Electricity Market Design: Experiences and Issues in Britain

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http://www.econ.cam.ac.uk/electricity
Major events in British Electricity

• Industry restructuring - 1990 on
• The end of the domestic franchise - 1999
• New Electricity Trading Arrangements (NETA) March 2001
Capacity connected to NGC

MW

OCGT
Oil
Coal
CCGT
import
Nuclear
demand

40,000
30,000
20,000
10,000
0

50,000
40,000
30,000
20,000
10,000
0

Apr-90 Apr-91 Apr-92 Apr-93 Apr-94 Apr-95 Apr-96 Apr-97 Apr-98 Apr-99 Apr-00 Apr-01

peak demand
Industry restructuring

- Flawed privatisation: concentrated generation
  - Offer’s price cap “encourages” sale of 6 GW plant
- Distribution: lax initial and 1995 price caps
  - RECs paid off debt, became under-geared
  - Labour’s windfall tax on “unjustified profits”
  - end of the Golden share and the take-over wave
- NP and Pgen bid for RECs: referred to MMC
- 11 RECs bought, 7 by US companies
Supply competition

- 1990: above 1 MW open = 30%
- 1994: above 100 kW open = 50%
- “1998” full liberalisation planned
- 1999 electricity liberalised but expensive
- 2001-3 supply margin widens
  - active market for supply businesses
"Other" includes PG and NP when not explicitly shown
Source: Richard Green
Liberalising domestic supply

- 24 May 1999 full domestic liberalisation
  - 13% switch by Dec 1999
  - 38% switch by Dec 2002
- Transmission and distribution prices reset
  ⇒ reduction of 9% of final bill 1998-2002
- wholesale prices ≈16-20% fall in final price
  - but supply cost rise
  - and profits also rise
Domestic liberalisation

Real domestic electricity prices 1990-2002

Supply liberalisation

£/year/3,300kWh
Cost-benefit analysis of supply competition

- Green-McDaniel (1998) criticise Offer’s SCBA
  - Offer: benefit = consumer gain; co. losses ignored
  - consumers gain £285m/y, co.s lose £415m/y (5 yrs)
- Offer’s cost allowance to supply companies
  - initial costs: £276 million ($440m)
  - extra on-going costs £36m/year ($58m/y)
- reduced bills relative to incumbent: £100m/yr ’98-02
- removing regulation allows margins to widen
  
  *Expensive and unattractive solution?*
Supply liberalisation

• prevents cross-subsidies from network
• but supply is a low margin business
  – risky: wholesale prices volatile
• credit risk potentially serious
• who is the supplier of last resort for voters?
• Ending franchise may prejudice generation investment and supply security
Keep or end franchise?

• If keep, then temptation to pass own generation costs through solutions:
  – no owned generation, or
  – yardstick regulation

• If end, then G+S complementary
  – but immobile customers penalised?
Horizontal for vertical swap

- PG & NP’s bids for RECs referred to MMC
  - denied by Sec. of State
- dash for gas and more competing generators
- impending supply liberalisation: “1998”
  ⇒ contracts shorter term, more competitive
- Reform of trading arrangements threatened
  ⇒ wholesale market becomes more risky
  ⇒ trade horizontal for vertical integration
Capacity Ownership of Coal Generation 1990-2002

Source: John Bower (Oxford Institute for Energy Studies)
Pool vs NETA: Pool

- day-ahead gross compulsory pool
- single-price auction for SMP
- capacity payment for availability
- firm access rights, no penalty for non-delivery
- PSA a contract: hard to change
Pool vs NETA: NETA

- Pool replaced by voluntary markets
- self-dispatch, physical contracts
- SO trades in balancing market to stabilise
- pay-bid in BM, different buy, sell prices
  \( \Rightarrow \) costly to be out of balance
- process for making modifications controlled by Ofgem
*a priori* defence of NETA

- “The Pool is too transparent and discourages bilateral bargaining”
- “Making balancing market a poor guide to SMP will encourage contracting”
- “If there is no market of last resort then must-run stations have to accept lower bids”
1998 critique

• The root problem is lack of competition
• If this is resolved the Pool may work better
• Pool replacement may then be unnecessary, costly and counterproductive. It will:
  – accelerate vertical integration
  – deter entry so equilibrium prices will rise
  – raise transaction costs and hence prices
Events from RETA to NETA

• Competition intensified
  – Jul 99 Edison buys 4GW $472/kW
  – raises load factor from 25% to 40+ %
  – AES buys Drax, then offers for sale
    ⇒ SMP falls 20-30% year-on-year
  – Oct 01 Edison Mission sells at $190/kW

• Interconnector raises UK gas prices
  – CCGT at margin
  – more dispersed ownership ⇒ more competition
Criticisms of NETA

• balancing market volatile and risky
• SSP low, moderately predictable
• SBP unpredictable, can be very high
• each agent penalised for imbalance
  ⇒ incentive to over-contract, spill at SSP
  ⇒ excessive self-balancing, reserves
Rationalised defence of NETA

- dual cash-out prices ⇒ asym risk
  ⇒ over-contracting ⇒ spot price↓
- over-contracting discourages market power
- spot market sets contract price then prices↓
- inefficiencies small price for more competition
A possible defence of NETA

• amplified pressure for vertical integration
• encouraged incumbents to trade horizontal for vertical integration
• this greatly increased competition
• then only changing governance required
• and could have saved £1 billion
What will happen in future?

- Suppliers have to buy, gencos do not have to sell
- In tight markets contracts will be expensive
- Will plant be disconnected to avoid grid charges?
- Will the market remain competitive enough not to need new entry?
- Or are the barriers to entry higher, leading to higher average future prices?
Conclusions

- Unbundling + market power $\Rightarrow$ excess entry
- supply competition + RETA $\Rightarrow$ wholesale risk
- wholesale risk $\Rightarrow$ G: divest and integrate with S
- plant sales + excess capacity $\Rightarrow$ fall in prices
- supply liberalisation $\Rightarrow$ profits from sticky customers
- Retail liberalisation costly in GB
- Reforming trading arrangements costly

*The ideal: cheaper wholesale competition*
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