



Never Stand Still

Australian PV Market Update & Implications for the Electricity Sector

Muriel Watt

SPREE, UNSW

IT Power Australia

APVI Board

IEA PVPS ExCo Alternate

The APVI

- Objective:
To support the increased development and use of PV via research, analysis and information
- Subscribers:
Businesses, researchers, government agencies, individuals with an interest in PV
- Work:
Independent, apolitical and widely cited by the PV sector, governments and stakeholders
IEA PVPS and IEA SHC representation for Australia



With support
from



National Survey Report of PV Power Applications in AUSTRALIA 2013



PHOTOVOLTAIC
POWER SYSTEMS
PROGRAMME

Prepared by the Australian PV Institute

Authors: Muriel Watt & Robert Passey (UNSW Australia & IT Power
Australia), Ben Noone & Ted Spooner (UNSW Australia)

PVPS

PV in Australia 2013

APVI – for the IEA PVPS

Muriel Watt & Rob Passey (ITP &
UNSW)

Ben Noone & Ted Spooner
(UNSW)



UNSW
AUSTRALIA



Australian Technical Guidelines for Monitoring and Analysing Photovoltaic Systems

Version 1.

November 2013

Heidi Deppert¹, Lina Bruen², Tim Sweeney³, Marlene Gahl⁴, Trevor Pryor⁵ and Muriel Watt⁶

¹School of Photovoltaic and Renewable Energy Engineering, University of NSW

²School of Electrical Engineering and Telecommunications, University of NSW

³School of Engineering and Information Technology, Murdoch University

With the Support of

ARENA



Australian Government
Australian Renewable
Energy Agency

Wednesday 5th March 2014

Program features

Multiple sessions covering technologies, applications, markets, issues and the future.

Ample discussion and networking opportunities.

Public lecture on energy storage R&D

Pricing

APVI and IBA Members \$125

Non-members \$175

Registering on the day \$200

You can register and pay [here](#)

Major sponsor: Global Sustainable Energy Solutions Pty Ltd



Associate sponsor Ergon Energy;
Supporting partner SMA-Australia

For more [information](#)

*A special APVI workshop as part of the
International Battery Association 2014
Conference*

Storage solutions and the future of the electricity grid

Location: Brisbane Conference & Convention Centre:
www.iba2014brisbane.com

Note: Registration for this half-day workshop includes access to the morning session of the IBA conference, as well as the evening public lecture.

Program: The morning session of the IBA conference will include local and international speakers discussing various battery chemistries - redox flow, lithium-ion and Pb-acid, in a range of applications.

The **afternoon workshop** will focus on applications of energy storage in the Australian context: technologies, markets, regulatory frameworks and customer issues. Discussion topics will include:

- What electricity customers are currently doing with storage; why and where might this be headed?
- What aspects of storage are electricity utilities interested in for better grid management?
- The inverter perspective on issues, including self-consumption, grid management functions and future possibilities.
- What sort of market and regulatory frameworks are needed to support an integration of the customer and utility interests?
- Assessing and valuing the various approaches to incorporating storage in the grid.

Afternoon session speakers include: Muriel Watt (APVI/IT Power Australia), Michelle Taylor (Ergon Energy), Matthew O'Regan / Susan Neill (GSES), Charles Wang (SMA-Australia), Graeme Bell (Hybrid Energy Consulting).



UNSW
AUSTRALIA

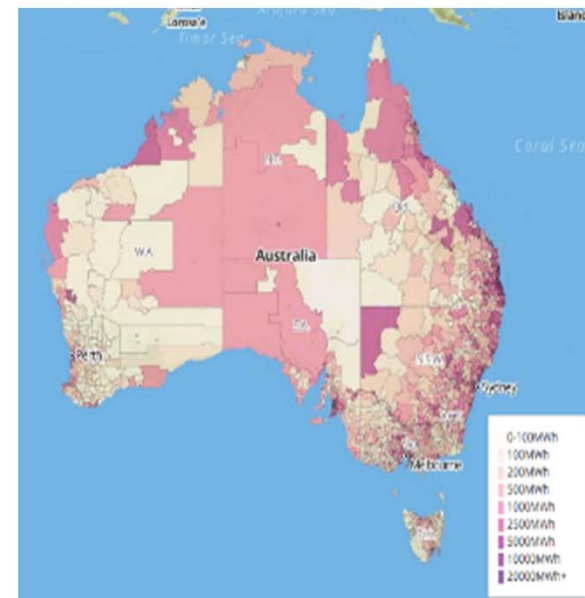
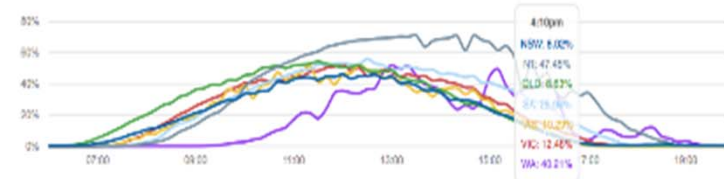
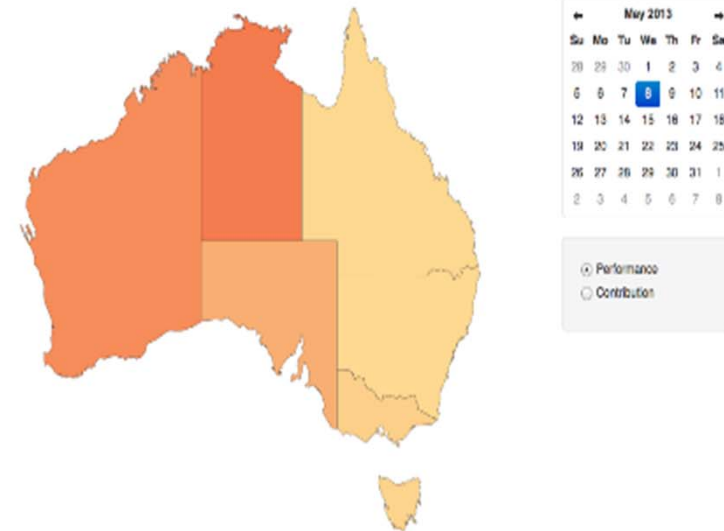
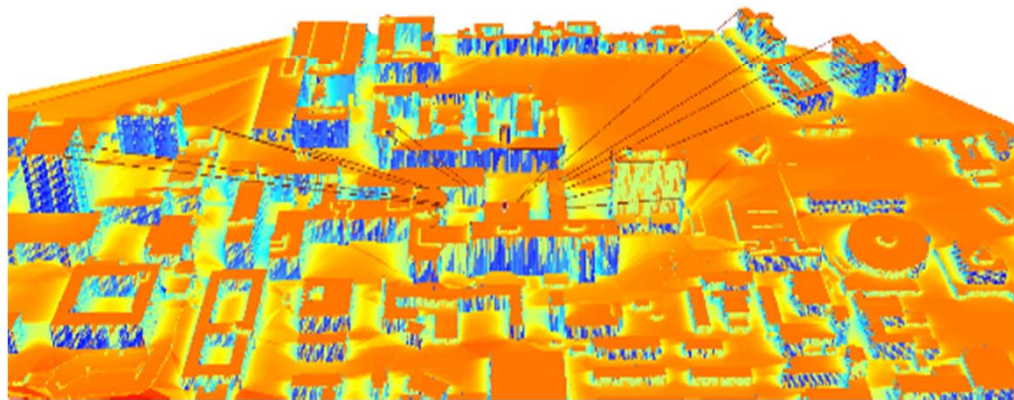
PV Map

Aim:

Tracking the uptake and impact of PV
Disseminating information to facilitate investment and research

Method & Outcomes:

- Capacity installed data and annual performance estimates
- Historical and live performance data
- Tool for assessing PV potential in urban environments



IEA PVPS



- **Mission**

To enhance the international collaborative efforts which facilitate the role of PV as a cornerstone in the transition to sustainable energy systems

- **Focus (26 countries, 5 associates)**

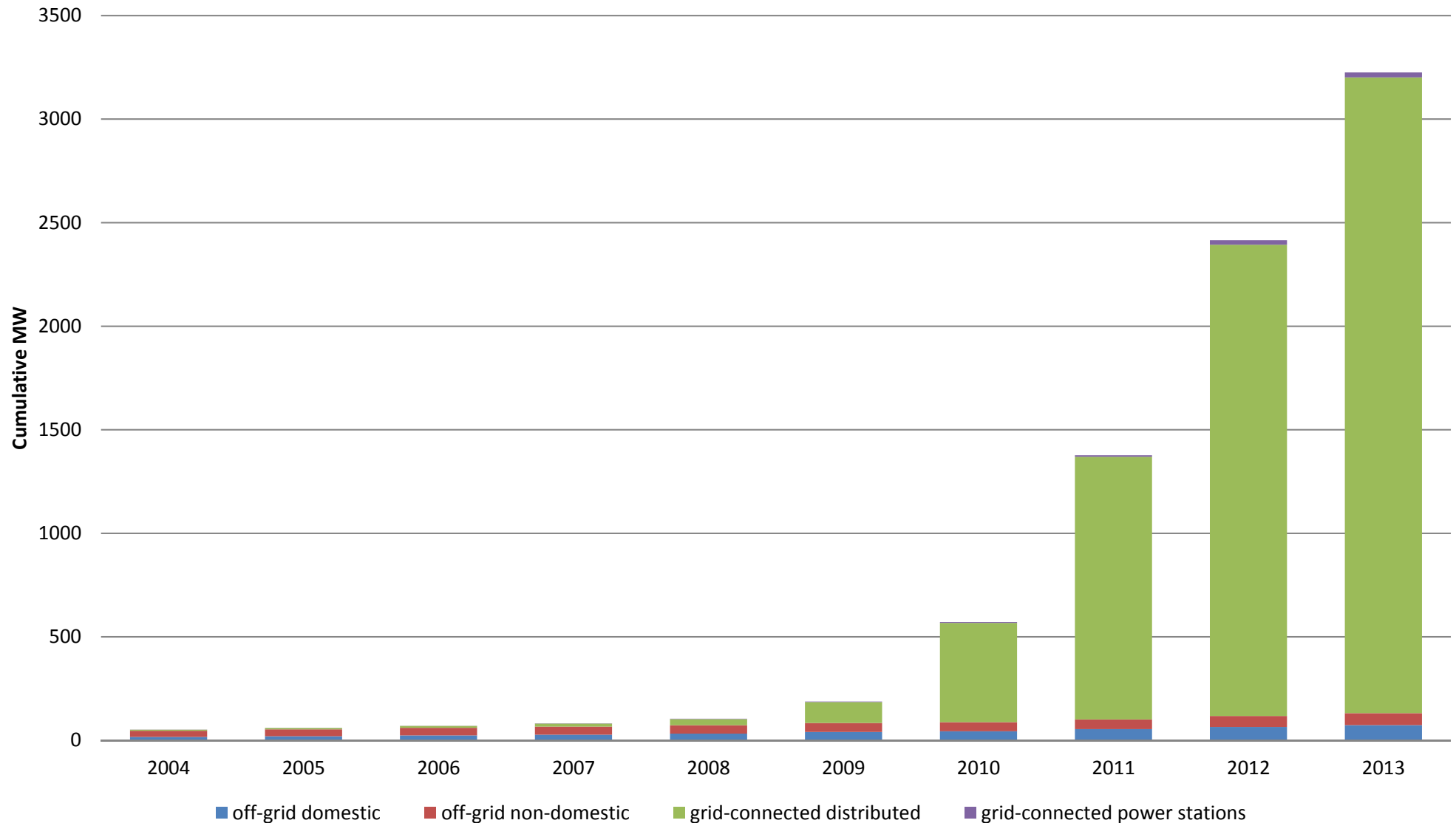
- PV technology development
- Competitive PV markets
- Environmentally & economically sustainable PV industry
- Policy recommendations and strategies
- Neutral and unbiased information

Current Australian PVPS Activities

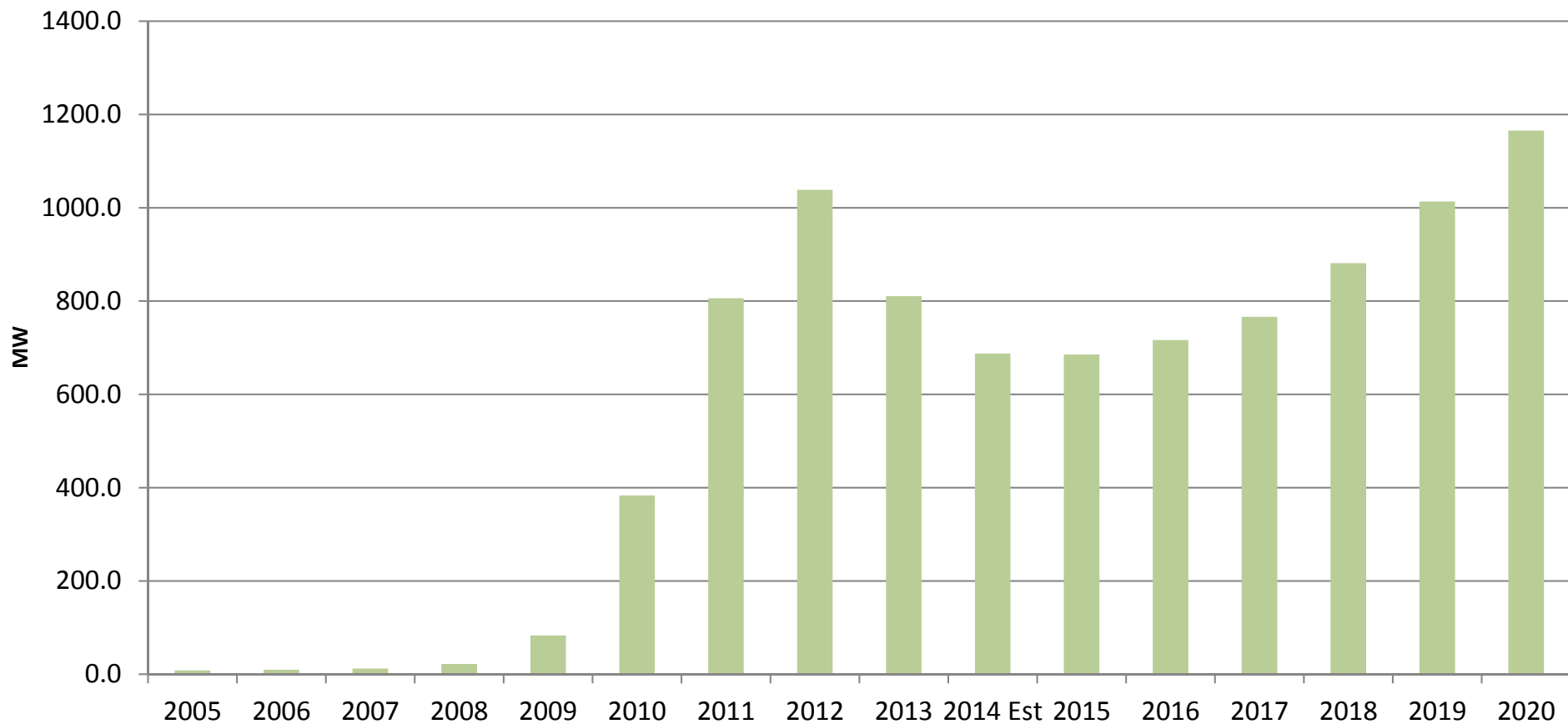


- ExCo Meetings – Renate Egan (Muriel Watt)
- PVPS Task 1 – PV Information Dissemination
 - Warwick Johnson (SunWiz)
 - **PV in Australia Report** → Trends Report
 - PVPS Annual Report
- PVPS Task 14 - High PV Penetration in Electricity Grids
 - Iain MacGill (UNSW), Glenn Platt (CSIRO), Anna Bruce (UNSW)
 - Australian Case Studies
- PVPS Task 13 - Climate Based PV Module Ratings (ASI and CEC funding)
 - Lyndon Frearson (CAT Projects), Anna Bruce (UNSW), David Parleviet, Martina Calais (Murdoch)
 - NREL PV Module Quality Assurance Taskforce - Sandy Pulsford (CEC)

PV Uptake over the past Decade



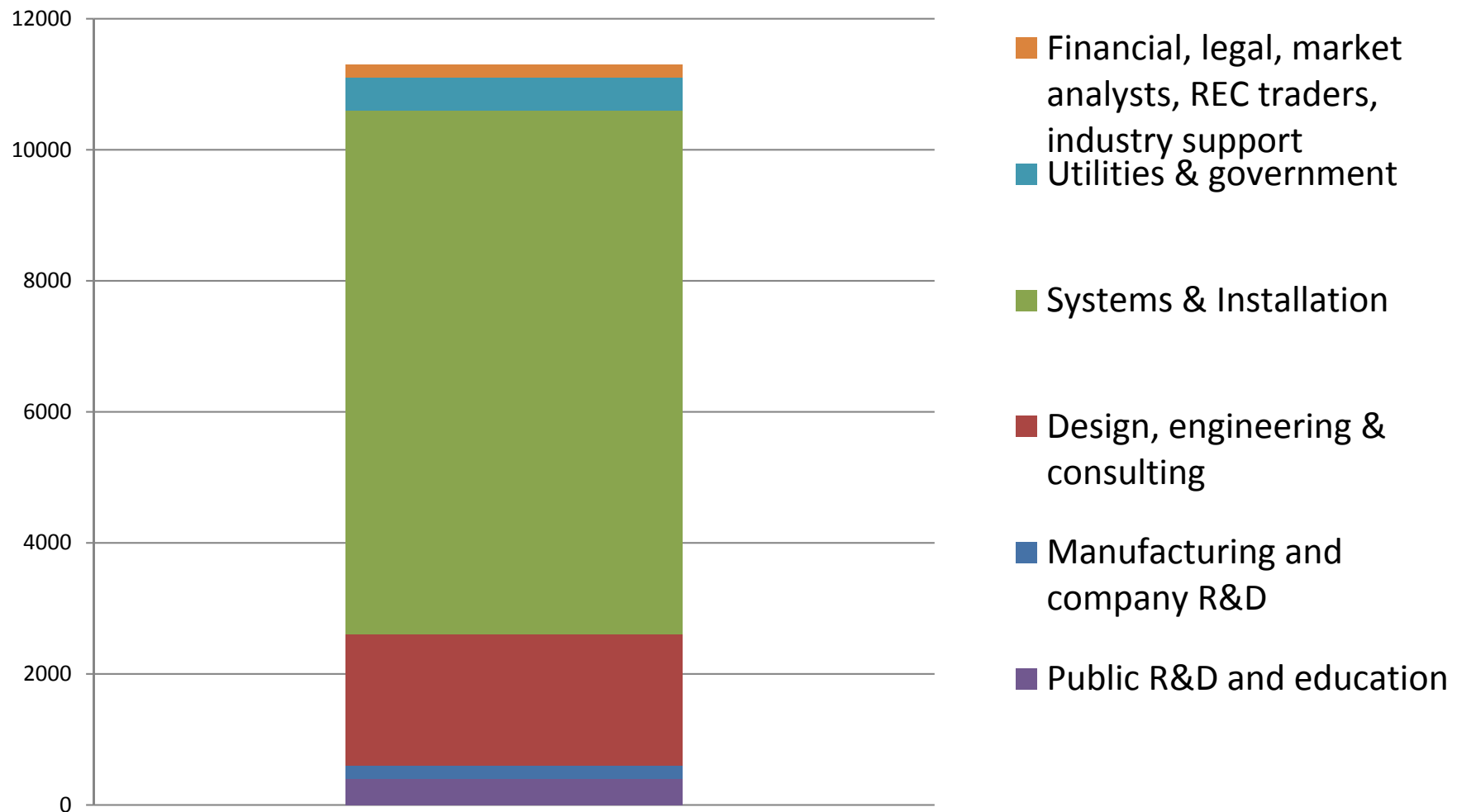
Annual installations and projections



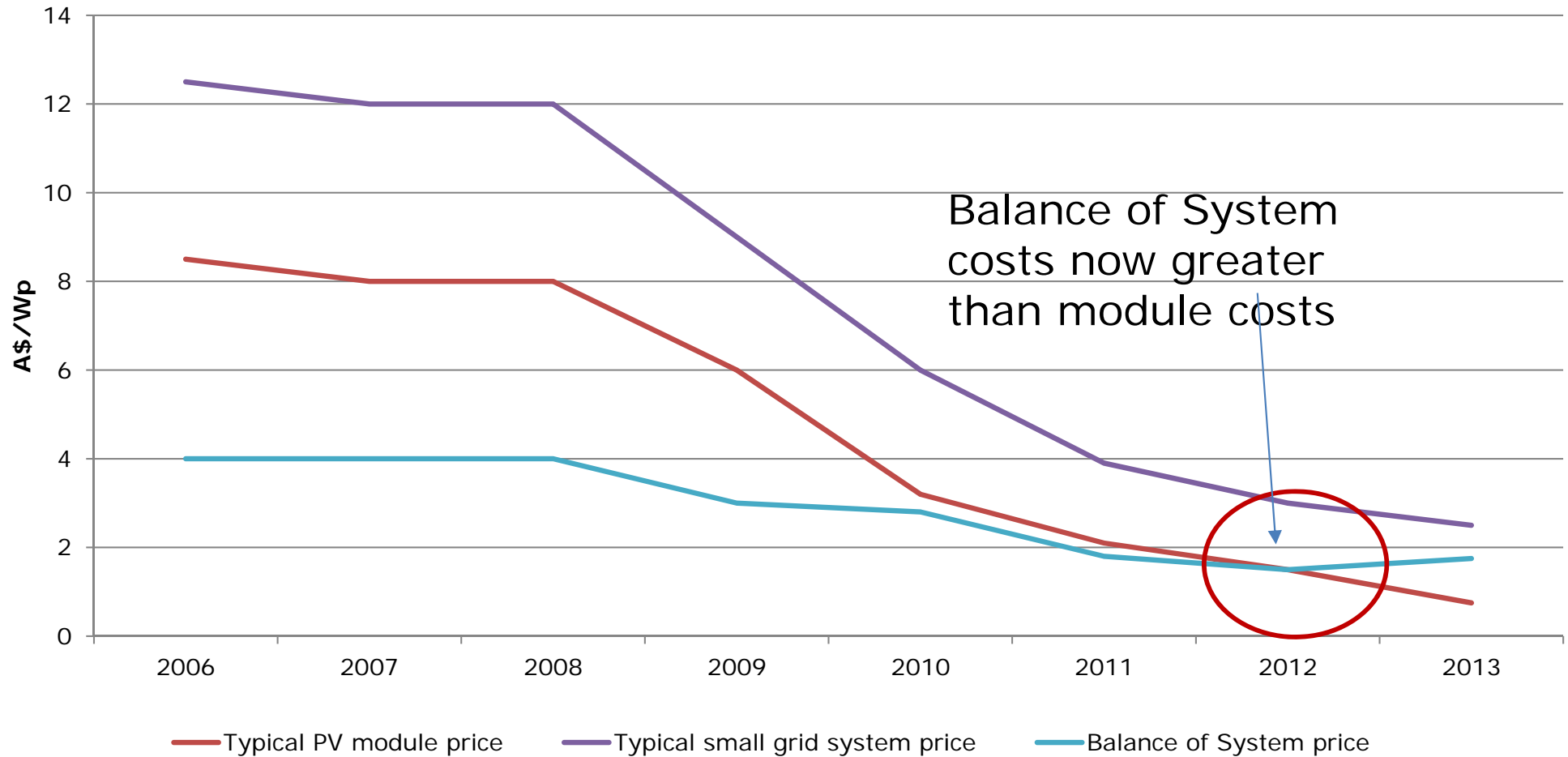
Key 2013 Market Statistics

PV capacity added	810 MW (796 MW grid; 14 MW off-grid)
Cumulative installed capacity	3225 MW (3,094 MW grid; 132 MW off-grid)
Electricity generated	4,500 GWh (2.3%)
Typical residential PV system price	\$2.50/Wp
Average size of residential PV systems	1 kW in 2009; 4kW in 2013
Number of Australian homes with a PV system	Over 1 million
Residential penetration levels	Average 15%; Over 30% in some areas
Turnover	A\$2.1 Billion

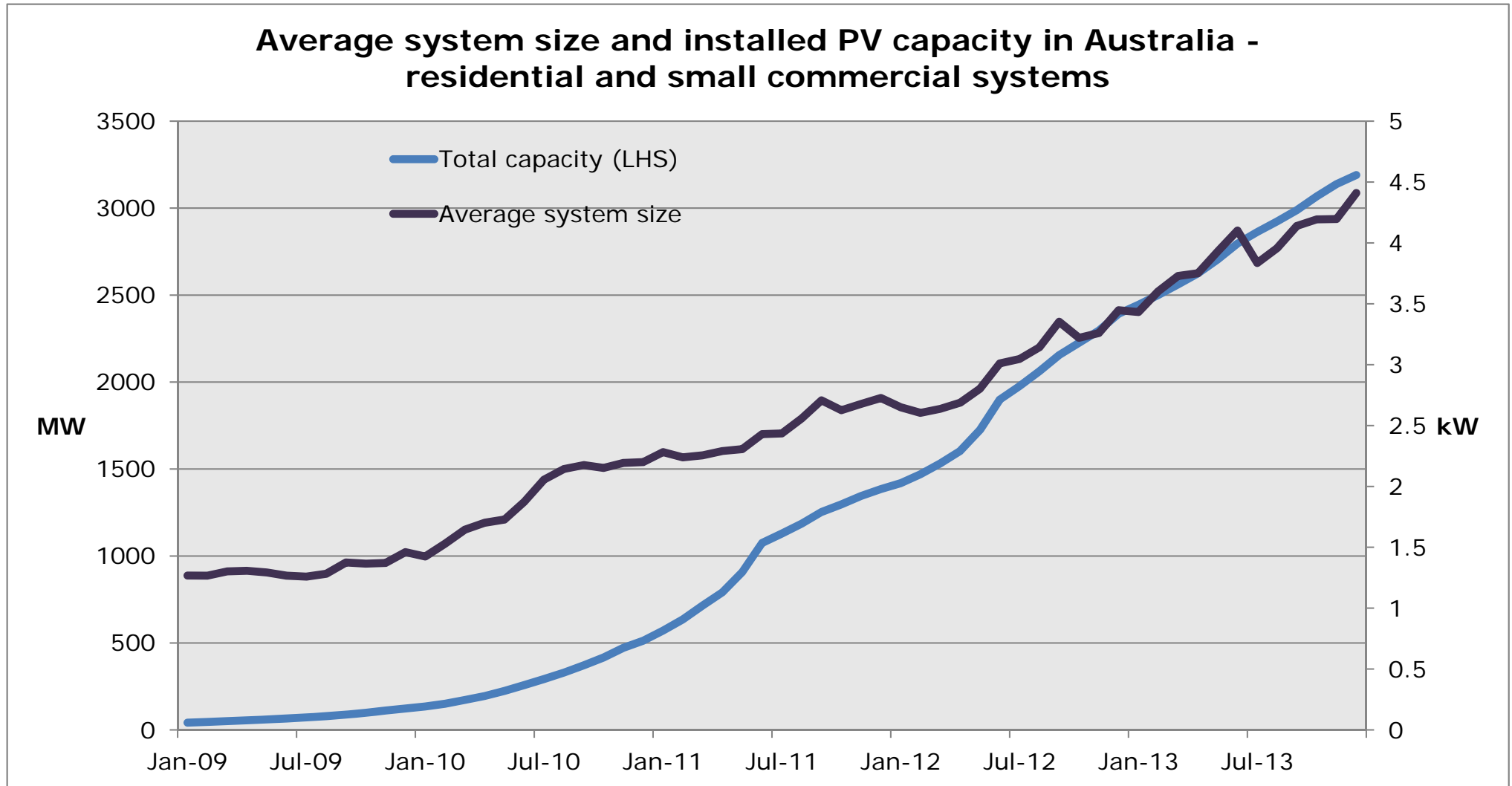
Employment



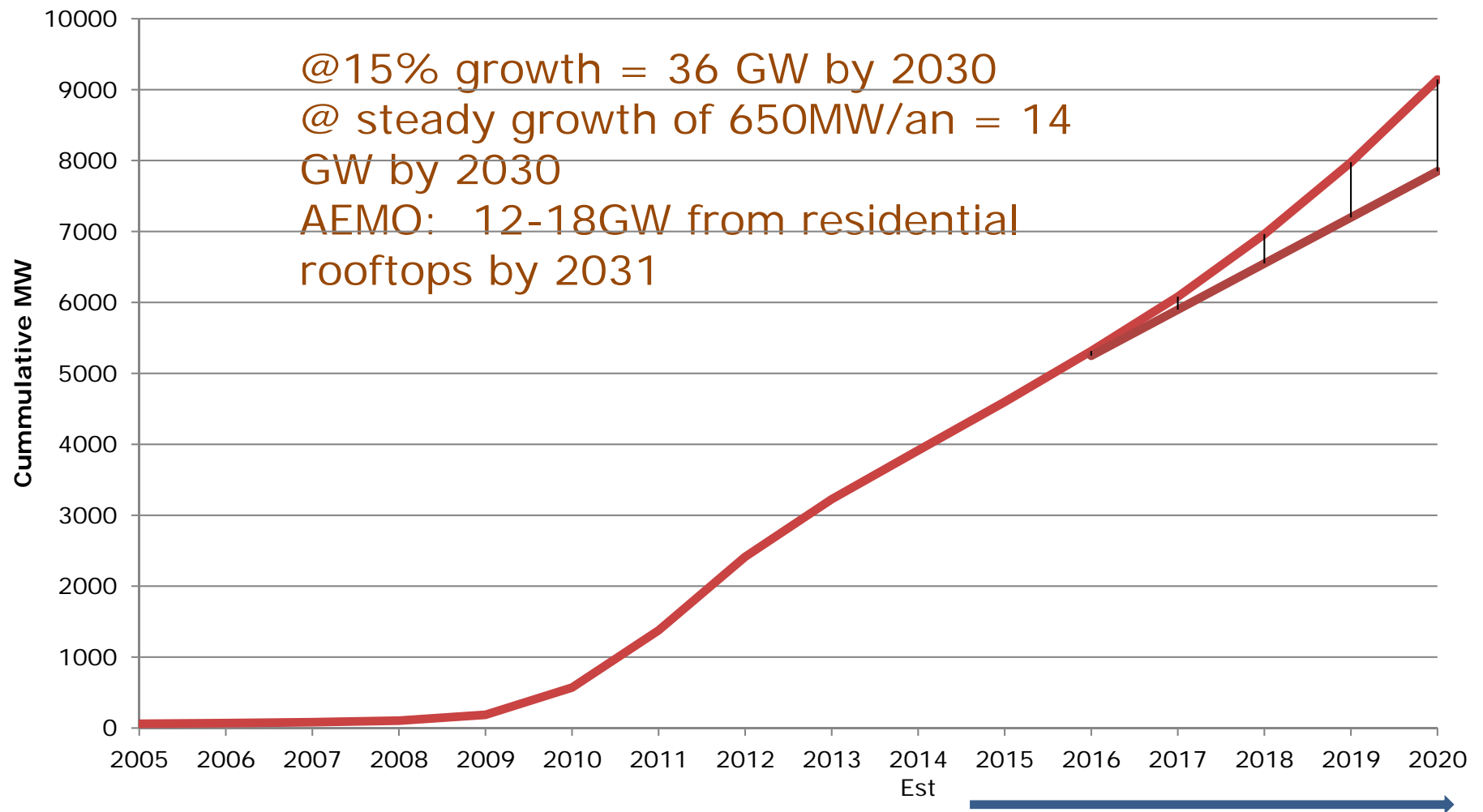
Australian system price trends



PV Size and Capacity (from CER data)



Possible cumulative installations of ~8-9GW by 2020



Public Research & Development Funding

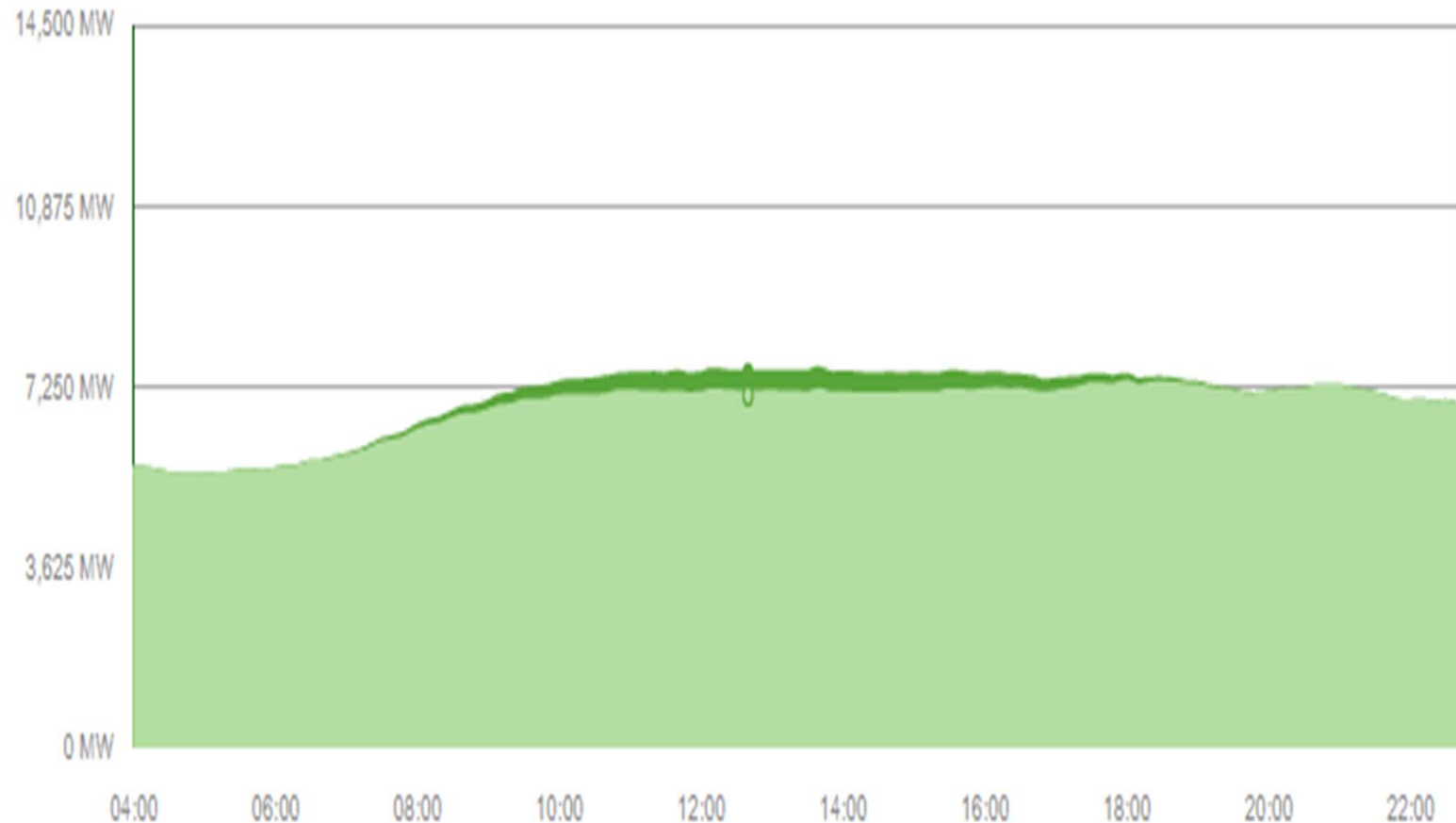
	R & D	Demonstration/Field test
National	\$175.6 M	\$78.5 M
State/regional	\$0.7 M	\$35.5 M
Total	\$290.3 M	

Tokelau PV system. Photo: IT Power



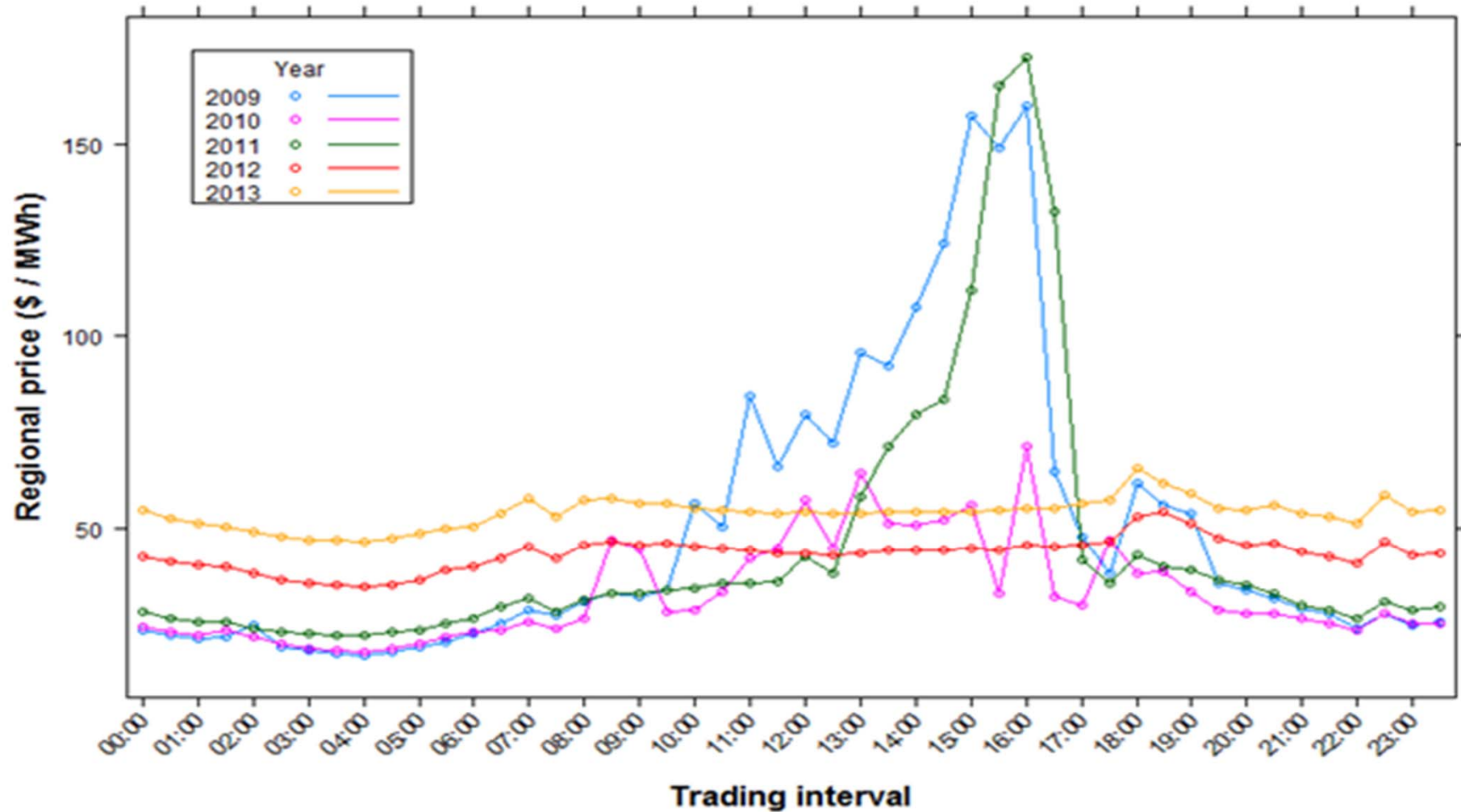
ELECTRICITY MARKET IMPACTS

Load reduction due to Distributed PV – NSW, 29 December 2013 (pv-map.apvi.org.au/)



12:40 pm
Total MW (PV)
NSW: 7,504 MW (430 MW)

Wholesale market impacts (Noone, 2013)



Market Implications

- The market favours incumbents
- Direct support frameworks for renewables are being removed
- Regulatory frameworks, current electricity market models and tariff structures are not designed for distributed energy participation
- New market models are not being implemented
- Instead, barriers are being placed on PV in particular to maintain status quo

Hervey Bay Hospital (Silex Solar)



**DISTRIBUTED ELECTRICITY
MARKET OPPORTUNITIES**

New Market Models Needed

(Passey, Watt & Morris, 2013)

- Distributed Energy (DG, RE H&C, DSM, EE, Storage) competes fairly in generation, distribution and retail
- Customer focus – facilitate interactions and prosumer markets
- Provide value for grid support services

Generation

- Major shift in investment from central to individual ownership
- Ensure value is attributed to DE
 - Marginal cost of energy
 - Time and location value
 - Resource value of displaced energy / alternative uses
 - Long term jobs and investment, reduced cross-subsidies
 - Local, regional and global environmental impacts, incl GHG

Distribution

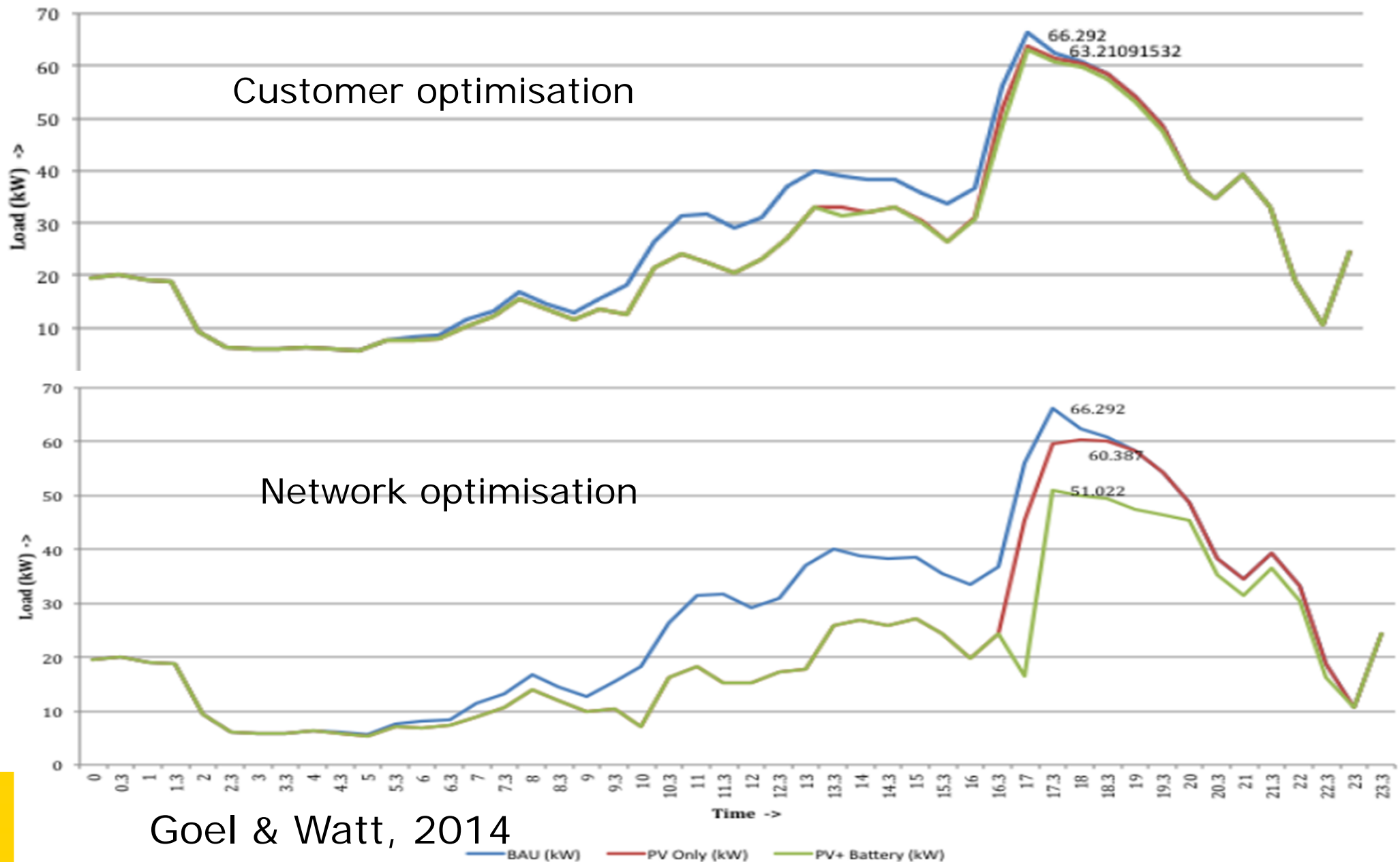
- Grids are no longer natural monopolies
- Move to integrated resource planning for networks
 - Transparency
 - 3rd party access and competition
 - DE considered on equal footing
 - For network upgrade as well as refurbishment
 - Even for smaller levels of expenditure
- Revenue Caps
 - To reduce direct link between kWh sales and revenue
- Allow Networks and others to provide DE options
 - Ring fencing Network businesses to overcome market power issues
- Pay for network value provided by DE
 - Voltage, frequency, storage (seconds, minutes, hours), load management / peak reduction

Retail (Passey & Watt, 2013 – see: apvi.org.au/reports/)

- Tariffs should be technology agnostic
- Tariffs should include a demand, time and perhaps location component, rather than relying on higher access fees for everyone - or just for PV owners
 - ensures, for instance, that air conditioner use is appropriately paid for
 - protects low income / low demand customers
- Competitive feed-in tariffs for RE and Storage
 - These should also be time and location stamped – higher value in peak times and in congested areas of the grid

Storage – the next major trend?

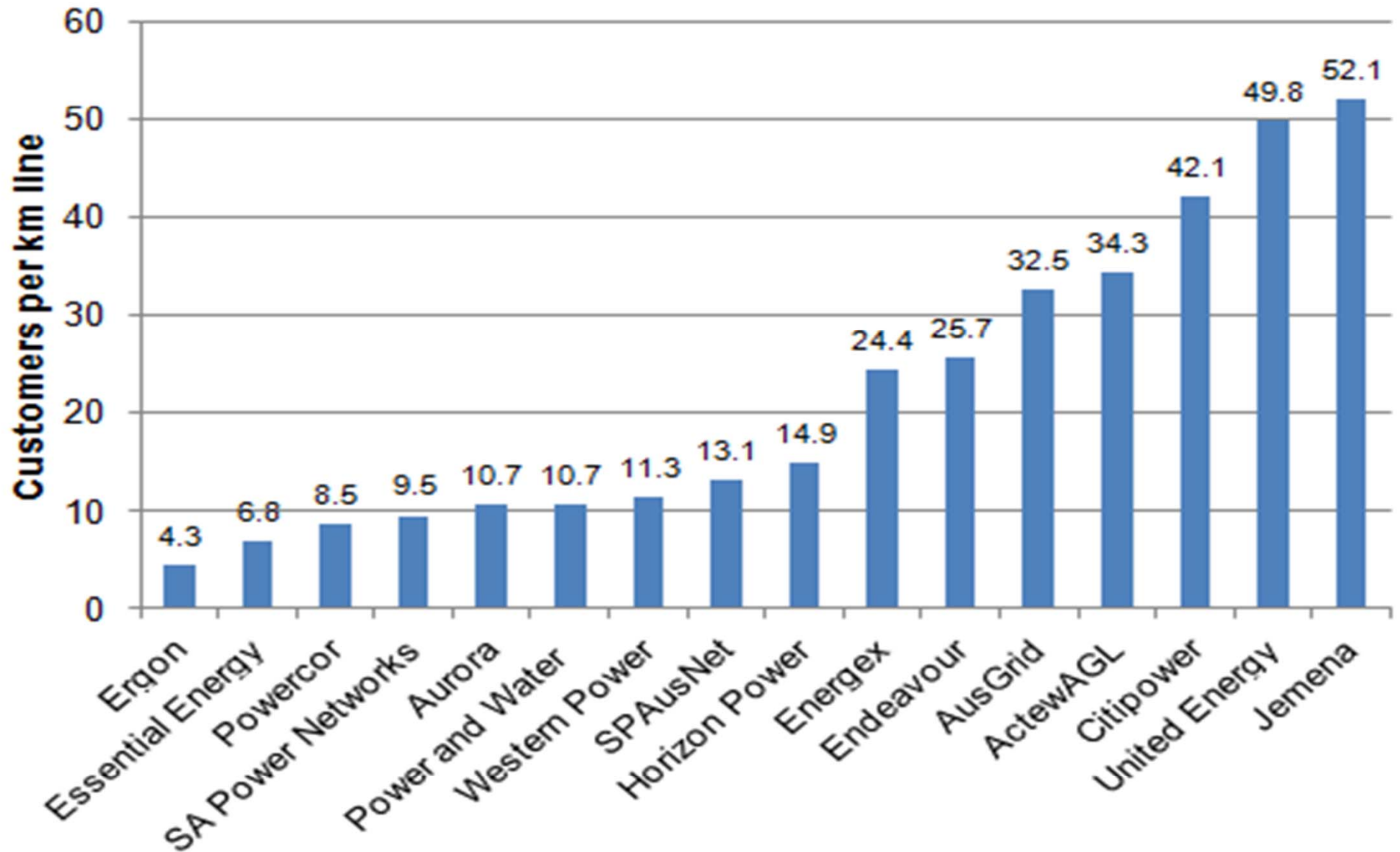
Links to larger PV systems, ZEB, DSM Etc etc



Mini & micro-grid options

- Especially in low density / high grid cost areas
 - Cheaper than maintaining past grids
 - More efficient use of infrastructure
 - More flexibility in energy service provision
 - More market competition
 - Safer and more reliable
 - especially during extreme weather
 - Reduced bush fire risk
- Prospects for more local control of energy systems

Average customer density



Data source: Australian Energy Regulator. State of the energy market 2012,
<http://www.aer.gov.au/node/18959>

Noone et al, 2014



2014 ASIA-PACIFIC
SOLAR RESEARCH
CONFERENCE

2014 Asia-Pacific Solar Research Conference

8-10 Dec 2014, UNSW, Sydney

- Australian PV Institute
- 9th Aseanian Conference on DSC & OPV
- CRC for Low Carbon Living
- Solar Thermal Electricity
with
- 2nd Annual Conference of Australian Centre for
Advanced PV

<http://apvi.org.au/solar-research-conference/>

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