

A dynamic model for Reverse Osmosis as part of a decision support tool for IMPROVED water fit-for-use

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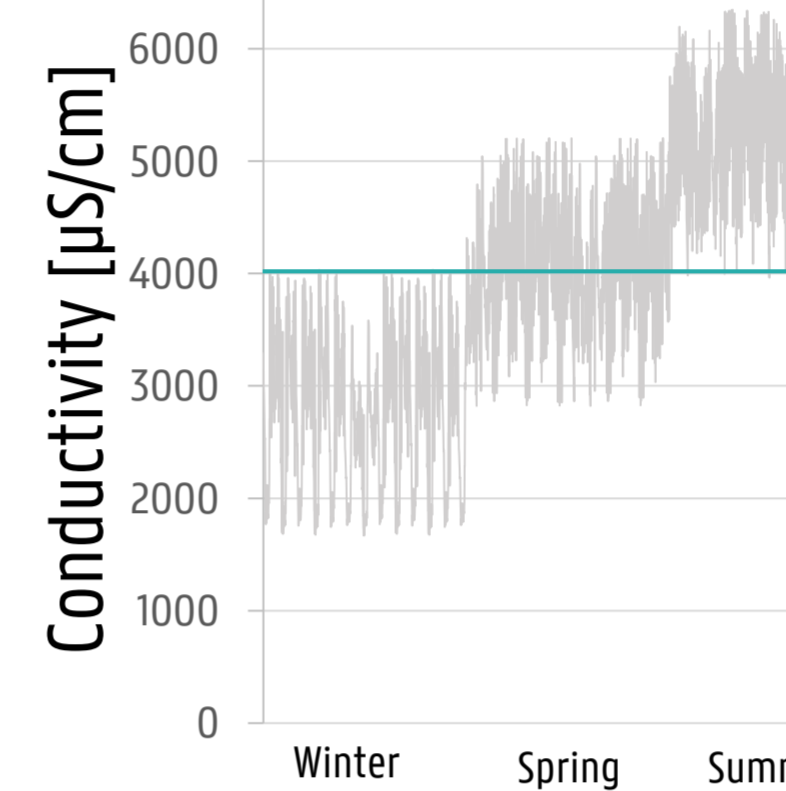
Supply of process water in industry is challenged by decline of water resources

Changing feed water properties
Requirements vary by sector

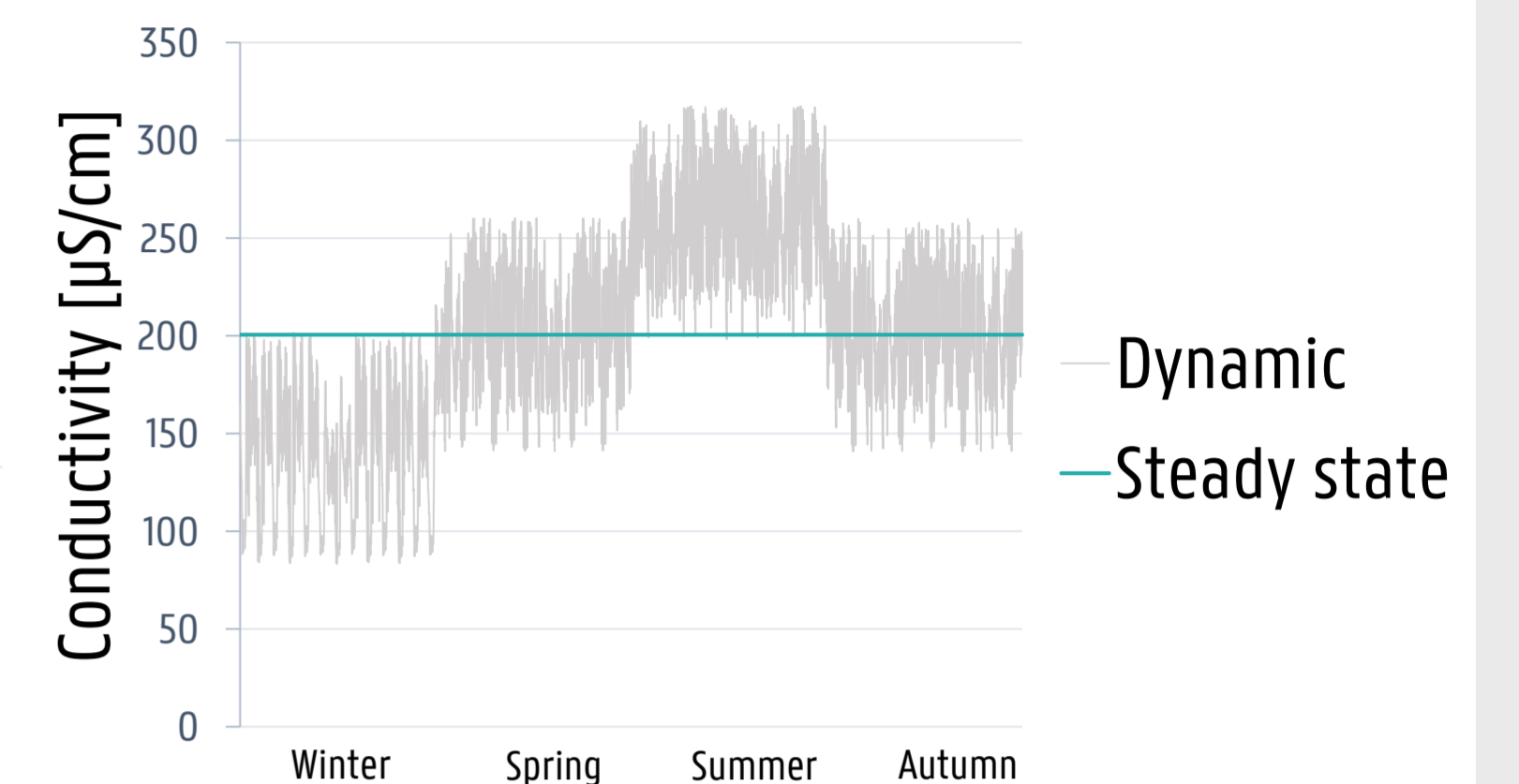
e.g. Kanaal Gent-Terneuzen
Conductivity Feed (INPUT)

Simulation with models to anticipate on these challenges

Lack of flexibility
No dynamics involved
No notion of uncertainty

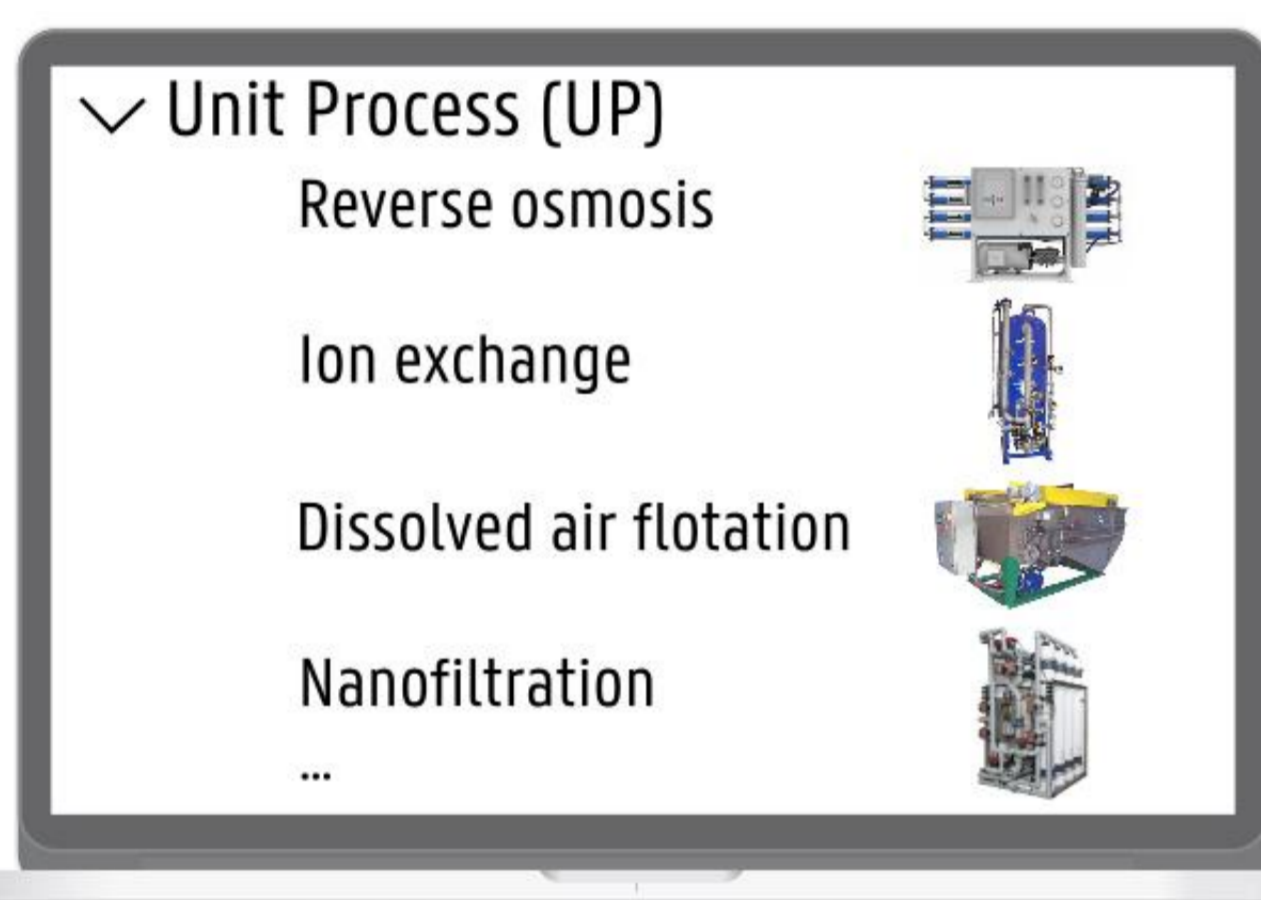


Water quality (OUTPUT)

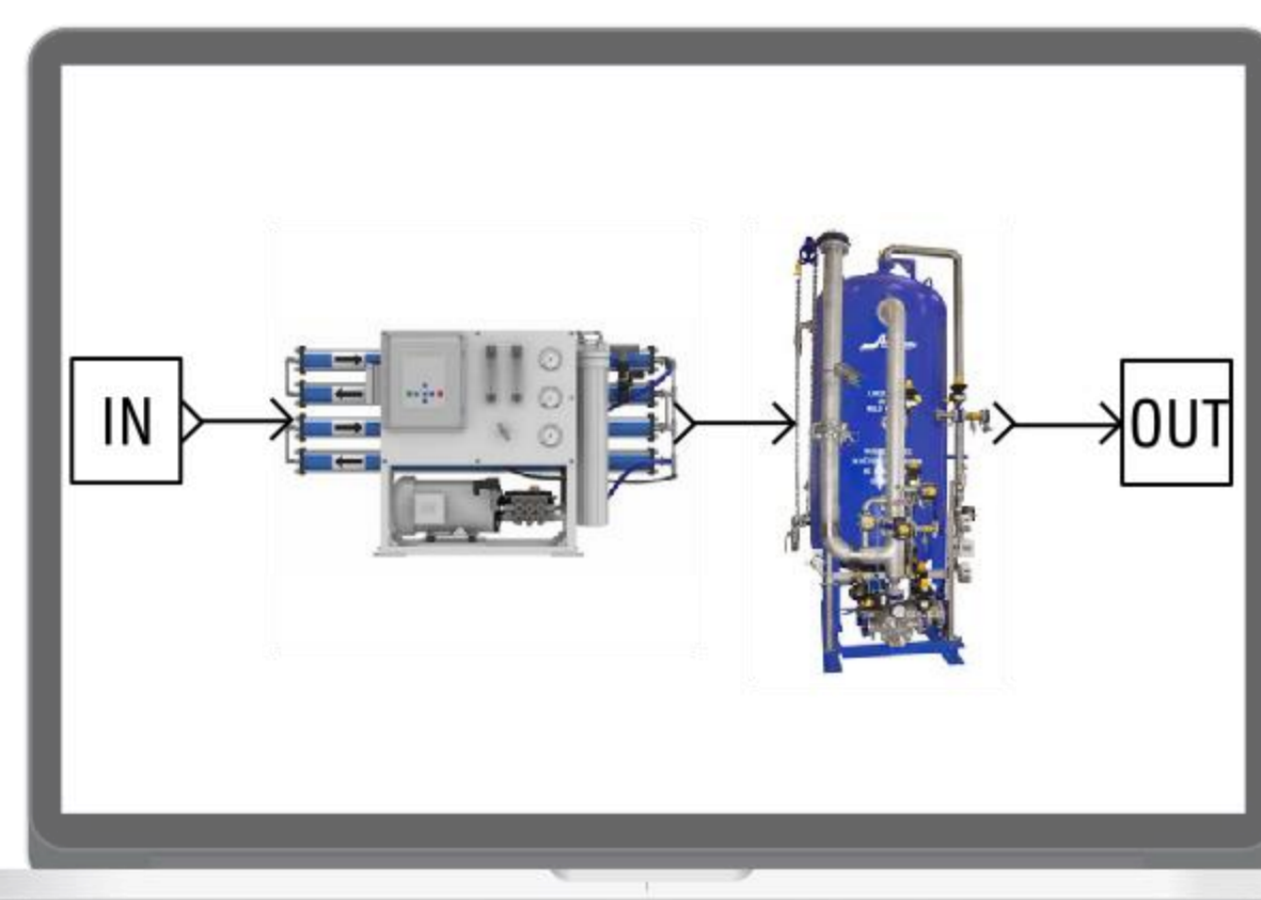


Development of a decision support tool

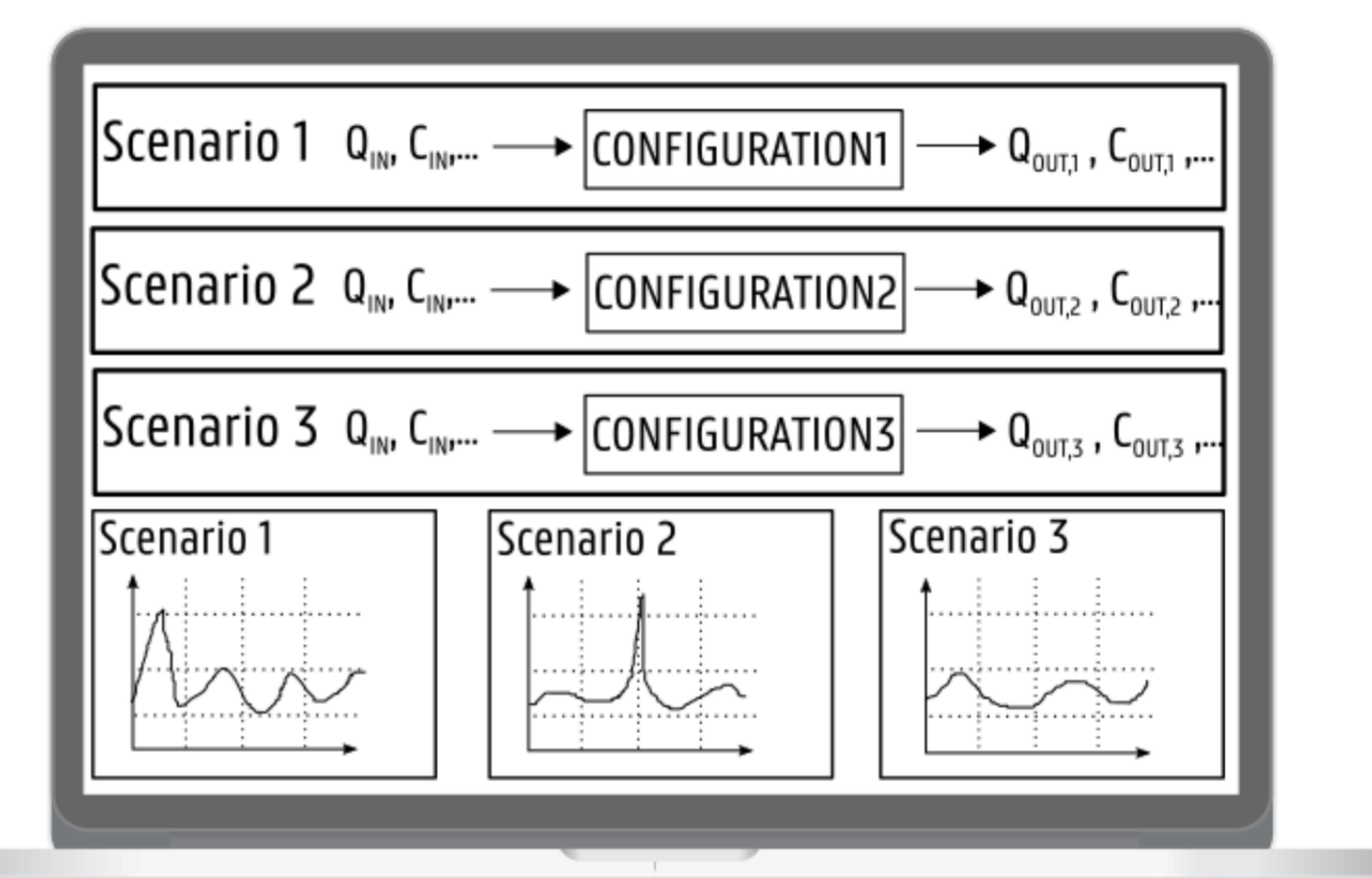
Model library



Configuration builder



Simulation environment



Post processing & Decision support

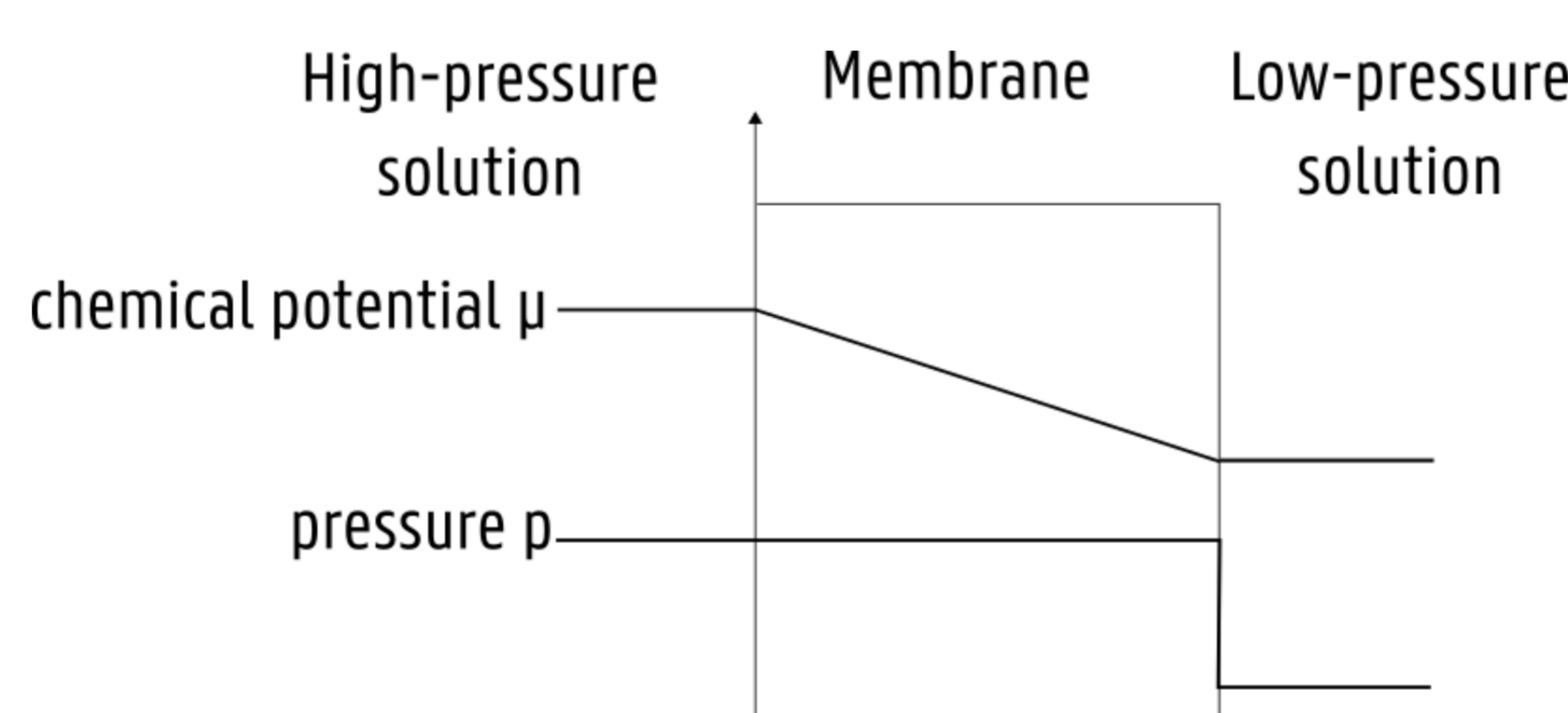
UP 1: Reverse osmosis

Transport through membranes described by the **solution-diffusion model**:

$$\text{Solute flux: } J_s = B \cdot (C_{s,f} - C_{s,p})$$

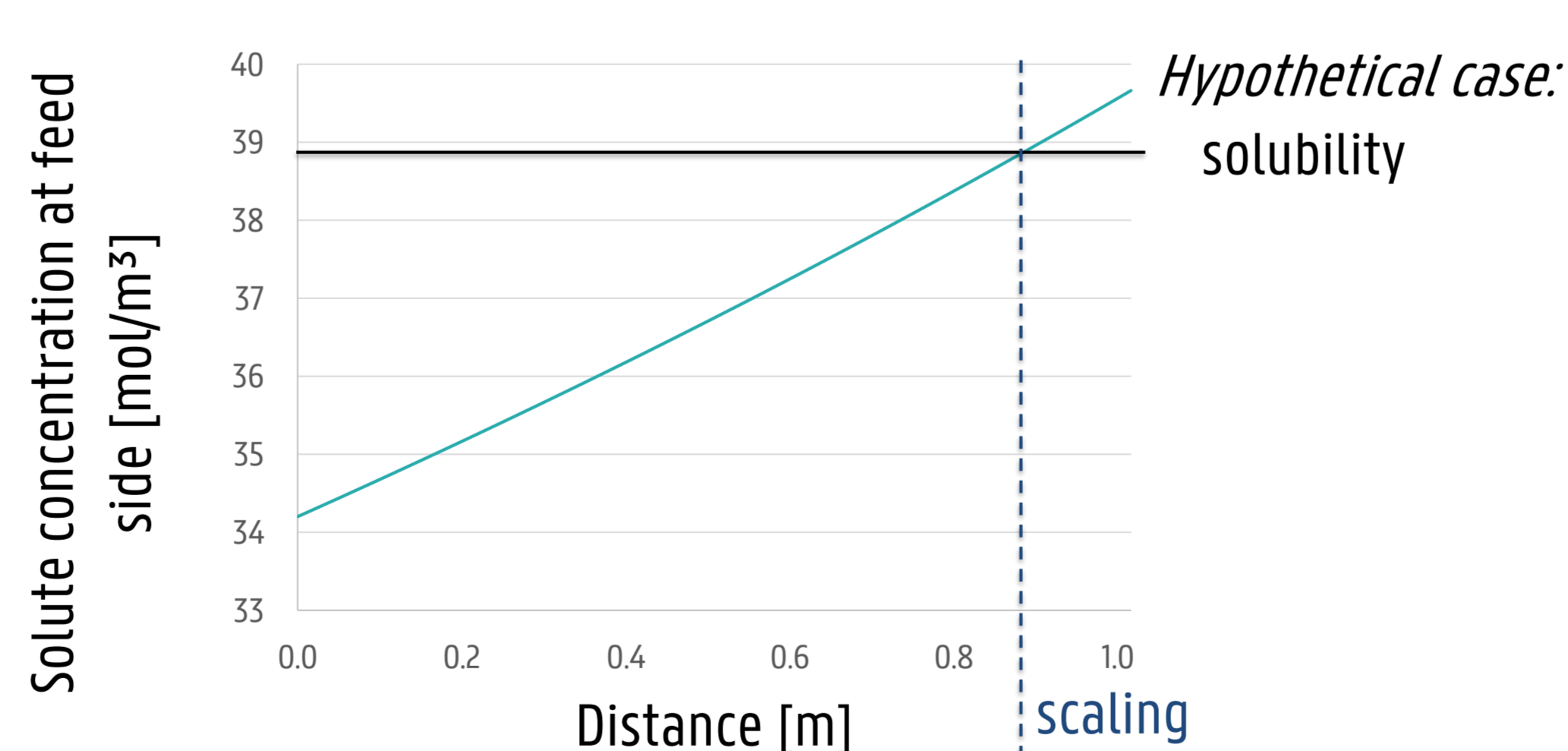
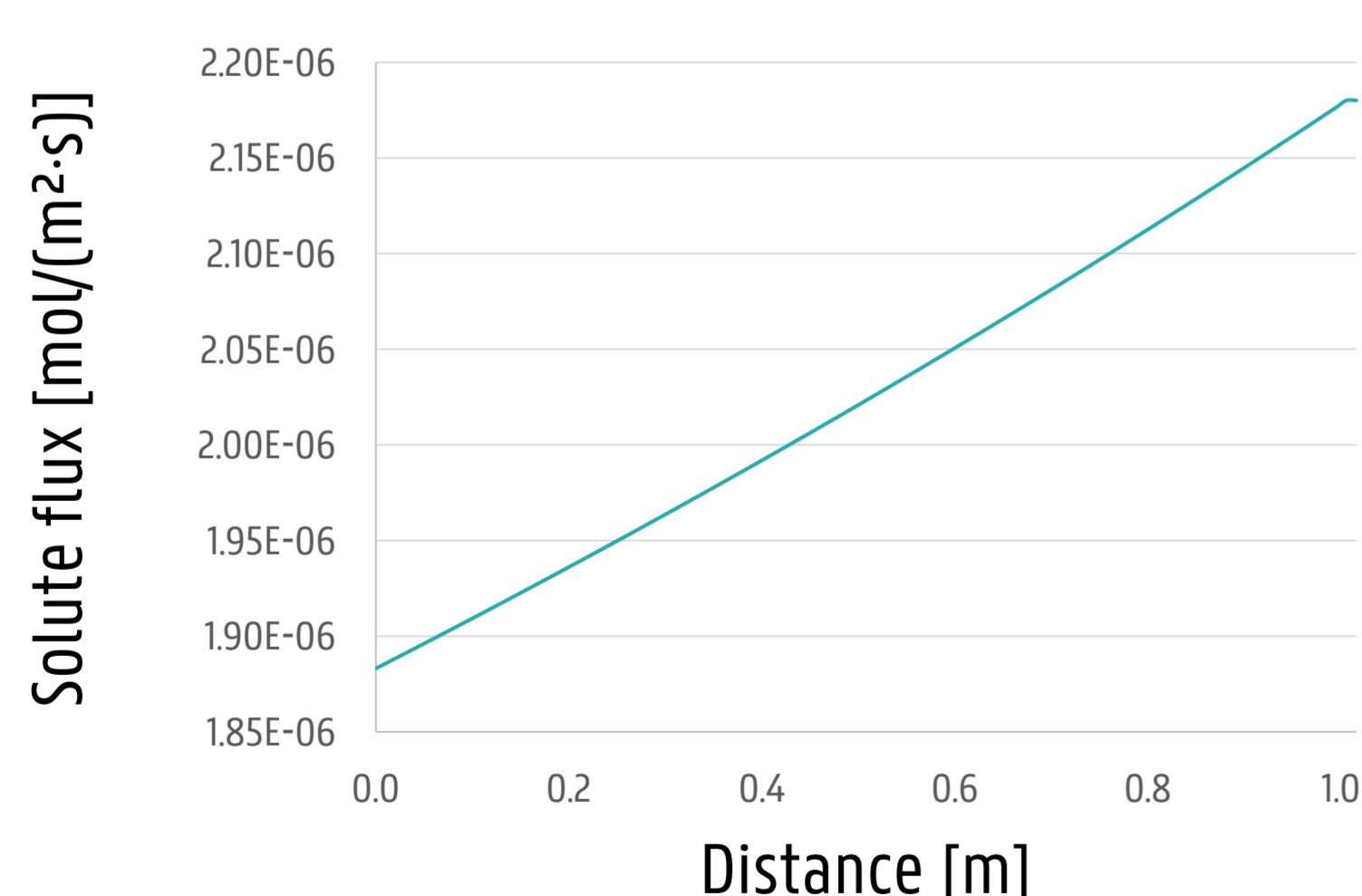
$$\text{Water flux: } J_w = L_p \cdot (\Delta P - \Delta \pi)$$

Assumptions:



Model with spatial dependence

- Simulation for DOW FILMTEC BW30HR-440i Element



Fluxes change along the RO module

Solute concentration at feed side increases (16%)

Risk: scaling at end of RO module

Dynamic simulations

- longer life span of membranes
- optimised control of plant

IMPROVED project



= 'improved water technology for chemical industry'



Knowledge grows

Three state-of-the-art mobile research facilities:

- purify the water in the most efficient way
- estimate the effect of corrosion or biofilm growth on the distribution system
- test the impact of the water quality on the downstream process

Data for calibration and validation