COMBINED
HEAT AND POWER
ALLIANCE

Notice 2022-49 – "Certain Energy Generation Incentives"

November 4, 2022

SUMITTED ELECTRONICALLY

Internal Revenue Service
CC: PA:LPD:PR (Notice 2022-49)
Room 5203
P.O. Box 7604, Ben Franklin Station
Washington, D.C. 20044

RE: Combined Heat and Power Alliance Comments on Notice 2022-49

Introduction

The Combined Heat and Power Alliance ("CHP Alliance") is the leading national voice for the deployment of combined heat and power ("CHP"). We are a diverse coalition of business, labor, contractor, non-profit organizations, and educational institutions with the common purpose to educate all about CHP, and how CHP and waste heat to power ("WHP") technologies can make manufacturers and other businesses more competitive, reduce energy costs, enhance grid and customer reliability, and reduce emissions.

The CHP Alliance appreciates the opportunity to submit comments in response to the request of the Treasury Department and Internal Revenue Service (IRS) in Notice 2022-49. As the Treasury Department and IRS implement the Inflation Reduction Act, the CHP Alliance asks that it do so in a manner that maximizes the immediate reductions in emissions available from "CHP 1.0" systems that rely upon fossil fuels and facilitate a successful transition to CHP 2.0 powered by renewable and lower-carbon fuels. To that end, our comments discuss: (1) standards for determining which technologies should qualify as zero emission for the clean electricity production and investment tax credits, (2) repowering existing facilities, and (3) structuring the continuity safe harbor period in light of the Inflation Reduction Act.

Clean Electricity Production Credit (sec. 45Y) and Clean Energy Investment Credit (sec. 48E)

Question: *What existing industry standards, if any, should the Treasury Department and the IRS consider in determining a taxpayer's eligibility for the § 45Y credit?*

Question: *Section 45Y(b)(2)(C)(i) requires the Secretary to annually publish a table that sets forth the greenhouse gas emissions rates for types or categories of facilities. What should the*

Treasury Department and IRS consider in publishing this table, including considerations around scope and the factors?

With respect to the scope of the table, the CHP Alliance urges the Treasury Department and the IRS to include all types of CHP and WHP systems in the annual table. Both CHP and WHP systems can deliver zero emissions electricity and maximize the efficient use of energy resources, thus lowering consumer costs and maximizing emission reductions. In addition, the existing tax incentives for CHP and WHP expire on December 31, 2024, and consumers, equipment manufacturers, project developers, gas and electric utilities, and others will need early and clear guidance from the Department and IRS about how to convert to the new tax credits in sections 45Y or 48E.

As the Treasury Department and IRS consider methods for determining eligible technologies under section 45Y, and by extension for section 48E, the CHP Alliance respectfully requests giving attention to three key issues: (1) developing methods of calculating net greenhouse gas emissions, which consider the emissions savings CHP systems provide in terms of creating an aggregate reduction in overall energy consumption, (2) recognizing CHP systems using renewable and other clean fuels as zero greenhouse gas emission facilities, and (3) recognizing WHP systems as zero emission, because they produce no incremental greenhouse gas emissions.

Methods for Calculating Net Greenhouse Gas Emissions for CHP Systems

Section 45Y(b)(2) allows for special greenhouse gas accounting rules allowing for a calculation of net greenhouse gas emissions rates for facilities that produce electricity through combustion and gasification. The energy and emission savings benefit of CHP systems results from the overall reduction in energy consumption resulting from combining the production of thermal and electric energy, as compared to producing each separately. To determine the CO_2 emissions savings resulting from a CHP system requires three calculations: (1) the CO_2 emissions of the CHP system, (2) the CO_2 emissions from displaced thermal energy at the site, (3) the CO_2 emissions from displaced electric generation, based on marginal grid emissions.

Attached to this letter, please find an appendix outlining methods for making these calculations, which are rooted in methodologies developed by the Environmental Protection Agency (EPA), United Nations, World Resources Institute, and World Business Council for Sustainable Development.

Clean and Renewable Fuels used in Combined Heat and Power Systems

The CHP Alliance believes the United States should continue to benefit from the overall energy efficiency of generating heat and power simultaneously, as the tax code transitions to incentivizing clean fuels. CHP systems operate with an overall efficiency of 65% to 85%, with some systems approaching 90% efficiency, compared to the 45% - 55% efficiency achieved when generating thermal and electric energy separately. Historically, CHP systems have run primarily on natural gas, but CHP systems can be fueled with renewable and zero-carbon fuels like biomass, biogas, renewable natural gas (RNG) or biomethane, renewable propane (rLPG), and hydrogen[1]. Incentivizing these zero emissions fuels to be used in very efficient CHP systems would minimize energy costs for consumers, maximize the emission reductions these fuels can achieve and extend the resource base of these fuels by using them most efficiently. As the IRS and Treasury Department consider establishing lists of eligible zero emission facilities, we urge giving a high priority to methodologies for establishing zero emission facilities and recommend relying on previous findings recognizing CHP facilities using these fuels as net-zero resources, which should be eligible under sections 45Y and 48E.

Biomass: The section 45 tax credit has long recognized biomass as a renewable energy resource. In 2018, Congress instructed[2] the U.S. Department of Agriculture and Environmental Protection Agency to implement policies recognizing the carbon neutrality of forest bioenergy and treat biomass as a renewable energy resource. Furthermore, if biological residuals from manufacturing waste are not used for energy, those waste products would further contribute to global warming by releasing methane.

Biogas: The Inflation Reduction Act incentivizes the production of biogas. The carbon dioxide fixed in organic matter from which biogas is derived comes from atmospheric CO_2, so the displacement of fossil fuels with biogas lowers CO_2 emissions. Biogas also mitigates methane emissions, which would otherwise escape from sites like landfills and manure lagoons.[3]

Renewable Natural Gas (RNG): As with biogas, RNG is considered carbon neutral, because it is derived from organic sources, which previously absorbed atmospheric CO_2, and the benefits of RNG expand when derived from organic wastes that would otherwise decay—creating methane emissions. RNG sourced from landfill-diverted food and green waste can provide a 125 percent reduction in greenhouse gas emission, and RNG from dairy manure can result in a 400 percent reduction when replacing traditional fuels.[4]

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[1] Over 600 of the existing 4,700 existing CHP systems in the U.S. are fueled by digester gas and landfill gas – DOE CHP Installations Database, https://betterbuildingssolutioncenter.energy.gov/chp/solutions-at-a-glance/us-doe-chp-installation-database

[2] Public Law 115-141 (March 23, 2018) (132 STAT. 695). https://www.congress.gov/115/plaws/publ141/PLAW-115publ141.pdf

[3] See Tim Juliani, September 24, 2020. "Is Biogas a 'Green' Energy Source. https://www.worldwildlife.org/blogs/sustainability-works/posts/is-biogas-a-green-energy-source

[4] SoCalGas. "What is Renewable Natural Gas." https://www.socalgas.com/sustainability/renewable-gas/what-is-renewable-natural-gas#:~:text=RNG%20is%20considered%20a%20carbon,decay%20and%20create%20methane%20emissions.

Renewable Propane (rLPG): Renewable propane is made by converting plant and vegetable oils, waste greases and animal fat into fuel, which has a far superior environmental result than disposal.[5]

Hydrogen: As the CHP Alliance outlined in our CHP H2 Roadmap,[6] the efficient use of clean hydrogen fuels enables greater carbon dioxide emission reductions and lowers costs for end users. The Inflation Reduction Act incentivizes the clean production of hydrogen fuels, which addresses a major barrier the CHP Alliance has identified in advancing the use of hydrogen in CHP systems. Now that Congress has incentivized the creation of this fuel, recognizing CHP systems using hydrogen as net-zero emission for the purposes of section 45Y and 48E tax credits would support an efficient means of using this fuel to produce thermal and electric energy.

Waste Heat to Power

Congress granted an investment tax credit to WHP systems in the 2021 Consolidated Appropriations Act under 26 U.S.C. §48(c)(5) that recognizes waste heat as a renewable energy resource (excess thermal energy that is generated as a by-product of highly energy intensive industrial processes such as cement, steel, glass and other application including microgrids, reciprocating gas engines, turbines, small power plants, boilers, furnaces, kilns, pipelines and marine applications and several others. WHP received the full 30% energy tax credit level because of its status as a zero incremental emissions resource. In addition, WHP is recognized as a renewable energy resource in seventeen state renewable portfolio standards, and as an energy efficiency resource in four additional states.

This tax credit is intended to encourage deployment of WHP technologies co-located at the host sites of the above-mentioned industries to recover waste heat that would otherwise be lost to the atmosphere and convert it to usable energy—electricity. Such technologies vastly reduce industry carbon intensity and are a critical tool in the nation's transition in decarbonizing the U.S. economy (especially the highly energy intensive industrial sector) for the duration of time it takes for industry to retrofit to meet net zero emission goals.

WHP systems do not use fuel, they generate electricity from wasted heat, and pressure drop. Only excess waste energy captured by the WHP system is used to operate the technologies that generate electricity. If this wasted energy is not recovered, the United States will waste an opportunity to generate cost-effective, greenhouse gas emission free power for America's

[5] Jon Leonard (2017, Aug. 22) "Renewable Propane as a Sustainable Fuel Solution in California." https://www.act-news.com/news/renewable-propane-sustainable-fuel-solution-california/
[6] Combined Heat and Power Alliance (2019). *Clean Hydrogen and Combined Heat and Power: A Roadmap for Industrial and Commercial Decarbonization.* https://chpalliance.org/wp-content/uploads/2019/08/CHP-Hydrogen-Roadmap-2.pdf

industrial sector and the electric grid. Therefore, waste heat recovery (WHP) should continue have the same treatment as currently recognized by Congress like other qualified energy resources such as wind, solar and geothermal under the section 45Y and section 48E tax credits.

Additional information about calculating emissions for WHP facilities is also included in the appendix.

Question: *Section 45Y(b)(2)(C)(ii) provides that, in the case of any facility for which an emissions rate has not been established by the Secretary, a taxpayer that owns such facility may file a petition with the Secretary for a determination of the emissions rate with respect to such facility. What procedures should be provided by the Treasury Department and the IRS for taxpayers to file such a petition? What should the Secretary consider when making such determinations?*

The CHP Alliance believes the Treasury Department and IRS should consider any unique factors about the petitioning technology, including improvements in efficiency and the ability to obtain fuels with lower lifecycle greenhouse gas emissions that may separate the specific technology from the general technology classes in the initial lists of eligible technologies.

Repowering Projects and the 80/20 Rule

Question: *Is clarification needed on the applicability of the 80/20 rule used to determine whether retrofitted or repowered projects may qualify as new energy property? If so, how should this be clarified?*

As previously mentioned, the CHP Alliance's Clean Hydrogen and Combined Heat and Power: A Roadmap for Industrial and Commercial Decarbonization, outlines the potential for achieving significant emission reductions through combining clean hydrogen fuels with the efficiency of CHP systems. In addition, similar opportunities exist to further emissions reductions using numerous bio-based renewable fuels. Many of these opportunities can be realized by retrofitting CHP systems, where they are presently hosted and replacing them with equipment capable of utilizing these clean alternative fuels. In many cases, the fair market value of the used property for such retrofits would constitute more than 20 percent of the facility's total value. As the original 80/20 rule was written primarily with wind energy facilities in mind, we believe the Treasury Department and IRS should revisit the 80/20 rule to consider a flexible rule that considers the repowering opportunities present across a broader range of technologies, which can speed the decarbonization of the U.S. economy.

Start of Construction

As the Treasury Department and IRS consider questions around the start of construction, the CHP Alliance believes the rules should be tailored to the statutory deadlines of the Inflation Reduction Act, and continue to consider the persistent supply chain challenges across all industries.

The CHP Alliance recommends that the continuity safe harbor period should be applied to the relevant deadline applicable to the tax credit, rather than the date the project actually begins construction. Such a rule would require only that the project sponsor meets the requirements to start construction before the applicable date, and finish the project within the continuity safe harbor period to be deemed to satisfy the continuity requirements.

The CHP Alliance also respectfully requests the Treasury Department and IRS to provide a continuity safe harbor period of five years—beginning in the year following the relevant deadline to start construction. Such a rule would provide project developers greater flexibility as they continue to wrestle with the procurement challenges associated with bottlenecked supply chains.

Conclusion

The CHP Alliance appreciates the opportunity to provide comments on the questions raised in the Treasury Department and IRS's request for information, which raise many complex and interrelated questions. Given the complexity of the questions arising out of this legislation, we hope the Treasury Department and IRS follow their previous practices and remain open to reexamining initial guidance when new information or external circumstances may support changes. Our organization would appreciate the opportunity to continue to engage with the Treasury Department and IRS on the implementation of the Inflation Reduction Act through additional comment opportunities, meetings, and other means. Please feel free to contact me with any questions you have.

APPENDIX

CALCULATING NET GREENHOUSE GAS (GHG) EMISSIONS SAVINGS FROM CHP

The energy and emissions savings benefit of a CHP system is found in the aggregate reduction in overall energy consumption. A CHP system replaces both a separate on-site thermal system (furnace or boiler) and purchased power (typically electricity from a central station power plant) with a single, integrated system efficiently producing both thermal energy and power concurrently. To accurately calculate the energy and subsequent GHG emissions savings from a CHP system, both outputs of the CHP system must be considered. The CHP system's thermal output displaces the fuel normally consumed in and emissions from on-site thermal generation in a boiler or other equipment, and the CHP power output displaces the fuel consumed and emissions from grid-connected generation. Emissions impacts of CHP projects are a function of both the amount and type of fuel consumed by CHP system and displaced thermal equipment at the site, and the marginal emissions of the servicing power grid.

To quantify the GHG emissions savings of a CHP system, the emissions released from the CHP system must be subtracted from the GHG emissions that would normally occur without the system (i.e., using conventional separate heat and power):[7]

$$C_S = (C_T + C_G) – C_{CHP}$$

Where:

- C_S = Total Emissions Savings
- C_T = Emissions from Displaced On-site Thermal Production
- C_G = Emissions from Displaced Purchased Grid Electricity
- C_{CHP} = Emissions from CHP System

Calculating CO_2 Emissions from the CHP System

The CO_2 emissions from the CHP system are a function of the amount and type of fuel consumed. The total amount of fuel consumed by the CHP system in terms of energy content (F_{CHP}) can be measured directly as the higher heating value of the fuel consumed (typically in MMBtu) or by the fuel volume or weight, which can then be converted to the energy value through fuel-specific energy factors or heating values. Fuel consumption can also be estimated based on the electric or power output of the CHP system and the net electric generation efficiency.

The CO_2 emissions associated with the CHP system can then be calculated based on total fuel consumption and fuel-specific emissions factors:

[7] The calculation methodology outlined below is based on *Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems*, 2020, U.S. EPA, https://www.epa.gov/sites/default/files/2015-07/documents/fuel_and_carbon_dioxide_emissions_savings_calculation_methodology_for_combined_heat_and_power_systems.pdf

$$C_{CHP} = F_{CHP} * EF_F$$

Where:

C_{CHP} = CO_2 Emissions from CHP System (lbs)
F_{CHP} = CHP Fuel Consumption (MMBtu)
EF_F = Fuel Specific Emission Factor (CO_2 lb/MMBtu)

The table below shows energy and CO_2 emissions factors for common fossil fuels:

Selected Fossil Fuel-Specific Energy and CO_2 Emissions Factors[8]

Fuel Type	Energy Density	CO_2 Emissions Factor, lb/MMBtu
Natural Gas	1,028 Btu/scf	116.9
Propane	91,452Btu/gallon	138.6
Distillate Fuel Oil #2	138,000 Btu/gallon	163.1
Residual Fuel Oil #6	150,000 Btu/gallon	165.6
Coal (Anthracite)	12,545 Btu/lb	228.3
Coal (Bituminous)	12,465 Btu/lb	205.9
Coal (Subbituminous)	8,625 Btu/lb	213.9
Coal (Lignite)	7,105 Btu/lb	212.5
Coal (Mixed-Industrial Sector)	11,175 Btu/lb	207.1

Calculating CO_2 Emissions from Displaced Thermal Energy at the Site

The emissions from displaced thermal energy at the site are a function of the amount and type of fuel currently consumed. The thermal energy produced by a CHP system displaces combustion of some or all of the fuel that would otherwise be consumed in boilers or other

[8] 40 CFR Part 98, Mandatory Greenhouse Gas Reporting, Table C-1: Default CO2; Emission Factors and High Heat Values for Various Types of Fuel, https://www.govinfo.gov/content/pkg/CFR-2015-title40-vol21/xml/CFR-2015-title40-vol21-part98-subpartC-appC.xml

thermal equipment to provide required heating or cooling services at the site. The energy and emissions associated with this displaced fuel consumption can be calculated using the thermal output of the CHP system and measured data on or reasonable assumptions about the efficiency characteristics of the displaced thermal equipment. Displaced thermal fuel use is calculated by:

$$F_T = CHP_T \;/\; \eta_T$$

Where:

F_T = Displaced On-Site Thermal Fuel (MMBtu)
CHP_T = CHP System Useful Thermal Output (MMBtu)
η_T = Thermal Equipment Efficiency (%)

Displaced CO2 emissions are then calculated based on the amount of displaced thermal fuel and the fuel specific emissions factor:

$$C_T = F_T \; * EF_F$$

Where:

C_T = CO_2 Emissions from Displaced On-site Thermal Production (lbs)_
F_T = Displaced On-Site Thermal Fuel (MMBtu)
EF_F = Fuel Specific Emission Factor (CO_2 lb/MMBtu)

Calculating CO_2 Emissions from Displaced Electric Grid Generation

The emissions from displaced grid generation are a function of the amount and emissions profile of generation displaced. Displaced grid electricity associated with on-site CHP include the grid electricity no longer supplied to the site because of the CHP output and any related transmission and distribution losses - a portion of the electricity transmitted over power lines is lost due to resistance and other forms of dissipation, commonly referred to as 'transmission and distribution losses'. The amount of power delivered to users is less than the amount generated at central station power plants, usually by an average of about 6 to 9 percent. Fuel and emissions savings from displaced grid power should therefore be based on the corresponding amount of displaced grid electricity generated and not on the amount of grid electricity delivered to (and consumed at) the site. This can be calculated using the following equation:

$$E_G = CHP_E \;/\; (1-L_{T\&D})$$

Where:

E_G = Displaced Grid Generation (MWh)
CHP_E = CHP System Electricity Output (MWh)
$L_{T\&D}$ = Transmission and Distribution Losses (%)

The equation above determines the total amount of grid electricity generation displaced by the power produced by the CHP system. The CO_2 emissions related to this displaced generation are based on the marginal emissions factor for the servicing grid:

$$C_G = E_G * EF_G$$

Where:

C_G = CO_2 Emissions from Displaced Grid Generation (lbs)
E_G = Displaced Grid Generation (MWh)
EF_g = Marginal Grid Emissions Factor (CO_2 lb/MWh)

Marginal Grid Emissions

A critical component in correctly calculating the emissions impacts of implementing an energy efficiency retrofit or installing CHP is to base estimates of displaced grid emissions savings on the marginal emissions factor for the servicing grid as recommended in the GHG Protocols developed by the World Resources Institute and the World Business Council for Sustainable, by the World Bank in their Clean Development Mechanism guidance and in several of U.S. Environmental Protection Agency guidance documents[9]. Marginal resources are the first/next unit of generation that is scaled back or avoided when grid demand is reduced. Marginal emission factors are typically different from average emissions factors used in facility or company inventories, and use of marginal emissions factors recognizes the emissions savings realized across the grid due to a CHP project, much of which are beyond the facility's inventory boundary.

Estimating marginal emission factors can be a complex and data intensive task, matching a project's output to the marginal generating sources on the grid in each hour. In practice, a range of estimation methods can be used that vary in their complexity and accuracy[10]. The U.S. EPA

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[9] *GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects,* World Resources Institute and the World Business Council for Sustainable Development, https://ghgprotocol.org/sites/default/files/standards_supporting/Guidelines%20for%20Grid-connected%20Electricity%20Projects.pdf
Tool to Calculate the Emission Factor for an Electricity System, United Nations' Clean Development Mechanism, https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf
Appendix I: Methods for Quantifying Energy Efficiency and Renewable Energy Emission Reductions, U.S EPA, https://www.epa.gov/sites/default/files/2016-05/documents/appendixi_0.pdf
Quantifying the Emissions and Health Benefits of Energy Efficiency and Renewable Energy, Part Two, Chapter 4, U.S.EPA,
https://www.epa.gov/sites/production/files/2018-07/documents/mbg_2-4_emissionshealthbenefits.pdf
Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems, 2020, U.S. EPA, https://www.epa.gov/sites/default/files/2015-07/documents/fuel_and_carbon_dioxide_emissions_savings_calculation_methodology_for_combined_heat_and_power_systems.pdf
[10] *GHG Protocol Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects, Chapter 10: Estimating the Margin Emission Factor,* World Resources Institute and the World Business Council for Sustainable Development,

has developed the *AVoided Emissions and geneRation Tool* (AVERT) to estimate marginal emissions rates for 14 regions across the United States which are based on one or multiple balancing authorities.[11] AVERT regions generally represent sections of the grid that have similar resource mix and emissions. The AVERT tool can estimate specific emissions reductions based on user-supplied hourly kWh data for detailed planning and custom analysis that accounts for seasonal and time-of-day variations. However, EPA has also developed emissions factors for AVERT based on pre-defined load patterns in each of AVERT's 14 regions. EPA recommends using the Uniform Energy Efficiency factors as a close representation of avoided emissions from CHP systems[12]. Note that AVERT factors include regional T&D losses.

Emissions Savings for Waste Heat to Power Projects

Waste heat to power (WHP) projects generate electricity onsite using process waste heat. There is normally no additional fuel used in implementing WHP nor thermal energy displaced at the site. As such, the calculation for emissions savings for WHP essentially is reduced to the estimate of displaced grid emissions:

$$C_G = E_G * EF_G$$

Where:

C_G = CO_2 Emissions from Displaced Grid Generation (lbs)
E_G = Displaced Grid Generation (MWh)
EF_g = Marginal Grid Emissions Factor (CO_2 lb/MWh)

[11] *AVERT Version 3.2, 2021 Data,* U.S. EPA, https://www.epa.gov/avert/download-avert

[12] *Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems*, 2020, U.S. EPA, https://www.epa.gov/sites/default/files/2015-07/documents/fuel_and_carbon_dioxide_emissions_savings_calculation_methodology_for_combined_heat_and_power_systems.pdf