“Improved Oil Recovery (IOR) by Smart Water”

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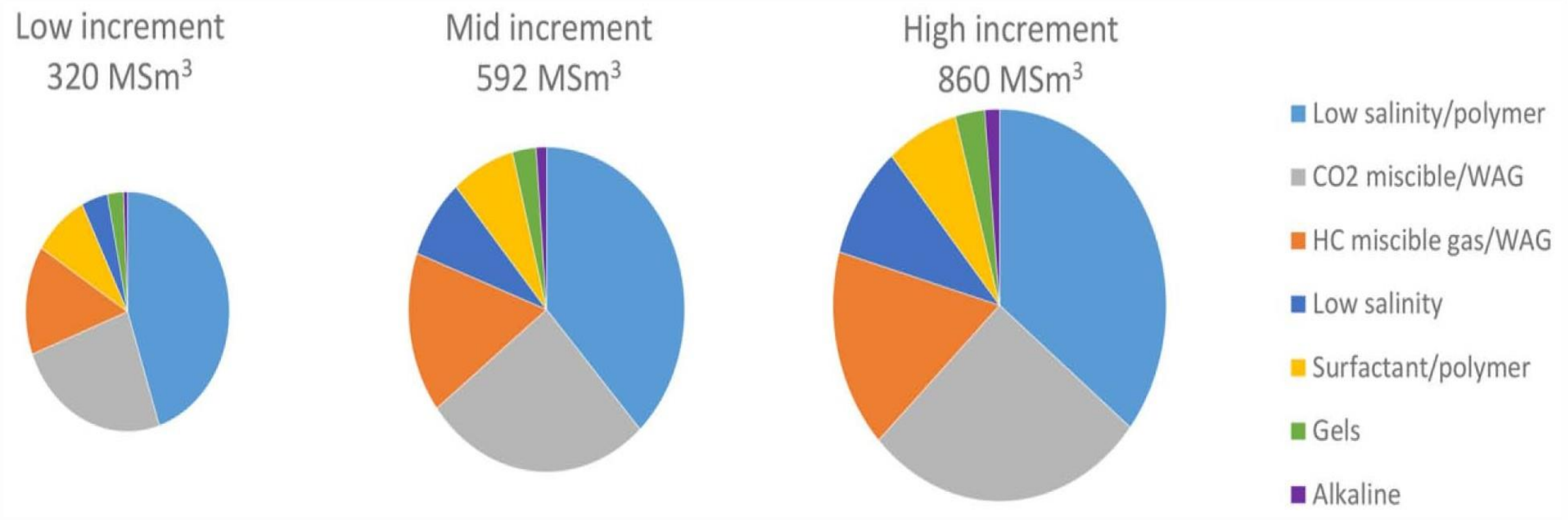
Technical potential of different Enhanced Oil Recovery (EOR) technology on Norwegian Continental Shelf (NCS)



2 billion barrels

3.7 billion barrels

5.4 billion barrels

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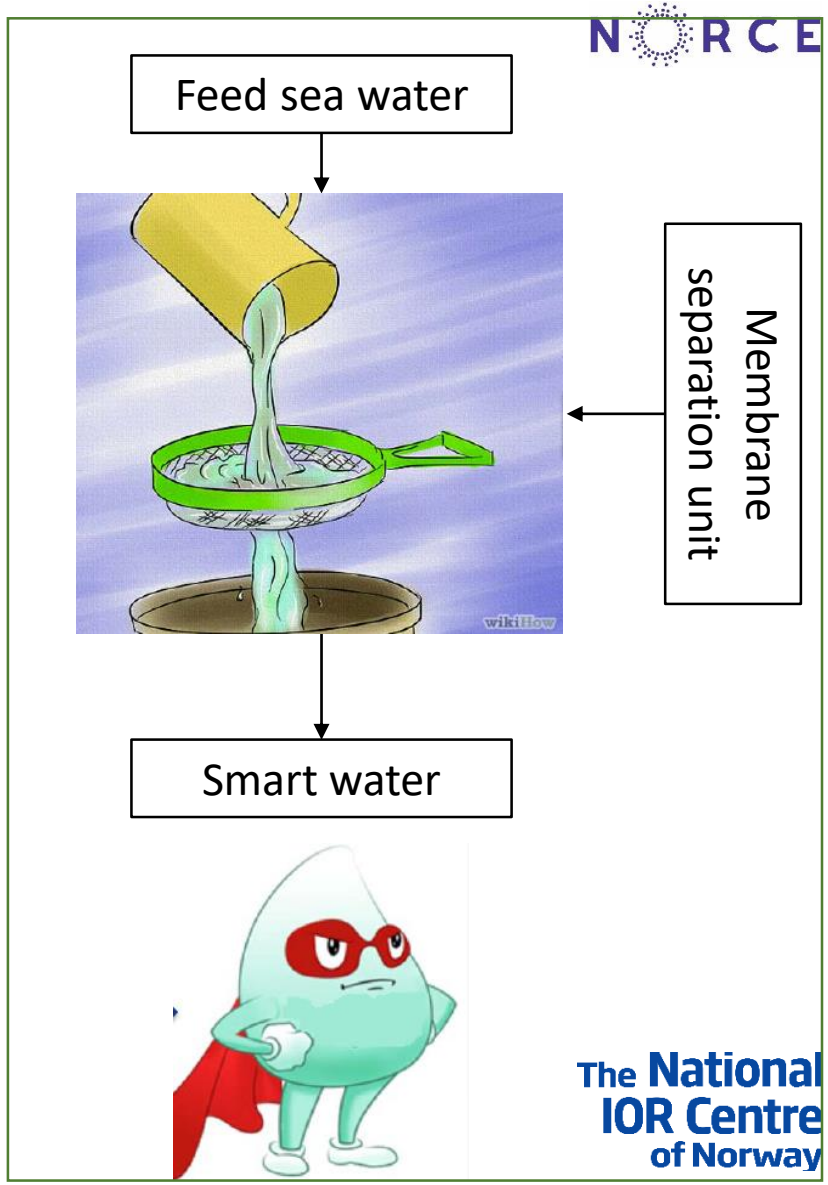
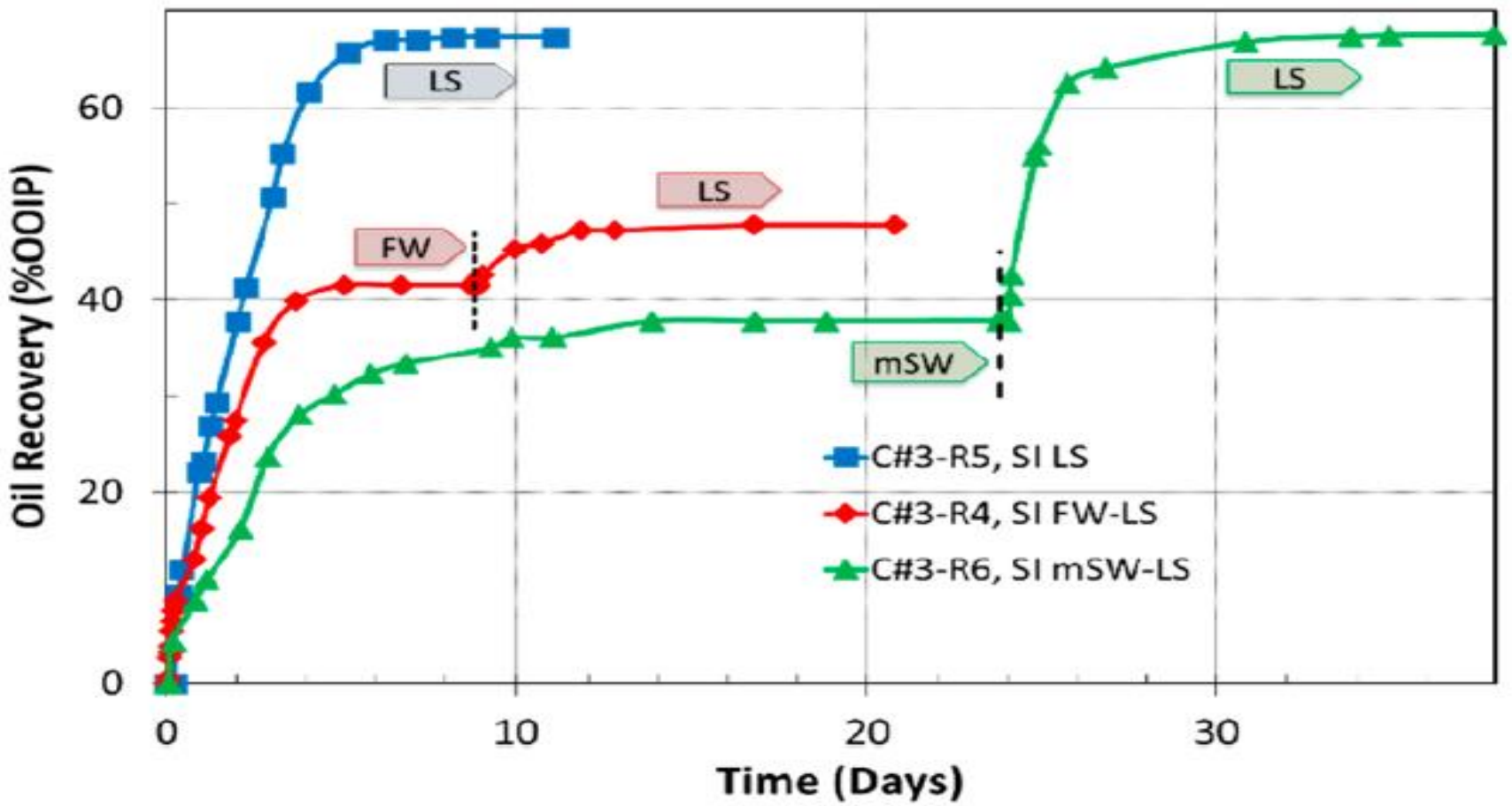
What is “Smart Water” (Low salinity)?

- Water with a modified ion composition that helps in altering the wettability.
- Can help in more efficient water sweep and accelerated oil production.
- Accelerated oil production: Less operation time: Less CO_2 emissions.
- No chemicals added - environmentally friendly, possible to manufacture cost-effectively.



Oil recovery test from laboratory studies using “Smart Water” in sandstone core



LS – Low salinity smart water
FW – Formation water
mSW – Modified sea water

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How Smart Water can be a “Low Emission” and “Low Discharge” Technology

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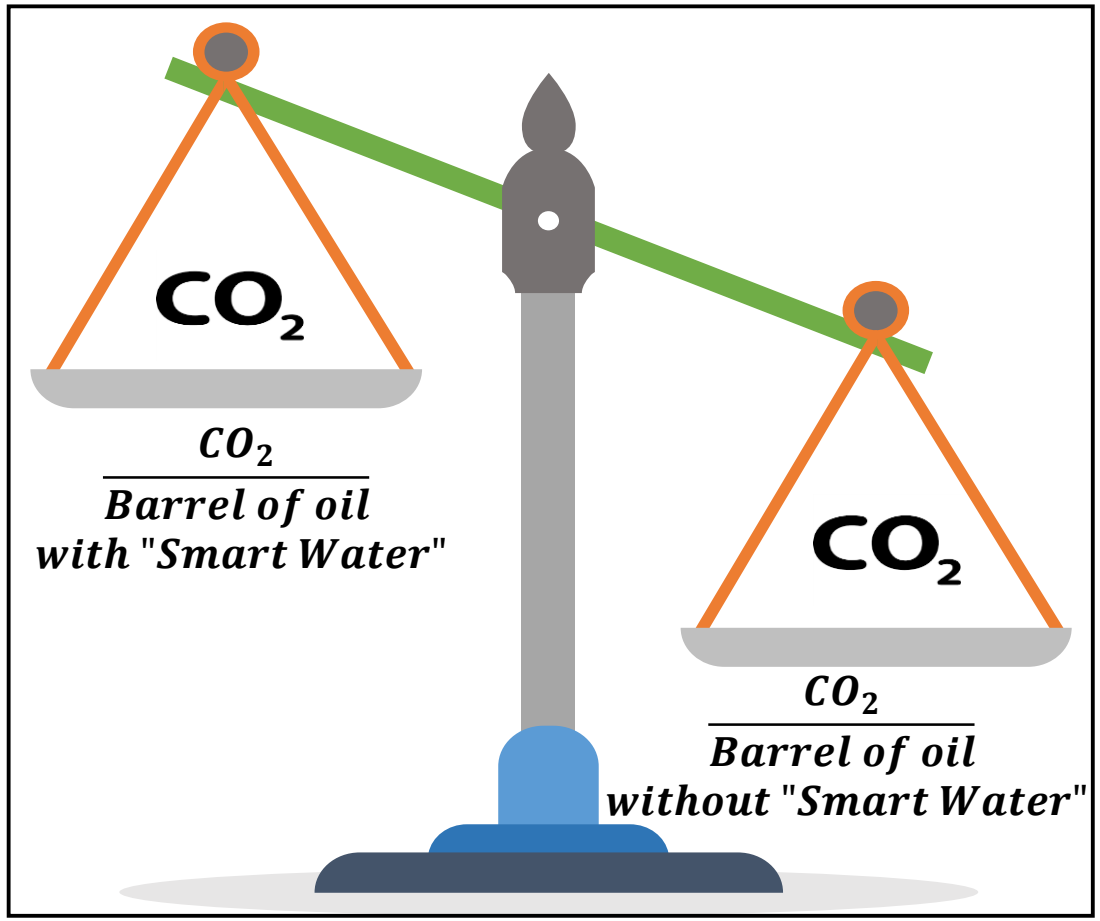
Emissions to air

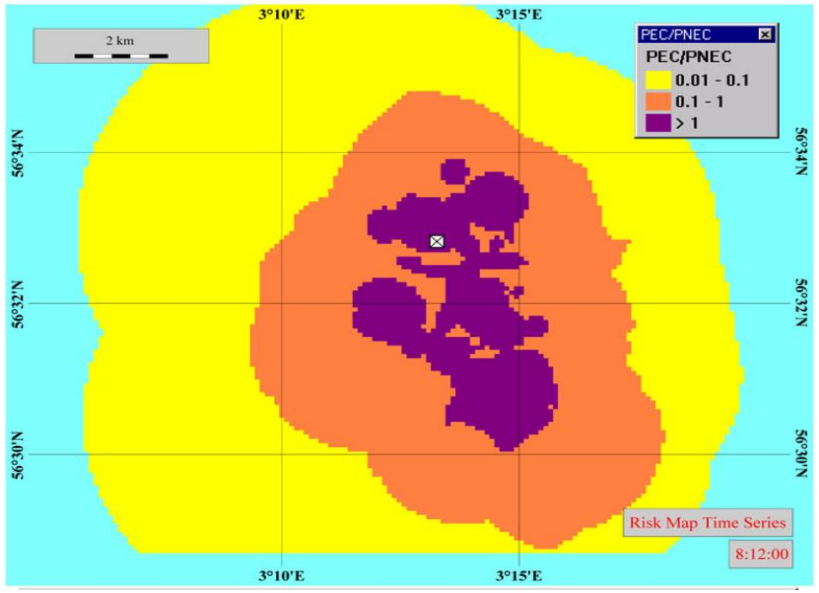
- Quantify emissions to air during the life-cycle of an oil field.
- Normalizing emissions to air and oil recovery $\left(\frac{CO_2}{Barrel\ of\ oil}\right)$ with and without smart water.
- Our vision is $\left(\frac{CO_2}{Barrel\ of\ oil}\right)_{with\ smart\ water}$ less than $\left(\frac{CO_2}{Barrel\ of\ oil}\right)_{without\ smart\ water}$.
- Reason: reduced operation time and more oil recovery per unit of water injected.



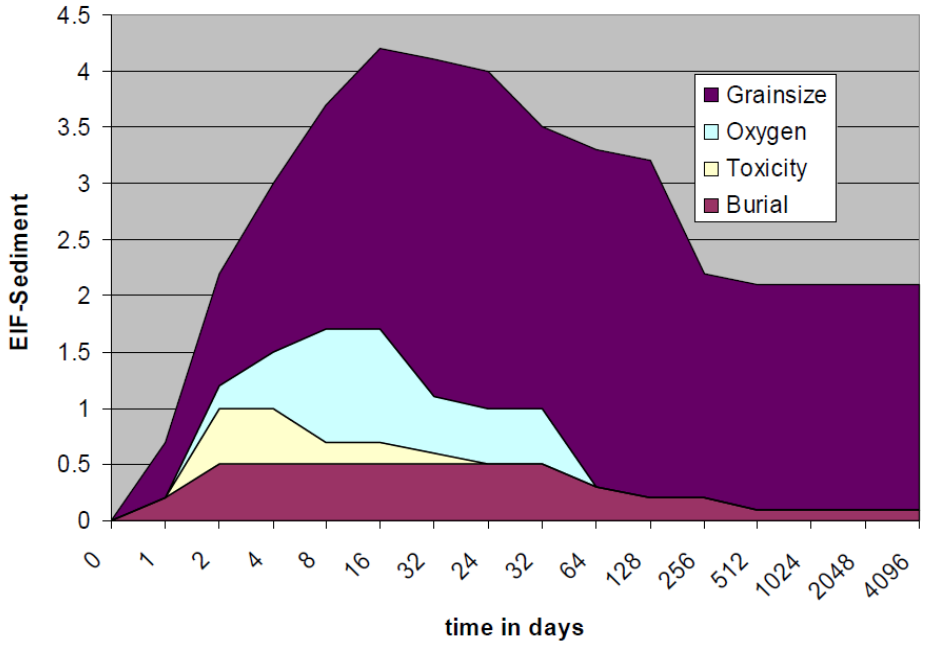
Discharges to marine environment

- Environmental risk assessment (ERA) of Produced water and Drilling discharges using Dose-related Risk and Effect Assessment Model (DREAM).

ERA of Produced water discharge



ERA of Drilling discharge



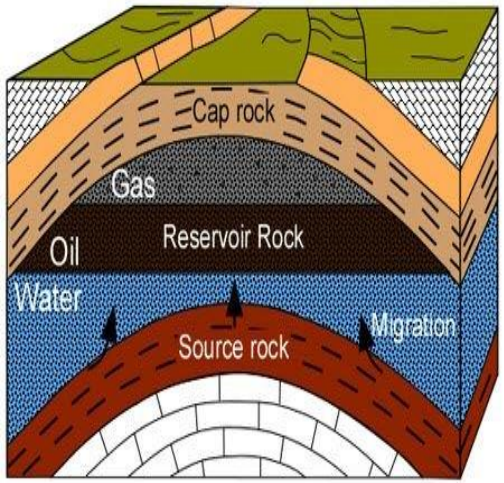
IOR "Smart Water" environmental benefits and increased oil recovery?

Recovered Oil

Emissions to air during the life cycle of an oil field when implementing smart water

Low emission

Smart Water production by Nano Filtration and Reverse Osmosis membrane process



Produced water discharges

Use of produced water for smart water production: Low discharge

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Field scale evaluation

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The 2019 user partners and observers:

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wintershall dea

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vår energi

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petoro

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