Key Issues in Global Electricity

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Overview

National electricity market liberalisation

Cross-border trade and regional electricity markets

Unresolved issues

A feasible solution
National electricity market liberalisation

Liberalisation means wholesale / retail markets replace government control and ....

STRUCTURE OF A LIBERALISED ELECTRICITY MARKET

Generators - Wholesale Market - Suppliers - Retail Market - Consumers

Physical Electricity Flow

Contract Flow
National electricity market liberalisation

.... in theory new entrants and increased efficiency should reduce consumer prices....

IMPACT OF LIBERALISATION IN ENGLAND & WALES 1990 - 2002

Oligopoly

Generators

Monopoly

RPI-X

Transmission

WHOLESALE MARKET

0 - 5%

Competitive

Suppliers

RETAIL MARKET

5 - 15%

Monopoly

RPI-X

Consumers

Distribution

Physical Electricity Flow
National electricity market liberalisation

…. but this outcome is not guaranteed and prices may rise instead.
National electricity market liberalisation

In reality regulation is still required to create and maintain a competitive industry…

SHARE OF COAL GENERATION CAPACITY IN ENGLAND & WALES

Source: EIA
National electricity market liberalisation

…. and governments will always want to intervene to set national energy policy

RECENT BRITISH ENERGY HEADLINES

28 Aug 02  British Energy drained by low prices-minister

1 Sep 02  British Energy ponders US sale

6 Sep 02  Nuclear firm British Energy begs for bailout

7 Sep 02  British Energy shares suspended as company warns of insolvency

8 Sep 02  Ministers offer guarantees to British Energy

9 Sep 02  British Energy falls almost 80 pct after LSE lifts trading curbs
Cross-border trade and regional electricity markets

New regional electricity markets are being created by economic / technical pressures.

FORCES FOR CHANGE IN CROSS-BORDER ELECTRICITY TRADE

- Increased efficiency and reduced scale of power plant
- Deregulation of national electricity markets
- Deregulation of national gas markets
- Increased investment in transmission cables
- Reduced cost and size of DC transmission
- Global electricity market
Cross-border trade and regional electricity markets

Interconnections have always existed between national electricity systems...

TRANSMISSION SYSTEMS IN THE EUROPEAN ELECTRICITY MARKET

Source: UCTE
Cross-border trade and regional electricity markets

…. but as wholesale spot / forward markets emerge so should cross-border trade

GEOGRAPHIC COVERAGE OF EUROPEAN ELECTRICITY EXCHANGES

- Baltic Pool
- Greece Pool
- Poland Pool
- EEX/LPX
- PowerNext
- NETA
- APX
- NordPool
- Iberia Pool
- Spain Pool
- Italy Pool
- BETTA
- EXAA

KEY
- Proposed
- Active Trading
Cross-border trade and regional electricity markets

…. and increase market efficiency by increasing competition between national generators

UCTE PHYSICAL ELECTRICITY FLOWS (MWh) IN 2000

Source: UCTE
Cross-border trade and regional electricity markets

As a result EU industrial price fell 24.4% 1997 – 2001 but 180% range persists…. 

Source: Eurostat
Cross-border trade and regional electricity markets

…. but household price only fell 10.1% 1997 - 2001 but still 160% range persists

Source: Eurostat
Unresolved issues

State and Federal policy objectives are interdependent and often in conflict

LIBERALISATION CONFLICTS

Competition

- Profit motive of capital market versus public service obligations
- Open access rights to transmission / distribution versus monopoly ownership
- Competitive industry structure versus creation of national champions

Security

- Indigenous generation versus low cost imports
- Generation fuel self sufficiency versus low cost imports
- Managed bilateral trade versus reliance on transit routes through third countries

Environment

- Lower prices versus higher environmental taxes
- Lowest cost technology (CCGT) versus renewables and nuclear
- Regional benefit of cross-border transmission lines versus impact on local area
Unresolved issues

Persistent differences in national prices are due to generator market power…

EU GENERATION CAPACITY CONCENTRATION RATIO (3 FIRM) 2001

SOURCE: European Commission, Company Accounts, OIES estimates
Unresolved issues

…. vertical integration between concentrated generation sector and monopoly ‘wires’ …. 

Control Areas of the German Transmission System Operators as at 1 Jan 2000

Unresolved issues

.... plus cross-border mergers may be preventing access to transmission / distribution

EUROPEAN INVESTMENTS OF EDF (APR 2002)

1. Estag 25%
2. Elcogas 29.1%
3. ISE 30%
4. Pego 10%
5. Graningue 36%
6. Motor Colombus 20%
7. Edasz 29%
8. Demasz 50.0%
9. Ech 58%
10. London Elec. 100%
11. SWEB 100%
12. EnBW 34%
13. Seaboard 100%
14. Hidrocanfabrico 59%
15. Bert 89%
16. Italenergia 18%
17. Montedison 97%
18. ATEL 13%
Unresolved issues

Interlocking relationships make regulation of network effects very complex

CORPORATE LINKS BETWEEN SWEDISH, GERMAN, UK MARKETS (APR 2002)
Unresolved issues

Commission believes import / export flows restricted by lack of transmission capacity....

**IMPORTS AS PERCENTAGE OF NET ELECTRICITY CONSUMPTION IN 2000**

Source: All data for 2001 except Eire which is for 2000 and from UCTE Memo 2001 (www.ucte.org) or Eurostat Energy Monthly Statistics 05:2002

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Key issues in Global Electricity
Unresolved issues

... and proposes 20% funding 7 electricity (5 gas) cross-border transmission axes ....

TENS INTERCONNECTOR PROJECTS OF COMMON INTEREST

- Power line
- Gas pipeline
- LNG terminal
- Gas storage

[Map showing interconnector projects of common interest]
Unresolved issues

…and a 10% target for renewables by 2010 to cut emissions and increase security.

EUROPEAN ELECTRICITY MARKET GENERATION CAPACITY MIX 2000

Source: EIA
Unresolved issues

… but competitive markets prefer low cost fuels increasingly from non-EU countries

**GENERATION TECHNOLOGY CAPACITY SHARE IN ENGLAND & WALES**

- OCGT
- Oil
- Pump Store
- Small Coal
- Medium Coal
- Large Coal
- CCGT
- Nuclear Magnox
- Nuclear AGR/PWR
- Hydro
A feasible solution

Pre-liberalisation most countries had monopoly ESI and competitive imports were banned

REGULATED MONOPOLIES

\[ P = \text{Price} \quad k = \text{Marginal Cost} = 20 \quad A = \text{Constant} = 50000 \quad E = \text{Elasticity} = 50 \]

Import Capacity Between Countries = \(1000\) \quad Net Flow Between Countries = \(0\)

\[ P_{\text{monopoly}} = \frac{A}{2E} + \frac{k}{2} = \frac{50000}{2\times50} + \frac{20}{2} = 510 \quad P_{\text{regulated}} = 50 \]
Public funding of cross-border transmission capacity build may increase competition....

COMPETING MONOPOLIES

\[ P = \text{Price} \quad k = \text{Marginal Cost} = 20 \quad A = \text{Constant} = 50000 \quad E = \text{Elasticity} = 50 \]

Import Capacity Between Countries = 50000  Net Flow Between Countries = 0

\[ P_{\text{competitive}} = 20 \]
A feasible solution

…. but this would not be necessary if dominant firms were broken up first

COMPETITIVE MARKET

\[ P = \text{Price} \quad k = \text{Marginal Cost} = 20 \quad A = \text{Constant} = 50000 \quad E = \text{Elasticity} = 50 \]

Import Capacity Between Countries = 1000    Net Flow Between Countries = 0

\[ P_{\text{competitive}} = 20 \]
John Bower is Senior Research Fellow at the Oxford Institute for Energy Studies. His research interest is in the emergence and evolution of cross-border electricity and gas markets. Specifically; the development of efficient pricing and investment mechanisms for transmission capacity, integration of energy markets, and energy price / credit risk management.

John’s previous career was in the commodity industry and his experience ranges from energy trading, at Marc Rich & Co, to risk management consultancy, with Coopers & Lybrand, advising commodity traders, producers and processors in base metal, precious metal, ‘softs’ and energy markets. Before joining the PhD programme he was Global Controller Metals/Commodities at Deutsche Morgan Grenfell.

John completed his PhD at London Business School in 2000. He also has an MBA from London Business School and an MA in Biochemistry from Oxford University.