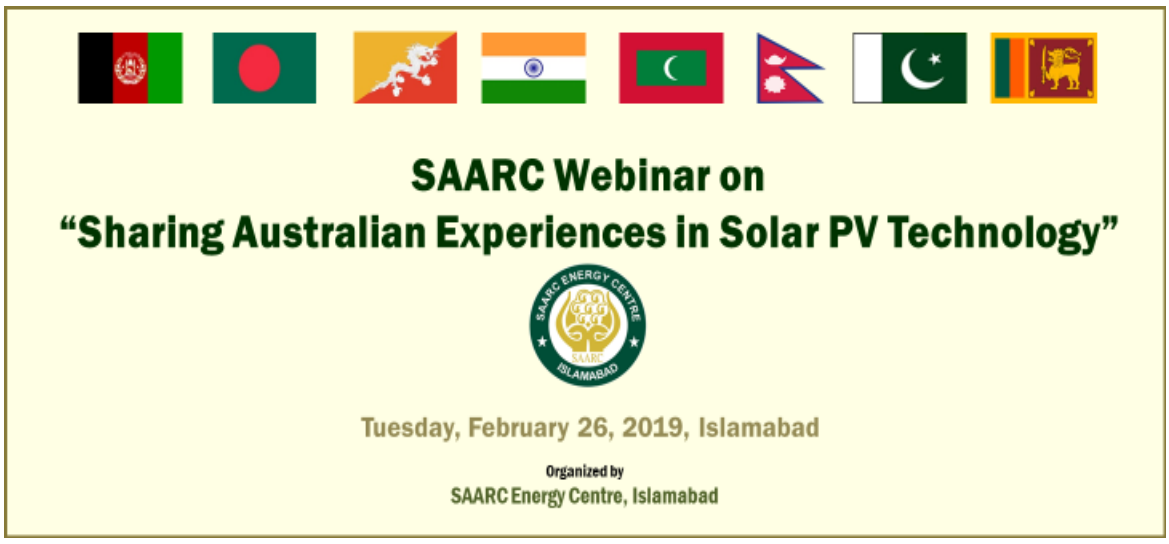
SAARC Energy Centre

THE REPORT



February 26, 2019

SAARC Energy Centre
697, Street 43, Sector E-11/4 (NPF),
Islamabad, Pakistan
www.saarcenergy.org

Introduction

SAARC Energy Centre, Islamabad under its approved programme activity for the year 2019 had successfully conducted a SAARC Webinar on "Sharing Australian Experiences in Solar PV Technology" on Tuesday, February 26, 2019. Webinar Agenda is available at Annexure I.

2. The Webinar highlighted Australian experiences in Solar PV with the SAARC Member States. The experts from Australia shared best practices, case studies and provide participants with information on successful policy interventions and large scale programmes /projects implemented in field of Solar PV by Australian Government.

Participation

3. The Webinar was attended by a total of 81 professionals that included delegates from Member States, Representatives of Regional/International organizations, Academia and private sector. The Resource Persons from Australian academia and industry gave detailed presentations on their government policies, successful programmes, case studies, and initiatives undertaken in the field of Solar PV technology. The focal person from United Nations ESCAP, Thailand gave an overview of the Australian energy market and outline of its Solar PV sector. The participants list is available at Annexure II.

Opening Remarks

4. Mr. Merrille Gonnetilleke welcomed all the delegates and participants for attending the webinar and showing keen interest. He also acknowledged the commitment and contribution of experts and focal person from UN-ESCAP in materializing the conduct of webinar.

5. He started with brief introduction of the SEC and its annual program activities with specific

emphasis on Renewable Energy. The programme activities of SEC which includes policy-based research studies, knowledge sharing events i.e., workshops, seminars, webinars, trainings, and pilot projects in all fields of Energy.

6. He apprised the participants that the Member States in SAARC region have huge and abundant resources of Solar energy which have not been harnessed to their actual potential. The member states of SAARC could learn from Australia which witnessed huge success in the Solar PV sector due to its innovative policies and interventions. Keeping in view the huge success of Solar PV sector in Australia, SAARC Energy Centre has engaged experts from Australian Industry and academia in this webinar to give detailed information on those effective policies/programmes implemented by them in the last 5-10 years. Those interventions undertaken by the Australian government with support of their key stakeholders such as industry and academia have helped their country in becoming top ten installers of Solar PV around the globe.

7. He thanked the experts of the webinar including focal person from UN-ESCAP for playing key role in realizing this webinar. He remarked that this webinar is just a first step, and the centre shall in future; continue conducting such knowledge sharing webinars. At the end, he again thanked all the participants for taking out time to attend the webinar.

Technical Proceedings

8. All the presentations delivered during the webinar are available at SEC's website www.saarcenergy.org. The Experts list is available at Annexure III and Presentations at Annexure IV. A brief information on the content of the delivered presentations is as follows:

Presentation 1 – How solar installer training accreditation and solar product accreditation schemes ensure Australia's solar revolution maintains quality and safety standards
Expert: Mr. Demian Netakhan, Director of Enhar Pty Ltd, Victoria, Australia

9. Mr. Demian gave an overview of the Smart Energy Council and Clean Energy Council in Australia which have supported its Solar PV sector by lobbying, advocating and conducting industry building campaigns. These councils driven by policy and regulation are also responsible for reviewing and adopting mandatory technical standards for products and installers. The Clean Energy Council offers Accreditation for installers of Solar PV and other renewable energy systems in Australia.

10. He mentioned that in presence of a strong Accreditation system in Australia, the pitfalls of quality problems, lack of trust in products and installation industry have been avoided. This nationally recognized accreditation system for products and installers has been the key for successful uptake of Solar PV in Australia.

11. Demian stated that this type of a nationally recognized accreditation system for products and installers is necessary for Solar PV success in any country. He suggested that national regulators in each country should make mandatory to uptake energy from renewable sources

through FiT and/or any other mechanisms only if the procured products and installation works on those projects were conducted by accredited companies.

12. At the end, he mentioned that the Solar PV sector, through nationally accreditation scheme has benefited from good credibility, recourse against poor products/installation, and better performance of systems.

Presentation 2 – An overview of Australia's policy journey for Solar PV

Expert: Dr. Anna Bruce, Senior Lecturer in the School of PV and RE Engineering, University of NSW, Sydney, Australia

13. Dr. Anna started her presentation by explaining Renewable Energy Policy Framework of Australia which depicted policies at different times in a technology lifecycle. She mentioned that the drive provided by Renewable Energy targets scheme in Australia i.e., 20% RE by 2030 and financial support provided by Clean Energy Finance Cooperation have helped in demonstration and commercialization of early RE projects. The Feed-in-Tariffs (FiT) once introduced were very generous keeping in view the rapidly decreasing prices of Solar PV and thus, had a big positive impact on the PV market.

14. Currently in the two states of Australia, more than 30% of the households have rooftop PV systems. These small-scale PV rooftop (below 100 kW capacity) have a promising payback period of 3-5 years. She talked about Solar Flagship scheme, the purpose of which was to demonstrate utility-scale PV projects in Australia. In the last 7-8 years, levelized cost of electricity from large-scale Solar PV in Australia has reduced from 40 to 7 cents/kWh (US$).

15. Lastly, she mentioned the Auction schemes that have been a leading policy around globe for supporting deployment of RE. These schemes provide guaranteed price for all energy generated from RE projects which provides a deal of certainty to project developer/financer. She mentioned that latest challenge now in Australia is providing flexibility for Variable Renewable Energy sources in electricity market through Battery Storage, Pumped Hydro technology and enhancing capacity of electricity transmission system.

Presentation 3 – The role of the Australian States in accelerating Solar PV uptake

Dr. Adrian Panow, Director of Deakin Energy, Victoria, Australia

16. Dr. Adrian started his presentation by giving an example of Feed-in-Tariff changes in South Australia over a course of few years from 2008 to 2013. In this short period of time, there were several changes made in FiTs which made investment for RE very difficult. He suggested that the Government should take a trajectory/pathway for FiT review changes which is clearer and for longer periods.

17. He showed a chart of annual increase in energy generated from residential Solar PV in Australia from 200 GWh in year 2012 to 1000 GWh in year 2017. In the course of 7 years (2011-2018), due to higher number of rooftop Solar PV, the average demand of electricity in the month

of November in South Australia at peak time (8 am to 4 pm) has decreased from an average of 1600 MW to 1000 MW.

18. He mentioned about Solar Home Package announced in year 2018 by Victorian state, whereby households in Victoria could get 50% rebate on average 4 kW Solar PV system (Total system costs A$ 4,500) and A$ 1000 on cost of solar hot water system. Another similar scheme i.e., 'Solar for Renter' which giving rebates to people living in rental accommodations was introduced.

19. At last, Dr. Adrian gave an overview of Hornsdale Power Reserve; a Lithium-ion battery storage system commissioned in year 2018 with discharge capacity of 100 MW and energy storage capacity of 129 MWh. The Storage bank shares a high voltage connection with a 300 MW Wind farm nearby which makes it cost effective. The commercial arrangements for battery bank are made in a way that 70 MW for 10 mins (discharge capacity 11.7 MWh) is contracted to the government for grid stability services while remaining 30 MW for 3 hours (discharge capacity 90 MWh) is available for selling to the market.

20. He mentioned that in future, Frequency Control Ancillary Services (FCAS) through battery storage would be more feasible (technically and financially) for utilities than the traditional Gas/Steam turbines.

Knowledge Sharing Session

21. The participants of the webinar provided their feedback on the quality and content of the event. The main discussions during this session revolved around topics such as Mechanism of disposal of Lithium-ion batteries, approximate life cycle of batteries, Economic comparison of battery bank versus Gas generators, charging Electric vehicles, and Frequency regulation through new technologies.

Wrap up and Conclusion

Mr. Michael Williamson, Section Chief, Energy Division, UN-ESCAP, Bangkok, Thailand

22. Mr. Michael Williamson from Energy Division of UN-ESCAP thanked everyone for attending the event and hoped that through this webinar, the participants have a broader understanding of Australia's journey in Solar PV sector. He praised the accreditation program of Australia which had helped enormously the industry and the consumers. He was also appreciative of the initiatives taken by Corporate entities in Australia for purchasing renewable energy directly from the utilities. He also mentioned the importance of replacing quick frequency response by Gas generators to battery storage. At the end, he thanked the presenters and specifically Director, SEC for giving him an opportunity to collaborate with the Centre on this webinar.

Vote of Thanks and Closing of Webinar

Mr. Ahsan Javed, Research Fellow (Renewable Energy), SAARC Energy Centre

23. Mr. Ahsan Javed, Research Fellow (RE) informed all the participants that the presentations will be available on SAARC Energy Centre's website (www.saarcenergy.org). He requested the participants to submit suggestions and comments to SEC for any further improvement, plus they may suggest and submit any topics of their interest to SEC for arranging future webinars. The webinar was closed with a thank you note to everyone attending the Webinar.

Annexure-I

Tentative Agenda

SAARC Webinar on "Sharing Australian Experiences in Solar PV Technology"

Tuesday, February 26, 2019; 1100–1430 hrs Pakistan Standard time (PKT)

1100 – 1105	Welcome and Introduction *Mr. Ahsan Javed, Research Fellow (Renewable Energy), SAARC Energy Centre*
1105 – 1115	Opening remarks *Mr. Merrille Gonnetilleke, Chairman Governing Board, SAARC Energy Centre*
1115 – 1130	Introduction to the speakers, Setting the scene – a brief outline of Australia's PV sector in 2019 *Mr. Michael Williamson, Section Chief, Energy Division, UNESCAP, Bangkok, Thailand*
1130 – 1215	Presentation 1 – How solar installer training accreditation and solar product accreditation schemes ensure Australia's solar revolution maintains quality and safety standards (includes 15 mins Q & A) *Mr. Demian Netakhan, Director of Enhar Pty Ltd, Victoria, Australia*
1215 – 1300	Presentation 2 – An overview of Australia's policy journey for Solar PV (includes 15 mins Q & A) *Dr. Anna Bruce, Senior Lecturer in the School of Photovoltaic and Renewable Energy Engineering, University of NSW, Sydney, Australia*
1300 – 1345	Presentation 3 – The role of the Australian States in accelerating Solar PV uptake (includes 15 mins Q & A) *Dr. Adrian Panow, Director of Deakin Energy, Victoria, Australia*
1345 – 1415	Knowledge sharing session
1415 – 1425	Wrap up and conclusion *Mr. Michael Williamson*
1425 – 1430	Vote of thanks and Closing of Webinar *Mr. Ahsan Javed*

Information for the participants:

1. All times mentioned in agenda are according to Pakistan Standard Time (PKT). The participants from other Member States of SAARC and Australia may attend Webinar by following their own national time. The time conversion for all countries is given below for reference:

Country	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Sri Lanka	Australia
Conversion Time	(PKT-00:30)	(PKT+01:00)	(PKT+01:00)	(PKT+00:30)	PKT	(PKT+00:45)	(PKT+00:30)	(PKT+06:00)

2. The participants can ask questions to presenters by typing questions or clicking to the raised hand option into the Attendees pane of the main window of GotoWebinar software. You may send in your questions at any time during the presentations; we will collect these and address them during the Q & A session at the end of each presentation. You may also discuss your queries during the knowledge sharing session of webinar.
3. All participants can also submit comments/views and/or observations on the webinar to SAARC Energy Centre through email to Mr. Ahsan Javed (ahsan@saarcenergy.org) before 5th March, 2019.

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Annexure-III

List of Experts

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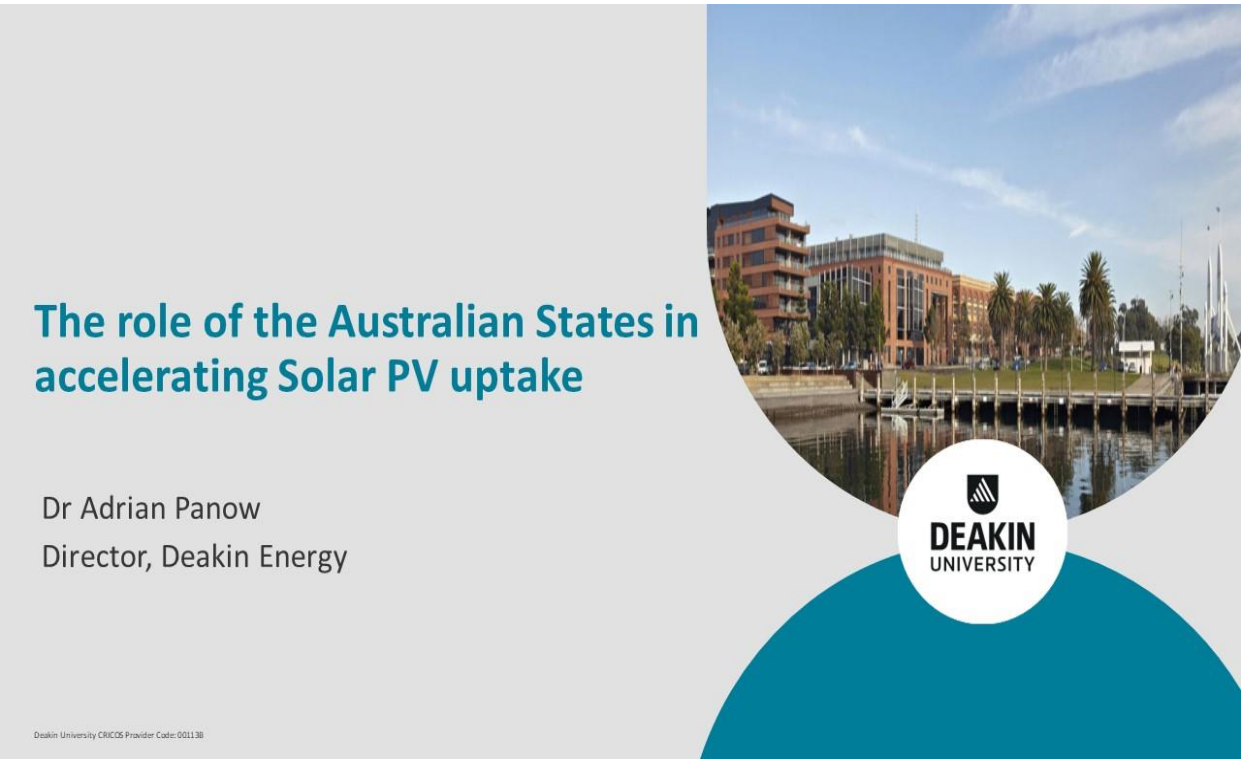
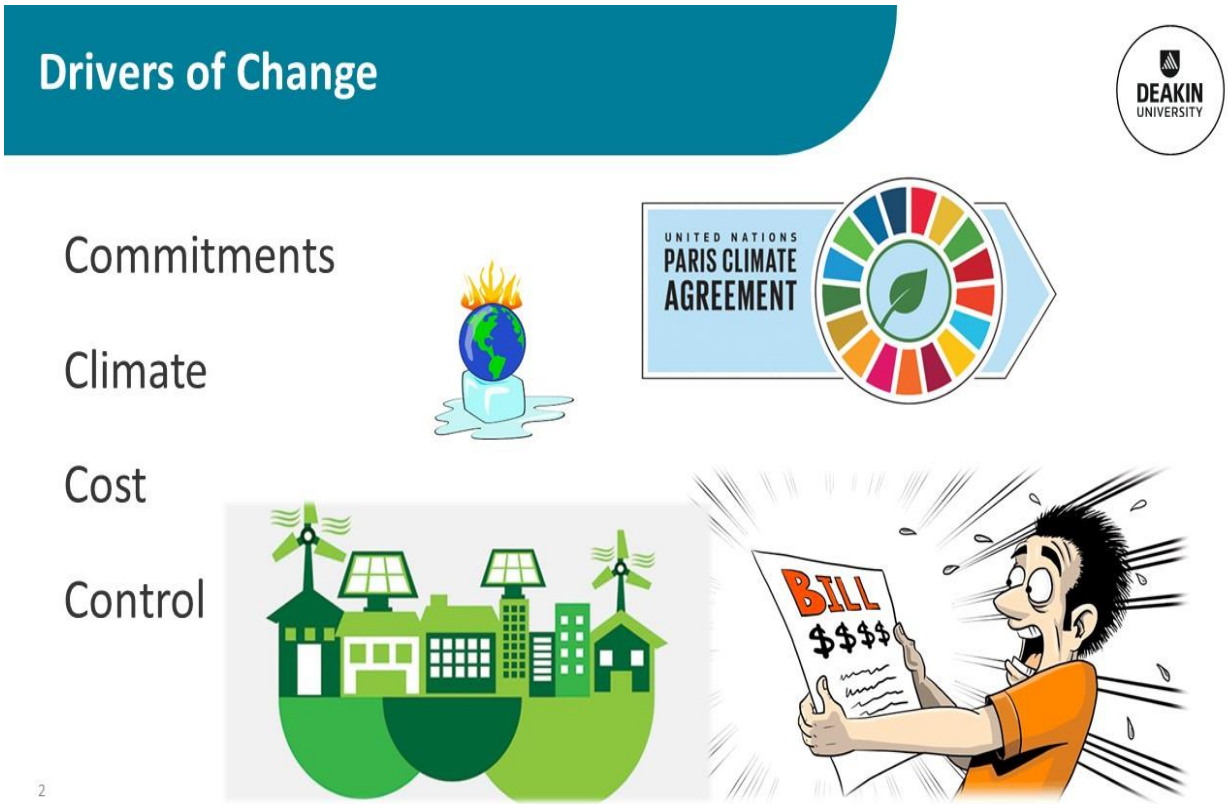
1.	Mr. Michael Williamson	Section Chief, Energy Division	United Nations ESCAP, Bangkok	williamson@un.org
2.	Dr. Adrian Panow	Director	Deakin Energy, Victoria, Australia	a.panow@deakin.edu.au
3.	Dr. Anna Bruce	Senior Lecturer	School of Photovoltaic and Renewable Energy Engineering, University of NSW, Sydney, Australia	a.bruce@unsw.edu.au
4.	Mr. Demian Netakhan	Director	Enhar Pty Ltd, Victoria, Australia	demian@enhar.com.au

Presentations Delivered During the Webinar

Presentation on "The Role of Australian States in Accelerating Solar PV Uptake" by Dr. Adrian Panow





Australian Government Commitment

DEAKIN UNIVERSITY

UNITED NATIONS PARIS CLIMATE AGREEMENT

Australia's target -

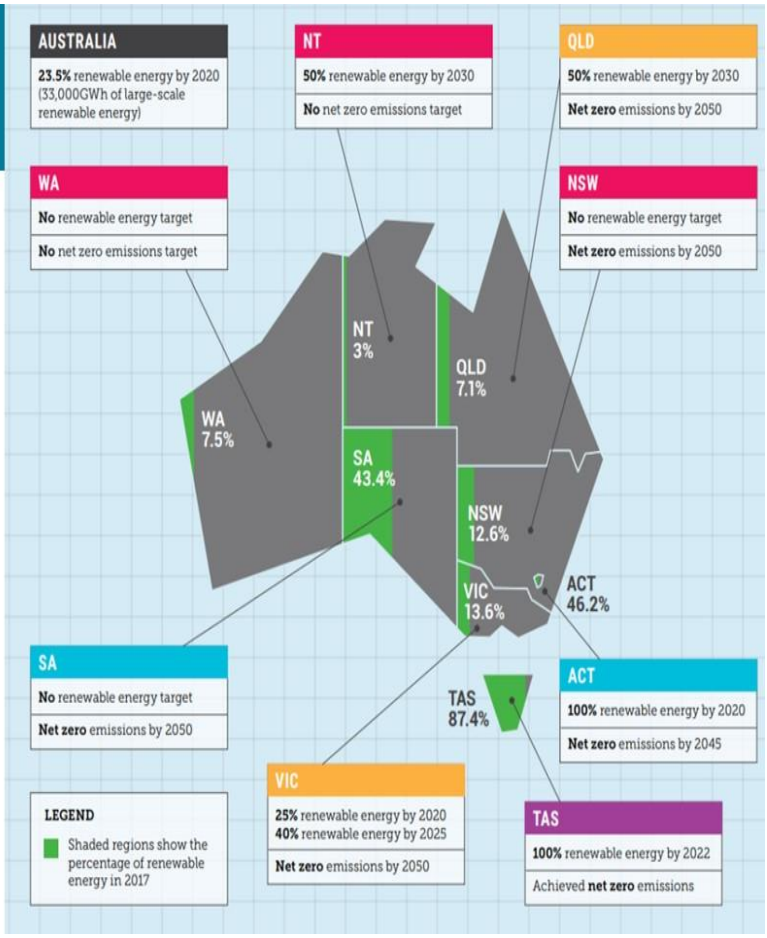
Australia will reduce emissions to 26-28 per cent on 2005 levels by 2030.

50-52 per cent reduction in emissions per capita and 64-65 per cent reduction in the emissions intensity of the economy between 2005 and 2030.

3

Commitments and Aspirations

CLIMATE COUNCIL



4

Concerns About Climate Change

4in5

78% concerned about climate change

27%	Very concerned
26%	Quite concerned
25%	Slightly concerned
11%	Not very concerned
10%	Not at all concerned

What are they concerned about?

The impact upon future generations

The state of the planet

Potential impacts on quality of life

Potential impacts on health

Misperceptions

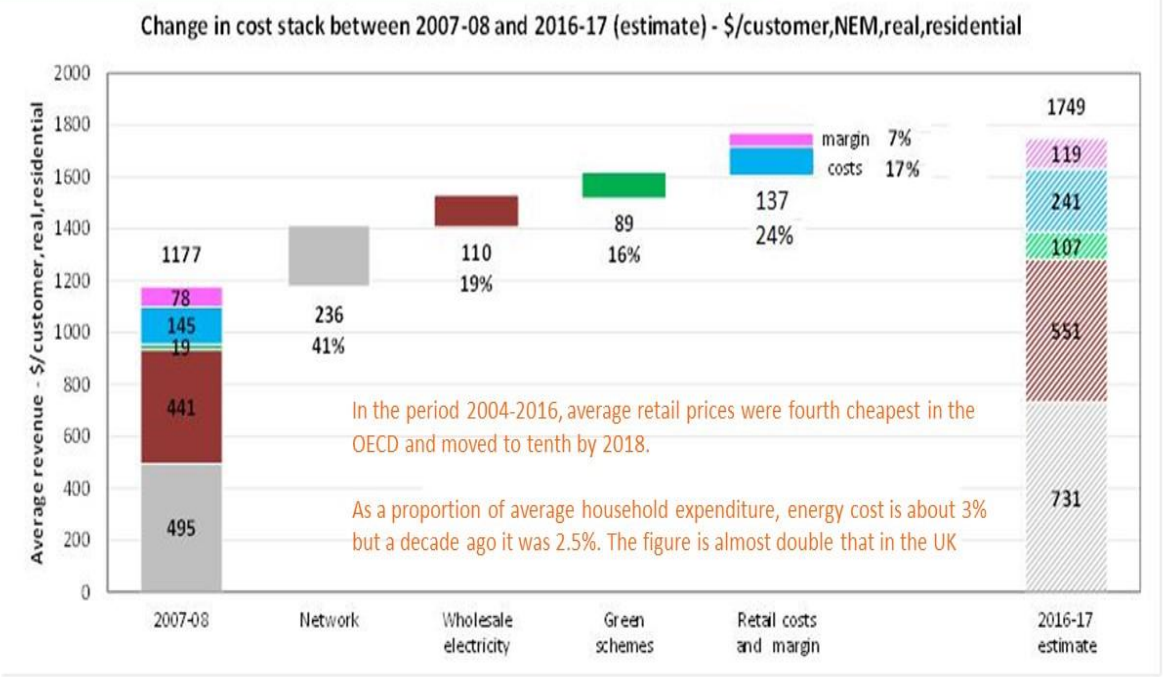
Only 48% think that others are concerned.

Sceptics think their opinion is held by 50% of population

4in5 Victorians

say [unusual] weather events are due to the influence of climate change

Components of a residential electricity bill



ACCC September 2017

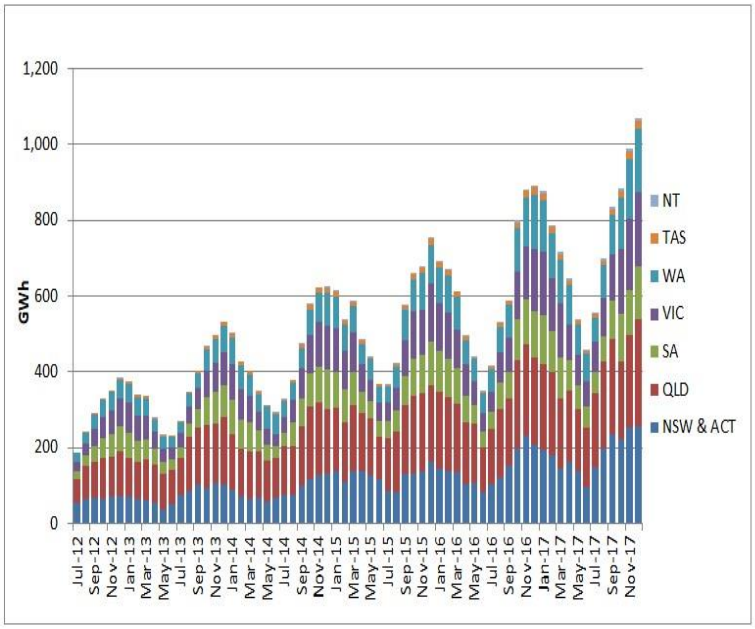
South Australia
Example of feed-in tariff arrangements and changes

- 1 July 2008 to 30 June 2028. Net feed-in tariff set at $0.44/kWh
- Reviewed in 2009-10 and amendments to the legislation took effect from 29 July 2011.
- Reduction of the feed-in tariff for customers receiving approval after 30 September 2011.
- Existing customers continue to receive 44 cents and in addition will receive a minimum retailer payment (6 cents) until 30 June 2028
- New customers approved between 1 October 2011 and 30 September 2013 receive 16 cents plus the minimum retailer payment until 30 September 2016
- New customers approved after 30 September 2013 will not receive any feed-in tariff, but will be eligible for the minimum retailer payment, that is a total payment of about 6 cents ("fair and reasonable" rate).
- Retailers are free to pay customers more than the legislated minimum rates.

7

Installation numbers and system size

Figure 6: Estimated residential PV generation (GWh)



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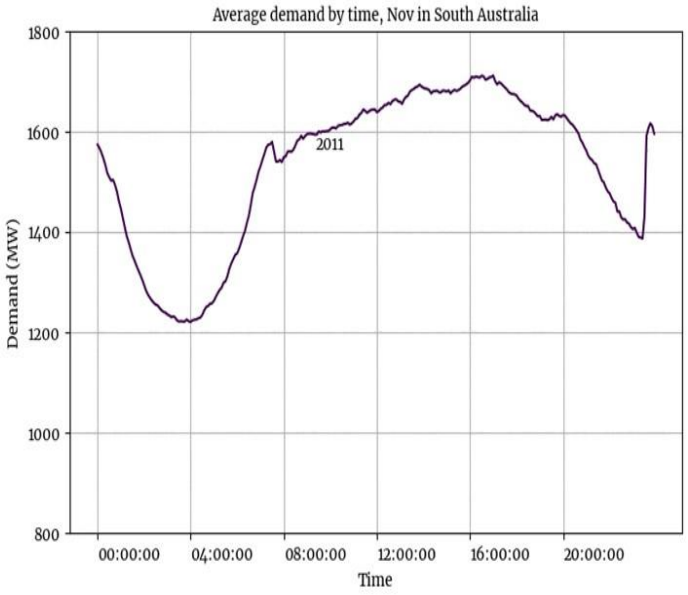
Source: Australian Energy Council analysis, January 2018

Consumers responding



D J McConnell 2019

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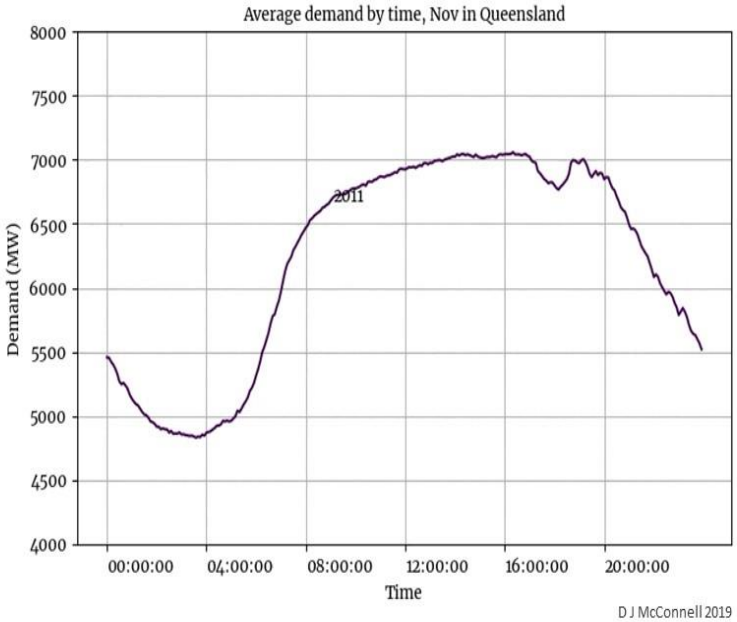
Changing Demand



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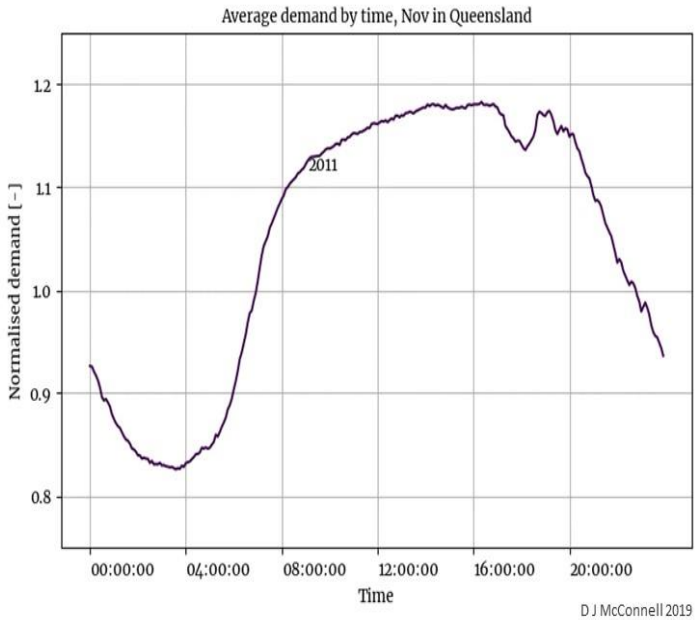
Same impact of rooftop solar



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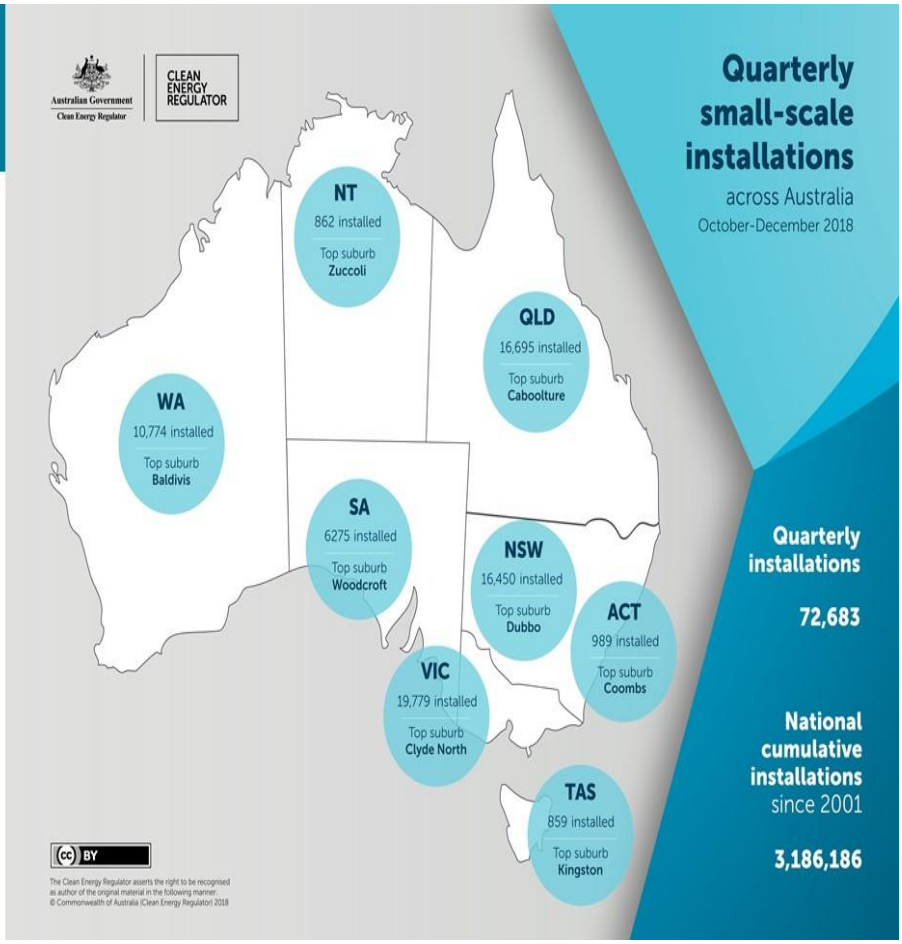
Installations by State



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Installations by Suburb – What does this indicate?

State	Top suburb	Solar water heater installations	Solar PV installations	Installed capacity (kW)
ACT	Coombs	81	13	99
NSW	Dubbo	6	164	1593
NT	Zuccoli	13	62	500
QLD	Caboolture	21	121	834
SA	Woodcroft	83	38	215
TAS	Kingston	16	11	68
VIC	Clyde North	193	253	1517
WA	Baldivis	14	150	891

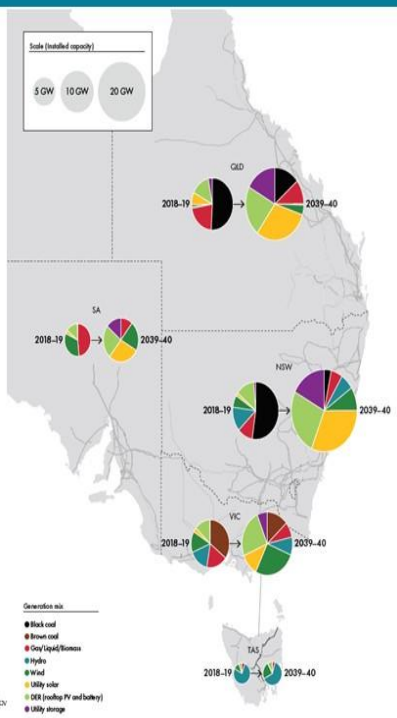
- Housing construction
- Urban renewal
- Cost of living pressures
- Targeted marketing
- Community energy
- Policy?

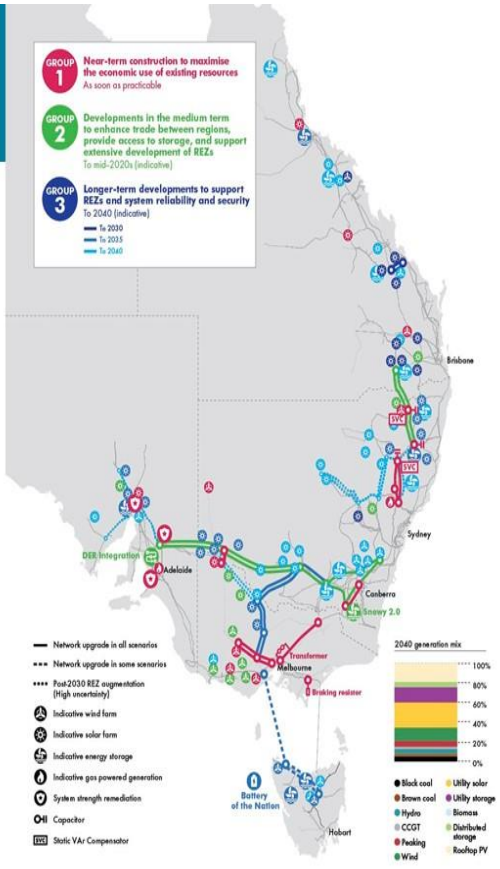
Clean Energy Regulator Oct – Dec 2018

13

Deakin University CRICOS Provider Code: 00113B

AEMO Integrated System Plan
Coping with a State-based history





14

Deakin University CRICOS Prov

Victorian Government Solar Programs
"Reduce customer bills"

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Solar Homes Package

"The Solar Homes package is about giving Victorian households greater control over their household bills."

50 percent rebate on the cost of an average 4kW solar PV system, (currently a $2,225 rebate for a system costing $4,450), or a $1,000 rebate on the cost of a solar hot water system.

Claimed benefits

PV – "Households will be able to save on average $890 per year..."

Solar Hot Water – "between $160-$400 a year..."

15

Victorian Government Solar Programs
"Reduce customer bills"

DEAKIN UNIVERSITY

Solar for Renters

"$82 million over 10 years to provide an additional 50,000 rebates on solar panels for Victorian renters."

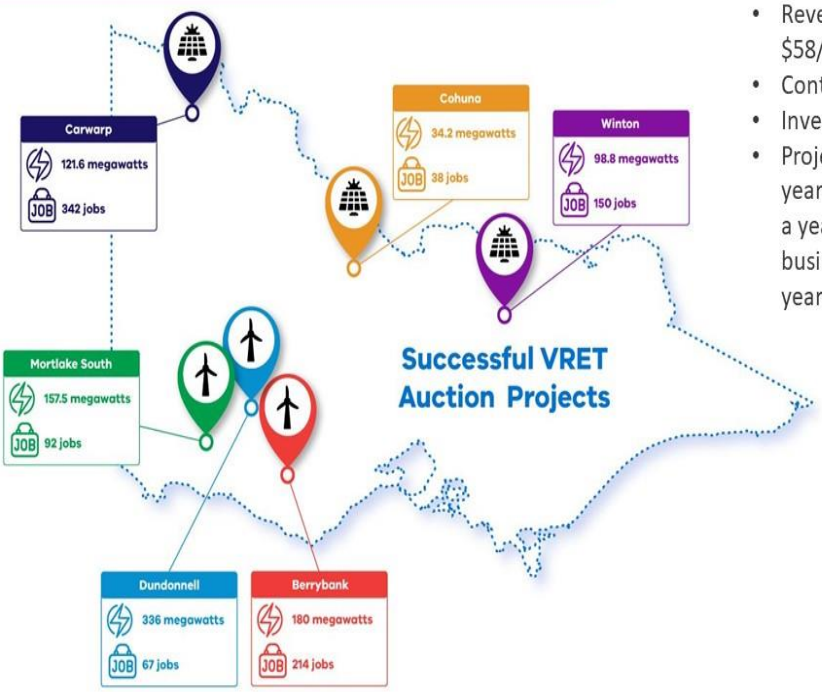
Renters will make a 25 percent contribution toward the cost of installation through a small levy on rent spread over four years, Government and the landlord cover the balance.

Example - $4,000 PV system – Government $2,000, landlord $1,000 (interest-free loan), renters a monthly levy totalling $250 per year for four years (interest-free loan).

Claimed benefits - save renters up to $890 per year; landlords see increased property value.

16

Victorian Renewable Energy Auction Scheme
"Jobs, energy security/reliability, climate"



- Reverse auction ($54-$58/MWh unsubsidised?)
- Contract for difference
- Investor certainty
- Projected benefits - $30 a year for households, $2,500 a year for medium businesses and $140,000 a year for large companies

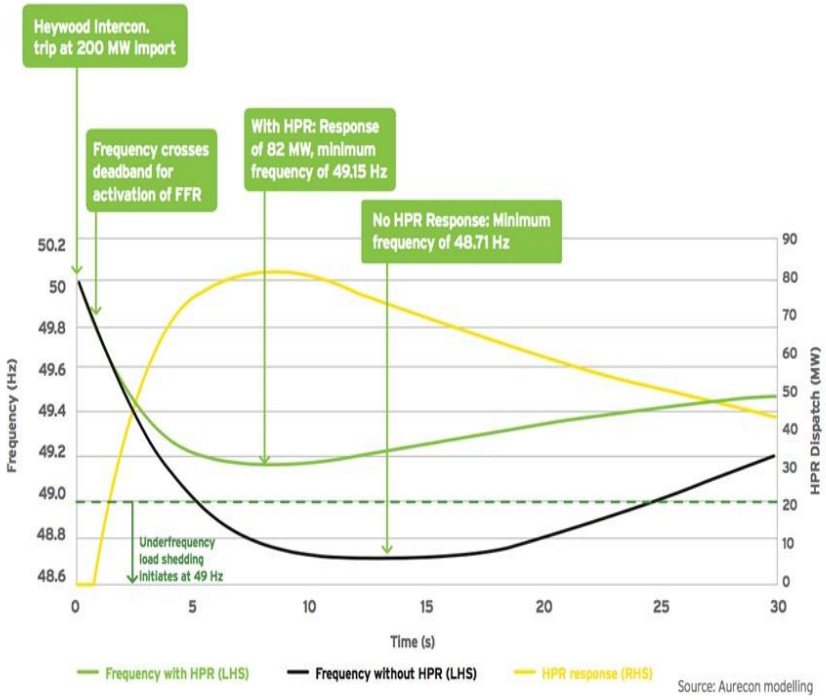
17

Hornsdale Power Reserve (HPR)

- Lithium-ion battery energy storage system
- Owned and operated by Neoen; supplied by Tesla
- Discharge capacity of 100MW; energy storage capacity of 129MWh
- Shares a 275kV network connection point with the 300MW Hornsdale windfarm
- 70MW of discharge capacity for designated system security services contracted with the South Australian Government
- 30MW capacity and 119MWh energy storage is available to Neoen for market participation

18

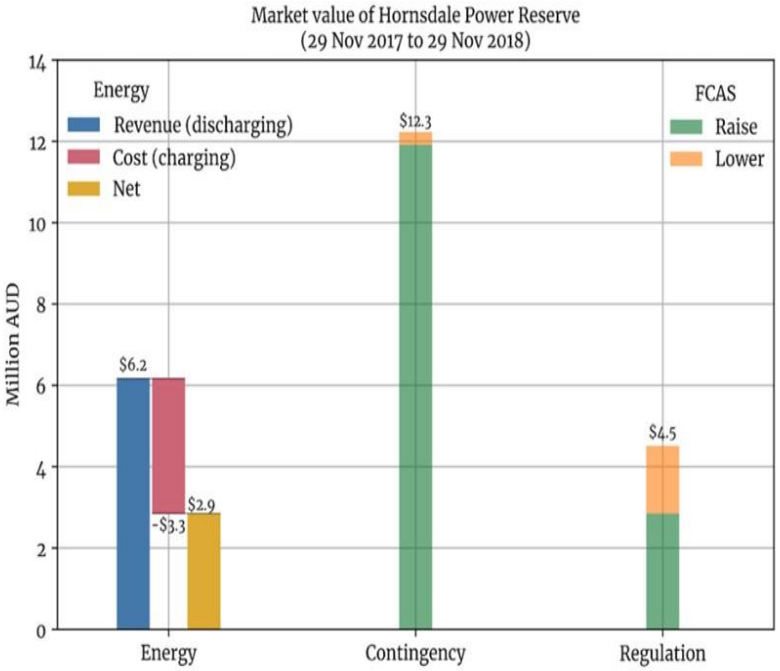
Sufficient to support security and reliability



Source: Aurecon modelling

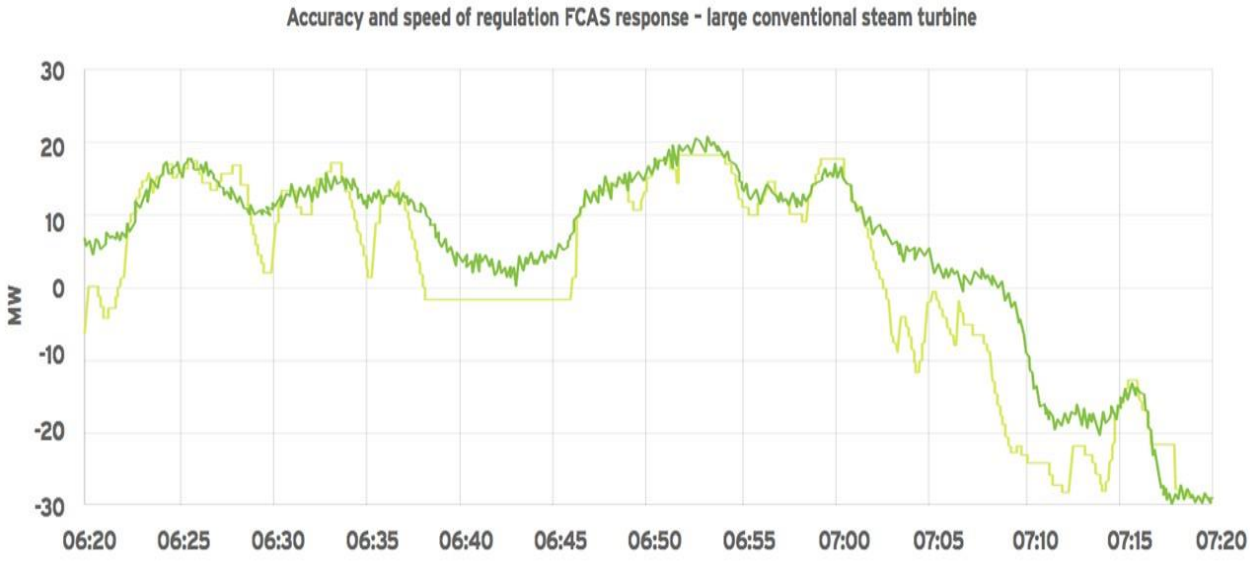
19

Financial Performance/Impact



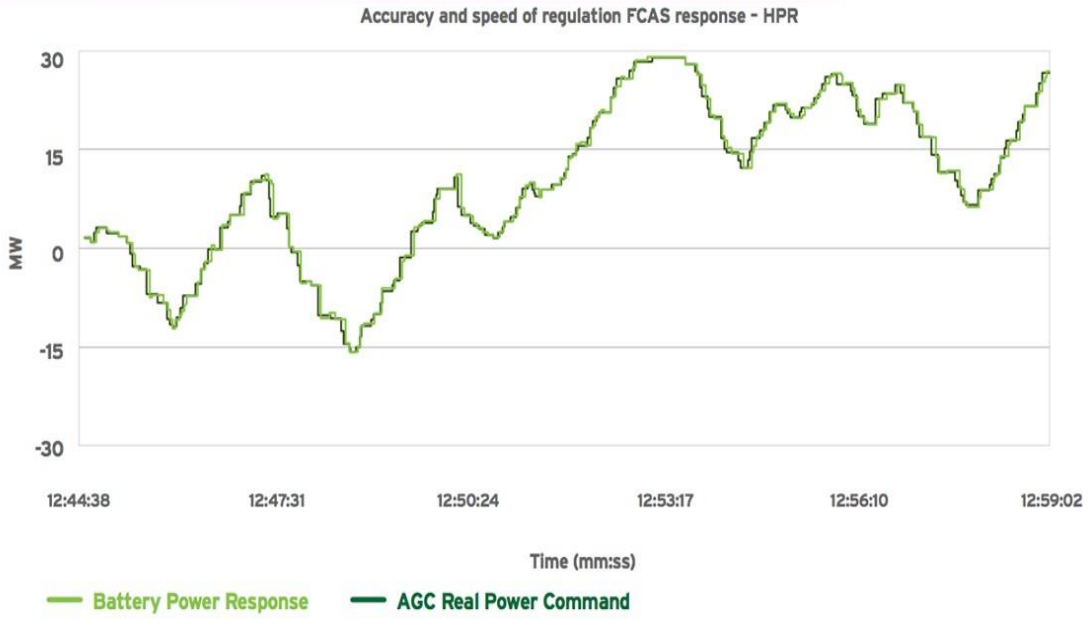
20

Gas FCAS Response



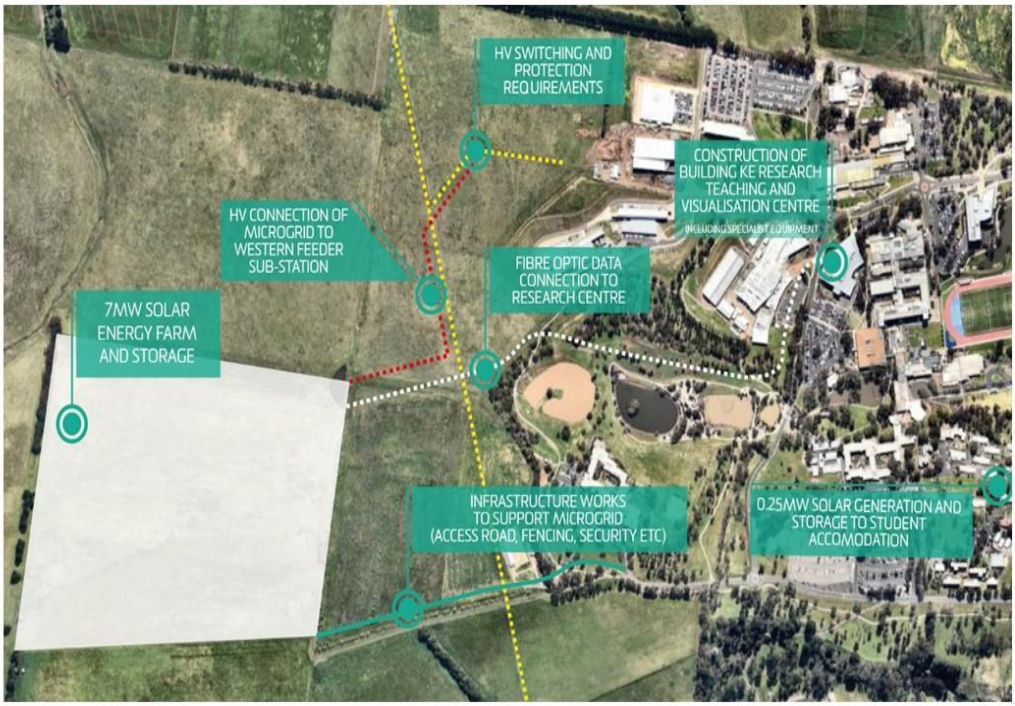
21

HPR FCAS Response



Source: Aurecon analysis of HPR logged data

Waurn Ponds Microgrid – Infrastructure Reality



- 7MW solar farm
- 1MW/1MWh storage
- 250kW + batteries distributed
- Research, teaching and visualisation centre
- AUD20m capital in the initial phase
- AUD10m research projected
- Potential growth in generation, storage and transport

Many drivers for progress

- *Consumer costs*
- *Jobs*
- *Climate commitments*

Much to learn.....

24

Presentation on "An Overview of Australia's Policy Jounet for Solar PV" by Anna Bruce

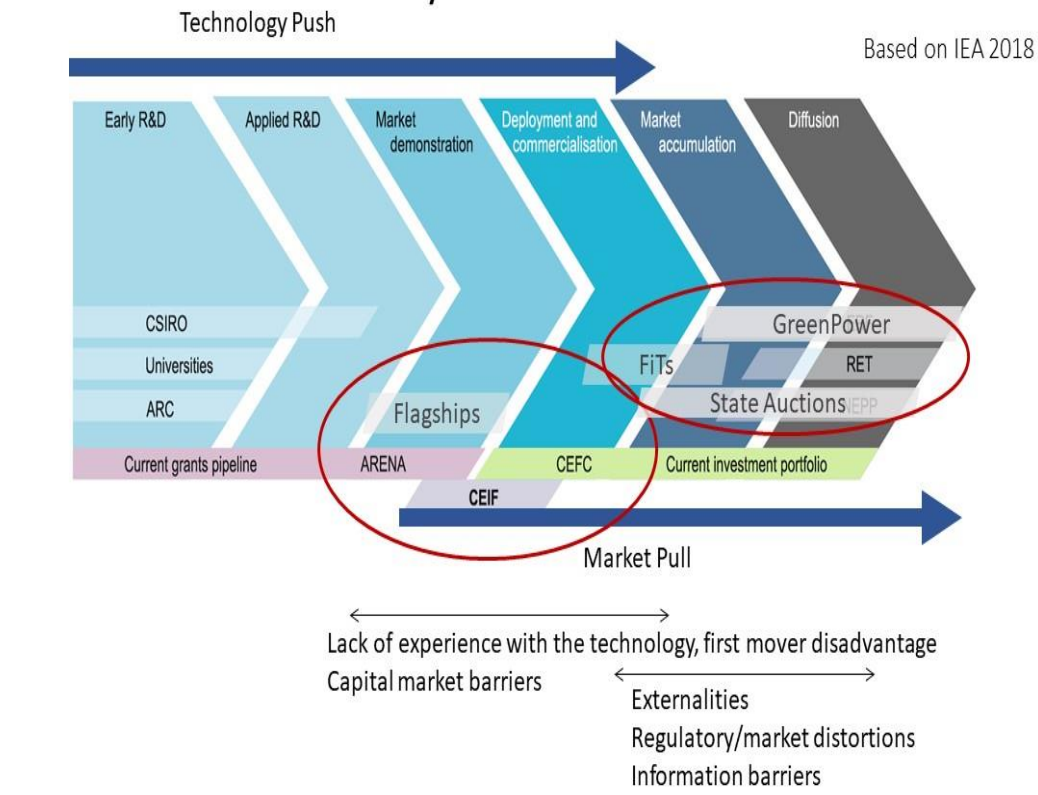
An overview of Australia's policy journey for Solar PV

Anna Bruce

Senior Lecturer, School of Photovoltaic and Renewable Energy Engineering

UNSW Sydney

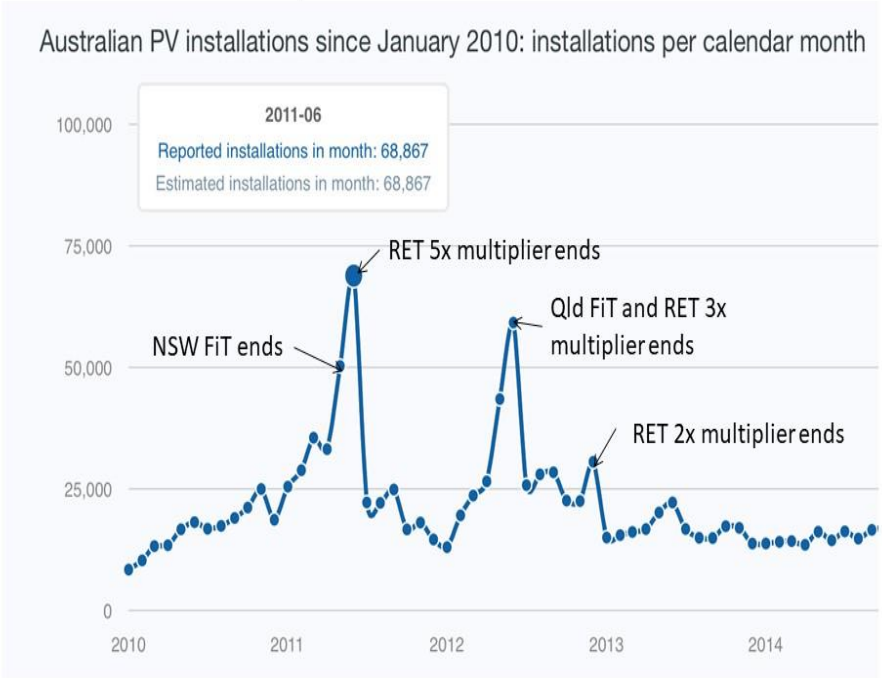
Australian RE Policy Framework



Beginnings – Little Bay

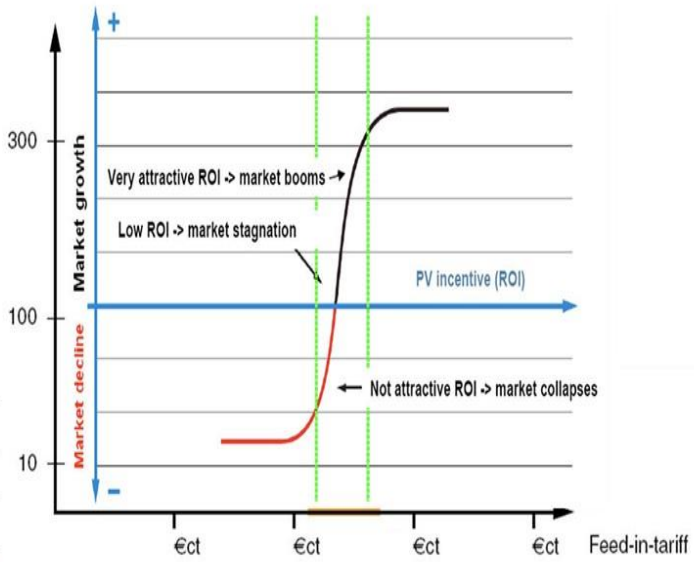
- 1994 The first licensed PV power generation facility in NSW connected to the grid
- Challenges
  - Grid connection
  - Generator registration
- 1996 Grid Connect Guidelines for PV
- Exemption for small generators

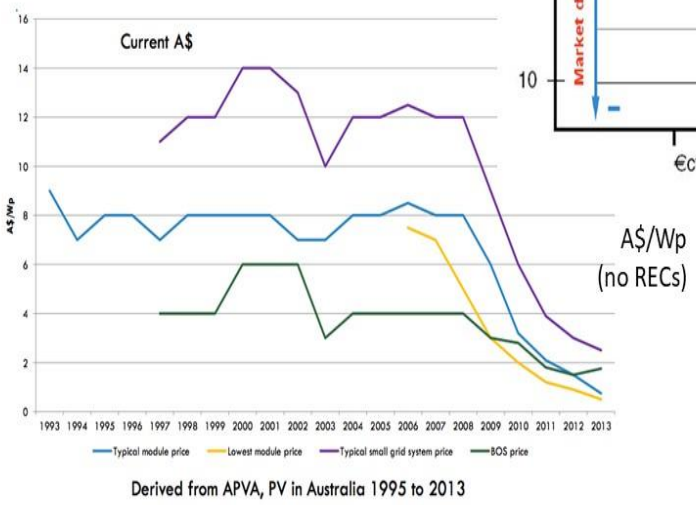
Boom & Bust: Impact of Scheme Ends on Market



4

Feed in Tariffs
Impact of FiTs
on Australian PV
Market
(APVA, 2012)





A$/Wp
(no RECs)

Derived from APVA, PV in Australia 1995 to 2013

Advantages of FiTs

- FiTs have been most successful in growing markets and local industries
- Provide a market signal based on system output, rather than a fixed capacity subsidy, and hence reward output (efficiency etc.)
- Well designed, encourages steady growth (investor certainty, easy to finance)
- Flexible - tariffs can be adjusted if capacity/markets size is too big/small
- Can target emerging technologies, specific locations
- Easy access to small producers (householders, cooperatives), low transaction costs

6

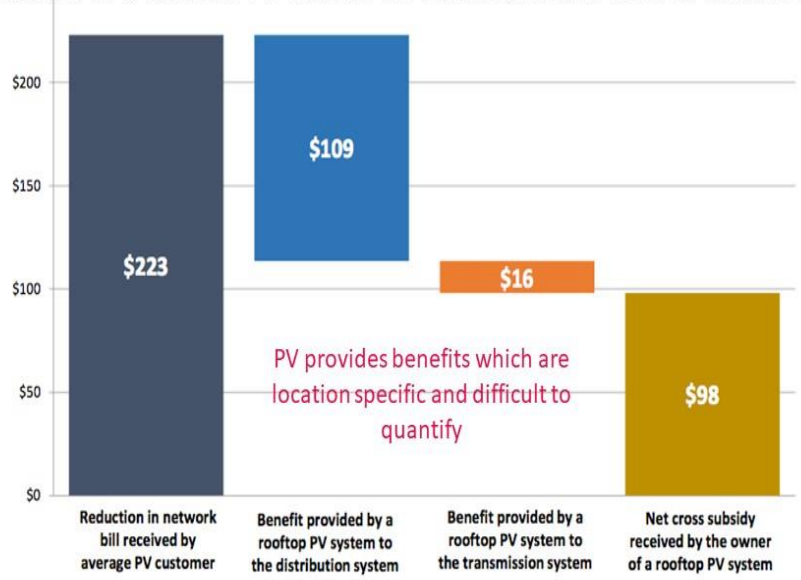
Disadvantages of FiTs

- Can cost a lot of money (non-solar electricity customers or taxpayers unhappy) & difficult to predict cost
  - Can be unexpected demand
  - Electricity wholesale prices can fluctuate (difference between standard and premium cost changes)
- If price is fixed, may not encourage price reduction (innovation -> dynamic efficiency)
  - ...but innovation may be encouraged by competition for market share (amongst manufacturers) & profitability + critical mass of industry players can better innovate
  - Even so, savings may not be passed on to customers (need regular adjustment of tariffs)
- Not attractive to networks -> no incentive to reduce barriers to RE (may increase them)
- Does not usually reflect variable value of electricity (time, location)
- Customers of utilities in good resource areas may bear most of the cost
  - Can be addressed by distributing costs among all areas

7

PV Network Tariff Cross Subsidy

Annual impacts of a rooftop PV system on the Endeavour Energy network and other custome



ENA 2014

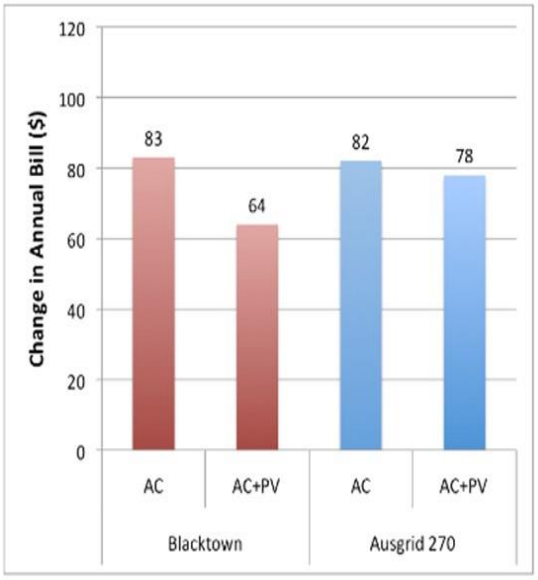
8

Other Cross Subsidies in Tariffs

- To consumers in different locations
- To consumers that use the network at peak times

Impact of owning air-conditioning (AC) and AC + PV on bills of other customers

CPD 2013



Network Tariff Changes and PV

- Likely that network peak load savings < value of tariff savings
- How much should PV owners pay to use the network?
- Proposals by DNSPs and others:
  - PV hosting limits
  - Increased fixed charges
  - High and non-transparent fees for network studies
- But at current penetration levels, most of the impact of PV on networks is revenue impact, not costs of managing technical issues

PV Tariffs in a Post 'Grid Parity' World

- What is the Value of PV?
  - To date, Australian FiTs have reflected energy value (avoided purchase of energy from the wholesale market by retailer) + avoided energy losses
  - Network value?
- Underlying network costs and benefits poorly aligned with tariffs - current Cost Reflective Tariffs
  - Do not incentivise DERs to provide services that are locationally and temporally aligned with grid needs
  - Do not compensate them for providing a range of network services and other values
- How to treat other distributed energy resource (DERs)?
- Need new business models for DNSPs and other key stakeholders that facilitate DERs

11

Victorian Time-varying FiT (2018)

Single-rate minimum feed-in tariff – final rate

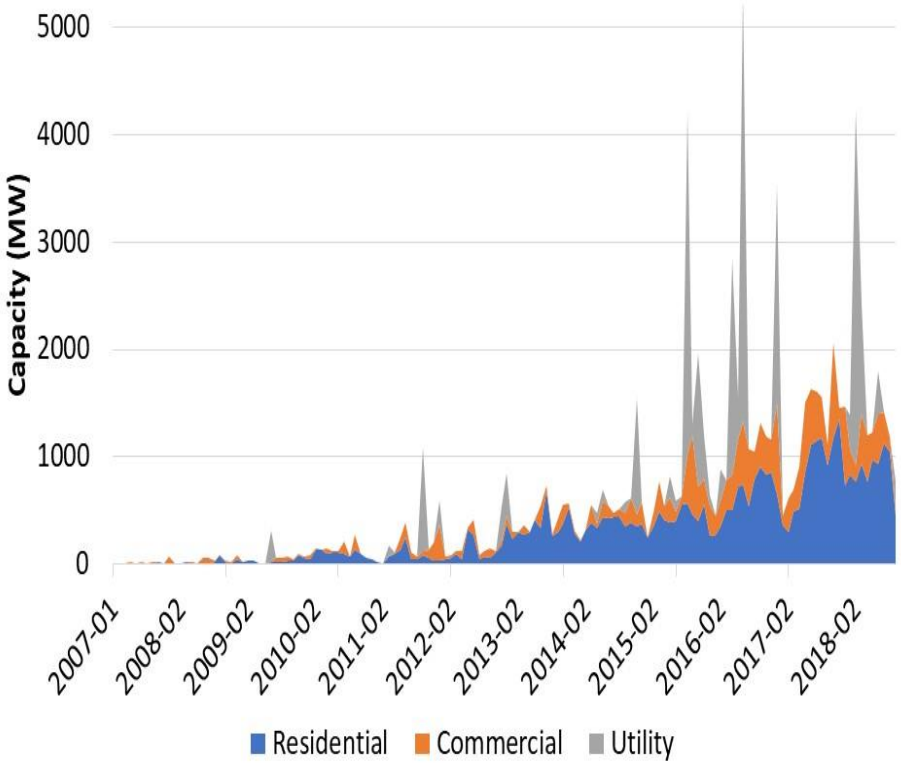
Tariff	Minimum rate to apply (all times) (c/kWh)
Single-rate minimum feed-in tariff:	9.9

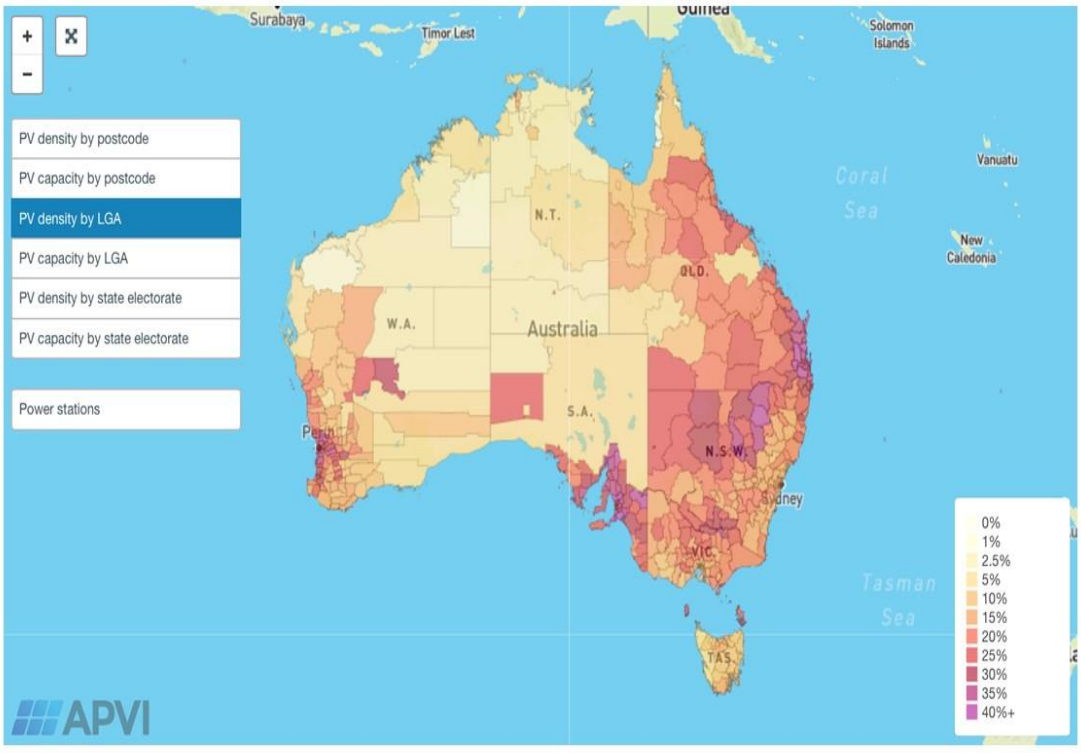
Time-varying minimum feed-in tariff – final rates

Period	Weekday	Weekend	Rate: cents per kilowatt hour (c/kWh)
Off peak	10pm – 7am	10pm – 7am	7.1 c/kWh
Shoulder	7am – 3pm, 9pm – 10pm	7am – 10pm	10.3 c/kWh
Peak	3pm – 9pm	n/a	29.0 c/kWh

12

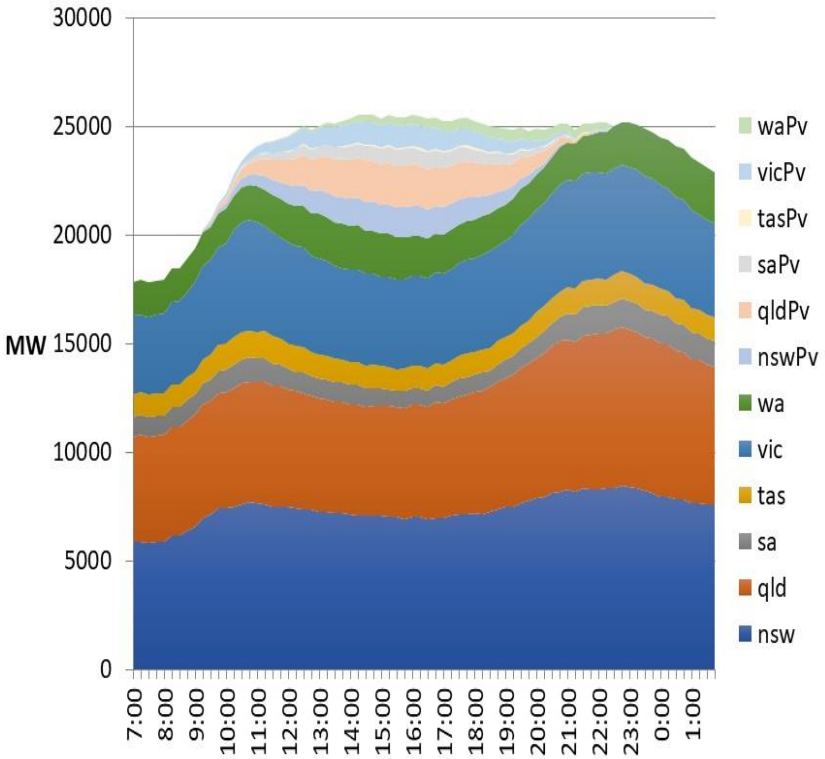
PV Growth


5000
4000
3000
2000
1000
0
Capacity (MW)
2007-01
2008-02
2009-02
2010-02
2011-02
2012-02
2013-02
2014-02
2015-02
2016-02
2017-02
2018-02
Residential
Commercial
Utility

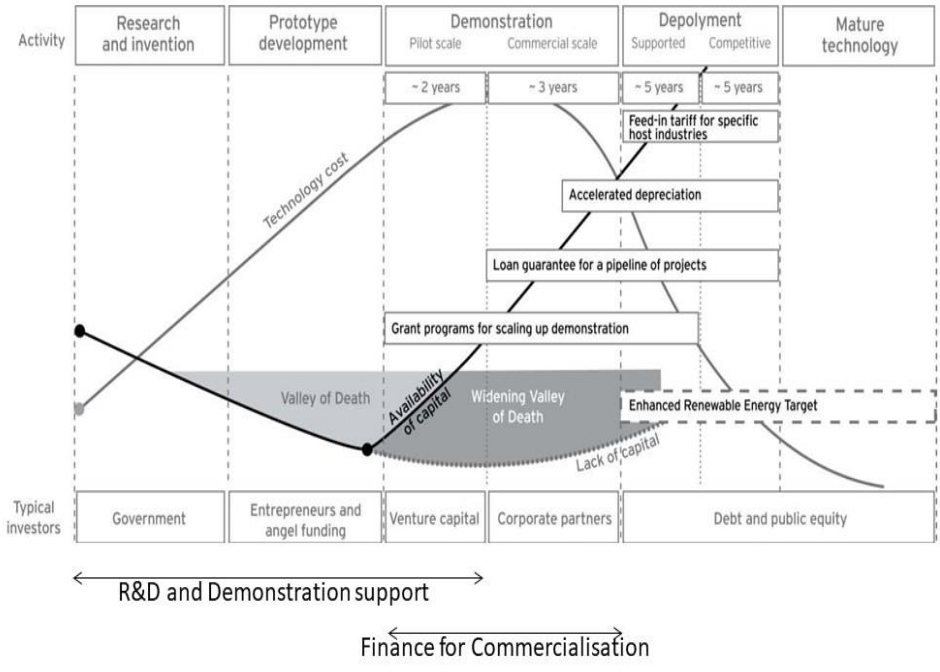

PV density by postcode
PV capacity by postcode
PV density by LGA
PV capacity by LGA
PV density by state electorate
PV capacity by state electorate
Power stations
Surabaya
Timor Lest
Solomon Islands
Vanuatu
New Caledonia
Coral Sea
Tasman Sea
N.T.
QLD.
W.A.
Australia
S.A.
N.S.W.
Sydney
VIC.
TAS.
Perth
0%
1%
2.5%
5%
10%
15%
20%
25%
30%
35%
40%+
APVI

Distributed PV Generation

- 22nd October 2018



Commercialisation Support and Financing



Lareg Scale Solar Support

- Solar Flagships Demonstrations
- ARENA grants
- CEFC financing support
- State government Reverse Auctions

Demonstration Grants Lessons Learnt

- Often require co-investment (e.g. 1:1 matching capital)
- Milestones problematic due to technology & institutional uncertainties -> much funding never gets disbursed
- Big grants are more risky
- High administrative costs
- Can damage public perception
- Does highlight regulatory & market issues and reduce risk for future projects
- Commercial interests reduce dissemination of learnings

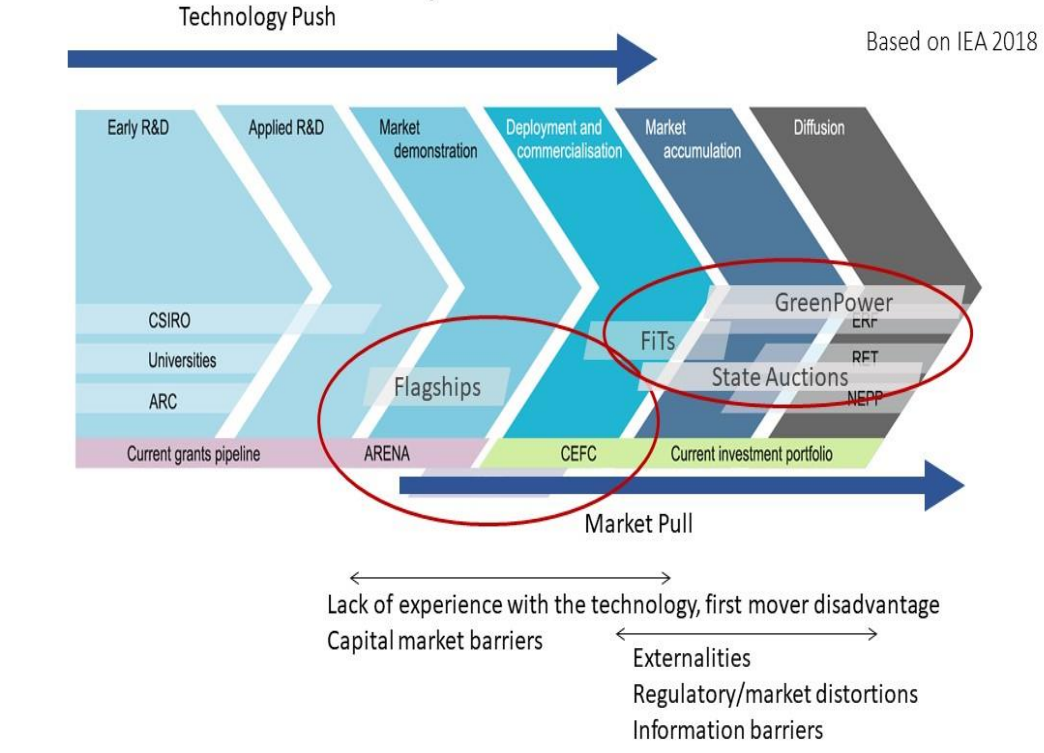
18

CEFC - Public Financing Support

- Projects in the capital intensive phase of technology development
- Tenor [timeframe] of debt suitable for renewable energy infrastructure projects
- Smaller scale renewable energy projects
- Institutional investor allocations to clean energy/technology fund managers
- Competitively priced long term debt finance for energy efficiency and low emissions technology
- Capital for enabling technologies, such as grid transmission, storage, and smart grid.

19

Australian RE Policy Framework



State Auctions

- State RE Targets

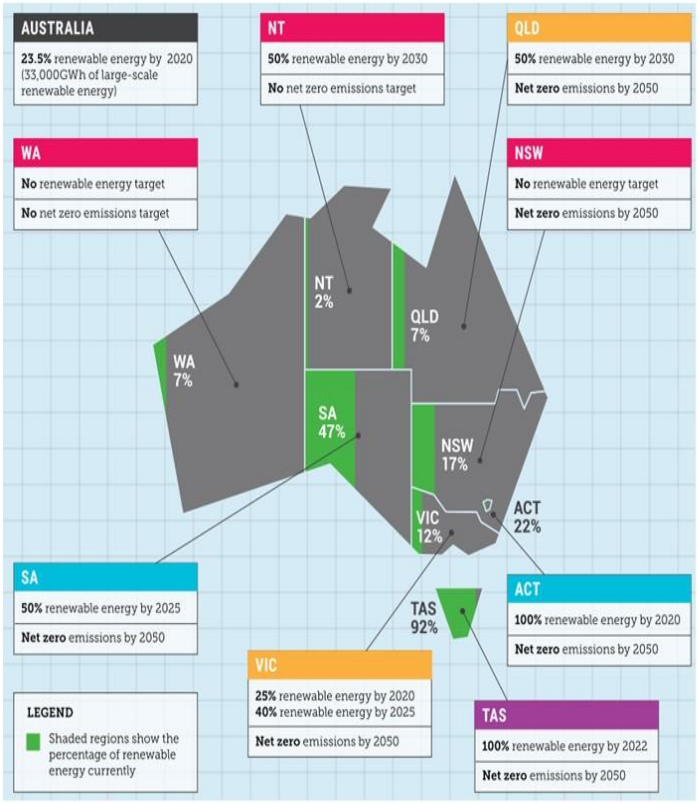
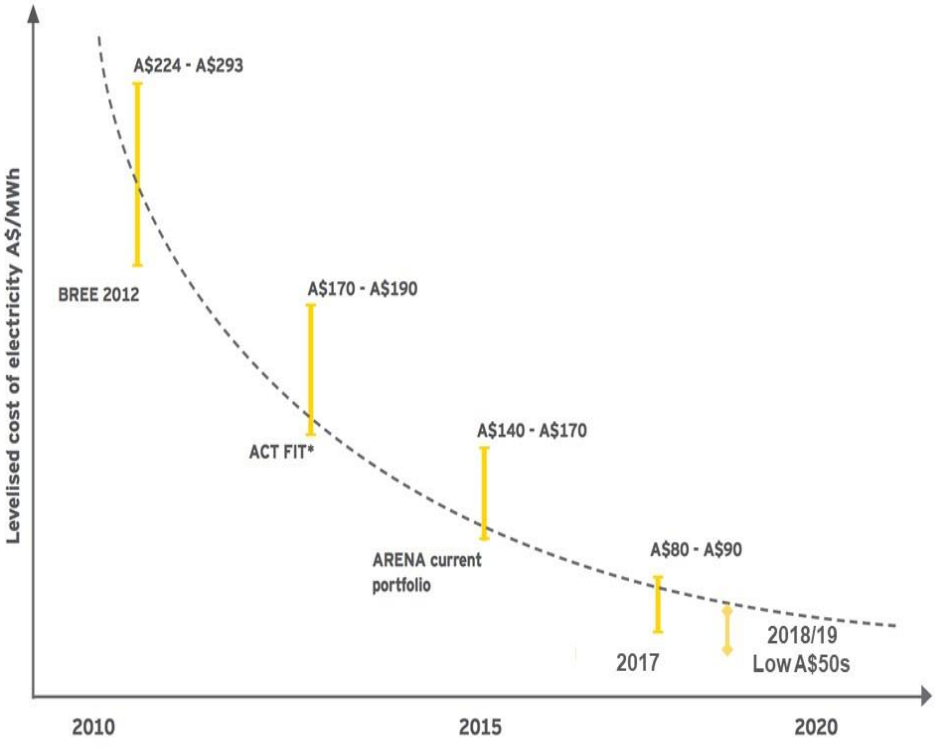
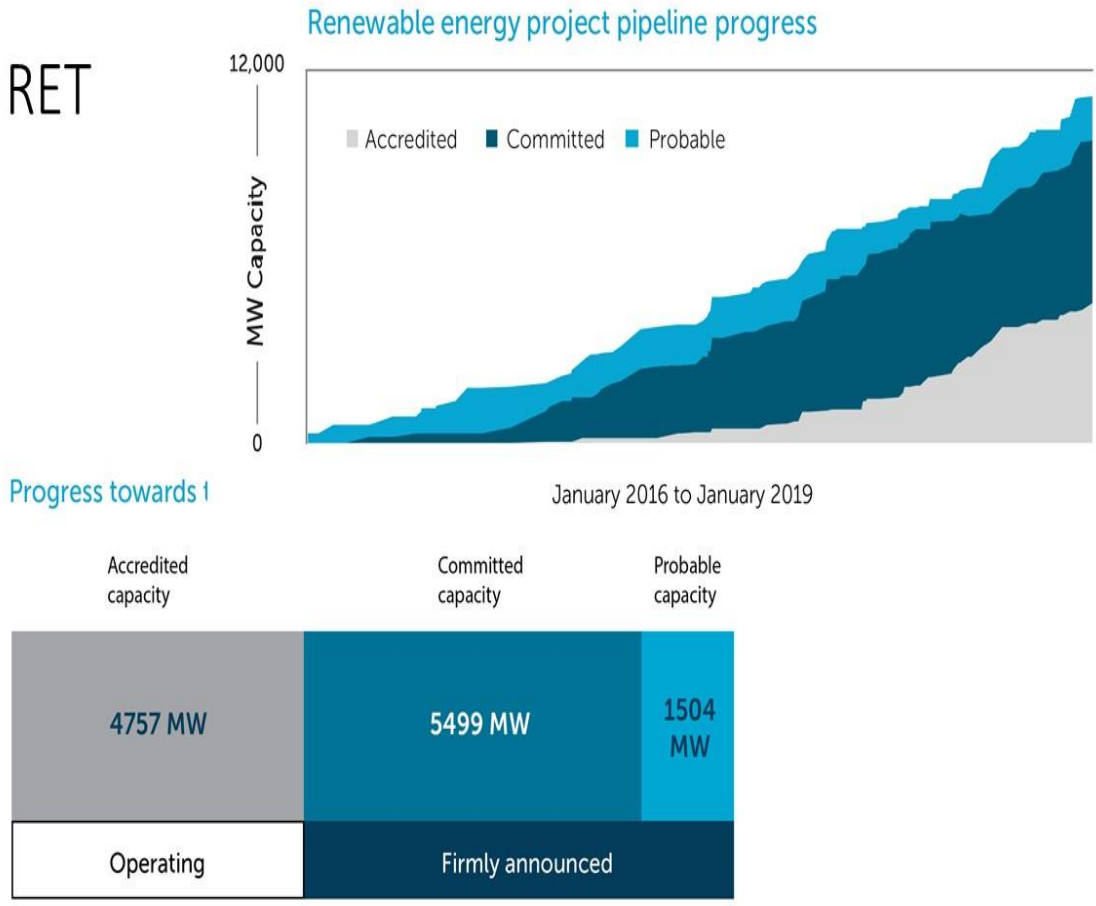


Figure 2 – Historical Levelised Cost of Energy for Australian large-scale solar

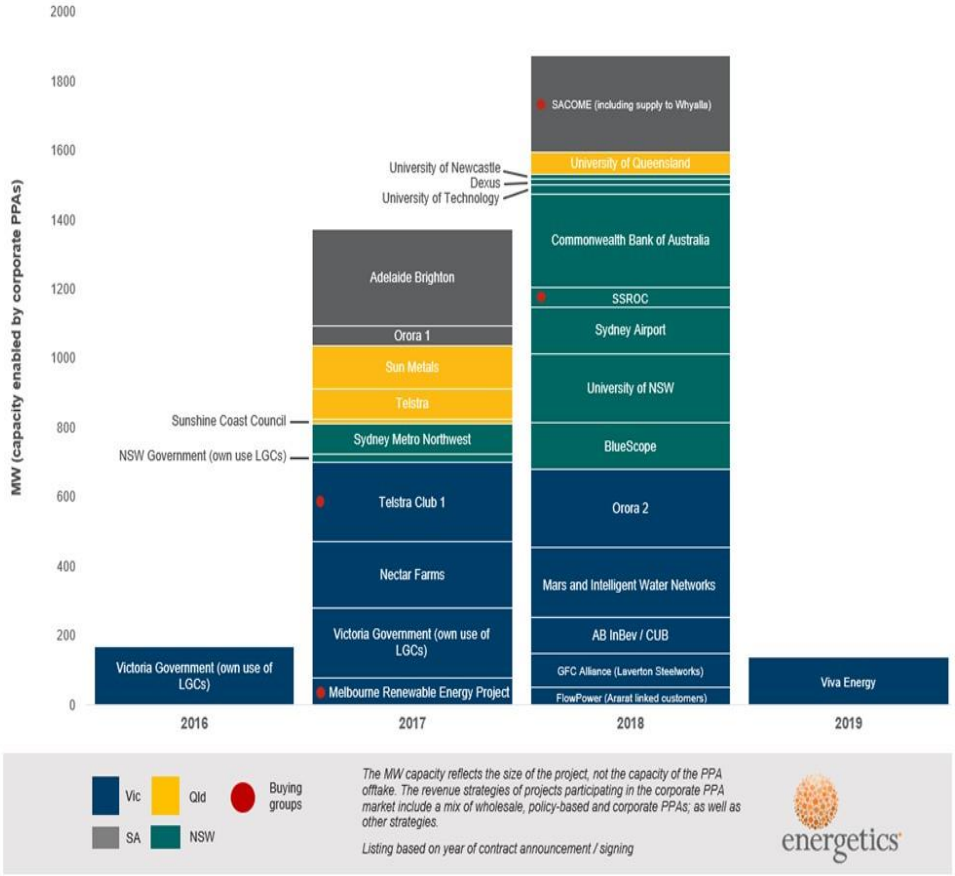
EY for Clean Energy regulator 2017

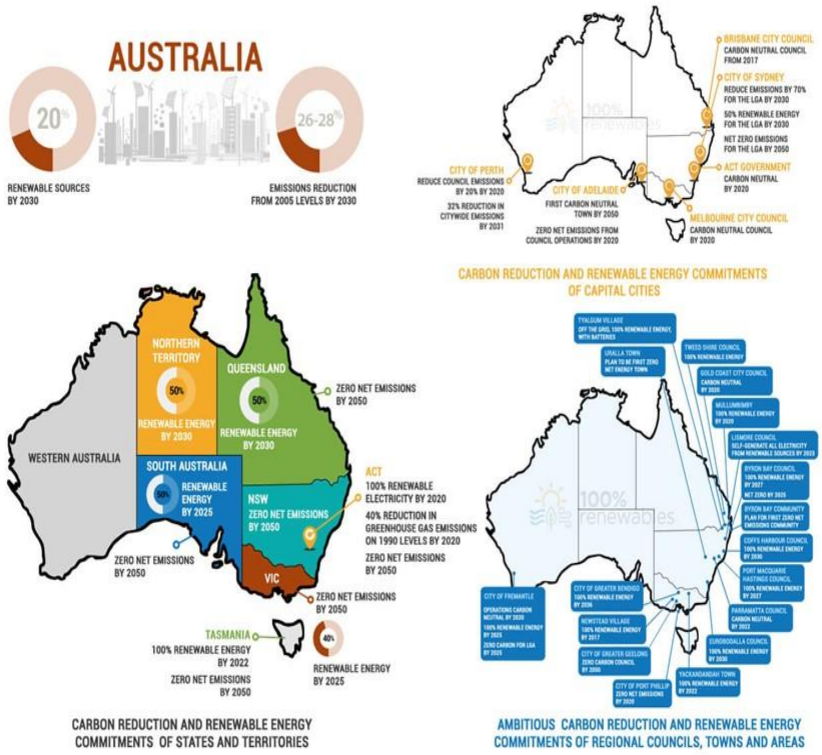




Auctions - Incentivising

Corporate PPAs





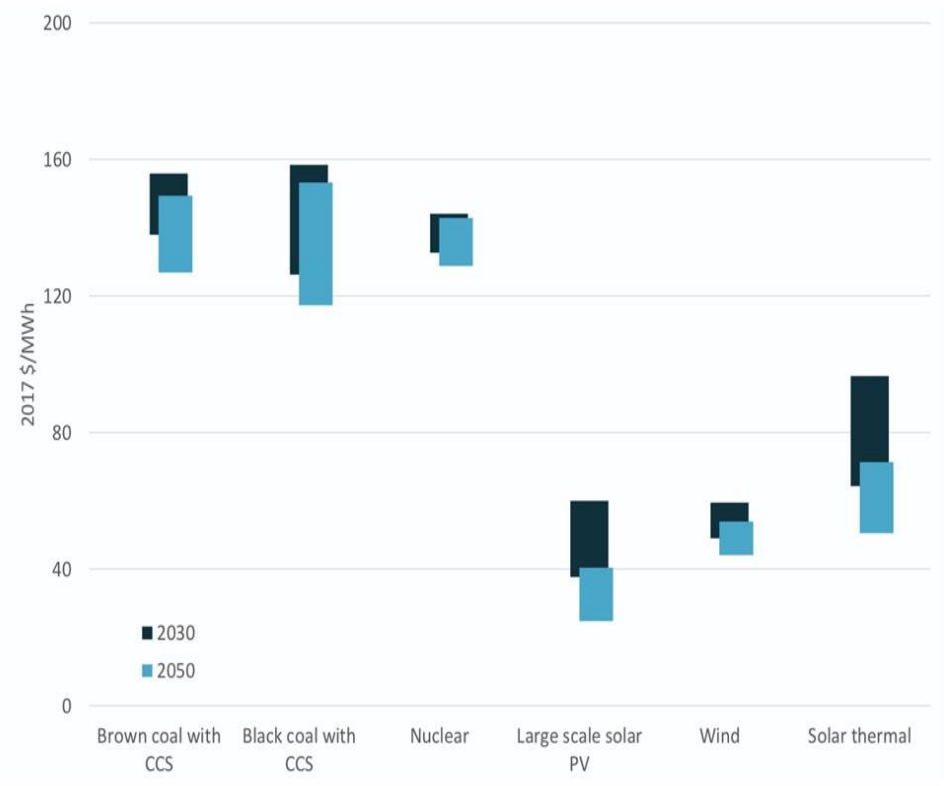
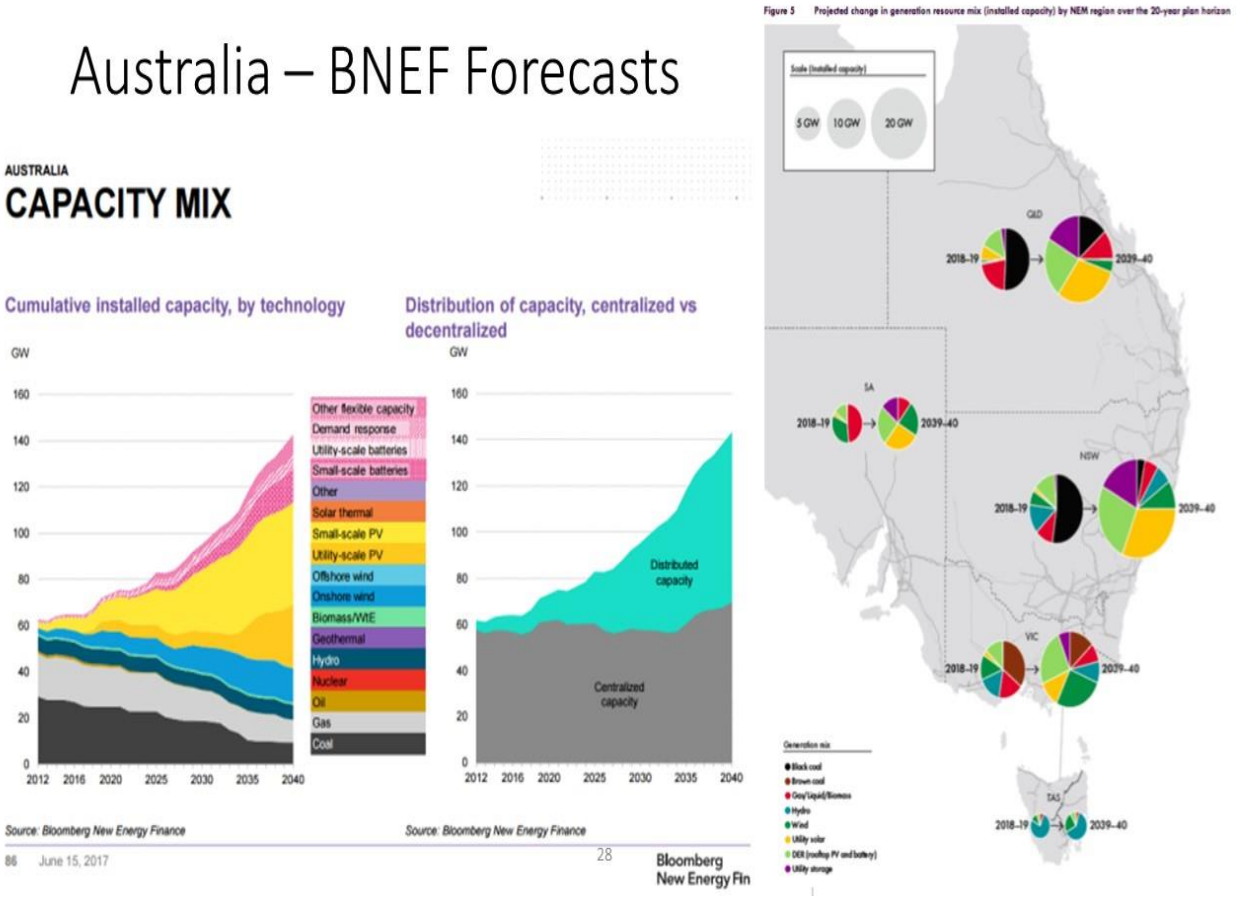


Figure 4-1: Conventional LCOE estimates for selected technologies



Presentation on "Sharing Australian Experiences in Solar PV Technology" by Demain Natakhan

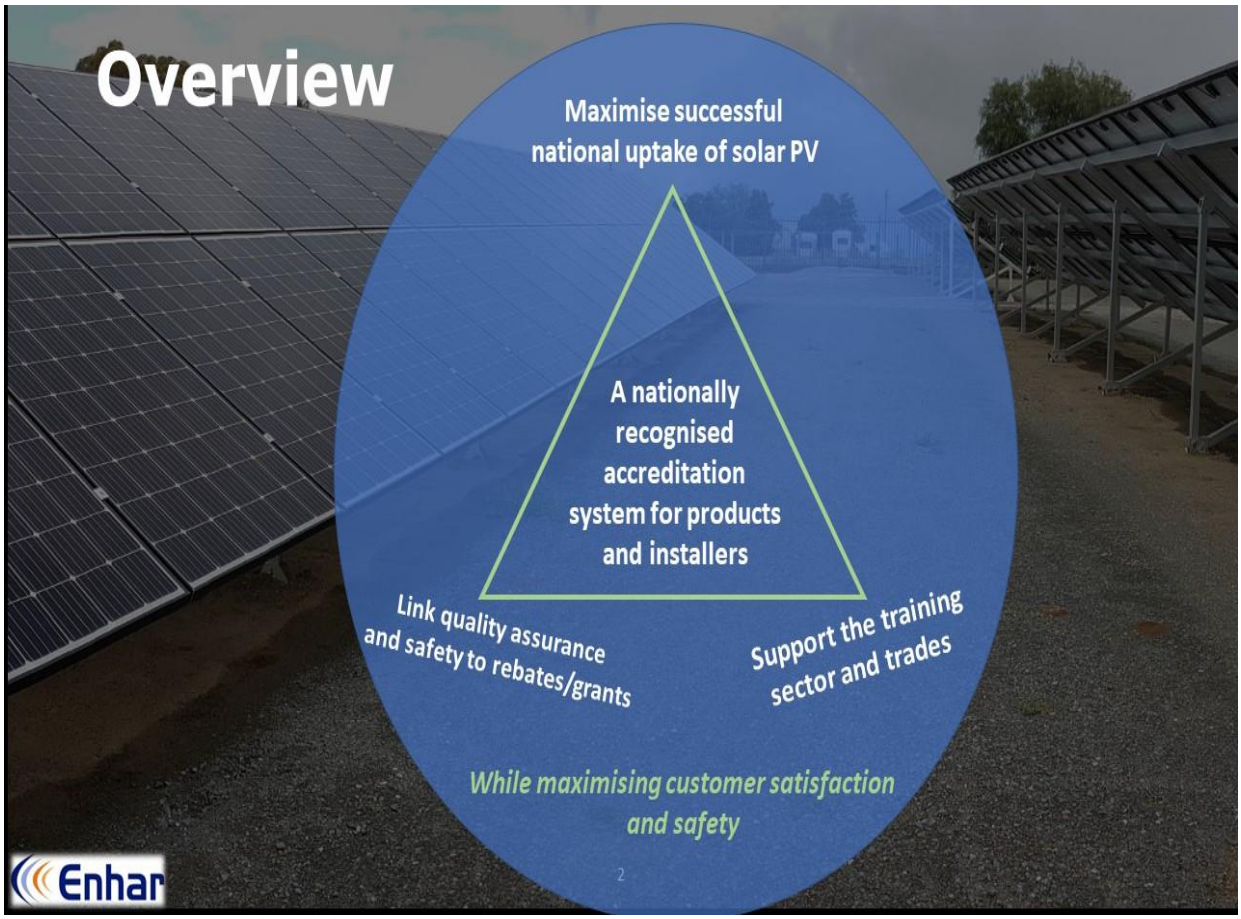
Enhar

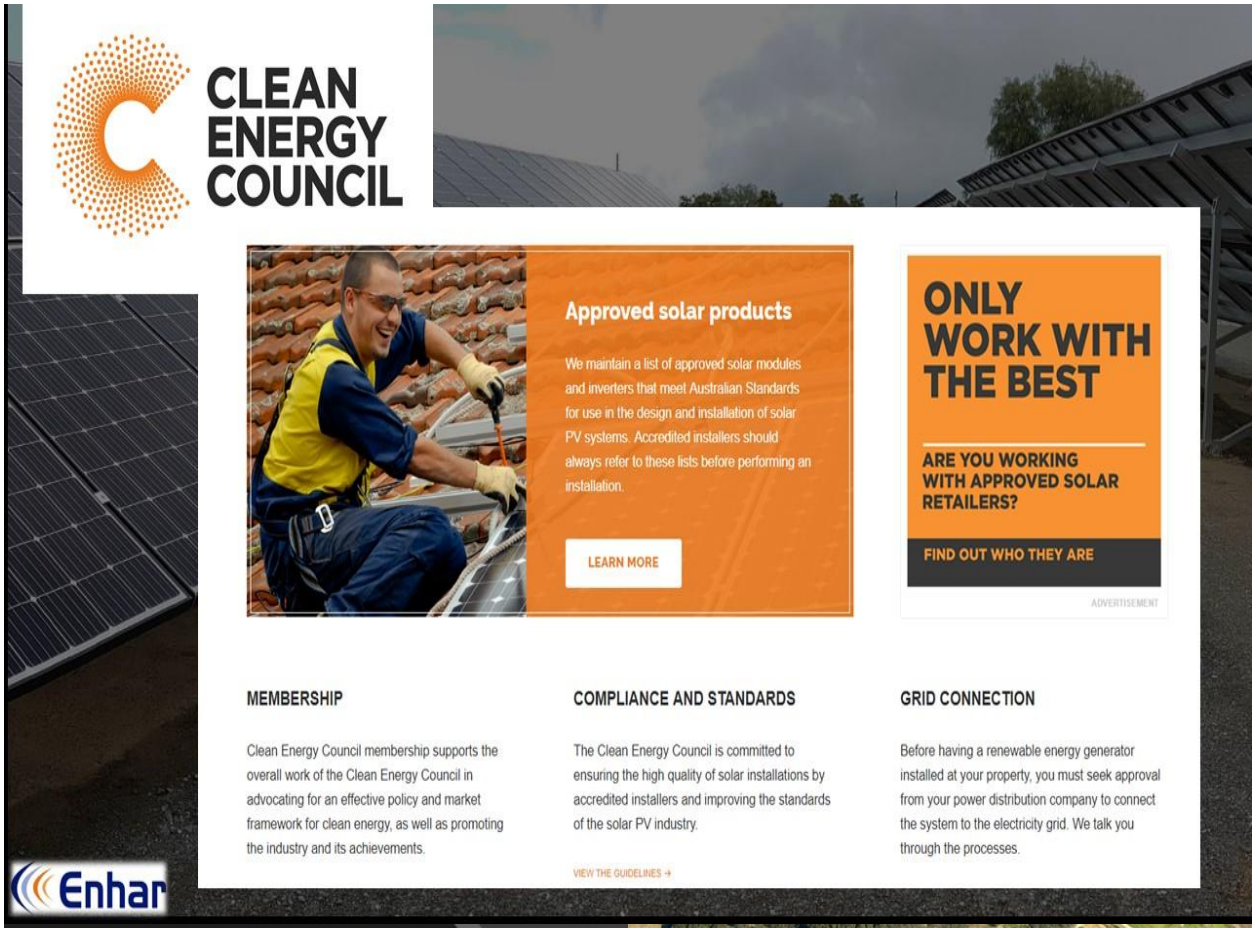
Enhar's own accreditations and memberships:

SMART ENERGY COUNCIL

SMALL BUSINESS MEMBER

CLEAN ENERGY COUNCIL MEMBER





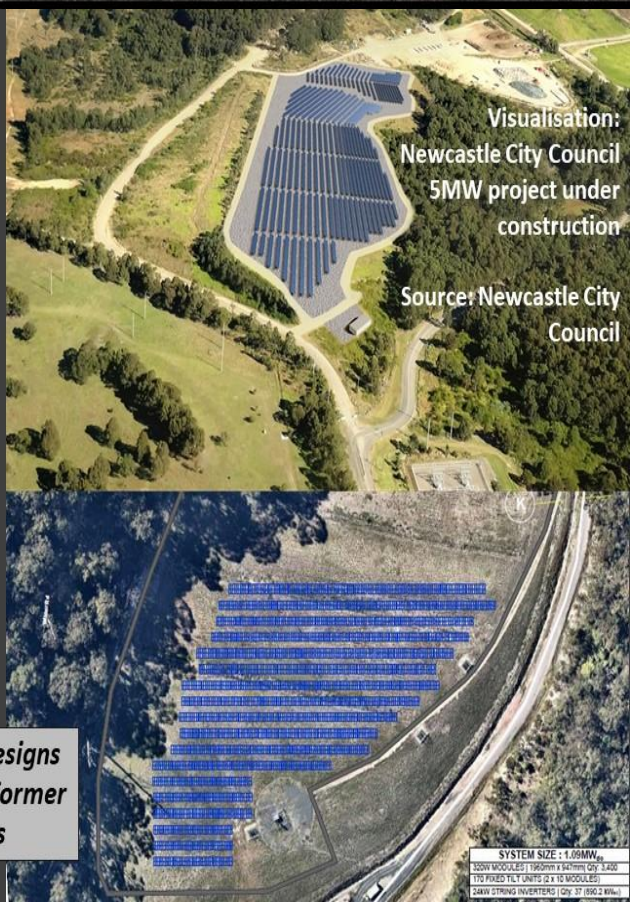
Some areas Enhar is working on:

Solar on former landfills

+ve Repurposing low value land

-ve Geotechnical challenges

Feasibility designs by Enhar on former landfills



Selecting the optimum array technology

Technologies include:

- North-facing fixed tilt
- Single axis trackers
- East-west fixed tilt
- PV geomembrane

Constraints include:

- Preservation of the cap's seal
- Differential settlement
- Landfill gas

Optimisation metrics include:

- Energy yield vs land area
- Lowest cost of energy
- Ease of maintenance

Images: Joule Energy

Images: Nextracker

Images: 5B

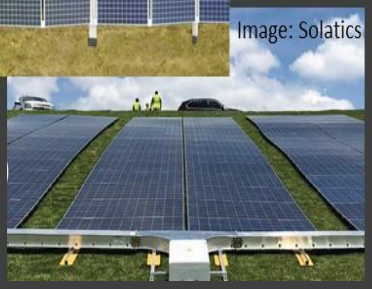


Image: Solatics

Thank you

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Photo: Enhar