The New York/New Jersey Combined Heat and Power Technical Assistance Partnership (NY/NJ CHP TAP’s)

Climate Action Council Draft Scoping Plan

Public Comments

## Introduction

New York State has implemented a bold and aggressive approach to addressing Climate Change. In 2019, with the passage of the Climate Law and Community Protection Act (CLCPA), the State of New York established the goal of a 100% renewable electric grid by 2040, and net-zero carbon emissions economy wide by 2050. The New York State approach places front and center a concern for environmental justice, equity, and delivering results to historically underserved populations. “*The Climate Act requires the state to invest or direct resources in a manner designed to ensure that disadvantaged communities to receive at least 35 percent, with the goal of 40 percent, of overall benefits of spending*”[[1]](#footnote-1).

To meet the targets laid out in CLCPA, there is a need for a large amount of dispatchable emissions-free resources (DEFRs)[[2]](#footnote-2). These DEFRs, an as-yet undefined technology, are essential for the safe and reliable operation of the New York State grid. For any number of reasons, the build out of renewables and supporting energy efficiency and grid functionality may fall short of projected targets. In that case, New York’s reliance on DEFRs can increase dramatically.

According to the New York State Climate Action Council draft Scoping Plan, some amount of low carbon fuel usage will be needed meet Climate Act emissions limits - three detailed Scenarios in the scoping plan include use of low carbon fuels: Scenario 2: *Strategic Use of Low Carbon fuels*, anticipates a “high” level of Low Carbon Fuels; Scenario 3*. Accelerated* *Transition Away from Combustion* envisions a limited or “Low” usage of Low Carbon Fuels; and Scenario 4: *Beyond 85% Reduction*, indicates a targeted or “Medium” level of usage.[[3]](#footnote-3)

To maximize efficiency, to enhance resiliency, to minimize costs and energy burdens and to extend supply, low carbon fuels should be used in the most efficient and optimal manner. Combined Heat and Power (CHP) systems operating on low and zero-carbon fuels are an efficient and economical approach for meeting the State’s need for dispatchable, emissions free resources that are distributed and flexible in their operation.

While efficiencies vary for CHP installations based on site-specific parameters, a properly designed CHP system will typically operate with an overall fuel use efficiency of 65–85% (DOE 2017).[[4]](#footnote-4) No matter what fuel – Renewable Natural Gas, Hydrogen, Gas with Carbon Capture or Biomass, CHP is the most efficient, and economic, use of the fuel when located at compatible thermal loads. With low- and moderate-income households in New York State already suffering a high and rising energy burden, energy affordability **is a matter of increasing concern.[[5]](#footnote-5)** New Yorkers have fallen further behind on utility bills during the pandemic, with total energy arrears of about $1.8 billion, according to January data from the state’s Public Service Commission. That’s more than twice the total before the pandemic, according to observers.[[6]](#footnote-6)

On-site consumption of emissions-free fuels can play an invaluable role in meeting system peaks, greatly reducing the need for costly investment in nearly unutilized or grossly under-utilized capacity. Using CHP to supplement heat pumps in large multifamily buildings and mixed-use campuses and commercial buildings, as well as in district heating loops can provide significant cost savings while delivering important resiliency benefits for vulnerable populations, critical infrastructure and important economic function. Where applicable, CHP delivers a double dividend benefit reducing winter electric peaks at a time when solar capacity factor is at its minimum and providing thermal energy security in the form of space heating and hot water.

Because CHP has historically used natural gas as a primary fuel, it is often left out of discussions on decarbonization technologies. However, CHP solutions can deliver measured, quantified, verified benefits similar to other clean energy technologies and systems. A November 2020 US DOE report notes the following:

*As states and utilities explore scenarios to meet energy-related goals, CHP can continue to provide value and help balance key priorities, including: 1) providing efficient and reliable electricity and thermal energy to the U.S. industrial sector; 2) increasing our power system’s resilience to support our nation’s critical infrastructure; 3) supporting grid integration of wind, solar, and energy storage technologies; and 4) helping the U.S. maintain its global leadership position in reducing carbon dioxide and other emissions while keeping electricity prices affordable.*[[7]](#footnote-7)

Large capital investments require considerable lead times for design, development, and operation. Investors in CHP and CHP/hybrid technology[[8]](#footnote-8) solutions and systems will benefit if their systems, contingent upon proven performance, are eligible to monetize environmental, energy, decarbonization and resiliency benefits. Implementation of pilots and demonstration projects with low carbon fuels and CHP could be designed to stress test performance of these projects providing valuable measurement and verification data. The performance of CHP solutions can then be compared against and paired in complement with other renewable and electrification solutions.

## Comments on Chapter 6 Achieving Climate Justice

Low and Moderate Income (LMI) households and disadvantaged communities have the greatest need for infrastructure hardening to withstand the consequences of climate change. From the recent past to the present, NYCHA has witnessed numerous instances of heat and hot water outages affecting unacceptably large numbers of public housing residents.[[9]](#footnote-9) When disruptions in energy supply occur, these communities are affected in an acutely disproportionate manner. They are not readily able to flee to homes outside of the area or state. They do not have excess disposable income to seek shelter in hotels or other accommodations.

This emphasizes the need for resilient housing and critical infrastructure, and solutions such as CHP that provide power, heating, and cooling during outages of extended duration. The Draft Scoping Plan fully expects an increase in the frequency and severity of climate events; therefore, resilient energy systems are providing a premium service. LMI areas and disadvantaged communities, both rural and urban, are most likely to have older or inadequate electric infrastructure.

Chapter 12 of the Draft Scoping Plan acknowledges the need for supplemental heat for certain applications of air-source heat pumps (ASHPs), most likely in the form of fossil fuels in the near-term. CHP, as it is the most efficient usage of fuels, and thus the lowest emitting option for the services it provides can play a role here. Where it is applicable, CHP is the most energy efficient method of providing supplemental heat. On-site consumption of various forms of biogas and renewable natural gas is not experimental, there are nearly 800 sites in the United States currently using renewable based CHP per the U.S. DOE Installation Database.

CHP is unparalleled in its ability to provide both electric and thermal resiliency and can do so with low carbon fuels. CHP can provide electric and thermal relief during climate events, supporting critical infrastructure like shelters and cool rooms, heated areas in the case of winter grid outages, and support for hospitals and healthcare providers. During some climate events, as seen historically in the case of Superstorm Sandy, grid outages could last for days or weeks, not hours.

## Resilience Benefits of CHP[[10]](#footnote-10)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| End Users |  | Utilities |  | Communities |
| •Provides a continuous supply of electricity and thermal energy for critical loads•Can be configured to switch automatically to “island mode” during a utility outage and to“black start” without grid power•Can withstand long, multiday outages | •Enhances grid stability and relieves grid congestion•Enables microgrid deployment for balancing renewable power and providing a diverse generation mix | •Ensures critical facilities such as hospitals and emergency services remain operating and responsive to community needs•Allows areas of refuge to operate during grid outages to provide shelter-in-place opportunities for those in need |

CHP MICROGRIDS DELIVERY RESILIENT POWER TO CRITICAL FACILITIES

After Fairfield, Connecticut suffered significant energy outages during Superstorm Sandy, the town invested in a CHP-based microgrid supporting its critical facilities. The microgrid features a 300-kW natural gas-fired generator, 47 kW of solar PV, and a 60-kW natural gas-fired CHP reciprocating engine as the microgrid anchor. It serves the fire station, police station, an emergency communications center, a public shelter, and a cell phone tower.

*Source: U.S. Department of Energy - Better Buildings Initiative, Distributed Generation (DG) for Resilience Planning Guide (January 2019).*

Modern CHP systems are capable of acting as a more flexible resource, offering key grid-supporting services needed to maintain operations and help balance the distribution system. CHP’s ability to defer or avoid the need for substation or switchgear investments, provide back-up power, deliver black start capability, or offer other ancillary services are additional features.[[11]](#footnote-11) CHP, appropriately sited, designed and configured, can provide a suite of valuable grid services. Insofar as CHP can deliver multiple value streams, it can be an important asset in keeping power and energy costs affordable.

## Comments on Chapter 12 Buildings

Chapter 12 states that *“Larger multifamily, mixed-use, or complex commercial buildings that are concentrated downstate also may use supplemental heat (likely gas) for peak cold conditions, with a plan to phase it out over time as technology develops.”[[12]](#footnote-12).* CHP provides the most-efficient method of providing supplemental heat to ASHPs, whether fueled by natural gas or low carbon fuels. As low carbon fuels become available, CHP can readily transition to them. District thermal loops, with ASHPs or geothermal loops, may also need supplemental heat on the coldest days in the winter, and CHP can provide the same benefits in that application as well.

In Scenario #2. one in ten ASHP are modeled to use fuel back-up to meet heating demands during the coldest 5% of hours. In this scenario, nearly all RNG is used in the buildings sector, assuming a 9% RNG blend in gas pipelines by 2030 and 100% RNG to meet dramatically reduced gas demand in buildings by 2050[[13]](#footnote-13). All current natural gas CHP systems by definition can operate on RNG without any modifications since RNG is essentially the same composition as today's pipeline natural gas. As of December 31, 2020, there were reported to be 774 CHP sites using renewable fuels such as digester gas and landfill gas, representing nearly 4.3 GWs of installed capacity[[14]](#footnote-14).

No matter the fuel utilized, CHP offers the double dividend of increased efficiency and increased winter peak reduction in electricity demand. A CHP system providing supplemental heat provides grid relief through both reduction in electric usage by heat pumps, and by the electricity generated by the CHP system. This approach delivers a much greater peak-shaving benefit than boilers alone. CHP running a small number of hours per year mitigates the need for oversizing of heat pumps on site and facilitates down-sizing asset investments all the way up the supply chain, requiring less grid infrastructure and renewable generation assets. Strategically utilizing CHP systems in this manner has the potential for delivering sizable cost savings.

Resiliency is also a key factor for many buildings sectors, such as college campuses, hospitals, and multi-family buildings and campuses, especially LMI and public housing. Reliance on the grid for heating and electricity reduces redundancy and limits the length of outages that can be operated through to the duration of on-site electric storage available. CHP can provide resilient power, heating and cooling for disadvantaged communities that are most vulnerable to the consequences of climate change and historically have inadequate energy infrastructure.

Strategic CHP investments now provide the opportunity to capture immediate carbon reductions and lay a supporting foundation for a transition to zero emissions onsite heating/power/cooling and resiliency solutions available from CHP systems. College campuses, multifamily buildings, hospitals, and critical business and government sites take several years to plan, design, build and commission operation of their energy systems.

If highly efficient, resilient, and environmentally superior CHP systems are excluded from the potential solution set today, they will not be available at critical system inflection points in 2030, 2035, or 2040. Securing carbon reductions today are more valuable than are carbon reductions occurring in 5 to 15 years. Accelerating carbon reductions in the near term also provides more time for zero-carbon product and process innovations to advance.

## Comments on Chapter 13 Electricity

To meet the targets laid out in CLCPA, there is a need for a large amount of dispatchable emissions-free resources (DEFRs). The NYISO has identified a potential need beyond NYSERDA’s New York Power Grid Study,[[15]](#footnote-15) estimating that up to 32 GW of DEFRs would be needed to stabilize the grid at winter peak in 2040.[[16]](#footnote-16) Additionally, in the event the build out of renewables falls short of projected targets, reliance on DEFRs will increase, perhaps dramatically

These DEFRs are an as-yet undefined technology. CHP utilizing low carbon fuels can meet those needs efficiently and economically. CHP with low carbon fuels is an ideal technology to fill the role of a DEFR. It represents the most efficient use of fuel due to its high operating efficiency of 70 – 80%, compared to a combined cycle power plant of ~55%. CHP also provides power production close to point of use, eliminating transmission losses and providing local resiliency.

A renewable grid with wide-scale building electrification requires load shifting on an unprecedented scale. On January 27, 2022, the NY/NJ CHP TAP co-hosted an informative webinar, which featured a presentation by the NYISO on the Grid of the Future[[17]](#footnote-17). An important take-away from that Webinar, titled CHP’s Role In Decarbonization, was the following observation:

*The Grid in Transition engenders a set of new market initiatives that will likely create revenue opportunities in the future for CHP. Mike Swider, Senior Market Specialist, NYISO pointed out that to the extent that a Combined Heat Power resource can follow a NYISO dispatch signal it can participate by selling energy, reserves and capacity Furthermore, these resources will be needed in significant capacity, so that the opportunity created is extensive.*[[18]](#footnote-18)

The U.S Environmental Protection Agency (EPA) Combined Heat and Power (CHP) Partnership identifies CHP's Role in Decarbonization as the following:[[19]](#footnote-19)

* [Reduce emissions while the grid transitions towards cleaner energy.](https://www.epa.gov/chp/chps-role-decarbonization#one)
* [Support solar and wind power resources in microgrids to increase on-site reliability
and resiliency.](https://www.epa.gov/chp/chps-role-decarbonization#two)
* [Reduce emissions in sectors that are hard to decarbonize.](https://www.epa.gov/chp/chps-role-decarbonization#three)

As stated in a 2020 report by US DOE[[20]](#footnote-20), Combined Heat and Power (CHP) supports the integration of variable renewable energy

“*Growing markets for CHP include hybrid installations and microgrids that integrate CHP with other distributed energy resources, including solar and storage. In these configurations, CHP can ramp up and down to balance variable generation as part of an on-site microgrid or in support of the local distribution grid, increasing the capacity to accommodate more renewable energy*”.

Pilots and demonstration projects can help develop CHP with low carbon fuels and demonstrate its potential in providing crucial stability and reliability for an all-renewable grid. CHP can provide the DEFR needs of the grid while simultaneously reducing otherwise onerous winter peaks. The non-carbon future includes and relies on DEFRs, and CHP can provide that service. No matter the fuel of choice, hydrogen, biogas, natural gas, or blends thereof, CHP is more efficient and emits less than central generation powerplants using the same fuel.

1. Source: <https://climate.ny.gov/Our-Climate-Act/Climate-Justice-Working-Group> Accessed June 5,2022 [↑](#footnote-ref-1)
2. Source: Grid in Transition: DEFRs and Dispatchability. Mike Swider, Senior Market Design Specialist NYISO. Projected CLCPA Winter Energy Production by Resource Type. DEFR’s 10%. NECHPI Town Hall, January 27,2022 [↑](#footnote-ref-2)
3. New York State Climate Action Council Draft Scoping Plan. December 30, 2021. Figure 5. Level of Transformation by Mitigation Scenario. Page 71. [↑](#footnote-ref-3)
4. Source DOE. 2017. Combined Heat and Power Technology Fact Sheet Series: Overview of CHP Technologies. May. Advanced Manufacturing Office. https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/CHP%20Overview120817\_compliant\_0.pdf [↑](#footnote-ref-4)
5. Customers, advocacy groups and elected officials oppose ConEd’s proposed double-digit rate increase. Utility Dive. Dive Brief. By Robert Walton. Date April 5,2022. [↑](#footnote-ref-5)
6. Ibid. [↑](#footnote-ref-6)
7. Meegan Kelly and Jamie Scripps. 2020. Combined Heat and Power in Integrated Resource Planning: Examples and Planning Considerations. Prepared by ICF for the State and Local Energy Efficiency Action Network. Page 5 [↑](#footnote-ref-7)
8. Pairing CHP with Solar PV and/or battery storage or thermal energy storage are examples of hybrid technology solutions [↑](#footnote-ref-8)
9. Most NYCHA developments suffered heat and hot water losses this winter. By Valeria Ricciulli Aug 12, 2019, 1:28pm EDT. Curbed New York. <https://ny.curbed.com/2019/8/12/20802116/nycha-heat-outages-hot-water-winter-legal-aid-society> accessed June 5, 2022 [↑](#footnote-ref-9)
10. Combined Heat and Power in Resilience Planning and Policy: Issue Brief. U.S. Department of Energy: Office of Energy Efficiency and Renewable Energy. August 2019. Figure 1. Page 2 [↑](#footnote-ref-10)
11. Meegan Kelly and Jamie Scripps. 2020. Combined Heat and Power in Integrated Resource Planning: Examples and Planning Considerations. Prepared by ICF for the State and Local Energy Efficiency Action Network. November 2020. Page 21 [↑](#footnote-ref-11)
12. New York State Climate Action Council Draft Scoping Plan. December 30, 2021. Chapter 12. Buildings Page 120. [↑](#footnote-ref-12)
13. Ibid., page 121 [↑](#footnote-ref-13)
14. U.S. Department of Energy Combined Heat and Power and Microgrid Installation Databases. Summary CHP data set. Tab State vs Fuel. Source: https://doe.icfwebservices.com/downloads/chp accessed June 1, 2022 [↑](#footnote-ref-14)
15. NYSERDA. 2021. New York Power Grid Study. Albany. Accessed at https://www.nyserda.ny.gov/About/Publications/New-York-Power-Grid-Study. [↑](#footnote-ref-15)
16. NYISO Climate Change Impact and Resilience Study: Phase II [↑](#footnote-ref-16)
17. Grid in Transition: DEFRs and Dispatchability. Mike Swider Senior Market Specialist, NYISO. Prepared for Northeast CHP Initiative (NECHPI) Webinar CHP’s Role in Decarbonization. January 27, 2022, <https://www.dropbox.com/s/pkxkk6e9mgwoj57/NYISO_GIT_DEFR_CHP_Final.pdf?dl=0> [↑](#footnote-ref-17)
18. CHP TAPs Engagement Role in Facilitating New Grid Markets for CHP Services,

By Tom Bourgeois Director U.S. Department of Energy’s New York New Jersey Combined Heat and Power Technical Assistance Partnership (NY/NJ CHP TAP) and Joseph O’Brien Applegate NY/NJ CHP TAP. Newsletter, March 6, 2022 [↑](#footnote-ref-18)
19. Source: <https://www.epa.gov/chp/chps-role-decarbonization> accessed on June 1, 2022 [↑](#footnote-ref-19)
20. Meegan Kelly and Jamie Scripps. 2020. Combined Heat and Power in Integrated Resource Planning: Examples and Planning Considerations. Prepared by ICF for the State and Local Energy Efficiency Action Network. November 2020. Page 10 [↑](#footnote-ref-20)