THE VALUE OF STOCHASTIC SHORT-TERM SCHEDULING

- Preliminary results

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Proposed methodology

1. Plan calculations

▶ SHARM is run for different scenarios of price and inflow, both stochastic and deterministic variants

▶ The resulting plan for the next day of each scenario represents the decision that would be made using the corresponding price or inflow as forecast.

2. Value calculations

▶ The plan of each scenario is converted to a load requirement

▶ SHARM is run again for all scenarios using:
- the corresponding load
- the ensemble fan
- a price add for selling or buying (2€)

▶ The objective now represents the value of each plan/load decision
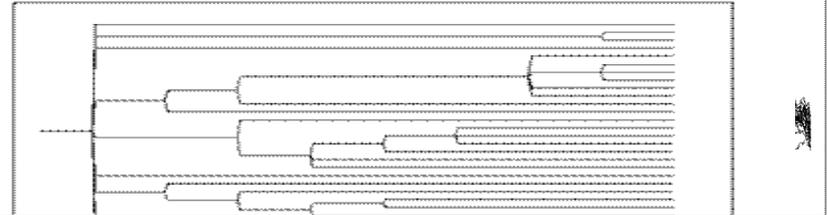
3. Utility calculations

▶ The differences in objective values represents the relative utility values

▶ This gives the utility value of
- stochastic modelling (ex forecast quality)
- applied to price independent bidding
- for one single day

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Scenarios and utility values

Expected increase of objective value

Real price/inflow

Ensemble fan (30+0)

Op...

Analysis details

- ▸ 3 selected river systems, for 4 random days
- ▸ The value of price and inflow are analysed independently
- ▸ MIP is not used
- ▸ Independent WV
- ▸ A common plan requirement is applied for the next day in the plan calculation

Value

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Results 1/3

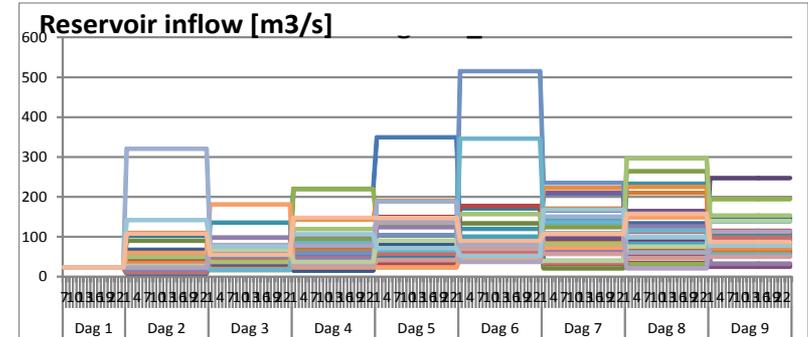▶ System: One single plant with low discharge capacity

Objective/utility compared to fan ensemble [€]		Summer	Autumn	Winter	Spring
Price	**Large tree (9+3)**	0	5	0	0
	Small tree (3+1)	0	12	0	0
	Deterministic tree (1+0)	0	12	0	0
	Average ensemble	0	0	0	0
Inflow	**Large tree (9+3)**	-16	0	2	33
	Small tree (3+1)	-4	-1	2	33
	Deterministic tree (1+0)	13	272	-3	33
	Average ensemble	-22	259	-1761	33

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How can a scenario get better than the fan?

▸ Iteration logic
- Some inaccuracies in the objective of the value calculations due to iterations

▸ The plan calculation has a common plan constraint
- In the value calculation this constraint is replaced with a load requirement

▸ The plan calculation doesn't see the future opportunity to buy/sell power
- In the value calculation the load can be redispatched individually in each fan scenario

Disfavours the stochastic optimizations!

Ensemble inflows

Schedules

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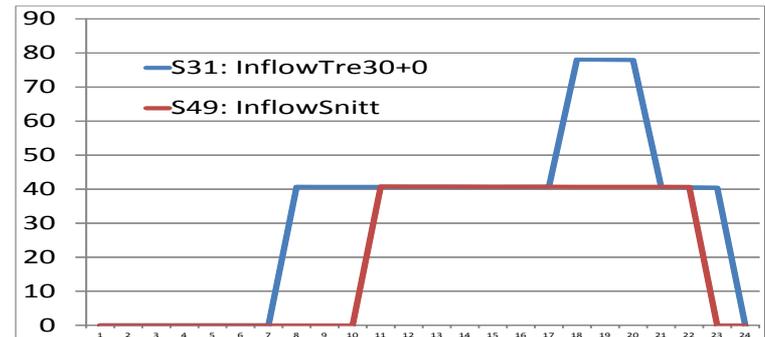
Results 2/3

▸ System: 2 plants in cascade, with stochastics on top reservoir

Objective/utility compared to fan ensemble [€]		Summer	Autumn	Winter	Spring
Price	**Large tree (9+3)**	-137	77	-1	6
	Small tree (3+1)	211	-2738	-19	6
	Deterministic tree (1+0)	253	-167	-9	-8
	Average ensemble	239	-280	-89	-4
Inflow	**Large tree (9+3)**	3	193	-1	-3
	Small tree (3+1)	4	191	-5	-4
	Deterministic tree (1+0)	-11	199	20	-8
	Average ensemble	9	216	-198	-6

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Results 3/3

▶ System: 2 plants in cascade, with stochastics on small reservoir in-between

Objective/utility compared to fan ensemble [€]		Summer	Autumn	Winter	Spring
Price	**Large tree (9+3)**	0	-18	-16	4
	Small tree (3+1)	0	-4	-4	23
	Deterministic tree (1+0)	-14	-133	-10	19
	Average ensemble	8	5	3	-496
Inflow	**Large tree (9+3)**	-2	1	4	18
	Small tree (3+1)	95	-7	10	55
	Deterministic tree (1+0)	113	-9	-26	335
	Average ensemble	104	-6	21	108

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Preliminary conclusions

▸ Stochastic optimizing in SHARM is working

▸ High increase in calculation times, even without MIP
- 5 times with small tree, 20 times with large tree

▸ Variable utility results
- Many periods with 0 utility (as expected)
- Inconsistent results, difficult to conclude on utility of stochastic modelling
- Should implement an intraday market in SHARM to complete the methodology

▸ Need more testing and verification of results and method
- Further testing with combined and correlated price and inflow

▸ Still much to learn from SHARM
- Many areas of use to be explored

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THANK YOU

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