

value

# Trading flexibility on the continuous intraday market

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# Today's speakers on flexibility trading



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# Agenda

Relevance of flexibility trading

Value's solution to the problem

P&L examples

Conclusions



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## ▶ Relevance of flexibility trading

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# Robust, flexible and scalable Volue platform



Energy Trading

55+ TWh

intraday traded every year through  
80M+ algorithmic trades



Production planning

150+ TWh

energy production planned yearly for  
multi-asset portfolios in Europe & Japan

# How do Volue define Flex trading?

Volue's Flex trading concept spans across the power supply value chain

1. Determining the optimal production range with given commitments, incl. DA/hedged positions, reserve obligations, TSO restrictions, etc.
2. Modelling financial conditions for moving within the feasible production range
3. Allocating the flexibility across active markets (here: continuous ID market)
4. Actively monitoring the order book and acting on market opportunities



# Seamless flex trading for multi-asset portfolios



Hydropower

Realise full benefits from advanced hydro modelling through dynamic, in-sync asset marketing



Thermal generation

Maximise asset returns with opportunistic start/stop optimisation, maximizing flex volume while respecting ramping constraints & redispatch calls



Large-scale BESS

Monetise market volatility with complex or hybrid BESS systems, rapidly reacting to order book changes



# Despite increasing RES penetration in Europe, flexible production is nowhere near to vanish



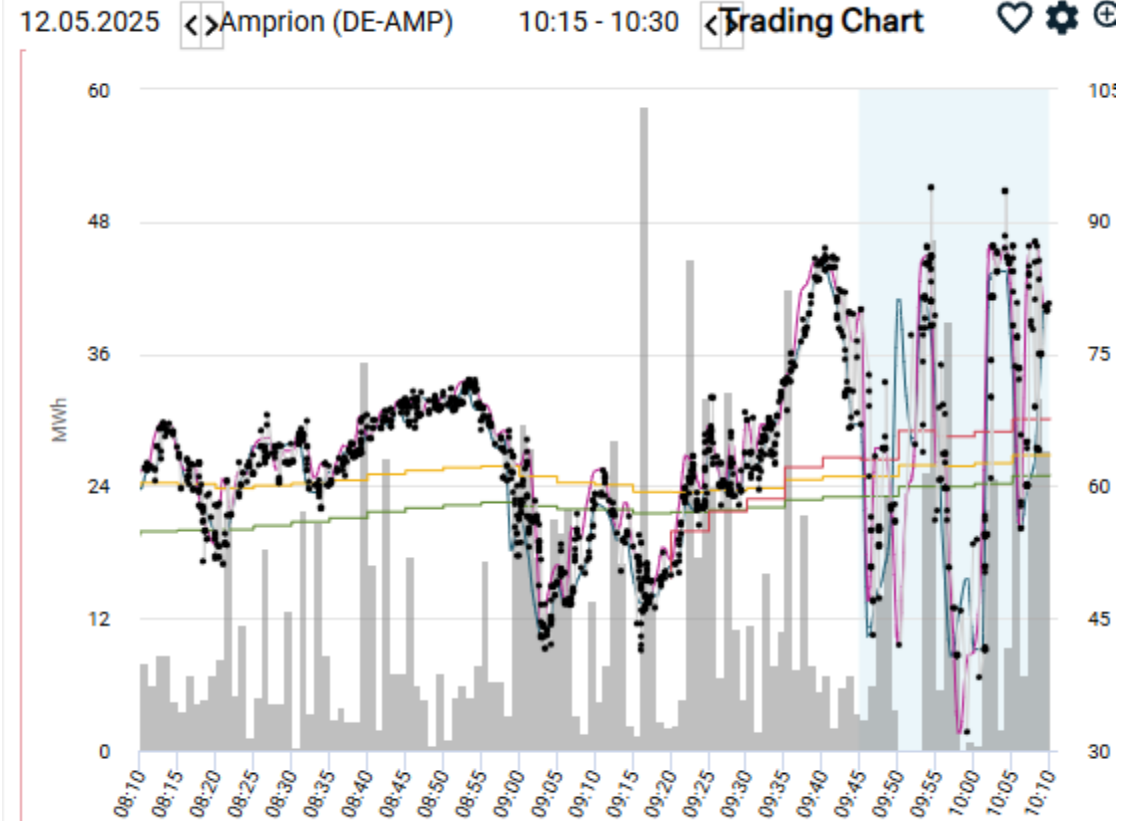
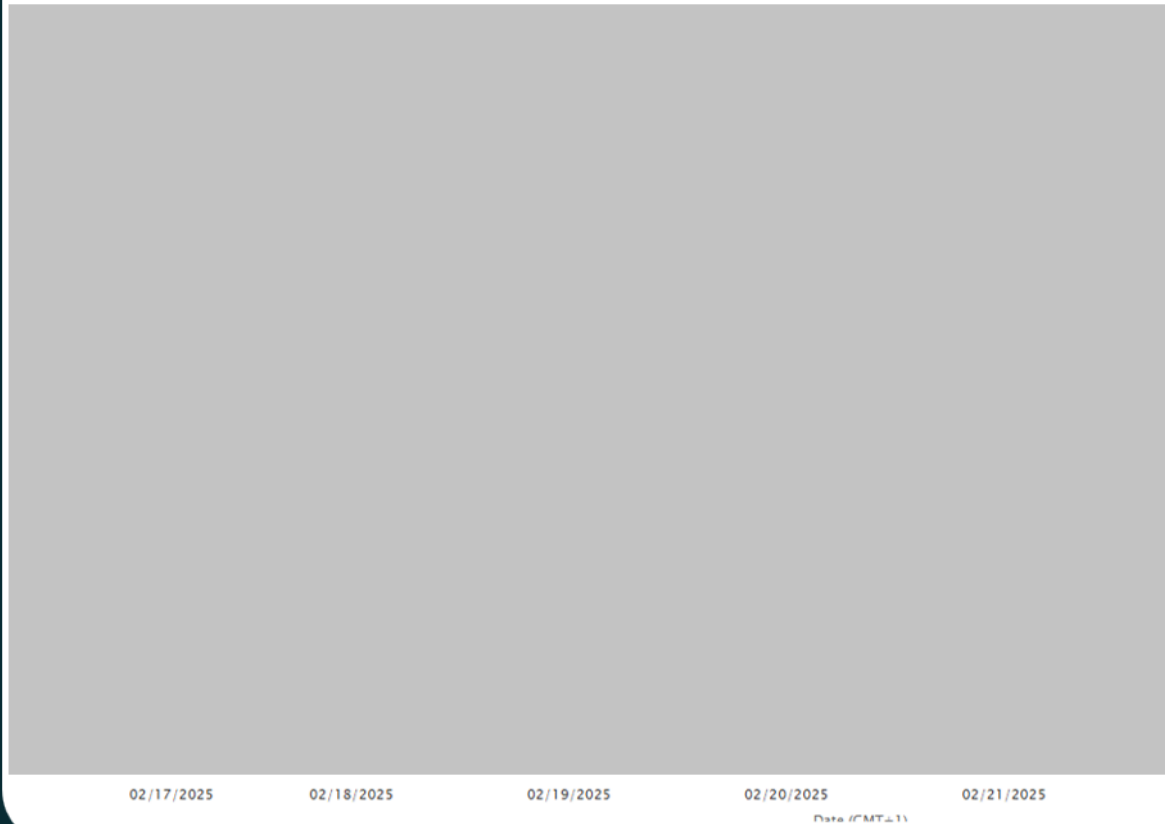
Table 1.5: Development of the Nordic power balance, all figures in TWh/year

Year	Hydro-power	Nuclear	Wind onshore	Wind offshore	Solar power	CHP	Thermal	Consumption	Net exports
2018	212.7	88.1	40.4	2.3	1.3	47.4	11.1	404.6	-1.3
2019	214.3	86.8	44.8	4.6	2.1	47.8	8.7	402.1	7.0
2020	216.0	69.7	51.5	5.3	2.3	44.4	6.0	398.6	-3.4
2021	217.8	74.0	57.7	6.5	2.9	43.9	6.6	406.2	3.2
2022	218.6	74.2	70.5	7.9	4.6	39.4	7.5	385.9	36.8
2023	219.1	79.4	82.6	10.0	6.9	32.3	5.4	385.1	50.7
2024	219.3	79.5	95.0	11.1	10.0	30.0	4.5	391.0	58.5
2025	219.5	81.4	98.5	11.3	12.7	28.4	4.2	406.4	49.6
2026	221.1	82.9	104.2	11.3	15.4	30.5	4.4	424.6	45.2
2027	221.4	84.0	109.0	11.3	18.3	29.7	4.3	444.4	33.6
2028	222.2	84.3	113.9	14.5	21.2	29.2	4.2	466.3	23.2
2029	223.8	84.9	118.8	16.5	24.1	28.9	3.3	483.4	16.9
2030	224.9	86.6	124.4	20.3	26.9	26.9	2.4	500.0	12.4
2031	225.5	86.4	127.1	28.0	29.0	25.7	0.8	511.7	10.9
2032	226.1	86.4	129.6	33.4	30.9	25.3	0.8	523.7	8.9
2033	226.6	86.3	129.6	39.3	32.8	24.4	0.8	532.2	7.7
2034	227.1	85.8	132.5	51.5	34.7	22.8	0.8	540.6	14.7
2035	227.6	85.5	133.7	63.6	36.3	21.2	0.9	548.4	20.5
2036	228.0	85.1	134.9	70.7	38.0	19.5	0.8	553.9	23.1
2037	228.4	92.7	136.2	76.5	39.6	18.3	0.9	559.2	33.3
2038	228.8	100.4	137.4	82.8	41.2	16.9	0.8	564.2	44.0
2039	229.2	99.9	138.7	86.7	42.8	16.1	0.8	568.6	45.7
2040	229.6	99.9	139.8	90.6	44.5	15.3	0.8	574.2	46.3
2041	229.8	100.7	140.3	91.9	46.0	15.8	0.8	579.7	45.6
2042	230.0	102.6	141.3	93.0	46.9	15.9	0.8	584.1	46.4
2043	230.2	104.5	142.1	94.2	47.8	16.0	0.8	588.6	47.1
2044	230.4	106.2	142.7	95.3	48.8	16.0	0.8	592.2	48.0
2045	230.6	106.2	143.0	96.4	49.6	16.0	0.8	596.1	46.6
2046	230.8	106.1	143.8	97.4	50.4	16.1	0.8	599.8	45.6
2047	231.0	106.1	144.6	98.4	51.1	15.9	0.8	603.3	44.6
2048	231.2	106.0	145.4	99.3	51.9	15.7	0.8	606.7	43.6
2049	231.4	106.0	146.1	100.3	52.6	15.8	0.8	610.1	43.0
2050	231.6	106.0	146.9	100.9	53.4	15.9	0.8	612.6	42.9
2051	231.8	105.8	147.7	101.6	54.2	15.8	0.8	615.1	42.5
2052	232.0	105.5	148.4	102.2	54.9	15.5	0.8	617.6	41.8
2053	232.2	105.3	149.2	102.9	55.7	15.2	0.8	620.1	41.1
2054	232.4	105.0	149.9	103.5	56.4	15.1	0.8	622.5	40.6
2055	232.6	105.0	150.7	104.2	57.2	15.1	0.8	625.0	40.5

\*) Adjusted to 2015 conditions  
\*\*) Based on values from weather scenarios 1986-2015

# Increasing short-term market volatility key in enabling the flex business case

Electricity production and spot prices in Germany i



# Why is real-time flex trading on the ID market relevant?



## Maximise asset returns 24/7:

Unlock value in short-term schedule optimisation & trading, as changes in intraday prices affect asset profitability. Create P&L with quick reactions to changed forecasts & demand (e.g., heat)



Integrate into existing trading infrastructure & processes:  
run automatised and algorithmic flex logic within the usual setup



## Benefit from sole market volatility:

generate returns by trading back and forth in the market, regardless of the absolute price level, without necessarily changing the final physical position



Add optionality for flexible assets:  
diversify market risk with continuous intraday participation



Better be a market maker than market taker:  
benefit from market spreads by providing liquidity

# Agenda

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▶ Value's solution to the problem

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# Trading decisions must be made close to the market for maximal flex P&L

## Optimiser-led flex trading

Optimiser in charge of determining the most profitable schedule & actions on market

Trader executes standard iceberg orders, based on decisions made earlier

Optimiser imports order book snapshot for a static production plan, assuming 'deterministic' trading outcomes

Exceptions (e.g. volatile prices, exchange outage) risk guaranteed execution



## Trader-facilitated flex trading

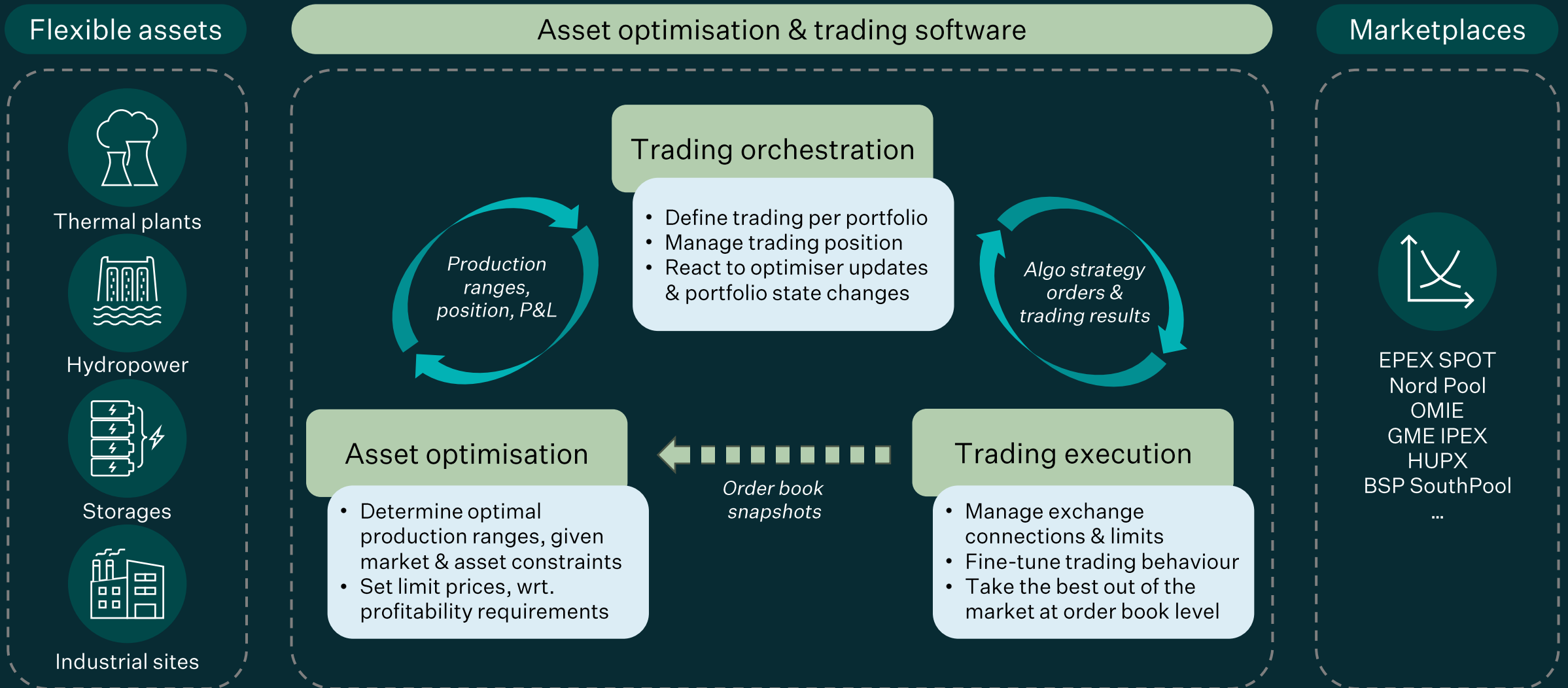
Optimiser in charge of determining the most profitable baseline schedule & avail. flexibility

Trader decides on deviations from baseline schedule, based on real-time market

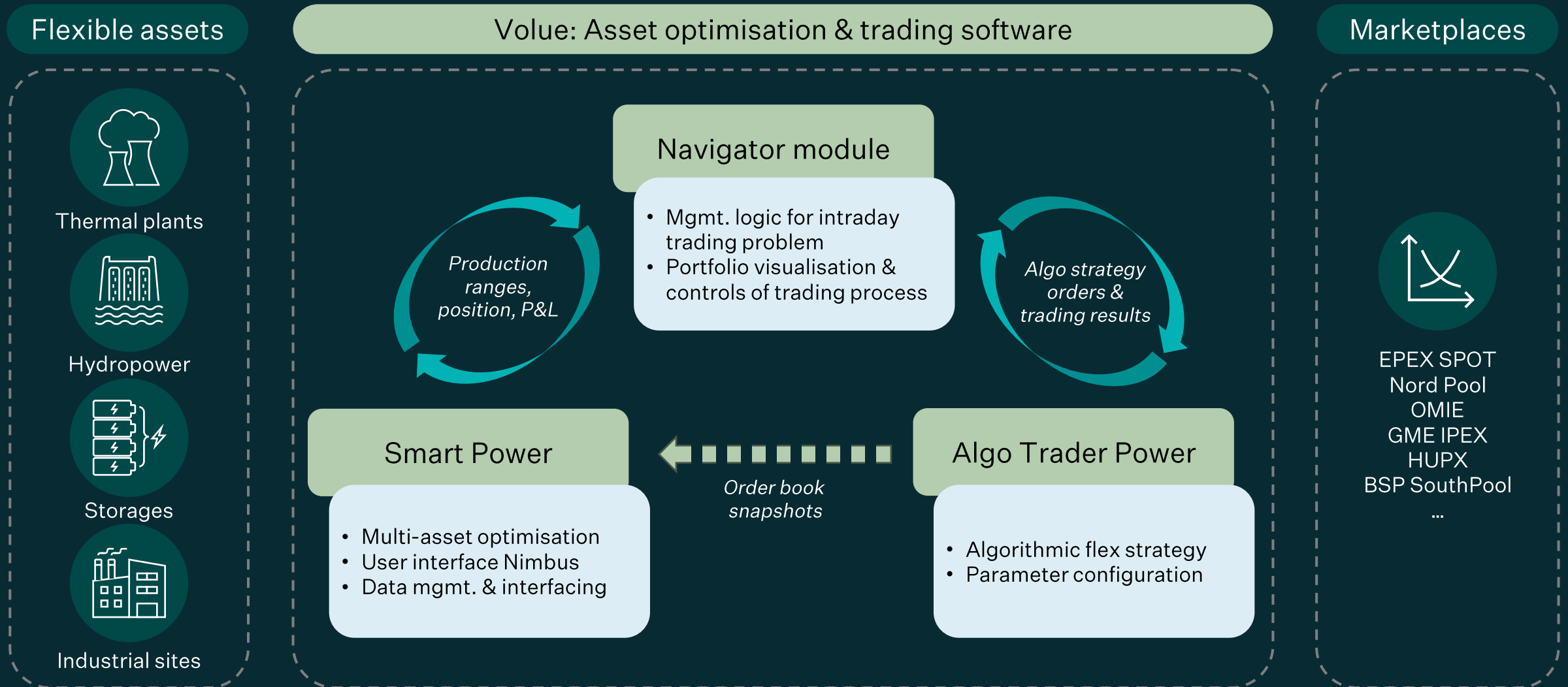
Optimiser imports order book data for choosing between high-level intraday production paths & market allocation

Trader isolates trading concerns from optimiser in most cases

# Proper processes required for bridging the two worlds



# Value delegates the problem to 3 main components

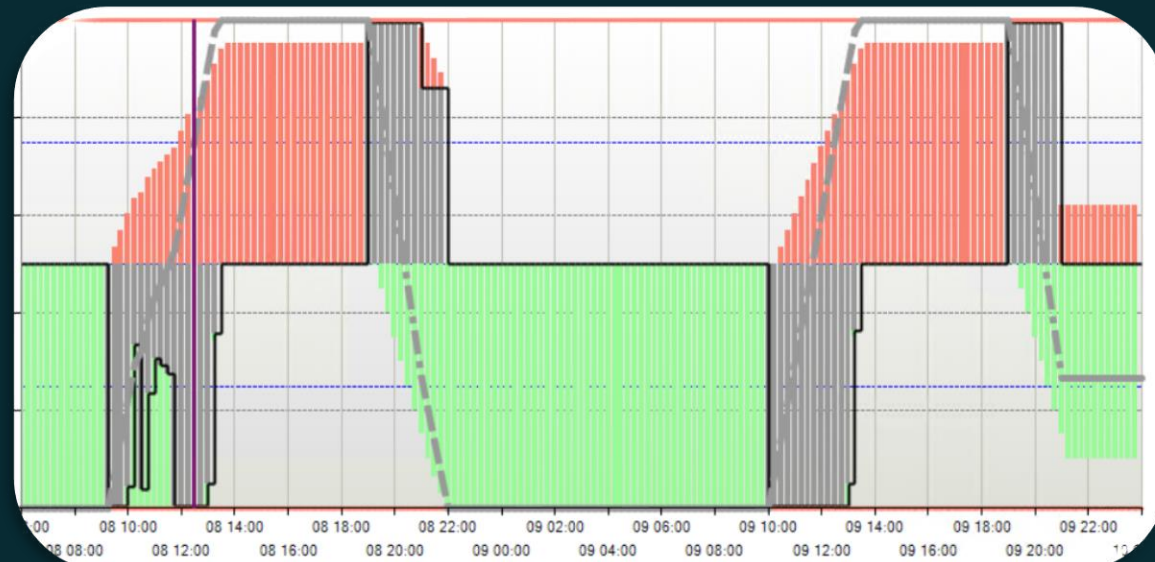


# Flexibility range subject to various restrictions



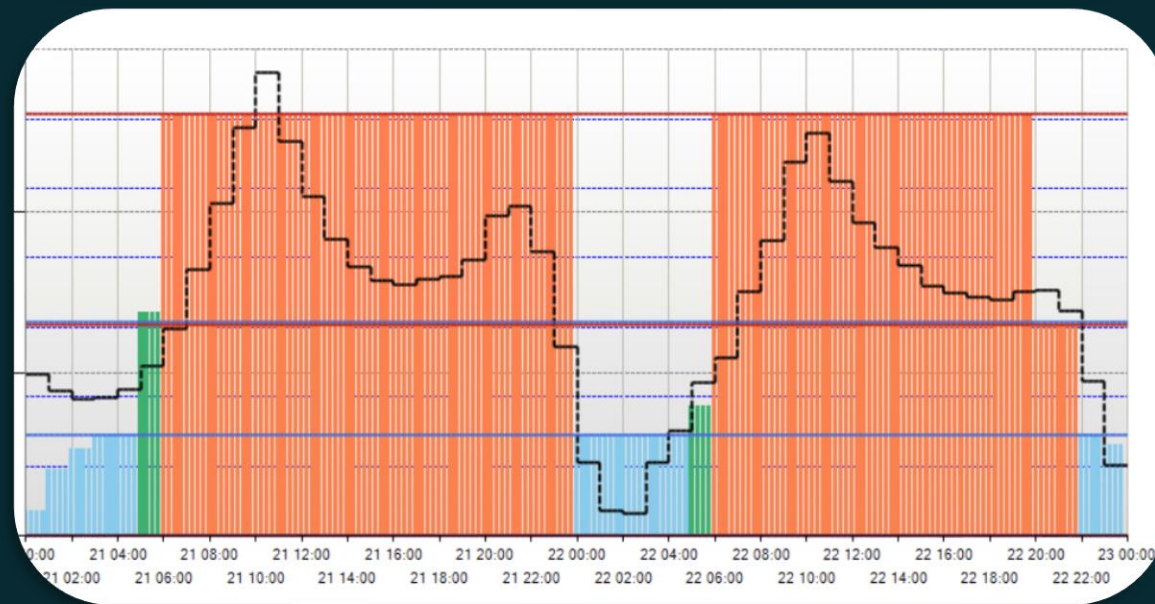
## BESS flexibility restrictions

- Restricted on energy
- Other markets
- Limit prices based on market
- Availability restrictions



## CCGT flexibility restrictions

- Operation modes
- Ramp rates
- Startups
- Limit prices based on fuel/CO2 cost
- TSO restrictions
- Availability





# Navigator automates intraday flex trading, synchronised with asset optimiser



Intuitive display of flexibility range & current position on UI



Market rules to specify trading behaviour per portfolio



Rule-based creation & mgmt. of algorithmic strategy orders



Communication with Algo Trader on trading targets & progress



Time series synchronisation on production ranges, limits & results



# Flex strategy in Algo Trader Power maximises P&L at order book level

1

Receive available flexibility & limit prices from Navigator

2

Trade diff. between current position & nearest point of allowed range like position closing

3

Place exchange order (sell or buy), according to max. likelihood of execution, given current order book

4

Continuously monitor order book and adapt active order

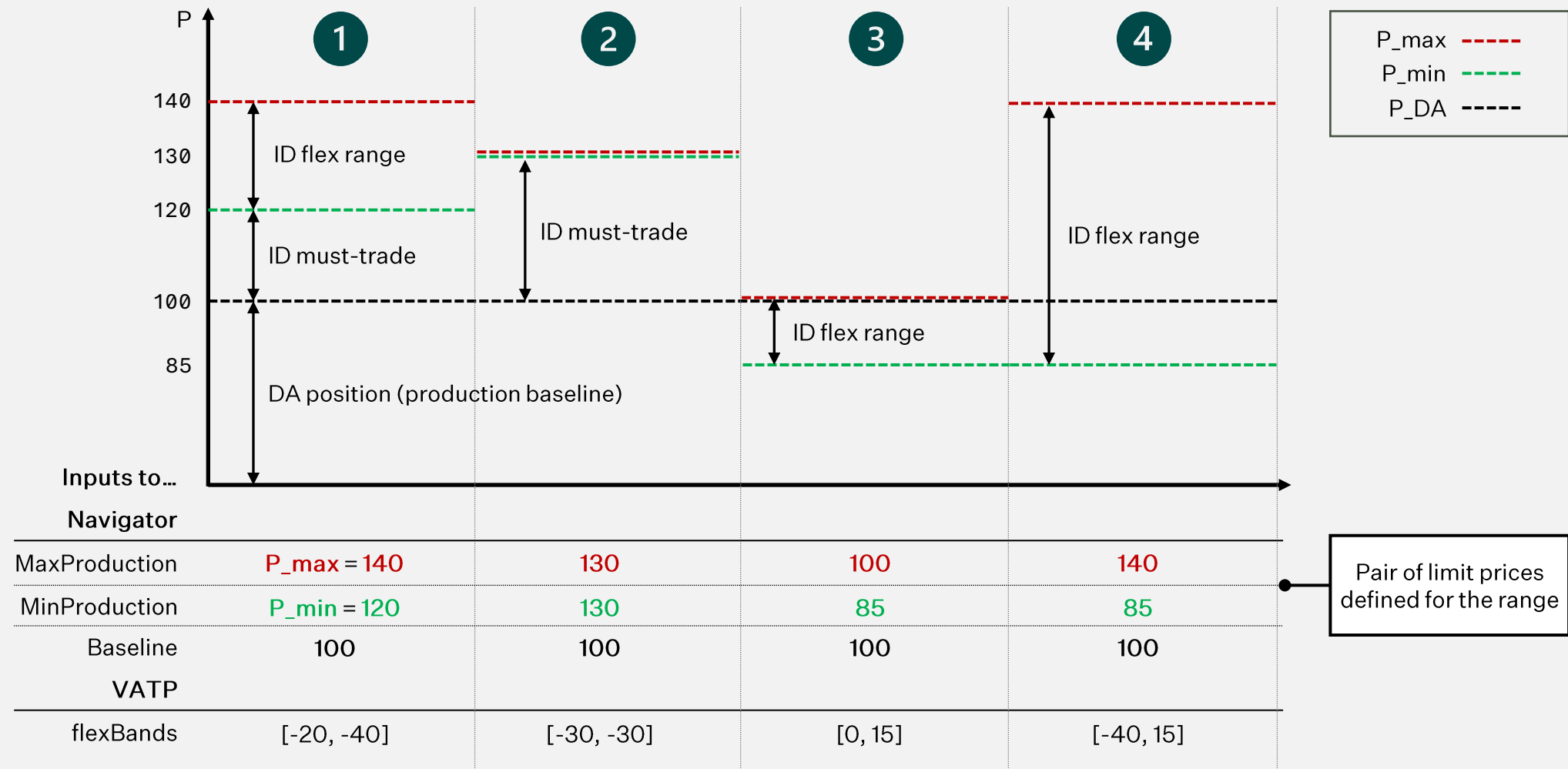
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Upon entering another 'block' in flex system, apply new limit price

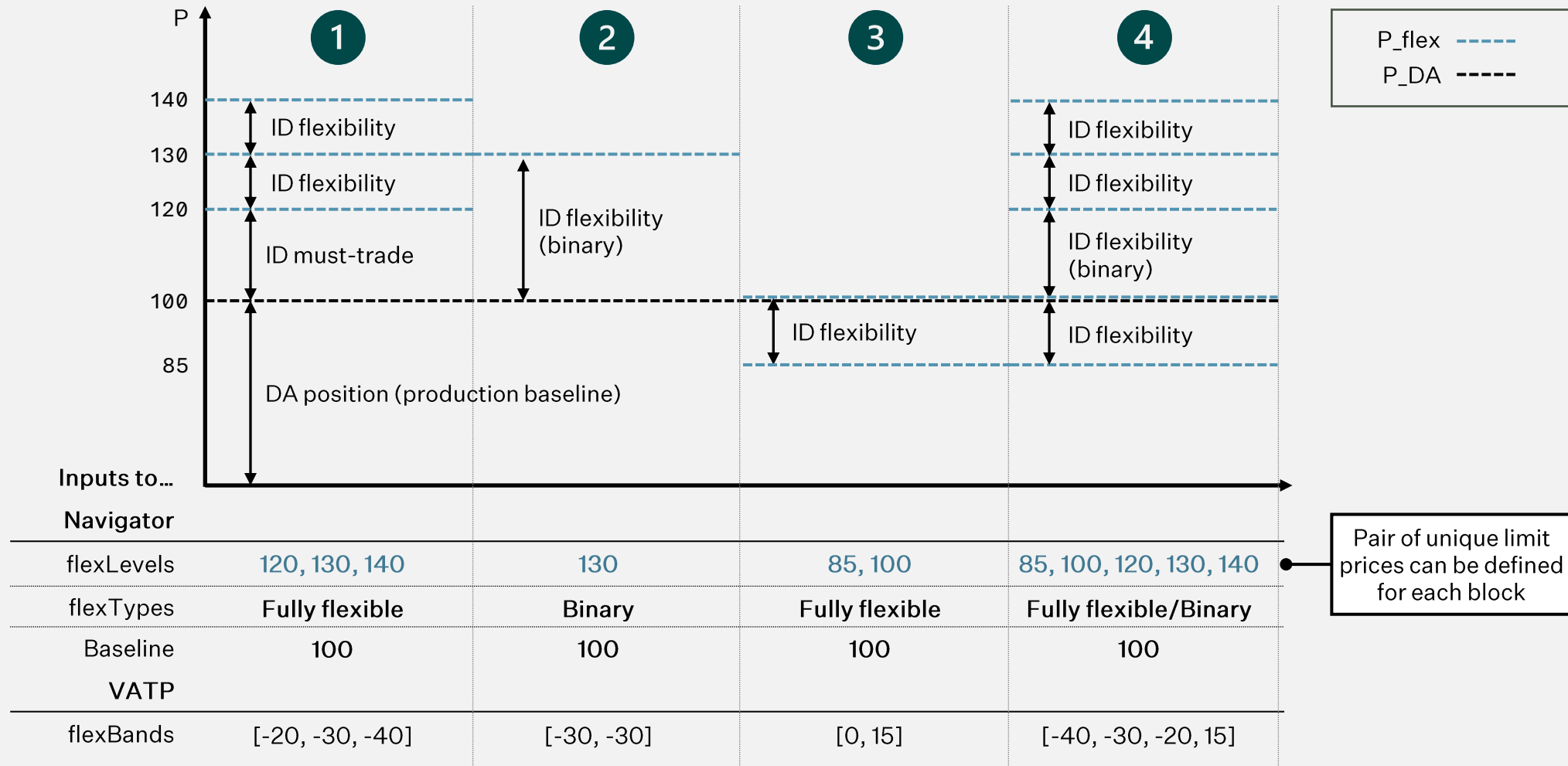
The screenshot displays two windows from the Algo Trader Power software. The 'Order Editor - Modify' window on the left is configured for a 'Flex Trading' strategy in the 'EPEX' market. It shows a 'Sell' order with a quantity of 0 and a limit of 0. A table of 'Flex Bands' is visible, listing signed quantities and limits. The 'Flex Trading Parameters' window on the right shows a 'Default' template and a list of parameters including '00. Test Environment (Basic)', '01-a. Order Positioning (Basic)', '01-d. Order Positioning Fallback (Advanced)', '02. Volume Distribution (Basic)', and '03. Take Profit (Advanced)'.

SignedQuantity	Limit	
-34.2	85	X
8.3	70	X
11	67	X
14	64	X
		X

# Range definition integrates with imbalance closing logic

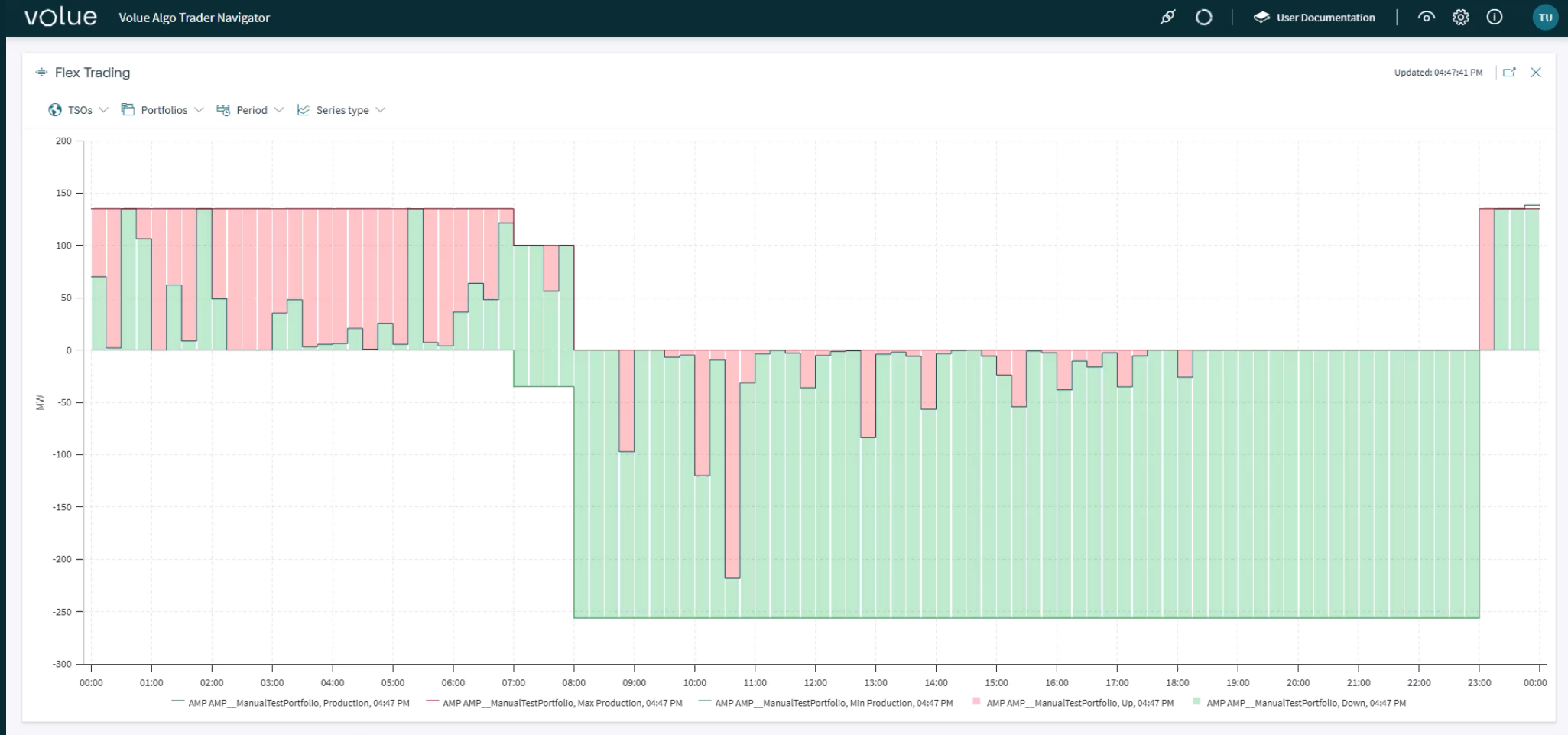


# Marginal cost (merit order) curve for adv. use cases





# Navigator shows trading progress & updates from optimiser in real time



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Relevance of flexibility trading

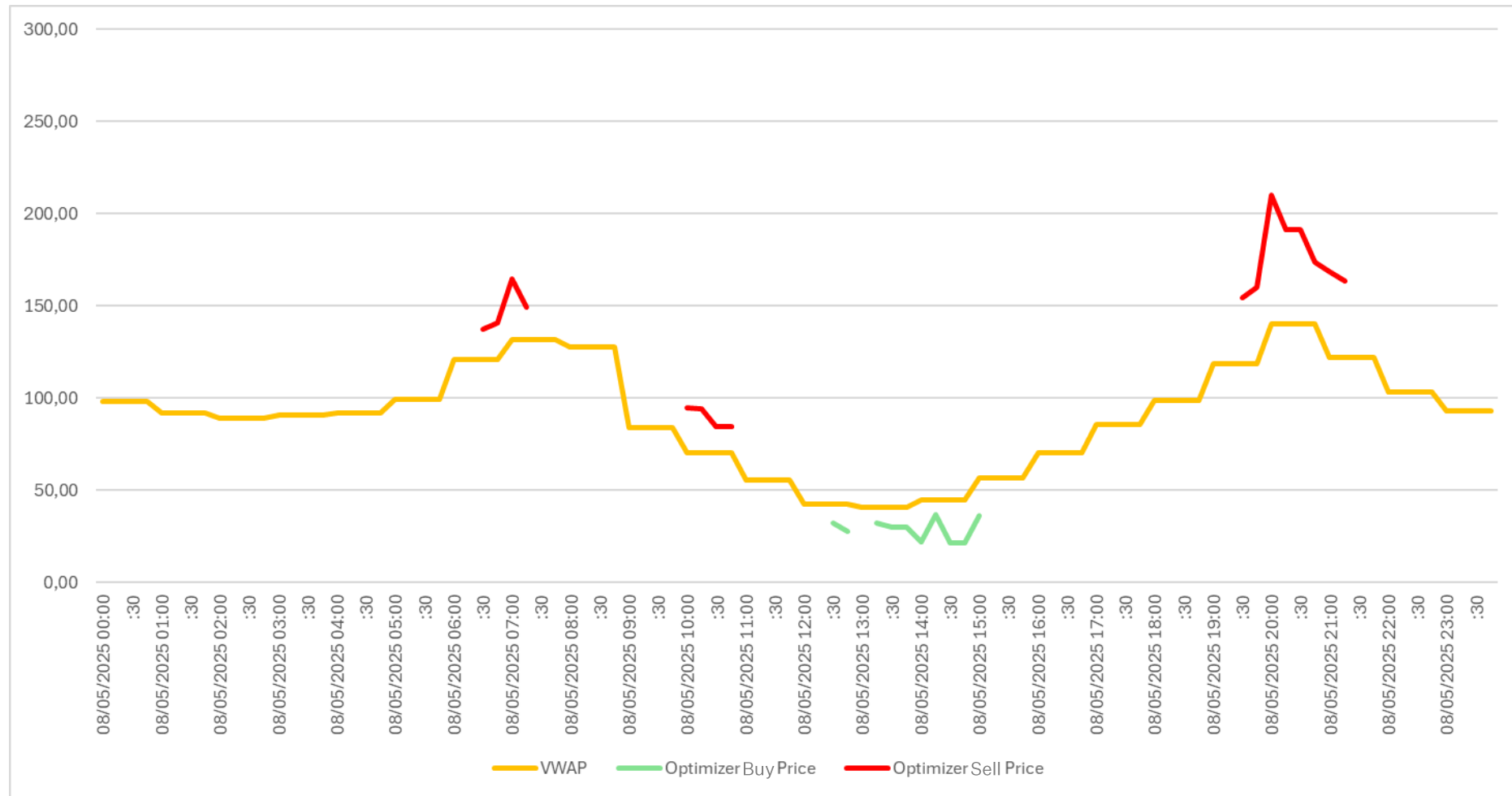
Value's solution to the problem

▶ P&L examples

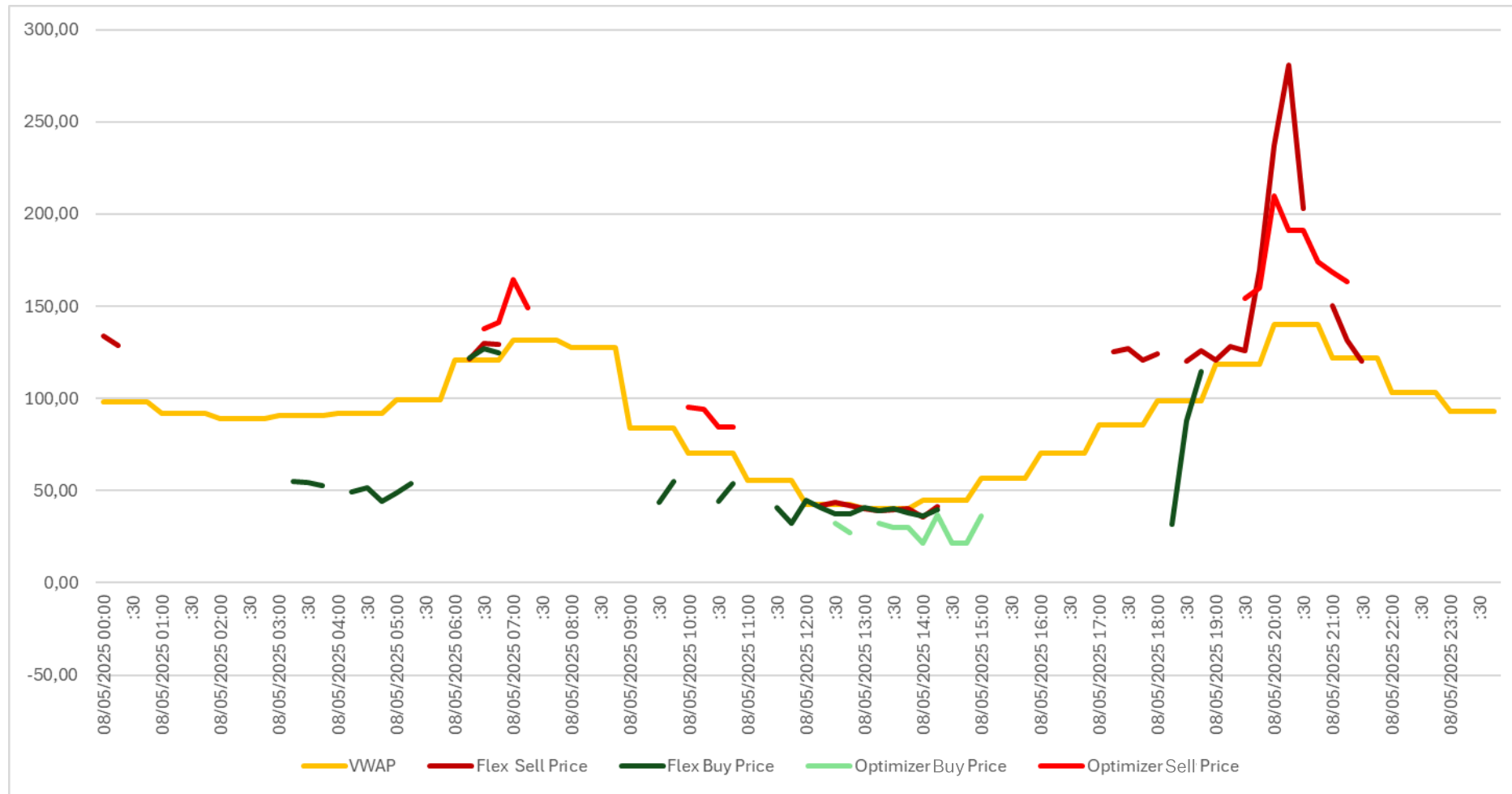
Conclusions



# Example: Realised prices from optimiser-led flex trading

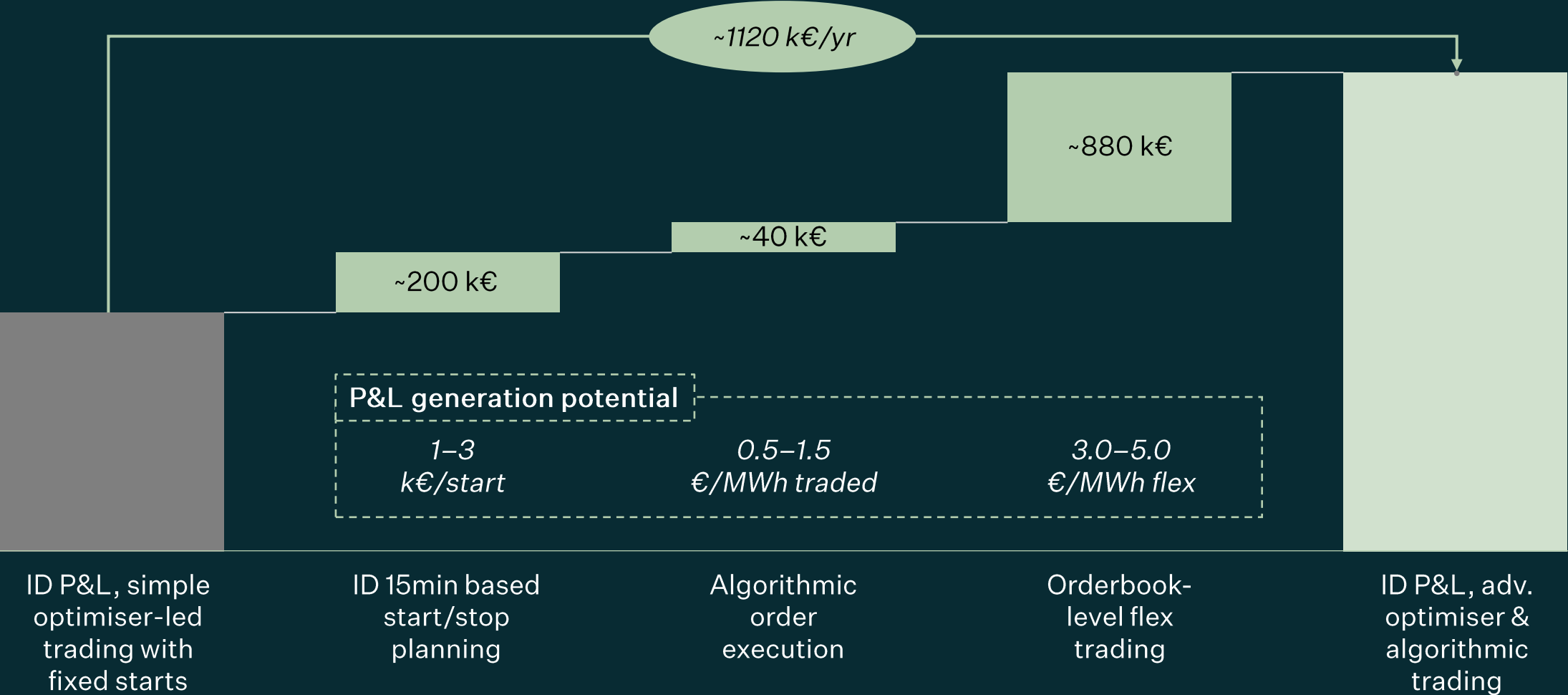


# Example: Realised prices from trader-led flex trading





# Example: Intraday P&L, 250 MW CCGT asset with 100 starts/yr, 100 MWh daily adjustments & 25 MW avg. flex



Source: Volue customer cases, Volue analysis

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# Intraday flexibility forms an essential P&L stream for asset-backed short-term traders



- Asset operators can monetise intraday market volatility through flex trading, adding to the existing sources of P&L
- First, ensure coordination between critical systems in asset optimisation & trading, integrating standard trading logic in setup
- In optimisation, focus on realistic constraints modelling & links with physical operations
- Make trading decisions within the real-time order book, ensuring fast reactions
- Start from a singular use case, iterating towards the maximal potential in portfolio

value