CPV Valley Energy Center
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January 9, 2023

VIA US AND ELECTRONIC MAIL

Mr. Daniel Whitehead
Division Director
Department of Environmental Conservation
Division of Environmental Permits
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Albany, NY 12233-1750
(daniel.whitehead@dec.ny.gov)

RE: CPV Valley, LLC – CPV Valley Energy Center Title V and Title IV Permit Applications DEC ID 3-3356-00136/000010 & 00009— Response to August 24, 2022 Second Request for Additional Information.

Dear Director Whitehead,

As you know, CPV Valley, LLC ("Valley" or "Applicant") has submitted applications for a Title V and IV (Phase II Acid Rain) permit (collectively, the "Application") under the Clean Air Act and Article 19 of the New York Environmental Conservation Law ("ECL") for its state-of-the-art 630-megawatt ("MW") natural gas-fired combined cycle generating station located in Wawayanda, Orange County, New York (the "Facility"). This letter serves as Valley's response to the New York State Department of Environmental Conservation's ("NYSDEC" or "Department") August 24, 2022 Second Request for Additional Information.[1]

NYSDEC REQUEST 1

NYSDEC Request 1. "*In the RFI, the Department requested additional detail on CPV's calculations of upstream GHG emissions associated with the Facility. The RFI Response indicated that CPV utilized DEC-provided emission factors for the calculation of such upstream emissions, specifically a document entitled 'Preliminary Interim Draft Emission Factors for Use by State agencies and Project Components,' dated February 2021. Since that time, DEC released the 2021 Statewide GHG Emissions Report, as required by the Climate Act. This includes Appendix A: Emission Factors for Use by State Agencies and Applicants (Appendix A). Please update CPV's analysis of upstream GHG emissions to utilize and cite to the emission factors in Appendix A.*"

[1] Valley continues to reserve all rights to challenge NYSDEC's revocation of its May 2019 application completeness determination and any other violations of the Uniform Procedures Act set forth in all prior communications.

Valley Response to Request 1. Valley has commissioned ICF to update its March 8, 2022 GHG Analysis Report to incorporate the new emissions factors set forth in Appendix A of the Department's 2021 Statewide GHG Emissions Report. The updated analysis is annexed hereto as **Attachment 1**.[2]

NYSDEC REQUEST 2

NYSDEC Request 2. "*...please provide an assessment of additional GHG mitigation measures at the Facility. This should include consideration of GHG mitigation measures that could be employed at the Facility immediately upon any permit issuance to CPV. Such potential GHG mitigation measures may include permit limits or phase downs on the operation of the Facility. Such GHG permit conditions could also include limits on the hours of operation of the Facility, limits on the fuel input at the Facility, or limits on the GHG emissions from the Facility, each of which could serve as GHG mitigation measures.*"

Valley Response to Request 2.

Recently adopted NYSDEC Program Policy requires that an explanation of potential alternatives or mitigation measures be prepared if the Department determines that a proposed project would be inconsistent with or would interfere with the attainment of the Statewide GHG emission limits but that there is sufficient justification for the project.

The Valley Energy Center is precisely the type of highly efficient and dispatchable generation that is required to reliably transition the State of New York to the increased use of intermittent renewable generation and energy storage to meet the CLCPA. While there is no support that Valley's continued operation under a new Title V permit would be inconsistent with or would interfere with the attainment of the Statewide GHG emission limits, should the Department make such a determination, Valley offers for the Department's consideration both an immediate mitigation measure as well as a longer term process in consultation with the Department for Valley to achieve GHG reductions consistent with the CLCPA.

Immediately Employable GHG Mitigation Measures

If additional GHG mitigation is required, Valley offers to accept a permit condition that requires 100% of the Valley Energy Center's natural gas fuel input to be procured with MiQ Standard certified natural gas ("MiQ Certified Gas") with Grade A Certificates ("MiQ Certificates") from the MiQ Digital Registry or if MiQ Certified Gas or such MiQ Certificates are no longer available, then a similar grade of certified natural gas and certificates from a reputable independent third party provider. Grade A MiQ Certified Gas provides for (i) the lowest calculated methane intensity, (ii) the most frequent auditing by accredited 3rd party certifying bodies, and

[2] ICF's GHG Analysis Report also provides upstream GHG emissions calculations based on NYSDEC's 2022 emissions factors set forth in Appendix A of the *2022 Statewide GHG Emissions Report*.

(iii) the most stringent policies and procedures for methane emissions management encompassed within the MiQ Standard.

After careful consideration of immediately employable GHG mitigation measures, Valley has concluded that purchasing MiQ Certified Gas for its natural gas requirements at the Valley Energy Center is a meaningful and independently verifiable GHG mitigation measure. Broadly, MiQ Certified Gas is natural gas that has been verified by an independent 3rd party to have been produced in a manner consistent with certain environmental, social and governance standards that results in a significantly reduced GHG emission impacts. One of the fundamental goals of natural gas certification is to reduce methane emissions while providing companies measurable verification that they are making impactful changes to natural gas facilities operations. Methane emissions are 84x as potent with respect to climate impacts as CO2 over a 20-year period,[3] so certified upstream methane emission reductions from MiQ Certified Gas are a material GHG mitigation measure.

The MiQ Standard is an independent framework for assessing methane emissions that occur as a result of the production of natural gas.[4] MiQ is an independent, not for profit foundation that was established for the primary purpose of accelerating methane emissions reductions in the natural gas sector.

Currently, MiQ is certifying approximately 15 bcf/day of natural gas in the United States representing approximately 4% of global natural gas production.

The MiQ Standard established an A – F grading system for methane emissions that independent 3rd party auditors use during the certification process for natural gas facilities. The A – F grading system is based on three criteria:

1. Methane Intensity;
2. Monitoring Technology Deployment; and
3. Company Practices.

As defined by the MiQ Standard, methane intensity is the ratio of methane emissions produced relative to the amount of natural gas produced, which is a baseline indicator of methane emissions performance. Methane intensity is a significant criterion in that it provides an indication of whether a natural gas facility's design will achieve minimal inherent methane emissions, and to the greatest extent possible, eliminates the potential for fugitive methane emissions.

The MiQ Standard, certification process, and GHG reduction potential is discussed fully in MiQ's Technical Documents.[5]

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[3] 6 NYCRR § 496.5 (setting forth carbon dioxide equivalent value for GHGs as provided by the IPCC using GWP20).
[4] Accessible at https://miq.org/regulators-and-governments/.
[5] Accessible at https://miq.org/documents/.

By way of example, utilizing Appendix A Table A1 "Emission Factors for Use by State Agencies and Applicants" from the 2021 Statewide GHG Emissions Report ("Appendix A") referenced in NYSDEC Request #1 above, and utilizing the Emission Factors for MiQ Certified Gas, based on the Valley Energy Center's average annual natural gas consumption of approximately 32,500,000 MMBtu-Year (rounded) for the years 2020 – 2022, Valley can reduce its upstream total annual CO_{2e} by nearly 1 million metric tons per year using MiQ Certified Gas. This represents an approximate 70% reduction in upstream total annual CO_{2e} as compared to Appendix A 2021 Emission Factors utilized by the Department. Calculations comparing MiQ Certified Gas emissions with the 2021 and 2022 Emission Factors are shown in Figure 1 and 2 below. For this reason, Valley has concluded that purchasing MiQ Certified Gas with MiQ Certificates from the MiQ Digital Registry for its natural gas requirements at the Valley Energy Center is a meaningful and independently verifiable GHG mitigation measure.

Figure 1- MiQ Grade A Compared to 2021 Emission Factors

UNITS	Valley Energy Center Average Annual Natural Gas Use 2020-2022 MMBtu-Year *	CO2 (g/MMBTu)	CH4 (g/MMBTu)	N2O (g/MMBTu)	Total CO2e ** (g/MMBTu)	Total CO2e (MT/MMBtu)	Total CO2e (MTCO2e/year)	% Reduction in Total CO2e (MTCO2e/year)
Fuel Type								
Natural Gas – 2021 Emission Factors	32,500,000	12,131	357	0.14	42,147	0.042147	1,369,778	
MiQ Standard Grade A Certified Natural Gas	32,500,000	12,131	10	0.14	13,013	0.013013	422,913	
Emission Reductions MiQ vs 2021 Factors		0	347	0	29,134	0.029134	946,864	**69.13%**

Figure 2- MiQ Grade A Compared to 2022 Emission Factors

UNITS	Valley Energy Center Average Annual Natural Gas Use 2020-2022 MMBtu-Year *	CO2 (g/MMBTu)	CH4 (g/MMBTu)	N2O (g/MMBTu)	Total CO2e ** (g/MMBTu)	Total CO2e (MT/MMBtu)	Total CO2e (MTCO2e/year)	% Reduction in Total CO2e (MTCO2e/year)
Fuel Type								
Natural Gas – 2022 Emission Factors	32,500,000	12,206	350	0.14	41,671	0.041671	1,354,308	
MiQ Standard Grade A Certified Natural Gas	32,500,000	12,206	10	0.14	13,088	0.013088	425,351	
Emission Reductions MiQ vs 2022 Factors		0	340	0	28,583	0.028583	928,957	**68.59%**

As shown above, use of MiQ Certified Gas as a replacement for Valley's current natural gas fuel input will result in measurable GHG emissions reduction that is real, quantifiable, permanent, verifiable, enforceable, and in addition to actions Valley is already required to take by law or regulation.

Long Term GHG Mitigation Process

In addition to the immediate employable mitigation measure discussed above, Valley continues to investigate GHG mitigation measures that would enable Valley's operations to not interfere with the CLCPA's required 40% reduction in statewide GHG emissions from 1990 levels by 2030, and 85% reduction in statewide GHG emissions from 1990 levels by 2050. The CLCPA also requires the state to achieve 70% renewable electricity by 2030 and 100% zero-emission electricity by 2040. Currently, technology does not exist to eliminate GHG emissions from the Valley Energy Center. To achieve such emission reductions by 2030, the Valley Energy Center is investigating various long-term mitigation plans including (i) the installation of a battery energy storage system ("BESS"), (ii) the use and production of green hydrogen at the Valley Energy Center or the sourcing of green hydrogen for the Valley Energy Center, (iii) the feasibility of carbon capture facilities located at or adjacent to the Valley Energy Center, and (iv) the use of renewable natural gas ("RNG) in sufficient quantities to be a viable long term GHG mitigation option. Valley proposes to complete detailed technical studies over the term of the Permits with semi-annual reporting requirements. The purpose of these studies is to evaluate the technical and economic feasibility of the long-term mitigation measures with the intent on implementing one or more options as soon as they become feasible.

Regarding incorporating a BESS at the site, modeling would be done to demonstrate how the addition of a BESS is expected to reduce operation of the natural gas units by a certain percentage. While a BESS will not replace the operation of the natural gas units, the battery will charge during the lowest cost hours which are increasingly the hours that solar and wind power is available at a price cheaper than natural gas and would then, along with other BESS connected to the grid, offset the need for gas plants at peak hours. In addition, a co-located BESS not only allows onsite storage of renewable energy from the grid, it also can be used in such a way as to reduce ramping of the gas-fired units, which otherwise results in the gas-fired units operating at output levels that are much more inefficient than operating at base load.

With respect to the use and production of green hydrogen at the Valley Energy Center, the detailed technical studies would include the evaluation of (i) the technical feasibility of using green hydrogen (at various green hydrogen percentages) at the Valley Energy Center, and (ii) the technical feasibility of locating green hydrogen production facilities at or adjacent to the Valley Energy Center, or the ability to source green hydrogen from other green hydrogen facilities that either are or could be under consideration.

Detailed technical studies related to the use of green hydrogen at the Valley Energy Center would include:

- Determining the green hydrogen co-firing potential of the existing combustion turbines ("CT") combustion systems, modification options (including CT auxiliaries) and the effect of green hydrogen co-firing on combustion metrics;
- Establishing the definition of the hydrogen/ natural gas mixing requirements with respect to control, monitoring and protection;
- Evaluating a high-level outlook of CT and plant performance for co-firing of green hydrogen;
- Determine the expected green hydrogen consumption for different levels of hydrogen co-firing;
- An evaluation of HRSG & flue gas systems (including SCR and ammonia forwarding and distribution systems) and the effect of co-firing scenarios on downstream equipment and overall plant performance and emissions;
- An evaluation of the performance impact of green hydrogen co-firing within the limits of the air permit (considering the effect of the currently installed SCR system);
- An evaluation of the performance impact of green hydrogen co-firing allowing higher out-of-engine NOx limits and the evaluation of potential SCR improvements and the resultant impact on the air permit; and
- An evaluation and outline of the potential requirements to expand/modify existing natural gas supply systems with the blending of green hydrogen.

Detailed technical studies related to locating green hydrogen production facilities at or adjacent to the Valley Energy Center for the production of green hydrogen would include:

- Identification of the green hydrogen production technologies that would be feasible to be located at or adjacent to the Valley Energy Center;
- Completion of a site assessment and an evaluation of production capacity based on the green hydrogen production technologies identified for green hydrogen volumes;
- Define the operational regimes and storage requirements in accordance with the availability of surplus, renewably sourced electricity inputs;
- Develop a green hydrogen production plant concept including general arrangements, preliminary one-line diagrams, and process flow diagrams;
- Develop a green hydrogen compression & storage conceptual design;
- Determine the green hydrogen production plant balance of plant ("BOP") elements and conceptual design including, but not limited to, demineralized water supply, cooling, and electrical subsystems;
- Determine the integration of the green hydrogen production facilities into the Valley Energy Center; and

- Develop a major equipment listing.

Valley has been in discussions with a potential strategic partner to co-locate a green hydrogen production facility on or near the Valley Energy Center with the primary intent to supply green hydrogen for state and regional transportation vehicles. The Valley Energy Center is ideal due to shared infrastructure, location to major transportation routes, as well as the ability to reduce hydrogen storage costs by co-firing hydrogen at the Valley Energy Center. To the extent Valley's Title V permit application is approved, Valley intends to pursue the feasibility of such opportunity.

As the Department is aware, Valley uses two Siemens F-class combustion turbine generators model SGT6-5000F/W501F and employs state-of-the-art emissions control technology. These combustion turbines use Siemens Energy's Dry Low Emission ("DLE") combustion technology that can currently burn up to 15% hydrogen with no or minimal upgrades and up to 30% hydrogen if retrofitted with currently available technology. By 2030, Siemens anticipates that its large gas turbine DLE systems will be capable of running on 100% hydrogen. Siemens anticipates that this will be accomplished by using various technology enablers such as incorporating modified or new burner designs into the existing turbines. Valley will continue to evaluate Siemens progress in technology development to enable 100% hydrogen combustion at the Valley Energy Center.

On December 12, 2022 Competitive Power Ventures, Inc. ("CPV") publicly announced the selection of a location in West Virginia as the host for an 1,800MW combined cycle generation project with carbon capture technology. CPV is also evaluating other combined cycle generation projects with carbon capture technology in strategic areas of the United States, all in an effort to advance CPV's decarbonization platform that will build upon two decades of prior success in the development, construction, and operation of highly efficient and low emitting electric generation projects. Consistent with CPV's decarbonization efforts elsewhere in the United States, as part of Valley's long term GHG mitigation measures, Valley will evaluate whether any feasible carbon capture opportunities exist for the Valley Energy Center.

As the Department is also aware, limited opportunities currently exist for the use of renewable natural gas ("RNG") at large combined cycle generation facilities in the State of New York due limited available quantities of RNG. Valley will, however, evaluate the feasibility of utilizing RNG for a percentage of the Valley Energy Centers fuel requirements.

Demonstrated Reliability Need Makes Operational Limitations Not Feasible

Valley previously submitted the New York Independent System Operator's ("NYISO") March 9, 2022 Additional Reliability Study (the "Study"), and the (April 21, 2022 Hudson Energy Economics, LLC ("HEE") Study analysis (the "Study Analysis") in support of Valley's Application.[6] As detailed in the Study Analysis, without the Valley Energy Center as a generation resource (i) the loss of load expectation increases significantly and would exceed the resource

[6] Valley Second Supplemental Response dated April 22, 2022.

adequacy criterion in 2031 and barely meet targets in 2030; (ii) a Transmission Security Analysis assuming no forced outages on generating units shows insufficient resources to meet the peak load plus operating reserve requirement in 2030; (iii) recognizing the risk of historic unit outage rates the NYISO will have insufficient resources to meet peak load plus reserves in every year from 2023 through 2031; (iv) assuming no forced outages on generating units the system will be 845 MW short of meeting 90/10 heatwave peak plus reserves in 2023 and more than 1,400 MW short in 2031; and (v) assuming historic generating unit outage rates the system would have insufficient resources to meet the 90/10 peak load in 2025 and would fail to meet the peak load by 540 MW in 2031.[7]

NYISO's Study prepared for the Valley Energy Center is consistent with NYISO's recently released 2022 Reliability Needs Assessment[8] (the "RNA"), which in summary concludes amongst other findings that (i) with increased renewable intermittent generation for achievement of the Climate Leadership and Community Protection Act (the "CLCPA") goal of 70% renewable energy by 2030, at least 17,000 MW of existing fossil generating units must be retained to continue to reliably serve forecasted demand; (ii) resource adequacy and transmission security margins are tightening over time across the New York State Bulk Power Transmission Facilities; (iii) demand forecast uncertainty or potential heatwaves of various degrees pose risks throughout the next ten years, especially in 2025; (iv) New York's current reliance on neighboring electric systems is expected to continue through the next ten years and without emergency assistance from neighboring regions New York would not have adequate resources throughout the next ten years; and (v) extreme events such as heatwaves or storms could result in deficiencies to serve demand statewide, especially in New York City.

Based on the above documented resource adequacy and transmission security considerations, permit limits or phase downs on the operation of the Facility, including limits on the hours of operation, fuel input, or GHG emissions from the Facility would not be a feasible or desirable mitigation measure alternative.

Given NYISO's resource adequacy concerns and forecast uncertainly, operational limits could potentially force Valley Energy Center to be unavailable during peak load periods leaving the grid operator with inadequate resources to meet peak load plus requirements. Not only would such limitations adversely impact reliability and transmission security, operational limitations on the Valley Energy Center intended as a GHG mitigation measure would likely result in an overall increase in state-wide or aggregate GHG emissions. This is because while such mitigation measures may result in onsite GHG emissions reductions, total state-wide or aggregate GHG emissions would actually increase, defeating the purpose of mitigation efforts.

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[7] *Id*.
[8] Accessible at https://www.nyiso.com/documents/20142/32940528/2022RNA_Draft1Report_forAug23ESPWG_v2.pdf/6289c7ab-ad8b-5531-a050-37a00c8024f0.

As one of the state's documented newest, most efficient, and highly flexible generating units, operational limits on the Valley Energy Center would necessarily require older, dirtier, and less efficient plants go online to make up for any resource shortfalls due to Valley's compliance with its proposed mitigation measures. In such a scenario, there would be a resulting increase in GHG emissions when compared to a scenario where the Valley Energy Center did not have operational limits and was able to provide the same resource but with less GHG and co-pollutant emissions. A full analysis on why operational limits as a GHG mitigation measure is set forth in ICF's January 06, 2023 Report annexed here as **Attachment 2**. Such a result is not rational because it would have the exact opposite effect intended by the proposed mitigation measures.

NYSDEC REQUEST 3

NYSDEC Request 3. *"Please calculate the co-pollutant emissions from each GHG source at the Facility and discuss any alternatives or mitigation measures that will be used to reduce the impact of those emissions on the facility's neighbors. If you conclude that measures previously proposed as part of the Facility's various submissions, or other GHG mitigation measures proposed in response to request number 2 above, are enough to mitigate these impacts, that should be discussed as well."*

Valley Response to Request 3.

GHG co-pollutants were calculated and impacts fully analyzed in Valley's EIS, and appropriate mitigation was considered and implemented through the SEQRA Findings Statement. Thus, while the existing record is already complete with respect to showing no disproportionate impacts on sensitive communities, the supplemental information discussed below makes clear that Valley's continued operation is also consistent with the CLCPA.

Co-pollutants evaluated in Valley's Environmental Justice Analysis

As the Department is aware, the Facility has been operating continually since early 2018 under a combined Air State Facility Permit ("ASF") and a pre-construction Prevention of Significant Deterioration ("PSD") permit. Prior to starting operations, the Facility underwent a full coordinated environmental review, with the Town of Wawayanda Planning Board acting as the State Environmental Quality Review Act ("SEQRA") Lead Agency and NYSDEC as an Involved Agency. The Lead Agency prepared both a draft environmental impact statement ("DEIS") and a final draft environmental impact statement ("FEIS") for the project, culminating in the adoption of a SEQRA Findings Statement and issuance of a special use permit and site plan approval in May 2013.

Environmental justice ("EJ") issues are discussed, in part, in the Facility's DEIS at § 7.5 and FEIS § 4.1.16. The EJ analysis considered disproportionate adverse human health and environmental impacts on minority and low-income populations using methodologies based upon the NYSDEC EJ Policy (CP-29, Environmental Justice and Permitting, Mar. 19. 2003) and federal guidance documents prepared by the United States Environmental Protection Agency ("USEPA") for use in preparing a National Environmental Policy Act ("NEPA") environmental justice analysis. Methodology for identifying the appropriate study area is discussed in DEIS § 7.5.2, which included a 2+ mile radius from the Facility's location. Valley implemented an Enhanced Public Participation Plan in accordance with NYSDEC's EJ Policy as set forth in DEIS § 7.5.3 and DEIS Appendix 1-B.

The substantive EJ analysis included relevant underlying data showing the maximum predicted impacts of CO, SO_2, PM_{10}, and NO_2 (DEIS § 7.5.4.1 [pg. 7-34]) for comparison with significant impact levels ("SILs"), as well as the sum of maximum Project impacts with conservative background air quality levels so that total predicted concentrations can be compared to the corresponding National Ambient Air Quality Standards (NAAQS) as set forth in DEIS Table 7-18 (**Attachment 3**). As concluded in the EJ analysis, (1) the Facility "is not considered to have any adverse air quality impacts"; the study area "will not receive a disproportionate share of the maximum short-term Project Impacts"; and that "the maximum predicted annual impacts are always below the corresponding SIL, so there will be no adverse impact from the Project. (DEIS § 7.5.4.1 [pg. 7-35]).

The EJ analysis also considered and found no adverse / disproportionate impacts throughout the environmental justice area regarding traffic and transportation impacts (DEIS § 7.5.4.2 [pg. 7-35]); noise impacts (DEIS § 7.5.4.3 [Pg. 7-36]); visual impacts (DEIS § 7.5.4.4 [Pg. 7-36]), and water (DEIS § 7.5.4.5 [Pg. 7-36]).

In the SEQRA Findings Statement, the Lead Agency concluded that "[b]ased on the EIS Documents, the Planning Board's findings are that positive socioeconomic impacts will result from the project with no adverse EJ impacts" (Findings Statement at 34). The Lead Agency's conclusion was first based on its finding that the project's EJ analysis was conducted "consistent with the principles set forth in Executive Order 12898, entitled 'Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations' and NYSDEC Policy CP-29" (Findings Statement at 37). Further, the Lead Agency determined that the EJ analysis demonstrated that (1) the "potential air emission concentrations did not cause violations of the National Ambient Air Quality Standards ("NAAQS") within the EJ study area, and therefore are not adverse"; (2) that the use of hazardous materials such as "oil, aqueous ammonia, and other chemicals at the Project site would not result in a disproportionate or adverse impact to the identified potential EJ area"; and (3) that noise and visual impacts within the study area "are not considered adverse or disproportionate" (Findings Statement at 37-38). Under this record, the Lead Agency determined that "[b]ecause of the socioeconomic benefits arising from the Project, and the avoidance of impacts to any identified EJ areas, no specific mitigation measures are warranted" (Findings Statement at 38). The Lead Agency's findings and conclusions are supported by the SEQRA record, which fully address Staff's questions regarding potential impacts to disadvantaged communities.

As such, Valley submits that the co-pollutant analysis undertaken as part of its EJ analysis remains valid and is equally applicable to a CLCPA § 7 (3) analysis.

Additional Co-Pollutant Analysis

As background, CLCPA § 7 (3) requires, in part, that in considering or issuing permits, State agencies shall not disproportionately burden "disadvantaged communities" ("DACs"), which, like an EJ analysis, includes consideration of GHG co-pollutants. The CLCPA Climate Council's Climate Justice Working Group ("CJWG") has developed a draft list identifying DACs to ensure that underserved communities benefit from the state's GHG reduction initiative. The Facility, located within Census Tract 36071011801, is on the CJWG's draft list of DACs.[9]

The CJWG identified certain environmental burdens and climate change risk indicators calculated by percentile rank[10] for Census Tract 36071011801 (see **Attachment 4**). Based on CJWG's data and analysis, Census Tract 36071011801 is above the NY state median for the following risk indicators: proximity to wastewater discharge[11] (52.2%); facilities with a Regulated Management Plan[12] ("RMP") (70.4%); scrap metal processing[13] (74.7%); and anticipated days with temperature above 90 degrees Fahrenheit[14] (63.3%); truck and bus traffic[15] (91.8%); agricultural land use[16] (80.2%); and drivetime to healthcare facilities[17] (92.1%).

Importantly, Census Tract 36071011801 is well below the state median for environmental burdens and risk indicators generally associated with natural gas-powered electric generation facilities such as benzene concentration (23.4%), particulate matter 2.5 micros ($PM_{2.5}$) (38.6%), industrial land use (12.5%); and power generation facilities (28.9%).

Valley commissioned TRC Environmental Corp. to undertake and update co-pollutant calculations (**Attachment 5**). Since Valley has now been in operation for over four years under an Air State Facility permit (Permit ID: 3-3356-00136/00001), TRC's updated report is based, in part, on actual reported emissions data for each of its six emission sources, rather than projected

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[9] CJWG Draft List of Disadvantaged Communities, *available at:* https://climate.ny.gov/-/media/project/climate/files/Draft-List-of-Disadvantaged-Communities.pdf (last accessed January 6, 2022).
[10] Meaning percent of populations, households, or tract area exposed to a particular environmental burden or risk factor.
[11] Census Tract is in the 52.2 percentile for population within 500 meters of toxicity-weighted wastewater discharges or stream concentrations.
[12] Census Tract is in the 70.4 percentile for having facilities within 5 kilometers of Tract center required to file risk management plans under Clean Air Act section 112(r).
[13] Census Tract is in the 74.7 percentile for the number of scrap metal processing and vehicle dismantler facilities.
[14] Census Tract is in the 63.3 percentile for anticipated annual number of days with maximum temperature above 90°F in the year 2050.
[15] Census Tract is in the 91.8 percentile for annual average daily count of diesel trucks and buses occurring on the roads within the census tract.
[16] Census Tract is in the 80.2 percentile for land area covered by agricultural land.
[17] Census Tract is in the 92.1 percentile average time and distance to the nearest 3 healthcare facilities.

data used in the EIS. A summary of the co-pollutant calculations set forth in the TRC report is as follows:

Table 1: Co-pollutant PTE calculations for the two combustion turbines and their associated duct-burners (Emission Units ["E.U."] U-00001 and U-00002).[18]

Co-pollutant	Emissions for Two Units (ton/yr)		
	Case 1 8,760 hr/yr Nat Gas	Case 2 8,040 hr/yr Nat Gas 720 hr/yr Distillate	Maximum of Cases 1 & 2
Criteria Pollutants			
NO_x	146	171	171
CO	115	113	115
VOC	28.0	28.1	28.1
SO_2	42.1	40.9	42.1
$PM_{2.5}/PM_{10}$	108	137	137

Table 2: Co-pollutant PTE calculations for the auxiliary boiler (EU U-00003).[19]

Co-pollutant	Emission Factor (lb/MMBtu)	Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)
Criteria Pollutants				
NO_x	0.05	1	2.29	2.29
CO	0.08	1	3.85	3.85
VOC	5.39E-3	2	0.25	0.25
SO_2	5.88E-4	2	0.03	0.03
$PM_{2.5}/PM_{10}$	7.45E-3	2	0.35	0.35

[18] Each combined-cycle unit is assumed to operate at its maximum capacity (for 8,760 hr/yr). Case 1 assumes turbine firing natural gas 8,760 hr/yr plus associated duct burners. Case 2 assumes each turbine firing natural gas and No. 2 fuel oil 8,040 hr/yr and 720 hr/yr, respectively, plus associated duct burners. Cases are evaluated, and the largest co-pollutant emission rate is selected as the co-pollutant PTE. It should be noted that while most of the co-pollutant emitted by the combined-cycle units are hydrocarbon products of incomplete combustion (PIC), and each unit is equipped with an oxidation catalyst that will oxidize these PIC, the Table 1 calculations only take credit for the emission rate reduction for formaldehyde.

[19] Assumed to operate at its rated capacity for 2,000 hr/yr.

Tables 3: Co-pollutant PTE calculations for the emergency diesel generator (EU U-00004).[20]

Co-pollutant	CAS No.	Emission Factor		Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)
		(lb/MMBtu)	(g/kWh)			
Criteria Pollutants						
NO_x			5.42	1	13.3	3.33
CO			0.80	1	1.97	0.49
VOC			0.23	1	0.57	0.14
SO_2		1.53E-03		2	2.36E-02	5.90E-03
$PM_{2.5}/PM_{10}$			0.80	1	1.97	0.49

Tables 4: Co-pollutant PTE calculations for the firewater pump engines (EU U-00005).[21]

Co-Pollutant	Emission Factor (lb/MMBtu)	Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)
Criteria Pollutants				
NO_x	0.0364	1	0.46	2.00
CO	0.073	1	0.92	4.02
VOC	0.005	1	0.06	0.28
SO	5.88E-4	2	7.39E-3	0.03
$PM_{2.5}/PM_{10}$	7.45E-3	2	0.09	0.41

Table 5: Co-pollutant PTE calculations for the two fuel gas heaters (EU U-00006).[22]

Co-Pollutant	Emission Factor (lb/MMBtu)	Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)
Criteria Pollutants				
NO_x	0.0364	1	0.46	2.00
CO	0.073	1	0.92	4.02
VOC	0.005	1	0.06	0.28
SO	5.88E-4	2	7.39E-3	0.03
$PM_{2.5}/PM_{10}$	7.45E-3	2	0.09	0.41

[20] Assumed to operate at its rated capacity for 500 hr/yr.
[21] Assumed to operate at its rated capacity for 500 hr/yr.
[22] Assumed to operate at its rated capacity for 8,760 hr/yr.

Based on the above, the record is clear that: (1) Census Tract 36071011801 is well below the state median for the CLCPA identified environmental burdens and risk indicators generally associated with natural gas-powered electric generation facilities (benzene concentration, $PM_{2.5}$, industrial land use, and power generation facilities); and (2) Valley's CLCPA co-pollutant calculations are consistent with the findings set forth in the EIS and SEQRA Findings Statement and show that based on the analysis performed, the Facility's continued operation will not disproportionately burden Census Tract 36071011801.

Moreover, for those identified environmental burdens and risk indicators in Census Tract 36071011801 that are above the NY state median for which the Facility has the potential to impact (wastewater discharge, facilities with a RMP, and truck and bus traffic), those impacts have been considered in the EIS and SEQRA Findings Statement, and found to have no adverse / disproportionate impacts (DEIS § 7.5.4).

Mitigation Measures Implemented and Proposed

The TRC Report also details the mitigation measures already implemented at the Facility. These include use of more expensive but thermally efficient combined cycle combustion units that minimizes fuel use resulting in reduced / more efficient project heat rates[23] (meaning less GHG and co-pollutants emitted per unit of electricity generated), and reduced carbon dioxide equivalents released.[24]

Each combined-cycle unit is equipped with an oxidation catalyst reducing products of incomplete hydrocarbon combustion, trace metals, CO, and VOC. The combined-cycle unit also utilizes dry low emission ("DLE") combustors and a selective catalytic reduction ("SCR") resulting in overall decreased NO_x formation and emission. The Facility also includes an auxiliary boiler to pre-heat steam plant reducing start-up duration where the combined-cycle units are less efficient. In sum, Valley has implemented these mitigation measures, requiring increased capital investment and ongoing additional operating and maintenance costs ("O&M"), but which results in quantifiable reductions in GHGs and its co-pollutants when compared to both Valley's allowable permit limits and other non-baseload combustion generation plants in the NPCC upstate New York subregion.

As such, consistent with the EIS and SEQRA Findings Statement, the mitigation measures Valley has implemented at the Facility already results in "avoidance of impacts to any identified EJ areas" (Findings Statement at 38), and the additional mitigation measures discussed above

[23] Project heat rates (in Btu/kWh) equal to 6,659 (2019); 6,938 (2020); 6,934 (2021); and 6,917 (2022) as compared to Valley's current permit limit of 7,605 Btu/kWh and a heat rate of 7,599 Btu/kWh for all Northeast Power Coordinating Council (NPCC) upstate New York subregion combustion generation plants.
[24] Project emitted 822 pounds of carbon dioxide equivalents released to generate one megawatt-hour of electricity (lb. CO2e/MWh) in 2020 as compared to Valley's current permit limit of 925 lb CO2e/MWh and other combustion generation plants, fossil fuel generation plants, and non-baseload generation plants located in the NPCC upstate New York subregion emitted, respectively, 836, 852, and 881 lb CO2e/MWh.

further confirm that Valley's application as its continued operation does not disproportionately burden DACs and is consistent with the CLCPA.

Conclusion

Valley's prior submissions and above responses fully satisfy NYSDEC's August 24, 2022 Request for Additional Information. Valley requests that NYSDEC immediately process the above information and issue the Facility a final permit.

Very truly yours,

Donald G. Atwood
Asset Manager Representative

c.
M. Sanza, Esq. (mark.sanza@dec.ny.gov)
J. Binder, Esq. (jonathan.binder@dec.ny.gov)

Attachment 1

Supplemental Greenhouse Gas Analysis for CPV Valley Energy Center Title V Permit Application

Submitted to:
Competitive Power Ventures

Submitted by:
ICF Resources, L.L.C.
1902 Reston Metro Plaza
Reston, VA 20190
703-934-3000

January 6, 2023

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1 Background

Competitive Power Ventures ("CPV") operates the Valley Energy Center ("Valley" or the "Facility"), a combined cycle gas turbine (CCGT) facility in Lower Hudson Valley in NYISO Load Zone G. It is currently going through the Clean Air Act Title V operating permit application after the NYSDEC issued a Notice of Incomplete Application on November 29, 2020, having initially issued a Notice of Complete Application on May 29, 2019. Specifically, the NYSDEC required CPV to demonstrate in its Title V application how the Facility would be consistent with the State's greenhouse gas emissions limits and the CLCPA's electric sector targets. In support of this requirement, ICF submitted a report titled "Greenhouse Gas Analysis for CPV Valley Energy Center Title V Permit Application" on March 8, 2021 ("March 2021 Report"). ICF then delivered two supplements to the report on October 7, 2021 ("October 2021 Supplement") and September 26, 2022 ("September 2022 Supplement").

The impact of the operation of the Facility on upstream emissions was calculated using the DEC's 2021 Statewide GHG Emissions Report which includes upstream emissions factors in Appendix A.[1] This supplemental report updates the data presented in ICF's September 2022 Supplement to utilize both the 2021 emission factors and the DEC's revised upstream emissions factors in the 2022 Statewide GHG Emissions Report.[2]

[1] NYSDEC, *2021 Statewide GHG Emissions Report*. Sourced from: https://www.dec.ny.gov/docs/administration_pdf/ghgsumrpt21.pdf

[2] NYSDEC, *2022 Statewide GHG Emissions Report*. Sourced from: https://www.dec.ny.gov/docs/administration_pdf/ghgsumrpt22.pdf

2 Analysis Results

Table 2-1 compares the preliminary DEC-provided upstream emissions factors that were utilized in the analysis presented in ICF's March 2021 Report and October 2021 Supplement, the emission factors from Appendix A of the 2021 Statewide GHG Emissions Report utilized in the September 2022 Supplement, and the emission factors from Appendix A of the 2022 Statewide GHG Emissions Report utilized in this supplemental report.

Table 2-1: Upstream Greenhouse Gas Emission Rates for Natural Gas Fuel

Emission Rate (g/MMBtu)	Effluent	
Preliminary Interim Draft Emission Factors, February 2021	CO2	11,913
	CH4	384
	N2O	0.136
	CO2e (GWP20)	44,205
2021 Statewide GHG Emissions Report	CO2	12,131
	CH4	357
	N2O	0.14
	CO2e (GWP20)	42,147
2022 Statewide GHG Emissions Report	CO2	12,206
	CH4	350
	N2O	0.14
	CO2e (GWP20)	41,671

Utilizing the revised upstream emissions factors, ICF recalculated the impact of the operation of the Facility on upstream GHG emissions. Tables 4-8 through 4-10 present the impact of the Facility on Statewide GHG emissions (CO_2, CH_4, N_2O) using both 2021 and 2022 upstream emission factors. These tables are intended to be a direct replacement for Supplemental Tables 4-8 through 4-10 provided in the October 2021 Supplement.

Table 4-8a: Amount of GHG Emissions from Other NYS Generators Displaced by the Facility (2021 Upstream Emission Factors)

Impact (thousand short tons) (CO2e)	Effluent	2025	2030	2040 (RNG)	2050 (RNG)	2040 and 2050 (Hydrogen)
Reduction in direct GHG emissions through displacement of other generators	CO_2	2,008	1,081	522	759	0
	N_2O	2	1	1	1	0
Reduction in upstream emissions due to reduced fuel consumption of displaced generators	CO_2	436	240	0	0	0
	CH_4	1,078	593	0	0	0
	N_2O	1	1	0	0	0
Total [B]		**3,525**	**1,915**	**522**	**760**	**0**

Table 4-8b: Amount of GHG Emissions from Other NYS Generators Displaced by the Facility (2022 Upstream Emission Factors)

Impact (thousand short tons) ($CO2e$)	Effluent	2025	2030	2040 (RNG)	2050 (RNG)	2040 and 2050 (Hydrogen)
Reduction in direct GHG emissions through displacement of other generators	CO_2	2,008	1,081	522	759	0
	N_2O	2	1	1	1	0
Reduction in upstream emissions due to reduced fuel consumption of displaced generators	CO_2	439	242	0	0	0
	CH_4	1,058	582	0	0	0
	N_2O	1	1	0	0	0
Total [B]		**3,508**	**1,906**	**522**	**760**	**0**

Table 4-9a: Impact of the Facility on GHG Emissions in NYS (2021 Upstream Emission Factors)

Impact (thousand short tons) ($CO2e$)	Effluent	2025	2030	2040 (RNG)	2050 (RNG)	2040 and 2050 (Hydrogen)
Increase in direct GHG emissions in NYS from generation by the Facility	CO_2	1,839	1,007	500	716	0
	N_2O	1	1	0	0	0
Increase in upstream GHG emissions from operation of the Facility	CO_2	436	239	0	0	0
	CH_4	1,077	590	0	0	0
	N_2O	1	1	0	0	0
Total [A]		**3,354**	**1,837**	**500**	**717**	**0**

Table 4-9b: Impact of the Facility on GHG Emissions in NYS (2022 Upstream Emission Factors)

Impact (thousand short tons) ($CO2e$)	Effluent	2025	2030	2040 (RNG)	2050 (RNG)	2040 and 2050 (Hydrogen)
Increase in direct GHG emissions in NYS from generation by the Facility	CO_2	1,839	1,007	500	716	0
	N_2O	1	1	0	0	0
Increase in upstream GHG emissions from operation of the Facility	CO_2	439	240	0	0	0
	CH_4	1,057	579	0	0	0
	N_2O	1	1	0	0	0
Total [A]		**3,337**	**1,827**	**500**	**717**	**0**

Table 4-10a: Net Impact on Statewide GHG Emissions from Operation of the Facility (2021 Upstream Emission Factors)

Impact (thousand short tons) (CO_2e)	Effluent	2025	2030	2040 (RNG)	2050 (RNG)	2040 and 2050 (Hydrogen)
Net reduction in GHG emissions [C] = [A] - [B]	CO_2	-170	-75	-22	-43	0
	CH_4	-1	-3	0	0	0
	N_2O	-1	-1	0	0	0
	Total	**-172**	**-78**	**-22**	**-43**	**0**

Table 4-10b: Net Impact on Statewide GHG Emissions from Operation of the Facility (2022 Upstream Emission Factors)

Impact (thousand short tons) (CO_2e)	Effluent	2025	2030	2040 (RNG)	2050 (RNG)	2040 and 2050 (Hydrogen)
Net reduction in GHG emissions [C] = [A] - [B]	CO_2	-170	-75	-22	-43	0
	CH_4	-1	-3	0	0	0
	N_2O	-1	-1	0	0	0
	Total	**-172**	**-78**	**-22**	**-43**	**0**

Attachment 2

Supplemental Emissions Analysis for CPV Valley Energy Center Title V Permit Application

Submitted to:
Competitive Power Ventures

Submitted by:
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1902 Reston Metro Plaza
Reston, VA 20190
703-934-3000

January 6, 2023

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Table of Figures

1. Background

Competitive Power Ventures (CPV) operates the Valley Energy Center (Valley, or the Facility), a nominal net 680-megawatt (MW) combined cycle gas turbine (CCGT) facility in Lower Hudson Valley in NYISO Load Zone G. It is currently going through the Clean Air Act Title V operating permit application after the New York State Department of Environmental Conservation (NYSDEC) issued a Notice of Incomplete Application on November 29, 2020, having initially issued a Notice of Complete Application on May 29, 2019. Specifically, the NYSDEC required CPV to demonstrate in its Title V application how the Facility would be consistent with the State's greenhouse gas emissions limits and the electric sector clean energy targets. In support of this requirement, ICF submitted a report titled "Greenhouse Gas Analysis for CPV Valley Energy Center Title V Permit Application" on March 8, 2021 (March 2021 Report). ICF then delivered two supplements to the report on October 7, 2021 (October 2021 Supplement) and September 26, 2022 (September 2022 Supplement).

ICF submits this report as part of CPV's response to NYSDEC's second Request for Additional Information (RFAI) that seeks to enforce operational limits on Valley as a potential mitigation measure for consistency with the requirements of the Climate Leadership and Community Protection Act (CLCPA). Through a review of historical data and recent New York ISO (NYISO) studies, this report addresses whether placing operational limits on Valley will result in a reduction in Statewide GHG emissions and support the electric sector targets enshrined in the CLCPA.[1]

[1] The New York ISO, or Independent System Operator, is a nonprofit quasi-governmental agency charged by New York to administer and operate its power system.

2. Executive Summary

ICF finds that enforcing operational limits on Valley over the next five years will lead to an increase, not decrease, in Statewide GHG emissions, and continued operation of Valley will be required to support the clean energy transition in New York. ICF's key findings are summarized below:

- Using historical generation statistics for generators in northeastern United States, Valley is found to be one of the lowest emitters of CO_2 per MWh (Megawatt-hour).
- The average CO_2 emission rate (or CO_2 intensity) of the thermal generation fleet in downstate NY (Zone G-K) is 1,143 lb/MWh, and the average CO_2 emission rate in upstate NY (Zone A-F) is 958 lb/MWh. The combined CO_2 emission rate of NYISO's entire thermal fleet is 1,089 lb/MWh. In the NYISO's neighboring regions, PJM and ISO-NE, average CO_2 emission rates of the thermal generation fleet are 1,326 lb/MWh and 887 lb/MWh, respectively.
- Valley generated nearly 4.5 million MWh annually on an average between 2019 and 2022 (Valley was only partly operational in 2018), serving 3% of annual energy load in NYISO. During this period, it emitted CO_2 at an average intensity of 815 lb/MWh and was the least emitting fossil resource in New York.
- Curtailment of Valley will result in generation from other thermal resources filling in to meet the shortfall in serving load. As Valley is one of the least emitting generators, its curtailment will lead to an increase in CO_2 emissions through increased generation from higher-emitting resources.
- ICF estimates that total Statewide CO_2 emissions will rise by 0.2-0.5 million ton/year over the next five years. The rise in emissions is dependent on the degree of curtailment of Valley. The lower bound estimate represents a less restrictive scenario with Valley limited to 50% annual capacity factor, while the upper bound estimate represents a more restrictive scenario with Valley limited to 10% annual capacity factor.
- Operation of Valley, even at full capacity, will not curtail renewable generators as the NYISO always dispatches them first before calling upon thermal generators to meet load. Thus, as their penetration grows, generation from renewables will displace generation from Valley, rather than Valley inhibiting renewables.
- Continued operation of Valley is required for a successful energy transition. The NYISO's 2021-2040 System & Resource Outlook (The Outlook) report finds that there will be a greater need for resources that can operate flexibly to compensate for the increased supply variability arising from new wind and solar resources. It further concludes that until new dispatchable, on-demand and emissions-free generating technologies are developed, "continued operation of fossil will be required in some manner during the

grid transition."[2] With the lowest CO_2 emissions rate among thermal generators in New York, and a quick ramping rate of 13 MW/min, Valley is the cleanest flexible fossil resource in the state capable of supporting its clean energy transition.

3. Key Findings

3.1. Curtailment of Valley will lead to higher, not lower, Statewide CO_2 emissions

CLCPA Section 7(2) requires all state agencies to consider whether their permit approval decisions are inconsistent with or will interfere with the attainment of the statewide GHG emission limits established in ECL section 75-0107 and promulgated at 6 NYCRR Part 496 (eff. December 30, 2020). Part 496 requires reductions of statewide GHG emissions to 60% of 1990 levels by 2030 and to 15% of 1990 levels by 2050, but the rule does not impose compliance obligations on individual sources. Further, the CLCPA amends the Public Service Law (PSL) to require the New York State Public Service Commission (PSC) to implement a program to achieve the following targets: 1) 70% of statewide electric generation from renewable energy systems by 2030; and 2) zero emissions from the statewide electric system by 2040.

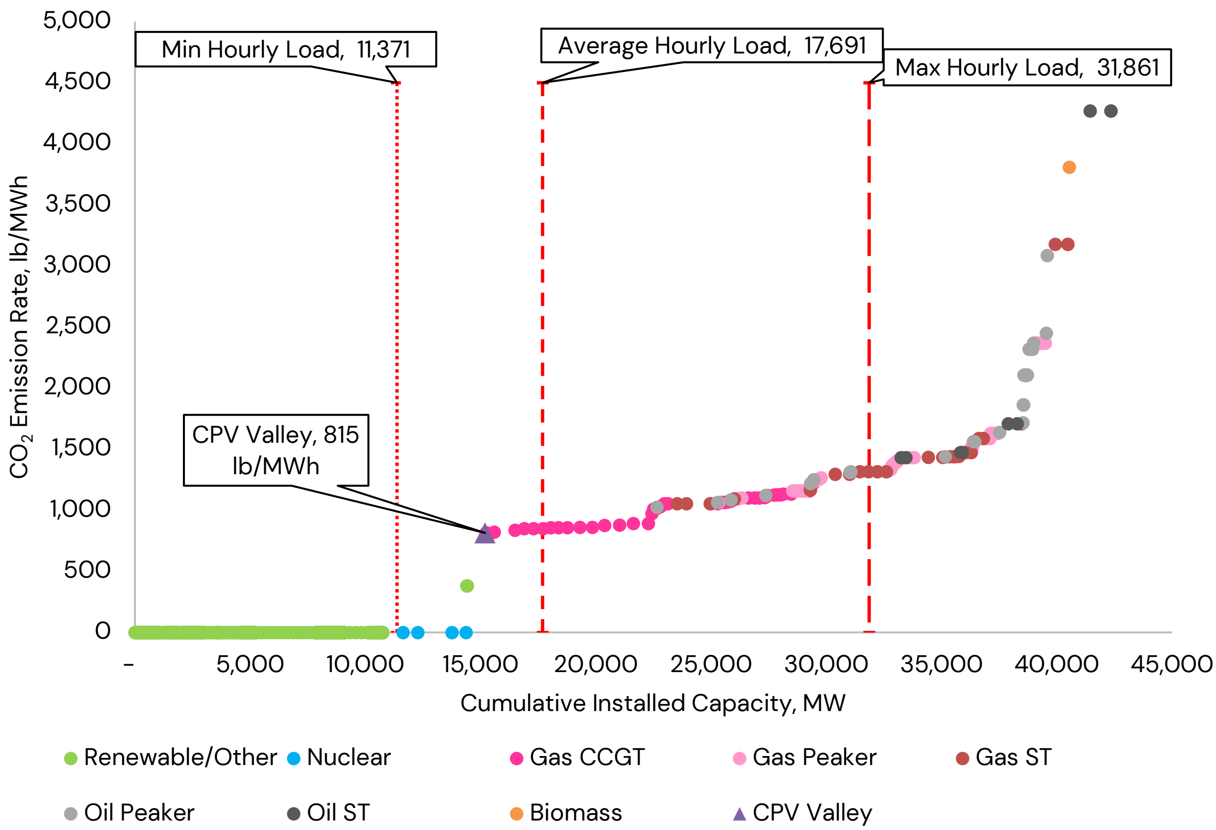
As part of its review process, the NYSDEC is evaluating whether granting a Title V permit to Valley would interfere with the attainment of the GHG targets of the CLCPA. Specifically, it is considering enforcing operational limits on Valley with the aim of reducing Statewide GHG emissions through direct curtailment of the Facility, a major point source of emissions. However, ICF finds that while curtailment of Valley will lead to a reduction in emissions in the Facility's immediate vicinity, it will cause a net increase in Statewide CO_2 emissions.

To evaluate the impact of Valley's curtailment on Statewide CO_2 emissions, ICF estimated the CO_2 footprint of generators that may be expected to fill in for Valley. To this end ICF relied upon historical generation and emissions data sourced from EIA 923 and EPA Clean Air Markets Program Data (CAMPD) for January 2018 through September 2022.[3] During this period, Valley emitted 7.4 million tons of CO_2 at an average emission rate of 815 lb/MWh. In comparison, NYISO's thermal generation fleet emitted a combined 155 million tons of CO_2 at an average emission rate of 1,089 lb/MWh. Figure 1 shows the NYISO's installed generation fleet arranged in increasing order of CO_2 emission rate and demonstrates Valley's emissions benefits over other generators. Figure 1 also shows the minimum, average, and maximum hourly load seen between 2018 and September 2022.

[2] NYISO, 2021-2040 System & Resource Outlook (The Outlook), September 22, 2022. pg. 8.

[3] EIA 923: https://www.eia.gov/electricity/data/eia923/; EPA CAMPD: https://campd.epa.gov/

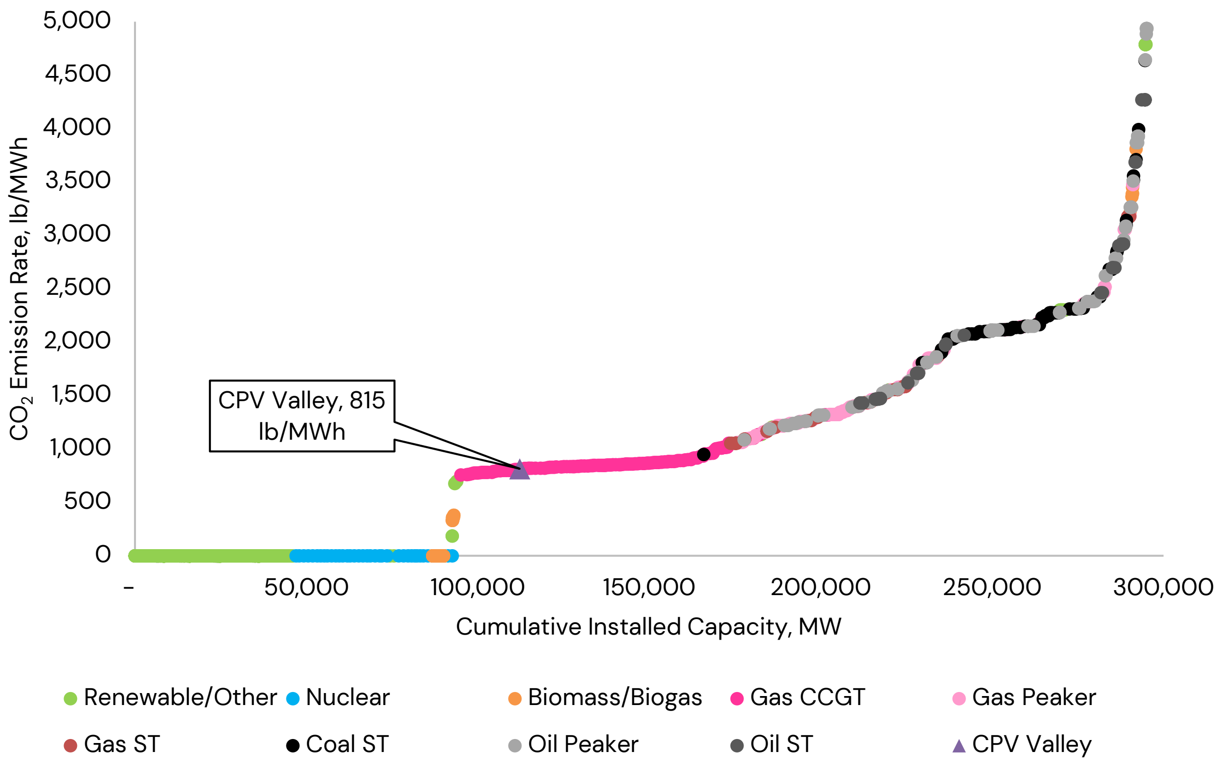
Figure 1: New York generators arranged in increasing order of CO_2 emission rate



Source: ICF analysis of EPA CAMPD and EIA 923 data

Similarly, Figure 2 shows the installed generation fleet in NYISO, ISO-NE, and PJM arranged in increasing order of CO_2 intensity and demonstrates Valley's superior emission rate in the broader region.

Figure 2: NYISO, ISO-NE, and PJM generators arranged in increasing order of CO_2 emission rate



Source: ICF analysis of EPA CAMPD and EIA 923 data

ICF finds that Valley is the lowest emitting thermal generator in NYISO and is a crucial resource for meeting energy load. From its first full year of operation in 2019 through September 2022, Valley operated at an average 75% net capacity factor and delivered nearly 4.5 million MWh annually, or 3% of the NYISO's annual energy load. If output from Valley is curtailed, generation from other thermal generators will increase to meet the shortfall in serving load. However, as demonstrated in Figure 1, all other generators in New York are more CO_2 intensive than Valley. Thus, net Statewide CO_2 emissions will rise if Valley, a low-emitting resource, is curtailed, and higher-emitting resources are dispatched instead.

For every MWh curtailed from Valley, ICF estimates that Statewide CO_2 emissions will rise by 274 lb. Net change in CO_2 emissions is calculated as the difference between the emissions saved by curtailing Valley and the emissions produced by replacement generation. For each MWh curtailed from Valley, the amount of emissions saved is equal to its CO_2 emission rate, 815 lb/MWh. Likewise, the amount of emissions produced by replacement generation is equal to its CO_2 emission rate. Due to the interconnected nature of the grid, generation curtailed from Valley may be filled in by several generators across New York. ICF projects CO_2 from Valley's replacement generation will be emitted at a rate close to the NYCA-wide average of 1,089 lb/MWh. Consequently, ICF estimates Statewide CO_2 emissions will rise by 274 lb per MWh curtailed (equal to the difference between the emission rates of Valley and Valley's replacement generation).

ICF estimated the net increase in CO_2 emissions at four hypothetical levels of curtailment of Valley. 90% curtailment implies Valley is restricted to an annual capacity factor of 10%, representing a 65% drop in generation from its 2019-2022 average net output of 75%. This equates to a reduction of nearly 3.8 million MWh. At this curtailment level, total Statewide CO_2 emissions will increase by 0.5 million tons annually. At a lower curtailment level of 50%, increase in Statewide CO_2 emissions is restricted to about 0.2 million tons annually. ICF's findings are summarized in Table 1 below.

Table 1: Impact of curtailment of Valley on CO_2 emissions in New York at different curtailment levels

Scenario	Attribute	Units	Value
	Emission rate of Valley [A]	lb/MWh	815
	Emission rate of replacement generation [B]	lb/MWh	1,089
	Net increase in emissions per MWh curtailed from Valley [C] = [B] - [A]	**lb**	**274**
90% Curtailment: Valley is restricted to 10% annual capacity factor	Estimated MWh curtailed from Valley [D]	MWh	3,876,111
	Total increase in emissions [E] = [C] * [D] / 2000	**tons**	**530,785**
75% Curtailment: Valley is restricted to 25% annual capacity factor	Estimated MWh curtailed from Valley [D]	MWh	2,982,591
	Total increase in emissions [E] = [C] * [D] / 2000	**tons**	**408,429**
60% Curtailment: Valley is restricted to 40% annual capacity factor	Estimated MWh curtailed from Valley [D]	MWh	2,089,071
	Total increase in emissions [E] = [C] * [D] / 2000	**tons**	**286,072**
50% Curtailment: Valley is restricted to 50% annual capacity factor	Estimated MWh curtailed from Valley [D]	MWh	1,493,391
	Total increase in emissions [E] = [C] * [D] / 2000	**tons**	**204,501**

Source: ICF analysis of EPA CAMPD and EIA 923 data

3.2. Continued operation of Valley will support, not inhibit, the clean energy transition in New York

The NYISO grid is expected to undergo a rapid transformation in the next five years. 9.5 GW of contracted renewable resources are scheduled to come online, and nearly 2 GW of on-demand, peaking resources in downstate New York are slated for retirement in response to the NYSDEC's Peaker Rule.[4] At the same time, the retirement or refurbishment of 10 GW of nuclear capacity between 2021 and 2025 in Ontario will greatly reduce its energy flows to the NYISO.[5] The inherent variability associated with wind and solar generation and the reduced availability of on-demand resources and imports will increase operational demands on the NYISO's existing fossil fleet. There will be a greater need for resources that can operate flexibly to meet the increased variability of renewable generation. Indeed, the NYISO's 2021-2040 System & Resource Outlook (The Outlook) report states: "This Outlook demonstrates that the flexible units will be dispatched more frequently but will operate for less hours with the year as the

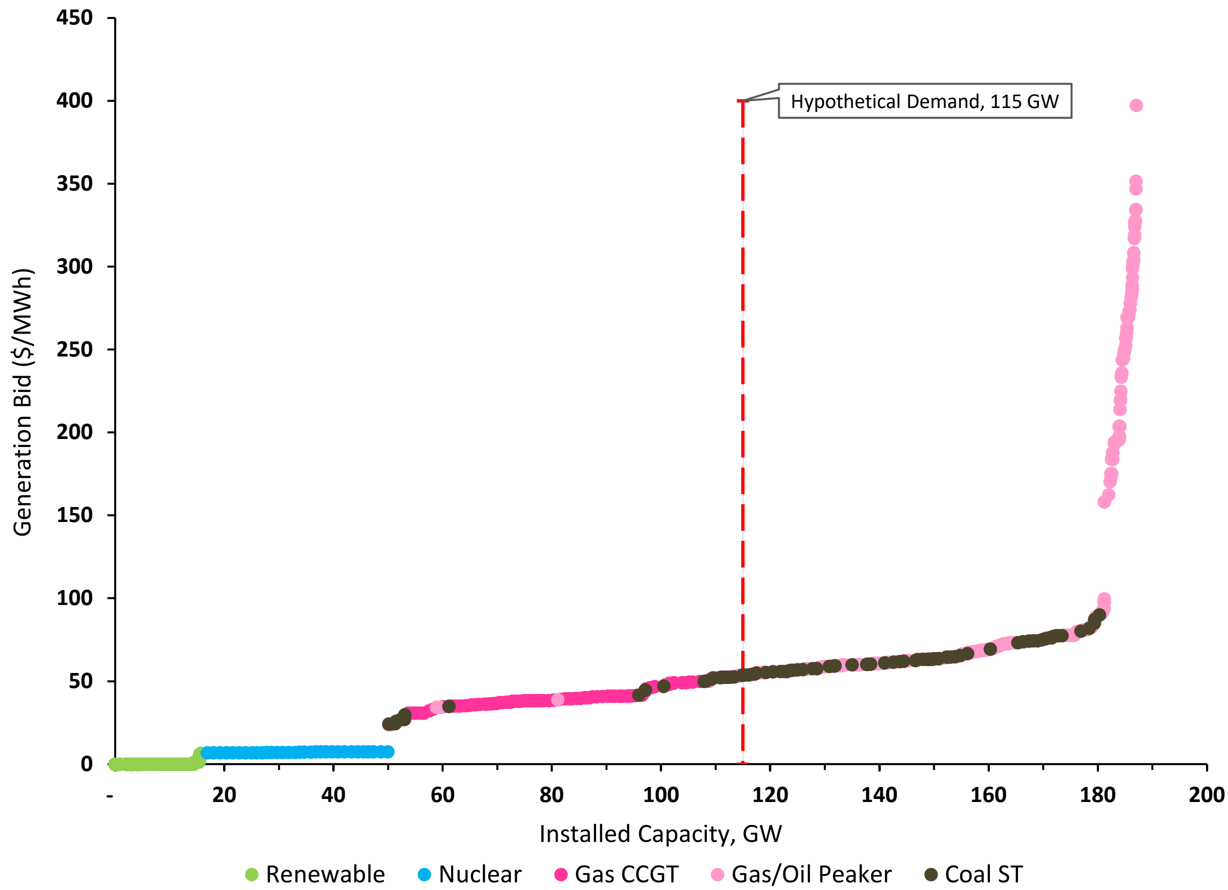
[4] NYISO, 2021-2040 System & Resource Outlook (The Outlook), September 22, 2022. pg. 33-34.
[5] Ibid, pg. 8.

transition unfolds. Until new technologies emerge, continued operation of fossil will be required in some manner during the grid transition."[6] Another NYISO report, the 2022 Reliability Needs Assessment (RNA), finds: "With increased renewable intermittent generation for achievement of the CLCPA goal of 70% renewable energy by 2030, at least 17,000 MW of existing fossil must be retained to continue to reliably serve forecasted demand."[7] The NYISO's recent findings reiterate the conclusion from ICF's March 2021 Report that flexible resources, including CCGTs like Valley, will be needed to supplement intermittent renewable generation and serve load reliably. With a fast ramp rate of up to 13 MW/min, short start-up lead time, and low CO_2 emission rate, Valley is one the prime fossil candidates to be retained to support New York's clean energy transition.[8]

While reliance on Valley and other flexible generators will be required to balance renewable generation variability, operation of Valley, even at full capacity, will never curtail emissions-free generation. Power markets are designed such that demand is satisfied at all times by the least cost generation available, subject to transmission and operational constraints. Figure 3 shows a hypothetical generation bid stack, with available generation capacity on the x-axis, and generation costs (or bids) on the y-axis. Renewable resources, including solar, wind, and hydro, have near-zero generation costs and are given priority for dispatch. Nuclear resources also have low generation costs due to the high energy density of nuclear fuel and are dispatched next. Finally, thermal resources are dispatched until supply matches demand (115 GW in the illustrative example below). As generation from low-cost renewable resources grows, higher-cost thermal resources (such as Valley) will get priced out in the bid stack more frequently, and hence, dispatch less.

[6] Ibid, pg. 8.
[7] NYISO, 2022 Reliability Needs Assessment (RNA), November 15, 2022, pg. 12.
[8] Ramp rate means the rate at which a generator is able to change its output level. CCGTs and combustion turbines (CT) are able to ramp up or down at up to 13 MW/min, but steam turbines (ST) can only change their outputs at less than 0.5 MW/min.

Figure 3: Illustrative generation bid stack (supply stack)



Source: ICF

Appendix

Table A 1: Supplementary CO_2 emissions rate calculations for NYISO, ISO-NE and PJM for the period January 2018 through September 2022

<table>
<tr><th rowspan="2">Region</th><th rowspan="2">Year</th><th colspan="3">Net Generation, MWh</th><th rowspan="2">Total CO_2 Emissions, tons [B]</th><th rowspan="2">CO_2 Emission Rate of Thermal, lb/MWh
[C] = [B] * 2000/[A]</th><th rowspan="2" colspan="2">Average CO_2 Emission Rate of Thermal, lb/MWh</th></tr>
<tr><th>Renewable /Other[9]</th><th>Nuclear</th><th>Thermal [A]</th></tr>
<tr><td rowspan="5">NYISO (A-F)</td><td>2018</td><td>35,337,766</td><td>26,600,051</td><td>20,611,442</td><td>9,761,291</td><td>947</td><td rowspan="5">958</td><td rowspan="10">1,089</td></tr>
<tr><td>2019</td><td>36,651,290</td><td>28,170,175</td><td>17,656,774</td><td>8,303,331</td><td>941</td></tr>
<tr><td>2020</td><td>35,821,139</td><td>26,562,172</td><td>16,472,001</td><td>7,619,029</td><td>925</td></tr>
<tr><td>2021</td><td>34,805,041</td><td>28,355,182</td><td>16,594,546</td><td>7,640,730</td><td>921</td></tr>
<tr><td>2022</td><td>19,422,318</td><td>19,816,761</td><td>12,382,722</td><td>6,773,180</td><td>1,094</td></tr>
<tr><td rowspan="5">NYISO (G-K)</td><td>2018</td><td>1,055,113</td><td>16,318,960</td><td>39,571,479</td><td>22,072,121</td><td>1,116</td><td rowspan="5">1,143</td></tr>
<tr><td>2019</td><td>1,081,343</td><td>16,694,843</td><td>37,812,342</td><td>21,576,601</td><td>1,141</td></tr>
<tr><td>2020</td><td>1,137,266</td><td>11,867,904</td><td>43,383,298</td><td>23,752,893</td><td>1,095</td></tr>
<tr><td>2021</td><td>1,164,237</td><td>2,821,401</td><td>46,600,068</td><td>26,102,590</td><td>1,120</td></tr>
<tr><td>2022</td><td>501,905</td><td>0</td><td>34,554,586</td><td>21,866,868</td><td>1,266</td></tr>
<tr><td rowspan="5">ISO-NE</td><td>2018</td><td>17,204,143</td><td>31,384,751</td><td>57,240,545</td><td>25,821,413</td><td>902</td><td rowspan="5" colspan="2">887</td></tr>
<tr><td>2019</td><td>17,341,367</td><td>29,817,525</td><td>53,180,652</td><td>22,433,568</td><td>844</td></tr>
<tr><td>2020</td><td>16,533,127</td><td>25,580,051</td><td>54,906,839</td><td>23,224,041</td><td>846</td></tr>
<tr><td>2021</td><td>16,415,225</td><td>27,072,626</td><td>59,809,615</td><td>25,621,310</td><td>857</td></tr>
<tr><td>2022</td><td>4,556,104</td><td>19,980,357</td><td>40,415,921</td><td>20,628,219</td><td>1,021</td></tr>
<tr><td rowspan="5">PJM</td><td>2018</td><td>60,320,193</td><td>250,451,471</td><td>527,918,262</td><td>373,101,125</td><td>1,413</td><td rowspan="5" colspan="2">1,326</td></tr>
<tr><td>2019</td><td>60,435,965</td><td>244,683,105</td><td>525,873,959</td><td>343,676,806</td><td>1,307</td></tr>
<tr><td>2020</td><td>63,060,557</td><td>243,804,056</td><td>508,657,300</td><td>320,108,328</td><td>1,259</td></tr>
<tr><td>2021</td><td>68,046,142</td><td>237,258,819</td><td>532,812,621</td><td>344,324,937</td><td>1,292</td></tr>
<tr><td>2022</td><td>37,230,128</td><td>179,166,380</td><td>388,892,023</td><td>265,618,775</td><td>1,366</td></tr>
</table>

[9] "Other" refers to generators burning renewable fuels such as landfill gas, sludge waste, municipal solid waste, wood waste solids, etc.

Source: ICF analysis of EPA CAMPD and EIA 923 data

Attachment 3

Attachment 3
DEIS Table 7-18

Table 7-18
CPV Valley Energy Center - Maximum Modeled Concentrations a/

Pollutant	Averaging Period	SIL (μg/m^3)	NAAQS (μg/m^3)	Background Concentration b/ (μg/m^3)	Maximum Ground-Level Project Impact (μg/m^3)	Total Ground-Level Concentration c/ (μg/m^3)
CO	1-Hour	2,000	40,000	3,893	563	4,456
	8-Hour	500	10,000	3,206	182	3,382
SO_2	3-Hour	25	1,300	55.0	3.3	58
	24-Hour	5	365	28.8	0.6	29
	Annual	1	80	5.2	0.04	5.2
PM_{10}	24-Hour	5	150	78	9.9	88
	Annual	1	50	35	0.2	35
NO_2	Annual	1	100	41.4	0.8	42

Notes:

a/ Maximum modeled ground-level concentration due to the worst case overall facility operating scenario (i.e., the facility operating scenario that resulted in the maximum modeled air quality impact) for each pollutant.

b/ Background concentrations are the highest second highest short term (1-, 3-, 8-, and 24-hour) and maximum annual concentrations.

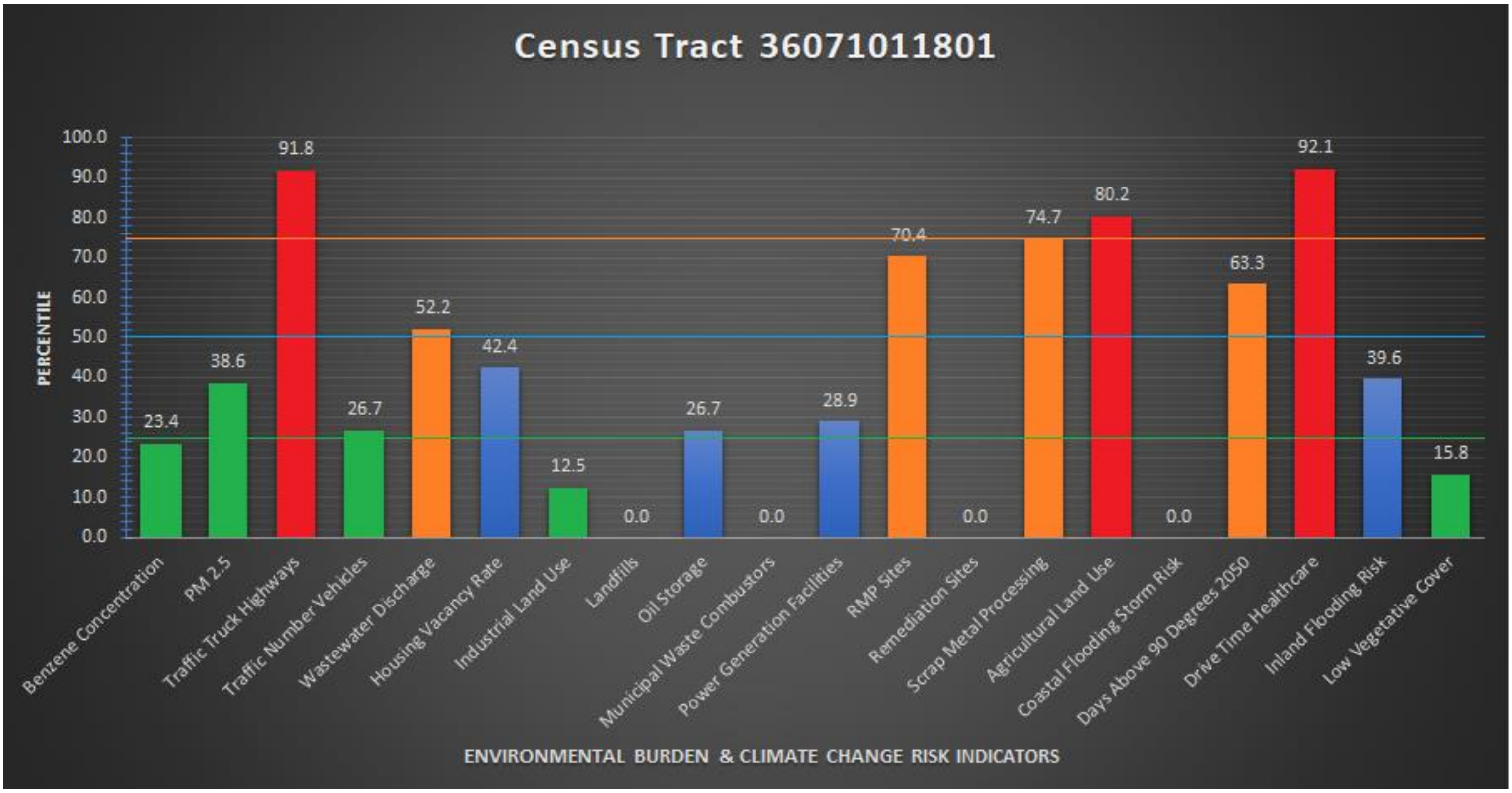
c/ Total concentration = background concentration + maximum modeled (i.e., ground-level) concentration.

Source: TRC Environmental Corp.

Source: Valley Draft Environmental Impact Statement at 7-34 (Table 7-18).

Attachment 4

Attachment 4
Census Tract 36071011801 Environmental Burdens / Risk Indicators



Source: Climate Justice Working Group (CJWG) Technical Documentation Appendix: Draft Disadvantaged Communities Indicators Workbook [XLSX], available at https://climate.ny.gov/-/media/project/climate/files/Technical-Documentation-Appendix-Draft-Disadvantaged-Communities-Indicator-Workbook.xlsx (last accessed January 4, 2022).

Attachment 5

CPV Valley Energy Center
Measures and Alternatives to Mitigate the Impacts of Co-Pollutant Emissions from Greenhouse Gas Emission Sources

Prepared for:

Competitive Power Ventures, Inc.

Prepared by:

TRC
21 Griffin Road North
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December 2022

1. Introduction

1.1. Legislative Background

Climate Leadership and Community Protection Act of 2019 (CLCPA)[1] sets goals for New York State to achieve 100 percent zero-emissions electricity generation by 2040 and anthropogenic greenhouse gas (GHG) emissions reductions (relative to the 1990-levels) of 40 percent by 2030 and 85 percent by 2050. Section 7(3) of CLCPA directs the New York State Department of Environmental Conservation (NYSDEC) to prioritize net reductions of GHG emissions and co-pollutants in disadvantaged communities (DAC).

The CLCPA defines co-pollutants as hazardous air pollutants (HAPs) that are emitted by a piece of equipment that emits GHG. For this report, carbon monoxide (CO), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen oxides (NO_x), ozone (O_3), and its precursors[2] are considered to be co-pollutants.

1.2. Purpose

The purposes of this report are to:

- Provide co-pollutant emission calculations for the Valley Energy Center (Project).
- Describe the measures and alternatives to reduce the Project's co-pollutant emissions and it impact on DAC.

2. Project Description

2.1. Co-Pollutant Emission Sources

Competitive Power Ventures, Inc. (CPV) owns and operates the Project, a 680-megawatt electric generation facility. The Project commenced operation during 2018 and operates under Air State Facility Permit ID: 3-3356-00136/00001 (Permit). The Project includes the following GHG emission sources:

- Emission Units U-00001 and U-00002: Two combined-cycle Siemens F-class combustion turbines, which are both equipped with duct-burners. They are capable of firing natural gas or No. 2 fuel oil.
- Emission Unit U-00003: One 46.7 million British thermal units per hour (MMBtu/hr) auxiliary boiler that fires natural gas. This boiler is used to heat the steam power plant to facilitate startup of the combined-cycle units. The boiler's operation is limited by the Permit to no more than 2,000 hours per year (hr/yr).

[1] https://www.nysenate.gov/legislation/bills/2019/S6599, accessed December 2022

[2] The Project does not directly emit O_3, but it does emit volatile organic compounds (VOC) and NO_x, which are O_3 precursors.

- Emission Unit U-00004: One 1,495 horsepower (hp) emergency diesel generator engine. This engine is operated for emergencies, maintenance, and testing only. Its operation is limited by the Permit to no more than 500 hr/yr.
- Emission Unit U-00005: One 282 hp firewater pump engine. This engine is operated for emergencies, maintenance, and testing only. Its operation is limited by the Permit to no more than 500 hr/yr.
- Emission Unit U-00006: Two 6.28 MMBtu/hr fuel gas heaters that fire natural gas.

2.2. Potential to Impact Disadvantaged Communities

The Project is located at 3330 Route 6, Middletown, New York, 10940 (Census Tract 36071011801). It is identified as a potential DAC in the CLCPA Climate Council's Climate Justice Working Group (CJWG) draft DAC list[3].

3. Co-pollutant Emission Calculations

Tables 1 through 5 provide calculations of the potential co-pollutant to emit (PTE) for each GHG emission source. PTE is the maximum capacity of a stationary source to emit under its physical and operational design. Any physical or operational limitation on the source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation, or on the type or amount of material combusted, stored, or processed, is treated as part of its design if the limitation is enforceable by the Administrator of the Environmental Protection Agency (EPA). Tables 1 through 6 provide the following:

- Table 1: Co-pollutant PTE calculations for the two combustion turbines and their associated duct-burners. Each combined-cycle unit is assumed to operate at its maximum capacity (based on data provided by the equipment vendor) for 8,760 hr/yr. Two cases (each turbine firing natural gas 8,760 hr/yr and each turbine firing natural gas and No. 2 fuel oil 8,040 hr/yr and 720 hr/yr, respectively) are evaluated, and the largest co-pollutant emission rate selected as the co-pollutant PTE. Most of the co-pollutant emitted by the combined-cycle units are hydrocarbon products of incomplete combustion (PIC), such as formaldehyde and acetaldehyde, or uncombusted constituents of natural gas such as benzene. Each combined-cycle unit is equipped with an oxidation catalyst that will oxidize these PIC. Nevertheless, the calculations in Table 1 take credit for the emission rate reduction for only formaldehyde.
- Table 2: Co-pollutant PTE calculations for the auxiliary boiler. It is assumed to operate at its rated capacity for 2,000 hr/yr.

[3] CJWG Draft List of Disadvantaged Communities, at pg. 30, *available at:* https://climate.ny.gov/-/media/Project/Climate/Files/Draft-List-of-Disadvantaged-Communities.pdf accessed December 2022).

- Tables 3 and 4: Co-pollutant PTE calculations for the emergency diesel generator and firewater pump engines. Each is assumed to operate at its rated capacity for 500 hr/yr.
- Table 5: Co-pollutant PTE calculations for the two fuel gas heaters. Each is assumed to operate at its rated capacity for 8,760 hr/yr.
- Table 6: A Summary of the Project's co-pollutant PTE.

The Project's Draft Environmental Impact Statement[4] describe a variety of air dispersion modeling analyses that demonstrated the following:

- The Project's emissions of nitrogen dioxide, CO, $PM_{2.5}$, and SO_2 would not cause or significantly contribute to violations of the National Ambient Air Quality Standards then applicable.
- The Project's emissions would not adversely impact vegetation in the site area.
- The Project's emissions of $PM_{2.5}$ precursors complied with the Federal and State requirements then applicable.
- The predicted impacts of the Project's non-criteria pollutant complied with the NYSDEC Guideline Concentrations then applicable.

4. Co-pollutant Emission Impact Mitigation Measures and Alternatives

4.1. Mitigation Measures

The impact of the Project's co-pollutant emissions on its neighbors are mitigated by the Project's design features and operational practices. The design features include the following:

- The Project's combined-cycle units are thermally efficient and minimize the amount of fuel burned (and amount of co-pollutants emitted) per unit of electricity generated. Table 7 compares the Project's heat rate [British thermal units of fuel burned to generate one kilowatt-hour of electricity (Btu/kWh)[5]] to electrical generators in the region and to Permit limits.
  - For calendar year 2020, EPA eGRID[6] reports that the Project's heat rate was 6,912 Btu/kWh, versus a heat rate of 7,599 Btu/kWh for all Northeast Power Coordinating Council (NPCC) upstate New York subregion combustion generation plants.

[4] Draft Environmental Impact Statement - CPV Valley Energy Center, Volume I, February 2009, Revision 2
[5] All heat rate data are expressed at fuel higher heating value (HHV).
[6] Emissions & Generation Resource Integrated Database (eGRID), https://www.epa.gov/egrid/download-data accessed December 2022.

- Project heat rates equal to 6,659; 6,938; 6,934; and 6,917 Btu/kWh were measured in 2019, 2020, 2021, and 2022, respectively. The Permit limit is 7,605 Btu/kWh[7].

- The Project's GHG emissions per unit of electricity generated are low. Table 8 compares the Project's GHG emissions [pounds of carbon dioxide equivalents released to generate one megawatt-hour of electricity (lb CO_2e/MWh)] to electrical generators in the region and to Permit limits.
  - For calendar year 2020, EPA eGRID reports that the Project emitted 822 lb CO_2e/MWh. The Permit limit is 925 lb CO_2e/MWh.
  - For calendar year 2020, EPA eGRID reports that combustion generation plants, fossil fuel generation plants, and non-baseload generation plants located in the NPCC upstate New York subregion emitted, respectively, 836, 852, and 881 lb CO_2e/MWh.
- The HAPs emitted by the Project's combined-cycle units are hydrocarbon PIC and trace metals contained in liquid fuels (No. 2 fuel oil and diesel fuel). CO and VOC are also PIC. Each combined-cycle unit is equipped with an oxidation catalyst that oxidizes the PIC and uncombusted natural gas constituents such as benzene.
- Each combined-cycle unit is equipped with dry low emission (DLE) combustors and a selective catalytic reduction (SCR) system. The DLE combustors decrease NO_x formation, and the SCR system reduces NO_x emissions to nitrogen and water.
- The Project's combined-cycle units are less efficient when they are starting up. The steam plant must be heated prior to bringing the combustion turbines to full load. To minimize startup duration, the Project's auxiliary boiler operates to heat the steam plant as needed prior to and during startup.

The impact of the Project's co-pollutant emissions on its neighbors are also mitigated by the Project's operational practices, including the following:

- The Project's combined-cycle units actual annual operating hours are less than the theoretical maximum potential hours of operation. Table 9 presents each combined-cycle unit's actual and maximum potential annual operating hours.

- The emergency generator firewater pump engines are operated only during emergencies, testing, and maintenance.

[7] Measured and permit limit heat rates are corrected to reference conditions per ASME PTC 46-1996 https://www.asme.org/codes-standards/find-codes-standards/ptc-46-overall-plant-performance, accessed December 2022.

- The Project's combined-cycle units are less efficient during startup and shutdown events. The oxidation catalyst is less effective in oxidizing organic co-pollutants during startup events. CPV operating practices minimize the frequency and duration of the combined-cycle units' startup and shutdown events. These are summarized in Table 10.

- The Project's combined-cycle turbines are each permitted to combust distillate oil for up to 720 hr/yr. Co-pollutant emissions are greater when firing distillate oil than when firing an equivalent amount of natural gas. Distillate oil is fired in the Project's combined-cycle turbines only when natural gas is unavailable or for testing.

- The Project's GHG emission sources are operated and maintained in accordance with manufacturer specifications and industry standards.

4.2. Alternatives

4.2.1. Green Hydrogen

Electrolysis is the process of using electricity to split water into hydrogen and oxygen. Green hydrogen produced by electrolysis using electricity generated using renewable energy. Green hydrogen can then be stored and combusted by dispatchable energy resources to generate electricity when it is needed without emitting GHG or co-pollutants.

The Project's combined-cycle turbines use DLE combustion technology. Siemens Energy reports that, using currently available technologies, the Project's combined-cycle turbines could burn up to 15 percent hydrogen with the minor modifications, or up to 30 percent hydrogen with more extensive retrofits. By 2030, Siemens anticipates that technologies will be commercially available which will enable large turbine DLE systems to combust 100 percent hydrogen fuel. Combusting green hydrogen in the Project's combined-cycle units is not now feasible because utility-scale green hydrogen infrastructure does not exist in the vicinity of the Project. CPV continues to monitor the feasibility of this alternative.

4.2.2. Renewable Natural Gas

Renewable natural gas (RNG) is a pipeline-quality gas derived from biomass or other renewable sources that is fully interchangeable with conventional natural gas. RNG is essentially the gaseous product of the decomposition of organic matter that has been processed to a high degree of purity. Producing and combusting RNG does not create new carbon emissions. Instead, RNG recycles carbon that was already in circulation, and which would have resulted in the emission of GHGs absent conversion. Like conventional natural gas, RNG is mostly methane. Therefore, the amount of co-pollutant emissions produced by burning RNG is similar to the amount of co-pollutant emissions produced by burning an equivalent amount conventional natural gas. Conventional natural gas also contains small amounts of heavier hydrocarbons (e.g., C2 - C6).

Therefore, burning conventional natural gas also produces small amounts of co-pollutants which are the PIC of the heavier hydrocarbons.

While RNG production may require new interconnections to pipelines, RNG supply does not necessarily require additional natural gas system infrastructure, such as transmission and distribution pipes. RNG can be transported in existing natural gas pipelines and used by conventional natural gas consumers. CPV continues to monitor the availability of RNG and the feasibility of combusting RNG in the Project's combined-cycle units.

5. Summary and Conclusion

The Project uses state-of-the art design features and operating practices to minimize and mitigate its co-pollutant emissions and its potential to impact disadvantaged communities. These include the following:

- Thermally efficient combined-cycle units.
- Catalyst systems which oxidize the combined-cycle units' CO and hydrocarbon co-pollutant emission.
- DLE combustors and SCR systems which decrease the combined-cycle units' NO_x emissions.
- Auxiliary boiler to minimize startup duration.
- Operating GHG sources fewer hours than allowed.
- Minimizing the frequency and duration of combined-cycle unit startup and shut down.
- Combusting distillate oil in the combined-cycle units only during testing or when natural gas is unavailable.
- Operating and maintaining GHG emission sources in accordance with manufacturers' specifications and industry standards.

These measures are consistent with the goals of the CLCPA. CPV continues to monitor the feasibility of alternative fuels to further mitigate its co-pollutant emissions and its potential to impact DAC.

Table 1: Potential to Emit
Two Combustion Turbines w/ Duct Burners
Emission Units U-00001 and U-00002

	Extreme Cold (-5 ^oF)	Moderate (51 ^oF)	Extreme Heat (90 ^oF)	Annual Total	
Combustion Turbine					
Operation (hr/yr)					
Case 1 - Natural Gas	1,440	14,640	1,440	17,520	(2 units)
Case 2a - Natural Gas	0	14,640	1,440	16,080	(2 units)
Case 2b - Distillate	1,440	0	0	1,440	(2 units)
Fuel Usage (MMBtu/hr)					
Case 1 - Natural Gas	2,238	2,002	1,859		
Case 2a - Natural Gas	2,238	2,002	1,859		
Case 2b - Distillate	2,140	1,889	1,752		
Duct Burners					
Operation (hr/yr)					
Case 1 - Natural Gas	0	14,640	1,440	16,080	(2 units)
Case 2a - Natural Gas	0	14,640	1,440	16,080	(2 units)
Case 2b - Distillate	0	0	0	0	(2 units)
Fuel Usage (MMBtu/hr)					
Case 1 - Natural Gas	0	186	457		
Case 2a - Natural Gas	0	186	457		
Case 2b - Distillate	0	0	0		

Co-pollutant	Emission Factor (lb/MMBtu)	Ref.	Hourly Emissions (lb/hr)			Annual Emissions (ton/yr)
			Winter	Spring/Fall	Summer	
Case 1 - Natural gas firing in combustion turbine for 8,760 hours per year per unit						
Criteria Pollutants						
NO_x		7	16.80	15.04	13.92	132.21
CO		7	10.20	9.20	8.40	80.74
VOC		7	2.03	1.82	1.68	15.99
SO_2		7	4.87	4.36	4.04	38.31
$PM_{2.5}/PM_{10}$		7	11.11	10.10	9.67	88.87
Hazardous Air Pollutants						
1,3 Butadiene	4.30E-07	1	9.62E-04	8.61E-04	7.99E-04	0.01
Acetaldehyde	4.00E-05	1	8.95E-02	8.01E-02	7.44E-02	0.70
Acrolein	6.40E-06	1	1.43E-02	1.28E-02	1.19E-02	0.11
Benzene	1.20E-05	1	2.69E-02	2.40E-02	2.23E-02	0.21
Ethylbenzene	3.20E-05	1	7.16E-02	6.41E-02	5.95E-02	0.56
Formaldehyde	1.10E-04	2	2.46E-01	2.20E-01	2.04E-01	1.94
Naphthalene (included in PAH)	1.30E-06	1	2.91E-03	2.60E-03	2.42E-03	0.02
Total PAH	2.20E-06	1	4.92E-03	4.40E-03	4.09E-03	0.04
Toluene	1.30E-04	1	2.91E-01	2.60E-01	2.42E-01	2.29
Xylenes	6.40E-05	1	1.43E-01	1.28E-01	1.19E-01	1.13
Total HAP						7.01

Case 2a - Natural gas firing in combustion turbine for 8,040 hours per year per unit						
Criteria Pollutants						
NO_x		7	16.80	15.04	13.92	120.12
CO		7	10.20	9.20	8.40	73.39
VOC		7	2.03	1.82	1.68	14.53
SO_2		7	4.87	4.36	4.04	34.80
$PM_{2.5}/PM_{10}$		7	11.11	10.10	9.67	80.87
Hazardous Air Pollutants						
1,3 Butadiene	4.30E-07	1	9.62E-04	8.61E-04	7.99E-04	0.01
Acetaldehyde	4.00E-05	1	8.95E-02	8.01E-02	7.44E-02	0.64
Acrolein	6.40E-06	1	1.43E-02	1.28E-02	1.19E-02	0.10
Benzene	1.20E-05	1	2.69E-02	2.40E-02	2.23E-02	0.19
Ethylbenzene	3.20E-05	1	7.16E-02	6.41E-02	5.95E-02	0.51
Formaldehyde	1.10E-04	2	2.46E-01	2.20E-01	2.04E-01	1.76
Naphthalene (included in PAH)	1.30E-06	1	2.91E-03	2.60E-03	2.42E-03	0.02
Total PAH	2.20E-06	1	4.92E-03	4.40E-03	4.09E-03	0.04
Toluene	1.30E-04	1	2.91E-01	2.60E-01	2.42E-01	2.08
Xylenes	6.40E-05	1	1.43E-01	1.28E-01	1.19E-01	1.02
Total HAP						6.37
Case 2b - Distillate oil firing in combustion turbine for 720 hours per year per unit						
Criteria Pollutants						
NO_x		7	51.43	45.43	42.14	37.03
CO		7	7.43	9.20	8.60	5.35
VOC		7	2.10	1.82	1.68	1.51
SO_2		7	3.27	2.89	2.68	2.35
$PM_{2.5}/PM_{10}$		7	51.35	46.19	42.10	36.97
Hazardous Air Pollutants						
1,3 Butadiene	1.60E-05	3	3.42E-02	3.02E-02	2.80E-02	0.02
Benzene	5.50E-05	3	1.18E-01	1.04E-01	9.64E-02	0.08
Formaldehyde	2.80E-04	3	5.99E-01	5.29E-01	4.91E-01	0.43
Naphthalene (included in PAH)	3.50E-05	3	7.49E-02	6.61E-02	6.13E-02	0.05
Total PAH	4.00E-05	3	8.56E-02	7.56E-02	7.01E-02	0.06
Arsenic	1.10E-05	4	2.35E-02	2.08E-02	1.93E-02	0.02
Beryllium	3.10E-07	4	6.63E-04	5.86E-04	5.43E-04	4.78E-04
Cadmium	4.80E-06	4	1.03E-02	9.07E-03	8.41E-03	0.01
Chromium	1.10E-05	4	2.35E-02	2.08E-02	1.93E-02	0.02
Lead	1.40E-05	4	3.00E-02	2.64E-02	2.45E-02	0.02
Manganese	7.90E-04	4	1.69E+00	1.49E+00	1.38E+00	1.22
Mercury	1.20E-06	4	2.57E-03	2.27E-03	2.10E-03	1.85E-03
Nickel	4.60E-06	4	9.84E-03	8.69E-03	8.06E-03	0.01
Selenium	2.50E-05	4	5.35E-02	4.72E-02	4.38E-02	0.04
Total HAP						1.98

Cases 1 & 2a - Natural gas firing in duct burners for 8,040 hours per year per unit						
Criteria Pollutants						
NO_x		7		1.48	4.00	13.74
CO		7		3.71	10.00	34.34
VOC		7		1.30	3.50	12.02
SO_2		7		0.40	1.09	3.74
$PM_{2.5}/PM_{10}$		7		2.02	5.45	18.71
Hazardous Air Pollutants						
2-Methylnaphthalene	2.35E-08	5		4.37E-06	1.07E-05	3.97E-05
3-Methylchloranthrene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
7,12-Dimethylbenz(a) anthracene	1.57E-08	5		2.91E-06	7.16E-06	2.65E-05
Acenaphthene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
Acenaphthylene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
Anthracene	2.35E-09	5		4.37E-07	1.07E-06	3.97E-06
Arsenic	1.96E-07	6		3.64E-05	8.95E-05	3.31E-04
Benzo(a)anthracene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
Benzene	2.06E-06	5		3.82E-04	9.40E-04	3.47E-03
Benzo(a)pyrene	1.18E-09	5		2.18E-07	5.37E-07	1.98E-06
Benzo(b)fluoranthene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
Benzo(g,h,i)perylene	1.18E-09	5		2.18E-07	5.37E-07	1.98E-06
Benzo(k)fluoranthene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
Beryllium	1.18E-08	6		2.18E-06	5.37E-06	1.98E-05
Cadmium	1.08E-06	6		2.00E-04	4.92E-04	1.82E-03
Chromium	1.37E-06	6		2.55E-04	6.27E-04	2.32E-03
Chrysene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
Cobalt	8.24E-08	6		1.53E-05	3.76E-05	1.39E-04
Dibenzo(a,h)anthracene	1.18E-09	5		2.18E-07	5.37E-07	1.98E-06
Dichlorobenzene	2.06E-06	5		3.82E-04	9.40E-04	3.47E-03
Fluoranthene	2.94E-09	5		5.46E-07	1.34E-06	4.96E-06
Fluorene	2.75E-09	5		5.09E-07	1.25E-06	4.63E-06
Formaldehyde	7.35E-05	5		1.36E-02	3.36E-02	0.12
Hexane	1.76E-03	5		3.27E-01	8.06E-01	2.98
Indeno(1,2,3-cd)pyrene	1.76E-09	5		3.27E-07	8.06E-07	2.98E-06
Lead	4.90E-07	6		9.10E-05	2.24E-04	8.27E-04
Manganese	3.73E-07	6		6.91E-05	1.70E-04	6.29E-04
Mercury	2.55E-07	6		4.73E-05	1.16E-04	4.30E-04
Naphthalene	5.98E-07	5		1.11E-04	2.73E-04	1.01E-03
Nickel	2.06E-06	6		3.82E-04	9.40E-04	3.47E-03
Phenanthrene	1.67E-08	5		3.09E-06	7.61E-06	2.81E-05
Pyrene	4.90E-09	5		9.10E-07	2.24E-06	8.27E-06
Selenium	2.35E-08	6		4.37E-06	1.07E-05	3.97E-05
Toluene	3.33E-06	5		6.19E-04	1.52E-03	5.62E-03
Total HAP						3.12

Co-pollutant	Emissions for Two Units (ton/yr)		
	Case 1 8,760 hr/yr Nat Gas	Case 2 8,040 hr/yr Nat Gas 720 hr/yr Distillate	Maximum of Cases 1 & 2
Criteria Pollutants			
NO_x	146	171	171
CO	115	113	115
VOC	28.0	28.1	28.1
SO_2	42.1	40.9	42.1
$PM_{2.5}/PM_{10}$	108	137	137
Hazardous Air Pollutants			
2-Methylnaphthalene	3.97E-5	3.97E-5	3.97E-5
3-Methylchloranthrene	2.98E-6	2.98E-6	2.98E-6
7,12-Dimethylbenz(a) anthracene	2.65E-5	2.65E-5	2.65E-5
Acenaphthene	2.98E-6	2.98E-6	2.98E-6
Acenaphthylene	2.98E-6	2.98E-6	2.98E-6
Anthracene	3.97E-6	3.97E-6	3.97E-6
Benzo(a)anthracene	2.98E-6	2.98E-6	2.98E-6
Benzo(a)pyrene	1.98E-6	1.98E-6	1.98E-6
Benzo(b)fluoranthene	2.98E-6	2.98E-6	2.98E-6
Benzo(g,h,i)perylene	1.98E-6	1.98E-6	1.98E-6
Benzo(k)fluoranthene	2.98E-6	2.98E-6	2.98E-6
Chrysene	2.98E-6	2.98E-6	2.98E-6
Cobalt	1.39E-4	1.39E-4	1.39E-4
Dibenzo(a,h)anthracene	1.98E-6	1.98E-6	1.98E-6
Dichlorobenzene	3.47E-3	3.47E-3	3.47E-3
Fluoranthene	4.96E-6	4.96E-6	4.96E-6
Fluorene	4.63E-6	4.63E-6	4.63E-6
Hexane	2.98	2.98	2.98
Indeno(1,2,3-cd)pyrene	2.98E-6	2.98E-6	2.98E-6
Naphthalene	1.01E-3	1.01E-3	1.01E-3
Phenanthrene	2.81E-5	2.81E-5	2.81E-5
Pyrene	8.27E-6	8.27E-6	8.27E-6
Toluene	5.62E-3	5.62E-3	5.62E-3
1,3 Butadiene	7.57E-3	0.03	0.03
Acetaldehyde	0.70	0.64	0.70
Acrolein	0.11	0.10	0.11
Benzene	0.21	0.28	0.28
Ethylbenzene	0.56	0.51	0.56
Formaldehyde	2.06	2.31	2.31
Naphthalene	0.02	0.07	0.07
Toluene	2.29	2.08	2.29
Xylenes	1.13	1.02	1.13
Arsenic	3.31E-4	0.02	0.02
Beryllium	1.98E-5	4.97E-4	4.97E-4
Cadmium	1.82E-3	9.21E-3	9.21E-3
Chromium	2.32E-3	0.02	0.02
Lead	8.27E-4	0.02	0.02
Manganese	6.29E-4	1.22	1.22
Mercury	4.30E-4	2.28E-3	2.28E-3
Nickel	3.47E-3	0.01	0.01
Selenium	3.97E-5	0.04	0.04
Total HAP	10.1	11.4	11.4

Reference:

1. AP-42, 5th Edition Tables 3.1-3
2. CATEF factor for natural gas-fired combustion turbines with SCR and oxidation catalyst median value, rounded to two significant figures. https://ww2.arb.ca.gov/california-air-toxics-emission-factor
3. AP-42, 5th Edition Tables 3.1-4
4. AP-42, 5th Edition Tables 3.1-5
5. AP-42, 5th Edition Tables 1.4-3
6. AP-42, 5th Edition Tables 1.4-4
7. Vendor data

Table 2: Potential to Emit
Auxiliary Boiler
Emission Unit U-00003

Annual Operating Schedule (hr) 2,000 Fuel Consumption (MMBtu/hr) 46.7

Co-pollutant	Emission Factor (lb/MMBtu)	Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)	Note
Criteria Pollutants					
NO_x	0.05	1	2.29	2.29	
CO	0.08	1	3.85	3.85	
VOC	5.39E-3	2	0.25	0.25	
SO_2	5.88E-4	2	0.03	0.03	
$PM_{2.5}/PM_{10}$	7.45E-3	2	0.35	0.35	
Hazardous Air Pollutants					
2-Methylnaphthalene	2.35E-8	3	1.10E-6	1.10E-6	PAH
3-Methylchloranthrene	1.76E-9	3	8.24E-8	8.24E-8	PAH
7,12-Dimethylbenz(a) anthracene	1.57E-8	3	7.33E-7	7.33E-7	PAH
Acenaphthene	1.76E-9	3	8.24E-8	8.24E-8	PAH
Acenaphthylene	1.76E-9	3	8.24E-8	8.24E-8	PAH
Anthracene	2.35E-9	3	1.10E-7	1.10E-7	PAH
Arsenic	1.96E-7	4	9.16E-6	9.16E-6	
Benzo(a)anthracene	1.76E-9	3	8.24E-8	8.24E-8	PAH
Benzene	2.06E-6	3	9.61E-5	9.61E-5	
Benzo(a)pyrene	1.18E-9	3	5.49E-8	5.49E-8	PAH
Benzo(b)fluoranthene	1.76E-9	3	8.24E-8	8.24E-8	PAH
Benzo(g,h,i)perylene	1.18E-9	3	5.49E-8	5.49E-8	PAH
Benzo(k)fluoranthene	1.76E-9	3	8.24E-8	8.24E-8	PAH
Beryllium	1.18E-8	4	5.49E-7	5.49E-7	
Cadmium	1.08E-6	4	5.04E-5	5.04E-5	
Chromium	1.37E-6	4	6.41E-5	6.41E-5	
Chrysene	1.76E-9	3	8.24E-8	8.24E-8	PAH
Cobalt	8.24E-8	4	3.85E-6	3.85E-6	
Dibenzo(a,h)anthracene	1.18E-9	3	5.49E-8	5.49E-8	PAH
Dichlorobenzene	2.06E-6	3	9.61E-5	9.61E-5	
Fluoranthene	2.94E-9	3	1.37E-7	1.37E-7	PAH
Fluorene	2.75E-9	3	1.28E-7	1.28E-7	PAH
Formaldehyde	7.35E-5	3	3.43E-3	3.43E-3	
Hexane	1.76E-3	3	0.08	0.08	
Indeno(1,2,3-cd)pyrene	1.76E-9	3	8.24E-8	8.24E-8	PAH
Lead	4.90E-7	4	2.29E-5	2.29E-5	
Manganese	3.73E-7	4	1.74E-5	1.74E-5	
Mercury	2.55E-7	4	1.19E-5	1.19E-5	
Naphthalene	5.98E-7	3	2.79E-5	2.79E-5	PAH
Nickel	2.06E-6	4	9.61E-5	9.61E-5	
Phenanthrene	1.67E-8	3	7.78E-7	7.78E-7	PAH
Pyrene	4.90E-9	3	2.29E-7	2.29E-7	PAH
Selenium	2.35E-8	4	1.10E-6	1.10E-6	PAH
Toluene	3.33E-6	3	1.56E-4	1.56E-4	PAH
Total PAH	4.04E-6		1.89E-4	1.89E-4	
Total HAP				0.09	

Reference:

1. AP-42 Table 1.4-1
2. AP-42 Table 1.4-2
3. AP-42 Table 1.4-3
4. AP-42 Table 1.4-4

Table 3: Potential to Emit
Emergency Generator
Emission Unit U-00003

Annual Operating Schedule (hr) 500 | Power Output (bkW) 1,115 [1]

Fuel Consumption (MMBtu/hr) 15.4 [1]

Co-pollutant	CAS No.	Emission Factor		Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)
		(lb/MMBtu)	(g/kWh)			
Criteria Pollutants						
NO_x			5.42	1	13.3	3.33
CO			0.80	1	1.97	0.49
VOC			0.23	1	0.57	0.14
SO_2		1.53E-03		2	2.36E-02	5.90E-03
$PM_{2.5}/PM_{10}$			0.80	1	1.97	0.49
Hazardous Air Pollutants						
Acetaldehyde	75-07-0	2.52E-05		3	3.89E-04	9.72E-05
Acrolein	107-02-8	7.88E-06		3	1.22E-04	3.04E-05
Benzene	71-43-2	7.76E-04		3	1.20E-02	2.99E-03
Formaldehyde	50-00-0	7.89E-05		3	1.22E-03	3.04E-04
Total PAH		2.12E-04		4	3.26E-03	8.16E-04
Acenaphthene	83-32-9	4.68E-06		4	7.22E-05	1.81E-05
Acenaphthylene	208-96-8	9.23E-06		4	1.42E-04	3.56E-05
Anthracene	120-12-7	1.23E-06		4	1.90E-05	4.74E-06
Benzo(a)anthracene	56-55-3	6.22E-07		4	9.60E-06	2.40E-06
Benzo(b)fluoranthene	205-99-2	1.11E-06		4	1.71E-05	4.28E-06
Benzo(g,h,i)perylene	191-24-2	5.56E-07		4	8.58E-06	2.14E-06
Benzo(k)fluoranthene	207-08-9	2.18E-07		4	3.36E-06	8.41E-07
Benzo(a)pyrene	50-32-8	2.57E-07		4	3.97E-06	9.91E-07
Chrysene	218-01-9	1.53E-06		4	2.36E-05	5.90E-06
Dibenzo(a,h)anthracene	53-70-3	3.46E-07		4	5.34E-06	1.33E-06
Fluoranthene	206-44-0	4.03E-06		4	6.22E-05	1.55E-05
Fluorene	86-73-7	1.28E-05		4	1.98E-04	4.94E-05
Indeno(1,2,3-cd)pyrene	193-39-5	4.14E-07		4	6.39E-06	1.60E-06
Naphthalene	91-20-3	1.30E-04		4	2.01E-03	5.01E-04
Phenanthrene	85-01-8	4.08E-05		4	6.30E-04	1.57E-04
Pyrene	129-00-0	3.71E-06		4	5.72E-05	1.43E-05
Toluene	108-88-3	2.81E-04		3	4.34E-03	1.08E-03
Xylenes	1330-20-7	1.93E-04		3	2.98E-03	7.44E-04
Total HAP						5.34E-03

Reference:

1. Vendor data (Caterpillar C175-20 Standby)
   https://s7d2.scene7.com/is/content/Caterpillar/CM20190430-aca82-c4a9f
2. Diesel fuel (15 ppm sulfur, 7 lb/gal, 0.137381 MMBtu/gal)
2. AP 42 Table 3.4-3.
3. AP 42 Table 3.4-4.

Table 4: Potential to Emit
Firewater Pump
Emission Unit U-00005

Annual Operating Schedule (hr) 500 Fuel Consumption (MMBtu/hr) 2.02 [1]

Co-Pollutant	CAS No.	Emission Factor (lb/MMBtu)	Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)
Criteria Pollutants					
NO_x		0.6763	1	1.37	0.34
CO		0.4356	1	0.88	0.22
VOC		0.0378	1	0.08	0.02
SO_2		1.53E-03	2	3.09E-3	7.72E-4
$PM_{2.5}/PM_{10}$		0.0362	1	0.07	0.02
Hazardous Air Pollutants					
Acetaldehyde	75-07-0	7.67E-04	3	1.55E-03	3.87E-04
Acrolein	107-02-8	9.25E-05	3	1.87E-04	4.67E-05
Benzene	71-43-2	9.33E-04	3	1.88E-03	4.71E-04
Formaldehyde	50-00-0	1.18E-03	3	2.38E-03	5.96E-04
Total PAH		1.68E-04	3	3.39E-04	8.49E-05
Acenaphthene	83-32-9	1.42E-06	3	2.87E-06	7.17E-07
Acenaphthylene	208-96-8	5.06E-06	3	1.02E-05	2.56E-06
Anthracene	120-12-7	1.87E-06	3	3.78E-06	9.44E-07
Benzo(a)anthracene	56-55-3	1.68E-06	3	3.39E-06	8.48E-07
Benzo(b)fluoranthene	205-99-2	1.88E-07	3	3.80E-07	9.49E-08
Benzo(g,h,i)perylene	191-24-2	9.91E-08	3	2.00E-07	5.00E-08
Benzo(k)fluoranthene	207-08-9	4.89E-07	3	9.88E-07	2.47E-07
Benzo(a)pyrene	50-32-8	1.55E-07	3	3.13E-07	7.83E-08
Chrysene	218-01-9	3.53E-07	3	7.13E-07	1.78E-07
Dibenzo(a,h)anthracene	53-70-3	5.83E-07	3	1.18E-06	2.94E-07
Fluoranthene	206-44-0	7.61E-06	3	1.54E-05	3.84E-06
Fluorene	86-73-7	2.92E-05	3	5.90E-05	1.47E-05
Indeno(1,2,3-cd)pyrene	193-39-5	3.75E-07	3	7.58E-07	1.89E-07
Naphthalene	91-20-3	8.48E-05	3	1.71E-04	4.28E-05
Phenanthrene	85-01-8	2.94E-05	3	5.94E-05	1.48E-05
Pyrene	129-00-0	4.78E-06	3	9.66E-06	2.41E-06
Toluene	108-88-3	4.09E-04	3	8.26E-04	2.07E-04
Xylenes	1330-20-7	2.85E-04	3	5.76E-04	1.44E-04
Total HAP					1.94E-03

Reference:

1. Vendor data (Cummins CFP23E-F50)
2. Diesel fuel (15 ppm sulfur, 7 lb/gal, 0.137381 MMBtu/gal)
3. AP 42 Table 3.3-2.

Table 5: Potential to Emit
Two Fuel Gas Heaters
Emission Unit U-00006

Operating Schedule (hr/yr) 8,760 Firing Rate (MMBtu/hr) 12.56 [1]

Co-Pollutant	Emission Factor (lb/MMBtu)	Reference	Hourly Emission (lb/hr)	Annual Emission (ton/yr)	Notes
Criteria Pollutants					
NO_x	0.0364	1	0.46	2.00	
CO	0.073	1	0.92	4.02	
VOC	0.005	1	0.06	0.28	
SO	5.88E-4	2	7.39E-3	0.03	
$PM_{2.5}/PM_{10}$	7.45E-3	2	0.09	0.41	
Hazardous Air Pollutants					
2-Methylnaphthalene	2.35E-08	3	2.96E-07	1.29E-06	PAH
3-Methylchloranthrene	1.76E-09	3	2.22E-08	9.71E-08	PAH
7,12-Dimethylbenz(a) anthracene	1.57E-08	3	1.97E-07	8.63E-07	PAH
Acenaphthene	1.76E-09	3	2.22E-08	9.71E-08	PAH
Acenaphthylene	1.76E-09	3	2.22E-08	9.71E-08	PAH
Anthracene	2.35E-09	3	2.96E-08	1.29E-07	PAH
Arsenic	1.96E-07	4	2.46E-06	1.08E-05	
Benzo(a)anthracene	1.76E-09	3	2.22E-08	9.71E-08	PAH
Benzene	2.10E-03	3	2.64E-02	1.16E-01	
Benzo(a)pyrene	1.18E-09	3	1.48E-08	6.47E-08	PAH
Benzo(b)fluoranthene	1.76E-09	3	2.22E-08	9.71E-08	PAH
Benzo(g,h,i)perylene	1.18E-09	3	1.48E-08	6.47E-08	PAH
Benzo(k)fluoranthene	1.76E-09	3	2.22E-08	9.71E-08	PAH
Beryllium	1.18E-08	4	1.48E-07	6.47E-07	
Cadmium	1.08E-06	4	1.35E-05	5.93E-05	
Chromium	1.37E-06	4	1.72E-05	7.55E-05	
Chrysene	1.76E-09	3	2.22E-08	9.71E-08	PAH
Cobalt	8.24E-08	4	1.03E-06	4.53E-06	
Dibenzo(a,h)anthracene	1.18E-09	3	1.48E-08	6.47E-08	PAH
Dichlorobenzene	2.06E-06	3	2.59E-05	1.13E-04	
Fluoranthene	2.94E-09	3	3.69E-08	1.62E-07	PAH
Fluorene	2.75E-09	3	3.45E-08	1.51E-07	PAH
Formaldehyde	7.35E-05	3	9.24E-04	4.05E-03	
Hexane	1.76E-03	3	2.22E-02	9.71E-02	
Indeno(1,2,3-cd)pyrene	1.76E-09	3	2.22E-08	9.71E-08	PAH
Lead	4.90E-07	4	6.16E-06	2.70E-05	
Manganese	3.73E-07	4	4.68E-06	2.05E-05	
Mercury	2.55E-07	4	3.20E-06	1.40E-05	
Naphthalene	5.98E-07	3	7.51E-06	3.29E-05	PAH
Nickel	2.06E-06	4	2.59E-05	1.13E-04	
Phenanthrene	1.67E-08	3	2.09E-07	9.17E-07	PAH
Pyrene	4.90E-09	3	6.16E-08	2.70E-07	PAH
Selenium	2.35E-08	4	2.96E-07	1.29E-06	PAH
Toluene	3.33E-06	3	4.19E-05	1.83E-04	PAH
Total PAH	4.04E-06		5.08E-05	2.22E-04	
Total HAP				2.17E-01	

Reference:

1. Vendor data (2 heaters)
2. AP-42 Table 1.4-2
3. AP-42 Table 1.4-3
4. AP-42 Table 1.4-4

Table 6: Potential to Emit
CPV Valley Energy Center

Co-pollutant	Potential to Emit (lb/yr)					
	Two Combustion Turbines w/ Duct Burners	Auxiliary Boiler	Emergency Generator	Firewater Pump Engine	Two Fuel Gas Heaters	Total
Criteria Pollutants						
NO_x	341,758	4,578	6,662	683	4,008	357,689
CO	230,148	7,692	983	440	8,032	247,295
VOC	56,125	504	283	38.2	550	57,499
SO_2	84,104	54.9	11.8	1.54	64.7	84,237
$PM_{2.5}/PM_{10}$	273,114	696	983	36.6	820	275,649
Hazardous Air Pollutants						
1,3 Butadiene	63.1					63.1
2-Methylnaphthalene	7.94E-02	2.20E-03			2.59E-03	0.08
3-Methylchloranthrene	5.95E-03	1.65E-04			1.94E-04	6.31E-3
7,12-Dimethylbenz(a) anthracene	5.29E-02	1.47E-03			1.73E-03	0.06
Acenaphthene	5.95E-03	1.65E-04	3.61E-02	1.43E-03	1.94E-04	0.04
Acenaphthylene	5.95E-03	1.65E-04	7.12E-02	5.11E-03	1.94E-04	0.08
Acetaldehyde	1,408		1.94E-01	7.75E-01		1,409
Acrolein	225		6.08E-02	9.34E-02		226
Anthracene	7.94E-3	2.20E-04	9.49E-03	1.89E-03	2.59E-04	0.02
Arsenic	34.6	1.83E-02			2.16E-02	34.6
Benzo(a)anthracene	5.95E-3	1.65E-04	4.80E-03	1.70E-03	1.94E-04	0.01
Benzene	560	1.92E-01	5.99E+00	9.42E-01	2.31E+02	798
Benzo(a)pyrene	3.97E-03	1.10E-04	1.98E-03	1.57E-04	1.29E-04	6.35E-3
Benzo(b)fluoranthene	5.95E-03	1.65E-04	8.56E-03	1.90E-04	1.94E-04	0.02
Benzo(g,h,i)perylene	3.97E-03	1.10E-04	4.29E-03	1.00E-04	1.29E-04	8.60E-3
Benzo(k)fluoranthene	5.95E-03	1.65E-04	1.68E-03	4.94E-04	1.94E-04	8.49E-3
Beryllium	0.99	1.10E-03			1.29E-03	1.00
Cadmium	18.4	1.01E-01			1.19E-01	18.6
Chromium	38.5	1.28E-01			1.51E-01	38.8
Chrysene	5.95E-03	1.65E-04	1.18E-02	3.57E-04	1.94E-04	0.02
Cobalt	2.78E-01	7.69E-03			9.06E-03	0.29
Dibenzo(a,h)anthracene	3.97E-3	1.10E-4	2.67E-3	5.89E-4	1.29E-4	7.47E-3
Dichlorobenzene	6.95	0.19			0.23	7.37
Ethylbenzene	1,127					1,127
Fluoranthene	9.92E-3	2.75E-4	0.03	7.69E-3	3.24E-4	0.05
Fluorene	9.26E-3	2.56E-4	0.10	0.03	3.02E-4	0.14
Formaldehyde	4,630	6.87	0.61	1.19	8.09	4,646
Hexane	5,954	165			194	6,313
Indeno(1,2,3-cd)pyrene	5.95E-3	1.65E-4	3.19E-3	3.79E-4	1.94E-4	9.89E-3
Lead	44.8	0.05			0.05	44.9
Manganese	2,436	0.03			0.04	2,436
Mercury	4.56	0.02			0.03	4.61
Naphthalene	151	0.06	1.00	0.09	0.07	153
Nickel	21.1	0.19			0.23	21.5
Phenanthrene	0.06	1.56E-3	0.31	0.03	1.83E-3	0.40
Pyrene	0.02	4.58E-4	0.03	4.83E-3	5.39E-4	0.05
Selenium	77.1	2.20E-3			2.59E-3	77.1
Toluene	4,589	0.31	2.17	0.41	0.37	4,592
Xylenes	2,254		1.49	0.29		2,255
Total HAP	22,767	173	10.7	3.87	435	23,389

Note that total HAP emissions does not equal the sum of the pollutant emissions values listed above. Speciated PAH and total PAH are both listed . The pollutant emissions values listed for the combustion turbines are the worse case o to emissions values with and without duct burner firing.

Table 7: Heat Rate Comparison
CPV Valley Energy Center

Project, Power Plant Category, or Requirement	Heat Rate (Btu/kWh, HHV)	Notes
CPV Valley Energy Project	6,912(1)	eGRID calendar year 2020 operation
CPV Valley Energy Project	6,650(2)	April 9, 2019 heat rate test
CPV Valley Energy Project	6,938(2)	May 27, 2020 heat rate test
CPV Valley Energy Project	6,934(2)	May 26, 2021 heat rate test
CPV Valley Energy Project	6,917(2)	June 7, 2022 heat rate test
All NPCC[3] Upstate NY Combustion Generation Plants	7,599(1)	eGRID calendar year 2020 operation
NYSDEC Maximum Allowable Heat Rate	7,605(2)	State Facility Permit 3-3356-00136/ 00001 Condition 19

1. EPA eGRID https://www.epa.gov/egrid/download-data
2. Corrected to reference conditions per, ASME PTC 46-1996 https://www.asme.org/codes-standards/find-codes-standards/ptc-46-overall-plant-performance
3. Northeast Power Coordinating Council

Table 8: Greenhouse Gas Emission Rate Comparison
CPV Valley Energy Center

Project, Power Plant Category, or Requirement	CO_2e Emission Rate (lb/MWh)	Notes
CPV Valley Energy Project	822(1)	eGRID calendar year 2020 operation
All NPCC Upstate NY Combustion Generation Plants	836(1)	eGRID calendar year 2020 operation
All NPCC Upstate NY Fossil Fuel Plants	852(1)	eGRID calendar year 2020 operation
All NPCC Upstate NY Non-baseload Plants	881(1)	eGRID calendar year 2020 operation
Maximum Allowable Emission Rate	925(2)	Measured on a 12-month rolling average basis

1. EPA eGRID https://www.epa.gov/egrid/download-data
2. State Facility Permit 3-3356-00136/ 00001 Condition 100

Table 9: Combined-Cycle Turbine Operating Hours
CPV Valley Energy Center

Year	Operating Hours[1]		
	Emission Unit U-00001	Emission Unit U-00002	Maximum Potential
2018	2,480	2,310	8,208 / 8,352[2]
2019	6,802	6,855	8,760
2020	7,814	7,421	8,784
2021	7,133	6,926	8,760
2022 (Q1 & Q2)	3,675	3,839	4,344

1. From EPA Clean Air Markets https://campd.epa.gov/data accessed October 2022.

2. U-00001 and U-00002 commenced operation on January 24, 2018 and January 18, 2018, respectively.

Table 10: Startup and Shutdown Event Frequency and Duration
CPV Valley Energy Center

Event Type	Extended Startup	Cold Startup	Warm Startup	Hot Startup	Shutdown
Unit Downtime Prior to Event	**>96 hours**	**>48 hours ≤96 hours**	**>8 hours ≤48 hours**	**≤ 8 hours**	**Not Applicable**
Year	**Event Frequency (Events/Year)**				
2018	3	0	9	4	2
2019	11	5	17	23	41
2020	7	6	20	31	53
2018 - 2020 Total	21	11	49	59	96
Year	**Average Event Duration (Hours/Event)**				
2018	1.71		2.43	0.88	0.13
2019	3.35	2.66	1.98	1.24	0.38
2020	2.52	1.65	1.77	1.27	0.28
2018 - 2020 Average	2.84	2.11	1.97	1.23	0.35

Table 11: Annueal Fuel Consumption
CPV Valley Energy Center

Year	Amount of Fuel Burned	
	No. 2 Fuel Oil / Diesel Fuel (gallon/year)	Natural Gas (standard cubic feet/ year)
2020	5,371	31,504,950,000
2021	1,541	28,887,150,000