Efficiency Analysis of Energy Networks:
An International Survey of Regulators

Aoife Brophy Haney & Michael Pollitt
University of Cambridge

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Context

- Considerable experience in energy network regulation re: efficiency analysis techniques
- Main indicators of "best practice" (Lovell, 2006)
  - Frontier-based methods
  - Large and high quality dataset
  - Panel data
  - Bootstrapping/confidence intervals
  - Quality, environmental and input price variables
- Factors that influence a regulator's choice of methods – not so well understood

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Survey Aims

Use and choice of benchmarking techniques

- What is the lay of the land?
- Is there convergence in electricity or gas?
- How about differences between transmission and distribution?

Details of the efficiency analysis process

- Differences in application of methods?
- Factors influencing choice?
- Barriers to best practice?
- Regional variation?

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Survey Method

June to October 2008
- Contact with regulatory reps initiated
- Online survey in both English and Spanish

Mixture of closed and open questions
- Expand on individual experience where necessary
- Insights into specific factors influencing choices

Electricity and gas network regulators
- Responses from 43 regulators in 40 different countries
- Europe, Australasia and Latin America

Best practice index
- Separate scores for electricity and gas industries
- Based on Lovell (2006)

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Survey Questions

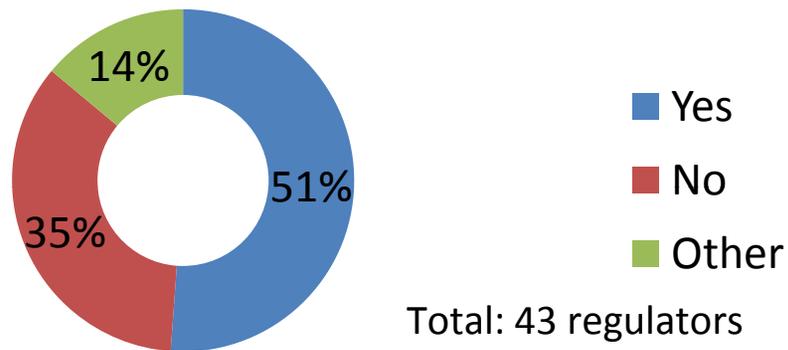## I. Choice of benchmarking techniques

- DEA, COLS, SFA or Process/Activity? Other?
- What was benchmarked? Capex, Opex, Totex?
- If benchmarking not used, why not?
- Any other techniques used but not part of formal process? Why?

II. Benchmarking analysis process

- Inside or outside regulatory agency?
- Specialism of consultants? Economics, Engineering, Law?
- Software?
- Uncertainty adjustments? Bootstrapping?
- International/Panel data; any problems?
- Environmental factors? How?
- Efficiency scores and final selection?

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Results: Choice of methods

Q. 3 Benchmarking techniques?
(Electricity or Gas – DEA, COLS, SFA or Process/Activity)

- **Yes** 51%
- **No** 35%
- **Other** 14%

Total: 43 regulators

In brief:
- Some evidence of size effect
- Very few countries don't use and are not considering benchmarking
- Advanced techniques more common in electricity than gas

*Other techniques:
- Unit cost model
- cost plus method
- simulation of most efficient company

Electricity	Gas
• 42 responses: 20 (48%) use advanced methods • 13 of these 20 regulate 7 or more companies	• 29 responses: only 8 (28%) use advanced methods • 6 of these 8 regulate 7 or more companies

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Results: Techniques by industry

Q. 5 Advanced benchmarking techniques by industry

D= Distribution T= Transmission	Electricity Rank	Frequency	Gas Rank	Frequency
Process/Activity	1	10 (D); 8 (T)	1	4 (D); 4 (T)
DEA	2	8 (D); 8 (T)	2	4 (D); 3 (T)
COLS	3	3 (D); 3 (T)	2	4 (D); 3 (T)
SFA	4	2 (D); 1 (T)	-	-

What is benchmarked if DEA, SFA, COLS used?

- Opex only: 9 out of 15
- Totex measure: 7 out of 15
- Capex only: only 1 (Colombia)
- Totex **and** Opex only (Great Britain)

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Results: If not, why not?

Q. 7 Why is benchmarking not used?

- Different methodology currently in place
- Small sector size viewed as a barrier
- Problems with or lack of data (regional effects)
- Regulatory/legislative barriers
- Due to commence implementing/designing methodology in near future

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Results: Analysis process

Internal/External Analysis
- 52% mixture
- 24% Internal; 24% External
- Total of 21 responses

Consultant specialism
- Economics (20)
- Economics and Engineering (15)
- Engineering (14)
- Law (4); Other (4)

International/Panel Data
- More widespread in electricity
- Very few use both – challenges of comparability, lack of data, legal restrictions etc.

Environmental factors
- 67% already incorporate in some way (total of 21)
- Most common method is second stage analysis in DEA

Software
- Tendency to favour free or widely available packages
- Positive from transparency perspective

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Best practice index

Indicator	Maximum Score
1. Current use of DEA, COLS, SFA, process/activity	1 (0.5 for concrete plans)
2. Use of more than one of above	1
3. Totex modelling	1
4. Use of panel data	1
5. Dealing with uncertainty: tests for well-behaved functional form, confidence interval analysis or specific adjustment	1
6. Incorporation of environmental factors	1
7. Use above techniques and have **either** ≥ 30 companies **or** < 30 companies and use of international data (large dataset)	1
8. Internal vs. external analysis: mixture (1); sophisticated internal (0.5); external only (0)	1
Total	**8**

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Best practice scores

Country	Electricity index score
Finland	8
Belgium	7.5
Austria; Great Britain	7
Netherlands; Slovenia	6
Hungary; Ireland	5
Portugal	4.5
New Zealand	4
Brazil; Colombia	3.5
Denmark; Estonia; Norway; Argentina; Peru	3
Northern Territory; Poland; Tasmania; Venezuela	2
Bolivia	1.5
Chile; Panama	1
Germany; Iceland; Ecuador	0.5
Cyprus; Czech Republic; Greece; Lithuania; Luxembourg; Sweden; Croatia; Romania; Dominican Republic; El Salvador; Mexico; Nicaragua; Uruguay; South Australia; Western Australia	0

Conclusions

- Wide variety in practices adopted
- No clear consensus on technique by industry
- Some evidence of a neighbourhood effect
- Very few regulators adhere closely to Lovell's definition of "best practice"
- Cooperation between regulators has potential to overcome some of data obstacles
- Demonstrating added value important