DMM Comments and Recommendations on Convergence Bidding Design Options

Eric Hildebrandt, Ph.D.
Department of Market Monitoring

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Market Surveillance Committee
General Session
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Overview

- **Summary of Previous Comments/Recommendations**
- **Additional Comments/Recommendations**
  - LMPM market power mitigation issues
  - Uninstructed deviations
  - Specific level of position limits
- **Illustrative Examples of Nodal Bidding Issues and Concerns**
  - Virtual Demand
  - Virtual Supply
  - Uninstructed Deviations

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Review of Previous DMM Comments/Recommendations

Conclusions (from Nov. 6 MSC Meeting)

- **Convergence bidding is an important market design element that can improve market efficiency.**
- **Convergence bidding at a nodal level creates the potential for market manipulation – design needs careful consideration and strong monitoring and mitigation tools.**
- **Better to start with simple design – LAP Convergence Bidding**
  - Captures most of the benefits of convergence bidding
  - Minimizes potential for nodal price manipulation
  - Provides opportunity for further study of the need and proper design of more granular convergence bidding

Potential Benefits of Convergence Bidding – Primary?

	LAP Design	Nodal Design
Deter strategic load "underscheduling"	Highly effective	Highly effective
Deter implicit virtual demand bidding via load "overscheduling"	Highly effective	Highly effective
Price Convergence at LAP level	Highly effective	Highly effective
Price Convergence at Nodal level	Highly effective (in absence of CAISO modeling errors)	Highly effective (in absence of gaming concerns)

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Potential Benefits of Convergence Bidding – Secondary?

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	LAP Design	Nodal Design
Limits supplier market power.	Limited effectiveness against market power, but avoids potential for increased market power/gaming	Potentially effective, provided highly liquid, competitive virtual bidding at nodes.
Outage hedging m for generators	Limited effectiveness	Highly effective
Generators can schedule in IFM, but earn real time MCP	Limited effectiveness	Highly effective
FTR holders can convert into real time hedge	Limited effectiveness	Highly effective

Key Mitigation Rules

	LAP Design	Nodal Design
CRR Settlement Rule	Probably not needed	Essential
Position Limits	Probably not needed	May be very important to start with relatively low limits (e.g. 10% of load/capacity at each node)
Ability to limit or suspend trading	Limited need	High need
Provisions to deter Uninstructed Deviations	Probably not needed	High need
Local Market Power Mitigation Modifications	May not be needed	May be needed – needs careful review

Monitoring Issues/Tools

- **Flagging of Convergence Bids**
- **Ability to Re-Run the DA Market**
  - Routine, daily counterfactual re-run of the DA Market excluding convergence bids
    - Convergence (or divergence) of DA and RT prices
    - Large or persistent losses
    - Impacts of each participant's convergence bidding on prices, congestion, and their net profits
- **Ability to Re-Run Settlement Outcomes If Significant Differences in Charges Exist Between Convergence and Physical Bids**
- **Monitoring/analysis of real time impacts and deviations**

Initial and ongoing monitoring needs greatly increase with nodal vs. LAP design

Further DMM Comments/Recommendations

Further DMM Comments/Recommendations

- **Convergence bidding at nodal level involves range of implementation and design issues that must be addressed in more detail.**
- **Key market power mitigation issues/concerns that should be addressed in more detail include:**
  - Treatment of virtual bids in LMPM process
  - Ability of generators to effect real time prices through uninstructed deviations
  - Specific level of position limits
- **Remainder of this presentation provides framework for further discussion and analysis of these issues.**

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Local Market Power Mitigation under Nodal Convergence Bidding

- **Mitigation of virtual supply bids under LMPM provisions appears to be infeasible/highly problematic**
  - No cost basis for setting Default Energy Bids (DEBs) for virtual bids
  - Approach based on previously submitted bids or market prices would highly problematic:
    - Could be circumvented, and/or
    - Would defeat concept of virtual bidding (bidding based on system/market expectations, risk mitigation, etc.)
- **Key questions appears to be how to treat virtual bids in pre-IFM LMPM mitigation**
  - Include virtual (like other ISOs) or exclude?
  - Physical demand vs. demand forecast

Pre-IFM Local Market Power Mitigation
Partial Range of Options

	Forecast Load	Physical Load Bids	Physical Supply Bids	Virtual Load Bids	Virtual Supply Bids
Current	✓		✓		
FERC Req.		✓	✓		
Option 1		✓	✓	✓	✓
Option 2	✓		✓		
Option 3	✓		✓	✓	✓

Further analysis need of options needed

Uninstructed Deviations by Generators

- **Generator's ability to deviate below dispatch level could be used to circumvent LMPM (see Example 3 in presentation)**
  - Nodal virtual demand bids could provide generators with tool to greatly leverage this potential "loophole"
  - Cause and impacts of outages and uninstructed deviations extremely difficult to effectively monitor and "police"
- **This problem may be mitigated by:**
  - Explicit penalties/charges on uninstructed deviations
  - Ex-post pricing
  - Relatively tight position limits on virtual demand bidding at specific nodes (e.g. 10% of modal load/supply capacity)
  - More targeted rule tied to potential impact of deviation on virtual demand bid? (e.g. analogous to FTR settlement rule?)

Position Limits

- **If nodal virtual bidding is pursued, DMM has suggested an initial limit of 10% of the load or supply at each node.**
- **Rationale:**
  - 10% level needed to limit ability of any individual supplier to significantly “move price” at one node under most conditions.
  - Assuming a competitive market with at least 4 to 6 highly active participants, 10% limit could still result in approximate level of virtual bidding in other ISOs (e.g. virtual bids = 40 to 60% of physical)
  - Assuming a less competitive market with just one or two highly active participants, 10% limit could still provide some limit on potential gaming/market power concerns
  - 10% level would allow generators significant “hedge” against undergeneration due to outages/operational problems, but would limit ability to profit from these operational problems.

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Illustrative Examples of Nodal Virtual Bidding Issues and Concerns

- **Base Case**
- **Example 1: Virtual demand bidding by generators**
- **Example 2: Virtual supply bidding by generators/other participants**
- **Example 3: Real time uninstructed deviations**

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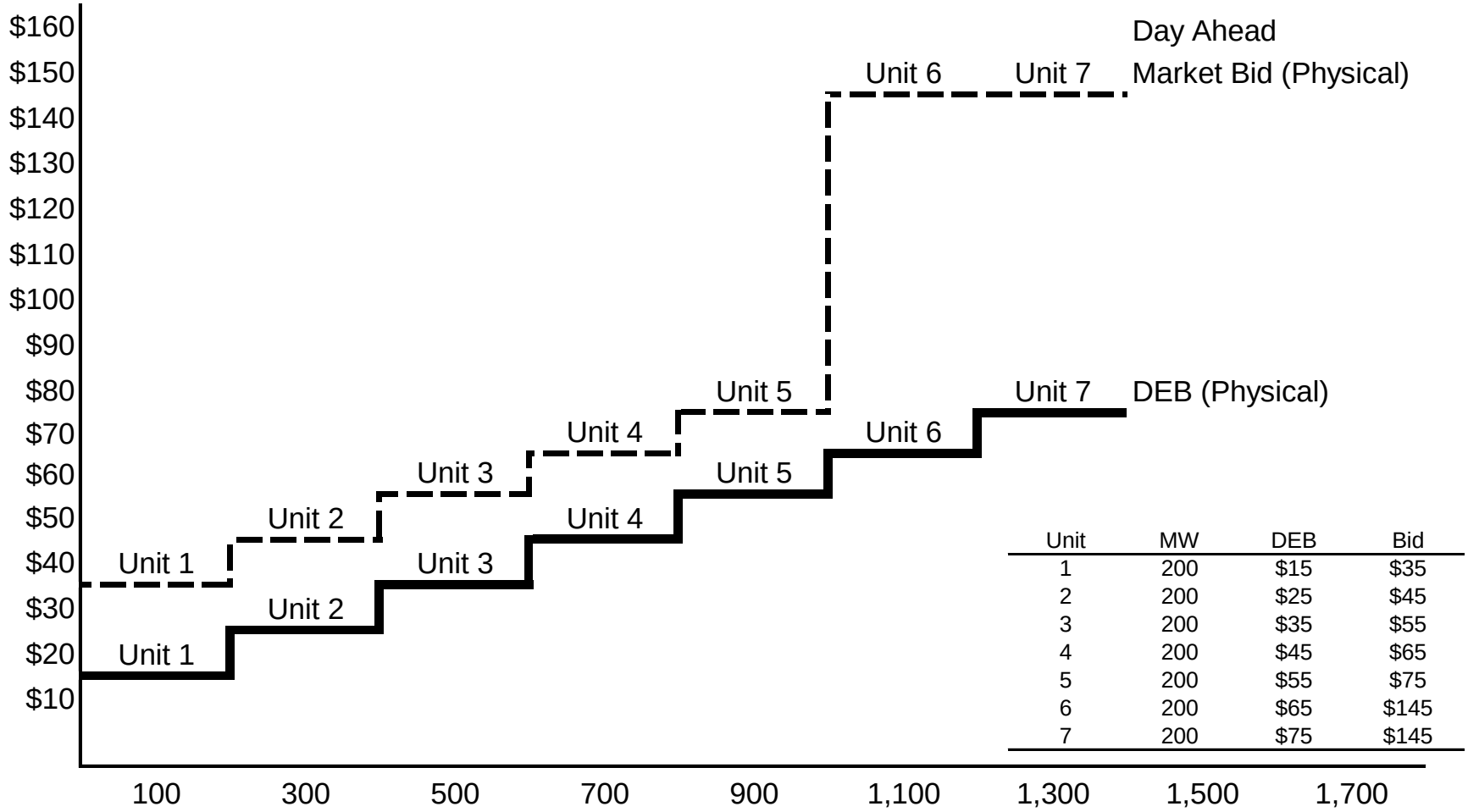
Base Case (no virtual bids)



Unit	MW	DEB	Bid
1	200	$15	$35
2	200	$25	$45
3	200	$35	$55
4	200	$45	$65
5	200	$55	$75
6	200	$65	$145
7	200	$75	$145

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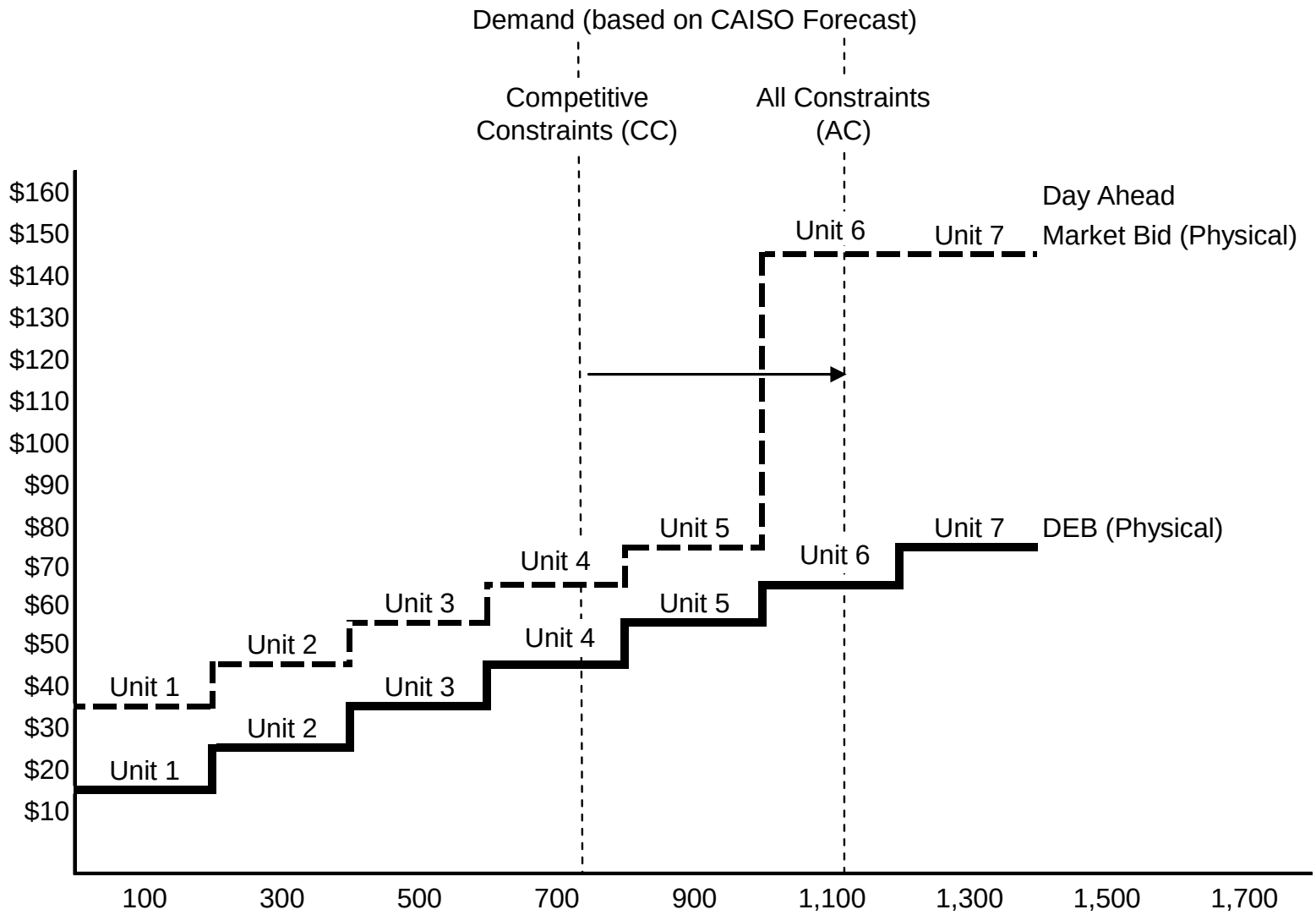
Base Case (no virtual bids)



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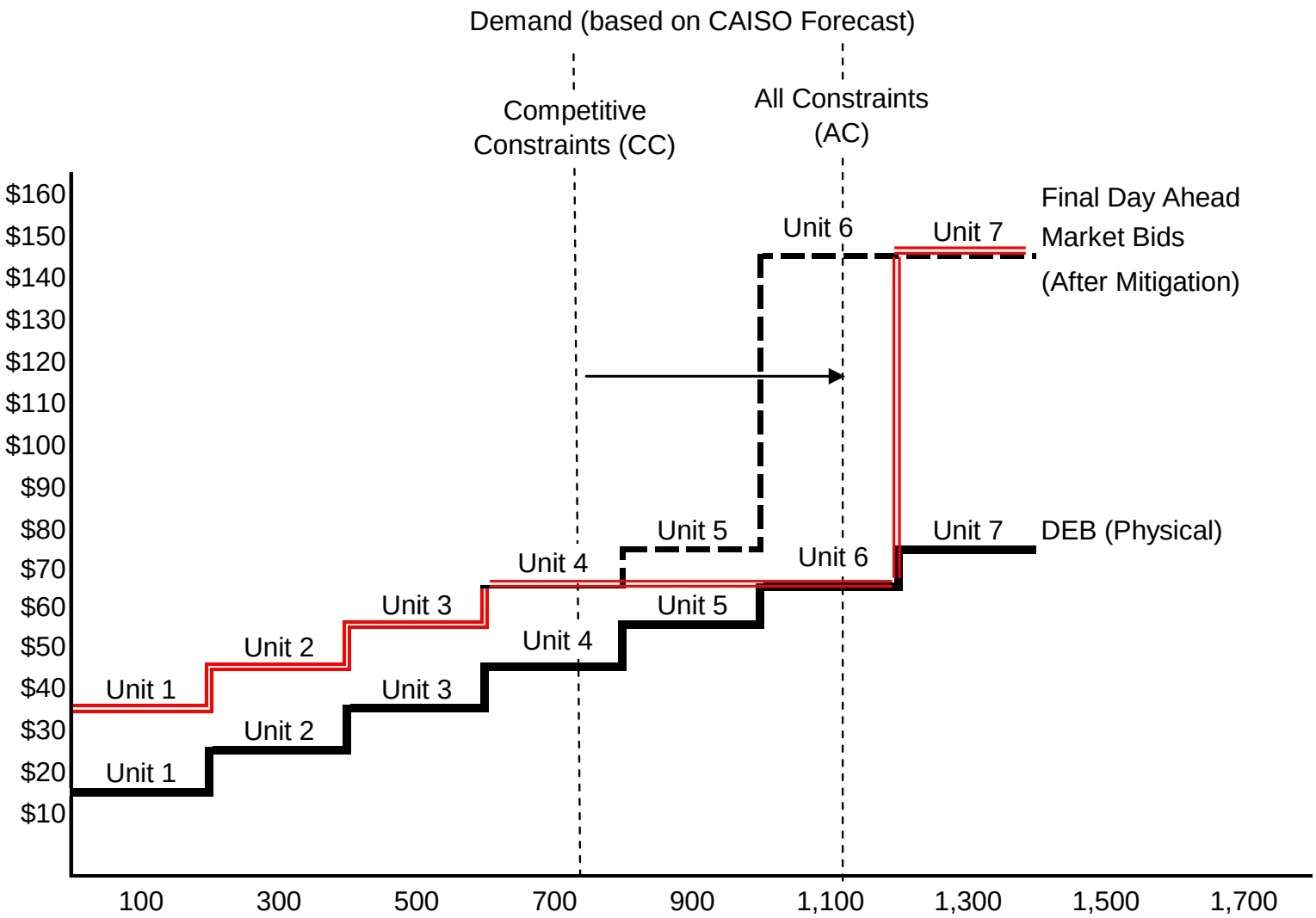
Base Case (no virtual bids)



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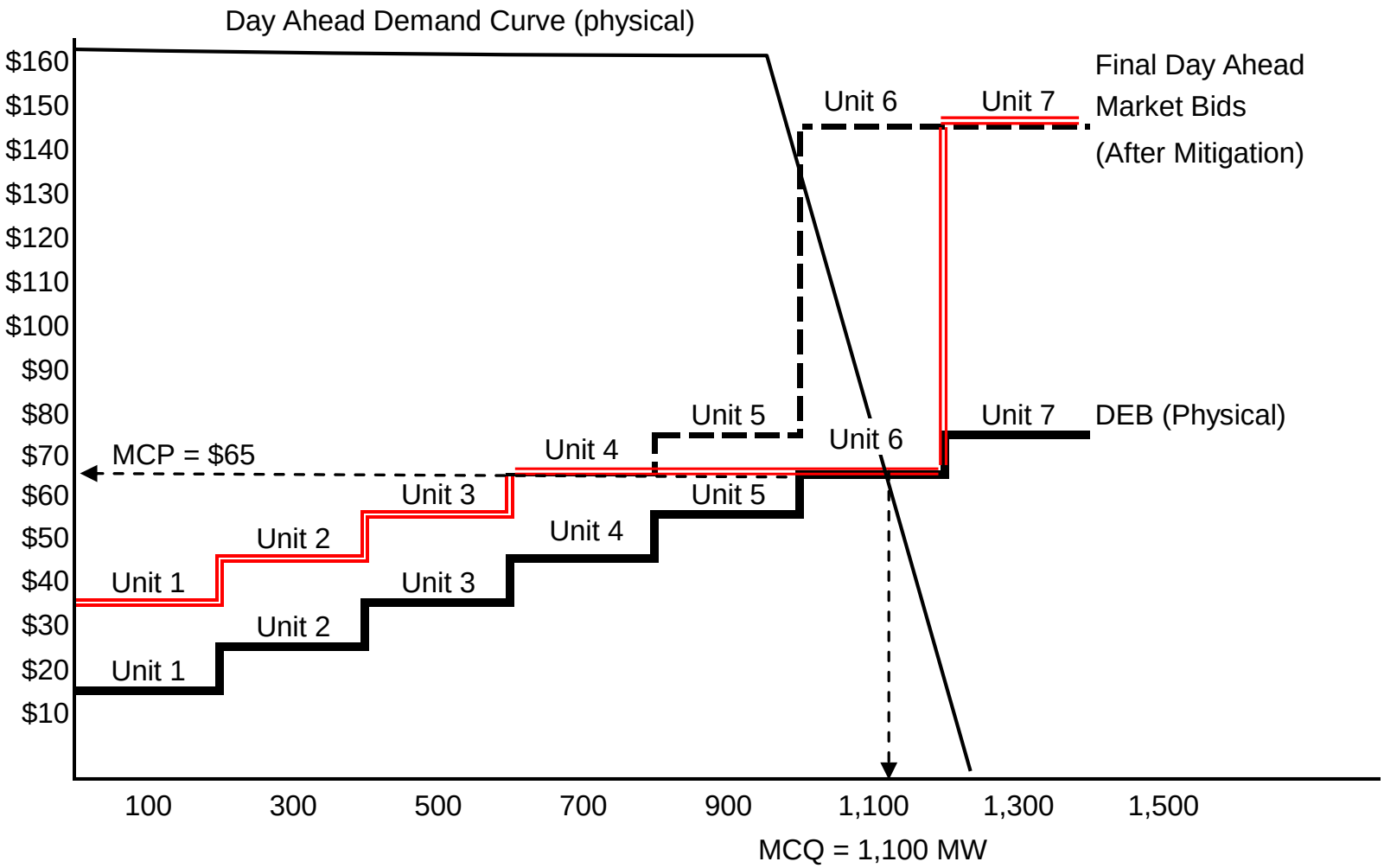
Base Case (no virtual bids)



Generator's Net Revenues
Base Case (no virtual bids)

Day Ahead Market

Unit	MW	DEB	MCP	Net
1	200	$15	$65	$10,000
2	200	$25	$65	$8,000
3	200	$35	$65	$6,000
4	200	$45	$65	$4,000
5	200	$55	$65	$2,000
6	100	$65	$65	$0
7	0	$75	$65	$0
	1,100			$30,000

Example 1: Virtual Demand Bids by Generators

- **Virtual demand bids by generator might be used to circumvent LMPM**
- **Although generator may loose on virtual demand bid, this may be profitable due to increase in revenues from DA sales from generation portfolio**
- **This problems may be mitigated by:**
  - Virtual supply bids from traders
  - Including virtual demand bids in pre-IFM LMPM runs

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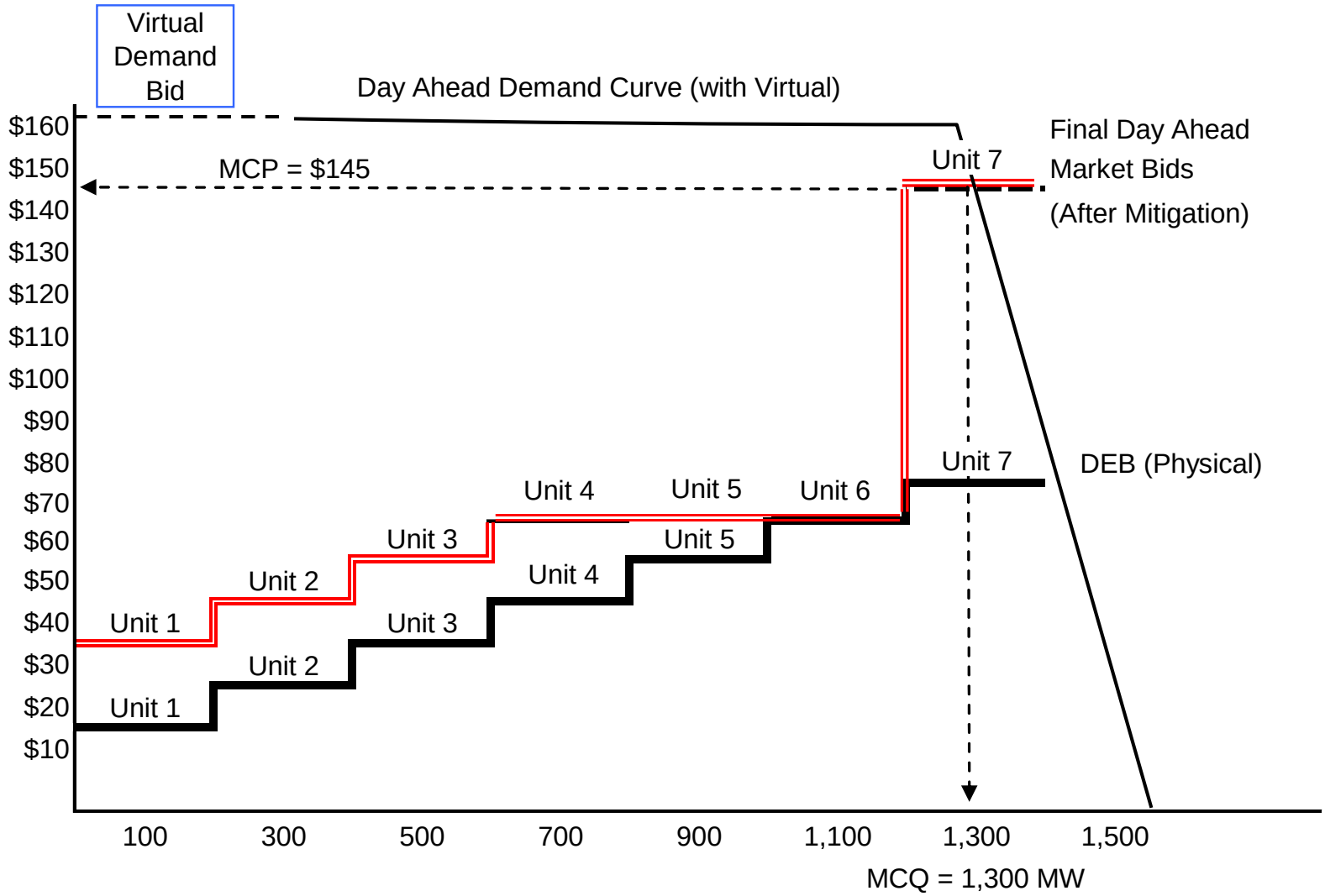
Example 1a: Virtual Demand Bid by Generator



Example 1a: Generator's Net Revenues With Virtual Demand Bid by Generator

Unit	MW	DEB	MCP	Net
1	200	$15	$145	$26,000
2	200	$25	$145	$24,000
3	200	$35	$145	$22,000
4	200	$45	$145	$20,000
5	200	$55	$145	$18,000
6	200	$65	$145	$16,000
7	100	$75	$145	$7,000
	1,300			$133,000

	MW	DA MCP	RT MCP	Net
Virtual Demand	300	$145	$65	-$24,000

Total	$109,000

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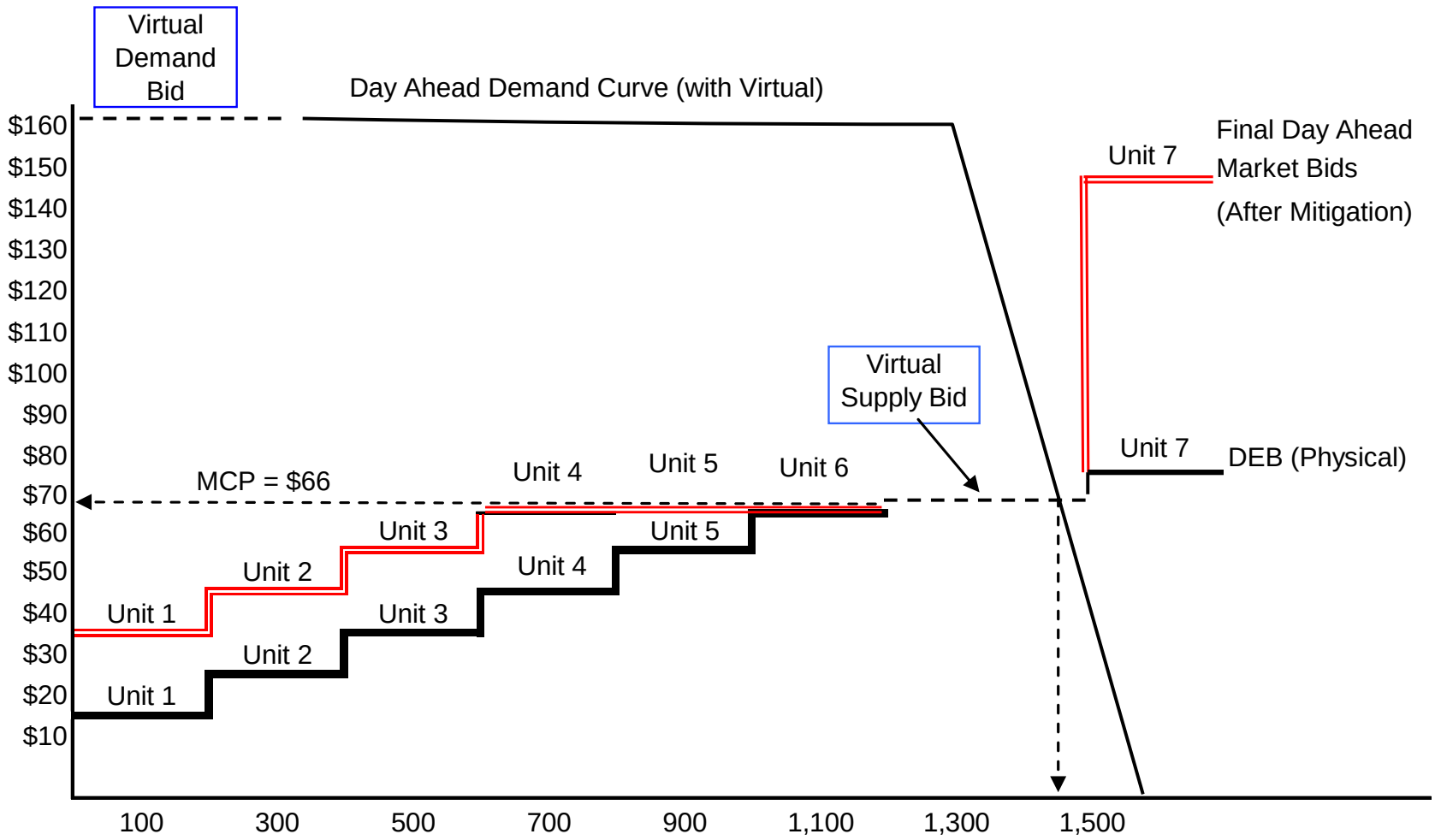
Example 1b: With Virtual Supply Bid by Trader



Example 1b: Generator's Net Revenues After Virtual Supply Bid by Trader

Day Ahead Market

Unit	MW	DEB	MCP	Net
1	200	$15	$66	$10,200
2	200	$25	$66	$8,200
3	200	$35	$66	$6,200
4	200	$45	$66	$4,200
5	200	$55	$66	$2,200
6	200	$65	$66	$200
7	0	$75	$66	$0
	1,200			$31,200

	MW	DA MCP	RT MCP	Net
Virtual Demand	300	$66	$65	-$300
Total				$30,900

* Generator's profits are just over base case of $30,000 due to small increase in DA MCP from $65 to $66 in this example.

Example 2: Virtual Supply Bids by Generators

- **Virtual supply bids by generators (or other participants) might also be used to circumvent LMPM**
- **This problem may be mitigated by:**
  - Lower priced virtual supply bids from traders
  - Excluding virtual supply bids in pre-IFM LMPM runs

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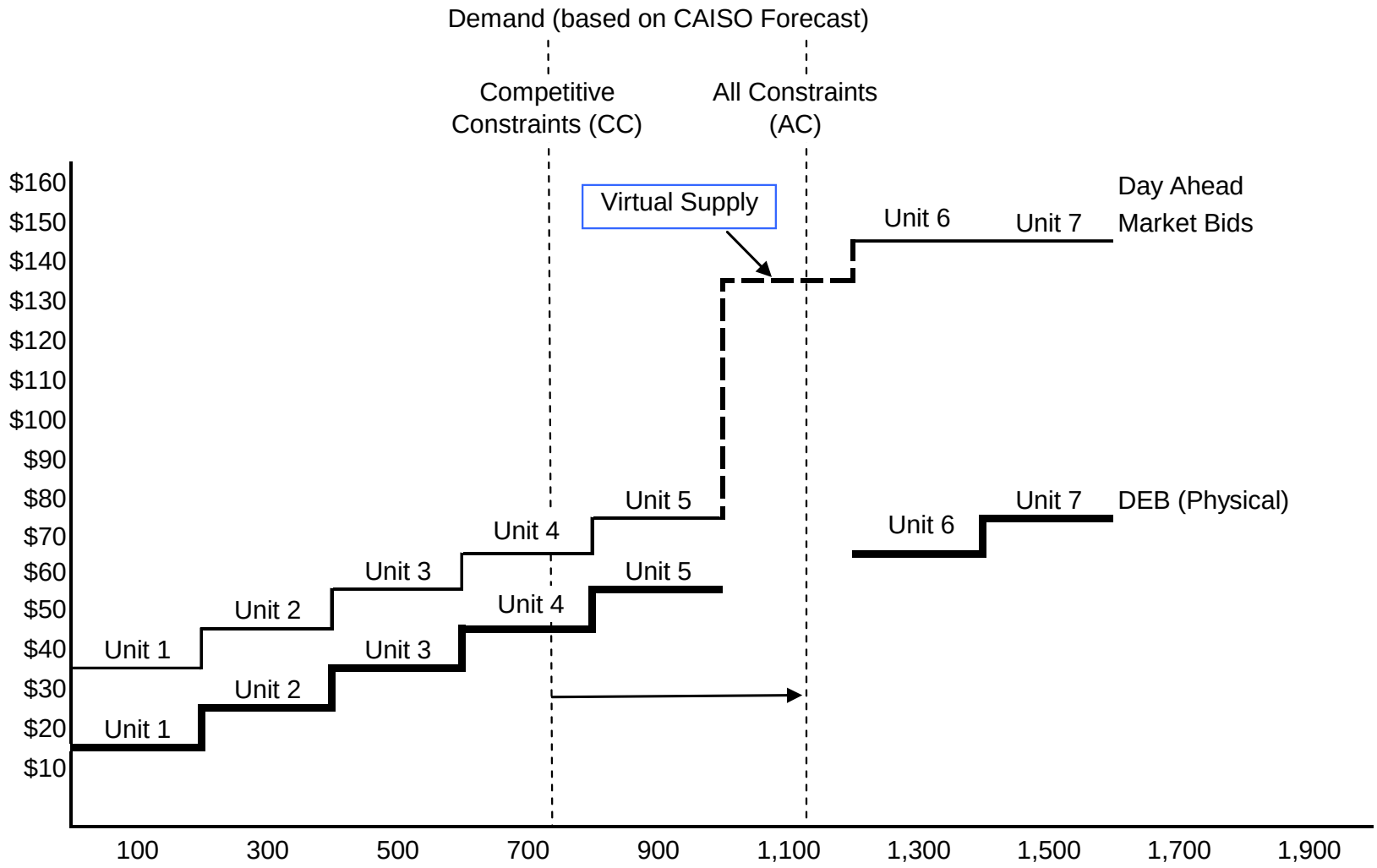
Example 2a: Virtual Supply Bid by Generator



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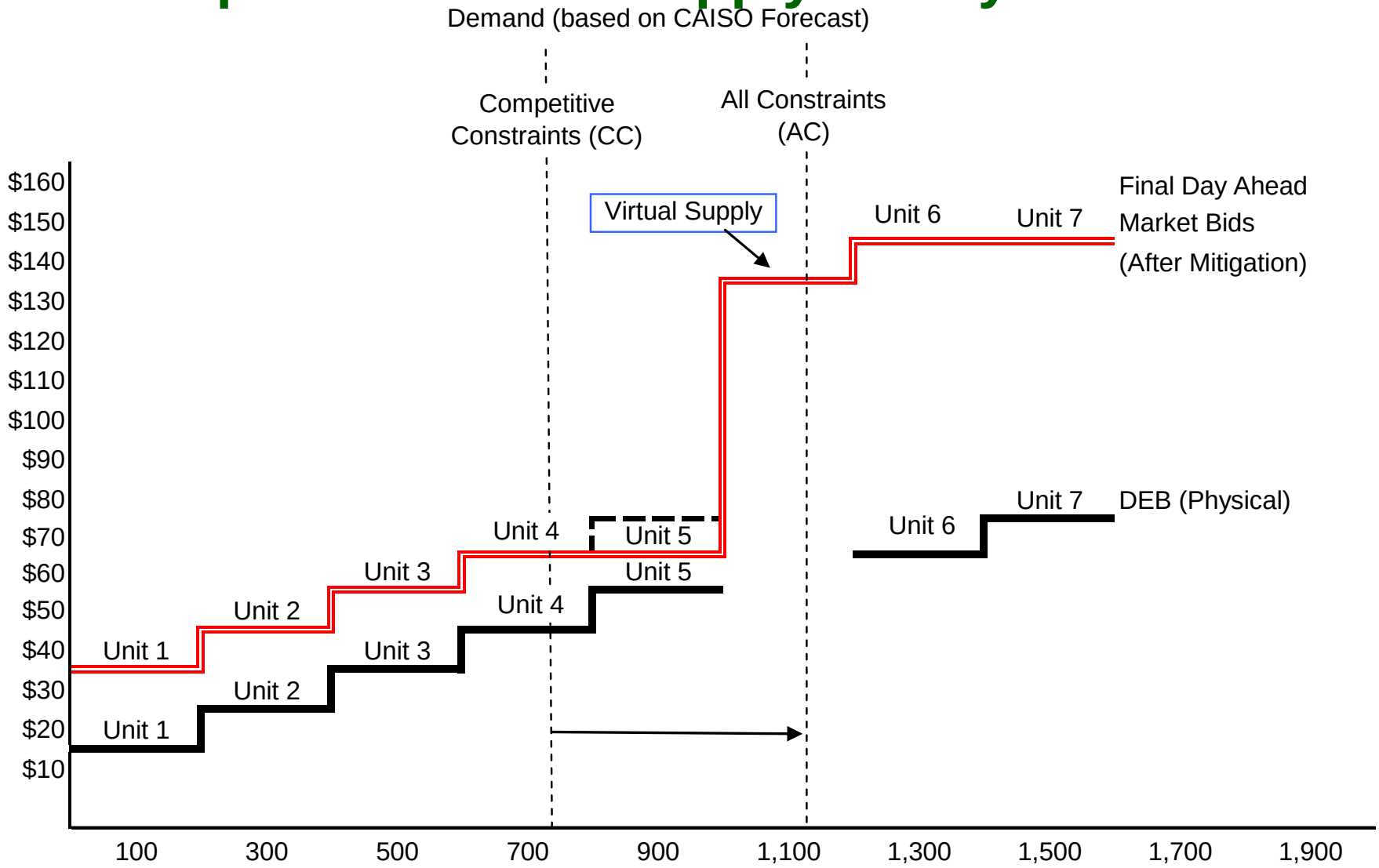
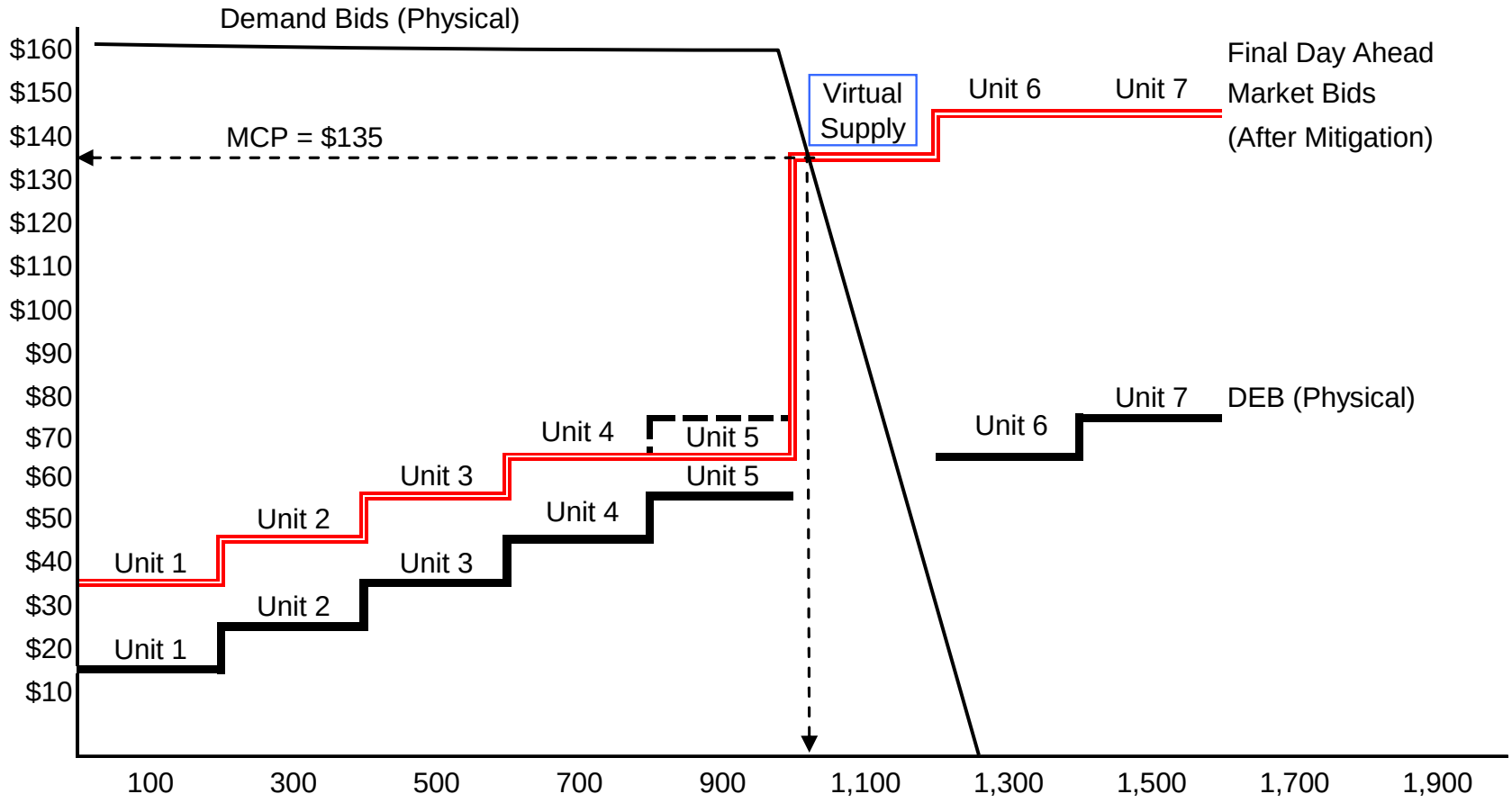
Example 2b: Virtual Supply Bid by Generator



Example 2c: Virtual Supply Bid by Generator



Note: Additional demand not met in IFM is met in RTM. In this example, assume this demand is met by the Unit 6 with DEB $65, so that RTM MCP = $65.

Example 2a: Generator's Net Revenues With Virtual Supply Bid by Generator

Day Ahead Market

Unit	MW	DEB	MCP	Net
1	200	$15	$135	$24,000
2	200	$25	$135	$22,000
3	200	$35	$135	$20,000
4	200	$45	$135	$18,000
5	200	$55	$135	$16,000
6	0	$65	$135	$0
7	0	$75	$135	$0
	1,000			$100,000

	MW	DA MCP	RT MCP	Net
Virtual Supply	25	$135	$65	$1,750

Total	$101,750

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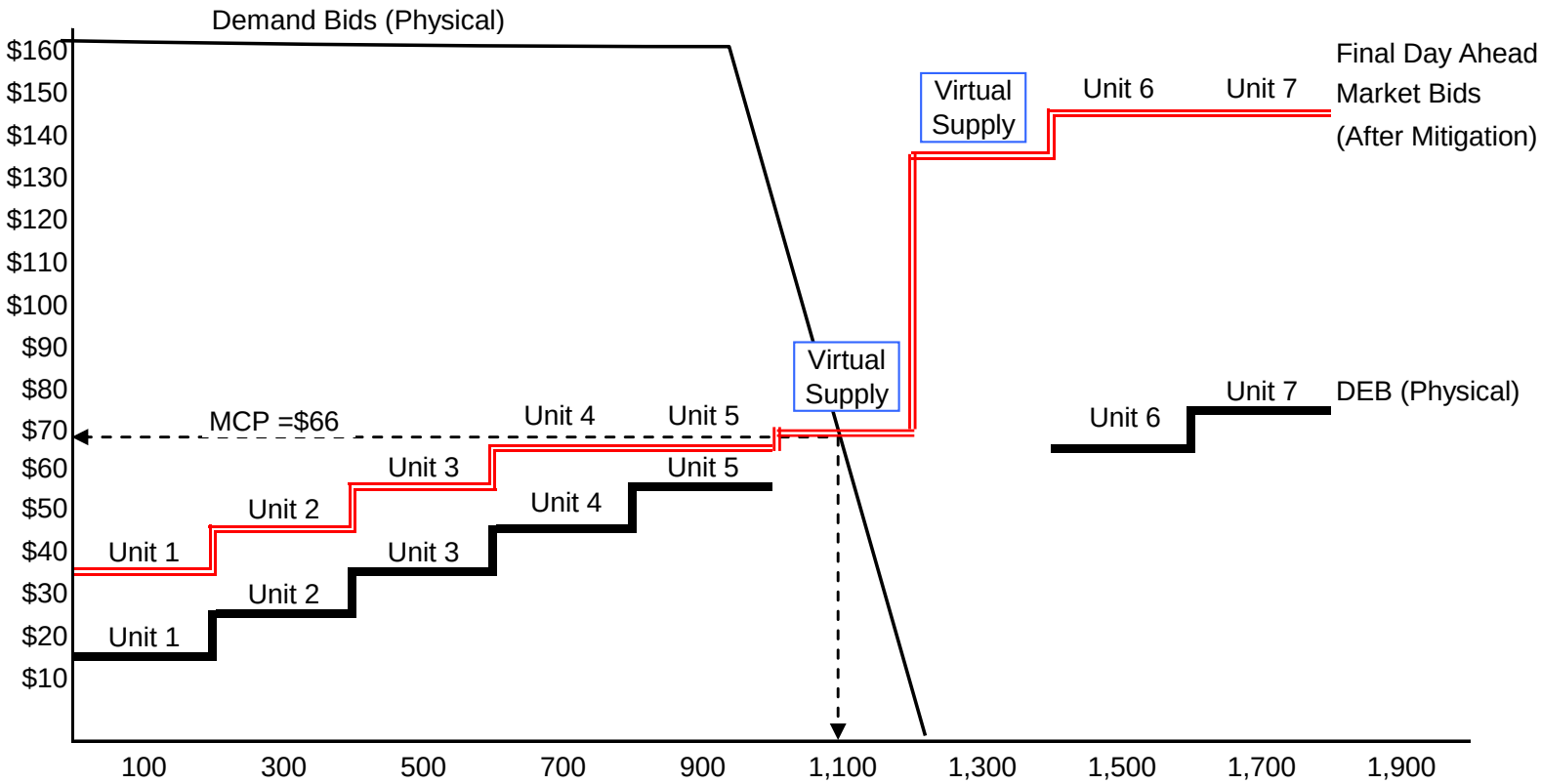
Example 2b: With Lower Priced Virtual Supply Bid by Trader



Example 2b: Generator's Net Revenues after Additional Virtual Supply Bid by Trader

Day Ahead Market

Unit	MW	DEB	MCP	Net
1	200	$15	$66	$10,200
2	200	$25	$66	$8,200
3	200	$35	$66	$6,200
4	200	$45	$66	$4,200
5	200	$55	$66	$2,200
6	0	$65	$66	$0
7	0	$75	$66	$0
	1,000			$31,000

	MW	DA MCP	RT MCP	Net
Virtual Supply	25	$66	$65	$25

Total	$31,025

* Generator's profits are just over base case of $30,000 due to small increase in DA MCP from $65 to $66 in this example.

Example 3: Uninstructed Deviations by Generators

- **Generator's ability to deviate below dispatch level could be used circumvent LMPM**
- **Nodal virtual demand bids could provide generators with tool to greatly leverage this potential "loophole"**
- **Cause and impacts outages and uninstructed deviations extremely difficult to effectively monitor and "police"**
- **This problem may be mitigated by:**
  - Explicit penalties/charges on uninstructed deviations
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  - Relatively tight position limits on virtual demand bidding at specific nodes (e.g. 10% of modal load/supply capacity)
  - More targeted rule tied to potential impact of deviation on virtual demand bid? (e.g. analogous to FTR settlement rule?)

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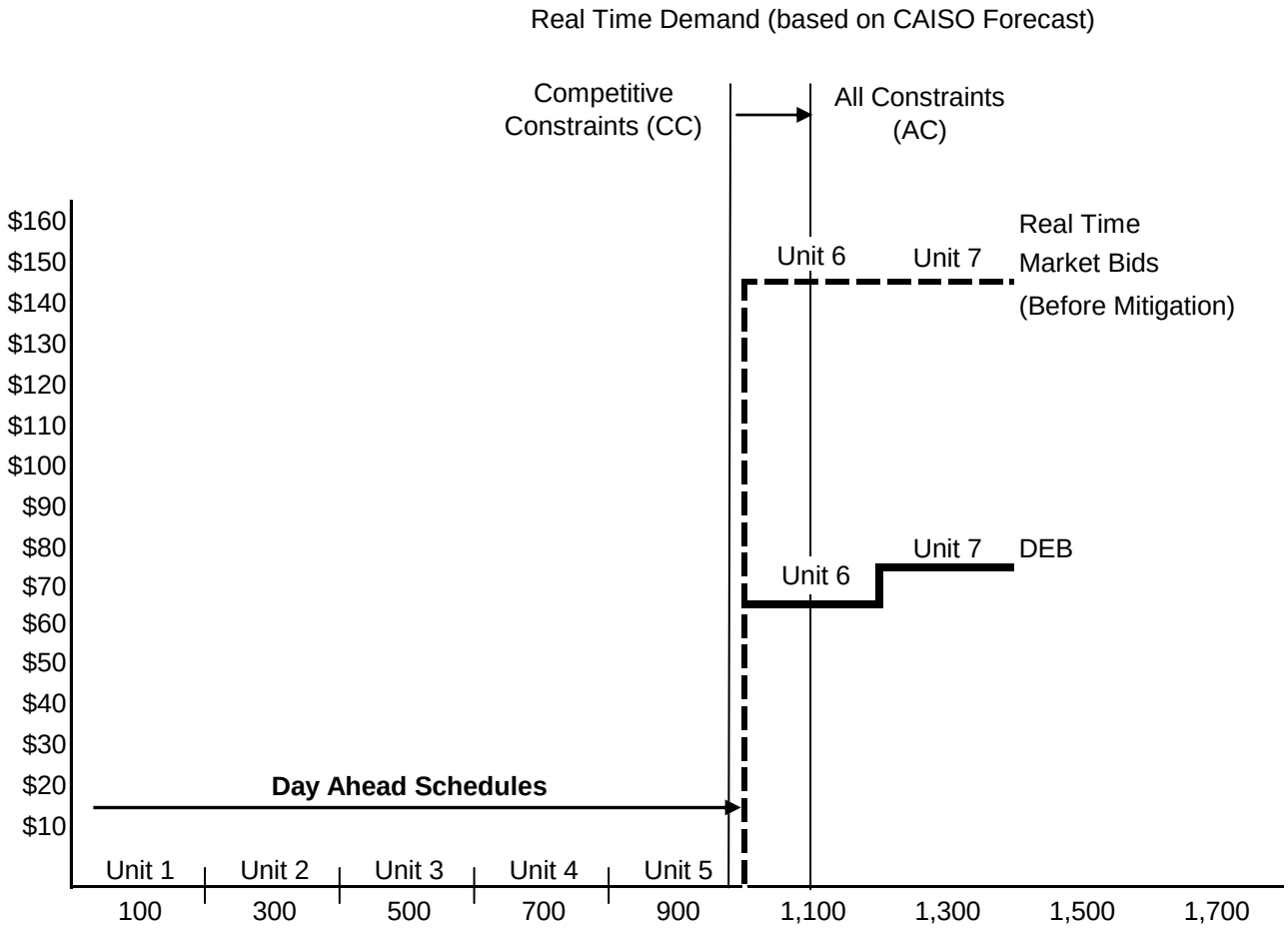
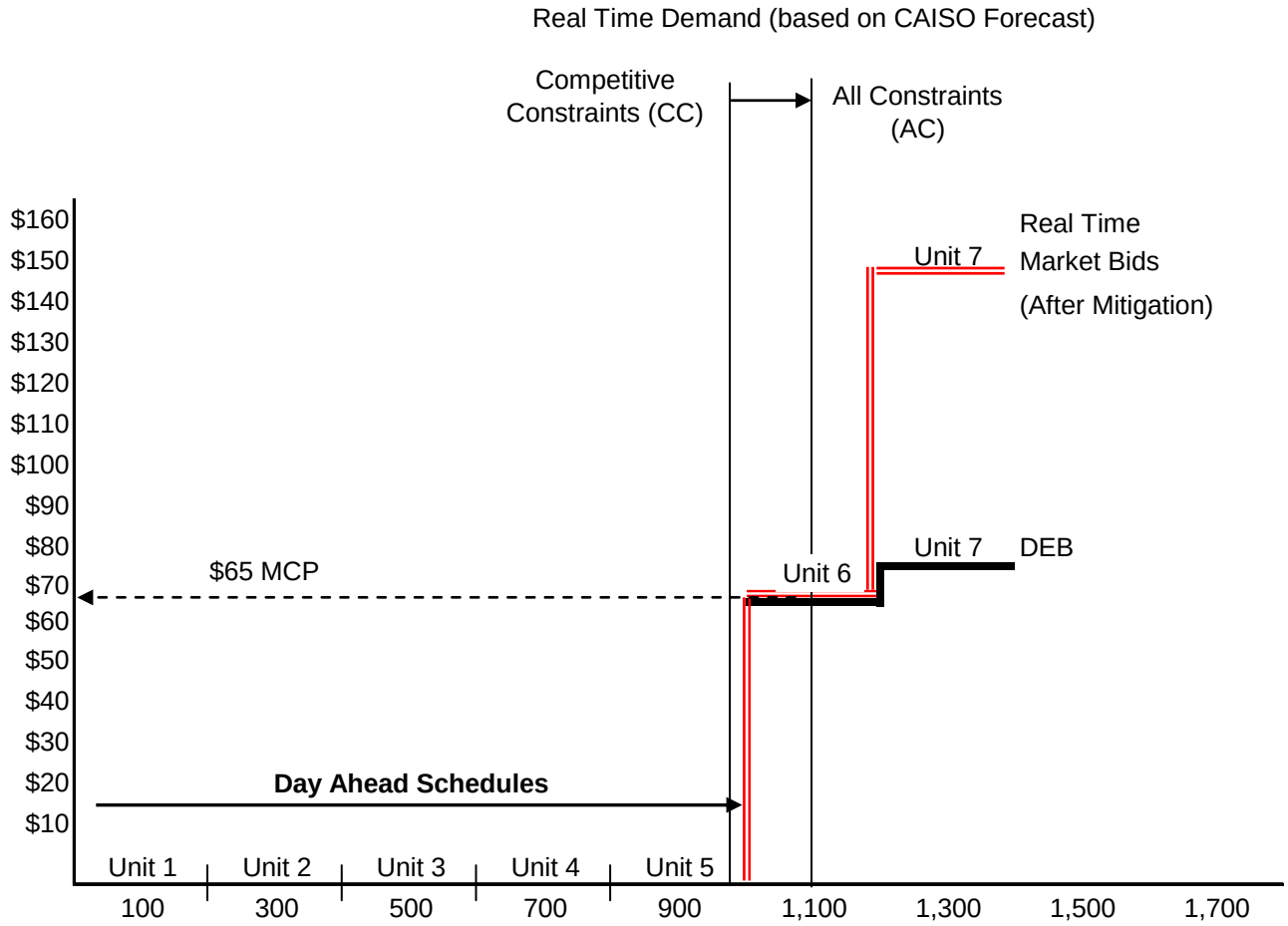
Example 3: Real Time Bid Mitigation



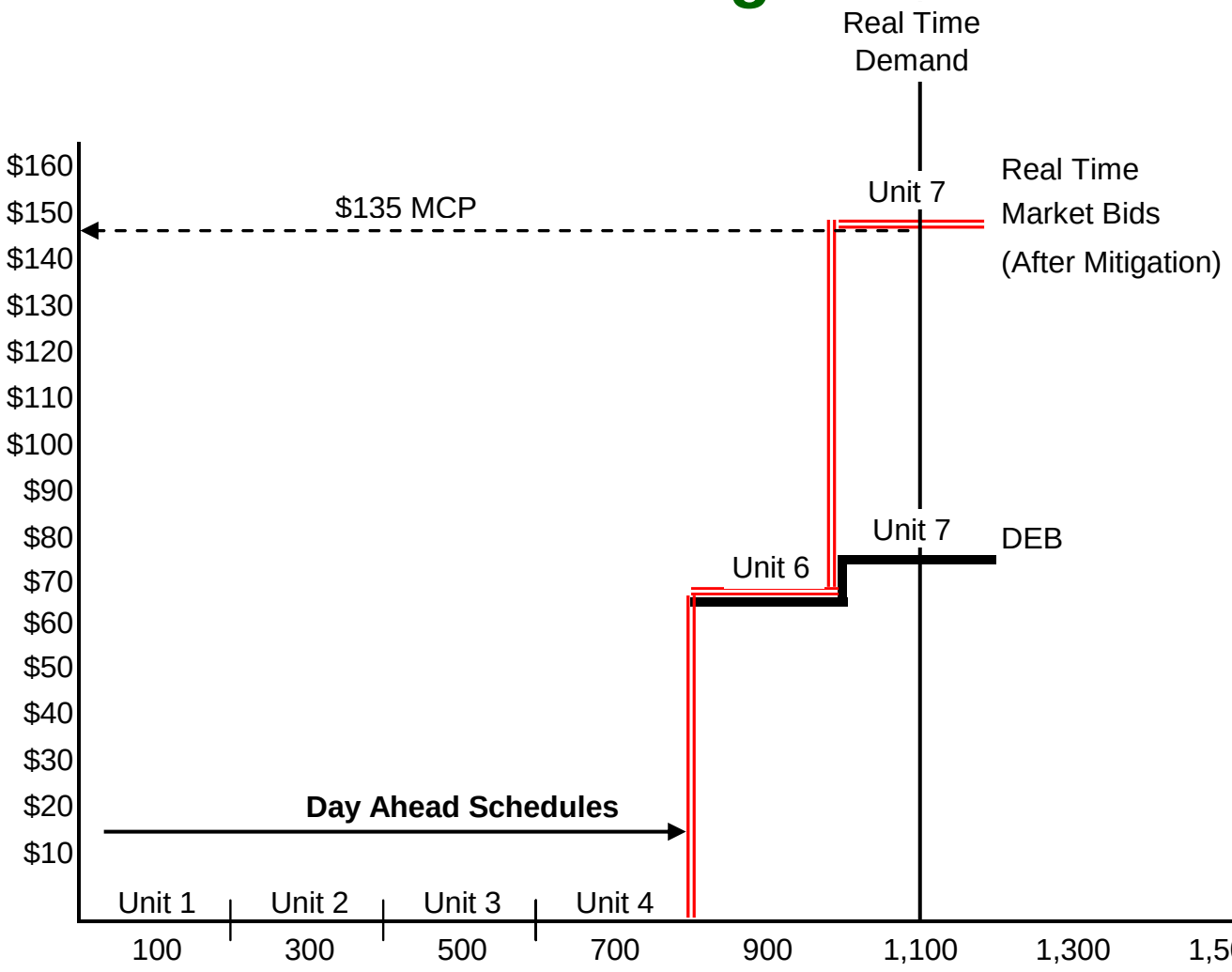
Note: This example extends IFM results shown in Example 2b to show potential impacts of uninstructed deviations in real time market.

Example 3: Real Time Bid Mitigation



Note: This example extends IFM results shown in Example 2b to show potential impacts of uninstructed deviations in real time market.

Scenario 3a: Outage of Unit 5



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Scenario 3a: Outage of Unit 5 Generator's Net Revenues

Day Ahead Market

Unit	MW	DEB	MCP	Net
1	200	$15	$66	$10,200
2	200	$25	$66	$8,200
3	200	$35	$66	$6,200
4	200	$45	$66	$4,200
5	200	$0	$66	$13,200
6	0	$65	$66	$0
7	0	$75	$66	$0
	1,000			$42,000

	MW	DA MCP	RT MCP	Net
Virtual Demand	300	$66	$135	$20,700

Real Time Market

Unit	MW	DEB	MCP	Net
5	-200		$135	-$27,000
6	200	$65	$135	$27,000
7	100	$75	$135	$13,500
	100			$13,500

Grand Total	$76,200

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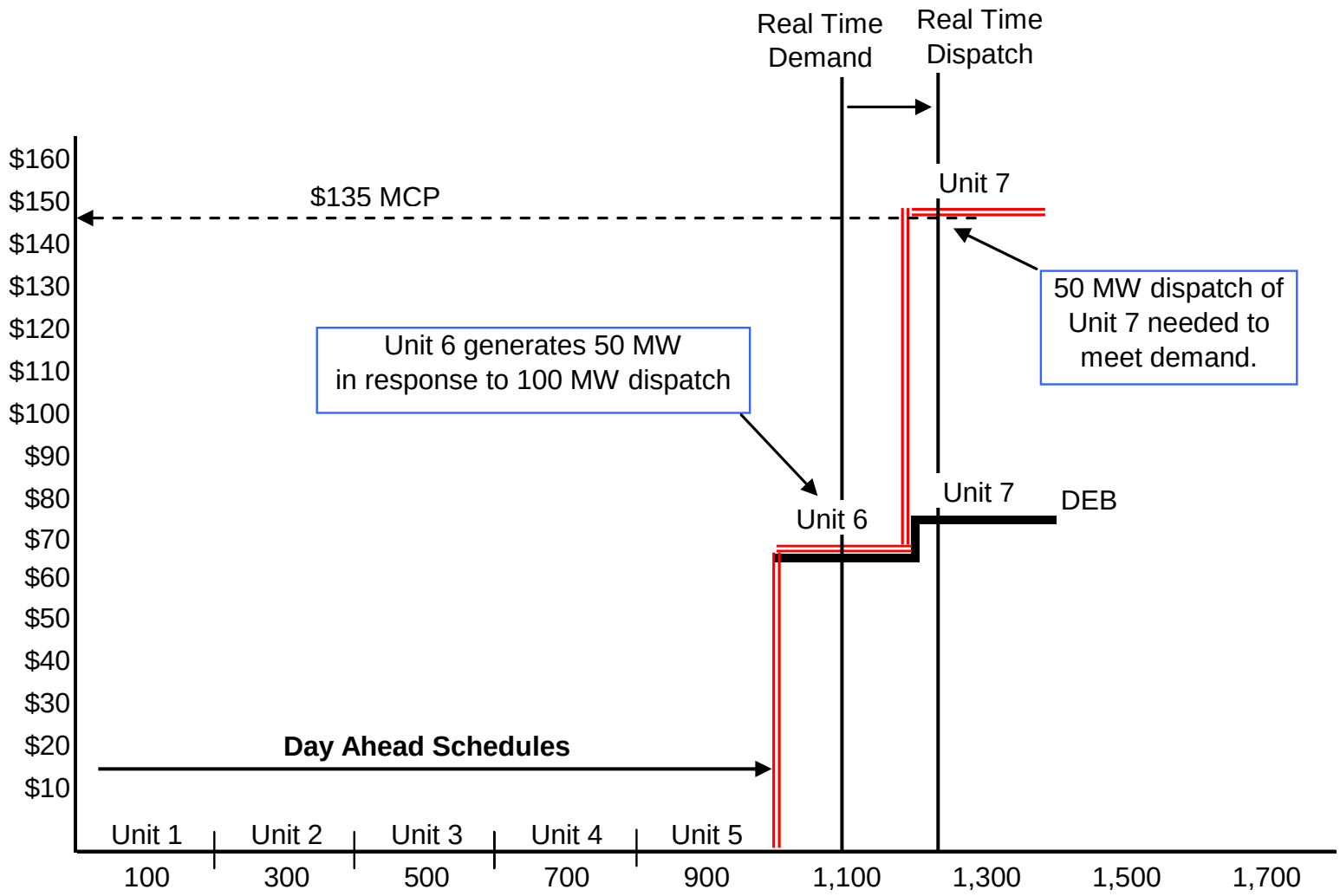
Scenario 3b: Undergeneration by Unit 6 in response to real time dispatch



Scenario 3b: Undergeneration by Unit 6 Generator's Net Revenues

Day Ahead Market

Unit	MW	DEB	MCP	Net
1	200	$15	$66	$10,200
2	200	$25	$66	$8,200
3	200	$35	$66	$6,200
4	200	$45	$66	$4,200
5	200	$55	$66	$2,200
6	0	$65	$66	$0
7	0	$75	$66	$0
	1,000			$31,000

	MW	DA MCP	RT MCP	Net
Virtual Demand	300	$66	$135	$20,700

Real Time Market

Unit	MW	DEB	MCP	Net
6	50	$65	$135	$6,750
7	50	$75	$135	$6,750
	100			$13,500

Grand Total	$65,200