MARTIN COAL GASIFICATION COMBINED CYCLE PROJECT

SITE CERTIFICATION APPLICATION SUFFICIENCY RESPONSES

VOLUME 1

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

FPL

STATE OF FLORIDA
DIVISION OF ADMINISTRATIVE HEARINGS

IN RE: Martin Coal Gasification/ Combined Cycle Project Power Site Certification Application, Florida Power & Light Company, PA89-27.	)	DOAH CASE NO. 90-0259

FLORIDA POWER & LIGHT COMPANY'S NOTICE OF FILING RESPONSES TO SUFFICIENCY QUESTIONS OF THE DEPARTMENT OF ENVIRONMENTAL REGULATION AND THE SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Applicant, Florida Power & Light Company (FPL), by and through undersigned counsel, hereby gives notice of its filing of responses to all the comments and questions of the Department of Environmental Regulation (DER) and to a portion of the comments and questions of the South Florida Water Management District (SFWMD) regarding the sufficiency of the Martin CG/CC Project Site Certification Application. FPL's responses to the DER sufficiency letter dated March 15, 1990, and the SFWMD letter dated March 12, 1990 are contained in a three volume document entitled "Site Certification Application Sufficiency Responses", dated May 8, 1990. Volume 1 contains responses to DER comments and questions. Volume 2 contains responses to SFWMD comments and questions. Volume 3 contains appendices to Volumes 1 and 2.

These responses are submitted in accordance with Rule 17-17.081(2), Florida Administrative Code (F.A.C.) and the Order on Sufficiency, dated April 25, 1990. Additional responses will be submitted with respect to certain SFWMD questions in accordance with the schedule for such submittals as agreed to by SFWMD and FPL and reflected in the Order on Sufficiency.

FPL points out that one set of full size copies of certain over-sized exhibits, particularly aerial photographs, has been provided to the agency that requested the information (either DER or SFWMD) and one full-sized copy has been provided to the other agency. The time and expense of reproducing full size copies prohibited providing multiple copies of these over-sized exhibits. However, reduced copies of these exhibits have been included in all other copies of this Response. The sets of full size copies have been delivered to Susan S. Coughanour of SFWMD and Hamilton S. Oven of DER. Wayne Ondler of FPL in West Palm Beach, (407) 640-2042, also retains full size copies of these oversized exhibits. Those wishing to view the full size exhibits may contact one of these individuals.

Respectfully submitted this 8th day of May, 1990.

HOPPING BOYD GREEN & SAMS

By: [signature]
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Attorneys for FLORIDA POWER & LIGHT COMPANY

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that copies of the foregoing have been furnished by hand delivery to each of the following this 8th day of May, 1990:

Gary Smallridge
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and by Federal Express to the following on May 8, 1990:

Roger G. Saberson
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Regional Planning Council
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FPL/MARTIN

COAL GASIFICATION/COMBINED CYCLE

SITE CERTIFICATION APPLICATION

RESPONSES TO

SUFFICIENCY COMMENTS BY

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

MAY 8, 1990

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

March 15, 1990

Ms. Mary Clark
Division of Administrative Hearings
The Desoto Building
1230 Apalachee Parkway
Tallahassee, Florida 32399-1550

Re: FPL Martin Coal Gasification/Combined Cycle Project
Power Plant Site Certification Application PA 89-27
DOAH Case No. 90-259

Dear Ms. Clark:

Pursuant to section 17-17.081, F.A.C., and section 403.404(3), F.S., the Department of Environmental Regulation finds the power plant siting application for the Martin Project to be insufficient. Sufficiency comments from the South Florida Water Management District, the Treasure Coast Regional Planning Council, Florida Department of Transportation, and the Florida Game And Fresh Water Fish Commission are attached. Also attached is a letter from the U.S. Environmental Protection Agency. Specific comments from this department are as follows:

1. Please provide emission estimates for the sulfur storage and handling system, fuel oil storage system, and the oxygen plant vents.

2. Will sampling ports be available to test compliance of each combustion turbine?

3. What are the expected emissions (lbs/hr) from the gassification plant flare stacks?

4. Please provide the following gas turbine exhaust conditions for firing with natural gas, No. 2 fuel oil, and coal-derived gas:

   a. Total mass flow (lb/hr)
   b. Moisture content
   c. Oxygen content

5. Please provide manufacturer's literature and specifications for the gas turbines that are being considered for the project.

3/19/90

6. The non-regulated pollutants antimony, barium, cobalt, radionuclides, zinc, fluorides, and chlorine are identified for gas/oil combustion in the publication "Control Technologies for Hazardous Air Pollutants." These pollutants should be addressed a part of the BACT.

7. Application should address the possibility of using "improved combustors" which are capable of limiting NOx to 25 ppm.

8. There is no indication as to what operating scenario (natural gas, oil, or coal gas) is addressed for SCR NOx control in Table 4-4. The cost of using SCR for NOx control should address the worst case operating scenario.

9. Provide basis for using capital recovery factor with 12 percent interest over 30 years for annualized capital cost in Table 4-4.

10. Provide basis for using levelizing factor with 12 percent interest, 30 years, and 5 percent escalation rate for levelized annual cost in Table 4-4.

11. BACT for controlling sulfur dioxide emissions from the combined cycle units should address the economics of using venturi scrubbing and low sulfur fuel oil (<0.3%) as was required for the Cool Water and Chesterfield Power facilities, respectively.

12. Once the gasification phase is completed do you anticipate the turbines will operate entirely on coal-derived gas?

13. Provide responses to EPA Region IV's comments regarding BACT (copy of letter attached).

14. Describe analytical method to be used in determining if HRSG Boiler Tube cleaning wastes, termed metal cleaning wastes (3.7.2-3), are hazardous. Include Analytes to be tested. Should the metal cleaning wastes be "deemed" hazardous by approved testing methods the hazardous waste generated should be managed in a fashion similar to that described in the "miscellaneous wastes" section (3.7.2-4).

15. Describe analytical method to be used in determining if wastes produced by the CG/CC units (5.4.2) are hazardous. Include analytes to be tested.

16. Section 3.6.1-5 discusses how constituents concentrate 2.57 times without introducing the affect of absorption to pond side/bottom on the factor of concentration. Discuss how concentrations of potentially hazardous constituents (table 3.6.1-1) may be expected to increase or decrease in side/bottom sediments over time.

17. Section 8.2.2 states that any residual chlorine in the circulating water discharge will be "consumed" within the cooling pond. What is the mechanism of "consumption"? What is the maximum capacity of the consumption of chlorine by the cooling pond? What are the concentration effects on the surficial aquifer water quality?

18. Sulphur is to be produced as a by-product of coal gasification process. The description of the handling of this material is adequate, but no mention is made of any odors that may be produced by the handling, cooling, and solidification of this material on the slab. Will any odors be produced?

19. The slag generated by the coal gasification process should be tested for EP Toxicity.

20. A sludge is to be generated from the waste water treatment systems. This sludge needs to be tested for hazardous constituents prior to disposal in a landfill on or off site.

21. The site application proposes to use a wet suppression method for minimizing fugitive particulate emissions. This process is to include a surfactant. What is the composition of this surfactant? What is the effect of this surfactant on the surficial aquifer? Will the surfactant leach any chemicals from the coal?

22. A mention is made of an underdrain system for the cooling pond. A more detailed description of this system is needed. Does the drain system empty into a canal or to the waste water treatment system? What is the effect of this system on the seepage from the pond?

23. Several large storage tanks are proposed. Are the pipes to and from these large tanks contained? The tanks must undergo a routine inspection for defects or leaks. Also, a contingency plan should be in place addressing catastrophic failure or ignition of these storage tanks.

24. Dewatering of the surficial aquifer proposed in this application would cause a 5 foot drawdown in the vicinity of the plant. According to the application, an irrigation well falls within the 5 foot drawdown boundary. Has the owner of the irrigation well been contacted and informed of this effect on his well? Does the irrigation well construction permit the continued use of the well for its intended purpose when subjected to a 5 foot drawdown?

25. The water quality monitoring program proposed for the site include 30 parameters (Table 2.3.4-4). The

parameter list should be expanded to include any hazardous wastes generated by the plant during routine operations such as paint thinner, chlorinated solvents, etc.

26. The water quality monitoring program proposed for the inside of the facility (within the CG/CC area) could not be reviewed. The referenced section (Section 5.2.3, page 5.2.3-1) was left out of the appropriate volume.

27. The surface water quality monitoring plan parameter list in Section 2.3.4.2, page 2.3.4-87 should reflect the criteria for General and Class III waters in accordance with FAC 17-3.061 and .121 as well as the additional analysis proposed in 25 above.

28. Conversations with FP & L staff personnel indicated that mitigation activities will take place on site. Please provide appropriate drawings and calculations for all construction activities related to the mitigation area.

29. Page 5.3.1-4 - Need to clarify why the L-65 Canal is classified as Class IV and not Class III. Does this water body meet the Class IV classification criteria of FAC Rule 17-3.16(2) (a)?

30. Table 5.2.1-2, page 5.2.1-5 - It should be noted that Lake Okeechobee is classified as Class I surface water and not Class III as indicated. (Refer FAC Rule 17-3.161(2) (c)43). Accordingly, Sections 5.2.1.5 must be resubmitted with an assessment of impact on Class I water quality standards.

31. Section 3.5.2.2, Treatment and Disposal, states a tertiary filtration system will be provided for additional solids removal; however, this system is not indicated on the flow schismatic, figure 3.4.2-1.

32. Page 5.51-2, F.A.C. 17-6,401 should include parameters of the point of discharge to include total suspended solids (TSS) and pH which will then be in accordance with Section 5.5.4, Measurement programs, of the application.

33. What storm event (10-year, 25-year, etc.) could be contained in the cooling pond prior to it discharging? Has any thought been given to the cumulative nutrient loading on the pond over a period of time and the effects (algae blooms, excessive surface vegetation, etc.) this may cause?

34. The definition of an interim Water System indicates that it must be "approved by Martin County". In Martin County <u>all</u> public water systems must be approved by DER.

35. Section 10.2.8, P. 1846.1:

The definition of a Nonpublic Water System should be in conformance with HRS's FAC 10D.4 definition. The definition, as is, is not accurate.

36. General:

The only information provided on the existing public water system serving the facility is a copy of D.E.R.'s letter of clearance/approval.

After checking the M.O.R. screen of the drinking water data base, flow records indicate that system has reserve capacity. However, from experience - these older systems are generally not constructed in accordance with today's standards. Information is needed on whether the proposed project will create additional potable water demand. If so, how much and will it take the existing treatment system over capacity? Should they upgrade to meet current standards?

37. In Figure 3.2.0-1, pg.3.2.0-2, ten runoff collection basins can be identified, associated with the coal storage, solids wastes storage, limestone storage, and other areas. It is not clear, after reviewing subject document, which of these basins will be lined. If any of these basins will <u>not</u> be lined, please provide an explanation for not lining same.

38. When waste streams are transferred from the basins above named, or from other areas, to treatment facilities and/or ultimately to the cooling pond, will said waste streams be conveyed by pipelines or by ditches?

39. If the waste streams are to be conveyed by ditches or other open channels, we recommend <u>lining</u> these ditches to the same specifications as the corresponding basins, et al. Please provide documentation regarding the lining of any and all waste stream conveyance ditches.

40. What is the identity and nature of the "granular material" that will be utilized as described on pgs. 3.3.4-1, 3.7.1-7, 3.7.1-12, 3.7.1-14, and 4.1.4-1? If any of this material consists of, or contains, ash, slag, or other combustion by-product, an evaluation of the potentials for ground water leachate contamination from said materials should be provided.

41. Table 2.3.2-3, pg. 2.3.2-22 shows ground water quality ranges for only those specific contaminants in only those specific wells in which water qualities exceed drinking water standards.

42. Please provide water quality data for all primary and secondary drinking water standards (including gross

alpha and $Ra^{226+228}$) for all the wells shown in Figure 2.3.2-1, pg. 2.3.2-6 (with the exception of Floridan wells). Please also provide well construction data for each of these wells, i.e. casing depths, well screen intervals, et al.

43. It is not clear, from a review of subject document, that the proposed plant qualifies as an "existing installation":
a) new units are proposed to be constructed serially, which do not interface with the units currently existing on site,
b) new processes and technologies are involved,
c) waste streams differ in number, size, and quality,
d) new byproducts would be produced ...

44. No specific ground water monitoring plan (GWMP) was submitted. Please provide a GWMP detailed according to the criteria of Rule 17-28.700(6) FAC, and specific for:
a) ground water (GW) seepage from the cooling pond,
b) GW seepage from the solid waste landfill area.

45. On pg. 5.3.3-8, an exemption from the monitoring of secondary drinking water standards in the cooling pond is claimed under Rule 17-28.700(8) (h) FAC. However, since the cooling pond also serves as the installation's primary industry waste percolation pond, with a subsurface discharge totaling 44 cfs to several tens of square miles of surrounding Class G-II ground waters of the State, and of such a quality projected to be above standards for Cl, TDS, and Fe, in addition to Na, it is therefore recommended that monitoring for all secondary (as well as primary) standards be implemented under 6)a) and b) above (re: Rules 17-28.700 (8) (e) and 17-28.700 (8) (h) FAC). Said analyses, as may be reasonably necessary to ensure that the designated use of affected ground waters and surface waters is not impaired, should continue for the life of the plant.

46. The solid waste area test cell program, so far a it was described on pgs. 3.7.1-10 through 15, is insufficient as proposed. To merely collect for analysis, "leachate and runoff resulting from rainfall", would not substitute for a ground water leachate study employing unlimited test cells and monitoring wells, primarily because of the great dilution with rainwater materials. Please provide, under 6)b) above, details of such a test-cell/ground water leachate study, or else provide documentation that the entire solid waste storage area would b lined and underdrained. Suggest that you also contact Solid Waste personnel for appropriate rule applicabilities.

47. A request for appropriate zone of discharge should be submitted with the GWMP.

48. The request for exemption from compliance with Na standard for G-II waters (and possibly for Cl, TDS, and Fe standards as well, should the installation be found to be "new"), should be deferred until such time as analyses of cooling pond water indicate that the 160 mg/l Na standard is being approached. The issue might be address upon subsequent renewal of the ground water monitoring permit, pursuant to conditions of certification.

49. Data from the Historical Sample program, Field Sampling Program and Ditch Water Quality Investigations (Section 2.3.4) should be presented in tabular form (in an appendix) in addition to the summary graphic form presented in the text.

50. Water bodies in Section 2.3.4 having ambient concentrations exceeding the applicable state water quality standard for zinc should be identified individually.

51. Water bodies in Section 2.3.4 having ambient concentrations exceeding the applicable state water quality standard for iron should be identified individually.

52. Data from the Field Sampling Program (Section 2.3.4) should be plotted individually for near-surface and near-bottom samples rather than as mean values. This would enable impacts resulting from sedimentation processes to be distinguished form water-column impacts. Data presented in Section 2.3.4 would be more legitimately compared with adjacent St. Lucie Canal stations PPD/US and PPD/DS rather than with summary data for all locations.

53. Zinc concentrations in the St. Lucie Canal appear higher downstream of the intake/discharge canal than upstream. These data should be compared with near-surface and near-bottom zinc concentrations and possible causes of this phenomenon should be discussed in the text.

54. Discussion of wet/dry season phenomena in the text (e.g., page 2.3.4-58, discussion of nitrate/nitrite data) occasionally contradicts the rainfall data (Table 2.3.3-2), which indicate the wet season to be May through October.

55. Does the value for mercury in Table 2.3.4-6 represent value for composited surface and bottom samples or a mean value for individual surface and bottom samples?

56. The locations of stations I_{1-7} and R_{1-6} should be identified in Figure 2.3.4-38.

57. Projected use inputs/outputs (Figure 3.5.0-1) do not balance for the CC units

58. Projected ground water use of 8,550 acre-ft. per year (5,297 GPM) on page 3.5.0-1 does not equal the sum of the ground water withdrawals (3,319 GPM) shown schematically in Figure 3.5.0-1.

59. A more detailed analysis should be provided for the cooling pond thermal analysis of Section 3.5.1. This analysis should clearly show all model input and output variables and provide justification for the input values used.

60. Mass balance calculations in Section 3.6.1 were performed using a gross pond seepage rate of 44 cfs. Page 2.3.3-8 states that "21 cfs (of this seepage) is collected by the pond underdrain system and returned to the pond." Use of gross rather than net seepage would cause constituent concentrations in the pond (Table 3.6.1-1) to be underestimated. These calculations should be repeated using net seepage rates. Does data indicate seepage rates have remained constant with time or is it accumulation in the reservoir?

61 The source for values of expected constituent concentrations used to calculate the CG/CC Diluted Contribution in Table 3.6.1-1 should be identified. Methods used to predict projected effluent quality for the wastewater treatment facility should be explained.

62 The dilution factor if 8 in Section 5.2.1.3 is derived from average flows in St. Lucie Canal. Assurance should be provided that canal flows are normally distributed if an average flow value is used to depict prevalent conditions.

63. Please explain how the biocide treatment destroys at least 50 percent of cooling pond ammonia as stated on page 5.2.1-15.

Hamilton S. Oven, Jr. P.E.

Hamilton S. Oven Jr

Administrator, Siting
Coordination Section
Division of Air Resources
Management

HSO/rrs

cc: To all parties

attachments

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

Source: H. Oven letter to M. Clark (March 15, 1990)

Comment #1

"Please provide emission estimates for the sulfur storage and handling system, fuel oil storage system, and the oxygen plant vents."

Response:

Sulfur Storage and Handling Systems

Since elemental sulfur from the CG units sulfur recovery process (Claus Plant) may contain as much as 300 ppmw of hydrogen sulfide (H_2S), the molten sulfur will undergo a cleaning process which reduces the concentrations of H_2S in the sulfur to levels where the gaseous releases can be effectively eliminated. Molten sulfur from the Claus Plant will be conveyed in enclosed pipes to steam heated 2-3 day storage tank(s) equipped with agitation or catalytic devices to encourage H_2S releases and an eductor system which collects the gas above the molten sulfur. The H_2S is driven off, collected, and directed to the tail gas treatment facility for incineration. The subsequent emission of SO_2 from this incineration represents less than one-half percent of the total project SO_2 emissions described in SCA Section 3.4.1.

Since the sulfur will be handled and stored in a molten state or continuous crystalline slabs, no sulfur related fugitive dust will be generated.

Fuel Oil Storage Systems

The four 3-day No. 2 fuel oil storage tanks associated with the CG/CC facility will emit a maximum of 7.5 tons/year of VOC (non-methane hydrocarbons) per year. This assumes the combustion turbines operate continuously (capacity factor 100%) on No. 2 fuel oil. This emission represents less than 1 percent of the total project emissions of VOC.

Oxygen Plant Emissions

As described in SCA Section 3.4.3, the oxygen plant does not emit any regulated or non-regulated pollutants.

The oxygen plant vents return ambient air minus the oxygen and most of the particulates (removed in the plant's filtering process) to the atmosphere.

Comment #2

"Will sampling ports be available to test compliance of each combustion turbine?"

Response:

Since flue gas from each turbine will always be directed to its own adjoining HRSG and stack, appropriate sampling ports will be provided in each stack.

Comment #3

"What are the expected emissions (lbs/hr) from the gasification plant flare stacks?"

<u>Response</u>:

Flaring of coal-derived gas will occur during the following scenarios:

- Startup
- Emergency Shutdown

<u>Startup</u>

The production rate of gas during startup is conservatively assumed to be about 100 percent of the normal rate. During startup, the particulates will be removed before the gas reaches the flare. The gas stream, however, will contain sulfur from the coal as H_2S and COS (carboxyl sulfide) which will be combusted to SO_2, H_2O, and CO_2 in the flare. Given the rate of gas production during startup and the presence of upstream particulate controls, the particulate emissions from a gasification unit flare will be approximately equal to the total controlled emissions from the combined cycle unit (two CT/HRSG's) firing coal-derived gas. The absence of upstream sulfur controls means that SO_2 emissions from the flaring are equivalent to the SO_2 generated from the direct combustion of the coal feedstock. The startup flare typically continues for 15-30 minutes after which the acid gas removal (AGR) system stabilizes and begins to clean the gas before flaring. The resulting particulate and SO_2 emission rates shown below are based on one-half hour of continuous flaring of one 400 MW gasification unit at 100 percent load and normalized to an hourly rate.

Total SO_2 per Flare (lb/hr) - 16,100

Total Particulates per Flare (lb/hr) - 76

Total NO_x per Flare (lb/hr) - 70

Given the flare's high combustion temperature and the availability of excess air, the flaring will emit negligible quantities of VOC and CO.

Emergency

Under emergency or abnormal conditions, gas to the flare will have gone through the particulate removal and sulfur removal processes. Therefore, maximum emissions during this flaring will approximate the SCA reported maximum emissions from the combined cycle units firing coal-derived gas.

Comment #4

"Please provide the following gas turbine exhaust conditions for firing with natural gas, No. 2 fuel oil, and coal-derived gas:

a. Total mass flow (lb/hr)
b. Moisture content
c. Oxygen content"

<u>Response</u>:

Following is a range of gas turbine exhaust conditions which envelop the conditions described by the combustion turbine vendors under consideration.

Temperature = 40° F (Maximum emission scenario)
Air Pressure = 14.7 psia

Fuel: Natural Gas

Mass Flow (klb/hr)	3,702
Moisture Content (%)	12.8
Oxygen Content (%)	11.6

Fuel: No. 2 Fuel Oil

Mass Flow (klb/hr)	3,763
Moisture Content (%)	12.6
Oxygen Content (%)	11.5

Fuel: Coal-Derived Gas

Mass Flow (klb/hr)	4,175
Moisture Content (%)	10.45
Oxygen Content (%)	11.5

Comment #5

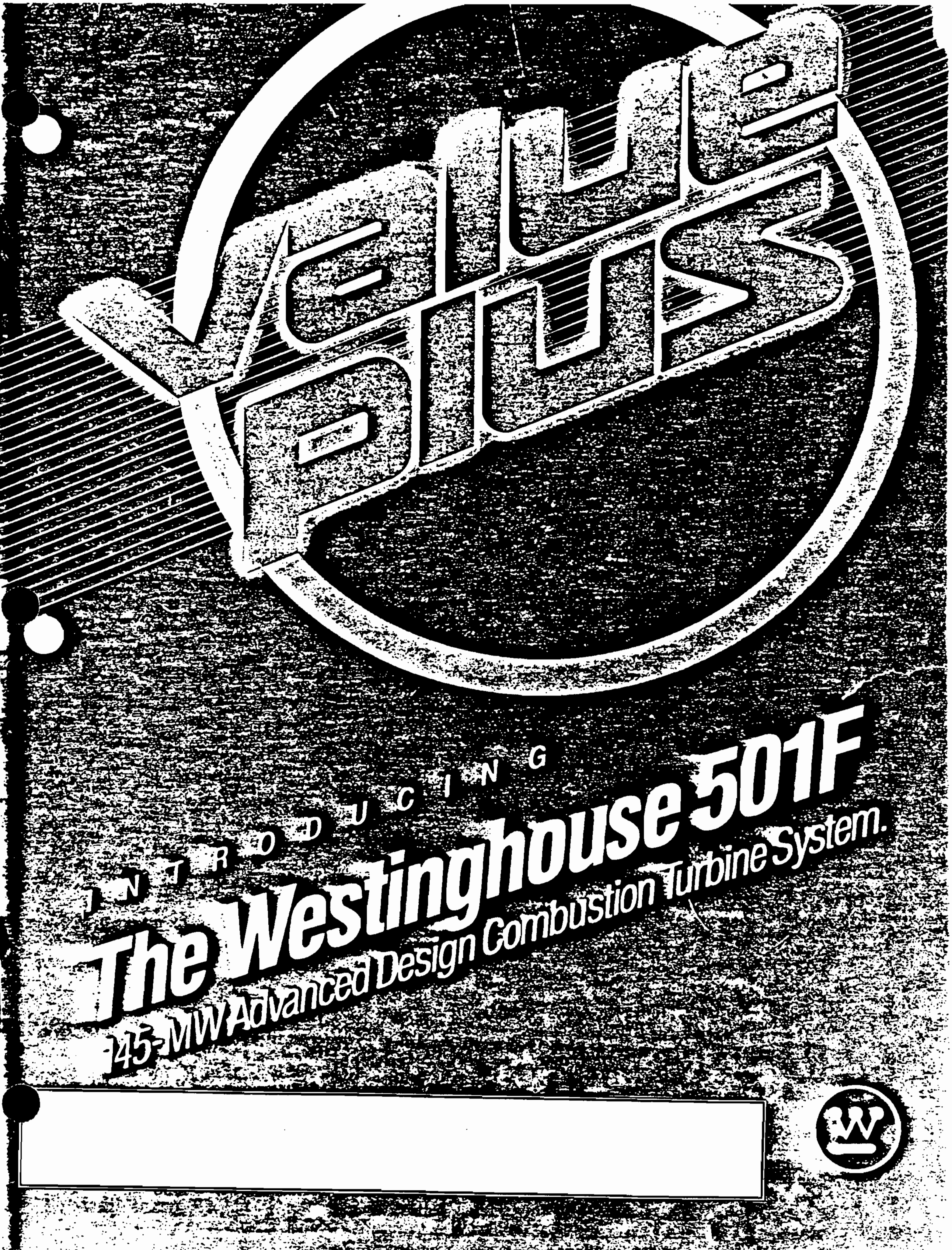
"Please provide manufacturer's literature and specifications for the gas turbines that are being considered for the project."

Response:

As the Martin CG/CC project has not selected a turbine vendor, both General Electric and Westinghouse literature and specifications of their advanced combustion turbines (the 7F and 501F, respectively) are attached for your information as Exhibit DER-5.

Exhibit DER-5

Advanced Combustion Turbine Vendor Information


Value
Plus
INTRODUCING
The Westinghouse 501F
145-MW Advanced Design Combustion Turbine System.

The 501F: The New Value in Power Generation

The power generation industry has shifted its focus to capacity additions in small increments and on short schedules—highly efficient and reliable power plants, capable of flexibility in application, siting and fuel use.

In response, Westinghouse has developed a new approach to combustion turbine power generation, an approach we call Value Plus, and a new Westinghouse combustion turbine product, the 501F.

The Value Plus approach combines the experience and strengths of Westinghouse Electric Corporation and Mitsubishi Heavy Industries, to provide superior combustion turbine products and services. Value Plus also means even greater responsiveness to customers' needs: short lead times, flexible scopes, multiple applications.

The new 501F advanced combustion turbine provides Value Plus through:

- Increased efficiency and capacity
- Advanced cooling technology
- Low NO_X emissions control
- Fuel flexibility
- Reliable design for multiple applications

▶ The 501F Setting New Standards in Efficiency

The 501F achieves a new level in combustion turbine efficiency by combining proven features with the most recent engineering advancements. When operating on natural gas, the 501F has a nominal output of 145 MW with simple cycle efficiency exceeding 34%. In combined cycle applications, the 501F can achieve an overall plant efficiency over 50% in power blocks from 210 MW.

501F Simple Cycle Performance*

Rating:	145 MW
Heat Rate:	10,000 BTU/KWH
Exhaust Flow:	932 LB/SEC
Exhaust Temp:	1061°F

**ISO conditions, natural gas, packaged plant.*

▶ The 501F Advanced Cooling Technology

The key to greater thermal efficiency and power capacity is increasing the turbine's capability to handle higher firing temperatures. The 501F achieves these increases in efficiency without compromising durability through the application of advanced cooling technologies. This allows the 501F to accommodate a turbine inlet temperature of 2300°F while maintaining critical component temperatures at or below levels proven to give long service life.

▶ The 501F New Technology for Emission Control

Our experience in emission control provided the basis for the innovative technology developed for the 501F. The new 501F design is based on a proven low NO_X hybrid combustion system that has met the stringent emission requirements of Japan since 1984. This system will reduce the need for steam or water injection for NO_X control.

▶ The 501F Fuel Flexibility

Building on previous Westinghouse experience, the 501F is compatible with natural gas, distillate oil, coal-derived gases and many other fuels.

▶ The 501F For Multiple Applications

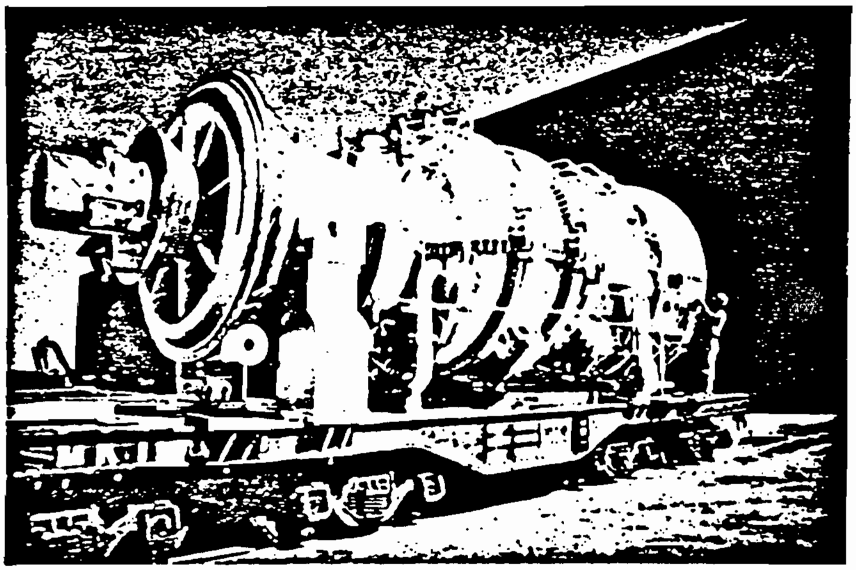
Westinghouse is packaging the 501F into several power systems to meet many applications—from simple and combined cycles to cogeneration and repowering.

The 501F: Combining Proven Technologies for Superior Performance-That's Value Plus

The 501F is the result of an accumulation of experience from proven combustion turbine models:

- W501D, the culmination of 20 years of design evolution
- MF111, which introduced the latest cooling technologies into heavy duty combustion turbines
- MW701D, a well proven 50-Hz, 125-MW adaption of the W501D design that has demonstrated a low NO_X hybrid combustor

Each has contributed to the Value Plus of the 501F.

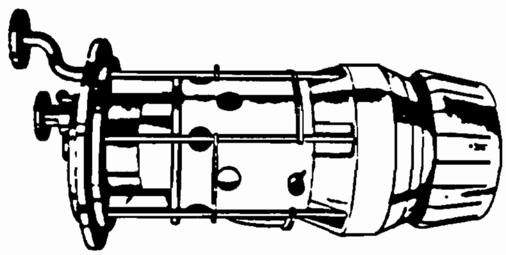


▶ *Demonstrated Reliability*

On the basis of years of demonstrated performance, several standard Westinghouse design features found in the 100-MW W501D are included in the 501F. Cold-end drive, two-bearing support and axial exhaust are major contributors to reliability and flexibility in the 501F. In addition, the advanced cooling technology of the 501F results in no increase in blade-path metal temperatures over that of the W501D—temperatures proven for reliability and extended life.

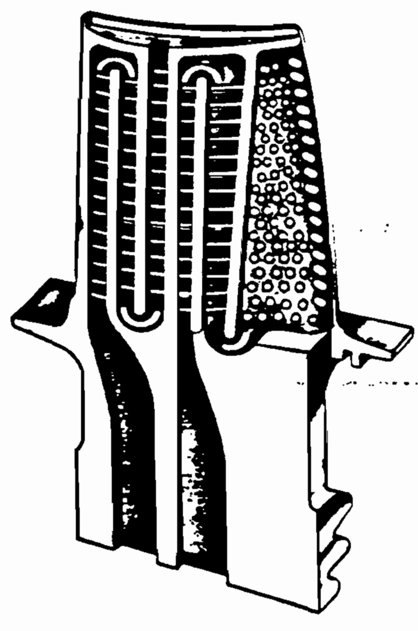
▶ *Low NO_X Combustor*

Since 1984, the MW701D has produced exhaust NO_X emissions below current EPA standards through an advanced low NO_X hybrid combustor with no steam or water injection. It features a two element design: a main lean pre-mix combustor and a pilot burner for flame stability.

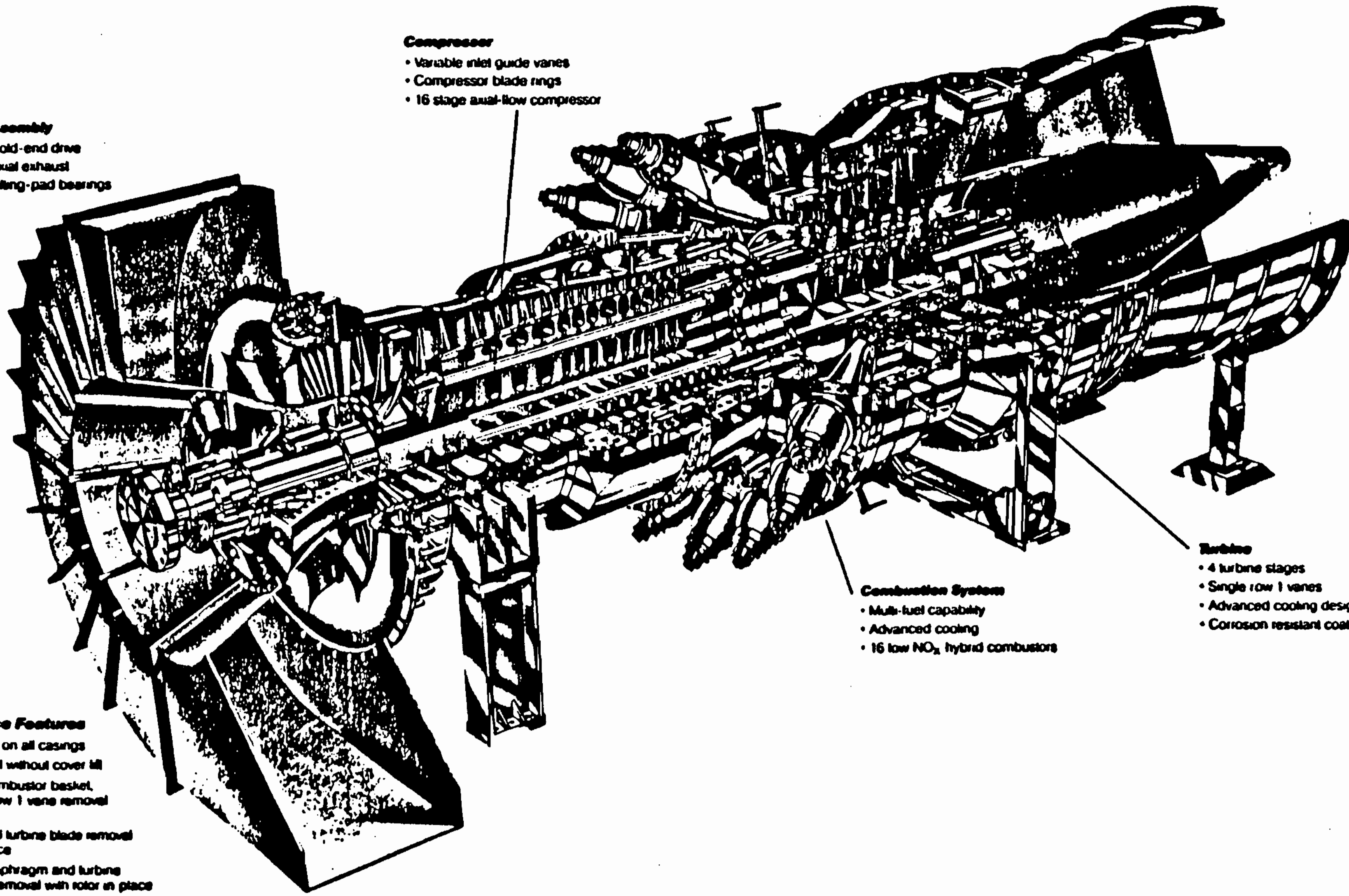


▶ *Advanced Cooling Technologies*

The advanced cooling technologies of the 501F were first successfully used in the MF111. This 14-MW combustion turbine was developed and tested in the early 1980s. Several MF111 units are now in commercial operation.



The 501F: 145-MW Advanced Design Combustion Turbine



▶ Maintenance Features

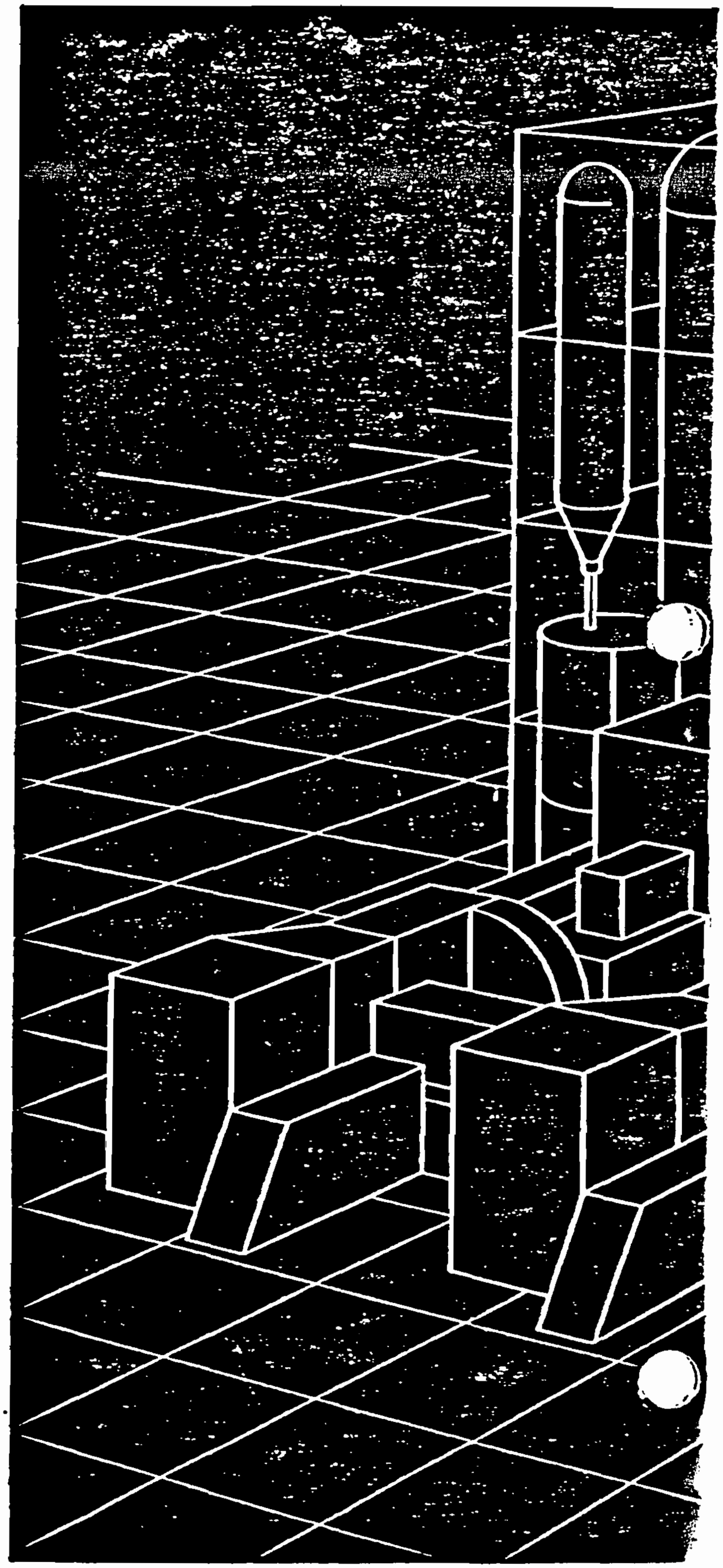
- Horizontal joints on all casings
- Bearing removal without cover lift
- Manways for combustor basket, transition and row 1 vane removal without cover lift
- Compressor and turbine blade removal with rotor in place
- Compressor diaphragm and turbine vane segment removal with rotor in place
- Ports for borescopic inspection

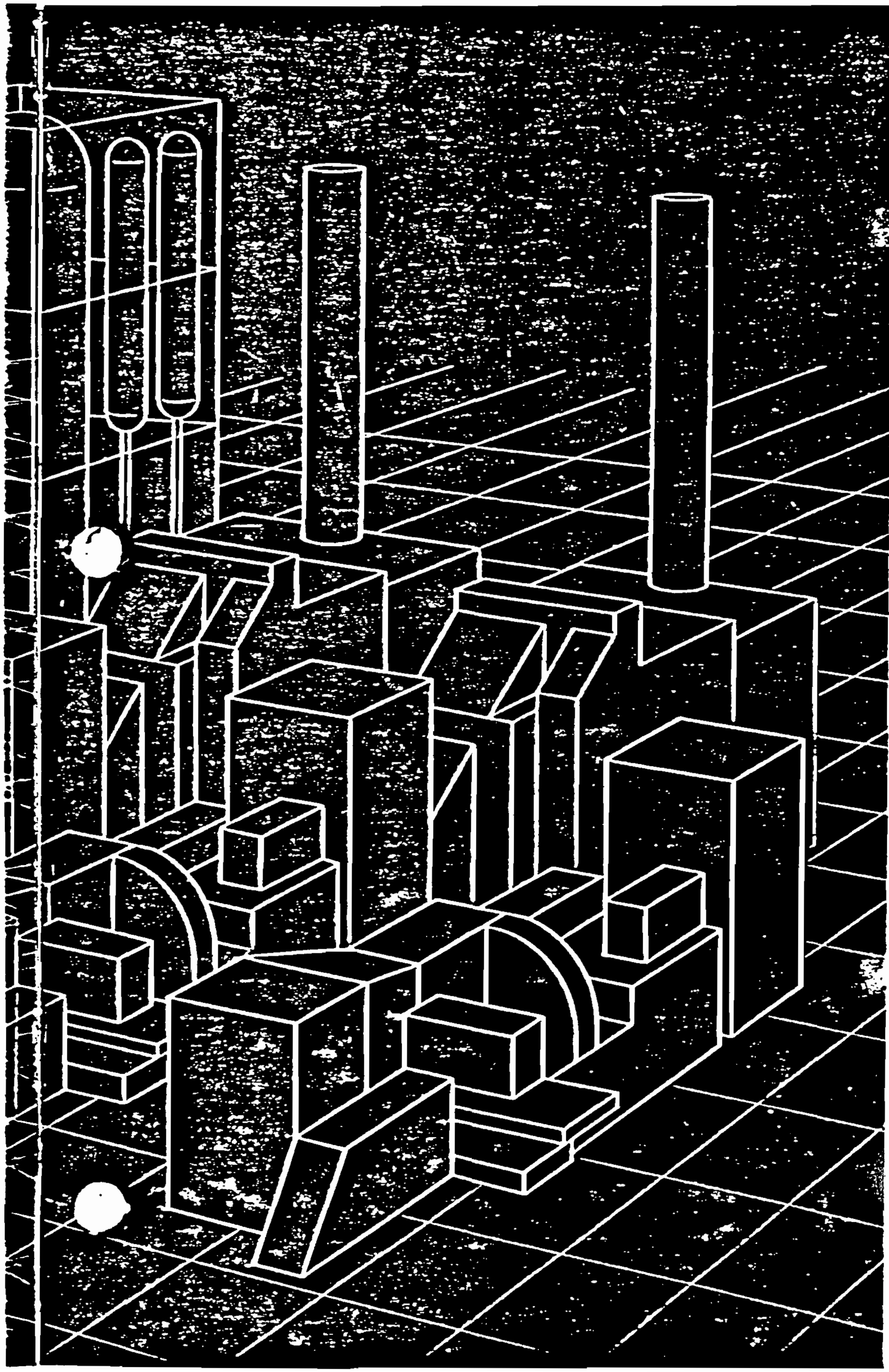
The 501F: *Planning Flexibility Means Value Plus*

Regardless of the application, the 501F combustion turbine is the basic building block for a wide variety of highly efficient and economical power generation systems.

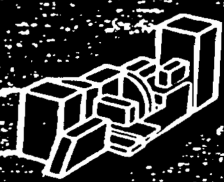
Whether applied in a simple or combined cycle configuration, the 501F offers distinct design advantages for superior performance, versatility in fuel usage and site adaptability. In a wide range of applications, the 501F offers planning flexibility and can be the economic choice for power generation.

Fuel versatility, site adaptability and application flexibility extend the 501F as the Value Plus choice for cogeneration and repowering.

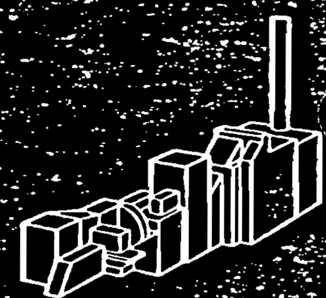




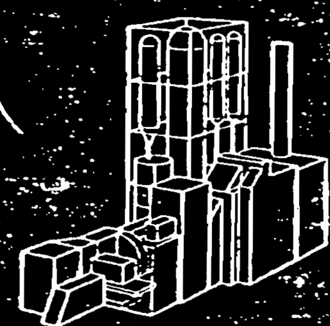
Phased Installation



Simple Cycle
- > 34% thermal efficiency
- convertible to combined cycle



Combined Cycle
- power blocks from 210 MW
- > 50% thermal efficiencies
- convertible to coal gas

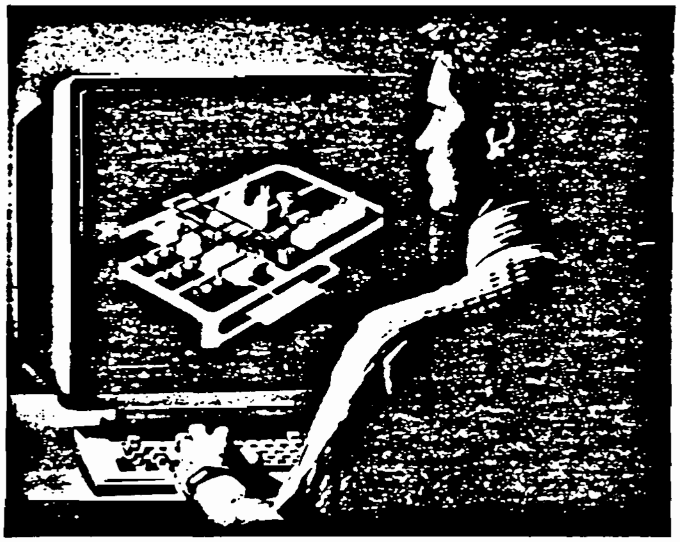


Coal Gas
- high efficiency
- low emissions
- reduced water requirements
- economic alternative

The 501F: Put Value Plus Into Your Power Project

▶ *Project Bankability*

The key to making a project a reality is making it financially feasible. That's where Westinghouse can make the difference. Through creative financing, innovative project structures, or equity participation, Westinghouse can help develop reliable power projects.



▶ *Total Project Responsibility*

Westinghouse can assume total project responsibility. Westinghouse has over 40 years experience in successfully managing complex power projects of all scopes and sizes. From extended scope to total turnkey management, Westinghouse has consistently demonstrated the project management capability essential for meeting the schedule and performance demands of an on-time project.

▶ *Strong Project Teams*

Successful projects are developed by strong teams. Westinghouse can form such teams by assembling the participants that best suit a project's needs. From electric utilities and industrial cogenerators to architect and engineers and project developers, Westinghouse can put together the right participants for the right power project.

▶ *Westinghouse. Meeting Your Power Generation Needs*

Through the Value Plus approach and the new 501F advanced combustion turbine, Westinghouse is fully prepared to respond to your current and future power generation needs. With Westinghouse, ***you can be sure*** of high-performance technology, fuel and application flexibility, and the customer responsiveness you've come to expect.

Value Plus—Westinghouse technology, project development and management expertise, flexible scopes, and innovative financing.

Value Plus—Mitsubishi's proven manufacturing quality and extensive test facilities.

Value Plus—Efficiency. Quality. Reliability. Performance. Bankability.

You can be sure... if it's Westinghouse

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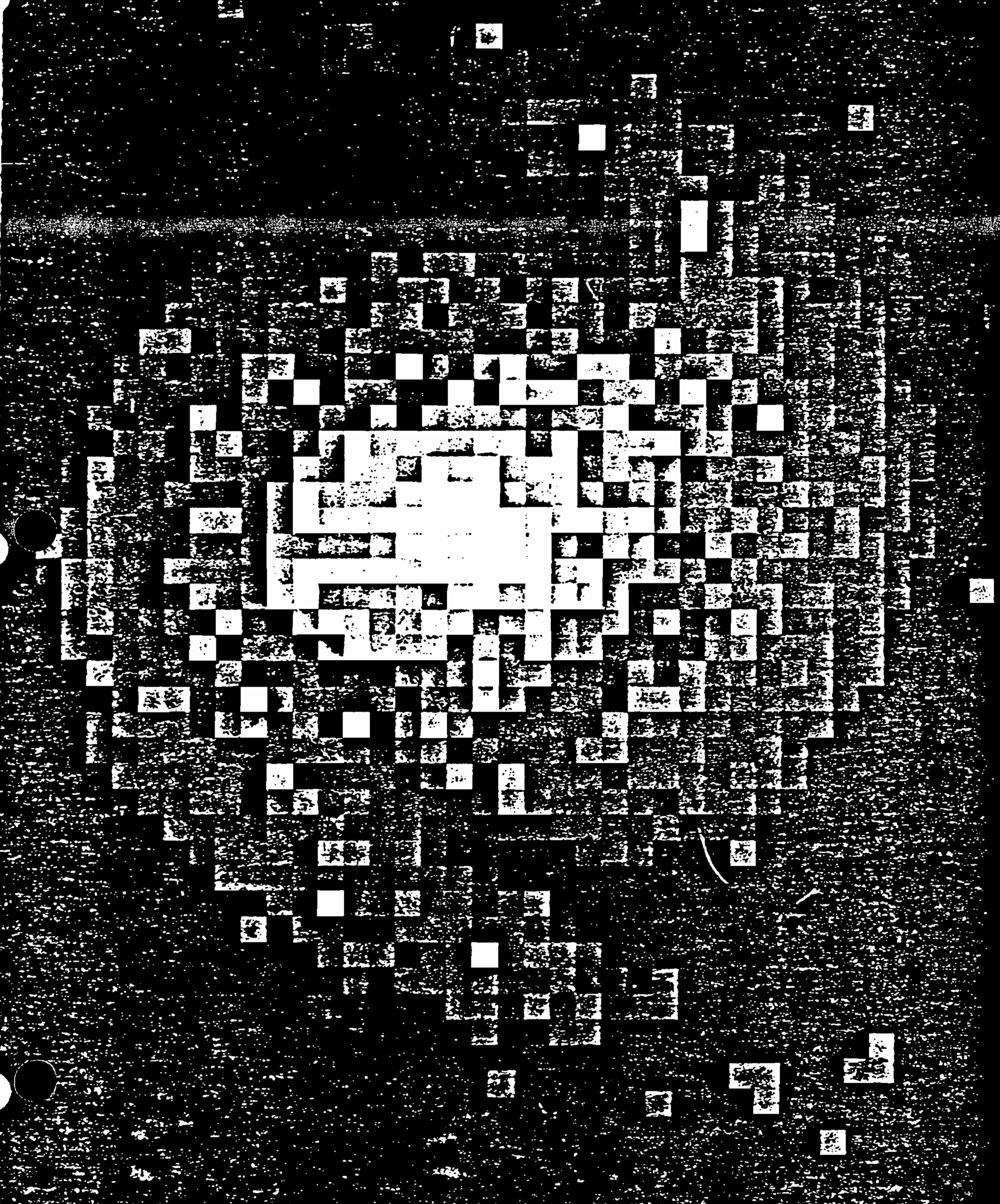
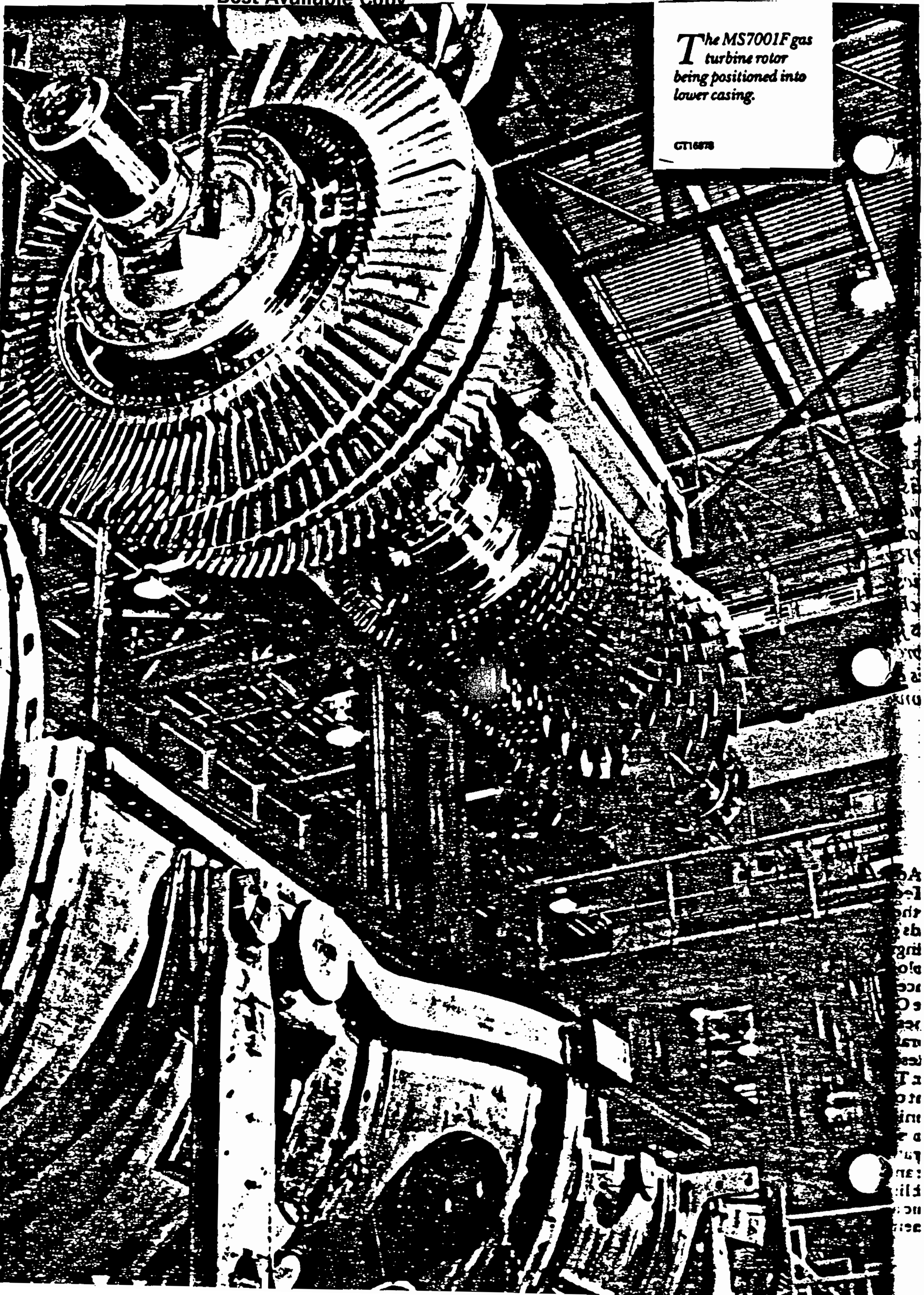
MS7001F ADVANCED DESIGN GAS TURBINE

New flexibility in power generation





The MS7001F gas turbine rotor being positioned into lower casing.

GT16878

THE WORLD'S MOST ADVANCED GAS TURBINE 7F

In every respect — output, efficiency, reliability, availability and ease of maintenance — the new MS7001F heavy-duty gas turbine outperforms all previous machines. Projections of 98% reliability, 95% availability, 3000 hours mean time between failures (MTBF) and in excess of 50% cycle efficiency in combined-cycle operation dramatically underscore its inherent superiority.

Nominally rated at 140 MW with a firing temperature of 2300°F, the 7F gas turbine has been designed to meet 60Hz power generation needs for reliable, efficient performance under peaking and baseload operation while utilizing a wide variety of fuel options.

The 7F gas turbine is designed to operate efficiently on natural gas, distillate fuel, or the medium-Btu gas fuel provided in the IGCC mode of installation. As a result, it is the ideal machine to make phased capacity additions — the progressive generation (PROGEN™) concept — realistically viable for electric utilities. The 7F machine is also the most efficient and cost-effective choice for large industrial systems. It provides opportunities for increased economic benefits in industries such as chemical processing, petrochemical refining and oil recovery, where there is a demand for large amounts of thermal energy in conjunction with power generation.

Significant Advances In Turbine Technology

To achieve the higher performance standards of the 7F gas turbine, GE engineers utilized major technological advances based on concepts tested and proven in the Company's aircraft engine business, heavy-duty gas turbine laboratories, and the GE Corporate Research and Development Center. These include the development of advanced cooling techniques; special high-strength alloys and improved high-temperature coatings; and component and system dynamic testing, enabling extensive aerodynamic and mechanical design refinements.

Primary areas of new design are in the axial-flow compressor; the multi-fuel-nozzle combustors; the first-stage nozzle and buckets; the off-base accessory arrangement; and the front-end drive which allows the use of an axial exhaust to enhance heat recovery applications.

Increased Output, Higher Efficiency

The new 7F machine's advanced efficiency will yield significant fuel savings over the life of the unit. In addition, reliability is extremely high due to its designed-in capability to permit maintenance and repair while the machine is running. For example, the off-base accessory skids incorporate redundant components arranged to facilitate replacement of parts without shutting down the unit or inhibiting its ability to carry a full load. The design of the entire 7F gas turbine, including the accessories, focuses on enhanced visual inspection and ease of maintenance.

ptimal Performance With
ld-On Capability

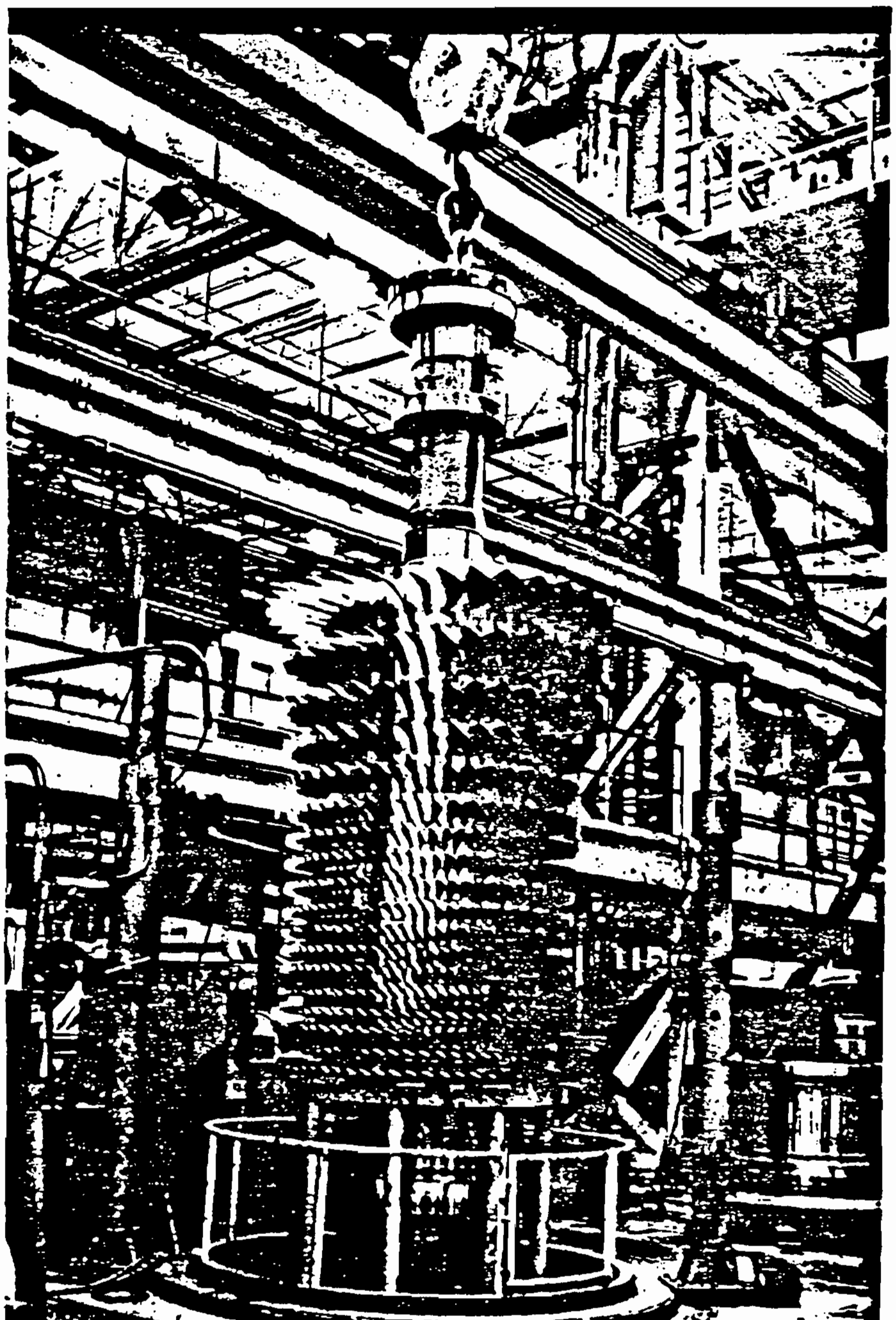
The MS7001F is GE's first major ·w combustion design since 80. Five years in development ıd pretest, it is based upon inciples proven during the ·sign and manufacture of over 000 GE combustion turbines . successful operation around ie world.

The new 7F turbine is the first achine to effectively close the op on the flexible PROGEN lanning option of progressive ıpacity addition over a period f years with operation in three ıodes: Simple-cycle; Combined-ycle; and Integrated Gasification ombined-Cycle.

In simple-cycle applications sing natural gas as fuel, the 7F is ominally rated at 140 MW with a iring temperature of 2300°F and n exhaust temperature of 1100°F. n combined-cycle operation urning natural gas, the total plant utput is in excess of 200 MW. At 100°F, the exhaust temperature s high enough to justify a reheat team cycle. Thus, the 7F is a cost-ffective machine for peaking ervice, with the added capability o provide major fuel savings n baseload combined-cycle operations. Further, the machine will operate effectively on the medium-Btu gas derived from coal in an integrated gasification combined-cycle (IGCC) mode. The availability of the advanced-design MS7001F turbine with modular add-on capability increases flexibility and reduces investment risk in meeting power generation needs into the next century.

The MS7001F rotor is of experience-proven bolted disk and shaft construction and consists of two major sections: the compressor and the turbine. The compressor rotor with its 18 bladed disks is ready for assembly to the 3-stage turbine.

GT17090



RELIABLE SIMPLE-CYCLE OPERATION

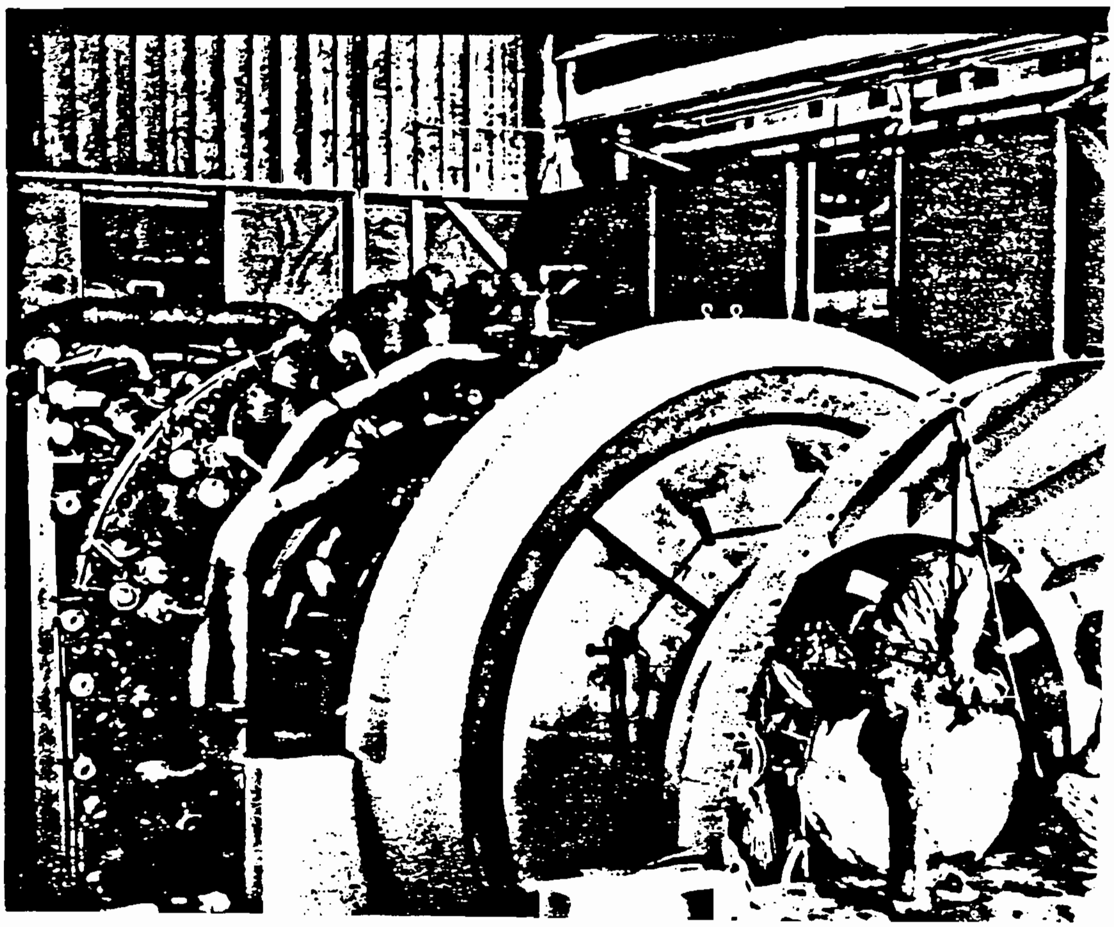
With 70% higher output than the proven MS7001E, the 7F gas turbine is the one machine that can best provide the additional power needed to meet peak demands expeditiously and economically.

The increase in efficiency of a full two percentage points over the former design represents potential savings of literally millions of dollars in operating economies. For example, when installed in simple-cycle mode to serve peaking needs, a 7F gas turbine can potentially save 5200 barrels of oil or 28 million cubic feet of gas each year over the projected 25-year service life of the machine.

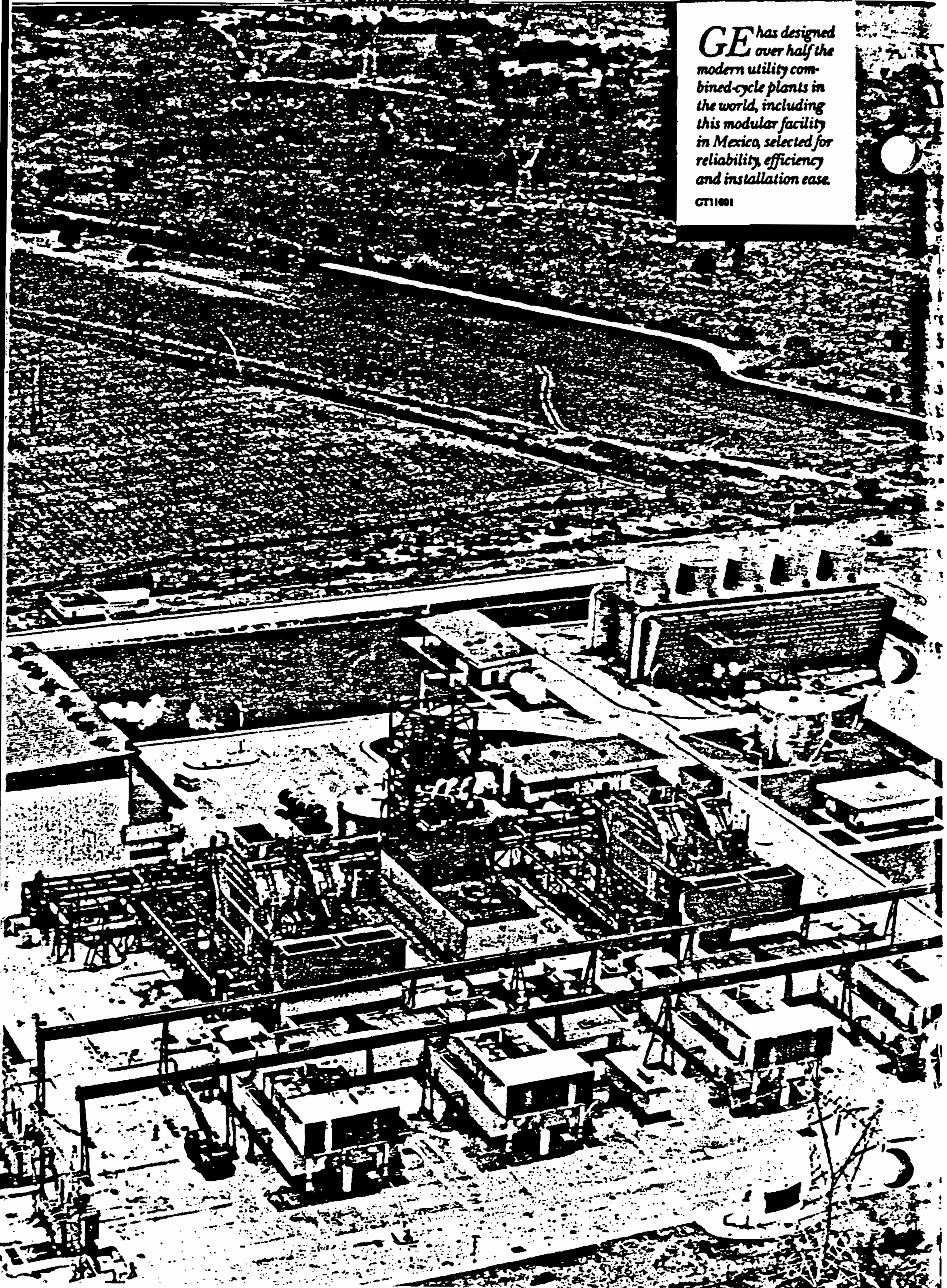
In addition to higher efficiency, the 7F machine provides greatly improved reliability due to the redundant design of the controls and accessories systems as well as the auxiliary power supply.

The 7F machine provides the opportunity to add large blocks of power relatively fast. GE will be able to build and erect a 7F simple-cycle plant and have it operating to meet demand within 24 months from date of order.

GT17119



All components of the MS7001F gas turbine were extensively tested during development. Testing of the first production unit began in the spring of 1987.



GE has designed over half the modern utility combined-cycle plants in the world, including this modular facility in Mexico, selected for reliability, efficiency and installation ease.

CT11691

Best Available Copy

EFFICIENT COMBINED-CYCLE OPERATION

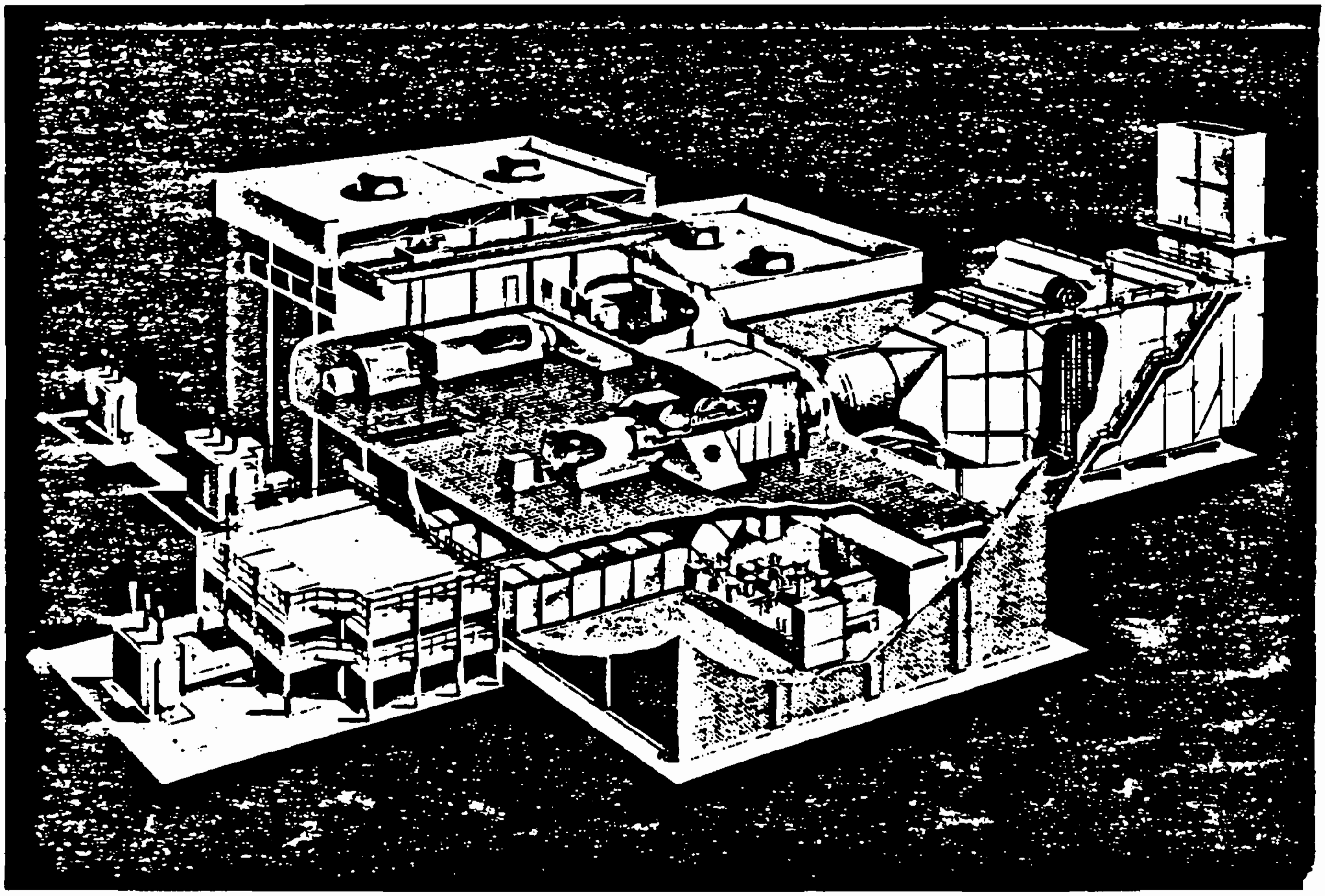
Because of its higher firing temperature and its higher exhaust temperature (1100°F), the 7F machine produces higher rated steam conditions. When the exhaust is passed through a heat recovery steam generator to power a steam turbine generator in the combined-cycle mode, fuel-to-electric-output energy efficiency exceeding 50% (LHV) is viable for the first time.

The front-end-drive design and axial exhaust configuration of the 7F turbine are ideally suited to in-line plant arrangement for simple- or combined-cycle operation, with the benefit of eliminating an elbow section upstream of the boiler.

In addition — like other GE gas turbines in over 56 combined-cycle plants worldwide — the 7F machine is designed to be environmentally clean. The combustion system has outstanding smoke characteristics and exceptional emissions performance. Water or steam is used to control NO_x to a level consistent with U.S. EPA New Source Performance Standards and with most California Air Quality Management District requirements. Installed in combined-cycle mode for mid-range to baseload operation, the 7F gas turbine will operate with a clear stack and at emission levels that can meet the most stringent pollution control standards.

Virginia Power Company is installing the first 7F gas turbine in combined-cycle operation. In addition to high efficiency and low capital costs, the utility cites turnkey construction and warranted performance by GE as major factors in selecting the 7F machine.

GT16512



PROVEN IGCC OPERATION

The 7F gas turbine inherently has the capability to efficiently utilize the medium-Btu gas produced in coal gasification systems. This fuel flexibility is a major advantage of the 7F machine, giving utilities the option of adding gasification equipment in the future as the third and final step in the PROGEN system concept. With coal being the most abundant fossil energy resource in the United States, this capability provides inherent protection against fluctuations in fuel availability and price.

As a participating partner in the Cool Water Coal Gasification Project near Daggett, California, GE has been instrumental in demonstrating the practicality of producing power cleanly and efficiently with gasified coal as a fuel. The nation's first commercial coal gasification plant, Cool Water began operation in June 1984, producing clean synthesis gas from 1000 tons of coal each day to generate up to 120 megawatts of electricity.

The experience gained in this pioneering project sponsored by the Electric Power Research Institute puts GE in the optimal position to assist in long-term IGCC power plant planning, installation and operation.

This 100 MW combined-cycle power plant located in southern California burns clean gas derived from a coal gasification process.

GT11300

ADVANCED DESIGN FEATURES

Significant advances in all elements of gas turbine design technologies have been made in recent years. These developments have made feasible the design of the new MS7001F heavy-duty gas turbine, while maintaining the design life standards of the experience-proven MS7001E machine.

Higher Firing Temperature

The firing temperature of the 7F gas turbine has been elevated from MS7001E's 2020 °F to 2300 °F, permitting the achievement of a 2 % increase in efficiency and a 70 % increase in output.

New Cooling Techniques

To accommodate the higher firing temperature, the 7F turbine employs advanced cooling techniques developed by GE for aircraft engines.

The first- and second-stage buckets of the MS7001F as well as all three nozzle stages are air-cooled. The first-stage bucket is convectively cooled by means of serpentine passages with turbulence promoters that are formed during the casting process. The cooling air leaves the bucket through holes in the tip as well as in the trailing edge.

New Combustion Liner Design

The MS7001F combustion system consists of 14 combustion chambers with 14-inch nominal diameter combustion liners. These liners are constructed in a manner similar to the liners used in the MS7001E gas turbine, except they are 30 % thicker and over eight inches shorter. This new design provides for extensive and effective impingement cooling of the liner wall with the higher firing temperature.

The liner cap incorporates six fuel nozzles. This reduces both noise and combustion wear, extending combustion inspection intervals beyond those associated with single-fuel-nozzle combustors.

Additionally, the multi-fuel nozzle concept results in a shorter flame which contributes to the overall 7F combustion system (including the transition piece) being 23 inches shorter than the MS7001E system.

New Compressor Design

The MS7001F compressor's aerodynamic and mechanical design closely follows that of the 17-stage MS7001E (633 lb./sec., 3600 rpm), but with an added zero stage and increased annulus area. The first two stages of the 7F compressor have been designed for operation in transonic flow, eliminating the need for variable stators for surge control. The 7F compressor contains three exit guide vane rows to straighten out the flow leaving the compressor and enhance its performance.

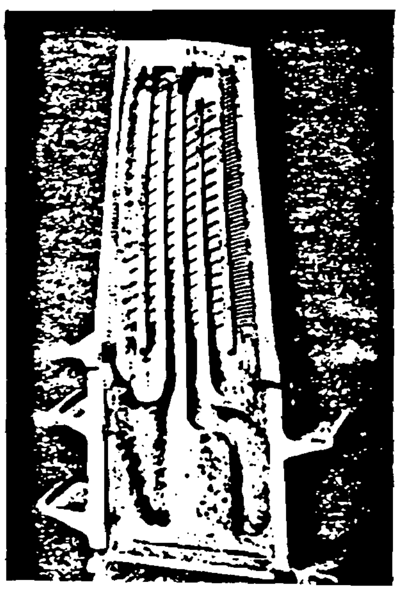
New Turbine Design

The 7F turbine features an effective aerodynamic design with zero exit swirl at full load and a moderate exit Mach number. To facilitate combustion inspection, two large manways are designed into the turbine shell. By means of these enlarged openings in the combustor bulkhead, each combustion chamber can be serviced without affecting the adjacent chambers.

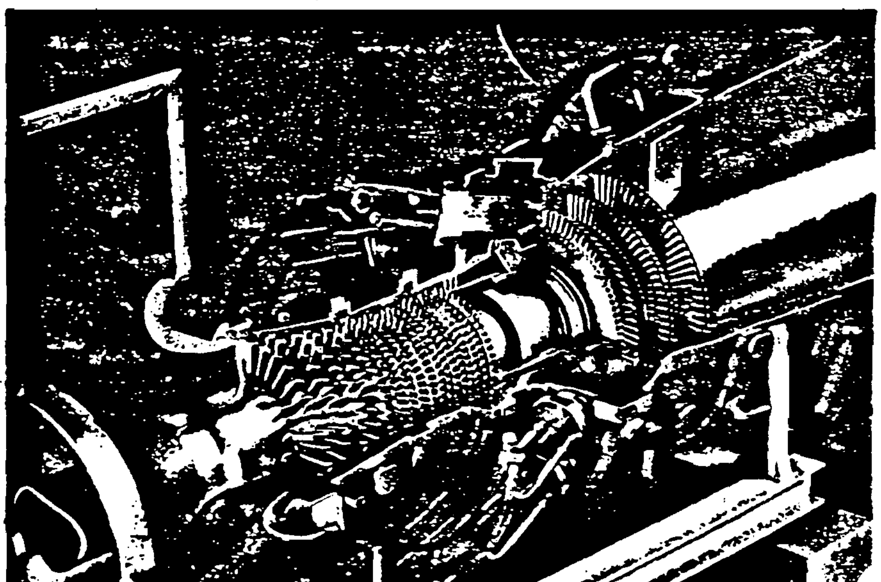
Proven Generator Design

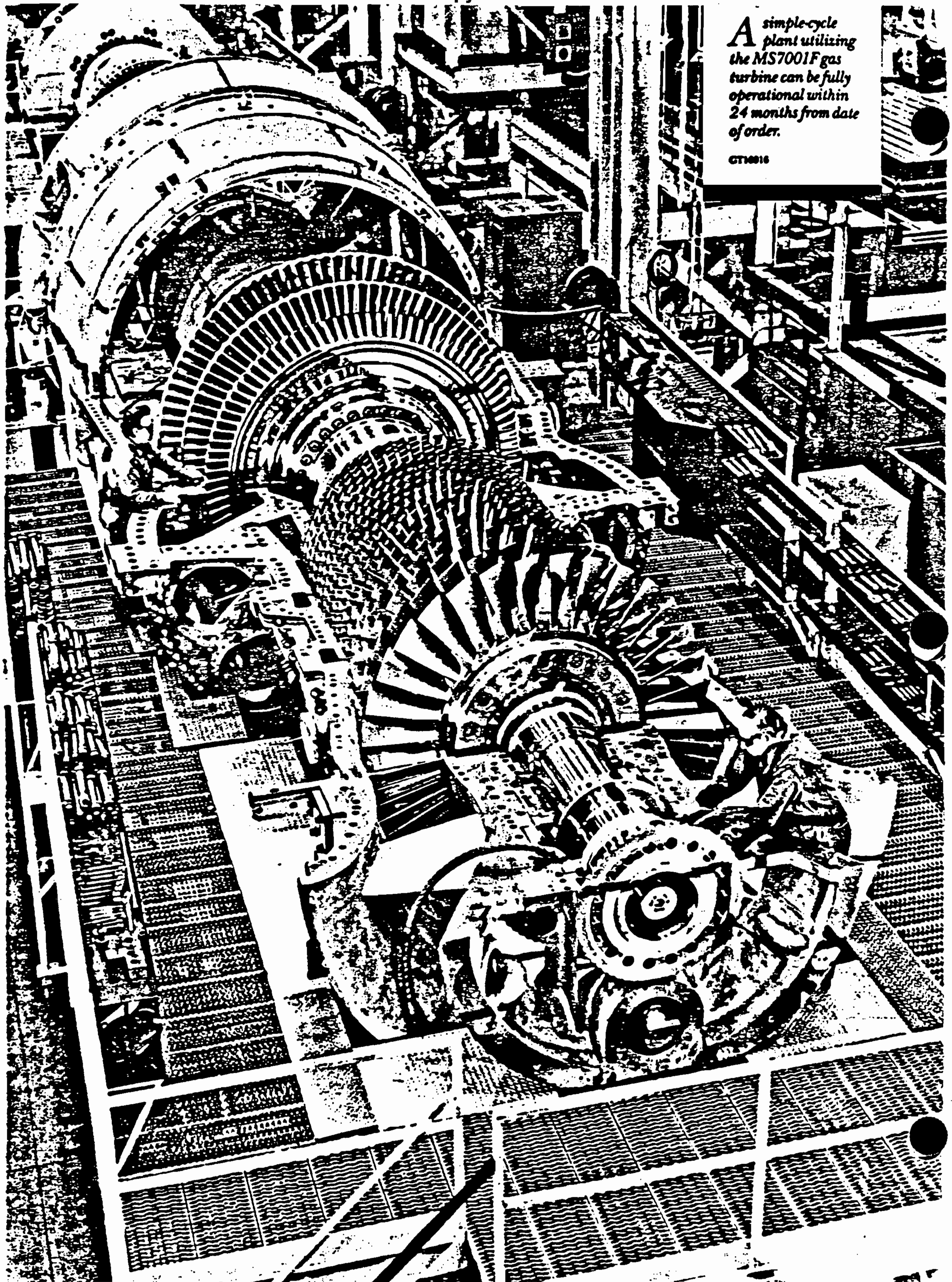
The 3600 rpm hydrogen-cooled generator utilizes an experience-proven design incorporating completely self-contained ventilation systems to protect against dirt, moisture and other contaminants. The high initial response of the static excitation system minimizes voltage fluctuations. No moving parts are required, resulting in high machine reliability.

GT12441



GT17274

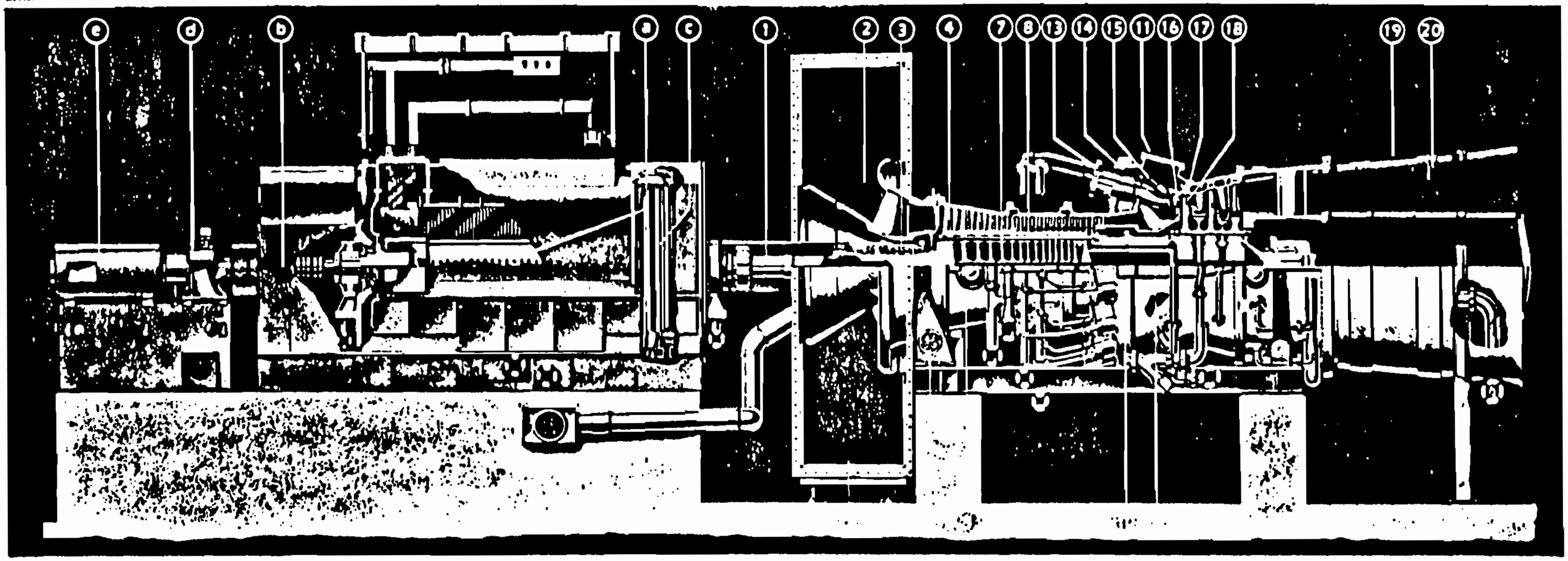




A simple-cycle plant utilizing the MS7001F gas turbine can be fully operational within 24 months from date of order.

GT16016

THE MS7001F ADVANCED TECHNOLOGY HEAVY-DUTY GAS TURBINE



Compressor

(1) Load Coupling — Short, rigid coupling directly connected to generator coupling. **(2) Axial/Radial Inlet Casing** — Proven design provides uniform inlet flow to compressor. **(3) Journal Bearings** — Bearings are tilting-pad type for improved rotor stability. **(4) Compressor Blading** — Evolution from 7E compressor with a zero stage added. Blade lengths increased for added flow. Blade material has been upgraded. **(5) Compressor Design** — Based on proven axial-flow design. Casing material upgraded to accommodate higher temperature and pressures. **(6) Rigid Forward Support** — In combination with the forward thrust bearing, limits thermal expansion of gas turbine into generator.

(7) Wheel Construction — Machined to nearly constant stress cross-section with contact faces at maximum diameter for high rotor stiffness. **(8) Through-Bolt Construction** — Large bolts at maximum bolt circle provide rigid rotor with required torque capability for front-end drive.

Turbine Stator Casings

(9) Horizontally Split — All casings split on horizontal centerline with through-bolting to facilitate maintenance.

Combustion System

(10) Combustor Bulkhead — Combustor outer cans attached over elongated holes in combustor bulkhead to permit removal of transition piece without lifting turbine shell. **(11) Top and Bottom Manway Access** — Permits an alternate way for removing the transition piece and Stage 1 nozzle without lifting turbine shell. **(12) Inlet Orientation** — Available in up, down or side arrangement. **(13) Fuel Distribution** — Single fuel line connection for each combustor end cover. **(14) Reverse Flow Combustion Chambers** — Supplement the impingement- and film-cooling of the liners and transition pieces, prolonging parts life. **(15) Impingement-Cooled Transition Piece** — Separate perforated shield around transition piece causes compressor discharge air to impinge on and effectively cool the transition piece.

Turbine

(16) Nozzle Design — Sidewalls and internal surfaces of vanes impingement-cooled with compressor discharge air. **(17) Stage 1 Stationary Shroud Design** — Gas path insert of high-temperature alloy, extensively impingement- and film-cooled and coated for maintenance of tight clearances with the Stage 1 bucket tip. **(18) Bucket Design** — Stage 1 bucket uses a turbulated serpentine-cooled design with trailing edge bleed cooling, based on aircraft engine technology. Stage 2 uses turbulated radial cooling holes. Stage 3 is uncooled. Stages 2 and 3 have integral Z-lock shrouds for vibration control, and all three stages have long shanks for vibration control and isolation of gas-path temperatures from the turbine wheels.

Exhaust

(19) Exhaust Diffuser — Straight axial (permitted by front-end drive) is insulated for thermal stability and reduced heat loss from exhaust before entering heat recovery system. **(20) Exhaust Thermocouples** — Three sets of 9 thermocouples each supply signals to each of the three SPEEDTRONIC MARK IV computers. The thermocouples are used for control and also for monitoring the combustion system.

Generator

(a) Hydrogen Cooled Generator — Experience-proven design incorporates completely self-contained ventilation system to protect against dirt, moisture and other contaminants. Generator operates at 3600 rpm. **(b) Static Exciter** — The high initial response will minimize voltage fluctuations during system disturbances. Static excitation system has no bearings or other moving parts, resulting in high machine reliability. **(c) Hydrogen Cooler** — Hydrogen has a thermal conductivity of nearly seven times that of air, and its ability to transfer heat through forced convection is about 50% better than that of air. Also with hydrogen cooling, there is practically no deterioration of the stator winding insulation because of corona. **(d) Torque Converter** — Permits the elimination of a turning gear by acting as a hydraulic turning device during cooldown. **(e) Starting Motor** — 2200 hp motor connected to the generator collector end provides normal total start cycle of 30 minutes to baseload.

ACCESSORY SYSTEM AND CONTROLS

7F

Each of the major accessory systems of the MS7001F gas turbine is designed to be installed on a separate skid utilizing electric-driven auxiliaries. This greatly improves crane coverage and working space around piping, valves and components. A significant benefit of this arrangement is the ability to utilize redundant components such as fuel and lube oil pumps, fans, filters and heat exchangers. In most cases, individual components can be replaced without the need to remove unassociated piping, wiring or adjacent components.

The roofs of all skids and the turbine enclosure are simply bolted to the side panels, permitting easy removal and overhead access, facilitated by the fact that no equipment is supported from the roof. In addition, all gauges can be conveniently read from outside the skids.

The 7F machine utilizes the advanced SPEEDTRONIC™ MARK IV Control System, consisting of redundant computer sections with a video display and membrane switch operator interface. The system can be enhanced for remote control and condition monitoring by the addition of the DATATRONIC™ Information and Control System.

The SPEEDTRONIC MARK IV Control System utilizes three control sections which are isolated from each other. A fourth computer regulates the data exchange between the three primary control sections. In this way, there is no common tie between the controls that could cause a failure to all the sections at one time.

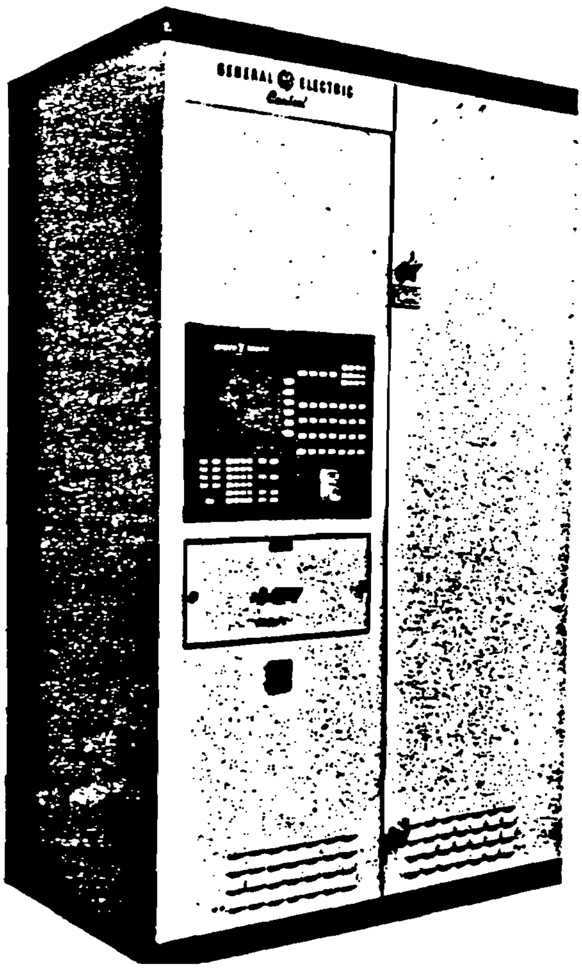
Redundant sensors are included in the system to increase control availability for turbines in applications where sensor failures are more likely and replacement may not be possible while the turbine is operating.

On-line diagnostics locate and identify faults, which can then be isolated and repaired without disruption to the turbine operation.

Failure rates have been reduced by decreasing the number of electronic components directly controlling the turbine. Most failures can be serviced on-line without the system being upset, shut down or tripped.

The 16-bit microprocessors used in the Mark IV Control have greatly reduced the large, complex, costly and less reliable systems required in the past for three-channel redundancy.

GT17285



More than 150 displays can be called up from the SPEEDTRONIC™ MARK IV Control System's memory. A drawer-mounted printer can produce a hard copy of any display. A CRT located right in the center of the control panel provides a broad overview of current operating conditions. A series of membrane switches on a central pad enables the operator to run the turbine and also to select detailed displays to investigate particular conditions of interest.

Comment #6

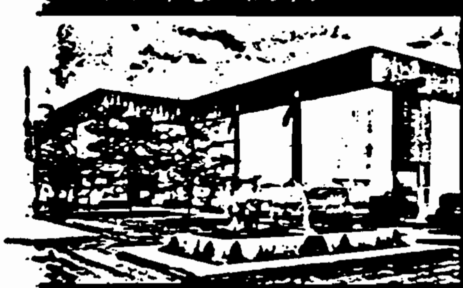
"The non-regulated pollutants antimony, barium, cobalt, radionuclides, zinc, fluorides, and chlorine are identified for gas/oil combustion in the publication 'Control Technologies for Hazardous Air Pollutants.' These pollutants should be addressed as part of the BACT."

Response:

The only viable technology for controlling CT emissions of these pollutants is efficient design/operation of the combustor. By minimizing the amount of fuel fired for each unit of power produced, efficient operation minimizes the emissions of these fuel-bound trace constituents. No other technologies have been applied to CTs for controlling these emissions.

GT16514

The MS7001F Advanced Technology Gas Turbine is built in one of the world's largest and most modern heavy-duty gas turbine plants located in Greenville, South Carolina.



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Much of the extensive developmental work done to make the 7F machine the basic gas turbine for the '90s was done in the Turbine Development Laboratory in Schenectady, NY.

Comment #7

"Application should address the possibility of using 'improved combustors' which are capable of limiting NOx to 25 ppm."

Response:

FPL is committed to selecting an "advanced" combustion turbine (CT) for the Martin project. The "advanced" CTs, which utilize a much higher firing temperature to make them more efficient (more MW out per unit of fuel), are markedly different than conventional CTs which have been previously permitted by regulatory agencies. It has been reported that the conventional CTs can meet a 25 ppm emission limit. However, the "Advanced" CTs, have not demonstrated a lower emission limit operation capability at this time.

As part of its detailed design process, FPL routinely conducts an engineering, contractual, and environmental evaluation of potential equipment. This process requires FPL to use a worst case scenario as stated in various places in the SCA. As part of this selection process for the proposed project, FPL considered the reliability, availability, and maintainability of the design in addition to the cost, energy input/output, and environmental impacts. This evaluation resulted in FPL selecting the best available design which optimizes the balance of all the pertinent criteria.

Comment #8

"There is no indication as to what operating scenario (natural gas, oil, or coal gas) is addressed for SCR NOx control in Table 4-4. The cost of using SCR for NOx control should address the worst case operating scenario."

Response:

As indicated in SCA Section 3.4.3 and PSD application page 85, the cost evaluation is based on natural gas firing. Though the capital costs associated with NO_x controls are not expected to differ for any of the three operating scenarios (natural gas, No. 2 oil, and coal-derived gas firing), operating costs for the natural gas are expected to be less than for the other fuels. Due to its lower heat content and higher combustion temperature, coal-derived gas requires increased steam and ammonia injection requirements (i.e. higher operating costs) to effect the same degree of NO_x control provided for natural gas scenario. No. 2 oil's higher combustion temperature and fuel bound nitrogen content also lead to increased steam/ammonia injection requirements and increased operating costs. By selecting the natural gas firing scenario, the BACT economic analysis demonstrated that a significant disparity between SCR and steam injection NO_x control costs exists even when considering the lowest cost operating scenario.

Comment #9

"Provide basis for using capital recovery factor with 12 percent interest over 30 years for annualized capital cost in Table 4-4."

Response:

These figures represent FPL's weighted average incremental cost of capital and are applied in all long-term financial studies. They were utilized in both the Annual Planning Hearing (APH) and the Petition to Determine Need for Electrical Power Plant 1993 - 1996 (November 1989, Table III.D.1).

Comment #10

"Provide basis for using levelizing factor with 12 percent interest, 30 years, and 5 percent escalation rate for levelized annual cost in Table 4-4."

Response:

See response to DER Comment #9.

Comment #11

"BACT for controlling sulfur dioxide emissions from the combined cycle units should address the economics of using venturi scrubbing and low sulfur fuel oil (<0.3%) as was required for the Cool Water and Chesterfield Power facilities, respectively."

Response:

The only reliable way FPL can commit to supplying this low sulfur fuel oil at this time is to purchase and supply GT-1 fuel oil (No. 1 Fuel oil), which is basically kerosene or Jet A fuel. This fuel would carry a typical cost premium of $0.05 per gallon ($2.10 per barrel). The economic impact of this can be calculated by multiplying the expected oil consumption per year for these units by this cost differential.

It would be difficult, at this time, to estimate the cost and economic impact of some of the other options, such as the cargo lot (approx. 200,000 bbl.) purchase of "low sulfur" No. 2 fuel oil and the carrying cost FPL would incur. The reason for this is that no producer handles this fuel as a routine commodity and thus, there is no price history available from which to determine its probable cost.

The Martin BACT limited its evaluations to viable, effective control technologies. Venturi scrubber control of SO_2 emissions from the firing of No. 2 oil in the proposed combustion turbines was not addressed because it is a self limiting technology which requires a resource of limited availability (ground water) and offers a low control efficiency. The flue gas particulate loading from combustion of No. 2 oil is minimal and is not sufficiently alkaline to promote neutralization of water used in the venturi scrubber. Thus, water applied to the flue gas stream quickly becomes acidic which limits its ability to continue to absorb SO_2. The resulting SO_2 control efficiency is probably less than 20%. To effect this limited control of SO_2, the venturi scrubber will consumptively use additional ground water.

Given the minimal effectiveness of this control technology, together with the fact that it represents an additional consumptive use of groundwater, an economic evaluation of venturi scrubbing does not appear warranted. According to Chesterfield and Cool Water representatives, the issue of venturi scrubbing for SO_2 when firing No. 2 fuel oil in the combustion turbine was not addressed in determination of BACT for these facilities.

Comment #12

"Once the gasification phase is completed do you anticipate the turbines will operate entirely on coal-derived gas?"

Response:

Under the design operating conditions, during periods where coal-derived gas proves to be the lowest cost fuel when compared to natural gas and No. 2 fuel oil, the Martin combined cycle Units 3-6 could operate entirely on coal-derived gas.

Regularly scheduled gasification unit maintenance outages and the fluctuating market prices and availability of coal, natural gas, and No. 2 oil will likely produce an operating scenario which utilizes all three fuels in an effort to provide cost-effective reliable electric power service.

Comment #13

"Provide response to EPA Region IV's comments regarding BACT (copy of letter attached)."

<u>Response</u>:

The EPA offered comments to the FDER on the SCA in a letter dated February 2, 1990. In this letter, EPA presented several issues related to the application of selective catalytic reduction (SCR) on the Martin CG/CC Project. This section presents responses and additional information on various topics related to SCR that were presented in the EPA letter. For continuity, the response is generally organized according to the requirements of evaluating BACT, i.e. technical feasibility, economic, environmental and energy impacts.

<u>Technical Feasibility</u>

The EPA suggests that SCR may be technically feasible for the Martin Project for three reasons:

1. Non-hazardous catalysts are available that do not promote the conversion of SO_2 to SO_3; thus, the formation of ammonium bisulfate is not promoted. Furthermore, these catalysts are not subject to poisoning from fuel-bound sulfur and since they are non-hazardous, catalyst disposal is not a significant problem;

2. Use of fuel oil will be for backup purposes only;

3. Sulfur content of fuel is typically limited to 0.3% in fuel oil or coal-derived gas on similar projects (Chesterfield).

The EPA suggestion that there are catalysts that are made of nonhazardous materials, which do not promote the formation of SO_3 from SO_2, and which have reduced contamination problems, does not accurately reflect the present state of development of those systems. The nonhazardous catalysts, principally made of zeolite-coated ceramic material, have only limited operational experience. These systems have been applied only to small gas turbines (e.g. less than 5 MW with three applications in the U.S.) and internal combustion engines (one U.S. application). These applications are primarily on natural gas-fired facilities and have been installed where other catalysts proved ineffective. These catalysts have not been demonstrated on combined cycle plants which fire oil or combined cycle plants of the size proposed for the Martin CG/CC Project. Indeed, none of the projects with SCR currently operating, in startup, or permitted, have a nonmetallic catalyst. Until these impacts are demonstrated commercially, the potential environmental impacts of hazardous waste disposal for catalysts must be included in the BACT evaluation.

Notwithstanding the potential benefit of these new SCR systems if they are demonstrated, there would still be significant problems associated with oil firing and SCR use not related to catalyst poisoning and catalyst related SO_3 formation. The addition of ammonia associated with any SCR, combined with SO_3 inherent in the flue gas resulting from oil firing (excluding catalyst effects), will promote the formation of ammonium bisulfate and result in corrosion of the low-pressure steam boiler tubes in the HRSG. Note that these tubes are located after the catalyst and in the temperature range for ammonium sulfate formation (see Attachment A).

The EPA incorrectly assumes that the Martin Project is designed for using No. 2 fuel oil only as a backup fuel. The Martin Project is being designated for full-load operation on either natural gas, coal-derived gas, or No. 2 fuel oil. Unlike the cogeneration projects which have accepted SCR in permit conditions, the Martin units must be capable of using fuel oil, regardless of the natural or coal-derived gas availability, at any time to meet electrical demands of the FPL system. In contrast, cogenerators (i.e., qualifying facilities), can simply stop power production. In fact, many of the facilities permitted with SCR limit the hours of oil operation and, in some cases, have considerably higher NO_x limits when burning oil (e.g., Ocean State Power permit allows the SCR to be bypassed during oil operation, and oil operation is limited to 1200 hours per year).

The EPA's justification for limiting fuel oil usage is not supported by the regulations. The applicable NSPS for combustion turbines, as referenced above, does not include a provision (as stated by EPA) which limits the use of fuel oil as emergency fuel. The Chesterfield limitation on fuel oil firing may be related to the area's nonattainment status for ozone; however, the Martin CG/CC Project is within an attainment area for ozone.

The Martin SCA and PSC Permit application both state that the project, when firing coal derived gas, will comply with the applicable NSPS (40CFR60 Subpart GG, i.e. 0.8% S in fuel). This statement does not mean that the coal-derived gas will actually contain 0.8% sulfur. The sulfur removal/recovery system inherent in the gasification process will remove 95% of the sulfur in raw coal-derived gas and thereby produce a synthetic gas with less than 0.3% sulfur fuel for use in the combustion turbines. This Martin CG/CC sulfur content in coal derived gas is therefore consistent with that referenced in Chesterfield facility BACT.

ECONOMIC IMPACTS

The EPA's position that the analysis does not provide the total cost per ton of NO_x removed fails to recognize that:

- o The base level of control for the advanced machines under consideration is 42 ppmvd for either natural or coal-derived gas and 65 ppmvd for oil firing, and

- o Steam injection is integral to the combustor design for both power production and NO_x control.

Consequently, the costs of reducing the NO_x emissions from their inherent 42 ppmvd to the SCR-controlled 9 ppmvd, as provided in the SCA and PSD Permit Application, are indicative of the total costs for NO_x control for combustion turbines.

ENVIRONMENTAL IMPACTS

The primary EPA comment on environmental impacts was related to catalyst disposal. Until nonhazardous material catalyst systems are developed and demonstrated, the potential environmental impacts of disposing of hazardous catalysts must be considered in the BACT analysis. The environmental impact of additional particulate emissions caused by SCR related formation of ammonium sulfate and ammonium bisulfate must also be considered in BACT.

ENERGY IMPACTS

EPA comments that the SCR energy impacts would not put a strain on the local energy supply or appear to be typical of plant energy usage. EPA does not support these statements with any factual data. While the energy impacts are not a large percentage of the total capacity of the Project, the energy impacts are significant in and of themselves. The expected fraction of one percent energy penalty translates to millions of kWh. This lost energy, which could provide annual service to thousands of residential customers, would have to be replaced by other less efficient means.

CONCLUSION

The EPA comments do not support the installation and operation of SCR on Martin Project. The information contained in the PSD Permit Application supports the proposed emission limits by rejecting the additional control technology based on project-specific technical feasibility and environmental, economic and energy impacts. It is clear from EPA regulations, guidelines, and policy and FDER regulations that such factors must be considered (see Attachment B which summarizes these requirements). When these factors are taken into account, it must be concluded that the BACT emission levels proposed by the applicant for the Martin Project are appropriate and reasonable.

ATTACHMENT A

SUPPLEMENTAL INFORMATION ON SCR OPERATION

EFFECTS OF SULFUR-BEARING FUELS ON SCR SYSTEM OPERATION

Sulfur contained in fuel will oxidize during combustion to form SO_2 and SO_3. In the SCR reactor, SO_3 will react with water and ammonia to form ammonium bisulfate, NH_4HSO_4, and ammonium sulfate, $(NH_4)_2SO_4$. The formation of ammonium bisulfate will lead to the rapid fouling and corrosion of the HRSG. Both compounds will result in high levels of PM10 emissions.

Ammonium bisulfate is an extremely corrosive and sticky substance that forms in the low temperature portion of the heat recovery steam generator (HRSG) where it deposits on the walls and heat transfer surfaces downstream. The deposits on the tube surfaces cause increased pressure drop with reduced power output and lower cycle efficiency. More importantly, the unit must be shut down and water-washed (to prevent corrosion damage) resulting in lower availability. Ammonium sulfate is not corrosive, but its formation will also contribute to plugging of the heat transfer system, leading to reduced efficiency and also contributing to higher particulate emissions.

The formation of ammonium bisulfate and sulfate downstream of the SCR reactor is a complex function of gas composition and temperature. This problem was evaluated in a study recently conducted by Exxon for General Electric Company. The results of Exxon's calculations are shown in Figures 1 and 2. Both calculations used an exhaust gas composition based on firing 0.2 percent sulfur distillate oil. In Figure 1, the unreacted ammonia leaving the SCR was assumed to be 6.5 ppm, and in Figure 2 it was 12 ppm. In Figure 1, ammonium bisulfate begins to form at temperatures below 380°, and below 360°, ammonium sulfate forms as well. By the time the gas reaches 260°, all of the sulfur present as either SO_3 or as H_2SO_4 has reacted, consuming all of the excess ammonia as well. Figure 2 shows that at the higher level of unreacted ammonia, only ammonium sulfate forms but excess ammonia in the stack gases would be 5 ppm.

The Exxon study was intended to illustrate that the formation of ammonium bisulfate is a complex function of the gas chemistry and temperature. These types of calculations are necessary but impractical on a real-time basis, and thus control of ammonium bisulfate over the full range of the Martin Project operating conditions is not practical.

The only effective means for limiting the formation of ammonium bisulfate is to limit the sulfur content of fuel. Pipeline quality natural gas has negligible sulfur content. However, the

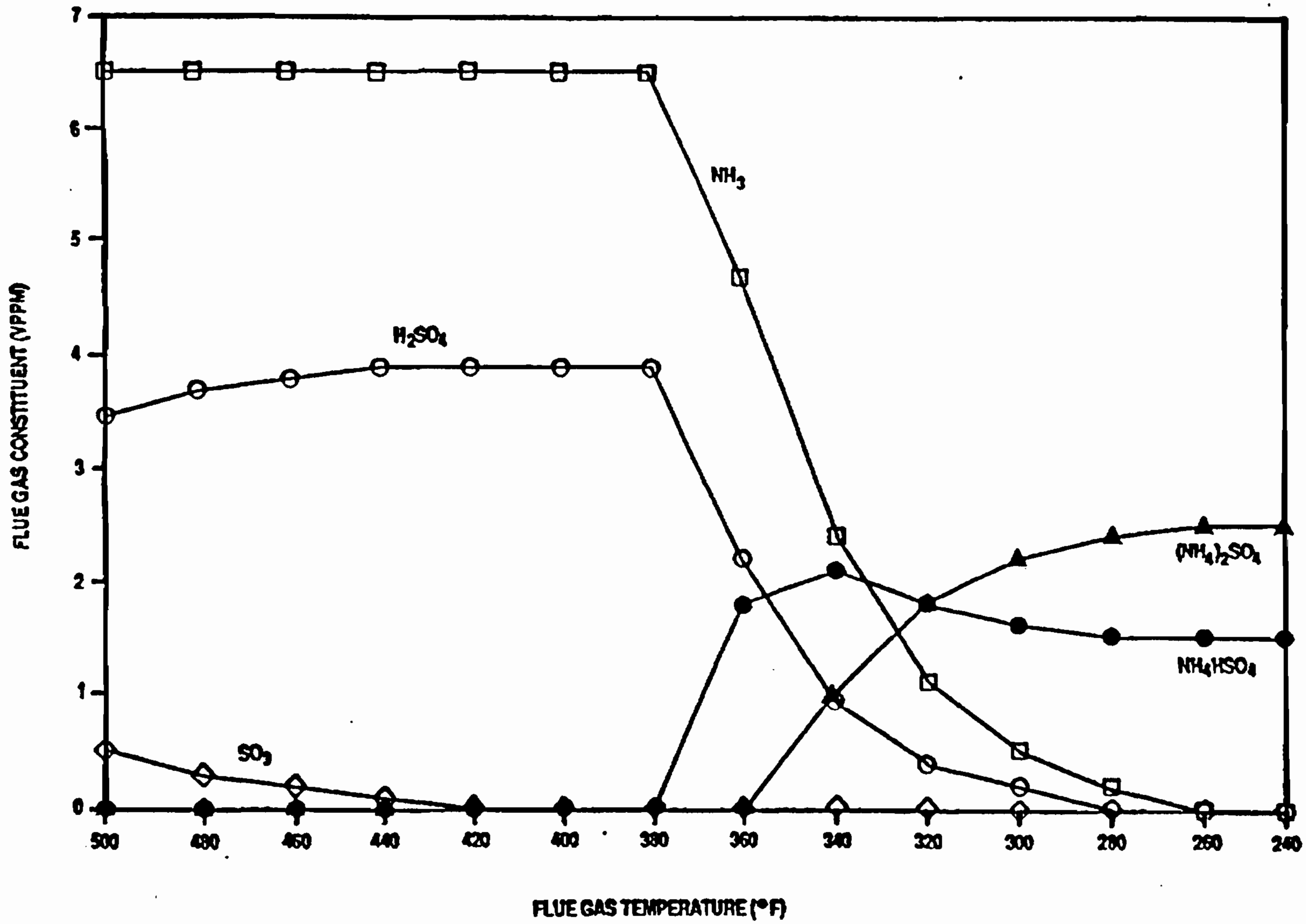


Figure 1 FLUE GAS EQUILIBRIUM COMPOSITIONS – GAS NO. 2

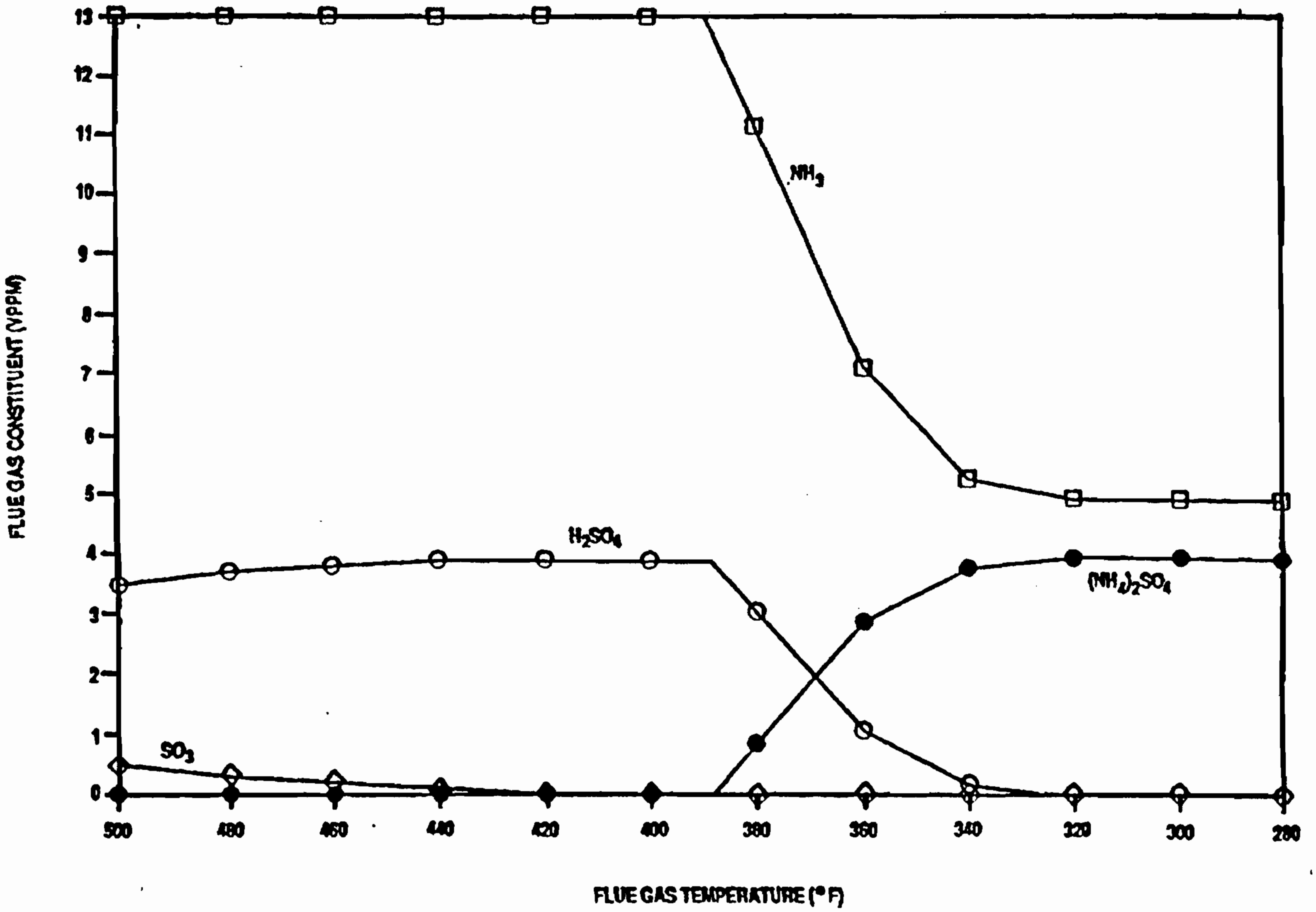


Figure 2 FLUE GAS EQUILIBRIUM COMPOSITIONS – GAS NO. 1

lowest sulfur content of the distillate oil available to the Martin Project is not low enough to prevent formation of ammonium bisulfate.

A further problem for SCR operation associated with firing sulfur-bearing fuels is the formation of particulate matter in the SCR. For the example shown in Figures 1 and 2, the sulfate particulate would increase the PM10 emissions by 49 and 55 lb/hr for each gas turbine, respectively.

In summary, there are two severe problems associated with the firing of fuels containing sulfur in a combustion turbine system with an SCR. First, a highly corrosive substance tends to form which rapidly deteriorates the system, leading to reduced power generation efficiency and high maintenance costs. Second, measures taken to prevent formation of corrosives will lead to higher emissions of either NO_2 or NH_3 and the PM10 emissions will be higher by a factor of five or six.

OPERATING EXPERIENCE

Combustion turbine operating experience with SCR in the U.S. has been limited to natural gas firing, except in one case, the United Airlines unit, which is discussed below. There are several facilities which have been licensed to operate using liquid fuel as a backup fuel; in all but the one case, however, those facilities have been permitted to shut down the SCR system during the periods that oil firing takes place, or they have simply never fired oil at all. As an example, in California, out of 41 permitted SCRs only 11 have been licensed to fire oil as a backup fuel. Of those 11, only 3 are now in operation, and only one (United Airlines) has ever fired oil.

The only SCR-controlled combustion turbine system to have fired oil is the United Airlines cogeneration plant at the San Francisco, California, airport. This plant, which is required to meet a NO_2 limit of 16 ppmvd using SCR, is fired on natural gas with Jet-A fuel as a backup. Jet-A fuel has a much lower sulfur content (i.e., 0.05 percent) and ash content, and is much more expensive and less available than distillate oil. The plant experienced a number of problems in its operations. During the first year of operation, the catalyst failed and was replaced three times. The cause of the catalyst failure was attributed both to poisoning of the catalyst by ammonium bisulfate and to gas pressure surges caused by automatic switching to jet fuel. The operators of the facility have stated that they will no longer operate the system on liquid fuel.

SCR manufacturers have stated that their systems have operated controlling oil and even coal-fired sources. SCR experience with oil and coal fuels has, however, only been demonstrated in conventional boiler plants where the SCR is not followed by heat transfer tubes which can be corroded by ammonium bisulfate. Conventional boilers also have much less exhaust gas temperature variation than a HRSG, facilitating a design which will avoid formation of ammonium bisulfate. Nevertheless, regenerative air heaters in some of these plants have experienced severe deposition/plugging and corrosion problems.

In summary, therefore, there is no clear example of technically demonstrated SCR performance for control of an oil-fired combustion turbine system, such as that proposed for the Martin Project.

RISKS ASSOCIATED WITH CATALYST HANDLING DISPOSAL

Employment of an SCR would require the handling and disposal of spent catalyst materials. Spent catalyst materials typically contain a heavy metal oxide such as titanium or vanadium that can leach into groundwater. Recently, California agency officials declared that such materials should be considered hazardous. As such, the handling and disposal of spent catalyst would pose a certain level of risk to human health and the environment.

Many catalyst suppliers will agree to provide material removal and disposal services as part of their overall service contract. While this may remove an environmental problem for the Martin Project, it does not eliminate the problem because hazardous materials will be handled at, and transported to, and from, the site. Further, it should be noted that such contracts do not guarantee that such services can be provided for the life span of the facility. Either a change in the status of the catalyst supplier or a change in the regulations affecting such an activity could result in the burden of catalyst removal and disposal being placed upon the Martin Project. For example, regulations are being developed in several states prohibiting or greatly restricting the importation or transportation of hazardous materials. Since Florida does not have a facility where spent SCR catalyst material may be disposed, the Project would have no place in the state to send its spent catalyst.

Zeolite-coated ceramic catalysts (nonhazardous) have only been installed and operated on a limited bases to small gas turbines (i.e., less than about 5 MW; 3 in the U.S.) and internal combustion engines (1 in the U.S.). The applications in the U.S. are primarily on gas-fired facilities. This technology has not been demonstrated on large combustion turbines. It is concluded, therefore, that handling and disposing of spent catalyst material constitutes an additional environmental impact that should be considered in the BACT decision.

ATTACHMENT B

SUMMARY OF REQUIREMENTS FOR MAKING A BACT DETERMINATION

The control technology review requirements of the federal and state PSD regulations require that all applicable federal and state emission limiting standards be met and that Best Available Control Technology (BACT) be applied to control emissions from the source [Chapter 17-2.500(5) (c), F.A.C.]. The BACT requirements are applicable to all regulated pollutants for which the increase in emissions from the facility or modification exceeds the significant emission rate.

BACT is defined in Chapter 17-2.100(25), F.A.C. as:

> An emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the department, on a case by case basis, taking into account energy, environmental, and economic impacts, and other costs, determined is achievable through application of production processes and available methods, systems, and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of such pollutant. If the Department determines that technological or economic limitations on the application of measurement methodology to a particular part of a source or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice, or operation.

The requirements for BACT were promulgated within the framework of PSD in the 1977 amendments of the CAA [Public Law 95-95; Part C, Section 165(a) (4)]. The primary purpose of BACT is to optimize consumption of PSD air quality increments and thereby enlarge the potential for future economic growth without significantly degrading air quality (EPA, 1978; 1980). Guidelines for the evaluation of BACT can be found in EPA's Guidelines for Determining Best Available Control Technology (BACT), (EPA 1978) and in the PSD Workshop Manual (EPA, 1980). These guidelines were promulgated by EPA to provide a consistent approach to BACT and to ensure that the impacts of alternative emissions control systems are measured by the same set of parameters. In addition, through implementation of these guidelines, BACT in one area may not be identical to BACT in another area. According to EPA (1980), "BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis."

The BACT requirements are intended to ensure that the control systems incorporated in the design of a proposed facility reflect the latest in control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the proposed facility. BACT must, as a minimum, demonstrate compliance with NSPS for a source (if applicable). An evaluation of the air pollution control techniques and systems, including a cost-benefit analysis of alternative control technologies capable of achieving a higher degree of emission reduction than the proposed control technology, is required. The cost-benefit analysis requires the documentation of the materials, energy, and economic penalties associated with the proposed and alternative control systems, as well as the environmental benefits derived from these systems. A decision on BACT is to be based on a sound judgement, balancing environmental benefits with energy, economic, and other impacts (EPA 1978).

More recently, the U.S. Environmental Protection Agency (EPA) has recommended the use of the "top-down" approach as the appropriate procedure for determination of BACT. Notwithstanding the appropriateness of the top-down approach, EPA's overall policy has not substantially changed.

EPA guidance is clear concerning the top-down BACT approach. Specifically, EPA states in its June 13, 1989 Background Statement on the Top-Down Policy regarding the factors of technical feasibility, and economic, environmental, and energy impacts:

> . . .the final weighing of those factors and the final BACT decision, are made by the permitting authority. Rejection of a control technology by a reviewing agency must have a rationale arrived at after full consideration of data determined in a consistent and sound manner. Such decisions may not be arbitrary, capricious, or contrary to law.

Further, in EPA's draft document entitled Top-Down Best Available Control Technology: A Summary (May 25, 1989), it is stated:

> However, when supported by a complete and objective review, technologies that can be demonstrated to be infeasible, unreasonable, or otherwise not achievable considering source-specific energy, economic, environmental, or technological reasons can be set aside.

Thus, in making a BACT Determination, FDER must:

1. Consider project-specific technical feasibility, and environmental, economic, and energy impacts;

2. Provide consistent and sound rationale for the BACT determination for each of the pollutants;

3. No arbitrarily reject the applicants source-specific technical and economic data or use data from completely different projects; and

4. Neither make capricious nor arbitrary decisions or use of data provided in the application or make decisions that are contrary to law.

Comment #14

"Describe analytical method to be used in determining if HRSG Boiler Tube Cleaning wastes, termed metal cleaning wastes (3.7.2-3), are hazardous. Include Analytes to be tested. Should the metal cleaning wastes be 'deemed' hazardous by approved testing methods the hazardous waste generated should be managed in a fashion similar to that described in the 'miscellaneous wastes' section (3.7.2-4)."

Response:

Per FPL's Chemical Control and Waste Minimization Program, all samples of waste collected to determine the hazardous nature of the waste shall be analyzed according to the EPA procedures found in 40 CFR 261 Appendix II (EP Toxicity Test).

The analytes to be tested are those contaminants listed in 40 CFR 261.24 Table I. Maximum Concentration of Contaminants for Characteristic of EP Toxicity.

If these metal cleaning wastes are determined to be hazardous, they will be managed in the same manner as that described in SCA Section 3.7.2, Hazardous Wastes.

Comment #15

"Describe analytical method to be used in determining if wastes produced by the CG/CC units (5.4.2) are hazardous. Include analytes to be tested."

Response:

See response to DER Comment #14.

Comment #16

"Section 3.6.1-5 discusses how constituents concentrate 2.57 times without introducing the affect of absorption to pond side/bottom on the factor of concentration. Discuss how concentrations of potentially hazardous constituents (table 3.6.1-1) may be expected to increase or decrease in side/bottom sediments over time."

Response:

According to modeling studies using the EPA metals speciation model, MINTEQA2, the dominant removal mechanisms for potentially hazardous constituents in the cooling pond of Florida Power & Light's Martin Plant are precipitation and adsorption onto sediments. Thus, removal would be to the bottom of the cooling pond, with no significant transport of sediment out of the cooling pond.

The dominant removal mechanism for iron is predicted to be precipitation, and the area-weighted accumulation rate of iron will be directly proportional to input. The accumulated iron will be in a bound form that is not bioavailable.

The dominant removal mechanism for copper, mercury, and zinc is predicted to be adsorption onto substrate materials in the cooling pond. These constituents will accumulate at a rate proportional to their input, but modified according to the adsorbed versus dissolved fractions. Removal of copper, mercury, and zinc by adsorption can be expected to continue, and the adsorbed fractions will not be bioavailable. The actual thickness of the absorption layer will be on the order of a few inches and will correspond to the depth to which sediment is worked by benthic biological processes.

Comment #17

"Section 8.2.2 states that any residual chlorine in the circulating water discharge will be 'consumed' within the cooling pond. What is the mechanism of 'consumption'? What is the maximum capacity of the consumption of chlorine by the cooling pond? What are the concentration effects on the surficial aquifer water quality?"

<u>Response</u>:

Chlorine will be "consumed" as a result of its chemical combination with ammonia and other reducing agents in the water.

When ammonia becomes dissolved in a water body such as the Martin cooling pond, a portion of the ammonia reacts with the water molecules to form ammonium ions (NH_4+) while the balance remains as un-ionized ammonia (NH_3). In general, the concentration of un-ionized ammonia increases with increasing pH, increases with increasing temperature, and decreases with decreasing ionic strength. Since the quantity of un-ionized ammonia cannot be directly measured, its concentration in water is based on the measured concentration of total ammonia (NH_3+ NH_4).

In order to prevent various types of bioaccumulation in cooling system components, chlorine is commonly added to the waters of the system. This chlorine is rapidly hydrolyzed to yield equimolar quantities of hypochlorous acid and hydrochloric acid (i.e., as follows):

$$Cl_2 + H_2O \text{ <---> } HOCl + H^+ + Cl^-$$

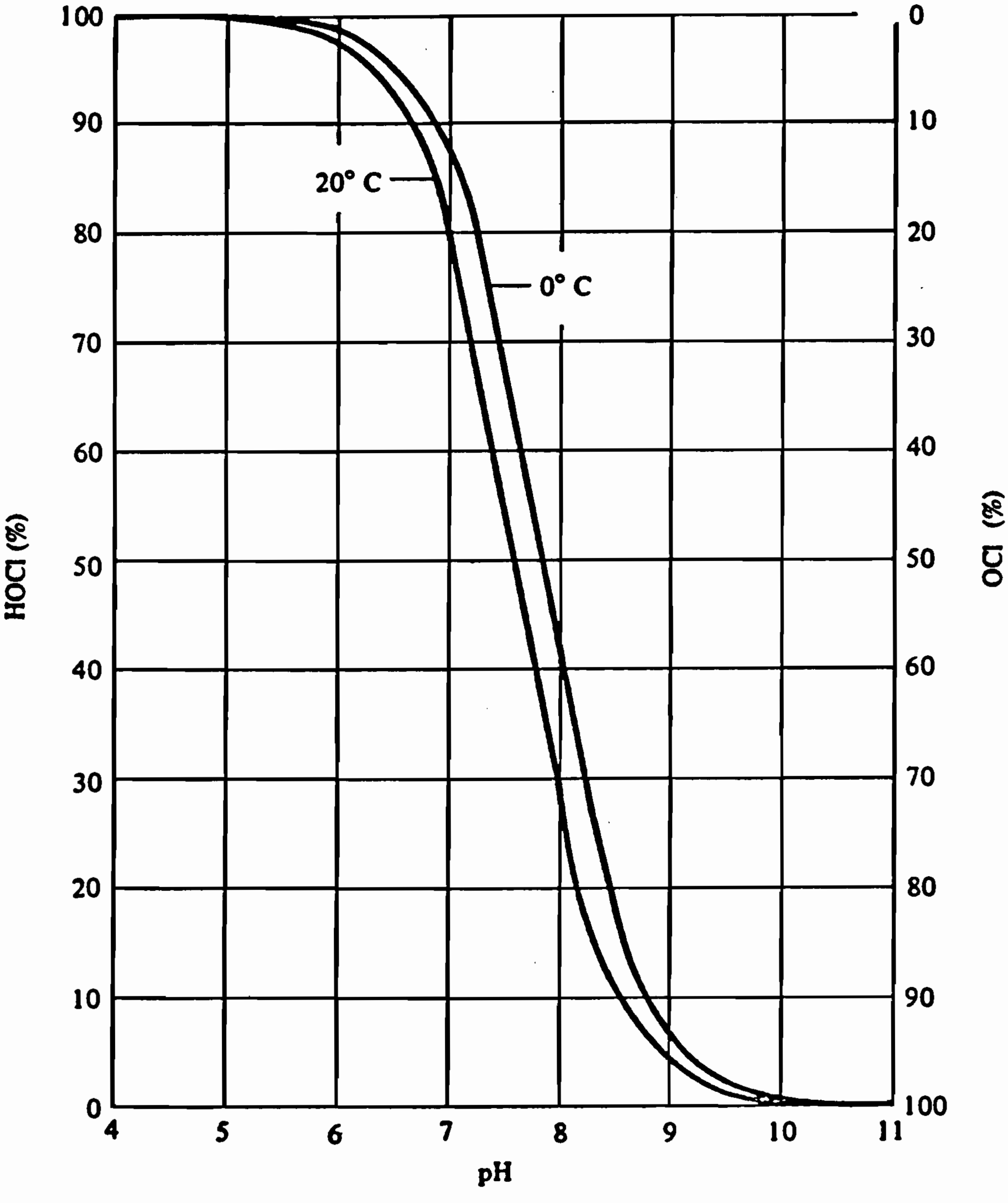
This hydrolysis usually proceeds to completion at pH values and concentrations normally experienced in water treatment and waste treatment operations.

Exhibit DER-17A shows the relationship between HOCl and OCl^- at various pH levels. Hypochlorous acid ionizes according to the following equation:

$$HOCl \text{ <---> } H^+ + OCl^-$$

The dissociation rate from hypochlorous acid to hypochlorite ion is sufficiently rapid, so equilibrium is maintained even though the hypochlorous acid is being continuously consumed. If a reducing agent is introduced into a water body which contains free available chlorine, the unconsumed residual redistributes itself between HOCl and OCl^-.

Chlorine reacts with ammonia in water to form chloramines as



Relationship between HOCl, OCl⁻, and pH.

EXHIBIT DER-17A

follows:

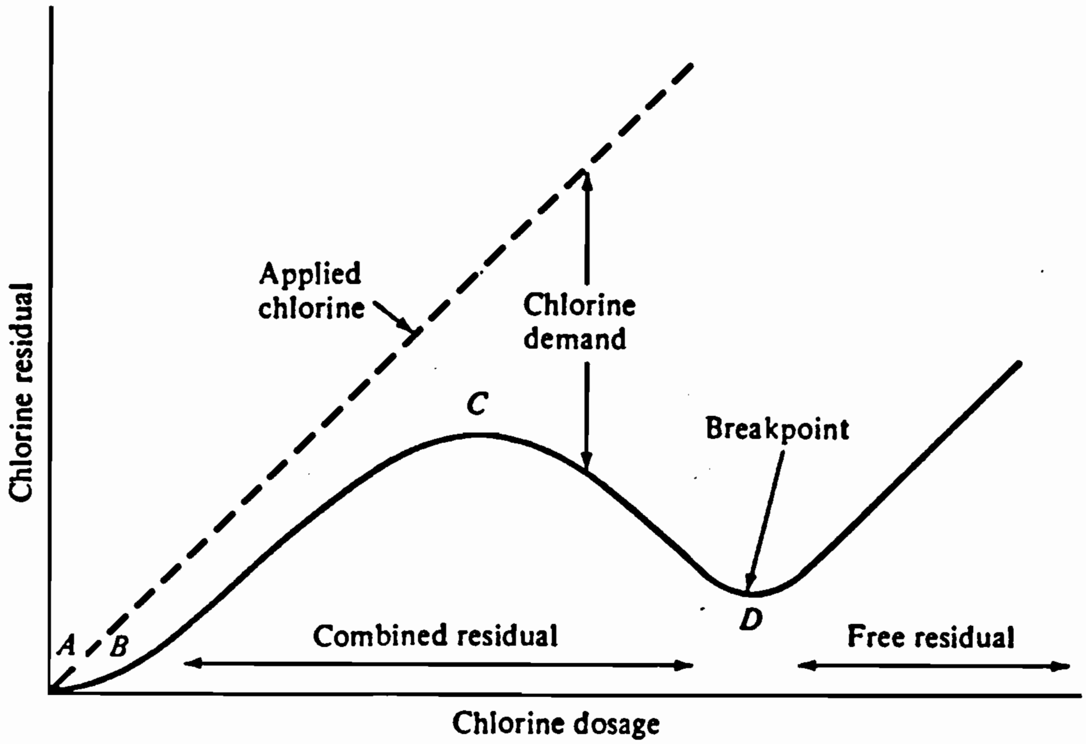
$$HOCl + NH_3 \rightarrow H_2O + NH_2Cl \text{ (monochloramine)}$$
$$HOCl + NH_2Cl \rightarrow H_2O + NHCl_2 \text{ (dichloramine)}$$
$$HOCl + NHCl_2 \rightarrow H_2O + NCl_3 \text{ (trichloramine)}$$

The chloramines formed are dependent upon the pH of the water, the amount of ammonia available, and the temperature. In the pH range of 4.5 to 8.5, monochloramine and dichloramine are formed. At room temperature, monochloramine exists alone above pH 8.5 and dichloramine occurs alone at pH 4.5. Below pH 4.4, trichloramine is produced.

Free available residual chlorine is that residual chlorine existing in water as hypochlorous acid or hypochlorite ion. Combined available residual chlorine is that residual existing in chemical combination with ammonia (i.e., chloramines) or organic nitrogen compounds. Also, chlorine demand is the difference between the amount of chlorine added to a water body and the quantity of free and combined available chlorine remaining at the end of a specified contact period.

When chlorine is added to a water body which contains reducing agents and ammonia, residuals develop that yield a curve similar to Exhibit DER-17B. Chlorine initially reacts with the reducing agents present and it develops no measurable residual, as shown by the portion of the curve extending from point A to point B. The chlorine dosage which exists at Point B is the amount required to meet the demand exerted by the reducing agents (i.e., those common to water and wastewater include nitrites, ferrous ions, and hydrogen sulfide).

The addition of chlorine in excess of that amount required up to Point B results in the formation of chloramines. Monochloramines and dichloramines are usually considered collectively since little control exists over which will be formed. The quantities that are formed of each of these two chloramines are primarily a function of pH. The chloramines thus established show an available chlorine residual and are effective as disinfectants. When all of the available ammonia has been reacted with, a free available chlorine residual begins to develop (i.e., Point C on the curve). As the free available chlorine residual increases, the previously produced chloramines are oxidized. This oxidation results in the creation of several oxidized nitrogen compounds, such as nitrous oxide, nitrogen, and nitrogen trichloride, which in turn reduce the chlorine residual, as seen on the curve of Exhibit DER-17B between Points C and D.



Chlorine-residual curve for breakpoint chlorination.

EXHIBIT DER-17B

As soon as the majority of the chloramines are oxidized, the addition of more chlorine to the water will create an equal residual, as indicated by the rising curve at Point D. Point D is generally referred to as the breakpoint. Beyond Point D, all added residual is free available chlorine. Some resistant chloramines can still be present beyond Point D, but their relative importance is small.

The oxidation of ammonia-nitrogen by the addition of excess chlorine can be represented by the following unbalanced chemical reaction:

$$NH^3 + HOCl \rightarrow N_2 + N_2O + NO_2^- + NO_3^- + Cl^-$$

The possible products formed, in order of importance, are nitrogen gas, nitrous oxide, and nitrite-nitrate nitrogen. Analyses in the pH range of 6.5 to 7.5, for initial ammonia-nitrogen concentrations of 8 to 15 mg/l, have shown that breakpoint chlorination can yield 95% ammonia removal, with nitrate and nitrogen trichloride residuals never exceeding 0.5 mg/l. The rate and extent of this reaction depend upon the pH, temperature, contact time, and initial chorine/ammonia ratio. The weight ratio of chlorine to nitrogen needed for ammonia destruction ranges between 8:1 and 10:1 of Cl_2 to N, with the lower value applicable to pretreated wastewater.

Breakpoint chlorination is adaptable to physical-chemical treatment and has the advantages of low capital cost, a high degree of efficiency and reliability, insensitivity to cold weather, and release of nitrogen as a gas. The main disadvantage is that essentially all the chlorine added is reduced to a chloride ion, thus contributing to the dissolved-solids concentration in the treated water. For example, at a 10:1 dosage ratio, oxidation of 20 mg/l of ammonia-nitrogen contributes 200 mg/l of chloride ion. Because the chlorine consumption will be relatively quick (on the order of 30 minutes or so), no effects on the surficial aquifer water quality are expected.

Comment #18

"Sulphur is to be produced as a by-product of the coal gasification process. The description of the handling of this material is adequate, but no mention is made of any odors that may be produced by the handling, cooling, and solidification of this material on the slab. Will any odors be produced?"

Response:

The only odors associated with the generation, handling and storage of molten and solid sulfur are related to the sulfur's potential to release hydrogen sulfide (H_2S). Since elemental sulfur from the CG units sulfur recovery process (Claus Plant) may contain as much as 300 ppmw of hydrogen sulfide (H_2S), the molten sulfur will undergo a cleaning process which reduces the concentrations of H_2S in the sulfur to levels where the gaseous releases can be effectively eliminated. Molten sulfur from the Claus Plant will be conveyed in enclosed pipes to steam heated 2-3 day storage tanks(s) equipped with agitation or catalytic devices to encourage H_2S releases and an eductor system which collects the air above the molten sulfur. The H_2S is driven off, and directed to the tail gas treatment facility for incineration.

The non-odorous molten sulfur is then directed to specially designed sulfur transport truck or rail cars for off-site delivery, or pumped to larger heated 30-day storage tanks, or poured into solid slabs in a concrete lined area.

In this cleaning process, the molten sulfur will be cleansed of odorous H_2S and the removed gas will be incinerated to eliminate its odor potential, handling, cooling, solidification and storage of sulfur in continuous crystalline slabs is not expected to produce odors.

Comment #19

"The slag generated by the coal gasification process should be tested for EP Toxicity."

Response:

The slag generated by the coal gasification process will be tested for EP toxicity as part of the by-product storage area test cell program. Method to be used is described in responses to DER Comments #14 and #15.

Comment #20

"A sludge is to be generated from the waste water treatment systems. This sludge needs to be tested for hazardous constituents prior to disposal in a landfill on or off site."

Response:

Operation of both the combined cycle (CC) and coal gasification (CG) wastewater systems will result in the generation of sludge filter cakes. These filter cakes will be independently tested in accordance with EPA procedures found in 40 CFR 61 Appendix II (EP Toxicity Test), federal, and state related toxicity requirements to determine if these wastes represent listed and/or characteristic wastes. If either is found to be hazardous, it will be treated and disposed of off-site by a licensed hazardous-waste contractor. If these wastes are found to be nonhazardous, they will be placed in a lined segregated portion of the by-product storage area. Pending the results of these tests, the wastes will be handled as hazardous wastes and stored in appropriate on-site containers in appropriate storage areas not to exceed 90 days (or such other period as allowed by regulations), in accordance with the generator standards of 40 CFR 262.34 (incorporated by reference into FAC 17-730).

Comment #21

"The site application proposes to use a wet suppression method for minimizing fugitive particulate emissions. This process is to include a surfactant. What is the composition of this surfactant? What is the effect of this surfactant on the surficial aquifer? Will the surfactant leach any chemicals from the coal?"

Response:

The surfactant is a nonhazardous detergent-like compound. The chemical compounds of these surfactants are treated as proprietary by their vendors; however, they are typically composed of long-chain molecules that contain hydrophobic (water repelling) tails and hydrophilic (water attracting) heads. When the surfactant is added to the water, the molecules align themselves on the surface of the water with the hydrophilic heads in the water and hydrophobic tails in the air. This lowers the high energy surface tension of the water, allowing it to more easily wet other surfaces. By lowering the surface tension, the formation of finer spray droplets is made easier also. This increases the usable surface area of the water and improves dust suppression efficiency. The addition of a surfactant only increases the total moisture of a suppression system by 1/2 of 1 percent. The surfactant is not expected to leach chemicals from coal. Because the coal pile is lined and its runoff is collected and treated, no surfactant from the coal pile is expected to enter the surficial aquifer. Similarly, other material handling areas are lined.

Comment #22

"A mention is made of an underdrain system for the cooling pond. A more detailed description of this system is needed. Does the drain system empty into a canal or to the waste water treatment system? What is the effect of this system on the seepage from the pond?"

Response:

The cooling pond underdrain system is composed of a series of 29 sump pumps located around the perimeter of the cooling pond embankment and connected by perforated pipes. A series of aerial photos of the Martin Site, showing the locations of these sump pumps has been provided to SFWMD in response to their Comment #7. Pond seepage is collected in the pipes and conveyed to the sump pumps where it is either pumped to drainage ditches, pumped to the Barley Barber Swamp or returned to the pond. The drainage ditches ultimately discharge to the L65 Canal or St. Lucie Canal. No seepage is sent to the waste water treatment system. This underdrain system collects a portion of the cooling pond seepage. In doing so, the system lowers the seepage path through the cooling pond embankment by reducing the hydrostatic head built up by groundwater mounding, thereby eliminating the potential for seepage to discharge at the toe of the embankment.

Comment #23

"Several large storage tanks are proposed. Are the pipes to and from these large tanks contained? The tanks must undergo a routine inspection for defects or leaks. Also, a contingency plan should be in place addressing catastrophic failure or ignition of these storage tanks."

Response:

The piping associated with the tanks referenced above will most likely be a combination of above ground and buried piping. The exact combination will be determined during detailed design. The piping will be welded/flanged single wall steel pipes. The buried sections of piping will either be cathodically protected, wrapped, or both, to prevent corrosion. The piping and tanks will meet all industrial standards and design criteria for this low pressure, low temperature use.

The piping and tanks will be inspected during construction and periodically thereafter to ensure structural integrity. The actual schedule for inspections will be based on an engineering and maintenance evaluation.

The tanks will also be located within a diked area, which is sized to contain the entire tank volume plus rainfall. The containment system will minimize the impact of a tank failure and will allow a fire protection system to be installed. The fire protection system will comply with NFPA 30, "Flammable and Combustible Liquids Code".

Each of FPL's plants has a Spill Prevention Control and Countermeasure (SPCC) plan to address what action will be taken in order to properly handle potential problems and to minimize any impact should a spill occur. The SPCC plan for the Martin site will incorporate the proposed project.

Contingency provisions addressing fuel or hazardous material spills are already established and documented for the Martin site in FPL's Comprehensive Oil, Hazardous Materials, and Hazardous Waste Management Program for Florida Power & Light's Martin Plant (Units 1 & 2).

The Martin CG/CC handles and stores significant quantities of No. 2 fuel oil. The CG/CC facility will employ similar containment and diversionary structures/materials used by existing Martin Units 1 & 2 to prevent discharged oil from reaching navigable waters. These include:

- o Coated-concrete containment walls around each fuel oil storage tank (sized to contain the contents of the tank plus an allowance for precipitation)

- o Containment dikes or curbs around ancillary fuel oil tanks

- o Containment structures for above ground portions of the piping connecting fuel tanks

FPL will extend its current Martin Unit 1 and 2 storage tank and piping inspection procedure to include the CG/CC fuel oil tanks. This procedure is outlined below:

All storage tanks, piping, joint, valve glands and bodies, pipeline supports, metal surfaces, and other above ground equipment and facilities from transporting or holding oil will be visually checked by each employee as he pursues his daily work. Any and all discrepancies will be reported immediately to an oil spill coordinator. Additionally, an entry will be made on the discrepancy report and corrective action will be taken.

A detailed and specific visual check of the entire facility (as indicated above) will be made on the first working day of each month. Records of these inspections will be maintained.

Off-site emergency response service will continue to be provided to the site per Martin County Sheriff's Department Letter of Serviceability to FPL, dated September 20, 1988.

Comment #24

"Dewatering of the surficial aquifer proposed in this application would cause a 5 foot drawdown in the vicinity of the plant. According to the application, an irrigation well falls within the 5 foot drawdown boundary. Has the owner of the irrigation well been contacted and informed of this effect on his well? Does the irrigation well construction permit the continued use of the well for its intended purpose when subjected to a 5 foot drawdown?"

Response:

The owners of surficial aquifer irrigation wells were not contacted regarding project impacts because aquifer analyses showed the impacts to be less than measurable upon irrigation well performance.

Examination of all available water use permits revealed that the surficial aquifer irrigation wells shown on Figure 2.3.3-3 of the SCA were all similarly constructed with at least 40 feet of surface casing and at least 60 feet of production interval. By making a conservative estimate that the potentiometric level of the production zone is 10 feet below ground level and subtracting 10 feet for pumping clearance, 80 feet of water column appear available for drawdown in any given well.

Aquifer performance tests of the production interval demonstrated an average transmissivity of 2500 ft^2/day (18,700 gpd/ft). Specific capacities of the pumping wells were approximately 10 gpm per foot of drawdown (Attachment 24-L, Aquifer Performance Tests). This falls within the range of theoretical specific capacities for confined and unconfined aquifers where:

$$\text{specific capacity}_{(confined)} = T/2{,}000 = 9.35 \text{ gpm/ft}$$

and

$$\text{specific capacity}_{(unconfined)} = T/1500 = 12.5 \text{ gpm/ft}$$

By estimating a well efficiency of 75%, an available water column of 80 feet and a specific capacity of 10 gpm/ft, the maximum capacity of each irrigation well was calculated to be 600 gpm. The reported maximum capacities of individual irrigation pumps ranged from 60 gpm to 300 gpm which equates to a range in utilization of 10 to 50% of well capacity. It is concluded that no surficial aquifer irrigation well will be significantly impacted by any project activity.

Comment Item #25

"The water quality monitoring program proposed for the site include 30 parameters (Table 2.3.4-4). The parameter list should be expanded to include any hazardous wastes generated by the plant during routine operations such as paint thinner, chlorinated solvents, etc."

Response:

FPL has challenged this request/comment in its response to DER's Determination of Insufficiency. DER has accepted FPL's response and no further information is needed at this time.

Comment #26

"The water quality monitoring program proposed for the inside of the facility (within the CG/CC area) could not be reviewed. The referenced section (Section 5.2.3 page 5.2.3-1) was left out of the appropriate volume."

Response:

This section was inadvertently omitted from the SCA and has been distributed to recipients of that document. An additional copy of this section is attached as Exhibit DER-26.

Exhibit DER-26

SRP5

5.2.3 MEASUREMENT PROGRAMS

5.2.3.1 Proposed Sampling Program

Since 1978, FPL has maintained a water quality sampling program at various locations on and in the vicinity of the Martin Plant. Locations of these sampling points are shown on Figure 2.3.4-6. The water quality sampling has been carried out for 30 parameters as identified in Table 2.3.4-4. FPL proposes to continue this same monitoring program during operation of the CG/CC project. The measurement program for surface water has been described in Section 2.3.4.1, subsection on Water Quality.

Additional water quality monitoring will be undertaken for any parameters established in the NPDES permit.

5.2.3.2 Mathematical Models Used

An equilibrium metal speciation model entitled MINTEQ A2 (version 2.01) was used to predict dissolved concentrations of copper, zinc, iron, and mercury within the cooling pond. This model was authored by David S. Brown and Jerry D. Allison for the U.S. EPA Environmental Research Laboratory in Athens, Georgia. A detailed description of the model (with references), and the modeling effort performed, is presented in Section 10.5.4.3 of this SCA. Results are summarized in Section 5.2.1.4. Following is a brief description of the model.

The MINTEQ model simulates two physical processes to predict chemical species concentrations within a given water. Firstly, it computes simultaneous solutions of the non-linear mass action expressions and linear mass balance relationships, a method often referred to as the "equilibrium constant method." This computation is performed using an iterative numerical technique

(Newton-Raphson method), and includes corrections for temperature (using the Van't Hoff equation) and ionic strength (using the Debye-Huckel or Davies equation, as appropriate).

Secondly, sorption processes can be modeled by one of the following options:

- o activity K_d model;
- o activity Langmuir model;
- o activity Freundlich model;
- o ion exchange model;
- o constant capacitance model;
- o triple-layer model.

Results from the model include a tabulation, for each species of concern, of the percent bound by precipitation, bound by sorption, and still available in aqueous solution.

The model was verified by running sample data sets which were provided by U.S. EPA with the model. Sorption thermodynamic data developed from site-specific investigations were added to the model's thermodynamic data base in accordance with procedures described in the User's Manual. The model was run for pH values (6.5, 7.5, and 8.5) spanning the range of values expected to occur within the cooling pond, and for temperatures of 77°F and 91°F.

Comment #27

"The surface water quality monitoring plan parameter list in Section 2.3.4.2, page 2.3.4-87 should reflect the criteria for General and Class III waters in accordance with FAC 17-3.061 and .121 as well as the additional analyses proposed in 9) above."

Response:

FPL has challenged this request/comment in its response to DER's Determination of Insufficiency. DER has accepted FPL's response and no further information is needed at this time.

Comment #28

"Conversations with FPL staff personnel indicated that mitigation activities will take place on site. Please provide appropriate drawings and calculations for all construction activities related to the mitigation area."

Response:

FPL has challenged this request/comment in its response to DER's Determination of Insufficiency. DER has accepted FPL's response and no further information is needed at this time.

FPL has agreed to provide SFWMD the mitigation plan information by June 8, 1990.

Comment #29

"Page 5.3.1-4 - Need to clarify why the L-65 Canal is classified as Class IV and not Class III. Does this water body meet the Class IV classification criteria of FAC Rule 17-3.16(2)(a)?"

Response:

Comment is actually addressed to page 5.2.1-4 rather than 5.3.1-4. Under FAC 17-3.161(3), all secondary and tertiary canals wholly within agricultural areas are classified as Class IV. Secondary and tertiary canals are further defined as being:

1) wholly artificial,
2) behind a control structure, or
3) part of a water control system connected to the works of a water management district.

The L-65 canal meets all the above requirements, or did at the time of its construction. In addition, it should be pointed out that both the existing and the proposed discharges to the L-65 canal meet Class III standards.

Comment #30

"Table 5.2.1-2, page 5.2.1-5 - It should be noted that Lake Okeechobee is classified as Class I surface water and not Class III as indicated. (Refer FAC Rule 17-3.161(2)(c)43). Accordingly, Section 5.2.1.1 through 5.2.1.5 must be resubmitted with an assessment of impact on Class I water quality standards."

Response:

DER is correct that Lake Okeechobee is a Class I surface water, and references to the Lake being Class III waters in Table 5.2.1-2 and on page 2.3.4-38 should be removed.

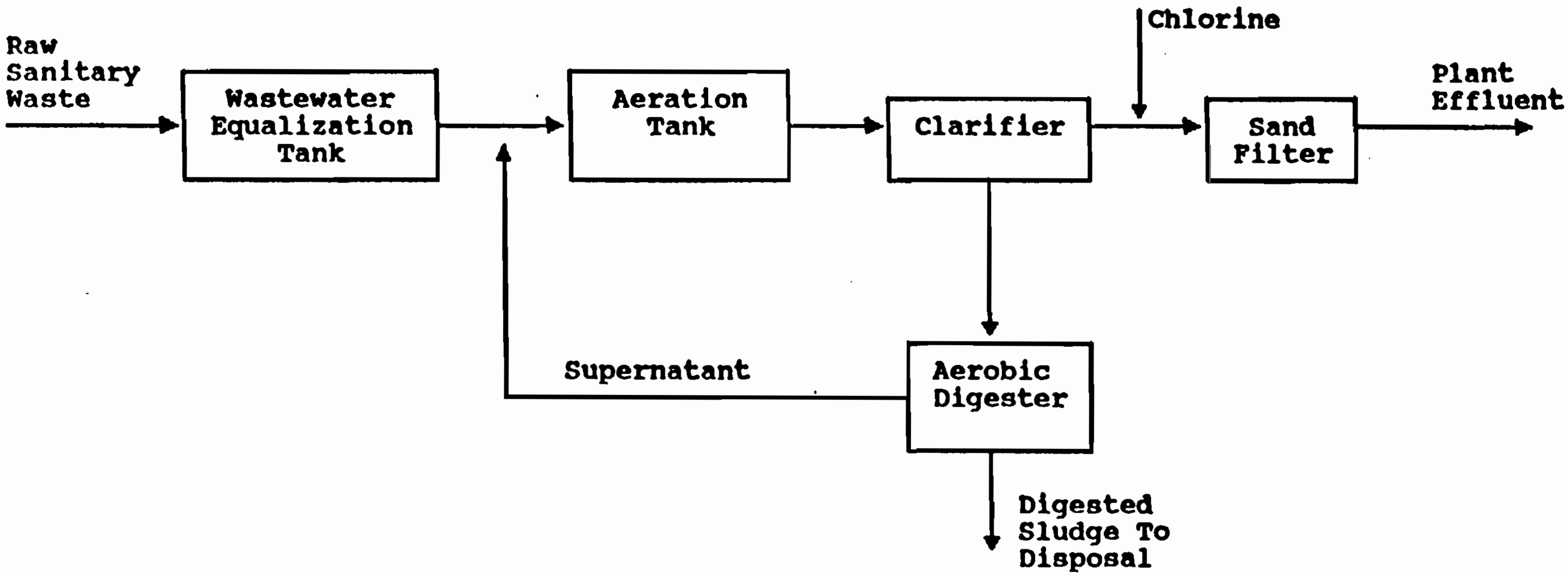
As described in Section 5.2.1-3, neither the existing nor the proposed discharge will enter Lake Okeechobee because the net flow in the St. Lucie Canal, in the vicinity of the site, is always downstream. Thus, no revision to Section 5.2.1.5 is necessary.

Comment #31

"Section 3.5.2.2, Treatment and Disposal, states a tertiary filtration system will be provided for additional solids removal; however, this system is not indicated on the flow schismatic, figure 3.5.2-1."

Response:

A sand filtration system will be provided for tertiary solids removal. This system was inadvertently omitted from Figure 3.5.2-1. A schematic revised to include this final filtration system is attached as Exhibit DER-31.



EXTENDED AERATION SANITARY WASTEWATER TREATMENT PLANT

EXHIBIT DER-31

Comment #32

"Page 5.51-2, F.A.C. 17-6.401 should include parameters of the point of discharge to include total suspended solids (TSS) and pH which will then be in accordance with Section 5.5.4, Measurement Programs, of the application."

Response:

Comment actually refers to page 5.5.1-2. FPL agrees, and will include these parameters in their water measurement programs.

Comment #33

"What storm event (10-year, 25-year, etc.) could be contained in the cooling pond prior to it discharging? Has any thought been given to the cumulative nutrient loading on the pond over a period of time and the effects (algae blooms, excessive surface vegetation, etc.) this may cause?"

Response:

The cooling pond typically has a freeboard in excess of 18 feet. The largest storm the SFWMD describes in their Permit Information Manual, Volume IV is the 3 day-one hundred year storm which yields about 12.2 inches or 1 foot of water. The U.S. Department of the Interior, Bureau of Reclamation, (Design of Small Dams, 1973), estimates the Probable Maximum Precipitation in the site vicinity as less than 31 inches. The maximum normal operating level of the pond is El. 31.0 feet. By permit with SFWMD, if the pond exceeds El 31.33 feet, spillway gates will be opened to discharge water at a controlled rate down to El. 31.0 feet. However, the cooling pond was designed and is capable of storing water up to a maximum flood level of 39.67 feet. This difference in elevation represents tremendous storage capacity that will far exceed any postulated storm event. Thus , FPL estimates that any storm event could be contained in the cooling pond.

FPL has investigated the cumulative nutrient loading of the cooling pond as it operates today and as proposed for the future. The two major nutrients examined were phosphate and nitrate. The percent increase in pond loading for these two is expected to be 12.5% and 6.7% respectively. As described in SCA Section 5.2.1-4, total nitrogen and phosphorous levels within the cooling pond are not predicted to exceed the ambient levels in the St. Lucie Canal. Therefore, in the highly unlikely event of a stormwater release from the cooling pond, nutrient levels in the cooling pond do not pose a threat to the St. Lucie Canal.

Comment #34

"Section 10.2.8, page 1846:

The definition of an Interim Water System indicates that it must be 'approved by Martin County'. In Martin County all public water systems must be approved by DER."

Response:

The referenced section of the SCA is an excerpt from the Martin County Code of Laws and Ordinances. FPL is not the author of this document. FPL is aware of DER's role in the permitting of public water systems, and seeks the necessary approval through its Site Certification Application.

Comment #35

"Section 10.2.8, page 1846.1:

The definition of a Nonpublic Water System should be in conformance with HRS's FAC 100.4 definition. The definition, as is, is not accurate."

Response:

The referenced section of the SCA is an excerpt from the Martin County Code of Laws and Ordinances. FPL is not the author of this document. DER may wish to communicate with Martin County concerning the inconsistency of the County's definition with HRS' definition of a Nonpublic Water System.

Comment #36

"General:

The only information provided on the existing public water system serving the facility is a coy of D.E.R.'s letter of clearance/approval.

After checking the M.O.R. screen of the drinking water data base, flow records indicate that the system has reserve capacity. However, from experience - these older systems are generally not constructed in accordance with today's standards. Information is needed on whether the proposed project will create additional potable water demand. If so, how much and will it take the existing treatment system over capacity? Should they upgrade to meet current standards?"

Response:

The proposed project will create additional potable water demand. However, the proposed project will be provided with a dedicated potable water system supplied by an onsite shallow well. This system will be totally separate from the existing water treatment system, and designed to meet or exceed all current standards.

Comment #37

"In Figure 3.2.0-1, pg. 3.2.0-2, ten runoff collection basins can be identified, associated with the coal storage, solids wastes storage, limestone storage, and other areas. It is not clear, after reviewing subject document, which of these basins will be lined. If any of these basins will not be lined, please provide an explanation for not lining same."

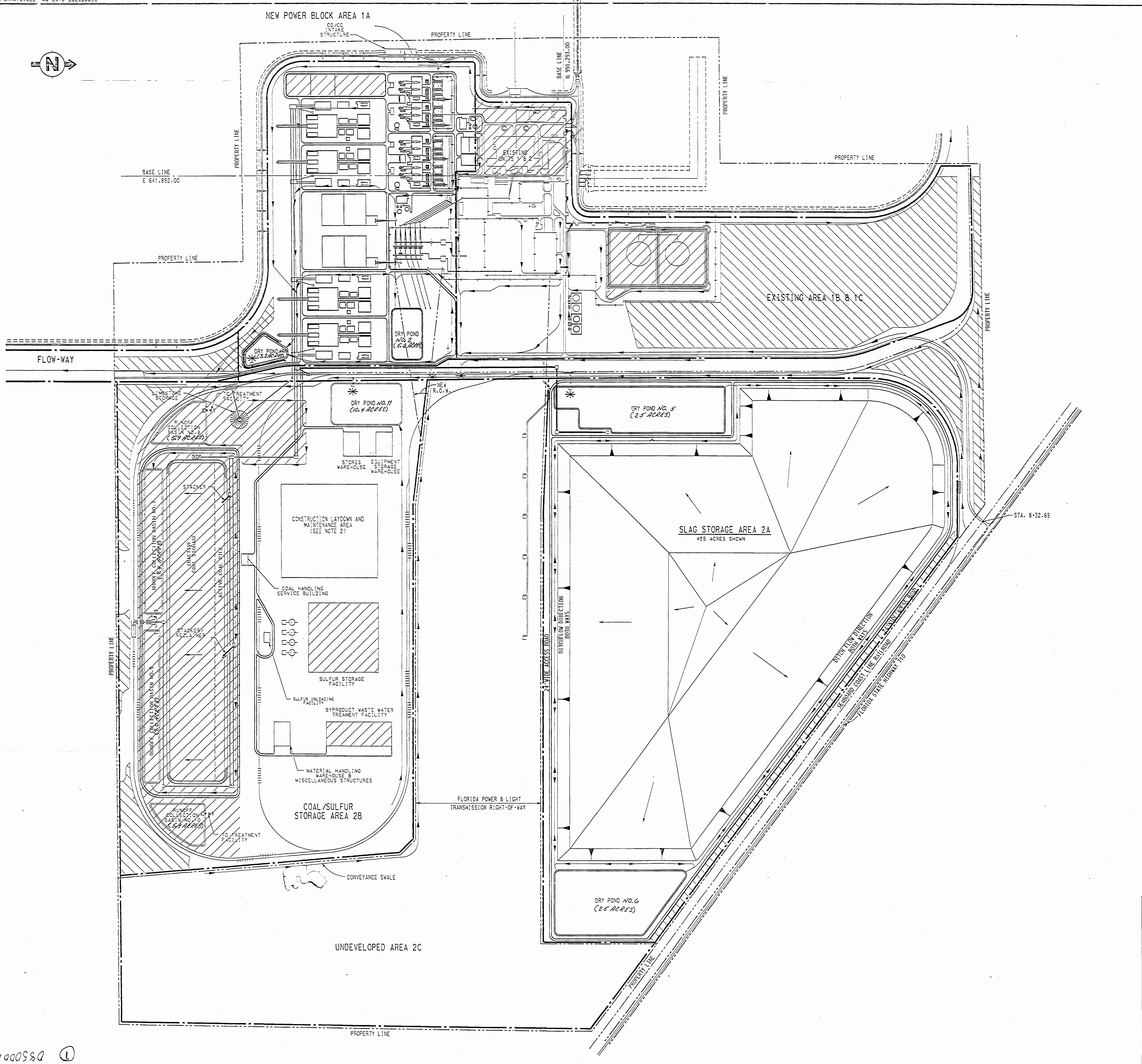
Response:

The attached Exhibit DER-37, "Revised Site Drainage Plan", shows nine collection ponds. Two temporary basins, which will be constructed on an as-needed basis, are not shown on this Exhibit.

Actively used compartments of Basin 5 will be lined for the duration of the test cell program. Should the results of that testing program indicate that the leachate/runoff is uncontaminated, the lining program for Basin 5 will be discontinued. Should the runoff/leachate prove to be contaminated, basins 5 and 6 will be lined completely.

Runoff collection basins No. 7-10 will handle potentially contaminated runoff, i.e. coal/limestone storage basins and by-product storage area (slag and sulfur) basins, and will be lined with a synthetic (HDPE) liner - 60 mil thickness.

The remaining basins No. 1-4 and 11 will contain uncontaminated runoff and will be unlined. The two temporary basins not shown on Exhibit DER-37 are basins No. 3 and 4 which are unlined.



NOTES

1. PLANT ELEVATIONS AS SHOWN ON DRAWINGS ARE REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM (NGVD).
2. CONSTRUCTION MAINTENANCE AND LAYDOWN AREA INCLUDES EQUIPMENT AND MATERIAL STORAGE, WORKSHOPS, FABRICATION SHOPS, TOOL ROOM, PAINT SHOP AND SUPPORT FACILITIES.

LEGEND

- ✳ OUTFALL STRUCTURES
- CONVEYANCE SYSTEM (DITCHES, SWALES, CULVERTS ETC.)
- AREAS DRAINING TO W.W.T.P. (WASTE WATER TREATMENT PLANT)
- DRAINAGE BASINS
- UPLAND PRESERVE AREA

EXHIBIT DER-37

REVISED SITE DRAINAGE PLAN

DS50001 ①

Comment #38

"When waste streams are transferred from the basins above named, or from other areas, to treatment facilities and/or ultimately to the cooling pond, will said waste streams be conveyed by pipelines or by ditches?"

Response:

Potentially contaminated runoff from the power block and the coal/limestone, slag, and sulfur storage areas will be conveyed by pipeline, concrete ditch, or lined ditch (60 mil HDPE), from lined collection basins to treatment facilities and finally to the cooling pond.

Comment #39

"If the waste streams are to be conveyed by ditches or other open channels, we recommend lining these ditches to the same specifications as the corresponding basins, et al. Please provide documentation regarding the lining of any and all waste stream conveyance ditches."

Response:

Uncontaminated runoff streams will be conveyed by unlined ditches or open channels to unlined collection basins. As addressed in the responses to DER Comments #37 and 38, contaminated runoff will be conveyed by pipeline, concrete ditch, or lined ditch to synthetically lined basins.

Comment #40

"What is the identity and nature of the 'granular material' that will be utilized as described on pgs. 3.3.4-1, 3.7.1-7, 3.7.1-12, 3.7.1-14, and 4.1.4-1? If any of this material consists of, or contains, ash, slag, or other combustion by-product, an evaluation of the potentials for ground water leachate contamination from said materials should be provided."

Response:

The granular fill described in the SCA will consist of sand collected from on-site areas. The use of slag or slag mixtures as fill is currently not anticipated. However, should qualitative analysis of the slag and slag leachate show that they are inert and nonhazardous, slag may be used with FDER concurrence as granular fill on-site.

Comment #41

"Table 2.3.2-3, pg. 2.3.2-22 shows ground water quality ranges for only those specific contaminants in only those specific wells in which water qualities exceed drinking water standards."

Response:

Water quality data, including those parameters which do not exceed drinking water standards, are provided in Section 10.5.3.3 of the SCA. Parameters to be analyzed were established prior to the pre-application sampling period in consultation with FDER staff. The FDER approved analysis parameters are listed as Table 2.3.2.2-2 on pages 2-25 to 2-27 of the Plan of Study.

Comment #42

"Please provide water quality data for all primary and secondary drinking water standards (including gross alpha and $Ra^{226+228}$) for all the wells shown in Figure 2.3.2-1, pg. 2.3.2-6 (with the exception of Floridan wells). Please also provide well construction data for each of these wells, i.e. casing depths, well screen intervals, et al."

Response:

DER has accepted FPL's position that additional water quality monitoring data including gross alpha and $Ra^{226+228}$ need not be provided.

Existing information on well construction data for groundwater quality monitor wells is listed below. Monitor well locations and screening intervals were selected in consultation with FDER staff as outlined in the Plan of Study.

Well Construction Data

Well ID	Total Depth (ft)	Screen Interval(ft)
CG/CC-SE1	39.5	29.5 - 39.5
CG/CC-SE2	17.25	7.25 - 17.25
PH-1	60 (est.)	N/A
CG/CC-NE1	34.5	24.5 - 34.5
CG/CC-NE2	16.6	6.6 - 16.6
CG/CC-SW1	39.75	29.75 - 39.75
CG/CC-SW2	17.5	7.5 - 17.5
N-3	40 (est.)	N/A
AMB-N1	17.7	15.7 - 17.7
AMB-N2	32.5	30.5 - 32.5
AMB-E1	14.5	12.5 - 14.5
AMB-E2	33.5	31.5 - 33.5
MW1A	18.25	8.25 - 18.25
CG/CC-MW1	155	50 - 150

Comment #43

"It is not clear, from a review of subject document, that the proposed plant qualifies as an 'existing installation':

a) <u>new</u> units are proposed to be constructed serially, which do not interface with the units currently existing on site,
b) <u>new</u> process and technologies are involved,
c) waste streams differ in number, size, and quality,
d) <u>new</u> byproducts would be produced . . ."

<u>Response</u>:

FPL is not claiming that the proposed CG/CC Project is an "existing installation" discharging to groundwater under Rule 17-28.700(1)(c), F.A.C. For further discussion, please see response to DER Comment #45 below.

Comment #44

"No specific ground water monitoring plan (GWMP) was submitted. Please provide a GWMP detailed according to the criteria of Rule 17-28.700(6) FAC, and specific for:

a) ground water (GW) seepage from the cooling pond,
b) GW seepage from the solid waste landfill area."

Response:

a) A Groundwater Monitoring Plan for the FPL Martin Plant including the cooling pond has been approved by FDER. A letter indicating FDER's approval of this GWMP was sent from Mr. Roy M. Duke, District Manager, Southeast Florida District Branch Office, FDER, to Mr. W. J. Barrow, Manager, Environmental Permitting and Programs, FPL, on March 28, 1985. This (referenced) letter is a part of permit number IO-43-48215. It is FPL's belief that the previously submitted and approved GWMP is adequate for seepage from the cooling pond. FPL proposes to continue the current, DER-approved groundwater monitoring program for the existing facilities at the FPL Martin Site, to groundwaters. As stated in SCA Section 5.3.5, groundwater monitoring has been undertaken since 1978 for 30 parameters. A copy of that approved plan is attached as Exhibit DER-44. The monitoring for the existing cooling pond will be for compliance with Class G-II standards at the boundaries of the FPL Martin Site, as permitted by Rule 17-28.700(8)(h), F.A.C., to insure that seepage from the pond "does not impair the designated use of adjacent and affected groundwaters and surface waters impacted by the groundwater."

b) Technically, the by-product storage area is not a solid waste landfill, however a GWMP will be prepared and submitted as a condition for site certification. The proposed plan will consist of monitor well pairs to be positioned on every side of the storage area with screened intervals within the upper sand layer in one well and within the deeper production zone in the other well. These wells will be located at the edge of the zone of discharge to act as compliance wells. In addition, other monitor well pairs will be positioned as close to the active parts of the storage area as feasible to provide an early warning if a problem develops. These wells will be screened at the top of the water table and at the base of the upper layer of sand (approximately 20 feet bgl).

Exhibit DER-44

Groundwater Monitoring Plan - FPL/Martin Site - Found in Appendix

Comment #45

"On pg. 5.3.3-8, an exemption from the monitoring of secondary drinking water standards in the cooling pond is claimed under Rule 17-28.700(8) (h) FAC. However, since the cooling pond also serves as the installation's primary industry waste percolation pond, with a subsurface discharge totaling 44 cfs to several tens of square miles of surrounding Class G-II ground waters of the State, and of such a quality projected to be above standards for Cl, TDS, and Fe, in addition to Na, it is therefore recommended that monitoring for all secondary (as well as primary) standards be implemented under 6)a) and b) above (re: Rules 17-28.700 (8) (e) and 17-28.700 (8) (h) FAC). Said analyses, as may be reasonably necessary to ensure that the designated use of affected ground waters and surface waters is not impaired, should continue for the life of the plant."

Response:

FPL believes it is entitled to a continuing exemption from secondary drinking water standards for groundwater discharges from the existing cooling pond at the FPL Martin Site, as allowed by Rule 17-28.700(8)(h), F.A.C. In its 1982 rulemaking, the Environmental Regulation Commission (ERC) adopted an amendment exempting cooling ponds from this requirement. See attached excerpt from transcript of ERC hearing, August 25-26, 1982 (Exhibit DER-45). Since 1979, when the pond was first used, it has received industrial waste effluent. The pond was originally sized and recognized for an approximate maximum cooling capacity for 4,000 MW of generating capacity. The Martin Site has been identified in FPL 10 Year Site Plans for the past decade as a site for new generating units.

Existing and projected adjacent land used that might utilize groundwater in the area of the cooling pond and its seepage flows are largely restricted to non-residential and agricultural uses. The present 1990 Martin County Comprehensive Growth Management Plan designates most of the surrounding lands for agricultural uses. New residential uses, if any, will be scattered and limited in density by this Plan. Therefore, no or minimal use will be made of groundwater as a source of drinking water in the area around the cooling pond.

Iron in groundwater discharges is not expected to exceed secondary drinking water standards. (See SCA p. 5.2.1-16). Concentrations of chlorides and TDS in the cooling pond resulting from plant discharges will be below these standards. However, concentrations of chlorides and TDS in cooling pond makeup water will concentrate to be above the secondary drinking water standards for these constituents. It is reasonable to regard any exceedance of secondary drinking water standards for chlorides and TDS primarily as a product of makeup water quality and the concentrating effect of the cooling pond. Therefore, the exemption should be recognized.

Exhibit DER-45

ERC Hearing Transcript Excerpt, Aug. 25 and 26, 1982

BEFORE THE

STATE OF FLORIDA

ENVIRONMENTAL REGULATION COMMISSION

IN THE MATTER OF: AGENDA ITEM VI,

CONSIDERATION OF PUBLIC COMMENT AND

TESTIMONY ON PROPOSED AMENDMENTS TO

CHAPTERS 17-3 AND 17-4, F.A.C.,

WATER QUALITY STANDARDS: GROUND WATER.

IN RE:	PUBLIC HEARING
BEFORE:	ENVIRONMENTAL REGULATION COMMISSION
DATES:	COMMENCED: 2:17 P.M., 8/25/82 CONCLUDED: 6:37 P.M., 8/26/82 (VOLUME I - PP. 1 - 129)
LOCATION:	HOST INTERNATIONAL HOTEL TAMPA INTERNATIONAL AIRPORT TAMPA, FLORIDA
AS REPORTED BY:	SUE S. HABERSHAW CERTIFIED COURT REPORTER REGISTERED PROFESSIONAL REPORTER NOTARY PUBLIC

COMMISSION MEMBERS PRESENT:

ROBERT L. PARKS, Chairman
A. STERLING HALL
RAYMOND E. BELLAMY
GEORGE M. BARLEY, JR.
JACQUELINE VAN VLIET
JOHN K. SHEPARD

DER STAFF PRESENT:

TERRY COLE, Assistant Secretary
MARY CLARK
TOM SWIHART
HOWARD RHODES
RODNEY DE HAN
DAN THOMPSON
BOB PATTON
BILL HENNESSEY
JERRY KOPALENSKI
BRAM CANTER

* * * * *

(WHEREUPON, THE MOTION CARRIED UNANIMOUSLY.)

MR. PARKS: We will move now to page (21), line 18, section (8), exemptions from secondary drinking water standards outside a zone of discharge in Class G-II ground water.

That goes over...

MR. RHODES: To conclusion.

MR. PARKS: ...through the end of the rule, with the exception of the effective date, which we held back on both of the rule changes and also the section back in 17-3 that is tied as I understand it to this section.

MR. RHODES: Yes, sir.

MR. PARKS: All right, sir.

MR. RHODES: In our entire length of discussions of secondary standards, we came to the conclusion that for existing sources it would be desirable for us to suggest that the effective date of the rule will be July 1, 1985, during which time monitoring could occur, and we could obtain some information that would be applicable to determining if there are major problems we did not anticipate.

The proposed standards would be for new discharges to become effective January 1, 1983. One could anticipate if they were going to build a new facility with some degree of rationality that what these standards were would affect it at that time.

That has to do with paragraph (a).

Paragraph (b) on page (22), the backside of the copy, has to do with cooling ponds. We looked at the cooling ponds and found that they are such large structures, and we don't think that will cause a problem in the secondary standard. We propose they still go with the primary and the free-froms throughout the rule.

That's essentially what we had. I think there will be some suggested amendments.

MR. PARKS: With reference to section (8), keeping in mind that I have incorporated by reference into this section all of the discussion and testimony which was received back on the Rule 17-3, I can't put my hand on it, or 17-4, is there anybody who wants to testify? Yes, sir?

MR. SHAW: Mr. Chairman, if I may, I'd like to explain the Florida Citrus Processors' proposed amendment 3(a), which I think all of you have before you, but if anyone doesn't have it, let me give you another.

MR. PARKS: All right.

MR. SHAW: I had 50 copies. I have now gotten down to about three more, if there are any who desire it.

Let me explain the differences between this proposal and the revised hearing draft, if I may.

Under both proposals, existing sources would be required to begin monitoring at the same time and in the same way for secondary standards as well as primary.

They will, although existing will be exempt, they would nevertheless have to monitor for secondary, so the two are identical as to monitoring.

Under both the Department's revised hearing draft and this one, secondary standards would apply to existing as well as new sources at any drinking water well, and there would be an absolute prohibition that would apply at all times and in all places to causing secondary standards to be violated in drinking water wells, whether it was caused by an existing or a new source.

The differences between the revised hearing draft and this proposal are, first, that under the revised hearing draft, secondary automatically would take effect with the same zone of discharge, with the same levels and everything, automatically on July 1, 1985.

Under this one it would not automatically take effect but would instead provide that it is the intent of this Commission to review and reassess secondary standards so as to complete rule making by that same date.

What this would allow you to do is to look at the data that, as I explained earlier, now is not available and decide whether you want to put them into effect as is with the same zone of discharge or something different.

If I may, Mr. Chairman, rather than argue the point, I'd like to sit down now and see if there is anyone who objects to this proposed amendment and later respond to it, if I may.

MR. PARKS: All right, sir. Is there anyone who objects to this amendment?

MR. THOMPSON: The Department has a response to it.

MR. PARKS: Fine.

MR. THOMPSON: I think the Department does not favor the proposed amendment. Our concern is it creates an open ended date for continuation of the exemptions for secondary standards.

As a result, there is no incentive for industry to try to cure what possible secondary violations there might be. They may hope to try to defer it for as long of a period of time as possible.

I think with the date there, that creates more of an incentive and also more of a certainty that they know that sooner or later they are going to have to, well, at a specific time certainly they will have to comply with it, so the need to start looking towards their current facility so that they can adjust it accordingly.

With an open ended date, that leaves everybody up in the air, some people with hopes and expectations that maybe they would never have to comply with secondary and drag the procedure on forever.

So for that reason we would object to it.

MR. PARKS: Anybody else objecting to it, that section? Yes, sir, Mr. Hankinson?

MR. HANKINSON: I think that Mr. Shaw's provision is very reasonable, and he has been very kind to Susan and I as we went through the hearings, but I believe in this case Mr. Thompson's arguments are persuasive, that we should stick with the schedule set up in the hearing draft.

I think the Department has demonstrated that they know enough that secondaries are an issue we need to deal with directly, and we need to demonstrate today that we are intending and are dealing with secondaries.

I also realize it takes times for existing industries to comply with new standards, particularly a standard involving the secondary criteria.

We would all I think like to move faster, but in this case I think the best, I'm not sure I can believe I am saying this, but I endorse the latest amendment, the 17th draft or whatever it is being called, the Department's position. Thank you.

MR. PARKS: Thank you. Is there any further discussion on this particular item?

MR. SHAW: I'd like to respond if there are not any other objections, briefly.

MR. PARKS: I don't guess there are any other. Would you like to respond I guess to the Department and Mr. Hankinson?

MR. SHAW: There was one objection actually, and that was that it would be open ended under mine, and that is correct, but bear this in mind. It is open ended in both directions, and should there be any need found to place this into effect sooner than July 1, 1984, '85, this would not preclude it.

This Commission could meet again any time it wished and put secondary standards or some version of it into effect sooner than July 1, '85.

So it cuts both ways, and we understand that.

Consider, however, that the Department staff is going to be quite busy looking at hazardous wastes, free-froms, and primary standards.

Obviously they will put more of their resources on those matters than on the non-health related secondary standards.

It may well be that they simply don't have the time to do the kind of reassessment and evaluation of the secondary monitoring data, which we do not presently have at all, and which we will then have in late '84, by late '84.

They may not have the time to any kind of evaluation at all prior to '85, and so the Commission will find itself in this position.

The deadline will be approaching, but no one yet has any data that has been evaluated, so you still won't be in a position to make a judgment whether it should or shouldn't go into effect, and yet it automatically does so.

I say to you that I would urge that you not cause this to go into effect automatically, so that if you find you need another month or need a year less or whatever, you can take whatever, as much or as little time as you need in order to make sure that you have the kind of data which we all agree is not now available either on how much is out there, where it is, what the economic impact of the cleanup will be.

I urge you, gentlemen and ma'am, to, I'm not sure how you want me to address you.

MS. VAN VLIET: Ma'am is fine.

MR. SHAW: At any rate, I have lost my train of thought. Go with me on this.

MR. PARKS: Anybody else on this section?

MR. HALL: If that contingency did arise, couldn't the Commission extend the time on a resolution?

MR. PARKS: Yes, sir.

MR. HALL: I don't see any sense of passing a special amendment.

MR. GREEN: I have something on (a) and (b), considering your preferences.

MR. PARKS: Well, let me see if there's anyone else on (a), and then I will go into (b), and you can do them both at one time. Is there anyone else on (a)? Okay.

MR. GREEN: In the interests of time we would just like to put in the record two reports. I have the authors here who could be examined.

They basically show we have a real problem on secondary standards in the utility industry. The difference between having to meet those today and being able to look at it in an orderly way, as time allows, is between 70 and 100 million dollars a year.

That's a big number. But we'd like that to be in the record.

We think the standards should be re-examined, and we think that time will be afforded.

Moving to (b), we have a proposed technical amendment that we have discussed with the Department. We don't think it changes their intent.

I apologize for handing out more papers. I promise you this is the last piece of paper I intend to pass out.

MR. BARLEY: It is going to cost how much?

MR. GREEN: The utility industry, if they had to meet secondary standards today, our estimates are it would cost 100 million dollars a year, based on existing monitoring data that is in the possession of the Department that's been analyzed and based upon the economic evaluation and so forth of those, that information.

What that really means is that in the next two and a half years we are going to have to come in and either get some exemptions or look at the standards carefully or something.

This is not going to go away. We would agree with everyone here that it is going to have to be looked at by this Commission. These are existing power plants that can't pick up and leave.

MR. BARLEY: That will be passed along?

MR. GREEN: It will be passed on to everyone. We have reason to believe that that problem is shared with many,

many other groups, including municipalities and others.

MR. PARKS: I'm not sure I understand where you are. You are not supporting either the Department's recommendation or the Shaw amendment? You are saying you don't want the industries you represent to have secondary standards?

MR. GREEN: No, sir. At this point we are saying that we agree with the proposal to delay the application of secondary standards to existing sources, to allow them time to sort it out.

That has been a proposed amendment before you.

This is supporting information for the record, to support that proposal in the addendum, the one you're looking at, the Department's.

MR. BARLEY: The one on cooling ponds?

MR. GREEN: No, sir, I haven't gotten to that yet.

MR. BARLEY: Which amendment are you talking about?

MR. PARKS: The Shaw amendment as I understand it, you still have to monitor anyway, so it will still cost you 100 million dollars.

MR. GREEN: No, sir, we're going to monitor. We don't have any problem with monitoring. It is the cleanup that is going to cost the 100 million dollars, shutting down the facility.

MR. PARKS: What I'm asking is if at the end, whether you do it under Shaw's version or the Department's version, in the end it is going to come out and say, "Apply secondary standards," and you are going to have to spend some money.

MR. GREEN: That's correct.

MR. PARKS: That's not going to change whether the Shaw amendment goes in or the Department amendment goes in, if the Department makes a decision to apply secondary standards.

MR. GREEN: We understand that.

MR. PARKS: Okay.

MR. GREEN: And we feel by July 1, 1985, we will have demonstrated, you know, one, we are entitled to an exemption, or we will have demonstrated that secondary standards are inappropriate, either before this Commission or another proceeding.

MR. PARKS: Okay.

MR. GREEN: Now with regard to (b), this is a technical amendment. You will notice we are proposing to strike the words "and affect the ground water". The practical affect of this amendment is to say that there are four cooling ponds in the entire State of Florida that we know are impacted by this, the manmade lakes that are huge, one in Manatee County, Martin County, and one in Sanford, and one at Turkey Point that really isn't in effect, because secondary doesn't apply anyway. Based on existing information, they meet primary standards, and we're proposing to exempt them from secondary. They can't meet secondary standards, but we agree that monitoring should occur to make sure that there is no impact that adversely affects the designated use of ground waters and surface waters.

We feel this amendment clarifies the intent of the Department and our amendment. I think they support this amendment.

MR. RHODES: We can agree to the amendment. We can support that.

MR. PARKS: Pardon me?

MR. RHODES: We can agree to the amendment. We can support that.

MR. PARKS: Do you want us to substitute...

MR. RHODES: Yes, sir.

MR. PARKS: ...Mr. Green's amendment? It will be done, and it will not be the (b) that we are considering.

MR. GREEN: Any questions from the Commission?

MR. BARLEY: How do we cure your other problem? How do we cure the 100 million dollar a year?

MR. HALL: We can't now.

MR. GREEN: If you adopt secondary standards to apply at any time, we are going to have a problem. This basically defers the issue.

MR. BARLEY: And that occurs, you are talking about in (a), not the one we've been, the one previously...

MR. GREEN: It's a result of 17-3.404, which applies secondary standards, and G-I and G-II, acquifers. This ties in with that. This exemption for the next three years from now approximately would not apply to those standards. We are going to go out and monitor and determine the extent of the problem.

And we hope at that time there will be a serious re-evaluation of the applicability of the standards to everyone.

MR. BARLEY: We haven't (3) and (4), have we?

MS. VAN VLIET: No, we haven't.

MR. GREEN: Thank you.

MR. PARKS: Thank you, sir. Are there any comments now on (b), as substituted? Hearing none...

DR. BETZ: Just, could you read the new (b), or the change? I simply want to know what it is. Thank you.

MR. BARLEY: Do you want a copy?

MR. PARKS: He's got one now.

MS. VAN VLIET: You want a deletion of the effective ground water standard for the four that you maintain are well monitored or not included? Those are the only ones.

MR. GREEN: That's right. These are existing cooling ponds. What this would do is take them out of this 13-point program that really costs for a 7,000-acre lake, and put them, the phrase added at the bottom here would allow the Secretary to require such ground water monitoring as she determines is necessary, to make it clear that any ground water monitoring requirements in these ponds would come under this section and not necessarily the other. That's the intent of it.

MR. PARKS: Any discussion on (b)? Hearing none, we will close the public testimony.

We will vote on the, what's the Commission's pleasure? We have the rule.

MS. VAN VLIET: Mr. Chairman, I move adoption of this portion of the rule as submitted by the Department, with the substitution of the FCG amendment for part (b) on page (22).

MR. PARKS: All right, the recommendation as substituted is moved. Is there a second?

MR. SHEPARD: I'd like to discuss just a little on the secondary standards. This 100 million dollars, numbers we are bandying around, I really don't see the difference in extending it the two or three years that the Shaw amendment asks for.

MR. PARKS: Could we get a second, and then we can go ahead and discuss it, and then you can amend it, Mr. Shepard?

DR. BELLAMY: I'll second it.

MR. PARKS: All right. It's been moved and seconded that we adopt it. Any discussion or amendments?

MR. SHEPARD: I'd like to amend whatever this section (a), I have the phrase here, to take into consideration the Shaw amendment as applicable to all these lines.

MR. BARLEY: I will second that.

MR. PARKS: It has been moved and seconded that the rule as substituted be amended as far as subsection (a) is concerned. Is there any discussion on the amendment?

MR. SHEPARD: My primary reason for this is if there isn't, if there is this controversy and there isn't the data, let's let them get a chance to get the data and then present it, and then we will put it in, put in the date and go on with the rule, and we've got it in the bag.

MS. VAN VLIET: Mr. Shepard, I'm going to go along with the Department's recommendation, that they feel comfortable with those and think they are indeed important.

The beating of the chest and the wailing and moaning about the DER notwithstanding, these people have prooven

I think throughout this process that they are flexible, rational, reasonable people, to the extent that I am concerned about all of the givings that they have given in this rule.

I certainly will be supportive of the Department in this case.

MR. SHEPARD: You can exempt anybody, anyplace, from secondary standards, the Department can, if they wish.

MR. PARKS: Mr. Cole?

MR. SHEPARD: Can the Department exempt anybody from secondary standards?

MR. COLE: Yes, there is a procedure under Section 243 that says that we can exempt anyone where it is shown to be necessary.

MR. PARKS: Any further discussion on the amendment? Hearing none, we will vote on the amendment. All those in favor of the amendment, say "Aye."

MR. BARLEY AND MR. SHEPARD: Aye.

MR. PARKS: Opposed?

ALL COMMISSIONERS EXCEPT MR. BARLEY AND MR. SHEPARD: No.

(WHEREUPON, THE MOTION FAILED.)

MR. PARKS: It fails four to two.

MR. HALL: If we have a rule, we will have to enforce it.

MR. PARKS: Okay. Are there any further amendments or discussion on (a) and (b)?

MS. VAN VLIET: Call for the question, Mr. Chairman.

MR. PARKS: All those in favor, say "Aye."

ALL COMMISSIONERS: Aye.

MR. PARKS: Opposed?

(WHEREUPON, THE MOTION CARRIED UNANIMOUSLY.)

MR. PARKS: It passes unanimously.

Please go back at this point to page (10).

We are not back to the rule we deferred, because at the request of Mr. Shaw, it was moved and passed by all of us to defer .404 on page (10), because of its reference to secondary drinking water standards. Testimony has been closed on that.

MS. VAN VLIET: Mr. Chairman, I move we adopt this section as submitted by the Department.

MR. PARKS: Is there a second?

DR. BELLAMY: Second.

MR. PARKS: It has been moved and seconded that Chapter 17-3.404 be approved as submitted by the Department.

DR. BELLAMY: This is effective January 1, 1983?

MR. PARKS: No, sir, we haven't gotten to that yet.

MR. BARLEY: This is the one where the problem was with the words "and secondary".

MR. PARKS: Yes, sir, we put it off.

MR. BARLEY: I move an amendment to delete the words "and secondary".

MR. PARKS: It's been moved.

MR. SHEPARD: Second.

MR. PARKS: Moved and seconded that the words "and secondary" be deleted in .404.

MR. HALL: And if we do that, would we have a rule really?

MR. SHEPARD: Sure, we will have a primary water standard.

MR. PARKS: Let's see, the words "and secondary", Mr. Barley, on line 25?

MR. BARLEY: 25.

MR. PARKS: All right. It has been moved and seconded. Any discussion on the amendment? All those in favor?

MR. SHEPARD AND MR. BARLEY: Aye.

MR. PARKS: Opposed?

ALL COMMISSIONERS EXCEPT MR. SHEPARD AND MR. BARLEY: No.

(WHEREUPON, THE MOTION FAILED.)

MR. PARKS: It is defeated. On .404 itself, is

Comment #46

"The solid waste area test cell program, so far as it was described on pgs. 3.7.1-10 through 15, is insufficient as proposed. To merely collect for analysis, 'leachate and runoff resulting from rainfall', would not substitute for a ground water leachate study employing unlimited test cells and monitoring wells, primarily because of the great dilution with rainwater materials. Please provide, under 6)b) above, details of such a test-cell/ground water leachate study, or else provide documentation that the entire solid waste storage area would be lined and underdrained. Suggest that you also contact Solid Waste personnel for appropriate rule applicabilities."

Response:

As discussed in Section 3.7.1, the entire "by-product storage area" will be lined unless test-cell data provide "convincing evidence" that the by-product materials pose no health hazards. The test cell will be designed to emulate field conditions in every way. The leachate collected from the test cell will have a residence time equal to the residence time of any cell in the by-product storage area. There will be no dilution prior to sampling.

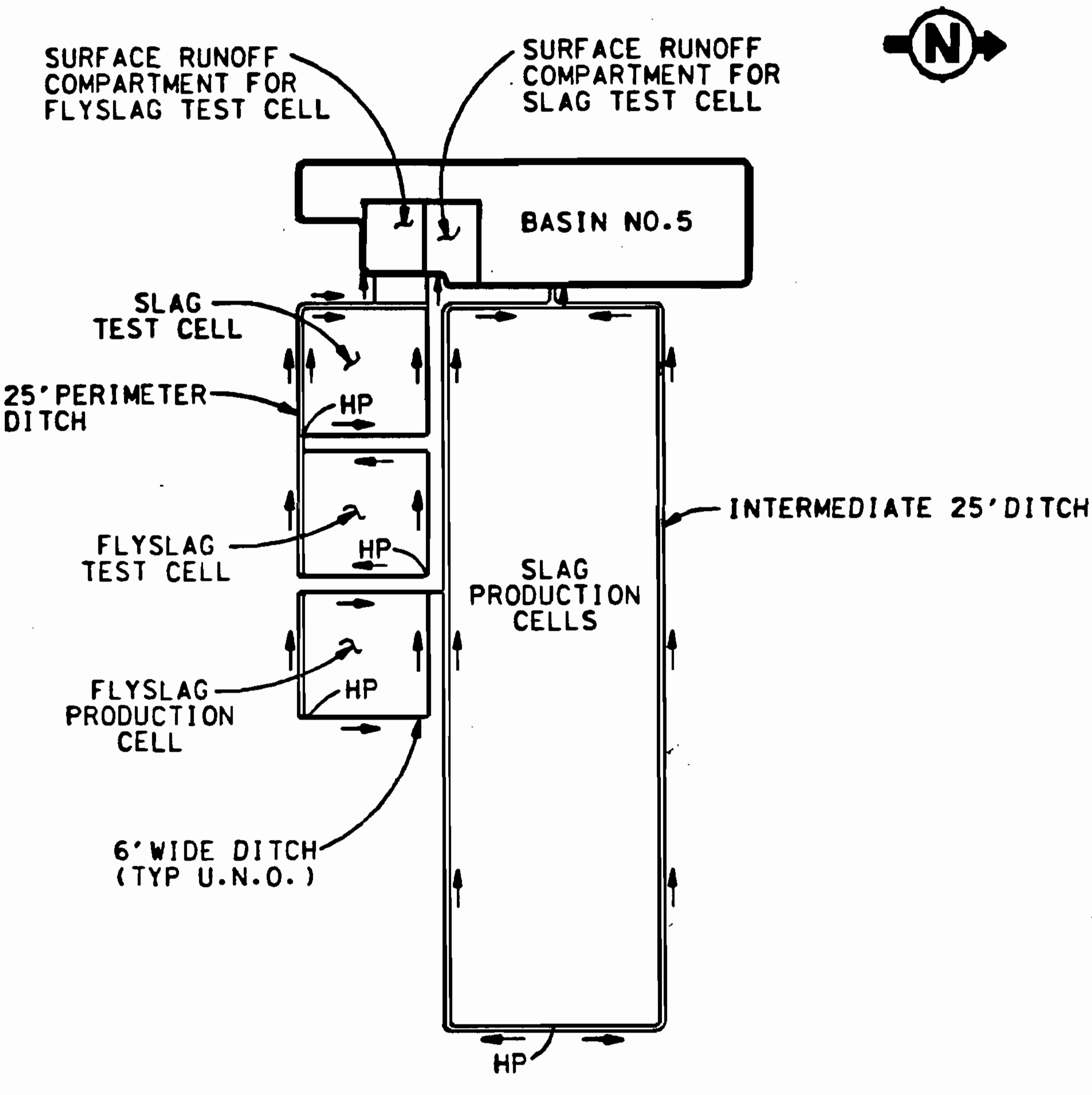
Since the submittal of the SCA, preliminary design of the by-product storage area has been completed. It addresses the slag and fly slag test cell program, up to 120 production cells, phasing plan, sequence of construction, leachate collection and surface water management.

During the course of this program, all slag storage areas will be lined and underdrained. The unlimited test cell/monitoring well arrangement recommended above is inappropriate for this situation because it would subject the local groundwater to slag runoff and leachate of uncertain quality.

A summary of the by-product storage development is found below:

The surface water management of the proposed by-product storage area will be developed in three stages of approximately 5, 10, and 15 year periods.

During the first stage, runoff detention Basin No. 5, and the perimeter ditches around the test cells and the production cells, will be constructed as shown on attached Exhibit DER-46A "First Stage Drainage Plan". The runoff from each test cell will be conveyed separately into



FIRST STAGE DRAINAGE PLAN

NOTES:

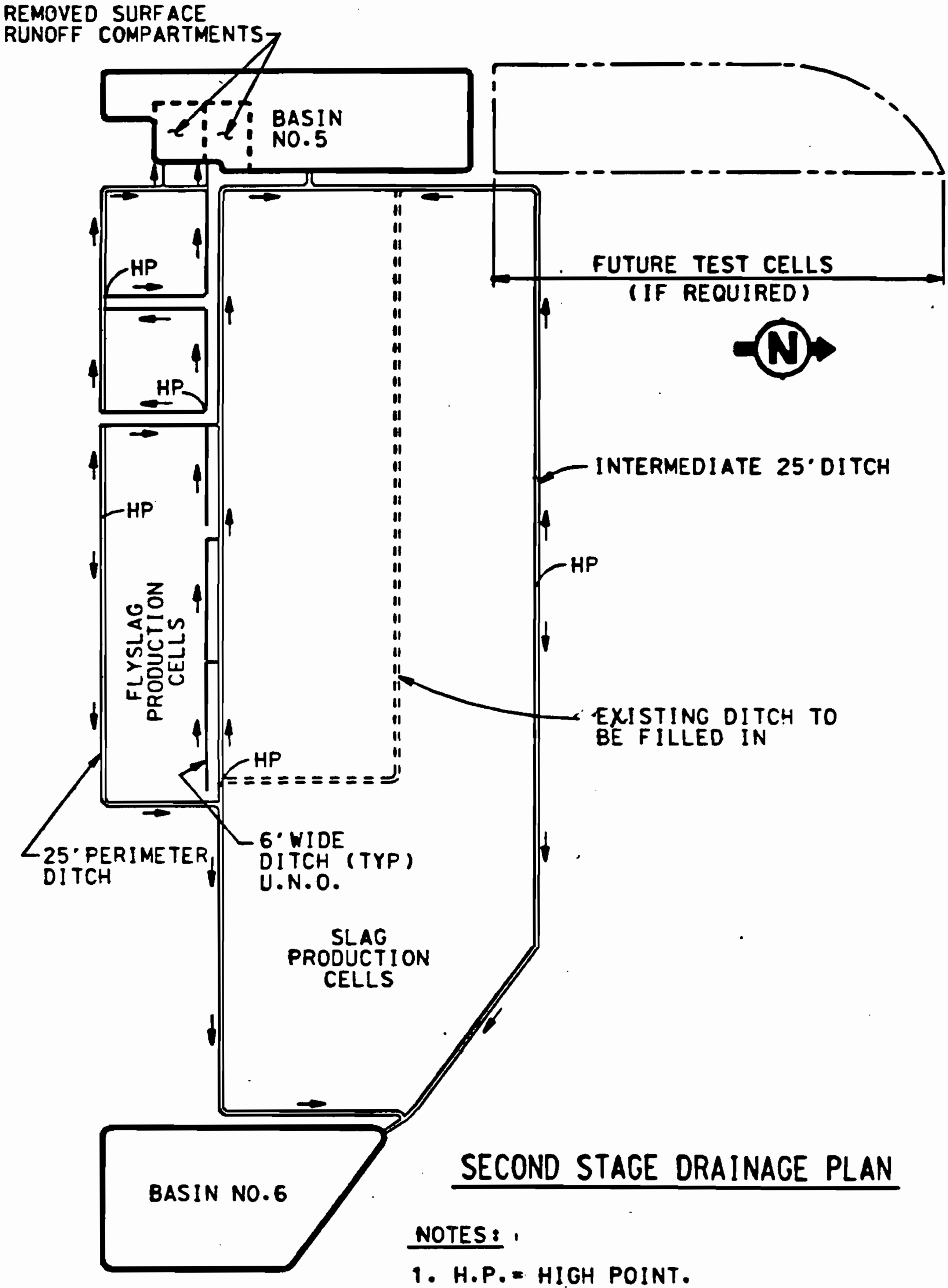
1. H.P.= HIGH POINT.
2. FOR LEACHATE COLLECTION SYSTEM.

EXHIBIT DER-46A FIRST STAGE DRAINAGE PLAN

individual compartments in the collection basin. The runoff from the production cells will be directly conveyed into the collection basin. The runoff from the undisturbed area will continue its existing course of flow and discharge into the existing eastern perimeter ditch. The temporary perimeter road and runoff ditches around Stage I test cells and production cells will separate the runoff water of the developed area from the undisturbed area.

In the second stage of development, runoff detention Basin No. 6, and the additional perimeter ditches around the production cells will be completed as shown on attached Exhibit DER-46B, "Second Stage Drainage Plan". The runoff from Stage II production cells will be directed to Basins No. 5 and 6. The runoff from the undisturbed area will continue its existing course of flow similar to the Stage I. The runoff ditch between Stage I and Stage II will be covered by the production cells of Stage II.

Provision will be made for future testing of leachate from slag and flyslag if warranted by changes in slag and flyslag quality due to changes in coal source. During the third and final stage, the remaining perimeter ditches will be completed, as shown on Exhibit DER-46C. The runoff from the entire by-product storage area will be conveyed into both collection basins, and will ultimately be discharged into the cooling pond or into the Eastern Perimeter Ditch, if the runoff from the by-product storage area proves to be uncontaminated.

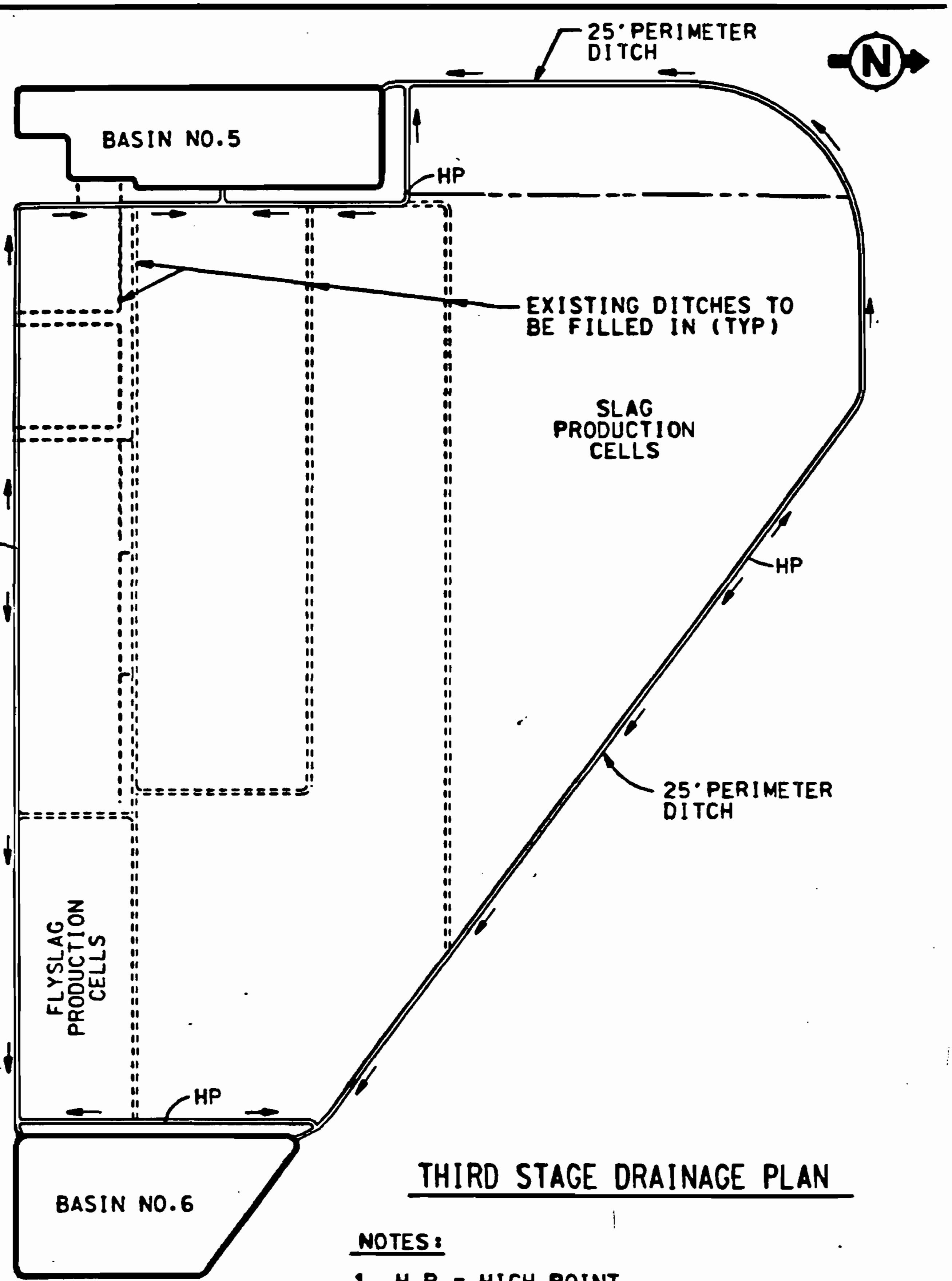


SECOND STAGE DRAINAGE PLAN

NOTES:

1. H.P. = HIGH POINT.

EXHIBIT DER-46B SECOND STAGE DRAINAGE



THIRD STAGE DRAINAGE PLAN

NOTES:

1. H.P.= HIGH POINT.
2. FOR LEACHATE COLLECTION SYSTEM, SEE DWG. SK-C-051.

EXHIBIT DER-46C THIRD STAGE DRAINAGE PLAN

Comment #47

"A request for appropriate zone of discharge should be submitted with the GWMP."

Response:

Pursuant to Rule 17-28.700(4)(b), F.A.C., the zone of discharge for the existing Martin cooling pond should continue to extend to the property boundaries of the Martin Site.

The only other installation on the site of the CG/CC project that may discharge to groundwater is the by-product storage area. FPL requests the DER to grant a zone of discharge pursuant to Rule 17-28.700(4), F.A.C., for the by-product storage area that extends from the edge of the by-product storage area 150 feet vertically to the bottom of the surficial aquifer or the top of the Hawthorne Formation, whichever is lower, and rising to a depth of 50 feet at a horizontal distance of 100 feet from the edge of the by-product storage area. The lateral zone of discharge dimension is justified by down-gradient buffer areas around the by-product storage area having widths of greater than one mile.

Comment #48

"The request for exemption from compliance with Na standard for G-II waters (and possibly for Cl, TDS, and Fe standards as well, should the installation be found to be 'new'), should be deferred until such time as analyses of cooling pond water indicate that the 160 mg/l Na standard is being approached. The issue might be addressed upon subsequent renewal of the ground water monitoring permit, pursuant to conditions of certification."

Response:

FPL's request for an exemption from compliance with the G-II standard for sodium should not be deferred. The request for the exemption presented in the SCA is based on the best data available to support that request. Deferring the sodium exemption request until some point in the future after plant operation has begun may result in the standard being exceeded before the exemption request can be acted upon by the appropriate entity. The Power Plant Siting Act affords a workable process to grant this exemption as part of the one-stop permitting that Act creates for electrical power plants. See Section 403.511(1), Fla. Stat.

Comment #49

"Data from the Historical Sample program, Field Sampling Program and Ditch Water Quality Investigations (Section 2.3.4) should be presented in tabular form (in an appendix) in addition to the summary graphic form presented in the text."

Response:

Data from the Historical Sampling Program is presented in tabular form in Appendix 10.5.4.2. Data from the Field Sampling Program are included in Exhibit DER-49. All available tabular data for the Ditch Water Quality Investigations have already been presented in Tables 2.3.4-9 and 2.3.4-10 of the SCA.

Exhibit DER-49

Field Sampling Program Data

PELA REPORT OF ANALYSIS

P.E. LaMoreaux & Associates, Inc.
Geochemistry Laboratory
4320 Old Highway 37 Lakeland, Florida 33813 Telephone 813 / 646-8526

Client Name : ENVIROSPHERE COMPANY
Sample Identification: SAMPLE #1 - Near Bottom 9/29/88
Sample Site : SURFACE WATER PELA Lab No. : 09-30-EVS-502
Sample Type : WATER Completion Date: 10-21-88
Sample Designator : INORGANIC

		---------- Units: mg/l ----------	
Parameter	Results	Detection Limits	Quantitation Limits
pH (standard units)	7.68	0.01	0.01
Specific Conductance (Micromhos)	580	1	1
Nitrite as N	0.02	0.01	0.01
Nitrate as N	0.84	0.01	0.01
Total Phosphorus as P	0.12	0.01	0.01
Ortho-Phosphate as P	0.09	0.01	0.01
Sulfate as SO4	19	1	1
Chloride as Cl	87.0	0.10	0.10
Total Ammonia as N	<0.01	0.01	0.01
Total Suspended Solids (TSS)	10	1	1
Total Dissolved Solids (TDS)	353	1	1
Turbidity as NTU	3.5	0.1	0.1
Oil & Grease	<0.1	0.1	0.1
Alkalinity as CaCO3	120	0.01	0.01
Total Hardness as CaCO3	159	0.01	0.01
Calcium as Ca	40.2	0.01	0.01
Magnesium as Mg	14.2	0.01	0.01
Sodium as Na	49.9	0.01	0.01
Arsenic as As	<0.001	0.001	0.001
Selenium as Se	<0.002	0.002	0.002
Mercury as Hg	<0.0001	0.0001	0.0001
Lead as Pb	0.004	0.001	0.001
Vanadium as V	<0.10	0.10	0.10
Nickel as Ni	<0.02	0.02	0.02
Iron as Fe	0.18	0.02	0.02
Copper as Cu	0.02	0.02	0.02
Zinc as Zn	<0.005	0.005	0.005
Potassium as K	5.69	0.01	0.01
Cadmium as Cd	<0.005	0.005	0.005
Chromium as Cr	<0.04	0.04	0.04

Amal Mostufa
Chief Chemist

State of Florida Certification #84183 State of Alabama Certification #40120 State of Kentucky Certification #90013

METHODS: "Standard Methods for the Examination of Water and Wastewater", Latest Edition, APHA, AWWA, AND WPCF and/or other EPA approved methods which meet FDER or ADEM protocol, unless otherwise designated.

REPORT OF ANALYSIS

PELA

P.E. LaMoreaux & Associates, Inc.
Geochemistry Laboratory

4320 Old Highway 37 Lakeland, Florida 33813 Telephone 813 / 646-8526

Client Name : ENVIROSPHERE COMPANY
Sample Identification : SAMPLE #2 Near Surface 9/29/88
Sample Site : SURFACE WATER PELA Lab No. : 09-30-EVS-503
Sample Type : WATER Completion Date : 10-21-88
Sample Designator : INORGANIC

Units: mg/l

Parameter	Results	Detection Limits	Quantitation Limits
pH (standard units)	7.68	0.01	0.01
Specific Conductance (Micromhos)	510	1	1
Nitrite as N	<0.01	0.01	0.01
Nitrate as N	0.60	0.01	0.01
Total Phosphorus as P	0.11	0.01	0.01
Ortho-Phosphate as P	0.06	0.01	0.01
Sulfate as SO4	31	1	1
Chloride as Cl	74.5	0.10	0.10
Total Ammonia as N	<0.01	0.01	0.01
Total Suspended Solids (TSS)	1	1	1
Total Dissolved Solids (TDS)	331	1	1
Turbidity as NTU	3.1	0.1	0.1
Oil & Grease	<0.1	0.1	0.1
Alkalinity as CaCO3	113	0.01	0.01
Total Hardness as CaCO3	153	0.01	0.01
Calcium as Ca	38.0	0.01	0.01
Magnesium as Mg	14.2	0.01	0.01
Sodium as Na	44.2	0.01	0.01
Arsenic as As	<0.001	0.001	0.001
Selenium as Se	<0.002	0.002	0.002
Mercury as Hg	<0.0001	0.0001	0.0001
Lead as Pb	0.004	0.001	0.001
Vanadium as V	<0.10	0.10	0.10
Nickel as Ni	<0.02	0.02	0.02
Iron as Fe	0.19	0.02	0.02
Copper as Cu	0.04	0.02	0.02
Zinc as Zn	<0.005	0.005	0.005
Potassium as K	5.48	0.01	0.01
Cadmium as Cd	<0.005	0.005	0.005
Chromium as Cr	<0.04	0.04	0.04

Amal Mostafa
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METHODS: "Standard Methods for the Examination of Water and Wastewater", Latest Edition, APHA, AWWA, AND WPCF and/or other EPA approved methods which meet FDER or ADEM protocol, unless otherwise designated.

REPORT OF ANALYSIS

PELA

P.E. LaMoreaux & Associates, Inc.
Geochemistry Laboratory
4320 Old Highway 37 Lakeland, Florida 33813 Telephone 813 / 646-8526

Client Name : ENVIROSPHERE COMPANY
Sample Identification: FPL/MARTIN 1/26/89
Sample Site : CGCC #1 Near-Bottom PELA Lab No. : 01-27-EVS-360
Sample Type : WATER Completion Date: 02-20-89
Sample Designator : INORGANIC

	---------- Units: mg/l ----------		
Parameter	Results	Detection Limits	Quantitation Limits
pH (standard units)	7.91	0.01	0.01
Specific Conductance (Micromhos)	600	1	1
Turbidity as NTU	8.6	0.1	0.1
Nitrate as N	1.01	0.01	0.01
Chloride as Cl	96.0	0.10	0.10
Total Hardness as CaCO3	191	1	1
Total Ammonia as N	0.09	0.01	0.01
Ortho-Phosphate as P	0.08	0.01	0.01
Total Alkalinity as CaCO3	152		
Sulfate as SO4	38	1	1
Total Suspended Solids (TSS)	205	1	1
Total Dissolved Solids (TDS)	391	1	1
Nitrite as N	0.04	0.01	0.01
Total Phosphorus as P	0.09	0.01	0.01
Oil & Grease	0.34	0.1	0.1
Calcium as Ca	51.5	0.01	0.01
Magnesium as Mg	15.0	0.01	0.01
Sodium as Na	56.4	0.01	0.01
Arsenic as As	0.025	0.001	0.001
Selenium as Se	<0.002	0.002	0.002
Mercury as Hg	0.0003	0.0001	0.0001
Lead as Pb	0.007	0.001	0.001
Vanadium as V	<0.20	0.20	0.20
Nickel as Ni	<0.02	0.02	0.02
Iron as Fe	0.31	0.02	0.02
Copper as Cu	<0.02	0.02	0.02
Zinc as Zn	0.110	0.005	0.005
Potassium as K	5.92	0.01	0.01
Cadmium as Cd	<0.005	0.005	0.005
Chromium as Cr	<0.04	0.04	0.04

Amal Mostafa
Chief Chemist

PELA

REPORT OF ANALYSIS

P.E. LaMoreaux & Associates, Inc.
Geochemistry Laboratory

4320 Old Highway 37 Lakeland, Florida 33813 Telephone 813 / 646-8526

Client Name : ENVIROSPHERE COMPANY
Sample Identification : FPL/MARTIN - 1/26/89
Sample Site : CGCC #2 Near Surface
Sample Type : WATER
Sample Designator : INORGANIC

PELA Lab No. : 01-27-EVS-361
Completion Date : 2-20-89

Parameter	Results	Detection Limits	Quantitation Limits
	Units: mg/l		
pH (standard units)	8.53	0.01	0.01
Specific Conductance (Micromhos)	600	1	1
Turbidity as NTU	7.3	0.1	0.1
Nitrate as N	1.04	0.01	0.01
Chloride as Cl	97.0	0.10	0.10
Total Hardness as CaCO3	190	1	1
Total Ammonia as N	0.08	0.01	0.01
Ortho-Phosphate as P	0.07	0.01	0.01
Total Alkalinity as CaCO3	170		
Sulfate as SO4	36	1	1
Total Suspended Solids (TSS)	5	1	1
Total Dissolved Solids (TDS)	364	1	1
Nitrite as N	0.04	0.01	0.01
Total Phosphorus as P	0.07	0.01	0.01
Oil & Grease	0.67	0.1	0.1
Calcium as Ca	51.4	0.01	0.01
Magnesium as Mg	15.1	0.01	0.01
Sodium as Na	56.1	0.01	0.01
Arsenic as As	0.009	0.001	0.001
Selenium as Se	<0.002	0.002	0.002
Mercury as Hg	0.0003	0.0001	0.0001
Lead as Pb	0.007	0.001	0.001
Vanadium as V	<0.20	0.20	0.20
Nickel as Ni	<0.02	0.02	0.02
Iron as Fe	0.30	0.02	0.02
Copper as Cu	<0.02	0.02	0.02
Zinc as Zn	0.070	0.005	0.005
Potassium as K	6.02	0.01	0.01
Cadmium as Cd	<0.005	0.005	0.005
Chromium as Cr	<0.04	0.04	0.04

Amal Mostafa
Chief Chemist

REPORT OF ANALYSIS

PELA
P.E. LaMoreaux & Associates, Inc.
Geochemistry Laboratory
4320 Old Highway 37 Lakeland, Florida 33813 Telephone 813 / 646-8526

Client Name : ENVIROSPHERE COMPANY
Sample Identification: FPL/MARTIN 1/26/89
Sample Site : CGCC #3 Near Surface PELA Lab No. : 01-27-EVS-362
Sample Type : WATER Completion Date: 02-20-89
Sample Designator : INORGANIC

Parameter	Results	Detection Limits	Quantitation Limits
	Units: mg/l		
pH (standard units)	8.30	0.01	0.01
Specific Conductance (Micromhos)	600	1	1
Turbidity as NTU	7.2	0.1	0.1
~~Nitrate as N~~	~~1.00~~	~~0.01~~	~~0.01~~
Chloride as Cl	98.0	0.10	0.10
Total Hardness as CaCO3	193	1	1
Total Ammonia as N	0.10	0.01	0.01
Ortho-Phosphate as P	0.07	0.01	0.01
Total Alkalinity as CaCO3	160		
Sulfate as SO4	36	1	1
Total Suspended Solids (TSS)	5	1	1
Total Dissolved Solids (TDS)	372	1	1
Nitrite as N	0.04	0.01	0.01
Total Phosphorus as P	0.07	0.01	0.01
Oil & Grease	<0.1	0.1	0.1
Calcium as Ca	52.3	0.01	0.01
Magnesium as Mg	15.1	0.01	0.01
Sodium as Na	55.0	0.01	0.01
Arsenic as As	0.010	0.001	0.001
Selenium as Se	<0.002	0.002	0.002
Mercury as Hg	0.0003	0.0001	0.0001
Lead as Pb	0.005	0.001	0.001
Vanadium as V	<0.20	0.20	0.20
Nickel as Ni	<0.02	0.02	0.02
Iron as Fe	0.15	0.02	0.02
Copper as Cu	<0.02	0.02	0.02
Zinc as Zn	<0.005	0.005	0.005
Potassium as K	5.02	0.01	0.01
Cadmium as Cd	<0.005	0.005	0.005
Chromium as Cr	<0.04	0.04	0.04

Amal Mostafa
Chief Chemist

State of Florida Certification #84183 State of Alabama Certification #40120 State of Kentucky Certification #90013

METHODS: "Standard Methods for the Examination of Water and Wastewater", Latest Edition, APHA, AWWA, AND WPCF and/or other EPA approved methods which meet FDER or ADEM protocol, unless otherwise designated.

Comment #50

"Water bodies in Section 2.3.4 having ambient concentrations exceeding the applicable state water quality standard for zinc should be identified individually."

Response:

Zinc exceedances were found in the St. Lucie Canal, Barley Barber Swamp, and both drainage ditches.

Comment #51

"Water bodies in Section 2.3.4 having ambient concentrations exceeding the applicable state water quality standard for iron should be identified individually."

Response:

Iron exceedances were found in the St. Lucie Canal, L-65 Canal, Lake Okeechobee, Barley Barber Swamp, and both drainage ditches.

Comment #52

"Data from the Field Sampling Program (Section 2.3.4) should be plotted individually for near-surface and near-bottom samples rather than as mean values. This would enable impacts resulting from sedimentation processes to be distinguished from water-column impacts. Data presented in Section 2.3.4 would be more legitimately compared with adjacent St. Lucie Canal stations PPD/US and PPD/DS rather than with summary data for all locations."

Response:

Data submitted in response to DER Comment #49 demonstrate insignificant differences between near-surface and near-bottom concentrations of chemical parameters. Plots of chemical concentrations at each sampling location are presented in Appendix 10.5.4.2. Because of the voluminous nature of these plots, and the lack of statistical significance between locations, the plots presented in Section 2.3.4-1 were limited to a representative minimum.

Comment #53

"Zinc concentrations in the St. Lucie Canal appear higher downstream of the intake/discharge canal than upstream. These data should be compared with near-surface and near-bottom zinc concentrations and possible causes of this phenomenon should be discussed in the text."

Response:

Field sampling program zinc concentrations were measured as follows:

1988		1989	
Surface	Bottom	Surface	Bottom
ND	ND	.070/ND*	.110

* Two samples were taken for QC purposes.

During the Historical Sampling Program, CW-3 was upstream and CW-4 was downstream. Zinc values at these locations were measured as follows:

	CW-4	CW-3
Maximum	0.1000	.0360
Average	.0116	.0098
Minimum	ND	ND

One could interpret this data as an indication that zinc concentrations are slightly higher downstream than upstream. The difference between surface and bottom is similar in magnitude to the difference between two surface samples.

FPL feels that discussion of possible causes of zinc in the ambient water would be speculative and therefore did not include such discussion in the SCA. However, the possible sources of zinc could include corrosion of galvanized metals (e.g. culverts), such as those found throughout the region.

Comment #54

"Discussion of wet/dry season phenomena in the text (e.g., page 2.3.4-58, discussion of nitrate/nitrite data) occasionally contradicts the rainfall data (Table 2.3.3-2), which indicate the wet season to be May through October."

Response:

FPL notes that the statement at the top of Page 2.3.4-58 is incorrect and should read: "The nitrate and nitrite dry season values are in excess of the historical maximum, although the wet season values are not".

Comment #55

"Does the value for mercury in Table 2.3.4-6 represent value for composited surface and bottom samples or a mean value for individual surface and bottom samples?"

Response:

Mercury was detected during the January 1989 sampling episode. One near-bottom sample and two near-surface samples were taken. All three samples were tested individually and the same value (.0003 mg/l) was obtained for each sample. No mercury was detected during the September 1988 sampling episode.

Comment #56

"The locations of station ^{I}1-7 and ^{R}1-6 should be identified in Figure 2.3.4-38."

Response:

The locations of the stations in question have been added to attached Exhibit DER-56. Relevant stations are as follows:

R_1 and I_1 - near downstream end of North Drainage Ditch (NDD)

R_6 - Near NE corner of cooling pond in NDD

I_7 - SE end of NDD

I_2, R_2 - south of existing plant, in small ditch which runs eastward into East Drainage Ditch (EDD)

I_4 - in EDD just downstream of confluence with ditch containing I_2 and R_2

I_3, R_3 - in EDD near its control structure at intake/discharge canal.

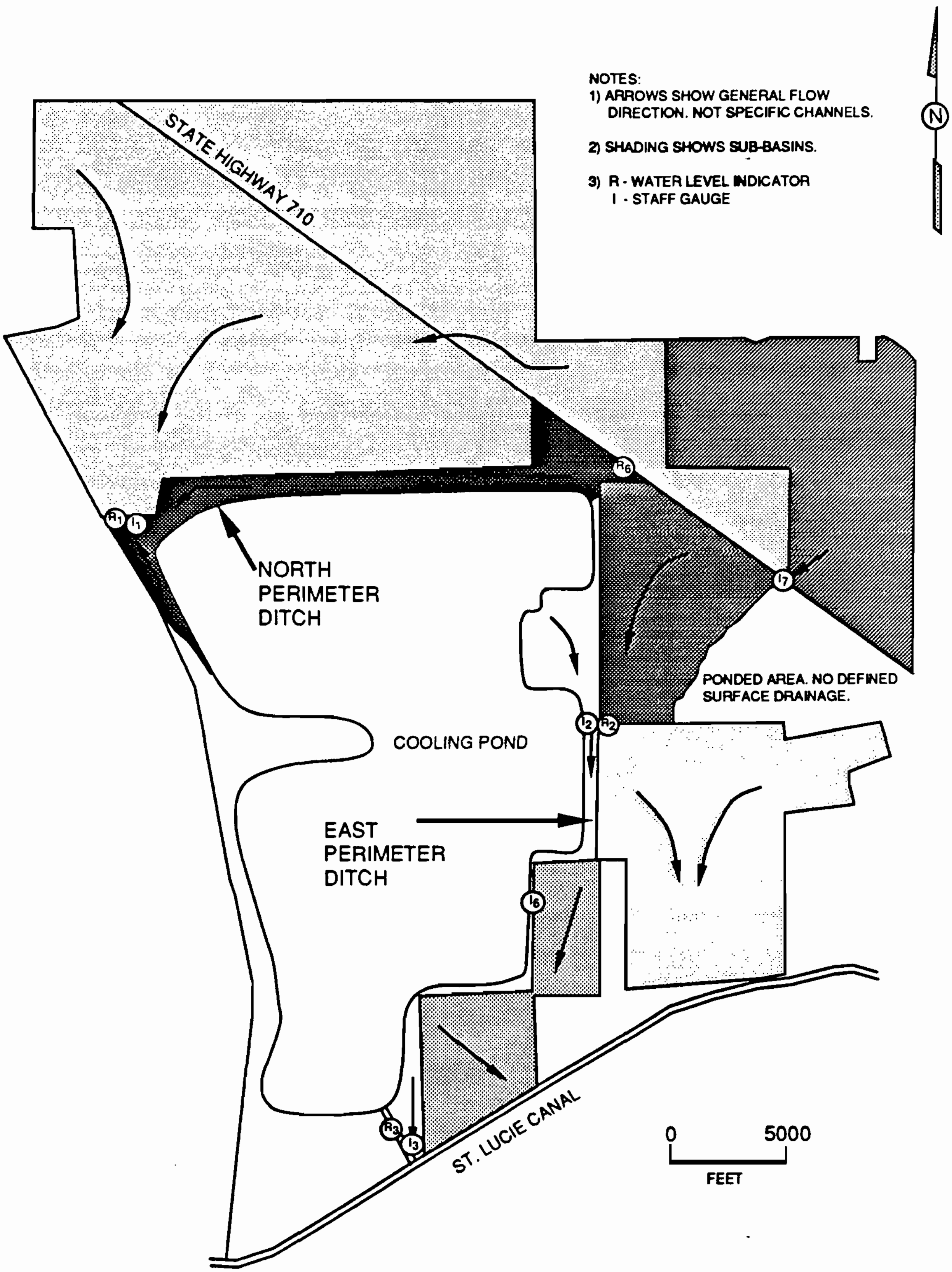


FIGURE DER-56 DRAINAGE AREAS

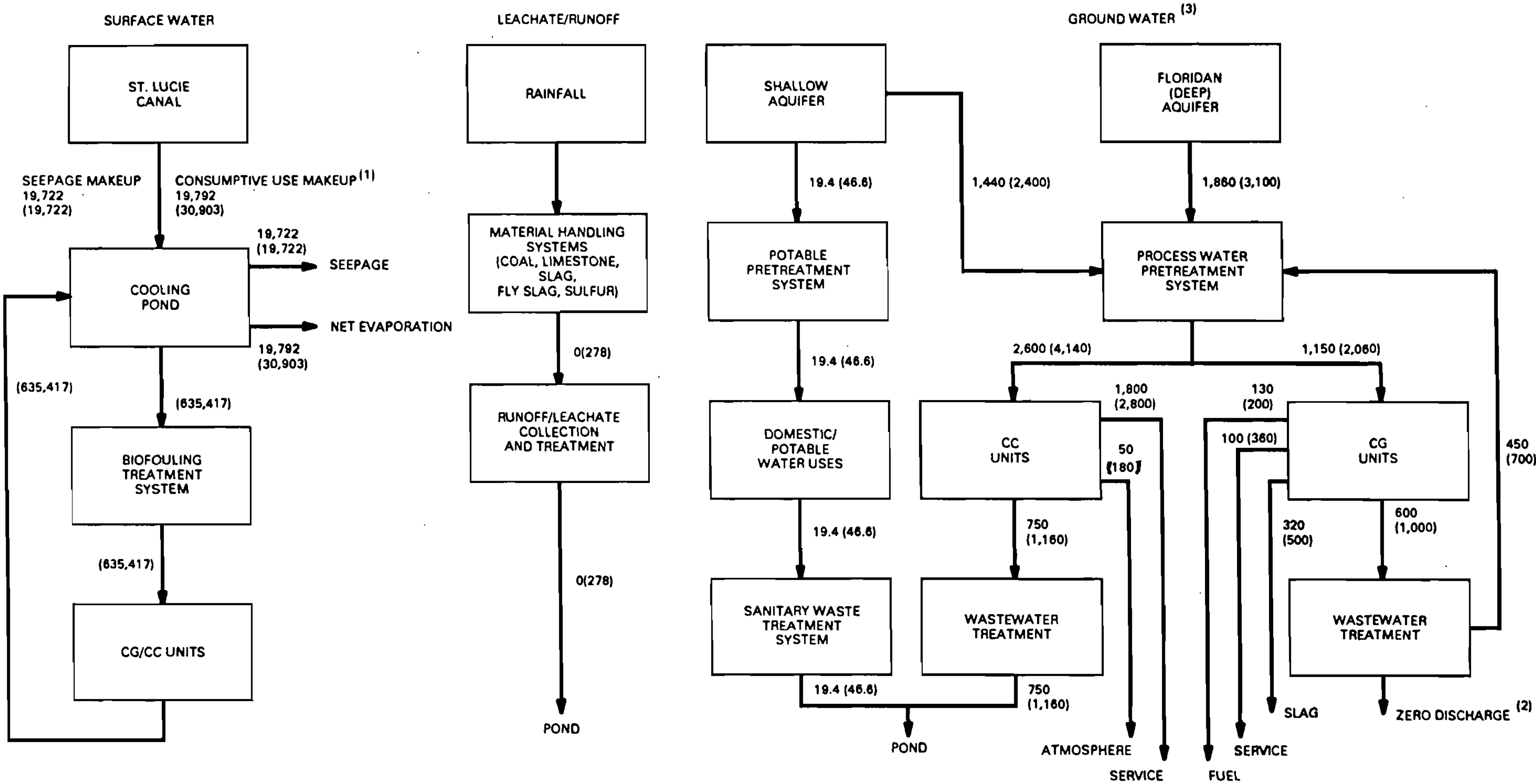
FPL Martin CG/CC Project

Comment #57

"Projected use inputs/outputs (Figure 3.5.0-1) do not balance for the CC units."

Response:

The inputs/outputs for the CC Units shown in SCA Figure 3.5.0-1 will balance if the average and peak flow discharges to the atmosphere are switched as provided in the attached Exhibit DER-57.



NOTES: FLOWS IN GPM
PEAK FLOWS IN PARENTHESES

(1) PRECONSTRUCTION CONSUMPTIVE USE = 12,778 GPM (PEAK)
(2) AVERAGE 150 GPM, PEAK 300 GPM LOST IN SLUDGE
(3) MAXIMUM TO AVERAGE DEMAND RATIO FOR GROUND WATER = 1.67

G–12/89–1468

EXHIBIT DER - 57

CG/CC PROJECT WATER USE

Source: Bechtel Power Corporation, 1989

FPL

Martin CG/CC Project

Comment #58

"Projected ground water use of 8,550 acre-ft. per year (5,297 GPM) on page 3.5.0-1 does not equal the sum of the ground water withdrawals (3,319 GPM) shown schematically in Figure 3.5.0-1."

Response:

The average projected groundwater use is smaller, approximately 5350 acre-ft per year or 3319 gpm, as indicated in Figure 3.5.0-1.

The peak average projected groundwater use is approximately 8770 acre-feet per year or 5500 gpm.

Comment #59

"A more detailed analysis should be provided for the cooling pond thermal analysis of Section 3.5.1. This analysis should clearly show all model input and output variables and provide justification for the input values used."

Response:

As described in SCA Section 3.5.1, the cooling pond thermal analysis was made to determine both the pond water temperature at the circulating water intakes and the pond's evaporative loss. The computer model and model input used, and model output produced for this analysis are described below:

Model Description

The computer model is a two-layer computer model which simulates flow and heat transfer in a cooling pond. Exhibit DER-59 shows a typical schematic of the pond and typical temperature distribution. The model simulates the key aspects of pond circulation, i.e. the mixing of the heated discharge as it enters the pond, and stratified flow in the pond. Heat transfer is simulated by calculating the various components of the heat flux, including incoming solar and atmospheric radiation, and outgoing fluxes including longwave radiation, evaporation, and conduction. The effects of transient meteorology, changes in heat loads and pond thermal inertia can be simulated.

Model Input

* Heat Load from Units 1 & 2 and CG/CC units (100% capacity)

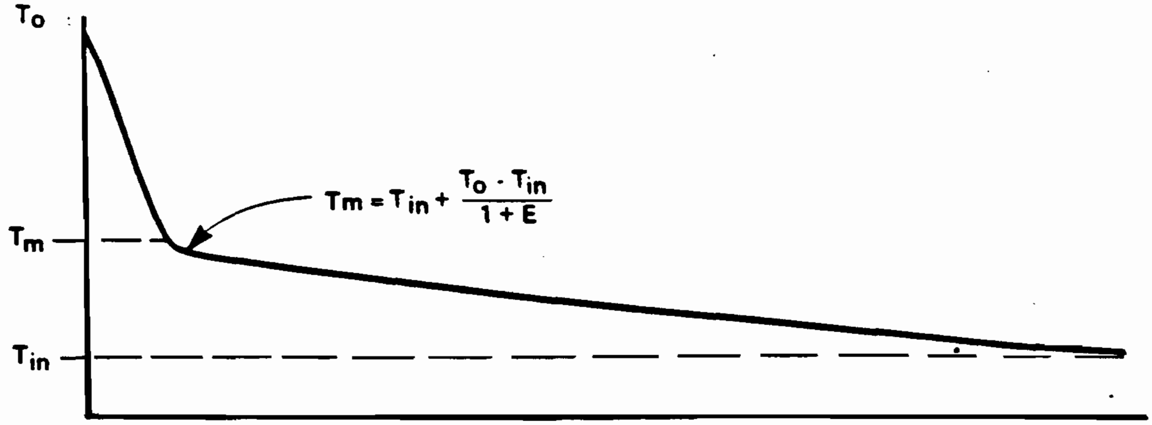
Unit 1 and 2	7.73×10^9 Btu/hr
CG/CC Units	6.00×10^9 Btu/hr
Total (approximate)	14.00×10^9 Btu/hr

The heat loads above represent conservative estimates based on an engineering evaluation of various plant configurations and manufacturers. The upward rounding in the heat load was made to accommodate any potential variation in heat cycle optimization of the proposed units.

* Pond Surface and Area

Clean Pond Surface Area - 6500 acres

Clean Pond Volume - 58,000 acre-feet



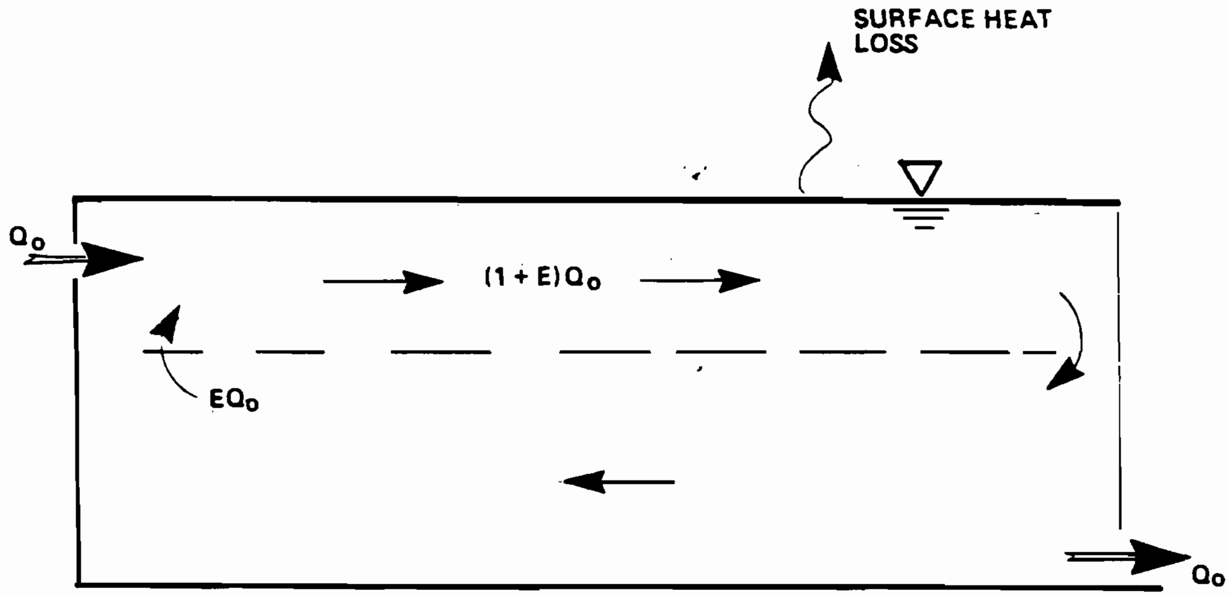


EXHIBIT DER-59

SCHEMATIC OF FLOW AND TEMPERTATURE DISTRIBUTION
IN COOLING POND MODEL

* Meteorological Data

  West Palm Beach Data (1955-1984): wind speed, air temperature, relative humidity, cloud cover, and solar radiation

  The West Palm Beach National Weather Service Station is the closest monitoring station which measures the required meteorological parameters on a continuous long term basis. Furthermore, the use of these data resulted in reasonable temperature predictions.

* Pond Operation

  - Maximum pond elevation is 31 feet NGVD.

  - Thermal performance analysis assumes 15 percent reduction in pond surface area to accommodate partial removal of aquatic growth.

  - The condenser and plant heat exchanger temperature rise for the existing and additional units is 19.7 F.

Model Output

* Monthly Estimates of Gross (natural & forced) and Natural Evaporation

* Monthly Estimates of Outlet Pond Water Temperature

Calculation of Net Evaporation

This model did not calculate net evaporation (gross evaporation - precipitation) from the pond. This calculation was performed separately using the following input:

Port Mayaca Data: precipitation

Gross Evaporation from the Pond (model output)

The data sources for evaporation (West Palm Beach) and precipitation (Port Mayaca) were used in lieu of coincident evaporation/precipitation data from Belle Glade to maintain continuity with initial cooling pond design studies by Mid-Valley which used these data sources. Note that Port Mayaca provided more representative precipitation data than that available from West Palm Beach because of its close proximity to the site.

Comment #60

"Mass balance calculations in Section 3.6.1 were performed using a gross pond seepage rate of 44 cfs. Page 2.3.3-8 states that '21 cfs (of this seepage) is collected by the pond underdrain system and returned to the pond.' Use of gross rather than net seepage would cause constituent concentrations in the pond (Table 3.6.1-1) to be underestimated. These calculations should be repeated using net seepage rates. Does data indicate seepage rates have remained constant with time or is it accumulation in the reservoir?"

Response:

The estimated seepage from the cooling pond is 44 CFS. This value is based on analyses of piezometers around the cooling pond embankment. In any given month the seepage value may vary due to local climatic conditions and pond elevation. A portion of this seepage is captured by the cooling pond underdrain system. Natural groundwater inflow and precipitation also contribute to the quantity of water captured by the underdrain system. The total quantity of water collected in the underdrain system sump pumps averages 21 CFS. Of this total, only 6 CFS are actually returned to the pond. Page 2.3.3-8 incorrectly states that an estimate of 21 CFS are collected by the pond underdrain system and returned to the pond.

The quantity of seepage returned to the pond constitutes approximately 13.6% of the total estimated seepage. This is within an acceptable range of the actual seepage value, considering the uncertainty inherent in predicting seepage losses.

The mass balance calculations were based on a 44 CFS seepage value. This is a value that has been accepted by the SFWMD as representative of the actual seepage. Considering a realistic range of pond seepage and the small percent of actual seepage collected in the underdrain system returned to the pond, the 44 CFS are the most acceptable value of pond seepage to use in the mass balance calculations.

Comment #61

"The source for values of expected constituent concentrations used to calculate the CG/CC Diluted Contribution in Table 3.6.1-1 should be identified. Methods used to predict projected effluent quality for the wastewater treatment facility should be explained."

Response:

WASTEWATER SOURCES

The column titled Coal Gasification/Combined Cycle (CG/CC) Diluted Contributions presented in SCA Table 3.6.1-1 is comprised of the following six wastewater sources:

- Combined cycle effluent
- Coal pile leachate
- Coal pile runoff
- Slag cell leachate
- Slag cell runoff
- Sanitary discharge

The flow and quality of each wastewater source was determined as follows:

Combined cycle effluent - The effluent from the combined cycle CC plant is estimated based on a weighted average of the different waste streams which comprise the effluent. The water source for the CC Plant is a mixture of the shallow aquifer and Floridan aquifer. Therefore, a raw water quality is developed based on historical water quality data from the two aquifers. The raw water is then the basis for the quality of the wastewater streams. The water quality in the water treatment system is changed by the clarifier, EDR/RO unit, and the demineralizer. The quality of each wastewater stream is dependent on its source. Wastewater from the area sumps, wastewater pressure filter, and the water treatment pressure filter are assumed to be the same quality as the product water from the water treatment clarifier. EDR/RO brine quality is based on rejecting 85 percent of the dissolved solids in the feed water into 15 percent of the feed water flow rate. The demineralizer regeneration waste composition is based on a computer simulation of the demineralizer system. All of the waste streams are combined as a weighted average to determine the composition of the mixture.

Coal Pile Leachate and Runoff - A total flow was calculated by multiplying the average annual rainfall (61.6 in./yr) times the coal pile area (67 acres). This total flow was then divided 80/20 between runoff and leachate. Coal pile leachate quality was developed from Table 7 of the State of Connecticut's Water Quality Implications of Coal Storage and Residuals Handling (January, 1984). The effluent quality of coal pile runoff was developed from data presented in the St. Johns River Power Park SCA (October, 1981).

Slag Test Cell Leachate and Runoff - A total flow rate was calculated by multiplying the average annual rainfall (61.6 in./yr) times the size of one open test cell (3.5 acres). This total flow was divided 80/20 between runoff and leachate. Slag leachate and runoff qualities were developed using EPRI report GS-6439 titled Long Term Leaching Tests with Coal Gasification Slag (July, 1989).

Sanitary Effluent - The average sanitary flow rate (28,000 gpd) was calculated by multiplying the number of plant personnel (800) times a typical industrial per capita requirement (35 gpd). Potable water, the source of this sanitary water, will be withdrawn from the shallow aquifer. Therefore, the composition of the shallow aquifer is the starting point for determining the composition of sanitary wastewater. This water quality will be modified due to use as potable water. Most notably, the 5 Day BOD, ammonia, nitrate, phosphate, and alkalinity levels will be increased. The sanitary effluent quality was calculated by assuming typical changes in common cations and anions (calcium, sodium, sulfate, chloride, etc.) due to domestic water use. These changes were made according to guidelines found in Wastewater Engineering: Treatment Disposal Reuse, by Metcalf & Eddy, Inc., 1979.

DILUTION METHODOLOGY

As explained in Section 3.6.1 of the SCA, a component mass balance for a particular constituent around the Martin cooling pond at steady state (concentrations do not change with time) is makeup flow rate (from the St. Lucie Canal) times the concentration in the discharge, equals the seepage flow rate times the concentration of the constituent in the seepage. Rainfall and evaporation are assumed to be pure water and therefore dropout of the component mass balance.

$$M * C_m + D * C_d = S * C_s$$

where M, D, and S are the makeup, discharge, and seepage flow rates; and C_s, C_m, and C_d are the concentrations of the respective constituents in the stream.

Since the only unknown is the concentration of the constituent in the seepage (C_s), solving the balance for C_s results in a generalized relationship for any constituent of the concentrations of the constituent in the makeup and discharge multiplied by factors of M/S and D/S, respectively,

$$(M/S) * C_m + (D/S) * C_d = C_s$$

The CG/CC effluent (discharge in the above balance) presented in the Table 3.6.1-1 is arrived at by applying the same idea to the individual streams which comprise the discharge from the plant (wastewater treatment, coal pile runoff, sanitary waste, slag area runoff, etc.).

Comment #62

"The dilution factor if 8 in Section 5.2.1.3 is derived from average flows in St. Lucie Canal. Assurance should be provided that canal flows are normally distributed if an average flow value is used to depict prevalent conditions."

<u>Response</u>:

The dilution factor of 8 is not derived from average flows in the St. Lucie Canal; it is derived from average <u>low</u> flows occurring when the St. Lucie locks are shut. The dilution factor averages 26 when the locks are open.

The use of the average <u>low</u> flow to calculate a dilution factor in no way implies that the flows are normally distributed; it merely reflects the following facts:

1. According to the USGS, flow records of the St. Lucie Canal at Lake Okeechobee (USGS 02276870) are of poor quality; and

2. SFWMD does not require permittees using water for irrigation to record flows.

Comment #63

"Please explain how the biocide treatment destroys at least 50 percent of cooling pond ammonia as stated on page 5.2.1-15."

Response:

The destruction of cooling pond ammonia by biocide is explained in the response to DER Comment #17.