

#H2OffThePress

Water for hydrogen production



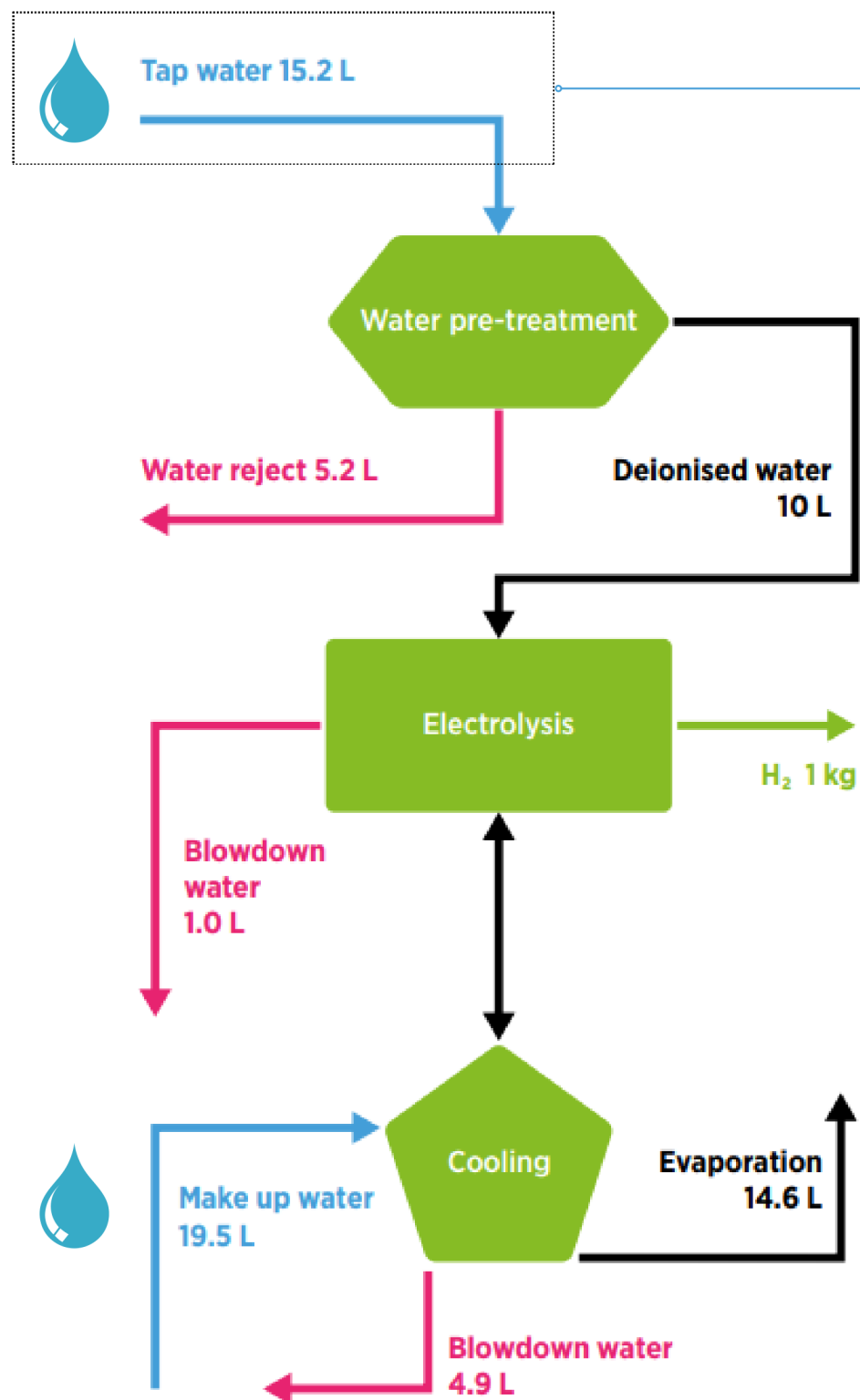
**Building a sustainable
hydrogen industry**



Water is key for all forms of hydrogen production



Water is required as an input for production and as a cooling medium for all types of hydrogen production



Water source requirements
(when direct intake of tap water is unavailable)

17.2L

**River or
Groundwater**

25.3L

Seawater

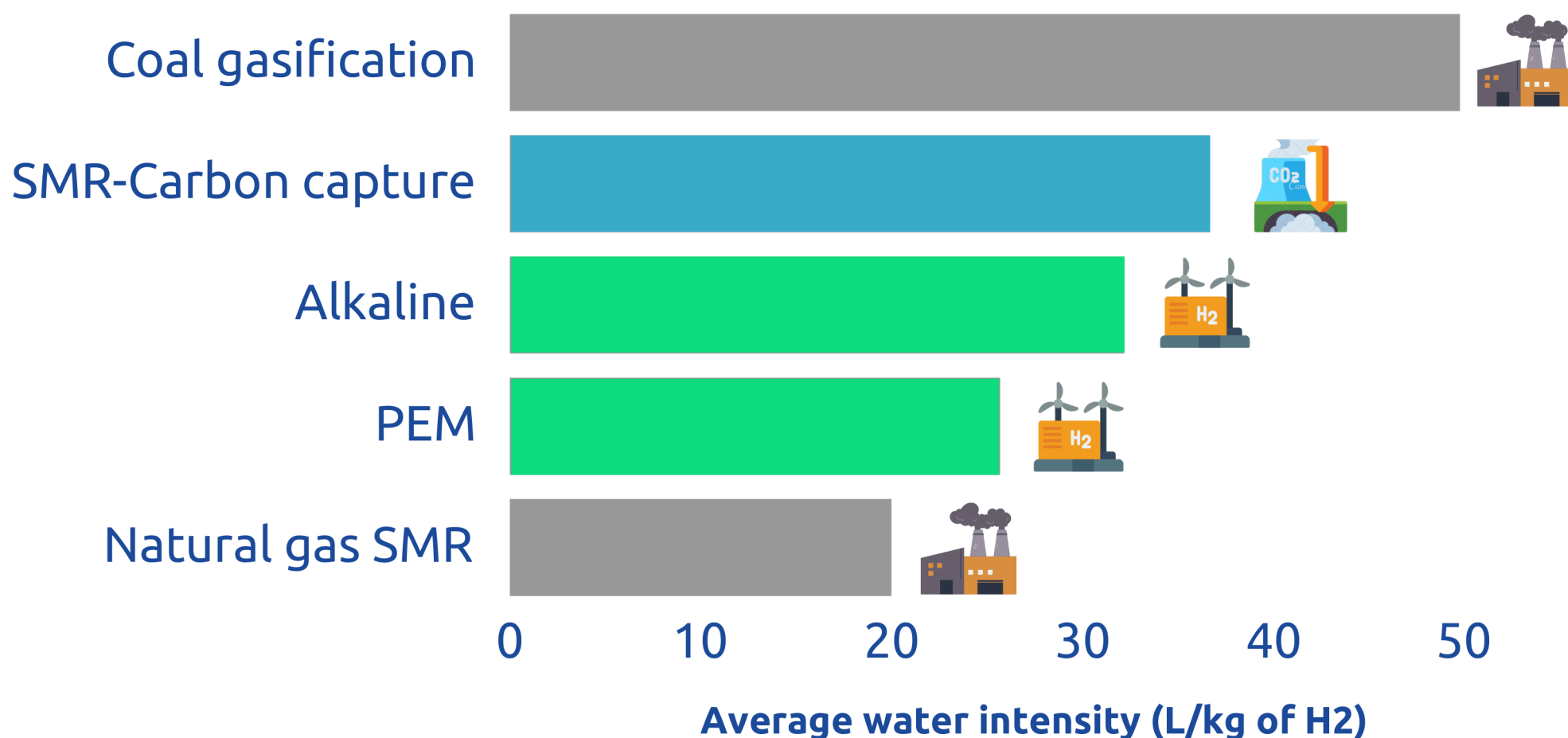


For 1kg of H₂ output

Green H2 is the most water efficient method of clean H2 production



While H2 production using natural gas is the most water efficient method, it is emission intensive



The water for green H2 technologies are to decrease even further with technological advancement as:



For every **1% increase in electrolysis efficiency**, the water withdrawal as well as consumption requirements of green H2 production **lessen by about 2%**

Water requirements may seem high but is just a fraction of what the energy sector consumes

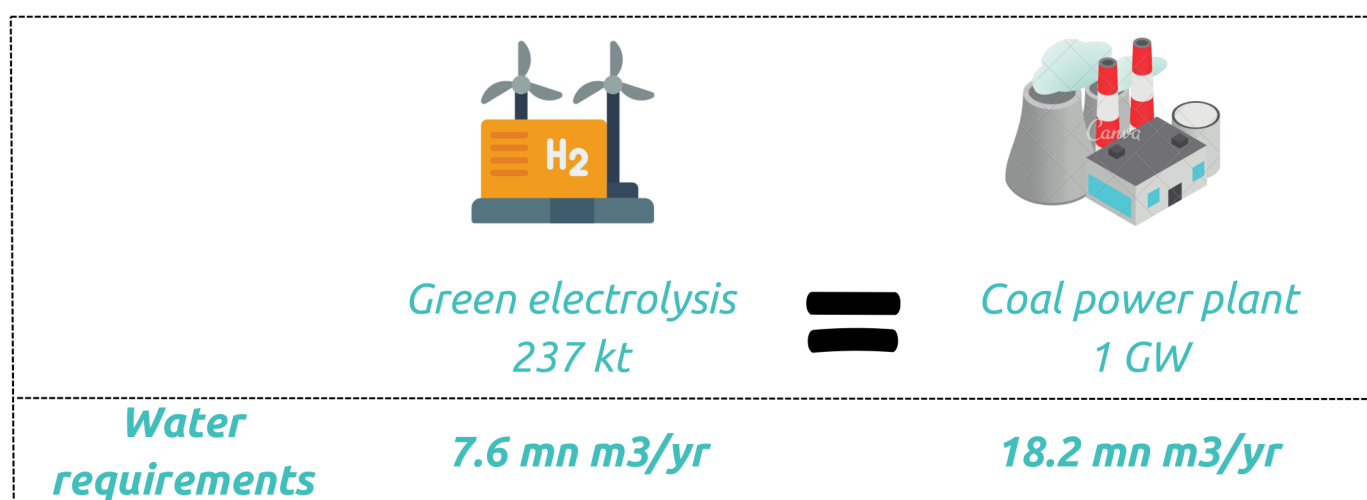


By 2040, annual global H₂ production would reach 247 Mt, green hydrogen accounting for almost 67% according to IRENA

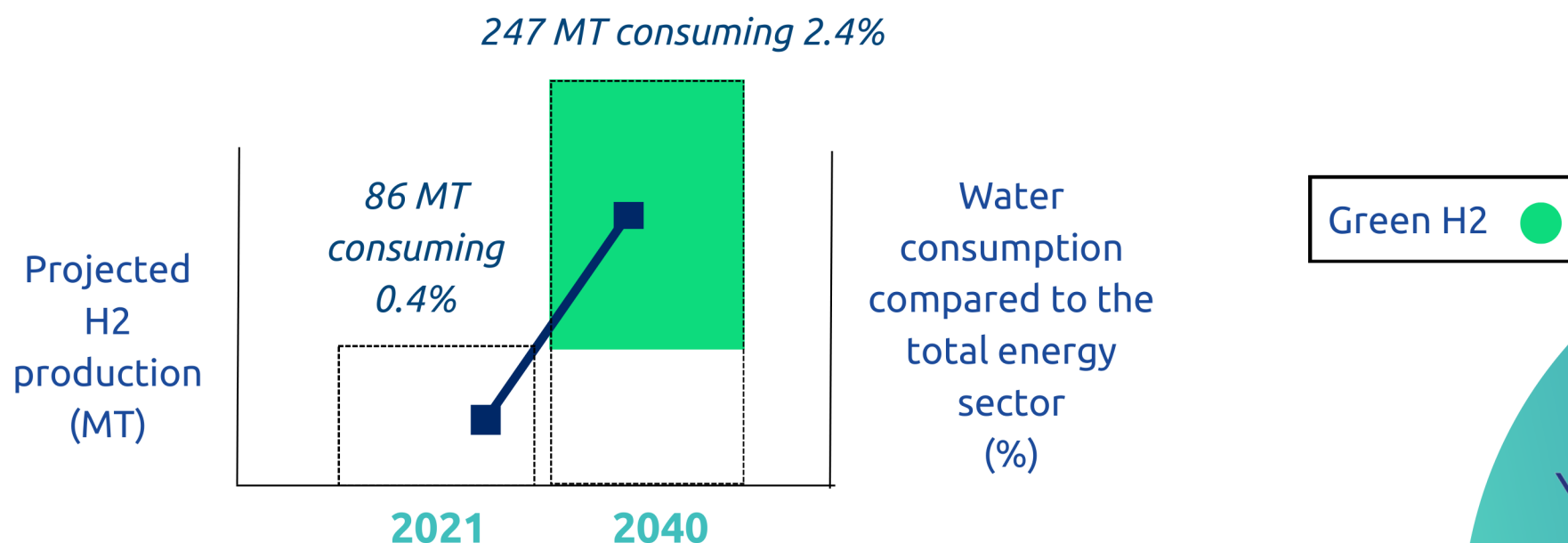


Commercial-scale hydrogen projects can be large water consumers and introduce significant competition for water resources at a local scale

But this volume is relatively small when compared to other water consumers



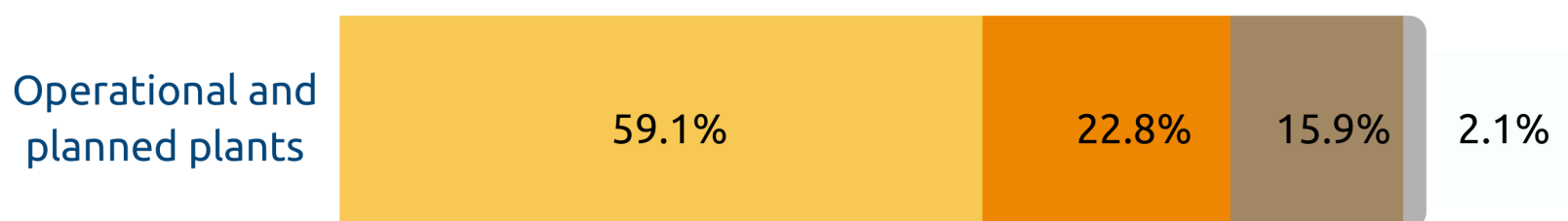
H₂ production also consumes a very small fraction of water when compared to the energy sector as a whole



Only 16% of the H2 projects globally are located in regions of severe water stress



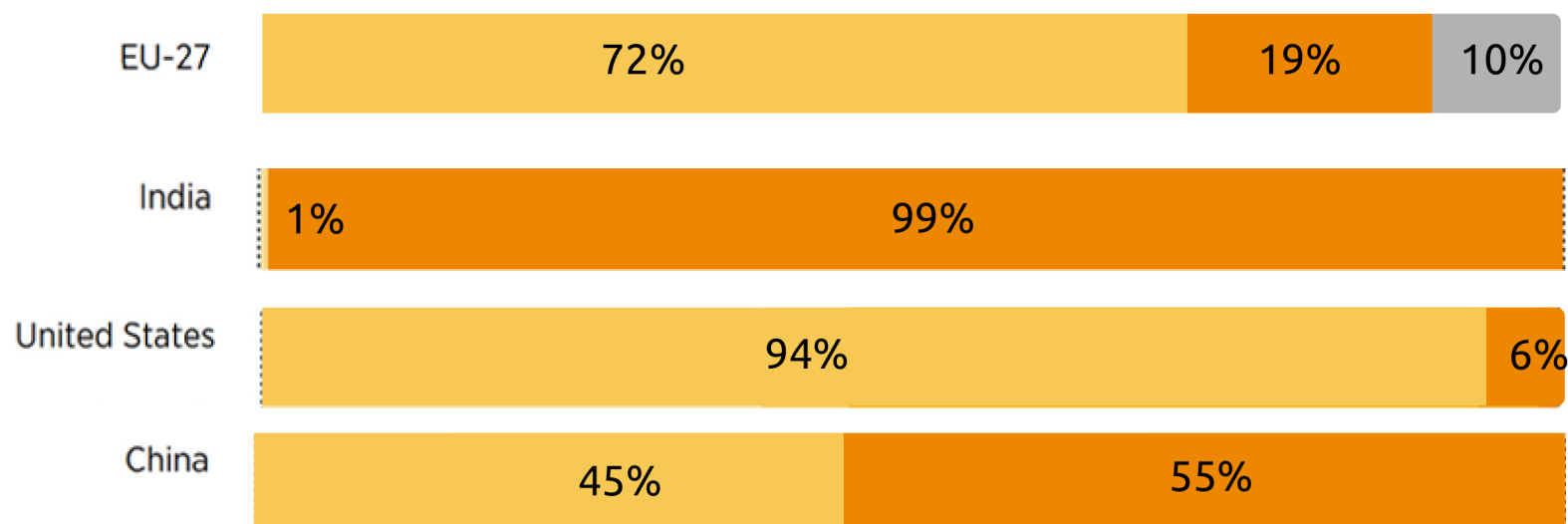
Most of the planned and operational green and blue H2 projects by 2040 are located in areas with low to medium water stress globally



% of hydrogen production capacity
by water stress conditions



While the EU has most of its planned and operational projects in low and medium stress regions, the same cannot be said about India



% of hydrogen production capacity
by water stress conditions

**Low to
medium**



**Medium to
high**



Arid



No data



Utilisation of seawater is critical in arid regions such as the Middle East



The Middle East is set to become one of the most important regions for H₂ production due to the availability of low cost renewables



Freshwater is extremely scarce in the Middle East as almost all areas in the region are either arid or under high water stress

This issue can be tackled with the use of seawater desalination, which is already in widespread use in the Middle East as

*Desalination
capacity*

48%

MENA

Rest of the world



With the Middle East aiming to produce 18.8 MT of H₂ by 2040 (10.9 of Green H₂), the desalinated water requirement is set to triple

2021

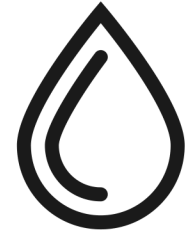
6 mn m³

2040

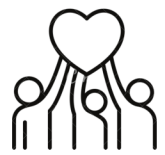
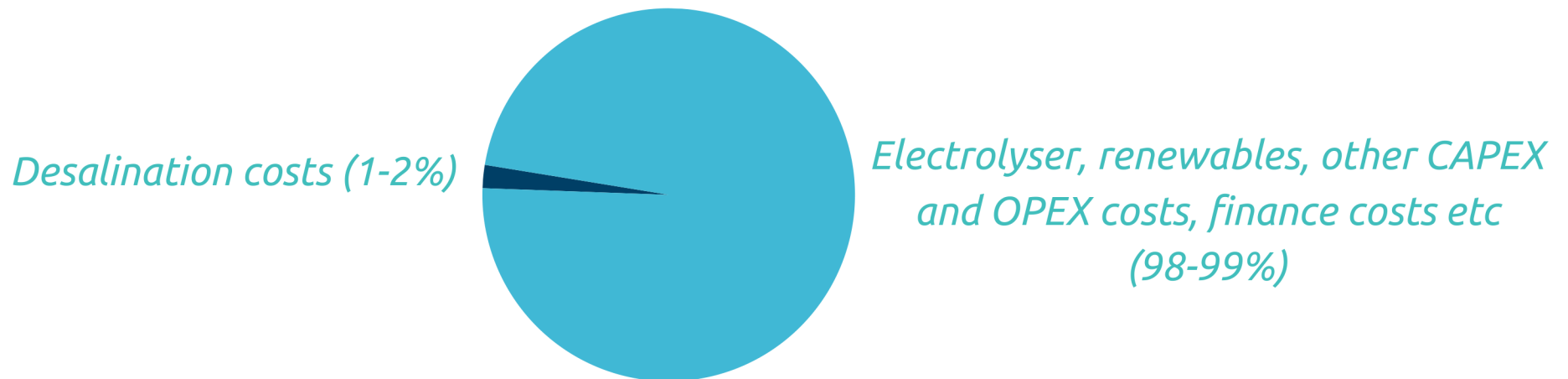
20 mn m³

*Desalinated water needs
(mn m³)*

Desalination costs only constitute a fraction of the total green H2 production costs



→ Desalination costs are marginal due to the scale of green H2 projects



This marginal cost helps Green H2 mega projects to potentially oversize their desalination plants, helping create commercial use for the produced desalinated water



Along with increase in desalination capacity, other issues must also be tackled such as



Brine production (high-concentration solution of salt in water) and thermal pollution from the process

References

IRENA, 2023 Water for hydrogen production