



Part 7: Electricity Supply Scenarios – How achieve Sustainability?

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What is Sustainable?



Criteria for Sustainable Electricity Supply:

✓ **Inexpensive**

low electricity cost
no long term subsidies

✓ **Secure**

diversified and redundant supply
power on demand
based on inexhaustible resources
available or at least visible technology
capacities expandable in time

✓ **Compatible**

low pollution
climate protection
low risks for health and environment
fair access



What's the Big Mistake?



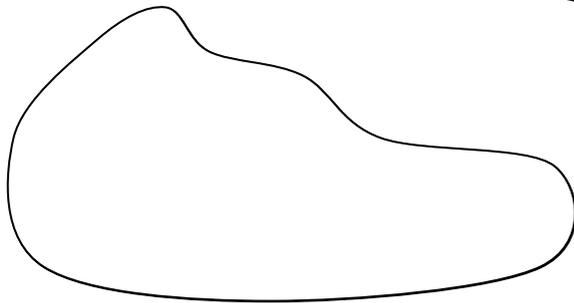
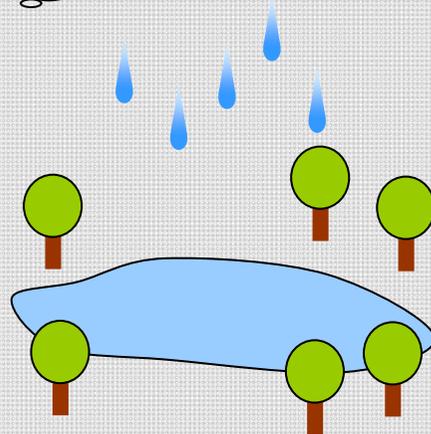
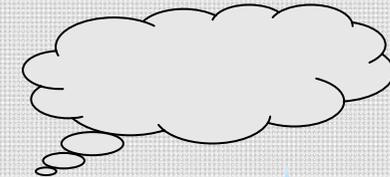
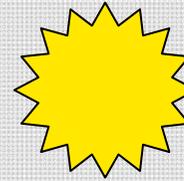


**Fossil
Energy ~~Sources~~
Storage**

Oil
Gas
Lignite
Coal

**Renewable Energy
Sources**

Sun
Wind
Water
Biomass



500 years later

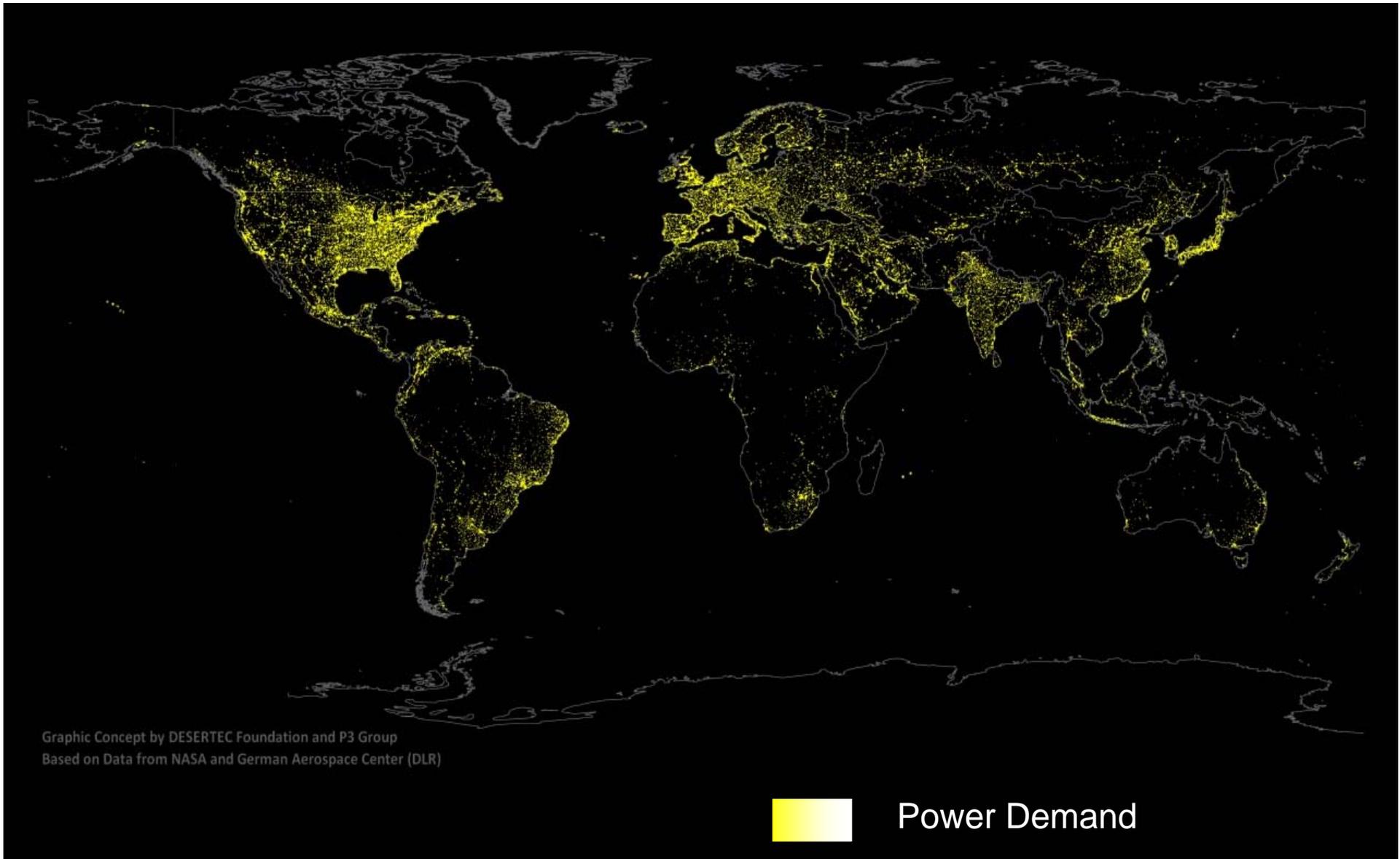
Who finds the
big mistake?

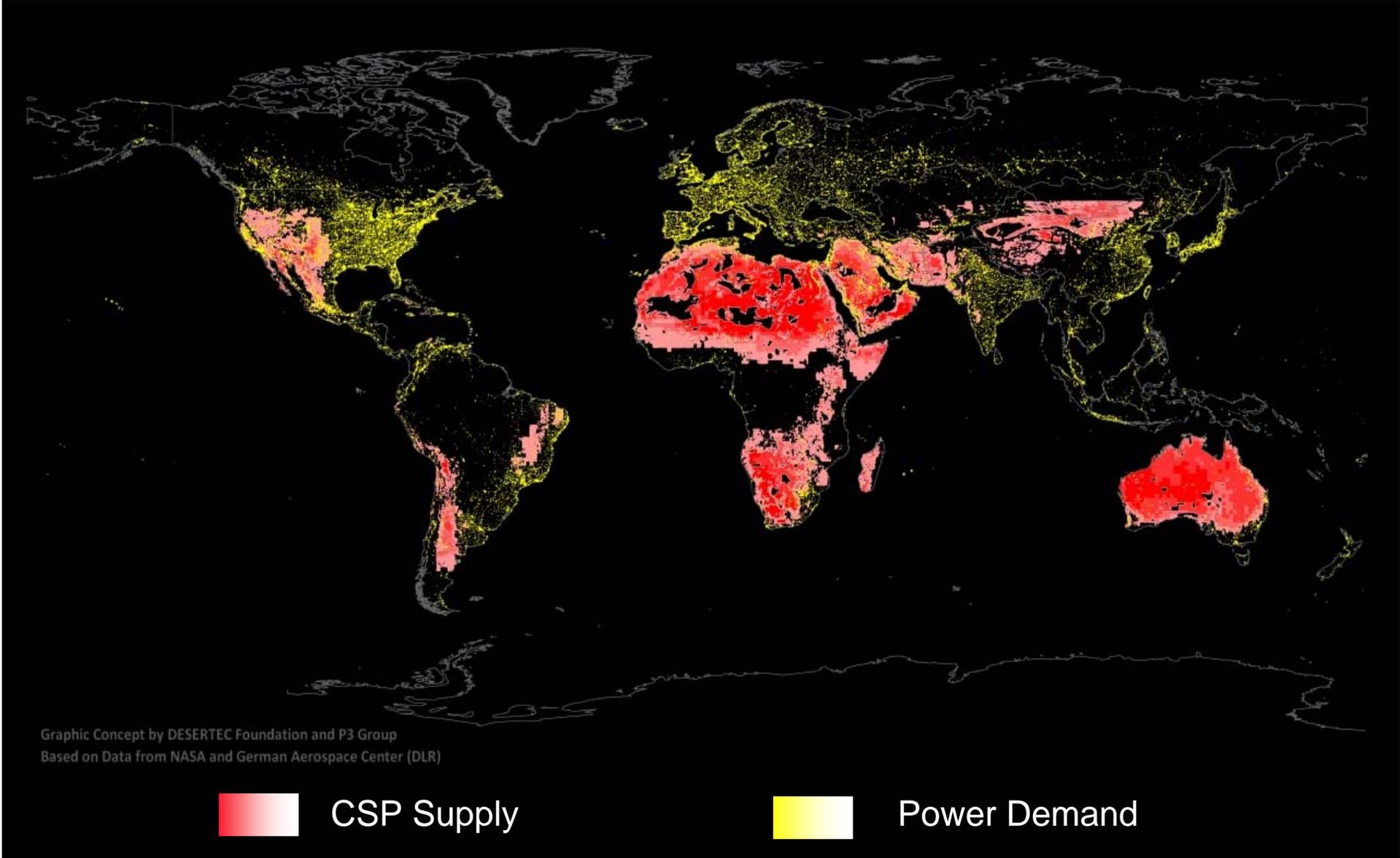


Homo sapiens sapiens, the wise wise man,
is the only species on earth that abstains from
making use of the world's energy sources and
instead empties the global energy storage.



Why HVDC-Interconnections?

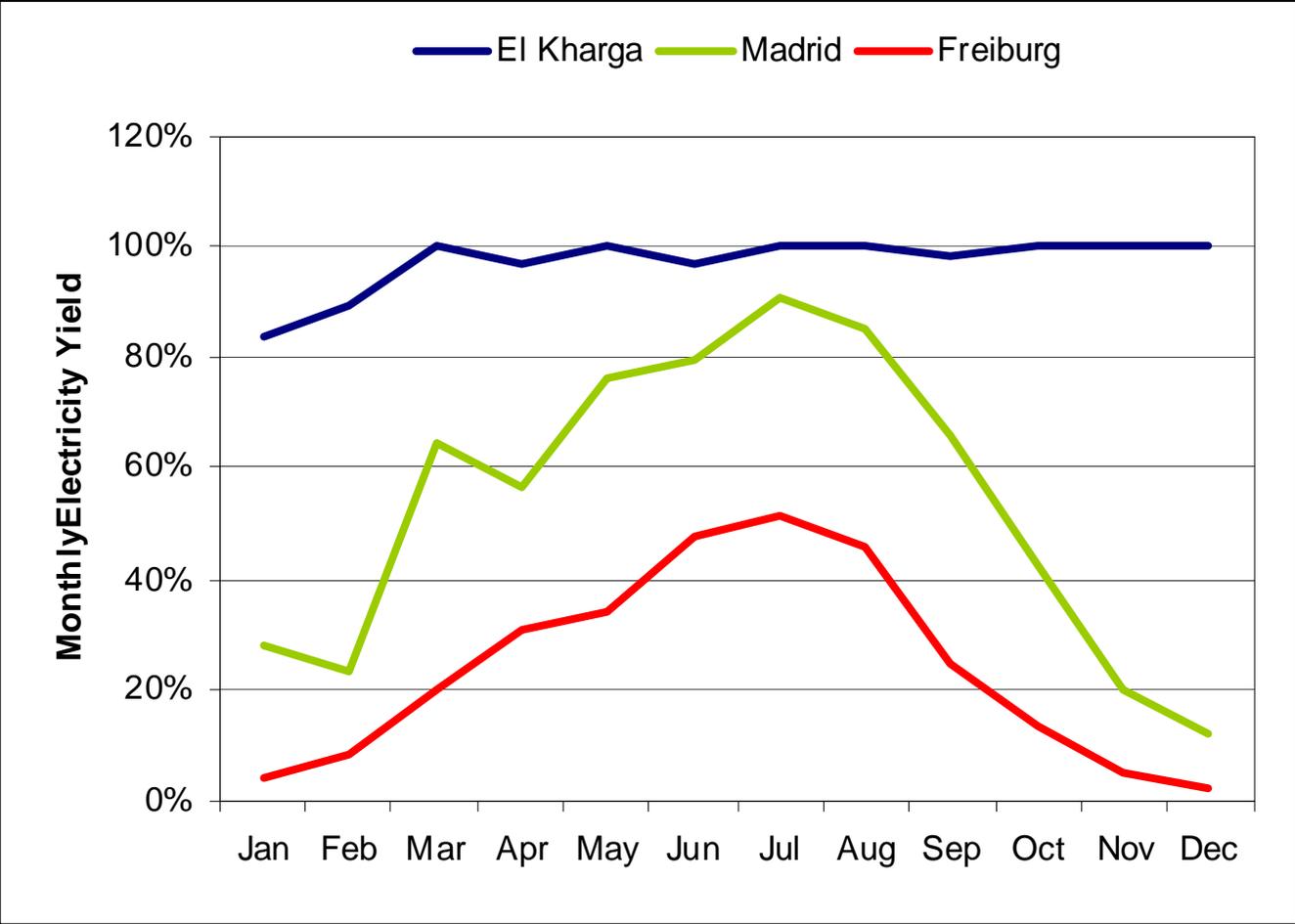






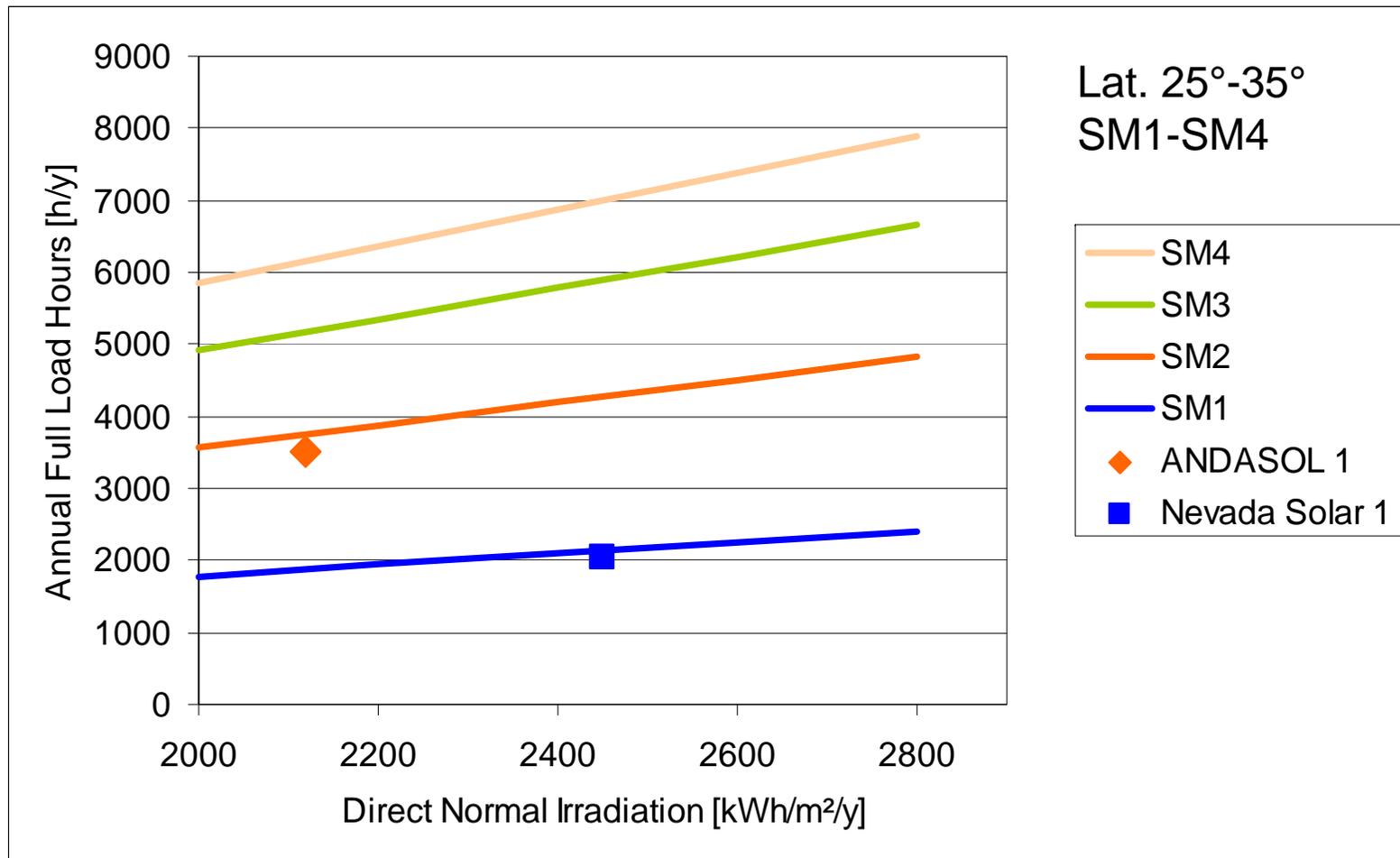
Effect of Site Conditions on the Availability of CSP

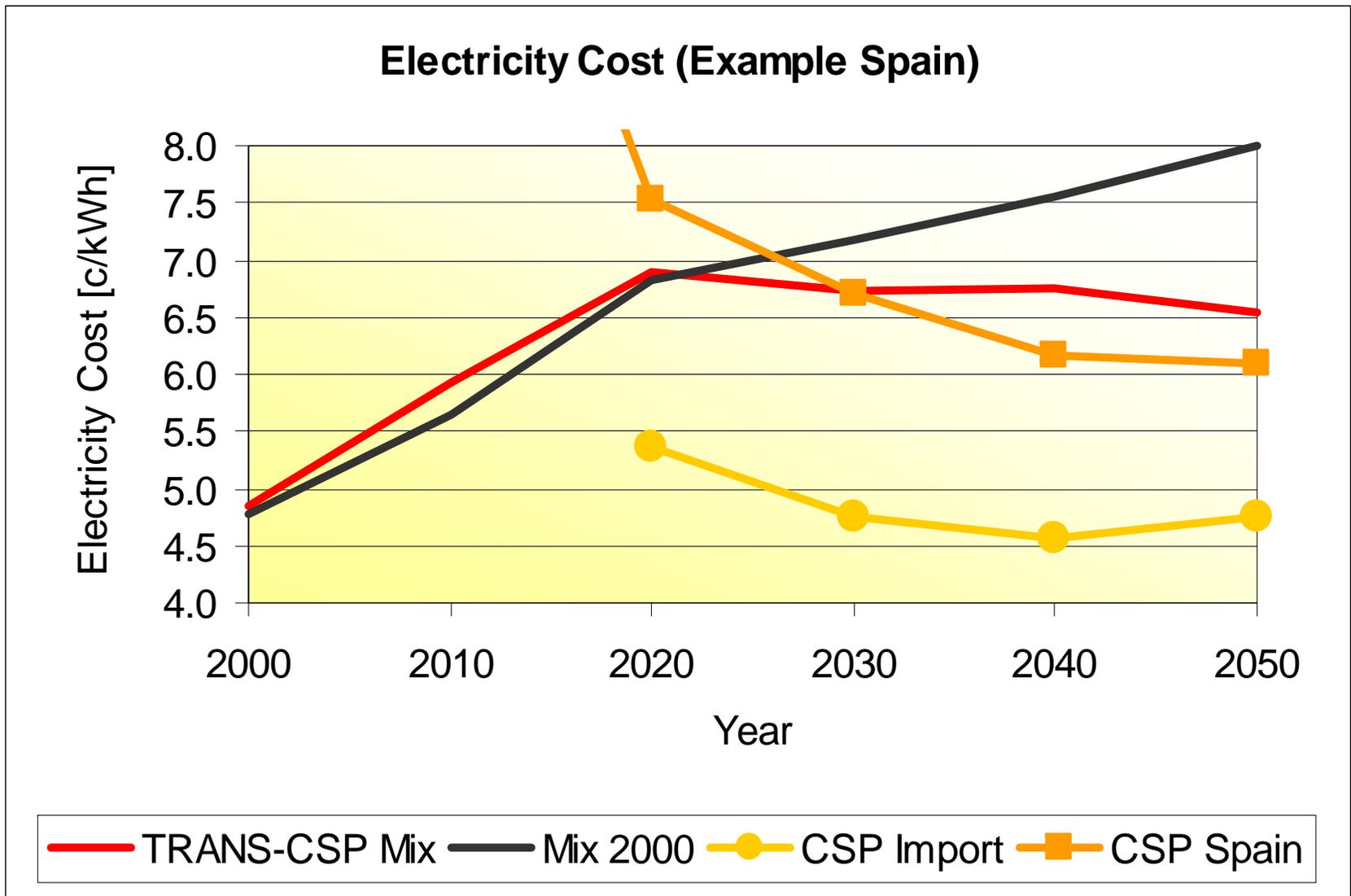
SM = 4





CSP for Peak, Medium and Base Load





constant €₂₀₀₀, fuel cost IEA 2005, CCS after 2020, 5% discount rate



Solar Power & Desalination Plants



Energy,
Water,
Food,
Labor and
Income

for further
300 Million
People
in MENA ?

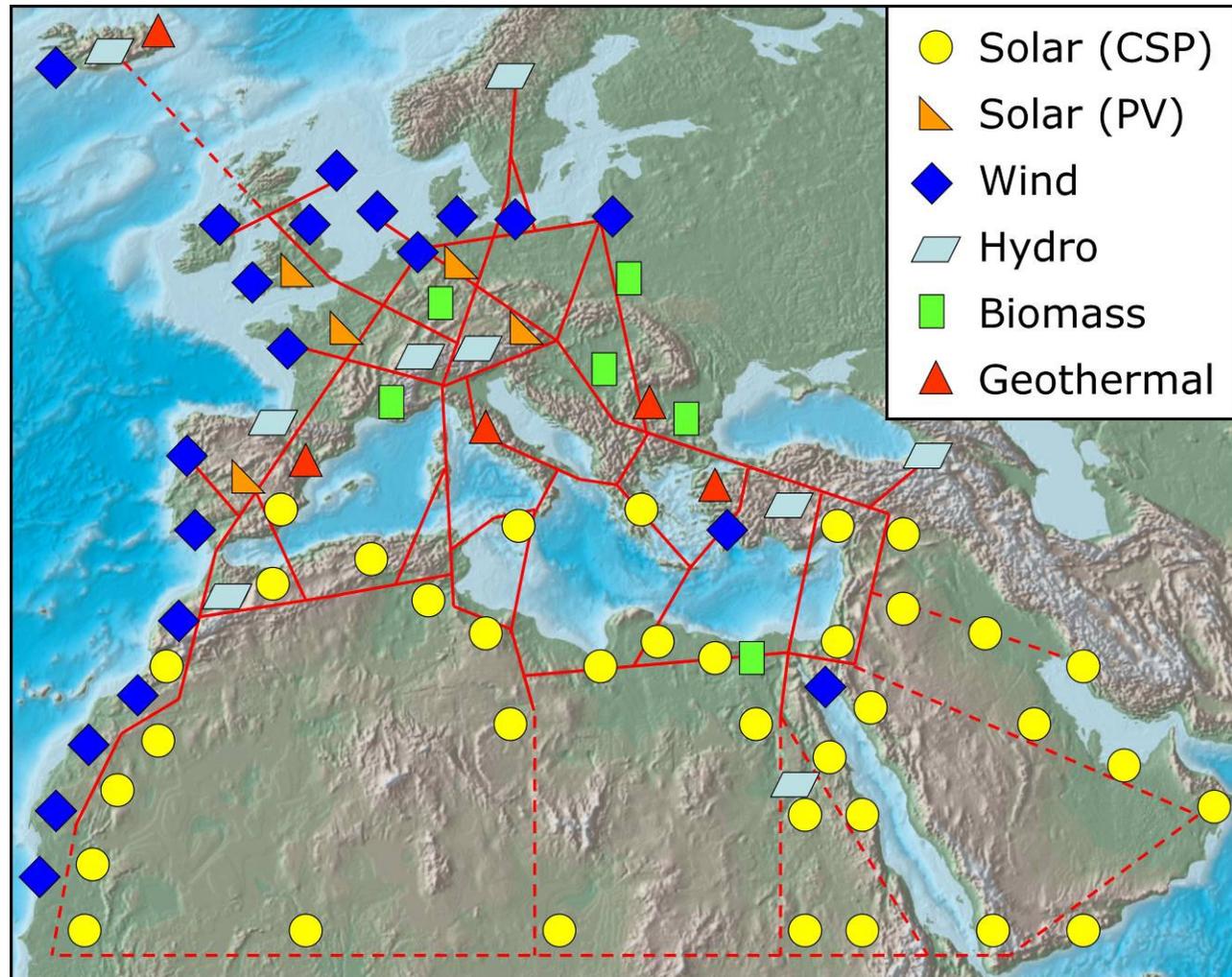


Trans-Mediterranean High Voltage Direct Current Electricity Grid: Interstate Highways for Renewable Electricity in EUMENA

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

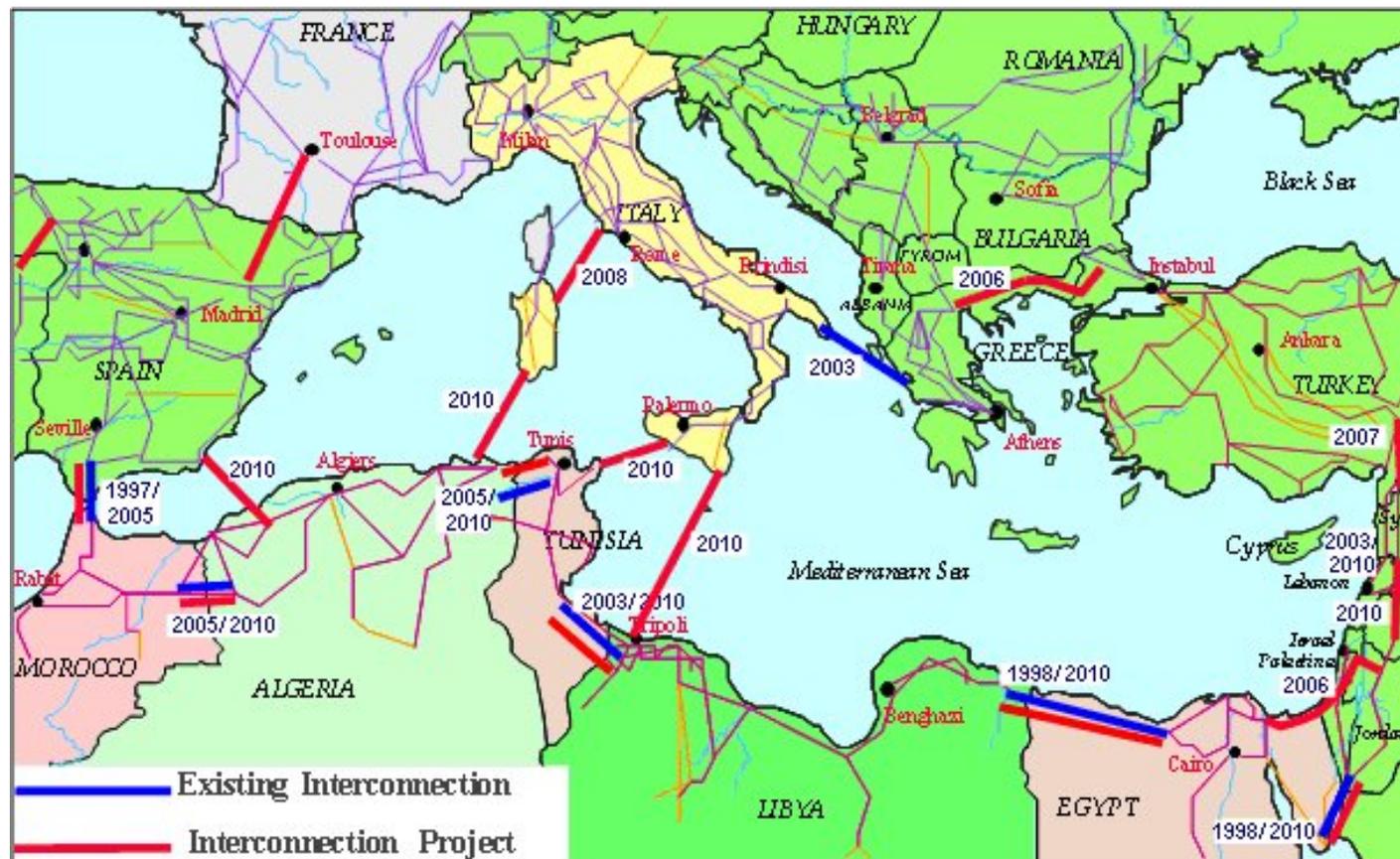


EUMENA:
Europe
Middle East
North Africa





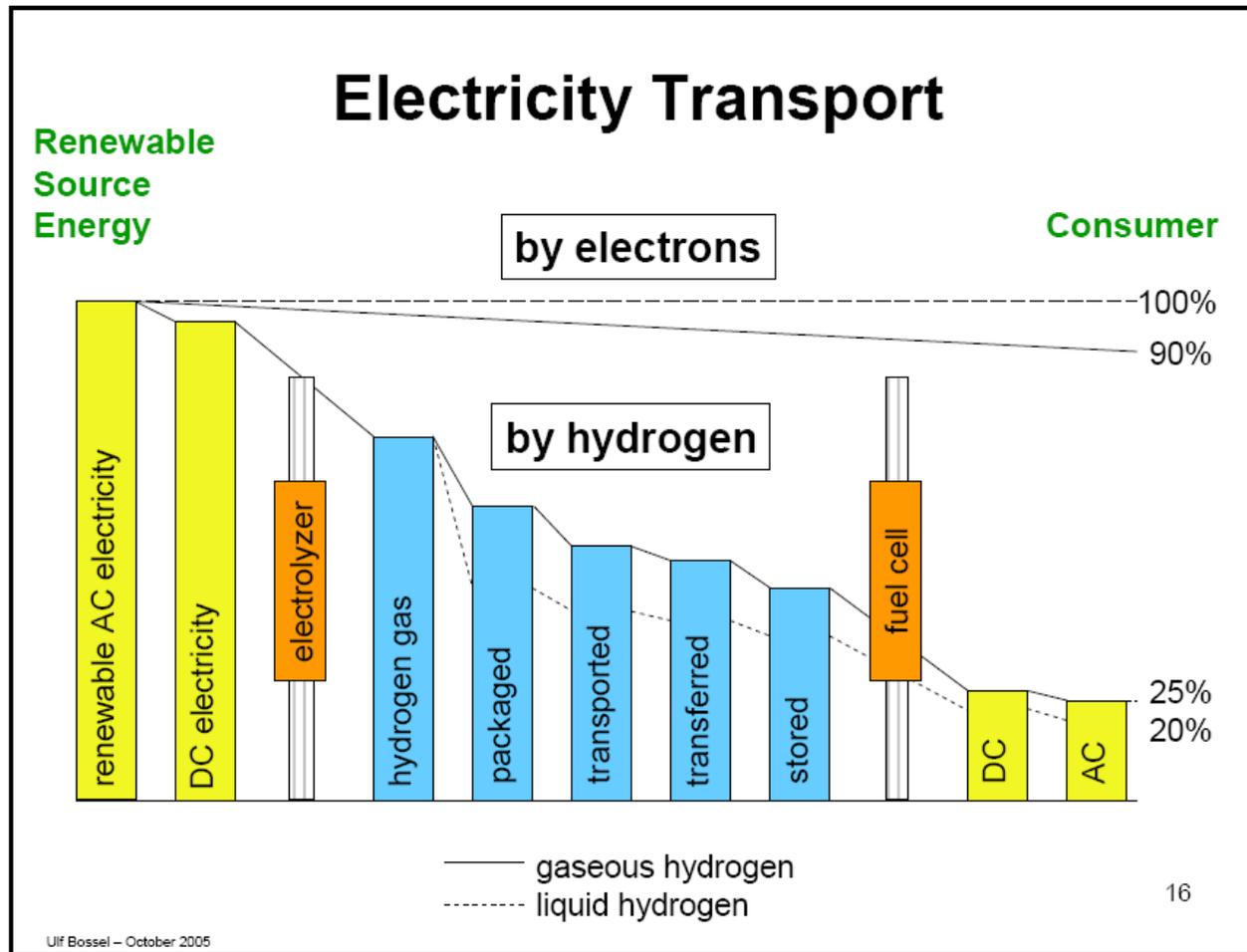
After closing the Mediterranean Ring in 2010, about 0.5 % of European electricity demand could be imported through the conventional AC grid. If upgraded to European standards, 3 %. However, 45 % of the solar electricity would be lost over 3000 km.



Source:
OME

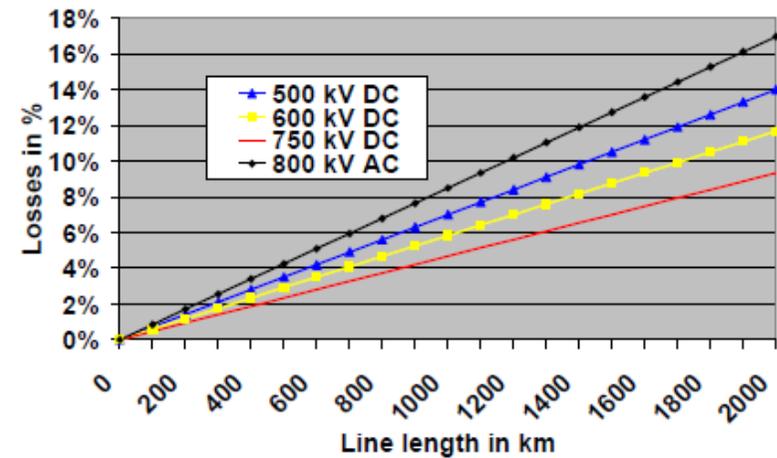
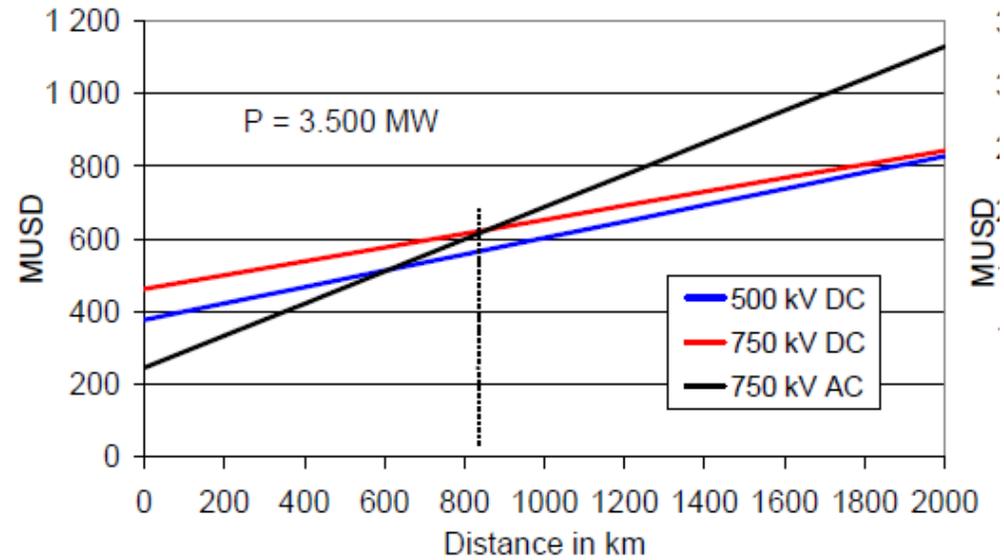
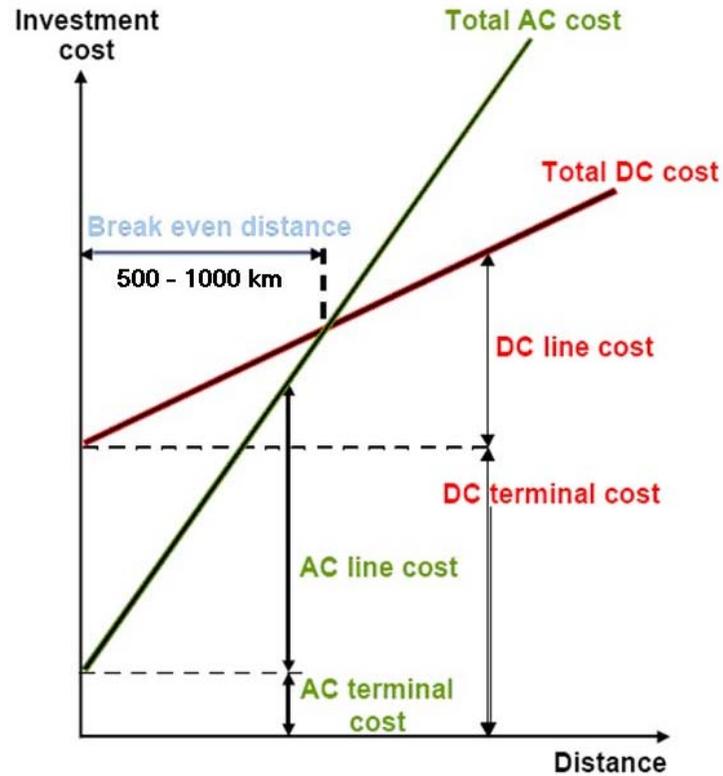


Power transmission via Hydrogen is possible, but 75 % of the solar electricity would be lost.





Cost of HVDC versus HVAC Links



HVDC High Voltage Direct Current
 HVAC High Voltage Alternating Current



Options for Solar Electricity Transfer over 2000 km Distance

Solar Power Transfer by:	Hydrogen	AC / HVAC	HVDC Line
Losses	75 %	30 % / 18 %	8 -14 %
Cost	very high	high	low
Adaptation to Consumers (Transformer)	has to be transformed to AC first	directly transformable	has to be transformed to AC first
Over Sea Transport	by tankers or pipelines	not over 30 km	standard solution
Visibility Impact	very low	high	low
Materials and Emissions	moderate	moderate	low
Preferred Application	eventually fuel for transport	regional and local power	long distance power transfer



Time for Discussion ...

