

Energy Conservation and Combined Heat and Power



Helping Building Owners Save Energy

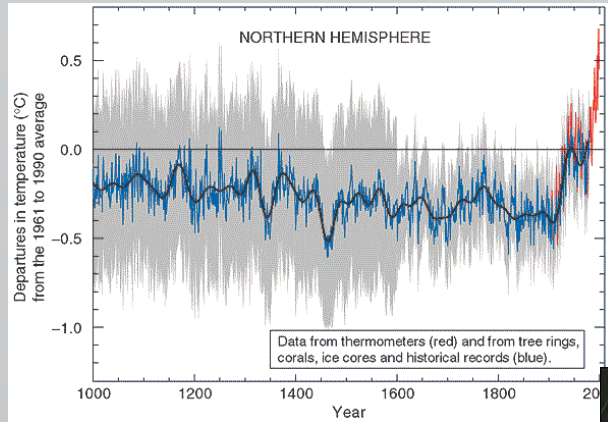
CONSERVATION — A
BETTER RETURN ON
YOUR INVESTMENT



- ⌚ Reasons for Energy Conservation
- ⌚ Government Conservation Programs
- ⌚ Investment Grade Audits and Studies
- ⌚ Combined Heat and Power
 - CHP or Cogen

Agenda

Climate Change



Hurricane Katrina



Ice Storms



Hurricane Sandy



Toronto Flooding

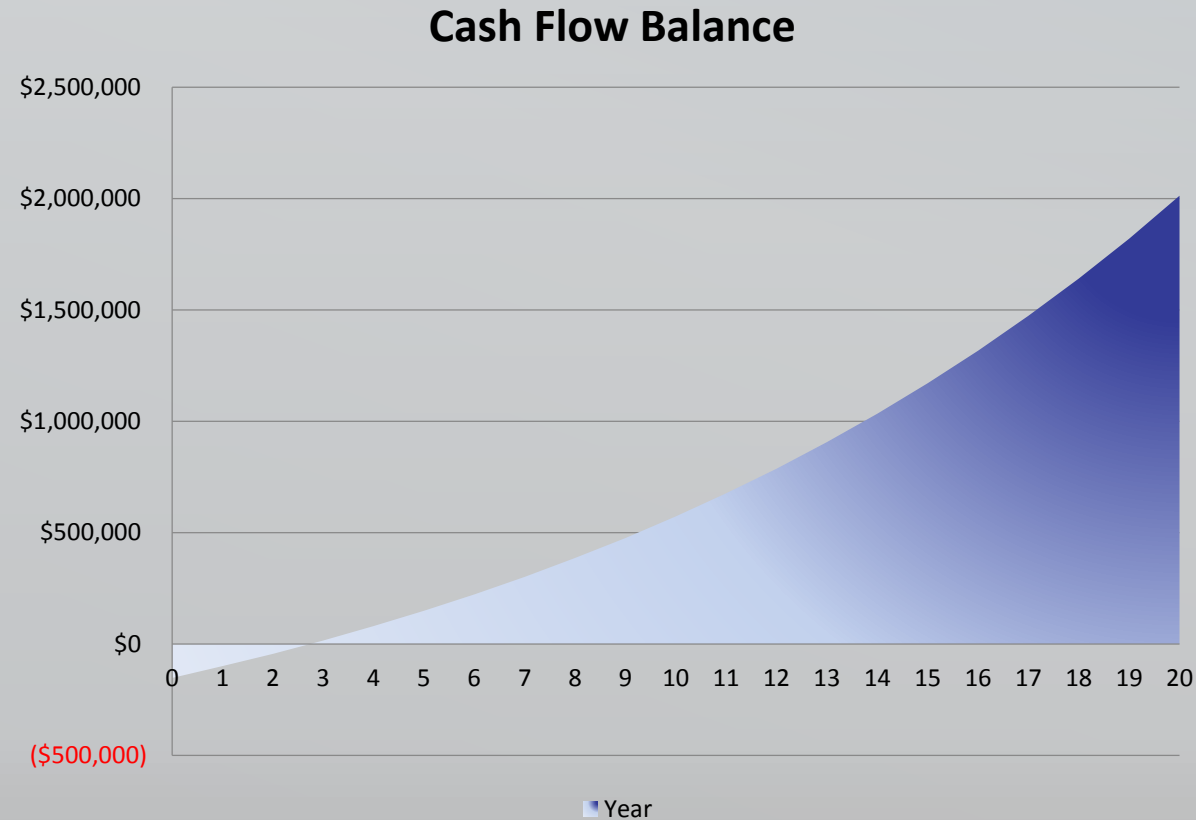


The Next Big Storm?



Altruistic Reasons for Energy Conservation

eProperty Value



Financial Reasons for Energy Conservation

Property Value

Cap Rate	Annual Utility Savings	Property Value Increase	Comment
3.50%	\$ 10,000	\$ 286,000	Q1 2016 Low Multifamily High-Rise - Colliers International
4.75%	\$ 10,000	\$ 211,000	Q1 2016 High Multifamily High-Rise - Colliers International
5.00%	\$ 10,000	\$ 200,000	Conservative
10.00%	\$ 10,000	\$ 100,000	Ultra-Conservative

- Conservation projects are usually a much better investment than the purchase of a new building.

Financial Reasons for Energy Conservation

⚙️ Reduced Risk

- Reduced exposure to utility costs.
- Reduced risk of equipment failure.
- Reduced exposure to extended power outages.
 - Combined Heat and Power (CHP or Cogen)
 - May be capable of back-up power generation.

Financial Reasons for Energy Conservation

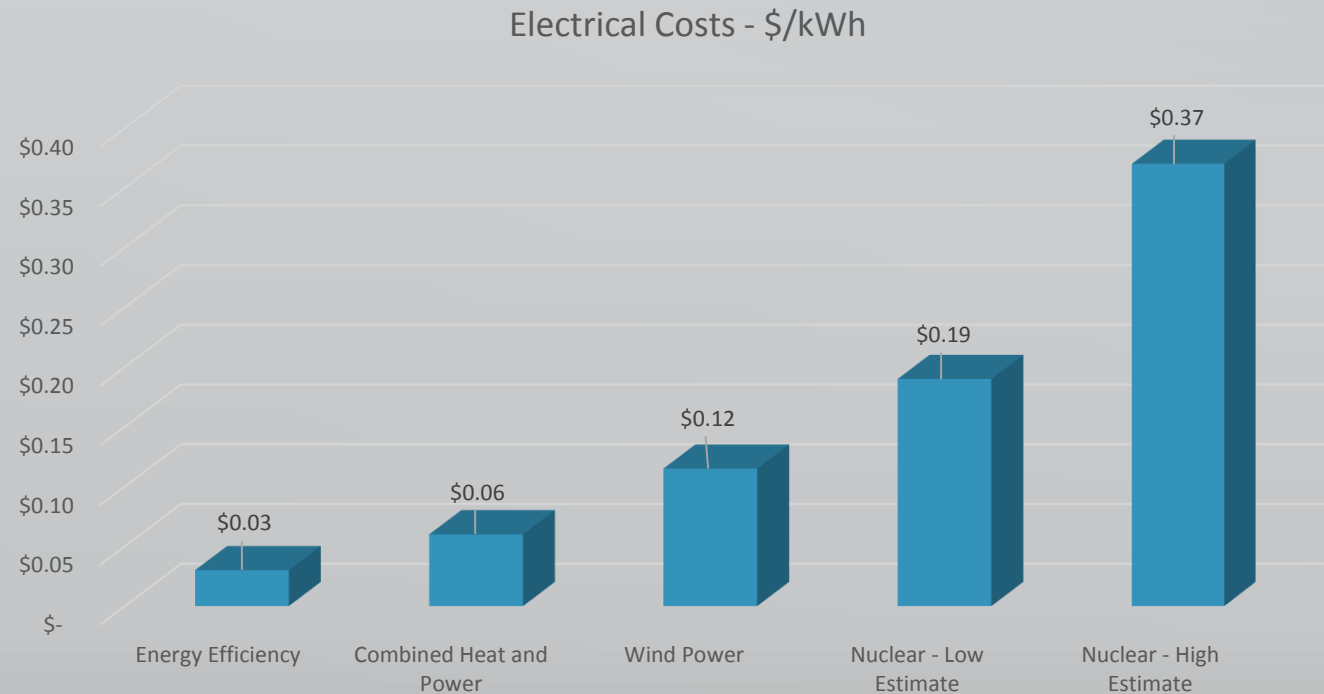
⚙️ 2015 to 2020 CFF

- 2015/16 – Shifted Focus to Conservation
 - IESO created 6 year Conservation First Framework (CFF).
 - Goal to reduce 8.7 TWh of electricity consumption by Dec. 2020.

Conservation First Framework

Conservation before Generation

- Ontario Clean Air Alliance estimates:



Conservation First Framework

⌚ DIY Approach

- Vendors approach owners with energy conservation products.
 - Costs are typically understated.
 - Savings are always overstated.
 - Interactive effects are ignored.

⌚ Investment Grade Energy Audit Approach

- Professional, unbiased study.
- Incentive funding of up to 50% of study cost through saveONenergy.
- Implementation funding between \$0.05/kWh (lighting) and \$0.20/kWh (CHP).

Finding Energy Conservation Opportunities

⚙️ Finding the Right Partner

– Very Important Factors

- Energy Audit Experience – Broad experience across several sectors.
- Energy Audit Experience – Specific to your building type.
- Energy Design Experience
- Vendor Neutral – No ties to suppliers or contractors

– Important Factors

- Experience with LDC's, both in general and specifically with Toronto Hydro.
- Energy conservation is the main focus of auditing firm.
- Reasonable fees for deliverables.

Investment Grade Energy Audit



Energy Project Stages

Energy Audit

Detailed Design

Incentive
Funding

Implementation
and Project
Management

Measurement
and Verification

Relative Costs

1-2%

7-10%

1%

>85%

0-1%

Importance to Success

40%

40%

0%

15%

5%

Investment Grade Energy Audit

⌚ Combined Heat and Power (CHP) (Cogen)

- What is really meant by “Energy Conservation”?

⌚ High Value Energy

- Electricity
- Potential Energy (eg. Water at the top of Niagara Falls)
- Fossil Fuels (Natural Gas)

⌚ Low Value Energy

- Solar, Wind
- High Grade Heat (Combustion Air, Steam)
- Low Grade Heat (Hot Water, Heated Air)

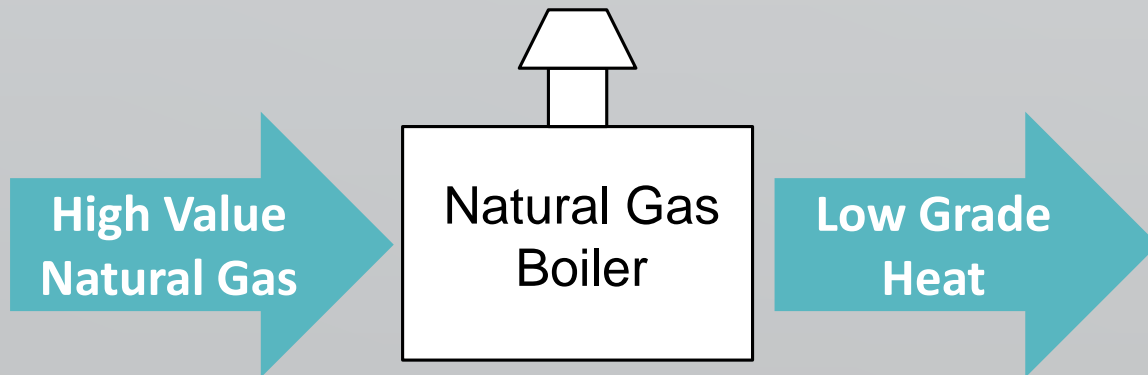


Natural Flow of Energy

Combined Heat and Power

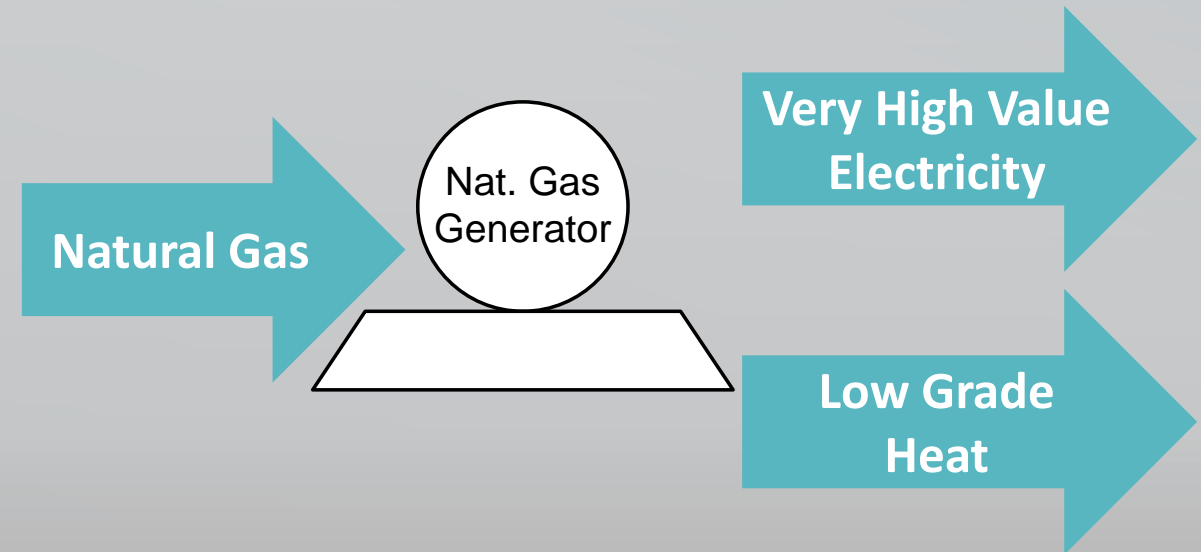
Traditional System

- Higher Value Energy (Natural Gas) is used to create Low Value Energy (Heat, DHW)



Combined Heat and Power

- Higher Value Energy (Natural Gas) is used to create Low Value Energy (Heat, DHW)



Combined Heat and Power

⚙️ Rules of Thumb

- Necessary for CHP to be economically viable:
 - 50 suites or more.
 - Central domestic hot water plant.
 - Electricity > 140,000 kWh/yr.
 - Natural Gas > 20,000 m³/yr.
- Important, but not absolutely necessary
 - Hydronic Heating
 - Make-up Air
- Nice to Have
 - Pool Heating
 - Garage Heating, Ramp Heating

CHP Specific to Multi-Residential

Available Equipment

- CHP is common in Europe, and some areas in the US.
- Over the past two years, small scale CHP has aggressively entered Ontario.
 - 19kW to 100kW are most common.



CHP Specific to Multi-Residential

⚙️ CHP Analysis Should Incorporate

- Hourly analysis (8760h/yr) based on electrical and thermal requirements.
 - Throttling of machine to match electrical and thermal loads.
- Ability to achieve an overall system efficiency of 65%.
- Internalize all costs over equipment life:
 - Inflation
 - Utility escalations
 - Annual Maintenance Costs
 - Engine Rebuild Costs
- Return On Investment (ROI or IRR)
- Net Present Value

CHP Specific to Multi-Residential



Questions