
FRAUNHOFER INSTITUTE FOR SOLAR ENERGY SYSTEMS ISE

Infos PV driven Brackish water desalination Qatar



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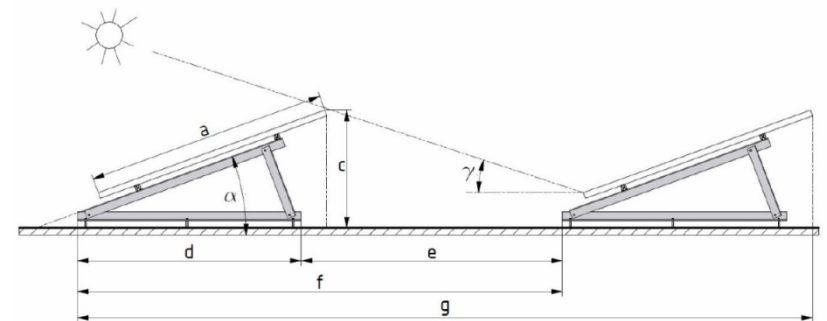
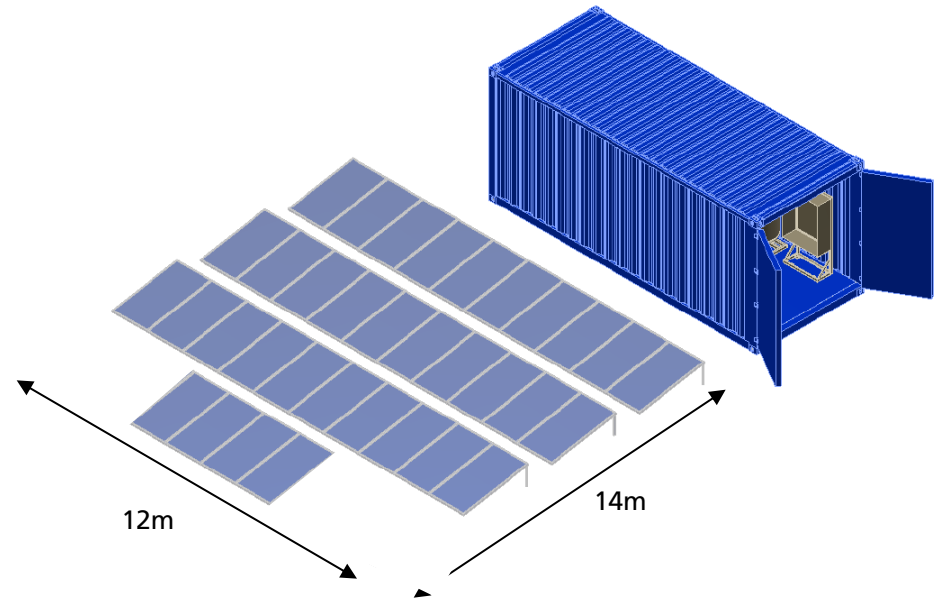
Info for PV-RO Request in Qatar
Freiburg, 08.06.2017

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Design Example: PV-RO Container on Cyprus ~5m³/day

PV Power Supply

- Design PV-generator:
 - 2x17 modules
 - 34 Module 7.65 kWp
- Angel of installation 45°



α : 45 °	a: 1,66 m	e: 2,52 m
β : 0 °	c: 1,17 m	f: 3,69 m
γ : 25 °	d: 1,17 m	g: 12,25 m

Design Example: PV-RO Container on Cyprus ~5m³/day

PV Power Supply

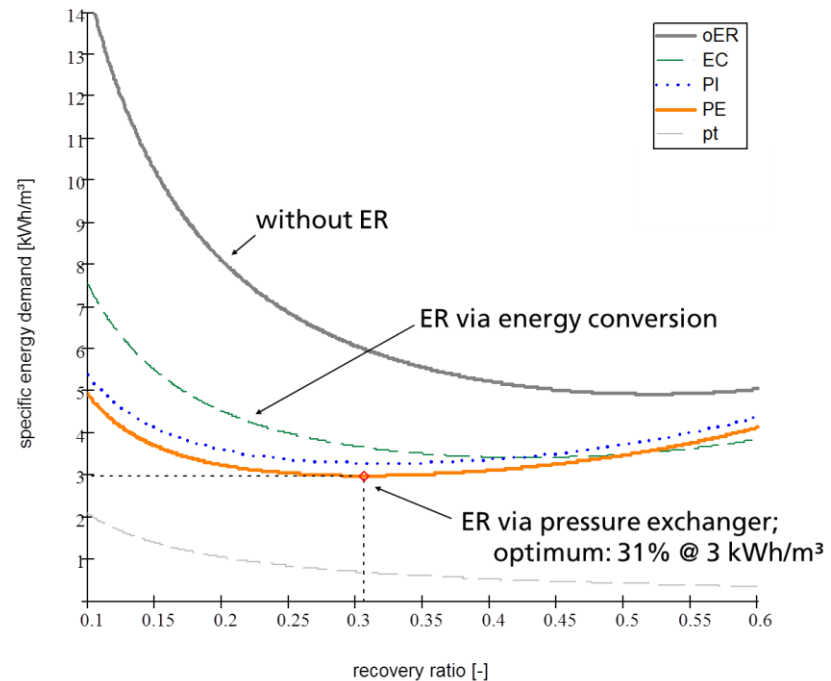
- Design PV-generator:
 - 2x17 modules
 - 34 Module 7.65 kWp
- Angel of installation 45°



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Specific energy demand - SEC

- Main dependencies:
 - Raw water salinity
 - Efficiency of pumps
 - Recovery ratio
 - Number of stages
 - Energy recovery concept



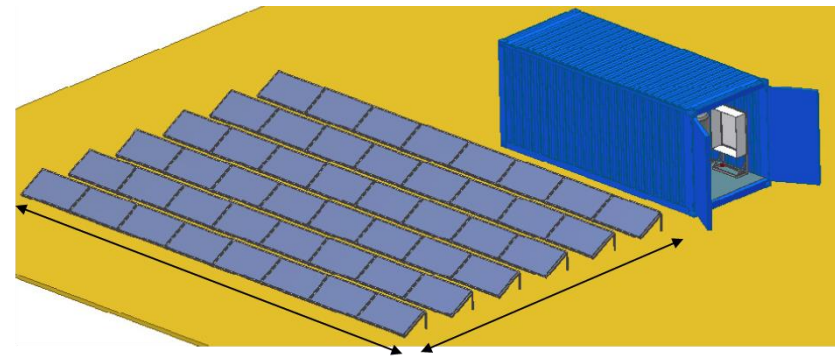
- For the requested case a SEC lower 2.4 kWh/m³ should be reachable

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Specific space requirement

■ Main dependencies:

- Global horizontal irradiance - GHI
- PV-technology and efficiency
- Mounting concept



- 0.04 kWp/m² (resp. 400 kWp/ha) is a useful average value for the estimation of space requirements of open-air PV powerplants
- Specific space for BWRO: ~ 25 m²/(m³/day)
 - For 250m³/day: 6,250 m² (0.625 ha)
 - For 1,000m³/day: 25,000 m² (2.5 ha)

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Specific costs PV

- Main dependencies
 - PV-technology
 - Taxes, shipping
 - Mounting concept
 - Power electronic



- Typical value for estimation: 1,470 €/kWp (complete)
- PV-Costs for BWRO:
 - For 250 m³/day: 376,320€
 - For 1000 m³/day: 1,508,220€

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Specific costs RO

- Main dependencies
 - Raw water salinity
 - Pre-treatment
 - RO-concept
 - Energy supply concept



- values for estimation: 14.000 €/(m³/hr)

Note: Average PV-day without backup energy supply or battery means only ~8h operation

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Effect of blending

- Main dependencies
 - Raw water salinity
 - Permeate salinity
 - Required product quality

- In this case:

	Volume [m ³]	Salinity [g/l]
required irrigation water	1,000	~ 0.5
RO permeate	1,000	~ 0.3
raw water for blending	20	~ 10

Thank you for your attention!



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