

Economics, Markets &
Methodology: Thinking about the
Behaviour of the UK's Gas &
Electricity Markets

Professor Philip Wright
University of Sheffield

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Outline

- The Nature of Demand and Supply (implications?)
- Supply side shocks and prices (fate of models?)
- Paper and Physical Markets (which is real?)
- Liberalisation increases cost of uncertainty (choice of uncertainty?)
- Company Strategies (desirability of vertical integration?)
- The Consumer: no countervailing power in switching (hedge not sovereign?)

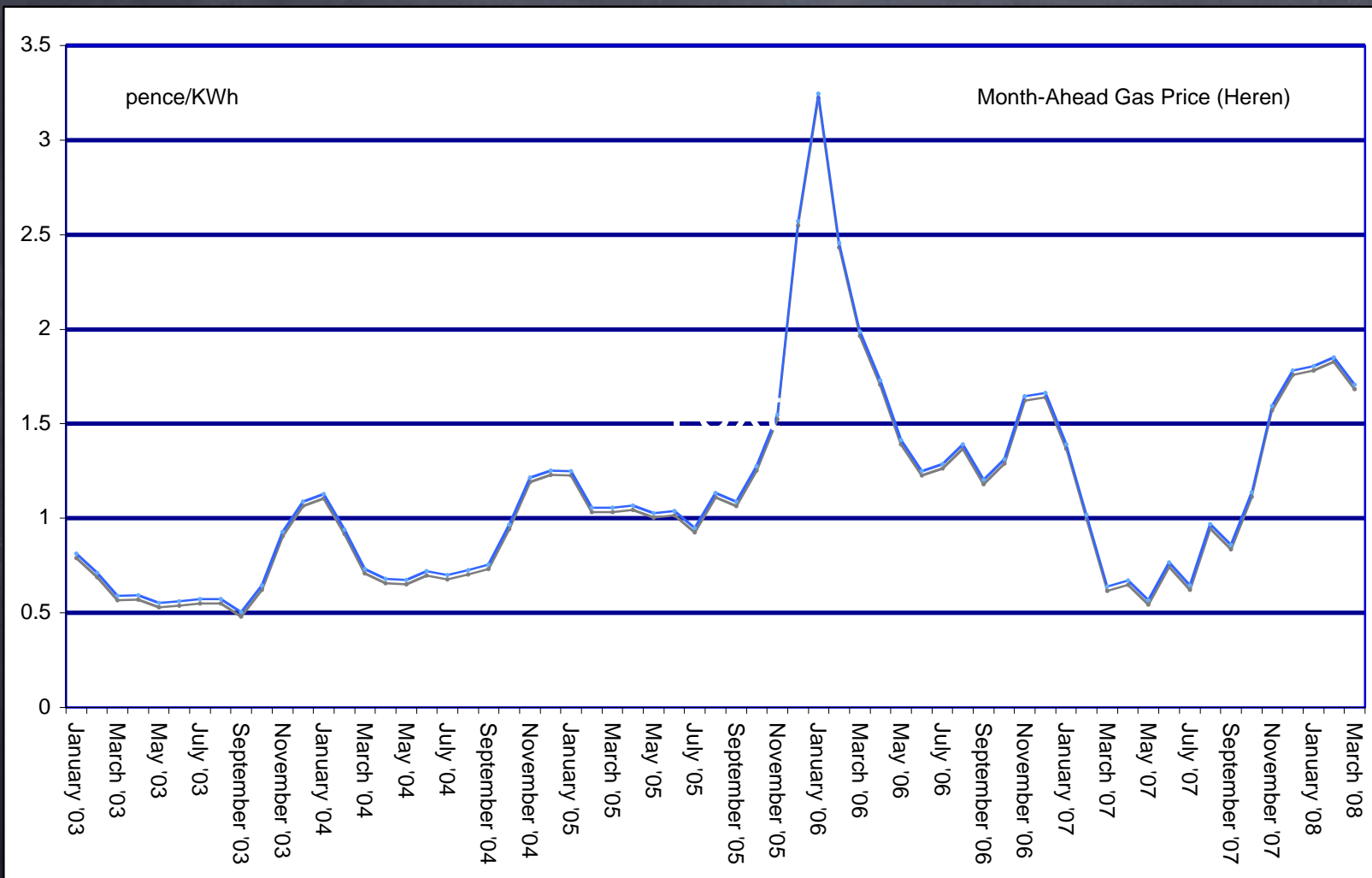
	<p>OLD LONG-TERM CONTRACTS (Beach Delivery, C and Producer Price Indexed)</p>
	<p>MONTHS OUT</p>
	<p>GAS Day minus one (D-1)</p>
	<p>DELIVERY under PAST CONTRACTS + SPOT PURCHASES and SALES: Within-Day (On-the-Day for-the-Day): OTC Prompt Desk and OCM. CONTRACTING for FUTURE DELIVERIES: OTC Forward Desk and Bilateral Contracts.</p>
	<p>SAP-priced (OCM System Average Price)</p>
	<p>MONTH minus one (M-1)</p>
	<p>MEDIUM-TERM CONTRACT (wholly Gas-Indexed)</p>
	<p>NEW LONG-TERM (NBP Delivery, wholly or partial Gas-Indexed)</p>
	<p>CONTINUING OLD LONG-TERM (Beach Delivery, C and Producer Price Indexed)</p>

Many Markets with Different Time Profiles: Implications for Demand & Supply?

Changing Complexity of Shocks: Implications for Prediction?

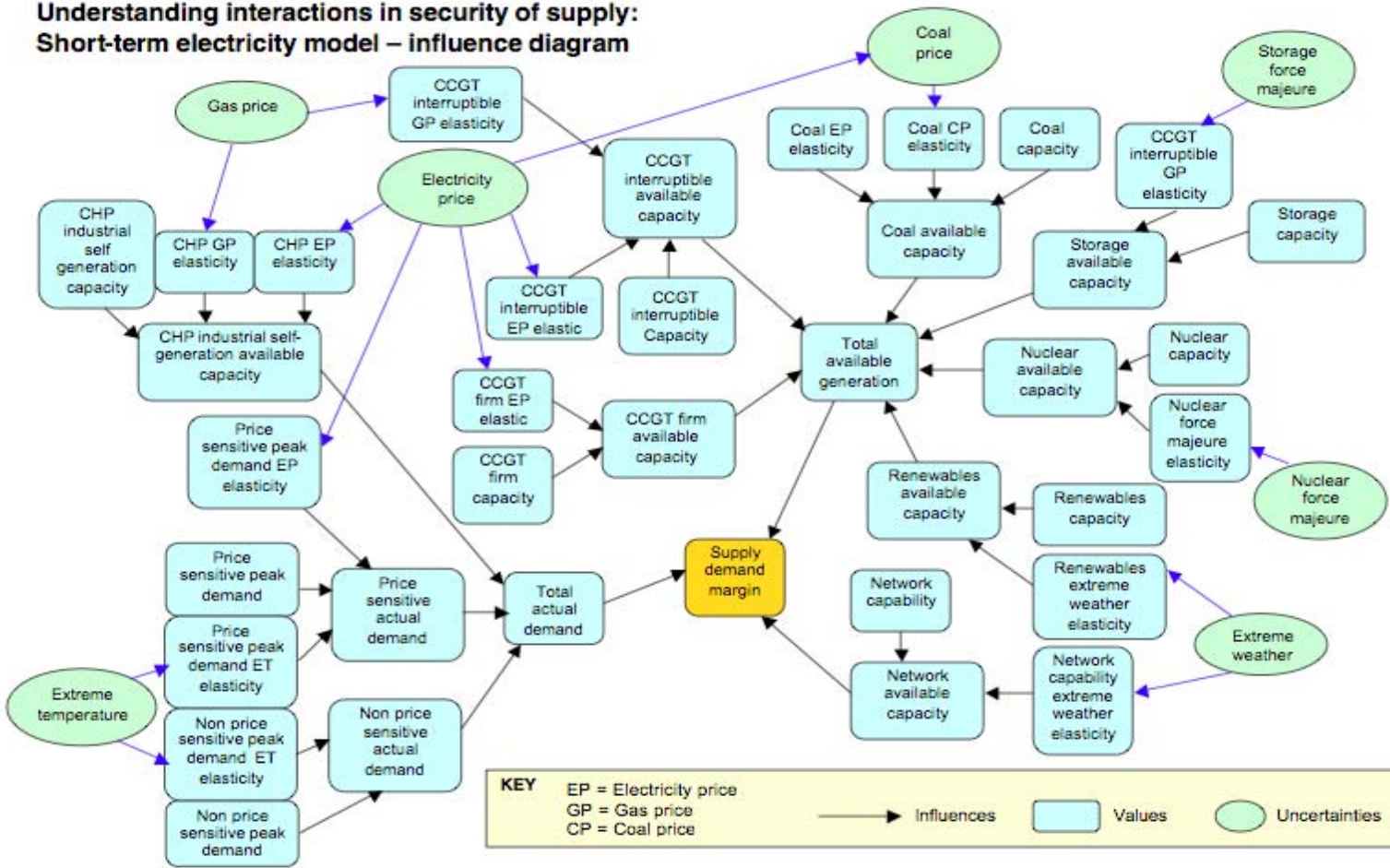
	OCTOBER/NOVEMBER 2003	AUGUST/SEPTEMBER 2004	JANUARY/FEBRUARY/MARCH 2006
	AUTUMN	SUMMER	WINTER
FIELD DECLINE	YES	YES	YES
LNG DELIVERIES BELOW EXPECTATIONS	NA	NA	YES
PLANNED MAINTENANCE	YES	YES	YES
UNPLANNED MAINTENANCE	YES	LITTLE	YES (including Rough Storage Fire)
INTERCONNECTOR RESPONSE	EXPORT	IMPORT	IMPORT (but insufficient)
STOCK RESPONSE	INTERRUPTED REBUILD	NONE	RUN-DOWN
CONTRACTUAL CONSTRAINTS ON RESPONSES	YES	NO	NO
SHIPPER UNDER-DELIVERY AGAINST NOMINATIONS	NO	NO	NO
UNANTICIPATED DAILY DEMAND	NO	NO	YES
HIGH SEASONAL DEMAND	NO	NO	YES
LOW SEASONAL DEMAND	NO	NO	NO

Physical System Shocks & UK Month-Ahead Gas Prices



System Complexity: An Electricity Example

**Understanding interactions in security of supply:
Short-term electricity model – influence diagram**

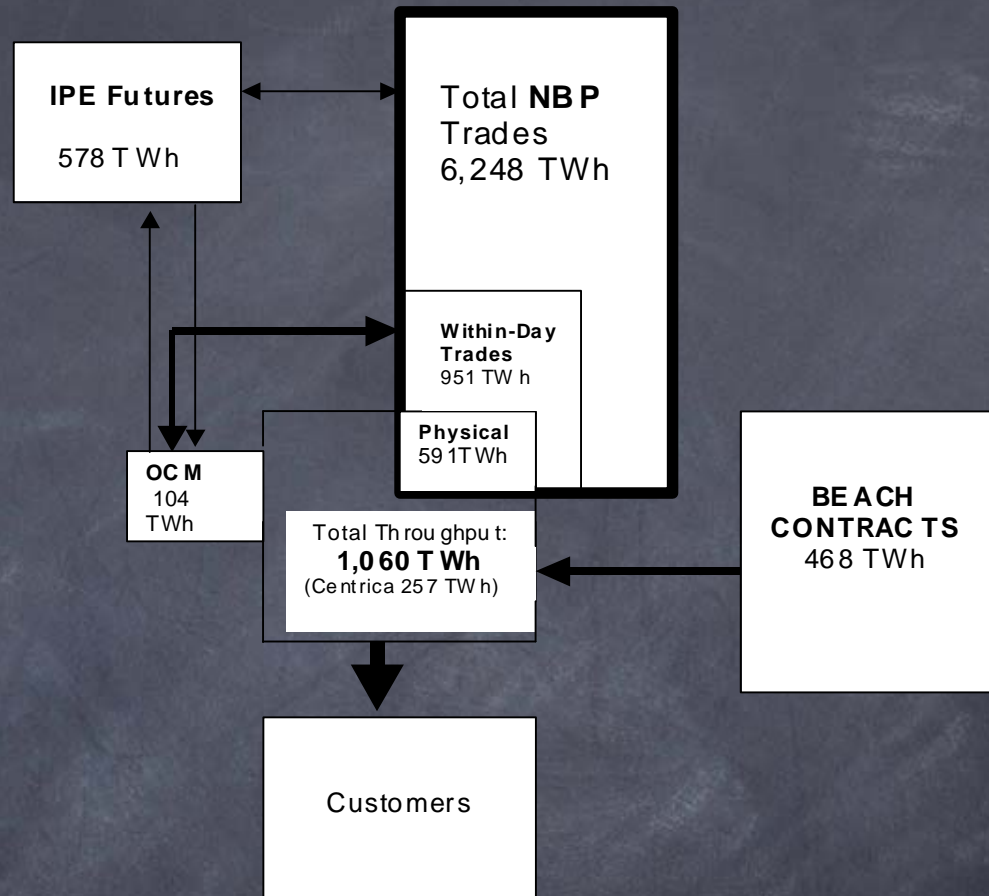


Complexity of Response: Government Emergency Planning

	DTI	National Grid	Ofgem	Gas Network Operators	DNOs	Generators	British Gas Service	UKOOA	HSE	Communication (Press Office)	Civil Contingencies Secretariat	Other Government Departments	Other Agencies
Gas Emergency (no isolation)	Y	Y	Y	O	O			O	O	O	O	O	O
Gas Emergency (isolation)	Y	Y	Y	Y	Y		Y	O	Y	O	O	O	O
Electricity Emergency	Y	Y	Y		Y	Y				O	O	O	O
Electricity & Gas Emergency (no isolation)	Y	Y	Y	O	O			O	O	O	O	O	O
Electricity & Gas Emergency (isolation)	Y	Y	Y	Y	Y	Y	Y	Y	Y	O	O	O	O
Black Start	Y	Y	Y	Y	Y	Y	O	Y	O	O	Y	Y	O
Developing Emergency (e.g. GS(M)R monitor)	Y	Y	Y	O	O	O	O	O	O	O	O		
Y – Required O – Optional													

Contact details for the above organisations are included in Annex 1

Paper Markets and Physical Markets



NBP Physical Trades as % of Total NBP Trades = **9.5%**

NBP Deliveries as % of Total Deliveries = **55.8%**

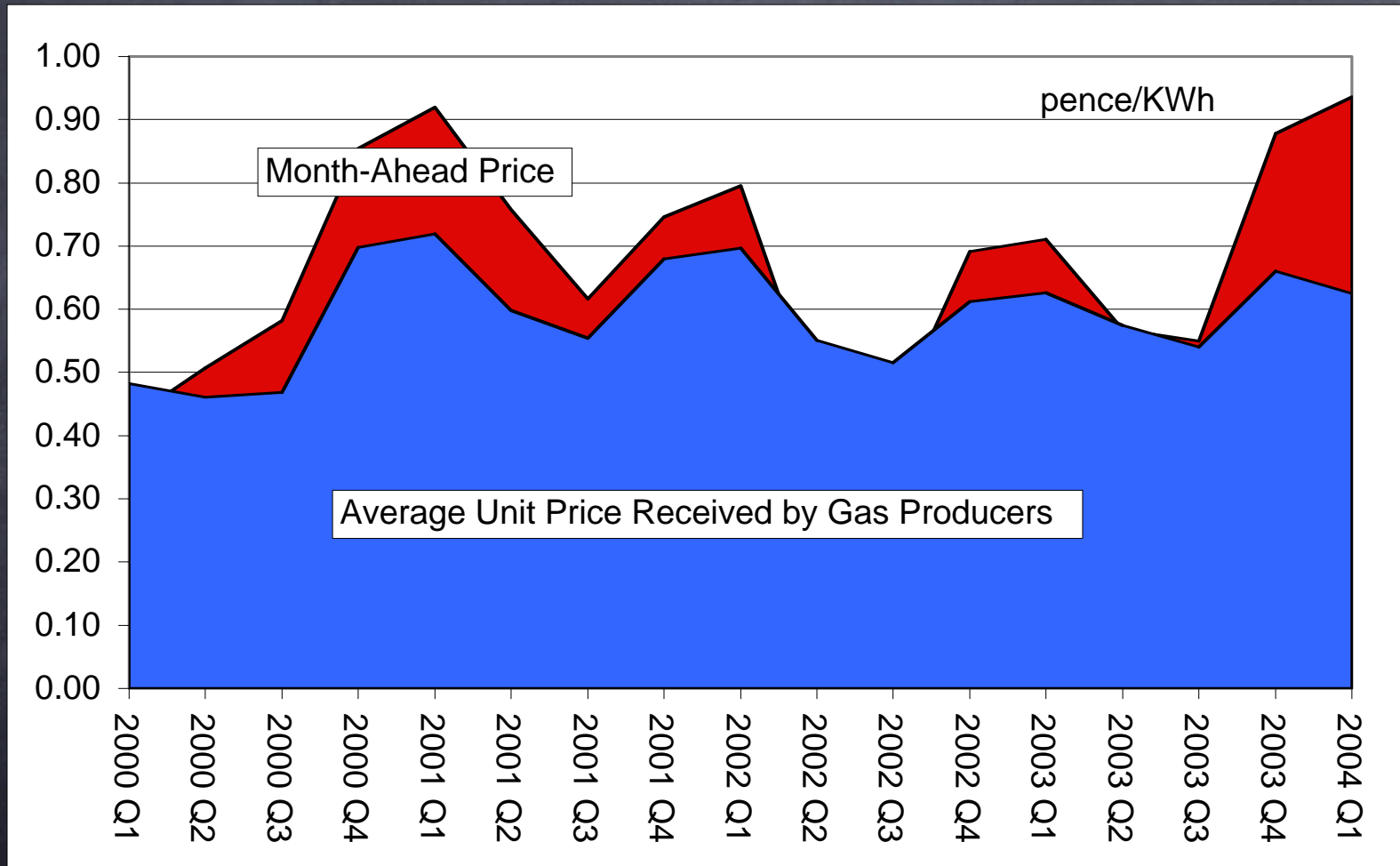
OCM as % of Throughput = **9.8%**

OCM as % of Total (NBP+OCM) Within-Day Trades = **9.8%**

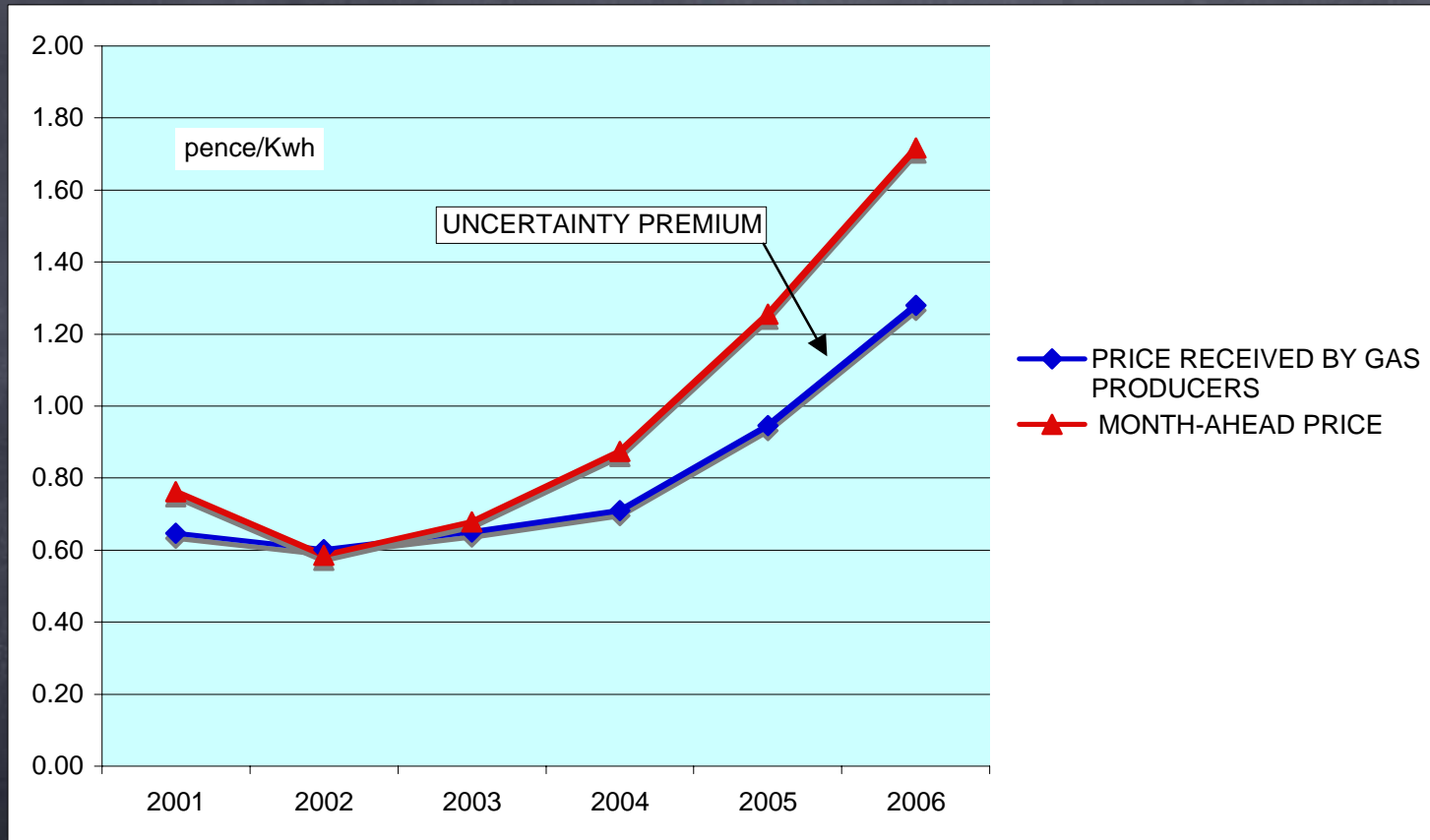
IPE as % of Throughput = **54.5%**

Centrica (British Gas Trading) as % of Throughput = **24.2%**

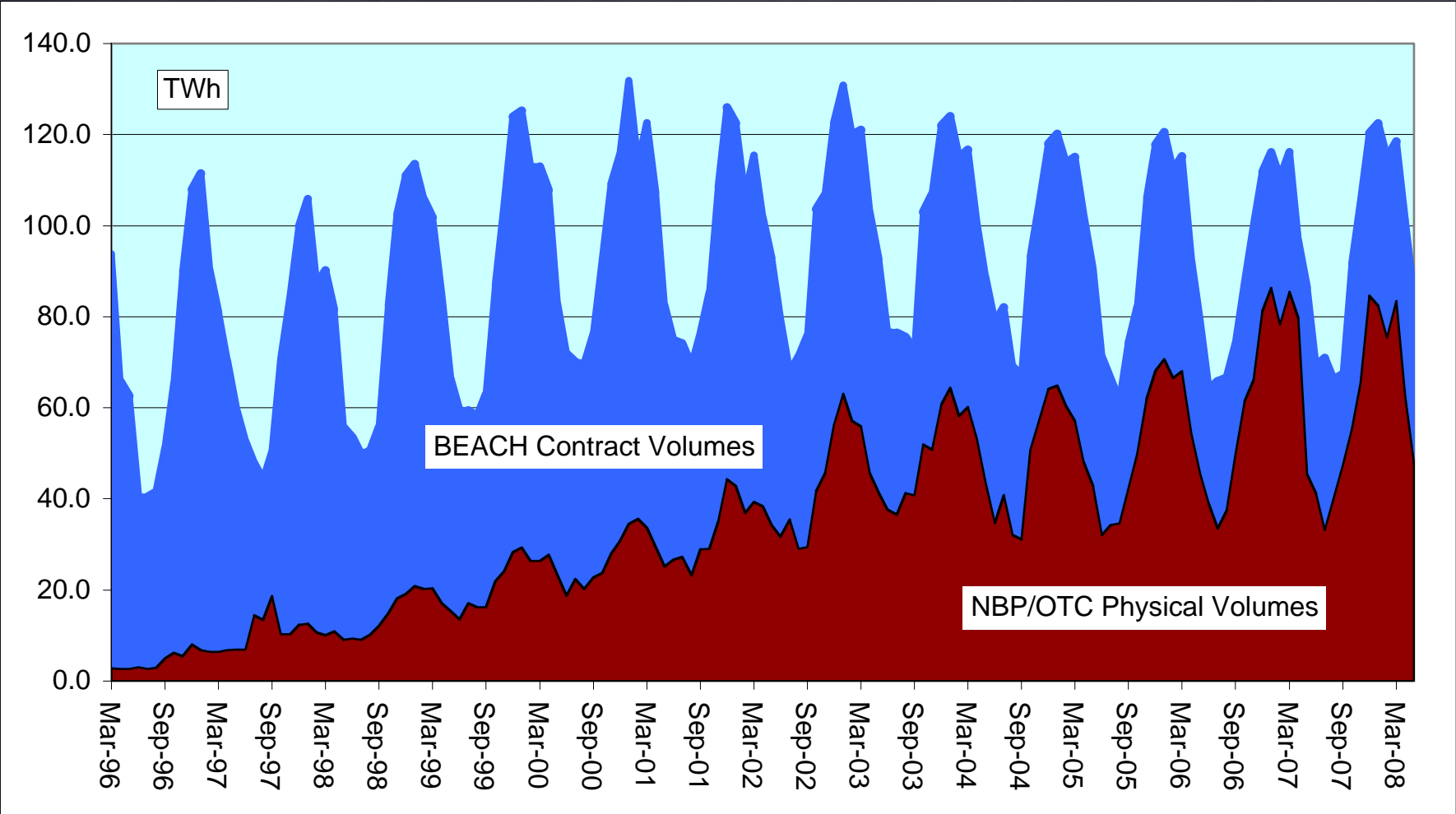
Liberalisation and Physical Supply Shocks: the Cost of Uncertainty and the Producer Price (1)



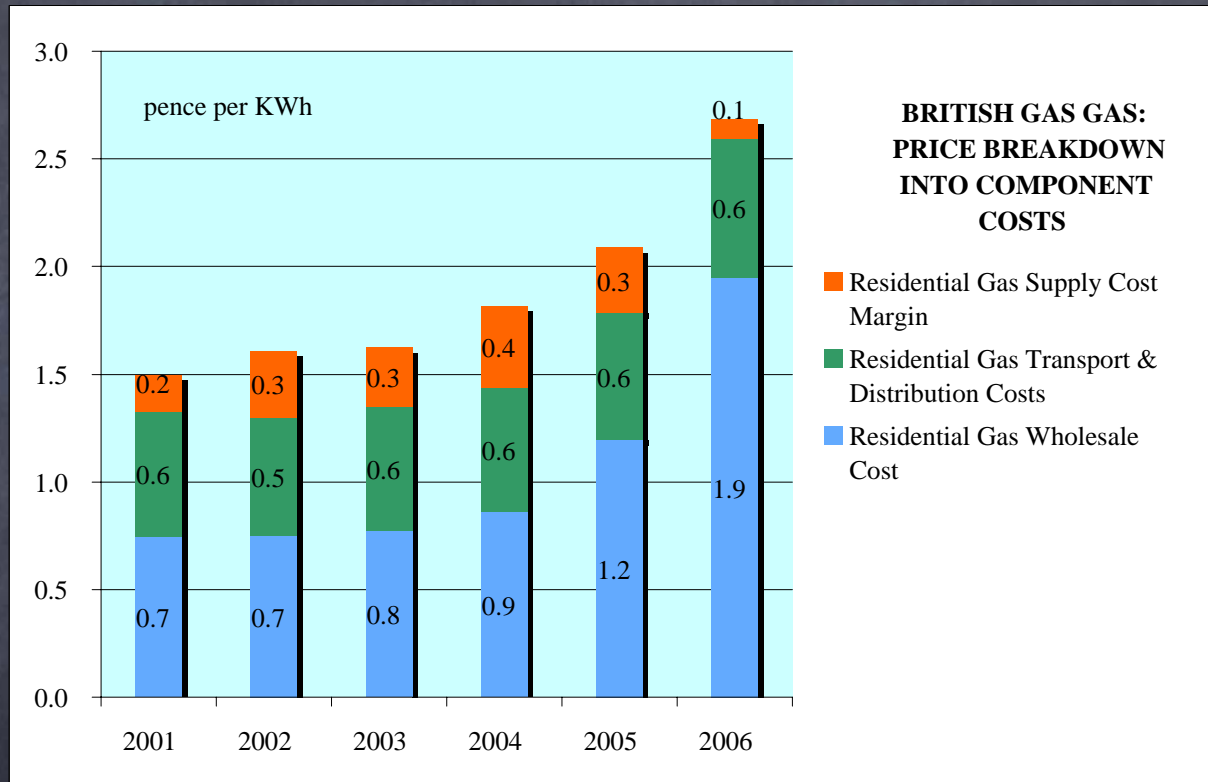
Liberalisation and Physical Supply Shocks: the Cost of Uncertainty and the Producer Price (2)



Gas Indexed Pricing Transmits Price Shocks into Long-Term Contracts



Price and its Component Costs: Not Just Multiple Markets; Also Multiple Costs



Managing Risk: Using Vertical Integration to Foreclose Competition

Company	Upstream		Mid-Stream				Downstream	
	Gas Production	Electricity Generation	Wholesale Trading	Transmission	Distribution	Gas Storage	Non-Domestic Supply	Domestic Supply
Centrica (British Gas)	g	e	g e			g	g e	g e
SSE		e	g e	e	g	g	g e	g e
Iberdrola (Scottish Power)		e	g e	e	e	g (minor)	g e	g e
E.ON UK	g (minor)	e	g e		e	g (minor)	g e	g e
RWE npower		e	g e				g e	g e
EDF Energy		e	g e		e	g (minor)	g e	g e

Vertical Integration in Action (1): Centrica plc

CENTRICA'S PROFITS FROM ITS UK ENERGY BUSINESSES (Operating Profit before Exceptional Items and Remeasurements)								
Financial Years ending December £million	British Gas Residential Gas & Electricity	British Gas Home Services	British Gas Business	Wholesaling & Trading	Gas Production	Gas Storage	TOTAL UK ENERGY Operating Profit £million	% Increase in Operating Profit
2001	-46	na	44	573		na	571	
2002	218	61	65	72	447	1	864	51.3
2003	136	84	51	81	480	40	872	0.9
2004	249	95	64	-61	573	69	989	13.4
2005	90	111	77	-117	1,020	154	1,335	35.0
2006	95	102	87	-178	864	228	1,198	-10.3
2007	571	151	120	234	429	240	1,745	45.7
TOTAL PROFIT 2001-2007	1,313	604	508	4,417		732	7,574	

Vertical Integration in Action (2): the Value of Electricity Generation

Ratio of Own
Generation
to Domestic
and SME
Supply
Volumes

	2003	2004	2005	2006	2007
Centrica	0.34	0.46	0.47	0.61	0.86
EDF Energy	na	na	na	1.28	na
E.ON UK	na	1.2	1.31	1.32	1.32e
Scottish Power	na	na	na	0.9	na
RWE npower	1.51	1.44	1.5	1.64	1.52
SSE	na	na	na	1.77	na

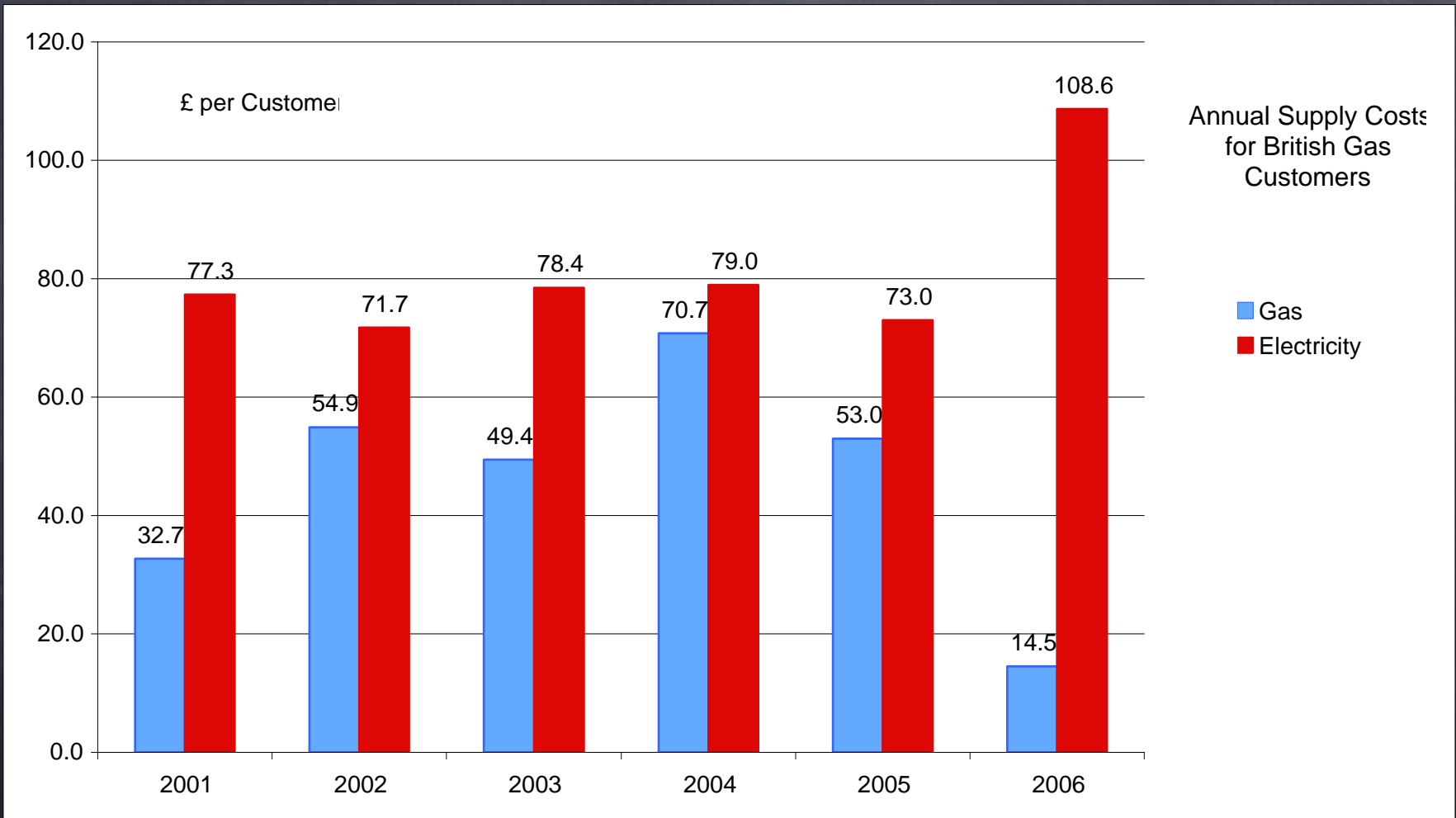
Vertical Integration in Action (2): the Value of Electricity Generation

Generation Segment		Supply Segment	
Electricity Generation Sales to Supply Business	24,544,320 MWh	Electricity Supply Sales to Domestic Customers	24,544,320 MWh
	Millions		Millions
Revenues	£928.6	Revenues @75.36/MWh	£1,849.7
Fuel Cost	£539.5	Wholesale Costs	£928.6
Other Costs	£180.9	Transportation Cost	£493.0
Operating Profit	£208.2	Supply Cost + profit	£428.1
Margin %	22.4	Supply Cost	£400.4
		Total Costs	£1,822.0
		Operating Profit	£27.7
		Margin % =	1.5

Generation Segment		Supply Segment	
Electricity Sales	24,544,320 MWh	Electricity Sales	24,544,320 MWh
	Millions		Millions
Revenues	£1,207.2	Revenues	£2,071.7
Fuel Cost	£701.4	Wholesale Costs	£1,207.2
Other Costs	£180.9	Transportation Cost	£493.0
Operating Profit	£324.9	Supply Cost + profit	£371.5
Margin %	26.9	Supply Cost	£400.4
		Total Costs	£2,100.5
		Operating Loss	-£28.9
		Margin % =	-1.4

Relationship between Own Generation and Supply

Use of Price Discrimination via Horizontal Integration

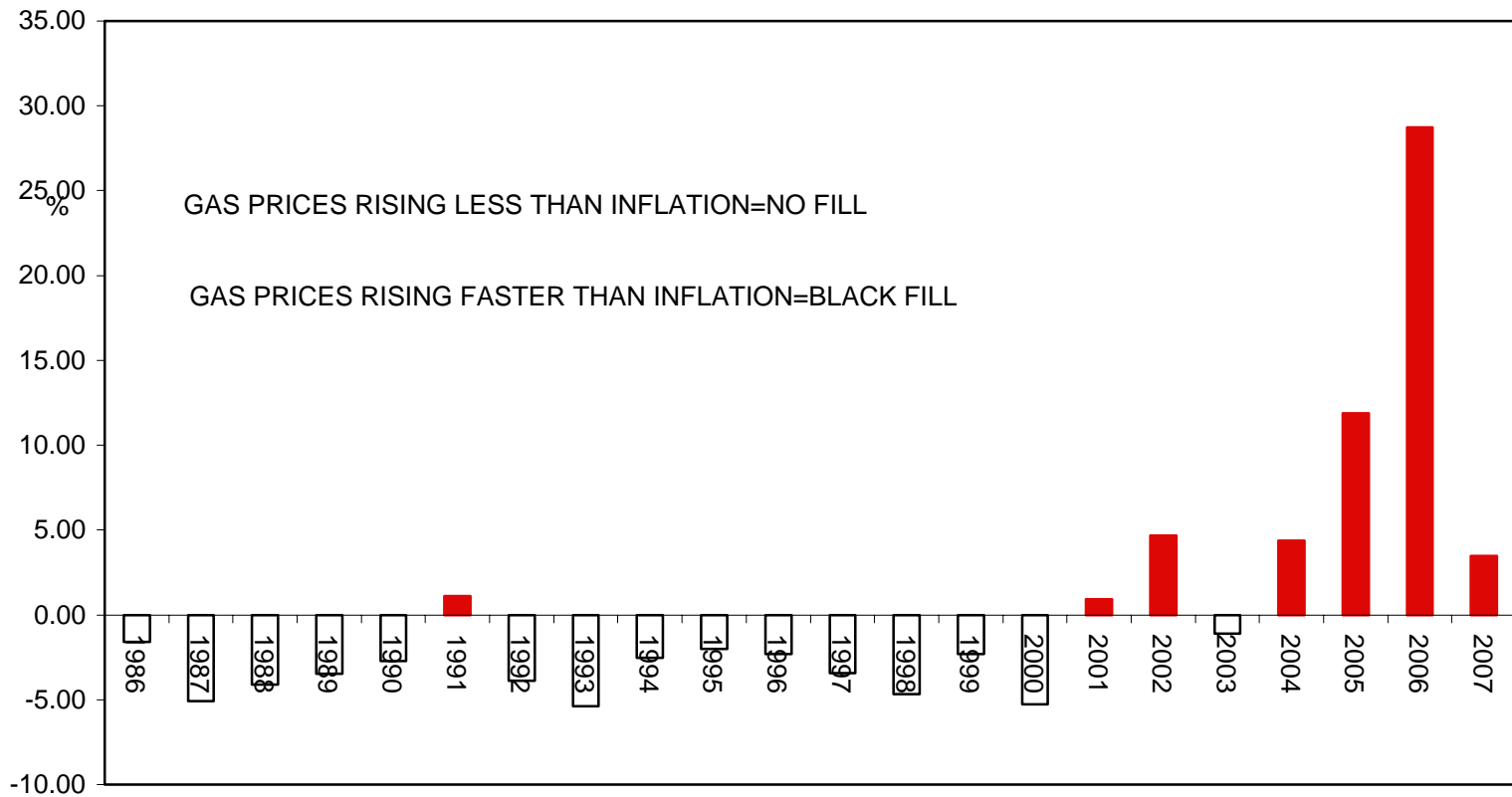


Certainty of Company Profits from UK Energy Businesses

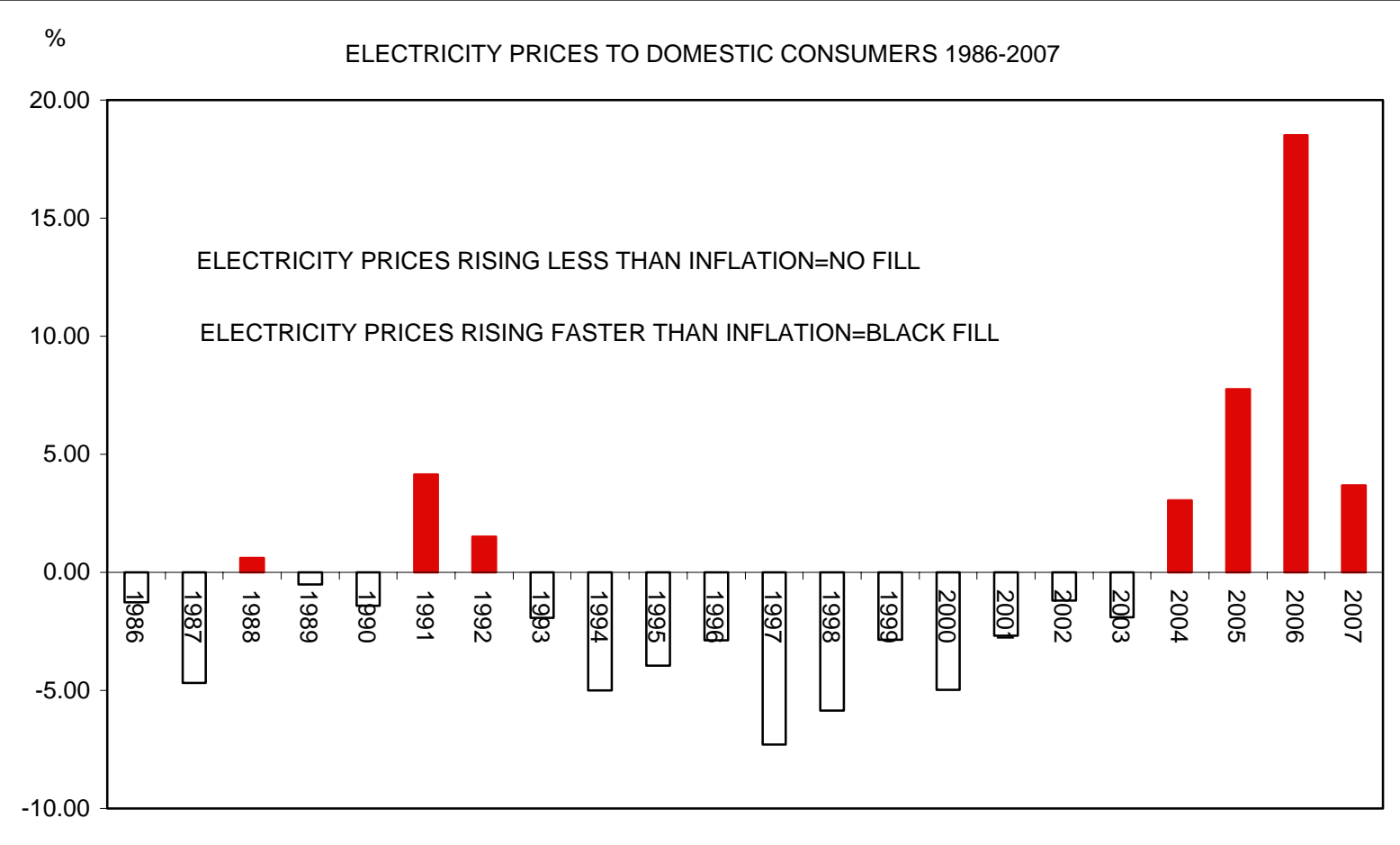
<u>£ million</u>	2003	2004	2005	2006	2007
Centrica plc	872	989	1,335	1,198	1,745
EDF Energy plc	517	521	587	647	na
E.ON UK plc	583	642	741	710	778
RWE npower	496	411	299	348	496
Iberdrola (Scottish Power)	495	597	739	955	na
SSE plc	680	790	887	1,081	na
Total Operating Profits	3,643	3,950	4,589	4,939	na
<i>of which Non-Regulated Profits</i>	2,360	2,709	3,061	3,420	na

Behaviour of Retail Prices: Domestic Gas

GAS PRICES TO DOMESTIC CONSUMERS 1986 - 2007



Behaviour of Retail Prices: Domestic Electricity



Switching as Consumer Defence?

Centrica's Residential Gas Prices and Gas Sales Volumes

	2001	2002	2003	2004	2005	2006	2007
Revenue from UK residential gas sales £m	4,029	3,805	3,742	4,170	4,196	4,832	4,296
UK residential gas sales TWh	260.6	228.4	226.6	219.7	194.8	179.3	159.4
UK residential gas customers (000s)	13,451	12,839	12,590	11,771	11,131	10,263	10,018
Weighted average UK residential gas price p/therm	43.80	47.12	47.57	53.16	61.16	78.66	79.26
Annual change in UK residential gas revenue %		-5.6	-1.7	11.4	0.6	15.2	-11.1
Annual change in UK residential gas sales (TWh) %		-12.3	-0.8	-3.0	-11.4	-7.9	-11.1
Change in number of UK residential gas customers (000s)		-612.0	-249.0	-819.0	-640.0	-868.0	-245.0
Annual change in UK residential gas customers %		-4.5	-1.9	-6.5	-5.4	-7.8	-2.4
Annual change in UK residential gas price %		7.6	1.0	11.8	15.0	28.6	0.8
Price Elasticity of UK Residential Gas		1.63	0.85	0.26	0.76	0.28	14.56

Switching as Consumer Defence?

Centrica's Residential Profits and Customer Numbers

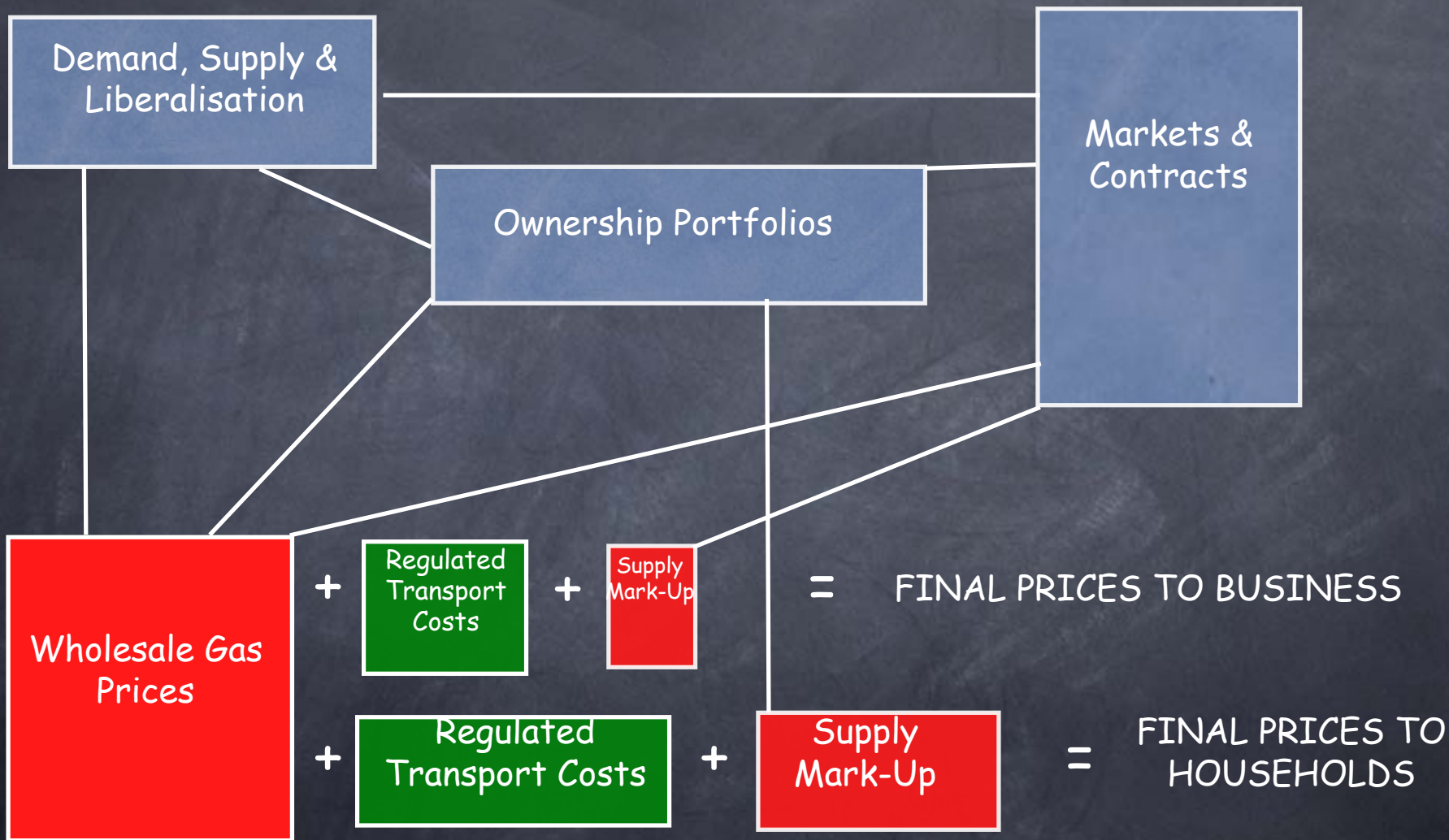
	2001	2002	2003	2004	2005	2006	2007
UK residential gas customers (000s)	13,451	12,839	12,590	11,771	11,131	10,263	10,018
UK residential electricity customers (000s)	5,374	5,795	6,189	5,950	5,920	5,759	6,019
Total UK residential customers	18,825	18,634	18,779	17,721	17,051	16,022	16,037
Annual change in total UK residential customers (000s)		-191	145	-1,058	-670	-1,029	15
Annual % change in total UK residential customers		-1.0	0.8	-5.6	-3.8	-6.0	0.1
UK residential energy operating profit £m	19.0	218	136	249	90	95.0	571.0
Annual % change in UK residential operating profit		1,047.4	-37.6	83.1	-63.9	5.6	501.1

Switching as Consumer Defence?

E.ON's Residential Prices and Customer Numbers

	2003	2004	2005	2006
UK residential gas sales TWh	51.2	51.5	54.1	52.4
UK residential electricity sales TWh	30.0	29.2	28.4	26.5
UK residential gas customers (000s)	2,527	2,673	2,656	2,649
UK residential electricity customers (000s)	5,397	5,380	5,148	4,956
Annual % change in UK residential gas sales (TWh)		0.6	5.0	-3.1
Annual % change in UK residential electricity sales (TWh)		-2.7	-2.7	-6.7
Annual % change in UK gas customers		5.8	-0.6	-0.3
Annual % change in UK electricity customers		-0.3	-4.3	-3.7
Annual % change in UK residential gas price		18.5	11.9	47.0
Annual % change in UK residential electricity price		16.4	7.2	30.0
Price elasticity of UK residential demand (gas)		-0.03	-0.42	0.07
Price elasticity of UK residential demand (electricity)		0.16	0.38	0.22

Developing a Conceptual Framework



Summary

Multiple markets: both vertical (different cost components of price) and horizontal (different time horizons; gas + electricity)

These markets are vulnerable to supply side shocks: impact depends on timing, response configurations, degree of slack in the market, contractual configurations (degree of contractual exposure to short term markets)

Positively correlated with the degree of vulnerability, liberalisation delivers dramatically increasing transaction costs which outweigh any initial benefits of liberalisation

Company strategy response controls market at the expense of the consumer, such that they require regulatory protection

To
Discover
And
Understand.

