Smart Orders

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Smarter Day Ahead

New Block Order Types

Context

- In its researches to facilitate markets and provide the best price signals, APX Group has identified a need for increased flexibility in the bids
- Such a need has been expressed/confirmed by various stakeholders in different contexts (CWE market coupling, European Intraday Target model, …)
- In this presentation, APX provides its stakeholders with new order types for the DAM, expected to be implemented at the launch of NWE market coupling
- Additionally, APX continuously performs extensive R&D activities to develop even more advanced products for its DAM and ID markets.

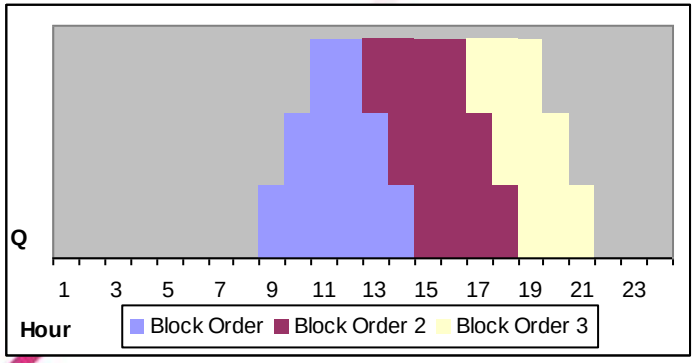
Linked Block Orders:

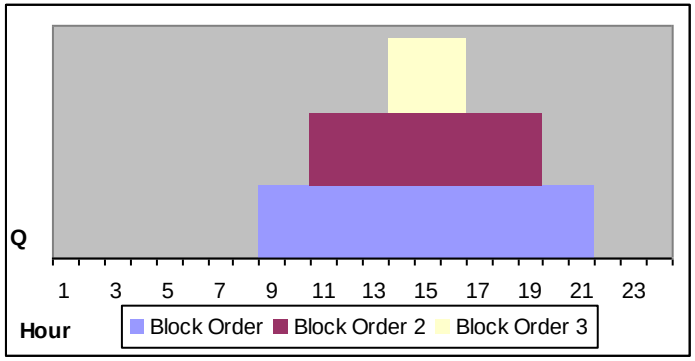
Definition:

- The execution of (a set of) profile block(s) is subject to the execution of another block
- Other standard execution rule apply in full

Use:

- Allows to explicitly consider technical and economical constraints
- For example, a first block may include the start-up costs of a production facility, and additional blocks comprising fuel costs may be linked to this blck
- Possibility to design complex linked structures (i.e. families)
- A similar product is currently in use at Nord Pool Spot





Example

Technical plant data

	MW	Cost
Pmin	50	65
	200	62
Pmax	300	60

- Produ
- Produ
- Margi
  from 5
- Margi
  MW to
- Margi
  MW to

Bidding strategies

- *Possible bidding strategy 1*:
  Block 1: Sell 50 MW @ 65 €
  Block 2: Sell 250 MW @ 59 €
  (linked to Block 1)
  => Unit is fully accepted if P>60;

- **Linked Block Orders: global wellfare considered**
- **The unit will also clear if baseload price is 60 ≤ P ≤ 65!**
- **The algorithm is not sequential, but considers the global wellfare of both blocks.**
- **(Unlike EMCC's algorithm.)**

Linked Block Orders – use cases

Optimise thermal power plants

- Offer plant using multiple orders, allowing it to run at different outputs, each reflected by their own cost level
- Run one/several hour(s) earlier or later if power prices remain interesting outside of the peak period

Optimise consumption processes

- Only execute part B of consumption process if part A of process was started earlier
- Or only start A+B when combination does not exceed certain costs

Optimise storage capacity

- Sell only during peak period if off-peak purchase order has been accepted and buy/sell combination is in the money

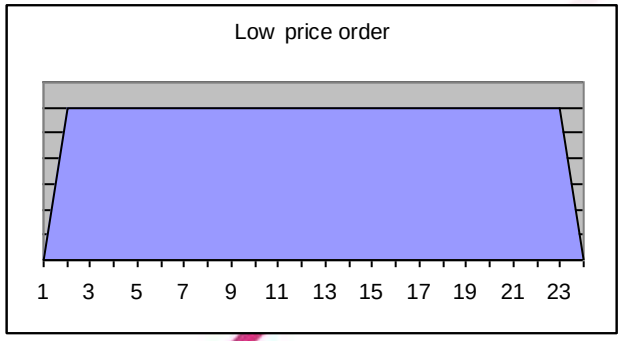
Exclusive Block Orders

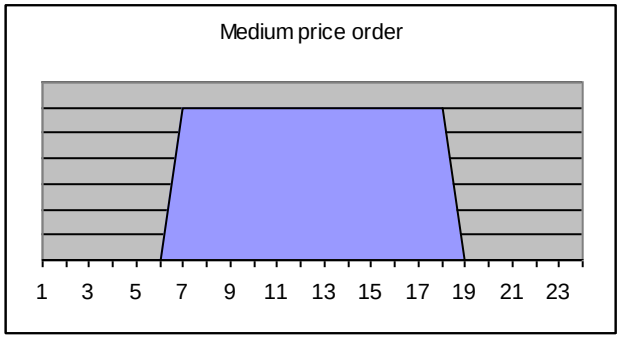
Definition:

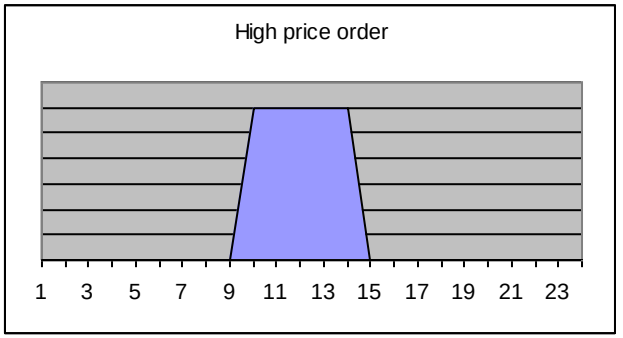
- **Within a set of profile blocks, at most one block can be accepted**
- **Other standard execution rule apply in full**

Use:

- **Allows to propose for trading different production patterns**
- **For example, a specific production plant can be offered**
  - at a low price for baseload production,
  - at a medim price for peak load production
  - >at a high price for super peak load production
  - …but can only be executed once







Exclusive Block Orders

Optimise thermal power plants

- Similar to using Linked Block Orders

Optimise combined heat & power installations

- Heat demand with flexible timing, or some heat buffer
- Flexibility might allow to produce heat & power when power prices are highest, using several exclusive production profiles

Optimise demand side management

- Case: End user can stop consumption, but only if DAM prices > 500 €/MWh and for max 2 hours/day
- “Program” load shedding on the DAM on the most expensive hours (and only of threshold is reached), using a combination of exclusive blocks of 2 hours
  - Block 1: hours 1 & 2
  - Block 2: hours 2 & 3
  - …

Benefits of Smart Orders

- **'Smarter' orders give more flexibility when introducing orders for the auction**

  →Better reflecting technical constraints of generation units

  E.g. no partial clearing at non-cost reflective price levels, lower PRB frequency (plant offered in smaller blocks), …

  →Easier bidding, less operational work

- **Result: better optimization of generation/consumption assets**

- **Better price formation**

- **More robust against uncertainties/errors in day-ahead price forecasts**

Longer term

- Combinations of Linked & Exclusive Block Orders
- More complex orders types such as Storage Orders

Storage Orders

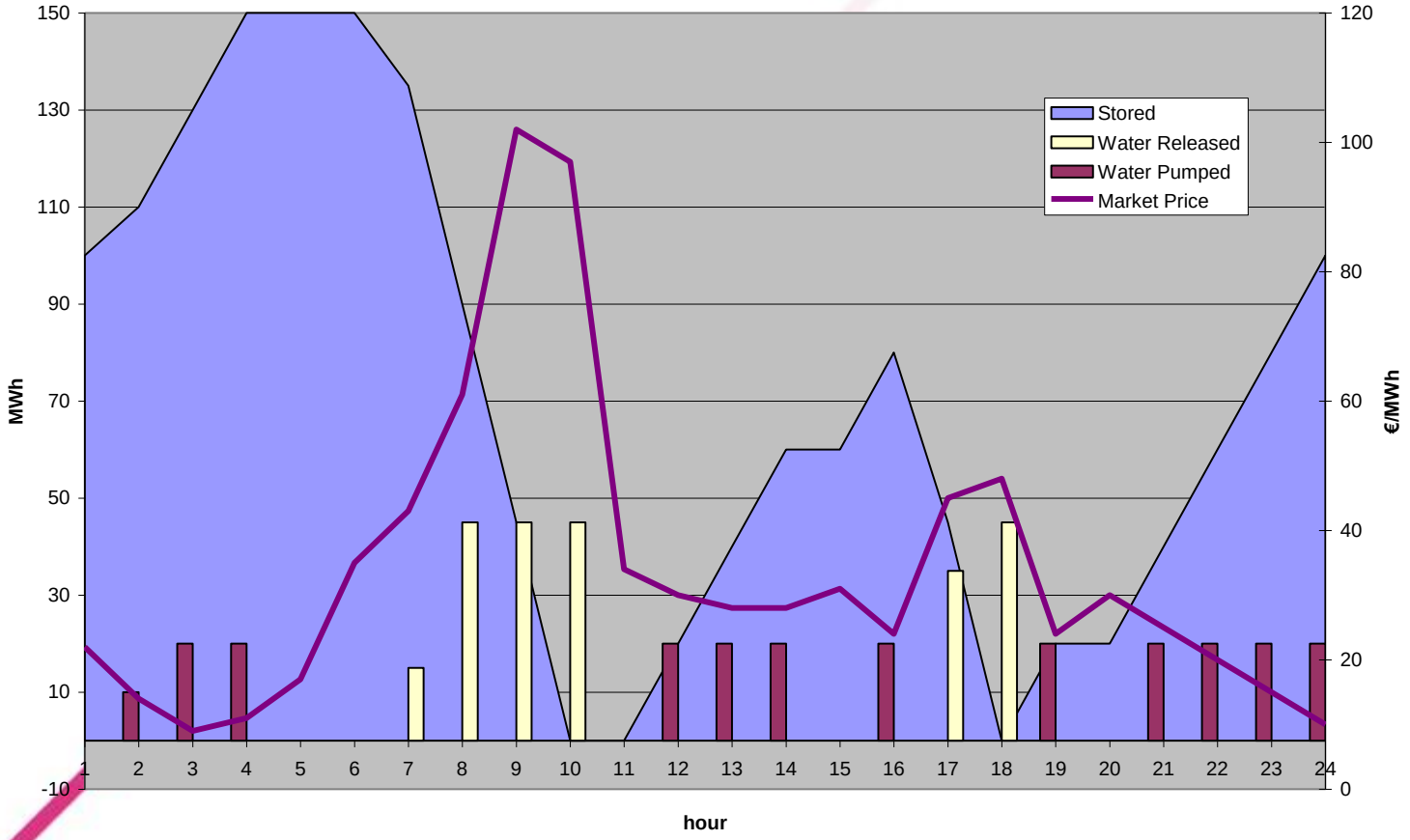
- **Cosmos (CWE algorithm) could also support much more advanced features such as tailor-made orders for energy storage devices (i.e. electrical cars, pumped-storage hydro dams, …):**

- **Inputs (for the case of pumped storage hydro):**
  - Quantity in reservoir at hour 0 (MWh)
  - Inflows at each hour of the day
  - Min and Max quantities in reservoir at end of each hour
  - Powers of the turbine and pump (MW)
  - Efficiency of cycle
  - « Price of water » P

- **Outputs: production/pumping schedule such that**
  - Water is released and power produced if price of water is smaller than market price. If forced to sell (e.g. because end-of-day limit), it is done during the most expensive hours.
  - Water is pumped and power consumed if price of water is larger than market price. If forced this is done during the cheapest hours.
  - Day/night arbitrage is done automatically (up to the limits of the reservoir) if profitable

Example : Pure pump storage

The full dispatch of the storage facility is automated; the operators are essentially left with the work of estimating the inflows and the « price of water »: the price at which they expect that they can sell the energy contained in the reservoir in the weeks/months ahead.



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