







Sustainable Electricity and Water for Europe, Middle East and North Africa

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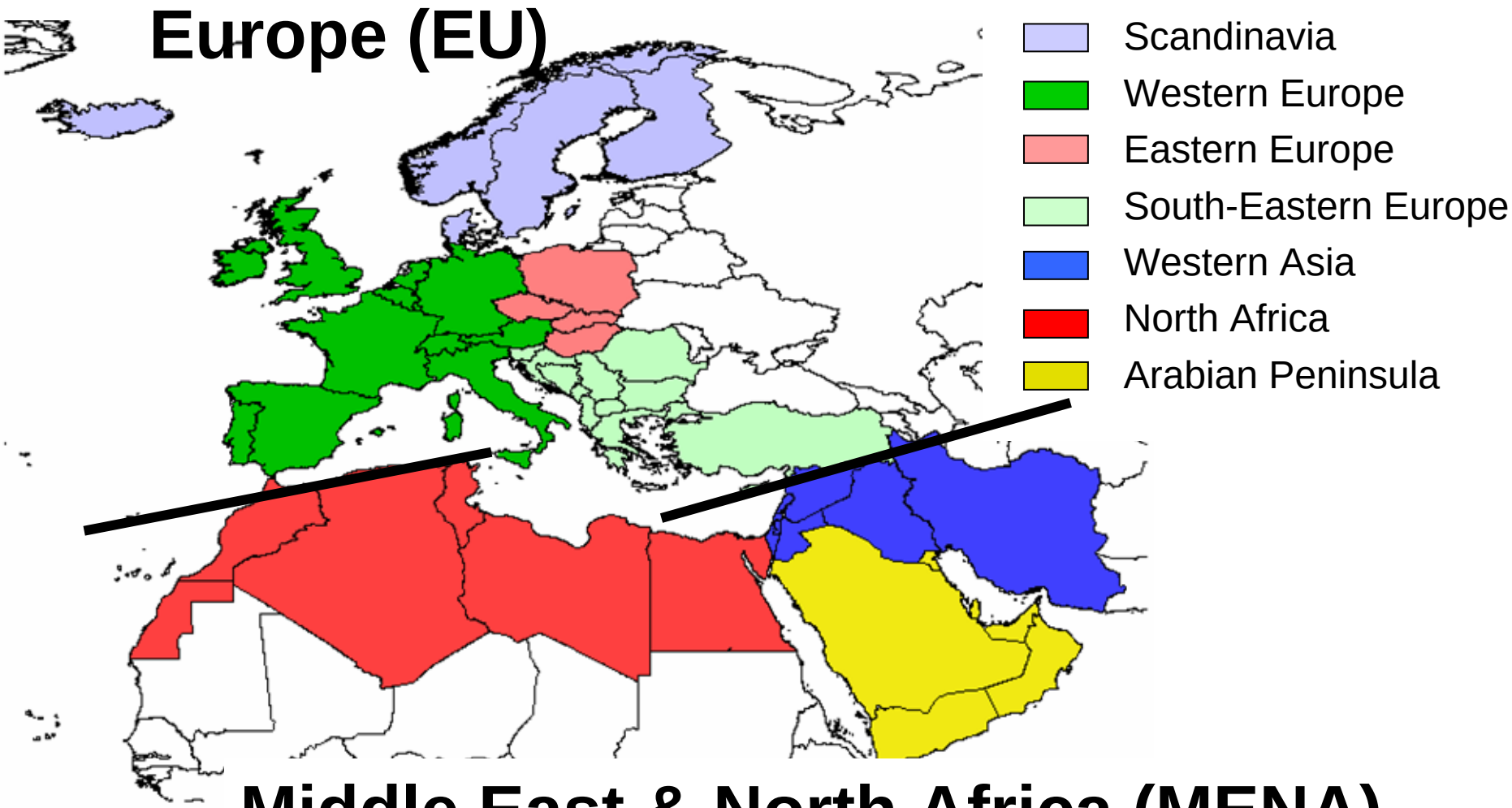
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Task

Assessment of the renewable energy potential for the sustainable supply of electricity and water in 50 countries of Europe, the Middle East and North Africa taking into consideration the option of Concentrating Solar Power.

Bundesministerium
für Umwelt, Naturschutz
und Reaktorsicherheit

50 Countries in EUMENA analysed



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 can be expanded in time

✓ **Compatible**

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

Portfolio of Energy Sources for Electricity:

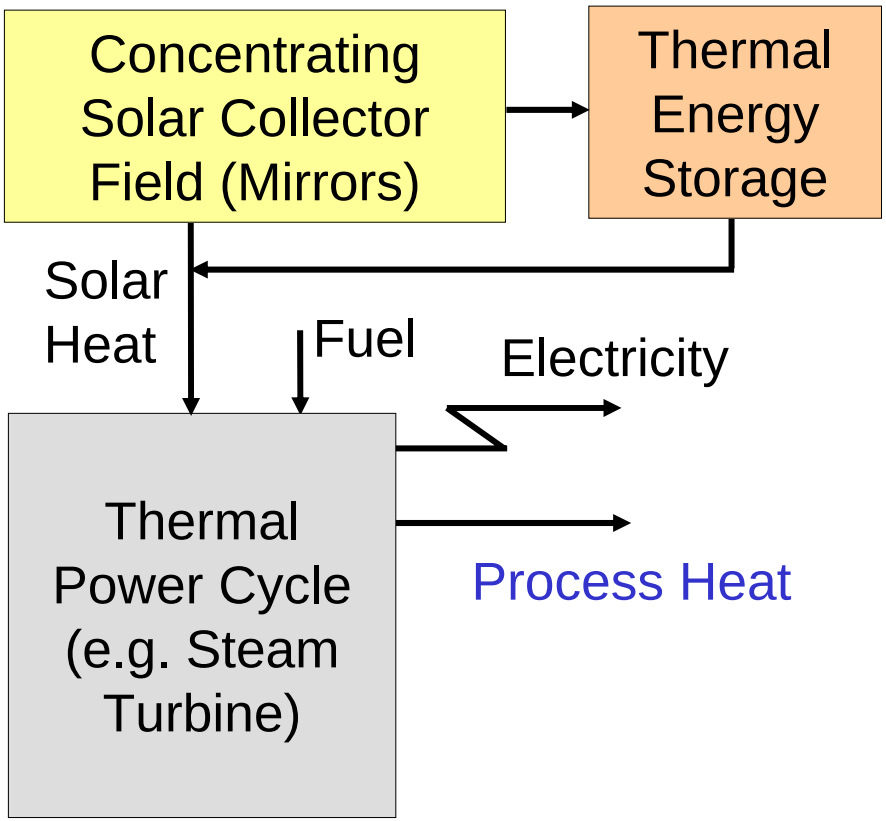
- ✓ Coal, Lignite
- ✓ Oil, Gas
- ✓ Nuclear Fission, Fusion
- ✓ Concentrating Solar Power (CSP)
- ✓ Geothermal Power (Hot Dry Rock)
- ✓ Biomass
- ✓ Hydropower
- ✓ Wind Power
- ✓ Photovoltaic
- ✓ Wave / Tidal

ideally stored primary energy

storable primary energy

fluctuating primary energy

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.





Achievements

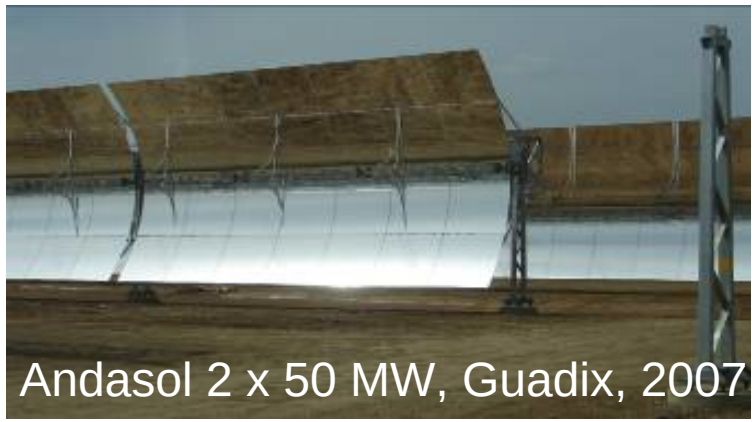


Novatec
Murcia,
2007

MAN/SPG
Almeria
2007

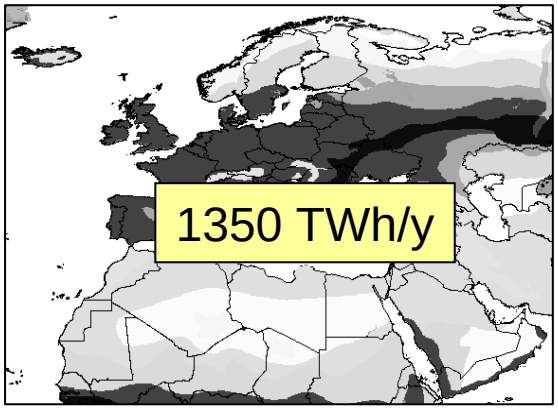




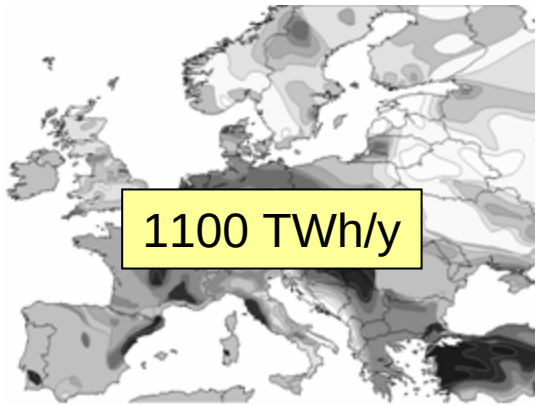


Renewable Electricity Potential in Europe, Middle East & North Africa

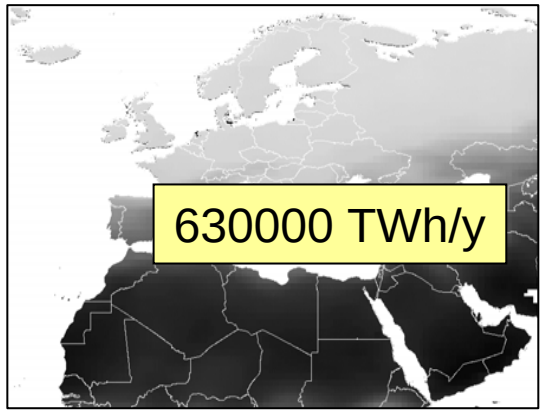
Biomass (0-1)

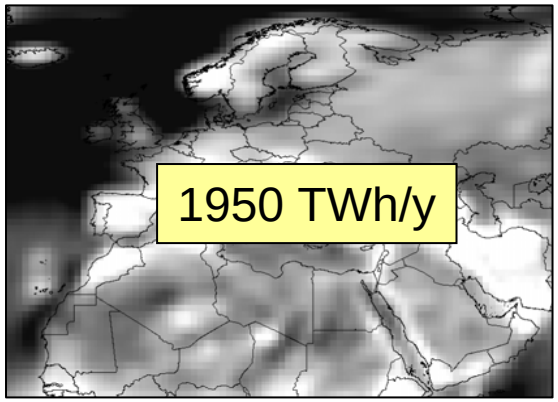


Geothermal (0-1)

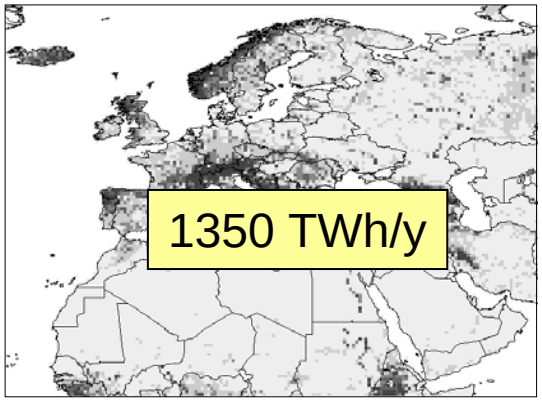


Solar (10-250)

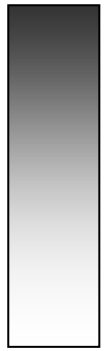




Wind Energy (5-50)



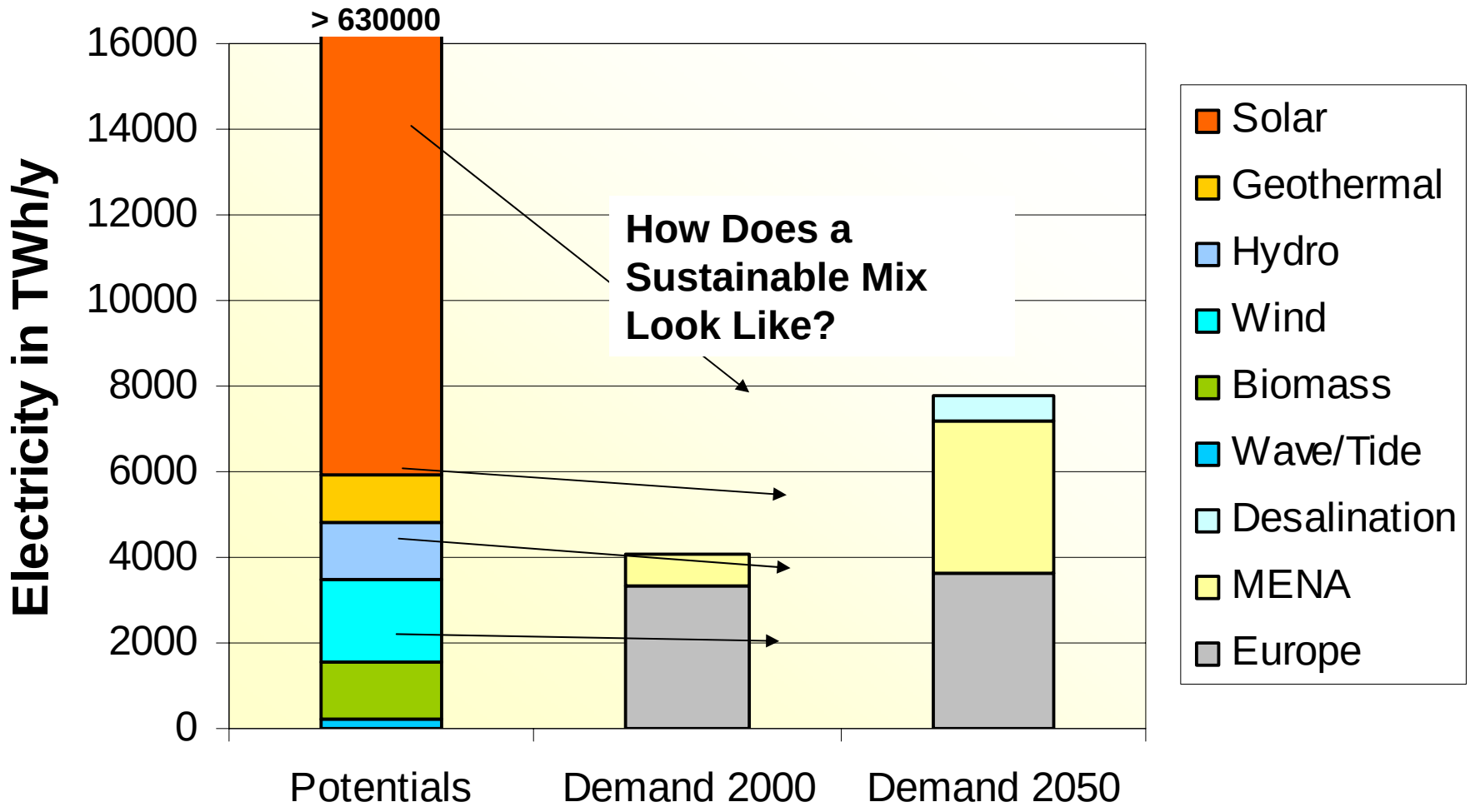
Hydropower (0-50)



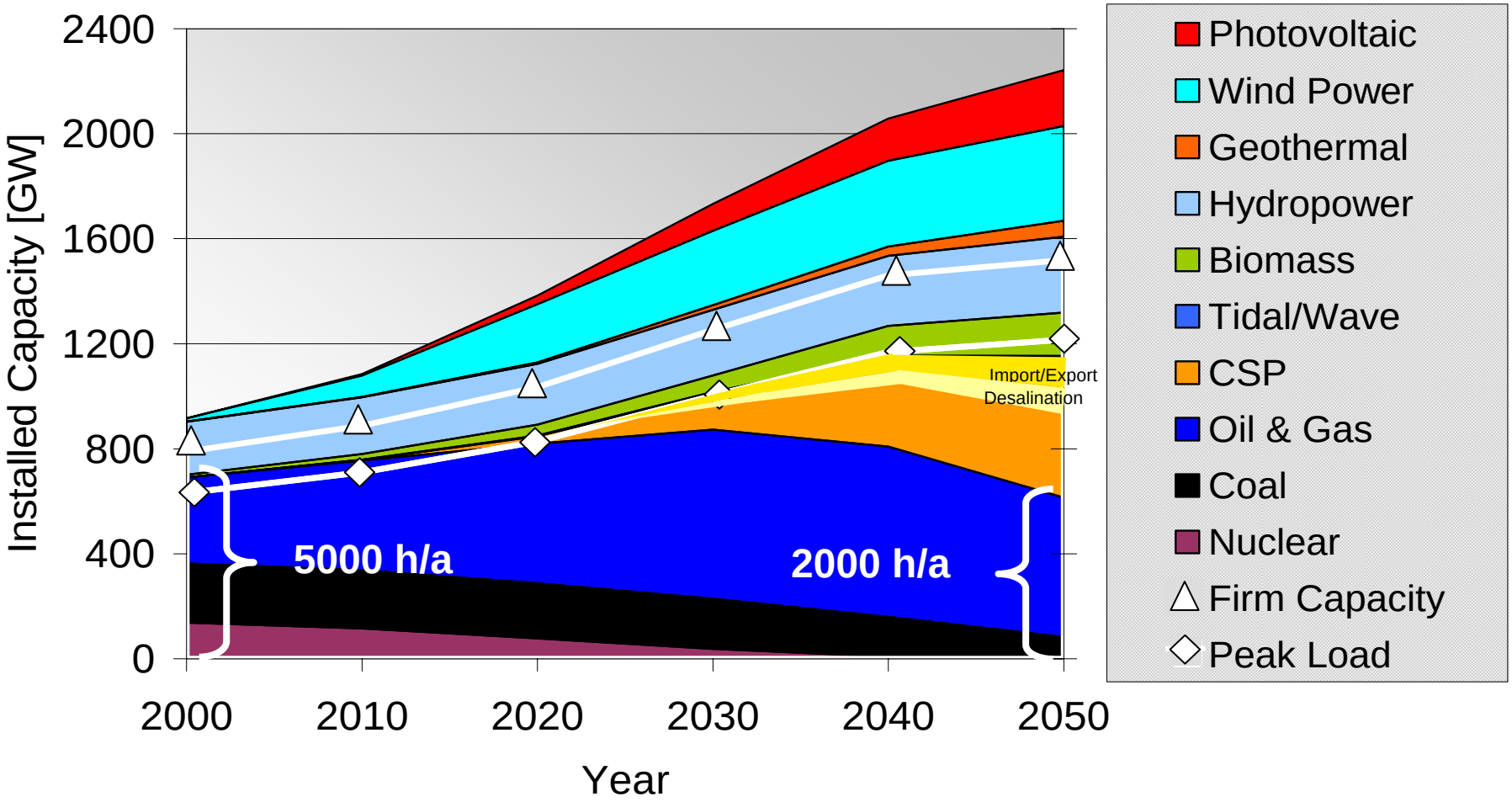
DLR

Electricity Yield
in GWh/km²

Economic Renewable Electricity Potentials vs. Demand in EUMENA

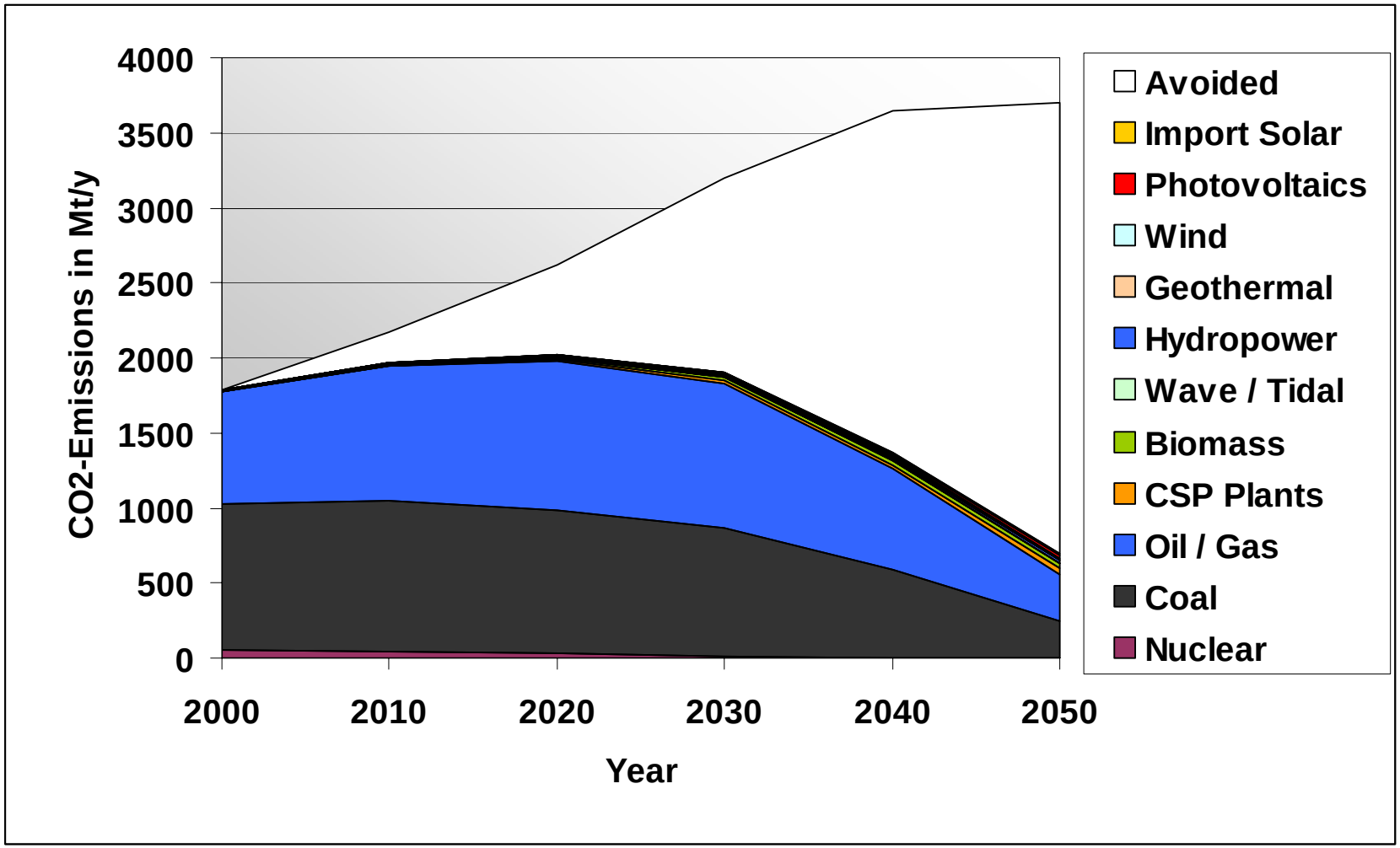


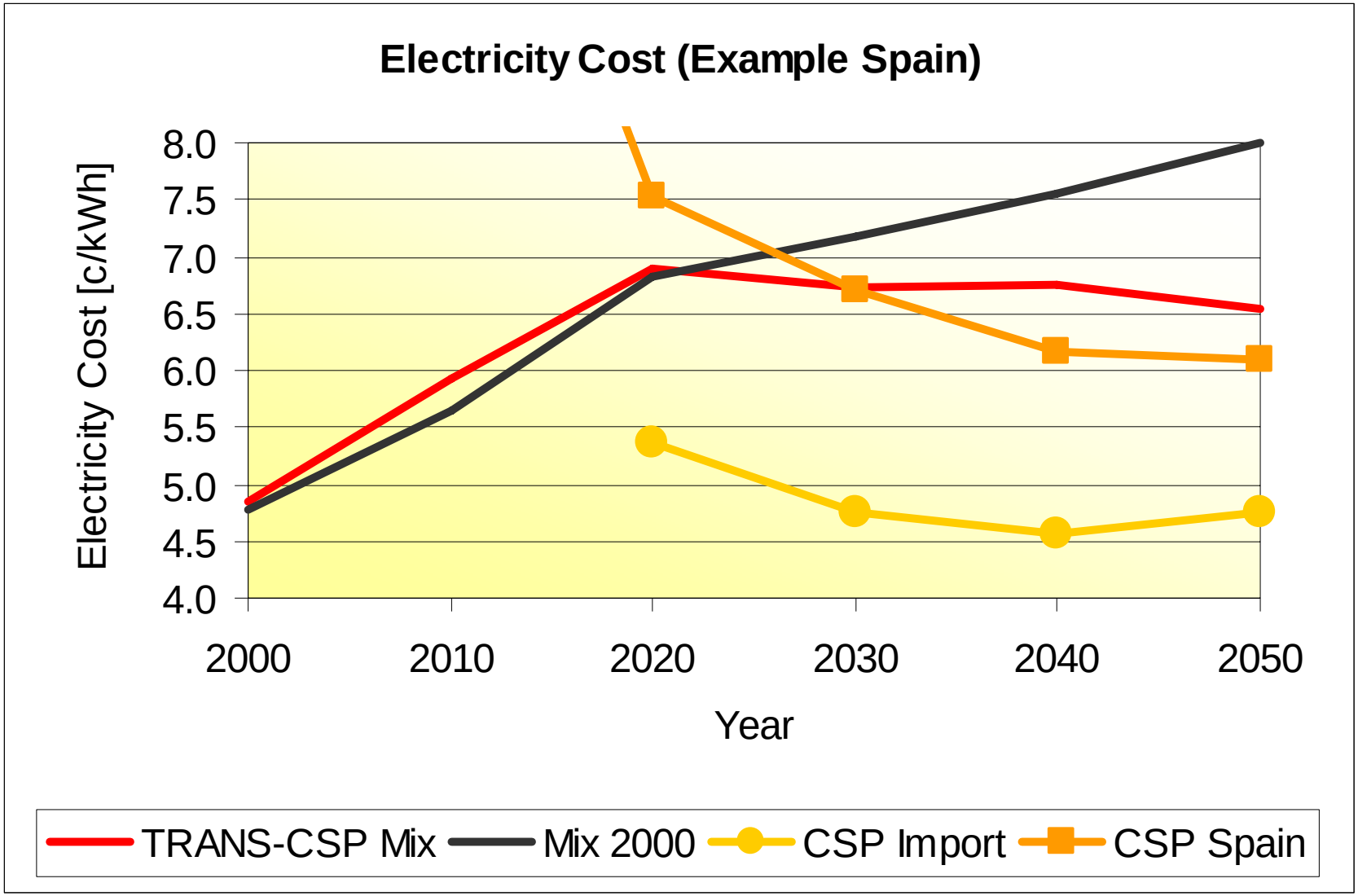
Installed Capacity vs. Peak Load in EUMENA



➔ **100 % availability plus 25 % reserve capacity**

Carbon emissions of EUMENA power sector are reduced to 38 % until 2050 in spite of a quickly growing demand




Electricity Cost (Example Spain)
Electricity Cost [c/kWh]
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
2000
2010
2020
2030
2040
2050
Year
TRANS-CSP Mix
Mix 2000
CSP Import
CSP Spain






One Square Kilometre of Desert Land using Concentrating Solar Thermal Power is enough to harvest up to:

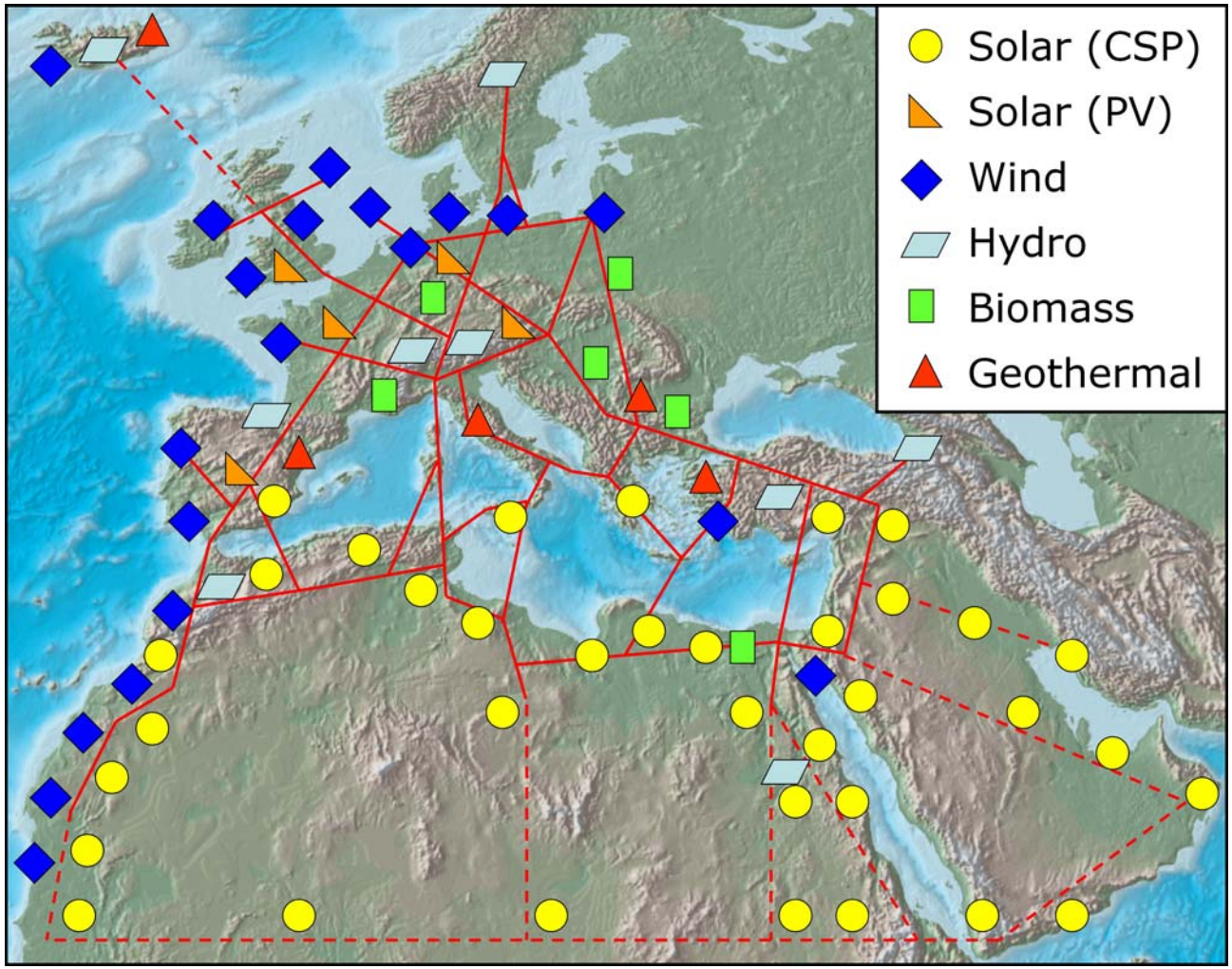
- 250 Million kWh/year of Electricity
- 60 Million m^3/year of Desalted Seawater

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

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

THE CLUB OF ROME

www.trec-eumena.net



Strategic Focal Points

- Efficiency Focus
- Renewable Energy Focus
- EU-MENA Cooperation Focus
- EU-MENA Interconnection Focus
- Balancing Power Focus

CSP is the Key

MED-CSP

Concentrating Solar Power for the Mediterranean Region

MENAREC 2
Amman, Jordan
May 2005

TRANS-CSP

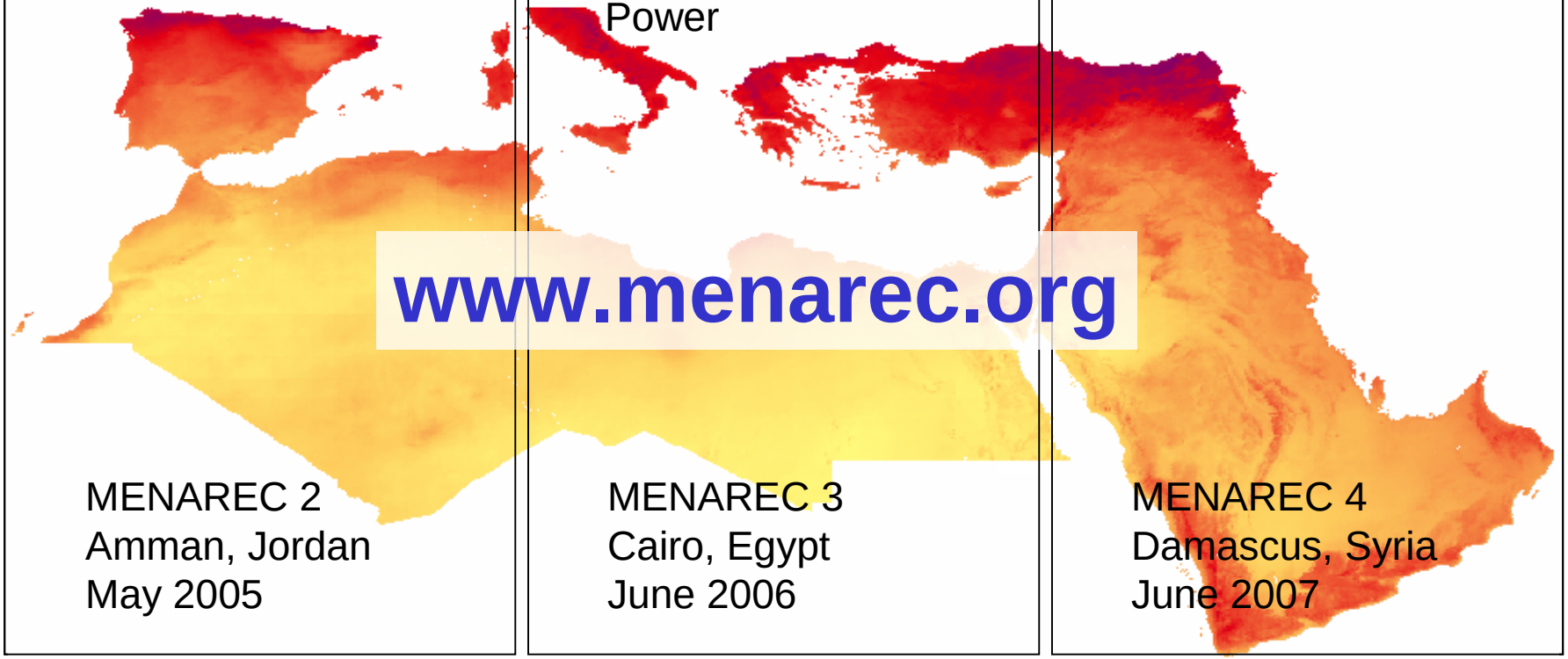
Trans-Mediterranean Interconnection for Concentrating Solar Power

MENAREC 3
Cairo, Egypt
June 2006

AQUA-CSP

Concentrating Solar Power for Sea Water Desalination

MENAREC 4
Damascus, Syria
June 2007



www.menarec.org