applicable)
5. ISSUED BY U. S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, Idaho 83401	CODE	6. ADMINISTERED BY (If other than block 5)	CODE

7. CONTRACTOR NAME AND ADDRESS Arizona Board of Regents University of Arizona 2045 N. Forbes, Suite 106 Tucson, Arizona 85705 Attn: W. Richard Hahman, Sr.	CODE	FACILITY CODE	8. AMENDMENT OF SOLICITATION NO. <input type="checkbox"/>
(Street, city, county, state, and ZIP Code)			DATED _____ (See block 9)
			<input checked="" type="checkbox"/> MODIFICATION OF CONTRACT/ORDER NO. DE-FC07-79ID12009
			DATED 6/26/79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers is extended, is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable laws
It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

1. Add the following paragraph (4) to Article II, Description of Responsibilities:

(4) The Participant in cooperation with the U.S. Geological Survey, shall drill nine heat flow holes and perform necessary logging and testing on said holes. Total cost of this work is \$10,000.00.

2. The total estimated cost set forth under paragraph A. of Article III, Financial Support of the Project, is increased by \$44,455.00 from \$312,315.00 to \$356,970.00.

3. The amount of funds obligated under paragraph C. of Article III, Financial Support of the Project, is increased by \$130,231.00 from \$226,739.00 to \$356,970.00.

4. Article XIII, is added to the contract to read as follows:

Article XIII - GOVERNMENT PROPERTY

The following items of property to be procured or fabricated by the Participant are

Except as provided herein, all terms and conditions of the documents referenced in block 3, as heretofore changed, remain unchanged and in full force and effect.

13. <input type="checkbox"/> CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT	<input checked="" type="checkbox"/> CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN <u>2</u> COPIES TO ISSUING OFFICE
14. NAME OF CONTRACTOR/OFFEROR ARIZONA BOARD OF REGENTS Sherwood E. Carr (Signature of person authorized to sign)	17. UNITED STATES OF AMERICA R. E. Simonds (Signature of Contracting Officer)
15. NAME AND TITLE OF SIGNER (Type or print) Sherwood E. Carr, Treasurer and Contracting Officer	16. DATE SIGNED 7/24/79
18. NAME OF CONTRACTING OFFICER (Type or print) R. E. Simonds, Director Contracts Management Division	19. DATE SIGNED 7/16/79

hereby listed as Government Property:

1. Conductivity Lab consisting of following:

<u>No.</u>	<u>Quantity</u>	<u>Item</u>	<u>Approx. Prices</u>
1	2	constant temperature baths	\$ 1,500
2	1	flow-through cooler	450
3	1	multi-meter	450
4	2	sets of 5 natural quartz standards	2,500
	2	sets of 5 silica glass standards	
5	6	single-bead thermocouples	225
	8	double-bead thermocouples	
6	1	thermocouple selector switch	100
7	6	terminal blocks	50
	3	pks. terminal lugs	
8	1	frame	350
	2	hydraulic jacks	
	1	hydraulic pump	
		valves	
9		miscellaneous items	225
		hoses	
		clamps	
		insulation	
		lexan plastic	
10	1	vacuum chamber	100
11	1	vacuum pump	650
12	2	laboratory tables	1,600
	1	sink with work area	
	1	35" wide drawer/cabinet unit	
13	1	balance	125
Total			\$ 8,325

2. Temperature logging unit as follows:

<u>No.</u>	<u>Quantity</u>	<u>Item</u>	<u>Approx. Prices</u>
1	2	basic unit	\$ 4,900
		reel and 1200 ft. cable	
		DVM	450
2	1	motor driven adaptor	700
3	1	battery option	600
4	2	spare thermistors	600
5	1	spare reel	400
6	1	cable head	450
7	3,000 ft.	cable (0.70/ft.)	2,100
Total			\$ 9,750

3. Truck 4 x 4 consisting of following at an estimated price of \$10,000.
 - a. Camper shell installed.
 - b. Mounting rack and hardware for the thermal logging unit.
 - c. Lighting in cargo area.
 - d. 115 volt wiring converter.
 - e. Seat mounted for operator.
 - f. Tie down bolts for cases and accessories.
 - g. Tailgate mounted cable pulley with depth counter.
4. Diazo Machine Brunning Model PD-160 at estimated price of \$4,500.
5. Planimeter at estimated price of \$300.
6. Water level indicator at estimated price of \$140.
7. Downhole water conductivity probe at estimated price of \$1100.00.
8. Refrigeration at an estimated price of \$340.00.

1. AMENDMENT/MODIFICATION NO. MO02
2. EFFECTIVE DATE 7/11/79
3. REQUISITION/PURCHASE REQUEST NO. none
4. PROJECT NO. (If applicable) RECEIVED

5. ISSUED BY U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401
6. ADMINISTERED BY (If other than block 5)
CODE JUL 31 1979
GEOHERMAL ENERGY BRANCH

7. CONTRACTOR NAME AND ADDRESS BOARD OF REGENTS
UNIVERSITY OF ARIZONA
BABCOCK BUILDING #3313
TUCSON, ARIZONA 85721
ATTN: JAMES T. WHEELY, DIRECTOR
SPONSORED PROJECTS SERVICE
8. AMENDMENT OF SOLICITATION NO. _____
DATED _____ (See block 9)
MODIFICATION OF CONTRACT/ORDER NO. DE-EC07-79ID12009
DATED 2/26/79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS
 The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers is extended, is not extended.
Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:
(a) By signing and returning _____ copies of this amendment (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS
(a) This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.
(b) The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.
(c) This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable laws.
It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION
1. The period of performance set forth under Article V, Term of Agreement, is hereby extended from January 15, 1980, through May 31, 1980.
2. The participant is authorized to subcontract with New Mexico State University (NMSU) for Schlumberger, and telluric current electrical exploration in the White Mountains and Fort Apache Indian Reservation of Arizona in accordance with NMSU Proposal #79-10-468, incorporated herein by reference. Total cost of the subcontract is not to exceed \$33,228 and participant is to use funds from the \$54,000.00 originally designated in the Cooperative Agreement for well drilling.

Except as provided herein, all terms and conditions of the documents referenced in block 8, as herebefore changed, remain unchanged and in full force and effect.

13. CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 2 COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR ARIZONA BOARD OF REGENTS
BY *James T. Wheeler*
(Signature of person authorized to sign)
17. UNITED STATES OF AMERICA
BY *J. P. Anderson*
(Signature of Contracting Officer)

15. NAME AND TITLE OF SIGNER (Type or print) James T. Wheeler, Director
Sponsored Projects Services
16. DATE SIGNED 7/23/79
18. NAME OF CONTRACTING OFFICER (Type or print) J. P. Anderson, Chief
Contract Administration Br. CMD
19. DATE SIGNED JUL 17 1979

1. AMENDMENT/MODIFICATION NO. A003
2. EFFECTIVE DATE 1/16/80
3. REQUISITION/PURCHASE REQUEST NO. 07-80ID12009.501
4. PROJECT NO. (if applicable)

ISSUED BY CODE
U. S. Department of Energy
Idaho Operations Office
550 Second Street
Idaho Falls, Idaho 83401

5. ADMINISTERED BY (If other than block 5)
RECEIVED
APR 9 1980

CONTRACTOR NAME AND ADDRESS CODE FACILITY CODE
Arizona Board of Regents
University of Arizona
2045 N. Forbes, Suite 106
Tucson, Arizona 85705
Attn: James T. Wheeler, Director
Sponsored Project Service

GEOHERMAL ENERGY
 AMENDMENT OF SOLICITATION NO.
DATED (See block 9)
 MODIFICATION OF CONTRACT/ORDER NO. DE-FC07-79ID12009
DATED 6-26-79 (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS
 The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers is extended, is not extended.
Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:
(a) By signing and returning _____ copies of this amendment (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment number. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

1. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS
(a) This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.
(b) The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.
(c) This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable Laws.
It modifies the above numbered contract as set forth in block 12.

2. DESCRIPTION OF AMENDMENT/MODIFICATION
1. Add the following paragraph (5) to Article II, Description of Responsibilities:
(5) The Participant shall continue the Low-to-Moderate Temperature Geothermal Site Evaluation in the State of Arizona in accordance with Attachment I to this Modification.
2. The total estimated cost set forth under Paragraph A. of Article III, Financial Support of the Project, is increased by \$300,000 from \$356,970 to \$656,970.
3. The amount of funds obligated under Paragraph C. of Article III, Financial Support of the Project, is increased by \$300,000 from \$356,970 to \$656,970. The total amount obligated includes \$226,739 obligated by the original contract, \$130,231 obligated by Modification No. A001, and \$300,000 obligated by this Modification No. A003.
4. The period of performance set forth under Article V, Term of Agreement, as previously extended by Modification No. M002 to May 15, 1980, is hereby further extended to January 15, 1981. The period of performance for work under this
--continued

See as provided herein, all terms and conditions of the documents referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 3 COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR ARIZONA BOARD OF REGENTS
BY Sherwood E. Carr
(Signature of person authorized to sign)

17. UNITED STATES OF AMERICA
BY Neil W. Fraser
(Signature of Contracting Officer)

15. NAME AND TITLE OF SIGNER (Type or print)
Sherwood E. Carr, Treasurer and Contracting Officer

16. DATE SIGNED
1/31/80

18. NAME OF CONTRACTING OFFICER (Type or print)
Neil W. Fraser, Director
Contracts Management Division

19. DATE SIGNED
2/5/80

MODIFICATION NO. A003 (cont'd)
CONTRACT NO. DE-FC07-79ID12009

12. Description of Amendment/Modification (cont'd)

Modification No. A003 is from January 16, 1980, through January 15, 1981.

5. Article XIV is added to the contract to read as follows:

"ARTICLE XIV - DATE OF INCURRENCE OF COSTS

The Contractor shall be entitled to reimbursement for costs incurred in an amount not to exceed \$51,000 on or after January 16, 1980, which if incurred after this modification had been entered into, would have been reimbursable under the provisions of this modification."

6. Paragraph A. of Article VII, Project Information is revised to read as follows:

A. Reports for work under this Modification No. A003 shall be submitted as shown on the attached DOE Form CR-537.

REPORTING REQUIREMENTS CHECKLIST

DOE Form CR-537
(1-78)

(See Instructions on Reverse)

FORM APPROVED
OMB NO. 38R-0190

1. IDENTIFICATION: Low-to-Moderate Temperature Geothermal Site Evaluation in Arizona	2. OBLIGATION INSTRUMENT: Modification No. A003 Cooperative Agreement No. DE-FC07-79ID12009
--	---

3. REPORTING REQUIREMENTS

A. PROJECT MANAGEMENT	Frequency	B. TECHNICAL INFORMATION REPORTING	Frequency
1. <input type="checkbox"/> Management Plan		1. <input checked="" type="checkbox"/> Notice of Energy RD&D Project (SSIE)	O
2. <input type="checkbox"/> Milestone Schedule & Status Report		2. <input checked="" type="checkbox"/> Technical Progress Report	Q
3. <input type="checkbox"/> Cost Plan		3. <input checked="" type="checkbox"/> Topical Report	Y
4. <input type="checkbox"/> Manpower Plan		4. <input checked="" type="checkbox"/> Final Technical Report	F
5. <input checked="" type="checkbox"/> Contract Management Summary Report	M	C. PMS/MINI-PMS	
6. <input checked="" type="checkbox"/> Project Status Report	M		
7. <input type="checkbox"/> Cost Management Report			
8. <input type="checkbox"/> Manpower Management Report			
9. <input checked="" type="checkbox"/> Conference Record	A		
10. <input checked="" type="checkbox"/> Hot Line Report	A	1. Cost Performance Report:	
		<input type="checkbox"/> Format 1 WBS	
		<input type="checkbox"/> Format 2 Functional	
		<input type="checkbox"/> Format 3 Baseline	
		<input type="checkbox"/> Format 5 Problem Analysis	
		2. <input type="checkbox"/> Cost/Schedule Status Report	
		3. <input type="checkbox"/> Management Control System Description	
		4. <input type="checkbox"/> Summary System Description	
		5. <input type="checkbox"/> WBS Dictionary	

FREQUENCY CODES: A - As Required Q - Quarterly
 C - Contract Change S - Semi-Annually
 F - Final (End of Contract) X - Mandatory for Delivery with Proposals/Bid
 M - Monthly Y - Yearly or Upon Contract Renewal
 O - One Time (Soon After Contract Award)

4. SPECIAL INSTRUCTIONS

Submit all reports to the DOE Program Officer at Idaho Operations Office (ID) as indicated below:

A.5 and 6 - Six copies are due at ID within fifteen days after end of the calendar month.

B.1 - Two copies are due at ID within fifteen days after Cooperative Agreement Award.

B.2 - Six copies are due at ID within fifteen days after end of the calendar quarter.

B.3 - Six copies are due not less than forty-five days prior to completion of the yearly term.

B.4 - Submit in draft forty-five days prior to completion date of Cooperative Agreement. After thirty days for DOE review, submit eleven copies including one camera-ready copy.

5. ATTACHED HEREWITH:

Report Distribution List

WBS/Reporting Category

6. PREPARED BY (Signature and date):	7. REVIEWED BY (Signature and date): <i>QC [Signature] 1-25-80</i>
--------------------------------------	---

REPORTING REQUIREMENTS CHECKLIST

PURPOSE

A checklist to identify and communicate additional reporting requirements which are not otherwise set forth in the General Purpose clauses of DOE contracts and agreements. It will be included as part of the contract or agreement. This form will be completed for each proposed contract or agreement and can be modified as required in Special Instructions to adapt it to a specific situation.

INSTRUCTIONS

Item 1 - Enter the title as indicated in the Procurement Request, Interagency Agreement, or Initiating Memorandum.

Item 2 - Enter the identification number of the Procurement Request or Interagency Agreement, the date of the memorandum, and contract number after award.

Item 3 - Check spaces to indicate plans and reports required. For each reporting requirement checked, indicate frequency of delivery in column provided using one of the frequency codes shown.

- 3.A.1 Management Plan** - The contractor's plan to manage the effort described in the statement of work or similar document. It will contain management methodologies, control systems, and procedures he will use. Includes milestones and other planning schedules, organizational identification and descriptions, and special and critical plans, such as test plans, plans for handling of Government owned property. Work breakdown structures, key personnel identification, and methods for monitoring progress toward objectives may be required.
- 3.A.2 Milestone Schedule and Status Report** - The contractor's milestone schedule for all work breakdown structure items, line items, or deliverables specified in the contract. Updated periodically (usually monthly) with status, progress toward completion, and percent completion of each line item and of the total contract.
- 3.A.3 Cost Plan** - A baseline plan for incurring costs on a contract or agreement to measure progress in terms of cost; update and forecast contract fund requirements; plan funding changes; and develop fund requirements and budget estimates.
- 3.A.4 Manpower Plan** - A baseline plan to allocate manpower to each reporting category identified in the contract or agreement.
- 3.A.5 Contract Management Summary Report** - A single-page graphic presentation of integrated cost, major milestones, and manpower for rapid visual analysis and trend forecasting.
- 3.A.6 Project Status Report** - A periodic report to communicate to DOE management an assessment of contract status, to explain variances and problems, and to discuss any other areas of concern or achievements.
- 3.A.7 Cost Management Report** - A periodic report of the status of costs compared to the Cost Plan. Data is used to: report actual and projected accrued costs; evaluate performance against plan; identify actual and potential problem areas; construct cost experience for projects and budgeting efforts; and, to verify the reasonableness of contractors' invoices.
- 3.A.8 Manpower Management Report** - A periodic report of the status of actual and projected manpower expenditure against the Manpower Plan. Data is used to evaluate performance against plan; identify actual and potential problem areas; and to construct manpower experience for projections and planning efforts.
- 3.A.9 Conference Record** - Documentation of the contractor's understanding of significant decisions, direction or redirection or required actions resulting from any meeting with DOE representatives.
- 3.A.10 Hot-Line Report** - A hardcopy report by the fastest means available, (TWX, etc) documenting critical problems, emergency situations, and important technical breakthroughs.

3.B.1 Notice of Energy R&D Project - A formatted, two-page report to provide information on unclassified DOE R&D projects for dissemination to the scientific, technical, and industrial communities and to the public. Also provides information to the Smithsonian Scientific Information Exchange.

3.B.2 Technical Progress Report - A formal, structured technical report, submitted periodically to communicate project results for dissemination to Government agencies, the scientific, technical and industrial communities and the public.

3.B.3 Topical Report - A special technical report prepared when a project has reached a point at which a major milestone or a significant phase has been completed, when unexpected results have been achieved, when it is logical to summarize results achieved, or when a new scientific or technological finding is deemed to warrant prompt publication.

3.B.4 Final Technical Report - Technical Progress Report reporting final results of DOE supported R&D and scientific projects.

3.C PMS/Mini-PMS

1) Cost Performance Report (PMS Application)

Format 1 - Reports current period and cumulative budget, actual costs and earned value data by work breakdown structure elements, identifies cost and schedule variances and provides contractor's estimate to complete comparisons to budgets.

Format 2 - Reports current period and cumulative budget, actual costs, and earned value data by contractor functional elements.

Format 3 - Provides periodic updating to the established performance measurement baseline. Incorporates authorized contract changes and internal re-planning into the performance measurement baseline.

Format 5 - Provides a narrative analysis of contract variances.

Cost/Schedule Report (Mini-PMS Application) - Periodic, usually monthly, report of cumulative budget, actual costs and earned value by summary work breakdown structure elements. Identifies cost and schedule variances and provides contractor's estimate to complete comparisons to budgets.

3) System Description (PMS Application) - Contractor's description of the management control system to be used in performing contract work. Must address all elements of the PMS criteria.

4) Summary System Description (Mini-PMS Application) - Contractor's summarized description of the management control system to be used in performing contract work.

5) WBS Dictionary - Lists and defines work breakdown structure. For more detailed instructions see PMS Manual.

Frequency Codes - Each code must have an identified time period (i.e., As Required - 5 days after event occurrence). These time periods are suggested in the solicitation and negotiated at contract award.

Item 4 - Identify any special reporting requirements not indicated in Item 3 and/or qualifiers to those selected. (Use additional sheets as necessary.)

Item 5 - Check appropriate blocks.

Report Distribution List - A comprehensive informative listing of reports by frequency of submission, addresses and number of copies for each addressee.

Reporting Categories (level of detail) - An identification by WBS level of task elements for which reporting will be required by DOE.

Item 6 - Signature of person or persons preparing the checklist and the date prepared. Preparation is by person or persons responsible for preparation of Procurement Request or Statement of Work.

Item 7 - Signature of the person reviewing the checklist and date reviewed.

Modification A003
Cooperative Agreement No.
DE-FC07-79ID12009

STATEMENT OF WORK

During the period from January 16, 1980 through January 15, 1981, the Participant shall perform the following tasks:

Task 1 - Avra Valley

- Compile existing geoscience information for the area including warm well and spring locations, depth temperature and geochemistry. Collect and analyze up to 20 water samples for warm wells greater than 30°C.; log all available wells for bottom hole temperatures, compute thermal gradients, and where core is available, obtain thermal conductivity and heat-flow calculations. Develop a report of the interpretation of data and develop maps depicting geoscience information for the area.

Task 2 - Arizona Hot Springs

- Location, geochemical sampling and water temperatures will be obtained for all Arizona hot springs and the results will be published. All information will be sent to the USGS Geotherm files for incorporation.

Task 3 - Clifton and Gillard Hot Springs

- Geologic structural mapping will be completed in the Clifton area. All available wells and springs will be tested for bottom hole temperatures and thermal gradients, up to 30 water samples will be collected and analyzed. Age dating of ash-flow tuffs and rhyolite intrusives will be completed. A report of the findings from previous work plus this years' effort will be developed.

Task 4 - Heat Flow

- Conduct a state-wide heat flow program for all available wells from which core is available. Obtain bottom hole temperatures, and compute thermal gradients. Compile a heat flow map of Arizona using all available data to date.

Task 5 - Northern Hassayampa Plain

- Conduct a reconnaissance gravity survey over a 140 square mile area. Develop an interpretation of the substructural geology based on the gravity data and other available surface and subsurface structural information. Produce a gravity map of the surveyed area. Conduct a geologic mapping survey of the Belmont Mountains at a 1:24,000 scale. Complete a mercury survey of the reconnaissance area; develop a map of the survey results and interpretations. Collect and analyze about 30

Task 5 - Northern Hassayampa Plain (Cont'd)

water samples from warm wells; obtain bottomhole temperatures and calculate thermal gradients. Develop a report on the geothermal potential of the Hassayampa Plain based on above data, and other available geoscience information.

Task 6 - Reconnaissance

- Collect and analyze water samples from hot wells in areas not previously studied under this contract. Obtain location, well depth, bottom hole temperatures and calculate thermal gradients for all available wells. Compile all available lithologic, structural, geochemical, and geophysical data for each area of significant geothermal potential based on thermal gradient and other information. Supply USGS Geotherm file with all new information.

Task 7 - Papago and Yuma

- Collect, analyze, and interpret all geologic, geochemical, and geophysical data available in the Yuma and Papago Indian Reservation areas. Log all available water wells for location, well depth, bottom hole temperatures, and convert to heat flow holes where possible. Collect and analyze approximately 60 water samples from selected warm wells. Prepare a report of the geothermal potential of the area based on the geoscience information collected.

Task 8 - San Pedro Valley

- Conduct same program as outlined in task 7 with the exception that only 15 water samples will be collected, and maps will be generated based on available geoscience information.

Task 9 - Safford - San Simon Area

- Conduct same program as outlined in Task 7 with the exception that only 30 water samples will be collected. In addition, a detailed structural map of the basin will be completed, and all available gravity data will be collected. Comparison of structural information and gravity data will be performed, and the basin structure will be modeled using the gravity and surface structural information. A report will be prepared about the findings in the basin.

Task 10 - Tucson Area

- Conduct same programs as outlined in Tasks 7 and 9.

Task 11 - Preliminary Resource Assessment Map

As per the proposal, the Arizona team will assist NOAA in the preparation of a Resource Assessment Map (1:500,000 scale) for public distribution. The map will contain, but not be limited to the following elements: location of wells and springs greater than 30°C. in temperature, geochemistry. Well depth, geothermometry, flow rate, volcanism, KGRA's, physiographic boundaries, and heat flow. All available information to date shall be incorporated. A descriptive pamphlet or legend will accompany the map for explanations and further details.

U. S. DEPARTMENT OF ENERGY
PROCUREMENT/FINANCIAL ASSISTANCE REQUEST-AUTHORIZATION

1. TO: J. P. Anderson, Chief, Contract Administration Branch
2. FROM INITIATING OFFICE: R. E. Wood, Director, Energy Technology Div

3. INITIAL: UPDATE: 4. PROCUREMENT: FINANCIAL ASSISTANCE:
5. PR NUMBER: _____ 6. PR CORRECTION LETTER: _____ 7. RELATED PR NUMBER: _____

ACTION IDENTIFICATION
3. TITLE: Low - to Moderate - Temperature Geothermal
Reserve Site Evaluation in Arizona

9. UNSOLICITED PROPOSAL NO: _____ 10. PROJECT NO: _____ 11. CFOA NO: _____
12. PRODUCT OR SERVICE: AGS 13. SUPPORT SERVICES: YES NO 14. CONSULTANT AWARD: YES NO
15. CONTROLLED DELIVERABLE: AGS 16. REPORT/DRAWING REQ: YES NO IF YES, ATTACH DETAILS.
17. CLASSIFICATION OF MATERIALS/WORK: U U - UNCLASSIFIED C - CONFIDENTIAL S - SECRET T - TOP SECRET
18. GOVERNMENT PROPERTY: F - FURNISHED P - PURCHASED N - NOT INVOLVED IF CODE FOR P, ATTACH DETAILS.

AWARD PLANNING
19. AWARD AS ORDER UNDER BIN: DE-FC07-79ID12009
20. DESIRED AWARD DATE: 01 16 80 21. KIND OF AWARD ACTION: IP 22. TYPE OF AWARD: X IF CODE T, ATTACH DETAILS.
23. IF MULTI-YEAR AWARD, INDICATE NUMBER OF YEARS: _____ 24. TYPE SOLICITATION INSTRUMENT: _____
25. EXTENT OF COMPETITION: _____ IF COMPETITIVE, ATTACH TECHNICAL EVALUATION PLAN. IF NON-COMPETITIVE, ATTACH JUSTIFICATION. REF: DOE-PR 9-3,305.51 or 9-4,909(+).
26. SOURCE SELECTION PROCEDURE: 4 1 - A-E 2 - SEB 3 - OTHER 4 - NONE
27. FOR A-E, SHOW ESTIMATED CONSTRUCTION COST IN DOLLARS: _____

AWARDEE
IF COMPETITIVE, HAS LIST OF SOURCES BEEN ATTACHED? YES NO IF NON-COMPETITIVE, COMPLETE 28-31.
32. NAME: University of Arizona ADDRESS: Tucson ARIZONA
33. DIVISION: Bureau of Geology and Mineral Technology 85721
34. GOCO/LAB: A - GOCO/LAB B - GOCO/NON-LAB C - NON-GOCO/LAB D - NOT APPLICABLE

FINANCIAL AWARD VALUE
2. GOV'T SHARE: \$ 300,000
3. TOTAL: \$ 300,000
4. CONSIDERATION IN KIND, LOAN, OR LOAN GUARANTEE DATA REPORTED ON PR-799C:
5. PROJECT PERIOD: FROM 01 16 80 THRU 01 15 81

CURRENT FY FUNDS COMMITTED

34. B&R NUMBER	37. FUND CLASS	38. DOLLAR AMOUNT
<u>AM-15-10</u>		<u>300,000</u>
-----		-----
-----		-----

6. FROM PR-799B (PART A): _____
7. TOTAL THIS PR: 300,000
8. FUNDING PERIOD: FROM 01 16 80 THRU 01 15 81
9. APPROPRIATION SYMBOL: _____
10. ALLOTMENT SYMBOL: _____
11. OBJECT CLASS: _____

* SEE BACK OF FORM FOR COOFS

PROJECT MANAGER
45. NAME: L.L. Mink
46. SIGNATURE: L.L. Mink
47. DATE: 12 28 79 48. OFFICE CODE: _____
49. FTS TELEPHONE NUMBER: 583-0638

PROGRAM OFFICIAL
50. NAME: R E Wood
51. SIGNATURE: R E Wood
52. DATE: 12 28 79

CERTIFYING OFFICIAL
53. NAME: _____
I HEREBY CERTIFY THAT THE FUNDS CITED IN ITEM 40 ARE AVAILABLE.
54. SIGNATURE: _____
55. DATE: _____

M. Hidmayer

JAN 03 1980

RECEIVED

JAN 7 1980

GEOTHERMAL ENERGY
BRANCH

Board of Regents
University of Arizona
Bureau of Geology and Mineral Technology
Babcock Building No. 3313
Tucson, Arizona 85721

Attention: James T. Wheeler

SUBJECT: MODIFICATION NO. A003 COOPERATIVE AGREEMENT NO. DE-FC07-79ID12009

Gentlemen:

You are hereby authorized effective January 16, 1980, to begin work and incur costs up to a maximum of \$51,000 under proposed Modification No. A003 to the subject cooperative agreement pending execution of the formal modification. Work is to be performed in accordance with Attachment I to this letter.

The resulting modification will include the following article:

"Date of Incurrence of Costs - The Contractor shall be entitled to reimbursement for costs incurred in an amount not to exceed \$51,000 on or after January 16, 1980, which, if incurred after this modification had been entered into, would have been reimbursable under the provisions of this modification."

In the event the Participant and the Government are unable to reach agreement and a modification is not executed, the Government shall not be liable for any obligations arising out of this letter.

Please indicate your acceptance of this action by signing in the space indicated below and returning one copy to this office.

Board of Regents

- 2 -

JAN 09 1980

If you have any questions, please contact J. O. Lee of my staff at telephone 208-526-1838.

Very truly yours,

Original Signed By

A. P. Anderson

J. P. Anderson

Contracting Officer

Chief, Contract Administration Branch

Contracts Management Division

ACCEPTED:

Name _____

Title _____

Date _____

bcc: M. A. Widmayer
E. G. Jones

CAB
JOLee:ak
1-2-80

P&B
FSSmith

FMD
EGJones

CAB
JPAnderson

Modification A003
Cooperative Agreement No.
DE-FC07-79ID12009

STATEMENT OF WORK

During the period from January 16, 1980 through January 15, 1981, the Participant shall perform the following tasks:

Task 1 - Avra Valley

- Compile existing geoscience information for the area including warm well and spring locations, depth temperature and geochemistry. Collect and analyze up to 20 water samples for warm wells greater than 30°C.; log all available wells for bottom hole temperatures, compute thermal gradients, and where core is available, obtain thermal conductivity and heat-flow calculations. Develop a report of the interpretation of data and develop maps depicting geoscience information for the area.

Task 2 - Arizona Hot Springs

- Location, geochemical sampling and water temperatures will be obtained for all Arizona hot springs and the results will be published. All information will be sent to the USGS Geotherm files for incorporation.

Task 3 - Clifton and Gillard Hot Springs

- Geologic structural mapping will be completed in the Clifton area. All available wells and springs will be tested for bottom hole temperatures and thermal gradients, up to 30 water samples will be collected and analyzed. Age dating of ash-flow tuffs and rhyolite intrusives will be completed. A report of the findings from previous work plus this years' effort will be developed.

Task 4 - Heat Flow

- Conduct a state-wide heat flow program for all available wells from which core is available. Obtain bottom hole temperatures, and compute thermal gradients. Compile a heat flow map of Arizona using all available data to date.

Task 5 - Northern Hassayampa Plain

- Conduct a reconnaissance gravity survey over a 140 square mile area. Develop an interpretation of the substructural geology based on the gravity data and other available surface and subsurface structural information. Produce a gravity map of the surveyed area. Conduct a geologic mapping survey of the Belmont Mountains at a 1:24,000 scale. Complete a mercury survey of the reconnaissance area; develop a map of the survey results and interpretations. Collect and analyze about 30

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Task 5 - Northern Hassayampa Plain (Cont'd)

water samples from warm wells; obtain bottomhole temperatures and calculate thermal gradients. Develop a report on the geothermal potential of the Hassayampa Plain based on above data, and other available geoscience information.

Task 6 - Reconnaissance

- Collect and analyze water samples from hot wells in areas not previously studied under this contract. Obtain location, well depth, bottom hole temperatures and calculate thermal gradients for all available wells. Compile all available lithologic, structural, geochemical, and geophysical data for each area of significant geothermal potential based on thermal gradient and other information. Supply USGS geothermal file with all new information.

Task 7 - Papago and Yuma

- Collect, analyze, and interpret all geologic, geochemical, and geophysical data available in the Yuma and Papago Indian Reservation areas. Log all available water wells for location, well depth, bottom hole temperatures, and convert to heat flow holes where possible. Collect and analyze approximately 60 water samples from selected warm wells. Prepare a report of the geothermal potential of the area based on the geoscience information collected.

Task 8 - San Pedro Valley

- Conduct same program as outlined in task 7 with the exception that only 15 water samples will be collected, and maps will be generated based on available geoscience information.

Task 9 - Safford - San Simon Area

- Conduct same program as outlined in Task 7 with the exception that only 30 water sampled will be collected. In addition, a detailed structural map of the basin will be completed, and all available gravity data will be collected. Comparison of structural information and gravity data will be performed, and the basin structure will be modeled using the gravity and surface structural information. A report will be prepared about the findings in the basin.

Task 10 - Tucson Area

- Conduct same programs as outlined in Tasks 7 and 9.

Task 11 - Preliminary Resource Assessment Map

As per the proposal, the Arizona team will assist NOAA in the preparation of a Resource Assessment Map (1:500,000 scale) for public distribution. The map will contain, but not be limited to the following elements: location of wells and springs greater than 30°C. in temperature, geo-chemistry. Well depth, geothermometry, flow rate, volcanism, KGRA's, physiographic boundaries, and heat flow. All available information to date shall be incorporated. A descriptive pamphlet or legend will accompany the map for explanations and further details.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. AMENDMENT/MODIFICATION NO. A004	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO. 07-811D12009.501	4. PROJECT NO. (If applicable)
ISSUED BY U. S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, Idaho 83401	CODE	5. ADMINISTERED BY (If other than block 5)	CODE

CONTRACTOR NAME AND ADDRESS Arizona Board of Regents University of Arizona 2045 N. Forbes, Suite 106 Tucson, Arizona 85705 Attn: James T. Wheeler, Director Sponsored Project Service	CODE	FACILITY CODE	6. AMENDMENT OF SOLICITATION NO. <input type="checkbox"/>	DATED (See block 9)
			7. MODIFICATION OF CONTRACT/ORDER NO. DE-FC07-79ID12009	DATED 1-16-79 (See block 11)

THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers is extended, is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable Laws.
It modifies the above numbered contract as set forth in block 12.

DESCRIPTION OF AMENDMENT/MODIFICATION

- The total estimated cost set forth under Paragraph A. of Article III, FINANCIAL SUPPORT OF THE PROJECT, is increased by \$6,000 from \$656,970 to \$662,970.
- The amount of funds obligated under Paragraph C. of Article III, FINANCIAL SUPPORT OF THE PROJECT, is increased by \$6,000 from \$656,970 to \$662,970. The total amount obligated includes \$226,739 obligated by the original contract, \$130,231 obligated by Modification No. A001, \$300,000 obligated by Modification No. A003, and \$6,000 obligated by this Modification No. A004.

As provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 3 COPIES TO ISSUING OFFICE

NAME OF CONTRACTOR/OFFEROR ARIZONA BOARD OF REGENTS	17. UNITED STATES OF AMERICA
<i>James T. Wheeler</i> (Signature of person authorized to sign)	BY <i>Nell W. Fraser</i> (Signature of Contracting Officer)
NAME AND TITLE OF SIGNER (Type or print) James T. Wheeler, Assistant Vice President University of Arizona, Sisco Bldg. Rm. #3313 Tucson, Arizona 85721	18. NAME OF CONTRACTING OFFICER (Type or print) Nell W. Fraser, Director Contracts Management Division
16. DATE SIGNED JAN 21 1981	19. DATE SIGNED JAN 23 1981

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

AMENDMENT/MODIFICATION NO. A005	2. EFFECTIVE DATE 1-16-81	3. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. (If applicable)
ISSUED BY S. Department of Energy Idaho Operations Office 50 Second Street Idaho Falls, Idaho 83401	CODE	6. ADMINISTERED BY (If other than block 5)	CODE File M. 2.1

CONTRACTOR NAME AND ADDRESS Arizona Board of Regents University of Arizona 2045 N. Forbes, Suite 106 Tucson, Arizona 85705 Attn: James T. Wheeler, Director Sponsored Project Service	CODE	FACILITY CODE	8. AMENDMENT OF SOLICITATION NO. <input type="checkbox"/>
			DATED (See block 9)
			<input checked="" type="checkbox"/> MODIFICATION OF CONTRACT/ORDER NO. DE-FC07-79ID12009
			DATED 6-26-79 (See block 11)

THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers is extended, is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) This Change Order is issued pursuant to _____
 The Changes set forth in block 12 are made to the above numbered contract/order.

(b) The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) This Supplemental Agreement is entered into pursuant to authority of Public Law 95-91, and other applicable laws.
 It modifies the above numbered contract as set forth in block 12.

DESCRIPTION OF AMENDMENT/MODIFICATION

Add the following paragraph (6) to Article II, Description of Responsibilities:

"(6) The Participant shall continue the Low-to-Moderate Temperature Geothermal Site Evaluation in the State of Arizona in accordance with Attachment I to this Modification."

The total estimated cost set forth under Paragraph A. of Article III, Financial Support of the Project, is increased by \$275,918 from \$662,970 to \$938,888. The Participant will contribute \$1,000 to funding of this cost.

The amount of funds obligated under Paragraph C. of Article III, Financial Support of the Project, is increased by \$274,918 from \$662,970 to \$937,888. The total amount obligated includes \$226,739 obligated by the original contract, \$130,231 obligated by Modification No. A001, \$300,000 obligated by Modification No. A003, \$6,000 obligated by Modification No. A004, and \$274,918 obligated by this Modification No. A005.

The period of performance set forth under Article V, Term of Agreement, as previously extended by Modification No. M003 to January 15, 1981, is hereby further

--Continued

As provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 3 COPIES TO ISSUING OFFICE

NAME OF CONTRACTOR/OFFEROR ARIZONA BOARD OF REGENTS	17. UNITED STATES OF AMERICA
<i>James T. Wheeler</i> (Signature of person authorized to sign)	BY <i>Neil W. Fraser</i> (Signature of Contracting Officer)
NAME AND TITLE OF SIGNER (Type or print) James T. Wheeler, Treasurer and Contracting Officer	16. DATE SIGNED 2/12/81
	18. NAME OF CONTRACTING OFFICER (Type or print) Neil W. Fraser
	19. DATE SIGNED FEB 23 1981

12. Description of Amendment/Modification (Cont'd)

extended to January 15, 1982. The period of performance for work under this Modification No. A005 is from January 16, 1981, through January 15, 1982.

5. Article XV is added to the contract to read as follows:

"ARTICLE XV - DATE OF INCURRENCE OF COSTS

The Participant shall be entitled to reimbursement for costs incurred in an amount not to exceed \$50,000 on or after January 16, 1981, which if incurred after this modification had been entered into, would have been reimbursable under the provisions of this modification."

6. Article VII, Project Information is amended to add the following:

"Reports for work under this Modification No. A005 shall be prepared and submitted in accordance with the Statement of Work in Attachment I including the DOE Form CR-537."

Modification A005
Cooperative Agreement No.
DE-FC07-79ID12009

STATEMENT OF WORK

During the period from January 16, 1981 through January 15, 1982, the Participant shall perform the following work:

1. Thermal Gradient Studies.

Temperature measurements will be obtained from wells of opportunity to determine thermal gradient information. Rock thermal conductivity and heat flow data will be obtained from wells with cuttings or core samples. Water chemistry will be determined on select wells throughout the state. Data will be tabulated in a final report.

2. Colorado Plateau and Transition Zone.

All well information such as well location, depth, and temperature will be collected from this study area in Arizona. All known geological, geophysical, and geochemical information will be collated as part of the reconnaissance work in the study area. Available water wells will be temperature logged; heat flow calculations will be made where core samples or chips are available; and water samples will be collected from selected wells for chemical analysis.

Maps will be produced of the area showing geothermal gradients, heat flow, and depths to warm-water aquifers. A summary report will be prepared on the geology, geophysics, and geochemistry of the study area as these data relate to geothermal potential.

3. Phoenix Area.

Studies in the Phoenix area will be similar to those outlined in Task 2. A geothermal gradient map, scale 1:250,000, and a summary report of the geothermal potential of the study area will be produced.

4. Tucson Area.

Studies in the Tucson area will be similar to those outlined in Task 2. A geothermal gradient map, scale 1:250,000, and a summary report of the geothermal potential of the study area will be produced.

5. Willcox Area.

Studies in the Willcox area will be similar to those outlined in Task 2. Available gravity data will be compiled and used to model depth to

bedrock in the basin. A gravity map, a geothermal gradient map, and a depth-to-bedrock map will be generated at a 1:62,500 scale. A summary report of the geology, geophysics, geochemistry, and computer modeling will be produced.

6. Safford Area.

Seven bore holes will be drilled to \pm 200 feet in the Safford area for heat flow determinations. Holes will be cased with small diameter pipe, allowed to equilibrate, and temperature logs will be run. Cuttings and/or core from the holes will be used to determine thermal conductivity for heat flow calculations. The drilling will follow all state and federal regulations pertaining to drilling heat flow holes. A report containing all logs, data, and interpretations of the geothermal potential of the Safford area will be produced as a final product.

7. Reporting requirements will be satisfied as outlined in the attached DOE Form CR-537 which is made part of this Modification. Arizona State resource maps produced as part of this cooperative agreement will be distributed free of charge.

1. AMENDMENT/MODIFICATION NO. **M006** 2. EFFECTIVE DATE _____ 3. REQUISITION/PURCHASE REQUEST NO. **07-82ID12009.501** 4. PROJECT NO. (If applicable) _____

5. ISSUED BY **U. S. Department of Energy** 6. ADMINISTERED BY (If other than block 5) _____
Idaho Operations Office CODE _____
550 Second Street
Idaho Falls, Idaho 83401

7. CONTRACTOR NAME AND ADDRESS CODE _____ FACILITY CODE _____

Arizona Board of Regents
University of Arizona
 (Street, city, county, state, and ZIP Code) **2045 N. Forbes, Suite 106**
Tucson, Arizona 85705
Attn: James T. Wheeler, Director
Sponsored Project Service

8. AMENDMENT OF SOLICITATION NO. _____
 DATED _____ (See block 9)
 MODIFICATION OF CONTRACT/ORDER NO. **DE-FC07-79ID12009**
 DATED **6-26-79** (See block 11)

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers is extended, is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA (If required)

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) This Change Order is issued pursuant to _____
 The changes set forth in block 12 are made to the above numbered contract/order.

(b) The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) This Supplemental Agreement is entered into pursuant to authority of **Article V of the Agreement.**
 It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION

The period of performance set forth in ARTICLE V - TERM OF AGREEMENT is hereby extended through March 31, 1982.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN **2** COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR 17. UNITED STATES OF AMERICA

BY **James T. Wheeler** BY **Kent R. Hastings**
 (Signature of person authorized to sign) (Signature of Contracting Officer)

15. NAME AND TITLE OF SIGNER (Type or print) 16. DATE SIGNED 18. NAME OF CONTRACTING OFFICER (Type or print) 19. DATE SIGNED

James T. Wheeler, Assistant Vice President **NOV 10 1981** **Kent R. Hastings** **11/3/81**
 Attn: By: 1A Home Bldg. Rm. #3313
 Tucson, Arizona 85721