# Electricity Market Design: Experiences and Issues in Britain

David Newbery, DAE Cambridge

*26th Annual IAEE Conference*

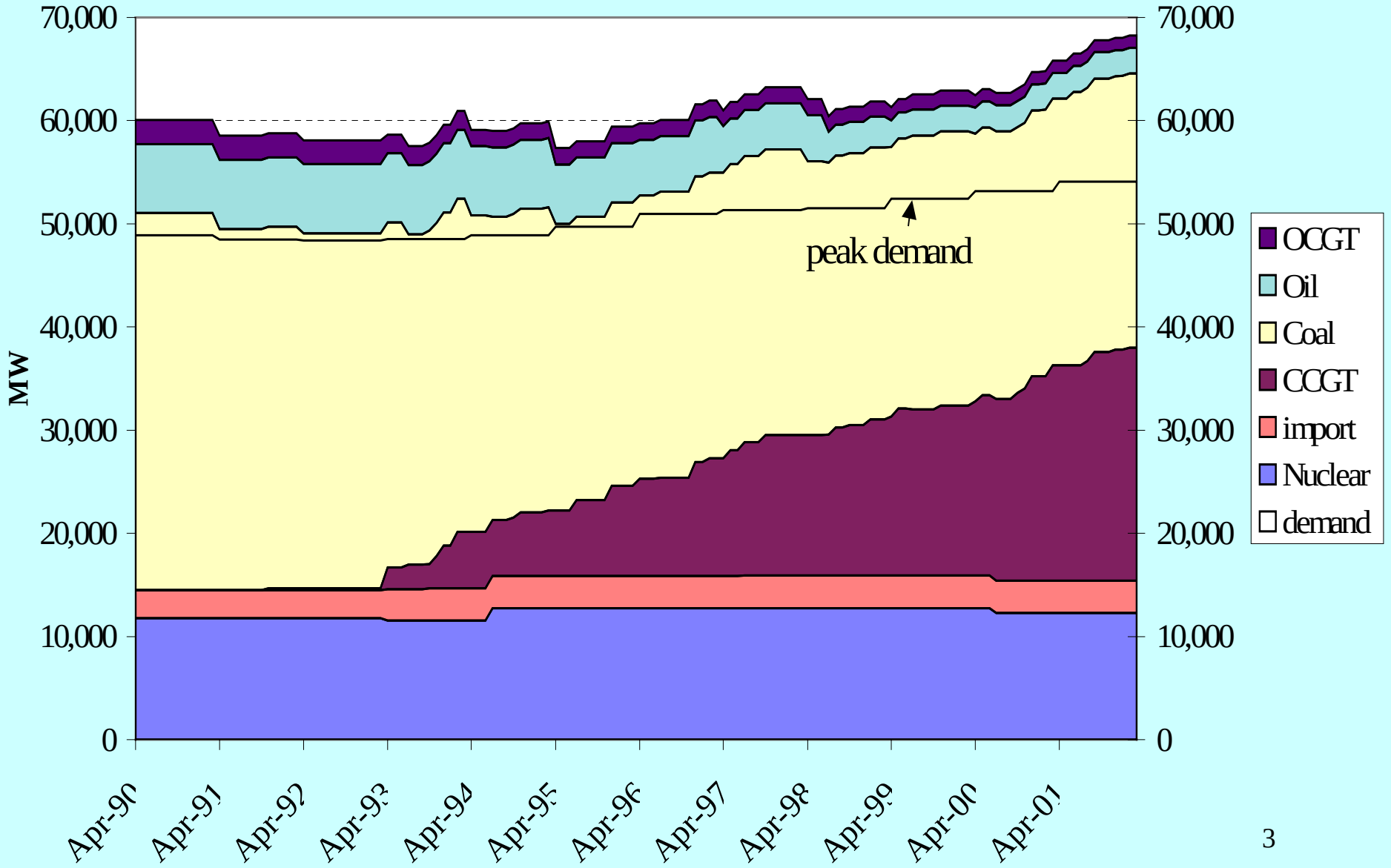
*Prague, 5 June, 2003*

http://www.econ.cam.ac.uk/electricity

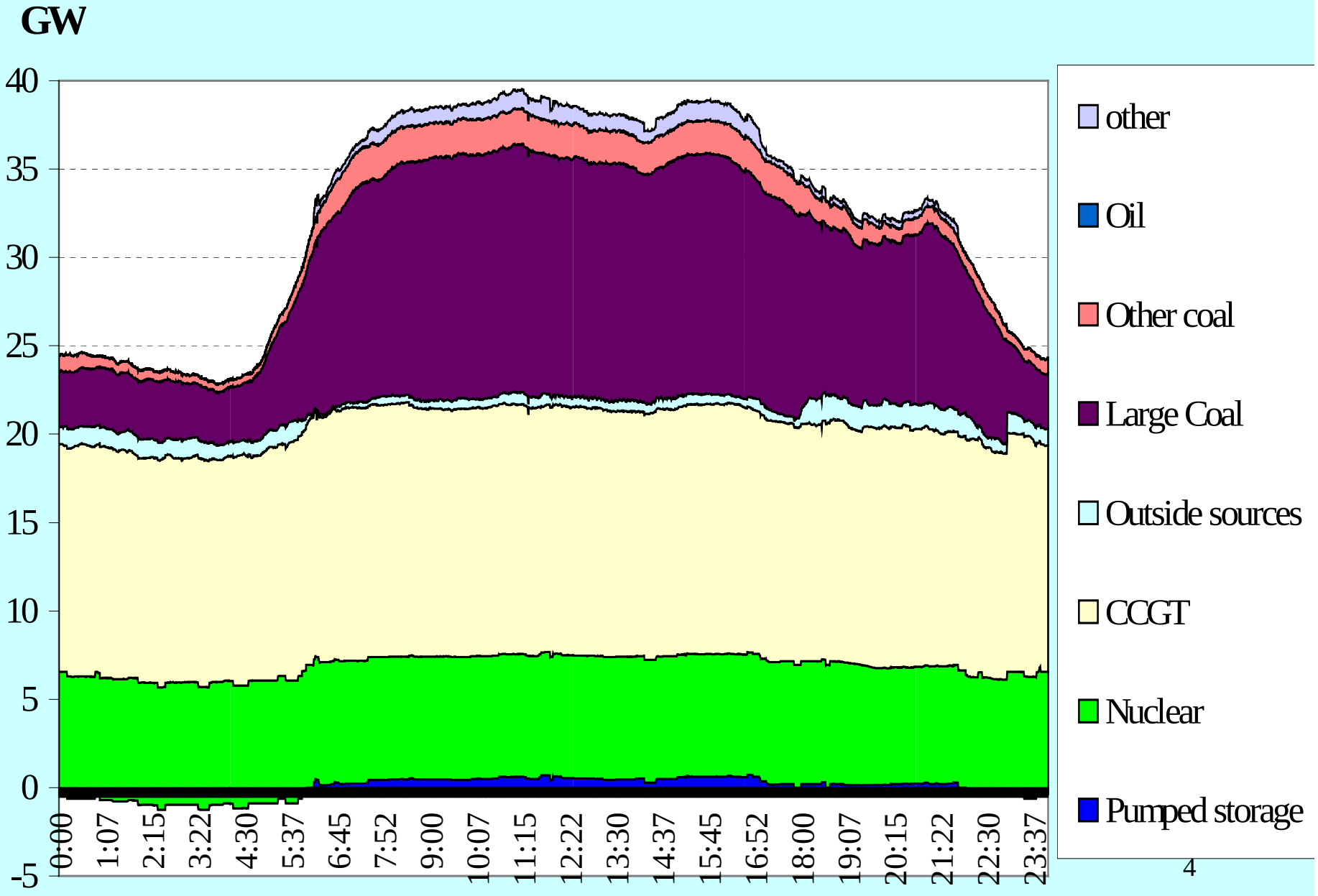
# Major events in British Electricity

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

# Capacity connected to NGC



# Demand 10 December 2002



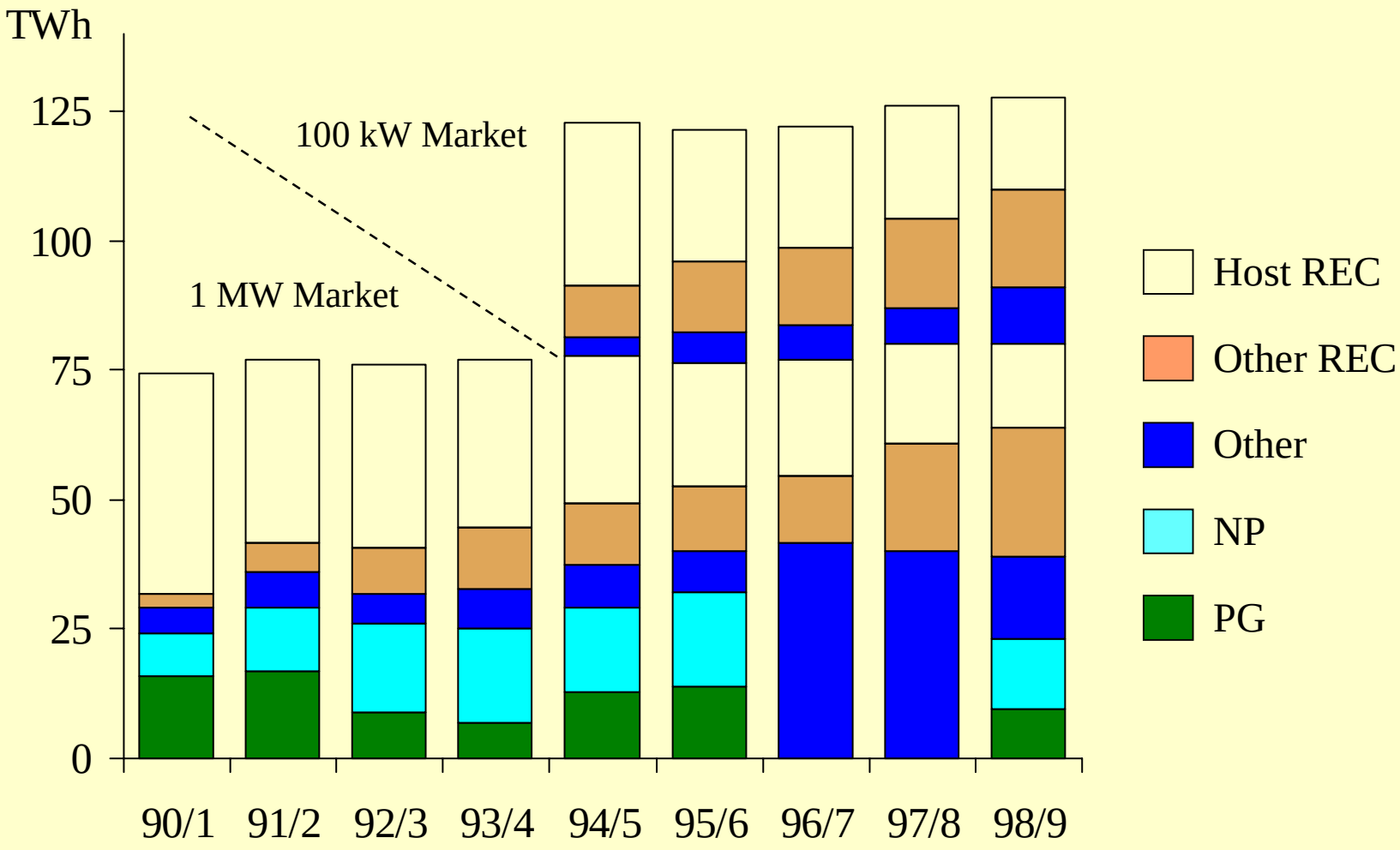
# Industry restructuring

- 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

# Competitive Supply: Output Supplied



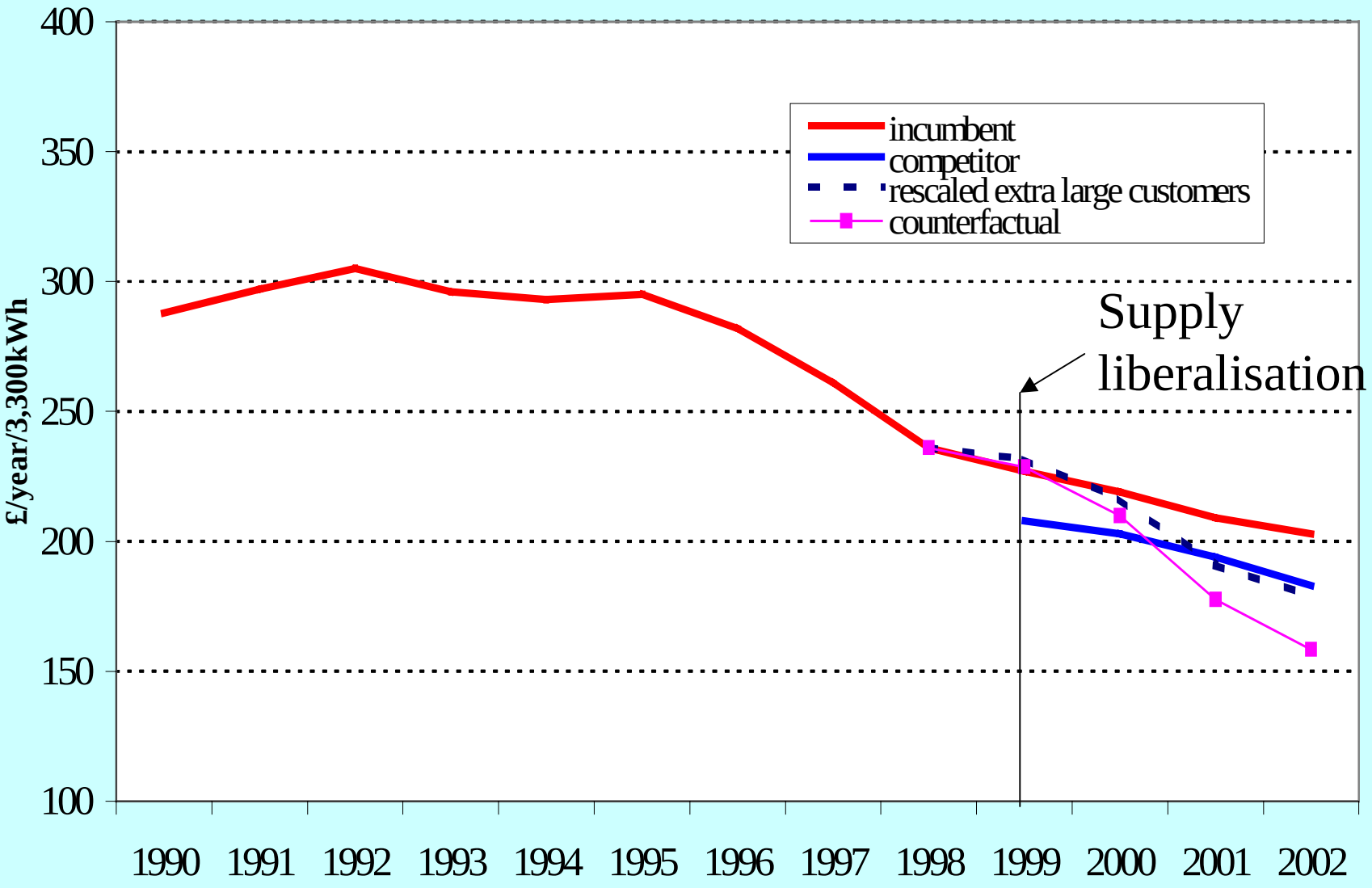

"Other" includes PG and NP when not explicitly shown
Source: Richard Green

# Liberalising domestic supply

- 24 May 1999 full domestic liberalisation
  - 13% switch by Dec 1999
  - 38% switch by Dec 2002
- Transmission and distribution prices reset

  $\Rightarrow$ reduction of 9% of final bill 1998-2002
- wholesale prices $\approx$16-20% fall in final price
  - but supply cost rise
  - and profits also rise

# Real domestic electricity prices 1990-2002



# 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?

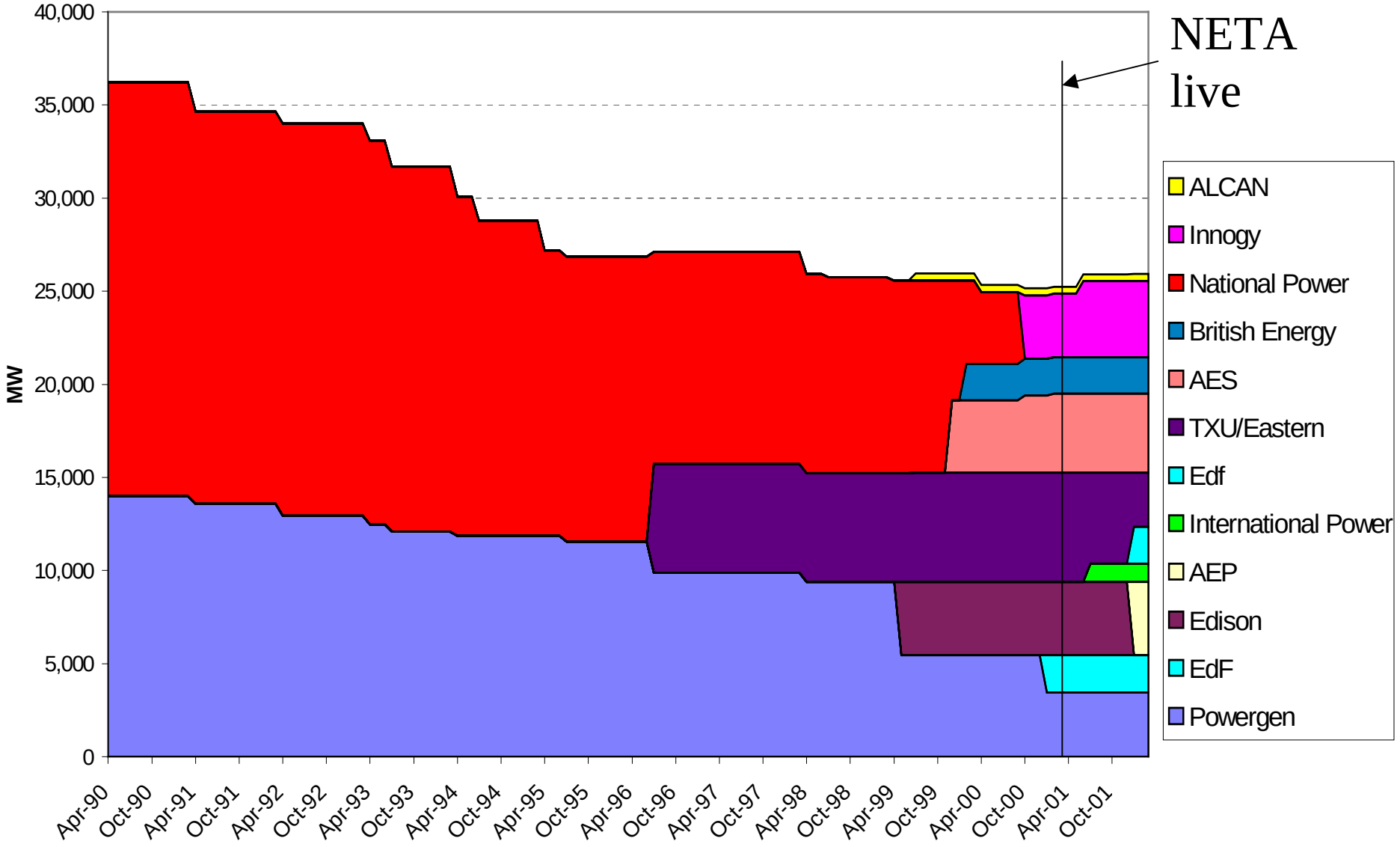
# Horizontal for vertical swap

- 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”

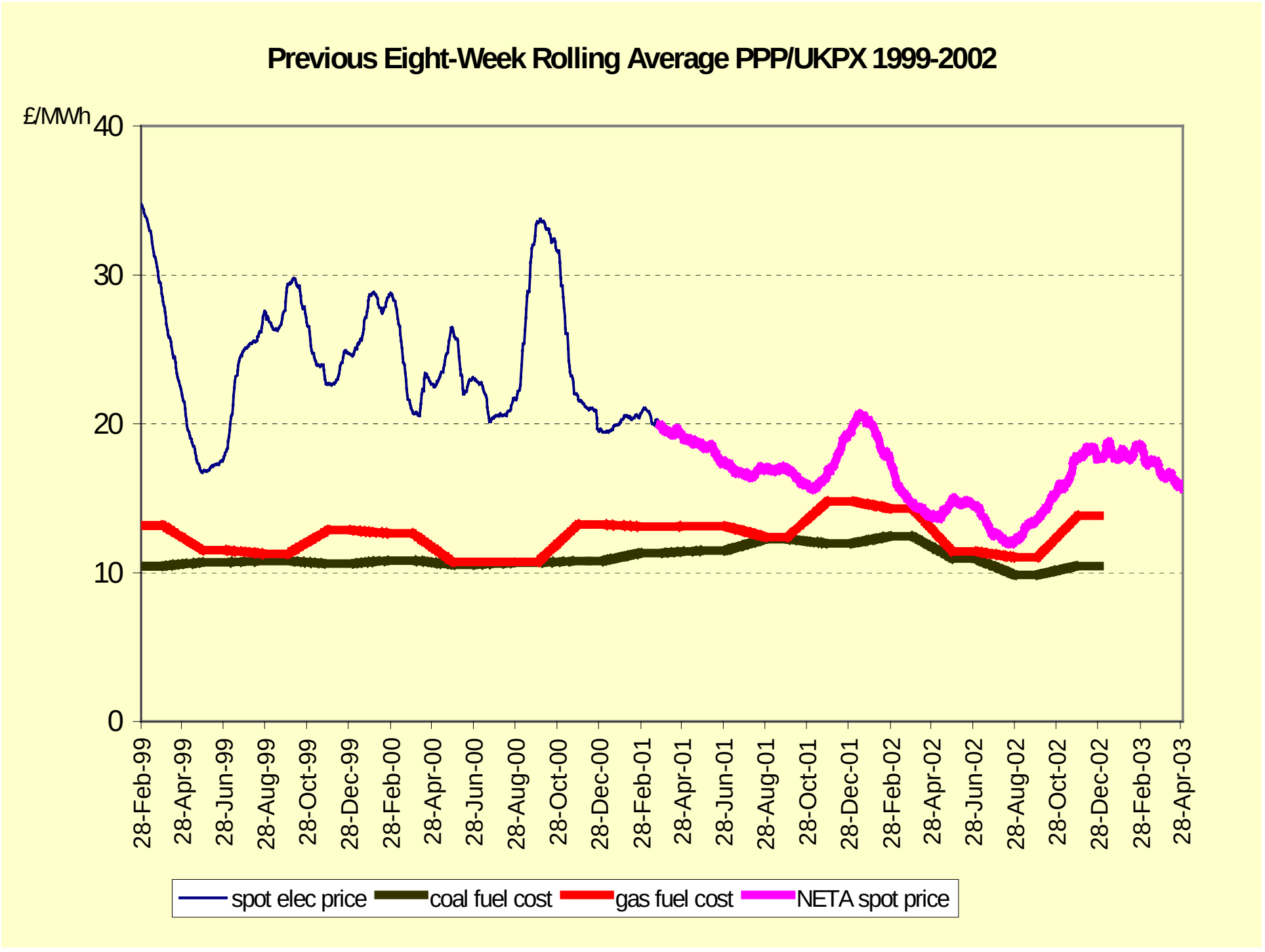
# 1998 critique

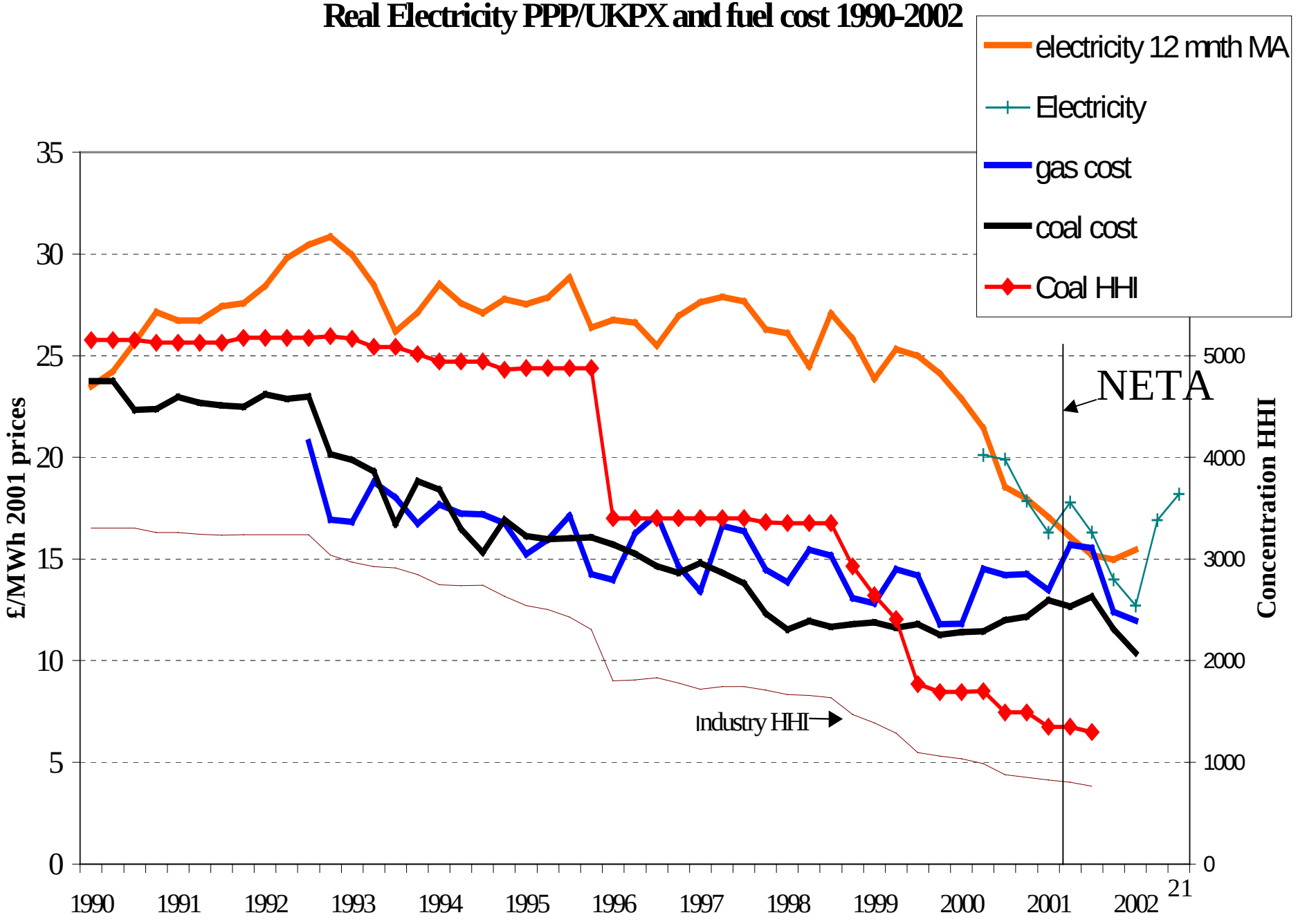
- The root problem is lack of competition
- If this is resolved the Pool may work better
- Pool replacement may then be unnecessary, costly and counterproductive. It will:
  - accelerate vertical integration
  - deter entry so equilibrium prices will rise
  - raise transaction costs and hence prices

# 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


Previous Eight-Week Rolling Average PPP/UKPX 1999-2002
£/MWh
40
30
20
10
0
28-Feb-99
28-Apr-99
28-Jun-99
28-Aug-99
28-Oct-99
28-Dec-99
28-Feb-00
28-Apr-00
28-Jun-00
28-Aug-00
28-Oct-00
28-Dec-00
28-Feb-01
28-Apr-01
28-Jun-01
28-Aug-01
28-Oct-01
28-Dec-01
28-Feb-02
28-Apr-02
28-Jun-02
28-Aug-02
28-Oct-02
28-Dec-02
28-Feb-03
28-Apr-03
spot elec price
coal fuel cost
gas fuel cost
NETA spot price


Real Electricity PPP/UKPX and fuel cost 1990-2002
electricity 12 mnth MA
Electricity
gas cost
coal cost
Coal HHI
£/MWh 2001 prices
Concentration HHI
NETA
Industry HHI
35
30
25
20
15
10
5
0
5000
4000
3000
2000
1000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002

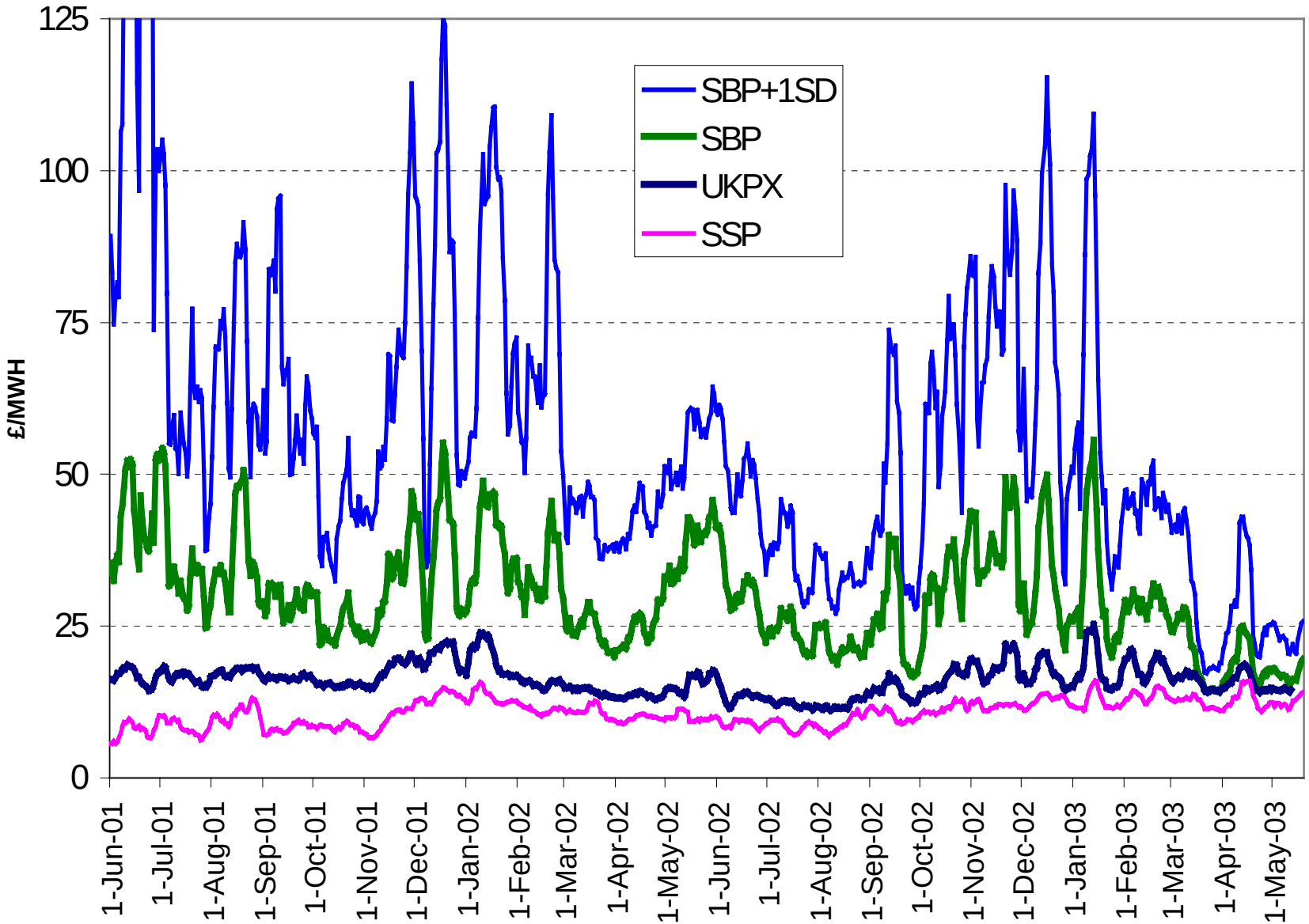
# Criticisms of NETA

- balancing market volatile and risky
- SSP low, moderately predictable
- SBP unpredictable, can be very high
- each agent penalised for imbalance

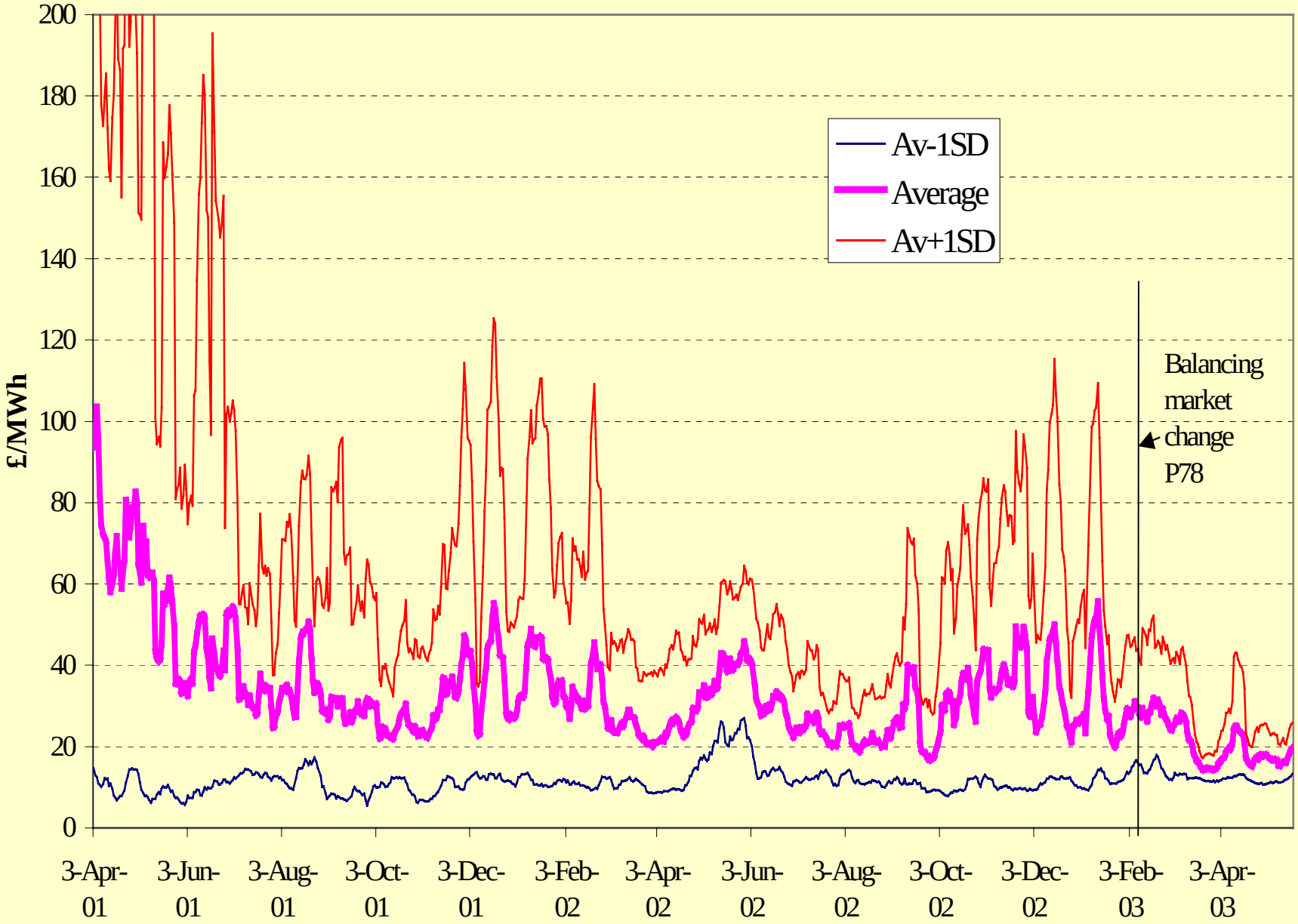
⇒incentive to over-contract, spill at SSP

⇒excessive self-balancing, reserves

# Spot and cash-out weekly moving average prices Jun '01- May '03



# 7-day moving average spread of SBP Apr '01-May '03



# Rationalised defence of NETA

- dual cash-out prices $\Rightarrow$ asym risk

$\Rightarrow$ over-contracting $\Rightarrow$ spot price$\downarrow$

- over-contracting discourages market power
- spot market sets contract price then prices$\downarrow$
- 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 ⇒ excess entry
- supply competition + RETA ⇒ wholesale risk
- wholesale risk ⇒G: divest and integrate with S
- plant sales + excess capacity ⇒ fall in prices
- supply liberalisation ⇒ profits from sticky customers
- Retail liberalisation costly in GB
- Reforming trading arrangements costly

***The ideal: cheaper wholesale competition***

# Electricity Market Design: Experiences and Issues in Britain

David Newbery, DAE Cambridge

*26th Annual IAEE Conference*

*Prague, 5 June, 2003*

http://www.econ.cam.ac.uk/electricity