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Pinon Pine Power Project

Annual Report
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Office of Fossil Energy
Federal Energy Technology Center
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Disclaimer

DISCLAIMER

ABBREVIATIONS AND ACRONYMS

BFW	Boiler Feedwater
CCT	Clean Coal Technology Program
CRADA	Cooperative Research and Development Agreement
DOE	U. S. Department of Energy
EIS	Environmental Impact Statement
EMP	Environmental Monitoring Plan
EPA	Environmental Protection Agency
FW USA	Foster Wheeler USA Corporation
FWPS	Foster Wheeler Power Systems
HGD	Hot Gas Desulfurization
HGF	Hot Gas Filter
HRSG	Heat Recovery Steam Generator
IGCC	Integrated Gasification Combined-Cycle
KRW	Kellogg-Rust-Westinghouse
KTDC	Kellogg Technology Development Center
LASH	Coal Ash with Spent Limestone
MAP	Mitigation Action Plan
MWK	The M. W. Kellogg Company
NDEP	Nevada Department of Environmental Protection
NDOT	Nevada Department of Transportation
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Health and Safety Administration
PDS	Plant Design System
PDU	Process Development Unit
PMP	Project Management Plan
PON	Program Opportunity Notice
PSCN	Public Service Commission of Nevada
PSD	Prevention of Significant Deterioration
RFQ	Request for Quotation
ROD	Record of Decision
SPPCo	Sierra Pacific Power Company
SUFCO	Southern Utah Fuel Company
UEPA	Utility Environmental Protection Act
UNR	University of Nevada Reno
UPS	Uninterruptible Power Supply

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1.0 EXECUTIVE SUMMARY

This annual report has been prepared to present the status of the Piñon Pine Power Project, a nominal 107 MWe (gross) coal-fired integrated gasification combined-cycle (IGCC) power plant addition to Sierra Pacific Power Company's (SPPCo) system. This project will also serve as a demonstration project cost-shared by the U.S. Department of Energy (DOE) and SPPCo under DOE's Clean Coal Technology (CCT) Program. The goal of the CCT Program is to demonstrate advanced coal utilization technologies that are energy efficient, reliable and able to achieve substantial reductions in emissions as compared with existing coal technologies.

The Piñon Pine Power Project will demonstrate an IGCC system utilizing the Kellogg-Rust-Westinghouse (KRW) fluidized-bed gasification process operating in an air-blown mode with in-bed desulfurization and hot gas clean-up with a western bituminous coal as the design fuel. Testing will also be performed on a high-sulfur eastern coal. The Piñon Pine Power Project will be constructed and operated at SPPCo's Tracy Power Station, an existing power generation facility located on a rural 724-acre plot approximately 17 miles east of Reno, NV (Appendix 1). This new unit is designated as Tracy Unit No. 4.

SPPCo, the project participant, has contracted with the Foster Wheeler USA Corporation (FW USA) for the overall project management, engineering, procurement and construction of the project. FW USA in turn has subcontracted with The M. W. Kellogg Company (MWK) for the engineering and procurement of key components for the Gasifier Island.

Key accomplishments for the project to date have been the following:

- Completion of the National Environmental Policy Act (NEPA) requirements, including the Draft and Final Environmental Impact Statements and the Record of Decision.

- Environmental permitting activities were successfully concluded when the Public Service Commission of Nevada approved the UEPA (Utility Environmental Protection Act) Application for the Piñon Pine Power Project. The UEPA was the final permit required to build and operate the plant. In 1996, ongoing permitting activities were successfully completed for individual permits for the construction phase, waste removal and equipment operation.

- The Mitigation Action Plan (MAP) was submitted and approved in 1995. The plan details the process for compliance of all mitigation measures identified in the Final Environmental Impact Statement. The plan was monitored by SPPCo and action taken as necessary to comply with commitments made in the Record of Decision.

- The Environmental Monitoring Plan initially drafted in 1992, was reviewed, revised and approval of the final plan was received from the DOE. The plan specifies monitoring activities by phase beginning with preconstruction (baseline), and continuing through the construction and operation of the project.

- Preliminary design and the 40% design review with DOE were completed. The 90% engineering & design and 20 % construction completion review with the DOE was held on site on January 17 and 18, 1996. The 90% construction completion review with DOE was held on site on October 29 and 30, 1996.

- The Definitive Cost Estimate for the project was completed (see Appendix 3 for estimate summary).

- Sierra Pacific Power Company's Board of Directors approved the Continuation Application submittal to the DOE and committed funding for Phase II and Phase III of the project. Approval of the Continuation Application was granted by the DOE. The Project Evaluation Report for Phase II of the project was submitted to DOE and approval received. The Continuation Application for Phase III funding was submitted to the DOE for approval.

- The viability of substituting the Transport Hot Gas Desulfurization System at the Kellogg Technology Development Center as an alternate to the more costly fixed bed system was successfully tested.

- An external desulfurizer sorbent supplier was selected and bench scale testing of first batch of commercially produced sorbent was performed.

- The process design phase of the facility and preliminary and detailed engineering phases were completed.

- Procurement of all equipment and bulks was completed. Procurement of spare parts is nearly complete with the balance of orders to be issued during the First Quarter of 1997.

- Sierra Pacific Power Company contracted with Foster Wheeler Power Systems (FWPS) through FW USA to provide technical support during commissioning and startup.

- The Start-Up Plan (Test/Turnover Program Manual) was developed and approved by the DOE. The manual outlines the commissioning process, identifies specific responsibilities among the various parties and provides a detailed start-up schedule.

- The Test Plan was developed and approval was received from the DOE. The Test Plan provides for the demonstration tests and other data collection required to obtain the data base and experience necessary for the detailed design, operation, control and maintenance of large-scale (over 250 MW) commercial plants.

- A training program for new Piñon Pine operations and maintenance staff was developed and scheduled for February through June 1996. During 1996, Piñon operators received training on safety orientation, management and team training, gasification overview and process, distributed control system, plant overview, Gas Turbine/Mark V, and Gas Turbine/gasifier integration and controls..

- Construction work on the Combined-Cycle and associated Offsites required to operate the facility with natural gas was completed.

- Construction activities for the Gasifier Island and the balance of the Offsites were in progress. Overall construction work will be completed during the First Quarter of 1997.

- Engineering and construction activities on the switchyard which connects the existing Tracy Plant with the Piñon Pine Plant were completed. Testing and energization of the facility was completed on June 24, 1996.

- An advanced steamblow technology was utilized to remove accumulated debris from the plant's piping. This process produced less strain on the plant's equipment while keeping noise to a minimum.

- Commissioning, start-up and synchronization of both the Gas and Steam turbines was completed. Performance testing indicated the Gas Turbine met capacity, heat rate and emission guarantees and the Steam Turbine met capacity guarantees. Sierra turned the Combined-Cycle plant over for 'Commercial Operation' on December 1, 1996.

- Sierra identified, evaluated and contracted for infrastructure requirements as appropriate to support; coal supply and testing; limestone and sorbent supply and testing; makeup water supply; disposal of sanitary waste; disposal of solid waste to approved landfill sites; and determination of the need for highway upgrading.

- SPPCo and Southern Pacific Lines entered into an Industrial Track Agreement for rail delivery of coal.

The start of the Demonstration Period (Phase III) is currently projected to begin during the First Quarter of 1997.

2.0 INTRODUCTION AND BACKGROUND

2.1 IGCC Technology Overview

Coal-fired power plants are still the mainstay of power generation world-wide. The emissions produced by coal combustion have led to an environmental burden to the point where the use of coal as fuel for electricity generation may be threatened. Parallel to the installation of flue gas scrubbers in conventional coal-fired power plants, research is proceeding on innovative power plant concepts which are not only more acceptable from an environmental standpoint but also feature higher efficiency. Technology of this kind is already available for oil and gas fuels in the form of combined-cycle gas and steam turbine power plants. To apply combined cycle technology to power production from coal, conversion of coal to a gaseous fuel is required by a coal gasification process. The most common coal gasification process essentially involves partial combustion of coal. This partial combustion provides the energy for further conversion of coal primarily into carbon monoxide and hydrogen.

In many regions in the United States, the effective electric reserves have declined to low levels and it is predicted that there will be a surge in new power plant orders. The criteria used for selecting a power plant technology will have to take into consideration cost competitiveness, environmental superiority, module size, fuel flexibility, reliability and availability, and construction lead time. Based on these criteria, IGCC technology is a leading candidate for new capacity addition. Demonstration of this technology should provide a coal-based option with cost of electricity that is competitive with more conventional technologies.

The Piñon Pine Power Project located at SPPCo Tracy Station incorporates the KRW gasification technology which will produce clean low-Btu gas for use as fuel in a Combined-Cycle power plant for production of low cost electricity in an environmentally sound manner.

The KRW process improves upon first generation IGCC technology in several aspects. Its pressurized, air-blown fluidized bed gasification technology will provide a higher thermal efficiency than a similar oxygen-blown system because it consumes less auxiliary power. A portion of the sulfur pollutants are captured within the fluidized bed before they can exit the gasifier. Additional impurities are removed through an advanced hot gas cleanup system which operates with a regenerative sulfur sorbent to remove sulfur compounds and barrier filters to remove particulates. In addition, the inherent modular design of the system and simple process configuration are expected to yield significantly lower engineering and construction costs.

The Piñon Pine Power Project integrates a number of technologies fostered by DOE. Among these are the KRW Energy Systems fluidized-bed gasifier, in-bed desulfurization using limestone sorbent, and zinc based sorbent sulfur removal from a hot gas stream. DOE and its predecessor agencies have supported development of this fluidized-bed gasification technology since 1972 when the design of a process development unit (PDU) was first initiated under contract with Westinghouse Electric Corporation. Construction of the PDU was completed in 1975 at Westinghouse's Waltz Mill Facility near Madison, Pennsylvania. From 1984 to 1988 the addition of dolomite and limestone to the gasifier bed for in-bed sulfur removal was successfully demonstrated at the PDU. These tests indicated that 85 to 90 percent sulfur removal efficiencies could be routinely achieved while using coal feedstocks containing 2 to 4.5 percent sulfur.

It is important that a demonstration of the advanced IGCC technology include actual integration of the gasifier with a combined-cycle power plant. This step is necessary in order to evaluate the adequacy of integrated control concepts and to measure actual performance of a complete power generation system on a utility grid. The modular concept of the proposed technology will provide information that is directly applicable to other commercial plants since such plants will essentially incorporate one or more replicates of the demonstration project plant configuration.

2.2 IGCC Development History

Almost all of the IGCC demonstration plants were designed around a more conventional approach, i.e., gas produced in the gasifier was either quenched or cooled and scrubbed for low temperature removal of sulfur compounds. These plants also removed ash/slag in a wet state. In order to limit the size of cool down trains and desulfurizer systems, gasifiers for these early plants were oxygen blown, thereby adding to capital cost and parasitic power consumption. Cooling of gas for sulfur removal not only lowered the cycle efficiency, but also required extensive equipment and handling of process water. These plants offered the advantage of reduced number of gasification trains and offered flexibility to adapt them to chemical production.

In order to meet challenges of the market place and environment, a simplified IGCC system incorporating air-blown gasification with hot gas cleanup has been developed. By eliminating the oxygen plant and minimizing the need for gas cooling and waste water processing equipment, the capital cost is reduced and plant efficiency is improved. Key features of the simplified IGCC system are shown in Appendix 2 and described below:

- Air-Blown Gasification

  In the simplified IGCC system, about 15 to 20 percent of the Gas Turbine compressor discharge air is extracted for use as oxidant in the gasifier. A booster air compressor increases the pressure of this extracted air to compensate for pressure losses through the gasifier and downstream hot gas cleanup system and fuel control valve.

- Hot Gas Cleanup

  To date, most major gasification plants have utilized either cold (wet) cleanup processes or gas filtration at moderately higher temperatures. The alternate approach of filtering the gas at high temperature enables the gas to maintain most of the sensible heat resulting in a higher plant efficiency. Equipment is minimized and there is no waste water production. Several types of filtering devices have been tested in pilot facilities and are available from several suppliers.

- Hot Gas Desulfurization

  Sulfur contained in coal is removed in two steps. Addition of limestone to the gasifier captures the hydrogen sulfide produced in the reducing environment of the gasifier. Sulfur not captured by the limestone leaves with the product gas and is removed in an external desulfurizer system.

- Sulfation

  Coal ash with spent limestone (LASH) contains calcium sulfide along with unconverted carbon. The sulfator oxidizes the CaS produced in the Gasifier into $CaSO_4$, combusts unconverted char and absorbs SO_2 in regeneration gas from external desulfurizer system. Small amounts of transport and depressurization gas as well as fines recovered from the transport reactor, ceramic filters and downstream baghouse are also combusted in the sulfator. The sulfator operates as a fluidized bed. The exothermic heat of reaction is removed by generating steam to maintain the bed material at a temperature of 1600°F. Additional heat is recovered from flue gas exiting the sulfator by generating and superheating steam. The sulfated LASH is suitable for landfill. Results from the bench scale testing were used to develop design data.

2.3 Project Selection and Cooperative Agreement

In January 1991, the DOE issued a Program Opportunity Notice (PON) soliciting proposals to demonstrate clean coal technologies that were capable of being commercialized in the 1990's. These technologies were to be capable of achieving significant reduction in the emissions of sulfur dioxide and/or nitrogen oxides and to provide for future energy needs in an environmentally acceptable manner. In response to the PON, DOE received proposals for projects that involved both advanced technologies that can be "retrofitted" to existing facilities and "re-powering" technologies that increase plant generating capacity, extend the operating life of a facility, and also reduce air pollution. The project proposed by SPPCo of Reno, NV was one of the nine projects selected for funding. The project encompasses the design, construction, and operation of a nominal 100 MWe (net), air blown KRW fluidized bed coal gasifier IGCC demonstration plant.

The Cooperative Agreement between SPPCo and the DOE was executed in August 1992. FW USA provided engineering and construction management services for the project. MWK provided engineering of the Gasifier Island.

2.4 Description of Existing Tracy Station

The existing plant site is located in Storey County in the Truckee River Canyon, on flat terrain abutting the Truckee River. The finished floor elevation of the plant is approximately 4,280 feet above sea level. Two mountain ranges flank the canyon. The Pah Rah Range is located to the north of the site, and the Virginia Range to the south. Clark Mountain, located approximately 3.5 miles to the south, is the largest feature in the area with an elevation of 7,195 feet above sea level. Figures 2-1 and 2-2 are maps showing the Tracy Station location and topography. Please refer to photographs in Appendix 5 for reviews of the existing site.

The Tracy Power Station is located on a 724-acre site approximately 17 miles east of the Reno/Sparks area adjacent to I-80. The facility consists of 3 steam generating units, producing 53 MW, 83 MW and 108 MW, respectively. Other facilities include an office building, two warehouses, a machine shop, a fuel oil storage area with five storage tanks, one diesel storage tank, one propane storage tank, two cooling towers, and one paved parking lot. There is also a 345 kilovolt (kV) transmission line and 120 kV and 60 kV transmission lines, with accompanying towers servicing the Reno area and the North Valmy Power Plant. Figure 2-3 is a plan view of the existing plant and locations of the proposed projects.

At night, the main areas of the Tracy Power Station (stacks; Units 1, 2 and 3; and warehouses) are lighted and clearly visible from I-80. The lighting is directed toward plant facilities and not at surrounding areas.

SPPCo has recently installed two 83.5 MW simple-cycle combustion-turbine generating units and auxiliary equipment to supply 167 MW of electrical power. These units began commercial operation in July 1994. Two stacks are associated with these units, each 55' tall. The Tracy Power Station is the site for these turbines.

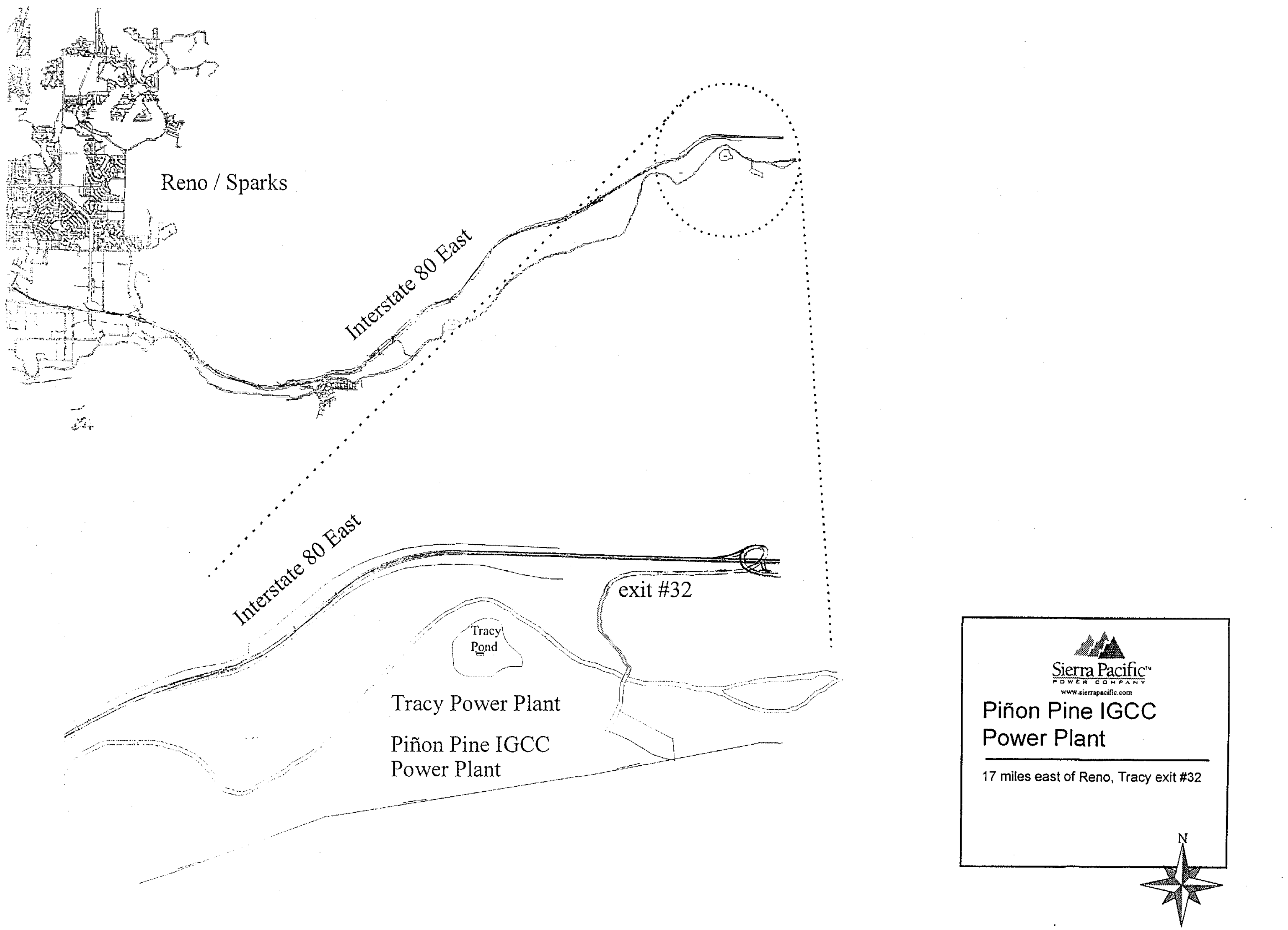


Figure 2-1: Tracy Station Location

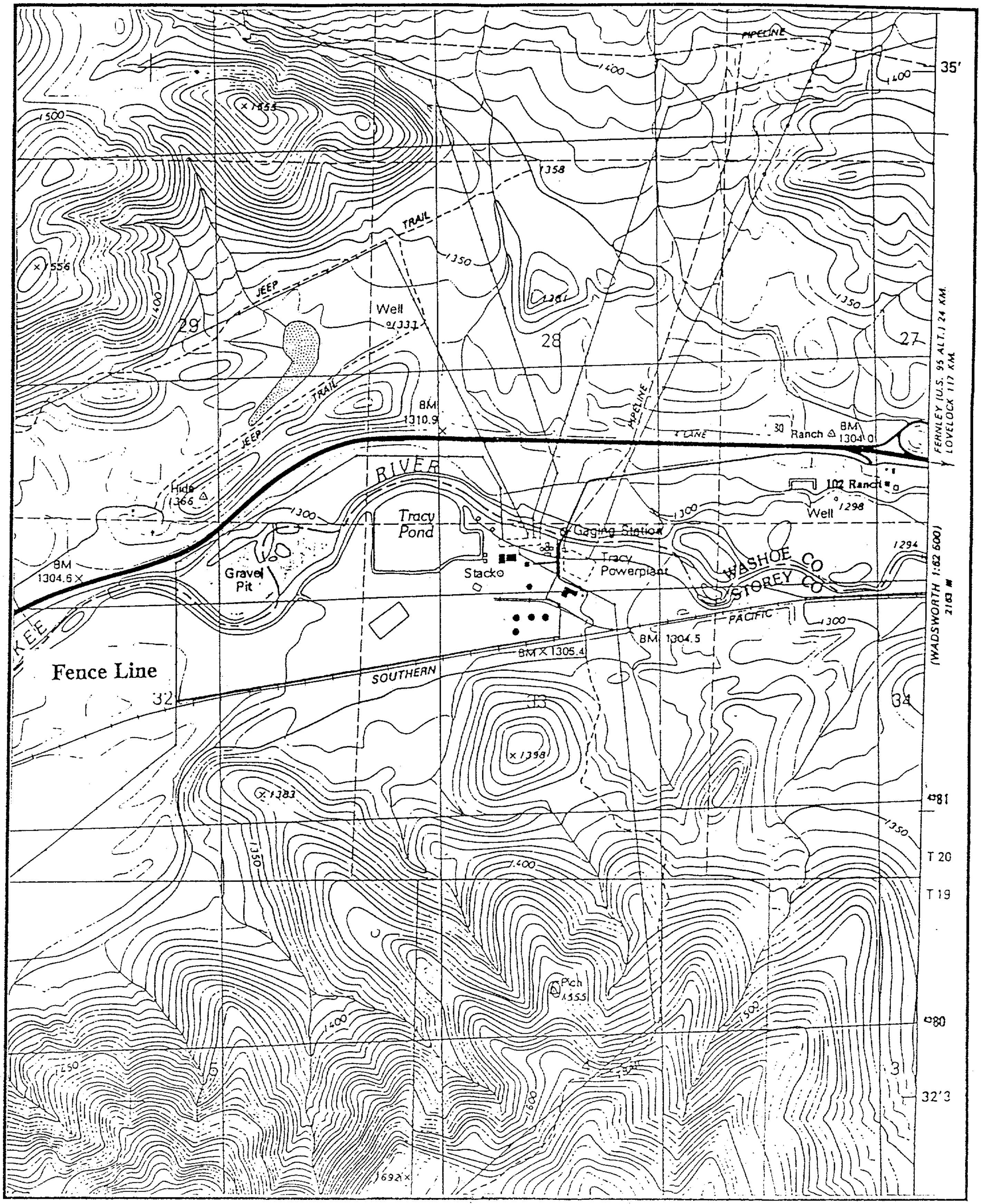


Figure 2-2: Tracy Station Topography

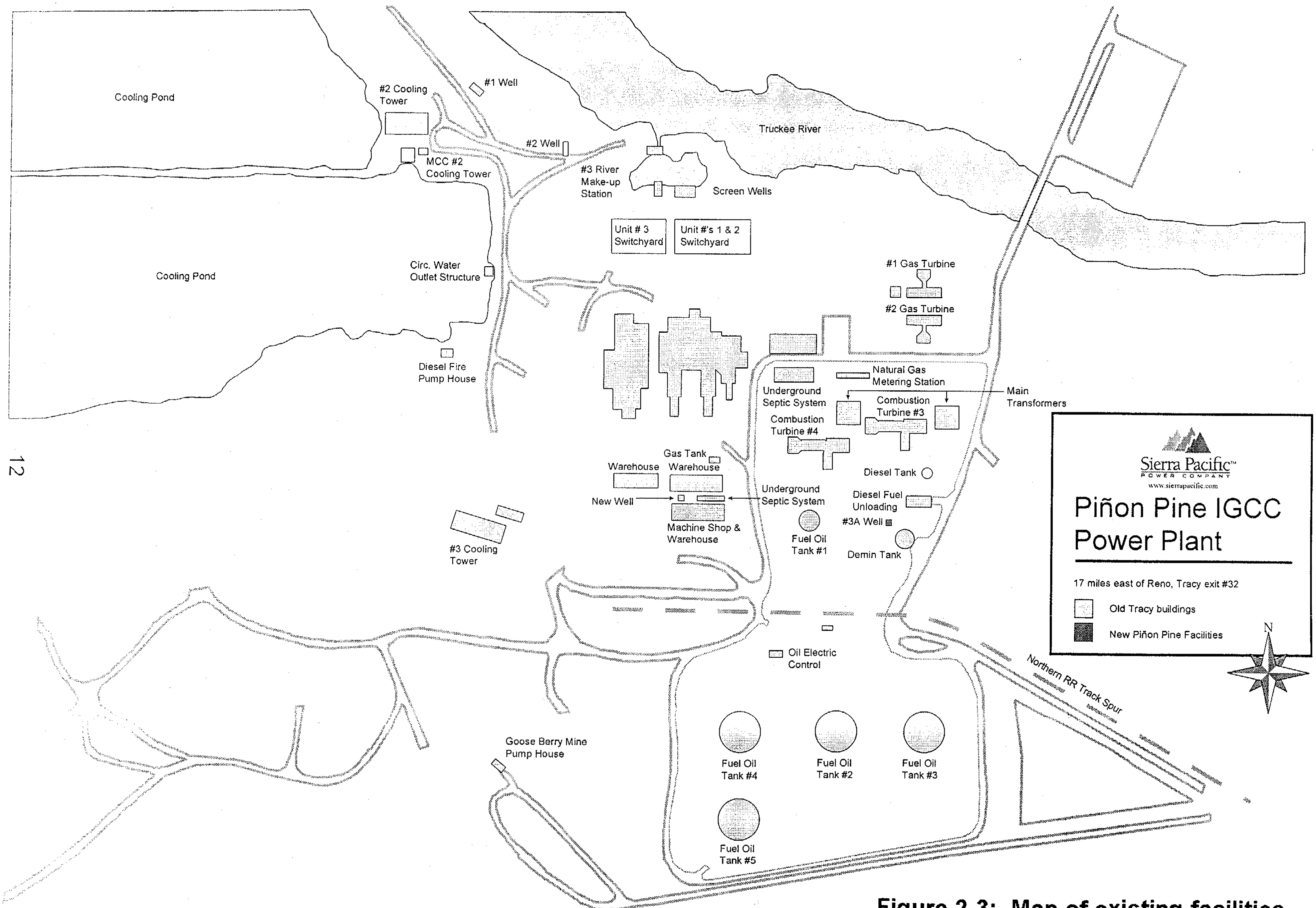


Figure 2-3: Map of existing facilities at Tracy Station

3.0 PROJECT OBJECTIVES

3.1 Overview of Objectives

The objectives of the Piñon Pine Power Project are to meet the power needs of the SPPCo customers and to demonstrate the technical, economic and environmental viability of a commercial scale IGCC power plant. This plant is based on an air blown, fluidized-bed gasifier incorporating full-stream hot gas clean up and a combustion gas turbine capable of utilizing low Btu gas. The project demonstrates that power plants based on this technology can be built at capital costs and with thermal efficiencies which significantly reduce electric power costs over more conventional technologies. The project also demonstrates the effectiveness of hot gas clean-up in achieving a negligible environmental impact (reduced SO_2 and NO_X emissions) and the operation of a low-Btu fuel gas combustion turbine. The performance to be demonstrated includes all major sub-systems of the IGCC system including coal and limestone feed systems, pressurized air-blown fluidized bed gasifier, hot product gas filtering and desulfurization with a regenerative sulfur sorbent, sulfator system, combustion turbine and steam cycle, and integrated control systems. Another objective is to assess the long term reliability, maintainability, and environmental performance of the IGCC technology in a utility setting at a commercial module size.

3.2 Project Phases

The Piñon Pine Power Project is divided into the following three distinct phases of activity as shown in the Summary Bar Chart Project Schedule included in Appendix 4:

3.2.1 Phase I - Design

The objective of activities during this phase is to provide the technical definition and definitive cost of the Piñon Pine Power Project. This effort provides process design, equipment identification and selection, integration of the gasifier system with the power plant, and system test planning as required to make certain that adequate design features exist to assure performance and operational success. Also, all required engineering information and support for all licensing, permitting and reliability activities was prepared during this phase.

3.2.2 Phase II - Construction

This phase includes all activities required to construct the plant in concert with the overall project plan. This will ensure that the facility is procured and constructed to specification, on schedule, and within budget. Procurement activities during this task include purchasing, inspections, expediting, traffic and commercial aspects of in-place subcontracting. Included in this effort are home office construction activities such as safety, quality assurance, labor relations, budgeting and scheduling, and field construction management activities including functions such as supervision of equipment installation, erection of materials, field engineering, field accounting, cost, schedule and material control, and subcontract administration.

3.2.3 Phase III - Operation

This phase covers all the labor, materials and services needed for plant operation for a 42-month period. The objective is to provide all the operational and management direction that will be necessary to provide the private sector with technical, economic and environmental evaluations on the advanced coal gasification combined-cycle power plants.

3.3 Accomplishments

This section of the report provides a summary of major activities and accomplishments during 1996.

3.3.1 Engineering

The overall engineering progress achieved through 1996 was 100% with the completion of the following major activities:

- Issued balance of instrumentation and electrical drawings for construction.
- Issued complex loop description, alarm summaries and UPS load requirements.
- Performed a technical risk assessment for the Gasifier Island, and issued a report outlining the required and recommended actions.

- Provided an availability analysis of the Gasifier Island equipment to support the RAM analysis performed by ARINC.

- Evaluated the impact of reduced Gas Turbine extraction air pressure on Gasifier Island operation. The evaluation indicated no adverse affect on operation at design conditions which remains to be verified by actual operation of the facility in IGCC mode.

- Issued requirements for the Gasifier Island solids sampling of LASH, sorbent, fines and waste solids.

- Issued the Gasifier Island "Inspection and Maintenance Manual" and recommendation to SPPCo regarding thermographic survey of refractory lined systems.

- Issued Mechanical Catalogs presenting vendor data.

- Completed the dynamic simulation of the IGCC facility. A report detailing all the findings was issued. No design changes were identified; however, one of the major achievements was establishment of guidelines for load ramping.

- Issued Gasifier Island Operating Instruction Manual which included system information packages describing detailed operation for particular systems.

- Issued final action/results for Design Hazard Review.

3.3.2 Environmental/Permitting Activities

To insure compliance with the National Environmental Policy Act, the Department of Energy developed implementing procedures (10CFR 1021) which required the preparation of a Mitigation Action Plan (MAP) after the completion of an Environmental Impact Statement and the associated Record of Decision. The purpose of the MAP is to address planning and implementation of all mitigation commitments made in the Record of Decision.

The Mitigation Action Plan was finalized by the DOE in 1995. Included in the plan are emissions performance standards, power plant design requirements, fog impact mitigation, mule deer habitat enhancement, tree screening along the Truckee River, archaeological site protection, soil erosion control and dust control. All mitigation activities identified in the plan are being implemented by SPPCo as appropriate. DOE oversight includes review of technical reports, on-site inspections and review of progress updates in quarterly reports submitted by SPPCo. The following major Mitigation Action Plan activities were performed by SPPCo during 1996.

Water trucks were provided on site 24-hours a day and were used for dust suppression as required. Biodegradable dust control agents were used with excellent success. This practice will continue throughout the entire construction process.

The Geotechnical Investigation Report was used to mitigate problems which were not addressed in the engineering process and reports will be issued as necessary.

In compliance with archaeological site protection, cultural resource sites identified in the Environmental Impact Statement were flagged and fenced for protection from disturbance during construction. Two additional sites were determined to be outside the SPPCo property line. These sites were not fenced since they were protected by an existing 4-strand barbed wire fence which marks the facility boundary.

The Tree Screening Plan was submitted to and approved by both the DOE and Storey County. During the fourth quarter 1995, the irrigation system which will utilize cooling water from the Tracy Plant was installed. Tree planting was accomplished in January 1996 and the area was protected by a 10-foot high double fence. On a monthly basis, site visits were made to inspect the progress of the trees and one of the 75 trees planted one was found to be dead. Trees were, and will continue to be watered on a regular basis.

The Mule Deer Habitat Enhancement Plan was prepared in 1995 with the assistance of a University of Nevada Reno (UNR) Biology student and calls for providing both cover (in the form of vegetation) and an "attractant" food source. Construction activities disturbed the deer's' access to the river (the primary water source for a small herd of about 20 animals) and the deer have relocated west of the project boundary and access the river just west of the existing cooling pond. Food is scarce in this location. It is the goal of the Plan to provide a mixture of perennial grasses and shrubs to act as attractants for the deer. The Plan was submitted to the DOE and approval was received. A severe fall and early winter drought caused soil moisture to be insufficient to support the containerized material, thereby, preventing the start of planting which was rescheduled to the first quarter of 1996. Installation of habitat enhancements which included containerized and seeded plant material, mulching, and a 10-foot tall fence were completed in 1996. Supplementary watering occurred two to three times a week depending upon soil moisture conditions and will continue until plants become established.

Testing of pH in water discharged to the evaporation pond commenced in July 1996 with the chemical flush of the piping.

In order to address the issue of fog and ice detection, SPPCo and the Nevada Department of Transportation (NDOT) negotiated and entered into a "Cooperative Agreement" to provide a fog warning sign. It will be the responsibility of NDOT to build and maintain the warning sign.

A petition was submitted to EPA Headquarters regarding acid rain applicability of the sulfator and start-up heater and confirmation was requested in writing from EPA Headquarters by January 31, 1996. In April of 1996, Region 9 EPA approved the technical approach for monitoring SO_2 emissions in the combustion turbine / HRSG stack.

Review of the Safety of Dam Permit application by the State Engineer was completed and a permit was issued in March of 1996 which allowed construction to commence on the evaporation pond.

A Public Water System Permit was approved by the State Bureau of Health Protection Services in the Third Quarter 1996. This permit is required for additions to, or modifications of an existing public water system if more than 500 feet of pipe extension or if it affects or adds more than 5% of the number of connections in the system. SPPCo will comply with all permit conditions.

SPPCo applied for a Groundwater Discharge Permit from the Nevada Division of Environmental Protection (NDEP). This permit is required of all potential point sources which includes cooling, holding and blowdown ponds. This permit is required for the evaporation pond and NDEP has granted permission to discharge into the pond and estimates approval of this permit will take place in mid-1997.

A Septic Tank Permit is required of any entity that installs an individual sewage disposal system and is administered by NDEP because the total estimated flow of all septic systems on the property exceeds 5,000 gallons per day. Permit approval was received during the Third Quarter 1996. SPPCo will comply with all permit conditions.

SPPCo has received or made application for various other permits which are required for waste removal and operation of equipment within the plant.

Sierra submitted a check and documentation from both Storey County and FW USA on fill placements to FEMA for final approval on removal of areas from the flood plain.

Ambient monitoring of air pollutant concentrations continues as required by the operating permit issued by NDEP.

3.3.3 Procurement Activities

Essentially all equipment items and specialty bulk items were purchased and delivered to the job site during 1996.

Recommendations for the purchase of operations/maintenance spares continued for equipment. All capital spares recommendations that were accepted by SPPCo have been purchased.

SPPCo reviewed Z-Sorb® testing program options, Caliscat produced a test batch, testing was performed in the second quarter 1996, and production began in May 1996. In October 1996, SPPCo began receiving shipments with the final batch arriving in November 1996.

Specifications for the coal supply were completed and a request for quotation (RFQ) was issued. SPPCo received vendor quotes and proceeded with review of quotes for spot-market coal.

An RFQ for the supply of limestone was issued, vendor quotes were reviewed and a purchase order was issued to Art Wilson Co. for the supply of 6600 tons of limestone (anticipated 1997 usage).

SPPCo contracted with the Lockwood and Beatty landfill sites for disposal of solid waste. Lockwood was selected as the primary site. Erickson Inc. was selected as the vendor for solid waste transportation to these sites.

After review of coke specifications by MWK, SPPCo selected and issued a purchase order for two fills of the coke silo (1600 tons) to Oxbow

Carbon & Minerals in Provo, Utah for start-up of the Gasifier Island. Due to the significantly lower price of petroleum coke products, SPPCo requested MWK develop a test plan for evaluation of these products for use during subsequent gasifier start-ups.

SPPCo issued purchase orders for calibration and carrier gas, UCON 500 for the heat transfer fluid system, nitrogen supply, carbon dioxide for the Gas Turbine fire suppression system, and chemical supplies necessary for start-up and initial operation.

3.3.4 Construction

During 1996, the work centered on completing the equipment setting, pipe installation, instruments and electrical work, and insulation. The Combined-Cycle area was completed and placed into operation along with associated offsite facilities. The coal handling equipment was completed and turned over to startup with the exception of some repair work on the Stacker-Reclaimer. The Gasifier Island was 91.4% complete with systems turnover to startup underway. Overall cumulative construction progress at year end 1996 was 97.6% The following is the status of work through the end of 1996 by major work packages:

- The foundation contractor completed all foundations and underground piping in May 1996. Cumulative progress for the year was 100.0%.

- The Waste Water Pond contractor started work in June 1996 and completed in July 1996. Cumulative progress for the year was 100.0%.

- The electrical and instrumentation installation contractor started work in February 1996, and completed work in the Combined-Cycle area which was placed into operation. Total progress for the year was 94.9%. Cumulative electrical and instrument progress in the Gasifier Island was 87.5%. At year end, all work was being pursued on a work list and punch list basis.

- The piping and equipment insulation contractor started insulation work in July 1996 and completed work in the Combined-Cycle area which was placed into operation. Total progress for the year was 63.5%. Cumulative insulation progress in the Gasifier Island was 29.8%.

- The protective coatings contractor applied protective coating to concrete basins in August and September 1996. Cumulative progress for the year was 100.0%.

- The Combined-Cycle piping and equipment installation contractor started work in February 1996 and completed in August 1996. Cumulative progress for the year was 100.0%.

- The final grading contractor started work in June 1996 and all permanent roads and guardrails were completed as of December 1996. Cumulative progress for the year was 100.0%.

- At year end 1996, all Gasifier Island piping work was being pursued on a work list and punch list basis. Mechanical turnovers are being done on a system basis in the Gasifier Island. Cumulative progress for the year was 87.3%.

- The non-piping Gasifier Island and Offsites structural steel and mechanical work was complete except for punch list items and touch up painting. The structural steel work on the T/G building was completed on August 15, 1996 and gasifier steel reached substantial completion with the remainder anticipated to be complete in early February 1997. Cumulative progress for the year was 96.0%.

- The Waste Water Treatment and Evaporation structural, mechanical and piping work was completed and turned over for operation. Cumulative progress for the year was 100.0%.

- The storage silo contractor started work February 1996 and completed in May 1996. Cumulative progress for the year was 100.0%.

- The stack contractor started work January 1996 and completed in June 1996. Cumulative progress for the year was 100.0%.

- The Cooling Tower CT-1201 Waste Evaporation Tower CT-1001 contractor started work February 1996. Work was completed on the Cooling Tower March 22, 1996. Work was completed on the Waste Evaporation Tower August 7, 1996. Cumulative progress for the year was 100.0%.

- The Gas Turbine Generator and Steam Turbine Generator contractor started work January 1996 and completed in September 1996. Cumulative progress for the year was 100.0%.

- The Fire Protection Systems contractor started work August 1996 and completed in November 1996. Cumulative progress for the year was 100.0%.

- The Coal Dome contractor started work March 1996 and completed in June 1996. Cumulative progress for the year was 100.0%.

- The Gasifier Elevator contractor started work June 1996 and completed in September 1996. Cumulative progress for the year was 100.0%.

- The Heat Recovery Steam Generator contractor started work December 1995 and completed in May 1996. Cumulative progress for the year was 100.0%.

- The Gasifier Refractory contractor started work March 1996 and completed in June 1996. Cumulative progress for the year was 100.0%.

- The Railroad Spur contractor started work February 1996 and completed in March 1996. Cumulative progress for the year was 100.0%.

- The Nitrogen Plant contractor started work August 1996 and completed in November 1996. Cumulative progress for the year was 100.0%.

3.3.5 Construction Support and Offsite Facilities

SPPCo provided support with safety, surveillance of work in progress and interfacing between work in progress and Tracy Plant operations and maintenance. SPPCo. reviewed engineering and procurement activities performed by FW USA and MWK.

Construction activities for the switchyard which connects the existing Tracy Power Plant with Piñon Pine Power Project were completed. All four transformers, which include the generator step-up transformers and station service transformers, were energized on June 24, 1996.

SPPCo performed ongoing evaluation of miscellaneous claims for Sierra's Risk Management Department.

An upgraded and automated rail crossing was installed by Southern Pacific Lines.

3.3.6 Startup

System Packages and Scoping drawings were received by SPPCo for review and mechanical acceptance. Outstanding items were identified on packages received and as those items were completed on each package, SPPCo approved Letters of Mechanical Acceptance.

The flush of the fire protection header took place on August 10, 1996. The flush was performed by the fire protection contractor in accordance with NFPA 24 Chapter 9 and the contractor's certification was submitted to Nevada Division of Forestry.

The CEM system, which was turned over by construction on August 15, 1996, was utilized to collect data during the Gas Turbine first fire. The opacity monitor recorded visible emissions peaking at 87 percent during the six-minute run period. The excess emissions were reported to NDEP on August 16, 1996 and a written report was submitted on August 19, 1996. No other excess emissions were experienced during 1996. Checkout of the CEM system by Carnot began on August 26, 1996 and commissioning was completed in November 1996.

SPPCo utilized an advanced steamblow technology to remove accumulated debris from the plant's piping. This process produced less strain on the plant's equipment while keeping noise to a minimum. Residents in the vicinity of the plant were notified in advance of the steamblow. No resident complaints were received during the 3-day process.

During the Third Quarter 1996, commissioning, start-up and synchronization of the Gas Turbine on natural gas was completed. On August 15, 1996, the 'first-fire' of the GE 6FA took place, and the unit was allowed to run at full speed for six minutes. GE performed combustion testing and tuning of the Gas Turbine in preparation for performance testing. Performance testing was completed on October

14, 1996 and results indicate the Gas Turbine met capacity, heat rate and emission guarantees.

Commissioning, start-up and synchronization of the Steam Turbine was completed. Performance testing was completed on October 28, 1996 and results indicate the steam turbine met capacity guarantees.

SPPCo turned the Combined-Cycle plant over for 'Commercial Operation' on December 1, 1996.

Piñon operators were provided training in the following areas:

- Safety orientation
- Management and team training
- Gasification overview and process
- DCS System
- Plant overview
- Gas Turbine/Mark V
- Gas Turbine/gasifier integration and controls

4.0 PLANT DESCRIPTION

The major systems of the Piñon Pine Power Project IGCC facility are described in this section.

4.1 Piñon Pine Power Project

The Piñon Pine Power Project demonstrates the performance of a coal-based Integrated Gasification Combined-Cycle (IGCC) power plant. The proposed facility is illustrated in Figure 4-1. The IGCC power plant includes a Gasifier Island (based on KRW's pressurized, air-blown, fluidized-bed coal gasifier, coupled to a combustion turbine and steam-based power island. The Gasifier Island includes a pneumatic coal feed system and lockhoppers, which introduces the coal into the gasifier, and an air-blown KRW gasifier capable of producing low-BTU gas. The gas from the gasifier is cooled to 1000°F and then transferred to a hot gas conditioning system for removal of sulfur compounds, particulates, and other contaminants as necessary to meet environmental and combustion turbine fuel requirements. The power island includes a combustion turbine (approximately 61 MW gross) capable of using natural gas or coal gas; a heat recovery steam generator (HRSG) system capable of supplying superheated high pressure steam generated in the HRSG to the gasification and desulfurization sections; a steam turbine (approximately 46 MW gross); all control systems; and required auxiliary systems.

Key equipment items and systems, which are part of the unique technology of the Piñon Pine Power Project, include the KRW gasifier with in-bed desulfurization, external regenerable sulfur removal, fine particulate filters, and some aspects of the Gas Turbine generator. Advanced KRW gasification technology produces a low-BTU gas, which is used as fuel in a combined-cycle power plant, and includes hot gas removal of particulates and sulfur compounds from the fuel gas, resulting in lower atmospheric emissions. Desulfurization is accomplished by a combination of limestone fed to the gasifier and treatment of the gas with zinc-based sorbent in a transport desulfurizer and subsequent sorbent regeneration for reuse in a transport regenerator. Particulates are removed by one high-efficiency cyclone and a barrier filter. These operations are carried out at an elevated temperature and pressure to eliminate the inefficiency and capital cost of cooling and cleaning the gas at low temperature, which is associated with other IGCC systems. Since water vapor is not condensed in the hot gas clean-up process, water effluents are reduced and consist only of a feedwater treating system effluent and boiler and cooling tower blowdown.

Raw coal, from western States, is received at the plant from a unit train consisting of approximately 84 railcars of approximately 100 ton capacity, arriving approximately once a week. Currently, Southern Pacific Railroad facilities are on site; the railroad line is a main east-west supply route. Upgrading and extending the spur on SPPCo land was completed for this project.

Coal is received at an enclosed unloading station and transferred to a coal storage dome. The unloading station consists of two receiving hoppers, each equipped with belt-type feeders that feed the raw coal conveyor system. All material handling systems are enclosed and supplied with dust collection systems for environmental control. Dust control equipment was utilized as required by State and Federal regulations.

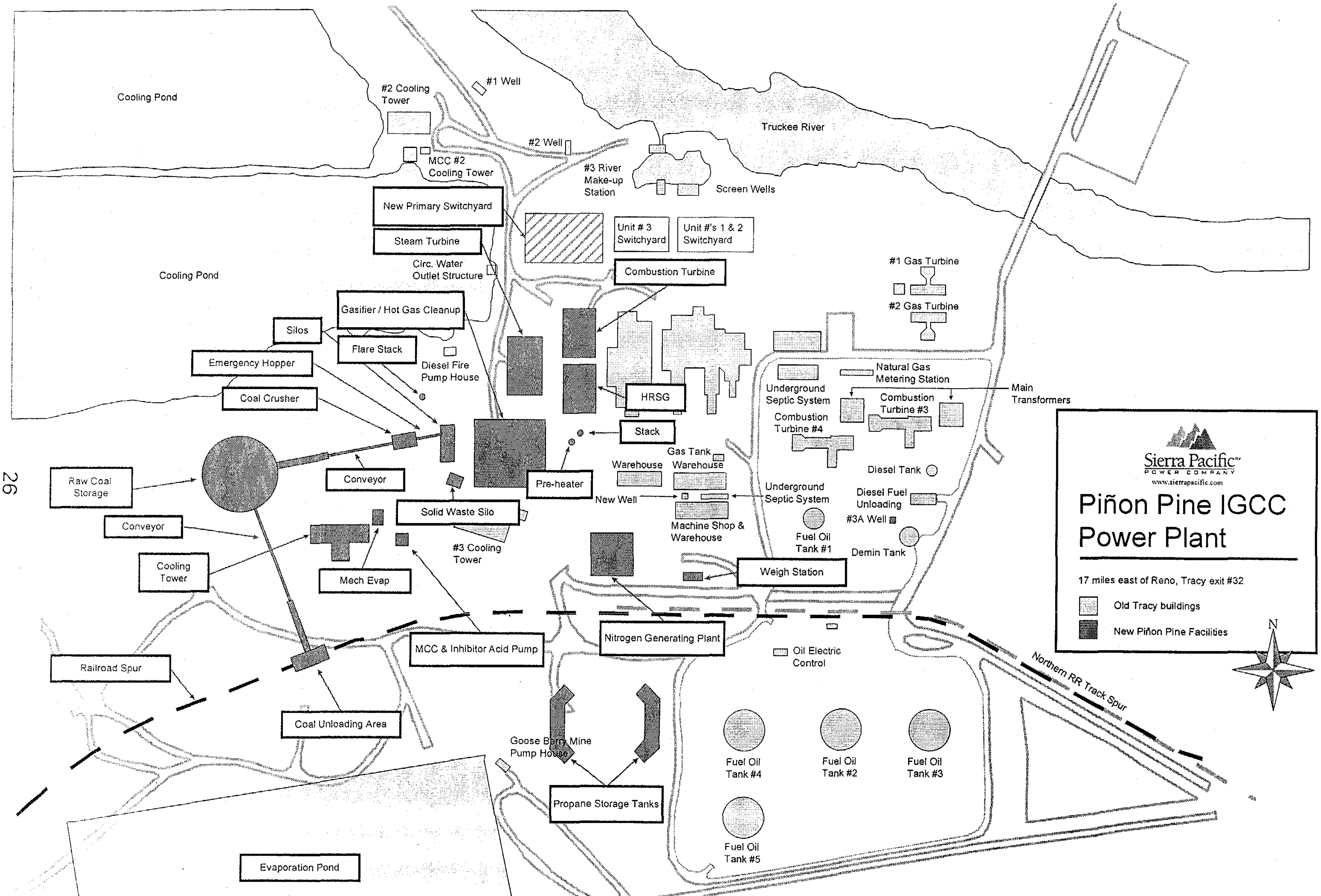


Figure 4-1: Map of existing facilities at Tracy Station with Piñon

4.2 Gasifier Island

4.2.1 Coal Gasification (Area 300)

This area contains the solids feed system and the gasifier with its associated cyclone. Solids feeds consist of the coal to be gasified and limestone sorbent used for capture of sulfur components emitted during gasification.

Coal and limestone, as well as coke breeze during start-up, are fed from a single conveyor to a lock hopper system for feed to the gasifier. The feed hopper provides a continuous feed of coal and limestone to the gasifier through the coal feeder. Solids from the feeder are picked up by transport air and fed directly to the gasifier central feed tube. Additional air from the recuperator is also fed through the same feed tube and the streams merge to form a central jet where the coal is quickly devolatilized, with the remaining char and limestone entering the bed. Combustion of char and gas occurs within the jet to provide heat necessary for endothermic devolatilization, gasification and desulfurization chemical reactions. Extraction steam from the steam turbine is also fed to the gasifier bed. Steam is injected at the gasifier grid to aid in fluidization of the gasifier bed.

Carbon monoxide and hydrogen form the major combustible constituents of the product gas. Methane and other hydrocarbons are produced in lesser quantities, primarily from the devolatilization process. The operating temperature of the gasifier is sufficiently high to crack any tars or oils that might be produced.

Gasification also results in the release of sulfur from the coal, primarily in the form of hydrogen sulfide. At gasifier operating conditions, the limestone sorbent fed with the coal quickly calcines and reacts with the hydrogen sulfide. The amount of hydrogen sulfide that is captured is limited by chemical equilibrium. With the low sulfur design basis Southern Utah Fuel Company (SUFCO) coal, approximately 50% of the sulfur released from the coal is removed from the gas. Sulfur exiting the gasifier in gaseous form is captured by the external desulfurizer system in Area 600.

The product gas exiting the top of the gasifier contains a significant quantity of entrained solids, consisting of char (unconverted coal), ash and sorbent. The gas enters the gasifier cyclone which removes most of the solids. Gas from the cyclone is directed to the product gas cooler and the product gas trim cooler for heat recovery. Solids collected in the gasifier cyclone are returned to the gasifier via the dipleg. Recycle gas from the recycle gas compressor is used to fluff the dipleg to facilitate flow of solids back to the gasifier bed.

Recycle gas is also used to provide fluidization gas and for cooling of the spent solids in the annulus at the bottom of the gasifier. The spent solids are withdrawn from the gasifier annulus by the ash feeder and pneumatically transferred to the ash collection and depressurization hopper for further processing in the sulfator system.

Figure 4-2 is an illustration of the Gasifier.

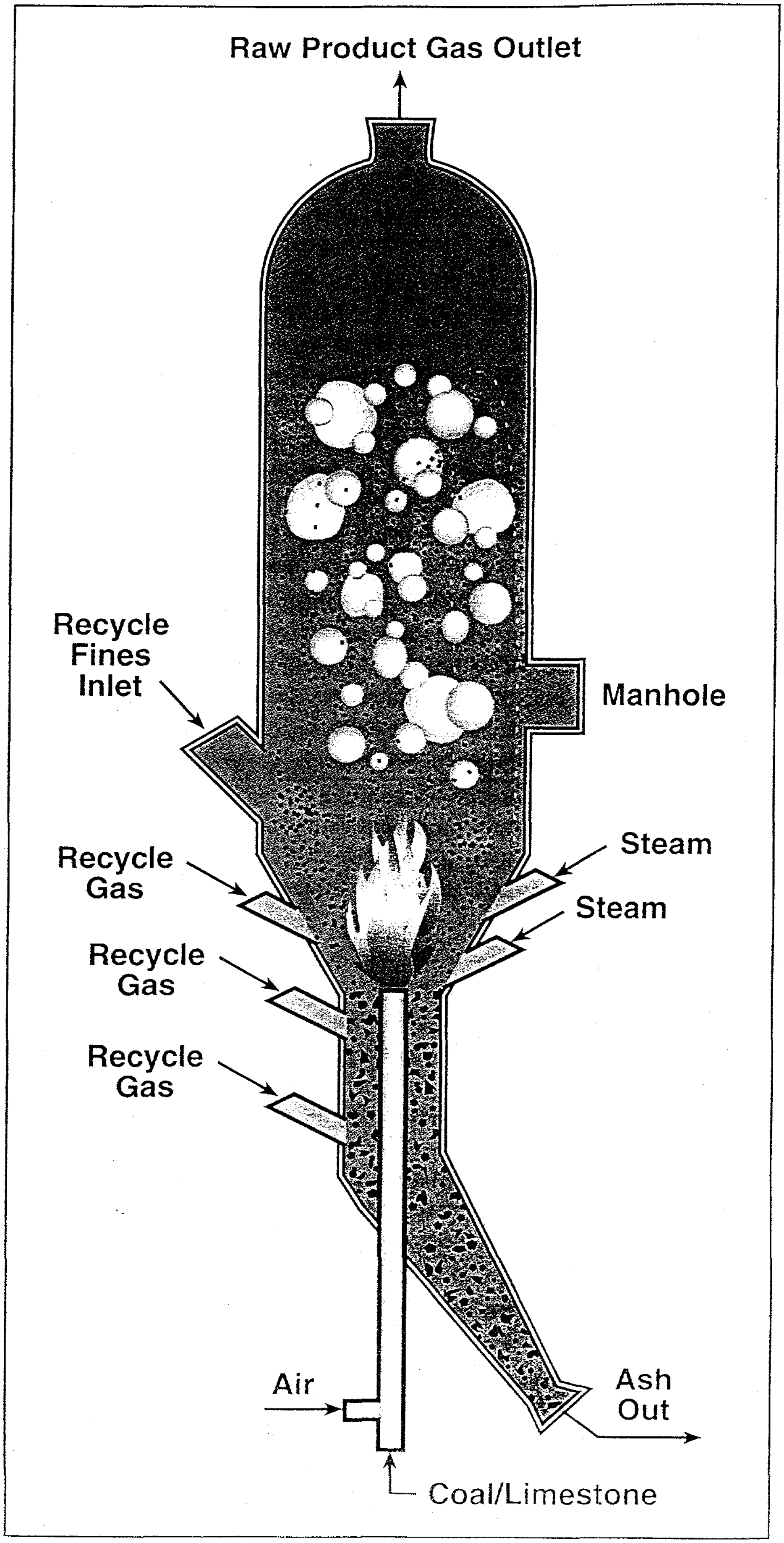


Figure 4-2: Gasifier

4.2.2 Oxidant Compression and Supply (Area 200)

This area provides air to the gasifier, air for regeneration of the desulfurization sorbent, air for coal and limestone feed pressurization and transport air for feeding coal and limestone into the gasifier.

Air for the Gasifier Island is extracted from the Gas Turbine's air compressor. A portion of this air is diverted for use during start-up of the gasifier. The major portion of the air, which is the oxidant feed to the gasifier, must be compressed above gasifier operating pressure. To minimize power consumption during compression, this air is cooled to 110°F in three exchangers in series. The knockout drum is provided downstream of these exchangers to remove any water condensed from air during cooling.

Air exiting the knockout drum is compressed by the boost air compressor to above gasifier pressure level. A portion of this air is cooled by cooling water in the transport air cooler and is split into two streams. One of these streams is used as transport air to feed solids into the gasifier. The other stream is diverted to the suction of the pressurization air compressor. The major portion of the air exiting the boost air compressor is reheated in the air recuperator and again divided into two streams. The major portion of this stream is fed to the gasifier while the other portion is used for regeneration of the zinc oxide based desulfurization sorbent.

4.2.3 Gas Stream Heat Recovery (Area 400)

This area includes cooling of the main product gas from the gasifier as well as cooling of the recycle gas.

Product gas from the gasifier cyclone is cooled to about 1000°F in the product gas cooler and the product gas trim cooler. Cooling is accomplished by generating steam from boiler feed water (BFW) supplied from the gasifier steam drum. Circulation through these two exchangers is by natural convection.

The gasifier steam drum operates at 1075 psia (nominal) and is supplied by BFW from Area 800. Steam from the gasifier steam drum is combined with superheated steam from the HRSG steam drum and passed through the superheater section of the HRSG in order to superheat it to 600°F prior to delivery to Area 800. Blowdown from the gasifier steam drum is combined with blowdown from the HRSG steam drum and also returned to Area 800.

4.2.4 Gas Stream Particulate Removal (Area 500)

This area provides final clean-up of particulates in the product gas stream and collection of all spent solids prior to final processing.

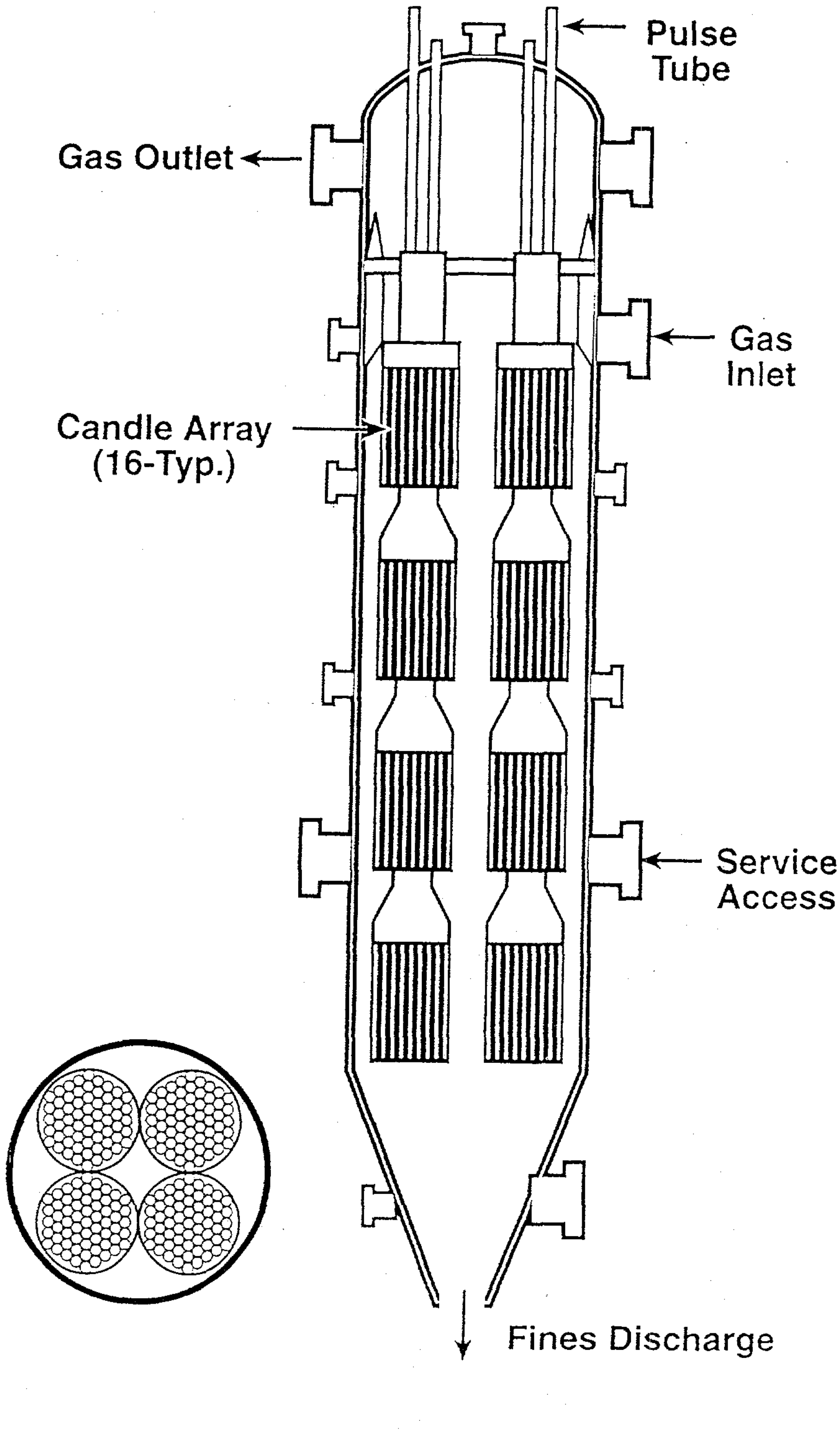
Desulfurized product gas from the desulfurization section still contains a small quantity of particulates. This stream is sent to the hot gas filter which essentially removes all of the remaining particulates. The hot gas filter is a ceramic candle type filter utilizing back pulse gas for cleaning. Candle elements used for filtration are housed in a steel vessel with access capability for replacement of candles. The particulate free desulfurized gas exits the filter and is sent to the Gas Turbine with a slip stream taken for use as recycle gas.

Blowback gas for cleaning of the filter elements is provided from the recycle gas system in Area 900. Fines removed by the filter elements are collected in the bottom of the filter vessel and discharged through the filter fines screw cooler, which cools the fines prior to discharging them into the filter fines collection hopper. Fines collected are depressurized and pneumatically conveyed to the sulfator system for further processing.

4.2.5 Desulfurization (Area 600)

This area desulfurizes the product fuel gas prior to delivery to the hot gas filter, and it conditions the solids waste for disposal.

Figure 4-3 is an illustration of the Hot Particulate Removal System.



The system consists of a vessel 10 feet in diameter, containing 748 silicon carbide candle filter elements that are 1.5 meters long. The candles are arrayed on sixteen plenum assemblies. Filter elements were installed after the assembly was in place.

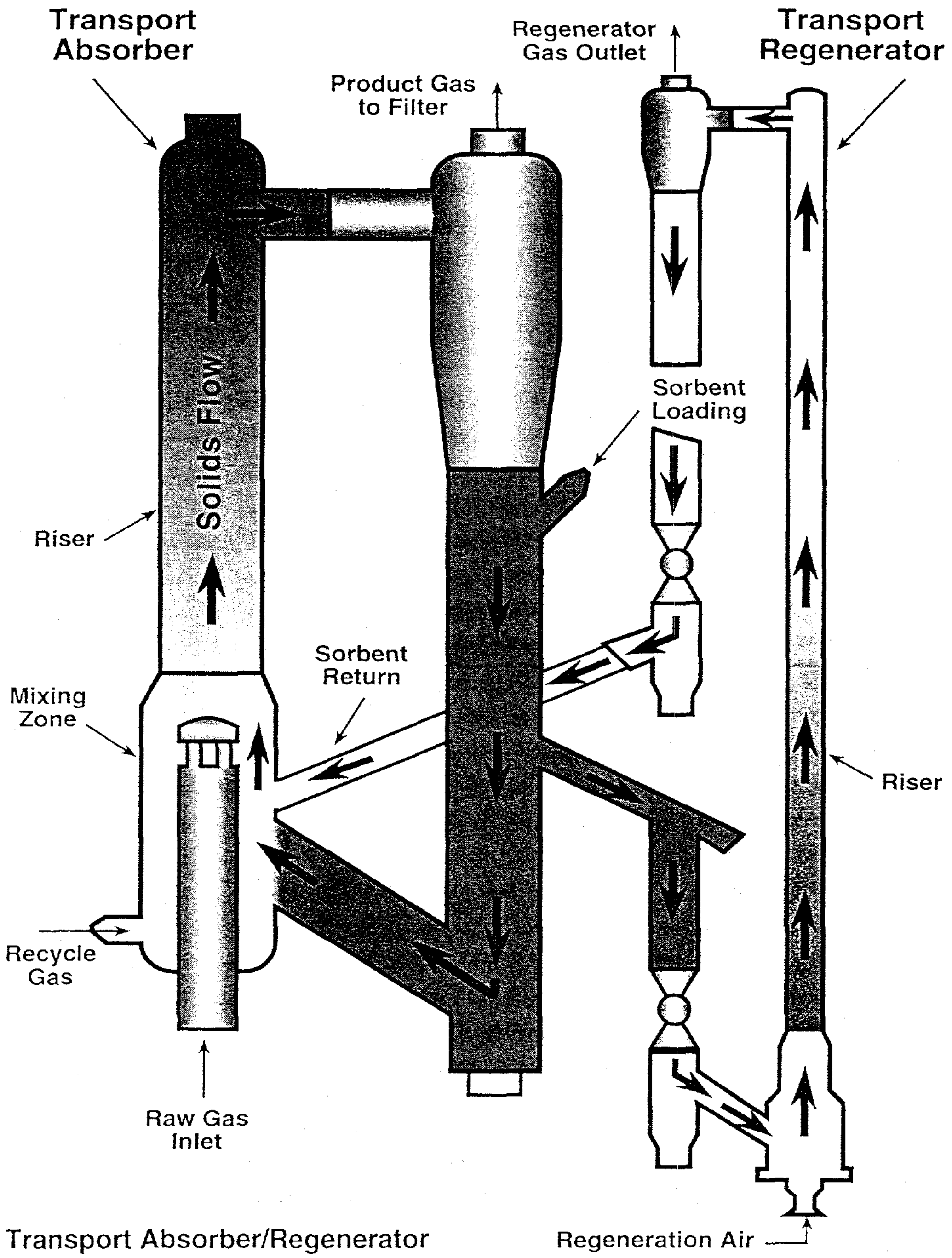
Figure 4-3: Hot Particulate Removal System

4.2.5.1 Desulfurization (Fuel Gas)

Fuel gas exiting the gas stream heat recovery area is fed to the fuel gas desulfurization system at approximately 1000°F. Sulfur compounds are removed from the gas by a zinc oxide based sorbent, which also contains nickel oxide. The sulfur compounds in the product gas to the Gas Turbine are reduced to less than 20 ppmv, and the mildly exothermic absorption reactions result in a small increase in the fuel gas temperature.

The fuel gas desulfurization system comprises a desulfurizer feed cyclone, transport desulfurizer and a transport regenerator. The fuel gas exiting the cyclone is fed to the mixing zone at the bottom of the riser where it mixes with zinc oxide based sorbent from the desulfurizer cyclone, which has recirculated these solids back to the riser via the standpipe. Absorption of gaseous sulfur compounds takes place in the narrower riser section as the fuel gas and sorbent flow upward into the desulfurizer cyclone. Solids collected in the desulfurizer feed cyclone are pneumatically transferred to the hot gas filter with recycle gas.

Figure 4-4 is an illustration of the Transport Reactor.



Transport Absorber/Regenerator System. Product gas is cleaned at 1000°F to less than 20 ppmv.

Figure 4-4: Transport Reactor

4.2.5.2 Waste Solids Treatment

With the exception of a small quantity of sulfur in the fuel gas to the Gas Turbine, all of the sulfur in the coal is ultimately disposed of in the sulfator system. This system serves the following functions:

1. Combustion of residual char in the ash and fines collected from gasification.

2. Capture of sulfur dioxide from both the residual char combustion and the desulfurizer regeneration effluent gas.

3. Oxidation of calcium sulfide produced in the gasifier to calcium sulfate.

The sulfator is a bubbling bed reactor which is fluidized by air supplied by the sulfator air compressor. Solids exiting the gasifier bottom which contain unconverted calcined limestone, sulfided limestone and ash (LASH) are conveyed to the sulfator with cooled recycle gas. Regeneration effluent gas from the desulfurization system is also fed to the sulfator for capture of sulfur dioxide by reaction with the unconverted calcined limestone in the solids from the gasifier. Provision has also been made to add fresh limestone to the sulfator if required to maintain sulfur removal efficiency.

The sulfator is operated at essentially atmospheric pressure. In order to maximize the sulfur dioxide capture and sulfide oxidation, the sulfator temperature is maintained at about 1600°F. Flue gas leaving the sulfator passes through the sulfator cyclone for removal of particulates and is then mixed with flue gas from the fines combustor prior to cooling in the HRSG to about 350°F. The gas then passes through the sulfator flue gas bag house filter for final removal of particulates and is sent to the stack. Particulates from the baghouse filter are conveyed with LASH back to the solid waste storage silo. Solids leaving the bottom of the sulfator are cooled in the sulfator solids screw cooler and collected in the sulfator solids collection hopper for disposal.

Filter fines collected in the hot gas filter are depressurized through the lockhopper system and conveyed to the fines combustor by a

Filter fines collected in the hot gas filter are depressurized through the lockhopper system and conveyed to the fines combustor by a stream of recycle gas to burn off carbon for additional heat recovery in the HRSG along with sulfator exhaust gas.

4.2.6 Recycle Gas Compression (Area 900)

This area provides for recompression and distribution of recycle gas to various users. The recycle gas from the recycle gas cooler is split into three streams. A portion is sent directly to the sulfator system for use as transport gas. A second stream is compressed by the recycle gas compressor to gasifier pressure for recycle directly to the gasifier and for use as fluffing gas in the desulfurizer area.

A third stream is further cooled in the recycle gas booster compressor trim cooler to 90°F before compression. The cooled gas is fed to the recycle gas booster compressor which can boost the pressure up to about 1200 psia. The high pressure gas is used as blowback gas to clean the hot gas filter elements. It is also used for pressurization of the ash depressurization hopper and the filter fines depressurization hopper.

4.3 Combined-Cycle

Gas Turbine Generator (Area 700)

A General Electric Model MS6001FA Gas Turbine Engine (70.1 MW ISO rating) was selected as the prime mover for the Piñon Pine Plant. It is an industrial frame-type Gas Turbine, scaled-down from GE's MS7001FA (150 MW) model. The technologically advanced firing temperature and cooling system of F-class Gas Turbines provide such units operating in Combined-Cycle power plants with the highest total-cycle efficiency of any proven type of fossil-fueled electric power generation system. The engine's output shaft power was reduced in rotative speed in a gearbox, from the optimum-efficiency value for a Gas Turbine of this size. Mechanical power is then converted to electrical power in a once-through air-cooled synchronous generator.

Steam Turbine Generator and Heat Recovery Steam Generator (Area 800)

Available thermal power in the exhaust gases is captured in a heat recovery steam generator (HRSG) to drive a condensing steam turbine generator.

The HRSG generates steam at two pressure levels. Steam generated in the HRSG and high pressure steam generated in the Gasifier Island, are combined, superheated in the HRSG and sent to the steam turbine generator. Low pressure steam generated is sent to the steam turbine generator and provides pegging steam for the deaerator heater. The HRSG also includes a condensate heating section.

The steam turbine generator is a condensing type. Extractions provide steam, after letdown and desuperheating, to the gasifier. Throttle steam letdown is used if and when low throttle steam rates cause the extraction pressure to fall unacceptably low. Additionally, this extraction provides steam for injection at the Gas Turbine generator for NO_X control when operating on natural gas.

The steam turbine exhausts into a surface condenser. Cooling water is used to condense the exhaust steam. Condensate is pumped from the condenser by the hotwell condensate pumps through the HRSG condensate heating section for the recovery of low level heat and thence to the deaerator. Venting of the condenser is accomplished by a vacuum pump system.

High pressure boiler feed water is pumped from the deaerator to the evaporator and Gasifier Island by the high pressure boiler feedwater pumps. High pressure boiler feedwater to the high pressure evaporator is preheated in an economizer section of the HRSG. Deaerated low pressure boiler feed water is pumped to the low pressure evaporators by the low pressure boiler feed water pumps. Boiler feedwater is preheated in an economizer section of the HRSG.

4.4 Offsites

Solids Handling (Area 100)

Raw coal, size 2" x 0, is received at the plant from a unit train consisting of up to eighty-four 100 ton railcars approximately every seven days. The coal is received at the enclosed unloading station and transferred to the coal storage dome. The unloading station is enclosed and provided with weather protection and a dust collection system to avoid uncontrolled coal dust emissions. The unloading station consists of two receiving hoppers, each equipped with belt type unloading feeder which feed the raw coal conveyor system. The conveyor system consists of the raw coal transfer conveyor and raw coal elevating conveyor. All material handling systems have been supplied with dust collection systems for environmental control, with special attention being paid to dust generating areas such as transfer points. Coal is weighed in transit by the raw coal receiving scale located on the raw coal transfer conveyor. An automatic sampling system is located at the discharge of the raw coal transfer conveyor which collects a representative sample to determine the quality of coal received. The raw coal unloading and conveyor system is sized to handle an 84 railcar train unloading operation in a four-hour period.

The coal is stored in a large field erected storage dome which is sized to store over 16,000 tons of coal, or approximately twenty day's requirement. No exposed storage of coal, such as a coal pile, is planned, thus all coal storage will be within the dome.

Coal in the storage dome is reclaimed by the automated coal pile reclaimer or discharged by emergency pile dischargers and vibratory feeders onto the raw coal collecting conveyor. This conveyor transfers the coal to the crushing station for crushing and screening.

In coal crushing and screening, the raw coal passes through a magnetic separator and is fed to the crusher to reduce the material size from 2" x 0" to ¼" x 0". A vibrating screen with ¼" square holes controls the product top size. Oversize material returns to the mill for further reduction through the oversize coal conveyor. The product-size material is conveyed away by a high angle conveyor and deposited in the coal silo. The coal silo is sized for 24-hour feed to the gasifier.

Gasifier feed conveying equipment is provided from the coal silo to the gasifier area. The conveying system consists of a gathering conveyor and an elevating conveyor. The conveying line can be utilized to handle coal, limestone and coke. As with the raw coal handling system, care will be taken to control any dust emission sources by means of a dust collection system.

Dried coke breeze, ¼" x 0, is received in the plant via trucks with pneumatic trailers for initial plant start-up and for each subsequent gasifier start-up. The sized coke is conveyed pneumatically to an 800 ton capacity coke storage silo using the truck-trailer pneumatic blower. Exhaust air from the filling operation is vented through a dust control filter system. The material from the coke silo is conveyed to the gasifier utilizing the coal/limestone conveyor system. The coke silo is equipped with a weigh feeder to feed the said coal conveyor system.

Sized limestone is received in the plant via trucks with pneumatic trailers on a daily basis. The sized limestone is conveyed pneumatically to a 300 ton (5-day) capacity limestone storage silo using the truck trailer pneumatic blower. Exhaust air from this filling operation is also vented through a dust control filter system. The material from the limestone silo is then fed at a controlled rate by a weigh feeder and blended with the coal on the same conveying line feeding the gasifier. Provisions are also included to transport limestone to the sulfator limestone feed hopper by pneumatic conveying. The material is discharged from the limestone silo and fed to the pneumatic conveying line by rotary airlock feeder.

Dust collection systems are provided in the plant for proper environmental control. Fabric filter collectors are used to control fugitive dust emissions from the transport and transfer of coal, coke and limestone.

Waste Water Treatment (Area 1000)

Waste water from the demineralization system and a sidestream from the main cooling tower is sent to the waste water treatment system. The sludge generated in the system is thickened and dewatered. The water from these processes is both recycled within the waste water system and discharged to an evaporation pond.

The solid waste from this system is discharged from a filter press in the form of a filter cake. It is retained on site in leak-proof containers with a storage capacity of 3 to 4 days. This non-toxic waste will then be taken to a local landfill utilizing the same containers which are suitable for highway travel.

The evaporation pond is lined and the system is designed to meet the requirements of the Nevada Division of Environmental Protection. The pond has a surface area of approximately 6 acres. The waste water is not anticipated to result in any adverse effect on wildlife such as migrating water fowl.

Solid Waste Handling (Area 1100)

Cooled solid waste (LASH) consisting of ash, fines and sulfated limestone from the sulfation unit is conveyed continuously to the solid waste storage silo using a pneumatic system. The air displaced from the silo and the conveyor is vented through the bin filter.

The LASH in the silo is loaded-out onto trucks during the day shift operation, 5 days per week. The silo is equipped with a bin discharger, discharge valve and a telescopic loading chute with a bag filter and fan to minimize dusting during the truck loading operation. The LASH is then hauled to the final disposal point. A local landfill has expressed interest in using the material as a cover, and other usages are being investigated.

The solid waste silo is sized for three days of storage (400 tons) to handle the solid waste production over the weekend without the need of the truck load-out operation.

Balance of Plant (Area 1200)

The raw water system provides water to the demineralization package which in turn provides boiler feedwater makeup to the deaerator. Additionally the raw water system provides water for the plant utility water system for miscellaneous users such as service wash station and cooling water chemical treatment systems. Well water is the source of water for the plant raw water system. Well water is pumped to the existing Unit 3 raw water tank and then pumped by the raw water pumps to the plant raw water system.

Water from an existing cooling pond provides makeup water for the cooling tower. Raw water is pumped from the existing pond to the cooling tower basin by an additional pump.

Water for safety showers and eyewashes and drinking water is provided by an existing plant well water system.

Fire protection water is provided by the existing plant system to the fire protection water loop. The source of fire protection water is a pump at the pond and two pumps drawing water from the Truckee River.

Makeup boiler feedwater is demineralized by a package consisting of cation, degasification, anion and mixed bed units. Also included are the storage and feeding of regenerating caustic and sulfuric acid, and appropriate local controls, including neutralization controls. Spare acid and caustic pumps and the neutralization air mixing system are also included.

Regeneration waste is stored in a neutralization tank, where the waste is mixed and neutralized before it is sent to the waste water system. Acid and caustic pumps are provided for neutralization.

Demineralized water is stored in a storage tank and pumped to the condensate system by the demineralized water pumps.

A chemical injection package consisting of facilities to feed and control appropriate quantities of oxygen scavengers, scale and corrosion inhibitors, and filming and neutralizing agents to the appropriate locations within the boiler feedwater system is provided.

A conventional induced-draft counter-flow cooling tower is used for the plant cooling water system. The basin is below grade. Cooling water is circulated by the vertical turbine cooling water pumps.

The cooling tower is designed for the 2½% occurrence condition of a 61°F wet bulb temperature and provides 71°F cooling water at that condition. Blowdown from the system is sent to the waste water treatment system.

Biocide injection is provided by a biocide feeder. Other additives, corrosion inhibitors, pH control biocides, and scale/deposit inhibitors, are injected into the cooling water by the water treatment injection system.

A conventional plant and instrument air compression system is provided. Two air compressors, one operating, one spare, are provided for the system. A single air receiver provides adequate surge capacity. The air is dried to a 40°F dewpoint using an air drying desiccant system prior to branching off to plant and instrument air headers.

A flare system is provided to incinerate the full product gas flow from the gasifier in the event of a power plant outage, gasifier start-up, or other emergencies. The flare is a vertical free-standing system. Pilots are designed to use natural gas.

Natural gas is utilized as a secondary fuel for the combustion Gas Turbine through two supply pipelines to the Tracy Station.

Nitrogen is required by the process for maintaining a constant flow of purge gas through selected equipment and instruments. The nitrogen package is a cryogenic air separation plant wherein the constituents of air are separated by cryogenic distillation delivering high purity nitrogen in the required quantity. Components of the package include compressors, storage tanks, a liquid nitrogen pump and vaporizers sized to provide for start-up, normal operation and a safe shutdown of the facility.

The existing Tracy sub-station is supplied at 120 kV. Connection to this system is through tie-in and service breakers feeding unit transformers connected to the gas and steam turbo-generators. The generators are rated at 13.8 kV with maximum generator output equal to elevated temperature and/or auxiliary cooling transformer rating as required. The auxiliary power is fed from each generator transformer servicing large motors 250 hp and over at 4.16 kV and 480 V for general distribution. The 4.16kV and 480 V is radial distribution. A second feeder from an existing 4.16kV transformer permits alternate service in the event of maintenance turnarounds or equipment outages. However, this transformer is not able to carry the coal gasification process in addition to the generator auxiliaries.

Auxiliary systems within the plant are provided through UPS or DC Batteries to support personnel safety, control room and critical equipment during shutdowns or power outages where required.

5.0 SCOPE OF WORK

5.1 General Project Requirements

The objective of this project is to demonstrate IGCC at a large scale for use in commercial electric generating plants. The project is to demonstrate equipment and system operability, performance and reliability, as well as process performance in removing sulfur dioxide and minimizing the formation of oxides of nitrogen. The specific goal of the project is to demonstrate that the air-blown IGCC technology is a cost effective, reliable, more efficient and environmentally superior alternative to conventional coal-fired electric power generation with flue gas desulfurization.

The project is aimed at demonstrating IGCC technology in a plant that is to be integrated into the SPPCo system. SPPCo has designed, constructed and will operate this grass-roots, integrated coal gasification combined-cycle facility at its Tracy Station near Reno, Nevada.

In this application of the process, one KRW gasifier, operating in the air blown mode with in-bed desulfurization and hot gas cleanup technology, will convert approximately 880 tons per day of bituminous coal into a low BTU fuel gas for use in a combustion turbine generator. The exhaust gases from the turbine will generate steam in a HRSG to drive a steam turbine generator. The plant will produce a nominal 100 MWe (net) of total electric power.

5.2 Project Management

The project is centrally managed by the Project Director of SPPCo. All management, reporting, and project reviews for the project shall be as required by the Cooperative Agreement. The Project Director is the official point of contact between SPPCo and DOE for the execution of the Cooperative Agreement. The Project Director is responsible for assuring that the project is conducted in accordance with the cost, schedule and technical baseline established in the Project Management Plan (PMP) and subsequent updates.

SPPCo has executed a contract with FW USA for design and construction of the facility. MWK is a subcontractor to FW USA for the design of the KRW fluidized bed gasification process and associated gas treatment processes.

Implementation details for all tasks are provided in a detailed schedule and Work Breakdown Schedule for the overall project presented in the PMP. An outline matrix of planned tests and procedures for the operational phase of the project are included to ensure that the basic design and installation philosophy match required operating and testing philosophies. The PMP is updated during each budget period of the project to reflect changes to the project baseline.

The Project Team under the direction of the Project Director is responsible for coordination, monitoring and reporting requirements in accordance with the Cooperative Agreement.

5.3 Engineering and Design

This effort provided process design, equipment identification and selection, integration of the gasifier system with the power plant, and system test planning as required to make certain that adequate design features exist to assure performance and operational success. The engineering and design effort was split into three separate tasks:

5.3.1 Gasifier Island

The areas of the plant addressed under this task include:

Area 200	Oxidant Compression and Supply
Area 300	Coal Gasification
Area 400	Gas Stream Heat Recovery
Area 500	Gas Stream Particulate Removal
Area 600	Desulfurization
Area 900	Recycle Gas Compression

a. Process Design

Work under this task provided a process specification package with supporting details for the gasification portion of the plant and plans for the integration of MWK's KRW gasification technology with the combined-cycle power plant. This effort included:

- Equipment Arrangement/Process Description
- Material and Energy Balances/Process Flow Diagrams
- Start-Up, Shutdown and Normal Operating Conditions
- Operating Philosophy/Test Plans
- Control Philosophy/Test Plans
- Supporting Technical Data/Process Loadsheets
- Special Design Requirements
- Catalyst and Chemical Requirements

b. Preliminary Engineering

Information generated under this task included, materials of construction, vessel analytical sketches, equipment design specifications, equipment summary sheets, process control diagrams, furnace data, exchanger data, plot plans, planning layout drawings, piping and instrument diagrams, requests for quotation, selection of equipment design and vendors, equipment general arrangement and elevation drawings, requisitions for certain instrumentation and piping items, piping flexibility/support studies of major lines, preliminary instrumentation and electrical runs, instrumentation power requirements, material take-off and requisition of alloy piping, and vendor utility requirements.

c. Detailed Engineering

This task focused on the production phase of the project including the detailed design work and bulk material requisitions required prior to construction as well as the requisite coordination work during the construction phase for the following areas:

- Piping
- Structural
- Concrete
- Buildings
- Electrical
- Instrumentation
- Insulation

5.3.2 Combined-Cycle

The areas of the plant addressed under this task were:

Area 700	Gas Turbine Generator
Area 800	Steam Turbine Generator and Heat Recovery Steam Generator

This effort proceeded under three tasks mirroring that of the gasification and offsites activity.

a. Process Design

The primary effort involved during this task established requirements for the interfacing enumerated below:

- Low-Btu Fuel Gas Requirements
- Auxiliary Natural Gas Requirements
- Extraction Air Limitations
- Boiler Feedwater Requirements
- Cooling Water Requirements
- Steam System Integration
- Feedwater and Condensate Integration
- Electrical Power, Generated and Auxiliary, Integration
- Control and Operating Philosophy and Systems
- Facilities Requirements

This task included an evaluation of the combustion properties of the low-Btu fuel, establishment of the combustor design requirements, preliminary design of the valving and fuel delivery system, and an analysis of the overall plant control system and operating procedures.

b. Preliminary Engineering

This task developed all the analytical and design planning work to refine the design details of the combined-cycle plant sections. Selection of vendors for various subcontracted equipment items, notably the heat recovery steam generator, were made. Other efforts included final block diagrams, preparation of piping and instrumentation drawings, equipment specifications, plot plans, utility requirements, planning layout drawings, piping flexibility analyses, and instrumentation and electrical drawings.

c. Detailed Engineering

This task focused on the production phase of the project including detailed design work, bulk material requisitions and procurement for materials. The work encompassed piping drawings with bill of materials, electrical and conduit drawings, building and foundation drawings, instrument drawings, insulation details and all other necessary construction drawings.

5.3.3 Offsites

The areas of plant addressed under this task included:

Area 100	Solids Receiving, Drying and Grinding
Area 1000	Waste Water Treatment
Area 1100	Solid Waste Handling
Area 1200	Balance of Plant

The engineering effort for these areas proceeded in parallel with that of the gasification and combined-cycle efforts.

a. Process Design

Primary emphasis centered on establishing requirement for the areas noted above as they interface with the gasification and combined-cycle systems including the following:

- Utility flow diagrams and descriptions, motor list, coal receipt and handling flow diagrams and descriptions, equipment lists, steam and water balances, effluent summaries, preliminary building requirement and site preparation requirements.

b. Preliminary Engineering

This task involved analytical and planning phase work for the offsites areas described above. Aspects of the two include development of the following:

- Plot plan, plant road drawings, utility block flow diagram, utility detailed description, coal receipt and handling detailed descriptions, waste treatment descriptions, piping & instrumentation diagrams, materials of construction, vessel analytical sketches and mechanical drawings, equipment summary sheets, exchanger data, selection of packaged system and equipment vendors, requisitions of some instruments and piping items, electrical one line diagrams, planning layout drawings, instruments and electrical runs, instrument power requirements, material take-offs and requisition of alloy piping.

c. Detailed Engineering

This task focused on the production phase of the project including detailed design work and bulk material requisitioning needed to start construction, together with the coordination required to be performed during the construction phase. The work included the following:

- Preparation of piping, structural steel, concrete, electrical, instrumentation, building and insulation drawings, details and requisitions.

5.4 Procurement Services

This task included the activities required to develop vendor and subcontractor lists, issue inquiries, and select vendors for the equipment and materials. This task did not include the purchase of equipment and materials, however vendor engineering services were procured where these were required to ensure that the Phase I definitive estimate was of adequate quality, and to advance the design effort. This task was divided into two areas:

a. Procure Vendor Engineering Services

Procure the engineering services from vendor for key equipment items to assist in estimating and design activities. Key equipment items included:

- Gas Turbine Generator
- Heat Recovery Steam Generator
- Steam Turbine Generator

b. Inquire and Select Balance of Equipment and Construction Subcontracts

The balance of the equipment and the construction subcontracts were inquired, the bids were analyzed, and the vendors/subcontractors selected in preparation for the purchase orders/subcontracts which were placed in Phase II.

5.5 Construction & Start-Up

5.5.1 Construction

This task included all activities required to construct the plant in concert with the overall project plan. This ensured that the facility was procured and constructed to specification and on schedule. Procurement activities during this task included purchasing, inspection, expediting, traffic and commercial aspects of in-place subcontracting. Included in this effort were home office construction activities such as safety, quality assurance, labor relations, budgeting and scheduling, and field construction management activities including functions such as supervision of equipment installation, erection of materials, field engineering, field accounting, cost, schedule and material control, and subcontract administration. This task included:

- Issue purchase orders and subcontracts to the vendors/subcontractors. Work included expediting, inspecting, and coordinating traffic for the equipment.

- The work effort during this task included development of a construction execution plan, detailed schedule, qualified bidder's list, site survey, tool and equipment lists, field administration procedures, material control procedures, safety procedures and reports, construction engineering reports, quality assurance plans and procedures, welding engineering reports, scheduling reports and construction progress reports.

- The work effort during this task included development of the final safety and accident prevention reports, final constructions progress reports, material receiving and exception reports, non-conformance reports and quality control reports.

5.5.2 Infrastructure Requirements

- Identify, evaluate and contract for the most appropriate coal supply source. Develop a program of testing as-received coal.

- Identify, evaluate and contract for the source of limestone. Develop a program for testing as-received in-bed and external trim sorbents.

- Identify supplies of makeup water for the project.

- Contract for disposal of sanitary waste.

- Contract for disposal of solid waste materials from the gasification system to an approved landfill site.

- Perform systems studies with Nevada Department of Transportation (NDOT) to determine the need for highway upgrading. Identify routing of site access roadways and bridging requirements.

5.5.3 Start-Up

- The objective of this task is to provide the resources for the pre-commissioning and initial systems operations for the project. Training, maintenance, safety, analysis and reporting procedures were developed.

  This task is divided into four subtasks:

  - Provide the resources for all required training of operating staff, including development of the detailed operating procedures.

  - Provide the resources required for the pre-commissioning and initial systems checkout of the project. Maintenance and safety procedures were executed to verify their effectiveness.

  - Provide the resources required for the commissioning and initial integrated operation of the project. Analysis and data acquisition procedures will be implemented. Methodology for reporting total demonstration plant performance results were established.

  - Perform all plant modifications including minor design revisions necessary to achieve acceptable demonstration plant performance at design specifications.

5.6 Environmental Permitting and Licensing

The activities under this task include completion of all required environmental data collection, finalization of environmental and socioeconomic impact assessments, preparing the Environmental Monitoring Plan (EMP), obtaining required environment-related permits and incorporating health and safety considerations in design and operation. This task included the following activities:

5.6.1 Environmental Studies

Collect and analyze environmental data required to support the regulatory and permitting processes, the EMP requirements and the DOE effort in support of the National Environmental Policy Act (NEPA). Data to be collected include:

- Air Quality and Climatology
- Water Quality
- Terrestrial Ecology
- Geohydrology
- Noise
- Archaeological and Historical Resources
- Land and Water Use
- Socioeconomics
- Other requirements which may be added during the working sessions with federal, state and local agencies

Efforts include the following activities:

- Collect and analyze data on the physical, biological, cultural and socioeconomic environment that is required for permitting
- Collect, analyze and report information for the EMP Outline that describes the existing environment

5.6.2 Environmental Monitoring Plan Requirements

Develop an EMP Outline and an EMP that are acceptable to DOE and provide the reports agreed upon with DOE. These efforts include the following:

- Develop the EMP Outline
- Develop the EMP which will provide detailed descriptions of the tasks set forth in the EMP Outline
- Collect, analyze and report on the required information described in the EMP

5.6.3 Environmental Related Permits

Obtain the required environment-related permits for construction and operation of the project. Required permits include one or more each for discharges into the atmosphere, discharge of waste water, construction in navigable airspace, earth disturbance, dams and impoundments, sewerage facilities, construction in floodplains, non-community water supply, solid waste disposal, hazardous waste disposal and land use. Activities under this task are scheduled to take place from the award of the cooperative agreement through obtaining operating permits and the permit for the solid waste disposal facility. The following tasks were performed in the period from detailed design to commercial operation.

- State agency coordination is a continuation of on-going activities wherein the regulatory agencies are updated on the design and schedule for the project and the project is updated on new and pending regulatory changes. This task supports the tasks that follow.

- A document was prepared that describes the regulations that must be met, the information required for the permit applications, and the schedule for application preparation.

- Design guidance was provided consisting of a series of focused coordination activities wherein specific agreements on design and information details are negotiated with regulatory agencies and are then communicated to designers. The purpose of the design guidance activity was to develop permit applications that are complete and in accordance with acceptable limits as submitted, thus expediting the permitting schedule.

- Permit applications were prepared with the design, environmental and modeling information required, and with the required approved and supplemental documents (e.g., Erosion and Sedimentation, Control Plans, Endangered Species Survey, and Archaeological Reports for all activities that disturb the earth. Preparedness Prevention and Contingency Plan for the Industrial Waste permit).

- The regulatory agency review and analyses of permit applications were expedited with prompt responses to agency comments and questions.

- The support necessary for public hearings was provided that resultd in overall favorable support for the project. Support activities included expert witnesses, environmental data and analyses and additional project information. Also included was the preparation of responses to questions and comments resulting from the public hearing and the written comment period.

- Permits and approvals will be obtained required for constructing the project, constructing the off-plot solid waste disposal facility, operating the project through start-up and shakedown, operating the project through the demonstration period, and making and supplying copies for DOE.

5.6.4 Public and Occupational Health and Safety Analyses

Incorporate into the plant design and requirements of (Federal) Occupational Safety and Health Administration (OSHA) regulations, guidelines of the National Institute of Occupational Safety and Health (NIOSH), fire and safety codes, etc., that are applicable to the project. Efforts ensured that reliable health and safety programs for construction and plant operation phases were developed. Specific activities completed are as follows:

- Incorporated health and safety considerations during design
- Provided training and implementation health and safety procedures for construction and operation

5.7 Start-Up and Operation

This phase covers all the labor, materials and services needed for plant operation for a 42-month period during Phase III of the Piñon Pine Power Project. The objective is to provide all the operational and management direction that will be necessary to provide the private sector with technical, economic and environmental evaluations on the advanced coal gasification combined-cycle power plants.

5.7.1 Operations

This task involves operating the gasifier system, combined-cycle power plant and associated systems at the required temperature, pressure, and coal and sorbent feed rates to meet the required power output of the facility. Specific data generated during this period of time include the following:

Operation - Plant operational data recorded by instruments and stored in the data acquisition system, daily operational logs, process or equipment anomalies, samples and chemical analysis of process and effluent streams as required, operational schedules and manhour records.

Plant Modifications - Modifications made to the facility in order to meet the required power output of the facility under various operating conditions.

Maintenance - Routine maintenance records, instrument repair records, compressor records, mechanical and rotating equipment records, pressure vessel certification, maintenance schedules, and manhours records.

This task is broken into three subtasks:

- Baseline operation of the plant using the design coal feeds.
- SPPCo will obtain sufficient operating data on high sulfur coals to enhance the marketing and licensing of this technology to a broad based energy sector.
- The plant will be modified based on the experience of extended operations on both high and low sulfur coals.

5.7.2 Data Collection and Reporting

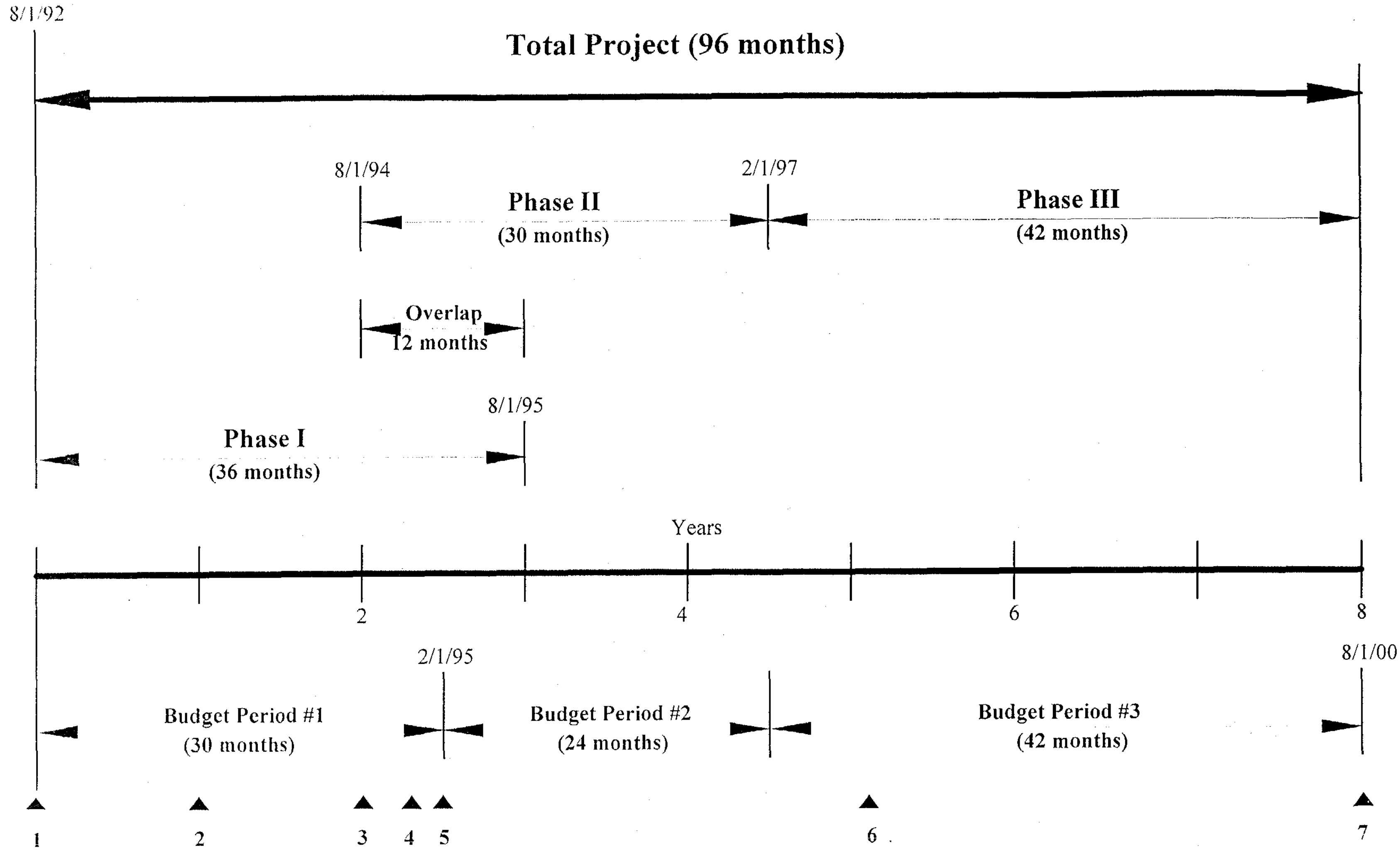
The purpose of this task is to collect the process performance data gathered on the 42-month operational phase of the Project and summarize it in a form that will be useful for the technical, economic and environmental evaluation of the advanced coal gasification combined-cycle. Data generated and maintained during this period will include the following:

- Monthly summary of minimum and maximum performance, monthly summary of process performance anomalies, heat and energy balance for selected performance periods, monthly summary of chemical/physical analysis, test plan/schedule for special performance testing, maintenance of instrument configuration drawings, maintenance of piping and instrument diagrams and process flow diagrams, document equipment modifications and equipment list changes.

6.0 TECHNICAL IMPACTS ON SCHEDULE

The Project Schedule has not changed since the last Annual Report.

The current schedule for IGCC operation is April 1997. A Summary Bar Chart Project Schedule is included in Appendix 4. A current time-line schedule is included as figure 6.0.



Milestone	Description
1	Project Starts
2	PSCN Approves Project
3	NEPA Completed
4	UEPA/Permits Approved
5	Construction Starts
6	Construction/Startup Complete
7	Testing Complete

FIGURE 6.0: Piñon Pine IGCC Power Project Master Schedule

7.0 CONCLUSIONS AND LOOK AHEAD

During the First Quarter of 1997, Phase II Construction will be completed and Phase III Operations will start with the following major activities:

- Solids System Test Procedure and Performance Test Plan for the Gasifier Island will be issued.

- The Gasifier Island will be mechanically complete, and all systems will be turned over to SPPCo.

- Operation of the Combined-Cycle Unit on natural gas will continue.

- Checkout of material handling systems will be completed.

- Checkout of all gasifier systems will be completed.

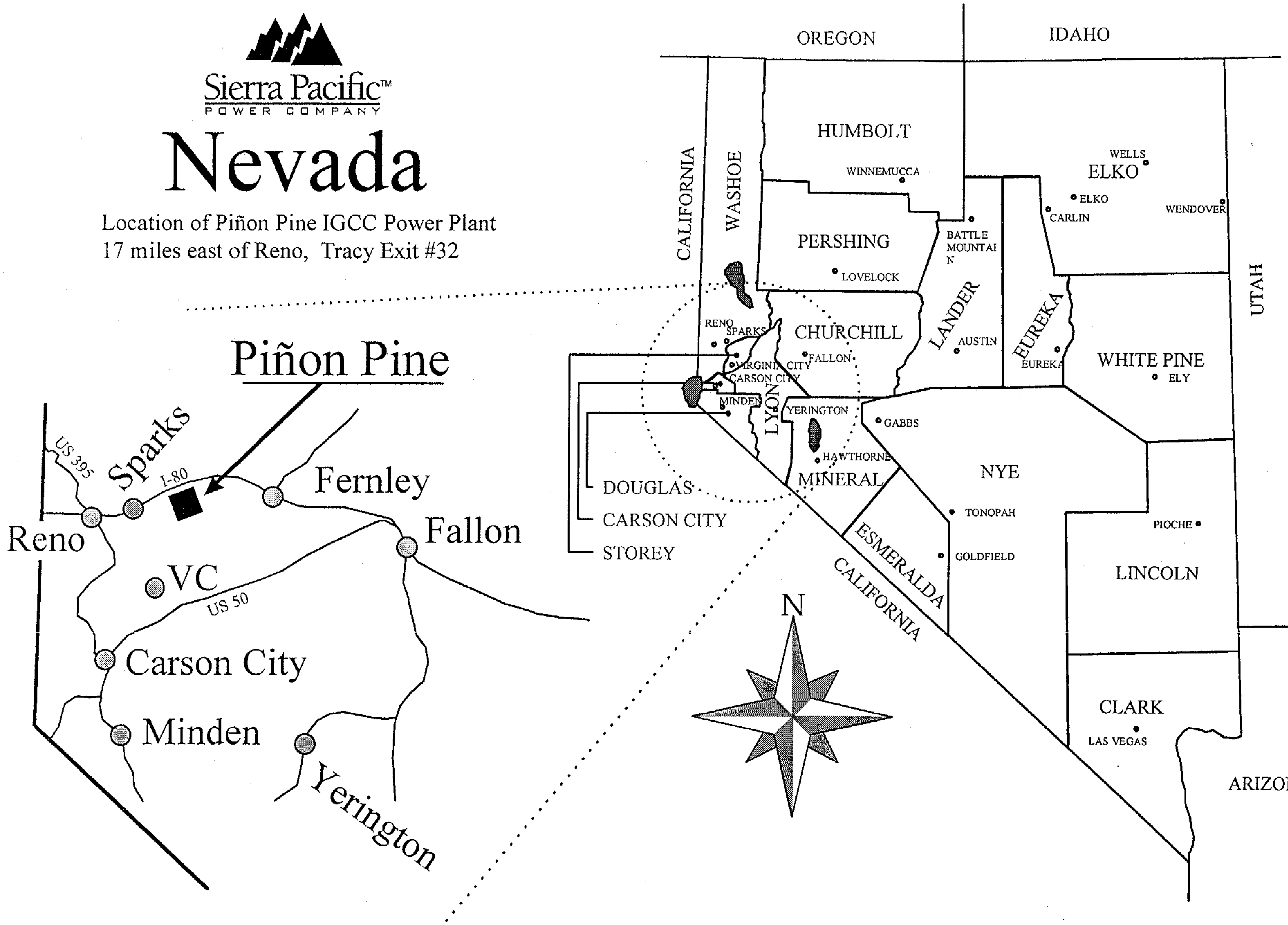
- Chemical flushing and steamblow of gasifier piping will be completed

- A 10-day unit outage will commence March 1, 1997 during which GE will perform a combustion inspection of the gas turbine prior to syngas operation.

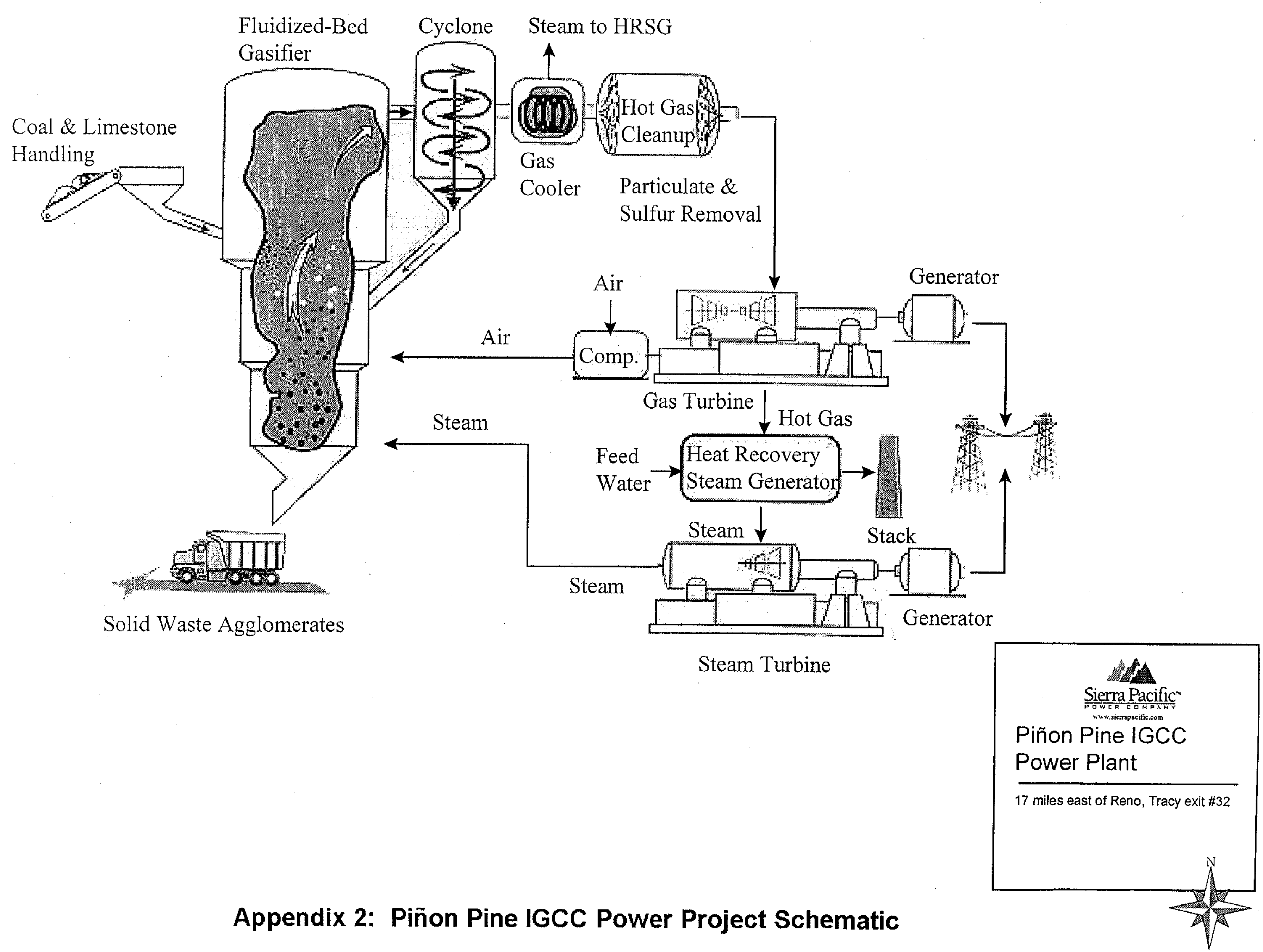
- All consumables (nitrogen, coal, coke and limestone) will be delivered onsite.

8.0 APPENDICES

1. Location of Piñon Pine IGCC Power Project
2. Piñon Pine IGCC Power Project Schematic
3. Definitive Estimate Summary
4. Summary Bar Chart Project Schedule
5. Photographs of existing Tracy facility



Appendix 1: Location of Piñon Pine IGCC Power Project



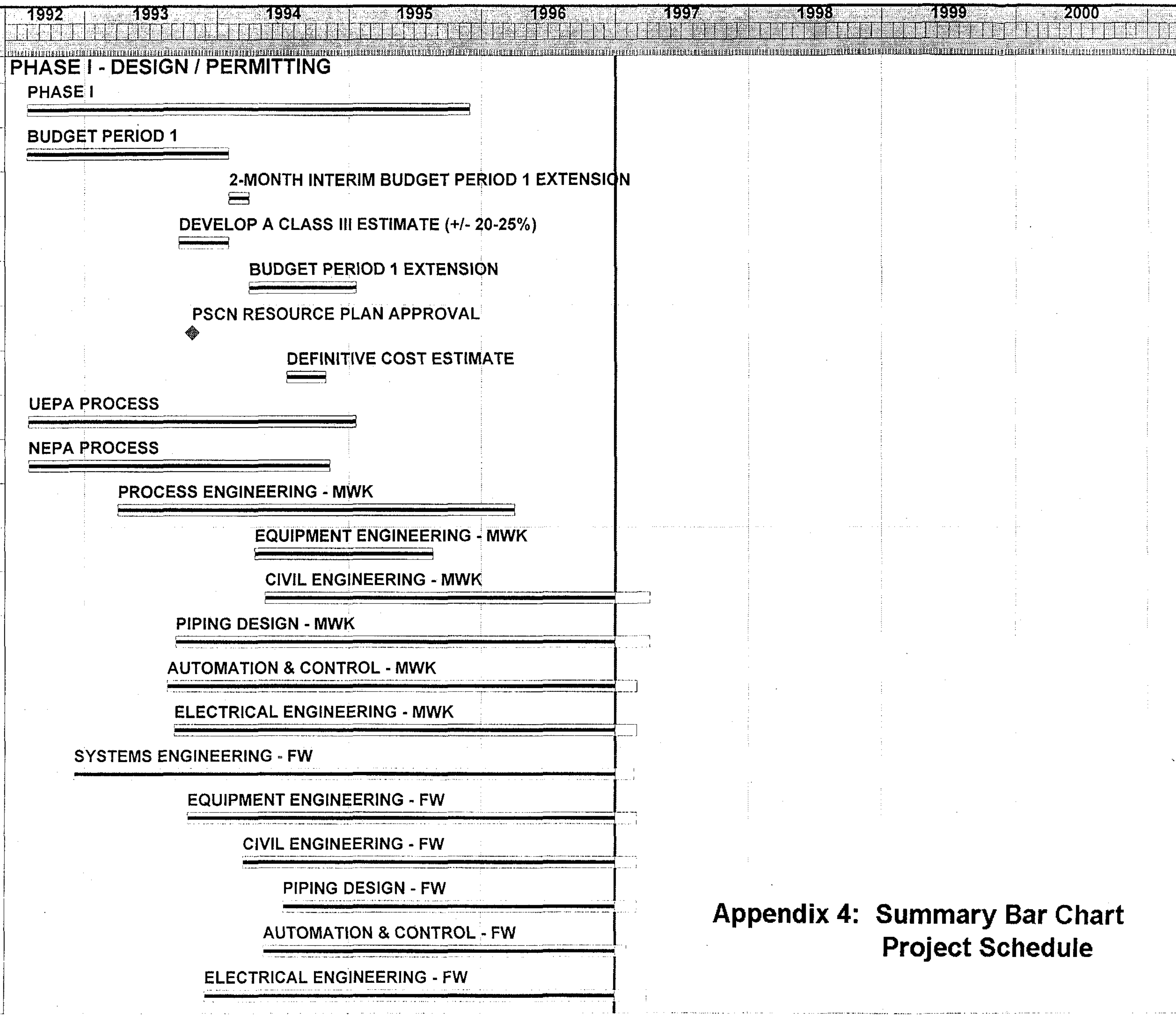
Appendix 2: Piñon Pine IGCC Power Project Schematic

APPENDIX 3
DEFINITIVE ESTIMATE SUMMARY
(Details by WBS)

		Definitive Estimate ($M)
PA-1	Pre-Award	404
1.1	Phase I	
1.1.1	Develop Gasifier Design	11,633
1.1.2	Develop Combined Cycle Design	3,818
1.1.3	Develop Offsites Design	4,357
1.1.4	Environmental & Permitting	2,435
1.1.5	Procurement Services	7,832
1.1.6	Project Coordination & Follow-Up	12,401
	Total Phase I	42,476
1.2	Phase II	
1.2.1	Construct Gasifier	50,464
1.2.2	Construct Combined Cycle	54,930
1.2.3	Construct Offsites	53,440
1.2.4	Secure Infrastructure Requirements	----
1.2.5	Start-Up	7,429
1.2.6	Project Coordination & Follow-Up	13,549
1.2.7	Sales & Use Taxes	5,872
1.2.8	Property Taxes	2,701
	Total Phase II	188,385
1.3	Phase III	
1.3.1	Operation	90,364
1.3.2	Data Collection & Reporting	1,551
1.3.3	Administration	3,837
1.3.4	Disposition	----
1.3.5	Sales & Use Taxes	2,526
1.3.6	Property Taxes	6,370
	Total Phase III - To be reviewed in 1997	104,648
	Total Estimated Shared Cost	335,913

Appendix 4: Summary Bar Chart
Project Schedule

Early Start	Early Finish	% Comp	Activity
1			PHASE I - DESIGN / PERMITTING
31JUL92A	29NOV95A	100	PHASE I
31JUL92A	31JAN94A	100	BUDGET PERIOD 1
01FEB94A	31MAR94A	100	2-MONTH INTERIM BUDGET PERIOD 1 EXTENSION
20SEP93A	31JAN94A	100	DEVELOP A CLASS III ESTIMATE (+/- 20-25%)
01APR94A	18JAN95A	100	BUDGET PERIOD 1 EXTENSION
	25OCT93A	100	PSCN RESOURCE PLAN APPROVAL
11JUL94A	28OCT94A	100	DEFINITIVE COST ESTIMATE
03AUG92A	18JAN95A	100	UEPA PROCESS
03AUG92A	08NOV94A	100	NEPA PROCESS
05APR93A	29MAR96A	100	PROCESS ENGINEERING - MWK
15APR94A	18AUG95A	100	EQUIPMENT ENGINEERING - MWK
13MAY94A	08APR97	99	CIVIL ENGINEERING - MWK
13SEP93A	08APR97	97	PIPING DESIGN - MWK
19AUG93A	28FEB97	97	AUTOMATION & CONTROL - MWK
06SEP93A	28FEB97	97	ELECTRICAL ENGINEERING - MWK
07DEC92A	21FEB97	99	SYSTEMS ENGINEERING - FW
15OCT93A	28FEB97	99	EQUIPMENT ENGINEERING - FW
14MAR94A	28FEB97	99	CIVIL ENGINEERING - FW
06JUL94A	28FEB97	99	PIPING DESIGN - FW
09MAY94A	31JAN97	99	AUTOMATION & CONTROL - FW
01DEC93A	31MAR97	99	ELECTRICAL ENGINEERING - FW



Project Start	01JUN92		Early Bar
Project Finish	25JAN01		Progress Bar
Data Date	31DEC96		Critical Activity
Run Date	14APR97		

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SPJ1

Sheet 1 of 2

FOSTER WHEELER USA-CONTRACT 15-4140
SIERRA PACIFIC: PINON PINE PROJECT
SUMMARY BAR CHART

Date	Revision	Checked	Approved

Early Start	Early Finish	% Comp	Activity
2			PHASE II - PROCUREMENT, CONSTRUCTION & START-UP
19JAN95A	31JAN97	95	BUDGET PERIOD 2
01DEC94A	31JAN97	97	PHASE II
27JAN95A	01APR96A	100	PROCUREMENT/RELEASE FOR FABRICATION
31OCT94A	10JUL96A	100	CONSTRUCTION BID PACKAGES
07JUN95A	28JUN96A	100	SITE PREPARATION/FOUNDATIONS/UNDERGROUND
21SEP95A	28FEB97	97	STEEL ERECTION
01APR96A	27DEC96A	100	MECHANICAL CONSTRUCTION
02JAN96A	07AUG96A	100	SET & ERECT GAS TURBINE GENERATOR
16MAR96A	31JAN97	90	ELECTRICAL INSTRUMENTATION
12JUL96A	14MAR97	89	EQUIPMENT & PIPE INSULATION
18JUL96A	02AUG96A	100	EQUIPMENT & PIPE PAINTING
	10OCT96A	100	PRECOMMISSIONING CC NATURAL GAS (START-UP)
	30DEC96	0	CONSTRUCTION MECHANICAL COMPLETION(CC & OFFSITES
31OCT96A		100	READY FOR COMMISSIONING
05NOV96A	02DEC96A	100	COMMISSIONING - COMB CYCLE ON NATURAL GAS
17MAR97	13JUN97	0	PRECOMMISSIONING (START-UP) SYNGAS
16JUN97	27JUN97	0	COMMISSIONING - SYNGAS
	07MAR97	0	COMPLETION OF CONSTRUCTION
30JUN97	30JUN97	100	FIRST SYNGAS OPERATION
3			PHASE III - OPERATION & DATA COLLECTION
31JAN97*	01AUG00	0	BUDGET PERIOD 3
31JAN97*	01AUG00	0	PHASE III

Timeline: 1992 1993 1994 1995 1996 1997 1998 1999 2000

Project Start	01JUN92
Project Finish	25JAN01
Data Date	31DEC96
Run Date	14APR97

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Early Bar
Progress Bar
Critical Activity

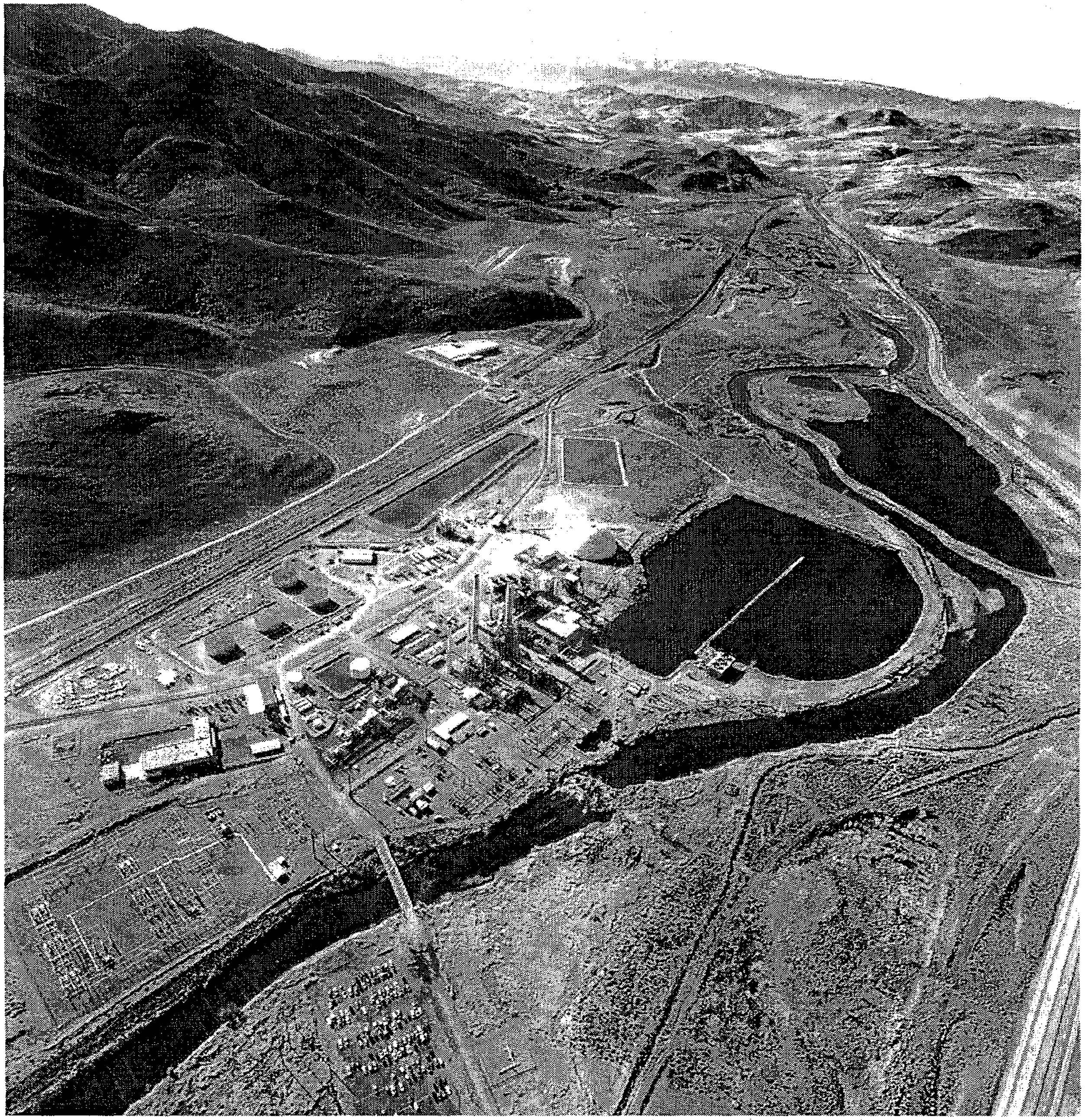
SPJ1

Sheet 2 of 2

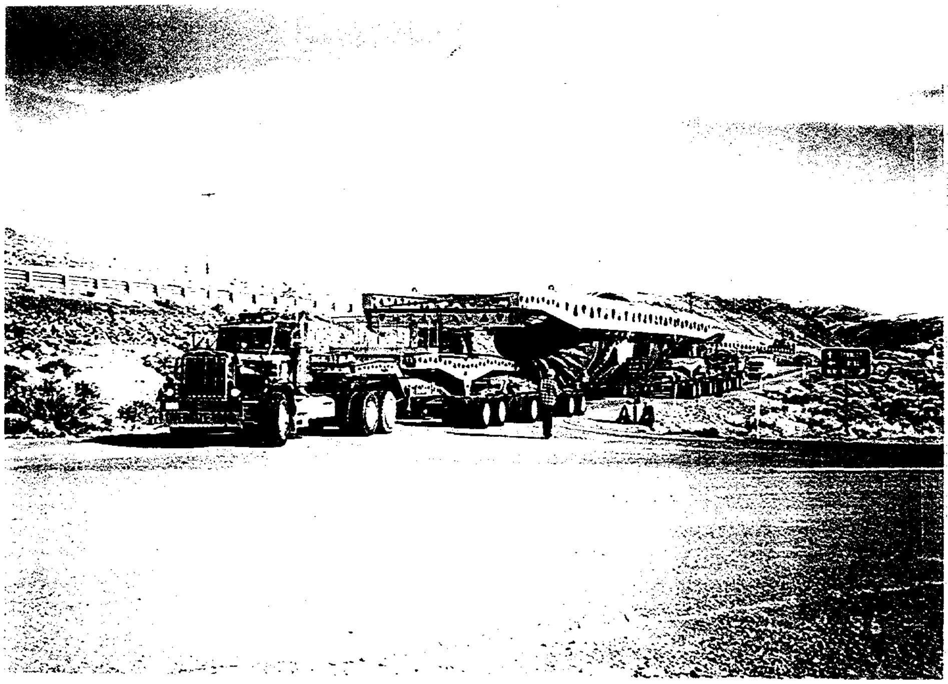
FOSTER WHEELER USA-CONTRACT 15-4140
SIERRA PACIFIC: PINON PINE PROJECT
SUMMARY BAR CHART

Date	Revision	Checked	Approved

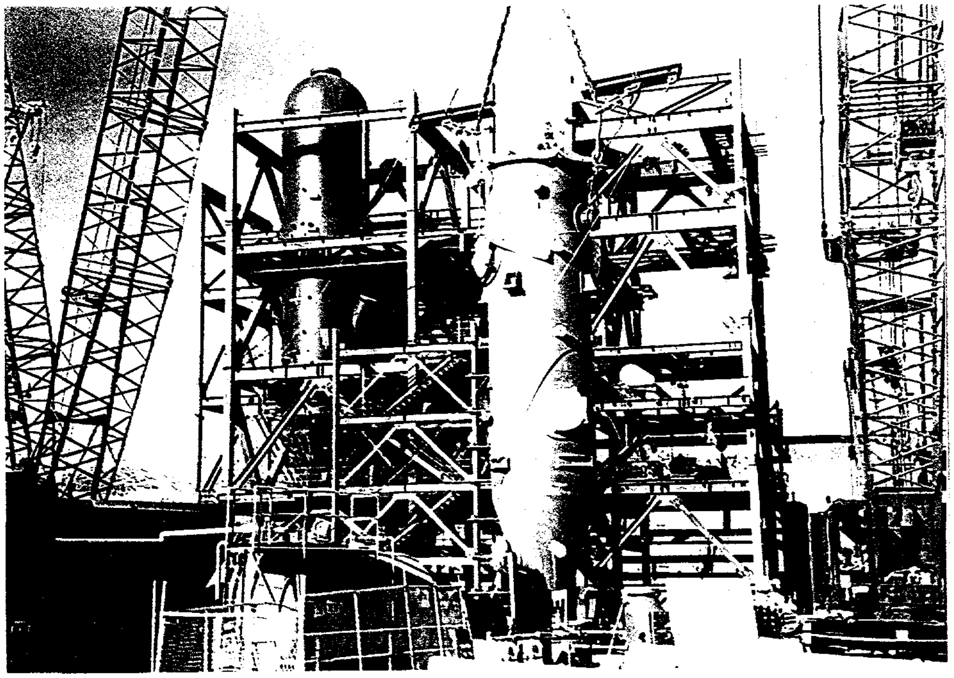
Appendix 5: Site Photos



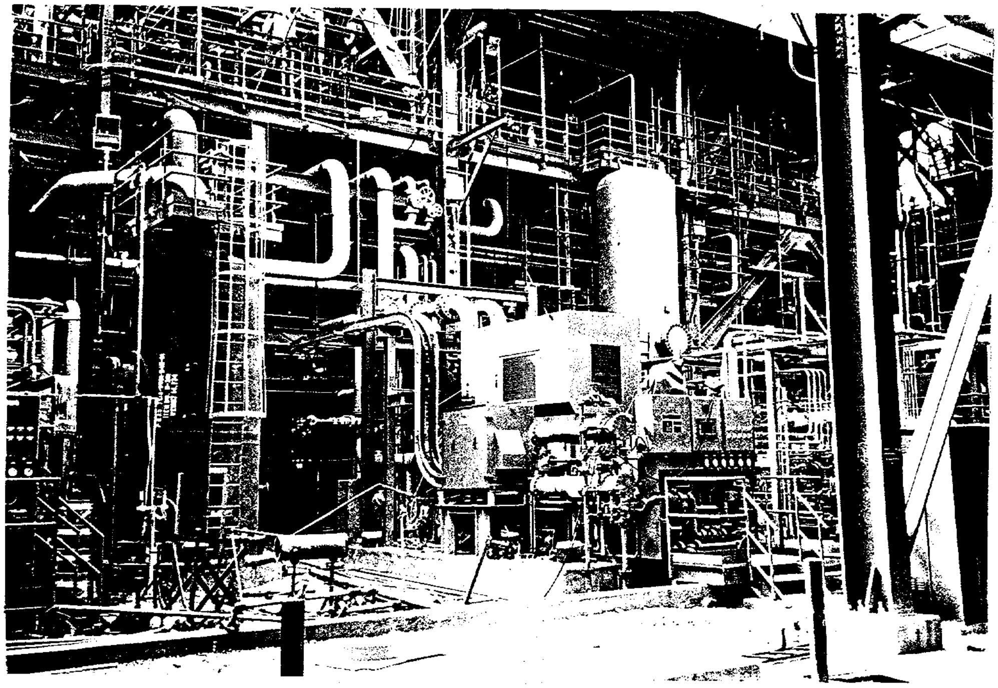
Aerial view of Tracy Site with Piñon Pine IGCC Project looking west



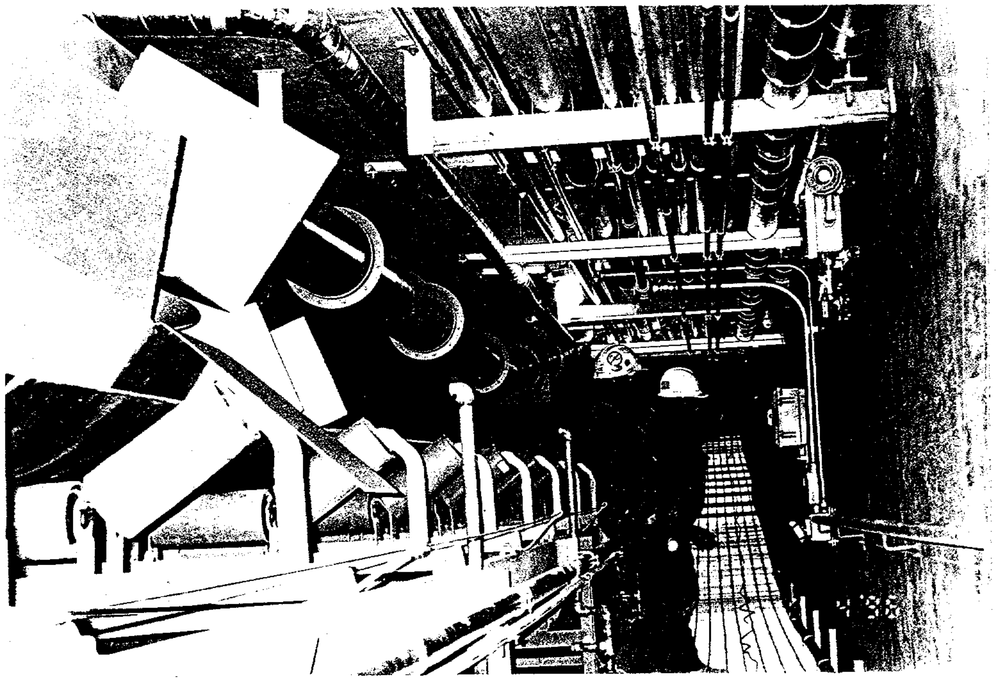
Gasifier (R301) transport arrival at site on January 4, 1996



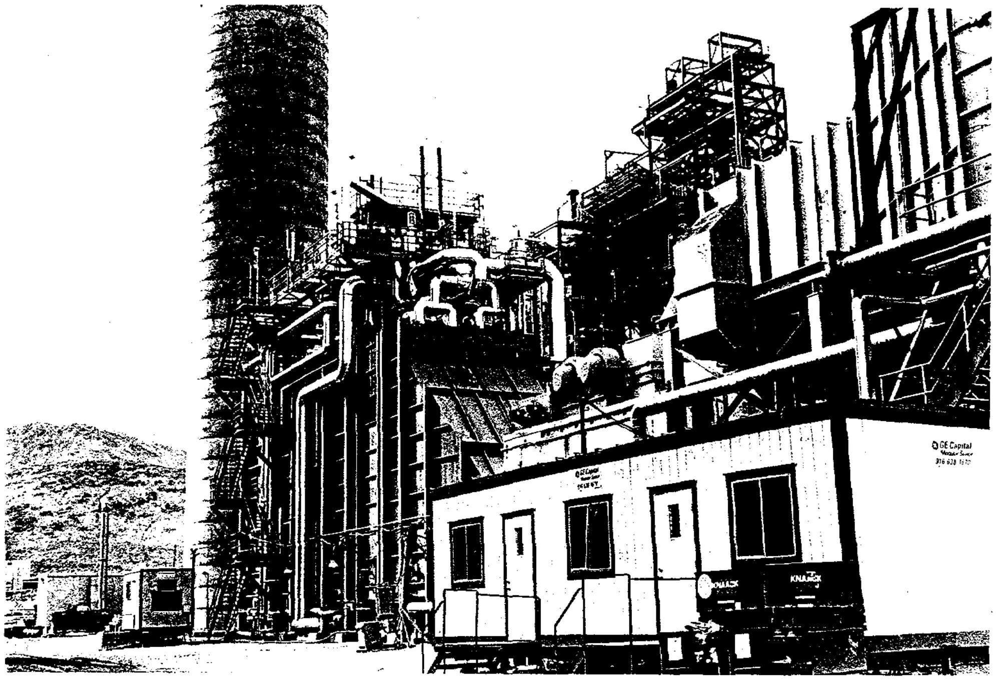
Gasifier (R301) left, and Hot Gas Filter (F501) right, in process of being set in the Gasifier Island structure



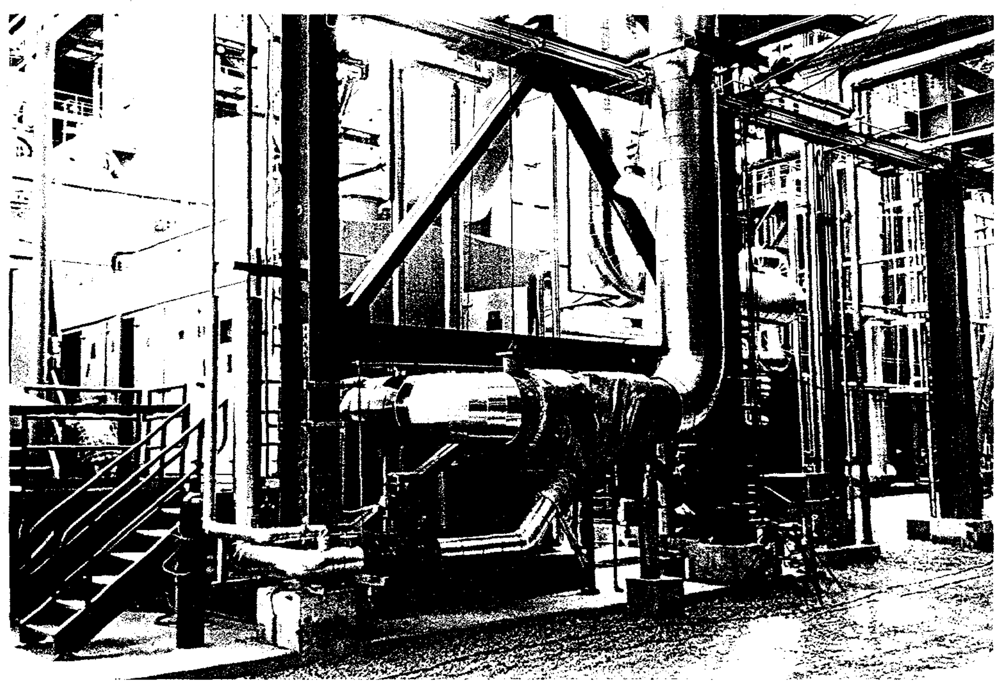
North side of Gasifier Island, Knockout Drum (D201) and Booster Air Compressor (C201)



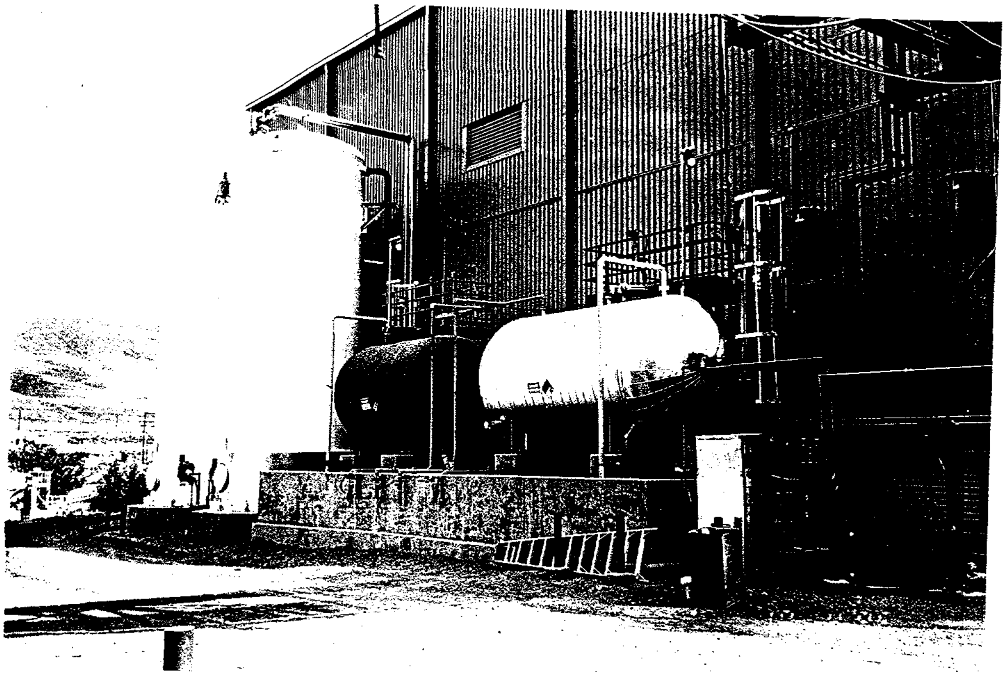
Coal Reclaim Tunnel



Gas Turbine (GT701), Heat Recovery Steam Generator (SG801), and Stack (ST801)

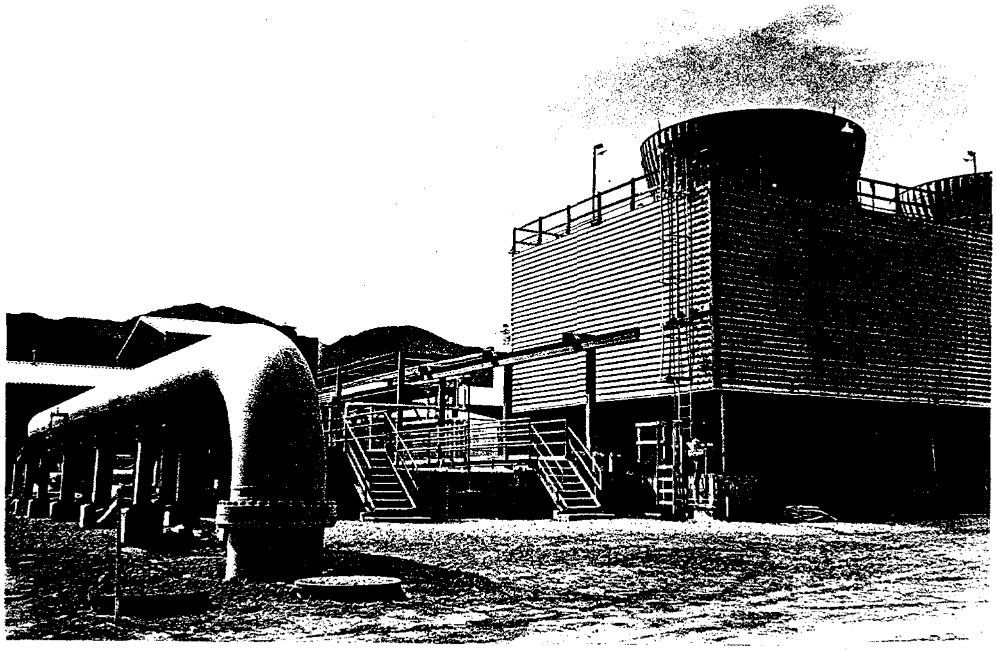


Syngas Module and Line for Gas Turbine

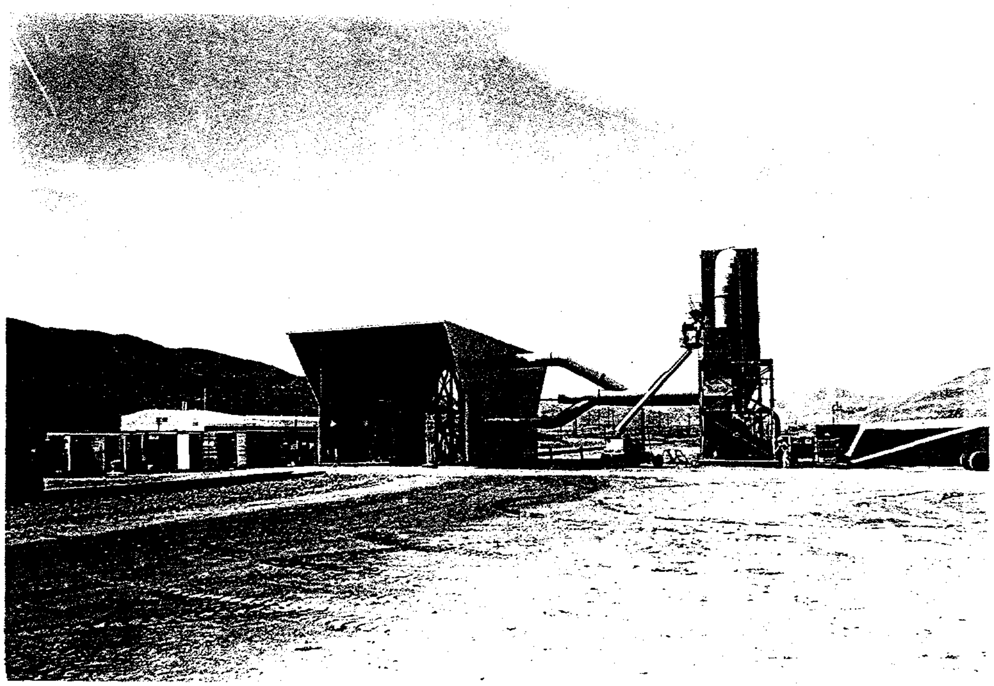


Demineralized Water System for Combined Cycle, Neutralization Tank, Demineralized Water Tank, Caustic Tank, and Acid Tank

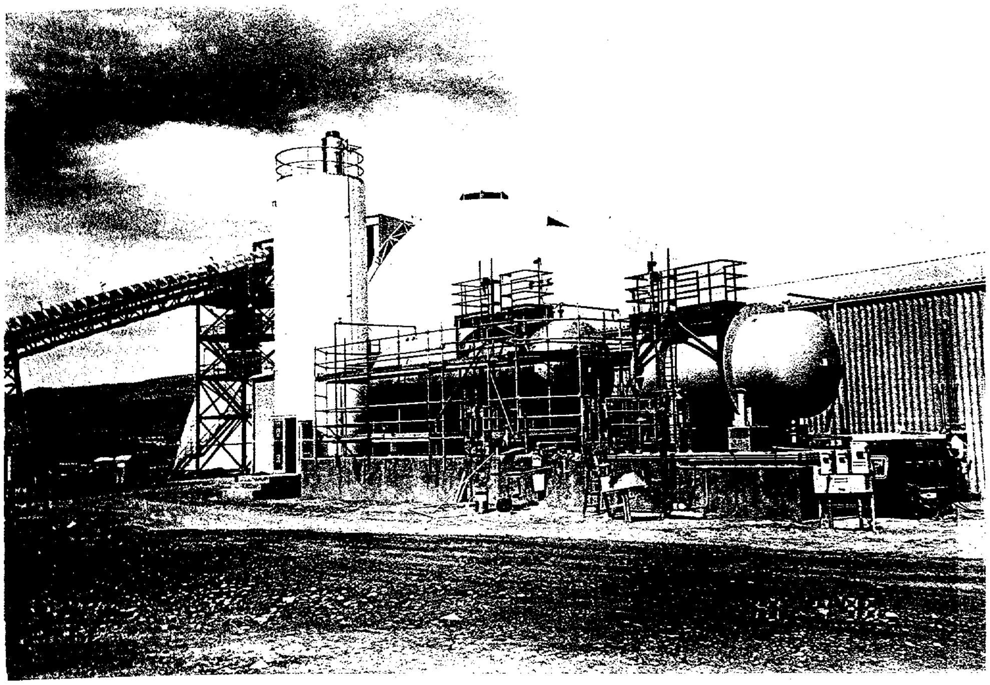
Coal Crusher (SR102) Structure



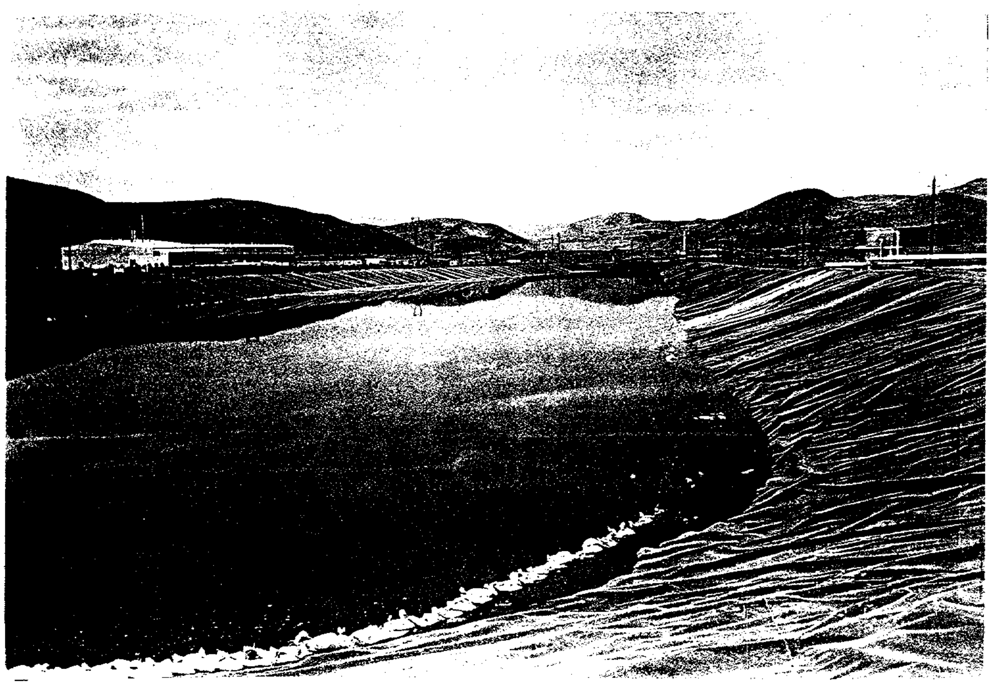
Cooling Tower (CT1201) and Circulating Water Supply



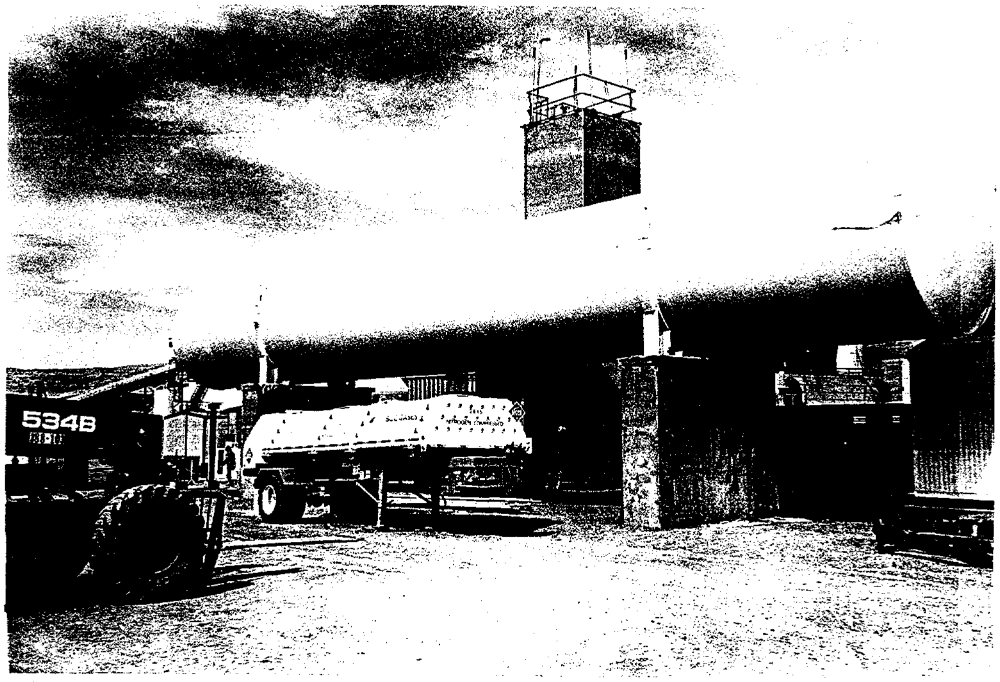
Coal Unloading Structure and Coal Receiving Dust Filter (F106)



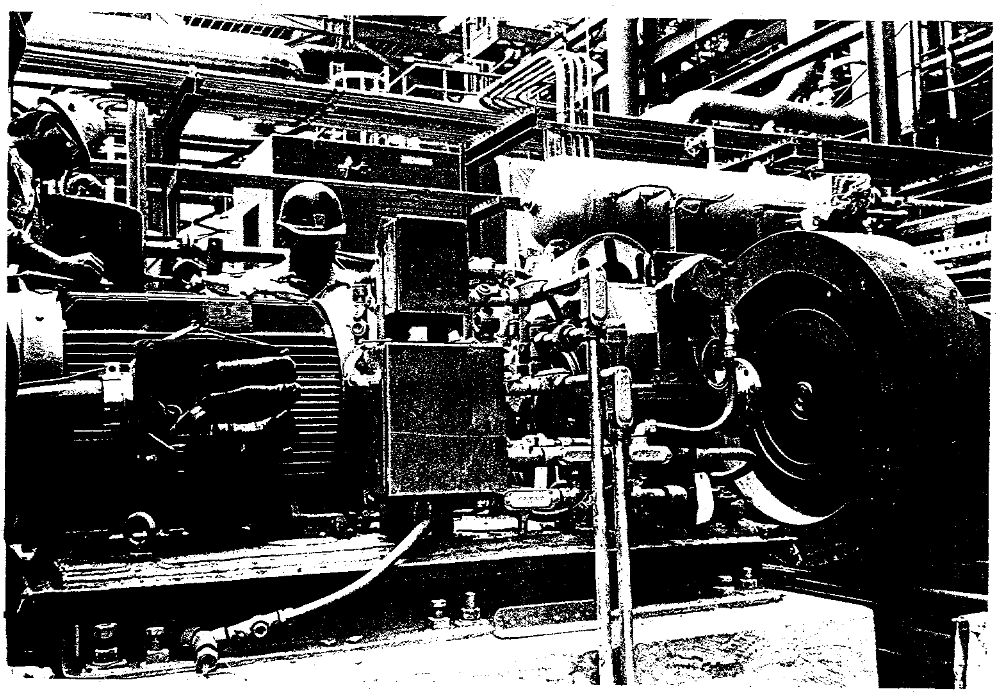
Cooling Tower Side Stream Softening System (PG1001), Soda Ash Silo (BN1001), Caustic Drum (D1001), Acid Drum (D1209)



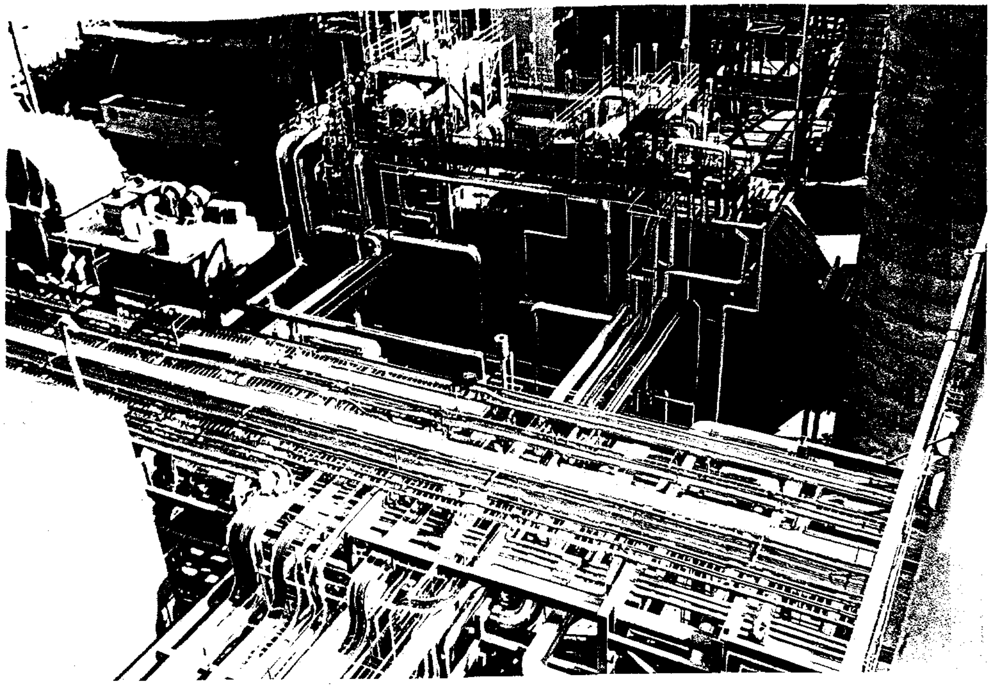
Evaporation Pond



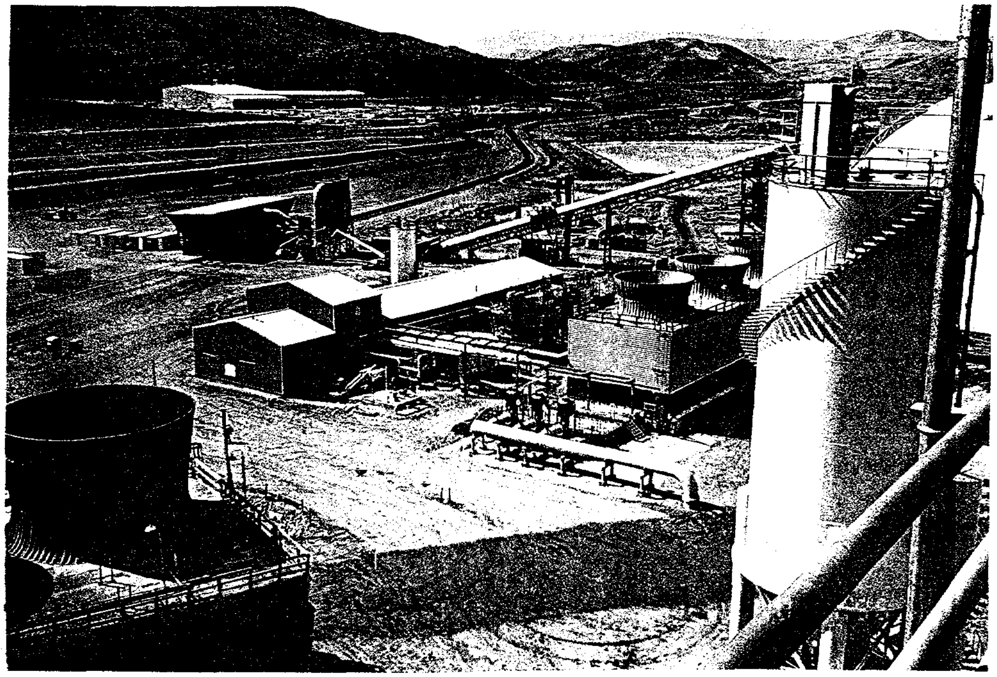
Nitrogen Tank (TK1205)



Aligning Recycle Gas Booster Compressor (C902)



North / South Piperack in the foreground, Gas Turbine, Heat Recovery Steam Generator and Stack in the background



Coal Unloading, Waste Water Building, Cooling Tower and Solid Waste Silo