

Commonwealth of Kentucky
Division for Air Quality
STATEMENT OF BASIS / SUMMARY

Title V, Operating
PERMIT ID: V-24-037
DTE Calvert City, LLC
480 N. Main Street, Calvert City, KY 42029
December 9, 2024
Durga Patil, Permit Review Branch

SOURCE ID: 21-157-00070
AGENCY INTEREST: 111104
ACTIVITY: APE20210001

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SECTION 1 - SOURCE DESCRIPTION

SIC Code and description: 4961, Steam and Air-Conditioning Supply.

Single Source Det. Yes No If Yes, Affiliated Source AI:

Source-wide Limit Yes No If Yes, See Section 4, Table A

28 Source Category Yes No If Yes, Category:

County: Marshall

Nonattainment Area N/A PM₁₀ PM_{2.5} CO NO_x SO₂ Ozone Lead
If yes, list Classification:

PTE* greater than 100 tpy for any criteria air pollutant Yes No
If yes, for what pollutant(s)?
 PM₁₀ PM_{2.5} CO NO_x SO₂ VOC

PTE* greater than 250 tpy for any criteria air pollutant Yes No
If yes, for what pollutant(s)?
 PM₁₀ PM_{2.5} CO NO_x SO₂ VOC

PTE* greater than 10 tpy for any single hazardous air pollutant (HAP) Yes No
If yes, list which pollutant(s):

PTE* greater than 25 tpy for combined HAP Yes No

*PTE does not include self-imposed emission limitations.

Description of Facility:

DTE Calvert City, LLC is a cogeneration facility to provide steam and electrical power. The facility will produce steam and electrical power for sale to existing facilities in the area and excess electrical power will be sold to a utility distribution system. The emission units include a Rental Boiler; Gas Turbine rated at 26 MW and two Heat Recovery Steam Generators. There are four operating scenarios for the plant; gas turbine plus both HRSG, gas turbine plus one HRSG, gas turbine alone, and both HRSG alone.

SECTION 2 – CURRENT APPLICATION AND EMISSION SUMMARY FORM

Permit Number: V-24-037
 Application Received: 11/29/2021

Activity: APE20210001
 Application Complete: 12/9/2024

Permit Action: Initial Renewal Significant Rev. Minor Rev. Administrative

Construction/Modification Requested? Yes No NSR Applicable? Yes No

Previous 502(b)(10) or Off-Permit Changes incorporated with this permit action Yes No

Description of Action:

- No changes at the facility since the issuance of the permit V-17-009 R1.
- Removed applicability of NESHAP YYYY, since the facility is not a major source of HAPs
- The facility did request the additional of rental air compressor to be brought on site for periods of time in case of major maintenance or break down of the existing air compressor and addition of rental portable generators. However, these have not been incorporated into the permit as these units are not currently on site and will be addressed through an off-permit change when needed.

| V-24-037 Emission Summary | | | | |
|--|-------------------|--------------------------------|--------------|----------------------------|
| Pollutant | 2023 Actual (tpy) | Previous PTE V-17-009 R1 (tpy) | Change (tpy) | Revised PTE V-24-037 (tpy) |
| CO | 156.06 | 324.6 | — | 324.6 |
| NO _x | 151.88 | 301.3 | | 301.3 |
| PT | 3.58 | 28.4 | | 28.4 |
| PM ₁₀ | 3.58 | 28.4 | | 28.4 |
| PM _{2.5} | 1.58 | 28.4 | | 28.4 |
| SO ₂ | 0.33 | 0.69 | | 0.69 |
| VOC | 6.56 | 17.4 | | 17.4 |
| Lead | 0.0093 | 0.0013 | | 0.0013 |
| Greenhouse Gases (GHGs) | | | | |
| Carbon Dioxide | 214,946 | 454,422 | — | 454,422 |
| Methane | 11.39 | 16.57 | | 16.57 |
| Nitrous Oxide | 5.04 | 9.52 | | 9.52 |
| CO ₂ Equivalent (CO ₂ e) | | 457,674 | | 457,674 |
| Hazardous Air Pollutants (HAPs) | | | | |
| Acetaldehyde | | 0.05 | — | 0.05 |
| Acrolein | | 0.008 | | 0.008 |
| Benzene | | 0.02 | | 0.02 |
| Ethyl Benzene | | 0.04 | | 0.04 |
| Formaldehyde | 0.852 | 1.26 | | 1.26 |
| Hexane | 1.377 | 4.82 | | 4.82 |
| Naphthalene | | 0.002 | | 0.002 |
| Propylene Oxide | | 0.04 | | 0.04 |
| Toluene | 0.146 | 0.16 | | 0.16 |
| Xylene | | 0.08 | | 0.08 |
| Combined HAPs: | | 6.47 | | 6.47 |

SECTION 3 – EMISSIONS, LIMITATIONS AND BASIS

| Emission Unit #1: RB1 Rental Boiler | | | | |
|--|-----------------------------------|--|---------------------------------------|---|
| Pollutant | Emission Limit or Standard | Regulatory Basis for Emission Limit or Standard | Emission Factor Used and Basis | Compliance Method |
| SO ₂ | 0.8 lb/MMBtu | 401 KAR 59:015, Section 5(1)(b) | 0.1747 lb/mmescf vendor specs | Assumed to be in compliance while burning natural gas |
| PM | 0.10 lb/MMBtu | 401 KAR 59:015, Section 4(1)(b) | 7.6 lb/mmescf AP-42, Chapter 1.4 | |
| | 20% Opacity | 401 KAR 59:015, Section 4(2) | N/A | |
| Initial Construction Date: Prior to January 13, 2003 | | | | |
| Process Description: | | | | |
| Model: Varies | | Primary Fuel: Natural Gas | | |
| Max Rated Capacity: 95 MMBtu/hr | | Controls: Low NOx burner | | |
| Applicable Regulation: | | | | |
| 401 KAR 59:015, New indirect heat exchangers, applies to RB1 (Rental Boiler). | | | | |
| 401 KAR 60:005, Section 2(2)(d), 40 C.F.R. 60.40c through 60.48c (Subpart Dc), Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, applies to RB1. | | | | |
| State Origin Requirements: | | | | |
| 401 KAR 63:020, Potentially hazardous matter or toxic substances. | | | | |
| Comments: | | | | |
| 401 KAR 63:002, Section 2(4)(iiii), 40 C.F.R. 63.7480 through 63.7575, Tables 1 through 13 (Subpart DDDDD), National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, is applicable to sources that are major for Hazardous Air Pollutants. Prior to the March 21, 2014 compliance date in 40 CFR 63, Subpart DDDDD, the source was established as an area source. Therefore, 40 CFR 63, Subpart DDDDD is not applicable. | | | | |
| 401 KAR 63:002, Section 2(4)(jjjjj), 40 C.F.R. 63.11193 through 63.11237, Tables 1 through 8 (Subpart JJJJJ), National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources, is not applicable as the source does not fire coal, biomass, or liquid fuels. | | | | |
| The total heat input of the two Heat Recovery Steam Generators (HRSGs) and the rental boiler while in operation will be limited to 620 MMBtu/hr higher heating value (HHV). See Section 4. Any boiler brought on site and operated under authorization of this emission unit shall be natural gas fired, equipped with low NO _x burners, and rated at less than or equal to 95 MMBtu/hr heat input capacity. Only one such boiler shall be allowed at any time. [401 KAR 52:020, Section 10] | | | | |
| Emission factors from Manufacturer’s specifications are used for NO _x and SO ₂ . Emission factors from AP-42 Chapter 1, Table 1.4-1, Table 1.4-2 and Table 1.4-3 are used for CO, PM ₁₀ , PM _{2.5} , PM, VOC, Lead, GHGs and HAPs. | | | | |

| Emission Unit #2: D-1 Gas Turbine 26 MW | | | | |
|---|--|--|---------------------------------------|---|
| Pollutant | Emission Limit or Standard | Regulatory Basis for Emission Limit or Standard | Emission Factor Used and Basis | Compliance Method |
| NO _x | ≤0.01095 percent by volume at 15% oxygen and on a dry basis (109.5 ppmvd at 15% O ₂) | 40 CFR 60.332(a)(1) and (b) | 89.97 lb/mmescf, vendor specs | CEMS |
| SO ₂ | Fuel shall not contain in excess of 0.8 weight percent sulfur | 40 CFR 60.333(b) | 0.1747 lb/mmescf vendor specs | Quarterly monitoring of Sulfur content of NG fired in the turbine |
| <p>Initial Construction Date: March 22, 1999</p> <p>Process Description: Model: GE LM-2500+ Primary Fuel: Natural Gas Rated Capacity: 276.6 MMBtu/hr (LHV) Controls: Dry Low NO_x Combustor</p> <p>Applicable Regulation: 401 KAR 51:220, CAIR NO_x ozone season trading program, applies to D-1 (26 MW Gas Turbine). 401 KAR 60:005, Section 2(2)(pp), 40 C.F.R. 60.330 through 60.335 (Subpart GG), Standards of Performance for Stationary Gas Turbines, applies to D-1 (26 MW Gas Turbine).</p> <p>Comments: Original application shows description fo the turbine as 26MW at 13.8KV (16 MW to chemical plant and 10 MW to the prower grid. Emission factors from Manufacturer’s specifications are used for NO_x and SO₂. Emission factors from AP-42 Chapter 3, Table 3.1-1, Table 3.1-2a and Table 3.1-3 are used for CO, PM₁₀, PM_{2.5}, PM, VOC, Lead, GHGs and HAPs. The initial performance test requirements of 40 CFR 63.335 were satisfied by the testing performed on May 2 – 4, 2000. The facility will not be in the CSAPR emissions trading program based on its continued CSAPR cogeneration exemption. See 40 CR Part 97.4(a)(1)(ii)(C) and 40 CFR 72.6(b)(4). 401 KAR 51:220 applies per Section 1.(2) of the regulation 401 KAR 51:220 effective 7-30-2018. 401 KAR 63:002, Section 2(4)(dddd), 40 C.F.R. 63.6080 through 63.6175, Tables 1 through 7 (Subpart YYYY), National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines, applies to D-1 (26 MW Gas Turbine). Subpart YYYY established limitations for HAP emissions from stationary combustion turbines located at major sources of HAP emissions, since the source is not a major source of HAPs, this regulation does not apply.</p> | | | | |

| Emission Unit #3 and #4: | | | | |
|---|-----------------------------------|--|---------------------------------------|--|
| D-3 Heat Recovery Steam Generator | | | | |
| D-4 Heat Recovery Steam Generator | | | | |
| Pollutant | Emission Limit or Standard | Regulatory Basis for Emission Limit or Standard | Emission Factor Used and Basis | Compliance Method |
| NO _x | 86 ng/J (0.20 lb/MMBtu) | 40 CFR 60.44b(h) and 40 CFR 60.44b(1)(1) | 50 lb/mmscf, vendor specs | CEMS |
| SO ₂ | 0.8 lb/MMBtu | 401 KAR 59:015, Section 5(1)(b) and Section 5(3) | 0.1747 lb/mmscf vendor specs | Assumed in compliance when burning natural gas |
| PM | 0.10 lb/MMBtu | 401 KAR 59:015, Section 4(1)(b) | 7.6 lb/mmscf AP-42, Chapter 1.4 | |
| | 20 % opacity | 401 KAR 59:015, Section 4(2) | N/A | |
| Initial Construction Date: March 22, 1999 | | | | |
| Process Description: | | | | |
| Model: Deltak Diamond Dino | | | | |
| Primary Fuel: Natural Gas | | | | |
| Rated Capacity: 262.7 MMBtu/hr (HHV) for Turbine Exhaust Fired mode; 310 MMBtu/hr (HHV) for Fresh Air Fired mode | | | | |
| Controls: Low NO _x Duct Burners | | | | |
| Applicable Regulation: | | | | |
| 401 KAR 51:160, NO _x requirements for large utility and industrial boilers, applies to D-3 and D-4 (Heat Recovery Steam Generators). | | | | |
| 401 KAR 51:220, CAIR NO _x ozone season trading program, applies to D-3 and D-4 (Heat Recovery Steam Generators). | | | | |
| 401 KAR 60:005, Section 2(2)(c), 40 C.F.R. 60.40b through 60.49b (Subpart Db), Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units, applies to D-3 and D-4 (Heat Recovery Steam Generators). | | | | |
| 40 CFR Part 75, Continuous Emission Monitoring. | | | | |
| State Origin Requirements: | | | | |
| 401 KAR 63:020, Potentially hazardous matter or toxic substances. | | | | |
| Precluded Regulation: | | | | |
| 401 KAR 51:210, CAIR NO _x annual trading program. This administrative regulation establishes requirements for the control of nitrogen oxides (NO _x) emissions from large boilers and turbines used in power plants, pursuant to the federal mandate published under the Clean Air Interstate Rule (CAIR), 40 CFR 96.101 to 96.188. This regulation applies to CAIR Nox units in Kentucky that are subject to 40 C.F.R. 96.104. Pursuant to 40 CFR 96.104(b), units in a State shall not be CAIR NO _x units if the following conditions are met: | | | | |
| (1) The unit qualifies as a cogeneration unit during the 12-month period starting on the date the unit first produces electricity and continuing to qualify as a cogeneration unit; and | | | | |

Emission Unit #3 and #4:

D-3 Heat Recovery Steam Generator

D-4 Heat Recovery Steam Generator

- (2) Not serving at any time since the start-up of the unit's combustion chamber, a generator with nameplate capacity of more than 25 MW supplying in any calendar year more than one-third of the unit's potential electric output capacity or 219,000 MWh, whichever is greater, to any utility power distribution system for sale.

The facility is a cogeneration unit and the permit has a federally enforceable operating limitation restricting the sale of electricity to any utility power distribution system to 219,000 MWh or less and so 401 KAR 51:210 is precluded.

401 KAR 60:005, Section 2(2)(b), 40 C.F.R. 60.40Da through 60.52Da (Subpart Da), Standards of Performance for Electric Utility Steam Generating Units. The affected facility to which this subpart applies is each 'electric utility steam generating unit' which is defined as any steam electric generating unit that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than 25 MW net-electrical output to any utility power distribution system for sale. Also, any steam supplied to a steam distribution system for the purpose of providing steam to a steam-electric generator that would produce electrical energy for sale is considered in determining the electrical energy output capacity of the affected facility. All the steam produced in the steam generators HRSG will be exported to chemical facility, no electricity will be produced using HRSG steam. Thus the HRSGs are not 'electric utility steam generating unit'. Also, 25MW for a year is equivalent to $25 \times 8760 = 219,000$ MWh. The facility has taken a limit that combined cycle gas turbine shall not supply for sale more than 219,000 MWh electrical output to any utility power distribution system.

Comments:

401 KAR 51:220 applies per Section 1.(2) of the regulation 401 KAR 51:220 effective 7-30-2018.

In order to preclude applicability of 401 KAR 51:210, *CAIR NO_x annual trading program*, and 40 CFR 60, Subpart Da, *Standards of Performance for Electric Utility Steam Generating Units for which Construction is Commenced After September 19, 1978* to the HRSG, the combined cycle gas turbine shall not supply for sale more than 219,000 MWh electrical output to any utility power distribution system.

The HRSG boilers are exempt from CSAPR ozone season requirements as the facility is not in the CSAPR emissions trading program based on its continued CSAPR cogeneration exemption. See 40 CR Part 97.4(a)(1)(ii)(C) and 40 CFR 72.6(b)(4).

Emission Unit #5: D-5 Emergency Engine (Diesel)

Initial Construction Date: April 2021

Process Description:

Model: Cummins QSK60-G6 NR2
Power Output: 2,992 HP

Primary Fuel: Diesel
Controls: None

Applicable Regulation:

401 KAR 60:005, Section 2(2)(dddd) 40 C.F.R. 60.4200 through 60.4219, Tables 1 through 8 (Subpart IIII), Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, applies to D-5 Emergency engine.

401 KAR 63:002, Section 2(4)(eeee), 40 C.F.R. 63.6580 through 63.6675, Tables 1a through 8, and Appendix A (Subpart ZZZZ), National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, applies to D-5 Emergency engine.

Comments:

Emission factors for NO_x, VOC, CO, SO₂, PM are from manufacturer specifications, emission of HAPs are calculated used emission factor in AP-42, Chapter 3.4-3.

Testing Requirements/Results.

N/A

SECTION 4 – SOURCE INFORMATION AND REQUIREMENTS

Table A - Group Requirements:

| Emission and Operating Limit | Regulation | Emission Unit |
|---|---|----------------------|
| Combined cycle gas turbine shall not supply for sale more than 219,000 MWh electrical output to any utility power distribution system | 401 KAR 51:210, CAIR NO _x annual trading program | D-3, D-4 |
| | 40 CFR 60, Subpart Da, Standards of Performance for Electric Utility Steam Generating Units | |
| Total heat input of the HRSGs and rental boiler limited to 620 mmBtu/hr HHV | 401 KAR 52:020, Section 10 | RB1, D-3, D-4 |

Table B - Summary of Applicable Regulations:

| Applicable Regulations | Emission Unit |
|---|----------------------|
| 401 KAR 51:160, NO _x requirements for large utility and industrial boilers | D-1, D-3, D-4 |
| 401 KAR 51:220, CAIR NO _x ozone season trading program | D-1, D-3, D-4 |
| 401 KAR 59:015, New indirect heat exchangers | RB1, D-3, D-4 |
| 401 KAR 60:005, Section 2(2)(c), 40 C.F.R. 60.40b through 60.49b (Subpart Db), Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units | D-3, D-4 |
| 401 KAR 60:005, Section 2(2)(d), 40 C.F.R. 60.40c through 60.48c (Subpart Dc), Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units | RB1 |
| 401 KAR 60:005, Section 2(2)(pp), 40 C.F.R. 60.330 through 60.335 (Subpart GG), Standards of Performance for Stationary Gas Turbines | D-1 |
| 401 KAR 60:005, Section 2(2)(dddd) 40 C.F.R. 60.4200 through 60.4219, Tables 1 through 8 (Subpart IIII), Standards of Performance for Stationary Compression Ignition Internal Combustion Engines | D-5 |
| 401 KAR 63:002, Section 2(4)(eeee), 40 C.F.R. 63.6580 through 63.6675, Tables 1a to 8, and Appendix A (Subpart ZZZZ), National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines | D-5 |
| 401 KAR 63:020, Potentially hazardous matter or toxic substances | RB1, D-3, D-4 |
| 40 CFR Part 75, Continuous Emission Monitoring | D-3, D-4 |

Table C - Summary of Precluded Regulations:

| Precluded Regulations | Emission Unit |
|---|----------------------|
| 401 KAR 51:210, CAIR NO _x annual trading program | D-3, D-4 |
| 401 KAR 60:005, Section 2(2)(b), 40 C.F.R. 60.40Da through 60.52Da (Subpart Da), Standards of Performance for Electric Utility Steam Generating Units | D-3, D-4 |

Table D - Summary of Non Applicable Regulations:

N/A

Air Toxic Analysis

N/A

Single Source Determination

N/A

SECTION 5 - PERMITTING HISTORY

| Permit | Permit Type | Activity# | Complete Date | Issuance Date | Summary of Action | PSD/Syn Minor |
|-------------|----------------|-------------|---------------|---------------|------------------------------|---------------|
| V-11-045* | Initial | APE20110001 | 5/24/2011 | 6/14/2012 | Title V Operating Permit | N/A |
| V-17-009 | Renewal | APE20160001 | 1/24/2017 | 6/23/2017 | Renewal | |
| V-17-009 R1 | Minor Revision | APE20200001 | 9/22/2020 | 5/31/2021 | Addition of emergency engine | |

* Units relating to the cogeneration facility were initially owned and operated by Air Products and Chemicals, Inc. (APCI). Contemporaneous netting Analysis was conducted to determine PSD applicability prior to the issuance of the permit F-99-004. APCI (AI 2915) used emissions decreases resulting from the shutdown of two existing coal-fired boilers and three indirect heat exchangers. The emission units (turbine and HRSGs) were authorized by federally-enforceable Permit F-99-004 issued on October 1, 1999. The addition of the rental boiler was authorized in permit VS-03-004 as a significant revision, with emissions from the boiler being less than the significant emissions increase that would trigger additional review under 401 KAR 51:017. Ownership of these units were transferred to DTE Calvert city in 2011.

SECTION 6 – PERMIT APPLICATION HISTORY:

N/A

APPENDIX A – ABBREVIATIONS AND ACRONYMS

| | |
|-------------------|---|
| AAQS | – Ambient Air Quality Standards |
| BACT | – Best Available Control Technology |
| Btu | – British thermal unit |
| CAM | – Compliance Assurance Monitoring |
| CO | – Carbon Monoxide |
| Division | – Kentucky Division for Air Quality |
| ESP | – Electrostatic Precipitator |
| GHG | – Greenhouse Gas |
| HAP | – Hazardous Air Pollutant |
| HF | – Hydrogen Fluoride (Gaseous) |
| HHV | – Higher Heating Value |
| HRSR | – Heat Recovery Steam Generator |
| MSDS | – Material Safety Data Sheets |
| mmHg | – Millimeter of mercury column height |
| NAAQS | – National Ambient Air Quality Standards |
| NESHAP | – National Emissions Standards for Hazardous Air Pollutants |
| NO _x | – Nitrogen Oxides |
| NSR | – New Source Review |
| PM | – Particulate Matter |
| PM ₁₀ | – Particulate Matter equal to or smaller than 10 micrometers |
| PM _{2.5} | – Particulate Matter equal to or smaller than 2.5 micrometers |
| PSD | – Prevention of Significant Deterioration |
| PTE | – Potential to Emit |
| SO ₂ | – Sulfur Dioxide |
| TF | – Total Fluoride (Particulate & Gaseous) |
| VOC | – Volatile Organic Compounds |