Heat is Power Association

October 27, 2025

The Honorable Scott Bessent
Secretary
U.S. Department of the Treasury
1500 Pennsylvania Avenue NW
Washington, DC 20220

RE: Request to Include WERP and Pressure Drop Technologies in §§45Y/48E Annual Table

Dear Secretary Bessent,

The Annual Table[1] (Table) that determines which categories of facilities qualify for the clean electricity production and investment tax credits (§§45Y/48E) was last updated by the Biden Administration on January 15, 2025. The Heat is Power Association (HiP) respectfully submits two requests to update the Table:

1. Inclusion of Waste Energy Recovery Property (WERP)

HiP requests that Treasury include "waste energy recovery property" in the Table without the current limiting eligibility requirement that WERP must derive energy only from facilities listed in the Table (i.e., wind, solar, hydropower, etc.). WERP systems generate electricity from waste heat produced by industrial or commercial processes and meet the statutory definition of facilities with a net lifecycle greenhouse gas emissions rate that is not greater than zero.

2. Inclusion of Pressure Drop Technologies

HiP requests that Treasury include "pressure drop technologies" as a distinct category on the Table. These systems capture the potential energy of pressurized fluids or gases during pressure letdown—such as in natural gas pipelines or industrial processes—and convert it directly to electricity without combustion or added fuel use.

These technologies are fundamentally different in their thermodynamic operation:
- WERP converts waste heat into power (temperature-based energy recovery).
- Pressure drop systems convert waste pressure into power (pressure-based energy recovery).

However, both WERP and pressure drop produce zero-emission, fuel-free, baseload electricity and meet qualifications under the *Existing Studies* clause of the One Big Beautiful Bill Act (OBBBA)[2], which allows the Treasury Secretary to add technologies to the Table if existing studies demonstrate they have a greenhouse gas emissions rate not greater than zero:

> *Sec. 45Y(b)(2)(C)(iii) EXISTING STUDIES.—For purposes of clause (i), in determining greenhouse gas emissions rates for types or categories of facilities for the purpose of determining whether a facility satisfies the requirements under paragraph (1), the*

[1] Rev. Proc. 2025-14, January 15, 2025. https://www.irs.gov/pub/irs-drop/rp-25-14.pdf.
[2] Pub. L. 119–21

Secretary shall consider studies published on or before the date of enactment of this clause which demonstrate a net lifecycle greenhouse gas emissions rate which is not greater than zero using widely accepted lifecycle assessment concepts, such as concepts described in standards developed by the International Organization for Standardization.

Additionally, HiP requests that pipeline compressor stations be added to the illustrative list of buildings and equipment to which WERP may apply under §1.45Y-1(a)(12) of 90 FR 4006. This would correct an error made under the Biden Administration's §§45Y/48E final regulations.[3]

Background

HiP is the international trade association for the waste energy recovery industry and is comprised of companies that manufacture, develop, or operate energy recovery systems that capture waste heat or pressure to generate zero-emission, baseload power.

WERP and pressure drop technologies offer several advantages over traditional renewable energy technologies:

- Rely only on waste products to generate power and enhance and augment existing energy infrastructure, **making the systems widely deployable across heavy industries** that produce medium- to high-temperature heat or pressure. Applications are commonly deployed to natural gas pipelines, data centers, steel mills, cement plants, paper factories, hydrogen facilities, and food processing plants, among others.
- WERP & pressure drop systems are baseload in nature, making them **capable of generating up to 24/7 reliable power** as long as the underlying industrial process generating heat/pressure is operating. Load generation is therefore stable and dispatchable, unlike intermittent resources.
- **Contribute to energy price stability.** WERP and pressure drop contribute to maintaining low and stable electricity prices by generating power from existing thermal energy streams without incurring additional fuel expenditures, thereby reducing exposure to fuel price volatility and enhancing the economic efficiency of power supply.
- Significantly **decrease grid demand from energy-intensive industries** that currently account for 33% of the nation's primary energy use.[4] By deploying waste energy recovery systems, heavy industries can generate new, behind-the-meter electricity, helping to ease strain during periods of peak demand and contribute to greater energy affordability.
- A 2015 market analysis indicates that WERP could **generate an additional 15 gigawatts of electricity** from currently untapped industrial heat streams,[5] abating 45 million metric tons of GHG emissions annually,[6] creating thousands of new jobs, and further strengthening U.S. industrial capacity. Market potential has expanded since the 2015 study with the growth of American industry and technological innovation.

[3] 90 FR 4006 et. seq. (January 15, 2025)
[4] https://www.eia.gov/energyexplained/use-of-energy/industry.php
[5] Elson, Amelia, Tidball, Rick, & Hampson, Anne. Waste Heat to Power Market Assessment. United States. https://doi.org/10.2172/1185773
[6] Figure based on a 90% WHP capacity factor and 2022 US electricity generation carbon intensity of 0.86 lbs per kWh (https://www.eia.gov/tools/faqs/faq.php?id=74&t=11)

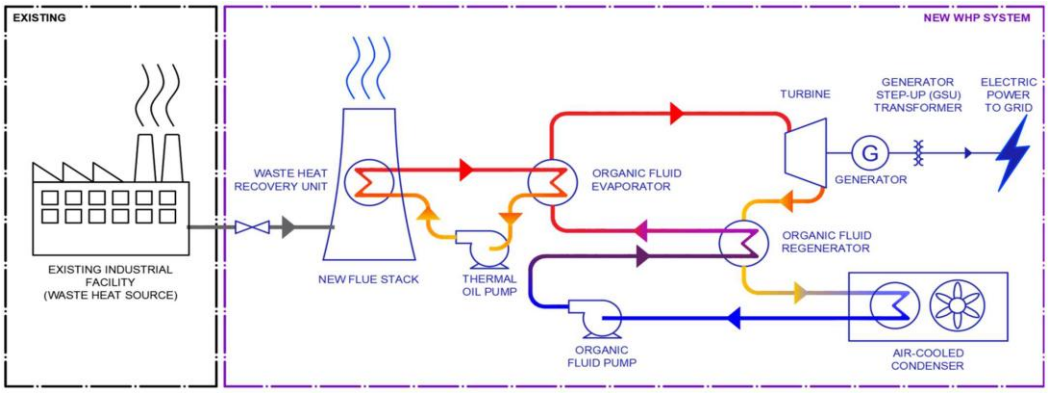
With full access to a federal 30% ITC in place, estimates suggest that **waste energy recovery systems could save businesses $3 billion annually in energy costs**,[7] increasing U.S. industrial competitiveness with China and other nations.

WERP Technology Overview

WERP, also referred to in industry terms and in federal agency resources as Waste Heat to Power (WHP), Waste Heat Recovery (WHR), and Bottoming-Cycle equipment, utilizes waste heat generated as a byproduct of an existing industrial, commercial, institutional, or residential process to drive turbines, engines, or thermoelectrics that can produce electricity for on-site consumption or grid export (see *Exhibit 1*).[8] While all Bottoming-Cycle applications are WERP facilities, it is important to clarify that WERP facilities are not "top-cycling" technologies; equipment commonly referred to as "Combined Heat and Power" (CHP).[9]

WERP technologies are based on the steam, organic rankine, supercritical CO2, and kalina thermodynamic cycles, as well as heat recovery steam generators with steam turbines, solid state thermal recovery, and backpressure steam turbines.[10] The key advantage of WERP systems is that they utilize heat from thermal processes, which would otherwise be wasted, to produce electricity or mechanical power, as opposed to consuming fuel for this purpose.[11]

Exhibit 1: LCA System Boundary of Generic Organic Rankine Cycle (ORC) WERP Project



Annual Table: WERP Eligibility

Under the Biden Administration's §§45Y/48E final regulations, WERP systems that generate electricity from heat derived from fossil fuel-powered processes and equipment are

[7] Figure based on estimated market penetration of 2.9 GW (Elson, Amelia, Tidball, Rick, & Hampson, Anne. *Waste Heat to Power Market Assessment*. United States. https://doi.org/10.2172/1185773), capacity factor of 90%, average U.S. retail electricity price of 12.68 cents/kWh in 2023 (https://www.eia.gov/electricity/state/), and ICF International modeled savings of a 30% ITC for WHP (https://www.pewtrusts.org/~/media/assets/2015/10/cleanercheaperstrongerfinalweb.pdf)

[8] DOE, Office of Energy Efficiency and Renewable Energy, *Combined Heat and Power Technology Fact Sheet Series* (April 2021). *"The capture and use of heat for a thermal purpose is classified as WHR, while capture and use of that heat to make electricity is WHP. Recovered waste heat can also be used for compressed air, industrial steam, absorption chillers, drying, hot water, preheated combustion air, or a combination of these."*

[9] *See 18 C.F.R. 292.202(e). "Bottom-cycle cogeneration facility means a 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."*

[10] *See Note* 8.

[11] EPA, *Waste to Heat Power Systems Overview*, Pg. 1 (April 2022).

characterized as combustion and gasification (C&G) facilities and therefore unable to claim the §§45Y/48E credits without approval from the Treasury Secretary.

As of January 15, 2025, only WERP systems that recover heat from the non-C&G technologies listed in the Table (wind, hydropower, marine and hydrokinetic, solar, geothermal, nuclear fission, and fusion energy) are deemed eligible to receive the credits.[12] Recovering waste heat from these listed sources is very uncommon since most industrial processes in the U.S. are still powered by non-renewable sources.

The OBBBA was enacted on July 4, 2025, providing a new pathway for technologies to be included on the Table through the *Existing Studies* clause. The clause allows the Treasury Secretary to "consider studies published on or before the date of enactment of this clause that demonstrate a net lifecycle greenhouse gas emissions rate which is not greater than zero using widely accepted lifecycle assessment concepts." HiP has provided, as an addendum to this letter, a lifecycle assessment published on August 1, 2024, by ICF Resources, LLC (ICF) that demonstrates WERP's qualification under the §§45Y/48E credits by using ISO 14040 and ISO 14044. The findings clearly define the LCA boundary as beginning at the point of power production, demonstrating WERP's emission value as falling within the statutory requirement of "not greater than zero." Existing federal agency findings and analyses of WERP also reinforce that the technologies meet zero-emission criteria:

- **Department of Energy (DOE):** The Office of Energy Efficiency and Renewable Energy, as well as Oak Ridge National Lab has assessed the technical and economic potential of WERP for the U.S. industrial sector and has concluded, and expressly stated as such in multiple publications, that WERP does not generate GHG emissions.
    - "WERP represents a significant emissions benefit as a clean energy technology with zero new emissions from the use of waste heat instead of carbon-based fuels." [13]
    - "Because power from WERP systems produces no additional greenhouse gas emissions if supplemental fuel firing is not used industry advocates believe the technology warrants incentives similar to those enjoyed by other clean energy technologies."[14]
    - "WERP is a clean energy technology; it produces no new emissions from the use of waste heat and often displaces electricity produced from carbon-based fuels."[15]
- **Environmental Protection Agency (EPA):** In 2021, the EPA published a methodology for calculating fuel and CO_2 emissions from cogeneration, which included a note on WERP that, "In the case of bottoming cycle, also known as… waste heat to power, power is generated on site from the hot exhaust of a furnace or kiln with no additional fuel requirement. Therefore, the fuel use and CO_2 emissions for both the WERP system and displaced thermal energy are all zero."[16]

[12] REV. PROC. 2025-14 TABLE 1 includes only "*Waste energy recovery property that derives energy from a source that is a type or category of facility described in this table."
[13] *Pg* 53. Elson, Amelia, Tidball, Rick, & Hampson, Anne. Waste Heat to Power Market Assessment. United States. https://doi.org/10.2172/1185773
[14] *Id.* at 56.
[15] U.S. DOE EERE Waste Heat to Power Fact Sheet https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Waste_Heat_to_Power_Fact_Sheet.pdf
[16] EPA, *Fuel and Carbon Dioxide Emissions Savings Calculation, Methodology for Combined Heat and Power Systems* (June 2021).

- **Electric Power Research Institute (EPRI):** In 2010, EPRI concluded in its report on WERP opportunities in the industrial sector, including pressure drop and exothermic energy sources, as sources of waste heat that "generate a net CO_2 emissions savings."[17]

As of February 2024, the DOE has cataloged approximately 800-900 MW of existing WERP capacity in operation at over 100 sites across the U.S.[18] WERP's existing installed capacity base represents only approximately 9.0% - 10.5% of the estimated 8.8 GW of technical potential across 2,946 facilities for WERP projects utilizing waste heat streams > 450 F.[19] EPRI estimates that the potential annual reduction in GHG emissions from deploying WERP technologies could conservatively exceed 50.7 million metric tons of carbon dioxide (CO_2) equivalent emissions ($MMTCO_2e$) per year, with no added emissions.[20] According to ICF, the incentives provided by 45Y/48E could potentially increase the market penetration of WERP utilizing the full potential of all technically viable heat streams to 14.5 GW of net zero emission, baseload electricity.[21]

HiP requests that Treasury remove the asterisk limiting WERP eligibility only to those systems that derive heat from other non-C&G technologies. The credits offset or reduce high up-front capital costs to develop WERP systems, allowing more WERP projects to become economically viable. WERP has the ability to capture 13.0% to 18.0% of the sector's underutilized waste heat resources. If the projected 1.4 quads of technically and economically recoverable waste heat were productively used by WERP, the U.S. industrial sector would realize a 9.0% reduction in energy usage.[22]

Pressure Drop Technology Overview

Pressure drop technologies capture waste pressure energy and convert it to zero-emission electricity that can be used for on-site consumption or grid export. Waste pressure recovery technologies capture otherwise wasted energy during pressure letdown and convert it into emission-free, baseload electricity. In the current system, pressure reduction is accomplished through throttling or pressure-reducing valves that dissipate the substance's potential energy as heat into the atmosphere. In other words, waste pressure is effectively a form of waste heat — it represents lost thermodynamic energy that could otherwise be converted into useful work.

DOE's National Energy Technology Laboratory, Office of Fossil Fuels has funded work related to pressure drop technologies. In a contract deliverable, the Prairie Research Institute, University of Illinois at Urbana-Champaign determined that "large consumers of natural gas, such as power plants or industrial customers, that also have electrical systems capable of receiving the expander generator output, are ideal [locations to install pressure drop technologies]."[23] American Society of Mechanical Engineers (ASME) researchers point out that the potential for pressure drop technologies in other applications, like the recovery of wasted pressure energy in oxygen consumed in blast furnaces, can generate tens of gigawatt-hours of electricity

[17] ERPI, *Waste Heat Recovery in Industrial Facilities, Opportunities for Combined Heat and Power and Industrial Heat Pumps*
[18] DOE, *CHP Installation Database* (Updated February 2024), *available at* https://doe.icfwebservices.com/downloads/chp.
[19] ICF International, prepared on behalf of Oak Ridge National Lab, *Waste Heat to Power Market Assessment*", Pg. 6 (March 2015).
[20] ERPI, *Waste Heat Recovery in Industrial Facilities, Opportunities for Combined Heat and Power and Industrial Heat Pumps*, pg. 65, Table 5-11. (2010). The GHG emissions savings are based on the average utility grid CO_2 emissions rate of 1,329 lb./MWh (EPA, 2008) with 6.55%-line losses (U.S. grid average 2008.) The WERP operational profile is an average of 7,000 hours/year.
[21] *See Note 5.*
[22] ACEEE, *Industrial Waste-Heat Recovery: Benefits and Recent Advancements in Technology and Applications*, (2007).
[23] Prairie Research Institute, University of Illinois at Urbana-Champaign, *Low-Cost Long-Duration Energy Storage at a Natural Gas Pipeline* (March 2022).

annually.[24] Because pressure differential is required to transport fluids at both small- (e.g., within facilities in piping) and large-scale (e.g., across the country in pipelines), the applicability of pressure drop technologies is broad.

By recovering this wasted energy, waste pressure technologies significantly improve the efficiency and sustainability of North America's energy infrastructure, particularly the country's natural gas pipeline network, which remains one of the continent's most valuable and extensive energy delivery systems. Work funded by DOE's Climate Protection Division, Office of Air and Radiation showed that, in the United States' natural gas network, pressure drop technologies have the potential to generate up to 27 terra-watt hours of clean electricity within the United States natural gas transmission network.[25] Integrating waste pressure recovery not only enhances the overall efficiency of gas infrastructure but also enables the generation of zero-emission power using an energy source that is wasted today. These systems meet America's energy needs by turning an existing, underutilized resource into reliable, baseload electricity.

Annual Table: Pressure Drop Eligibility

In the preamble of the §§45Y/48E regulations under section '4. Waste Energy Recovery Property (WERP)', Treasury states, "pressure drop technologies are also not appropriately considered WERP for purposes of §§45Y/48E credits because they convert pressure, rather than heat, directly to electricity" and that "at this time, this type of technology is also not included within the list of certain Non-C&G Facilities with a GHG emissions rate that is not greater than zero."

HiP requests that Treasury include "pressure drop technologies" as an eligible type or category of facility on the Annual Table, distinctly separate from WERP. HiP has provided, as an addendum to this letter, two lifecycle assessments published on July 1, 2025, that demonstrate pressure drop qualification under §§45Y/48E credits by using ISO 14040 and ISO 14044. The findings clearly define the LCA boundary as beginning at the point of power production, demonstrating pressure drop technology emissions value as falling within the statutory requirement of "not greater than zero."

HiP recommends defining pressure drop technologies as "technologies that generate electricity solely from the potential energy of pressurized fluids and gases. Examples of these technologies include, but are not limited to, turboexpanders and pressure recovery turbines, and examples of pressurized fluids and gases include, but are not limited to, natural gas, steam, air, and industrial gases."

Amend WERP Examples to Include Pipeline Compressor Stations

The Biden Administration erroneously and confusingly excluded pipeline compressor stations from its illustrative list of WERP in §45Y-1(a)(12). HiP requests that Treasury correct the mistakes in the existing §§45Y/48E guidance to rectify the errors.

Consistent with ISO methodologies, standards, and allocation rules, only waste heat recovered by WERP from a pipeline compressor station - not the emissions attributable to the compressor stations' operations - should be included in an LCA. Therefore, HiP requests that Treasury

[24] ASME, *Evaluating the Energy Recovery Potential in Industrial Gas Pipeline Networks: A Preliminary Analysis of Gas Expander Applications for Nitrogen, Oxygen and Hydrogen* (June 2024).
[25] Lawrence Berkeley National Laboratory, *Electricity Production from Natural Gas Pressure Recovery Using Expansion Turbines* (2009).

update guidance to provide capital markets and industry with regulatory certainty in the following ways:

(1) Strike the existing preamble language in Section VII.B.4 of the Summary of Comments and Explanation of Revisions:

> *"While pipeline compressor stations are buildings or equipment the primary purpose of which is not the generation of electricity, they do not generate electricity solely from heat and thus are not appropriately considered WERP."*

(2) Add pipeline compressor stations to the illustrative list of examples located in §45Y-1(a)(12) of buildings or equipment WERP can utilize in the generation of electricity:

> *(12) Waste energy recovery property (WERP). WERP is property that generates electricity solely from heat from buildings or equipment if the primary purpose of such building or equipment is not the generation of electricity. Examples of buildings or equipment the primary purpose of which is not the generation of electricity include, but are not limited to, manufacturing plants, medical care facilities, facilities on school campuses,* ***pipeline compressor stations*****,** *and associated equipment*.

Conclusion

WERP and pressure drop technologies are inherently zero-emission and meet all statutory criteria for eligibility under the 45Y/48E clean electricity credits. HiP urges Treasury to:

1. Add "waste energy recovery property" to the Annual Table without limiting its source of recovered heat
2. Add "pressure drop technologies" as a separate eligible category; and
3. Correct the guidance issued by the previous administration by adding "pipeline compressor stations" to the list of examples of buildings or equipment the primary purpose of which is not the generation of electricity.

Making these changes will incentivize U.S. industries to more quickly deploy waste energy recovery systems, bolstering America's industrial competitiveness and improving grid resiliency.

For questions, please contact HiP's Government Affairs Director, Colden Franklin, at colden@heatispower.org.

Addenda:

- LCA of Waste Heat to Power – ICF Resources LLC
- LCA of Pressure Drop_TurboexpanderGenerators – RODO Consulting
- LCA of Pressure Drop_Steam – RODO Consulting