November 20, 2014

U.S. Environmental Protection Agency
EPA Docket Center (EPA/DC), Mailcode 28221T
Attention Docket ID No. OAR–2013–0602
1200 Pennsylvania Ave., N.W.
Washington, DC 20460.

Re: Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, EPA–HQ–OAR–2013–0602, 79 Fed. Reg. 34830 (June 18, 2014)

Dear Administrator McCarthy:

The Alliance for Industrial Efficiency (hereinafter, "The Alliance") appreciates this opportunity to comment on the Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (hereinafter "proposed rule" or "Carbon Guidelines"). The Alliance is a diverse coalition that includes representatives from the business, environmental, labor and contractor communities. We are committed to enhancing manufacturing competitiveness and reducing emissions through industrial energy efficiency, particularly through the use of clean and efficient power generating systems such as combined heat and power (CHP) and waste heat to power (WHP). Several aspects of the Carbon Guidelines help advance these goals. We also offer several modest recommendations to encourage greater use of industrial energy efficiency as a means of compliance for EGUs.

The Alliance has a long track record of engagement in this area. We have filed comments on the related 111(b) rulemaking for new sources, submitted a white paper detailing recommendations for advancing CHP and WHP through the Existing Source Rule along with a separate letter elaborating complementary state policies, and testified at the public hearings on the proposal in November 2013 and July 2014. The following comments reiterate many of the recommendations from these earlier materials.

As an initial matter, we are pleased to see that EPA has put energy efficiency at the core of this proposal. We applaud EPA for proposing a system-wide approach, which recognizes the interconnections of the electricity system. This flexible approach is critical for the rule to encourage CHP deployment at our nation's hospitals, universities and manufacturing facilities. We also applaud EPA for once again setting emissions targets using an output-based standard. As we have noted in previous rulemakings, output-based standards credit energy efficiency by rewarding generators that have the highest "output" of megawatt-hours per "output" of pollutants.

We note that EPA did not explicitly include CHP or WHP in the four building blocks when determining state emission targets. We do not opine on the appropriateness of the proposed targets. We believe that EPA should say states can comply with the rule using CHP and WHP.

EPA recognizes the potential role for CHP in the proposed rule: "In all types of market structures, large energy users might independently see additional energy efficiency opportunities or opportunities for self-generation using options such as combined heat and power…and states can structure their plans to allow the CO_2 reductions achieved at affected EGUs through such actions to assist in reaching compliance."[1] States that include CHP and WHP as eligible energy-efficiency technologies will be able to surpass the relatively modest 1.5 percent annual electricity savings reflected in the targets. As such, states that encourage CHP and WHP will have less difficulty complying with the rule.

Our comments raise three key recommendations to strengthen the treatment of CHP and WHP in the rule:

1. EPA should expressly state that CHP and WHP at unaffected units are eligible compliance technologies for EGUs;
2. Several modest changes are needed to ensure that the rule recognizes CHP's benefits at affected units; and
3. EPA should encourage states to include CHP and WHP in their compliance plans to reduce emissions from unaffected units and provide appropriate guidance for crediting these projects.

I. EPA Should Expressly State that CHP and WHP at Unaffected Units Are Eligible Compliance Technologies for EGUs

The proposed rule needs to expressly state that CHP qualifies as an efficiency resource at unaffected units. EPA should also clarify that WHP qualifies as a zero-carbon generation resource. It is not clear that references to energy efficiency throughout the rule include CHP. Nor is it clear that references to low and zero-carbon resources include WHP. CHP is mentioned once as an example of an "energy efficiency opportunit[y]," [2] and WHP is not mentioned at all. Significantly, the proposed rule outlines four building blocks, each of which represents a category of measures that states can use to reduce CO_2 from existing power plants to achieve their emission target. With limited exception,[3] CHP is not expressly included in these building blocks. While CHP and WHP were generally not considered when setting the state emission targets, these technologies *can* and should be used to achieve them. For instance, CHP and WHP can be used to reduce emissions at the affected facilities themselves (Building Block 1); by substituting generation at EGUs with expanded use of biomass CHP and WHP by other unaffected sources in the region (Building Block 3); or by displacing central generation by deploying CHP and WHP at hospitals, universities and factories (Building Block 4). We are concerned, however, that states will view the building blocks as a roadmap to achieve their targets and that they will not look beyond the limited policies that EPA expressly included therein. We urge EPA to expressly state the role of CHP and WHP in helping affected units achieve state emission targets and to provide examples of how these cleaner and more efficient power-generating systems might be included in state plans.

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[1] U.S. EPA, June 2, 2014, 79 Fed. Reg. 34830, 34888, "Proposed Rule: Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units."
[2] 79 Fed. Reg. at 34888 ("large energy users might independently see additional energy efficiency opportunities or opportunities for self-generation using options such as combined heat and power, solar, or power purchase agreements…").
[3] A handful of large-scale CHP systems are regulated as affected sources and thus included in EPA's calculation of heat-rate improvements in Building Block 1.

EPA requests comment "on whether industrial combined heat and power approaches warrant consideration as a potential way to avoid affected EGU emissions."[4] The Alliance strongly believes that such systems should be recognized as a potential compliance tool for EGUs. As an initial matter, we note that references to "industrial CHP" ignore the significant potential for CHP in institutional and commercial sectors, particularly in systems serving universities, downtown areas, hospitals, military bases and other multi-building settings. Accordingly, we recommend that EPA encourage states to recognize industrial, commercial and institutional CHP and WHP as appropriate means to avoid affected EGU emissions.

Section 111(d) requires EPA to set the standard to reflect the emissions limits achievable through the "best system of emission reduction taking into account the cost … and any nonair quality health and environmental impact … the Administrator determines has been adequately demonstrated." While EPA largely did not consider CHP potential when setting the state emission targets, it seems clear that CHP satisfies these requirements. Indeed, as elaborated below, CHP (1) reduces CO_2 emissions, (2) is cost effective, (3) enhances electric reliability, and (4) is adequately demonstrated. Moreover, the remaining potential for CHP and WHP is great and evaluation, measurement and verification protocols for these technologies are well established. EPA should highlight these benefits in the proposed rule and expressly state that CHP and WHP are valuable and acceptable compliance tools for unaffected units, notwithstanding their omission from the building blocks.

1. CHP Reduces CO_2 Emissions

U.S. power generation is woefully inefficient – and has not improved since Dwight Eisenhower occupied the White House. In fact, as Figure 1 illustrates, roughly two-thirds of energy inputs (68 percent) are lost, mainly as waste heat during power generation, with a mere 32 percent actually delivered to customers. In fact, it has been estimated that the energy lost in the United States from wasted heat in the power generation sector is greater than the total energy use of Japan.[5] This inefficient fuel use has led to unnecessary emissions.

By generating both heat and electricity from a single fuel source, CHP dramatically lowers emissions and increases fuel efficiency – allowing utilities and companies to effectively "get more with less." CHP can use more than 70 percent of fuel inputs. As Figure 2 illustrates, total fuel use is significantly greater with conventional, separate heat and power generation (here 154 units) than it is with CHP (here 100 units). Savings are even larger with WHP, which captures waste heat that would typically be vented from an industrial facility and uses it to make electricity with no additional combustion and no incremental emissions.

[4] 79 Fed. Reg. at 34905.
[5] U.S. Dep't of Energy, Oak Ridge National Laboratory, 2008, "Combined Heat and Power: Effective Energy Solutions for a Sustainable Future," at 5 (http://info.ornl.gov/sites/publications/files/Pub13655.pdf).

FIGURE 1: Losses from Conventional Power Generation[6] (TWh)

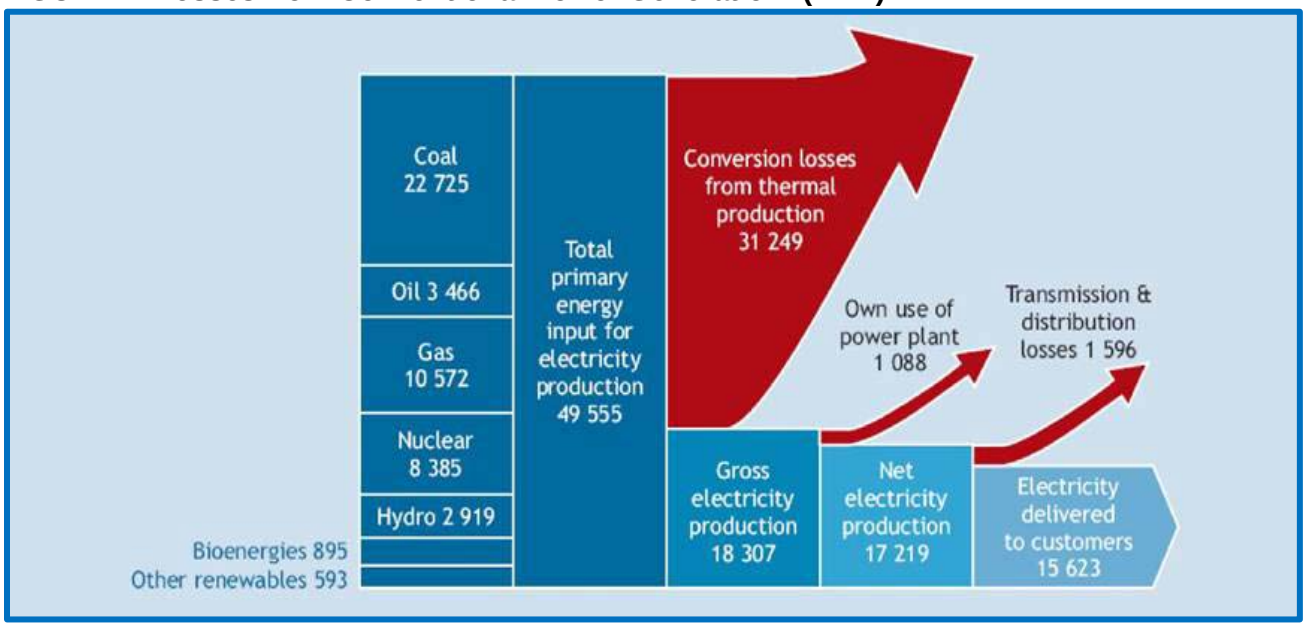
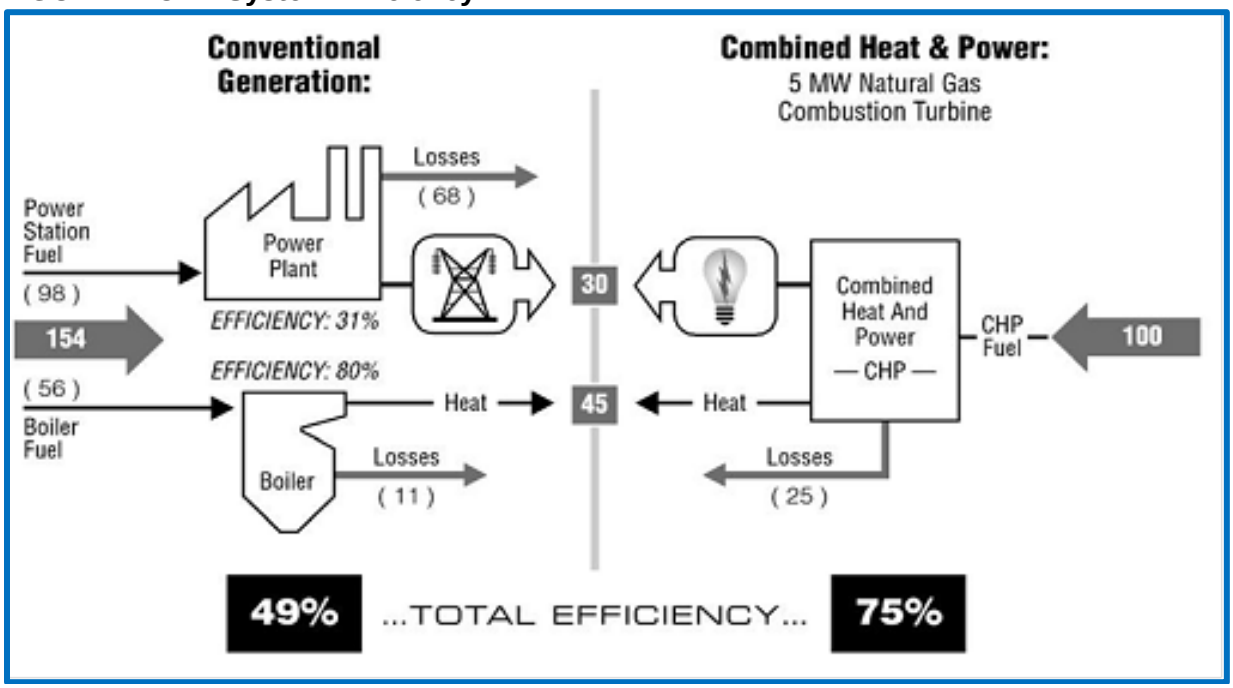


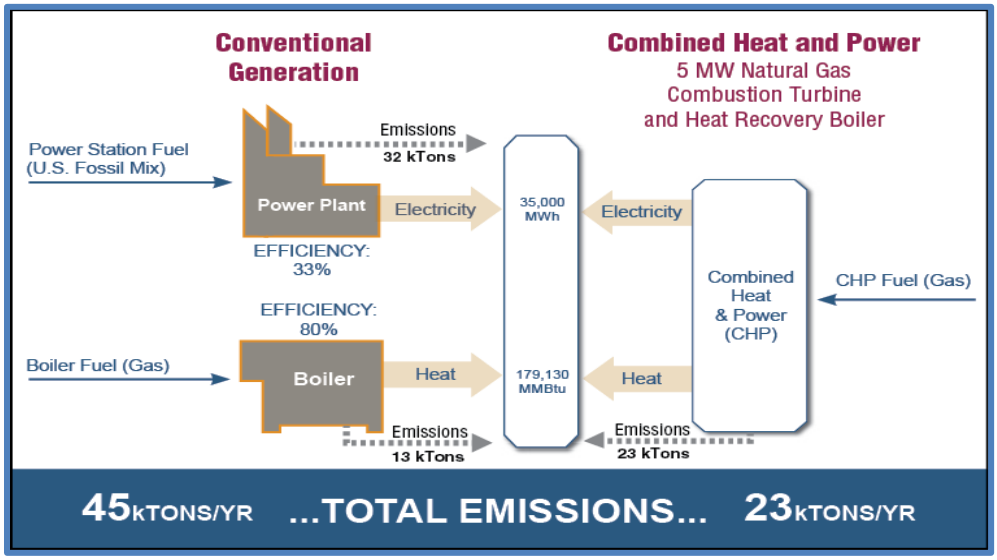
FIGURE 2: CHP System Efficiency[7]



[6] International Energy Agency, 2008, "*Combined Heat and Power: Evaluating the benefits of greater global investment,"* at 6 (Figure 3) (http://www.iea.org/papers/2008/chp_report.pdf).
[7] U.S. EPA, "Output-Based Environmental Regulations Fact Sheet" (http://ww.epa.gov/chp/state-policy/obr_factsheet.html) (Note that this figure is for illustration only. CHP performance relative to separate heat and power depends on numerous site- and project-specific factors).

By producing both heat and power from a single fuel source (CHP) and by capturing otherwise wasted heat from industrial processes to generate additional electricity (WHP), CHP and WHP dramatically lower energy use and associated emissions. In fact, CHP can produce one-half the carbon dioxide (CO_2) emissions of the separate generation of heat and power to deliver the same amount of useful energy (Figure 3).[8] WHP produces electricity with no additional combustion and no incremental carbon emissions.

FIGURE 3: CHP Has Significantly Lower Carbon Dioxide Emissions than Conventional Generation



For these reasons, EPA should expressly identify CHP and WHP in the rule as a means of lowering emissions at unaffected units to help achieve our national goals. Elsewhere, EPA Administrator, Gina McCarthy has recognized CHP's GHG benefits. For instance, upon awarding several industrial facilities for their investments in CHP, she recently explained, "The CHP technology offers a strategy to help meet the goals of the President's Climate Action Plan for a cleaner power sector while boosting the efficiency and competitiveness for many U.S. manufacturers."[9] In August 2012, the Administration announced a goal of installing 40 gigawatts of new CHP by 2020. Achieving this goal would annually save energy users 1 quadrillion Btu and reduce CO_2 emissions by 150 million metric tons.[10] Under a more ambitious scenario, the Department of Energy estimates that increasing CHP from its current 8-percent share of U.S. electric power to 20 percent by 2030 would reduce CO_2 emissions by more than 800 million metric tons per year – the equivalent of removing more than half of the current passenger vehicles from the road. This amounts to a 10-percent reduction in projected U.S. energy-related CO_2 emissions in 2030.[11] Such full-scale deployment would be equivalent to the power

[8] U.S. EPA, Combined Heat and Power Partnership, "Environmental Benefits" (graphic) (http://www.epa.gov/chp/basic/environmental.html) (visited Sept. 4, 2014).
[9] U.S. EPA, Sept. 30, 2014, "Press Release: EPA Honors Manufacturers with ENERGY STAR Award" (http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/41a49d0a9fa717d985257d63004f5b7f!OpenDocument).
[10] U.S. Department of Energy and U.S. EPA, 2012, "Combined Heat and Power: A Clean Energy Solution," at 3 (http://www.epa.gov/chp/documents/clean_energy_solution.pdf).
[11] ORNL, *supra* note 5, at 4 (reporting avoided 2030 emissions under 20-percent scenario); DOE-EPA, *supra* note 10, at 11. (reporting current avoided CO_2 emissions); and Energy Information Administration,

produced by more than 480 conventional power plants,[12] displacing 5.3-quadrillion Btus of fuel from conventional sources – or half the total energy currently consumed by U.S. households.[13] (Table 1) EPA should identify CHP and WHP's emission benefits in the rule itself.

TABLE 1: CHP/ WHP Projections (2030) and Environmental Benefits

	2012[14]	2030[15]
Total Electricity Generating Capacity	82 GW (8% current capacity)	241 GW (20% predicted capacity)
Annual Energy Savings	1.8 Quads	5.3 Quads
Annual CO_2 Reduction	240 MMT	848 MMT
Number of Car Equivalents Taken Off Road	40 Million	154 Million

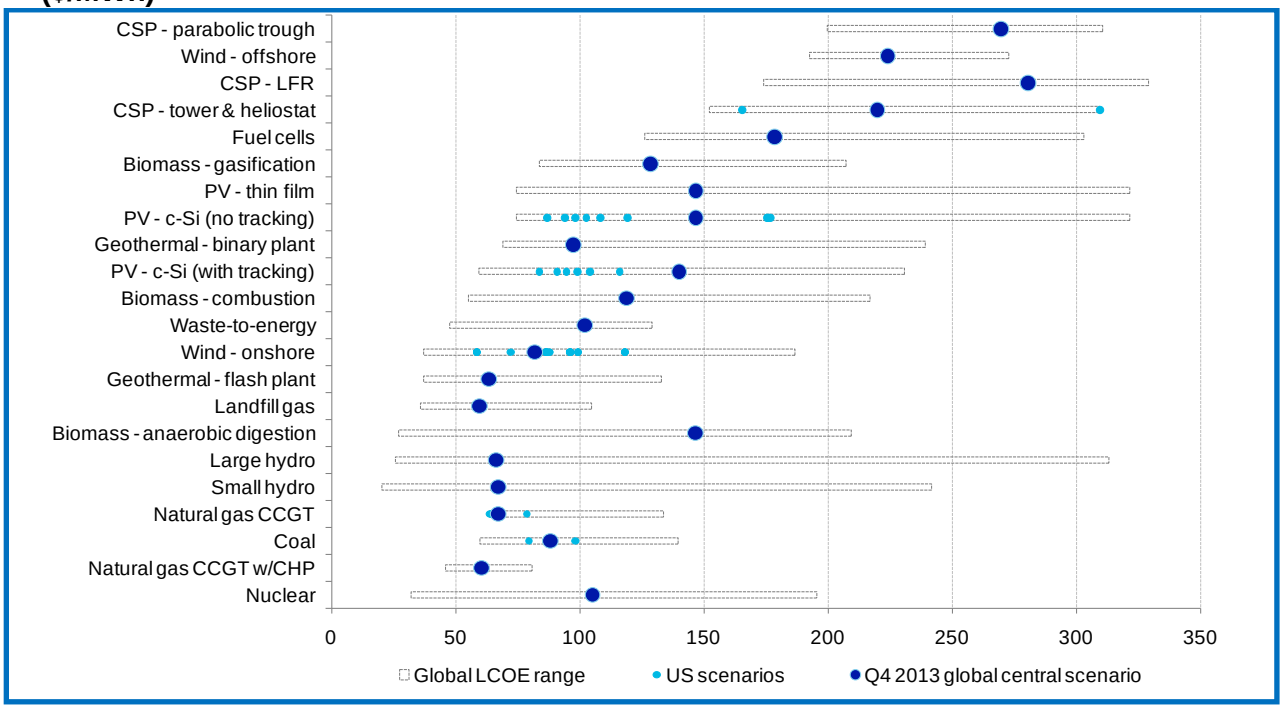
2. CHP and WHP Are Cost-Effective

Because host facilities are more efficient, they can purchase less fuel and electricity. This makes them more competitive and reliable. Achieving the Administration's 40-GW goal would support $40 to $80 billion in new capital investment.[16] Under DOE's more ambitious 20-percent scenario, full-scale deployment of CHP could create more than 1-million new skilled jobs and generate $234-billion in new investments.[17]

The inclusion of off-site energy-efficiency measures make it technically and economically feasible to provide greater reductions in power-sector CO_2 emissions, since efficiency measures, including CHP and WHP, are among the lowest cost sources of energy (Figure 4, next page). Moreover, CHP and WHP can provide CO_2 reductions at a fraction of the cost of other sources of distributed power (Table 2).

2014, "Energy-Related Carbon Dioxide Emissions by Sector and Source, United States," in *Annual Energy Outlook 2014* (http://www.eia.gov/forecasts/AEO/) (reporting projected CO_2 emissions in 2030).
[12] ORNL, *supra* note 5, at 4 (http://info.ornl.gov/sites/publications/files/Pub13655.pdf) (reporting 240,900 MW. Estimate assumes typical power generation of 500 MW from a traditional power plant).
[13] *Id.*
[14] DOE-EPA 2012, *supra* note 10, at 11.
[15] ORNL, *supra* note 5, at 12.
[16] DOE-EPA 2012, *supra* note 10, at 4.
[17] ORNL, *supra* note 5.

FIGURE 4: Levelized Costs of Energy across Power-Generation Technologies, Q4 2013 ($/MWh)[18]



Recent analysis by the American Council for an Energy-Efficient Economy[19] and Center for Clean Air Policy[20] found that the Carbon Guidelines could support 10 to 20 gigawatts of new CHP – the equivalent of 20 to 40 conventional power plants. As part of an overall strategy on energy efficiency, ACEEE's analysis found that CHP can help create more than 600,000 new jobs and save consumers more than $48 million. ACEEE further found that these investments will yield a return of as much as 400 percent, making this an unbeatable investment. Much of

[18] Bloomberg New Energy Finance and Business Council for Sustainable Energy, Feb. 2014, "Sustainable Energy in America 2014 Factbook," Figure 19 (citing Bloomberg New Energy Finance, EIA. Note: LCOE is the per-MWh inflation-adjusted lifecycle cost of producing electricity from a technology assuming a target internal rate of return (IRR) of 10 percent across all technologies. All figures are derived from Bloomberg New Energy Finance analysis. Analysis is based on numbers derived from actual deals (for inputs pertaining to capital costs per MW) and from interviews with industry participants (for inputs such as debt/equity mix, cost of debt, operating costs, and typical project performance). Capital costs are based on evidence from actual deals, which may or may not have yielded a margin to the sellers of the equipment; the only 'margin' that is assumed for this analysis is 10 percent after-tax equity IRR for the project sponsor. The dark-colored circles correspond to a global central scenario, with the exception of nuclear, gas, and coal – where the dark-colored circles correspond to a US-specific central scenario (i.e., accounting for U.S. fuel prices). 'CCGT' stands for combined cycle gas turbine; 'c-Si' stands for crystalline silicon; 'CSP' stands for concentrated solar power; 'LFR' stands for linear Fresnel reflector.)

[19] Sarah Hayes et al., ACEEE, April 29, 2014, "Change Is in the Air: How States Can Harness Energy Efficiency to Strengthen the Economy and Reduce Pollution" (http://aceee.org/research-report/e1401).

[20] Stacey Davis and Tom Simchak, Center for Clean Air Policy, May 2014, "Expanding the Solution Set: How Combined Heat and Power Can Support Compliance with 111(d) Standards for Existing Power Plants" (http://ccap.org/resource/expanding-the-solution-set-how-combined-heat-and-power-can-support-compliance-with-111d-standards-for-existing-power-plants/).

the growth associated with CHP deployment would occur in manufacturing states in the Midwest.

TABLE 2: CHP Value Proposition[21]

Category	10 MW CHP	10 MW PV	10 MW Wind	Combined Cycle (10 MW Portion)
Annual Capacity Factor	85%	22%	34%	70%
Annual Electricity	74,446 MWh	19272 MWh	29784 MWh	61320 MWh
Annual Useful Heat	103,417 MWh_t	0	0	0
Footprint Required	6,000 ft^2	1,740,000 ft^2	76,000 ft^2	N/A
Capital Cost	$20 million	$60.5 million	$24.4 million	$10 million[22]
Annual Energy Savings	308,100 MMBtu	196,462 MMBtu	303,623 MMBtu	154,649 MMBtu
Annual CO_2 Savings	42,751 Tons	17,887 Tons	27,644 Tons	28,172 Tons
Annual NOx Savings	59.4 Tons	16.2 Tons	24.9 Tons	39.3 Tons
Cost Per Ton of CO_2 Savings	**$468**	**$3,382**	**$883**	**$355**[17]

The values in Table 2 are based on:

- 10 MW Gas Turbine CHP with 28% electric efficiency and 68% total efficiency, 15 PPM NOx
- Capacity factors and capital costs for PV and Wind based on utility systems in DOE's Advanced Energy Outlook 2011
- Capital cost and efficiency for natural-gas combined-cycle system based on Advanced Energy Outlook 2011 (540 MW system proportioned to 10 MW of output), NGCC 48% electric efficiency, NOx emissions 9 ppm
- Electricity displaces National All Fossil Average Generation (eGRID 2012): 9,572 Btu/kWh, 1,743 lbs CO_2/MWh, 1.5708 lbs NOx/MWH; 6.5% transmission and distribution losses; CHP thermal displaces 80% efficient on-site natural gas boiler with 0.1 lb/MMBtu NOx emissions)

3. CHP and WHP Enhance Electric Reliability

CHP has non-air quality health and environmental impacts. The proposed rule provides flexibility to states to "rely on a diverse set of energy resources [to] ensure system reliability."[23] CHP advances this goal in several ways.

[21] DOE-EPA, 2012, *supra* note 10, at 8 (cost per ton of CO_2 savings added to original table). Note that PV costs have declined substantially since 2012; however, capital costs remain significantly higher than CHP.

[22] Note that this estimate does not include any transmission and distribution investments, which might be required for a new central-station plant. Such costs would be substantial and would greatly increase the capital cost associated with a natural-gas combined-cycle unit. Such investments would *not* be required for CHP, since CHP systems provides energy at the point of use.

First, CHP and WHP systems alleviate burdens on transmission and distribution lines because they depend on localized, on-site electricity generation at existing facilities. In this way, CHP and WHP can help avoid costs associated with investment in and construction of transmission infrastructure. EPA acknowledges this benefit in the proposed rule, noting that "many demand-side management approaches, including programs to encourage end-use energy efficiency, distributed generation, and combined heat and power … actually reduce demand for centrally generated power and thus relieve pressure on the grid."[24]

Second, because CHP and WHP systems have the ability to operate independent of the grid, they can provide reliability during a power outage. After Superstorm Sandy, more than eight-million people along the eastern seaboard lost power. But hospitals, universities and manufacturing facilities with CHP and an islanding switch kept the lights on.[25]

4. CHP Is Adequately Demonstrated

These projects are adequately demonstrated. Dating back to Thomas Edison, whose early power plants sold both electricity and steam to nearby buildings, today there are more than 4,000 CHP installations throughout the United States.[26] (Figure 5) CHP capacity outside the United States is even greater, as the U.S. is ranked only thirteenth in the world for the share CHP has of total power production. Likewise, WHP capacity in Asia far exceeds U.S. capacity.[27] CHP supplies less than 9 percent of U.S. electric capacity, well below the levels in other industrialized economies like Germany (13%), Russia (31%) or Denmark (53%).[28] Clearly, CHP is "adequately demonstrated," but deployment needs to be expanded with favorable policies. State compliance plans under 111(d) can stimulate further investment in the United States.

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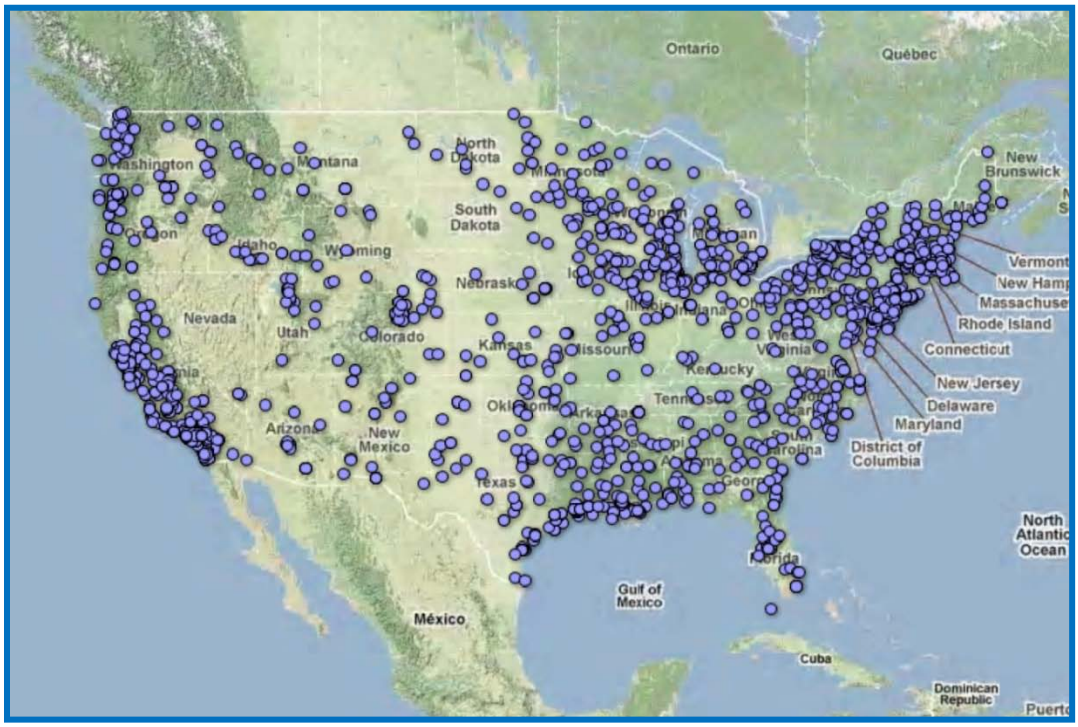
[23] 79 Fed. Reg. at 34833.
[24] 79 Fed. Reg. at 34899; *see also* 79 Fed. Reg. at 34884 ("[B]y reducing the overall amount of electricity that needs to be transmitted between EGUs and customers, demand-side energy efficiency tends to relieve stress on the grid, thereby increasing system reliability.").
[25] *See, e.g.,* U.S. EPA, June 18, 2014, 79 Fed. Reg, 34830, 34899, "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units" (noting that CHP "reduce[s] demand for centrally generated power and thus relieve[s] pressure on the grid.")
[26] CHP Installation Database, 2014. Database developed by ICF International for Oak Ridge National Laboratory and DOE (http://www.eea-inc.com/chpdata/). Note that some CHP systems have multiple generating units.
[27] *See, e.g.,* Institute for Industrial Productivity and International Finance Corp, June 2014, "Waste Heat Recovery for the Cement Sector: Market and Supplier Analysis" (http://bit.ly/1mkePL2).
[28] ORNL, *supra* note 5, at 22 and International Energy Agency, 2009, "Cogeneration and District Energy: Sustainable Energy Technologies for Today … and Tomorrow," at 11 (http://www.iea.org/files/CHPbrochure09.pdf).

FIGURE 5: U.S. CHP Installations[29]



EPA has repeatedly recognized the value of CHP as a proven cost-effective technology to reduce greenhouse gas emissions. It has incorporated CHP in its greenhouse gas best available control technology (BACT) guidance[30] and issued awards to various CHP Energy Star projects in recognition of their emissions reductions.[31] Many states have likewise recognized the emission benefits of CHP and WHP. For instance, 18 states recognize WHP as a renewable or efficiency resource in their state portfolio standards because WHP produces electricity with no incremental combustion or emissions. (see Appendix - "State WHP Catalogue")

5. The Remaining Potential for CHP Is Vast

In 2008, Department of Energy's Oak Ridge National Laboratory ("ORNL") assessed the economic and environmental benefits of a "high deployment strategy," wherein CHP and WHP

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[29] DOE, 2014, "CHP Installation Database" (Database developed by ICF International for Oak Ridge National Laboratory and DOE) (http://www.eea-inc.com/chpdata/index.html).

[30] *See, e.g.,* U.S. EPA, Office of Air and Radiation, EPA–HQ–OAR–2010–0841; FRL–9228–2, Nov. 2010, "PSD and Title V Permitting Guidance for Greenhouse Gases," March 2011, "PSD and Title V Permitting Guidance for Greenhouse Gases," at 29, 30 & 31 (hereinafter "BACT Guidance") ("Applying the most energy efficient technologies at a source should in most cases translate into fewer overall emissions of all air pollutants per unit of energy produced"; "The second category of energy efficiency improvements includes options that could reduce emissions from a new greenfield facility by improving the utilization of thermal energy and electricity that is generated and used on site." and "For example, an applicant proposing to build a new facility that will generate its own energy with a boiler could also consider ways to optimize the thermal efficiency of a new heat exchanger that uses the steam from the new boiler.").

[31] *See, e.g.,* U.S. EPA, Combined Heat and Power Partnership (listing winners of the agency's Energy Star CHP Awards and highlighting carbon reductions) (http://www.epa.gov/chp/partnership/current_winners.html) (visited Sept. 4, 2014).

would provide 20 percent of U.S. electric capacity by 2030 – up 122 percent from the time the report was written.[32] This scenario is on par with DOE's projections for wind,[33] and current nuclear power production.[34] The ORNL scenario is based on the additional deployment of 156 gigawatts (GW) of CHP and WHP from 2008 to 2030. Notably, a 2010 ICF report confirmed 130 GW of technical CHP potential in the commercial and industrial sectors.[35] A separate 2012 analysis found 7 to 10 GW of additional WHP potential.[36] These assessments indicate that – with the right policies and incentives in place – the ORNL deployment scenario is tenable. We further note that – as EPA properly recognizes – evaluation, measurement and verification (EM&V) protocols and procedures for CHP are "well established," further supporting its use as a compliance pathway for EGUs. Failing to expressly include these technologies as a way to avoid affected EGU emissions would prevent states from realizing these benefits. Accordingly, EPA should encourage states to incorporate policies that support CHP deployment in their state plans.[37]

II. The Rule Should Be Modified to Ensure Affected CHP Units Are Adequately Treated

The proposed rule includes several provisions that relate to the subset of existing CHP installations that are treated as Electric Generating Units. These provisions only apply to the handful of the nation's 5,408 CHP operating units that are directly affected by the rule.[38] States may nonetheless choose to credit emission reductions from unaffected units in their compliance plans. As such, these provisions send an important signal to the states about the appropriate treatment of CHP under a system-wide approach. The Alliance offers several recommendations to ensure that the benefits of these CHP units are adequately recognized.

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[32] ORNL, *supra* note 5, at 4.
[33] U.S. Department of Energy, 2008, "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply" (http://www.nrel.gov/docs/fy08osti/41869.pdf)
[34] EIA, 2013, "Electric Power Annual," Table 1.1. (http://www.eia.gov/electricity/annual/)
[35] ICF-USCHPA-WADE, Oct. 2010, "Effect of a 30 Percent Investment Tax Credit on the Economic Market Potential for Combined Heat and Power," at 11-12 (Tables 3 & 4) (projecting roughly 65 GW of technical potential in each the industrial and commercial/ institutional sectors, for a total of 130 GW); *see also* DOE-EPA, *supra* note 10, at 13 (reaffirming these findings); personal communication with Anne Hampson, ICF Consulting, Nov. 22, 2013 (noting that their current estimates for CHP on-site technical potential are 126 GW).
[36] U.S. EPA, CHP Partnership, May 2012, "Waste Heat to Power Systems," at 2.
[37] EPA, State Plan Considerations TSD at 49, Table 2.
[38] The Technical Support Document only lists 9 percent (489) of the 5,408 existing CHP and WHP units as directly affected by the rule. *See* U.S. EPA, June 2014, "Technical Support Document: E-Grid Methodology" (http://www2.epa.gov/sites/production/files/2014-06/20140602tsd-egrid-methodology_0.xlsx) and CHP Installation Database, 2014. Database developed by ICF International for Oak Ridge National Laboratory and DOE (http://www.eea-inc.com/chpdata/index.html). *See also* 79 Fed. Reg. at 34954 (§ 60.5795 What affected EGUs must I address in my state plan?) (noting that applicability is limited to "A stationary combustion turbine that has a base load rating greater than 73 MW (250 MMBtu/h), was constructed for the purpose of supplying, and supplies, one-third or more of its potential electric output and more than 219,000 MWh net-electrical output to a utility distribution system on a 3-year rolling average basis, combusts fossil fuel for more than 10.0 percent of the heat input during a 3-year rolling average basis and combusts over 90% natural gas on a heat input basis on a 3-year rolling average basis.").

1. The Rule Should Provide a 100-Percent Thermal Credit for Affected CHP Units

The proposed rule would credit all of the electricity produced by CHP systems, but only 75 percent of their useful thermal output. EPA invites comment on "a range of two-thirds to 100 percent credit for useful thermal output in the final rule to better align incentives with avoided emissions."[39]

While the Alliance is gratified to see this thermal credit in the proposed rule, we do not believe that thermal output should be discounted. Rather, to properly account for the benefits of energy efficiency, the rule should credit 100 percent of a facility's useful thermal output.

The characteristic that makes CHP both clean and efficient is its ability to produce both useful thermal and electric output simultaneously. The system's environmental benefits will only be recognized if both of these products are considered. EPA recognizes this. In a 2012 white paper on methods for calculating CO_2 savings from a CHP system, EPA determined, "To calculate the fuel and CO_2 emissions savings of a CHP system, both electric and thermal outputs of the CHP system must be accounted for."[40] For this reason, it is important to consider both thermal and electric output when determining an affected unit's emission rate. The proposed rule represents a good first step, but stops short of fully crediting system benefits.

A 2005 EPA memo examining thermal credits explained that "giving between 75 to 100 percent thermal credit for thermal output from CHP units most accurately accounts for the environmental benefits of CHP."[41] In the context of that rule (which addressed criteria pollutants, not CO_2), EPA found that 75 percent was appropriate since it represented the average equivalent input-based emissions for the regulated pollutants (NOx, SO_2 and PM) based on interpolating then current input-based New Source Performance Standards for industrial boilers and utility boilers. This rationale does not apply to this rule, which is regulating CO_2. Further, unlike with criteria air pollutants, there are no National Ambient Air Quality Standards for CO_2. Moreover, the memo acknowledges that "one could also argue that 100 percent credit for thermal output is also appropriate."[42]

There is precedent supporting a 100-percent thermal credit. For instance, EPA has recognized 100 percent of thermal output in the NSPS for Stationary Combustion Turbines.[43] A 100-percent credit has likewise been applied in several states.[44] Notably, the Proposed Stationary

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[39] 75 Fed. Reg. at 34914.
[40] U.S. Environmental Protection Agency, CHP Partnership, Aug. 2012, "Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems" (http://www.epa.gov/chp/documents/fuel_and_co2_savings.pdf).
[41] Memo from Christian Fellner to Utility, Industrial, and Commercial Boiler NSPS File, Feb. 2005, "Combined Heat and Power (CHP) Compliance," at 4.
[42] *Id.*
[43] *See* New Source Performance Standard (NSPS) for Stationary Combustion Turbines (40 CFR Part 60, Subpart KKKK) (crediting 100 percent of thermal output); New Source Performance Standard (NSPS) for Electric Utility Steam Generating Units (40 CFR Part 60, Subpart Da) (crediting 75 percent of thermal output from CHP systems).
[44] *See* U.S. EPA, CHP Partnership, Feb. 2013, "Accounting for CHP in Output-Based Regulations," at 7-9 (citing California's multi-pollutant regulations and Texas permit by rule and standard permitting program) (http://www.epa.gov/chp/documents/accounting.pdf).

Combustion Turbine Rule favorably cited Texas' permit-by-rule regulation, which gives facilities 100-percent credit for steam generation thermal output.[45]

We understand that it may be appropriate to discount thermal output where there are concerns that the thermal energy is not being accurately measured or properly used. Such concerns do not exist here. The proposed rule includes strict monitoring requirements for CHP systems.[46] These requirements should help alleviate any concerns about so-called "sham" CHP projects.

EPA also seeks comment on whether EGUs producing both electric energy output and useful thermal output should report both electric and useful thermal output.[47] As explained above, these units should report both thermal and electric output. To do otherwise would minimize their measured and verified emissions benefits.

This matter has important implications for state compliance plans. While only a handful of existing CHP systems are affected by the Carbon Guidelines,[48] the proposed rule offers states the flexibility to credit emission reductions from unaffected units in their compliance plans. States may look to EPA's treatment of thermal output from affected units as a guide for the appropriate treatment of these systems in their compliance plans and underlying policies (e.g., portfolio standards). Absent proper consideration of their thermal output, states will underestimate the emissions benefits of CHP units potentially leading to investments in other technologies, which may be more costly or less efficient or reliable in the long run.
EPA's treatment of thermal output also has important policy implications beyond climate regulation. Congress is currently exploring options for comprehensive tax reform. In December 2013, the Senate Finance Committee released a draft energy tax reform proposal, which provided a "technology neutral tax credit" for all clean-energy technologies that are 25 percent cleaner than the grid average. Given their carbon benefits, WHP and CHP should readily meet this test – however, the proposal was limited to electrical output. Using this approach, CHP would not be eligible for favorable tax treatment. As tax reform moves forward, Congress will look to EPA for guidance. Again, by crediting 100 percent of thermal output in the Carbon Guidelines, EPA sends a signal to Congress that it should do the same.

EPA recognizes the relevance of such policy considerations. The proposed rule seeks comment on the appropriate thermal credit "to better align incentives with avoided emissions."[49] As noted above, the Administration has supported numerous policies to encourage greater CHP deployment. Providing a full – 100 percent – thermal credit would place the Carbon Guidelines squarely in line with these broader deployment goals.

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[45] 70 Fed. Reg. 8314, at 8318 (Feb. 18, 2005).
[46] *See, e.g.,* 79 Fed. Reg. at 34955 (§ 60.5805) ("…an affected EGU that is a combined heat and power facility must install, calibrate, maintain and operate equipment to continuously measure and record on an hourly basis useful thermal output and, if applicable, mechanical output, which are used with net electric output to determine net energy output."); 79 Fed. Reg. at 34913 ("State plans with a rate-based form of the emission performance level must require affected EGUs to report hourly net energy output (including net MWh generation, and where applicable, useful thermal output) to the EPA on an annual basis.").
[47] 79 Fed. Reg. 34914.
[48] *See supra* note 38, and accompanying text.
[49] 75 Fed. Reg. at 34914.

2. The Line-Loss Credit for Affected Units Should Reflect Actual System Losses

The proposed rule appears to include a five-percent line-loss credit for affected CHP systems. For CHP facilities, net energy output is defined as "the net electric or mechanical output from the affected facility divided by 0.95, plus 75 percent of the useful thermal output."[50] There is no explanation for why output is "divided by 0.95"; however, the Carbon Pollution Guidelines for New Stationary Sources (111(b)) explicitly provided a 5 percent "line loss credit" for CHP systems "to account for a five percent avoided energy loss in the transmission of electricity."[51] Conversations with EPA staff confirm that this credit is likewise reflected in the instant proposal. We commend EPA for including this credit in the rule, as avoided line losses are one of the key benefits of distributed energy generation.[52] We believe, however, that the proposed credit is inadequate.

On average, actual line losses from conventional generation are higher than 5 percent, and thus CHP projects that avoid such losses warrant a higher credit. The technical support documents accompanying the rule repeatedly refer to line losses of 7 percent or higher. For instance, as part of the BSER methodology for energy efficiency, EPA applies a transmission and distribution loss factor of 7.51 percent.[53] In the Technical Support Document for State Plan Considerations, EPA notes that national average line losses are 7 percent.[54] The inconsistency between the technical support documents and the rule itself is inappropriate. Moreover, line losses come at a significant economic cost – contributing to nearly $26-billion in foregone revenue in 2010 alone.[55] These losses are even greater during peak hours. In fact, a 2011 report by the Regulatory Assistance Project finds that a grid segment or area with average line losses of 7 percent could have marginal line losses of 20 percent during peak load.[56] Studies at Carnegie Mellon University and the Massachusetts Institute of Technology have shown that one megawatt-hour (MWh) of local generation, like CHP, can displace up to 1.47 MWh of central

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[50] 79 Fed. Reg. at 34956-57.
[51] U.S. EPA, Jan. 8, 2014, 79 Fed. Reg. 1430, 1448, "Proposed Rule: Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units."
[52] *See, e.g.,* U.S. EPA., Combined Heat and Power Partnership, "Efficiency Benefits" ("Because CHP is more efficient, less fuel is required to produce a given energy output than with separate heat and power. Higher efficiency translates into…reduced grid congestion and avoided distribution losses") (http://www.epa.gov/chp/basic/efficiency.html) (visited Sept. 4, 2014).
[53] U.S. EPA, June 2014, "Goal Computation Technical Support Document," at 17 ("The 7.51% scaling factor effectively converts the retail sales figure into a corresponding total net generation value that accounts for transmission and distribution losses") (http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-goal-computation.pdf).
[54] U.S. EPA, June 2014, Technical Support Document, "State Plan Considerations," at 50 ("According to EIA data, nationally, annual electricity transmission and distribution losses are equivalent to about seven percent of the electricity that is input to the transmission system in the United States.") (http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-state-plan-considerations.pdf).
[55] U.S. Energy Information Administration, DOE/EIA-0348(01)/2, Jan 27, 2012, State Electricity Profiles 2012 (Table 8: "Retail Sales, Revenue, and Average Retail Price by Sector, 2000 and 2004 through 2010") (reporting average retail prices of 9.83 cents/ kWh in 2010); *Id.* (Table 10: "Supply and Disposition of Electricity, 2000 and 2004 through 2010 (Million Kilowatthours)") (reporting 261,990 million kilowatt hours in estimated losses in 2010) (9.83 cents * 261,990 million kilowatt hours = $25.8 billion).
[56] Jim Lazar & Xavier Baldwin, Regulatory Assistance Project, "Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements," July 2011, at 2 (explaining that "marginal losses avoided are much greater than average losses on a utility distribution system" because "losses grow exponentially with load.").

generation in some cases.[57] These numbers imply the CHP benefit should be well above 5 percent where such lines-loss benefits exist. In the 111(b) proposal, EPA asserted that 5 percent "represents a reasonable average amount for the avoided transmission and distribution losses for CHP facilities."[58] In fact, a line-loss credit of 7 or 7.5 percent would be more "reasonable." To do so, net electric output should be divided by .93. EPA should further clarify that the credit applies to both CHP and WHP.

The proposed rule also provides that the apparent line-loss credit would apply whenever the useful thermal output is at least 20 percent of the total output.[59] We suggest that the rule add an efficiency standard to be consistent with the definition of qualifying CHP projects in the tax code.[60] This will help counter any concerns that may exist about "sham" CHP projects.

Lastly, the final rule should eliminate any ambiguity surrounding the line-loss credit. As written, this credit only applies to a subset of existing CHP systems that are directly affected by the rule.[61] States will consider EPA's approach, however, when determining how to account for output from CHP systems in their compliance plans. For this reason, EPA should elaborate on CHP's transmission and distribution benefits and encourage states to apply a similar line-loss credit when accounting for CHP and WHP installations at unaffected units. These benefits are consistent with EPA's stated interest in enhancing electric reliability.

3. EPA Should Provide Assurances to CHP Hosts

EPA's system-wide approach allows states to achieve their emission targets through off-site energy-efficiency investments. Hospitals, universities and manufacturing facilities can help reduce emissions throughout the airshed by installing CHP and WHP systems. While these investments will reduce regional emissions because these facilities are now producing electricity on site, installing a CHP system may cause their own emissions to modestly increase. To encourage these investments, EPA should find a way to assure industrial hosts that actions taken today to help EGUs comply with the Carbon Guidelines will not adversely affect them under any potential future carbon NSPS for another sector.

III. EPA Should Encourage States to Include CHP and WHP in their Compliance Plans.

The proposed rule sets emissions targets, but provides tremendous flexibility to states to determine the best way to achieve them. EPA must clarify that states can look beyond the policies expressly included in the building blocks to meet their targets. EPA should also ensure that states are aware that CHP and WHP provide valuable compliance tools that can help reduce emissions from unaffected units and provide appropriate guidance for states to include supportive policies in their compliance plans. This will be particularly important in coal-heavy

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[57] Masoud H. Nazari and Professor Marija, Oct. 2010, "Enhancing Efficiency and Robustness of Modern Distribution Systems" (reporting 270 billion KWh in transmission and distribution losses in the U.S. in 2007; concluding that 1 MW of correctly located distributed generation can displace, on average, 1.5 MW of grid generation).
[58] 79 Fed. Reg. at 1448.
[59] 79 Fed. Reg. at 34957.
[60] *See* Section 48(c)(3)(A) ("The term 'combined heat and power system property' means property comprising a system— … (ii) which produces— (I) at least 20 percent of its total useful energy in the form of thermal energy … [and] the energy efficiency percentage of which exceeds 60 percent…").
[61] *See supra* note 38, and accompanying text.

states in the industrial Midwest.[62] EPA should also provide additional data to encourage use of these technologies.

1. EPA Should Provide Appropriate Guidance to States

States will need templates and guidance to develop favorable CHP and WHP policies for their compliance plans. EPA notes that states "requested clear methodologies for measuring EE/RE policies and programs, so that these could be included as part of their compliance strategies.' The EPA also heard that states would like examples of effective state policies and programs."[63] Elsewhere, EPA acknowledges that it "intends to develop guidance for evaluation, monitoring, and verification (EM&V) of renewable energy and demand-side energy efficiency programs and measures incorporated in state plans."[64] It is not clear whether this commitment encompasses programs that advance CHP and WHP. States will need such guidance to help incorporate both utility-funded and private and non-utility delivered CHP programs into their plans.

Many states will advance CHP and WHP through ratepayer-funded programs. These states will need examples of portfolio standards that recognize CHP and WHP. The Technical Support Document acknowledges that CHP may be appropriately included in state portfolio standards to help achieve emission targets.[65] EPA should provide model rules that states can incorporate into their respective plans. Many states already have portfolio standards that recognize CHP and WHP.[66] Massachusetts' Alternative Energy Portfolio Standard (APS) provides a particularly good model for the treatment of CHP. EPA should provide technical materials to help other states develop similar targets. Because many states will need to adopt legislation to create or expand their portfolio standards to include CHP and WHP, these materials should be provided as soon as possible.

States may also consider adopting other complementary policies to increase CHP and WHP deployment.[67] EPA should provide concrete examples of these policies along with guidance about how they can be made enforceable, so that states can consider them when developing their state plans.

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[62] *See* Davis and Simchak, *supra* note 20 (noting that much of the growth associated with CHP deployment under the Carbon Standard would occur in manufacturing states in the Midwest, with the greatest potential in Illinois, Indiana, Michigan and Ohio).
[63] 79 Fed. Reg. at 34927-34928.
[64] 79 Fed. Reg. at 34909.
[65] See U.S. EPA, June 2014, Technical Support Document (TSD) for Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units Docket ID No. EPA-HQ-OAR-2013-0602, "State Plan Considerations TSD" (http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-state-plan-considerations.pdf) ("Energy Efficiency Resource Standards (EERS) set multiyear targets for energy savings that utilities or third-party program administrators typically meet through customer energy efficiency programs but also through other approaches, such as peak demand reductions, building codes and combined heat and power (CHP)." (emphasis added)
[66] *See, e.g.,* U.S. EPA, "Portfolio Standards and the Promotion of Combined Heat and Power" (http://www.epa.gov/chp/documents/ps_paper.pdf). *See also* Appendix for portfolio standards that include WHP.
[67] *See* Alliance for Industrial Efficiency, Nov. 22, 2013, "Considerations in the Design of a Program to Reduce Carbon Pollution from Existing Power Plants" (available at http://www.dgardiner.com/wp-content/uploads/2013/11/Alliance-Comments-on-Design-of-111d_Nov_2013.pdf) (providing examples of state policies that support CHP and WHP deployment).

We note that in addition to advancing CHP through utility-run efficiency programs (e.g., by including it in state portfolio standards), many energy-efficiency projects like CHP are also delivered through other means. For that reason, EPA should issue clear guidance for crediting efficiency delivered through private and non-utility programs and projects. This includes efficiency generated by Energy Savings Performance Contracting and projects that are self-implemented by building and industrial facility owners. EPA should clarify in advance of its final rule how privately delivered and non-investor-owned utility delivered energy efficiency, which is outside of the ratepayer programs, can be included in a state plan. EPA should also provide guidance on how this crediting should work, and address states' and stakeholders' questions about enforceability, such as by clarifying the relationship between enforceable requirements in a plan and the broad measures that may be used to meet such requirements. These supporting materials should be provided as soon as possible (and before the Carbon Standards are finalized) as states are already beginning to assess their compliance options.

2. EPA Should Encourage States to Credit all of the Electricity Generated By Unaffected CHP Units

The proposed rule limits GHG emissions from Electric Generating Units. We understand that given the scope of the proposed rule, EPA may be required to only consider the displaced emissions from the affected EGUs. Thus the full electricity output of unaffected, efficient CHP systems should be credited in the same manner as any other beyond-the-fence energy-efficiency measure, without regard to the modest increase in emissions that may result at the facility installing the CHP unit. This approach is consistent with the way a number of states such as Massachusetts, Maryland and Illinois have incorporated CHP into their Energy Efficiency Resource Standards (EERS). Accordingly, where states include unaffected CHP units in their compliance plans, all of the electricity generated by such units should be treated as a kilowatt hour displaced from the grid. We urge EPA to prepare guidance for states to this effect.

The myriad benefits elaborated in Part I coupled with the Administration's goal of deploying 40 gigawatts of new CHP by 2020 support treating CHP at unaffected units in this manner. Moreover, while CHP at unaffected units may result in modest on-site emission increases, these units remain subject to strict standards for criteria pollutants and must often meet minimum efficiency requirements to ensure they are operating cleanly and efficiently. We believe it would be appropriate for states to establish minimum performance requirements for unaffected CHP units to ensure there are creditable savings.[68]

If, despite the GHG reductions at the affected EGUs, EPA determines that electricity produced by unaffected CHP units should be discounted to account for incremental on-site emissions at the CHP host facility, the calculation must be simple, accurate and understandable. In this case, EPA should provide guidance to states on the application of the avoided-emissions approach, which would calculate an effective emissions rate for unaffected CHP units based on measurement of (or reasonable assumptions about) the usable thermal output and characteristics of displaced onsite boilers.[69] The credit awarded such facilities would be

[68] Many state CHP regulations require at least 20 percent of the fuel's recovered energy to be thermal and an overall CHP system efficiency of 55 to 60 percent.

[69] *See* U.S. EPA, CHP Partnership, Feb. 2013, "Accounting for CHP in Output-Based Regulations," at 7-9 (citing California's multi-pollutant regulations and Texas permit by rule and standard permitting program) (http://www.epa.gov/chp/documents/accounting.pdf).

determined by prorating the electric output of the CHP system by comparing the CHP effective emissions rate to the area's 2012 average fossil emissions rate.[70]

3. EPA Should Provide Economic Data on the Benefits of CHP and WHP

To further encourage states to include CHP and WHP in their compliance plans, EPA should include data on estimated job benefits from increased CHP and WHP deployment. The proposed rule projects "an increase of 78,000 jobs in the demand-side energy efficiency sector" in 2020 from implementation of the rule.[71] This estimate does not appear to consider potential job growth associated with CHP and WHP. Including the full suite of eligible energy-efficiency technologies would support more optimistic estimates. As noted above, if CHP produced 20 percent of U.S. electric capacity, it would create 1-million new jobs in the design, construction, installation and maintenance of equipment. Recent analysis by ACEEE finds that CHP could help create more than 600,000 new jobs as part of an overall strategy on energy efficiency. [72] The Blue-Green Analysis reports that approximately 4.4 direct jobs are created or maintained for every $1-million invested in CHP construction, installation, and manufacturing.[73]

EPA's Regulatory Impact Analysis should include data on job-creation associated with CHP and WHP deployment under the rule.

CONCLUSION

We support EPA's use of a system-wide approach to reduce GHG emissions. As elaborated above, CHP and WHP provide substantial environmental and nonair quality health benefits and are demonstrated, cost-effective control strategies. The 2012 industrial efficiency executive order mandates that federal agencies – including EPA – embrace policies to increase deployment.

In sum, our comments offer three key recommendations to strengthen the treatment of CHP in the proposed rule:

1. EPA should clarify that both CHP and WHP at unaffected units are eligible compliance mechanisms for EGUs;
2. EPA should make several modest changes to ensure that the rule recognizes CHP's benefits at affected units; and
3. EPA should encourage states to include CHP and WHP in their compliance plans to help reduce emissions from unaffected units.

These simple changes will encourage greater use of CHP and WHP and help realize their environmental, economic, and reliability benefits.

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[70] 1 kWh credit = kWh_{CHP} * (1-(CHP Effective Emissions Rate / 2012 Average Fossil Emissions Rate)).
[71] 79 Fed. Reg. at 34841 & 34935.
[72] Hayes et al., *supra* note 19.
[73] Blue-Green Alliance, March 2014 (Draft), "Combined Heat and Power: An Opportunity for U.S. Workers."

Thank you for the opportunity to comment. We look forward to working with EPA throughout the rulemaking process.

Sincerely,

David Gardiner, Executive Director
Alliance for Industrial Efficiency

APPENDIX

Catalog of States in Which Waste Heat to Power is Provided Incentives in Renewable Energy and Energy Efficiency Policies and Programs

Overview

Waste heat to power (WHP) is gaining increasing attention as a clean, renewable, and efficient technology. By capturing otherwise wasted heat from industrial processes and using it to generate power with no additional fuel and no incremental emissions, waste heat to power reduces the need for electricity from the grid and its associated emissions. Waste heat is generated in massive quantities at industrial facilities every day and if harnessed to make power, could generate 10 GW of emission-free electricity in the United States[1].

WHP is included in a growing number of state policies promoting clean energy. WHP is a qualifying resource in more than half of the twenty-nine states which have Renewable Portfolio Standards (RPS) to increase the share of renewable energy in their state, leading to higher economic growth, improved energy security, and improved environmental quality. In addition, WHP qualifies as an energy efficiency measure in two of the 27 state Energy Efficiency Resource Standards (EERS), goals or targets.

The unique characteristics of WHP as a fuel-free, combustion-free, and emission-free source of distributed and base-load power make it especially well-suited to addressing critical public policy objectives related to increasing industrial efficiency and reducing emissions of greenhouse gases and criteria pollutants like nitrogen oxides and particulates.

This paper highlights the policies and programs in the nineteen states that currently include WHP in their renewable energy or energy efficiency portfolio standards, providing incentives for utilities, independent power producers, and industrial companies to harness the waste heat produced on site and use it to generate additional electricity without additional fuel, combustion or emissions. The specific incentives provided and the terminology and definition for WHP in each state are summarized below.

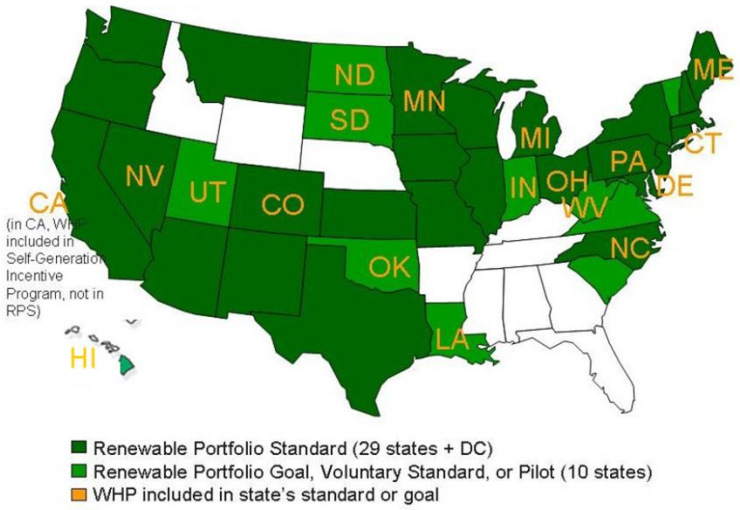
In addition, this paper includes the definition for combined heat and power (CHP) in each case where it is defined in that state's portfolio standard. CHP is another clean and efficient technology that also makes use of waste heat (though specifically waste heat off power generation systems) and is frequently included in the same discussions as WHP. Some federal regulators incorrectly characterize WHP as CHP; this paper highlights the distinctions states have made in recognition of the different benefits provided by each type of system.

The Heat is Power Association (HiP) commends states for including WHP in their policies and programs, and encourages other states as well as the federal government to ensure WHP is included in any future or amended renewable energy and energy efficiency policies or programs.

[1] Waste Heat to Power Systems, EPA, May 2012, http://www.heatispower.org/wp-content/uploads/2012/06/EPA-waste_heat_power-report-5.2012.pdf

Key Findings

1. **Nineteen States Include WHP in their Portfolio Standards**
    - States that have renewable energy incentive programs are shaded green in the map below. The seventeen states in which WHP qualifies in renewable energy incentive programs and the two states (DE, MN) in which WHP qualifies in energy efficiency incentive programs are indicated by the orange state abbreviation.



2. **State WHP Terminology is Inconsistent**
    - Although there is near universal agreement regarding the names and definitions for common renewable energy technologies and resources such as wind, solar, and geothermal, WHP is known by many different names and definitions.
    - Thirteen different terms are used to identify WHP in the nineteen states that include WHP in their renewable energy and energy efficiency policies and programs:

CA	Waste heat capture
IN[2], LA	Waste heat recovery
CT	Waste heat recovery system
MN	Waste heat recovery converted into electricity
UT	Waste gas or waste heat capture or recovery
OH	Waste energy recovery system
NV	Energy recovery process
CO, DE, SD, ND, WV	Recycled energy
IN[3], OK, PA	Industrial byproduct technology
ME	PURPA small power production facility
MI	Industrial cogeneration
NC	Combined heat and power system[4]
HI	Renewable Electrical Energy

[2] WHP qualifies under two terms in IN.
[3] WHP qualifies under two terms in IN.
[4] Defined as a "system that uses waste heat to produce electricity or useful, measureable thermal or mechanical energy at a retail electric customer's facility."

3. **State WHP Definitions Vary**
    - The exact definition of WHP varies state to state. See the State Summaries below and Attachment A for each state's term and specific definition of WHP.
    - The definition of WHP in all states includes at least the use of waste heat to generate electricity.
    - Six states (CT, DE, HI, IN, MI, NC) include incentives for waste heat to thermal in addition to waste heat to electricity.
    - Eight states (CO, LA, MI, NV, ND[5], OH, SD, UT[6]) explicitly exclude waste heat from power generation processes from qualifying as WHP.

4. **States Treat WHP and CHP Separately**
    - CHP also qualifies for some renewable energy and energy efficiency policies and programs. However, of the nineteen states that include WHP in their policies or programs, none defines WHP as a type of CHP.
        - Seven state programs (CO, MI, NV, ND, OK, SD, UT) do not include, mention or define CHP.
        - Five state programs (CA, HI, IN, MN, WV) mention CHP but do not define it.
        - Six state programs (CT, DE, LA, ME, OH, PA) include a definition for CHP that does not include WHP.
        - One state program (NC) defines WHP as "combined heat and power," a system that uses waste heat to produce electricity or useful, measureable thermal or mechanical energy. All other state and federal definitions of combined heat and power require production of both heat and power.
    - Most states, as well as DOE, EPA and Congress, define CHP similarly – the simultaneous or sequential generation of electricity and useful thermal energy. Some definitions include a specified ratio of thermal to electricity production and/or an efficiency requirement. In general, WHP does not qualify as CHP under these CHP definitions.
    - In no state is fossil fuel-fired CHP considered to be renewable. A CHP system fueled by a renewable resource such as biomass, however, is generally considered renewable whether or not CHP is explicitly mentioned in the program.

5. **Federal Agency WHP and CHP Definitions Can Cause Confusion**
    - While Congress and numerous states consistently define WHP and CHP separately, DOE and EPA do not.
    - See Attachment B for legislative and agency definitions of WHP and CHP.

About The Heat is Power Association and the Waste Heat to Power Industry

The Heat is Power Association is the trade association of the waste heat to power industry. HiP advances the market for WHP projects and technologies by educating decision makers about the value of waste

[5] ND only allows waste heat from power generation systems that consume wellhead gas that would otherwise be flared, vented, or wasted.

[6] UT allows waste heat from power generation systems only if that waste heat is from a combined cycle combustion turbine that uses waste gas or waste heat.

heat as a resource for fuel-free, emission-free electricity generation and an economic driver for global competitiveness. HiP works with policy makers to introduce federal legislation that recognizes WHP on par with other sources of emission-free power (eg., renewable energy resources) and works with industry, government and NGOs to incorporate WHP into state RPSs and federal renewable energy and energy efficiency programs.

HiP members, including project developers, technology innovators, equipment suppliers and installers, are collaborating to develop a robust market for WHP technologies across the U.S. More information can be found at the website www.heatispower.org.

- State Summaries begin on next page -

State Summaries

California
Waste Heat Capture

- The Self-Generation Incentive Program (SGIP) provides incentives to support existing, new, and emerging renewable and distributed energy resources, including customers who produce electricity with waste heat to power.
  - Renewable and waste heat capture technologies qualify for the same incentive: $1.13/W.
  - Waste heat to power and pressure reduction turbine technologies are included under the waste heat capture category.
  - Non-renewable, conventional CHP, including micro-turbines, gas turbines and internal combustion engines, qualify for $0.46/W.
- Systems less than 30 kW receive their full incentive upfront. Systems with a capacity of 30 kW or greater receive half the incentive upfront and half will over the following five years of operation based on the actual performance. In 2013, the maximum incentive was $5 million or 60% of eligible project costs.
- http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip/aboutsgip.htm
- http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/143459.PDF

Colorado
Recycled Energy

- Colorado's Renewable Energy Standard (RES) includes Recycled Energy as an eligible renewable energy resource
  - "'Recycled energy' means energy produced by a generation unit with a nameplate capacity of not more than fifteen megawatts that converts the otherwise lost energy from the heat from exhaust stacks or pipes to electricity and that does not combust additional fossil fuel. Recycled energy does not include energy produced by any system that uses energy, lost or otherwise, from a process whose primary purpose is the generation of electricity, including, without limitation, any process involving engine-driven generation or pumped hydroelectricity generation."
  - "'Eligible energy' means renewable energy, recycled energy, or greenhouse gas neutral electricity generated by a facility using coal mine methane or synthetic gas."
  - "'Eligible energy resources' are renewable energy resources or facilities that generate recycled energy or greenhouse gas neutral electricity generated using coal mine methane or synthetic gas"
- For Investor Owned Utilities (IOU), the RPS calls for 3% of retail electricity sales in Colorado to come from renewable electricity in 2007, increasing to 30% in 2020 and each year thereafter.
- For cooperatives and municipal utilities, the RPS calls for 1% of retail electricity sales on Colorado to come from renewable electricity in the years 2008-2010, increasing to 10% in 2020 and each year thereafter.
- http://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=5738

Connecticut
Waste Heat Recovery System

- Connecticut's Renewable Portfolio Standard (RPS) includes Waste Heat Recovery System as a Class III resource
  - "A waste heat recovery system produces electrical or thermal energy by capturing preexisting waste heat or pressure from industrial or commercial processes"
  - Eligible systems that recover waste heat or pressure from commercial and industrial processes must be installed on or after April 1, 2007. Existing units that have been modified on or after January 1, 2006, may earn certificates only for the incremental output gains.
- The RPS also includes CHP as a Class III resource
  - "The electricity output from combined heat and power systems with an operating efficiency level of no less than fifty percent that are part of customer-side distributed resources developed at commercial and industrial facilities in this state on or after January 1, 2006" where "'Combined heat and power system' means a system that produces, from a single source, both electric power and thermal energy used in any process that results in an aggregate reduction in electricity use."
- The RPS requires each electric supplier and electric distribution wholesale supplier to obtain at least 23% of its retail load by using Class I & II resources. Four percent can come from Class III resources. The total RPS target for all three Classes is 27% by 2020.
- http://www.ct.gov/pura/cwp/view.asp?a=3354&q=415186
- http://www.cga.ct.gov/2011/pub/chap277.htm#Sec16-1a.htm

Delaware
Recycled Energy

- "Recycled energy savings" are eligible for Delaware's Energy Efficiency Resource Standard (EERS).
  - "'Recycled energy savings' means a reduction in electricity or natural gas consumption that results from a modification of an industrial or commercial system that commenced operation before July 29, 2009, in order to make productive use of electrical, mechanical, or thermal energy that would otherwise be wasted, as determined in accordance with regulations promulgated by the Secretary."
- Combined heat and power also qualifies under the EERS.
  - "'Combined heat and power' means a system that uses the same energy source both for the generation of electrical or mechanical power and the production of steam or another form of useful thermal energy."
  - "'Combined heat and power system savings' means the electric output, and the electricity saved due to the mechanical output, of a combined heat and power system, adjusted to reflect any increase in fuel consumption by that system as compared to the fuel that would have been required to produce an equivalent useful thermal energy output in a separate thermal-only system, as determined in accordance with regulations promulgated by the Secretary."
- The Act establishes targets, based on 2007 actual consumption and peak demand, of 15% reduction in electricity consumption, 15% reduction in peak electricity demand, and 10% reduction in natural gas consumption by 2015.

- http://delcode.delaware.gov/title26/c015/index.shtml
- http://www.dnrec.delaware.gov/energy/information/Documents/EERS/Final%20EERS%20Workgroup%20Report.pdf

Hawaii
Renewable Electrical Energy

- Hawaii's Renewable Portfolio Standard (RPS) includes WHP as "renewable electrical energy" where the waste heat originates from a renewably fueled cogeneration or CHP system.
  - "Renewable electrical energy" means electrical energy generated using renewable energy as the source; and electrical energy savings brought about by the use of energy efficiency technologies, including heat pump water heating, ice storage, ratepayer-funded energy efficiency programs, and use of rejected heat from co-generation and combined heat and power systems, excluding fossil-fueled qualifying facilities that sell electricity to electric utility companies and central station power projects.
- Renewably fueled combined heat and power systems also qualify as renewable electrical energy.
- Each electric utility in Hawaii must generate a percentage of its electricity from "renewable electrical energy" sales. The first goal was 10% by December 31, 2010 and the ultimate goal is 40% by December 31, 2030.
- http://www.capitol.hawaii.gov/session2009/bills/HB1464_CD1_.htm

Indiana
Waste Heat Recovery/Industrial Byproduct Technologies

- Waste heat to power qualifies as a clean energy resource in Indiana's voluntary Clean Energy Portfolio Standard (CPS), called the Comprehensive Hoosier Option to Incentivize Cleaner Energy (CHOICE). There is no limit on how much WHP can be used toward the CHOICE program.
  - "Clean energy resource" includes a number of "sources, clean sources, alternative technologies, or programs used in connection with the production or conservation of electricity."
  - WHP can qualify as a clean energy resource under "industrial byproduct technologies that use fuel or energy that is a byproduct of an industrial process" and "waste heat recovery from capturing and reusing the waste heat in industrial processes for heating or for generating mechanical or electrical work."
- CHP systems are also included in the CPS but are part of a group of clean energy resources that can comprise no more than 30% of the total renewable energy resources an electricity supplier can claim for the CHOICE program.
- The CPS is a voluntary goal of 10% clean energy by 2025, based on the level of electricity supplied by the utility in 2010. To participate in the CPS, qualifying electric utilities must apply to the Indiana Utility Regulatory Commission (IURC) no later than two years after the beginning of the first two goal periods; goal period I is from 2013 through 2018, and goal period II is from 2019 through 2024. Only public utilities may participate in the program.

- Indiana's CPS was repealed in 2012, but their preference for WHP has been documented nonetheless and thus could appear if the policy is reinstated.
- http://www.in.gov/oed/2649.htm
- http://www.in.gov/oed/2650.htm
- http://www.in.gov/iurc/files/IC_8-1-37(1).pdf

Louisiana
Waste Heat Recovery

- Louisiana's Renewable Energy Pilot Program, established in 2010 to evaluate whether a renewable portfolio standard is suitable for Louisiana, includes Waste Heat Recovery as an eligible system.
  - Waste Heat Recovery is defined as "any technology that recovers heat that is normally discharged to the atmosphere as a byproduct of a separate process and utilizes that waste heat to produce electricity."
- Renewably fueled combined heat and power (CHP) can also qualify – "a plant designed to simultaneously produce both electricity and thermal energy recovered for purposes other than electric power production. Also known as cogeneration. For purposes of the Renewable Energy Pilot, only CHP projects that are based on non-fossil fueled resources are permitted."
- The program has two major components:
  - Under the research component, utilities were required to develop at least three projects from a combination of either small self-build research projects or projects offered on a tariff to purchase new renewable energy.
  - Under the RFP component, both IOUs and cooperatives issued RFPs for new, long-term renewable resources that would come online between 2011 and 2014.
- http://lpscstar.louisiana.gov/star/ViewFile.aspx?Id=870fff5f-5836-406f-a888-264776b26095

Maine
PURPA small power production facility

- Maine's Renewable Resource Portfolio Requirement includes both renewable resources and efficient resources.
- WHP qualifies as a Class II renewable resource if it meets the definition of a small power production facility under the Federal Energy Regulatory Commission PURPA rules (18 Code of Federal Regulations, Part 292, Subpart B), as in effect on January 1, 1997.[7]
  - A "small power production facility" is defined as a generating facility of 80 MW or less whose primary energy source is renewable (hydro, wind or solar), biomass, waste, or geothermal resources, where *waste* means an energy input – including residual heat, heat from exothermic reactions, and refinery off-gas or any energy input that has little or no current commercial value and exists in the absence of the qualifying facility industry
- CHP qualifies as an efficient resource if:

[7] Class I resources are new renewables that have come online after September 1, 2005.

  - It meets the definition of "qualifying cogeneration facility" under the Federal Energy Regulatory Commission rules, 18 Code of Federal Regulations, Part 292, Subpart B, as in effect on January 1, 1997,
    - "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.
  - Was constructed prior to January 1, 1997, and
  - During any calendar year, the sum of the useful power output and the useful thermal energy output of the facility is no less than 60% of the total energy input to the facility.
- Each electricity provider must supply at least 30% of their total electric sales using electricity generated by eligible renewable and certain energy efficiency resources.
- http://www.mainelegislature.org/legis/statutes/35-a/title35-asec3210.html
- http://www.mainelegislature.org/legis/statutes/35-a/title35-A.pdf
- http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr;sid=c2f9230257fb3396769e1518e6a237c3;rgn=div5;view=text;node=18%3A1.0.1.11.58;idno=18;cc=ecfr
- http://www.maine.gov/mpuc/legislative/documents/RPS%20Statute.pdf
- https://www.ferc.gov/industries/electric/gen-info/qual-fac/what-is.asp

Michigan
Industrial Cogeneration

- Michigan's Renewable Energy Standard (RES) includes WHP as a qualified "advanced clean energy resource."
  - "Industrial cogeneration facility" means a facility that generates electricity using industrial thermal energy or industrial waste energy.
  - "Industrial thermal energy" means thermal energy that is a by-product of an industrial or manufacturing process and that would otherwise be wasted. For the purposes of this subdivision, industrial or manufacturing process does not include the generation of electricity.
  - "Industrial waste energy" means exhaust gas or flue gas that is a by-product of an industrial or manufacturing process and that would otherwise be wasted. For the purposes of this subdivision, industrial or manufacturing process does not include the generation of electricity.
- Under the RES, all utilities must generate 10% of their retail electricity sales from renewable energy resources by 2015.
  - To meet this requirement, utilities may use a combination of the three types of credits: renewable energy credits (RECs), energy optimization credits (EOCs), and advanced cleaner energy credits (ACECs).
  - One credit of any type is equal to 1 MWh. Utilities may use EOCs or ACECs instead of RECs with approval of the PSC and no more than 10% of a utility's obligation may be met using a combination of EOCs and ACECs.
  - PSC approval is not required for industrial cogeneration facilities.
- http://www.michigan.gov/documents/mpsc/2007-SNB-0213_254495_7.pdf
- http://www.michigan.gov/documents/mpsc/michigan_energy_credits__10_15_12_401309_7.pdf

Minnesota
Waste Heat Recovery Converted into Electricity

- Minnesota's Energy Efficiency Resource Standard (EERS) allows the Commissioner to establish energy savings goals for electric and gas utilities. Waste heat to power systems can be included in those goals.
  - "'Energy conservation improvement' means a project that results in energy efficiency or energy conservation. Energy conservation improvement includes waste heat that is recovered and converted into electricity… [as well as] waste heat recovered and used as thermal energy."
  - "'Waste heat recovery converted into electricity' means an energy recovery process that converts otherwise lost energy from the heat of exhaust stacks or pipes used for engines or manufacturing or industrial processes, or the reduction of high pressure in water or gas pipelines."
- Demand-side natural gas or electric energy displaced by use of waste heat recovered and used as thermal energy, including the recovered thermal energy from a cogeneration or combined heat and power facility, is eligible to be counted towards a utility's natural gas or electric energy savings goals, subject to department approval.
  - "'Waste heat recovered and used as thermal energy' means capturing heat energy that would otherwise be exhausted or dissipated to the environment from machinery, buildings, or industrial processes and productively using such recovered thermal energy where it was captured or distributing it as thermal energy to other locations where it is used to reduce demand-side consumption of natural gas, electric energy, or both."
- The EERS goal is a 1.5% reduction in annual average retail sales (for both electric and gas utilities) beginning in 2010.
- http://mn.gov/commerce/energy/topics/conservation/How-CIP-Works.jsp
- https://www.revisor.mn.gov/statutes/?id=216B.241

Nevada
Qualified Energy Recovery Process

- Nevada's Energy Portfolio Standard (EPS) includes a Qualified Energy Recovery Process as an eligible renewable energy system.
  - "'Qualified energy recovery process' means a system with a nameplate capacity of not more than 15 megawatts that converts the otherwise lost energy from:
    - "The heat from exhaust stacks or pipes used for engines or manufacturing or industrial processes; or"
    - "The reduction of high pressure in water or gas pipelines before the distribution of the water or gas, to generate electricity if the system does not use additional fossil fuel or require a combustion process to generate such electricity."
    - "The term does not include any system that uses energy, lost or otherwise, from a process whose primary purpose is the generation of electricity, including,

        - without limitation, any process involving engine-driven generation or pumped hydrogeneration."
- The EPS requires the state's two investor-owned utilities to derive or save a portion of their electricity using renewable energy systems or efficiency measures. The target increases 3% every 2 years, reaching 20% in 2015 through 2019, 22% in 2020 through 2024, and 25% in 2025 and thereafter.
- http://puc.nv.gov/Renewable_Energy/Portfolio_Standard/
- http://puc.nv.gov/Renewable_Energy/RPS/Statutes_Regulations/
- http://www.leg.state.nv.us/NRS/NRS-704.html#NRS704Sec7809

North Carolina
Combined Heat and Power System

- North Carolina's Renewable Energy and Energy Efficiency Portfolio Standard (REPS) includes waste heat to power (WHP) as a renewable energy resource or an energy efficiency resource.
    - Waste heat used to produce electricity or useful, measurable thermal energy at a retail electric customer's facility is considered:
        - A "renewable energy facility" if the waste heat is from a renewable resource
        - An "energy efficiency measure" if the waste heat is from a non-renewable resource
    - "'Combined heat and power system' means a system that uses waste heat to produce electricity or useful, measurable thermal or mechanical energy at a retail electric customer's facility."
        - This definition could apply to topping and bottoming cycle cogeneration, WHP and combined-cycle power plants.
    - "'Energy efficiency measure' means an equipment, physical, or program change implemented after January 1, 2007, that results in less energy used to perform the same function. 'Energy efficiency measure includes, but is not limited to, energy produced from a combined heat and power system that uses nonrenewable energy resources. 'Energy efficiency measure' does not include demand-side management."
    - "Renewable energy facility" includes, among others, a facility that "generates useful, measurable combined heat and power derived from a renewable energy resource."
    - "Renewable energy resource" includes "waste heat derived from a renewable energy resource and used to produce electricity or useful, measurable thermal energy at a retail electric customer's facility."
- The REPS requires all investor-owned utilities (IOUs) to supply 12.5% of 2020 retail electricity sales from eligible energy resources by 2021. Municipal utilities and electric cooperatives must meet a target of 10% of electricity sales from eligible energy resources by 2018. Up to 25% of the requirements may be met through energy efficiency measures. After 2018, up to 40% of the standard may be met through energy efficiency, including CHP.
- http://www.ncleg.net/enactedlegislation/statutes/pdf/bysection/chapter_62/gs_62-133.8.pdf
- http://www.ncuc.net/ncrules/Chapter08.pdf
- http://www.ncuc.commerce.state.nc.us/reps/reps.htm
- http://www.ncleg.net/Sessions/2007/Bills/Senate/PDF/S3v6.pdf

North Dakota
Recycled Energy

- North Dakota's voluntary renewable energy objective includes Recycled Energy as a qualifying resource.
  - "Recycled energy systems producing electricity from currently unused waste heat resulting from combustion or other processes into electricity and which do not use an additional combustion process. The term does not include any system whose primary purpose is the generation of electricity unless the generation system consumes wellhead gas that would otherwise be flared, vented, or wasted."
- Under the objective 10% of all retail electricity sold in the state must be obtained from renewable energy and recycled energy by 2015. The objective's target applies to all types of utilities. Municipal and electric cooperatives that receive wholesale electricity through a municipal power agency or generation and transmission cooperative can aggregate their renewable and recycled energy to meet the objective. The objective is voluntary; there is no penalty for failing to comply.
- http://www.legis.nd.gov/cencode/t49c02.pdf?20140824172234

Ohio
Waste Energy Recovery System

- Ohio's Alternative Energy Portfolio Standard (AEPS) qualifies Waste Energy Recovery Systems both as a renewable energy resource and as an energy efficiency resource.
  - "'Waste energy recovery system' means a facility that generates electricity through the conversion of energy from either of the following:
    - Exhaust heat from engines or manufacturing, industrial, commercial, or institutional sites, except for exhaust heat from a facility whose primary purpose is the generation of electricity; or
    - Reduction of pressure in gas pipelines before gas is distributed through the pipeline, provided that the conversion of energy to electricity is achieved without using additional fossil fuels."
- Combined heat and power system (CHP) qualifies as an energy efficiency resource only.
  - "Combined heat and power system" means the coproduction of electricity and useful thermal energy from the same fuel source designed to achieve thermal-efficiency levels of at least sixty per cent, with at least twenty per cent of the system's total useful energy in the form of thermal energy.
- Of the total AEPS requirement of 25% in 2025, at least half must come from renewable energy resources and half from advanced energy resources.
- In June 2014, SB 310 froze the AEPS procurement schedule for two years and added two years to the final renewable benchmark of 12.5% in 2024, extending it to 2026.
- http://codes.ohio.gov/orc/4928

Oklahoma
Industrial By-Product Technologies

- Oklahoma's Renewable Energy Goal (REG) for electric utilities includes Industrial By-Product Technologies as demand side management (DSM) measures.

  - Industrial by-product technologies are defined as “the use of a by-product from an industrial process, including the reuse of energy from exhaust gases or other manufacturing by-products that are used in the direct production of electricity at the facility of a customer”
- The goal calls for 15% of the total installed generation capacity in the state to be derived from renewable sources or energy efficiency by 2015. Energy efficiency can be used to meet up to 25% of the goal. DSM measures qualify as energy efficiency.
- http://ok.gov/energy/documents/hb3028.pdf
- http://www.oscn.net/applications/oscn/DeliverDocument.asp?CiteID=459327

Pennsylvania
Industrial By-Product Technologies

- Pennsylvania’s Alternative Energy Portfolio Standard (AEPS) includes WHP as a Tier II alternative energy source, which includes:
  - “Demand-side management consisting of the management of customer consumption of electricity or the demand for electricity through the implementation of… industrial by-product technologies consisting of the use of a by-product from an industrial process, including reuse of energy from exhaust gases or other manufacturing by-products that are used in the direct production of electricity at the facility of a customer.”
  - “Distributed generation systems, which means the small-scale power generation of electricity and useful thermal energy.”
- CHP systems can also fall under the definition of “distributed generation systems, which means the small-scale power generation of electricity and useful thermal energy.”
- The Alternative Energy Portfolio Standard (AEPS) requires each electric distribution company and electric generation supplier to provide 18% of their electricity from Alternative Energy Sources. By compliance year 2020-2021, 8% of electricity must come from Tier 1 sources and 10% must come from Tier II sources.
- http://www.pacode.com/secure/data/052/chapter75/chap75toc.html

South Dakota
Recycled Energy

- South Dakota's Renewable, Recycled and Conserved Energy Objective includes Renewable and Recycled Energy as “qualifying electricity,” defined as:
  - Electricity "produced from wind, solar, hydroelectric, biomass and geothermal resources, and electricity generated from currently unused waste heat from combustion or another process that does not use an additional combustion process and that is not the result of a system whose primary purpose is the generation of electricity."
- Under the objective 10% of all retail electricity sales must be obtained from renewable energy and waste heat-to-power (defined as "recycled energy") by 2015. There are no penalties or sanctions for retail providers that fail to meet the goal.
- http://legis.sd.gov/docs/legsession/2008/Bills/HB1123ENR.pdf
- http://legis.sd.gov/statutes/DisplayStatute.aspx?Type=Statute&Statute=49-34A-94

Utah
Waste Gas or Waste Heat Capture or Recovery System

- Utah's Renewables Portfolio Goal includes a “waste gas or waste heat capture or recovery system” as an eligible renewable energy source.
  - "Renewable energy source" includes an electric generation facility or generation capability or upgrade that becomes operational on or after January 1, 1995 that derives its energy from, among others:
    - Waste gas and waste heat capture or recovery whether or not it is renewable, including methane gas from an abandoned coal mine or a coal degassing operation associated with a state-approved mine permit
    - A waste gas or waste heat capture or recovery system, other than from a combined cycle combustion turbine that does not use waste gas or waste heat
- The goal requires investor-owned utilities, municipal utilities, and cooperative utilities to use eligible resources to account for 20% of their 2025 adjusted retail electric sales. It has no interim targets; the first compliance period is 2025.
- http://le.utah.gov/code/TITLE54/54.pdf

West Virginia
Recycled Energy

- West Virginia’s Alternative and Renewable Energy Portfolio Standard (AREPS) includes WHP as a qualifying renewable energy resource. "Renewable energy resource" includes “recycled energy”, which means useful thermal, mechanical or electrical energy produced from:
  - Exhaust heat from any commercial or industrial process;
  - Waste gas, waste fuel or other forms of energy that would otherwise be flared, incinerated, disposed of or vented; and
  - Electricity or equivalent mechanical energy extracted from a pressure drop in any gas, excluding any pressure drop to a condenser that subsequently vents the resulting heat.
- CHP is not defined and is mentioned only once (“the commission shall further consider interconnection standards for combined heat and power”).
- The AREPS requires investor-owned utilities (IOUs) with more than 30,000 residential customers to supply 25% of retail electric sales from eligible alternative and renewable energy resources by 2025.
- http://www.legis.state.wv.us/WVCODE/ChapterEntire.cfm?chap=24&art=2F

Attachment A: WHP and CHP Definitions in State Renewable Energy and Energy Efficiency Incentive Programs

	WHP	CHP
CA[8]	Not defined but WHP technologies and pressure reduction turbines are treated separate and distinct from fossil fuel based CHP; they qualify for a higher incentive than does CHP.	Included but not defined.
CO	"Recycled energy" converts the otherwise lost energy from the heat from exhaust stacks or pipes to electricity and does not combust additional fossil fuel. "Recycled energy" does not include waste heat from a process whose primary purpose is the generation of electricity.	Not defined or included.
CT	A "waste heat recovery system" produces electrical or thermal energy by capturing preexisting waste heat or pressure from industrial or commercial processes.	A system that produces both electric power and thermal energy from a single source with >50% efficiency and is a customer-side distributed resource developed at commercial and industrial facilities.
DE	"Recycled energy savings" means a reduction in electricity or natural gas consumption that results from a modification of an industrial or commercial system… in order to make productive use of electrical, mechanical, or thermal energy that would otherwise be wasted.	'Combined heat and power'" means a system that uses the same energy source both for the generation of electrical or mechanical power and the production of steam or another form of useful thermal energy.
IN	"Industrial byproduct technologies" use fuel or energy that is a byproduct of an industrial process; waste heat recovery captures and reuses the waste heat in industrial processes for heating or for generating mechanical or electrical work.	Included but not defined.
LA	Any technology that recovers heat that is normally discharged to the atmosphere as a byproduct of a separate process and utilizes that waste heat to produce electricity.	A plant designed to simultaneously produce both electricity and thermal energy recovered for purposes other than electric power production. Only CHP projects that are based on non-fossil fueled resources are permitted under the program.
ME	Meets the PURPA definition of "small power production facility" whose primary energy source is waste, including residual heat, heat from exothermic reactions, and refinery off-gas, or any energy input that has little or no current commercial value and	Meets the PURPA definition of "qualifying cogeneration facility" - equipment used to produce electric energy and forms of useful thermal energy used for industrial,

[8] "Decision Modifying The Self-generation Incentive Program And Implementing Senate Bill 412" clarifies the distinction and provides different incentives for each WHP and CHP, https://www.socalgas.com/documents/business/selfgen/2012/D-11-09-015.pdf

	exists in the absence of the qualifying facility industry.	commercial, heating or cooling purposes, through the sequential use of energy - plus the sum of the useful power output and the useful thermal energy output of the facility is no less than 60% of the total energy input to the facility.
MI	A facility that generates electricity using industrial thermal energy (thermal energy that is a by-product of an industrial or manufacturing process and that would otherwise be wasted) or industrial waste energy (exhaust gas or flue gas that is a by-product of an industrial or manufacturing process and would otherwise be wasted). Industrial and manufacturing processes do not include the generation of electricity.	Does not meet the definition of "industrial cogeneration facility" and is not separately defined or included in the RES.
MN	An energy recovery process that converts otherwise lost energy to electricity or thermal energy from the heat of exhaust stacks or pipes used for engines or manufacturing or industrial processes, or the reduction of high pressure in water or gas pipelines.	Not defined but may count toward a utility's natural gas or electric energy savings goals.
NV	Converts the otherwise lost energy from the heat from exhaust stacks or pipes used for engines or manufacturing or industrial processes; or the reduction of high pressure in water or gas pipelines before the distribution of the water or gas, to generate electricity if the system does not use additional fossil fuel or require a combustion process to generate such electricity. Does not include waste heat from a process whose primary purpose is the generation of electricity.	Not defined or included.
NC	"Combined heat and power system" means a system that uses waste heat to produce electricity or useful, measurable thermal or mechanical energy at a retail electric customer's facility.[9] Waste heat used to produce electricity or useful, measurable thermal energy is considered "renewable" if the waste heat is from a renewable resource and "energy efficiency" if the waste heat is from a non-renewable resource.	See "combined heat and power system" definition under WHP column; it does not specify the system must produce both heat and power.
ND	Systems producing electricity from currently unused waste heat resulting from combustion or other processes into electricity and which do not use an additional combustion process. Does not include waste heat from a process whose primary purpose is the generation of electricity unless the generation system consumes wellhead gas that would otherwise be flared, vented or wasted.	Not defined or included.

[9] This definition could apply to topping and bottoming cycle cogeneration, WHP and combined-cycle power plants.

OH	A facility that generates electricity through the conversion of energy from either exhaust heat from engines or manufacturing, industrial, commercial or institutional sites, except for exhaust heat from a facility whose primary purpose is the generation of electricity) or reduction in pressure from gas pipelines provided that the conversion of energy to electricity is achieved without using additional fossil fuels.	The coproduction of electricity and useful thermal energy from the same fuel source designed to achieve thermal efficiency levels of at least 60%, with at least 20% of the system's total useful energy in the form of thermal energy.
OK	The use of a by-product from an industrial process, including the reuse of energy from exhaust gases or other manufacturing by-products that are used in the direct production of electricity at the facility of a customer.	Not defined or included.
PA	The use of a by-product from an industrial process, including the reuse of energy from exhaust gases or other manufacturing by-products that are used in the direct production of electricity at the facility of a customer.	Distributed generation systems, which means the small-scale power generation of electricity and useful thermal energy.
SD	Electricity generated from currently unused waste heat from combustion or another process that does not use an additional combustion process and that is not the result of a system whose primary purpose is the generation of electricity.	Not defined or included.
UT	Waste gas and waste heat capture or recovery whether or not it is renewable, including methane gas from an abandoned coal mine or a coal degassing operation associated with a state-approved mine permit. A waste gas or waste heat capture or recovery system, other than from a combined cycle combustion turbine that does not use waste gas or waste heat.	Not defined or included.
WV	Recycled energy means useful thermal, mechanical or electrical energy produced from exhaust heat from any commercial or industrial process; waste gas, waste fuel or other forms of energy that would otherwise be flared, incinerated, disposed of or vented; and electricity or equivalent mechanical energy extracted from a pressure drop in any gas, excluding any pressure drop to a condenser that subsequently vents the resulting heat.	Mentioned (commission shall consider interconnection standards for CHP) but not defined.

Attachment B: Federal Legislative and Agency Definitions for WHP and CHP

Congress defines WHP and CHP separately in the Energy Independence and Security Act of 2007, §451 Industrial Energy Efficiency:

- WHP: "The term 'recoverable waste energy' means waste energy from which electricity or useful thermal energy may be recovered through modification of an existing facility or addition of a new facility."
- CHP: "The term 'combined heat and power system' means a facility that simultaneously and efficiently produces useful thermal energy and electricity and 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."[10]

Congress defines CHP for the Investment Tax Credit (ITC) in §48 of the US Tax Code. WHP is not defined in the tax code and does not qualify for the ITC under the CHP definition.

- Combined heat and power system property comprises "a system which 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), which produces 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 at least 20 percent of its total useful energy in the form of electrical or mechanical power (or combination thereof), the energy efficiency percentage of which exceeds 60 percent."[11]

DOE and EPA say WHP is a type of CHP but their definitions for CHP do not support the assertion that WHP is a type of CHP:

- "Combined heat and power (CHP) is an efficient and clean approach to generating electric power and useful thermal energy from a single fuel source.[12] Instead of purchasing electricity from the distribution grid and burning fuel in an on-site furnace or boiler to produce thermal energy, an industrial or commercial facility can use CHP to provide both energy services in one energy-efficient step. The average efficiency of power generation in the United States has remained at 34 percent since the 1960s — the energy lost in wasted heat from power generation in the U.S. is greater than the total energy use of Japan. CHP captures this waste energy and uses it to provide heating and cooling to factories and businesses,[13] saving them money and improving the environment."[14]
- "CHP can be configured either as a topping or bottoming cycle. In a topping cycle, fuel is combusted in a prime mover such as a gas turbine or reciprocating engine, generating electricity or mechanical power. Energy normally lost in the prime mover's hot exhaust and/or cooling systems is recovered to provide process heat, hot water, or space heating/cooling for the site. In a bottoming cycle, also referred to as waste heat to power, fuel is combusted to provide thermal input to a furnace or other industrial process and some of the heat rejected from the process is then used for power

[10] http://thomas.loc.gov/cgi-bin/cpquery/?&dbname=cp110&sid=cp110KLxX8&refer=&r_n=hr474.110&item=&&&sel=TOC_442060&
[11] http://www.law.cornell.edu/uscode/text/26/48
[12] No state nor Congress ties WHP to a single fuel source.
[13] No state nor Congress requires a thermal component in their definition of WHP.
[14] Combined Heat and Power: A Clean Energy Solution, US DOE & US EPA, August 2012, http://energy.gov/sites/prod/files/2013/11/f4/chp_clean_energy_solution.pdf

production.[15] For optimal efficiency, CHP systems are typically designed and sized to meet a facility's baseload thermal demand."[16],[17]

- "Waste heat to power (WHP) is the process of capturing heat discarded by an existing industrial process and using that heat to generate power…. The recovery of industrial waste heat for power is a largely untapped type of combined heat and power (CHP), which is the use of a single fuel source to generate both thermal energy (heating or cooling) and electricity."[18]

DOE's definition of CHP: [19]

- "Combined heat and power (CHP), also known as cogeneration, is:
  - The concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy.[20]
  - A type of distributed generation, which, unlike central station generation, is located at or near the point of consumption.[21]
  - A suite of technologies that can use a variety of fuels[22] to generate electricity or power at the point of use, allowing the heat that would normally be lost in the power generation process to be recovered to provide needed heating and/or cooling."[23]

EPA's definition of CHP[24]

- "Combined heat and power (CHP), also known as cogeneration, is the simultaneous production of electricity and heat from a single fuel source[25], such as: natural gas, biomass, biogas, coal, waste heat, or oil. CHP is not a single technology, but an integrated energy system that can be modified depending upon the needs of the energy end user. CHP provides:
  - Onsite generation of electrical and/or mechanical power.
  - Waste-heat recovery for heating, cooling, dehumidification, or process applications.[26]
  - Seamless system integration for a variety of technologies, thermal applications, and fuel types into existing building infrastructure."[27]

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[15] This describes one type of WHP; there are others that do not fit this description, including those that use heat from exothermic reactions, pressure drop on pipelines, or mechanical energy.
[16] WHP systems are not designed to meet a facility's baseload thermal demand; they use whatever amount of waste heat they can harness to produce power.
[17] Combined Heat and Power: A Clean Energy Solution, US DOE & US EPA, August 2012, http://energy.gov/sites/prod/files/2013/11/f4/chp_clean_energy_solution.pdf
[18] Waste Heat to Power Systems, EPA, May 2012, http://www.heatispower.org/wp-content/uploads/2012/06/EPA-waste_heat_power-report-5.2012.pdf
[19] Combined Heat and Power Basics, http://energy.gov/eere/amo/combined-heat-and-power-basics
[20] WHP is not the concurrent production of electricity or mechanical power and useful thermal energy; WHP does not necessarily provide heat or steam for a thermal application.
[21] WHP is distributed generation, located at or near the point of waste heat production.
[22] WHP uses waste heat in place of a fuel.
[23] WHP does not necessarily provide heating or cooling.
[24] Combined Heat and Power Partnership Basic Information http://www.epa.gov/chp/basic/index.html
[25] See footnote 12
[26] WHP does not necessarily provide waste heat recovery for heating, cooling, dehumidification, or process application.
[27] WHP may be integrated into a larger system, or may stand alone, generating electricity from waste heat.