In 2050, the world’s population will need 3 planets to cover its demand for resources.

How can 10 billion people live peacefully together on just one planet?

Energy is abundant

Annual economic potential, in PWh (= 1000 TWh)

Global demand (2008): 18 PWh/y

Source: Trieb et al., DLR, 2009

Potential DESERTEC regions

Source: Gerhard Knies

EU-MENA ... a rapidly growing region

This is a second Europe. How can it be achieved?
The DESERTEC Concept for EU-MENA

DLR Studies: renewable energy potential in the EU and in MENA

- Electricity demand in EU-MENA in the year 2050: 7,500 TWh/y
  - Biomass: 1,350 TWh/y
  - Geothermal: 1,100 TWh/y
  - Windpower: 1,950 TWh/y
  - Hydropower: 1,350 TWh/y
  - Solar power: 630,000 TWh/y

Vision for 2050

3 Samples out of 20 EU-MENA HVDC interconnections each line transmitting 5 Giga Watt

- Transmission losses 10-15%

Situation 2010 with 220/400 kV AC Lines

- Planned 2014 Egypt-Saudi Arabia 1400 km Rated 3000 MW ±500 kV

Peak load management: in Saudi Arabia noon peak and in Egypt evening peak

The DESERTEC Concept for EU-MENA

The best sites offer the greatest benefit for climate protection

- For the same investment, the best sites can produce more clean electricity and therefore replace more conventional power
- Solar energy especially in the south, wind power in coastal areas, hydropower in the mountains, biomass in fertile central Europe, geothermal as available

Solar Hybrid Power Station with Desalination

Conventional Steam Power Station

Desalination (MED) with Waste Heat

Desalinated Seawater

Solar Hybrid Power Station

Mediterranean Ring, initiated 1987 by Minister Abaza of Egypt
**Step 1:**
Solar field in Hybrid operation for day and night service. Solar share ~30%

**Step 2:**
Solar field with Heat Storage for Night operation + boiler as back up. Solar share ~99% & ~1% bio-fuel for days with sand storms or clouds.

**Electricity production scenario for EU and MENA**
- MENA: Power from deserts mainly for local electricity demand and desalination
- Europe: Expansion of domestic renewable energies
- Dispatchable desert power complements the European electricity mix, enabling a higher proportion of PV & Wind, thus quickening the shift to a renewable energy supply.

**Freshwater Demand Prospects by Country**
- Natural Renewable Water
- Deficit ~ 2 x Nile

**Desertification of Soils due to Groundwater Over-exploitation and Salinization (e.g. Bahrain)**
Source: Dr. Waleed Zebari, Arabian Gulf University

Groundwater withdrawal exceeds safe yield Saghir 2000
The DESERTEC concept for 10 billion people

- Responsibility when managing the remaining resources
  - Education for wise Resource Management
- All peoples of the earth shall have a realistic chance for development
  - Energy for Development
- Collect energy from the deserts, as it is abundant and not used
  - The Sun gives in 6 hours the Energy used in one year
- Transport the collected energy from the deserts over long distances to the users
  - Via HVDC, an available technology
- Produce potable water by desalination to satisfy food demand
  - Clean Electricity and use of Waste Heat for Desalination

What can we do to foster Development of MENA?

- Long term power purchase agreement to supply clean Energy from MENA to EU
- MENA shall shift subsidies from Oil/Gas for electricity production to subsidising delivered electricity, giving priority to locally produced components.
- Ground an EU-MENA company that builds HVDC lines between EU and MENA.
- Ground an EU Company that that buys clean electricity from MENA and sells it to the EU grid.
- Agree that the delivery of electricity is coupled with a reasonable amount of desalted seawater: e.g. 20-40 m³ for each MWh delivered electricity.

Source: Gerhard Knies