Australian PV Market Update and Grid Parity Implications

Muriel Watt
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OUTLINE

• The global and Australian PV market
• The levelised cost of electricity from grid-connected PV
• Future rate of installations
• The role of the grid in a solar world
Global PV Market Development

- 8 GW installed in 2009
- 18 GW in 2010
- 26 GW in 2011
- 27-33 GW projected for 2012
- Installed capacity now > 70 GW
- Module production costs < $1/Wp
International PV Targets  
(PVPS, 2011)

- USA: Solar 10% of energy by 2020
- Japan: 28GW by 2020, 53 GW by 2030
- India: 20 GW solar by 2022 + 2 GW off-grid
- Italy: 23 GW by 2016
- China: 15 GW by 2015; 50 GW by 2020
- France: 5.4 GW by 2020; 25,000 new jobs
- Spain: 3.6% of electricity by 2020
- 12% of EU electricity by 2020? (EPIA, 2009)
AUSTRALIAN MARKETS, PRICES & TRENDS

305 kWp PV system on Alice Springs Crown Casino

Photo: SunPower Corp
Australian PV Market (APVA, 2012)

More than double 2010 installations

Cumulative kW

- off-grid domestic
- off-grid non-domestic
- grid-connected distributed
- grid-connected power stations
Annual installations
Australian Market Drivers

2011
• Solar Credits X3
• Feed-in Tariffs
• Solar Schools
• Solar Cities

2012
• Grid parity for own use
• Carbon price
• Solar Credits X2
• Reduced or no FiTs
• Solar Flagship
• Development of commercial sector?
Module price trends
(APVA, PV in Australia report, various years)

Current A$

AUD/Wp


Typical module price  Best price
Grid System Price Trends

Current A$
Government RD&D Funding - $99.5 M

Significant change in 2011 due to SHCP ending

- Markets: 30%
- Research: 31%
- Demonstration: 39%
THE LEVELISED COST OF ELECTRICITY FROM GRID-CONNECTED PV SYSTEMS

• And Implications for Grid Parity
Residential Grid Parity

- When PV LCOE = electricity tariff (prevailing or NPV)
- Both reached in 2012 without subsidies, assuming all PV power receives retail tariff
- Solar Credits make upfront cost affordable
- FiTs provide immediate cashflow

Despite this ➔

- Market spooked by SC & FiT changes
- Negative media – subsidies, poor quality imports, fire, cyclones, floods, grid problems
- Customers want < 10 yr payback
- Several large and many small company bankruptcies
- New marketing strategies needed and this is starting to happen
Residential System Price trends and Grid Parity Projections (APVA, 2011)
Sensitivity to 25% change

- Purchasing power of AUD
- Module Efficiency (% STC)
- End System Delivery Margin (%)
- Importer / Distributor Margin (%)
- Inverter Costs ($/Wp)
- Module Costs ($/Wp)
- Interest Rate (%)
Commercial Sector
(APVA 2012)
Impact of STC price

![Bar chart showing the impact of STC price on LCOE* (c/kWh). The x-axis represents the STC price (2012$) and the y-axis represents LCOE* (c/kWh). The chart compares the LCOE* for No STC, 20, 25, 30, 35, and 40 STC prices.]
Utility-Scale PV: module efficiency impacts (APVA, 2012)
Wholesale price parity

- From 2017, with LGCs, depending on trends
- Needs R&D
  - Efficiency improvements
  - Manufacturing cost reductions
  - New technologies
- Needs deployment to bring BOS costs down
- Intermediate size (up to 30 MW) promising but approval and interconnection costs not transparent and disproportionately high
MARKET PROJECTIONS
Possible annual installations

—if residential market stabilises from 2013
Possible cumulative installations of ~8GW by 2020

Grid & Off-grid residential static, other sectors growing at 15% +150MW Flagships

AEMO: 12-18GW from residential rooftops by 2031
THE ROLE OF THE GRID IN A SOLAR WORLD
So what now?

- One of the 1st countries to reach parity but:
  - NEM designed for central generation
    - No incentive to value distributed energy
    - No inherent right or incentive to export to grid

- Hence export offers between 0 and wholesale rate (8c) once FiT's cease, if allowed at all
  - Favours own use & smaller systems
  - Storage now of great interest
  - Link to electric vehicle rollout?
  - Move to self-sufficiency & off-grid solutions?
## Elect price increases (AEMC)

<table>
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<tr>
<th>Component</th>
<th>c/kWh</th>
<th>% increase</th>
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<tr>
<td>Wholesale price</td>
<td>7.64</td>
<td>19</td>
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<td>Transmission</td>
<td>1.56</td>
<td>8</td>
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<tr>
<td>Distribution</td>
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<tr>
<td>Retail</td>
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<td>14</td>
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<tr>
<td>RET</td>
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<td>FiTs</td>
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<td>3</td>
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<tr>
<td>EE &amp; DSM</td>
<td>0.57</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>0.12</td>
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Technical Issues

- Inflexible coal generation base makes Australia least able to accommodate PV cf countries with more hydro and gas
- Installations already being limited because old networks (physical infrastructure, regulations & operating strategies) not designed for distributed generation
- > $50B in network upgrades
  - could increased DE (PV, EE & DSM) provide a lower cost solution?
  - Could we end up with stranded assets if net zero energy / self-sufficiency increases?
- Smart grids needed
  - not just TOU meters, but also communication with DE & appropriate two-way tariff structures
  - May end up with a very different grid
Regulatory Issues

- Monopoly distribution businesses earn money by kWh transmission and can pass through all increased costs
- Retailer earnings based on kWh sold
  - Neither has incentive to facilitate DE
- What will be the impact of a move to higher fixed charges as a % of total tariff?
- TOU metering rollout but network upgrades going ahead before impacts can be assessed
  - Electricity use already dropping
- How does competition survive if electricity retailers can intervene in the market and can also be DE product owners/suppliers?
Implications

• What happens to current retail market structures if:
  – All buildings are net zero energy
  – Usage keeps dropping
  – Customers opt for on-site storage and purchase only in off-peak periods?

• How long will customers put up with electricity price increases when:
  – Least cost planning options have not been used?
  – Bills go up even if usage is negligible?

• Customers now have an option, since DE is readily available & cheaper than grid power!
A Distributed Energy Market

- Rights and technical standards for connection of DE technologies to the grid
- Formalisation of the portability of DE services
- Trading rules and requirements
- Ancillary service requirements and rewards
- Appropriate DUOS charges
- The role and regulation of new energy service providers
- Pass through of energy and network cost reductions due to DE to the owners or customers generally
References

- AEMC, 2010, Future possible retail electricity price movements 1 July 2010 to 30 June 2013
- APVA, 2012, PV in Australia 2011, Report for the PVPS
- APVA, 2011, Residential sector modelling of PV and electricity prices
- APVA, 2012, Commercial sector modelling of PV and electricity prices
- APVA, 2012, Modelling of Large-Scale PV systems and electricity prices