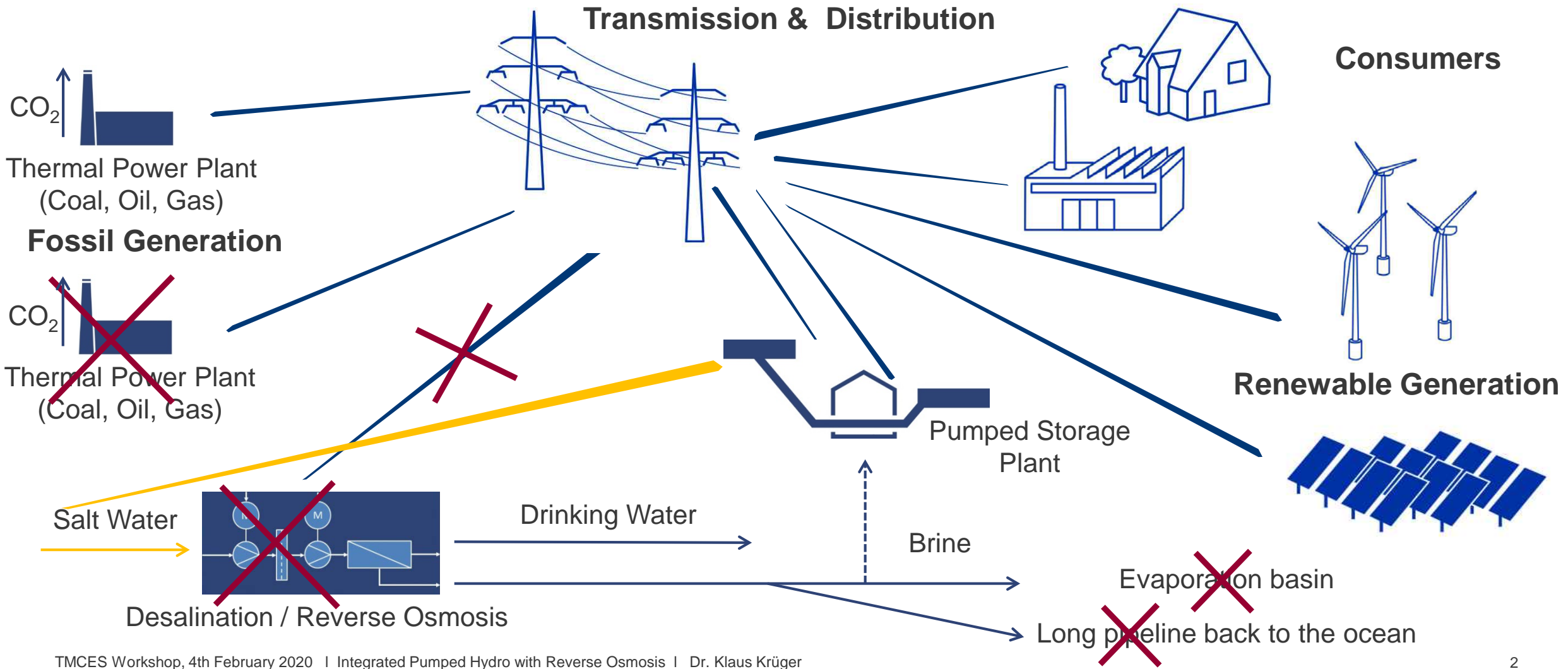
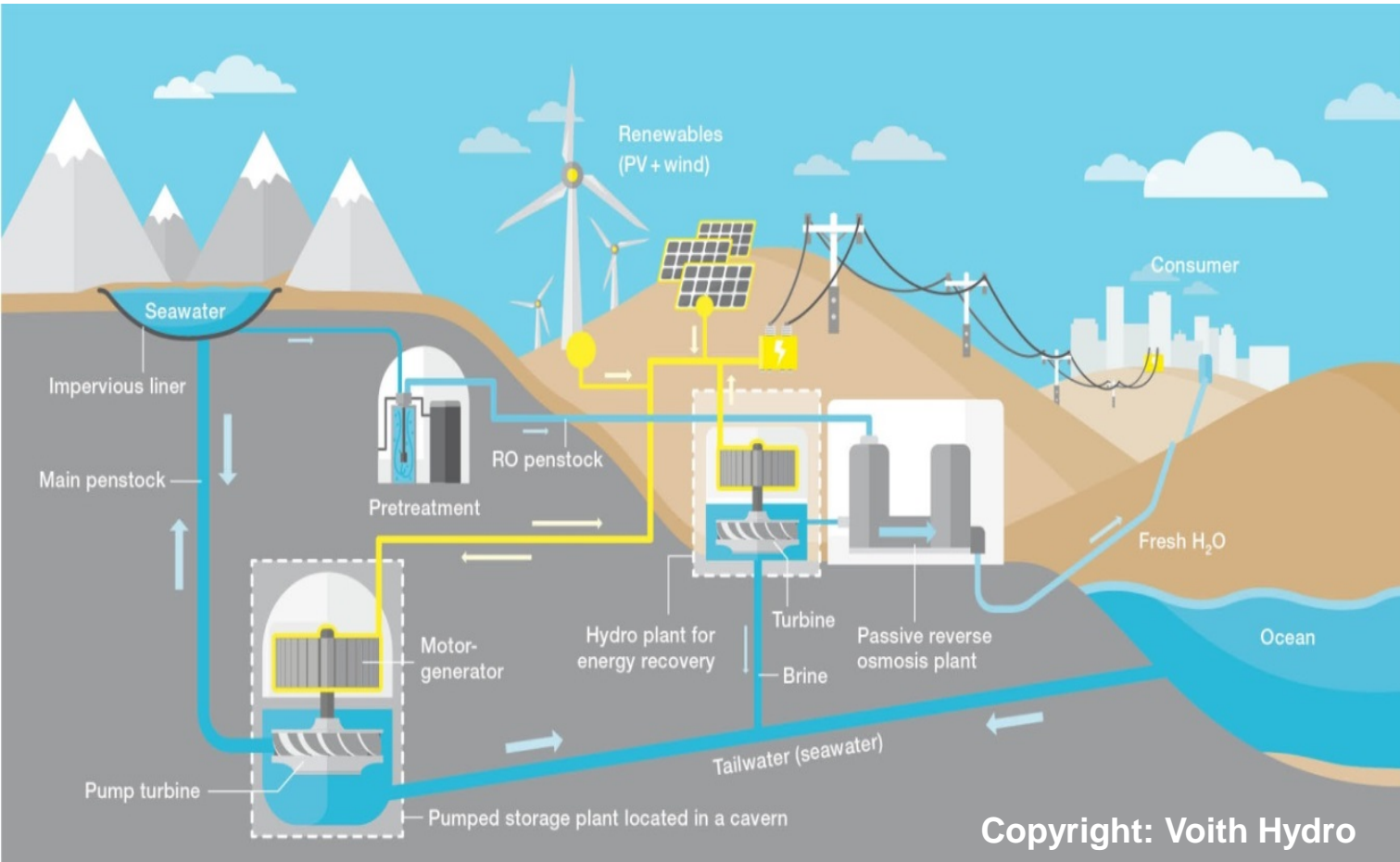


How can pumped storage help providing CO₂ -free electricity and fresh water in arid coastal areas with scarcity of water ?

Symbiotic approach: co-location of renewables & pumped storage & passive RO



Schematic of proposed Integrated Pumped Hydro with Reverse Osmosis System (IPHROS)



Copyright: Voith Hydro

Seawater is pumped up into a lined upper reservoir using renewable energy sources

Pumped hydro is operated in a daily cycling mode: during daytime in pump mode and during night in turbine mode

A small amount of the reservoir water flows back through a pretreatment filter and to a passive RO plant

High pressure brine flows to a hydro energy recovery plant, where the power output is sent to grid

Low pressure brine is diluted with seawater flowing into tail water (in turbine mode only)

Source: Slocum et. al 2016:

<http://www.sciencedirect.com/science/article/pii/S2213138816300492>

The idea was first proposed in the 1970's: What changed?

- Reliability increase and cost decrease of RO increased significantly in the last 20 years
- The cost of electricity by wind and PV decreased significantly in the last two decades
- OEMs like Voith Hydro developed materials and corrosion protection measures for steel structures in direct contact with seawater
- Brine dilution using tail water flow in turbine mode can overcome environmental concerns

Thank you!

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