AUSTRALIAN SOLAR INSTITUTE

Financing models to support solar innovation, from research through demonstration and beyond

Business opportunities in the Australian solar market, Austrade Seminar, Intersolar

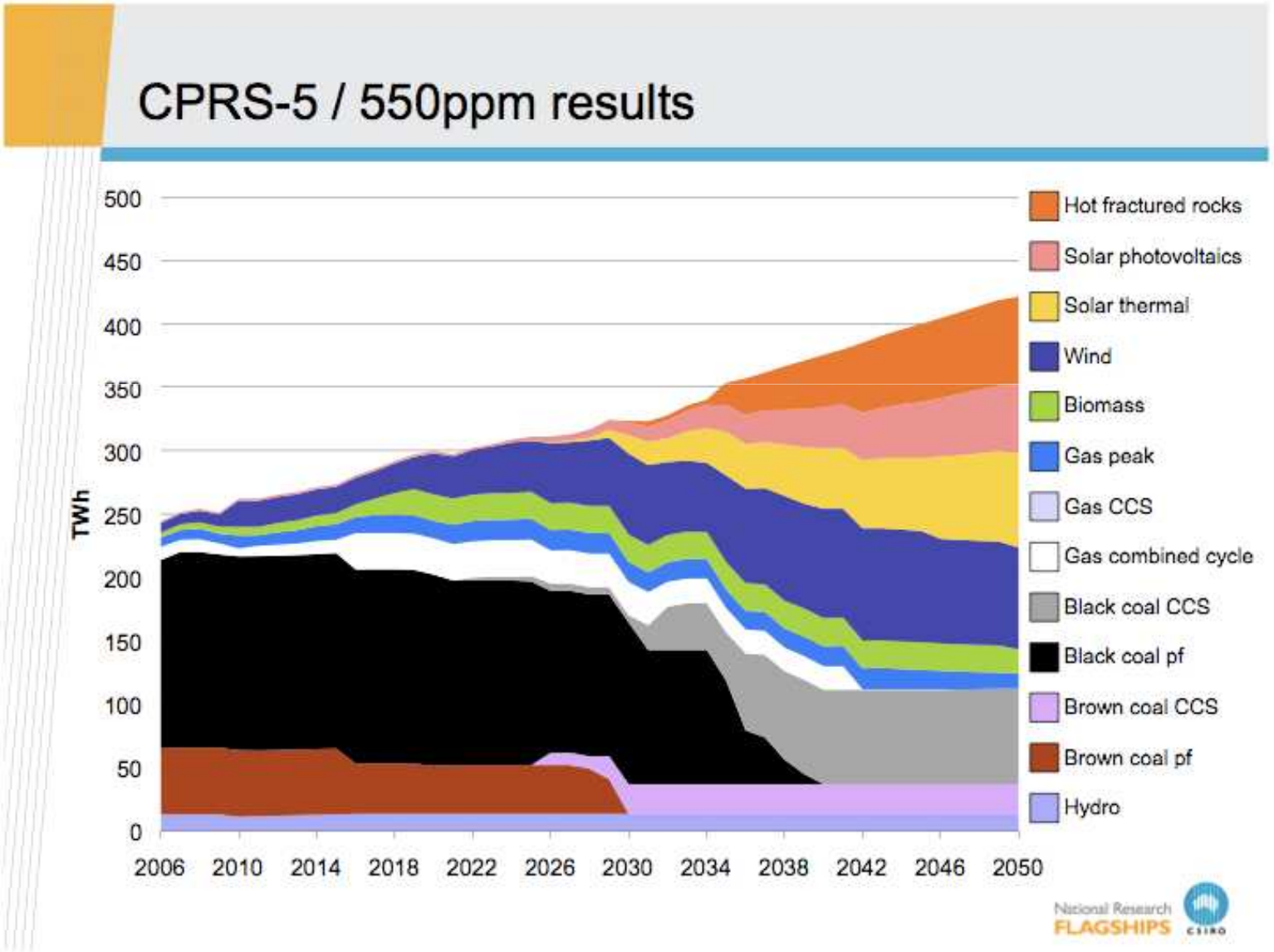
9 June 2011, Munich

Outline

- About the ASI
- R&D Project Portfolio
- RD&D Funding Models
- Summary

AUSTRALIAN SOLAR INSTITUTE

Australia forecast – solar 20-25% by 2050



Progress across the full set of costs is required to increase solar deployment

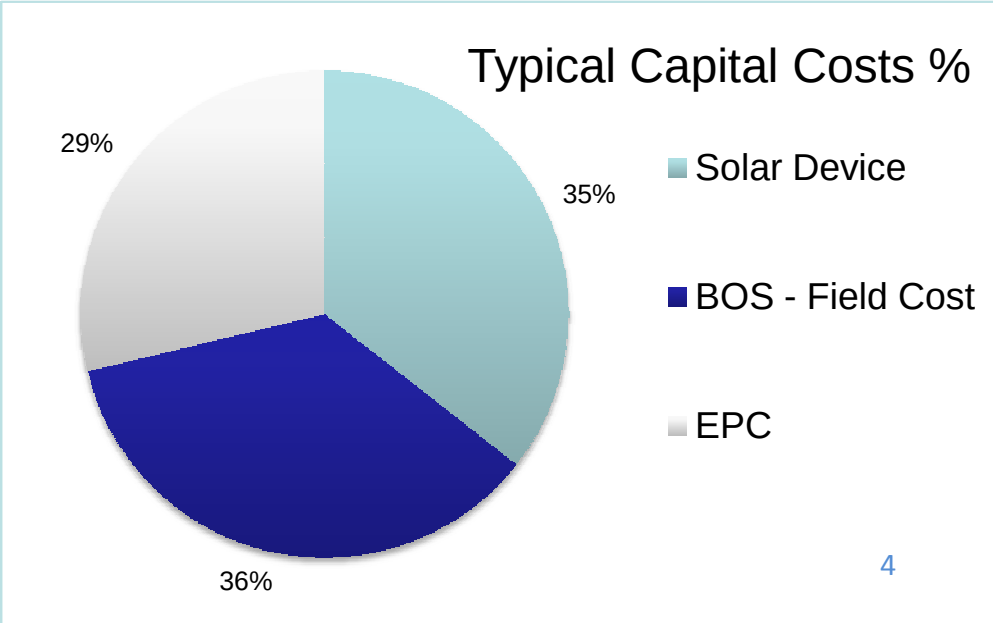
$a → Finance Channel Margins

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

$c → Solar Device

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

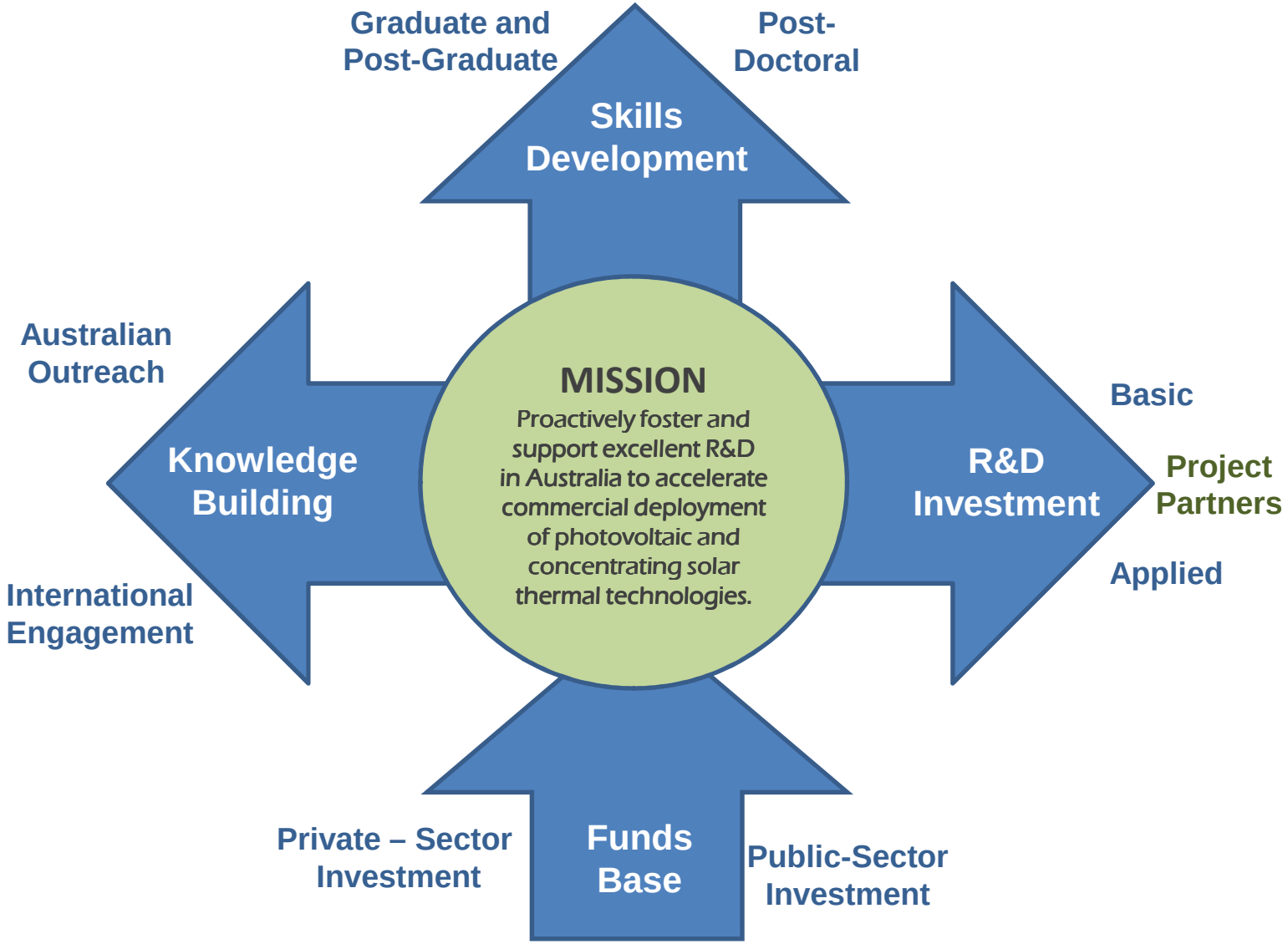
$$\frac{\$Lifetime\ Costs}{MWHrs\ Supplied} = \$/MWHr\ (LCOE)$$



AUSTRALIAN SOLAR INSTITUTE

ASI – strategic focus areas

R&D Investment, Skills Development and Knowledge Building



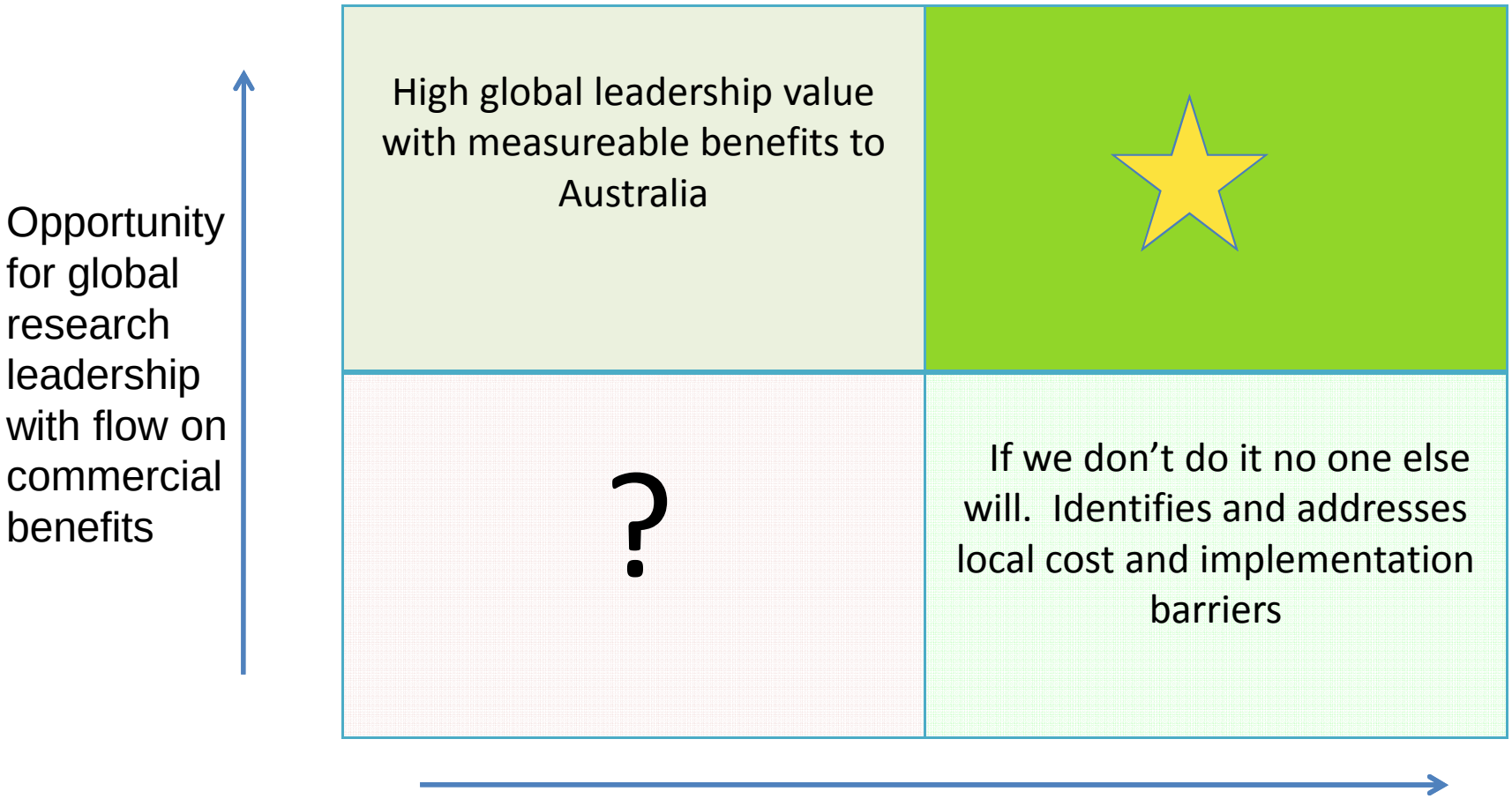
AUSTRALIAN SOLAR INSTITUTE

The Australian Solar Institute

- Australian Government initiative for solar PV and CST R&D.
- ASI grant-funded solar R&D projects take place in research institutions and companies around Australia and internationally.
- c$200m portfolio of solar R&D projects leveraged by c$66m of Australian Government funding.
- Leverage from industry, research institutions and state governments at an average ratio of 2:1 (up to 5:1).
- ASI-funded projects supporting over 100 researchers.
- Australian Government's A$1.5 billion Solar Flagships Program - disseminating economic and technical learnings.
- International engagement
  - U.S. – Australia Solar Energy Collaboration
  - MoU with Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. – PV-focused
  - MoU with Deutches Zentrum für Luft- und Raumfahrt (DLR) – CSP-focused
  - Strategic engagement with Asia

AUSTRALIAN SOLAR INSTITUTE

Portfolio Planning



AUSTRALIAN SOLAR INSTITUTE

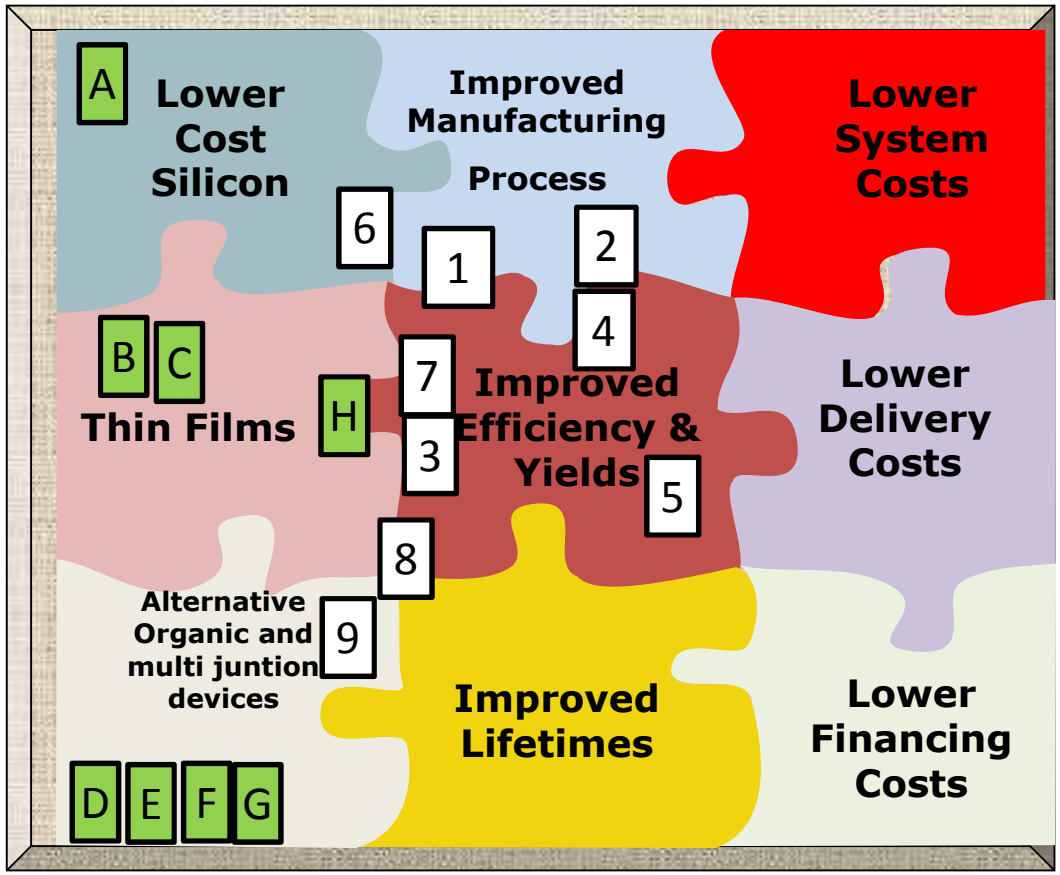
PV R&D Portfolio Mapping

$41m ASI leveraging $155m

Today

Round 1

1. ANU Solar labs
2. UNSW SIRF
3. ANU Plasmonics
4. UNSW Core
5. UNSW Suntech Silex
6. ANU SLIVER
7. BT Imaging Inline Inspection Tools
8. Sapphicon
9. UQ OPV



Round 2

A. UNSW Low-cost silicon
B. ANU Industry Ready N-Type Si Solar Cells
C. CSG Next Gen Si on Glass
D. UNSW Hot Carrier Cell
E. UNSW 40% Efficient PV Power Tower Receiver
F. UniMelb OPV
G. UNSW Quantum Dots
H. USyd Upconversion

Goal

AUSTRALIAN SOLAR INSTITUTE

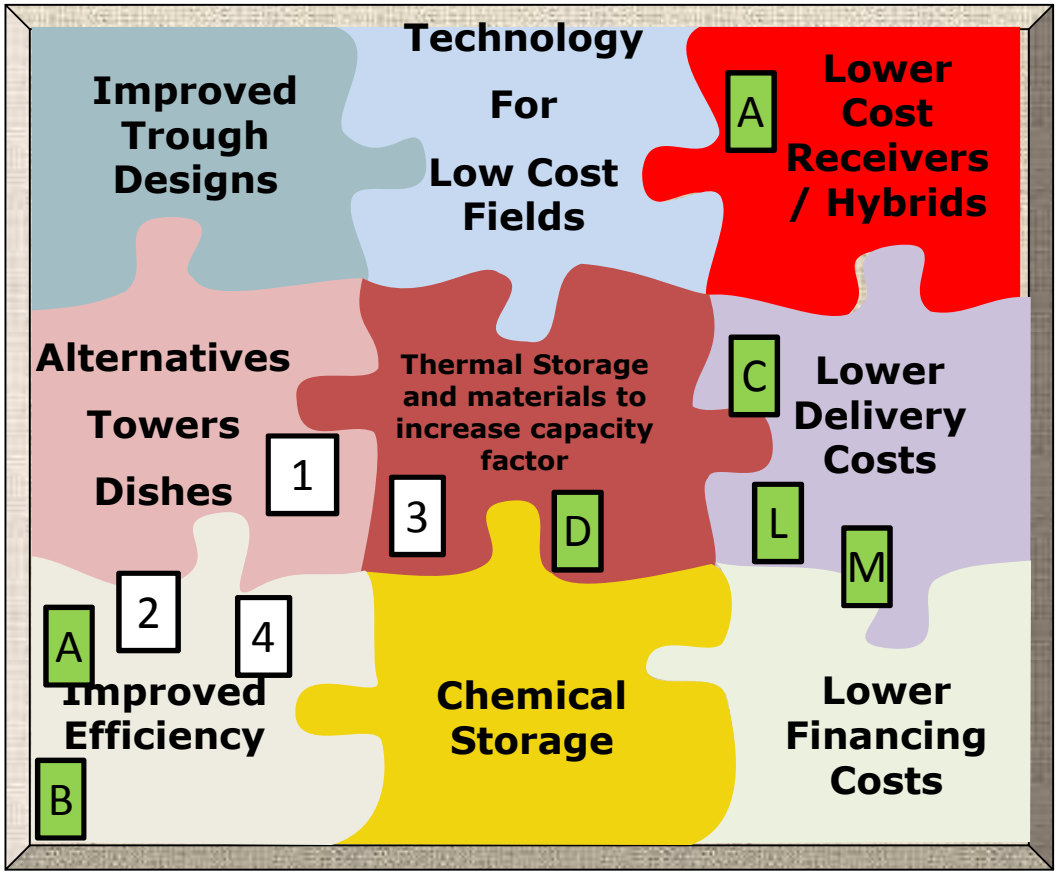
CST R&D Portfolio Mapping

$24.7m ASI leveraging $54mm

Today

Announced Round 1

1. CSIRO ANU Foundation
2. CSIRO / ANU Core Steam
3. CSIRO/ANU Core Storage
4. Uni Newcastle Thermionic Devices



Round 2

CST

A. CSIRO Air Turbines
B. CSIRO Thermodynamic Topping Cycles
C. ANU Roof Mounted Hybrid CST
D. Graphite Energy Storage

Enabling

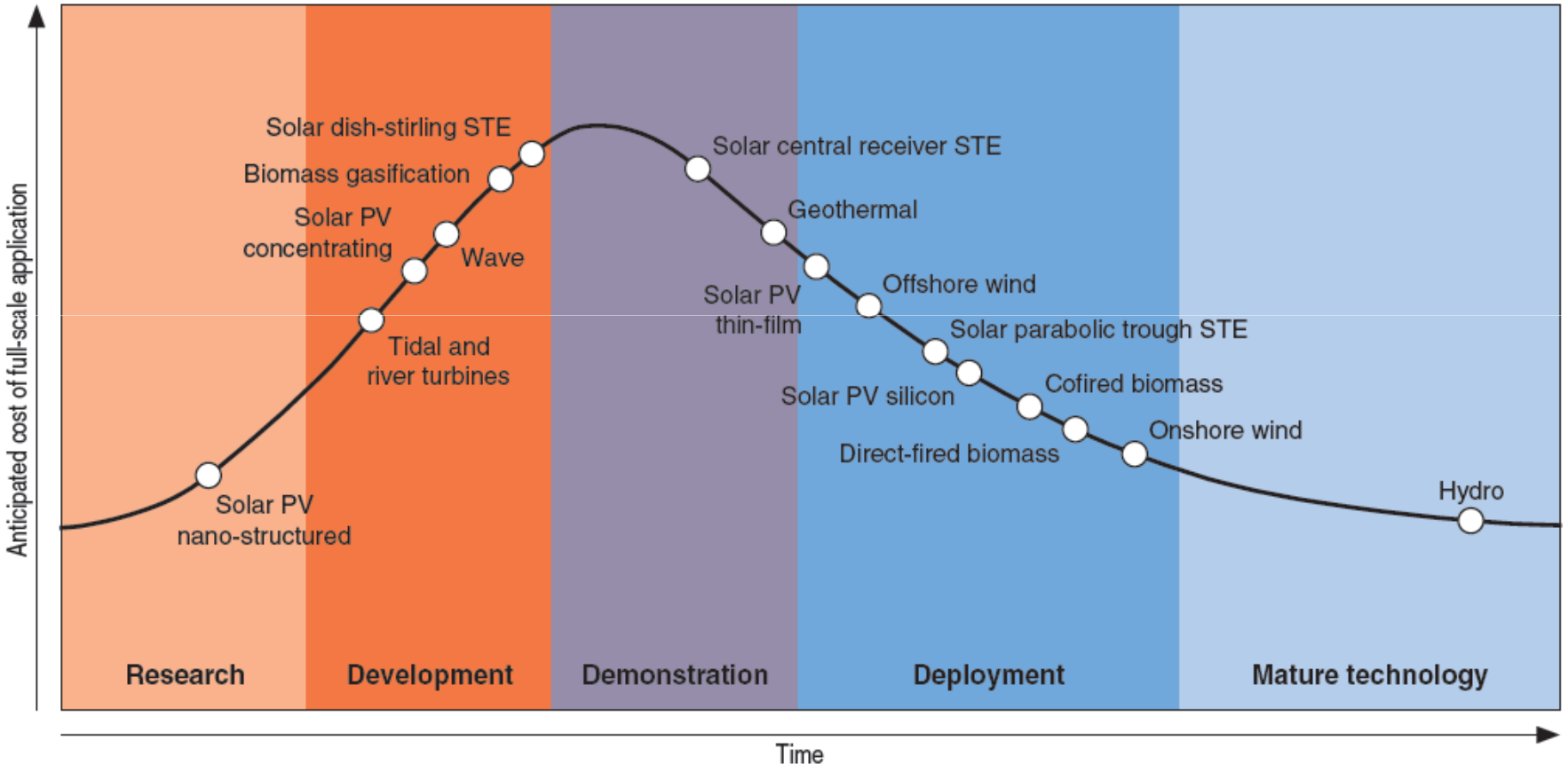
L. CSIRO – Intermittency
M. UNSW – Forecasting

Goal

AUSTRALIAN SOLAR INSTITUTE

Professor Stuart Wenham, UNSW

CAPEX learning curve for renewable technologies



Source: Wyld Group

ABARE and Geoscience Australia, *Australian Energy Resource Assessment, Chapter 2 Australia's Energy Resources and Market*, March 2010

Solar RD&D funding sources and models

- ASI commissioned Baker and McKenzie Global Benchmarking Report:
  - First known attempt to systematically identify and analyse funding models used in Australia and internationally to finance solar and other renewable energy RD&D
  - Emphasis on PPP models to leverage private $
  - Important piece of thought leadership in dynamic Australian policy environment
- The report does not seek to assess, comment on, or influence current or future Australian government policy or programs, at a Federal or State level

  Report available at www.australiansolarinstitute.com.au

AUSTRALIAN SOLAR INSTITUTE

Some barriers to financing solar RD&D

- Lack of cost-competitiveness of solar energy technologies relative to conventional energy technologies and market-ready renewables
- Performance and technology risks, particularly for more innovative/less proven technologies
- Long project development and repayment timeframes coupled with high initial capital costs
- Risks and costs associated with grid connection
- Political risk where technology development depends on public support
- Lack of long-term market data to be used as a basis for risk determination
- Sophisticated, reliable solar resource generation forecasting methodologies
- Reduced risk appetite, coupled with heightened insolvency risk and an increase in the cost of capital, due to the global financial crisis

AUSTRALIAN SOLAR INSTITUTE

Financial risk-sharing in solar RD&D

Identify financing instruments that:

- Create a sustained incentive for private investment i.e. a continuing driver for investment by the private sector, leveraging public funds
- Mitigate risks for both public and private investors, or generate appropriate returns for risk exposure
- Create sustainable revenue streams for investors, to ensure ongoing financial support

- How do various public-private funding models perform against these criteria?

AUSTRALIAN SOLAR INSTITUTE

Government Grants

- Mainstay of public funding for Australian solar RD&D:
  - ASI
  - Solar Flagships
- Necessary for early stage R&D
- Proven ability to leverage private finance, e.g. ASI model
- Early-stage grants meet a significant proportion of R&D costs, while capital intensity still relatively low (cf. demonstration)
- Staging (via milestones) can provide sustained support and incentives
- Disadvantages:
  - Incentives limited to the short-term (duration of funding rounds)
  - Capital-intensive for grantor: equity injection without repayment

AUSTRALIAN SOLAR INSTITUTE

Public-private funds

- Typically a "pool" of public and private sector $, professionally managed and invested in corporate entities - VC-style
- Diversified portfolio spreads risk among investors
- May incorporate range of incentives:
  - Matched public investment commitments
  - Preferential returns to private investors
- May be combined with other models, e.g. revolving loan funds
- Good investments generate returns = self-sustaining
- But are RD&D investments too high risk?

AUSTRALIAN SOLAR INSTITUTE

Equity guarantees

- Government guarantee to mitigate risk that equity investor will lose investment (or part thereof) should investee(s) fail
- Partial guarantee to mitigate moral hazard and encourage prudent investment decisions
- Self sustaining:
  - Don’t require significant initial capital outlay by govt
  - Revenue from fees commensurate with risk exposure
- Sustained investment incentive for private investors: endures so long as guarantees is available
- Tenor can be adapted to fit RD&D timeframes
- More appropriate in medium-late stages of innovation cycle, to promote private equity investments in solar companies

AUSTRALIAN SOLAR INSTITUTE

Public sector loans

- In general:
  - Are capital-intensive, but sustainable - assuming repayment with interest
  - May not be appropriate for pre-commercial activities
- Concessional
  - terms favourable to borrower (low/zero interest rates, longer tenors)
  - equal ranking reduces risk exposure (cf subordinated loans)
  - must nonetheless take borrower credit risk exposure
  - “Soft” terms limit commercial sustainability for lender
  - but private investment incentive may mirror loan rounds, spike and then drop rather than being sustained

AUSTRALIAN SOLAR INSTITUTE

Public sector loans (cont.)

- Subordinated
  - quasi-equity; has lower priority ranking than private lenders
  - strengthens private investment incentive
  - Increases lender's exposure to borrower credit risk
- Balloon
  - Interest-only during loan term
  - Bullet repayment of principal at maturity
- Commercial
  - Provided on commercial terms to borrowers perceived as too high risk for private lenders

AUSTRALIAN SOLAR INSTITUTE

Public sector guarantees

Loan guarantees

- Guarantee of private sector loan to mitigate risk of loss should borrower default, e.g. U.S. DoE loan guarantees for solar projects
- Similar risk assessment as for direct loans
- Public sector can potentially provide long tenors
- Guarantor exposure to borrower credit risk, with potentially limited scope to control borrower's business
- More appropriate in late stages of innovation cycle, for lending to companies generating cash flow

Performance guarantees

- Guarantee of a technology's performance using specific performance indicators (e.g. in demonstration activity)
- Intensive risk assessment to determine credit and technology risks and apply performance indicators

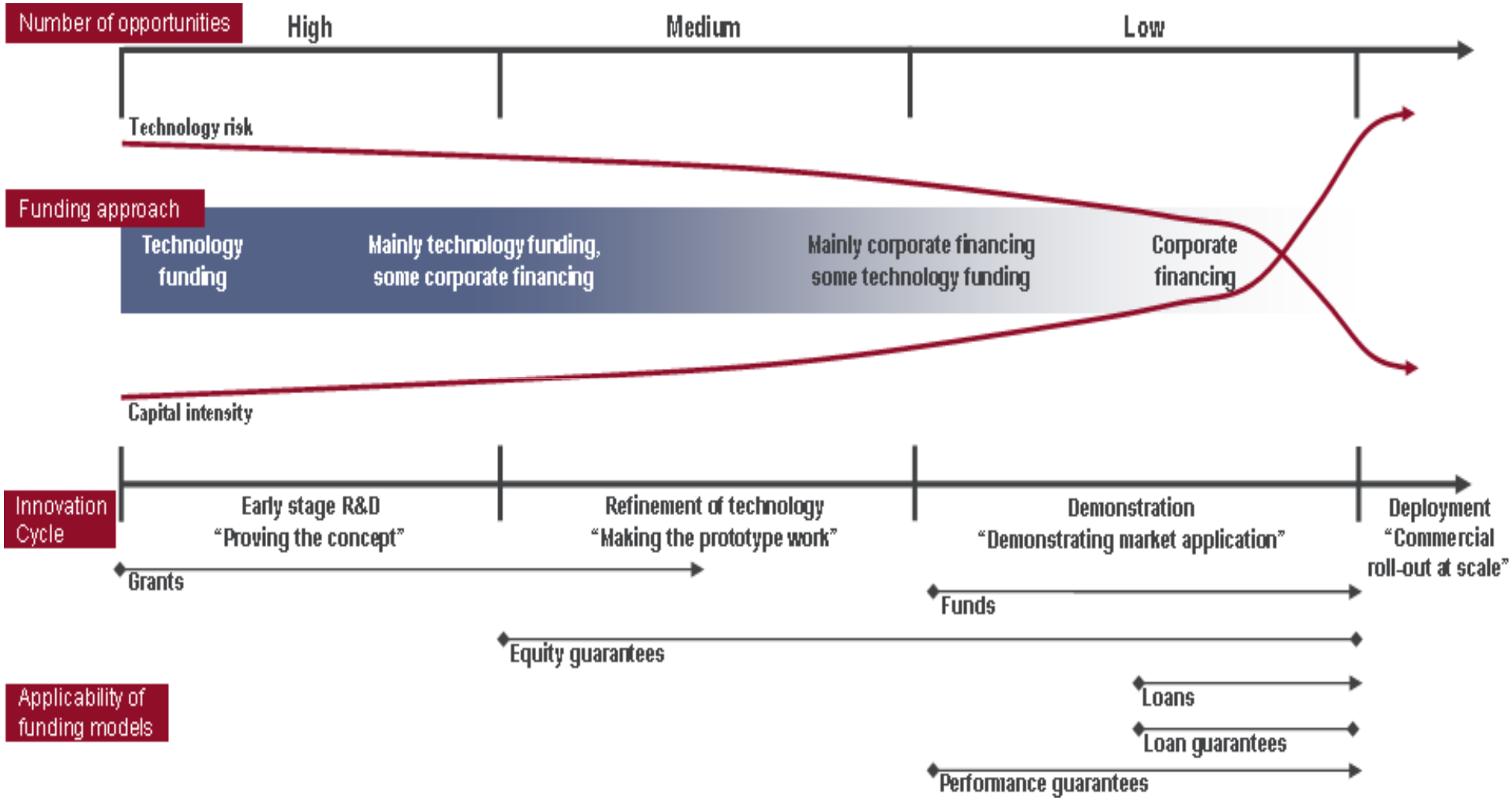
AUSTRALIAN SOLAR INSTITUTE

A portfolio of models?

- Different instruments across stages of the solar innovation cycle
- Commercialisation and deployment of solar technologies may be best assisted by a portfolio of models:
  - Grants for early stage R&D
  - Equity guarantees for angel, VC , PE investments
  - Pooled public-private funds to channel investment into promising seed and growth-stage solar companies
  - Loans, loan guarantees, performance guarantees for demonstration activity

AUSTRALIAN SOLAR INSTITUTE

Finance through the solar innovation cycle



AUSTRALIAN SOLAR INSTITUTE

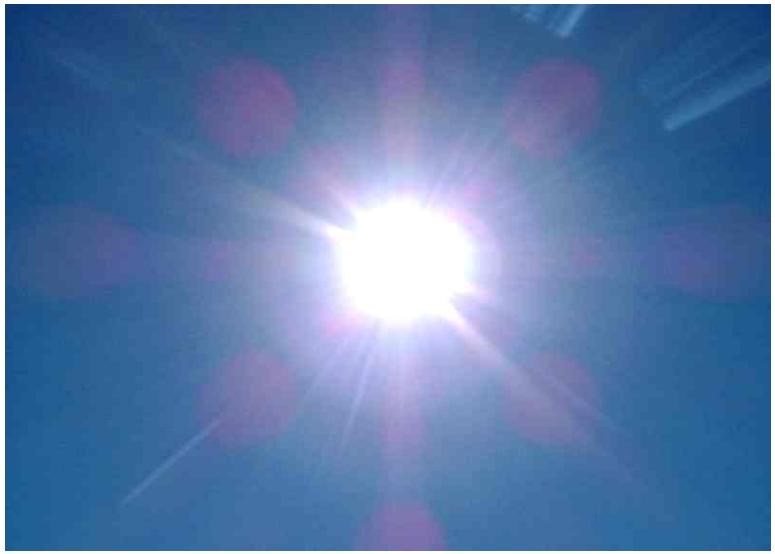
23

Summary

- RD&D plays a critical role in pushing solar technologies down the cost curve
- As solar device costs continue to fall, greater emphasis required on increasing availability and decreasing the cost of finance to enable deployment of solar energy
- A portfolio of funding models may be the most effective means of supporting solar technologies through the innovation cycle, from R&D through demonstration and beyond
- Welcome contributions to the discussion!

AUSTRALIAN SOLAR INSTITUTE

Contact



Olivia Coldrey

Investment Director

Australian Solar Institute

(61 2) 4960 6302

www.australiansolarinstitute.com.au

AUSTRALIAN SOLAR INSTITUTE