



Global PV Markets Perspectives

Lionel Perret, Task 1 Swiss representative, Planair SA

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Technology Collaboration Programme
by IEA

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What is IEA PVPS?



- The International Energy Agency (IEA), founded in 1974, is an autonomous body within the framework of the Organization for Economic Cooperation and Development (OECD).
- The Technology Collaboration Programme was created with a belief that the future of energy security and sustainability starts with global collaboration. The programme is made up of thousands of experts across government, academia, and industry dedicated to advancing common research and the application of specific energy technologies.
- The IEA Photovoltaic Power Systems Programme (PVPS) is one of the Technology Collaboration Programme established within the International Energy Agency in 1993
- 32 members - 27 countries, European Commission, 4 associations
- *"To enhance the international collaborative efforts which facilitate the role of photovoltaic solar energy as a cornerstone in the transition to sustainable energy systems"*

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10 years challenge: towards the TW-scale



The fast development of the PV market happened in only one single decade, with larger and more efficient plants developed on all continents. Task 1 studies how PV can contribute to mitigating climate change, how the market is developing, what are the best policies and how to develop the industry.

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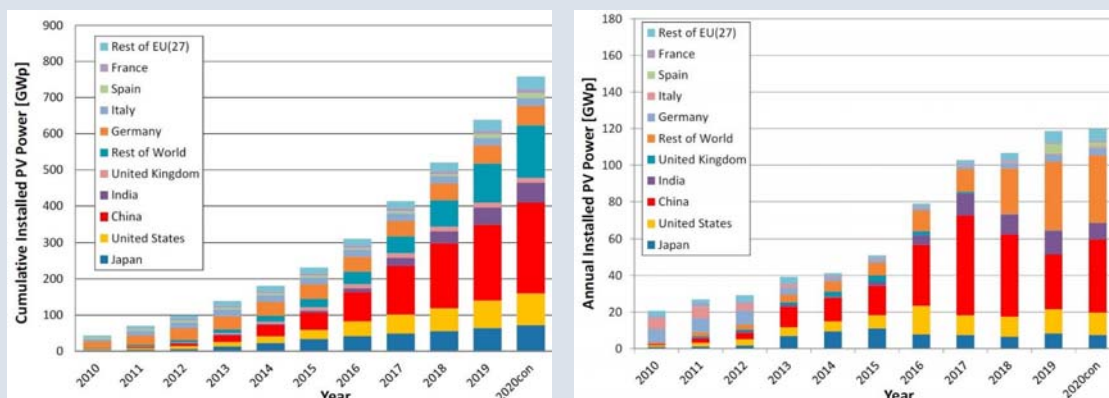
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At least 635 GW at the end of 2019



- 635 GW cumulative installed capacity in 2019
- 3 consecutive years of more than 100 GW added per year.
- Still heavily concentrated in 10 countries, including the largest economies and largest populations: China, USA, India, European Union, Japan, etc.



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Some (good) numbers



100 GW added means...

- 300.000.000 panels installed
- 20.000.000 installations of 5 kWp
- One sixth of all PV installations ever
- Today we will install roughly 1 million PV panels in the world.
- 42000 panels every hour
- 10500 panels during this speech (3.5 MW)

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Some (bad) numbers



But 100 GW added also means...

- 14 Wp added per human being while we need around 10 kWp
- Less than 3% of the electricity consumption
- Less than 1% of the energy consumption
- And huge discrepancies between countries

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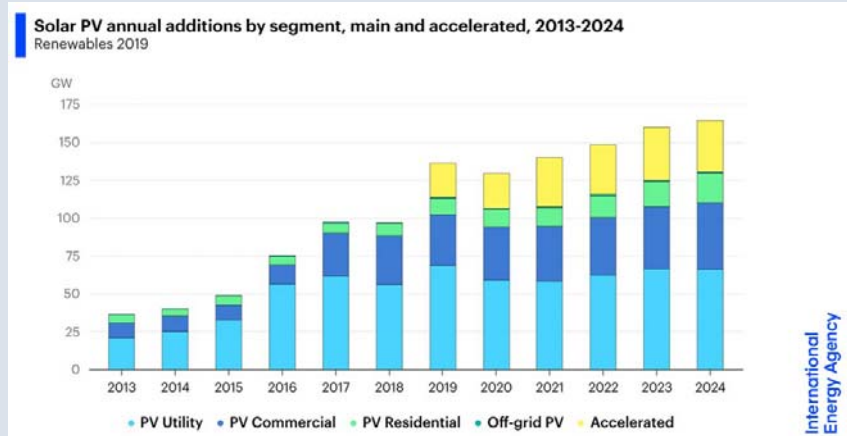
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Utility-scale dominates but distributed grows



- Market segmentation has been dominated by utility-scale PV plants in the last 6 years, with a change coming from China since 2017 and 2018.
- Floating ~ 1 GW p.a
- BIPV < 1 GW p.a
- AgriPV is new and growing slow
- VIPV is still in its infancy
- Distributed PV welcomes self-consumption business models.



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Most competitive PV installations



- Utility-scale PV is super competitive with prices below 0,02 USD/Wp
- Continuous decrease of winning bids
- Merchant PV is gaining Momentum

TABLE 3.1 LOWEST WINNING BIDS IN PV TENDERS FOR UTILITY SCALE PV SYSTEM IN 2018 AND Q3 2019

LATIN AMERICA	Brazil	17,52	USD/MWh
EUROPE	Portugal	17,17	USD/MWh
AFRICA	Tunisia	24,40	USD/MWh
MIDDLE EAST	Jordan	24,80	USD/MWh
ASIA	India	35,00	USD/MWh
LATIN AMERICA	Brazil	35,58	USD/MWh
ASIA	India	36,00	USD/MWh
ASIA	India	36,00	USD/MWh
MIDDLE EAST	Armenia	46,00	USD/MWh
WESTERN EUROPE	Germany	48,63	USD/MWh
AFRICA	Senegal	48,87	USD/MWh

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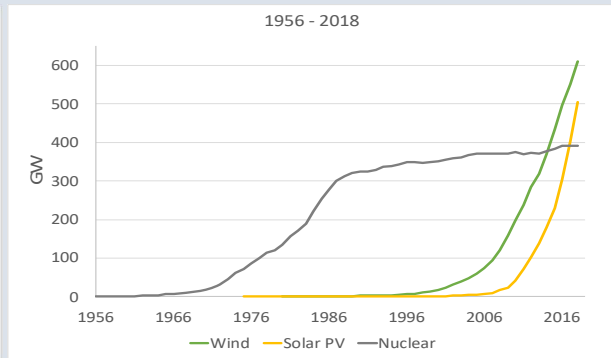
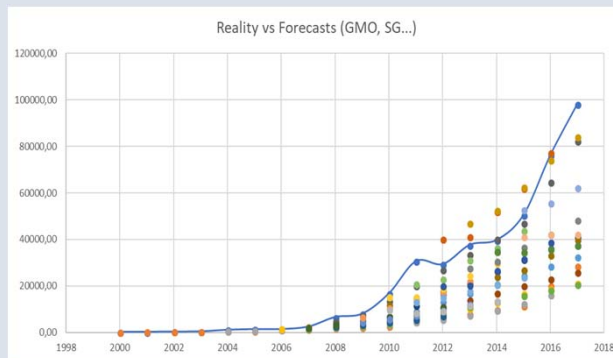
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Trend to underestimate PV deployment



- Even the most optimistic forecast have underestimate the last years role of PV
- PV and Wind on track to change energy systems



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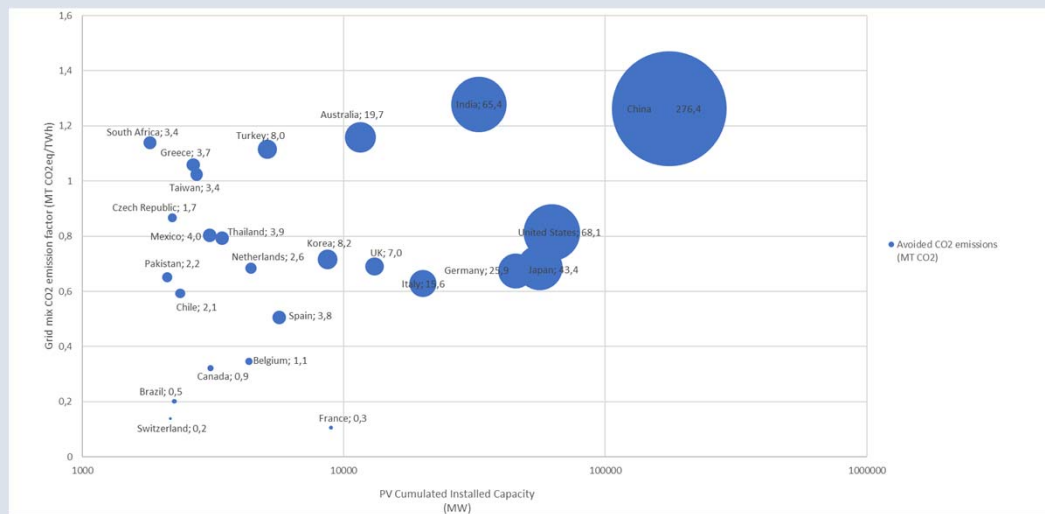
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CO2 savings from PV



- More than 500 MT a year.



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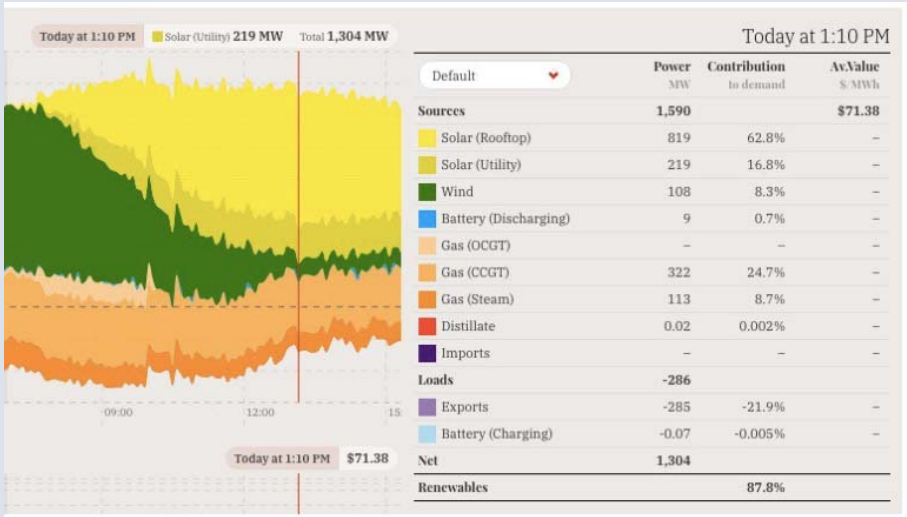
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Australian Case :



Solar reaches 80 % share of demand in South Australia on Saturday (12/10/19)

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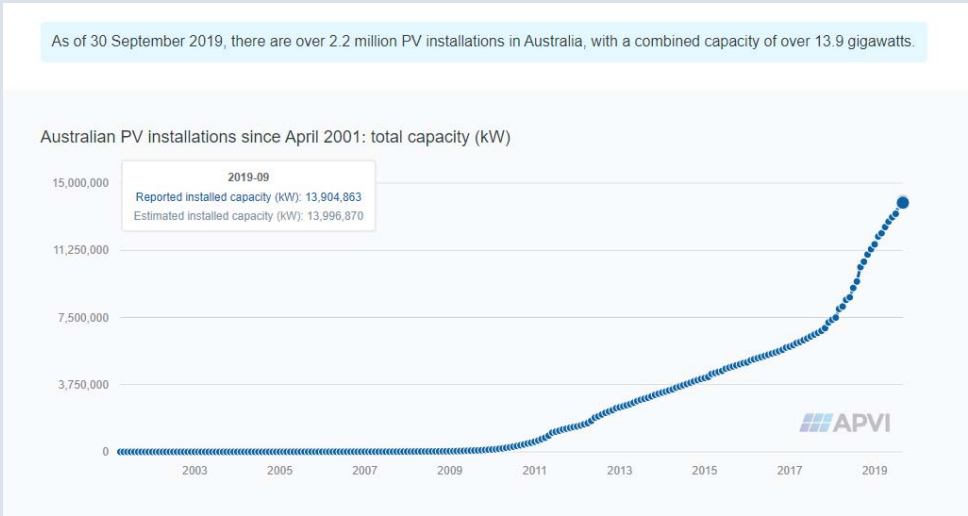
Australian Case :



Total installed capacity > 13GW

As of 30 September 2019, there are over 2.2 million PV installations in Australia, with a combined capacity of over 13.9 gigawatts.

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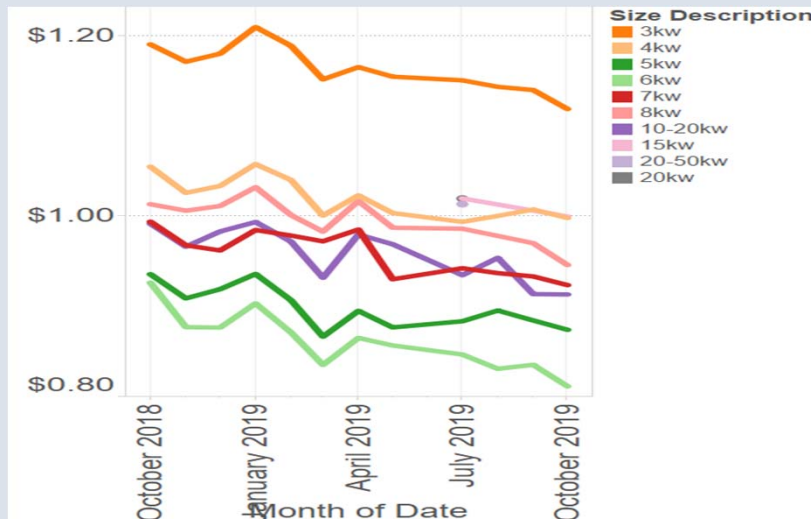
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Australian case :



6kW plants are the cheapest !

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Korean case :



2-3 GWp market mainly driven by obligatory renewable supply ratio

- Multiplier for each installation type depending on priorities
- Potential high penalties
- New Target in discussion

Annual RPS Target

Obligatory renewable service supply ratio (Additional table no.3 of Enforcement Ordinance of the Act on the Promotion of the Deployment, Use and Diffusion of New and Renewable Energy)

Year	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21	'22~
Ratio(%)	2.0	2.5	3.0	3.2	4.0	5.0	6.0	7.0	8.0	9.0	10

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Multipli er	Eligible Energy Sources	
	Installation Type	Detail
1.2	On Land (General)	Less than 100 kW
1.0		100 kW ~ 3,000 kW
0.7		Larger than 3,000 kW
0.7	On Forest & Field	Regardless of capacities
1.5	On Building & Existing Facilities	Less than or equal to 3,000 kW
1.0		Larger than 3,000 kW
1.5	Floating on the Water Surface	
1.0	Self-use PV Electricity Transaction	
5.0	PV+ESS	2018, 2019
4.0		2020

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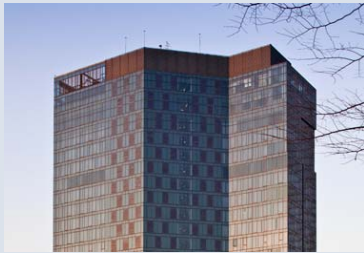
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A few emblematic installations



BIPV - Building Integrated Photovoltaics

Best Western Songdo Park Hotel



Terminal 2, Incheon Airport



Songdo Global Univ. Campus



City Hall (New Office), Seoul



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A few emblematic installations



Agri PV development in Korea and Japan

- Special foundation system for watery soft ground is used
- The column spacing was designed to fit the size of the agricultural tractors.
- Korean goal : 2,2, GWp in 2022 and 10 GWp in 2030

Akita
pref.



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Toyota city,
Aichi pref.



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A few emblematic installations



Mini-PV for Energy-vulnerable Citizens – Seoul

- Large social PV program also in China



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A few emblematic installations



Floating PV

- Potential : 9.7 GW in South Korea
- Most competitive PV in Malaysia



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A few emblematic installations



Saemangeum Reclaimed Area Project

- Application types :
- PV & Floating PV : 2.8 GW
- Off-shore Wind : 1.0 GW
- Fuel Cell : 200 MW



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A few emblematic installations



Kubuqi Desert (China)

Application type: Desert

- 1 GW project being built
- Greening and sand fixation project
- 1 million m²
- Different types of modules and trackers
- 3'000 labor workers



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A few emblematic installations



Zhangjiakou City (China)

- Application type: high and hilly lands
- Built for the Olympic Winter Games organized in Zhangjiakou City in 2022
- Capacity : 875 MW
- Altitude between 1000 and 2000 m



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A few emblematic installations



Cixi Intertidal Project (China)

- Application type: intertidal
- First large-scale intertidal PV power plant built in China
- Capacity : 220MW



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A few emblematic installations



Jianglang Mountain (China)

- Application type: Forest, Agriculture
- Investment : 2 billion RMB (270 million CHF)
- Capacity : 200MW
- Combines the industrial, agricultural and service industries
- 2.7 million m2 of herbal medicine, vegetables, kiwifruits, tea and crops



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A few emblematic installations



Tennant Creek (Australia)

- 10 GWp solar farm and a potential 20-30GWh storage facility near
- Preassembled system
- High voltage direct current transmission to Singapore
- Will supply 1/5th of Singapore's elec supply



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Lionel Perret, Task 1 Swiss representative, Planair SA

Lionel.perret@planair.ch



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