

National Grid

NETA Early Operating Experiences

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NETA EARLY OPERATING EXPERIENCE

- ◆ NETA CHALLENGES FOR FREQUENCY CONTROL
- ◆ WEDNESDAY 25th APRIL - AN EVENING WITH NGC
- ◆ MANIFEST ERROR UPDATE



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NEW CHALLENGES FOR FREQUENCY CONTROL

SELF DESPATCH

- ◆ **Synch/Desync times no longer centrally managed**
- ◆ **Many more generators ramping up/down to meet desired physical positions**
- ◆ **Managing Frequency Response while generators are ramping in both directions is more difficult**
- ◆ **Can affect demand pick ups & potentially lead to high / low frequency oscillations**
- ◆ **Avoidance of high price options - potentially leads to coarser frequency control**



NEW CHALLENGES FOR FREQUENCY CONTROL

Balancing Mechanism Characteristics

- ◆ Ongoing requirement to ensure sufficient generation will be available exactly at the time it is required to meet the demand
- ◆ Constant requirement to be looking forward
- ◆ Physical and Dynamic Characteristics of BMUs need to be taken into consideration
- ◆ Cannot rely on Bid Offer Acceptances in short timescales alone
- ◆ Control Room designed to ensure delivery of stable & secure transmission system

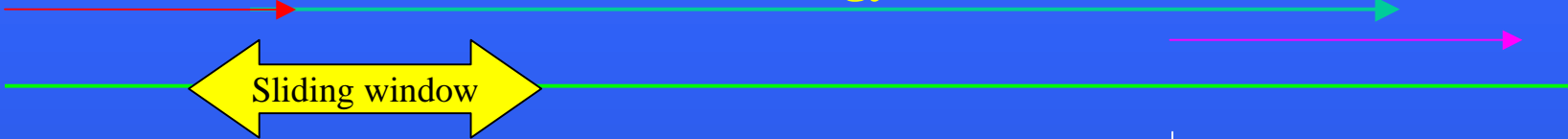


NETA Structure

Day Ahead Analysis

Strategy

Real Time Balancing



Operational Strategy Manager (OSM)

National Balancing Engineer NBE

Energy Strategy Engineer (ESE)

Energy Optimisation Engineer (EOE)

Operational Energy Manager (OEM)

Zonal Balancing Engineers

Transmission Strategy Engineer (TSE)

Transmission Optimisation Engineer (TOE)

t-42hrs

t-18hrs

t-5hrs

Gate Closure

t=0



National Grid

NEW CHALLENGES FOR FREQUENCY CONTROL

How NGC Assesses and Accepts BOAs

- ◆ Strategy Team assess demand profiles and estimates, expected generation output and other factors
- ◆ Despatch tools support Bid / Offer Volume purchase decisions
- ◆ Strategy assumes accurate PN / BOA following and follows rules set out in Grid Code / Balancing Principles Statement
- ◆ Zonal Balancing Engineers issue BOAs to meet half hour targets
- ◆ National Balancing Engineer is responsible for managing the frequency second by second



BID / OFFER ACCEPTANCE TIMESCALES

- ◆ Bids and Offers can be taken at any time within the Balancing Mechanism Window
- ◆ Advantages of long term BOAs
 - Reduces number of actions required in short timescales
 - Ensures sufficient availability of Bids and Offers given plant dynamics
- ◆ Disadvantages of long term BOAs
 - May be a more cost optimal solution as uncertainty reduces closer to real time
 - Risk of “Unwinding”: an incident may mean the BOA must now be bought out, potentially at high cost



BID / OFFER ACCEPTANCE TIMESCALES

- ◆ Assessment of PNs and forecast demand from day ahead through to real time
- ◆ Strategy team will take early BM action to ensure market remains within a reasonable window short or long
- ◆ Strategy Team assess benefits of early BOA action within this window



Degree to which BOAs are purchased in advance of real time will depend upon

- ◆ Shape of the demand curve (including TV pickup etc)
- ◆ The cost differential between BM Bid and Offer prices over the whole BM window
- ◆ System Conditions (e.g poor weather)
- ◆ Plant Dynamics of BMUs
- ◆ Likelihood of unplanned loss of generation/demand
- ◆ Risk and cost of unwinding Bid/Offer Acceptances
- ◆ Demand forecast errors
- ◆ Inter and Intra half hour pricing effects
- ◆ Balancing Services options
- ◆ System Contingencies



Short Term BOAs

- ◆ Required to control the frequency
- ◆ Usually due to unexpected changes in demand or generation



Short Term BOAs

◆ Demand Changes

- Unexpected TV pickup or change in TV programme start/end times
- Change in weather
- National event eg Concorde crash



Short Term BOAs

◆ Generation Changes

- plant problems (MEL changes)
- poor PN or BOA following
- Different data at station, EMC and NGC



Short Term BOAs

- ◆ These short term changes will affect frequency
- ◆ NGC need to take corrective action
- ◆ This is done by units capable of fast delivery
 - on steam / demand, smaller volumes per BMU
 - on hydro, larger volumes
 - use the cheapest combination to meet conditions



Short Term BOAs

- ◆ ***NGC issue BOAs to enable the lowest cost solution given the latest expectation of times and volumes required, and the ability of the BMU to provide the service in the time left to delivery.***



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Typical Evening “Drop Off”

- ◆ Drop off of demand as business and industry close for the day
- ◆ Reduction in demand from tea time loading
- ◆ TV pickups
- ◆ Dives away before 1A overnight demand pickup



Example of NGC Actions

Wednesday April 25th 2001

- ◆ Typical example of an evening in the control room
- ◆ No special events or TV programmes expected
- ◆ Balancing Mechanism reflective of many days thus far
- ◆ No major losses of BMUs during the period



Wednesday 25th April 2001

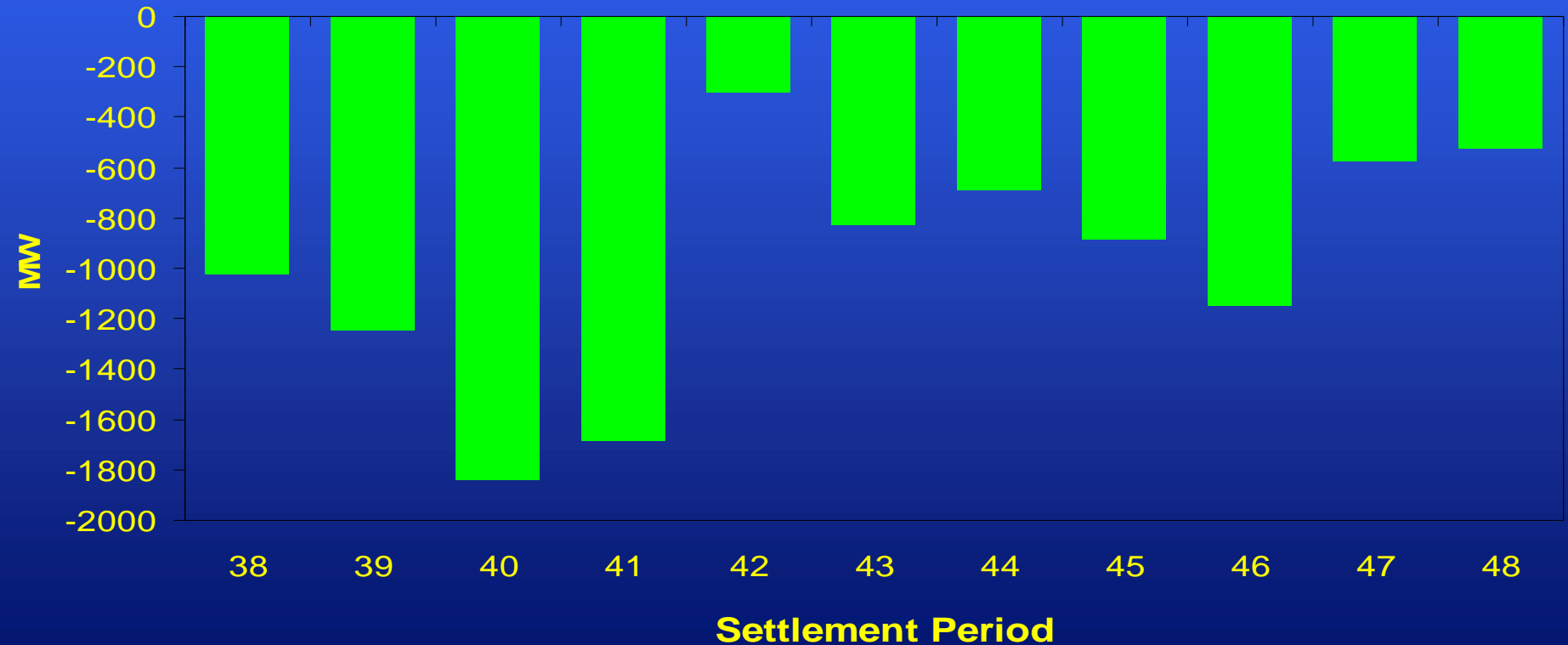
At 1730

- ◆ Gate Closure for 2100
- ◆ Assessment of all Bids / Offers to 2100
- ◆ Strategy Action and Analysis for Evening Drop off
 - Are there sufficient options (up and down) for the drop off
 - Are there TV pickups that require fast acting plant to be ordered
 - Is there sufficient downward regulation in the trough before 1A?
- ◆ Balancing action for Tea time peak and beginning of Evening Drop off



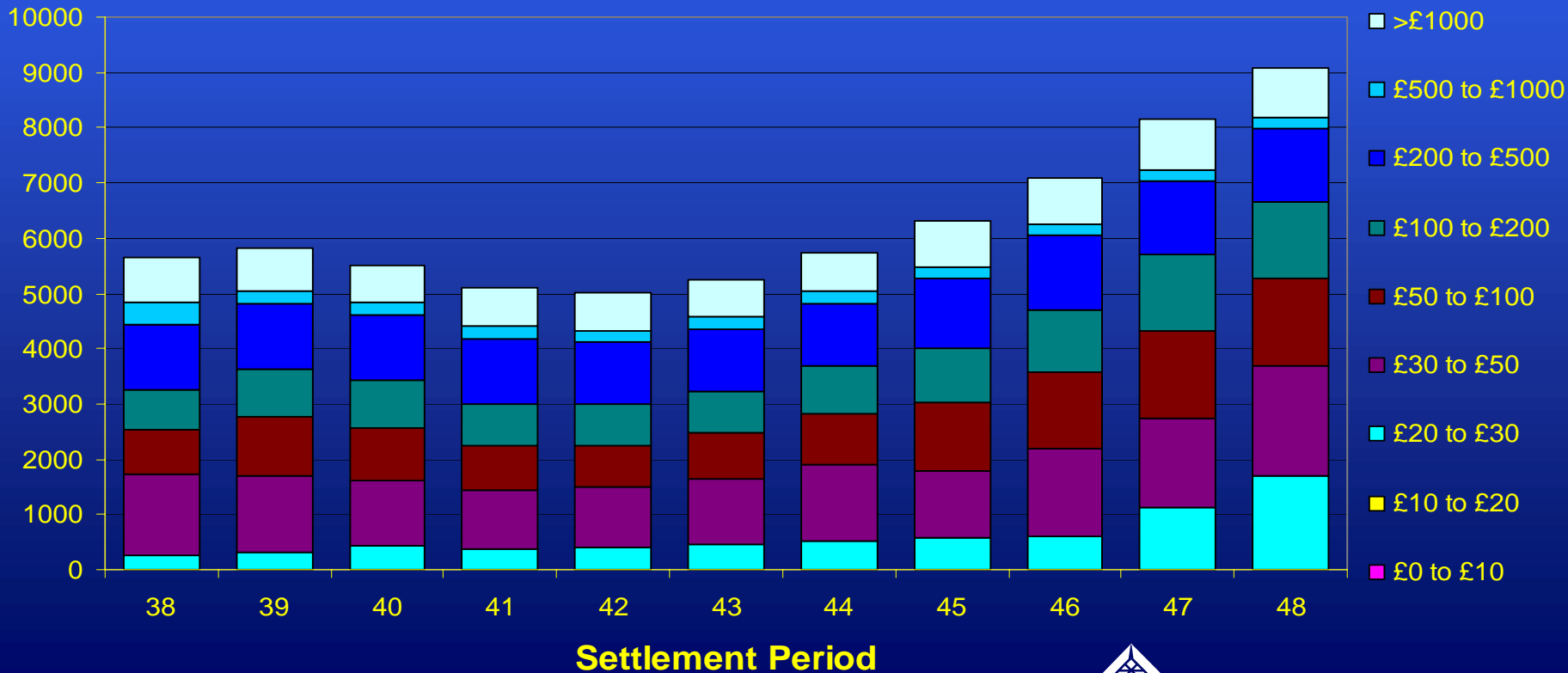
Wednesday 25th April 2001

Gate Closure Imbalance Volume



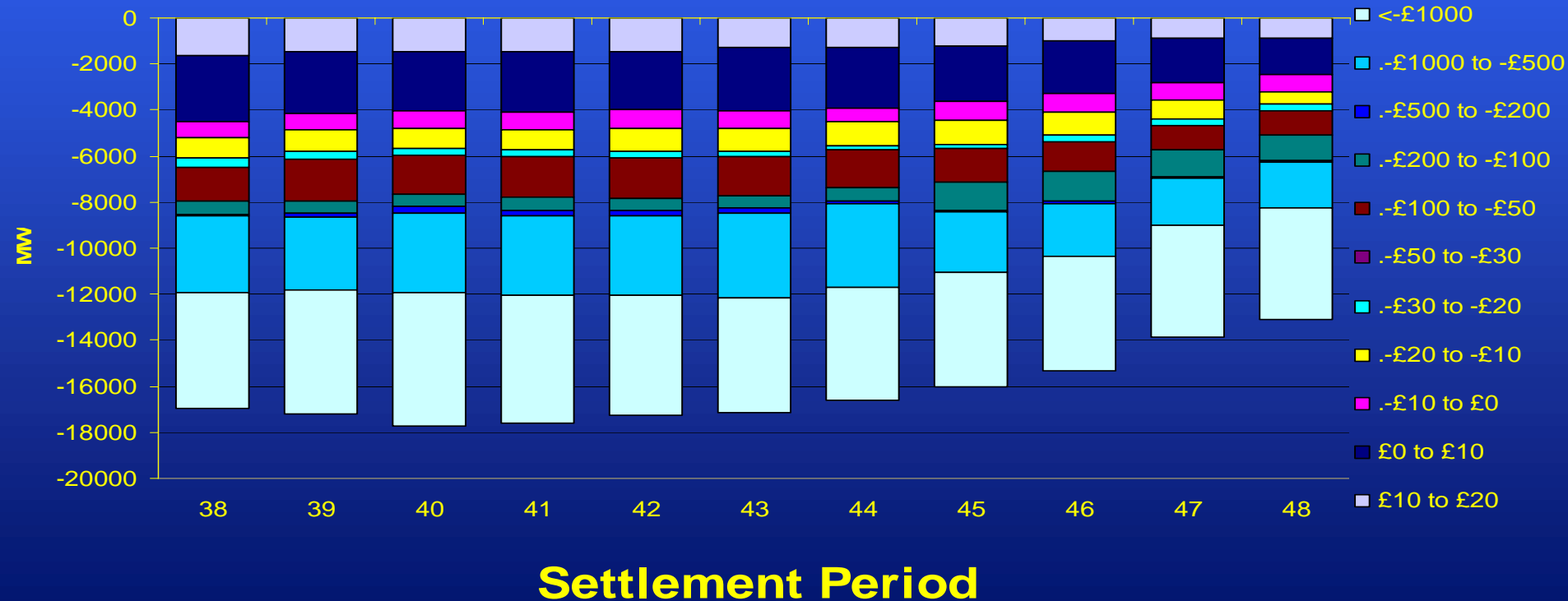
Wednesday 25th April 2001

Half Hourly Offer Volume By Price Stack



Wednesday 25th April 2001

Half Hourly Bid Volume By Price Stack



Wednesday 25th April 2001

- ◆ Strategy handover
- ◆ Overview of 2000 - 2030
- ◆ Plan the 2030 TV pickup
- ◆ Look in detail at 2030 - 2100



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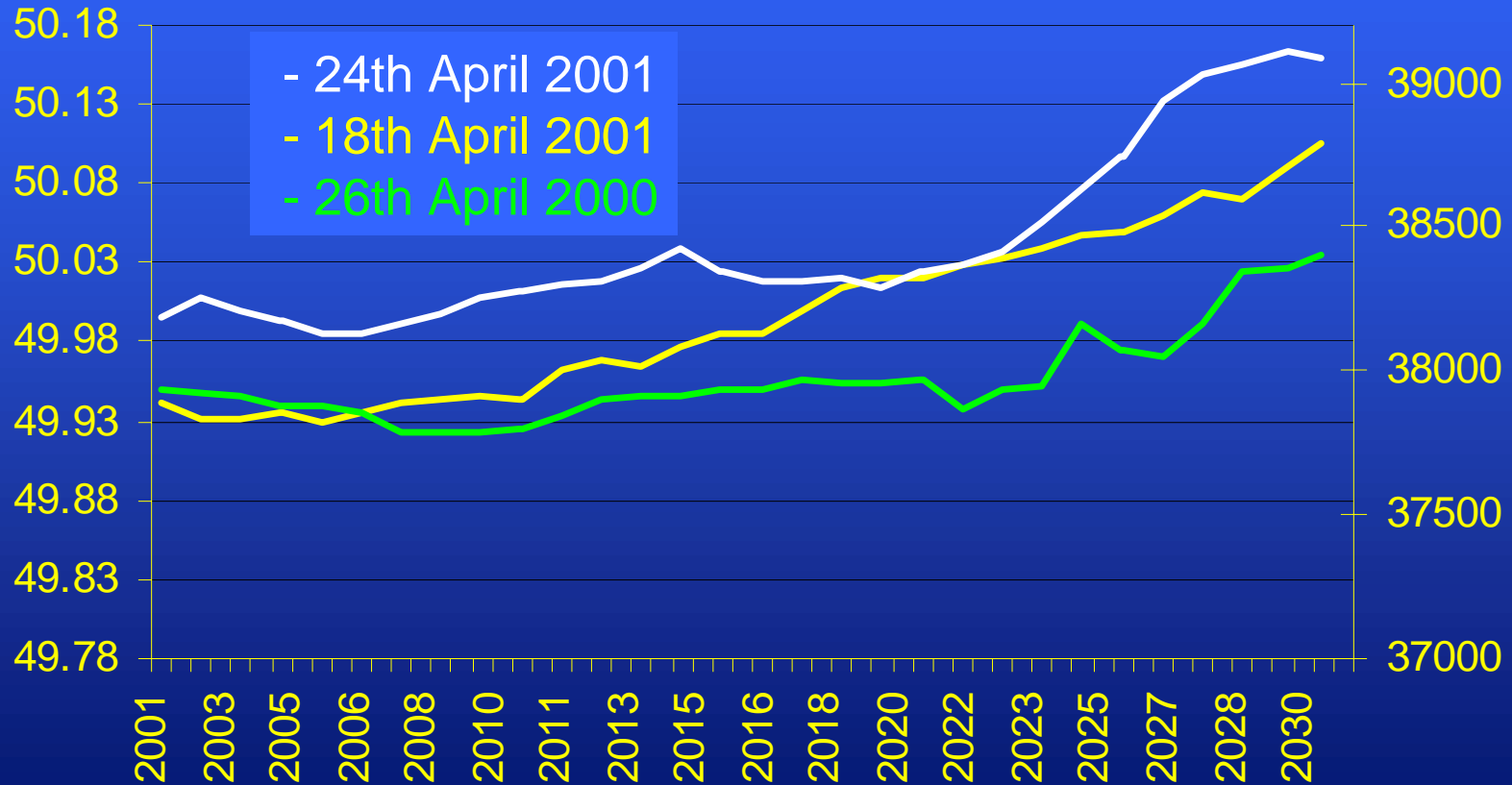


Handover From Strategy Team

- ◆ Sufficient positive and negative margin
- ◆ Sync/desync times examined
- ◆ Demand profile and estimates
- ◆ Options for further syncs/desyncs
- ◆ Options for TV pickups



Intra Half Hour Demand Profile



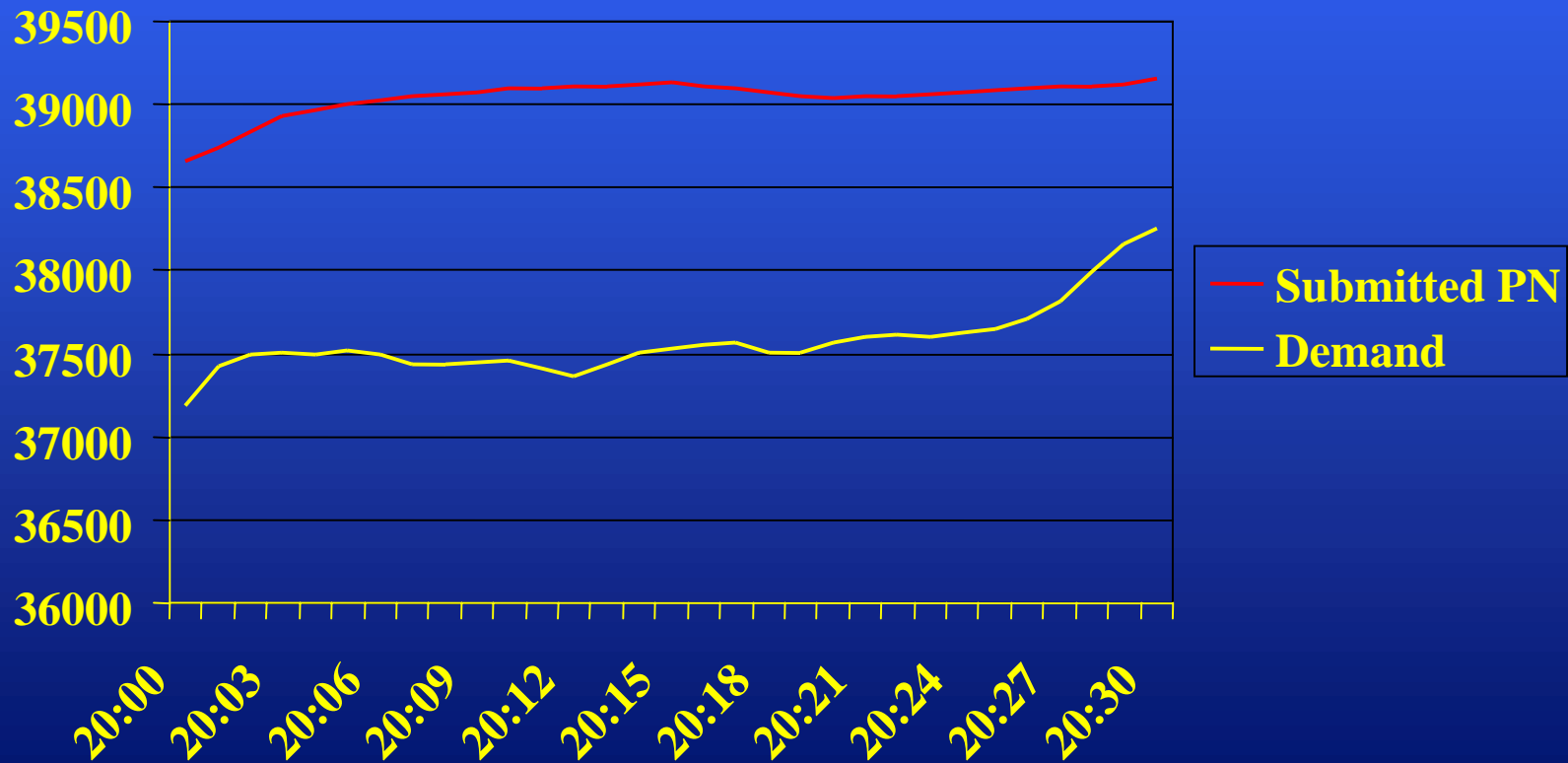
Time	TV Station	Estimated TV Pickup	Lighting Up	Total	TV Programmes
19:15	ITV	150	0	150	Emmerdale CB
19:28 / 19:30	ITV / BBC1	450	0	450	Emmerdale END / Tomorrow's World END
19:45	ITV	200	0	200	CoronationStreet CB
19:58/20:00	ITV / BBC1	900	0	900	Coronation Street END/Mean Streets END
20:15	ITV	200	150	350	Airline CB
20.27/20:30	ITV / BBC1	450	250	700	Airline END/Animal Hospital END
20:45	ITV	200	50	250	Kavanagh QC CB
21:05	BBC1	150	0	150	This is your life END
21:10	ITV	200	0	200	Kavanagh QC CB
21:30	ITV	200	0	200	Kavanagh QC CB
21:50	ITV	200	0	200	Kavanagh QC CB
22:00	BBC1	150	0	150	Crimewatch UK END
22:10	ITV	200	0	200	Kavanagh QC CB
22:28	ITV	350	0	350	Kavanagh QC END

Wednesday 25th April 2001

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PNs vs Demand 2000 - 2030

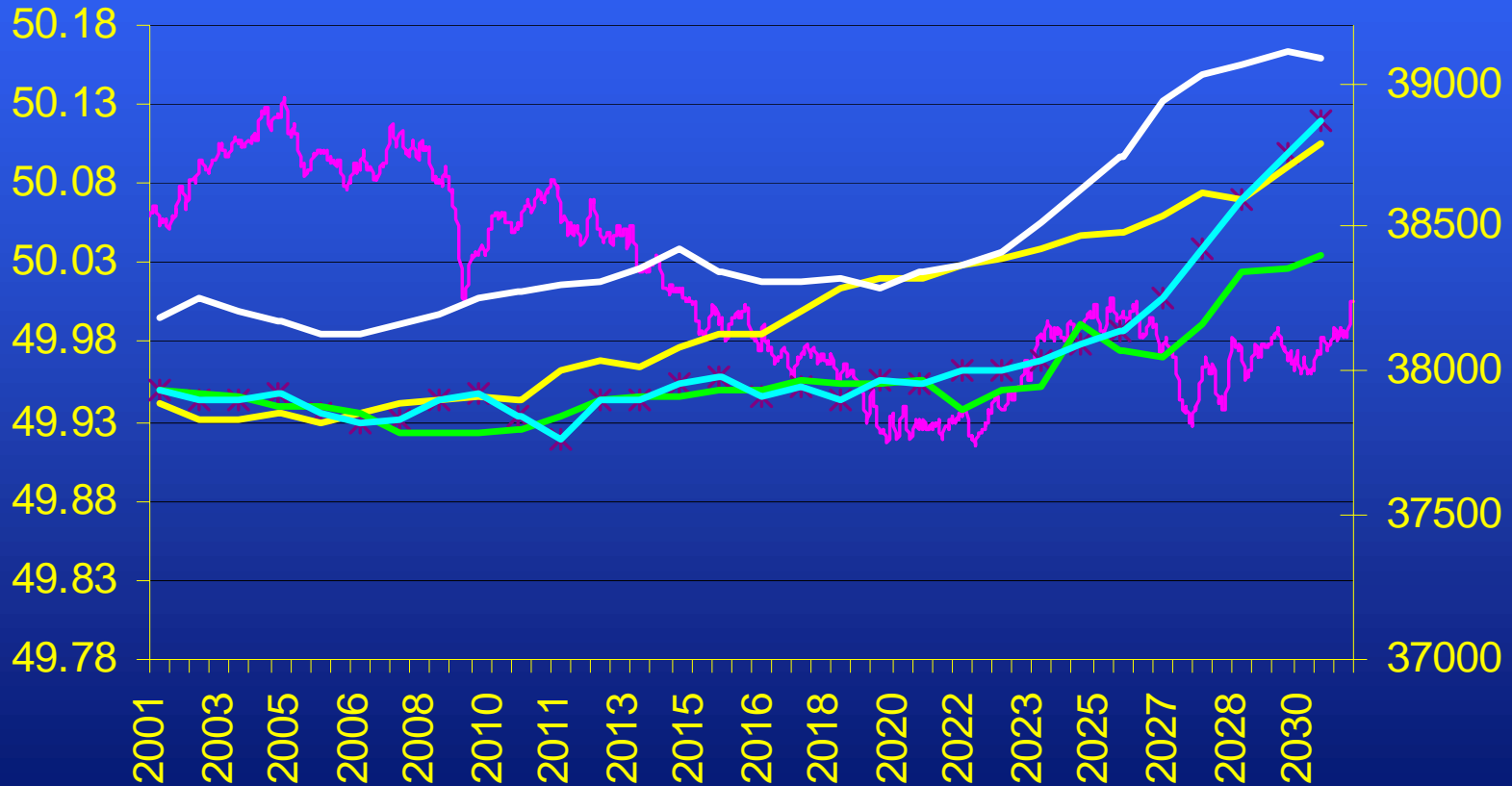


BIDS Taken in advance of 2000

	Unit		Estimated MW	End Time
◆	EGGPS-3	Bid	150	2027
◆	SEAB-1	Bid	280	2022
◆	RUGPS-6	Bid	250	2025
◆	RUGPS-7	Bid	250	2025
◆	SHBA-2	Bid	25	2012
◆	WBUPS-2	Bid	81	2021
◆	EGGPS-1	Bid	100	2013
◆	TESI-1	Bid	11	2011



Wednesday 25th April 2001



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Planning for 2030 TV pickup

- ◆ Forecast 700MW
- ◆ Options
 - All on steam
 - Part steam, part fast acting plant
 - How much? 500 - 900?
- ◆ Fast acting plant???



Fast Acting Plant Parameters

BMU	NDZ	SG Avail	Offer Price
ISG-SSTH1	NTO 1 min	N/A	185
Dino-2	30	N	456
Dino-3	5	Y	5000
Dino-4	5	Y	5000
Dino-5	20	N	145
Dino-6	15	Y	1850
Ffes-1	10	Y	5000
Ffes-2	15	N	99.98
Ffes-3	15	Y	960
Ffes-4	10	Y	5000
Indq-1	13	N/A	175
Tremfd-1	NTO 2 min	N/A	



220

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Decision

- ◆ 700MW steam (mostly end of bids)
- ◆ To cover the rapid increase in demand, programme 150MW Dino-5 and 90MW Ffes-2 for 5 min duration
- ◆ ISGSSTH1 and Tremrfa on short NTO in case pickup bigger than forecast
- ◆ Dino-6 and Ffes-3 on SG in case a BMU trips and to cover non delivery

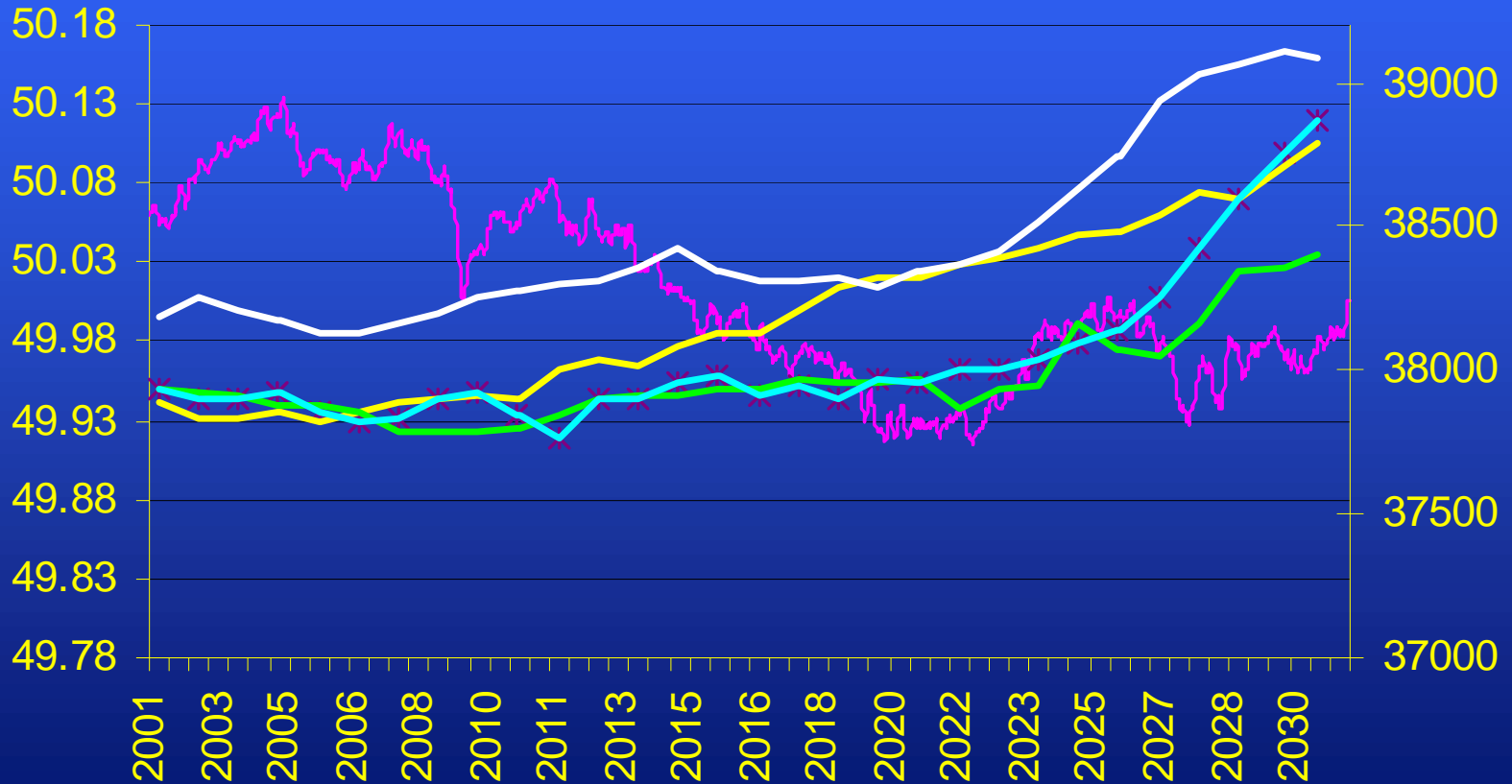


BOAs Taken 2025 - 2035

	TIME ACCEPTED	For	Bid / Offer	Approx MW	Reason	Indicative price (£)	
◆	EGGPS-1	20:22	20:24	Offer	40	20:30 TV Pickup	14
◆	LITTD1	20:26	20:28	Offer	211	20:30 TV Pickup	159
◆	CDCL-1	20:27	20:29	Offer	20	20:30 TV Pickup	37
◆	DINO-5	20:29	20:30	Offer	150	20:30 TV Pickup	145
◆	FERR-4	20:30	20:32	Offer	45	20:30 TV Pickup	23
◆	FFES-2	20:31	20:32	Offer	90	20:30 TV Pickup	99
◆	DINO-5	20:33	20:34	Offer	150	20:30 TV Pickup	145



Wednesday 25th April 2001

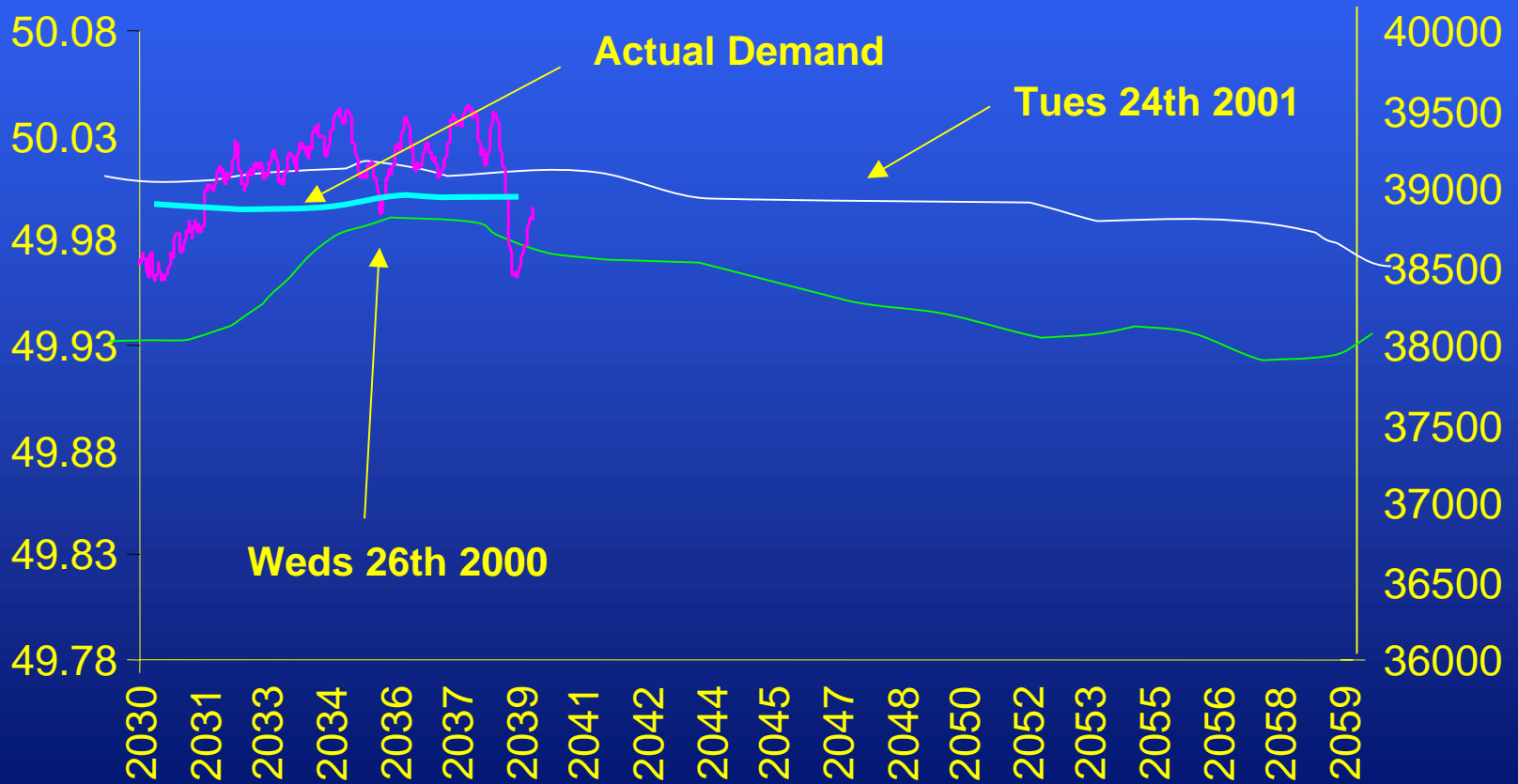


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- ◆ Overview of 2000 - 2030
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2030 to 2100



2030 to 2100



BOAs Taken 2040 - 2046

	TIME ACCEPTED	For	Bid / Offer	Approx MW	Reason	Indicative price (£)	
◆	ISG-SSTH1	20:43	20:46	Offer	150	Frequency Control	184
◆	TESI-1	20:43	20:45	Offer	12	Frequency Control	23
◆	TESI-2	20:43	20:45	Offer	12	Frequency Control	23
◆	FERR-4	20:44	20:46	Offer	40	Frequency Control	23
◆	FFES-3	20:44	20:45	Offer	90	Frequency Control	960
◆	SEAB-1	20:44	20:46	Offer	135	Frequency Control	15
◆	FERR-4	20:45	20:47	Offer	70	Frequency Control	23
◆	FERR-1	20:46	20:48	Offer	54	Frequency Control	26
◆	FIFO-14	20:46	20:48	Offer	10	Frequency Control	20
◆	TESI-1	20:46	20:48	Offer	20	Frequency Control	23
◆	TESI-2	20:46	20:48	Offer	20	Frequency Control	23
◆	COTPS-1	20:47	20:49	Offer	56	Frequency Control	33
◆	BRGG-1	20:48	20:50	Offer	10	Frequency Control	33
◆	CNQPS-1	20:48	20:50	Offer	15	Frequency Control	33



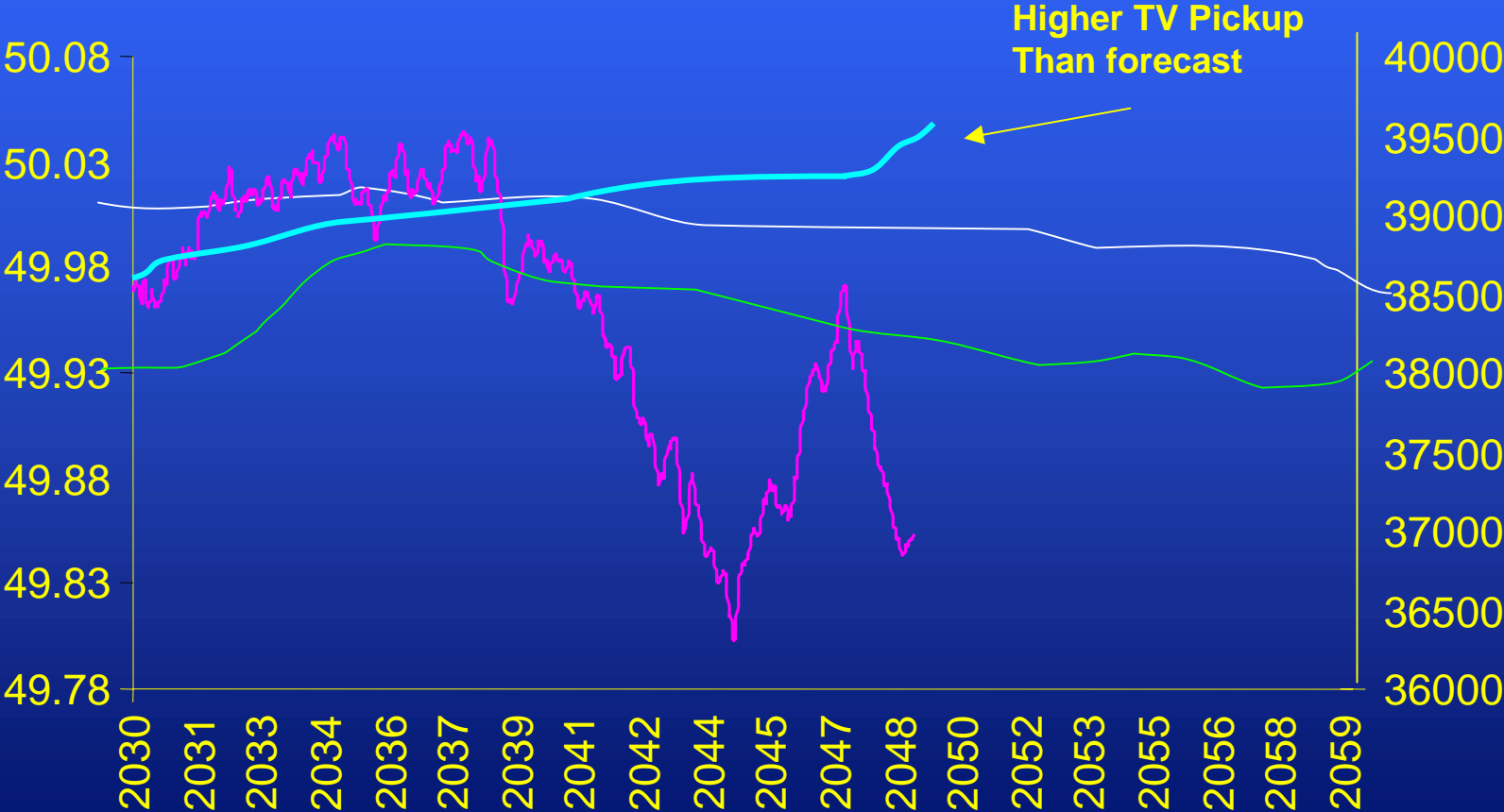
2030 to 2100



2030 to 2100



2030 to 2100



BOAs Taken 2046 - 2100

		TIME ACCEPTED	For	Bid / Offer	Approx MW	Reason	Indicative price (£)
◆	DINO-6	20:48	20:49	Offer	150	Frequency Control	1850
◆	FFES-3	20:48	20:49	Offer	90	Frequency Control	960
◆	DRAXX-2	20:49	20:51	Offer	15	Frequency Control	27
◆	MEDP-1	20:49	20:51	Offer	20	Frequency Control	27
◆	RATS-2	20:50	20:52	Offer	50	Frequency Control	28
◆	RATS-3	20:50	20:52	Offer	20	Frequency Control	30
◆	TESI-1	20:50	20:52	Offer	13	Frequency Control	23
◆	TESI-2	20:50	20:52	Offer	13	Frequency Control	23
◆	AESB-1	20:51	20:52	Offer	10	Frequency Control	30
◆	DAMC-1	20:51	20:53	Offer	20	Frequency Control	30
◆	FFES-3	20:52	20:53	Offer	90	Frequency Control	960
◆	CDCL-1	20:53	20:55	Offer	20	Frequency Control	37



BOAs Taken 2046 - 2100

	TIME ACCEPTED	For	Bid / Offer	Approx MW	Reason	Indicative price (£)	
◆	ISG-SSTH1	20:53	20:56	Offer	150	Frequency Control	184
◆	KILLPG-2	20:53	20:55	Offer	20	Frequency Control	43
◆	FERR-2	20:54	20:56	Offer	42	Frequency Control	
◆	FERR-4	20:54	20:56	Offer	40	Frequency Control	23
◆	DIDC3	20:55	20:57	Offer	15	Frequency Control	
◆	EGGPS-4	20:55	20:57	Offer	17	Frequency Control	
◆	KINO-3	20:55	20:57	Offer	65	Frequency Control	
◆	DRAXX-1	20:56	20:58	Offer	10	Frequency Control	8
◆	DRAXX-3	20:56	20:58	Offer	10	Frequency Control	
◆	DRAXX-5	20:56	20:58	Offer	10	Frequency Control	
◆	MEDP-1	20:56	20:58	Offer	36	Frequency Control	27
◆	FIFO-13	20:57	20:59	Offer	25	Frequency Control	



2030 to 2100

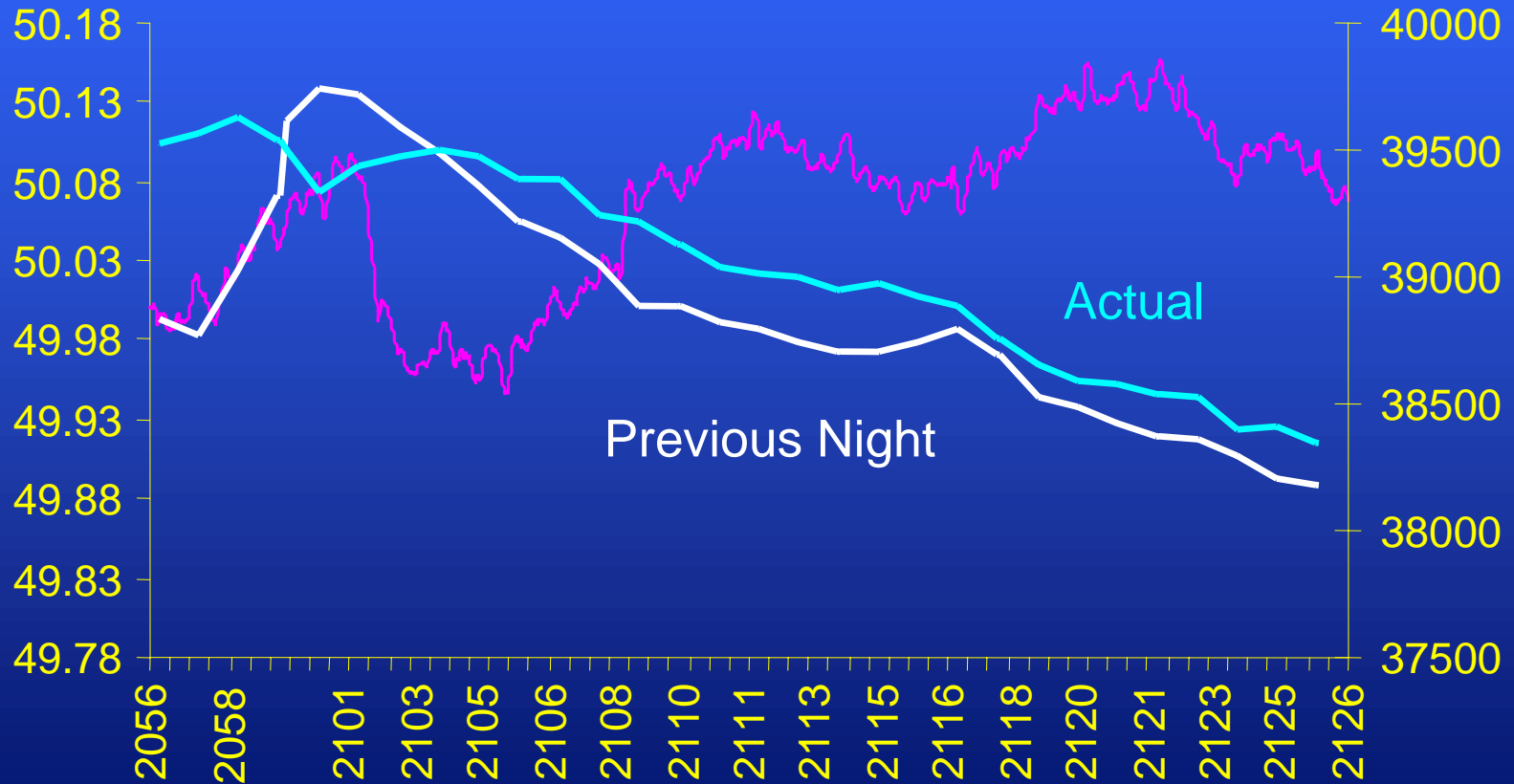


Wednesday 25th April 2001

- ◆ The most expensive offer price was £1850
- ◆ The System Buy Price was £223.64
- ◆ 9 BOAs were used for 2030 TV Pickup
- ◆ Further 38 BOAs used for frequency control within half hour
- ◆ Total Offer Volume: 298MWh



2100 - 2130



Conclusions

- ◆ Very difficult to track events across a half hour, let alone a whole day
- ◆ Important to have supporting data such as frequency and expected demands to a very high resolution
- ◆ Bid / Offer Prices in isolation cannot give the full picture



Conclusions

- ◆ *NGC issue BOAs to enable the lowest cost solution given the latest expectation of times and volumes required, and the ability of the BMU to provide the service in the time left to delivery.*



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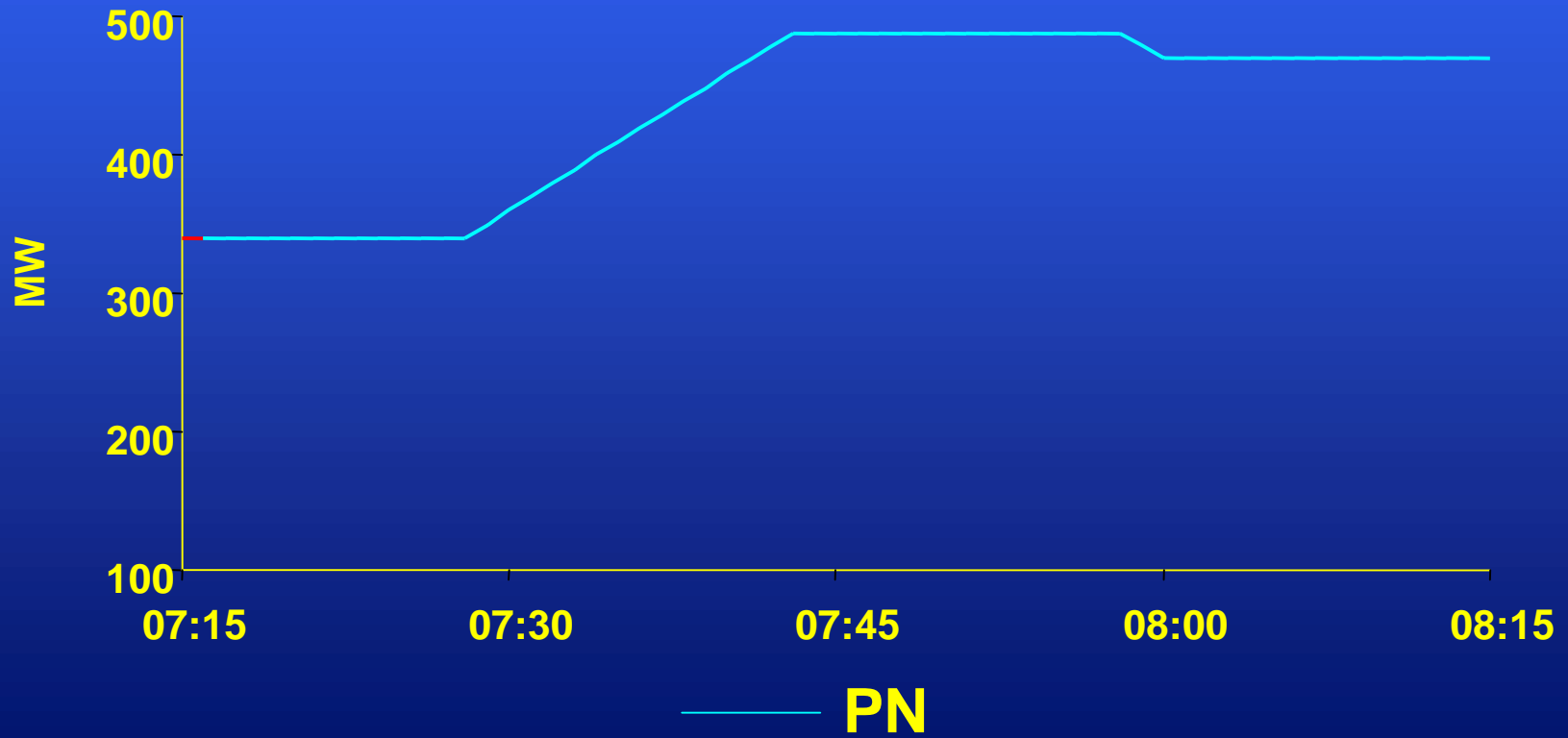


Manifest Error

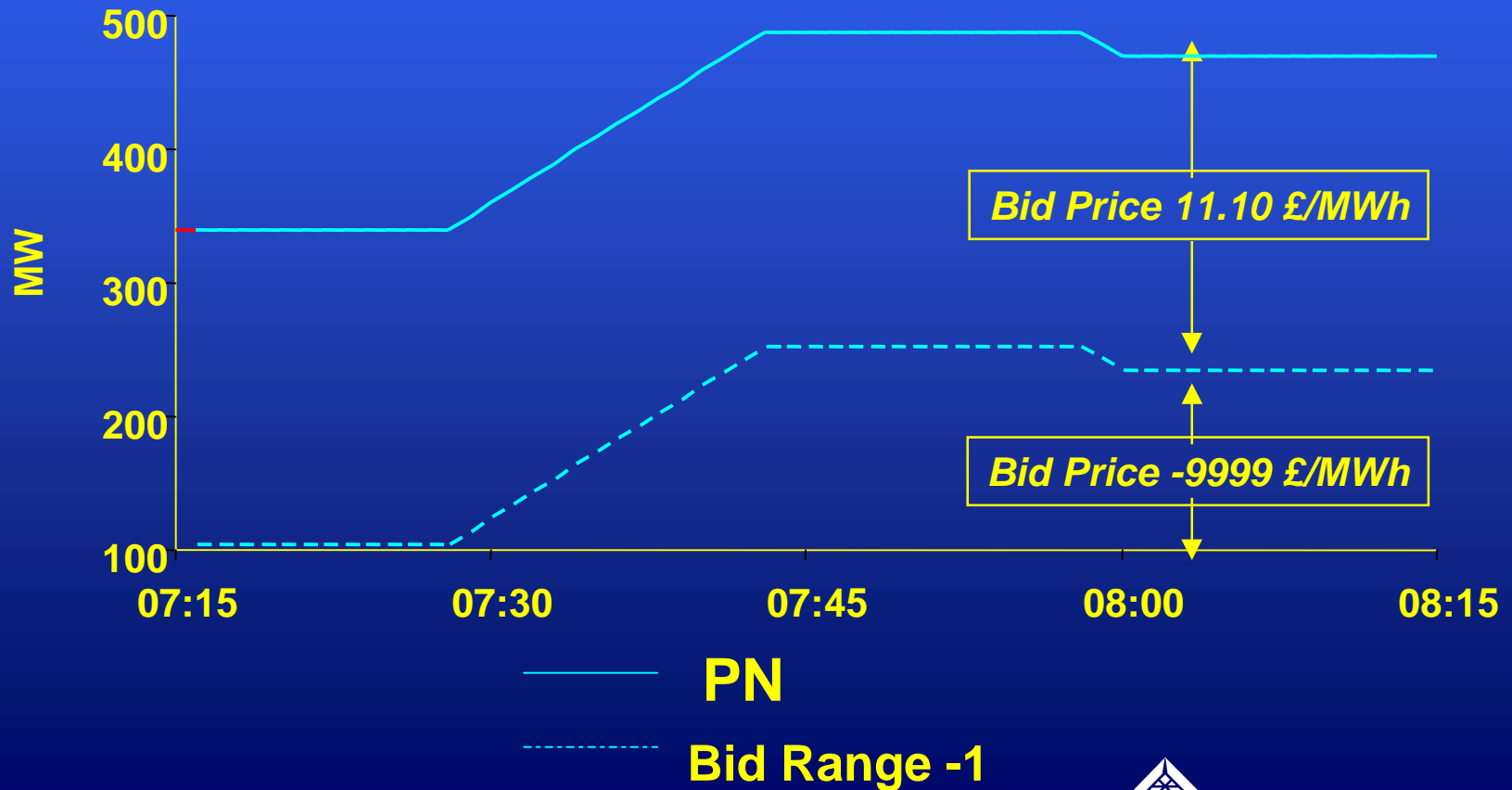
- ◆ NGC initiated notification of a third manifest error on May 2nd
- ◆ Result of NGC accepting bid on a flexible BMU to a fixed MW level
- ◆ Bid range -1 of the BMU profiled across a changing PN
- ◆ PN reduced, causing Bid volume accepted to clip into second Bid / Offer pair for 3.5 MWh.



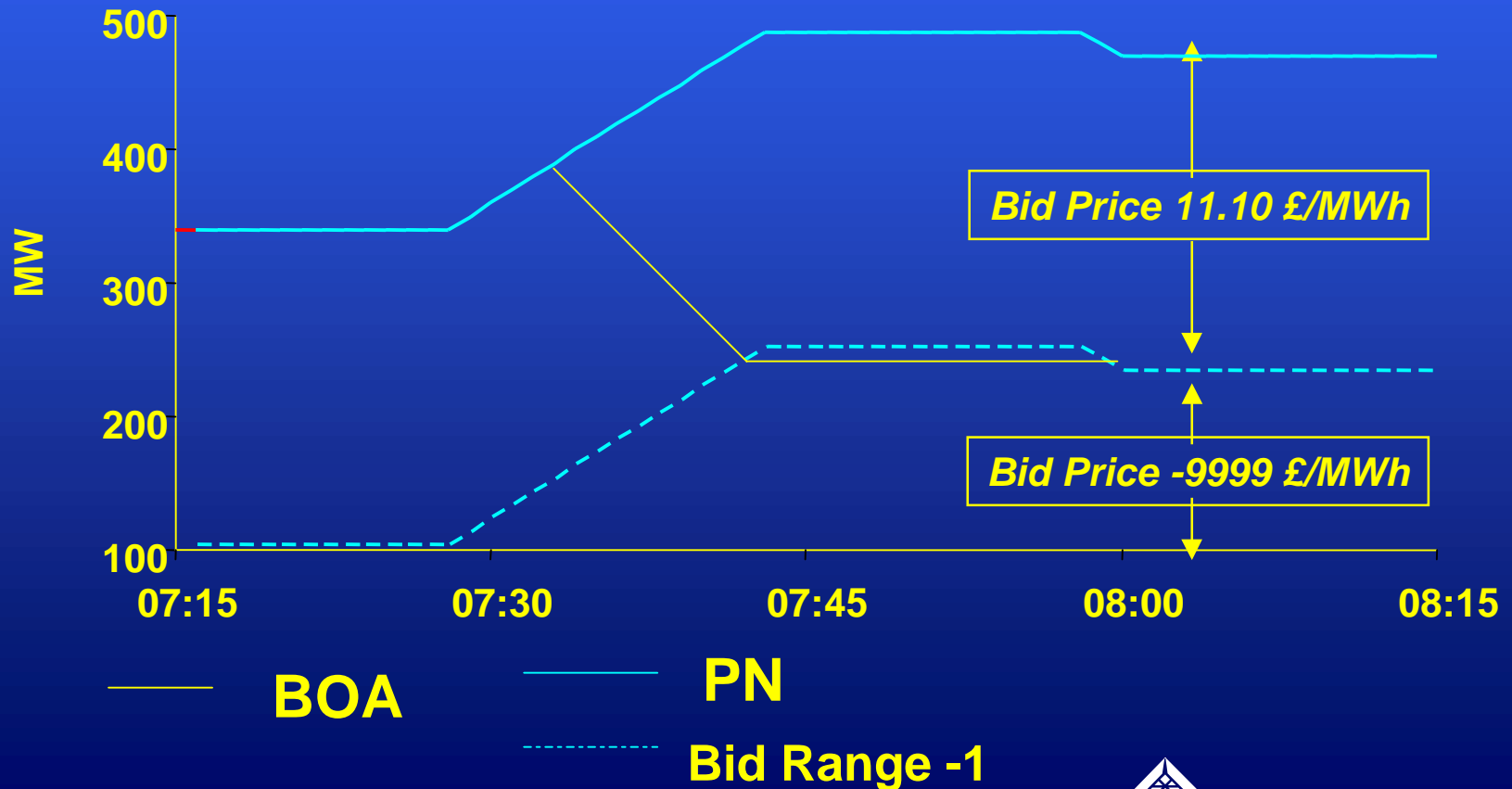
Manifest Error



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