Ameren ILLINOIS | Energy Efficiency PROGRAM

# MICRO-COMBINED HEAT AND POWER: BRIDGE TO YOUR ENERGY FUTURE

Tony Ranallo
Principal
BOILERSOURCE

# Why Are We Here Today?

Ameren ILLINOIS | Energy Efficiency PROGRAM

- **Identify the Issues**
- Review the Technologies
- Meet the Manufacturers and Products
- Target Markets and Applications
- Making It Easy

# Industry Overview

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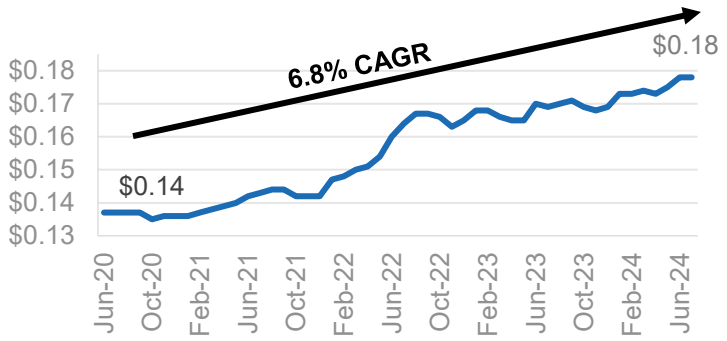
## The Problem: Homes and Businesses Need Resilient and Affordable Clean Power

### America's Grid is Unreliable

### Power Costs are Increasing



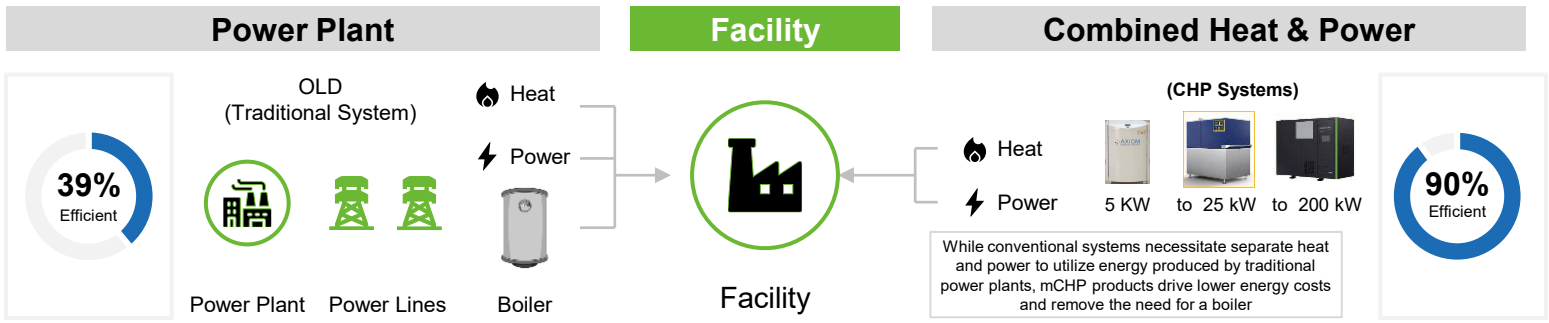

### We Need Cleaner Power

## mCHP Products

- Award winning
- Green
- Affordable
- Practical
- Tested and validated
- Patent Cooperation Treaty ("PCT") patented
- Multi fuel mix, including hydrogen

## Select Product Overview

Combined Heat and Power ("CHP") Offers High Efficiency, Energy Security, and Significant Decarbonization




CHP systems have been successfully used for decades in the industrial sector and are twice as efficient as the most efficient conventional gas power plants. mCHP systems are a miniaturized and optimized version of these industrial-scale systems.

# The US is Heading into an Energy Crisis

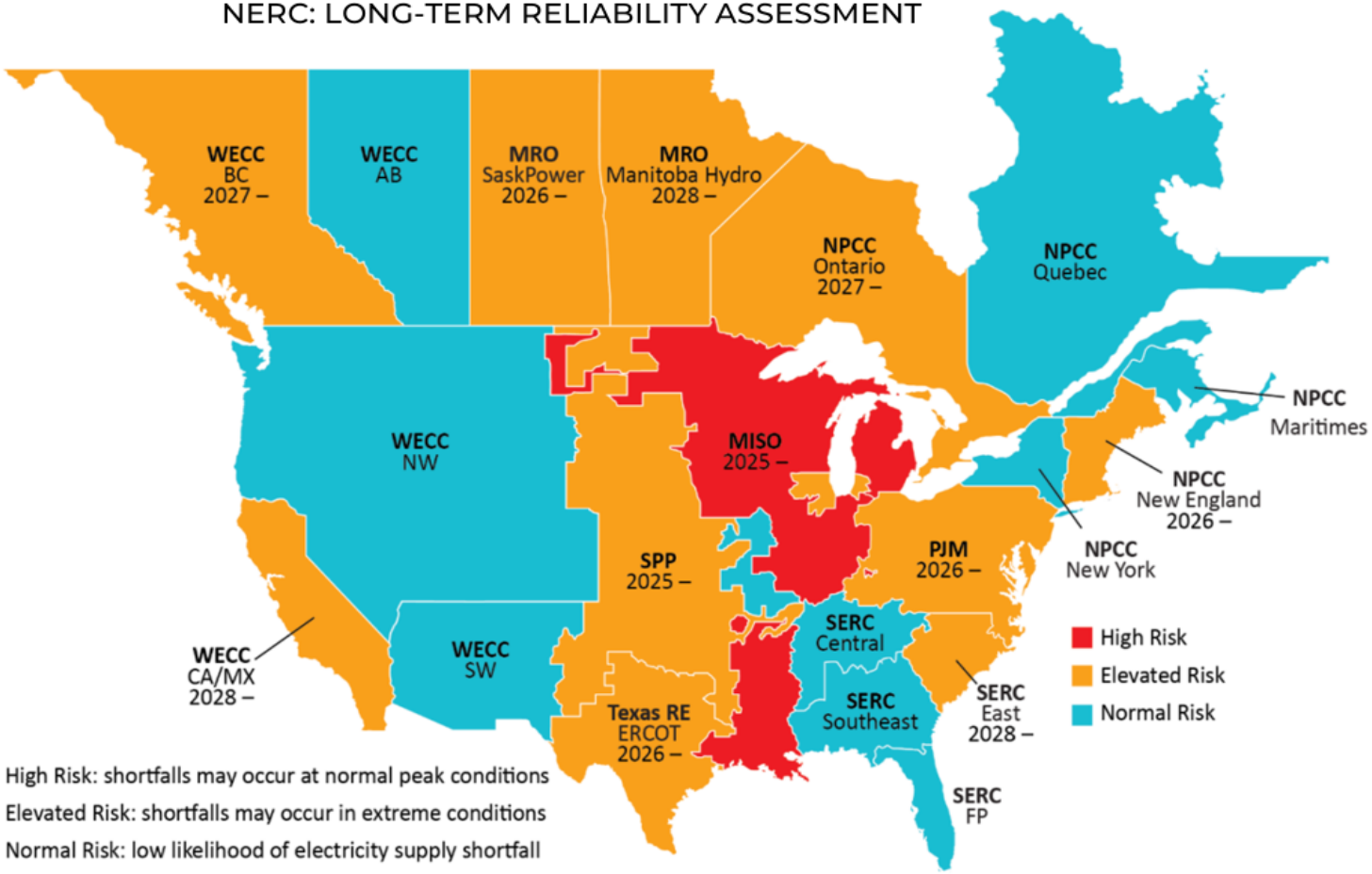
"By the summer of 2026 we will have **supply disruption**"

-Executive Director PJM

"By the summer of 2027 we will see **voltage collapse**"

-Executive Director PJM

NERC: LONG-TERM RELIABILITY ASSESSMENT




High Risk: shortfalls may occur at normal peak conditions

Elevated Risk: shortfalls may occur in extreme conditions

Normal Risk: low likelihood of electricity supply shortfall

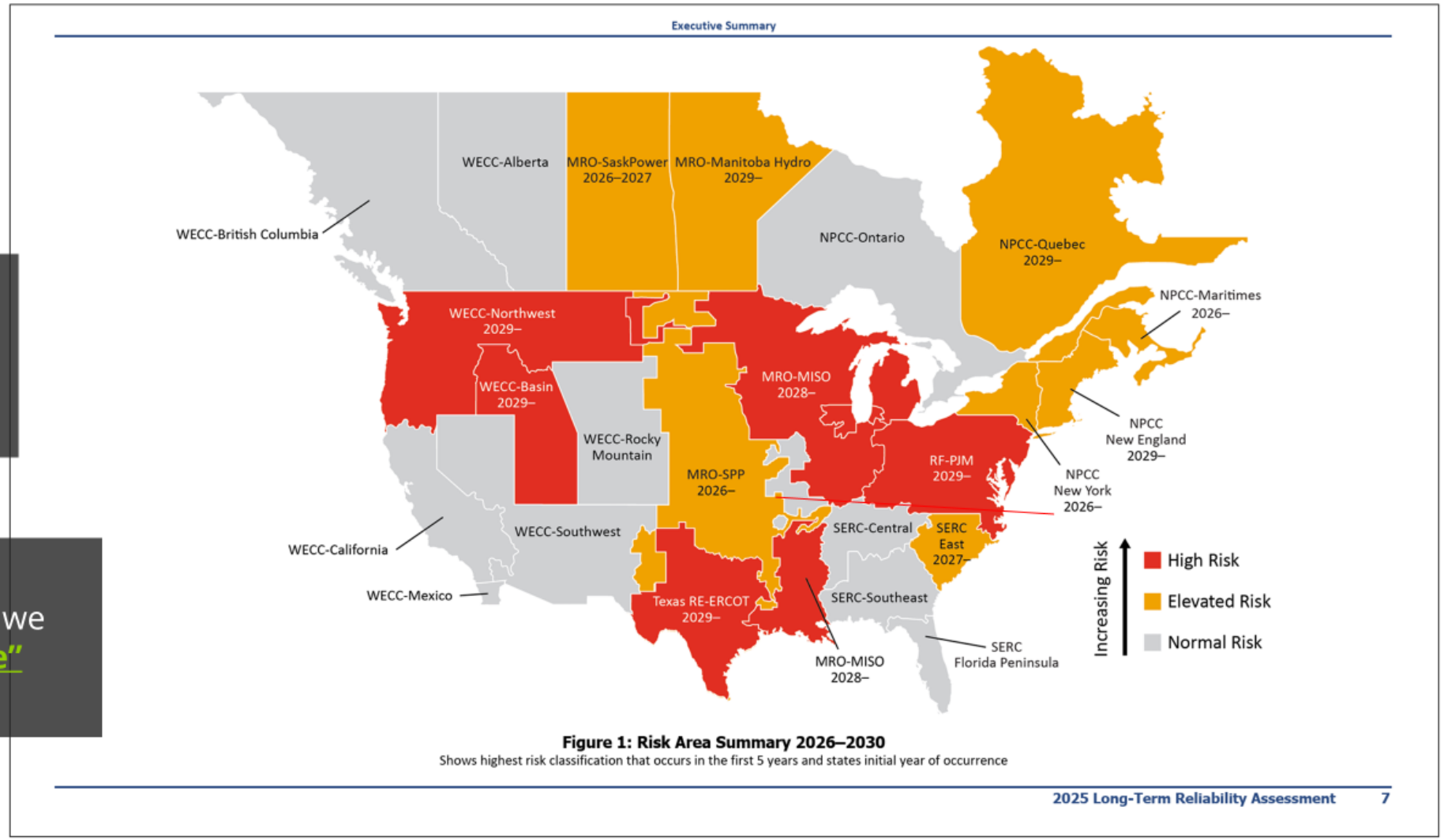
# Newest assessment even darker...

"By the summer of 2026 we will have **supply disruption**"

-Executive Director PJM

"By the summer of 2027 we will see **voltage collapse**"

-Executive Director PJM




Published by NERC in January of 2026 as a part of their "Long-Term Reliability Assessment" document

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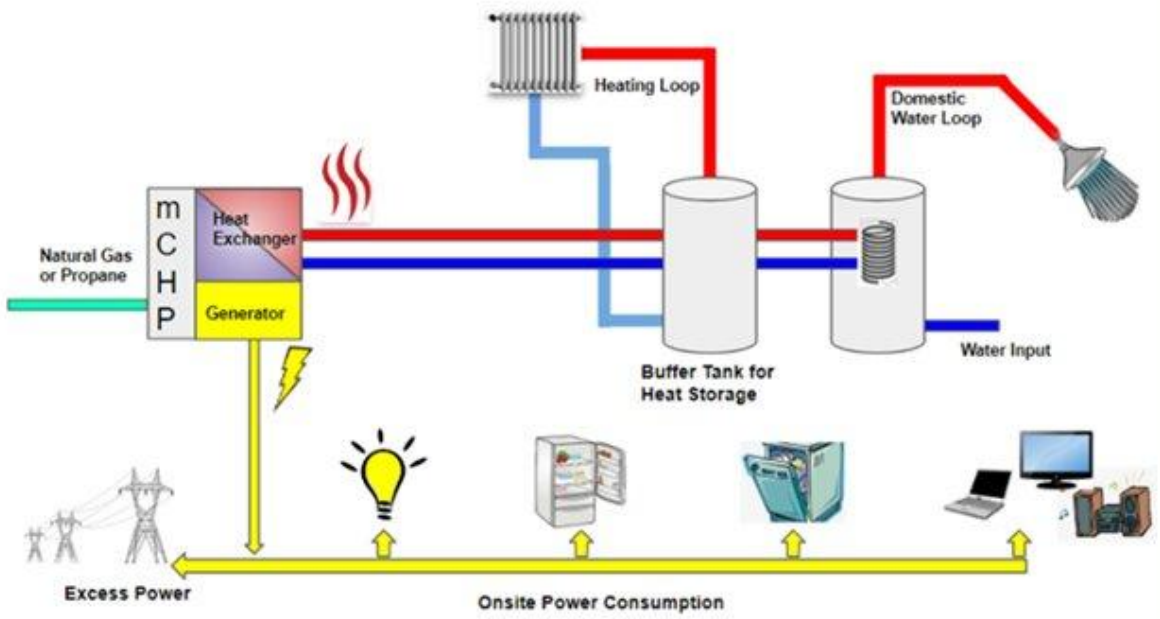
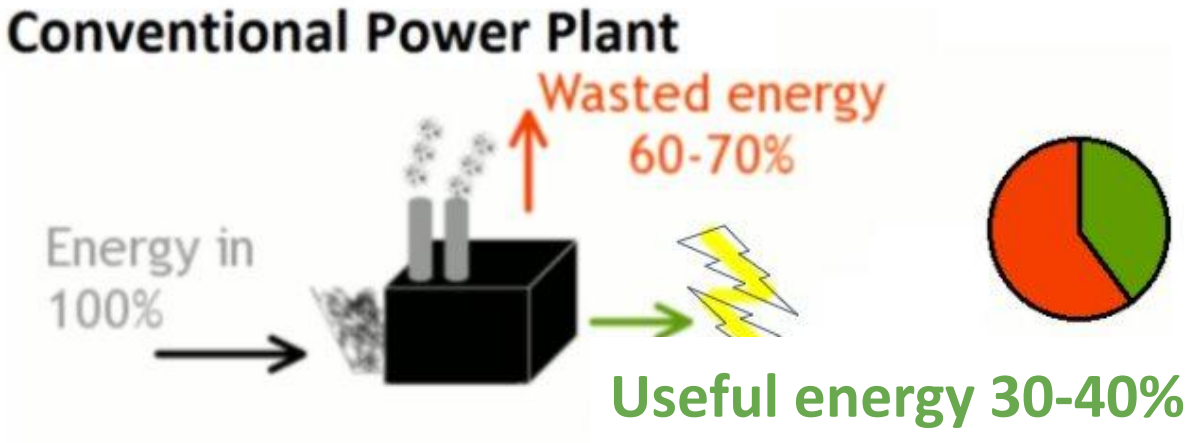
# mCHP – Innovative Technology




mCHP 90+% efficiency v. 30-40% efficiency with conventional power grid



# Energy Center Main Advantages

- Flexibility of components and fuel
  - Natural Gas, Propane, Biogas (only EU), H2 Ready
- Lower dependency on any one fuel (oil, gas, electricity)
- Partially independent from grid – resistant to blackouts
- Significantly lower $CO^2$ emissions
- Low operating costs – short payback time
- Turn energy use from a cost center to a profit center
- Higher efficiency
- Mature, reliable product
- **It simply works!**

# Regarded as Superior Technology

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Combined Heat and Power is regarded by the Environmental Protection Agency (EPA), Department of Energy (DOE) and the Energy Information Agency (EIA) as one of the most affordable, cleanest, efficient and reliable energy sources available.

EPA - CHP is Superior for Hospitals

EPA - CHP offers Efficiency, Environmental, Economical and Reliability Benefits

DOE - CHP can Improve Nation's Energy, Economic, Environmental Future

DOE - CHP can be Deployed Quickly, Cost-Effectively, and With Few Geographic Limitations

EIA - CHP Fills an Important Energy Niche

EIA - CHP is one of the Most Efficient and Effective Sources of Electric Generation

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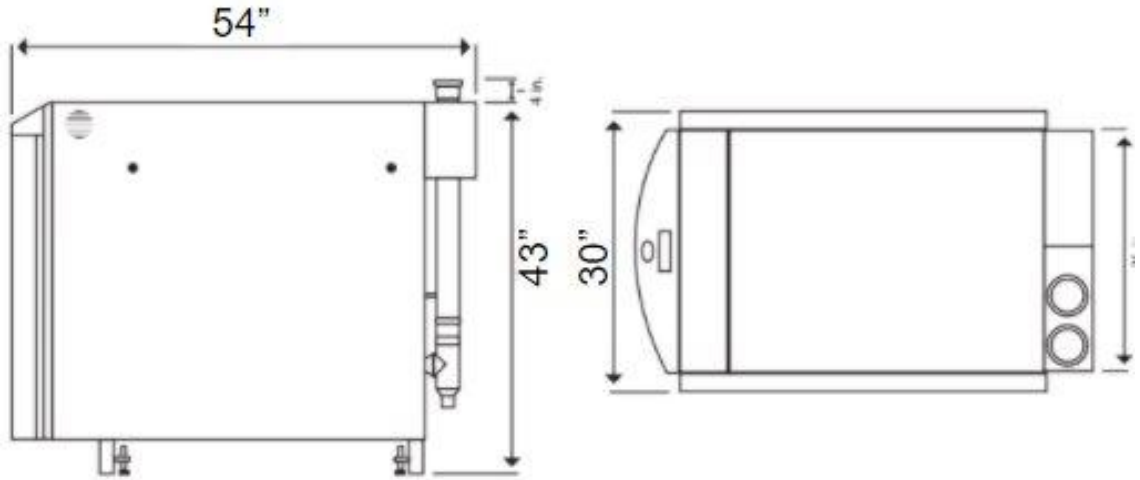
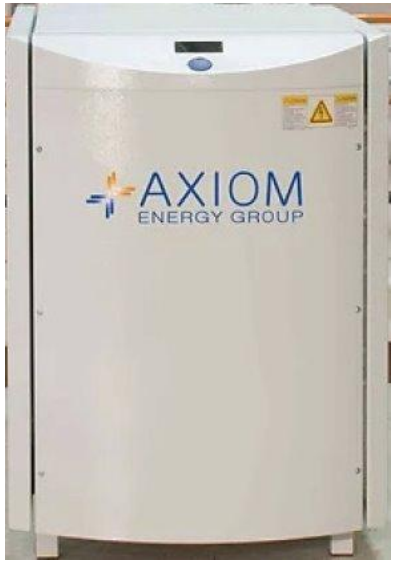
# Axiom Energy mCHP System Overview

## Compact and Modular



- 1.2 - 4.4 kWh of electricity (single phase)
- 15,000 - 47,000 btu/hr of heat - Propane
- 13,000 - 42,500 btu/hr of heat - NG
- Exhaust Gas Temperature 1800° F
- Overall efficiency = 93%
- Sound Level - 55dB

# Chicago Multifamily mCHP

## Success Story: 5550 S. Dorchester Avenue, Chicago, IL

> **"Imagine if your water heater also made electricity and you didn't have to spend any more to keep it running."**
>
> — **Jon Nichols,**
> Director of Sustainability for Antheus Capital/ Fernwood Property Management

**Installed equipment**
- Two Axiom Energy 4.4 kW mCHP units
- Integration with existing domestic hot water infrastructure
- On-site electricity generation for common-area building loads

**Projected energy impact**
- 50,000 kWh generated annually
- 20% of building electric load offset
- Recovered waste heat met 55% of annual hot water demand
- 95% total fuel utilization efficiency through mCHP generation

**Building benefits**
- Lower operating costs
- Improved energy efficiency
- Reduced strain on existing equipment
- Project completed in less than six months

### How a Chicago apartment building improved efficiency and generated its own power with a micro combined heat and power (mCHP) system

The Peoples Gas Energy Efficiency Program helps multifamily building owners identify innovative ways to reduce energy costs while improving building performance.

At 5550 S. Dorchester in Chicago's Hyde Park neighborhood, a mCHP system was installed to generate electricity on-site while providing useful thermal energy for domestic hot water production.

The project demonstrates how mCHP technology can be successfully integrated into a typical multifamily building to improve efficiency, reduce operating costs, and increase overall system performance.

### Key takeaways

Two 4.4-kilowatt (kW) Axiom Energy mCHP units were installed at a 120-unit multifamily residential building managed by Fernwood Property Management and Antheus Capital.

The system generates electricity that is used to offset common-area electrical demand within the building while simultaneously recovering thermal energy that is used to preheat domestic hot water.

The project was completed in less than six months and demonstrates how mCHP technology fits successfully in a typical multifamily building to drive energy savings and lower operating costs.

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### Addressing multifamily energy challenges

Like many multifamily buildings, 5550 S. Dorchester relies on centralized systems to provide domestic hot water and heating to residents.

Prior to the project, the building's domestic hot water system was operating reliably but required significant energy to meet demand. At the same time, rising electricity costs were increasing pressure on operating budgets.

The property owner was interested in identifying technologies capable of reducing energy costs while maintaining resident comfort and reliable service.

"5550 S. Dorchester is a regular old multifamily building," explained Jon Nichols, Director of Sustainability for Antheus Capital and Fernwood Property Management. "It's pretty typical of our portfolio."

The project offered an opportunity to evaluate whether mCHP technology could provide value not only for this property but potentially for other buildings throughout the company's portfolio.

### Optimizing energy use with mCHP

Working with the Peoples Gas Energy Efficiency Program and project partners Boilersource and Premistar, the building owner evaluated opportunities to integrate mCHP technology into the existing domestic hot water system.

Because the technology was integrated into existing infrastructure, installation was completed with minimal disruption to residents and building operations.

The system's initial results are:

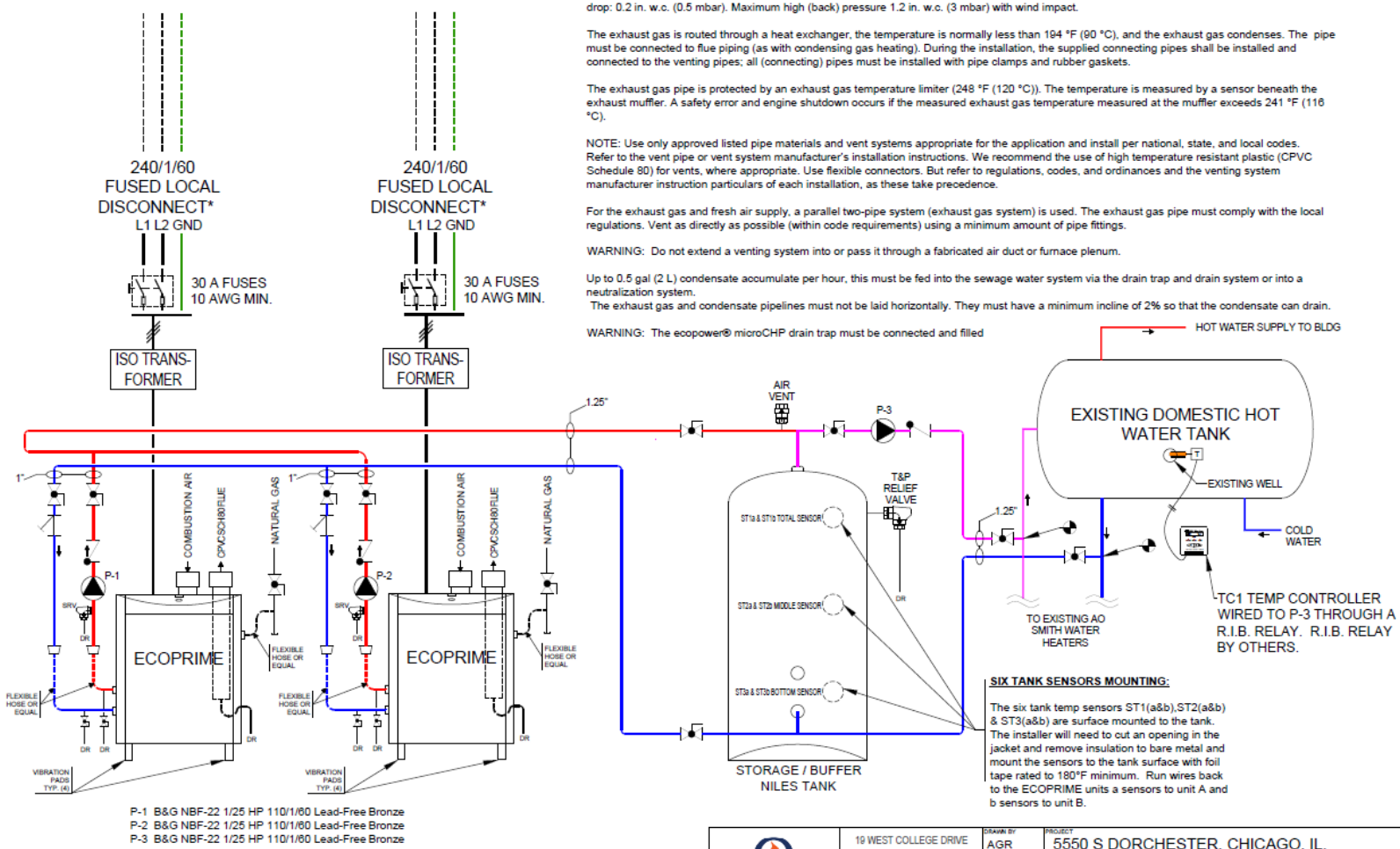
- Generate approximately **50,000 kWh** annually
- Supply approximately **55%** of domestic hot water demand
- Offset approximately **20%** of the building's electric load

"The installation of the mCHP has taken out a real chunk of our electricity cost," said Nichols. "Being able to reduce that kW demand is enormous."

The project also demonstrates that mCHP technology can be successfully deployed in typical multifamily buildings rather than only large commercial or industrial facilities. mCHP is a decarbonization opportunity for property owners looking to reduce their building's carbon footprint while meeting their energy needs.

"Almost any of our legacy buildings could be appropriate," Nichols noted.

For property owners facing rising energy costs, that may be the most valuable takeaway of all.




**VENTING NOTES:**

A trained installer must install the connections. The fresh air supply and the exhaust gas pipes and vents must comply with NFPA 54 (ANSI Z223.1) installation guidelines or state and local codes. The rules and regulations of the respective country and locality must be observed.
Maximum length of the air intake path: 65 ft. (19.8 m) minimum inner diameter 2.76 in. (70mm) with a maximum of six 90 degree bends. Maximum length of the exhaust system: 65 ft. (19.8 m) at minimum inner diameter 2.76 in. (70 mm), with a maximum of six 90 degree bends. Total pressure drop: 0.2 in. w.c. (0.5 mbar). Maximum high (back) pressure 1.2 in. w.c. (3 mbar) with wind impact.

The exhaust gas is routed through a heat exchanger, the temperature is normally less than 194 °F (90 °C), and the exhaust gas condenses. The pipe must be connected to flue piping (as with condensing gas heating). During the installation, the supplied connecting pipes shall be installed and connected to the venting pipes; all (connecting) pipes must be installed with pipe clamps and rubber gaskets.

The exhaust gas pipe is protected by an exhaust gas temperature limiter (248 °F (120 °C)). The temperature is measured by a sensor beneath the exhaust muffler. A safety error and engine shutdown occurs if the measured exhaust gas temperature measured at the muffler exceeds 241 °F (116 °C).

NOTE: Use only approved listed pipe materials and vent systems appropriate for the application and install per national, state, and local codes. Refer to the vent pipe or vent system manufacturer's installation instructions. We recommend the use of high temperature resistant plastic (CPVC Schedule 80) for vents, where appropriate. Use flexible connectors. But refer to regulations, codes, and ordinances and the venting system manufacturer instruction particulars of each installation, as these take precedence.

For the exhaust gas and fresh air supply, a parallel two-pipe system (exhaust gas system) is used. The exhaust gas pipe must comply with the local regulations. Vent as directly as possible (within code requirements) using a minimum amount of pipe fittings.

WARNING: Do not extend a venting system into or pass it through a fabricated air duct or furnace plenum.

Up to 0.5 gal (2 L) condensate accumulate per hour, this must be fed into the sewage water system via the drain trap and drain system or into a neutralization system.
The exhaust gas and condensate pipelines must not be laid horizontally. They must have a minimum incline of 2% so that the condensate can drain.

WARNING: The ecopower® microCHP drain trap must be connected and filled

**SIX TANK SENSORS MOUNTING:**

The six tank temp sensors ST1(a&b),ST2(a&b) & ST3(a&b) are surface mounted to the tank. The installer will need to cut an opening in the jacket and remove insulation to bare metal and mount the sensors to the tank surface with foil tape rated to 180°F minimum. Run wires back to the ECOPRIME units a sensors to unit A and b sensors to unit B.

P-1 B&G NBF-22 1/25 HP 110/1/60 Lead-Free Bronze
P-2 B&G NBF-22 1/25 HP 110/1/60 Lead-Free Bronze
P-3 B&G NBF-22 1/25 HP 110/1/60 Lead-Free Bronze

| | | | | |
|---|---|---|---|---|
| BOILERSOURCE Going Beyond the Boilerplate | 19 WEST COLLEGE DRIVE ARLINGTON HEIGHTS, IL 60004 (847) 253-1040 BOILERSOURCE.COM | DRAWN BY AGR | PROJECT 5550 S DORCHESTER, CHICAGO, IL. | REVISION 4 |
| | | CHECKED BY | DRAWING TITLE TWO AXIOM ECOPRIME mCHP WITH BUFFER TANK FOR DHW ONLY | DATE 1/8/26 |
| | | SCALE NONE | | SHEET |

- 12 - 24 kWh of electricity (480/3/60)
- 112,000 - 163,000 BTUH of heat - NG
- Water supply temperature ~185$^0$ F
- Total overall efficiency = 93%
- 49dB

* Storage tank is not included in the basic price

## STORAGE TANK

- Stores excess heat in the event of high demand for electricity
- Reserve in the event of high demand for heat

## POWER UNIT

- Engine drives generator
- Generator produces electricity
- Heat exchanger transfers heat to the Q-Heat Distributor

## Q-HEAT DISTRIBUTOR

- Absorbs heat from the Power Unit
- Distributes heat to the water circuit and/or Storage Tank

## iQ-CONTROL PANEL

- Controls the system to meet requirements
- Analyses in real-time your consumption patterns and optimises operation fully automatically

# Half Acre Beer Company mCHP Project

Success Story

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> **"We've done a lot of work in the sustainability area already. The engineering study showed this was the biggest opportunity we still had."**
>
> — **Travis Hixon,**
> Director of Operations for
> Half Acre Beer Company

**Installed equipment**
- Two EC Power XRGI-25 mCHP units
- Two 450-gallon storage tanks
- Integrated heat recovery and hot water preheating system

**Projected energy impact**
- Generate up to 48 kilowatts (kW) of on-site electricity
- 14% of building electric load offset
- Recovered waste heat met 59% of annual hot water demand
- 93% total fuel utilization efficiency through mCHP generation

**Projected annual impact**
- $17,888 net operating savings
- 138,000 kilowatt hours (kWh) electricity savings

## A better batch of savings: how Half Acre Beer Company puts every therm to work

The Peoples Gas Energy Efficiency Program helps businesses identify innovative ways to reduce operating costs by improving energy efficiency.

When Half Acre Beer Company wanted to understand where it could make its next meaningful energy improvement, an engineering study pointed to an opportunity hiding in plain sight. By installing a micro combined heat and power (mCHP) system, the brewery now uses natural gas to generate electricity on-site while putting recovered heat to work in the brewing process — helping lower overall energy costs without disrupting production.

## Looking beyond the obvious

After years of investing in sustainability and efficiency, Half Acre has already completed many of the improvements typically recommended for breweries. Rather than assuming there was little left to gain, the brewery applied for an engineering study from the Peoples Gas Energy Efficiency Program to take a closer look at mCHP.

The engineering study confirmed mCHP could successfully improve overall energy performance. Even better, rising electricity prices made generating power on-site with natural gas even more valuable than originally projected.

"We've done a lot of work in the sustainability area already," said Travis Hixon, Director of Operations. "This was the biggest opportunity we still had."

## Making a complex project feel simple

Implementing the technology was new to a brewery of Half Acre's size.

Working with the Peoples Gas Energy Efficiency Program and project partners Kinergetics, Boilersource, and Stanton Mechanical, the brewery found a way to integrate the system into its existing facility despite limited available space. Installation was carefully coordinated around daily operations, allowing brewing to continue with no interruption.

"They were very respectful and professional working in a live production environment," said Hixon. "Really, there was no lost production time."

## A model for other facilities

Every brewery depends on reliable electricity and large volumes of hot water. The mCHP system addresses both needs simultaneously by generating electricity while recovering heat that would otherwise be wasted.

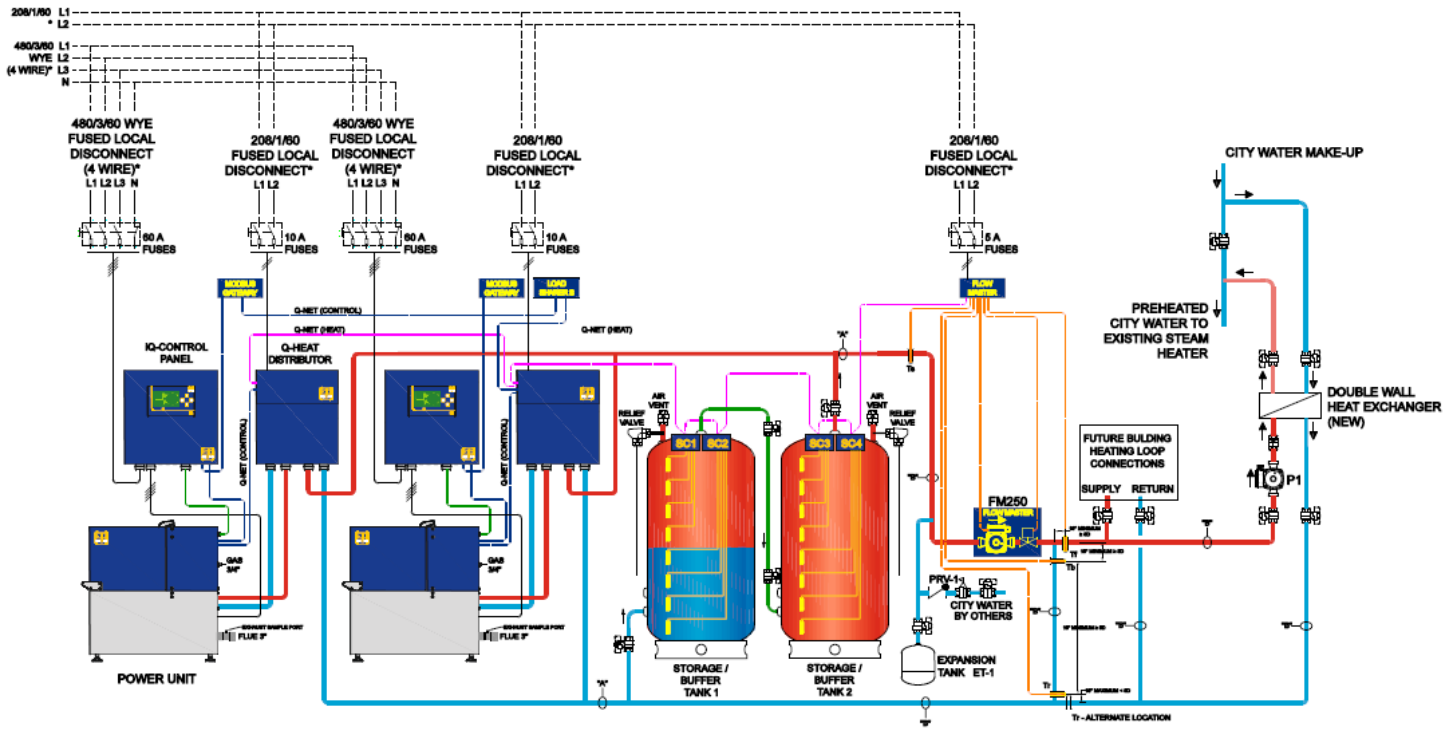
For breweries and other businesses with continuous thermal and electrical demand, mCHP can be a practical way to improve efficiency, reduce operating costs, and make better use of the energy they already consume.

## Explore your facility upgrade path

See how mCHP is helping breweries, food processors, and other industries improve efficiency, lower operating costs, and strengthen operational reliability by making better use of energy they already consume.

## Interested in learning how mCHP can work for your building?

Contact **innovative-solutions@peoplesgasdelivery.com** to discuss your options.




## Technical Specifications

| MODEL XRGI 25 | 2 UNITS |
|---|---|
| KW OUTPUT | 48 |
| FLA @ 100% | 82 |
| Recommended Natural Gas Pressure Range | 8 - 10" w.c. |
| Combustion Air Net Free Area | 48 sq. in. |
| INPUT MBH @100% | 524 |
| OUTPUT MBH @100% | 326 |
| MANIFOLD A SIZE - MINIMUM | 2" |
| MANIFOLD B SIZE - MINIMUM | 2" |
| STORAGE CONTROL - PANELS / SENSORS | 4 / 16 |
| TANK RELIEF VALVE SIZE / PRESS | 3/4" / 60 PSI |

## Bill of Material

| ITEM | DESCRIPTION |
|---|---|
| P1 | PUMP B&G PL-45 C.I./S.S. 1/6 HP 1.5" Flanges 115/60/1 * |
| P2 | |
| P3 | |
| ST1 & 2 | NILES TANK - Model S-36-102 415 GALLON BUFFER TANK. SC sensors to be field installed. To be field insulated |
| HX1 | HEXONIC - Safety Plate Double Walled Brazed Plate Heat Exchanger LB47SP-60H-1"-UM approx 336 MBH |
| ET-1 | AMTROL SX-90V OR EQUAL |
| PRV-1 | B&G MODEL B-38 OR EQUAL SET TO 12 PSI |
| FM 250 | FLOW MASTER MODEL FM 250 208/1/60* |
| | |
| * | Provide ground per NEC and local electric code |

**SCOPE:**

The goal of this project is to reduce electrical consumption and reduce the electrical demand charge for the facility. All the heat provided by the CHP units will reduce the heat generated by the existing steam boiler.

| | | | |
|---|---|---|---|
| 19 WEST COLLEGE DRIVE<br>ARLINGTON HEIGHTS, IL 60004<br>(847) 253-1040<br>BOILERSOURCE.COM | DRAWN BY: AGR<br>CHECKED BY:<br>SCALE: NONE | PROJECT: HALF ACRE BEER COMPANY<br>DRAWING TITLE: EC POWER 2 - XRGI 25 SYSTEMS, 2 - BUFFER TANKS, HEATING, & DHW HX | REVISION: 12<br>DATE: 10/30/25<br>SHEET: |

ENGINUITY
POWER SYSTEMS

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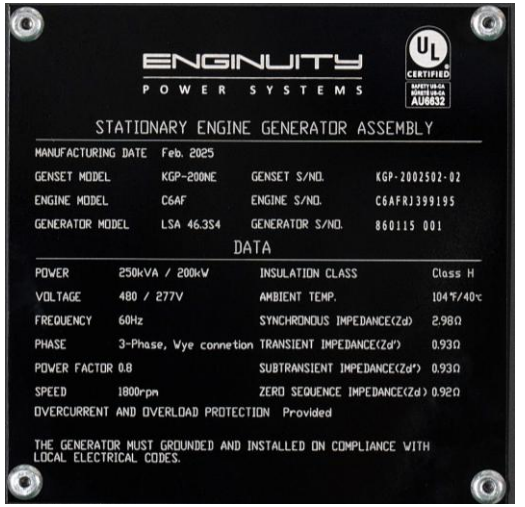
# Enginuity CHP

- 100 and 200kW CHP systems available
- Continuous on-site power and hot water
- Usable heat for facility needs
- Higher total efficiency
- Energy that works every day
- Maintain continuous operations
- Reduce exposure to grid disruptions
- Make better use of the energy they already consume

**Meaning more value from every unit of energy vs. ~55% efficiency from even the best grid power plants**

# E|200 Spec Summary

- Powered by: natural gas
- EPA and UL certified
- 180kW continuous electric output (peak at 200kW)
- Approx. 1.1M BTUs output
- 58 gallons per minute $H_2O$ at 203° F



# E|200 and E|100 Spec Deep Dive

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## 200KW SPECIFICATIONS

ENGINUITY POWER SYSTEMS

| | | |
|---|---|---|
| Electric Power Output | Peak | 200kW |
| | Continuous | 180kW |
| | Standby | 150kW |
| | Voltage / Frequency | 480VAC / 60Hz |
| | Output Wiring | 3 phase / 4 wire |
| System Efficiency | Electric Generation Efficiency | 31.3% |
| | Heat Recovery Efficiency | 53.7% |
| | Overall Efficiency | 85.0% |
| Engine | Manufacturer | Hyundai |
| | No. of Cylinder | 6 |
| | Aspiration | Turbo Charged Intercooler |
| Fuel | Fuel Types | Natural Gas, Propane* |
| | Fuel Pressure - Minimum | 5 kPa (20 inch w.c.) |
| | Fuel Pressure - Maximum | 40 kPa (161 inch w.c.) |
| | Fuel Consumption (flow) | 57.5 m^3/hr (33.8 ft^3/min) |
| | Fuel Consumption Rate** | 1,962,700 BTU/hr |
| | Fuel Connection Port Size | NPT 1-1/2" (40A) |
| Sound Level | Measured at 9.84ft (3m) | 85 dBA |
| Dimension | Length | 3,200 mm (126 in) |
| | Width | 1,830 mm (76 in) |
| | Height | 2,158 mm (85 in) |
| | Height (with cooling fans) | 2,486 mm (98 in) |
| | Weight (dy, no fluids added) | 3,200 kg (7,055 lb.) |
| Thermal Output | Peak | 336 kW (1,146,000 BTU/hr) |
| | Continuous | 309 kW (1,054,000 BTU/hr) |
| | Standby | 263 kW (897,000 BTU/hr) |
| Water | Temp difference supply / return (ΔT) | 20 °C (36 °F) |
| | Output Water Temp - Max | 95 °C (203 °F) |
| | Water Flow - Max rated | 221 LPM (58.4 GPM) |
| | Water Connection Port Size | 2" (50A) |

*Notes:*
**all performance specs are based on natural gas, for detailed performance on propane contact EPS*
***based on LHV of 34,129 BTU / m^3*

## 100KW SPECIFICATIONS

ENGINUITY POWER SYSTEMS

| | | |
|---|---|---|
| Electric Power Output | Peak | 110kW |
| | Continuous | 100kW |
| | Standby | 100kW |
| | Voltage / Frequency | 480VAC / 60Hz |
| | Output Wiring | 3 phase / 4 wire |
| System Efficiency | Electric Generation Efficiency | 30.8% |
| | Heat Recovery Efficiency | 54.2% |
| | Overall Efficiency | 85.0% |
| Engine | Manufacturer | Hyundai |
| | No. of Cylinder | 6 |
| | Aspiration | Natural Aspiration |
| Fuel | Fuel Types | Natural Gas, Propane* |
| | Fuel Pressure - Minimum | 5 kPa (20 inch w.c.) |
| | Fuel Pressure - Maximum | 40 kPa (161 inch w.c.) |
| | Fuel Consumption (flow) | 28.5 m^3/hr (16.8 ft^3/min) |
| | Fuel Consumption Rate** | 972,700 BTU/hr |
| | Fuel Connection Port Size | NPT 1-1/2" (40A) |
| Sound Level | Measured at 9.84ft (3m) | 85 dBA |
| Dimension | Length | 2,980 mm (117 in) |
| | Width | 1,630 mm (64 in) |
| | Height | 2,256 mm (89 in) |
| | Height (with cooling fans) | 2,486 mm |
| | Weight (dy, no fluids added) | 3,000 kg (6,613 lb.) |
| Thermal Output | Peak | 194 kW (662,000 BTU/hr) |
| | Continuous | 183 kW (624,000 BTU/hr) |
| | Standby | 183 kW (624,000 BTU/hr) |
| Water | Temp difference supply / return (ΔT) | 20 °C (36 °F) |
| | Output Water Temp - Max | 95 °C (203 °F) |
| | Water Flow - Max rated | 139 LPM (36.7 GPM) |
| | Water Connection Port Size | 2" (50A) |

*Notes:*
**all performance specs are based on natural gas, for detailed performance on propane contact EPS*
***based on LHV of 34,129 BTU / m^3*

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- **Target Markets and Applications**
- Making it Easy

# Applications

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Indoor Agriculture

Distilleries

Manufacturing

Hotels

Pharmaceutical Lab

Sports Club

Multi-Family

Hospitals

Industrial

Food Processing

Nursing Homes

Municipal

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# What Makes Us Special

- Field and internal support teams.
  - System evaluation, design, troubleshooting, training, startup, etc.
- Bridge between our system manufacturers and the industries we serve.
  - Experience and responsiveness during the design phase and installation.
  - We will work with MFES assessors and Trade Ally Contractors to make the process easy.
- Work with manufacturers to ensure their products continuously improve.
- WBE/DBE

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**Tony Ranallo**
COO/ Principal
(847) 770-0788 cell
tony@boilersource.com

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BOILERSOURCE
*Going Beyond the Boilerplate*

***We are a nationally certified Women-owned Business Enterprise (WBE)***
***Going Strong for Over 50 Years!***

Certified WBENC Women's Business Enterprise

INNOVATION · UNDERSTANDING · COMMITMENT
TLC360°
***Let us tell you about our TLC360° promise!***

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# THANK YOU