



# Renewable Energy Partnership EU-MENA

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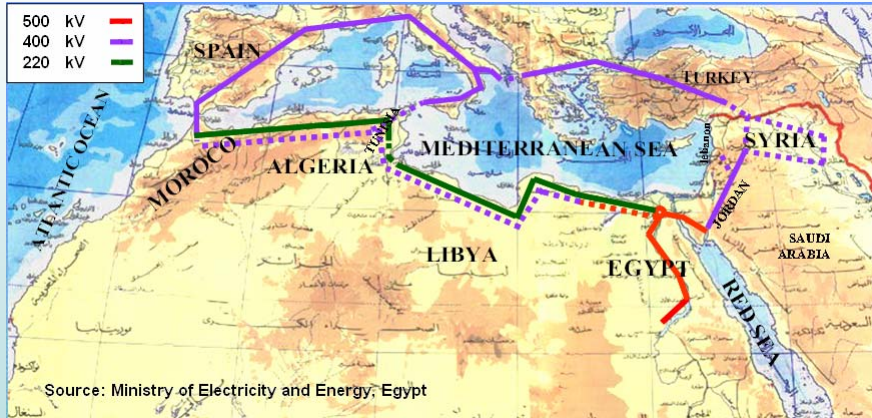
[www.nokraschy.net](http://www.nokraschy.net)  
[www.solarec-egypt.com](http://www.solarec-egypt.com)  
[www.menarec.org](http://www.menarec.org)



## Big Problems need Big Solutions ....

- **Till 2050 the fossil fuels will be scarcer and therefore more expensive....**  
The Hamburger World Economy Institute HWWI predicted in 2005 that oil will cost 120 \$/Barrel in 2030 ..... 2000 it was 20 \$/BBL  
→ **Energy saving programs make sense.**
- **From 2050 to 2100 saving programs are not sufficient....**  
→ **it is essential to find a substitute for fossil fuels.**  
**.... Small Solutions cover the sight**

## The Solution is Renewable Energy Partnership EU-MENA



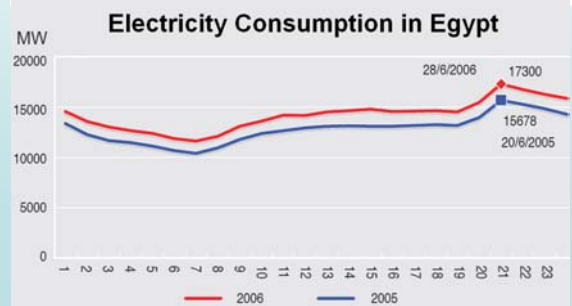
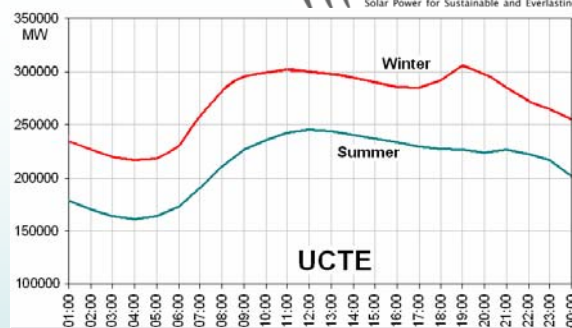
**Transmission lines around the Mediterranean are almost complete.**  
Beside compensating peeks, clean energy can be transported to Europe.

3

The idea started as attempt to compensate peak demands.

The losses of the AC-Lines will be in the range of 25-45%

HVDC will have 10-15% losses

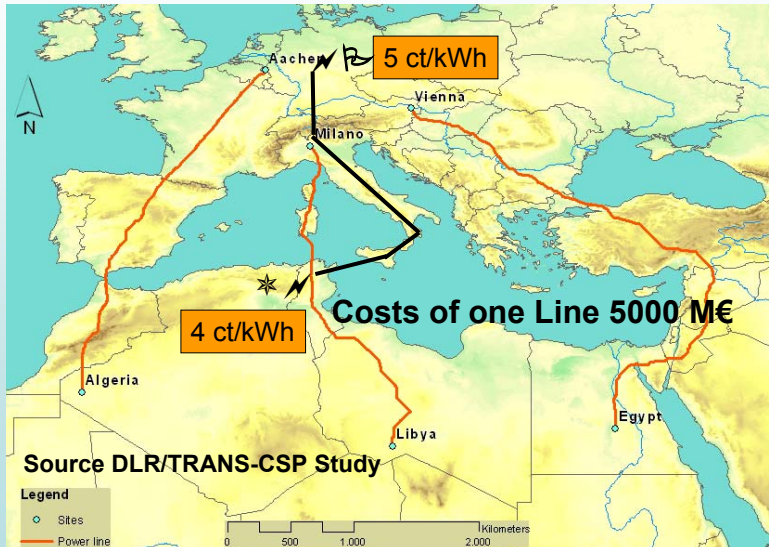


4

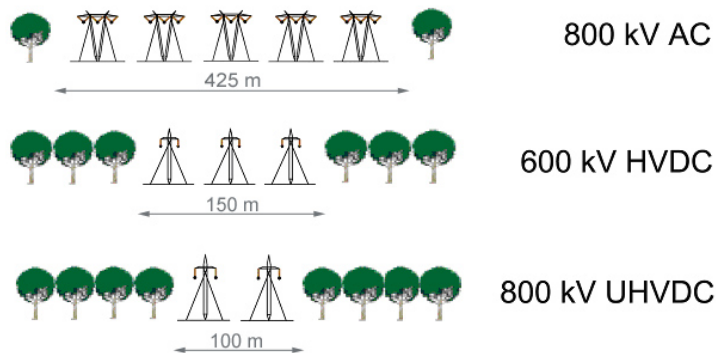
## Till 2050

The CSP in North Africa will cost 4 ct/kWh

3 Samples for EU-MENA HVDC Interconnection, transport cost 1 ct/kWh



## Space required for 10 GW Power Lines



Source: ABB & DLR

An EU-MENA Public Private Partnership Company  
can build the line and then collect the transmission fees

## A Political and Financial

### Framework shall give security to the participants

#### For Example:

- Taking advantage of **CDM certificates** to compensate power generation from coal in Europe.
- A European company establishes together with a company from MENA a **Low Cost Solar Power Station** in a MENA country.
- **Solar-Hybrid** concept is preferred to ensure supply on demand.
- The solar electricity share of at least **20%** will be transmitted to Europe (**Transmission costs 1 ct/kWh with HVDC lines**) while the conventional share will be consumed in the MENA country.
- Beside electricity, **desalted water** will be produced from the waste heat of the power station, thus boosting the economies.
- Electricity may be used to produce **clean Hydrogen**

7

## General Ideas for the Framework

- Renewable energy shall be produced where it is most economical. For example in MENA countries
  - **Wind 10 m/s (gulf of Suez and Atlas mountains)**
  - **Sun 3000 kWh/m<sup>2</sup>/y (nearly all over the Sahara)**
- Agreements between country groups or bilateral agreements are suitable to reach the goal.
- Mutual benefit is aimed in this co-operation.
- At the start phase strong support from the European country to the MENA country will accelerate the development.
- Clean electricity and Hydrogen from MENA shall cover about 15% of Europe's demand.

8

## What can the MENA-country do?

- Offer free land and infrastructure.
- Buy the conventional electricity share (for example at 2.5 ct/kWh depend. on fuel price)
- Buy the desalted water produced from waste heat (for example at 50 ct/m<sup>3</sup>)
- Guarantee by law capital security.
- Free from taxes for the first 10 years.

9

## What can the European country do?

1. Set a quota for clean electricity, which is increased each year by 1% points over the actual value for each electricity producer. This is compatible with the target of 20% in 2020.
2. Extend support to clean electricity and clean Hydrogen for supplies from outside the country.
3. Set incentive prices for clean electricity import:
  - for example 12 ct/kWh for solar electricity
  - for example 8 ct/kWh for wind electricityTo cover the initial costs of production and transmission.
4. The incentive price is valid only for the clean share of a hybrid system.
5. The incentive price is guaranteed for 10 years.
6. After 10 years it is reduced by 10% points each year.

10

## What are the „Win-Win-objectives“?

- **Europe wins:**
  - Clean and cheaper electricity and Hydrogen.
  - **Employment** due to machinery export.
  - Diversification of energy sources.
- **MENA wins:**
  - **Water**.
  - Sells electricity and Hydrogen for a reasonable price.
  - Social and economic development.
- **Environment wins:**
  - **Less CO<sub>2</sub>** emission.
  - This system encourages developing low cost equipment and extending solar share to 100% using heat storage.

11

A short explanation of CSP  
and  
Low Cost CSP  
follows

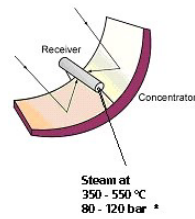
12

# Concentrating Solar Power Technologies (CSP)

relevant for Power Stations are 5 MW to 1000 MW

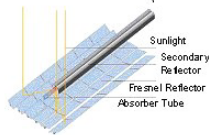
**Parabolic Trough**  
5-600 MW

line concentrators

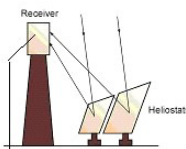


Steam at  
350 - 550 °C  
80 - 120 bar \*

**Linear Fresnel**  
5-600 MW

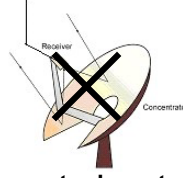


point concentrators



Molten Salt, Air or Helium at  
600 - 1200 °C  
1 - 20 bar \*

**Solar Tower**  
5-100 MW



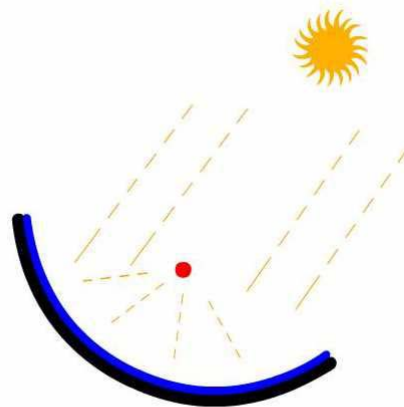
**Parabolic Dish**  
0,5-50 kW

not relevant

Source: DLR

13

## Parabolic trough Technology



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**Proven Technology of the past century**

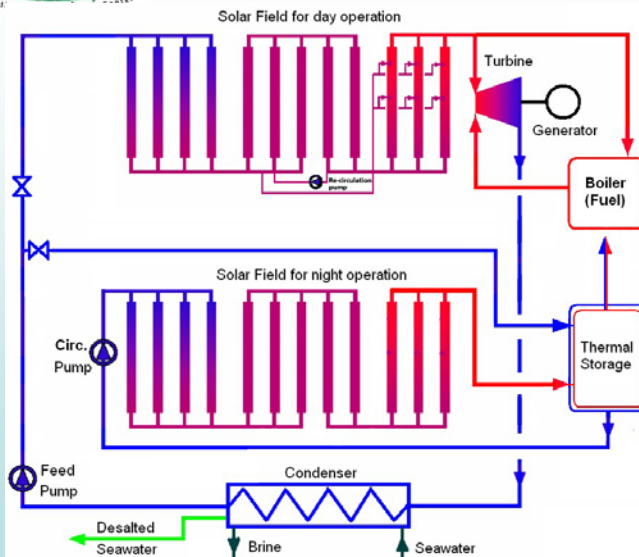
14

# CSP-Plant in California



15

# Solar Hybrid Power Station with Desalination



Step 1:  
Solar field  
in Hybrid  
operation for  
day and night  
service.

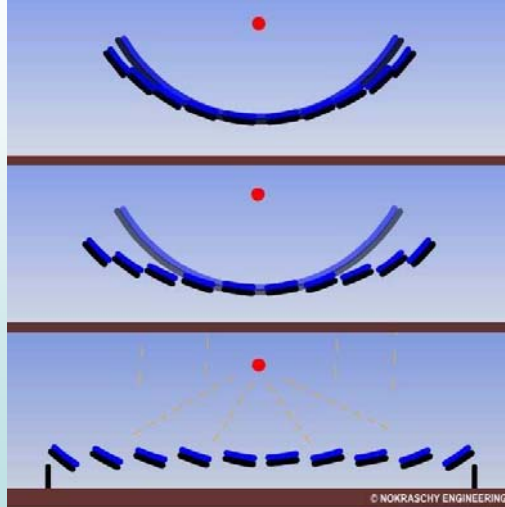
Step 2:  
Solar field  
with Heat  
Storage for Night  
operation + fossil  
boiler as reserve.

**Desalination (MED) with Waste Heat**

16



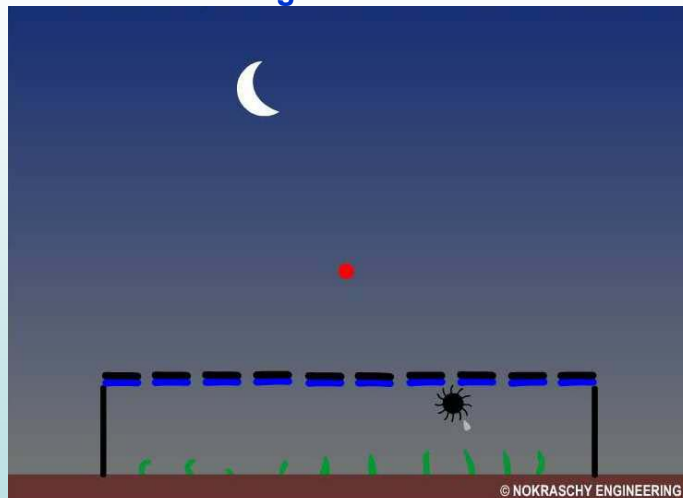
## Advanced Design: Flat Mirrors



**Best collection of the Sunrays. Simple, cost effective and usage of area underneath mirrors is possible**

17

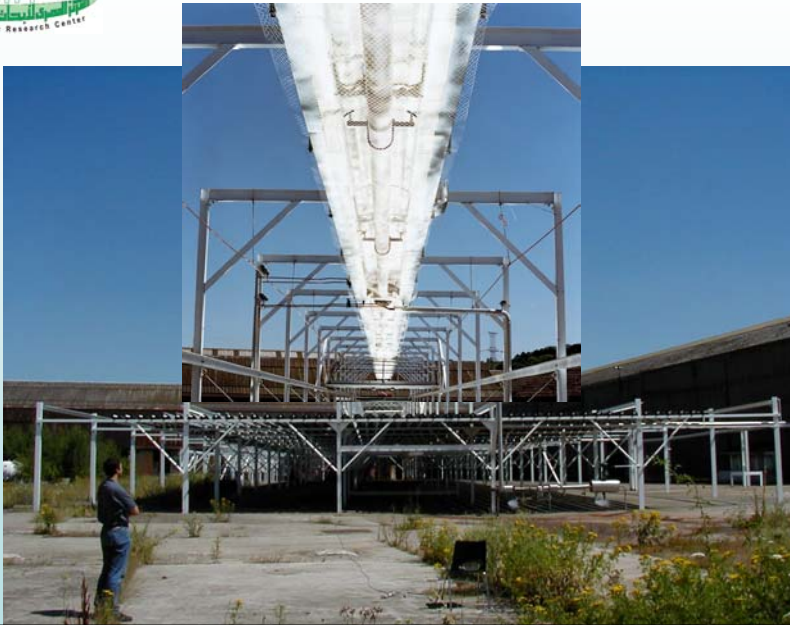
## Automated Cleaning ... ... less cleaning water & it is not wasted



**In the shadow plants need less irrigation water**

18

## CSP in action



19

## Thank you for your attention



Source:  
MeteoSat  
EUMETSAT

**This picture shows how sunny is MENA**

20