



**Allegheny County
Health Department**

Allegheny Energy Center Invenergy Air Permit Public Information Presentation

Elizabeth Township

May 4, 2021

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Section Chief, Engineering**



Agenda

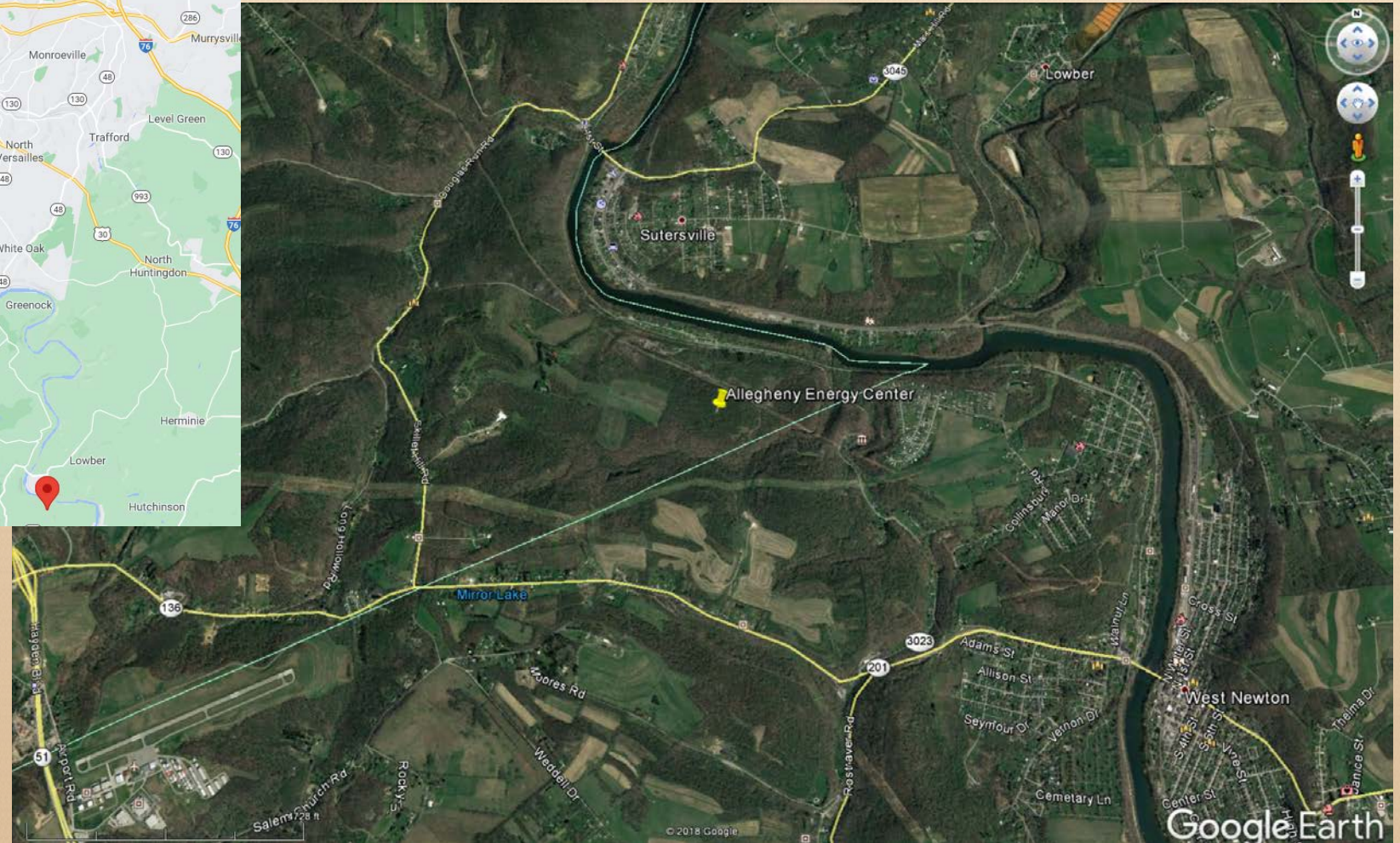
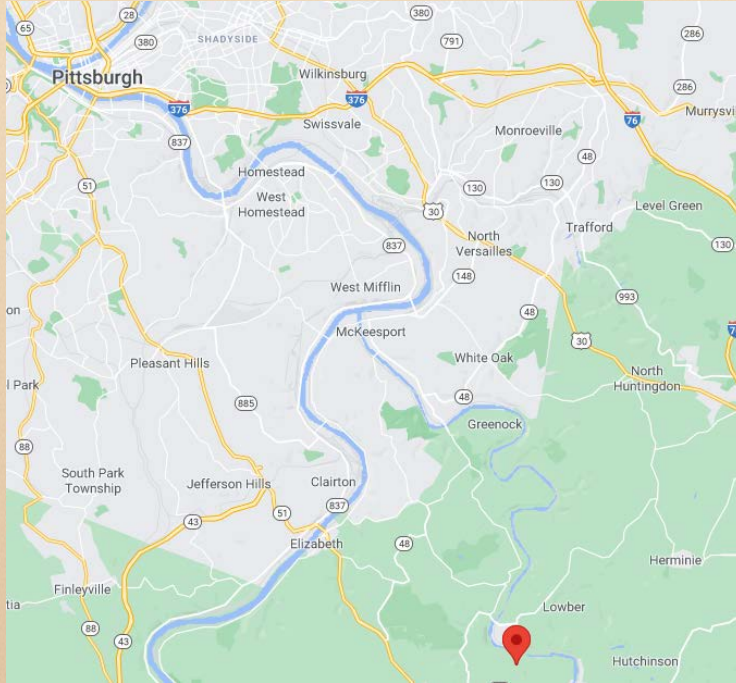
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- ▶ **Overview of the Proposed Installation**
- ▶ **Description of the Air Permit and Parts**
- ▶ **Overview of Permit Requirements**
- ▶ **How You Can Find Information and Make Comments**
- ▶ **Q&A**



Project Location

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Terminology

- ▶ NO_x = Nitrogen Oxides
- ▶ SO_x = Sulfur Oxides
- ▶ VOC = Volatile Organic Compounds
- ▶ CO = Carbon Monoxide
- ▶ NH_3 = Ammonia
- ▶ HAP = Hazardous Air Pollutants
- ▶ MW = Megawatt
- ▶ tpy = Tons per year
- ▶ lb/hr = Pounds per hour
- ▶ MMBtu = Millions of British Thermal Units
- ▶ CFR = Code of Federal Regulations
- ▶ PSD = Prevention of Significant Deterioration
- ▶ NSR = New Source Review
- ▶ PJM = Pennsylvania, Jersey, Maryland Power Pool



Combined Cycle Power Turbine

- **Natural gas-fired combined cycle power plant**
- **1x1 configuration: 1 gas turbine x 1 steam turbine, 639 MW:**
 - Heat recovery steam generator (HRSG) with supplementary natural gas-fired duct burners (DBs)
- **Control technology:**
 - Selective Catalytic Reduction (SCR) for NO_x control
 - Low-NO_x burners
 - Oxidation catalyst for CO and VOC control
- **PJM Electrical Grid Interconnection**
- **Project will use Air Cooled Condensers (ACC) for cooling system**
- **Gas supply via existing interstate pipeline.**



What is a Combined-Cycle Power Plant?

1. Gas turbine burns fuel:

- ▶ The gas turbine compresses air and mixes it with fuel that is heated to a very high temperature. The hot air-fuel mixture moves through the gas turbine blades, making them spin.
- ▶ The fast-spinning turbine drives a generator that converts a portion of the spinning energy into electricity.

2. Heat recovery system captures exhaust:

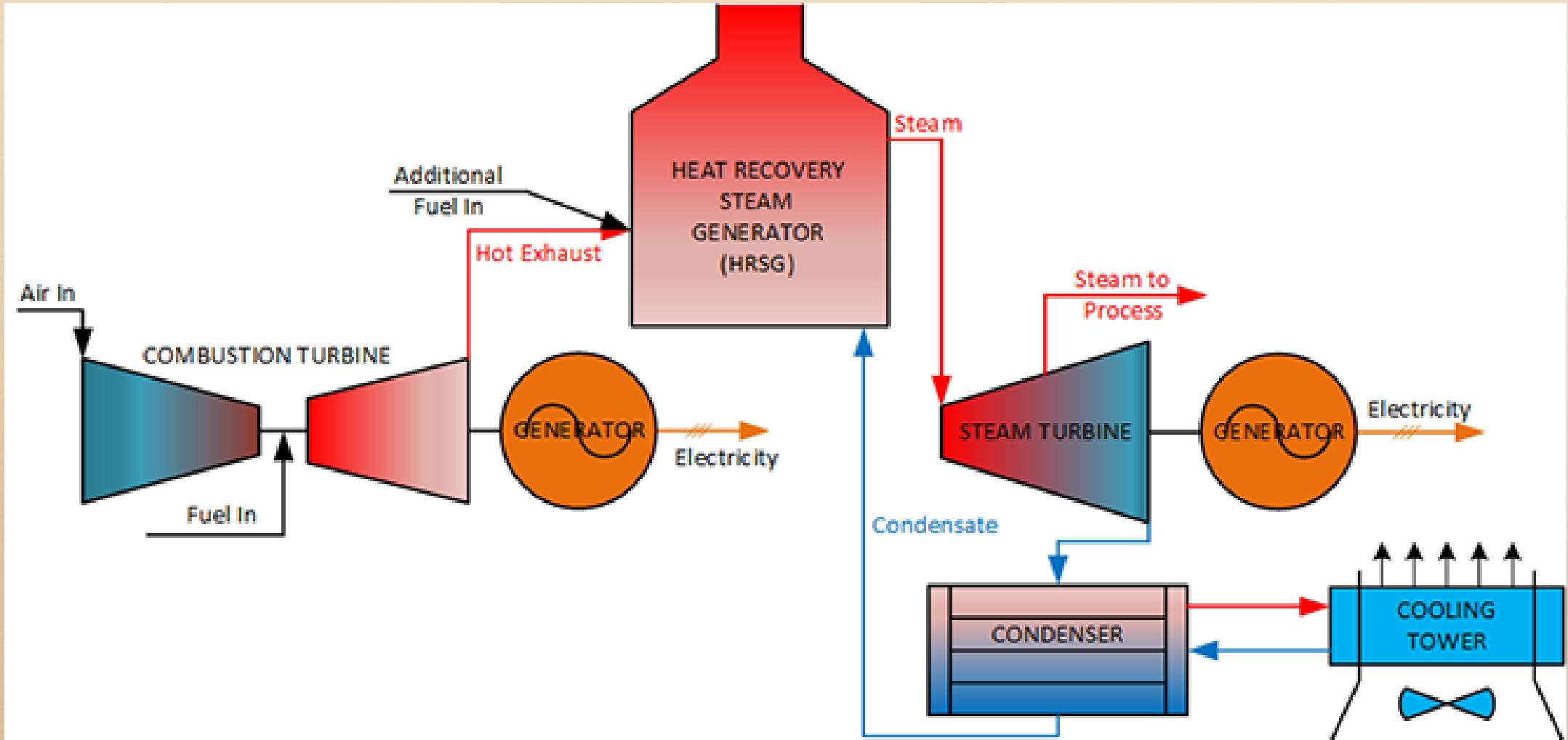
- ▶ A heat recovery steam generator (HRSG) captures exhaust heat from the gas turbine that would otherwise escape through the exhaust stack.
- ▶ The HRSG creates steam from the gas turbine exhaust heat and delivers it to the steam turbine.

3. Steam turbine delivers additional electricity:

- ▶ The steam turbine sends its energy to the generator drive shaft, where it is converted into additional electricity.



What is a Combined-Cycle Power Plant?





What are the Emissions?

- ▶ **NO_x (nitrogen oxides) – formed under high heat when oxygen reacts with nitrogen in the air. Combines with VOC to make ozone (smog)**
- ▶ **SO_x (sulfur oxides) – formed when sulfur in the fuel reacts with oxygen**
- ▶ **CO (carbon monoxide) – formed when carbon in the fuel does not completely react with oxygen.**
- ▶ **VOC (volatile organic compounds) – fuel that is not completely burned**
- ▶ **CO₂ (carbon dioxide) – a by-product of combustion**



What are the Emissions? (cont'd.)

- ▶ NH_3 (ammonia) – used in the NO_x control process; some can be emitted.
- ▶ H_2SO_4 (sulfuric acid mist) – formed when SO_x reacts with NH_3 at low temperatures.
- ▶ HAP (hazardous air pollutants) – found in fuels such as natural gas that are not easily destroyed by combustion.
 - Formaldehyde
 - Benzene
 - Ethylbenzene
 - Toluene
 - Xylene



How Are Emissions Controlled?

- ▶ **Low NO_x burners**

- ▶ Control air and fuel mixing to lower flame temperature.

- ▶ **Oxidation Catalyst**

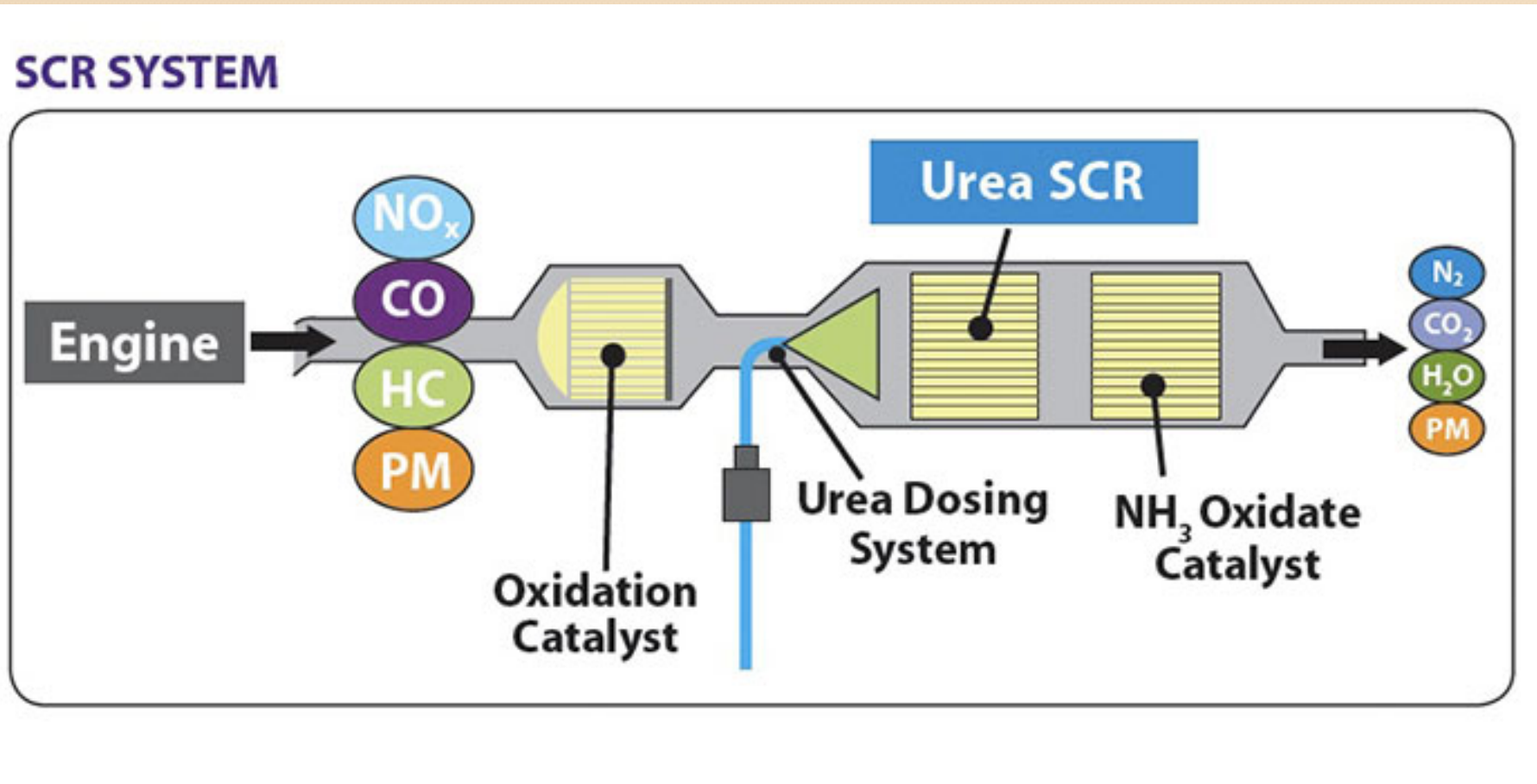
- ▶ Takes hydrocarbon emissions (VOC) and CO and oxidizes them into H₂O and CO₂.

- ▶ **Selective Catalytic Reduction (SCR)**

- ▶ Reacts NO_x with ammonia (NH₃) to make N₂ and H₂O.



How Are Emissions Controlled?





Other Associated Equipment

- ▶ **Duct Burners** – increase the heat energy of the turbine exhaust to increase the output of the heat-recovery steam generator (these are permitted with the combustion turbine).
- ▶ **Emergency Generator** – 2,000 kW, uses ultra-low sulfur diesel, and is limited to 100 hours/year of operation.
- ▶ **Fire Water Pump** – 1.9 MMBtu/hr, uses ultra-low sulfur diesel, and is limited to 500 hours/year of operation.
- ▶ **Auxiliary Boiler** – 88.7 MMBtu/hr, ultra-low-NO_x burners, flue gas recirculation.
- ▶ **Dew Point Heater** – 3.0 MMBtu/hr, keeps condensation from building up in the lines.
- ▶ **Tanks** – for ammonia (for the SCR), lubricating oil, diesel fuel.



Applicable Regulations

The following Federal, State, and County air quality standards have been incorporated into the permit:

- ▶ **Best Available Control Technology (BACT)**
- ▶ **Lowest Achievable Emission Rate (LAER)**
- ▶ **40 CFR Part 60 Subpart KKKK** – *Standards of Performance for Stationary Combustion Turbines.*
- ▶ **40 CFR Part 60, Subpart TTTT** – *Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units*
- ▶ **40 CFR Part 60, Subpart IIII** – *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.*
- ▶ **Part 63, Subpart YYYY** – *National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines.*



Summary of Emissions

INVENERGY	
POLLUTANT	ANNUAL EMISSION LIMIT (tons/year)
Particulate Matter	89
Nitrogen Oxides (NO _x)	146
Sulfur Oxides (SO _x)	24
Carbon Monoxide (CO)	170
Volatile Organic Compounds (VOC)	93
Sulfuric Acid Mist	17
Ammonia	98
Total Hazardous Air Pollutants (HAP)	11
Greenhouse Gases (CO ₂ e)	1,948,493



Summary of Emissions Comparison with Other Facilities

POLLUTANT	ANNUAL EMISSION LIMITS (tons/year)		
	Allegheny Energy (Invenergy) 639 MW	Springdale Energy 372 MW	Cheswick 637 MW
Particulate Matter	89	166	1,027
Nitrogen Oxides (NO _x)	146	210	5,629
Sulfur Oxides (SO _x)	24	53	13,923
Carbon Monoxide (CO)	170	550	581
Volatile Organic Compounds (VOC)	93	48	82.1
Sulfuric Acid Mist	17	6	187.9
Ammonia	98	245	49.5



Summary of Emissions Comparison with Neighbor

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POLLUTANT	ANNUAL EMISSION LIMIT (tons/year)	
	Allegheny Energy (Invenergy)	US Steel Clairton
Particulate Matter	89	1,365
Nitrogen Oxides (NO _x)	146	5,295
Sulfur Oxides (SO _x)	24	4,150
Carbon Monoxide (CO)	170	1,106
Volatile Organic Compounds (VOC)	93	370
Sulfuric Acid Mist	17	--
Ammonia	98	168



Parts of the Permit

- ▶ **For public comment, there are 3 documents for review:**
 - ▶ Draft Installation Permit
 - ▶ Draft Technical Support Document (TSD)
 - ▶ Calculation spreadsheet

- ▶ **For issuance, there is also a Comment/Response Document, which addresses all comments received, and whether a change was made to the permit due to the comment.**



Parts of the Permit (Cont'd.)

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- I. Contact Information
- II. Facility/Installation Description
- III. General Conditions
- IV. Site Level Conditions
- V. Emission Unit Level Conditions
- VI. Miscellaneous
- VII. Alternative Operating Scenarios
- VIII. Emissions Limitations Summary



Parts of the Permit (Cont'd.)

V.	EMISSION UNIT LEVEL TERMS AND CONDITIONS	19
A.	639 MEGAWATT COMBINED CYCLE POWER BLOCK (P001):	19
B.	EMERGENCY GENERATOR (EG01):	29
C.	AUXILIARY BOILER (B001):	32
D.	DEW POINT HEATER (H001):	35
E.	AQUEOUS AMMONIA STORAGE TANK (T001):	37
F.	LUBRICATING OIL STORAGE TANK (T002):	38
VI.	MISCELLANEOUS	39
A.	FIRE WATER PUMP (WP01)	39
B.	DIESEL STORAGE TANKS T003 AND T004	41
C.	SOURCES OF MINOR SIGNIFICANCE/OTHER MISCELLANEOUS SOURCES	42



Subsections of the Permit

- ▶ **Within each subsection of the Emission Unit Level Terms and Conditions Section, there are the following:**
 1. Restrictions
 2. Testing Requirements
 3. Monitoring Requirements
 4. Recordkeeping Requirements
 5. Reporting Requirements
 6. Work Practice Standards



Restrictions

- ▶ **Restrictions for the Combustion Turbine include:**
 - ▶ Emissions limits
 - ▶ Requirement to use only pipeline quality natural gas
- ▶ **Restrictions for the Emergency Generator and Fire Pump include:**
 - ▶ Limits on fuel use and hours of operation
 - ▶ Limits on sulfur content in the fuel
- ▶ **Restrictions for the Auxiliary Boiler and Dew Point Heater:**
 - ▶ Emissions limits
 - ▶ Limits on allowable fuel use
- ▶ **Restrictions on materials allowed to be stored in tanks**



Testing Requirements

- ▶ Annual testing of the Combustion Turbine for NO_x
- ▶ Testing for PM, PM_{10} , $\text{PM}_{2.5}$, SO_2 , CO, NH_3 , VOC, formaldehyde, and sulfuric acid mist at least once every 2 years
- ▶ Testing of the Auxiliary Boiler for NO_x every 5 years



Monitoring Requirements

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- ▶ Continuous emissions monitors for NO_x, CO, and O₂ on the Combustion Turbine
- ▶ Continuous monitoring of SCR operational parameters
- ▶ Meters to record the amount of fuel used in the Combustion Turbine, Auxiliary Boiler, Dew Point Heater
- ▶ Monitoring of sulfur content of the fuel used in the Combustion Turbine
- ▶ Non-resettable hour meters on the Emergency Generator and Fire Pump



Recordkeeping Requirements

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- ▶ **For the Combustion Turbine, recordkeeping includes the following:**
 - ▶ Records of operation, maintenance, inspections, fuel usage, steam load, and startups/shutdowns
 - ▶ Records of all air pollution control system performance evaluations and all records of calibration checks, adjustments, and maintenance performed
- ▶ **For the Emergency Generator and Fire Pump:**
 - ▶ Records of hours of operation and fuel shipments
 - ▶ Records of diesel fuel certifications from fuel suppliers



Recordkeeping Requirements (cont'd.)

- ▶ **For the Auxiliary Boiler and Dew Point Heater:**
 - ▶ Records of the amount of natural gas combusted, cold starts, total operating hours, and records of operation, maintenance, inspection, and calibration of equipment
- ▶ **For the Tanks:**
 - ▶ Records of throughput and inspections
- ▶ **Additional:**
 - ▶ Amount of sulfur hexafluoride (SF₆) dielectric added to each circuit breaker unit on a monthly basis
 - ▶ Records if a circuit breaker is activated



Reporting Requirements

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- ▶ **The facility will be required to submit reports every 6 months, including:**
 - ▶ Results from the continuous emissions monitors
 - ▶ Total operating hours of the Emergency Generator and Fire Pump
 - ▶ Fuel use
 - ▶ Throughput in the tanks
 - ▶ Maintenance records



Where Can I Find the Permit Draft?

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- ▶ Copies of the permit draft may be found on the ACHD website:

<https://www.alleghenycounty.us/Health-Department/Programs/Air-Quality/Public-Comment-Notices.aspx>

- ▶ Call (412) 578-8115 to request a copy



How Can I Comment on the Permit?

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1. Submit your comments in writing to the ACHD at

Air Quality Program
301 39th Street
Building #7
Pittsburgh, PA 15201

1. Submit comments via email to AQPermits@alleghenycounty.us
2. Register for the virtual hearing on June 8 and give them orally



Questions?

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