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# ON-SITE POWER EXPO

## Featuring Combined Heat and Power (CHP), Solar PV, and Energy Storage

# On-Site Power Expo Partners

**Batteries/Fuel Cells:**
New York Battery and Energy Storage Technology Consortium - NY-BEST

**Solar PV:**
New York Solar Energy Industries Association - NYSEIA
Solar Energy Industries Association - SEIA

**Combined Heat and Power (CHP):**
Northeast Clean Heat and Power Initiative - NECHPI
CHP Association
World Alliance for Decentralized Energy - WADE
International District Energy Association - IDEA

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# On-Site Power Expo Partners

**Government:**
U.S. Department of Energy
U.S. Environmental Protection Agency
NYS Department of Public Service
NYC Department of Buildings
NYC Retrofit Accelerator

**Utilities:**
Con Edison
National Grid
New York Power Authority
Long Island Power Authority / PSEG-Long Island

**Finance:**
NY Green Bank
NYC Energy Efficiency Corporation - NYCEEC

**Clean Energy Implementation Support:**
Sustainable CUNY
Pace Energy and Climate Center

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# NYSERDA Advice

## On-Site Power Systems can positively impact your triple-bottom-line

- ***Financial*** - Energy cost savings
- ***Sustainability*** - Reduced carbon footprint
- ***Reliability*** - Some configurations can provide power during a utility grid outage

## When considering an On-Site Power System, it is good to also consider Energy Efficiency

- Energy Efficiency is the first, best investment (upgrade to better lighting, better motors, better insulation, better appliances, etc.)
- Fulfilling your needs by using energy more efficiently will minimize the size and installation cost of an On-Site Power System

# NYSERDA Advice

## An Individual Technology can deliver a successful On-Site Power solution

- ***Solar PV*** - Photovoltaics
- ***Energy Storage*** - Batteries
- ***Combined Heat and Power (CHP)*** - Also known as Cogeneration

## A Hybrid (integrated, multi-technology) On-Site Power System can offer extra value in some cases, such as

- Solar + Storage provides firm production despite periodic cloudiness
- CHP + Solar + Storage provides robust resiliency and economically vibrant flexibility

**Choose from an ample cadre of competent solution providers**

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# What is combined heat and power (CHP)?

CHP is an *integrated energy system* that:

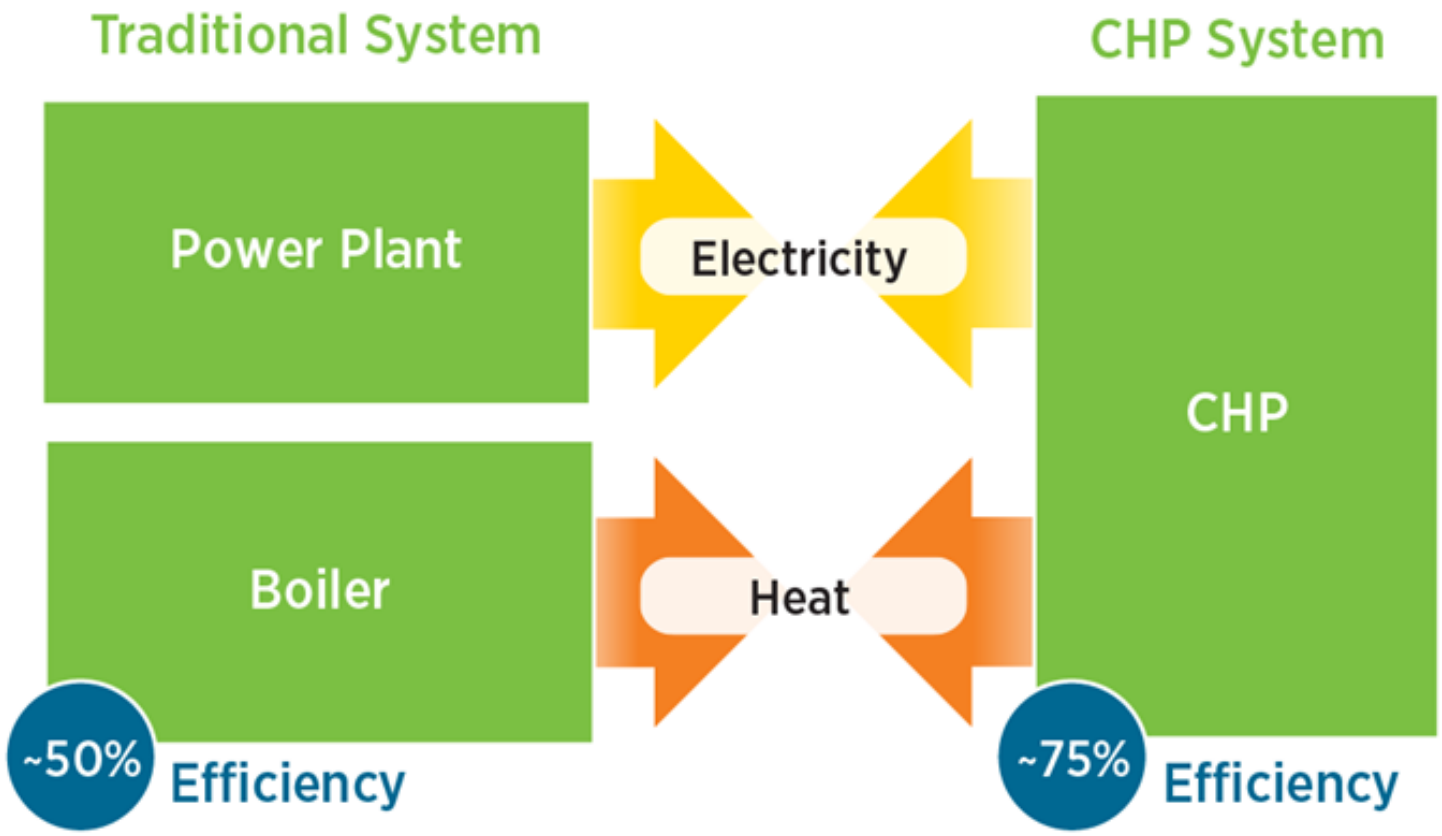
- Is located at or near a factory or building
- Generates electrical and/or mechanical power
- Recovers byproduct heat for
  - heating,
  - cooling or
  - dehumidification
- Can utilize a variety of technologies and fuels

# What is combined heat and power (CHP)?

CHP is the simultaneous production of electricity and heat from a single fuel source


CHP is also commonly referred to as **cogeneration**.

# Compared to separately producing electricity and heat, CHP is much more efficient.



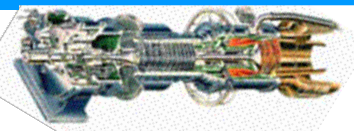

Efficiency = lower energy costs = lower total emissions

# CHP can use a Variety of Technologies and Fuels

Fuels: **Natural Gas – Biogas - Propane**

**Microturbines**

**Gas Turbines**



**Reciprocating Engines**


**Fuel Cells**

50 kW 100 kW 1 MW 10 MW 20 MW

# What are common uses for CHP?

- Produce onsite some of your everyday electrical power and continue to buy remainder from the utility grid, while
- Recycling the electric generator's byproduct heat for use in heating and/or cooling, and
- Keep power flowing to your priority loads during grid outages

# CHP is a great option for many market sectors

## Industrial

- Chemical manufacturing
- Ethanol
- Food processing
- Natural gas pipelines
- Petrochemicals
- Pharmaceuticals
- Pulp and paper
- Refining
- Rubber and plastics

## Commercial

- Data centers
- Hotels and casinos
- Multi-family housing
- Laundries
- Apartments
- Office buildings
- Refrigerated warehouses
- Restaurants
- Supermarkets
- Green buildings

## Institutional

- Hospitals
- Schools (K – 12)
- Universities & colleges
- Wastewater treatment
- Residential confinement

## Agricultural

- Concentrated animal feeding operations
- Dairies
- Wood waste (biomass)

# CHP Is Used Nationwide

**>4,300 CHP Sites (2013)**

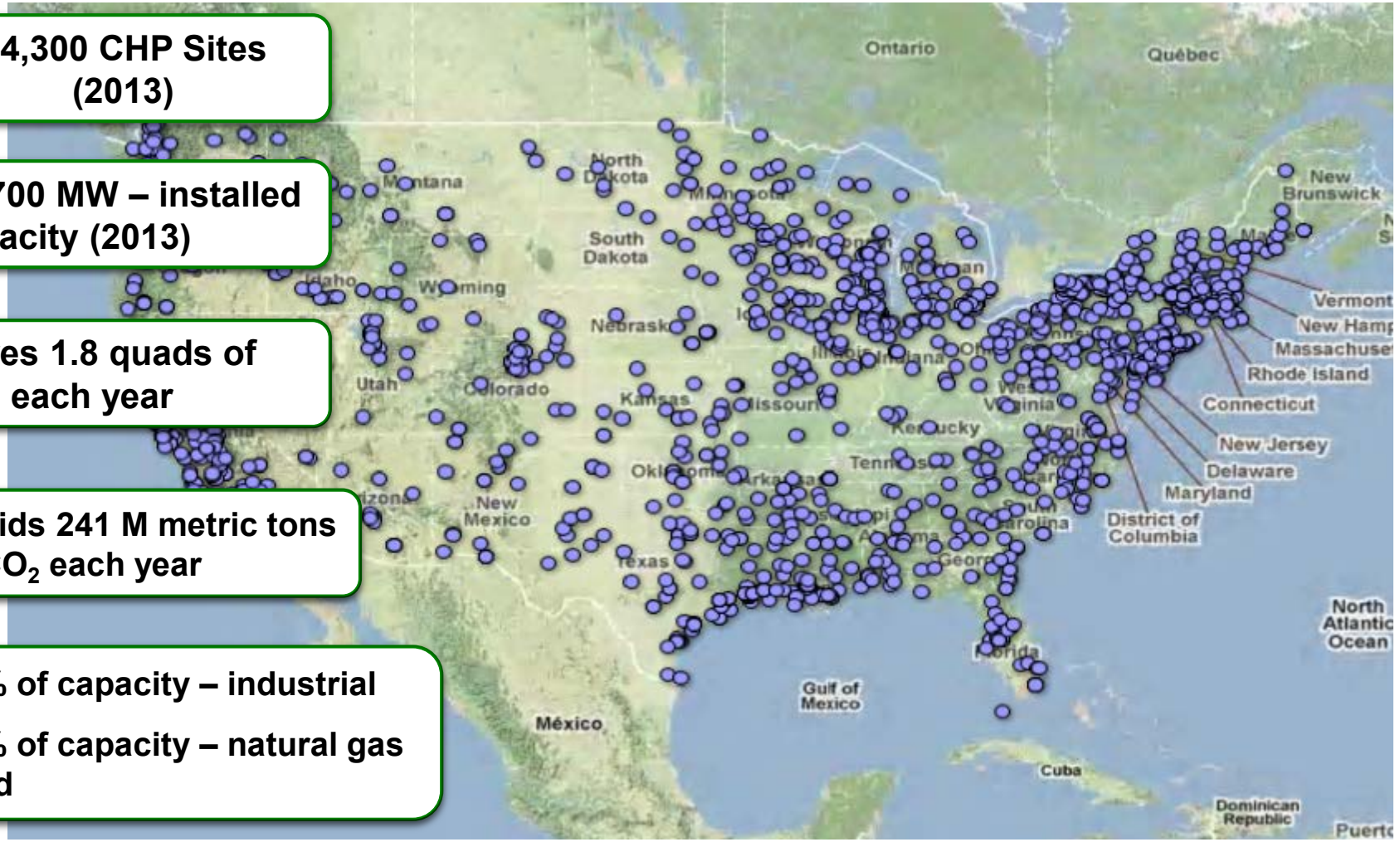
**82,700 MW – installed capacity (2013)**

**Saves 1.8 quads of fuel each year**

**Avoids 241 M metric tons of $CO_2$ each year**

**86% of capacity – industrial**

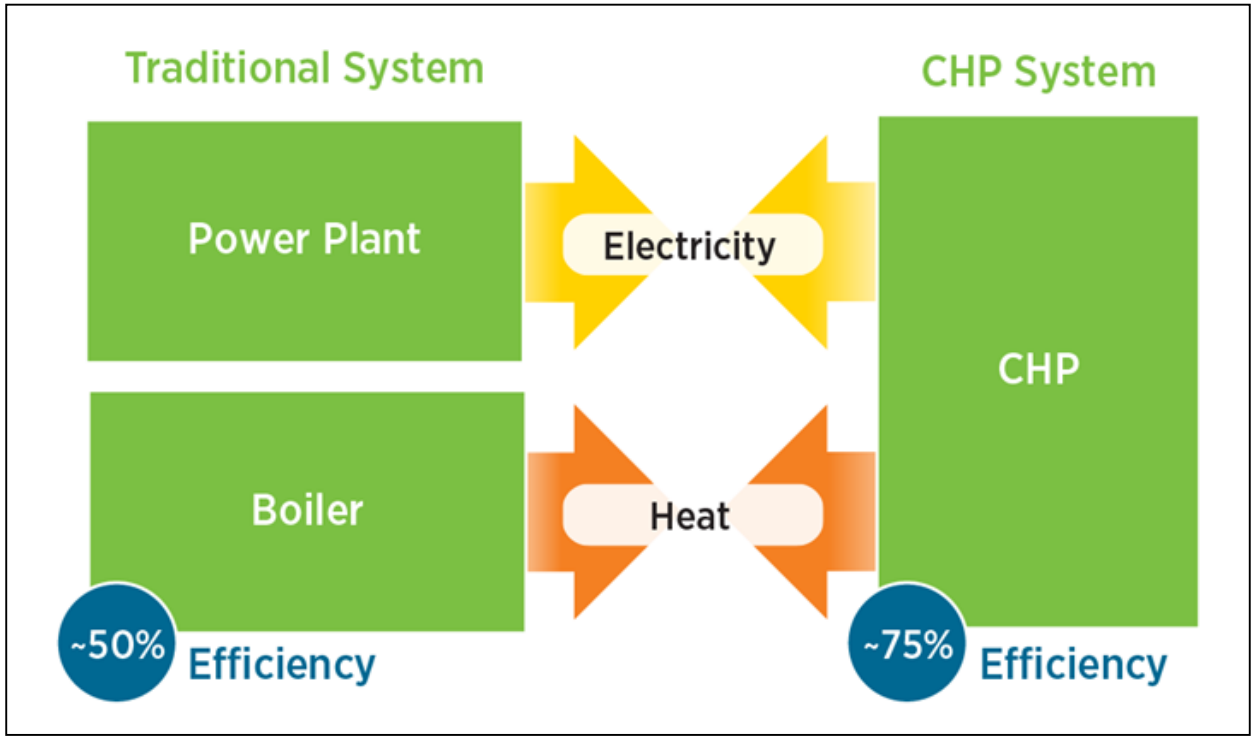
**69% of capacity – natural gas fired**




*Source: DOE CHP Installation Database (U.S. installations as of Dec. 31, 2013)*

# What are the benefits of CHP?

- CHP is *more efficient* than separate generation of electricity and heat



# What are the benefits of CHP?

- Higher efficiency translates to *lower operating cost,* (but requires capital investment)

# What are the benefits of CHP?

- Higher efficiency *<u>reduces emissions of all pollutants</u>*

# What are the benefits of CHP?

- CHP can also *increase energy reliability and enhance power quality*
  - CHP provides reliable dispatchable power
  - CHP provides thermal energy during grid outages
  - CHP can offset some capital costs associated with investments in traditional backup power
  - Avoid business shutdowns or act as “shelter-in-place” centers of refuge

Ride through the storm with electricity and heat!

# Resilient CHP systems in Hurricane Sandy

- **The College of New Jersey (NJ) – 5.2 MW CHP**
  - "Combined heat and power allowed our central plant to operate in island mode without compromising our power supply." - *Lori Winyard, Director, Energy and Central Facilities at TCNJ*
- **Fairfield, University (CT) – 4.6 MW CHP**
  - 98% of the Town of Fairfield lost power, university only lost power for a brief period at the storm's peak
  - University buildings served as area of refuge for off-campus students
- **Princeton University (NJ) – 15 MW CHP**
  - CHP/district energy plant supplies all heat and hot water and half of the electricity to campus of 12,000 students/faculty
  - "We designed it so the electrical system for the campus could become its own island in an emergency. It cost more to do that. But I'm sure glad we did." – *Ted Borer, Energy Manager at Princeton University*
- **Danbury Hospital (Danbury, CT) – 4.5 MW CHP**
  - Supplies 371 bed hospital with power and steam to heat buildings, sterilize hospital instruments & produce chilled water for AC
  - $17.5 million investment, 3-4 year payback, cut AC costs 30%
- **The Long Island Home (Long Island, NY) – 1.3 MW CHP**
  - Serves 197 bed South Oaks Hospital and 320 resident Broadlawn Manor
  - Stayed operational and isolated from LIPA grid for 15 days
- **Bergen County Utilities Wastewater (Little Ferry, NJ) - 2.8 MW CHP**
  - Process sewage for 47 communities

# CHP provides the benefit of backup generation and so much more!

- CHP provides continuous benefits to host facilities, rather than just during emergencies
- CHP can result in daily operating cost savings
- CHP offsets capital costs associated with investments in traditional backup power

# CHP versus backup generation

| | CHP | Backup Generation |
|---|---|---|
| System Performance | • Designed and maintained to run continuously<br>• Improved performance reliability | • Only used during emergencies |
| Fuel Supply | • Natural gas infrastructure typically not impacted by severe weather | • Limited by on-site storage |
| Transition from Grid Power | • May be configured for “flicker-free” transfer from grid connection to “island mode” | • Lag time may impact critical system performance |
| Energy Supply | • Electricity<br>• Thermal (heating, cooling, hot/chilled water) | • Electricity |
| Emissions | • Typically natural gas fueled<br>• Achieve greater system efficiencies (80%)<br>• Lower emissions | • Commonly burn diesel fuel |

# What are the public benefits of CHP?

- On-site electric generation *reduces grid congestion and avoids distribution costs*
  - New York is developing markets to compensate CHP and other on-site generation owners for reducing grid congestion

# Project Snapshot: Gurwin Jewish Nursing & Rehabilitation Center

- **Location:** Commack, NY
- **Fuel:** Natural gas
- **Size:** Three 150kW CHP systems (450kW total)
- **Operation:** 24/7
- **Use of thermal energy:** Domestic hot water, space heating
- **Annual electricity:** 3.7 megawatt-hours
- **Annual Savings:** $375,000
- **Simple payback period:** 3 years
- **Began operation:** 2010


See full project profile at www.NortheastCHPTAP.org

# Project Snapshot: Boa Vista Apartments

- **Location:** New Bedford, MA
- **Facility size:** 99 apartment units, 80,000 sq. ft.
- **Fuel:** Natural gas
- **Size:** 75 kW CHP system
- **Operation:** 24/7
- **Use of thermal energy:** Domestic hot water, space heating
- **Annual Savings:** $58,000
- **Began operation:** 2009


See full project profile at www.NortheastCHPTAP.org

# Am I a good candidate for CHP?

- CHP-compatible building-types should have:
  - Significant annual energy consumption for both electricity and heat
  - Master-metered is best
  - Many hours per year for “coincident” need of electricity and heat

- Thermal distribution piping:
  - Must have: building heating via centralized hot water distribution pipes
  - Helpful: building cooling via centralized chilled water distribution pipes

# What does it cost to install CHP?

| System Size | Typical Customer (these are real examples) | Total Cost | NYSERDA Incentive | Out-of-pocket Expense |
|---|---|---|---|---|
| 100 kW | Hotel 150 rooms | $478,000 | $180,000 | $298,000 |
| | Multifamily 100 units | $370,000 | $198,000 | $172,000 |
| 200 kW | Multifamily 500 units | $625,000 | $350,000 | $275,000 |
| | Multifamily 450 units | $850,000 | $350,000 | $500,000 |
| 300 kW | Multifamily 700 units | $1,800,000 | $561,000 | $1,239,000 |
| 400 kW | 10-story @ 60,000 sq.ft. mixed-use residential & commercial | $1,170,000 | $454,000 | $716,000 |
| 600 kW | Hotel 400 rooms | $1,800,000 | $930,000 | $870,000 |
| 800 kW | 7-story @ 200,000 sq.ft. mixed-use commercial | $3,400,000 | $1,276,000 | $2,124,000 |

In this size range, NYSERDA incentives are, on average, about 40% of the overall cost of the project

# How much would I save?

Savings will depend on your purchase style, and is influenced by your preference for a deal either with low upfront costs or with best lifetime savings:

- Buy
- Lease
- Lease-to-own

*NYSERDA incentive helps you achieve a simple payback period of approximately 4-6 years.*

*Equipment lifespan of at least 15 years is typical.*

- Power Purchase Agreement
- PPA with Buy-out Clause

*No Money Down!*

*Save approximately 10% off your electric bill starting on day-one.*

# Incentives for CHP

- NYSERDA offers incentives for the installation of grid-connected CHP systems at customer sites that pay the System Benefits Charge (SBC) on their electric bill (PON 2568)
  - Bonus incentives for:
    - At sites of “critical infrastructure” such as hospitals, nursing homes, food distribution centers, emergency command posts, other
    - Sites within Con Edison’s “CHP Target Zone” circuits
- Innovative financing might be available through NYC Energy Efficiency Corporation

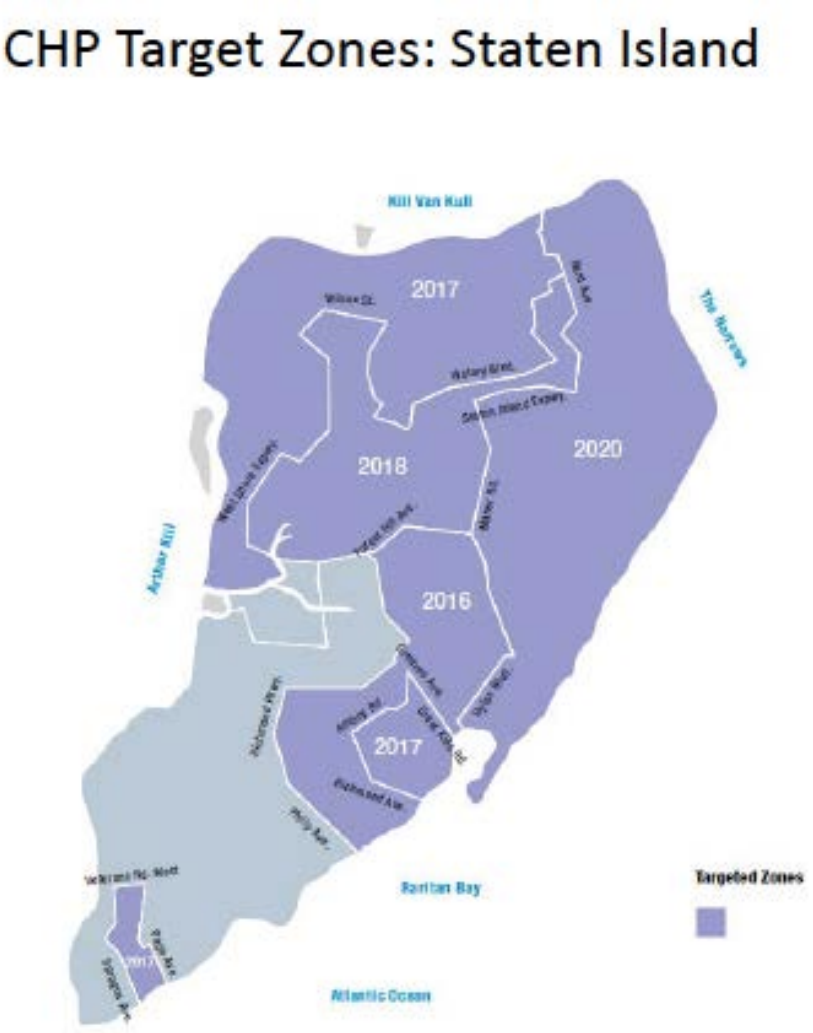
# Con Edison Target Zones

## CHP Target Zones: Manhattan


## CHP Target Zones: Bronx

# Con Edison Target Zones


# Con Edison Target Zones



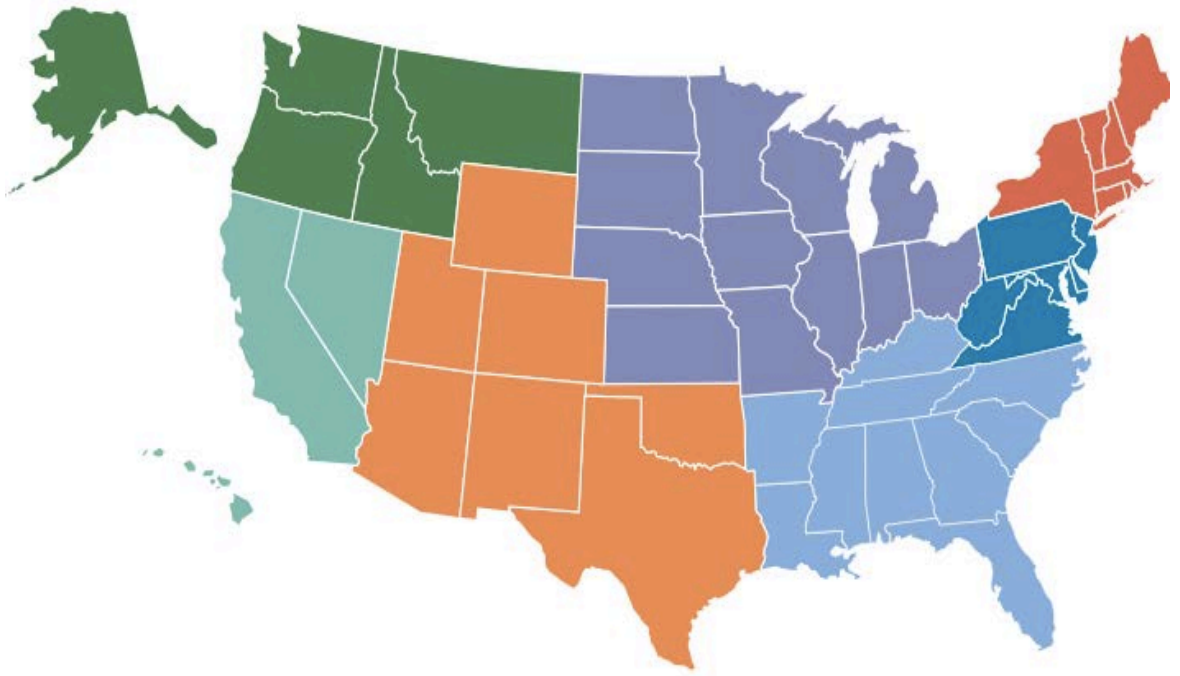
# The U.S. Department of Energy's CHP Technical Assistance Partnerships can help!

www.NortheastCHPTAP.org

- Technical Assistance (Top priority!)
  Providing technical assistance to potential CHP host sites from initial CHP screening to installation.

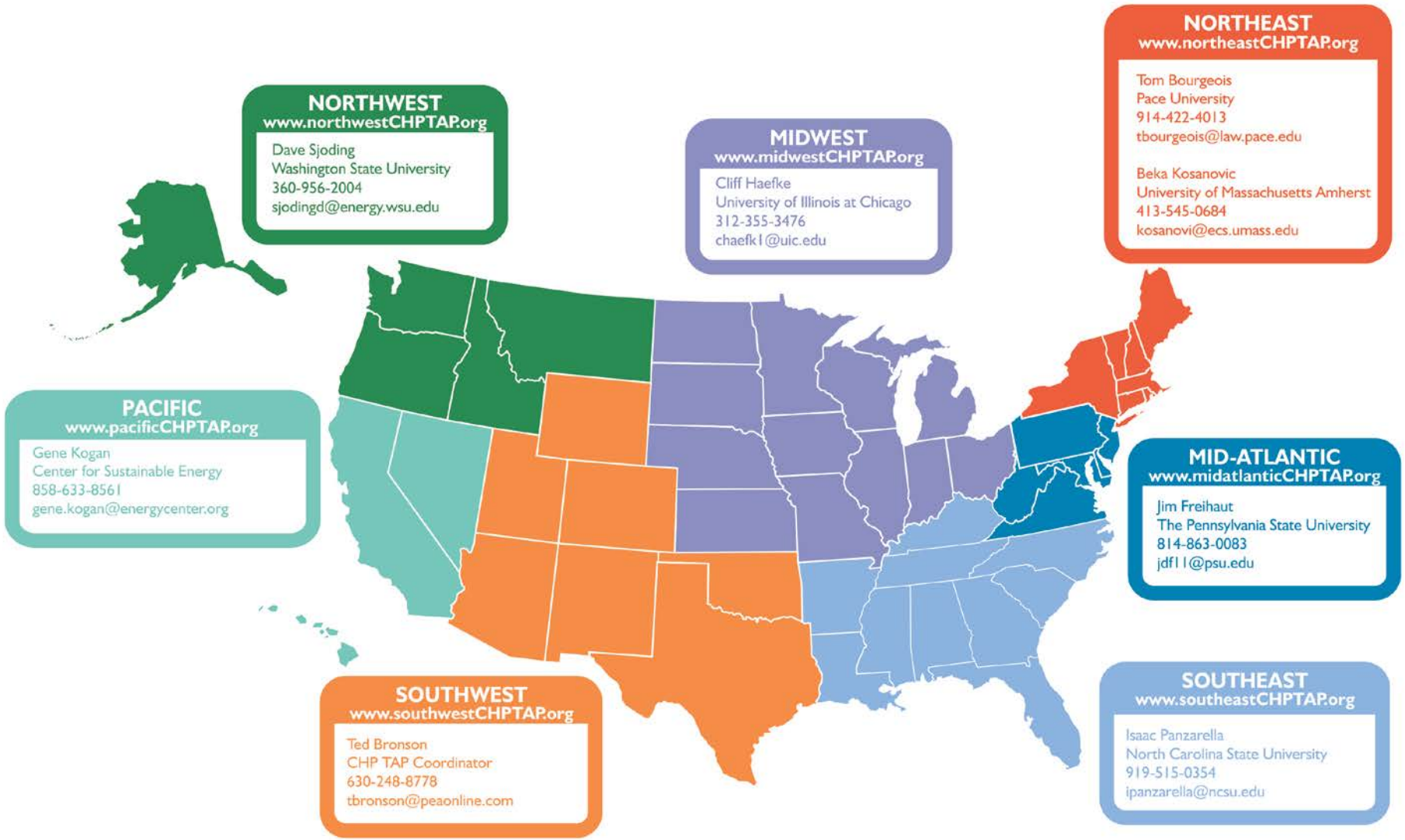
- Market Opportunity
  Supporting key end-user stakeholders (associations, utilities, commissions, etc) to further the installation of CHP.

- Education and Outreach
  Providing information on the energy and non-energy benefits and applications of CHP to state and local policy makers, regulators, end users, trade associations, and others.



www.energy.gov/chp

# DOE CHP Technical Assistance Partnerships (CHP TAPs)




**DOE CHP Technical Assistance Partnerships (CHP TAPs): Program Contacts**

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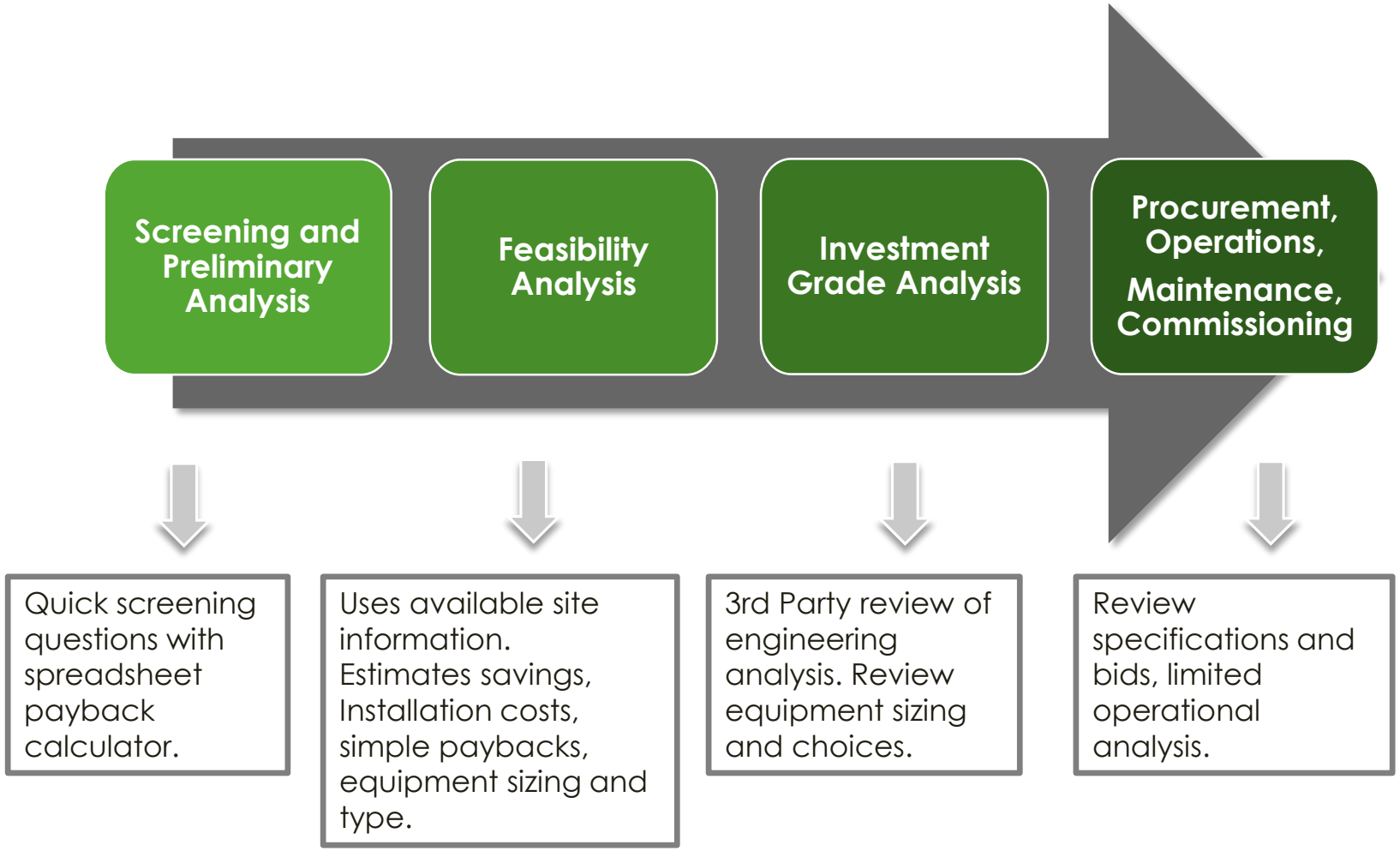
# The U.S. Department of Energy's CHP Technical Assistance Partnerships can help!

www.NortheastCHPTAP.org

Services offered to CHP end users:



# Northeast Clean Heat and Power Initiative

- 501(c)6 non-profit corporation dedicated to accelerating the deployment of efficient clean heat and power applications in the Northeast.
- Members include prominent CHP development firms, non-profit organizations, and regional utilities.
- Active across the Northeast in regulatory proceedings and other initiatives.

NECHPI

NORTHEAST CLEAN HEAT AND POWER INITIATIVE

www.nechpi.org