

- Natural Gas On-site Generation - Diversifying Your Options to Withstand Frequent and Prolonged Power Outages

Tim Short
Manager Market Development
Enbridge Gas Distribution

DRIE: “Real Threats, Real Plans”
Toronto, ON

February 26, 2008



Objectives

- Intro
- Defining different types of power generation
- Recent changes to key Standard
- Assessing your options
- Questions



Enbridge Gas Distribution


- Local gas utility (1.8 million customers)
- Dedicated to developing market for DG (distributed generation):
 - conditioning market:
 - support full range of DG: small (e.g. >50 kW) to merchant (e.g. >10 MW)
 - identify barriers (e.g. Standards & Codes)
 - lobby public agencies
 - develop portfolio of business partners
 - research, verify technologies
 - walk customers and designers through options

Do your plans assume that
you have power?

Do you have the ability to
produce your own?

If

“Yes, I’ve got a UPS and backup generator system”,
how long can you hold out with this system with utility power down?

A faint, stylized illustration of two hands shaking is visible in the background, positioned below the main text. The hands are rendered in a light teal color, matching the background, and are shown in a firm grip, symbolizing agreement or partnership.

What were companies prepared to pay for a litre of diesel for their generators on Aug.14, 2003 when they first found out that the blackout covered north-eastern North America?

Answer

Anything.



Who would have thought

Media-reported power outages in Ontario

Year	Power Outages (#)	Average Duration (# of hours range)
Aug. - Dec. (2003)	11	6 and 12 hrs
2004	17	1 and 6 hrs
2005	124	1 and 6 hrs
2006	207	12 and 24 hrs
2007	237	6 and 12 hrs
Jan. (2008)	12	1 and 6 hrs

Information tracked by Enbridge Research Services

Power outages:

- ⇒ are more common than you think
- ⇒ can often be longer than you think

Take-away messages

- Causes of power interruptions are irrelevant
- Keep an eye on aging infrastructure
 - 75% of Ontario's electrical generation to be replaced by 2020
 - e.g. Toronto:
 - City currently only capable of generating 2% of its own demand
 - 2-transformer stations (Manby and Leaside) feeding city have >50% of their equipment older than 30yrs w/ some exceeding 50
- Does your plan allow you to withstand frequent and prolonged power outages?
- Are you a “preferred diesel customer”?
 - *Many, many* claim to be
 - Check out insurance industry's report: ICLR fall '07 report on back-up systems

“Do I need emergency, backup or standby power?”

- Make sure you're clear on what your needs are:
 - terms used interchangeably
- Only 1 of the 3 is a legal requirement:
 - emergency generator:
 - life-safety loads
 - national CSA C282-05 Standard (“Emergency Electrical Power Supply for Buildings”)
 - C282 referenced in Building and Fire Codes
- Standby or backup generation is a business decision, not a legal one:
 - Standby: enough for firm to reach a stable state until power is restored (e.g. industrial)
 - Backup: enough power to continue operations (e.g. data centre, call centre)



Word on emergency power

- Emergency generator can also:
 - have non life-safety loads
 - serve more than 1-purpose (e.g. emergency + backup + peak-shaving + co-generation)
- CSA C282-05 generator fuel options:
 - diesel
 - propane
 - natural gas:
 - stored
 - utility-fed

Recent
change in
CSA C282
Standard



Scoping your options

- Decide what you wish to do:

- emergency power
- standby/backup power
- combination

Standard compliance, power resilience

and perhaps:

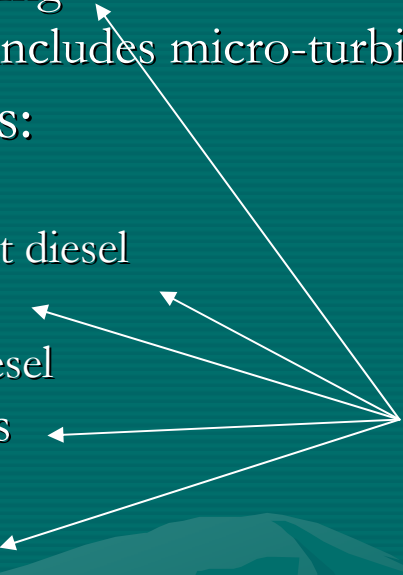
- peak-shaving
- co-generation

Business return

- Decide what your priority is
- Determine what the cost to business of short vs. extended and frequent vs. infrequent power outages is



The technology and fuel options

- On-site generators:
 - reciprocating
 - turbines (includes micro-turbines)
 - Fuel options:
 - diesel:
 - straight diesel
 - bi-fuel
 - bio-diesel
 - natural gas
 - bio-gas
 - propane
 - Diversify your portfolio
 - combination of stored and utility-fed fuel sources
 - Each fuel-type has pros & cons
- Most consistent with
need for power resilience*
- 





Bi-fuel generation



- Definition: bi-fuel enables a diesel generator to run on either 100% diesel or a combination of diesel + natural gas. (It can NEVER run on 100% gas).
 - generator can revert from (diesel + gas) operation to diesel-only seamlessly should there be an interruption in gas supply
 - check with vendor on gas : diesel fuel ratio

Options – pros & cons

	Emergency		Standby/Backup		Economic Applications	
	Pro	Con	Pro	Con	Pro	Con
Diesel	<ul style="list-style-type: none"> -meets key Standard/Codes -typically lower capital cost -meets transient loads 	<ul style="list-style-type: none"> -issue w/ long outages -fuel degradation -higher emissions -risk of leaks, spills -odour -space required for tanks -cost of storing and caring for fuel 	-same as "Emergency"		-no add'l	<ul style="list-style-type: none"> -higher fuel cost -stricter emission thresholds - includes more demanding environmental permitting -fuel inventory management critical
Bi-fuel	<ul style="list-style-type: none"> -same as "Diesel" w/ the following add's: -simple, quick to install -cost effective -increase run-time, lengthens time required to increase storage capacity -meets key Standard/Codes 	<ul style="list-style-type: none"> -same as "Diesel" w/ the following add's: -can be difficult to optimize w/ certain installations -no standard emissions 				<ul style="list-style-type: none"> -same as "Diesel" w/ the following add: -difficult to measure gas:diesel ratio in real-time and hence cost of operation
Natural Gas	<ul style="list-style-type: none"> -convenience from continuous feed -no odour -no environmental risk from spills -no fuel degradation -no working cost of fuel in storage -cleaner emissions ("green" option) 	<ul style="list-style-type: none"> -higher capital cost -larger footprint for engine -add'l load management may be required -facility may be located outside of gas utility's service area 			<ul style="list-style-type: none"> -same as "Emergency" w/ the following add: -lower fuel cost -superior emissions to access environmental permit 	-no add'l

Thumbnail estimate for up-front costs

	Emergency (\$/kW)	Standby/Backup (\$/kW)	Economic Applications	
			Peak-shaving	Co-generation
Diesel	\$ 400	\$ 400	N/A	
Bi-fuel	\$ 450	\$ 450		
Natural Gas	\$ 600	\$ 600	\$ 1,000	\$ 2,000

- N.B.
1. meant for illustrative purposes only
 2. consider impact of leveraging assets for multi-purposes



Thumbnail cost estimate for maintenance

	Emergency (\$/yr for a 1MW unit)	Standby/Backup (\$/yr for a 1MW unit)	Economic Applications	
			Peak-shaving (\$/yr for a 1MW unit)	Co-generation
Diesel	\$2,500 => includes 2-visits w/ 1 being an oil &+ filter change plus \$3,000 for a load-bank rental plus carrying cost of 24hrs of stored diesel (~\$500)		N/A	
Bi-fuel				
Natural Gas			\$5,000 (based on 250hrs/yr)	\$0.015/kWh

N.B. meant for illustrative purposes only



Questions

**Tim Short, Manager Market
Development**

Enbridge Gas Distribution

tel.: 416-753-6296

e-mail: tim.short@enbridge.com

