



# 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

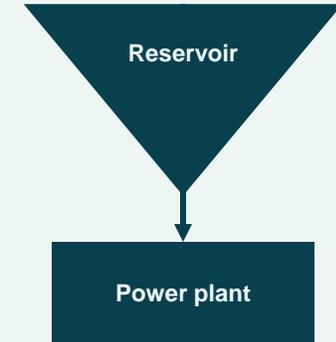


# Including reserve markets in operative Prodrisk runs in Hafslund

- 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

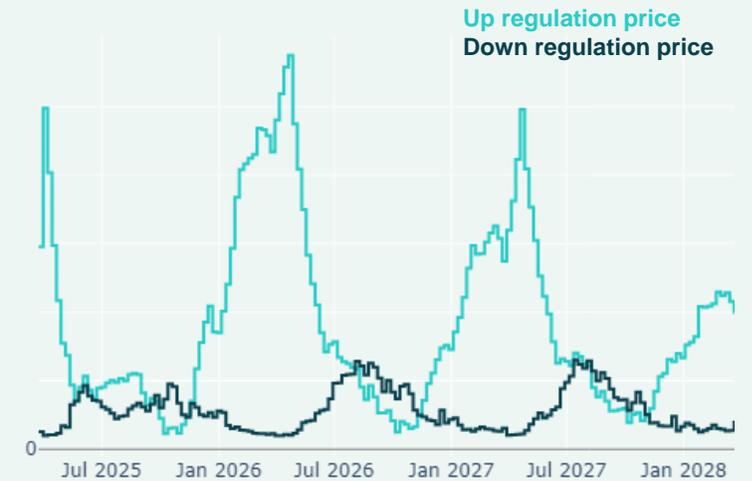
## Module assumptions

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



## Market assumptions

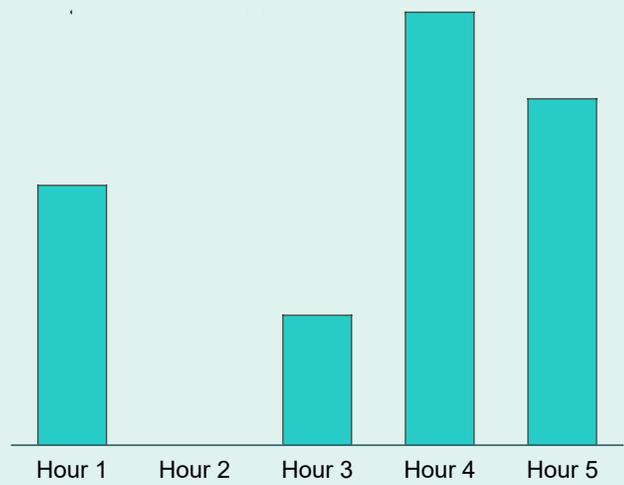
- Market size: Maximum total capacity to be sold in the up and down regulation markets
- Market prices; Internal forecast
- Limitations: Same price in all scenarios



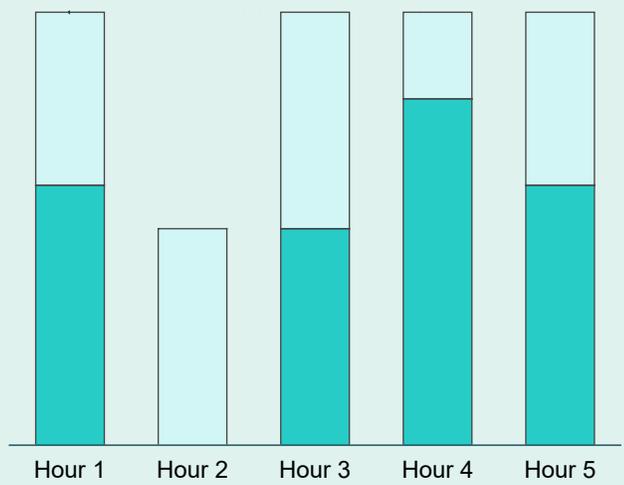
# Representing capacity markets in Prodisk

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

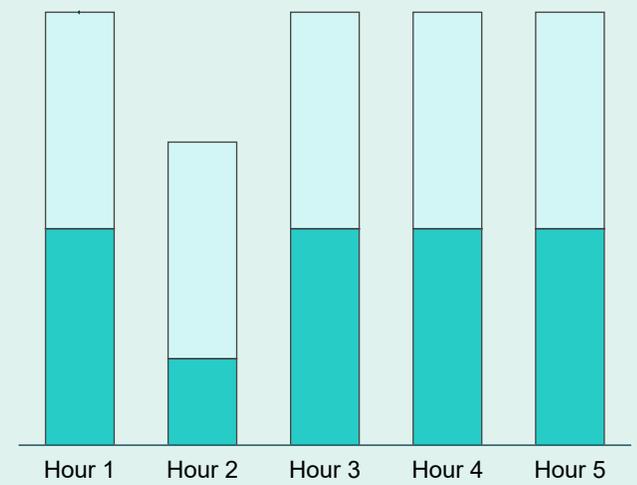
Only considering spot market



With capacity market (up)



With capacity obligation (up)

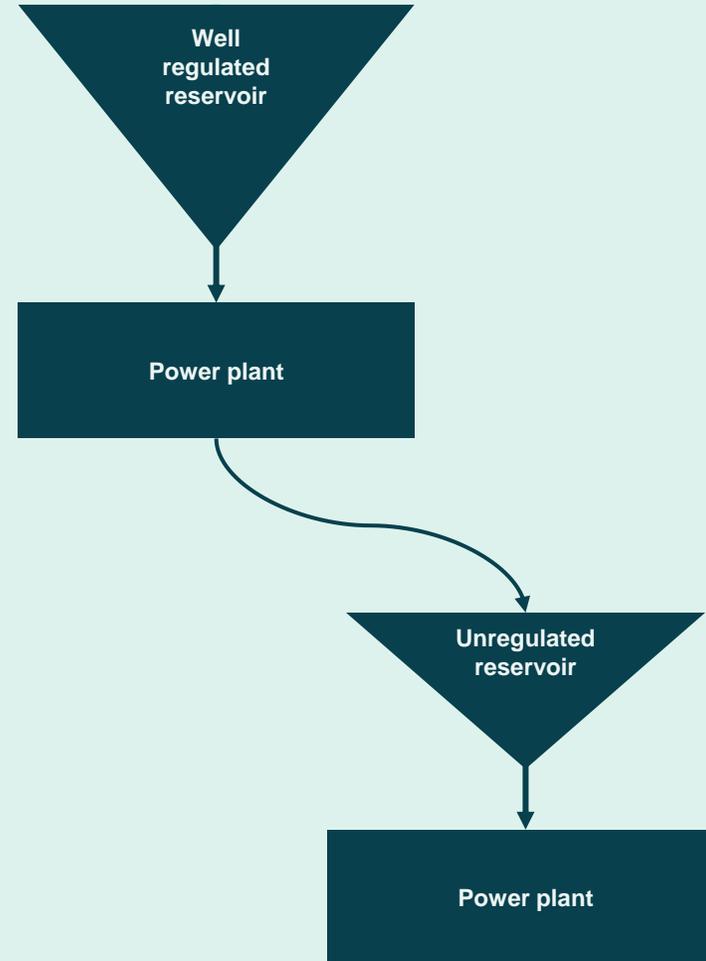


# Example system

Comparing two Prodrisk runs

1.  
Up and down  
regulation on  
both plants

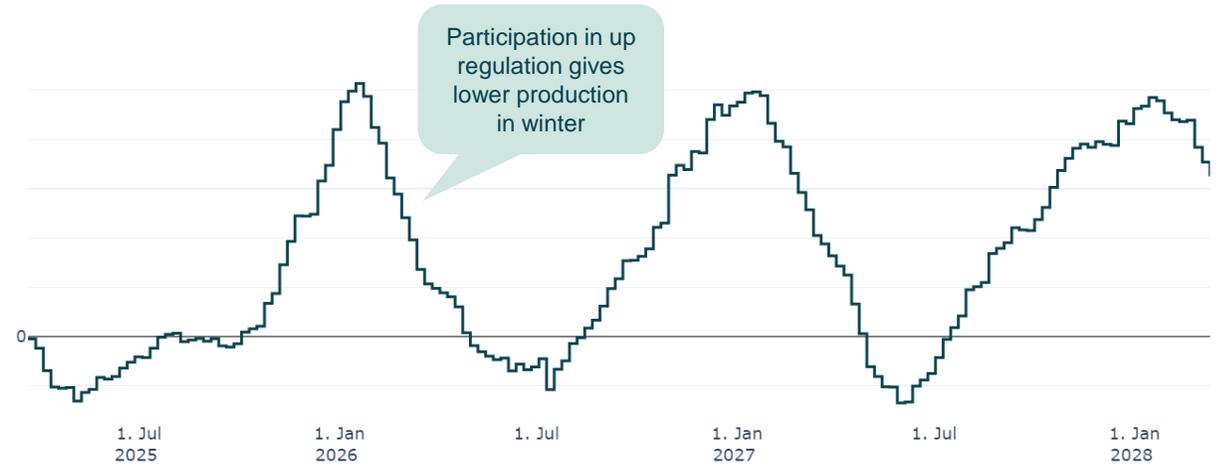
2.  
Without  
reserve  
markets



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

Production plan ►

accumulated difference in production with and without reserve markets



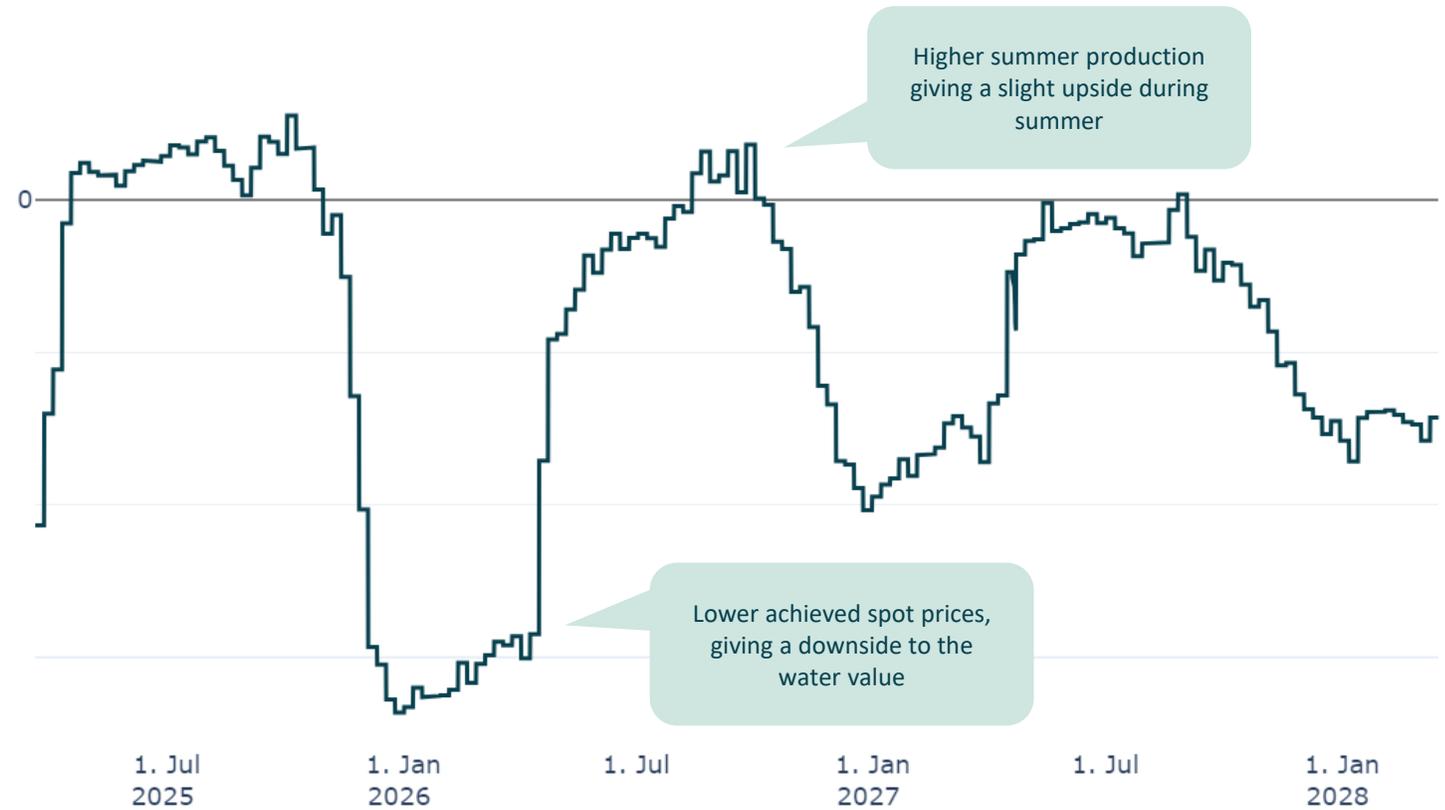
Reservoir filling ►

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





Hafslund