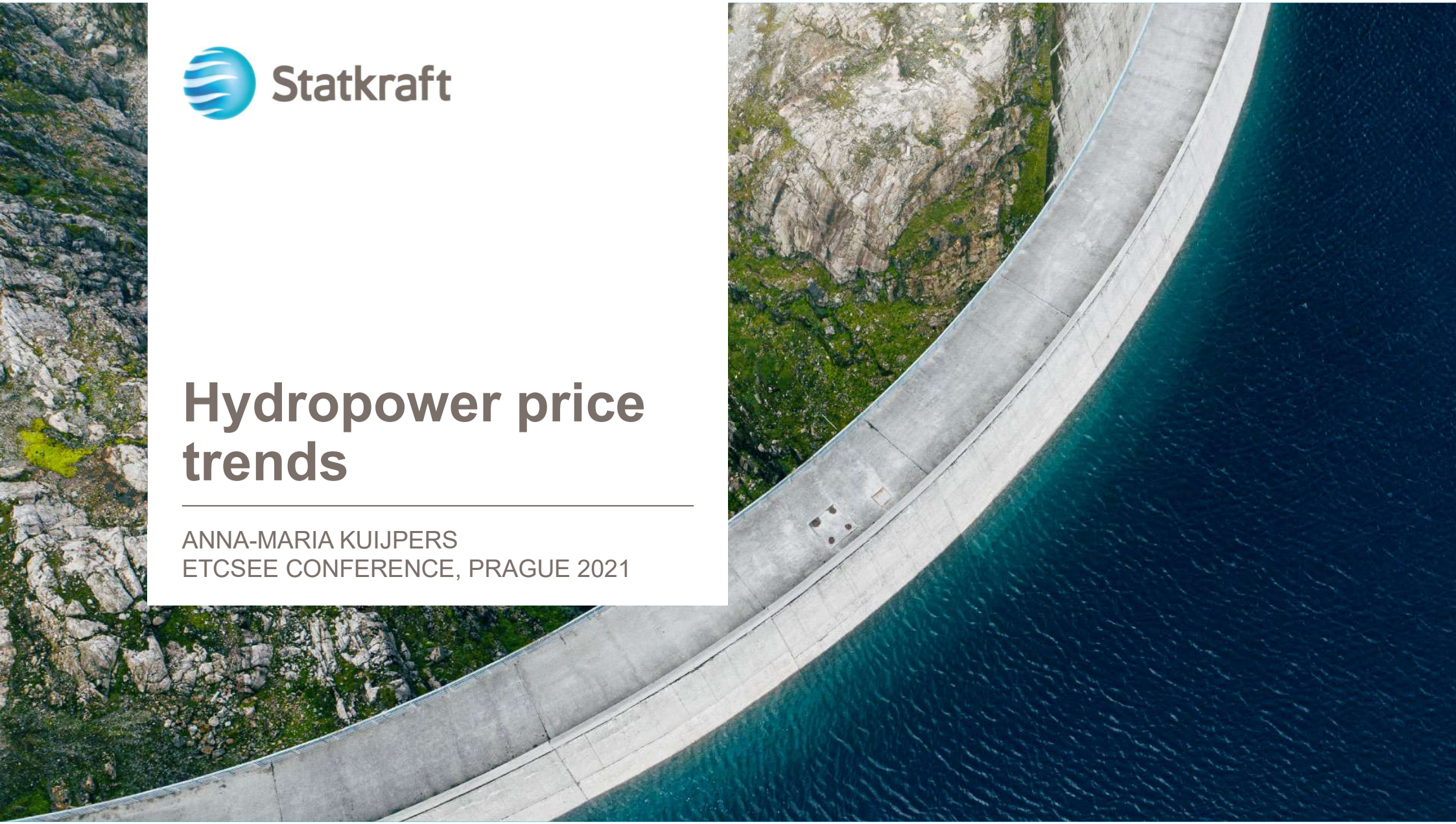


Hydropower price trends

ANNA-MARIA KUIJPERS

ETCSEE CONFERENCE, PRAGUE 2021

Statkraft at a glance

Own capacity

20 000 MW

65 TWh → **92%** renewable

Third party capacity

20 200 MW

Employees

4 500

Key figures 2020

Power generation

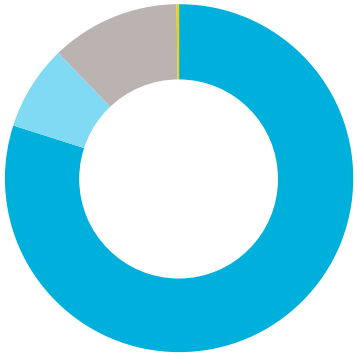
65 TWh

Installed capacity

20 000 MW

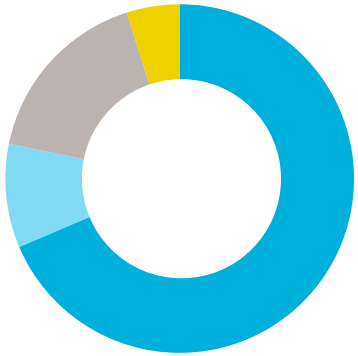
Technology **

- Hydropower 80 %
- Wind power 7 %
- Gas power 12 %
- Solar and bio 1%



Geography **

- Norway 68 %
- Nordic region ex. Norway 10 %
- Europe ex. Nordic region 17 %
- The rest of the world 5%



* And other income ** Generation capacity

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Statkraft presence in Albania

- South-east Albania, Devoll River
- Plants:
  - **Banja HPP**
  - **Moglice HPP**
- total installed capacity approximately **269 MW** and a planned annual production of approximately **700 GWh.**

Granting Concession
2009

Preconstruction
2009 - 2013

Construction
2013-2020

Operations
2016: Banja, 2020: Moglice

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Topics

- Hydro pricing of new hydro
  - Brief introduction
  - LCOE and flexibility
- Hydro pricing of existing hydro
  - Modelling & production forecast
  - Water value
- Conclusion

Hydro costs for new hydro – very brief introduction

- Increase to 1.153 GW installed capacity
  (world wide in 2020)
- Hydro share within renewables:
  - 41% in 2020
  - down from 72% in 2010, due to new wind/PV.
- Low cost source of energy
  - LCOE (**L**evelized **c**ost **o**f **e**lectricity for new capacity) of hydro is close to onshore wind.
- Water supply services

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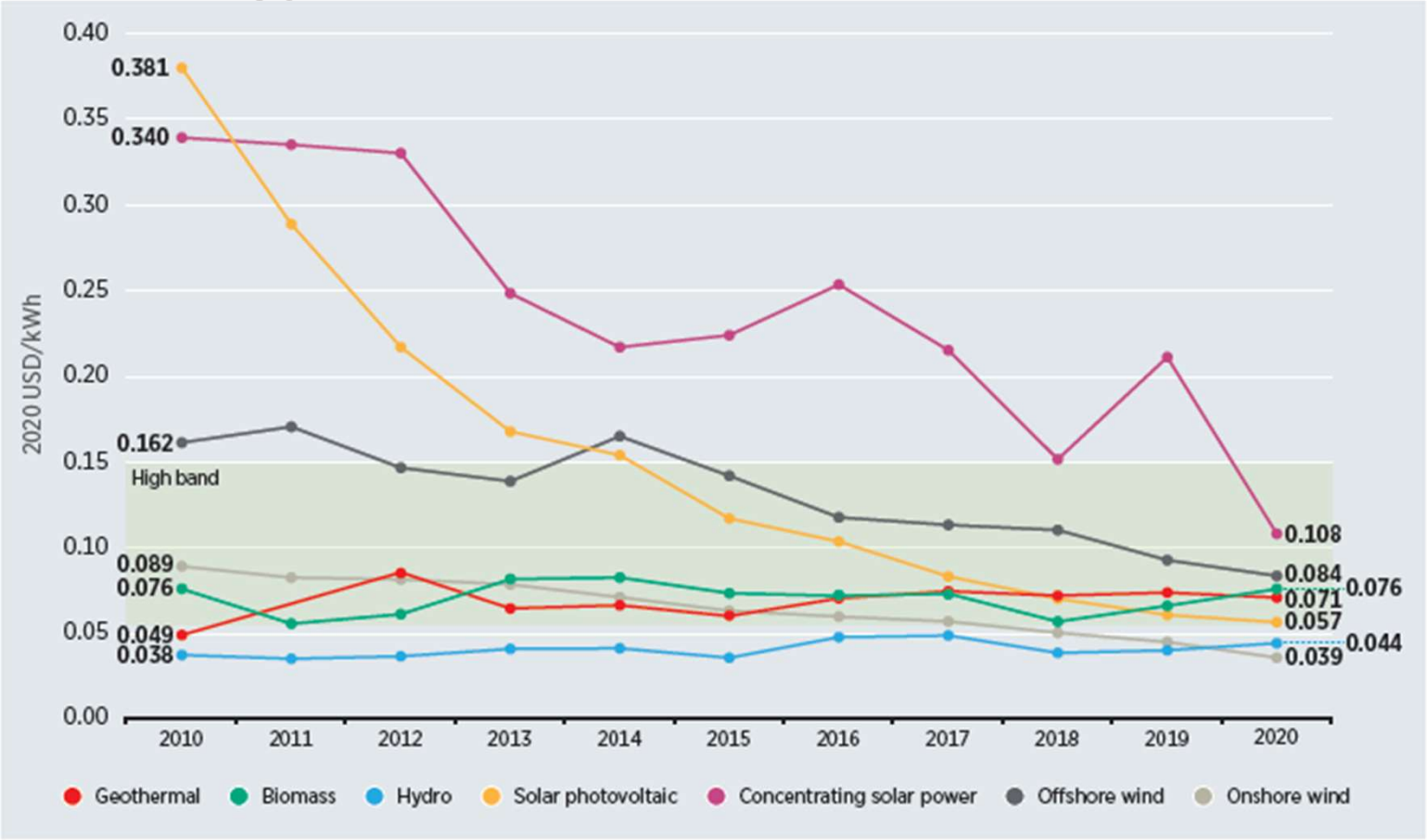
Global weighted-average utility scale LCOE by technology, 2010-2020



Source: IRENA Renewable Cost Database

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Large hydro project LCOE and capacity weighted averages by region 2010-2020

Source: IRENA Renewable Cost Database.

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Flexibility

- Size, location, type of turbine, the „water head“, downstream flow rate and seasonal inflow

- **3 categories of hydro assets:**
  - Run-of-river

  vs. Reservoir and Pumping storage

- Flexibility (reservoir storage)
  - frequency response
  - black start
  - spinning reserve

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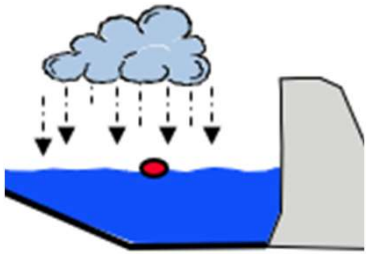
Hydro pricing impacts on existing hydro - modelling

- Three step process in terms of model run:
  - **Long term** price and inflow forecast: SDDP South-East-Europe model
  - **Water value** calculation, Seasonal model
  - **Short term** Hydro Optimization Model



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From long term price forecast to Day-Ahead production planning

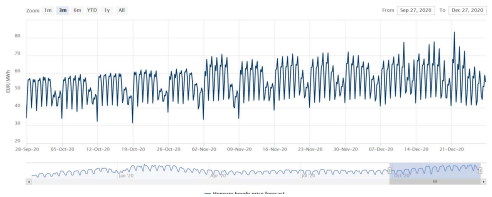
Long-term model Year+4

Water Value model 52 weeks

Market prices

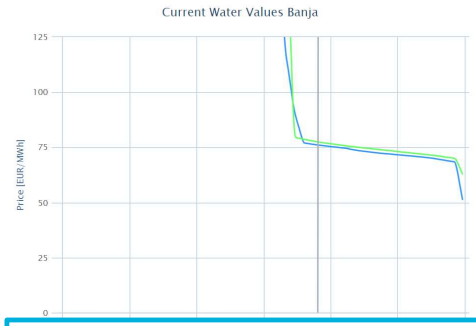
Short term model

Production plan

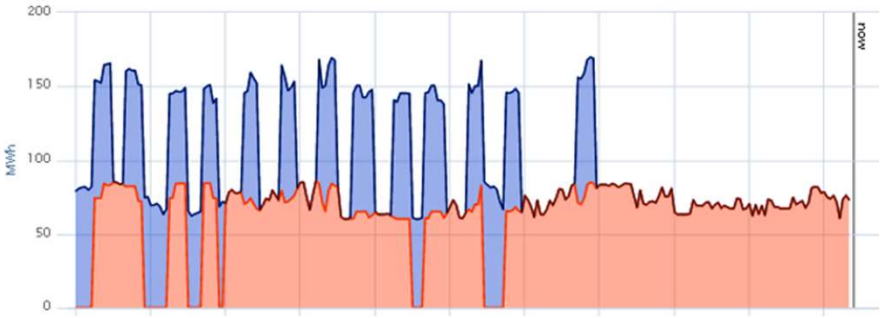


Hourly prices per scenario

Inflow scenarios



Water values



Optimal production plan

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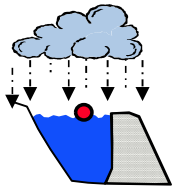
Water value

Reservoir 1 (small reservoir)

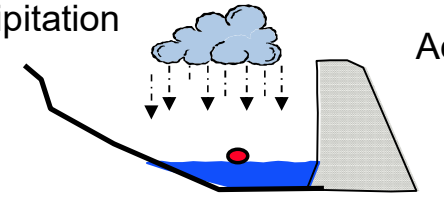
Future precipitation



Actual reservoir level: high >> water value low

Reservoir 2 (big reservoir)

Future precipitation



Actual reservoir level: low >> water value high

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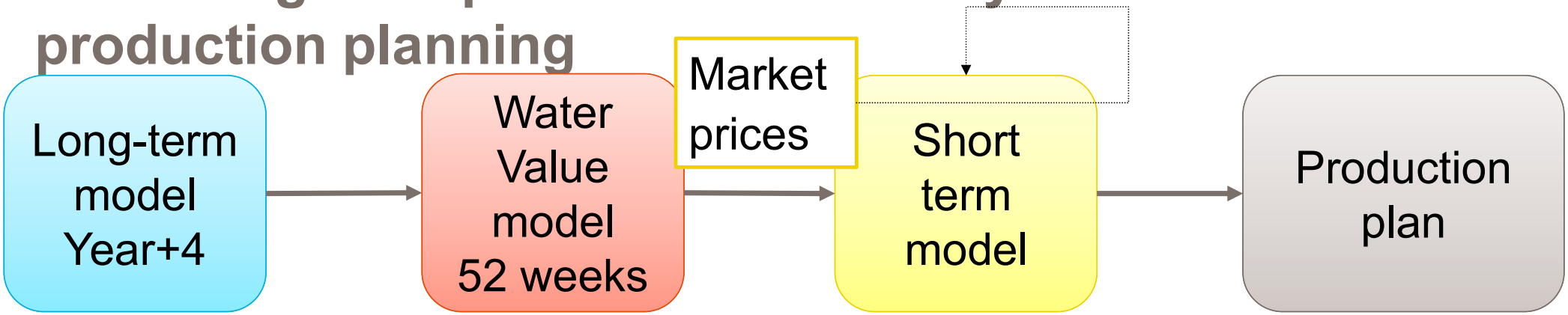
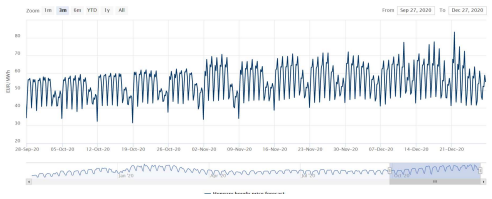
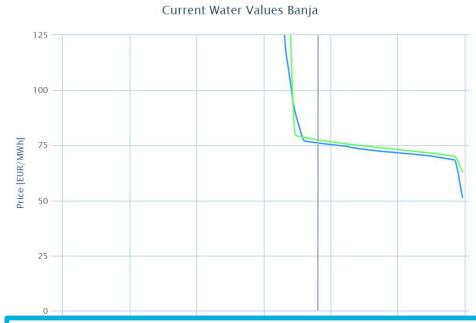
From long term price forecast to Day-Ahead production planning



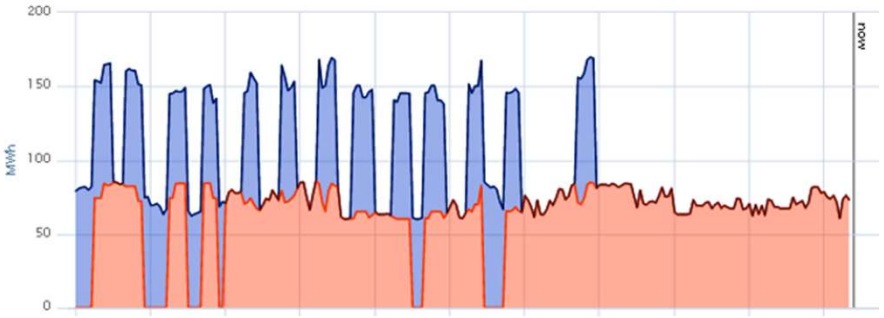


Hourly prices per scenario

Inflow scenarios



Water values



Optimal production plan

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