Hydropower planning and scheduling in the future

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Helping utilities work smarter

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Poland
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International Customers


DSİ

Optimizing Energy Resources
Smart Energy – Work flow

Assumptions
Hydropower producer

- Competitive electricity market
- Don’t pay for the water
- Negligible marginal cost
- Opportunity cost – water value

Mid-term planning
Purpose

- Mid-term: 6 months-3 years
- Purpose:
  - To guide planning on shorter horizons (water values, limits)
  - Simulate effects of changes in production system, e.g., upgrades, constructions, jurisdictions.
  - Simulate effects of a revision schedule
  - Assessments of risks (physical, financial)

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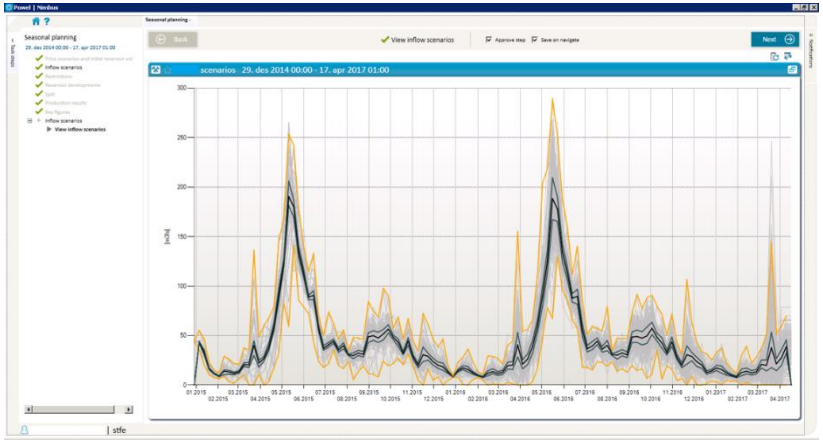
Mid-term planning
Features

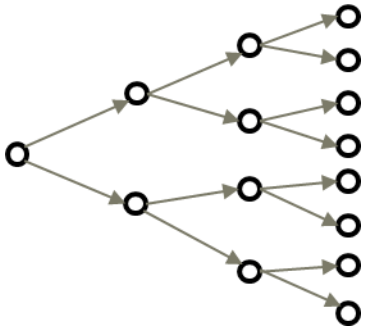
Mid Term Planning

- Uncertainty in future inflows and price
- Coarser time resolution (days, weeks)
- Less detailed system description (station model, no start/stop, no water travel times)

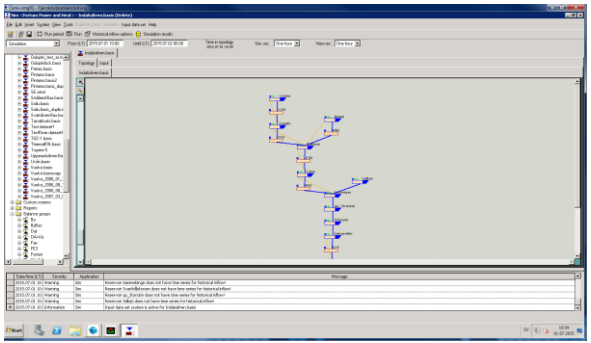


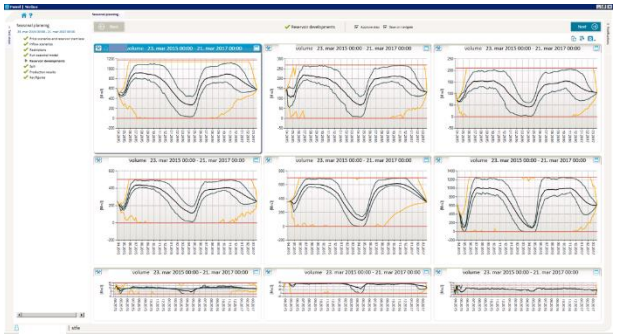
Powel Optimal Midterm

Mid Term Planning



- Stochastic optimization model
- Based on linear programming
- Scenario tree description for inflow and price
- Process interface for daily planning
- Common data model as for short-term planning





Market bidding

Traditional Day Ahead Planning

Market bidding

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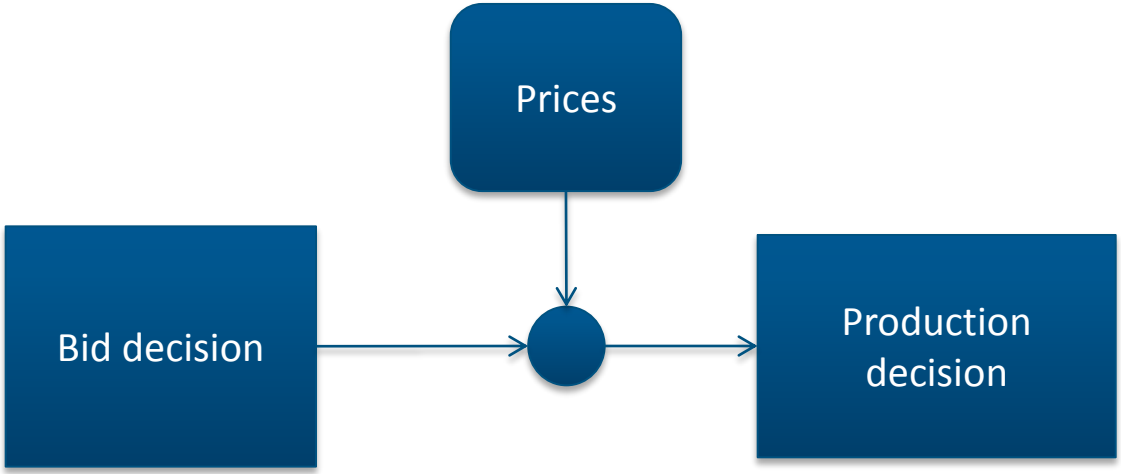
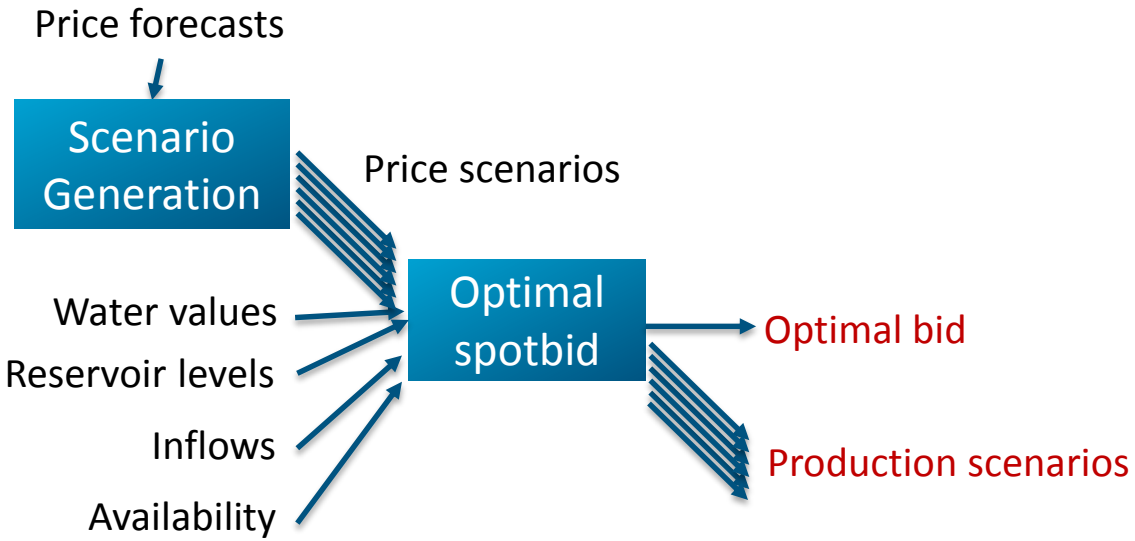
Order of decisions

Market bidding



Optimal Spotbid
Input and output

Market bidding



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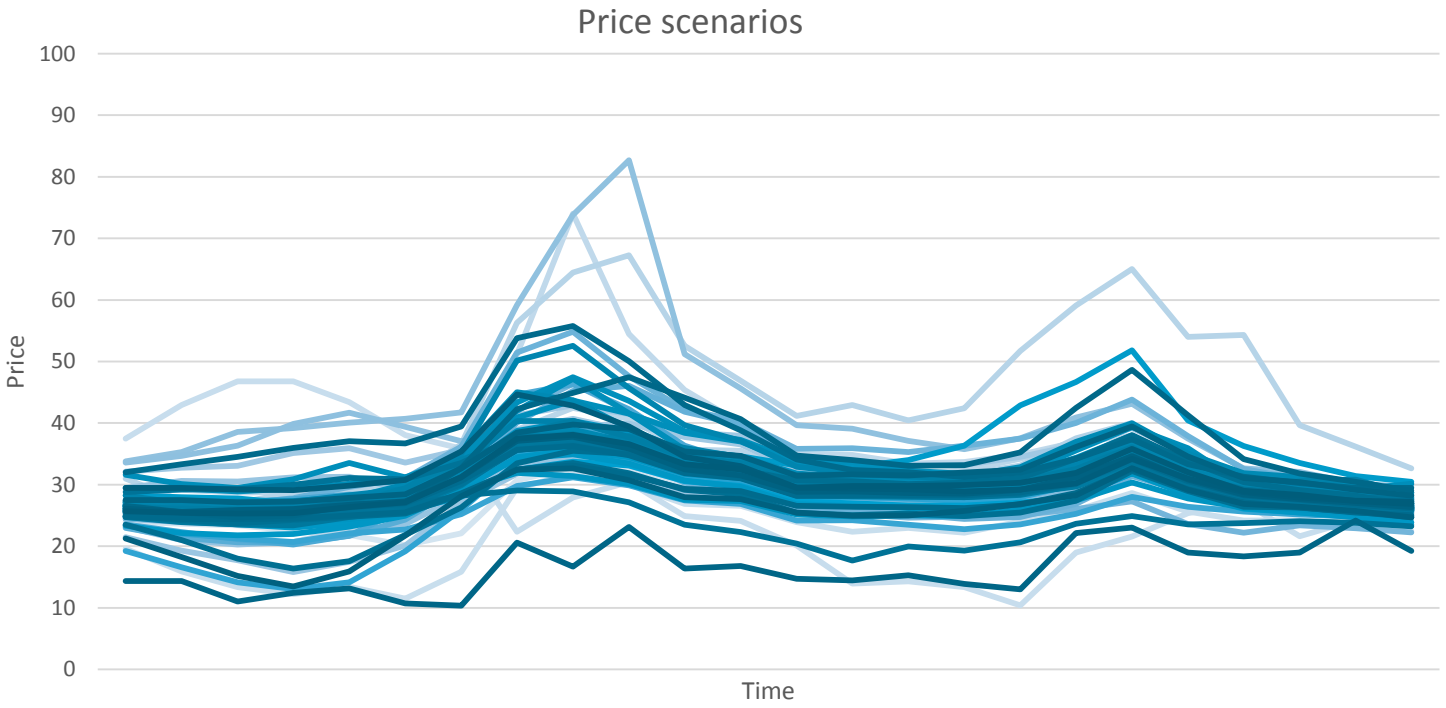
Price scenarios
Example with 100 scenarios

Market bidding



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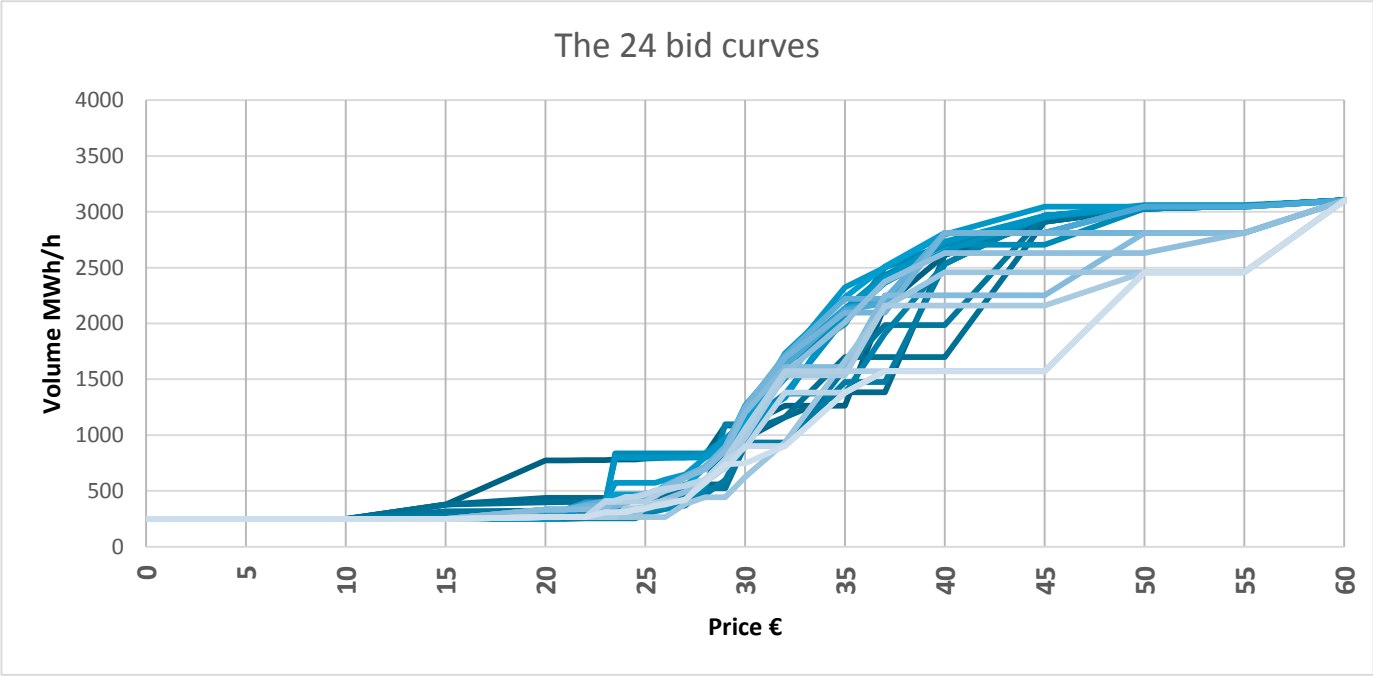
Output from Optimal Spotbid
Optimal bid

Market bidding



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Multi-market bid-optimisation

Market bidding

- Rolling-stage Stochastic bidding
- Considers the expected value of following market

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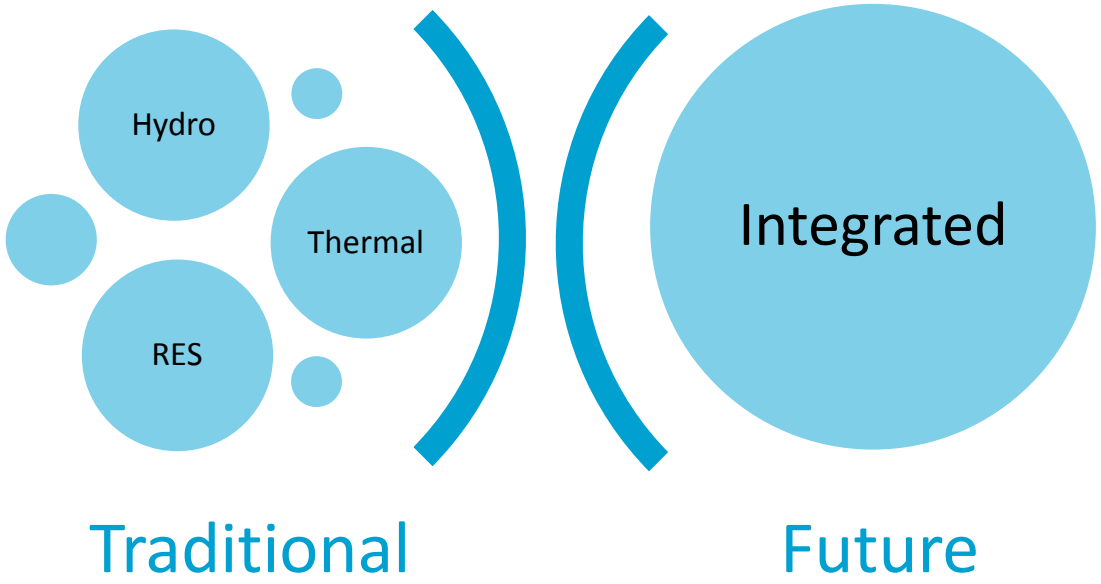
Multi-asset optimisation

Production planning



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Intraday Operations

Intraday Operations

- Increasing volumes in intraday markets
  - RES trading in direction of balance
  - Market opportunities for flexible power production
- Demanding market operation
  - Continues market
  - Short execution times

Future for Hydropower Scheduling

- Large amount of data
- Stochastic optimisation
  - Midterm
  - Bidding
- Multi-market bid-optimisation
- Multi-asset production planning
- Automated intraday-trade
- Re-optimisation on new data
- Fully integrated one-stop solution

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