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**Environmental, Health and Safety Assessment: ATS 7H
Program (Phase 3R) Test Activities at the GE Power Systems
Gas Turbine Manufacturing Facility, Greenville, SC**

**Topical Report
February 1998**

Work Performed Under Contract No.: DE-FC21-95MC31176

For
U.S. Department of Energy
Office of Fossil Energy
Federal Energy Technology Center
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1.0 Introduction	2
1.1 Purpose and Content.....	2
1.2 General Facility Description	2
1.3 General Project Description	4
1.3.1 Machining and Miscellaneous Manufacturing Operations.....	4
1.3.2 Specialty Coating Operations	4
1.3.3 Conventional Coating Operations	4
1.3.4 Testing.....	5
2.0 Discussion of Potential Impacts	6
2.1 Air Quality.....	6
2.2 Water Resources	6
2.3 Waste Management	7
2.4 Pollution Prevention.....	8
2.5 Land Use	8
2.6 Noise	8
2.7 Ecological Status and Biodiversity	9
2.8 Socioeconomic Impact.....	9
2.9 Historical, Archaeological and Cultural Resources.....	10
2.10 Occupational Safety and Health	10
2.11 Cumulative Impacts	10
2.12 Summary of Impacts	11
3.0 Listing of Required Permits and Licenses	12
4.0 Compliance Assessment	13
4.1 Environmental Protection.....	13
4.2 Occupational Safety and Health	13
5.0 List of GE and Agency Contacts.....	14

List of Tables

Table 1. Summary of Impacts	11
Table 2. List of Required Permits and Licenses	12
Table 3. Compliance with Environmental Protection Requirements	14
Table 4. List of Relevant Health and Safety Training.....	17

List of Figures

Figure 1. Site Plot Plan	3
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1.0 Introduction

1.1 Purpose and Content

International Technology Corporation (IT) was contracted by General Electric Company (GE) to assist in the preparation of an Environmental, Health and Safety (EH&S) assessment of the implementation of Phase 3R of the Advanced Turbine System (ATS) 7H program at the GE Gas Turbines facility located in Greenville, South Carolina. The assessment was prepared in accordance with GE's contractual agreement with the U.S. Department of Energy (GE/DOE Cooperative Agreement DE-FC21-95MC31176) and supports compliance with the requirements of the National Environmental Policy Act of 1970.

This report provides a summary of the EH&S review and includes the following:

- General description of current site operations and EH&S status,
- Description of proposed ATS 7H-related activities and discussion of the resulting environmental, health, safety and other impacts to the site and surrounding area,
- Listing of permits and/or licenses required to comply with federal, state and local regulations for proposed 7H-related activities,
- Assessment of adequacy of current and required permits, licenses, programs and/or plans.

1.2 General Facility Description

GE Greenville is a fully integrated machining, assembly and testing facility for the manufacture of large industrial gas turbine components and systems. The gas turbines are sold to a wide range of domestic and international customers in the government and private sector, typically for power generation or manufacturing processes. To meet customer and regulator specifications and requirements, the turbine models manufactured and tested by GE regularly vary in a number of ways, such as size, design, combustion configuration and rated capacity.

An important step in GE's manufacturing process involves testing and certifying turbine performance prior to shipment to customers. This routine turbine testing represents a quality control function integral to the overall manufacturing operation. The turbine testing operations are designed to monitor turbine performance and ensure conformance with customer and regulatory requirements.

GE Gas Turbines is located in Greenville, South Carolina (Greenville County) near the intersection of Interstate Highways 85 and 385 and South Carolina Highway 146. Figure 1 depicts the location of the facility and the general site layout.

GE
Gas Turbine

Figure 1
Site Plot Plan

Reference: Rust E&I/GE Dwg. No. 82032-H-G01

1.3 General Project Description

This study addresses ATS 7H-related activities at the GE Power Systems Gas Turbines facility located in Greenville, South Carolina. The Greenville facility will be manufacturing and testing gas turbine components and systems developed under Phase 3R of the ATS 7H program. Manufacturing of the new components and systems will be conducted using existing production equipment and operations. Testing of the new systems will require construction of a new testing facility (test stand 8). Affected operations are described below.

1.3.1 Machining and Miscellaneous Manufacturing Operations

The bulk of the GE Gas Turbines' operations consist of both conventional and specialized machining for the manufacture of metal turbine components. Other manufacturing operations conducted at the plant include the following: extrusion presses, welding, heat treating, parts cleaning, pickling, abrasive and vibratory treatment, non-destructive inspection and testing, and rust preventative coating application. Turbine parts and components are assembled throughout the facility into a gas turbine system.

GE anticipates that full-scale production of the ATS 7H system will be accommodated by the existing manufacturing equipment and operations with minimal modifications.

1.3.2 Specialty Coating Operations

GE operates several specialty coating systems as part of the current manufacturing process. These systems are used for the application of high performance powdered metal coatings to turbine components using plasma coating processes. The coating operations are carried out in fully enclosed cells which vent to the atmosphere through high efficiency filtration systems. Current coating operations include the following: one booth in the Flame Spray area, two booths in the Vacuum Plasma Spray (VPS) area, and five booths in two separate Thermal Barrier Coat (TBC) areas.

GE anticipates that full-scale production of the ATS 7H system will require operation of three additional TBC booths to accommodate the larger parts associated with the ATS 7H turbine. Construction of two of these booths began in early 1997, and is expected to be completed by the third quarter of 1997. Construction of the third booth has not yet been scheduled.

1.3.3 Conventional Coating Operations

GE operates four paint booths as part of the current manufacturing process. These booths are used for the application of both extreme performance and conventional air-dried coatings to turbine components and finished systems. Coatings are applied primarily using conventional, manual, air-spray type paint spray guns. Roller application is also used for flat panel surfaces. Touch-up of painted parts may be conducted on the shop floor using

either aerosol cans or touch-up guns. Solvent materials are used for preparation of surfaces prior to coating and also for cleaning of coating equipment.

GE anticipates that full-scale production of the ATS 7H system will be accommodated by the existing painting operations.

1.3.4 Testing

Turbine testing operations are currently conducted in test stands 1, 2, 3, 4, 6 and 7. Each test stand is equipped with instrumentation and equipment necessary to operate and monitor the turbines during testing. An instrumented turbine is tested in a series of brief runs of a few hours each to evaluate the turbine's performance relative to engineering specifications. The series of runs comprises a test for an individual turbine. Information obtained from testing includes a calculated efficiency of the machine, heat rate, air flow, vibration data, and mechanical testing of the air, fuel and lubrication systems. Testing includes a wide range of operating conditions. Test run time targets are scheduled to collect the necessary data with a minimum firing time and fuel consumption. Turbines being tested are fired using either low sulfur distillate fuel oil or natural gas.

Testing of the new ATS 7H turbine will require construction of test stand 8 in order to accommodate the larger physical size of the new turbines. No new utility systems will be installed as part of test stand 8. However, GE will be extending the existing utilities and support systems currently used in the test operations including: electrical, potable water, sanitary and process sewers, compressed air, test fuel supply, closed-loop cooling systems, and fire protection.

2.0 Discussion of Potential Impacts

2.1 Air Quality

The GE Gas Turbines facility has been issued a SC Department of Health and Environmental Control (DHEC) Operating Permit (No. 1200-0094) which places emissions and operating restrictions on various processes throughout the plant. GE also obtains construction permits as applicable for individual operations prior to installation at the plant. The facility is considered a *major* source of air pollutants under the Part 70 Operating Permit program and submitted a Part 70 application to DHEC in 1995. The application has been deemed administratively complete and is currently under review by the agency.

Implementation of the ATS 7H program at Greenville will not affect emission units already in operation and permitted under the state program. Additional installations required include three TBC booths, an associated abrasive blast booth and test stand 8. Operation of the coating and abrasive blast booths will result in emissions of particulate matter and metals. All emissions will be in compliance with South Carolina Operating Permit No. 1200-0094.

Operation of test stand 8 will generate emissions from the combustion of natural gas and distillate fuels. These emissions will consist primarily of criteria pollutants and a minimal amount of HAPs. GE has applied for a construction permit for test stand 8. The addition of test stand 8 to the existing Test Stands will not result in any increases in the allowable hourly or annual emission rates from the overall Test Stands. Additionally, the emissions from test stand 8 will not result in any changes in the modeled emission impacts. Therefore, no additional impact on air quality is anticipated.

2.2 Water Resources

GE Gas Turbines receives process and potable water from the Greenville Waterworks.

Sanitary wastewater generated at the plant is discharged directly to the Western Carolina Regional Sewer Authority (WCRSA) publicly owned treatment works (POTW) without pretreatment. Process wastewater generated by plant operations is treated in a wastewater pretreatment facility located on site prior to discharge to the WCRSA POTW. The pretreatment operations and discharge are regulated by WCRSA Pretreatment Permit No. IO1559, issued January 26, 1996.

First flush stormwater discharges to the industrial wastewater treatment facility. Second and successive stormwater flushes are discharged to several outfalls located around the plant fence line. Stormwater discharge is regulated under an SCDHEC General NPDES Stormwater Permit.

GE operates several treatment systems for remediation of groundwater. Treated water is discharged at several outfalls located around the plant. Discharge is regulated under SCDHEC NPDES Permit No. SC0003484, issued December 28, 1993.

Manufacturing of the ATS 7H system will be conducted using existing equipment and operations. Since implementation of the ATS 7H program is not expected to significantly increase the number of turbines produced, increases of water usage and wastewater generation from the manufacturing operations are expected to be negligible.

Construction of test stand 8 will require extension of existing water and sewer systems at the plant. According to test area personnel, water is used only incidentally and not as part of the testing operations. Uses of water will include the following: potable water for restrooms and drinking fountains; firewater protection systems; and city water for washing turbines, equipment and building surfaces. Wastewater from the restrooms and drinking fountains will be discharged to the plant sanitary sewer. Wastewater from fire protection systems and equipment washing will be discharged to the pretreatment facility. While the water usage and wastewater generation has not been quantified, GE expects these impacts to be minimal and to be easily accommodated by the current water supply and sewer systems.

Implementation of the ATS 7H program at Greenville is not expected to have an impact on NPDES discharges of either stormwater or treated groundwater.

2.3 Waste Management

The Gas Turbines facility is currently regulated by a Postclosure Care Hazardous Waste Permit (No. SCD 049 126 097) issued under the Resource Conservation and Recovery Act (RCRA) for surface impoundments previously operated by GE. The site is also considered to be a Large Quantity Generator and less-than-90-day accumulation facility for hazardous waste.

Wastes generated at the facility primarily consist of scrap metal produced during machining and other manufacturing operations. Other waste streams associated with production include: waste oils from hydraulic and machining systems, paint and associated waste, overspray from powdered coating applications, and dust/sludge from grinding and grit blasting operations. Other waste streams incidental to production include: construction debris, office and medical department waste, scrap wood and other packaging materials, batteries, lighting ballasts, spill cleanup materials and soil from remedial investigations.

Characterization of waste streams is accomplished through either chemical analysis or knowledge of the process which generates the waste. Hazardous wastes are generated at various locations throughout the plant. Once the containers are full, they are transferred to the Hazardous Waste Building where they are prepared for shipment. Hazardous waste is not stored on site for more than 90 days from the time it is generated. Nonhazardous

wastes are generated and accumulated at various locations throughout the plant. Wastes are manifested or documented as required by regulation for transport to receiving facilities for recovery, treatment or disposal.

Manufacturing of the ATS 7H system will be conducted using existing equipment and operations. Since implementation of the ATS 7H program is not expected to significantly increase the number of turbines produced, increases in waste generation from the manufacturing operations are expected to be negligible.

Current turbine testing operations do not contribute significantly to the amount of waste generated at the plant. Installation of test stand 8 may increase the amount of debris shipped for disposal during construction activities, but should not significantly impact long term waste generation at the plant.

2.4 Pollution Prevention

No specific pollution prevention goals are planned in association with the ATS 7H project implementation at Greenville. However, GE continually investigates opportunities for reducing waste generation through design changes, material substitution, process changes, evolving recycling options and other pollution prevention methods.

2.5 Land Use

GE Gas Turbines is located on roughly 380 acres near the intersection of Interstate Highways 85 and 385 and South Carolina Highway 146. Approximately one half of the total area is used for manufacturing and support buildings, staging areas, roadways and parking areas. The remaining area is undeveloped woods and fields. The site itself is zoned for *industrial* use. The majority of the adjacent property is zoned as *industrial* or *commercial* and is in use for light industry and commercial businesses. A small portion of the adjacent property is zoned as *residential* or *multi-family* and accommodates individual homes and apartment complexes.

The majority of the ATS 7H project at GE Gas Turbines will be accommodated by existing manufacturing and support buildings. Construction of test stand 8 will require development of an additional one-half acre (approximate) of the existing site. The new test facility will be located near and have a similar appearance to existing test stands 6 and 7. No new access roads to the site will be required for either construction or operation of test stand 8. Consequently, no additional impacts to land use or aesthetics will occur as a result of the ATS 7H project.

2.6 Noise

Noise generated by operations at the Gas Turbines facility is regulated under the Greenville County zoning ordinance for *industrial* areas. However, the zoning ordinance does not regulate noise by a specified quantifiable level.

As part of a turbine system design phase, GE develops estimates of noise levels generated from testing/operation of the turbine. These data are then used to select appropriate sound dampening equipment to be incorporated into the test facility design. The design specifications for test stand 8 include the use of silencing equipment on both the inlet and the exhaust of the turbine and also the use of acoustical insulation on the outside walls of the test building. With the use of this equipment, noise generated by testing of the ATS 7H system is anticipated to be consistent with that generated by turbines currently tested at the site. Therefore, no additional impact is anticipated.

2.7 Ecological Status and Biodiversity

As part of applying for the facility's RCRA permit, several state and federal agencies were contacted to determine whether activities on site are subject to the following federal laws: Wild and Scenic Rivers Act, Endangered Species Act and Fish and Wildlife Act. Agencies contacted include the following: South Carolina Water Resources Commission, National Park Service (U.S. Department of Interior), and Fish and Wildlife Service (U.S. Department of Interior).

Responses from the National Park Service and the SC Water Resources Commission indicated that the South Tyger River and its tributaries, which include Little Rocky Creek, are neither presently designated nor currently eligible for Scenic River status under the South Carolina Scenic Rivers Program.

The Fish and Wildlife Service indicated that activities on site will not affect any nearby wetlands. The service also provided a list of endangered and threatened species that are known to occur within Greenville County. None of these species is known to occur on the Gas Turbines property.

Manufacture of the ATS 7H system will occur within existing buildings. Construction of test stand 8 will require development of land directly adjacent to existing test stands 6 and 7. This land has been cleared and disturbed as part of previous construction projects. The project will have no direct impact on rivers, streams or other waterways or previously undisturbed sections of the property. Therefore, no adverse ecological impacts are anticipated as a result of the ATS 7H project.

2.8 Socioeconomic Impact

Manufacture and testing of the ATS 7H system will be accommodated through use of the existing GE workforce at the plant. Construction of test stand 8 will employ contract labor currently on site for other, unrelated construction activity. Consequently, negligible impact on the labor force or the availability of transportation and public services is expected as a result of the ATS 7H project.

2.9 Historical, Archaeological and Cultural Resources

As part of applying for the RCRA permit, the South Carolina Department of Archives and History was contacted to determine whether activities on the site will have adverse effects on any archaeological or historical sites. Based on the Department's records, the plant is not located in the immediate vicinity of any known archaeological or historical sites. Since the ATS 7H project will involve only existing buildings and areas that are already in use (*i.e.*, test stand 8 will be constructed adjacent to existing test stand 7), no impact on archaeological or historical resources is expected to occur.

2.10 Occupational Safety and Health

GE has established a comprehensive program at the Gas Turbines facility to protect worker health and safety in compliance with the requirements of the Occupational Safety and Health Act (OSHA). This program generally includes, but is not limited to, the following:

- design of equipment and building structures in compliance with applicable codes,
- identification of work hazards and required personal protective and safety equipment,
- hazard communication training,
- training of workforce to perform production tasks, maintenance tasks and use of equipment,
- training of workforce in both general and specific safety procedures relating to production tasks, personal protective equipment and emergency incidents,
- emergency response procedures and coordination with outside response agencies, and
- staffing of on-site medical facility.

The manufacturing, construction and testing activities associated with the ATS 7H project are consistent with activities currently carried out on site by both GE and contract personnel. No additional or unusual health and safety issues are anticipated as part of the ATS 7H project. GE anticipates that the current plant program is sufficient to protect worker health and safety.

2.11 Cumulative Impacts

The contractual agreement requires that the assessment evaluate the cumulative impact which is "the impact to the environment which results from incremental impact from the proposed action when added to the impacts from past, present and reasonably foreseeable future actions." No previous study is available which quantifies the impacts from the original construction and subsequent modifications of the GE Gas Turbines facility. Therefore, the cumulative impact to date cannot be quantified for this study. However, based on the above discussions and ongoing compliance with appropriate environmental permits, the contribution of the ATS 7H project to the cumulative impacts is anticipated to be negligible.

2.12 Summary of Impacts

Table 1 summarizes the potential impact from implementation of the ATS 7H project for the various areas of concern.

Table 1. Summary of Impacts

Area of Concern	Potential Impact
Air Quality	negligible impact anticipated
Water Resources	negligible impact anticipated
Waste Management	negligible impact anticipated
Pollution Prevention	no measurable impact anticipated
Land Use	no measurable impact anticipated
Noise	no measurable impact anticipated
Ecological Status and Biodiversity	no measurable impact anticipated
Socioeconomic	no measurable impact anticipated
Historical, Archaeological, Cultural	no measurable impact anticipated
Occupational Safety and Health	no measurable impact anticipated

3.0 Listing of Required Permits and Licenses

Table 2 provides a listing of the environmental, health and safety permits and licenses required in conjunction with implementation of the ATS 7H program at GE Gas Turbines.

Table 2. List of Required Permits and Licenses

Compliance Area	Permit/License	Issuing Authority	Status
Air Quality	Construction and Operating Permits for existing miscellaneous manufacturing operations	SC DHEC	Issued prior and unrelated to ATS 7H project. No modifications to these permits are required for implementation of project.
	Construction Permit for TBC Booths 6, 7 and 8	SC DHEC	Issued 8/7/96 (Permit No. 1200-0094-DI)
	Construction Permit for Abrasive Blast Booth	SC DHEC	Issued 3/27/97 (Permit No. 1200-0094-DJ)
	Construction Permit for Test Stand 8	SC DHEC	Internal draft issued by state on 6/17/97 (Permit No. 1200-0094-DH-R1). No specific date targeted for issuance, but final permit anticipated by 7/97.
	Operating Permits for TBC Booths 6, 7 and 8; Abrasive Blast Booth; Test Stand 8	SC DHEC	Not required since facility has submitted Part 70 Operating Permit Application.
Water Resources	No additional permits or licenses required for implementation of ATS 7H project	Not Applicable	Not Applicable
Waste Management	No additional permits or licenses required for implementation of ATS 7H project	Not Applicable	Not Applicable
Occupational Safety and Health	No permits or licenses required for implementation of ATS 7H project	Not Applicable	Not Applicable

4.0 Compliance Assessment

This section describes efforts on the part of GE Gas Turbines to comply with various environmental protection and health and safety laws and regulations.

4.1 Environmental Protection

Gas Turbines' EHS department has the responsibility to maintain GE's compliance with applicable environmental regulations. Table 3 provides a list of key environmental laws and regulations, the applicability with respect to the site and the ATS 7H project, and GE's status with respect to relevant requirements. No additional permits, licenses or plans are required in order to proceed with the ATS 7H project.

4.2 Occupational Safety and Health

GE has established a comprehensive health and safety program at the Gas Turbines facility. The program is designed to ensure compliance primarily with the requirements of the Occupational Safety and Health Act (OSHA), and the health and safety requirements of other governing regulations.

The manufacturing, construction and testing activities associated with the ATS 7H project are consistent with activities currently carried out on site by both GE and contract personnel. No additional or unusual health and safety issues are anticipated as part of the ATS 7H project.

The adequacy of GE's health and safety program is reflected primarily through its procedures and the extensive training portion of the program. However, the proper design and installation of equipment (e.g., walking-working surfaces or machine guarding) and the training of employees in the use of that equipment is ensured through GE's engineering procedures.

Table 4 provides a list of health and safety training activities currently in effect at the plant. No additional programs will be required to protect worker health and safety in activities related to the ATS 7H project.

Table 3. Compliance with Environmental Protection Requirements

Law/Regulation/Requirement	Affected Activities	Status of Relevant Requirements
State Air Permitting Program	Miscellaneous manufacturing activities. Turbine testing at test stand 8.	Manufacturing activities have been granted necessary permits. Construction permit for testing activity is currently under review by agency.
<ul style="list-style-type: none"> Federal Clean Air Act and Amendments (CAAA) Part 70 Operating Permit Program HAPs/MACT/NESHAPs New Source Performance Standards New Source Review (PSD) Ozone Depleting Substances 	<p>Applicable to facility-wide air emissions</p> <p>No requirements presently applicable to facility or 7H project.</p> <p>No requirements applicable to facility or ATS 7H project.</p> <p>Turbine testing at all test stands.</p> <p>Applicable facility-wide. No additional impact from ATS 7H project.</p>	<p>Part 70 application is currently under review by state agency. Application will be updated to reflect addition of TBC, abrasive blasting and test stand 8.</p> <p>Not applicable.</p> <p>Not applicable.</p> <p>PSD permit issued 4/25/96 (Permit No. 1200-0094-DH) regulates turbine testing activities at test stands 1, 2, 3, 4, 6 and 7. Turbine testing at test stand 8 will be conducted in compliance with emission and operating limits previously set forth in this permit.</p> <p>Gas Turbines has developed a program to ensure facility-wide compliance with relevant subparts of 40 CFR 82.</p>
<ul style="list-style-type: none"> Federal Clean Water Act (CWA)/ State Water Pollution Control Program Process Wastewater Stormwater 	<p>Applicable to wastewater generated facility-wide. No additional impact from ATS 7H project.</p> <p>Applicable to stormwater generated facility-wide. No additional impact from ATS 7H project.</p>	<p>Facility operates under a Pretreatment Permit (ID No. IO1559) issued by Western Carolina Regional Sewer Authority (WCRSA).</p> <p>Facility discharges stormwater under an NPDES General Stormwater Permit and maintains a Stormwater Pollution Prevention Plan.</p>

Table 3. (cont'd) Compliance with Environmental Protection Requirements

Law/Regulation/Requirement	Affected Activities	Status of Relevant Requirements
Federal Clean Water Act (CWA)/ State Water Pollution Control Program • Remediated Groundwater	Applicable to groundwater remediation systems. No additional impact from ATS 7H project.	Facility discharges treated groundwater under NPDES Permit SC0003484.
Oil Pollution Act	Applicable facility-wide. No additional impact from ATS 7H project.	Facility maintains a Spill Prevention Control and Countermeasure Plan as required under 40 CFR 112.
Safe Drinking Water Act (SDWA)	Not applicable to GE Gas Turbines.	Drinking water supplied by local municipality.
Resource Conservation and Recovery Act (RCRA)	Applicable facility-wide. No additional impact from ATS 7H project.	Facility operates under Postclosure Care Hazardous Waste Permit No. SCD 049 126 097. Gas Turbines is a Large Quantity Generator and less than 90-day accumulation facility.
Comprehensive Environmental Response Compensation and Liability Act (CERCLA)	Applicable facility-wide. No additional impact from ATS 7H project.	GE Gas Turbines provides release notification information as required by 40CFR302.6
Emergency Planning and Community Right-to-Know Act (EPCRA)	Applicable facility-wide. No additional impact from ATS 7H project.	Gas Turbines provides release notifications as required by Section 304 and submits annual reporting documentation in compliance with Sections 311, 312 and 313.
Toxic Substances Control Act (TSCA)	Applicable facility-wide. No additional impact from ATS 7H project.	GE has developed corporate program for ensuring compliance with TSCA requirements. Gas Turbines has personnel designated to perform duties required under the corporate program.
Noise Control Act	Not applicable to GE Gas Turbines.	Not applicable.
Endangered Species Act	Not applicable to GE Gas Turbines.	Not applicable.
National Historic Preservation Act	Not applicable to GE Gas Turbines.	Not applicable.
Marine Protection, Research and Sanctuaries Act	Not applicable to GE Gas Turbines.	Not applicable.

Table 3. (cont'd) Compliance with Environmental Protection Requirements

Law/Regulation/Requirement	Affected Activities	Status of Relevant Requirements
Fish and Wildlife Coordination Act	Not applicable to GE Gas Turbines.	Not applicable.
Coastal Zone Management Act	Not applicable to GE Gas Turbines.	Not applicable.
Coastal Barrier Management Act	Not applicable to GE Gas Turbines.	Not applicable.
Federal Insecticide, Fungicide and Rodenticide Act	Not applicable to GE Gas Turbines.	Not applicable.

Table 4. List of Relevant Health and Safety Training

Training Subject	Regulation	Training Subject	Regulation
Access to Employee Exposure and Medical Records	29 CFR 1910.20(b),(g)	Fixed Extinguishing Systems	29 CFR 1910.160(b)(10); 29 CFR 1926.156, 157
Cadmium	29 CFR 1910.1027(m)(04); 29 CFR 1926.1127	Hazard Communication	29 CFR 1910.1200(h); 29 CFR 1926.59
Confined Spaces	29 CFR 1910.146(g),(h),(i),(j),(k)	Hazardous Materials: Carriage by Motor Vehicle	49 CFR 177.816(a),(b)
Control of Hazardous Energy	29 CFR 1910.147(c)(7)	Hazardous Materials: Carriage by Public Highways: Loading and Unloading	49 CFR 177.834(i)(4)
Crane Slings	29 CFR 1910.184(d)	Hazardous Waste Facilities	40 CFR 262.34(a)(4); 40 CFR 265.16; 40 CFR 270.30(e); 40 CFR 264.16; 40 CFR 265.16
Cranes - Overhead & Gantry	29 CFR 1910.179(b)(8), (o)(3)	Hazmat Transportation	49 CFR 171.8; 49 CFR 172.700, 702, 704; 49 CFR 173.1(b); 49 CFR 174.7; 49 CFR 175.20; 49 CFR 176.13; 49 CFR 177.800, 825
Electrical Safety	29 CFR 1910.269, 332, 333	Hazardous Waste Operations	29 CFR 1910.120(e), (p)(7), (p)(8), (q)(6); 29 CFR 1926.65
Employee Alarm Systems	29 CFR 1910.165(b)(4), 29 CFR 1926.159	Laboratories	29 CFR 1910.1450(f)
Emergency Plans and Fire Prevention Plans	29 CFR 1910.38	Liquefied Petroleum Gases	29 CFR 1910.110(b)(16), (d)(12)(i), (h)(11)(vii)
Fall Protection	29 CFR 1926.503, 1060	Mechanical Power Presses	29 CFR 1910.217(e)(3), (f)(2), (h)(13)
Fire Brigades	29 CFR 1910.150, 156(c)	Occupational Noise Exposure	29 CFR 1910.95(k), (l)
Fire Detection Systems	29 CFR 1910.158, 164(c)(4)	Personal Protective Equipment	29 CFR 1910.132(f)
Fire Extinguishers, Portable	29 CFR 1910.157(g), 29 CFR 1926.150	Powered Industrial Trucks	29 CFR 1910.178(l)

Table 4. (cont'd) List of Relevant Health and Safety Training

Training Subject	Regulation	Training Subject	Regulation
Radiation, Ionizing	29 CFR 1910.96(f)(3)(viii), (X)(2); 29 CFR 1926.53	Universal Waste Handlers	40 CFR 273.16
Radiation, Non-ionizing	29 CFR 1926.54	Vehicle-Mounted Elevating and Rotating Work Platforms	29 CFR 1910.67(c)(2)(ii)
Respiratory Protection	29 CFR 1910.134(a)(3), (b)(3), (e)(2)-(5); 29 CFR 1926.103	Ventilation of Open-Surface Tanks	29 CFR 1910.94(d)
TSCA	40 CFR 717	Welding, Cutting and Brazing	29 CFR 1910.252(a), 253(a), 254(a), 255(a); 29 CFR 1926.350, 351, 352
Signs and Tags	29 CFR 1910.154(c)(1)(ii), (2)(ii), (3)	Woodworking Machinery	29 CFR 1910.213(s)(5)

5.0 List of GE and Agency Contacts

This section provides a list of addresses and phone numbers for environmental, health and safety contacts at GE and regulatory agencies.

GE Gas Turbines facility:

Environmental, Health and Safety Department
GE Gas Turbines
P.O. Box 648
Greenville, SC 29602
Larry Teachey - EHS Manager (864) 675-2966
Allison Ranson - Environmental Program Manager (864) 675-3033

SC DHEC local office:

South Carolina Department of Health and Environmental Control
Appalachia II EQC
301 University Ridge
Suite 5800
Greenville, SC 29201
(864) 241-1090

SC DHEC main office:

South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201
General Inquiries (803) 734 9201
Bureau of Air Quality (803) 734-4750
Bureau of Water Pollution Control (803) 734-5300
Bureau of Land and Waste Management (803) 896-4000

U.S. Environmental Protection Agency:

U.S. EPA Region 4
Atlanta Federal Center
61 Forsyth St., SW
Atlanta, GA 30303-3104
(404) 562-9900

**Appendix to "Environmental, Health, and Safety Assessment:
ATS 7H Program (Phase 3R) Test Activities at the GE Power Systems
Gas Turbine Manufacturing Facility, Greenville, SC**

Table of Contents

	<u>Tab No.</u>
Response to verbal request from K. Mahajan, August 15, 1997	1
Responses to 43 questions from K. Mahajan	2
Responses to selected questions from (2) above	3
SCDHEC air emissions report for Question 14	4
PSD air quality analysis model test for Question 15	5
Facility noise survey for Question 23	6
Question/response to Robert Shih, Mangi Environmental Group, October 3, 1997	7
Map of test stands and noise levels provided to Mangi Environmental Group, October 6, 1997	8
Phone conversation with Mangi Environmental Group, October 10, 1997	9
Questions/responses from El Dorado Engineering	10
Questions/responses regarding NEPA topics, October 24, 1997	11
Test Stand #8 operation permit application emissions information	12

1

FACSIMILE MESSAGE

**GENERAL ELECTRIC COMPANY
POWER GENERATION ENGINEERING
GAS TURBINE ADVANCED TECHNOLOGY PROGRAMS
1 RIVER ROAD, SCHENECTADY, NY 12345
U.S.A.**

DATE: Aug 15, 1997

TO: Kanwal Mahajan

Receiver's Address: _____

Data Phone No: 8 (304) 285-4403

2

Pages to Follow

Note: ① no special interest groups are involved
Kanwal ② Greenville Air Permit - public notice
instate water permit - public notice
additional information on our permit process.

From: Tom Chance

Sender's Address: Building 53 - Room 425

Telephone No.: (518) - 385 - **Data Phone No.:** (518) - 385 - 4314

Aug. 15, 1997

Additional information request for the construction of Test Stand 8 (Advanced Machine Testing)

General Site Information

The General Electric (GE) Gas Turbine Manufacturing Operation (GTMO) is located at 300 Garlington Road in the county of Greenville, South Carolina. The facility is geographically located at 34 49' 30" north latitude and 82 16' 50" west longitude. The site comprises one parcel of approximately 380 acres located east of the intersection of Interstate Highways 85 and 385.

The GTMO facility was constructed in 1967 on a previously undeveloped parcel. Approximately half of the property is occupied by manufacturing and support service buildings, utility structures, a recreational area, and parking areas, while the remainder consists of undeveloped wooded areas and fields. The main facility structures include the Main Manufacturing Building, a Service Building, a Recycling Building, the Combustion Liner Manufacturing Building, Test Stands Buildings, a Wastewater Treatment Plant, an Electrical Sub-Station and an On-site Landfill.

Wetlands, Floodplains, Historic or Cultural Sites, Endangered or Threatened Plants and Animals

Test Stand 8 will be constructed to test the Advanced Turbine that is presently being designed and built. Test Stand 8 will be constructed the vicinity of the six existing test stands. The construction area is in a previously graded flat area between existing Test Stand 6 and Test Stand 7. Test Stand 8 will not be constructed in an area occupied by threatened or endangered plants or animals, or historic or cultural sites. Test Stand 8 will not be constructed in a floodplain or wetlands area. Due to the large size of the GTMO site, areas of wetlands and floodplains do exist but should not be adversely impacted by construction and operation of Test Stand 8. A site-wide jurisdictional wetlands delineation, site-wide preliminary protected species assessment, site-wide protected species survey and regulatory review of Section 404 Permitting requirements of the Clean Water Act was conducted in May 1994. A copy of this report and regulatory correspondence is available upon request.

Air Permitting

The entire state of South Carolina is considered to be in attainment for all national air quality standards including ozone. The State of South Carolina requires any person who plans to construct, alter or add to a source of air contaminants, including installation of any device for the control of air contaminant discharges, to first obtain a construction permit from the South Carolina Department of Health and Environmental Control (SCDHEC). No construction may begin prior to receipt of a Permit to Construct from SCDHEC.

The construction permit requires the applicant to submit detailed information and calculations, dispersion modeling for criteria pollutants and air toxics, scaled plot plans showing dimensions of all structures (including height) on the site that may affect pollutant dispersion as well as all property lines and any information necessary for determination of the expected impact on air quality from the proposed project.

Once an construction permit application is received by the SCDHEC, it is assigned to an engineer for review. The section head reviews all construction permits prior to issuance to the facility. The construction permit requires a 15 day waiting period following the issuance of the permit to construct. This is not a public comment period but the facility and other parties knowing of the proposed activity have the right to submit comments to the SCDHEC. There are no known organized groups or parties of people that have protested any of the proposed operations at the facility.

Construction of a new major source or major modification of an existing source of air pollutants that will result in a significant increase in air pollutants as defined by the Clean Air Act requires the site to submit a Prevention of Significant Deterioration (PSD) permit application which demonstrates that the proposed project will not significantly deteriorate the existing air quality. Permits sought under this program must

be posted for public notice in the newspaper. A 30 day period is allowed for public comment. In April 1996, the GTMO site underwent PSD review for the addition of natural gas to the test stands. At that time no adverse public was received.

To obtain an operating permit a written request must be submitted to the SCDHEC no later than 15 days prior to placing the source into operation. This written request will trigger an inspection by the Department. An Operating permit will be issued upon the completion of a satisfactory inspection by SCDHEC. A Title V operating permit application must be submitted for facilities with potential criteria pollutant emission rates greater than tons per year (TPY) and potential emissions of Hazardous Air Pollutants (HAP) of 10 TPY for an individual HAP or 25 TPY for total HAP emissions.

The GTMO represents a major source of air pollutants, primarily as a result of the combustion of fossil fuels in the turbine test operations. In accordance with Federal and State regulations, GTMO submitted a Title V operating permit application to SCDHEC in November 1995. The application has been deemed administratively complete and is waiting to undergo technical review. At the time that a Title V permit is issued, the facility will comply with all of the required Public Notice requirements.

On July 30, 1997, the previously issued PSD permit was modified by SCDHEC to include construction of Test Stand 8. According to that permit (1200-0094-DH-R1), construction activities may begin on August 14, 1997. A copy of the Construction Permit is enclosed which details the conditions that GTMO must meet to operate in compliance with the regulations.

2

GE Power Systems

Thomas F. Chance
Program Manager - Advanced Turbine Systems

Power Generation Systems
General Electric Company
1 River Road, Schenectady, NY 12345
518 385-9421, Fax: 518 385-4314

August 22, 1997

Kanwal Mahajan
US Department of Energy
Federal Energy Technology Center
PO Box 880
3610 Collins Ferry Road
Morgantown, WV 26507-0880

**Subject: GE Response to DOE-FETC Comments on GE's NEPA Topical Report
for the Phase 3 Restructured Program (DE-FC21-95MC31176)**

Dear Kanwal:

In response to your e-mail request of August 8, 1997, please find attached the following:

- GE responses to the DOE/FETC Comments/Questions
- A plot plan of the GE Greenville test facility (ref. Questions #9 and #13)
- South Carolina Department of Health and Environmental Control Construction Permit for Stand 8 (ref. Question # 16).

We trust this supplemental information will support the DOE in completing the Environmental Assessment for the FSNL testing contemplated by the Phase 3 Restructured Program.

Sincerely,

Thomas F. Chance

Enclosures-2

cc: C.S. Cook, Office
F. J. Rossetti, Office

**Comments on General Electric's Draft Environmental
Information Package (7/97)**

1. Several topics were not addressed, including:

Long-term cumulative impacts

No long-term cumulative impacts are expected as a result of this project. Construction of test stand 8 is expected to begin in August 1997 and be completed in April 1998. No additional construction is planned for the manufacture of the H turbine.

Visual impacts

The visual impact of the addition of test stand 8 to the facility is expected to be minimal since it will be located between two existing test stands. The impact of the test stand emissions on visibility was evaluated during issuance of the PSD air permit for addition of the natural gas line. It was determined that emissions from the test stands will not have a significant adverse impact on visibility.

Transportation

The manufacture of the H machine is not expected to have a significant impact on transportation. No new roads into the facility are planned. An access road will be constructed within the facility leading from existing roads to the entrance of test stand 8. Parts and supplies for the H machine will enter the facility by truck in the same manner as current parts. The finished turbine will leave the plant by rail car. Two new rail cars have been purchased by GE to transport the H turbine from the facility. GE is currently evaluating options to upgrade portions of the rail line leaving the facility.

Resource commitments

GE has committed substantial resources to the development, manufacture and testing of the H machine in compliance with all applicable laws, regulations, and contractual requirements.

Accidents and accidental releases

General Electric has numerous programs in place to prevent accidents and accidental releases. These same programs will be followed during the manufacture of the H turbine. One CERCLA reportable release occurred from the facility in 1996. To date, no CERCLA reportable releases have occurred in 1997.

2. More quantification is required on potential impacts or discharges to air, water, and waste as a result of the proposed project.

The potential impacts of the turbine test stands on air quality were thoroughly investigated during the Prevention of Significant Deterioration (PSD) review for the addition of natural gas to the Test Stands. As the manufacture and test of the H machine is not expected to result in a significant increase in water consumption or waste water generation, GE did not request an increase in the allowable emissions from the Test Stand for the addition of test stand 8; therefore, the evaluations performed during the PSD review are still valid.

3. An aerial view of the turbine facility would be helpful.

An aerial photograph of the facility has been provided.

4. Information on the local area surrounding the facility is needed, such as the following:

Local population

The population of Greenville County is 362,000. The population of the City of Greenville is 58,000.

Facility employment

The GE facility currently employs approximately 1,680.

Emergency response agreements and organizations

Emergency response agreements have been established with the Mauldin Fire Department, Greenville County Sheriff's Department, St. Francis Hospital, Greenville County Emergency Preparedness, and the South Carolina Department of Health and Environmental Control (SCDHEC).

Location of local residences

Apartment buildings are located to the north of the facility. Single family residences are located to the east of the facility. South of the facility is commercial, and west of the facility is the intersection of Interstate Highways 85 and 385. The closest residence is approximately 0.5 miles from the test stand.

5. **Comparison of ATS 7H turbine with existing GE turbines manufactured at the facility is needed. This should include specification of the unique features of the ATS 7H turbine compared to other turbines that come off the assembly line.**

The H turbine will have a four stage turbine rotor, whereas the current turbine models have 1, 2, or 3 stage turbine rotors. The H turbine will be steam cooled, and current turbines are air cooled. The H turbine will be manufactured using higher strength and higher temperature metal alloys.

6. **What are the *minimal modifications* required for manufacturing the new turbine?**

The minimal modifications to the manufacturing operations include the construction of test stand 8, a new assembly stand, new lathe, modification to the assembly area, and increases in the capacity of the lifting devices.

7. **What is the manufacturing capacity and current production status of GE's turbine facility?**

What is the sequence of steps in turbine processing between manufacture and testing?

The maximum annual manufacturing capacity of the turbine facility is currently approximately 115 turbines. Planned production for 1997 is approximately 75 turbines, and approximately 80 turbines for 1998.

8. **Information on operational discharges at the new test facility is needed.**

The air emissions permit for the entire test facility, including the six existing test stands and test stand 8 are listed below. The emissions will be within these limits.

Pollutant	Pounds per Hour	Tons per Year
Particulate Matter	55.5	8.7
Sulfur Dioxide	396.1	71.1
Carbon Monoxide	27169.4	6880.8
Nitrogen Oxides	855.3	179.6
Volatile Organic Compounds	843.6	68.0

9. **A plot plan showing the location of test stand number 8 is needed. What, if any, would be the differences between the new test stand and the existing test stands?**

Test stand 8 will be located between test stands 6 and 7. The building for test stand 8 will be similar in size to the building for test stand 4, and the emissions stack for stand 8 will be similar to the stack for stand 7. A plot plan is enclosed.

10. **What are the chemical and physical characteristics of the coatings to be used for turbine components? Would there be any differences from the coatings currently used?**

The chemical and physical characteristics for the coatings will be similar to those currently being used on turbine components. The coatings generally contain nickel, chromium, cobalt, manganese, aluminum, yttrium, and zirconium.

11. What are the sizes of the TBC booths? Where are they located? A description of the operations conducted in the booths is needed.

The TBC booths range in size from approximately five feet by ten feet to approximately 15 feet by 20 feet. Five TBC booths are located on the east side of the Combustion Building. The other two booths are located at the south end of the Main Manufacturing Building.

12. Operation of the booths is indicated to produce particulate and metal emissions. Can details be provided on their characteristics and quantities?

Total particulate emissions from the TBC booths, as listed in the Title V permit application, are expected to be less than .0001 pounds per hour per coater and .0004 tons per year per coater.

13. What are the distances to utility tie-ins?

Distances from where to the utility tie-ins? The Turbine facility is currently served by Greenville Water, Duke Power electricity, Western Carolina Regional Sewer Authority, and Piedmont Natural Gas. See attached plot plan for relative distances.

14. A more complete description of the turbine testing program is needed, including test period durations, number of test periods, fuel feeds, other material feeds, and emissions. Quantification of the incremental addition to existing discharges from the turbine manufacturing facility is needed in order to present *before* and *after* indications of the environmental consequences of the ATS project.

Each turbine is tested in a series of brief runs of a few hours each. The duration of the overall test varies, but is generally 5 to 50 hours per turbine. Materials fed to the turbine include fuel (natural gas or low sulfur diesel fuel), electricity, air, and various lubricating oils. The air emissions permit requires GE to track annual and hourly air emissions and report to SCDHEC every six months. Information must include annual emissions on a rolling basis and hourly emissions during periods of simultaneous operation of multiple test stands.

15. Operations at the test stand are indicated to produce criteria pollutants and hazardous air pollutants. Can details be provided on their characteristics and quantities? Indications are that emissions expected from the test stand have been modeled for their ambient impacts. Can these modeling results (before and after) be provided? Also, how close to the allowable emission cap will the turbine facility be after operation of test stand 8?

The results of the emissions modeling have been extensively reviewed by SCDHEC, EPA, and the Federal Land Manager for the US Forest Service. The model output files are extremely detailed, but can be provided upon request. Emissions from the test stands are expected to increase with the switch from diesel fuel to natural gas, even without the addition of test stand 8.

16. Can FETC obtain a copy of the facility air permit (1200-0094), or pertinent sections thereof?

A copy of air permit 1200-0094-DH-R1 which addresses the recent changes to the test stands is included.

17. What treatments are used in the wastewater pretreatment facility? Are there quality limits on the discharge before release to the POTW? Have any problems been experienced in achieving pretreatment requirements?

The wastewater treatment facility provides oil/water separation, equalization, chemical precipitation and settling. The POTW has set limits on pH (6-9) and oil and grease (100 ppm.) There was one exceedence of the oil and grease limit in 1994.

18. Since GE currently has a program in place for treatment of groundwater, FETC should ensure, probably through contractual language, that no DOE liability will be incurred as a result of our participation in turbine development work at the facility.

DOE has been supporting the H machine development since August 1993. The obligations of the parties related to ES&H and NEPA activities are defined by the provisions of the Cooperative Agreement. .. No change in the provisions of the Cooperative Agreement is contemplated as a result of this submittal or DOE's action in response to same. Further, the groundwater remediation system was installed to address contamination resulting from historical operations which are no longer present at this facility. GE does not anticipate a situation where DOE would be liable for any contamination.

19. Will new facilities be constructed for personnel, as indicated by projected uses of potable water? If so, what are those facilities?

No new facilities are planned for personnel.

20. Can information be provided on the characteristics of wastewater from equipment cleaning?

All industrial wastewater from the facility is combined in a single industrial sewer. Analyses on individual waste streams are not generally performed. Only minimal equipment cleaning is performed in an effort to minimize water consumption and wastewater generation.

21. Indications are provided of the types of wastes generated at the turbine facility. Does GE have any programs in place for waste material recycling? If so, what are they and how successful have they been?

GE has several programs in place to recycle all possible waste materials. These programs have been very successful in reducing the volume of waste sent off site for disposal.

22. Will any of the activities required for the ATS 7H program encroach on any undeveloped areas of the plant site? If so, details are required.

Manufacturing activities for the H turbine will take place within the existing manufacturing facilities. Test stand 8 will be located between existing test stands 6 and 7.

23. How does the local zoning ordinance regulate noise? Has GE developed any noise characterizations information around the test stands during turbine testing? If so, can details be provided?

There are no local zoning ordinances which regulate noise. A noise survey has been conducted around the GE facility. The results of the survey can be provided, if needed.

24. What is the size of the existing workforce? How many of these employees would be involved with ATS 7H activities?

The current GE workforce at the facility is approximately 1680. Approximately half to three-fourths of these employees will be involved in some aspect of H machine production.

25. What would the schedule (duration) for construction activities? What would be the size of the construction contractor's workforce? Would this labor requirement be met through the local labor market? Who would be responsible for oversight of the construction contractor's work practices?

Construction of test stand 8 will be completed by Fluor Daniel. Labor requirements will be met by current Fluor Daniel employees and subcontractors. Maximum workforce to construct test stand 8 is estimated to be 250 employees. Fluor Daniel will have an on-site construction manager. The GE test stand manager will be responsible for overseeing the construction contractor's work.

26. **Has OSHA performed any inspections at the turbine facility? If so, can details be provided?**
In 1993 OSHA investigated the facility and noted potential labeling and personnel protection equipment violations. These findings were contested by GE and were overturned in court.
27. **What has been the recent accident/incident history at the turbine facility and how does it compare with industrial operations?**
The facility accident rate to date for 1997 is 2.26 as compared to a national average of 12.9 for SIC code 3511.
28. **Are there any other significant elements of the GE comprehensive OSHA program at the turbine facility?**
GE has a comprehensive health and safety program and is in the process of preparing for OSHA VPP star certification.
29. **Has any final action been taken by the State on the construction permit for the new test stand?**
The state construction permit was issued on July 30, 1997 and allowed construction to begin on or after August 14, 1997. A copy of that permit is attached.
30. **What is the size of the existing ES&H department at the turbine facility and what specialty disciplines exist within the department's workforce?**
The EHS Department includes six staff members, nine hourly operators and one administrative assistant.
31. **Has GE received any recent Notices of Violation of environmental standards or permits? If any have been received, when was the most recent such Notice and what was its target?**
Notices of violation have been received in 1990 for RCRA permitting violations, 1994 for exceeding the POTW oil and grease limit, and 1996 for upgrading an air pollution control device without a permit. There are no outstanding NOV's.
32. **Does GE participate in any voluntary ES&H programs, such as Responsible Care, Voluntary Protection, etc?**
GE is in the process of applying for OSHA VPP Star status. In South Carolina, the application process takes three years. The GE facility is in the second year. Based on current injury and illness rates, GE should qualify for star status by the end of 1998.
33. **Is GE certified, or working on certification, to any consensus standards, such as ISO 9000 or ISO 14000?**
The GE Gas Turbine facility is currently ISO 9001 certified. Certification under ISO 14000 has not yet been sought.
34. **Does GE plan any expansion in capacity of operations at the turbine facility?**
GE is not currently planning any expansion of the capacity of operations. The addition of test stand 8 is not being made to increase capacity of the test stands. Test stand 8 is being added to accommodate the larger size of the H turbine.
35. **Are there any major development initiatives underway or planned in the vicinity of the turbine facility?**
Development in the vicinity of the GE facility includes the construction of a Wal-mart superstore and other commercial development.

36. Upon completion of the demonstration program with DOE, what would be the expected disposition of the turbine? What disposition options would be considered?
Commercial sale of the turbine is contemplated. Information relating to any such commercial transaction is regarded as competitively sensitive and business proprietary.
37. Does not identify alternatives (project, site, technology, etc).
Because the GE Gas Turbine manufacturing facility already exists, consideration of alternative site was not necessary. No facility exists which is large enough to test the completed H turbine, and testing at the manufacturing site is most economical since experienced test personnel are located at the facility.
38. Does not address what happens to facilities constructed in Greenville after testing is completed. What are the long-term effects of adding these facilities?
The GE facilities will continue to be used for the manufacture and testing of gas turbines. For purposes of this Cooperative Agreement, the ES&H and NEPA considerations are pertinent to the manufacture and FSNL testing of the first production grade 7H advanced gas turbine.
39. Does not address the long-term effects of successful demonstration of the technology.
GE has embarked on a vigorous program for the commercial promotion of the H Technology. For purposes of this Cooperative Agreement, the ES&H and NEPA considerations are pertinent to the manufacture and FSNL testing of the first production grade 7H advanced gas turbine.
40. Does not address effects of what happens to engine after testing. Would the engine be converted to coal or biomass fuels?
Disposition of the engine after testing is confidential information. No plans exist to convert to coal or biomass fuels since no system exists for feeding these fuels into a gas turbine.
41. It appears that there have already been substantial commitment of funds in some areas. On page 4 it is noted that two of the three TBD booths needed for the project are under construction. Has work been done that would limit the reasonable alternatives that might be considered?
The TBC booths have already been completed and are currently being placed into operation since these booths are used for coating components for other turbine frame sizes. The TBC booths were not added solely for use in manufacturing the H turbine.
42. The document does not provide adequate quantification or estimates of such items as air emissions or solid waste, hazardous waste, and wastewater generation to allow conclusions on whether any of these waste streams represent a significant issue. The document draws conclusions without any estimates or numbers to back up the conclusions.
The conclusions were based on the fact that no increases in wastewater or air emissions permits were needed solely as a result of manufacture of the H machine. With the exception of test stand 8, the facilities used to manufacture the H turbine will also be used to manufacture other turbine models.
43. Page 12, Table 2: Would the Title V permit have to be modified to include this project?
The Title V Permit has not been issued. The modification will be included in the permit at the time it is issued.

3

**U. S. Department of Energy
Federal Energy Technology Center**

3610 Collins Ferry Road
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626 Cochran's Mill Road
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September 29, 1997

Mr. Thomas F. Chance
Project Manager - Advanced Turbine Systems
GE Power Systems
Power Generation Systems
General Electric Company
1 River Road
Schenectady, NY 12345

Subject: Department of Energy's response to General Electric's September 24, 1997, National Environmental Policy Act related correspondence for the Phase 3 Restructured Program (DE-FC21-95MC31176)

Dear Mr. Chance:

As a result of your September 24, 1997, response to our questions, the Department of Energy (DOE) is focusing its National Environmental Policy Act review effort on manufacturing and testing of MS7001H gas turbine. The environmental information furnished by General Electric (GE) indicates that only minimal environmental impacts would result from the proposed action. In order for DOE to arrive at the same conclusion, supported by the Environmental Assessment (EA) document, it needs data that it can analyze independently. DOE has contracted Mangi Environmental Group, Incorporated to assist in preparation of the EA document. GE has addressed the issue adequately on qualitative basis, but need to provide quantitative information. The enclosed request for information is focused on obtaining such quantitative data.

The EA document will have a separate section for the GE project. GE will be given an opportunity to review this section for proprietary information before a draft EA is made public. Considering the schedule for phase 3R and need for 45 days public review period, the department requests this information by October 6, 1997.

Sincerely,

Kanwal Mahajan
Project Manager

Enclosure

REQUEST FOR INFORMATION - SEPTEMBER 29, 1997

August 22, 1997 response by GE to DOE/FETC comments

1. Question 14: Provide a copy of GE's latest six-months' report to SCDHEC on air emissions, and an estimate of the amount of natural gas required as fuel for the MS7001H turbine test.
2. Questions 15: A description and a sample output of the model used for PSD and Part 70 Operating Permit application. Provide worst-case emissions from the planned test. Show how total emissions would stay within permitted limits.
3. Question 20: An estimate of water usage for equipment washing during the turbine test.
4. Question 21: A list of existing recycling programs.
5. Question 23: A copy of the facility noise survey. An estimate of the noise level from MS7001H turbine test and projected noise level with silencing equipment and outside wall insulation in place (as identified in Section 2.6 of the Draft Report).
6. Question 24: Size and source of workforce required for testing operations, including turbine connection, firing, and disassembly.
7. Question 27: OSHA records related to the turbine testing activities for the past year (e.g., accident history of existing test stands similar in operation to Test Stand 8).

Additional Questions:

8. A summary of the current emergency response procedures for the operation of test stands (e.g., accidental gas or oil release).
9. In reference to Sections 2.7 and 2.9 in the July 1997 Draft Report, when was the correspondence and coordination with the agencies (South Carolina Water Resources Commission, National Park Service, U.S. Fish and Wildlife Service, and South Carolina Department of Archives and History) completed?

MEMORANDUM

*General Electric Power Generation
P. O. Box 648
300 Garlington Road, Room 239
Greenville, South Carolina 29602-0648
Phone (864) 675-3033 Fax (864) 675-2772
Dialcom 8*288-3033 Fax 8*288-2772*

To: Tom Chance
From: Allison Ranson
Re: Reply to NEPA Request for Additional Information 9/29/97
Date: October 7, 1997
Copies: Jim Rossetti, Jim Sevinsky, Carl Bugg, Chuck Rockwell, Larry Teachey

1. **Question 14: Provide a copy of GE's latest six-months' report to SCDHEC on air emissions, and an estimate of the amount of natural gas required as fuel for the MS 70001H turbine test.**

A copy of the most recent report to SCDHEC is attached. Estimated amount of natural gas required for the MS 7001H test is 67.9 MM scf.

2. **Question 15: A description and a sample output of the model used for PSD and Part 70 Operating Permit application. Provide worst-case emissions from the planned test. Show how total emissions would stay within permitted limits.**

A copy of the modeling section from the PSD permit application is included. No modeling was done as part of the Part 70 permit application. Emission estimates for the MS7001H turbine have not yet been developed; however, they are expected to be similar to emissions from the MS9001H, but slightly lower due to the lower flow rate. Current 9H emission estimates are well below the maximum hourly emissions allowed by the air emissions permit. The permitted emissions from the test stands are as follows:

Pollutant	Pound per Hour	Tons per Year
PM10	55.5	8.7
SO2	396.1	71.1
NOx	885.3	179.6
CO	27,169.4	6,880.8
VOC	843.6	68.0

The current air permit limits were developed to allow all six existing test stands to fire simultaneously and not exceed the hourly emissions based on current turbine models. Before the 7H turbine is tested, emission estimates will be developed and compared to the permit limits to determine if restrictions need to be placed on simultaneous firing or other turbine. GE's air permit requires the tracking of periods of simultaneous emissions to ensure compliance with the hourly emissions limit and tracking of annual emissions on a rolling 12-

month basis to ensure compliance with the annual emissions limit. These requirements will continue to be met by GE.

3. **Question 20: As estimate of water usage for equipment washing during the turbine test.**

The turbine is typically not washed during the turbine test. The only water usage would be for minor clean-up of the test stand, which is estimated to be less than 200 gallons per test.

4. **Question 21: A list of existing recycling programs.**

The following is a list of waste streams which are recycled:

Waste Metal Powders (VPS)
Nickel Cadmium Batteries
Lead Acid Batteries
Scrap Carbon Steel
Scrap Stainless Steel
Scrap Stainless Steel Chips
Scrap carbon Steel Chips
High Value Grinding Swarf (two types)
Silver from X-Ray Stations
Cardboard
Office Paper

5. **Question 23: A copy of the facility noise survey. An estimate of the noise level from MS7001H turbine test and projected noise level with silencing equipment and outside wall insulation in place (as identified in Section 2.6 of the Draft Report).**

A copy of the facility noise survey is attached. A copy of the noise analysis for Test Stand 8 and the 9H machine is also attached. Noise levels from the 7H turbine are expected to be no greater than those from the 9H turbine.

6. **Question 24: Size and source of the workforce required for testing operations, including turbine connection, firing, and disassembly.**

Installation and removal of the turbine in the test stand is typically performed by a contractor who currently employs ten to 11 employees for this activity. Firing of the turbine is performed by GE employees. There are currently 41 hourly and eight salaried employees in the total turbine testing operations.

7. **Question 27: OSHA records related to the turbine testing activities for the past year (e.g., accident history of existing test stands similar in operation to Test Stand 8).**

OSHA recordable injuries and illnesses relating to turbine testing activities for 1996 and 1997 year to date are as follows:

	1996	1997 YTD
GE Employees	0	1
Contract Employees	1	1

8. **A summary of the current emergency response procedures for the operation of test stands (e.g., accidental gas or oil release).**

General Electric has an on-site Emergency Response Team (ERT). Back-up fire protection is provided by the Mauldin Fire Department. Both GE ERT and Mauldin FD employees have received training in responding to fires involving natural gas and diesel oil and in containment techniques for releases of diesel oil. GE ERT and Mauldin FD employees are knowledgeable in the location of oil and gas cut-off valves.

GE has a written emergency response plan which outlines general procedures to be followed in the event of any emergency. The main elements of this plan include 1. Purpose and Scope 2. Initial Response Actions, 3. Plant Emergency Signals and Evacuation Procedures, 4. Emergency Response Internal Contacts, 5. Emergency Response External Notifications, 6. Emergency Response Equipment, 7. Follow-up Actions, 8. Natural Disasters, and 9.0 Threatening and Harassing Telephone Calls.

9. **In reference to Sections 2.7 and 2.9 in the July 1997 Draft Report, when was the correspondence and coordination with the agencies (South Carolina Water Resources Commissions, National Park Service, U.S. Fish and Wildlife Service, and South Carolina Department of Archives and History) completed?**

Correspondence with the agencies listed was as follows:

July 31, 1991

U.S Fish and Wildlife Service	July 18 & 24, 1991	August 19, 1991
SC Department of History and Archives	July 18, 1991	August 6, 1991

The July 22, 1991 letter for the SC Water Resources Commission incorrectly listed GE as being in Spartanburg County. This was corrected in a letter from the Commission dated September 27, 1993.

10. **Question 14 For the 7H turbine 100-hour test, what is the expected duration of each run (range of hours)? Estimated number of runs? Duration of the overall test period (weeks, or months)?**

Tests may last a full 24 hours/day. Duration of the overall test period is several weeks. Plan is to take 18 steady state performance points (72 test hours), and 28 hours to cover the rest of the mechanical check-out.

4

Post-It™ brand fax transmittal memo 767		# of pages > 2510
To Tom Chance	From Allison Ranson	
Co.	Co.	
Dept.	Phone # 288-3033	
Fax # 235-4314	Fax # -2772	

Allison D. Ranson
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General Electric Company
300 Gartington Road, P. O. Box 648
Rm. 239, Greenville, SC 29602
(864) 675-3033 Fax: (864) 675-2772

August 28, 1997

Ms. Stephanie Shealy, Environmental Engineering Associate
Bureau of Air Quality
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

RE: General Electric Gas Turbines Test Stands Semi-Annual Report
First and Second Quarters 1997

Dear Ms. Shealy:

Condition 11 of Construction Permit 1200-0094-DH requires General Electric to submit bi-annual reports to the Bureau of Air Quality's Technical Management Section. The reports are required to include the following information: 1) Total Emissions for Each Month, 2) Total Emissions for the Previous Two Quarters, 3) Twelve Month Rolling Sum of Emissions for the Previous Year, 4) Amount of Distillate Fuel Used During the Previous Two Quarters, and 5) Emission Rates for Periods of Simultaneous Operation. The enclosed information is submitted in accordance with this requirement.

1. Total Emissions for Each Month

Attachment 1, "Test Stand Emissions by Month - Rolling 12-Month Total", provides the total emissions from the Test Stands for each month in the first and second quarters. The emission factors used to calculate these emissions are included at the bottom of the table.

2. Total Emissions for the Previous Two Quarters

Attachment 1 also provides the emissions from the Test Stands for the third and fourth quarters of 1996.

3. Twelve Month Rolling Sum of Emissions for the Previous Year

The sum of the emissions for the previous twelve months is included in Attachment 1. These emissions are compared against the annual permit limits. Review of this attachment indicates that the Test Stand emissions were well below the permitted emission limits.

Ms. Stephanie Shealy
August 28, 1997
Page 2

4. Amount of Distillate Fuel Used During the Previous Two Quarters

Attachment 1 lists the amount of distillate fuel and the amount of natural gas used during each month for the previous 12 months.

5. Emission Rates for Periods of Simultaneous Operation

Attachment 2 depicts the time period during which a turbine was physically present in a Test Stand during the first and second quarters of 1997. This does not represent the time during which the turbine was actually being fired. General Electric has installed an electronic data logging system to collect data on the actual start and stop times for each run of a turbine test. (The total test for a given turbine will include a series of runs.) The electronic data logging system was still being developed during the first quarter of 1997, therefore, exact start and stop times for each run were not available for parts of the first quarter.

The purpose of reporting emissions during periods of simultaneous operation is to demonstrate that GE has remained below the hourly emission rates specified in the Construction Permit. Attachment 3 presents the maximum theoretical hourly emission rates which could have occurred assuming that each turbine was fired for the entire period during which it was in a Test Stand. It should be recognized that these data greatly overestimate the actual hourly emissions since the turbines are fired for only a small percentage of the time they are in the test stands. A review of Attachment 3 shown that at all times GE operated below the permitted hourly emission rates.

If you have any questions pertaining to the information provided in this report, please give me a call at (864) 675-3033.

Sincerely,

Allison D. Ranson
Environmental Projects Manager

Attachments (3)

cc: Larry Teachey
Carl Bugg

TEST STAND EMISSION BY MONTH - ROLLING 12 MONTH TOTAL

October 1996

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr tons	SO2 lbs/hr tons	CO lbs/hr tons	NOx lbs/hr tons	VOC lbs/hr tons
5					2.50	25.70	492.10	37.70	169.92
6B	2	23.1	18,013		8.50	14.40	84.10	41.60	10.30
6FA	1	45.8	60,068		8.50	48.20	331.90	106.00	39.40
6FA (gas)					2.50	0.01	2765.50	63.10	26.40
7E	1	35.7	53,550		5.00	17.90	383.00	59.20	65.90
9E					8.00	75.50	431.60	180.30	58.48
7F					8.50	74.96	638.50	122.13	62.40
9F					10.00	83.03	677.35	160.08	75.80
October Total	4	104.6	131,631	0	0.38	1.59	15.41	3.96	2.20

November 1996

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr tons	SO2 lbs/hr tons	CO lbs/hr tons	NOx lbs/hr tons	VOC lbs/hr tons
5					2.50	25.70	492.10	37.70	169.92
6B	1	9.4	6,578		8.50	14.40	84.10	41.60	10.30
6FA					8.50	48.20	331.90	106.00	39.40
6FA (gas)	1	17.6	41,299	3,723,500	2.50	0.01	2765.50	63.10	26.40
7E	3	26.8	9,081		5.00	17.90	383.00	59.20	65.90
9E	1	10.6			8.00	75.50	431.60	180.30	58.48
7F					8.50	74.96	638.50	122.13	62.40
9F					10.00	83.03	677.35	160.08	75.80
November Total	6	64.4	56,958	3,723,500	0.17	0.71	32.15	2.50	1.47

December 1996

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr tons	SO2 lbs/hr tons	CO lbs/hr tons	NOx lbs/hr tons	VOC lbs/hr tons
5					2.50	25.70	492.10	37.70	169.92
6B					8.50	14.40	84.10	41.60	10.30
6FA					8.50	48.20	331.90	106.00	39.40
6FA (gas)					2.50	0.01	2765.50	63.10	26.40
7E	2	24.9	38,080		5.00	17.90	383.00	59.20	65.90
9E	1	21.2	56,313		8.00	75.50	431.60	180.30	58.48
7F	3	76.5	296,134		8.50	74.96	638.50	122.13	62.40
9F	6	122.6	390,527	0	10.00	83.03	677.35	160.08	75.80
December Total					0.53	4.19	37.45	8.15	4.38

TEST STAND EMISSION BY MONTH - ROLLING 12 MONTH TOTAL

July 1996

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 lbs/hr	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5	1	10.9	7,173		2.50	25.70	492.10	37.70	169.92
6B					8.50	14.40	84.10	41.60	10.30
6FA					8.50	48.20	331.90	106.00	39.40
6FA (gas)					2.50	0.01	2765.50	63.10	26.40
7E					5.00	17.90	383.00	59.20	65.90
9E	1	8.1	4,667		8.00	75.50	431.60	180.30	58.48
7F					8.50	74.96	638.50	122.13	62.40
9F					10.00	83.03	677.35	160.08	75.80
July Total	2	19.0	11,840	0	0.08	0.38	2.21	0.96	0.29

August 1996

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 lbs/hr	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5	1	10.6	3,050		2.50	25.70	492.10	37.70	169.92
6B	3	34.3	24,966		8.50	14.40	84.10	41.60	10.30
6FA	1	24.6	33,372		8.50	48.20	331.90	106.00	39.40
6FA (gas)					2.50	0.01	2765.50	63.10	26.40
7E	1	16.4	24,600		5.00	17.90	383.00	59.20	65.90
9E	3	26.3	56,688		8.00	75.50	431.60	180.30	58.48
7F					8.50	74.96	638.50	122.13	62.40
9F					10.00	83.03	677.35	160.08	75.80
August Total	9	112.2	142,676	0	0.41	2.12	16.95	5.07	2.87

September 1996

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 lbs/hr	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5	1	9.9	16,538		2.50	25.70	492.10	37.70	169.92
6B	2	19.4	14,201		8.50	14.40	84.10	41.60	10.30
6FA					8.50	48.20	331.90	106.00	39.40
6FA (gas)					2.50	0.01	2765.50	63.10	26.40
7E	2	21.7	32,448		5.00	17.90	383.00	59.20	65.90
9E	4	33.4	68,967		8.00	75.50	431.60	180.30	58.48
7F					8.50	74.96	638.50	122.13	62.40
9F	1	58.1	210,665		10.00	83.03	677.35	160.08	75.80
September Total	10	142.5	342,819	0	0.57	4.13	34.29	8.89	4.83

TEST STAND EMISSION BY MONTH - ROLLING 12 MONTH TOTAL

January 1997

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 tons	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5	2	18.8	15,992		2.50	25.70	492.10	37.70	169.92
6B					8.50	14.40	84.10	41.60	10.30
6FA	1	24.0		5,249	8.50	48.20	331.90	106.00	39.40
6FA (gas)	2	22.0	31,100		2.50	0.01	2765.50	63.10	26.40
7E					5.00	17.90	383.00	59.20	65.90
9E					8.00	75.50	431.60	180.30	58.48
7F					8.50	74.96	638.50	122.13	62.40
9EC (gas)	1	45.5		18,721	5.80	0.30	7033.10	160.40	67.10
9F					10.00	83.03	677.35	160.08	75.80
January Total	6	110.3	47,093	23,969	0.30	0.34	198.19	5.45	2.67

February 1997

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 tons	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5	4	30.1	22,636		2.50	25.70	492.10	37.70	169.92
6B					8.50	14.40	84.10	41.60	10.30
6FA					8.50	48.20	331.90	106.00	39.40
6FA (gas)	2	34.9	53,363		2.50	0.01	2765.50	63.10	26.40
7E					5.00	17.90	383.00	59.20	65.90
9E					8.00	75.50	431.60	180.30	58.48
7F					8.50	74.96	638.50	122.13	62.40
9F					10.00	83.03	677.35	160.08	75.80
February Total	6	65.0	75,999	0	0.22	0.53	7.95	1.66	1.30

March 1997

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 tons	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5	2	20.5	14,623		2.50	25.70	492.10	37.70	169.92
6B (gas)	2	15.9		1,532	8.50	0.09	84.10	41.60	10.30
6FA					1.30	0.01	371.80	42.40	3.90
6FA (gas)	3	18.5	27,391		8.50	48.20	331.90	106.00	39.40
7E					2.50	0.01	2765.50	63.10	26.40
9E					5.00	17.90	383.00	59.20	65.90
7F	1	42.3	111,105		8.00	75.50	431.60	180.30	58.48
9F					8.50	74.96	638.50	122.13	62.40
March Total	8	97.2	153,118	1,532	10.00	83.03	677.35	160.08	75.80
					0.32	1.90	20.86	3.89	2.07

TEST STAND EMISSION BY MONTH - ROLLING 12 MONTH TOTAL

April 1997

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 lbs/hr	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5									
6B (gas)	1	7.5		729	2.50	25.70	492.10	37.70	169.92
6FA					1.30	0.10	371.80	42.40	3.90
6FA (gas)					8.50	48.20	331.90	106.00	39.40
7E (gas)	2	22.2		4,485	2.50	0.01	2765.50	63.10	26.40
9E					2.50	0.10	1321.30	90.40	24.20
7F (gas)	1	19.3		7,954	8.00	75.50	431.60	180.30	58.48
9F					4.00	0.20	5775.80	131.80	55.00
April Total	4	49.0	0	13,168	10.00	83.03	6773.5	160.08	75.80
					0.07	0.00	71.80	2.43	0.81

May 1997

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 lbs/hr	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5									
6B (gas)	2	20.1		2,050	2.50	25.70	492.10	37.70	169.92
6FA					1.30	0.10	371.80	42.40	3.90
6FA (gas)					8.50	48.20	331.90	106.00	39.40
7E (gas)	2	31.0		6,168	2.50	0.01	2765.50	63.10	26.40
9E (gas)	1	5.8		1,750	2.50	0.10	1321.30	90.40	24.20
7F					4.00	0.20	1647.30	150.40	16.70
9F (gas)	1	30.4		17,085	8.50	74.96	638.50	122.13	62.40
May Total	6	87.3	0	27,053	5.80	0.30	8500.80	181.80	82.00
					0.15	0.01	158.21	5.03	1.71

June 1997

FRAME SIZE	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 lbs/hr	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
5									
6B (gas)	1	29.4		2,831	2.50	25.70	492.10	37.70	169.92
6FA					1.30	0.10	371.80	42.40	3.90
6FA (gas)					8.50	48.20	331.90	106.00	39.40
7E	2	13.7	20,654		2.50	0.01	2765.50	63.10	26.40
9E					5.00	0.12	383.00	59.20	65.90
7F					8.00	75.50	431.60	180.30	58.48
9F (gas)	2	43.6		26,240	8.50	74.96	638.50	122.13	62.40
June Total	5	86.7	20,654	29,071	5.80	0.30	8500.80	181.80	82.00
					0.18	0.13	193.41	4.99	2.30

TEST STAND EMISSION BY MONTH - ROLLING 12 MONTH TOTAL

12-Month Rolling Total (July 1996-June 1997)

	# UNITS TESTED	TEST HOURS	LIQ FUEL USED	NAT GAS USED	PM lbs/hr	SO2 lbs/hr	CO lbs/hr	NOx lbs/hr	VOC lbs/hr
12-MO. TOTAL	72	1,061	1,373.315	3,818,293	3	16	789	53	1
PERMIT LIMIT					8.7	71.1	6888.8	179.6	68.0

Emission Factors Used (lb/hr)									
Model	PM	SO2	CO	NOx	VOC	Source			
5001	2.50	25.70	492.10	37.70	169.92	1994 Flodman Factors corrected to VOC=80%, mass balance for SO2			
6000B-Liquid	8.50	14.40	84.10	41.60	10.30	IT Stack monitoring data (1994); Flodman Factors for PM			
6000B-Gas	1.30	0.10	371.80	42.40	3.90	PSD Permit Application, higher of values for std and DLN combustors			
6001FA -Liquid	8.50	48.20	331.90	106.00	39.40	PSD Permit Application			
6001FA -Gas	2.50	0.01	2765.50	63.10	26.40	PSD Permit Application - DLN Combustion			
7001E-Liquid	5.00	17.90	383.00	59.20	65.90	IT Stack monitoring data (1994); Flodman Factors for PM			
7001E-Gas	2.50	0.10	1321.30	90.40	24.20	PSD Permit Application, higher of values for std and DLN combustors			
9001E-Liquid	8.00	75.50	431.60	180.30	58.48	1994 Flodman Factors corrected to VOC=80%, mass balance for SO2			
9001E-Gas	4.00	0.20	1647.30	150.40	16.70	PSD Permit Application, higher of values for std and DLN combustors			
7001F-Liquid	8.50	74.96	638.50	122.13	62.40	Radian Stack monitoring data (1992) corrected for IGV & VOC=80%			
7001F-Gas	4.00	0.20	5775.80	131.80	55.00	PSD Permit Application, higher of values for std and DLN combustors			
9000EC-Gas	5.80	0.30	7033.10	160.40	67.10	PSD Permit Application, DLN combustion			
9001F-Liquid	10.00	83.03	677.35	160.08	75.80	IT Stack monitoring data (1994); Flodman Factors for PM			
9001F-Gas	5.80	0.30	8500.80	181.80	82.00	PSD Permit Application, higher of values for std and DLN combustors

Key to Frame Sizes
61XX = MS6000B
650X = MS6001FA
710X = MS7001E
750X = MS7001F
810X = MS9001E
950X = MS9001F
980X = MS9000EC

Attachment 3 Emissions During Periods of Simultaneous Operation

Emission Factors Used (lb/hr)					
Model	PM	SO ₂	CO	NO _x	VOC
5001	2.50	25.70	492.10	37.70	169.92
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
6000B-Gas	1.30	0.10	371.80	42.40	3.90
6001FA -Liquid	8.50	48.20	331.90	106.00	39.40
6001FA -Gas	2.50	0.01	2,765.50	63.10	26.40
7001E-Liquid	5.00	17.90	383.00	59.20	65.90
7001E-Gas	2.50	0.10	1,321.30	90.40	24.20
9001E-Liquid	8.00	75.50	431.60	180.30	58.48
9001E-Gas	4.00	0.20	1,647.30	150.40	18.70
7001F-Liquid	8.50	74.96	638.50	122.13	62.40
7001F-Gas	4.00	0.20	5,775.80	131.80	55.00
9000EC-Gas	5.80	0.30	7,033.10	160.40	67.10
9001F-Liquid	10.00	83.03	677.35	160.08	75.80
9001F-Gas	5.80	0.30	8,500.80	181.80	82.00

January 13-20

Model	PM	SO ₂	CO	NO _x	VOC
7001E-Liquid	5.00	17.90	383.00	59.20	65.90
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
9000EC-Gas	5.80	0.30	7,033.10	160.40	67.10
Total	19.30	32.60	7,500.20	261.20	143.30
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

January 23-28

Model	PM	SO ₂	CO	NO _x	VOC
7001E-Liquid	5.00	17.90	383.00	59.20	65.90
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
6001FA -Gas	2.50	0.01	2,765.50	63.10	26.40
Total	16.00	32.31	3,232.60	163.90	102.60
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

February 6-7

Model	PM	SO ₂	CO	NO _x	VOC
7001E-Liquid	5.00	17.90	383.00	59.20	65.90
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
6001FA -Gas	2.50	0.01	2,765.50	63.10	26.40
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
Total	24.50	46.71	3,316.70	205.50	112.90
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

February 26

Model	PM	SO ₂	CO	NO _x	VOC
7001E-Liquid	5.00	17.90	383.00	59.20	65.90
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
7001F-Liquid	8.50	74.96	638.50	122.13	62.40
Total	30.50	121.66	1,189.70	264.53	148.90
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

Attachment 3 Emissions During Periods of Simultaneous Operation

March 10,13 & 14

Model	PM	SO2	CO	NOx	VOC
7001E-Liquid	5.00	17.90	383.00	59.20	65.90
6000B-Liquid	8.50	14.40	84.10	41.60	10.30
6000B-Gas	1.30	0.10	371.80	42.40	3.90
7001F-Liquid	8.50	74.96	638.50	122.13	62.40
Total	23.30	107.36	1,477.40	265.33	142.50
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

May 2-5

Model	PM	SO2	CO	NOx	VOC
7001E-Gas	2.50	0.10	1,321.30	90.40	24.20
9001F-Gas	5.80	0.30	8,500.80	181.80	82.00
6000B-Gas	1.30	0.10	371.80	42.40	3.90
7001F-Gas	4.00	0.20	5,775.80	131.80	55.00
Total	13.60	0.70	15,969.70	446.40	165.10
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

May 12-13 and May 20-27

Model	PM	SO2	CO	NOx	VOC
7001E-Gas	2.50	0.10	1,321.30	90.40	24.20
9001E-Gas	4.00	0.20	1,647.30	150.40	16.70
9001F-Gas	5.80	0.30	8,500.80	181.80	82.00
6000B-Gas	1.30	0.10	371.80	42.40	3.90
Total	13.60	0.70	11,841.20	465.00	126.80
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

June 10-20

Model	PM	SO2	CO	NOx	VOC
7001E-Liquid	5.00	17.90	383.00	59.20	65.90
9001F-Gas	5.80	0.30	8,500.80	181.80	82.00
6000B-Gas	1.30	0.10	371.80	42.40	3.90
Total	12.10	18.30	9,255.60	283.40	151.80
Perm. Limit	55.50	396.10	27,169.40	885.30	843.60

5

Post-It™ brand fax transmittal memo 7671		# of pages • 23
To Tom Chance	From Allison Ransom	
Co.	Co.	
Dept.	Phone # 298-3033	
Fax # 235-4314	Fax # -2772	

6.0 Air Quality Analysis

The purpose of the ambient air quality analysis is to demonstrate that the proposed project will not result in a significant deterioration in air quality. Determination of "significant deterioration" is dependent upon land-use classifications. An analysis of the impacts the proposed project will have on Class I areas is presented separately in Section 7.

Air quality modeling analyses, by means of dispersion modeling, were performed to assess the ambient air quality impact of the proposed project. The dispersion modeling analyses demonstrate compliance with the PSD increment and NAAQS for NO₂ and compliance with the NAAQS for CO. Thus, the air quality analysis demonstrates the proposed project will not result in a significant deterioration of ambient air quality.

6.1 Background

The proposed project at GE will lead to a *significant increase* in emissions of carbon monoxide and nitrogen oxides (NO_x). One requirement of a PSD analysis is to determine whether the proposed project will exceed the available *PSD increment*. This increment is the maximum allowable increase in the modeled ambient concentration of a pollutant above the baseline ambient concentration. Since PSD increments for carbon monoxide have not been established, GE need only demonstrate that the project will not cause an exceedence of the NAAQS.

Oxides of nitrogen are regulated in two ways. Nitrogen dioxide (NO₂) is a criteria pollutant for which a NAAQS and PSD increment have been established. The NO₂ increment is based on an annual averaging period: 2.5 µg/m³ in Class I areas and 25 µg/m³ in Class II areas. NO_x emissions (along with VOC emissions) are also regulated under PSD as precursors to ozone formation. Neither an increment nor a standard for NO_x emissions (as an ozone precursor) has been established.

The dispersion modeling analysis involves two distinct phases: (1) a preliminary analysis and (2) a full impact analysis. The *preliminary analysis* considers only the net emissions increase of a pollutant from a proposed modification and compares the modeled value to a

prescribed *significant ambient impact level*. The results of the preliminary analysis determine whether a full impact analysis is required. Specifically, the preliminary analysis:

- determines whether the applicant can forego further air quality analyses for a particular pollutant;
- may allow the applicant to be exempted from the ambient monitoring data requirements; and
- is used to define the impact area within which a full impact analysis must be carried out.

If the preliminary analysis indicates a significant impact, then a *full impact analysis* is required. This analysis requires modeling not only the proposed modifications, but all emission units (including those not at the source) that may impact ambient air concentrations in the significant impact area.

These analyses were performed using EPA and South Carolina dispersion modeling techniques.

6.2 Site Area Characteristics

Certain site area characteristics, including wind climatology, land use classification, and terrain analysis, are necessary components of the dispersion modeling analysis.

6.2.1 Wind Climatology

GE is located in Greenville County, in the northwest portion of South Carolina. The facility is about 10 miles southeast of downtown Greenville, and about 10 miles southwest of the Greenville-Spartanburg International Airport. The Appalachian Mountain chain lies northeast to southwest about 170 miles to the northwest of GE.

Figure 3 presents a five-year composite wind rose using meteorological data collected at the Greenville-Spartanburg airport. The figure illustrates the influence of the mountains on the large-wind wind patterns in northwestern South Carolina, as the wind blows predominately parallel to the orientation of the mountain chain.

6.2.2 Land Use Classification

Air dispersion models require that the land use in the vicinity of the source be classified as either URBAN or RURAL so as to assign the proper dispersion coefficients. Follow-

ing the procedure outlined in *Supplement B to the Guideline on Air Quality Models (Revised)* (Appendix W of 40 CFR 51), the land use classification is based on the typing scheme developed by Auer. If more than 50% of the area within 3 km of the source is classified as heavy industrial, light-moderate industrial, commercial, single-family compact residential, and multi-family residential, the site is classified as urban; otherwise, the site is classified as rural.

The land use in the vicinity of GE is overwhelmingly a mixture of common residential, metropolitan natural, and undeveloped rural; all three of these categories merit the RURAL designation. Thus, rural dispersion coefficients were used for this analysis.

6.2.3 Terrain Analysis

South Carolina DHEC modeling guidance requires terrain to be considered in the dispersion analysis only if elevations within five kilometers of the source vary by more than 50% of the shortest, non-fugitive, on-site stack being modeled. Figure 4 depicts the US Geological Survey map of the terrain in the immediate vicinity of GE (elevation 289 meters above mean sea level). Terrain in most directions slopes downward from the GE facility. The exception is the northwest, where the terrain slopes upward. Two significant terrain features are Roper Mountain (elevation of 366 meters) and Butler Hill (363 meters). Outside of these the two points, terrain elevations vary by less than 50% of the shortest stack height; therefore at the remaining receptors terrain elevations need not be considered. The Roper Mountain and Butler Hill receptors include terrain elevation.

6.3 Pre-Application Air Quality Monitoring

It is not necessary to collect continuous ambient monitoring data because adequate data are collected by the Greenville County Health Department. Collection of continuous ambient monitoring data is only required as part of the air quality analysis under certain circumstances. DHEC has discretionary authority to exempt an applicant from this data requirement if either (1) the predicted ambient impact caused by the modification, *i.e.*, the highest modeled concentration for the applicable averaging time, or (2) the existing ambient pollutant concentrations are less than the prescribed significant monitoring value (Table 5). Presently, ambient air quality data for nitrogen dioxide and carbon monoxide are collected by the Greenville County Health Department. The data collection site is located in the city of Greenville (UTM coordinates 371,830 northing; 3,855,925 easting)

Figure 3. Wind Rose from 5 Years of Data Collected at Greenville-Spartanburg.

approximately 10 km from GE (Site ID Number 45-045-008). DHEC guidance allows any data collected within 10 km of the source to be acceptable for the pre-construction monitoring requirement.

Table 5. Significant Monitoring Concentrations

Pollutant	Significant Monitoring Concentrations	
	Averaging Time	Concentration ($\mu\text{g}/\text{m}^3$)
Carbon monoxide	8-hour	575
Nitrogen dioxide	annual	14

6.4 Air Dispersion Modeling

Air dispersion modeling was used to perform the preliminary analysis in order to determine whether there is a *significant impact* to air quality. If the modeling indicates a *significant impact*, the impact area will be determined. The impact area is the "circular area with a radius extending from the source to (1) the most distant point where approved dispersion modeling predicts a significant ambient impact will occur, or (2) a modeling receptor distance of 50 km, whichever is less." If the preliminary analysis indicates a significant increase may occur, then a full impact analysis is required. The full impact analysis requires modeling all sources within 50 km that may impact ambient concentrations within the significant impact area.

6.4.1 Industrial Source Complex Model

Air dispersion modeling was used to determine if the proposed project will have a *significant impact* on air quality from the proposed project. The modeling analysis was performed with the Industrial Source Complex (ISC2) model, the preferred model for most permitting applications. The ISC2 model can be used to model an indefinite number of sources; it can be used for a number of varying averaging times; and the model considers the effect of building downwash on plume dispersion. The ISC2's limitations include that it cannot be used in complex terrain (defined as terrain height above plume height); it must be used with

another model in intermediate terrain (defined as terrain height above stack height, but less than plume height); and it cannot be used for distances further than 50 km from the source.

A USGS map was used to evaluate the terrain in the immediate vicinity of GE. The SCREEN2 model was used to estimate plume height. (Stack Data for Test Stand 3, presented in Tables 8 and 9, were used since the corresponding stack had the lowest exit temperature and exit velocity). Plume height is estimated to be 129 meters, with the distance to final plume rise being 151 meters. The highest terrain point within a 5 km circle around the facility is Roper Mountain (2.6 kilometers to the northwest), which is 77 meters above the GE base elevation. Butler Hill (6 kilometers to the northwest) has an elevation of 74 meters. Stack height is approximately 18 meters. Thus while most of the terrain surrounding the facility is classified as "simple," these two locations are classified as "intermediate." In regions of intermediate terrain, EPA has established has a policy that both the ISC2 and the complex terrain model COMPLEX I should be used; the results from each should be compared, hour by hour, and the higher of the two is the final result.

The modeling analysis was performed with the commercially available software package BEEST.¹ BEEST contains the ISC2 (short term) and COMPLEX I models, and automatically implements EPA's intermediate terrain policy.

The ISC2 model has two modes: a long-term mode (ISCLT2) and a short-term mode (ISCST2). The ISCLT2 was used for modeling NO₂ emissions since all evaluation criteria for this pollutant are based on an annual averaging period. The ISCST2 was used for carbon monoxide, where the applicable standards are based on averaging periods of one hour and eight hours.

The purpose of the initial modeling analysis is to demonstrate the change in ambient air concentrations of CO and NO₂ as a result of the proposed project. To determine this impact, the model input file contained two scenarios for each pollutant. The first scenario was based on the current stack parameters and emission rates; the second run was based on the stack parameters and requested allowable emission rates associated with the proposed project. The difference in the predicted concentrations for each of these runs is the change in

¹ BEEST Version 2.10 available from BEELINE software (see Reference 6 in § 6.7). The BEEST model has been certified for use in regulatory applications by US EPA (see letter in Appendix B).

ambient air quality as a result of the modification. Modeling results were evaluated against the Class II significance levels in Table 6. If modeled values are below these thresholds, a *significant impact* analysis is not required.

Table 6. Class II Significance Levels

Pollutant	Level of Significance ($\mu\text{g}/\text{m}^3$) by Averaging Period		
	Annual	8-hour	1-hour
NO ₂	1	--	--
CO	--	500	2,000

6.4.2 Modeling Input Data

Test operations at GE are performed at a source comprised of six test stands (Numbers 1, 2, 3, 4, 6, and 7). Emissions from Test Stands 1, 2, and 3 can be from one or both of two stacks. Test Stand 4 has three stacks. Test Stands 6 and 7 have only one stack. For those stands with multiple stacks, the stack closest to the fenceline was selected. The distance between stacks is only a few meters. For some turbine frame sizes, emissions during testing are from both stacks. The modeling analysis assumed all emissions were discharged through one stack. Table 7 summarizes the stack descriptions including the stack ID label in the modeling. (The prefix "A" in a stack ID in the model input and output files indicates the stack parameters are for after the modification. "Before" and "After" calculations were made using the ISC Source Group option.) Modeled pollutant emission rates are listed in Table 8. These values represent the highest emission rates of the current turbine frame sizes. Stack parameters are listed in Table 9. Stack exit temperature and stack exit velocity differ for the CO and NO₂ scenarios, since the highest emission rate for a pollutant may be associated with different frame sizes.

For carbon monoxide, the emission rates in Table 9 are based on the maximum 1-hour emission rate for each test stand. For NO₂, average hourly emission rates were determined in the following manner. The annual NO_x emissions rate ~~was~~ for each test stand was estimated, based on a reasonable partitioning of the requested allowable emissions, and divided by 8,760 hours per year. This calculation yields the average emission rate for each test

stand. A sum of the NO₂ emission rate for each test stand, multiplied by 8,760 hours per year is a conservative (i.e., "high") estimate of the requested allowable annual emissions for NO₂. In this analysis, no attempt was made to estimate the expected NO₂ fraction in NO_x emissions. The assumption that all NO_x is converted to NO₂ for the purpose of the modeling demonstration is also conservative (i.e., yielding a "high" modeled concentration).

Table 7. Stack Descriptions for the GE Test Stands

Stack #	Source Description	Type	Stack Dir	Raincap	ISC ID
1	Test Stand #1	Point	Vertical	No	TS1SW
2	Test Stand #2	Point	Vertical	No	TS2SW
3	Test Stand #3	Point	Vertical	No	TS3SW
4	Test Stand #4	Point	Vertical	No	†
5	Test Stand #6	Point	Vertical	No	TS6
6	Test Stand #7	Point	Vertical	No	TS7

†TS4RND is the ID for the round stack and TS4RECT is the ID for the rectangular stack.

Table 8. Modeled Emission Rates

Pollutant:	Stack 1	Stack 2	Stack 3	Stack 4	Stack 5	Stack 6
	TS1	TS2	TS3	TS4	TS6	TS7
	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
<i>Before Modification:</i>						
Nitrogen Dioxide	1.7	1.3	3.9	3.7	1.3	6.0
Carbon Monoxide	492.1	492.1	492.1	677.0	492.1	677.0
<i>After Modification:</i>						
Nitrogen Dioxide	1.6	1.6	14.8	15.6	1.4	13.5
Carbon Monoxide	1,321.4	1,321.4	7,033.3	8,500.8	492.1	8,500.8

Table 9. Stack Parameters

Stack Parameter:		Stack 1	Stack 2	Stack 3	Stack 4	Stack 5	Stack 6
		TS 1	TS 2	TS 3	TS 4	TS 6	TS 7
Stack Height Above Ground (meters)		17.1	17.1	18.3	18.0	20.6	20.1
Inside stack diameter (meters)		3.9	3.9	4.4	†	4.1	8.3
Before Modification:							
Stack Exit Temperature (K)	CO	519	519	519	533	519	533
	NO ₂	672	480	478	478	672	533
Stack Exit Velocity (m/sec)	CO	15.7	15.7	12.3	16.6	14.3	16.8
	NO ₂	20.1	17.3	18.7	18.5	18.3	16.8
After Modification:							
Stack Exit Temperature (K)	CO	492	480	530	533	519	533
	NO ₂	492	480	530	533	672	533
Stack Exit Velocity (m/sec)	CO	17.8	17.3	25.6	16.6	14.3	16.8
	NO ₂	17.8	17.3	25.6	16.6	18.3	16.8

†Stack 4 has two identical, rectangular stacks and one circular stack. During testing, exhaust from certain frame sizes is vented through the rectangular stacks, and for others the exhaust is vented through the circular stack. All but one of the modeled scenarios for Test Stand 4 were based on turbine that used the round stack (which has a diameter of 8.4 meters). One scenario, the *before modification* case for NO₂, is based on a turbine that uses the rectangular stack. For modeling purposes only one stack, the stack closest to the fence line, is used. The rectangular has a diameter of 4.4 meters.

6.4.3 Meteorological Data

Meteorological data used in air dispersion modeling must be spatially and temporally representative of the area of interest. The nearest National Weather Service surface station is at the Greenville-Spartanburg Airport, approximately 10 miles northeast of GE. Data collected at this site is representative for the GE facility. The terrain in the immediate vicinity of GE is not "complex" (*i.e.*, terrain elevation above stack elevation), so a complex terrain

air dispersion model, which requires on-site meteorological data, is not needed. Mixing height data are available from Athens, Georgia. The DHEC *Modeling Guideline* specifies data from these two locations should be used for modeling analyses in Greenville County.

As stipulated in the *New Source Review Workshop Manual*, the data used in a PSD analysis should be the most recent, consecutive five years of data available. The most recent five-year period available is 1988 through 1992. All five years of the Greenville-Spartanburg data, and the period 1989 through 1991 of the Athens mixing height data were obtained directly from the US EPA Support Center for Regulatory Air Modeling (SCRAM) computer bulletin board. Mixing height data for 1988 and 1992 were not available on SCRAM and were obtained directly from the National Climatic Data Center (NCDC). Since the NCDC data had not received the additional level of quality control of the SCRAM data files, missing observations in the NCDC data files were substituted following procedures in the EPA memorandum *Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models* (July 7, 1992) available on SCRAM.

The meteorological data were processed using the EPA PCRAMMET program (available on SCRAM). The output from PCRAMMET is an hourly file that includes wind speed, direction, stability category, and mixing height. This file was used as input data for the ISCST2 model runs.

The anemometer height at the Greenville-Spartanburg airport is only 7 meters above ground (the model's default value is 10 meters). The anemometer height adjustment option was selected for this analysis.

The ISCLT2 model requires climatological data on wind speed, wind direction, and stability. Yearly summaries were created using the Greenville-Spartanburg 1988-1992 data. Climatological data on average temperature and average mixing height by stability category were obtained by averaging the hourly data found in the PCRAMMET processed data files.

6.4.4 Building Downwash Analysis

A building downwash analysis was performed using EPA's latest BPIP algorithm (version 95086) contained in the commercially available software package GEP-BIP². Direction-specific width and heights for each stack are contained in a file on the attached diskette. Different files were used for the short-term and long-term applications. (The ISCST2 uses 36 azimuthal coordinates; the ISCLT2 uses 16 azimuthal coordinates).

6.4.5 Receptor Placement

Placement of the receptors was based on a polar grid, centered on the round stack at Test Stand Number 4. (This stack is located at the approximate center of the six test stands.) Receptors were located along radials spaced 10 degrees apart. A partial ring was placed 900 meters from the origin (rings smaller than this were totally within the fenceline). Full rings for the ISCST2 modeling were placed at 1000, 1500, 2000, 2500, 3000, 4000, 5000, 6000, 7000, 8000, 9000, and 10,000 meters from the origin. For the ISCLT2 modeling receptors were placed at 1000, 1500, 2000, 3000, 4000, 5000, 7500, 10,000, 12,500, 15,000, 17,500, 20,000 and 50,000 meters from the origin. Receptors were placed 100 meters apart along the fenceline. Finally, two additional receptors were included: one at Roper Mountain and one at Butler Hill. The elevation above grade (at GE) was included for the receptors (77 and 74 meters respectively).

6.4.6 Additional Options

Additional model options selected for this analysis, following guidance in *Supplement B to the Guideline on Air Quality Models* and the *South Carolina Air Modeling Guidelines* include:

- Regulatory Default Options
- Flat Terrain Option

6.5 Modeling Results

The modeling results are presented in the following sections. Results from the analyses of carbon monoxide and nitrogen oxides are discussed separately. A significant impact area for CO emissions extends out to 6 kilometers from test operations. However, the full impact analysis demonstrated no exceedence of the NAAQS for CO. NO₂ emissions were below the significant impact threshold, and no further analysis is required.

² GEP-BPIP Version 5.10 incorporates BPIP Version 95086 as described in BPIP Model Change Bulletin #4 (April 1995) available on SCRAM.

6.5.1 Preliminary Analysis of Carbon Monoxide Emissions

The ISCST2 model (using EPA's intermediate terrain policy for the receptors at Roper Mountain and Butler Hill) was used to calculate the maximum off-site concentration of carbon monoxide for 1-hour and 8-hour averaging periods. Tables 10a and 10b summarize the results from modeling runs using five years of meteorological data. The maximum 1-hour and 8-hour concentrations are presented.

Table 10a. Summary of 1-hour CO concentrations

		Maximum 1-hour Concentration ($\mu\text{g}/\text{m}^3$)				
		1988	1989	1990	1991	1992
Receptor	East	-2,190.2	-2,190.2	-2,190.2	-2,190.2	-2,190.2
Location	North	1,331.3	1,331.3	1,331.3	1,331.3	1,331.3
Before Modification		768.9	764.4	755.8	757.0	755.2
After Modification		3,059.6	3,125.5	3,142.2	3,106.9	2,966.4
Change in Conc.		2,291	2,361	2,386	2,349	2,211
Significance Level		2,000	2,000	2,000	2,000	2,000

Table 10b. Summary of 8-hour CO concentrations

		Maximum 8-hour Concentration ($\mu\text{g}/\text{m}^3$)				
		1988	1989	1990	1991	1992
Receptor	East	-2,190.2	-2,190.2	-2,190.2	-2,190.2	-2,190.2
Location	North	1,331.3	1,331.3	1,331.3	1,331.3	1,331.3
Before Modification		233.0	373.2	322.2	237.1	208.1
After Modification		863.8	1,534.1	1,211.0	981.8	877.7
Change in Conc.		631	1,161	889	745	670
Significance Level		500	500	500	500	500

In each year, the CO significance level is exceeded at the Roper Mountain receptor for both the 1-hour and 8-hour averaging periods.

Figure 5 is a contour plot of the maximum 1-hour CO concentrations out to 10 kilometers. The GE facility is outlined in the center of the plot and contours are in intervals of $200 \mu\text{g}/\text{m}^3$. This figure reveals three maxima of CO concentrations: one is located along

the eastern fenceline; the second is at Roper Mountain; and the third is at Butler Hill. Figure 6 depicts values of the maximum 1-hour increase in concentrations at all modeled receptors between 1.5 and 6 kilometers. The plot indicates that the maximum concentration at Roper Mountain ($2,361 \mu\text{g}/\text{m}^3$) is greater than the CO 1-hour significance level. The maximum value at Butler Hill is $1,310 \mu\text{g}/\text{m}^3$, which is below the significance level. Concentrations at the non-elevated receptors near Roper Mountain were also below the significance level. The Roper Mountain receptor is 2.6 km from GE.

Figure 7 is a contour plot of the maximum increase in 8-hour CO concentrations out to 10,000 meters. Contours are in intervals of $100 \mu\text{g}/\text{m}^3$. The three local maxima for the 8-hour averaging period are in the same location as for the 1-hour. Figure 8 is a plot of the values of the maximum increase in 8-hour concentrations at each receptor between 1.5 and 6 kilometers from GE. The maximum value is at the Roper Mountain receptor ($1,160 \mu\text{g}/\text{m}^3$) and is greater than the CO significance level. The next highest value is at Butler Hill ($723 \mu\text{g}/\text{m}^3$) which also is higher than the CO significance level. At other nearby receptors, modeled concentrations are below the significance threshold. Butler Hill is just under 6 kilometers from GE.

6.5.2 Significant Impact Area

The CO *significant impact area* is the furthest distance for which a modeled value above the significance level occurred for either averaging period. The Butler Hill receptor (just under 6 kilometers from GE) was the most distant receptor for either averaging period. Therefore the significant impact area extends out to 6 kilometers.

In the next step of the analysis, the *full impact analysis*, emissions of carbon monoxide from all facilities within 50 km of GE are considered in order to determine the maximum concentration of carbon monoxide at all receptors within 6 kilometers of Test Stand 4. This modeled concentration was then compared to the National Ambient Air Quality Standard (NAAQS).

Figure 5. Maximum Increase in 1-hour CO Concentrations Out to 10 km.

Units are $\mu\text{g}/\text{m}^3$.

Contours are in intervals of $200 \mu\text{g}/\text{m}^3$.

Figure 6. Maximum Increase in 1-hour CO Concentrations between 1.5 and 6 km.

Units are $\mu\text{g}/\text{m}^3$.

Figure 7. Maximum Increase in 8-hour CO Concentrations out to 10 km.

Units are $\mu\text{g}/\text{m}^3$.
Contours are in intervals of $100 \mu\text{g}/\text{m}^3$.

Figure 8. Maximum Increase in 8-hour CO Concentrations between 1.5 and 6 km.

Units are $\mu\text{g}/\text{m}^3$

6.5.3 Full Impact Analysis of Carbon Monoxide Emissions

The full impact analysis requires evaluating all stationary sources that may impact CO concentrations in the significant impact area. This analysis includes all CO emission units on the facility's South Carolina operating permit. Emissions from these units were recently modeled as part of a South Carolina Standard No. 2 ("Ambient Air Quality Standards") compliance demonstration. The data on these emission units and model input data were obtained from the modeling report submitted to DHEC in September 1994.

DHEC provided information on all non-GE stationary sources of carbon monoxide within 50 kilometers of GE (see Appendix E). DHEC guidance permits the use of the "20D Method" as a screening technique for determining which sources need to be included in the full impact analysis. Using this technique, an existing source can be excluded from the full impact analysis if its emissions in tons per year is less than 20 times the distance in kilometers from the source undergoing PSD review. Table F-1 presents the results of this screening. None of the other sources had emissions greater than the screening criteria. Three of the sources are located within the significant impact area, but their annual emissions of CO are quite small (4.25, 1.29, and 1.00 tons per year respectively) and none are located near (*i.e.*, within 2 kilometers) of the receptors which had modeled values above the significance threshold. Thus, no offsite sources of CO were identified that would impact CO concentrations within the significant impact area.

Modeling of all CO emissions from GE, including the requested allowable emissions limitations for the test stands, was carried out to determine the maximum 1-hour and 8-hour off-site concentrations. These results are summarized in Tables 11a and 11b. Comparison to the NAAQS (including accounting for background values) is presented in Table 12. Modeled concentrations are all below the NAAQS for carbon monoxide.

The modeling results demonstrate that the proposed project and the requested increase in carbon monoxide emissions will not lead to significant deterioration in air quality.

Table 11a. Maximum 1-hour CO concentrations - Full Impact Analysis

		Maximum 1-hour Concentration				
		1988	1989	1990	1991	1992
Receptor	East	-2,190.2	-2,190.2	-2,190.2	-2,190.2	-2,190.2
Location	North	1,331.3	1,331.3	1,331.3	1,331.3	1,331.3
Concentration ($\mu\text{g}/\text{m}^3$)		3,060	3,126	3,142	3,106	2,966

Table 11b. Maximum 8-hour CO concentrations - Full Impact Analysis

		Maximum 1-hour Concentration				
		1988	1989	1990	1991	1992
Receptor	East	-2,190.2	-2,190.2	-2,190.2	-2,190.2	-2,190.2
Location	North	1,331.3	1,331.3	1,331.3	1,331.3	1,331.3
Concentration ($\mu\text{g}/\text{m}^3$)		864	1,534	1,211	982	878

Table 12. Modeled Concentrations and Comparison with Applicable Standards

Pollutant	Avg. Time	Max Modeled Conc. ($\mu\text{g}/\text{m}^3$)	Back-ground Conc. † ($\mu\text{g}/\text{m}^3$)	Total Conc. ($\mu\text{g}/\text{m}^3$)	Allow-able Conc. ($\mu\text{g}/\text{m}^3$)	Shows Compliance?
S.C. Regulation No. 62.5 - Standard No. 2 - Ambient Air Quality Standards:						
Carbon Monoxide	1 hour	3,142	8,100	11,242	40,000	YES
	8 hour	1,534	6,200	7,734	10,000	YES

† Background concentration based on monitor in Greenville County (Site ID Number 45-045-008). Provided to Tony Warren of IT Corporation by Kevin Clark of DHEC on 6/21/95.

6.5.4 Modeling Results and Requirements for Preconstruction Monitoring

With the exception of the receptors at Roper Mountain and Butler Hill, the modeled maximum increase in CO concentration does not exceed the significant monitoring concentration of $575 \mu\text{g}/\text{m}^3$ (8-hour average) for four of the years of meteorological data. For the fifth year, this value is exceeded only during two averaging periods at a receptor

located along the GE fenceline. Moreover, the full impact analysis indicates that emissions from other facilities and other GE units have little additional impact on CO concentrations.

Although Roper Mountain and Butler Hill are below plume height, the elevated terrain at these receptors is closer to the plume center line, and as a result modeled concentrations are higher at these points than for the surrounding terrain.

In the modeling analysis, it was assumed that all six test stands were in operation simultaneously for the eight-hour averaging period, an extraordinarily unlikely occurrence as one run of a test generally only lasts from three to four hours. Therefore the modeled 8-hour concentration is a very worst-case estimate. Further analysis of the modeling data (including the full impact analysis) indicate that the proposed project will not significantly affect the NAAQS in Greenville County.

Although the modeled 8-hour exceeded the significant monitoring concentration, the full impact analysis demonstrated that the proposed project will not approach the NAAQS thresholds for CO. Furthermore, a monitoring station is operating in the City of Greenville and is about 10 kilometers from GE. For these reasons, preconstruction monitoring should not be required.

6.5.5 Preliminary Analysis of Nitrogen Dioxide Emissions

The ISCLT2 model was used to calculate the maximum off-site annual concentration of nitrogen dioxide. Table 13 summarizes the results for five years of meteorological data.

Table 13. Summary of NO₂ Concentrations

		Maximum Annual Concentration (µg/m ³)				
		1988	1989	1990	1991	1992
Receptor	East	-8,034.9	-9,575.6	6,427.9	-5,130.3	-5,130.3
Location	North	-9,575.6	8,034.9	7,660.4	-14,095.4	-14,095.4
Before Modification		0.0134	0.0136	0.0152	0.0142	0.0153
After Modification		0.0228	0.0230	0.0254	0.0244	0.0260
Change in Conc.		0.009	0.009	0.010	0.010	0.011
Significance Level		1.0	1.0	1.0	1.0	1.0

Figure 9 is a plot of the maximum annual increase in NO₂ concentrations (1992 meteorological data). Modeled concentrations are below the Class II significance level for NO₂; therefore, no further analysis is required.

6.6 Summary

The ambient air quality modeling analyses demonstrate that the proposed project will not lead to a significant deterioration in air quality. The air dispersion modeling analysis reflected a worst-case operation scenario with all six test stands operating simultaneously, and where appropriate, considered other sources that could affect the significant impact area. The analysis also demonstrated that no violation of the NAAQS for carbon monoxide would occur. The proposed operation scenario did not exceed the significance level for nitrogen dioxide.

6.7 References

1. *New Source Review Workshop Manual (Draft)*, EPA Office of Air Quality Planning and Standards, October 1990
2. *Supplement B to the Guideline on Air Quality Models (Revised)* (Appendix W of 40 CFR 51), February 1993
3. *Air Quality Modeling Guidelines*, South Carolina Department of Health & Environmental Control, August 1993
4. Auer, A.H., Jr., "Correlation of Land Use and Cover with Meteorological Anomalies," *Journal of Applied Meteorology*, Vol. 17, pp. 636-643.
5. Support Center for Regulatory Air Models (SCRAM), accessed through EPA Technical Transfer Network (TTN). The TTN phone number is (919) 541-5742.
6. GEP-BPIP Version 5.10 and BEEST Version 2.10, provided by BEELINE Software (214) 233-5463.
7. *User's Guide for the Industrial Source Complex (ISC2) Dispersion Models, Volume I*, EPA-450/4-92-008a, EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, March 1992.

Figure 9. Maximum Annual Increases in NO_x Concentrations

Units are $\mu\text{g}/\text{m}^3$

Contours are in intervals of 0.002 $\mu\text{g}/\text{m}^3$

6

h&k

**Sound Level Survey
Gas Turbine Test Stands
General Electric Manufacturing Facility
Greenville, South Carolina
March 1997**

H & K Report No. 1275

H & K Job No. 2381

April 14, 1997

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of pages **30**

To Tom Chance	From Allison Ransom
Co.	Co.
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Prepared For: **Mr. Jim Sevinsky**
GE Power Generation
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GE Power Generation
Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

1.0 Introduction

In this report we present the results of community sound level measurements for the gas turbine test cells at the G E Greenville manufacturing facility. The primary purpose of the study was to determine the sound levels of at the existing residential areas adjacent to the GE manufacturing facility, due to the operation of the turbine test cell no. 7. Measurements were also conducted on the plant side in the immediate vicinity of the test cell no. 7. In addition sound level measurements were obtained with test cell no. 6 in operation. The sound level measurements were conducted on the week of 4 March 1997.

2.0 Site Description

The Greenville manufacturing facility is located in Greenville SC near the intersection of US 85 and US 385. Drawing 1 shows the plant layout and the existing development around the site. The development at the site consisted of the main manufacturing buildings on the northwest portion of the site and the gas turbine test stand in the center of the site.

The gas turbine test stand facility consists of 6 individual test cells located in three separate buildings. Test cells 1, 2, 3 and 4 are located in a common building. Test cells 6 and 7 are located in separate buildings. We understand that test cell 5 was decommissioned in the past. Each test cell is equipped with an exhaust muffler in a stack and an air intake duct and muffler.

3.0 Measured Sound Levels

We present the results of the sound level measurements in this section of the report. Sound level measurements were obtained in conjunction with the scheduled testing schedule for the week of 4 March 1997. Drawing 1 shows the measurement positions initially identified as potentially significant. However during the initial testing it was determined that the sound levels at position no. 8 were so heavily influenced by traffic noise from I-85 that further measurements at this position would not result in a significant evaluation of the test cell operation sound level impact. In addition, due to the influence of extraneous noise sources (traffic from I-385 & I-185, as well as operations from the GE main building), we determined that sound level measurements at position no. 6 would also not provide a representative impact of the test cell operation. Therefore the major emphasis of the measurement sequence was directed to the off plant locations to the north, east and south of the G E manufacturing facility (i.e. positions 5, 7, 9, 10 & 11). Due to the time schedules for the turbine testing during the week of 4 March 1997, it was not possible to obtain a complete measurement sequence at each measurement location for each turbine test.

At each measurement location the equivalent sound levels for the octave bands from 31 through 8,000 were measured. In addition the A-weighted and Linear overall sound levels were measured. The measured data was obtained in such a manner as to attempt to exclude "extraneous sound" such as occasional vehicle traffic along nearby roads, aircraft and other transient noises.

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Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

Drawing 1. Vicinity Map

GE Power Generation
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Report No. 1275, 4/14/97

The measurement system consisted of a model 2900 Real-Time Analyzer/Sound Level Meter (Type 1 per ANSI Standard S1.4 & S1.11) equipped with a model 2559 1/2-in. condenser microphone (with a windscreen) and a model 900 preamplifier (all by Larson-Davis Laboratories). Prior to each measurement sequence the complete system was calibrated with an external microphone calibrator (model CA250 by Larson-Davis Laboratories, ser. no. 2140, last calibration date of 2/6/97). The meter was placed on a tripod with the microphone set at approximately 5 feet above the ground.

Appendix A contains the measured octave band data obtained at the position. On these data sheets we provide the measured octave band sound levels, as well as the (1) Linear sound level {Lin}, (2) C-weighted sound level {C} and (3) A-weighted sound level {dBA}. These data are presented in the approximate chronological order obtained.

3.1 Test Cell No. 7

Test cell no. 7 is typically utilized for the testing of the GE frame 7 gas turbines. Figures 1, 2 & 3 show the measured sound pressure levels 400 feet from the test cell with and without the turbine frame 7F in operation. Figure 4 shows the measured sound level approximately 600 feet from the test cell with and without the turbine in operation. Generally these data indicate that:

- a) The primary sound level influence of test cell no. 7 is in the easterly direction.
- b) The increase in sound level occurs in the octave bands from 63 through 1,000 Hz octave bands, with the most predominate influence in the 125 Hz octave band.
- c) The setting of the inlet guide vane (IGV) influences the sound level in the 125 Hz octave band.

Figures 5 through 9 show the measured octave band sound levels measured in the community adjacent to the GE manufacturing facility with test cell no. 7 in operation. Specific comments for each location are:

- **Position 5.** Figure 5 shows the measured sound levels at position no. 5, in the woods south east of the test cells. Generally operation of the test cell appeared to increase the A-weighted sound levels 7 to 12 dB depending on the inlet guide vane setting. The primary influence being in the octave bands from 125 through 500 Hz. The operation of test cell no. 7 was audible at this position.

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Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

- **Position 7.** Figure 6 shows the measured sound level at position no. 7, in the woods, north west of the test cells. As is indicated by the data, the operation of the test cell did not have a significant influence on the sound levels at this site. There were two reasons for this, first the traffic noise from I-85 was the primary contributor to the general area sound levels, and secondly the main buildings at the GE site provided a certain degree of shielding. In the early morning hours of 3/8/97 (01:20 hrs with 88 deg. IGV) the test cell was faintly audible when the traffic sound was at a minimum.
- **Position 9.** Figure 7 shows the measured sound levels at position no. 9, near a residential development north east of the test cells. The test cells were audible at this position, however the data does not indicate a significant increase in sound levels.
- **Position 10.** Figure 8 shows the measured sound levels at position no. 10, near a residential development east of the test cells. The primary influence of the test cell operation appeared to be an increase in the sound levels of the 125 through 1,000 Hz octave bands. The sound of the test cell operation was audible at this position.
- **Position 11.** Figure 9 shows the measured sound levels at position no. 11, in a commercial development south of the test cells. The primary influence of the test cell operation appeared to be an increase in the sound levels of the 125 through 4,000 Hz octave bands. The sound of the test cell operation was audible at this position. Actually when this data was obtained the wind had shifted direction (out of north west), which is may have increased the levels and resulted in a more efficient transmission of the higher frequency sound.

In general the primary influence of the test cell no. 7 operation in the community corresponds with the data obtained at 400 feet. That is:

- d) The primary sound level influence of test cell no. 7 is in the easterly direction.
- e) The increase in sound level occurs in the octave bands from 63 through 1,000 Hz octave bands, with the most predominate influence in the 125 Hz octave band.
- f) The setting of the inlet guide vane (IGV) influences the sound level in the 125 Hz octave band.

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Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

3.1 Test Cell No. 6

On the early morning hours of 3/5/97 we had the opportunity to conduct sound level measurements with test cell no. 6 in operation. During the time of this test a Frame 6B gas turbine was in operation with an inlet guide vane setting of 84 degrees. Figures 10, 11 and 12 show the measured sound levels 400 feet from test cell no. 6. Generally these data indicate that the primary sound propagation is in the easterly direction and the most significant sound level increase is the 2,000 Hz octave band.

Figures 13, 14, 15 and 16 show the measured octave band sound levels measured in the community adjacent to the GE manufacturing facility with test cell no. 6 in operation. During the testing the sound due to the test cell was not audible at positions 5, 7 and 9. The sound was slightly audible at position no. 10 (note the wind was out of the north on this date)

4.0 Conclusion

We believe the measured sound levels obtained during the week of 4 March 1997 provide an accurate representation of the acoustical impact of the operation of the gas turbine test cell 6 and 7.

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Turbine Test Cells, Greenville, SC

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Report No. 1275, 4/14/97

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Figure 1. Position 1, In Plant
400 Feet East of Test Cell 7
With and Without Test Cell 7 In Operation

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Figure 2. Position 2, In Plant
400 Feet North of Test Cell 7
With and Without Test Cell 7 In Operation

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Figure 3. Position 3, In Plant
400 Feet West of Test Cell 7
With and Without Test Cell 7 In Operation

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Figure 4. Position 4, In Plant
600 Feet South East of Test Cell 7
With and Without Test Cell 7 In Operation

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Figure 5. Position 5, Off Plant Site
2,100 Feet South East of Test Cell 7
With And Without Test Cell 7 In Operation

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Turbine Test Cells, Greenville, SC

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Figure 6. Position 7, Off Plant Site
2,400 Feet North West of Test Cell 7
With And Without Test Cell 7 In Operation

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Figure 7. Position 9, Off Plant Site
2,700 Feet North East of Test Cell 7
With and Without Test Cell 7 In Operation

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Turbine Test Cells, Greenville, SC

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Report No. 1275, 4/14/97

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Figure 8. Position 10, Off Plant Site
2,400 Feet East of Test Cell 7
With and Without Test Cell 7 In Operation

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Figure 9. Position 11, Off Plant Site
3,450 Feet South of Test Cell 7
With and Without Test Cell 7 In Operation

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Report No. 1275, 4/14/97

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Figure 10. Position 1A, In Plant
400 Feet East of Test Cell 6
With and Without Test Cell 6 In Operation

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Report No. 1275, 4/14/97

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Figure 11. Position 2A, In Plant
400 Feet North of Test Cell 6
With and Without Test Cell 6 In Operation

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Figure 12. Position 3A, In Plant
400 Feet West of Test Cell 6
With and Without Test Cell 6 In Operation

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Report No. 1275, 4/14/97

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Figure 13. Position No. 5, Off Plant Site
2,400 Feet South East of Test Cell 6
With And Without Test Cell 6 In Operation

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Turbine Test Cells, Greenville, SC

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Report No. 1275, 4/14/97

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Figure 14. Position 7, Off Plant Site
2,250 Feet North West of Test Cell 6
With And Without Test Cell 6 In Operation

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Figure 15. Position 9, Off Plant Site
2,850 Feet North East of Test Cell 6
With and Without Test Cell 6 In Operation

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Turbine Test Cells, Greenville, SC

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Report No. 1275, 4/14/97

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Figure 16. Position 10, Off Plant Site
2,700 Feet East of Test Cell 6
With and Without Test Cell 6 In Operation

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Turbine Test Cells, Greenville, SC

CAS GREENVILLE

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Appendix A

Field Data

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GE Power Generation
Turbine Test Cells, Greenville, SC

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Report No. 1275, 4/14/97

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CONSULTANTS IN ACOUSTICS
HOUSTON

Test Cell No. 6
Frame 6B, 84 deg. IGV

JOB NO.: 2381

CLIENT: GE Power Generation

LOCATION: Greenville, SC

DATE: 03/05/97

CONSULTANT: Reginald H. Keith & Wade R. Worley

Wind - Out of North, 2 - 4 mph

Temp. - 50 deg. F

Clear Skies

DESCRIPTION	Time	31	63	125	250	500	1000	2000	4000	8000	LINC	dBA
1. With Test Cell 6 In Operation - Leg												
2. Position 1A	02:25	74.5	70.0	68.5	65.0	61.5	60.5	58.5	61.0	49.5	77.5	69.9
3. Position 2A	02:31	72.0	68.5	64.5	62.0	49.0	51.5	55.0	49.0	30.0	74.5	59.9
4. Position 3A	02:40	70.5	67.5	64.0	56.0	54.5	51.0	56.0	46.5	25.5	73.1	59.8
5. Position 5 Test Cell Audible	02:05	61.0	56.0	44.5	47.0	45.5	42.5	37.5	27.0	21.5	62.5	47.1
6. Position 7 Test Cell Inaudible	02:50	59.5	58.5	50.0	41.5	46.0	44.5	34.0	23.0	22.0	62.5	47.6
7. Position 9 Test Cell Inaudible	03:04	57.0	57.5	57.5	54.5	44.5	43.5	41.0	33.5	25.5	63.0	50.3
8. Position 10 Test Cell Slightly Audible	03:14	59.5	58.0	52.0	42.0	41.5	40.5	43.5	26.0	22.0	62.4	47.4
8. Ambient Measurements - Leg												
10. Position 5	04:23	57.5	55.0	45.5	44.5	45.0	39.0	31.0	24.5	20.5	59.9	44.9
11. Position 10	04:01	59.0	59.5	54.5	45.5	44.0	42.5	30.5	23.0	19.5	62.8	46.8
12. Position 11	03:47	57.5	55.0	45.5	44.5	45.0	39.0	31.0	24.5	20.5	59.9	44.9
13.												
14.												
15.												
16.												
17.												
18.												
19.												
20.												
21.												

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1 OF 7

GE Power Generation
Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

HOOVER & KEITH INC.

CONSULTANTS IN ACOUSTICS

HOUSTON

Ambient Sound Measurements

Prior To Operation of Test Cell 7

JOB NO.: 2381

CLIENT: GE Power Generation

LOCATION: Greenville, SC

DATE: 03/06/97

CONSULTANT: Reginald H. Keith

Wind - Out of South West, 3 - 6 mph

Temp. - 56 to 50 deg. F, 85% RH

Clear Skies

DESCRIPTION	Time	31	63	125	250	500	1000	2000	4000	8000	LINC	dBA
1. Ambient Measurements - Leg												
2. Position 1	21:25	80.5	62.0	59.0	51.5	48.0	47.0	41.0	36.5	27.0	65.8	51.6
Cranking from Test Cell 7, Blowers from Comb. Bldg., Distant Traffic											64.6	
3. Position 2	21:30	62.5	64.5	63.0	57.0	51.0	50.0	46.0	42.5	28.0	68.7	55.5
Blowers from Comb. Bldg.,											67.7	
4. Position 3	21:15	62.5	67.0	68.5	62.5	57.0	51.5	49.5	46.5	38.0	71.4	58.6
Cranking from Test Cell 7, Distant Traffic											70.8	
5. Position 4	21:35	62.0	65.5	62.5	56.5	54.5	49.0	46.5	42.5	30.5	68.9	56.1
Equipment at G. E. Treatment Plant											68.0	
6. Position 5	21:45	57.5	58.0	51.5	44.0	48.0	42.0	35.0	32.5	29.5	61.5	47.1
Wind in Trees,											60.0	
7. Position 7	22:05	60.5	62.5	59.5	54.0	51.0	50.0	42.5	32.2	26.0	66.3	53.9
Primarily Traffic from I-85											65.3	
8. Position 9	23:45	58.5	61.5	55.0	48.5	48.0	45.5	40.0	33.5	28.0	64.2	50.1
Primarily Traffic from I-85, Blowers from Comb. Bldg. Audible											63.0	
9. Position 10	22:15	57.5	60.5	57.0	47.0	46.0	44.0	37.0	30.0	24.0	63.6	48.2
Distant Traffic, Insects											62.5	
10. Position 11	00:25	58.0	58.0	51.5	44.5	41.5	41.5	34.0	26.5	22.5	61.7	45.9
(3/7)											60.1	
11.												
12.												
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2 OF 7

GE Power Generation
Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

HOOVER & KEITH INC.
CONSULTANTS IN ACOUSTICS
HOUSTON

Test Cell No. 7

Frame 7F, 54 deg. IGV

JOB NO.: 2381
CLIENT: GE Power Generation
LOCATION: Greenville, SC
DATE: 03/07/97
CONSULTANT: Reginald H. Keith

Wind - Out of South West, 3 - 6 mph, 03:00 to 04:00 hrs
Wind - Out of North West, 0 - 7 mph, 04:30 to 06:00 hrs
Temp. - 56 to 50 deg. F. 85% RH
Clear Skies

DESCRIPTION	Time	31	63	125	250	500	1000	2000	4000	8000	LINC	dBA
1. With Test Cell 7 In Operation - Leq												
2. Position 1 Primarily Test Cell	03:45	74.0	73.0	78.5	69.5	72.5	59.5	47.0	42.0	28.0	81.6	71.1
											81.0	
3. Position 2 Test Cell, Comb. Bldg., Distant Traffic	03:30	70.0	70.0	70.5	63.0	56.5	53.0	49.0	46.5	28.0	75.3	60.6
											74.3	
4. Position 3 Test Cell, Distant Traffic	03:10	68.0	69.0	70.0	66.5	58.5	52.5	48.5	40.5	28.5	74.7	61.7
											74.0	
5. Position 4 Test Cell, G E Treatment Plant	03:50	72.5	78.5	78.5	71.5	72.5	59.5	49.0	42.0	27.0	82.2	71.3
											81.7	
6. Position 5 Test Cell Audible, Insects, Wind in Trees	04:10	65.5	59.5	65.0	62.0	62.5	48.0	38.5	29.0	26.5	70.4	60.8
											89.8	
7. Position 6 Test Cell Audible, Traffic from I-85 and I-385	05:35	66.0	64.0	63.0	61.5	61.0	52.0	43.5	31.5	24.5	70.5	60.2
											69.5	
8. Position 7 Traffic from I-85	04:30	61.0	58.5	54.5	52.5	53.0	50.0	38.5	25.5	23.5	64.4	53.8
											62.9	
9. Position 8 Traffic from I-85	05:50	64.5	66.0	63.0	54.0	54.5	55.5	47.0	30.0	21.0	69.9	58.1
											68.8	
10. Position 9 Traffic From West, Wind in Trees, Test Cell Barely Audible	04:45	58.5	60.0	55.5	49.0	48.0	46.5	34.5	27.0	23.5	63.5	50.1
											62.3	
11. Position 10 Test Cell Audible, Distant Traffic, Insects	05:00	62.0	60.5	66.0	58.0	55.0	47.0	32.5	24.0	22.5	68.9	56.0
											68.2	
12. Position 11 Test Cell Audible, Truck Idle at 200 ft. Distant Traffic	05:15	58.0	65.5	63.0	54.5	55.5	46.5	42.0	32.5	28.5	68.5	55.3
											67.7	
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3 OF 7

GE Power Generation
Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

HOOVER & KEITH INC.
CONSULTANTS IN ACOUSTICS
HOUSTON

Test Cell No. 7
Frame 7F, 88 deg. 1GV

JOB NO.: 2381
CLIENT: GE Power Generation
LOCATION: Greenville, SC
DATE: 03/07/95
CONSULTANT: Reginald H. Keith

Wind - Out of North West, 0 - 7 mph, 04:30 to 06:00 hrs
Temp. - 50 deg. F, 70% RH
Clear Skies

DESCRIPTION	Time	31	63	125	250	500	1000	2000	4000	8000	LIN/C	dBA
1. With Test Cell 7 in Operation - Leq												
2. Position 1	07:55	78.5	75.0	89.5	71.5	69.0	81.0	48.5	45.0	27.5	90.0	74.7
											89.8	
3. Position 2	08:30	71.0	70.5	76.5	64.5	58.0	51.0	47.5	41.0	25.5	78.0	62.6
											77.4	
4. Position 3	08:15	69.0	71.5	75.5	69.0	58.5	52.5	52.0	39.0	27.0	78.2	64.3
											77.8	
5. Position 4	08:05	71.0	75.5	85.5	68.5	70.5	59.5	51.0	40.0	24.0	86.3	72.2
											86.1	
6. Position 5	07:50	68.5	62.5	64.5	55.5	57.0	46.5	35.0	28.0	23.5	70.0	56.2
Test Cell Audible											68.7	
7. Position 10	07:30	65.0	64.0	73.5	57.5	53.5	50.0	37.5	30.5	21.5	76.2	60.8
Test Cell Audible											76.0	
8. Position 11	07:20	61.5	66.5	70.0	53.5	54.5	51.0	43.5	35.5	24.0	72.2	57.7
Test Cell Audible											71.7	
9.												
10.												
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4 OF 7

GE Power Generation
Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

HOOVER & KEITH INC.
CONSULTANTS IN ACOUSTICS
HOUSTON

Test Cell No. 7
Frame 7F, 54 deg. IGV

JOB NO.: 2381
CLIENT: GE Power Generation
LOCATION: Greenville, SC
DATE: 3/7 & 8/1997
CONSULTANT: Reginald H. Keith

Calm Winds
Temp. - 43 deg. F
Clear Skies

DESCRIPTION	Time	31	63	125	250	500	1000	2000	4000	8000	LINC	dBA
1. With Test Cell 7 In Operation: Leq												
2. Position 1 Test Cell, Comb. Bldg. Fans, Insects	23:30	75.0	71.0	76.0	68.5	69.5	54.5	43.5	33.0	21.5	80.0	68.3
3. Position 4	23:50	71.5	69.0	73.5	63.5	62.0	52.5	49.5	37.5	22.5	76.9	62.9
4. Position 5 Test Cell Audible, Birds, Insects, Distant Traffic	23:40	65.0	58.0	62.5	55.5	54.0	41.5	34.0	30.0	19.5	67.9	53.7
5. Position 9 Test Cell Audible, Comp. Bldg. Fans, Traffic	00:05	60.0	56.5	57.5	55.5	46.5	44.0	30.0	21.0	20.0	63.9	50.4
6. Position 10 Test Cell Audible, Distant Traffic, Insects	00:10	63.0	64.0	65.5	56.5	53.0	44.0	32.5	24.5	19.5	69.4	54.5
7. Position 11 Test Cell Audible, Traffic From West, Insects	00:25	54.0	55.5	54.5	48.0	45.0	43.5	32.5	24.0	23.5	59.9	47.3
8. Note Check at Position 7, Test Cell Inaudible, Traffic Only												
9.												
10.												
11.												
12.												
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15.												
16.												
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SHEET 5 OF 7

GE Power Generation
Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

HOOVER & KEITH INC.
CONSULTANTS IN ACOUSTICS
HOUSTON

Test Cell No. 7
Frame 7F, 88 deg. IGV

JOB NO.: 2381
CLIENT: GE Power Generation
LOCATION: Greenville, SC
DATE: 03/08/97
CONSULTANT: Reginald H. Keith

Calm Winds
Temp. - 43 deg. F
Clear Skies

DESCRIPTION	Time	31	63	125	250	500	1000	2000	4000	8000	LINC	dBA
1. With Test Cell 7 In Operation - Leq												
2. Position 1 Test Cell, Comb. Bldg. Fans	00:50	78.5	75.0	87.0	68.5	68.5	56.5	50.0	39.0	25.5	87.7	72.5
3. Position 4 Test Cell, G E Treatment Plant	00:55	71.0	73.5	83.0	63.5	64.0	55.5	51.5	41.5	25.0	83.8	68.5
4. Position 5 Test Cell Audible, Insects	01:05	65.0	62.0	68.0	55.5	60.0	45.5	32.0	20.5	19.5	71.0	58.7
5. Position 7 Primarily Traffic from I-85, Test Cell faintly Audible When Traffic is Low	01:20	61.5	60.5	59.5	52.0	50.0	48.5	35.5	20.0	20.0	65.8	52.3
6. Position 9 Primarily Traffic from West, Test Cell faintly Audible	01:30	61.0	57.5	68.0	47.0	43.5	40.5	29.0	22.0	20.0	63.6	46.2
7.												
8.												
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SHEET 6 OF 7

GE Power Generation
Turbine Test Cells, Greenville, SC

Hoover & Keith Inc.
Report No. 1275, 4/14/97

HOOPER & KEITH INC.											
CONSULTANTS IN ACOUSTICS											
HOUSTON											
Ambient Sound Measurements After Operation of Test Cell 7 on 3/8/97											
JOB NO.: 2381 CLIENT: GE Power Generation LOCATION: Greenville, SC DATE: 03/08/97 CONSULTANT: Reginald H. Keith											
DESCRIPTION	Time	31	63	125	250	500	1000	2000	4000	8000	LINC dBA
1. Ambient Measurements - Leq											
2. Position 10	01:45	58.0	55.0	51.5	45.0	45.5	37.5	31.5	20.0	18.5	59.7 45.3
3. Position 11	01:55	52.5	55.0	51.5	43.0	44.0	39.0	27.5	20.5	20.5	58.4 44.5
4. Position 9	02:05	56.5	56.5	52.5	48.5	50.0	47.5	31.0	22.5	19.5	61.9 50.9
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SHEET

7 OF 7

7

THE MANGI ENVIRONMENTAL GROUP, INC.

701 West Broad St., Suite 205, Falls Church, VA 22046

TEL 703-534-2484 FAX 703-534-2487

REC: DUP/FAX

97 OCT -3 AM 10:17

FAX TRANSMISSION

DATE: 10/2/1997
TO: Kanwal Mahajan
FAX #: 304-285-4403
FROM: Robert Shih
PAGES: 1

Att: Phil Szczerzenie

MESSAGE:

We have missed one item of information request from the list submitted to GE:

GE's August 22, 1997 Response to FETC Comment

14. For the 7H turbine 100-hour test, what is the expected duration of each run (range of hours)? Estimated number of runs? Duration of the overall test period (weeks, or months)?

Please forward this to GE as soon as possible, and let me know if you have any questions. Thank you.

A. Tests may last a full 24 hrs/day. Duration of the overall test period is several weeks. Plan is to take 18 steady state performance points (72 hrs) and 28 hrs to cover

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL

of pages = 2

To	Tom CHANCE	From	KANWAL MAHAJAN
Dept./Agency	GE	Phone #	(304) 285-4965
Fax #	(518) 385-4314	Fax #	(304) 285-4403
NSN 7540-01-317-7368		GENERAL SERVICES ADMINISTRATION	

the rest of the mechanical testing points.

8

**Table 10: Estimated A-wt and Octave Band Sound
Test Stand 8 Only**

Pos. No.	Description	A-Wt	Octave Band Center Frequency - Hz								
			31	63	125	250	500	1000	2000	4000	8000
1	1200 Ft East	54	67	65	57	51	45	44	50	43	19
2	1200 Ft North	55	66	65	58	53	46	44	51	44	18
3	1200 Ft West	54	63	62	58	55	45	42	51	40	13
4	1200 Ft South	49	61	60	55	50	45	42	42	40	17
5	S. Property Line	36	56	52	45	39	31	27	27	12	-35
6	W. Property Line	54	61	62	58	55	44	41	50	39	7
7	N. Property Line	42	58	56	51	46	37	31	35	18	-27
8	N. W.	33	51	48	42	38	28	23	24	6	-54
9	North of Site	44	61	60	47	43	36	34	40	25	-28
10	E. Property Line	43	62	60	47	42	35	32	39	24	-25
11	South of Site	37	53	51	45	41	33	27	28	8	-59

The modeling results indicate that the sound level from Test Stand No. 8 will exceed the requested criteria of 47 dBA at 1200 feet. The estimated sound level will be approximately 54 dBA at 1200 feet in the north, east and west direction. For the south direction, the estimated sound level at 1200 feet is approximately 49 dBA, because of topography and shielding from existing site structures.

Appendix B shows the estimated A-weighted sound level contours for Test Cell No. 8 only.

6.0 Conclusion

We believe the modeling results accurately reflect the expected environmental sound levels from the operation of the proposed test stand 8 with its current design configuration. Note that the modeling methodology incorporates certain assumptions with respect to the sound emission levels of the gas turbine and vendor reported noise suppression equipment, as detailed in Section 4 of this report.

Emprise Corporation
GE Test Stand 8

Hoover & Keith Inc.
Report No. 1303, 9/3/97

Figure 2 Sound Level Evaluation Positions

9

Mangi Environmental Group (703) 534-2484

Oct 12, 1997 phone call to Mangi Environmental (Robert Shih) regarding 7H emissions calculations. As this is GE proprietary, I told Robert to use the average of the 9F and 9EC tests as representative

9F 1375 lb/cu

7H 1230

9EC 1119

of 7H levels (flow volume dependent), and I checked with Greenville (Roy Washam - combustion). He said this is a fair representation, not the best, but definitely ballpark.

T. Chance

Oct 13, 1997

10

EL DORADO ENGINEERING INC.

DESIGNERS/CONSULTANTS

October 15, 1997

Thomas Chance
G.E.

Dear Mr. Chance:

El Dorado Engineering Inc. (EDE) is providing air quality analysis on the Environmental Assessment (EA) for the Advanced Turbine System No-Load Demonstration Project. In the course of our analysis, we have formulated the following questions that require answers/comments from G.E. for clarification.

- 1) We were told that G.E. would like to use actual 9F and 9EC turbine emissions as surrogates for 7H. We need additional information that assures us that this should be the case. Flow rate alone does not assure representativeness. Other parameters, such as exhaust temperature and fuel type, combined with flow rate, will indicate how applicability of the surrogate. We also would like to know how the exhaust temperature for 7H will be determined. For example, the test stand emissions provided by G.E. in the semi-annual report to the Bureau of Air Quality show an emission rate for SO₂ of 83.03 lbs/hr for 9F, and 0.30 lbs/hr for 9EC; other listed emission rates also vary significantly.
- 2) We received dispersion modeling summary/results of the PSD Permit for the 9H emissions. Is this all that G.E. plans on providing? We believe that modeling should be performed to include all test stands, including Test Stand 8, and should be performed on all criteria pollutants present (not just CO and NO_x, as was provided), as well as any HAPS that are predicted in significant amounts. Justification should be made for all criteria pollutants not evaluated. Is additional dispersion modeling planned? Please comment.
- 3) For the modeling that was provided (and new modeling that may be planned):
 - a) Why were ISCST2, ISCLT2, SCREEN2 utilized rather than ISCST3, ISCLT3, SCREEN3?
 - b) Why was a separate model used for downwash? ISC includes downwash considerations.
 - c) Was the "regulatory option" included with the ISC modeling?

Please provide responses to these comments as soon as possible. Feel free to call me at (801) 966-8288 with any questions you may have.

Sincerely,

Rick O. Frandsen

Director of Business Development

October 17, 1997

Ms. Allison D. Ranson
Environmental Project Manager
General Electric Company
P.O. Box 648
Greenville, SC 29602-0648

Response to Comments from El Dorado Engineering Inc. Letter of October 15, 1997
Air Quality Analysis for Construction of Test Stand 8

Dear Ms. Ranson:

The following responses are provided to the questions from El Dorado Engineering Inc. (EDEI) regarding the air quality analysis of the Environmental Assessment for the Advanced Turbine System No-Load Demonstration Project. EDEI's comments are presented in *italics*.

1. *We were told that GE would like to use actual 9F and 9EC turbine emissions as surrogates for 7H. We need additional information that assures us that this should be the case. Flow rate alone does not assure representativeness. Other parameters, such as exhaust temperature and fuel type combined with flow rate, will indicate how applicability [sic] of the surrogate. We would also like to know how the exhaust temperature will be determined. For example, the test stand emissions provided by GE in the semi-annual report to the Bureau of Air Quality show an emission rate for SO₂ of 83.03 lbs/hr for 9F, and 0.30 lbs/hr for 9EC; other listed emission rates vary significantly.*

The analysis for the addition of Test Stand 8 (TS8) was straightforward, following the previous procedures outlined in the PSD application and permit. The emissions information used for a particular turbine type is based on best available data, which is a combination of:

- A proprietary GE algorithm for predicting emissions of NO_x, CO and unburned hydrocarbons (note: this method has been shown generally to provide conservatively high values compared to measurements under FSNL conditions);
- Actual measured emissions data, when available;
- SO₂ emissions data based on the fuel flow rate and the maximum sulfur content of the fuel. Sulfur in fuel constitutes the potential source of sulfur dioxide formation;
- EPA emission factors for PM.

IT PN 772.326.01
NEPACMNT

DRAFT

October 17, 1997
Ms. Allison Ranson
Page 2 of 3

The GE engineering algorithms predict exhaust temperature. Temperature is also a parameter monitored during the actual test operations.

There are two fuels used in the test stands: distillate and natural gas. The SO2 emissions are, of course, much lower when testing occurs with natural gas rather than with distillate fuel. The two emission rates cited in EDEI's comment serve as a good example of differences primarily associated with the two fuels.

2. *We received dispersion modeling summary/results of the PSD Permit for the 9H emissions. Is this all that GE plans on providing? We believe that modeling should be performed to include all test stands, including Test Stand 8, and should be performed on all criteria pollutants present (not just CO and NOx, as was provided), as well as any HAPS that are predicted in significant amounts. Justification should be made for all criteria pollutants not evaluated. Is additional dispersion modeling planned? Please comment.*

As noted in the Construction Permit application for TS8, taking into account the full matrix of test stands and turbine types, there is no increase in allowable emissions above the PSD permit levels following the construction of TS8. The modeling analysis further indicates that no increase in maximum ground-level impacts occur with the addition of TS8, using the constraints of the current PSD permit in short-term and long-term emission rates, as well as the proposed stack location and exhaust parameters.

The modeling results for the PSD permit assumed that the worst-case emitting turbine, evaluated pollutant-by-pollutant, was operating in each of the (then) six test stands, for the entire averaging period for a given pollutant. For example, as noted in the PSD application (in this case, in the discussion of CO emissions): "In the modeling analysis, it was assumed that all six test stands were in operation simultaneously for the eight-hour averaging period, an extraordinarily unlikely occurrence as one run of a test generally only lasts from three to four hours."

The PSD permit and the Construction Permit for TS8 require GE to track simultaneous test operations to assure compliance with the PSD permit's short-term (hourly) emission rates. As noted previously, the best available information is used for each turbine type.

Criteria pollutants were modeled with the PSD application / Construction Permit application of July 1995 in accordance with federal New Source Review procedures, as well as South Carolina's Standard 2 and modeling guidelines. This analysis included modeling SO2 and PM10. The project resulted in a *significant increase* for only NOx and CO. A *significant impact* area occurred only for CO, and required a *full impact analysis*.

Standard 8 (South Carolina air toxics rule) was also addressed with the PSD application and the Construction Permit application for TS8. IT is not aware of a "significance"

IT PN 772.326.01
NEPACMNT

DRAFT

TOTAL P.04

October 17, 1997
Ms. Allison Ranson
Page 3 of 3

threshold at which HAPs should be modeled. Again, it should be emphasized that the addition of TS8 does not result in an increase in allowable emissions.

The modeling analyses are considered complete. No additional modeling is planned.

3. *For the modeling that was provided (and new modeling that may be planned):*

a) Why were ISCST2, ISCLT2, SCREEN2 utilized rather than ISCST3, ISCLT3, SCREEN3?

EPA models were current at the time of use. Future projects would likewise require the most current, approved model(s) and version.

b) Why was a separate model used for downwash? ISC includes downwash consideration.

BPIP is a pre-processor to automate the determination of direction-specific building widths and heights. This information is then used in the downwash analysis in ISC.

c) Was the "regulatory option" included in the ISC modeling?

Yes.

Please do not hesitate to contact us to address any additional comments or questions regarding the air quality analysis for the operation of the test stands.

Sincerely,

IT CORPORATION

Matthew Ayer, P.E.
Project Manager

IT PN 772.326.01
NEPACMNT

DRAFT

P.04

TO GE GREENVILLE

OCT-20-1997 14:19 FROM ITROS-CINCINNATI

11

Chance, Thomas F (PS, NPI)

From: Ranson, Allison D (PS, EHS)
Sent: Friday, October 24, 1997 11:09 AM
To: Chance, Thomas F (PS, NPI)
Cc: Teachey, Larry D (PS, Plant/EHS); Sevinsky, James A (PS, Legal)
Subject: FW: Still More NEPA Stuff (with slight modifications)

Tom,

1. Why were only CO and NOx modeled?

I am sending you by fax some more pages from the PSD Permit Application. As shown in Section 3 of the permit application, CO and NOx were the only pollutants for which a "significant" increase in emissions was being sought. The PSD levels of significance are listed in Table 1, Page 9 along with the requested increases in emissions. The only two pollutants for which GE sought a significant increase in allowable emissions were CO and NOx. Because the increase in the other pollutants was not significant, GE was not required to model the impact of these increases.

It is important to understand that this permit application was for the installation of natural gas to test stand 1, 2, 3, 4, and 6 and NOT for the construction of test stand 8. This is important because the "Limits in Current Operating Permit" in Table 1 on Page 9 refer to the allowable emissions before the addition of natural gas. The PSD permit for the addition of natural gas was issued to GE on April 24, 1996. At that time the allowable annual emissions were raised to the "Requested Allowable Emission" levels also shown in Table 1, Page 9. The allowable hourly emissions were raised to the levels shown in Table 2, Page 10 of the faxed information. These allowable emissions are also listed in the PSD Permit, which I provided to you previously.

2. Why does the modeling not need to be redone to include test stand 8?

Test stand 8 was constructed to enable GE to test the physically larger H machines, and not to increase the overall capacity of the test stands. GE evaluated two alternatives for the testing of the H machines. The first alternative was to modify existing stand 7 to accommodate the H machines. In addition to modifying stand 7, stand 3 would also have to be modified to accommodate frame F machines that would be displaced from stand 7. This option was discarded, however, because it would have meant taking stands 3 and 7 out of service for many months. During this period, GE would not have had sufficient test capacity to meet the test schedule. The second alternative was to construct a new stand. Because the two options were relatively close in price, GE selected the second option since it has less adverse impact on GE's ability to meet the test schedule. The important point here is that stand 8 was constructed to add a stand that could physically accommodate the H machines and NOT to increase GE's overall test capacity.

Because there would be no increase in test capacity, GE did not seek any increase in the hourly or annual emission limitations. The modeling performed for the natural gas PSD permit was based on worst case hourly emissions (i.e., the requested hourly emissions shown in Table 2.) This approach is explained further in the letter I sent you earlier this week (Ayer to Ranson, October 17, 1997). These values were not increased during the permitting of stand 8; therefore, the modeling inputs would have been the same. Since the same inputs would have resulted in the same outputs, SCDHEC did not require GE to redo the modeling. The important points to remember are :

1. The test stands are permitted by SCDHEC as one source. The individual test stands do not have individual permit limits.
2. GE did not seek any increase in hourly or annual emissions to construct stand 8.
3. Stand 8 was constructed so that GE would have a stand that could accommodate the physically larger H machines. These machines could have been tested in the existing stands; however, the length of time needed to implement the changes would have had a negative impact on GE's ability to meet the test schedule.
4. The original modeling was performed using worst case, maximum hourly emissions as the input. These allowable emission levels were not changed during the permitting of stand 8.
5. GE is required to track periods of simultaneous test stand operation to ensure the actual hourly emissions do not exceed the allowable hourly emission levels.
6. This permitting approach was approved by both SCDHEC and EPA Region IV (see attached letter McCaslin

to Ranson, July 23, 1997).

7. The first turbine to be tested in stand 8 will be the 9H and not the 7H, which is the focus of the NEPA study.

I hope this clarifies any remaining concerns. Please let me know if you have any difficulty receiving the faxed material.

Allison Ranson

GE Power Systems

Environmental, Health & Safety

ransonal@psgvl.ps.ge.com

Phone: (864) 675-3033 dialcomm: 8*288-3033

Fax: (864) 675-2772 dialcomm: 8*288-2772

12

Post-It™ brand fax transmittal memo 7671		# of pages > 9
To Tom Chance	From Allison Ransom	
Co. GE	Co. GE	
Dept.	Phone # 8*675-3033	
Fax # 8*235-4314	Fax # -2772	

Executive Summary

GE Power Generation (GE) manufactures and tests gas turbines at its facility in Greenville, South Carolina. Turbines are performance tested prior to delivery to customers. GE presently performs this testing using distillate fuel in one of six test stands, as allowed by the facility's South Carolina operating permit. GE is proposing a project to run a natural gas line to the test stands to facilitate turbine testing using natural gas. This application is for a permit that authorizes the full range of anticipated operating conditions for the Greenville turbine test facility after installation of the natural gas pipeline. Based on the estimated emission increases associated with the proposed project, GE has concluded that the proposed project is subject to Prevention of Significant Deterioration (PSD) review for carbon monoxide (CO) and nitrogen oxides (NO_x).

As required by federal and South Carolina regulations, a PSD review consists of the following elements:

- An analysis of best available control technology (BACT) for the proposed project;
- An air quality impact analysis to demonstrate the proposed project will not lead to a significant deterioration in air quality;
- A Class I impact analysis to demonstrate the proposed project will not impact Class I protected wilderness areas; and
- An additional impacts analysis (e.g., impacts on soil, vegetation, visibility) to demonstrate that additional impacts from the proposed project are not expected.

This application is submitted to fulfill PSD review requirements. It presents a determination of BACT for carbon monoxide and nitrogen oxides emissions from test operations. The BACT analyses concluded that add-on pollution control equipment is not feasible for the proposed project. The ambient air quality analysis demonstrates that the proposed project will not lead to violation of the National Ambient Air Quality Standards or lead to a significant deterioration in air quality. The Class I impact analysis demonstrates that the proposed project will not adversely impact Air Quality Related Values (nitrate deposition and visibility) at two Class I areas within 120 kilometers of GE (Linville Gorge,

North Carolina and Shining Rock, North Carolina), or at other, more distant Class I areas. The additional impacts analysis satisfies PSD requirements in demonstrating that no other environmental impacts will result from the proposed project.

3.0 Requested Emission Limit and Compliance Requirements

This application is for a permit that authorizes the full range of anticipated operating conditions for the Greenville turbine test facility after installation of the natural gas pipeline. This section presents the requested allowable emission limits, summarizes the results of the BACT analysis for CO and NO_x, addresses the need to consolidate and clarify permit requirements applicable to the turbine test facility, and outlines a program for demonstrating compliance with the requested limitations and other applicable requirements.

3.1 Analysis of Emissions Associated with the Proposed Project

To ensure that the requested allowable limits reflect the full range of operating conditions that may be conducted at GE's turbine test facility, a number of factors were considered, including the following:

- manufacturing capacity of the turbine production facility;
- forecasted production ranges of particular frame sizes;
- unique emissions characteristics of the turbines projected to be tested at the turbine test facility;
- testing with either natural gas or distillate fuel; and
- estimated test duration.

GE has developed an algorithm for calculating NO_x, CO, and VOC emissions from turbines during testing. For most of the frame sizes currently tested, the emission factors for testing with distillate fuel have been validated in agency-witnessed source measurements using an approved protocol based on EPA reference methods. For those turbines with no emissions measurement data available, SO₂ emissions are computed by assuming 100% of the sulfur content in the fuel is converted to SO₂. PM₁₀ emissions are based on GE criteria for full speed, full load operation.

3.1.1 Annual Limits

The requested allowable emission limits for the proposed project are listed in Table 1. These limits reflect, pollutant by pollutant, the maximum anticipated current and future emissions associated with testing turbines. Also presented in Table 1 are the emission limits in GE's current South Carolina operating permit, average actual emissions over the last two years (1993 and 1994), the estimated annual emission change relative to actual

emissions, the estimated change relative to present allowable emissions, and the applicable PSD thresholds.

Table 1. Test Stands Emissions Data

	<i>(tons per year)</i>				
	PM ₁₀	SO ₂	CO	NO _x	VOC
Limits in Current Operating Permit	14.12	73.27	451.88	122.12	74.10
1993-1994 Average Actuals	5.5	38.0	326.8	78.4	42.0
Requested Allowable Emissions	8.7	71.1	6,880.8	179.6	68.0
Emission Change from Average Actuals	3.2	33.1	6,554.0	101.2	26.0
Emission Change from Current Allowables	-5.4	-2.2	6,428.9	57.5	-6.1
PSD Level of Significance	25	40	100	40	40
Significant Increase?	NO	NO	YES	YES	NO

Based on the estimated emissions increases associated with the proposed project presented in Table 1, GE has concluded that the project is subject to PSD review for both CO and NO_x.

3.1.2 Short Term Limits

A necessary part of the PSD analysis is to evaluate the ambient air quality impact of the proposed project. To conduct the analysis, GE developed short term emissions estimates that reflect the maximum anticipated current and future emissions rates associated with testing turbines. These rates are summarized in Table 2.

As explained in detail in Sections 6, 7, and 8 of this application, no appreciable impact on ambient air quality will be associated with the proposed project. To ensure that operations are always conducted in a manner that is consistent with the air quality analysis contained in this application, the short term emission rates contained in Table 2 should be included as emissions limitations in the PSD permit.

Table 2. Hourly Emission Limits

Pollutant	Emission Rate (lb/hr) ¹
PM ₁₀	55.5
SO ₂	396.1
CO	27,169.4
NO _x	885.3
VOC	843.6

¹ Total from all six test stands

3.2 Results of BACT Analyses for CO and NO_x

Because the proposed project will result in significant net emissions increases for CO and NO_x, GE conducted BACT analyses for these two pollutants. A full description of the BACT analyses is provided in Section 5 of this application, but the results are summarized below.

3.2.1 BACT for NO_x

The BACT analysis for NO_x emissions from the turbine test facility indicated that add-on pollution control equipment for the proposed project is not feasible. Accordingly, no add-on controls are proposed for control of NO_x emissions after installation of the natural gas pipeline.

3.2.2 BACT for CO

The BACT analysis for CO emissions from the turbine test facility indicated that add-on pollution control equipment for the proposed project is not feasible. Accordingly, no add-on controls are proposed for CO emissions after installation of the natural gas pipeline.

3.3 Consolidation of Clarification of Permit Requirements

The emission limitations and other requirements associated with this PSD application should be implemented in a manner that will ensure no conflicts with existing requirements that apply to the turbine test operations. In other words, compliance with the short-

term and annual emissions limitations will satisfy all applicable state and federal air pollution control laws and requirements.

3.3.1 Relationship of PSD Permit to Existing Requirements

The PSD permit that will be issued pursuant to this application will impose emissions limitations and other requirements on the turbine test facility. GE's current South Carolina Operating Permit No. 1200-0094 already imposes emissions limits and other requirements on this source (the turbine test facility is identified as emissions unit No. 04 in the existing operating permit). To avoid conflicting and/or uncertain compliance requirements, the proposed PSD permit should state explicitly that it supersedes sections of Permit 1200-0094 that apply to test operations.

3.3.2 Opacity Standard

Special provisions in South Carolina Regulation 62.5, Standard 1, Section I allow for exceeding a 20 percent opacity limitation during startup and shutdown periods of unspecified length. The existing operating permit provides that opacity at the turbine test facility may exceed 20 percent opacity during startup and shutdown. Because operations at the turbine test facility are inherently variable, and based on the intent of the regulation to allow a grace period for non-steady state operating conditions, GE proposes that the PSD permit provide that opacity may exceed 20 percent for a 30 minute period during startup and shutdown of turbines in the test facility. Operation of the facility in accordance with good air pollution controls as described in the Special Provisions of R. 61-62.5, Standard 1, Section I satisfies the requirements of the opacity standard.

3.3.3 South Carolina and Federal Permitting Requirements

An important result of this PSD permitting effort must also be to ensure certainty as to when activity conducted after issuance of the PSD permit might trigger the need for additional South Carolina or federal preconstruction permitting. The requested allowable emission limitation and compliance demonstration requirements described in this section will provide certainty on this matter if the PSD permit states, consistent with South Carolina Regulation 61-62.5, Standard No. 7, Section I, Part T(3), that the baselines for calculating emissions increases associated with planned activity at the turbine test facility are the allowable emissions limitations contained in the PSD permit. Of course this evaluation is only required if the planned activity is an alteration under South Carolina rules or a physical change in the method of operation under federal rules, and not one of the routine activities that have long been established as inherent to the design and function of the

turbine test facility (e.g., the installation/removal of different or new turbines from the test stand buildings, and related activities such as adding or replacing associated equipment including ductwork, adapters, skids, flow dividers, air compressors, electrical and fuel hook-ups, and similar adaptations of associated equipment).

3.4 Method for Demonstrating Compliance

This section summarizes the steps that GE will take to establish that the limitations proposed in this section are federally enforceable (i.e., "permanent, quantifiable, and otherwise enforceable as a practical matter."). GE proposes to maintain records to demonstrate compliance with the emission limitations and other requirements as follows:

Test Stand Number and Unit Tested

Each time a turbine is tested, GE will record the test stand at which the test occurred and will provide a description of the turbine in sufficient detail to determine the emission factors to be used in determining emissions from the test.

Date and Duration of Each Test

For each test, GE will record the dates and duration of the test in hours to one decimal place.

Fuel Type

GE will record either distillate fuel or natural gas.

Sulfur Content

The distillate fuel used in the turbine test facility may contain no more than 0.25 weight percent sulfur (see § 3.3.3). GE or its suppliers will measure the sulfur content of the distillate fuel used on a delivery basis. Total sulfur content of the fuel will be calculated on a volume-weighted average.

Emissions

The total emissions of CO, NO_x, SO₂, PM₁₀, and VOC (i.e., non-methane, non-ethane hydrocarbons) for each test will be calculated and recorded. The total emissions for each pollutant will be the product of the run time and the emissions factor for the given pollutant.

Total Emissions for the Month

Total emissions of a given pollutant will be calculated as the sum of emissions for that pollutant from each test at the turbine test facility for the subject calendar month.

Total Emissions for the Last 12 Months

The PSD permit will include annual emissions limitations (averaged on a 12-month rolling basis) for CO, NO_x, SO₂, PM₁₀, and VOC. Compliance with the annual limit for a given pollutant will be demonstrated on a monthly basis by summing and recording the monthly emissions for that pollutant for the 12 prior months.

Maximum Average Hourly Emission Rate

The PSD permit will include maximum average hourly emission rate limits. For days on which more than one test stand was in operation, GE will record which test stands were in operation simultaneously and will compute the maximum one-hour emission rate for discrete, non-rolling 1-hour periods during simultaneous operation.

Periodic Compliance Reports

GE will submit compliance reports to DHEC by August 31 and February 28 for the periods January through June, and July through December respectively. The reports will contain: (1) the rolling 12-month average annual emissions that were determined for each month of the reporting periods; and (2) results of GE determinations of the maximum one-hour average emission rate (as defined in the previous paragraph) on days when more than one test stand is operated simultaneously during the reporting period. The report will also include the emission factors that were used to demonstrate compliance with the permit.

The facility will maintain the records described above for 5 years. Proposed emission limitations and compliance requirements are summarized in Table 3.

Table 3. Summary of Proposed Permit Terms and Conditions

Limitation	Proposed Limit	Monitoring and Record Keeping	Compliance Demonstration	Reporting
Rolling 12-month Average (tpy)	CO	1. Record turbines tested.	1. Use GE emission factors to determine emissions from each run. 2. Determine total emissions for each calendar month. 3. Determine total emissions for last 12 months.	Total emissions for each month and for each 12-month period ending during the reporting period will be reported on August 31 for the six months ending June 30 and on February 28 for the six months ending December 31.
	NO _x			
	SO ₂	2. Record date and duration of each test.		
	PM ₁₀			
	VOC			
Maximum Hourly Average (lb/hr)	CO	For periods when more than one turbine is being fired, GE will: 1. Record the turbines that are running concurrently, and 2. Record the duration of concurrent operation.	1. Use GE emission factors to determine emissions from each turbine during periods of concurrent operations. 2. Determine the maximum average emission rate for discrete, non-rolling 1-hour periods during simultaneous test stand operations.	Emission rates for periods of simultaneous operation will be reported on August 31 for the six months ending June 30 and on February 28 for the six months ending December 31.
	NO _x			
	SO ₂	On a delivery basis, GE or its suppliers will measure the sulfur content of the distillate fuel used on a volume-weighted average.		
	PM ₁₀			
	VOC			
Sulfur Content of Distillate Fuel	Sulfur content limit of 0.25 weight percent as a volume-weighted average.	Sulfur content of fuel.		Fuel sulfur content will be reported on August 31 for the six months ending June 30 and on February 28 for the six months ending December 31.

00 Bull Street
Columbia, SC 29201-1708

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July 23, 1997

Allison D. Ranson
General Electric Company
P.O. Box 648
Greenville, SC 29602-0648

Re: Turbine Test Stand No. 8

Dear Ms. Ranson:

The Bureau has received your request for amending the PSD construction permit number 1200-0094-DH to include the construction of an additional Test Stand No 8. In the request for amending the PSD permit GE noted that the construction of this test stand, which will be subject to the allowable emission limits for the test stands set forth in PSD permit number 1200-0094-DH will only allow GE to test a new model of turbine. The addition of test stand 8 will result in no change in the BACT, no emissions increase above the permitted emission rates and no change in the modeled impacts. Based on this information provided by GE, the Bureau believes this change can be handled through an administrative amendment to the current PSD permit. The only changes required in the permit will be in the description to include the construction of the additional test stand and in condition 17 to clarify that the allowable emission limits apply to all test stands

This request was discussed in an E-mail to Gregg Worley with EPA region IV in Atlanta. He agrees that this change can be handled through an administrative amendment and will not require the permit to undergo another public comment period.

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To Tom Chance	From Allison Ranson	
Co. GE	Co. GE	
Dept.	Phone # 8*675-3033	
Fax # 8*235-4314	Fax # -2772	

If you have any questions, or need additional information please contact either Stephanie Shealy at (803) 734-0030 or myself at (803) 734-3542.

Sincerely,

Steve McCaslin
Permit Section Manager
Engineering Services Division
Bureau of Air Quality

cc: Stephanie Shealy, BAQ
Gregg Worley, EPA region IV

SDM:sm