TECHNICAL PROGRESS REPORT
HEALY CLEAN COAL PROJECT

DOE COOPERATIVE AGREEMENT
DE-FC-22-91PC90544

QUARTERLY REPORT NO. 1 & 2
FOR THE PERIOD
JANUARY - JUNE, 1991

SEPTEMBER 1991

ALASKA INDUSTRIAL DEVELOPMENT AND EXPORT AUTHORITY

Prepared by

STONE & WEBSTER ENGINEERING CORPORATION

LEGAL NOTICE

This report was prepared by Stone & Webster Engineering Corporation (S&W) pursuant to a Cooperative Agreement between the U.S. Department of Energy and the Alaska Industrial Development and Export Authority (AIDEA). Neither S&W, AIDEA nor any of their subcontractors nor the U.S. Department of Energy, nor any person acting on their behalf:

(A) Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately-owned rights; or

(B) Assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method or process disclosed in this report.

Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by S&W, AIDEA or the U.S. Department of Energy. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Department of Energy.

SECTION 1 - SUMMARY

The objective of the Healy Clean Coal Project (HCCP) is to demonstrate the integration of an advanced combustor and heat recovery system with both high and low temperature emission control processes. The resulting emission levels of SO_2, NO_x, and particulates are expected to be significantly better than the federal New Source Performance Standards (NSPS).

The project demonstration will start January 1, 1996 with testing complete January 1, 1997. The site is located adjacent to the existing Healy Unit No. 1 power plant in Alaska. The project is funded by the U.S. Department of Energy (DOE), and the Alaska Industrial Development and Export Authority (AIDEA).

The project is broken down into the following three phases over a 72 month period.

Phase IA - Project Definition
Phase IB - Design
Phase IIA - Procurement
Phase IIB - Construction
Phase III - Operation

The HCCP is currently in Phase IA - Project Definition which is also the first Budget Period. Phase IA is oriented toward baselining the project. The following accomplishments are planned for the first Budget Period:

- Technology Baseline - all decisions about flowsheets, specific equipment types, equipment placement, and demonstration configuration will be made,
- Schedule Baseline - the schedule will be of sufficient detail to allow cost estimating,
- Cost Baseline - the cost estimate will provide the basis for project management decisions,
- Financing - financial plans pertaining to the Participant's share of total project costs will be established, and
- NEPA - all requested information for DOE to satisfy its responsibility under the National Environmental Policy Act will be submitted.

Phase IA is followed by Phase IB which is the detailed engineering and design. Phase IIA overlaps Phase IB in its entirety and allows for release for material procurement and fabrication of equipment and systems.

This report covers Pre-Award activities, and January - June 1991, Phase IA activities. The environmental program for the HCCP is proceeding on schedule. Field data collection is largely completed and a draft Environmental Information Volume (EIV) has been submitted to the Department of Energy (DOE) to support DOE's preparation of a federal Environmental Impact Statement (EIS). Preparation and submittal of permitting documents is underway. Studies and design work supporting the draft EIV were also completed.

Contract negotiations continued for the Boiler/Combustor and FGD systems. These contracts are anticipated to be awarded during the next reporting period. The Turbine/Generator procurement contract was issued for bids, with this award also scheduled for the next quarter. Many of the equipment procurement specifications will commence next quarter to eventually support the project budget capital cost estimate in advance of budget period II.

The Ohio coal testing was completed at TRW's Cleveland facility. Healy coal was burned for the first time on March 27, 1991. Coal tests continued with the collection of a 5-ton ash sample for use by Joy in Niro's Copenhagen test facility.

Project management activities including contracting, financing, and DOE reporting are underway. The project engineering, design, and construction schedule are being prepared. These schedules will provide the basis for project control, monitoring, and the cost plan required for further DOE reporting.

SECTION 2 - INTRODUCTION

The Healy Clean Coal Project (HCCP) is jointly sponsored by the Alaska Industrial Development and Export Authority (AIDEA) and the U.S. Department of Energy (DOE). This Technical Progress Report is required under the DOE Cooperative Agreement, Section XV, "Reporting Requirements" and Attachment C, "Federal Assistance Reporting Checklist". It covers pre-award activities and the period of January through June 1991.

The primary objective of the HCCP is to conduct a cost-shared project that will demonstrate a new power plant design which features innovative integration of an advanced combustor and heat recovery system coupled with both high and low temperature emission control processes. The parties anticipate that, if the demonstration project is successful, the technology could become commercialized during the 1990's and will be capable of (1) achieving significant reductions in the emissions of sulfur dioxide and the oxides of nitrogen from existing facilities to minimize environmental impacts such as transboundary and interstate pollution and/or (2) providing for future energy needs in an environmentally acceptable manner.

The demonstration project is proposed to be built adjacent to the Golden Valley Electric Association (GVEA) existing Healy Unit No. 1 pulverized coal power plant. This site is located near Healy, Alaska.

Alaskan bituminous and subbituminous coals will be tested. Coal from the adjacent Usibelli Coal Mine (UCM) will be pulverized and burned at the proposed facility to generate high-pressure steam that will be used by a steam turbine generator to produce electricity. The primary coal to be fired is a blend of run-of-mine (ROM) and waste coals. ROM coal is a subbituminous coal with a higher heating value (HHV) of approximately 7,800 Btu/lb, a low sulfur content of 0.2%, and an ash content of 8%. The waste coal is either a lower grade seam coal or ROM contaminated with overburden material. It has a HHV, sulfur content, and ash content of approximately 6,100 Btu/lb, 0.15%, and 25% respectively. An advantage of the slagging combustor is that it can utilize low quality coals effectively.

Emissions of SO_2 and NO_x from the plant will be controlled using TRW's entrained combustor with limestone injection, in conjunction with a boiler supplied by Foster Wheeler. Further SO_2 and particulate removal will be accomplished using Joy Technologies, Inc.'s (Joy) Activated Recycle Spray Absorber System. Successful demonstration of these technologies is expected to result in NO_x emissions of less than 0.2 lb/MMBtu and SO_2 removal efficiencies greater than 90% with a limestone reagent.

The TRW Entrained Combustor (See Figure 1) is designed to operate utilizing staged combustion to minimize NO_x formation. These conditions are obtained using a precombustor, then a main combustor for partial combustion, with combustion completion occurring in the boiler. The first and second stages of combustion produce a sufficiently high temperature to generate a slag (liquid ash) while reducing the fuel-bound nitrogen to molecular nitrogen (N_2). The final stage of combustion in the boiler occurs at a combustion temperature maintained below the temperature that will cause thermal NO_x formation.

The combustor is also used to reduce SO_2 emissions by the injection of pulverized limestone into the hot gases as they leave the combustor and enter the boiler. This technique changes the limestone into lime (flash calcination) which reacts with the sulfur compounds in the exhaust gas to form calcium sulfate. The flue gas, which contains the remaining sulfur compounds, calcium sulfate, and other solid particles, leaves the boiler and passes through a Joy spray dryer absorber (See Figure 2) and a bag filter for further SO_2 and particulate removal prior to exiting through the stack.

The innovative concept to be demonstrated in the second-stage SO_2 removal equipment is the reuse of the unreacted lime, which contains minimal fly ash. The majority of fuel ash was removed in the combustor in the form of slag. A portion of the solids collected from the spray dryer absorber vessel and the bag filter are first slurried with water, chemically and physically activated, and them atomized in the spray dryer absorber vessel for second-stage SO_2 removal. Third stage SO_2 and particulate removal occurs in the bag filter as the flue gas passes through the reactive filter cake in the bags. The use of limestone in the combustor, combined with the recycle system, reduces plant wastes and increases SO_2 removal efficiency when burning high and low sulfur coals.

The integrated process is shown in Figure 3. The integrated process is suited for repowering or retrofitting existing facilities or for new facilities. It is expected to provide an alternative technology to conventional pulverized coal boilers, flue gas desulfurization (FGD), also known as a scrubber, and currently available conventional NO_x control processes, while lowering overall operating costs and reducing the quantity of solid wastes.

The total project activities include design, permitting, procurement, fabrication, construction, start-up, testing, and reporting of results. Construction of the demonstration facility is expected to start in the spring of 1993 and continue for 2.5 years. Following completion of the demonstration test program, the plant is expected to continue to operate and be maintained as a

commercial utility electric generation station.

The proposed HCCP is to be a nominal 50 MWe facility consisting of two pulverized-coal-fired entrained combustors, a boiler, a spray dryer absorber with activation and recycle equipment, a bag filter, a turbine generator, coal and limestone pulverizing and handling equipment, and associated auxiliary equipment.

The specific objectives of the HCCP demonstration are to: (1) demonstrate the use of Alaskan, low-sulfur bituminous and subbituminous coals of medium to high ash and moisture content; (2) demonstrate large utility boiler repowering capability of the TRW Entrained Combustion System; (3) demonstrate large utility boiler retrofit capability of the TRW Entrained Combustion System on oil-designed boilers with no derating and on pulverized coal and cyclone furnace design boilers with improved performance, and lower NO_x, SO_2, and particulate emissions; (4) demonstrate the TRW Entrained Combustion System's capability to simultaneously control NO_x and SO_2 using overfire air ports and limestone injection into the combustion products; (5) demonstrate the enhanced capability of the TRW Entrained Combustion System for simultaneous NO_x and SO_2 removal when combined with back-end SO_2 absorption techniques; (6) demonstrate the energy efficiency of the integrated technology; and (7) demonstrate the cost effectiveness of the technology.

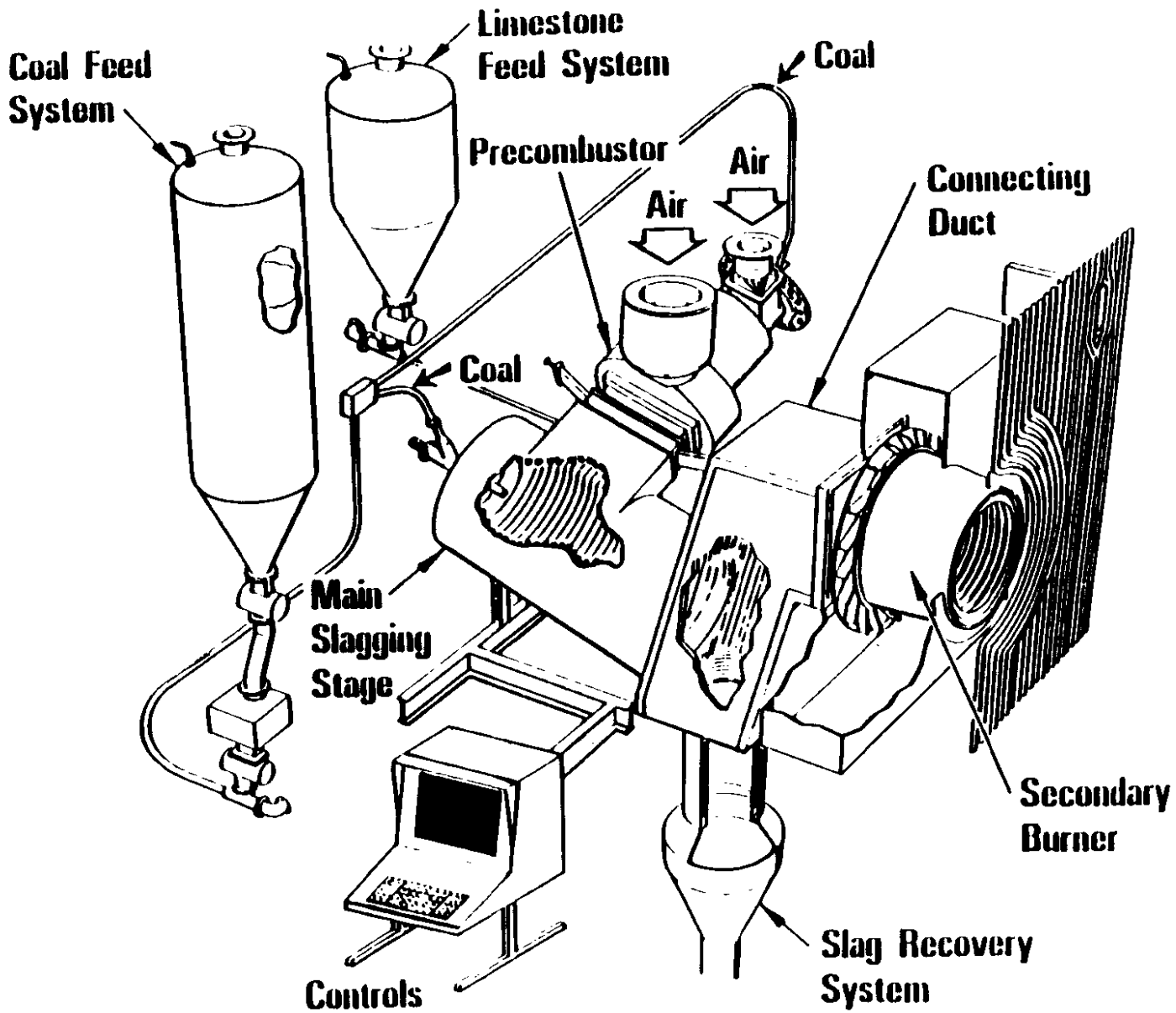


Figure 1
TRW ENTRAINED COMBUSTION SYSTEM
Healy Clean Coal Project

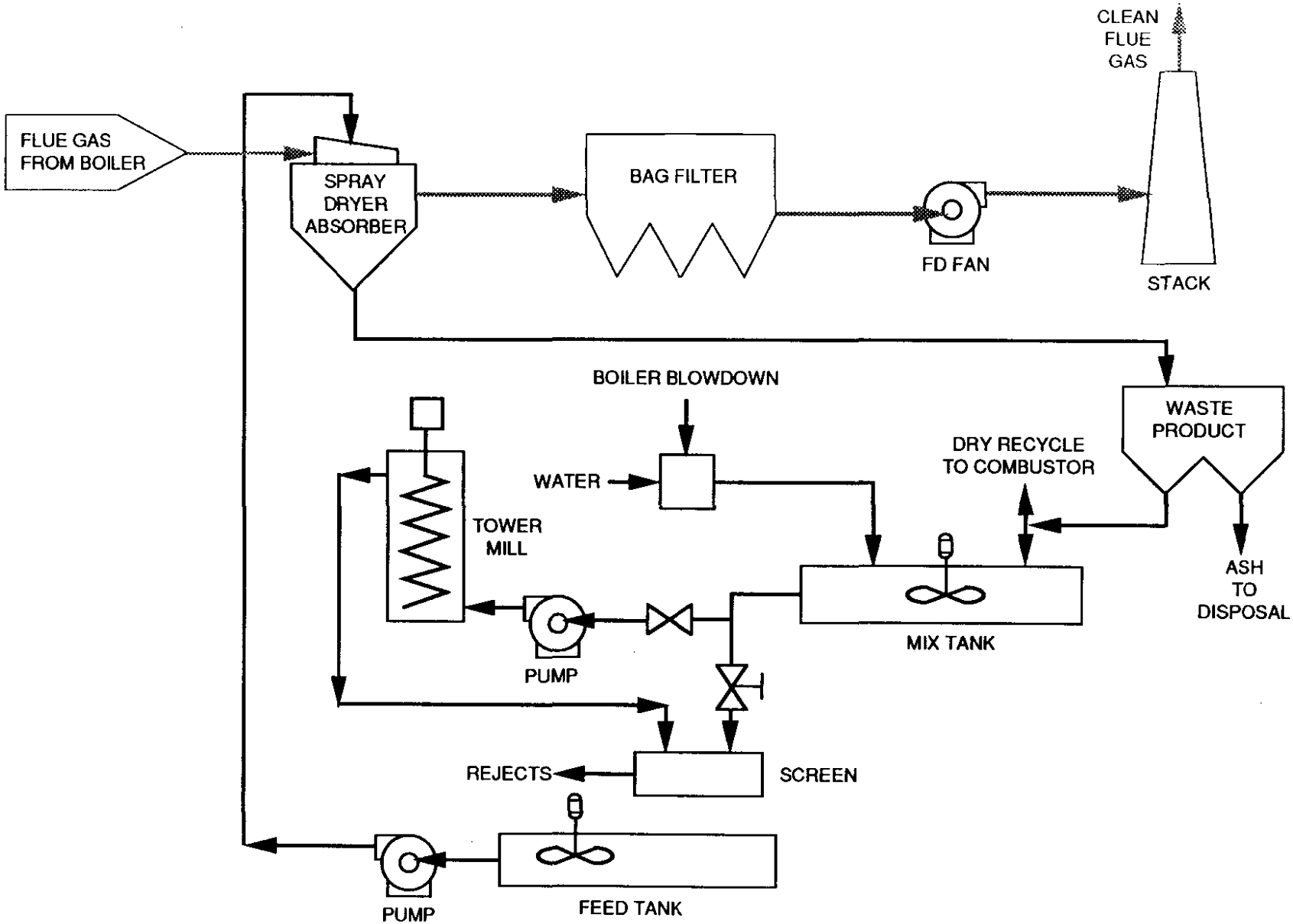
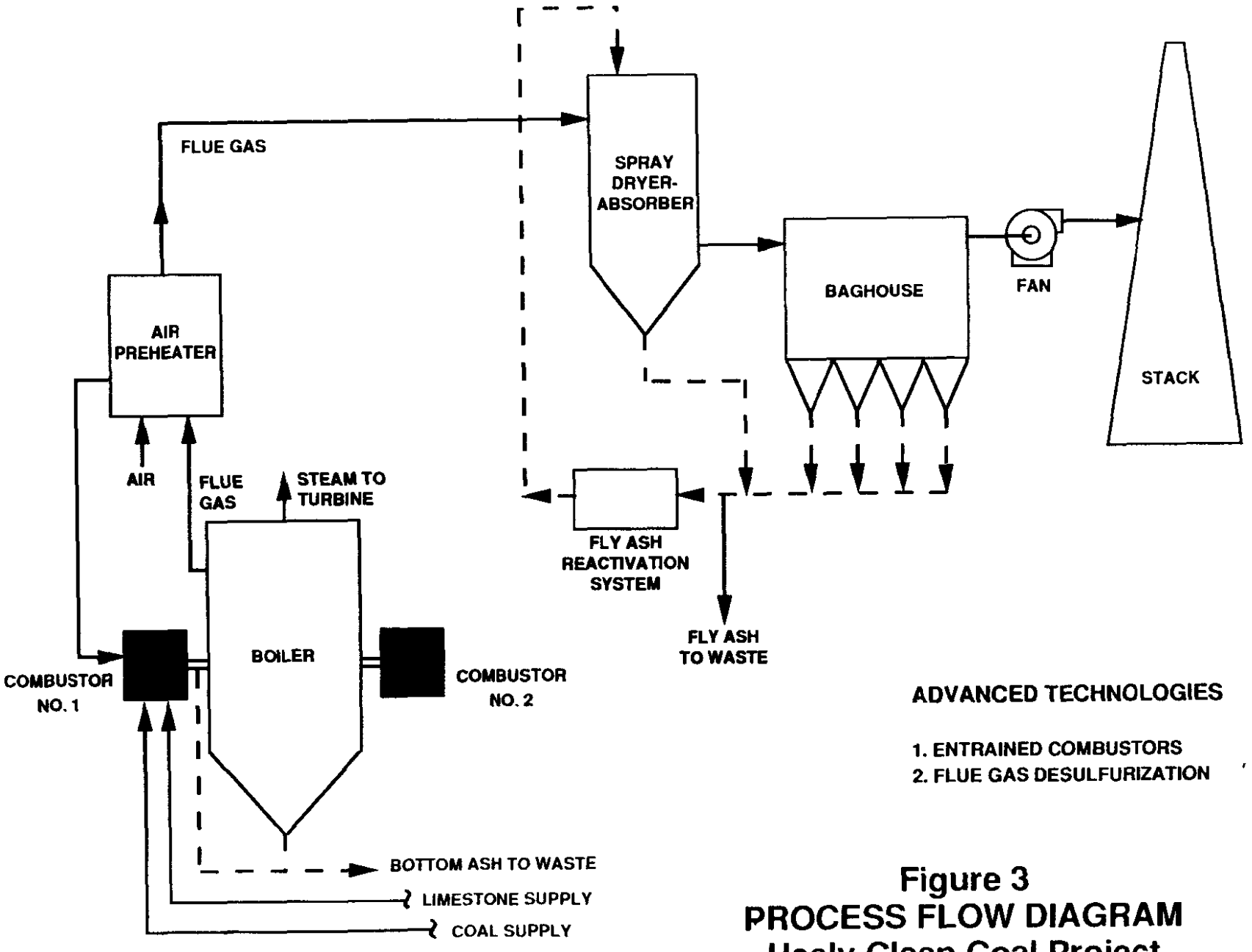


Figure 2
JOY ACTIVATED RECYCLE SYSTEM
Healy Clean Coal Project

M0991020



ADVANCED TECHNOLOGIES

1. ENTRAINED COMBUSTORS
2. FLUE GAS DESULFURIZATION

Figure 3
PROCESS FLOW DIAGRAM
Healy Clean Coal Project

M0991019

SECTION 3 - PROJECT STATUS

The following status is for Phase I work from January to June, 1991.

Project Management

The HCCP team participants and their primary roles include:

- Alaska Industrial Development and Export Authority (AIDEA) - Ownership, overall project management and financing.
- Golden Valley Electric Association, Inc. (GVEA) - Operator and purchaser of the HCCP electrical output.
- Usibelli Coal Mine, Inc. (UCM) - Coal supplier and ash disposal.
- TRW, Inc. (TRW) - Entrained combustion system technology supplier.
- Joy Technologies, Inc. (Joy) - Spray dryer, fabric filter and ash recycle system technology supplier.
- Stone & Webster Engineering Corporation (S&W) - Architect/Engineer

In addition Foster Wheeler Energy Corporation (FWEC) will be contracted for TRW's combustor detailed design and boiler supply and erection.

The State of Alaska has granted $25,000,000 plus interest earnings to the HCCP. AIDEA's board of directors have met during this reporting period. AIDEA has completed and presented to its board a financial plan for the project. The report, which was completed in July 1991, indicated that the HCCP is financially feasible. The board established a fund, based on the financing plan, that will be a source of funds which, with other sources, will allow completion of the project as it is currently budgeted and scheduled.

AIDEA's contract negotiations with TRW, FWEC and Joy have progressed to finalization. Copies of the contracts will be sent to the parties, including DOE. Contracts with GVEA and UCM are pending.

GVEA filed an application to the Alaska Public Utility Commission (APUC) for approval of the Power Sales Agreement (PSA). However, the APUC rejected the application in April because of an incomplete financing plan and Power Sales Agreement for HCCP. AIDEA completed its financial feasibility plan in July, and is now finalizing the PSA with GVEA. GVEA plans to refile a complete application to the APUC in December.

The required monthly reporting under the terms of the Cooperative Agreement, Article XV, reporting requirements were fulfilled during this reporting period, including monthly reporting and the Project Evaluation Plan for Budget Period 1. Project meetings are held weekly to discuss schedule and budget progress.

Preparation of the project engineering and construction schedule, and cost plan continued. The AIDEA/DOE Cooperative Agreement was completed and signed in April 1991.

Permitting/NEPA Compliance

- Agency Meetings

  The environmental program for the HCCP began in early January 1990 with the establishment of contacts with federal and state resource agencies with jurisdiction over proposed activities. The HCCP was formally introduced to the agencies through a general agency meeting held in Fairbanks, Alaska on March 1, 1990. At that meeting HCCP Participants were introduced, the DOE Clean Coal III program was discussed, the innovative technologies were explained, environmental documentation available for use by the HCCP was identified, and anticipated permit requirements were discussed. Each of the agencies were asked to provide, subsequent to the meeting, a letter identifying permit requirements for the HCCP.

  Based on the letters received from the agencies, a Permit and Environmental Plan document was prepared and provided to the agencies and DOE during April 1990. The Permit and Environmental Plan was prepared to establish a single source document which would provide information on the anticipated permitting and NEPA compliance requirements for the HCCP. The Permit and Environmental Plan indentified the major Participants, discussed Participant relationships and responsibilities, outlined the project schedule, identified the major federal and state permits, and identified data collection needs to support the permitting and NEPA compliance requirements.

  A second general agency meeting was held on July 12, 1990 in Fairbanks, Alaska. The purpose of the meeting was to introduce agency representatives to DOE and Oak Ridge National Laboratory (ORNL) personnel, provide an overview of the NEPA requirements and schedule for preparation of an Environmental Impact Statement (EIS) for the HCCP, and present a list of the baseline environmental studies which were proposed to be conducted to support preparation of an EIS and project permits.

- Field Data Collection

  Field data collection studies were initiated during summer 1990. Each of the studies are identified and discussed below.

  - Site Selection - A site selection study was initiated to determine the most advantageous location for siting the HCCP. The two sites which were compared were the original location (north site) and a location adjacent to the existing GVEA Healy Unit No. 1 power plant (south site). The study included a technical and economic analysis of the two sites. The final recommendation identified the south site as the preferred site for construction of the HCCP. Information from this study was used to support preparation of the description of alternatives to the proposed action.

  - Geotechnical Site Investigation - A geotechnical site investigation program was undertaken to provide sufficient understanding of site conditions for design of foundations, excavations, and other subsurface aspects for the HCCP. The initial steps of the program included collecting available information regarding site and regional geology, geotechnical conditions encountered during investigation for and construction of the adjacent existing Healy Unit No. 1 power plant, and foundation types used for the existing Healy Unit No. 1 power plant. Subsequent steps in the geotechnical site investigation program included drilling test borings and excavating test pits to obtain soil samples and to provide information on the presence and distribution of various soil types. Soil properties were also evaluated using various laboratory tests on samples. Site geology and geohydrology was investigated using test borings, monitoring wells, and pumping tests. These investigations, together with local information available from construction of the existing Healy Unit No. 1 power plant and regional information available from the nearby UCM coal mine, provided an adequate understanding of geology and geohydrology of the site.

  - Floodplain Analysis - To provide detailed documentation on the extent of the 100-year floodplain, a topographic map with a contour interval of 2 feet was developed from aerial photography taken specifically for the detailed floodplain analysis. The area of topographic mapping extended from about 0.5 mile upstream from the USGS gauging station (which is located upstream from the HCCP site) to a distance approximately 1 mile downstream from the HCCP site and for about 1 mile up Healy Creek. USGS provided a flood frequency analysis of the Nenana River and Healy Creek. A detailed flood routing analysis was

performed to ascertain the stage and surface area coverage of the 100-year flood.

- Potential Water Sources and Water Availability - To evaluate the quantity of ground water available for the HCCP, as well as ground water gradients at the site, several observation wells were drilled and installed. These wells were monitored to determine the potentiometric water surface in strata considered possible sources of water. Monitoring was accomplished on a monthly basis for a 1 year period to gain an understanding of seasonal variations in flow rates. Pumping tests were performed using the monitoring wells to quantify the permeability of water-bearing strata.

- USGS Gauging Station - Historical discharge data were available from the U.S. Geological Survey for the Nenana River for the period 1950 through 1979. A complete discharge record from the gauging station referred to as "Nenana River Near Healy, Alaska" (USGS Station No. 15518000) exists for that period. The gauging station was dismantled after 1979.

  Under a cooperative funding agreement with AIDEA, USGS established a new gauging station on the Nenana River near the HCCP site. USGS equipped the gauging station with modern instrumentation which is be capable of taking more accurate measurements of low winter flows that the older instrumentation previously used at the gauging station.

- Water Quality Study - Limited water quality information was available from the USGS for the Nenana River at the now-abandoned gauging station referred to as "Nenana River Near Healy, Alaska." To complement and supplement existing water quality data, a 1 year water quality study was initiated with USGS under a cooperative funding agreement with AIDEA to collect detailed information on water quality parameters for the Nenana River, Healy Creek, and ground water at the HCCP site. Ground water samples were collected from drilled monitoring wells.

- Endangered Species Survey - A survey for the threatened and endangered peregrine falcon was initiated at the request of the U.S. Fish and Wildlife Service. The survey also included documentation of the presence of other non-endangered raptor nests. The survey area documented nesting raptors within a 5 mile radius of the HCCP site. No nesting peregrine falcons occurred within the survey area.

- Botanical Resources - Aerial mapping of vegetation types in the general project area was conducted following acquisition of current aerial photography. Descriptions of vegetation composition of vegetation types was derived from existing vegetation data currently being collected by UCM for its nearby mine. On-site field investigations were also conducted to provide descriptions of vegetation types for which existing data could not be extrapolated to the HCCP site.

- Vegetation Injury Study - A field study was initiated to ascertain the condition of the vegetation surrounding the existing Healy Unit No. 1 power plant at the HCCP site, particularly in regard to the effect of sulfur dioxide (SO_2) emissions. From the study it was documented that the existing Healy Unit No. 1 is not having an adverse effect on sensitive vegetation species at any distance from the plant; a particularly sensitive lichen was found growing in abundance only 400 feet in the prevailing downwind direction.

- Wetlands - A determination of the presence of U.S. Army Corps of Engineers jurisdictional wetlands at the HCCP site and the north site and along access corridors was prepared.

- Air Quality and Meteorological Monitoring Program - The air quality and meteorological monitoring program involved the erection of two meteorological towers and installation of ambient air quality monitoring equipment. The air quality and meteorological monitoring field program was initiated during August 1990 and will be concluded during August 1991. Meteorological parameters that were continuously monitored on the towers included temperature, wind speed, wind direction, Pasquill stability class, dew point, precipitation, pH, sulfur dioxide, nitrogen dioxides, inhalable particulates (PM_{10}), and mixing height.

  A best available control technology (BACT) analysis was performed for each pollutant expected to be emitted in significant amounts. The purpose of the analysis is to determine the level of emission control that is feasible for the HCCP, taking into consideration currently available control technology and economic, energy, and environmental impacts.
  Air quality modelling has been performed using the first 6 months of on-site air quality and meteorological data to assess the effects of pollutant emissions on ambient air quality, visibility, vegetation, and soils. The EPA-approved models used for air quality impact

assessment include ISCST and RTDM. Air quality dispersion modeling results using fall and winter meteorological data indicate that air emissions from the HCCP would not adversely affect air quality degradation limits in the Class I air quality area within Denali National Park and Preserve (DNPP). It is anticipated that air quality dispersion modeling using data collected during spring and summer will not contain meteorological conditions which would result in levels of air quality impacts which are greater than those calculated using the fall and winter data. As a consequence, the impact of the HCCP on the Class I air quality degradation limits in DNPP is not anticipated to result in significant obstacles to permitting the HCCP.

The EPA-approved models used for visibility impact assessment include PLUVUE and a valley box model approach. Model input included meteorological and mixing height data acquired at the monitoring sites, applicable plant stack gas parameters, pollutant emission rates based on the BACT analyses, and emission rates from the existing Healy Unit No. 1 power plant.

The issue of the impact of air emissions from the HCCP, and the cumulative impact of adding the HCCP emissions to the existing Healy Unit No. 1 emissions, on visibility of a plume within the DNPP Class I area has not been fully resolved. A plume from an emission source could become visible if a sufficient quantity of largely colorless gaseous pollutants emitted from a source were to chemically convert over time in the atmosphere to produce different gases which are visible to the human eye. This is a separate, but related, issue from the Class I air quality degradation limits addressed above. Preliminary plume visibility modeling using fall and winter meteorological data has suggested that during a small proportion of the daylight hours a gaseous pollutant plume from the HCCP may be visible to an observer located within the DNPP Class I area. The preliminary visibility modeling has also suggested that a gaseous pollutant plume from the existing Healy Unit No. 1 alone may be visible to the same observer. However, in contradiction to the preliminary visibility modeling results, there have been no recorded complaints from local residents, visitors to DNPP, or from the National Park Service itself which would suggest that the existing Healy Unit No. 1 produces a visible gaseous pollutant plume of the type predicted by the preliminary modeling. This suggests that the plume visibility modeling is overly conservative in its prediction of level of impacts.

- Noise - The acoustical environment surrounding the HCCP site was measured using standard noise data collection techniques. Several noise stations were established around the existing Healy Unit No. 1 power plant to measure existing background noise levels. Impacts of construction and operation noise levels were assessed based on the background data.

- Land Ownership - Land ownership information was collected for land areas proposed for the HCCP and land for all adjacent landowners who may be directly impacted by construction or operation of the project.

- Construction Camp - A preliminary determination of the type, location, and schedule for constructing a temporary construction camp to house construction workers has been conducted.

- Historical/Archaeological Cultural Resources Survey - Contact with the Alaska State Historic Preservation Office (SHPO) has indicated that a significant amount of historical/archaeological survey work has been undertaken in the railbelt area. No significant cultural resources have been discovered in the Healy area to date. Much of the north and HCCP sites have been disturbed by construction activities in the past. Additionally, both sites occur within relict channels of the Nenana River, further reducing the probability of the presence of cultural resources. The SHPO has determined that surveys for archaeological or historical resources do not need to be conducted to further confirm the absence of historical/archaeological resources at the sites.

- Aircraft Safety - Federal Aviation Administration officials have been contacted for a determination of the aircraft safety considerations associated with constructing a new stack in the Healy area of the Nenana River valley.

- Socioeconomics - Studies of the socioeconomic effects of construction and operation of the HCCP on the local and regional economies have been undertaken. Local communities analyzed for the socioeconomic effect of construction and operation of the HCCP were Cantwell, McKinley Park, Healy, Anderson, and Clear Air Force Base. Parameters analyzed included population characteristics, existing workforce, employment statistics, wage and income characteristics, community revenues and expenditures, housing, housing development potential, and community services.

- Heat Rejection System Study - A waste heat-rejection system utilizing once-through cooling water from the Nenana River is proposed for the HCCP. Engineering and environmental studies were undertaken which described the proposed system and methods to minimize or eliminate problems gathered from operating experience of a similar heat-rejection system utilized by the existing Healy Unit No. 1. All resource agencies with permitting authority relative to the proposed heat-rejection system were contacted to ascertain whether the proposed action would be acceptable. The conclusion of these discussions was that the proposed heat-rejection system could be successfully permitted assuming proper consideration was given to adequately mixing of the discharged water and dissipation of the waste heat into the waters of the Nenana River.

- Environmental Information Volume

  During fall and winter 1990-1991, an Environmental Information Volume (EIV) was prepared for the HCCP. The EIV is a compilation of site- and project-specific information which will be used as the basis for project-specific NEPA documents to be prepared by DOE. The information to be contained within the EIV was necessary for DOE to fulfill its responsibilities to conform to the Council on Environmental Quality regulations for Implementing the Procedural Provisions of NEPA, 40 CFR Parts 1500-1508, and DOE regulations for implementation of NEPA (10 CFR Part 1021).

  The EIV was prepared to address the following major areas: 1) a discussion of the proposed action and its alternatives including a physical and engineering description of the proposed action, a description of the phases of construction and operation of the proposed action, and an analysis of all alternatives to the proposed action; 2) a description of the existing environment including air quality, hydrological, geological, water quality, ecological, historical and archaeological, land ownership and use, recreational, socioeconomic, visual and aesthetics, and energy form and materials resources and health and safety issues; 3) a detailed analysis of the impacts of construction, operation, and final disposition of the proposed facilities which address all aspects of the existing environment, a summary of agency concerns and recommendations with regard to identified potential impacts, and mitigation options and monitoring requirements relating to identified potential impacts; 4) a discussion of impacts of alternatives to the proposed action; and 5) a regulatory compliance plan which addresses regulatory and permit requirements and anticipated regulatory and permit modifications.

A draft EIV was submitted to DOE during February 1991. Subsequently, the draft EIV was supplemented or updated with sections covering air quality, visibility, water quality, endangered species, alternative sites, and the proposed construction camp based upon on-going information gathering activities in the field.

- Permitting

  Initial permitting activities addressed the need to obtain permits for installation of the air quality and meteorological monitoring system and for other field activities.

Preparatory to initiating permitting activities for the HCCP, individual meetings were held with state and federal agencies to discuss permitting requirements, as follows:

Alaska Department of Environmental Conservation (ADEC), May 6, 1991
Alaska Department of Fish and Game (ADF&G), May 7, 1991
Alaska Department of Natural Resources (ADNR), May 6, 1991
U.S. Fish and Wildlife Service (USFWS), May 6, 1991
U.S. Army Corps of Engineers (Corps), May 8, 1991
U.S. Environmental Protection Agency (EPA), May 21, 1991

Permitting activities commenced during spring and summer 1991. Initial permitting activities concentrated on preparation of the major federal and state permits for the HCCP. Preparation of National Pollutant Discharge Elimination System (NPDES) permit applications and State of Alaska wastewater discharge permit applications were begun during June 1991. In addition, the Corps Section 404 for work in wetlands and the Nenana River, the Best Available Control Technology (BACT) portion of the Prevention of Significant Deterioration (PSD) for applicable air emissions were initiated. Preparation and submittal of permit applications will continue through summer and fall 1991.

Engineering

TRW conducted a test burn of two Alaska coals between March 29 and June 7, 1991 at the TRW coal combustion test facility in Cleveland, Ohio. This test facility consists of a TRW Model 35 coal combustion system integrated with a 29,000 lb steam/hr Keeler boiler. The coal firing capacity of the facility was increased specifically for these tests. Improvements in technology and equipment were also incorporated.

The tests were designed to provide data that will form the basis of the scale-up and design of the combustor and other systems for the HCCP. The tests also provided calcined material to enable Joy/NIRO to perform pilot plant tests, planned for August, for design of the spray dryer system.

The objectives of the tests were to:

- Evaluate combustion system operation and performance using selected Alaska (Usibelli) coals.

- Collect 5-tons of flash-calcined baghouse catch material (FCM) from the flue gas stream and prepare for shipment to NIRO in Denmark for spray dryer tests. Limestone from Alaska was injected into the combustor/furnace interface.

The approach to this project required making necessary modifications to the test facility, then to conduct a series of tests on the Healy coals.

Facility modifications were required to handle higher coal flow rates necessitated by the low heating value of the coals, and to address safety concerns arising from the high volatility of the coal. Modifications were also made to prevent pulverized coal agglomeration and/or accumulation during transfer. This applied to both the pulverizer sweep air system and to the coal feed transport and recycle systems. System lightoff methods and precombustor design were modified to obtain operability and performance consistent with safe boiler firing practices.

The test series:

- Established facility operations for the Healy coals (coal preparation system operation and mill capacity)

- Evaluated the coals in terms of grinding and handling characteristics, combustion, and slagging characteristics.

- Produced 5 tons of FCM for the Joy/NIRO spray dryer tests.

TRW has reported that the Healy coal test burn demonstrated that the Healy performance coal and the Two Bull Ridge (TBR) coal can be effectively burned in TRW's coal combustion system. The coal was handled, pulverized, and fed safely and reliably in the Cleveland test facility coal preparation and feed system. Good to excellent combustion performance was achieved with both coals as measured by carbon losses. Slag capture was excellent with the performance coal (85%). Slag capture with the TBR coal was less (45%). This is attributed directly to the higher T_{250} (2900 vs 2750°F) of the TBR coal. The larger combustor size and higher preheat temperature (650 vs 400°F) which will be present at Healy will accommodate the TBR coal. A capability for low NO_x was demonstrated. Finally, the tests demonstrated that FCM for the Joy/NIRO spray dryer SO_x capture system can be produced by the TRW coal combustion system using Alaska coal and limestone.

During this reporting period, the heat rejection system study, the once-through cooling evaluation, and the heat rejection assessment were completed. The design criteria was updated and issued for participant review. The calculations and analysis in support of the EIV and permitting activities were also issued. The preliminary water treatment system description was completed. The final issue of the geotechnical report was completed in February. The preliminary piping and instrumentation diagrams (P&ID's) (symbols and legends) and the electrical one-line diagrams (index, legend, and general notes) were both started.

The shop fabricated tanks specification has started during this reporting period.

The plant architectural renderings were started and continued during this reporting period.

Negotiations were carried on throughout this reporting period for the Boiler, Combustor, and FGD System contracts. The Turbine/ Generator procurement specification was also completed and issued for bids.

A number of engineering studies were completed in the Pre-Award Phase (prior to January, 1991) including:

Waste Coal Cleaning - The purpose of the waste coal cleaning study was to conduct a non-site specific technical and economic evaluation of potential coal prescreening and air classifying systems which may enhance the heating value and performance of the waste coal. The study included a comparison of the economic impacts on the boiler and power plant auxiliary equipment based on the use of the performance coal versus a blend of run-of-mine (ROM) coal and cleaned waste coal. The study findings determined that a waste coal cleaning system did not provide sufficient fuel enhancement and/or reduction in power plant equipment costs to justify the additional capital and operating costs required by the waste coal cleaning facilities.

Site Differential Cost Estimate - In AIDEA's August 1989 proposal to the DOE, the HCCP was proposed to be located just west of the existing UCM coal loadout facility. GVEA has identified that a substantial plant operating cost savings could be realized if the project were located adjacent to GVEA's Unit 1. This study presented capital cost estimates for differences in coal transportation, ash disposal, and total plant construction costs between the existing Unit 1 site (South site) and the UCM loadout facility site (North Site). The South site was selected due to the significant savings to be realized in operating costs as compared to relatively minor capital cost differences.

Entrained Combustor Study - A study was conducted to evaluate the use of either two or three entrained combustors. The two combustor

configuration has lower costs than the three combustor arrangement. However, the two larger combustors represent a greater scale-up from the Cleveland facility combustor. The project decision was to continue with the two combustor configuration as originally proposed to the DOE. TRW is planning full scale design verification testing of the precombustor in order to minimize scale-up risks for the HCCP.

In addition to studies other engineering and design activities were completed in the pre-award phase. The preliminary general arrangements, flow diagrams, and electrical main one-line diagram were completed to support the DEIV. The geotechnical site borings and soil boring calculations were completed to support the geotechnical report. The preliminary heat balance was completed. The preliminary test program for demonstration was developed.

The following specifications were completed during the Pre-Award Phase.

- The coal fired boiler and entrained combustor system specification
- Combustor and auxiliary system technical specifications
- Boiler design/supply and erection specifications
- FGD system technical specification and FGD system furnish and erect technical specification

SECTION 4 PLANS FOR NEXT QUARTER (JULY - SEPTEMBER 1991)

The following highlights activities planned for next quarter:

- Complete negotiations and award TRW, FWEC, and Joy Contracts.
- Continue Preparation of Engineering, Design and Construction Schedule.
- Continue Required Monthly and Quarterly DOE Reporting Submittals.
- Issue TRW coal test report
- Commence testing of FCM material at Niro facility in Denmark.
- Issue preliminary Construction Camp/Facilities Selection for participant review.
- Continue administration of S&W environmental subcontractor efforts.
- Complete BACT Analysis and Report.
- Submit NPDES Applications.
- Continue preparation of Corps Sect 404 Permit Applications.
- Continue preparation of state and local permit applications.
- Continue support of DOE Environmental Impact Statement (EIS) activity.
- Commence preparation of the Plant Layout letter report.
- Commence preparation of the Electrical Station Service Study.
- Update and issue the Design Criteria.
- Commence the Preliminary General Arrangements, P&ID's System Descriptions, and One-Line Diagrams.
- Commence the following Equipment Procurement Specifications.
  - Plant Sample System
  - Deaerator

- Feedwater Heaters
- Combustion Air Preheater
- Chemical Feed System
- Plant Control System
- Power Circuit Breakers
- Main and Unit Aux Transformers
- Outdoor Instrument Transformers
- Travelling Screen
- Condenser
- Turbine Building Bridge Crane
- Coal Handling Equipment
- 480V Load Centers
- Medium Voltage Switchgear
- Circulating Water, Condensate & Feedwater Pumps

- Commence Civil Drawings.
- Complete Plant Architectural Renderings.
- Commence Design of the Boiler/Combustor & FGD Systems.
- Award the Turbine/Generator Contract.
- Continue Participant Design Reviews as Required.
- Continue Preparation of the Project Procedures Manual.