COMBINED HEAT AND POWER ALLIANCE

Combined Heat and Power and Infrastructure Plans

Introduction:

Combined heat and power (CHP) systems can play an integral role in a wide array of infrastructure projects. As such, CHP systems should be included in infrastructure planning, especially for facilities that require a consistent source of electric and thermal energy.

Including CHP in infrastructure planning can:

- Reduce energy costs
- Improve the resiliency of critical infrastructure and communities
- Increase the reliability of a modern electric grid
- Reduce greenhouse gas and other emissions

Types of infrastructure projects that can benefit from CHP:

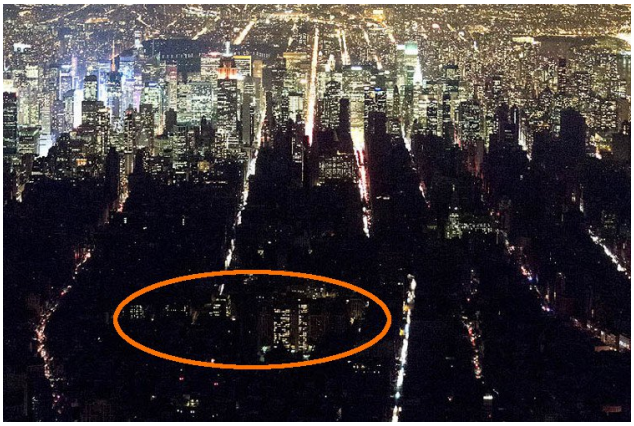
- Airports
- Colleges & Universities
- Hospitals & Nursing Facilities
- Electricity Supply
- Electric Grid
- Emergency Response Facilities
- Microgrids
- Military Installations
- Municipal Buildings
- Wastewater Treatment Plants

Reduce Energy Costs

CHP systems are efficient electric and thermal energy generation units that can reduce energy costs. Improvements in CHP technology over time have resulted in properly designed CHP systems typically operating with an overall efficiency of 65-85%, compared to an overall efficiency of only 45-55% when electricity and thermal energy are provided separately.[1] Getting more energy outputs from the same fuel inputs reduces energy costs. In addition, since CHP systems are typically located close to where the electric and thermal energy will be used, savings are also achieved from reduced line losses, electricity that is typically lost during transmission and distribution from a central power plant to the end user.

While numerous facilities are already saving money with their CHP systems, there is a significant opportunity to capture additional energy savings through further CHP installations. In 2016, the U.S. Department of Energy (DOE) estimated that there was more than 240 GW of CHP technical potential across all facility types.[2] Though progress to date is substantial, many facilities are leaving savings on the table.

Improve Resiliency of Critical Infrastructure Facilities and Communities



During Hurricane Sandy, NYU's microgrid provided an island of light[5]

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[3] – are particularly well suited to utilize distributed energy resources such as CHP, as access to energy is a high priority for ensuring that critical facilities can continue to deliver services and assist in recovery.[4]

Many critical infrastructure customers such as hospitals, universities, and municipalities have successfully deployed CHP systems, increasing their resiliency against natural disasters, emergencies, or other events that may impact the electric grid.

This can mitigate the impacts of an emergency by keeping critical facilities operational until power is restored. Resilient infrastructure makes for resilient communities. By including CHP systems in infrastructure plans, facilities can continue to provide crucial services to their communities during electric grid disruptions. Maintaining these services during times of emergency allows communities to withstand a severe event and move quickly into a recovery phase.

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[1] United States Department of Energy, "Combined Heat and Power (CHP) Technical Potential in the United States," Mar. 2016, p. 3-4. https://www.energy.gov/sites/prod/files/2016/04/f30/CHP%20Technical%20Potential%20Study%203-31-2016%20Final.pdf

[2] *Id.* at 21.

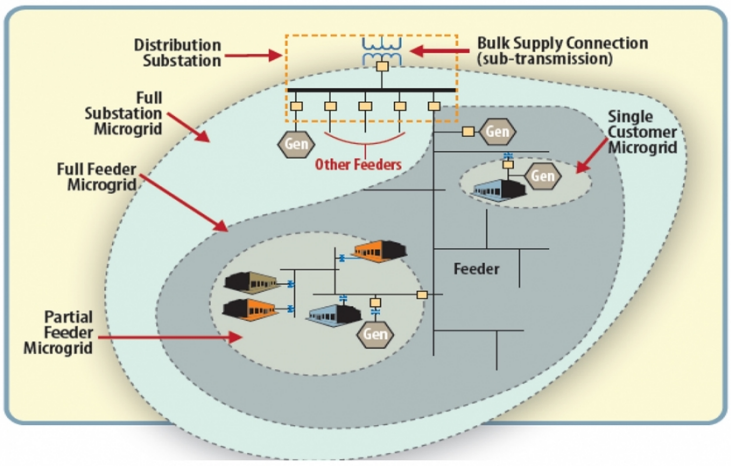
[3] Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism (USA PATRIOT ACT) Act of 2001. Pub. L. 107-56 at Sec. 1016(e). 26 Oct. 2001. https://www.congress.gov/bill/107th-congress/house-bill/3162/text.

[4] 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.

[5] Engineering 360. June 30, 2017. https://insights.globalspec.com/article/5714/ny-prize-competition-drives-community-microgrid-development

Increase the Reliability of a Modern Electric Grid

The reliability of the electric grid – the ability to get power where and when needed – depends on grid operators ensuring that sufficient generation resources are available to meet demand. As more intermittent resources such as solar and wind are added to the grid, operators will have to balance these resources with those that can provide a consistent source of power. CHP systems typically run continuously and generate a consistent amount of power. As such, they could be called upon by grid operators to send electricity into the grid when renewable supply is unable to meet demand. In this way, CHP systems can improve the reliability of the larger power grid while supporting the addition of renewables.



The Role of Microgrids in Helping to Advance the Nation's Energy System[6]

CHP systems can also provide reliable power to a local community as part of a microgrid, allowing several buildings or facilities to keep the lights on during a grid outage. 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 and power outages.[7] 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.[8]

Reduce Greenhouse Gas and Other Emissions

The efficiency that CHP systems are able to achieve allows them to also reduce emissions. Because CHP systems combust less fuel to provide the same energy services, they reduce all types of emissions, including greenhouse gases, criteria pollutants, and hazardous air pollutants. As a consequence, natural gas-fired CHP can produce electricity with about one-quarter of the GHG emissions of an existing coal power plant.

When additional power is needed, either to supply the electric grid when demand is high or to provide backup power during a gird outage, generation units fueled by coal, oil, or diesel are frequently brought into service, increasing emissions. In the same circumstances, a CHP system fueled by natural gas can produce fewer emissions than these other types of generation units, avoiding the increased emissions from coal, oil, or diesel.[9]

In addition to reducing emissions now, CHP systems have the potential to reduce emissions even further in the future as renewable fuels are developed and used. As technologies advance, CHP systems will be able to utilize renewable fuels to even further reduce emissions. Moreover, CHP will likely be the most efficient way to use renewable fuels, maximizing the amount of energy output that can be gleaned from the fuel inputs, and thereby maximizing emissions reductions.

To Learn More

For more information on CHP's role in infrastructure, please visit the CHP Alliance: https://chpalliance.org/join

[6] United States Department of Energy, Office of Electricity, "The Role of Microgrids in Helping to Advance the Nation's Energy Systems." https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid/role-microgrids-helping

[7] 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.

[8] 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.

[9] United States Environmental Protection Agency, "Valuing the Reliability of Combined Heat and Power," Jan. 2007, p. 2. https://www.epa.gov/sites/production/files/2015-07/documents/valuing_the_reliability_of_combined_heat_and_power.pdf.