Methane Emissions Management

IAGT Symposium 2005

Banff, Alberta

TransCanada
In business to deliver

Greenhouse Gas Emissions Management

AGENDA

- TransCanada in Business
- Climate Change Policy/Strategy
- Greenhouse Gas Emissions
- Emissions Management Strategy
- TransCanada's Experience
  - **Control Methodologies**
  - **Research & Development**
- Conclusion

TransCanada

Leading North American energy company

- Competitively positioned in natural gas transmission & power services
- $22.1 billion of premium pipe and power assets ($Cdn at Dec. 31, 2004)
- Skilled, expert people with strong technical knowledge
- Strong financial position

Member of Dow Jones Sustainability Indexes







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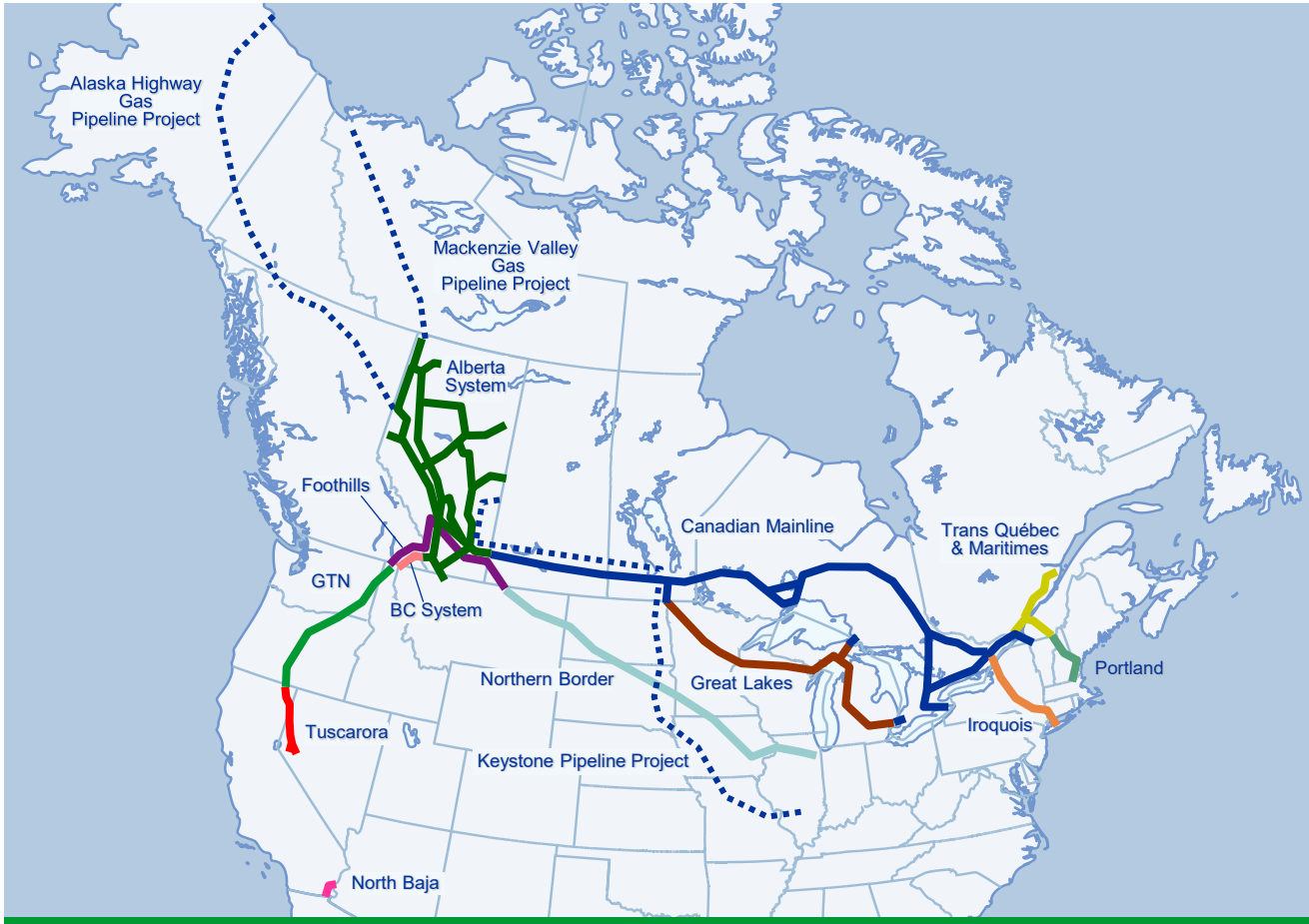
Natural Gas Transmission Assets



41,000 km of wholly owned pipeline; 11.5 Bcf/day

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TransCanada's Power Assets

TransCanada 22 plants; 4,700 MW
(including LP and plants in development)

TransCanada Power, L.P.
11 plants; 744 MW

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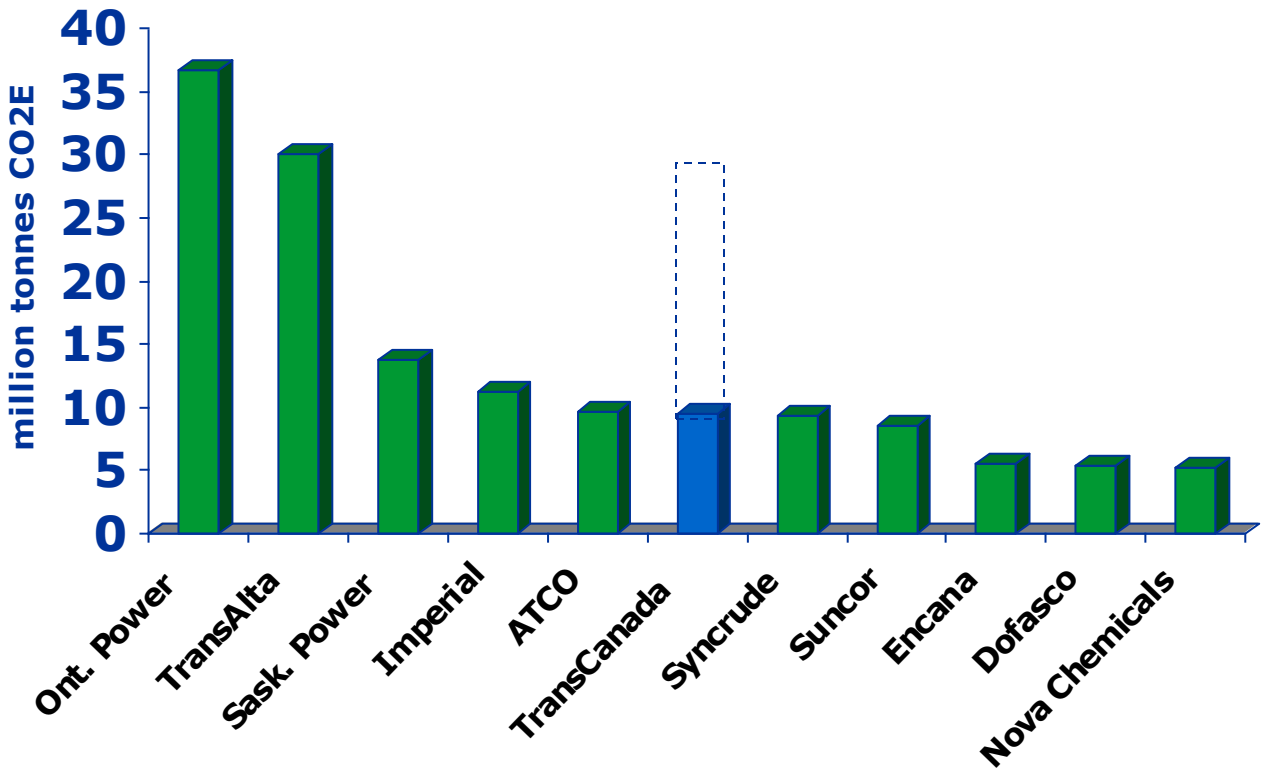
Corporate GHG's 2003



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Existing and Proposed Mandatory Reporting Requirements

WHY EMISSIONS MANAGEMENT?

- **NPRI** (CAC reporting - June 1st annually)
- **AB Environment** (GHG reporting)
- **Environment Canada** (GHG reporting June 1, 2005)
- **Ontario Env.** (Reg. 127- NOx quarterly,CO2 annually; Reg 397 – CEMS/PEMS data for non-OPG Power Plants commenced Jan 1, 2004)
- **US North Eastern Registry (**GHG reporting - within next two years)

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Climate Change Policy

- Climate Change issue is not going away.
- Greenhouse Gas Emissions is potential liability for TransCanada.
- We have a plan in place to manage climate change.
- TransCanada believes in promoting global solutions to this global challenge.
- TransCanada believes prudent action is required.
- TransCanada believes in a strong commitment to technological innovation.

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Methane Emissions Management

Climate Change Strategy

Participation in National Processes

- Issue Table Process
- Upstream Oil and Gas Working Group

Direct Emissions Reduction

- Fugitive Emissions Management
- Blowdown Emissions Management

Technology Development

- Dry Gas Seals
- Methane Biofiltration
- Combustion processes

Emissions Offsets

- Landfill Gas Reuse
- CDM/JI

Business Opportunities

- ?

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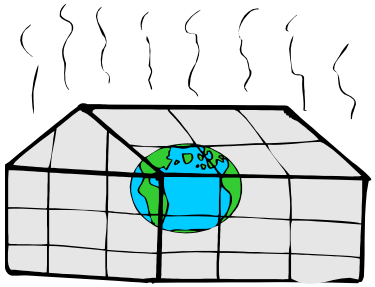
Sources of Greenhouse Gas Emissions

Source of Greenhouse Gas in TransCanada

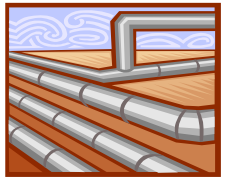


CO2
CH4
N2O

Direct

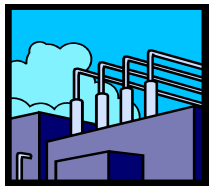
Indirect Electricity

Power Plants



Pipelines (include Valves, Compressor and Meter Stations)

Utility Consumption



Cancarb - Carbon black facility

- Company Vehicle
- Rental Vehicle
- Employee Vehicle

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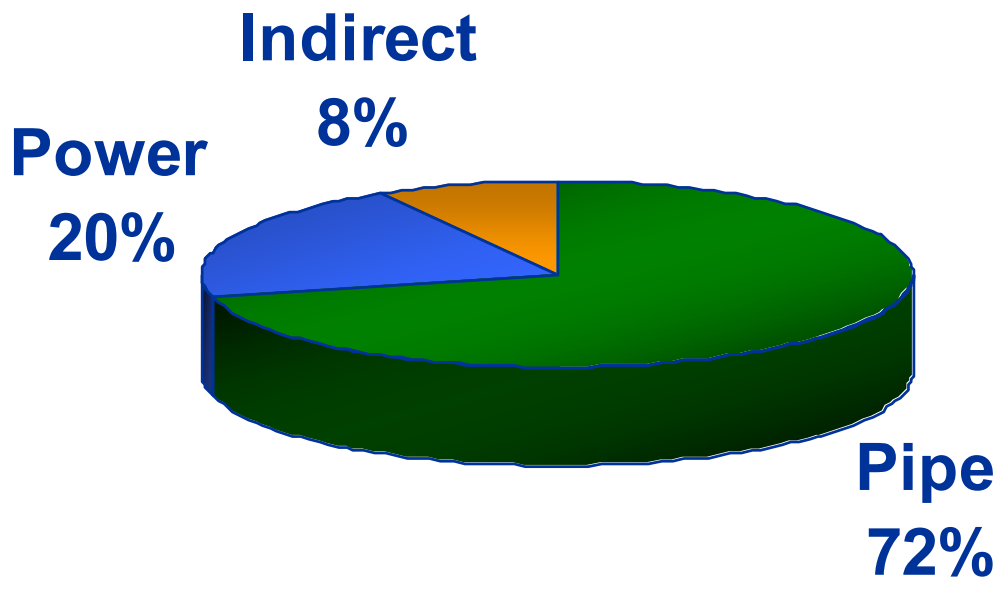
Methane Emissions Management

GHG Emissions by Type



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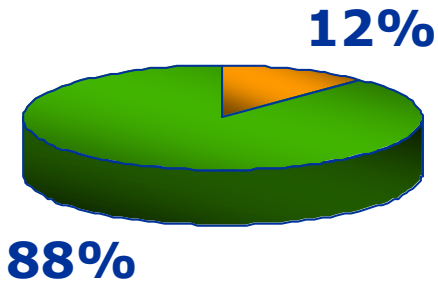
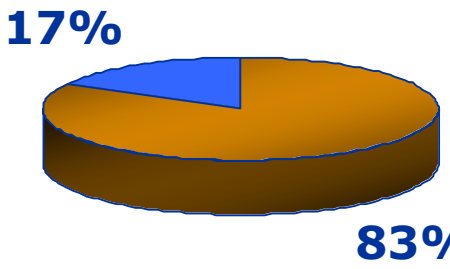
Methane Emissions Distribution

Greenhouse Gases



Methane Emissions



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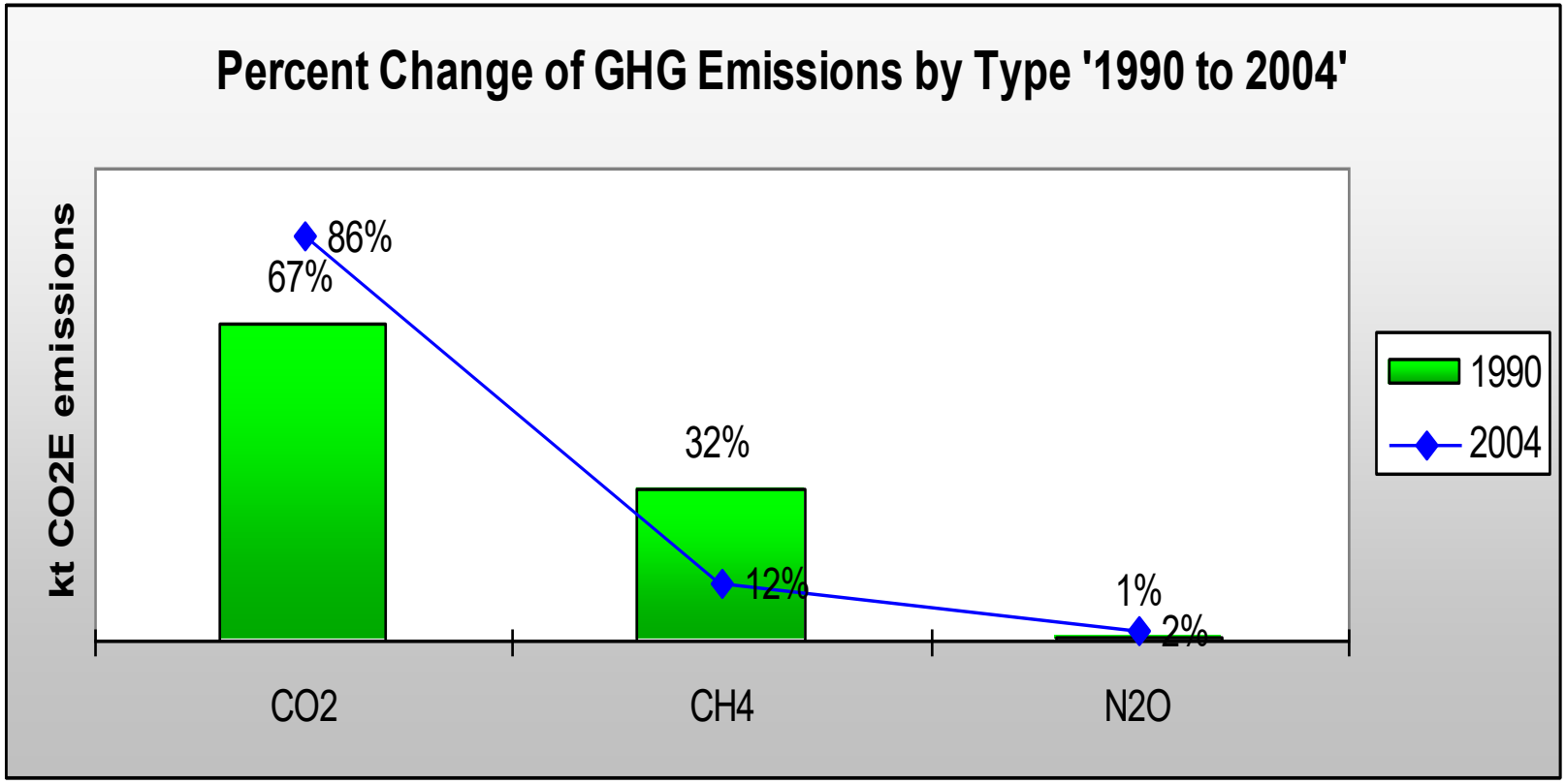
Total Direct GHG Emissions and Methane Emission Decline



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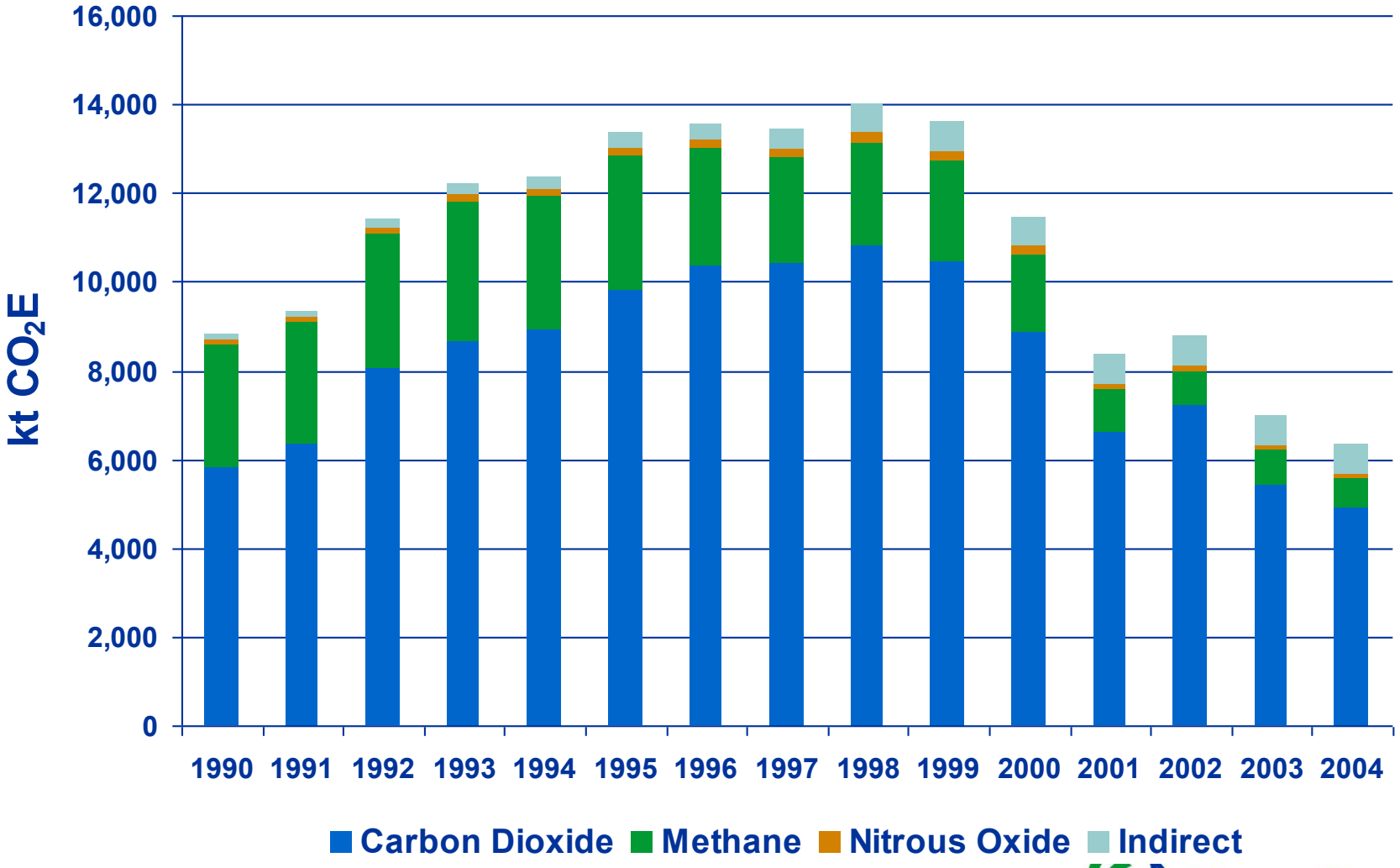
GHG Emissions from Pipeline Operations and Methane Reduction



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Greenhouse Gas Emissions Management

TCPL Emissions Management System

Combustion Emissions

- CO_2
- CH_4
- N_2O
- CO
- VOC's
- NOx

Energy Efficiency and conservation

Vented Emissions (CH_4, CO_2)

Fugitive Emissions

LDAR
(leak detection & repair)

HFS
(measurement)

Blowdown Emissions

- transfer compression
- pipeline inspection tools
- buttering and hot tapping
- stopple plugs
- repair sleeves
- hot line lowering
- incineration

R & D

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Fugitive Emissions Management Program

- **Reduce** fugitive emissions by implementing an effective leak detection and repair (LDAR) program and support Canada's national emissions reduction strategy

- **Measure** fugitive emissions from our facilities and contribute to the Canadian greenhouse gas reporting initiatives
  - use of high flow sampler (HFS)
  - annual measurement program for 10% CS, 5% MS and 5% VS per region
    - Will try to achieve five year cycle for each facility

- **Reduce** engineered fugitive emissions through research and development programs in place

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Fugitive Emissions Management Program Targets

LDAR - Leak Detection & Repair Program

(Complete LDAR for all the facilities as per M12 & M24 TOP through AVANTIS)

100 % CS, 50 % MS, 50 % Valve sites

V.P Ops. & Eng. Objective:

- **100% completion of LDAR**
- **100,000 tonnes CO2E savings** **(early start will help us achieve this target)**

HFS - Fugitive Emissions Measurement Program

10% CS, 5% MS, 5% Valve sites

REPORT through GeoFind

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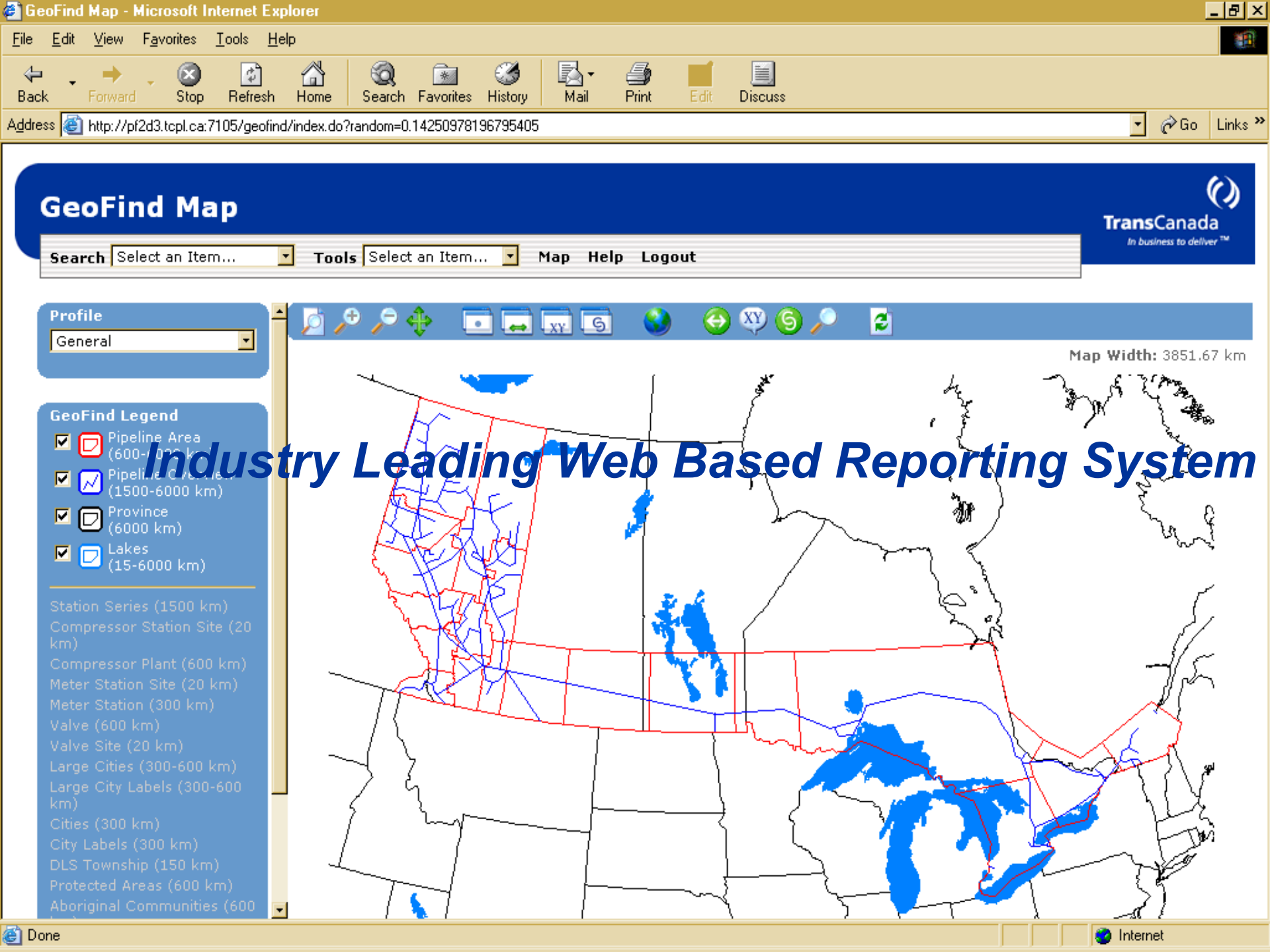
GeoFind Map - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Discuss
Address http://pf2d3.tcpl.ca:7105/geofind/index.do?random=0.14250978196795405
Go Links
GeoFind Map
TransCanada
In business to deliver
Search Select an Item...
Tools Select an Item...
Map Help Logout
Profile
General
GeoFind Legend
Pipeline Area (600-
Pipeline (1500-6000 km)
Province (6000 km)
Lakes (15-6000 km)
Station Series (1500 km)
Compressor Station Site (20 km)
Compressor Plant (600 km)
Meter Station Site (20 km)
Meter Station (300 km)
Valve (600 km)
Valve Site (20 km)
Large Cities (300-600 km)
Large City Labels (300-600 km)
Cities (300 km)
City Labels (300 km)
DLS Township (150 km)
Protected Areas (600 km)
Aboriginal Communities (600
Map Width: 3851.67 km
Industry Leading Web Based Reporting System
Done
Internet

Fugitive Emissions Management

(LDAR vs Measurement)

- **High Flow Sampler Measurement**
  - **Accuracy; ± 10%**
  - identification of most "cost effective fixes"
- **Bacharach HFS - NEW**

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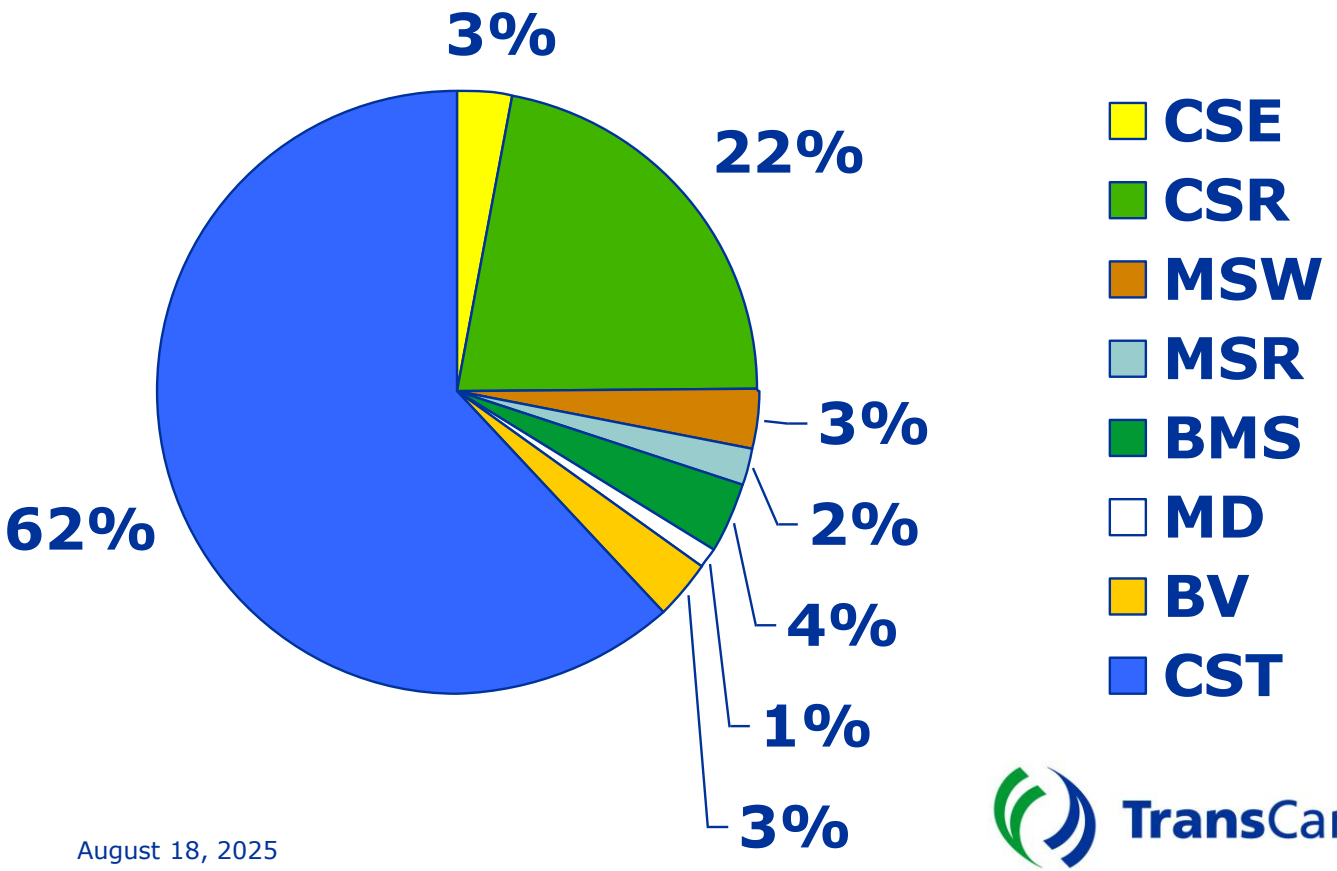
Measurement Program

- Complete measurement 20% of system per annu
  - with High Flow Sampler
    - **conventional bagging is 10 times slower**
- Develop annual leak rates for different types of facilities to calculate system emissions
- This inventory of emissions is reported to Natior Emissions Reductions Program in VCR report

Methane Emissions Management

Methane Emissions from pipeline system by type of facility.



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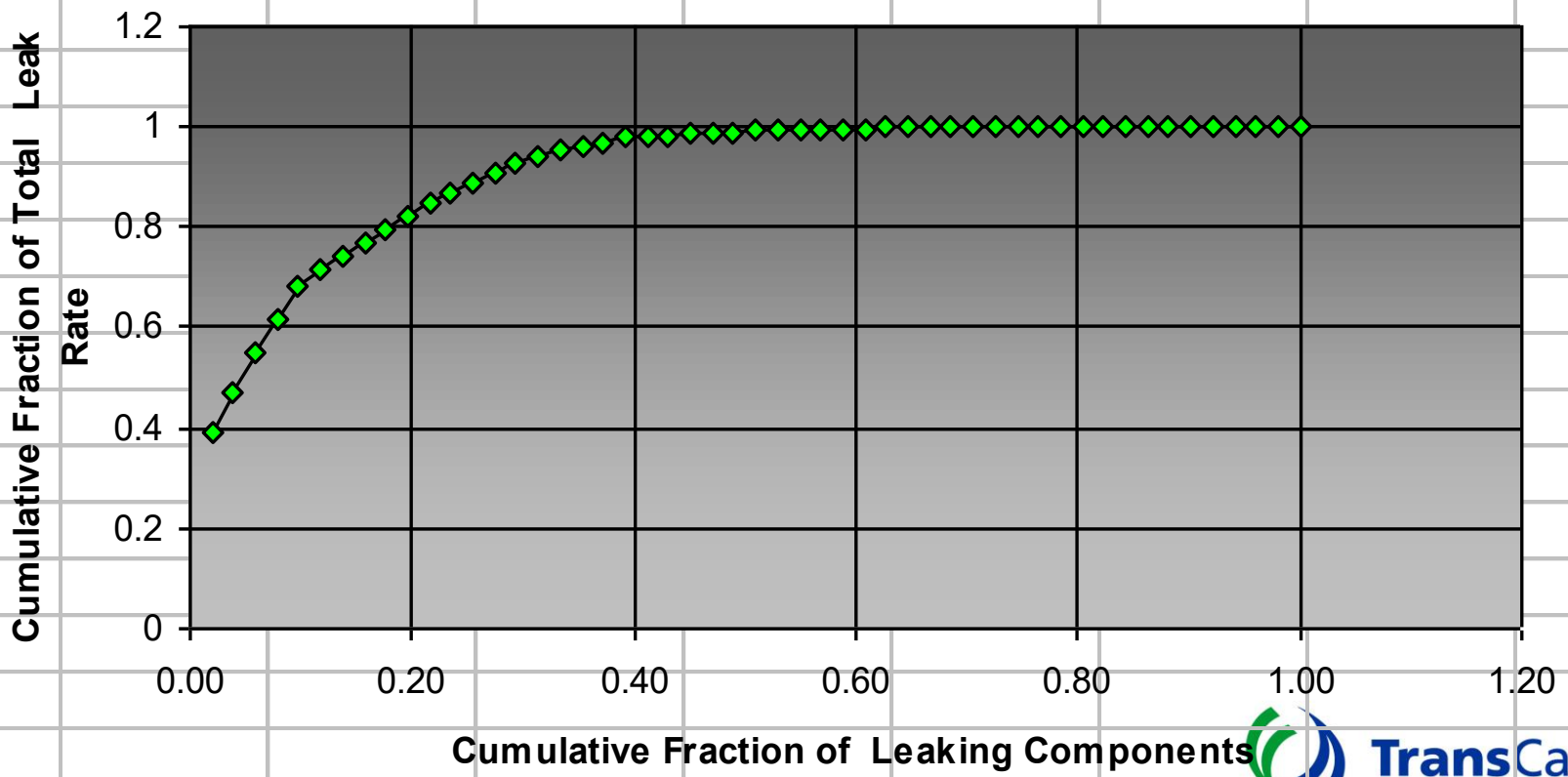
Methane Emissions Management

Sample Field Measurement Data Analysis



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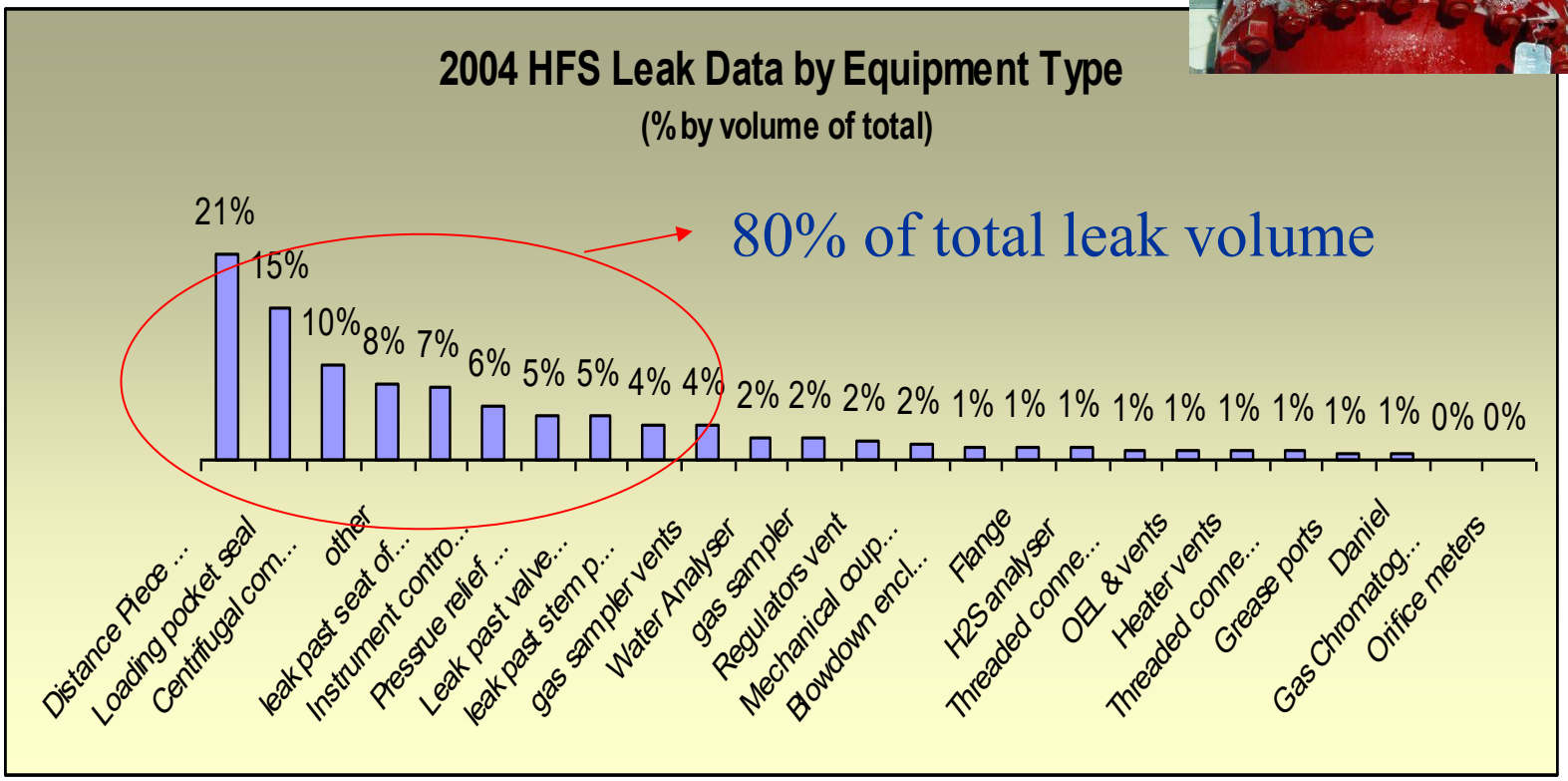
Fugitive Emissions Management - Opportunities

Priority repairs…



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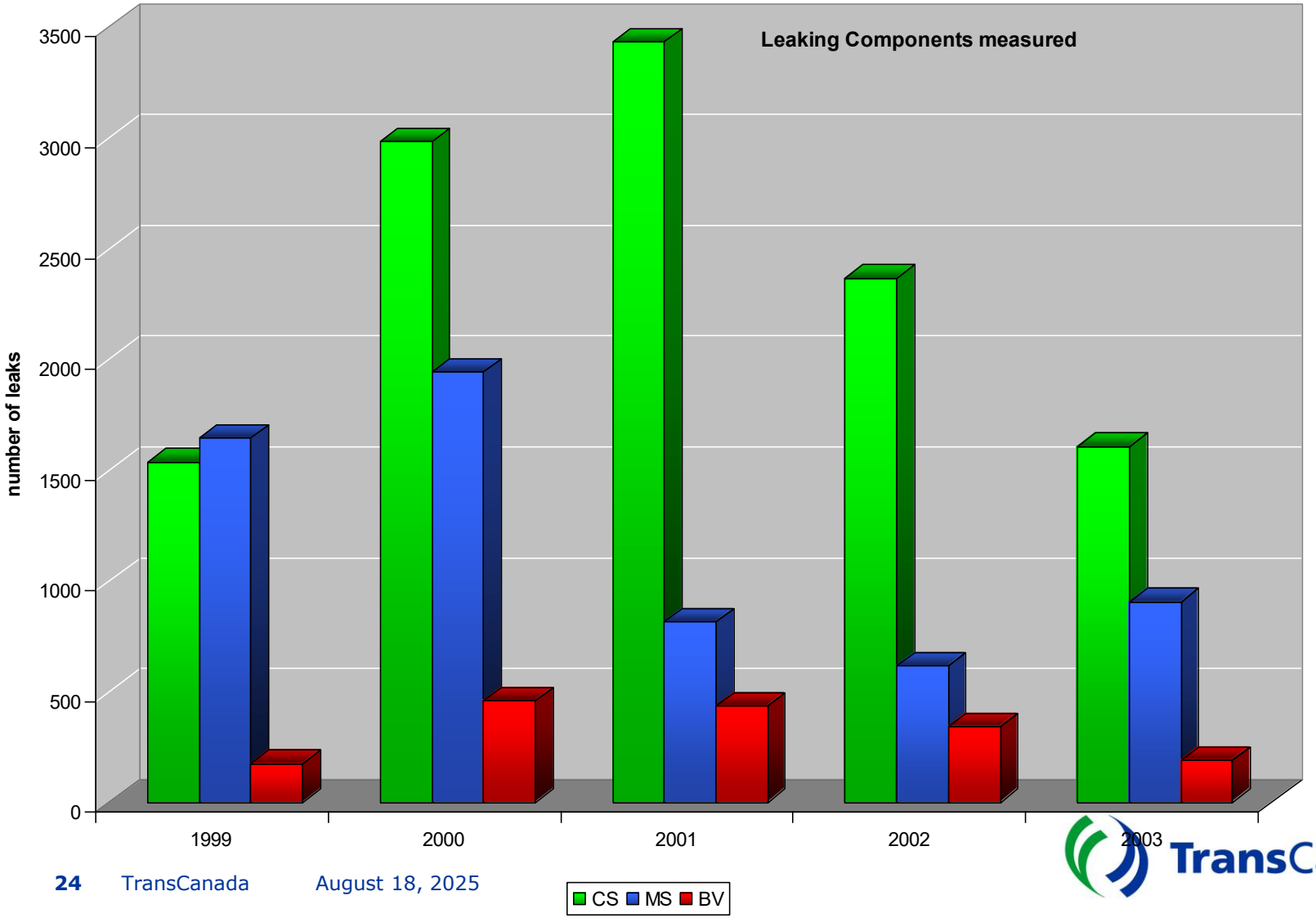
Fugitive Emissions Management - Opportunities



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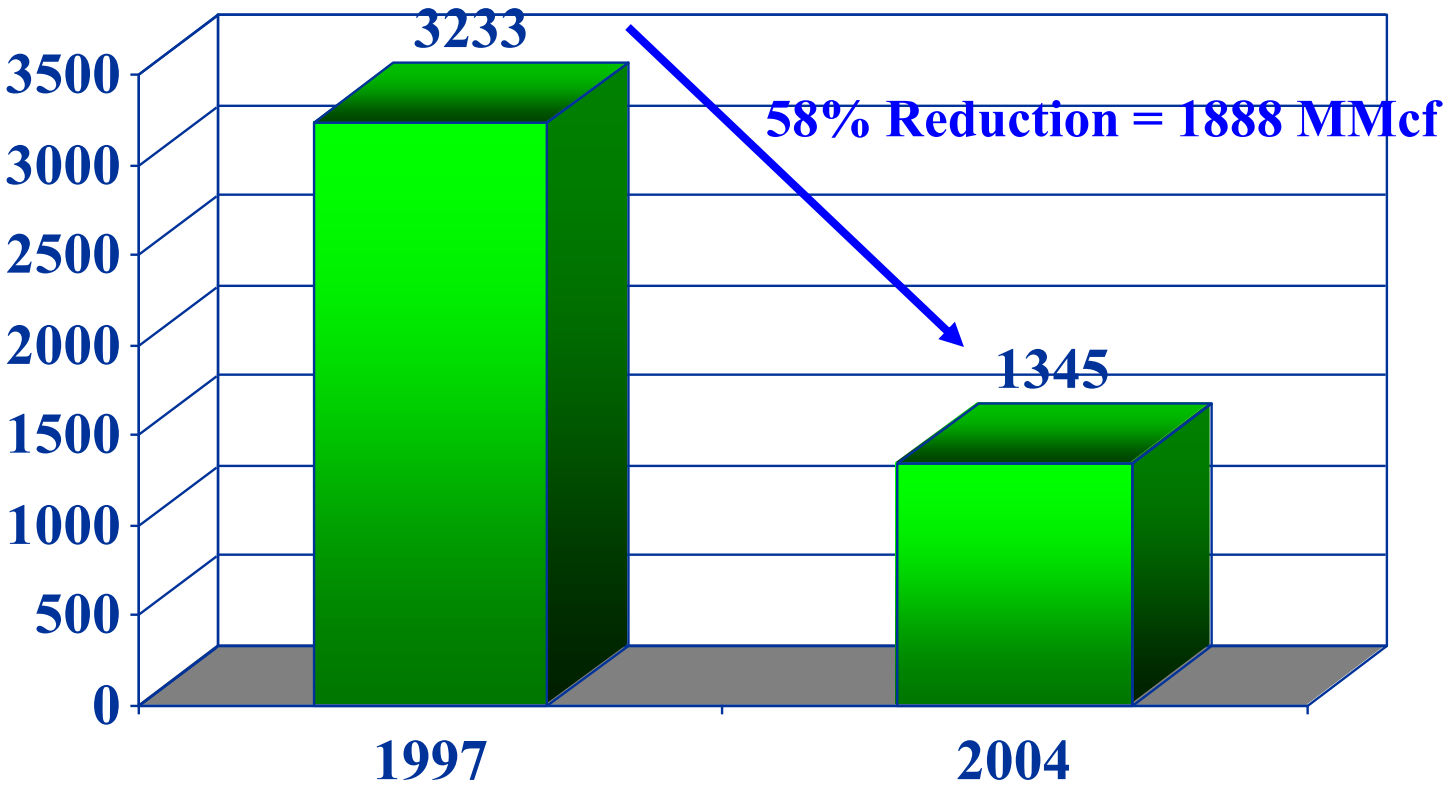
LDAR Program Achievement

Fugitive Emissions in million ft3 CH4



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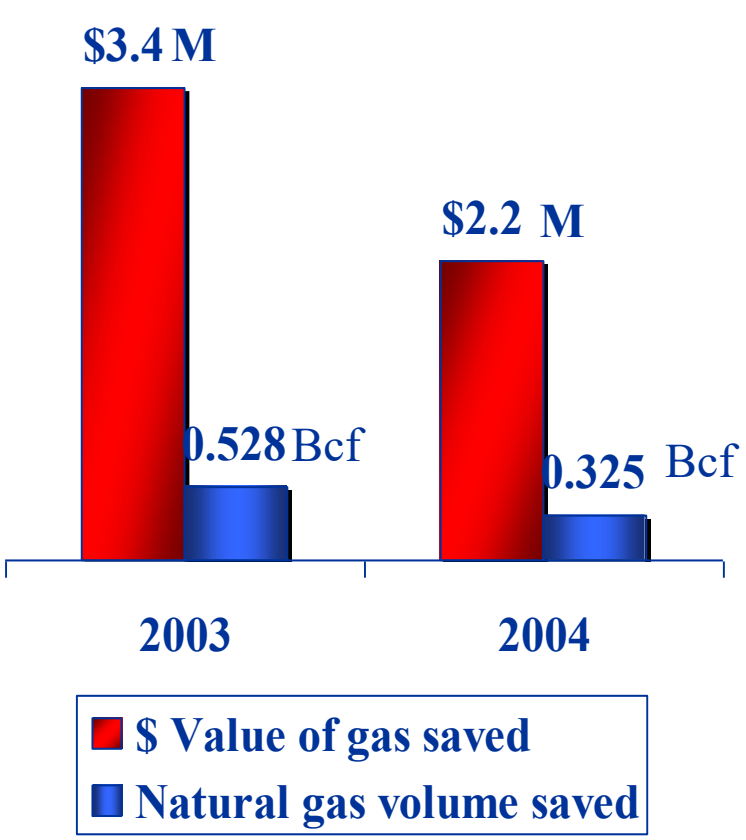
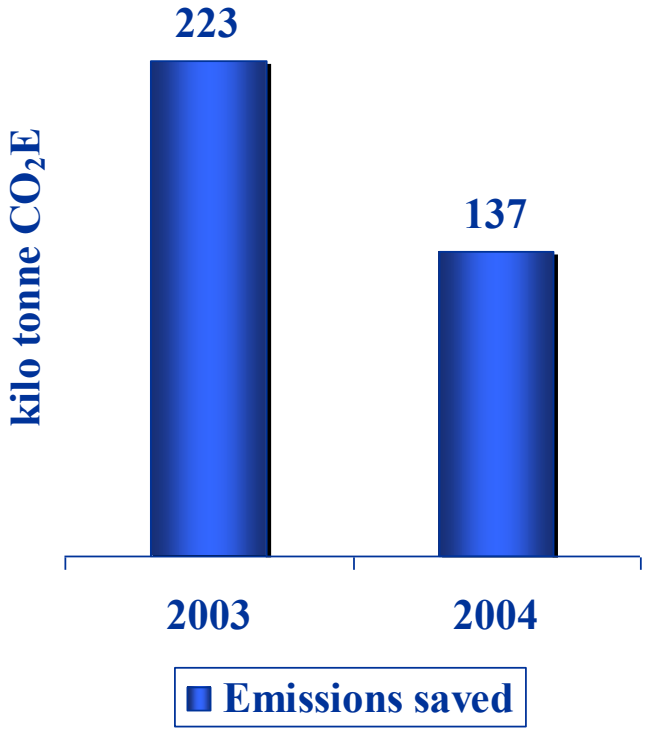
LDAR Program Savings





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Methane Emissions Management

Reducing Emissions by using Transfer Compressor

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Blowdown Emissions Management

(Control Methods and Technologies Used)

- Scheduling Practices
- Operational Adjustments
- Transfer (Pull-down) Compressors
- Buttered Stubs
- Hot Tapping
- Sleeves
- Stopples
- Hot line lowering

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2004 Summary of Savings from Methane Emission Reduction Programs

Minimizing Blowdown Emissions	711,000 tonnes of CO2E (49,076 e3m3)
Transfer Compression	322,000 tonnes of CO2E (22,218 e3m3)
Valve Sealing	0
Buttering & Hot Tapping	169,000 tonnes of CO2E (11,644 e3m3)
Repair Sleeves	220,000 tonnes of CO2E (15,213 e3m3)
Reducing Fugitive Emissions	137,000 tonnes of CO2E

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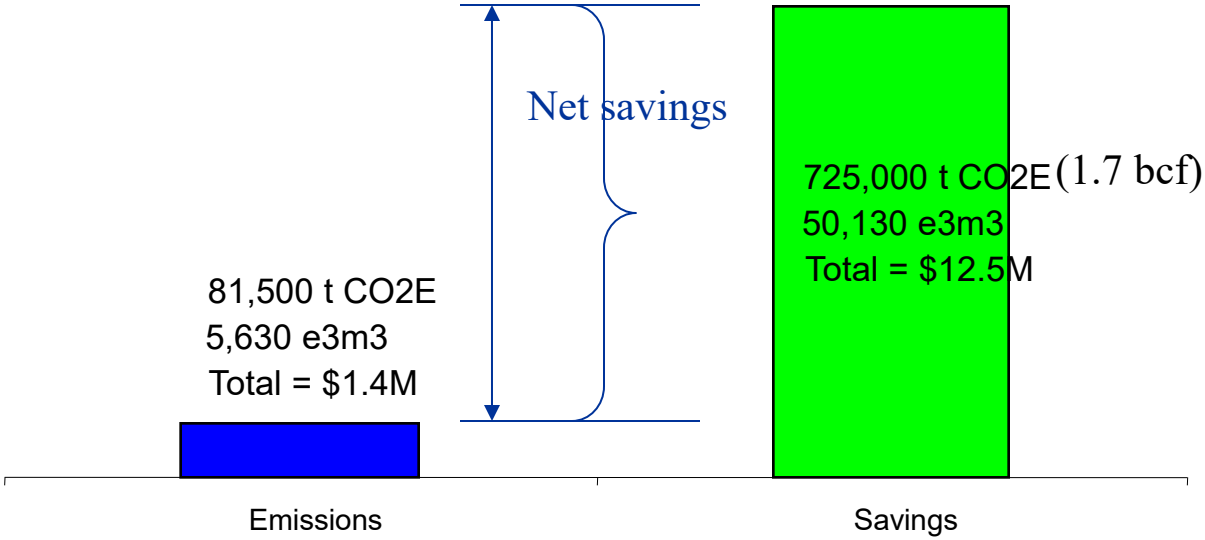
Blowdown Emissions Management Savings

2004 Blowdown Emissions/Savings



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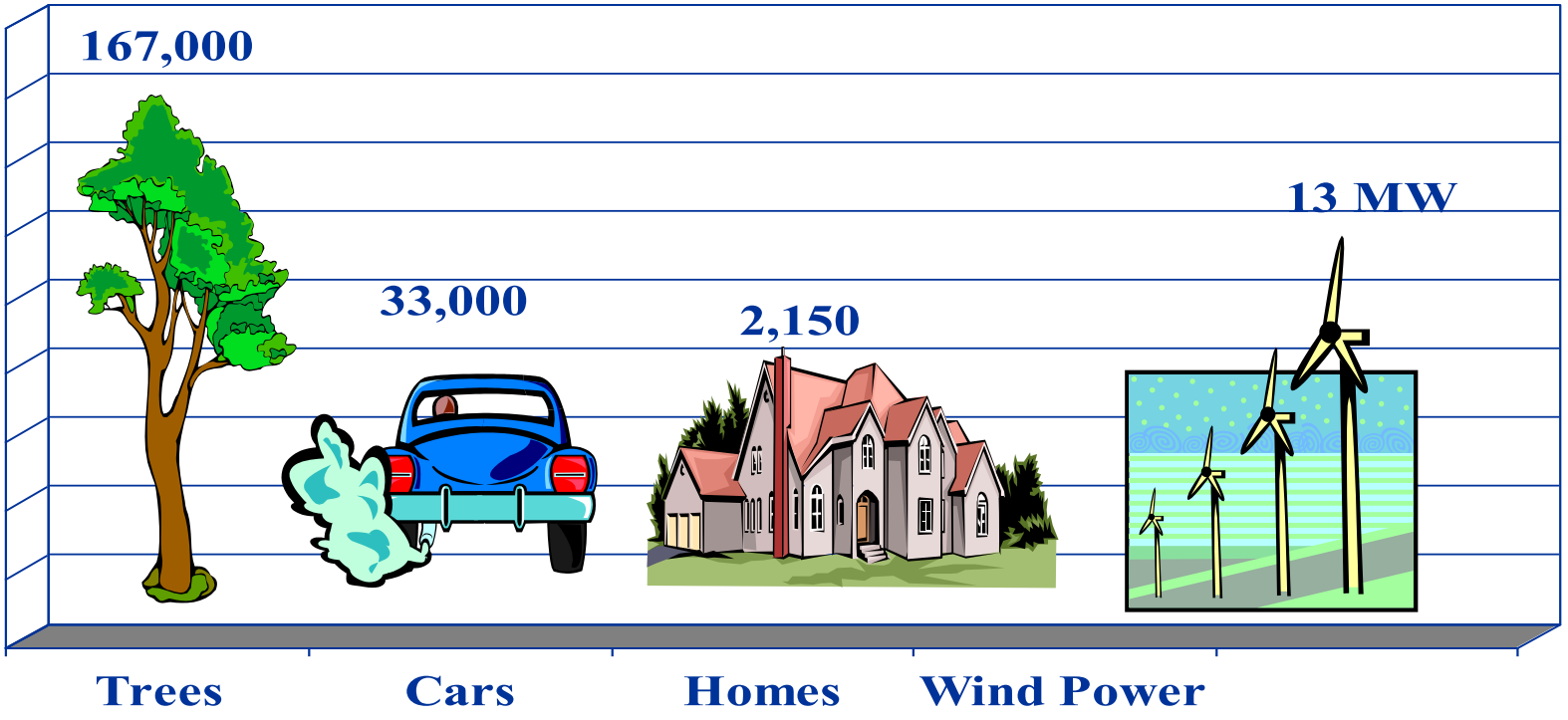
LDAR Program Savings - Gas saved in Tree Equivalent

2004 Fugitive Emissions (LDAR) Program Contribution



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Other Methane Emission Reduction Projects

Project	Status
Gas-Gas Ejector (for Dry Gas seal vent gas)	Bench testing at Didsbury CST
Biofiltration (for Engineered emissions)	Pilot Testing at three MS sites
Fuel Cell (for remote power replacing TEG's)	Feasibility report completed
CH4 Incinerator (for low concentration methane leaks)	Start initial study with Natural Resources Canada
Sterling Engine (highly efficient 20-24% compared to TEG's 5%)	Preliminary Investigation

R & D

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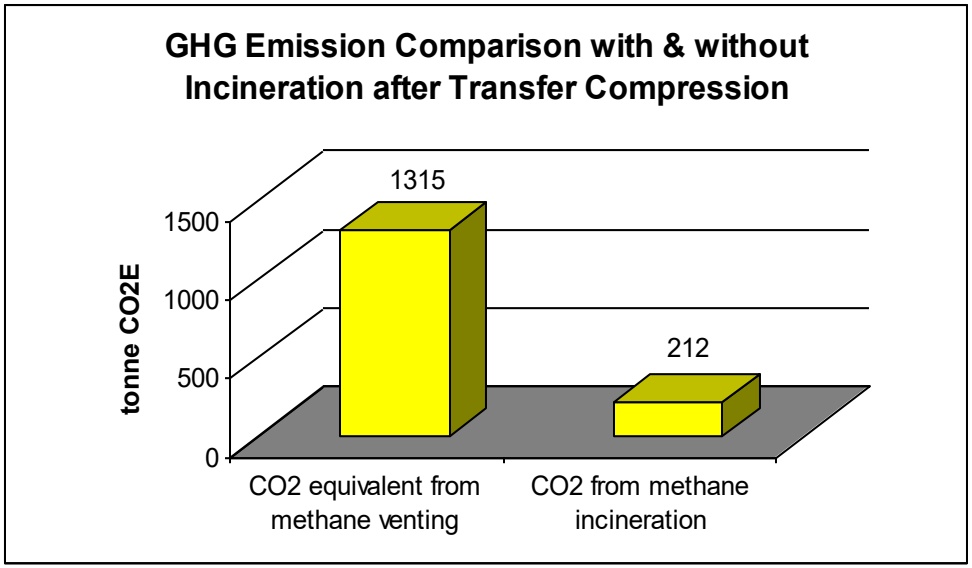
Technology R&D

Use of Incinerator for Blowdowns

R & D

- **Incineration of blowdown gas instead of venting (after transfer compression)**
- **At Caron Compressor Station, Moose Jaw, November 2002**



Emission savings of 1,100 t CO2E

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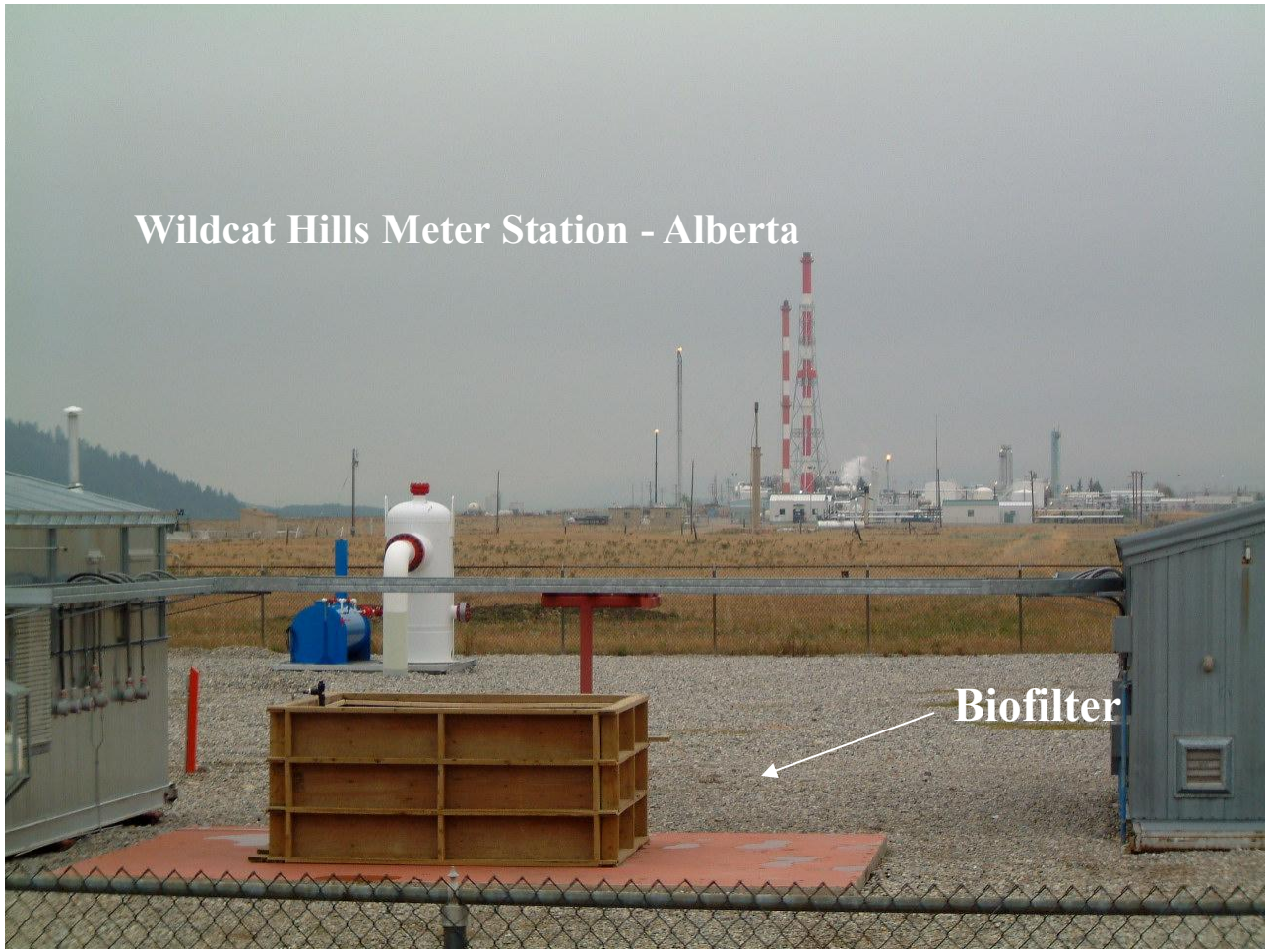
Biofilteration for Engineered Emission Mitigation (R&D Project)



Over 90% conversion of methane to CO2, released from gas analyzers.

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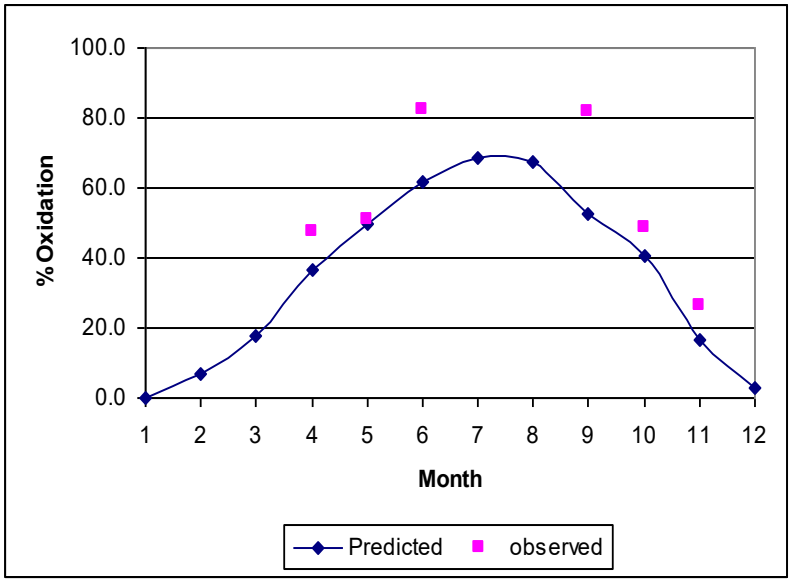
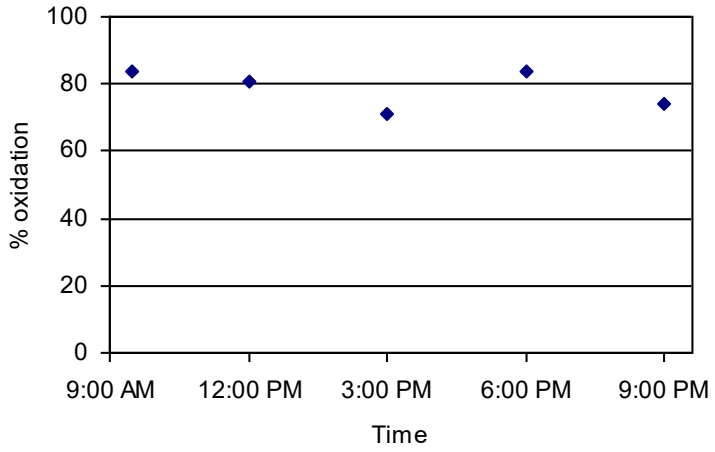
Biofilteration for Engineered Emission Mitigation (R&D Project)

Biofilter Pilot Plant for Methane Emissions Reduction

R & D





Gas-Gas Ejector for Dry Gas Seal Compressors Leak capture - (R&D Project)

R & D

- Use of gas-gas ejector to recompress seal gas emissions
- Designing a gas-gas ejector to capture seal gas emissions and re-inject to compressor inlet
- Re-injecting to high pressure system
- Application to TransCanada Compressors
  - 538 MMSCF/yr. of natural gas
  - 227,000 tCO2E/yr. of greenhouse gas emissions
- Negligible operating cost

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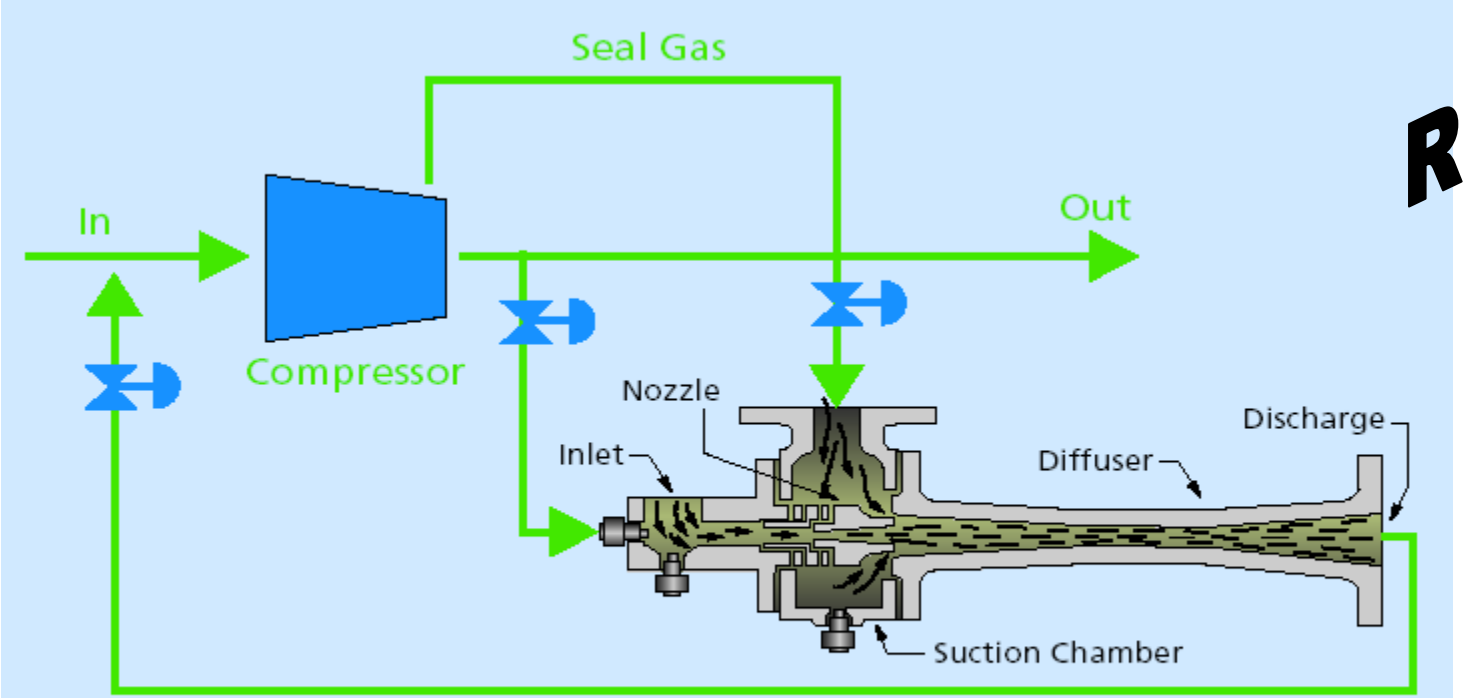
Gas-Gas Ejector for Dry Gas Seal Compressors
Leak capture - (R&D Project)

Conceptual Flow Diagram

System wide implementation will give gas savings of 570 MMCF/yr.

R & D



Conceptual flow diagram for use of Ejector by TransCanada.
Ejector: Ludweg, EE, 1980.

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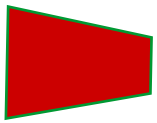
Gas-Gas Ejector for Dry Gas Seal Compressors Leak capture - (R&D Project)

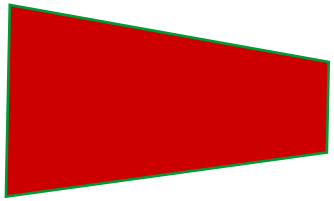
Compressor Dry Gas Seal Emissions Mitigation Research Project

653 t CO_2 E/yr.



1 seal

227 kt CO_2 E/yr. (538 MMCF/yr)



348 seals

Emissions Value = $ 0.68 M

Market value of gas = $ 3.70M @ $6.84/1000 ft3

R & D

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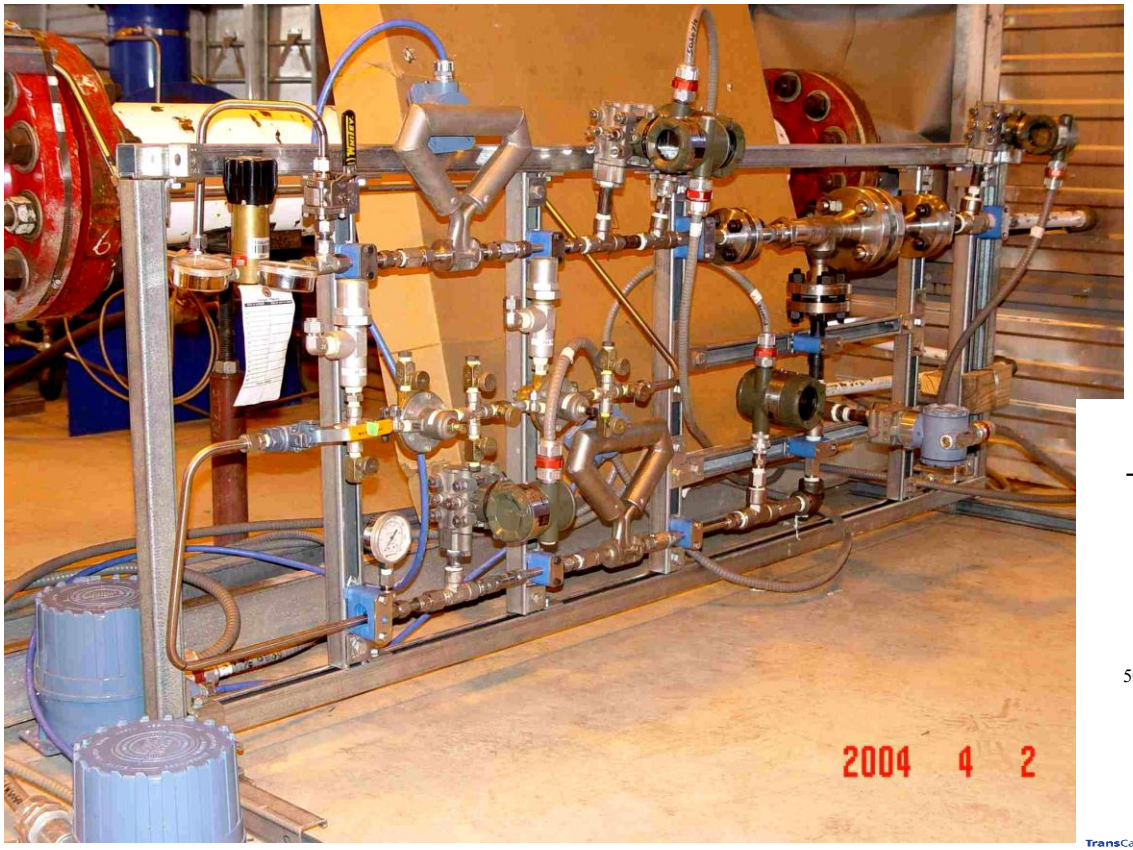
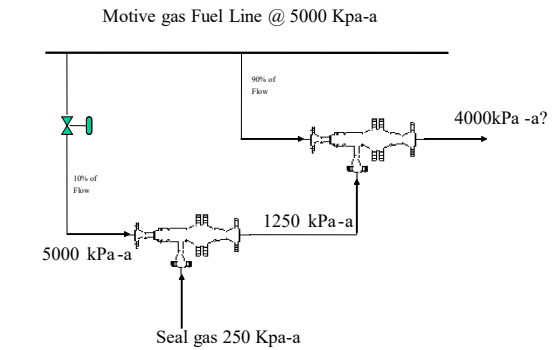
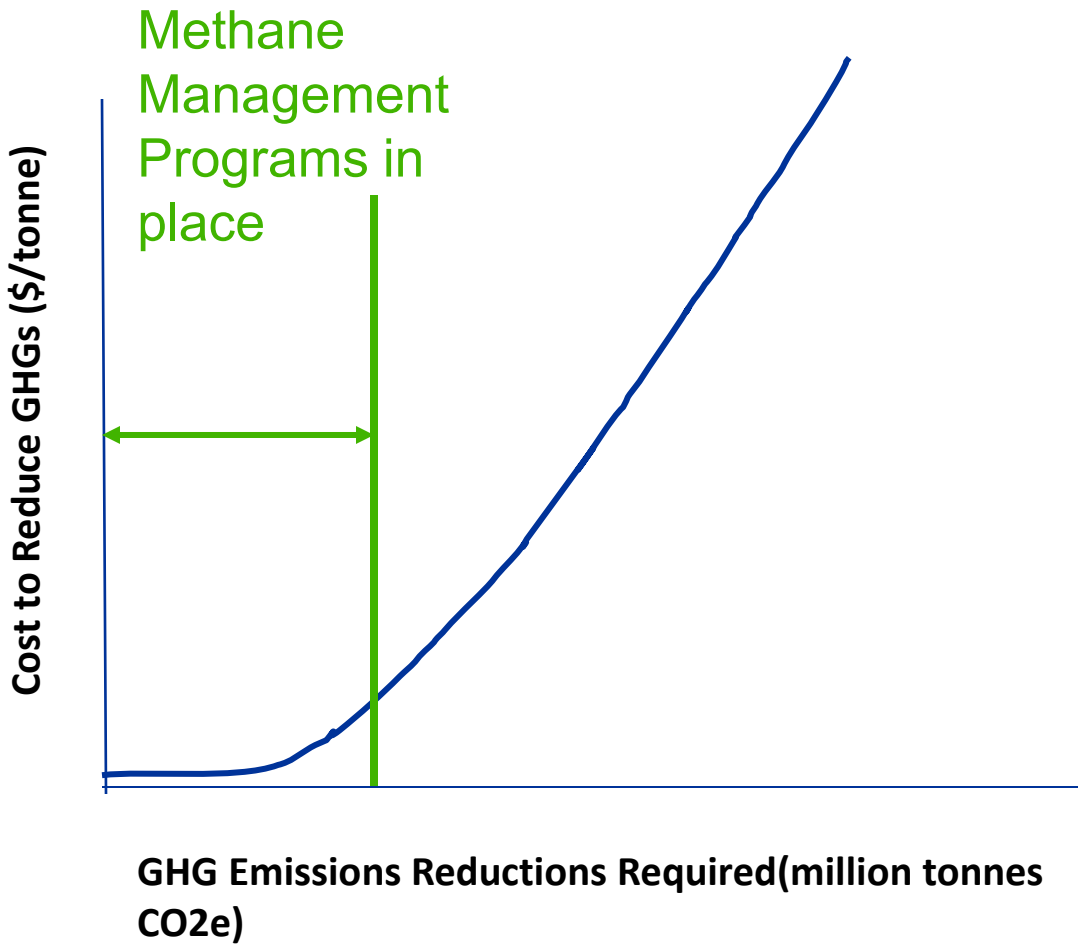
Gas-Gas Ejector for Dry Gas Seal Compressors Leak capture - (R&D Project)





CONCLUSION - Cost Curve



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2005 Fugitive Emissions Management Program

Thank you and questions?

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