PUSCH Australia

Solar Heating and Cooling in Australia –
An industry roadmap for the built environment

Update
Net Household Expenditure and Use

Source: ABS (2016)

a – Electricity
b – Gas
Total Energy Consumption
Commercial Buildings

Source - pitt&sherry
Fuel Mix
Commercial Buildings

Source - pitt&sherry
Electricity End Use Shares Commercial Buildings

Average all periods, n=1150

- HVAC: 43%
- Lighting: 26%
- Total Equipment: 20%
- Domestic hot water: 10%
- Other electrical process: 2%

Source - pitt&sherry
PV installations
Cumulative Residential Solar Water Heater Installations
Commercial Solar Hot Water STC projection
What drives heating/cooling demand growth?

Projected Population Australian Capital Cities 2012 - 2061

Source: ABS (2013)
What drives heating/cooling demand growth?

- Economy continues growth path
- Residential Building Energy consumption growth from 441.1 PJ (2017) to 467 PJ (2020)
- Commercial Building consumption growth from 159.4 PJ (2017) to 169.6 PJ (2020)
- But: Electricity and Gas prices will continue to rise
Federal Regulatory and Support measures

• Renewable Energy Target (RET) with small-scale technology certificates (STC) for sale to electricity retailers
• Clean Energy Finance Corporation (CEFC)
• National Construction Code (NCC) Volume 1, Section J
• National Australian Built Environment Rating System (NABERS)
• Building Energy Efficiency Disclosure (BEED) Act with Commercial Building Disclosure (CBD), requiring Building Energy Efficiency Certificate (BEEC)
• Energy Efficiency in Government Operations (EEGO) with Green Leases
Other national programs

- AS5389 – estimate energy consumption of solar heating and cooling systems for receiving government support such as STCs
- Green Building Council (GBCA) – Green Star Rating
State Regulatory and Support Measures

- Environmental Upgrade Agreements (EUAs) – Victoria, NSW
- Energy Savings Scheme – NSW
- Victorian Energy Upgrade
- ACTSmart Business Energy and Water Program
- Energy Savers
- South Australian Energy Productivity Program
- Energy utility peak demand reduction projects, demand management projects and renewable energy buyback schemes
Market Barriers

• Very high initial cost
  • No local production of
  • Limited experience – high quotes to mitigate perceived risk
  • Bureaucratic hurdles for support programs

• Lack of awareness of benefits / unrealistic expectations
  • Strong interest but little knowledge
  • Quick payback expected
  • 100% solution expected

• Split Incentives
Market Barriers

• Inexperienced / untrained consultants and trade
  • SHC systems not covered in standard training and university curriculum
  • Consultant fee models only support standard systems design
  • Consultants inflate fees to cover risks

• Technical and financial risks
  • Project owners perceive risks
  • Negative perception from underperforming demonstration systems
  • Australian market interesting for international players but often targeted with limited focus/funds

• Alternative Technologies
  • PV and high efficiency heat pumps
## Opportunities

<table>
<thead>
<tr>
<th>Application</th>
<th>Residential</th>
<th>School</th>
<th>Universities &amp; VET</th>
<th>Office</th>
<th>Public buildings</th>
<th>Hotel</th>
<th>Restaurant</th>
<th>Supermarket</th>
<th>Retail strip</th>
<th>Shopping centre excl. supermarket</th>
<th>Hospital</th>
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</thead>
<tbody>
<tr>
<td>Typical operating hours</td>
<td>8am-12pm</td>
<td>8am-1pm</td>
<td>8am-9pm</td>
<td>8am-9pm</td>
<td>9am-5pm</td>
<td>9am-5pm</td>
<td>24 hours</td>
<td>12 hours</td>
<td>7am-10pm</td>
<td>8.30am-6pm</td>
<td>8.30am-6pm</td>
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<tr>
<td>Operating days</td>
<td>50-100</td>
<td>200</td>
<td>240</td>
<td>240</td>
<td>365</td>
<td>310-380</td>
<td>360</td>
<td>330</td>
<td>360</td>
<td>365</td>
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</table>

| CURRENT balance | Low | High | Medium | Low | Low | Low | Medium | Medium | Medium | Low | Low | Low | Low | High |
| Indicative capacity range | 2 to 15kW | 15 to 50kW | 50 to 500kW | 50 to 500kW | 500kW to 2MW | 10 to 500kW | 10 to 500kW | 100kW to 2MW | 100kW to 2MW | 100kW to 2MW |
| Relative hot water use | High | Low | Low | Low | Low | High | High | Medium | Low | Low | Low | Low | High |
| Fresh air requirement | Low | High | High | Low | Medium | Low | High | Low | Low | Low | Low | Low | High |

| Latent load | Average | Above average | Average | Average | Average | Above average | Average | Average | Average | Above average |
| HVAC energy use (kWh/ha) | 102 | 18 | 3.5 | 27.6 | 1.1 | 3.3 | NA | NA | NA | NA | NA | 9.9 |
| HVAC energy intensity (MJ/m²/yr) | 115 | <18 | 160-440 | 380 | 300-550 | 680 | NA | NA | NA | NA | NA | 680 |
| Current stock size (number / 100m²) | 8,402 / 1,004,000 | 9,141 / 1,004,000 | 4,585 / 16,721 | NA / 47,498 | 3010 | 4,403 / 11,787 | NA / 13,787 | 1,891 / NA | 346,704 / 22,599 | 1,352 / 13,994 |
| Incumbent technology | AC Split | AC Split | AC Ducted / Package, Central plant | AC Ducted / Package, Central plant | AC Ducted / Package, Central plant | AC Split, Ducted / Package | AC Split, Ducted / Package | AC Ducted / Package, Central plant |
| Complexity of incumbent technology | Low | Low | Medium | Medium | Medium | Low to Medium | Medium | Low | Medium to High | High |

[coolgaia logo]
Australian climate zones (AS5389)
## Niche Fit

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Residential</th>
<th>School</th>
<th>University</th>
<th>Office</th>
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<th>Hotel</th>
<th>Restaurant</th>
<th>Retail</th>
<th>Hospital</th>
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1. Not a good diurnal load match; for worthwhile deployments, requires daytime usage.
2. Dependent on fresh air requirements and latent load
3. For smaller deployments
4. For parts of climate zone as per requirements
## Recommendations

<table>
<thead>
<tr>
<th>Regulate</th>
<th>Support</th>
<th>Inform</th>
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<tbody>
<tr>
<td>Standardisation / Best Practice design – extend AS5389</td>
<td>Environment Upgrade Agreements (EUA)</td>
<td>Training/Knowledge dissemination</td>
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<tr>
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<td>On-Bill Finance</td>
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<td></td>
<td>Energy Performance Contracts (EPCs) / Energy Services Companies (ESCOs)</td>
<td>Pilot projects</td>
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</table>
Dark horse?
Thank you!