NOKRASCHY ENGINEERING
Mechanical Vibrations and Infrasound under Control
Solar Power for Sustainable and Everlasting Energy

Renewable Energy Partnership EU-MENA

Berlin, 28 March 2008

Dr.-Ing. Hani El Nokraschy

www.nokraschy.net
www.solarec-egypt.com
www.menarec.org

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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

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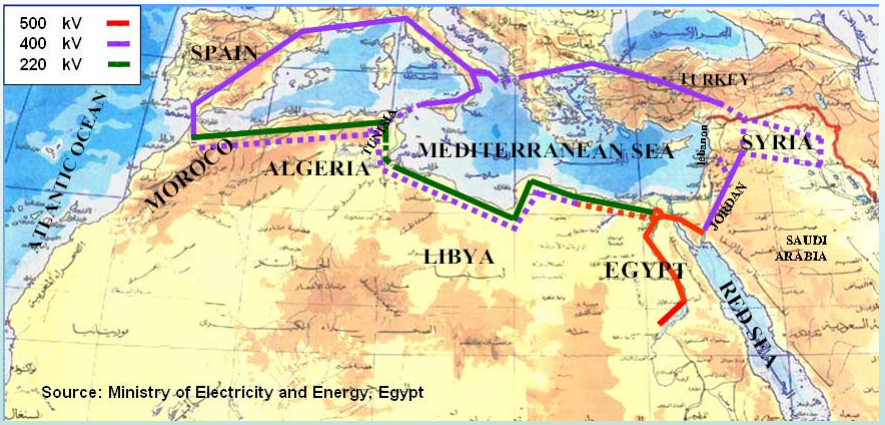
The Solution is Renewable Energy Partnership EU-MENA



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

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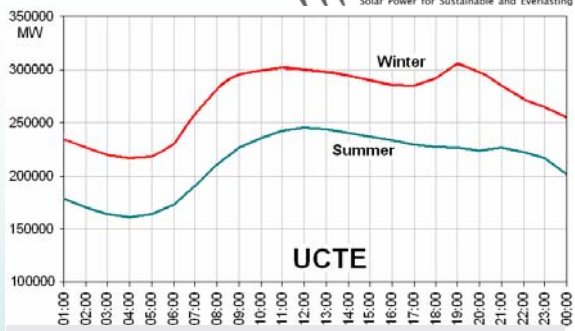
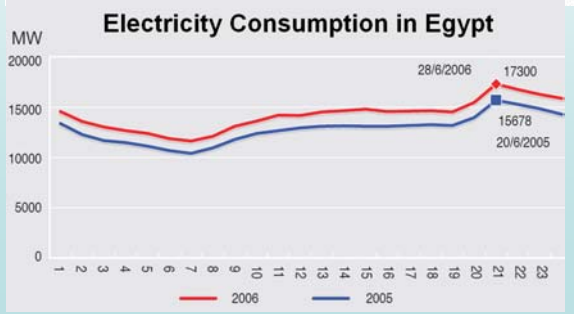
The idea started as attempt to compensate peek demands.

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

HVDC will have 10-15% losses

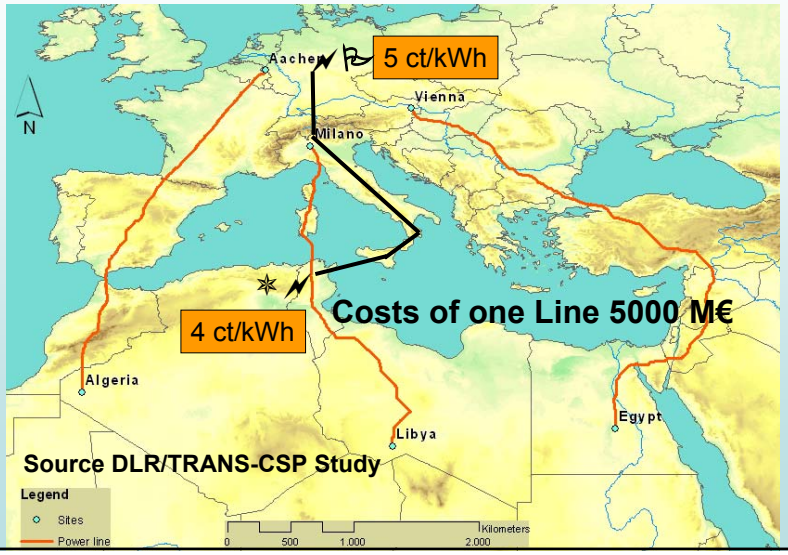




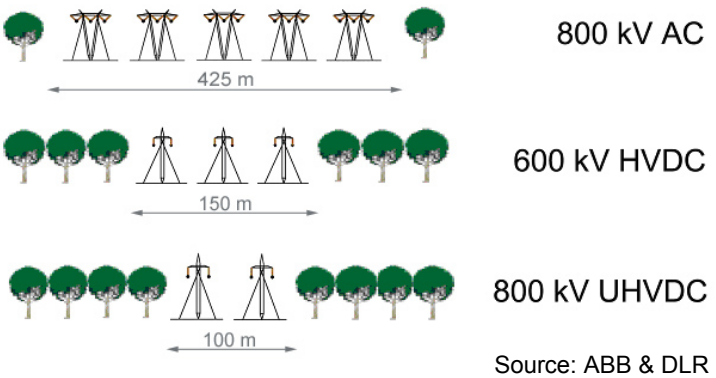
Till 2050

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

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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

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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/m²/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.

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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/m³)
- Guarantee by law capital security.
- Free from taxes for the first 10 years.

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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 electricity

   To 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.

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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_2 emission.
  - This system encourages developing low cost equipment and extending solar share to 100% using heat storage.

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A short explanation of CSP
and
Low Cost CSP
follows

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Concentrating Solar Power Technologies (CSP)

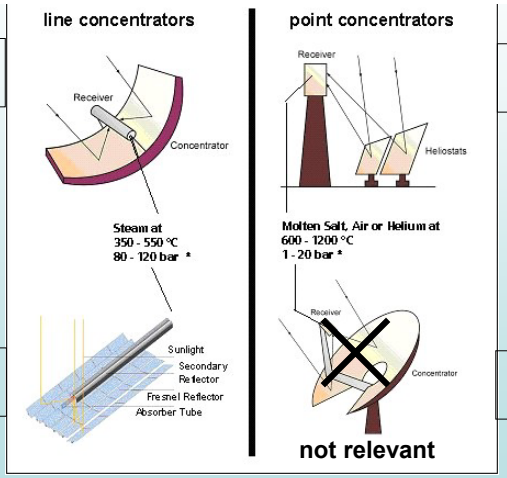
relevant for Power Stations are 5 MW to 1000 MW

Parabolic Trough 5-600 MW

Solar Tower 5-100 MW

Linear Fresnel 5-600 MW

Parabolic Dish 0,5-50 kW



Source: DLR

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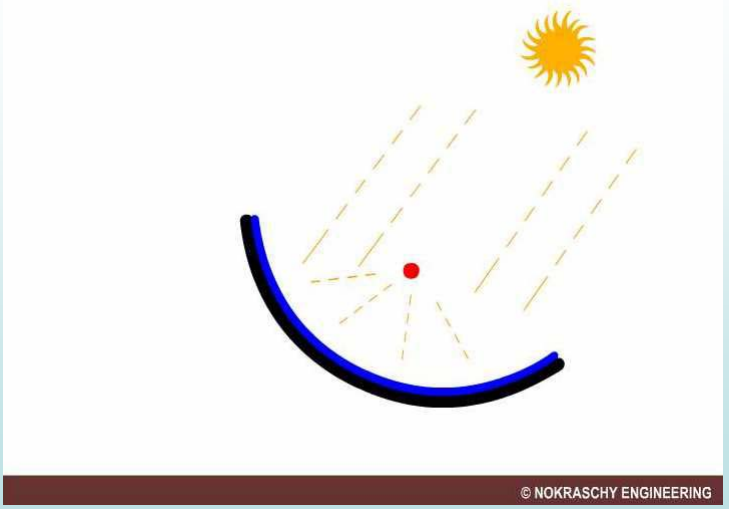
Parabolic trough Technology



Proven Technology of the past century

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CSP-Plant in California

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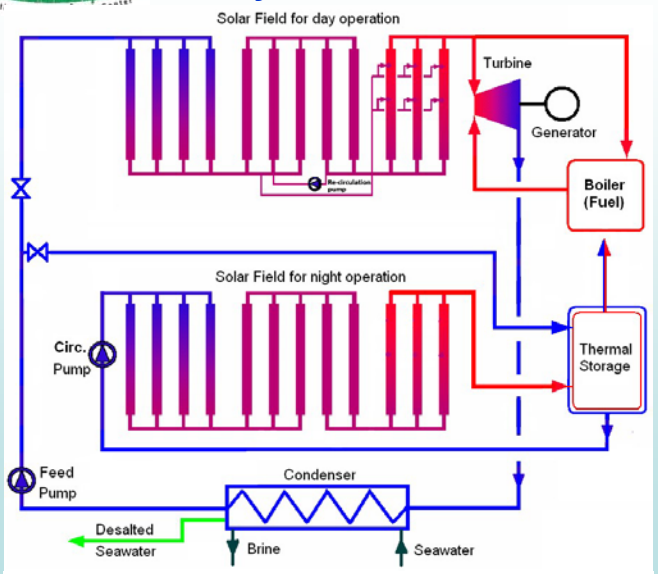
Solar Hybrid Power Station with Desalination



Desalination (MED) with Waste Heat

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.

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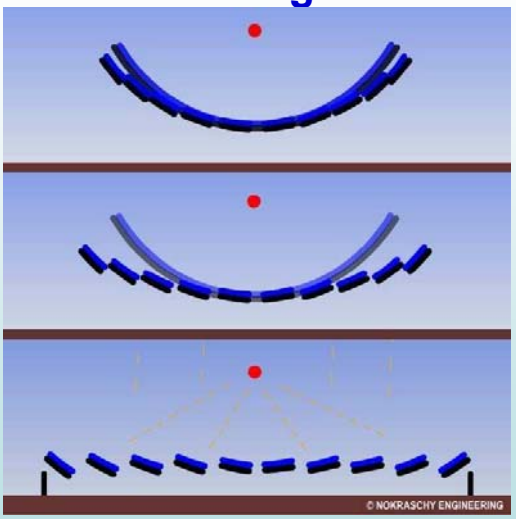
Advanced Design: Flat Mirrors



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

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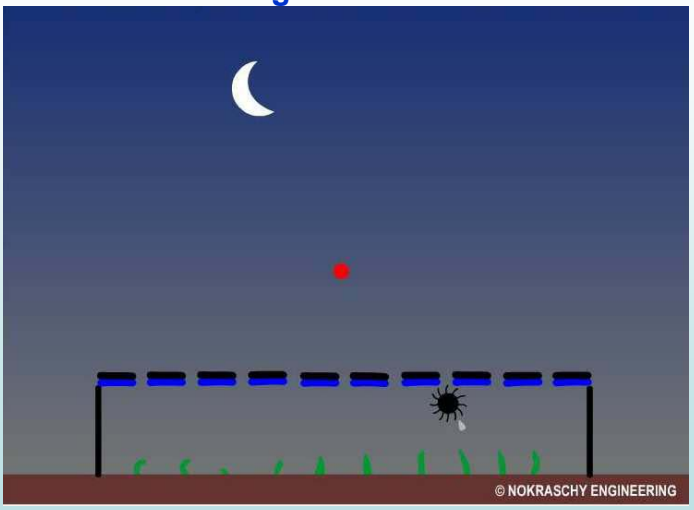
Automated Cleaning …

… less cleaning water & it is not wasted



In the shadow plants need less irrigation water

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CSP in action

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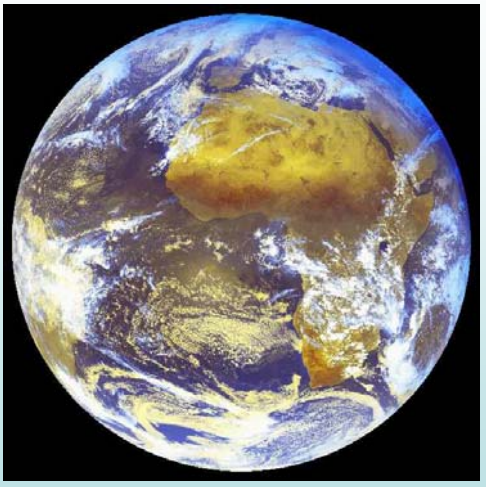
Thank you for your attention



Source:
MeteoSat
EUMETSAT

This picture shows how sunny is MENA