



# SOLAR ENERGY ON A GRAND SCALE



# HelioDynamics

- HD solar technology –
  - 8 years, €5m of R&D
- Four years of field testing
- Solar systems working in Greece and USA
- Manufacturing today
- Projects under construction
- First CE Certified system



# Power Generation – which way?

- Coal fired steam power plant with carbon sequestration
- Nuclear power
- Renewable energy



# The challenges - Coal

- Carbon sequestration so far does not work:
  - CO<sub>2</sub> leaks back out
  - Carbon capture uneconomic



# The challenges - Nuclear

- Nuclear industry is one major incident from shutdown:
  - power plants
  - fuel reprocessing
  - hyper-toxic nuclear waste
- Timescales of implementation (10-15 y)

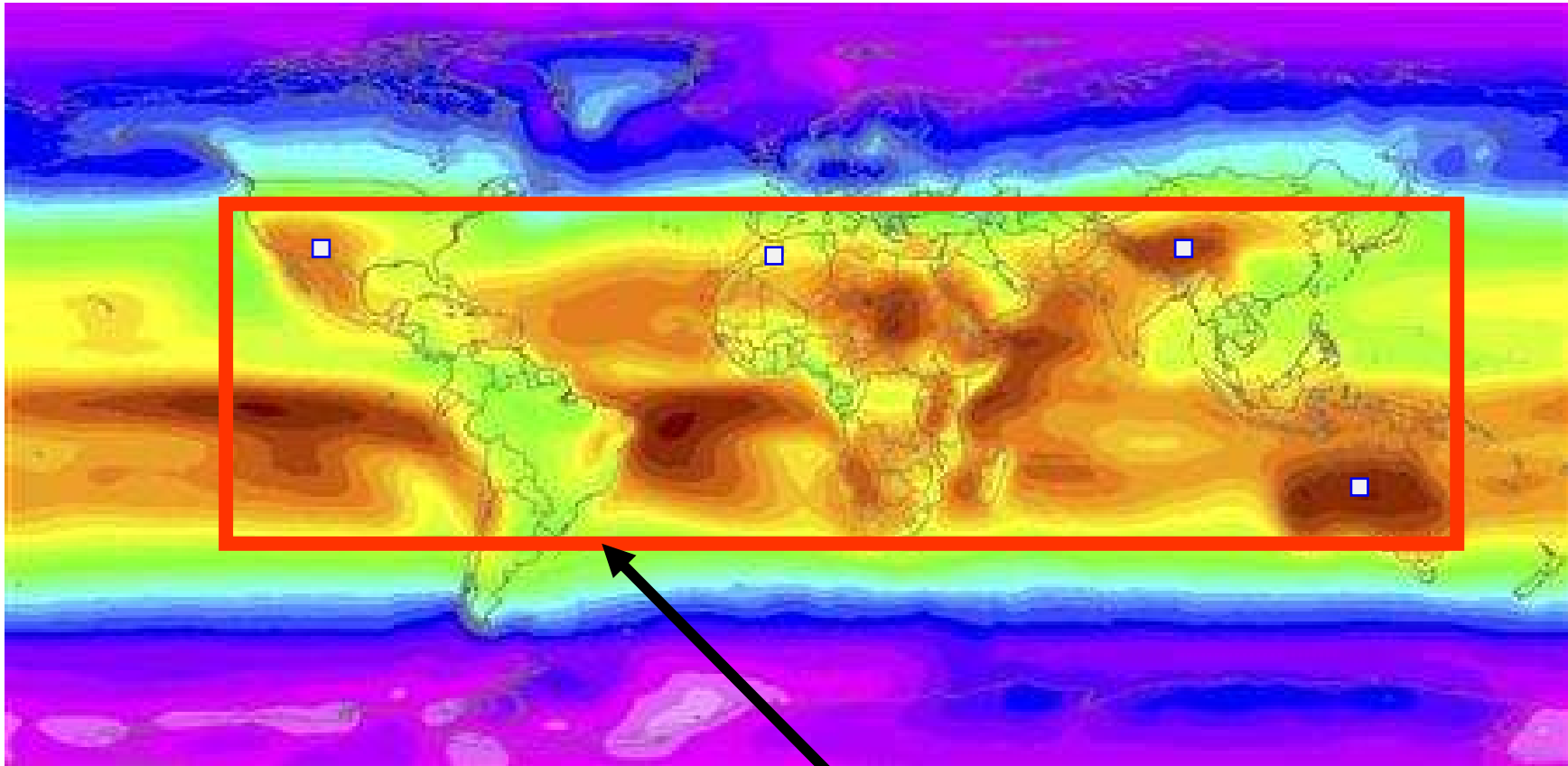


# The challenges - Renewables

- Renewables:
  - Number of choices with range of costs
  - load matching
  - financing
  - political collaboration



# Where the sun shines brightest



**Our market**



# Large scale by concentration

## Positives

- Much less PV cell area
- Higher cell efficiency
- Low costs

## Negatives

- Waste the diffuse light





# A NEW SOLAR ENERGY COLLECTOR TECHNOLOGY

- Breakthrough solar collector from HelioDynamics
- Makes heat hotter, quicker,
- Makes power more cheaply

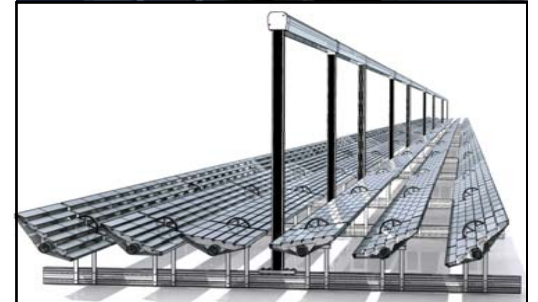




# THE SOLAR BREAKTHROUGH

## Hotter –

- intensely focused light
- captured efficiently
- high temperatures for efficient cooling - 180 C

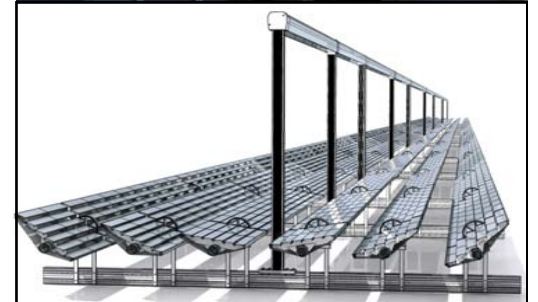




# THE SOLAR BREAKTHROUGH

**Faster –**

- low thermal mass heats up quickly – (~15 min, full sun)
  - essential for effective cooling

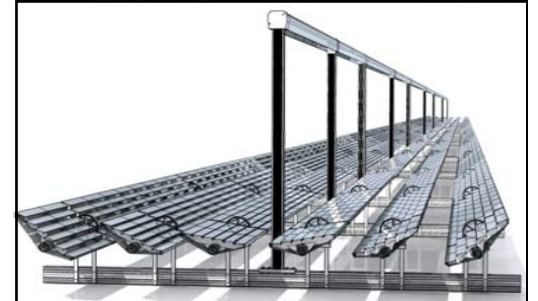




# THE SOLAR BREAKTHROUGH

## Cheaper –

- thin flat glass mirror
- light structure, yet stiff and strong
- mass production, simple assembly
- tough against hail, high winds, sand and dust, ultraviolet





# Achieving scale with Concentrating PV

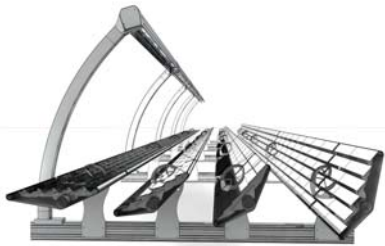
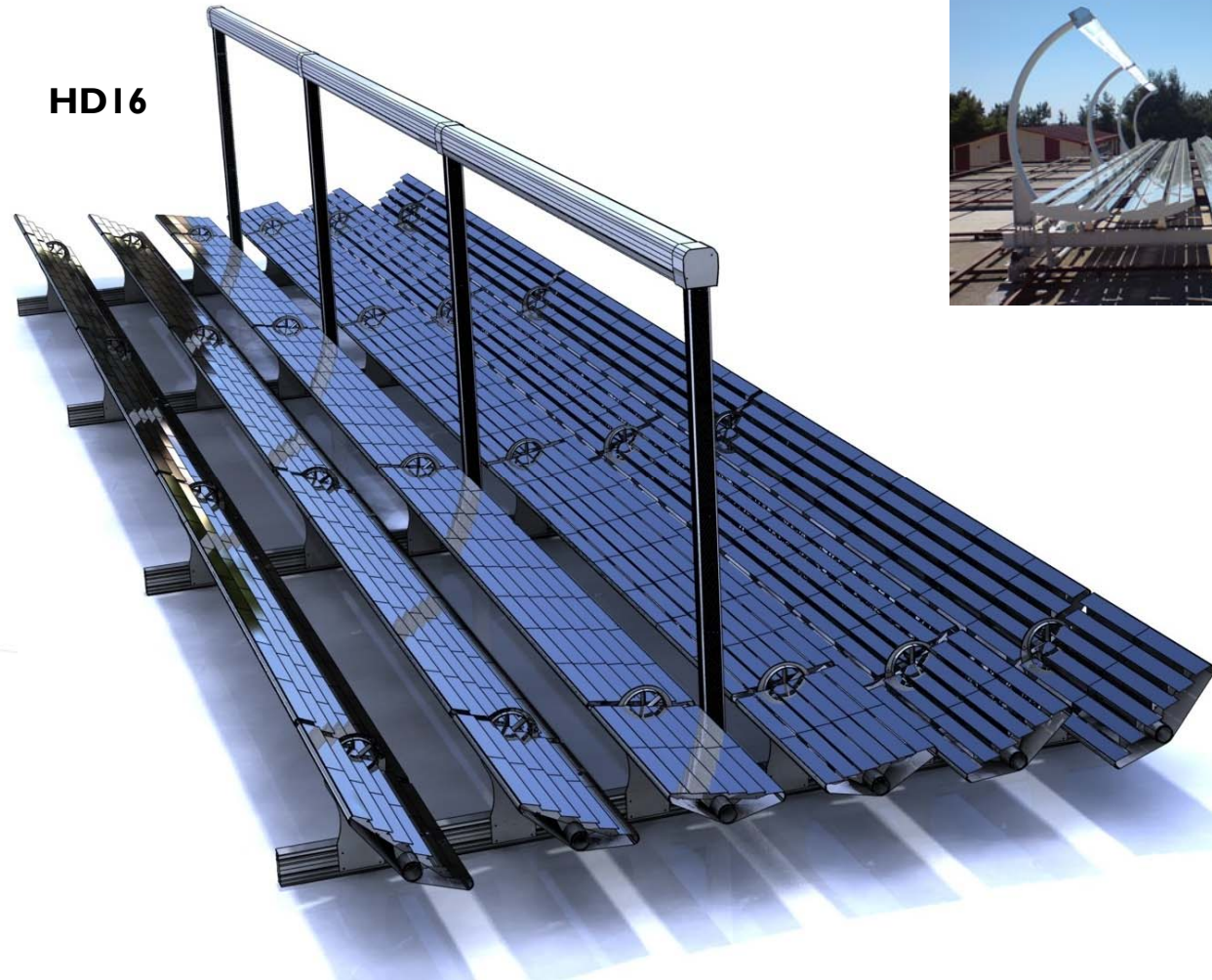
- 6% of silicon wafer used for HD16.c CHP solar
- Silicon temperatures lower than for flat plate solar, so greater efficiency of cell
- At this concentration, access to 500 MWe/y
  
- At 100 suns, access 3 GWe/y of PV-Si
- At 750 suns, access 5 GWe/y of PV-GaAs



# HD SOLAR COLLECTOR RANGE



HD16



HD10





# APPLICATIONS

- Building air-conditioning,
- District cooling,
- Industrial heat and cooling,
- Desalination,
- Power generation,
- Water pumping.



# Benefits

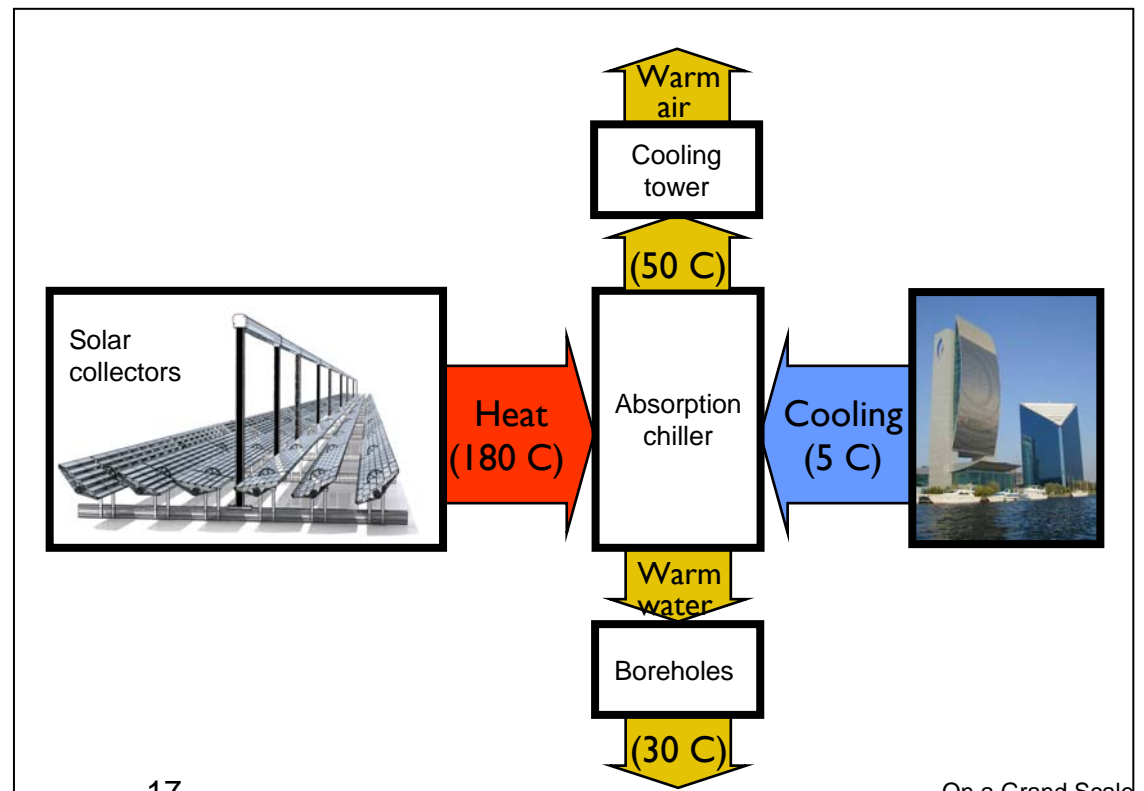


- Decouple the timing of projects from availability of the power grid or gas network
- Visibly meet green targets
- Reduce business exposure to future energy price spikes



# HOW SOLAR COOLING WORKS

- Solar collectors capture sun's energy to make high temperature heat
- Absorption chillers cool buildings
- Cooling towers and/or boreholes discard both heat flows





# Solar desalination

- Technology options:
  - Heat for Multi-stage flash distillation (MSF)
  - Power and heat for multi-effect distillation (MED) – 2 power options
  - District cooling and low temperature MED
  - Power for Reverse Osmosis (R-O)



# SOLAR INSTEAD OF GRID POWER

- Many countries have land and sun
- Multiple ways to reduce power demand
- Economic when combined with high building standards and appliance standards
- Enables organisations to grow faster than the grid

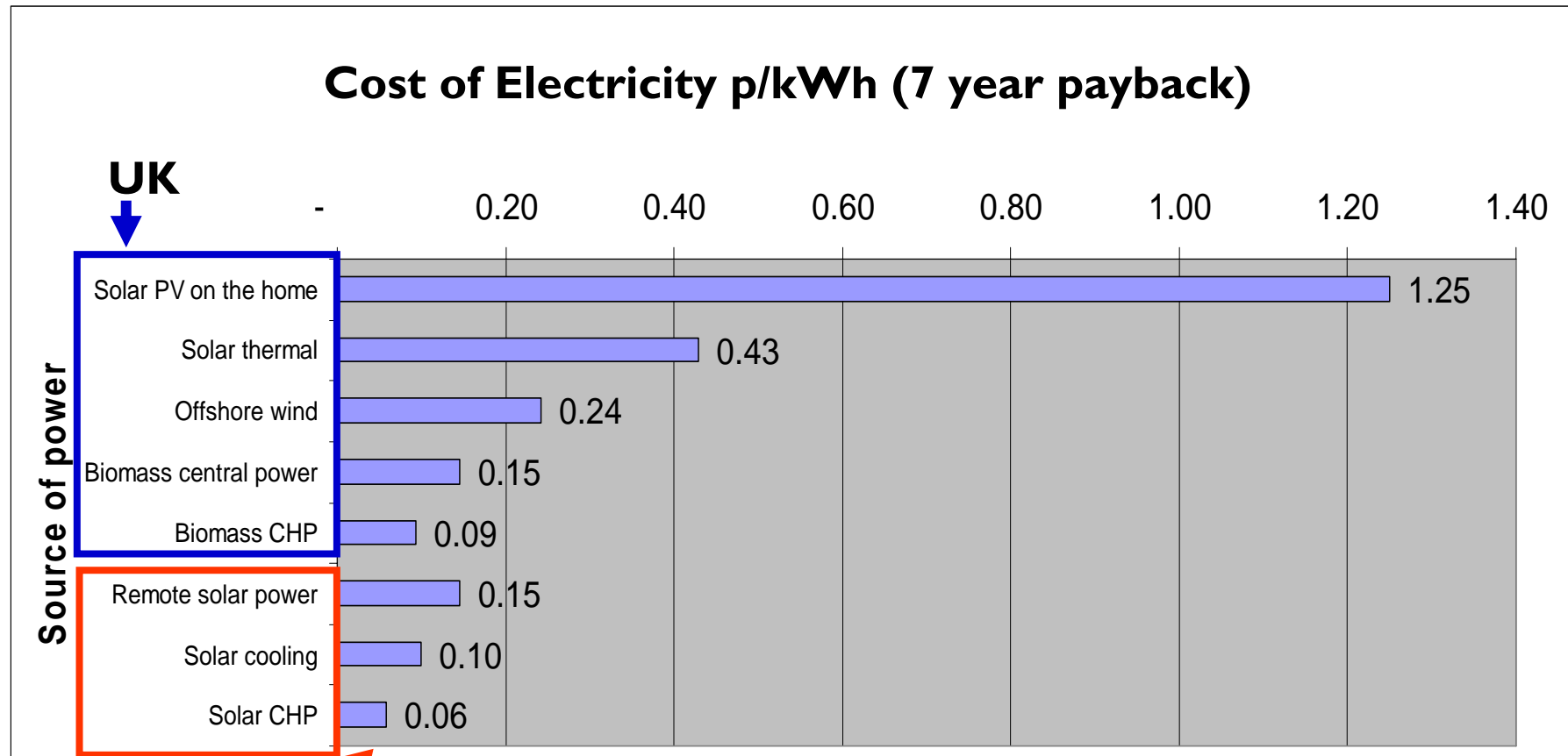


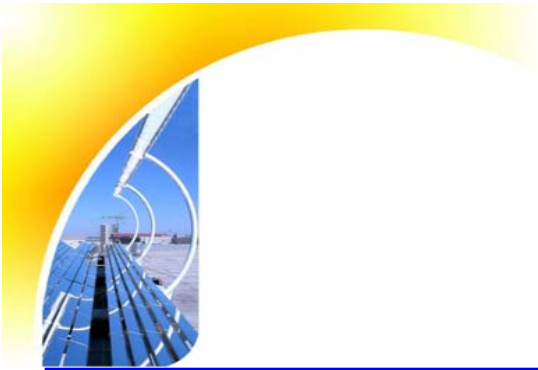
# Best use for concentrating solar

- Solar communities
  - e.g. Green Workforce communities in the Middle East
    - timely infrastructure
    - walking communities
    - mobility
    - lower cost long term
    - silent energy.



# Cost of different sources of RE





[www.heliodynamics.com](http://www.heliodynamics.com)