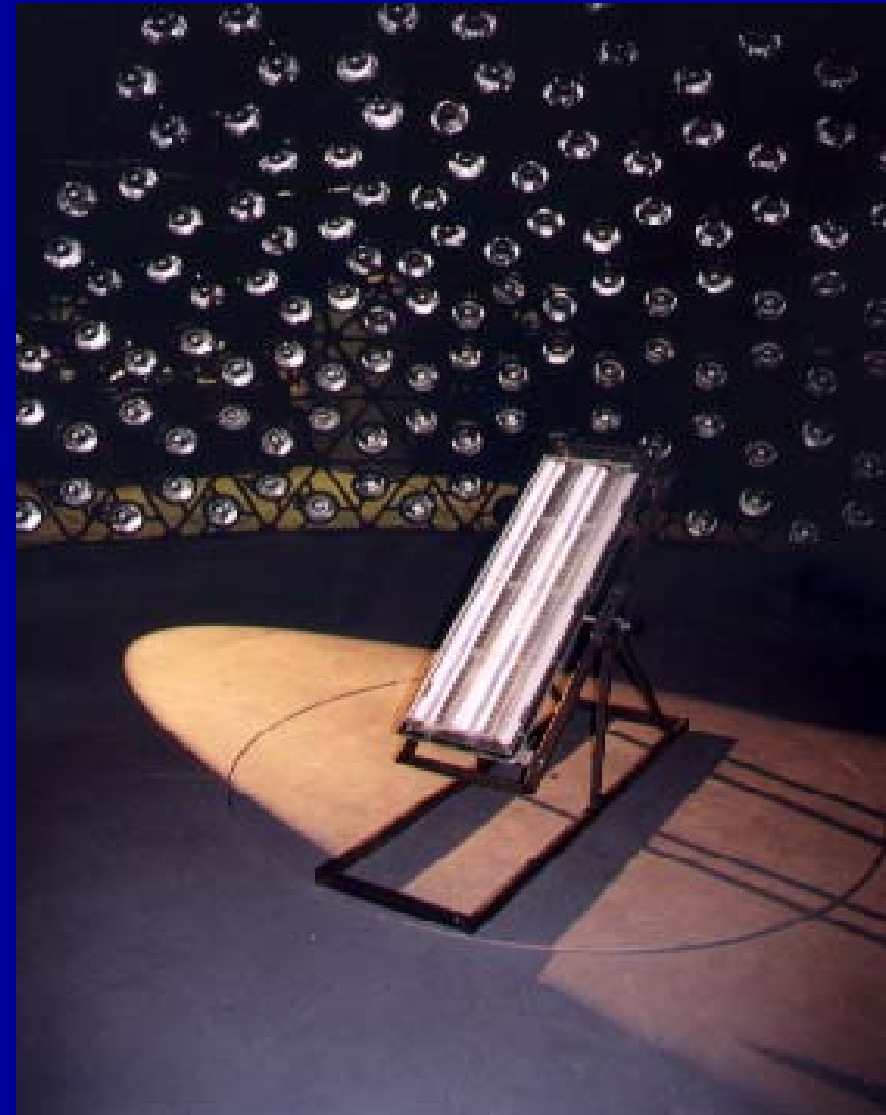


# New Solar and Tidal Technologies

Commercialisation of  
innovative  
Technologies with  
high potential for  
Stainless Steel use for  
Renewable Energy

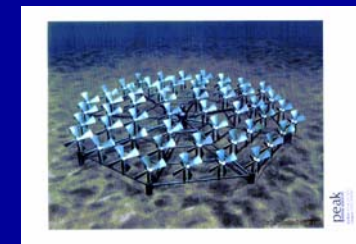
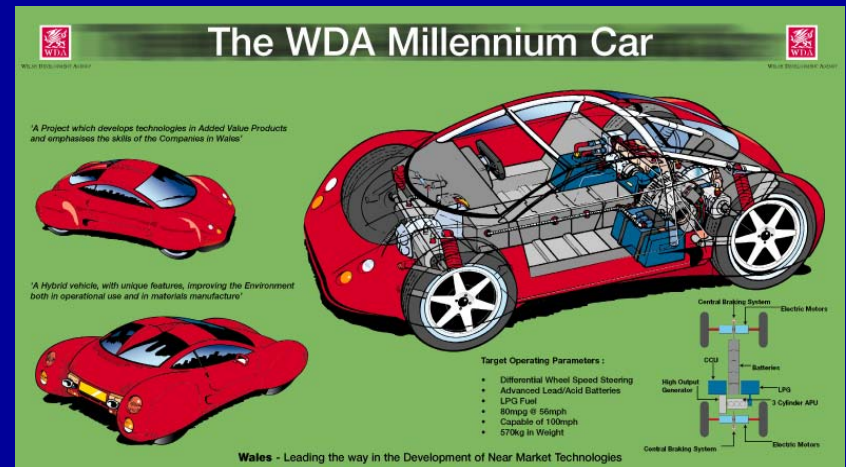


# WHY Solar and Tidal

- Renewable energy generation – increasing Targets
  - 20% by 2020
- Public and Building Industry - now very conscious of Energy use, CO<sub>2</sub>, Global warming, Price of energy
- New technologies/economics being developed
- Integrated System Technologies available
- Reduction of Grid Load
  - Individual property energy systems – When?

# Phil Bacon

- Europus Ltd - MD
  - R&D Project Management, Commercialisation
- Clients
  - Consultant to Welsh Development Agency for sustainable energy, Automotive
  - European Commission Aeronautics, Project Management
  - Tidal Hydraulic Generators Ltd
  - Energy International Systems Ltd
  - Bank support
  - Investment Group support



# Acknowledgement

- Collaboration with Corus on Solar Panel and Tidal Projects
- Opportunity through Corus R&D to speak at the Conference

# NEW Solar Potential

- Solar thermal absorbers:
  - Heat pipe technology
  - Stainless steel
- Solar Thermal Air Conditioning
  - Compressor replaced with Ejector
- Super vacuum insulation
  - 15mm equivalent to 150mm polyurethane but 600°C
  - Stainless steel



# Solar thermal Heat Pipe absorber

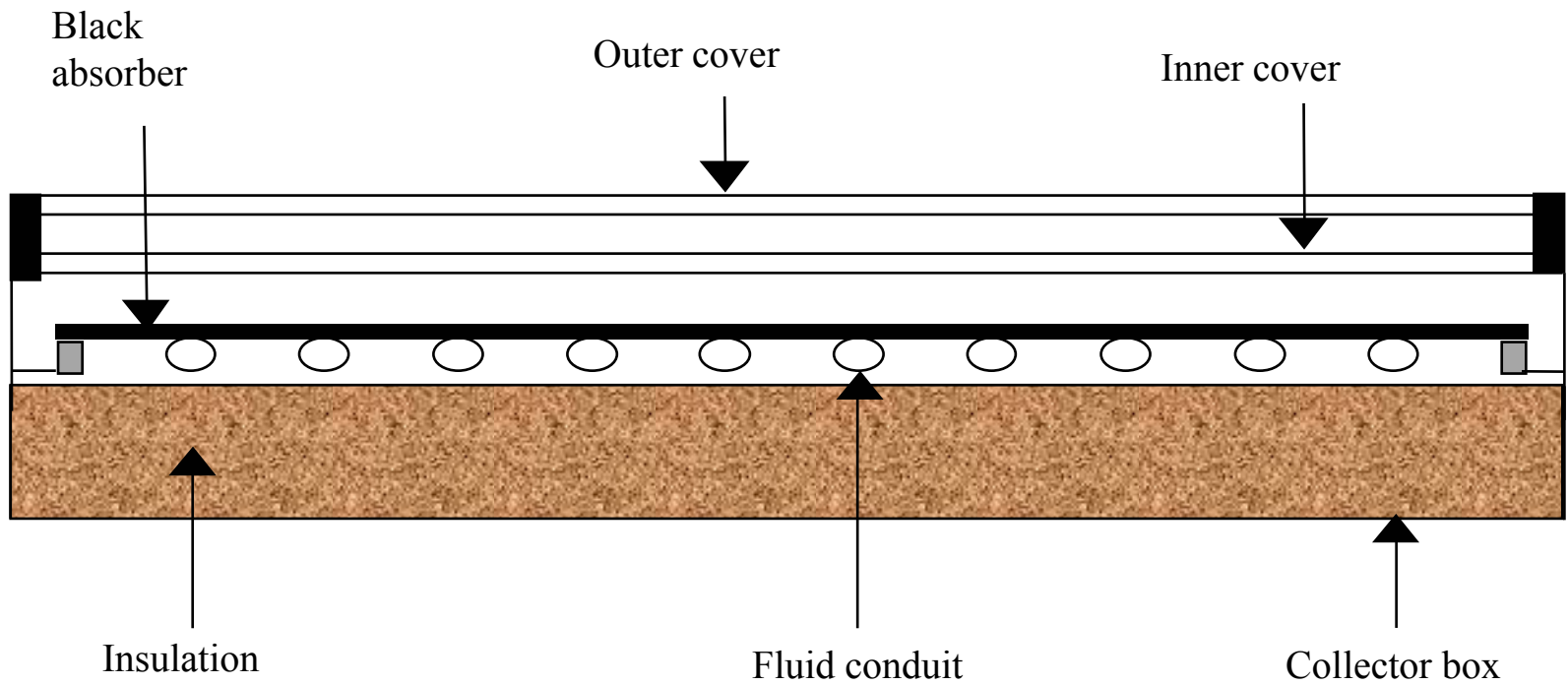
- Four years R&D/development
- Heat pipes transfer heat - between 500 and 1000 times faster than copper
- Used as thermal absorber - efficient at higher temperatures - 50% at 100°C above ambient
- Fresnel Lens – Magnification x 5



# Characteristics

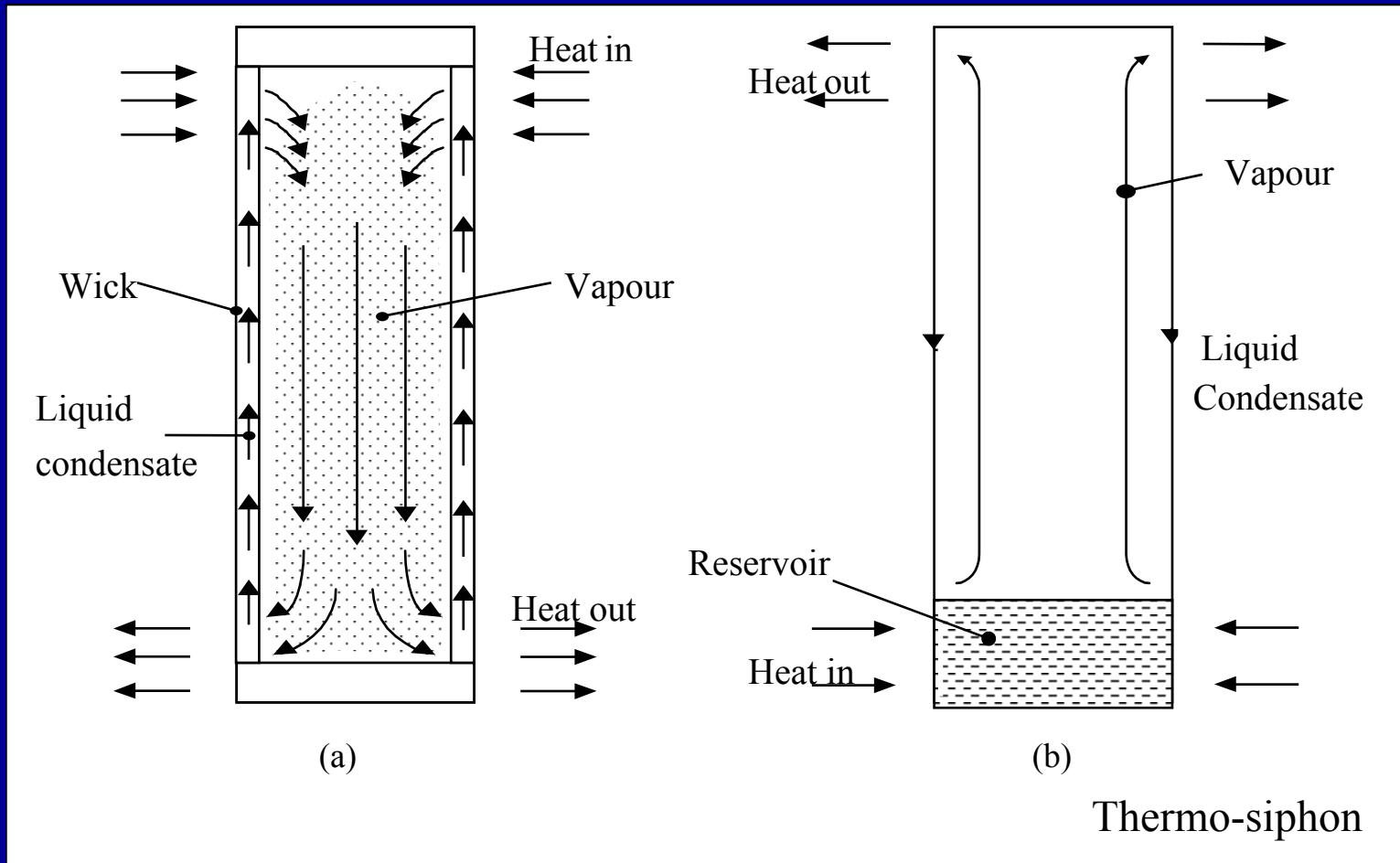
- High Relative Efficiencies results in:
  - Smaller area or higher temperatures
  - Stainless steel 0.25mm thick gives:
    - Very Responsive
    - Light weight
    - Long life
    - Structurally strong – design into buildings
  - Blocks heat absorption to buildings

# Flat Plate Absorber

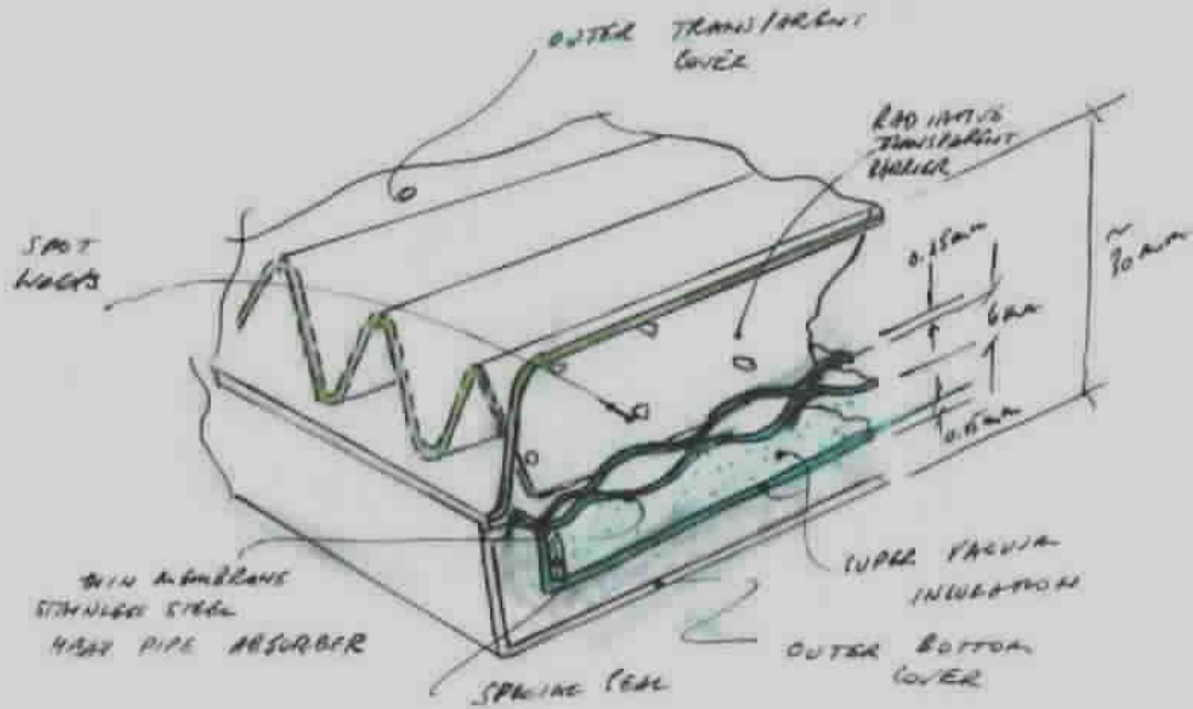




# Heat Pipes



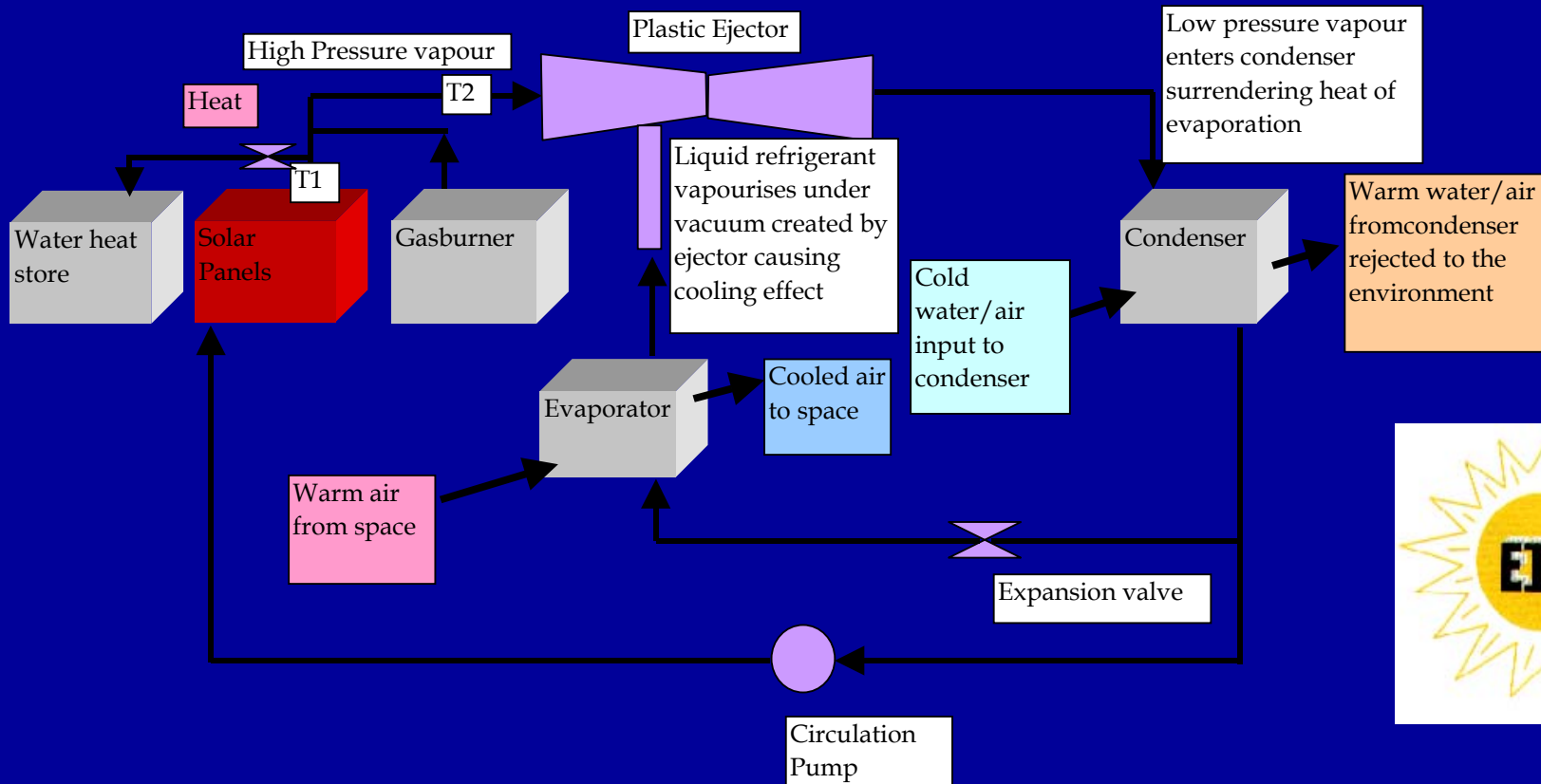
# Panel Construction



# Potential for this climate

- Water Heating/Room or Comfort Cooling
- Max. Temperatures up to 240°C (Further development work being done)
- Use as Air-conditioning power source
  - Hybrid system – or just solar
  - Micro control system
  - Trials early next year in Greece, Denmark and UK
- Process Pre-heat as panel technology increases temperatures

# Air Conditioning



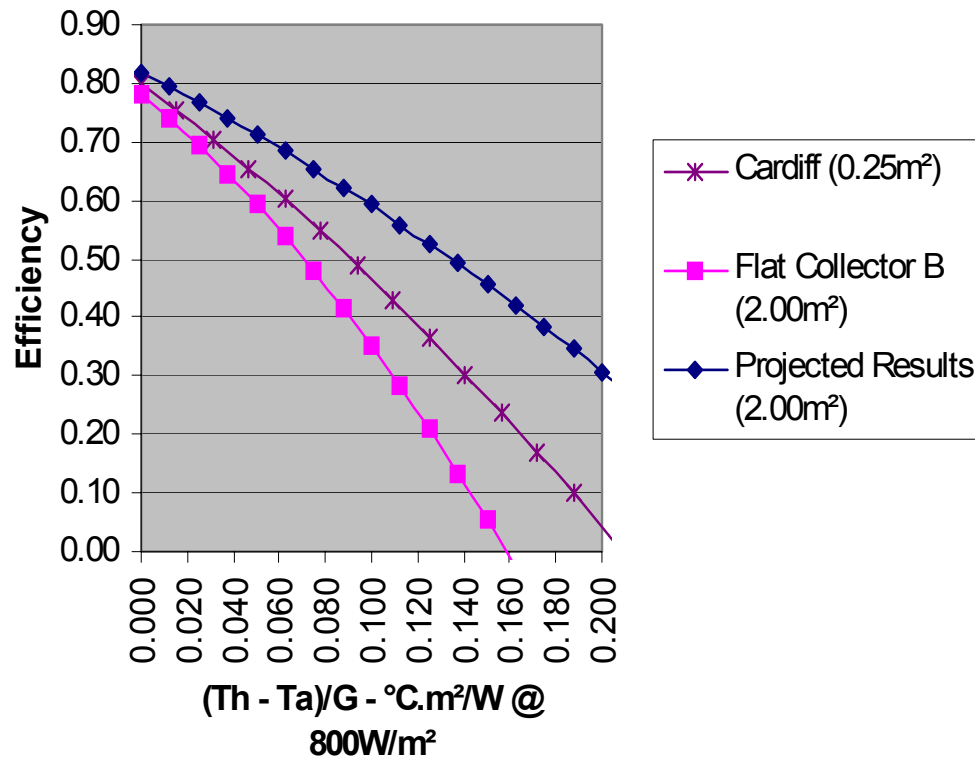
Hybrid Solar System for air conditioning using a plastic ejector

# Typical performance

- 4M<sup>2</sup> panels provides cooling for 200M<sup>2</sup> house – Northern Europe ~ 1kW of cooling
- Technology is dependent upon:
  - Local Building Materials
  - Building characteristics
  - Ambient Temperatures
  - Comfort specification
- Costs/M<sup>2</sup> are very competitive compared to flat plate
  - BUT thinner section, lighter

# Efficiency

Efficiency Curves v Radiation levels



# Super Vacuum Insulation

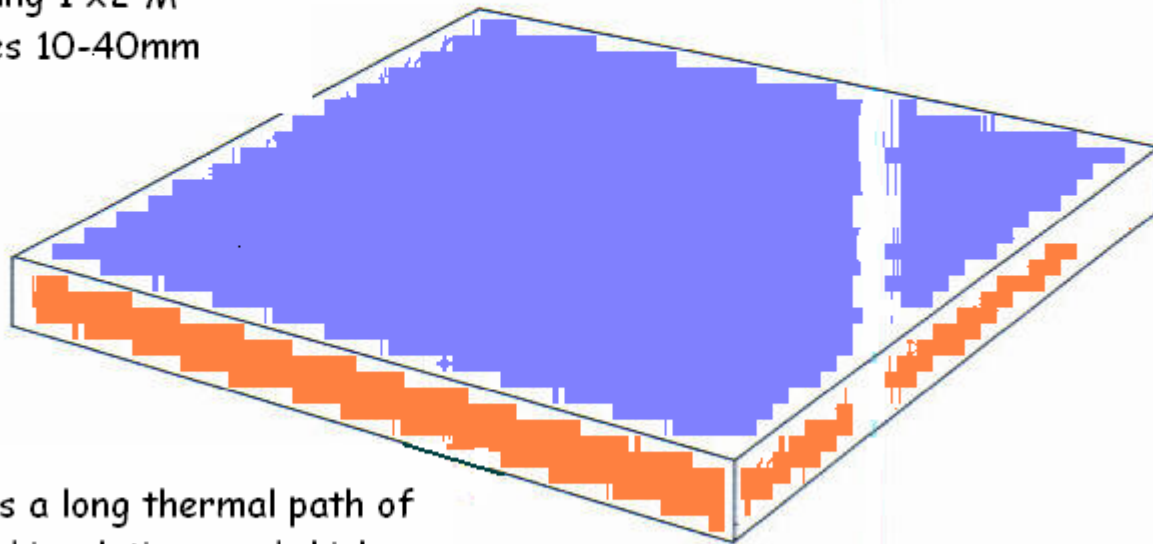
- Panels 15 mm thickness ~ 150 polyurethane
- Normal Edge loss - 9W/M length at 200°C temp. difference
- This SVP - 1.5W/M length ~ same as plastic but can handle temps -150 to +600°C
- Coefficient conductivity  $K =$
- 2 to 5 mW/Mk at 20°C
- Made from 0.1mm stainless steel



# Insulation

Stainless Steel Super Vacuum Insulation  
panels

Sizes varying 1 x 2 M  
Thicknesses 10-40mm



Edge has a long thermal path of  
steel and insulation sandwich



# Commercial Options



- Solar
  - Panels
    - JV to Build local semi automated factory - Now
  - Super vacuum panels
    - JV to build local semi automated factory – 3 months
    - Uses – refrigeration, transport, building, ovens, furnaces
  - Market £Billions
  - Air conditioning systems
    - JV to use technology and implement – 15 months time

# Negotiations

- UK Factory for insulation
- UK Sales, Marketing, Project implementation organisation
- Middle East factory/Sales and Marketing
- Australia/USA interest in JV

# Tidal Stream Energy

RICHARD AYRE

Tidal Hydraulic

Generators Ltd



Trials Barge for different Blade designs

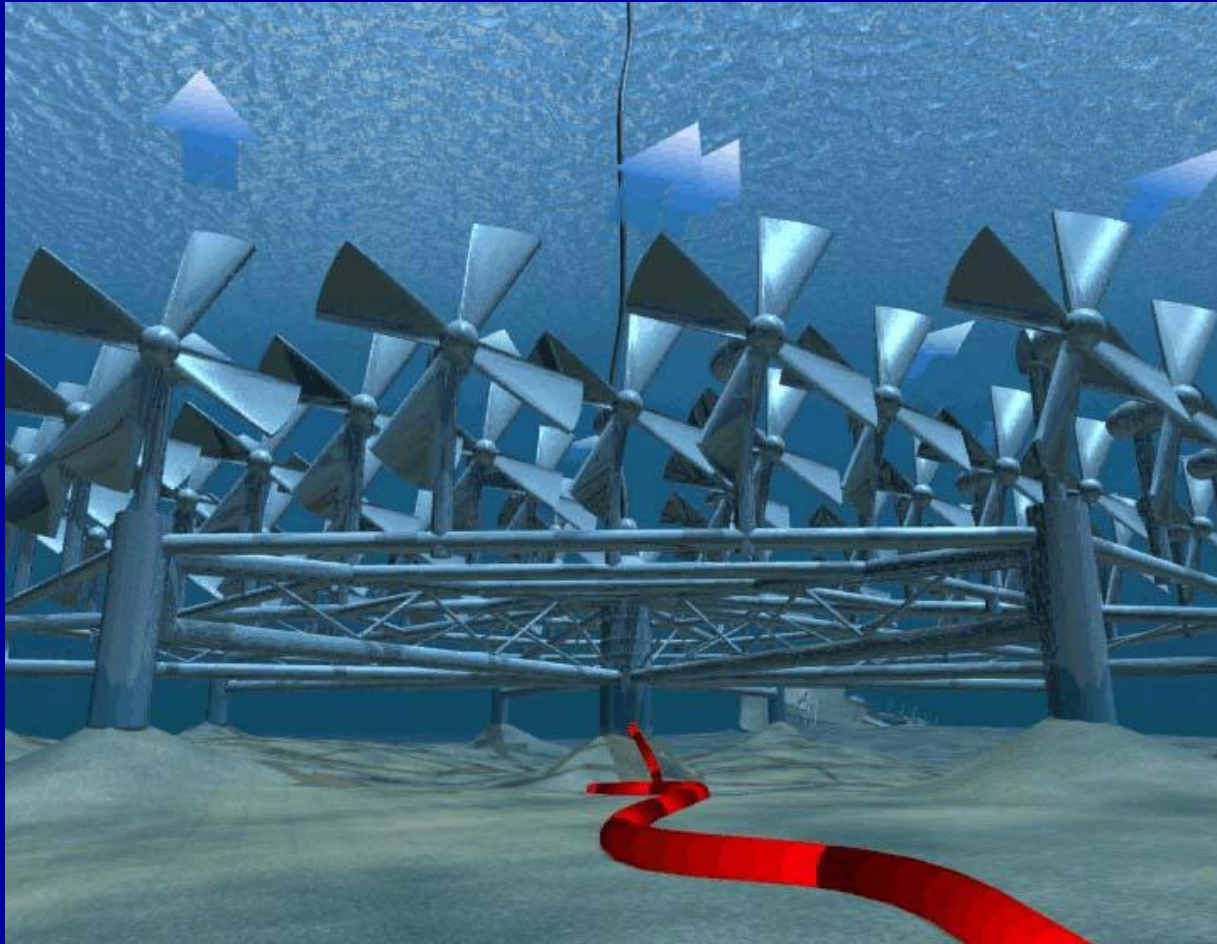
# Prototype Production Design

- Five turbine ARRAY design started 20.1.2003 – complete in Jan 2005
- Computer Modelling, detail design of blades/optimisation, structure, generators,
- System for installing/lifting Array in one day
- Testing/materials and wear/encrustation
- Performance characteristics

# Energy Production

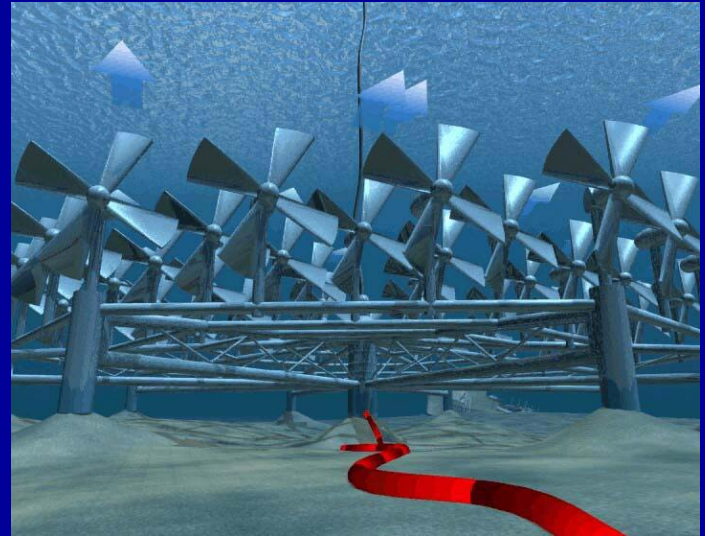
- Five turbine array 6M diameter blades in 6 knots tidal stream velocity
- Average  $\sim 250\text{kW} + (\text{max. } 1\text{MW})$
- For lower velocities  $\sim 2$  knots
  - Increase number of turbines for an array (40)
  - Increase Max.10M diameter
- World potential
  - 0.1% of tidal stream = 5 x existing electrical capacity

# Tidal Stream Array



# Tidal Hydraulic Generators Ltd

- First in UK to generate electricity to land (March 2003)
- Comparable with on shore wind price
- Can be utilised for:
  - Electrical generation
  - Desalination
  - Hydrogen Generation



# Benefits and Costs

- Environmentally welcomed
- Not seen and heard on surface
- Fish stocks can increase
- Can be removed completely, cheaply and quickly
- Financial Model - very positive
- 5 turbine array project to prove this



# Future

- Desalination plant direct from Array – 2 years
- Desalination – Electrolysis – Hydrogen – 3 years
  - Cheaper than underwater cables to the grid (£1 million/mile)
  - Local Hydrogen infrastructure – within 20 years

# Commercial Potential

- Tidal Stream
  - Tidal Hydraulic Generators Ltd
  - Partner for the existing project
  - In two/three years looking for JVs across the world ( UK covered)
    - Electrical Energy Generation
    - Desalination
    - Hydrogen Production