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BACA GEOTHERMAL DEMONSTRATION PROJECT

QUARTERLY TECHNICAL PROGRESS REPORT FOR PERIOD OCTOBER 1, 1980 - DECEMBER 31, 1980

Prepared By
WESTEC Services, Inc.
505 Marquette, N.W.
Albuquerque, New Mexico

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AND

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WESTEC Services, Inc.
505 Marquette N.W., Suite 1500
Albuquerque, NM 87102

ABSTRACT

The purpose of this quarterly technical progress report is to document work completed on the Baca 50 Megawatt (MWe) Geothermal Demonstration Power Plant Project, Baca Location No. 1, New Mexico, during the period of October 1, 1980 to December 31, 1980. The work was performed by Union Geothermal Company of New Mexico and Public Service Company of New Mexico with the support and cooperation of the U.S. Department of Energy. Topics covered in this quarterly report include progress made in the well and steam production systems, the power plant and transmission systems, and in the project data management program.

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SECTION 1: INTRODUCTION

1.1 Introduction

The Baca Geothermal Demonstration Power Plant (GDPP) Project is organized and cost-shared under a cooperative agreement which brings together the U.S. Department of Energy, Public Service Company of New Mexico, and Union Geothermal Company of New Mexico as partners in a joint undertaking. For a brief outline of the organization of the Project please refer to the Quarterly Technical Progress Report for the period April 1, 1980 through June 30, 1980.

This Project is intended to stimulate commercial development of hydrothermal (liquid-dominated geothermal) resources in the United States. While technological capability to utilize these resources has been available for at least a decade, the actual risks and benefits associated with such utilization have not been accurately known. Without specific data obtained from actual operation of a commercial-scale hydrothermal facility, potential participants may well be reluctant to pursue hydrothermal options. Financial institutions and investors require accurate risk and project cost data before committing large amounts of capital. Utilities need hard data on the availability and reliability of a geothermal-based steam supply. A full-scale demonstration plant such as the Baca GDPP should thus provide such requisite data to the commercial sector.

The GDPP Project is to demonstrate that hydrothermal resources can be utilized to produce electric power on an economically competitive commercial scale and that power so generated is economically feasible and reliable, and can be integrated into existing system operations. Further requirements are to demonstrate that environmental and legal (licensing) considerations can be satisfactorily addressed at reasonable cost and in a reasonable time frame and that long term reservoir performance can be predicted with confidence.

To accomplish these objectives, the Project is to have an operational demonstration period during which all aspects of plant performance, environmental impact, and costs will be reported.

1.2 Scope of the Report

This Quarterly Technical Progress Report provides a review of progress made by Union Geothermal Company of New Mexico (Union) and Public Service Company of New Mexico (PNM) during the period of October 1, 1980 through December 31, 1980. More detailed treatment of specific topics will be covered in topical reports.

1.3 Summary, October 1, 1980 to December 31, 1980

Union's motion to dismiss the Santa Ana Pueblo's appeal of the State Engineer's water rights Findings and Order was denied.

There was no power plant construction activity during the quarter, pending issuance of a Certificate of Public Convenience and Necessity (CCN) by the New Mexico Public Service Commission (PSC). When it became apparent that the CCN ruling would not be made prior to the onset of winter weather, PNM demobilized the plant construction contractor.

Due to the ongoing PSC hearings and demobilization of the construction contractor, material procurement and delivery were reduced to a minimum. Only materials that suppliers could not store or shipments that could not be stopped were received at the site location through the quarter.

The U.S. Forest Service issued a right-of-way permit for the transmission corridor, contingent upon a favorable PSC ruling.

A draft report on wellfield archaeology was completed during the quarter. This report is being reviewed for comment by the Participant.

Subsurface data management continued with the development of a cross-sectional model of permeability through lithological zones for the Baca reservoir.

The First Annual Baca Symposium was tentatively scheduled for September 1981.

SECTION 2: WELL AND STEAM PRODUCTION SYSTEM

2.1 Introduction

This section summarizes Well and Steam Production System progress during the quarter. Union Geothermal Company of New Mexico (Union) is responsible for work on this subsystem of the project.

2.2 Licensing and Permitting

Union's licensing and permitting effort has been chiefly directed at securing approval from the State Engineer for water rights transfers. The water is needed to offset possible stream diminution associated with field production to support an initial fifty megawatt power plant.

The State Engineer's ruling in favor of Union's application for water rights transfers was appealed by the Santa Ana Pueblo during the preceding quarter. In November 1980, a motion to dismiss this appeal was filed by Union with the District Court. On December 18, 1980, a ruling by the District Court denied Union's motion and allowed the Santa Ana Pueblo to refile the original appeal.

2.3 Preproduction Drilling and Testing

Union's responsibility for the development of the geothermal field and the production of steam from the liquid-dominated resource includes the drilling, preproduction flowrate testing, injectivity testing and interference/communication testing of the wells. The activities undertaken during the quarter are outlined in this section.

2.3.1 Drilling

Baca No. 21 was drilled in September 1980 to a total depth of 3000 feet (914 m). At this level the well was flow tested for an eight hour period at a mass flowrate of approximately 137,000 pounds (62,000 kg) per hour with 48 psig (331 kPa) wellhead pressure. After the flow-test, electric logs were run, the tie-back casing was installed and the well was cleaned out and completed October 5, 1980.

Drilling commenced on Baca No. 22 on October 12, 1980. By December the well had been drilled to 6485 feet (1977 m). A subsequent open hole flow test indicated that the well would not produce at a commercial rate. The well was plugged back to 2650 feet (808 m) and directional redrilling was initiated. At the end of the quarter, the well was being directionally drilled at a depth of 5520 feet (1683 m).

2.3.2 Well Testing

Flow testing of Baca No. 20 was started during the preceding quarter and continued through this reporting period. Separator back pressures were varied during the quarter to determine a deliverability curve. Separator pressures ranged from 90 to 156 psig (620 to 1,076 kPa). At a separator pressure of 90 psig (620 kPa), a mass flowrate of 67,400 pounds (30,600 kg) per hour was achieved with 38,000 pounds (17,200 kg) per hour steam fraction (corresponding to a 56 percent flash rate). At the end of the quarter, the separator pressure was at 115 psig (793 kPa) with a total mass flowrate of 56,000 pounds (25,400 kg) per hour including 32,000 pounds (14,500 kg) per hour of steam (corresponding to a 57 percent flash rate).

Union's testing of Baca No. 20 during this reporting period included the use of a new method for two-phase flow recording. The testing used multiple orifice plates in the two-phase production piping to determine if an accurate two-phase flow measurement could be made without knowing the steam fraction. By the end of November 1980, enough data had been collected to permit a mathematical evaluation of this flow rate calculation method. The result of this evaluation was not available at the end of the quarter.

Attempts to flow test Baca No. 21 were unsuccessful due to difficulties experienced with the separator diffuser. However, preliminary flowing of the well indicated a restriction in the well bore. Cleanout operations were conducted at depths from 2772 feet (845 m) to 2781 feet (848 m). Flow testing of this well was rescheduled for early January.

2.4 Production System Engineering

Union is providing production and injection system piping, steam separators, steam scrubbers and associated pumps, valves and controls for the Project. Union's engineering activities during this reporting period are summarized in the following sections.

2.4.1 Production System Design

Design of the production and injection piping continued during the quarter. Union and PNM met in October 1980 to discuss plant area piping. As a result of this meeting, a possible interference was identified in the power plant equipment laydown area. Union's piping design in this area is being modified to minimize possible interferences.

Union's design of the steam production system includes three satellite separator stations located in the wellfield, each combining the output of several wells. The locations of these stations are indicated in Figure 2.1, Conceptual Fluid Production Pipeline System. The design specifications for Satellite Station No. 1 (SS-1) production system are being readied for the issuance of construction bid requests scheduled for February 1981. Satellite Station No. 3 (SS-3) preliminary piping and vessel layout is complete. This layout will be finalized after pipeline rights-of-way surveys and SS-3 well locations are completed in Spring 1981.

Union has completed construction of a "mini-separator", patterned after a full-scale vertical test separator for use in flow testing of wells. The "mini-separator" is currently being used on Baca No. 20 well testing with favorable results. Further testing using higher production rate wells is planned.

2.4.2 Equipment Purchases

In anticipation of construction start-up in mid-spring, Union is soliciting quotes for insulation, pipe, pipe fittings and valves for the production system. Quotes for long lead time materials for Satellite Station No. 3 are also being solicited.

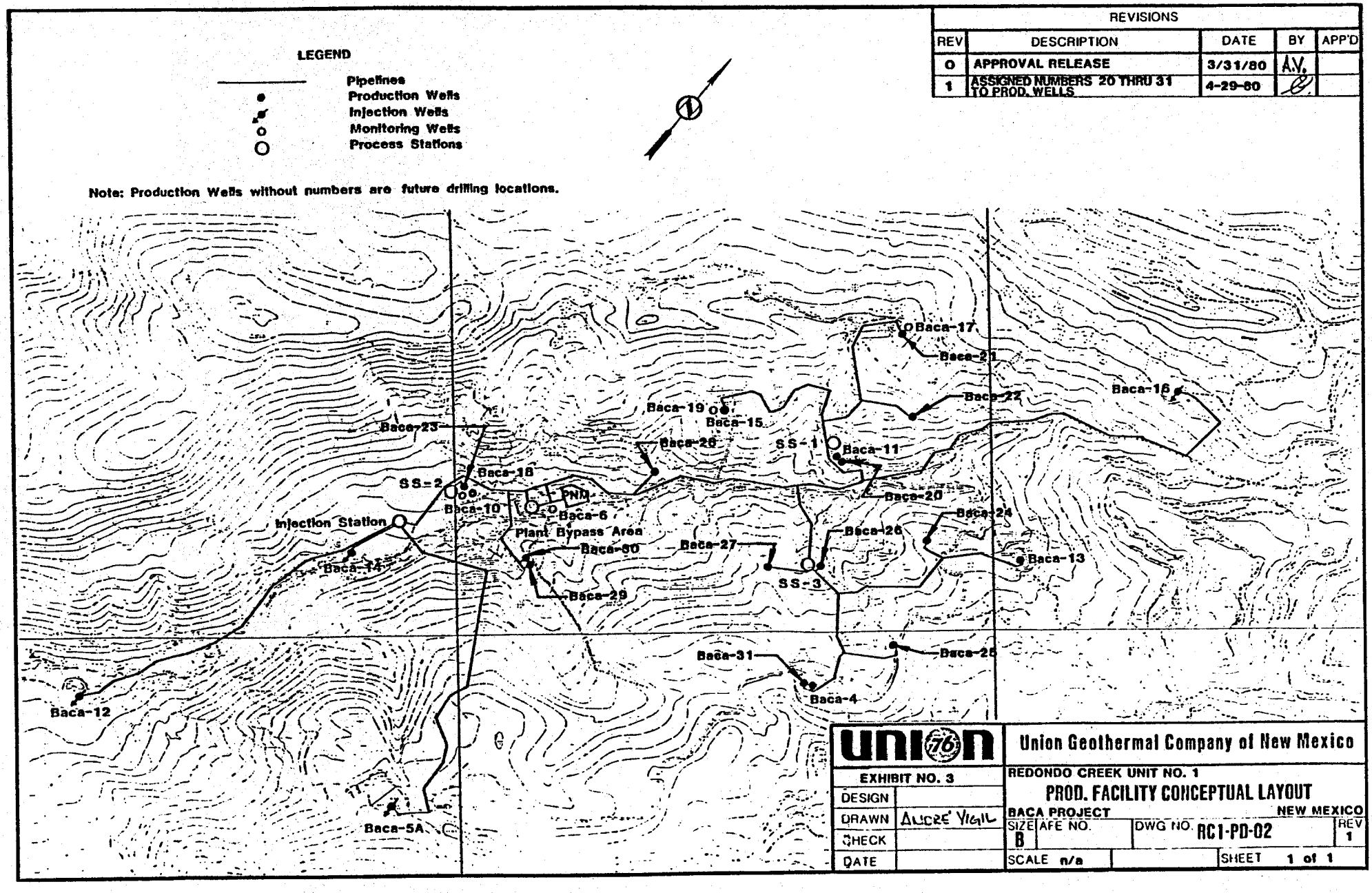

Figure 2.1 Conceptual Fluid Production Pipeline System

SECTION 3: POWER PLANT AND TRANSMISSION SYSTEM

3.1 Introduction

This section summarizes progress on the power plant and transmission system during the quarter. Public Service Company of New Mexico (PNM) is responsible for this task. Major PNM subcontractors are M.M. Sundt Construction Company and Bechtel Power Corporation.

3.2 Licensing and Permitting

Hearings before the New Mexico Public Service Commission (PSC) on PNM's application for a Certificate of Public Convenience and Necessity (CCN) to construct the power plant were underway throughout the quarter.

On October 20, 1980, the PSC ruled in favor of a motion to hear testimony from the intervenors related to the potential socioeconomic and religious impacts, and safety and reliability aspects, of the project. Testimony in these areas was presented by the intervenors from November 5 through November 10, 1980.

Hearings before the PSC were completed on November 10, 1980. Later in November 1980, the intervenor Energy Project filed a request with the PSC for a rehearing on their motion to join Union in the proceedings. No decision on this request was recorded by the end of the quarter.

On December 22, 1980, PNM filed its legal brief summarizing its case before the PSC. The intervenor's briefs are currently scheduled to be filed January 16, 1981, after which PNM will file its reply. The final PSC decision on PNM's application for a CCN is expected in mid-February 1981.

A detailed summary of the process of obtaining the Certificate of Public Convenience and Necessity for the project will be prepared as part of the project legal and regulatory constraints reporting (see Section 5.4).

3.3 Power Plant Design and Construction

The major PNM contractors working on the Baca power plant design and construction effort during the quarter were Bechtel Power Corporation (Bechtel), F. M. Fox and Associates (Fox) and M. M. Sundt Construction Company (Sundt). Bechtel is responsible for engineering design, equipment procurement and construction management, while Sundt has been awarded the overall construction contract. Fox is contracted to do materials testing in support of the Sundt work. Included in this section are progress reports on power plant engineering, equipment procurement and plant site preparation and construction.

3.3.1 Design Documents

Comments on Bechtel's September 1980 presentation of the Power Plant Detail Design are presently being accumulated by PNM. PNM will forward these comments to DOE upon completion.

3.3.2 Power Plant Engineering

Plant engineering continued on schedule during the fourth quarter of 1980. Bechtel estimated their engineering efforts to be 90 percent complete at the end of the quarter.

The turbine generator vendor, General Electric Company (GE), has not released certified drawings of turbine-operator design data according to the contract schedule. GE has submitted a revised drawing schedule and is attempting to remain on the new schedule, with limited success.

The estimate of the total number of Bechtel Engineering drawings required for the project has been revised from 363 to 386. To date, 333 or 86 percent of the required drawings have been issued for construction or for construction planning.

3.3.3 Procurement

Under the terms of their engineering subcontract with PNM, Bechtel prepares specifications, solicits bids, and evaluates proposals for all power plant equipment. Proposal summaries, with purchase recommendations, are then submitted to PNM for approval.

At the end of the quarter, Bechtel estimated their procurement effort to be 66 percent complete. Equipment purchased by Bechtel (as agent for PNM) during the quarter included:

Positive Displacement Meters
Primary Flow Elements
Diesel Oil Storage Tank Accessories
Electronic Field Instruments
Pressure Indicators

Equipment and material vendors have been requested to delay shipment until construction activities at the plant site resume on the currently scheduled date of April 1981. The only equipment being received at the plant site is that which had been ordered and could not be stored or delayed by the supplier.

3.3.4 Plant Site Preparation and Construction

Under the Cease and Desist Order issued by the PSC on July 30, 1980, only specific site preparation tasks were allowed to continue to completion. Construction progress for the quarter, under the order, included the completion of the retaining wall behind the cooling tower, backfill around the retaining wall, stabilization of cut slopes, and storm drain installation.

When it became apparent that the ruling on the CCN, and therefore the start of construction on the power block building, would be delayed until at least mid-November 1980, PNM elected to demobilize the construction contractor for the winter, effective October 28, 1980, to eliminate standby charges. Remobilization of the contractor, M.M. Sundt & Company, is scheduled for April 1, 1981, pending issuance of a CCN.

3.3.5 Power Plant Construction Schedule

The construction schedule has been significantly impacted by delays in obtaining a Certificate of Public Convenience and Necessity (CCN), and particularly by the issuance of a Cease and Desist Order by the PSC during the preceding quarter. Based on an estimated April 1981 remobilization of the general construction contractor, scheduled turbine roll has been delayed nine months in the revised schedule from the original date of January 1, 1982 to October 1, 1982. Bechtel is reviewing the revised schedule in an effort to minimize the impact of these delays.

3.4 Transmission System

Electrical power generated by the Baca GDPP will be routed to a PNM substation near Los Alamos, New Mexico, approximately 22 miles (35 km) east of the power plant facility. Progress in design and construction of the transmission system is described in the following sections.

3.4.1 Right-of-Way

In November 1980, the U.S. Forest Service (USFS) issued a right-of-way (ROW) permit for the portion of the transmission corridor passing through Forest Service owned land. However, the USFS has included a stipulation in the permit that no work begin on their land until a favorable PSC ruling is issued on the Certificate of Public Convenience and Necessity for the overall plant. Approximately 4.7 miles (7.6 km) of the total 22 mile (35 km) corridor crosses USFS land. The ROW permit presently commits the land for less than a thirty year lease period.

Approximately 4 miles (6.3 km) of the corridor is on DOE land (part of Los Alamos Scientific Laboratory). Right-of-way maps were prepared and submitted to DOE in September 1980 in an application for a right-of-way permit for this portion of the corridor. DOE had not yet ruled on the application at the end of the quarter.

The remaining length of transmission corridor traverses privately owned land. PNM is currently negotiating for ROW permits for this portion of the corridor.

3.4.2 Transmission Line Design and Procurement

Design of the electric transmission system continued with transmission line design approximately 90 percent complete and substation design approximately 30 percent complete at the end of the quarter. Due to power plant construction delays, transmission system engineering will be suspended at these levels until power plant construction resumes in the Spring of 1981.

SECTION 4: ENVIRONMENTAL MONITORING

4.1 Introduction

Environmental monitoring programs have been established by the Participant and WESTEC to record baseline conditions prior to monitoring the effects of geothermal development. Progress and activities in these programs are discussed in the following sections.

4.2 Water Quality

Surface waters in the plant and wellfield areas and in the Jemez watershed are monitored for flow rate and water quality on a monthly basis.

Union monitors Redondo Creek at a site near Baca No. 12, effectively downstream from both the plant site and wellfield, and at six additional sites in the Jemez watershed. Monitoring at these seven sites continued on schedule during the quarter.

An increase in siltation was noted in Redondo Creek at the confluence with Sulfur Creek, and at the confluence of Sulfur Creek and San Antonio Creek. Field investigations attribute the silt buildup to runoff from wellpads under construction, wellfield roadways and the plant construction site. Monitoring of Redondo Creek for silt buildup began in October and continued through the quarter. Gabions, wire mesh cages filled with rocks, are being buried along the Redondo Creek roadway as a means of reducing siltation.

WESTEC completed surface water monitoring at each of their five monthly sampling sites during the quarter. Site W-1, located 2500 feet (762 m) above the plant site on Redondo Creek, was frozen over in November and December, and no flow/discharge measurements could be gathered.

4.3 Hydrology

The effects of geothermal fluid withdrawal on groundwater levels and quality are monitored through sampling of local springs and observation wells.

Union's groundwater monitoring program includes six springs measured for discharge rate and water quality changes, and twelve surface water observation wells in which depth to water is periodically recorded. Sampling frequency is typically two to three times per year, to include Spring and Fall. The Fall sampling was performed on schedule during the quarter.

WESTEC supplements Union's hydrology program with additional sampling points at two springs and two surface water observation wells. Measurement and sampling at these sites was accomplished during the first week of October 1980.

4.4 Air Quality/Meteorology

Air quality and meteorology data are being collected continuously on and around the Baca Location to provide a basis for hydrogen sulfide (H_2S) dispersion modeling and to establish baseline data prior to power plant start-up. PNM and WESTEC have developed complementary data collection programs in order to provide a broad data base.

Data collection continued throughout the quarter at PNM's 200 foot (60 m) meteorological tower. PNM placed two mobile air quality monitors in Sulfur Canyon on October 23 and 29. The monitors were placed in the same general location that they were placed in November 1979. The two units are scheduled to collect data in this location through March 1981.

WESTEC's meteorological monitoring continued throughout the quarter. WESTEC is preparing a report summarizing the data acquired from the meteorological weather stations in Summer 1980. This report is scheduled for issuance in mid-January 1981.

Planning efforts continued for the winter atmospheric tracer studies. This study will measure sulfur hexafluoride (SF_6) gas diffusion from elevated releases to simulate cooling tower plume dispersion and transport. The preliminary scope of work for the study was developed during November and plans were finalized in December. The study period is targeted for the first three weeks in February if a suitable clear and stable period develops. The tracer study subcontractor will be ES&S of Kelseyville, California. An operations plan for the study will be issued by mid-January for review and comment.

Union made arrangements with PNM in October 1980 to monitor ambient levels of hydrogen sulfide in Redondo Canyon with a mobile monitoring station when Satellite Station No. 1 is constructed and tested at full capacity.

4.5 Floral Studies

The WESTEC floral monitoring program focuses on assessment of the effects of cooling tower emissions on the local ecosystems, while supplementing Participant vegetation studies.

WESTEC's 1980 field data collection for the ecology monitoring program was completed during the previous quarter. Work during the current quarter included laboratory analysis of vegetation and soil samples, and data compilation. The first annual report on the ecological monitoring program, describing methodologies and analysis results is expected to be completed in early January 1981.

4.6 Revegetation

As part of the environmental impact mitigation program set forth in the Final Environmental Impact Statement, disturbed areas not in general use are being returned to their originally vegetated state.

Plants of the Southwest, Inc. was contracted by Union to perform the revegetation of wellfield areas. Five hundred ponderosa pine seedlings were planted on recently cut slopes near the wellpads of Baca No. 15 and Baca No. 19. Slopes not suitable for tree seedlings were hydroseeded with native grasses.

4.7 Faunal Studies

Faunal studies and inventories of the wellfield, plant area and transmission corridor are periodically performed as part of the environmental impact assessment of the project.

Due to early unseasonal snow falls, the fall elk transects data collection was not completed. In addition, the identification of the endangered Jemez Mountain salamander habitat was unsuccessful. Consequently, no salamander transects were established for 1980.

Twenty voucher specimens from the October 1980 small mammal trapping were placed with the University of New Mexico Museum of the Southwest. No rare or endangered species were noted.

With the completion of the bird transect count on November 7, 1980, the Participant's biotic monitoring was completed for 1980. Biotic monitoring data for 1980 are presently being compiled and analyzed.

4.8 Archaeological Surveys

The Office of Contract Archaeology (OCA) of the University of New Mexico was contracted by Union to identify and catalog historically significant sites in the wellfield area. A draft report of their findings, which had originally been scheduled for delivery in July 1980, was completed and issued to the Participant in December 1980. When this report is accepted by the Participant the finalized report will be submitted to the State Historic Preservation Office for their records.

SECTION 5: DATA GATHERING AND DISSEMINATION

5.1 Introduction

Work performed under the Work Breakdown Structure (WBS) Task 1.3, the Data Gathering and Dissemination Task, has been subcontracted by the Participant to WESTEC Services, Inc. (WESTEC). All funding for this segment of the project is provided by DOE. The data management subcontract places primary responsibility for data collection with the Participant, while the data subcontractor is to compile, store, evaluate and report the project data. In addition to the information communication function, the data subcontractor supplements the data gathering efforts of the Participant in the areas of ecology, hydrology and meteorology, and supports the Participant's efforts in the areas of project promotion and public relations.

5.2 Data Base Development

The data base development task is composed of activities necessary to provide an automatic data processing capability for the electronic storage and retrieval of project-generated information. This task consists of the general areas of system definition, design, installation and operation. Progress made during the quarter in the areas of system definition and design is described in the following paragraphs.

A Digital Equipment Corporation (DEC) PDP 11V03 micro computer, that will function both as a timesharing terminal and as an off-line data processor, was installed in mid-October. The software interface between this hardware and the United Computing Systems (UCS) timesharing hardware was completed. This software interface allows WESTEC to store and retrieve data files on the UCS timesharing system. The UCS timesharing system offers a unique Data Base Management System (DBMS) software entitled TRIAD, which facilitates the creation and maintenance of linked data files (data bases). Familiarization with the use of the TRIAD software continued during the quarter.

The Community Survey Response Data Base design was completed. To test the performance of the design, several survey responses were entered into test data files and a test data base was generated. Debugging of the test data base is now in progress. Actual survey data is being digitized for entry into the data base.

The GEOCOST computer simulation program, developed by Battelle Northwest Laboratories, was obtained by WESTEC from the National Energy Software Center in Argonne, Illinois. This program is proposed for use in evaluating probable costs of geothermal power development and analyzing the cost sensitivity of specific engineering parameters. The program has been loaded into the UCS time-sharing computer and is in the process of being debugged.

5.3 Information Communication Planning

The primary objective of the Baca Data Gathering and Dissemination Task is to identify the potential project information user groups and to provide them with the quantitative bases for assessing the technological and economic risks and benefits associated with involvement in a geothermal development project such as the Baca GDPP Project. To meet this objective, industrial and financial community survey worksheets were prepared and distributed to a representative sampling of the geothermal community during the preceding quarter.

Fifty-eight (58) of the one-hundred and one (101) community survey worksheets mailed were returned by the end of the quarter. One general conclusion drawn from the responses received to date is that the long term performance and dependability of the reservoir is perceived as the major risk/interest area. The responses to the industrial and financial community survey worksheets will be evaluated to clearly define the information needs of each of the user communities. Following this evaluation, a plan for communicating with each of the ten user communities will be formulated.

5.4 Legal and Regulatory Constraints

WESTEC is compiling a history and analysis of the impacts of legal and regulatory constraints on the project as a guide for future geothermal development. WESTEC submitted a draft of the first semi-annual Legal and Regulatory Constraints Report for Participant approval in mid-October. After incorporation of comments, the final draft of the Legal and Regulatory Constraints Report was submitted to the Participant for final approval on December 23, 1980.

5.5 Financial Analyses

WESTEC will provide financial analyses appropriate to the needs of specific user communities identified in the Information Communication Plan (see Section 5.3). Work in this area has been subcontracted by WESTEC to Coopers & Lybrand, Certified Public Accountants (C&L). The current level of effort continues to involve planning and organizing financial data files. The ongoing communication with the Participant continued through the quarter to define the types, sources, and availability of financial information on the Baca Project to be used to develop the standard financial analysis reports for the financial community. A further evaluation of the Community Survey worksheets during the next quarter will provide needed input to this planning effort.

5.6 Geological and Geophysical Data Mangement

Systems, Science and Software, Inc. (S^3) has been subcontracted by WESTEC to evaluate new and previously developed geological and geophysical data on the Baca reservoir and to develop a computerized project data file for this data. No new well data was released by the Participant during the quarter, therefore work in this area was limited to examination of existing Participant data. A semi-annual status report on the data compiled in the Geological and Geophysical Data (Geo-Data) File is being prepared for release next quarter.

During the quarter, a digitized working map of the shallow temperature gradient measurements collected by Union between 1970 and 1974 was created. All sixty-six of the shallow gradient holes were located and identified on the working map in both the Lambert longitude and latitude and the Transverse Mercator New Mexico Plane Coordinates. The coordinates were digitized and filed in conjunction with data on wellhead elevations and borehole temperatures at various depths.

5.7 Subsurface Data Management

WESTEC has subcontracted S^3 to store, evaluate and disseminate reservoir engineering data including well tests, interference tests and geophysical and hydrological data and to simulate the characteristics of the Baca geothermal reservoir using an S^3 proprietary computer program. The following is a summary of these efforts during this quarter.

5.7.1 Reservoir and Well Test Data

During this quarter, S^3 completed a detailed analysis of the drilling records and the pressure and temperature static profiles for all of the Baca wells for which information was available (Baca Wells No. 4 through 19). By studying records of the state of the borehole fluid during drilling and well shut-in, both before and after fluid injection and withdrawal, S^3 has identified the locations of high formation permeability and computed the initial reservoir conditions at these depths. By correlating the reservoir conditions determined from the borehole measurements with geological data, S^3 then constructed reservoir cross-sections which define reservoir lithology, zones of permeability, and the initial reservoir fluid temperature and pressure conditions.

The detailed analyses of the drilling and shut-in data of Baca Wells No. 4 through 19 and the integrated model of the Baca reservoir system that has evolved from them are currently being documented as a project Topical Report. This report is expected to be completed during the next quarter.

During the preceding quarter, the S^3 geothermal reservoir simulator was used in a series of runs to produce a theoretical framework for interpreting pressure transient data for geothermal wells producing or injecting fluids into either single-phase or two-phase reservoir systems. The draft report describing these results has been approved for publication as a project Topical Report and will be available for distribution in January 1981.

During December 1980, the available Baca well flow test data (especially Baca No. 15) were examined in detail. During the next quarter S^3 plans to continue the analysis of the data and to use the cross-sectional models of the pre-production reservoir system and the theoretical framework provided by the simulations to help guide the development of a quantitative understanding of the Baca reservoir. The purpose of this continuing analysis is to independently evaluate the flow test data presented by Union. Both flow through fractures and Darcian flow in a porous medium are being considered as reservoir flow models.

5.7.2 Equation of State Development

S^3 completed incorporation of the equation-of-state package as a subroutine in the S^3 reservoir simulator. Currently, the draft report, which describes the thermodynamic considerations and calculative procedures in the package, is being expanded to include numerical examples for fluid states of interest in the Baca reservoir system. Preparation of this project Topical Report will be completed in February 1981.

5.7.3 Reservoir Case History

S^3 is developing a case history document of the Baca geothermal reservoir system. During this reporting period, a draft of the section on the geology of the Valles Caldera was completed and the section on exploration geophysics was initiated. This document will be updated and published periodically as wellfield development continues.

5.7.4 Reservoir Data File

The Reservoir Data File as currently constructed consists of four major files: the General Information File, the Individual Well File, the Interference Data File, and the Core Data File. A semiannual Status Report is being prepared which describes the Reservoir Data File in detail and which contains a current computer listing of the General Information File and the Individual Well File. This Status Report is scheduled for completion in January 1981.

5.8 Production System Data Management

WESTEC will compile production system engineering data furnished by the Participant into site specific and general design criteria that will be useful to other resource developers. Review of production system design data began in September, following receipt of Union's Preliminary Design Review Document. WESTEC will await more detailed design data from the Participant before documenting the production system design criteria.

5.9 Power Plant Data Management

During the quarter WESTEC received a copy of the GEOCOST Computer program from the National Energy Software Center. This program will be evaluated for use in the analysis of cost and performance parameters. In addition, the GEOCOST program will also be reviewed by WESTEC to determine its usefulness for calculating power plant performance during the operational phase.

5.10 Project Promotion/Public Relations

WESTEC coordinates with the Participant's public relations personnel and provides specific public relations services necessary to stimulate interest in the project and promote data availability in support of the project's primary objectives. A summary of activities in these areas follows.

5.10.1 Information Requests

By the end of the reporting period WESTEC received and filled twelve data requests from groups outside the Project, supplying a total of eighty-one individual Participant Historical Reports.

5.10.2 Presentations and Symposia

Planning for the first annual Baca Symposium continued during the quarter. A representative of the Geothermal Resources Council (GRC) met with the recently formed Symposium Program Committee, which includes representatives of DOE, the Participant, and WESTEC, to discuss a proposed schedule and organization for the Symposium. The GRC is providing planning and logistics support for the Symposium. The Program Committee has tentatively scheduled the Symposium for the first week of September 1981 with Albuquerque, New Mexico as the primary choice for location.