How Australia can add and capture value in a global solar industry

The 49th Annual AuSES Conference

Solar 2011

Australian Technology Park, Sydney, December 2, 2011

Mark Twidell, Executive Director ASI

Outline

- Context
- Australia's strengths
  - Developing and licensing technologies
    - case studies
  - Deregulated, diverse energy market
  - Resources (physical and human!)
- Opportunities

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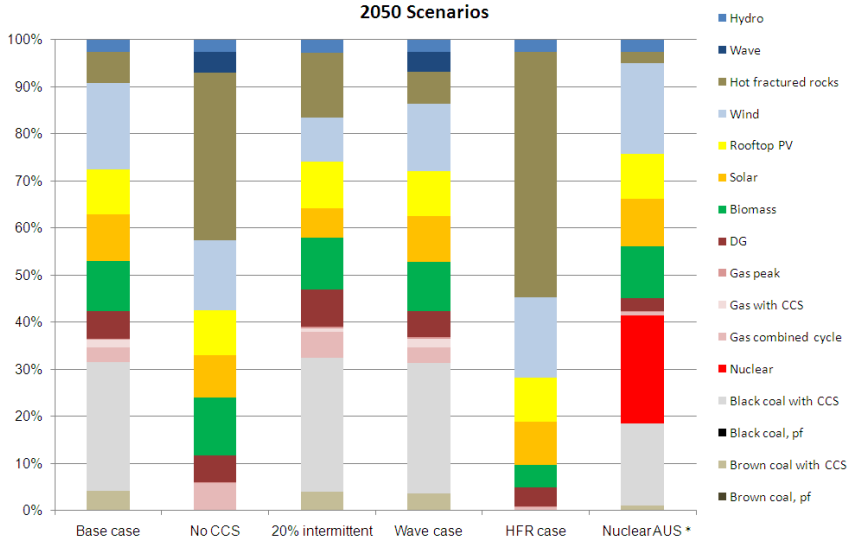
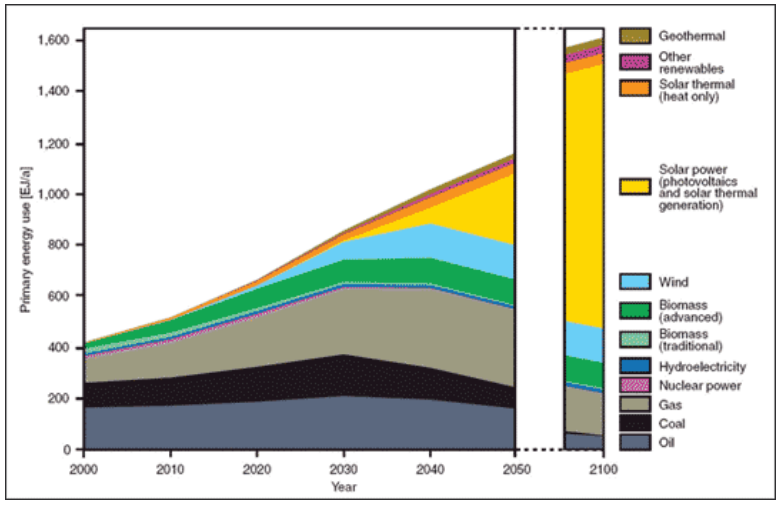
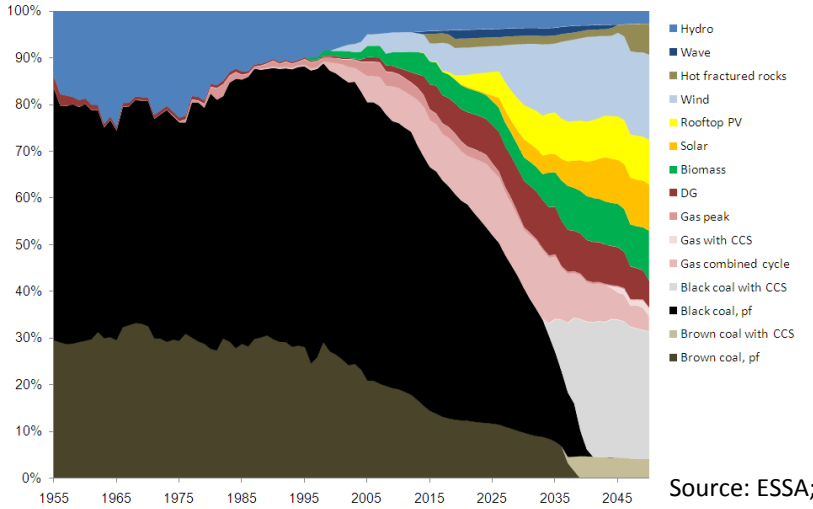
Various forecasts project continued solar growth – typically 20-25% of supply by 2050



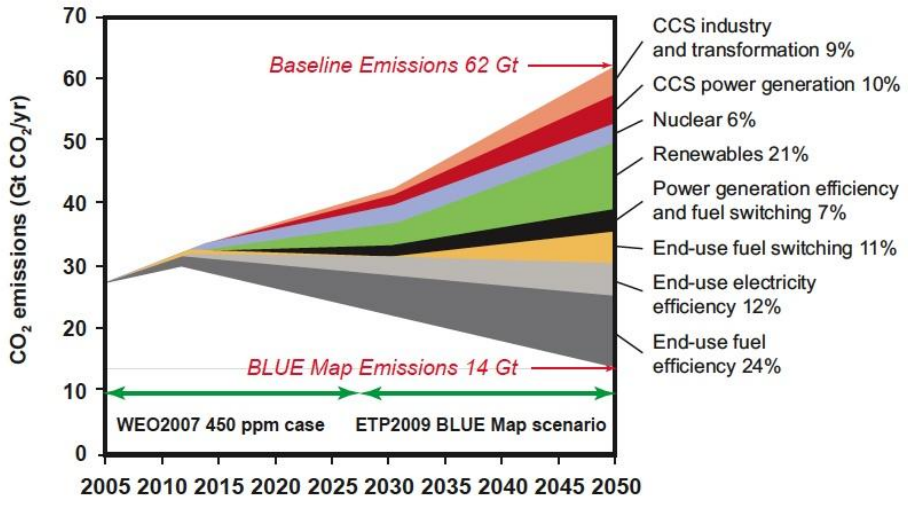
Source: CSIRO ESM Feb 2011



German Advisory Council on Global Change (WBGU)

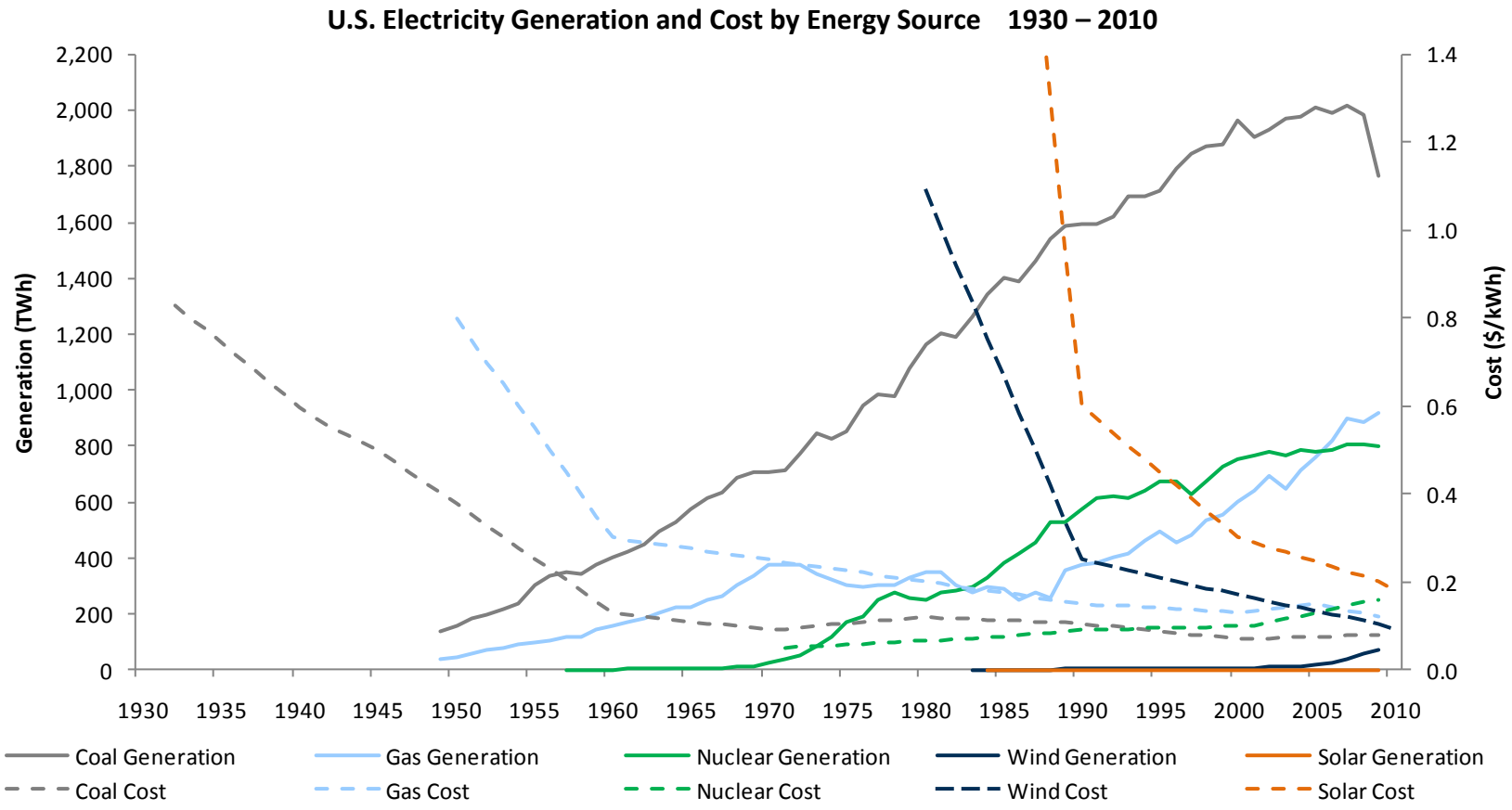


Source: ESSA; CSIRO ESM Mar 2011



Source: IEA

Historical and full market context shows both the challenge and opportunity



Sources: EIA, MIT, American Energy Independence; NREL; Cooper; Hudson estimates.

Slide used with permission from Paul Ho of Hudson Clean Energy

HUDSON CLEAN ENERGY

Progress across the full set of costs is required to increase commercial viability and deployment

$a → Finance Channel Margins

$b → Other Hardware, Civils, Install , Land, O&M

$c → Solar Device

Local Costs

70-80% of employment in these areas

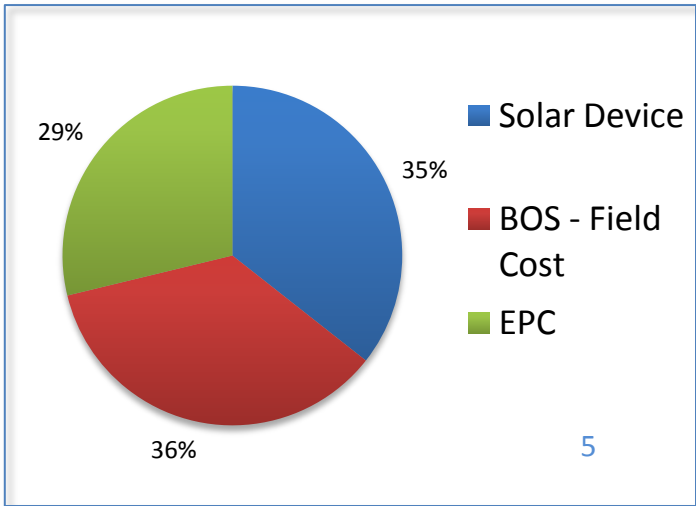
Global Cost

Technology IP key value

$$\frac{\$\text{Lifetime Costs}}{\text{MWHrs Supplied}} = \$/\text{MWHr}$$

$$\frac{(\$a+\$b+\$c)}{\text{MWHrs}} = \$/\text{MWHr (LCOE)}$$

Typical Capital Costs %



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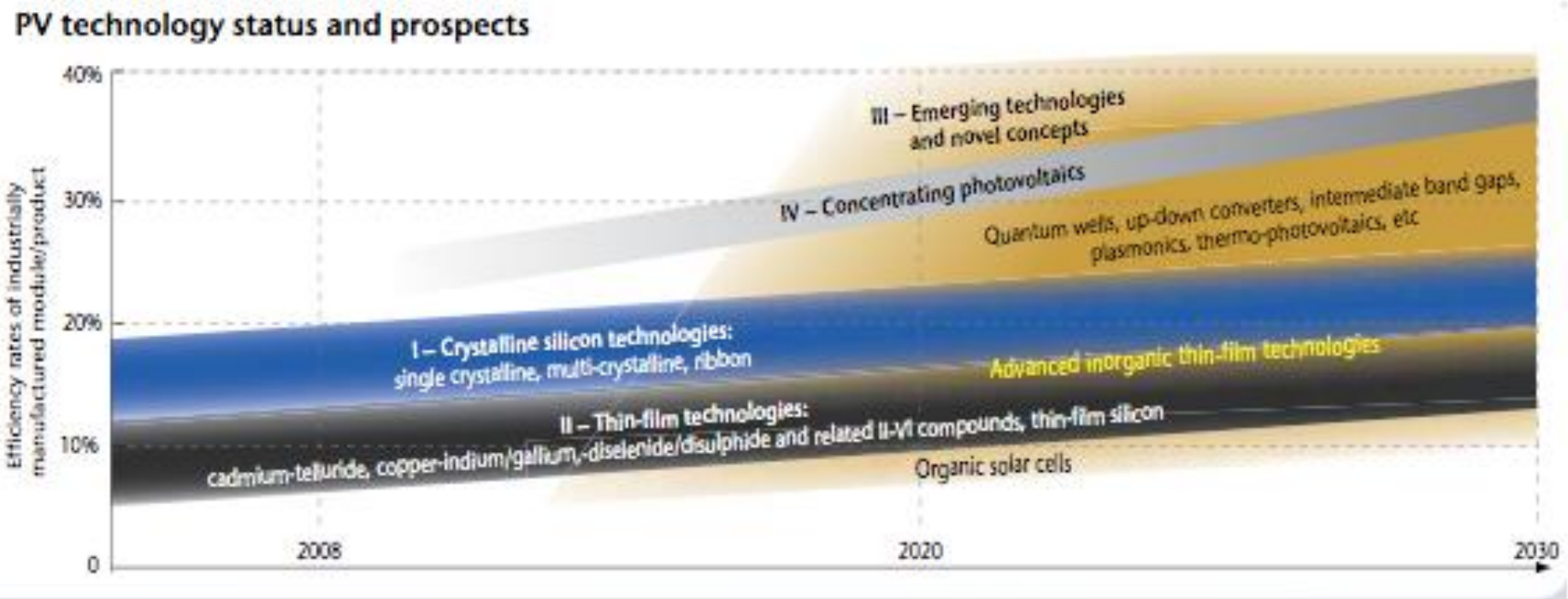
High level strategic technology roadmaps are in place

- Today's technology will continue to evolve – lowering costs and increasing efficiency
- New technology emerging that will accelerate trends



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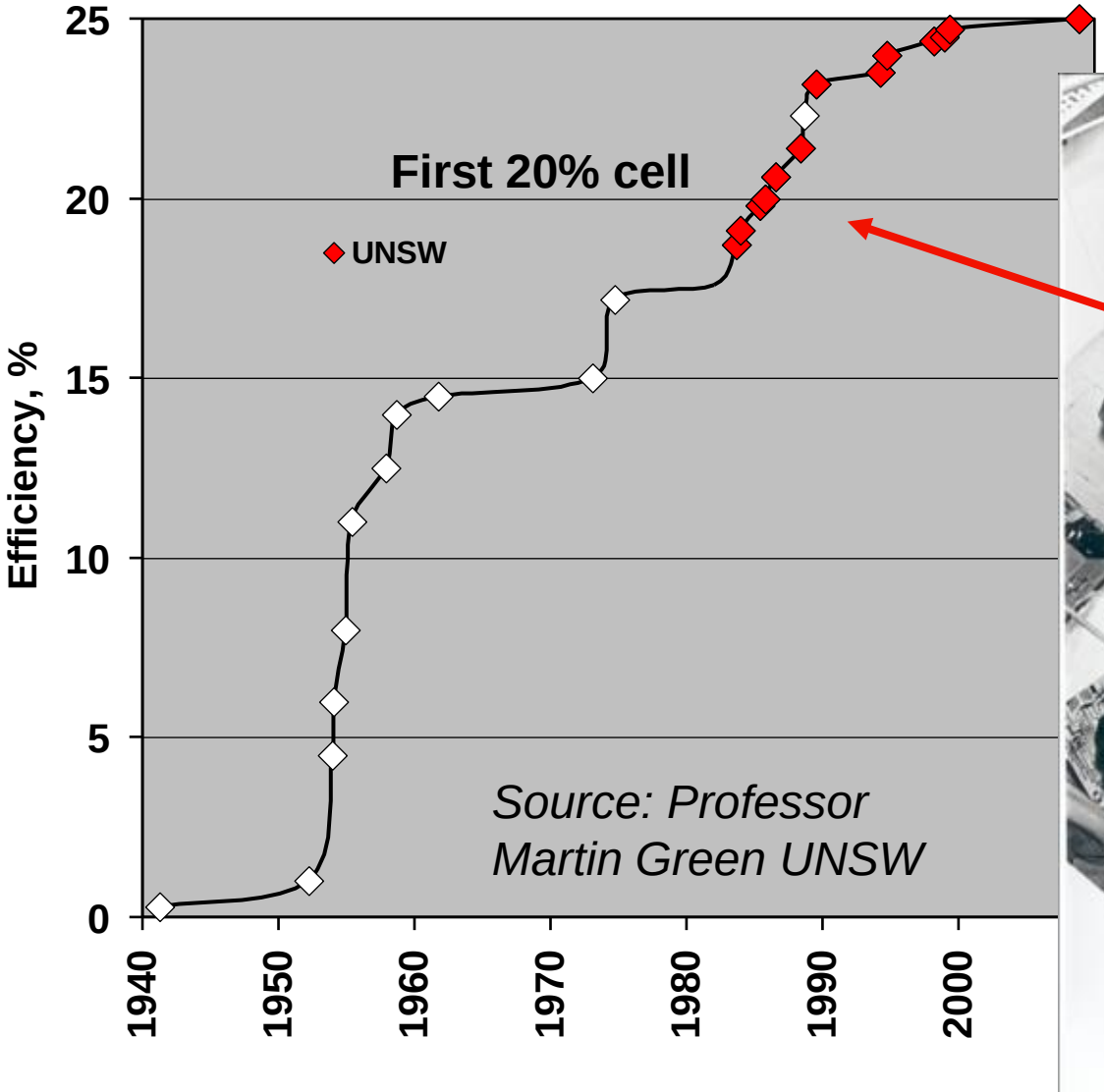
Australian technology and research capability is world leading



Australian alumni now leaders in a global industry

Tech Transfer

Trina, Solarfun CTO

Suntech/ Sunergy/ JA Solar/ Sunrise Global

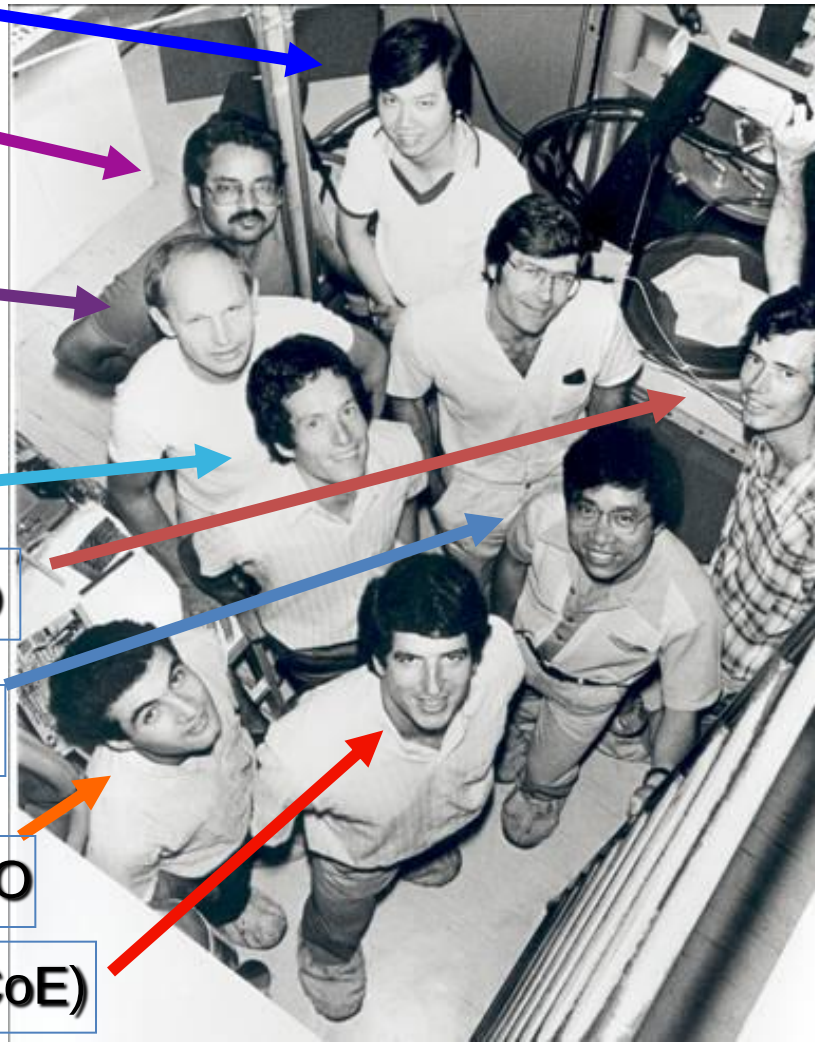
ANU CoE

UNSW PV CoE/ Suntech CTO

China Sunergy CTO

CSG Solar CEO

PV Centre of Excellence (PV CoE)



Case Study 1

- University of NSW & Suntech developing high efficiency “semiconductor finger” solar cells that overcome the fundamental limitations of screen printed cells.
- Developing and then adapting the high performance rear inter digitated contacting scheme to both n-and p-type Czmono and cast multicrystallinesilicon wafers.
- Develop the UNSW PERL cell technology to a new 26% world record.
- Demonstrate multiXmodule efficiency of 18% exceeding current world record and production cost savings allowing ‘grid parity’ pricing.

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Case Study 2

- Trina Solar and ANU
- $3.3M ASI funding for project combining existing fast and inexpensive methods used to make today's standard p-type silicon solar cells with the latest advances in higher efficiency n-type silicon cells. 3 parts:
  - Developing 20% efficient n-type cells with Trina
  - Improving standard p-type cell to 19% with Trina
  - In collaboration with UNSW, developing industry-ready n-type cells with >22% efficiency

" This project will allow us to take some of our best innovations out of the laboratory, and into industry. We expect that by switching to n-type silicon wafers, the efficiency of standard screen printed silicon solar cells can be improved significantly, while still keeping costs down."

Dr Daniel Macdonald,
Lead Chief Investigator.

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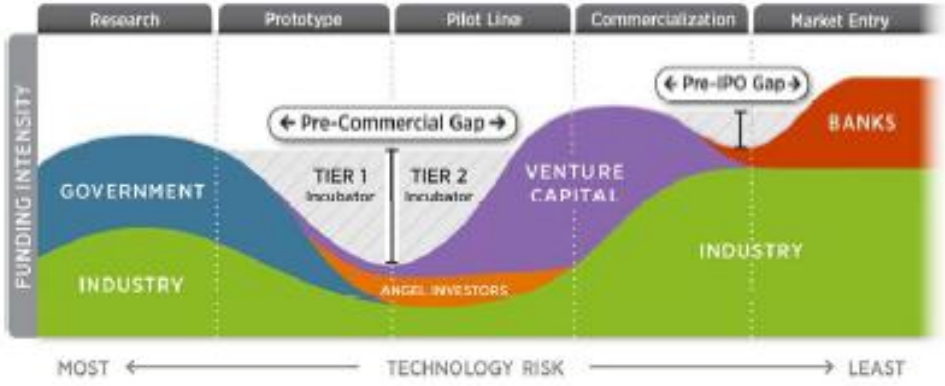
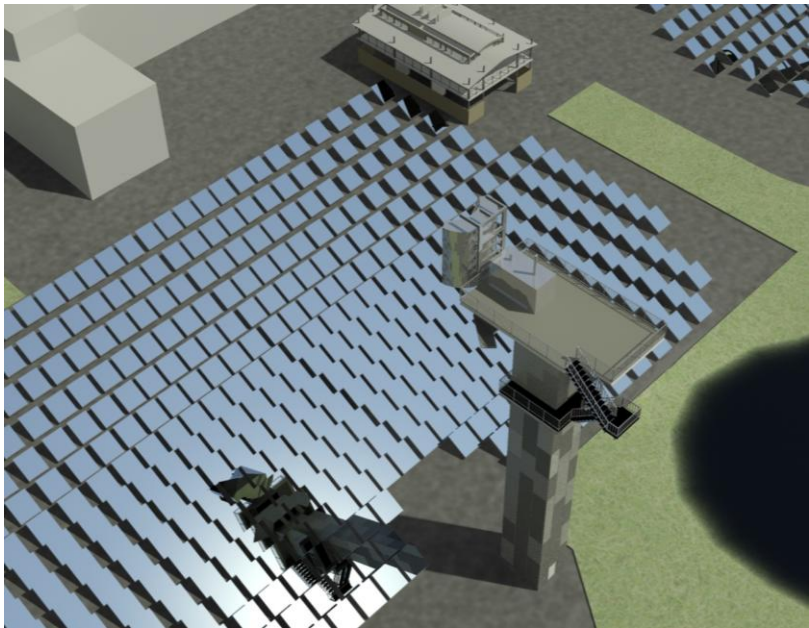
Case Study 3 : New technology requires demonstration to gain “bankable” capital market support – e.g CSP Tower

- R&D Pilot Phase
  c$5m 400kW prove basic operation
- Phase 1 Demonstration
  1MW $10m - prove yield
- Phase 2 Pre Commercial Demonstration
  4-5MW $30m – prove reliability & revenue
- Phase 3 Early Commercial Operation - 50MW $200m prove financial return

Capital Finance Key Barrier



Source : US DoE 2011



Prize – Competitive Solar Electricity with hybrid / storage integration to provide firm supply

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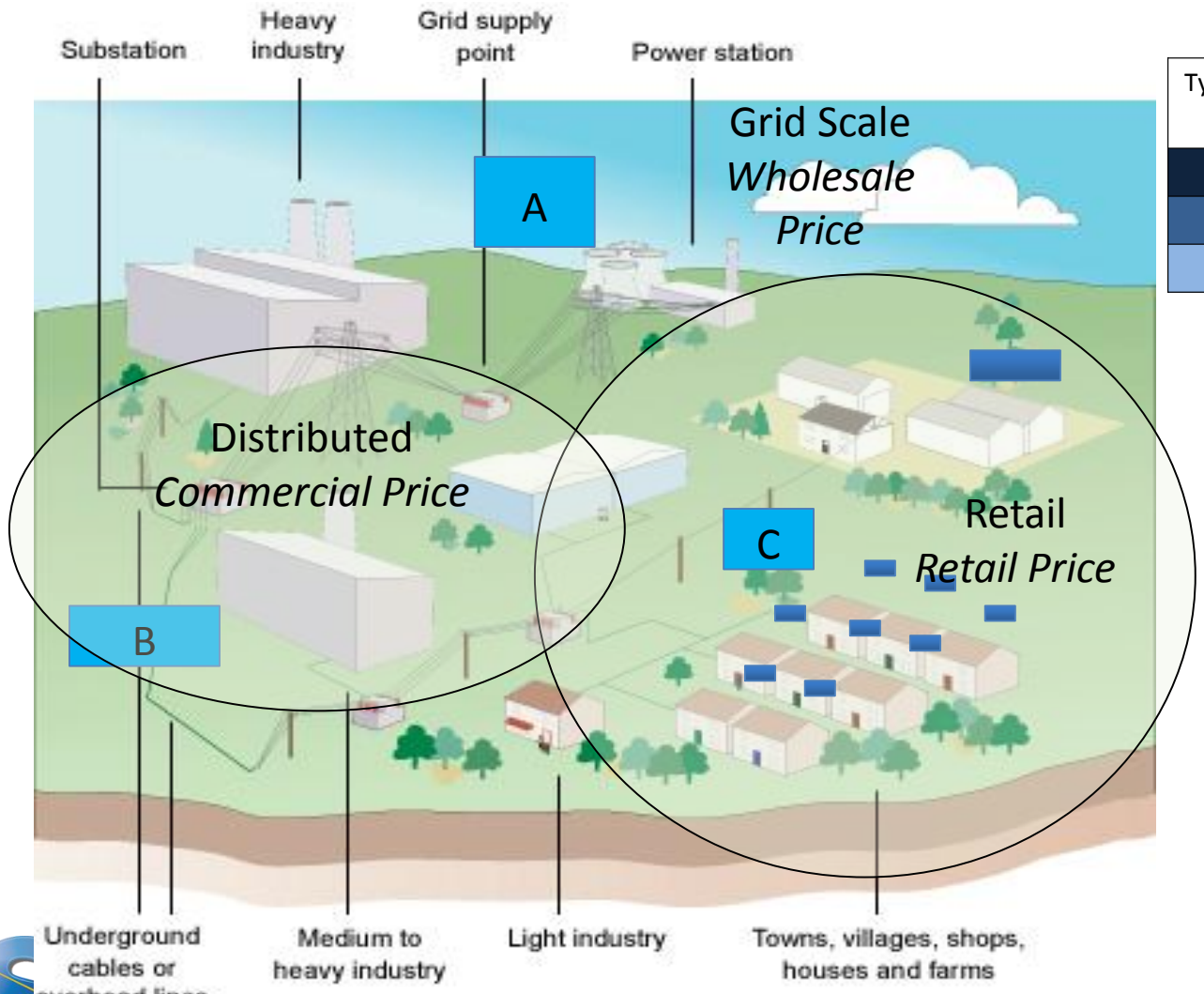
Solar has an opportunity across Australian electricity markets



Type	MW Range	2030 Parity
A	>5MW	$80-150
B	<5MW	$130-220
C	1-100kW	$220-400

Sources of Value

$/MWHr NEM Pool
Time of Day

$/MWHr RET/Carbon

Distributed Value
Retail Price

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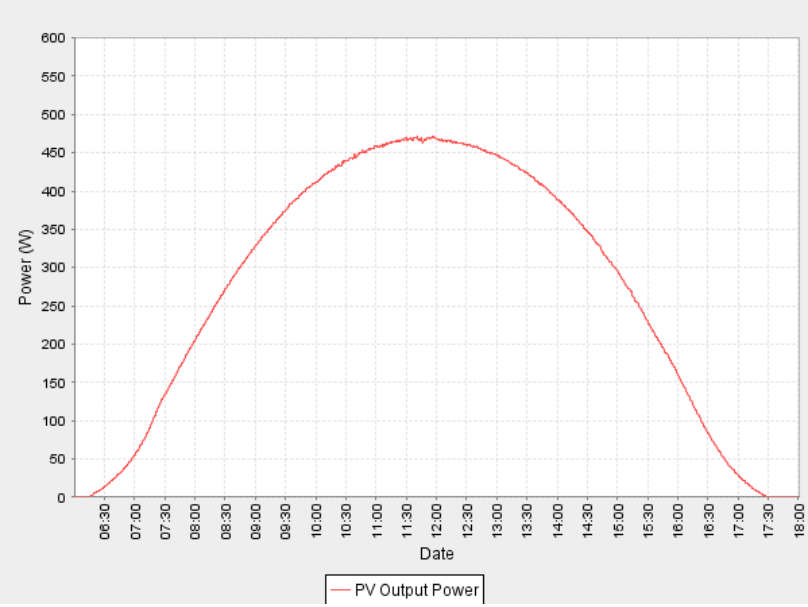
Variability of PV – network value?

Solar power generated on a sunny day



Solar power generated on a cloudy day

Source CSIRO. Distributed Energy Team 2010

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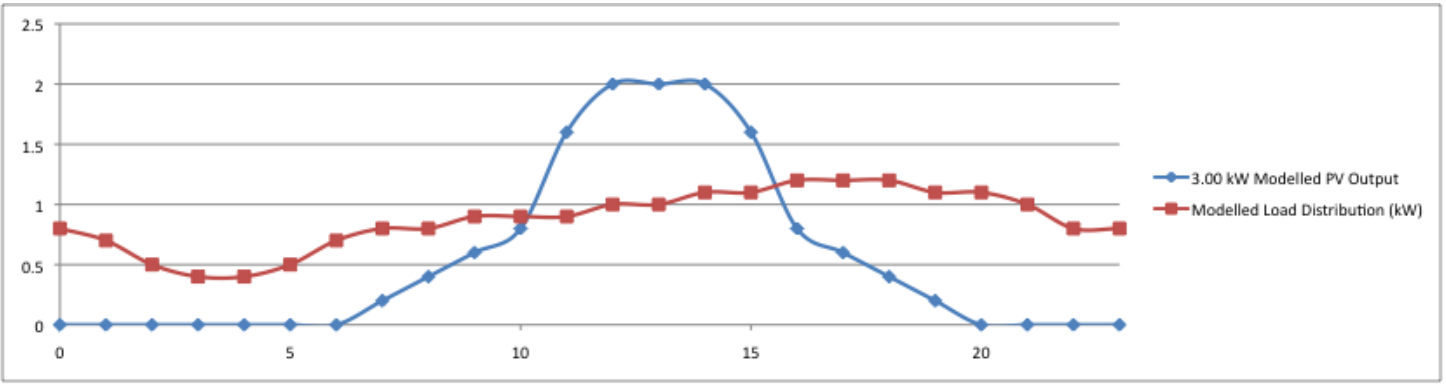
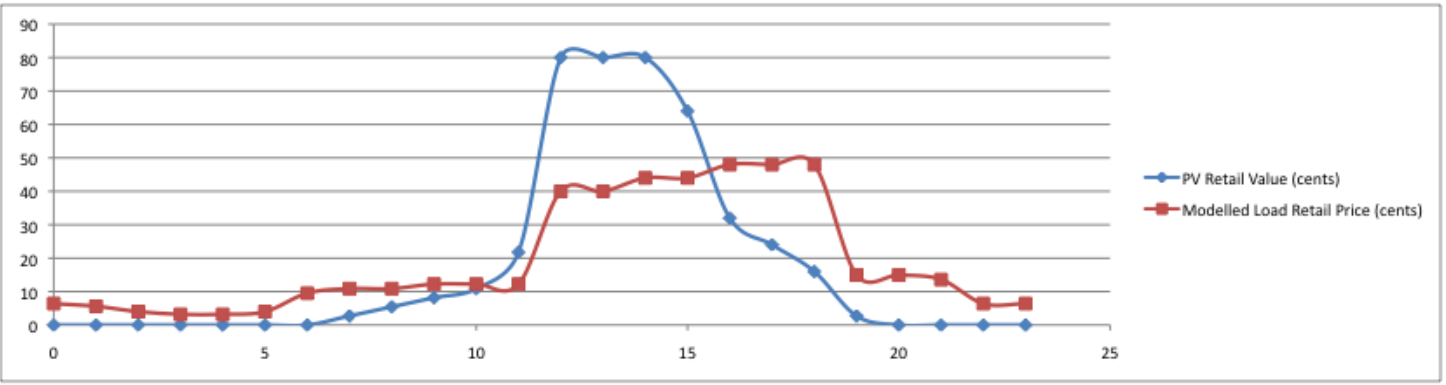
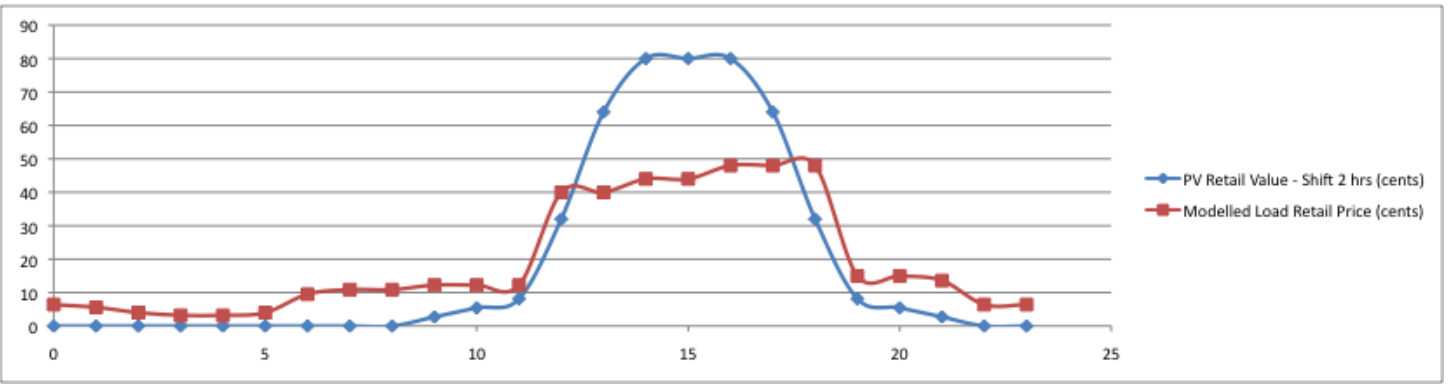
2011 Time of day retail pricing shows a clear value proposition



3kW PV system
13 kWHrs output vs
21 kWHr load



3kW PV system
$retail output =
$home consumption
Off Peak 8c/kWHr
Shoulder 12c/kWHr
Peak 39c/kWHr

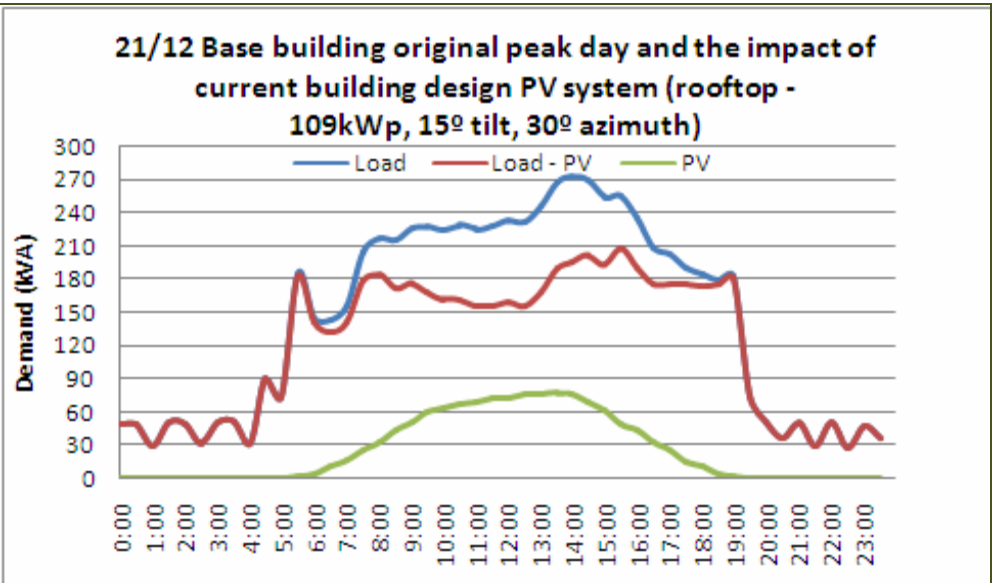


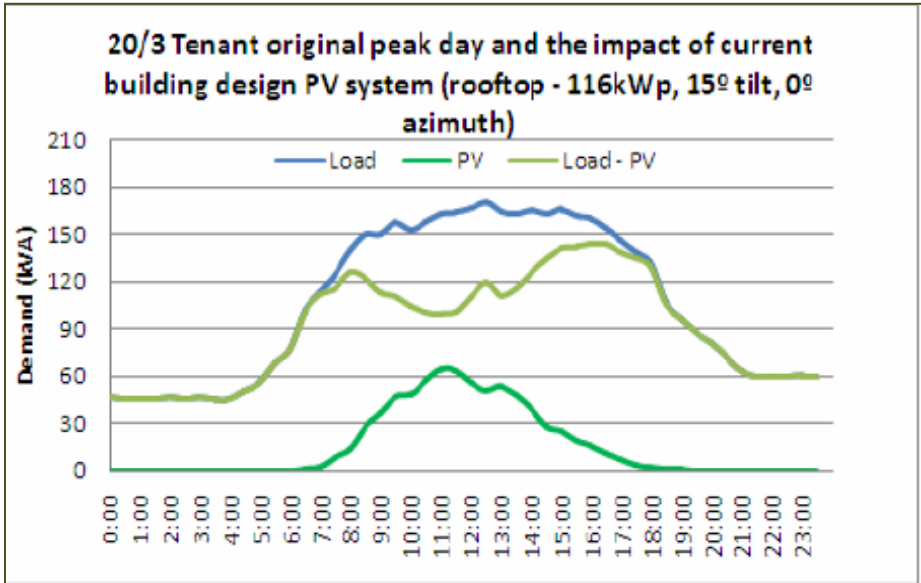
3kW PV system
2 hr shift by mix of
Facing west/storage
$retail output
>$home consumption

Commercial Building Market

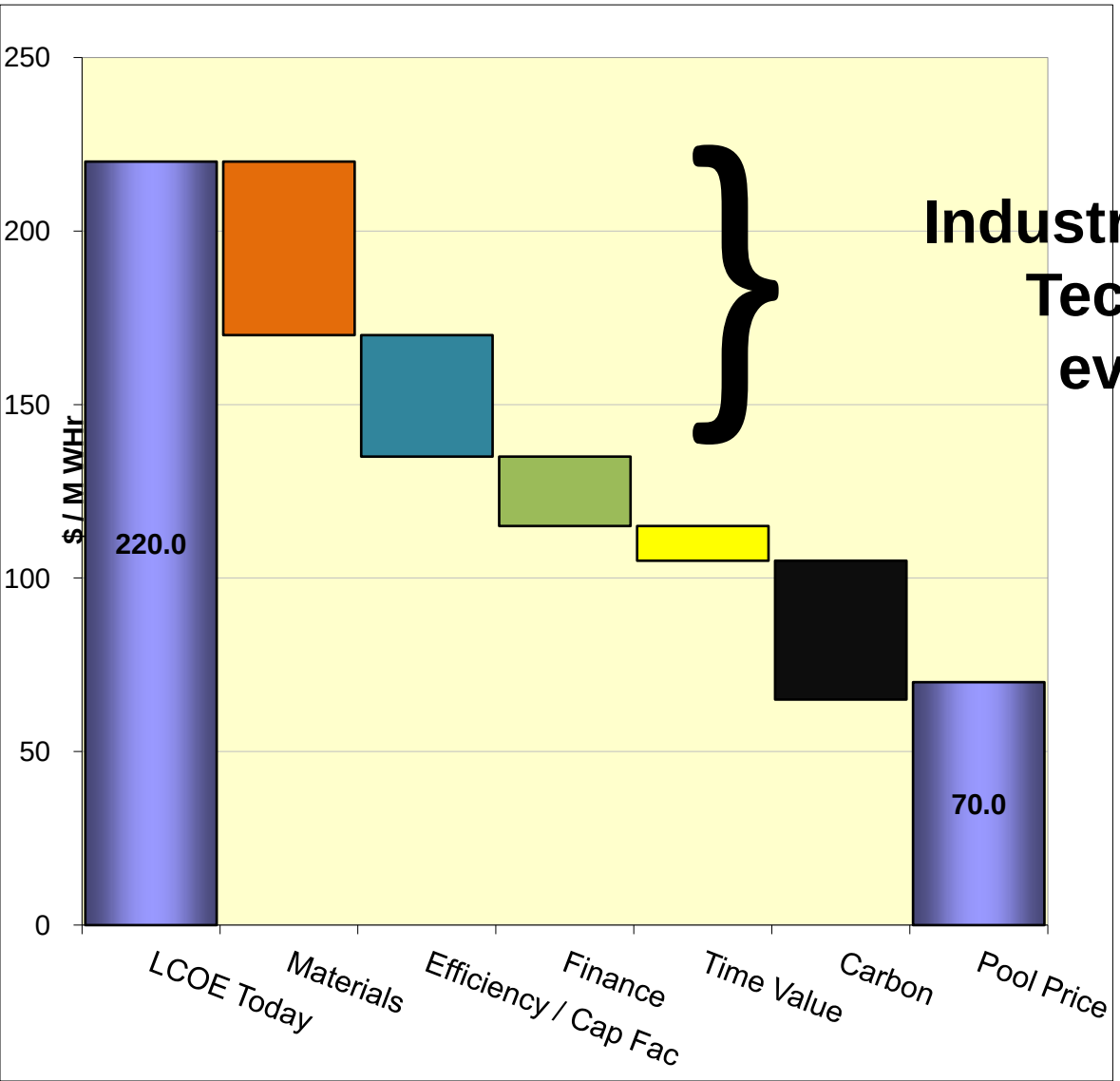
Source: Australian PV Association
Lam 2008

- 10% of Australia's GHG emissions
- 22% of Australia's electricity
- Increasing to 32% by 2029-30 (ABARE)





Indicative large scale solar path to wholesale pool price parity

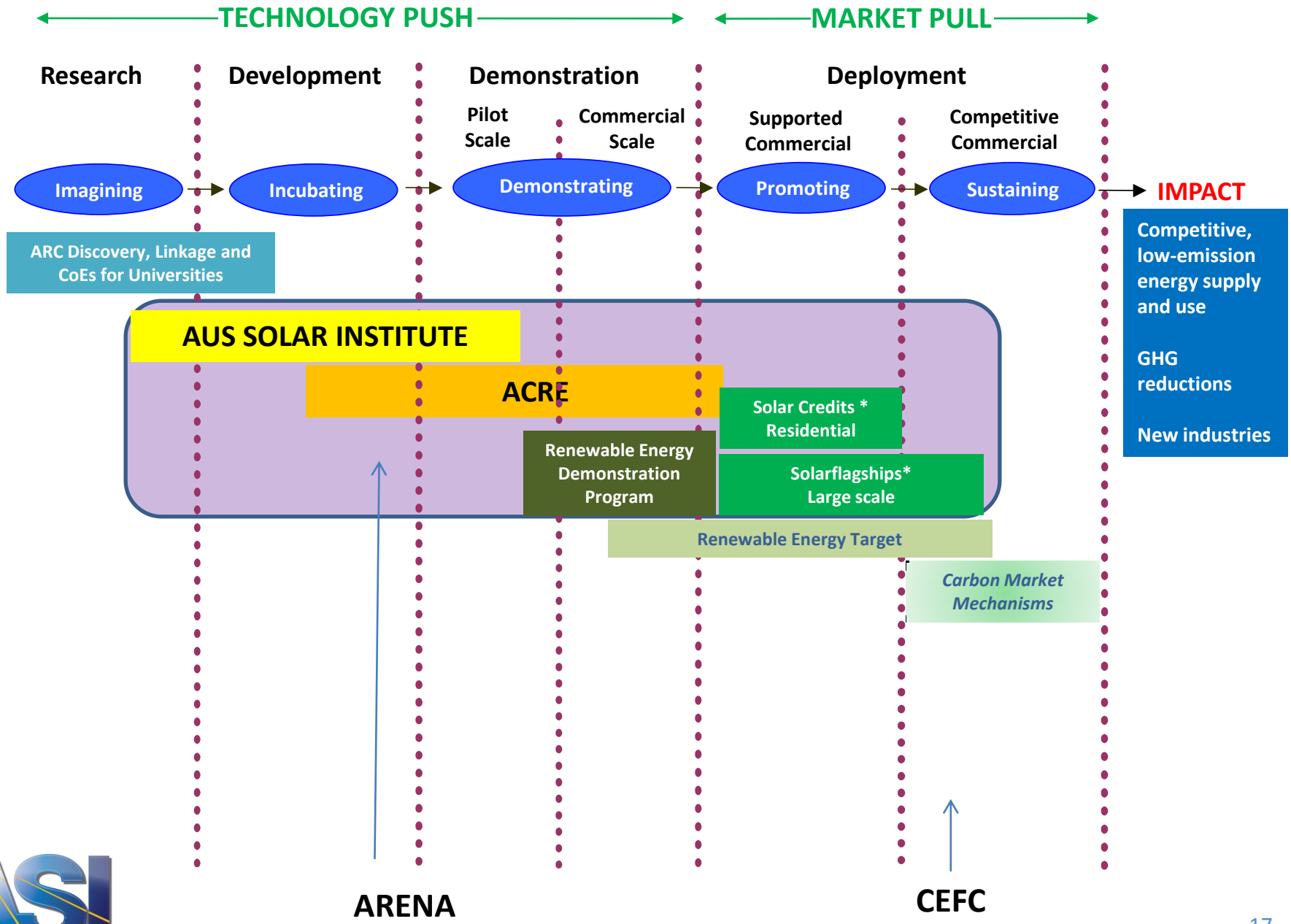


Industry Scale and Technology evolution

Energy Market Reform & Evolution

Timeframe :2020

Government support across the innovation chain



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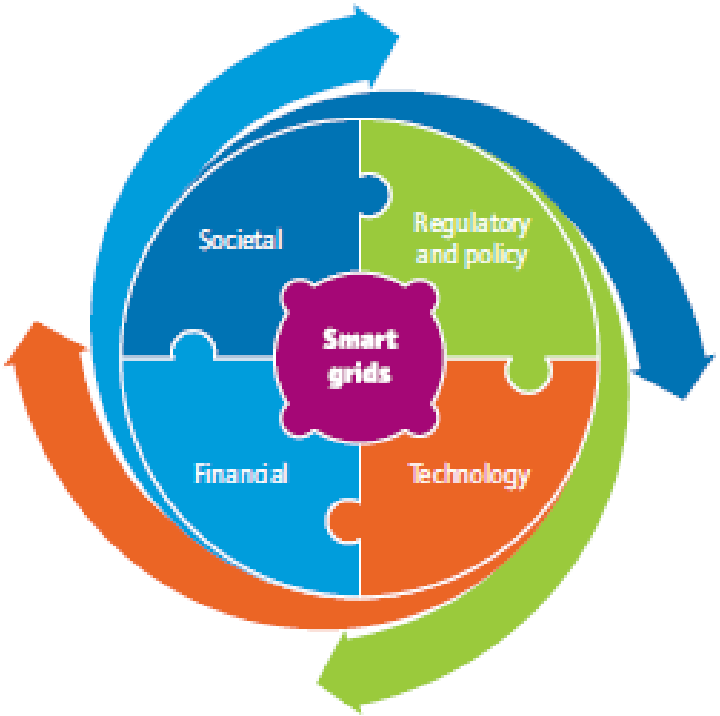
In summary, major trends shaping the direction of the Australian solar industry

- Energy is getting smart
  - Baseload redefined
  - Energy efficiency – low voltage?
- Technology innovation is ramping up
- Solar costs falling as traditional energy costs rise
- Electric transport as a storage
- Social networks influencing electrical networks?



Source: IEA Smart Grids Roadmap 2011

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Thank you

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