Energy Efficient Water Heating – Review of the 2007 – 2012 EECA Program

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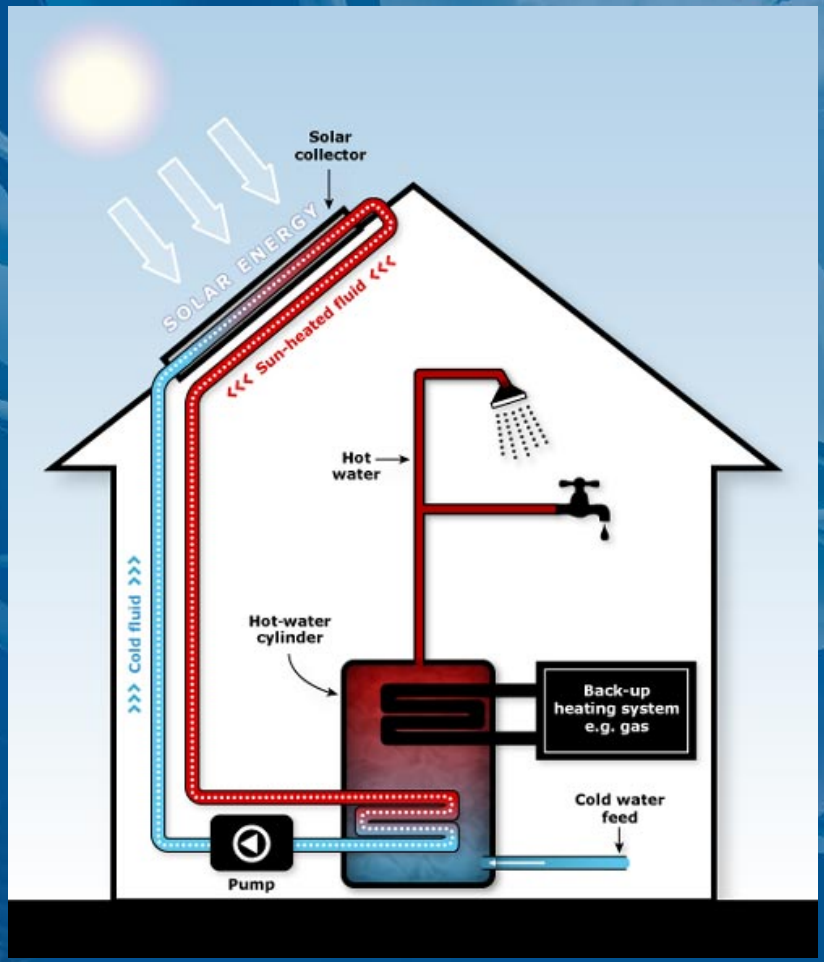
PROJECT SOLAR LTD
PERFORMANCE ANALYSIS OF RENEWABLE ENERGY SYSTEMS

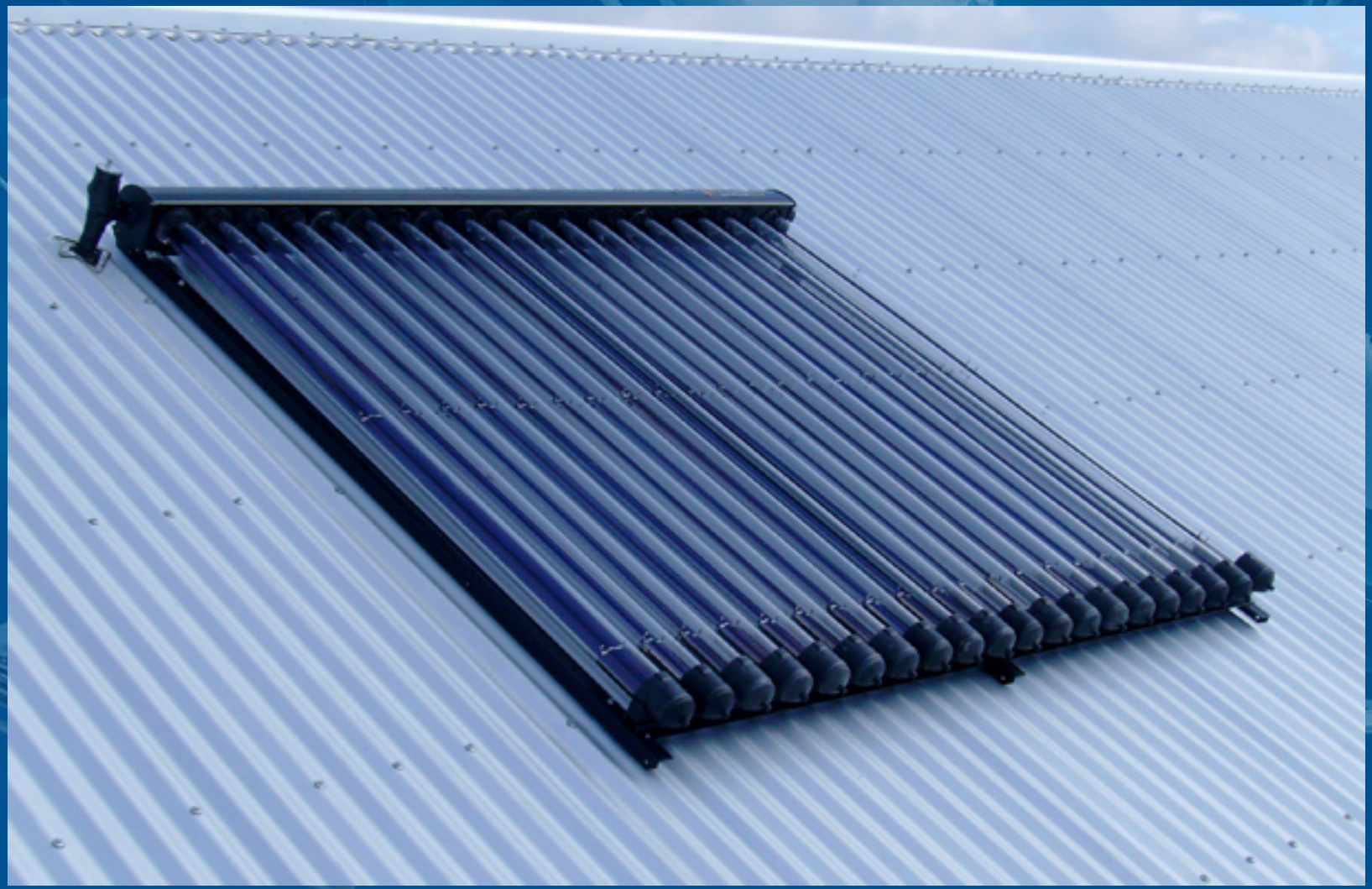
Water Heating Options

- Electric resistance
  - Storage
  - Instantaneous
- Gas
  - Storage
  - Instantaneous
- Solar
- Wetback
- Heat-pump water heater
- Pellet / Coal / Woodchips
- Solar PV?


Solar collector
SOLAR ENERGY
Sun-heated fluid
Hot water
Cold fluid
Hot-water cylinder
Back-up heating system e.g. gas
Cold water feed
Pump


sola 60


BEASLEY
SOLAR PRESTIGE



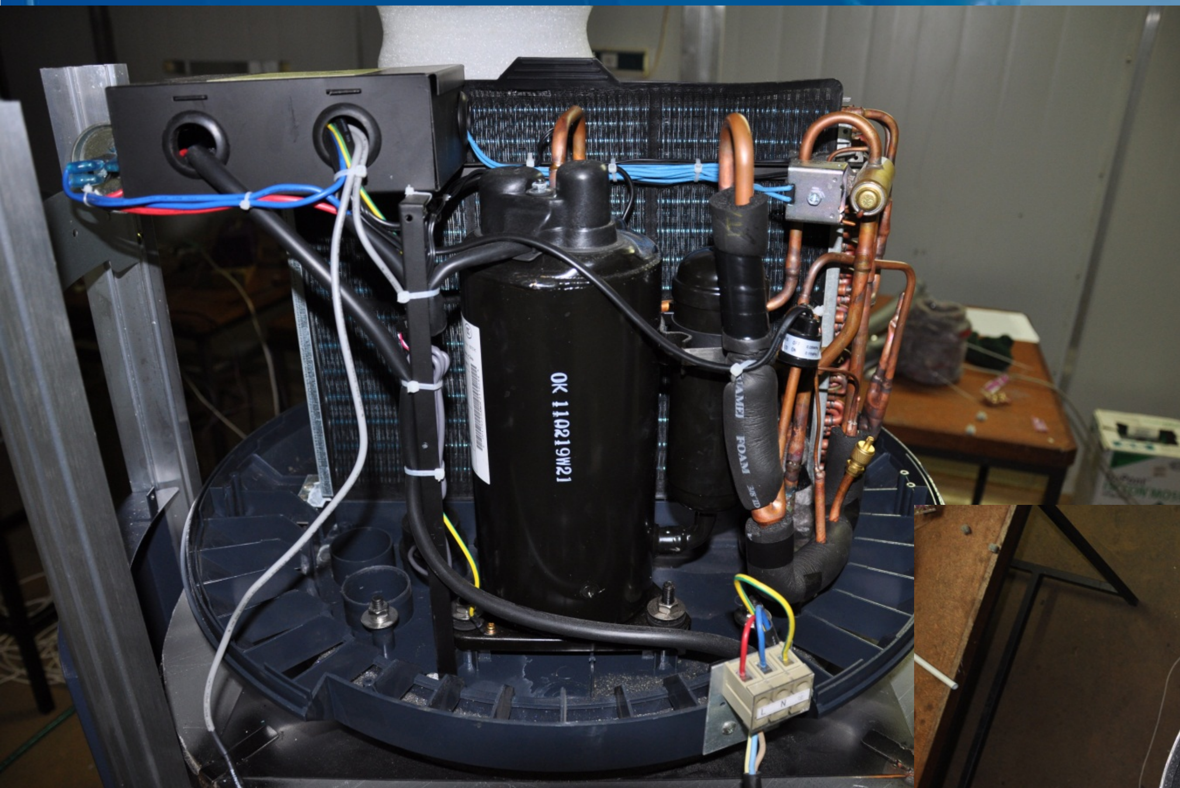

Rheem
Install a Rheem
Low Pressure
SERVICE FREEPHONE
OPERATING INSTRUCTIONS


BEASLEY


SOLAR READY
WARNING
HJ COOPER
GREEN ENERGY


S1: 59°C
S2: 53°C
S3: 53°C
240W
3109kWh
esc
TDC 3
Temperatur-Differenz-Controller


David Hook
Thermocell


OK 11Q219W21

Solar Policy – International

- Compulsory in Israel and Spain
- China has is the world's largest SWH market. 30 Million households.
- Subsidies in Germany, Austria, Sweden, the Netherlands, and France
- Aim to reduce GHG emissions, need for more generation plant
- All OECD countries have some Govt support for Solar.
- IEA in July this year encouraged all OECD nations to increase funding for SWH

Solar Policy - Australia

- Excellent solar resource
- Industry developed from CSIRO research in the 1950's
- Large export industry developed, based around 'packaged systems'
- Water heating 28% of home energy use
- Subsidies based on REC's, now called STC's.
- Vary in value, but rebates have at times meant nearly free systems
- Only about 5% market penetration
- Very high administrative burden on companies
- No auditing of installations
- Lack of innovation in the market
- High component turnover rate
- Cheap night rate electricity tariffs

Solar Policy - Australia

- Solar Electric (PV) market based on Feed in Tariffs
- 10 fold increase between 2009 – 2011
- 2.3% of total electricity production
- Mandatory RE Target of 20% by 2020
- 4 solar plants to produce 1000 MW of electricity
- $1.6 billion in Govt Subsidies
- Scaling back of FIT in 2012
- Removal of GFC stimulus for SWH in 2012
- STC value has dropped from over $40 to around $20 by 2012
- Legislation in place to phase out electric water heating, but not enacted.

Solar Policy - NZ

- Generally good solar resource
- $500 subsidy from 1978 – 1982. Poor system performance.
- Initially $300 subsidy towards a loan from 2002
- 4 main companies. Three products manufactured in NZ
- Steady increase in imported product from 2003
- 45% pa growth rate in the Industry from 2003 – 2006
- EECA working in partnership with the Solar Industries Association
- Had to belong to the SIA to get EECA Grants
- Building consents required, but not widely practised
- Generally no Standards for systems

EECA SWH Program

- Began late 2006
- Support Agreement Greens / Labour
- 4 P's
  - Price
  - Perception
  - Plumbers
  - Performance
- 'step up' in systems being installed
- Solar as 'RE Flagship'
- Target of 500,000m^2 installed over 5 years (to 2012)
- Initial phase of 'Distributed Generation' system of the future
- Lessons learnt useful for future Programs – eg PV
- 5 year programme
- $15.5 million for first 3 ½ years
- 15,000 – 20,000 systems to be installed by 2010

EECA SWH Programme

Perception

- Introduction of AS/NZS2712:2002
- Independent information to guide consumer decision making
- Encouraging use of solar on Govt building including schools
- Motivation of demand through promotion / advertising etc
- Development of case studies

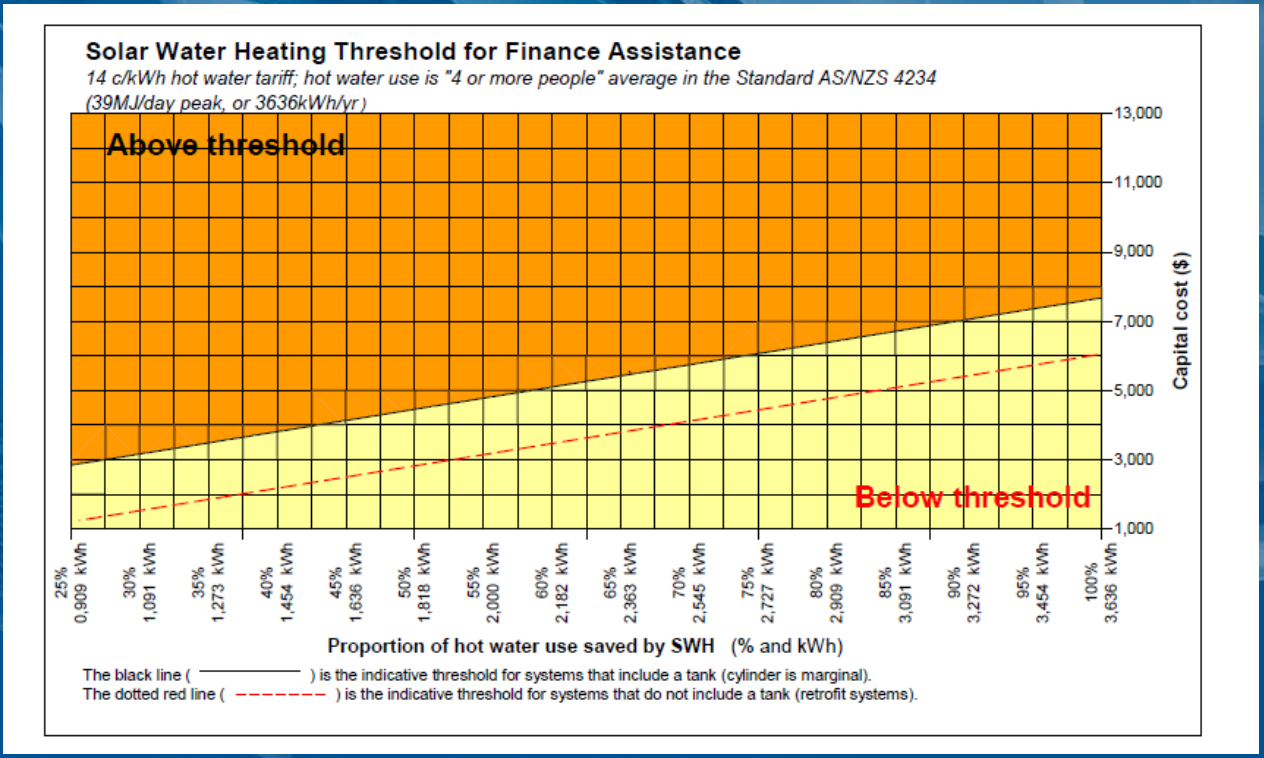
Performance

- Introduction of modelled energy savings to AS/NZS4234:2007 (DR)
- Apples for Apples comparison

EECA SWH Programme

Price

- Considered too high
- Use of the Threshold for Financial Assistance
- Based on modelled energy savings



EECA SWH Programme

Plumbers

- Introduction of Unit Standard Installation Course at Wintec
- Course subsidised by EECA
- Became required to get EECA Grant
- Industry provided some workshops / seminars
- EECA provided guidance on system design
- Auditing Programme of Installation

Innovation Grant

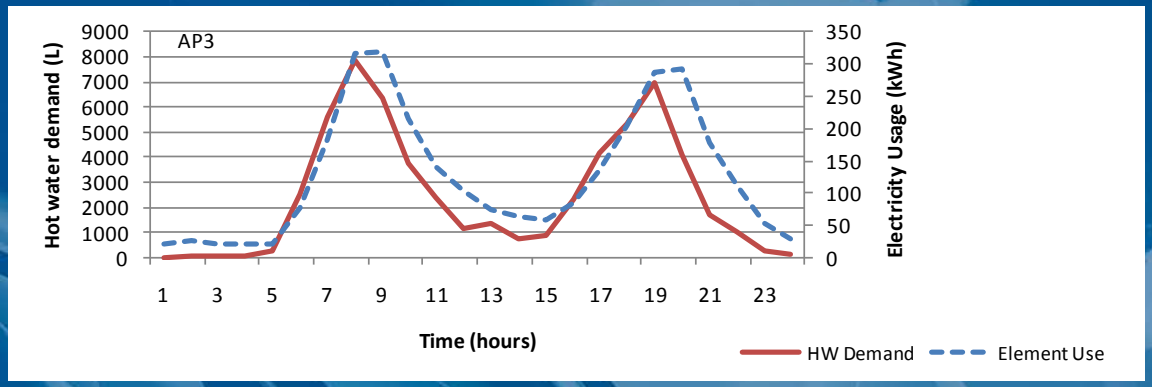
- Contestable scheme with 50% subsidy
- Had innovation as objective
- Not for ‘business as usual’ installations
- Industry support applications welcomed
- Broad range of projects funded
- Up to $100,000 available

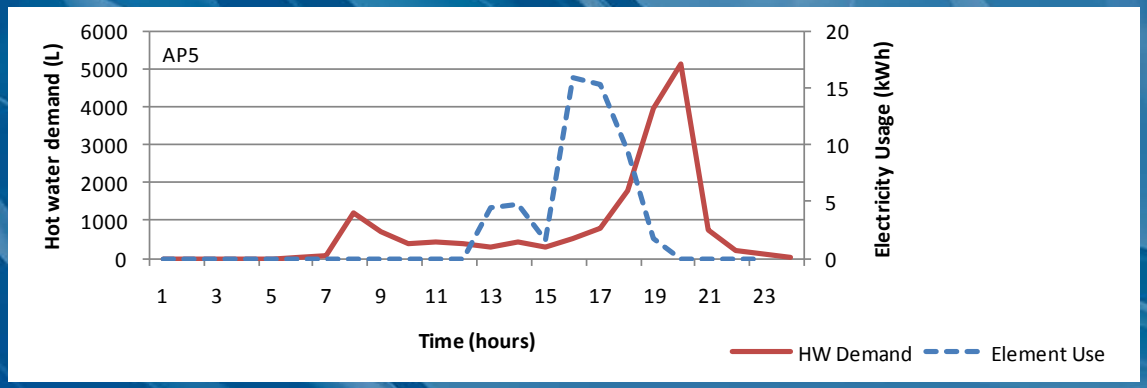
EECA SWH Programme

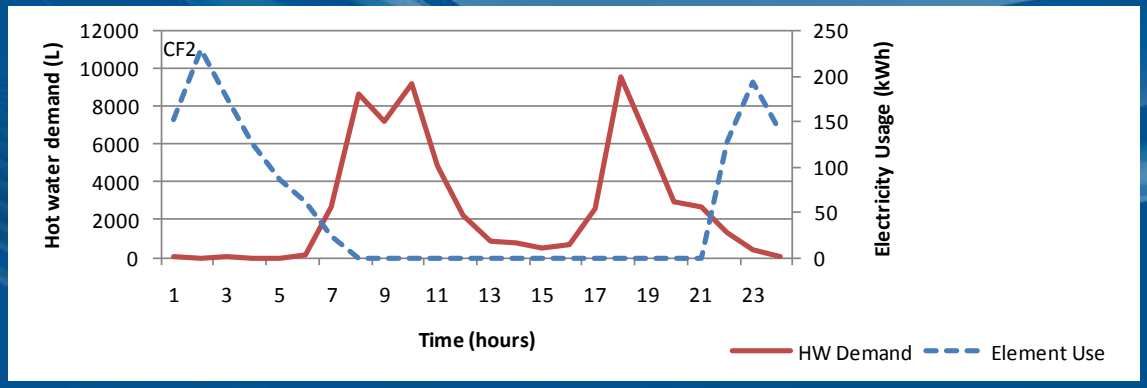
- Assistance for New Home Builders from May 2007
- Grants for Public Buildings up to $50,000
- Technical Guide for Architects and Builders
- Guide to retrofitting to existing tanks
- Development of an Acceptable Solution under the Building Code (G12/AS2)
- BRANZ Monitoring Study of system performance and installation for 35 systems
- Support of the Association

EECA SWH Program

- Quality problems with the largest two suppliers
- Many Chinese evacuated tube collectors had poor performance
- Only one supplier could achieve the TFA to get Grant
- EECA and SIA fell apart
- GFC struck. Consent numbers collapsed
- G12/AS2 Version 1 released late 2007
- Heavy investment in testing / modelling / training throughout 2008
- SWH lack of cost effectiveness
- Grant based on compliance to Standards. $1000 for all systems
- BRANZ Release the results of the monitoring study. 38% savings.
- HPWH had 52% savings


AP3
Hot water demand (L)
Electricity Usage (kWh)
Time (hours)
HW Demand
Element Use


AP5
Hot water demand (L)
Electricity Usage (kWh)
Time (hours)
HW Demand
Element Use


CF2
Hot water demand (L)
Electricity Usage (kWh)
Time (hours)
HW Demand
Element Use

EECA SWH Program

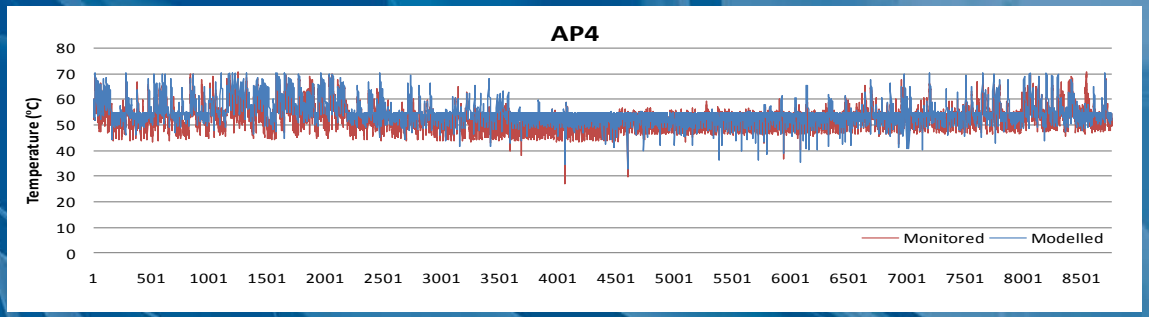
EECA SWH Program

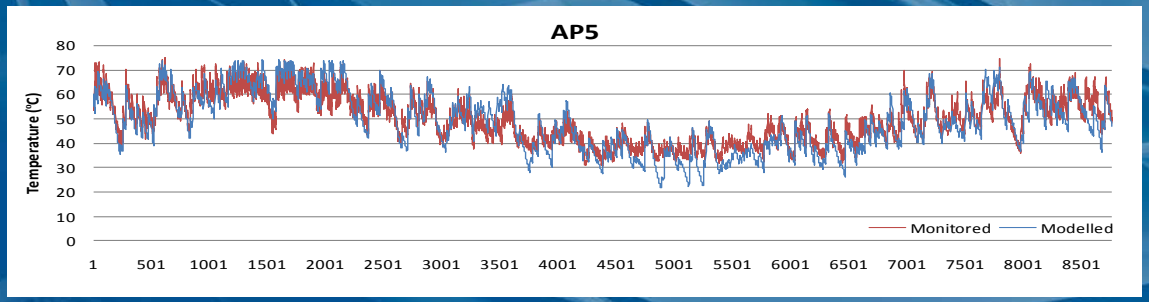
Improvements began to occur in 2009

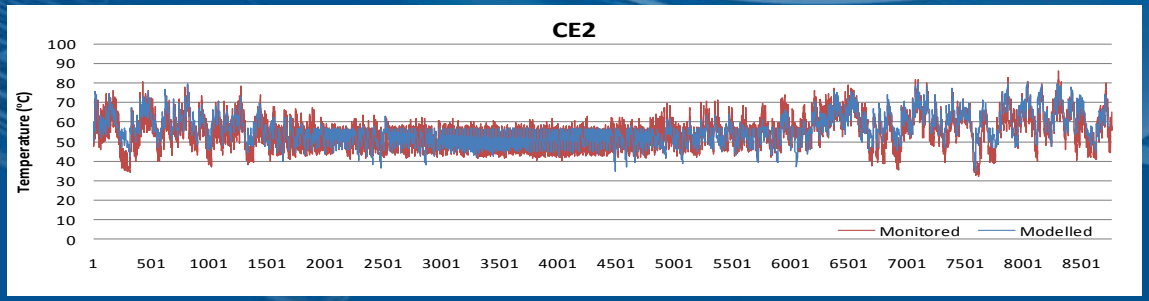
- TFA abandoned Dec 2008 for $1000 Grants
- Evacuated tube collectors were redesigned, retested, remodelled with improved performance
- Installation audits greatly improved
- Innovation Fund Projects underway. Up to $100,000
- G12/AS2 revised
- Nelson City Council began a Solar Saver Scheme
- TRNSYS modelling of the BRANZ systems helped restore confidence in system performance
- Improved understanding in Industry of factors affecting energy performance of the systems.
- Change in collectors and tank configurations evident.
- Pool heating for Schools began to be subsidied

Using performance information

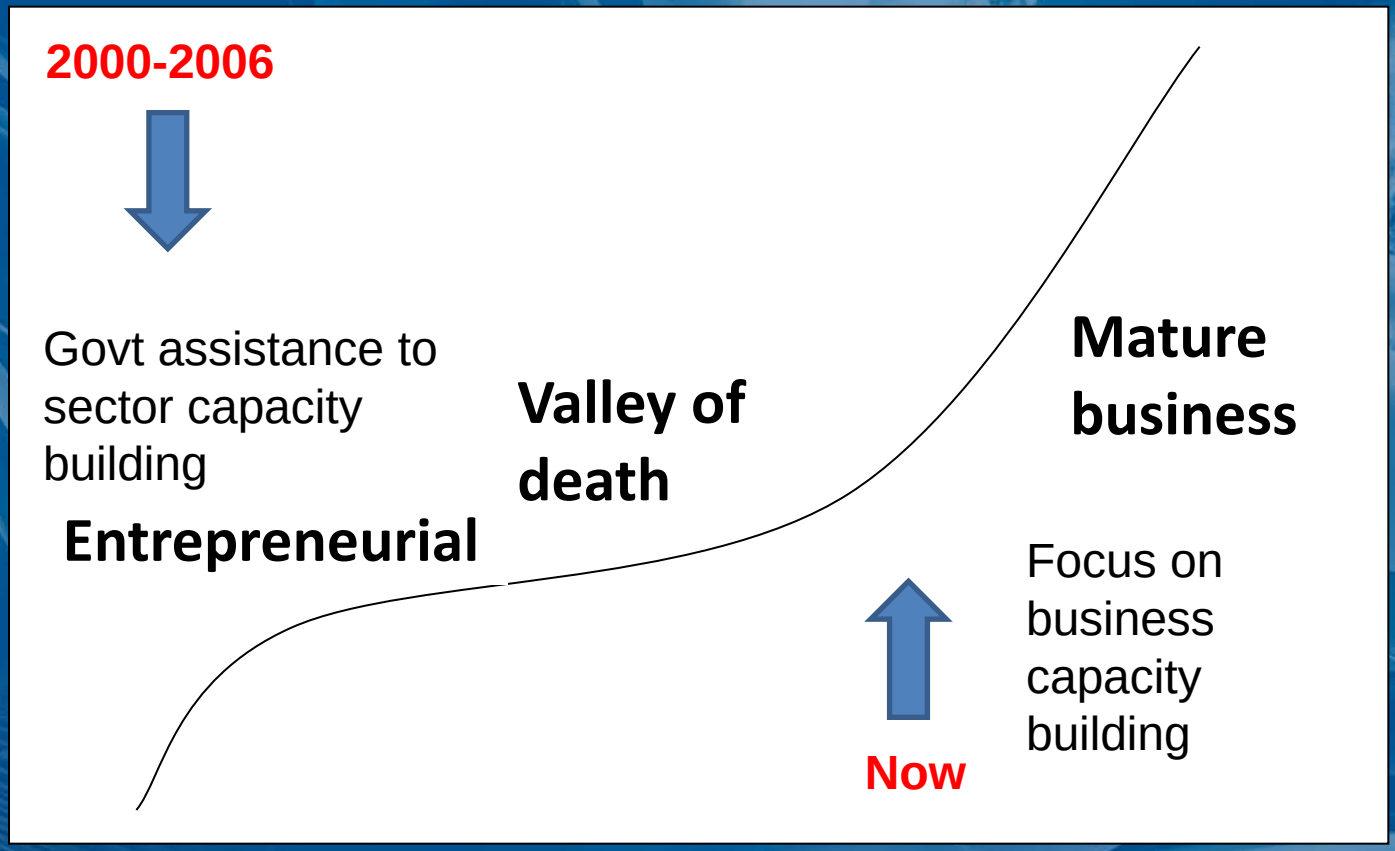
- Accuracy of the performance information







Business Maturity Profile



EECA SWH Program

2010 - 2012

- Energy Star brought in for systems with 70% savings
- Grants of either $500 or $1000 (if Energy Star)
- Increased focus on warranties etc
- Some corporate involvement in Industry eg SolarCity, Meridian, WEL Networks, Vector.
- HPWH Pilot Trial / Study
- HPWH Test Methodology / Modelling
- Auckland Council began a Pilot aiming to install 250 systems
- Nelson CC announced the end of the Solar Saver Scheme
- EECA Scheme ended June 2012
- To be replaced with ‘information provision on water heating’

EECA SWH Program

Key Points:

- Prices never dropped for the systems
  - Increased compliance costs reduced industry capacity
  - Regulation became excessive, especially at Council level
  - No economies of scale
- Industry today has excellent product range
- Vastly improved both performance and installation from pre 2006
- Poor guidance of consumer by EECA website
- On-going EECA support was becoming detrimental to Industry
- Total of 11463 EECA Grants issued
- Still very few systems with proven (monitored) energy savings
- On-going legacy issues, especially with Innovation Fund projects
- BRANZ Report and ‘Rusty Panels’ debacle continues to stunt growth

EECA SWH Program

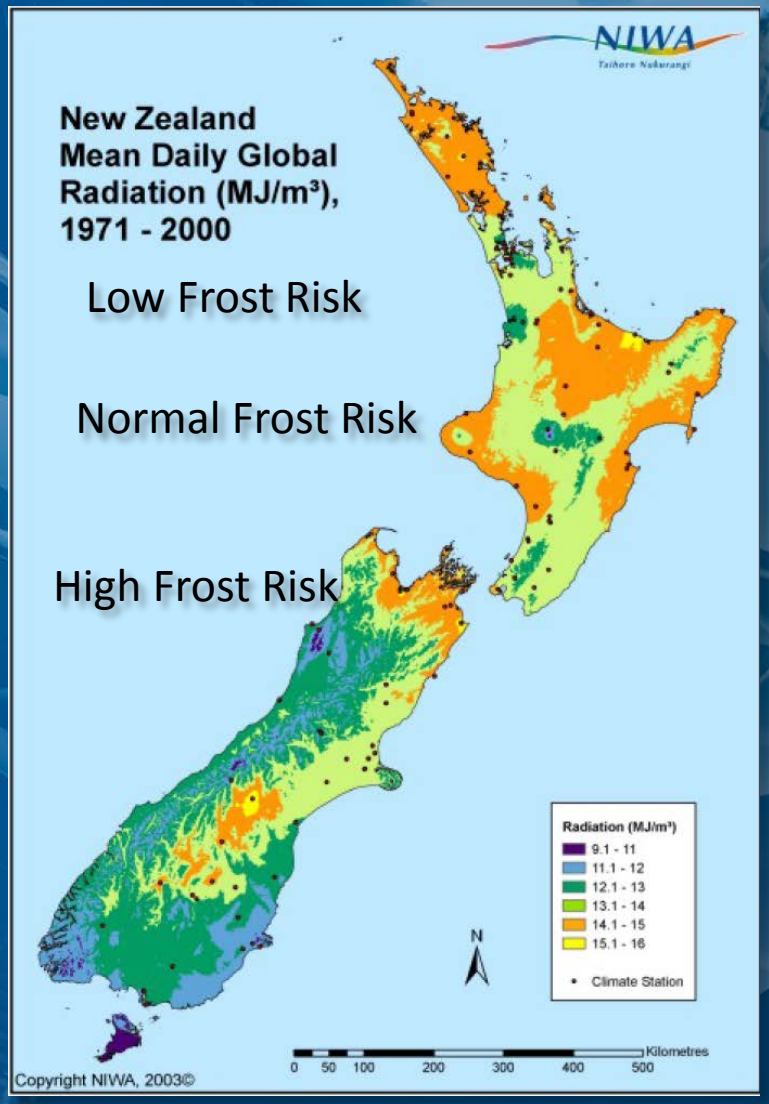
Key Points:

- HPWHs never had the opportunity solar did
- HPWH affected by variable performance of multi-pass split systems
- Continued questions over durability

Future of SWH

Solar Association Customer Assurance Scheme

- Mark II
- Aims to provide 'Assurance to the Customer"
- Based on:
  - Accreditation of Suppliers, Retailers, Installers
  - System Grading Scheme for Zone
  - Complaints Procedure linking back to Accreditation
  - Audit Program part of Accreditation
- Was being implemented prior to Budget Announcement
- System Grading Scheme has a strong focus on:
  - Durability
  - Low on-going costs
  - Performance through Design
  - Guidance of consumer for appropriate system design for location


NIWA
Taihoro Nukurangi
New Zealand
Mean Daily Global
Radiation (MJ/m³),
1971 - 2000
Low Frost Risk
Normal Frost Risk
High Frost Risk
Radiation (MJ/m³)
9.1 - 11
11.1 - 12
12.1 - 13
13.1 - 14
14.1 - 15
15.1 - 16
Climate Station
N
0 50 100 200 300 400 500
Kilometres
Copyright NIWA, 2003©

Future of SWH

Dept of Building and Housing

- Provide framework for the Building Code
- Performance based Code, not prescriptive
- Must show compliance with Code
- Acceptable Solutions (G12/AS2) one way of doing so
- Compliance with Standards is another AS/NZS3500.4*
- No consents required from approx years end for existing WH installations
- Presents Quality Assurance Challenges for Industry
- Will result in price pressure for Industry
- Role of Association??

Future of SWH

Parliamentary Commissioner of the Environment

- Peak Demand drives investment in new generation
- Peaking plant Gas fired
- New Fossil Fuelled plants 'lock in' CO_2
- Flattening peaks essential to integrate RE
- Solar performs worst when best needed
- Solar en mass won't flatten peaks, therefore not useful
- Recommends no tax or rates based funding for SWH
- HPWH have a role to reduce peaks
- Load shifting to night rates for Electric WH
- Recommends EECA improve information on WH options

Parliamentary Commissioner for the Environment
Te Kaitiaki Taiao a Te Whare Pāremata

Future of SWH

PCE Report – flawed approach

- There is already a system for reducing peak demand
- Smart Grid, based on smart meters should be more widely developed
- Report on the failure of the market model to provide price signals when the cost, and environ cost of electricity is high
- SWH in effect extend the Hydro system capacity
- Night tariffs only suit those with low HW demand, unless large tanks installed.
- Ignores gas HW heating
- Ignores solar / wetback synergy for carbon neutral WH
- Energy Savings major driver of Industry

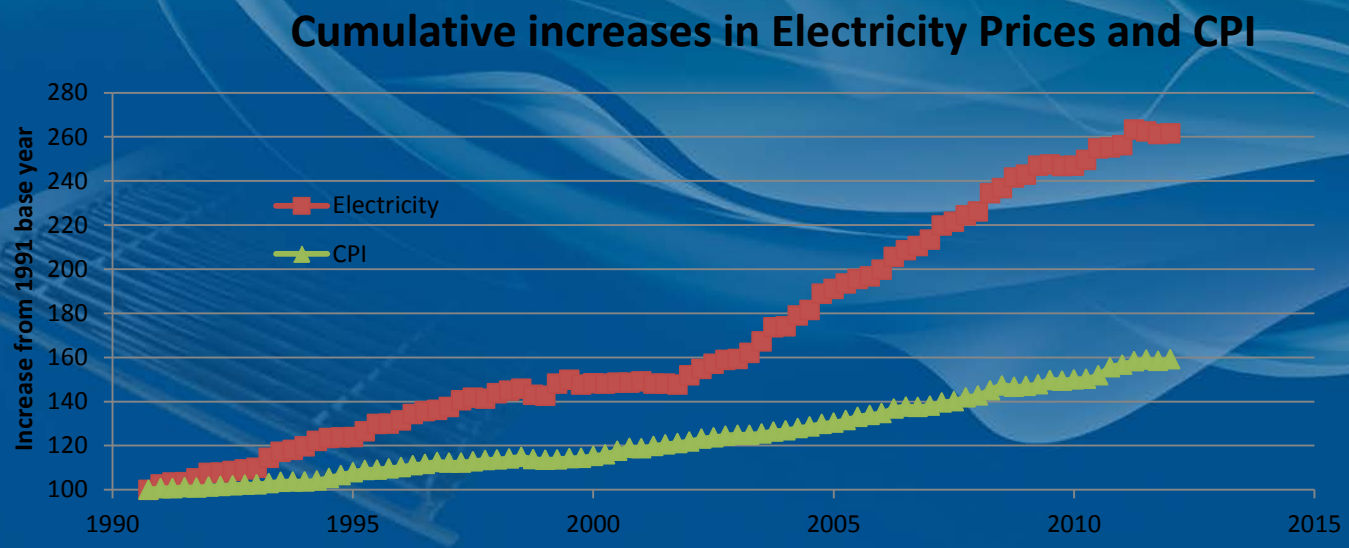
Future of SWH

Fuel Poverty in increasing in NZ

Water heating an increasing proportion of energy bills

Affects families with children

Key need to help this group in community



Future of SWH

Role of Councils

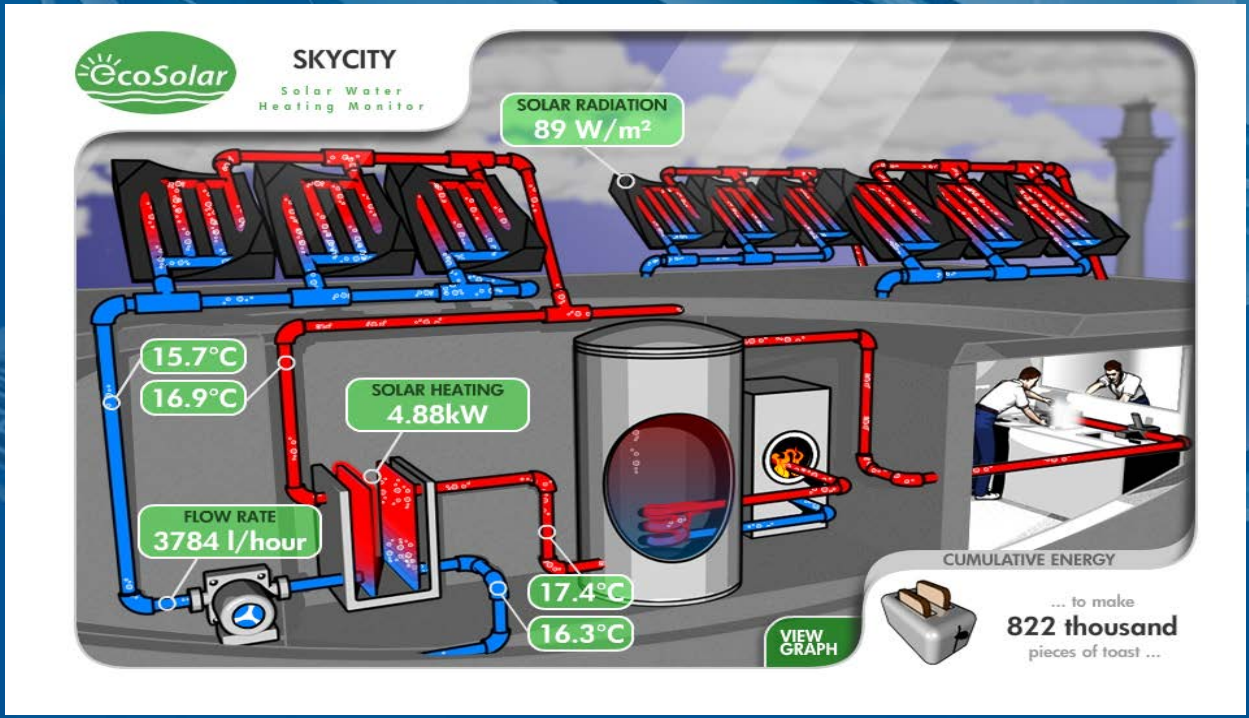
- Social Responsibility
- Rates based Schemes
- Council Housing
- Rental Market is key
- SWH and HPWH should both be promoted
- Durability is as important as performance

Role of EECA

- Support the Association and CAS implementation
- Transparent information about WH options
- Act as a conduit to the various Association sites

Monitoring performance

- Online monitoring:
  - Uses a ‘cloud’ server to gather and analyse data in real-time
  - Online flash based graphics provide instantaneous results
  - Has automated fault recognition / response
  - Installed at SkyCity
  - Accuracy??



Future of SWH

Key Challenge is to maintain the advances achieved under the EECA Scheme in this new environment.