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Some Recent 'High PV Penetration' Developments in Australia

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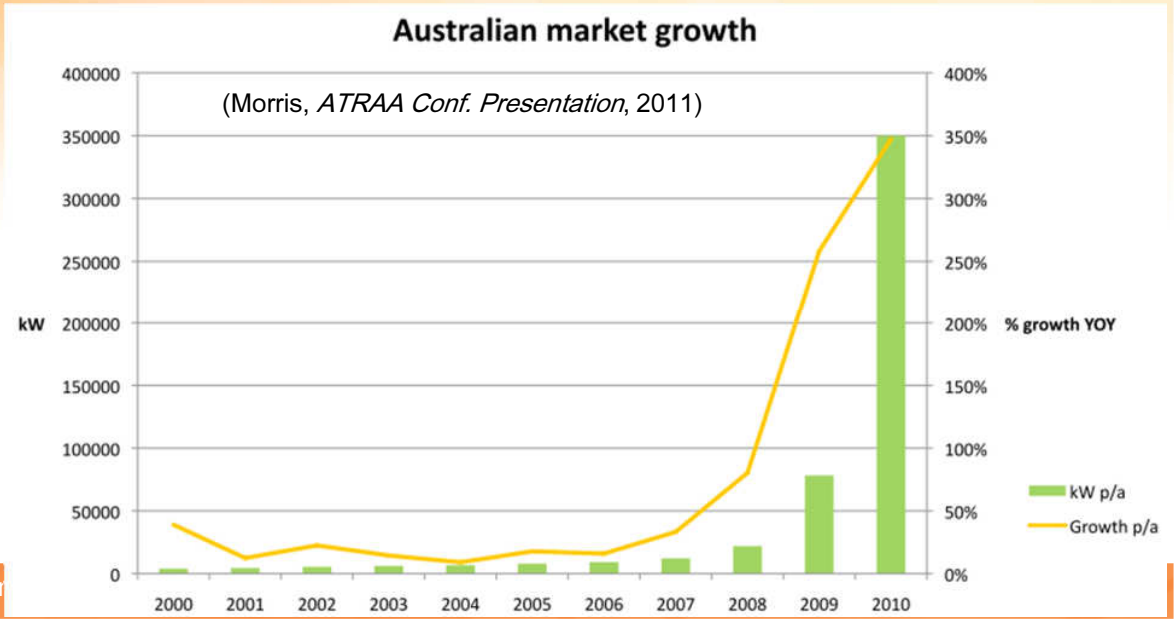
In summary

- Australian participation being funded by Australian Solar Institute (ASI) with additional stakeholder support through Australian PV Association (industry, government, academia)
- Approx. 1GW PV now installed, almost all distributed
- Costs have fallen significantly for small PV systems
  - A$11/W in 2009 (standard domestic installation – not including metering)
  - A$6/W in 2010
  - A$4-5/W in 2011
  - Estimated A$4-4.50/W for Solar Flagships (150MW) over 2012-15
- Modest and now decreasing government support
  - Federal Government - Renewable Energy Certificates muliplier
  - Some state based net feed-in tariffs; now largely being wound back due to 'excess' demand

Australian PV uptake has recently accelerated

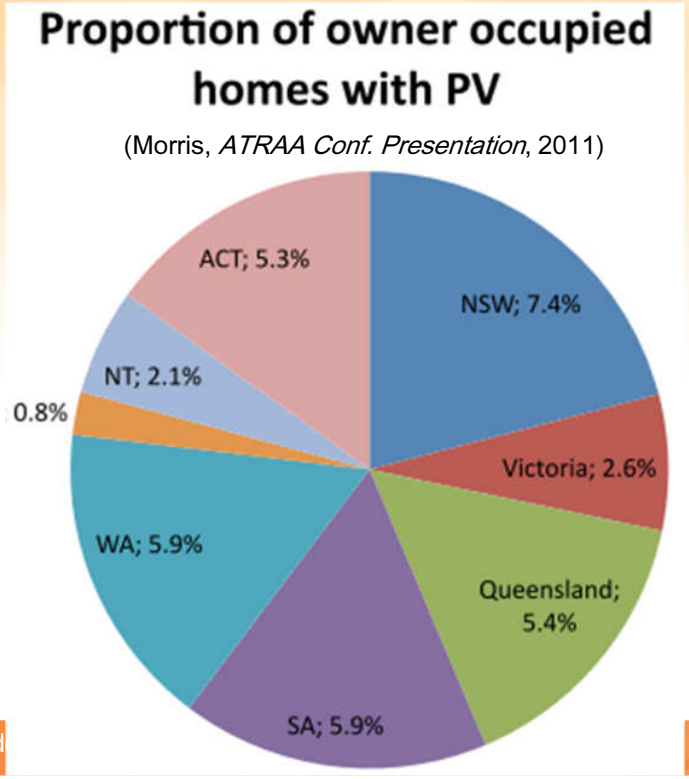
- High recent growth in PV deployment – almost all residential systems
- Penetration levels in some regions of the Dx network becoming significant – solar cities, demographics, developer strategies



Some recer

… nearly all small-scale domestic systems

- Almost all <5kW and connected to LV Distribution System
- Regional distribution a factor of climate but, particularly, also jurisdictional policy support
  (note: most state policies now being substantially wound back)



… growing issues

Solar dream gets caught in gridlock

Peter Hall

THE solar power revolution is in danger of stalling, with the State Government admitting the electricity grid is failing to cope with its green vision.

Energy Minister Stephen Robertson confirmed new applications for rooftop solar systems were being rejected in areas where Queensland's high uptake threatened the safety and reliability of its network.

"Thousands of homeowners hoping for promised power savings of up to $540 via a 1.5kW system are in limbo, with those wanting larger systems even being asked to pay more than $20,000 to help cover local upgrades.

Energex said the state's electricity network since the 1950s had been designed to deliver power from the station to the home and the voltage now heading "the other way" was causing a huge dilemma.

more than 107,000 Queensland households have jumped at the Solar Bonus Scheme, launched in 2008, exporting 72.5 million kW hours back to the grid.

However, unless significant, costly upgrades are completed, many who might want to add solar panels in the future may not be able to.

Energex is warning Queenslanders considering installing solar to make applications well before entering a contract with an installer in case they are not able to proceed.

Spokesman Mike Swanston told *The Courier-Mail* about 600 local distribution transformer zones on the Gold Coast, Brisbane Valley and Sunshine Coast had reached saturation.

Mr Swanston said, at this stage, only a handful of applications had been "rejected outright", but he confirmed that 30 per cent saturation was the "trigger" for applications to be

being examined closely."

Mudgeeraba resident Andries Kaden was stunned when his application for a 10kW system was knocked back.

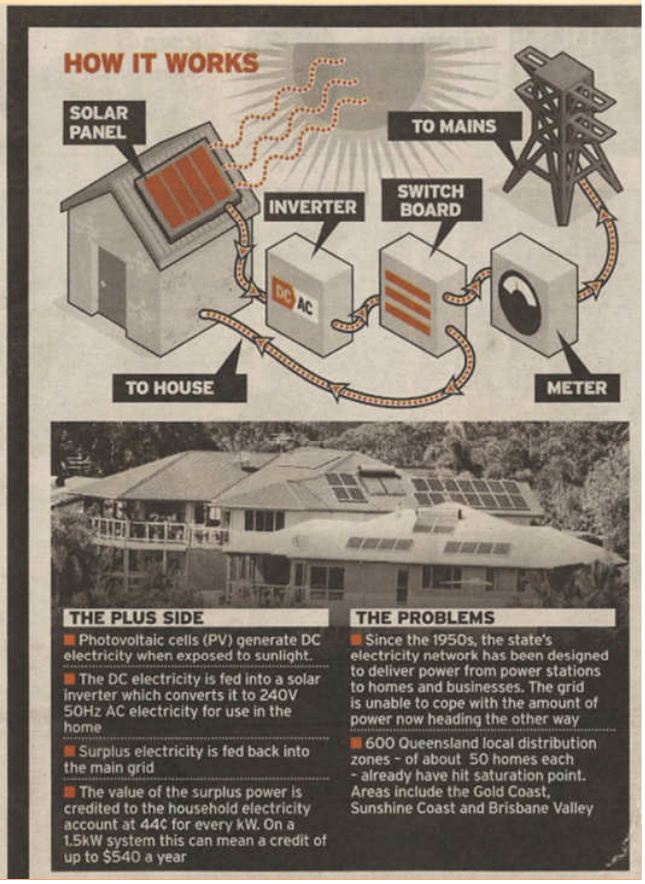
Mr Kaden was told there were enough solar systems in the area and the transformer would have to be upgraded for him to install one.

"Energex told me if I wanted to proceed I would have to pay between $20,000 and $30,000 for an upgrade," he said.

"I couldn't believe it because we have all been told to grab this, but it's not possible. You had better get in quick if you want solar is all I can say.

"I fought this all the way to the minister and they have since said I can have the system but I am a guinea pig to see if the network can handle it."

Mr Robertson advised Mr Kaden he was to be part of a trial "to see if the electricity network can operate at higher penetration levels".



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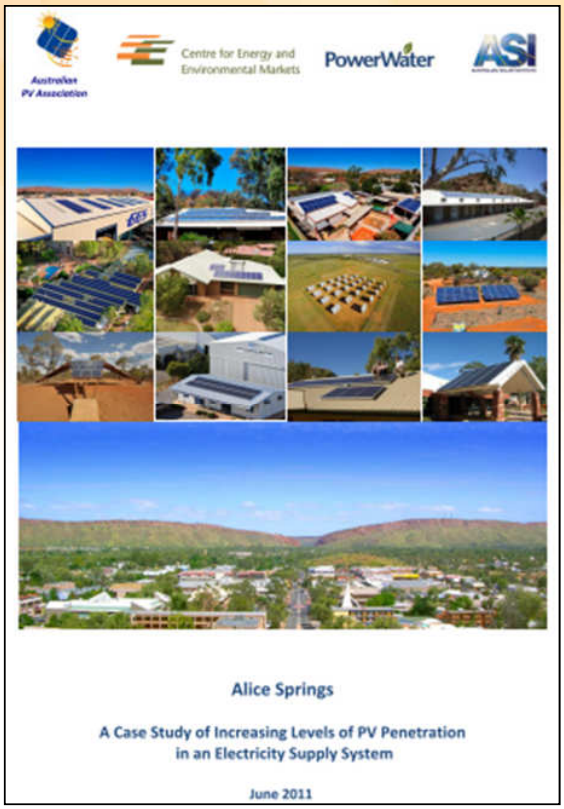
Potential Australian High PV Case Studies

- Alice Springs Solar City – *Case study now completed*
  - Regional (50MW) grid with gas-fired generation
- Townsville Solar City (Magnetic Island)
  - PV with major demand management initiative
- Newington, Sydney
  - Former Sydney Olympics Atheletes village
- Blacktown Solar City
- High PV penetration diesel mini-grids
  - Primarily in the WA and NT

Alice Springs Case Study



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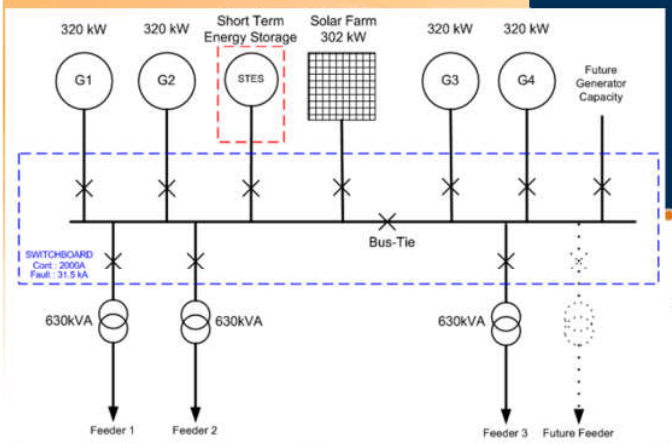
Wider objectives for case studies

- Engaging key stakeholders for appropriately facilitating high PV penetrations
- An emphasis on successful innovation for PV
- Case studies of
  - Key issues arising from high PV penetrations in a range of Australian contexts
  - successful management of these high PV penetrations
  - Identification of future issues and options that support more proactive management in emerging high PV penetrations

High PV mini-grids



Marble Bar	
Diesel Generation	4 x 400 kW Detroit 60 engines
PV Modules	1350 x SunPower 225 (303.5 kW)
PV Mounting System	135 x T20 Single -Axis Tracker
PV Inverters	45 – SMC 7000HV
Short Term Energy Inverter	ABB PCS100 ESS
Short Term Energy Storage	Pillar Flywheel

Worlds first high penetration solar/diesel hybrid stations

- Largest single axis tracking arrays in Australia
- 80% day time load from solar energy
- 30% annual load from solar energy

Solar Flagships
Moree Solar Farm

- Funding for the development of large scale solar power in Australia: demonstration of the potential of solar energy in Australia, including efficient integration and operation of large scale solar power in Australia's energy markets.
- 150MW capacity - Poly-crystalline panels
- Single axis tracking
- A$600-700m estimated cost
- Construction to commence mid 2012
- Significant research funding component being led by CSIRO

www.moreesolarfarm.com.au

FRV PacificHydro bp solar

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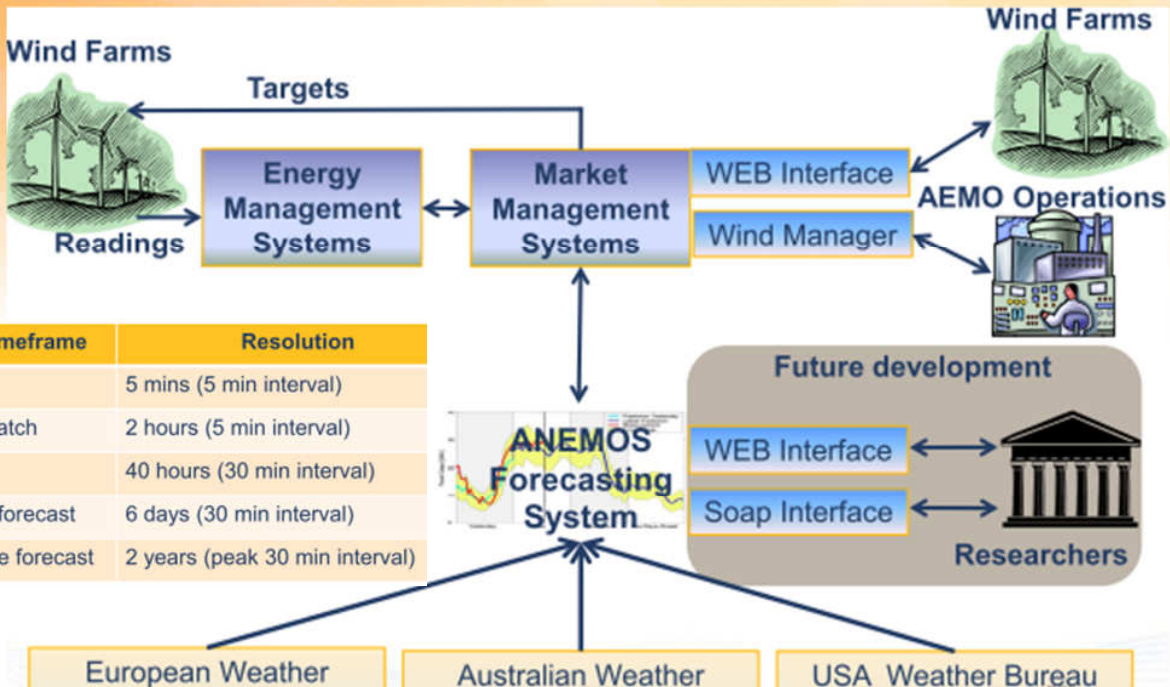
Renewable energy forecasting

- Centralised forecasting for Wind, solar now under development



Forecast timeframe	Resolution
Dispatch	5 mins (5 min interval)
5min Pre Dispatch	2 hours (5 min interval)
Pre Dispatch	40 hours (30 min interval)
6 day reserve forecast	6 days (30 min interval)
2 years reserve forecast	2 years (peak 30 min interval)

Some related high PV penetration efforts

- Solar forecasting
  - Universities, CSIRO, commercial providers
  - Australian Energy Market Operator (AEMO) interest
- Smart grids
  - Distribution network service provider pilot programs
  - Smart grid, smart city (Ausgrid, Fed. Govt, CSIRO, technology providers)
- PV integration (case studies)
  - Range of universities, CSIRO
- PV inverter and connection standards
  - Some revisions drawing on international & local experience