



The 4th Middle East North Africa
Renewable Energy Conference

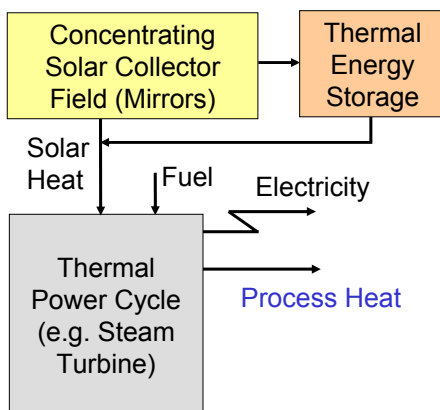
MENAREC 4

Damascus, Syria
20-24 June 2007

Concentrating Solar Power for Seawater Desalination

Franz Trieb, German Aerospace Center (DLR)

Principle of a Concentrating Solar Thermal Power Plant



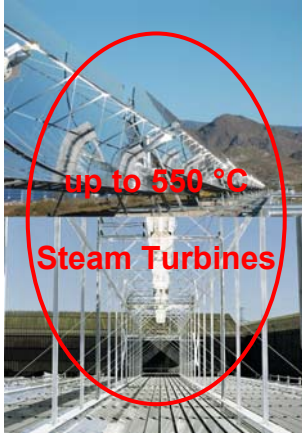
- concentrated, easily storable solar thermal energy as fuel saver

- firm capacity, power on demand

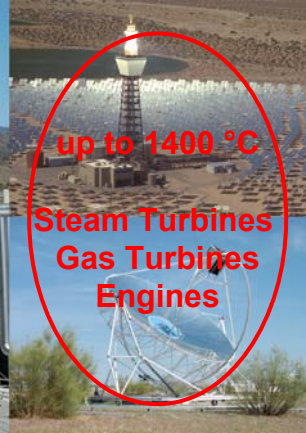
- combined generation of process heat for cooling, industry, desalination, etc.

Concentrating Solar Thermal Power Technologies

parabolic trough (PSA)



solar tower (SNL)

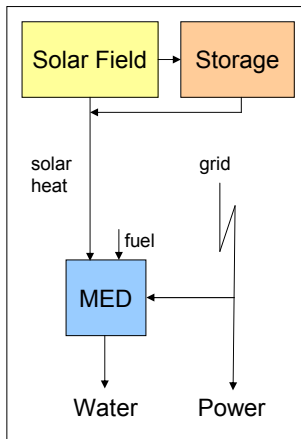


linear Fresnel (SPG/MAN)

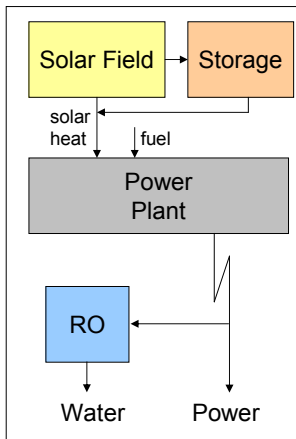
parabolic dish (SBP)

Concentrating Solar Thermal Power for Seawater Desalination

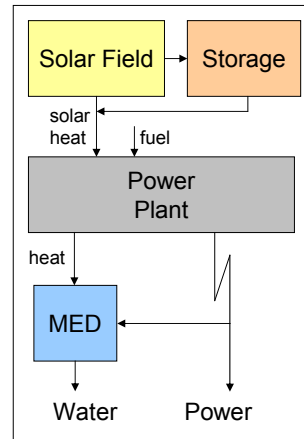
Heat Only



Power Only

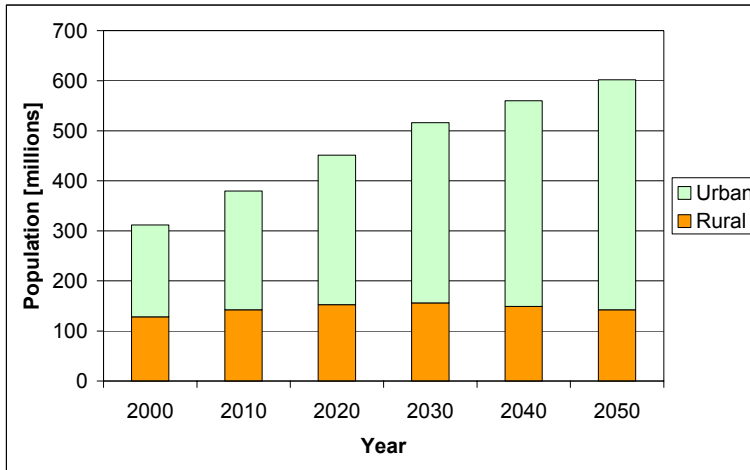


Combined Heat & Power

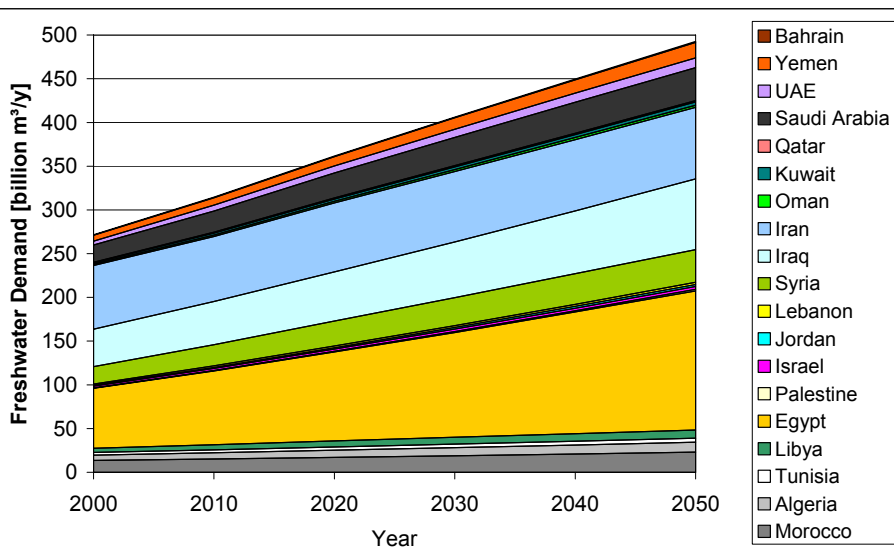


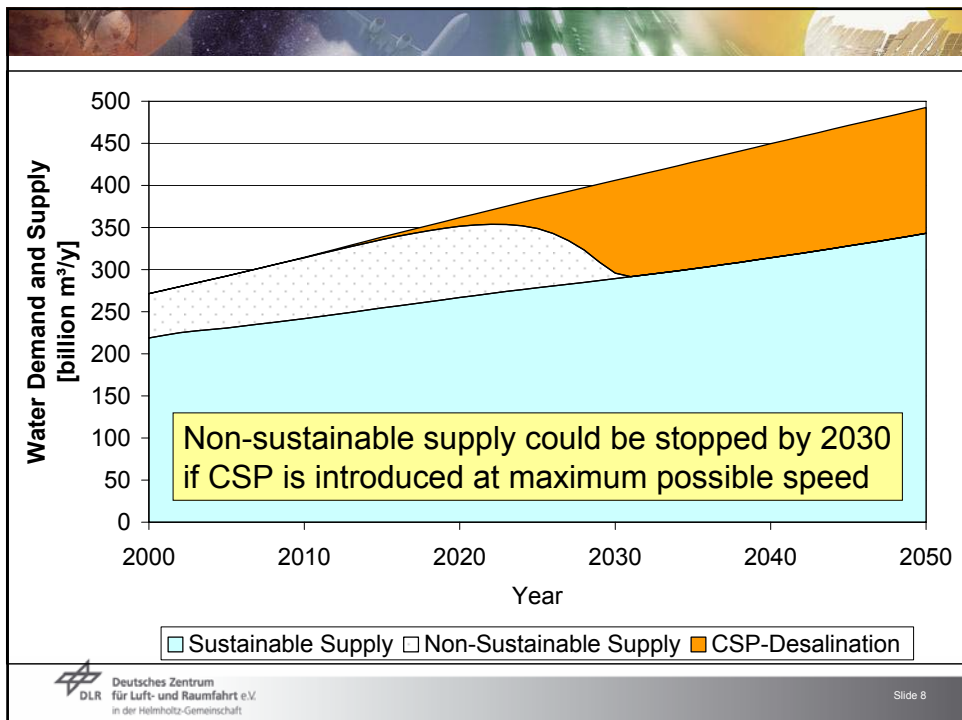
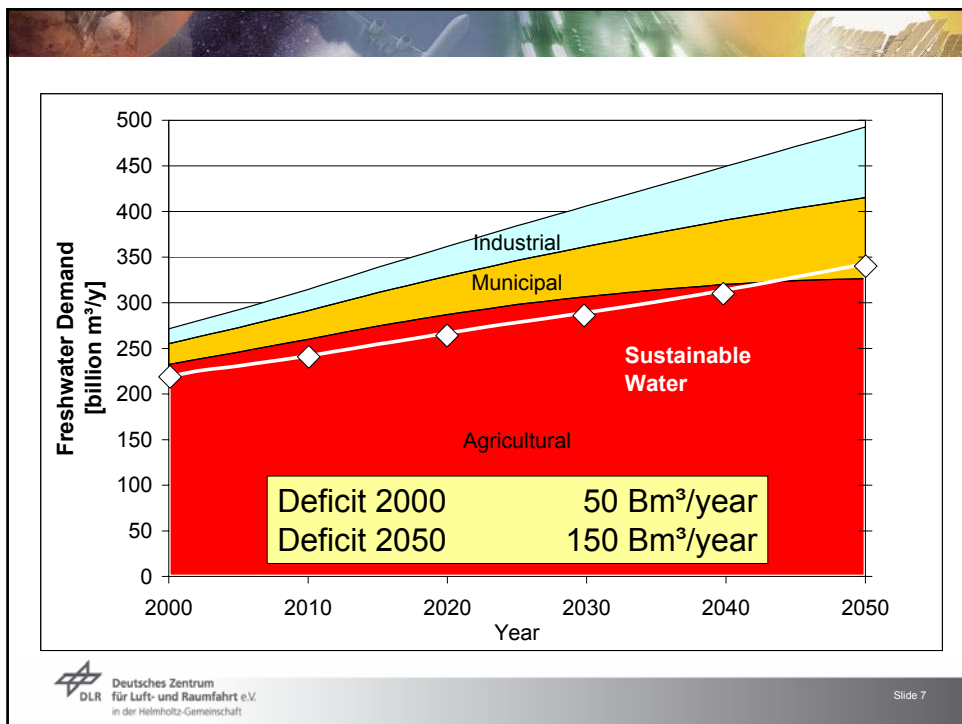
MED: Multi-Effect-Distillation; RO: Reverse Osmosis Membrane Desalination

MENA Population will grow from 300 Million to 600 Million

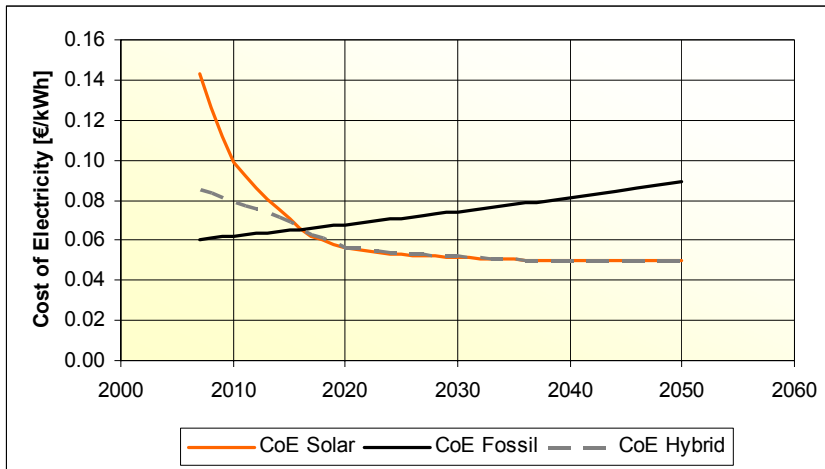


Source: United Nations 2006



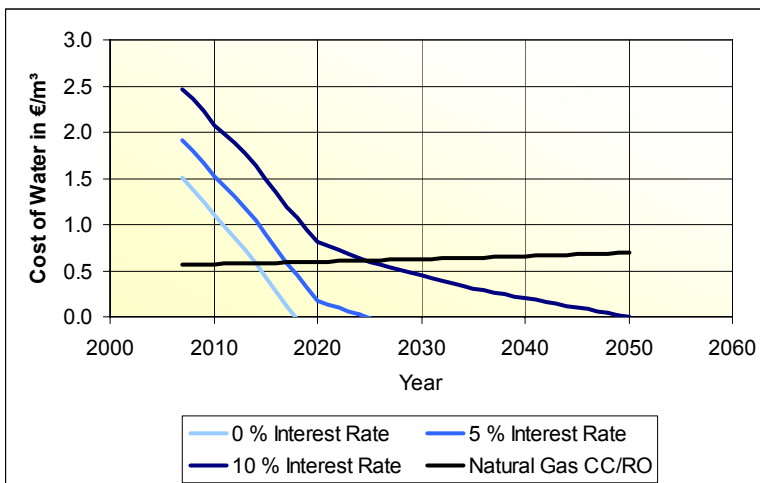


Unsubsidised cost of electricity of CSP versus natural gas CC



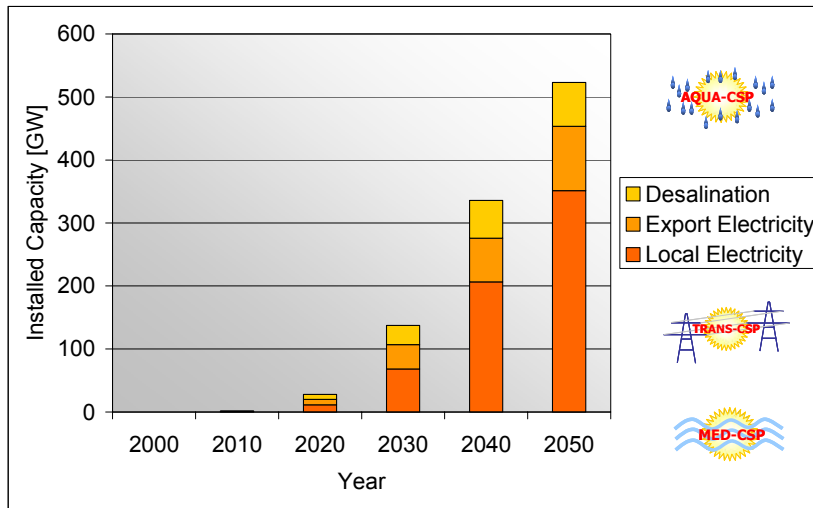
Discount rate 5%, economic life 25 years, fuel cost 25 €/MWh, fuel cost escalation 1 %/y, irradiance 2400 kWh/m²/y, real €2007, €/€=1

Unsubsidised Cost of Water from CSP versus Natural Gas CC/RO

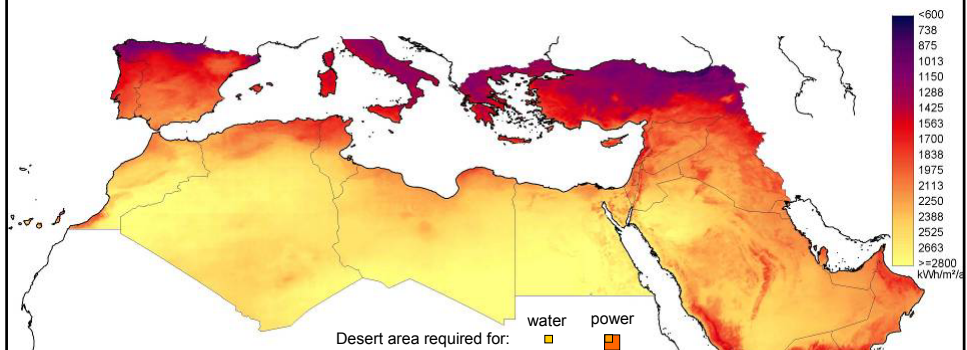


Discount rate 5%, economic life 25 years, fuel cost 25 €/MWh, escalation 1 %/y, irradiance 2400 kWh/m²/y, real €2007, RO power 4.5 kWh/m³

CSP Market Potential in EUMENA



Direct Solar Irradiance in EUMENA in kWh/m²/y



1 km² is enough to desalinate 165,000 m³/day.
50 km x 50 km are needed to avoid the MENA water deficit in 2050.

Solar irradiance 2400 kWh/m²/year x 10 % CSP efficiency / 4 kWh/m³ RO power consumption / 365 days/year = 0.165 m³/m²/day





SEGS 350 MW, California



Planta Solar 10 MW, Sevilla



Novatec
Lorca



MAN/SPG
Almeria

Current CSP Development



Nevada Solar I, 64 MW



Andasol 2 x 50 MW, Guadix

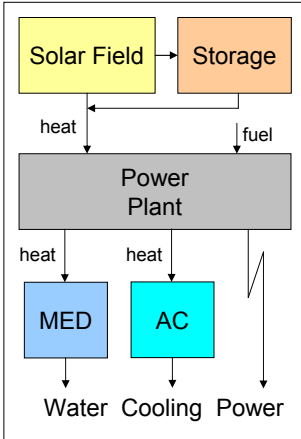


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Slide 13



Concentrating Solar Power for Electricity, Cooling and Desalination



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graph TD
    SF[Solar Field] -- heat --> S[Storage]
    S -- heat --> PP[Power Plant]
    SF -- heat --> PP
    PP -- heat --> MED[MED]
    PP -- heat --> AC[AC]
    PP -- Power --> P[Power]
    MED -- Water --> W[Water]
    AC -- Cooling --> C[Cooling]
        
```

MED **Multi-Effect-Desalination**
AC **Absorption Chiller**

Example: Ayla Oasis Resort, Aqaba, Jordan





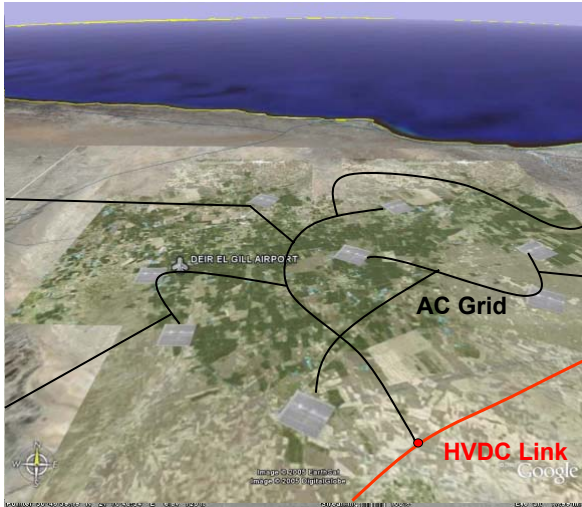

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Slide 14

Deserts as Powerhouses and Water Works



TREC

Clean Power from the Deserts
Trans-Mediterranean
Renewable Energy Cooperation
In conjunction with The Club of Rome



www.trec-eumena.org



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(artist view created with
Google Earth)

Slide 15

Full Reports and Country Data:

<http://www.dlr.de/tt/med-csp>

<http://www.dlr.de/tt/trans-csp>

<http://www.dlr.de/tt/aqua-csp>



Thank You !



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Slide 16