Global PV market and Industry Status

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BECQUEREL INSTITUTE - BRUSSELS

- Research oriented Institute and consulting company for Solar Technologies.
- Global PV Market Analysis including competitiveness and economics.
- Industry analysis together with quality & reliability.
- Support for PV development
- Integration into electricity systems (grids and markets).

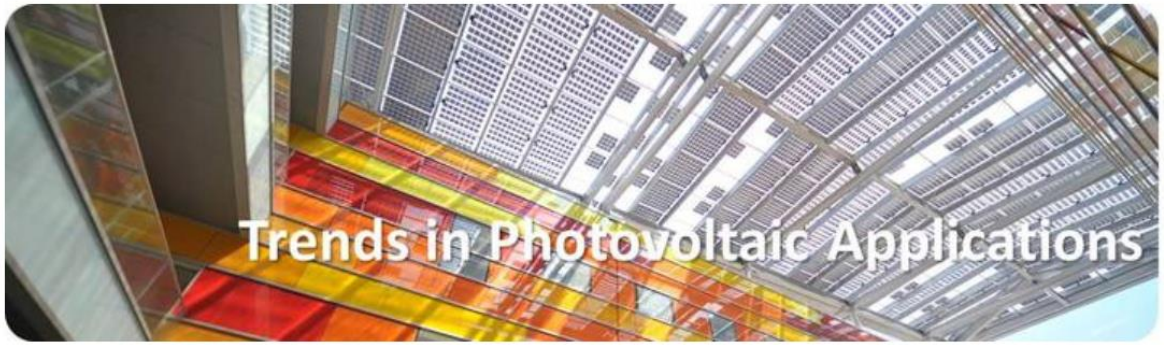
- In-house experts / Global network of experts and stakeholders
- PV Market Alliance partner

IEA PVPS TRENDS REPORT

WHO WE ARE | NEWS | EVENTS | LATEST PUBLICATIONS | KEY TOPICS | TASKS | INTRANET

T1 | T2 | T3 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 | T13 | T14 | T15 | T16

| Review and Analysis Of PV Self-consumption Policies **Trends** | Snapshot | Contacts Task 1



22nd Edition - 2017

2016 was a record year which saw the PV market jumping to 76 GW for the very first time. It has confirmed the global PV markets trends and the consolidated market development observed since 2013. The rise of PV markets in Asia and Americas has been confirmed, with China installing more than 34,55 GW alone. Overall, more than 65 GW of PV were installed in the IEA PVPS member countries during 2016, whereas the global PV market is estimated to stand just below 76 GW. The global installed total PV capacity is estimated at roughly 303 GW at the end of 2016 and will have reached close to 400 GW at the end of 2017.

PV modules and system prices have seen again a significant decline, pushed by industry overcapacities but also extremely competitive tenders on all continents. On the industry supply side, production increased again whereas competition remains high. Policy support continues to be relevant but is quickly moving towards new more market-oriented business models, even if feed-in tariffs and similar financial incentives remain the main driving force.

In many regions of the world, PV is becoming the cheapest option for electricity generation from not only new renewable energy

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Download the

2017 Edition

2017 Executive Summary

Tables and Figures (PPT)

Figures in a PPT

Tables and Annexes in a PPT

Previous Editions

2016 Edition (1992-2015)

2015 Edition (1992-2014)

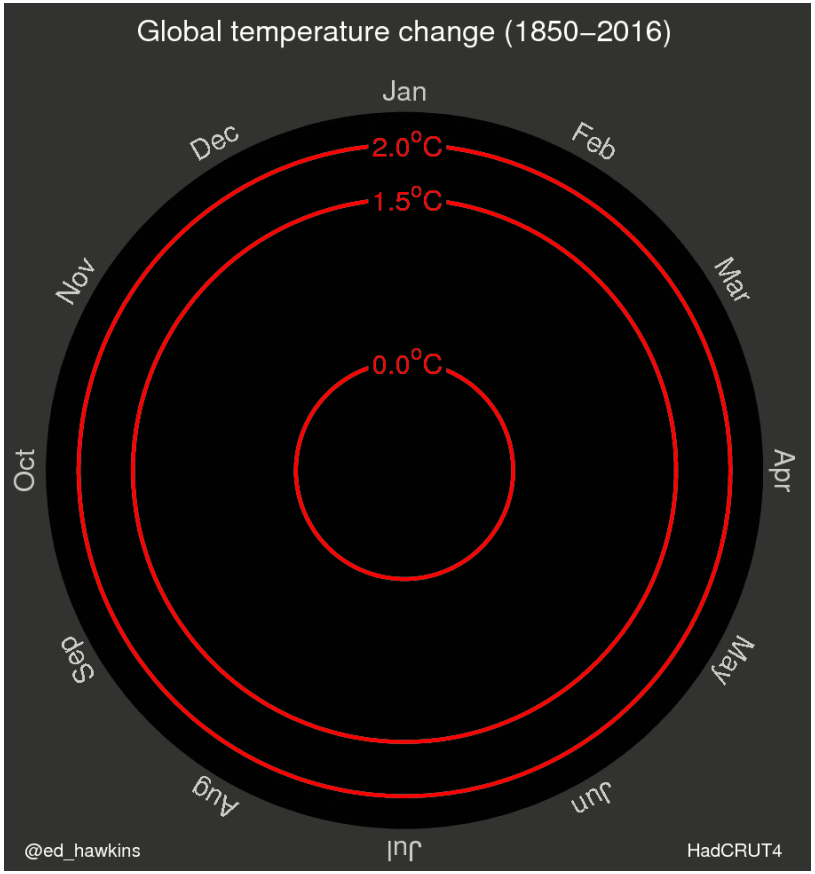
2015 Executive Summary

2014 Edition (1992-2013)

CIVILIZATIONS & ENVIRONMENT

FINEST ACHIEVEMENTS OF CIVILIZATION

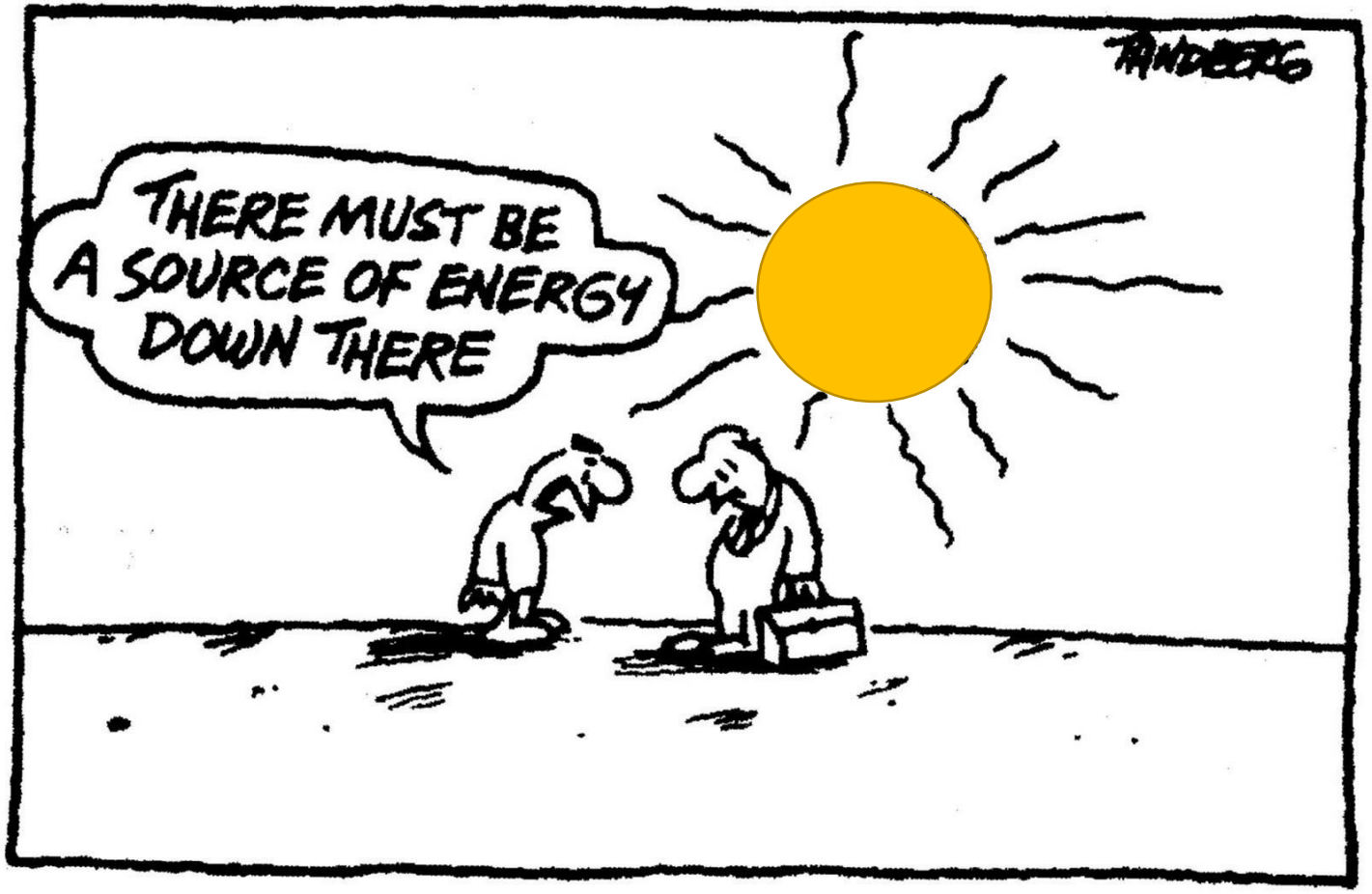
THE CLIMATE CHANGE THREAT



"Well, I think the climate change is just a very, very expensive form of tax.

PotUS - 2016

ISN'T IT OBVIOUS ?



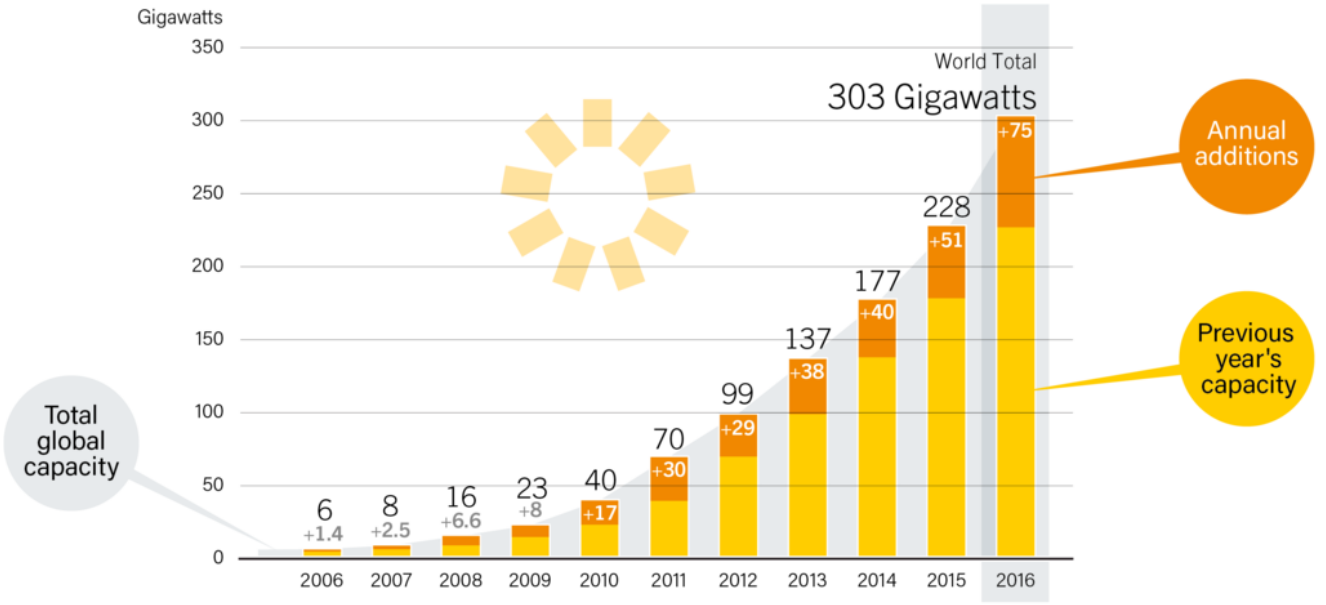
(ENERGY) REVOLUTION

FRANCESCO STARACE (ENEL-EURELECTRIC)

A GROWING MARKET

Figure: 15

Solar PV Global Capacity and Annual Additions, 2006-2016



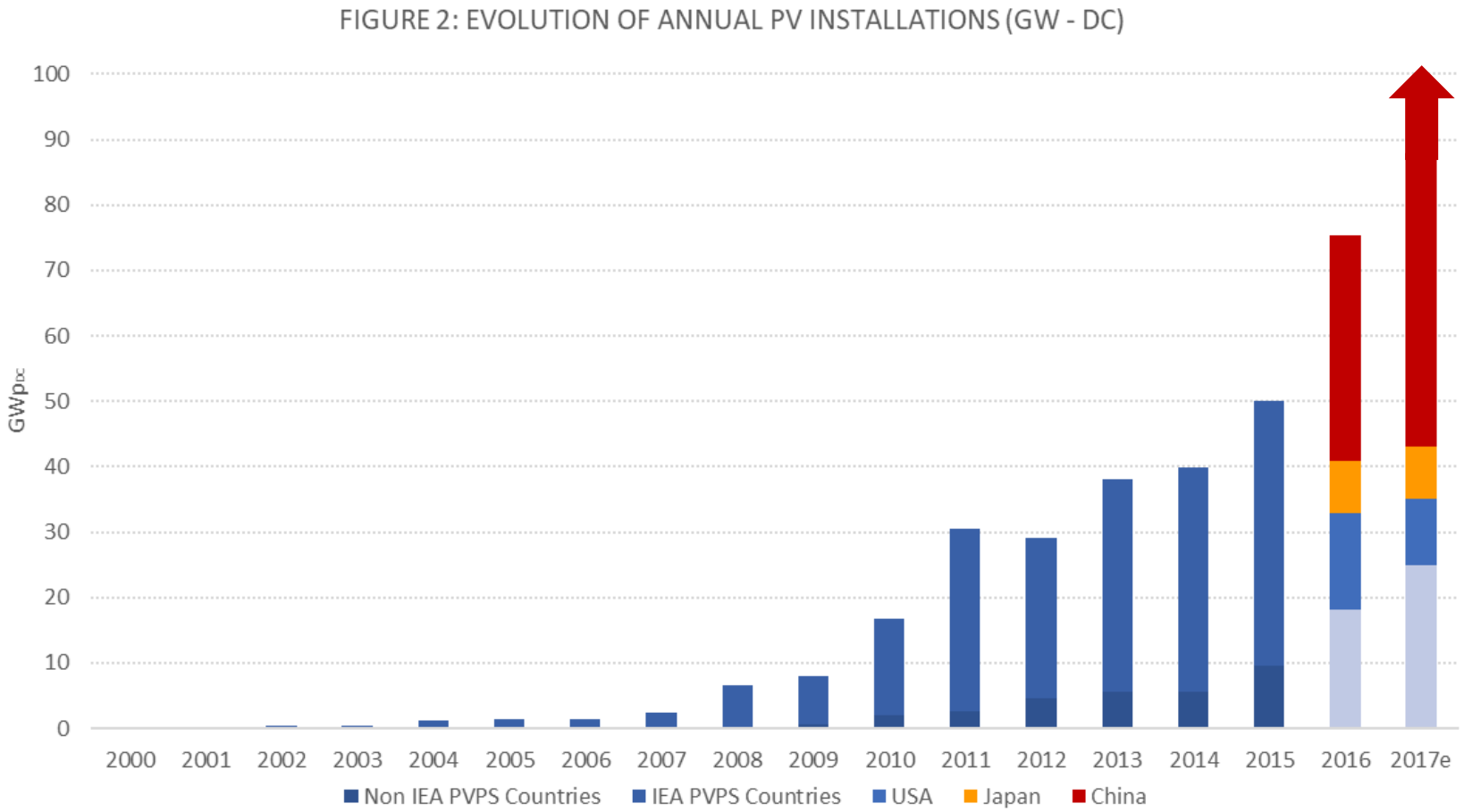
+100

~400

REN21 *Renewables 2017 Global Status Report*

Source: IEA PVPS.

GROWING YES BUT WHERE

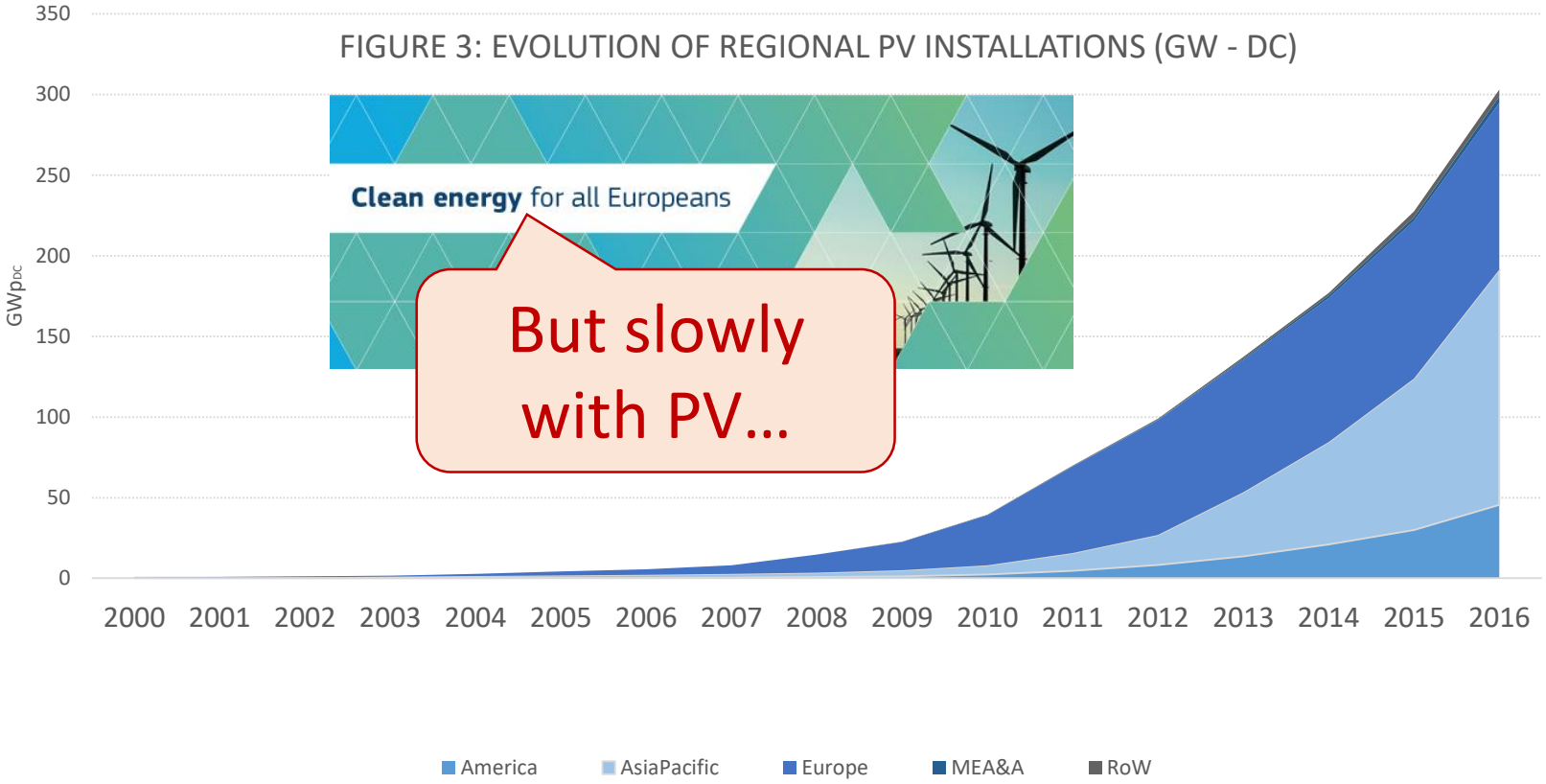


2017 PRELIMINARY

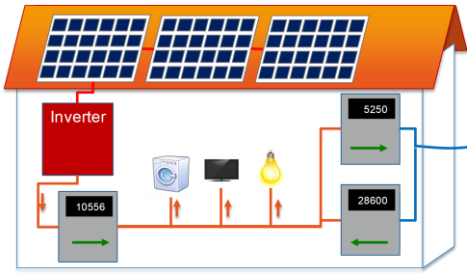
China	53 GW
USA	10 GW (est.)
India	9 GW (est.)
Japan	7 GW
EU	6 GW
Turkey	2.5 GW
RoW	12.5 GW

AND EUROPE ?

27… 5%



A TALE OF 2 MARKETS



Distributed PV

Self-consumption, energy effiency, grid parity, competition with utilities distribution business

Prosumers

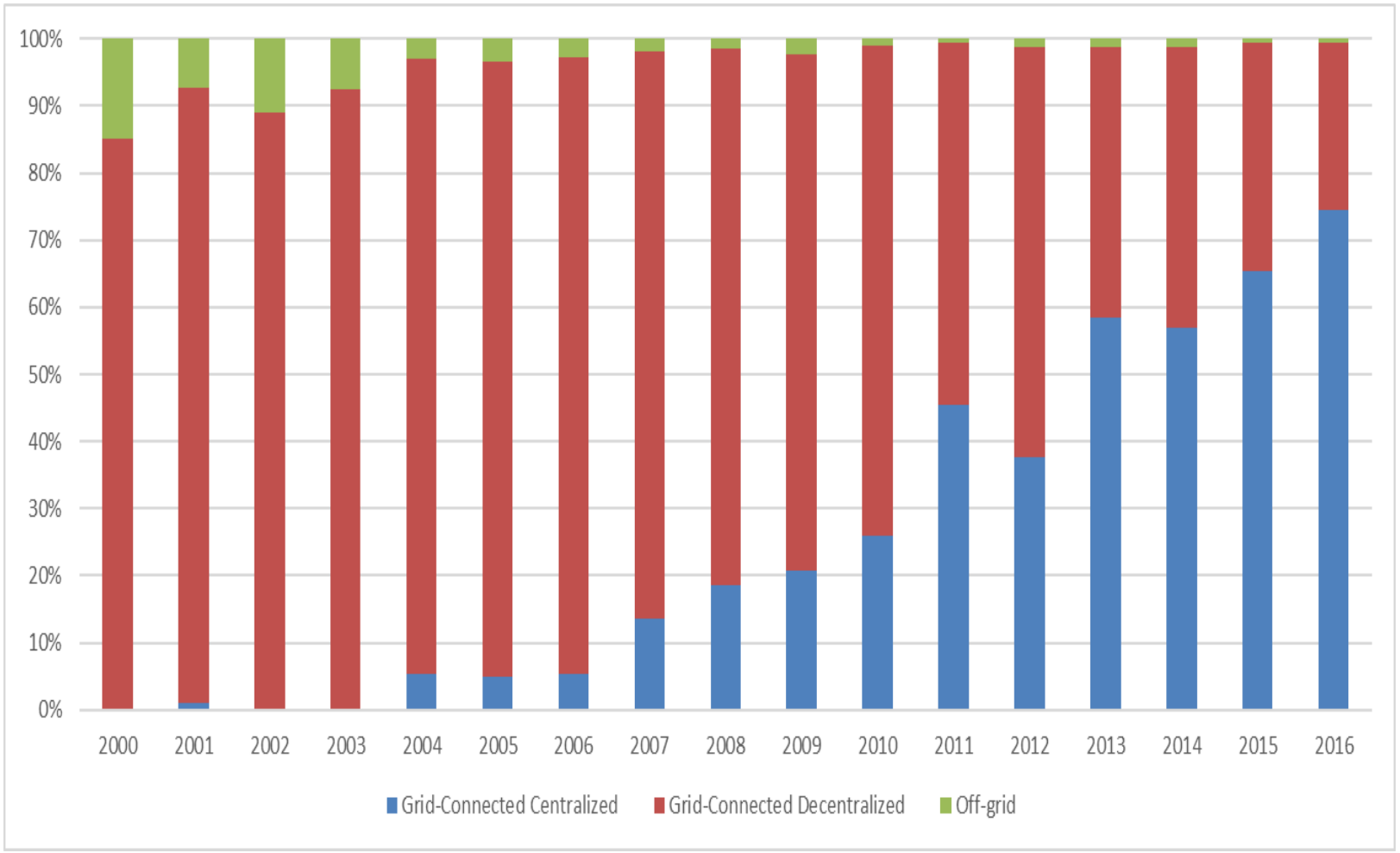
One technology

Producers

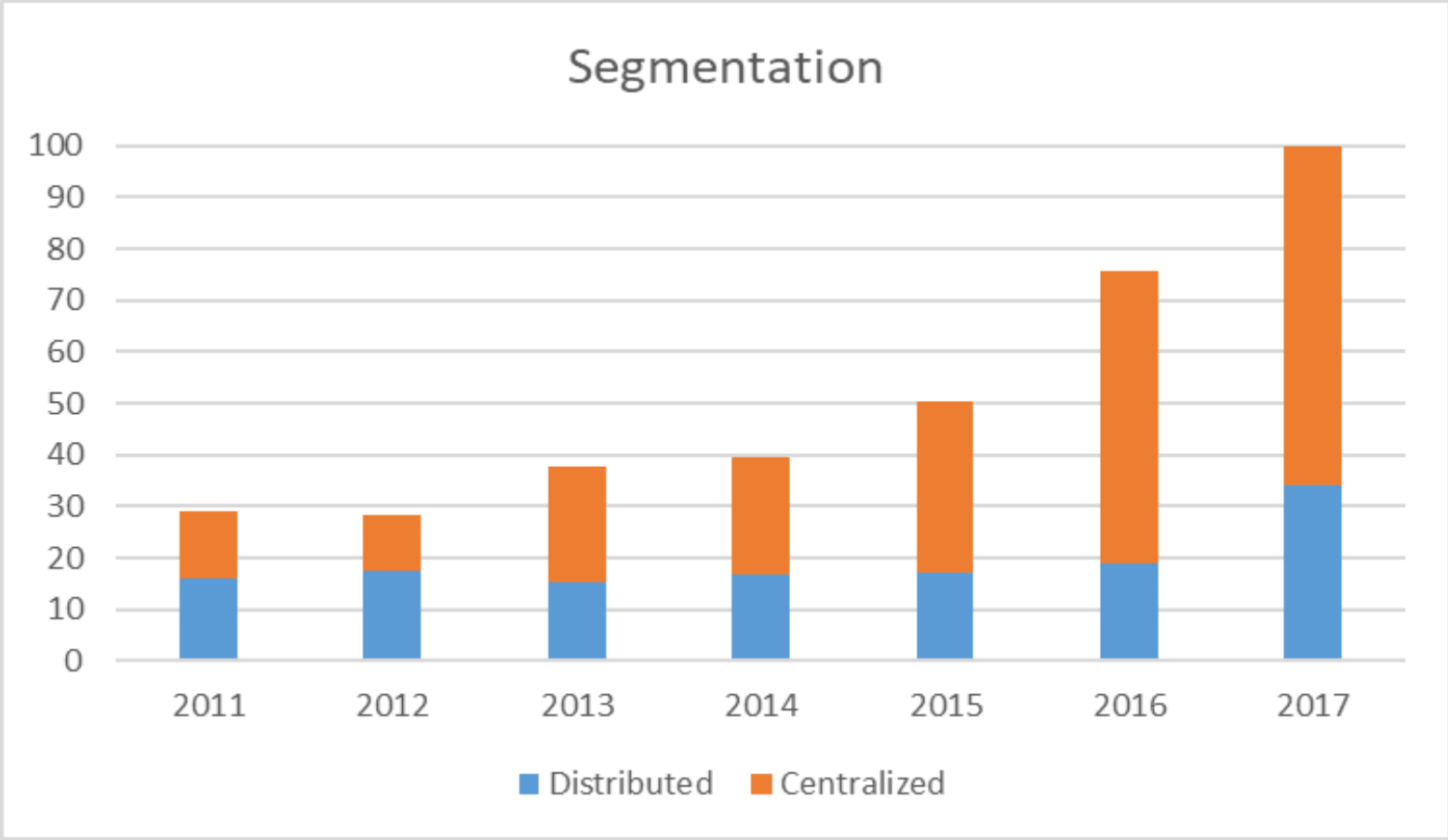
Grid injection, PPA, competition with utilities generation business

Centralized PV

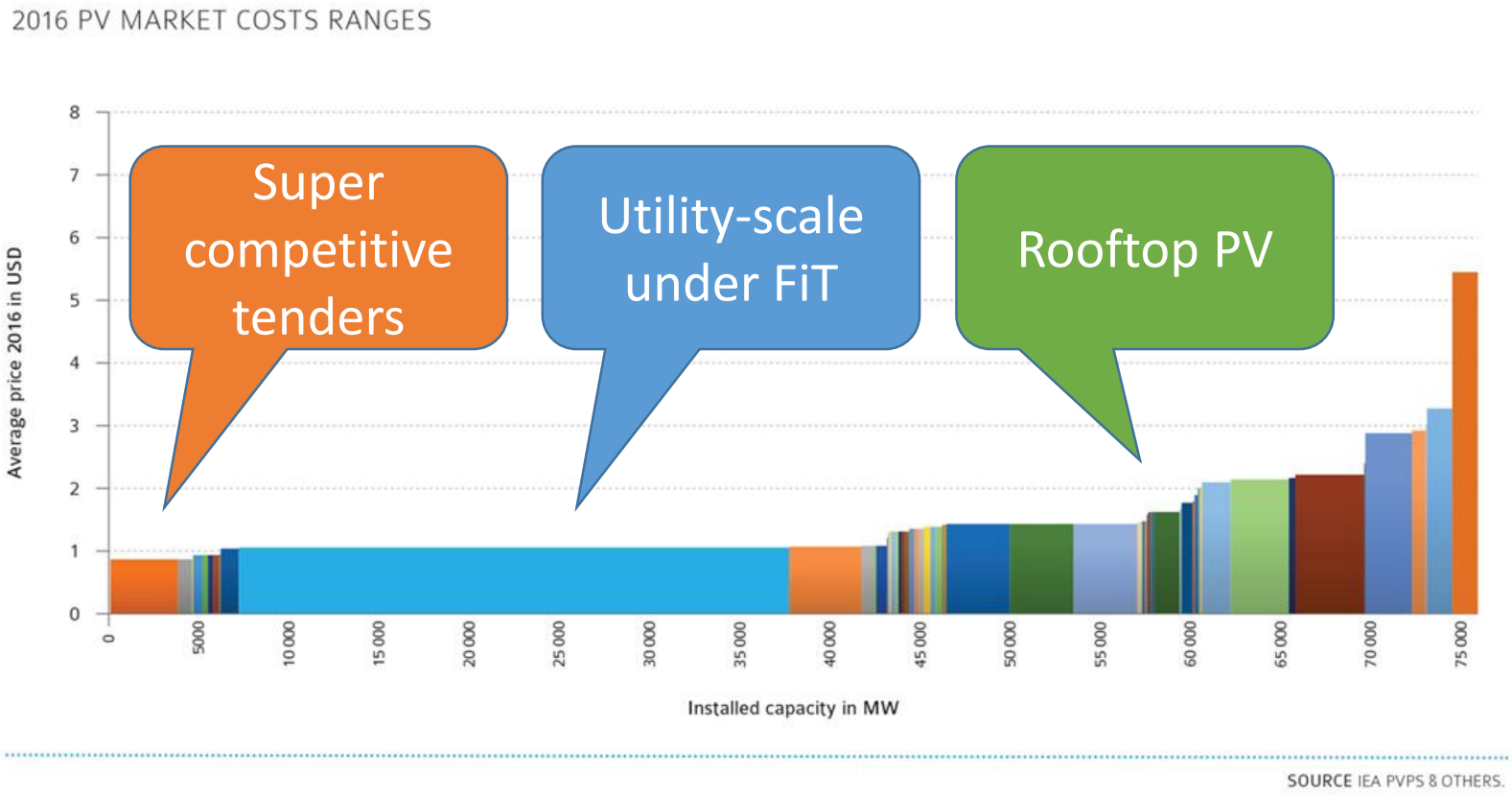
UTILITY-SCALE DOMINATES



SEGMENTATION



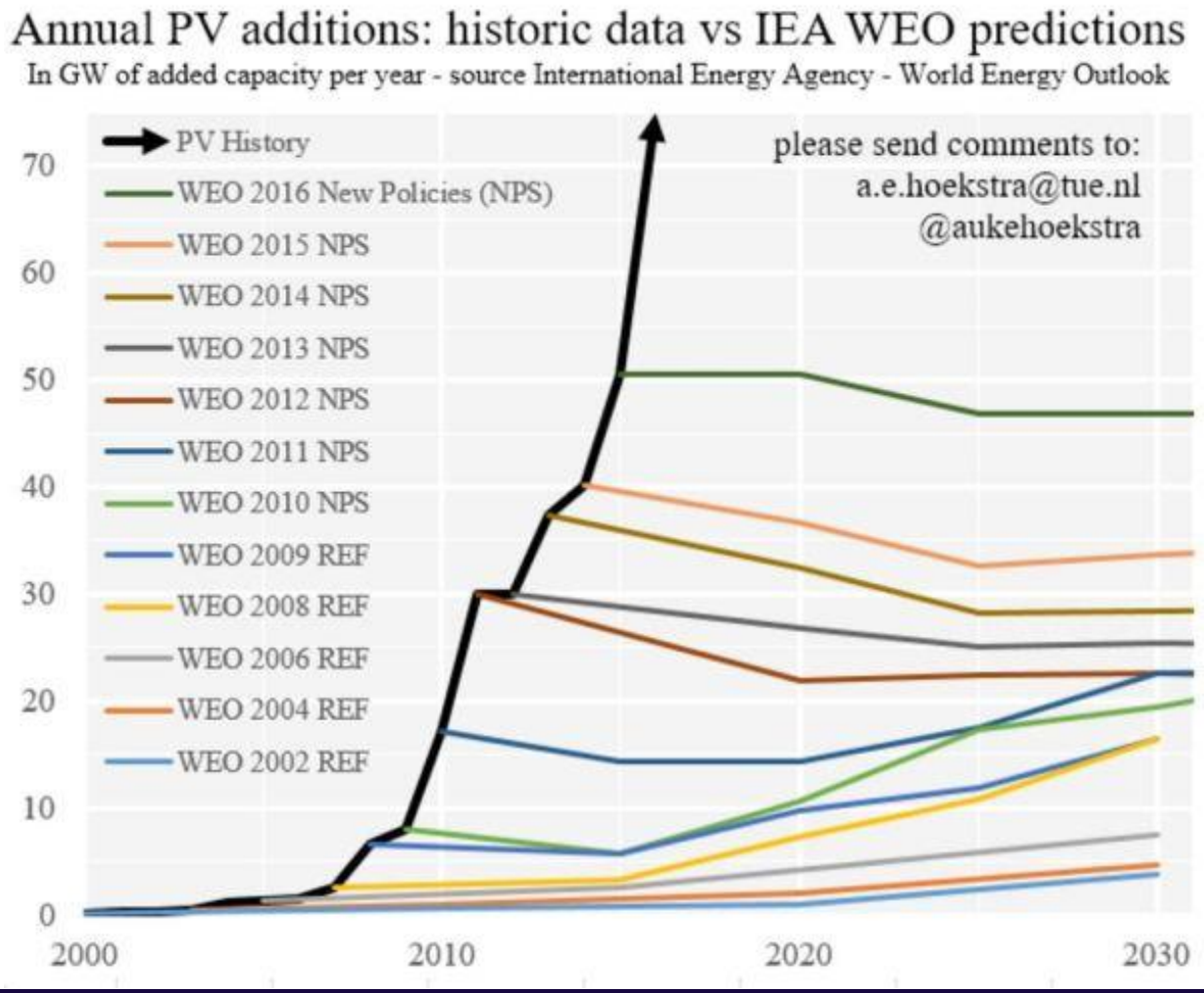
SYSTEM PRICES



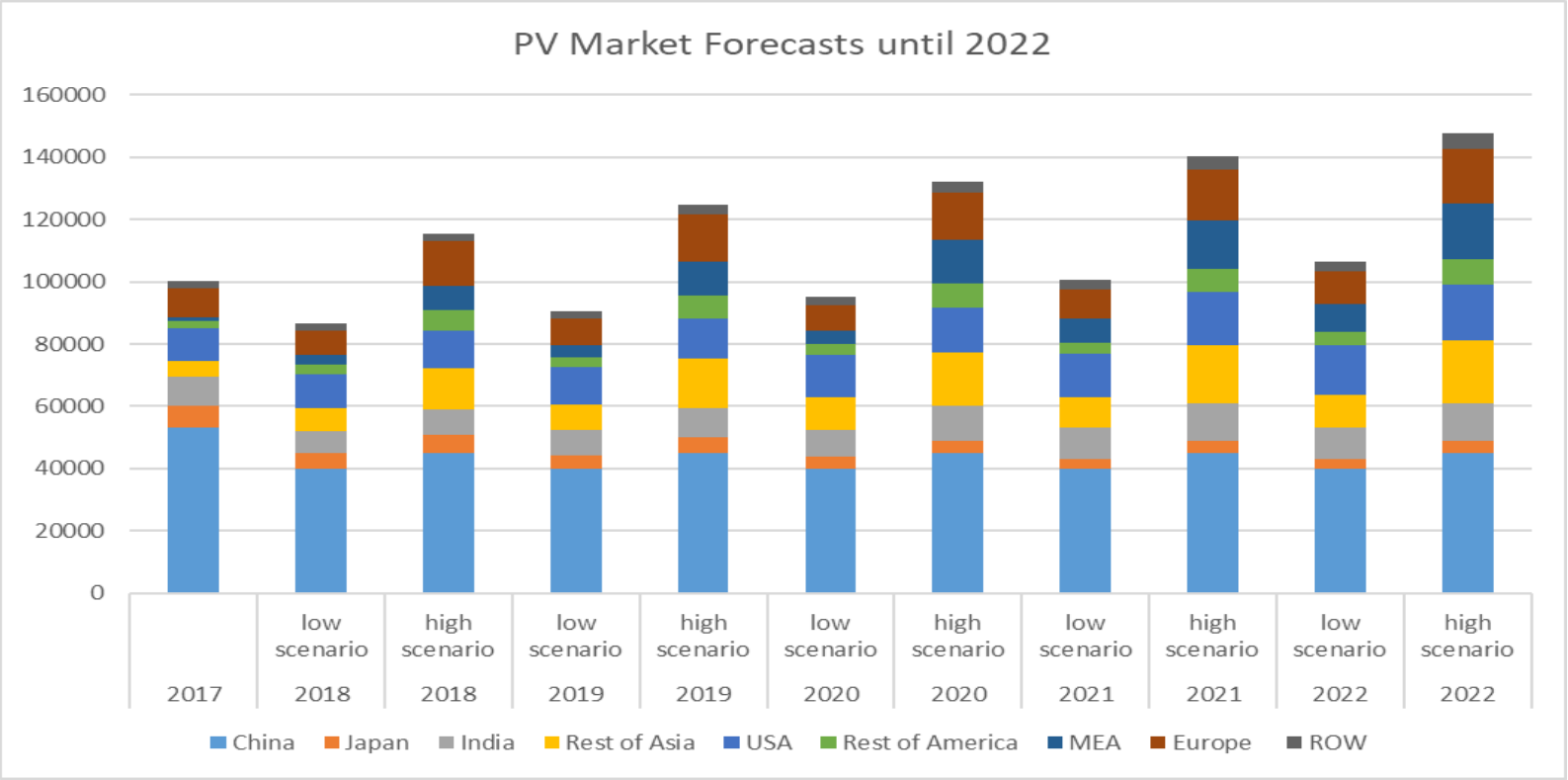
SUMMARY

- Key market features
  - A large part of the global PV market is located in Asia, with China dominating. The global PV market has doubled in two years.
  - The growth outside of China has a 15% CAGR.
  - Europe (EU) has difficulties to cope with the end of the FIT-era.
  - Distributed PV represented less than 20 GW from 2011 to 2016. Then it jumpted to 34 GW in 2017. Thanks to 19 GW in China.
  - The distributed PV market remains dominated by FIT policies outside of Europe, and net-metering evolving towards self-consumption policies in Europe (and US, Japan…)
  - The bulk of the PV market is extremely competitive with half of the market below the 1 USD/Wp mark in 2017.
  - Value of the PV market in 2017 could be estimated around 125 Billion USD (new installations).

NOT EASY TO CONVINCE



FORECASTS?

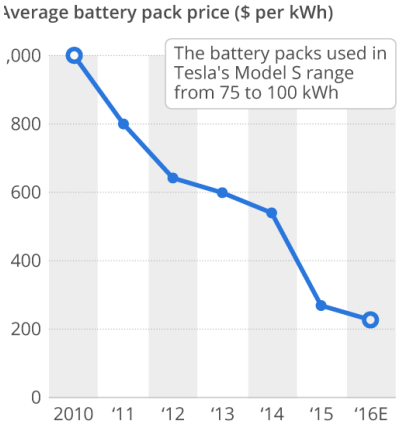


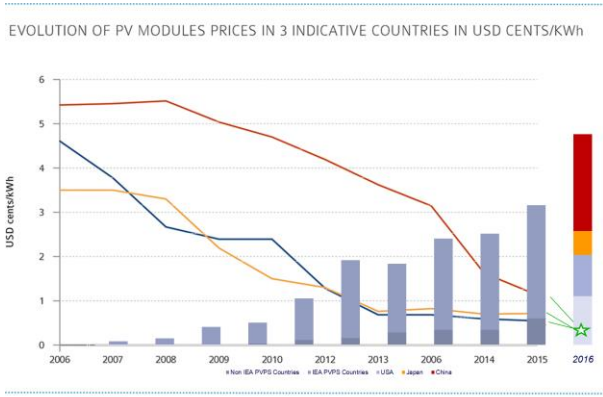
The PV Market Alliance

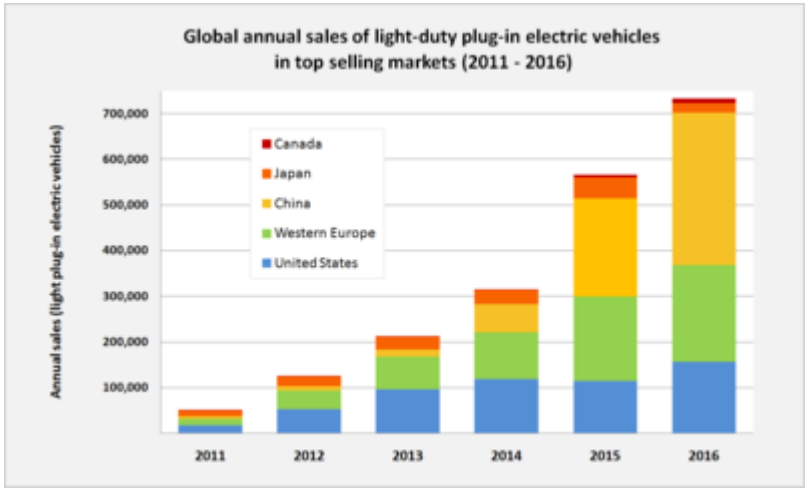
BUT THIS COULD GO FASTER

1. PV is becoming fast the cheapest source of electricity.
2. The past has seen faster developments:
    1. From 2012 to 2017: market x 3
    2. From 2007 to 2012: market x 15
3. PV on cars could represent dozens of MV
4. PV on buildings are developing as well.
5. So… 200 GW a year in 2022 ? Or more ?

TRIPLE (CONNECTED) I/E-REVOLUTION

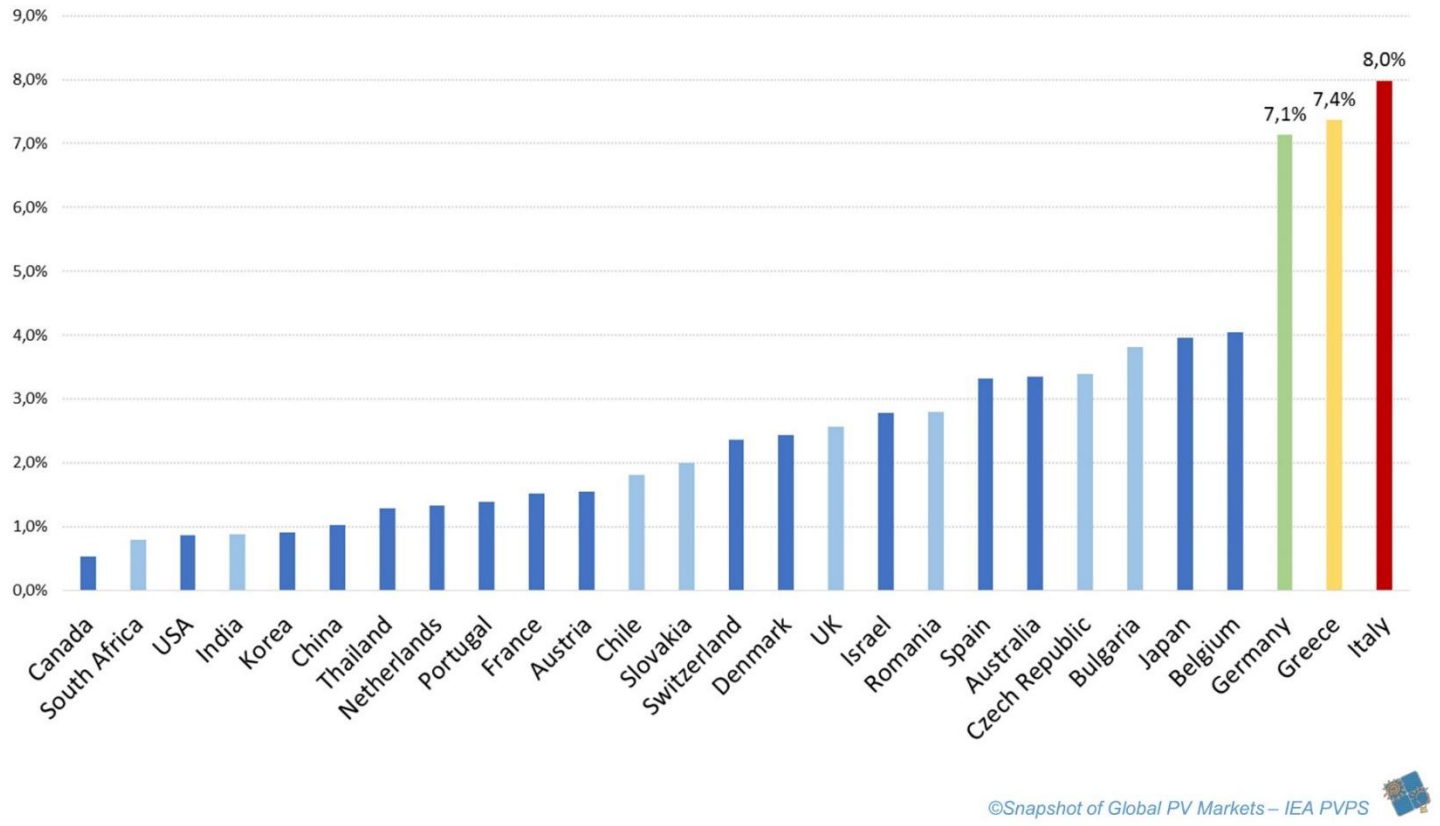






ENERGY VS POWER

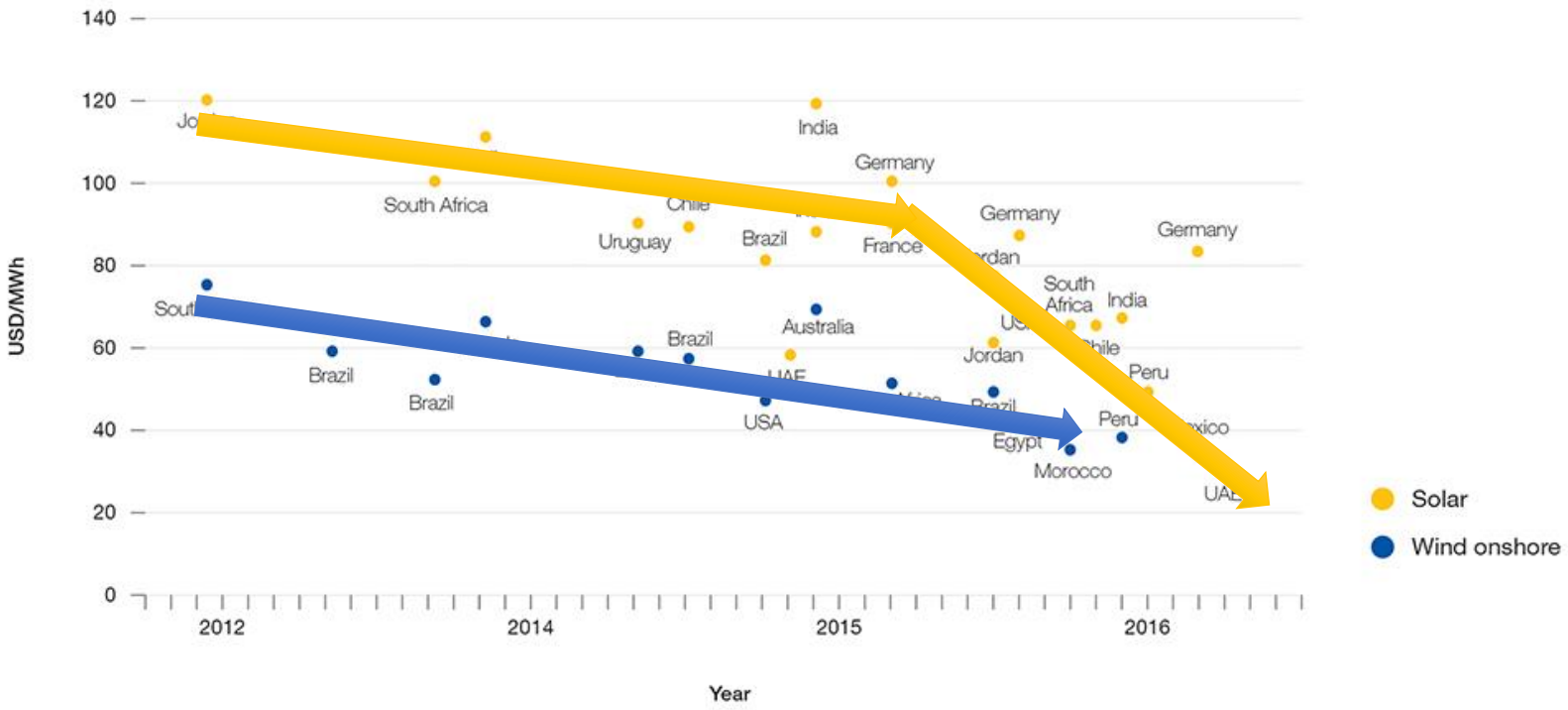
FIGURE 4: NATIONAL PV PENETRATION IN % OF THE ELECTRICITY DEMAND BASED ON 2015 CAPACITIES



©Snapshot of Global PV Markets – IEA PVPS

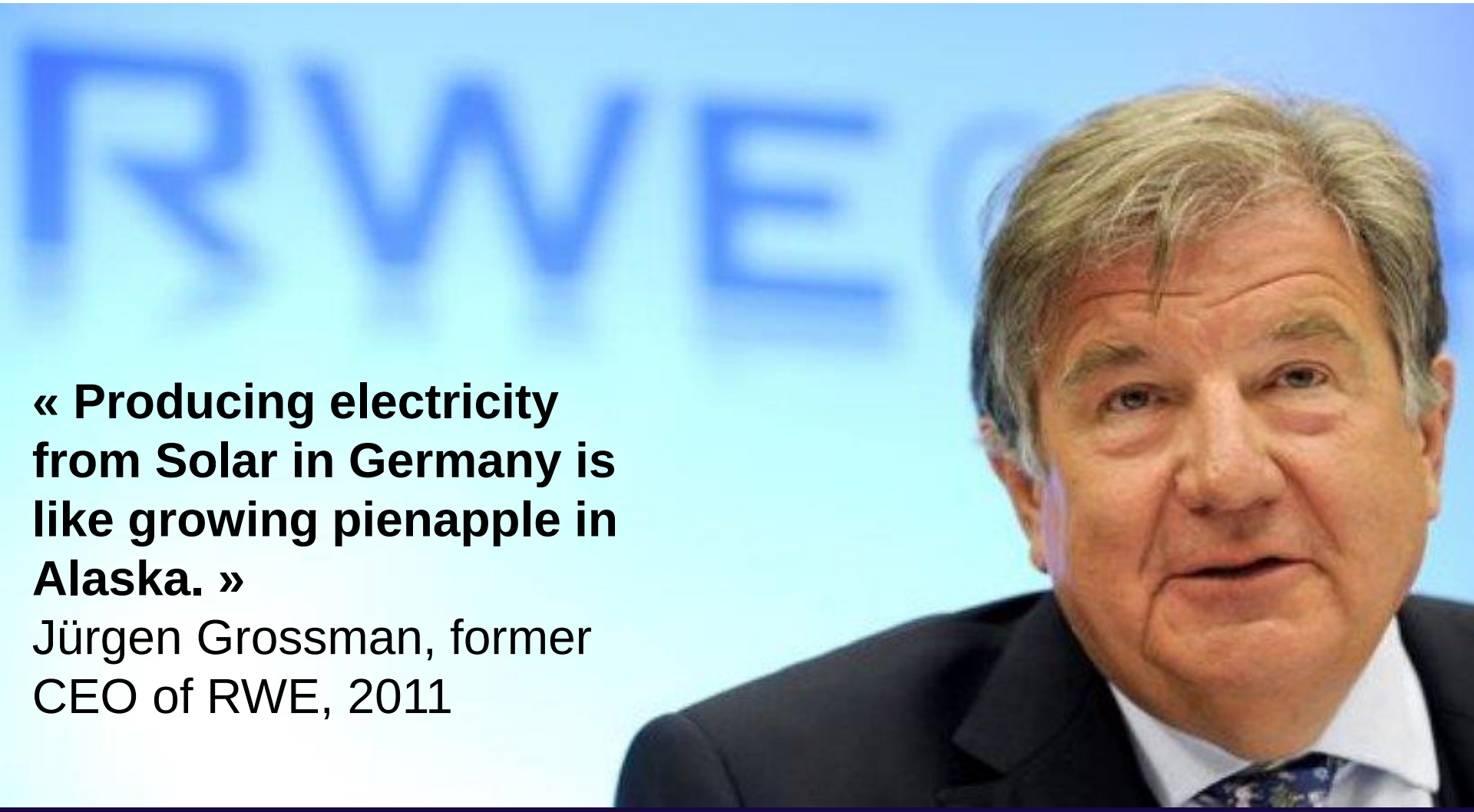
UTILITY-SCALE PV FALLING PRICES

FIGURE 1 PPA PRICE OFFERS FOR SOLAR PV AND WIND ONSHORE POWER PLANTS IN DIFFERENT COUNTRIES



Source: International Energy Agency 2016

GROWING PINEAPPLE IN ALASKA?



« Producing electricity from Solar in Germany is like growing pienapple in Alaska. »
Jürgen Grossman, former CEO of RWE, 2011

PV BELOW 0,02 USD/KWH ?

Saudi Arabia's 300 MW solar tender may conclude with lowest bid ever

0,0168 $ per kWh

A consortium formed by UAE-based Masdar and French energy giant EDF has offered to deploy all the tendered capacity at a LCOE of 0.06697 SAR [illegible]on, seven of the eight bids were under $0.03 per kWh. The tender's bidders will be announced by the end of January 2018.

OCTOBER 4, 2017 EMILIANO BELLINI

MARKETS | UTILITY-SCALE PV | SAUDI ARABIA

Germany's auction for large-scale solar concludes at €0.0429 per kWh

The average price for bids submitted in Germany's auction for large-scale solar has fallen below the mark of €0.050/kWh for the first time. A total of 20 projects with a combined capacity of 222 MW were awarded by the Federal Network Agency.

OCTOBER 16, 2017 SANDRA ENKHARDT

UTILITY-SCALE PV | GERMANY

Spain's auction allocates 3.5 GW of PV capacity

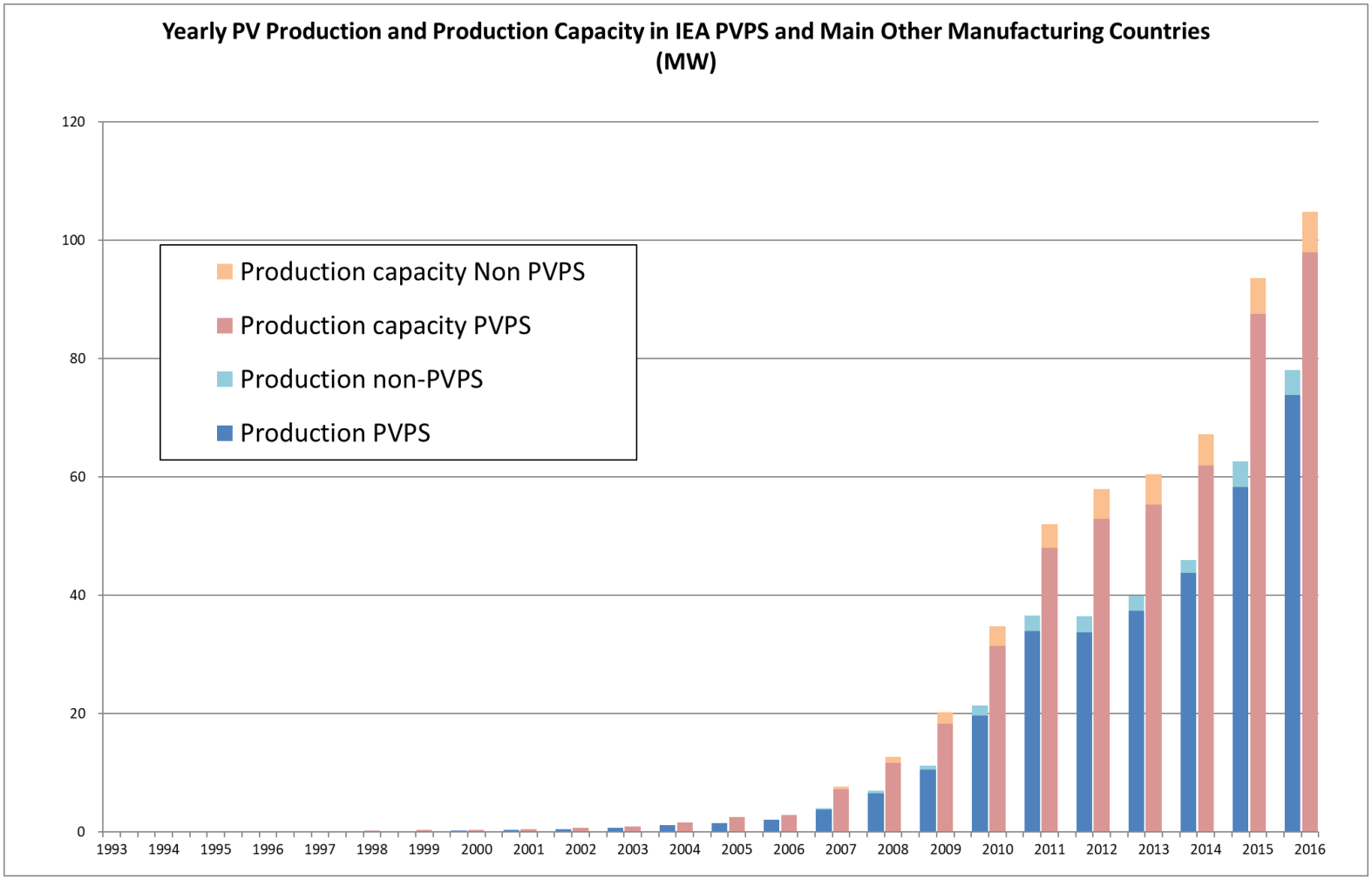
Solar had the largest share in Spain's renewable energy auction, leaving wind power, which won all the allocated capacity in the previous auction, with just 720 MW.

JULY 26, 2017 EMILIANO BELLINI

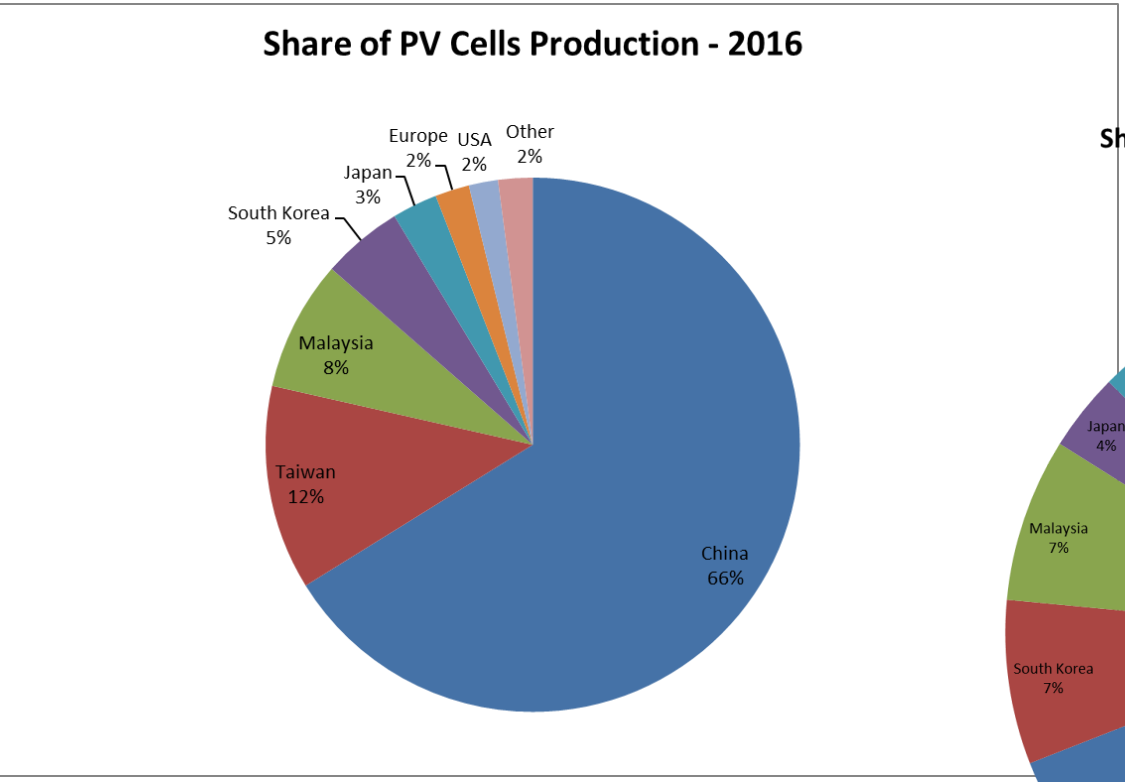
MARKETS | UTILITY-SCALE PV | SPAIN

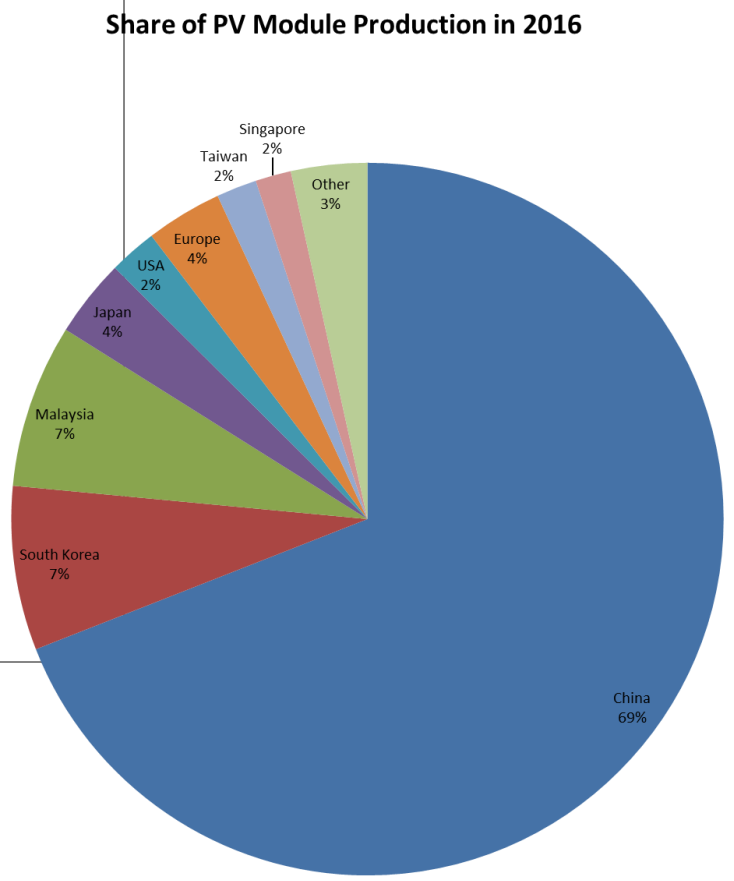
THE PV INDUSTRY

OVERCAPACITIES IN THE INDUSTRY?

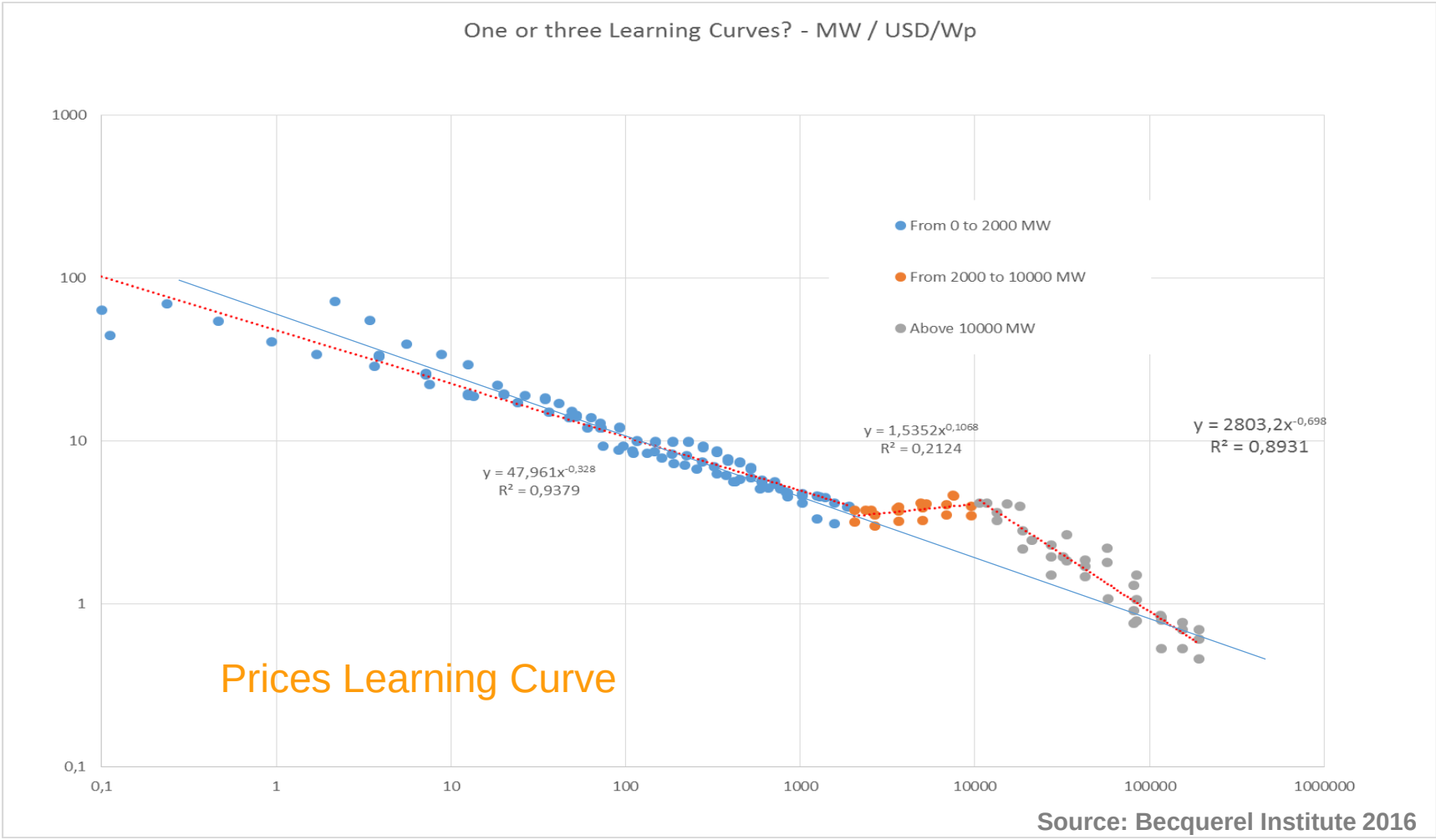


CHINA AND ASIA RULE THE WORLD

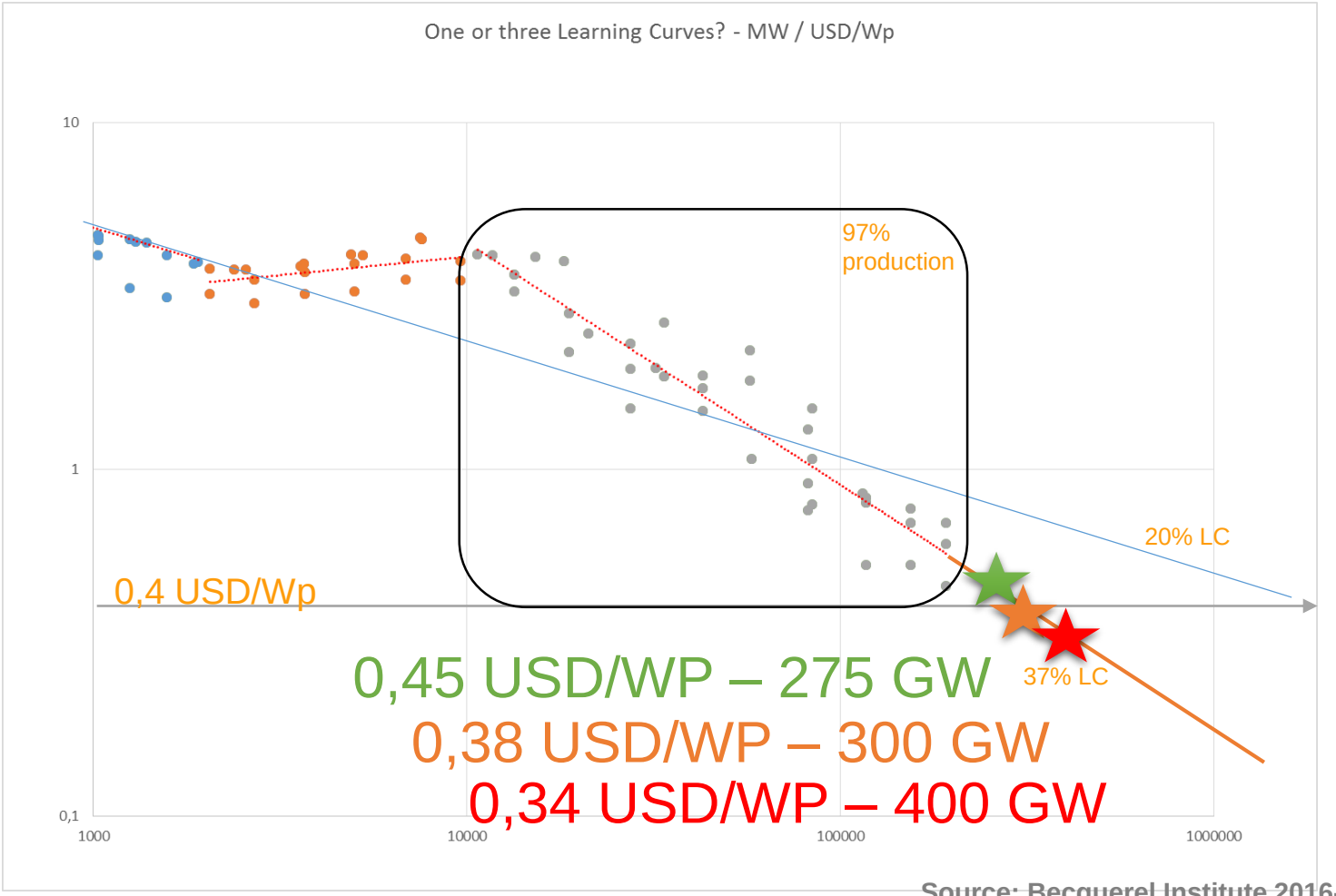




ANOTHER PERSPECTIVE

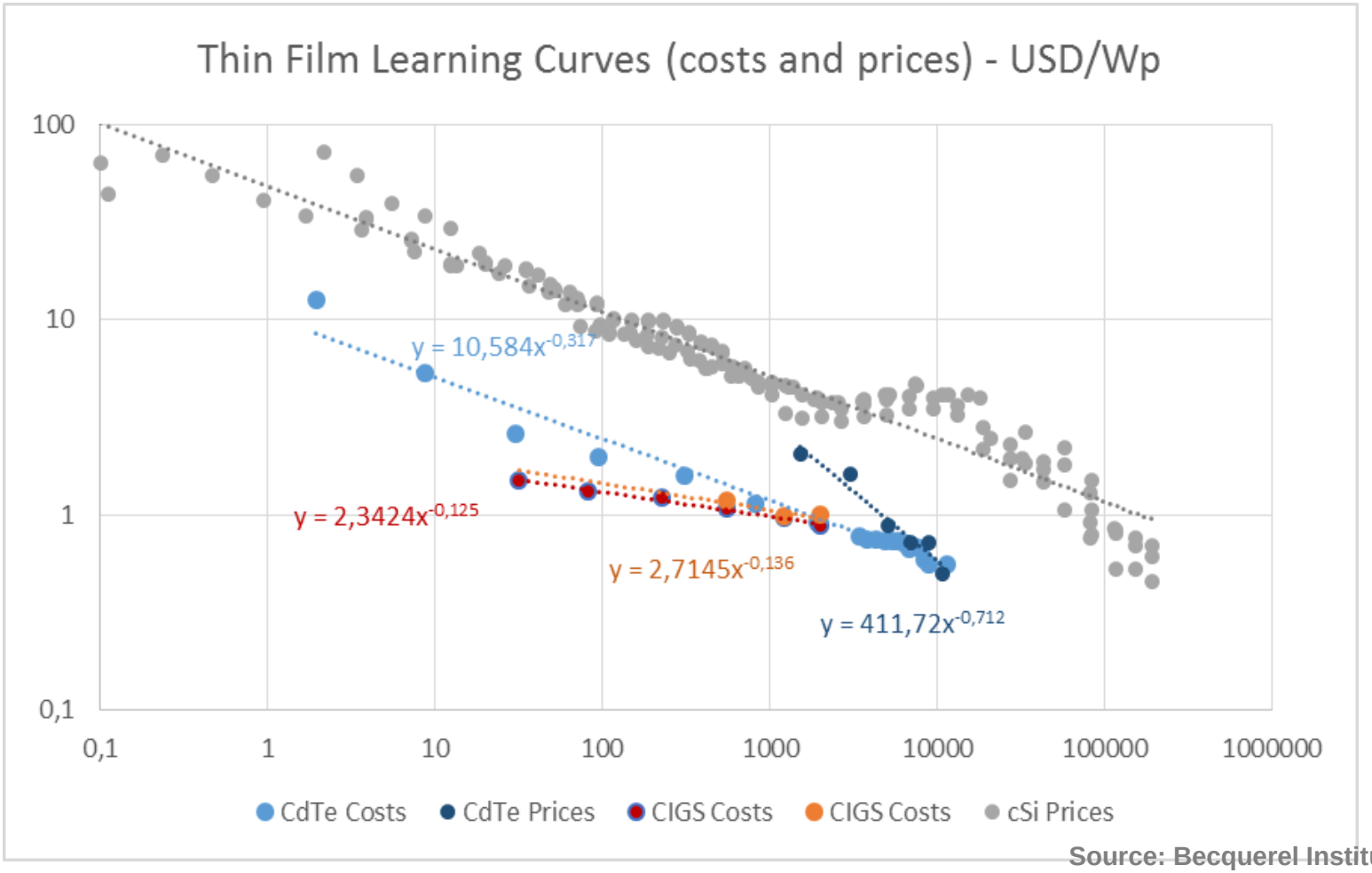


PV PRICE LEARNING CURVE



Source: Becquerel Institute 2016-2017

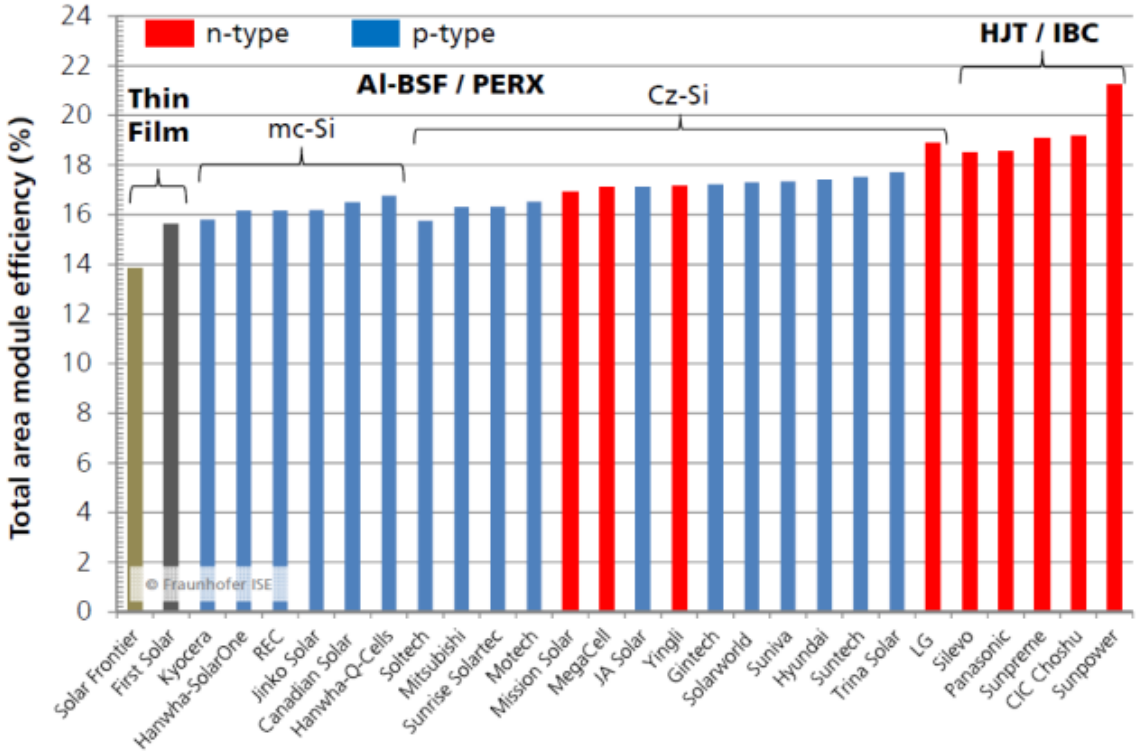
4.2. THIN FILM LEARNING CURVES



Source: Becquerel Institute 2016

TECHNOLOGY VIEW

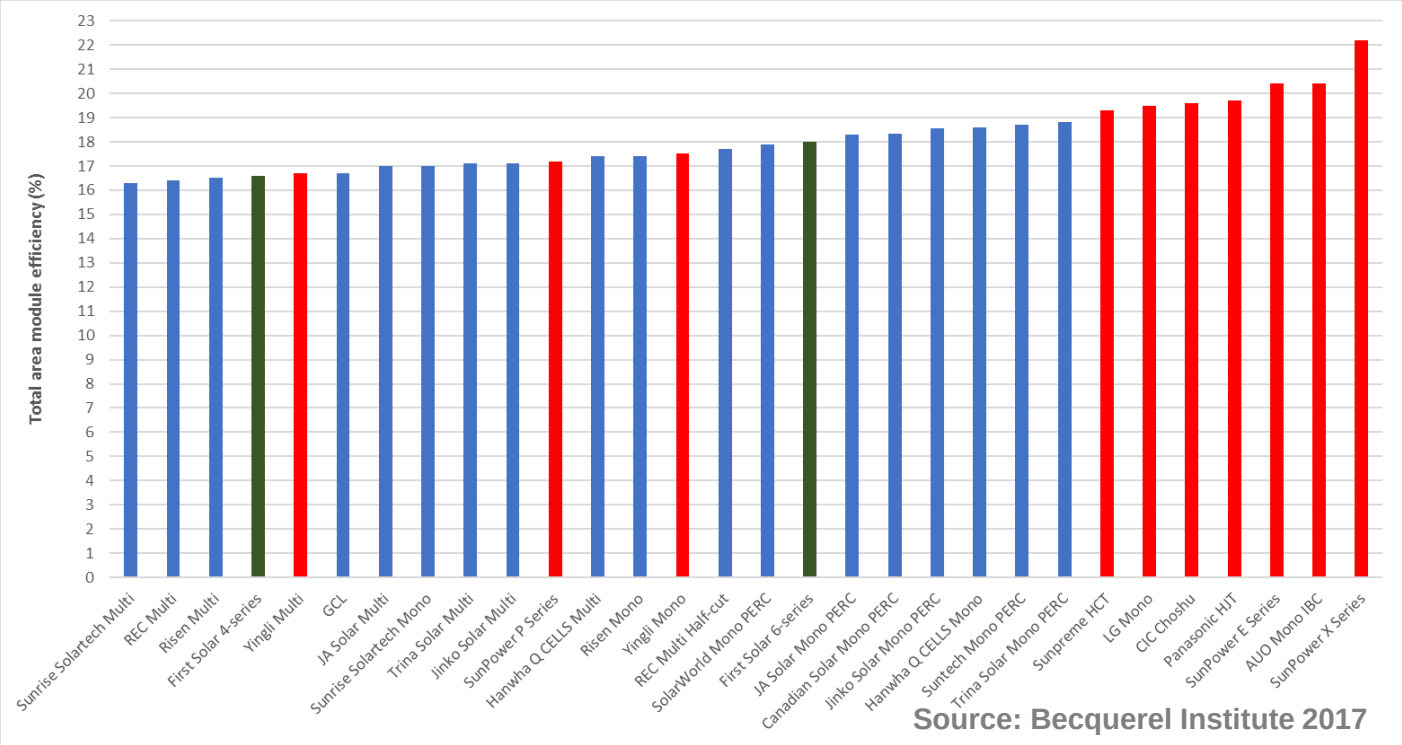
Evolution of efficiencies change the market conditions: from nov 2015



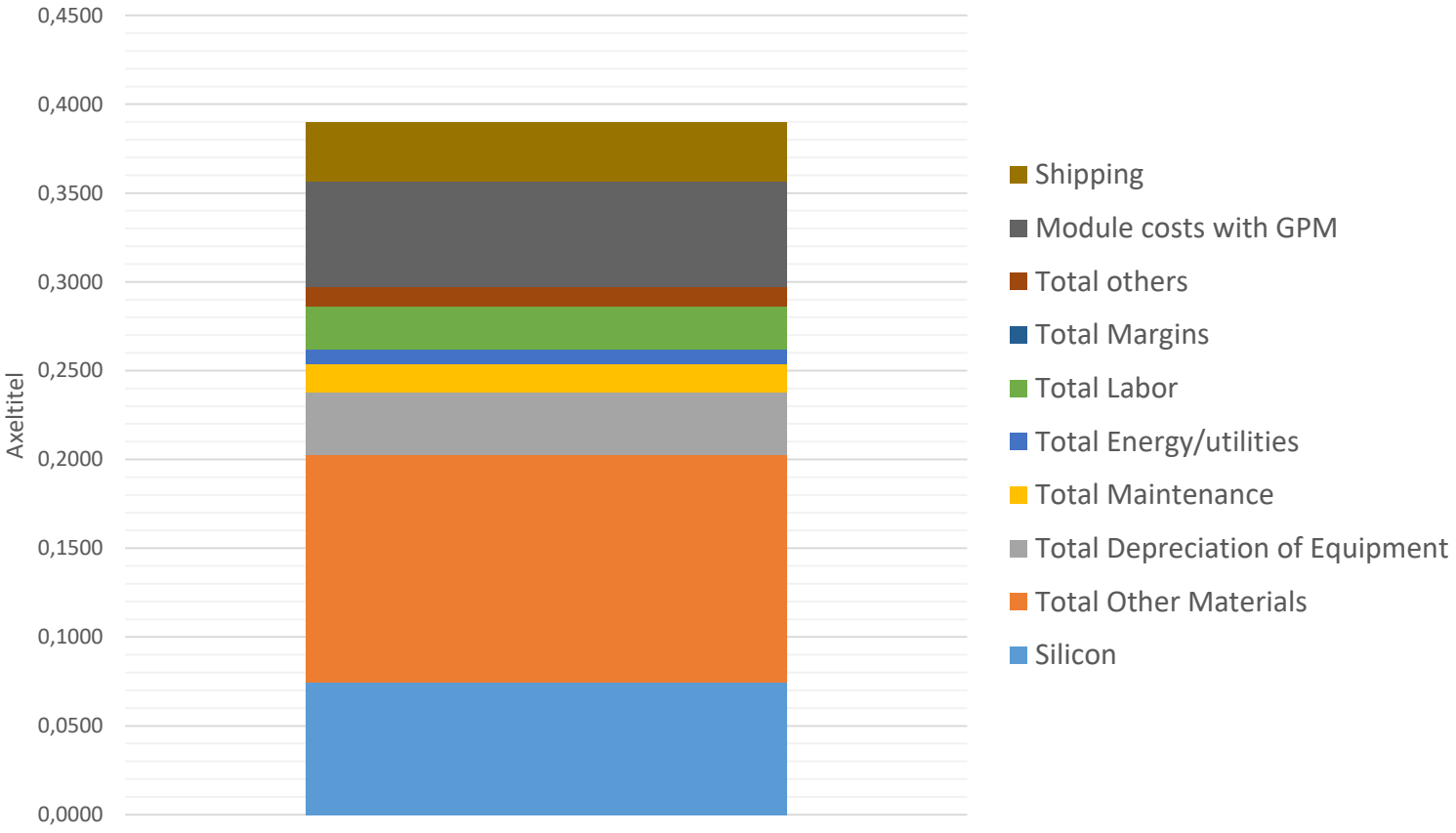
Note: Exemplary overview without claim to completeness; Selection is primarily based on modules with highest efficiency of their class and proprietary cell concepts produced by vertically integrated PV cell and module manufacturers; Graph: Jochen Rentsch, Fraunhofer ISE. Source: Company product data sheets. Last update: Nov. 2015.

GAME CHANGER?

Evolution of efficiencies change the market conditions: thin film CdTe become more competitive while all efficiencies are improving.



ROLE OF MATERIALS



EUROPE IS NOT DEAD

- Heterojunction
  - Enel Green Power with 250 MW
  - + … at least two other manufacturers
- Epitaxial wafers
  - Pilot line for Nexwafe without competition
- Wafers
  - Photowatt announced at least 500 MW to start
- + BIPV + …

CONCLUSIONS

The revolution has just started…

From simple modules to BIPV, roads, floatting PV, urban furniture, cars, trains, planes…

PV will be the CHEAPEST source of energy in this century.

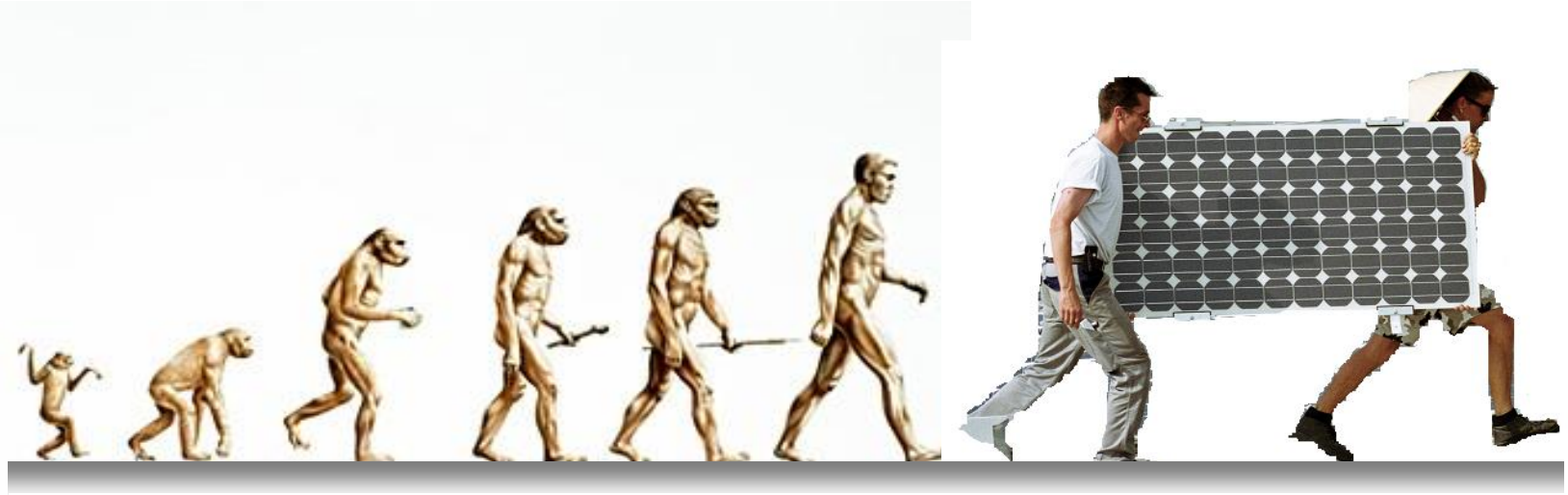
The fate of the industry and the market is not written, it depends on policy choices.

QUOTE

« PV is not the source of electricity of the future…

… it is already a reality today »

NEXT STEP IN EVOLUTION



Thanks for your attention

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