



**UNSW**  
THE UNIVERSITY OF NEW SOUTH WALES

**AUSTRALIAN  
PV INSTITUTE**

*International workshop on*

**PV and the electricity grid:  
overcoming the technical growing pains**

**Location:** Law Theatre, University of NSW,  
Kensington (please see map overleaf)

**Date:** Tuesday 26<sup>th</sup> November, 2013

**Time:** 10am to 4pm (coffee/tea on arrival at 9:45am) and lunch provided

**Program:** The workshop will discuss the results to date of the IEA PVPS Task 14\*:  
*High penetration of PV in electricity grids* and considers the findings in the  
Australian context.

***Welcome***

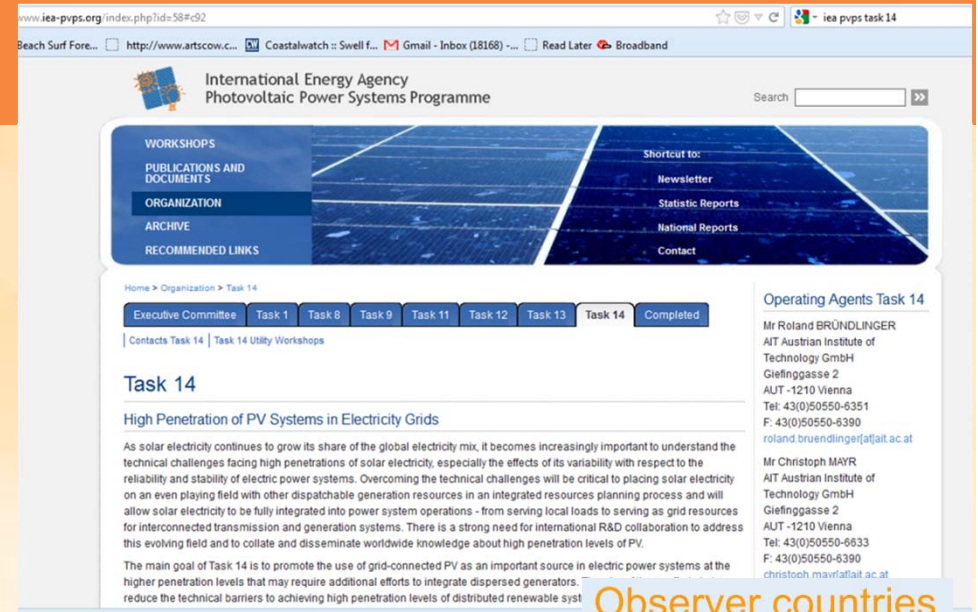
***Iain MacGill***

Associate Professor, School of Electrical  
Engineering and Telecommunications  
Joint Director (Engineering), CEEM



# Task 14 participation

- 14 Countries, new observers



## Observer countries

- Since 2010



- Since 2012

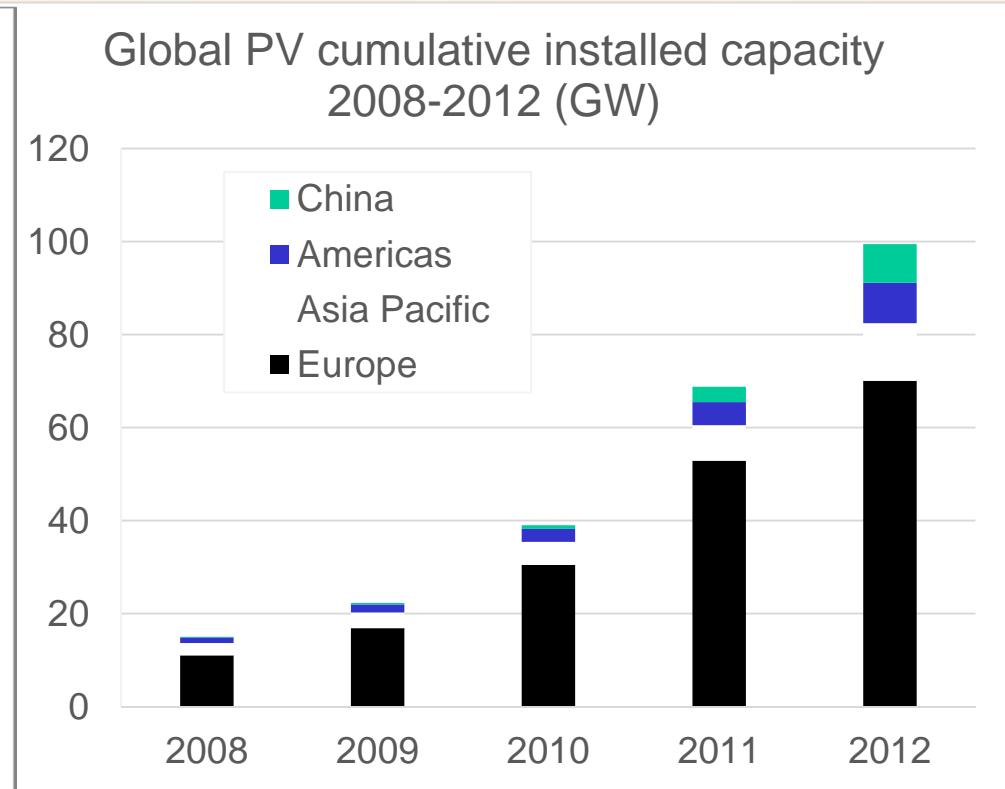
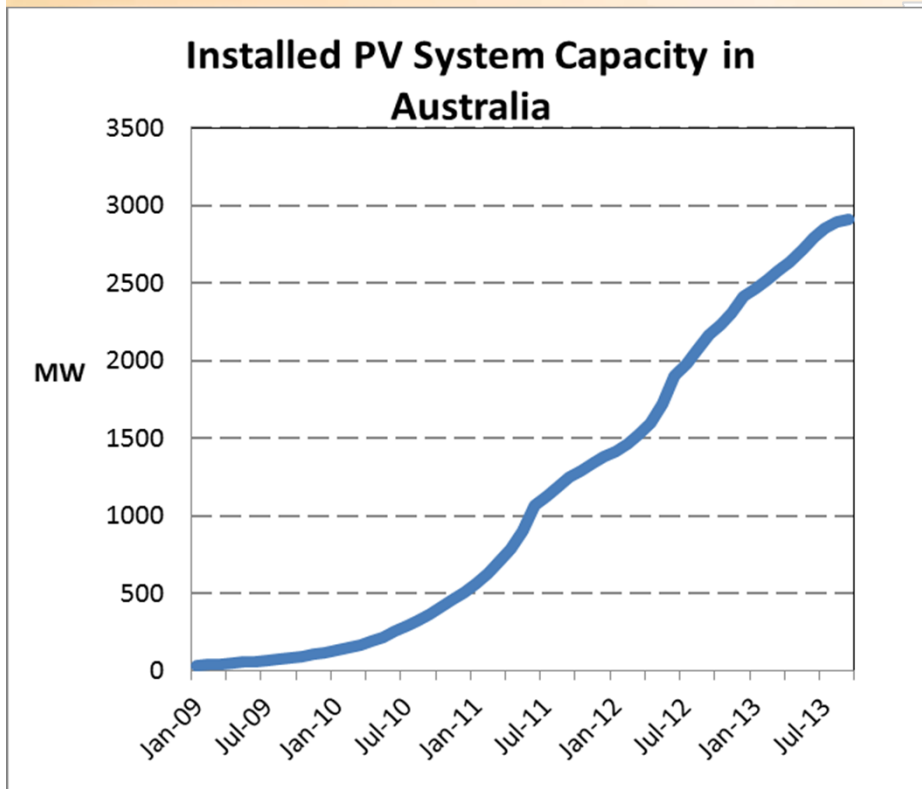


- Australian participation through APVA with ARENA funding support for international collaboration
- Australian contributions to date from Partners including APVA, CEEM – SPREE – EE&T UNSW, CSIRO, NT PWC, Horizon Power, CAT Projects, Ergon



# A key high PV penetration challenge – keeping up

- 2008 – Sydney workshop on PV and the Smart Grid
- 2009 – Task 14 scoping workshop
- 2010 – First Task 14 meeting





# Value of international perspectives

Load profile of E.ON Bavaria against upstream grid operator (E.ON Netz)

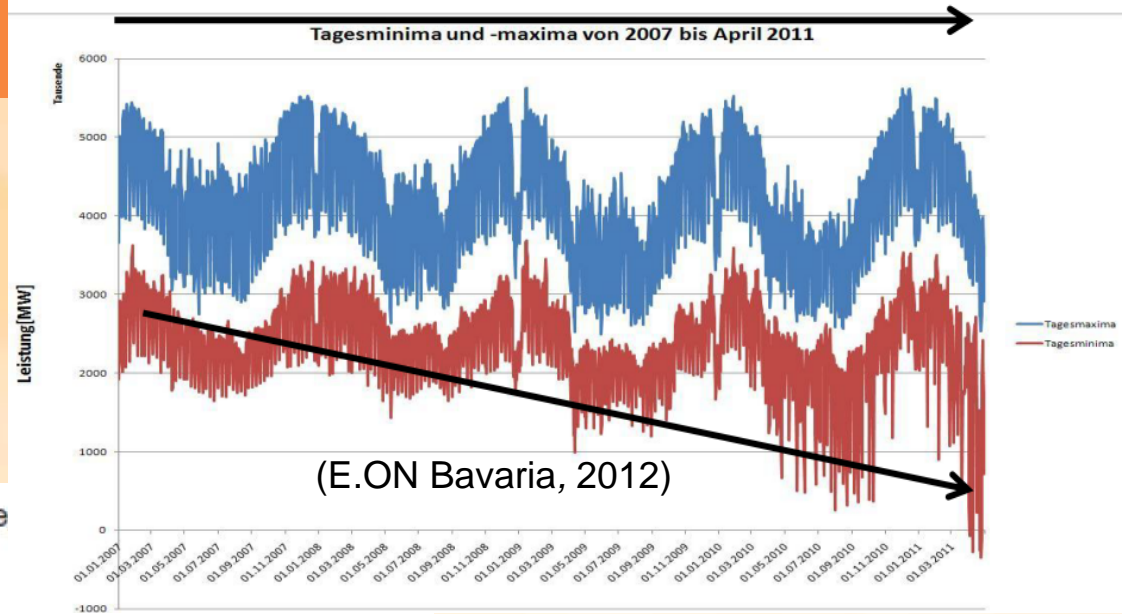
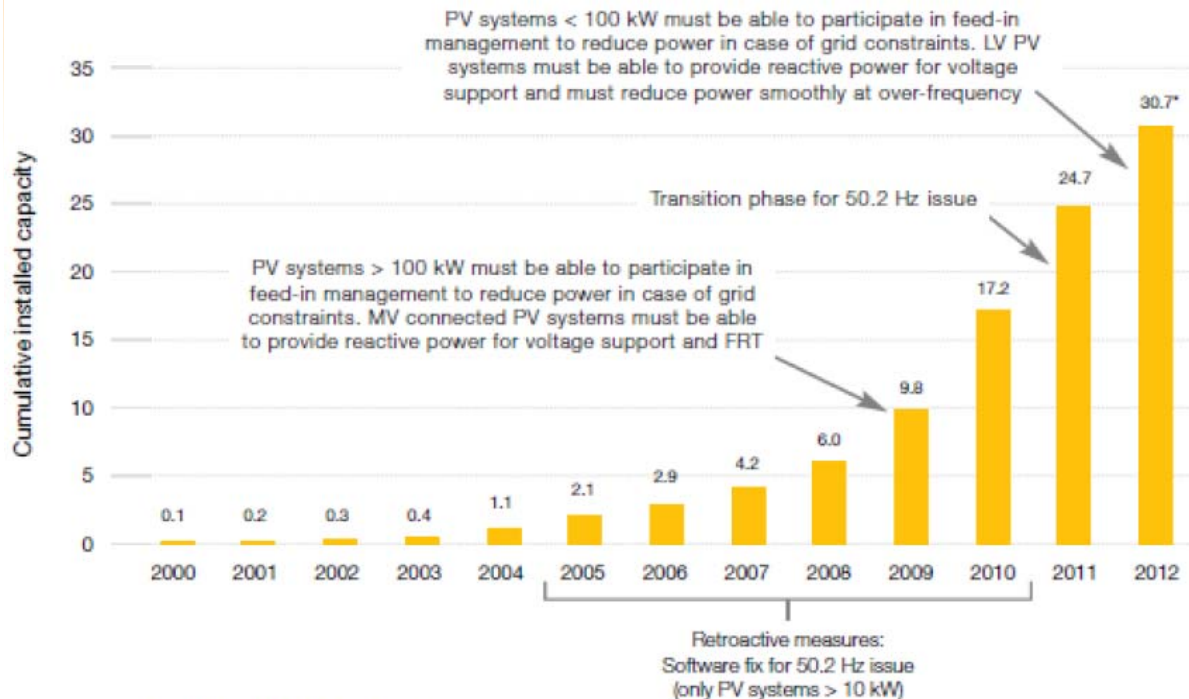


Figure 44 - Evolution of the German grid code and re deployment (GW) (EPIA, 2012)



source: Based on EPIA and SMA figures, 2012  
\* EPIA forecast

*“The future is already here — it's just not very evenly distributed”*

William Gibson

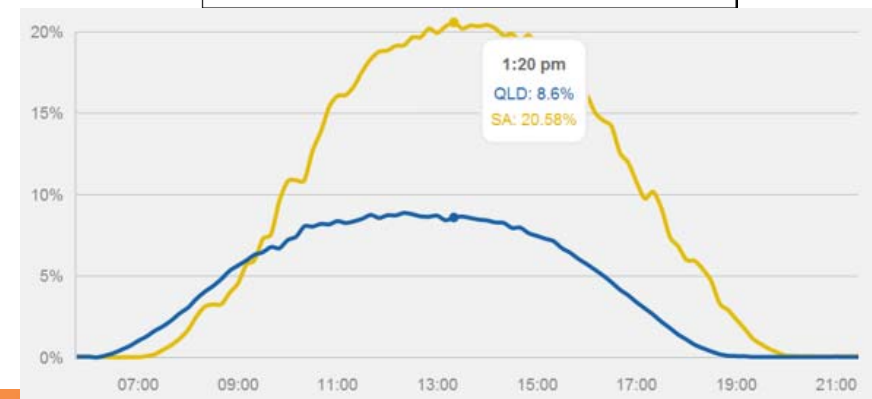
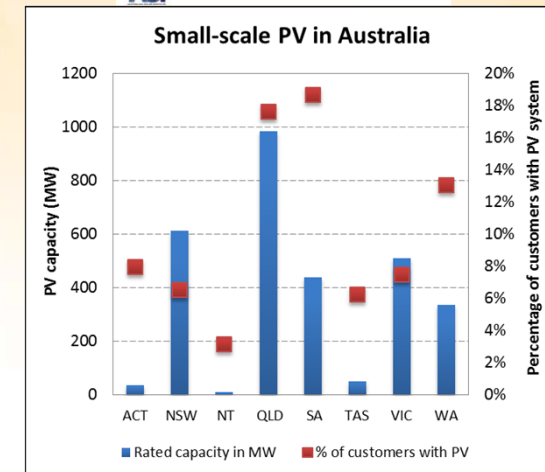
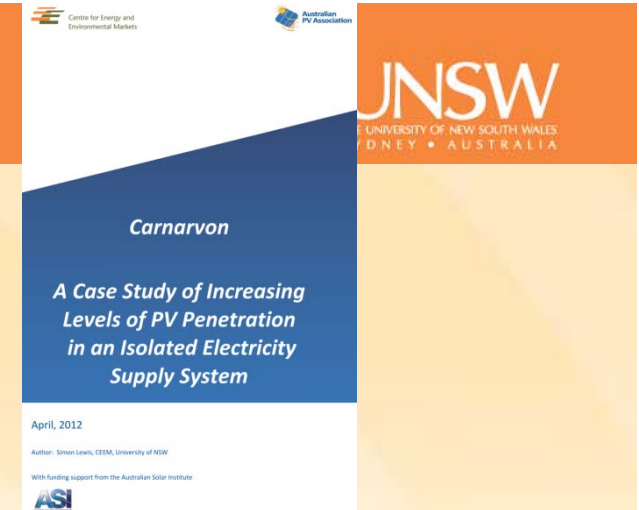


# Value of Australian perspectives

- high PV penetration isolated grids

- World leading residential PV penetrations

- Growing system penetrations





# The challenge + opportunity for a clean energy future

## **We must seize the opportunity for a clean energy future.**

Let me be straight: our ongoing failure to realise the full potential of clean energy technology is alarming. Midway through 2012, energy demand and prices are rising steadily, energy security concerns are at the forefront of the political agenda, and energy-related carbon dioxide (CO<sub>2</sub>) emissions have reached historic highs. Under current policies, both energy demand and emissions are likely to double by 2050.

To turn the tide, common energy goals supported by predictable and consistent policies are needed across the world. But governments cannot do this alone; industry and citizens must be on board. The public needs to understand the challenges ahead, and give the necessary support and mandate for policy action and infrastructure development. Only decisive, effective and efficient policies can create the investment climate that is ultimately needed to put the world on a sustainable path.

The good news is that technology, together with changed behaviour, offers the prospect of reaching the international goal of limiting the long-term increase of the global mean temperature to 2°C. By reducing both energy demand and related greenhouse-gas (GHG) emissions, strategic application of clean energy technologies would deliver benefits of enhanced energy security and sustainable economic development, while also reducing human impact on the environment.

**(IEA, *Energy Technology Perspectives*, 2012)**



# The morning – the Task, Australian context

- 10:00 – 10:20 Welcome and Background: Assoc. Prof. Iain MacGill, UNSW**
- 10:20 – 10:40 Update on ARENA's activities - including R&D and other support for higher renewable energy grid penetration: Lara Olsen, General Manager Strategy, ARENA**
- 10:40-11:10 The PVPS High PV Penetration Task – background, scope and findings: Mr Christoph Mayr & Mr Roland Bruendlinger, Austrian Institute of Technology**
- 11:10 – 11:40 Utility experiences with high PV penetration – Australian survey results: Ben Noone, UNSW**
- 11:40-12:10 Magnetic Island – an Australian Case Study – Dr Anna Bruce, UNSW & Dean Condon, Ergon Energy**
- 12:10-12:40 Addressing issues created by high PV penetration at inverter level: Andros Cadavid, SMA Australia**



# The afternoon – international perspectives

**1:40-3:45**      **High Penetration in the European Context: Mr Manoel Reking, European PV Industry Association**

**High PV in Local Distribution Grids & Update on PV in Germany, Dr Thomas Stetz, Fraunhofer IWES, Germany**

**Overview of grid integration research in the U.S, Barry Mather, NREL**

**Smart Inverter Technology for high PV Penetration: Mr Roland Bruendlinger, Austrian Institute of Technology**

**(TBC) Solutions for high PV penetration from central PV generation plants: Prof. Kazuhiko Ogimoto, University of Tokyo, Japan**

**3:45 – 4:00**      **General discussion**