November 22, 2019

The Honorable Kathy Castor
Chair
Select Committee on the Climate Crisis
H2-359 Ford Building
Washington, DC 20515

Dear Chair Castor,

The Combined Heat and Power Alliance (the Alliance)[1] appreciates the opportunity to respond to the House Select Committee on the Climate Crisis's request for information as the Select Committee develops recommendations on policies, strategies, and innovations to achieve substantial and permanent reductions in pollution and other activities that contribute to the climate crisis. The Alliance is a coalition of businesses, labor, contractors, non-profit organizations, and educational institutions who share the vision that Combined Heat and Power (CHP) and Waste Heat to Power (WHP) can reduce emissions, enhance grid reliability, reduce energy costs, and make America's manufacturers and other businesses more competitive.

The Alliance urges the Select Committee to recommend policies that will encourage additional deployment of CHP and WHP systems. While CHP and WHP technologies are commercially available and are successfully used in a variety of sectors, barriers exist that prevent additional deployment, thereby preventing additional emissions reductions and other benefits.

As a coalition of numerous groups with a common vision, the Alliance has provided answers only to those questions that are applicable to our group.

Sincerely,

David Gardiner
Executive Director
Combined Heat and Power Alliance

[1] The Combined Heat and Power Alliance was known as the Alliance for Industrial Efficiency until September 2019.

Response of the Combined Heat and Power Alliance to the House Select Committee on the Climate Crisis's Request for Information

Additional deployment of combined heat and power (CHP)[1] and waste heat to power (WHP)[2] systems should be a goal of any comprehensive climate policy due to the amount of energy efficiency and reduced emissions that can be achieved, especially in difficult to decarbonize sectors such as industry and commercial buildings. While CHP and WHP technologies are commercially available and are successfully used in a variety of sectors, there are economic and financial, regulatory, and informational barriers to their deployment, according to the Department of Energy (DOE),[3] thereby preventing additional emissions reductions and other benefits. To overcome these barriers, the policies that the Select Committee recommends should include:

1. **Financial incentives** to install CHP and WHP systems, such as tax incentives.
2. **Regulatory** approaches, such as Clean Energy or Energy Efficiency Standards.
3. A robust **technical assistance program** to provide data and information to end-users such as manufacturers, hospitals, governments, colleges and universities, and others.

Adoption of such policies will support the decarbonization of the industrial and commercial buildings sectors while increasing economic competitiveness, help businesses and communities become more resilient in response to climate change, encourage additional deployment of solar and battery technologies, and reduce all greenhouse gas emissions. By using industrial efficiency, CHP and WHP, manufacturers can cut carbon emissions by 174.5 million short tons in 2030 – equal to the emissions from 46 conventional power plants – while saving businesses $298 billion from avoided electricity purchases.[4]

The following describes the benefits of additional CHP deployment, barriers CHP and WHP face, and recommended policies that will help to overcome the identified barriers so the nation can achieve additional CHP deployment and commensurate emissions reductions. This comprehensive view includes answers to a number of the Select Committee's specific questions, which are identified in parentheticals.

Benefits of CHP deployment

The benefits of CHP and WHP systems are numerous. A 2016 DOE report described CHP as "a commercially-available, clean energy solution that directly addresses a number of national priorities including improving the competitiveness of U.S. manufacturing through reduced costs, increasing energy efficiency, reducing emissions, enhancing our energy infrastructure, improving energy security

[1] Combined Heat and Power (CHP) uses a single fuel source to generate both heat and electricity. CHP systems have twice the energy efficiency of the average power plant.
[2] Waste Heat to Power (WHP), also known as "bottoming cycle CHP," uses industrial waste heat which would typically be released into the atmosphere and captures it to generate electricity with no additional fuel and no incremental emissions.
[3] United States Department of Energy, "Barriers to Industrial Energy Efficiency," June 2015. https://www.energy.gov/sites/prod/files/2015/06/f23/EXEC-2014-005846_5%20Study__0.pdf.
[4] Alliance for Industrial Efficiency, "State Ranking of Potential Carbon Dioxide Emission Reductions through Industrial Energy Efficiency," Sept. 15, 2016, p. 1. https://www.dgardiner.com/alliance-industrial-efficiency-releases-state-industrial-efficiency-ranking/.

and resiliency, and growing our economy."[5] When electricity and thermal energy are provided separately as occurs with conventional power production, overall energy efficiency ranges from 45-55%, while a properly designed CHP system will typically operate with an overall efficiency of 65-85%.[6] Since CHP and WHP systems use heat that may otherwise be wasted, deployment of these systems can also make these businesses more competitive by reducing energy costs while cutting carbon emissions.

Reduced Emissions

Additional deployment of CHP and WHP systems will result in increased efficiency, reducing emissions of carbon dioxide and other pollutants. There is a significant opportunity to capture additional energy and emissions savings through CHP installations. In 2016, the DOE estimated that there was more than 240 gigawatts (GW)[7] of CHP technical potential across all facility types.[8] In a joint DOE and U.S. Environmental Protection Agency (EPA) report, the agencies stated that installing just an additional 40 GW of CHP would eliminate over 150 million metric tons of carbon dioxide emission each year – the equivalent of the emissions of over 25 million cars.[9] Since CHP and WHP systems use heat that may otherwise be wasted, deployment of these systems can also make businesses more competitive by reducing energy costs while cutting emissions.

Utilizing CHP and WHP results in reduced energy use both through efficiencies achieved by generating electric and thermal energy at the same source and by using that energy on site, decreasing the amount of energy lost in the electric transmission and distribution system. CHP systems use less fuel to provide the same energy services, reducing all types of emissions including greenhouse gases, criteria pollutants, and hazardous air pollutants.[10] (question 9)

Reduced Emissions: Industry

CHP and WHP can help the industrial sector to decarbonize. (question 1.c) As of 2016, the industrial sector had 73 GW of on-site CHP technical potential, with the chemicals, petroleum refining, and food sectors comprising the largest amount of that potential.[11] There is widespread recognition in America's manufacturing sector of the need to reduce industrial emissions. A 2018 report from the Alliance examined the public clean energy goals of 160 of the nation's largest industrial companies with a

---

5 United States Department of Energy, "Combined Heat and Power (CHP) Technical Potential in the United States," Mar., 2016, p. 1. https://www.energy.gov/sites/prod/files/2016/04/f30/CHP%20Technical%20Potential%20Study%203-31-2016%20Final.pdf
6 United States Department of Energy, "Combined Heat and Power Technology Fact Sheet Series," Nov. 2017. https://www.energy.gov/sites/prod/files/2017/12/f46/CHP%20Overview-120817_compliant_0.pdf
7 One gigawatt (GW) is equal to 1000 MW.
8 United States Department of Energy, *supra* note 5 at 21.
9 United States Department of Energy and United States Environmental Protection Agency, "Combined Heat and Power: A Clean Energy Solution," Aug. 2012, p. 5. https://www.energy.gov/sites/prod/files/2013/11/f4/chp_clean_energy_solution.pdf.
10 United States Environmental Protection Agency Combined Heat and Power Partnership, "Fuel and Carbon Dioxide Emissions Savings Calculation Methodology for Combined Heat and Power Systems," Feb. 2015, p. 6. https://www.epa.gov/sites/production/files/2015-07/documents/fuel_and_carbon_dioxide_emissions_savings_calculation_methodology_for_combined_heat_and_power_systems.pdf.
11 United States Department of Energy, *supra* note 5 at 24.

combined 2,100 manufacturing facilities in the United States. It found that 79% of these companies had greenhouse gas (GHG) targets, while 43% had energy efficiency (EE) targets.[12]

Reduced Emissions: Buildings

There is a great opportunity to realize energy and emissions savings by increasing CHP use in the commercial buildings sector. (question 1.d) In the U.S., CHP installations in commercial facilities make up 58% of CHP sites, but account for only 14% of capacity, which is due to the relatively small size of these facilities compared to industrial facilities.[13] DOE found that the technical potential for commercial CHP was nearly 76,000 megawatts at more than 240,000 sites across the country.[14] The types of facilities with the greatest capacity potential were commercial office buildings, colleges and universities, hospitals, schools, government buildings, hotels, multifamily buildings, and military installations.[15]

Reduced Emissions: Renewable Fuels

Renewable fuels have the potential to power CHP systems, further reducing emissions. Renewable fuels, such as biomass[16] or biogas,[17] as well as renewable natural gas (RNG)[18] and hydrogen can be used to power CHP systems. Many of these technologies are still in nascent stages of development, so advancing a broad range of renewable fuel technologies and allowing markets to determine future development is the best approach in the short-term. Over time, CHP systems can evolve and use different types of fuel. A system using natural gas today may run on RNG or hydrogen in the future.

Increased economic competitiveness

The industrial sector is the largest energy user in the U.S. economy consuming about one third of all domestic energy demand.[19] Manufacturing accounts for the vast majority of energy consumption in this sector: in 2012, manufacturers consumed 74% of industrial energy, the equivalent of 24% of all energy consumed in the country.[20] This energy consumption comes with a significant cost: as of 2016, industry spent $230 billion annually on energy.[21] Reducing energy consumption through energy efficiency measures such as deployment of CHP will help companies to save money, increasing their competitiveness in the global marketplace. (question 2) (See Appendix B for case studies.)

---

[12] Alliance for Industrial Efficiency, "Committed to Savings: Major U.S. Manufacturers Set Public Goals for Energy Efficiency," June 26, 2018. https://www.dgardiner.com/committed-to-savings-major-u-s-manufacturers-set-public-goals-for-energy-efficiency/.
[13] United States Department of Energy, *supra* note 5 at 7.
[14] *Id.* at 22.
[15] *Id.* at 25.
[16] Biomass includes forest and crop residues, wood waste, or food-processing residue.
[17] Biogas includes manure biogas, wastewater treatment biogas, or landfill gas
[18] RNG, also known as biomethane, is a pipeline-quality gas that is fully interchangeable with natural gas and compatible with U.S. pipeline infrastructure.
[19] The Alliance for Industrial Efficiency, *supra* note 4 at 2.
[20] *Id.*
[21] *Id.*

Increased Resiliency and Reliability

CHP and WHP increase the resilience and reliability of the electric grid for their hosts, but also for a host facility's surrounding community. (question 11) As distributed resources they can operate independently from the electric grid and can keep the lights on and the power running when the grid is down as a result of a hurricane, threat of wildfire, extreme weather event or cyber-attack. CHP and WHP systems provide additional benefits in that they typically run and are maintained continuously, provide a consistent source of heat and power unlike intermittent resources such as wind and solar, and have lower emissions than diesel or oil generators. They typically are powered with natural gas, which arrives at a host facility through a pipeline. (See Appendix B for case studies.)

Facilities that are critical infrastructure – assets, systems, and networks that, if incapacitated, would have a substantial negative impact on national security, economic security, or public health and safety[22] – are particularly well suited to utilize distributed energy resources as access to energy is a high priority for ensuring that critical facilities can continue to deliver services and assist in recovery.[23]

CHP Enables Solar and Storage in Microgrids

CHP and WHP systems may also be connected to a microgrid, allowing several buildings or facilities to keep the lights on during a grid power outage. When a traditional electric grid has an outage or needs to be repaired, all users of the grid are impacted. A microgrid is a local energy grid that can disconnect from the traditional grid and operate on its own during a traditional grid outage.[24] To function independently, a microgrid requires either battery storage or a form of distributed generation such as CHP or WHP. CHP systems provide 39% of the energy in existing microgrids.[25] CHP systems can be paired with renewable resources such as solar as well as battery storage to provide a consistent source of power in a microgrid. Microgrids are used by universities, military installations, municipalities, and public institutions, helping to maintain the reliability of their electric and thermal energy supply and to improve their resiliency against extreme weather conditions and power outages.[26] In some locations, a number of critical facilities such as hospitals, fire and police stations, emergency shelters, and gas stations can be connected and configured to operate in isolation from the larger utility grid, even during extended outages.[27]

---

[22] Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism (USA PATRIOT ACT) Act of 2001. Pub. L. 107-56 at Sec. 1016(e). 26 Oct. 2001. https://www.congress.gov/bill/107th-congress/house-bill/3162/text.

[23] United States Department of Energy Better Buildings, "Distributed Generation (DG) for Resilience Planning Guide," Jan. 2019, p. 4. https://betterbuildingsinitiative.energy.gov/sites/default/files/attachments/DG%20for%20Resilience%20Planning%20Guide%20-%20report%20format.pdf.

[24] United States Department of Energy, "How Microgrids Work," Jun. 17, 2014. https://www.energy.gov/articles/how-microgrids-work.

[25] Greentech Media, "US Microgrid Growth Beats Estimates: 2020 Capacity Forecast Now Exceeds 3.7 Gigawatts," Jun. 1, 2016. https://www.greentechmedia.com/articles/read/u-s-microgrid-growth-beats-analyst-estimates-revised-2020-capacity-project#gs.fmnot7GL.

[26] *Id.*

[27] United States Department of Energy, "CHP for Resiliency in Critical Infrastructure," May 2018, p. 3. https://betterbuildingsinitiative.energy.gov/sites/default/files/attachments/CHP_Resiliency.pdf.

Job Creation

Additional deployment of CHP will make use of highly skilled American labor and American technology.[28] (question 2) A 2008 report by the Oak Ridge National Laboratory found that if the U.S. adopted policies to achieve 20% of generation capacity from CHP by 2030, such policies could create nearly one million new, highly-skilled, technical jobs throughout the country.[29] Data shows that employment in CHP grew in both 2017 and 2018.[30] In 2018, CHP generation technologies employed 29,245 workers and grew 7% over the prior year.[31] Those employed in this sector are mostly in professional in business services (59.1%), though a significant number are also employed in construction (14.5%), wholesale trade, (13%) and manufacturing (7%).[32] Employers in the CHP generation industry expect almost 4% growth in 2019, led by the utilities and construction sectors, with each expecting about 9% growth.[33]

Barriers

According to a 2015 report from the Department of Energy, CHP and WHP face economic and financial, regulatory, and informational barriers to deployment.[34] Specifically, DOE said these barriers included:

Economic and Financial Barriers: The key economic and financial barriers to the accelerated adoption of CHP include internal competition for capital, the "split-incentive" between capital improvement and operation and management budgets, securing low-cost financing due to financial risks, and lack of financing instruments such as Master Limited Partnerships.[35]

Installation of CHP systems typically requires a significant upfront investment which can eclipse long-term benefits. Insufficient capital and internal competition for capital prevent many facilities from installing CHP systems, even when such a system has an attractive financial return.[36] A company may also be hesitant to make investments outside of its core business and may require an even higher rate of return compared to other, more familiar capital investments.[37] Internal accounting practices that

[28] United States Department of Energy, *supra* note 5 at 3.
[29] Oak Ridge National Laboratory, "Combined Heat and Power: Effective Energy Solutions for a Sustainable Future," Dec. 2008, p. 4. https://info.ornl.gov/sites/publications/files/Pub13655.pdf.
[30] National Association of State Energy Officials and Energy Futures Initiative, "U.S. Energy & Employment Report," May 2018, p. 13. https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5c7f3708fa0d6036d7120d8f/1551849054549/USEER+2019+US+Energy+Employment+Report.pdf; National Association of State Energy Officials and Energy Futures Initiative, "The 2019 U.S. Energy & Employment Report," p. 50. https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5c7f3708fa0d6036d7120d8f/1551849054549/USEER+2019+US+Energy+Employment+Report.pdf.
[31] National Association of State Energy Officials and Energy Futures Initiative, "2019 U.S. Energy & Employment Report," at 71. There is a significant overlap with other sectors and many companies with CHP report according to their underlying fuel source.
[32] *Id.*
[33] *Id.* at 72.
[34] United States Department of Energy, *supra* note 3.
[35] *Id.* at 95. *See also* United States Department of Energy, "Barriers to Industrial Energy Efficiency: Report to Congress," June 2015, p. 9-10. https://www.energy.gov/sites/prod/files/2015/06/f23/EXEC-2014-005846_6%20Report_signed_0.pdf.
[36] *Id.* at 95.
[37] *Id.* at 96.

separate plant operation and maintenance budgets from capital improvements, resulting in costs and savings accruing to different budgets, can also make it difficult to demonstrate the financial benefits of a system.[38] Facilities may also have a hard time finding favorable financing for a long-term investment in the facility upgrade.[39]

Regulatory Barriers: Regulatory barriers include utility business models which often fail to value the efficiency and other benefits that CHP and WHP deliver. This may result in rate designs that do not appropriately recognize the value of the services the CHP systems provide to the grid; inconsistent interconnection requirements and failure to recognize all of the benefits of CHP systems were also acknowledged as barriers by DOE.[40]

In addition to financial and tax barriers, regulatory barriers that impact project economics can also restrict capital outlays for CHP systems. Though CHP and WHP systems can operate independently from the electric grid, many facilities that install such systems still interconnect with the electric grid to provide backup power during scheduled or unscheduled outages. A lack of uniform interconnection rules across jurisdictions can make CHP installation more difficult.

Informational Barriers: The lack of information regarding CHP systems creates another barrier to additional deployment. Potential users of these systems may not be aware of the benefits in energy efficiency and reduced carbon and GHG emissions that could be realized. Even when benefits are known, a lack of information may make it difficult to demonstrate internally that a CHP system is a wise investment. In addition, financial institutions that could provide financing may be unfamiliar with CHP systems and deny needed capital or increase the cost of capital to mitigate their own risk.

Policies to Support Increased CHP Deployment

To overcome these barriers and to more fully realize the benefits of CHP, the following policies will support increased CHP deployment which will result in reduced emissions (questions 1 and 9), increased resiliency and reliability of the electric system (question 11), and increased economic competitiveness (questions 2 and 5). Adoption of such policies could help to decarbonize industry (question 1.c) and decarbonize buildings (question 1.d), would increase federal investment resulting in increased research, development, and deployment of CHP systems (question 5.a), and encourage more investment by private companies in CHP systems (question 5.b). Many pieces of legislation have already been introduced that address these barriers, and many enjoy bipartisan support. The Select Committee should consider these policies as it develops its recommendations. (See Appendix A for a more complete list of federal legislation.)

Financial Incentives

The financial incentives described here will help to encourage additional deployment of CHP systems across all sectors, but may be particularly important in the industrial and commercial sectors where internal competition for capital and higher returns on capital investments may be required for unfamiliar

[38] *Id.* at 97.
[39] *Id.*
[40] *Id.* at 103-104.

technologies. Providing financial support can help to overcome the barriers of high upfront costs and uncertainty about investments outside of a company's core business.

Tax Policy

Tax policy is among the most important areas where Congress could encourage rapid deployment of CHP and WHP, using a variety of tools including:

Federal Investment Tax Credit (ITC): First signed into law in 2005 as part of the Energy Policy Act, the federal Investment Tax Credit (ITC) has played, and continues to play, a critical role in driving energy innovation and technological leadership in the United States. The federal ITC has helped to create thousands of jobs, lower electricity prices for families and businesses, reduce carbon emissions, and maintain the country's competitive edge in emerging energy technologies. Increasing, or at the very least maintaining, this tax credit for CHP will continue to allow American businesses to realize energy and cost savings, support clean energy jobs, and reduce carbon and other GHG emissions.

While the ITC supports the deployment of CHP systems, WHP systems have not benefitted from this policy. Despite the fact that WHP is a zero-emission energy resource, these systems currently do not qualify for the Section 48 ITC.[41] The exclusion of WHP systems from the federal ITC put such projects at a competitive disadvantage. The proposed Waste Heat to Power Investment Tax Credit Act would rectify this problem by allowing an energy tax credit for investments in WHP property.

Master Limited Partnerships: Historically, tax policies have stimulated investments in both conventional and clean energy projects, but conventional energy technologies have access to low-cost capital through financing mechanisms that are not available to CHP projects, such as Master Limited Partnerships (MLPs). A MLP is a business structure that provides tax advantages to the partners in the business, allowing energy projects that qualify to have lower cost of capital.[42]

New Tax Credits or Tax Systems: To the extent any technology neutral tax credit regimes or economy-wide tax systems such as cap and trade are being considered, it is essential to ensure that the emissions for CHP systems are appropriately calculated, such as the model in the Clean Energy for America Act. If a carbon pricing regime is under consideration, allowance structures must appropriately account for the savings realized by CHP systems.

Other Financial Incentives

Loan Programs: Loan programs can also be an effective policy to support additional CHP deployment. For example, the LIFT America Act creates a loan program to support the deployment of distributed energy systems for states, institutions of higher education, and electric utilities as well as a technical assistance and grant program to provide information and technical assistance.

[41] There are key differences between CHP and WHP systems that prevent WHP from accessing the ITC as written: while CHP systems capture waste heat generated in the production of electricity for thermal uses, WHP systems capture waste heat and energy from thermal processes and operations and convert that energy into electricity.
[42] United States Department of Energy, *supra* note 3 at 98.

Grant Programs: Federal grants could also help to increase CHP deployment in the United States and such legislation has previously been proposed such as the Job Creation through Energy Efficient Manufacturing Act which would provide grants for energy efficiency improvement projects in the manufacturing sector. By improving the efficiency of industrial plants, policies such as this will reduce carbon and other GHG emissions, reduce energy costs for manufacturers making them more competitive, and create jobs.

Regulatory Approaches

Congress could adopt policies that drive electric utilities to help deploy significant amounts of CHP and WHP. These include:

Clean Energy or Energy Efficiency Standards: A federal Clean Energy Standard, requiring that utilities obtain certain amounts of electricity from clean resources, could help to reduce carbon and other GHG emissions at the national level. Technologies such as CHP and WHP reduce these emissions and should be included in any standard under consideration. To the extent that the Select Committee recommends a Clean Energy Standard, such a standard should include required standards for CHP. (question 1.b.i)

Utility Efficiency Programs: In some jurisdictions, utilities are required to deliver additional energy efficiency or renewable energy resources. Well-designed utility energy efficiency programs are a proven way to increase deployment of industrial energy efficiency and to save money for all electricity customers. These programs make efficiency investments cost-effective for industrial companies and help all of a utility's electric customers by lowering their bills. Through a program, a utility may offer free energy audits at industrial facilities to identify ways in which the facility can reduce its energy use and save money, as well as custom program incentive offerings. In these ways, a utility efficiency program can offer industrial companies a fresh look at potential savings, technical expertise, and financial assistance to implement projects. Due to the significant efficiency benefits CHP and WHP systems provide, these systems should be eligible technologies for such programs. These programs need not be limited to industrial facilities: utility programs could also be designed to benefit commercial buildings and residential customers.

While electric utilities are largely regulated at the state level, federal policies that encourage or support utility efficiency programs could provide the impetus needed for utilities and companies to come together and make investments to improve energy efficiency.

Interconnection Standards: Standardized interconnection rules can help to establish a clear and uniform process and technical requirements for CHP systems and other on-site generation to connect to the electric grid. Though most states have adopted interconnection standards or guidelines, requirements and implementation are inconsistent between states, and sometimes within states.[43] This lack of uniformity makes it challenging for manufacturers of CHP equipment to design and produce modular packages and may reduce economic incentives for installation.[44] Federal policies could help to make interconnection standards uniform across jurisdictions.

[43] United States Department of Energy, *supra* note 3 at 106.
[44] *Id.* at 105-106.

Technical Assistance: The lack of information regarding the benefits of CHP systems creates another barrier to additional deployment. On-going data collection and publishing of data will allow researchers to track trends in the CHP industry and may help to identify new areas of deployment and build confidence in the market to encourage additional private and public investment. (question 12) The DOE's CHP Technical Assistance Partnerships (TAPs) are a crucial resource that provide market analyses, education on the energy and non-energy benefits and applications of CHP to state and local policy makers, regulators, energy end-users, and trade associations, as well as technical assistance to end-users and to help them through the development process from initial CHP screening to installation.[45] Continued authorization of and funding for this program is essential to increasing understanding and deployment of CHP systems.

Conclusions

The benefits of additional CHP and WHP deployment are clear: these systems can provide emissions reductions in the near-term, especially from sectors that have proven difficult to decarbonize due to their high thermal loads, such as industry and buildings. CHP systems also provide benefits such as increased resiliency and reliability during power system failures, increased global economic competitiveness due to reduced costs and use of domestic fuels, and increased domestic job creation. While there are existing challenges to additional widespread installations, the policy recommendations outlined here will help to reduce these barriers and realize the potential environmental and economic benefits that can be achieved with additional CHP deployment.

[45] United States Department of Energy Better Buildings, "CHP Technical Assistance Partnerships (CHP TAPS). https://betterbuildingssolutioncenter.energy.gov/chp/chp-taps.

Appendix A

Legislation to Support Increased CHP and WHP Deployment

Financial Incentives

- The Renewable Energy Extension Act[1] (Sen. Cortez Masto - D)
  - The Federal Investment Tax Credit (ITC) was first signed into law in 2005 as part of the Energy Policy Act, the ITC has played, and continues to play, a critical role in driving energy innovation and technological leadership in the United States.
  - The federal ITC has helped to create thousands of jobs, lower electricity prices for families and businesses, reduce carbon emissions, and maintain the country's competitive edge in emerging energy technologies.
  - Section 48 and Section 25D of the ITC provide tax credits that cover renewable energy technologies such as CHP, micro-turbines, solar energy, geothermal, fuel cells, and distributed wind energy
  - This Act would extend the section 48 investment tax credit for CHP for five years.

- Waste Heat to Power Investment Tax Credit Act[2] (Sen. Carper - D)
  - The exclusion of WHP systems from the federal ITC put such projects at a competitive disadvantage. This Act would rectify the problem by allowing an energy tax credit for investments in WHP property.

- LIFT America Act[3] (Rep. Pallone – D)
  - Creates a loan program to support the deployment of distributed energy systems for states, institutions of higher education, and electric utilities as well as a technical assistance and grant program to disseminate information and provide technical assistance to nonprofit and for-profit entities for identifying, evaluating, planning, and designing distributed energy systems.
  - Section 31101 – Authorizes $515 million per year (2020-2024) for a grant program to support state, local, and tribal governments in their efforts to employ "resiliency related technologies," like CHP, to harden their electric grids and protect critical infrastructure.
  - Section 31201 - Authorizes $200 million per year (2020-2024) for a financial assistance program to support grid modernization partnership projects and allow greater customer based electric generation.
  - Sections 33301 – 33304 – Establishes several programs to support distributed energy systems, including CHP and WHP. These include the creation of a revolving loan fund to support states, tribes, higher education institutions and utilities distributed energy

[1] United States. Cong. Senate. Renewable Energy Extension Act of 2019. 116th Cong. 1st sess. S. 2289. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/2289.
[2] United States. Cong. Senate. Waste Heat to Power Investment Tax Credit Act. 116th Cong. 1st sess. S. 2283. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/2283?r=2&s=1.
[3] United States. Cong. House of Representatives. Leading Infrastructure for Tomorrow's America Act. 116th Congress. 1st sess. H.R. 2741. Washington: 2019. https://www.congress.gov/bill/116th-congress/house-bill/2741.

deployment projects, and a technical assistance and grant program to assist nonprofit and profit entities with site identification, evaluation, engineering, and design of distributed energy systems.

- Job Creation through Energy Efficient Manufacturing Act[4] (Rep. Cartwright – D)
    - Would require the DOE to establish a Financing Energy Efficient Manufacturing Program that provides grants for energy efficiency improvement projects in the manufacturing sector.
    - Entities eligible for grants would include state energy offices, nonprofit organizations, electric cooperative groups, or certain entities with a public-private partnership.
    - The grant recipients would then distribute subgrants to nongovernmental, small or medium sized manufacturers located in the state in which the recipient is located to carry out projects that improve the energy efficiency of the manufacturers and develop technologies that reduce electricity or natural gas use by the manufacturers.

- Master Limited Partnerships Parity Act[5] (Sen. Coons – D)
    - A Master Limited Partnership (MLP) is a business structure that provides tax advantages to the partners in the business, permitting investors to trade shares and thereby allowing energy projects that qualify as MLPs to have lower cost of capital.
    - This bill from 2017 would amend the tax code to expand the definition of "qualifying income" for MLPs to include income and gains from renewable and alternative energy generation projects (in addition to fossil fuel-based energy generation projects that are already eligible).

- Clean Energy for America Act[6] (Sen. Wyden – D)
    - A technology neutral clean energy tax credit that accounts for both the thermal and electric energy that CHP systems generate when determining a system's overall greenhouse gas reduction benefit.

<u>Industrial Efficiency</u>

- Energy Savings and Industrial Competitiveness Act[7] [8] (Rep. Welch – D, Rep. McKinley - R)
    - The House of Representatives and the Senate have nearly identical versions of this bill.

---

[4] United States. Cong. Senate. Job Creation through Energy Efficient Manufacturing Act. 115th Cong. 1st sess. S. 1687. Washington: 2017. https://www.congress.gov/bill/115th-congress/senate-bill/1687. A similar bill was also introduced in 2018, *see* United States. Cong. House of Representatives. Job Creation through Energy Efficient Manufacturing Act. 115th Cong. 2d sess. H.R. 5042. Washington: 2018. https://www.congress.gov/bill/115th-congress/house-bill/5042/text.

[5] United States. Cong. Senate. Master Limited Partnerships Parity Act. 115th Cong. 1st sess. S. 2005. Washington: 2017. https://www.congress.gov/bill/115th-congress/senate-bill/2005.

[6] United States. Cong. Senate. Clean Energy for America Act. 116th Cong. 1st sess. S. 1288. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/1288/text.

[7] United States. Cong. Senate. Energy Savings and Industrial Competitiveness Act of 2019. 116th Cong. 1st sess. S. 2137. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/2137/text?format=txt.

[8] United States. Cong. House of Representatives. Energy Savings and Industrial Competitiveness Act of 2019. 116th Cong. 1st sess. H.R. 3962. Washington: 2019. https://www.congress.gov/bill/116th-congress/house-bill/3962/text?format=txt&r=6&s=1.

- Promotes energy savings in residential buildings and industry, and for other purposes. Model building code targets should be adjusted in recognition of the potential savings from distributed generation and onsite renewable energy.
    - Establishes a grant program for organizations training workers in the energy efficiency and renewable energy industries.
    - Creates a program for coordinating energy and financing energy efficiency and renewable energy retrofits for schools.
    - Title II establishes industrial research and assessment centers focused on smart and sustainable manufacturing and a sustainable manufacturing initiative.

- Smart Manufacturing Leadership Act[9] [10] (Rep. Welch – D, Rep. Reed – R)
    - The House of Representatives and the Senate have nearly identical versions of this bill.
    - Requires the Secretary of Energy, in consultation with the National Academies, to develop and complete a national plan for smart manufacturing technology development and deployment to improve the productivity and energy efficiency of the manufacturing sector.
    - Requires the Secretary to expand the scope of DOE's Industrial Assessment Centers to assist small and medium manufacturers and facilitate access to the National Laboratories for small and medium manufacturers.
    - Authorizes the Secretary to make competitive grants to States for establishing state programs to support the implementation of smart manufacturing technologies.

<u>Regulatory</u>

- Clean Energy Standard Act[11] [12] (Rep. Lujan - D)
    - The House of Representatives and the Senate have identical versions of this bill.
    - Amends PURPA to establish a market- oriented standard for clean electric energy generation.
    - Appropriately provides credits for the greenhouse gas reduction benefits of CHP.

- HEAT Act[13] (Sen. Shaheen – D)
    - Directs the DOE to establish model rules and procedures for interconnection and its associated costs and procedures for determining fees or rates for supplementary power, backup or standby power, maintenance power, and interruptible power supplied to facilities that operate CHP and WHP systems.

---

[9] United States. Cong. House of Representatives. Smart Manufacturing Leadership Act. 116th Cong. 1st sess. H.R. 1633. Washington: 2019. https://www.congress.gov/bill/116th-congress/house-bill/1633/text.
[10] United States. Cong. Senate. Smart Manufacturing Leadership Act. 116th Cong. 1st sess. S. 715. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/715/text.
[11] United States. Cong. House of Representatives. Clean Energy Standard Act of 2019. 116th Cong. 1st sess. H.R. 2597. Washington: 2019. https://www.congress.gov/bill/116th-congress/house-bill/2597.
[12] United States. Cong. Senate. Clean Energy Standard Act of 2019. 116th Cong. 1st sess. S. 1359. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/1359.
[13] United States. Cong. Senate. Heat Efficiency through Applied Technology Act. 116th Cong. 1st sess. S. 2706. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/2706.

- North American Energy Security and Infrastructure Act of 2015[14] (Rep. Upton – R)
  - Section 3115 recognizes WHP as a renewable energy resource for purposes of federal electricity purposes.

Information

- CHP Support Act[15] [16] (Rep. Welch – D, Rep. Kinzinger – R, Rep. McKinley – R)
  - The House of Representatives and the Senate have nearly identical versions of this bill.
  - Reauthorizes and funds the CHP Technical Assistance Partnerships (TAP) program for the next five years.
  - The CHP TAP program enables higher education research centers to provide assistance and analysis for businesses looking to invest in CHP technology. Would continue to provide information to manufacturers about the benefits of CHP and WHP.

[14] United States. Cong. House of Representatives. North American Energy Security and Infrastructure Act of 2015. 114th Cong. 1st sess. H.R. 8. Washington: 2015. https://www.congress.gov/bill/114th-congress/house-bill/8.
[15] United States. Cong. House of Representatives. CHP Support Act. 116th Cong. 1st sess. H.R. 1480. Washington: 2019. https://www.congress.gov/bill/116th-congress/house-bill/1480/text.
[16] United States. Cong. Senate. CHP Support Act of 2019. 116th Cong. 1st sess. S. 2425. Washington: 2019. https://www.congress.gov/bill/116th-congress/senate-bill/2425/text.

Appendix B

Case Studies

Resiliency and Reliability

Case studies have demonstrated the benefits of CHP systems during severe weather events that result in electric grid service disruption.

- Hospitals
  - South Oaks Hospital in New York[1]
    - During and after Superstorm Sandy in 2012, the hospital was able to remain operational.
    - The hospital was able to provide critical services for two weeks relying solely on their CHP system and admitted displaced patients, offered refrigeration of vital medicines to those who had lost power, and welcomed the local community to recharge phones and electronic devices at their facility.
  - Texas Medical Center[2]
    - The Texas Medical Center has a 48 MW CHP system that provides electricity, steam, and chilled water to 45 buildings, roughly 85% of the Center's campus.
    - The system has been in operation since 2010 and provides between $6-12 million in energy cost savings per year.
    - Though much of Houston and the surrounding area was without power during Hurricane Harvey in 2017, the Center's CHP system was able to provide life sustaining power for air conditioning, refrigeration, heating, and other services.
    - While much of the surrounding area was flooded, the elevated design of the CHP system allowed it to operate throughout the storm.
  - Greenwich Hospital (Connecticut)[3]
    - The Hospital installed a CHP system in 2008 consisting of two 1,250 kW engines to serve the 175 bed facility. It also has backup generators.
    - After Superstorm Sandy in 2012, the area surrounding the Hospital lost power for approximately 7 days. When the hospital lost grid power, it went down for about 7 seconds before the backup generators kicked in and power was restored. The CHP system shut down and restarted in island mode, with the transition from using grid power to operating solely on the CHP system took approximately 5 minutes.

---

[1] ICF International, "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities," Mar. 2013, p. 13. https://www.energy.gov/sites/prod/files/2013/11/f4/chp_critical_facilities.pdf.
[2] Better Buildings, U.S. Department of Energy, "Distributed Generation (DG) for Resiliency Planning Guide," Jan. 2019, p. 63. https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/DG%20for%20Resilience%20Planning%20Guide%20-%20report%20format.pdf.
[3] ICF International, "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities," at 14; and Better Buildings, U.S. Department of Energy, "Distributed Generation (DG) for Resiliency Planning Guide," at 63.

        - The Hospital was able to continue normal operations throughout the storm and admitted 20 additional patients.

    - Mississippi Baptist Medical Center[4]
        - The hospital has a 4.6 MW CHP system that allowed the facility to continue operations during a 52 hour grid outage during Hurricane Katrina in 2005.
        - As the grid became unstable during the hurricane, the Medical Center shed some load, disconnected from the power grid, and continued operation with the CHP system providing all power.
        - The Medical Center also provided shelter, food, and clothing to stranded local citizens and displaced patients from other hospitals.
        - The hospital ran for more than 50 hours and was the only such facility in the Jackson metropolitan area to remain nearly 100% operational.

- Military
    - Twentynine Palms Marine Corps Air Ground Combat Center (California)[5]
        - The Marine Corps Air Ground Combat Center (MCAGCC) provides live fire arms training prior to deployment and its public works department supports over 28,000 military and civilian personnel on an installation with 1,685 buildings.
        - In 2003, MCAGCC started operating a 7.2 MW dual-fueled combustion turbine, the exhaust from which is captured in a heat recovery generator that supplies a high-temperature hot water system, used directly for eating and domestic hot water. It also drives an absorption chiller for cooling and air conditioning.
        - The base is at the end of an electric distribution line and experiences frequent grid outages. During outages, the plant can operate in island mode and supply power to four critical load circuits on the base.
        - The CHP system has black start capability through a diesel generator.
        - Since the installation of he system, the base has had to enter island mode a number of times due to curtailment by the electric utility.

- Wastewater Treatment
    - Bergen County Utilities Authority (New Jersey)[6]
        - The Authority's wastewater treatment plant installed a 2.8 MW biogas-fueled CHP system in 2008 to heat anaerobic digester tanks and provide the facility with about 90% of its electricity needs.
        - The facility relied heavily on its CHP system during Superstorm Sandy, allowing the facility to process sewage for its 47 municipalities and approximately 550,000 customers during and after the storm.

[4] Better Buildings, U.S. Department of Energy, "Distributed Generation (DG) for Resiliency Planning Guide," at 64.
[5] ICF International, "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities," at 22-23.
[6] Better Buildings, U.S. Department of Energy, "Distributed Generation (DG) for Resiliency Planning Guide," at 66.

- Educational Institutions
  - The College of New Jersey[7]
    - During and after Superstorm Sandy in 2012, the College was able to disconnect from the electric grid for a week and the campus continued to operate despite the grid disruption.
    - The College's equipment was used to assist the state's largest utility in reestablishing service after the grid outage: the utility was able to use the College's equipment to back-feed one of its power lines to bring it back in service.

  - Louisiana State University[8]
    - The campus has two CHP systems, one installed in 1993 and another installed in 2005. The later has a 20 MW capacity and operates 24 hours a day, 7 days a week, providing 65% of the electric demand of the campus and 98% of the thermal load.
    - This newer plant allows the university to keep much of the campus on-line in the event of severe weather or grid power failure.
    - In 2005 during Hurricane Katrina, the university never lost power during Hurricane Katrina, allowing the school to continue to operate and allow administrative offices of other institutions to relocate to the main campus. The on-campus conference center and hotel housed many of the university's employees that were displaced by the hurricane.
    - For four days in 2008 during Hurricane Gustav, the CHP system provided electricity to critical sections of the campus.

  - New York University[9]
    - The NYU Washington Square Campus facilities are served by at 14.4 MW CHP system, which was installed in 2010. The electricity generated from the system supplies 22 campus buildings while the steam is used to produce hot water for 27 campus buildings and meets 100% of their space heating and cooling and hot water needs.
    - During Superstorm Sandy in 2012, the CHP system went into island mode when the local grid went down, and the University's core campus was able to maintain both power and heat. The system enabled University and New York City officials to set up a command post on campus as well as serve area residents forced to evacuate their homes.
    - The CHP system does not cover the NYU Langone Medical Center. The Medical Center's backup generator failed and the Medical Center had to evacuate its patients to nearby hospitals.

[7] ICF International, "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities," at 18.
[8] ICF International, "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities," Mar. 2013 at 24.
[9] ICF International, "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities," at 29.

- Data Centers[10]
    - Public Interest Data Center (New York)
        - The data center at Public Interest Network Services in Manhattan provides companies with office communications support. The center has an uninterruptible power supply and CHP system: a 65 kW microturbine-based CHP system provides for all the computer and office lighting electric loads and thermal energy is captured and used for space heating and cooling.
        - During Superstorm Sandy, the power to the building and surrounding area was out for more than two days, but the data center was able to remain fully operational.
        - Though no staff were at the building when the power went out, the automatic switch system transferred the data center load to an uninterruptible power supply while the CHP system was transferring to island mode. The automated transition took about one minute to complete.

- Companies
    - Sikorsky Aircraft Corporation (Connecticut)[11]
        - Sikorsky installed a CHP system at its helicopter manufacturing facility in Stratford in 2011. The system is 10.7 MW and supplies 84% of the facility's power needs and 85% of the facility's steam heating needs.
        - The facility's CHP system did not experience any disruptions during Superstorm Sandy in 2012.
        - The company offered free helicopter transport services for disaster relief personnel in New Jersey, New York, and Connecticut after the storm. The helicopters ferried water, snacks, diapers, flashlights, and other necessities to Staten Island University Hospital in New York.

    - Florida Public Utilities – Eight Flags Energy CHP Plant, Amelia Island[12]
        - The utility owns and operates a 21.7 MW CHP system at an industrial customer site on Amelia Island.
        - During normal operations, electricity from the CHP system is a source of reliable baseload electricity for about 16,000 utility customers and the thermal energy supplies steam and heated water to the host facility, a large paper mill.
        - The CHP system has the ability to support critical services to the residents of Amelia who are especially vulnerable to severe weather and outages. The CHP system is designed to survive a category 4 storm surge.

---

[10] Better Buildings, U.S. Department of Energy, "Distributed Generation (DG) for Resiliency Planning Guide," at 66-67.
[11] ICF International, "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities," at 31.
[12] Better Buildings, U.S. Department of Energy, "Distributed Generation (DG) for Resiliency Planning Guide," at 15.

Economic Competitiveness

Case studies help to illustrate the potential savings realized from CHP installations.

- Kraton's Belpre, Ohio facility that manufactures polymers used in medical products, paving, adhesives, and roofing installed natural-gas fired CHP boilers to replace their outdated coal-fired boilers. The CHP system captures heat that would otherwise be unused by the facility's processes, and facility now produces about one-third of its energy for free, dramatically lowering energy costs and accruing savings on lower safety and maintenance costs.[13]

- HARBEC, a toolmaking company in upstate New York, installed a CHP system which today provides the majority of the plant's electric power needs and all the heating and cooling required by the company for HVAC and processes.[14] The captured heat from the facility not only drives the facility's climate controls, but also powers the process loop that cools more than 30 injection molding machines: the faster that process happens, the more quickly product is delivered.[15] HARBEC has averaged $20,000 reduced electric and gas costs monthly.[16]

[13] Alliance for Industrial Efficiency, "Case Study: Energy Efficiency Is Good for Business: Kraton Combined Heat and Power," Aug. 2016. https://chpalliance.org/wp-content/uploads/2016/11/Kraton_case_study_FINAL.pdf.
[14] Alliance for Industrial Efficiency, "Case Study: Energy Efficiency Is Good for Business: HARBEC Combined Heat and Power," Aug. 2016. https://chpalliance.org/wp-content/uploads/2016/08/HARBEC-Case-Study.pdf.
[15] *Id.*
[16] *Id.*