

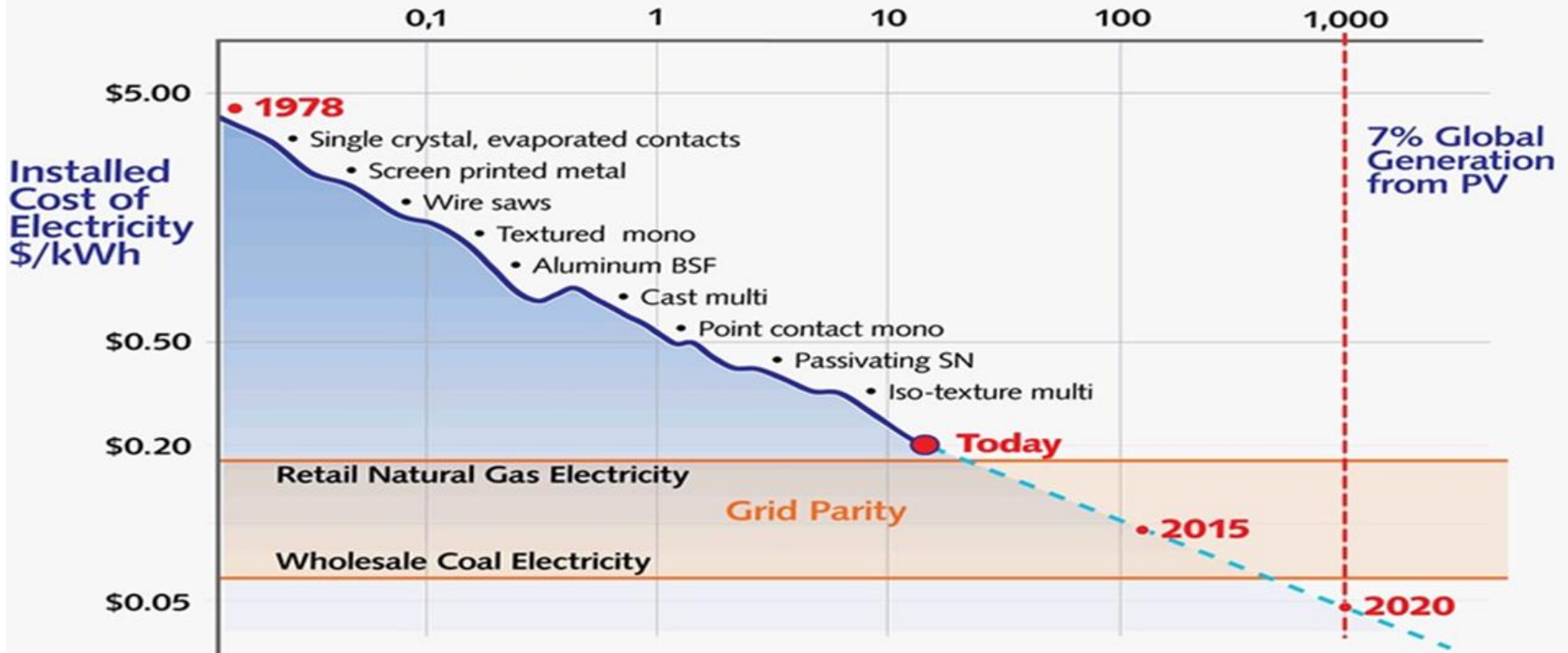


Associate Professor
Alistair Sproul
School of Photovoltaics &
Renewable Energy Engineering

Rooftop & Utility scale Photovoltaics

10th GRIHA Summit
Delhi, India, Dec 11 – 12, 2018

Cumulative production GigaWp

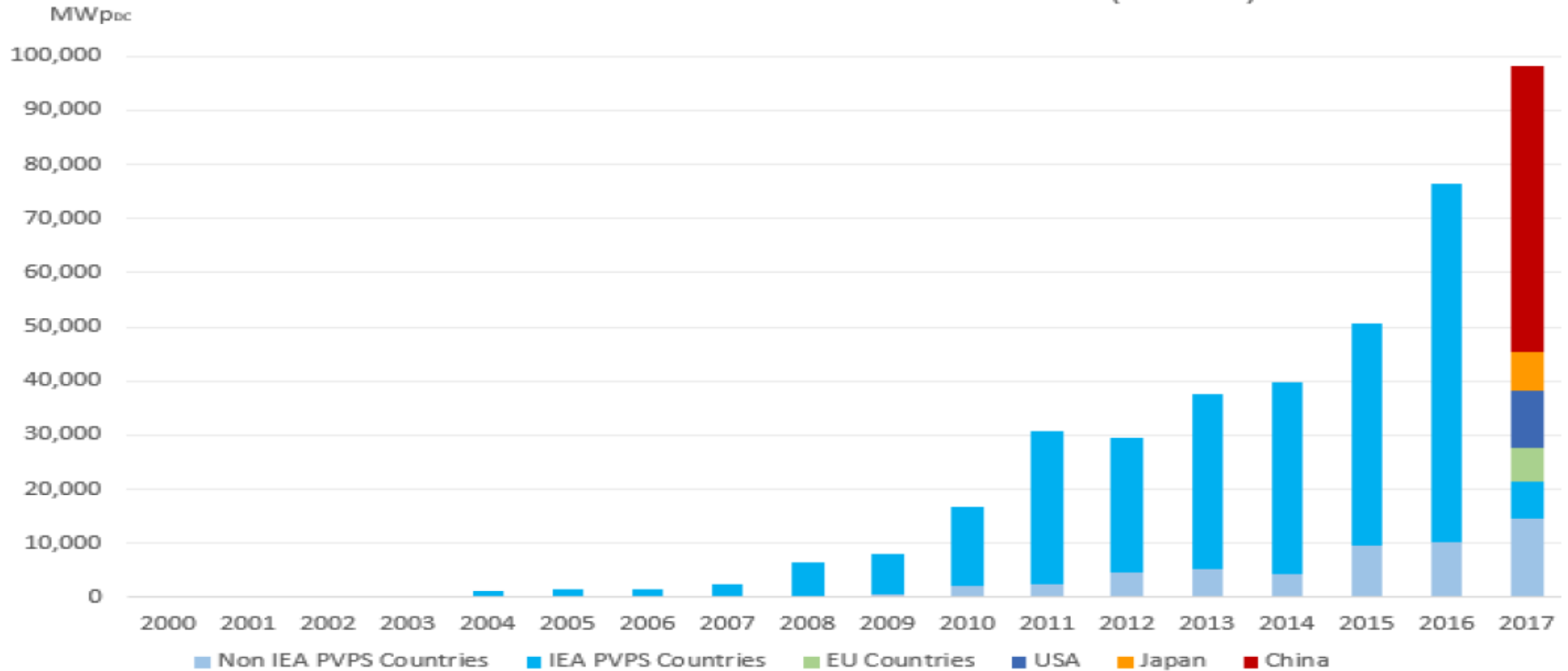


Source: Professor Emanuel Sachs, Massachusetts Institute of Technology.

* Assumes annual production growth of 35% and an 18% learning curve. PV costs based on 18% capacity factor and 7% discount rate.

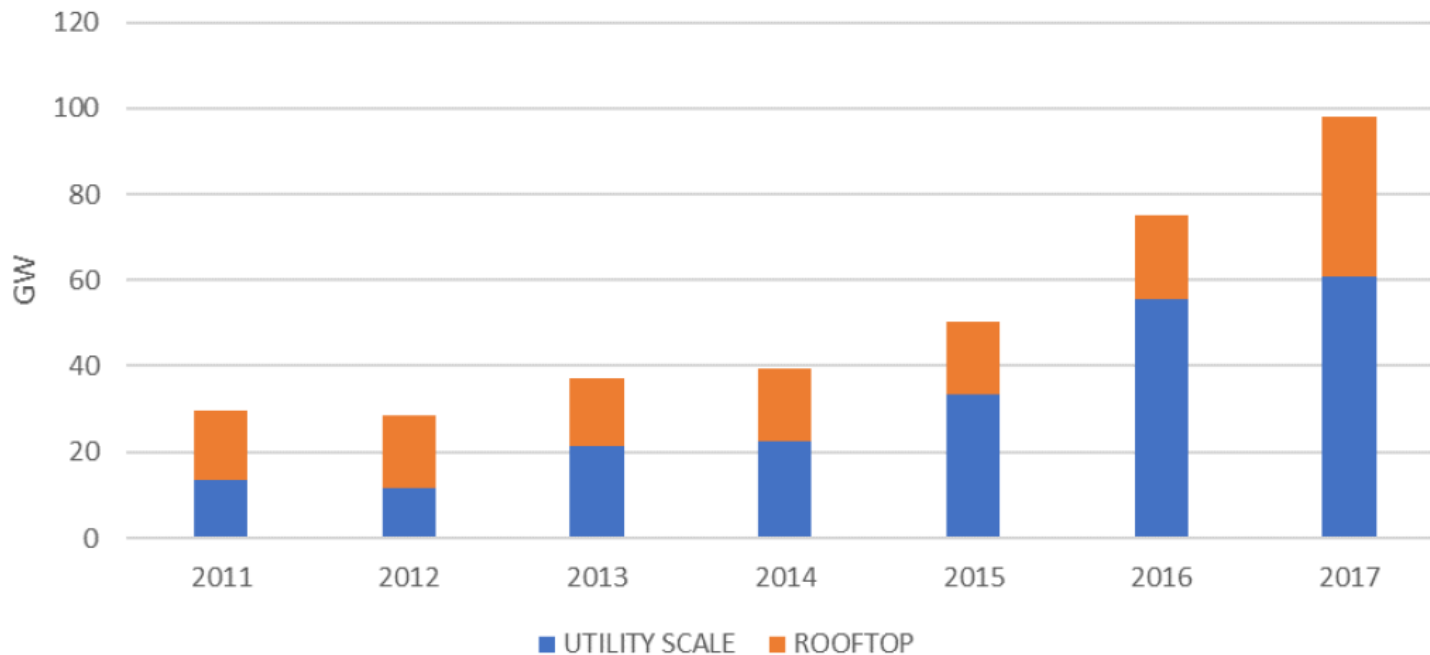
Global annual PV installations

FIGURE 1: EVOLUTION OF ANNUAL PV INSTALLATIONS (MW - DC)

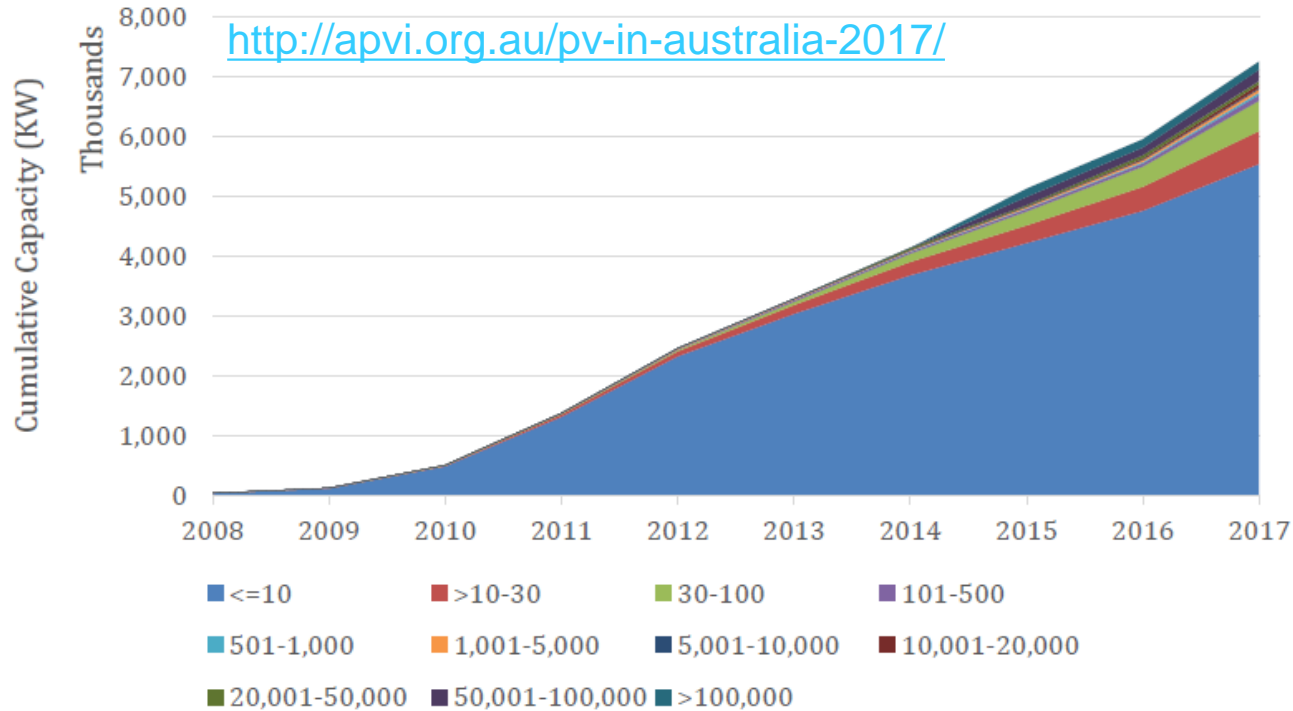


Global: Rooftop & Utility Scale PV

FIGURE 5: SEGMENTATION OF PV INSTALLATION 2011 - 2017



Cumulative installed PV capacity, Australia



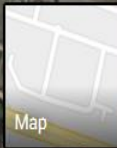
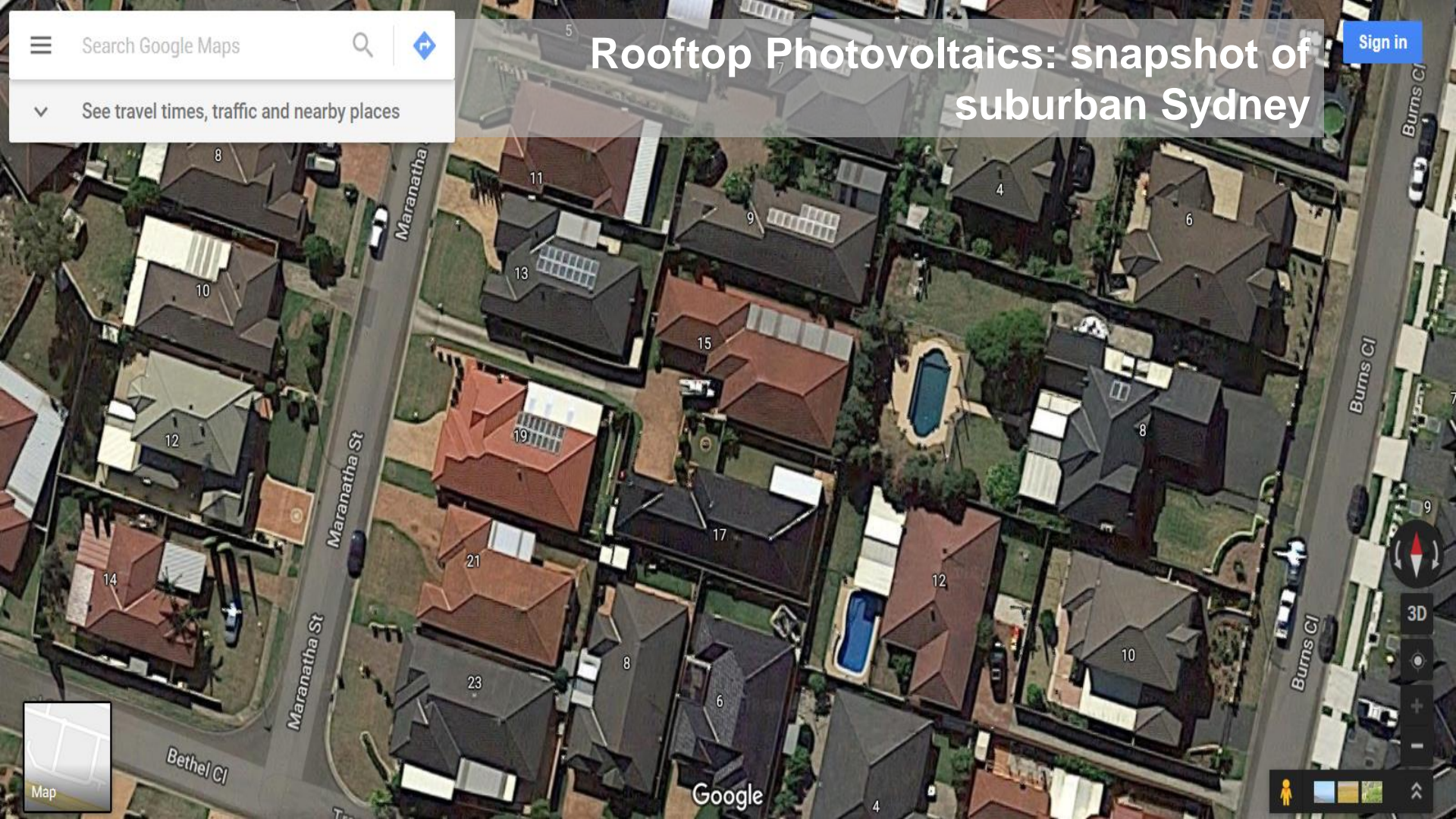
- Total installed PV in Australia end of 2017 over 7 GW peak.
- 2018 – utility scale installation greater than rooftop
- Headed for 10 GW for 2018 (~40% increase/year)

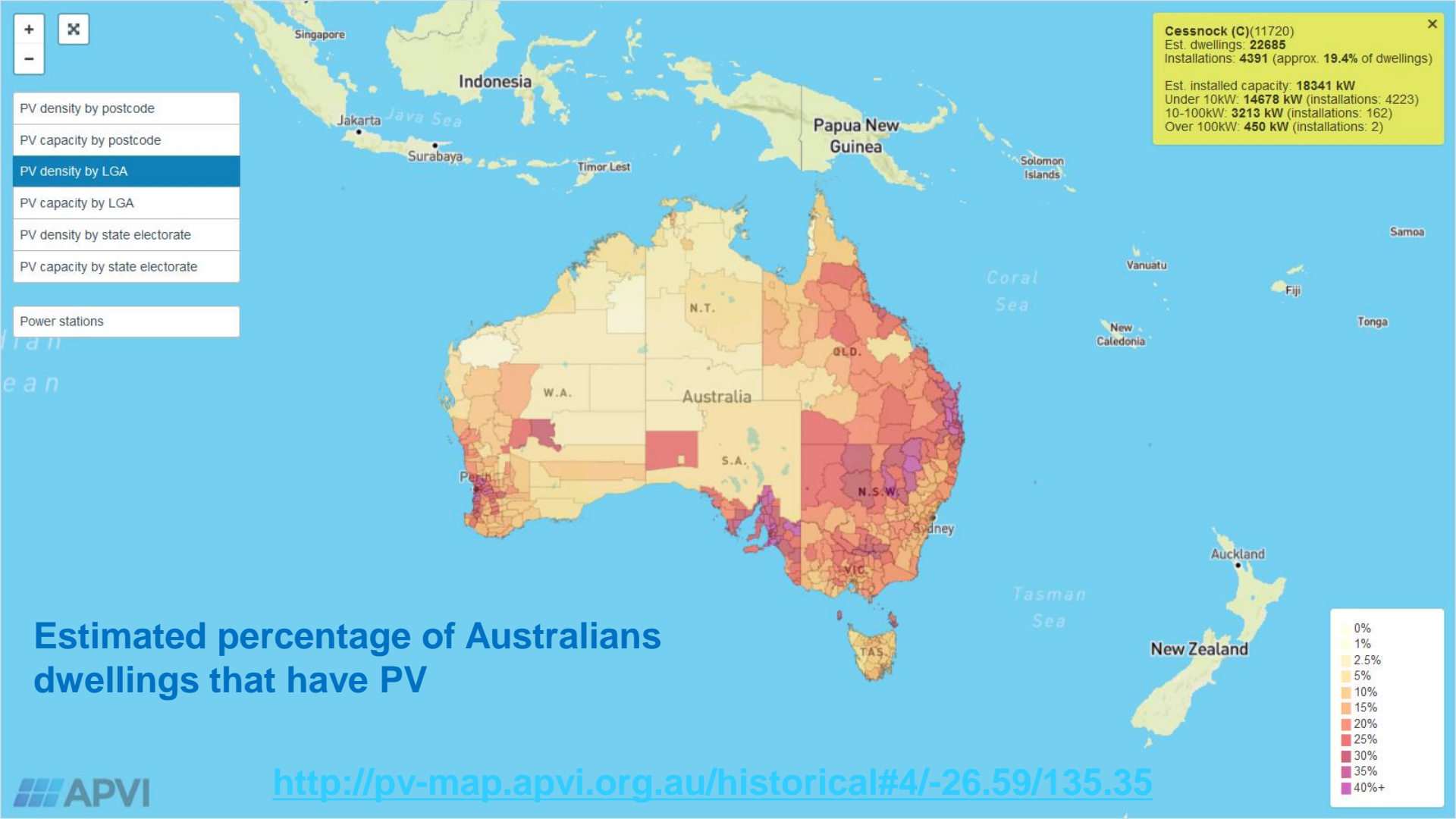
☰ Search Google Maps 🔍 📍

▾ See travel times, traffic and nearby places

Rooftop Photovoltaics: snapshot of suburban Sydney

Sign in





- 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

Cessnock (C)(11720) X

Est. dwellings: **22685**

Installations: **4391** (approx. **19.4%** of dwellings)

Est. installed capacity: **18341 kW**

Under 10kW: **14678 kW** (installations: 4223)

10-100kW: **3213 kW** (installations: 162)

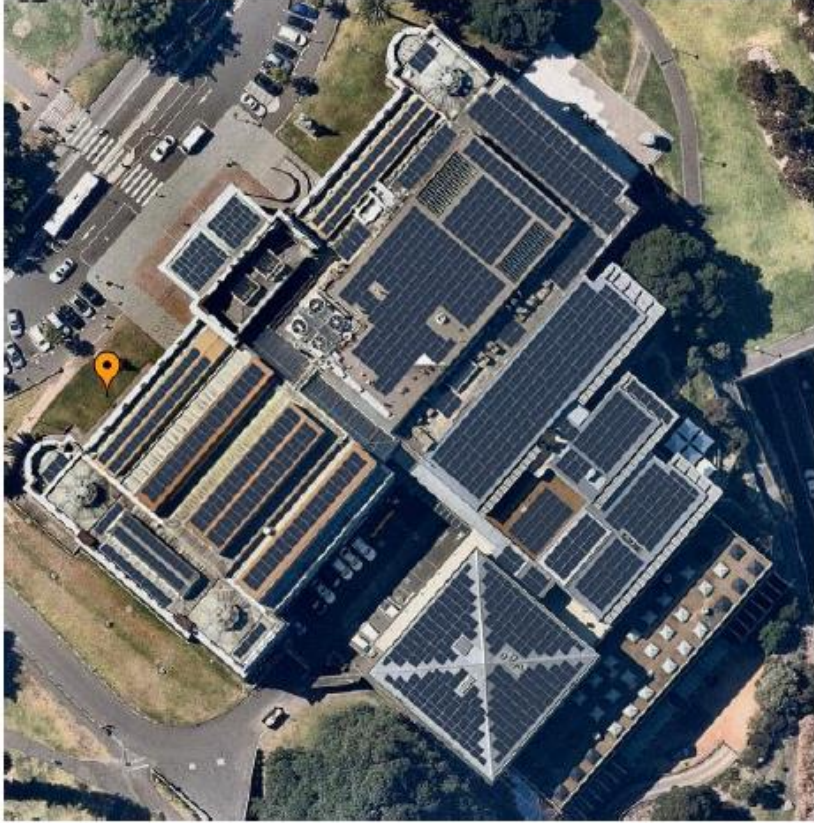
Over 100kW: **450 kW** (installations: 2)

Estimated percentage of Australians dwellings that have PV

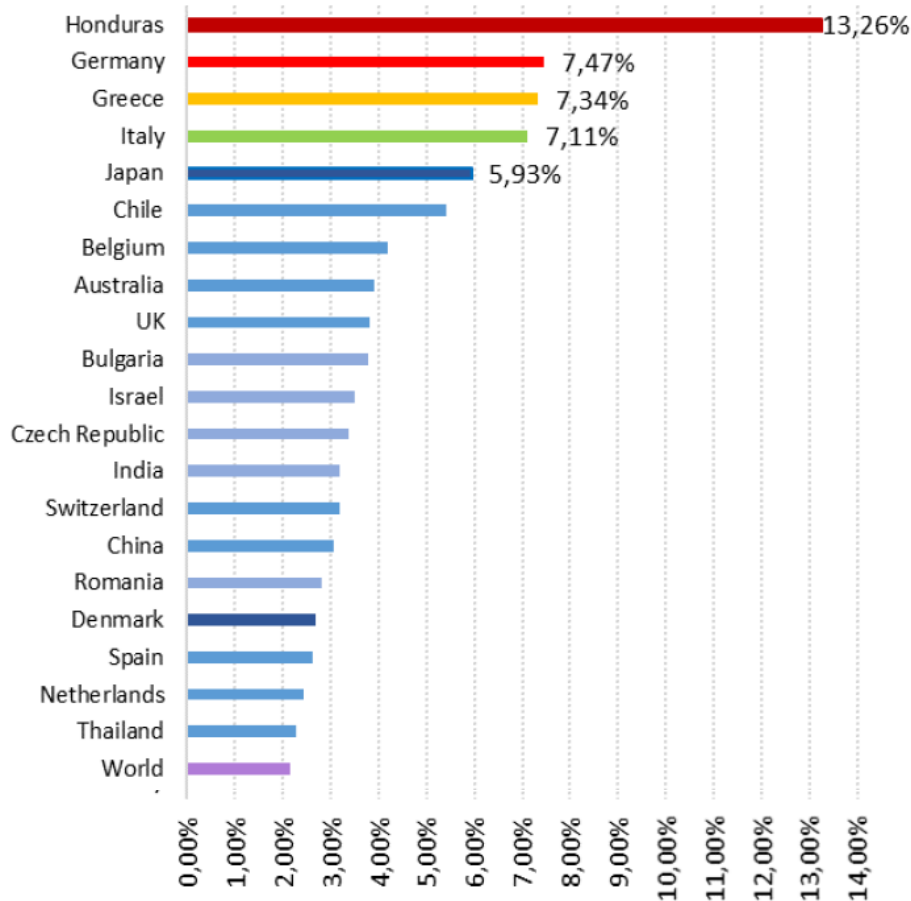
<http://pv-map.apvi.org.au/historical#4/-26.59/135.35>

0%
1%
2.5%
5%
10%
15%
20%
25%
30%
35%
40%+

PV potential rooftop installations: Sydney

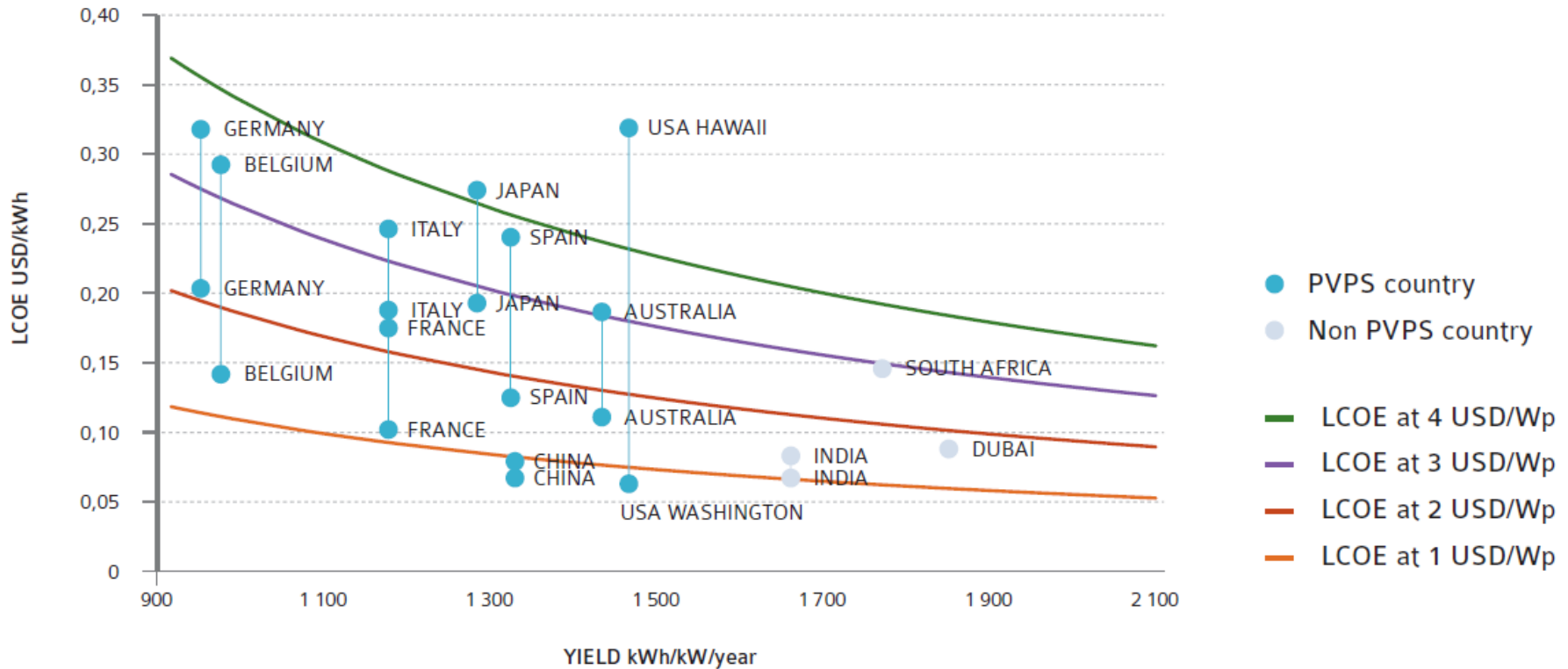


Estimate of total electricity demand met by PV generation by country for 2017



<http://www.iea-pvps.org/fileadmin/dam/public/report/statistics/IEA-PVPS - A Snapshot of Global PV - 1992-2017.pdf>

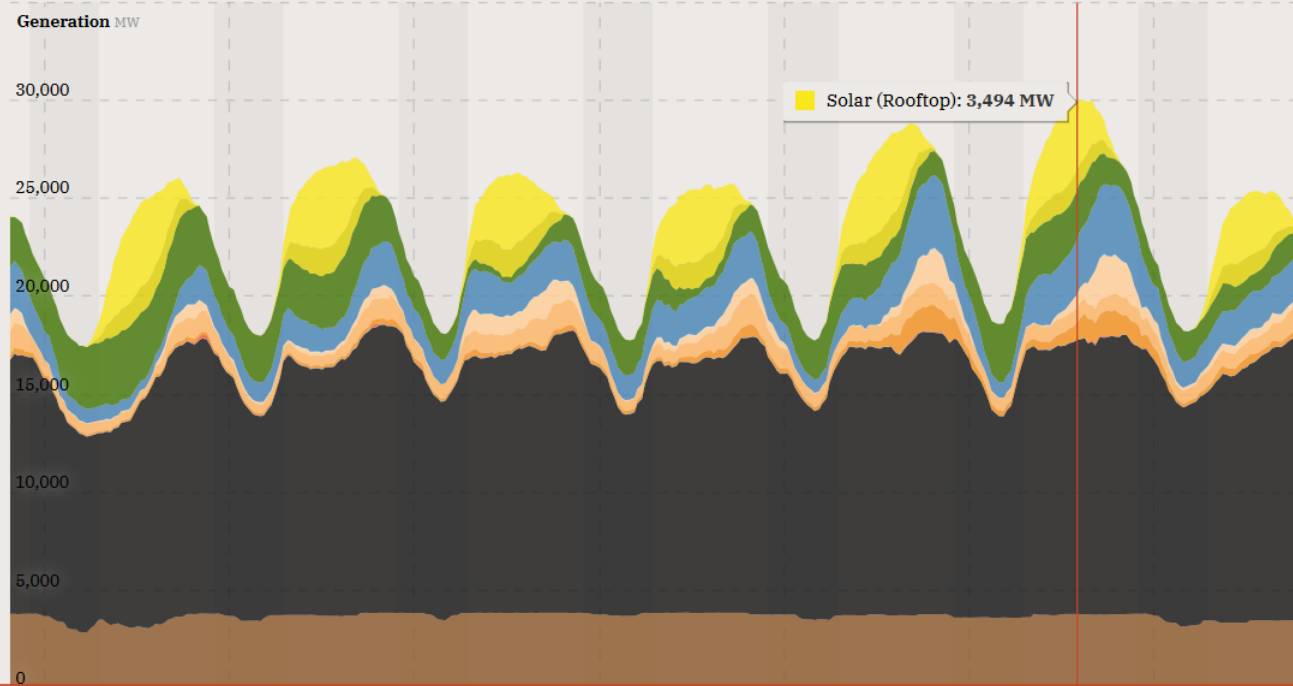
PV Levelized Cost of Electricity (LCOE)



Electricity mix, Australia: increasing PV, wind and hydro

All Regions ▼

7 Dec, 2:00pm



SUMMARY

Sources	Power MW	Contribution to generation
Sources	29,976	
Solar (Rooftop)	3,494	11.7%
Solar (Utility)	1,020	3.4%
Wind	2,540	8.5%
Hydro	2,803	9.3%
Battery (Discharging)	0	0.00%
Gas (Reciprocating)	33	0.1%
Gas (OCGT)	637	2.1%
Gas (CCGT)	788	2.6%
Gas (Steam)	853	2.8%
Distillate	0.06	0.00%
Biomass	27	0.09%
Black Coal	13,993	46.7%
Brown Coal	3,787	12.6%

Sources: AEMO, BoM

Loads

TYREE Energy technology building, UNSW

150 kW PV 6 star efficient building



UNSW to go 100% off-site solar

In the first deal of its kind in the world university sector, UNSW has reached an agreement with Maoneng Australia and Origin Energy to have 100% of its electricity supplied by photovoltaic solar energy by 2019.



Sunraysia solar farm will be built by Maoneng near Balranald – western NSW.

UNSW power purchase arrangement.

- **100% solar – price is lower than standard “black” electricity (coal, gas).**
- **No subsidies**

<http://sunraysiasolarfarm.com.au/>

Artist's impression of 200 MW_{AC} Sunraysia Solar Farm

The future is very close: solar roof, batteries, efficient buildings + EV



<https://www.wired.com/2016/10/tesla-unveils-new-line-camouflaged-solar-panels/>

Conclusions

- Photovoltaics is growing fast (~40% per annum **cumulatively**).
- Rooftop photovoltaics together with utility scale photovoltaics is now cost competitive with fossil fueled electricity in many parts of the world.
- A major transition away from coal, gas and oil is now well and truly underway
- Countries with greater sunshine have a natural advantage and PV electricity is **still** getting cheaper.
- PV as an industry can deliver power from Watts to TeraWatts – homes, villages, cities and nations.
- PV and other renewables **at scale** will aid humanity in moving towards developing sustainable habitats now and for future generations.