Financing solar energy through the innovation cycle

Olivia Coldrey, Investment Director

All Energy Conference

11 October 2012

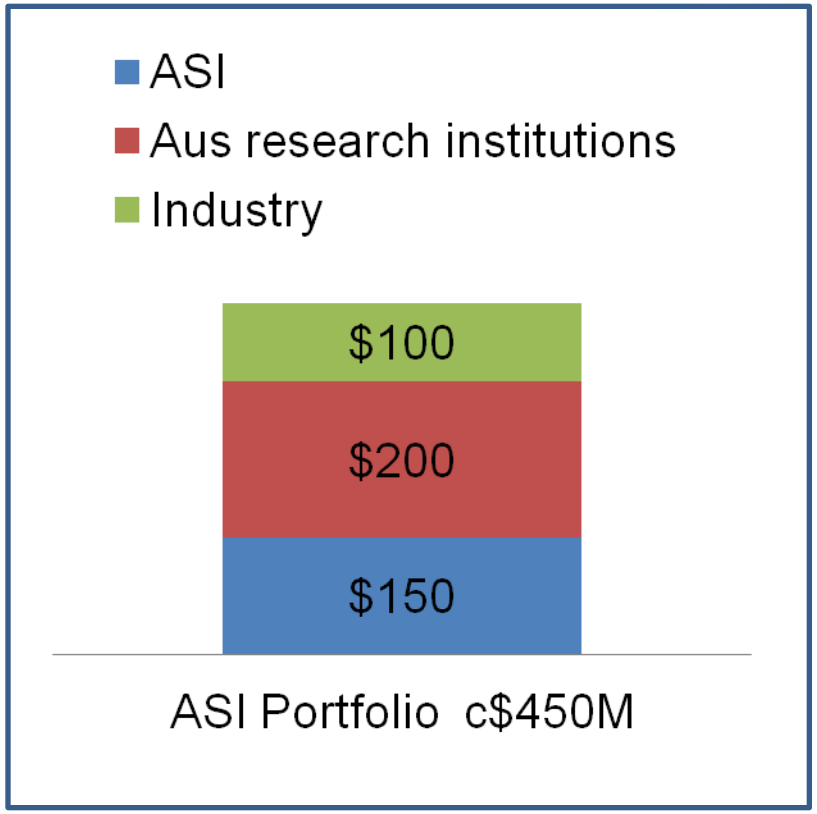



Australian Solar Institute

- Australian Government initiative for R&D into solar PV and CSP technologies
- Newcastle HQ; small team of specialists
- ASI-funded solar R&D projects in research institutions and companies around Australia and internationally, supporting 100+ Australian researchers
- Skills Development program
- Knowledge Sharing, incl. Australian Government's $1.5b Solar Flagships Program – sharing learnings
- International engagement – U.S..-Australia Solar Energy Collaboration; MoUs with Fraunhofer Institute and DLR in Germany

ASI portfolio on track to be c$450m by end 2012 leveraged by $150m Australian government funding

AUSTRALIAN SOLAR INSTITUTE

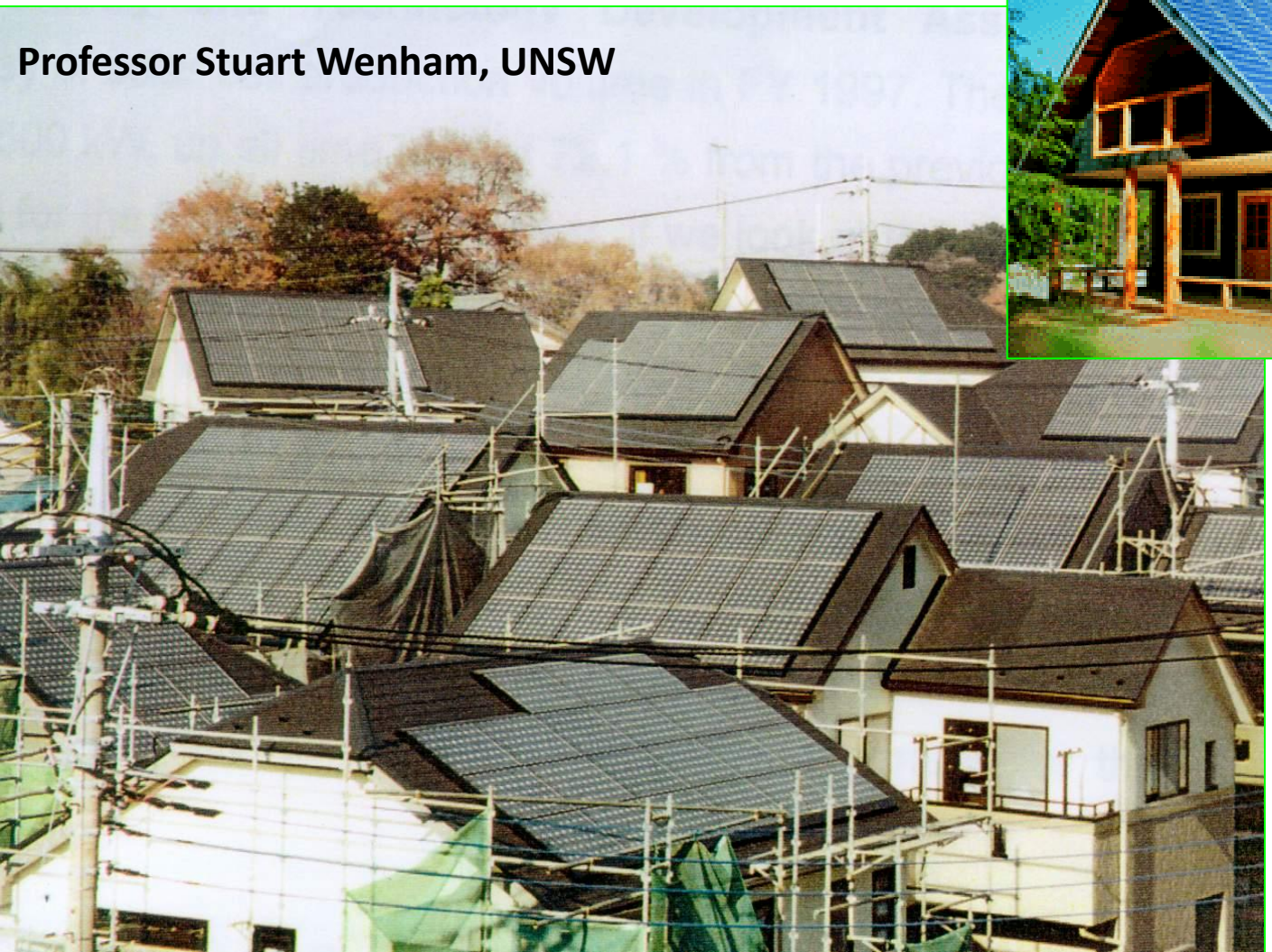


Chevron Human Energy
SPECTROLAB A BOEING COMPANY
BERKELEY LAB LAWRENCE BERKELEY NATIONAL LABORATORY
NEPSOLAR
STANFORD UNIVERSITY
Trinasolar The power behind the panel.
CHROMASUN
Yale
ERGON. ENERGY
THERMAX Sustainable solutions Energy & Environment
innovia FILMS
NREL NATIONAL RENEWABLE ENERGY LABORATORY
SUNTECH
AEMO AUSTRALIAN ENERGY MARKET OPERATOR
BLUESCOPE STEEL
ANU THE AUSTRALIAN NATIONAL UNIVERSITY
Delta electricity
MITSUBISHI HEAVY INDUSTRIES, LTD. Our Technologies, Your Tomorrow
CSIRO
ena energy networks association
U.S. DEPARTMENT OF ENERGY
Fraunhofer
graphite energy
Sandia National Laboratories
UNSW THE UNIVERSITY OF NEW SOUTH WALES SYDNEY · CANBERRA · AUSTRALIA
VastSolar
BOSCH
Silanna
PowerWater
ABENGOA SOLAR
Energía Solar
imagination at work
Australian Government Bureau of Meteorology

Outline

- Solar energy: market context
- ASI view of barriers and risks through the innovation cycle
- Innovative financing solutions: a public sector perspective
- Clean Energy Future Plan: support for renewable energy

Photovoltaics can be Roof-top Systems



PV can be Central Power Plants

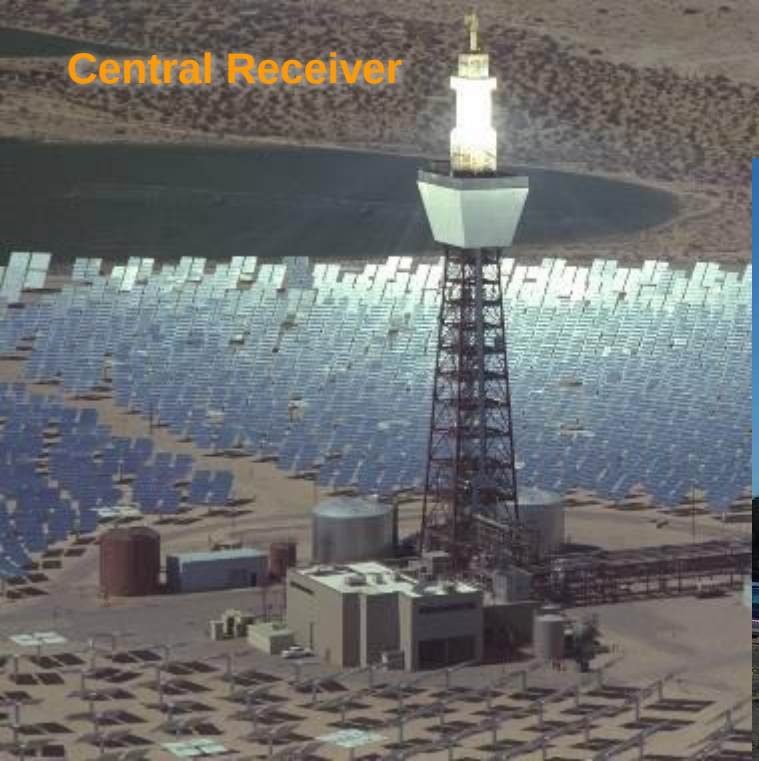
Professor Stuart Wenham, UNSW

Concentrating Solar Thermal is:

Parabolic Trough

Paraboloidal Dish

Central Receiver



Linear Fresnel

Dr. Keith Lovegrove, IT Power

Solar state of play

Solar PV: 70GW deployed globally

- Australian R&D critical part of global supply chain
- Local costs a major driver with PV device now <$1pW
- Technology – efficiency is key to lower installed costs
- Business models and distributed generation regulation and policy settings critical factors

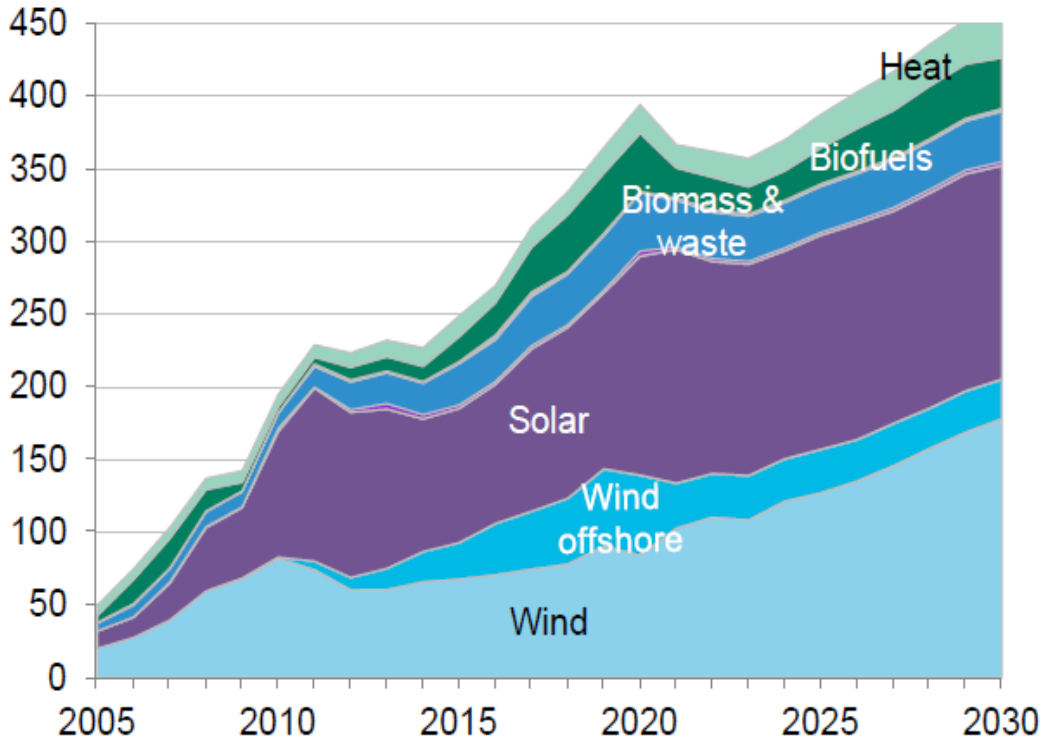
CSP : <2GW deployed globally

- RD&D of high temperature point focus (towers / dishes) technology critical to driving costs down to commercial viability
- Integrating cost effective storage and offering appropriate reward for dispatchable renewables are key investment drivers
- Australian end of grid and off-grid applications already economic further work required in R&D, demonstrating prospective technologies and lowering perceived operational risks
- Business models will emerge with greater investor confidence via technology demonstration

Global Investment Renewable Energy

AUSTRALIAN SOLAR INSTITUTE

Annual Renewable Energy Investment (US$ billion)

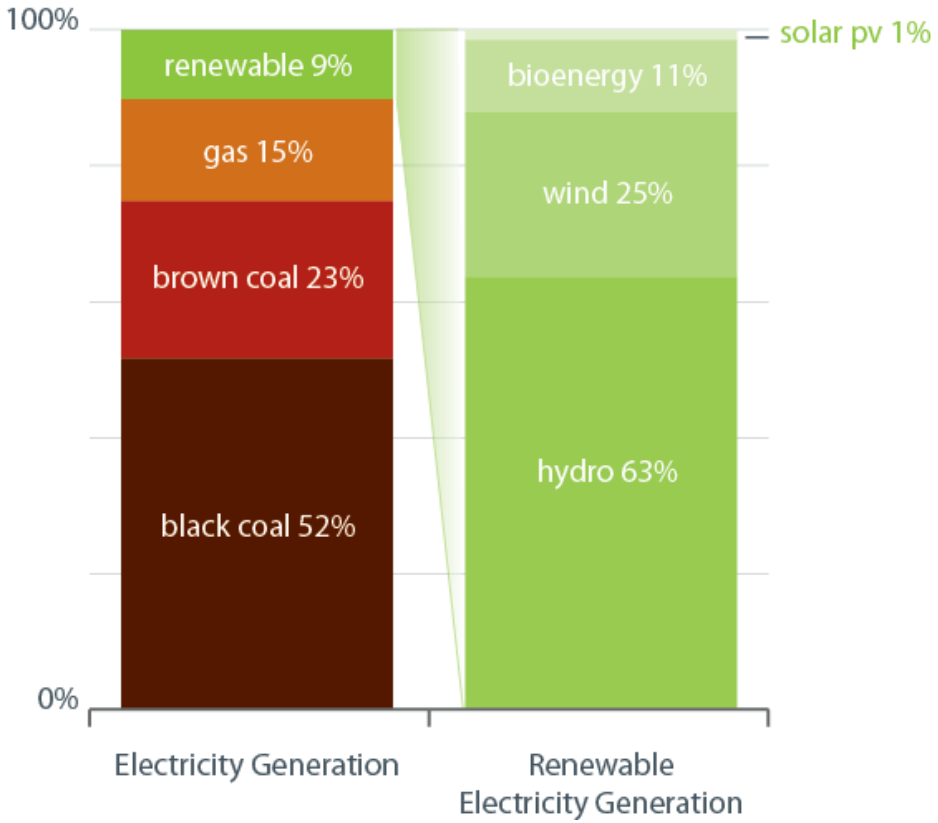


Source: Bloomberg New Finance (2011)

Renewables in Australia's energy mix

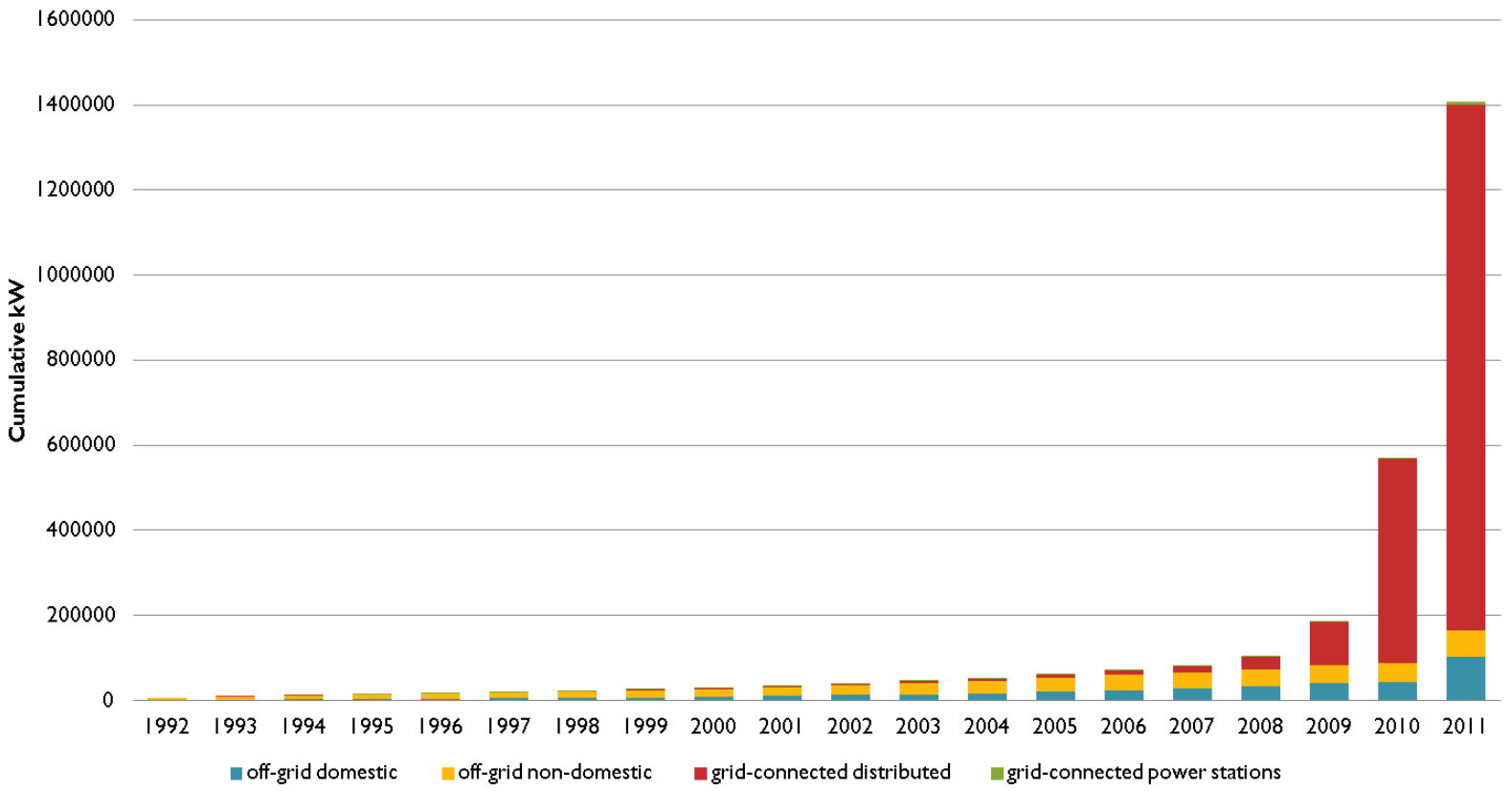
AUSTRALIAN SOLAR INSTITUTE

Australian Electricity Generation 2009-10



Source: ABARES, *Australian Energy Statistics* (2011)

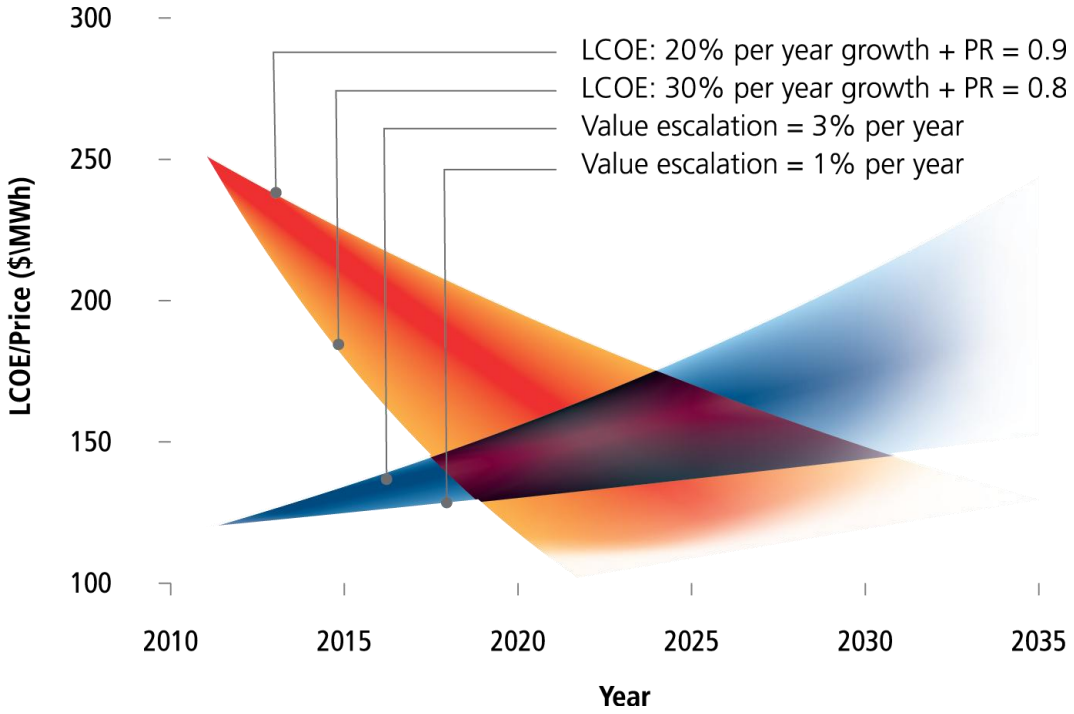
Australian PV market – what's happened



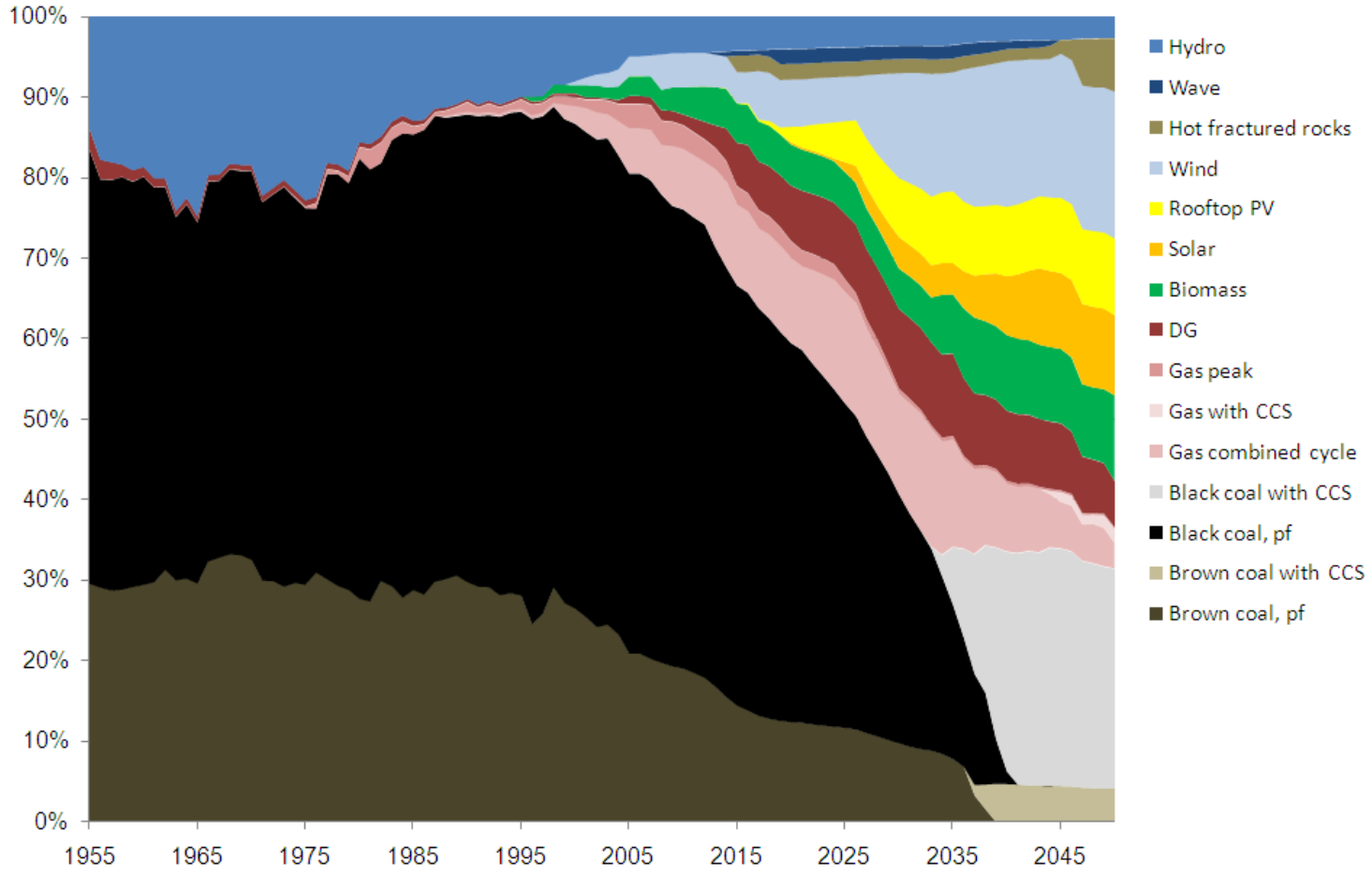
The CSP commercial equation

AUSTRALIAN SOLAR INSTITUTE

Indicative baseline LCOE: $252 per MWh for a typical 64MW$_e$ trough CSP plant vs. potential earnings of $120 per MWh in today's grid connected markets.

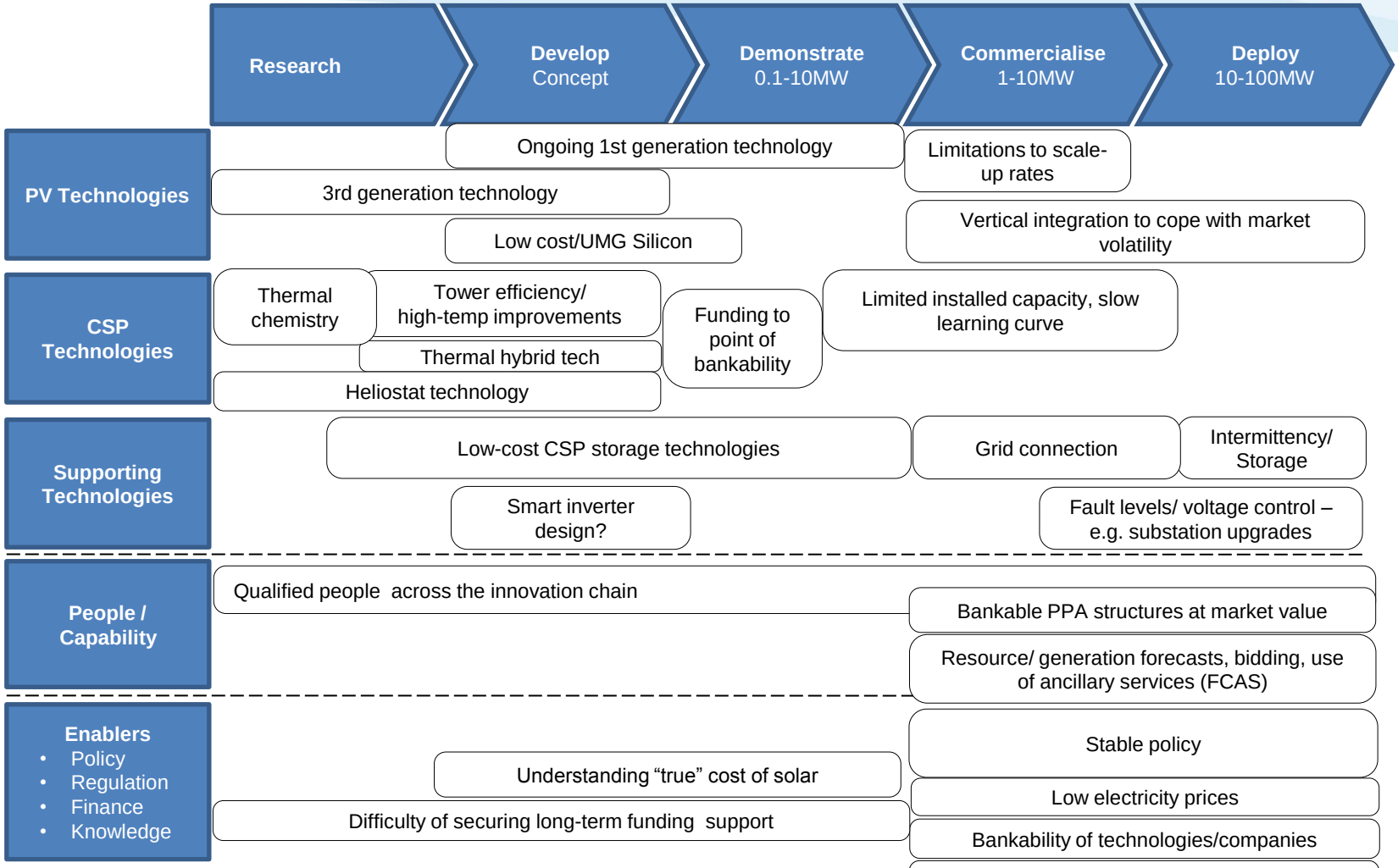


Solar in Australia – what's the future? - 20-25% by 2050



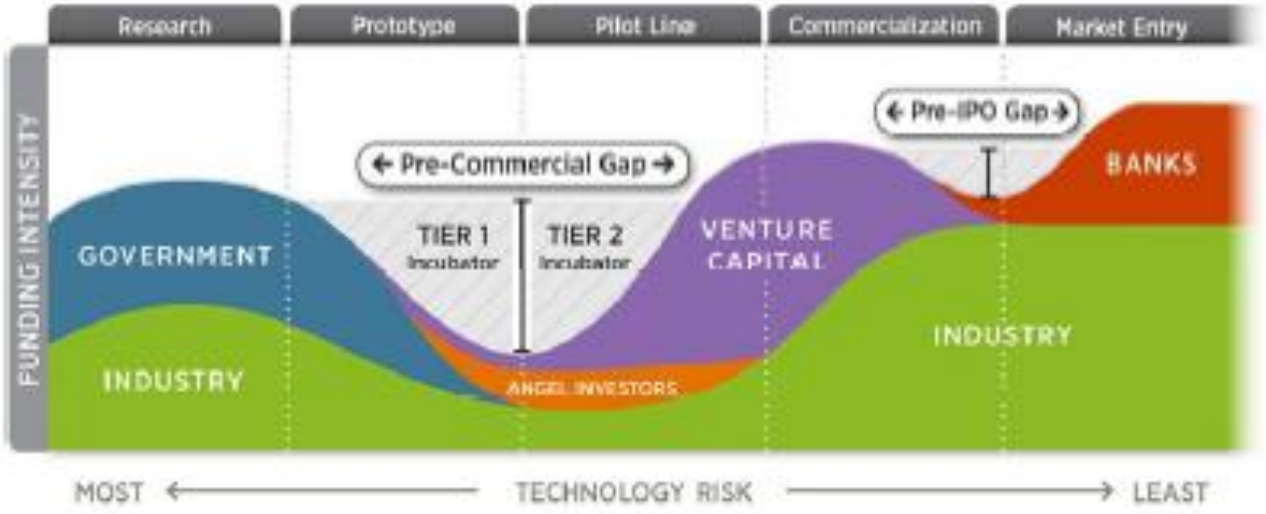
Source: ESSA; CSIRO ESM Mar 2011

Summary of barriers on the solar innovation chain



ASI thanks the Boston Consulting Group for assistance in preparation of this slide: in particular Philip Hirschhorn – Principal, Energy Practice

New technology requires demonstration to gain bankable capital market support



Source : US DoE 2011

CSP Tower example:

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

Prize: Competitively priced solar electricity with hybrid /storage integration providing firm supply

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

AUSTRALIAN SOLAR INSTITUTE

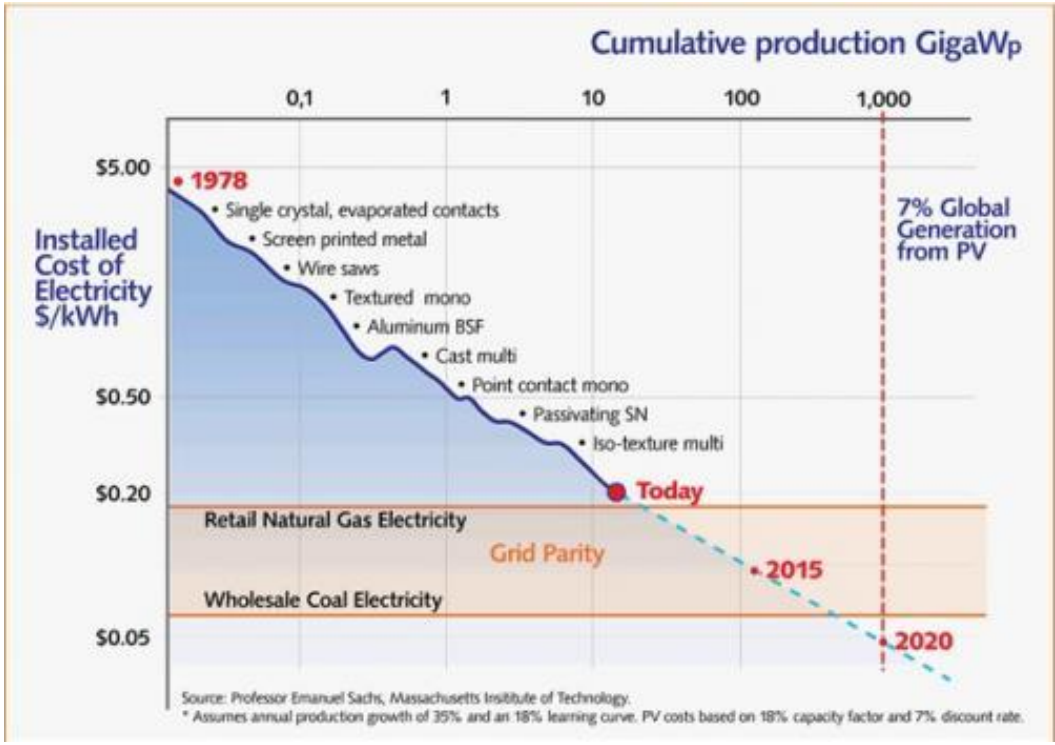
LCOE Drivers

- Finance Channel Margins
- Other Hardware, Civils, Install , Land, O&M
- Solar Device

Local costs
70-80% of employment in these areas

Global costs
Technology IP key value

PV LCOE now <$200MWHr



Visual impact of increased conversion efficiency – both PV & CSP

AUSTRALIAN SOLAR INSTITUTE

Eff 10% **15%** **20%**

Area required for a 6.5MW PV Power Plant at various efficiencies

Source : Sunpower Corporation.

Local area related costs (civils, steel, installation etc) now greater than the $/W driven items that follow global price trends / learning curves

Barriers to financing large-scale solar projects

AUSTRALIAN SOLAR INSTITUTE

Technology

- Performance risk, particularly for less proven technologies
- Solar technologies less cost competitive than conventional energy technologies and market-ready renewables

Project

- High initial capex + long project development and repayment timeframes
- Risks and costs associated with grid connection
- Political risk where project viability depends on policy support measures (e.g. FiTs)

Barriers to financing large-scale solar projects

Project cont'd

- Lack of long-term market data as basis for risk assessment
- Sophisticated, reliable solar resource generation forecasting methodologies

Market / Price

- Secure, long-term, competitively –priced electricity off-take arrangements
- Reduced risk appetite, heightened insolvency risk and increase in the cost of capital due to GFC and ongoing uncertainty in financial markets

Financing solutions – a public sector perspective

How can the public sector best catalyse and leverage private sector $?

Ideally:

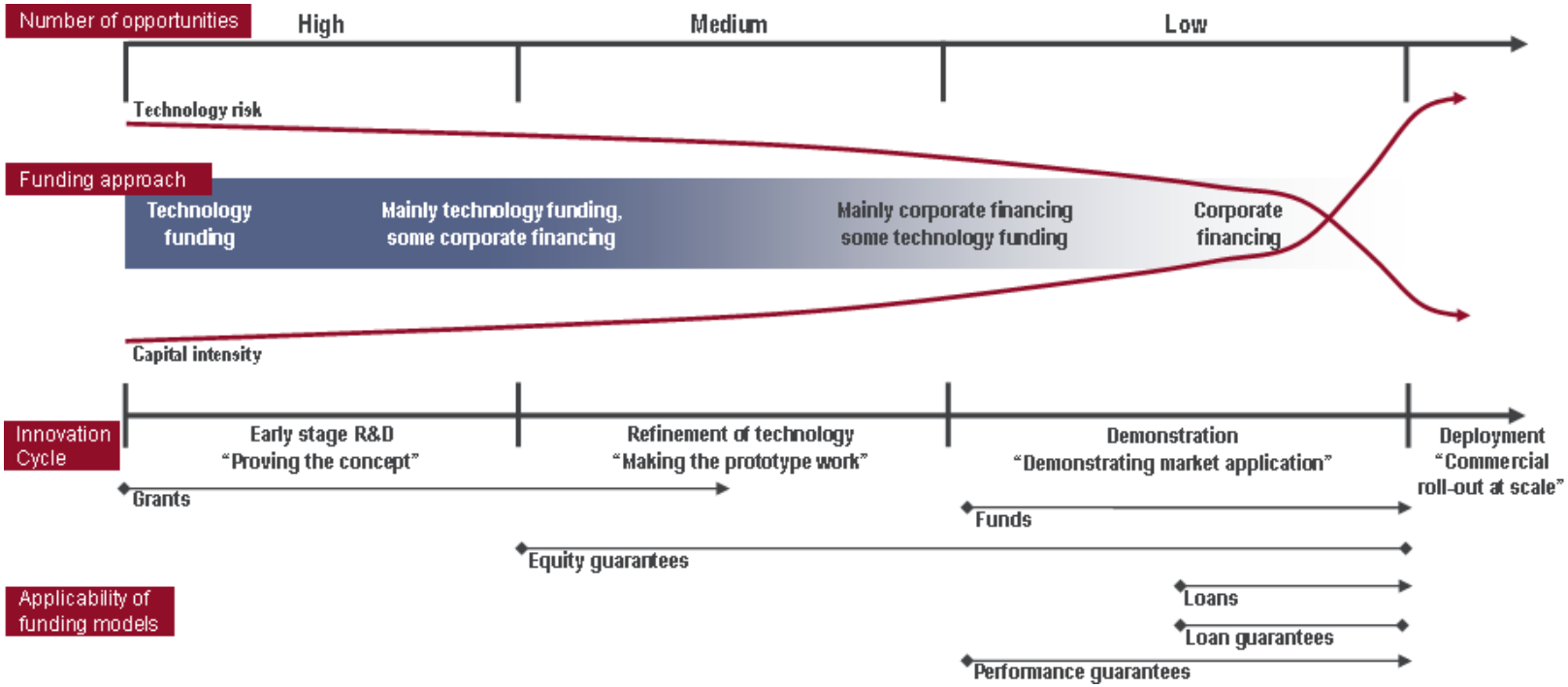
- help create revenue streams that provide a sustained incentive for private investment
- mitigate risks and generate appropriate returns for risk exposure
- be suited to stage of technology development (R,D,D,D)
- be flexible and innovative – accommodate changing market circumstances
- minimise administrative and financial complexity

A portfolio of financing instruments, e.g.:

- Grants for early stage R&D, e.g. ASI funding
- Equity guarantees for angel and early VC investments
- Pooled public-private funds for equity investment in promising growth-stage solar companies, e.g. REVC Fund
- Loans, loan guarantees, performance guarantees for demonstration activity and large-scale projects
- Government-backed secure, off-take arrangements (e.g. FiT, PPA, CFD)

Consistency of application is key!

Financing needs through the solar innovation cycle



Public sector loans

Commercial

- Direct credit on commercial terms to borrowers perceived as too high risk for commercial market lenders
- Capital-intensive but sustainable - assuming repayment

Concessional

- Borrower-friendly terms: low/zero interest, long tenors
- “Soft” terms limit commercial sustainability for lender
- Private investment incentive may mirror loan rounds, spike and then drop rather than be sustained

Subordinated

- Quasi-equity; has lower priority ranking than senior creditors
- Strengthens private investment incentive
- Increases lender’s exposure to borrower credit risk

Case study: Loans

- **EIB & EC Risk Sharing Finance Facility**
  - Credit risk shared between European Investment Bank and European Community *(& partner banks)*
  - Market-rated, non-subsidised loan with interest rates that reflect project specific risk margin
  - ***Med-long term*** and ***subordinated*** to incentivise private sector lending – a vehicle for high-risk projects to be funded that would otherwise not be
  - Min. loan size of €7.5M and max 50% of project cost (reqs in-kind contribution)
  - E.g. Sener/Abu Dhabi's Gemasolar (€80M direct risk RSFF loan).

Public Sector Guarantees

AUSTRALIAN SOLAR INSTITUTE

Loan guarantees – catalysing private sector $

- Guarantee of private sector loan to mitigate risk of loss should borrower default
- Similar risk assessment as for direct loans
- Guarantor exposure to borrower credit risk

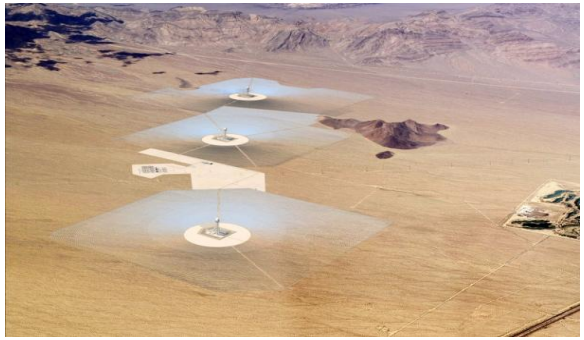
Performance guarantees – mitigating technology risk

- Guarantee of technology performance using specific performance indicators
- Intensive risk assessment to determine credit and technology risks and apply performance indicators

Case study: Loan Guarantee

U.S.DOE Loan Guarantee Program

- Guarantee of up to 80% of loan amount (100% if lender is U.S. Treasury's Federal Financing Bank)
- Unusually long tenors – up to 30 years
- Not subordinated to other obligations of borrower "Step-in" rights to IP, technical data and physical assets
- E.g. February 2010: $1.37 bn loan guarantee in favour of lenders to BrightSource Energy's Ivanpah project



NREL Renewable Energy Finance Tracking Initiative: http://financere.nrel.gov/finance/REFTI. Tracks debt interest rates, equity returns, financial structure, PPA duration etc

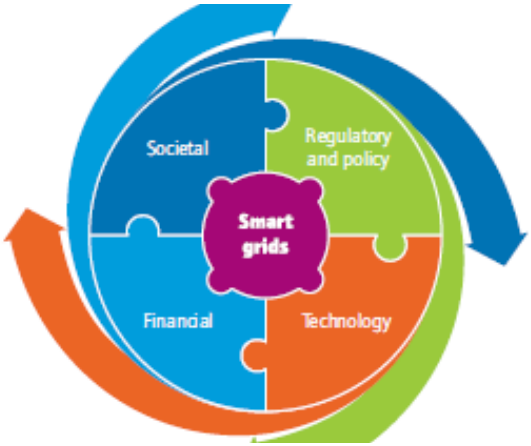
Taking a Lead from the Multilaterals

- Development bank / export finance context
- Financial product innovation
  - World Bank Group – seed funding for cleantech through to project finance and political risk insurance
  - Asian Development Bank – carbon funds
  - Export Credit Agencies
    - EKF Climate: carbon credit-related and technology performance g'tees - carbon credits as revenue stream
    - U.S. EXIM Environmental Export Financing: US$3 billion portfolio of supported projects through working capital, insurance, long-term direct loans, loan guarantees and project finance
    - JBIC: carbon credit trading platform

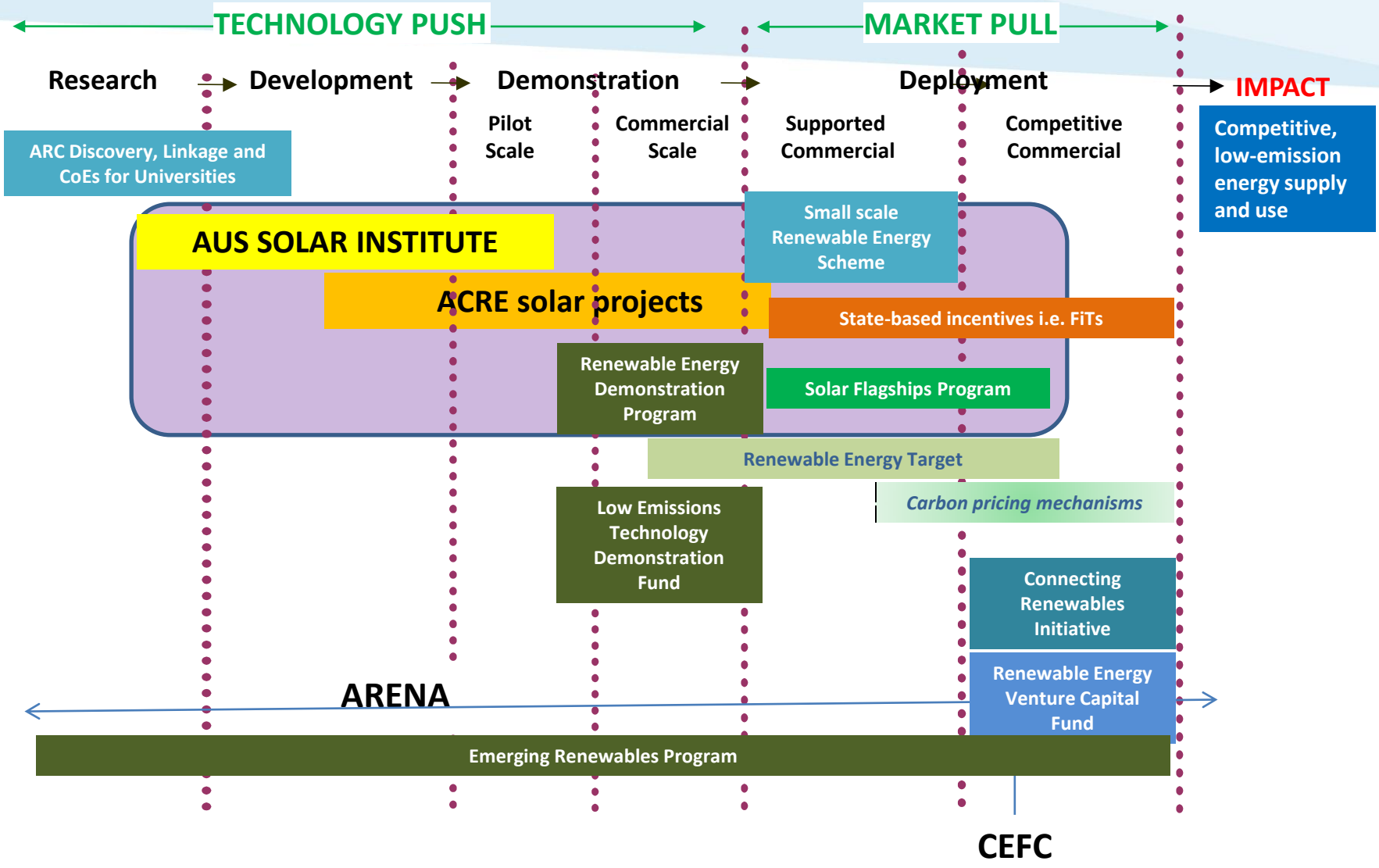
Next steps for solar in Australia: trends and potential sources of value

AUSTRALIAN SOLAR INSTITUTE

- Wide and growing solar deployment
- Australian R&D critical, high-value part of global supply chain
- Technology – efficiency is key to lower installed costs
- Local costs now a major driver with PV device <$1pW
- Enablers, business models and distributed generation regulation and policy settings are critical



Policy framework - market drivers



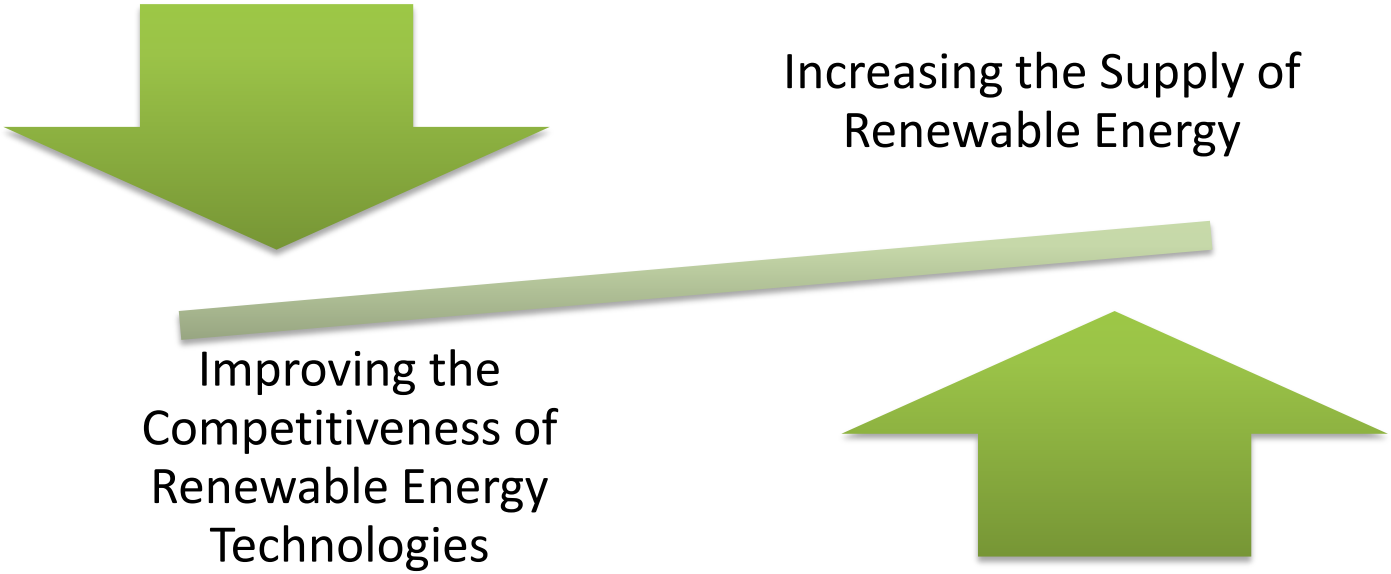
Clean Energy Future Plan

- ARENA
  - $3.2 billion investment to promote R&D, demonstration, commercialisation and deployment of renewable energy projects
  - Grant funding
- CEFC
  - $10 billion for investment in commercialisation and deployment of renewable energy, energy efficiency and low-pollution technologies, and manufacturing businesses providing input into these sectors
  - Financial products and structures to address the barriers currently inhibiting investment

ARENA - the basics

AUSTRALIAN SOLAR INSTITUTE

$3.2 billion in funding



Olivia Coldrey, Investment Director
olivia.coldrey@australiansolarinstitute.com.au
02 4960 6302

www.australiansolarinstitute.com.au