
Power Supplies in the Pacific Northwest

# Benefits and Consequences of Natural Gas Fired Generation

Craig Martin

August 13th, 2004

TransCanada
*In business to deliver*

# TransCanada Overview

TransCanada
*In business to deliver*

# Who is TransCanada?

- Competitively positioned in natural gas transmission & power services
- $20.5 billion of premium pipe and power assets ($Cdn at Dec. 31, 2003)
- Skilled, expert people with strong technical knowledge
- Strong financial position

2003 Canada's Most Respected Corporations



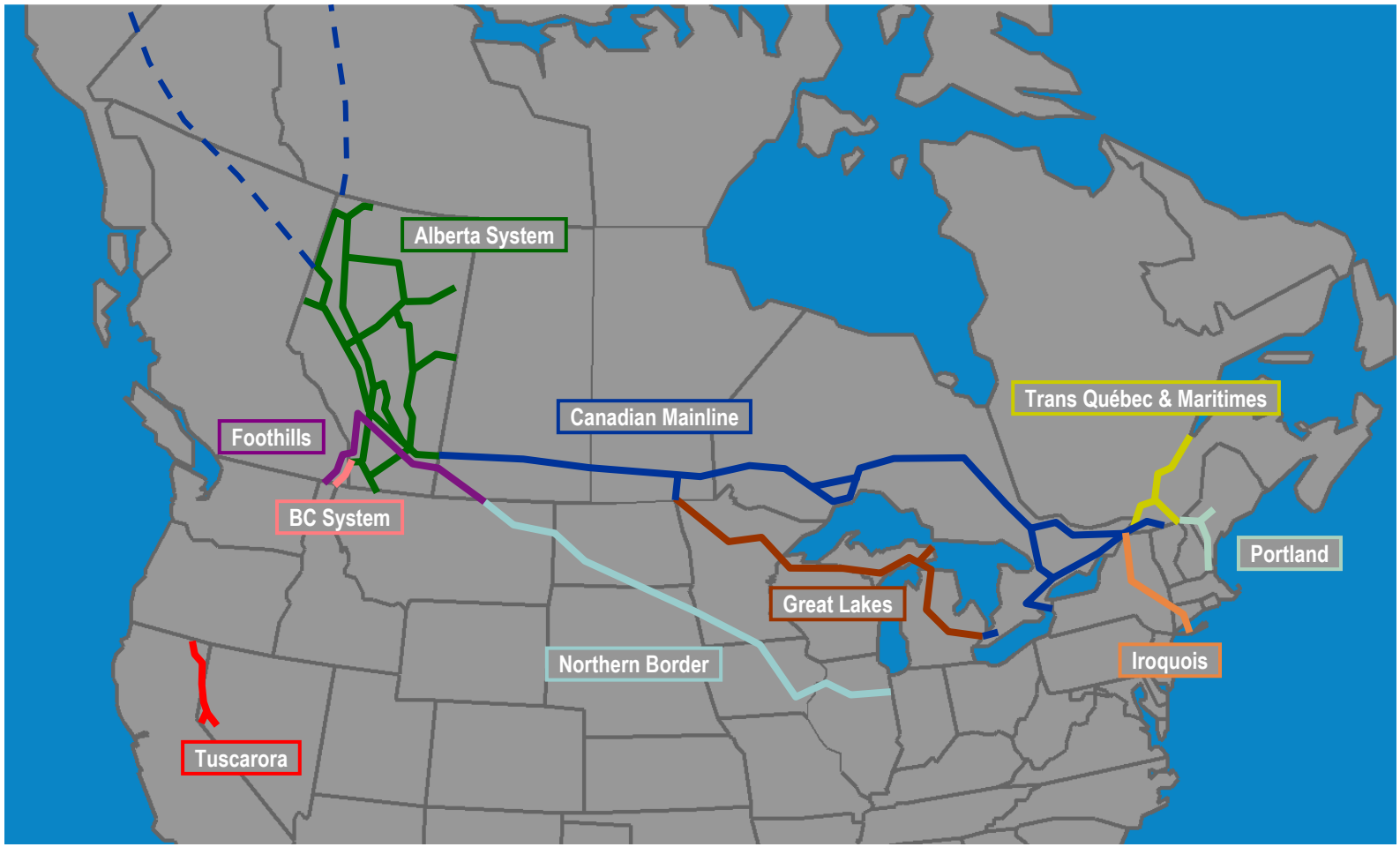






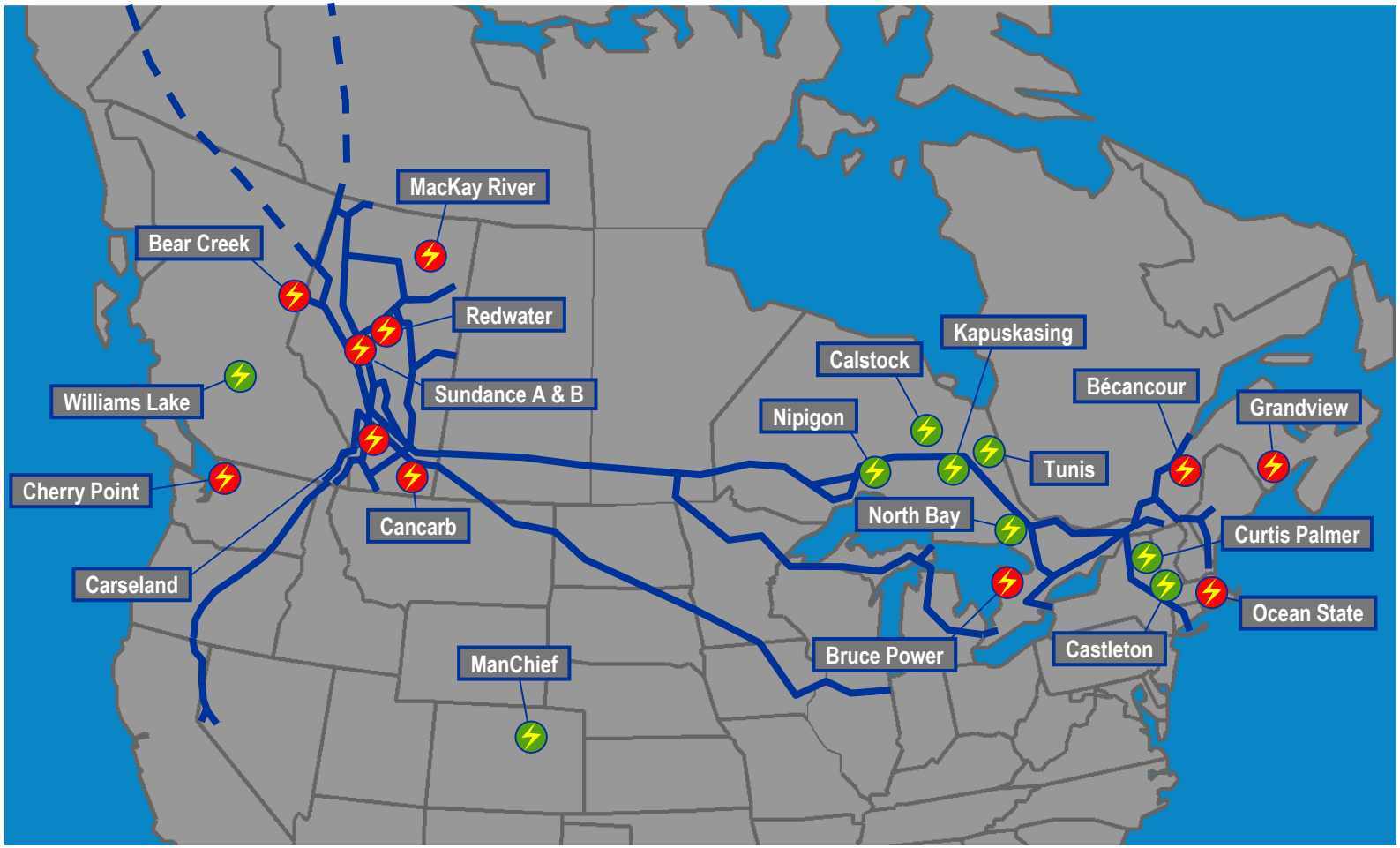
TransCanada

# Natural Gas Transmission Assets




39,000 kms of wholly owned pipeline;  11 Bcf/day

# Power Generation Assets




TransCanada 20 plants; 4,700 MW
(including LP and plants in development)

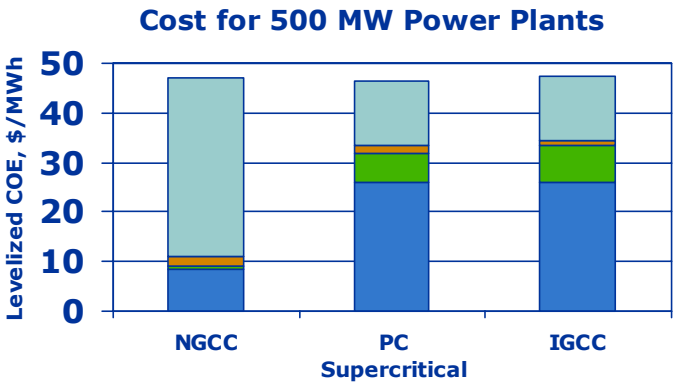
TransCanada Power, L.P.
9 plants; 688 MW

# Introduction

TransCanada
*In business to deliver*

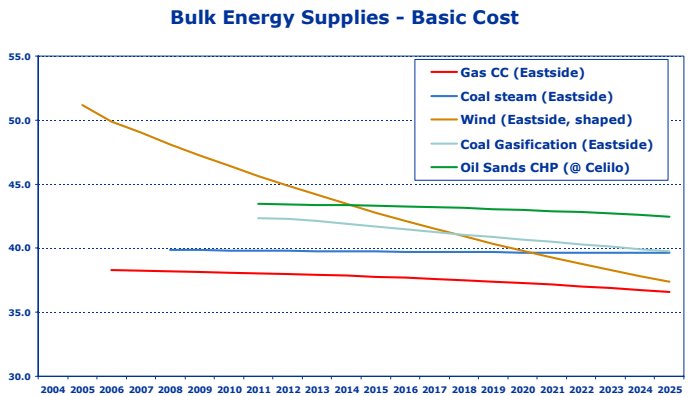
# Comparing the Competition

## EPRI



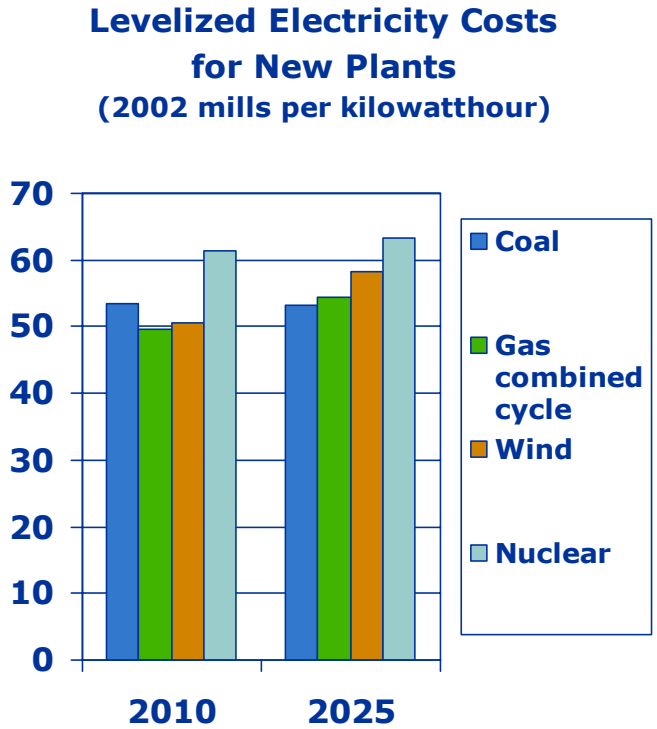

*Source: EPRI, Cost Comparison IGCC and Advanced Coal*

## NWPCC



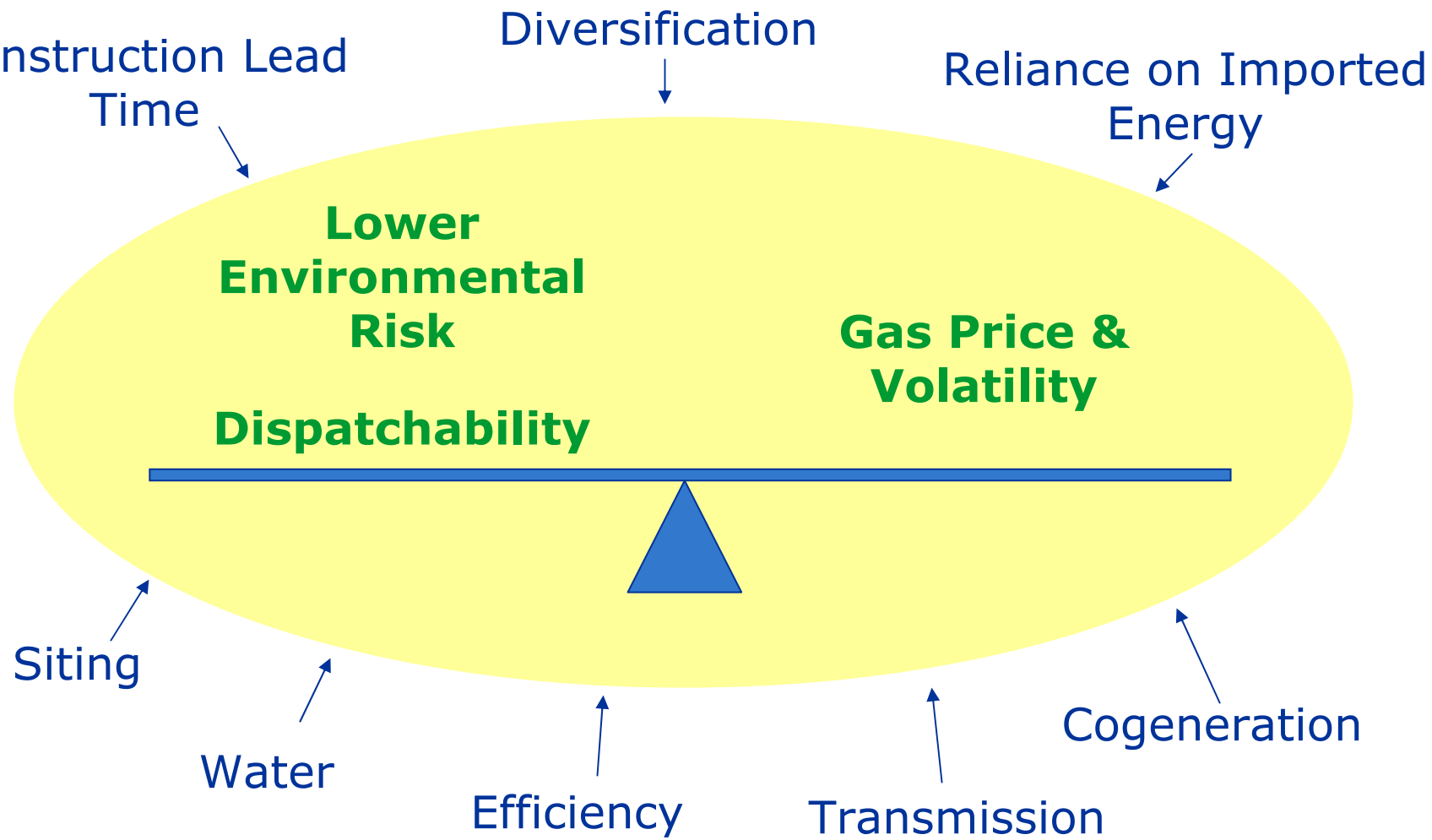

*Source: NWPCC, Mid-C Conference 2004*

## DOE/EIA




*Source: EIA Outlook - 2004*

# Gas Fired Generation - Considerations






TransCanada

# Natural Gas Generation – Key Messages

- **The historical price advantage for gas is history**
- **New coal can now compete w/ gas in some markets**
- **Environmental risk is harder to manage than gas price risk**
- **Other factors in Pac-NW favor gas over coal and wind**
- **Gas will continue to be part of regional resource portfolio**



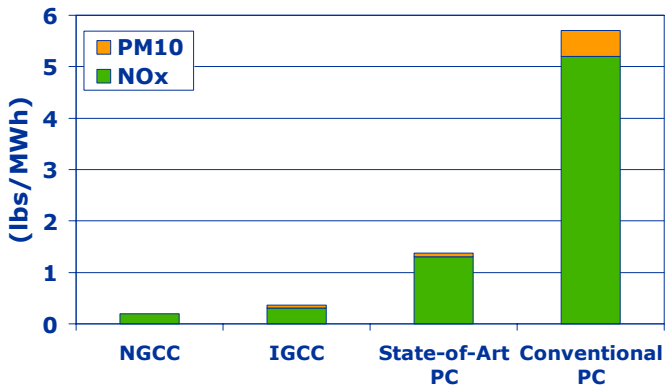
TransCanada

# Environmental Risk

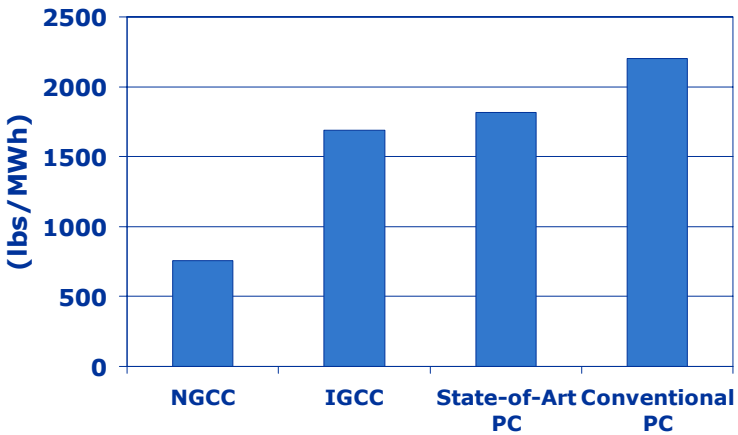
TransCanada
*In business to deliver*

# Environmental Risk

**Air Emissions**




**Greenhouse Gas Emissions**



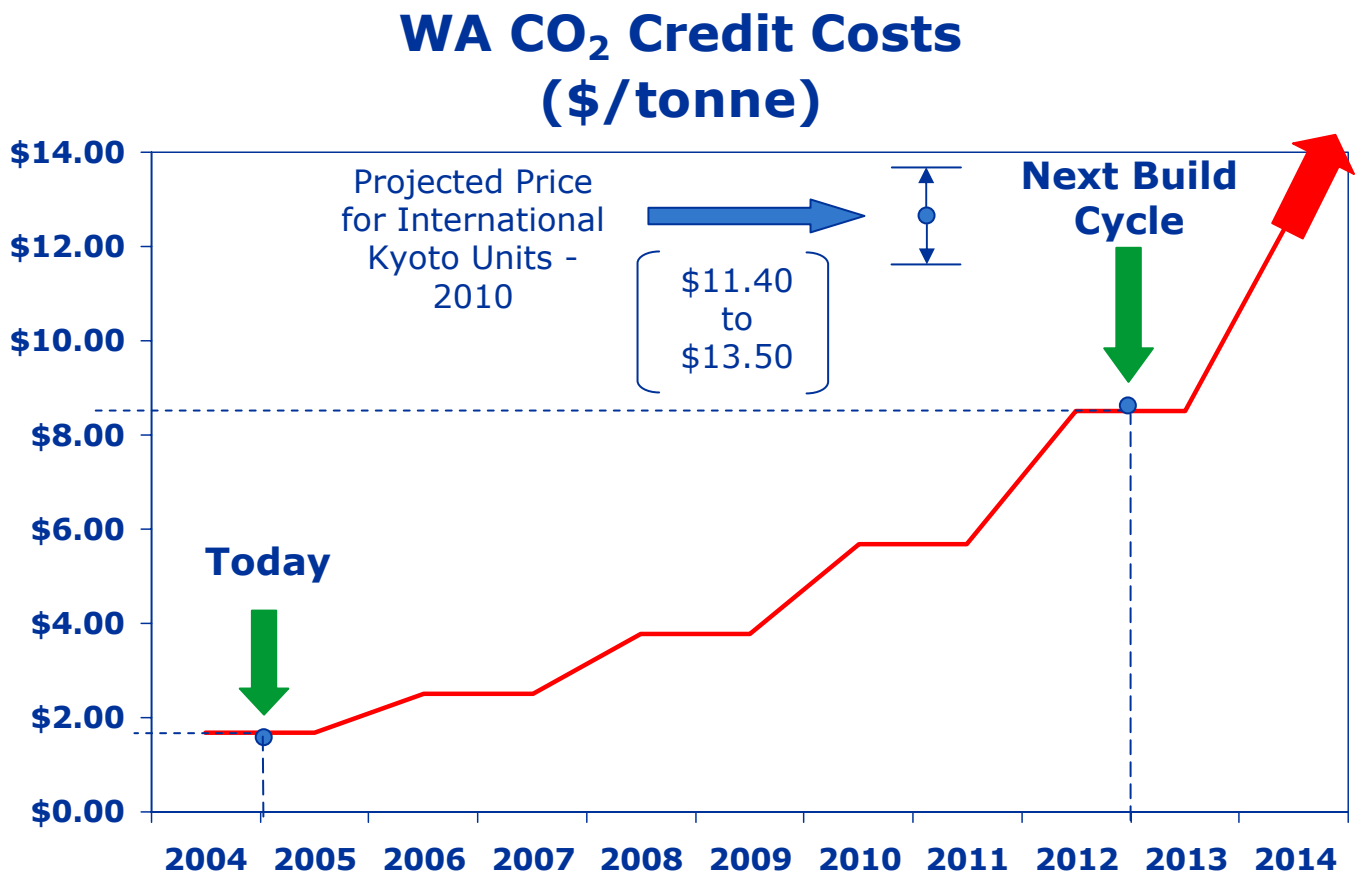

*Source: National Energy Technology Laboratory*

- NGCC emits 85% less NOx and 60% less $CO_2$ than state-of-the-art pulverized coal



TransCanada

# Potential $CO_2$ Cost Exposure

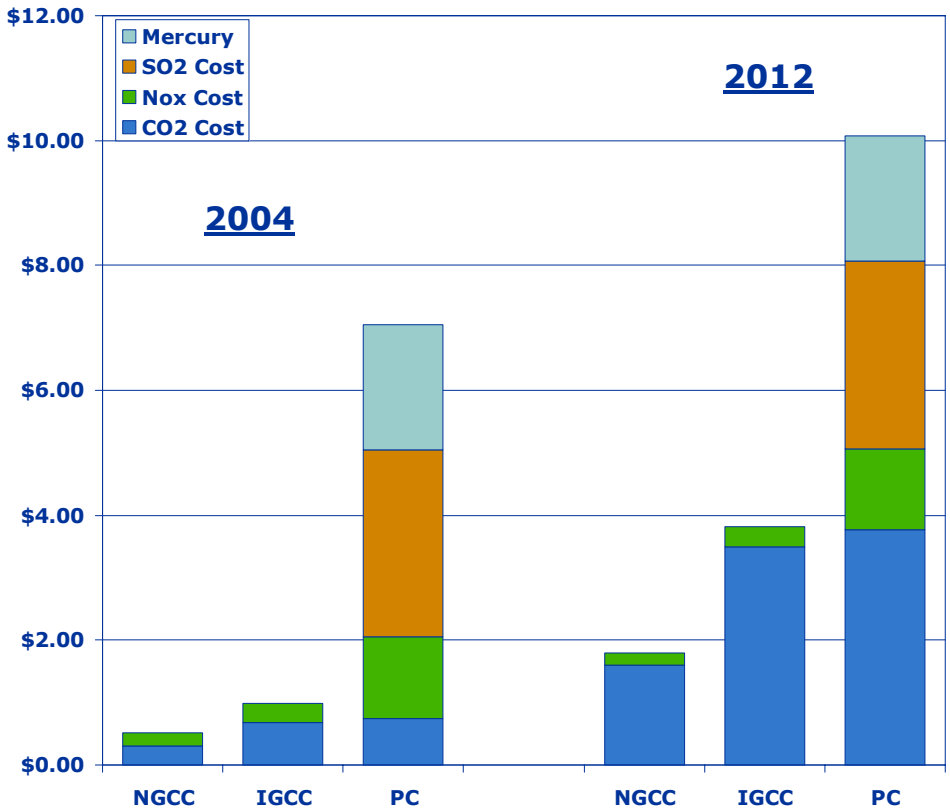





TransCanada

# Potential Air Emissions Cost Exposure

**Potential Emissions Mitigation Costs ($/MWh)**




*Sources: PIRA, TransCanada*



TransCanada

# Environmental Risk - Summary

## Cost Risk:

- Future air emissions mitigation costs are unknown; will increase from today's mark
- NGCC cuts that risk 50% - 100% (depending on component)

## Public Concern Risk:

- Public concern can delay, drive up cost or kill otherwise good projects
- Low environmental impact of NGCC can mitigate this

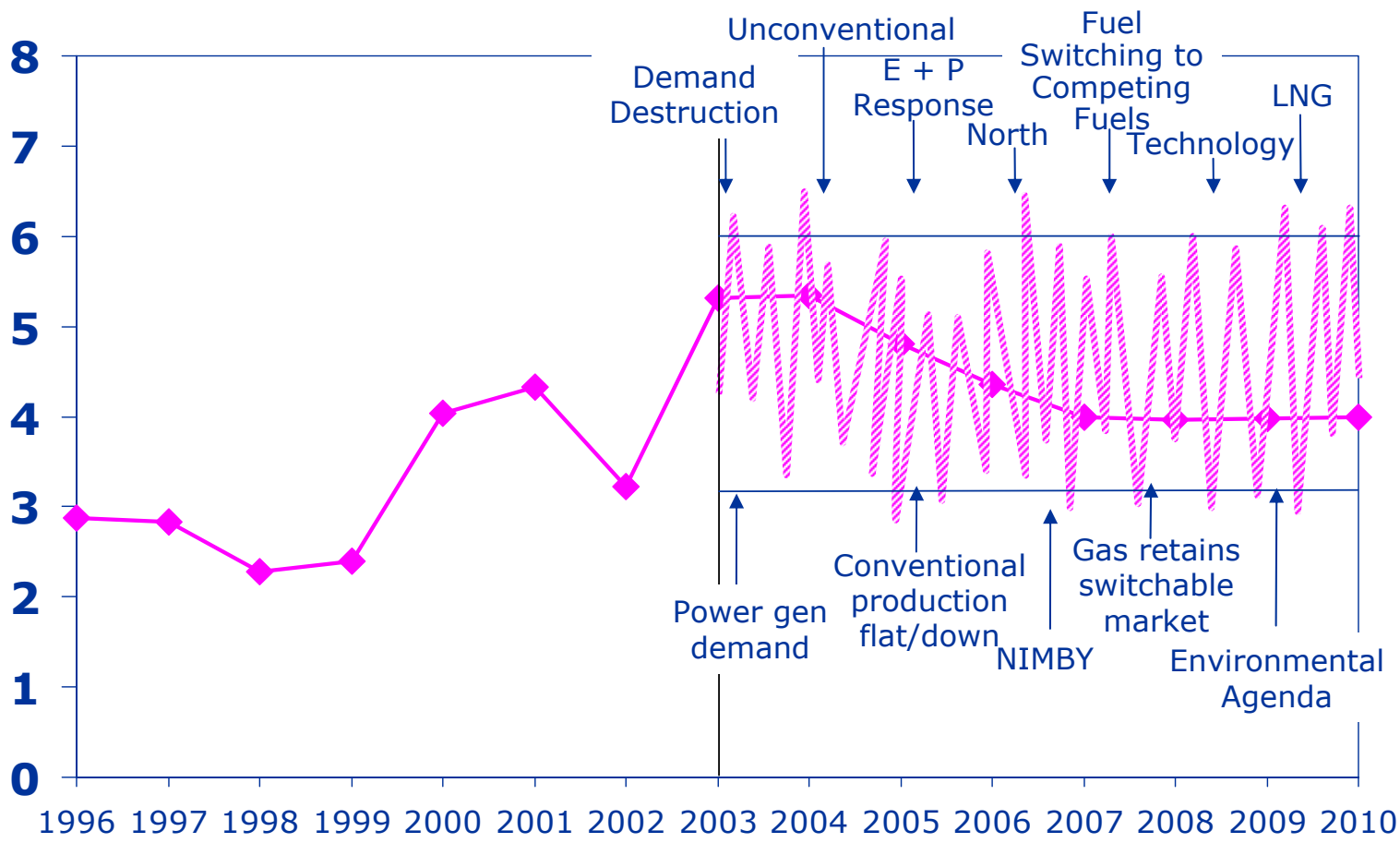


TransCanada

# Gas Pricing & Volatility

TransCanada
*In business to deliver*

# Natural Gas Price Outlook
## (NYMEX 2002 US$/MMBtu)




*Source: TransCanada TSO 2004*



TransCanada

# Managing Volatility

## Physical

- Fixed price firm
- Dual fuel capability
- Dispatchability

## Structured Products (available from gas marketer):

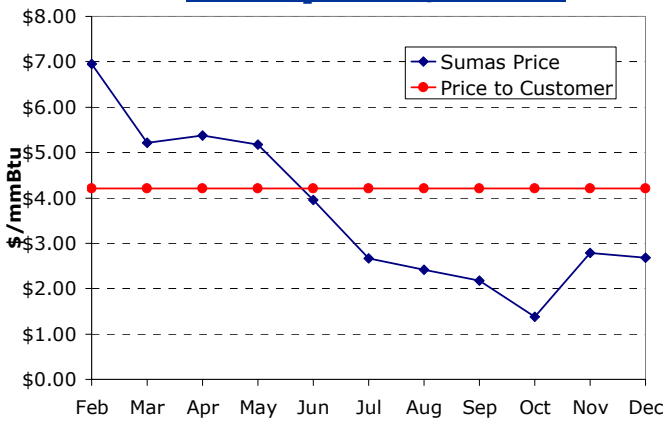
- Swaps (converting floating price to fixed)
- Participating Caps
- Costless Collars
- Extendables
- Etc.



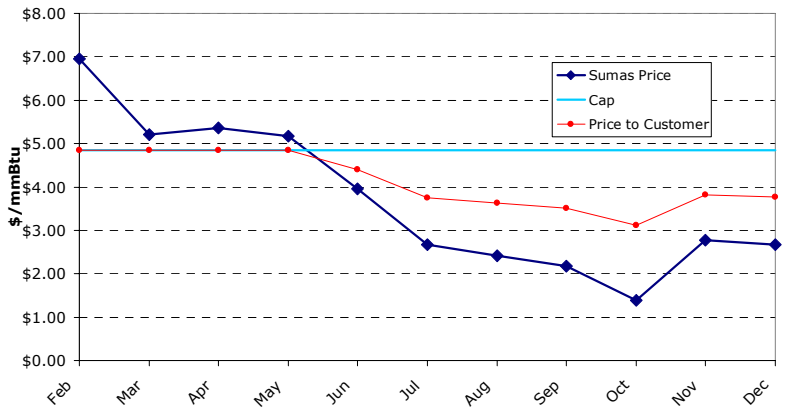
TransCanada

# Structured Products - Examples

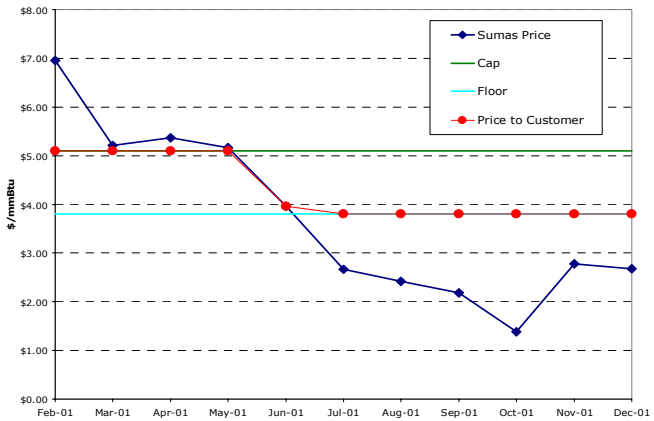
## Swap @ $4.20



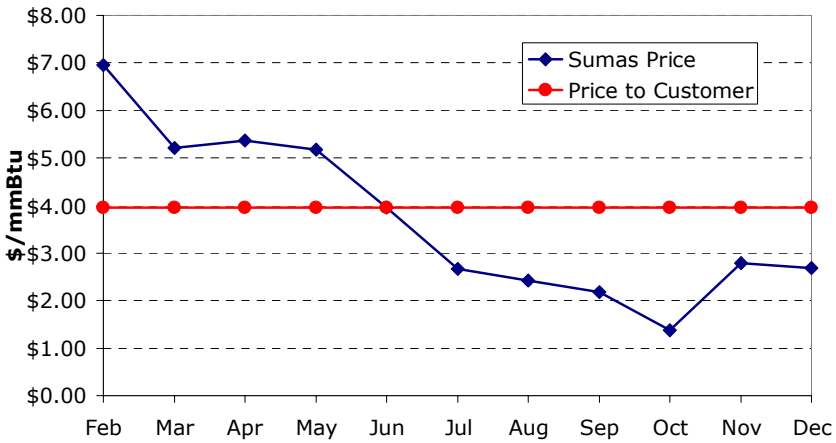

## Particip'g Cap @ $4.95




## Costless Collar




## Extendible @ $3.95



# Gas Price & Volatility - Summary

## Gas Price:

- We have entered new regime for price
- Price expected to average out at $4.00/MMBtu
- Excursions between $3 to $6

## Price Volatility:

- Risk can be managed
- Regulators will need to recognize reality of price volatility and develop rules accordingly

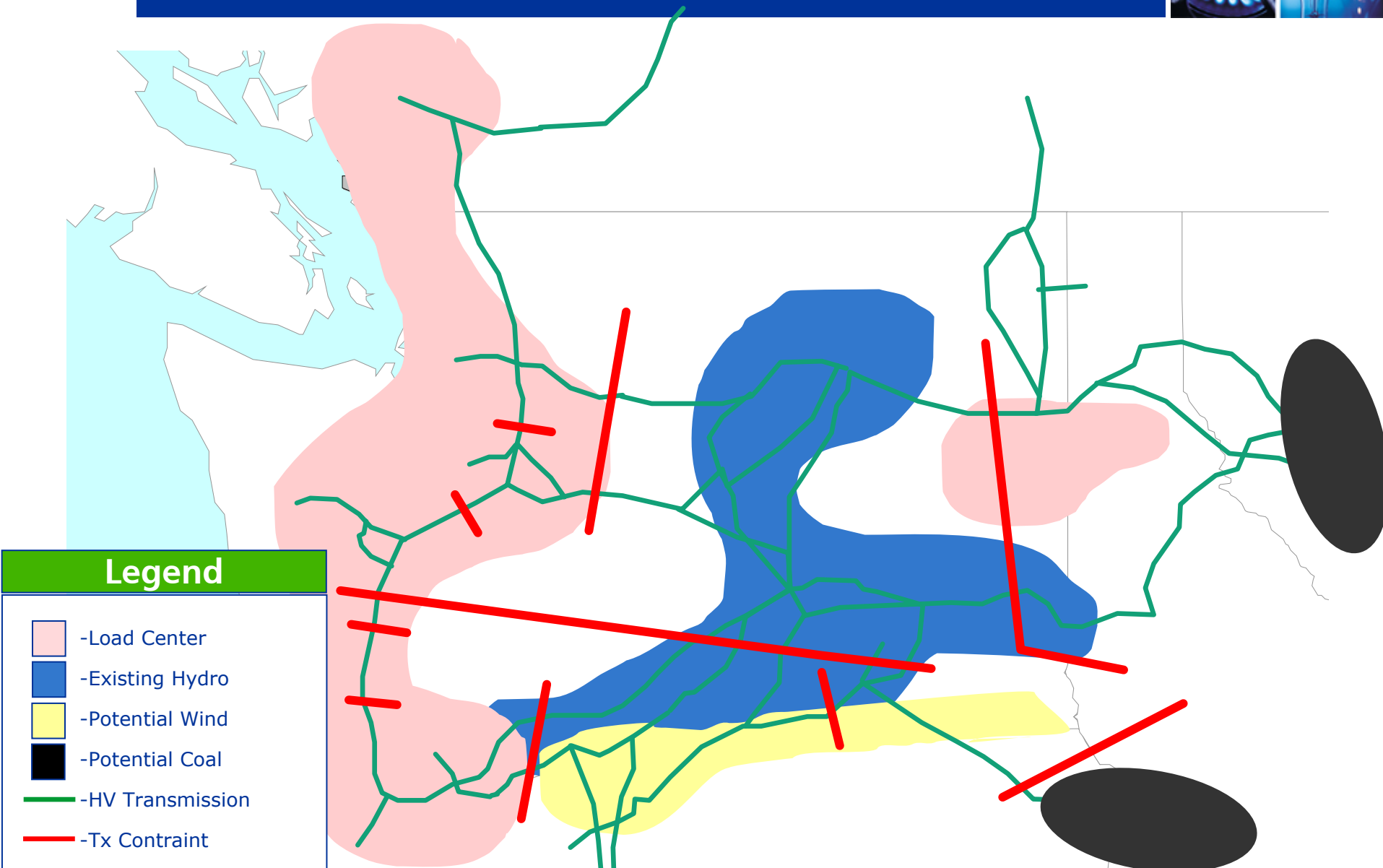


TransCanada

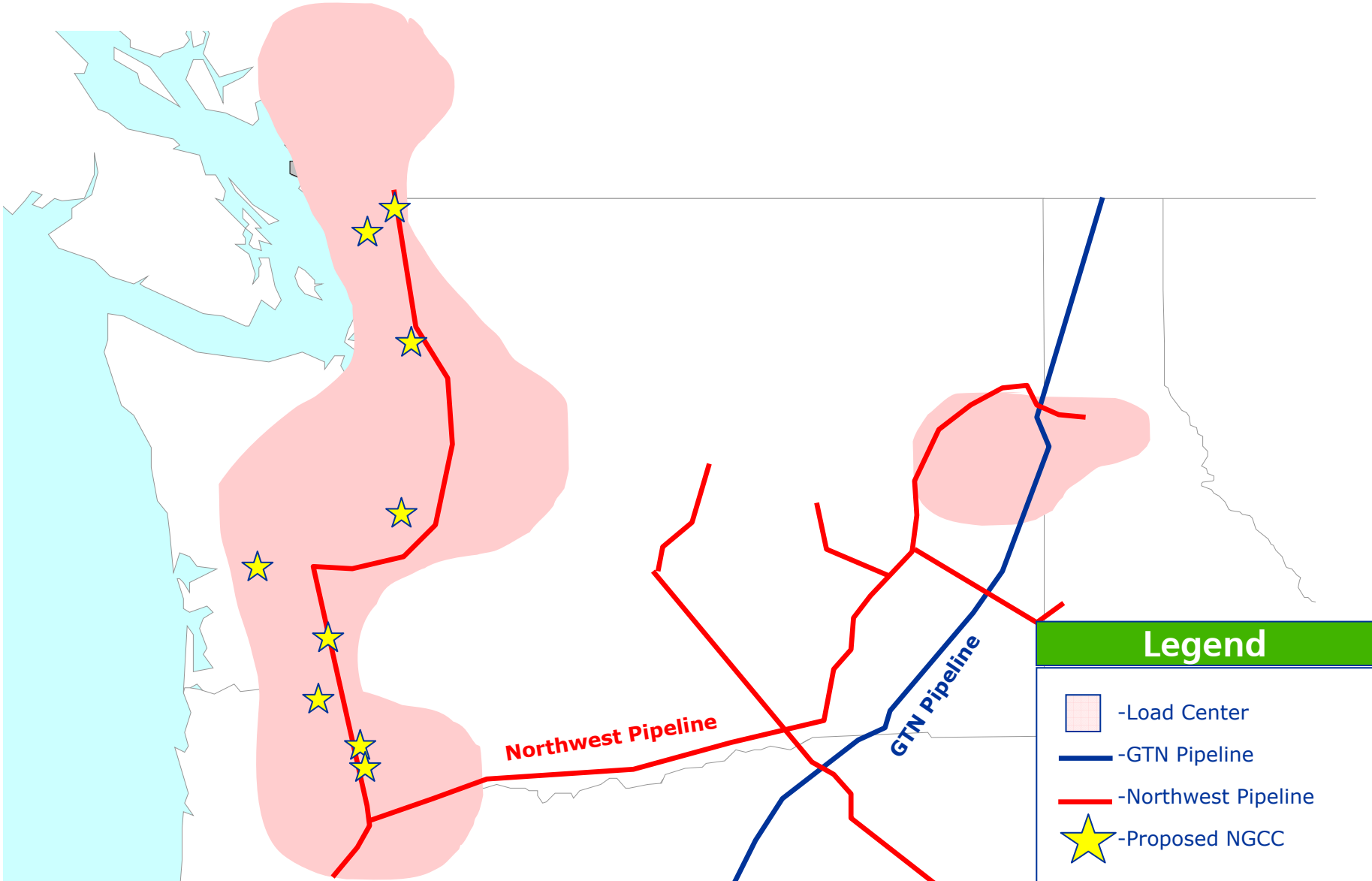
# Other Factors:
# Siting and Transmission

TransCanada
*In business to deliver*

# Transmission & Resource Issues



# NGCC Can Be Sited Strategically



# NGCC Siting - Summary

**Can be sited near load:**

- Minimal new transmission infrastructure needed
- Minimizes transmission losses
- Gas pipelines already built to load centers

**Can be sited to support transmission system:**

- Alleviate constraints
- Defer/Reduce/Eliminate new transmission investment

**Can be sited near industry:**

- Cogeneration



TransCanada

# Other Factors: Cogeneration

TransCanada
In business to deliver

# Cogeneration - Summary

- **Large scale cogen can provide economy of scale and operating flexibility same as combined cycle**
- **Large scale cogen provides cost savings:**
  - Higher efficiency
  - Shared infrastructure
  - No must run power
- **Overall cost savings relative to stand alone combined cycle: $5.00+/MWh**



TransCanada

# Conclusions

TransCanada
*In business to deliver*

# Summary – Gas Fired Generation

## Primary Benefits

- Lower environmental risk relative to coal
- Operating Flexibility

## Primary Consequences

- Gas Price Volatility



TransCanada

# Conclusions – Gas Fired Generation

- **Gas & coal are competitive with one another on generating cost basis.**
- **Dispatchability and lower environmental risk outweight gas price risk.**
- **Other factors favor gas over coal and wind:**
  - Siting & Transmission
  - Cogeneration
- **NGCC will be added to regional resource mix when new, firm capacity is required.**



TransCanada


Power Supplies in the Pacific Northwest

# Benefits and Consequences of Natural Gas Fired Generation

Craig Martin

August 13th, 2004

TransCanada
*In business to deliver*