

# Alternative Sources of Energy

## Distributed Generation

economics,  
variability factors,  
capacity contributions, and  
environmental considerations  
related to utility integration issues.

turbines, cogeneration, solar, distributed generation and  
wind.

# What is Distributed Generation?

Small-scale power generation technologies located close to where electricity is used to provide an alternative to or an enhancement of the traditional electric power system.

Difference from emergency generators?

# Why the Interest?

Blackouts

Ice Storm

Electricity shortages and prices

RELIABILITY and SECURITY

# Economics?

- Depends on the relative price of fuel in to electricity out (spark gap)
- Electricity may be a variable price
- Depends on the proponent (fuel cells in Berlin)

# Is DG GREEN?

Not necessarily!

Renewable DG is certainly

Fossil-fueled DG may be if heat is utilized  
year round.

Depends on source of grid electricity.

# Multiple Sites Responding

- Response to price, shortage, etc
- Communication by internet or electrical
- Use of existing stand by generators

# 75 kW Microturbine CHP Application

---

## *Project Description*

*2301 Midland Avenue, Scarborough has the first Canadian installation of a micro-turbine supplying electricity and waste heat to a building. The gas-fired unit was intended to operate continuously, providing 75 kW electric and 155 kW thermal heat. Natural gas consumption by the building's boilers has been reduced by the application of recovered heat to space heating systems in winter and humidity control systems in summer.*

# Project Description

*2301  
Midland  
Avenue,  
Scarborough*





# Site Description

*2301 Midland  
Avenue, Scarborough*



# Site Description

Enclosure

Heat Rec. Unit

Concrete Pad

Turbine

Gas Meter

Fuel

Transformer

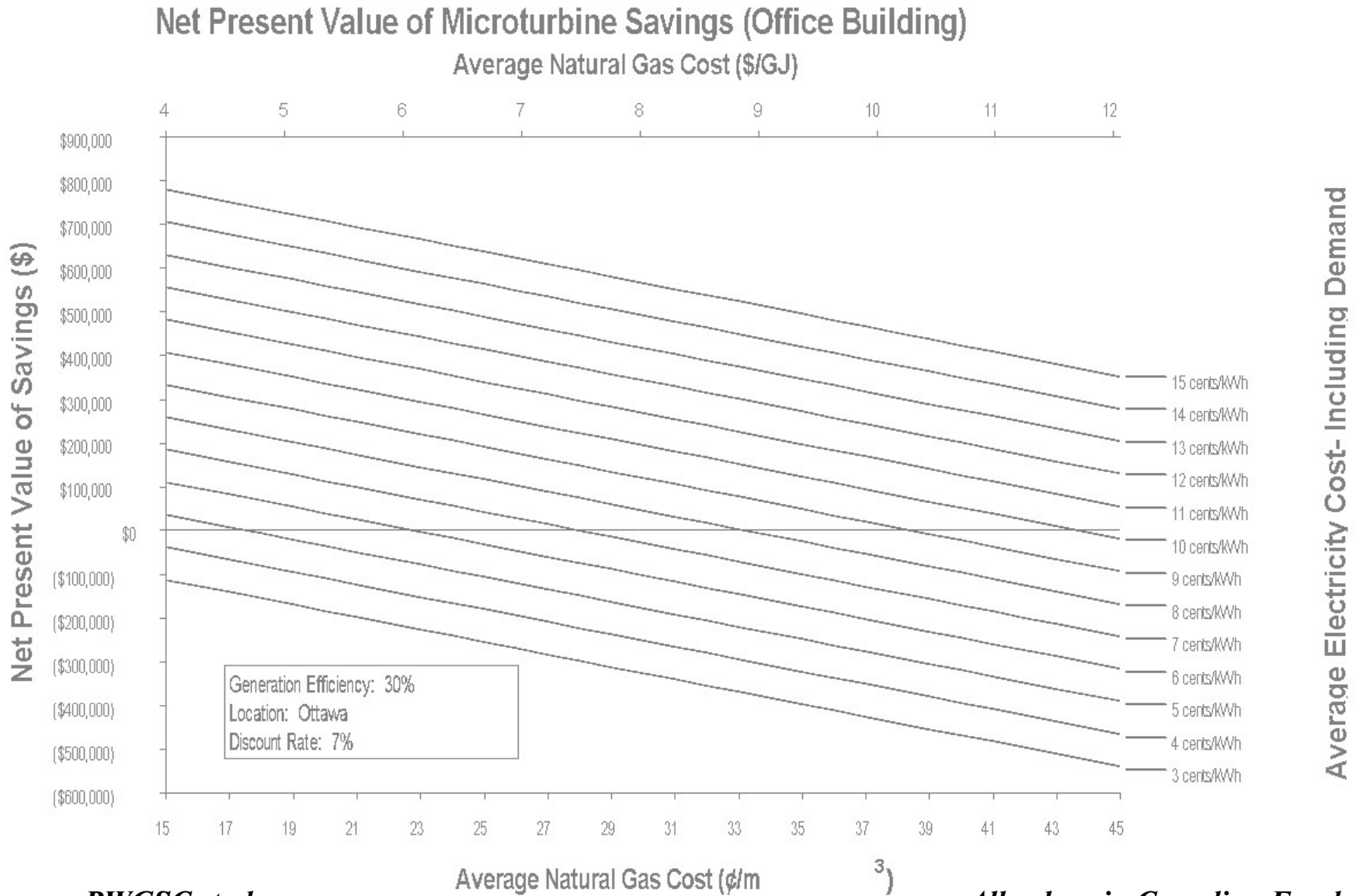
Sloped lines on water loop

H<sub>2</sub>O





# Reasons for doing the project



Source: PWGSC study

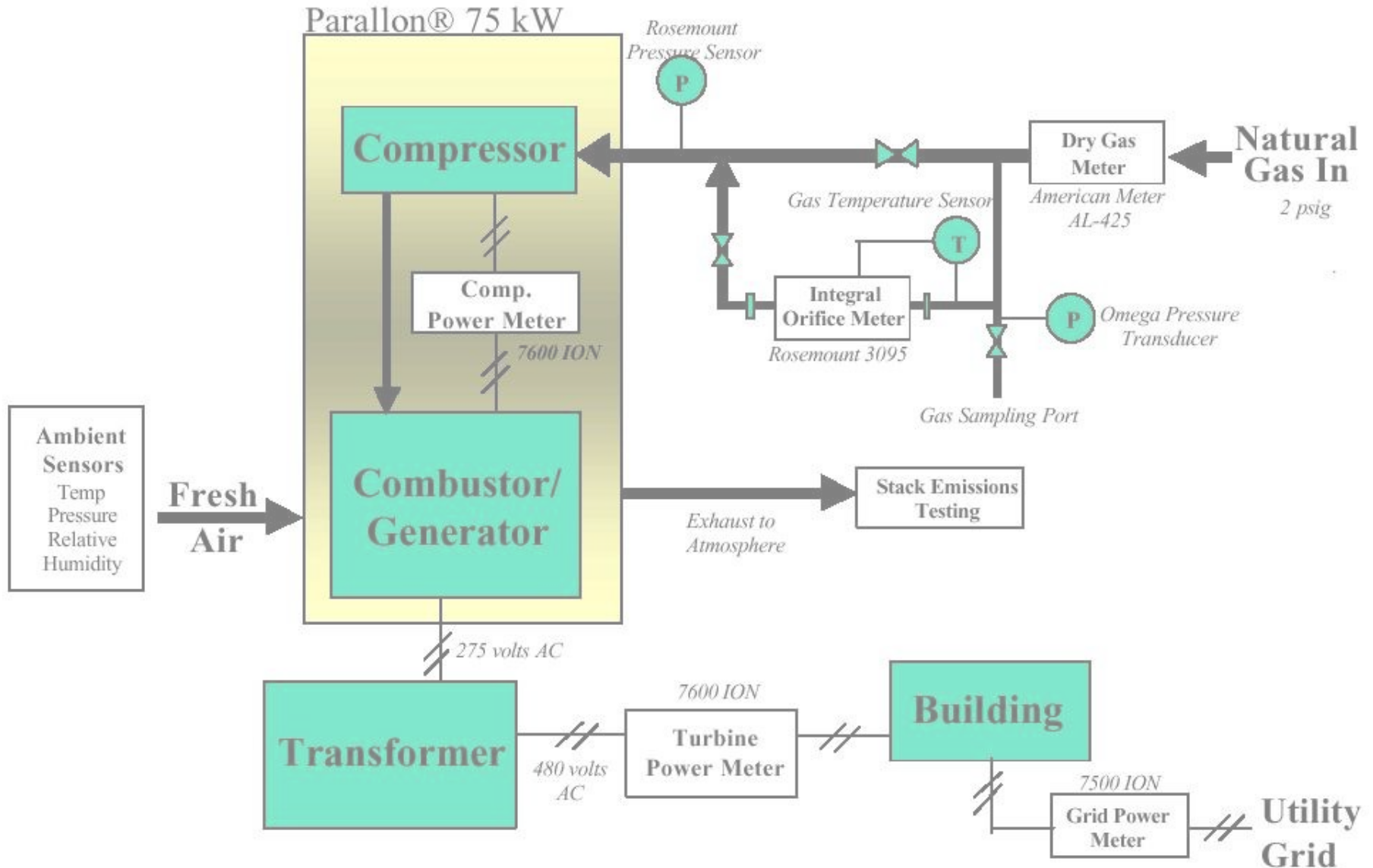
All values in Canadian Funds

# **Project chronology: 2000 - 2001**

---

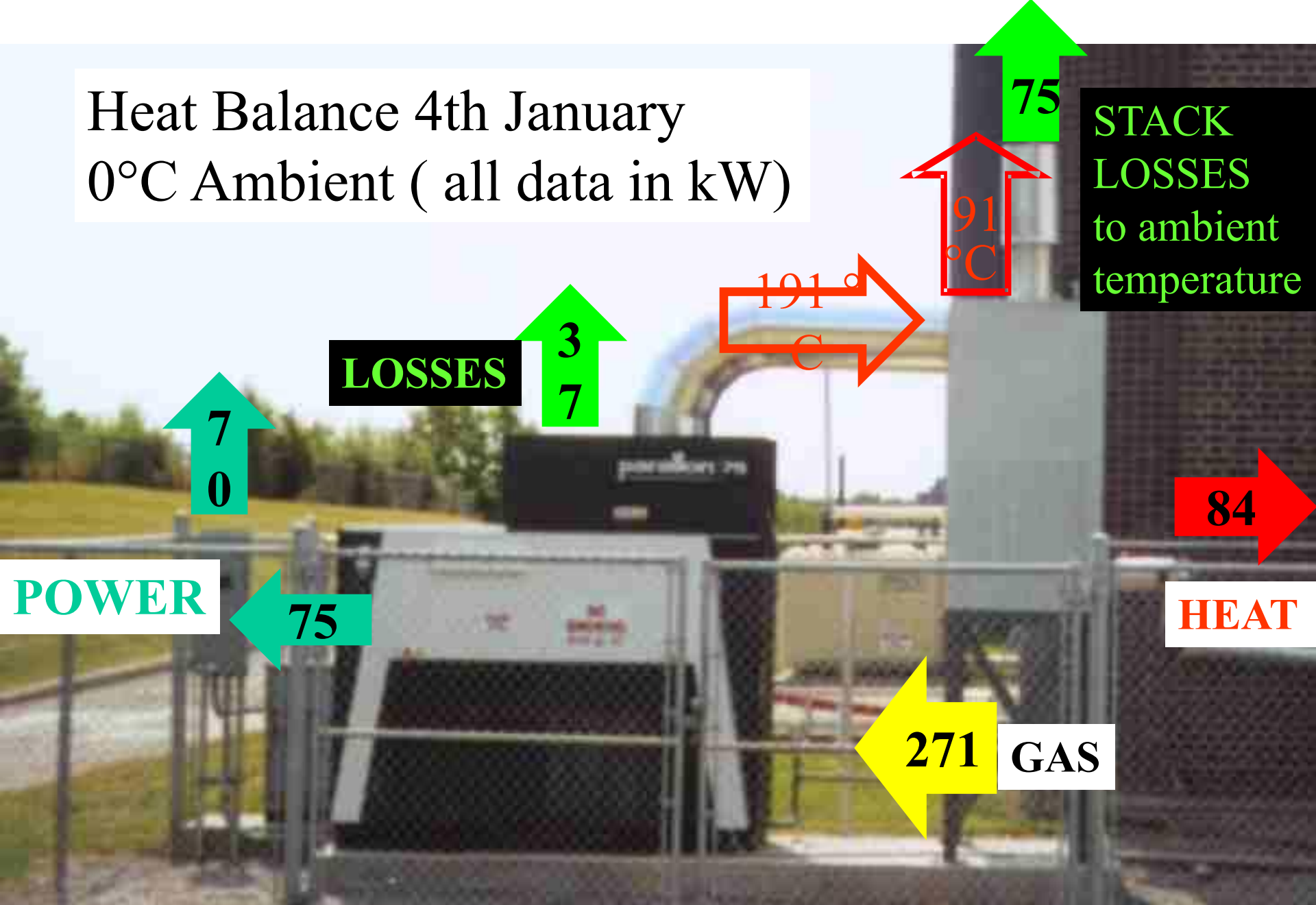
- April 12, 2000 – Equipment Delivery (originally planned for September 30, 1999)
- June 9, 2000 – Commissioned (originally planned for October 30, 1999)
- November 7, 2000 – Unit shut down pending ETS Field Certification
- June 9, 2000 - November 7, 2000 – Availability: 60%
- Gas compressor and core replaced after 2000 hours of operation
- January, 2001 – Monitoring Underway (originally planned for November 30, 1999)
- January 4 – Emissions Testing
- January 26 – A minor gas leak was detected by Enbridge and repaired by Honeywell.
- February 5 – Versatech (mechanical contractor) replaced the bottom flange of gas meter and installed a flexible connector to the cogeneration unit.
- February 6 – Vestar restarted the co-gen unit at 10:30 a.m. Logging was restarted at 12:00 noon (after 2614 hours of operation).
- February 8 – Turbine stopped at 2 p.m.

# Schematic of Typical Measurement System



Source: EPA Environmental Technology Verification Report

Heat Balance 4th January  
0°C Ambient ( all data in kW)



# Emission Testing January 4th



# Site Description

---

## ***Building Host:***

***Health Canada Laboratory Building***

***@ 2301 Midland Avenue***

***3-story building***

***approximate altitude of 600 ft.***

***The building has also recently undergone a FBI (Federal Buildings Initiative) project that reduces its energy consumption by 50% through more efficient lighting, controls and a conversion of the constant volume ventilation to a variable volume system. (Retrofit done by Vestar, an energy services company supplying third party financing.)***



# 75 kW Microturbine CHP Application

---

## *Reasons for doing the project*

*Benefits of CHP (Combined Heat and Power) microturbines:*

- Reduction of greenhouse gas production*
- Potential energy cost savings*
- Versatility and stand-alone capability*
- Possibility of selling power back to grid*

# Site Description

Enclosure

Heat Rec. Unit

Concrete Pad

Turbine

Gas Meter

Fuel

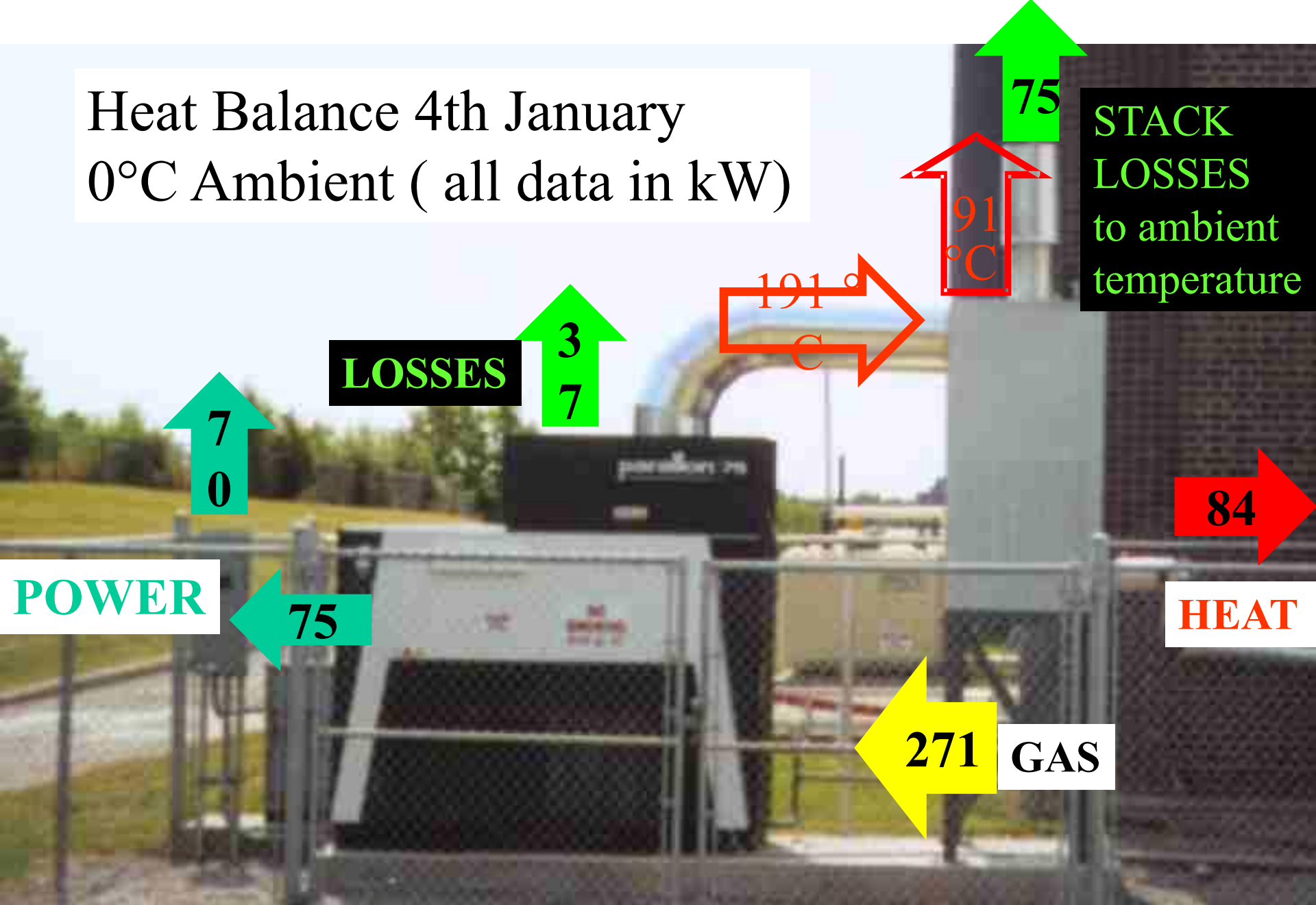
Transformer

Sloped lines on water loop

H<sub>2</sub>O



Heat Balance 4th January  
0°C Ambient ( all data in kW)



# 75 kW Microturbine CHP Application

## *Conclusions*

- *The heat recovery was lower than expected (62.4 vs 155 kW) due to thermal losses on uninsulated parts of the recuperator and a reduced thermal output in winter.*
- *The heating circuit design was a success using water instead of glycol in an outside freezing environment.*
- *The noise issue, which had originally concerned the building operator, proved not to be a problem.*
- *The emission data was found to be within specifications.*