



Introduction to Renewable Energy

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Agenda

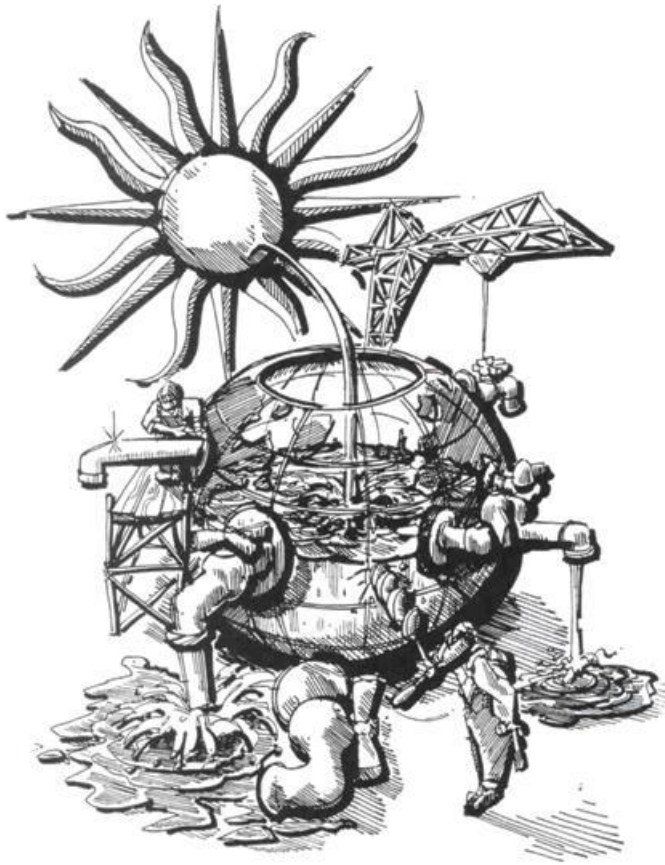


- Why Renewables?
- Renewable Energy Sources & Technologies
 - Solar
 - Hydro
 - Wave
 - Bio-fuels
 - Wind
 - Geo-thermal
 - Bio-gas
- Project Example
- More on SWH
- Questions



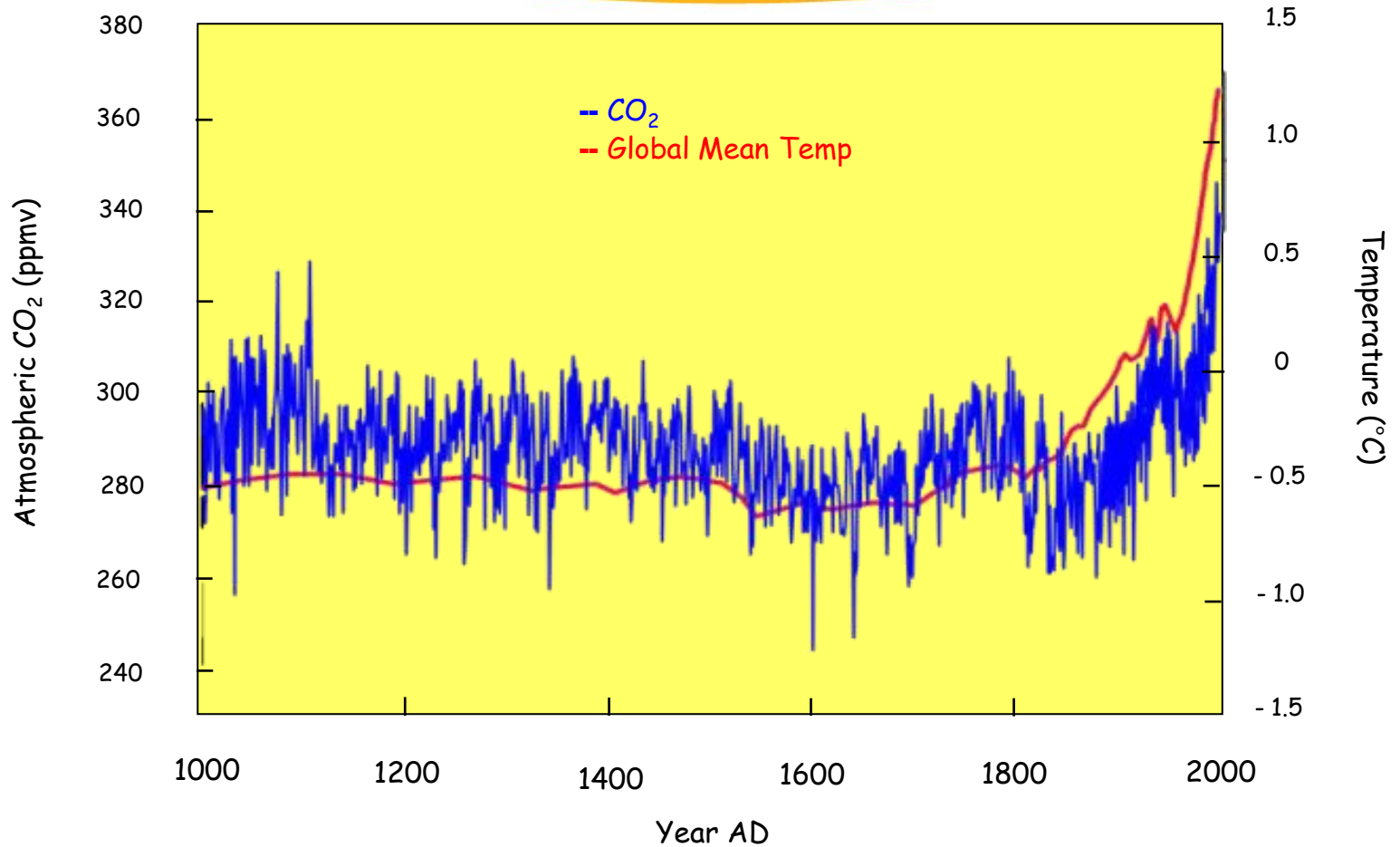
Why Renewables?

The problem...



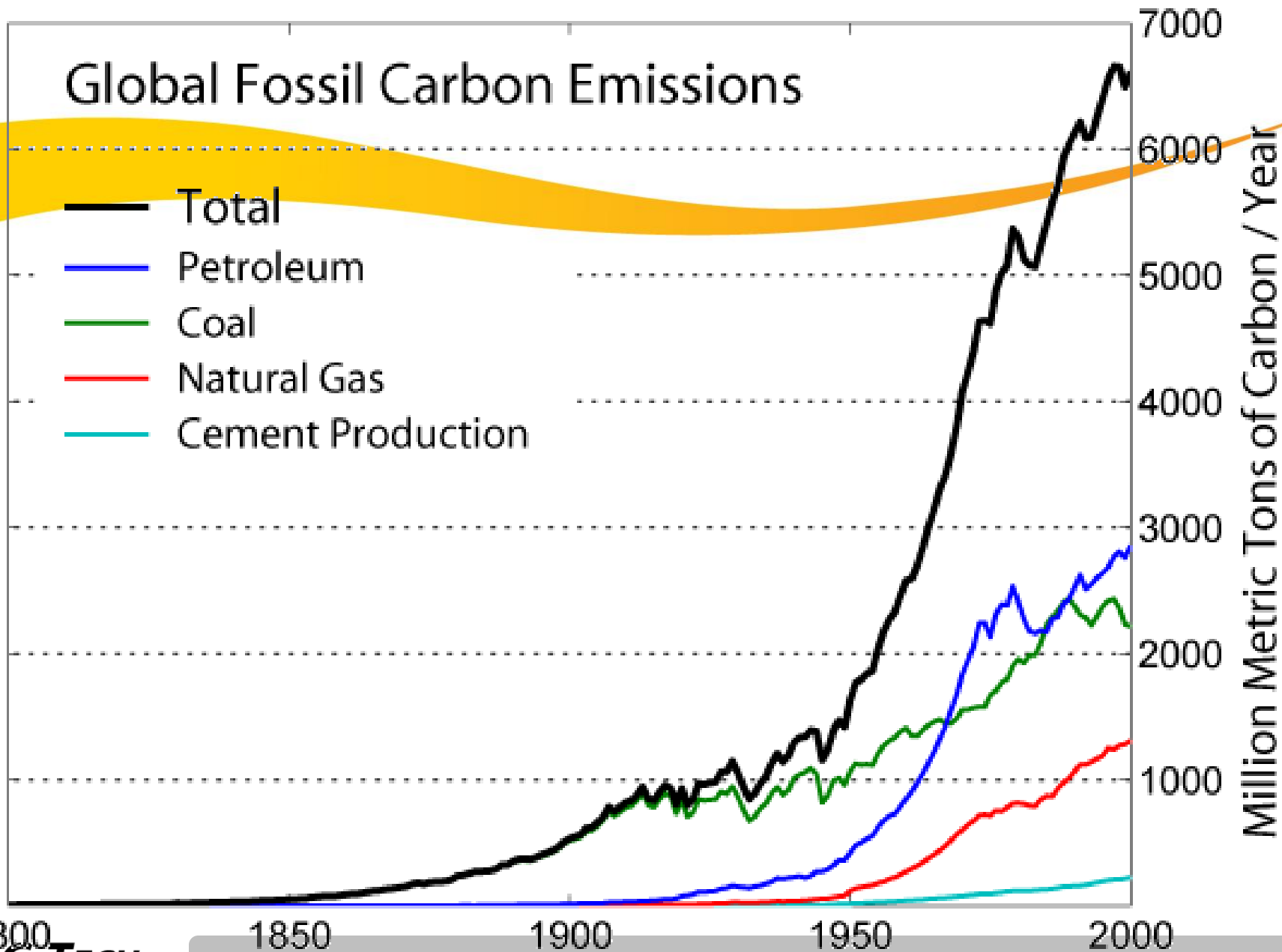
- Unsustainable Resource Use
- Climate Change
- Collapse of Ecological Systems

Past & Today CO₂ & Temp



Global Fossil Carbon Emissions

- Total
- Petroleum
- Coal
- Natural Gas
- Cement Production



APRIL 3, 2006

www.time.com AOL Keyword: TIME

SPECIAL REPORT GLOBAL WARMING

TIME

**BE
WORRIED.
BE **VERY**
WORRIED.**

Climate change isn't some vague future problem—it's already damaging the planet at an alarming pace. Here's how it affects you, your kids and their kids as well

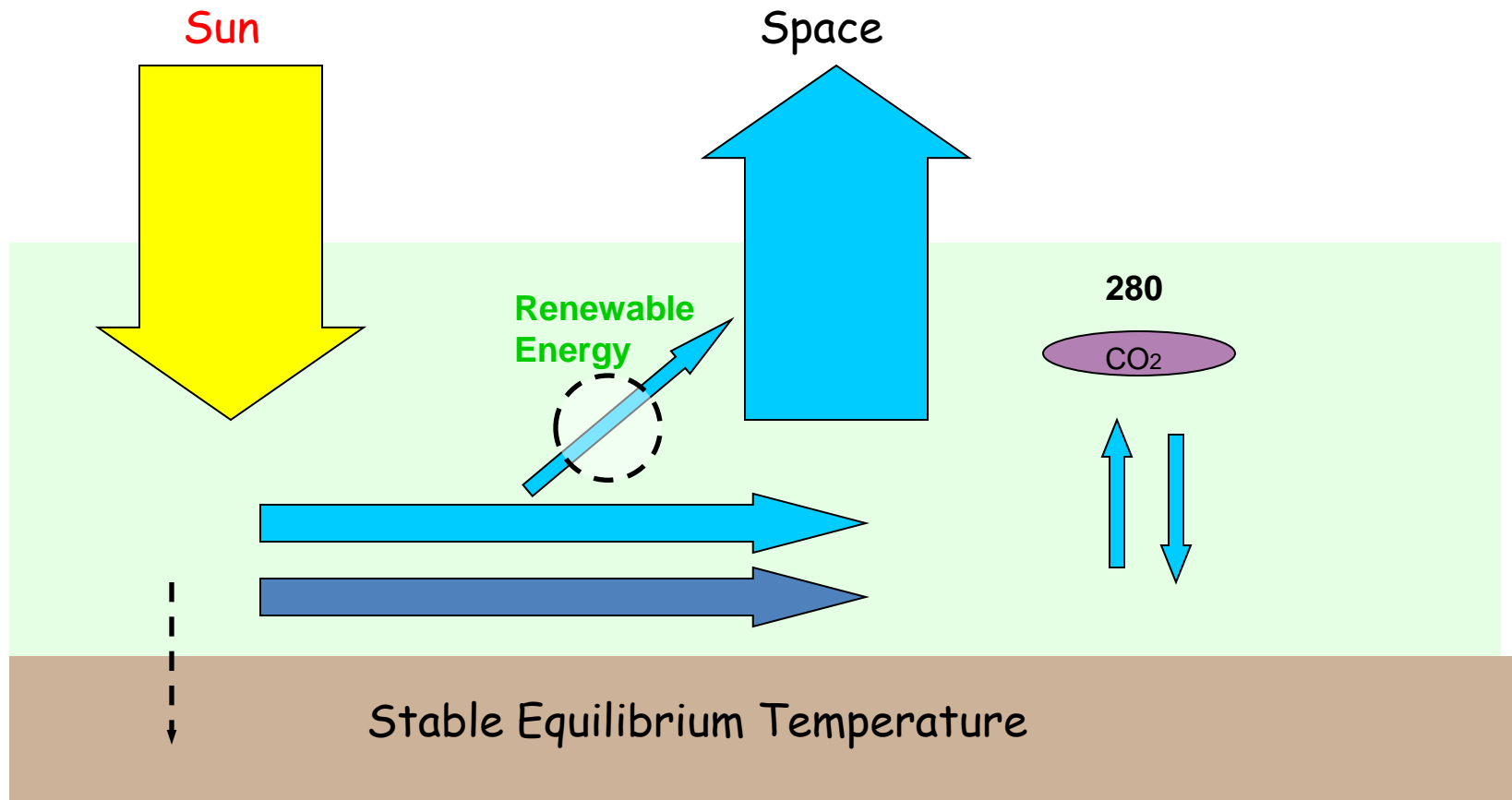
EARTH AT THE TIPPING POINT

**HOW CHINA & INDIA CAN HELP
SAVE THE WORLD—OR DESTROY IT**

THE CLIMATE CRUSADERS



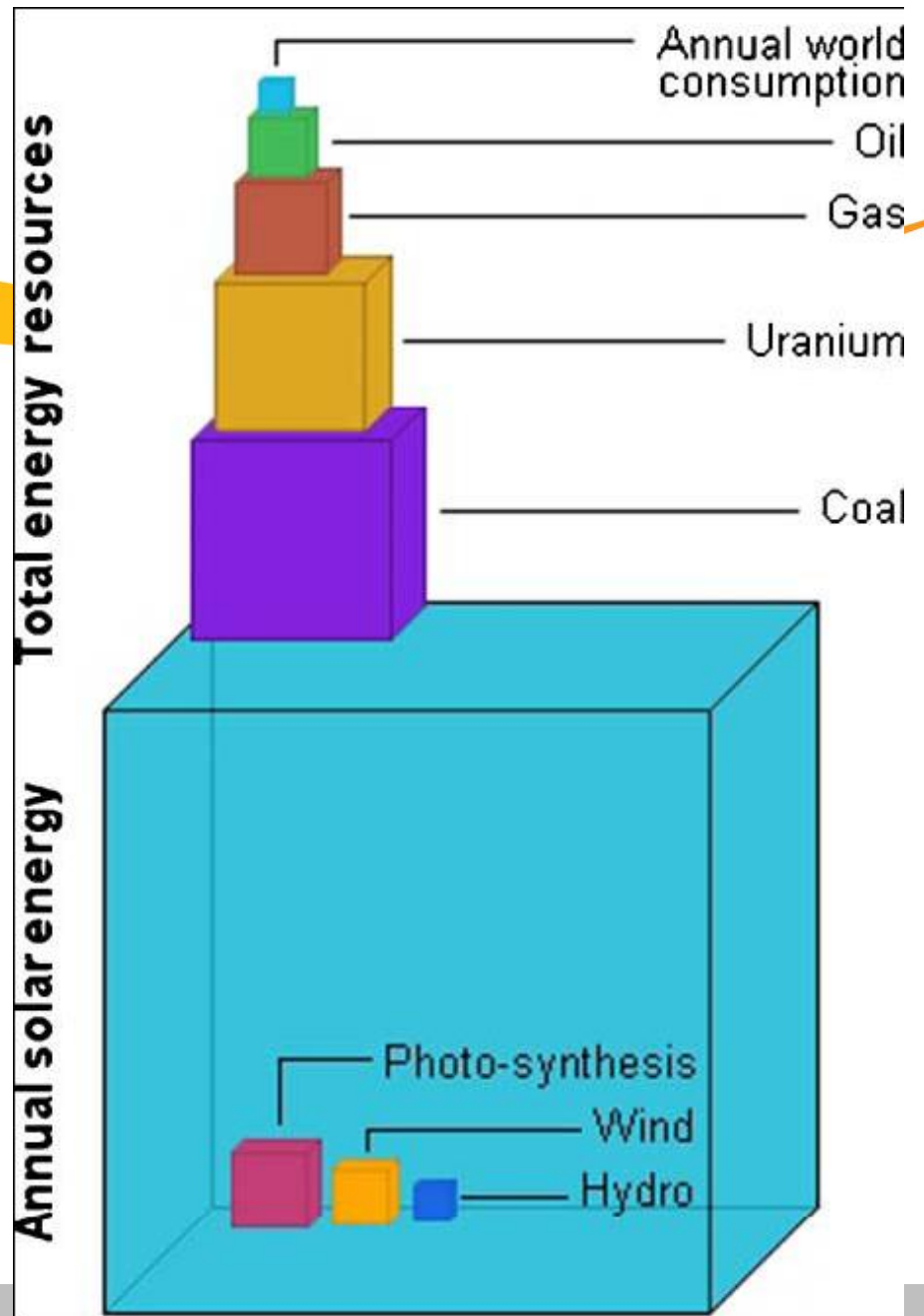
Global Warming: Renewable Energy



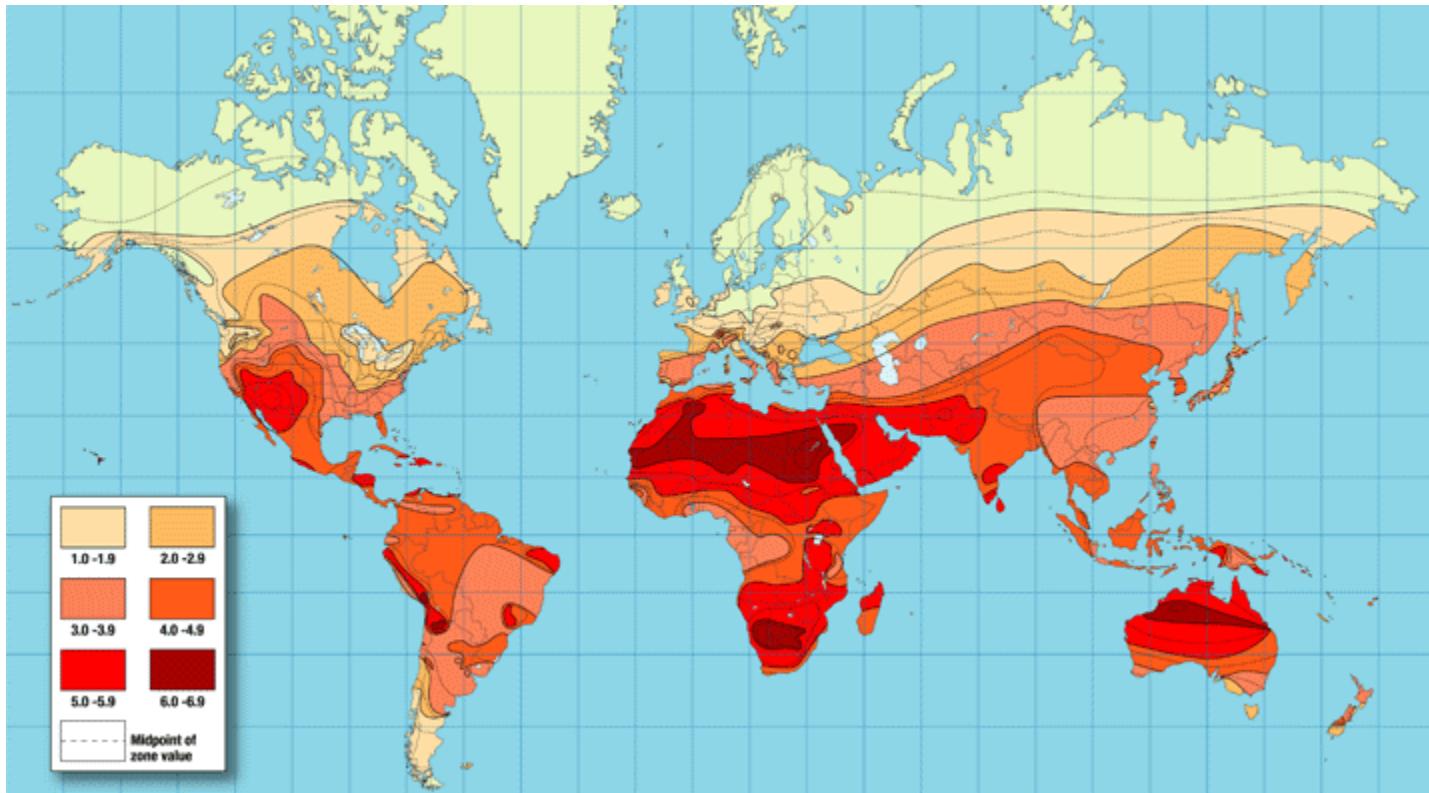


RE Sources

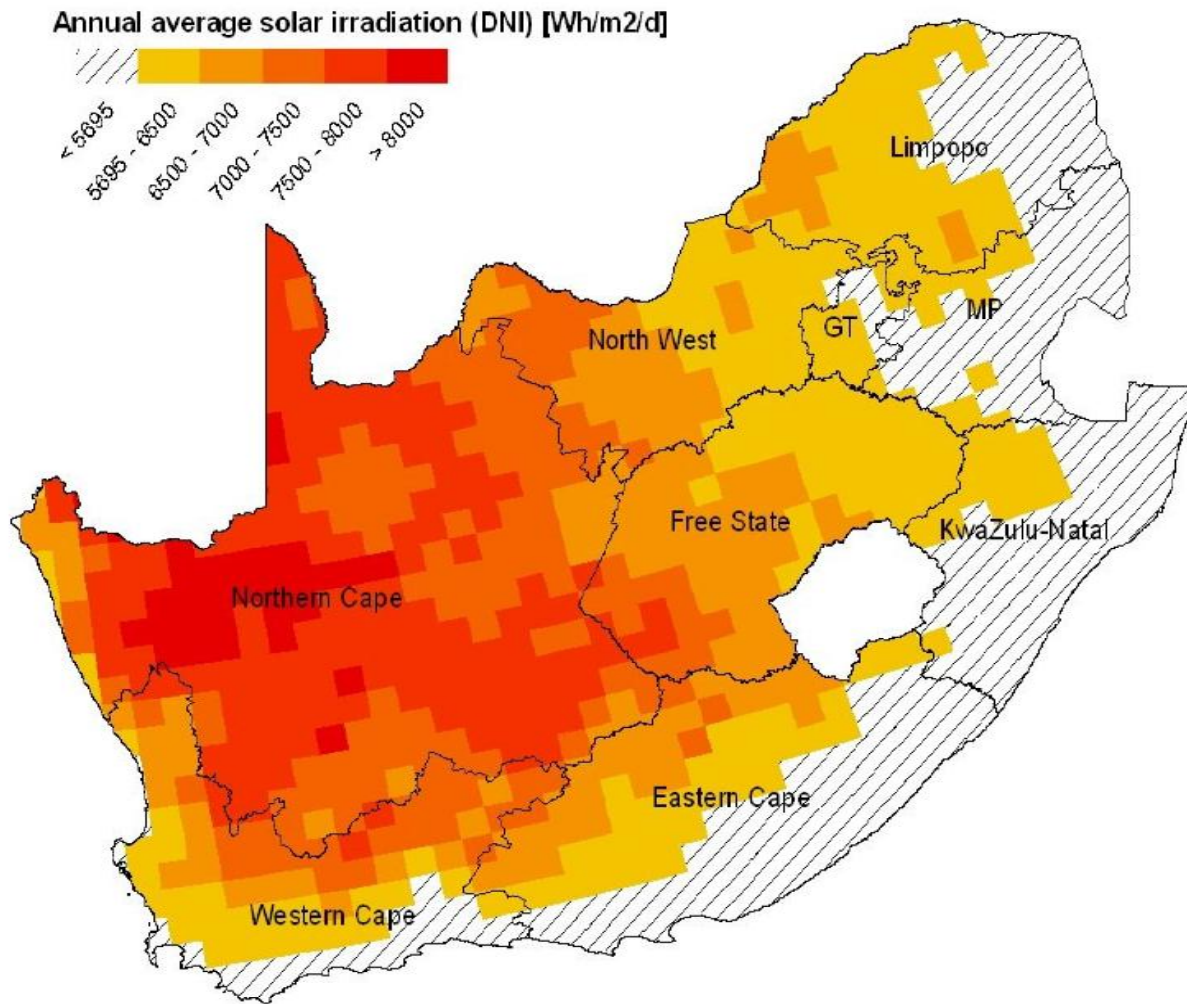
Renewable Power



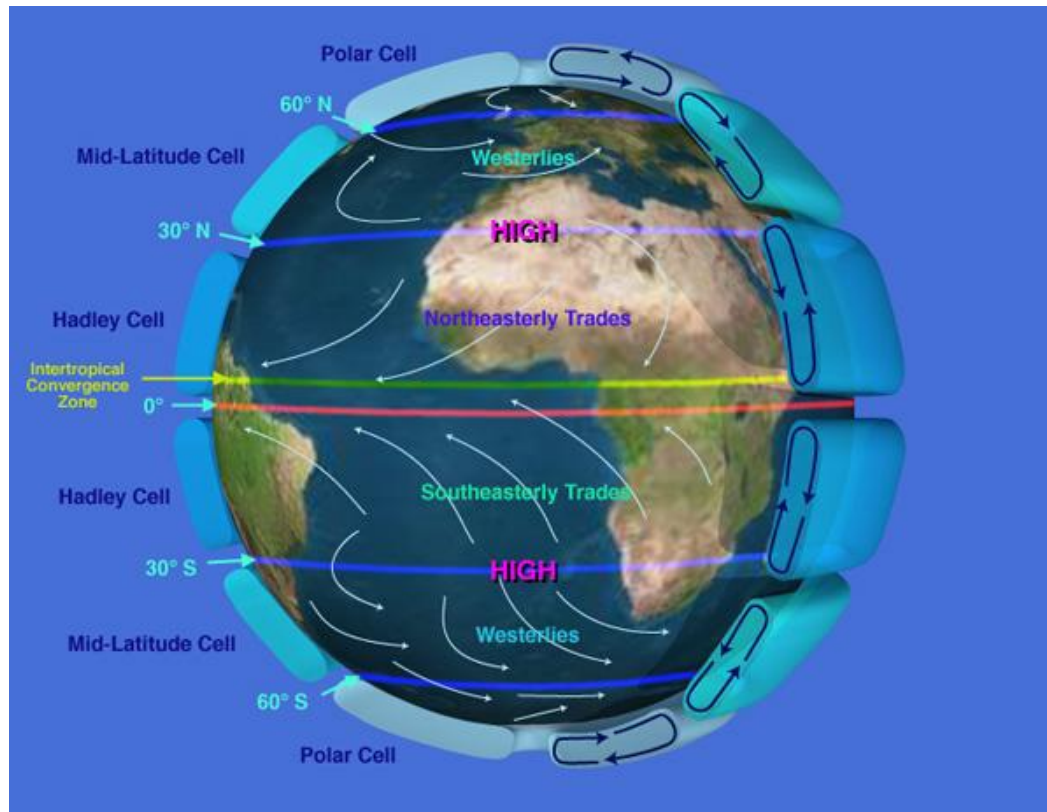
Solar in the World



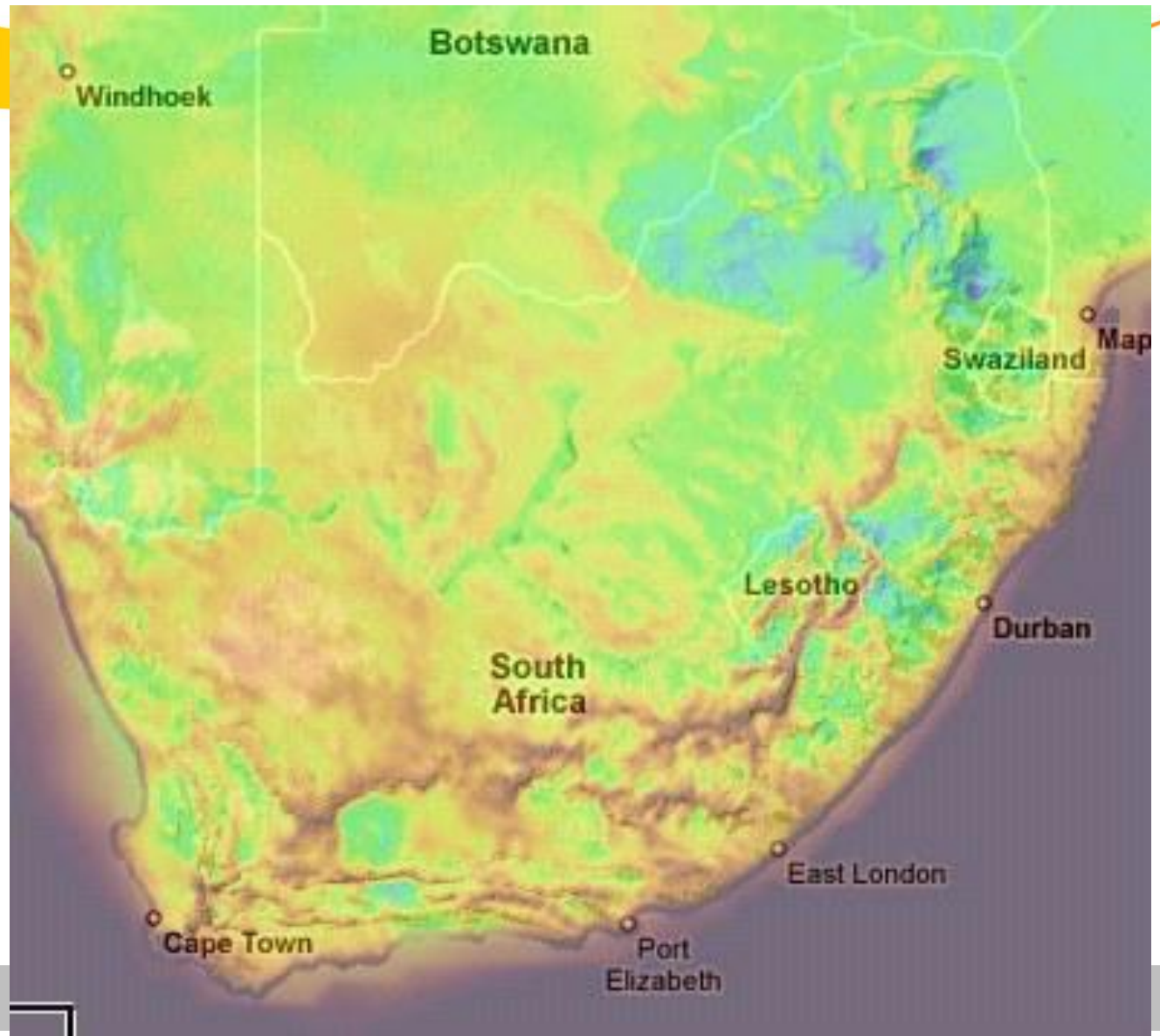
Solar in South Africa



Wind is solar powered



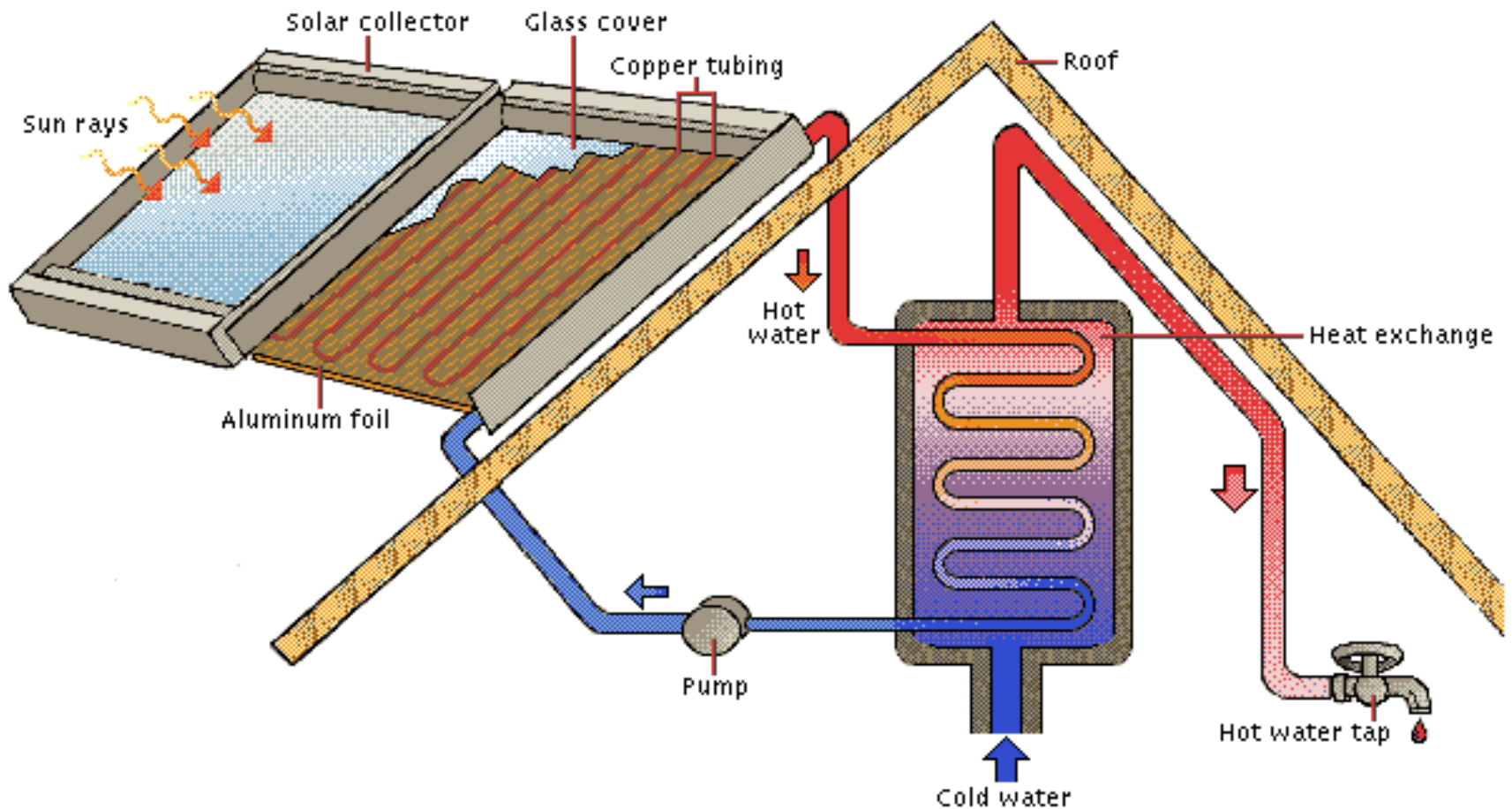
Wind in South Africa





RE Technologies

Solar Water Heating



Solar Air-conditioners

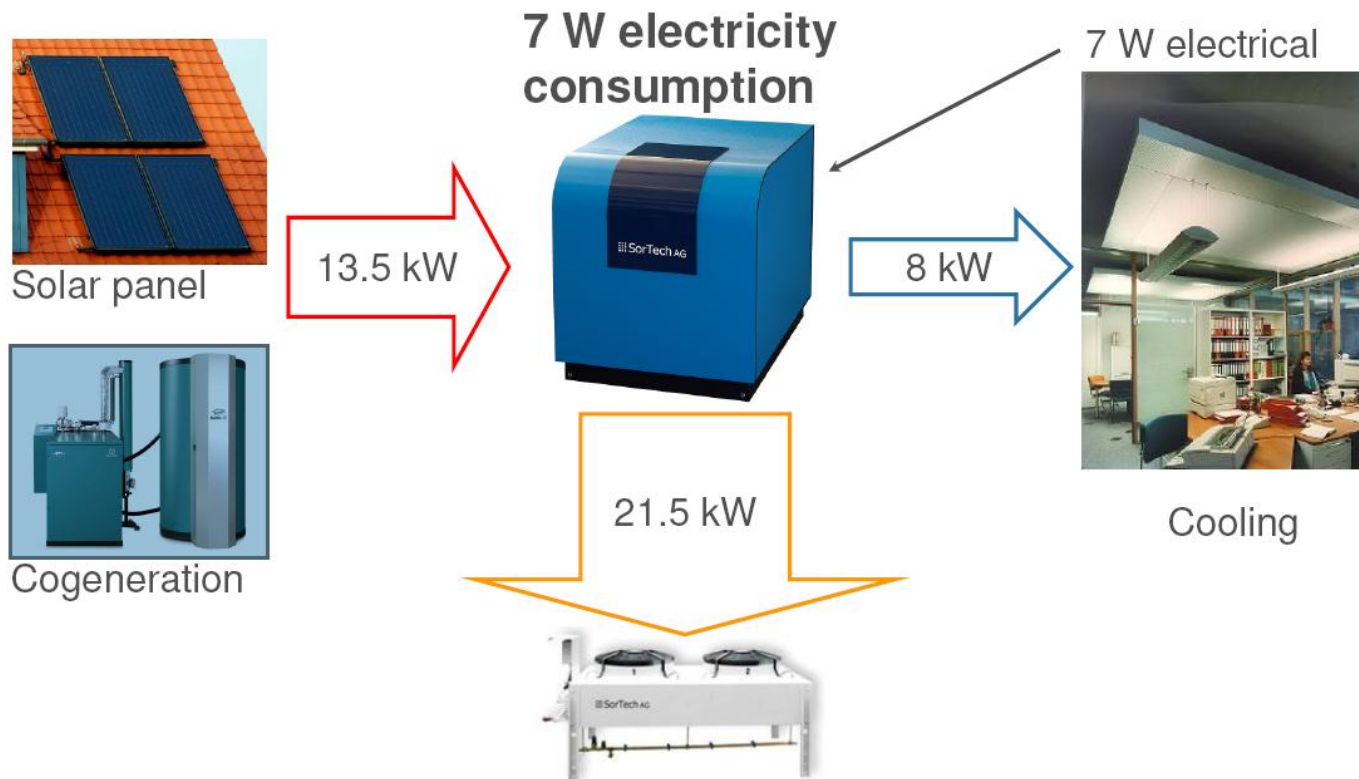
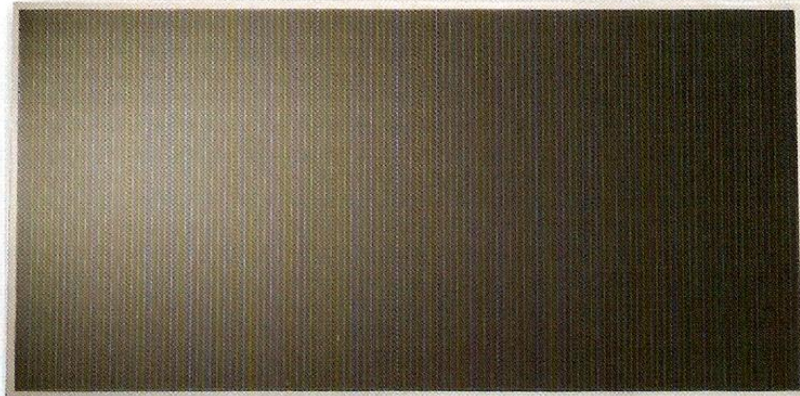
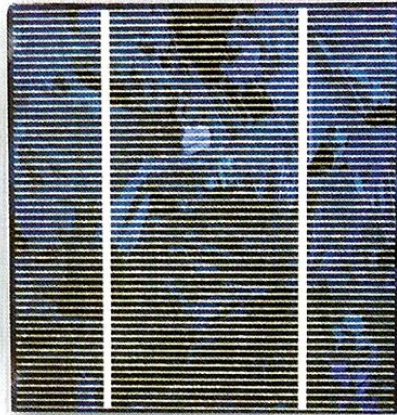
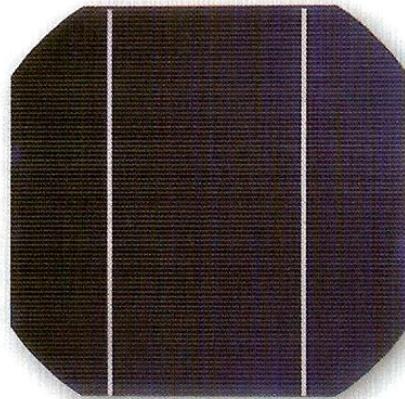


Photo-Voltaics





Photovoltaics



- Silicon
 - Crystalline
 - Poly
 - Mono
 - Amorphous (thinfilm)
- Other
 - Multi-junction
 - Copper-indium-gallium-diselenide (CIGS)





Process

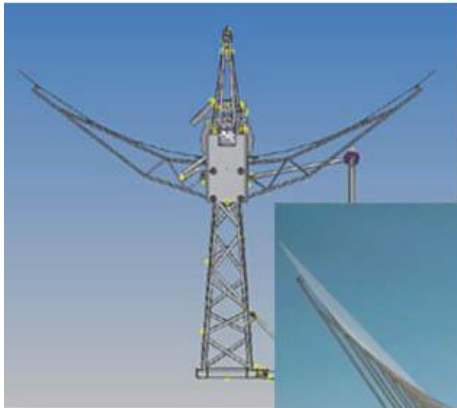
From sand to PV module



Solar Value Chain

Concentrated Solar Thermal





Parabolic Troughs



Parabolic Dishes with Stirling Engine



Central Tower

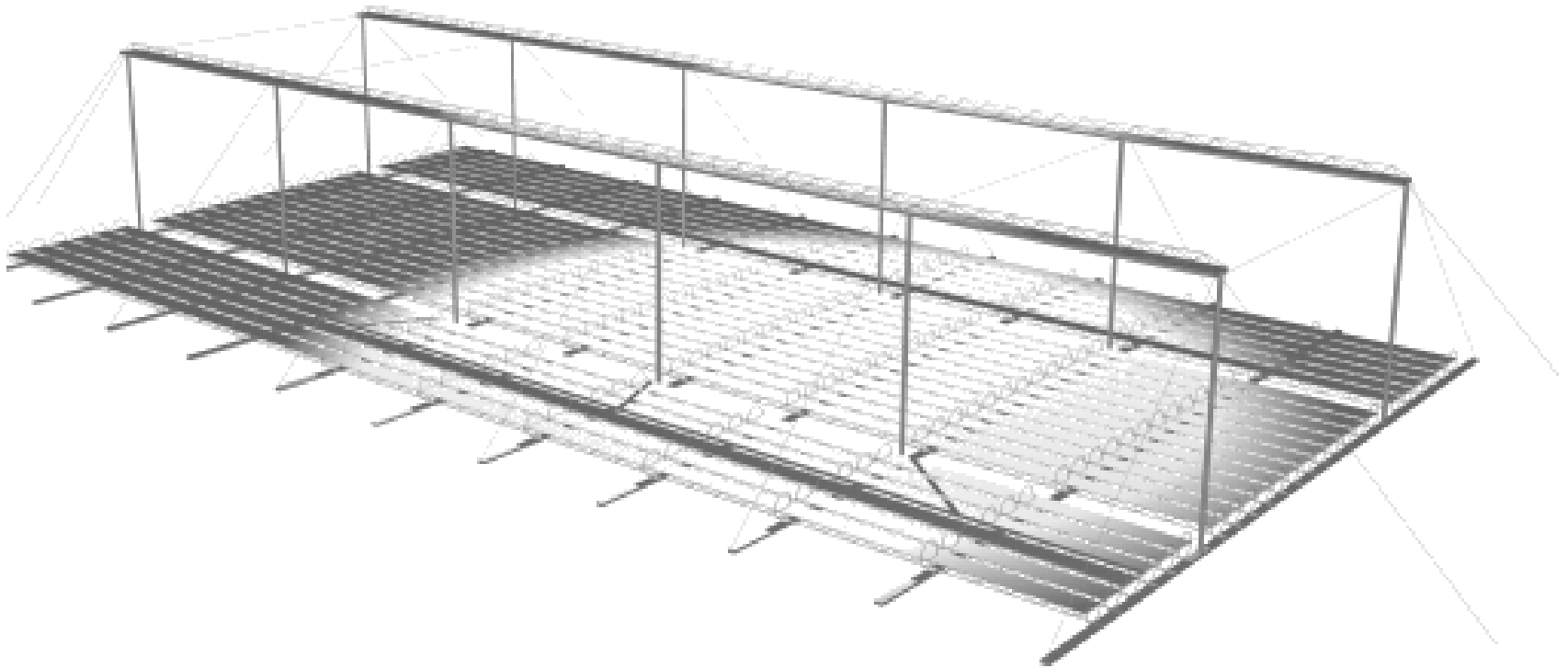


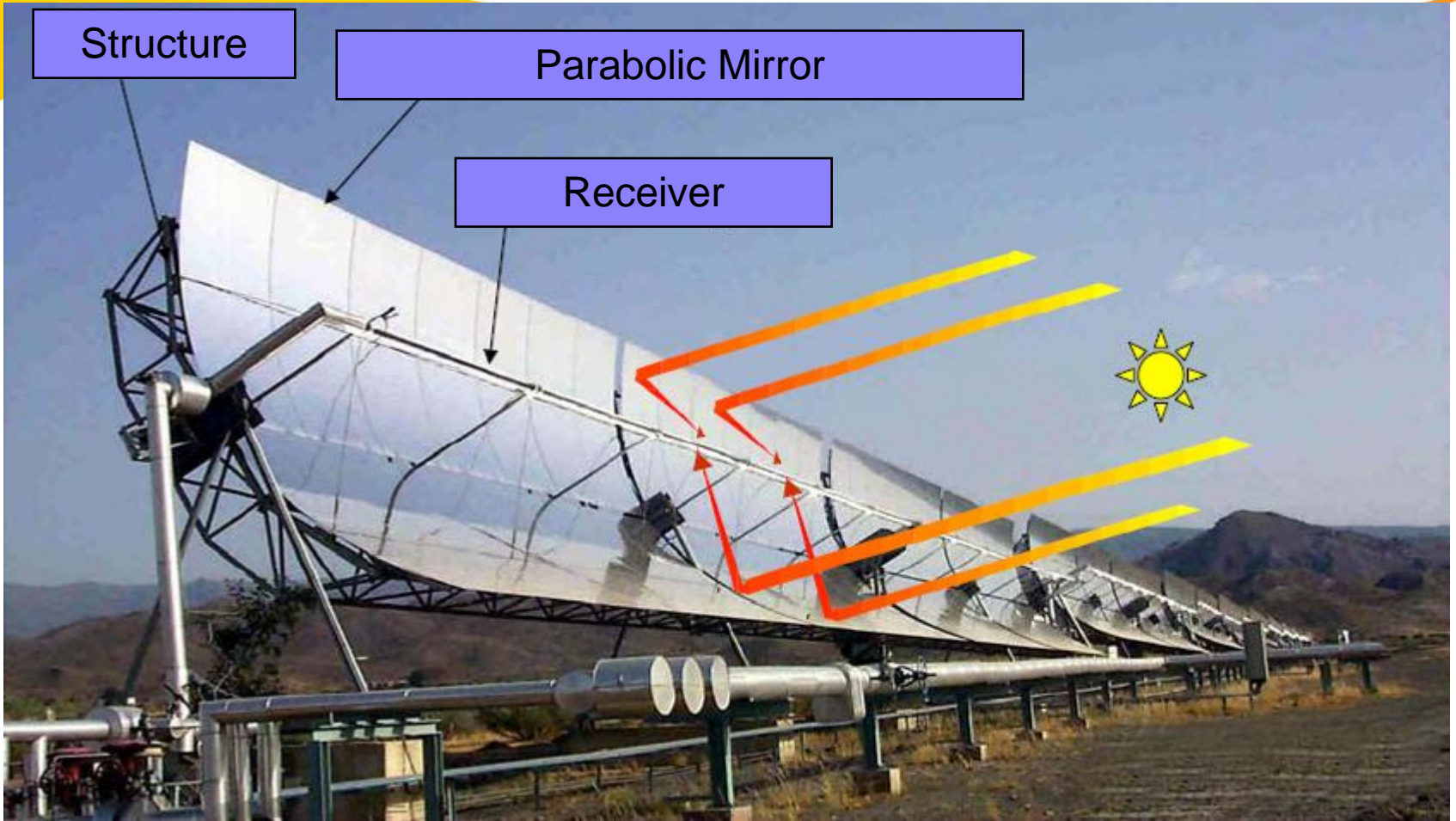
Fresnel Concentrators

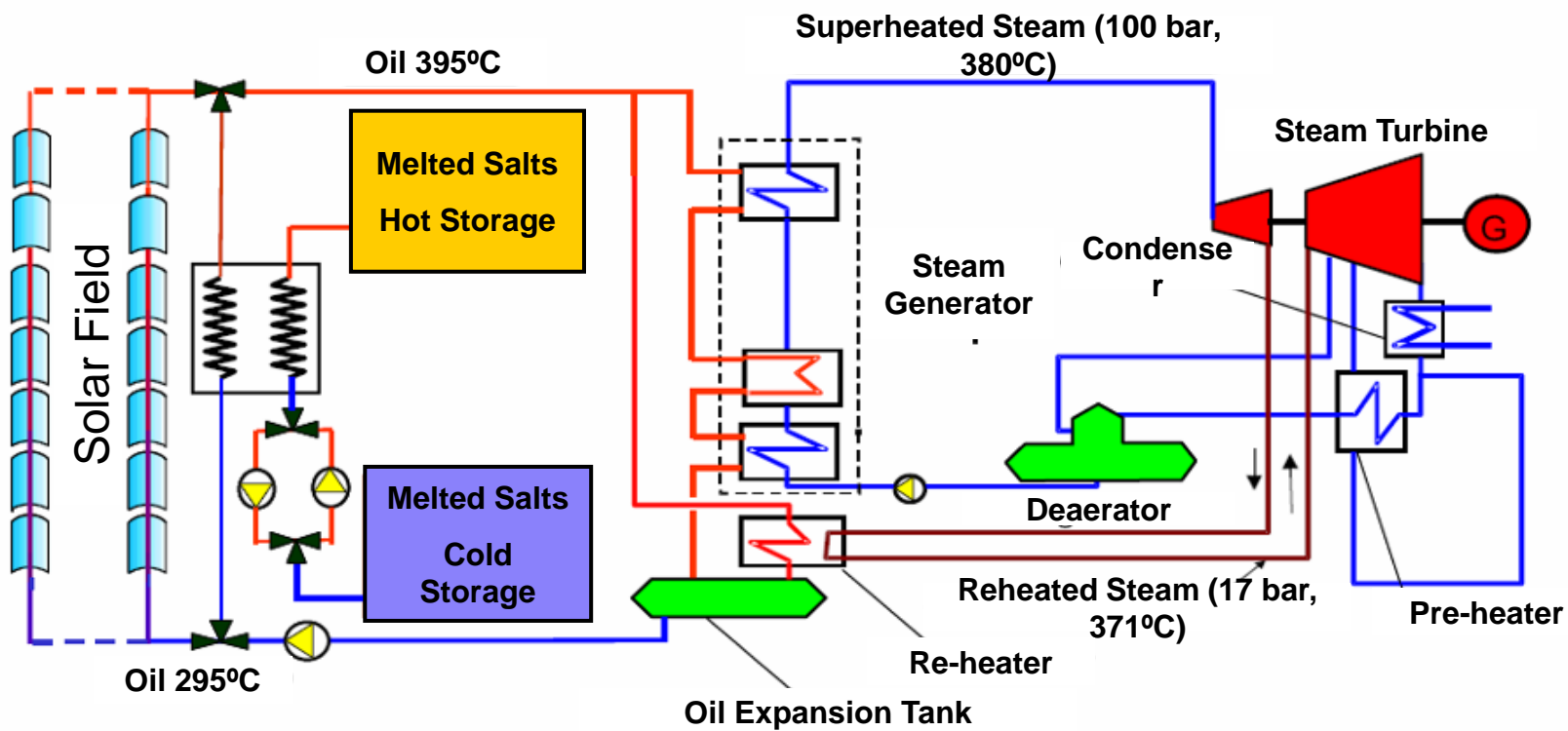




CSP: Linear Fresnel

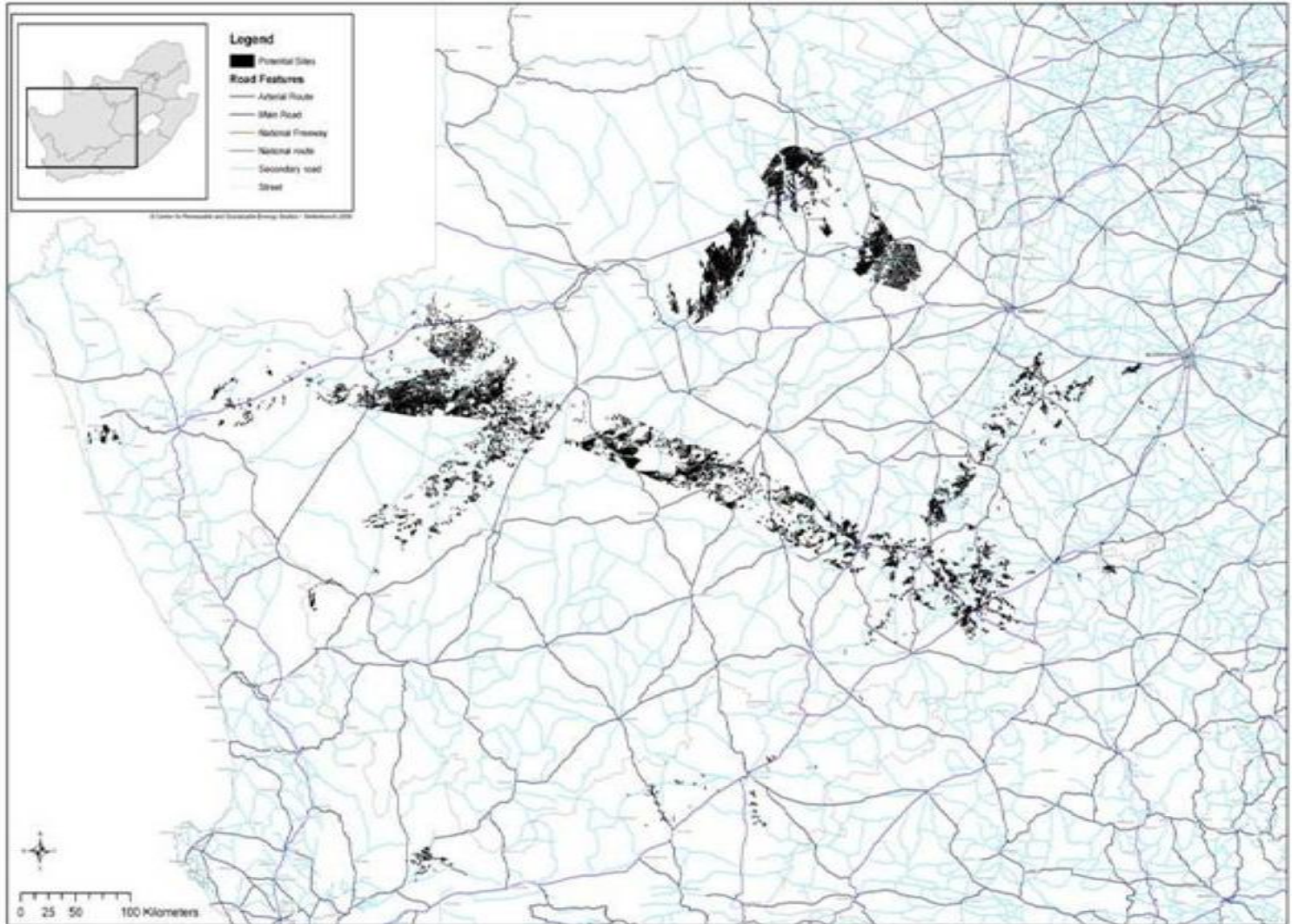




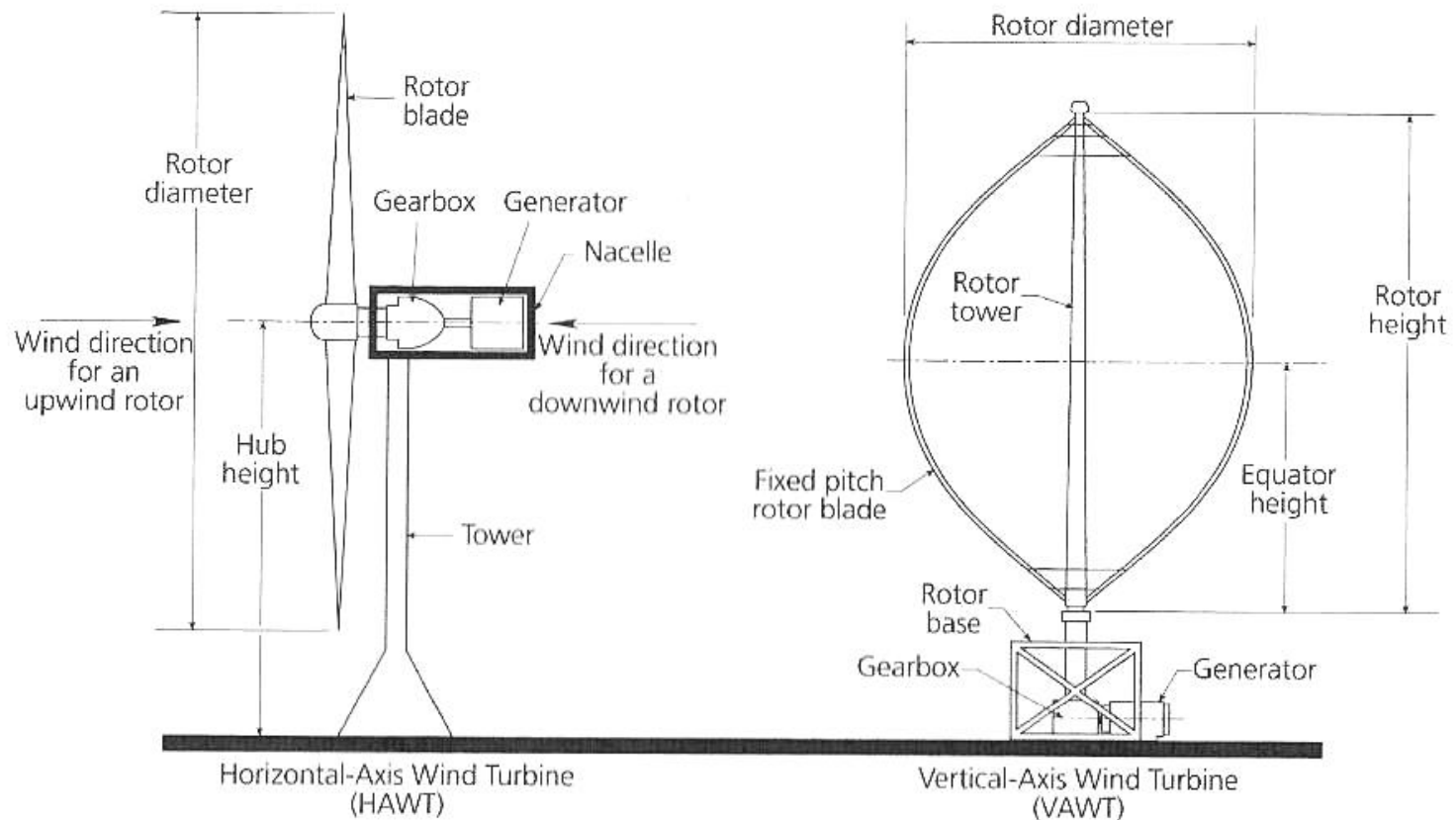




Places for CSP



Wind Turbines

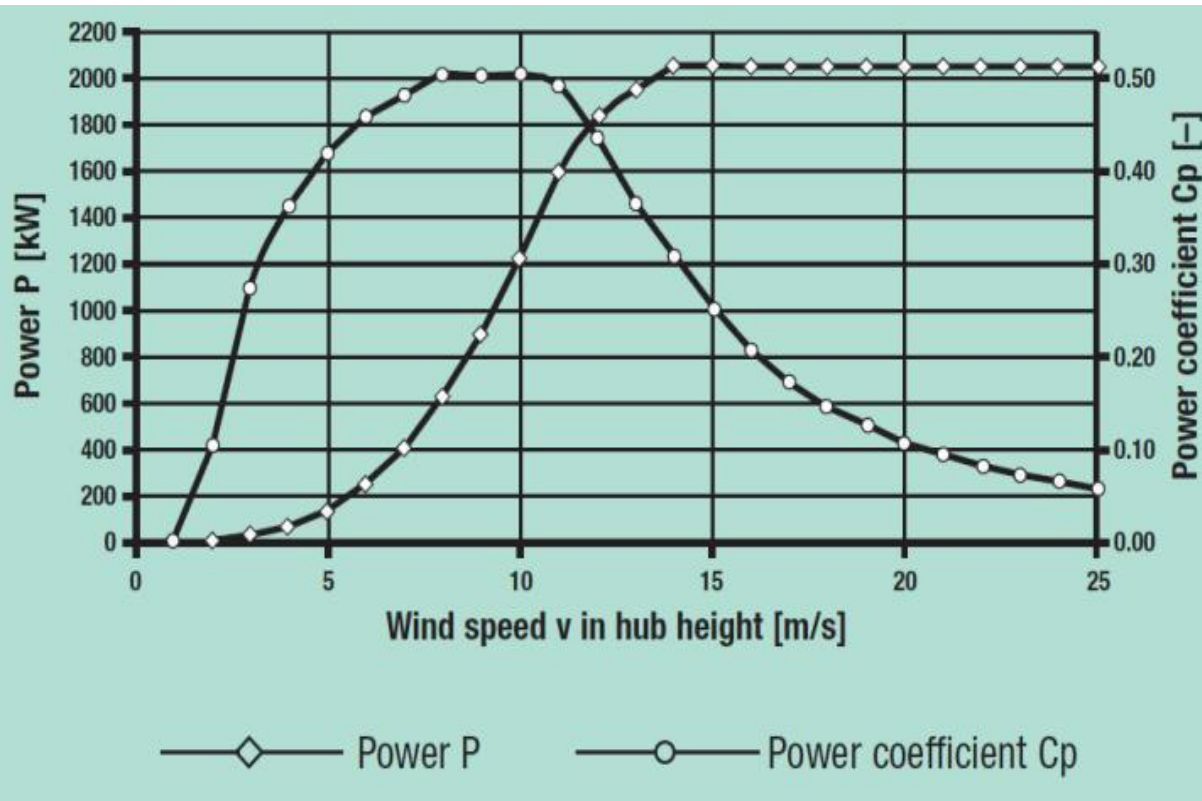








Wind Power = cube function of Wind Speed

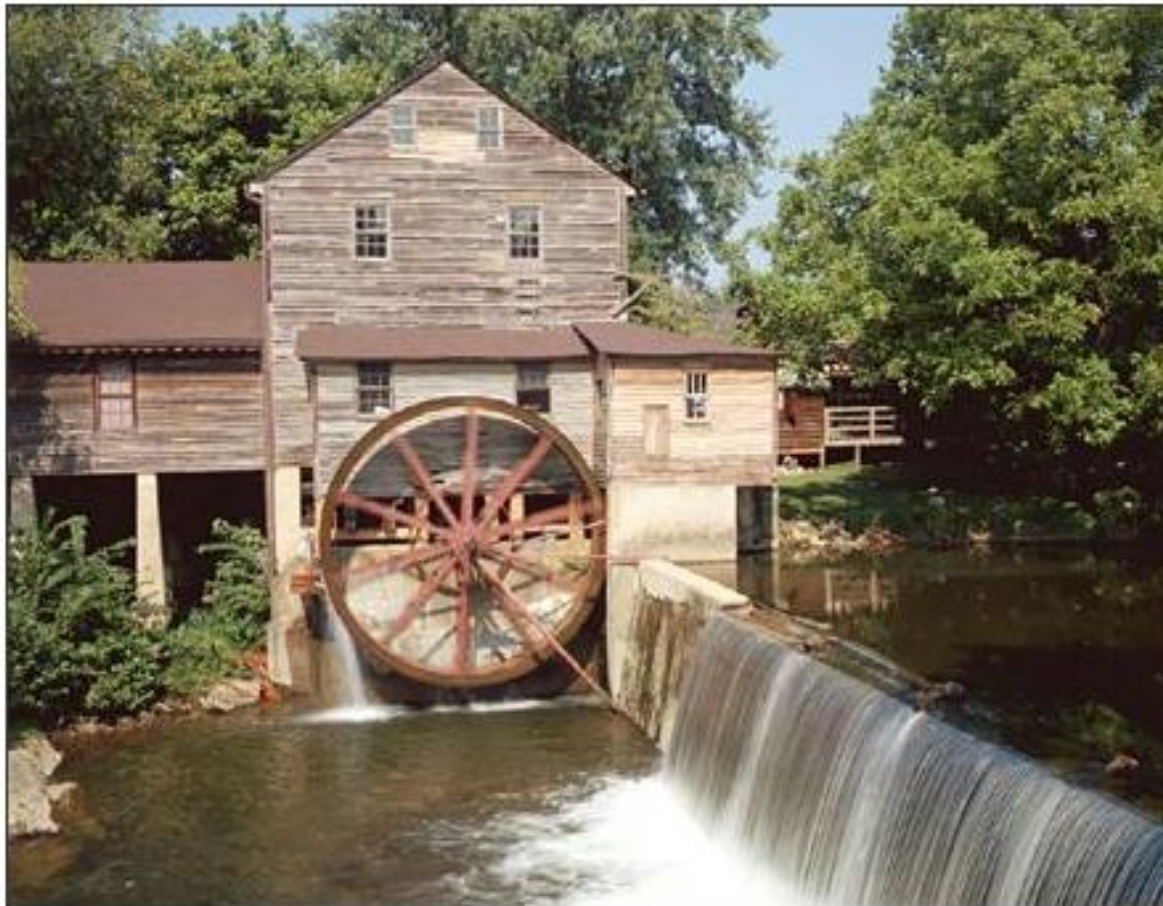


Projects

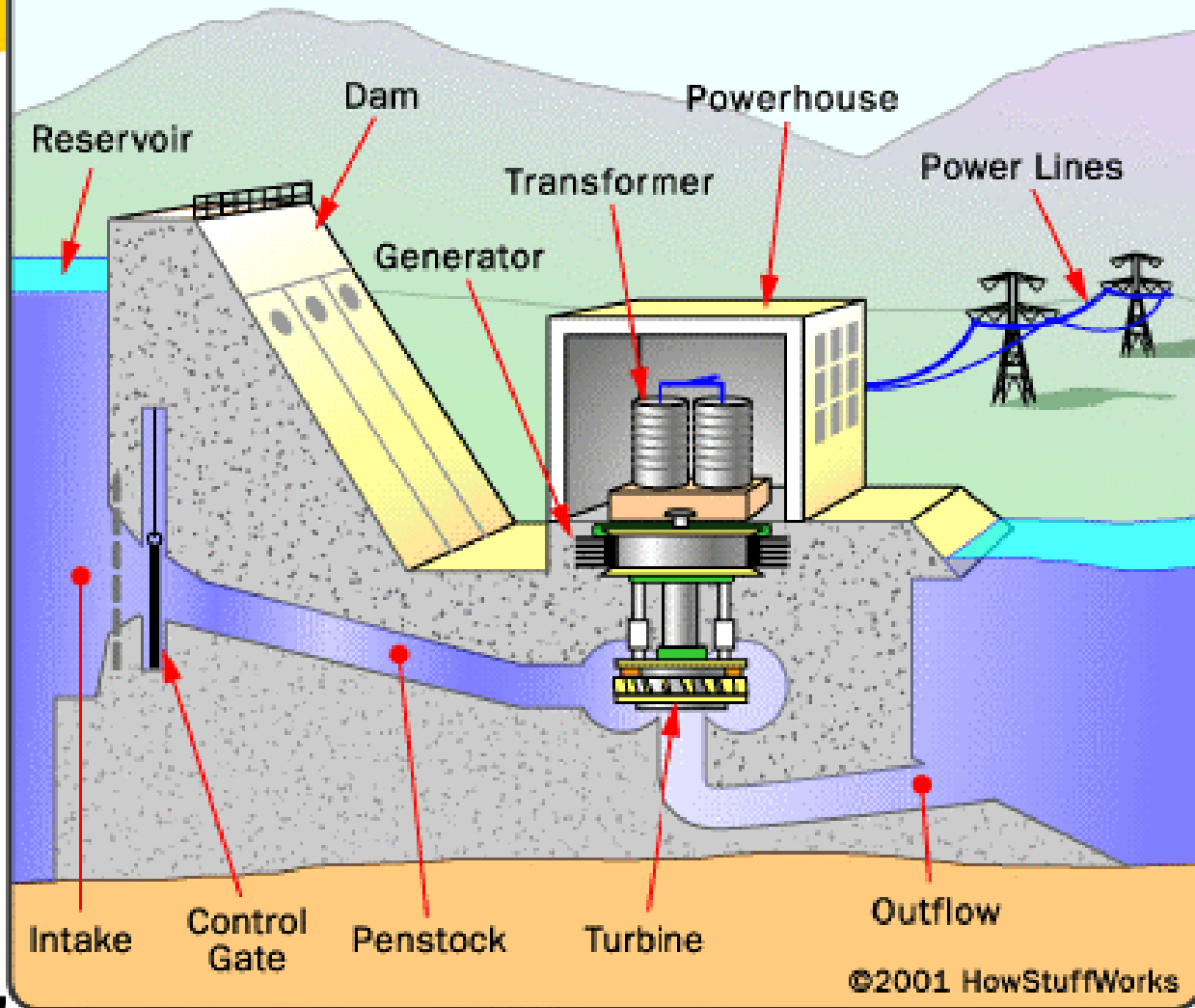
- Napier Farm
 - 15kW Proven Wind Turbine

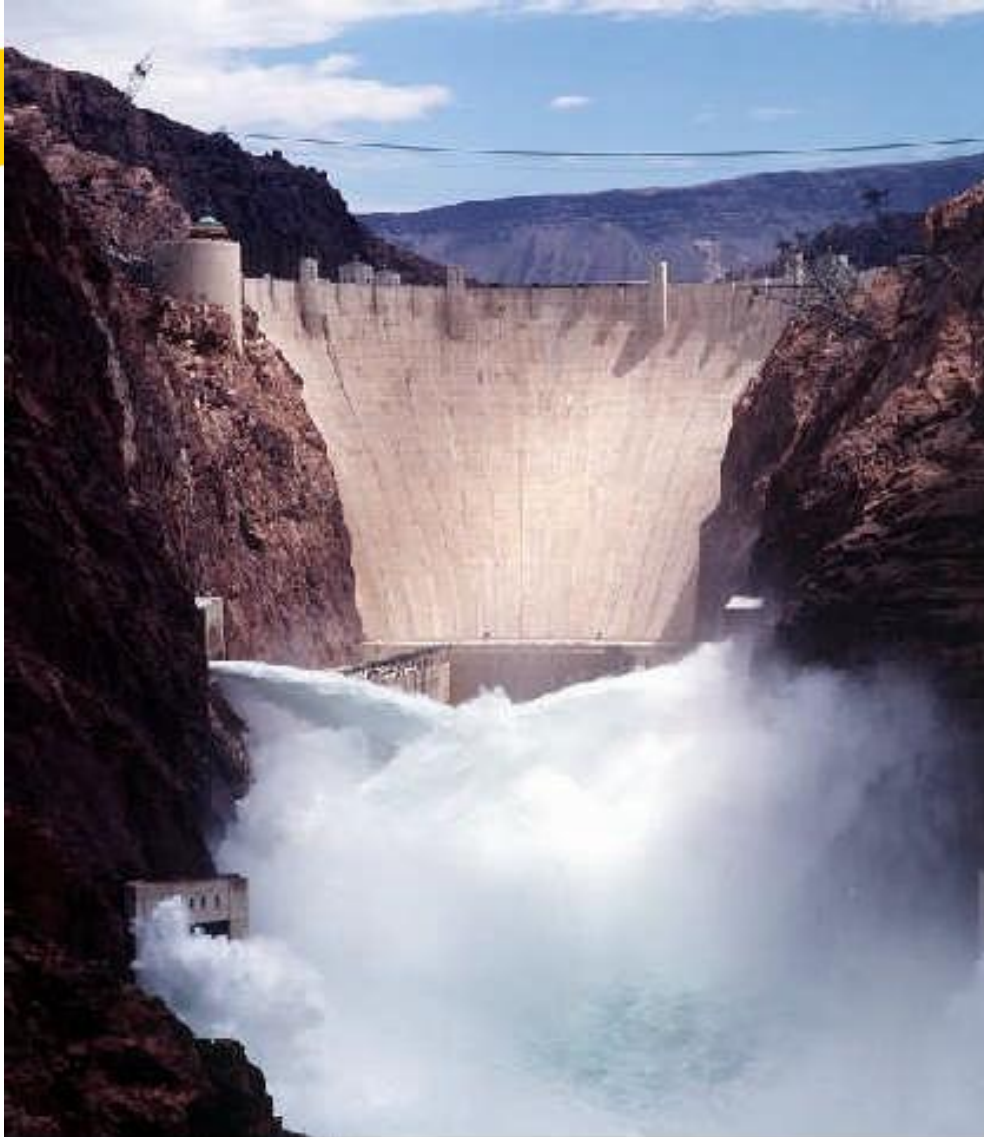


Hydro



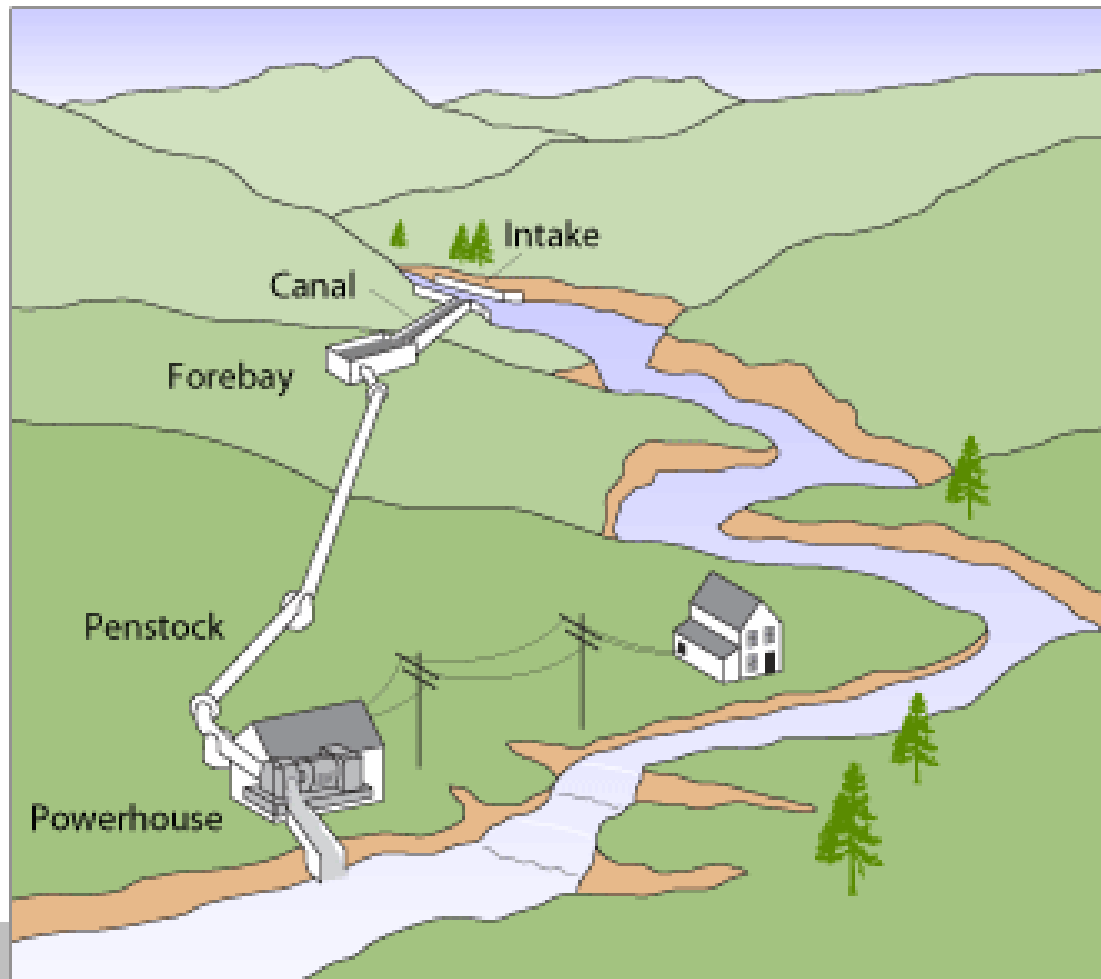
Inside a Hydropower Plant





Hoover Dam

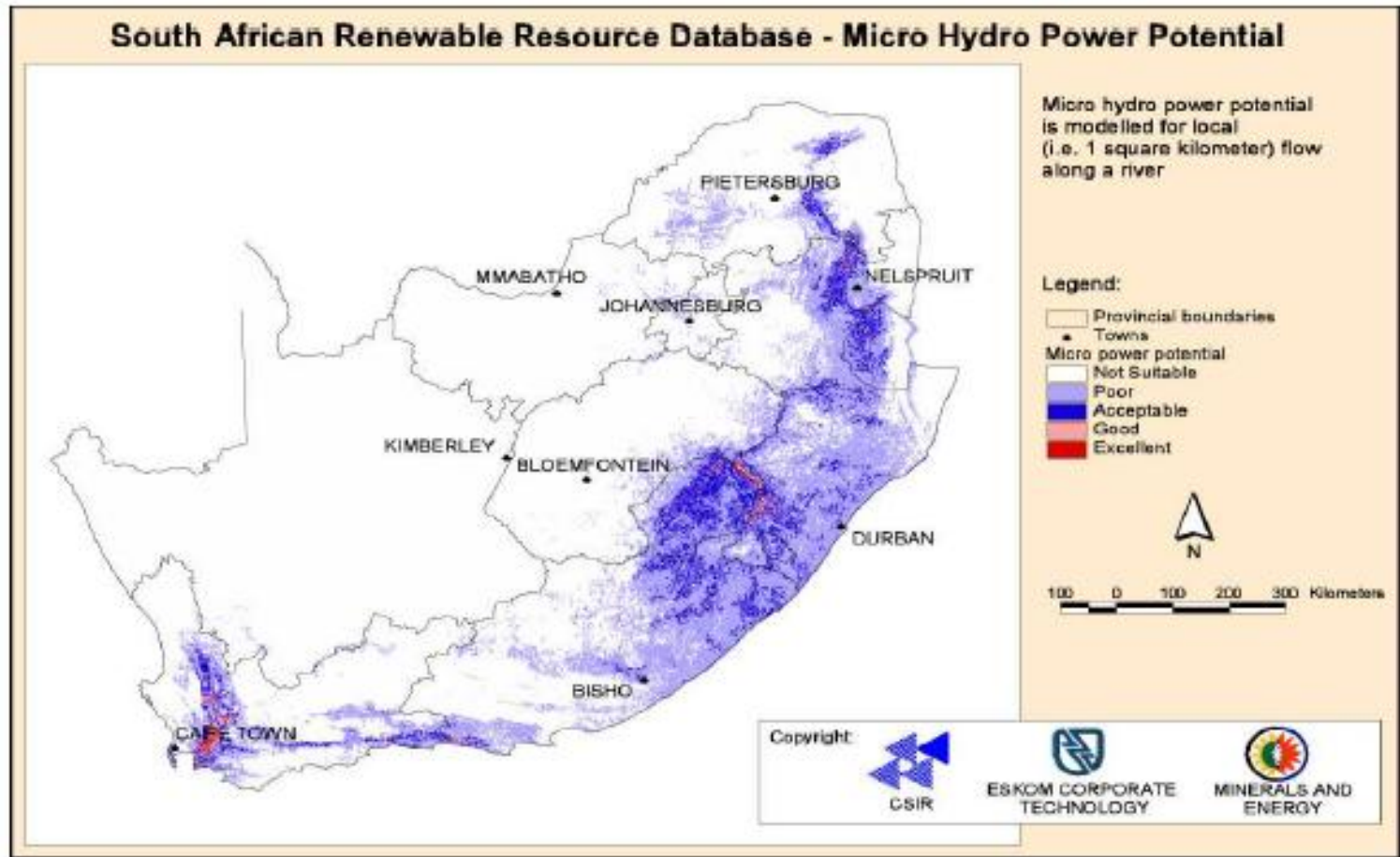
Micro-hydro



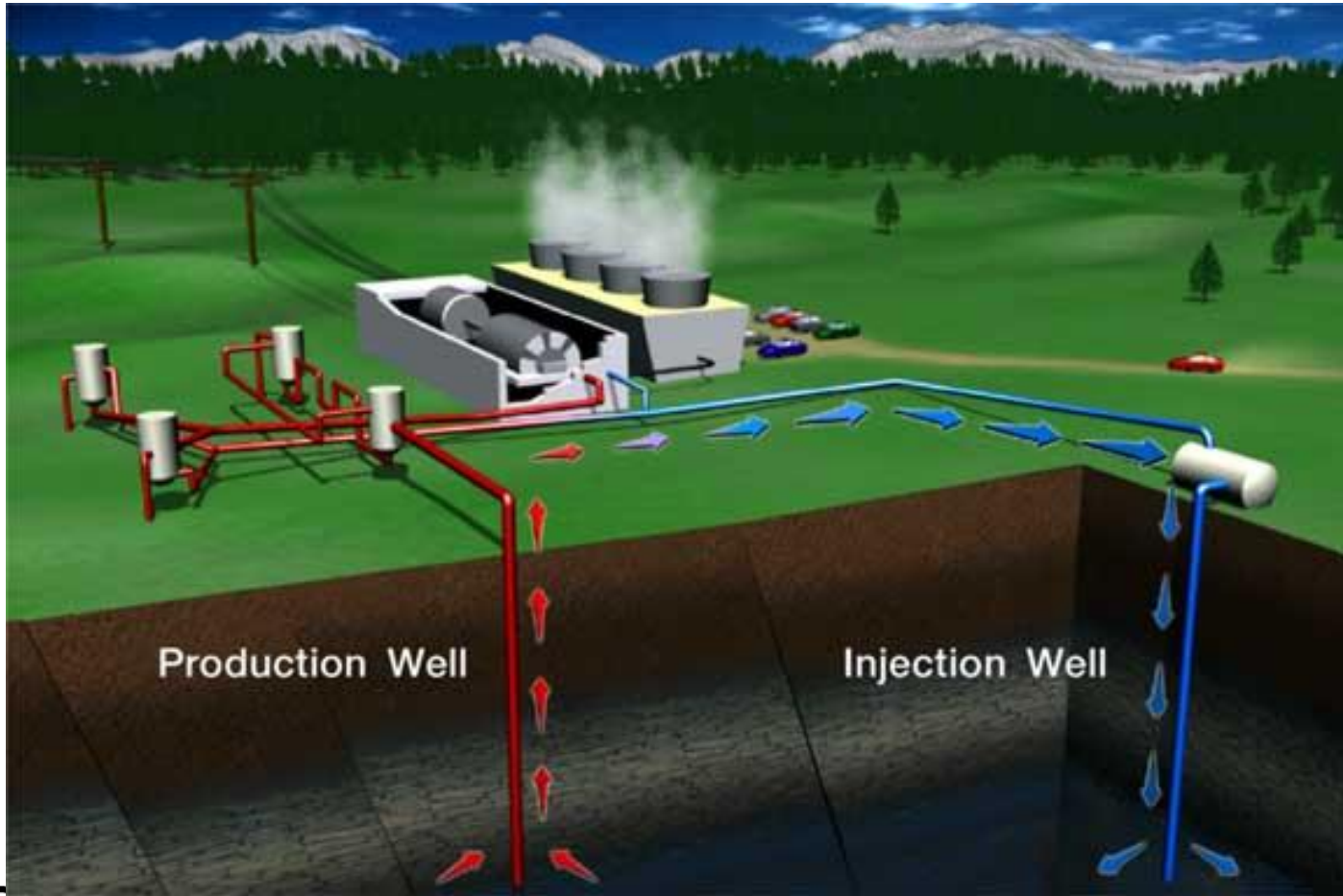
Micro-hydro



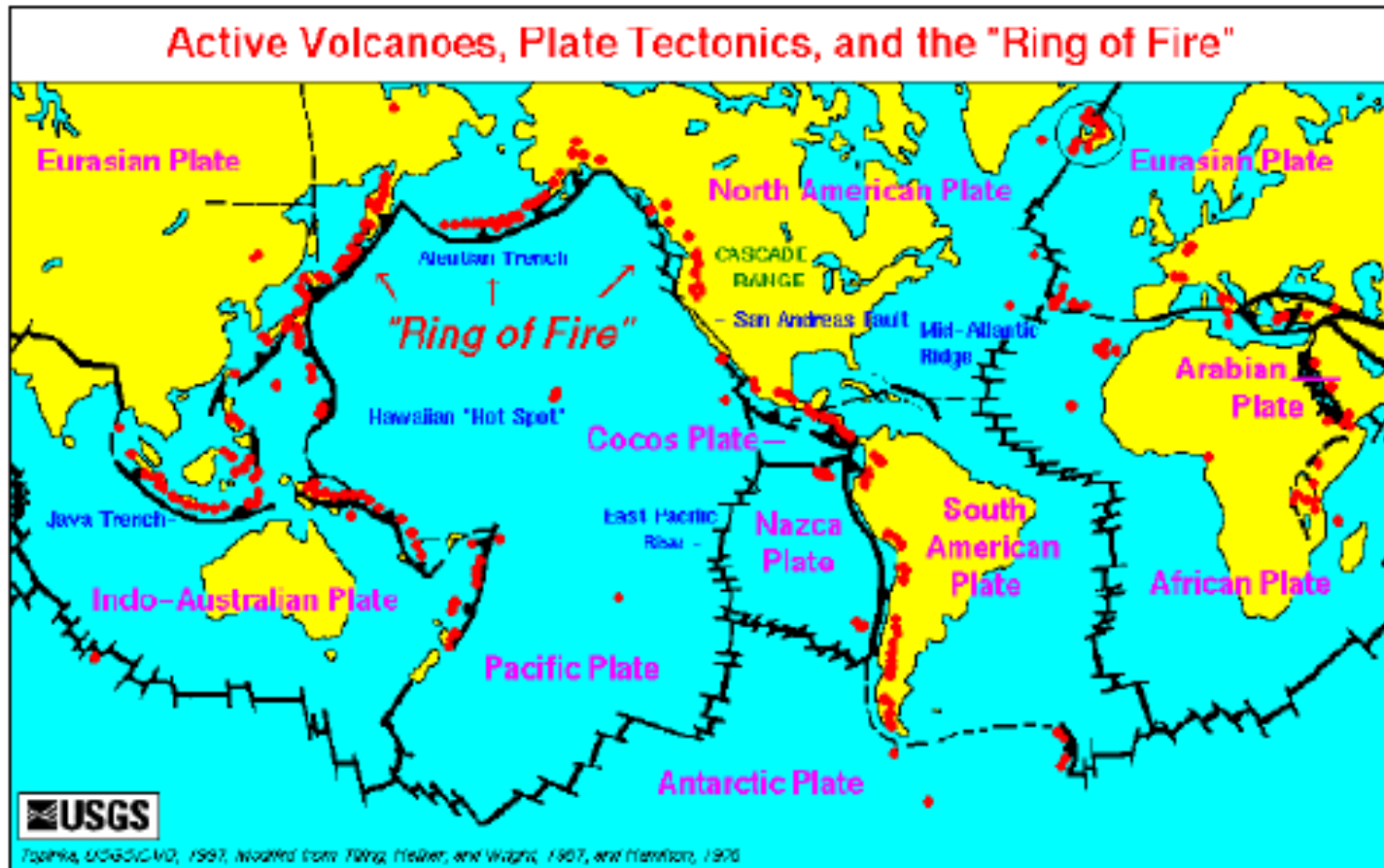
Micro-hydro potential



Geo-thermal Power Station



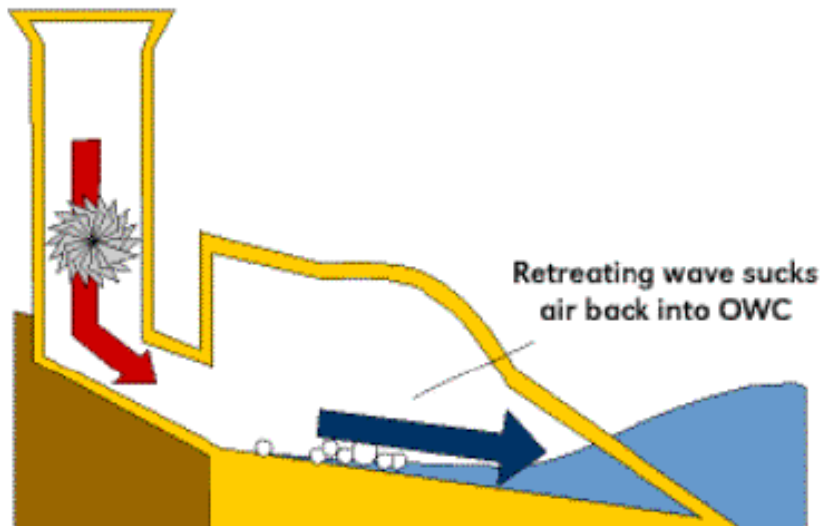
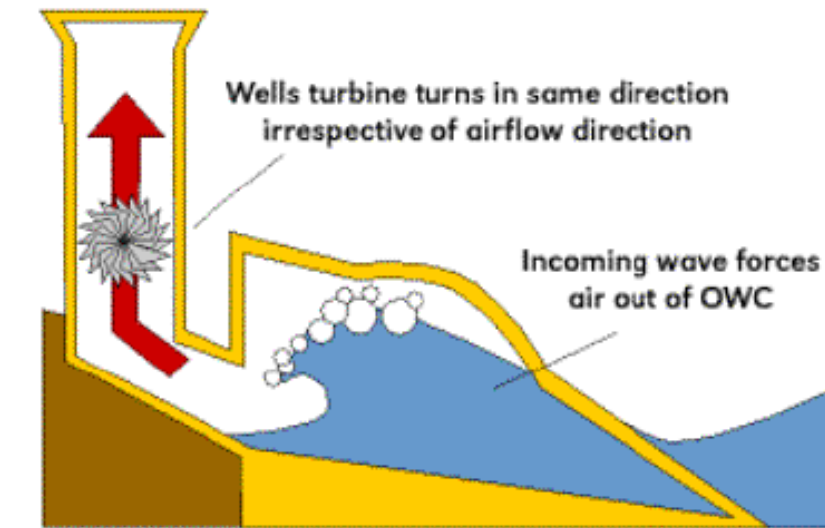
Geo-thermal



Wave



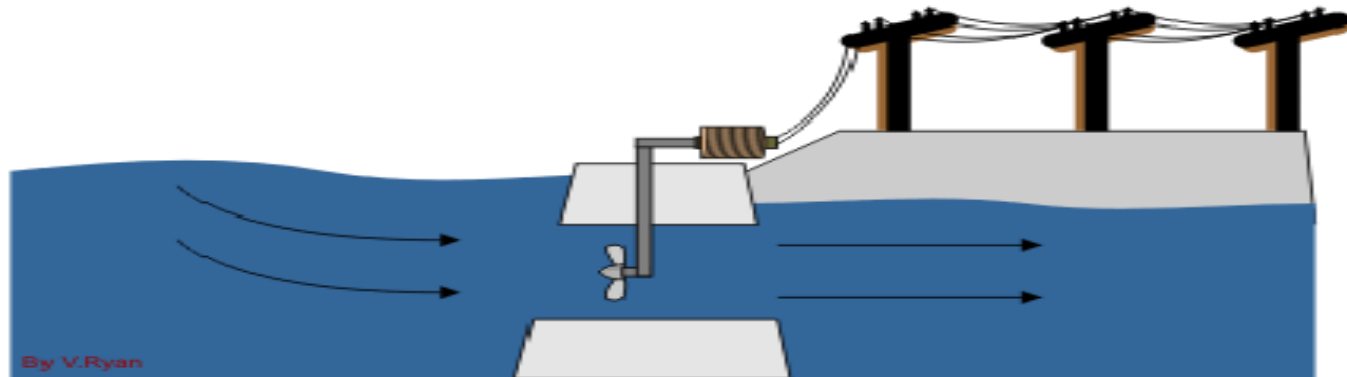
Wave



Wave

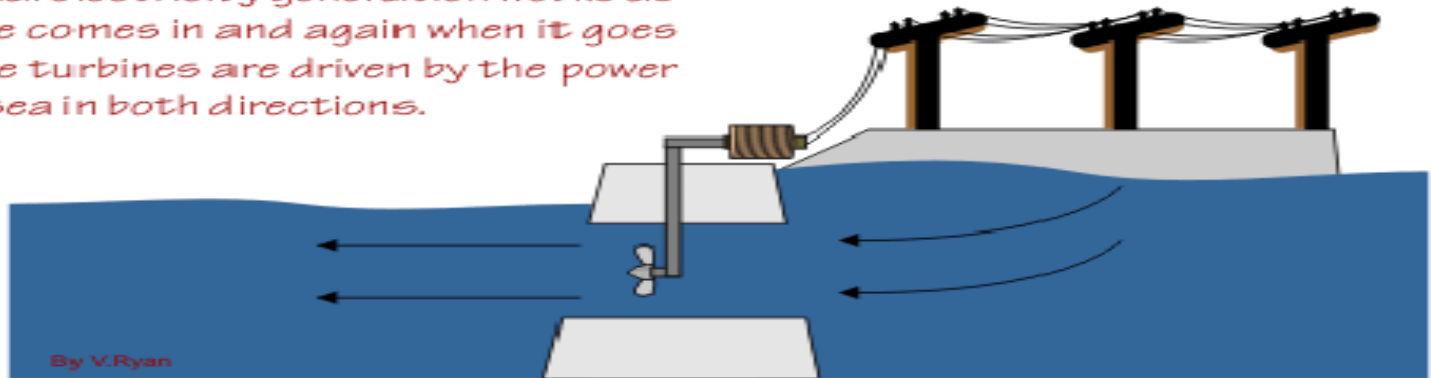


Tidal Power



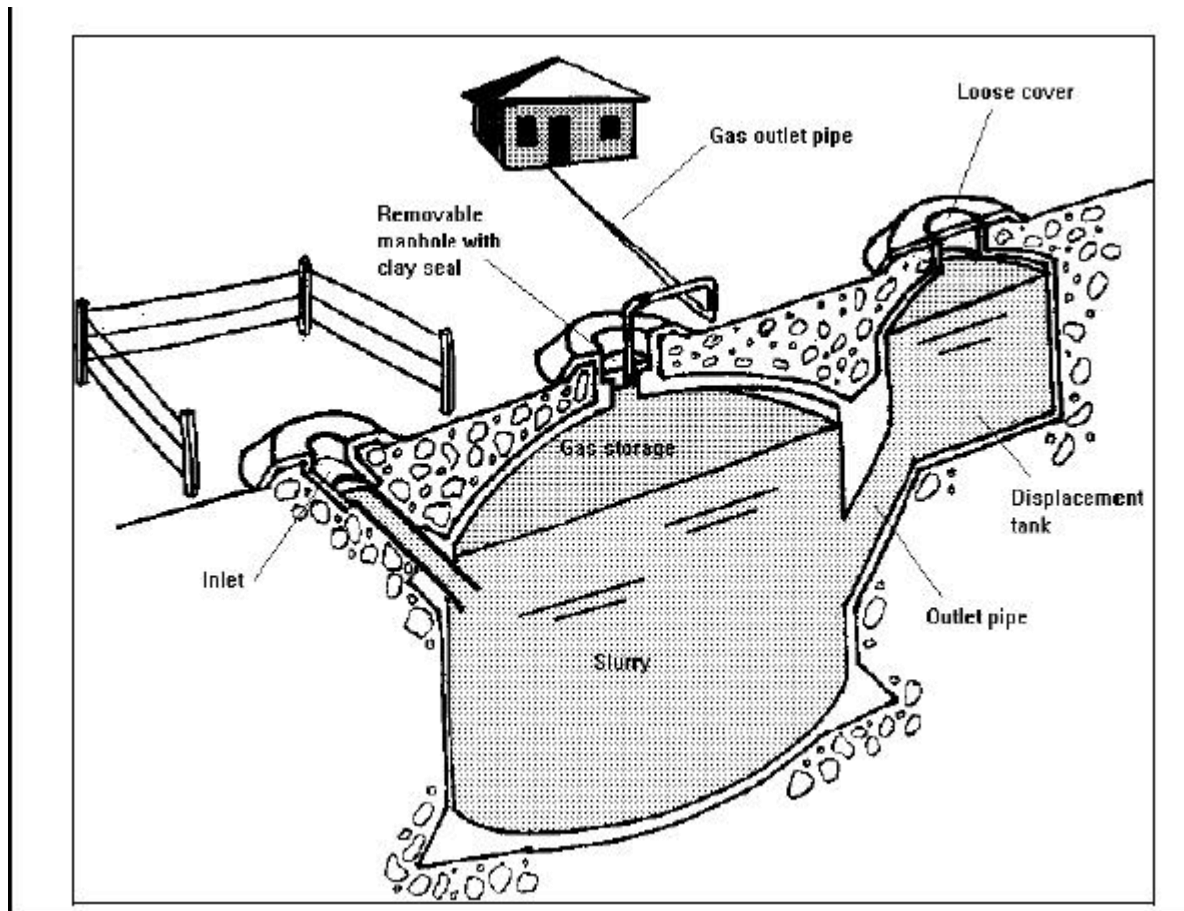
TIDE COMING IN

This tidal electricity generation works as the tide comes in and again when it goes out. The turbines are driven by the power of the sea in both directions.



TIDE GOING OUT

Bio-digestors



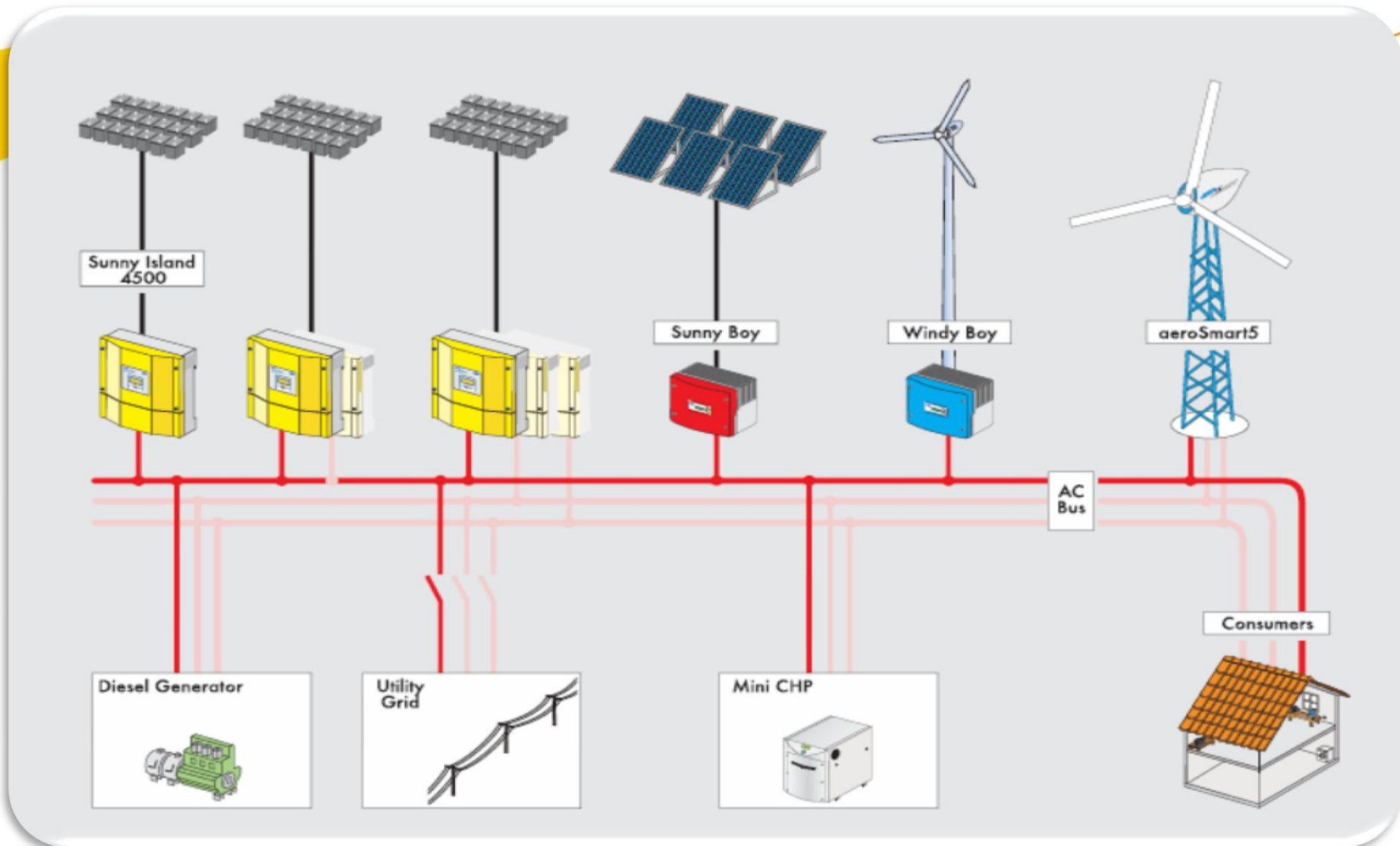
Bio-fuels





Project Example

Complete End-to-End Energy Solutions













DANGER
VERY HIGH VOLTAGE
DO NOT: TOUCH
KEEP AWAY







Solar Water Heaters

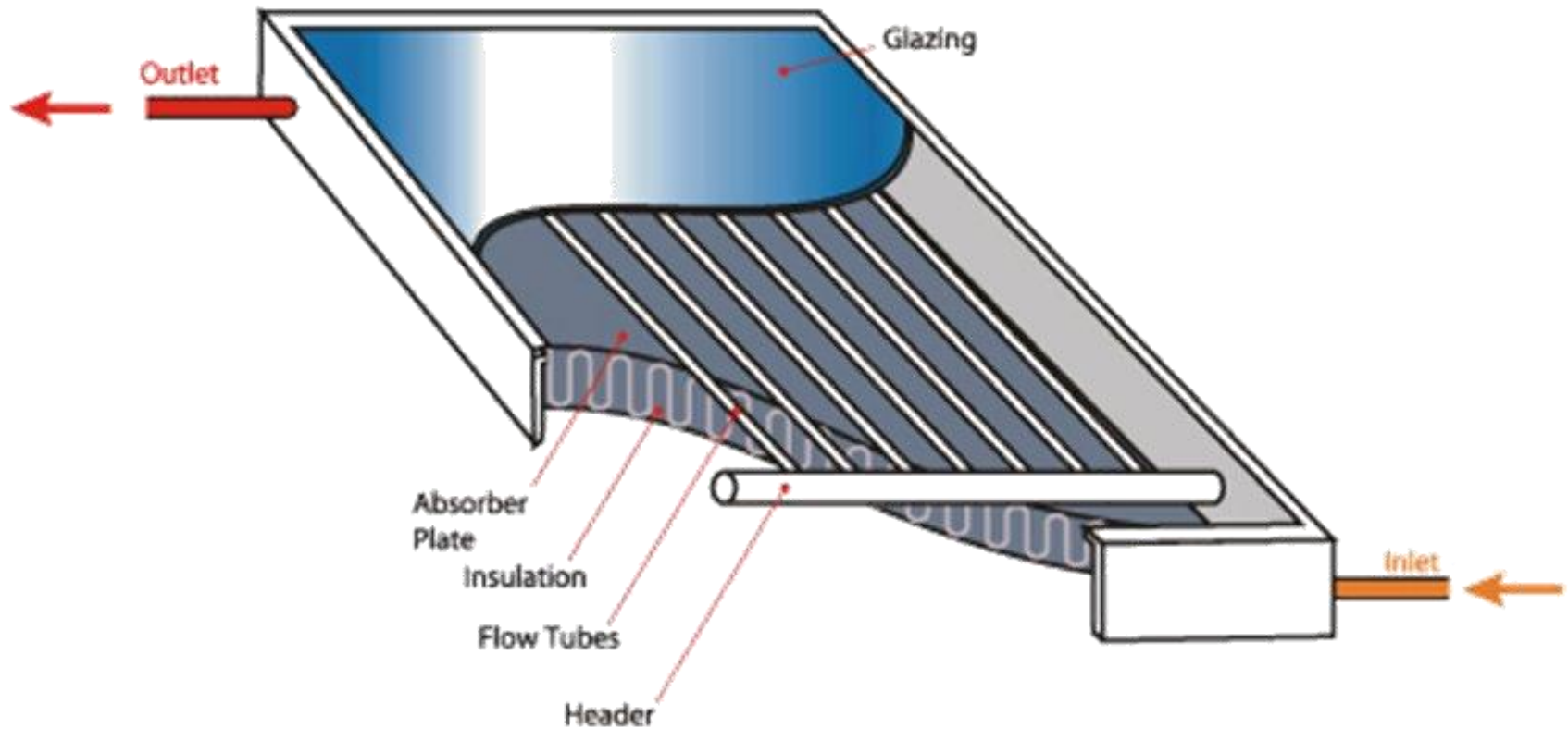


Panels



- Flat plate collectors
- Vacuum tube collectors
 - Vacuum tube-low pressure
 - Vacuum pipe-high pressure
- Swimming pool collectors

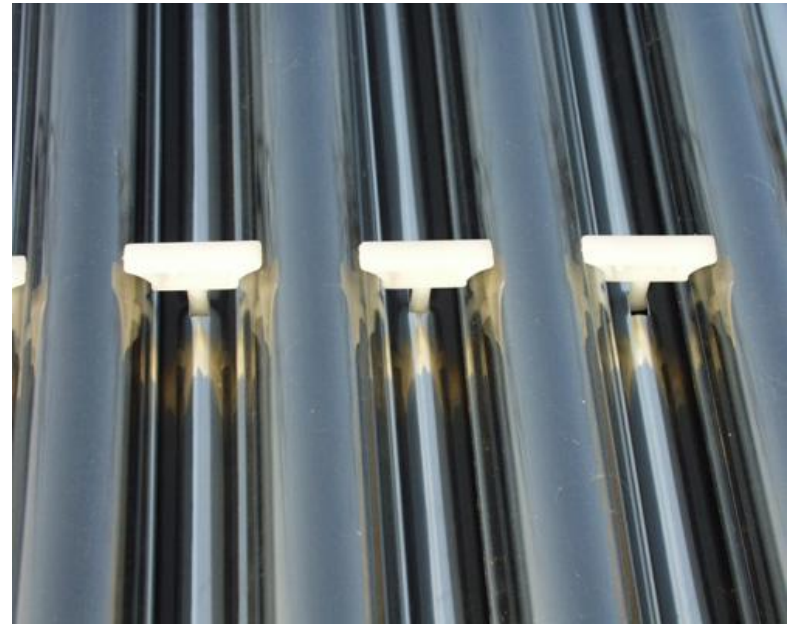
Flat Plate Collectors



Flat Plate Collectors cont.

- Design:
 - Copper fins welded/clamped to copper pipes
- Fins absorb sun's heat -> pipes
- 60-70° C water
- More efficiency than Vacuum Tube

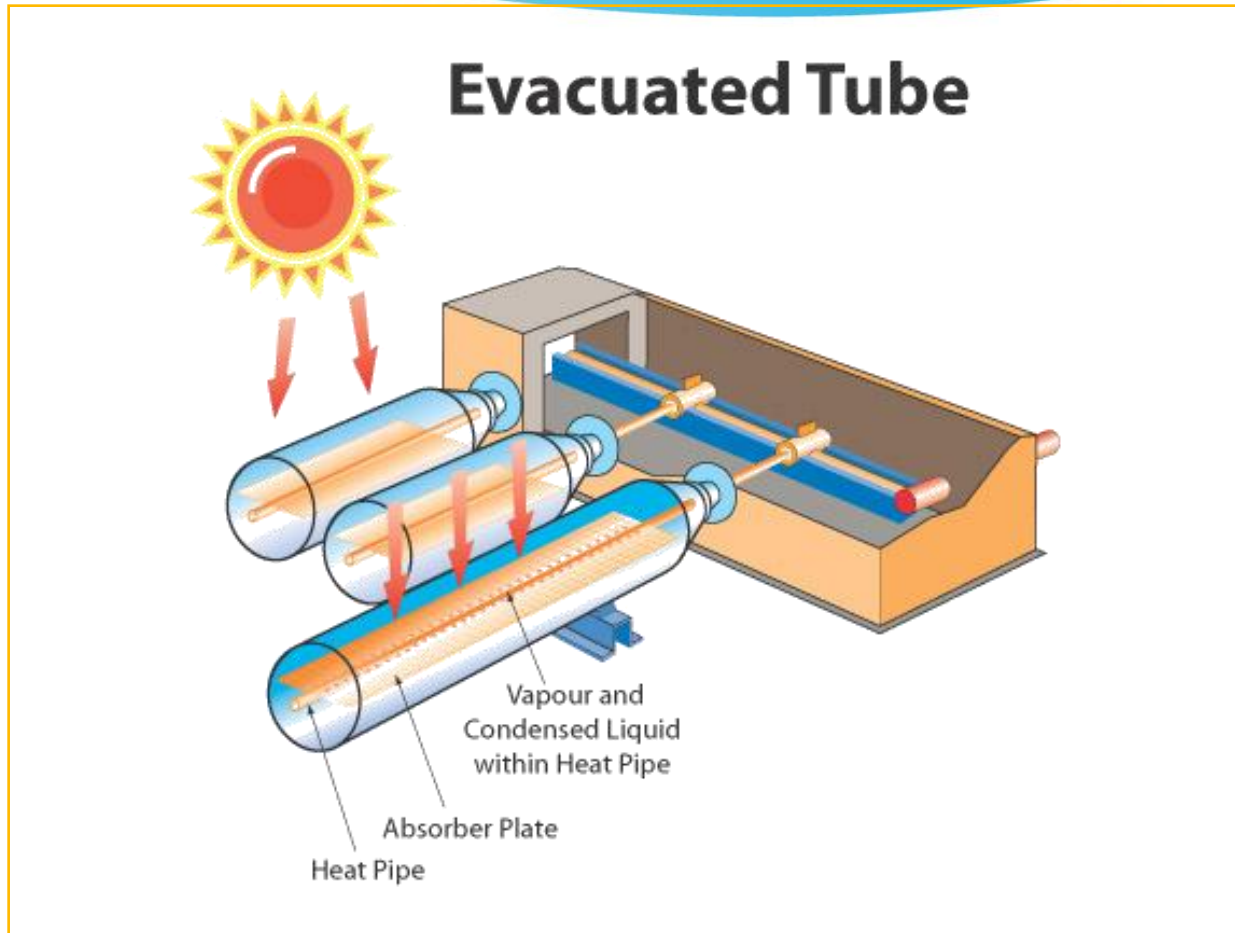
Vacuum Tube



Vacuum Tube cont.

- Low-pressure
 - Two glass tubes, vacuum between
 - Selective coating on inner tube
 - 70-100+° C water
- High pressure
 - Glass tube with vacuum, copper rod inside or heat pipe
 - Heat conducted to manifold at the top
 - 60-80° C water
- Less efficient than Flat-plate

Vacuum Tube cont.





Geysers



- Horizontal – traditional in SA
 - On-roof (close-couple / compact) (insurance discount)
 - In-roof (split)
- Vertical – garage / boiler room
- Direct – no heat-exchanger
- Indirect – heat-exchanger



Residential Configurations



- Direct vs Indirect
- Heat exchangers
- Pumped systems

Direct vs Indirect

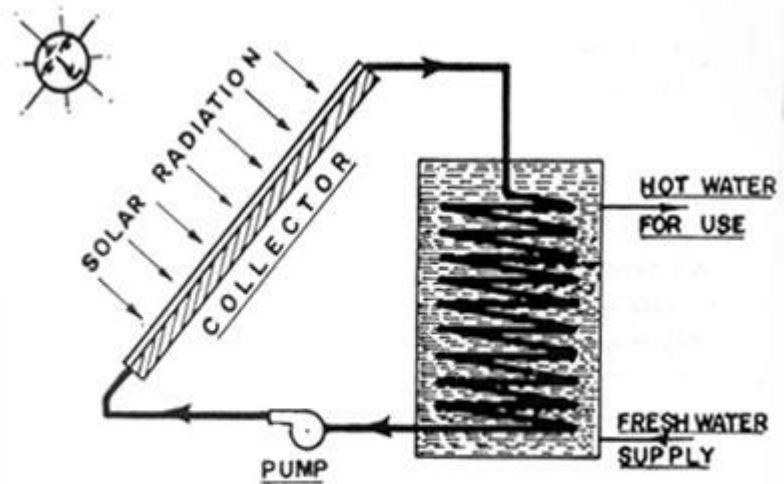
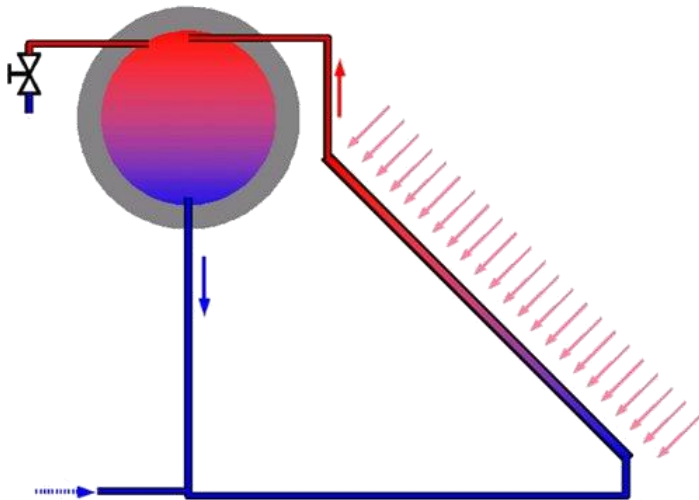
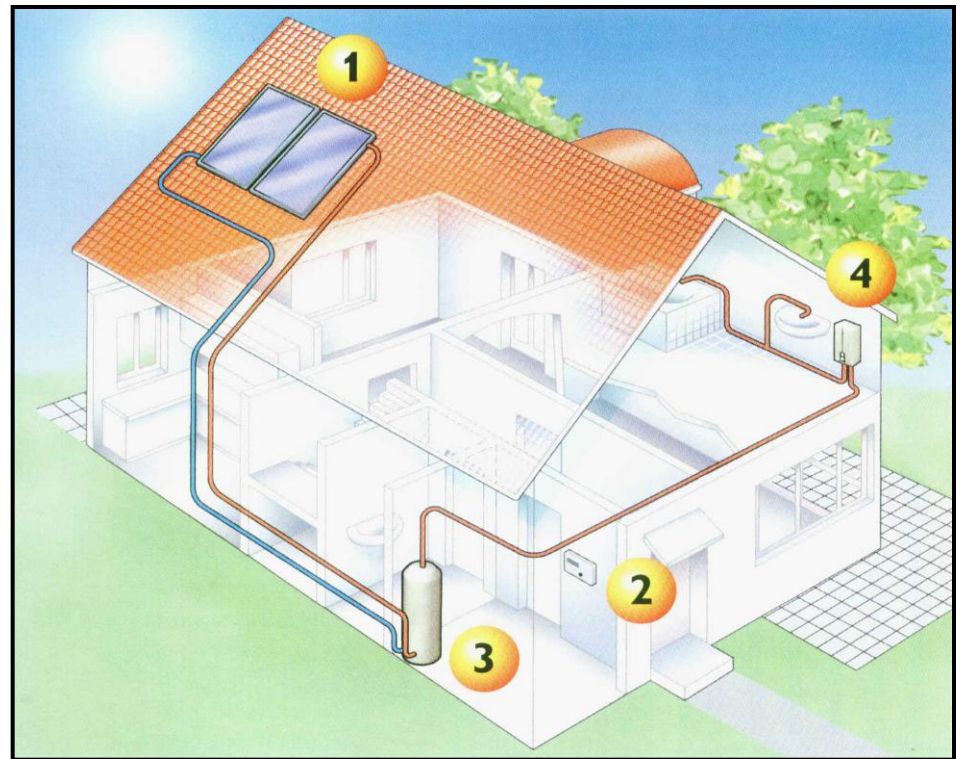


FIG: 3 SOLAR WATER HEATER WITH HEAT EXCHANGER

Pumped Systems

- Electrical pumped
- PV pumped



Thermodynamic Solar Water Heaters (Solar Heat Pumps)

- Works even when cloudy & rainy
- Panels can be painted
- Easy installation
- More savings than SWH with elec backup?





Solar Water Heaters



- When should you do it?

NOW IS THE TIME

- Eskom rebate just gone up, will go down each year.
- www.eskomdsm.co.za



G-TECH
ENERGY

Renewable Energy
Energy Efficiency

www.gtechenergy.co.za



Directors



- Frank Spencer
 - Engineer & Project Manager
 - Extensive Renewable & Sustainable Energy experience
- Jonty Rhodes
 - Retired international cricket player
- Malcolm Rutherford
 - Previously CFO of a large South Africa IT company
 - Director of numerous other companies
- Jeff Beer
 - Leading Magistrate (UK), Agriculturalist and Entrepreneur
 - Awarded the Order of the British Empire (OBE) in 2005

Key Partners



- Wind
 - Proven Energy (UK)
- Solar
 - SHARP Photovoltaics (UAE)
 - Energie Thermodynaic SWH (Portugal)
- Other
 - Sortech absorption chiller (Germany)
 - NRG wind assessment equipment (USA)
 - Graffo Towers (SA)
- Professional
 - Watermarc Engineers (SA)
 - 3E (Belgium)
 - DHK Urban Concepts (SA)





Thank you

Questions?

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