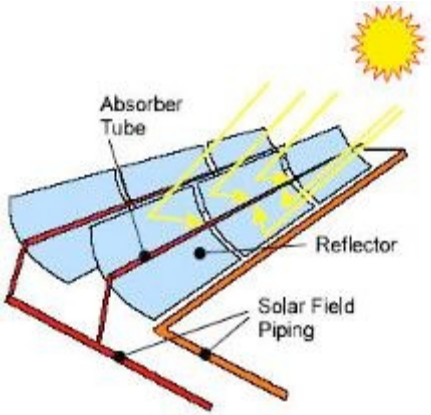
ENERGYMIXX

HelioDynamics

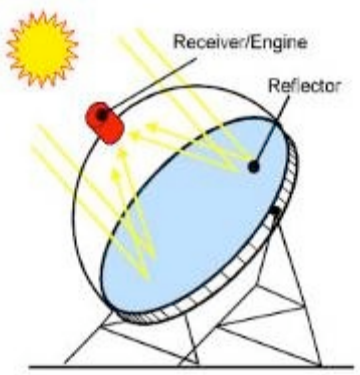
May 2009

CSP AND CPV

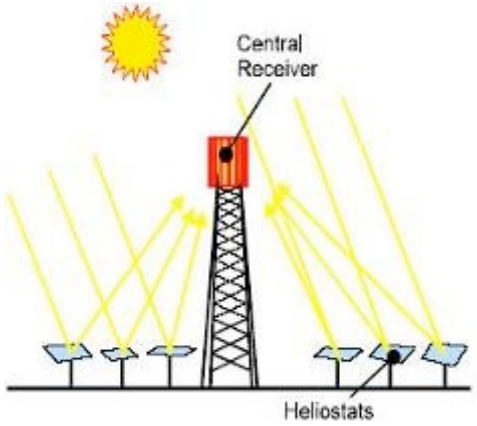
- CSP - Concentrating solar power
- CPV - Concentrating photovoltaics



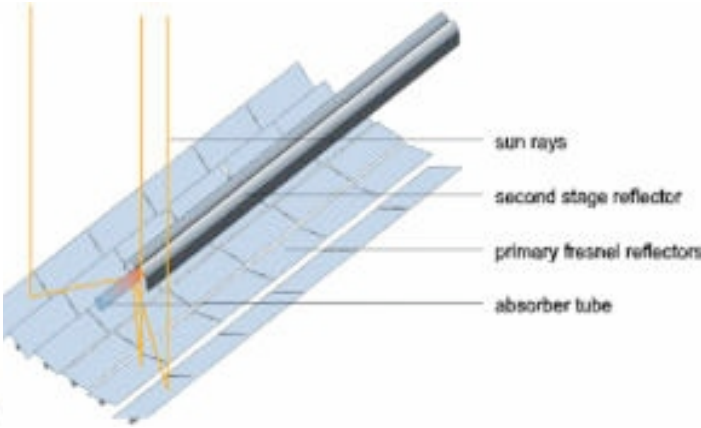
Parabolic trough



Dish



Power Tower



Linear Fresnel

HelioDynamics

CSP Parabolic Trough – Andasol-1, 50 MWe

HelioDynamics

CSP -Dish Stirling – SES 'SunCatcher', 25 kWe

HelioDynamics

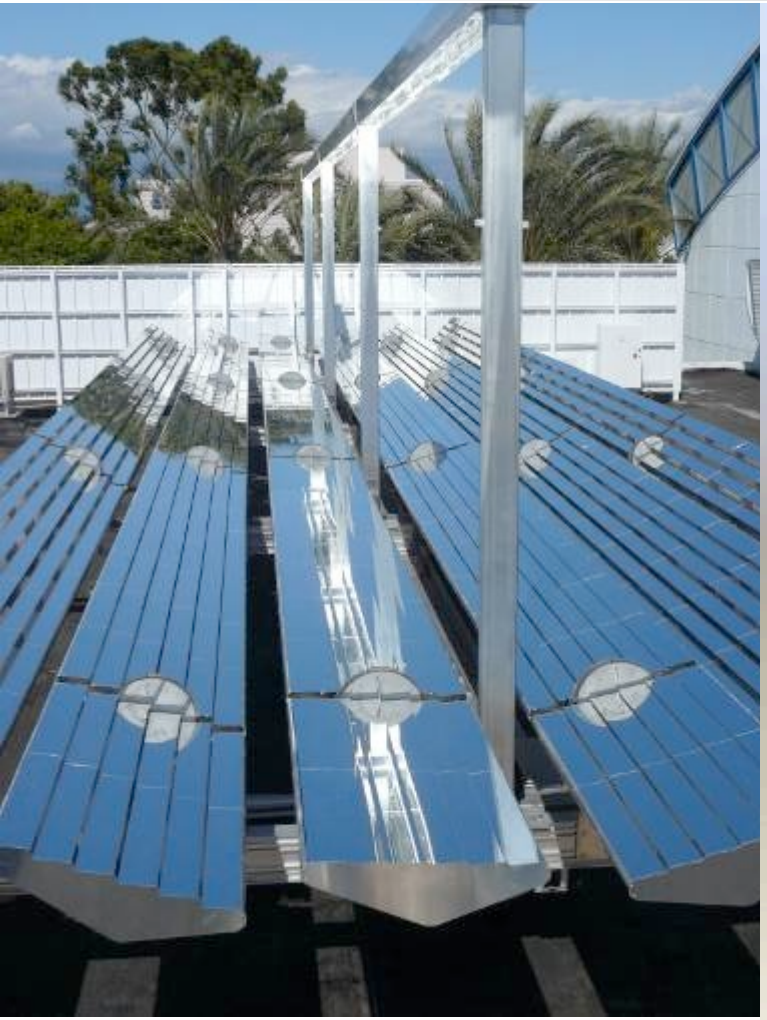
CSP - Power Tower – Abengoa PS-20

HelioDynamics

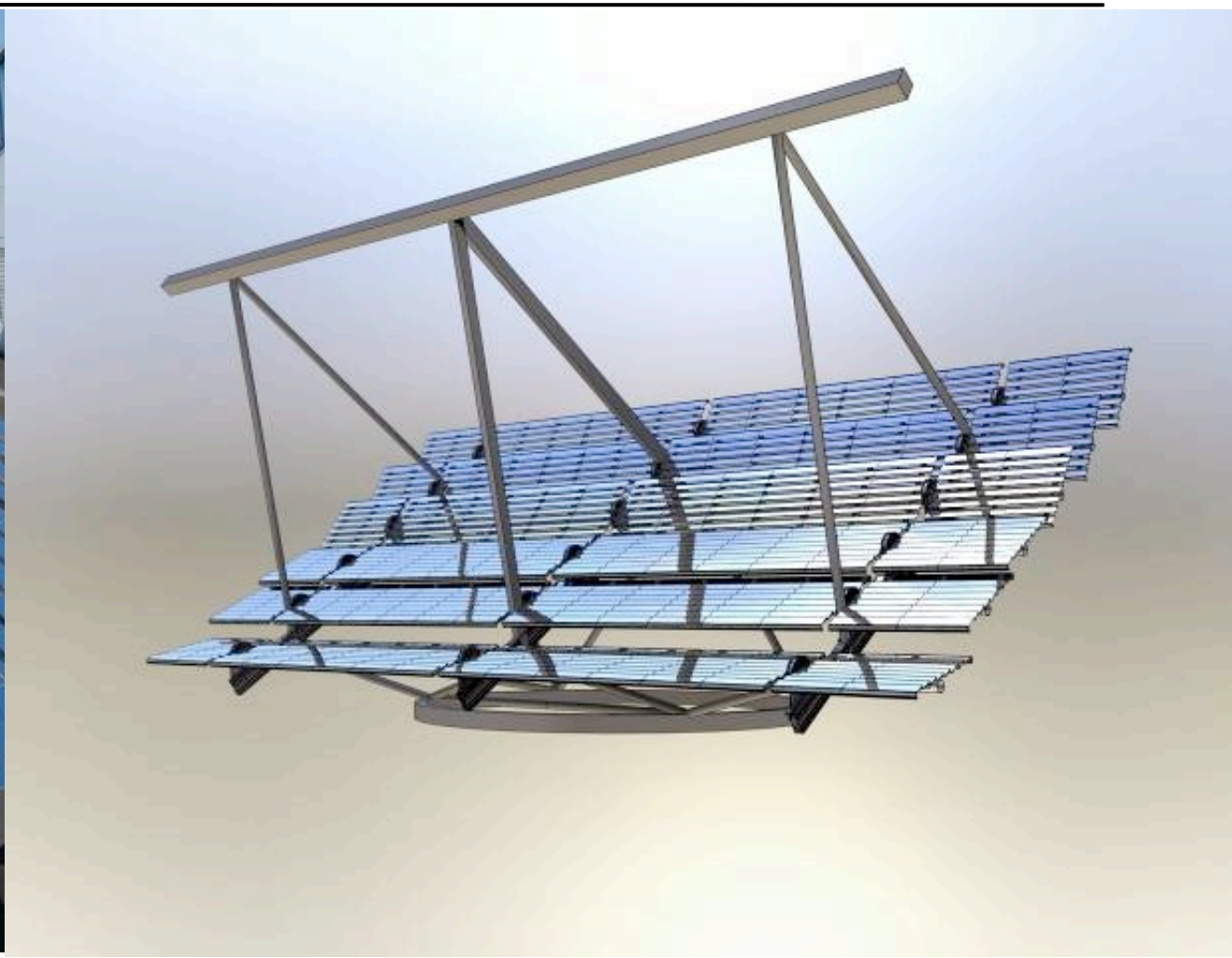
CSP - Linear Fresnel – Ausra – 5 MWe trial

HelioDynamics

CPV - silicon 5 kWe and gallium arsenide 14 KWe



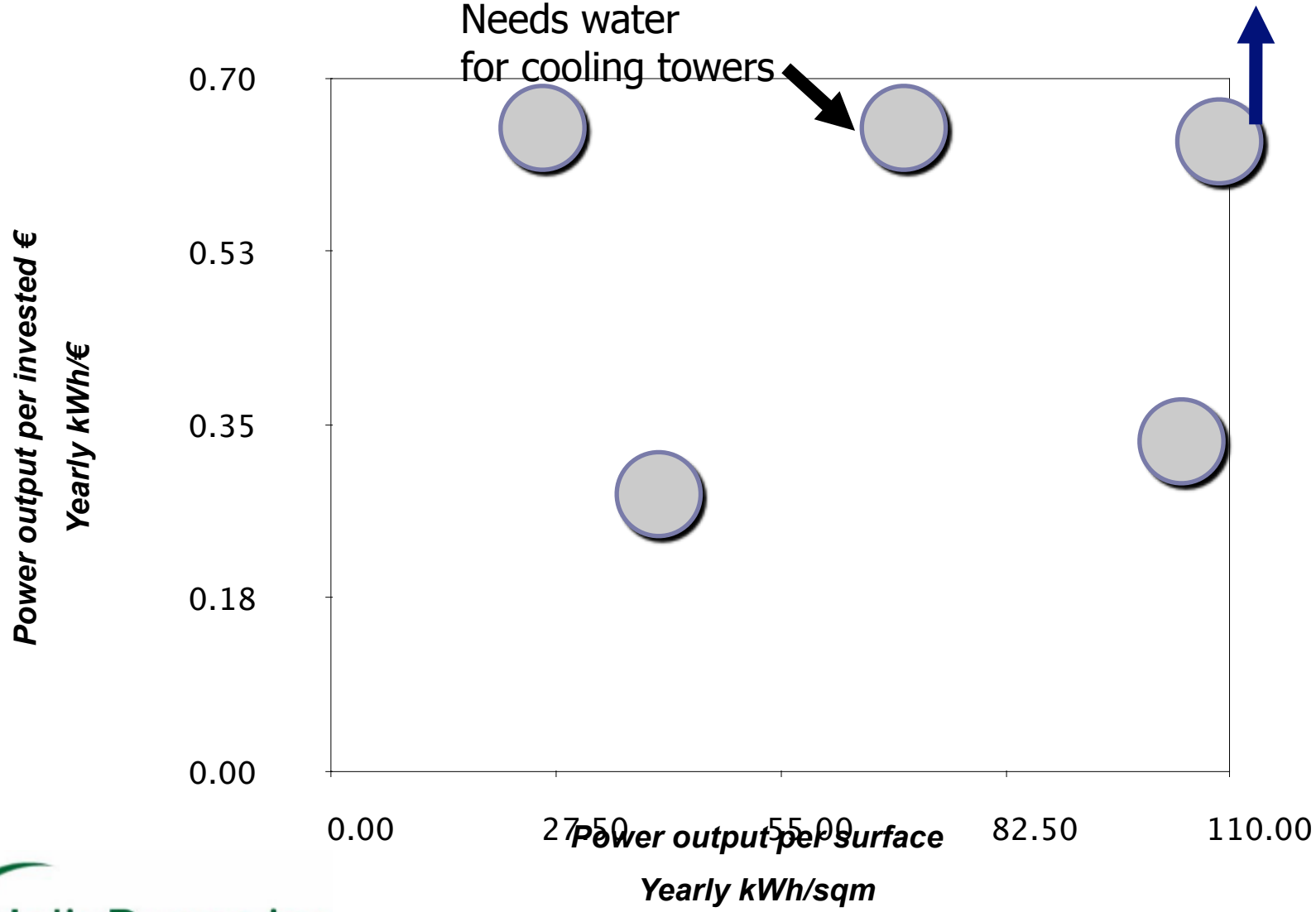
5 kWe silicon CHP



14 kWe gallium arsenide power generator

HelioDynamics

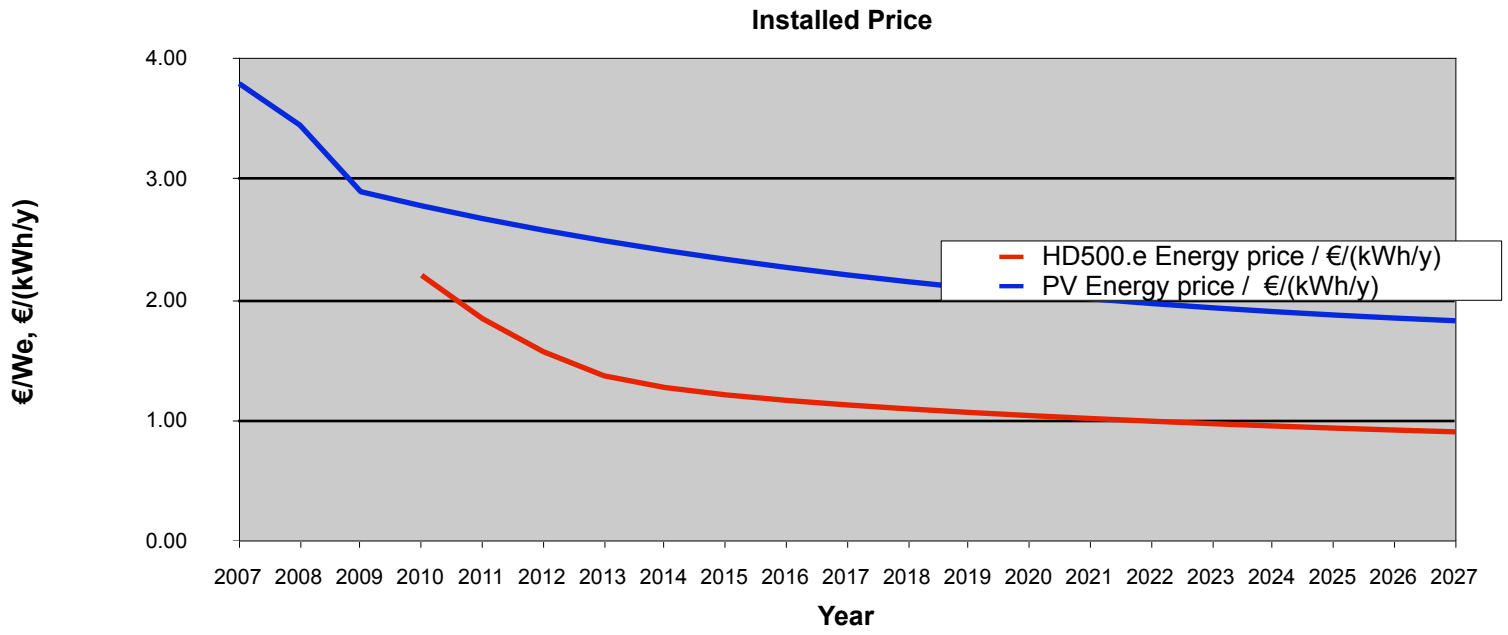
CSP or CPV?



HelioDynamics

COST OF CPV AND TRADITIONAL FLAT PLATE PV COMPARED

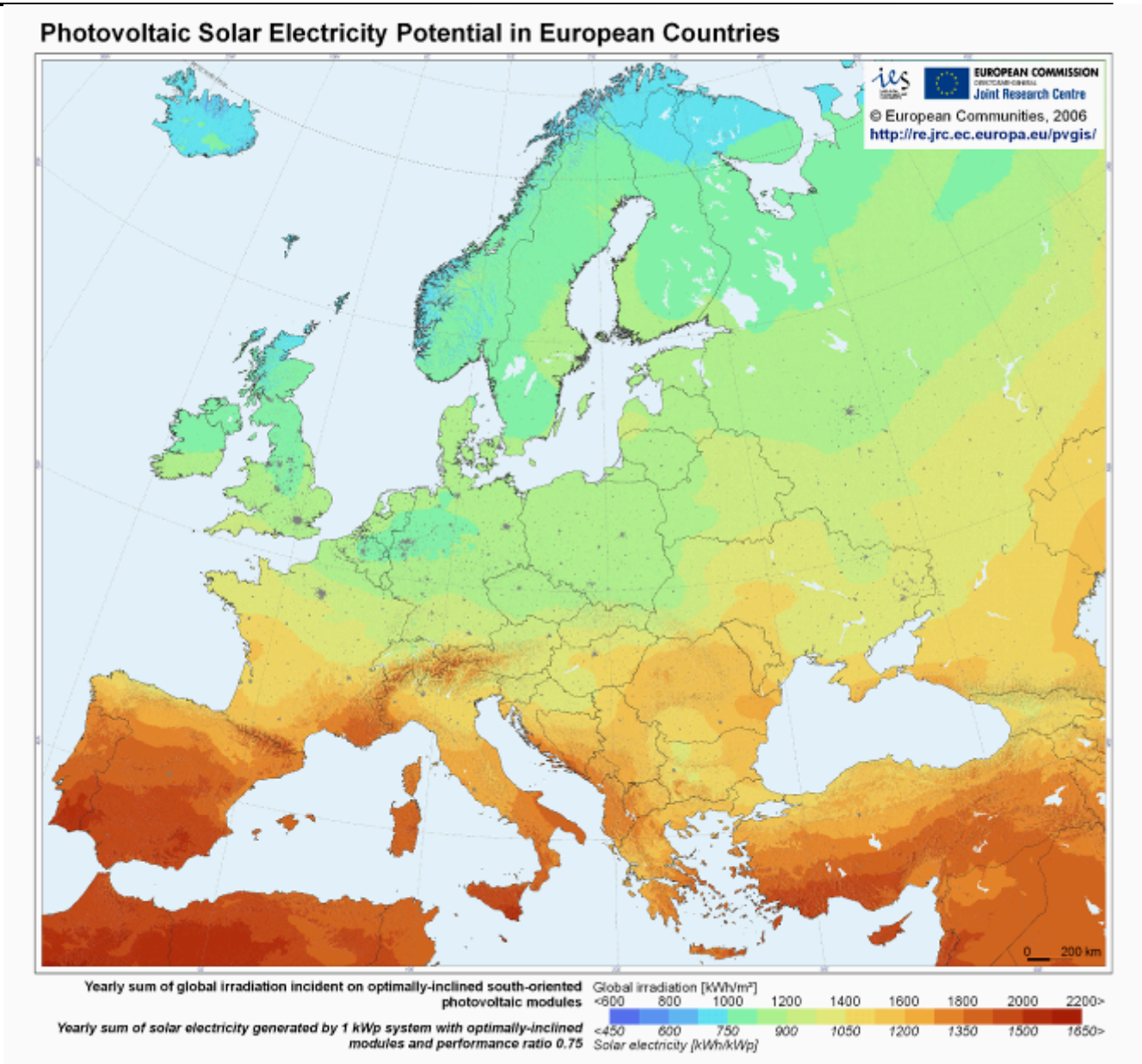
Energy obtained from HD500.e is half the cost of photovoltaic



HelioDynamics

Where does the sun shine?

- European solar resources show the importance of Portugal, Spain, Italy and Morocco as resource-rich states.



HelioDynamics

CSP or CPV - 2

- Clouds create large power fluctuations in solar plants and solar boilers
- Major fatigue issues with CSP
  - Minimal with CPV because of low operating temperatures
- Long reheat times for CSP
  - instant with CPV

HelioDynamics

Sustainable Electricity Technology- 'East Atlantic Sustainable Electricity Association'

- Wind, hydro and pumped storage (1 week)
- Pumped storage (24 h)
- Solar fields (CPV)
- Multiple links of HVDC – both undersea and overland

HelioDynamics

HVDC cable technology

- Improvements in insulation durability pushing cable operating voltages to 800 kV for each leg
- Insulation improvements arising from ultra-clean materials and high integrity water barriers
- Enable trans-continent power links

HelioDynamics

Pumped storage

- Essential to any large-scale renewable energy scheme
- Currently pumped storage deals with grid fluctuations over half an hour
- Renewable energy pumped storage designed to deal with power fluctuations of >100 hours

HelioDynamics

Electrified transport – and power store

- Electric transport does double duty:
  - oil-free freight and passenger transport
  - short term power storage
- Reduces the line capacity required for evening peaks

HelioDynamics

What will this cost?

❑ Solar (CPV)-	€360 bn,	€15,000/household
❑ Wind -	€100 bn,	€4,000/household
❑ HVDC -	€100 bn,	€4,000/household
❑ Storage -	€100 bn,	€4,000/houeshold
	€660 bn	€26,000/household

Compared to 2010 estimate of UK expenditure on Oil, Coal and Gas consumption of €70bn/y

HelioDynamics

HelioDynamics

- This presentation was written by Graham Ford, Managing Director of HelioDynamics Ltd
  - **+44 1954 713 971**
- HelioDynamics is an innovator of solar concentrators, and the creator of the Clustered Linear Fresnel Concentrator
- **www.heliodynamics.com**

HelioDynamics