

# HEBER GEOTHERMAL BINARY DEMONSTRATION PROJECT

**QUARTERLY TECHNICAL PROGRESS REPORT  
FOR THE PERIOD  
JANUARY 1, 1982 – MARCH 31, 1982**



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

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JANUARY 1, 1982 - MARCH 31, 1982

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This report was prepared as an account of work performed by San Diego Gas & Electric; sponsored by the Electric Power Research Institute, the Imperial Irrigation District, the California Department of Water Resources, and the Southern California Edison Company, hereinafter called Sponsors; and supported by the U. S. Department of Energy, an agency of the United States Government. Neither San Diego Gas & Electric, nor the Sponsors, nor the United States Government nor any agency thereof, nor any of their employees or subcontractors, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement or recommendation by San Diego Gas & Electric, or the Sponsors, or the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of San Diego Gas & Electric, or the Sponsors, or the United States Government or any agency thereof.

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 January 1, 1982, through March 31, 1982. 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 (SDG&E), the United States Department of Energy (DOE), the Electric Power Research Institute (EPRI), 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 to demonstrate the technical and economic feasibility of geothermal power generation. The Project will be the first commercial-scale hydro-thermal 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 hydro-thermal 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 report describes the Project's progress for the period of January 1, 1982, through March 31, 1982.

Negotiations continued on the Union Oil Company heat sales contract. Essentially, all contract terms have been agreed upon by SDG&E and Union. Approval of the Agreement by Project participants and the California Public Utilities Commission (CPUC) is now being sought.

WESTEC Services has been selected to conduct temperature dispersion modeling studies at the Heber site. The studies will determine the effect of cooling tower blowdown discharge on the temperature of the New River.

SDG&E's Process/Mechanical Engineering group reviewed 43 technical documents for conformance with their intended use. Comments and recommendations on the documents were issued to Fluor. The Electrical Engineering group estimated that a \$600,000 savings could be realized by using a 4.16 kV auxiliary transformer in lieu of a 13.8 kV motor bus. The savings would be in lower equipment costs.

The Dravo construction management team has developed a preliminary Project Master Control Network. It will be finalized in April, providing firm dates are received from Fluor on dates when drawings and specifications can be issued for bidding of construction contracts.

In February, SDG&E and DOE representatives met to discuss federal procurement preferences. As a result, a new standard equipment contract was drafted in the format customarily used by government procurement agencies. This should permit faster DOE review of subsequent equipment purchases.

## 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, including the brine return pipeline, 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/engineer, and the construction manager to manage the design, procurement, construction, and start-up of the power plant systems and the associated switchyard and distribution system. 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 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:

SDG&E presented the economic analysis of the Union Oil Company's heat sales agreement to the SDG&E Group Vice Presidents and Geothermal Advisory Committee on January 8, 1982. The consensus was that Union be approached for a lower price.

SDG&E met with Union on January 12 and presented its position, asking for reduction of the ceiling on the O&M passthrough and a 12% reduction in price. Union responded the following day offering a \$3,000,000 reduction in the O&M passthrough ceiling, but held fast on price. The Project responded later that week that SDG&E would have a problem supporting the contract before the Sponsors' Management Committee and the CPUC.

On January 19, Union suggested phasing the contract in three steps to reduce their up-front risk and offered an additional price concession.

A lengthy discussion of the contract economics was presented to the Sponsors' Management Committee on January 22. Phasing of the contract was discussed, and the Project was advised that DOE could not fund separate reservoir data contract negotiations.

A revised draft of the contract was completed January 25. SDG&E met again with Union on January 26 and 28. It was agreed to phase the contract in two steps with 100% brine flow to be achieved before the end of the demonstration period. Another draft incorporating these changes was completed on January 29.

SDG&E's Regulatory Affairs held preliminary discussions with high level CPUC Staff members regarding their pre-approval of the heat sales agreement with Union. The Staff indicated its support for use of the Advice Letter procedure.

SDG&E representatives met with Union in Los Angeles on February 1 and reached agreement on essentially all the contract terms for heat sales.

Draft #16 of the heat sales agreement, dated February 9, was completed and circulated within SDG&E for review. The draft was also sent to the Project Participants (with a letter of confidentiality) for their review. In addition, copies were sent to DOE with certain modifications requested by Union.

SDG&E's Forecasting and Analysis Department updated the contract economic analysis, which was then presented to the SDG&E Geothermal Advisory Group. The Advisory Group requested that a comparison be made of Union's price to SDG&E's GO 131-B resource plan, as well as to the SDG&E oil fuel avoided cost. They also requested a sensitivity study looking at plant availability lower than 75%. Moreover, the Group approved the filing of an Advice Letter and the Project visiting the CPUC staff to discuss the basic concepts of the contract.

Representatives of SDG&E met with members of the CPUC staff on February 19. The basic terms, price, and economic analysis were presented. The CPUC response was positive, and they are now waiting for an Advice Letter filing.

The updated report on heat contract terms and economics was presented to the Sponsors' Management Committee on March 3. The comments received were considered in subsequent analyses and negotiations.

The Heber Binary Project has contracted with KRTA (USA) Limited to prepare a price analysis of the heat contract. All data required for the work has been sent to KRTA. Their report is due on April 23.

Union agreed to remove the 25% weighted "Fuels and Related Products and Power" component from the price index and replace it with a 10% weighted "Diesel to Commercial Customers" component with appropriate adjustments to the other cost related components. Project representatives met with Union on March 16 and March 31, with additional meetings scheduled on April 1 and 2 to complete the contract language. Union is now willing to sign the contract subject to favorable review by the CPUC and to DOE consent to the approval of the contract. The Project plans to seek a resolution from the SDG&E Board of Directors on April 27. Assuming approval, the contract will be signed on April 28.

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:

Groundwater level monitoring continued at the Heber site over the entire quarter.

Temperature monitoring continued at the New River. Temperature monitors containing data for December, January, and February were removed and sent to the consultant for data reduction. At the same time, new monitors were installed each month.

WESTEC Services, Inc., was selected as the consultant for conducting temperature dispersion modeling studies. Studies will determine the effect of cooling tower blowdown discharge on the temperature of the New River under warm and cold water conditions. Actual temperature data from the monitoring program was provided (see item above). Additional requirements for Phases II and III to the Temperature Dispersion Modeling requirement have been received from SDG&E's Licensing & Environmental Department. These have been forwarded to WESTEC.

SDG&E representatives met with Imperial Valley APCD staff members on February 9, 1982. The purpose of the meeting was to determine the data input desired for an application for an Authority to Construct permit.

## 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:

#### PROCESS/MECHANICAL ENGINEERING

On February 9, SDG&E and DUCI (Dravo Utility Constructors, Inc.) representatives visited the East Mesa Binary Plant. During that visit, corrosion samples from the main condensers were taken to be analyzed by the SDG&E material test lab.

#### ELECTRICAL AND I&C ENGINEERING

In February, Fluor issued a study of an alternate auxiliary electrical system based on revised cost data for deleting the 13.8 kV motor bus. SDG&E concurred with Fluor's recommendation to use a three-winding 4.16 kV auxiliary transformer in lieu of a 13.8 kV bus to overcome motor starting voltage dip problems. Savings in initial equipment cost will be about \$600,000. However, it will be necessary to revise equipment specifications for the unit auxiliary transformer, bus ducting, large motors, medium voltage switchgear, circulating water pumps, and hydrocarbon booster pumps.

An interface meeting was held on January 13 among SDG&E, IID, and Fluor. Major topics discussed were switchyard layout and revision of cost estimates for transmission line upgrading.

In February and March, Fluor continued work on the revision of the auxiliary system one-line. Addenda required due to deletion of the 13.8 kV bus were issued to bidders on the auxiliary transformer, circulating water pumps, and hydrocarbon booster pumps.

SDG&E's Transmission Planning group is finalizing computer studies concerning IID's system stability and voltage dips relative to generation and auxiliary load characteristics. A meeting will be held in the next quarter to discuss results of the finalized studies and any impact on IID system operation.

#### CIVIL/STRUCTURAL ENGINEERING

Analysis of the survey distances pertaining to the plant site have indicated that discrepancies exist on some of the plans being used on the Project. The SDG&E Land Department is attempting to provide the Project with one set of accurate figures which can then be used by everyone

involved with the plant. One particular area of concern involves the drainage ditch on the east side of the parcel which is situated within the proposed right-of-way required for the expansion of Dogwood Road.

Fluor was authorized to proceed with a hydraulic model study for the circulating water pump pit structure.

#### EQUIPMENT SPECIFICATIONS AND DRAWINGS

A review was completed of the following technical documents and letters were issued to Fluor containing combined multi-discipline and DUCI comments and recommendations. Mechanical, electrical, and civil/structural features, overall design, materials, and operational performance requirements were checked for conformance with the intended use.

1. Fire Protection System Design Criteria
2. Hydrocarbon Storage Tank Specifications and Drawings
3. Diesel Generator Specification
4. Electrical Area Classification Drawing
5. Central Control Equipment Layout Drawing
6. Reinforcing Steel Supply Specification
7. Reinforcing Steel Placement Specification
8. Seismic Dynamic Analysis Criteria for Steel Stacks
9. Circulating Water System Design Criteria
10. Concrete Unit Masonry Specification
11. Site Grading and Drainage Plans
12. Site Survey Map
13. Metal Wall Stud System Specification
14. Glass and Glazing Specification
15. Piping Design Criteria
16. Plumbing Design Criteria
17. Miscellaneous Centrifugal Pumps Specification
18. Vacuum Pumps Specification
19. Painting and Galvanizing Specification
20. Toilet Facilities Specification
21. Main and Shop Building Architectural Drawings
22. Concrete Construction Specification
23. Anchor Bolts and Sleeves Specification
24. General Arrangement of Site Equipment and Buildings
25. Laboratory Furniture Specification
26. Chemical Laboratory and Shop Arrangements Drawings
27. Fire Protection System P&ID
28. Water Treatment and Distribution System P&ID
29. Cooling Water System P&ID
30. Hydrocarbon System P&ID
31. Brine and Wastewater Disposal System P&ID
32. Brine System P&ID
33. Ready-Mixed Concrete Specification
34. Fencing and Gates Specification
35. Synchronous Motors Specification
36. Electrical Requirements Specification
37. Non-Segregated Phase Bus Specification
38. Flare Stack/Air Blower Specification

39. Gas Chlorination Equipment Specification - Major recommendations included: (1) reduction of system size from 8000 ppm to 4000 ppm, and (2) elimination of vaporizer on basis of the capacity reduction.
40. Relief and Flare System P&ID - Major recommendations included: (1) deletion of brine relief to hydrocarbon flare stack, and (2) reduction in number of flare knockout drum drain pumps to one. (Note: System analysis has shown that relief flow could be reduced by a factor of 15.)
41. Inert Gas System P&ID - Major recommendations included: (1) deletion of two nitrogen pumps, (2) deletion of surge drum, and (3) use of star-fin vaporizers.
42. Diesel Generator System P&ID - Major recommendations included: (1) auto start of diesel generator and tie-in to bus, (2) elimination of storage tank level alarms, and (3) modification of transfer pump piping to unload tanker truck and increase size of one pump for unloading at faster rate.
43. Central Control System Specification - Major recommendations included: (1) further separation of I&C and DAS requirements and (2) that the Request For Quotation not be released for bid until overall process control design has been developed.

#### AVAILABILITY/RELIABILITY ENGINEERING

The PL&G contract received conditional approval by DOE in late March. SDG&E's Major Project Buying Group is presently resolving the issues presented by the conditions imposed by DOE.

Amendment No. 3 to the Pickard, Lowe & Garrick (PL&G) Availability Enhancement Contract has received SDG&E approval.

Pickard, Lowe & Garrick completed their availability assessment of the plant, system by system, based on the initial issue of the P&ID's and issued a report entitled "Initial Definitive Design System Availability Assessments." This report evaluates the availability of the principal plant systems, and compares that assessed availability to target values.

The system availability targets were also updated based on the initial issue of the P&ID's in a report entitled "Availability Data Book, Initial Definitive Design Phase."

The final "Instrumentation and Control System Study," which compares the attributes of distributed digital control systems, analog control systems, and hybrid digital/analog control systems on a conceptual design basis, was issued. It makes a recommendation for the plant central control system based on reliability, maintainability, cost performance, and flexibility.

PL&G issued a series of reports on the maintainability and reliability of the major process equipment based on user and vendor data services.

The first of these reports was entitled "Failure Rate Distribution and Mean Time to Repair Estimates for Heat Exchanger and Condenser." A revision of this report was later issued to reflect new failure rate data

obtained from existing installations of AL 29-4. AL 29-4 or AL 29-4c is the preferred heat exchanger and condenser tube mateial.

The remaining two reports, entitled "Unavailability Distributions for Principal Pumps" and "Unavailability Distributions for Principal Valves," will be issued during the next quarter.

PROCUREMENT

The Project is generally committed to contracting with the Elliott Company for the hydrocarbon turbine generator. There are some portions of the draft contract that were changed by Elliott's offer. Because these changes need clarification, and because the Project has prepared a new standard equipment contract, it was necessary to meet with Elliott to clarify the terms of the agreement. The turbine generator consent package was revised by Fluor and forwarded to DOE for review and consent in March. The actual contract was re-done by SDG&E with Major Project Buying coordinating the inputs from appropriate organizational elements. The patent clauses of this contract have created difficulties for the review. The review has been held up pending SDG&E forwarding DOE a clean, edited copy replacing the ones currently in their office.

In February, SDG&E and DOE representatives met to discuss federal procurement preferences. As a result, a new standard equipment contract was drafted in the format customarily used by government procurement agencies. This should permit faster DOE review of subsequent equipment purchases.

### 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:

The Letter Agreement between DUCI and SDG&E, prepared as an interim arrangement pending pre-award audit results, was submitted to DOE. That agreement, by its terms, expired on March 31, 1982. However, DOE has increased the duration of the proposed Letter Agreement for an additional 30 days.

The Dravo Utility Constructors, Inc. (DUCI) Project Construction Manager has moved to San Diego. Joining him are the Cost and Schedule Engineer, the Construction Engineer, and the Contract Administrator.

A meeting was held on January 27 where Fluor presented a construction schedule which interfaced with their engineering and procurement efforts. This construction schedule was broken down into the DUCI construction packages but indicated a 1½- to 2-month slip in construction from the dates previously proposed by DUCI. The decision was made to slip those packages heavily dependent on procurement (i.e., mechanical, electrical, cooling tower erection), but maintain the start of the first construction package, site preparation, in the Fall of 1982 timeframe.

DUCI has completed the Work Breakdown Structure and Code of Accounts for the construction contract and submitted them for SDG&E approval.

A draft standard construction contract has been formulated by the SDG&E Law Department. This draft is being combined with the requirements of DUCI by the Project Construction Manager. This DUCI-acceptable draft will then be circulated to all interested parties and then serve as the basis for determining SDG&E's final construction contract for the Project.

A preliminary Project Master Control Network has been developed; it will be finalized in April, providing firm dates are received from Fluor on dates when drawings and specifications can be issued for bidding of construction contracts.

DUCI has continued work on developing a Construction Project Procedures Manual as a part of the Construction Management Plan effort. These procedures will be issued to SDG&E for their review and comment in April.

DUCI's Quality Control Supervisor prepared a preliminary Quality Assurance Program that was submitted to SDG&E for discussion as part of a proposed Vendor Surveillance effort.

#### 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. These efforts shall include the necessary personnel training and the correction of equipment or system problem areas identified during plant start-up.

##### STATUS:

During this period, SDG&E in-house work continued on the Start-up Planning and Procedures Manual. Also, DUCI's Start-up Supervisor met with SDG&E start-up personnel to further develop an integrated start-up procedure for SDG&E, DUCI, and contractors.

## 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, the construction manager, 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:

#### PARTICIPANT FUNDING

IID's legal counsel approved the draft Assignment Agreement between SDG&E and IID. An executable contract was prepared. Execution is pending action on the State/SDG&E Assignment Agreement.

On March 25, 1982, Southern California Edison Company informed SDG&E that they were not exercising their option, pursuant to Section 32.4 of the Participation Agreement, to assume an Ownership Interest in the Heber Binary Project by the March 31, 1982, expiration date. Edison shall remain a Participating Contributor.

#### COOPERATIVE AGREEMENT MODIFICATION

The basis was provided to DOE for the major equipment estimate in the December 16, 1981 (Phase I - extended) modification proposal. The Subcontracting Plan has been requested from Fluor to submit to DOE. This will enable DOE to proceed with the final review of the proposal and move on to negotiations to conclude the modification for the Cooperative Agreement.

#### DEFINITIVE ESTIMATE

Preparation of the in-house estimates to be included in the Definitive Estimate has progressed on schedule. However, a major effort in re-estimating, to reduce costs, is underway and will impact the April 15, 1982 target date for delivery to DOE. This re-estimating effort entails a complete overhaul of the estimate due to updated escalation factors and

recalculating revised labor, material, travel, and other expense elements. The required time to complete this will be about three weeks. It now appears the target date will be April 30. Running parallel to the in-house re-estimating effort, Fluor and DUCI are revising their estimates as well.

#### GENERAL

SDG&E's Internal Auditing Department will be conducting an audit of Fluor Power Service's direct costs. A pre-audit meeting was held by the SDG&E Contracts Audit Section. In attendance were members of the Project Staff and Task Force who were requested to attend for input.

The Sponsors' Technical Committee met on January 21, 1982, and the Sponsors' Management Committee met on January 22, 1982. Major topics of discussion included the heat sales agreement, federal funding for the Project, equipment procurements, and a general update on the Project status.

On March 3, a special meeting of the Sponsors' Management Committee was held to discuss the heat sales agreement, the negotiations with DOE on the grant agreement, Southern California Edison's participation in the Project, and the turbine generator procurement.

On February 17, SDG&E Legal Department personnel met with DOE representatives to discuss federal procurement preferences. Comments have been combined from DOE and the SDG&E management consultant with the October 21 draft of the standard equipment contract. This latest draft is in the final stages of preparation prior to transmitting it to DOE, Fluor, and Elliott.

The draft Quality Assurance Management Plan was revised to incorporate comments from DOE and resubmitted for their review. It was approved for printing and was distributed in March.

In-house schedule responsibility has been assumed by the Heber Binary Project staff. One staff member will dedicate his efforts to bring the Project up to speed with simple bar-chart type schedules for those nine departments/sections that have schedule input to the Project. DUCI will assume the Project master schedule responsibility. This change was implemented in order for the Project to have better control of the schedule as it enters into the construction phase.

On January 26, Project Management presented a status report to the Imperial County Board of Supervisors. Feedback from the Supervisors indicated that the information was well received. The Supervisors are hopeful and optimistic that the Project's plans will reach the fruition that has long been anticipated in the Valley. At least one Supervisor agreed that future updates can be provided in a published format, in lieu of a more formal presentation.

The model for risk analysis has been completed, but the decision was made to postpone work on the Heber risk assessment until mid-1985, when initial operational data will be used to evaluate the commercial risks for potential commercial operation of the facility.

WBS 1.3  
POWER PLANT DEMONSTRATION

WBS 1.3.1 - DEMONSTRATION, OPERATION, AND MAINTENANCE

OBJECTIVE:

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

STATUS:

There was no activity in this WBS during this 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 their 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:

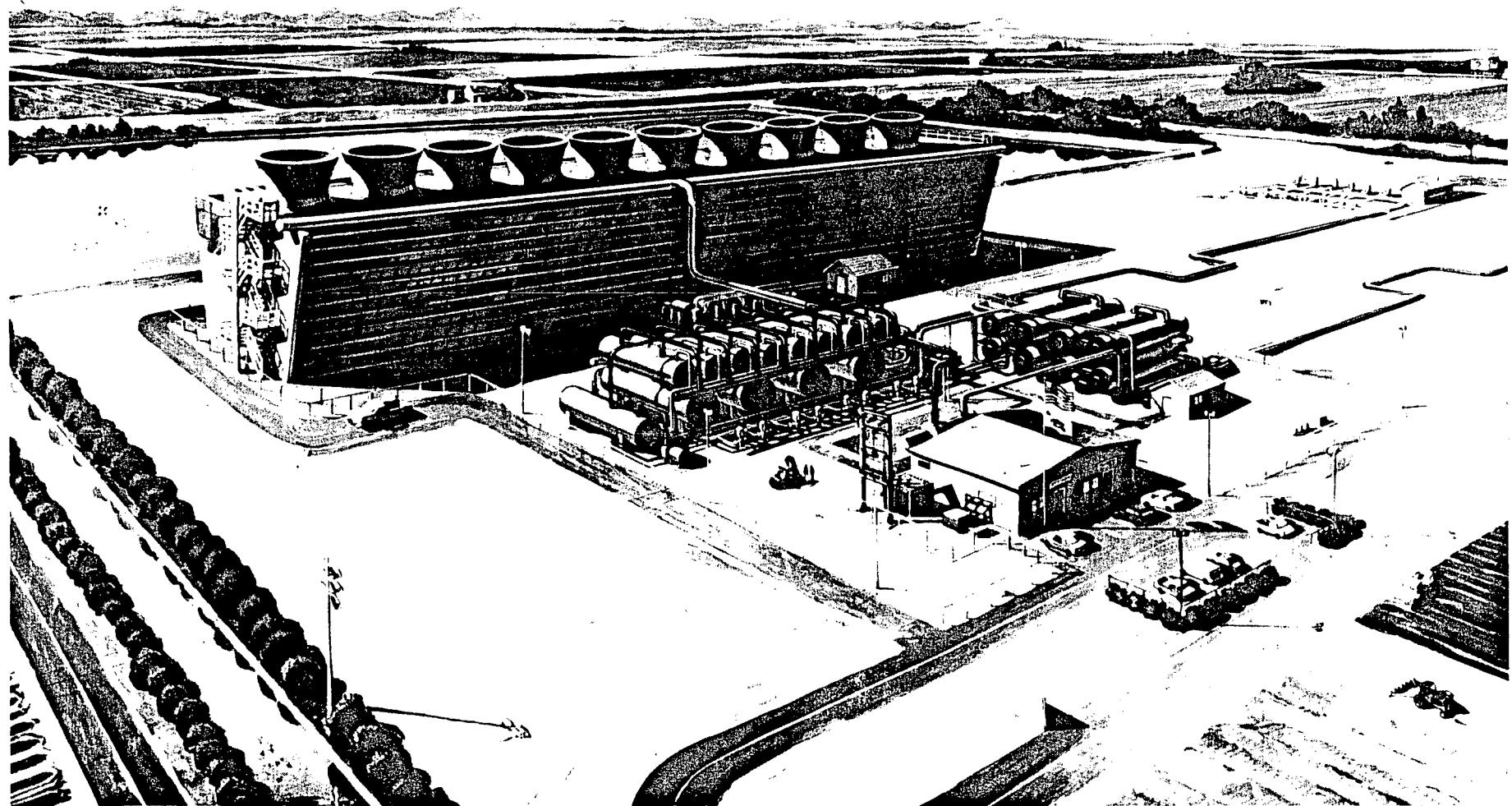
Letters were forwarded to Fluor delineating the requirements of the Data Acquisition System (DAS) and the Corrosion Monitoring Plan (CMP). A meeting was held with Fluor on January 14 to discuss the incorporation of the DAS requirements into the Central Control System specification.

The Definitive Estimate for the CMP and the DAS was completed in February.

A meeting was held with the SDG&E Information Systems Section in March to discuss the use of SDG&E programmers and computer hardware to process the DAS data. Minor changes were made to the DAS hardware specification to insure data compatibility with SDG&E equipment, and agreement on the feasibility of using SDG&E programmers and some existing software was reached.

A preliminary design review meeting on the leakage detection system (to be developed by Battelle Pacific Northwest Laboratories) is scheduled for the latter part of April. This meeting will discuss the design, procurement, testing, and installation of the leakage detection system, as well as aspects of the total corrosion monitoring program.

FIGURE 1  
HEBER BINARY PROJECT  
ARTIST'S RENDERING



**FIGURE 3**  
**HEBER BINARY PROJECT**  
**WORK BREAKDOWN STRUCTURE**

