

Silicon to Solar (S2S) Study

A Roadmap for Australian PV manufacturing

Muriel Watt
APVI & ITP Renewables



Authors:

Michelle Vaqueiro Contreras, Renate Egan and Nathan Chang (ACAP), Brett Hallam (ITP Renewables), Oliver Hartley (Bright Dimension), Muriel Watt (APVI), Will Rayward-Smith, Matt Walden, Elizabeth Boylan, Anna Thoran and Camille Malbrain (Deloitte)

ACKNOWLEDGEMENTS

This presentation is from findings of the “APVI Silicon to Solar Study”, conducted by the APVI under the Australian Renewable Energy Agency’s Advancing Renewables Program.



Australian Government
Australian Renewable
Energy Agency

ARENA

Contributing Partners



Advisory Board

Mark Bonnar, Mark Twidell, David Jordan

Collaborators

Over 50 stakeholders have collaborated for this study including Chinese and European manufacturers, the US Department of Energy, and companies considering the establishment of Australian production.

Major Supporters



General Supporters



SIEMENS

tindo solar

This presentation is based on the “APVI Silicon to Solar Study”. The Study was conducted by the Australian PV Institute (APVI) under the Australian Renewable Energy Agency’s Advancing Renewables Program in collaboration with the Australian Centre for Advanced Photovoltaics, Bright Dimension, ITP Renewables and Deloitte.

The views expressed herein are not necessarily the views of the Australian Government, and the Australian Government does not accept responsibility for any information or advice contained herein.

This publication includes a contribution from Deloitte Financial Advisory Pty Limited, a member firm of Deloitte Touche Tohmatsu. This contribution contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or their related entities, including Deloitte Financial Advisory Pty Limited (collectively the “Deloitte Network”) is, by means of contributing to this publication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser. No entity in the Deloitte Network shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited (“DTTL”), its global network of member firms, and their related entities, including Deloitte Financial Advisory Pty Limited (collectively, the “Deloitte organisation”). DTTL (also referred to as “Deloitte Global”) and each of its member firms and related entities are legally separate and independent entities, which cannot obligate or bind each other in respect of third parties. DTTL and each DTTL member firm and related entity is liable only for its own acts and omissions, and not those of each other. DTTL does not provide services to clients. Please see www.deloitte.com/about to learn more.

DISCLAIMERS

Projected annual Australian PV demand

June 2023 installed capacity: **32 GW**
(residential and utility)

AEMO ISP baseline forecasts: **5 – 15 GW** per annum
(Range: Step Change – Hydrogen Superpower)

Alternative ambitious forecasts: **37 – 70 GW** per annum
(Range: ARENA Ultra low-cost solar whitepaper
– Net Zero Australia)

To replace fossil fuel energy exports: **> 100 GW** per annum

WE NEED SOLAR AND LOTS OF IT!

Annual Global Forecasts:

- 1TW by 2027/28
- 5TW by 2050

Existing government priorities and funding programs critically reliant on access to abundant solar power



National Battery
Strategy



National Hydrogen Strategy
and Hydrogen Headstart
Program



Future
Fuels
Strategy



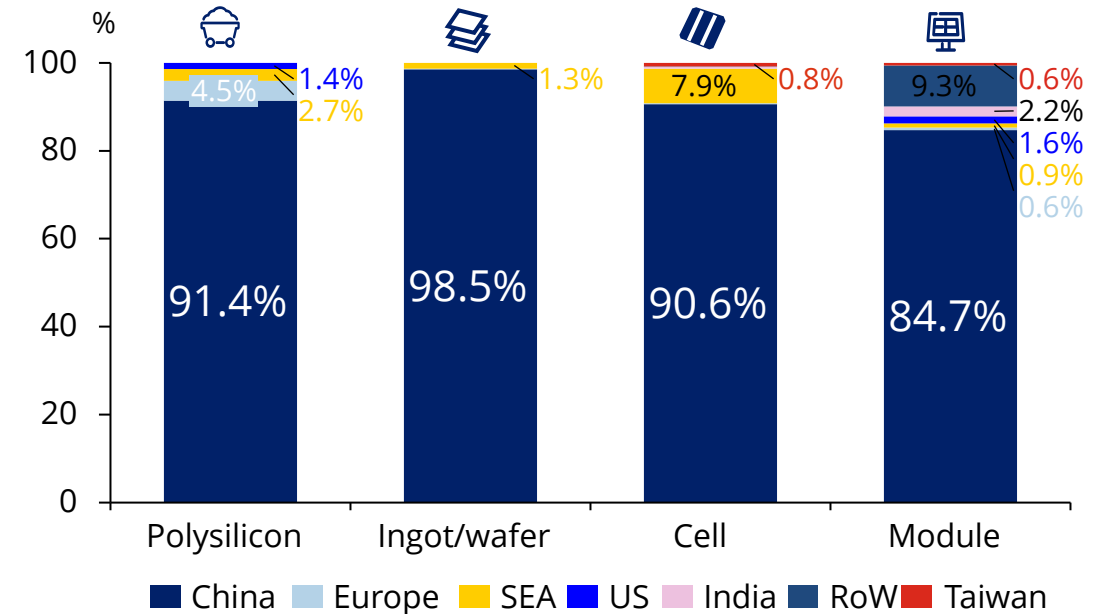
Alumina
decarbonisation
roadmap

RISKS

China has strategically supported its solar industry for 20 years and brought the world low-cost, high-efficiency and good quality solar modules

→ Supply concentration

Market share in 2023 global PV manufacturing production



Australia needs to:

- Secure access to sufficient PV to meet domestic demand and underpin low carbon export ambitions
- Build resilience to future supply chain disruptions
- Gain control over future energy security which is highly solar dependent
- Implement sustainable manufacturing standards to ensure labour-transparent, decarbonised production with full product stewardship

INVESTING IN AUSTRALIA'S SOLAR FUTURE PROVIDES HIGH RETURNS AND REWARDS

Development of 10GW Poly-Si and 5GW of ingot/wafer, cells and module manufacturing is an opportunity to:

RETURN

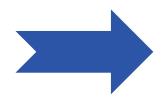
- Create ~4000 skilled, well-paid jobs
- Attract ~\$3bn in upfront investment
- Retain Australian IP and solar talent
- Grow ancillary industries

REWARD

- Unlock skills and knowledge spill-over into other industries
- Create a manufacturing ecosystem
- Boost economic complexity and sophistication
- Develop a new low-carbon export market

S2S STUDY OUTLINE:

1. Techno-economic Analysis of the value chain comparing Australia and China



2. Business Rationale
 (Levelised Cost of Production - LCOP)

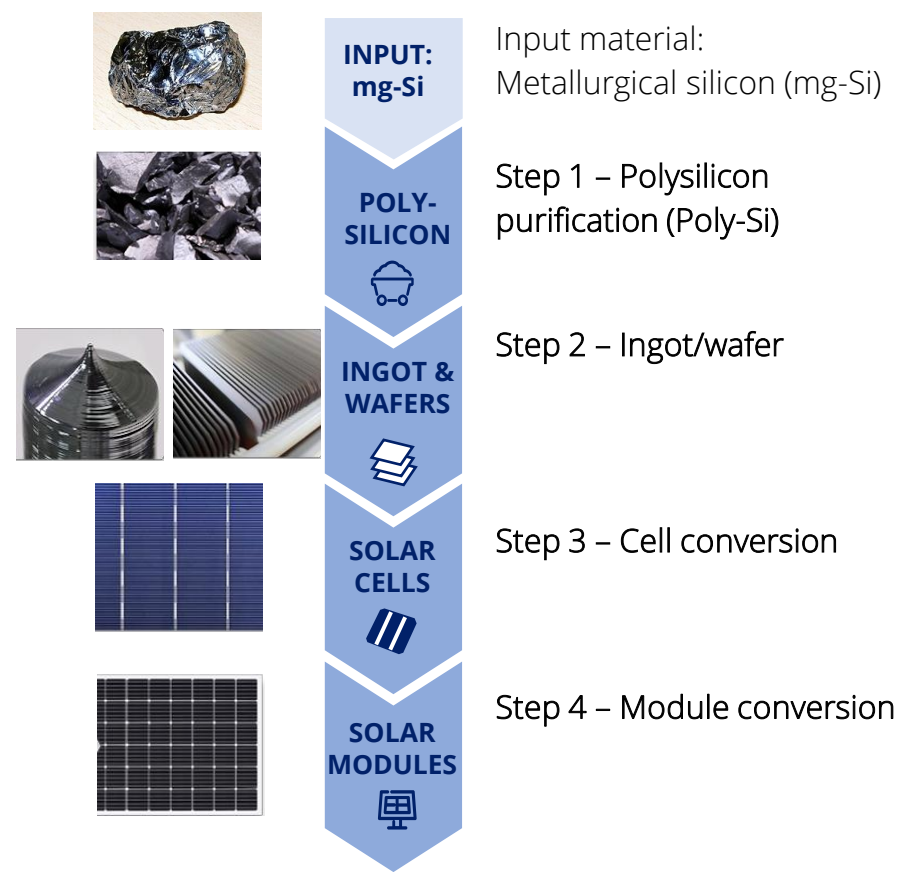


3. Policy analysis
 Enabling policies
 Supply-side policies
 Demand-side policies



4. Recommendations:
➤ Immediate
➤ Next 12 months
➤ Years 1-5

Solar value chain



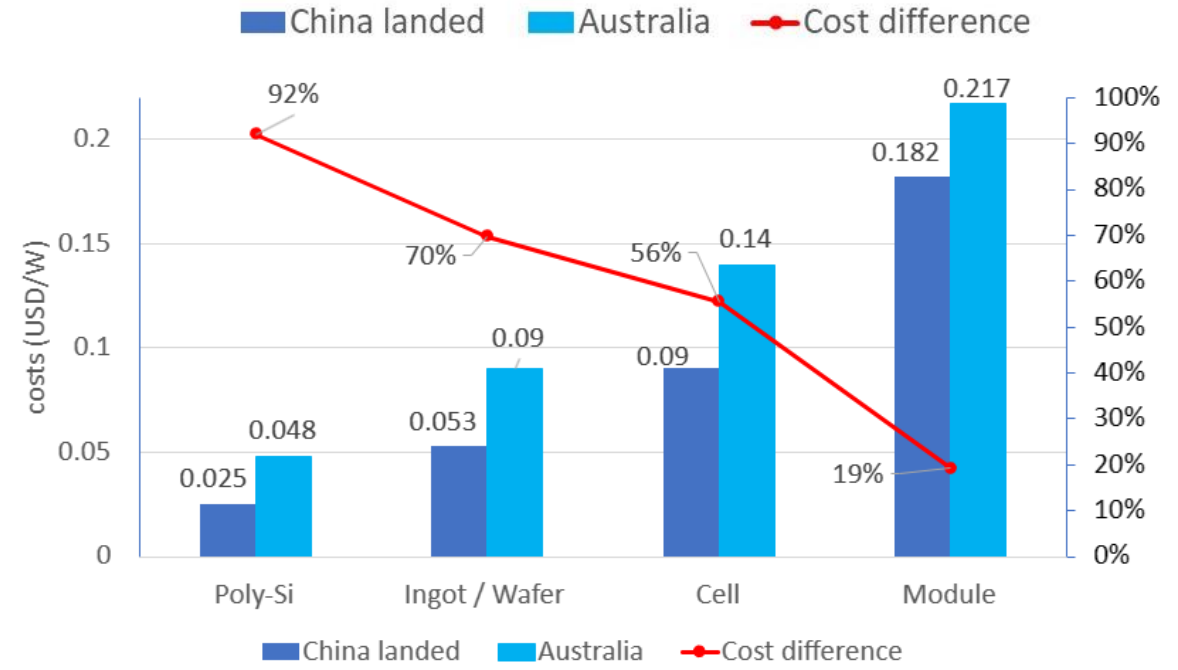
Guiding Principles:

Develop a credible solar manufacturing strategy for Australia that is:

- ✓ **Viable:** globally competitive and economically viable long term.
- ✓ **Relevant:** at scale for future Australian and global demand.
- ✓ **Timely:** set up within a timeframe to achieve net zero by 2050.

BRIDGING THE COST GAP

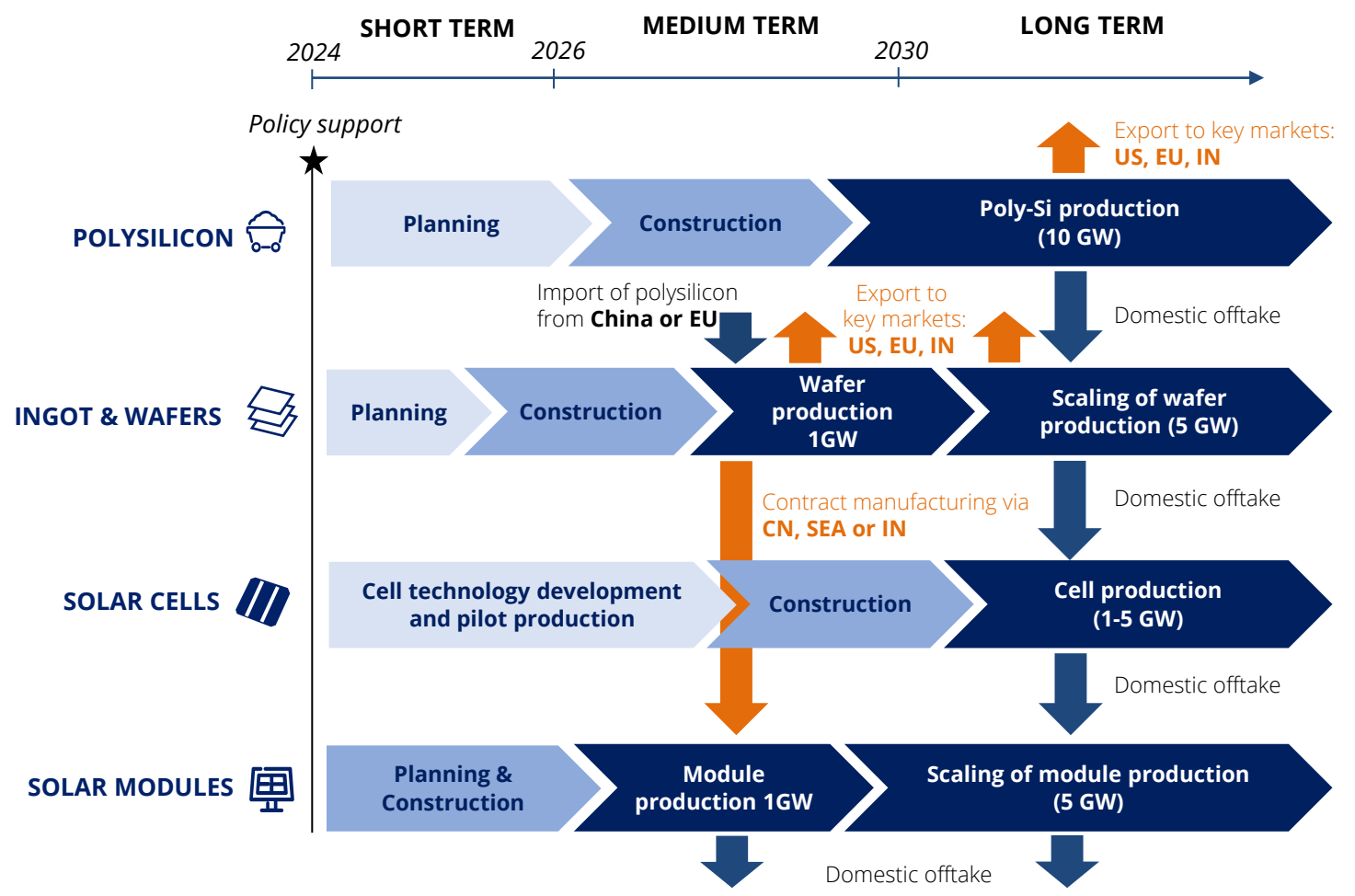
Australian costs using previous input material procured in China and shipped to Australia vs cost of the landed good from China assuming large volume procurement



	25,000 t (10GW)	1GW (→ 5 GW)	1GW (→ 5 GW)	1GW (→ 5 GW)
Minimum Viable Scale				
Initial capital investment	1.3bn AUD	119m AUD	155m AUD	56m AUD
Direct jobs	520 FTE	190 FTE	240 FTE	260 FTE
Offtake market focus	Domestic + export	Domestic + export	Domestic	Domestic

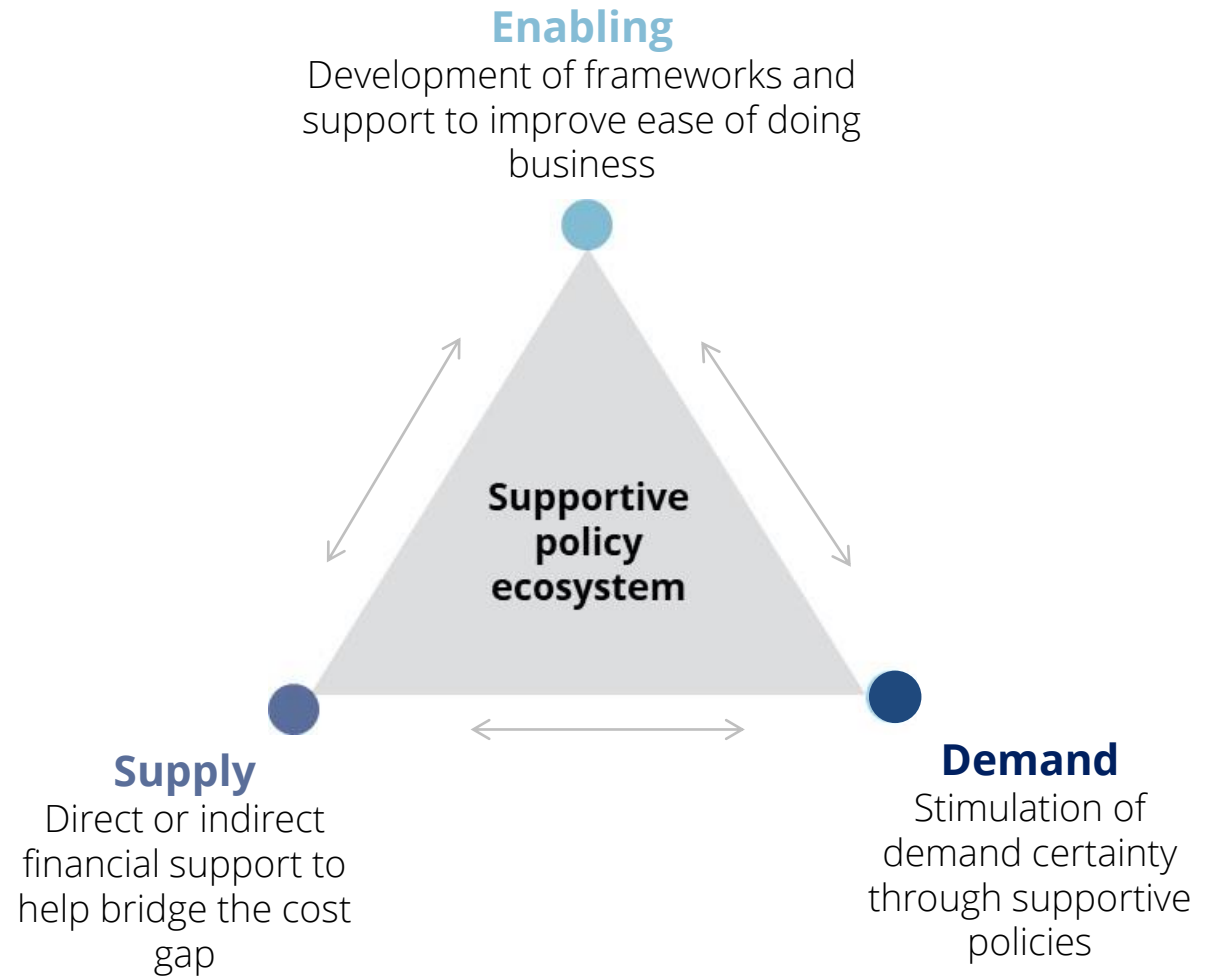
ROADMAP TO SOLAR MANUFACTURING

A fully integrated domestic value chain can be developed to service domestic demand for modules and an export market at the polysilicon and ingot/wafer steps



SUPPORTIVE POLICY ECOSYSTEM

A supportive policy ecosystem comprising a combination of policy levers is needed



BUILDING PV MANUFACTURING IN AUSTRALIA

Objectives:

- (i) Mitigate supply risks (**Risk**)
- (ii) Create a solar industry for domestic demand and export (**Return**)
- (iii) Re-establish manufacturing in Australia (**Return**)

Immediately

- Declare PV manufacturing industry a strategic national priority
- Set-up Solar Manufacturing Taskforce

Next 12 months

- Facilitate enabling policies: people, permits and partners
- Implement financial support mechanisms for PV manufacturing
- Secure budget for the selected subsidies
- Strive for broad political support

Years 1-5

- Implement support for 10 years of facility operation
- Introduce local content incentives and government procurement
- Continue R&D support
- Consider targeted support via electricity price guarantees
- Consider additional up-front capital support