February 16, 2016

Mailed to: Internal Revenue Service
CC:PA:LPD:PR (Notice 2015-70)
Room 5203
P.O. Box 7604
Ben Franklin Station
Washington, DC 20044

Submitted electronically to:
Notice.Comments@irscounsel.treas.gov

Re: Notice 2015-70 Request for Comments on Definitions of Section 48 Property

The Heat is Power Association (HiP) and undersigned companies and organizations appreciate the opportunity to offer recommendations on the Request for Comments on Definitions of Section 48 Property issued by the Department of the Treasury (Treasury Department) and the Internal Revenue Service (IRS), Notice 2015-70. Specifically, our comments and recommendations below address the request for comments on comprehensive definitions of the property described in Section 3 of the notice.

Summary of Comments

We request that the Treasury and IRS clarify the definition of combined heat and power (CHP) property in Sec. 48(c)(3). As presently written, the CHP definition limits the 10 percent investment tax credit (ITC) to certain CHP projects known as topping cycle cogeneration. This definition should be corrected to include both types of cogeneration—topping cycle and bottoming cycle. Congress, the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) all formally recognize bottoming cycle cogeneration in law, regulation and published reports, and commonly refer to it as waste heat to power (WHP). Excluding bottoming cycle cogeneration from the definition of eligible technologies in Section 48 removes an important financial tool to support deployment of this clean energy technology, making it challenging for these fuel-free, emission-free systems to compete in the marketplace.

Background

The Public Utility Regulatory Policies Act (PURPA) amended the Federal Power Act in 1978 to promote energy conservation and greater use of domestic and renewable energy. PURPA, which included

Waste heat to power (WHP) uses waste heat from industrial processes to generate electricity with no additional fuel, no combustion, and no incremental emissions. The Heat is Power Association (HiP) is an industry-led advocacy organization focused exclusively on advancing WHP, a group of technologies that can enhance industrial efficiency and help drive U.S. competitiveness. Established in 2011, supporters include WHP technology manufacturers, project developers, component manufacturers, research institutions, and other industry associations and stakeholders.

incentives for both topping cycle and bottoming cycle cogeneration and required utilities to purchase electricity from qualifying facilities at the utilities' avoided cost, define cogeneration as follows:[1]

> (c) Cogeneration facility means equipment used to produce electric energy and forms of useful thermal energy (such as heat or steam), used for industrial, commercial, heating, or cooling purposes, through the sequential use of energy;
>
> (d) Topping-cycle cogeneration facility means a cogeneration facility in which the energy input to the facility is first used to produce useful power output, and at least some of the reject heat from the power production process is then used to provide useful thermal energy;
>
> (e) Bottoming-cycle cogeneration facility means a cogeneration facility in which the energy input to the system is first applied to a useful thermal energy application or process, and at least some of the reject heat emerging from the application or process is then used for power production;

As a result of PURPA, the U.S. began to produce cleaner, more efficient energy from cogeneration and renewable energy sources.

However, some cogeneration developers took advantage of a loophole in the regulation to install topping cycle cogeneration systems that met the letter but not the spirit of the law. These large electric generators produced only the minimum amount of thermal energy to meet the efficiency criteria. This loophole was not an issue for bottoming cycle systems since the primary purpose of these systems was the production of thermal energy and the efficiency criteria did not apply to those systems.

In 1998, nearly 20 years after PURPA passed, a group of cogeneration technology manufacturers and project developers joined forces to promote the spirit of the law. They called for widespread deployment of more efficient cogeneration systems and began using the term "combined heat and power" or CHP, the term used to describe these types of systems in Europe. These CHP systems were based on technological advances that could generate power and heat from the same fuel source much more efficiently than had been required by the PURPA efficiency standard. The group's mission was to separate CHP from the less efficient "PURPA cogeneration machines," as they had come to be known, and promote CHP as a higher efficiency alternative to separate heat and power generation.

The DOE and the EPA both established programs to support CHP; educate industry about the potential energy savings, cost savings, and environmental benefits of the technology; and highlight barriers inhibiting more widespread deployment. Today these programs are called the EPA CHP Partnership and the DOE CHP Technical Assistance Partnerships (CHP TAPs).

In 2007, Congress passed the Energy Independence and Security Act (EISA) to, among other things, move the U.S. toward greater energy independence and security, increase the production of clean renewable fuels, and improve the energy performance of the Federal Government. Section 451 of EISA

[1] 18 CFR 292.202

defines CHP similarly to the way it is defined in Sec. 48 of the U.S. tax code.[2] Like in Sec. 48, the definition of CHP applies only to topping cycle cogeneration. There is a separate definition in EISA for "recoverable waste energy: waste energy from which electricity or useful thermal energy may be recovered through modification of an existing facility or addition of a new facility." Thus, EISA recognizes the differences between topping and bottoming cycle by applying separate and distinct definitions to CHP (topping cycle) and recoverable waste energy (WHP or bottoming cycle).

In 2008, Congress further encouraged deployment of efficient CHP by including CHP as a qualifying technology in the ITC.[3] The efficiency requirements in the ITC were very meaningful – nearly 50 percent higher than they were in PURPA – and set a relatively high bar for CHP systems: the overall system needed to be at least 60 percent efficient, at least 20 percent of the output needed to be in the form of electricity, and at least 20 percent of the output needed to be used for a thermal purpose. As mentioned above, PURPA contained efficiency requirements for topping cycle projects but no efficiency requirements for bottoming cycle projects. Unfortunately, the ITC did not include the exemption from the efficiency and output requirements that existed for bottoming cycle cogeneration in PURPA.

The vast majority (if not all) WHP projects cannot meet the criteria established in the ITC for two reasons. First, the overall efficiency of the system, which the ITC requires to be greater than or equal to 60 percent, can be very difficult to measure. Whereas power generation systems usually generate electricity from one fuel input, industrial processes are not as straightforward: they may have multiple processes that use multiple energy sources and produce multiple heat streams. The heat exiting industrial processes cannot usually be measured accurately and is inconsistent and variable, made up of a number of heat streams, the temperatures and flows of which change regularly based on the processes occurring in the plant. Accounting for the efficiencies of these disparate processes can be overly complex and oftentimes impossible.

The second problem is that WHP projects will almost never produce enough electricity to meet the 20 percent output threshold. By their nature, WHP projects convert discarded, often low temperature heat resources, into electricity. Whereas topping cycle projects are designed to most efficiently convert high value fuel to electricity and thermal energy without regard for an intervening industrial process, WHP projects are designed to generate as much electricity as possible from lower value leftovers. PURPA recognized that because the capture and conversion of any waste heat to electricity was environmentally beneficial, efficiency criteria were not relevant or even appropriate. Unfortunately, the CHP ITC failed to account for the reality that while any electrical output produced from waste heat reduced overall emissions and achieved the objectives established for the 10 percent tax credit, WHP

[2] The EISA definition of CHP does not include the 20 percent thermal and 20 percent electrical output requirement but does include the 60 percent overall efficiency requirement:

> (2) Combined heat and power.--The term `combined heat and power system' means a facility that--
> ``(A) simultaneously and efficiently produces useful thermal energy and electricity; and
> ``(B) recovers not less than 60 percent of the energy value in the fuel (on a higher-heating-value basis) in the form of useful thermal energy and electricity.

[3] The Energy Improvement and Extension Act of 2008 (H.R. 1424) expanded the Section 48 investment tax credit in a number of ways and for a number of technologies, including adding combined heat and power (CHP) systems property.

projects would not be able to meet the 20 percent electric output threshold. For additional explanation of why WHP projects cannot meet the criteria established in the ITC, see the appendix.

Since 2008, DOE has published at least three papers that continue to support and recognize the technical distinction between topping and bottoming (WHP) cycles.[4] In addition, DOE keeps track of all CHP projects, both topping and bottoming cycle, in an online database.[5]

Most recently, in 2015, EPA's Clean Power Plan (CCP) Final Rule defined CHP (topping cycle) and WHP (bottoming cycle) separately and specified WHP as well as CHP as solutions states could use to help meet their greenhouse gas emission targets.[6]

At Issue

As enumerated above, the efficiency and electricity output requirements in the definition of CHP in Sec. 48 of the tax code almost always preclude WHP from qualifying for the tax credit. However, the benefits of WHP (bottoming cycle) projects and the overlap between CHP and WHP have been recognized for many years by Congress, EPA, DOE, and states.

Since 2008, U.S. innovators have made significant advances in WHP technologies, many of which are now entering the marketplace with more in the development pipeline. These systems are mostly being deployed in Europe and Asia due to positive policies, desire for more efficient systems, and shorter returns on investment. While the systems vary, with some based on Organic Rankine cycle (ORC), Stirling engine, thermoelectrics, Kalina cycle, supercritical CO_2, and steam turbine, all share attributes of a common public policy interest: they generate power from left over waste heat, and in the process use no additional fuel and produce no incremental emissions.

While there are hundreds of WHP systems installed throughout Asia and Europe, there is only 766 MW of installed WHP capacity at 96 sites in the U.S. despite 15,000 MW of technical potential.[7] By correcting the qualification of bottoming cycle cogeneration in the ITC, WHP will gain greater parity with other clean energy technologies. Further, WHP technology already manufactured by U.S. businesses will be deployed here to create jobs and help address key public policy concerns.

[4] Combined Heat and Power: A Clean Energy Solution, U.S. DOE and U.S. EPA, August 2012; Barriers to Industrial Energy Efficiency, U.S. DOE, June 2015; Waste Heat to Power Market Assessment, ICF for Oak Ridge National Laboratory, March 2015.
[5] DOE CHP Installation Database maintained by ICF at this link - https://doe.icfwebservices.com/chpdb/
[6] 80 Fed. Reg. 64662 at 64902, footnote 965: The accounting considerations described in this section are for a ''topping cycle'' CHP unit. A topping cycle CHP unit refers to a configuration where fuel is first used to generate electricity and then heat is recovered from the electric generation process to provide additional useful thermal and/or mechanical energy. A CHP unit can also be configured as a ''bottoming cycle'' unit. In a bottoming cycle CHP unit, fuel is first used to provide thermal energy for an industrial process and the waste heat from that process is then used to generate electricity. Some waste heat power (WHP) units are also bottoming cycle units and the accounting treatment for bottoming cycle CHP units is provided with the WHP description below. https://www.federalregister.gov/articles/2015/10/23/2015-22842/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating#citation-965
[7] Waste Heat to Power Market Assessment, ICF for Oak Ridge National Laboratory, March 2015.

The Solution

The solution is simple and well within the scope of this request for public comment. Treasury and IRS should clarify the definition of CHP in Section 48 so that it includes both topping cycle and bottoming cycle cogeneration. Topping cycle is already included in the definition of CHP in the ITC; adding the definition of bottoming cycle to the definition of CHP would be a simple way to include both forms of cogeneration in the CHP definition. We recommend clarifying the existing internal revenue code (black text) by adding the text in blue:

(A) Combined heat and power system property

The term "combined heat and power system property" means property comprising either a topping cycle or bottoming cycle system—

(i) which is a topping cycle system that uses the same energy source for the simultaneous or sequential generation of electrical power, mechanical shaft power, or both, in combination with the generation of steam or other forms of useful thermal energy (including heating and cooling applications),

(ii) which produces—

(I) at least 20 percent of its total useful energy in the form of thermal energy which is not used to produce electrical or mechanical power (or combination thereof), and

(II) at least 20 percent of its total useful energy in the form of electrical or mechanical power (or combination thereof), and

(iii) the energy efficiency percentage of which exceeds 60 percent, ~~and~~ or

(iv) which is a bottoming cycle system in which the energy input to the system is first applied to a useful thermal or mechanical energy application or process and at least some of the reject heat or energy emerging from the application or process is then used for power production, and

(v) ~~(iv)~~ which is placed in service before January 1, 2017.

Conclusion

For the reasons stated above, the undersigned companies and organizations urge the Treasury Department and IRS to clarify the definition of CHP in Sec. 48(c)(3) to include bottoming cycle, also known as waste heat to power. We recommend a simple, straightforward fix to add WHP to the ITC by clarifying the definition of CHP in Section 48 in a way that explicitly adds bottoming cycle projects to the definition.

We appreciate the opportunity to comment on the Treasury and IRS Request for Comments on the

Definition of Section 48 Property. Please do not hesitate to contact Susan Brodie of the Heat is Power Association at 630.292.1304 if you have questions or would like to discuss this matter further.

Thank you for your consideration of the views of the waste heat to power industry on these important issues.

Sincerely,

Susan Brodie
Executive Director
Heat is Power Association

Jennifer Kefer
Executive Director
Alliance for Industrial Efficiency

Matthew L. Scullin, Ph.D.
Founder & CEO
Alphabet Energy, Inc.

Michael Sams
President & CEO
AMSEnergy Corp

Dale Louda
Executive Director
CHP Association

Sam P. Weaver
CEO
Cool Energy, Inc.

Thomas Telegades
CEO
Cornerstone Sustainable Energy

Philip D. Brennan
CEO
Echogen Power Systems, LLC

John Fox
CEO
ElectraTherm

Michael F. Newell
CEO
Ener-G-Rotors

Gilles David
President
ENERTIME

Bernie Podberesky
President
FBB Combustion LLC

Darren Schumacher
VP, Product Development
Gentherm Incorporated

Loy Sneary
President & CEO
Gulf Coast Green Energy

Ray Deyoe
Managing Partner
Integral Power

Patricia Sharkey
Policy Director
Midwest Cogeneration Association

Rob Steir
Managing Director
MindForce Consulting LLC

Marco A. Giamberardino
Executive Director, Government Affairs
National Electrical Contractors Association (NECA)

Josh Nordquist
Director of Business Development
Ormat

Phyllis Cuttino
Director, Pew Clean Energy Initiative
Pew Charitable Trusts

Mo Klefeker
President and CEO
Primary Energy Recycling Corporation

Stanley Kolbe
Director, Governmental Affairs
The Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

David Gray
Owner
ThermaDrive

Clotilde Rossi di Schio
Business Development Manager Americas, and
Marco Baresi
Institutional Relations Manager
Turboden

APPENDIX: How the ITC is Currently Applied to CHP Projects

To meet the definition of CHP in the ITC, a system must use the same energy source to generate both electrical and/or mechanical shaft power plus steam or other forms of useful thermal energy, and

a) produce at least 20 percent of its total useful energy in the form of thermal energy and at least 20 percent of its total useful energy in the form of electrical or mechanical power

MWh ELECTRICITY generated + mmBtu HEAT generated = 100% of the output.

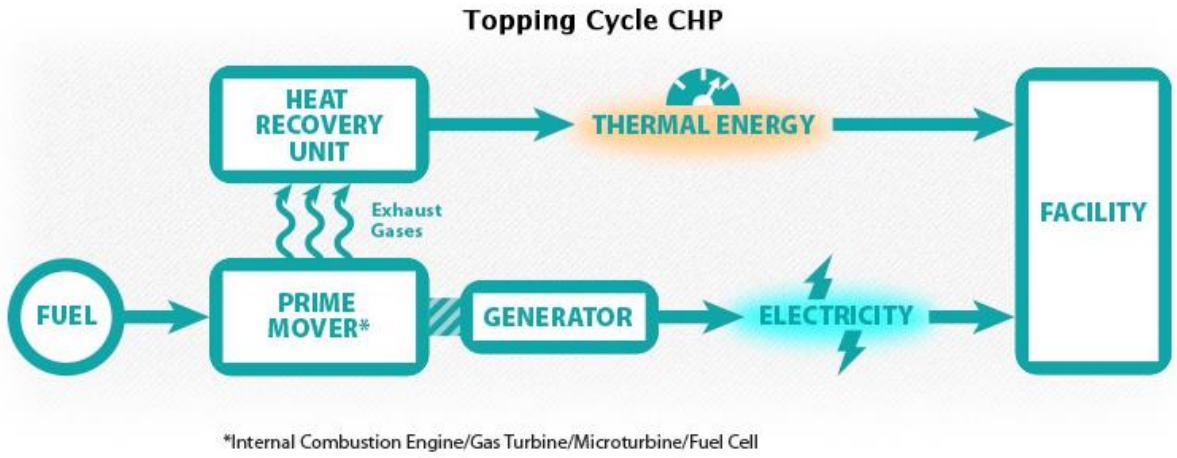
Of that output, 20%-80% must be ELECTRICITY and 20%-80% must be HEAT

and

b) have an energy efficiency percentage which exceeds 60 percent.

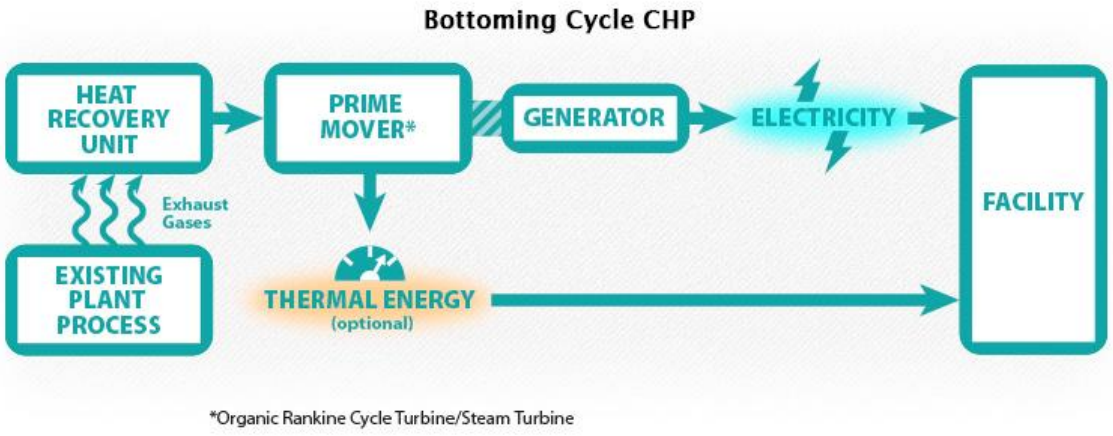
$$\frac{\text{MWh ELECTRICITY} + \text{mmBtu HEAT}}{\text{mmBtu FUEL}} >= 60\% \text{ fuel efficient}$$

The values needed for the calculations above can be measured and the formulas can be applied in topping cycle systems.



In bottoming cycle systems, however, the heat exiting industrial processes cannot usually be measured accurately; it is inconsistent and variable, made up of a number of heat streams, the temperatures and flows of which change regularly based on the processes occurring in the plant. Without measuring the heat exiting the industrial process and entering the heat recovery unit, it is not possible to calculate the overall efficiency (b. above).

Moreover, it is nearly impossible to meet the 20% electric generation requirement (a. above) because as a byproduct of a process, waste heat has a far lower energy content than the energy content of the initial fuel source from which it was created.



Source of diagrams: https://energycenter.org/self-generation-incentive-program/business/technologies/chp, downloaded February 14, 2016