

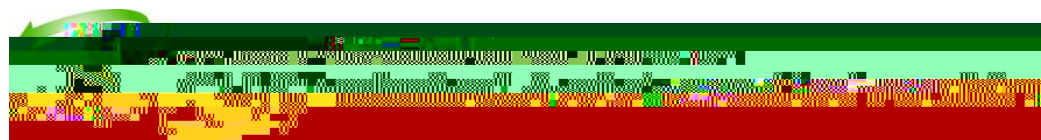
Clean Energy Generation

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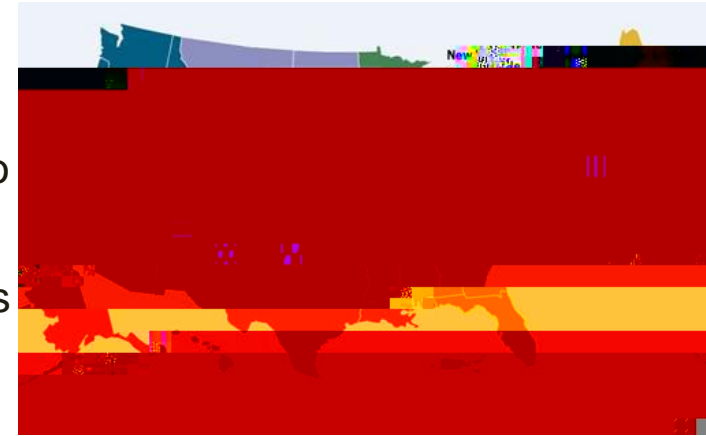
DOE CHP Technical Assistance Partnerships (CHP TAPs)

End User Engagement

- ‡ Partner with strategic End Users to advance technical solutions using CHP as a cost effective and resilient way to ensure American competitiveness
- ‡ Utilize local fuels and enhance energy security. CHP TAPs offer fact-based, nonbiased engineering support to manufacturing, commercial, institutional and federal facilities and campuses.

Stakeholder Engagement

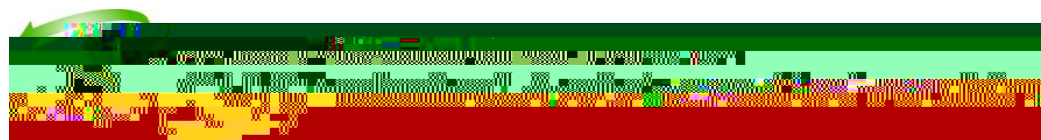
- ‡ Engage with strategic Stakeholders, including regulators, utilities, and policy makers, to identify and reduce the barriers to using CHP to advance regional efficiency.
- ‡ Work with stakeholders to identify and reduce the barriers to using CHP to advance regional efficiency. CHP TAPs provide fact-based, nonbiased education to advance sound CHP programs and policies.



www.energy.gov/chp

Technical Services

- ‡ As leading experts in CHP (as well as microgrids, heat to power, and district energy) the CHP TAPs work with sites to screen for CHP opportunities as well as provide advanced services to maximize the economic impact and reduce the risk of CHP from initial CHP screening to installation.



DOE CHP Technical Assistance Partnerships (CHP TAPs)



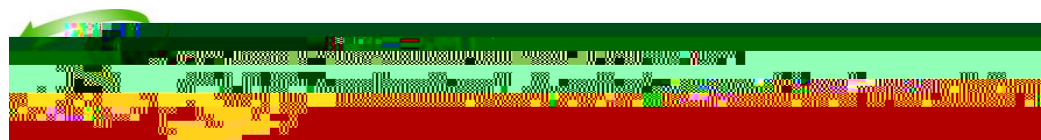
DOE CHP Deployment
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What Is Combined Heat and Power (CHP)?

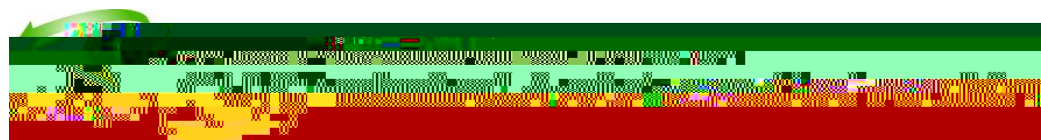
- f* Form of Distributed Generation (DG)
- f* An integrated system
- f* Located at or near a building / facility
- f* Provides at least a portion of the electrical load and
- f* Uses thermal energy for:
 - C Space Heating / Cooling
 - C Process Heating / Cooling
 - C Refrigeration/Dehumidification



CHP System Components



- f* Prime Mover
- f* Heat Recovery
- f* Thermal Technology
- f* Accessory Devices
- f* Switchgear
- f* Interconnectors



CHP TAP WWTP Analysis

Plant Energy Use

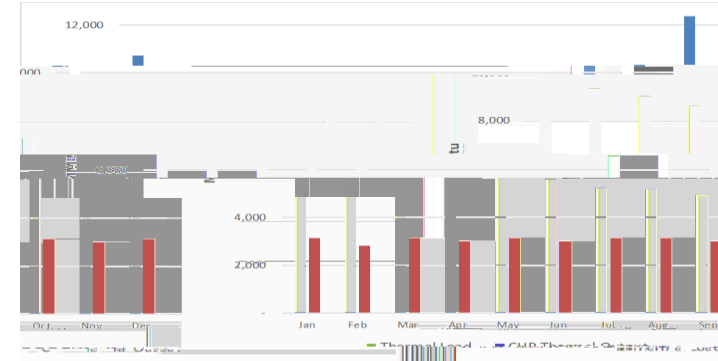
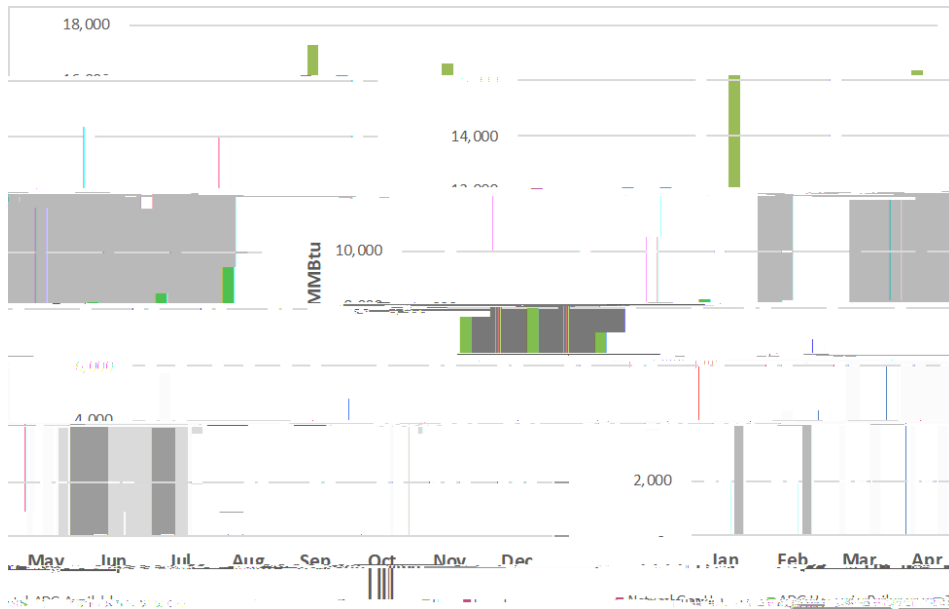
Electricity: 64,000 MWh

Natural Gas: 40,000 MMBtu

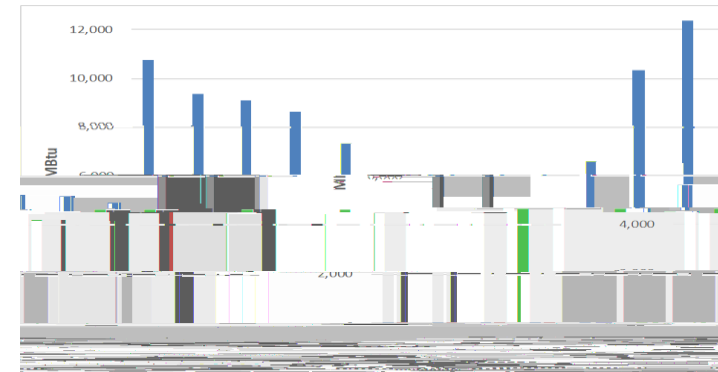
ADG: 156,000 MMBtu

80,000 MMBtu used

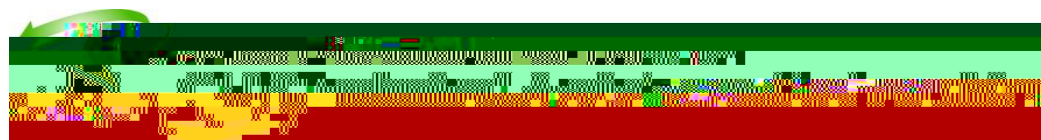
76,000 MMBtu flared



Option 1: All ADG at the site is consumed either by the CHP system or boilers (1.2 MW CHP)

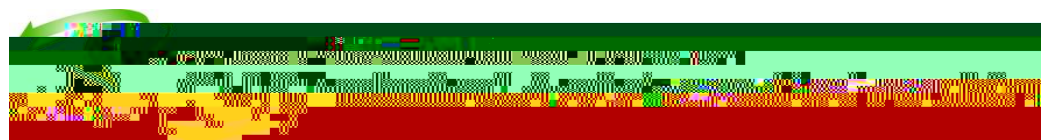


Option 2: System based on the minimum addressable thermal (1.7 MW CHP)



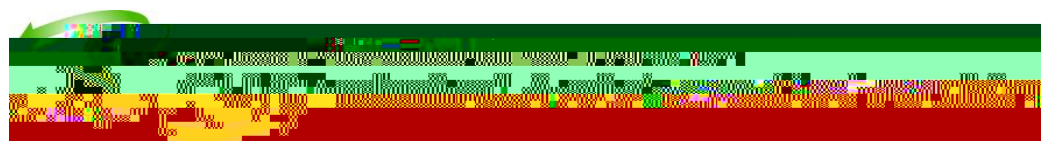
What Are the Benefits of CHP?

- f* CHP is **more efficient** than separate generation of electricity and heating/cooling
- f* Higher efficiency translates **lower operating costs** (but requires capital investment)
- f* Higher efficiency **reduces emissions** of pollutants
- f* CHP can also provide **energy reliability** particularly important at **WWTPs**
- f* On-site electric generation can **reduce grid congestion** and avoid distribution costs.



Resiliency

- f* Behind the meter CHP reduces electric demand of
t t d W [•
- f* When installed with black start and island mode capabilities CHP can provide uninterrupted power in the event of grid outages, allowing for continued operation of critical infrastructure
- f* 11 billion gallons of untreated and partially treated sewage flowed into waterways due to loss of power at metropolitan NY and NJ WWTPs in the aftermath of

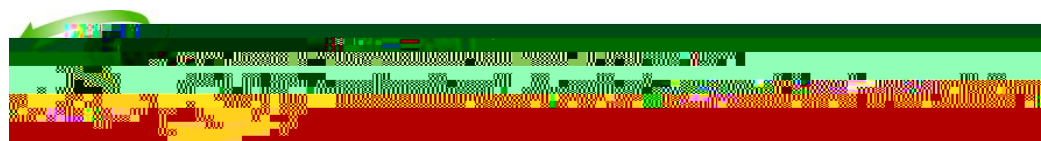


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Draft Scoping Plan

W4. Water Resource Recovery Facility Conversion

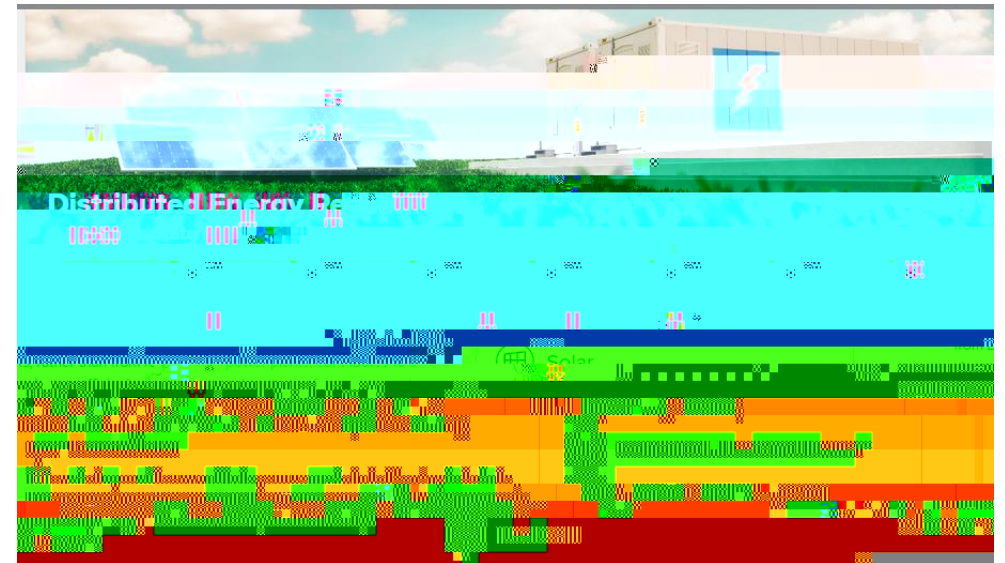
f Transforming wastewater treatment plants to emphasize the capture of beneficial
prog0 1 79.2 330.55 Tm 0 g 0 G [(pr)14(og0 1 7 4r-0.502 0 RG [(Draft Scoping P



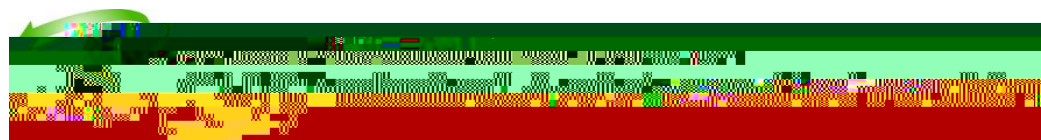
NYSERDA Funded CHP at WWTPs

- ‡ Over 10 projects at 7 different facilities with installed capacity of 4.8 MW
- ‡ **Consumed 2,14MMcf biogas to produce 100 GWH**
- ‡ Predominantly RICE prime mover providing base load generation, exporting to grid, with HW heat recovery for digester heating and space heating.

- ‡ Baseline WWTP Emissions (from electricity and natural gas combustion, CHP therm. 40%, Boiler Eff. 80%) = 641,803 tons CO₂e
- ‡ Emissions from NYSERDA WWTP CHP system = 378,386 tons CO₂e
- ‡ CHP Portfolio delivered 263,416 tons CO₂e over system life to date.
 - ‡ 20,263 tons CO₂e / yr
 - ‡ 4,221.4 tons CO₂e / MW yr

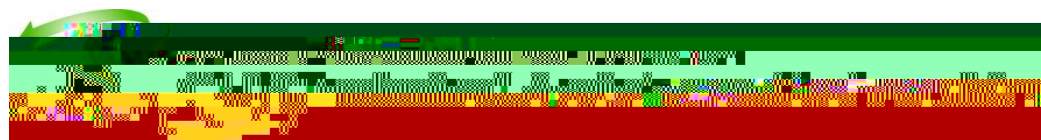


Source: <https://der.nyscrda.ny.gov/map/>



NY CHP Potential - WWTP

f Of the 600+ WWTP in NY, 136 utilize anaerobic digestion and produce biogas / methane.
f



Project Snapshot:

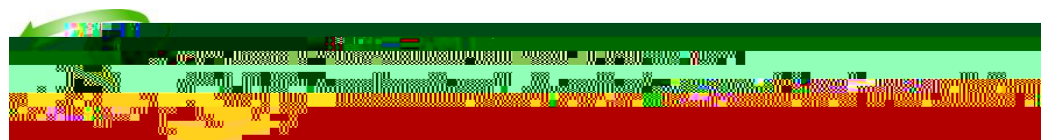
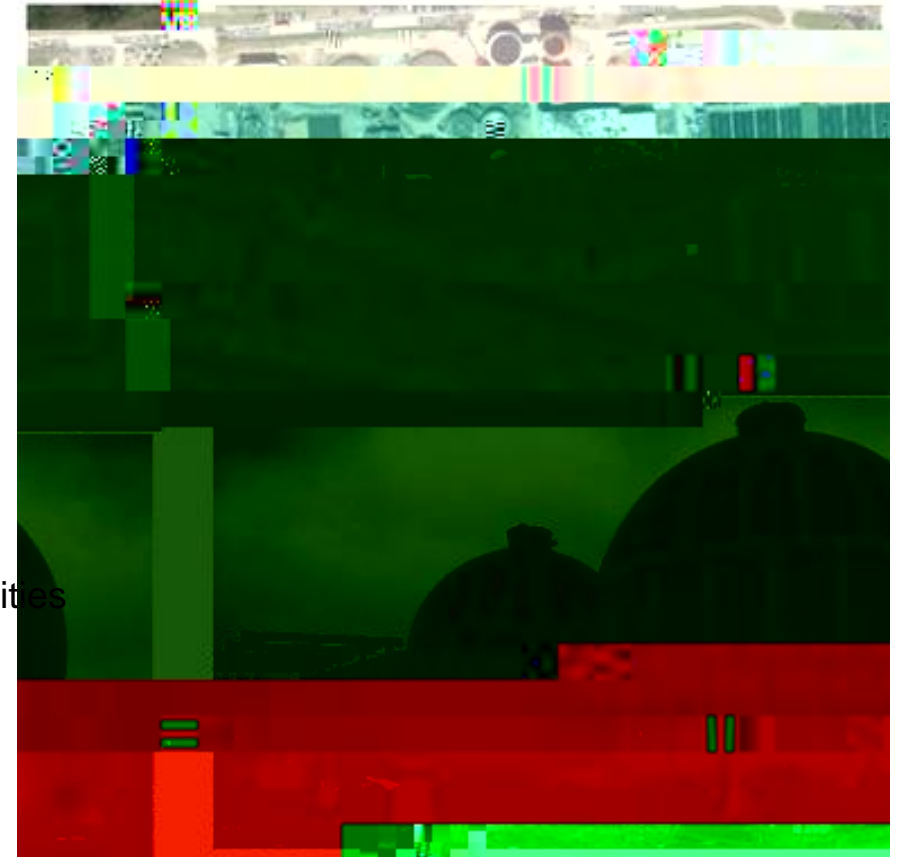
CHP at Wastewater Treatment O4erts

Oneida County Sewer District Water Pollution Control P4ert
Utica, NY

Application/Industry Wastewater Treatment P4ert
Capacity 600 kW (additional 400 kW in progress)
Prime Mover Microturbine
Fuel Type Biogas
Thermal Use Process and building heat
Installation Year 2019

Highlights:

- f* Additional 400 kW of capacity received 75% funding from NY Environmental Facilities Corporation (EFC) Green Infrastructure Grant.
- f* Installation of the anaerobic digester replaced existing sludge incinerators that



Project Snapshot:

CHP at Wastewater Treatment Plants

North River Wastewater Treatment Plant

Harlem, NY

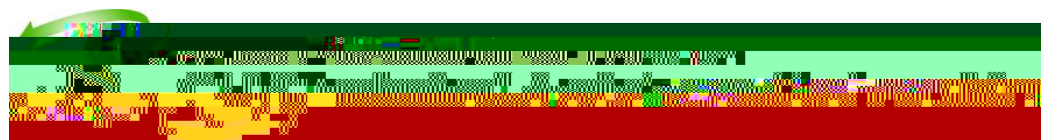
Application/Industry Wastewater Treatment Plant

Capacity 12 MW

Prime Mover Reciprocating Engine

Fuel Type Biogas & Natural Gas

Thermal Use:



Project Snapshot:

CHP at Wastewater Treatment Plants

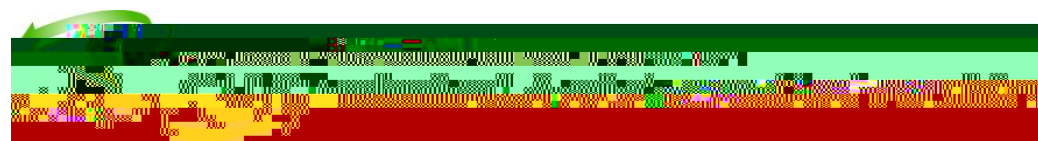
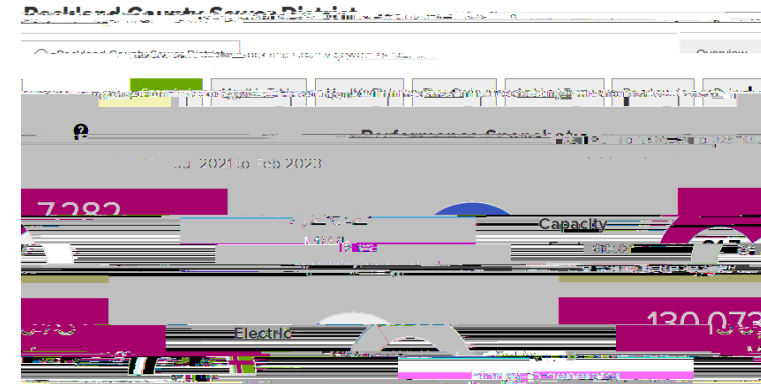
Rockland County Wastewater Treatment Plant
Orangeburg, NY

Application/Industry Wastewater Treatment Plant
Capacity 633 MW
Prime Mover Reciprocating Engine
Fuel Type Biogas
Thermal Use Process and building heat
Installation Year 2021

Highlights:

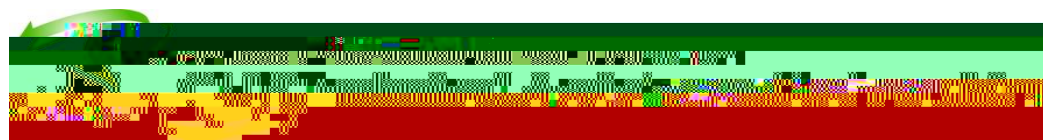
- f* CHP system installed in order to make use of excess biogas that historically was flared.
- f* Project includes gas treatment system in order to extend engine life. System removes moisture, particulates, hydrogen sulfide (H₂S), and siloxane.
- f* Before CHP the facility flared nearly 60% of the biogas produced. CHP operation is anticipated to reduce flared biogas to < 8%.

<https://der.nysed.gov/reports/view/performance/?project=2380>



Growth of Hybrid DER Systems

- f* Hybrid DER approaches offer the opportunity for technologies to complement one another

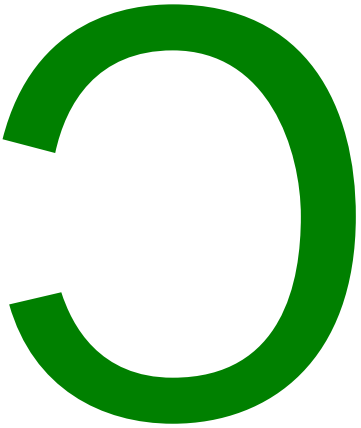


Food Waste Diversion

f NYS Food Donation and Food Scraps Recycling Law went into effect January 1, 2022

f





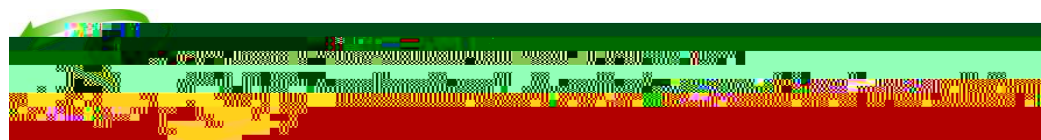
f High level assessment to determine if site shows potential for a CHP project

C Quantitative Analysis

- 2 Energy Consumption & Costs
- 2 Estimated Energy Savings & Payback
- 2 CHP System Sizing

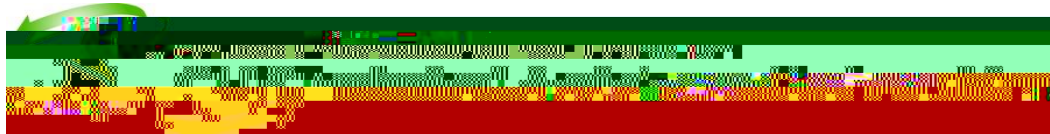
C Qualitative Analysis

- 2 Understanding project drivers
- 2

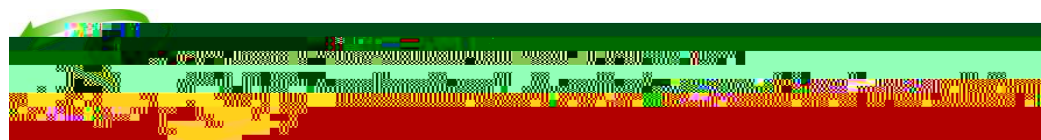
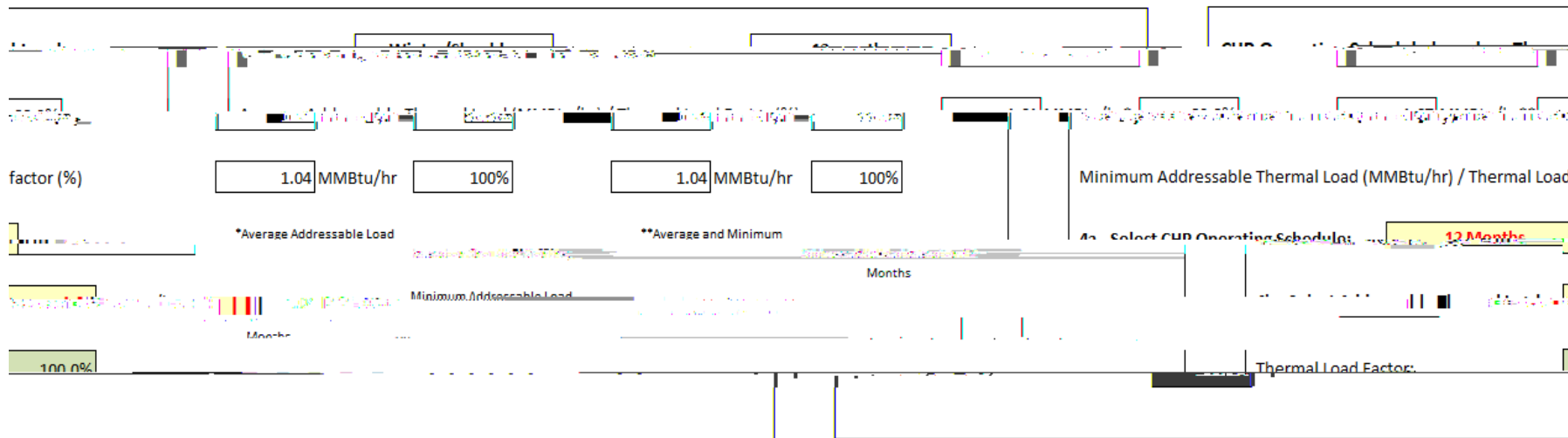
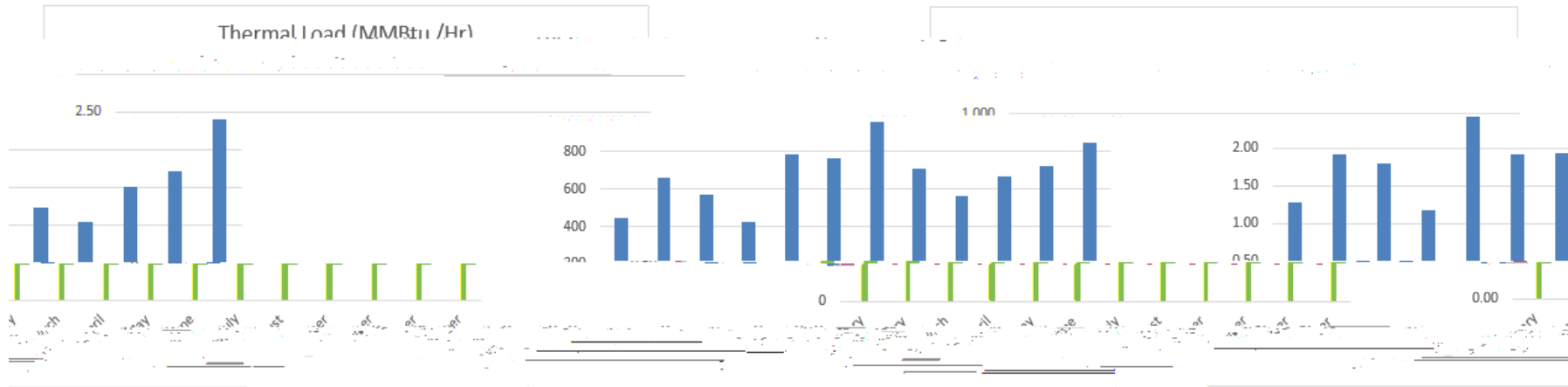


CHP screening analysis

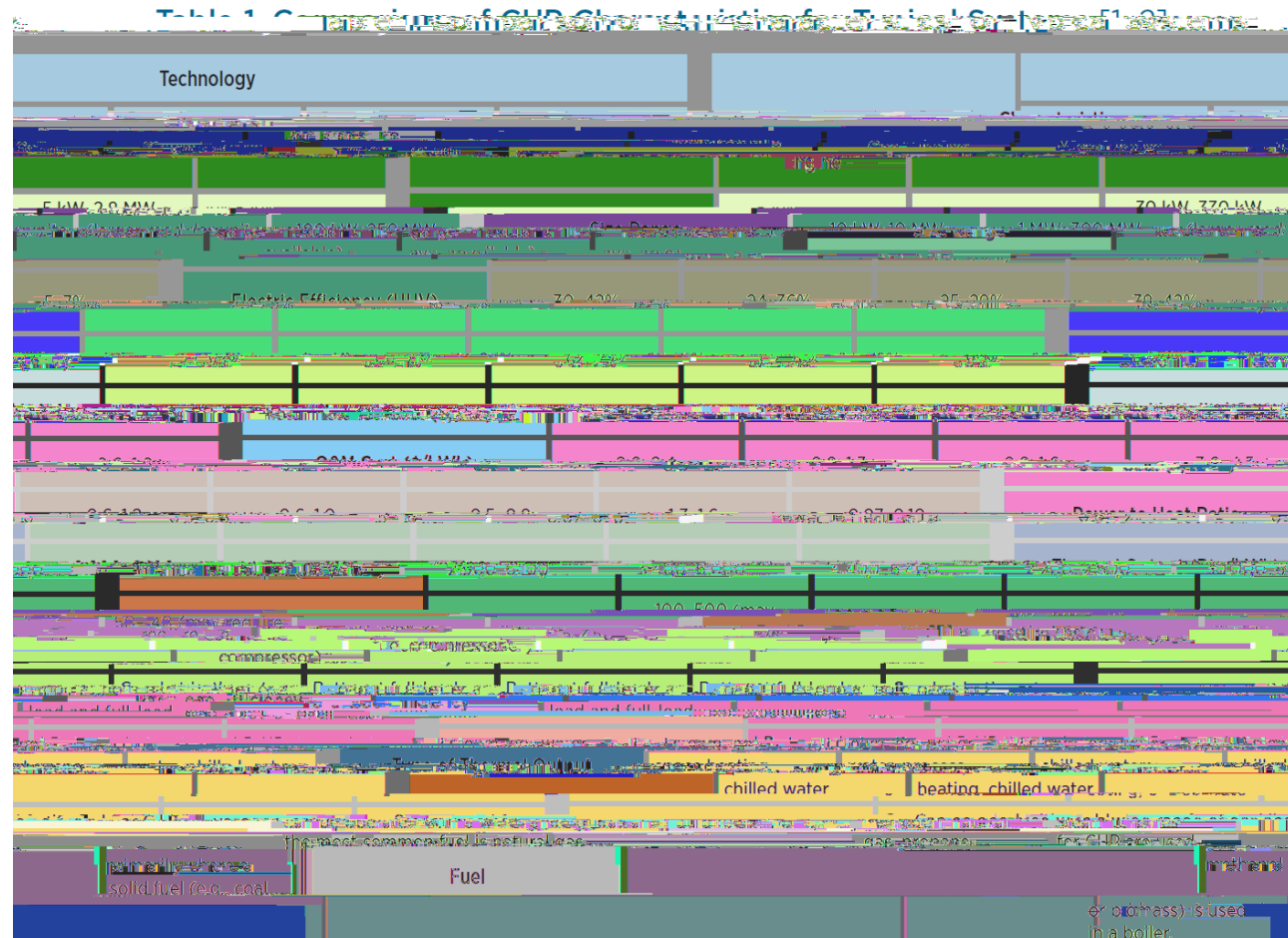
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Electricity Bill Data													
Billing days per month	31	28	31	30	31	30	31	31	30	31	30	31	365
Monthly Electric Use kWh	314,896	415,658	399,882	288,952	553,359	518,596	514,023	500,416	380,979	469,093	489,757	453,181	5,298,792
Monthly Peak Demand kW	905	902	948	926	1,057	1,083	1,131	1,138	1,031	989			



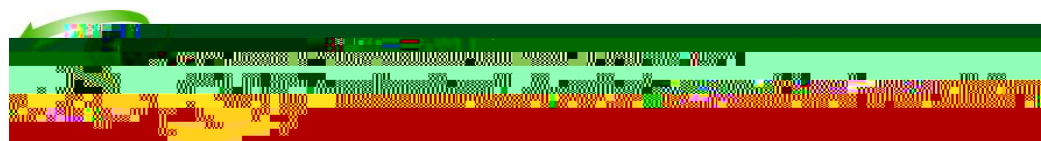
CHP screening analysis



Prime Mover Driven CHP Performance Assumptions



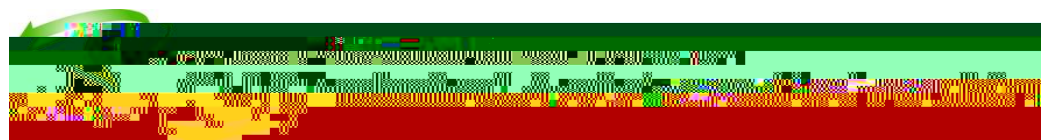
<https://betterbuildingsolutioncenter.energy.gov/pbp/casestudies>



A Feasibility Analysis Typically Involves:

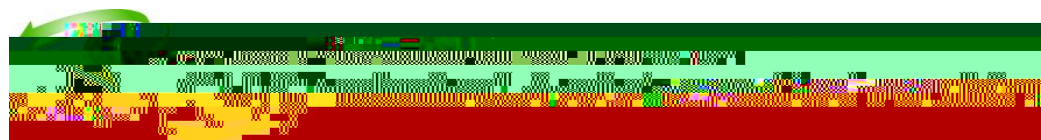
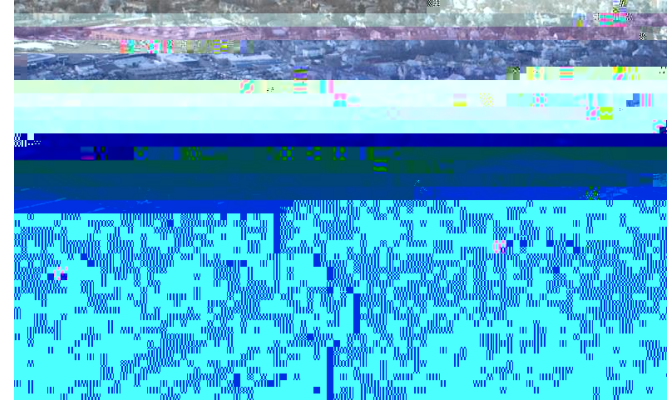


- f* Electrical load profiling
- f* Thermal load profiling
- f* Unit sizing
- f* Thermal use determination (what to do with the heat)
- f* Installation cost estimations
- f* Financial calculations (simple payback, ROI, etc.)
- f* Cost/savings information compared to what your facility would pay if the CHP system were not installed



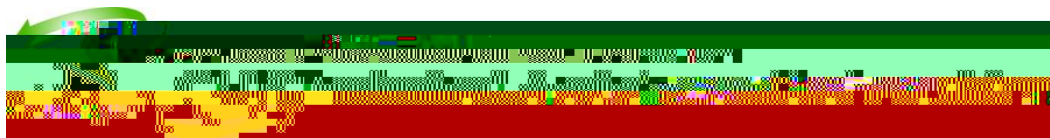
Biogas Use Options ² CHP vs. Boilers

NYC DEP



Example Hourly Analysis

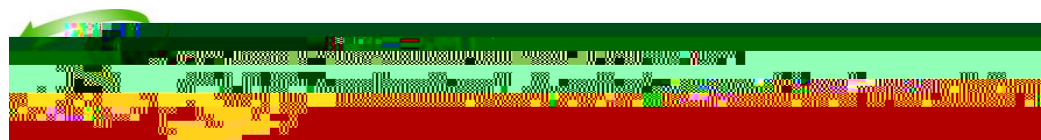
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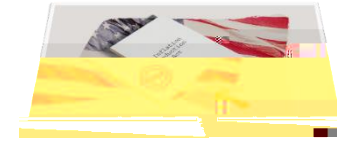
Funding Sources

- f* Environmental Facilities Corporation Green Innovation Grant Program Energy Efficiency¹
 - C** Round 12 of funding closed July 29, 2022. Applicants must complete a Consolidated Funding Application (CFA)
 - ² DEC has indicated there are significant funds available, stay tuned for new round of funding
 - C** Qualifying projects must provide power to a Publicly Owned Treatment Works (POTW) and may include wind, solar, microhydroelectric, and biogas CHP
 - C** Projects may receive up to 50% of total eligible costs, or 75% if in environmental justice area.

1 - <https://efc.ny.gov/gigp>



IRA Tax Credits



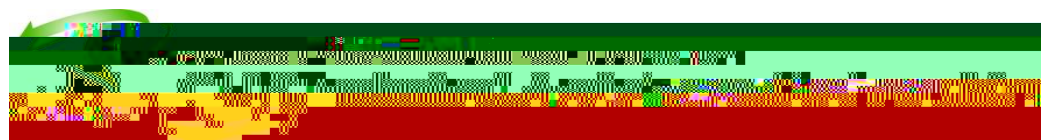
f Inflation Reduction Act

C Base & Bonus Rates

- ² The base rate for the ITC is 6%.
- ² The bonus rate for the ITC is 5 times the base rate (30%)
- ² Taxpayers receive the bonus rate for meeting the prevailing wage and apprentice requirements. Projects under 1 MW are exempted

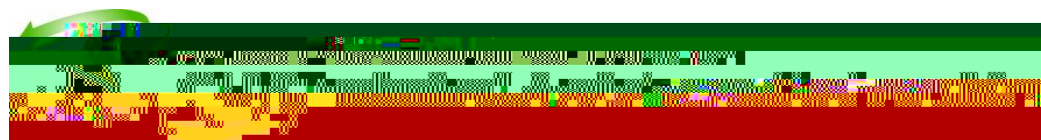
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- ² Organizations exempt from tax under subtitle A of the Internal Revenue Code are ^ %o %o o] o v š] š] • _ (} OE] OE š %o Ç u v š • X / (š Z (] o] š eligible for a direct production payment. The Treasury Department will have to create some regulations and procedures allowing taxpayers to make direct pay claims.

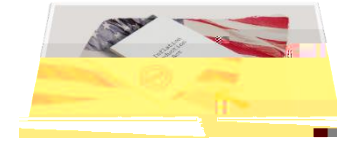


f Plus 10% Points: Domestic Content Bonus

- C** To meet the domestic content requirement the facility must use 100% domestic iron and steel and a specified percentage of domestic manufactured products, which



Additional Resources Addressing Tax Credits



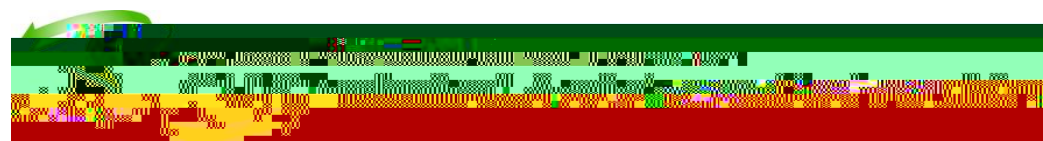
Midwest Cogeneration Association (MCA). please visit the following MCA Webinar recording of a David [v] [•] presentation on IRA/ITC Tax Credits related to CHP

<https://attendee.gotowebinar.com/recording/8658387316124991833>

Visit the Combined Heat and Power Alliance (CHP Alliance) website for information on tax credits.

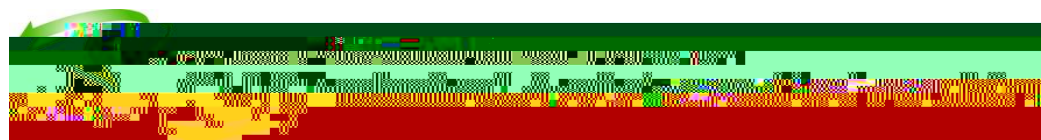
[C https://chpalliance.org/frequentlyaskedquestionschp-and-whp-in-the-inflation-reduction-act/](https://chpalliance.org/frequentlyaskedquestionschp-and-whp-in-the-inflation-reduction-act/)

<https://chpalliance.org/combined-heat-and-power-inflation-reduction-act/>



Summary

- f* CHP is a proven technology which is commercially available and has a history of deployment in tandem with other renewable technologies
- f* CHP is an essential component of the transition to carbon free energy systems.
 - C* CHP gets the most out of a renewable fuel source
 - C* High overall utilization efficiencies
 - C* Integration with and support of renewables and storage
- f* WWTPs are an ideal site for these technologies
 - C* Base load application with both electric and thermal needs
 - C* Critical infrastructure in need of resiliency which CHP provides
 - C* Incorporation of food scraps diverts waste from landfills, satisfying NY Food Scraps Law, and enabling increased biogas (power and heat) production



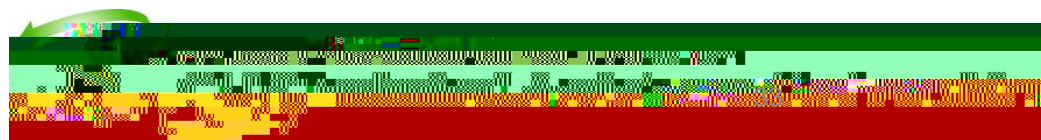
Next Steps

Contact CHP TAP for assistance if:

f If you need an unbiased 3rd Party Review of a CHP proposal for CHP on-site.

f If you have an existing CHP plant and are interested in expanding the plant.

f If you need an unbiased 3rd Party Review of a CHP proposal.



Thank You

Questions?

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<http://www.energy.pace.edu/>

