

Under the Patronage of His Excellency **Eng. Abdulrahman bin Abdulmohsen AlFadley**
Minister of Environment, Water & Agriculture

منتدى المياه السعودي
saudi water forum **SWF 2024**



Application of Clean Energy in Desalination Industry



29 April – 01 May 2024



Hilton Riyadh Hotel & Residences
Riyadh, Saudi Arabia

Organized by

وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture



المؤسسة العامة لتحلية المياه المالحة
Saline Water Conversion Corporation (SWCC)



شركة المياه الوطنية
National Water Company



الشركة السعودية لشراكات المياه
Saudi Water Partnership Company



المؤسسة العامة للمياه
Saudi Water Partnership Company



منظم المياه
Water Regulator



المركز الوطني لكفاءة وترشيد المياه
NATIONAL WATER EFFICIENCY AND CONSERVATION CENTER
MAEE



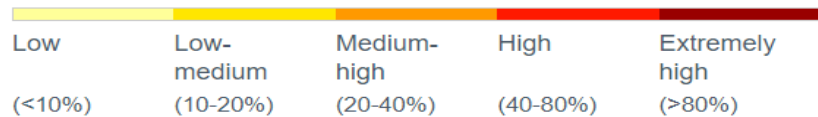
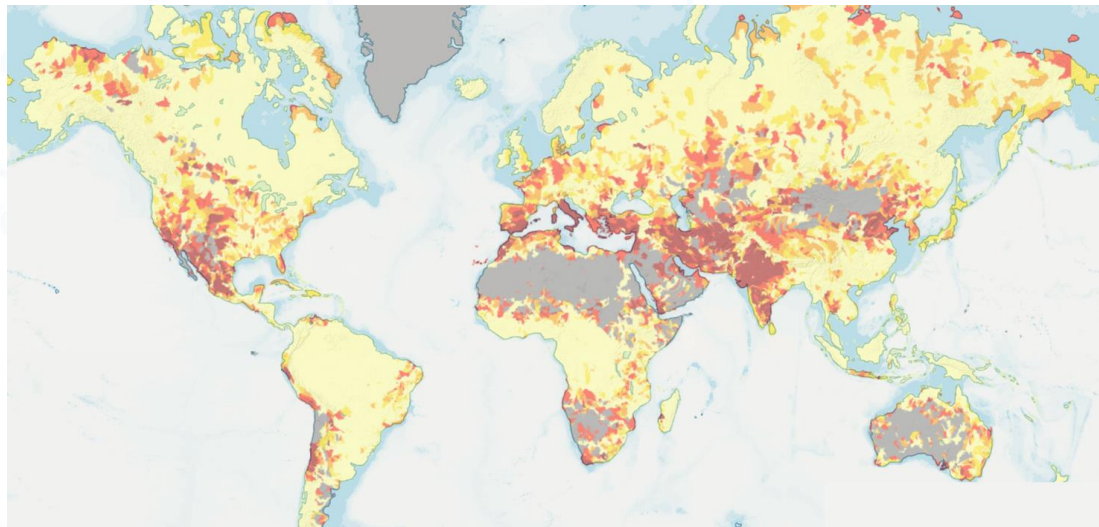
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Global Water Demand Growth

Driven by ambitious development plans, population rise and structural water scarcity

MENA countries already experience high scarcity and stress level will continue to increase

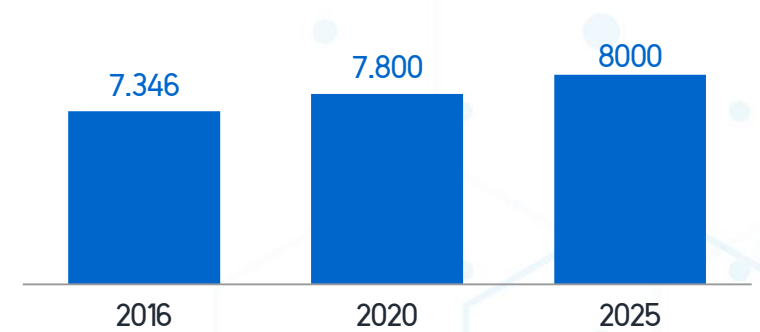
Water stress per capita (m³ / inhabitant/year)



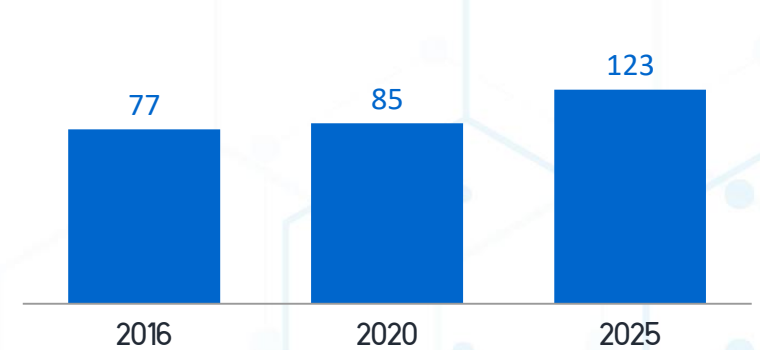
-  Arid and low water use
-  No data

Population and economy shows healthy growth in the globe, which results in a growing water need

Population, M people



Est. global GDP, Tr USD

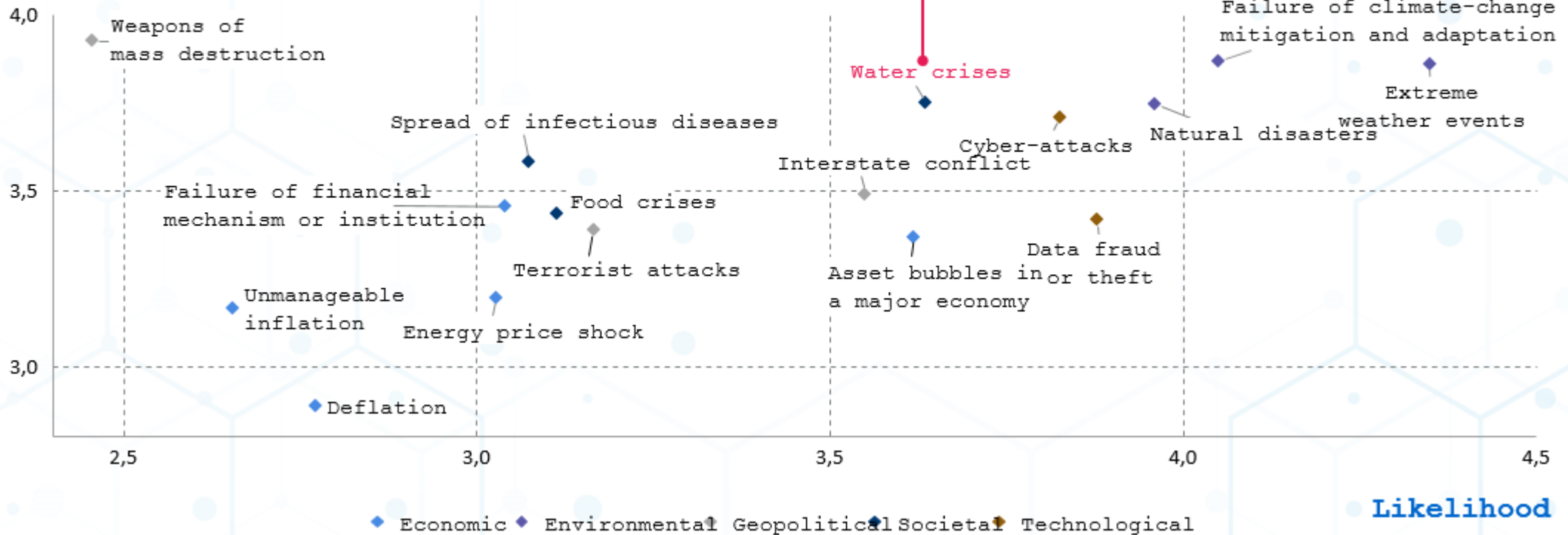


Note: Based on river basins facing water stress; 81 countries have territories which are facing extreme water stress. Source: FAO Aquastat; UN World Water Development Report 2015; World Resources Institute (2021); EIU.

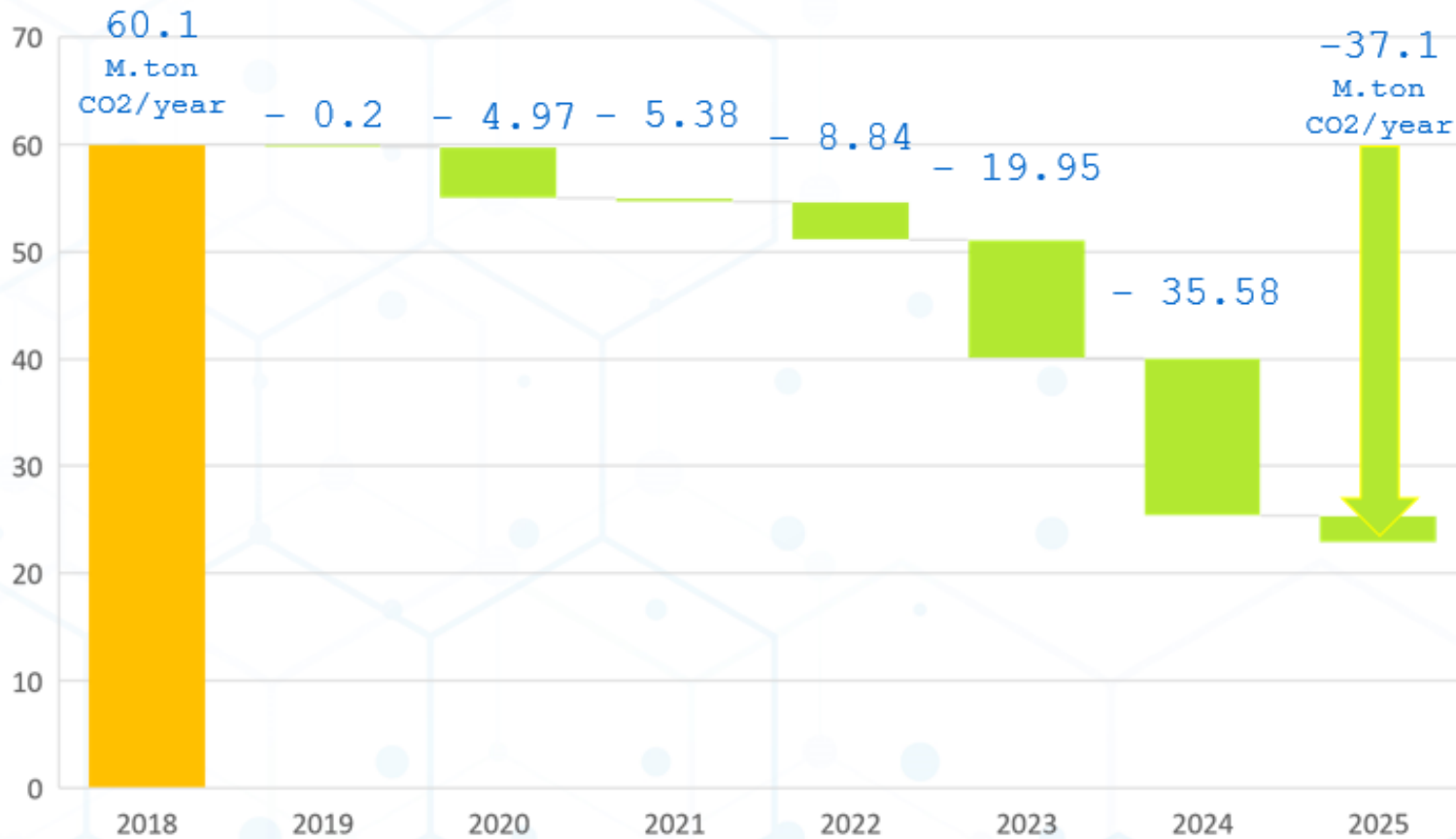
A global water crisis is the 4th biggest risk in terms of impact and 9th in terms of likelihood

WEF Global Risks Landscape

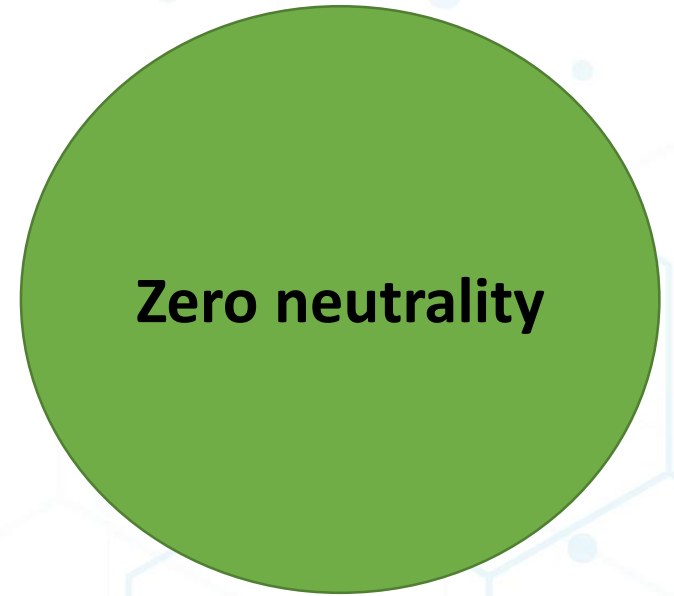
Impact



SWCC Journey for Carbon Reduction



Target in 2045



GREEN DESALINATION

Enhance
process to
reduce energy
consumption

Achieved :
from 18 Kwh/m³ to 2.27
kwh/m³

Powering
desalination by
clean energy

Achieved : 770 MW

Capturing CO₂ a

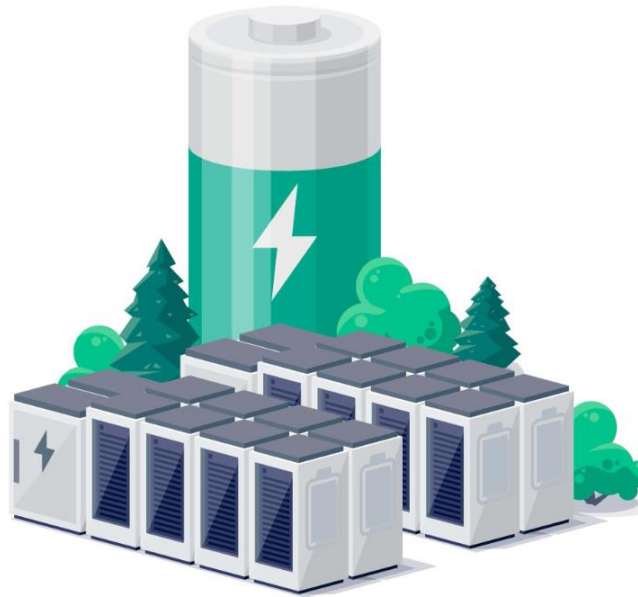
In process :
Capturing CO₂ and utilize in post
treatment

Challenges of green desalination

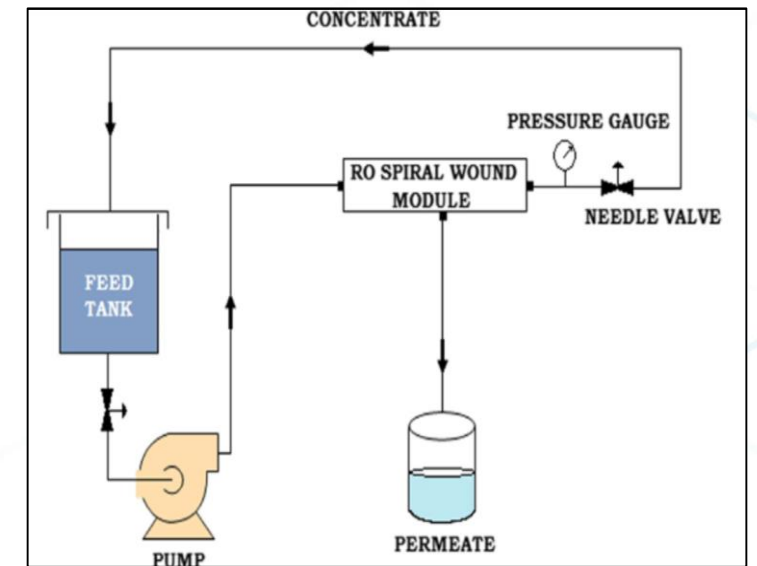
Reliability : solar and wind energy need to be more reliability for desalination



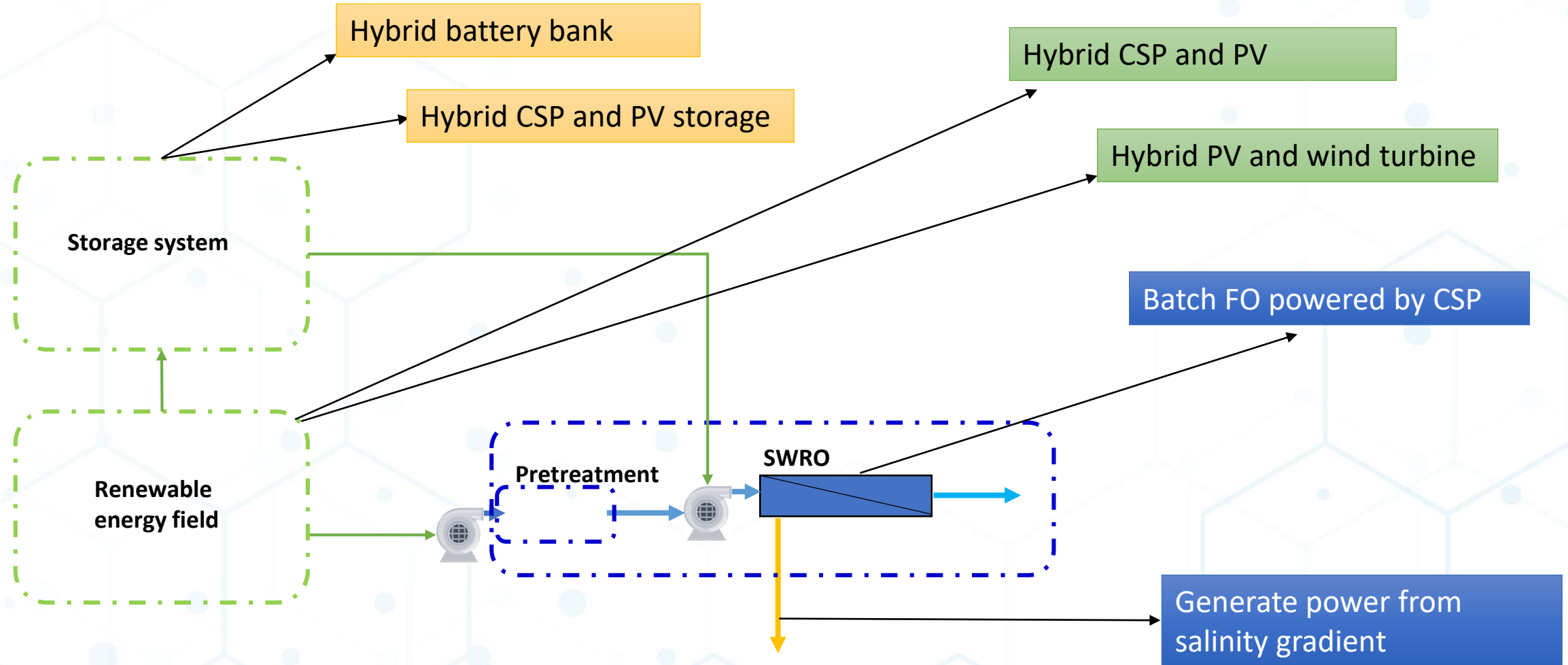
Energy storage:
Required energy storage for operation in night time



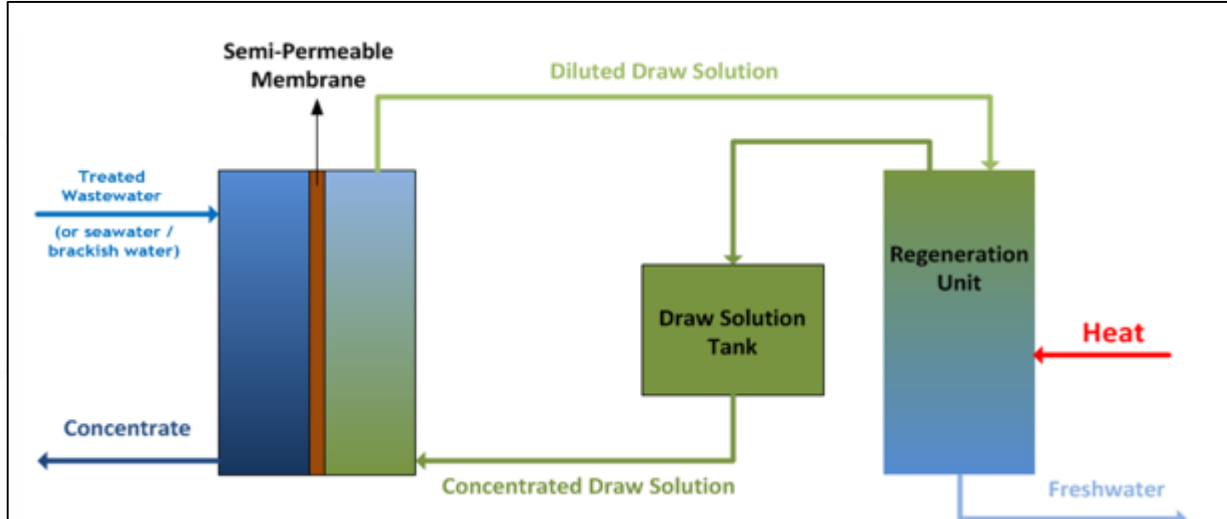
Energy intensive process : desalination is high energy consumption process that required to big area for renewable energy



WTIIRA effort in green desalination

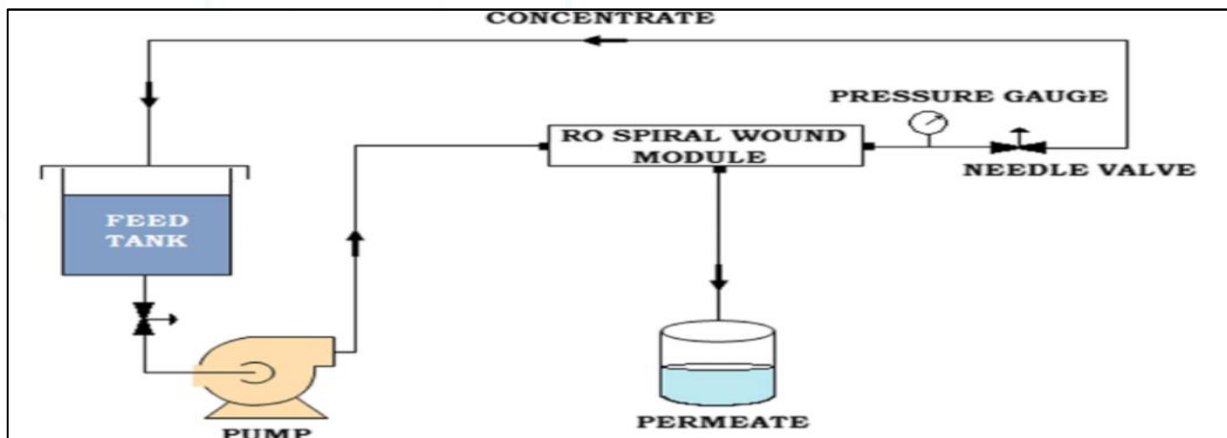


Innovative fully green desalination process



Forward osmosis

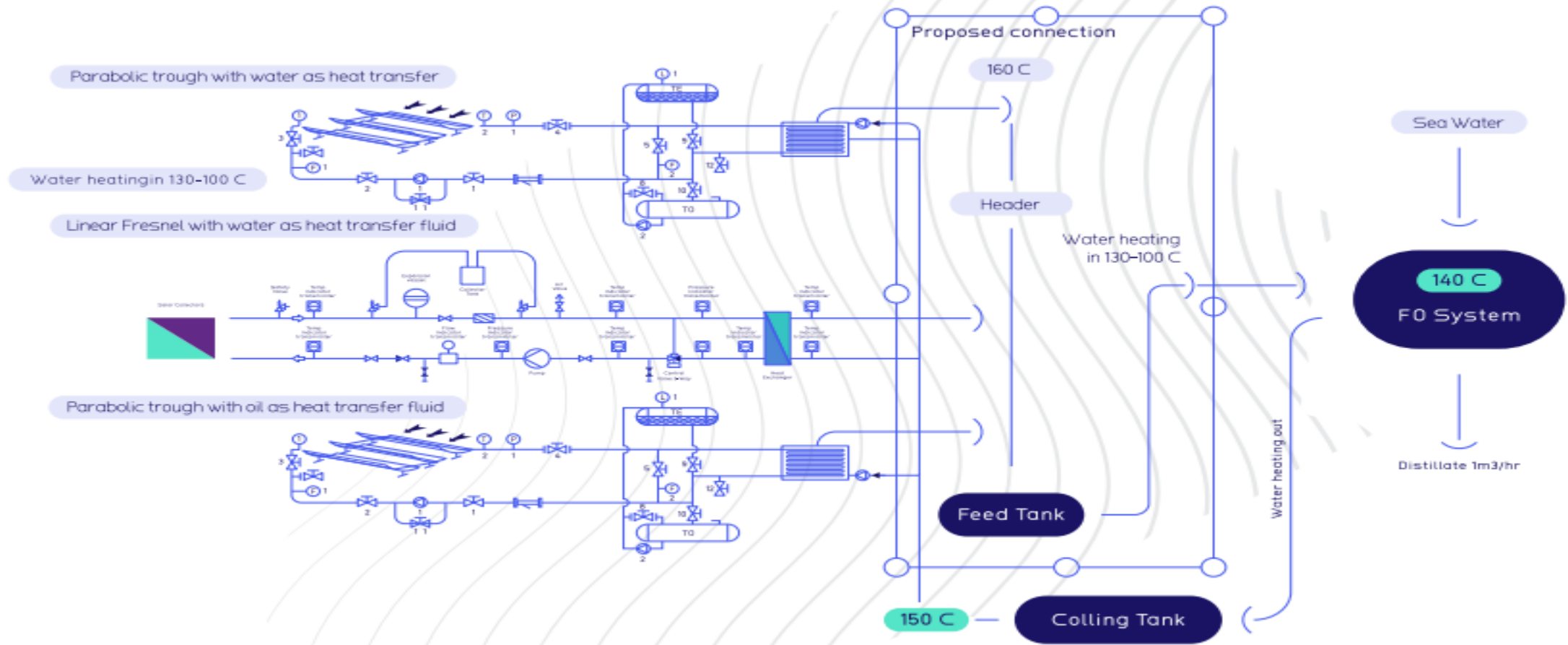
- 1- low energy consumption 25 Kwh thermal ,0.4 Kwh electrical /m3
- 2- can be work as batch or continuous system
- 3- low pressure process



Reverse Osmosis

- 1- high energy consumption 3-2.27 kwh/m3
- 2- continuous system
- 3- high pressure process

CSP coupling with F0



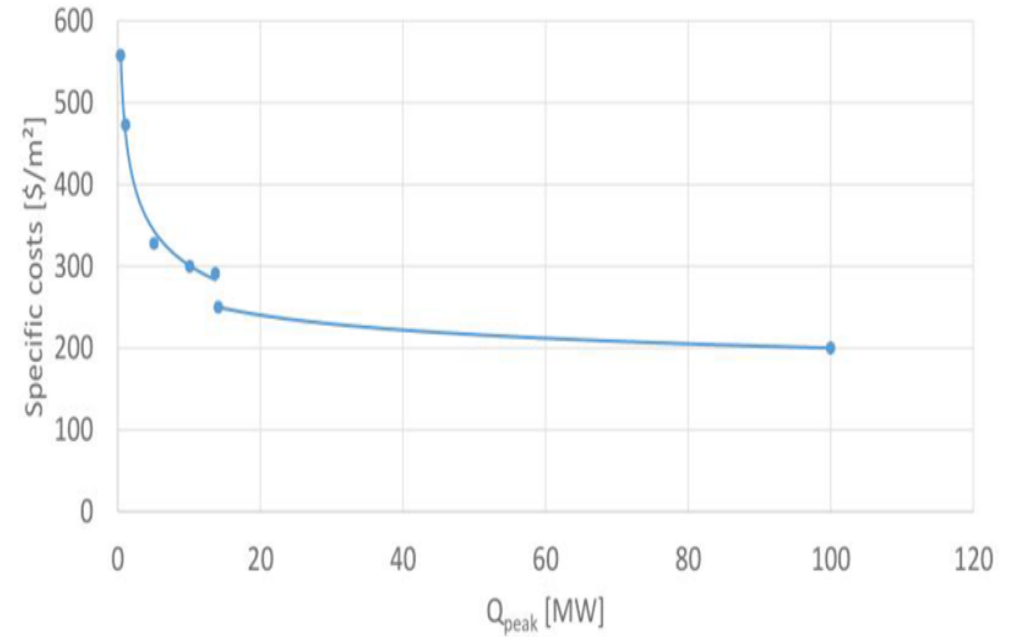
Feasibility study

$$LCOW = \frac{Crf * CAPEX + OPEX}{water\ production} \dots\dots\dots (1)$$

Item	CAPEX \$
Solar collector	10,000,000
FO unit	15,500,000
Total CAPEX	25,500,000

Item	OPEX
Solar field	11\$/m2
FO	0.18 \$/m3
Total OPEX for solar	220,000 \$

Life time	25 years
Total water production	73,000,000
Specific water cost	2.5-2 SR/m3



Future Aspects

- Make a research to reach a full green desalination with high reliability and convenient water production cost
- Use a different hybrid clean energy to achieve reduction of carbon dioxide and competitive energy price
- Make research in green hydrogen to utilize it as clean fuel
- Utilize a by product in commercial scale to support clean energy such as use brine in salt gradient power generation and carbon capture system to support clean energy
- select a desalination technology that can be compatible with renewable energy to reach to fully green desalination such as utilize FO with CSP
- Support green desalination research and collaboration

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THANK YOU!



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