

# **Benchmarking Study of European Gas Transmission Networks**

*Prepared for the Council of European  
Energy Regulators (CEER)*

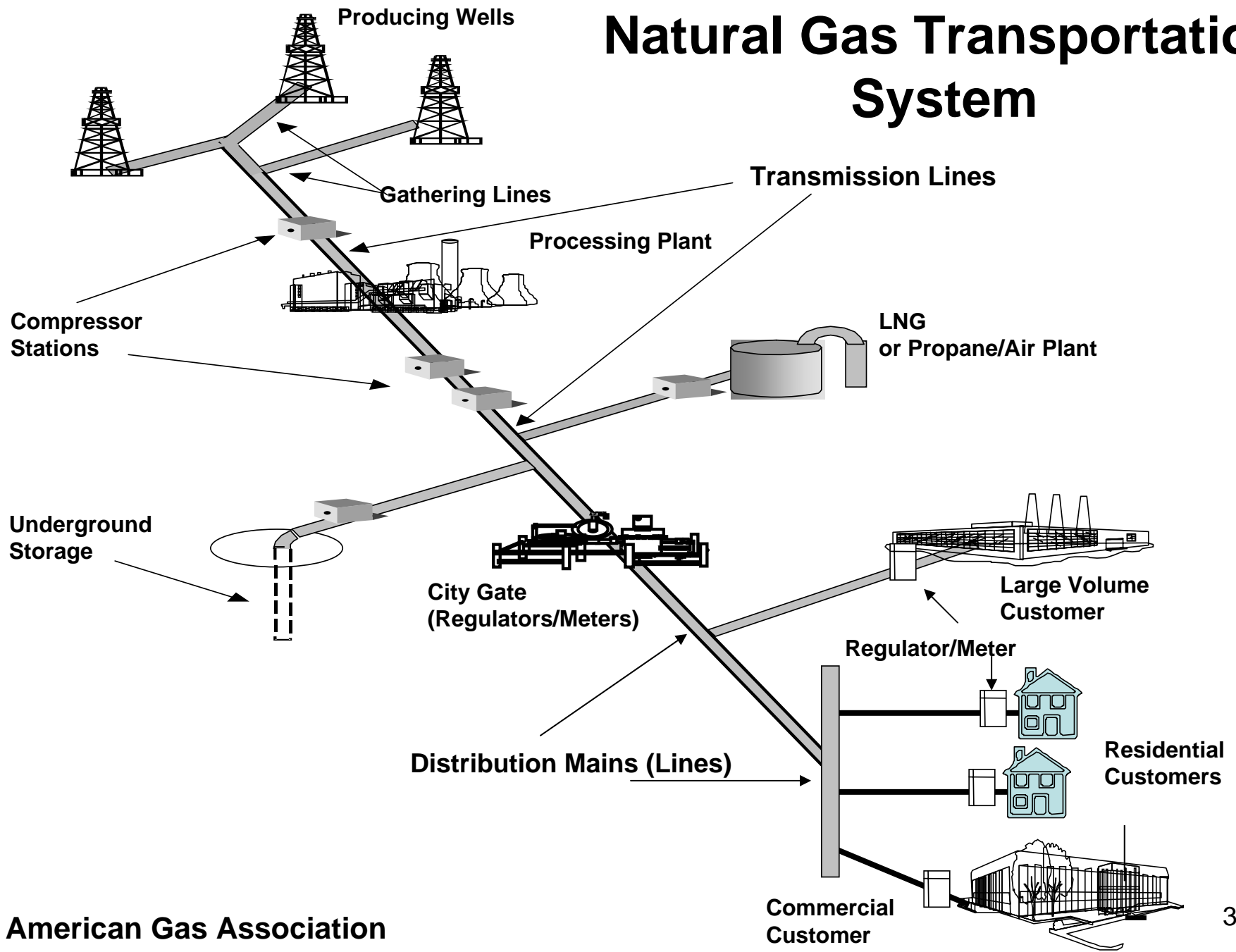
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*Tooraj Jamasb  
David Newbery  
Michael Pollitt  
Thomas Triebs*





# Objective

- Develop more knowledge and experience in using benchmarks for cost regulation of gas transmission systems

# Natural Gas Transportation System



# Approach: issue option

- Few European comparators  US firms  
(two functions for US data: make techniques feasible, world best practice?)
- (International) comparability  data  
standardization, controlling for differences
- Few relevant studies  cost-driver  
analysis
- Robustness of results   
SFA, DEA, COLS / consistency tests

# Approach: data

- Pooled cross section - panel better but not possible today
- FERC data – detailed and fairly standardised, but requires cleaning. Not collected for benchmarking
- Standardization – separate transmission from storage, balancing

# Data: Observations

**Table 1: Number of observations**

<b>Country</b>	<b>Years</b>	<b>No. of companies</b>	<b>No. of obs.</b>
A	2002-2004	1	3
B	2004-2005	1	2
C	2000-2004	1	5
D	2004	1	1
US	1996-2004	43	317
<b>TOTAL (before any outlier removal)</b>		<b>47</b>	<b>328</b>

# Data: Cost measures

**Table 6: Cost measures and their composition**

Name	Composition	Remarks
O&M	O&M	includes labour, excludes fuel, taxes and rents
Totex1	O&M, depreciation	
Totex2	O&M, depreciation, cost of capital	Cost of capital equals the written down value (historic asset base less accumulated depreciation) multiplied by a cost of capital percentage (7%)
Revenue	Revenue (less fuel)	Revenue is not built up from components but given as reported.

# Data: output measures

**Table 7: List of cost drivers**

Name	Composition (unit)	Remarks
Delivery	Total yearly throughput of gas transmitted (m <sup>3</sup> /year)	For US, only gas owned by others
Mains	Total length of pipelines (km)	
Horsepower	Total amount of compressor horsepower on pipelines (HP)	
Stations	Total number of compressor stations (#)	
Units	Total number of compressor units (#)	
Capacity	The maximum of all past and present measures of daily peak delivery times the number of days per year (m <sup>3</sup> /year)	This measure is not precise as technical capacity is likely to be greater than peak delivery
Load factor	Delivery over capacity (%)	(see remark on capacity)



# Cost-driver analysis: Output correlations

Table 14: Correlations among outputs

	<b>Delivery</b>	<b>Mains</b>	<b>HP</b>	<b>Stations</b>	<b>Units</b>	<b>LF</b>	<b>Capacity</b>
<b>Delivery</b>	1.00						
<b>Mains</b>	0.76	1.00					
<b>HP</b>	0.87	0.85	1.00				
<b>Stations</b>	0.64	0.88	0.83	1.00			
<b>Units</b>	0.64	0.89	0.81	0.92	1.00		
<b>Load factor</b>	0.38	0.11	0.27	0.04	-0.00	1.00	
<b>Capacity</b>	0.94	0.78	0.84	0.67	0.69	0.04	1.00

# Cost-driver analysis: OLS

Table 17: Regression results for final Cobb-Douglas models

	O&M	Totex1	Totex2	Revenue
Capacity	0.508**	0.693**	0.779**	0.728**
	(0.048)	(0.043)	(0.050)	(0.050)
Mains	0.688**	0.325**	0.224**	0.278**
	(0.036)	(0.032)	(0.037)	(0.037)
<i>adj. R Squared</i>	0.86	0.82	0.77	0.77

\*\* p<0.01; \* p<0.05; ^ p<0.10 two tailed

# Outlier treatment

- SFA: none
- COLS: Frontier through 90th percentile
- DEA: Removal of 10% of most efficient firms

# Results: mean scores by country

**Confidential**

# Results: SFA scores

**Confidential**

# Consistency: *rank corr.*

Table 31: Rank correlation for SFA, COLS, and DEA (VRS) scores

		SFA				COLS			
		O&M	Totex1	Totex2	Revenue	O&M	Totex1	Totex2	Revenue
COLS	O&M	0.99	0.58	0.36	0.21				
	Totex1	0.57	0.99	0.91	0.68				
	Totex2	0.35	0.91	0.99	0.77				
	Revenue	0.21	0.68	0.76	0.99				
DEA (VRS)	O&M	0.91	0.52	0.32	0.19	0.92	0.52	0.31	0.19
	Totex1	0.54	0.89	0.81	0.66	0.53	0.88	0.81	0.66
	Totex2	0.38	0.84	0.91	0.75	0.37	0.82	0.89	0.74
	Revenue	0.27	0.65	0.72	0.92	0.25	0.63	0.70	0.92

# Discussion

- US data fulfils its purpose
  - Similar ranking of European firms as in tariff benchmark?
- SFA not readily applicable
- Environmental variables
- Revenue benchmarking might catch all (cost *and* tariff)!
- Data collection and standardization are key!
- Start European data collection ASAP

**Thank you!**