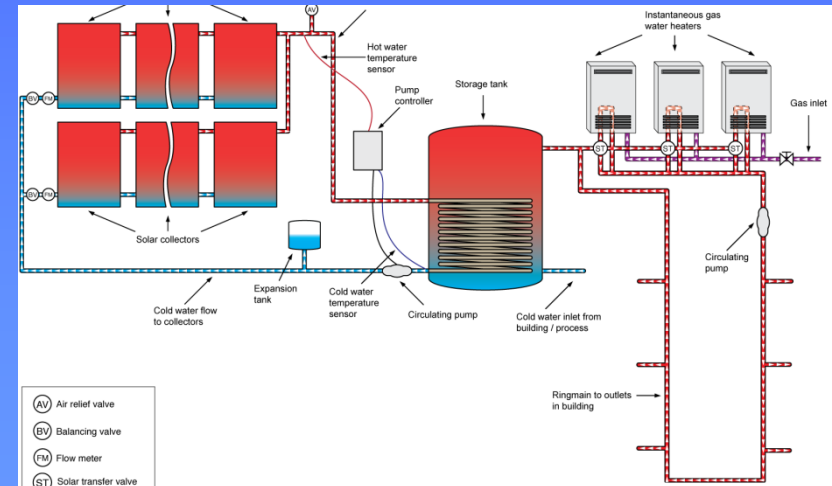


Deployment Challenges for Renewable Energy Water Heating in Australia

Graham Morrison

Em Professor, University of New South Wales

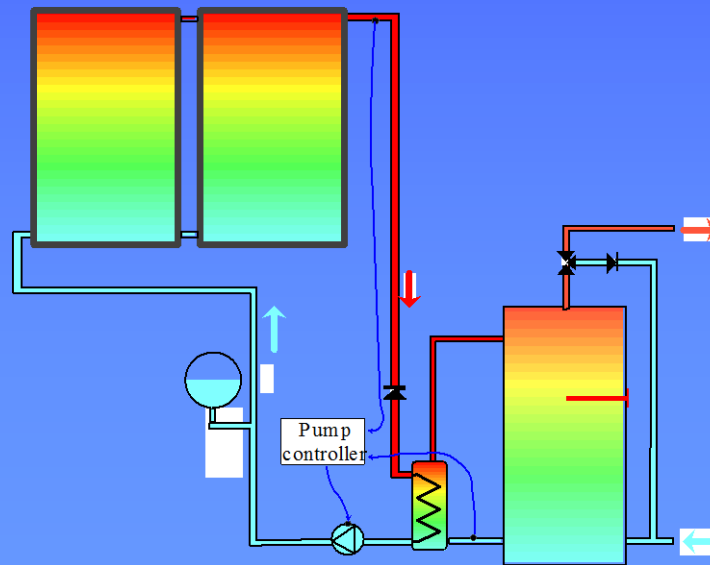
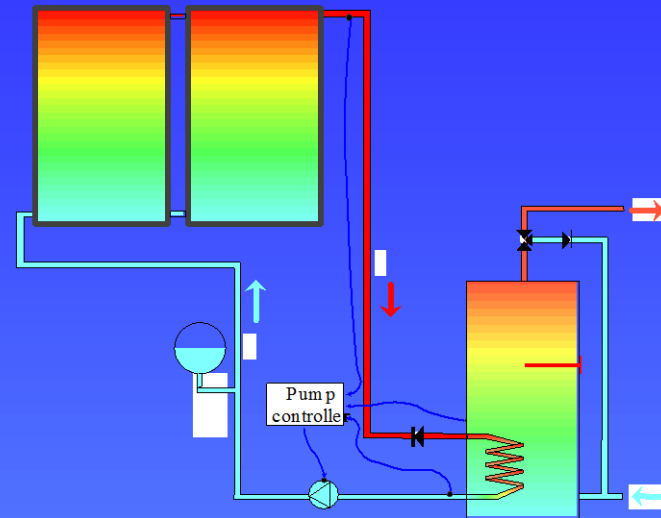
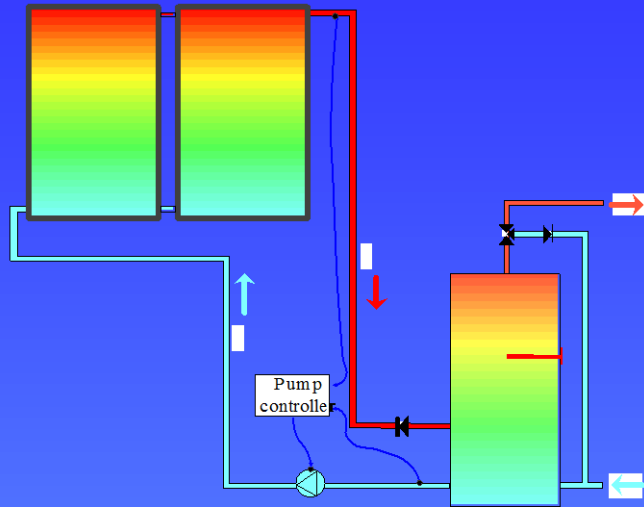
Thermal Design pty ltd



THERMOSYPHON SOLAR WATER HEATER



PUMPED CIRCULATION SWH



EVACUATED TUBE SOLAR WATER HEATER



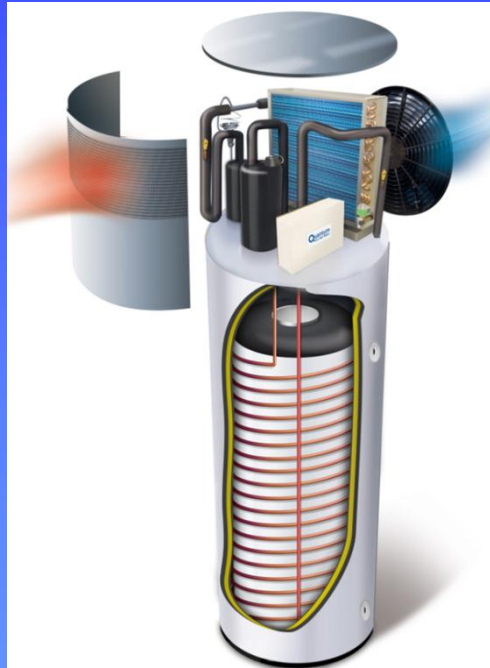
PLASTIC MOULDED INTEGRAL SOLAR WATER HEATER



HEAT PUMP WATER HEATERS



Solar boosted



Air source



Promoting Deployment of Renewable Energy in Australia

-technology improvements
-capital cost offset

- Renewable Energy Certificates

(now Small technology certificates)

1 MWh (displaced) = 1 certificate = \$40 (has been \$15 to \$50)

Performance based rating assessment.

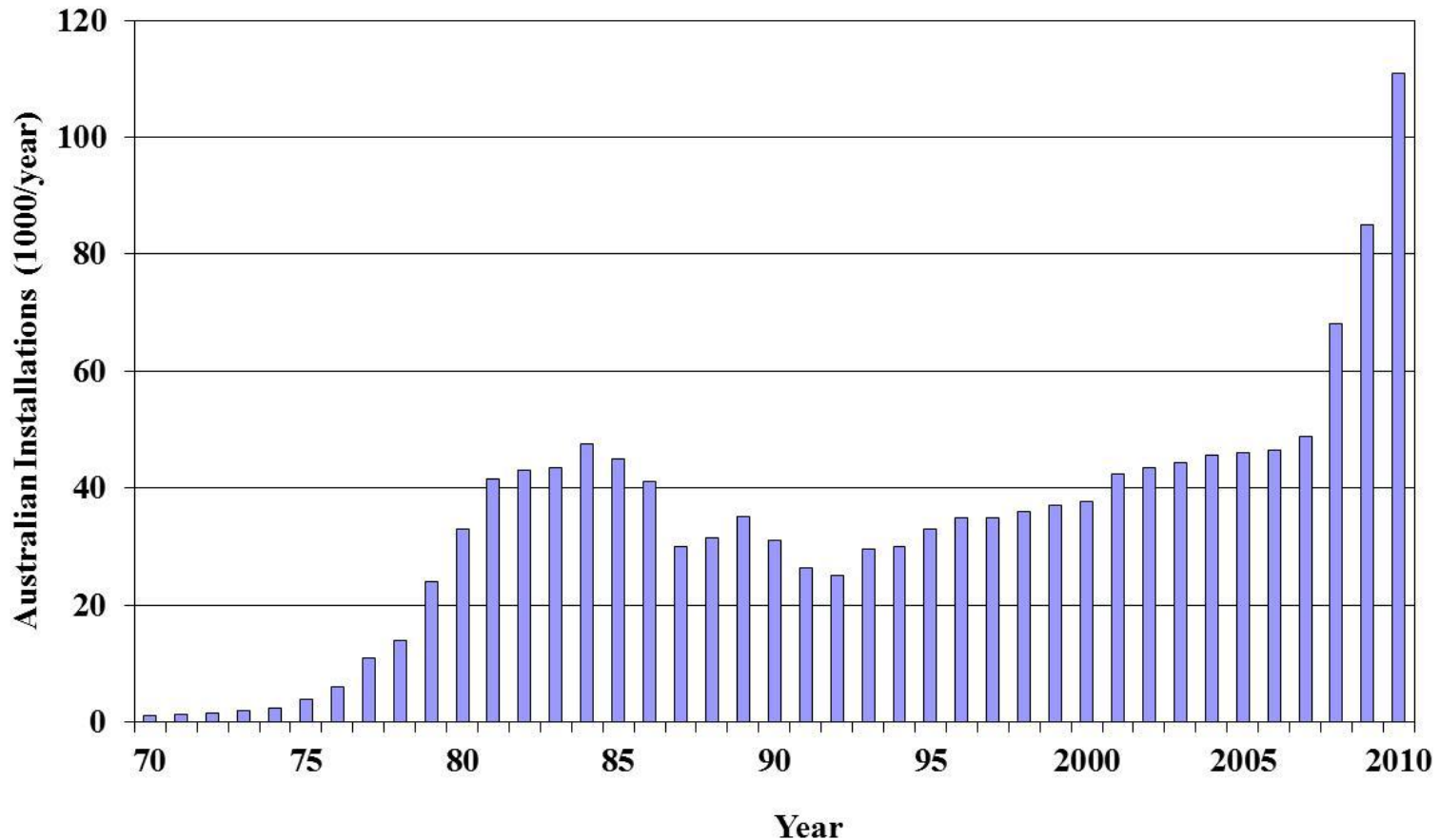
- Federal & State government support up to \$1000

Minimum performance for entry, but most subsidies not related to performance.

ENERGY CONSERVATION AND SOLAR ENERGY SUPPORT SCHEMES IN AUSTRALIA

- Roof insulation scheme \$50 to \$100/t CO₂
- PV renewable energy certificate multiplier
4 free certificates = \$160/t CO₂
- PV feed-in tariffs
40c/kWh bonus = \$400/t CO₂
- Solar water heater STC
\$40/t CO₂
- Solar water heater subsidy state governments ?

Solar & Heat Pump Domestic Water Heating Systems Installed in Australia



Data smoothing due to two year registration period for REC

BOOM-BUST CYCLE AVOIDED FOR SWHs

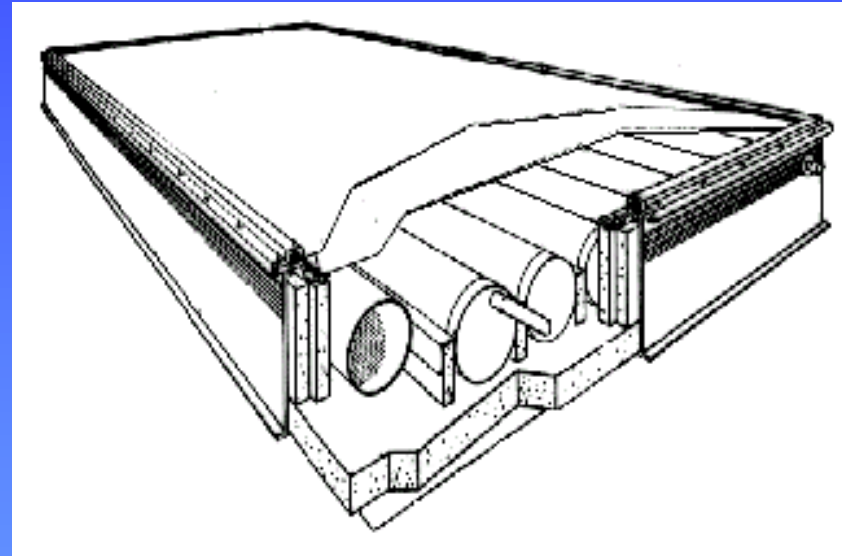
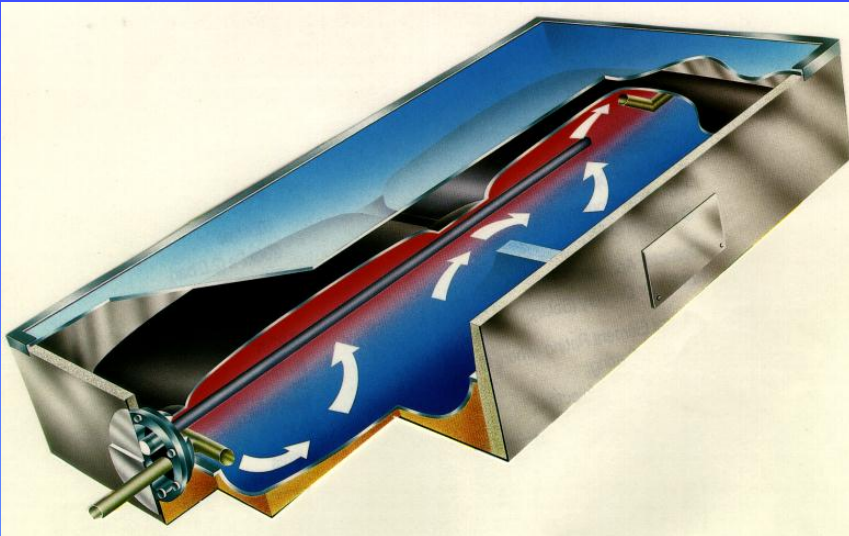
(but not for heat pumps)!

- **Well established standards**
Keeps junk products out of the STC scheme and hence minimises consumer complaints (but a lot of manufacturer complaints!).
- **Technology transfer to manufacturers**
Manufacturers rate their products using approved software package.

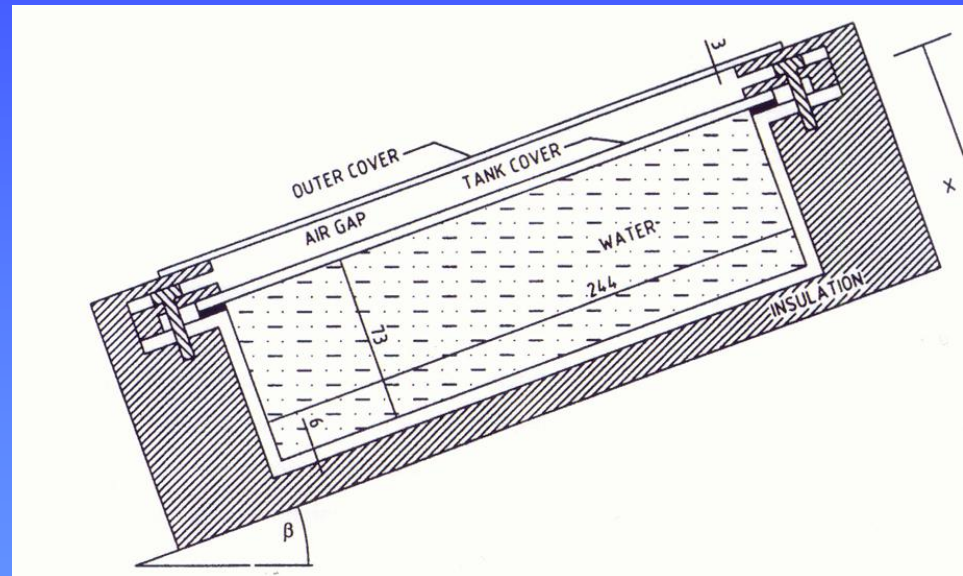
SOLAR WATER HEATER STANDARDS

- Australia has been a leader in the development of standards for product quality and performance rating.
- Australian standards have been adopted as the basis of International Standards.
- Integrity of STC scheme for solar water heaters is based on qualification to AS/NZS 2712 and performance is rated using AS/NZS 4234.

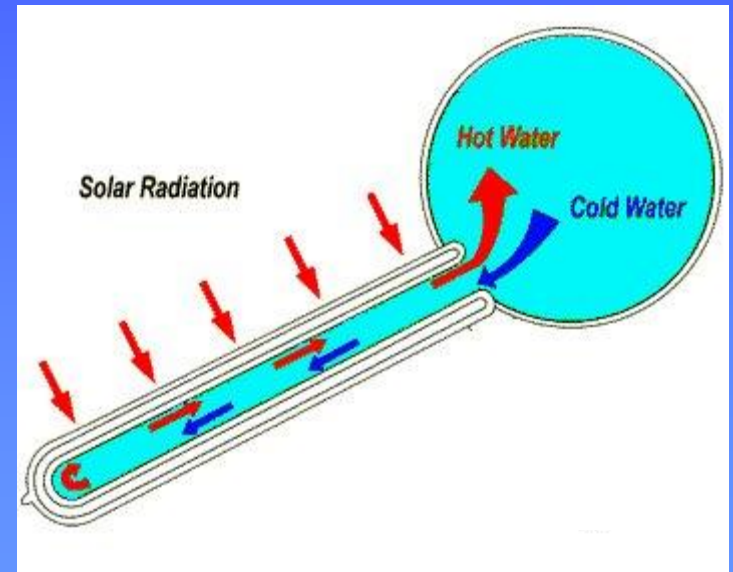
INTEGRAL TANK-COLLECTOR SYSTEMS



INTEGRAL SOLAR WATER HEATER



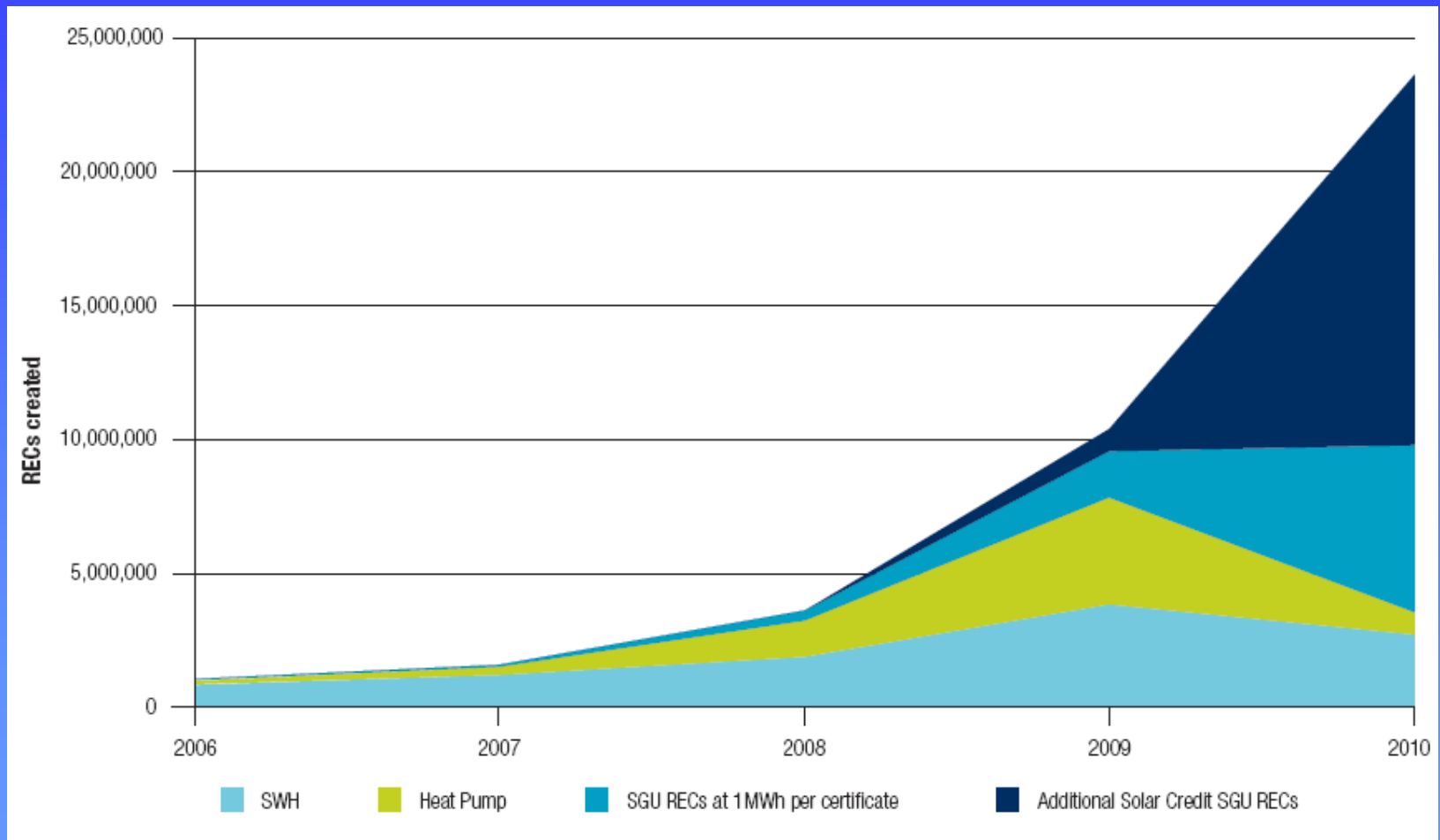
FLOODED-TUBE EVACUATED SOLAR WATER HEATER



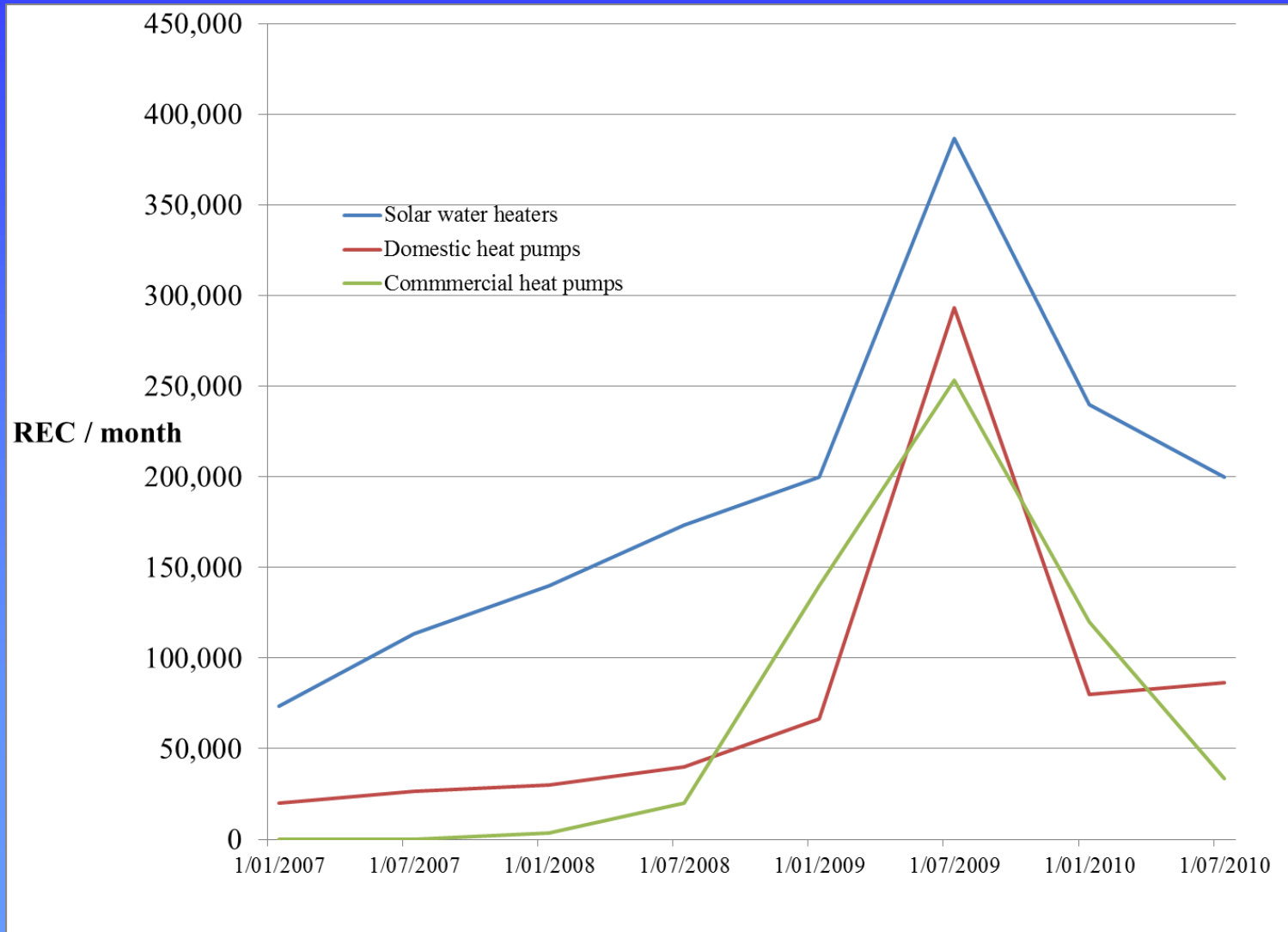
SOLAR WATER HEATER STC RATING SCHEME

- Manufacturers rate their products using measured component characteristics and annual performance modelling software (TRNSYS).
- Sample of manufacturers performance claims are audited.
- Major benefit of this process has been the transfer of product design and performance assessment technology to manufacturers. This has resulted in significant improvement in product performance.

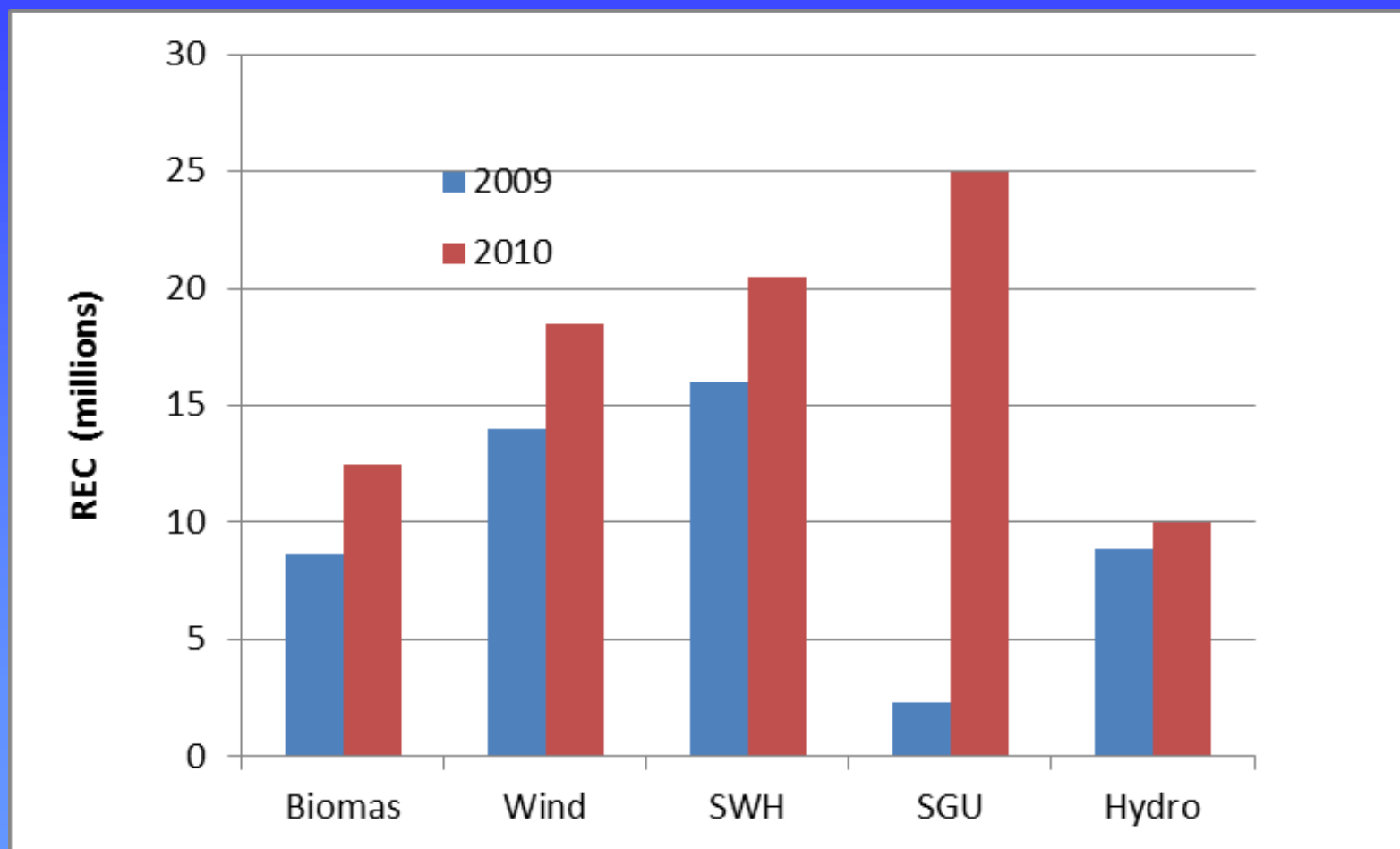
RECs created by SWH and SGU



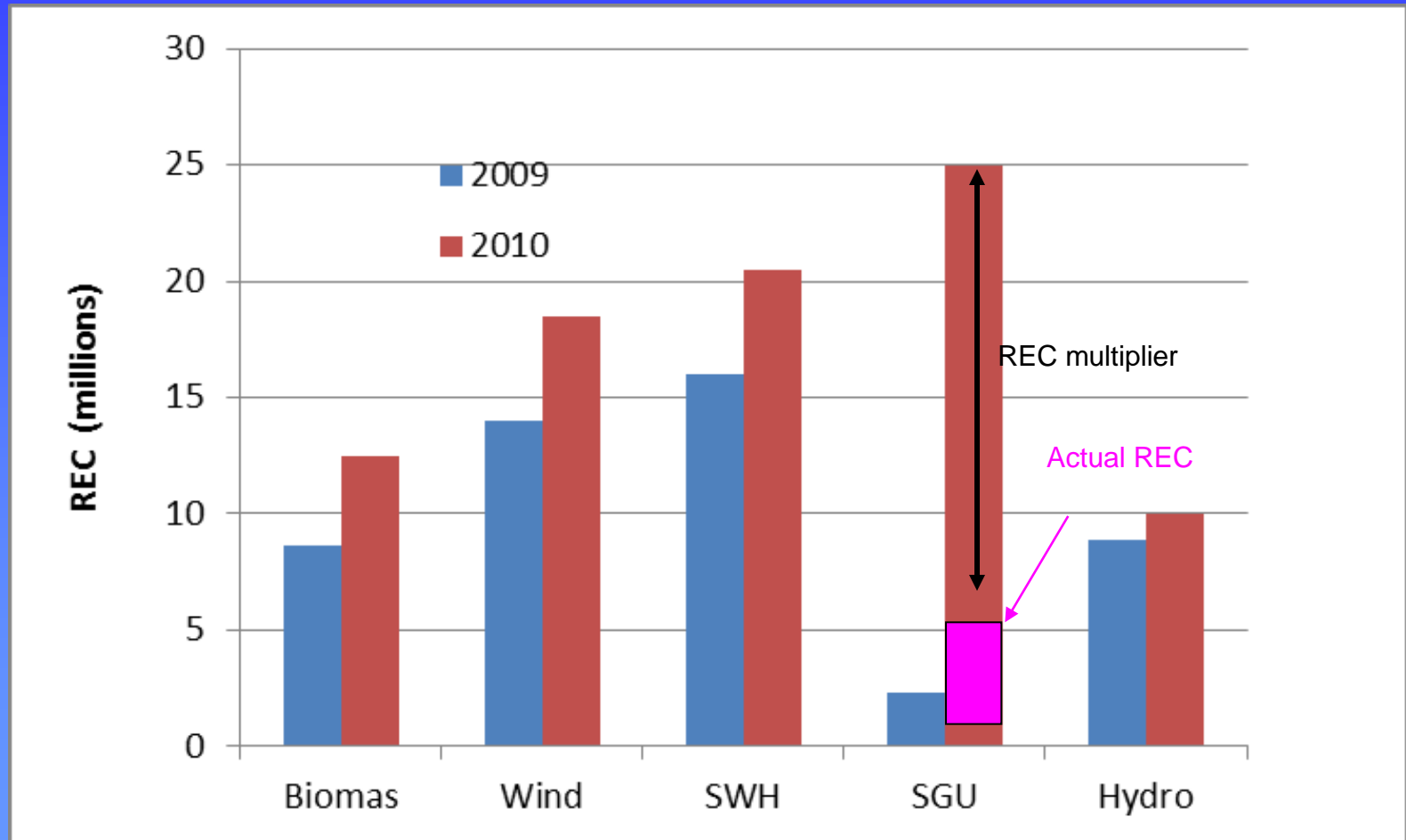
REC by water heater type



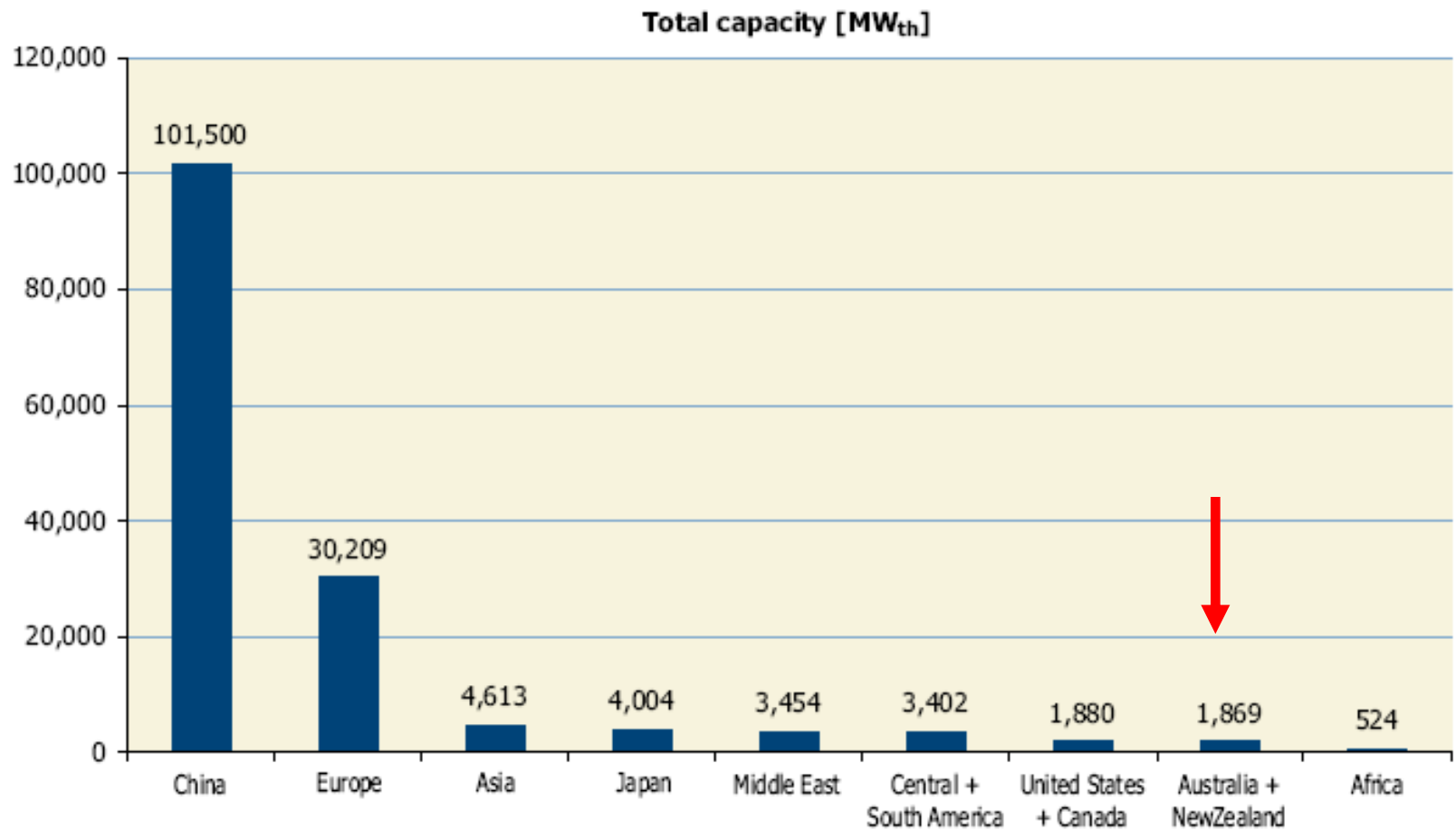
Cumulative RECs by energy source



Cumulative REC by energy source



TOTAL CAPACITY OF SOLAR WATER HEATERS 2009



Africa :
Asia :
Central + South America:

Namibia, South Africa, Tunisia, Zimbabwe
India, South Korea, Taiwan, Thailand

Barbados, Brazil, Chile, Mexico, Uruguay

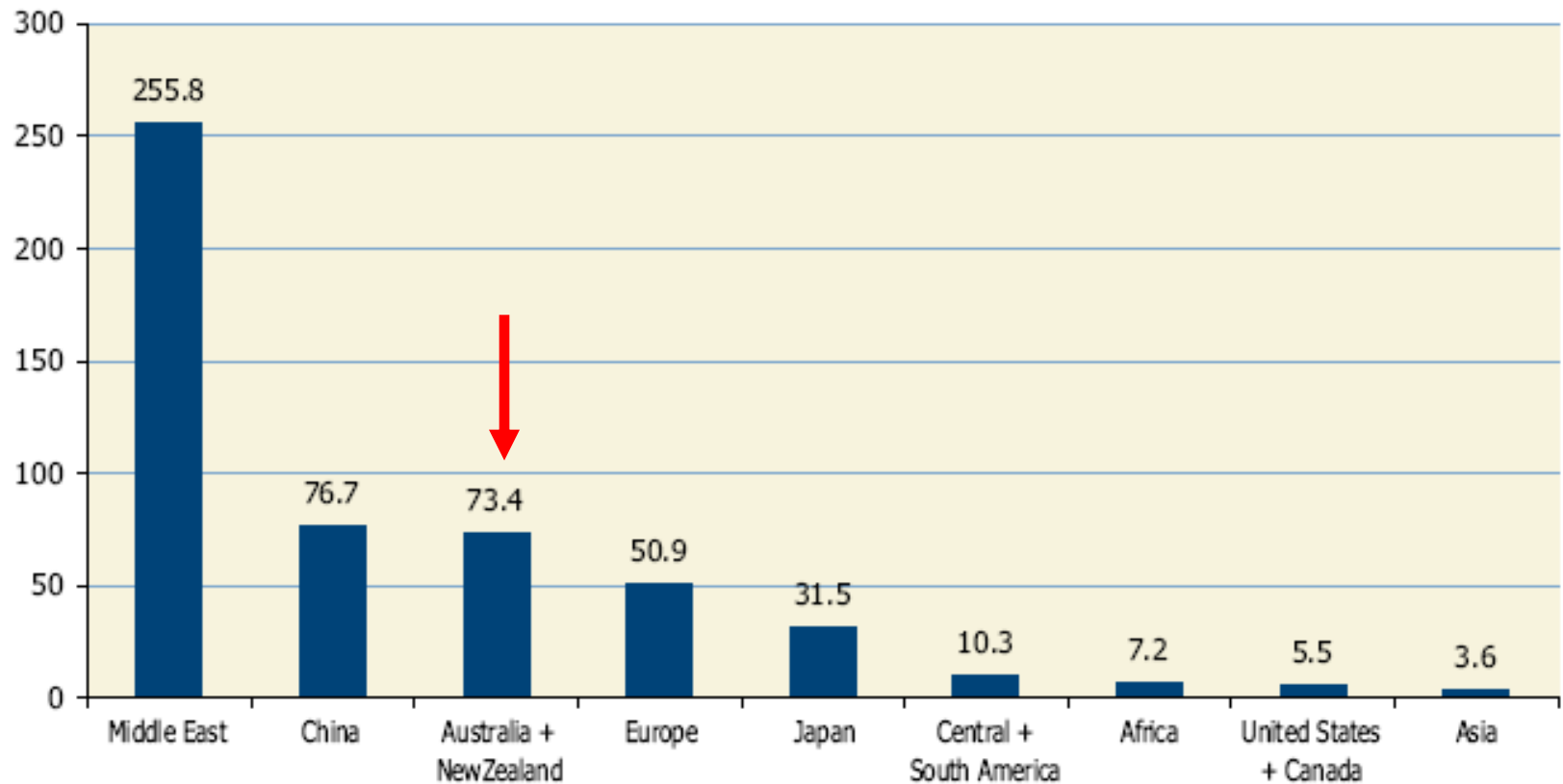
Europe:

EU 27, Albania, Former Yugoslav Republic of Macedonia, Norway, Switzerland, Turkey
Israel, Jordan

Middle East:

CAPACITY PER 1000 INHABITANTS

(kWh_{thermal}/1000 inhabitants) 2009



Africa: Namibia, South Africa, Tunisia, Zimbabwe

Asia: India, South Korea, Taiwan, Thailand

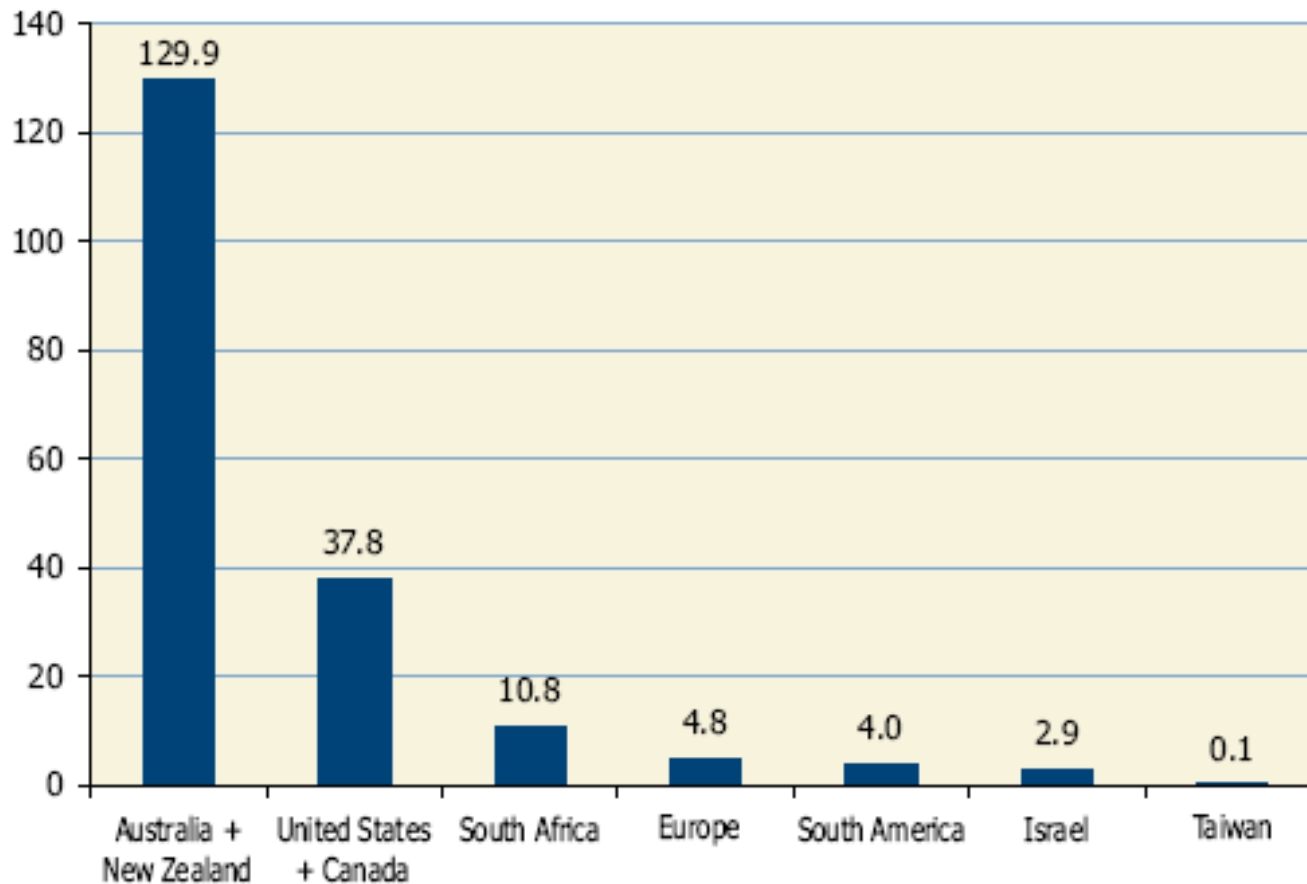
Central + South America: Barbados, Brazil, Chile, Mexico, Uruguay

Europe: EU 27, Albania, Former Yugoslav Republic of Macedonia, Norway, Switzerland, Turkey

Middle East: Israel, Jordan

UNGLAZED SOLAR WATER HEATING CAPACITY

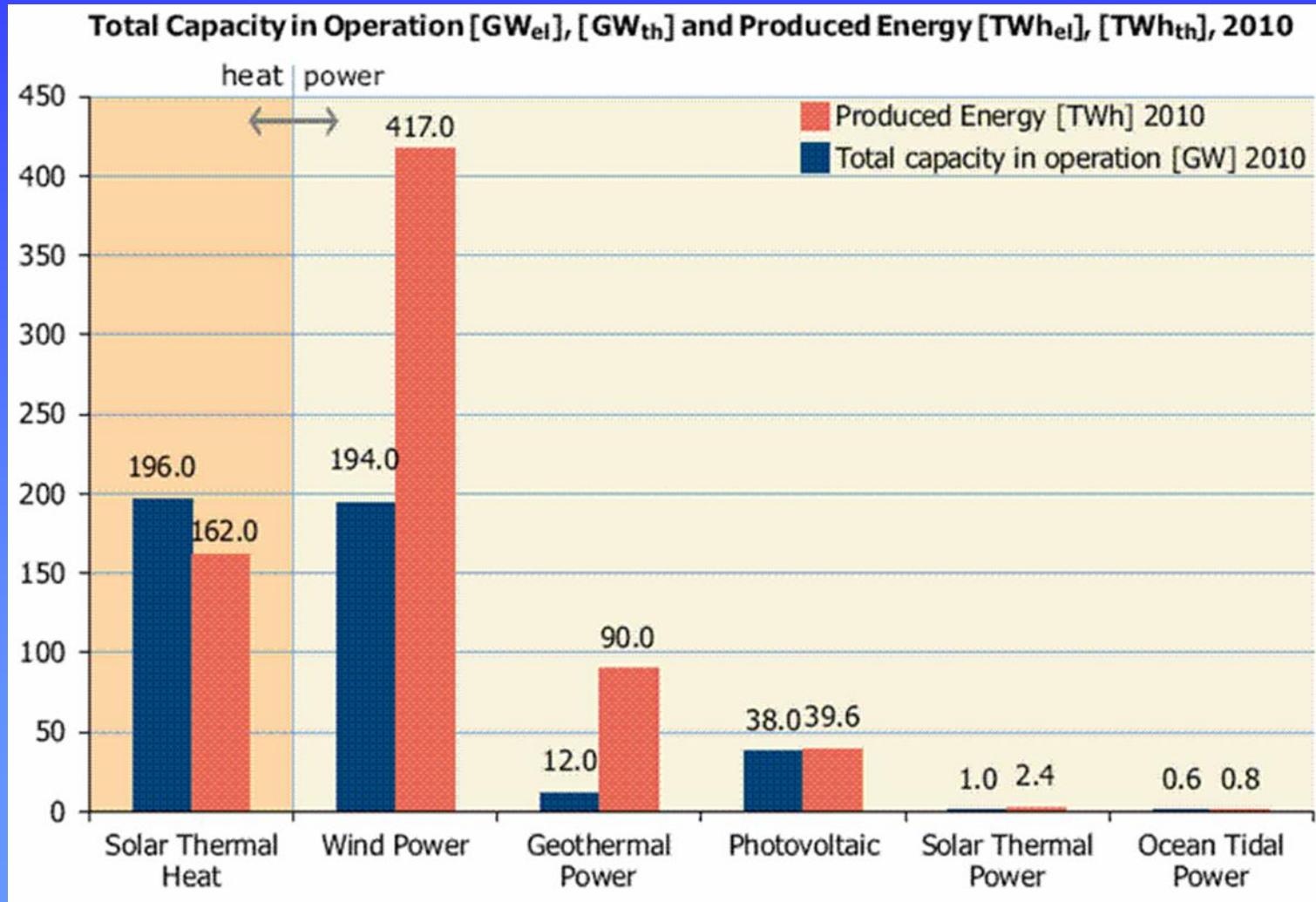
(kWh/ 1000 INHABITANTS)



Europe: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland

South America: Brazil, Chile, Mexico

CURRENT IMPLIMENTED CAPACITY AND ENERGY PRODUCED



CONCLUSIONS

- Solar water heater deployment has been successful because it has avoided excessive boom/bust cycles.
- Base support on product specific ratings and not generic technology promotion.
- Including manufacturers in product rating process leads to competition on the basis of product performance and hence good design and product innovation.
- Successful implementation and continuous growth of renewable energy water heating in Australia relative to other countries.

FUTURE DEPLOYMENT CHALLENGES

- Improved auditing process for standards compliance
- Supporting growing number of product suppliers
- Improved installation practices
- Technology improvements

REC created by water heater type

