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HEBER GEOTHERMAL BINARY DEMONSTRATION PROJECT

QUARTERLY TECHNICAL PROGRESS REPORT FOR THE PERIOD APRIL 1, 1981 - JUNE 30, 1981

San Diego Gas & Electric
Post Office Box 1831
San Diego, California 92112

Prepared for
The Department of Energy
Under Cooperative Agreement No. DE-FC03-80RA50239

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Date Published
September 1981

By
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DISCLAIMER

ABSTRACT

The purpose of this quarterly technical progress report is to document work completed on the nominal 65 Megawatt (Mwe gross) Heber Geothermal Binary Demonstration Project, located at Heber, California, during the period of April 1, 1981, through June 30, 1981. The work was performed by San Diego Gas & Electric Company under the support and cooperation of the U. S. Department of Energy, the Electric Power Research Institute, the Imperial Irrigation District, the California Department of Water Resources, and the Southern California Edison Company. Topics covered in this quarterly report include progress made in the areas of Wells and Fluid Production and Injection Systems, Power Plant Design and Construction, Power Plant Demonstration, and Data Acquisition and Dissemination.

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SUMMARY

Recognizing the desirability of demonstrating the operation of the binary cycle process for commercial-scale electric production, San Diego Gas & Electric Company (SDG&E), the United States Department of Energy (DOE), the Electric Power Research Institute (EPRI), and a consortium of utilities including the California Department of Water Resources (DWR), the Imperial Irrigation District (IID), and the Southern California Edison Company (SCE) joined together to carry out the Heber Geothermal Binary Demonstration Project.

The purpose of the Heber Binary Project is to design, construct, and operate a nominal 65 Mwe (gross) commercial-scale, binary cycle power plant and to demonstrate the technical and economic feasibility of geothermal power generation. The Project will be the first commercial-scale hydrothermal generating facility in the United States utilizing liquid-dominated resources and the binary energy conversion process. It is expected that information developed by this demonstration project will be applicable to a wide range of moderate-temperature, low-salinity hydrothermal reservoirs. Geothermal generation from the Project offers the possibility of displacing 525,000 barrels of oil per year that would otherwise have to be burned in Southern California. Figure 1 shows an artist's rendering of the Project and Figure 2 shows the location.

This quarterly report describes progress for the period April 1, 1981, through June 30, 1981.

Work continued on retaining federal funding for the Project. Both the full House and Senate authorized funding in June, and it is anticipated that both will appropriate the funding in July.

In addition, the California State budget for Fiscal Year 1981-82 included $2 million in funding for the Project. An agreement will be negotiated by September 1981 for the State's ownership interest.

In view of the uncertainty of contined federal funding for the Project, negotiations proceeded slowly on the heat sales agreement. A draft agreement was transmitted to Union Oil, along with a copy of the decision from the California Public Utilities Commission regarding Southern California Edison's Heber Project. It is expected that negotiations will increase when some definitive word is given on federal funding.

The Environmental Program Plan, which includes programs for the monitoring requirements identified in the DOE Environmental Assessment, is being revised. Work continued on some of the monitoring programs as required.

Engineering work continued at a good pace. Ertec issued their final geotechnical report on site soils and seismic criteria. Pickard, Lowe and Garrick issued several cost-benefit analyses of system alternate configurations. Flour Power Services primary efforts were directed in the following major areas:

- Development of Project Control Documents
  Work continued on the Project Procedures Manual and the Quality Assurance Program and Manual.

- Setup of Cost/Schedule Controls
  Work continued and the majority of Work Package budgets and schedules were issued to SDG&E.

- Floating Cooling Study
  SDG&E comments were incorporated in the final report, which was issued in June 1981.

- Turbine Generator Engineering
  Work was essentially completed on the Technical Specification and the technical portion of the Request for Quotation. A letter to obtain expression of interest from potential bidders was issued, responses were received, and five bidders have been preselected.

- System Engineering
  Work was initiated on process calculations and P&ID development for the Brine Heat Exchange and Return System, Hydrocarbon System, Cooling Water System, and a number of the plant auxiliary systems. Specifications work for the major brine and hydrocarbon system equipment is under way.

- Electrical Engineering
  Work continued on developing the high voltage one-line diagram and design interfaces with the IID system.

Bids were evaluated for the Construction Manager contract, and final selection will be made in July 1981.

It now appears that a data management contractor will not be supporting the Project at least during the early design phases. In lieu of that, DOE, EPRI, and SDG&E each made separate assessments of the Data Acquisition System (DAS) requirements, and a plan was outline for DAS implementation into Fluor's engineering and design activities.

TECHNICAL PROGRESS

INTRODUCTION

The scope of the Heber Binary Project is to design, construct, and operate a commercial-size, binary cycle geothermal power plant at the Heber reservoir for a two-year demonstration period. The goal of the Project is to demonstrate the technical and economic feasibility, as well as the environmental acceptability, of geothermal power generation using the binary process. Our work plan for the Project consists of four major tasks, or Work Breakdown Structure (WBS) elements (see Figure 3), that are described below:

WBS 1.1 - WELLS AND FLUID PRODUCTION AND INJECTION SYSTEMS

Primary responsibility for this task has been assigned to the heat supplier. The task consists of well drilling, the construction of surface facilities for geothermal fluid production and injection, and operation of the field facilities to support plant operation.

WBS 1.2 - POWER PLANT DESIGN AND CONSTRUCTION

This task consists of the work by SDG&E, the architect/engineeer, and a construction manager to manage the design, procurement, construction, and start-up of the power plant systems and the associated switchyard, distribution system, and the brine return pipeline. The task includes obtaining necessary permits, associated monitoring, design, procurement, construction, start-up, and project management activities.

WBS 1.3 - POWER PLANT DEMONSTRATION

This task consists of the work by SDG&E to operate the power plant for a two-year period to achieve the basic objectives of the Project. The task includes services, repairs, facilities, overhaul, cleaning, consumables, testing, spare parts, and the tools necessary to operate the plant in a safe and reliable manner.

WBS 1.4 - DATA ACQUISITION AND DISSEMINATION

This task consists of the work by SDG&E and DOE in gathering, reducing, evaluating, and reporting on reservoir and plant performance data.

The WBS will serve several functions. It divides the work into discrete and manageable work packages which, taken in the aggregate, will constitute Project implementation. To some extent, it will dictate organizational lines, and will be an important management tool. It provides a method of accounting for all work that must be performed, and is the basis for manpower loading and scheduling. In addition, it will be used for cost and schedule control and progress audit.

The following describes each subtask objective and status to date.

WBS 1.1
WELLS AND FLUID PRODUCTION AND INJECTION SYSTEMS

WBS 1.1.1 - DESIGN AND CONSTRUCTION

OBJECTIVE:

This WBS element will be performed and funded entirely by the heat supplier. It will include work to design, build, and test production and injection systems necessary to deliver fluid from the reservoir to the power plant and, after use, return the fluid into the reservoir.

STATUS:

- A draft heat sales agreement was transmitted to Union Oil on May 8, 1981, for their review. Also for their consideration, Union was provided with a copy of the California Public Utilities Commission's Decision 93035, which denied Southern California Edison's Heber application.
- A meeting was held on May 29 with SDG&E, Union, and Fluor representatives to discuss the technical interface for the design of the Project. Union will use the existing Chevron design as a point of departure.
- On June 30, 1981, it was requested that Union consider owning the injection pipeline and injection pumps serving the plant.
- Work on this WBS element will commence with the execution of the heat sales agreement.

WBS 1.2
POWER PLANT DESIGN AND CONSTRUCTION

WBS 1.2.1 - ENVIRONMENTAL STUDIES AND PERMITS

OBJECTIVE:

The objective of this WBS element is to obtain the necessary permits and provide environmental studies and monitoring to facilitate plant design and ensure compliance with government regulations for plant construction and operation.

STATUS:

- One of the conditions of Geothermal Production/Conditional Use Permit #8-80 granted by Imperial County in January 1980 is to "commence construction of the Project or provide evidence of substantial progress within 18 months from the date of issuance of this permit." A letter was sent to Imperial County Planning Director, Dick Mitchell, demonstrating the progress on the Project. Information included major activities to date, status of federal funding, contracts let, budget expenditures, etc.

  Chevron Resources company also sent a letter to the Planning Director showing their substantial progress in order to comply with Permit #10-80, also granted in January 1980.

- The Environmental Program Plan, which includes programs for the monitoring requirements identified in the Environmental Assessment (#DOE/EA-0119) prepared by the Department of Energy, is being revised to incorporate suggested additions of the DOE and update program schedules. The plan will be published in the next quarter.

- Meteorological Tower Refurbishment

  Applied Conservation Technology, Inc., was selected as the successful bidder for the refurbishment of the Heber meteorological tower. Arrangements have been made with the International Brotherhood of Electrical Workers to perform certain tasks with Union labor, as required by SDG&E. Consent must be received from DOE prior to execution of this contract by SDG&E.

  The meteorological tower will be refurbished to collect wind speed, wind direction, temperature, temperature differential, precipitation, humidity, and H_2S level data. It is anticipated that data collection will be continuous at least through the first year of plant operation.

- New River Study

A study is required to meet Condition 3.1 of Decision 1557 of the State Water Resources Control Board (SWRCB) approving appropriation of water from the New River. The task requires SDG&E and Chevron to determine minimum flow quantity, or other measurable standard, required to protect habitat of New River.

SDG&E has prepared a draft report on the effects of the water diversion on the flow rates and water quality in the New River, as well as the impact on the aquatic habitat. Chevron is to prepare a discussion on operational aspects which will be included in the final report submitted to the Regional Water Quality Control Board (RWQCB).

It is anticipated that SDG&E/Chevron will submit their completed report to the RWQCB by October 1, 1981. Approval of the study by the RWQCB will be subject to their workload (possibly six months). Once the study is approved, the task is completed subject to any conditions the RWQCB may impose.

- New River Flow and Temperature Monitoring

Equipment capable of continuously monitoring the temperature and flow of the New River will be obtained and installed at a point 30' downstream of the outfall of the Beech Drain in the New River. It is anticipated that monitoring will begin in September 1981, and continue through the demonstration period. The information obtained from this monitoring program will be incorporated into the plant design and used for future National Pollutant Discharge Elimination System (NPDES) permit requirements.

- Site Water Table Monitoring

Water table monitoring at the site will begin in July 1981, and will continue every two weeks until the beginning of construction. The information obtained will be used by Fluor in the design of the settling ponds.

- Chevron Monitoring Programs

In accordance with the Geothermal Element of the Imperial County General Plan, Chevron Resources is conducting the following monitoring programs:

Subsidence - Chevron has conducted a subsidence survey for 1980-1981. Another survey will be conducted in early 1982. Once production actually begins, monitoring will occur bi-annually until a decision is made to do otherwise.

Seismic - Chevron is conducting continuous seismic monitoring to provide data on baseline seismic activity and any deviations that occur during periods of power production. Reports are provided to

Imperial County every year in December, and will continue as long as required.

Water Analysis - Chevron will sample and analyze water out of the Strout Drain bi-annually in June and December. This program will continue as long as it is required.

WBS 1.2.2 - POWER PLANT ENGINEERING, DESIGN, AND PROCUREMENT

OBJECTIVE:

The objective of this WBS element is to prepare engineering and design specifications and procure major equipment to build a nominal 65 Mw (gross) electrical geothermal power plant. Special studies also will be accomplished whenever required.

STATUS:

The following describes work accomplished under each of the major contracts:

- Ertec Western, Inc. (formerly Furgo, Inc.)

  The final geotechnical report was issued by Ertec in May 1981. The report indicates that the site soils consist primarily of stiff silty clays and dense to very dense silty sands. Footings and mat foundations are recommended for all structures, except those subject to high uplift forces. Groundwater level ranges approximately 10 to 20 feet below grade. Because of the expansion potential of the soils, several special design provisions were recommended in the report.

- Fluor Power Services, Inc.

  PROJECT IMPLEMENTATION AND CONTROL (WORK PACKAGES A & B)

  Cost and Schedules (Work Packages A001, A005, and B002)

  Completed and submitted for SDG&E approval schedules and budgets for the following Work Packages:

D001 - D002	Brine and Hydrocarbon System Engineering
E001 - E010	Auxiliary System Engineering
F001 - F002	Site/Plot Plan and Model Development
G001 - G004	Civil/Structural/Architectural Engineering and Design
J001 - J003	Turbine-Generator Engineering
K001 - K006	Piping Engineering and Design
L001 - L004	Electrical System Engineering and Design
M001 - M004	Control Systems (I&C) Engineering and Design
N001 - N002	Insulation and Coatings Engineering
P001 - P005	Procurement
Q001 - Q006	Omnibus Activities
R001 - R003	Switchyard Engineering and Design

Work was also initiated on schedule and budget preparation for the following Work Packages:

B007	Independent Engineering Reviews
P003	Vendor Surveillance Program

Completed the Planned Progress Curves for all the Work Packages submitted to SDG&E.

Project Procedures (Work Package A002)

Work continued on the Project Procedure Manual, with issuance planned for July 1981.

Quality Assurance (Work Packages A004 and B004)

Received SDG&E comments on the Project QA Manual. A meeting was held on May 15, 1981, to resolve those comments.

Availability Enhancement Support (Work Package B006)

Fluor provided comments on PL&G's Availability Data Book and Cost-Benefit Analyses of the Hydrocarbon Condensers, Brine/Hydrocarbon Heat Exchangers, and the High Voltage Power Distribution System. Also participated in a meeting on June 1, 1981, with PL&G and SDG&E to discuss recommendations from these studies.

Purchasing (Work Package P002)

Discussions continued with SDG&E procurement personnel to attempt to arrive at a mutually agreeable basis for issuing RFQ and PO documentation. Additional rework of commercial terms and conditions may be rquired by Fluor.

Floating Cooling Study (Work Package T001)

SDG&E comments were incorporated in the final report, which was issued in June 1981.

Long Term Makeup Water Study (Work Package T002)

A scope of work, schedule, and manhour budget was prepared for SDG&E consideration, and was revised after discussions on the nature and extent of the study. Fluor proposes to evaluate treating requirements for makeup water from the New River. The evaluation will take into account economic feasibility, wastewater and waste solid disposal, and impact on initial plant design. Capital and operating costs and a block flow diagram will be prepared for each alternative.

TECHNICAL PROGRESS

Project Design Guide (Work Package A003)

Written comments from participating members of the DOE Technical Review Committee were received based on Revision 1 of the Project Design Guide. These comments will be assessed by Fluor as the detailed engineering is performed and will be considered where applicable in the next update of the Design Guide, which will be issued in July 1981.

Review of EPRI ER-1099 (Work Package C001)

Work on this package was completed in April. Follow-up design developments will be reported under Work Package A003.

Power Cycle Conceptual Design (Work Package C002)

Process calculations for equipment selection parameters and flow diagrams were continued.

Brine Heat Exchange and Return System Engineering (Work Package D001)

Detailed process calculations and a preliminary Brine System P&ID have been completed. Lines have been sized. The initial combined process flow diagram for the Brine and Hydrocarbon Systems has been completed. This presents start- and end-of-run full power operating parameters.

Work was started on the Mechanical and Electrical Equipment List.

Work was started on the technical specifications for the brine/hydrocarbon heat exchangers and the brine return pumps. Suggested Bidders' List for this equipment was prepared.

Process data sheets for the brine/hydrocarbon heat exchangers and the brine return pumps were completed.

Initiated computer design analysis for the brine/hydrocarbon heat exchangers.

Efforts to determine selection of materials of construction for the brine/hydrocarbon heat exchangers were started.

An analysis of the type of variable speed control to be used for the brine return pumps was initiated.

Hydrocarbon System Engineering (Work Package D002)

Detailed process calculations and a preliminary Hydrocarbon System P&ID have been completed. Line sizes have been determined. The initial combined process flow diagram for the Brine and Hydrocarbon Systems has been completed. This presents start- and end-of-run full power operating parameters.

Work was started on the Mechanical and Electrical Equipment List.

Work was started on the technical specifications for the hydrocarbon condensers, booster pumps, condensate pumps, and the accumulator vessel. Suggested Bidders' List for this equipment was prepared.

Preparation of process data sheets for hydrocarbon condensers, condensate pumps, and booster pumps have been completed.

Initiated computer design analysis for the hydrocarbon condensers.

Work to determine materials of construction for the hydrocarbon condensers was started.

Sizing of the hydrocarbon accumulator vessel has been started.

Hydrocarbon Unloading and Recovery System (Work Package E001)

Preliminary flow rates and storage tank size have been calculated. Preliminary P&ID process development and line sizing has been completed. Process data sheets for the unloading pumps, vapor recovery compressor, and storage tank were started. Controls work was started on the P&ID.

Hydrocarbon Relief and Flare System (Work package E002)

Process calculations were initiated.

Cooling Water System (Work Package E003)

Bidders' List for cooling tower suppliers was prepared. Preliminary P&ID controls and process development has been completed. Process data sheets for the main cooling water pumps, service water pumps, service water tank, service water coolers, and cooling tower were prepared. Verified the in-house computer program for checking cooling tower design parameters.

Plant and Instrument Air System (Work Package E004)

Preliminary P&ID process development and process data sheets for the air compressors and dryers were initiated. The technical specification for the air compressors and dryers was started.

Fire Water System (Work Package E005)

Work continued on the detailed process calculations and P&ID development. Process data sheets for the fire water pumps were started.

Water Treatment and Distribution System (Work Package E007)

Preliminary line sizes have been determined. Silt removal ponds have been sized. Preliminary P&ID process development was completed.

Nitrogen System (Work Package E008)

Initial process calculations and P&ID development have been completed. The amount of nitrogen required for start-up and shut-down has been determined.

Brine and Wastewater Disposal System (Work Package E009)

P&ID development was started.

Site Data and Plot Plan Development (Work Package F001)

Site and plot plan related work was initiated on site drainage and discharge, cut and fill balancing, and water supply locations from the Central Main Canal. Development of conceptual rough grading design for site drainage, ponds, roads, etc., was started.

Fluor participated in a meeting with Ertec and SDG&E on May 18, 1981, to discuss final issue of Ertec's "Site Specific Geotechnical Report."

Fluor participated in a meeting with IID and SDG&E on June 8, 1981, to discuss water supply and discharge interfaces.

Fluor requested additional observation wells be installed to monitor ground water level at the settling pond area.

Architectural Engineering and Design (Work Package G002)

A preliminary copy of the "Outline Architectural Design Criteria" was submitted to SDG&E for review. The document addresses the architectural considerations such as building space and area requirements, building materials, and landscaping for the Project.

Preliminary architectural sketches for the Main Building and Shop and Storage Building were prepared and submitted to SDG&E for review.

Turbine-Generator Engineering (Work Packages J001 through J003)

Prepared the "commercial" part of the hydrocarbon turbine generator RFQ for SDG&E review. A review and evaluation of responses returned by potential bidders interested in supplying the turbine generator

was conducted. Letters of Interest were sent to twelve manufacturing companies for their review of the qualification requirements for bidding. Eight manufacturers sent in affirmative replies and four declined the opportunity to become involved. The field was narrowed to five manufacturers, who Fluor recommended be approved for bidding.

Work was essentially completed on the technical specification and the "technical" portion of the RFQ, including incorporation of comments resulting from SDG&E and Fluor independent engineering review.

Electrical System Engineering (Work Packages L001 and L002)

Preliminary engineering continued on the electrical one-line metering and protection diagram. The present design includes both 13.8 kv and 4.16 kv auxilary load buses, a 82 Mva, 13.8 kv generator, and a 50 Mva, 13.8 - 34.5 kv step-up transformer (see Figure 4).

The step-up transformer will be back-fed to supply start-up power for the unit rather than using a separate auxilary transformer. Potential design constraints regarding full voltage starting of motors as large as 5,000 hp have been incorporated into the present design. Work has also begun on detailed specification of major electrical equipment.

Control System Engineering and Design (Work Package M002)

Work continued on development of control room layout, preparation of an Instrument Index format (which was sent to SDG&E for comment in June), P&ID Legend and Symbols drawing, and preparation of additional material for evaluating digital versus analog control systems. Two meetings were held to evaluate and resolve issues related to implementing a digital based control system.

Insulation and Coatings Engineering (Work Package N001)

Preparation of the Painting and Galvanizing Specification for equipment and piping was started.

Switchyard and Transmission System Interfact (Work Package R002)

Two meetings have been held among representatives of IID, SDG&E, and Fluor to discuss technical aspects of interfacing the Heber plant to IID's 34.5 kv transmission system. The major issues addressed were (1) schedule requirements for the upgrading of eight miles of 34.5 kv transmission line by IID, (2) development of guidelines for the starting of large motors, and (3) preliminary discussion of the operational interface.

- Pickard, Lowe and Garrick

A draft Availability Enhancement and Reliability Plan was prepared as a deliverable under the DOE Cooperative Agreement. The Plan outlines the general approach to be utilized in meeting the purpose of the Availability Engineering Program, which is being implemented by Pickard, Lowe and Garrick, Inc. (PL&G), and lists the reports and deliverables required. This Plan will be finalized and submitted to DOE in the next quarter.

The Availability Enhancement and Reliability Plan attempts to maximize the availability of the Heber plant. This objective is justified, not only by the economic value of the increased productivity of the plant, but also by establishing the detailed data base upon which future geothermal binary power plants will be designed. In addition, to demonstrate the potential of the binary process to produce economical power from geothermal resources, this demonstration plant must exhibit characteristics that are normally optimized only through successive designs. The only way one can hope to accomplish a design reflecting a similar degree of optimization in a first-of-a-kind facility is through a thorough review of the design utilizing availability (reliability) engineering techniques. Subsequent geothermal binary facility design efforts would then have the benefit of existing system availability models, as well as current specific data.

During this reporting period, PL&G updated the Conceptual Design Availability Data Book based on the Design Guide issued by Fluor. PL&G also performed cost-benefit analyses of alternate configurations for the following systems:

- Brine/Hydrocarbon Heat Exchanger
- Hydrocarbon Condenser
- Substation
- Cooling Tower

Results of the Brine/Hydrocarbon Heat Exchanger study show that availability improvements over the Design Guide base case are probable. The cost-benefit analysis estimated a significant annual rate return on marginal power replacement cost savings with the addition of isolation valves on the heat exchangers pairs.

Isolation of the condensers by valving, if practicable, could also result in significant savings on marginal power replacement cost.

The comparative cost-benefit analyses on the Substation and Cooling Tower Systems show that alternate configurations for the respective systems would only achieve marginal availability improvement. Hence, expenditure on redundancies was not recommended.

Work also began on cost-benefit analyses of alternate configurations for the following systems:

- Service and Instrument Air
- Instrumentation and Control

Results of these studies will be reported in the next quarter.

All of these reports constitute a design input to Fluor, who will make the final design decisions.

WBS 1.2.3 - POWER PLANT CONSTRUCTION

OBJECTIVE:

The objective of this WBS element for Phase I is to provide construction input to the architect/engineer during the design of the power plant to allow construction in an orderly, cost effective manner. In Phase II, efforts will focus on actual construction of the geothermal binary power plant.

STATUS:

- A Construction Manager will be hired to review engineering design. He will be responsible for dividing construction work into manageable packages and issuing invitations for competitive bidding on lump-sum, fixed-price contracts. He will evaluate the bids received and make recommendations based on his review of them. The Construction Manager also will monitor subcontractors' work, provide reports on subcontractor progress and cash flow to aid in the budgeting process, inspect the subcontractors' work for compliance with engineers drawings, and turn over finished construction to the San Diego start-up team.

- The Request for Proposal (RFP) was issued in April 1981 to the following potential contractors: Fluor, Parsons, Stone & Webster, Gilbert/Commonwealth, United Engineers and Constructors, Dravo, Lummus, C. F. Braun, and Bechtel.

- A pre-proposal meeting was held April 17, and eight of the nine firms attended. C. F. Braun declined to submit a proposal. As a result of the questions raised at this meeting, an addendum to the RFP was issued, and the proposal due date was extended.

- A Kepner-Tregoe analysis of the eight Construction Manager proposals was completed, and four proposals were identified for further evaluation. A detailed cost evaluation of the proposals was conducted using current dollars, and the field was narrowed from four to three based on the evaluated cost of each proposal. Instead of formal presentations by the three competing firms, informal discussions between the appropriate parties were held to clarify points within the respective proposals. With each of the three firms having comparable technical competence and experience, as well as a good understanding of the scope of work, the evaluation effort concentrated on the two lowest evaluated bidders. In July, the references from past jobs of the two finalists will be checked, and interviews will be set up with top members of the proposed construction management teams. The final selection will be made in July.

WBS 1.2.4 - POWER PLANT START-UP

OBJECTIVE:

The objective of this WBS element is to start-up, check-out, and test the completed power plant. This effort shall include the necessary personnel training and the correction of equipment or system problem areas identified during plant start-up.

STATUS:

- In-house work continued on the Start-Up Planning and Procedures Manual.

WBS 1.2.5 - PROJECT MANAGEMENT

OBJECTIVE:

The objective of this WBS element is to provide Project management by establishing interfaces and control between SDG&E, the heat supplier, the architect/engineer, other subcontractors, and the Sponsors; defining schedules and reporting progress based on actual accomplishments; finalizing procedures for management, engineering, start-up and design, construction cost and scheduling, accounting, procurement, and reporting; providing cost control by combining estimating, recording, reporting, analyzing, forecasting, and trending of cost data; monitoring work package budget estimates and reporting progress; negotiating and administering Project agreements and contracts; coordinating legal, public information, geothermal heat supply, and procurement activities; and preparing, reviewing, and publishing information regarding the technical status, cost, and schedules of the Project.

STATUS:

- The Sponsors' Technical Committee met on April 2. They approved the concept of floating cooling at the 65 Mw average annual gross output design condition.

- The Sponsors' Management Committee met on April 22. They concurred with the Technical Committee's recommendation to proceed with floating cooling. They also approved Modification #1 to the DOE Cooperative Agreement, which increased DOE's funding level from $4,000,000 to $5,963,509.

- Work continued on Modification #2 to the DOE Cooperative Agreement. The following scope changes will be included:

  (1) Extend Phase I to September 30, 1987.
  (2) Extend environmental studies and permits to end of Project.
  (3) Extend engineering and design to end of Project.
  (4) Procure all major equipment.
  (5) Add construction management.
  (6) Extend project management to end of Project.
  (7) Add SDG&E's estimate to data acquisition and dissemination (18 months).
  (8) Include a portion of data acquisition and dissemination.
  (9) Reflect the change in SDG&E's administrative and general rate from 3.28% to 4.27%.

  Modification #2 includes only Phase I work. This extension of Phase I increases its total cost by $37,834,336 (from $10,876,382 to $48,710,718). The increase includes costs through September 30, 1987.

A draft package will be distributed to the Sponsors' Management Committee at their next meeting on July 15, for their review.

- Work continued on retaining federal funding for the Project. R. K. Fuller has met with Legislators and key members of various committees to generate their support.

  On May 14, 1981, the House of Representative Committee on Science and Technology adopted the FY '82 DOE authorization bill (H.R. 3146) providing $8 million for the Heber Binary Project.

  A subcommittee had authorized the $8 million earlier; however, prior to full Committee action, a substitute to the subcommittee recommendation has been proposed which would have reduced the Heber authorization back to $4 million. It should be noted that Heber was authorized within the constraints set by the President.

  In June, both the full House and Senate authorized funding for the Project. The House authorization was for $8 million. The Senate authorization was for an unspecified amount. The final authorized amount will be decided in conference in early July. It is anticipated that both the House and the Senate will appropriate the funding in July.

- On April 21, 1981, Bob Lacy testified before the State of California Assembly Energy Subcommittee at the AB 51 hearings to provide the panel with information on the technical merits of the Project, energy potential, and its financial needs. The subcommittee expressed its desire that the State, if an appropriation is approved, should receive ownership status. A modification to AB 51 was drafted which would allow the State to participate in the Project as an owner, entitling them to take a share of the electric power, as well as obligating them to share in all liabilities.

  On April 30, 1981, Bob Lacy made a similar presentation to the State of California Senate Finance Subcommittee responsible for energy and resources.

  In May, the Assembly and Senate Finance Subcommittees recommended a $2 million budget augmentation to their respective committees for the Project. The appropriation would increase the State's ownership share to approximately $3.6 million. This was subject to passage of AB 51 and continued federal funding.

  In June, Governor Brown signed the State's Budget for Fiscal Year 1981-82, which included $2 million in funding for the Project. (This action came in lieu of passage of AB 51, which was designed to provide funding for an undesignated binary cycle geothermal power plant). The Department of Water Resources, acting for the State, was given 90 days to negotiate a participation agreement with SDG&E. The State's ownership interest will result in decreased SDG&E ownership and financial exposure.

- SDG&E applied to WEST (Western Energy Supply & Transmission) Associates for $25,000 in funding assistance for our geothermal technology transfer effort (i.e., documenting experience at the Magma 10 Mw binary facility). Unfortunately, the total WEST budget was reduced resulting in the proposal being rejected.

- The Chart of Accounts was amended to include the Fluor Work Packages. This will enable in-house support groups to easily identify what account number they should use when reviewing Fluor work and serve as an easy cross-reference to the Fluor Work Packages.

- The following are the cumulative costs for WBS 1.2 and 1.4 through June 1981.

WBS (2nd Level)	Budgeted	Actual
1.2	$3,370K	$,828K
1.4	,120K	,002K
1.0 (Total)	$3,490K	$,830K

Source: June 1981 - Contract Management Summary Report.

WBS 1.3
POWER PLANT DEMONSTRATION

WBS 1.3.1 - DEMONSTRATION ACTIVITIES

OBJECTIVE:

The objective of this WBS element is to demonstrate reliable and economic geothermal power generation.

STATUS:

- No activity on this WBS during the quarter.

WBS 1.4
DATA ACQUISITION AND DISSEMINATION

WBS 1.4.2 - DATA ACQUISITION, ANALYSIS, AND DISSEMINATION

OBJECTIVE:

The overall objective of the data management effort is to acquire, store, evaluate, and report Project data to the energy generation industry and to other parties interested in liquid-dominated geothermal power plant performance. The intended result is to stimulate commercial development of hydrothermal resources in the United States.

STATUS:

- Solicitation of bids for the data management contract were held in abeyance because of the uncertainty of continued federal funding.

- It now appears that a data management contractor will not be supporting the Project at least during the early design phases. Original Project organization established the data contractor as responsible for interfacing with Fluor to define Data Acquisition System (DAS) requirements for incorporation into the design of plant I&C and data acquisition systems.

  In lieu of a data management contractor, DOE, EPRI, and SDG&E each performed separate assessments of the DAS requirements, and a plan was outlined for DAS implementation into Fluor's engineering and design activities. Fluor needs the information on instrumentation and computer requirements by early July to maintain scheduled activities.

FIGURE 1

HEBER BINARY PROJECT
ARTIST'S RENDERING

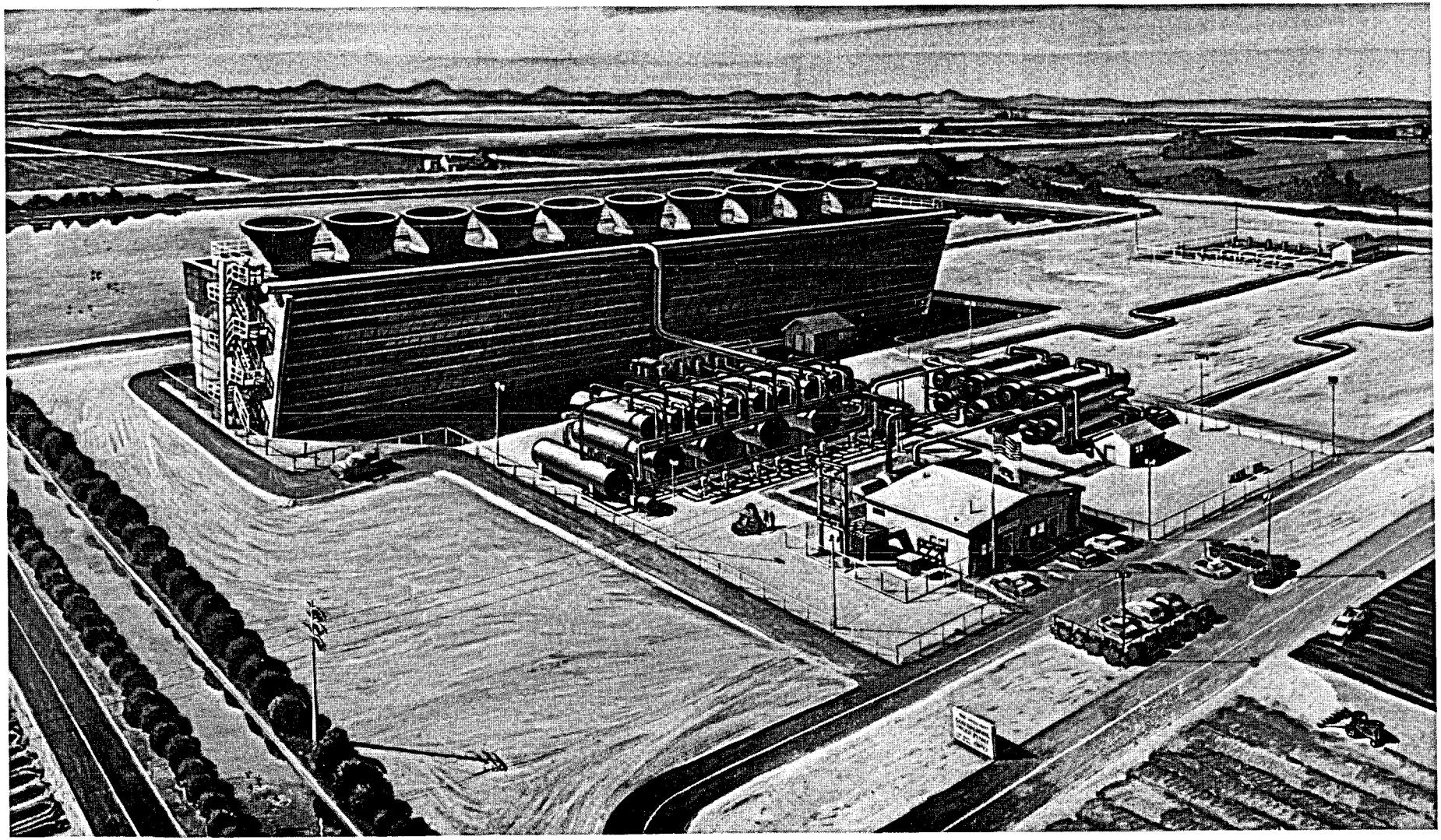

FIGURE 2
HEBER BINARY PROJECT
PLANT LOCATION

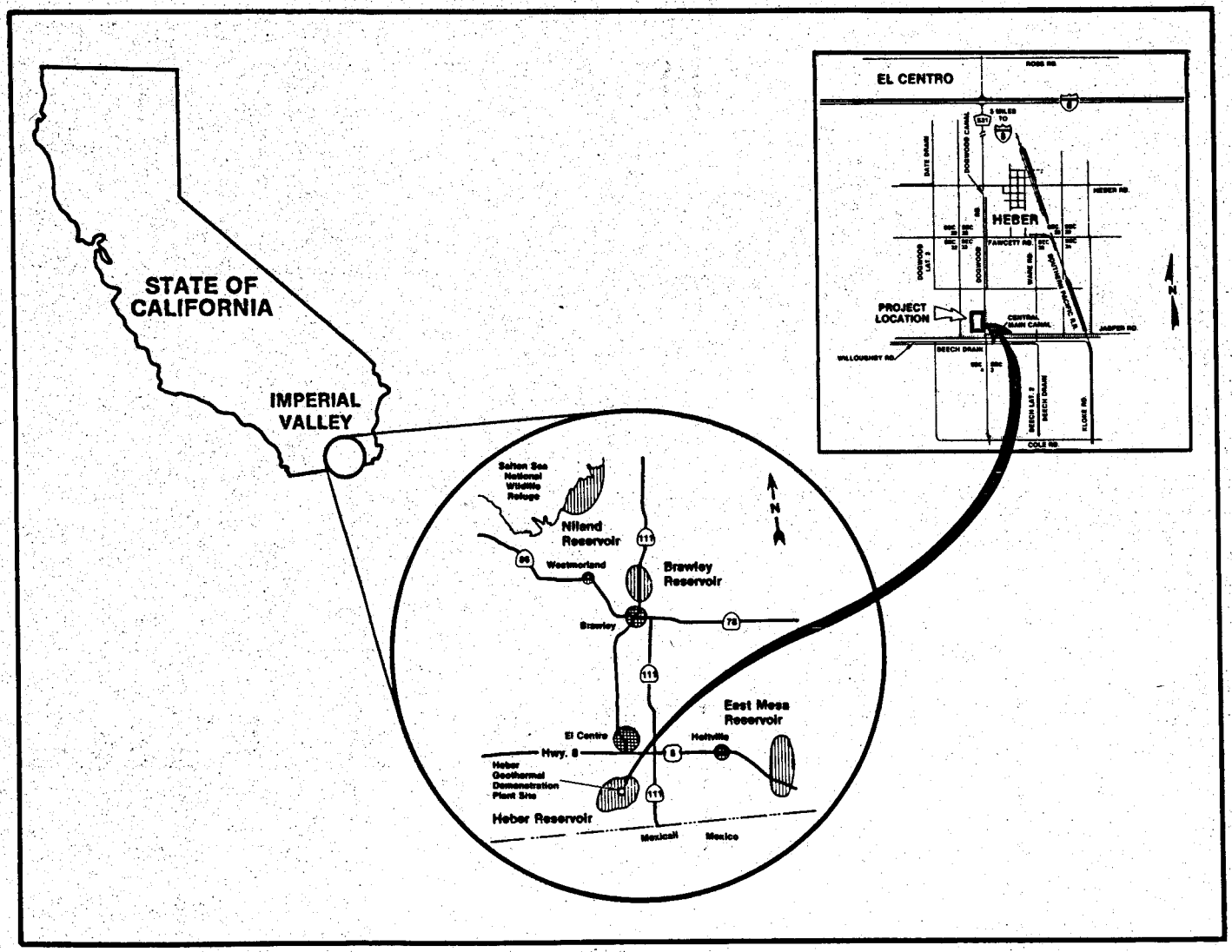

FIGURE 3
HEBER BINARY PROJECT
WORK BREAKDOWN STRUCTURE

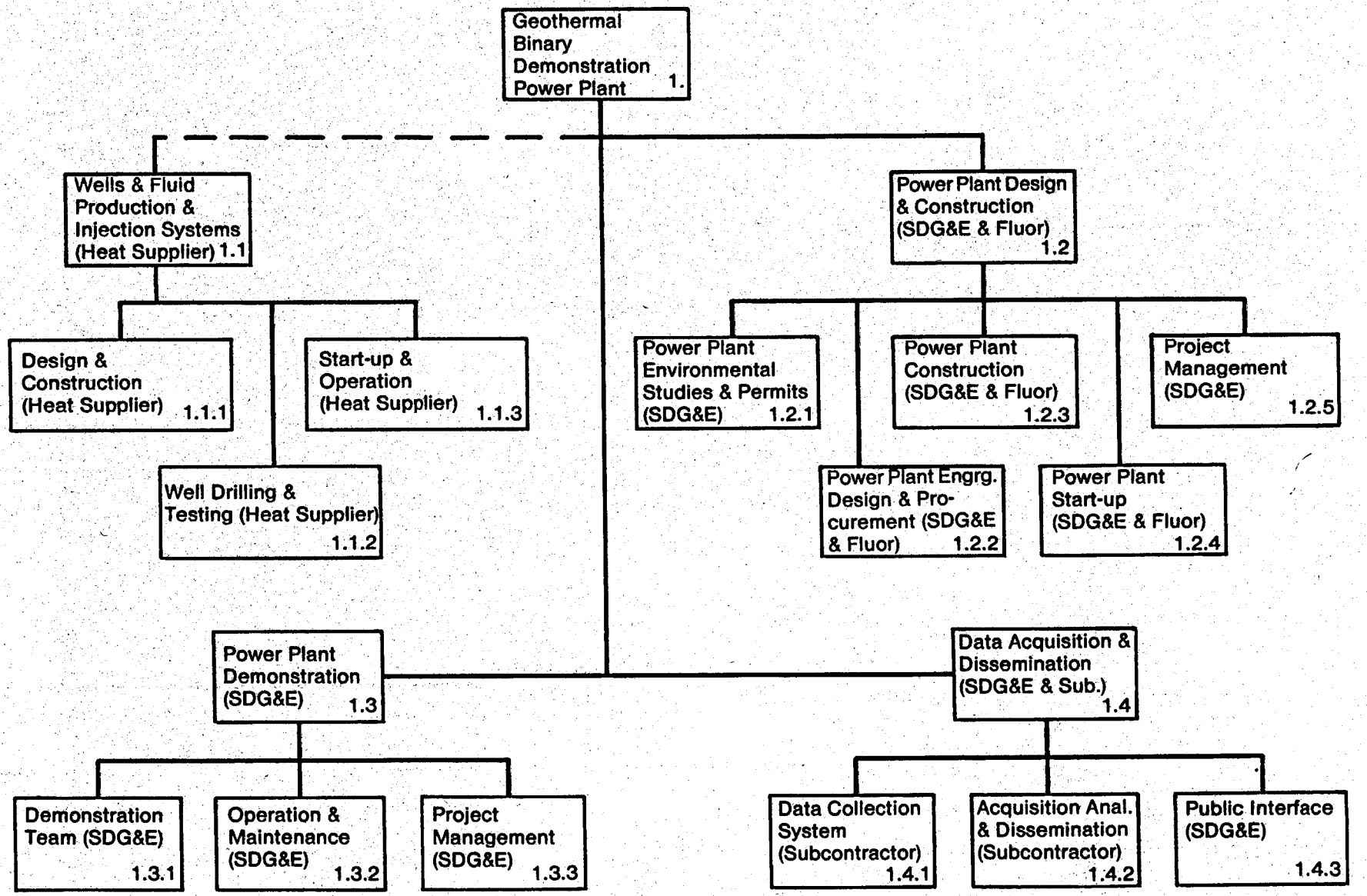

FIGURE 4
HEBER BINARY PROJECT
PRELIMINARY ELECTRICAL ONE-LINE DIAGRAM