I-SEM Trialing of EUPHEMIA

Working Group 9

26TH January 2016

Agenda

- SEMO Update
- PCR/EUPHEMIA Update
- Recent WG Feedback
- Batch Two Results and Analysis
- Batch Three Trial Script
- Next Steps

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SEMO Update

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SEMO Update – Recent Activities

- Analysis of commercial phase batch 2:
  - Review of results against trial scenarios
  - Trial script with outcomes shared
  - Analysis outlined later in presentation

- Industry engagement:
  - Feedback from working group
  - Facilitated industry conference call
  - Details of feedback discussed in later slides

SEMO Update – Recent Activities

- Engagement with I-SEM teams:
  - Further attempts to work towards harmonised calendar
  - Need to reschedule some EUPHEMIA meetings
  - Continued work to give firm dates early

- Beginning contract negotiations with preferred vendor for NEMO services
  - Detailed plan to be developed over coming weeks
  - Plan to consider milestones for input into service design and NEMO rules development

PCR/EUPHEMIA Update

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PCR Update – Recap of previous content

- PCR have been responding to concerns about EUPHEMIA:
  - Concerns around overall efficiency
  - Concerns around transparency of the algorithm
  - Concerns raised by industry (EURELECTRIC, EFET, etc.)

- Have responded through industry engagement:
  - Presentations at European Stakeholder Committee (ESC)
  - Have looked at ways to drive efficiency
  - Have presented on future of algorithm
  - Links available in slides for WG 7 & 8

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PCR Update – PCR Stakeholder Forum

- PCR held stakeholder forum 11/01/2016:
  - Attended by SEMO and other stakeholders
  - Forum for feedback and discussion
  - Presentations by PCR and N-Side

- One stage of a wider set of engagements:
  - Further ESC presentations and discussion
  - Feedback through EURELECTRIC, EFET and other stakeholders
  - Further PCR stakeholder forums
  - SEMO will keep WG informed of meetings as applicable

PCR Update – PCR Stakeholder Forum

- Forum focused on technical aspects of the algorithm:
  - Implementation of solver software
  - Recent improvements to solve times
  - Stayed away from issues of market design (e.g. order types)

- Outlined releases for 2016:
  - Two releases planned (9.4 and 10)
  - No impact on the I-SEM EUPHEMIA Trial

- https://www.apxgroup.com/services/research-projects/pcr/

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PCR Update – PCR Stakeholder Forum

- Reviewed market design proposals from ESC meeting:
  - Potential benefits of replacing order types
  - Potential benefits of reviewing the pricing rules
  - PCR looking for industry feedback
  - Industry requesting additional information

- No timeline for further developments:
  - No consensus opinion
  - No timeline for R&D of solutions
  - Significant testing would be required to prove benefits

Recent WG Feedback

WG Feedback - Unscripted Phase Confidentiality

- Original plan - Two batches of approx. 14 days:
  - Based on historical SEM trading days
  - One open and one confidential batch
- WG feel this is no longer required:
  - Limited data would be available
  - Given structure, this may limit value of confidential batch
- Both batches will be open in unscripted trial:
  - Inputs and outputs available as in scripted phase

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WG Feedback – Comparison to SEM Data

- Desire for a formal benchmarking against SEM:
  - No benchmarking will take place
  - Reasons outlined in section 5.8 of initial phase report
- Prediction of I-SEM prices is out of scope:
  - Various factors affecting accuracy of such an exercise
- SEMO will provide relevant SEM data:
  - Performed using SEM market systems
  - As close in terms of data as possible (e.g. wind profile)
  - Will be provided in the coming weeks

WG Feedback – Analysis of Data

- Desire for further GB price analysis:
  - Request sent to APX for trial GB prices
  - Should be provided in near future
- Including 05/08/2015:
  - Plan is based on using same dates to save time
  - Conditions (wind and load) can be replicated with existing orders
- Further engagement of technical expert:
  - SEMO happy to facilitate
  - Clear purpose for interactions required

WG Feedback – Analysis of Data

- WG check of inputs:
  - Requested to help catch errors prior to execution
  - Can not interfere with overall timelines
  - Inputs will be sent around for review
  - All reviews must happen within 1 WD

- Limitations/assumptions reporting:
  - SEMO feel all assumptions/limitations are reported
  - SEMO request detail on how to better communicate such issues

Batch Two Results and Analysis

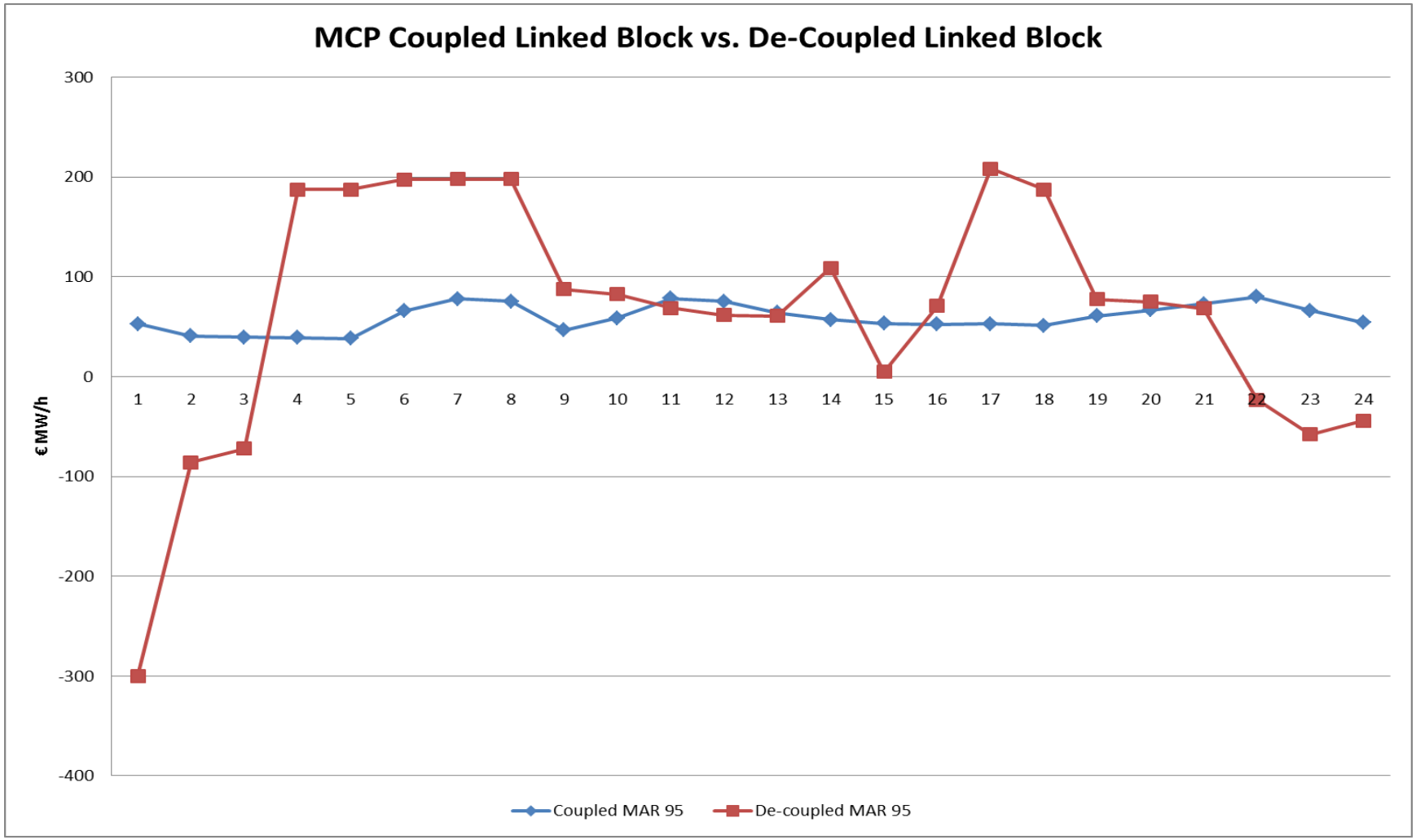
Batch 2 – Issue with Price Making Demand

- Further analysis has showed that the price making demand was 99% of the total actual value
- Due to rounding after processing of the data-sets
- No material impact on results
- Corrected for batch three

Batch 2 – Objective

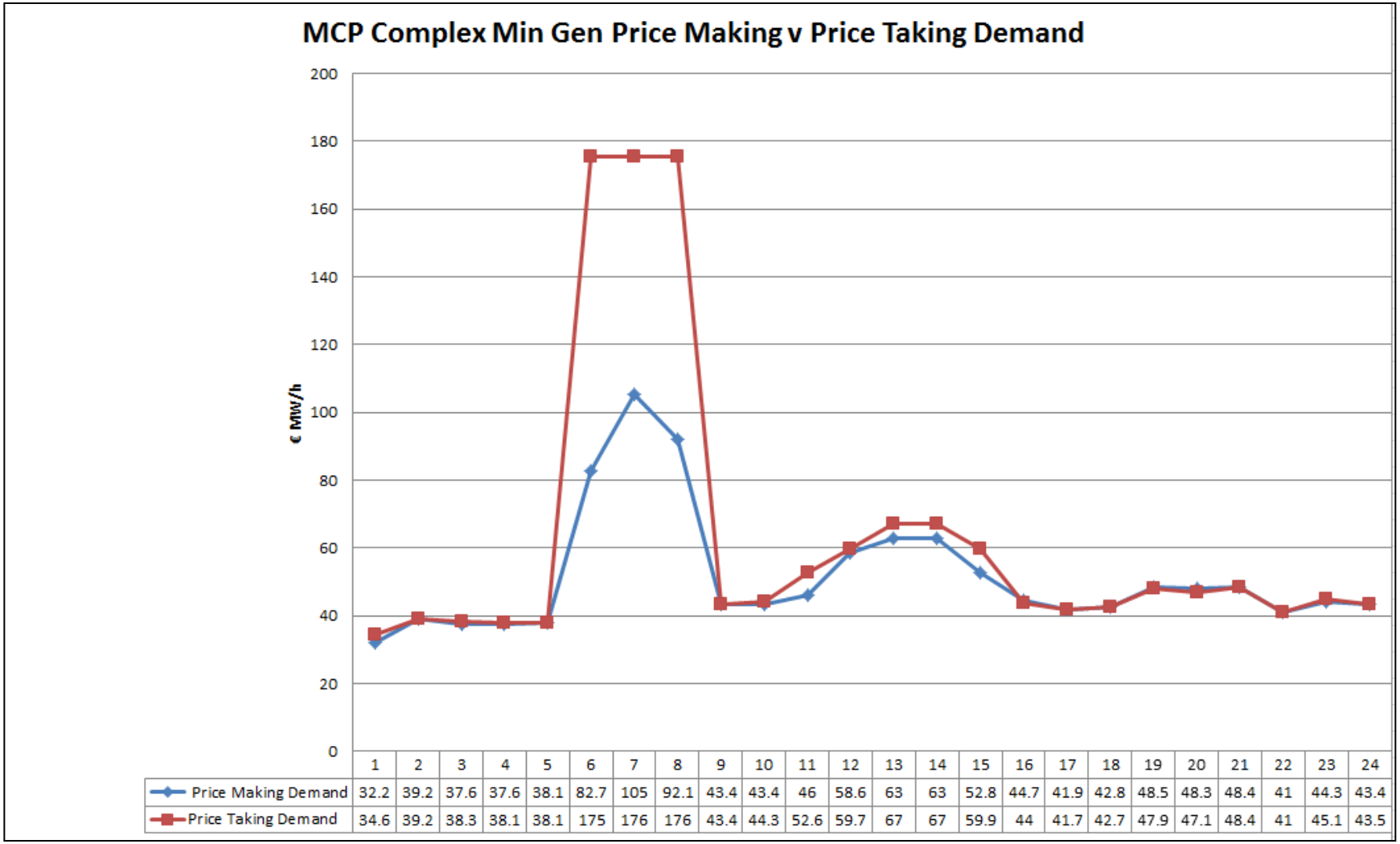
- Expand on batch one results:
  - Do wind and demand make linked blocks viable?
  - Does having range of wind and demand bid improve pricing?
- Investigate complex orders:
  - What is effect of applying no-load cost to the VT?
  - Does using a negative PQ1 improve scheduling without risk?
- Investigate MAR levels:
  - Does decreasing the MAR improve results?
  - What is the financial risk of decreasing the MAR?

Batch 2 – Objective 1 Linked Block Viability



- When de-coupled prices are volatile
- Wind & load (@20/10%) don't provide resilience

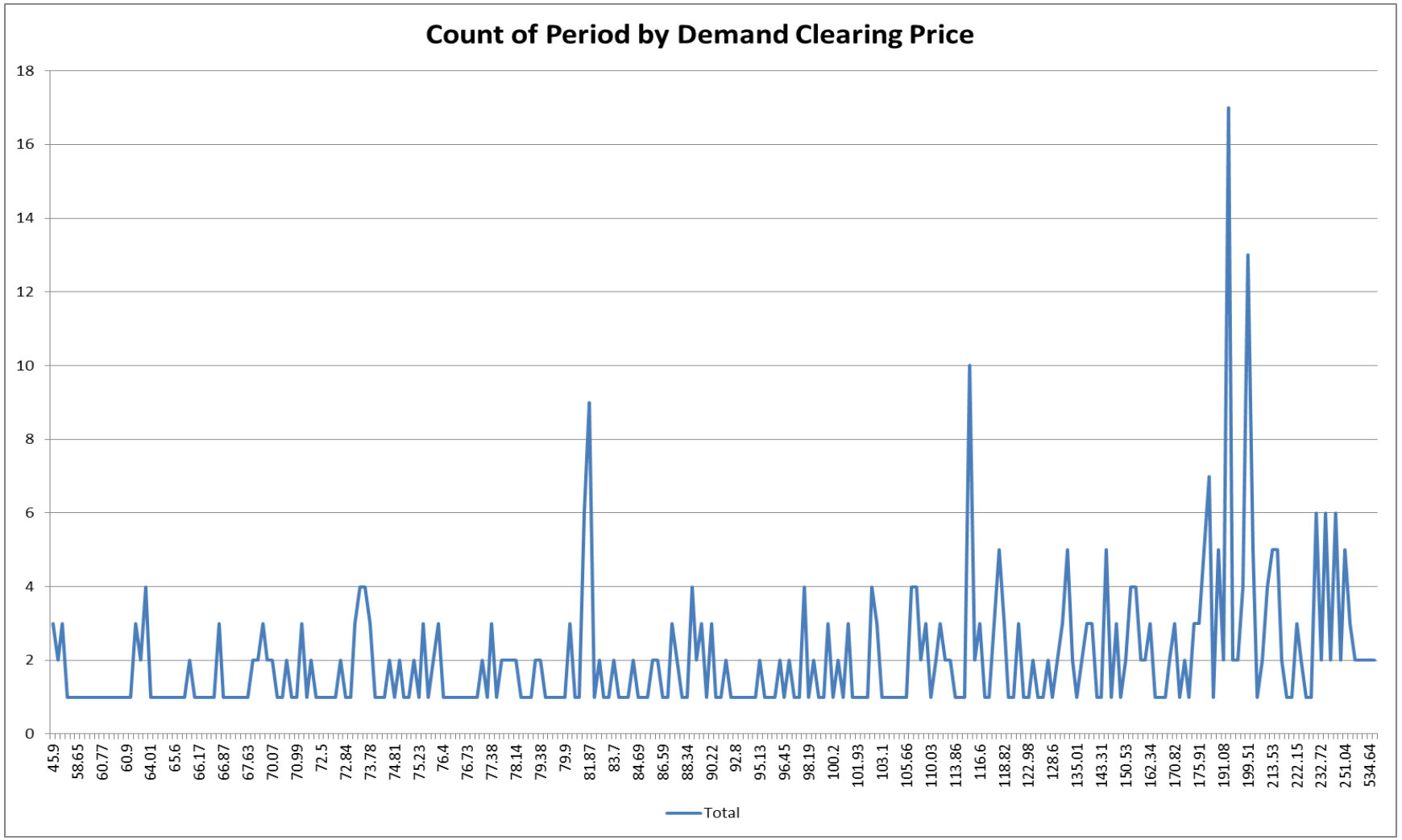
Batch 2 – Objective 2 Wind and Demand Pricing



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Price Making Demand	32.2	39.2	37.6	37.6	38.1	82.7	105	92.1	43.4	43.4	46	58.6	63	63	52.8	44.7	41.9	42.8	48.5	48.3	48.4	41	44.3	43.4
Price Taking Demand	34.6	39.2	38.3	38.1	38.1	175	176	176	43.4	44.3	52.6	59.7	67	67	59.9	44	41.7	42.7	47.9	47.1	48.4	41	45.1	43.5

- Demand caps prices for small jumps in stack
- Savings may only be made in DAM

Batch 2 – Objective 2 Wind and Demand Pricing



- Demand set price 546 times with 272 unique prices
- Prices based on profiling of demand and extra steps

Batch 2 – Objective 2 Wind and Demand Pricing

Wind Unit	Price	Marginal Periods
GU_Wind_3	-86	2
GU_Wind_5	-72	2
GU_Wind_7	-58	4
GU_Wind_9	-44	4
GU_WIND_10	-37	2
GU_WIND_11	-30	1
GU_WIND_12	-23	2
GU_WIND_15	-2	2
GU_WIND_16	5	2
GU_WIND_18	17	8
GU_WIND_19	23	6
GU_WIND_20	29	4
GU_WIND_21	35	3

- Set price in 42 periods in batch 2 vs. 0 in batch 1
- Wind set the price across a range of prices
  - Multiple steps were useful

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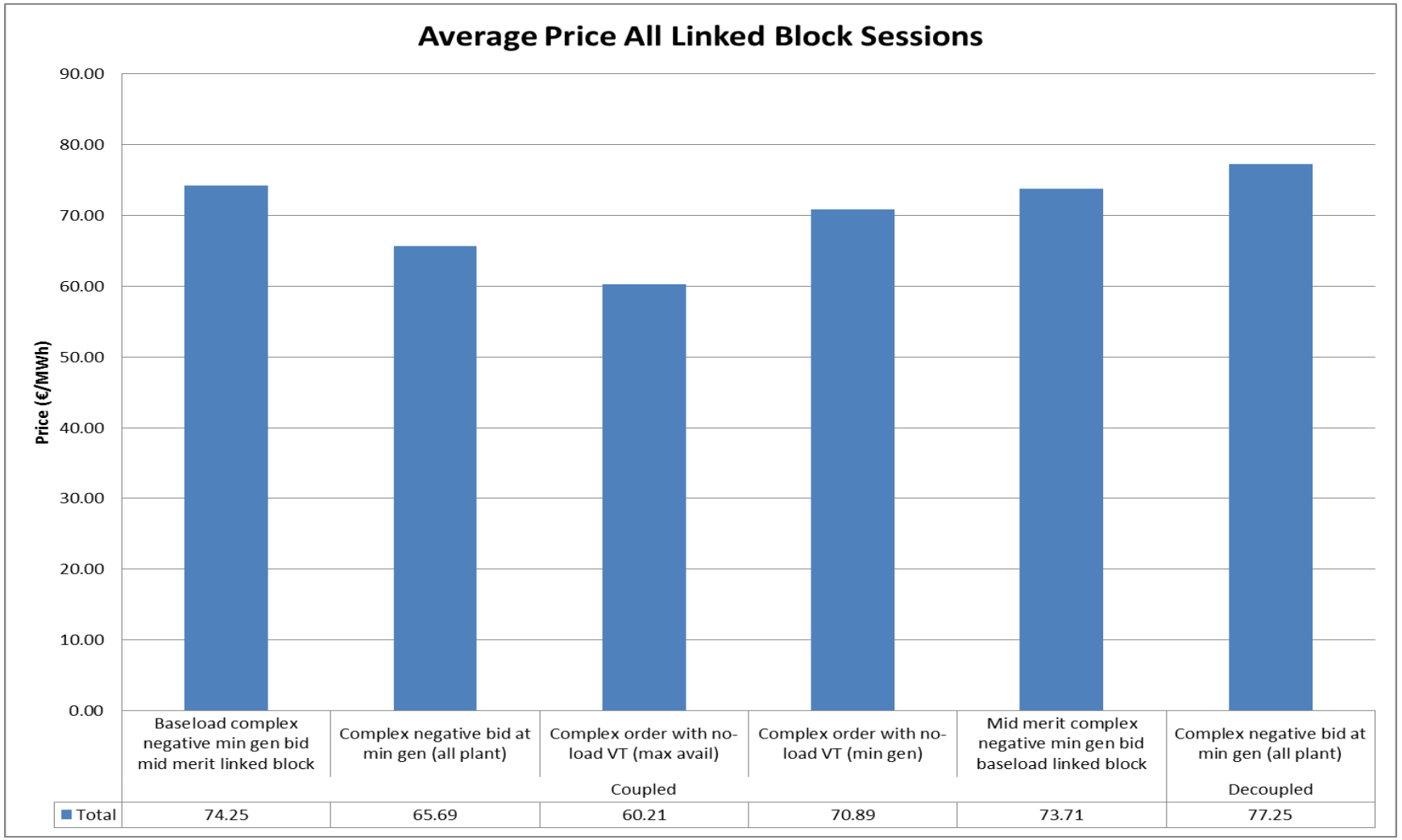
Batch 2 – Wind and Demand Summary

- Wind and Demand do not support linked blocks alone:
  - Prices disimproved since batch 1
  - As trialled, wind and demand are not sufficient price makers

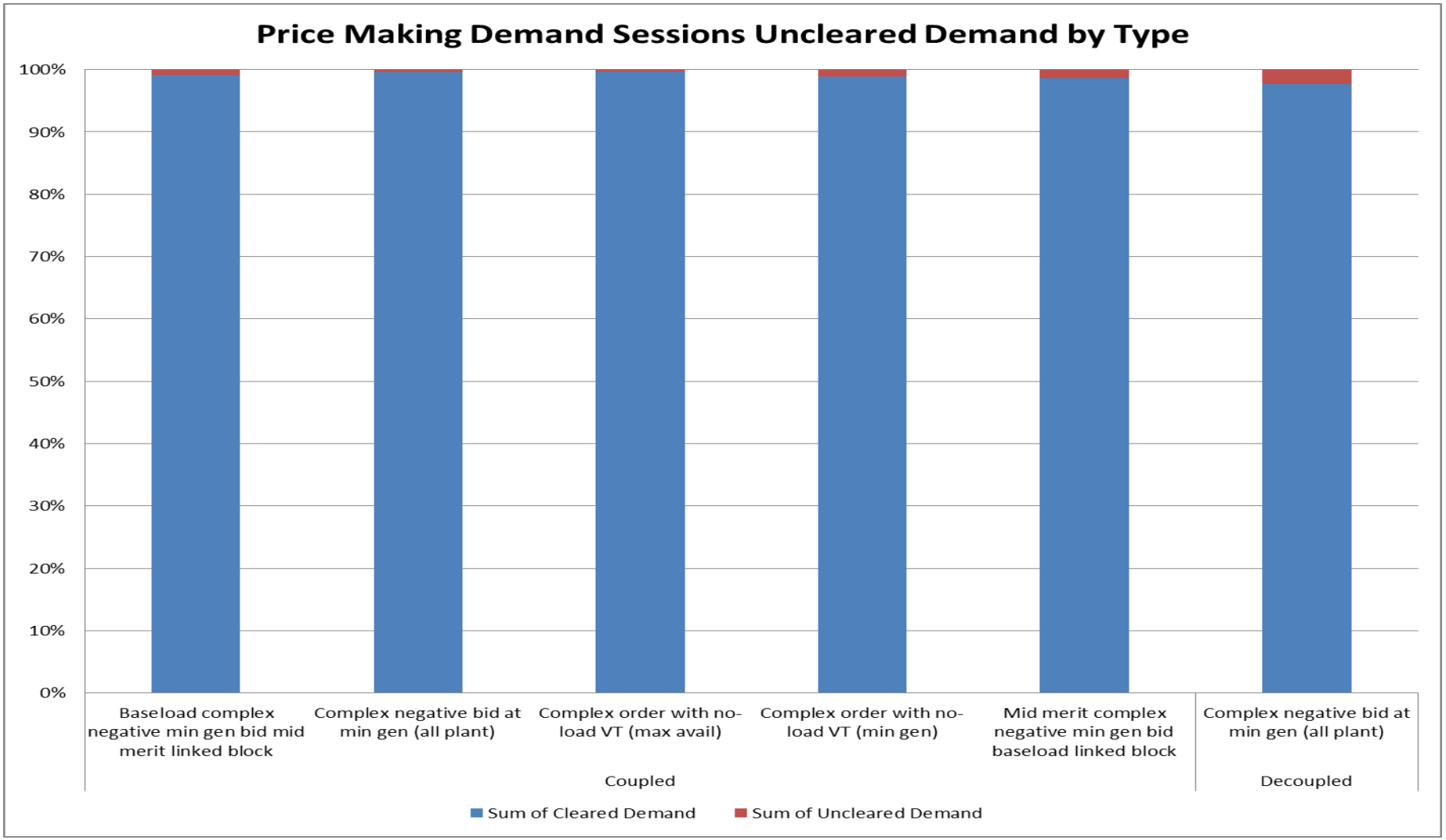
- Wider range of prices set by demand and wind:
  - Batch one had same price set in multiple hours
  - Demand and wind each set multiple prices across days
  - Should more accurately be reflecting true cost to market
  - Improvement is linked to accuracy of assumptions

Batch 2 – Objective 3 Complex Pricing



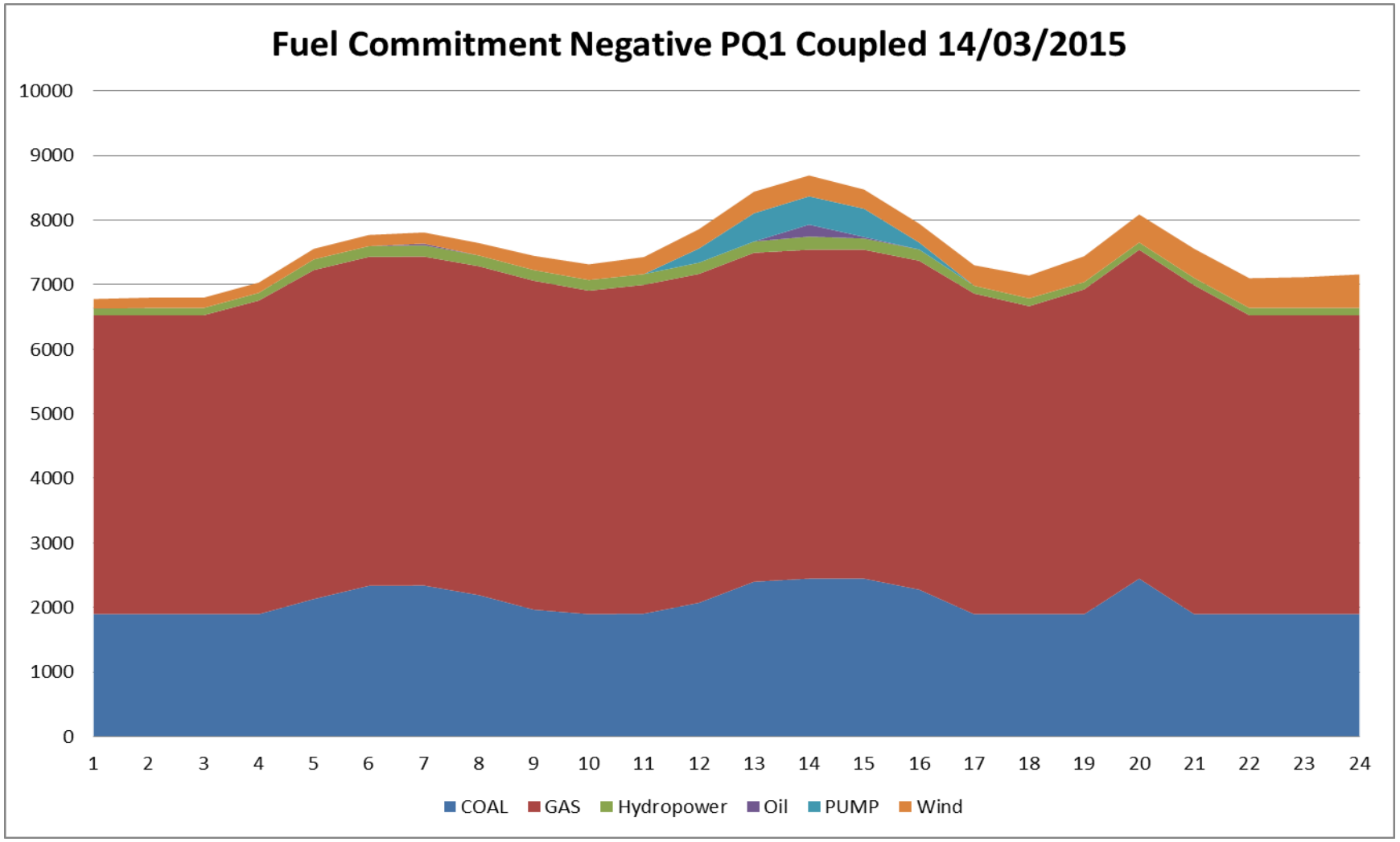
- Complex Order with Max avail lowest average price
- Negative bids do not cause adverse prices

Batch 2 – Cleared vs Uncleared Demand



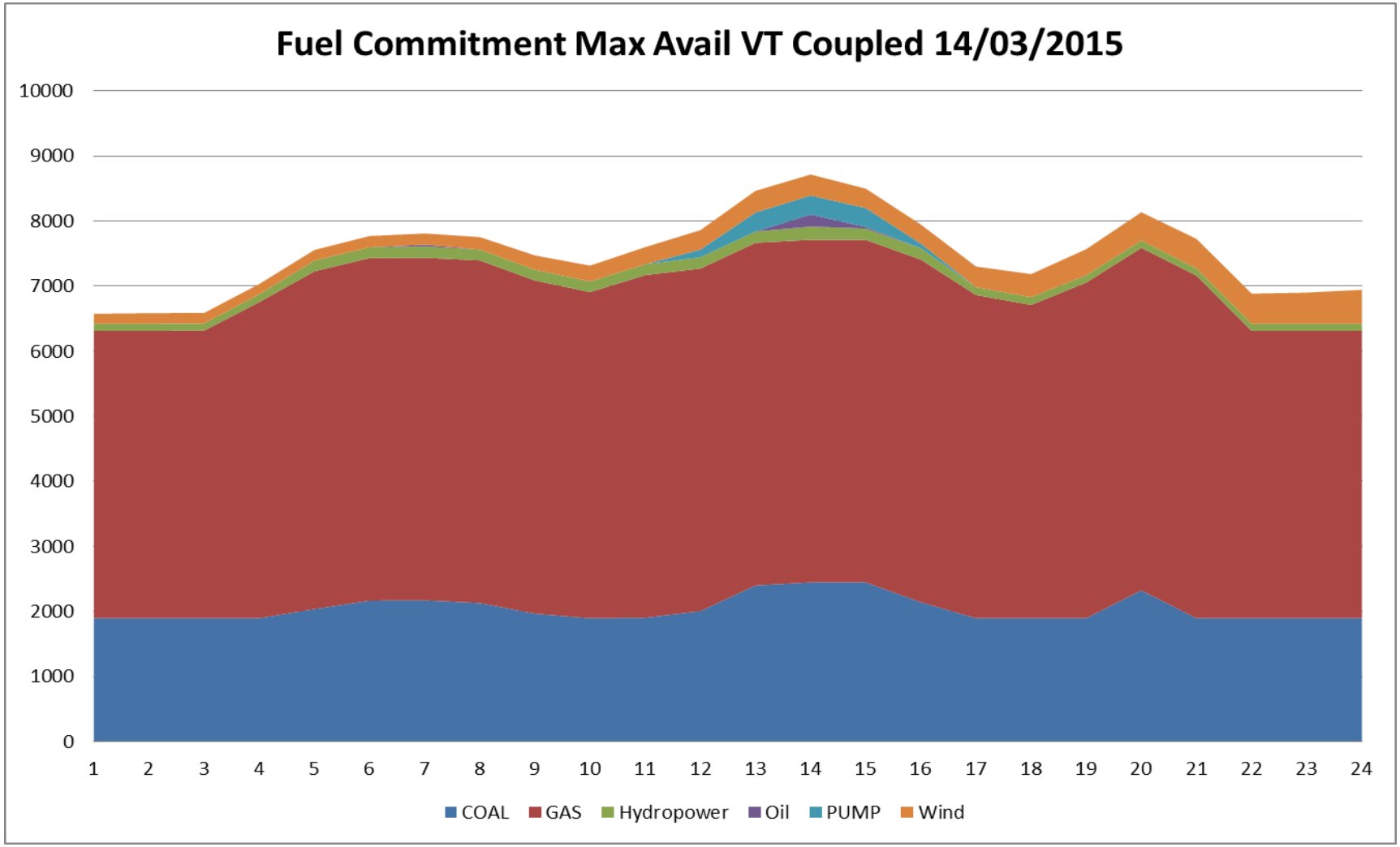
- Majority of demand is cleared overall
- Negative bid clear over 97.5% demand decoupled

Batch 2 Complex Fuel Mix



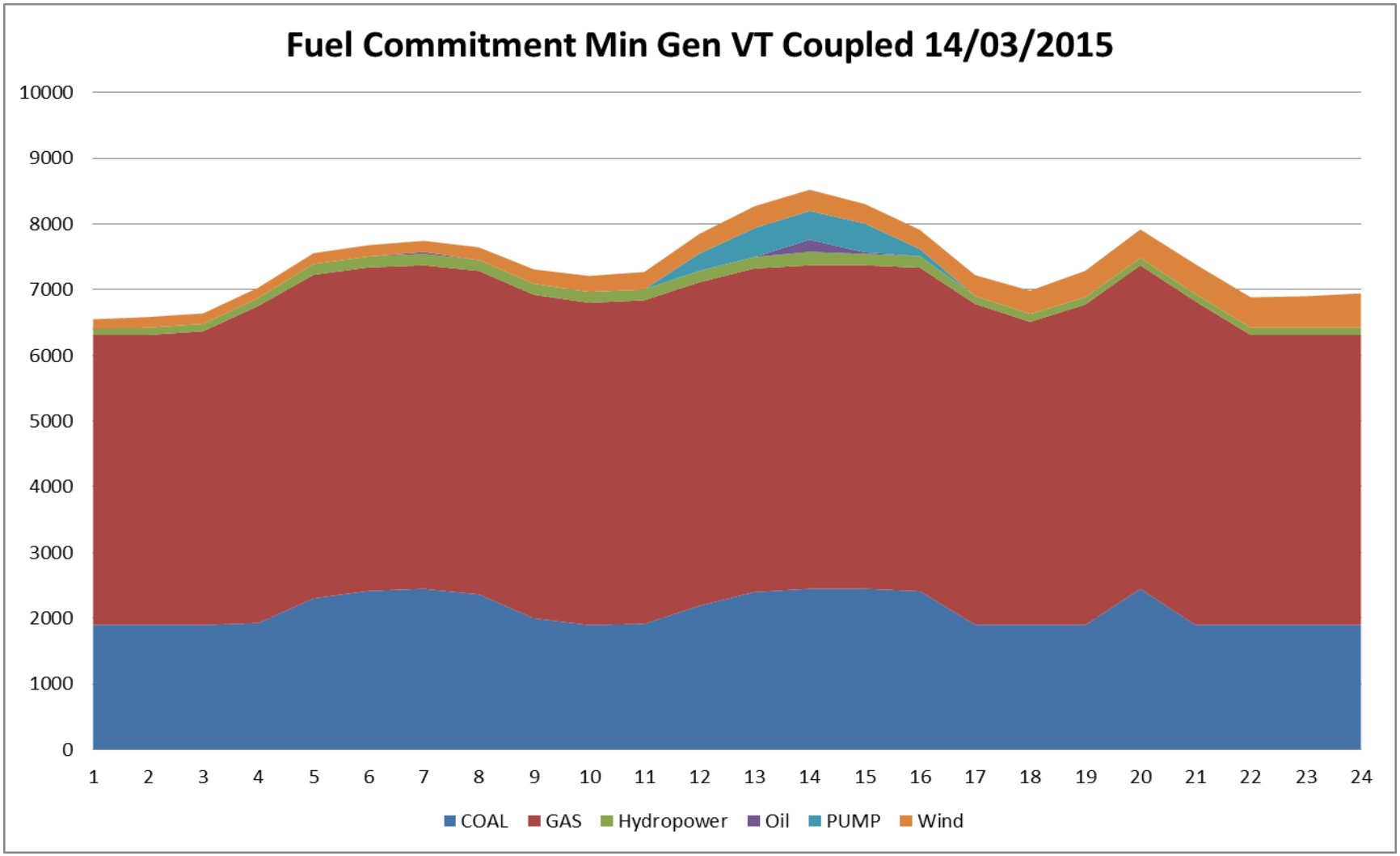
- Fuel Mix is as expected
- Primarily coal and gas

Batch 2 Complex Fuel Mix



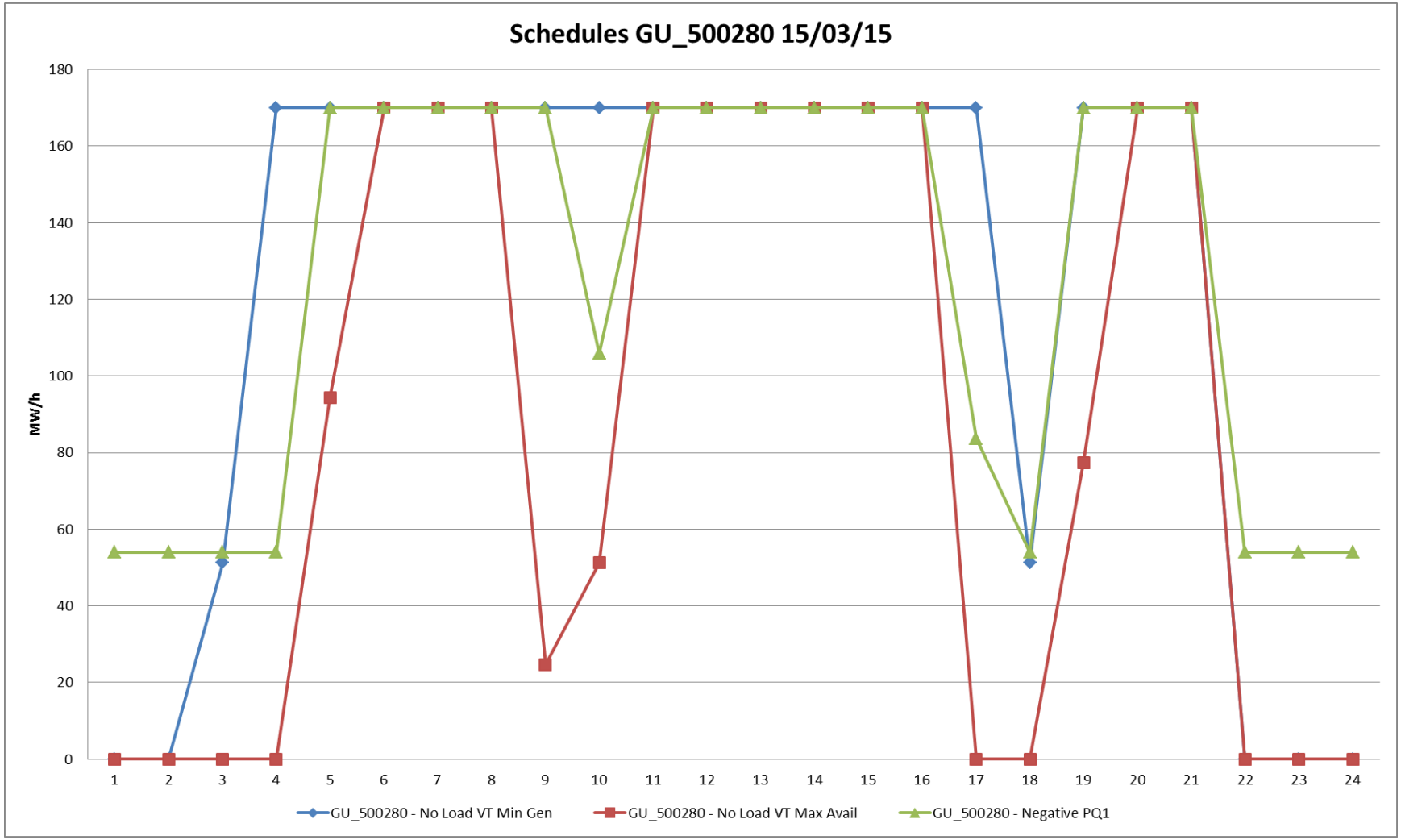
- Fuel Mix is as expected
- Very few changes to overall fuel mix

Batch 2 Complex Fuel Mix



- Fuel Mix is as expected
- Very few changes to overall fuel mix

Batch 2 Complex Schedules



- Negative min gen has full cost recovery
- All methods give differing schedules

Batch 2 – Complex Summary

Variable	Value
Number of units with complex order	21
Number of sessions	60 (20 with linked blocks included)
Total schedules created	685
Schedules which under recovered	3
% of scheduled which under recovered	0.44%

- Units risk under recovery with complex order:
  - Only small percent of cases under recover costs
  - No cases of under recovery with negative PQ1
  - Impact of under recovery may be high

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Batch 2 – Complex Order Summary

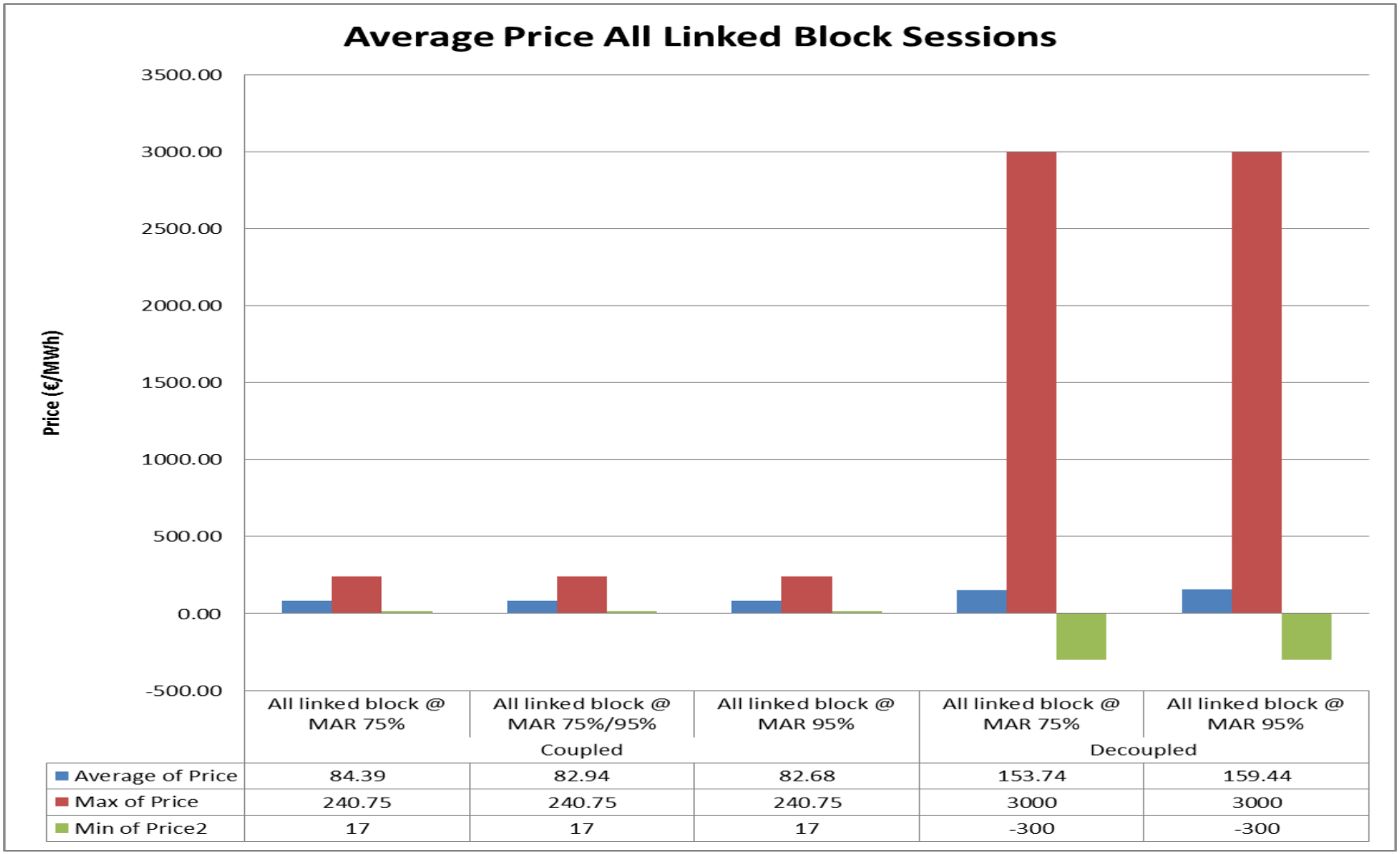
- Negative PQ1 avoids risks without significant change to price:
  - All plant recover costs with this method (under recovery with others)
  - Average price largely in line with other results
  - Average price increased with decoupling

- Altering VT has effect on pricing:
  - Min gen method had little effect to average price
  - Max avail method showed lower average price
  - Both showed cases of under recovery of costs
  - Changing VT without altering PQs can improve the price

Batch 2 – Complex Order Summary

- Regardless of the VT cost is a risk:
  - No way to effectively account for shutdowns with MIC only
  - Altering MIC to add flexibility alters risks faced
- Improved MIC needed with negative PQ1:
  - Prices were still high due to old assumptions about MIC
  - FT or VT could be altered to improve results
- Best approach most likely a mix
  - Good understanding of complex orders required

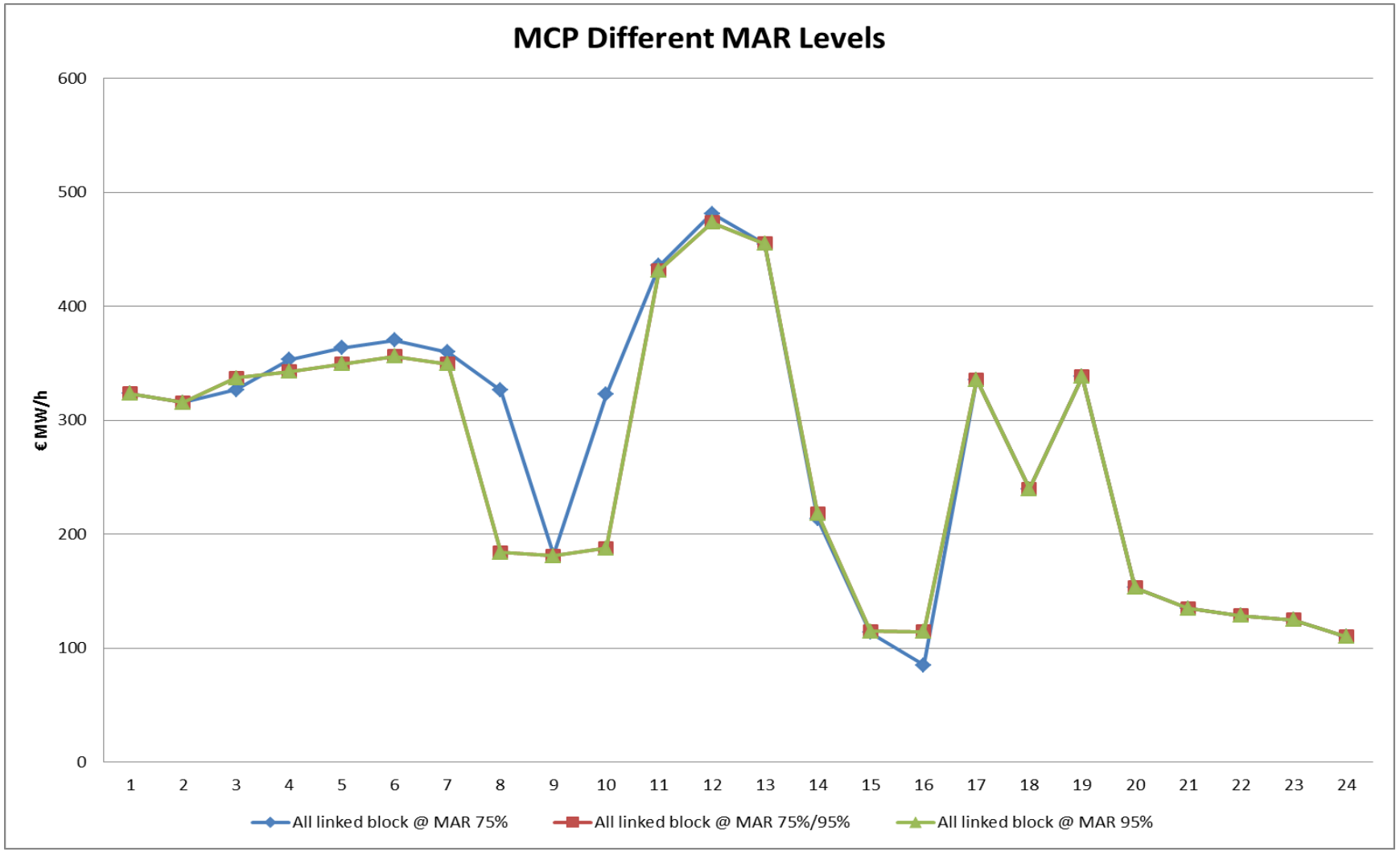
Batch 2 Analysis – Linked Block Average Prices



	All linked block @ MAR 75%	All linked block @ MAR 75%/95%	All linked block @ MAR 95%	All linked block @ MAR 75%	All linked block @ MAR 95%
	Coupled			Decoupled	
Average of Price	84.39	82.94	82.68	153.74	159.44
Max of Price	240.75	240.75	240.75	3000	3000
Min of Price2	17	17	17	-300	-300

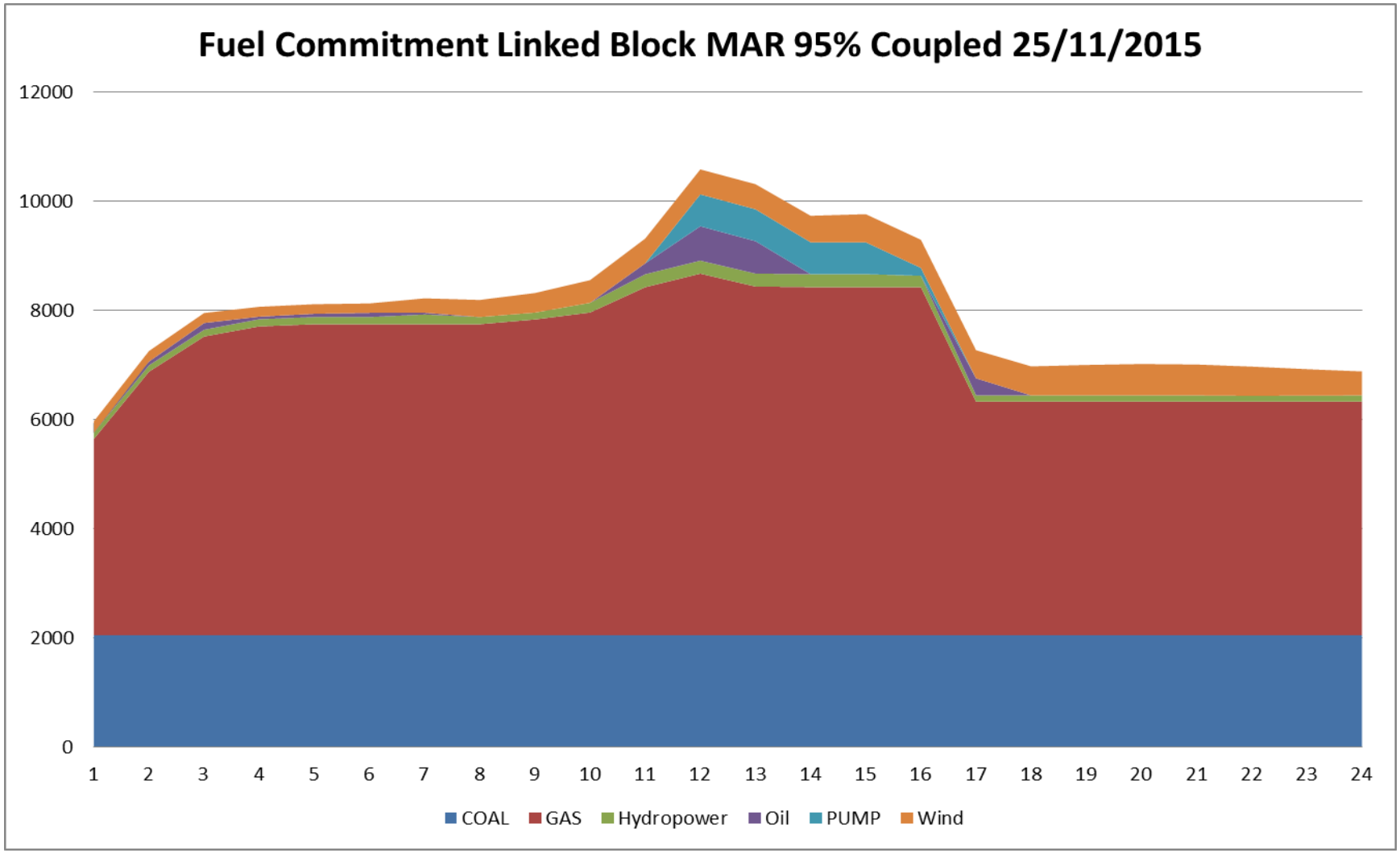
- MAR did not have significant effect on price
- Price is volatile when decoupled

Batch 2 Analysis – Hourly Prices per MAR Level



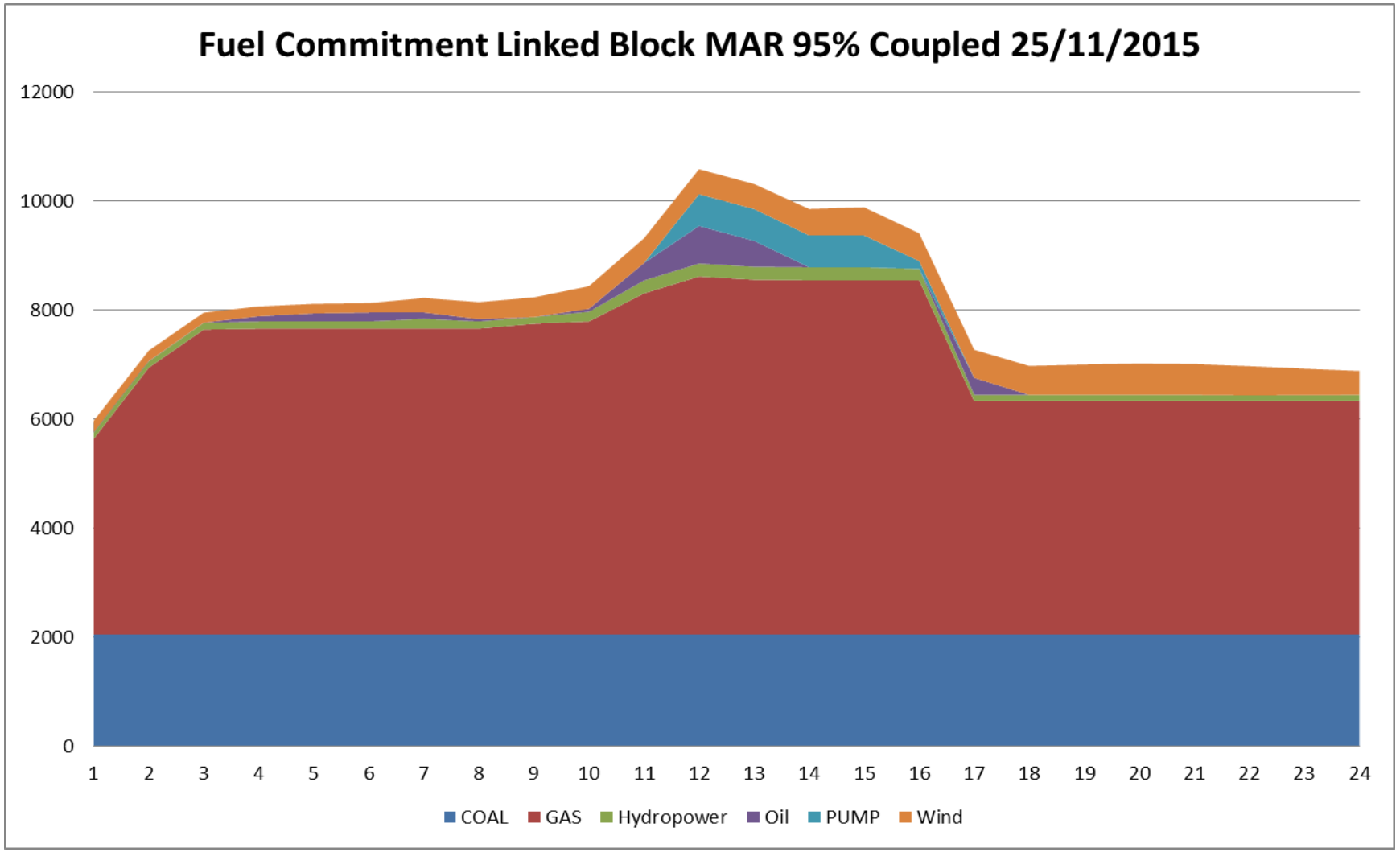
- Some differences in hourly prices
- In some cases, same price in all hours

Batch 2 Linked Block Fuel Mix



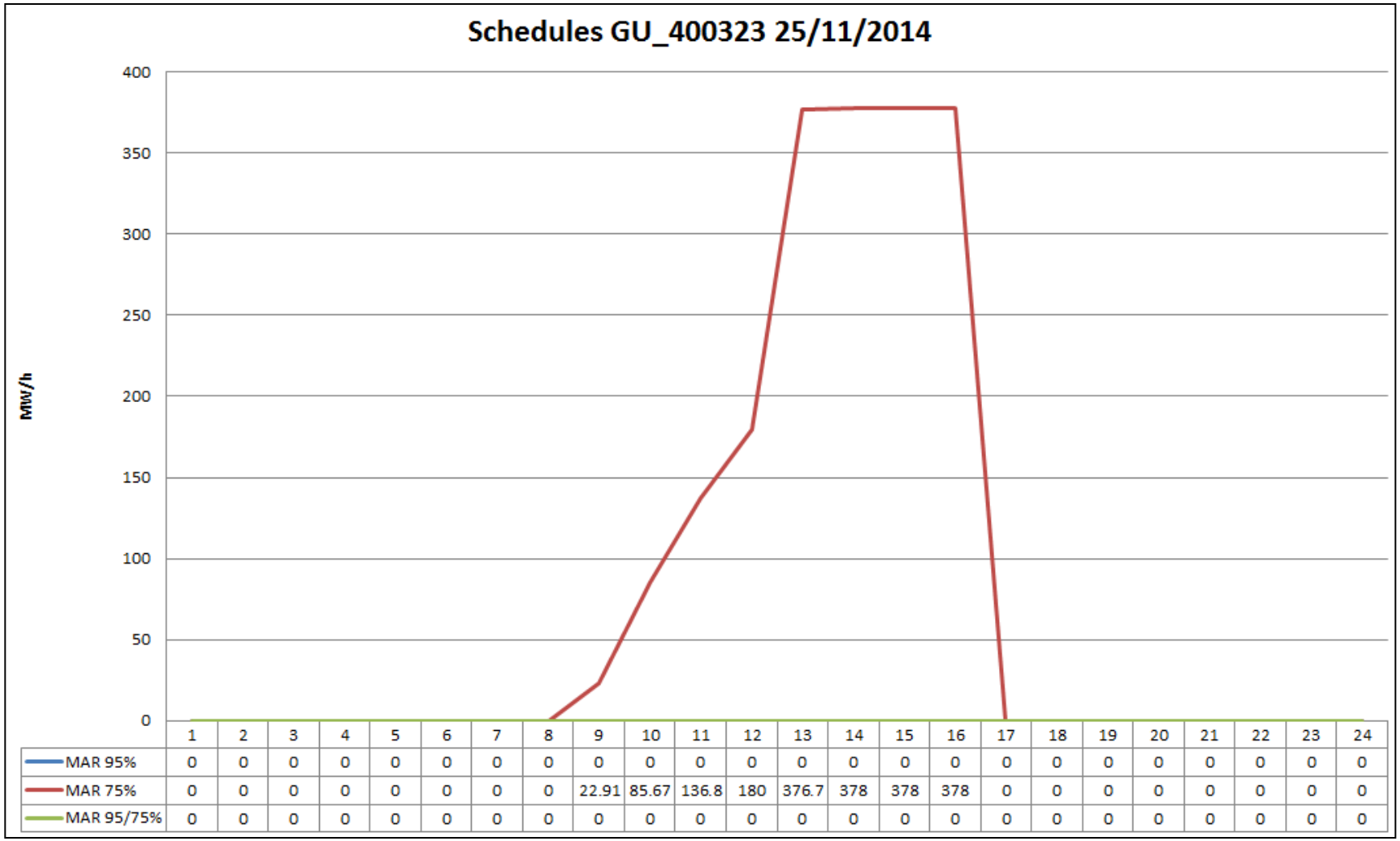
- Primarily coal and gas
- Drop in gas in hour 17 as blocks are deactivated

Batch 2 Linked Block Fuel Mix



- Largely the same as with 95% MAR
- Same structure and volumes to the blocks

Batch 2 Linked Block MAR Schedule



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
MAR 95%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAR 75%	0	0	0	0	0	0	0	0	22.91	85.67	136.8	180	376.7	378	378	378	0	0	0	0	0	0	0	0
MAR 95/75%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- Unit runs in the 75% MAR case (c. 78%)
- Unit does not recover costs incurred by profile

Batch 2 – Linked Block Summary

Variable	Value
Number of units with MAR < 1	21
Number of sessions	40
Total schedules created	548
Schedules which under recovered	2
% of scheduled which under recovered	0.36%

- Units risk under recovery with MAR less than 1:
  - Evidence shows few cases of under recovery of costs
  - Impact of under recovery may be high
  - Under recovery may be difficult to unwind in IDM/Balancing

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Batch 2 – Linked Block Summary

- Changing MAR alone has little effect on price:
  - Average, min and max price is similar across sets
  - Effects similar for coupled and decoupled sets
  - Effects can be seen in some individual cases

- Units risk under recovery without changing price:
  - Units relying on inframarginal rent to recover costs
  - Potentially losing revenue in DAM
  - Profile is feasible but price does not reflect costs
  - Is this worse position than small erroneous starts?

Batch 2 – Areas for further study

- Alter demand/wind price:
  - Will this have a large effect on prices
  - Will this have a large effect on the cleared demand
- Combine negative PQs with alter MIC:
  - Can units get better price and have lower risk
- Alter the price of linked blocks:
  - What is the effect on price of including a risk premium?
  - How does this effect cost recovery?

Batch Three Trial Script

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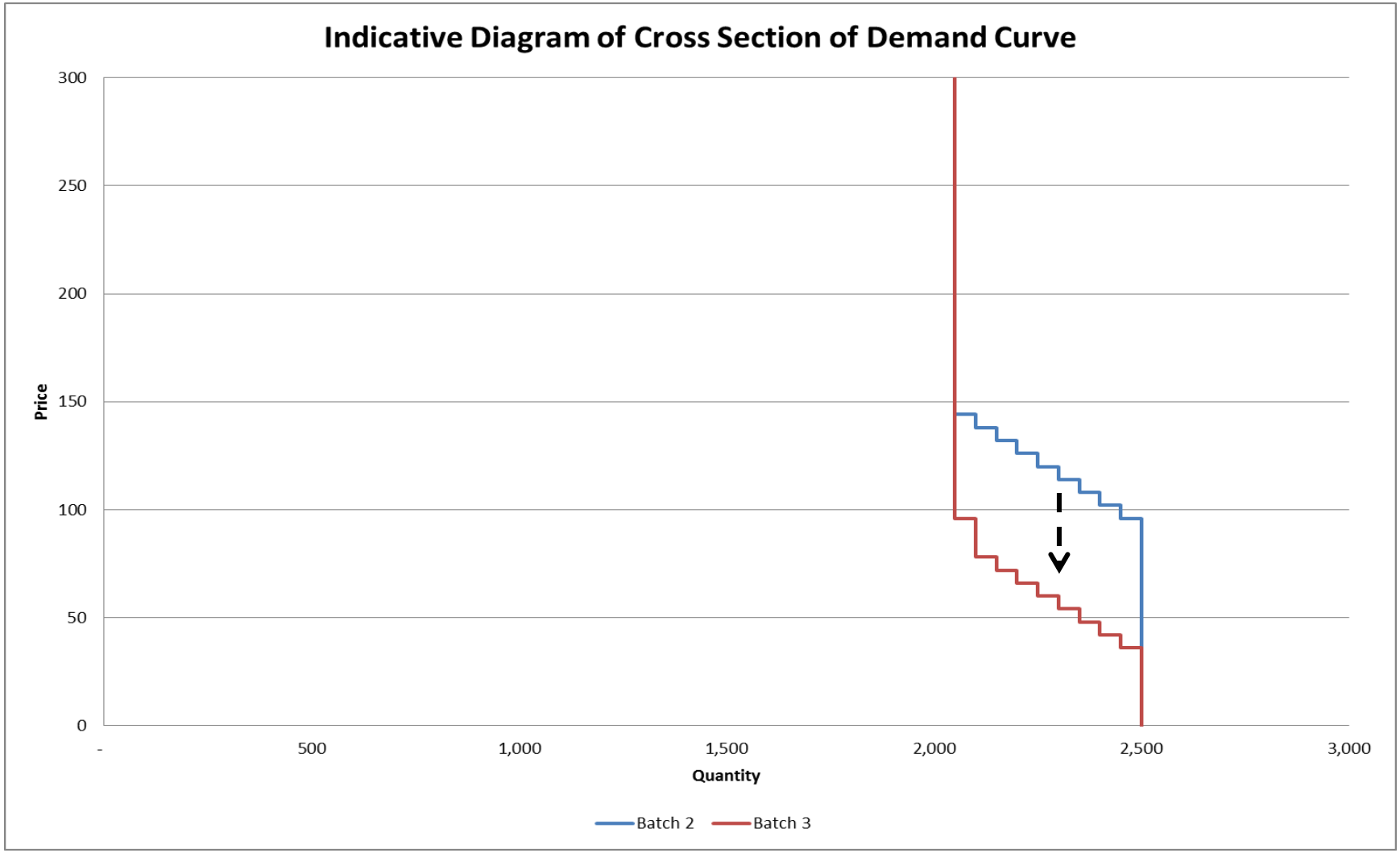
Batch 3 – Overview

- Script based on WG feedback:
  - Draft script prepared based on feedback
  - Draft script discussed shared with WG
  - Final script agreed with WG representatives

- Covers a wide range of topics:
  - Alterations to MIC assumptions
  - Alterations of linked block assumptions
  - Specific trials devised by WG members
  - Alteration to wind and demand assumptions

Batch 3 - Revised Demand Assumption

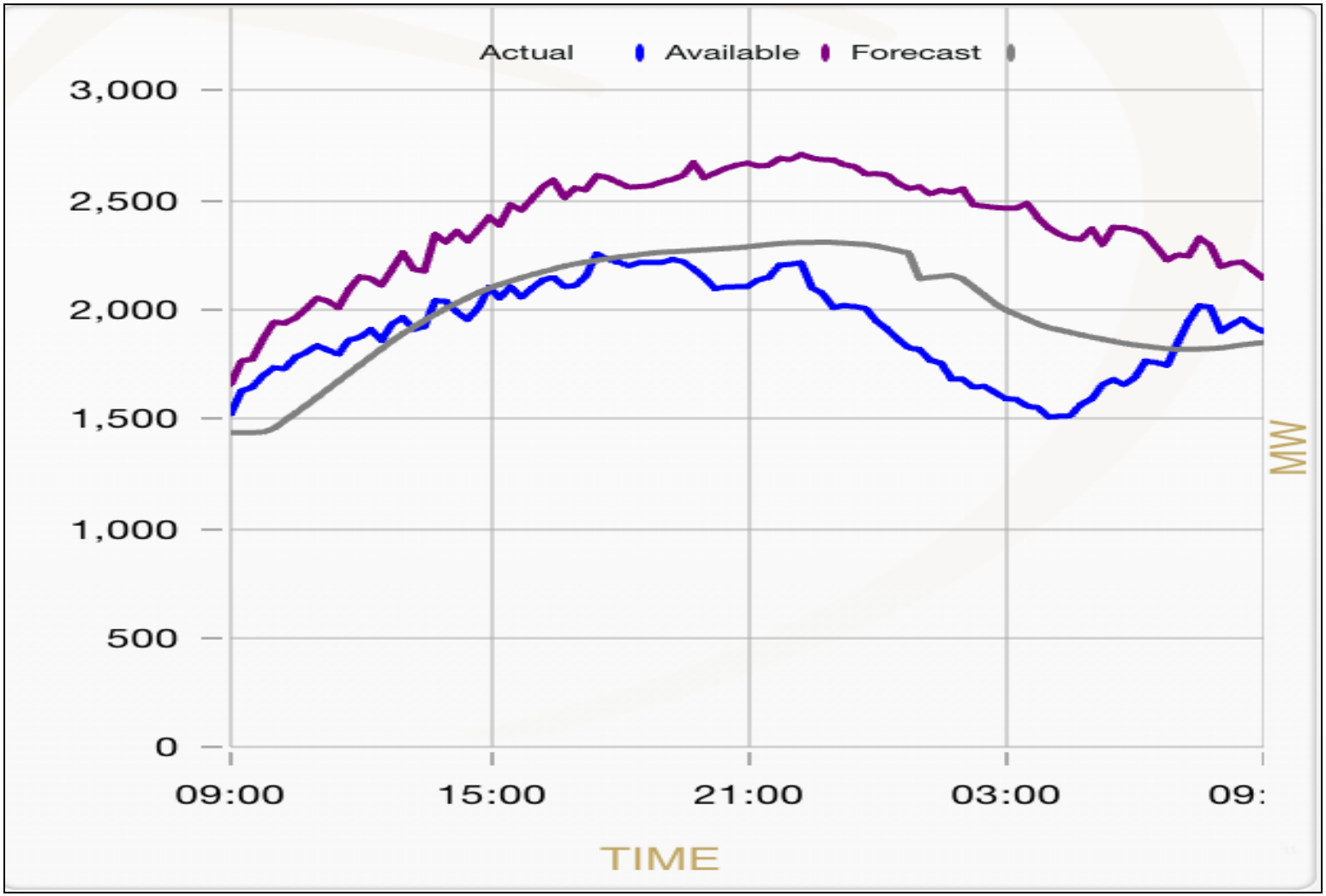


- Structure remains largely unchanged
- Prices lowered to be closer to SMP

Batch 3 – Linked Block Assumptions

- Risk premium included in price:
  - Price adjusted to 1/MAR (e.g. 1/0.95)
  - Target the issue of under recovery of costs
- Staggering of linked blocks:
  - Different units using different numbers of hours
- Altering assumptions about MAR:
  - Twin plants using different MAR levels
  - Different MAR levels at different times

Batch 3 – High Wind/Low Demand



- Specific trading day could not be investigated
- Wind and load conditions replicated in forecasts

Batch 3 – High Wind/Low Demand

Item	Price	IWEA MW	% of Schedule
REFIT * -1	€69.72	1800	61%
ROC * -1	€56.77	650	22%
Zero price	€0	500	17%

- Figures based on IWEA submission:
  - Submission shared with WG with trial script
- Prices based on most recent figures:
  - http://www.dcenr.gov.ie/energy/SiteCollectionDocuments/Renewable-Energy/Refit%20Reference%20Prices.pdf
  - https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-buy-out-price-and-mutualisation-ceiling-2014-15

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Batch 3 – Specific Trials

- Assetless trader:
  - Bid @ -€200 buy and €200 sell for 200 MW
- Trials on twin plants:
  - Plant 1 and plant 2 using different assumptions
  - Only twin plant using complex/linked block included
  - New orders not created for peaker plant
- Oil price for dual units:
  - Enter oil bids for Kilroot and Tynagh
  - Units declared above their maximum availability

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Next Steps

Next Steps

- SEMO to release training materials:
  - Will be two weeks before first training sessions
  - SEMO will answer any WG queries
- Batch 3 Results:
  - SEMO will provide results as soon as possible
- Batch 4 Trial Script:
  - Script for final scripted batch
  - Will cover 100 trial days

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