



# Hafslund

## Multi-market modelling in Prodrisk

Hydropower Scheduling User Meeting, May 2025  
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# Agenda

- Experience in Hafslund
- **Example:** How does reserve markets impact the production plan in Prodrisk?
- Summary

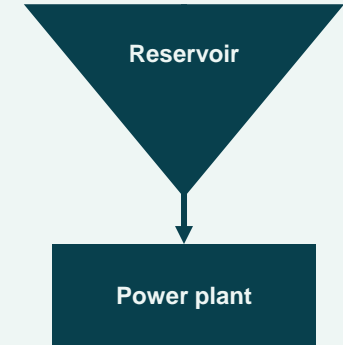


# Including reserve markets in operative Prodrisk runs in Hafslund

- We have included reserve markets for up and down-regulation for our water courses in Prodrisk in NO1 and NO5
- Since last fall, continuously adjusted and improved to fit our overall strategy

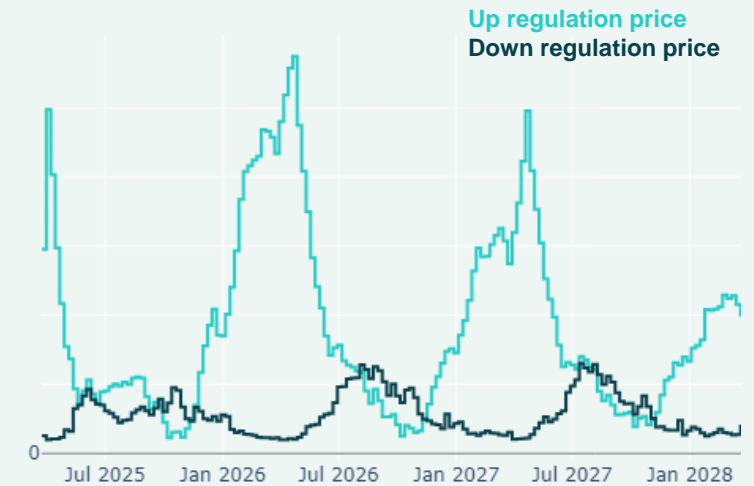
## Module assumptions

- Maximum capacity available for up regulation and down regulation
- Limitations: No activation of reserves



## Market assumptions

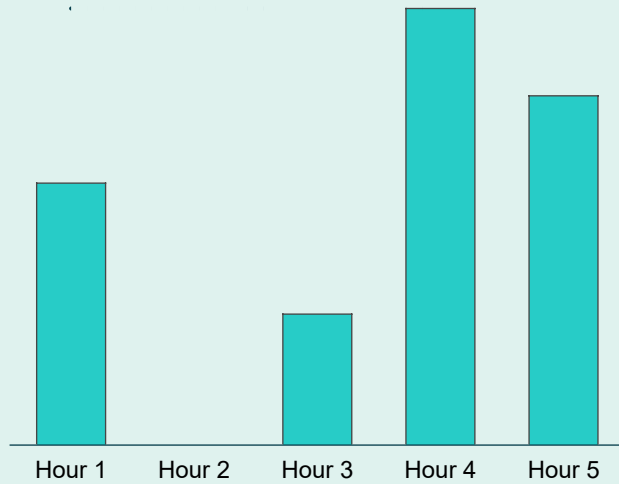
- Market size: Maximum total capacity to be sold in the up and down regulation markets
- Market prices; Internal forecast
- Limitations: Same price in all scenarios



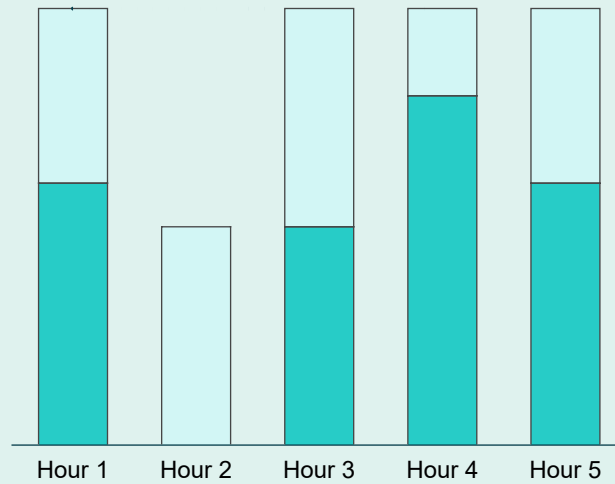
# Representing capacity markets in Prodisk

- Capacity for spot market
- Capacity for up regulation market
- Max capacity

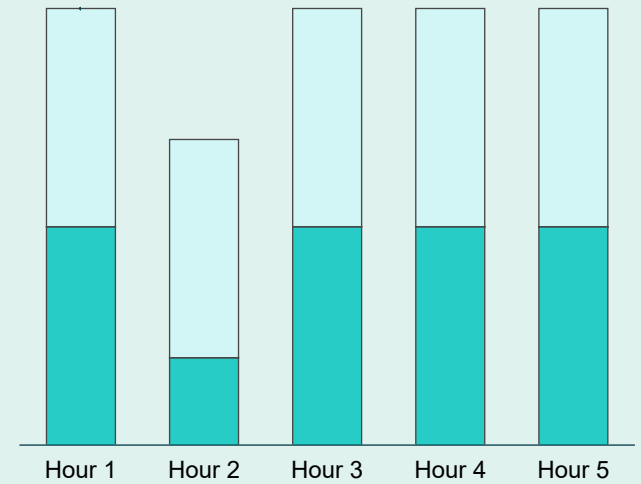
Only considering spot market



With capacity market (up)



With capacity obligation (up)

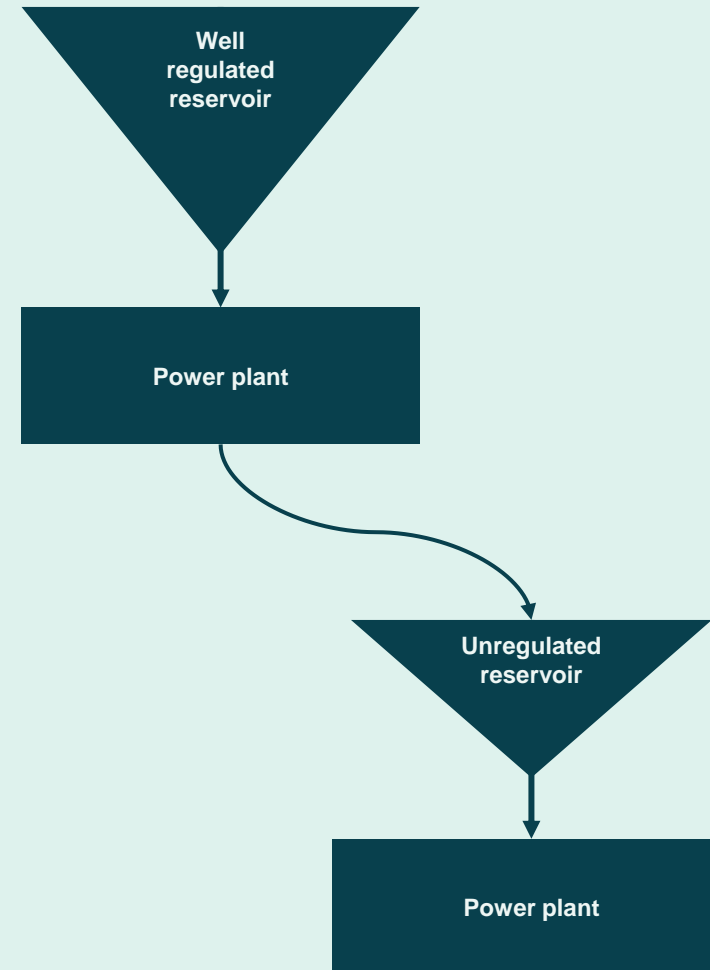


# Example system

Comparing two Prodrisk runs

1.  
Up and down  
regulation on  
both plants

2.  
Without  
reserve  
markets

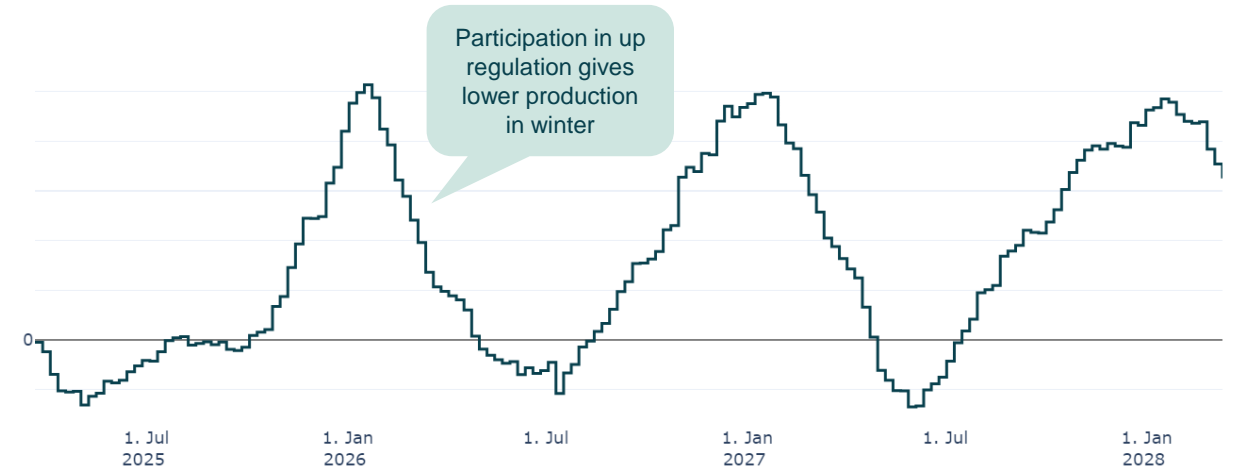


# How does the introduction of capacity markets impact production plan?

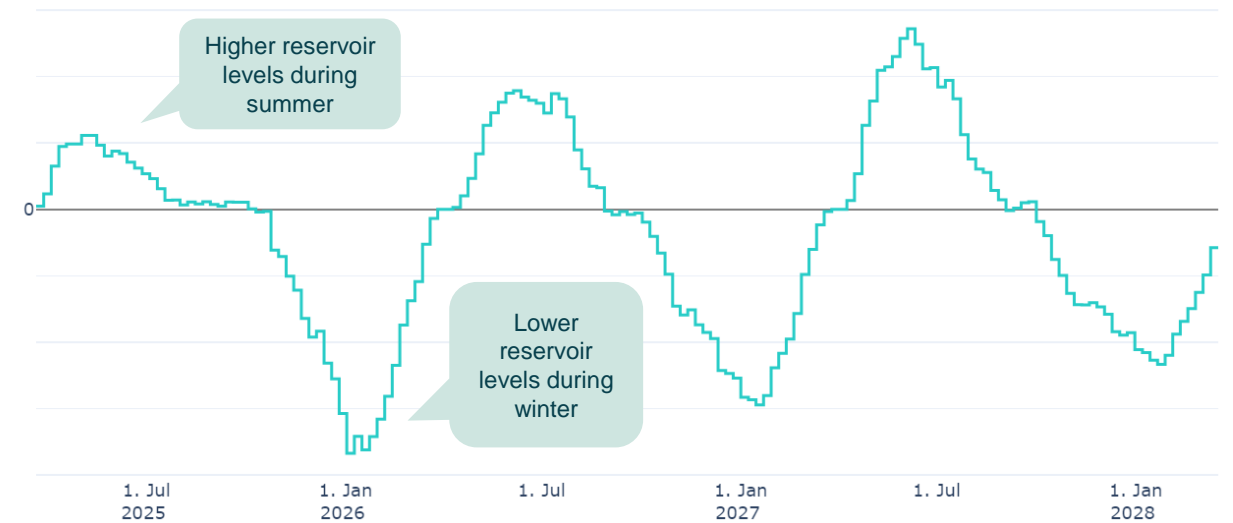
Production plan ►

Reservoir filling ►

accumulated difference in production with and without reserve markets

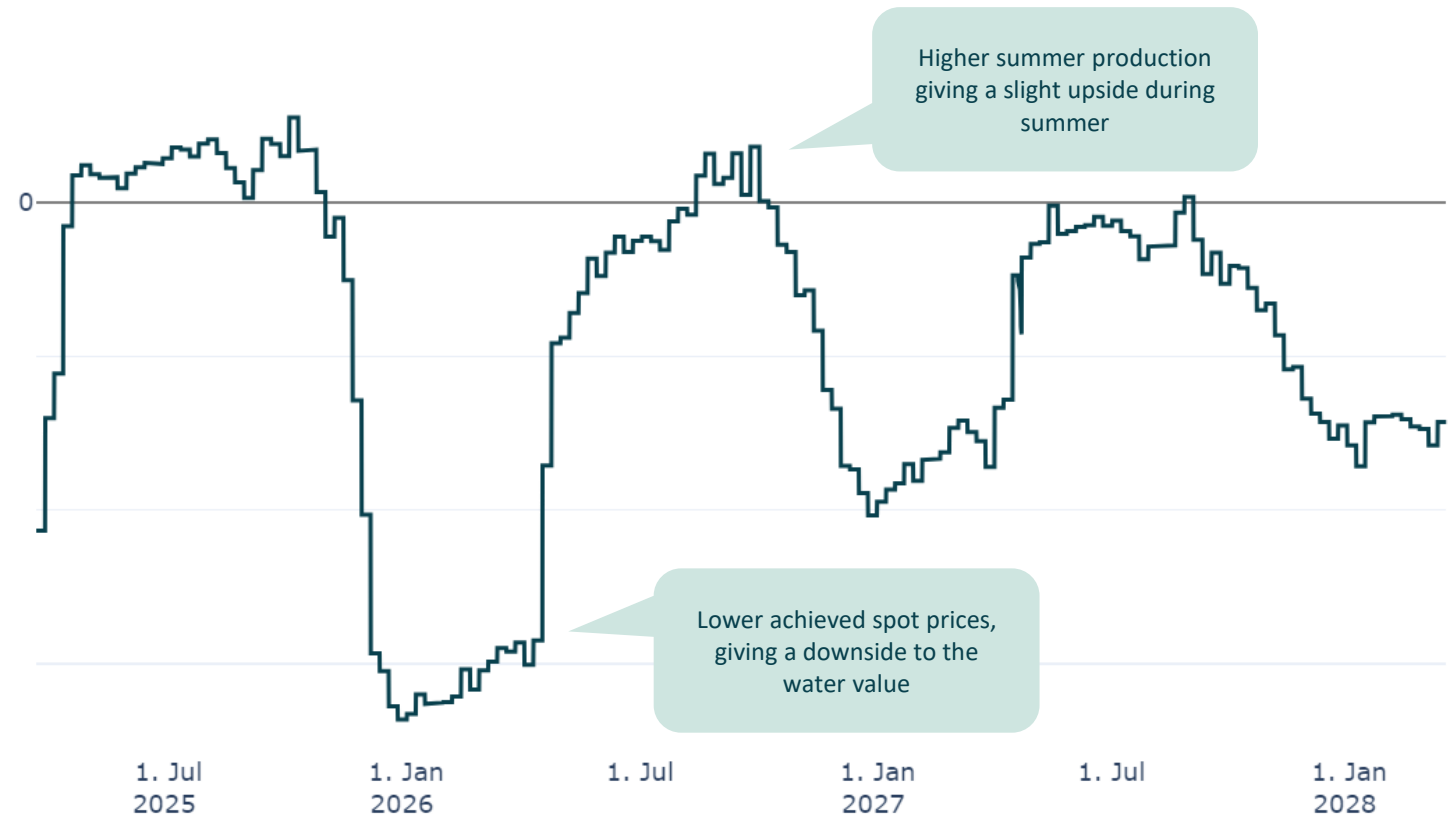


difference in reservoir filling with and without reserve markets



How does the introduction of capacity markets impact water value?

difference in water value compared to no reserve markets



# Summary

- Production plan closer to how we act in the market when including multi-market modelling
- Including reserve market gives Prodrisk more room for optimization. Requires important assumptions such as price forecasts for multiple markets
- Impact on reservoir profile, must account for external risks
- Single scenario for reserve market prices might underestimate the impact on water values, as spot prices and reserve market prices can be correlated





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