I-SEM Trialing of EUPHEMIA

Working Group 10

10TH March 2016

Agenda

- SEMO Update
- Paradoxically Rejected Blocks
- Batch Three Results and Analysis
- Batch Four Trial Script
- Unscripted Phase Arrangements
- Report Arrangements
- Next Steps

SEMO Update

EIRGRID semo Single Electricity Market Operator SONI

SEMO Update – Recent Activities

- Unscripted phase training:
  - Three sessions attended by c. 50 participants
  - Good level of engagement throughout
  - Helped inform the arrangements required (more later)

- EPEX Spot/ECC selected as service provider for NEMO services:
  - Will provide DAM, IDM and clearing services for the I-SEM
  - Process for NEMO implementation has kicked off
  - Process for NEMO rules development being planned
  - Process for PCR change request being discussed

SEMO Update – Milestones for close out

- I-SEM EUPHEMIA Trial report:
  - To be published by SEMO 31/05/16
  - Drafts to be circulated to WG in advance for comments
  - Schedule for periodic review outlined in later slides
- RA decision on order types for I-SEM DAM:
  - 6 weeks after EUPHEMIA Trial report (mid-July)
  - Will directly follow from the report
- Other milestones through NEMO implementation work:
  - PCR change request; NEMO rules development

EIRGRID semo Single Electricity Market Operator SONI

Paradoxically Rejected Blocks

PRBs – Background

- Paradoxically rejected blocks (PRBs):
  - Block which is rejected despite being in-the-money
  - Affects all block types (offshoot of having no paradoxical acceptance)
  - Subject of concern across European markets
  - Information from PCR below:

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

- Does not mean block should/should not have been accepted:
  - In most cases block being accepted would reduce welfare
  - Forcing EUPHEMIA to accept block lowers the price
  - This new price would not allow block to be accepted

EIRGRID semo Single Electricity Market Operator SONI

PRBs – Example from Data (Batch 2)

- Two units offered the same volumes in LB family:
  - Session ID 20150281
  - Used same structure (i.e. same volumes and number of blocks)
  - GU_500280 average price of 99.67
  - GU_500282 average price of 95.98

- GU_500280 accepted and GU_500282 rejected:
  - GU_500280 accepted despite higher cost
  - Part of the branch and bound of the solution
  - GU_500282 accepted first but excluded in branching
  - With GU_500282 excluded, GU_500280 was examined and accepted

PRBs – Linked block

- Harder to quantify with linked blocks:
  - Welfare is transferred from child to parent
  - Multiple possible configurations of welfare transfer
  - System flags blocks on an individual basis
  - Not within our scope to identify all PRBs in I-SEM trial

- Overall welfare transfers need to be considered:
  - Not as simple as comparing prices of blocks
  - Overall impact of accepting the block may be further reaching
  - Ceteris paribus, cheaper blocks/families should still be accepted

PRBs – Points for I-SEM operations

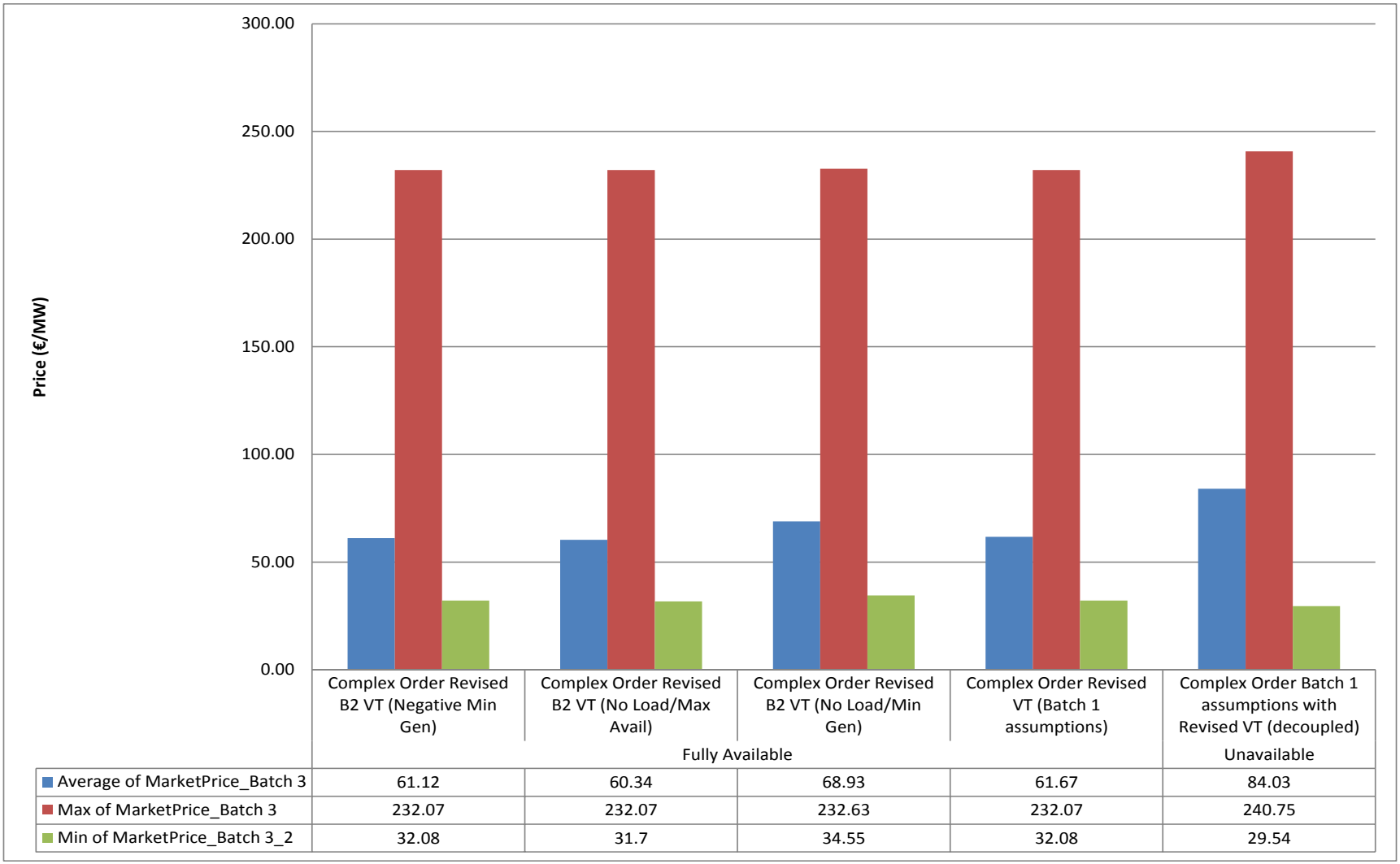
- New release of EUPEMIA (9.3) targeted PRBs:
  - New module to reinsert PRBs
  - PRBs are reinserted to see if they improve welfare
  - This does not work for linked blocks currently
- Information on PRBs is considered owned by the PX:
  - Currently reported on (member only) by EPEX daily
  - Report outlines all blocks and market prices
  - Participants need to work out number of PRBs
- Paradoxical rejection also applies to complex orders (PRMIC)

Batch 3 Results and Analysis

Batch 3 – Objective

- Assess multiple methods of complex orders:
  - Which method led to better pricing outcomes
- Assess linked block methods:
  - Will altering certain outputs improve results in specific circumstances
  - Compare results from altering twin plant assumptions
- Compare linked block and complex orders:
  - Compare results from mixed sets to single sets

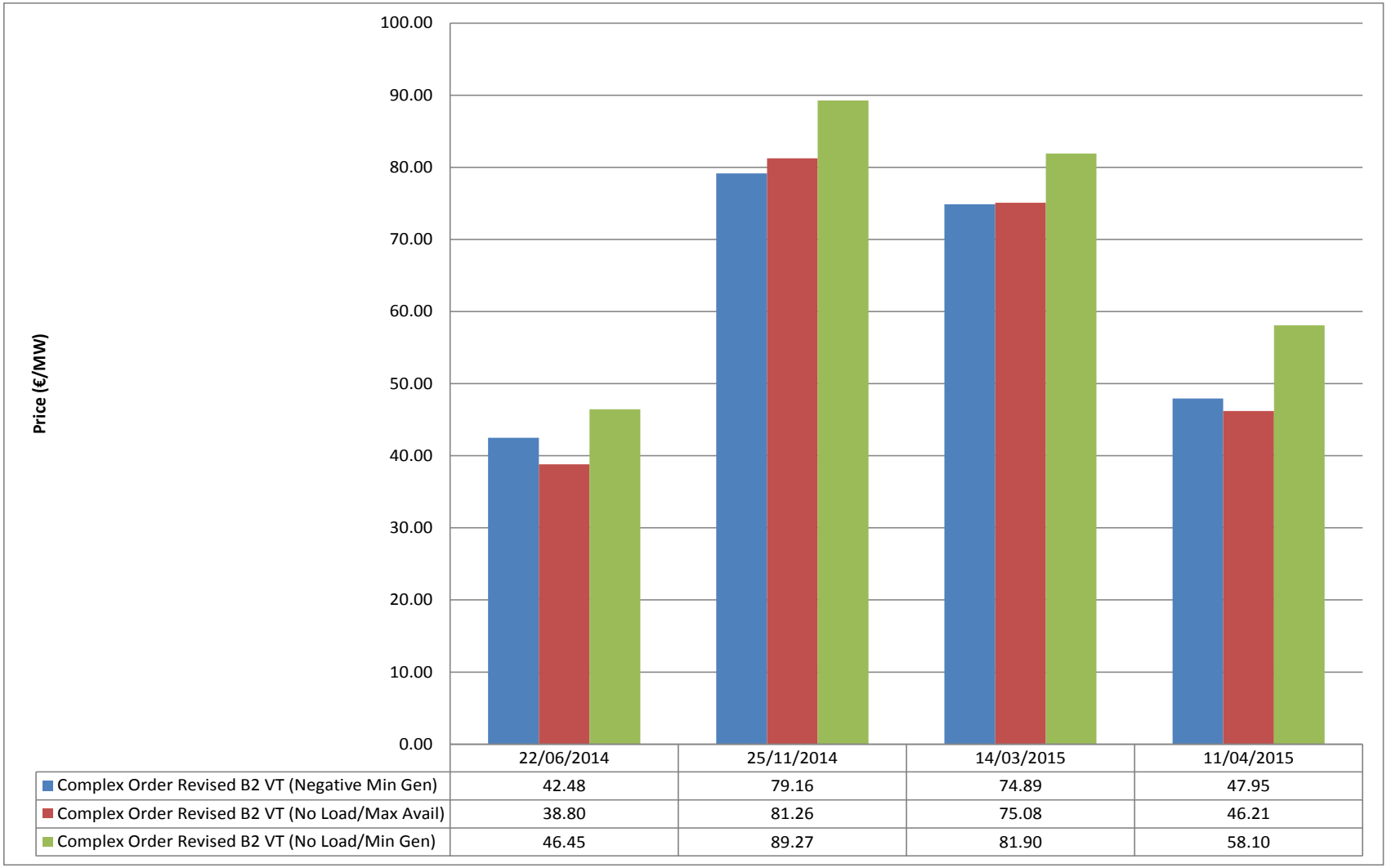
Batch 3 Results – Comparison of Complex Orders



	Complex Order Revised B2 VT (Negative Min Gen)	Complex Order Revised B2 VT (No Load/Max Avail)	Complex Order Revised B2 VT (No Load/Min Gen)	Complex Order Revised VT (Batch 1 assumptions)	Complex Order Batch 1 assumptions with Revised VT (decoupled)
	Fully Available				Unavailable
Average of MarketPrice_Batch 3	61.12	60.34	68.93	61.67	84.03
Max of MarketPrice_Batch 3	232.07	232.07	232.63	232.07	240.75
Min of MarketPrice_Batch 3_2	32.08	31.7	34.55	32.08	29.54

- No load/min gen led to higher average pricing
- Decoupling led to on average 20 – 25 euro increase

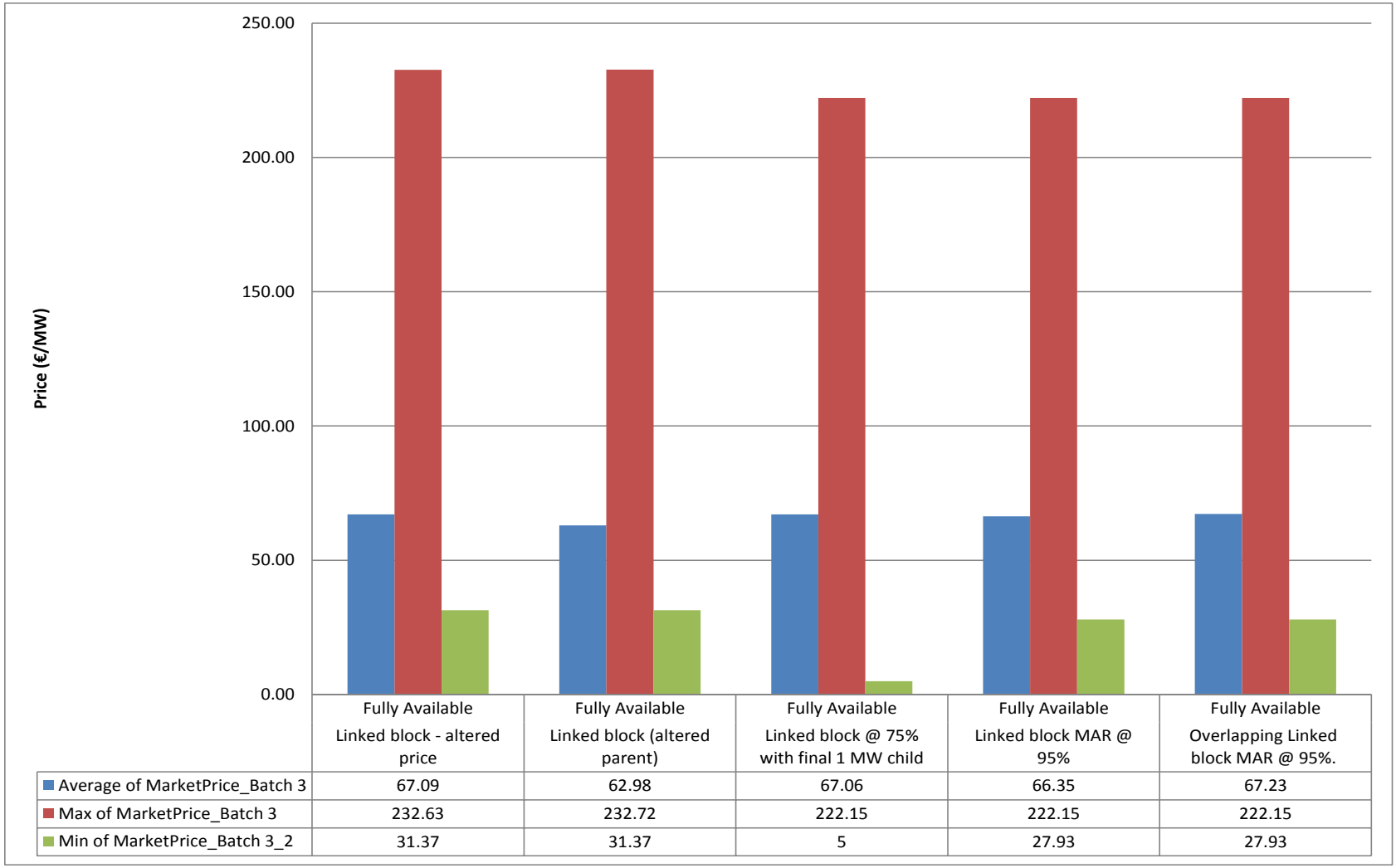
Batch 3 Results – Comparison of Complex Orders (Daily)



	22/06/2014	25/11/2014	14/03/2015	11/04/2015
Complex Order Revised B2 VT (Negative Min Gen)	42.48	79.16	74.89	47.95
Complex Order Revised B2 VT (No Load/Max Avail)	38.80	81.26	75.08	46.21
Complex Order Revised B2 VT (No Load/Min Gen)	46.45	89.27	81.90	58.10

- Inconclusive which gives best result on daily basis
- Advantages of methods apply to different situations

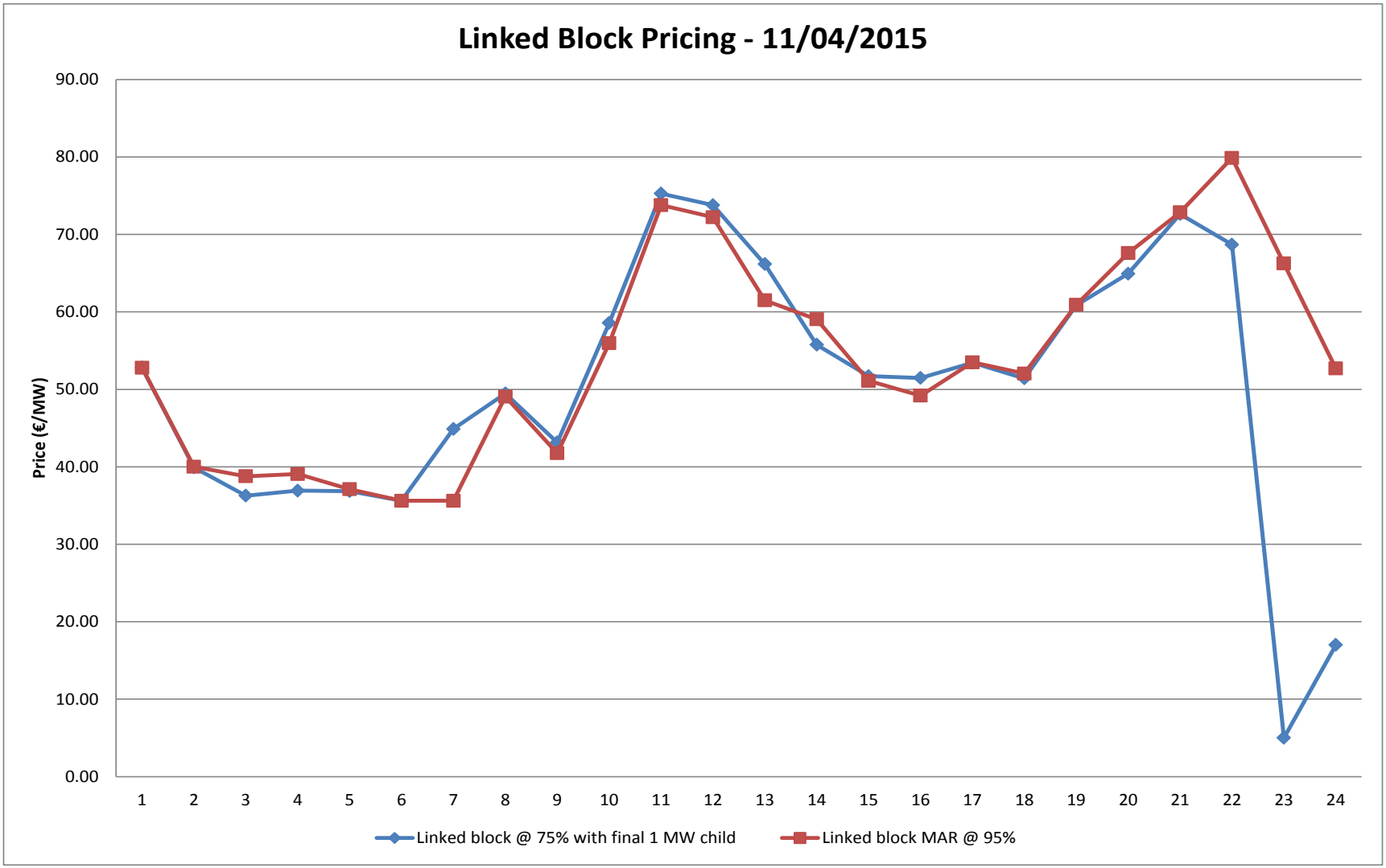
Batch 3 Results – Comparison of Linked Blocks



	Fully Available Linked block - altered price	Fully Available Linked block (altered parent)	Fully Available Linked block @ 75% with final 1 MW child	Fully Available Linked block MAR @ 95%	Fully Available Overlapping Linked block MAR @ 95%.
Average of MarketPrice_Batch 3	67.09	62.98	67.06	66.35	67.23
Max of MarketPrice_Batch 3	232.63	232.72	222.15	222.15	222.15
Min of MarketPrice_Batch 3_2	31.37	31.37	5	27.93	27.93

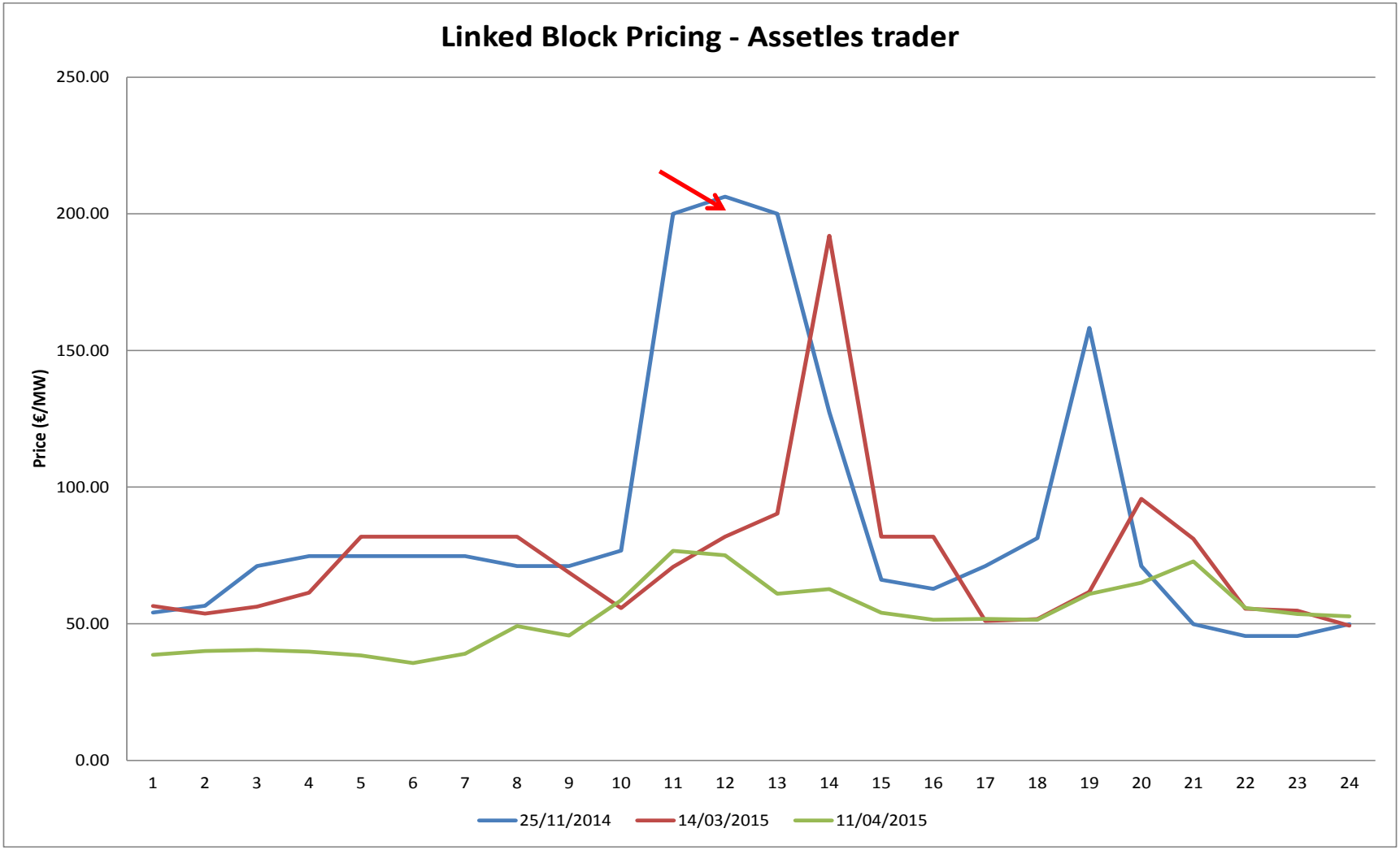
- Most changes did not cause a significant change
- Evidence that altered parent improved pricing

Batch 3 Results – Linked Blocks, Low Price Event



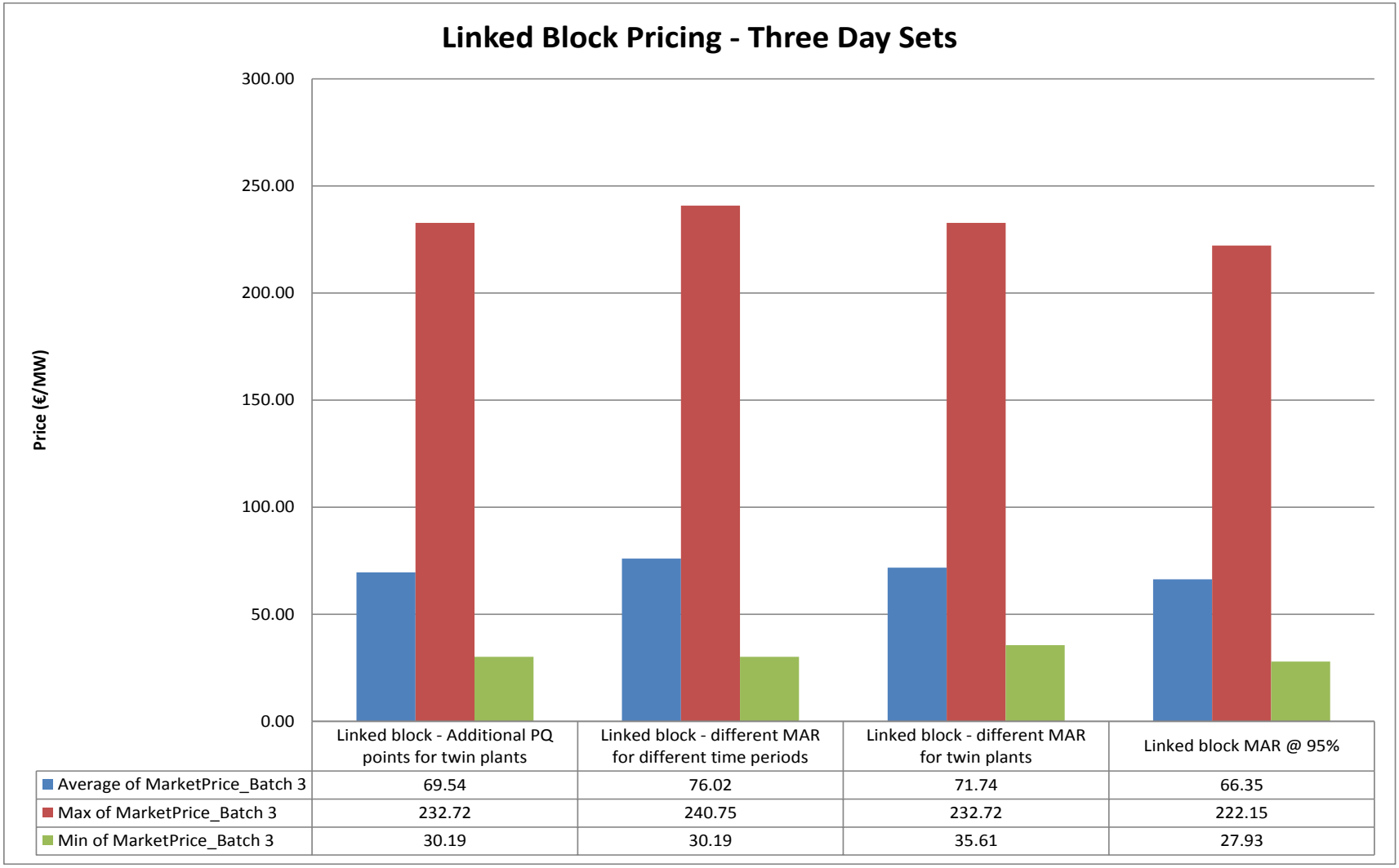
- Low price due to interconnector congestion
- Interconnector hits full export in 75% 1 MW child case

Batch 3 Results – Assetless Trader



- Orders become activated in three periods
- Number of periods linked to price of order

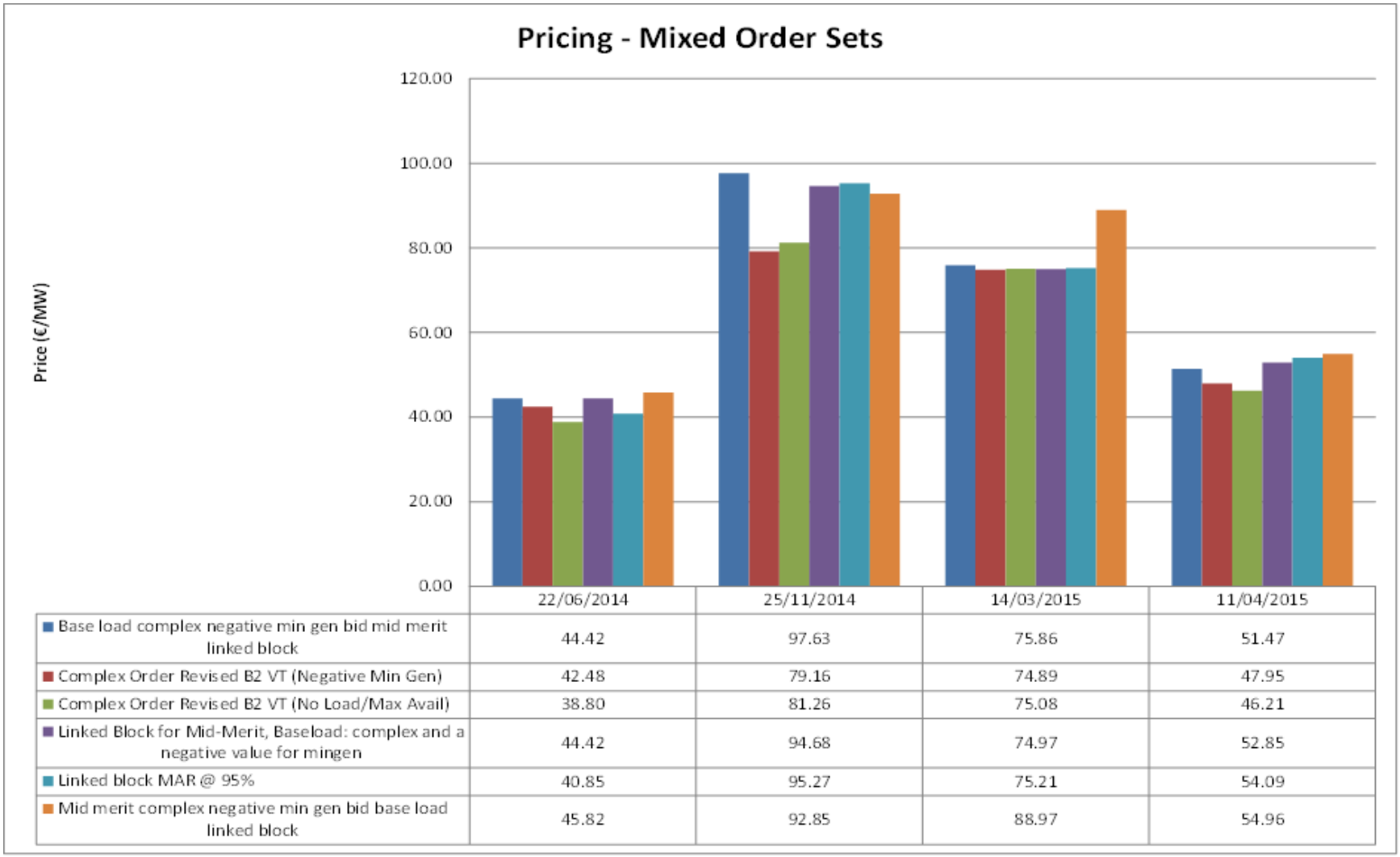
Batch 3 Results – Linked Block Pricing



	Linked block - Additional PQ points for twin plants	Linked block - different MAR for different time periods	Linked block - different MAR for twin plants	Linked block MAR @ 95%
Average of MarketPrice_Batch 3	69.54	76.02	71.74	66.35
Max of MarketPrice_Batch 3	232.72	240.75	232.72	222.15
Min of MarketPrice_Batch 3	30.19	30.19	35.61	27.93

- Altered methods shown above led to price increases

Batch 3 Results – Complex Orders vs. Linked Blocks

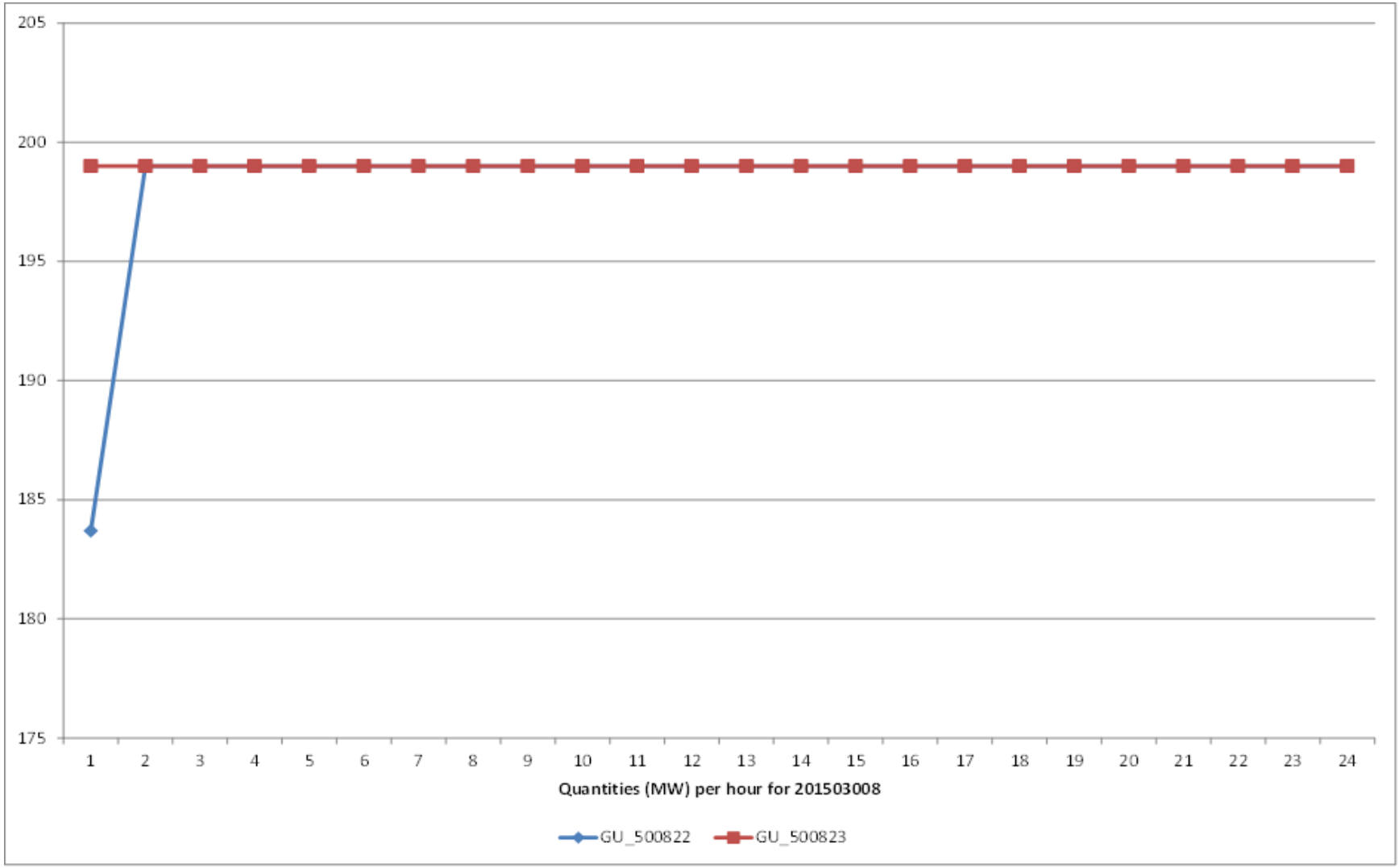


	22/06/2014	25/11/2014	14/03/2015	11/04/2015
Base load complex negative min gen bid mid merit linked block	44.42	97.63	75.86	51.47
Complex Order Revised B2 VT (Negative Min Gen)	42.48	79.16	74.89	47.95
Complex Order Revised B2 VT (No Load/Max Avail)	38.80	81.26	75.08	46.21
Linked Block for Mid-Merit, Baseload: complex and a negative value for mingen	44.42	94.68	74.97	52.85
Linked block MAR @ 95%	40.85	95.27	75.21	54.09
Mid merit complex negative min gen bid base load linked block	45.82	92.85	88.97	54.96

EIRGRID semo Single Electricity Market Operator SONI

- Inconclusive on mixing linked block and complex
- Complex have more stable and lower pricing outcomes

Batch 3 Results – Complex vs LB for Twin Plant



- 500822 using linked block; 500823 using complex
- Scheduling is dependent on assumptions applied

Batch 3 – Summary

- Inconclusive on method for best results with complex:
  - Complex results were poor using no-load/min gen method
  - Unclear between no-load/max gen and neg PQ1 methods
  - Prices meant no difference between -500 and 0 PQ1
- Inconclusive on mix of orders:
  - Mixing improved stability of linked block results
  - Unclear as to whether complex in isolation is better
- Additional complexity did not improve linked block pricing:
  - Additional PQ points; 1 MW child etc.

Batch 4 Trial Script

EIRGRID semo Single Electricity Market Operator SONI

Batch 4 – Feedback on data

- FX rate: NI Units have been converted to € for batch 4

- Heat states: Some units that should have had a “cold” start cost were attributed a “warm” start. This has been corrected in batch 4.
- Hydro units that did not submit an energy limit were omitted from previous batches. Now included in batch 4.
- Indaver omitted from previous batches. Now included in batch 4.

Batch 4 – Objective

- Final scripted trial:
  - Iterative trial based on previous findings
  - Assess the market using standardised assumptions
  - Take account of any recent updates

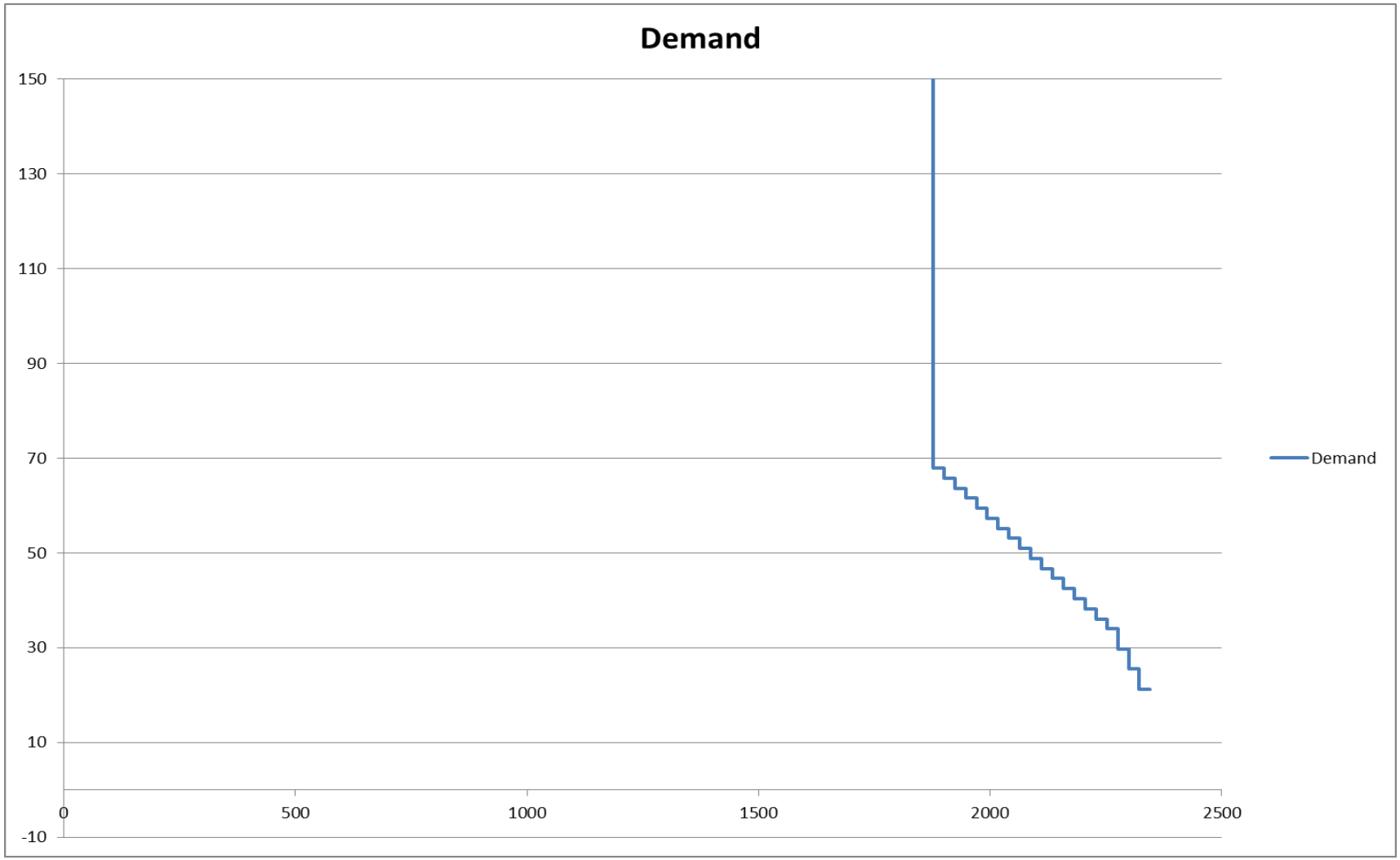
- A number of refinements identified:
  - Alignment of load and wind with GB
  - Further refinement of complex orders
  - Further refinement of demand orders

Batch 4 – Demand Values

- Demand at 20% price making:
  - Maintain price range previously discussed
  - Assess effect of additional volumes
  - Assess effect of more price increments (i.e. broken into multiple steps)

- Half sessions will use price taking demand:
  - Based on working group feedback
  - Feedback asked for significant use of price taking demand
  - Will allow for direct comparison to price making demand

Batch 4 – Demand Values Graph



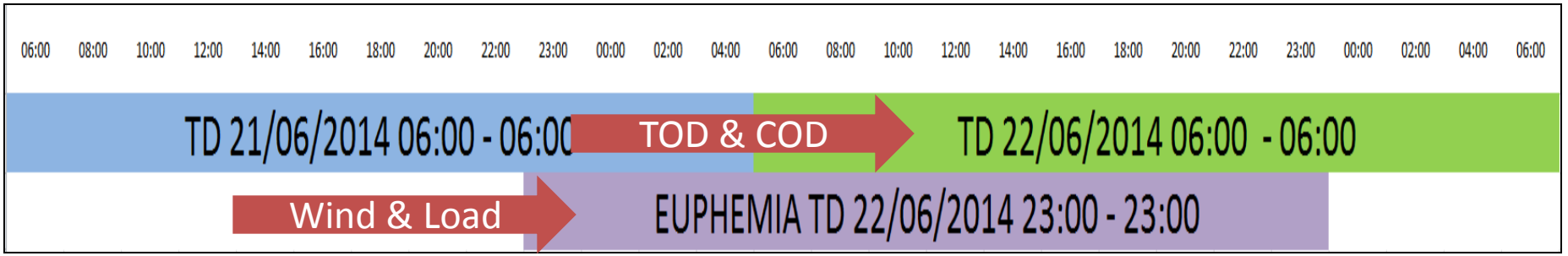
- Smaller price gaps than in batch 3 (more steps)
- Price gaps more sensitive as price increases

Batch 4 – Timeframe alignment

- Trials have been performed on a SEM trading day basis:
  - 06:00 – 06:00
  - Goal was to use single set of TOD and COD
  - Better align with the SEM for initial comparisons

- Other bidding zones running on EUPHEMIA trading day:
  - 23:00 - 23:00 GMT (SEM day 7 hours behind)
  - Causes misalignment of load and wind profiles with GB
  - Potential impact on the accuracy of interconnector flows

Batch 4 – Demand Values Graph



- Wind and load data are aligned with EUPHEMIA:
  - 23:00 (TD-1) – 23:00 (TD)

- TOD and COD aligned with SEM:
  - Single source of data
  - No need to average COD across trading days

Batch 4 – Complex Orders with no VT

- Discussion in PCR on removal of the VT:
  - Related to overall efficiency of the solution
  - Only a discussion at this point – no decision planned
  - Prudent to look at runs which have a zero VT

- Goal is to assess the overall risk:
  - Comparison to runs which use different VT types
  - Assess the overall risk of not including the VT
  - Too little information to assess a strategy for using FT
  - Assumed running cost could be put into the FT (e.g. no loads)
  - Will provide information ahead of the unscripted phase

Batch 4 – Complex Orders mixing strategies

- Two complex order strategies investigated:
  - Altering the PQs to improve scheduling
  - Altering the VT to take account no-load costs

- Goal is to assess if mixing methods provides best results:
  - Altered VT with altered PQ pairs
  - Could give benefits to scheduling and cost recovery
  - Assessment of risk mitigation (risks are always present)

- Goal is to further stress our implementation of complex orders:
  - Want best understanding of the orders ahead of unscripted phase

Batch 4 – SEM Data Comparison

- SEMO to provide data for comparison:
  - Coupled and decoupled data from the SEM
  - Relevant load and wind values will be used
- Usual caveats with performing comparisons apply:
  - EUPHEMIA trial is not a replication exercise
  - Various differences between inputs and algorithms
- Data will be provided as part of trial work:
  - Schedule is being discussed with market operations
  - Will need to work around existing ops for CMS access

Unscripted Phase Arrangements

Unscripted Phase – Feedback

- Proposals sent to participants:
  - Feedback received from multiple parties
  - Feedback useful in determining best approach
  - Final arrangements sent to all unscripted phase participants

- A number of refinements identified:
  - Data provided to participants
  - Minor corrections to template documents
  - Changes to the trial dates

- Request that one trial day has mandatory start up input:
  - SEMO unclear on how to monitor if BCOP is not used

Unscripted Phase – Trial Dates

- Original proposal based on December 2015:
  - Idea was to use the most up to date information available
  - Most up to date SEM and EUPHEMIA topology
  - Based on verbal feedback across training days

- Feedback expressed need for a range of dates:
  - Summer/winter mix
  - Different conditions across seasonal days
  - Some requests for specific dates based on wind profile

- Revised set of dates has been prepared based on feedback

Unscripted Phase – Trial Dates

Date	Condition
27/12/15	Winter Day
02/12/15	Winter Day
09/06/15	Summer Day
01/06/15	Summer Day
04/08/15	Desired Wind Level
11/03/15	Desired Wind Level
17/11/15	Desired Wind Level

- Final dates should allow for a range of conditions
- Seven days will be trialled across four batches:
  - 1A and 1B: inputs by 01/04
  - 2A and 2B: inputs by 29/04

EIRGRID semo Single Electricity Market Operator SONI

Unscripted Phase – Data Provision

- Request to provide additional information:
  - SEM COD and TOD
  - FX rates
  - Commodity prices
  - Provide single source for people's assumptions
- Request to provide example data:
  - Examples of different order types
  - Provide basis for checking inputs before sending to SEMO
- Information will be provided in advance of deadline:
  - Information provided on best endeavours basis

EIRGRID semo Single Electricity Market Operator SONI

Report Arrangements

Report Arrangements - Background

- Report is the final output of the EUPHEMIA Trial:
  - Similar to Initial Phase report
  - Will outline assumptions, results and analysis
  - Will be based on WG meeting content (e.g. analysis/slides)

- Report will be written in stages to allow for parallel running:
  - Majority of results/assumptions available by end of March
  - Drafts will be updated as new results become available
  - Drafts will be updated for comments received
  - Periodic reviews are preferred but not mandatory

SEMO Update – Report Review Stages

10/03
- WG Meeting 10
- Batch 4 data executed in EUPHEMIA

01/04
- Working draft 1 of report circulated
- Covers scripted phase and unscripted assumptions

29/04
- Working draft 2 of report circulated
- Updated for comments and unscripted phase 1

Date TBC (Mid-May)
- WG Meeting 12 to agree final comments
- Report published by SEMO 31/05/2016

➢ Suggestions are welcome on timeline outlined

➢ Final date is firm date agreed with RAs

EIRGRID semo Single Electricity Market Operator SONI

Report Arrangements – Final Report

- Report will be published by SEMO:
  - Publicly available on SEMO website
  - Shared with RAs in addition to publication
- Report will be reflective of comments received:
  - All WG comments received will be considered
  - Preference is to receive comments early in the process
  - Early comments will better allow for discussion on points
- Report is expected to have a recommendation:
  - Recommendation will feed into RA decision making on order types

EIRGRID semo Single Electricity Market Operator SONI

Next Steps

Next Steps

- SEMO to release revised unscripted tools:
  - Updated for agreed trial dates
  - Updated following working group comments
  - Screenshot example outputs will be included
- Batch 4 Results:
  - Batch data sent to APX for execution
  - SEMO will provide results as soon as possible
- Interim intraday design:
  - NEMO implementation team looking for participant input
  - Can facilitate calls or meetings to discuss

EIRGRID semo Single Electricity Market Operator SONI

Disclaimer

The information contained herein including without limitation any data in relation to Euphemia test results (the "Information") is provided 'as is' and no representation or warranty of any kind, express or implied, is made in relation to the Information and all such representations or warranties, express or implied, in relation to the Information are hereby excluded to the fullest extent permitted by law. No responsibility, liability or duty of care to you or to any other person in respect of the Information is accepted, and any reliance you or any other person places on the Information is therefore strictly at your own or their own risk. In no event will liability be accepted for any loss or damage including, without limitation, indirect or consequential loss or damage, arising out of or in connection with the use of the Information. By using or relying on the Information, you automatically consent to the terms and conditions of this disclaimer. In the event that the Information is provided by you, in whole or in part, to a third party for whatever reason you shall ensure that this disclaimer is included with the Information and brought to the attention of the third party.

EIRGRID semo Single Electricity Market Operator SONI