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(DE94000098)

Tampa Electric Company
Polk Power Station
Unit No. 1

Annual Report
January - December 1992

October 1993

Work Performed Under Contract No.: DE-FC21-91MC27363

For
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Tampa Electric Company
Tampa, Florida

DISCLAIMER

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Morgantown, West Virginia 26507-0880

By
Tampa Electric Company
P.O. Box 111
Tampa, Florida 33601

October 1993

Tampa Electric Company
DOE IGCC Project
Polk Power Station - Unit #1
1992 Technical Progress Report

Table of Contents

Executive Summary

This report satisfies the requirements of the Cooperative Agreement DE-FC21-91MC27363, novated as of March 5, 1992, to provide an annual update report on the year's activities associated with Tampa Electric Company's 260MW IGCC demonstration project for the year 1992.

PROJECT DESCRIPTION

As part of the Tampa Electric Polk Power Unit #1, a Texaco pressurized, oxygen-blown entrained-flow coal gasifier will convert approximately 2300 tons per day of coal (dry basis) into a medium-BTU fuel gas with a heat content of about 250 BTU/scf (LHV). Coal-water slurry is combined with oxygen in the gasifier to produce a high-temperature (2500°F), high-pressure syngas. Molten coal ash flows out of the bottom of the vessel into a water-filled quench tank where it freezes into a solid slag. Syngas produced in the gasifier flows through a high-temperature heat recovery unit which cools the gases prior to entering two parallel clean-up areas.

A portion (up to 50%) of the hot syngas is cooled to 1000°F and passed through a moving bed of zinc titanate sorbent which removed sulfur containing components of the fuel gas. The project will be the first in the world to demonstrate this advanced metal oxide hot gas desulfurization technology at a commercial scale.

The remaining portion of the syngas is cooled to 400°F for conventional acid gas removal. This portion of the plant is capable of processing between 50% and 100% of the dirty syngas.

The cleaned low-BTU syngas is then routed to the combined cycle power generation system where it is mixed with air and burned in the gas turbine combustor. Nitrogen from the ASU is injected through the same combustor fuel nozzle. The hot exhaust gases are expanded through the turbine to generate about 192MW of electricity.

Heat is extracted from the expanded exhaust gases by a heat recovery steam generator to produce high pressure steam. This steam, along with the steam generated in the gasification process, drives a steam turbine to generate an additional 132MW of power. Internal process power consumption is approximately 62MW, and includes power for coal grinding, air separation, and feed pumps. Net output from the IGCC demonstration plant will be 260MW.

1992 Progress

At the beginning of 1992, the Cooperative Agreement, which had originally been negotiated between the Clean Power Cogeneration

Limited Partnership of C.R.S.S Capital and TECO Power Services (TPS), was formally transferred to Tampa Electric Company. Subsequent to the signing of the original Cooperative Agreement, TPS bought out the interests of it's partner to become the sole participant. Along with this transfer, the project was altered to become a 260MW oxygen-blown, entrained-flow gasifier with a General Electric 7F Combustion Turbine. The original 120MW of HGCU was maintained and 260MW of Cold Gas Clean-Up (CGCU) was added to insure that 260MW of gas clean-up capability would be available regardless of the Hot Gas Clean-Up (HGCU) performance. A key step, once the modification was signed, was to negotiate a license agreement with Texaco. This license normally includes a specified amount of engineering. Texaco proposed that they perform this preliminary engineering in conjunction with their license engineering and to emphasize their commitment to the project, they proposed to do this at a very favorable rate. By utilizing their approach, the project was able to commence preliminary engineering, at or below projected cost, while taking the necessary time to prepare sufficient details to enable us to solicit competitive bids for the detailed engineering services and still maintain schedule. The result of this effort was that Texaco completed the conceptual engineering for the project and TEC received bids for the detailed engineering services on December 21, 1992, a significant schedule saving activity.

During 1992, procurement for major equipment and long lead items was initiated. The equipment package for the combined cycle system was bid and awarded, bids were received for the ASU and syngas coolers, and negotiations began for the GEESI HGCU system.

Significant accomplishments were achieved in the permitting area. The land use hearing at Polk County was successfully completed. Negotiations were completed for land purchase. Also, all sufficiency issues related to the Polk County Conditional Use Permit were resolved.

In support of preparation of an Environmental Impact Statement (EIS) for the site, a Public Scoping Meeting was held in August 1992 to solicit public comments on preparation of the EIS. As a result of subsequent meetings between EPA and DOE, it was agreed that a better arrangement would be for EPA to be lead agency for the EIS. During 1993, efforts will be focused on making that transition.

In summary, significant accomplishments occurred during 1992 which enabled TEC to more adequately define the preliminary scope, schedule and cost for the project. The results of that effort all point toward the successful completion of the IGCC project on schedule, within budget and at expected capacity and heat rate.

I. PROJECT SUMMARY

This project consists of a highly integrated, nominal 260MW (net) oxygen-blown entrained-flow IGCC plant with 120MW HGCU capability and capability for 260MW of cold gas clean-up (CGCU), to insure that this plant can operate at 260MW, in the IGCC configuration.

In this project, the definition of commercially available equipment is that equipment which can be purchased on the open market and has normally available guarantees and warranties. With the exception of the HGCU, only commercially available equipment for this project. The approach supported by DOE is the highly integrated arrangement of these commercially available pieces of hardware or systems, in a new arrangement which is intended to optimize cycle performance, cost, and marketability at a commercially acceptable size of nominally 260MW (net). Use of the HGCU will provide additional system efficiencies by demonstrating the technical improvements realized from cleaning syngas at a temperature of 1000°F before the sulfur removal is attempted. The low temperature process is plagued by the irreversible cooling losses and, associated reheating before admitting the gas to the combustion turbine.

Gasification

The proposed project will utilize commercially available gasification technology as provided by Texaco in their licensed oxygen-blown entrained-flow gasifier. In this arrangement, coal is ground to specification and slurried in water to the desired concentration in rod mills. This coal slurry and an oxidant (95% pure oxygen) are then mixed in the gasifier burner where the coal chemically reacts, in an oxygen deficient environment, to produce syngas with a heat content of about 250BTU/SCF (LHV) at a temperature in excess of 2500°F. The oxygen will be produced from an Air Separation Unit (ASU). The gasifier is expected to achieve greater than 95% carbon conversion in a single pass. It is currently planned for the gasifier to be a single vessel feeding into one radiant syngas cooler where the temperature will be reduced. After the radiant cooler, the gas will then be split into two (2) parallel convective coolers, where the temperature will be cooled further to about 900°F. One stream will go to the 50% HGCU system and the other stream to the traditional CGCU system with 100% capacity. This flow arrangement was selected to provide assurance to Tampa Electric that the IGCC capability would not be restricted due to the demonstration of the HGCU system.

A traditional amine scrubber type system with conventional sulfur recovery will be use. Sulfur from the HGCU and CGCU systems will

be recovered in the form of H_2SO_4 and elemental sulfur respectively. Both of these products have a ready market in the phosphate industry in the central Florida area. It is expected that the annual production of 14,000 tons of elemental sulfur and 45,000 tons of H_2SO_4 produced by this 260MW (net) IGCC unit will have minimal impact on the price and availability of these products in the phosphate industry.

Most of the ungasified coal exits the bottom of the gasifier/radiant syngas cooler into the ash lock hopper where it is mixed with water. These solids generally consist of coal ash and other combusted coal products. As they exit the lock hopper they are non leachable products which are readily saleable for blasting grit, roofing tiles, and construction building products.

Obviously, the water in the slag lock hoppers requires treatment before it can be either discharged or reused. Our plan is to implement a system whereby all of the water from the gasification process is cleaned and reused thereby creating no requirement for discharging process water from the gasification system.

HGCU

The HGCU system is being developed by General Electric Environmental Services, Inc. (GEESI). This process is undergoing pilot plant testing at GE's CR&D laboratory facilities in Schenectady, NY.

One specific issue in the HGCU system for the Tampa Electric project is the metal oxide sorbent being demonstrated. The originally proposed 120MW IGCC project envisioned using a zinc ferrite sorbent. Due to the requirements of the oxygen-blown entrained-flow gasifier, versus the fixed-bed air-blown gasifier, the sorbent material was changed to zinc titanate which is a more robust material and more amenable to the oxygen-blown entrained-gasifier product gas than zinc ferrite.

In addition to the high efficiency primary cyclone being provided upstream of the HGCU system, a high temperature barrier filter will be considered for possible installation downstream of the HGCU to protect the combustion turbine.

Use of sodium bicarbonate, $NaHCO_3$, will also be investigated for possible injection upstream of the barrier filter for removal of chloride and fluoride species on the barrier filter media by forming stable solids, NaCl and NaFl, which would be disposed of with other plant solid byproduct streams.

Combined Cycle

The key components of the combined cycle are the advanced combustion turbine (CT), heat recovery steam generator (HRSG), and steam turbine (ST), and generators. The advanced CT will be a GE 7F operating with a firing temperature of about 2300°F. It is expected that this CT will be able to generate about 192MW over the entire operating ambient range using syngas as the fuel. The unit will be designed for low-NO_x emissions firing syngas, with low sulfur fuel oil for start-up and as backup fuel.

GE is currently optimizing arrangements for increasing fuel inlet temperatures and also for lowering the pressure drop across the fuel inlet control valving. This has a compounding effect on cycle efficiency by also allowing a lower pressure in the ASU, requiring less air and nitrogen compressor parasitic power.

A heat recovery steam generator is installed in the combustion turbine exhaust to complete the traditional combined cycle arrangement and provide steam to the 130MW steam turbine.

No auxiliary firing is proposed within the HRSG system. Hot exhaust from the CT will be channeled through the HRSG to recover the CT exhaust heat energy. The HRSG high pressure steam production will be augmented by high pressure steam production from the coal gasification (CG) plant. All high pressure steam will be superheated in the HRSG before delivery to the high pressure ST.

The ST will be designed as a double flow reheat with low pressure crossover extraction. The ST generator will be designed specifically for highly efficient combined cycle (CC) operation with nominal turbine inlet throttle steam conditions of approximately 1,450 psig and 1,000°F with 1,000°F reheat inlet temperature.

The operation of the CC power plant will be coordinated and integrated with the operation of the CG process plant. The initial start-up of the power plant will be carried out on low-sulfur distillate fuel oil. Transfer to syngas will occur upon establishment of fuel production from the CG plant.

Under normal operation, syngas and nitrogen from the ASU will be provided to the CT. The syngas/nitrogen mix at the CT combustion chamber will be regulated by the CT control system to control the NO_x emission levels from the unit.

Cold reheat steam from the high pressure turbine exhaust and HRSG intermediate pressure steam will be combined before reheating the HRSG and subsequent admission to the intermediate pressure ST. Some intermediate pressure stem will also be supplied from the HRSG to the sulfur recovery unit.

It is expected that at least 96% percent of the sulfur present in the coal will be removed by the CGCU and HGCU systems.

The advanced CT in the IGCC unit will use nitrogen addition to control NO_x emissions during syngas firing. Nitrogen acts as a diluent to lower peak flame temperatures and reduce NO_x formation without the water consumption and treatment/disposal requirements associated with water or steam injection NO_x control methods. Nitrogen used for injection will be provided by the air separation unit which is also used to generate oxygen for the gasification process. Maximum nitrogen diluent will be injected to minimize NO_x exhaust concentrations consistent with safe and stable operation of the CT. Water injection will be employed to control NO_x emissions when backup distillate fuel oil is used and during the first year of the 7F CT operation when the unit is operated in the simple cycle mode. NO_x emissions from the remaining IGCC facility combustion sources will be controlled using low-NO_x burners and/or combustion practices that reduce NO_x formation.

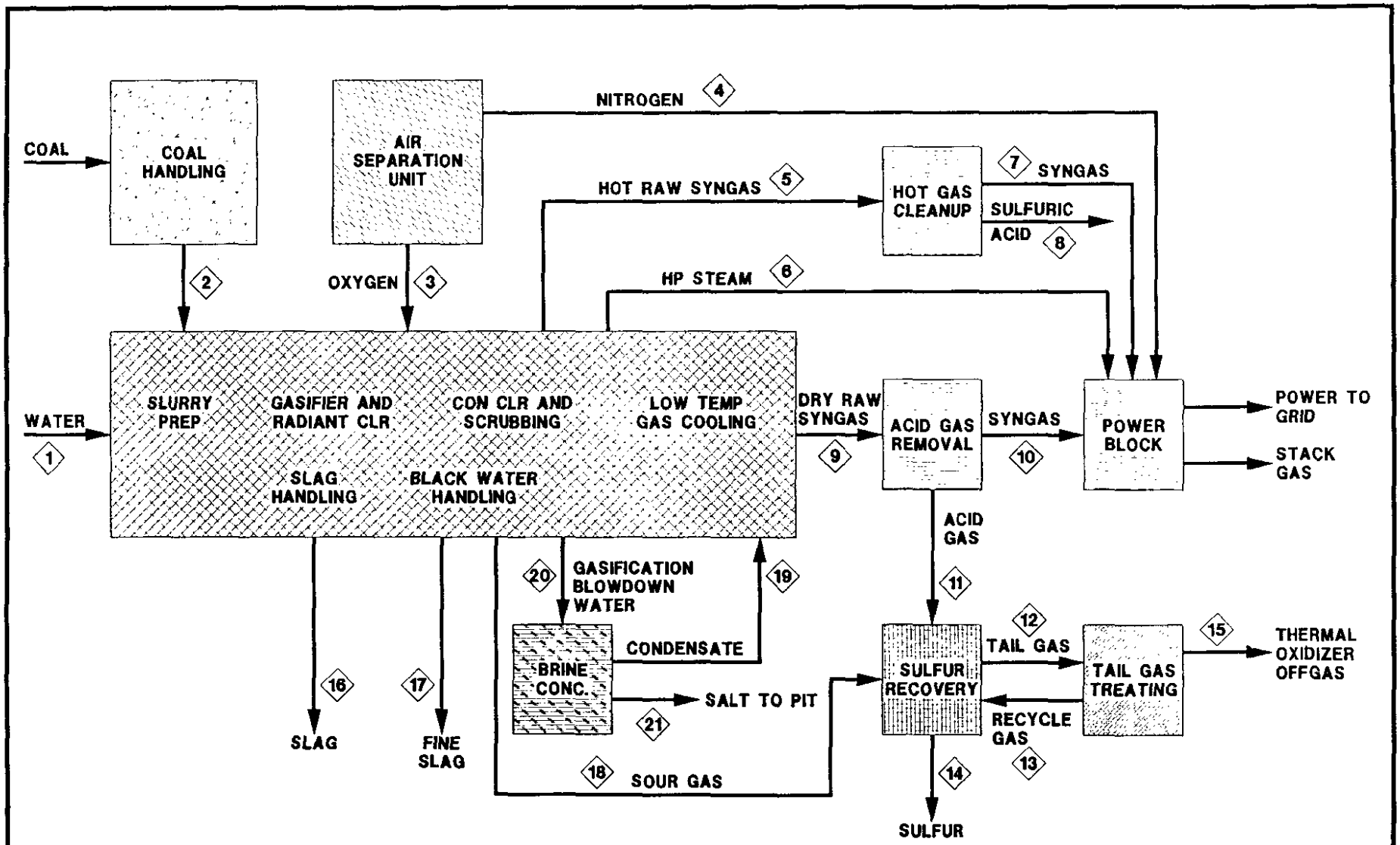
Air Separation Unit

The air separation unit will use ambient air to produce oxygen for use in the gasification system and sulfur recovery unit, and nitrogen which will be sent to the advanced CT. The addition of nitrogen in the CT combustion chamber has dual benefits. First, since syngas has a substantially lower heating value than natural gas, a higher fuel mass flow is needed to maintain heat input which also results in higher CT power output. Second, the nitrogen acts to control potential NO_x emissions by reducing the combustor flame temperature which, in turn, reduces the formation of NO_x in the fuel combustion process.

As potential backup systems to the air separation unit, liquid oxygen and nitrogen storage systems may be considered. If these storage systems are provided, the backup liquid oxygen and nitrogen systems will be maintained in a cold, ready-to-start state.

Integration

The heart of the overall project will be the integration of the various pieces of hardware and systems. Maximum usage of heat and process flow streams can usually increase overall cycle effectiveness and efficiency. In this arrangement, benefits are derived from using the experience of other IGCC projects, such as Cool Water, to optimize the flows from different subsystems. For example, low pressure steam from the HRSG will be produced to supply heat to the coal gasification facilities for process use. The HRSG will also receive steam energy from the coal gasification heat exchangers to supplement the steam cycle power output.



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01/21/93

TAMPA ELECTRIC
A TECO ENERGY COMPANY

POLK POWER STATION PROJECT
BLOCK FLOW DIAGRAM

DESIGNED BY	CHECKED BY	APPROVED BY
DATE 01/93	JOB NO.	
FILE NAME MRCPFD		DWG NO

Additional low energy integration will occur between the HRSG and the coal gasification plant. Low pressure steam will be provided by the HRSG to the coal gasification facilities for process use and some low level waste heat in the gasification facilities will be used for condensate heating for the HRSG. Condensate from the St condenser will be returned to the HRSG/integral deaerator by way of the gasifier, where some condensate preheating occurs.

Probably the most novel integration concept in this project is our intended use of the ASU. This system provides oxygen to the gasifier in the traditional arrangement, while simultaneously using what is traditionally excess or wasted nitrogen to increase power output and improve cycle efficiency and also lower NO_x formation.

II. BACKGROUND

In August of 1989, Clean Power Cogeneration Limited Partnership (CPC), consisting of CRSS Capital and TECO Power Services (TPS), submitted a proposal to the Department of Energy (DOE) for the Clean Coal 3 Demonstration Project. The anticipated configuration was a 120 MW fixed-bed, air-blown, integrated coal gasification power plant including hot gas cleanup. The combustion turbine was expected to be a General Electric frame 6 and the fixed-bed gasifier was intended to be supplied by Lurgi Corporation. This project was originally intended to be installed at the City of Tallahassee's Arvah B. Hopkins plant. This was an existing gas fired facility which, at that time, was intending to install a DOE repowering project, replacement of an existing oil and gas fired boiler with a large state-of-the-art fluidized bed boiler.

DOE notified CPC in December 1989 that they had been selected for their award. The following year a cooperative agreement was finalized between CPC and United States Department of Energy on March 17, 1991.

During 1992, contracting differences of approach resulted between the City of Tallahassee and CRSS Capital and TEC Power Services (TPS). This resulted in TPS becoming the sole participant.

In 1992, Tampa Electric Company reviewed the IGCC project and determined that it would fit well with their own generation expansion plan. As a result, it was decided that Tampa Electric Company would buy out the interests of TECO Power Services and CPC and make this project an integral part of Tampa Electric's generation expansion plan. Prior discussions with the involved regulatory agencies revealed that it would be possible to structure an arrangement whereby all concerns could be addressed simultaneously. The arrangement that was ultimately configured required the installation of a back-up

cleanup system to insure that the hot gas cleanup system would not jeopardize the availability of the unit's dispatch for Tampa Electric Company's needs. In addition, certain other environmental and efficiency concerns needed to be addressed. These concerns revolved around the applicability of an arrangement whereby the system would be reconfigured to an oxygen-blown entrained-flow gasifier along with a General Electric F type combustion turbine, a 120 MW hot gas cleanup system and a 260 MW coal gas cleanup system.

This arrangement was the optimum for Tampa Electric Company. It addressed all the concerns of the utility industry. It also had significant benefits to the Department of Energy. It resulted in a system with a larger size, increased efficiency, and lower capital cost per MW than was originally proposed for the City of Tallahassee site.

In order to satisfy the needs of Tampa Electric Company and the Department of Energy simultaneously, the cooperative agreement was novated and Tampa Electric Company assumed all of the requirements of the original cooperative agreement and would maintain the original DOE funding. To preserve the DOE commercialization obligation, a contract was structured whereby TECO Power Services would maintain project management responsibility to enable them to be able to market the IGCC project for future units. This contract was developed and subsequently approved by the DOE and associated regulatory agencies.

All this resulted in Tampa Electric Company signing a novated cooperative agreement with the Department of Energy on March 5, 1992. The larger size and improved performance made this a win-win situation for all parties involved.

During 1992, the primary effort for Tampa Electric Company was to conduct the preliminary engineering. This effort would define the scope, schedule, and budget for the newly revised project to ascertain that it was indeed satisfactory to go into the Budget Period II construction phase. This preliminary engineering was to be done by Texaco. Texaco would define project costs, scope of the effort for a detailed A/E, and the potential procurement of items with long lead times which would have to be purchased early in the project in order to meet the commercial operation date of July 1996 for the entire IGCC project.

It is important to note that the novated cooperative agreement contains all of the requirements of the original cooperative agreement but resulted in a project of larger size, more applicability to the utility industry and a better heat rate and a lower capital cost per MW.

III. ENVIRONMENTAL/PERMITTING

All of the documents produced to support the environmental licensing efforts associated with the Polk Power Station project were developed under the direct supervision of Tampa Electric Company. A tabular list of these documents is included as Attachment A. Environmental Consulting and Technology, Inc., Tampa Electric Company's environmental licensing consultant on the project, played a major role in the development of each of these documents. Significant support in the development of the licensing documents was received from United Engineers and Constructors, Texaco, General Electric, General Electric Environmental Services, Inc. and many departments within Tampa Electric Company and TECO Power Services.

A. Environmental Information Volume (EIV)

The Volume of Environmental Information (EIV) is the document required by the DOE to initiate the federal Environmental Impact Statement (EIS) process. An EIS is required for any project that involves a major federal action. In the case of the Polk Power Station project there are two major federal actions:

1) the issuance of a National Pollutant Discharge Elimination System (NPDES) permit by the U.S Environmental Protection Agency (EPA), and; 2) the partial funding of the project by DOE.

The EIV is a detailed document that describes the proposed project, the need for the project, the project site and how it was selected, the risks and benefits of the project and project alternatives, such as alternative sites and equipment technologies. The EIV contains an environmental analysis of the existing conditions at the project site. This analysis covers such areas as atmospheric, surface water hydrologic, geologic, groundwater hydrologic, ecological, land use and zoning, socioeconomic and aesthetic conditions. Also included in the EIV is a description of the consequences of project construction and operation and the methods to be used to insure the compliance of the project with all applicable regulatory requirements.

The draft EIV was first submitted to DOE in March 1992. DOE was assisted in their review of the EIV by the U.S. Army Corps of Engineers (COE) and COE's environmental consultant, CH_2M Hill. Tampa Electric Company received comments on this draft and these comments were then incorporated into the document. The EIV was then resubmitted to DOE in June 1992. Sufficiency comments on the EIV were received from DOE in July 1992. Sufficiency comments addressed areas such as site reclamation, site meteorology, and surface and groundwater modeling. Tampa

Electric Company responded to DOE's August 1992 comments in a document entitled "Responses to Sufficiency Review Comments". Additional sufficiency comments were received from DOE in November 1992. Tampa Electric Company responded to these comments in a revised "Responses to Sufficiency Review Comments" document that was provided to DOE in November 1992. On March 5, 1993, DOE advised Tampa Electric Company that the EIV met all of the requirements of DOE's Clean Coal Technology III solicitation, Appendix J--Information Requirements for the National Environmental Policy Act (NEPA), and is therefore, a final document.

B. Site Certification Application (SCA)

The Site Certification Application (SCA) is the comprehensive environmental licensing application required by the State of Florida under the Florida Electrical Power Plant Siting Act (FEPPSA). This document also meets the form and content requirements necessary for environmental licensing of the project under the federal EIS process. The detail in this document is substantial and the document itself serves as the overriding environmental licensing application for both state and federal agencies.

The SCA provides detailed environmental information and applications that address the following major areas:

- Need for Power and the Proposed Facilities
- Site and Vicinity Characterization
- The Plant and Directly Associated Facilities
- Effects of Site Preparation and Plant and Associated Facilities Construction
- Effects of Plant Operation
- Economic and Social Effects of Plant Construction and Operation
- Site and Plant Design Alternatives
- Site Reclamation Requirements
- Agency Coordination, and
- Appendices (individual permit application forms and support documents)

The SCA was submitted to the Florida Department of Environmental Regulation (DER) on July 30, 1992. On August 14, 1992, DER officially determined that the SCA was complete. This completeness determination means that the document meets all the form and content requirements of the FEPPSA. The document was then distributed to all the remaining state and federal agencies with permit review authority over the project.

The first round of sufficiency comments on the SCA were received from DER on October 12, 1992. This first sufficiency package consisted of approximately 600 comments from regulatory authorities. These comments were addressed in a

two volume sufficiency response package that was submitted to all applicable permitting agencies on December 4, 1992. Sufficiency comments addressed items such as air quality modeling, surface and groundwater modeling, site reclamation, and water treatment facilities.

The Table of Contents for the SCA is summarized in this document as Attachment B.

C. Environmental Impact Statement (EIS)

As stated above, an Environmental Impact Statement (EIS) is required for the Polk Power Station project as a result of the need for the issuance of an NPDES permit from EPA and the partial funding of the project by DOE. The Notice of Intent to prepare an EIS to assess the environmental effects of construction and operation of the proposed project was filed on July 28, 1992.

DOE then held a Scoping Meeting for the project on August 12, 1992 in Ft. Meade, Florida. This meeting was held to give the affected public the opportunity to comment on the proposed project. It also provided a forum for DOE and EPA to discuss NEPA matters, such as development of the interagency Memorandum of Understanding (MOU). This MOU serves as the guidance document describing the specific role each federal agency and the applicant will play during the EIS process.

The EIS is the federal permitting report for the project. In the EIS, there is a detailed discussion of the project and project alternatives, such as site and equipment technology options. The document also provides a detailed analysis of the existing environment at the site, addressing such areas as hydrology, geology, air quality, land use and zoning, socioeconomic and aesthetics. The document also provides a detailed analysis of the environmental impacts of project construction and operation. The EIS addresses the full site buildout of 1150 MW, which includes the nominal 260 MW IGCC unit.

On December 28, 1992, a meeting between DOE, EPA and Tampa Electric Company was held in EPA's offices in Atlanta to discuss the possibility of transferring the lead agency for the EIS process from DOE to EPA. The reason for exploring this option was the fact that DOE's interests included mainly those facilities associated with the nominal 260 MW IGCC facility while EPA was concerned with the impacts of the entire nominal 1150 MW site buildout. Since the scope of EPA's interests was considerably larger, it was agreed by all parties involved that it was more appropriate for EPA to assume lead agency status. It was determined that all parties involved would pursue this option.

D. Land Use

The Power Plant Site Selection & Siting Task Force was formed to identify a suitable site for the needed power plant facilities. Tampa Electric Company conducted the Power Plant Site Selection Assessment program between September 1989 and November 1990. The overall objective of this site selection program was to select a site or sites which were considered the most suitable for developing the needed power plant based on a combination of environmental, socioeconomic, land use, and engineering/economic factors. A six-county study area was selected for choosing a site in west-central Florida.

An integral aspect of this program was the formation by Tampa Electric Company of a public Siting Task Force which actively participated in the site selection efforts. The Siting Task Force was comprised of 17 private citizens from environmental groups, businesses, and universities in the Tampa Electric Company service area and throughout Florida. Tampa Electric Company's object for involving the Siting Task Force in the site selection process was to ensure that local and statewide public issues and environmental concerns relative to new power plant development were adequately and accurately considered in selecting a suitable site for the new power plant.

Attachment C provides a listing of the Siting Task Force members and a brief description of their backgrounds.

Based on the results of detailed environmental and engineering/economic evaluations, the Siting Task Force recommended three adjacent areas located in southwest Polk County as the most suitable or preferred sites for locating the planned power plant facilities. The three preferred sites had similar environmental characteristics in that each had been disturbed by previous ongoing phosphate mining activities. The Task Force recommended that Tampa Electric Company pursue acquisition and environmental licensing efforts for any one of the three preferred sites. Tampa Electric Company concurred with the recommendations of the Siting Task Force and selected one of the preferred sites in southwest Polk County as the location for the power plant.

The Polk Power Station is located in the southwestern portion of Polk County, Florida. The land use and zoning designations for the Polk Power Station site are Phosphate Mining (PM) and Rural Conservation (RC), respectively. The Project is a permitted use in both of these districts, subject to obtaining a Conditional Use Permit (CUP).

Tampa Electric Company submitted a CUP application to Polk County on January 24, 1992. Supplemental information in support of the application was filed with the county on February 12, 1992. Polk County held an Impact Review Meeting

on the CUP application on March 16, 1992. The Polk County Zoning Advisory Board recommended approval of the CUP for the project on May 13, 1992. On June 2, 1992 the Polk County Board of County Commissioners approved the CUP for the Polk Power Station project.

Under the FEPPSA, a Hearing Officer from the Florida Division of Administrative Hearings must hold a hearing to determine the project's consistency and compliance with all applicable land use plans and zoning ordinances. This land use hearing was held in Bartow, Florida on October 29, 1992. In the hearing, Tampa Electric Company presented its case demonstrating that the project was consistent and in compliance with all applicable land use plans and zoning ordinances. Polk County also stipulated to this determination. No public opposition was voiced in this hearing.

On November 23, 1992, the Hearing Officer issued a determination to the Governor and Cabinet of the State of Florida stating that the project was consistent and in compliance with all applicable land use plans and zoning ordinances.

E. Conceptual Reclamation Plan (CRP)

Since the Polk Power Station site has been impacted by phosphate mining activities, the project must be developed in accordance with the requirements of Section 211, Florida Statutes, Chapter 16C-16, Florida Administrative Code and the Polk County Phosphate Mining Ordinance 88-19. The state reclamation requirements are administered by the Florida Department of Natural Resources (DNR).

To address these mining-related regulatory requirements, a Conceptual Reclamation Plan (CRP) must be developed and submitted to DNR and Polk County. The CRP details the reclamation efforts that will be taken to develop the project on a site that has been mined for phosphate, in a manner that is consistent with all applicable mining regulations. This document addresses such issues as acre for acre, type for type reclamation of wetlands, restoration of pre-mining drainage basins, and restoration of pre-mining storm water runoff characteristics.

To comply with the applicable mining reclamation requirements, Tampa Electric Company developed a CRP for the site and submitted it to the DNR on October 13, 1992. Completeness comments on this document, dated November 13, 1992, were received from the DNR. Issues raised by the DNR addressed topics such as hydrology modeling, wetlands mitigation and site development. Tampa Electric Company responded to these comments on December 18, 1992.

Attachment D contains a summary of the Table of Contents for the CRP.

IV. SITE STATUS

A. Land Acquisition

The Tampa Electric Company Polk Power Station site is located in southwest Polk County. The site consists of approximately 4348 acres and has been impacted by phosphate mining operation. Previous property owners were Agrico Chemical Company and American Cyanamid Company. Tampa Electric has negotiated agreements with these land owners for the acquisition of this property prior to the start of construction activities. As can been seen from the site photo (Attachment E) considerable site work will be required.

B. Site Development

Site development efforts have focused around the development of the construction bid package. It included the technical specifications associated with the cooling reservoir construction, earthwork, revegetation, reclamation, roads, railroads, and fencing requirements for the Polk Power Station Site. Revegetation and reclamation design was provided by Environmental Consulting and Technology, Incorporated (ECT). United Engineers and Constructors, Incorporated, (UE&C) transformed this revegetation design into the site development construction package. UE&C began this technical specification development in November 1992 and the targeted completion date is April 1994.

Additional activities associated with site development include the subsurface investigation soil boring specifications which were completed in May 1992 and bid packages were issued in July 1992. The contract was awarded to Williams & Associates in August 1992, the work was completed in October and a report was issued in November 1992.

C. By Products

It is currently anticipated that cold gas clean-up facilities at the Polk Power Station will generate approximately 90 tons per day of elemental sulfur. This material is expected to be sold into the phosphate industry in the central Florida area. Negotiations were initiated in 1992 with Freeport Sulphur Company as the major supplier of sulfur to Agrico Chemical Company in central Florida.

The hot gas clean-up facilities at the Polk Power Station will generate approximately 125 tons per day of sulfuric acid. Negotiations are currently under way with Sulfuric Acid Trading Company to purchase this byproduct sulfuric acid.

Sulfuric Acid Trading Company markets surplus sulfuric acid produced from phosphate chemical plants in the central Florida area.

Slag production of approximately 210 tons per day will result at the Polk Power Station. This material is expected to be sold and used in the manufacturing of sandblast material, roofing shingles, and road bed aggregate. Tampa Electric currently sells its entire production of similar slag from coal-fired wet bottom boilers and cyclone boilers to Reed Mineral Division of Harsco Corporation. During 1992, negotiations were undertaken with Reed Mineral for the purchase of the Polk Power Station slag production.

All these contracts are expected to be concluded in early 1993.

D. Substation & Distribution

During 1992, work progressed on the development of cost estimates and preliminary engineering for the Polk Power Station and for the transmission corridors necessary to connect the site to the Tampa Electric system. Transmission corridors consist of approximately one mile of-on site 230KV circuits to connect to the existing Hardee-Pebbledale transmission circuit and an approximate 5 mile off-site transmission corridor of 230KV line to connect to the Tampa Electric Mines-Pebbledale transmission circuit.

E. Public Communication

In order to maintain community awareness of the Polk Power Station Project, Tampa Electric undertook a series of public meetings. Presentations consisting of the following items were made to various local communities: information on how new generating capacity needs are determined, how the site selection was done on the Polk Power Station site by an independent task force (comprised of environmental, community, and academic leaders), information regarding project technology/ environmental features, and the site social/ economic impacts on local community and the county. Tampa Electric's involvement in environmental preservation and enhancement and Tampa Electric involvement in the communities were also presented in a series of public sessions. These sessions took place on April 30, 1992 for the residents in the immediate vicinity of the plant site and the community of Bradley Junction. On May 7, 1992, a presentation was made at Forte Meade, Florida and on May 12, 1992 in Mulberry, Florida and May 19, 1992 in Bartow, Florida. Following the presentations a forum for questions was provided. Project engineering, project management, and project environmental personnel were on hand to answer questions from the public about the Polk Power Station project.

V. PROJECT COSTING

A. July 1992 Preliminary Estimate

The preliminary estimate was based on the then most current information available and was consistent with filings to the Florida Public Service Commission. This preliminary estimate was submitted to the D.O.E. on July 31, 1992 as part of the Project Management Plan. Tampa Electric Company's official project authorization document was signed on July 20, 1992 by the President of Tampa Electric Company. The project estimate was presented in the form of a "Total Project Summary" of various cost categories (attachment F).

The project categories were segregated into: IGCC Facilities, Site Development, Tampa Electric/Teco Power Service Management and Previous Costs (Thru 6/92). The estimate included in the "IGCC Facilities" category which represented non owners costs as prepared by Texaco during preliminary engineering. The "IGCC" facilities estimate was a "factored" estimate by Texaco and included no quotes, bids, data sheets or specific information.

Site Development costs were prepared by United Engineers and included all expected site development costs necessary to obtain operating permits.

Within the Tampa Electric/Teco Power Service Management category were the following activities: IGCC PROJECT Management & General summarizing all internal Tampa Electric and TECO Power Services Project Management cost. The Project Management costs are associated with engineering, construction, design review and approvals, plant and project accounting, quality assurance, legal and contract administration services and A&G, and overhead costs. These cost estimates were on a location and resource detail with review and approval by the following respective Tampa Electric Company departments; Environmental/Permitting: estimate related to environmental specialists and legal support necessary to obtain construction and operating permits for the IGCC facility in Polk County; Construction Substation: to provide temporary power for construction and will be handled internal by Tampa Electric Company; Plant Monitoring & Communications and Plant Control & Information Systems: related to equipment and labor for voice and data links to existing Tampa Electric and outside network services; Mobilization: costs are associated with plant service equipment and training of plant personnel; Land Purchase: is the price of land to be used for the Polk Power Station; and previous costs to the project (thru June 1992): for engineering, permitting and site selection related to the current IGCC configuration and for the earlier plant design.

B. December 1992 Estimate

In 1992, Texaco updated the cost estimate to represent a total installed capital cost on an "as built" basis by plant section and excluded owner's land acquisition, site preparation & development, license fees, permitting, mobilization and capitalized inventory costs. This estimate included the negotiated cost the General Electric Engineered Equipment Package for the power island (Power Generation and Heat Recovery sections). Bid data for the turnkey oxygen plant (air separation unit), syngas coolers, and detailed engineering were included to the extent possible in this cost estimate. Major equipment items were specified, and most of their costs were based on either budgetary quotes or competitive bid information.

C. Total Expense through 1992

Table #1 shows the project/expenses through December 1992. This table indicates Tampa Electric, thru December 1992 spent $14,968,600 and DOE has provided $3,741,372 of the $15,550,000 Budget Period 1 Funding.

VI. SCHEDULE

A. Original Schedule and Actual Results

The Polk IGCC Project Schedule has continued to evolve with the project and although not all scheduled milestones were achieved in 1992, the project is still generally on schedule for commercial operation of the IGCC on June 30, 1996.

Milestones scheduled for completion in 1992 included:

- FPSC Issue Determination of Need - 3/1/92
  The Florida Public Service Commission issued the determination of need for the Polk Project as expected on 3/2/92. This supported continuing the project with Tampa Electric as defined in the Cooperative Agreement.

- Submit Environmental Impact Volume (EIV) - 5/1/92
  The Environmental Impact Volume was submitted in June 1992.

- DOE Scoping Meeting - 8/15/92
  The DOE Scoping Meeting was held as scheduled in Ft. Meade, Fl on August 12, 1993.

- Award Hot Gas Cleanup Engineering - 8/15/93
  The scope of this milestone has been modified to include separate contracts for process engineering and equipment supply. Tampa Electric has released GEESI to perform

TABLE 1

POLK POWER STATION
Variances thru 12/92

Description	1992 Projected Authorization	1992 Actuals	1992 Variance
Tampa Electric	9,044,092	9,646,859	602,767
Permitting	909,142	1,339,260	430,118
Preliminary Engineering	3,217,000	3,293,853	76,853
IGCC Facility	24,668,000	4,443,000	20,238,000
DOE Reimbursement	(6,140,000)	(3,741,372)	2,398,628
TOTAL POLK PROJECT	31,698,234	14,968,000	(16,729,634)

preliminary engineering and is negotiating an engineering contract with GEESI to provide the process design for the Hot Gas Cleanup demonstration project. A separate contract will be awarded to fabricate and supply the equipment.

- Award Gasification Equipment Supply - 7/15/92
  Tampa Electric has received quotes from gasification vessel vendors and is actively negotiating with two vendors to supply the major gasification coolers. Based on the design information received from the successful vendors and their schedule of fabrication, the equipment will be delivered to the site May 1995 to support the construction and erection schedule if notice to proceed is given by May 1993.

- Award Air Separation Equipment Supply - 7/15/92
  The scope of this milestone includes engineering, design, construction and start-up via a turnkey contract. The successful bidder's detailed engineering, design and construction schedule demonstrates their ability to complete the project as scheduled by June 30, 1996, based on contract award by spring 1993.

- Award Cold Gas Cleanup Equipment Supply - 7/15/92
  The scope of this milestone has been included in the A/E contract to be awarded in the spring of 1993. Based on the preliminary engineering supplied by Texaco as part of the Preliminary Engineering Package (PEP), the A/E will have the opportunity to procure this equipment through the competitive bidding process to support the construction of the IGCC.

- Award Combined Cycle Equipment Supply - 8/15/92
  This contract was awarded to GE in December, 1992. CT delivery and combined cycle deliveries have been scheduled by contract to support the erection and start-up efforts required to meet schedule. In addition, Tampa Electric is negotiating a gas turbine erection contract with GE to erect this gas turbine. The expected award of the CT erection contract is spring, 1993.

- Prepare Preliminary Cost Estimate - 7/1/92
  The preliminary cost estimate was completed by Texaco to support the Project Scope Approval document required by Tampa Electric in July 1992 to continue this project.

- Prepare Refined Engineering Cost Estimate 11/1/93
  The Refined Cost Estimate was submitted on December 10, 1992 by Texaco.

- Issue Tampa Electric Project Scope Approval (PSA) - 8/15/92
  The Tampa Electric Project Scope Approval document was

completed in July as scheduled to support Tampa Electric's internal project review requirements. With the PSA a revised project schedule was issued and also included as the project schedule in the DOE Project Management Plan (rev. 0 dated 7/15/92).

- Submit FDER Site Certification Application (SCA) - 8/15/92
  The SCA was submitted to the Florida Department of Environmental Regulations (FDER) on July 30, 1992 as scheduled. This began the Florida permitting process and will support the certification hearing in the summer of 1993 and the start of construction scheduled for January, 1994.

- Land Use Hearing - 10/15/92
  The Land Use Hearing was held as scheduled on October 29, 1992.

B. Current Schedule

Based on the preliminary engineering and cost estimates and discussions with potential turnkey contractors, it was decided that a more viable approach to the development of this project would be through contracts for A/E services and Construction Management services rather than a complete turnkey contract. Tampa Electric developed a revised project schedule based on this concept and it was issued with the A/E RFP (Rev. 2 dated 11/9/92) (Attachment G). This schedule continues to support the commercial operation of the IGCC on July 1, 1996. It also continues to schedule permitting activities to support site construction activities beginning in January, 1994.

Delays in the schedule for procurement of the A/E services and CM services have materialized but do not currently threaten to delay the start of construction or the commercial operation dates. The state permitting process is on schedule for a site certification hearing in the summer of 1993, and approval to support start of construction in January, 1994.

VII. PROJECT CONTROLS

A. Project Management Department

Tampa Electric Company's Project Management Department is responsible for the successful management, construction, and start-up of the Polk Power Station including all activities and decisions which impact the project scope, schedule, budget plus D.O.E. daily technical interaction, predominantly at the Morgantown Energy Technical Center (METC). Overall responsibilities include the engineering, permitting, site development, transmission, fuels selection, land and right-of-way acquisition and project controls.

The department is staffed with a Project Director/Vice President, TPS Project Manager responsible for the DOE related activities, and a Tampa Electric Project Manager responsible for the remainder of the project, Project Controls Manager, a Cost Engineer and Administrative support. This group interacts on a daily basis with almost all of the Tampa Electric Departments, regulatory agencies, vendors and DOE to insure the overall project execution plan is implemented.

TECO Power Services' role is to manage the power block activities associated with the Polk Unit #1. TPS is functionally responsible for the engineering, construction and start-up of the project through a matrix management team consisting of Tampa Electric production personnel along with TPS engineering, cost and schedule support. TPS also has overall responsibility for marketing the commercial version of the demonstrated technology as defined in commercialization requirement of the Cooperative Agreement. This organization is shown in (Attachment H).

B. Reports

Project Management is responsible to insure accurate and timely issuance of all DOE reports. Project Management works directly with the Finance Department of Tampa Electric on all financial report requirements. The Vice President of Finance approves all financial reports submitted to DOE. Reports related to the technical side of the project are completed within Project Management and submitted approved by the Project Director.

Monthly cost reports have been developed internal to Tampa Electric according to the Work Breakdown Structure. This information is broken down by location, resource and by month comparing actual costs versus the budget estimate. Project Management submits this information to Tampa Electric Company's Business Planning Department for a total company construction review.

C. Project Management Plan

1. Policy Statement

Tampa Electric Company adopted the Project Management Plan (PMP) and further designated it as the PMP the TPS Project Manager will use and follow in the management of the Integrated Gasification Combined Cycle (IGCC) Project, implemented under Cooperative Agreement No. DE-FC21-91MC27363 as novated by Amendment M001 dated 3/5/92.

2. Overview

The primary objective of the program covered by this Project Management Plan (PMP) is to conduct a cost-

shared project that demonstrates an Integrated Gasification Combined Cycle (IGCC) technology. This demonstration is expected to show that an oxygen-blown

IGCC can achieve significant reductions of SO_2 and NO_x emissions when compared to existing and future coal-burning power plants and compete with natural gas fired plants.

Tampa Electric Company has the sole authority and responsibility for all aspects and phases of the project including those outlined in the Cooperative Agreement. The TPS Project Manager, Donald Pless, will exercise and be responsible for the DOE portion (Power Block) of the project implementation with overall, executive supervision provided by Mr. Charles Black, Vice President - Project Management and project Director - Polk Unit #1. Mr. Black reports directly to the President of Tampa Electric Company, Mr. Girard Anderson.

Tampa Electric Company has obtained and administers the resources necessary to implement the three phases of the project through a series of contracts with providers of various services and equipment during the project phases. At this time, the project is planned to be administered as follows:

a. Preliminary Engineering and Permitting Phase

The preliminary engineering/design and permitting phase provided a "baseline" for the overall IGCC project, including the technical scope, the project cost estimate and the project detailed schedule.

b. Construction Phase

At the conclusion of the Preliminary Design/Permitting Phase, sufficient design information was developed, for Tampa Electric to issue a request for proposals from bidders for the detailed engineering with bids received 12/21/92. Construction management bid packages are expected to follow about 4/1/93.

c. Operation and Demonstration Test Phase

Plant operation and maintenance, and demonstration are the responsibility of Tampa Electric during Phase III which is expected to start about January 1, 1996. To assure efficient and smooth operations, both during plant start-up and demonstration, Tampa Electric operating personnel will participate fully during the design, construction and start-up phases of the project.

3.

a.

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d. Chart of Account/Work Breakdown Structure

The Work Breakdown Structure was developed to identify costs as they are expended and tasks as they are committed. The WBS divides the total work of the project into the major phase areas and allows TEC to manage cost and monitor progress achieved in relation to these costs. The major emphasis is placed on subcontractor costs.

The Budget Period I Spending Curve was developed as a baseline for the Polk Power Station Project and dated July 15, 1992. The schedule was updated in November of 1992 with a more definitive schedule due to DOE the 2nd quarter of 1993. The A/E will use the latest information available and develop a Project Summary schedule and a detailed engineering schedule covering construction, site development, permitting and interface between project participants.

The Milestone Plan and Log was prepared for Phase I, design and permitting through December 31, 1993. This information was submitted to DOE as part of the Project Management Plan in July 1992. This information is updated on a quarterly basis and submitted on DOE forms 459B and 459E.

VIII. PRELIMINARY ENGINEERING

A. Preliminary Engineering Contract

For this project, the most significant activity that occurred during 1992, was the Texaco Preliminary Engineering effort. Although the arrangements for the preliminary engineering turned out considerably different than intended, the results accomplished the desired effect within a desired time frame and for fewer dollars expended than would have been with a more conventional approach. Attachment I depicts an artist's rendering of our proposed site arrangement.

Tampa Electric Company realized that the preliminary engineering concept for this project was of utmost importance for a successful completion of the project. To that end, selection of an engineer to do the conceptual arrangement/design was extremely important. Conventionally, Tampa Electric would have prepared a bid specification, bid, and evaluated the services all taking about six (6) months.

In order to avoid this delay, discussions began with Texaco to provide key engineering information to support the overall project design and the environmental permitting process. In addition, Texaco was approached to provide specific design concepts to assure that their licensed technology would be appropriately used in the overall project. This was a vital

element of Texaco's overall marketing strategy to provide IGCC projects using Texaco gasification to the industry in general.

Texaco, consented to perform this preliminary engineering to support the overall project. The key element of Tampa Electric's decision to perform conceptual engineering using Texaco was based on their proposed costing for this effort. The pricing that Texaco offered for this effort was well below that of the conventional A/E costing methodologies and below a cost that could have been achieved through the normal bidding process.

B. Preliminary Engineering Package

The Preliminary Engineering Package (PEP) prepared by Texaco under the Preliminary Engineering contract was essentially completed on December 7, 1992 as scheduled. The results of the PEP generally confirm the results of Fluor-Daniel Technology Study, indicating that the efficiency and capacity of our proposed arrangement are practical and economically feasible.

Texaco and Tampa Electric agreed to defer delivery of some minor portions of the package which were not essential for bidding of the detailed engineering. Those items are expected to be completed during the first quarter of 1993.

The PEP consists of three volumes of drawings, descriptions and other data and four volumes of specifications. Drawings prepared include essentially all of the Process Flow Diagrams (PFD), and Process & Instrumentation Diagrams (P&ID) for the complete IGCC unit. The package does not include significant drawings for the Hot Gas Clean Up (HGCU) system which is still under development by GEESI.

The PEP defines the heat and material balance for the IGCC system and describes the essential arrangements and design features of the plant. The Design Basis Document forms the basis for development of the PEP and the significant results contained therein. This design basis document was developed using the same information that was presented in the Site Certification Application IGCC Process Descriptions, Chapter

3. The package includes the results of several optimization studies which were performed by Texaco. Additional optimizations are expected to be performed, in cooperation with Texaco, by the detailed engineer during the first six months of their effort.

The PEP has been submitted to the engineering firms bidding on the detailed engineering as part of the bid documents. Initial reports from all the bidders have indicated the PEP is very complete and well done. All bidders have indicated that

only minor changes will likely be necessary to the PEP documents to incorporate final optimizations and specific design enhancements and details.

A technical review, by DOE, of the PEP and other project documents is scheduled to occur early in the first quarter of 1993.

C. License Agreements

1. Texaco License Agreement

On October 21, 1992, a License Agreement for Use of "Texaco Gasification Power Systems" was signed by Tampa Electric Company, TECO Power Services Corporation and Texaco Development Corporation. The primary purpose of this License Agreement was for Texaco to grant to Tampa Electric Company a license to utilize the Texaco gasification technology. The Texaco Gasification Power System (TGPS) includes a broad range of technologies and patents. TGPS goes beyond the gasifier itself, and includes integration of gasification with the combustion turbine, steam turbine, and heat recovery steam generator for the purpose of generating electric power. A description of the limits of TGPS with respect to the entire IGCC Project is shown in Attachment J.

Further, the license provides for use of Texaco's technical information regarding gasification and for technical services that Texaco will provide during start up and testing of the IGCC facility.

The parties to this agreement also provided for a revenue sharing plan for coal-based TGPS sold in and outside the U.S. Due to the repayment obligations under the Cooperative Agreement, TECO Power Services (TPS) is an important link in the revenue sharing and royalty payments. TPS, through this license agreement, has obtained rights to any IGCC technology that Tampa Electric obtains or develops. This will provide an incentive for TPS to commercialize that technology and enhancements to it.

As part of licensing a technology, Tampa Electric also requires that the technology provide certain performance. In this specific case, the Texaco gasifier and TGPS will be required to operate with the balance of the IGCC facility. There are specific parameters for which Tampa Electric must be assured will be met, so that the design of the rest of the facility can be integrated with the TGPS design.

This basically sets a carbon/oxygen ratio and relates the consumption of these feeds to the amount of syngas (H_2 + CO) produced in the gasifier. These guarantee parameters then dictate to design of the coal preparation and ASU area of the facility.

Since loading the CT is critical to the overall unit performance, Texaco also provides a guarantee of the amount of syngas (H_2 +CO) being produced each day. To satisfy the other part of the combined cycle section of the IGCC plant, a parameter for theoretical steam production is also guaranteed. This is a function primarily of the syngas coolers and their ability to make HP and MP steam for the steam turbine. This value of heat transfer and energy utilization will be based on the performance of the actual syngas coolers purchased.

The License Agreement calls for performance tests to be done after the plant has gone through precommissioning. The tests will determine whether or not the performance guarantees are met. The agreement requires Texaco to provide certain changes, corrections and/or liquidated damages if guarantees are not met.

Additionally, the agreement sets out a schedule for Tampa Electric to pay the licensing fees to Texaco. These payments are spread over several years, with the last payment due upon successful completion of the performance guarantees.

2. TPA License Agreement

Under the Preliminary Engineering Agreement, Texaco was responsible for conceptual design of the Cold Gas Clean Up (CGCU) System. Texaco requested bids from two companies for the subcontract for that design. Following a bidding process, the work was awarded to TPA, Inc. of Dallas, Texas. Texaco entered into an agreement with TPA to perform the engineering and design work.

Texaco notified Tampa Electric that it would be necessary for Tampa Electric to sign license and secrecy agreements with TPA regarding the use of some specific technologies that TPA provided. On December 9, 1992, Tampa Electric and TPA signed three (3) license agreements (incorporating confidentiality provisions) for the following technologies:

a. Ammonia Gas Processing Claus

b. Oxygen System Technology

c. Tail Gas Treating Technology

These three (3) license agreements allow Tampa Electric access to the technology and designs and provide for Tampa Electric to construct and operate the CGCU System using TPA's technology.

The first technology is specific to the type of syngas produced in the TGPS. The ammonia in the syngas is stripped out and then fed separately in the Claus unit from the concentrated H_2S steam. Capture of the ammonia, followed by conversion to nitrogen, helps to minimize NO_x emissions in the CT.

TPA also provided specific performance guarantees for oxygen consumption, sulfur recovery, sulfur production, sulfur purity, and outlet sulfur compound characteristics. The performance testing section lays out the conditions under which these and other guarantees must be met.

TPA will require that Tampa Electric submit certain design and construction drawings/plans to them for approval. The license fee payment schedule has three (3) milestones. The equal payments are due upon signing (completed), delivery of all design data, and satisfaction of performance guarantees.

D. Cycle Definition

1. Capacity and Performance

During 1992, many performance enhancements and cycle optimizations were performed to improve the base operating plant. Studies were conducted to address the following areas:

1. Air Separation Unit (ASU)
2. High Temperature Gas Cooling (HTGC)
3. Clean Fuel Gas Heater
4. Gasification Train
5. Steam Turbine Condensate Heating
6. Low Temperature Gas Cooling (LTGC)
7. Acid Gas Removal
8. Effluent Water Optimization

The single most significant change as a result of the optimization studies was in the high temperature gas cooling area. In this study, gas-to-gas heat exchangers were selected over high pressure economizers. The net effect of the gas-to-gas exchangers is that more energy is sent to the Combustion Turbine as heat in the fuel (higher fuel delivery temperature), therefore, requiring less fuel flow with a higher fuel delivery temperature the same total energy can be delivered to the turbine with less flow. This lower fuel flow resulted in

significant savings in capital cost and a significant improvement in heat rate. The tradeoff in this study was a loss in steam production. With more energy being transferred directly to the fuel feed to the more efficient combustion turbine, less energy is available for steam production for the steam turbine.

In the process of Preliminary Engineering, several other changes have occurred in the plant configuration and in the plant performance estimates not falling into the category of the "official" optimization studies. These include the addition of an medium pressure steam system in the gasification area (for transfer line and soot blower cooling), several changes in the estimated steam consumption in the acid gas removal and sulfur recovery areas, and changes to the performance estimates of the air separation unit.

Overall, the original targets for plant performance have not been changed. However, with the plant configuration much better defined, we now are more able to target specific areas to investigate improvements during the detailed engineering phase of the project. As we move into the next phase of engineering, and as we continue to better define the plant configuration, we will investigate other potential performance improvements.

2. Sulfur - Sulfuric Acid

The present design for sulfur removal and recovery is to provide 100% capacity for CGCU and approximately 50% capacity for HGCU. We expect to normally operate in a 50% CGCU and 50% HGCU mode.

The HGCU System will produce a concentrated SO_2 stream from its regeneration area. This SO_2 will be converted to sulfuric acid in a plant separate from the CGCU System.

It is expected that the H_2S produced from the CGCU system will be converted to elemental sulfur and subsequently sold in the phosphate area.

Tampa Electric also expects to market the sulfuric acid byproduct. We are presently negotiating an agreement with the local sulfuric acid market. This byproduct will be used in the local phosphate industry. Sulfuric acid can be transported by rail or truck as is presently done in great quantities in central Florida.

Preliminary engineering and cost estimates for the sulfuric acid plant are being coordinated by GEESI since the integration with HGCU is critical.

3. General Electric

General Electric's (GE) attention during calendar year 1992 was focused on the following three basic objectives:

a. Execution of a contract with Tampa Electric Company (TEC) to provide the Engineered Equipment Package (EEP).

b. Provision of support to TEC and Texaco in the completion of the Preliminary Engineering Package (PEP) and,

c. Provision of support to TEC in the site permitting activities.

The year closed with completion of all objectives with the exception of item 3, in which responses to inquiries by permitting agencies remain ongoing.

The contract between GE and TEC, in which GE has agreed to provide TEC an Engineered Equipment Package was executed on November 6, 1992. Attachment K is a general arrangement drawing of the 7F combustion turbine and combined cycle layout. The EEP consists of a nominal 192 MW, Model MS7001F combustion turbine-generator, a steam turbine-generator and a three-pressure level, reheat, natural circulation design heat recovery steam generator (HRSG). Delivery of the combustion turbine-generator is scheduled to be completed in April 1994 to support simple cycle commercial operation planned for July 1995. The delivery of the steam turbine-generator and HRSG shall be completed March 1995 to support combined cycle commercial operation planned for July 1996.

In support of the effort to produce the project's Preliminary Engineering Package (PEP), GE (a) produced and/or reviewed plant layout, electrical and mechanical drawings describing the IGCC plant, (b) produced functional specifications for the equipment comprising the Power Block, and (c) assisted TEC and Texaco in the completion of the project's Design Basis Document. The PEP was completed in December 1992.

GE worked with TEC and others to produce the Site Certification Application (SCA) which was submitted for review by various permitting agencies in July 1992. The GE assistance included providing information on equipment noise characteristics, air emissions data and plant water consumption requirements. Review of the SCA by the agencies is continuing. GE is assisting TEC in developing responses to the agencies' inquiries.

4. General Electric Environmental Services, Inc.

The HGCU System is being designed by General Electric Environmental Services, Inc. (GEESI). Tampa Electric and GEESI are presently negotiating a final contract for GEESI to perform preliminary and detailed engineering for the HGCU System. In order to support the project schedule (without having the final contract signed), Tampa Electric released GEESI, on December 31, 1992, to continue its detailed engineering work. That release contains specific requirements for GEESI performance and places a cap on monthly and cumulative authorized expenditures.

GEESI work through year end included the following tasks:

a. Regeneration system configuration and sequencing.

b. Preparation of process flow diagrams and material balances.

c. Preparation of system control concepts.

d. Preparation of piping and instrument diagrams.

e. Development of nahcolite system for halogen removal.

f. Preparation of general arrangement drawings and specifications.

Attachment L and M depict the generalized process flow diagram and general arrangement drawings, respectively.

GE and Tampa Electric engineers have worked together reviewing GEESI documents, to ensure consistency and compatibility with the balance of the project. As work with the syngas coolers has progressed, Texaco and GEESI have discussed process interfaces regarding temperature and particulate loadings. Texaco has provided GEESI data on its expected particulate removal system to account for that. The two companies have exchanged data on high performance cyclones and barrier filters, to ensure that the HGCU system absorber and CT are properly protected from excessive particulate loading. Texaco has also made recommendations for the mechanical/structural connections between the syngas cooling system and the HGCU inlet. Proper integration with the gasification system is necessary to provide for:

a. Thermal expansion differences between syngas cooler and HGCU piping.

b. Combining HGCU inlet particulate collection with the gasification system process waste.

c. Strategy for HGCU when in the 100% CGCU mode.

d. Shutdown for the HGCU when in the 50/50 mode.

Items c and d above have required close contact between GE and GEESI so that the combustion turbine controls can be designed to accommodate the HGCU system as these changes are made.

GEESI continues to do testing and development of its HGCU System at its Corporate Research and Development Pilot plant. Tampa Electric personnel have made visits to the pilot plant during recent tests. Some of that recent testing was done to determine regenerator internal design and to obtain more data on sorbent pellet attribution rates. GEESI is working to assure uniform gas flow in its regenerator. Proper control of gas flow and temperature throughout the bed will provide for uniform regeneration and SO_2 outlet gas flow and concentration. That is critical for proper operation of the sulfuric acid plant that will follow the HGCU system.

One of the primary enhancements that GEESI is working on is to make the regeneration system more automatic. The present pilot plant operates mostly in the manual mode. Automatic sequencing of the regeneration process will be necessary for an operating power plant. As GEESI learns more about its lockhopper sequencing and regenerator gas flow and temperature relationships, it is improving the process control concept. Tampa Electric continues to work closely with GEESI to assure that the HGCU System will operate in an integrated mode with the IGCC plant.

5. Annual Technical Review

As part of DOE's annual technical review process, DOE conducted an overall assessment of the technical, commercial, and cost aspects of the projects. Although this work was actually performed during the week of January 4, 1993, it is included here because their review was performed on the work product developed during 1992.

Except for the potential developmental aspects related to HGCU, the DOE review team indicated they were comfortable with the overall project concept and status at that point in time.

IX. DETAILED ENGINEERING

A. Architect/Engineer Bids

Tampa Electric conducted an extensive review of Architect/Engineering firms capabilities to perform the detailed design of the IGCC plant and concluded this review

with the selection of four companies or groups of companies to bid on the effort. The four selected to bid included Bechtel, Ebasco in a joint effort with Foster Wheeler, Fluor-Daniel, and United Engineers & Constructors in a joint effort with Uhde (a German engineering firm with experience in design and construction of Texaco gasifiers.) The companies were selected based on their past experience with gasification and related technology design. Proposals were received from all bidders except for the Ebasco/Foster Wheeler team, which withdrew part way through the bidding cycle.

Each bidder was requested to supply three bid pricing alternatives. The three alternatives were 1) lump sum, 2) reimbursable with a guaranteed maximum price and 3) reimbursable with incentives. All bidders submitted all three alternatives, with each providing their own specific incentive plans as requested. Proposal prices all revealed that the reimbursable arrangement with incentives was the most cost effective of the three pricing alternatives. Accordingly, those alternatives were concentrated on during the bid evaluation process. The proposal evaluation process and awarding of the contract for these services is expected to be complete during the first quarter, or early in the second quarter, of 1993.

Early review of the proposal documents revealed significant differences in the interpretation of the bid documents by the bidders. Extensive evaluation of the basis for each proposal is expected to be necessary to be assured that all are evaluated on an equivalent basis.

B. Equipment Suppliers

1. Syngas Cooling System

In July, 1992, Texaco and Tampa Electric sent out requests for proposals for the supply of the Syngas Cooling System (SCS). Proposals were received on September 15 from six (6) bidders. Both Tampa Electric and Texaco performed preliminary technical and commercial evaluations of the proposals. Following discussions with the bidders to clarify their offerings, a "short list" was created.

The evaluation led to the conclusion that no single vendor had the expertise and pricing advantage to supply the entire SCS. Different vendors had varying amounts of expertise and experience in radiant coolers, convective coolers, and gas/gas heat exchangers. On a technical and commercial basis, Tampa Electric and Texaco reached the conclusion that formal negotiations should continue as follows:

a. With MAN GHH AG of Oberhausen, Germany for the radiant syngas cooling system,

b. With L & C Steinmüeller of Gummersbach, Germany for the connective and gas/gas heat exchanges.

Attachment N shows the tentative general configuration of that arrangement.

Tampa Electric met with these vendors individually and jointly to determine scope and project working relationships. While these two companies are competitors, both realize the importance of the IGCC project. Since MAN GHH will have the greater scope of work, MAN GHH and Steinmüeller have agreed that MAN GHH will coordinate the overall project for both vendors.

A major change has been made in the contracting concept. Originally, it was intended that Texaco would have contracted directly with the SCS vendor(s). Texaco would then contract with Tampa Electric to supply their equipment, along with other guarantees and terms, under a "Key Vessel Agreement". Due to the technical and commercial complexity, Tampa Electric decided to forego this arrangement and contract directly with SCS vendors. Because of this, considerable effort has been required to modify and re-draft the contract and technical specifications. Tampa Electric has continued to utilize Texaco as a technical consultant during development of the specifications.

Tampa Electric has met several times with the vendors to finalize the technical scopes of work. As their SCS technology is still in the development stage, numerous enhancements have been worked out with the vendors to provide for:

- Better integration with the power block
- Greater efficiency in steam production
- Reduced particulate deposition and plugging
- Lower cost material selection

Tampa Electric will continue to finalize these contracts. Major provisions of these contracts will be to provide performance guarantees and to assure the two (2) vendors work very closely to integrate their designs.

The size of the radiant cooler is of note in this discussion. The radiant cooler will be required to handle the extreme conditions of temperature, pressure, and slag/particulates. The present design calls for a pressure vessel that is approximately 133 feet long, 17 feet in diameter, weighing about 900 tons.

The vessel will be transported to the Tampa Port by ship. Due to its size, movement by road may not be feasible, primarily because of bridge interference. It is expected that the vessel will be transferred to a special rail car and then moved to the site. Special steps will be taken similar to that used to move the large vessel for the Cool Water IGCC Demonstration Program.

The convective coolers and gas/gas exchangers are much smaller and can be moved overland by rail or truck. Coordination with the balance of plant construction will be critical to assure that the installation of their vessel car occur on its arrival.

2. Air Separation Unit

Bids for the Air Separation Unit (ASU) were solicited from four (4) vendors in July 1992. The proposals were received in September and an evaluation was performed to determine the lowest evaluated cost. Several alternatives were considered including liquid oxygen and nitrogen production and storage and a configuration with a cooling tower as opposed to using cooling pond water. In addition, vendors were asked to quote on the basis of a turnkey plant (including all construction requirements) and an engineered equipment package only.

After extensive evaluation, the base proposal from Air Products and Chemical, Inc. (APCI) was determined to represent the lowest evaluated cost. This proposal is for a turnkey plant with no liquid oxygen or nitrogen storage and no cooling tower. Negotiations are currently ongoing between APCI and Tampa Electric with a contract anticipated some time in April 1993. The base performance for this plant will be as follows:

- Oxygen Production (TPD) (95% purity) 2,074
- Nitrogen Production (TPD) (99% purity) 6,310

Note: The conditions specified above are based on a 90°F ambient temperature and "Design Case" flows with other factors as defined in the specifications and basis for design. A significant improvement in Power Consumption is realized at lower ambient temperatures and normal operating conditions.

Attachment O shows the general configuration of the Air Separation Unit.

3. General Electric

GE is required to supply TEC with an Engineered Equipment Package (EEP) consisting of a GE manufactured combustion turbine-generator and steam turbine-generator. GE will

also provide the heat recovery steam generator (HRSG) which will be manufactured by the Henry Vogt Machine Co. (Vogt).

The GE efforts during calendar year 1992, specific to the equipment to be provided under the EEP contract included:

a. identification of the performance requirements for the equipment,

b. development and testing of a combustor system for the combustion of the syngas produced by the gasification system, and

c. procurement of the HRSG.

GE, in conjunction with efforts by TEC and Texaco, has proposed equipment intended to satisfy the project's capacity and heat rate requirements. The equipment and performance characteristics were described in the GE Proposal No. IPS-8380.

In 1992, GE worked to demonstrate "proof of concept" that low NOx emissions could be produced from the combustion of syngas using current combustor designs. Development and testing sponsored by DOE and EPRI were conducted with nitrogen as the diluent in the blended mode (syngas and nitrogen pre-mixed prior to introduction into the combustor) and the head end injection mode (nitrogen introduced into the combustor in a stream separate from the syngas). Test results have shown that low NO_x can be obtained with either mode. The next phase of the program will concentrate on the development of the combustor hardware to be used in this project.

A Letter of Intent was executed in December 1992 between GE and the Henry Vogt Machine Company (Vogt) in which GE identified Vogt as the selected vendor to design, manufacture and deliver to the site the HRSG as described in the GE Proposal No. IPS-8380. The selection of Vogt as the successful vendor represented the culmination of the efforts of GE and TEC in evaluating the proposals of three vendors: A Release for Manufacture is expected to be issued to Vogt during mid-1993 and delivery is targeted for completion in March 1995.

4. GEESI

The previous discussion in Cycle Definition, described the progress made with GEESI. The present plans are for GEESI to supply only preliminary and detailed engineering. This will be reflected in the final contract.

Tampa Electric expects that the supply of the HGCU equipment will be done under a bid solicitation. GEESI may decide to bid to supply this equipment. While it will be specialty equipment, a well written specification and a competitive bidding process will provide the project with the proper equipment at the least cost.

The detailed engineer will be responsible for designing the HGCU interface with the IGCC plant. It is likely that installation of the HGCU System will be part of the overall IGCC plant construction.

X. CONSTRUCTION

A. Combustion Turbine Erection

As has been previously indicated, General Electric was awarded the engineered equipment package for the design and engineering and supply of the combined cycle equipment. In order to optimize the interface, and costing, it was decided to award the CT erection to General Electric. The scope of this effort involves the erection of that equipment supplied by General Electric under their engineered equipment package. This should insure that the overall installation of the CT would meet the requirements set forth in Tampa Electric Company's specifications and the GE engineered equipment package contract. It is expected that the contract for the installation of the combustion turbine should be finalized early in 1993.

B. Construction Management

At about the same time the specification was being prepared for the architect engineering bids, Tampa Electric Company's construction department began formulation of the construction management contract and bid documents. It is the intent to bid the construction management services immediately after award of the A/E contract. By doing this, it can be assured that the scope of work requirements for the A/E are adequately meshed into the scope of work requirements for the construction manager.

C. Construction Contracts

Present plans call for the construction manager to bid and award and implement at least five (5) major contracts. These contracts would include site development, CT installation, balance of plant CT installation, and IGCC installation. The air separation contract is being done on a separate turnkey basis. In addition, other minor subcontracts may be negotiated for specialty contracts required for the overall project.

The construction manager's contract is expected to be consummated during the middle part of 1993. The construction contracts should be bid and awarded during the latter part of 1993.

XI. PROJECTIONS FOR 1993

A. DOE Design Review

As previously noted, DOE conducted their design review during the last part of 1992. Preliminary indications are, with the exception of the expected uneasiness associated with the development of the hot gas cleanup, DOE feels comfortable with the cost, concept, and overall arrangement of our IGCC project.

B. Air Separation Unit

It is anticipated that the air separation unit contract with turnkey installation will be finalized and awarded during the last part of the first quarter of 1993. This evaluation is expected to be very straight forward with the award to the low evaluated bid.

C. Detailed Engineering Services

During the early part of 1993, evaluations and negotiations for the detailed engineering will be completed. It is expected that by early April 1993, the detail engineer can begin work in earnest. The effort will take the concept developed in Texaco's Preliminary Engineering Package and convert that into detailed engineering and design which can be effectively bid as construction contracts which would then result in a completed project, meeting the goals and specifications set forth in Tampa Electric Company's design criteria.

D. Syngas Coolers

During the first part of 1993, final negotiations will be underway with the syngas cooler vendors. This order will be one of the most critical components of the entire IGCC in that it sets forth specific fuel requirements for the combustion turbine.

E. Permitting

The state permitting process is not expected to create any major hurdles. Efforts in 1992 resulted in expected comments and concerns from intervenors with no major problems being uncovered.

The most critical area will be the federal permitting process. With the expected transfer of the EIS lead agency status from DOE to EPA, it is expected that significant and potentially severe impacts to the overall cost and project schedule, specifically the permitting schedule, could be encountered during 1993. Tampa Electric Company's best efforts will be required to minimize these effects on the overall permitting schedule. We still believe that with adequate support from the EPA and DOE, the overall project schedule can be maintained essentially intact.

F. Hot Gas Clean-Up

During the early part of 1993, negotiations will be completed for the Hot Gas Clean Up system design. At that point in time, General Electric Environmental Systems can then begin in earnest their detailed design effort for the Hot Gas Cleanup System. As previously noted, this particular aspect of the project has the most potential for problems. Tampa Electric Company and the detailed engineer will have to pay particular attention to the developments related to this part of the system. Ongoing testing at GEESI will be required to fully support the overall efforts and requirements and interfaces with the hot gas cleanup system. It is expected that by year end 1993, specific details will be completed on the hot gas clean-up system that will enable the A/E to take construction bids for the installation of the hot gas clean-up system.

G. Combustion Turbine Installation Contract

Also during the early part of 1993, it is expected that the contract for the installation of this combustion turbine as provided by General Electric under the engineered equipment package will be completed. This will enable GE and the CM to begin a constructability review of the combustion turbine with the A/E as he prepares his detailed engineering.

H. Construction Management

Award of the construction management contract in the middle part of 1993, is essential. We are firmly convinced that the construction manager's input into the constructability and other construction requirements for the project are required. An overall integration of the construction and the design will be required to make the project successful.

I. Continuation Application

Toward the end of 1993, Tampa Electric Company will be submitting a continuation application request to DOE. This application is to request DOE approval to take the concept developed during Budget Period I and implement it during Budget Period II. This implementation is expected to commence with construction starting in early 1994. Therefore, prompt approval of the continuation application will be required to maintain the overall project schedule.

XII. SUMMARY

Tampa Electric Company's effort during 1992, and the proposed effort for 1993 continues to convince Tampa Electric that this project is sound and will provide the results intended: to confirm that the IGCC technology can indeed provide significant reductions in coal fired power plant emissions while providing an economically sound basis for installing coal-fired base-load generation. Tampa Electric still expects

that this project will confirm DOE's choice for selecting this IGCC project. It will be a success for the Clean Coal Technology program in general, and provide the options necessary to the utility industry as it goes go forward into the twenty-first century, for cost effective methods for meeting new generation requirements in an environmentally acceptable manner.

XIII. LIST OF ATTACHMENTS

A. EIV - Environmental Permits Listing
B. SCA - Table of Contents Summary
C. Members of the Site Selection Task Force
D. Conceptual Mine Reclamation Plan - Table of Contents
E. Site Photo of Mine Cuts
F. Total Project Summary & Cost Sharing Percentages
G. Project Schedule
H. Organization Chart
I. Artist Rendering - Proposed Site Arrangement
J. TGPS Limits
K. 7F General Arrangement
L. HGCU Generalized Process Flow Diagram
M. HGCU General Arrangement
N. Syngas Cooler General Arrangement
O. ASU General Arrangement

Attachment A

Environmental Permits Listing

Table 5.0.0-1. Major Potentially Applicable Environmental Regulations and Licensing Considerations

---

Federal

1. NEPA (CEQ 40 CFR 1500-1508; 7 CFR 1794)
2. Air: NSPS (EPA 40 CFR 60 Subparts GG and Da)
3. Air: PSD (EPA 40 CFR 52.21)
4. Water: NPDES (EPA 40 CFR 423, 122)
5. Dredge and Fill (USACE Section 404; 33 CFR 320-330)
6. Stack Height (FAA 14 CFR 77; EPA 40 CFR 51)
7. Endangered Species (50 CFR 17)

State

1. Power Plant Siting Act (FDER 403.501-403.518, F.S.; Chapter 17-17, F.A.C.)
2. Air: NSPS (FDER Chapter 17-2.660, F.A.C.)
3. Air: PSD (FDER Chapter 17-2.500, F.A.C.)
4. Air: Nonattainment (FDER Chapter 17-2.510, F.A.C.)
5. Surface Water Discharge (FDER Chapter 17-302, 17-4 F.A.C.)
6. Groundwater Discharge (FDER Chapter 17-3., 17-4 F.A.C.)
7. Effluent Limitations (FDER Chapter 17-660, F.A.C.)
8. Stormwater (FDER Chapter 17-25, F.A.C.)
9. Dredge and Fill: Wetlands (FDER Chapter 17-312, F.A.C.)
10. Land Use: FDOA Coastal Zone Areas (Chapter 380.19, Chapter 380.23, F.S.); Environmentally Endangered Land (Chapter 259, F.S.); Areas of Critical Concern (Chapter 380, F.S.); Aquatic Preserves (Chapter 258.35, F.S.); Outstanding Florida Waters (Chapter 17-302, F.A.C.) (Chapter 258, Chapter 259, F.S.); National and State Parks and Recreation Areas (Chapter 592.12, F.S.); National Forests National Wildlife Refuges and State Wildlife Management Areas (Chapter 372, F.S.); State Wilderness Areas (Chapter258.17, F.S.); Indian Reservations (Chapter 285, F.S.)
11. Archaeology/Historical (FDOS Chapter 267, F.S.; Chapter 1A, F.A.C.)
12. Stack Height (FDOT Chapter 14-60.09, F.A.C.)
13. Highway/Railroad (FDOT Chapter 14, F.A.C.)
14. Solid Waste (FDER Chapter 17-700, F.A.C.)
15. Hazardous Waste (FDER Chapter 17-730, F.A.C.)
16. Electric and Fields (FDER Chapter 17-274, F.A.C.)
17. Phosphate Mining Reclamation (FDNR 211, 378, F.S.; Ch 16C-16, 16C-17, F.A.C.)
18. Drinking Water (FDER Chapter 17-555)
19. Domestic Waste (FDER Chapter 17-600)

Table 5.0.0-1. Major Potentially Applicable Environmental Regulations and Licensing Considerations (Continued, Page 2 of 2)

Regional

1. Consumptive Water Use (SWFWMD Chapter 40D-2,3, F.A.C.)
2. Stormwater Discharge (SWFWMD Chapter 40D, F.A.C.)
3. Land Use: Regional Policy Plans (CFRPC and TBRPC Chapter 186, F.S.; Chapter 27D, F.A.C.)
4. Works of District (SWFWMD Chapter 40D-6, F.A.C.)
5. Surface Water Management (SWFWMD Chapter 40D-4, F.A.C.)

Local

1. Land Use: Local Government Comprehensive Planning Act of 1975 with Amendments (Chapter 163 F.S.); Polk County
2. Construction Permits
3. Surface Water Management (Polk Ordinance 88-04)
4. Phosphate Mining (Polk Ordinance 88-19)

Source: ECT, 1992.

Attachment B

Table of Contents
Site Certification Application (SCA) Summary

SCA TABLE OF CONTENTS SUMMARY

VOLUME 1:

VOLUME 2:

5.0 Effects of Plant Operation
5.1 Effects of the Operations of the Heat Dissipation System
5.2 Effects of Chemical & Biocide Discharges
5.3 Impacts on Water Supplies
5.4 Solid/Hazardous Waste Disposal Impacts
5.5 Sanitary & Other Waste Discharges
5.6 Air Quality Impacts
5.7 Noise
5.8 Changes to Non-Aquatic Species Populations
5.9 Transportation & Other Plant Operation Effects
5.10 Archaeological Sites
5.11 Resources Committed
5.12 Variances

VOLUME 3:

6.0 TRANSMISSION LINES & OTHER LINEAR FACILITIES

6.1 Transmission Lines
7.0 Economic & Social Effects on Plant Construction & Operation
7.1 Socio-Economic Benefits
7.2 Socio-Economic Costs
8.0 Site & Plant Design Alternatives
8.1 Alternative Sites
8.2 Alternative Means of Satisfying The Need For The Project
8.3 Proposed Site Design Alternatives
9.0 Polk Power Station Site Reclamation Requirements & Plans
9.1 Background of Site Reclamation Requirements & Plans
9.2 Relationship of Proposed Plant & Associated Facilities to Reclamation Rules
9.3 Release Procedures
9.4 Financial Responsibility
9.5 Variances & Amendments
10.0 Coordination
11.0 Appendices

VOLUME 4:

11.1.3 Prevention of Significant Deterioration Permit Application

VOLUME 5:

11.2 STATE PERMIT APPLICATIONS

11.3 Zoning Descriptions & Consistency Determinations
11.4 Land Use Plan Descriptions
11.5 Cultural Resource Survey & Florida Division of Historic Resources Opinion Letter
11.6 Transportation Analysis: Polk Power Station
11.7 Geology/Geohydrology Monitoring Program & Supporting Information

VOLUME 6:

11.8 Surface Water Hydrology Monitoring Program & Supporting Information
11.9 Aquatic Ecology Monitoring Program & Supporting Information-Macroin-Vertebrate Sampling Results
11.10 Terrestrial Ecology Monitoring Program & Supporting Information

VOLUME 7:

11.11 Annual Monitoring Data Report for Tampa Electric Company Prevention of Significant Deterioration Network, Polk County, Florida
11.12 Noise Monitoring Program & Supporting Information
11.13 Hazardous Materials/Wastes Supporting Information
11.14 Need Determination Petition & Florida PSC Order Determining Need
11.15 Power Plant Site Selection Assessment & Siting Task Force Members
11.16 Supporting Information For Conceptual Reclamation Plan Application: Maps
11.17 List of Preparers

Attachment C

Members of the Site Selection Task Force

MEMBERS OF POWER PLANT SITING TASK FORCE

BRUCE A. SAMSON, CHAIRMAN - President, University of Tampa

JAMES W. APTHORP - Executive Vice President, Gulfstream Holding Company

DR. SANFORD V. BERG - Professor of Economics, University of Florida

ROBERT T. BRAMSON, M.D. - Radiologist in Tampa

HENRY CARLEY - Coordinator, minority student outreach programs at HCC

DR. DAVID DENSLOW - Professor of Economics, University of Florida

ETHEL HAMMER - Director of Planning, Taub & Williams law firm, Tampa

CLAYTON LYONS - President, Masters Containers, Lakeland

RICHARD T. PAUL - Manager, Tampa Bay Sanctuaries - National Audubon Society

JILL E. PETTIGREW - Staff attorney, Second District Court of Appeal of Florida in Lakeland

WALTER L. PRESTON - Owner and President, Manatee Fruit Company, Palmetto

NATHANIEL P. REED - President, 1000 Friends of Florida

DR. MARK STEWART - Chairman, Geology Department, University of South Florida

SALLY THOMPSON - President, Hillsborough Environmental Coalition

VICTORIA TSCHINKEL - Former Secretary of Florida Department of Environmental Regulation

WILLIAM J. WEBBER, AIA - Former Senior Vice President, Reynolds, Smith & Hills - Tampa

DR. BERNARD YOKEL - President, Florida Audubon Society

MARY KUMPE, Senior Consultant to Siting Task Force - Board member, 1000 Friends of Florida

MEMBERS OF POWER PLANT SITING TASK FORCE

Bruce A. Samson; Chairman of Siting Task Force
Mr. Samson is a former investment banker and has served as chairman of the Southwest Florida Water Management District (SWFWMD) board. A Harvard MBA, he is now president of the University of Tampa.

James (Jim) W. Apthorp
Mr. Apthorp is a member of the board of 1,000 Friends of Florida, executive vice president of Gulfstream Holding Company, vice president of the Greater Tampa Chamber of Commerce, a director of University Community Hospital, and serves on the Florida Judicial Council.

Dr. Sanford V. Berg
Dr. Berg is a professor of Economics at the University of Florida (UF). He is also executive director of Public Utility Research Center at UF, and has served as a consultant to various private and public organizations, including the Florida PSC, the Governor's Energy Office, the National Bureau of Standards, and the Office of Technology Assessment. He is widely published on business and economic topics.

Robert T. Bramson, M.D.
Dr. Bramson has been a radiologist in Tampa since 1974.

Henry Carley
Professionally, Mr. Carley has been an educator at the college level for the last 17 years, primarily at Hillsborough Community College (HCC). He is presently the coordinator of minority student outreach programs at HCC, which focuses on recruitment and retention. He is president of the Tampa branch of the NAACP and affiliated with a number of Tampa area charities and organizations such as the March of Dimes and American Legion.

Dr. David Denslow
Dr. Denslow is interim director of the Bureau of Economic and Business Research and a professor in the Department of Economics at UF. He is chairman of the Governor's Council of Economic Advisors for Florida, and was selected as the University Alumni Professor for 1989-1991--an award given by the National Alumni Assn. The award recognized Denslow's influence on students and alumni as a classroom teacher and included a cash award and research assistance.

Ethel Hammer
Ms. Hammer has been director of planning for Taub & Williams law firm in Tampa since 1985 where she is responsible for coordination of all land use-related activities including zoning petitions, site plans, and developments of regional impact. She was with the Hillsborough County Department of Development Coordination between 1980 and 1985, much of the time as principal planner. Between 1978 and 1980, she was environmental planner for the Hillsborough County Planning Commission. Ms. Hammer has a masters degree in environmental planning.

Clayton Lyons
Mr. Lyons has been president of Master Containers in Lakeland since 1969. He came to that post from eight years with Florida Tile Industries. He has his bachelors from Florida Southern College, and has studied business at the graduate level at University of South Florida (USF). He has a lengthy list of awards and civic activities in the Lakeland area, and is currently an officer with the Polk Museum of Art in Lakeland and on the executive committee of the Boy Scouts of America council in Tampa. He was recently appointed by the governor to the Central Florida Regional Planning Council.

Richard T. Paul
Having earned a masters in wildlife ecology, Mr. Paul joined the National Audubon in 1972, first as a research biologist, and since 1980 as manager of Tampa Bay Sanctuaries. Under his protection are large colonies of as many as 25 species of birds. He is currently serving on the Agency on Bay Management and has served on other local environmental advisory committees. His field and research experience is extensive and worldwide, including Antarctica and Thailand.

Jill E. Pettigrew
Ms. Pettigrew is a member of the Florida Bar. She is staff attorney to the Second District Court of Appeal of Florida in Lakeland. She reviews trial records, researches issues under appeal, drafts case summaries and analyses, and makes recommendations to the presiding judge.

Walter L. Preston
Mr. Preston is owner and president of Manatee Fruit Company in Palmetto, a company founded by his grandfather in 1892. He is a member of the Manatee County Agricultural Advisory Council and is active in a number of professional associations. Gov. Graham appointed him to the Future of Agriculture in Florida task force, and in 1986 he was named Outstanding Florida Agriculturist by the Florida Association of County Agricultural Agents. He is a director of the Manatee County Blood Bank and of First Florida Bank.

Nathaniel P. Reed
Mr. Reed is president of the Hobe Sound Company, a real estate and holding company. He is currently president of 1,000 Friends of Florida and is a former member of the National Audubon Board and served on the board of the Nature Conservancy. He is currently on the board of the Natural Resources Defense Council and the National Geographic Society. Mr. Reed was Assistant Secretary of the Interior from 1971-1977 and chairman of the Florida Department of Air and Water Pollution Control from 1968-1971. He is currently chairman of the Commission on the Future of Florida's Environment.

Dr. Mark Stewart
Dr. Stewart is a professor in and chairman of the USF Geology Department. At USF since 1976, he is certified as a professional hydrogeologist by the American Institute of Hydrology, and is a registered professional geologist in Florida. He is currently a director of the Association of Ground Water Scientists and Engineers, and is on the editorial board of the Journal of Ground Water. He is extensively published in his field.

Sally Thompson
Ms. Thompson is president of the Hillsborough Environmental Coalition, on the board of the Tampa Audubon Society, and a member of Sierra Club and other local environmental groups. Professionally, she is chief of personnel for the Tampa Public Works Department and has been with the City of Tampa for 15 years.

Victoria Tschinkel
Ms. Tschinkel is a consultant specializing in environmental matters with the law firm of Landers & Parsons. She was secretary of the Florida Department of Environmental Regulation from 1981 to 1987. She was a board member of 1,000 Friends of Florida and a member of the National Academy of Public Administration. Ms. Tschinkel currently serves on the U.S. Department of Energy's Advisory Committee on Nuclear Facility Safety, on the Advisory Council of the Electric Power Research Institute, as a member of the Tallahassee/Leon County Local Planning Agency, on the board of Florida Defenders of the Environment, and on the board of Environmental and Energy Study Institute. Ms. Tschinkel received the Tropical Audubon Society's Conservation Award and Environmental Protection Agency's Service Award in 1984.

William J. Webber, AIA
Mr. Webber is retired from Reynolds, Smith & Hills (RSH), an architectural and engineering firm, where he was a senior vice president in the Tampa office. An architect by profession, Webber was one of the original partners in RSH before it became a corporation.

Dr. Bernard Yokel

Dr. Yokel has his doctorate in marine science with a specialization in estuarine ecology, and is currently the president of the Florida Audubon Society. He came to the Florida Audubon in 1984 from a position as director of research and environmental protection in Naples for The Conservancy. In 1974 he came to the Conservancy from a four-year position as director of the Rookery Bay Marine Research Station at Naples. The Rookery Bay project was a demonstration experiment to determine if an essentially unaltered natural system could be conserved in the presence of an expanding population and aggressive development. He has a lengthy list of community services and special appointments and has been extensively published.

Walker Roberts, Communications Consultant to Task Force

Roberts & Hice (R&H) provides communications services to the task force. R&H is a full-service firm with clients in several industries; it specializes in hospital/medical public relations and in Florida issues management. Mr. Roberts edited Florida Trend magazine for about a decade, and, in his career as a business journalist, has started, owned, or worked on numerous other publications, including the Miami Herald. He serves clients with Florida issues management needs for R&H, as well as offering media consulting.

Mary Kumpe, Senior Consultant to Task Force

Ms. Kumpe served as senior consultant to the task force. She is a former vice-chairman of the federal Gulf of Mexico Fishery Management Council. She has completed the Harvard University program in Environmental Policy and Management. She is a former governing board member of the SWFWMD, a board member of 1,000 Friends of Florida, and has served as a regional planning commissioner on the Southwest Florida Regional Planning Council. Ms. Kumpe chaired the Sarasota County Chamber of Commerce' committee which formulated the Chamber's contribution to the county comprehensive plan and she served on the 1987 State Comprehensive Plan Committee.

Attachment D

Table of Contents
Conceptual Mine Reclamation Plan

TAMPA ELECTRIC COMPANY

POLK POWER STATION

Polk County, Florida

CONCEPTUAL RECLAMATION PLAN APPLICATION

TAMPA ELECTRIC
A TECO ENERGY COMPANY

October 1992

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued, Page 2 of 2)

Attachment E

Site Photo of Mine Cuts

PHOSPHATE MINING OPERATION

PHOSPHATE MINE CUTS AFTER MINING

Attachment F

Total Project Cost Summary

POLK POWER STATION
July 92 Preliminary Estimate
($ X 1,000)

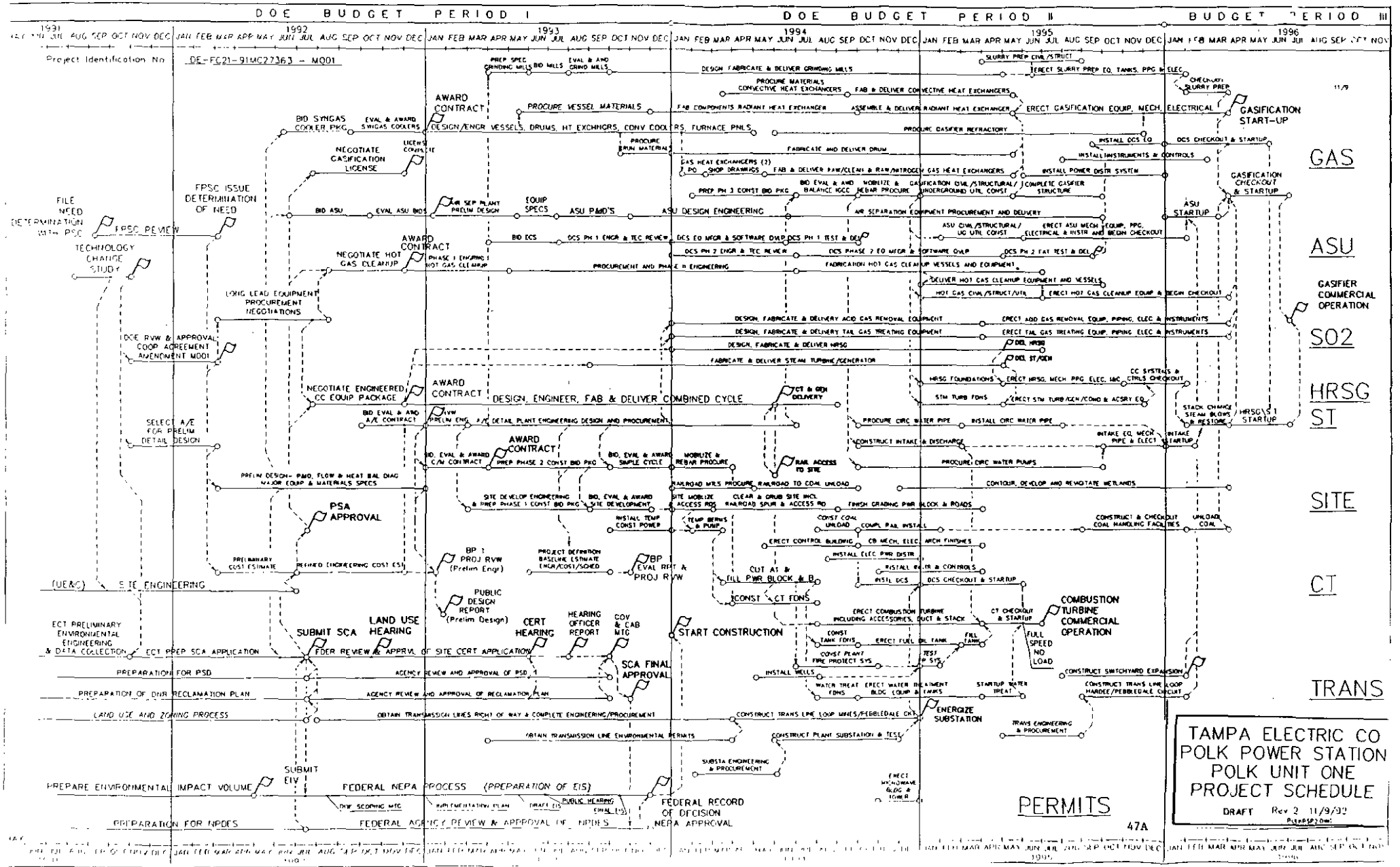
	Project Total	DOE Total
IGCC Facilities		
Hot Gas Cleanup	24,042	12,021
Cold Gas Cleanup	35,127	0
Gasification & License	103,696	20,739
Air Separation Unit	45,310	9,062
Power Block	118,610	23,722
Balance of IGCC	46,831	9,366
Engineering	53,529	10,733
Site Development	36,202	7,259
TEC Owners Costs	51,722	7,727
Project Subtotal	**515,069**	**100,629**
DOE Reimbursement	100,629	N/A
Project Total	414,440	100,629

Attachment G

Project Schedule

Attachment H

Organization Chart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DOE BUDGET PERIOD II
BUDGET PERIOD III
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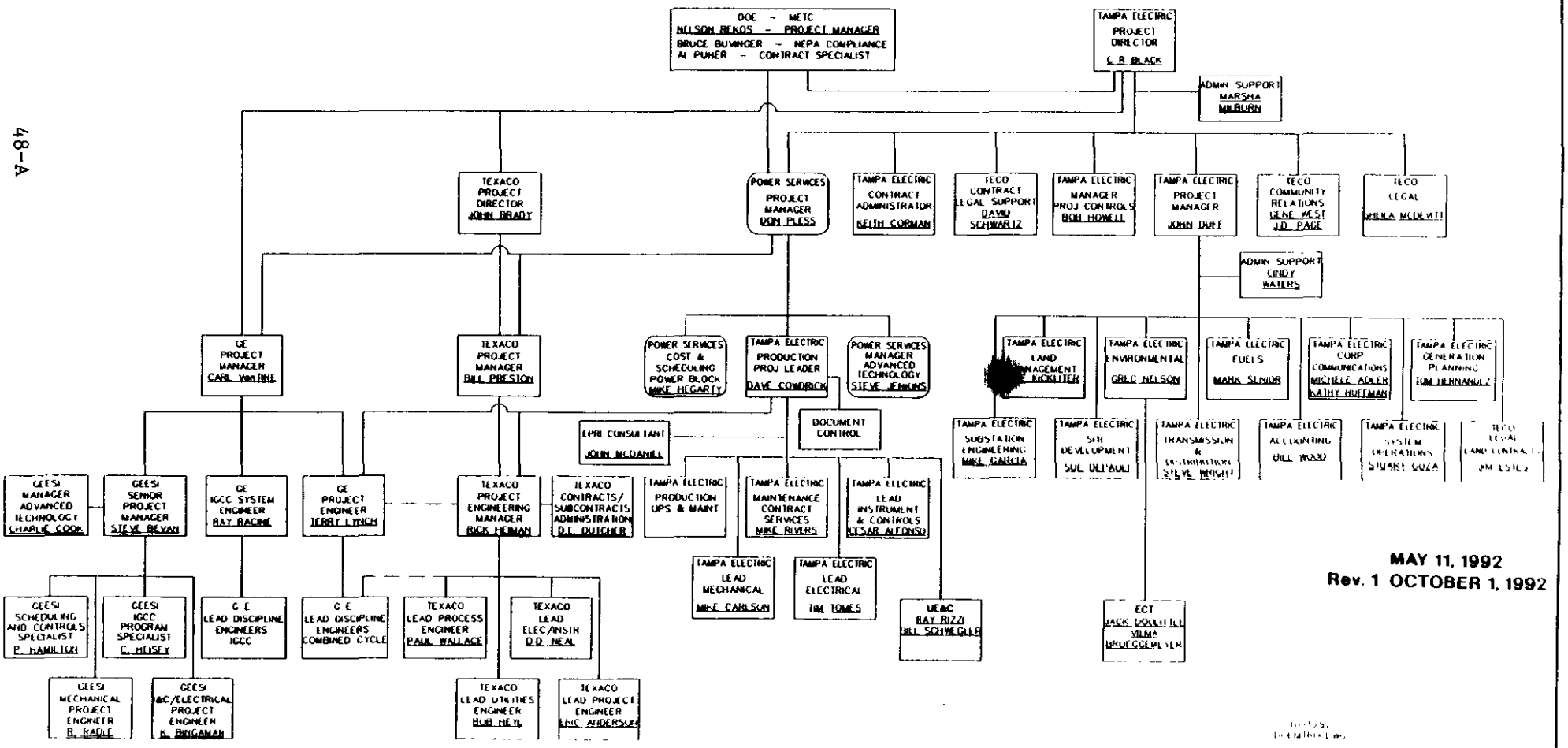
1992
1993
1994
1995
1996
Project Identification No DE-FC21-91MC27363 - M001
GAS
ASU
HRSG
ST
SO2
SITE
CT
TRANS
PERMITS
GASIFIER COMMERCIAL OPERATION
COMBUSTION TURBINE COMMERCIAL OPERATION
GASIFICATION START-UP
AWARD CONTRACT
DESIGN, ENGINEER, FAB & DELIVER COMBINED CYCLE
START CONSTRUCTION
SCA FINAL APPROVAL
ENERGIZE SUBSTATION
PSA APPROVAL
FEDERAL RECORD OF DECISION NEPA APPROVAL
TAMPA ELECTRIC CO
POLK POWER STATION
POLK UNIT ONE
PROJECT SCHEDULE
DRAFT Rev 2 11/9/92

POLK UNIT No. 1
TOTAL PROJECT ORGANIZATION



MAY 11, 1992
Rev. 1 OCTOBER 1, 1992

Attachment I

Artist Rendering
Proposed Site Arrangement

TAMPA ELECTRIC CO.
POLK POWER STATION - IGCC

Attachment J

TGPS Limits

EXHIBIT A
Identification of TGPS and Non-TGPS
Components in Engineering Contract Scope of Work

TGPS Components

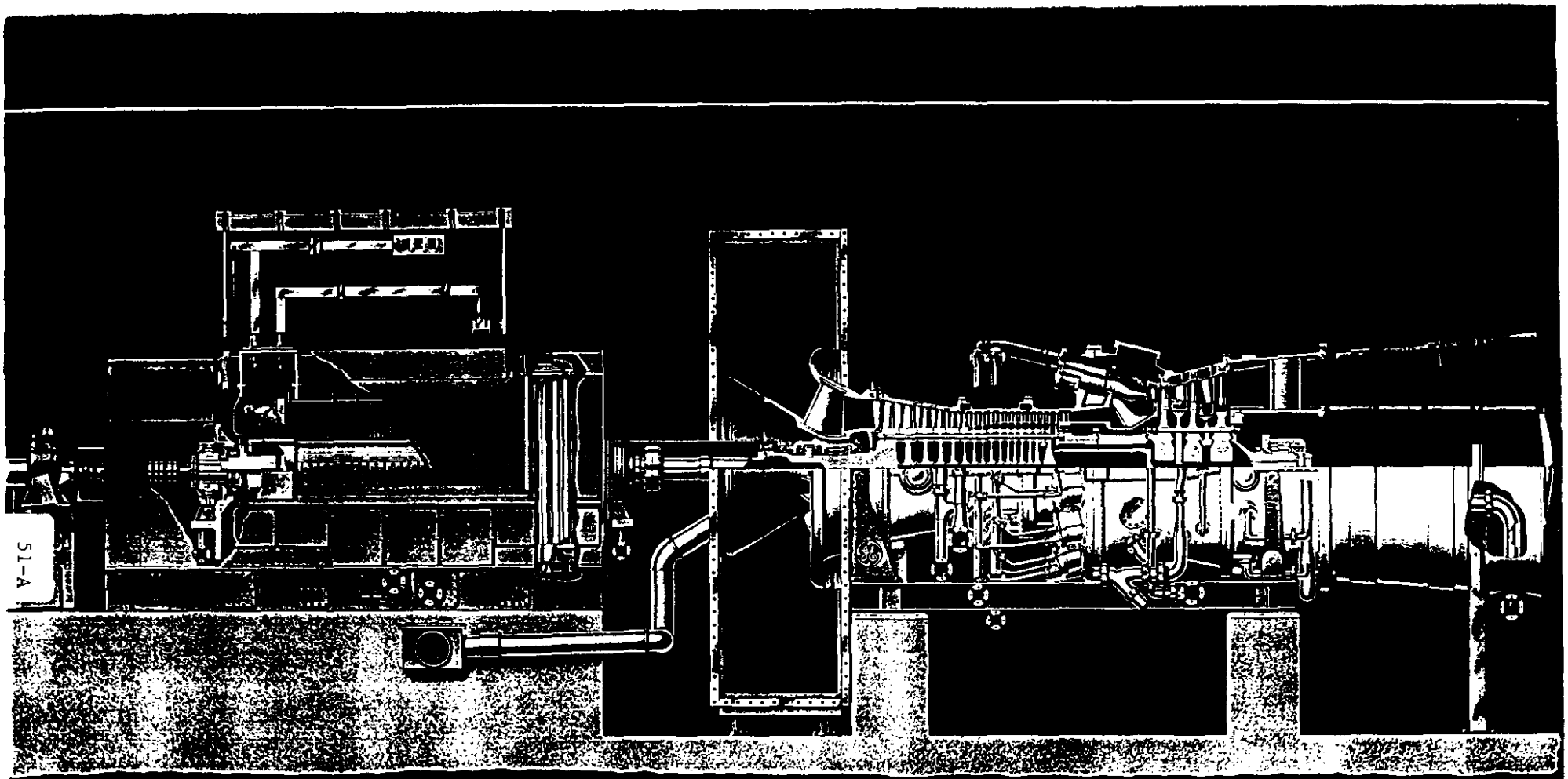
1. Integration of Air Separation into TGPS
2. Slurry Preparation
3. Gasification
4. Gas Cooling
5. Integration of Acid Gas Removal into TGPS
6. Integration of Sulfur Recovery into TGPS
7. Integration of Tail Gas Treating into TGPS
8. Integration of Hot Gas Cleanup into TGPS
9. Integration of HGCU Sulfur Recovery into TGPS
10. Integration of Combustion Turbine into TGPS
11. Integration of Steam Turbine into TGPS
12. Integration of HRSG into TGPS
13. Integration of Cooling Water System into TGPS
14. Waste Water Treating
15. Plant Distributed Control System - TGPS components
16. Integration of Interconnecting Piping into TGPS

Non-TGPS Components

1. Site Improvements/Civil work
2. Condensate & BFW Treating
3. Feed Water Treating
4. Utility (Flare, Plant, Air, Fire Water) Systems
5. Interconnecting Piping (excluding integration into TGPS)
6. Plant Electrical Systems
7. Electrical Switch board
8. Buildings
9. Coal Receiving
10. Backup fuel system
11. Railroad

Attachment K

7F General Arrangement



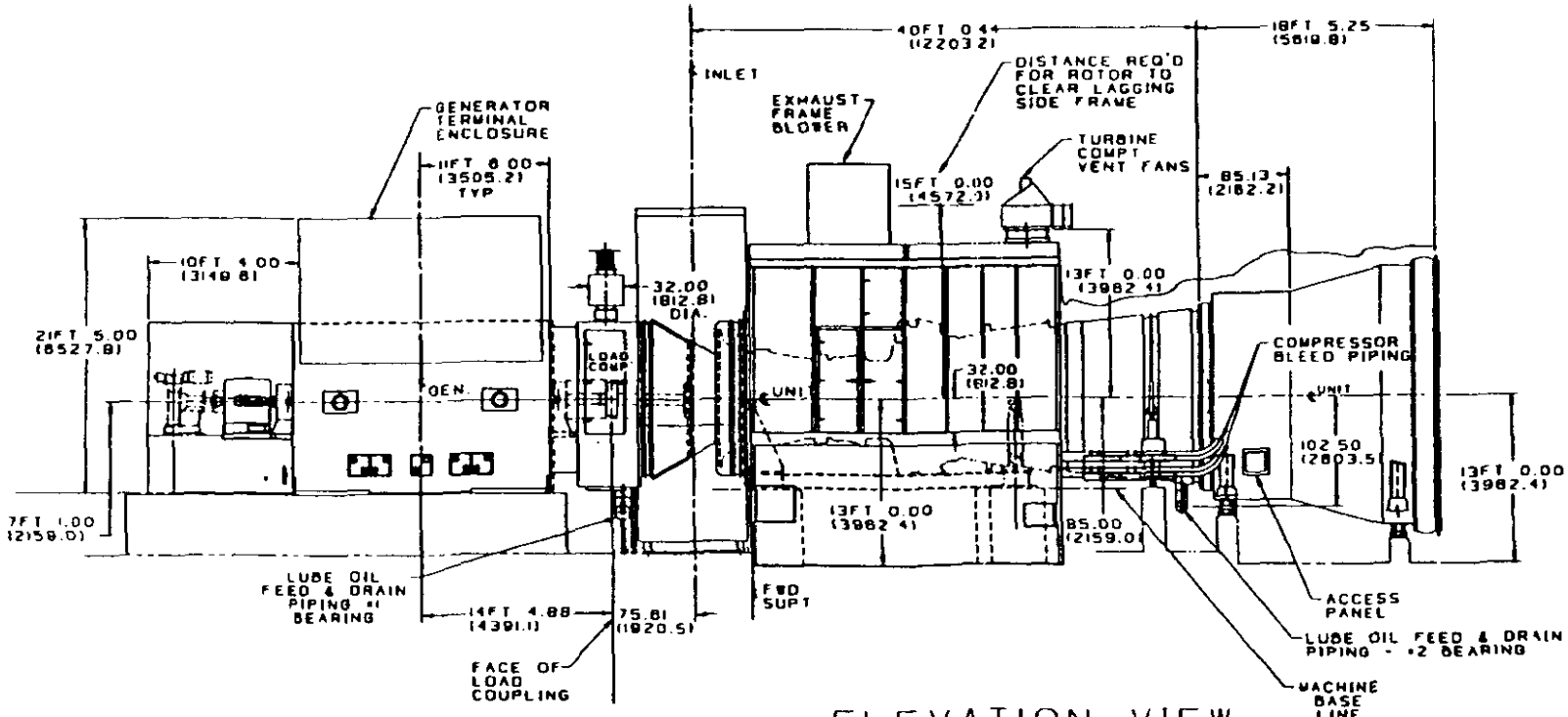
51-A

MODEL SERIES 7001F

SIMPLE-CYCLE, SINGLE-SHAFT
HEAVY-DUTY GAS TURBINE WITH HYDROGEN COOLED GENERATOR

Attachment L

HGCU Generalized Process Flow Diagram



ELEVATION VIEW

8 DT-IN 7 6 5 4

52-A

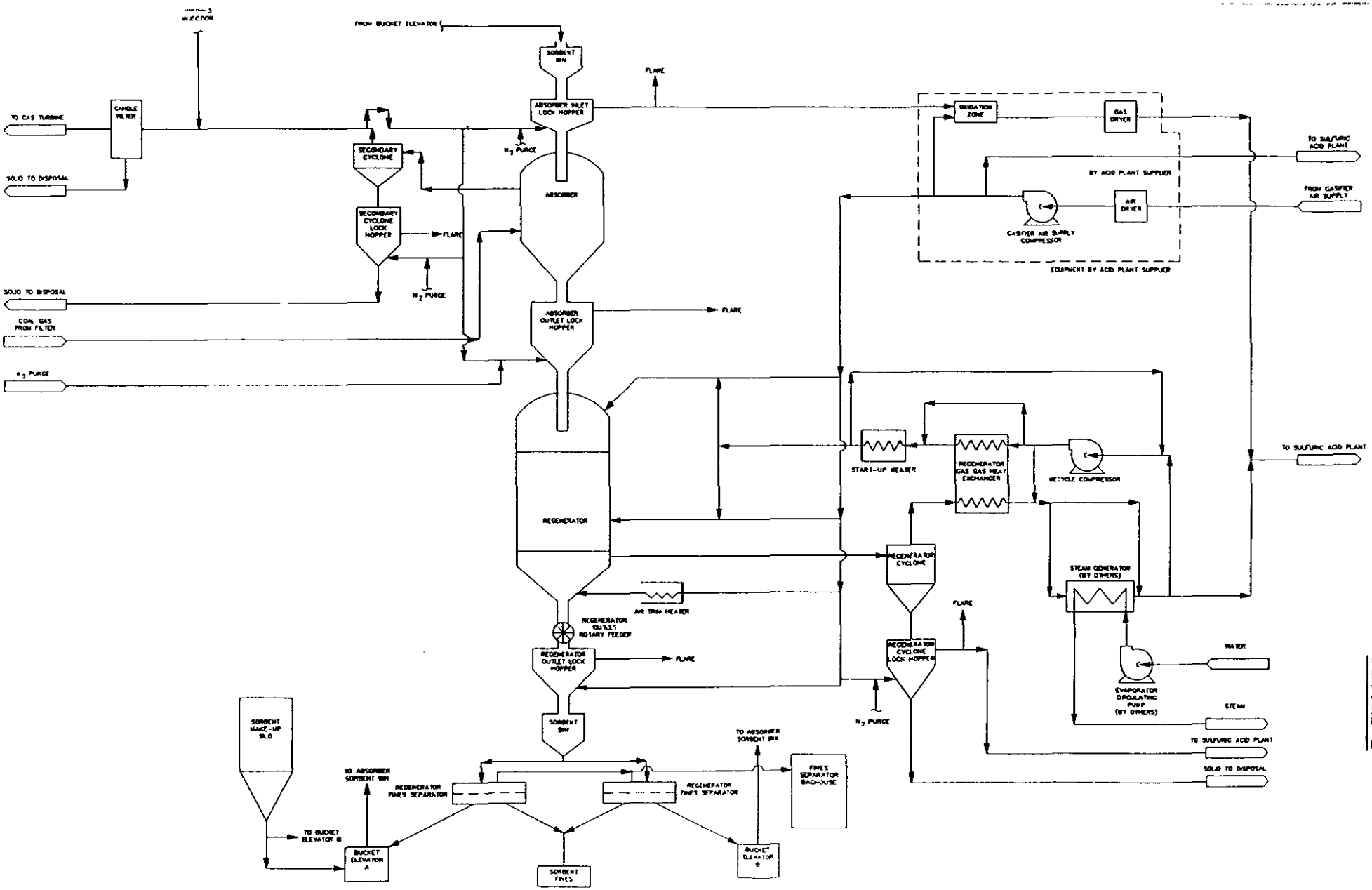
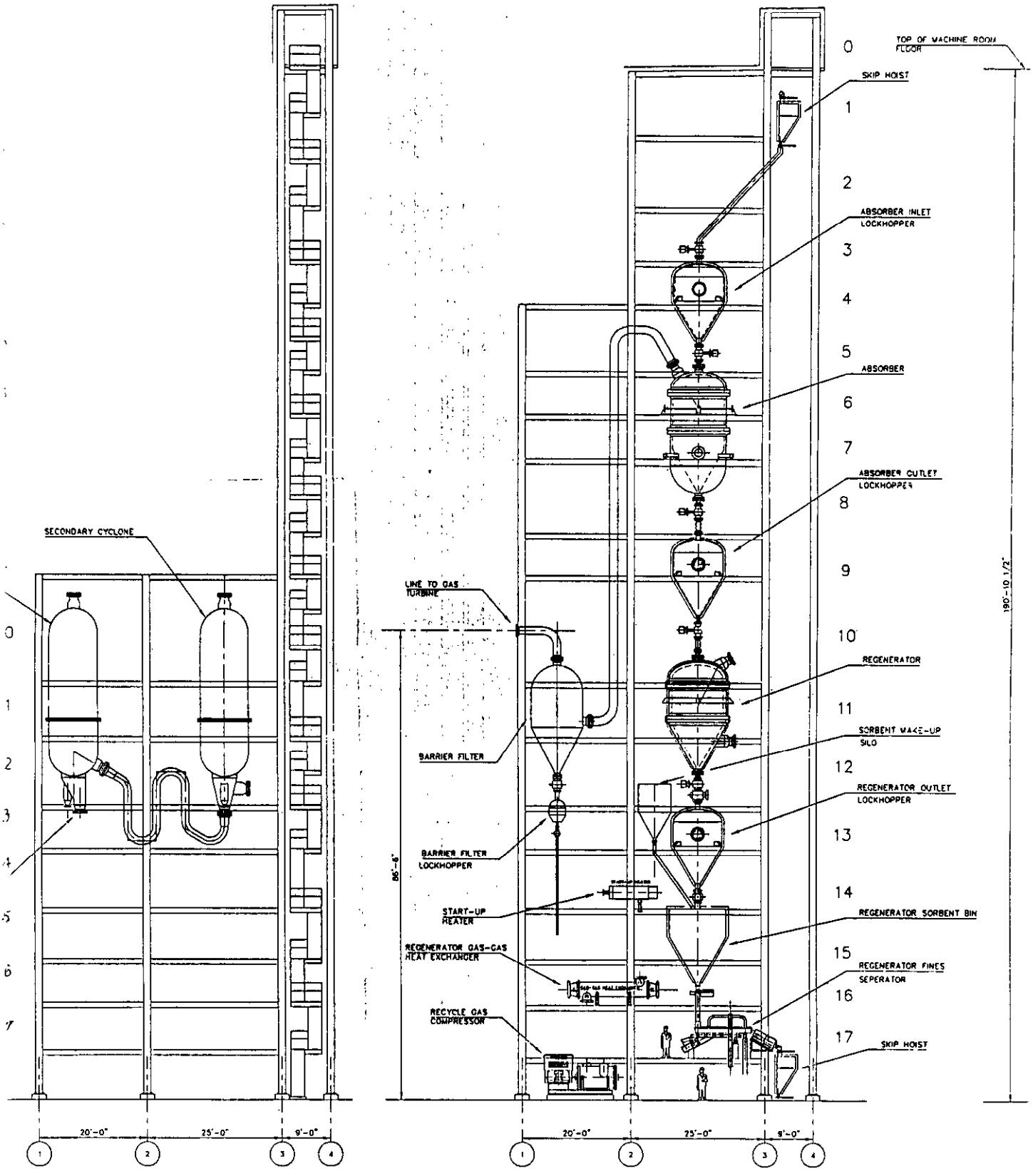

TO GAS TURBINE
CANDLE FILTER
SOLID TO DISPOSAL
FROM BUCKET ELEVATOR
SORBENT BIN
ABSORBER INLET LOCK HOPPER
FLARE
SECONDARY CYCLONE
SECONDARY CYCLONE LOCK HOPPER
ABSORBER
N_2 PURGE
SOLID TO DISPOSAL
COAL GAS FROM FILTER
ABSORBER OUTLET LOCK HOPPER
REGENERATOR
OXIDATION ZONE
GAS DRYER
BY ACID PLANT SUPPLIER
AIR DRYER
GASIFIER AIR SUPPLY COMPRESSOR
EQUIPMENT BY ACID PLANT SUPPLIER
TO SULFURIC ACID PLANT
FROM GASIFIER AIR SUPPLY
START-UP HEATER
REGENERATOR GAS GAS HEAT EXCHANGER
RECYCLE COMPRESSOR
REGENERATOR CYCLONE
STEAM GENERATOR (BY OTHERS)
AIR TRIM HEATER
REGENERATOR OUTLET ROTARY FEEDER
REGENERATOR OUTLET LOCK HOPPER
REGENERATOR CYCLONE LOCK HOPPER
WATER
EVAPORATOR CIRCULATING PUMP (BY OTHERS)
STEAM
SORBENT MAKE-UP SILO
TO ABSORBER SORBENT BIN
REGENERATOR FINES SEPARATOR
FINES SEPARATOR BAGHOUSE
TO BUCKET ELEVATOR B
BUCKET ELEVATOR A
BUCKET ELEVATOR B
SORBENT FINES

FIGURE 2

Attachment M

HGCU General Arrangement



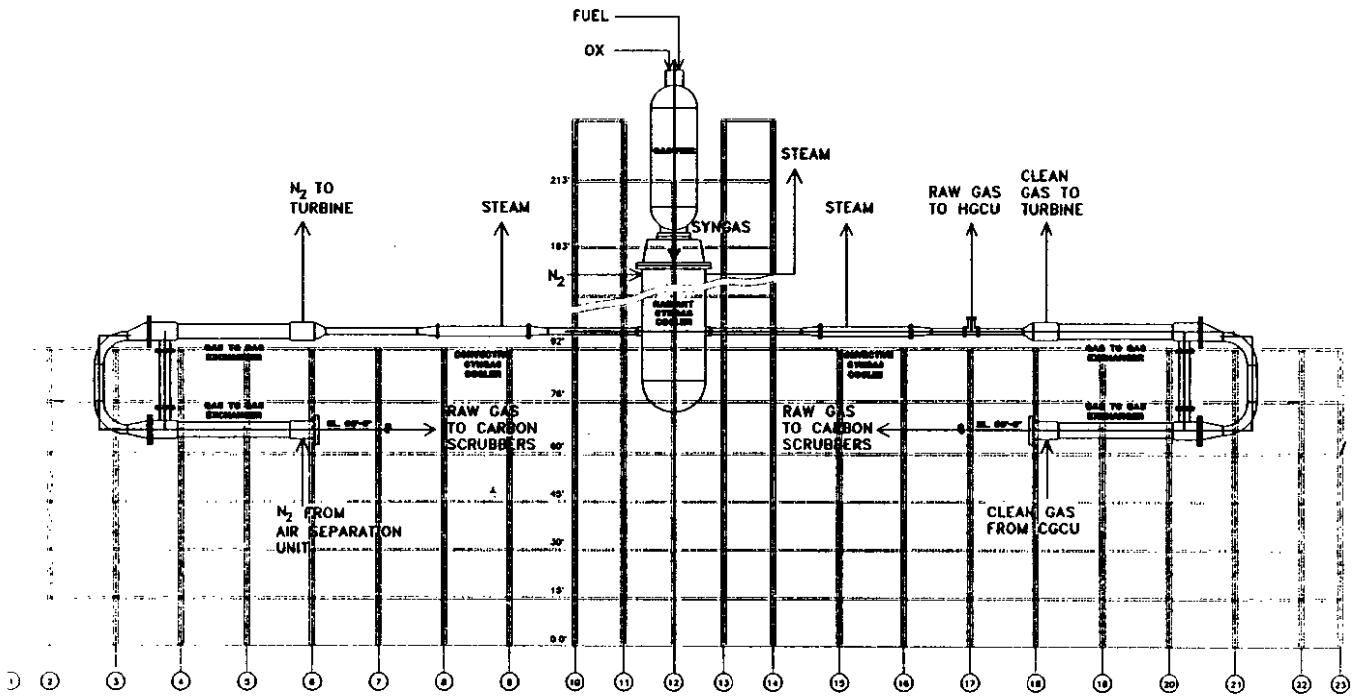
TEC-IGCC PROJECT
POLK POWER STATION UNIT #1
PRELIMINARY GENERAL ARRANGEMENT

DATE: 2/16/93 BY: BDF
SCALE: 1/8" = 1'-0"

SKETCH: C9662-BDF-101

Attachment N

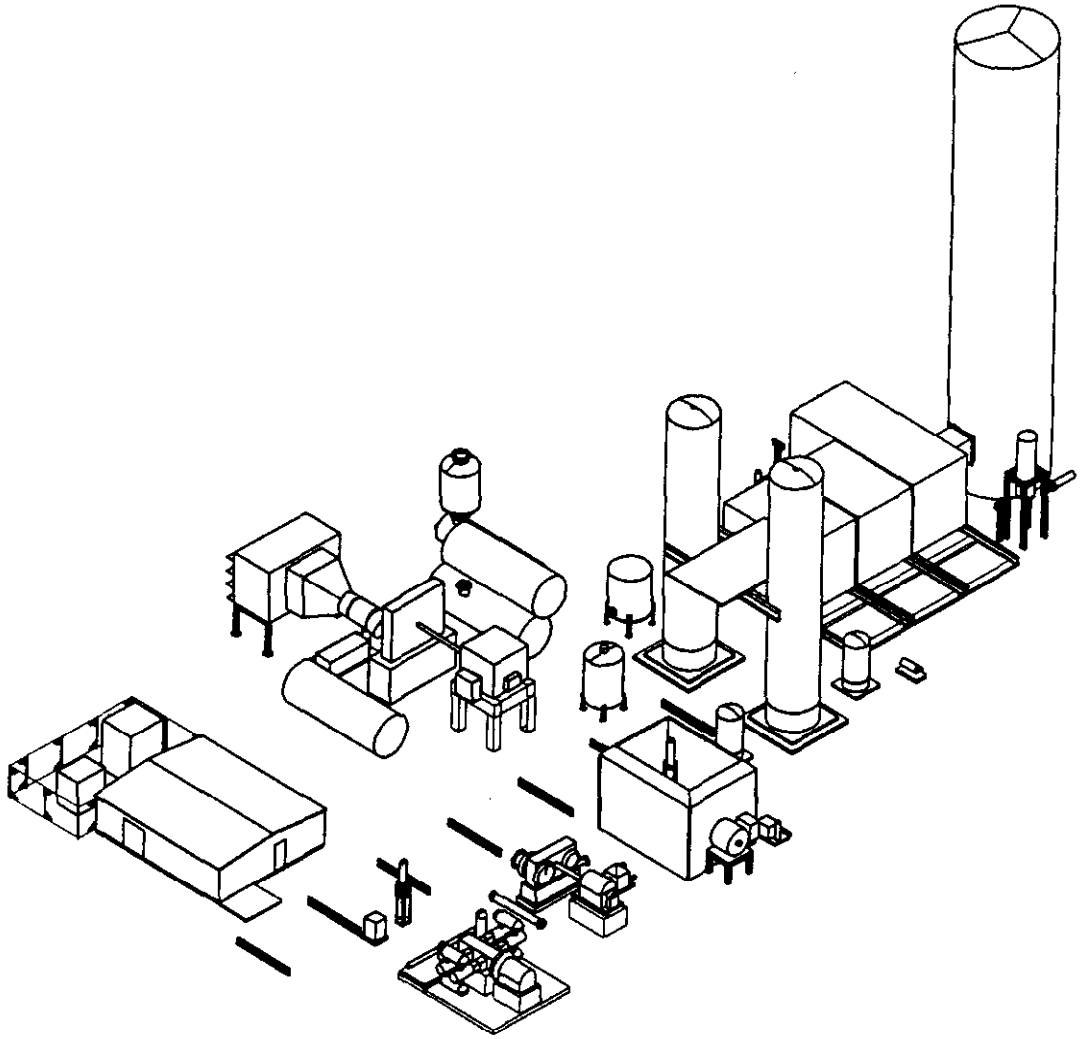
Syngas Cooler General Arrangement



TAMPA ELECTRIC ENERGY COMPANY	**POLK POWER STATION EQUIPMENT ARRANGEMENT**	DESIGNED BY / CHECKED BY / API DATE 06/93 JOB NO. L50-10 FILE NAME OPT-4SYM DW. E

Attachment O

ASU General Arrangement



ISO VIEW

ECN NO.	REV.	ZONE	REVISION DESCRIPTION	DATE	BY	CHK'D	APPD.

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
FRACTION ± DECIMAL ± ANGLE ±
HOLE LOCATION ± HOLE SIZE ±

FIRST USED ON: LON-2DN60

M. D. JOSLIN — DRAWN — DATE 11SEP92
CHECKED
ENGINEER
APPD.

TITLE
FACILITY ARRANGEMENT

ISO
TAMPA ELECTRIC
POLK COUNTY, FL

AIR PRODUCTS AND CHEMICALS, INC.
ALLENTOWN, PENNSYLVANIA
TOTAL SAFETY

FILE 2DN60FD4, LDN
DWG NO. 1-XXX-240
D
REV. Ø
SCALE 1"=15'-0"
WT.
SHEET 1

*U.S. GOVERNMENT PRINTING OFFICE: 1994-550-168-00014