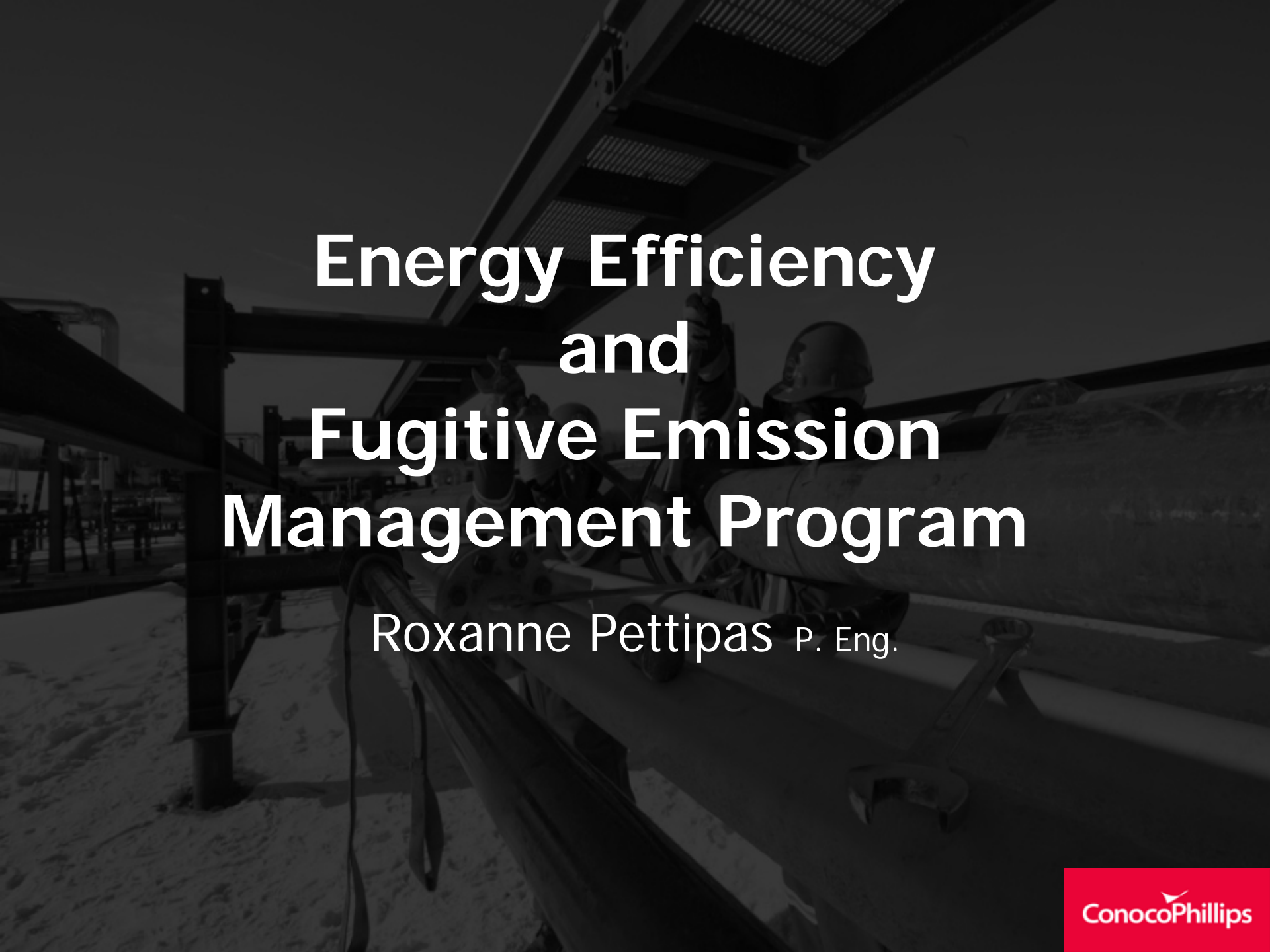




ConocoPhillips

A grayscale photograph of an industrial facility, likely an oil or gas processing plant. The image shows a complex network of pipes, walkways, and structural beams. In the foreground, a worker wearing a hard hat and safety gear is visible, looking towards the right. The overall scene is dimly lit, with strong shadows and highlights, creating a sense of depth and scale.

Energy Efficiency and Fugitive Emission Management Program

Roxanne Pettipas P. Eng.

OVERVIEW


- Energy Efficiency
- Fugitive Emission Pilot Study Findings
 - Source Data
 - Facility Comparison
 - Economics
- PATH FORWARD



Energy Efficiency

- Energy Efficiency and Product Recovery Team
 - Steering Committee
 - Planning and Implementation
- Areas of focus
 - Identify opportunities for improved Energy Efficiency
 - Pilot projects
 - Developing Programs (fugitives emissions)





Fugitive Emission Management Pilot Study (ConocoPhillips Canada)

FUGITIVE EMISSIONS

**Losses (leaks) of HC product
(methane, propane, VOC's)**

UNINTENTIONAL FUGITIVES

- normal wear and tear / damage
- improper or incomplete assembly of components
- inadequate material specification
- manufacturing defects

INTENTIONAL FUGITIVES

- venting (tanks, controllers, comp. seals, stacks, etc.)



“Why worry about some little leaks?” (ConocoPhillips Canada)

- On average natural gas processing plants lose between 0.05 to 0.5% of their total production to fugitive emissions
- Based on ConocoPhillips Canada production, fugitive gas losses may amount to between \$2,000,000 and \$20,000,000 USD per year
- This provides a significant opportunity to increase production through fugitive emission reduction
- Majority of fugitive emissions arise from a minority of leaking components

What is the Problem?...

“Gas leaks are *invisible* and *go unnoticed*”

PILOT STUDY OBJECTIVE

(ConocoPhillips Canada)

Evaluate new leak detection and measurement technologies and determine actual facility fugitive emission rates

Drivers

- Increase production & reduce costs by recovering lost gas
- New regulations in Canada
- Increase operations Health & Safety
- Reduce GHG emissions
- Part of ConocoPhillips Canada goals and programs - E/E, Gas Star Program, and BIC Initiative

DETECTION TECHNOLOGY

GasfindIR®

- optical emission technology
- infrared video camera with hydrocarbon/VOC filter
- provides visible images of a HC gas emissions in real-time

Suggested Benefits :

- Rapid, accurate and safe detection
- Scan hard-to-reach components from a distance
- Assessments performed without interruption of operations
- Inspection times are minimal, which can keep costs down.
- With exact leak source info, repairs are less time consuming and less expensive.
- Cost-effectively scan hundreds of components simultaneously



MEASUREMENT TECHNOLOGY

Hi Flow[®] Sampler

- volumetric leak measurement
- vacuum flow rate detection uses dual-element hydrocarbon (methane) detector
- measures hydrocarbon concentrations in the captured air stream and determines the leak flow rate (+- 10%)

Suggested Benefits :

- offers a much higher accuracy of measurement (compared to conventional methods)
- allows an objective cost-benefit analysis of each repair opportunity



Pilot Study Scope

- Evaluate 22 facilities (9 gas plants and 13 comp. stns.) from various asset areas
- Obtain fugitive emission data
- Complete repair cost/benefit analysis
- Create recommendations for applying a Canada-wide program (Canadian Association of Petroleum Producers "CAPP" Best Management Practice)



Pilot Study Results

Average Payback (years)	0.37
NPV (US\$)	~\$2 million
CO₂e Emission Rate (tonnes/year)	21,000

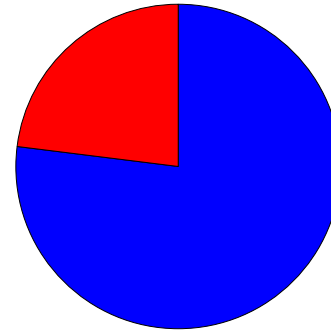


* Using for Illustration Purposes \$5.50 USD/mmbtu and \$25.00 USD/tonne CO₂e

Pilot Study SOURCE INFO

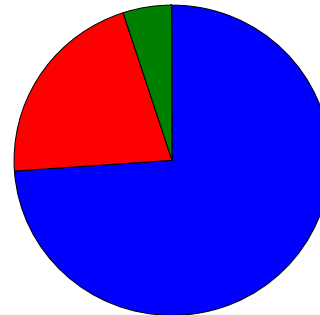
of Sources

- **77%** leaking components (111)
- **23%** other fugitive emission sources (33)
- **92%** economical to repair (133)



Composition

- **75%** Process gas (108)
- **21%** Fuel gas (30)
- **4%** Propane (6)

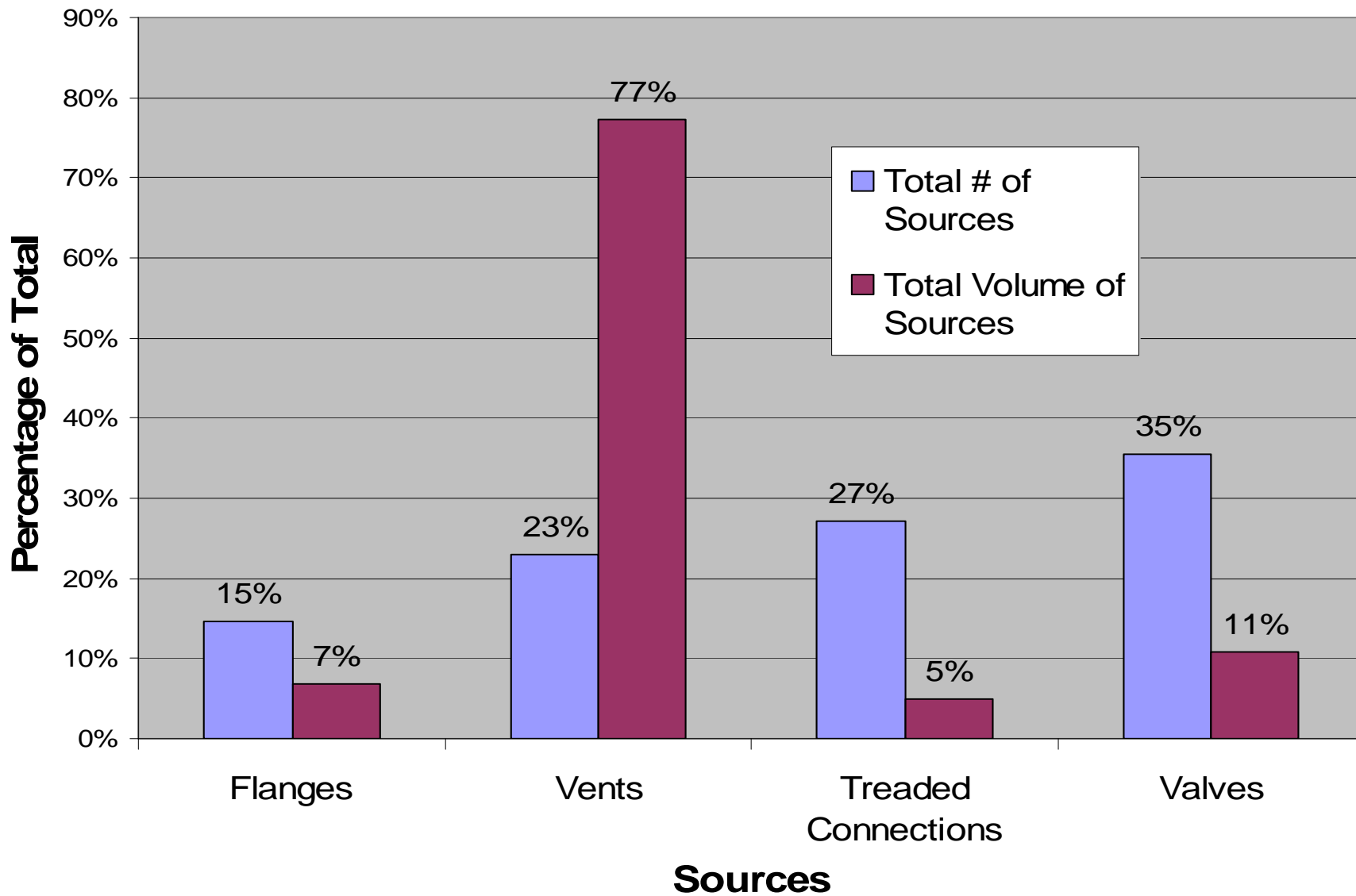


Location

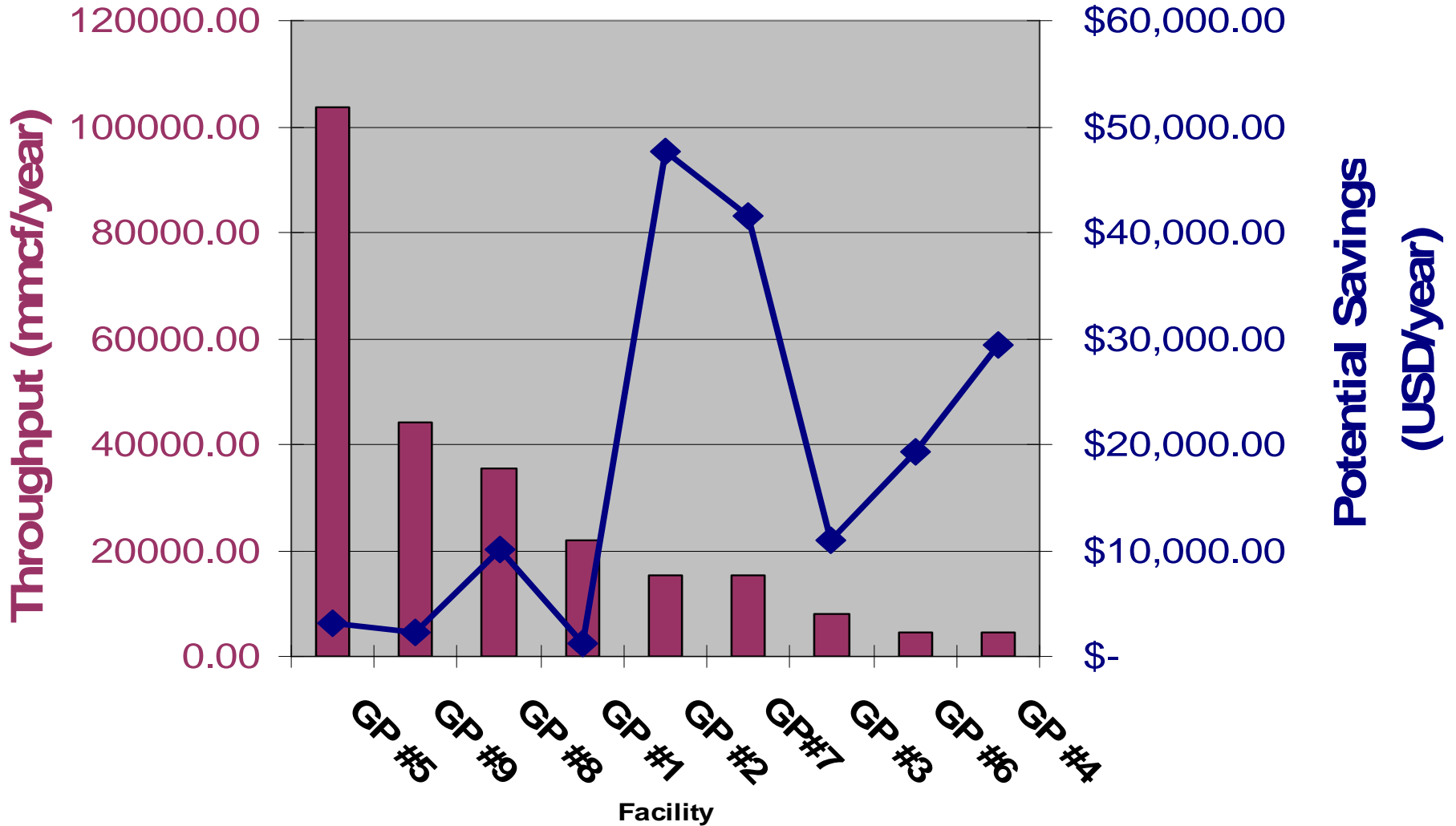
- **72%** Compressor Buildings
- **20%** Process Buildings
- **4%** Outside piping
- **4%** Tanks



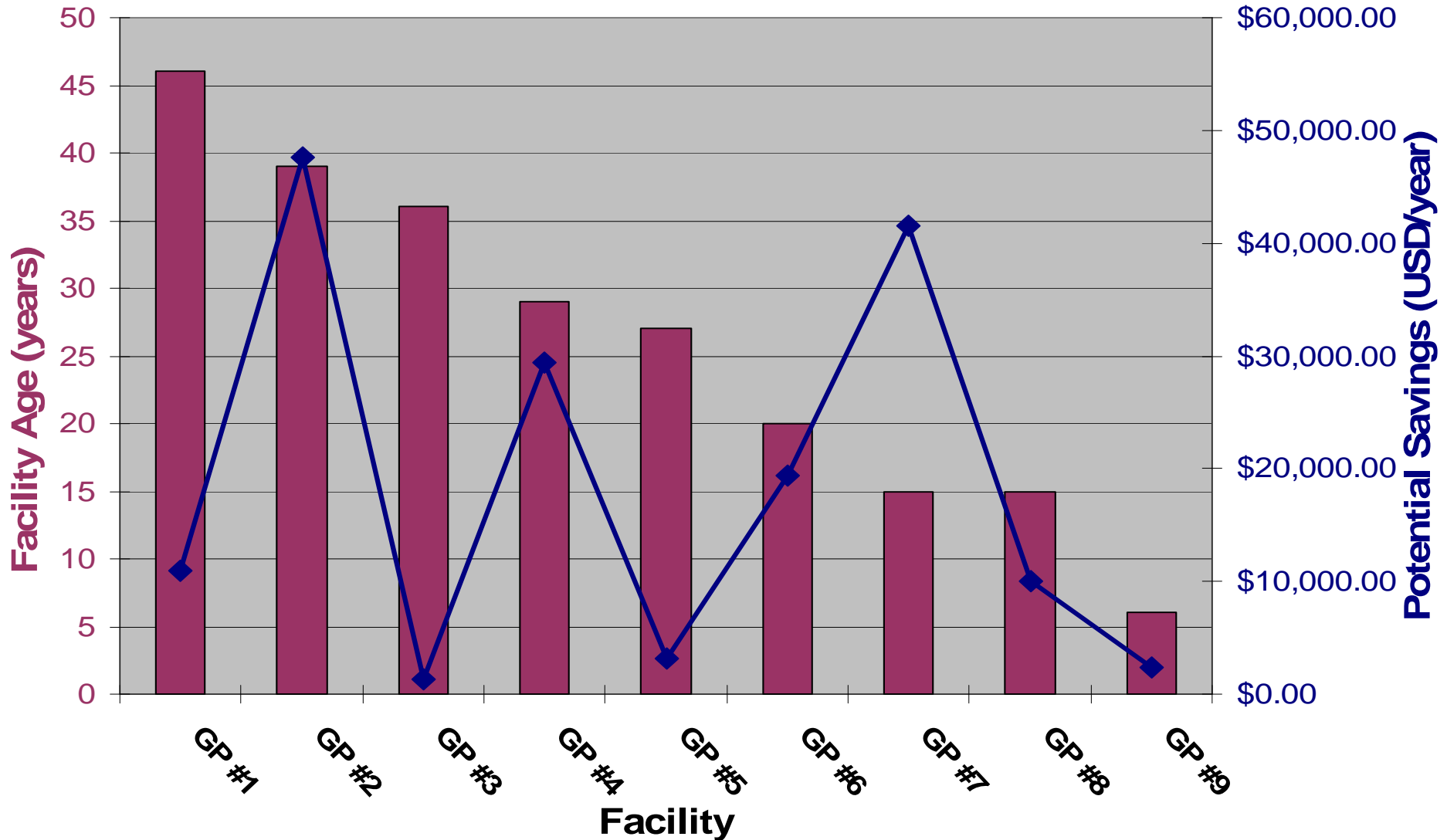
Pilot Study SOURCE TYPES



GAS PLANT THROUGHPUT COMPARISON



GAS PLANT AGE COMPARISON



ECONOMIC PROJECTION ConocoPhillips Canada

	~\$16,000
Average Total Cost/Facility (US\$/year) (assessment and repairs)	\$8,000
Total Est. NPV (US\$/year)	~\$35,000,000
CO2e/year Reduction (tonnes)	~630,000

* Using for Illustration Purposes \$5.50 USD/mmbtu and \$25.00 USD/tonne CO₂e

PATH FORWARD

- **Fugitive Emission Management Program**
 - Field assessments started in September 2007
 - 2 year testing cycle
 - 2 outsourced vendors
 - Individual report/results for each facility or area
 - Imbed into Operations and Facility Design
 - Develop repair tracking system and refine data management system
- **Evaluate pipeline & wellsite opportunities within Energy Efficiency and Product Recovery Team**
- **Education / Knowledge Sharing**
- **Energy Efficiency and Product Recovery Team identify other opportunities for ConocoPhillips Canada**

QUESTIONS?

CONTACT INFO:

Roxanne Pettipas, P.Eng

403-233-4221

Roxanne.m.pettipas@conocophillips.com