

Solar hot water options

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EnergyAE

Enabling innovation for sustainable future

Research and Development

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Project development & implementation

Solar thermal / PV

Storage

Building energy

Heat pumps

Numerical Modelling

System Design

Project Management

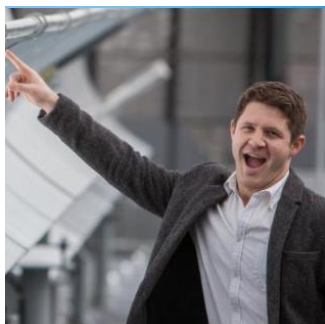
Technical advisory

EnergyAE

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Australian Distributor for TRNSYS software www.trnsys.com

Training in TRNSYS: <https://learn.trnsys.guru/>



Overview

Why is it important?

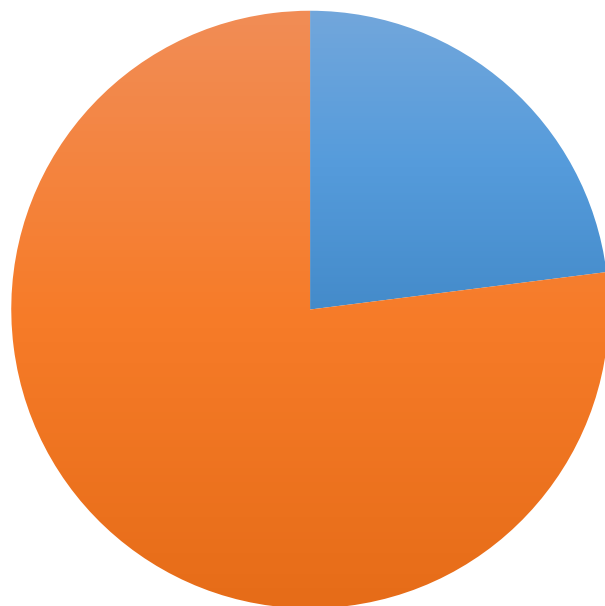
Options?

What do they save and cost you and the earth?

New Innovation?

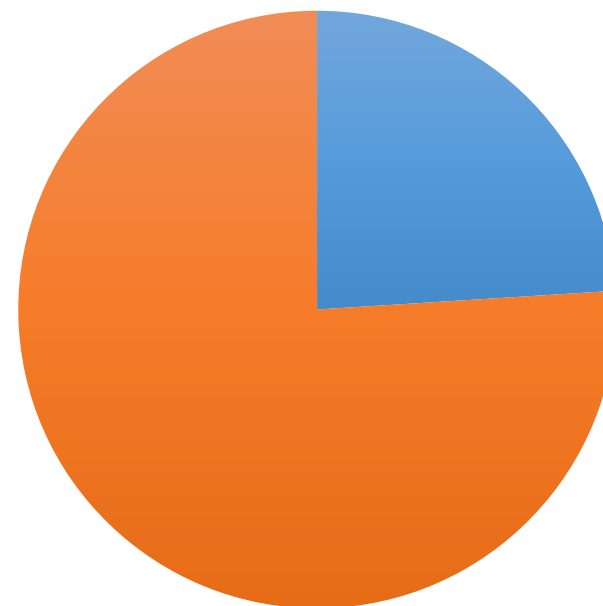
Energy and GHG emissions of hot water

23% of household energy Use



■ Hot Water ■ Other

24% of household GHG



■ Hot Water ■ Other

Australia

<http://www.abs.gov.au/ausstats/abs@.nsf/Products/9C96AA9AEAA1E416CA25774A0013BE79>

Creating hot water uses a lot of energy

A 10 minute shower is equivalent to running a 15W light for a week

Emissions come from:

- Indirectly from consumption electricity generated from coal
- Directly from combustion of gas

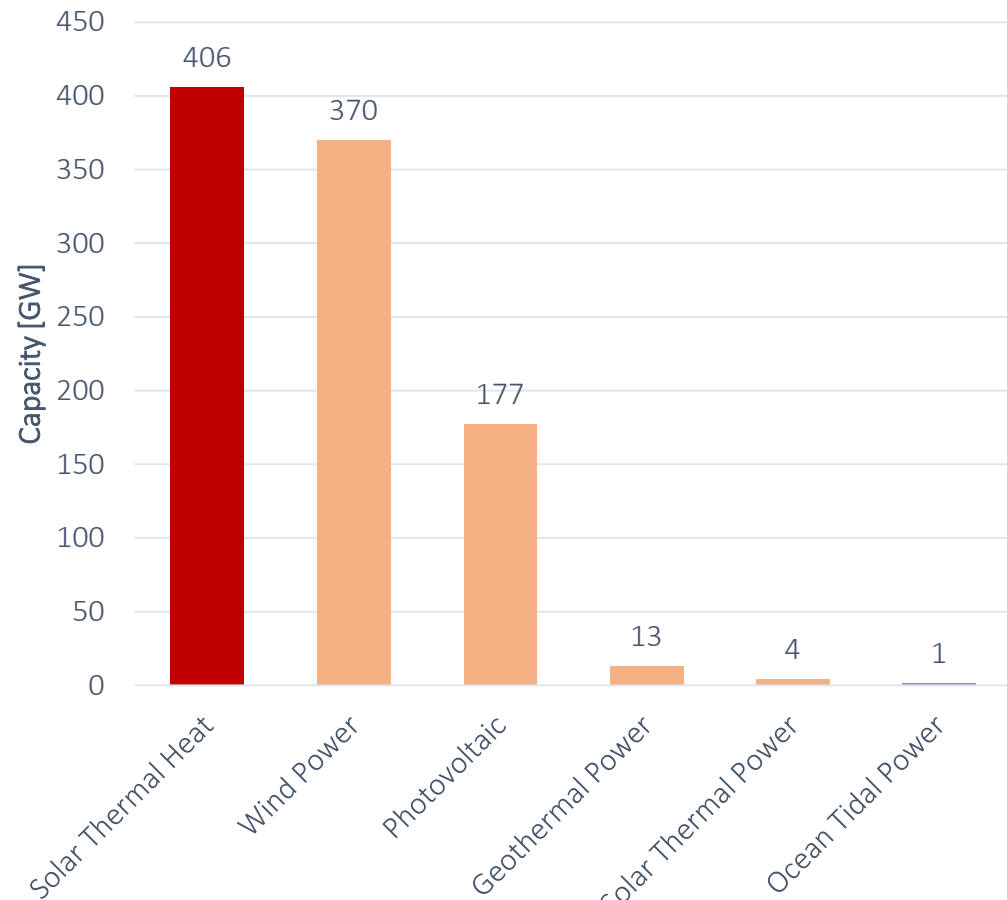
Question for the audience?

What is the largest 'new' renewable by capacity in the world?

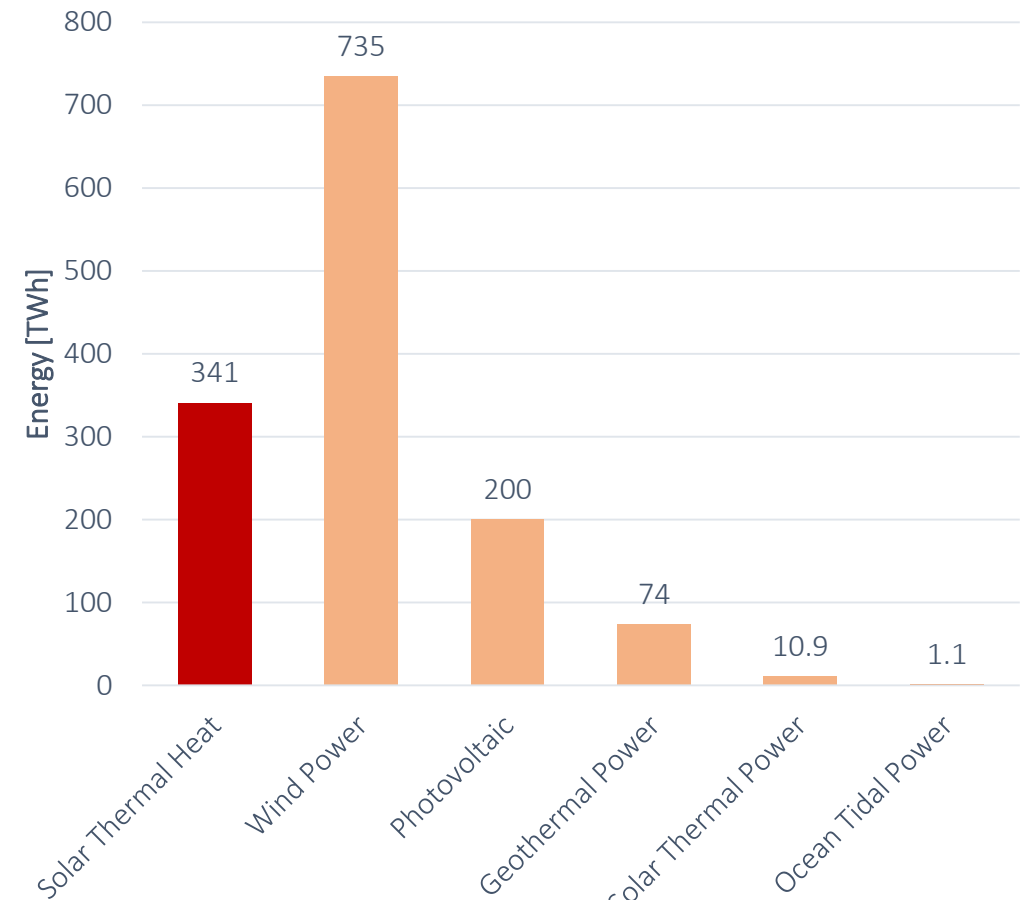
- A) Solar Photovoltaic
- B) Solar Hot Water
- C) Wind Power

B) Solar Hot Water

Installed Capacity [GW]



Energy Delivered [TWh]



Most of the capacity



[GreenBuildingTalk](#)

Options



Electric



Instant Gas



Solar hot water



Heat Pump



PV water heating

When to use each?

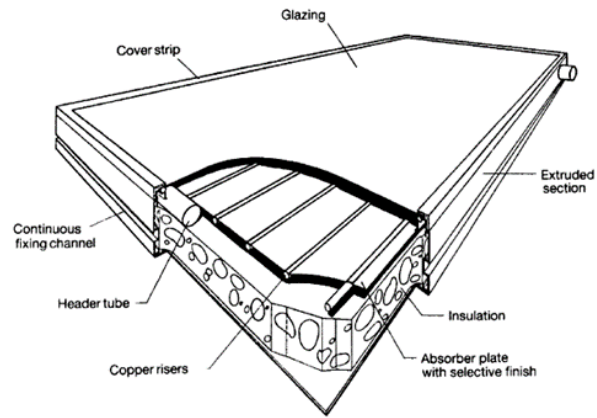
Tech	Description	Fuel	Benefit	Disadvantage
Electric	Storage of hot water heated by an electric element	Electricity only	Simple, cheap to install	Expensive to operate, high ghg emissions
Instant Gas	Heats water instantly as its being used through gas boiler	Natural Gas or LPG	Simple, cheap to install, more cost effective to operate than electric	Can be expensive to operate, better ghg emissions.
Solar hot water	Uses solar energy directly to heat water	Solar energy + back up electricity or gas energy	Low cost to operate, low ghg emissions	Need roof space, expensive to install

When to use each?

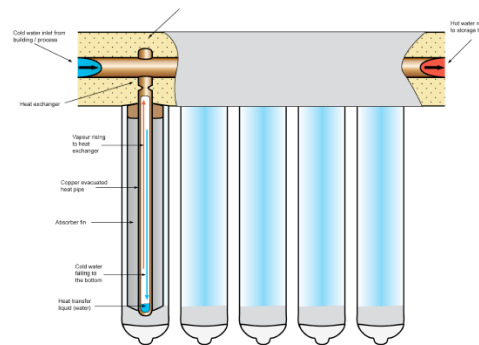
Tech	Description	Fuel	Benefit	Disadvantage
Heat Pump	Uses a vapour compression cycle to heat water (similar to a reverse cycle air conditioner)	Electricity	Usually cheap to run, low emissions	Can be noisy, not good for small loads
PV + electric	Converts excess solar to electricity and heats storage hot water	Solar electricity + grid electricity	Simple, cost effective	Requires a timer or controller.

Solar Thermal for Hot Water

Flat plate

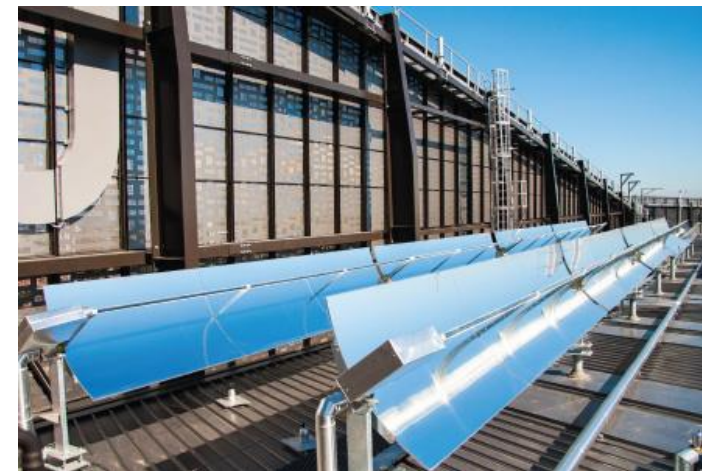
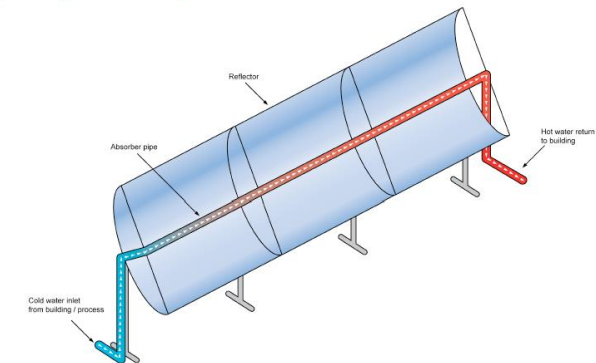


Evacuated Tube

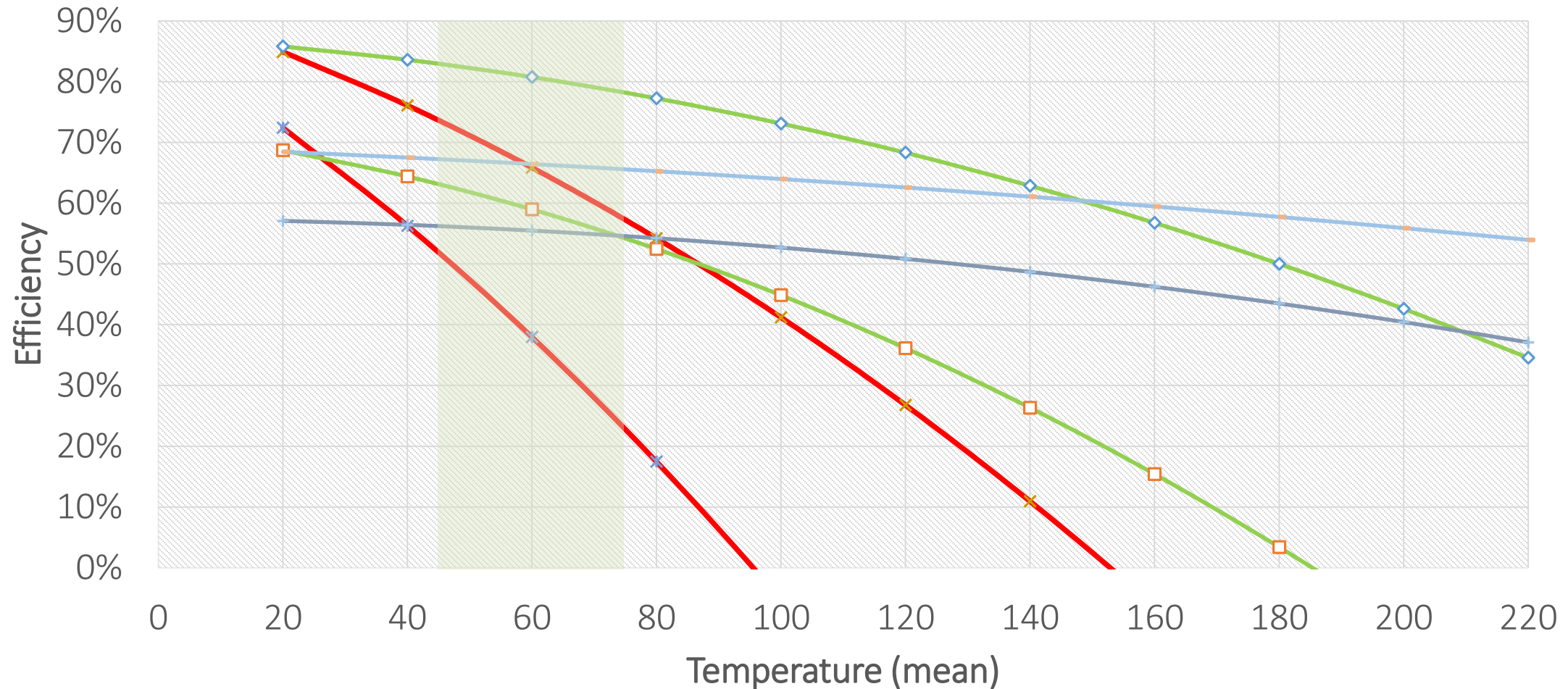


Concentrating

Figure 2.4: Typical concentrating collector



Efficient use of solar energy



Solar hot water

How big should it be?

Where should it go?

Should I install flat plate or evacuated tube?

Should I use a Pumped or Roof top thermosiphon system?

Should I use an Open or Closed loop?

What kind of backup heat should I use Gas or electric backup?

Can I only use solar with no backup option?

What do they cost to run?

Technology	Annual Cost	GHG emissions (KG)	Up front cost include installation	STCs
Electric Element	\$1,465	5,626	\$1,000.00	0
Continuous Gas	\$608	1,915	\$1,000.00	0
Solar Hot Water	\$294	1,130	\$5,200.00	30 / -\$1140
Heat Pump	\$339	1,302	\$3,750.00	28 / -\$1064

Assumptions on the assessment

TRNSYS software simulation with identical load assumptions

Load: 38MJ / day about 3x10min showers per day + More

Climate: Climate Zone 3 from Clean Energy Regulator in Byron Bay

Facing North-west at 20° tilt

Clear roof without shading

Electricity rate \$0.25/kWh, Gas rate \$20/GJ

Innovations

PV Water Heating – controller

German - RESOL DeltaTherm PV - <http://www.resol.de/>

Australian - Energy Smart Water - <http://esw.net.au/>

Thank you!

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PV + Heat Pump

Is it worth it?

- The Heat Pump studied uses 1350 kWh per year of electricity
- Could be supplied by an additional 1kW of PV
- Cost \$2750 for the heat pump and an additional \$1000 for PV (incremental cost of PV \$1/W)
- without a controller, there is no way to operating the HP when there is excess PV energy.

PV + Electric

Is it worth it?

- The Electric Element studied uses 5380 kWh per year of electricity
- Could be supplied by an additional 3.7 kW of PV
- Cost \$1000 for the electric water heater and an additional \$3700 for PV (incremental cost of PV \$1/W)
- More expensive than PV + Heat Pump
- without a controller, there is no way to operating the water heater when there is excess PV energy.

Government rebates