June 6, 2022

TO: U.S. ENVIRONMENTAL PROTECTION AGENCY
FR: THE INSTITUTE OF CLEAN AIR COMPANIES
RE: AVAILABLE AND EMERGING TECHNOLOGIES FOR REDUCING GREENHOUSE GAS EMISSIONS FROM COMBUSTION TURBINE ELECTRIC GENERATING UNITS, DOCKET ID NO. EPA-HQ-OAR-2022-0289

The Institute of Clean Air Companies (ICAC) appreciates the opportunity to offer comments in response to EPA's Draft White Paper on Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Combustion Turbine Electric Generating Units (EPA-HQ-OAR-2022-0289).

ICAC is a national trade association of companies that supply greenhouse gas management, air pollution control and monitoring systems, equipment, and services for stationary sources. For 60 years, ICAC member companies have helped to clean the air by developing and installing reliable, cost-effective control and monitoring systems. We support technology-neutral and flexible policies that enable cost-competitiveness and a diverse set of technologies to compete in the market.

ICAC member companies believe there will continue to be a need for turbines and baseload units to supply power when alternative energy sources cannot meet demand. Our comments will address specific sections or exhibits in the draft white paper, providing clarification or more information where necessary.

Again, ICAC appreciates the opportunity to offer comments on this draft white paper, and we look forward to answering any further questions should EPA seek additional information.

Best regards,

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Introduction

The Institute of Clean Air Companies (ICAC) appreciates the opportunity to respond to the Environmental Protection Agency's (EPA) Draft White Paper on Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Combustion Turbine Electric Generating Units (EPA-HQ-OAR-2022-0289).

ICAC is a trade association headquartered in Arlington, VA, and represents more than 30 companies in the air pollution control, greenhouse gas management, and emissions measurement industry. ICAC members have successfully developed and deployed solutions to address emissions challenges for more than 60 years and are uniquely positioned to provide their expertise on emerging clean technologies and advancing clean technology markets. ICAC members have successfully commercialized solutions for the industrial, power, oil and gas, and maritime sectors, and have worked to address challenges that emerge at the nexus of air and water pollution management. Pollutants managed by member technologies include mercury, acid gases, PM, NOx, SOx, VOCs, HAPs, GHGs, HCl, and coal ash. Our members have operations in all 50 states and range from multi-national corporations with thousands of employees to small businesses focused on local emission challenges.

ICAC member companies believe there will continue to be a need for turbines and baseload units to help supply power when alternative energy sources cannot meet needs. Original Equipment Manufacturers (OEMs) are in the process of developing technology capable of combusting pure hydrogen, although this is still a few years from being available for larger frame turbines. The long-term emissions goal is for stack NOx to be similar for hydrogen-fired units as that of natural gas-fired units. However, Best Available Control Technology (BACT) has not been established for hydrogen-fired turbines, so the process should allow for reasonable emission levels to be set initially and then ratchet down through time as it has been for natural gas and other fuels. These discussions should occur when the burner technology is ready for commercial use and data is available for confirmation.

The following comments will call attention to specific sections or exhibits in the draft white paper. ICAC members remain ready to provide information to help inform EPA's efforts on this topic and welcome the opportunity for additional conversations with agency members.

4.0 GHG Emissions from Combustion Turbine EGUs

Formation of Nitrous Oxide

The use of selective catalytic reduction (SCR) systems can at times generate very small amounts of N_2O. This reaction is highly dependent on the temperature at the SCR and the composition of the SCR catalyst. Much work has been done to lower the conversion to N_2O at higher temperatures. Many of the newer high-temperature SCR catalysts generate much less than 1% conversion to N_2O, a negligible amount of emissions.

The addition of dilution air has been a strategy to bring exhaust temperatures to within the operating range of traditional vanadium SCR catalysts. While that had been a more cost-effective solution, newer, high-temperature catalysts make that unnecessary in many cases.

5.2 Efficiency Improvements

Any addition of equipment downstream of a turbine creates back pressure and loss of efficiency. However, this does not mean that equipment, such as those to control pollution, is a hindrance to lowering greenhouse gases and pollution.

Exhibit 5-2. Design efficiency of simple cycle combustion turbines AND Exhibit 5-4. Combined cycle efficiency

The efficiency of the fleet of gas turbines has been included and shown in Exhibits 5-2 and 5-4. The efficiency is shown on a fuel higher heating value basis (HHV). It is industry practice to express both gas turbine and combined cycle power plant efficiency on a fuel lower heating value (LHV) basis. ICAC recommends showing efficiency on an LHV basis to be consistent with industry practice.

Additionally, the efficiency of combined heat and power (CHP) plants in section 5.0 and reciprocating internal combustion engines (RICE) in section 8.0 are expressed on an LHV basis. The efficiency basis should be consistent throughout the document.

5.4.1 Fast Start/Flexible Combined Cycle EGUs

The emergence of catalysts to operate at high temperatures for both NOx and CO control has been well demonstrated and in operation for over 25 years.

Sections 5.6-5.9 GHG Emission Control Technologies

The EPA white paper identifies various GHG emission control technologies, notably, carbon capture utilization and storage (CCUS), oxy-fuel combustion, and hydrogen combustion. Significant investment and research and investment are being devoted to these technologies. As noted in the EPA white paper, these technologies are in various stages of research, engineering study, development, and demonstration projects. However, at the writing of this EPA white paper, these technologies are not currently commercially demonstrated at full scale without compromising plant performance, operability, or cost, for use as either Best System of Emission Reduction (BSER) or Best Available Control Technologies (BACT). As industry strives to meet the challenges of delivering clean, reliable, low-cost electricity with reduced CO2 intensity, these technologies will continue to be developed and, the technology maturity and full-scale commercial viability will improve. Assessment of these technologies will need to remain current with the development of these technologies as they are considered in regulatory and permitting assessments.

5.9 Hydrogen

In the draft white paper, EPA cites the Long Ridge Energy Generation Project in southeast Ohio as an example where hydrogen could be used as fuel. Because the volume of hydrogen being blended in at this facility is small, the CO catalyst did not have to be altered. Generally, blending hydrogen does not require new gas turbine exhaust CO or SCR technology. However, as the ratio of hydrogen increases, there will be a point at which the moisture content in the exhaust may require adjustments to the technology for controlling NOx (and possibly CO).

Additionally, this section cites the Intermountain Power Authority project, which utilizes two single-shaft combined cycle trains. This is not a “converted” coal plant, as EPA states, because that would imply the repowering of existing coal plant steam turbines. We recommend that EPA refer to it as “replacement” instead.

Exhibit 5-12. Types of Hydrogen Production

ICAC supports technology-neutral and flexible policies that enable cost-competitiveness and a diverse set of solutions to compete in the market. The hydrogen economy has the potential to flourish with government support to scale-up proven technologies and drive down costs through large-scale demonstration projects for different production methods in regions with unique characteristics (e.g., end-users, storage options, resources, feedstocks, existing infrastructure).

All production methods will be required, as some methods are more suitable for certain geographies and will be more desirable based on a variety of factors. For example, regions with ample renewable feedstocks and energy sources may be better suited for green hydrogen deployment. Alternatively, regions with existing infrastructure, access to low-carbon methane (i.e., Renewable Natural Gas), and ample CO_2 storage options may be better suited for blue hydrogen. Additionally, in the near term, retrofitting an existing production facility will allow for larger volumes of low-carbon hydrogen to be produced more rapidly. If end-users require a more limited volume, then green hydrogen produced through electrolysis could be a better option. Both the near and long-term technologies must be supported to reach decarbonization goals as quickly as possible.

5.6.2 Energy-Output Integrated Renewables

Very few, if any, grid interconnection points are “often worth hundreds of millions of dollars," which would be cost-prohibitive. It may take hundreds of millions to develop a new, long-distance transmission line, but system upgrades are typically limited to tens of millions of dollars.

5.6.3 Integrated Energy Storage

While a coupled system can provide the opportunity to “bid into an ancillary service”, it provides significantly limited benefit compared with making that same Battery Energy Storage System (BESS) resource available to support the entire grid, not just a single generation resource.

Exhibit 5-9. Energy Storage Technologies

“Iron-Air Batteries” should be added to this exhibit as an example of a medium-term technology.

6.3 Methane from Abandoned Oil and Gas Wells

ICAC is unsure of EPA’s intent in this section of the draft white paper. Does EPA intend to look at future regulations that require fleets of new gas turbines to be responsible for controlling emissions from abandoned wells?

6.4 Coal Mine Methane

ICAC is uncertain about EPA’s intent to include coal mine methane (CCM) control in a draft white paper focused on gas turbines and CO2 control but we would be happy to provide comment to EPA in a different forum. In the meantime, the Department of Energy has a program, REMEDY, https://arpa-e.energy.gov/technologies/programs/remedy that addresses capture and destroy of coal mine methane.

8.0 Alternative to Combustion Turbines

Reciprocating internal combustion engines (RICE) have always been an alternative to gas turbines and are often favored due to their ability for rapid start-up. RICE engines have a much flatter derating curve than combustion turbines, in which the compressor section produces reduced combustion pressures at decreased speeds. RICE engines, with their smaller size, also provide the plant the ability to operate part load with all but one unit at maximum full load efficiency.

The issue of methane slip from RICE engines is an ongoing issue. Catalyst evaluations are underway to address this, but the low operating temperatures of RICE engine designs are a challenge.

Conclusion

ICAC is committed to regulatory actions that support environmental stewardship and protect human health. ICAC member companies are proud of their role in helping to clean the air by developing and installing reliable, cost-effective control and monitoring systems that have enabled compliance with environmental requirements. ICAC stands ready to assist EPA on this topic and further air pollution reduction efforts.

Contributing Members:

Burns & McDonnell

Johnson Matthey

Mitsubishi Power