



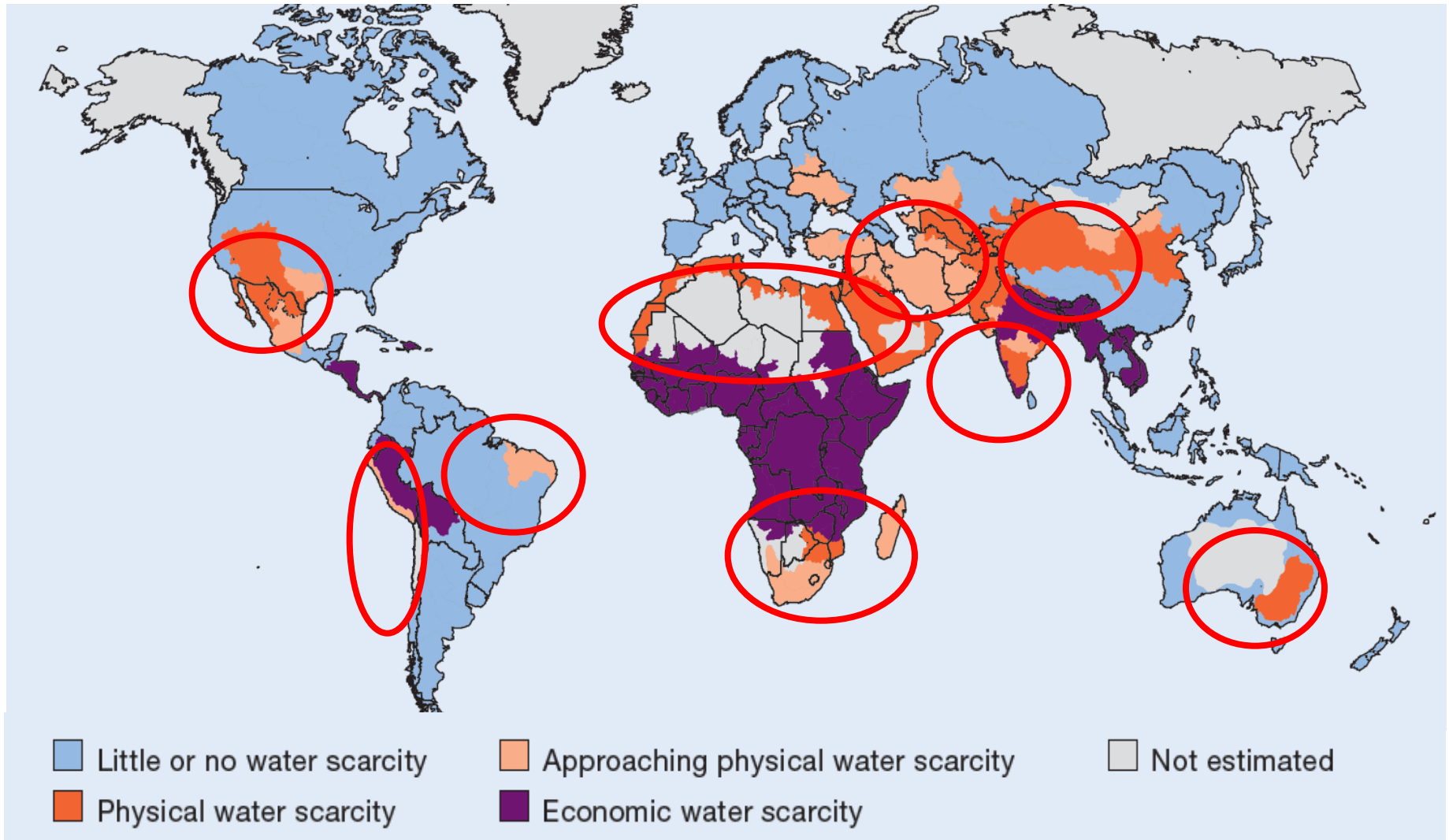
Combined Solar Power and Desalination Plants: Update on the MED-CSD Project

Franz Trieb

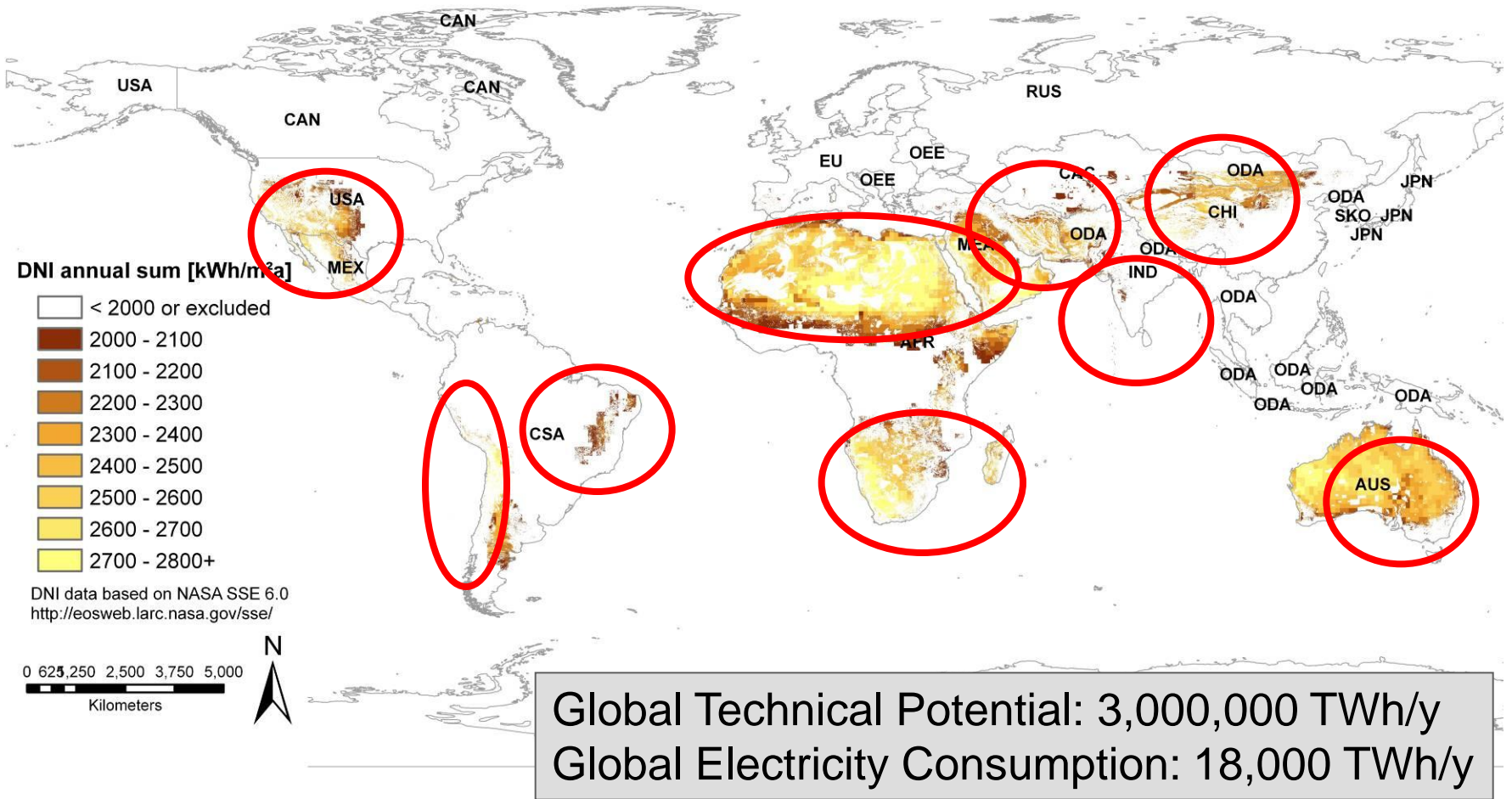
IEA Paris, March 23, 2009



Global Water Scarcity



Global Potential for Concentrating Solar Power



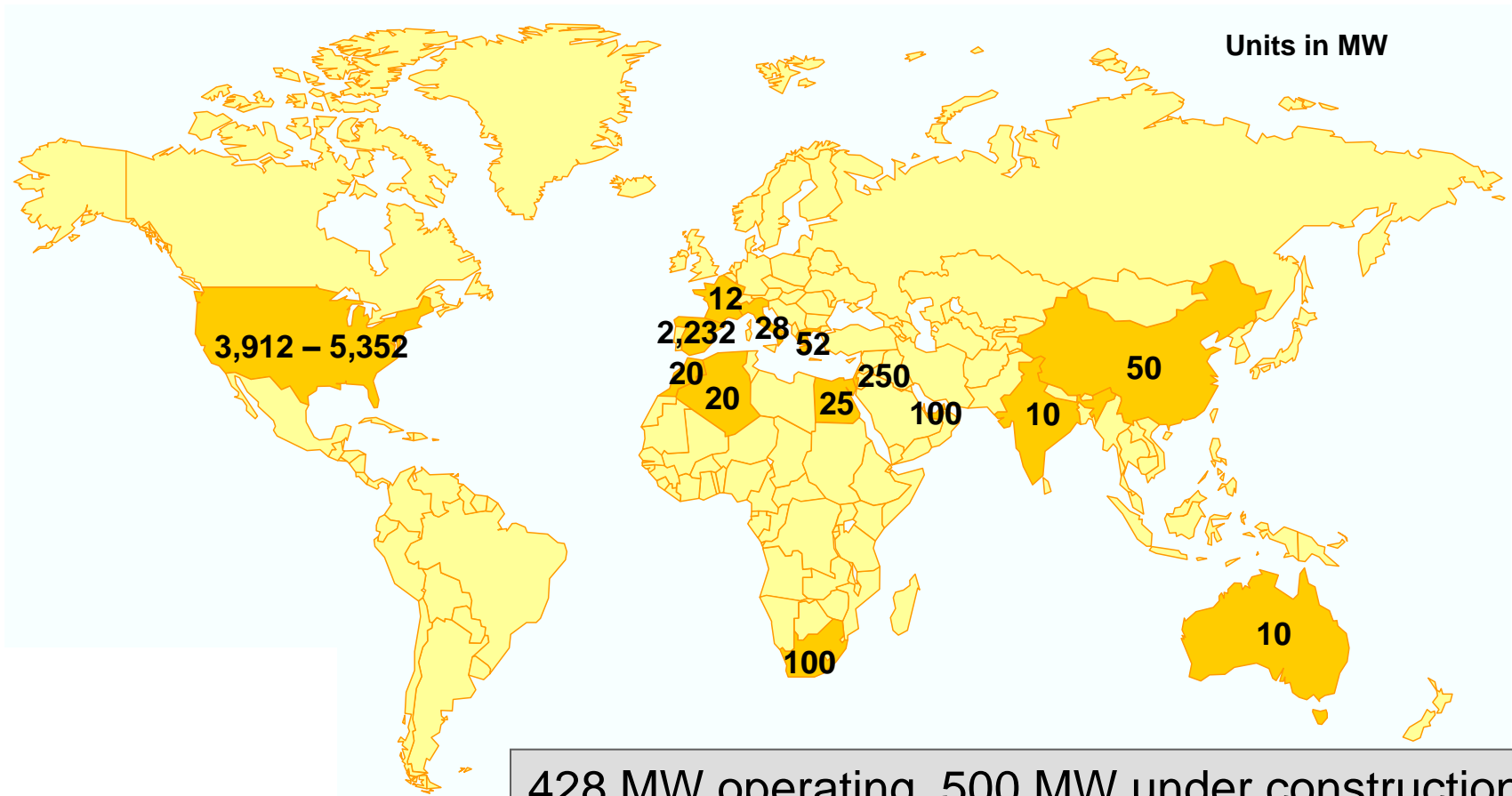
Data provided by  (2008) for EU-project REACCESS

| DNI Class | Africa | Australia | Central Asia, Caucasase | Canada | China | Central South America | India | Japan |
|--------------|------------------|----------------|-------------------------|----------|----------------|-----------------------|---------------|----------|
| 2000-2099 | 102,254 | 6,631 | 14,280 | 0 | 8,332 | 31,572 | 7,893 | 0 |
| 2100-2199 | 138,194 | 18,587 | 300 | 0 | 18,276 | 20,585 | 1,140 | 0 |
| 2200-2299 | 139,834 | 36,762 | 372 | 0 | 43,027 | 24,082 | 550 | 0 |
| 2300-2399 | 141,066 | 87,751 | 177 | 0 | 28,415 | 20,711 | 774 | 0 |
| 2400-2499 | 209,571 | 148,001 | 64 | 0 | 11,197 | 6,417 | 426 | 0 |
| 2500-2599 | 203,963 | 207,753 | 0 | 0 | 11,330 | 3,678 | 13 | 0 |
| 2600-2699 | 178,480 | 142,490 | 0 | 0 | 2,180 | 5,120 | 119 | 0 |
| 2700-2800+ | 346,009 | 49,625 | 0 | 0 | 3,079 | 11,827 | 15 | 0 |
| Total | 1,459,370 | 697,600 | 15,193 | 0 | 125,835 | 123,992 | 10,928 | 0 |

| DNI Class | Middle East | Mexico | Other Developing Asia | Other East Europe | Russia | South Korea | EU27+ | USA |
|--------------|----------------|---------------|-----------------------|-------------------|----------|-------------|--------------|----------------|
| 2000-2099 | 3,432 | 1,606 | 4,491 | 6 | 0 | 0 | 866 | 14,096 |
| 2100-2199 | 12,443 | 3,378 | 5,174 | 13 | 0 | 0 | 497 | 17,114 |
| 2200-2299 | 39,191 | 3,650 | 10,947 | 2 | 0 | 0 | 660 | 21,748 |
| 2300-2399 | 60,188 | 5,807 | 30,776 | 0 | 0 | 0 | 162 | 16,402 |
| 2400-2499 | 71,324 | 15,689 | 19,355 | 0 | 0 | 0 | 90 | 23,903 |
| 2500-2599 | 34,954 | 7,134 | 4,429 | 0 | 0 | 0 | 69 | 8,116 |
| 2600-2699 | 32,263 | 1,534 | 253 | 0 | 0 | 0 | 31 | 2,326 |
| 2700-2800+ | 36,843 | 1,878 | 136 | 0 | 0 | 0 | 34 | 0 |
| Total | 290,639 | 40,675 | 75,561 | 21 | 0 | 0 | 2,409 | 103,704 |

CSP potentials in TWh/y available in the REACCESS world regions for different DNI Classes

Global Concentrating Solar Power Projects



428 MW operating, 500 MW under construction
~8,000 MW under development

New Concentrating Solar Power Projects

PS10, PS20 Sevilla, Spain
(10 MW + 20 MW, 2007 & 2009)



New Concentrating Solar Power Projects



Nevada Solar One
Las Vegas, USA (64 MW, 2007)



ANDASOL 1, Guadix, Spain (50 MW, 7 h Storage, 2009)



Linear Fresnel Demos



Plataforma
Solar
Almeria,
Spain

(MAN/SPG)

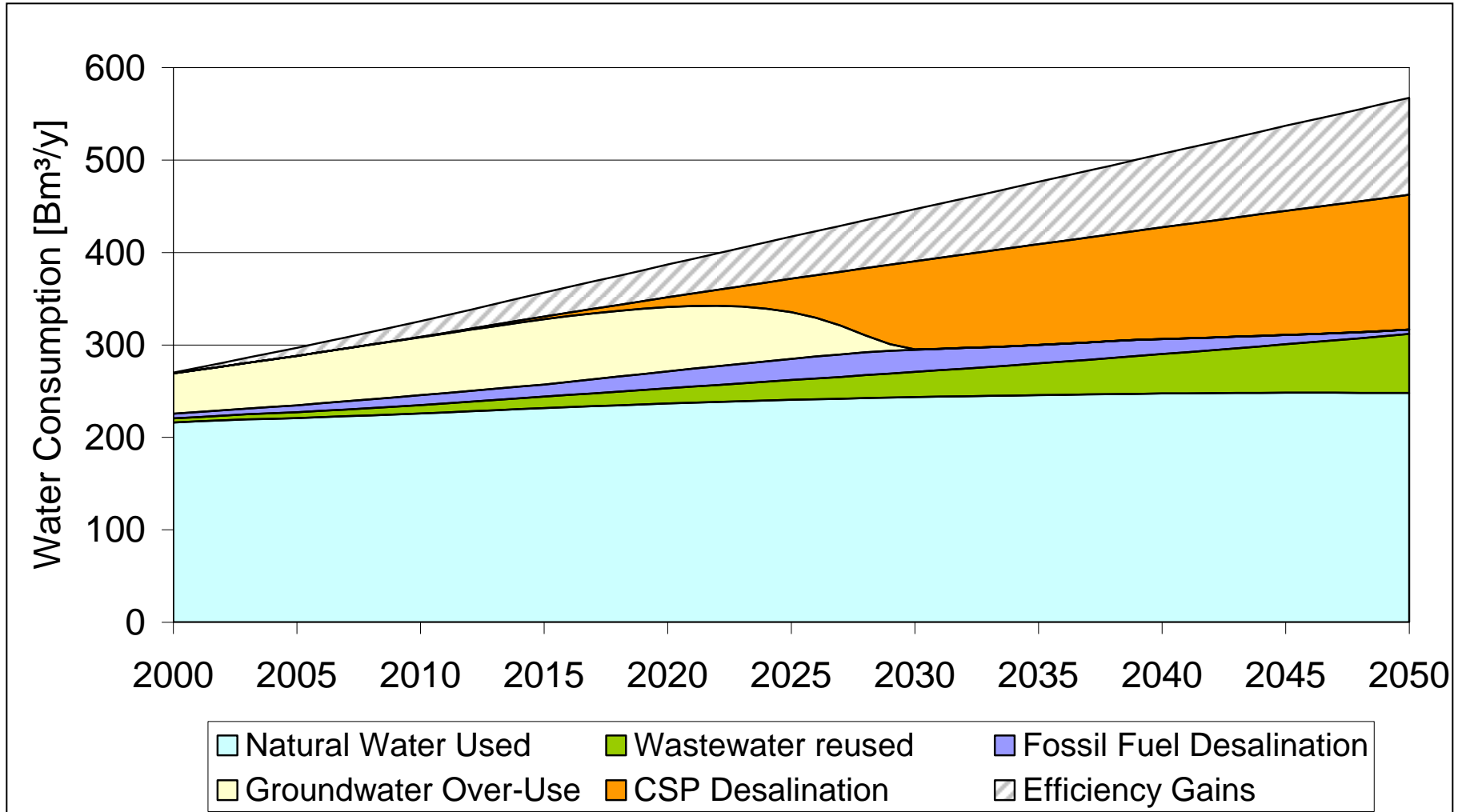


Calasparra,
Spain

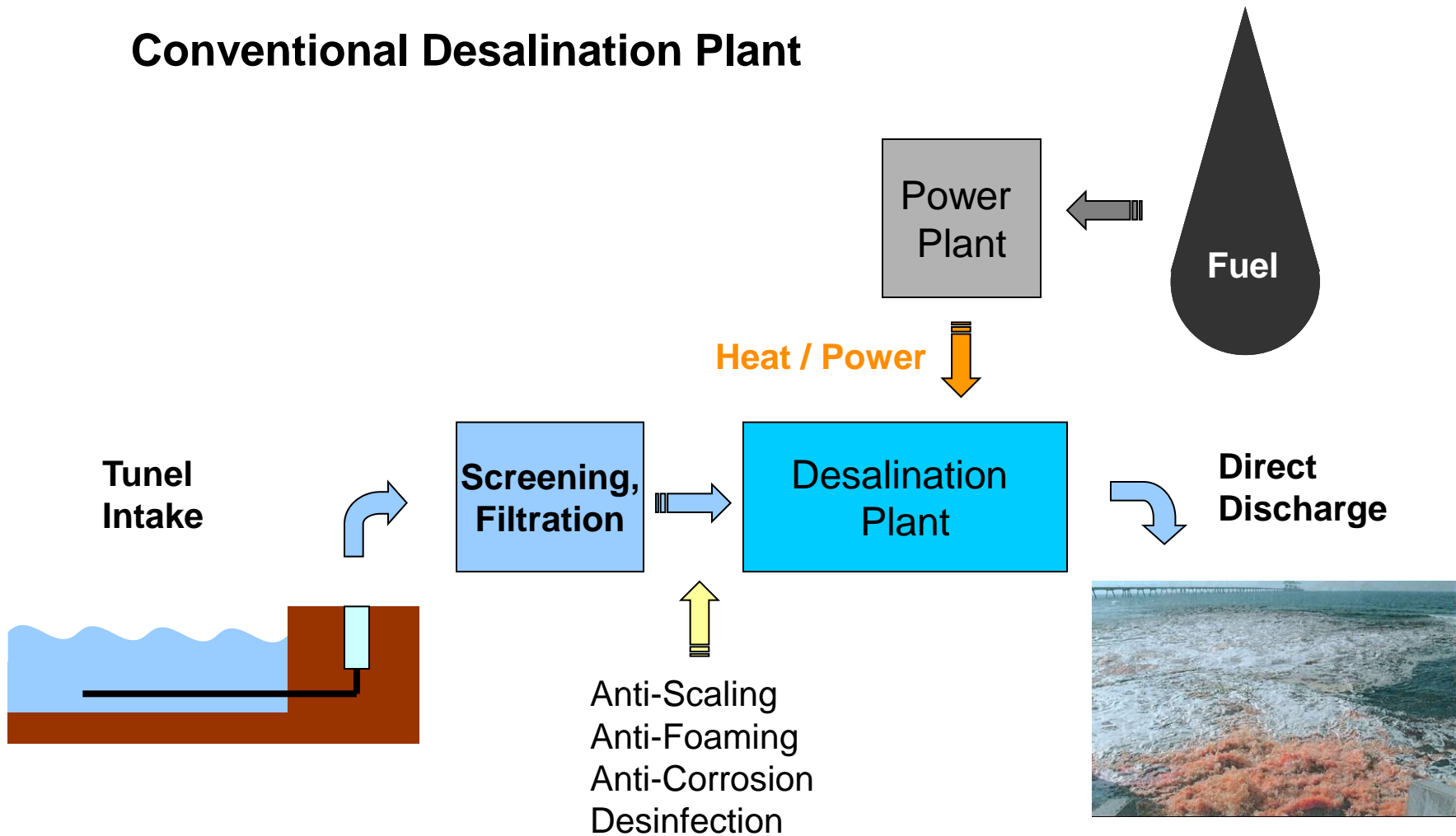
(Novatec)



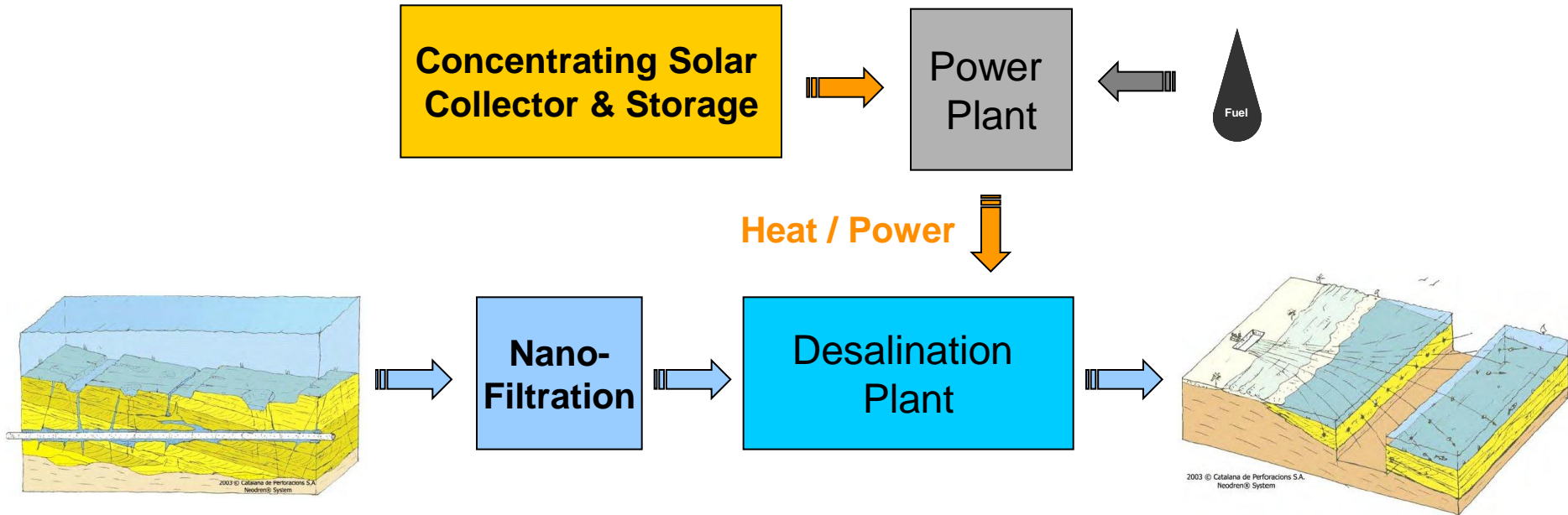
AQUA-CSP Scenario for Middle East & North Africa



Conventional Desalination Plant



Advanced CSP-Desalination Plant



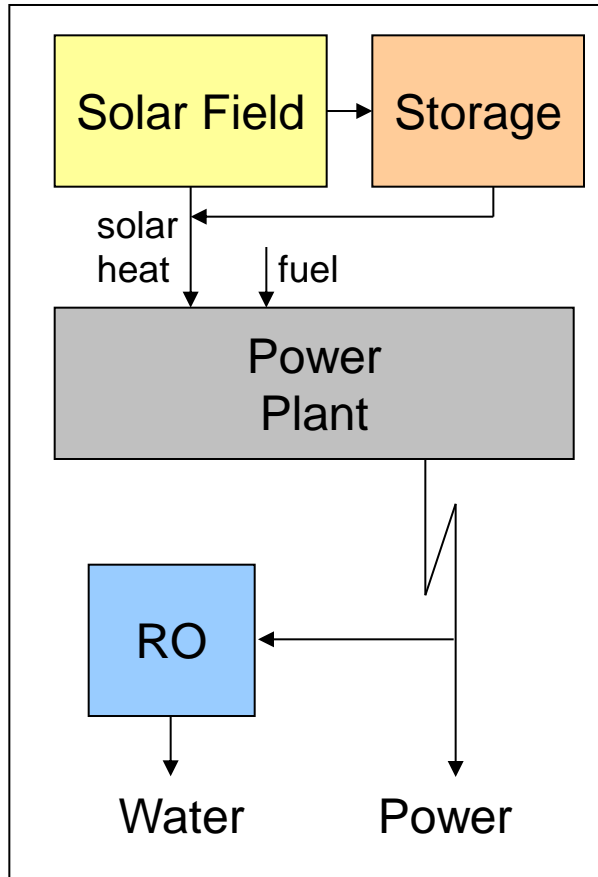
**Horizontal Drain Intake or
Micro- & Ultrafiltration**

Horizontal Drain Discharge

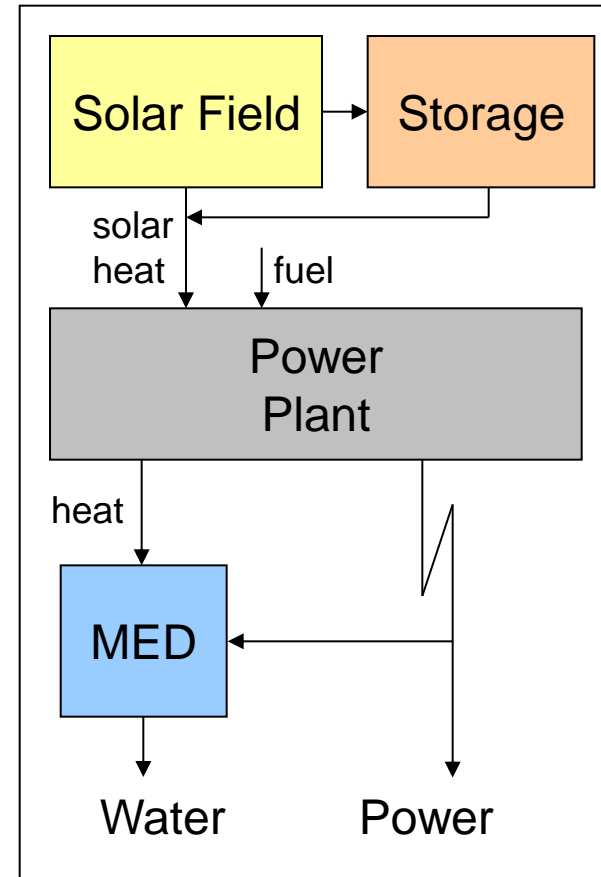


Configurations of CSP Desalination Plants

Power Only



Combined Heat & Power



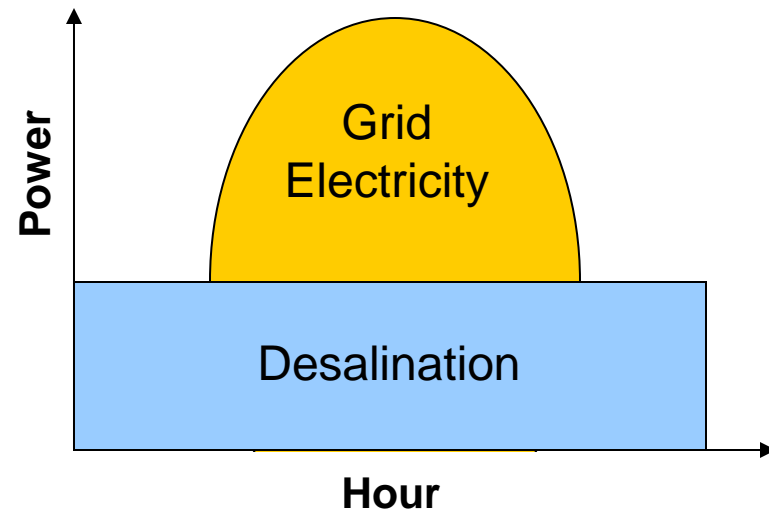
MED: Multi-Effect-Distillation

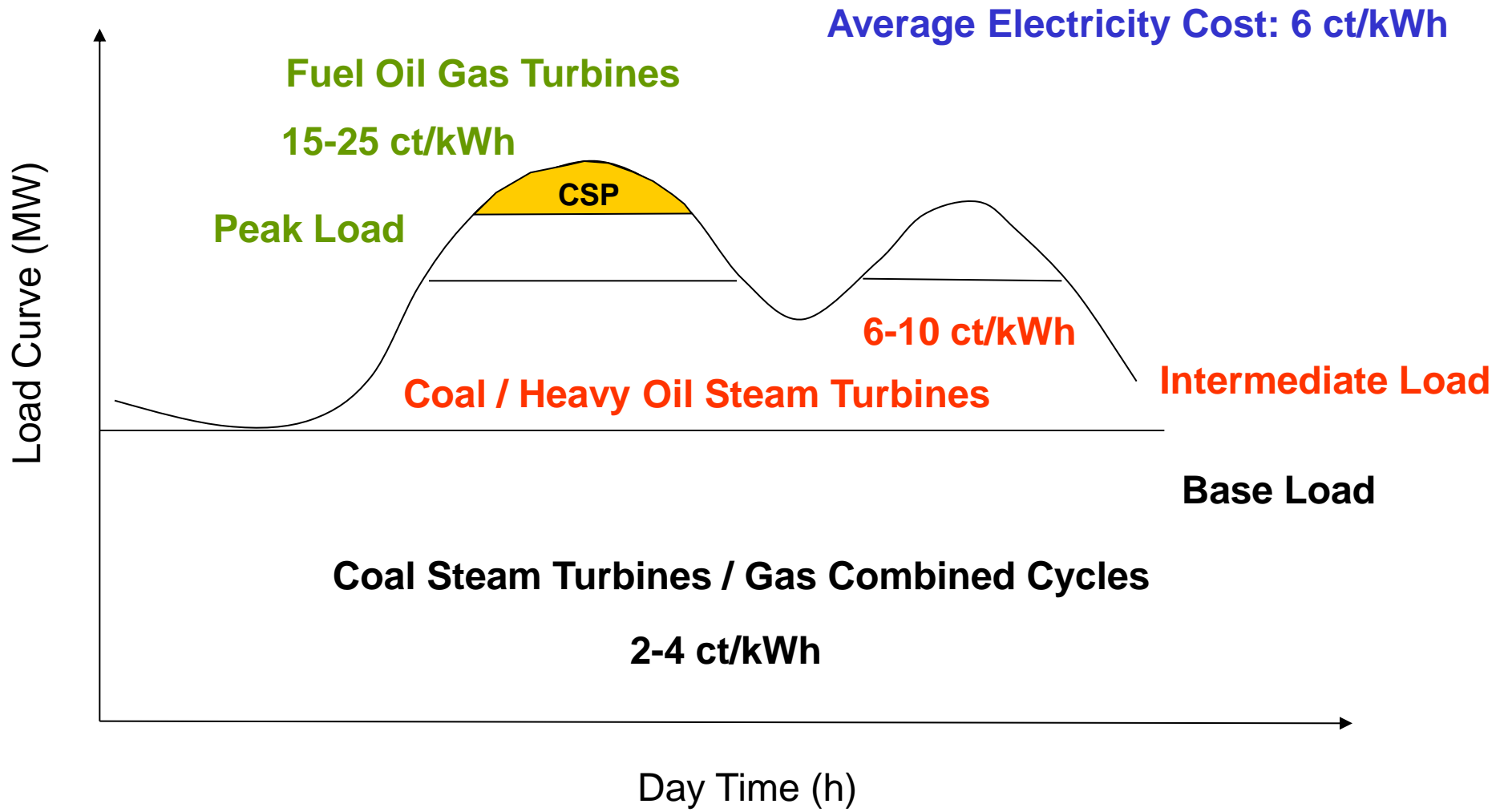
RO: Reverse Osmosis Membrane Desalination

General Operating Conditions

- Combined Production of Electricity and Water
- Daytime Peaking Power to Grid
- Continuous Operation of Desalination Plant

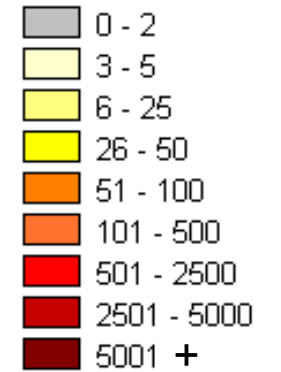
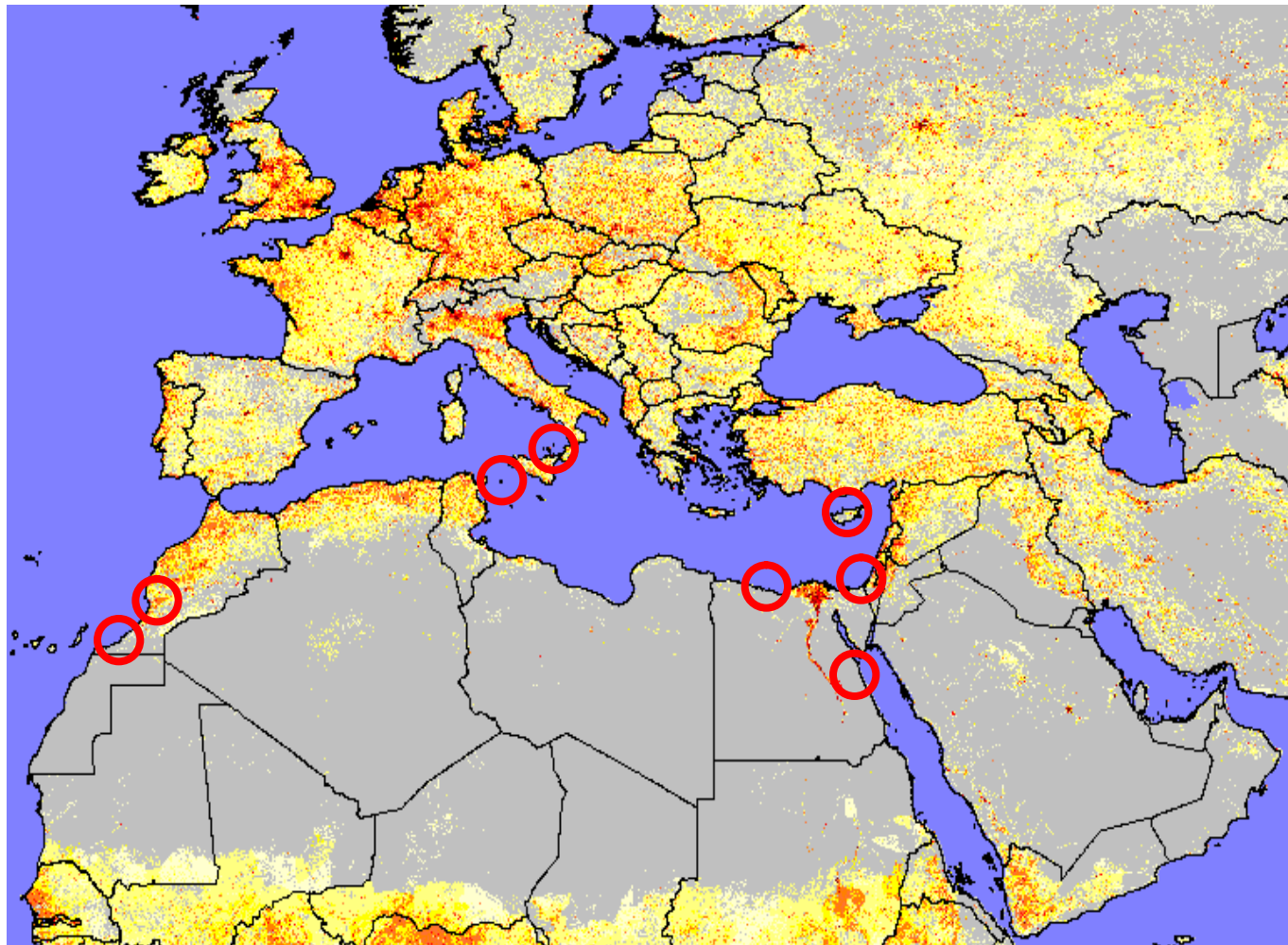
- Peak Load Power
- Base Load Water





| CSP/RO | CSP/MED |
|--|---|
| Integrated Operation | Integrated Design |
| Parabolic Trough Collector | Linear Fresnel Collector |
| Superheated Steam Turbine | Saturated Steam Turbine |
| Synthetic Heat Transfer Fluid | Direct Steam Generation |
| Molten Salt or Concrete Energy Storage | Concrete or Phase Change Energy Storage |
| Capacity: 15 MW / 10,000 m ³ /d | 15 MW / 10,000 m ³ /d |
| Investment: 100 M€ | 100 M€ |

Site Selection for CSP Desalination Plants



Population/km²



Thank You!

