NETA and Electricity Prices

Richard Green
University of Hull Business School
Outline

• The big picture
• Price-setting under NETA
• Price patterns 1996-2004
• Model-based exploration
E&W Electricity Prices

£/MWh (99/00)

Transport Uplift
Uplift
Capacity Payment
SMP

NETA: RPD plus Balancing

Should NETA reduce prices?

- Pay-as-bid versus marginal pricing
- Dampens down the highest prices
- How will generators bid?

>(developed from joint work with Tanga McDaniel)
Bids in the Balancing Mechanism

- The highest-cost seller with a chance of being needed bids at marginal cost
  > Assuming there are others with still higher costs
- Other sellers bid above marginal cost
- The lowest-cost buyer with a chance of being needed bids at marginal cost
  > Assuming there are others with still lower costs
- Other buyers bid below marginal cost
The Balancing Mechanism

Marginal Cost

Demand in PX

Supply in PX

GW

£/MWh
The Balancing Mechanism

Marginal Cost

Bid to buy

Offer to sell

£/MWh

GW

Demand in PX

Supply in PX

GW
Where should they trade?

- Generators trade off the chance of selling at a high price in the BM against selling in the PX and perhaps buying back their output cheaply.
- Suppliers trade off the chance of having to buy at SBP rather than the PX price, against losing (PX-SSP) if they buy too much.
- This gives demand and supply curves in the day-ahead markets.
The Balancing Mechanism

- Marginal Cost
- Demand in PX
- Supply in PX

£/MWh vs GW
Theoretical conclusion

- Generators expect to get the same under pay-as-bid and marginal pricing
- The PX price is the expected marginal cost of generation (or demand-side bidding)
- Suppliers’ payments will be less volatile with pay-as-bid than marginal pricing
Implications

- Demand-weighted price unchanged
- Time-weighted price higher under NETA!
- But this analysis assumes:
  > No risk aversion
  > No market power
- We need to look at the data
Prices

£/MWh

- Full price
- Energy price

Apr-96 Apr-97 Apr-98 Apr-99 Apr-00 Apr-01 Apr-02 Apr-03
Why did British Electricity Prices Fall After 1998? (mk II)

Joanne Evans and Richard Green
Research strategy

• Many things were changing as NETA was introduced
  > Market structure (plant divestitures)
  > Fuel prices
  > Ratio of demand to capacity was falling

• Model how these would affect prices for a fixed set of market rules

• Does the relationship between the prediction and the actual data change with NETA?
The model

• Cournot competition
  > Generally understood, unique predictions

• Linear demand curves (21 per month)
  > Quantities are 0th, 5th, 10th … percentile of month’s demand
  > Prices are 2.5th, 5th, 10th … percentile of actual prices
  > Equal slopes give average elasticity of around -0.2

• Marginal costs: fuel and variable O&M
  > S/M/L coal, early/mid/late CCGT, Oil, OCGT, PS Hydro
The firms

• Seven strategic firms:
  > National Power, PowerGen, Eastern, Edison, EdF, AES, AEP

• One semi-strategic:
  > British Energy runs all its available nuclear plant, but follows Cournot strategy for Eggborough (coal)

• Competitive fringe:
  > Magnox stations, independent CCGTs & a couple of coal
Capacity by firm

MW

Nuclear Electric

National Power

Eastern

PowerGen

Fringe

Edison

EdF

AES/Drax

AEP

Apr-96 Apr-97 Apr-98 Apr-99 Apr-00 Apr-01 Apr-02 Apr-03
Prices
(3-month moving averages)
Prices and costs
(3-month moving averages)
Prices and costs
(3-month moving averages)

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<th>Cournot Estimate</th>
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£/MWh

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Lerner indices
(3-month moving averages)
Lerner indices
(3-month moving averages)

£/MWh

- Cournot Estimate
- Energy price
- All plant HHI

Apr-96 Apr-97 Apr-98 Apr-99 Apr-00 Apr-01 Apr-02 Apr-03
Lerner indices
(3-month moving averages)
Lerner indices
(3-month moving averages)
Mean Electricity Prices

£/MWh

System Buy Price
UKPX Ref Price Data
System Sell Price

Regression of Energy Price

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Regression of Full Price

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Regression of Energy Price

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## Regression of Full Price

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Conclusions

- Many things changed at the time NETA was introduced
- Prices would have fallen under “constant market rules and behaviour”
- Prices may have fallen further than this in 2002
- Prices seem to have recovered recently!