

East Tennessee Natural Gas, LLC  
5400 Westheimer Court  
Houston, TX 77056

Mailing Address:  
P.O. Box 1642  
Houston, TX 77251-1642



2010 DEC 14 PM 1:13

December 13, 2010

Mr. John E. Trimmer  
East Tennessee Permit Program  
Division of Air Pollution Control  
Tennessee Department of Environment & Conservation  
9<sup>th</sup> Floor, L & C Annex  
401 Church Street  
Nashville, TN 37243-1531

**RE: EAST TENNESSEE NATURAL GAS  
STATION 3110 (WARTBURG)  
OPERATING PERMIT RENEWAL  
PERMIT NO. 053993F  
EMISSION SOURCE NO. 65-0028-01**

Dear Mr. Stephens:

East Tennessee Natural Gas, LLC (ETNG) submitted a renewal application for the above-reference permit on June 2, 2010. After receipt of the Department's letter dated November 30, 2010, a review of our archive information regarding Source 65-0028-01 and the basis for emission estimates was initiated.

The Wartburg Station was among several acquired from El Paso Natural Gas several years ago. We have been trying to base renewal applications on available data from Solar where we lacked verifiable test data used by El Paso. In developing the renewal application for Wartburg, an assumption was made that the units were similar to those in place at our Station 3201 (Lobelville). Upon further research, two references were found that more accurately characterize potential emissions from the Wartburg Station. The first is currently available operating and nominal emissions expectations from the turbine manufacturer (Solar); the second is a performance test that was conducted by El Paso in 1996. For your convenience, a copy of certain portions of the 1996 test report and TDEC's review are attached.

Based on the most appropriate manufacturer emissions expectations, which are supported by the results of the 1996 performance test, ETNG is re-submitting the renewal application for 65-0028-01. ETNG requests your consideration of the following in its review of the enclosed application and ultimate authorization to continue operations.

The manufacturer and test data indicate that maximum potential annual emissions for this source are below major source levels. There have been no physical changes to and there have been no changes in the method of operation of the permitted equipment. ETNG is requesting authorization as a Conditional Major Source based on the nominal emission rates for NOx, CO provided by Solar. ETNG is willing to confirm compliance with these emission rates by representative periodic testing with consideration to the actual operating schedule of the units.

Should you have any questions concerning the present application, please feel free to contact me or Sabino Gomez at (713) 989-8342.

Sincerely,



Victoria Wagner  
EHS Manager – US Operations

Enclosures

c: Daniel Myshrall, Spectra Energy Transmission/ETNG, Nashville  
Barry Buchanan, Spectra Energy Transmission/ETNG, Abingdon, VA

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**STATION 3110 – WARTBURG**  
**OPERATING PERMIT RENEWAL APPLICATION FORMS**  
**AND**  
**SUPPORTING DOCUMENTATION**  
**(RESUBMITTAL)**

## **APPLICATION FORMS**



NOT TO BE USED FOR TITLE V APPLICATIONS

PERMIT APPLICATION

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APC 20

PLEASE TYPE OR PRINT AND SUBMIT IN DUPLICATE FOR EACH EMISSION SOURCE. ATTACH APPROPRIATE SOURCE DESCRIPTION FORMS.

1. ORGANIZATION'S LEGAL NAME East Tennessee Natural Gas Company			/// FOR	APC COMPANY--POINT NO.
2. MAILING ADDRESS (ST/RD/P.O. BOX) P.O. Box 1642			/// APC	APC LOG/PERMIT NO.
CITY Houston	STATE TX	ZIP CODE 77251-1642	PHONE WITH AREA CODE (713) 627-5210	
3. PRINCIPAL TECHNICAL CONTACT Edward L Anderson - Monterey Office			PHONE WITH AREA CODE (931) 839-2268	
4. SITE ADDRESS (ST/RD/HWY) 142 Clayton Howard Road			COUNTY NAME Morgan	
CITY OR DISTANCE TO NEAREST TOWN Wartburg		ZIP CODE 37887	PHONE WITH AREA CODE (931) 346-3579	
5. EMISSION SOURCE NO. (NUMBER WHICH UNIQUELY IDENTIFIES THIS SOURCE) 65-0028-01		PERMIT RENEWAL YES (X) NO ( )		
6. BRIEF DESCRIPTION OF EMISSION SOURCE Three natural gas-fired Solar Saturn T-1300 turbines (1,360 bhp each at ISO standard conditions). [1466 HP @ 0 °F]				

7. TYPE OF PERMIT REQUESTED				
CONSTRUCTION ( )	STARTING DATE	COMPLETION DATE	LAST PERMIT NUMBER	EMISSION SOURCE REFERENCE NUMBER
OPERATING (X )	DATE CONSTRUCTION STARTED 06/10/1996	DATE COMPLETED 09/01/1996	LAST PERMIT NUMBER O53993F	EMISSION SOURCE REFERENCE NUMBER 65-0028-01
LOCATION TRANSFER ( )	TRANSFER DATE		LAST PERMIT NUMBER	EMISSION SOURCE REFERENCE NUMBER
ADDRESS OF LAST LOCATION				

8. DESCRIBE CHANGES THAT HAVE BEEN MADE TO THIS EQUIPMENT OR OPERATION SINCE THE LAST CONSTRUCTION OR OPERATING PERMIT APPLICATION.  
No physical changes or changes in the method of operation have occurred or are proposed. Authorization is being requested as a Conditional Major Source based on the nominal emission rates for NOx, CO provided by Solar so that emission representations reflect a basis that can be unequivocally supported..

9. SIGNATURE (APPLICATION MUST BE SIGNED BEFORE IT WILL BE PROCESSED)		DATE 12-9-2010
10. SIGNER'S NAME (TYPE OR PRINT) Fulkra J Mason	TITLE Vice President	PHONE WITH AREA CODE (713) 627-5400

**TABLE OF POLLUTION REDUCTION DEVICE OR METHOD CODES**  
(ALPHABETICAL LISTING)

NOTE: FOR CYCLONES, SETTLING CHAMBERS, WET SCRUBBERS, AND ELECTROSTATIC PRECIPITATORS. THE EFFICIENCY RANGES CORRESPOND TO THE FOLLOWING PERCENTAGES:

HIGH: 95-99+%. MEDIUM: 80-95%. AND LOW: LESS THAN 80%.

IF THE SYSTEM HAS SEVERAL PIECES OF CONNECTED CONTROL EQUIPMENT, INDICATE THE SEQUENCE, FOR EXAMPLE:

008'010.97%.

IF NONE OF THE BELOW CODES FIT, USE 999 AS A CODE FOR OTHER AND SPECIFY IN THE COMMENTS.

NO EQUIPMENT .....	000	LIMESTONE INJECTION--DRY .....	041
ACTIVATED CARBON ADSORPTION .....	048	LIMESTONE INJECTION--WET .....	042
AFTERBURNER--DIRECT FLAME .....	021	LIQUID FILTRATION SYSTEM.....	049
AFTERBURNER--DIRECT FLAME WITH HEAT EXCHANGER .....	022	MIST ELIMINATOR--HIGH VELOCITY .....	014
AFTERBURNER--CATALYTIC.....	019	MIST ELIMINATOR--LOW VELOCITY .....	015
AFTERBURNER--CATALYTIC WITH HEAT EXCHANGER .....	020	PROCESS CHANGE .....	046
ALKALIZED ALUMINA.....	040	PROCESS ENCLOSED .....	054
CATALYTIC OXIDATION--FLUE GAS DESULFURIZATION.....	039	PROCESS GAS RECOVERY .....	060
CYCLONE--HIGH EFFICIENCY.....	007	SETTLING CHAMBER--HIGH EFFICIENCY .....	004
CYCLONE--MEDIUM EFFICIENCY .....	008	SETTLING CHAMBER--MEDIUM EFFICIENCY .....	005
CYCLONE--LOW EFFICIENCY .....	009	SETTLING CHAMBER--LOW EFFICIENCY .....	006
DUST SUPPRESSION BY CHEMICAL STABILIZERS		SPRAY TOWER (GASEOUS CONTROL ONLY).....	052
OR WETTING AGENTS.....	062	SULFURIC ACID PLANT--CONTACT PROCESS .....	043
ELECTROSTATIC PRECIPITATOR--HIGH EFFICIENCY.....	010	SULFURIC ACID PLANT--DOUBLE CONTACT PROCESS .....	044
ELECTROSTATIC PRECIPITATOR--MEDIUM EFFICIENCY .....	011	SULFUR PLANT .....	045
ELECTROSTATIC PRECIPITATOR--LOW EFFICIENCY .....	012	VAPOR RECOVERY SYSTEM (INCLUDING CONDENSERS,	
FABRIC FILTER--HIGH TEMPERATURE.....	016	HOODING AND OTHER ENCLOSURES) .....	047
FABRIC FILTER--MEDIUM TEMPERATURE.....	017	VENTURI SCRUBBER (GASEOUS CONTROL ONLY) .....	053
FABRIC FILTER--LOW TEMPERATURE.....	018	WET SCRUBBER--HIGH EFFICIENCY .....	001
FABRIC FILTER--METAL SCREENS (COTTON GINS).....	059	WET SCRUBBER--MEDIUM EFFICIENCY .....	002
FLARING .....	023	WET SCRUBBER--LOW EFFICIENCY .....	003
GAS ADSORPTION COLUMN--PACKED .....	050	WET SUPPRESSION BY WATER SPRAYS.....	061
GAS ADSORPTION COLUMN--TRAY TYPE .....	051		
GAS SCRUBBER (GENERAL: NOT CLASSIFIED).....	013		

**TABLE OF EMISSION ESTIMATION METHOD CODES**

NOT APPLICABLE EMISSIONS ARE KNOWN TO BE ZERO.....	0
EMISSIONS BASED ON SOURCE TESTING .....	1
EMISSIONS BASED ON MATERIAL BALANCE USING ENGINEERING EXPERTISE AND KNOWLEDGE OF PROCESS.....	2
EMISSIONS CALCULATED USING EMISSION FACTORS FROM EPA PUBLICATION NO. AP-42 COMPILATION OF	
AIR POLLUTANT EMISSIONS FACTORS.....	3
JUDGEMENT .....	4
EMISSIONS CALCULATED USING A SPECIAL EMISSION FACTOR DIFFERING FROM THAT IN AP-42.....	5
OTHER (SPECIFY IN COMMENTS) .....	6



NOT TO BE USED FOR TITLE V APPLICATIONS

# EMISSION POINT DESCRIPTION

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APC 22

PLEASE TYPE OR PRINT AND SUBMIT IN DUPLICATE FOR EACH STACK OR EMISSION POINT.

ATTACH TO THE PERMIT APPLICATION.

<b>1. ORGANIZATION NAME</b> East Tennessee Natural Gas Company					///	APC COMPANY POINT NO.	
					FOR		
<b>2. EMISSION SOURCE NO. (FROM APPLICATION)</b> 65-0028-01			<b>FLOW DIAGRAM POINT NUMBER</b> Not Applicable		///	APC SEQUENCE NO.	
					APC		
<b>3. LOCATION:</b> →	<b>LATITUDE</b> 36° 04' 15"	<b>LONGITUDE</b> 84° 32' 29"	<b>UTM VERTICAL</b>		<b>UTM HORIZONTAL</b>		
<b>4. BRIEF EMISSION POINT DESCRIPTION (ATTACH A SKETCH IF APPROPRIATE):</b> T-1A: Natural gas-fired Solar Saturn T-1300 turbine (1,360 bhp at ISO standard conditions) exhaust stack.					<b>DISTANCE TO NEAREST PROPERTY LINE (FT)</b>  212		
COMPLETE LINES 5 AND 6 IF DIFFERENT FROM THAT ON THE PROCESS OR FUEL BURNING SOURCE DESCRIPTION (APC 21)							
<b>5. NORMAL OPERATION:</b> →	<b>HOURS/DAY</b> 24	<b>DAYS/WEEK</b> 7	<b>WEEK/YEAR</b> 52		<b>DAYS/YEAR</b> 365		
<b>6. PERCENT ANNUAL THROUGHPUT:</b> →	<b>DEC.-FEB.</b> 25	<b>MARCH-MAY</b> 25	<b>JUNE-AUG.</b> 25		<b>SEPT.-NOV.</b> 25		
<b>7. STACK OR EMISSION POINT DATA:</b> →	<b>HEIGHT ABOVE GRADE ( FT )</b> 22.33	<b>DIAMETER (FT)</b> 2.00	<b>TEMPERATURE (°F)</b> 974	<b>% OF TIME OVER 125°F</b> 100	<b>DIRECTION OF EXIT (UP, DOWN OR HORIZONTAL)</b> UP		
<b>DATA AT EXIT CONDITIONS:</b> →	<b>FLOW (ACTUAL FT³/MIN. )</b> 30,493	<b>VELOCITY (FT/SEC)</b> 161.77	<b>MOISTURE (GRAINS/FT³)</b> 187		<b>MOISTURE (PERCENT)</b> 5.93 vol%		
<b>DATA AT STANDARD CONDITIONS:</b> →	<b>FLOW (DRY STD. FT³/MIN)</b> 10,183	<b>VELOCITY (FT/SEC)</b> 54.02 (dry)	<b>MOISTURE (GRAINS/FT³)</b> 0 (dry)		<b>MOISTURE (PERCENT)</b> 0.00 vol% (dry)		
<b>8. AIR CONTAMINANTS</b>	<b>ACTUAL EMISSIONS</b>						
	<b>EMISSIONS (LBS/HR)</b>		<b>CONCENTRATION</b>	<b>AVG. EMISSIONS (TONS/YR)</b>	<b>EMISSIONS* EST.</b>	<b>CONTROL DEVICES*</b>	<b>CONTROL EFFICIENCY%</b>
	<b>AVG.</b>	<b>MAXIMUM</b>					
PARTICULATES	0.11	0.36 0.12	**	0.47	3	000	0
SULFUR DIOXIDE	0.06	0.18 0.06	***	0.24	3	000	0
CARBON MONOXIDE	3.55	35.01 11.67	PPMVD at 15% O2	15.53	5	000	0
ORGANIC COMPOUNDS	0.03	1.41 0.47	PPMVD at 15% O2	0.14	5	000	0
NITROGEN OXIDES	4.69	14.52 4.84	PPMVD at 15% O2	20.54	5	000	0
FLUORIDES							
OTHER( SPECIFY )						000	0
OTHER( SPECIFY ) Formaldehyde	0.01	0.16		0.05	3	000	0

( OVER )



NOT TO BE USED FOR TITLE V APPLICATIONS

**PROCESS OR FUEL BURNING** DEC 14 PM 1:13  
**SOURCE DESCRIPTION**

APC21(& 24)

PLEASE TYPE OR PRINT, SUBMIT IN DUPLICATE AND ATTACH TO THE PERMIT APPLICATION.

<b>1. ORGANIZATION NAME</b> East Tennessee Natural Gas Company		/// FOR	APC COMPANY-POINT NO.	
<b>2. EMISSION SOURCE NO. ( AS ON PERMIT APPLICATION )</b> 65-0028-01		SIC CODE 4922	/// APC	APC PERMIT/LOG NO.
<b>3. DESCRIPTION OF PROCESS OR FUEL BURNING UNIT</b> Three natural gas-fired Solar Saturn T-1300 turbines (1,360 bhp each at ISO standard conditions; 1466 hp @ 0 °F).				
<b>4. NORMAL OPERATION:</b> →	HOURS/DAY 24	DAYS/WEEK 7	WEEKS/YEAR 52	DAYS/YEAR 365
<b>5. PERCENT ANNUAL THROUGHPUT:</b> →	DEC.-FEB. 25	MARCH-MAY 25	JUNE-AUG. 25	SEPT.-NOV. 25
<b>6. TYPE OF PERMIT APPLICATION</b>				( CHECK BELOW ONE ONLY )
PROCESS SOURCE: APPLY FOR A SEPARATE PERMIT FOR EACH SOURCE. ( CHECK AT RIGHT, AND COMPLETE LINES 7, 8, 13, AND 14 )				( )
PROCESS SOURCE WITH IN-PROCESS FUEL: PRODUCTS OF COMBUSTION CONTACT MATERIALS HEATED. APPLY FOR A SEPARATE PERMIT FOR EACH SOURCE. ( CHECK AT RIGHT, AND COMPLETE LINES 7, 8, AND 10 THROUGH 14 )				( )
NON-PROCESS FUEL BURNING SOURCE: PRODUCTS OF COMBUSTION DO NOT CONTACT MATERIALS HEATED. COMPLETE THIS FORM FOR EACH BOILER OR FUEL BURNER AND COMPLETE AN EMISSION POINT DESCRIPTION FORM ( APC 22 ) FOR EACH STACK. ( CHECK AT RIGHT, AND COMPLETE LINES 9 TO 14 )				( X )
<b>7. TYPE OF OPERATION:</b> CONTINUOUS , ( )		BATCH ( )	NORMAL BATCH TIME	NORMAL BATCHES/DAY
<b>8. PROCESS MATERIAL INPUTS AND IN-PROCESS SOLID FUELS</b>	DIAGRAM* REFERENCE	INPUT RATES (POUNDS/HOUR) DESIGN      ACTUAL		(FOR APC USE ONLY) SCC CODE
A.				/
B.				/
C.				/
D.				/
E.				/
F.				/
G.				/
TOTALS				/

\* A SIMPLE PROCESS FLOW DIAGRAM MUST BE ATTACHED.

( OVER )

**9. BOILER OR BURNER DATA: ( COMPLETE LINES 9 TO 14 USING A SEPARATE FORM FOR EACH BOILER )**

BOILER NUMBER  T1A	STACK NUMBER**  <u>T1A</u>	TYPE OF FIRING***  Single Pipe, High Pressure	RATED BOILER HORSEPOWER  1466 at 0°F	RATED INPUT CAPACITY (10 <sup>6</sup> BTU/HR) 18.11 at 0°F (HHV)	OTHER BOILER RATING (SPECIFY CAPACITY AND UNITS)
BOILER SERIAL NO. 21139		DATE CONSTRUCTED 06/10/1996	DATE OF LAST MODIFICATION (EXPLAIN IN COMMENTS BELOW).		

\*\* BOILERS WITH A COMMON STACK WILL HAVE THE SAME STACK NUMBER.

\*\*\* CYCLONE, SPREADER ( WITH OR WITHOUT REINJECTION ), PULVERIZED ( WET OR DRY BOTTOM, WITH OR WITHOUT REINJECTION ), OTHER STOKER ( SPECIFY TYPE ), HAND FIRED, AUTOMATIC, OR OTHER TYPE ( DESCRIBE BELOW IN COMMENTS ).

**10. FUEL DATA: ( COMPLETE FOR A PROCESS SOURCE WITH IN-PROCESS FUEL OR A NON-PROCESS FUEL BURNING SOURCE )**

PRIMARY FUEL TYPE ( SPECIFY )				STANDBY FUEL TYPE( S ) ( SPECIFY )				
Natural Gas				None				
FUELS USED	ANNUAL USAGE	HOURLY USAGE		% SULFUR	% ASH	BTU VALUE OF FUEL		(FOR APC ONLY) SCC CODE
		DESIGN	AVERAGE					
NATURAL GAS:	10 <sup>6</sup> CUFT 140,995	CUFT 16,095	CUFT 16,095	/// / /	///	1,020 BTU/scf (HHV)		16.4 MM Btu/hr
#2 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		///			
#5 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		///			
#6 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		///			
COAL:	TONS	LBS	LBS					
WOOD:	TONS	LBS	LBS	/// / /	///			
LIQUID PROPANE:	10 <sup>3</sup> GAL	GAL	GAL	/// / /	///	85,000		
OTHER (SPECIFY TYPE & UNITS.):								

11. IF WOOD IS USED AS A FUEL, SPECIFY TYPES AND ESTIMATE PERCENT BY WEIGHT OF BARK

12. IF WOOD IS USED WITH OTHER FUELS, SPECIFY PERCENT BY WEIGHT OF WOOD CHARGED TO THE BURNER.

13. COMMENTS

14. SIGNATURE

DATE

Fulkra J Mason, Vice President

12-9-10

**9. BOILER OR BURNER DATA: ( COMPLETE LINES 9 TO 14 USING A SEPARATE FORM FOR EACH BOILER )**

BOILER NUMBER	STACK NUMBER**	TYPE OF FIRING***	RATED BOILER HORSEPOWER	RATED INPUT CAPACITY (10 <sup>6</sup> BTU/HR)	OTHER BOILER RATING (SPECIFY CAPACITY AND UNITS)
T-2A	<u>T-2A</u>	Single Pipe, High Pressure	1,466 at 0°F	18.11 at 0°F (HHV)	Please see Table A-1 for site-rated capacities at different ambient temperatures.
BOILER SERIAL NO. 1376S		DATE CONSTRUCTED 06/10/1996	DATE OF LAST MODIFICATION (EXPLAIN IN COMMENTS BELOW).		

\*\* BOILERS WITH A COMMON STACK WILL HAVE THE SAME STACK NUMBER.

\*\*\* CYCLONE, SPREADER ( WITH OR WITHOUT REINJECTION ), PULVERIZED ( WET OR DRY BOTTOM, WITH OR WITHOUT REINJECTION ), OTHER STOKER ( SPECIFY TYPE ), HAND FIRED, AUTOMATIC, OR OTHER TYPE ( DESCRIBE BELOW IN COMMENTS ).

**10. FUEL DATA: ( COMPLETE FOR A PROCESS SOURCE WITH IN-PROCESS FUEL OR A NON-PROCESS FUEL BURNING SOURCE )**

PRIMARY FUEL TYPE ( SPECIFY )				STANDBY FUEL TYPE( S ) ( SPECIFY )			
Natural Gas				None			
FUELS USED	ANNUAL USAGE	HOURLY USAGE		% SULFUR	% ASH	BTU VALUE OF FUEL	(FOR APC ONLY) SCC CODE
		DESIGN	AVERAGE				
NATURAL GAS:	10 <sup>6</sup> CUFT 140,995	CUFT 16,095	CUFT 16,095	/// / /	/// /	1,020 BTU/scf (HHV)	16.4 MMBtu/hr
#2 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		/// /		
#5 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		/// /		
#6 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		/// /		
COAL:	TONS	LBS	LBS				
WOOD:	TONS	LBS	LBS	/// / /	/// /		
LIQUID PROPANE:	10 <sup>3</sup> GAL	GAL	GAL	/// / /	/// /	85,000	
OTHER (SPECIFY TYPE & UNITS.):							

11. IF WOOD IS USED AS A FUEL, SPECIFY TYPES AND ESTIMATE PERCENT BY WEIGHT OF BARK

12. IF WOOD IS USED WITH OTHER FUELS, SPECIFY PERCENT BY WEIGHT OF WOOD CHARGED TO THE BURNER.

13. COMMENTS

14. SIGNATURE

DATE

Fulkra J Mason, Vice President

**9. BOILER OR BURNER DATA: ( COMPLETE LINES 9 TO 14 USING A SEPARATE FORM FOR EACH BOILER )**

BOILER NUMBER T-3A	STACK NUMBER** <u>T-3A</u>	TYPE OF FIRING*** Single Pipe, High Pressure	RATED BOILER HORSEPOWER 1,466 at 0°F	RATED INPUT CAPACITY (10 <sup>6</sup> BTU/HR) 18.11 at 0°F (HHV)	OTHER BOILER RATING (SPECIFY CAPACITY AND UNITS) Please see Table A-1 for site-rated capacities at different ambient temperatures.
BOILER SERIAL NO. 10897		DATE CONSTRUCTED 06/10/1996	DATE OF LAST MODIFICATION (EXPLAIN IN COMMENTS BELOW).		

\*\* BOILERS WITH A COMMON STACK WILL HAVE THE SAME STACK NUMBER.

\*\*\* CYCLONE, SPREADER ( WITH OR WITHOUT REINJECTION ), PULVERIZED ( WET OR DRY BOTTOM, WITH OR WITHOUT REINJECTION ), OTHER STOKER ( SPECIFY TYPE ), HAND FIRED, AUTOMATIC, OR OTHER TYPE ( DESCRIBE BELOW IN COMMENTS ).

**10. FUEL DATA: ( COMPLETE FOR A PROCESS SOURCE WITH IN-PROCESS FUEL OR A NON-PROCESS FUEL BURNING SOURCE )**

PRIMARY FUEL TYPE ( SPECIFY )				STANDBY FUEL TYPE( S ) ( SPECIFY )			
Natural Gas				None			
FUELS USED	ANNUAL USAGE	HOURLY USAGE		% SULFUR	% ASH	BTU VALUE OF FUEL	(FOR APC ONLY) SCC CODE
		DESIGN	AVERAGE				
NATURAL GAS:	10 <sup>6</sup> CUFT 140,995	CUFT 16,095	CUFT 16,095	/// / / /	/// /	1,020 BTU/scf (HHV)	16 4 MM Btu/hr
#2 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		/// /		
#5 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		/// /		
#6 FUEL OIL:	10 <sup>3</sup> GAL	GAL	GAL		/// /		
COAL:	TONS	LBS	LBS				
WOOD:	TONS	LBS	LBS	/// / / /	/// /		
LIQUID PROPANE:	10 <sup>3</sup> GAL	GAL	GAL	/// / / /	/// /	85,000	
OTHER (,SPECIFY TYPE & UNITS.):							

**11. IF WOOD IS USED AS A FUEL, SPECIFY TYPES AND ESTIMATE PERCENT BY WEIGHT OF BARK****12. IF WOOD IS USED WITH OTHER FUELS, SPECIFY PERCENT BY WEIGHT OF WOOD CHARGED TO THE BURNER.****13. COMMENTS****14. SIGNATURE****DATE**

Fulkra J Mason, Vice President

12/9/10

**9. CHECK TYPES OF MONITORING AND RECORDING INSTRUMENTS THAT ARE ATTACHED:**OPACITY MONITOR ( ), SO<sub>2</sub> MONITOR ( ), NO<sub>x</sub> MONITOR ( ), OTHER (SPECIFY IN COMMENTS) (X )**10. COMMENTS**

Section 7: Stack exhaust data is based on manufacturer's data at an average annual ambient temperature of 59.10°F (see Table A-1).

Section 8: Emissions data is based on calculations that are documented in Tables A-2.

Section 9: Monitoring or recordkeeping should be necessary to document compliance with the terms and condition of the permit. Monthly fuel consumption records and 12-month running total fuel consumption records should be sufficient.

The turbine is subject to NSPS, Subpart GG. Performance testing was conducted on November 20, 1996 in accordance with the applicable requirements of NSPS, Subparts A and GG. The turbine complies with the NSPS, Subpart GG nitrogen and sulfur monitoring requirements in accordance with §§60.334(h)(2) and 60.334(h)(3), respectively.

**11. SIGNATURE****DATE**

Fulkra J Mason, Vice President

- \* REFER TO THE BACK OF THE PERMIT APPLICATION FORM FOR ESTIMATION METHOD AND CONTROL DEVICE CODES.
- \*\* EXIT GAS PARTICULATE CONCENTRATION UNITS: PROCESS — GRAINS/DRY STANDARD FT<sup>3</sup> ( 70°F ); WOOD FIRED BOILERS — GRAINS/DRY STANDARD FT<sup>3</sup> ( 70°F ); ALL OTHER BOILERS — LBS/MILLION BTU HEAT INPUT.
- \*\*\* EXIT GAS SULFUR DIOXIDE CONCENTRATIONS UNITS: PROCESS — PPM BY VOLUME, DRY BASES; BOILERS — LBS/MILLION BTU HEAT INPUT.



NOT TO BE USED FOR TITLE V APPLICATIONS

## EMISSION POINT DESCRIPTION

APC 22

PLEASE TYPE OR PRINT AND SUBMIT IN DUPLICATE FOR EACH STACK OR EMISSION POINT.  
ATTACH TO THE PERMIT APPLICATION.

2010 DEC 14 PM 1:13

<b>1. ORGANIZATION NAME</b> East Tennessee Natural Gas Company				///	APC COMPANY POINT NO.		
<b>2. EMISSION SOURCE NO. (FROM APPLICATION)</b> 65-0028-01				FOR			
				///	APC SEQUENCE NO.		
				APC			
<b>3. LOCATION:</b> →	LATITUDE 36° 04' 15"	LONGITUDE 84° 32' 29"	UTM VERTICAL		UTM HORIZONTAL		
<b>4. BRIEF EMISSION POINT DESCRIPTION (ATTACH A SKETCH IF APPROPRIATE):</b> T-2A: Natural gas-fired Solar Saturn T-1300 turbine (1,360 bhp at ISO standard conditions) exhaust stack.					DISTANCE TO NEAREST PROPERTY LINE (FT)  205		
COMPLETE LINES 5 AND 6 IF DIFFERENT FROM THAT ON THE PROCESS OR FUEL BURNING SOURCE DESCRIPTION (APC 21)							
<b>5. NORMAL OPERATION:</b> →	HOURS/DAY 24	DAYS/WEEK 7	WEEK/YEAR 52		DAYS/YEAR 365		
<b>6. PERCENT ANNUAL THROUGHPUT:</b> →	DEC.-FEB. 25	MARCH-MAY 25	JUNE-AUG. 25		SEPT.-NOV. 25		
<b>7. STACK OR EMISSION POINT DATA:</b> →	HEIGHT ABOVE GRADE ( FT ) 22.33	DIAMETER (FT) 2.00	TEMPERATURE (°F) 974	% OF TIME OVER 125°F 100	DIRECTION OF EXIT (UP, DOWN OR HORIZONTAL) UP		
DATA AT EXIT CONDITIONS: →	FLOW (ACTUAL FT³/MIN. ) 30,493	VELOCITY (FT/SEC) 161.77	MOISTURE (GRAINS/FT³) 187		MOISTURE (PERCENT) 5.93 vol%		
DATA AT STANDARD CONDITIONS: →	FLOW (DRY STD. FT³/MIN) 10,183	VELOCITY (FT/SEC) 54.02 (dry)	MOISTURE (GRAINS/FT³) 0 (dry)		MOISTURE (PERCENT) 0.00 vol% (dry)		
<b>8. AIR CONTAMINANTS</b>	ACTUAL EMISSIONS				EMISSIONS* EST.	CONTROL DEVICES*	CONTROL EFFICIENCY%
	EMISSIONS (LBS/HR) AVG.      MAXIMUM		CONCENTRATION	AVG. EMISSIONS (TONS/YR)			
PARTICULATES	0.11	0.12	**	0.47	3	000	0
SULFUR DIOXIDE	0.06	0.06	***	0.24	3	000	0
CARBON MONOXIDE	3.55	11.67	PPMVD at 15% O2	15.53	5	000	0
ORGANIC COMPOUNDS	0.03	0.47	PPMVD at 15% O2	0.14	5	000	0
NITROGEN OXIDES	4.69	4.84	PPMVD at 15% O2	20.54	5	000	0
FLUORIDES							
OTHER( SPECIFY )						000	0
OTHER( SPECIFY ) Formaldehyde	0.01	0.16		0.05	3	000	0

( OVER )

**9. CHECK TYPES OF MONITORING AND RECORDING INSTRUMENTS THAT ARE ATTACHED:**OPACITY MONITOR (    ), SO<sub>2</sub> MONITOR (    ), NOX MONITOR (    ), OTHER (SPECIFY IN COMMENTS) (X    )**10. COMMENTS**

Section 7: Stack exhaust data is based on manufacturer's data at an average annual ambient temperature of 59.10°F (see Table A-1).

Section 8: Emissions data is based on calculations that are documented in Tables A-2.

Section 9: Monitoring or recordkeeping should be necessary to document compliance with the terms and condition of the permit. Monthly fuel consumption records and 12-month running total fuel consumption records should be sufficient.

The turbine is subject to NSPS, Subpart GG. Performance testing was conducted on November 20, 1996 in accordance with the applicable requirements of NSPS, Subparts A and GG. The turbine complies with the NSPS, Subpart GG nitrogen and sulfur monitoring requirements in accordance with §§60.334(h)(2) and 60.334(h)(3), respectively.

  
11. SIGNATURE12/9/10  
DATE

Fulkra J Mason, Vice President

\* REFER TO THE BACK OF THE PERMIT APPLICATION FORM FOR ESTIMATION METHOD AND CONTROL DEVICE CODES.

\*\* EXIT GAS PARTICULATE CONCENTRATION UNITS: PROCESS — GRAINS/DRY STANDARD FT<sup>3</sup> ( 70°F ); WOOD FIRED BOILERS — GRAINS/DRY STANDARD FT<sup>3</sup> ( 70°F ); ALL OTHER BOILERS — LBS/MILLION BTU HEAT INPUT.

\*\*\* EXIT GAS SULFUR DIOXIDE CONCENTRATIONS UNITS: PROCESS — PPM BY VOLUME, DRY BASES; BOILERS — LBS/MILLION BTU HEAT INPUT.



NOT TO BE USED FOR TITLE V APPLICATIONS

## EMISSION POINT DESCRIPTION

APC 22

2010 DEC 14 PM 1:13

PLEASE TYPE OR PRINT AND SUBMIT IN DUPLICATE FOR EACH STACK OR EMISSION POINT.  
ATTACH TO THE PERMIT APPLICATION.

<b>1. ORGANIZATION NAME</b> East Tennessee Natural Gas Company					///	APC COMPANY POINT NO.	
					FOR		
<b>2. EMISSION SOURCE NO. (FROM APPLICATION)</b> 65-0028-01			<b>FLOW DIAGRAM POINT NUMBER</b> Not Applicable		///	APC SEQUENCE NO.	
					APC		
<b>3. LOCATION:</b>	<b>LATITUDE</b> 36° 04' 15"	<b>LONGITUDE</b> 84° 32' 29"	<b>UTM VERTICAL</b>		<b>UTM HORIZONTAL</b>		
→							
<b>4. BRIEF EMISSION POINT DESCRIPTION (ATTACH A SKETCH IF APPROPRIATE):</b> T-3A: Natural gas-fired Solar Saturn T-1300 turbine (1,360 bhp at ISO standard conditions) exhaust stack.						<b>DISTANCE TO NEAREST PROPERTY LINE (FT)</b>  202	
COMPLETE LINES 5 AND 6 IF DIFFERENT FROM THAT ON THE PROCESS OR FUEL BURNING SOURCE DESCRIPTION (APC 21)							
<b>5. NORMAL OPERATION:</b>	<b>HOURS/DAY</b> 24	<b>DAYS/WEEK</b> 7	<b>WEEK/YEAR</b> 52		<b>DAYS/YEAR</b> 365		
→							
<b>6. PERCENT ANNUAL THROUGHPUT:</b>	<b>DEC.-FEB.</b> 25	<b>MARCH-MAY</b> 25	<b>JUNE-AUG.</b> 25		<b>SEPT.-NOV.</b> 25		
→							
<b>7. STACK OR EMISSION POINT DATA:</b>	<b>HEIGHT ABOVE GRADE ( FT )</b>	<b>DIAMETER (FT)</b>	<b>TEMPERATURE (°F)</b>	<b>% OF TIME OVER 125°F</b>	<b>DIRECTION OF EXIT (UP, DOWN OR HORIZONTAL)</b>		
→	22.33	2.00	974	100	UP		
<b>DATA AT EXIT CONDITIONS:</b>	<b>FLOW (ACTUAL FT<sup>3</sup>/MIN. )</b> 30,493	<b>VELOCITY (FT/SEC)</b> 161.77	<b>MOISTURE (GRAINS/FT<sup>3</sup>)</b> 187		<b>MOISTURE (PERCENT)</b> 5.93 vol%		
→							
<b>DATA AT STANDARD CONDITIONS:</b>	<b>FLOW (DRY STD, FT<sup>3</sup>/MIN)</b> 10,183	<b>VELOCITY (FT/SEC)</b> 54.02 (dry)	<b>MOISTURE (GRAINS/FT<sup>3</sup>)</b> 0 (dry)		<b>MOISTURE (PERCENT)</b> 0.00 vol% (dry)		
→							
<b>8. AIR CONTAMINANTS</b>	<b>ACTUAL EMISSIONS</b>				<b>EMISSIONS* EST.</b>	<b>CONTROL DEVICES*</b>	<b>CONTROL EFFICIENCY%</b>
	<b>EMISSIONS (LBS/HR)</b>		<b>CONCENTRATION</b>	<b>AVG. EMISSIONS (TONS/YR)</b>			
	<b>AVG.</b>	<b>MAXIMUM</b>					
PARTICULATES	0.11	0.12	**	0.47	3	000	0
SULFUR DIOXIDE	0.06	0.06	***	0.24	3	000	0
CARBON MONOXIDE	3.55	11.67	PPMVD at 15% O2	15.53	5	000	0
ORGANIC COMPOUNDS	0.03	0.47	PPMVD at 15% O2	0.14	5	000	0
NITROGEN OXIDES	4.69	4.84	PPMVD at 15% O2	20.54	5	000	0
FLUORIDES							
OTHER( SPECIFY )						000	0
OTHER( SPECIFY ) Formaldehyde	0.01	0.16		0.05	3	000	0

( OVER )

**9. CHECK TYPES OF MONITORING AND RECORDING INSTRUMENTS THAT ARE ATTACHED:**OPACITY MONITOR ( ), SO<sub>2</sub> MONITOR ( ), NOX MONITOR ( ), OTHER (SPECIFY IN COMMENTS) (X )**10. COMMENTS**

Section 7: Stack exhaust data is based on manufacturer's data at an average annual ambient temperature of 59.10°F (see Table A-1).

Section 8: Emissions data is based on calculations that are documented in Tables A-2.

Section 9: Monitoring or recordkeeping should be necessary to document compliance with the terms and condition of the permit. Monthly fuel consumption records and 12-month running total fuel consumption records should be sufficient.

The turbine is subject to NSPS, Subpart GG. Performance testing was conducted on November 20, 1996 in accordance with the applicable requirements of NSPS, Subparts A and GG. The turbine complies with the NSPS, Subpart GG nitrogen and sulfur monitoring requirements in accordance with §§60.334(h)(2) and 60.334(h)(3), respectively.

**11. SIGNATURE****DATE**

Fulkra J Mason, Vice President

\* REFER TO THE BACK OF THE PERMIT APPLICATION FORM FOR ESTIMATION METHOD AND CONTROL DEVICE CODES.

\*\* EXIT GAS PARTICULATE CONCENTRATION UNITS: PROCESS — GRAINS/DRY STANDARD FT<sup>3</sup> ( 70°F ); WOOD FIRED BOILERS — GRAINS/DRY STANDARD FT<sup>3</sup> ( 70°F ); ALL OTHER BOILERS — LBS/MILLION BTU HEAT INPUT.

\*\*\* EXIT GAS SULFUR DIOXIDE CONCENTRATIONS UNITS: PROCESS — PPM BY VOLUME, DRY BASES; BOILERS — LBS/MILLION BTU HEAT INPUT.

## **EMISSION CALCULATIONS**

**East Tennessee Natural Gas Company  
Station 3110 (Wartburg Compressor Station)  
Turbine Manufacturer's Operating and Nominal Emissions Data for Saturn T-1360**

Parameters		Values								
Ambient <sup>2</sup>	Temperature	°F	0.00	20.00	26.50	40.00	59.10	60.00	80.00	100.00
	Elevation	ft	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310
	Pressure	psia	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
	Relative Humidity	%	60	60	60	60	60	60	60	60
	Specific Humidity	lb <sub>H2O</sub> /lb <sub>Dry Air</sub>	0.0006	0.0015	0.0021	0.0033	0.0068	0.0070	0.0139	0.0266
Fuel <sup>3</sup>	Lower Heating Value (LHV)	BTU/scf	939.2	939.2	939.2	939.2	939.2	939.2	939.2	939.2
	Higher Heating Value (HHV)	BTU/scf	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6	1,043.6
Turbine	Elevation Loss	hp	87	77	76	73	69	69	64	58
	Inlet Loss	in <sub>H2O</sub>	3	3	3	3	3	3	3	3
		hp	23	22	22	21	20	20	19	18
	Exhaust loss	in <sub>H2O</sub>	4	4	4	4	4	4	4	4
		hp	13	13	13	13	13	13	13	12
	Off-Optimum NPT Loss	hp	53	50	48	45	39	39	31	22
	Net Output Power	hp	1,466	1,420	1,403	1,369	1,313	1,310	1,234	1,130
	Heat Input at LHV	MMBTU/hr	16.30	15.82	15.65	15.30	14.78	14.75	14.13	13.36
	Heat Rate at LHV	BTU/hp-hr	11,119	11,135	11,152	11,177	11,256	11,260	11,452	11,822
	Heat Input at HHV	MMBTU/hr	18.11	17.58	17.39	17.00	16.42	16.39	15.70	14.84
	Heat Rate at HHV	BTU/hp-hr	12,354	12,379	12,391	12,419	12,507	12,511	12,724	13,137
	Fuel Consumption	MMscf/hr	0.017	0.017	0.017	0.016	0.016	0.016	0.015	0.014
Exhaust	Temperature	°F	890	907	912	922	938	939	954	968
	Water Fraction	vol%	5.03%	5.15%	5.24%	5.42%	5.93%	5.95%	6.95%	8.71%
	Non-Water Fraction	vol%	94.97%	94.85%	94.76%	94.58%	94.07%	94.05%	93.05%	91.29%
	O <sub>2</sub> Content	vol% (dry)	16.20%	16.20%	16.20%	16.21%	16.21%	16.21%	16.22%	16.24%
	Molecular Weight	lb/lb-mol	28.65	28.63	28.62	28.60	28.54	28.54	28.43	28.23
	Flow Rate	lb/hr	53,701	52,119	51,586	50,479	48,791	48,711	46,733	44,379
		scfm	11,859	11,515	11,401	11,165	10,813	10,796	10,399	9,944
		acfm	32,302	31,751	31,551	31,136	30,493	30,463	29,654	28,639
NO <sub>x</sub> Emissions		lb/lb-mol	46.01	46.01	46.01	46.01	46.01	46.01	46.01	46.01
		ppmvd, 15% O <sub>2</sub>	74.16	77.92	78.67	80.22	79.72	79.70	74.45	62.58
		ppmvw	56.11	58.88	59.34	60.31	59.62	59.59	54.95	45.12
		lb/hr	4.84	4.93	4.92	4.90	4.69	4.68	4.16	3.26
		lb/MMBTU at LHV	0.297	0.312	0.314	0.320	0.317	0.317	0.294	0.244
		lb/MMBTU at HHV	0.267	0.281	0.283	0.288	0.286	0.285	0.265	0.220
CO Emissions		lb/lb-mol	28.01	28.01	28.01	28.01	28.01	28.01	28.01	28.01
		ppmvd, 15% O <sub>2</sub>	293.88	226.84	205.08	159.89	99.05	96.17	96.86	98.10
		ppmvw	222.33	171.40	154.71	120.21	74.07	71.90	71.49	70.73
		lb/hr	11.67	8.74	7.81	5.94	3.55	3.44	3.29	3.11
		lb/MMBTU at LHV	0.716	0.552	0.499	0.388	0.240	0.233	0.233	0.233
		lb/MMBTU at HHV	0.644	0.497	0.449	0.350	0.216	0.210	0.210	0.210
THC Emissions		lb/lb-mol	16.80	16.80	16.80	16.80	16.80	16.80	16.80	16.80
		ppmvd, 15% O <sub>2</sub>	7.86	7.88	7.91	7.96	7.96	8.03	8.15	8.42
		ppmvw	5.95	5.96	5.97	5.98	5.95	6.00	6.01	6.07
		lb/hr	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16
		lb/MMBTU at LHV	0.011	0.012	0.012	0.012	0.012	0.012	0.012	0.012
		lb/MMBTU at HHV	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.011

**NOTES**

- Operating and emissions data was provided by the turbine manufacturer (Solar Turbines, Inc.) for the following ambient temperatures: 0°F, 20°F, 40°F, 60°F and 80°F. Data for 26.5°F and 59.1°F are interpolated from the manufacturer's data. An ambient temperature of 26.5°F corresponds to the lowest monthly daily minimum ambient temperature and 59.1°F corresponds to average annual ambient temperature as obtained from USEPA's TANKS 4.0 program for Nashville, TN.
- Ambient pressure and humidity are values assumed by the turbine manufacturer to be representative. Emissions are affected by the values used; however, it is believed that the affect is minimal.
- The heating value of the natural gas used to fuel the turbine will vary. However, it is believed that any variation would have a minimal affect.

## **TEST DATA REFERENCES**



MAY - 1

STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
9th Floor, L & C Annex  
401 Church Street  
Nashville, Tennessee 37243-1531

April 28, 1997

Mr. Ted Wurfel  
Environmental Scientist  
Tenneco Energy  
P. O. 2511  
1010 Milam Street  
Houston, Texas 77252-2511

Reference Number: 65-0028-01-S4 (Station 3110)

Dear Mr. Wurfel:

The Tennessee Division of Air Pollution Control has received the gaseous source test report submitted by Tenneco Energy for a Solar Saturn T-1360 gas-fired compressor turbine (Unit 3A) operated by East Tennessee Natural Gas and located in Morgan County (Station 3110). This source testing was conducted on November 20, 1996 by personnel of the Tenneco Energy Environmental, Health, Safety, and Technology Services. Pursuant to the United States Environmental Protection Agency (EPA) letter dated September 19, 1996, compliance testing could be waived for two of the three gas turbines that make up this fuel burning installation if one of the turbines was determined to have nitrogen oxides emissions of less than fifty percent of the applicable federal emission standard.

The source test report has been reviewed by the Compliance Validation Program. Based on this review it has been determined that the report is technically correct and thus, is acceptable to the agency. From the review of the source test report it was noted that the sampling methodology utilized followed the procedures outlined in EPA Source Test Method 20 (40 CFR 60, Appendix A) and the Tenneco testing protocol dated October 15, 1996.

In the review of the operational parameters presented in the report it was noted that the turbine operated very close to its designed power rating. Specifics of this are listed on Attachment 1 to this letter. Thus, the operation of this turbine was at an acceptable level for an official compliance demonstration.

Mr. Ted Wurfel  
Tenneco Energy  
Station 3110 Unit 3A  
April 28, 1996  
page 2 of 3

During the testing period the measured nitrogen oxides emissions from Unit 3A were 55.6 ppm corrected to 15 percent oxygen and ISO standard conditions and 2.8 pounds per hour. The 55.6 ppm of nitrogen oxides corrected to 15 percent oxygen and ISO standard conditions demonstrates compliance with the regulatory nitrogen oxides emission standard of 150 ppm by volume at 15 percent oxygen and on a dry basis. This standard is set forth in Subparagraph 1200-3-16-.31 (3) (a) 2. of the Tennessee Air Pollution Control Regulations (40 CFR 60.332 (a) (2)). This also demonstrates compliance with the current permit stipulated nitrogen oxides emission limit of 84 ppm of nitrogen oxides corrected to 15 percent oxygen (Permit #741853F, Condition 5). In addition the 3.76 pounds per hour of nitrogen oxides demonstrates compliance with the current permit stipulated nitrogen oxides emission limit of 27.7 pounds per hour the three gas turbines that constitute this fuel burning installation (Permit #741853F, Condition 5).

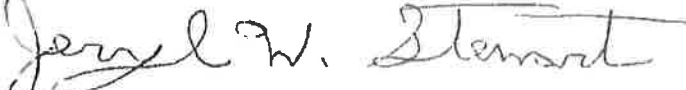
The measured sulfur concentration value of the fuel being combusted in this turbine, less than one ppm sulfur, demonstrates that this turbine was demonstrating compliance with either the sulfur dioxide emission standard of 150 ppm by volume at 15 percent oxygen and on a dry basis or the maximum fuel sulfur content of 0.8 percent by weight. These standards are set forth in Paragraph 1200-3-16-.31 (4) of the Regulations (40 CFR 60.333). This also demonstrates compliance with the current permit stipulated sulfur dioxide emission limits of four ppm of sulfur dioxide corrected to 15 percent oxygen and on a dry basis and 1.47 pounds per hour (Permit #741853F, Condition 4).

The Division considers that this source test report is acceptable as a demonstration of compliance and from the data presented considers that this turbine has met the stipulated testing requirements and is in compliance with the applicable nitrogen oxides and sulfur dioxide emission standards. In addition, as the nitrogen oxides emission rate was less than fifty percent of the applicable federal emission standard, the testing requirement for the other two turbines located at this fuel burning installation is waived pursuant to the EPA letter dated September 19, 1996.

Mr. Ted Wurfel  
Tenneco Energy  
Station 3110 Unit 3A  
April 28, 1996  
page 3 of 3

If you have any questions concerning the matters addressed by this letter, please contact Mr. Jeryl W. Stewart at (615) 532-0605.

Sincerely,



for John W. Walton, P.E.  
Technical Secretary  
Tennessee Air Pollution Control Board

attachment - 1

cc: Knoxville Field Office

ATTACHMENT 1

Summary of Turbine Operation

Station 3110 Unit 3A

Test Date November 20, 1996

Turbine 3A heat input during test 13.9 MMBtu/hr

Rated heat input capacity for this turbine 14.45 MMBtu/hr  
(from April 4, 1994 permit application)

Turbine 3A turbine horsepower during test 1,209 BHP

Rated turbine horsepower for this turbine 1,300 BHP  
(from April 4, 1994 permit application)



**COMPLIANCE TEST REPORT  
for  
THE SOLAR SATURN TURBINES  
at  
TENNESSEE GAS PIPELINE STATION 3110  
Wartburg, TN**

November 25, 1996

Prepared for the  
**STATE OF TENNESSEE  
DEPARTMENT OF HEALTH AND ENVIRONMENT**

By

**Richard C. Schoonover  
Research Engineer**

**TENNECO ENERGY  
ENVIRONMENTAL, HEALTH, SAFETY AND  
TECHNICAL SERVICES**

**5510 South Rice Avenue  
Houston, TX 77081  
(713) 662-5335**

**Emissions Test Report for  
Compliance Testing at  
Station 3110 Wartburg, Tennessee**

**INTRODUCTION**

The three Solar Saturn turbines at Station 3110 have been uprated from T-1100 units to T-1360 units. The Environmental, Health, Safety and Technology Services Department of Tenneco Energy conducted testing to determine the exhaust emission rates for oxides of nitrogen (NOx). The corrected NOx emissions level fell below the 75 ppm threshold set by the EPA, thereby allowing the data collected during the compliance test will to be used as representative data for the other two Solar Saturn turbines at the station. The test was conducted in basic accordance with approved Environmental Protection Agency (EPA) test methods as described in the Code of Federal Regulations, Title 40, Part 60, Appendix A and Tenneco Energy's test protocol.

**TEST SUMMARY**

The results of the emissions compliance test performed on November 20, 1996 at East Tennessee Natural Gas compressor station 3110, in Wartburg, Tennessee are summarized below. The two-minute averages, collected during the test, analyzer calibrations, and certification sheets, are included in the appendices of this report.

**Table I:**

Run #	Completion Time	Ambient Rated Horsepower	Exhaust Oxygen Content	Corrected NOx ppm Level
1	10:30 am	1,215	16.65%	54.9
2	11:58 am	1,209	16.65%	55.5
3	1:25 pm	1,202	16.65%	56.4
Average		1,208.6	16.65%	55.6

Additionally, a fuel gas sample was collected and analyzed for the overall sulfur content of the gas. The sulfur content of the fuel gas was below 0.0001% by weight. The results of the analysis are listed in the appropriate section of the Appendices.

**SECTION I**

***Summary of Test Results***



**TABLE A-2**  
**Gas-Fired Turbines**  
**Hourly and Annual Emission Estimates**

Source	Wartburg				
Unit	3110-01:3111-03				
Type	turbine				
Make	Solar				
Model	T-1360				
Fuel	Natural Gas				
Fuel Higher Heating Value (HHV)	1,020 BTU/scf			1,020 BTU/scf	
Ambient Temperature	59 °F			0 °F	
Power Output	1,313 bhp (mech.) 979 kW (elec.)			1,466 bhp (mech.) 1,093 kW (elec.)	
Heat Rate at HHV	12,507 BTU/hp-hr			12,354 BTU/hp-hr	
Operating Hours	8,760 hrs/yr				
Fuel Consumption	16,095 scfh 140.995 MMscf/yr			17,756 scfh	
Heat Input at HHV	16.42 MMBTU/hr 143,815 MMBTU/yr			18.11 MMBTU/hr	
		Avg. Hourly	Max. Annual		Max. Hourly
NO <sub>x</sub>	291.32 lb/MMscf	4.6889 lb/hr	20.5375 tpy	272.49 lb/MMscf	4.8385 lb/hr
CO	220.35 lb/MMscf	3.5465 lb/hr	15.5338 tpy	657.38 lb/MMscf	11.6727 lb/hr
SO <sub>2</sub>	3.47 lb/MMscf	0.0558 lb/hr	0.2445 tpy	3.47 lb/MMscf	0.0616 lb/hr
PM <sub>10</sub>	6.73 lb/MMscf	0.1084 lb/hr	0.4746 tpy	6.73 lb/MMscf	0.1195 lb/hr
TOC (Total)	10.62 lb/MMscf	0.1709 lb/hr	0.7487 tpy	139.68 lb/MMscf	2.4802 lb/hr
Methane	8.30 lb/MMscf	0.1336 lb/hr	0.5854 tpy	109.20 lb/MMscf	1.9391 lb/hr
Ethane	0.29 lb/MMscf	0.0047 lb/hr	0.0204 tpy	3.81 lb/MMscf	0.0676 lb/hr
VOC (Total)	2.03 lb/MMscf	0.0326 lb/hr	0.1429 tpy	26.67 lb/MMscf	0.4735 lb/hr
HAP (Total)	0.99 lb/MMscf	0.0160 lb/hr	0.0699 tpy	13.05 lb/MMscf	0.2316 lb/hr
Acetaldehyde	3.86E-02 lb/MMscf	0.0006 lb/hr	0.0027 tpy	5.08E-01 lb/MMscf	0.0090 lb/hr
Acrolein	6.18E-03 lb/MMscf	0.0001 lb/hr	0.0004 tpy	8.13E-02 lb/MMscf	0.0014 lb/hr
Benzene	1.16E-02 lb/MMscf	0.0002 lb/hr	0.0008 tpy	1.52E-01 lb/MMscf	0.0027 lb/hr
Butadiene (1,3-)	4.15E-04 lb/MMscf	0.0000 lb/hr	0.0000 tpy	5.46E-03 lb/MMscf	0.0001 lb/hr
Ethylbenzene	3.09E-02 lb/MMscf	0.0005 lb/hr	0.0022 tpy	4.06E-01 lb/MMscf	0.0072 lb/hr
Formaldehyde	6.86E-01 lb/MMscf	0.0110 lb/hr	0.0483 tpy	9.02E+00 lb/MMscf	0.1601 lb/hr
Naphthalene	1.26E-03 lb/MMscf	0.0000 lb/hr	0.0001 tpy	1.65E-02 lb/MMscf	0.0003 lb/hr
PAH	2.12E-03 lb/MMscf	0.0000 lb/hr	0.0001 tpy	2.79E-02 lb/MMscf	0.0005 lb/hr
Propylene Oxide	2.80E-02 lb/MMscf	0.0005 lb/hr	0.0020 tpy	3.68E-01 lb/MMscf	0.0065 lb/hr
Toluene	1.26E-01 lb/MMscf	0.0020 lb/hr	0.0088 tpy	1.65E+00 lb/MMscf	0.0293 lb/hr
Xylenes	6.18E-02 lb/MMscf	0.0010 lb/hr	0.0044 tpy	8.13E-01 lb/MMscf	0.0144 lb/hr

**NOTES**

1. Fuel higher heating value selected to correspond to AP-42 emissions factors, but representative of gas in Tennessee.
2. Manufacturer provided data on: power output, heat rate, along with NO<sub>x</sub>, CO, and UHC (or TOC) emissions.
3. The average annual temperature for Nashville, TN (59°F) was extracted from USEPA's TANKS program and 55°F is used as the temperature appropriate for estimating annual emissions. A temperature of 0°F is used to estimate maximum hourly emissions.
4. With the exception of NO<sub>x</sub>, CO, TOC, and TAPs, emissions based data provided in Table 3.1-1 of AP-42 (dated 4/00).
5. Speciated TAP emissions based on data provided in Table 3.1-3 of AP-42 (dated 4/00).
6. Methane, Ethane, VOC, HAP, and Speciate TAP AP-42 emission factors were scaled based on manufacturer's data for TOC:

$$EF_{Scaled} = (EF_{AP42})(EF_{TOC}/EF_{TOC-AP42})$$

63.6  
153.3