



uniongas

A Spectra Energy Company

Combined Heat & Power (CHP)

How Self-Generation Might be Right for You

Hugh Cumming
Allen Chan

Why Consider CHP?

✓ **Save on Energy Costs**

- Lower operating costs
 - You can save 6-7 cents per kWh if you generate behind the meter
 - Guard against electricity price hikes - forecast 33% increase by 2019

✓ **Improve Operations**

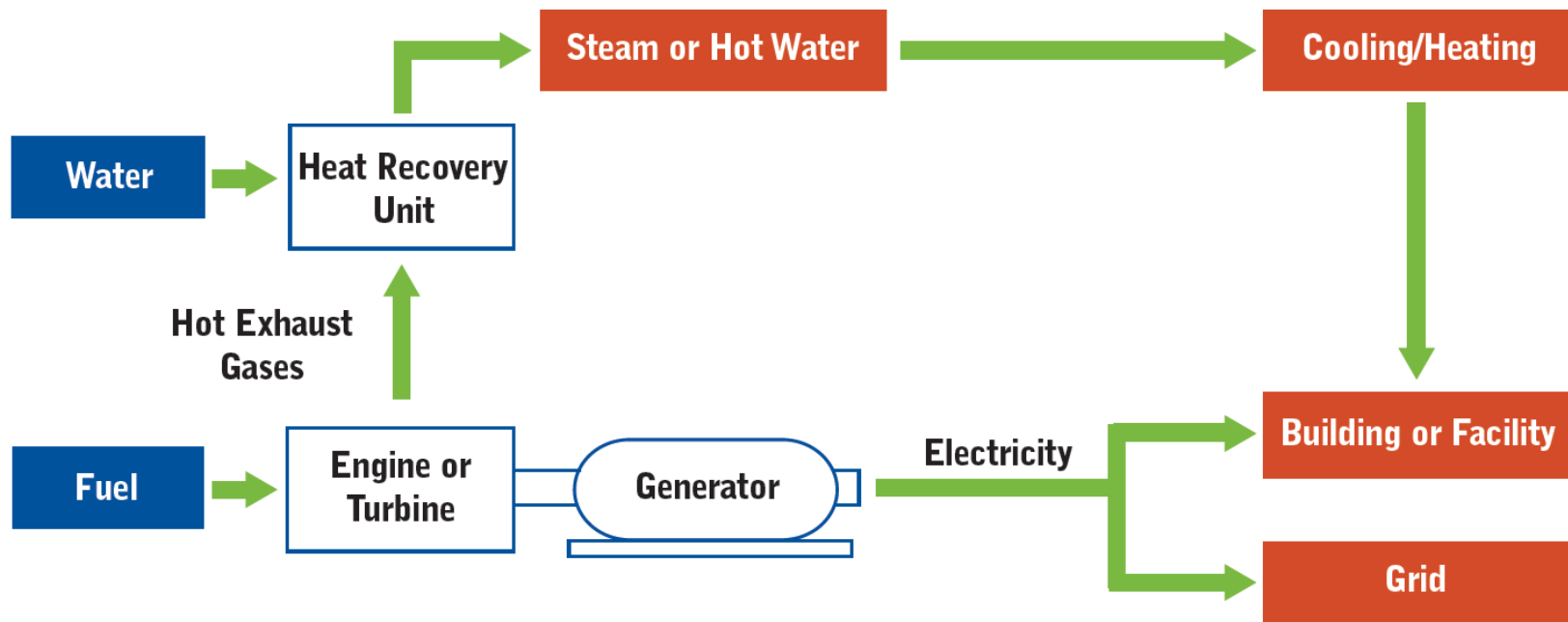
- Minimizes down-time and impact to operations

✓ **Proven Track Record**

- Over 50 years of reliable operating history

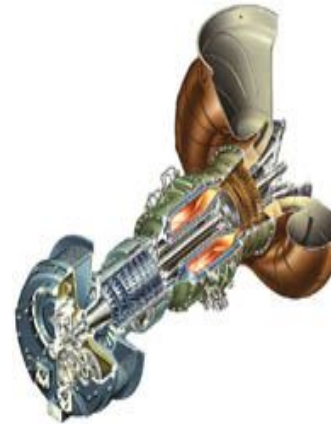
One Fuel for Two Jobs


CHP takes waste heat produced from the generation of electricity and converts it to hot water or steam



Electricity generation without heat recovery can make sense

Three Natural Gas Technologies for CHP



| | Reciprocating Engines | Gas Turbines | Micro-Turbines |
|----------------------|--|-----------------|--------------------------------------|
| Size of Installation | 5 kW to 10 MW | 1 to 300 MW | 30 kW to 200 kW |
| Typical Applications |  Variable Loads | Continuous Duty | Noise and Vibration Restricted Areas |

Three Natural Gas Technologies for CHP

| | Reciprocating Engines | Gas Turbines | Micro-Turbines |
|---|-----------------------|-------------------|-------------------|
| Est. Capital Cost ^{1, 2} (\$ per kW) | 2,500 | 3,000 | 4,500 |
| Est. Electricity Savings ^{3, 4} (cents per kWh) | 7.40 ⁵ | 8.40 ⁶ | 5.80 ⁷ |

¹ Assumptions based on midpoint of capital costs provided in US Department of Energy CHP Catalog, March 2015

² Assumed 1 CAD = 0.77 USD

³ Assumed 1 cent per kWh in O&M

⁴ Assumed currently electricity prices of 14 cents per kWh

⁵ Assumed ICE heat rate range of 8,000 BTU/kWh

⁶ Assumed gas turbine heat rate range of 6,500 BTU/kWh

⁷ Assumed micro-turbine heat rate range of 10,300 BTU/kWh

Summer Loads for Increased Efficiency

Absorption Chiller



Steam-Driven Centrifugal Chiller



Don't forget cooling opportunities!!!

Who Is Installing CHP Systems?

CHP installations over the past 5 years

- Automotive Assembly
- Manufacturing
- Greenhouse
- Food and Beverage
- Multi-Residential
- Health Care



Green Metals Canada Inc. (Woodstock, ON)

- A leading environmentally responsible scrap metal and plastic recycling company
- Consists of a large facility for processing and recycling metals and a small office area
- **35 kW micro CHP** unit brings electricity cost savings as well as contributing to an environmental friendly operation
- Waste heat is utilized for hot water, space heating, and to wash off the winter ice build-up around truck weight stations.
- Project efficiency allowed project to qualify under the Union Gas incentive program
- **Estimated Payback → 7 years**



North Bay Regional Health Sciences Centre (North Bay, ON)

- An acute care facility housing 401 beds within 750,000 square feet
- **1.6 MW Reciprocating Engine CHP**
- Waste heat used for space heating
- Constructed under a design build services agreement with North Bay Hydro and Johnson Controls. North Bay Hydro will be operating the cogeneration facility over the next 20 years
- Project efficiency allowed project to qualify under IESO and Union Gas incentive programs
- **Estimated Payback → Immediate (PPP)**



Toyota Motor Manufacturing Canada Inc. (Cambridge, ON)

- Operates a 3 million sq. ft. production facility
- **10 MW Gas Turbine CHP**
- Uses of waste heat: Supplement large steam boilers, space heating, and reduce air conditioning electrical demand through the use of steam-driven chillers.
- Also, Toyota plans to heat a nearby greenhouse for non-profit organizations.
- Project efficiency allowed project to qualify under IESO and Union Gas incentive programs
- **Estimated Payback → Confidential**



To Get Started

Talk to the energy experts at Union Gas

- Determine whether CHP is a good fit
- Get a first-cut screening of your facility
- What's needed to perform the first-cut screening?
 - Last 12 months hydro bills
 - An idea of where gas is consumed in facility

FREE



Verify with your local electric utility to determine if there's capacity to connect

Sample Economics from the Screen

Modelled CHP unit → **GE Jenbacher**

Suggested size → **635 kW**

Estimated installed costs → **\$1.6 million**

Electricity Analysis

- Cost paid to buy electricity from grid (before taxes)
→ **14.37 cents per kWh**
- Estimated cost to produce electricity (including maintenance)
→ **5.95 cents per kWh**
- Estimated electricity savings
→ **\$293,000 per year**

Gas Analysis

- Net increase in gas usage
→ **377,000 m³ per year**
- Net increase in gas costs
→ **\$62,000 per year**

Sample Economics from the Screen

Net Savings → **\$231,000 / year**

Estimated IRR (n=20) → **13%**

Estimated simple payback → **7 years**

With incentives...



4 years

Three Key Takeaways

1. CHP helps you save on energy costs



2. Lots of uses for heat generated



3. Implementing a CHP is easier than ever before



You are not on your own – Union Gas will guide you through the process

Contacting Union Gas



Hugh Cumming

hcumming@uniongas.com

Allen Chan

achan@uniongas.com

We'll connect you with your Union Gas Account Manager