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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

# Methane Utilization at Coquitlam Landfill: Opportunities and challenges at an old, closed landfill

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Global Methane Initiative  
Vancouver, BC  
March 14, 2013

# Methane Utilization at Coquitlam Landfill: Overview

## Objectives of Presentation

1. Cohesive story on historic methane collection/ utilization, LFG System upgrade, LFG utilization and carbon accreditation
2. Challenges of LFG utilization for an old landfill



What do a 30-year old closed landfill and 25,000 beef cows have in common?



Both generate the same amount of methane!



Trivia: One beef cow “emits” approx. 0.5 tonnes GHGs per year



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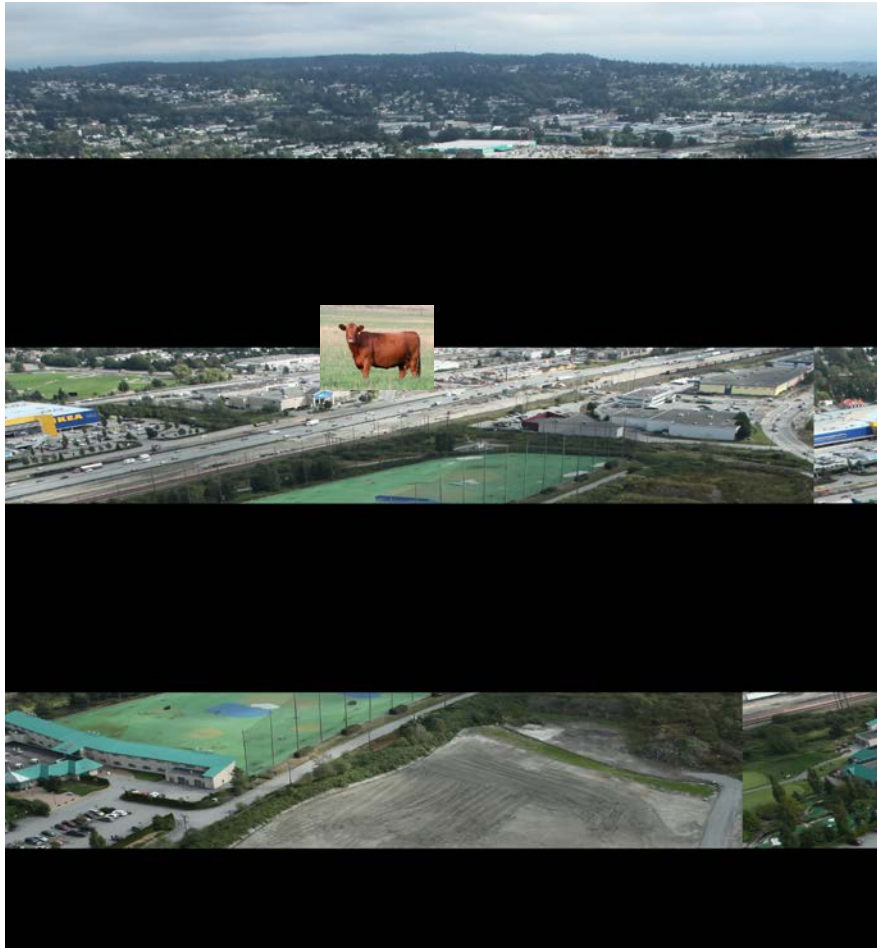
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# Outline

- Landfill History
- BC Regulations
- Drivers: Sustainability Framework
- Carbon accreditation
- Methane generation and capture
- Options for beneficial use (2009 and 2012 study)
- What's next?



# Coquitlam Landfill - History



- Urban setting (near Vancouver)
- 2 Million tonnes of MSW from 1975 to 1983
- Landfill Gas (LFG) Collection System constructed in 1993
- LFG beneficially used as fuel by paper recycling facility from 1993 to 2011
- Avoided fugitive methane emissions 135,000 tonnes CO<sub>2</sub> E since 1993



# Coquitlam Landfill - History (cont.)



- Flaring of gas started in 2011
- Current flow: 110m<sup>3</sup>/h
- LFG Collection System upgrade to increase gas capture
- Looking for new beneficial user



# Landfill Gas Regulations

- BC Landfill Gas Management Regulation in Effect January 1, 2009
- Applies to active landfills that receive waste – **Coquitlam Landfill Exempt**
- LFG capture and destruction qualifies for carbon credits and not limited to 2016

Ministry of Environment

PROVINCE OF BRITISH COLUMBIA  
ORDER OF THE LIEUTENANT GOVERNOR IN COUNCIL  
Order in Council No. 903, Approved and Ordered DEC - 8 2008

Executive Council Chambers, Victoria  
On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and consent of the Executive Council, orders that effective January 1, 2009,

1 the following provisions of the *Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act, 2008, S.B.C. 2008, c. 20*, are brought into force:

- (a) section 1;
- (b) section 2, insofar as it enacts sections 76.2, 76.21 and 76.5;
- (c) section 6, insofar as it enacts section 114 (1) (a) to (f) and (2);
- (d) section 11, insofar as it enacts section 120 (2) (a) to (d) and (f) to (h) and (3) (a) to (c), and

2 the attached Landfill Gas Management Regulation is made.

Minister of Environment  
Presiding Member of the Executive Council

Authority under which Order is made: (This part is for administrative purposes only and is not part of the Order.)  
Act and section: Greenhouse Gas Reduction (Emissions Standards) Statutes Amendment Act, 2008, S.B.C. 2008, c. 20, s. 37  
Other (specify): Environmental Management Act, S.B.C. 2003, c. 53, s. 76.21  
November 20, 2008

page 1 of 12  
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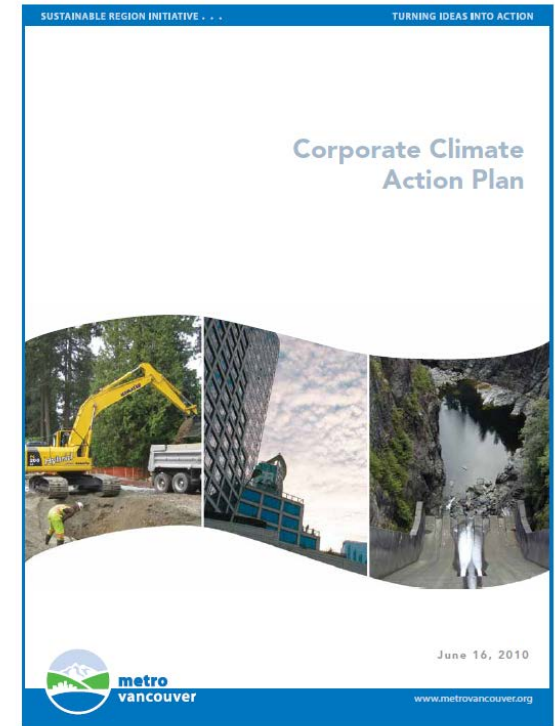
# Drivers: Metro Vancouver Sustainability Framework

## Greenhouse Gases Targets

- Regional: Reduce 15% by 2015 and 33% by 2020
- Corporate: Carbon Neutrality (signatory to BC Climate Action Charter)

## Energy Targets

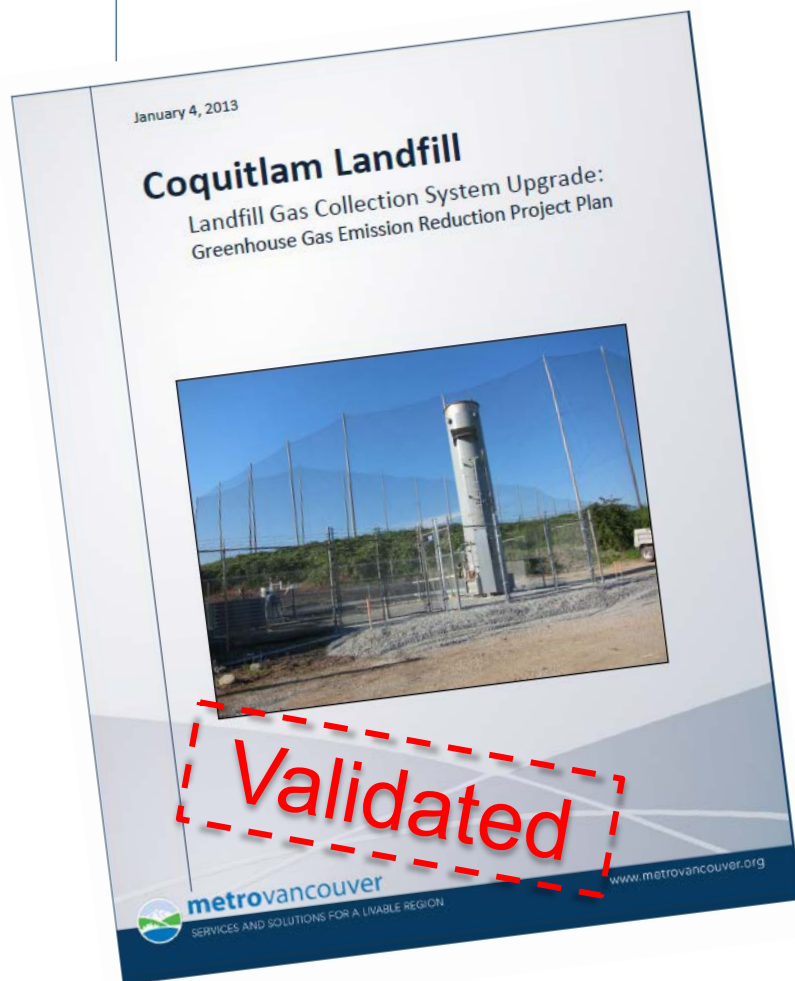
- Increase energy recovery from existing solid waste operations by 10% by 2015
- Seek alternate forms of energy



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# Carbon Credits - Methane Destruction



- Expanding LFG collection means environmental benefits

## Carbon credits:

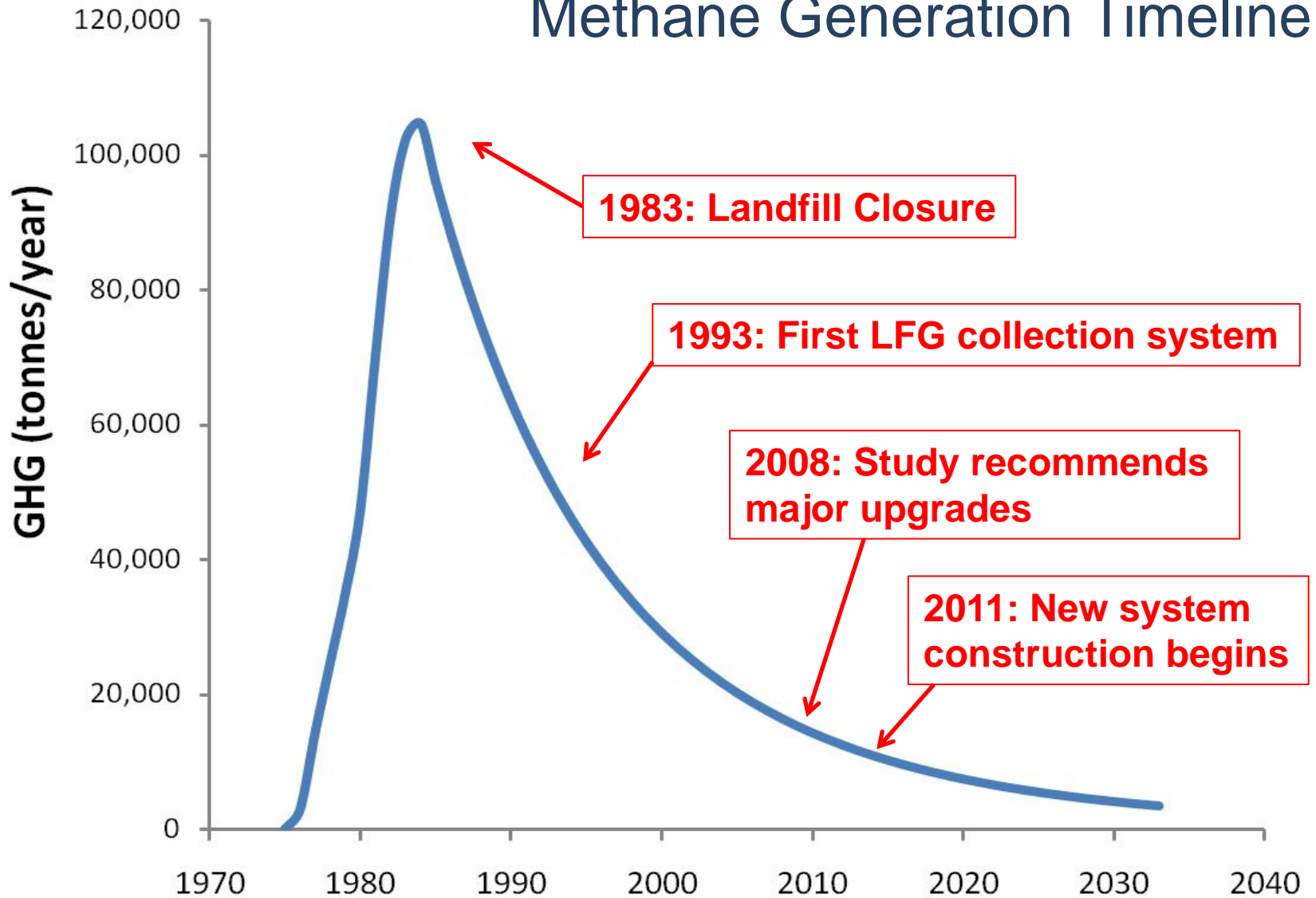
- Project Plan validated for 10yr
- B.C. Climate Action Charter
- Could offset up to **one third** of MV's carbon footprint
- Future beneficial use = more GHG reduction & credits



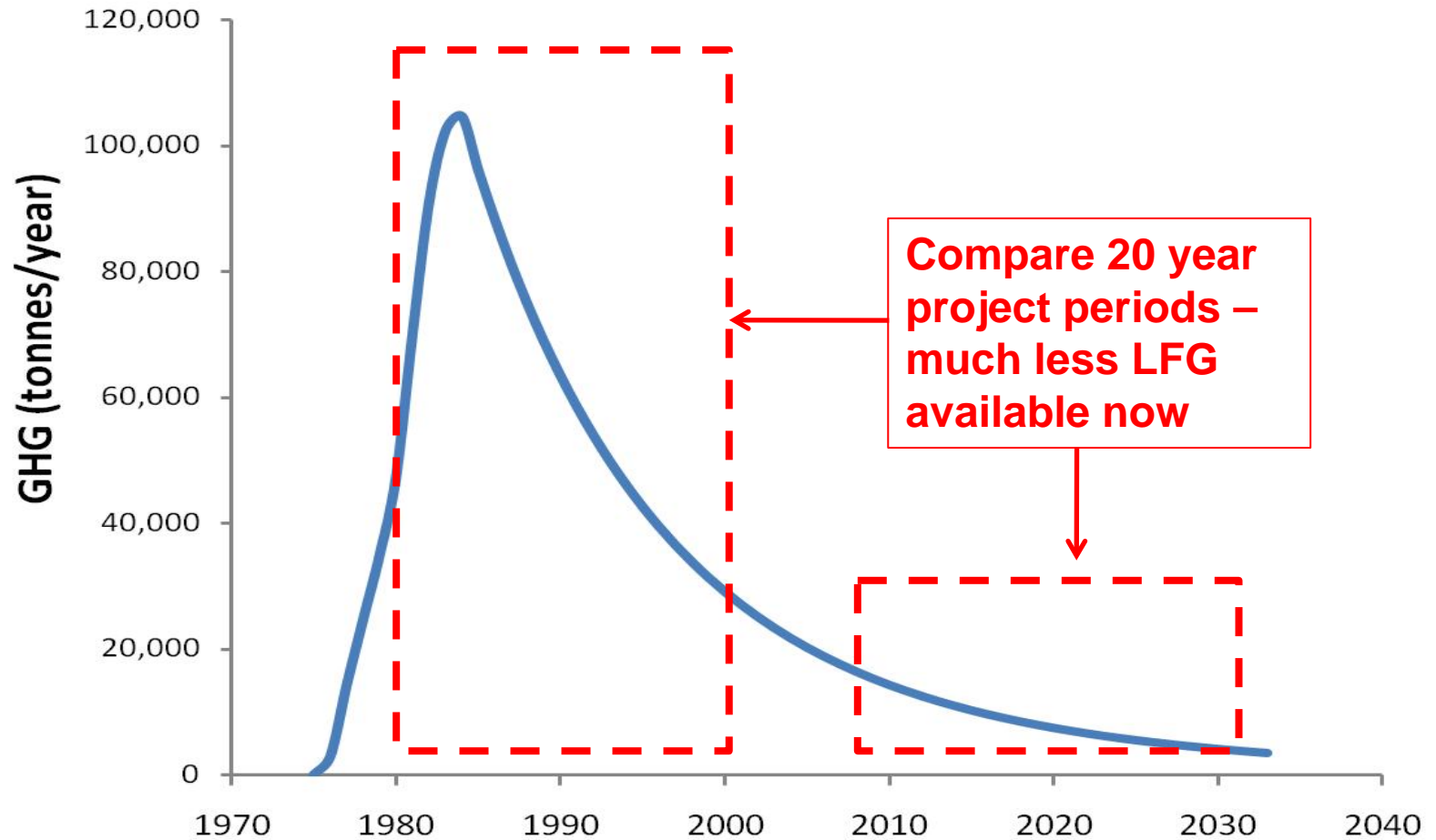
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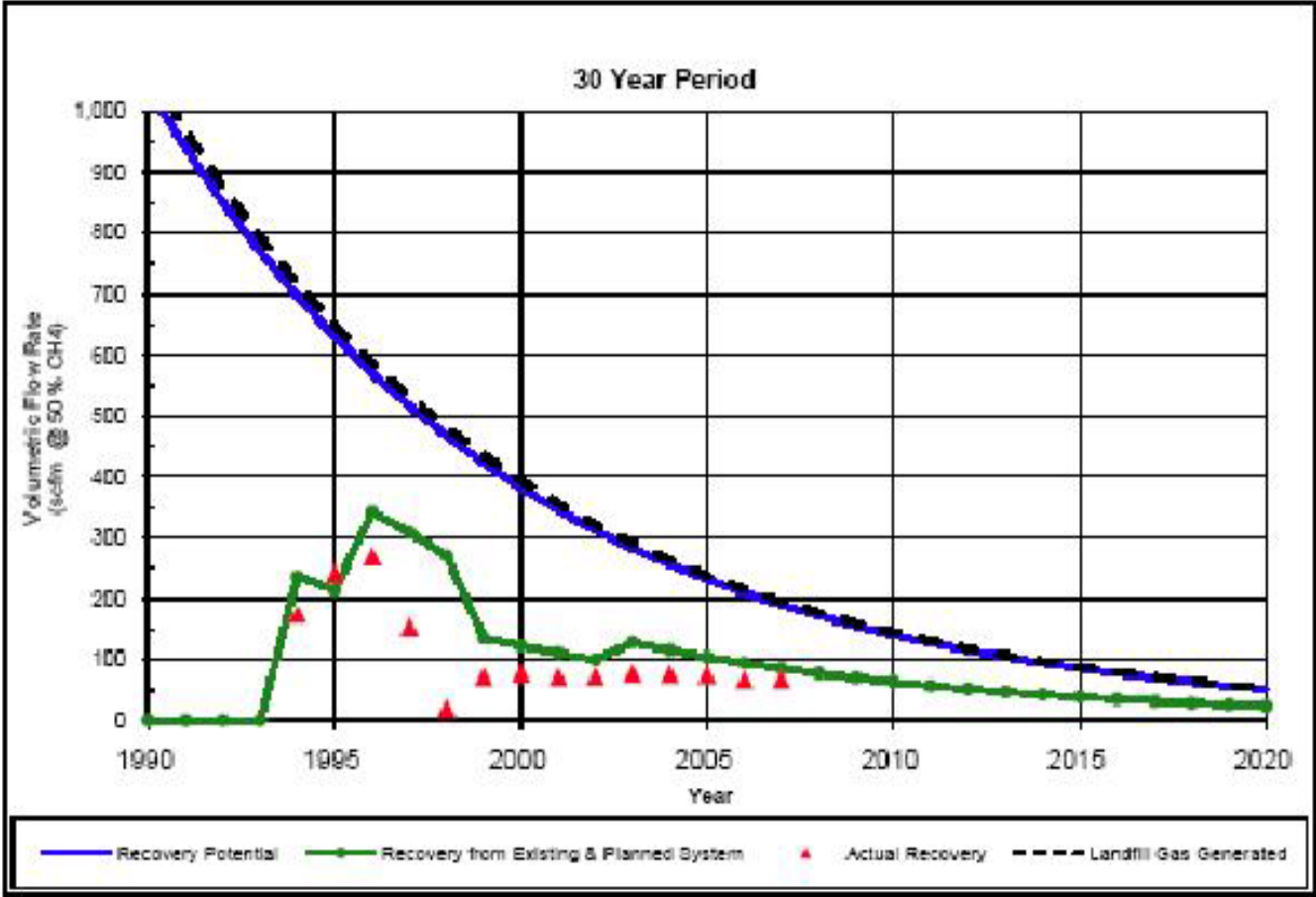
# Methane Generation Timeline



# Methane Generation Timeline: LFG Utilization Project – Why?

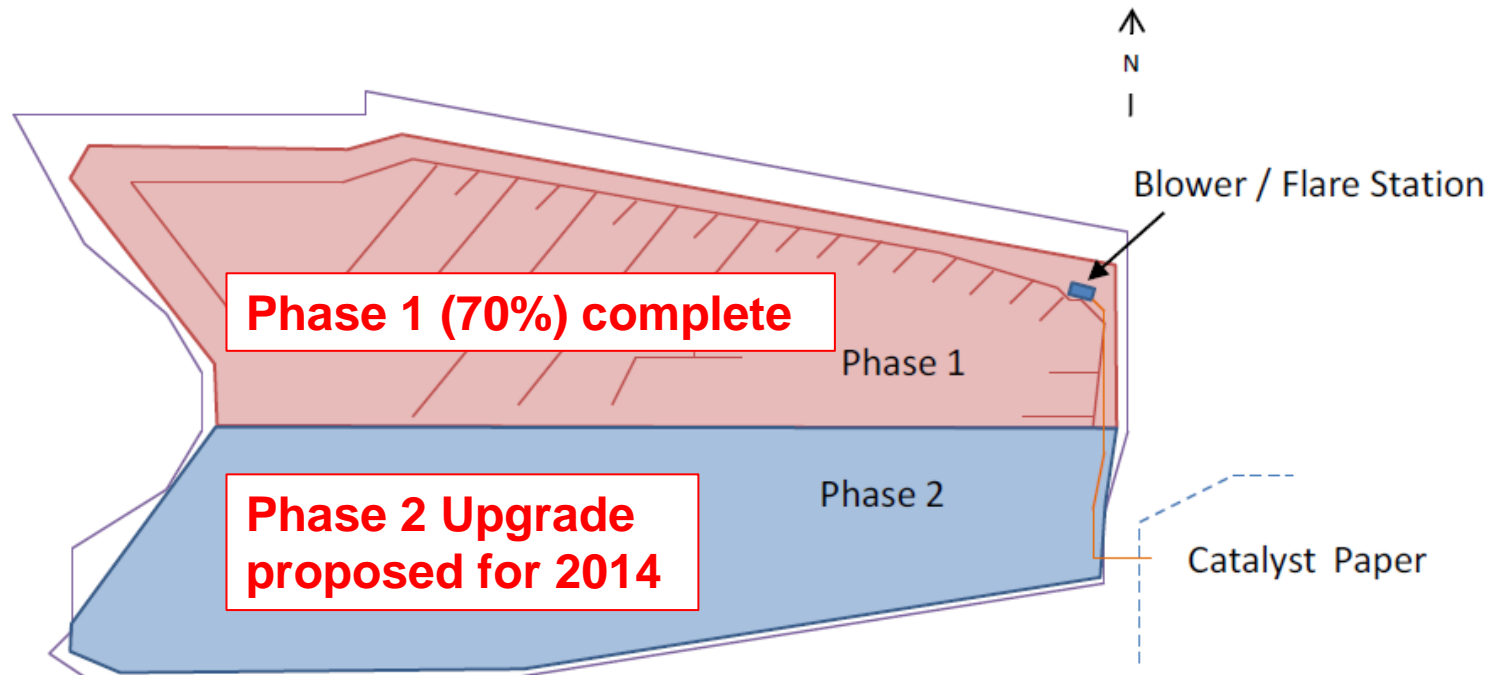


# Landfill Gas Generation and Collection



# Collection System Upgrade – required for utilization project

- 2009 Utilization Assessment: should upgrade LFG system to increase potential for a utilization project



# Landfill Gas Utilization Challenges for an Old Closed Landfill

1. Low quantities of gas
2. Declining generation rates of gas
3. Landfill Gas Quality characterized as poor
4. Completing feasibility studies is difficult



# Utilization Options for 2009 Study

- Scenario A: 110 m<sup>3</sup>/h in 2010
  - Direct use – hypothetical user 1 km from the landfill
  - 2 x 65 kW microturbines for electricity generation
  - 1 x 100 kW cogeneration engine
- Scenario B: 220 m<sup>3</sup>/h in 2010
  - Direct use – hypothetical user 1 km from the landfill
  - 4 x 65 kW microturbines for electricity generation
  - 2 x 100 kW cogeneration engine
  - Upgrading to pipeline – Assumes N2 level is <2%.



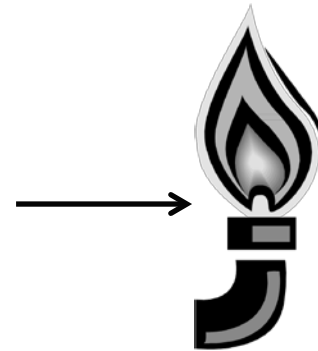


# Results of 2009 Utilization Assessment

	<b>Direct Use</b>	<b>Microturbines 2 x 65 kW 4 x 65 kW</b>	<b>Micro-cogeneration 100 kW engine 200 kW engine</b>
Scenario A Net Present Value	\$200k	-\$700k	-\$800k
Scenario B Net Present Value	\$700k	-\$900k	-\$200k
Scenario B GHG emissions reductions over 20 years (tonnes CO <sub>2</sub> E)	-14,900	-1,400	-6,700



# Options for beneficial use (2012 study)



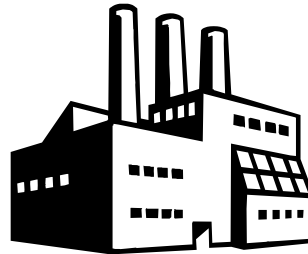
Flare



Heating,  
Greenhouses



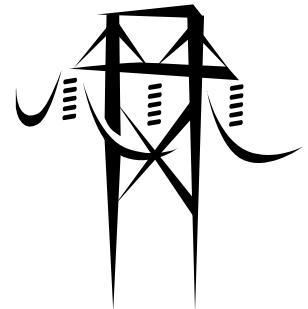
Upgrade and inject  
into natural gas  
pipeline



Direct use in  
modified  
boiler



CNG for use  
in vehicles



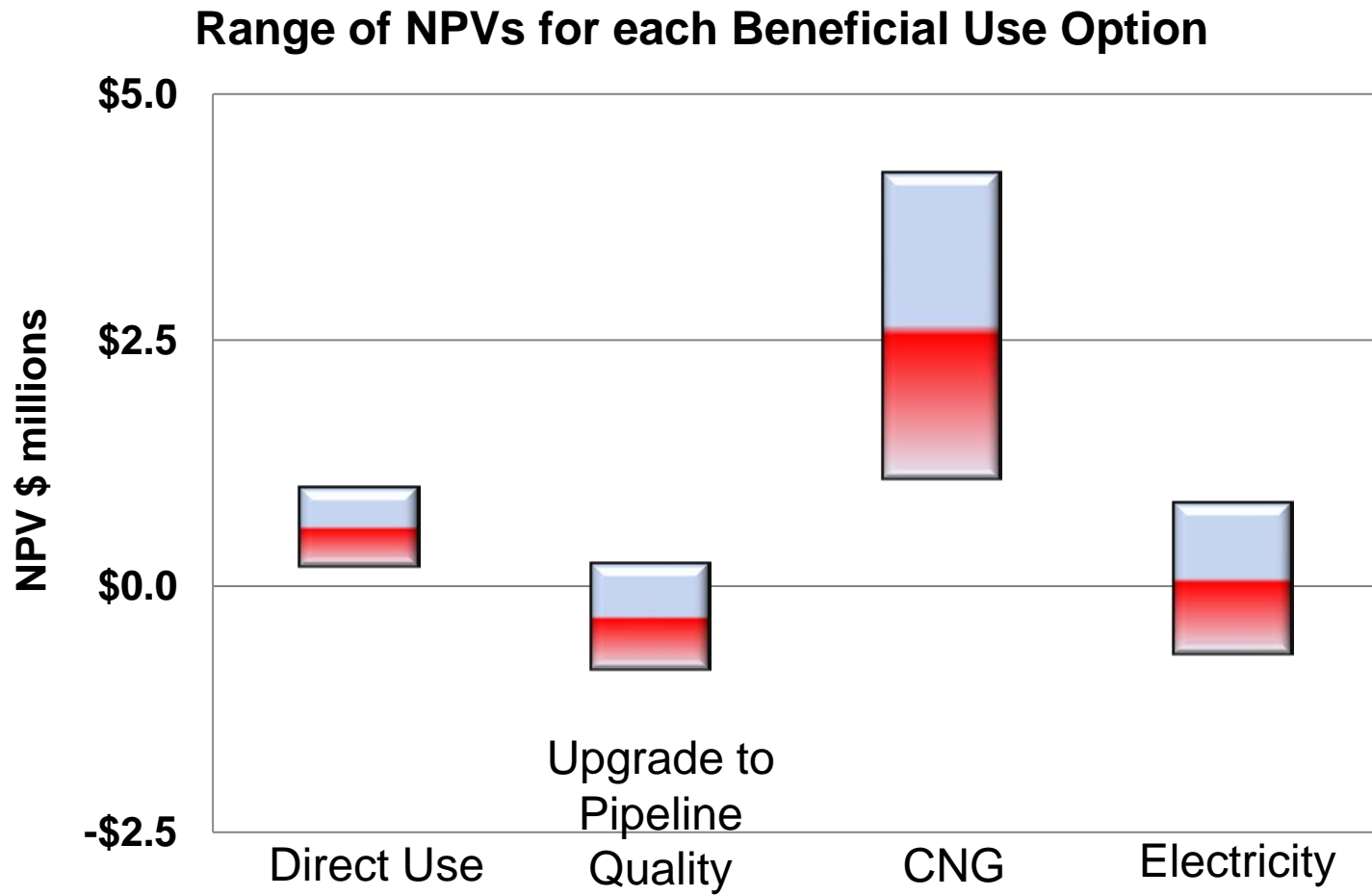
Electricity  
Generation



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# Summary of Preliminary Feasibility Study - Utilization Options



# Next Steps

- Phase 2 collection system upgrade
- Update analysis with new LFG capture to assess feasibility and options
- Procurement process to find beneficial user



# Contact Information

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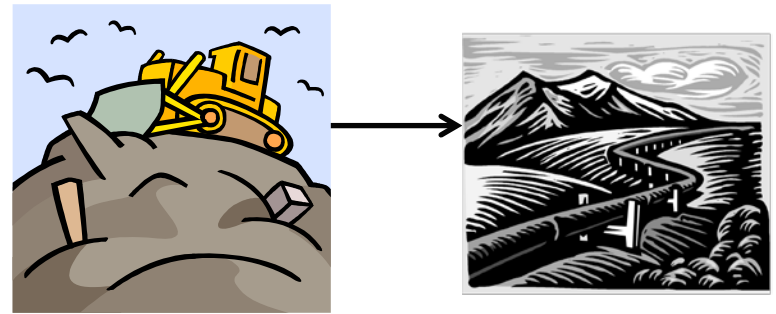
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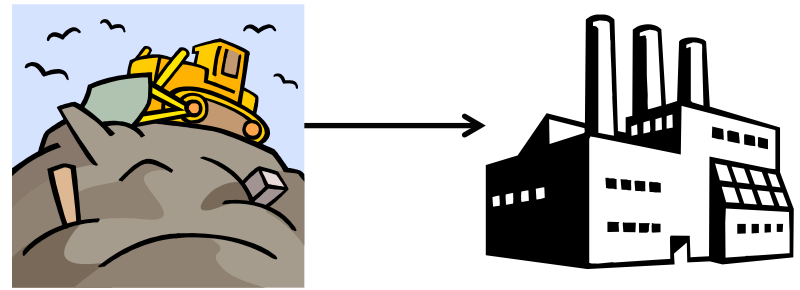
# Upgrade & Inject into Natural Gas Grid



<b>Description</b>	Metro produces pipeline quality natural gas and injects into the natural gas grid
<b>Technical Requirements</b>	Stringent pipeline quality specs need to be met and pressure to 3,600 psi
<b>Key Considerations</b>	High capital cost (due to purification & treatment) Price of natural gas Relatively high power use for compression (operating)
<b>Cost</b>	\$1,000,000 - \$1,500,000
<b>GHG benefits</b>	11,000 t CO2 annually



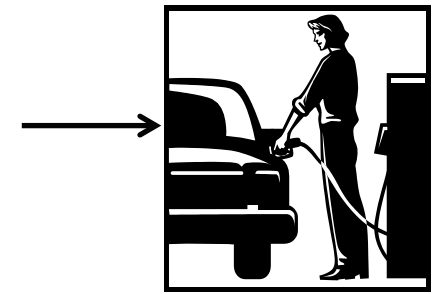
# Option – Direct Use



<b>Description</b>	Metro sells raw LFG to a nearby industrial business for use in their boiler
<b>Technical Requirements</b>	Condensate management system & boiler modifications
<b>Key Considerations</b>	Price of natural gas - revenues Pipeline distance - capital
<b>Cost</b>	\$500,000 - \$1,500,000
<b>GHG benefits</b>	25,000 t CO2 annually



# Compressed Natural Gas for Vehicles

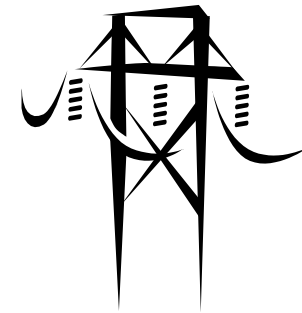


<b>Description</b>	Produce CNG for use in vehicles.
<b>Technical Requirements</b>	Purify gas to min 88% methane and compress to over 3,000 psi
<b>Key Considerations</b>	Nitrogen removal Delivery infrastructure and fueling stations Type and number of CNG vehicles
<b>Cost</b>	\$1,500,000 - \$2,000,000 High operating costs
<b>GHG benefits</b>	24,000 t CO2 annually





# Electricity



<b>Description</b>	Metro produces electricity and sells to BC Hydro
<b>Technical Requirements</b>	Similar to reciprocating engines, LFG treatment required (typically siloxanes)
<b>Key Considerations</b>	Microturbine units can handle low volumes of LFG Ability to obtain BC Hydro contract for low electricity output
<b>Cost</b>	\$500,000 - \$1,000,000
<b>GHG benefits</b>	0 (in BC electricity is hydro generated)

