Global PV Markets & Industry Status

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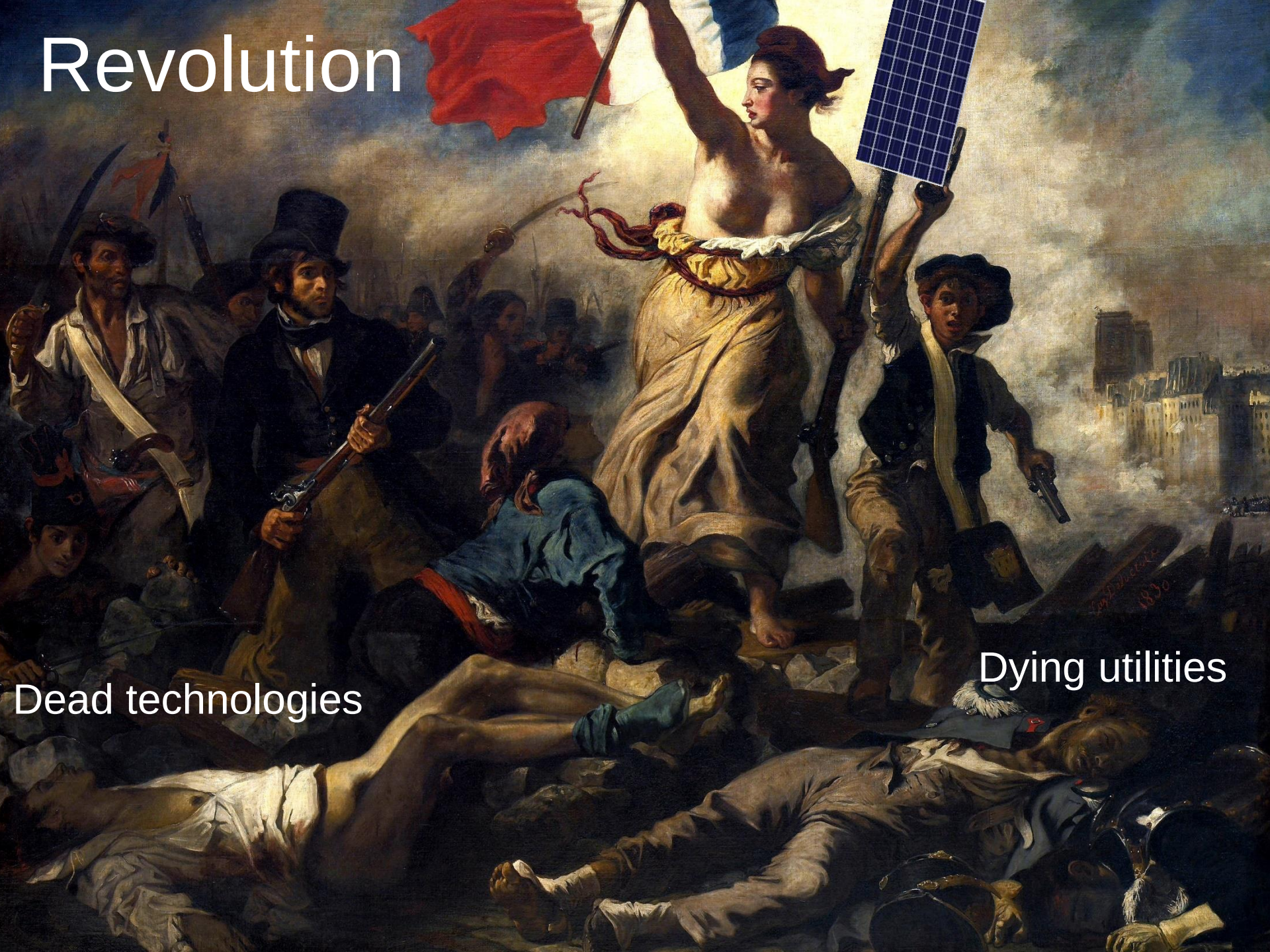
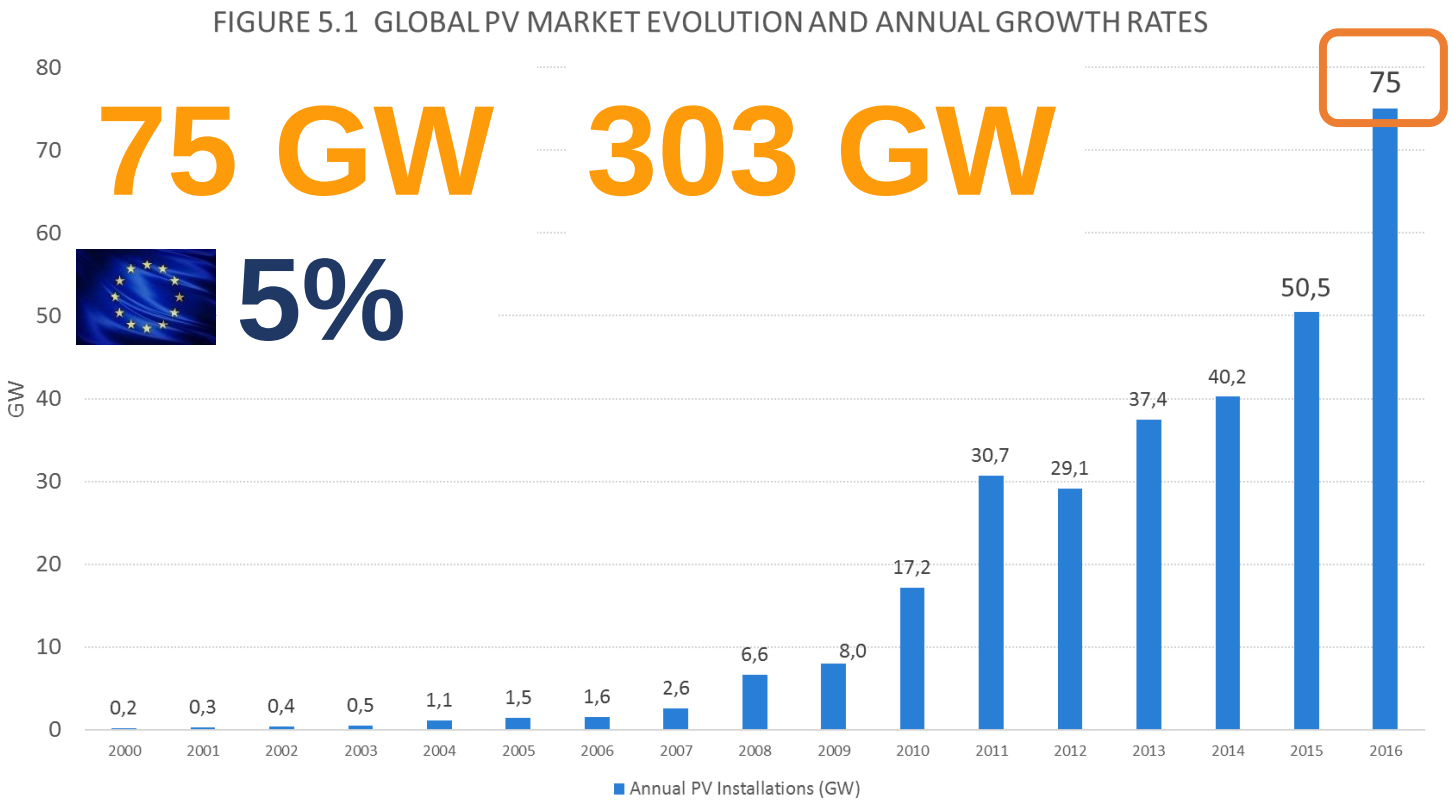
BECQUEREL INSTITUTE

- Research oriented Institute and consulting company for Solar PV Technologies.
- Global PV Market Analysis including competitiveness and economics.
- Industry analysis together with quality & reliability.
- Integration into electricity systems (grids and markets).
- In-house experts / Global network of experts and stakeholders
- **PV Market Alliance** partner

Revolution

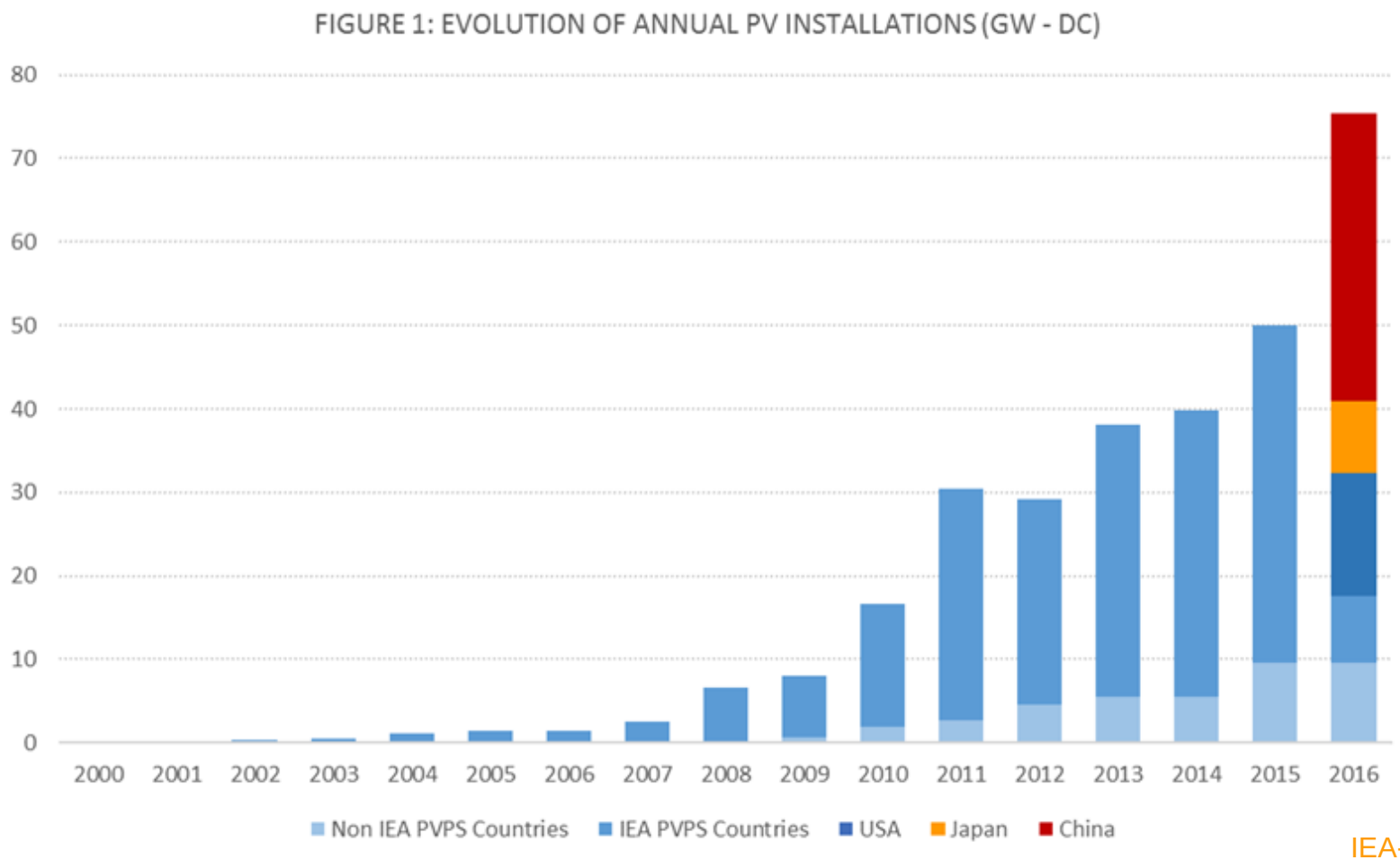


FROM 1.1 TO 75 GW IN 12 YEARS ?



PV Market Alliance 2017

75 GW INSTALLED IN 2016

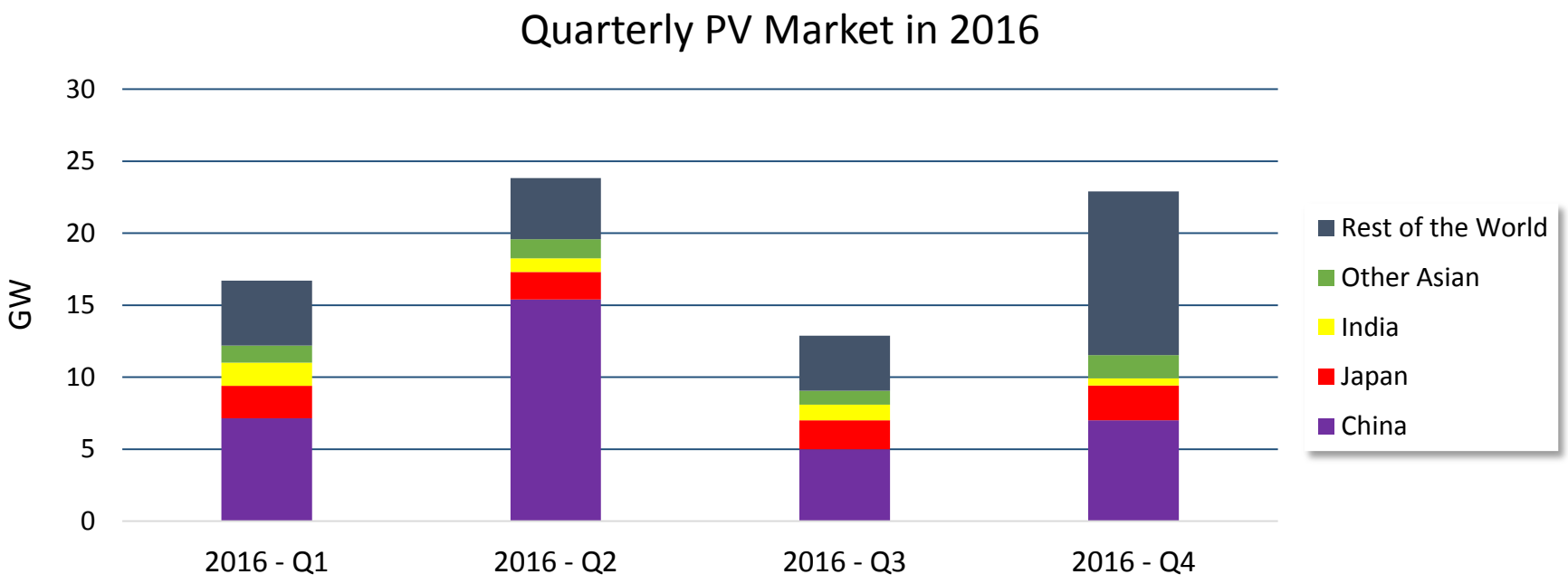


IEA-PVPS 2017

FROM 2015 TO 2016

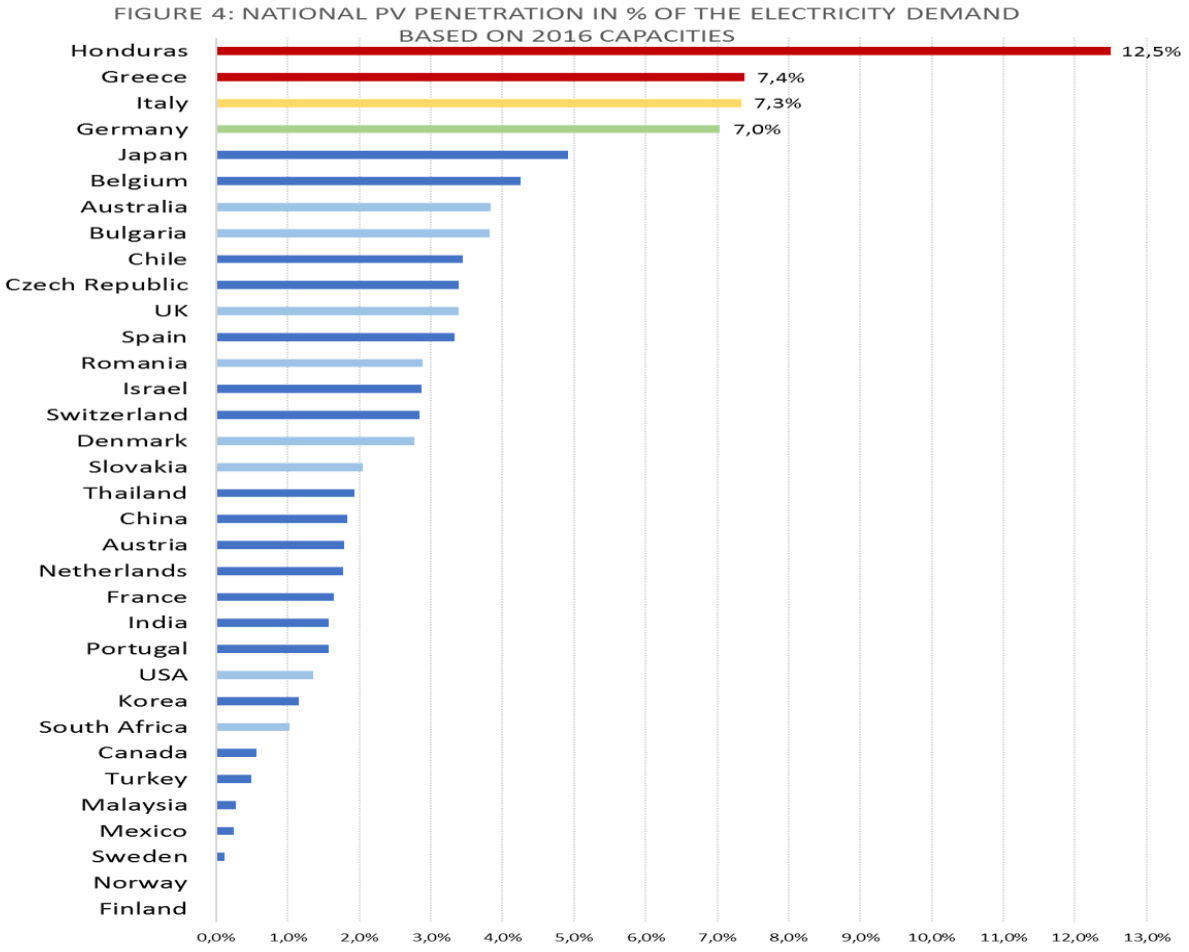
- China grew 15 to 34 GW
- US grew from 7 to 14,7 GW
- Japan went down from 11 to 8,6 GW
- Europe went down from 8 to 6 GW
- India doubled at 4 GW
- RoW was stable

QUARTERLY INSTALLATIONS 2016



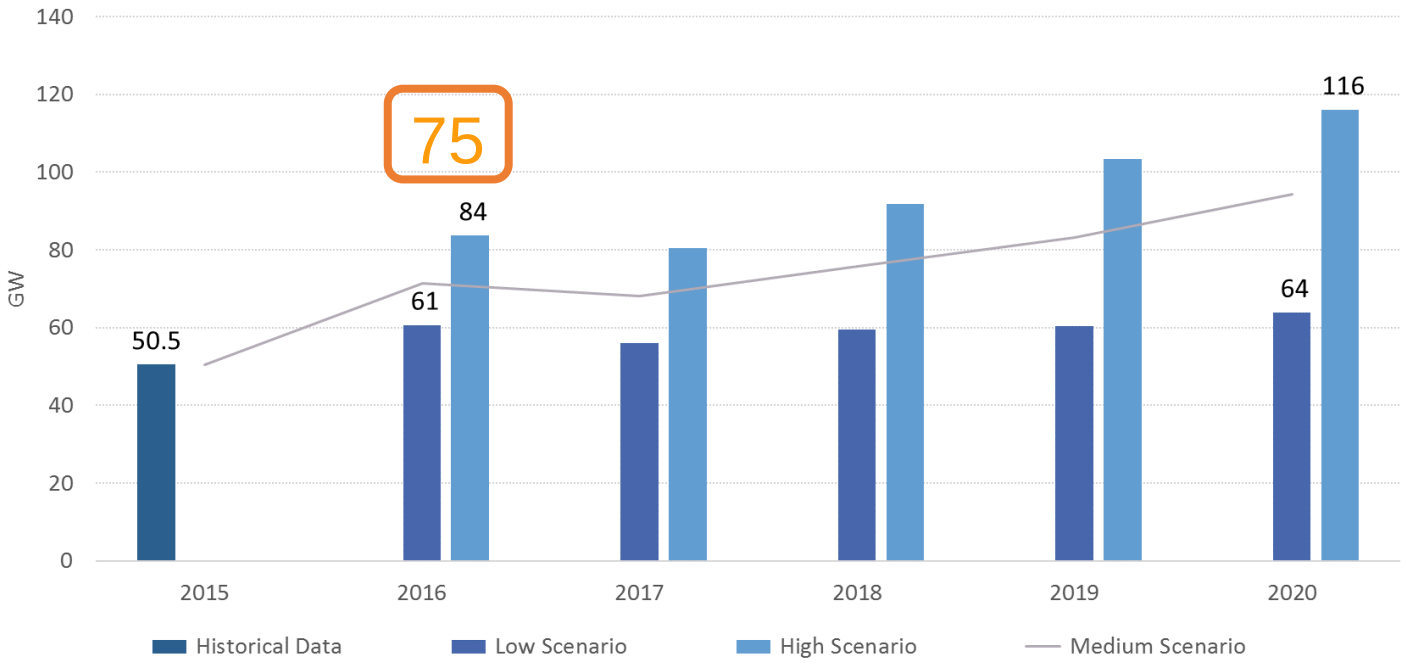
Source: Becquerel Institute 2017

PV PENETRATION



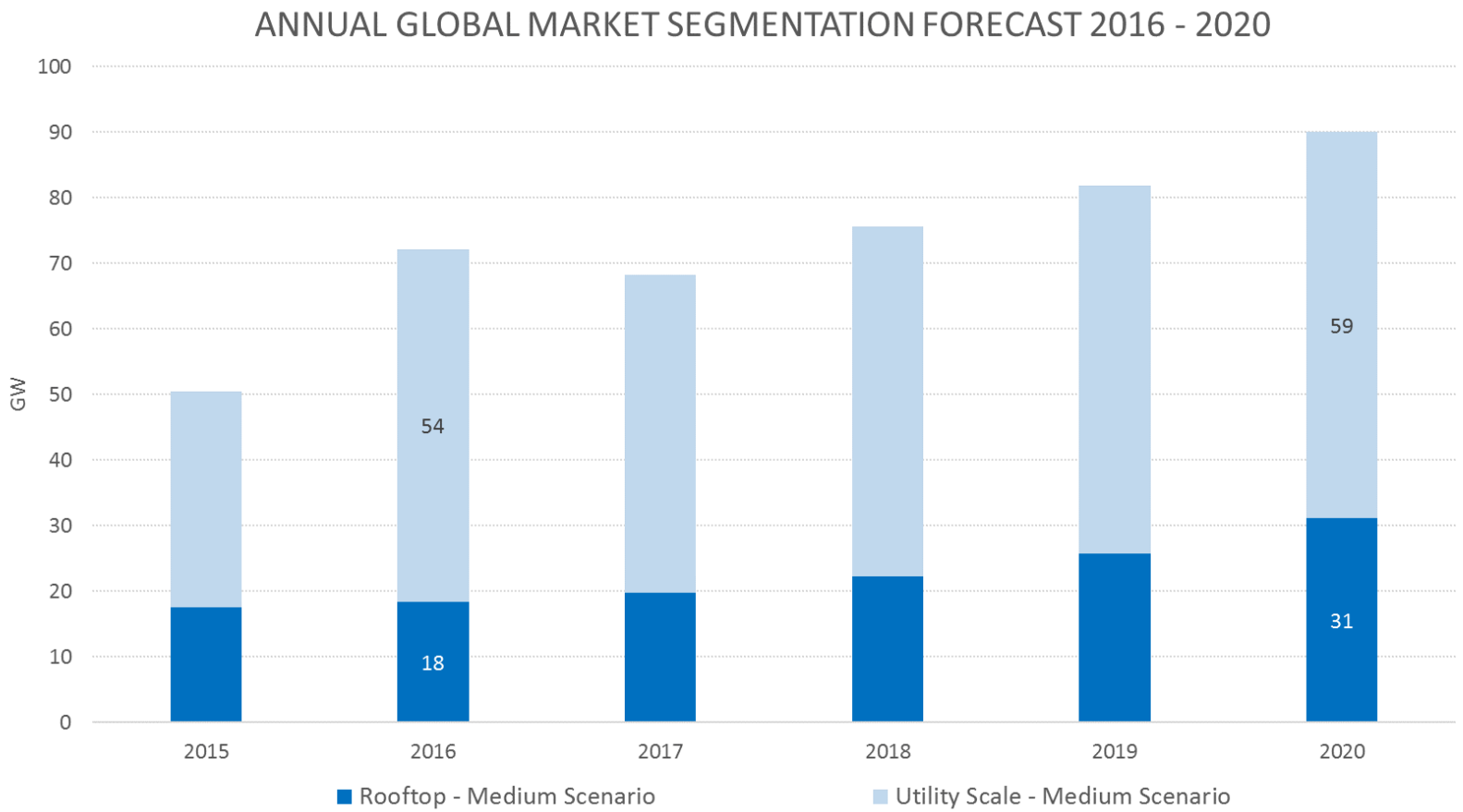
IEA-PVPS 2017

PERSPECTIVES



Source: PV Market Alliance – Becquerel Institute 2016

PERSPECTIVES



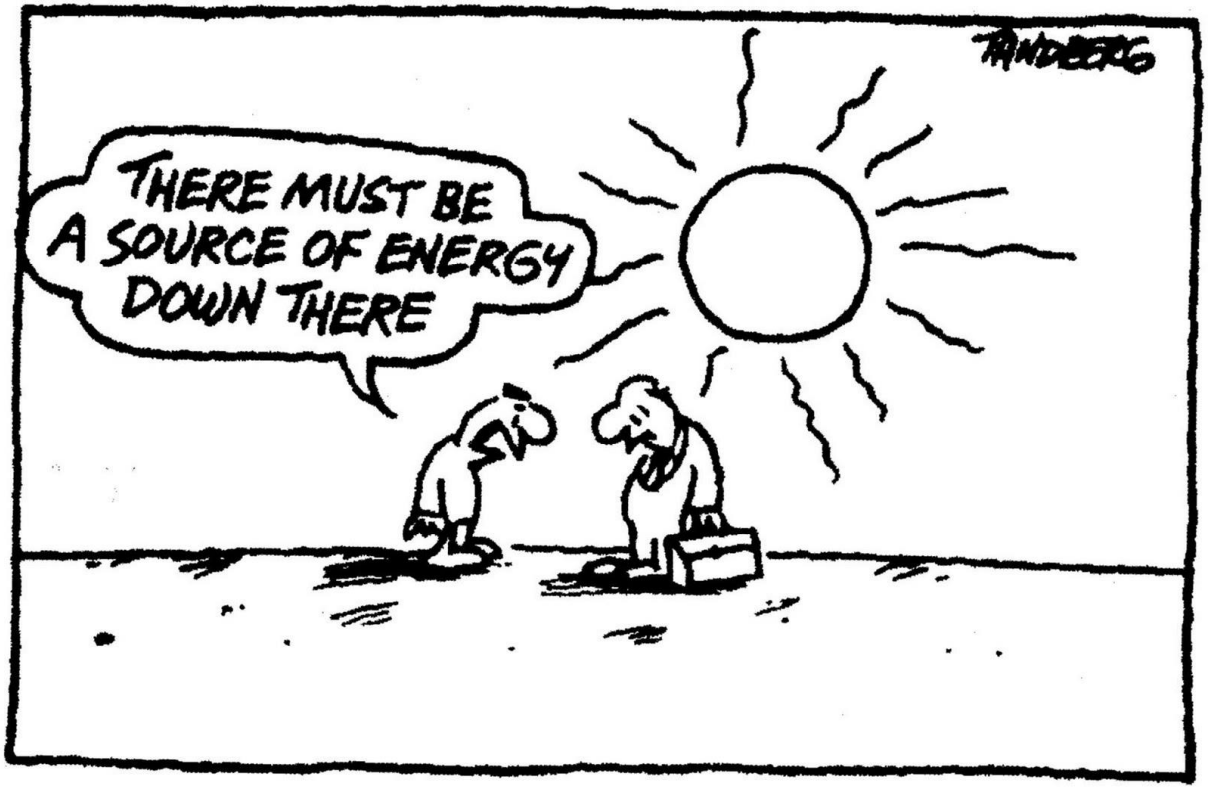
Source: PV Market Alliance – Becquerel Institute 2016

MARKET DRIVERS

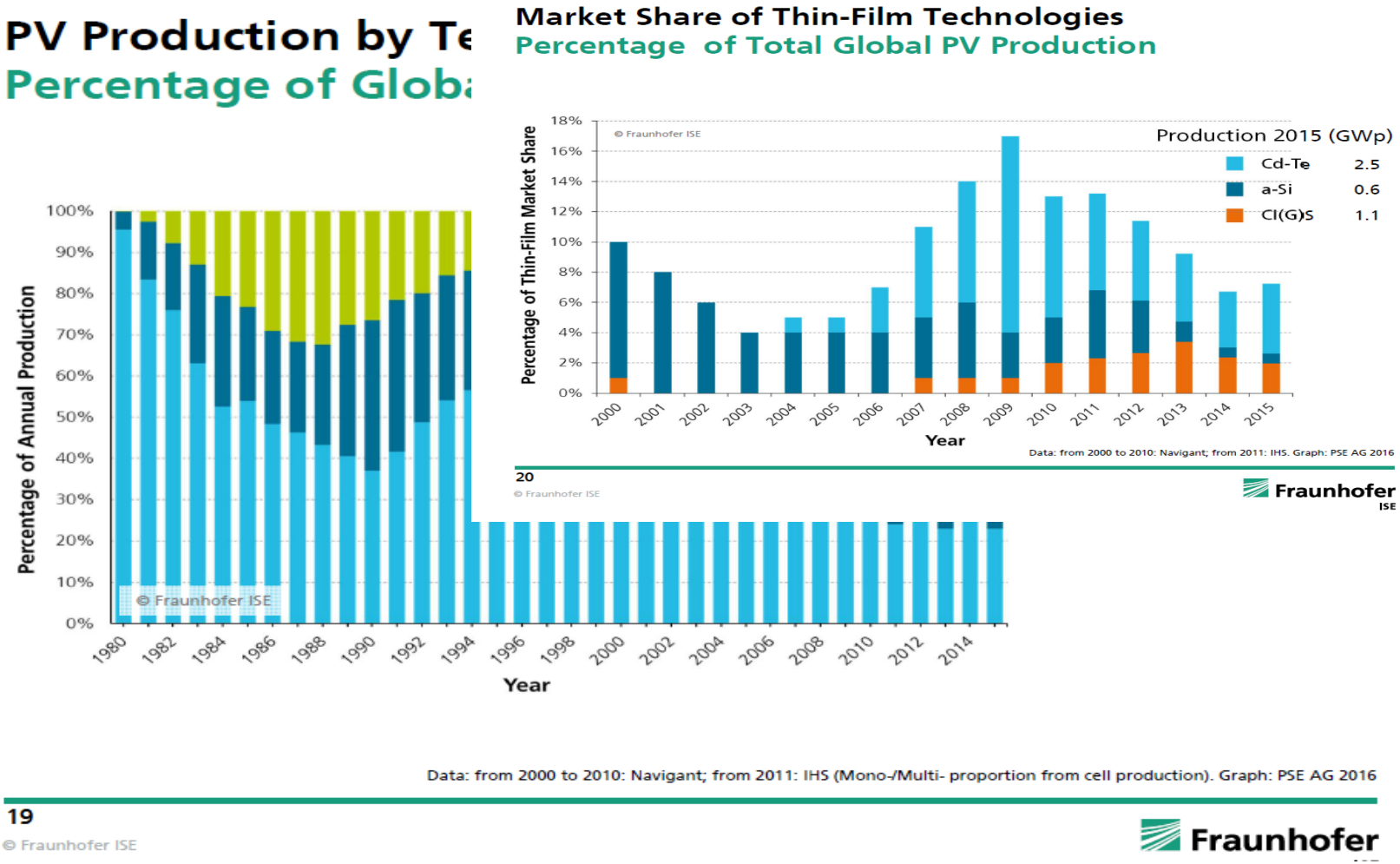
PV market developments in …

- China ?
- Japan – stable or decreasing
- US – uncertain after 2017
- India growing
- Europe – stable or growing?
- RoW: stable or growing

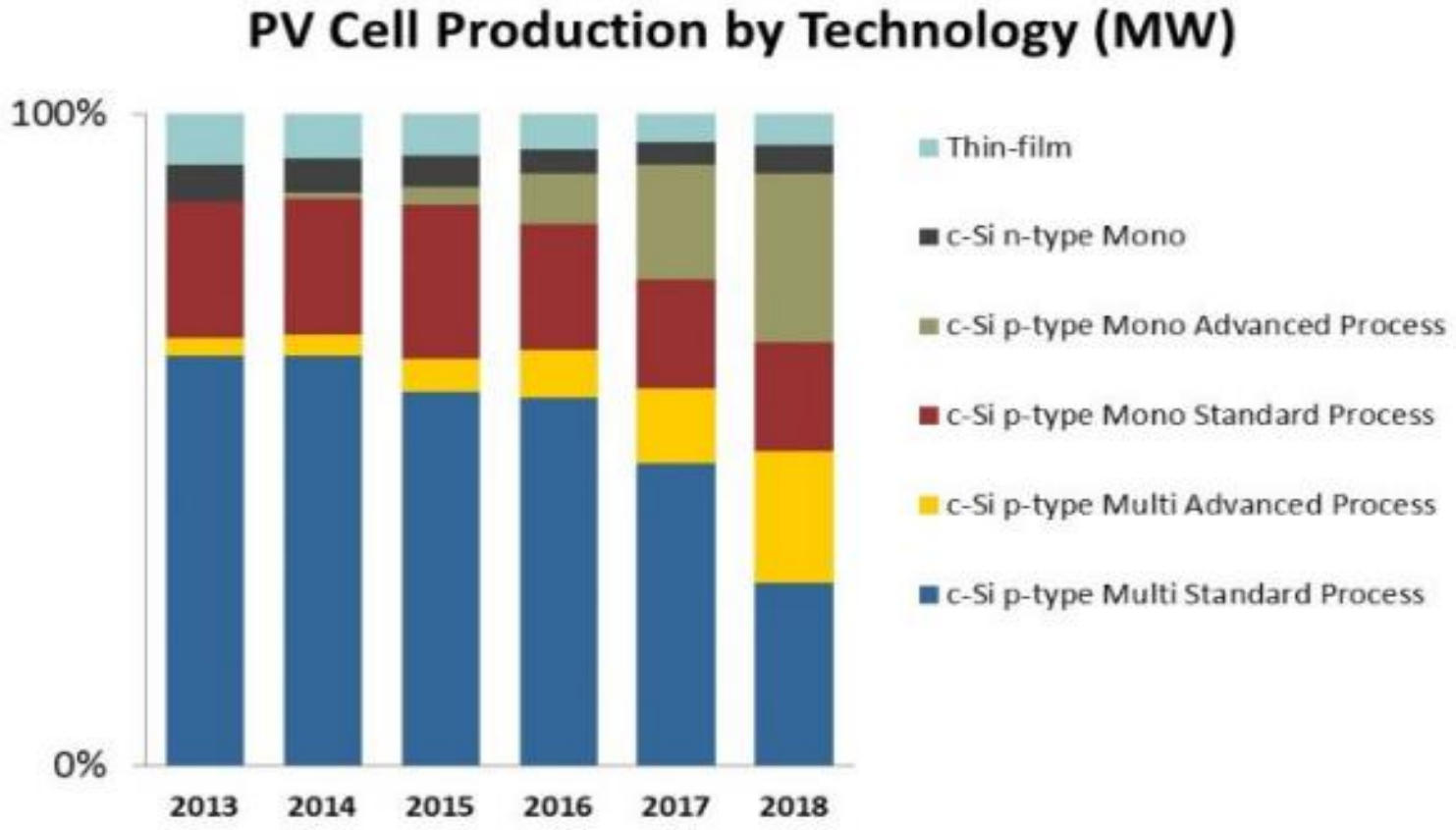
TECHNOLOGIES



TECHNOLOGIES

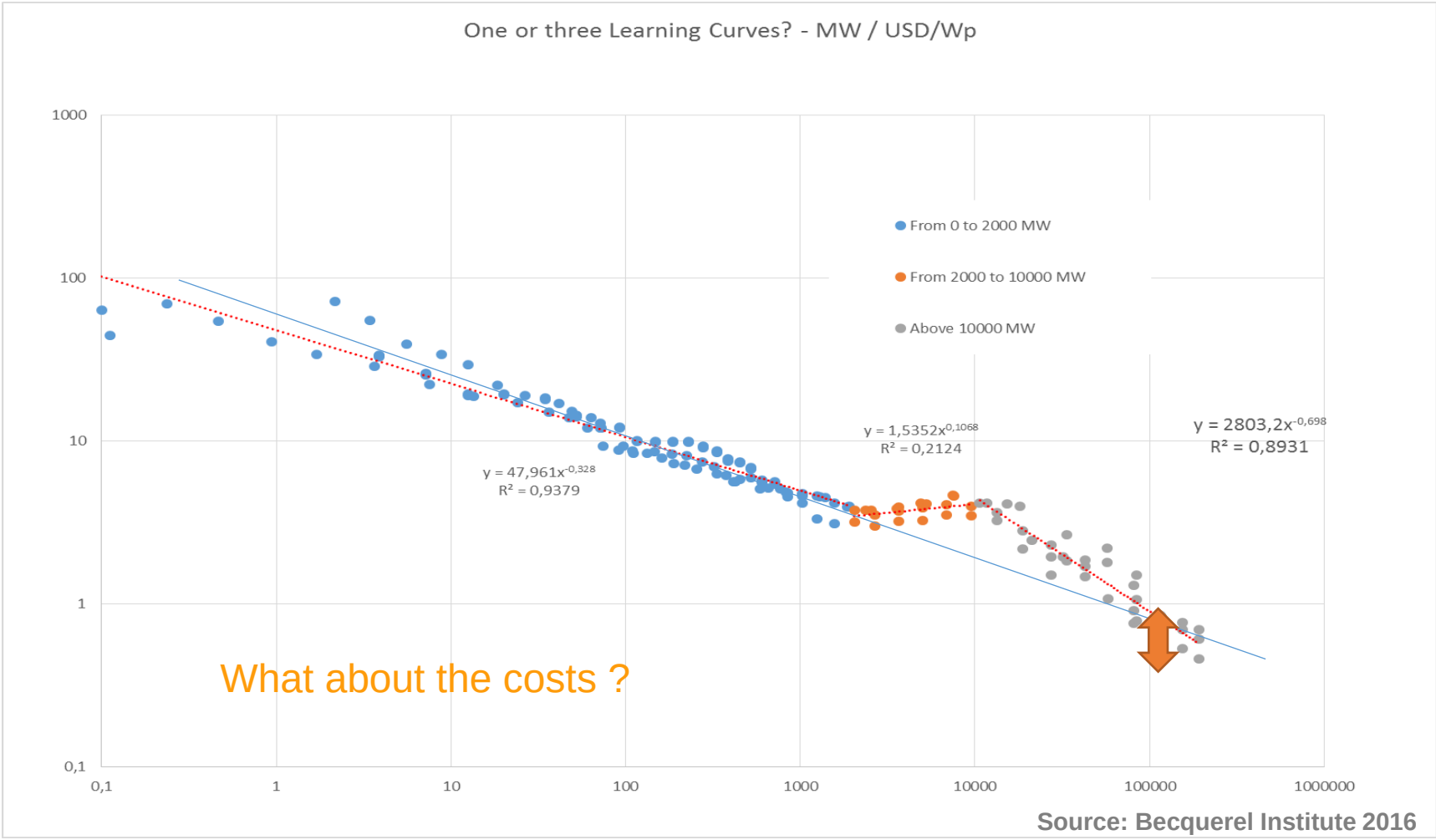


COMING SOON

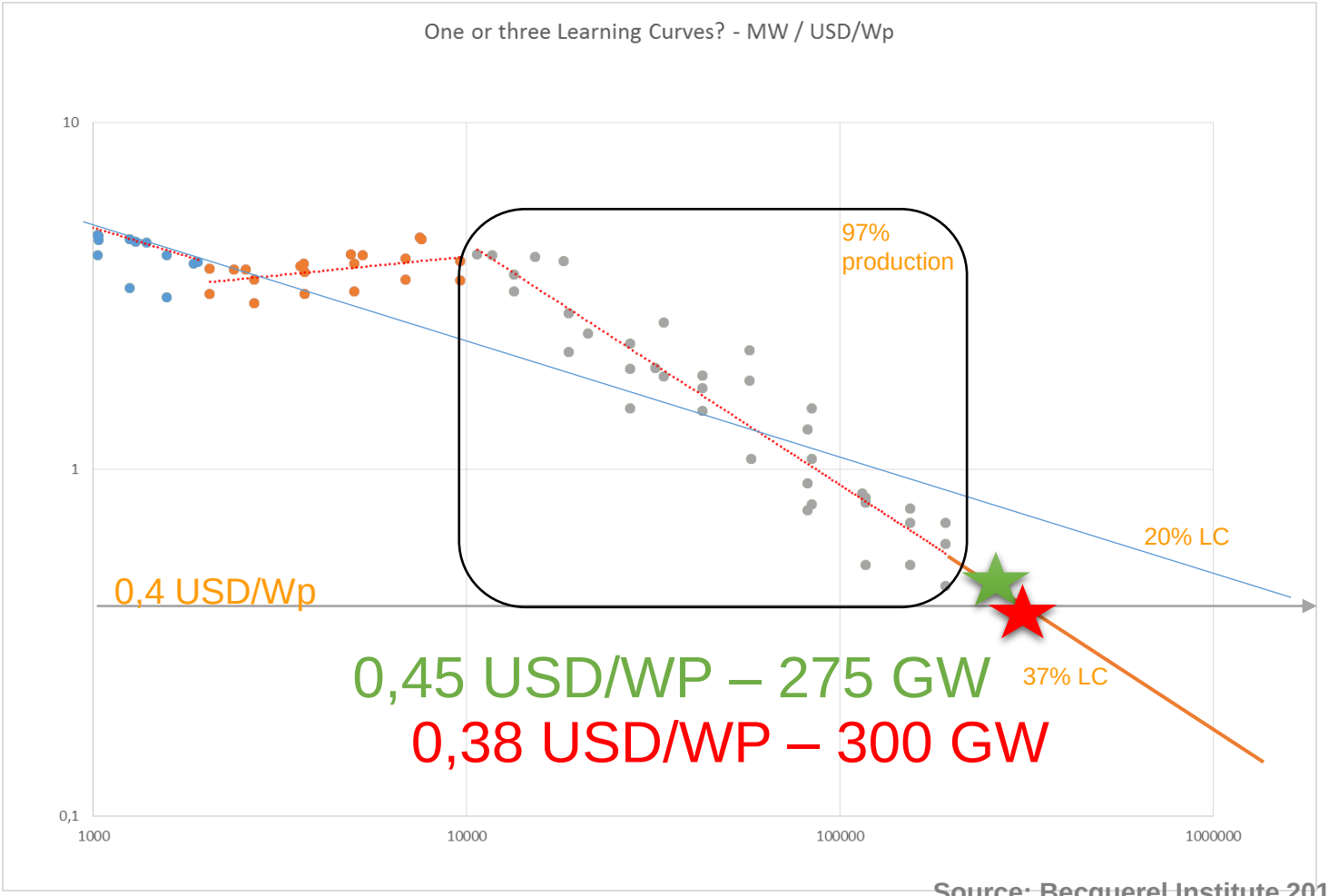

PV Cell Production by Technology (MW)
100%
0%
2013
2014
2015
2016
2017
2018
Thin-film
c-Si n-type Mono
c-Si p-type Mono Advanced Process
c-Si p-type Mono Standard Process
c-Si p-type Multi Advanced Process
c-Si p-type Multi Standard Process

COSTS AND PRICES

ANOTHER PERSPECTIVE

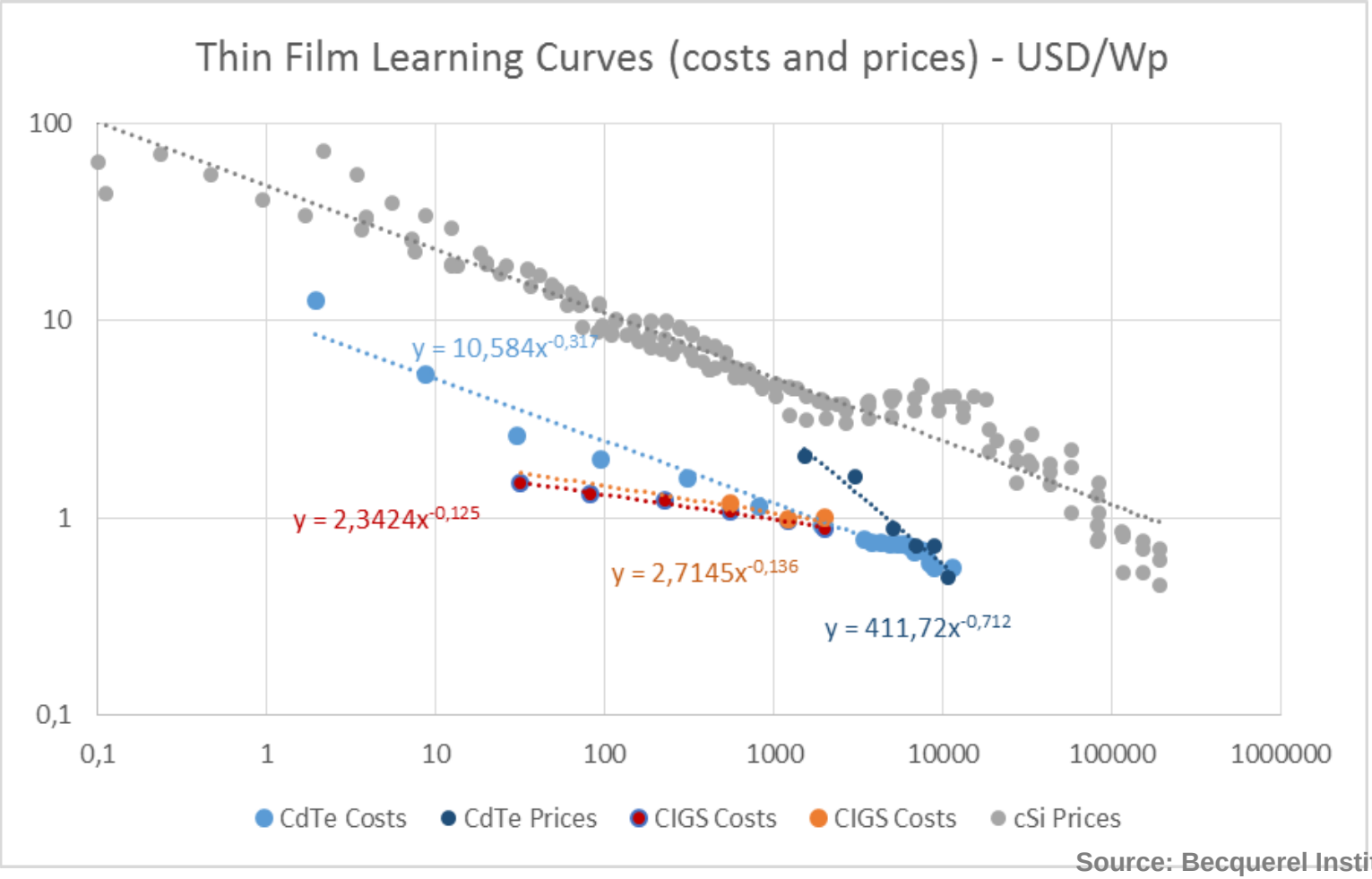


PV PRICE LEARNING CURVE



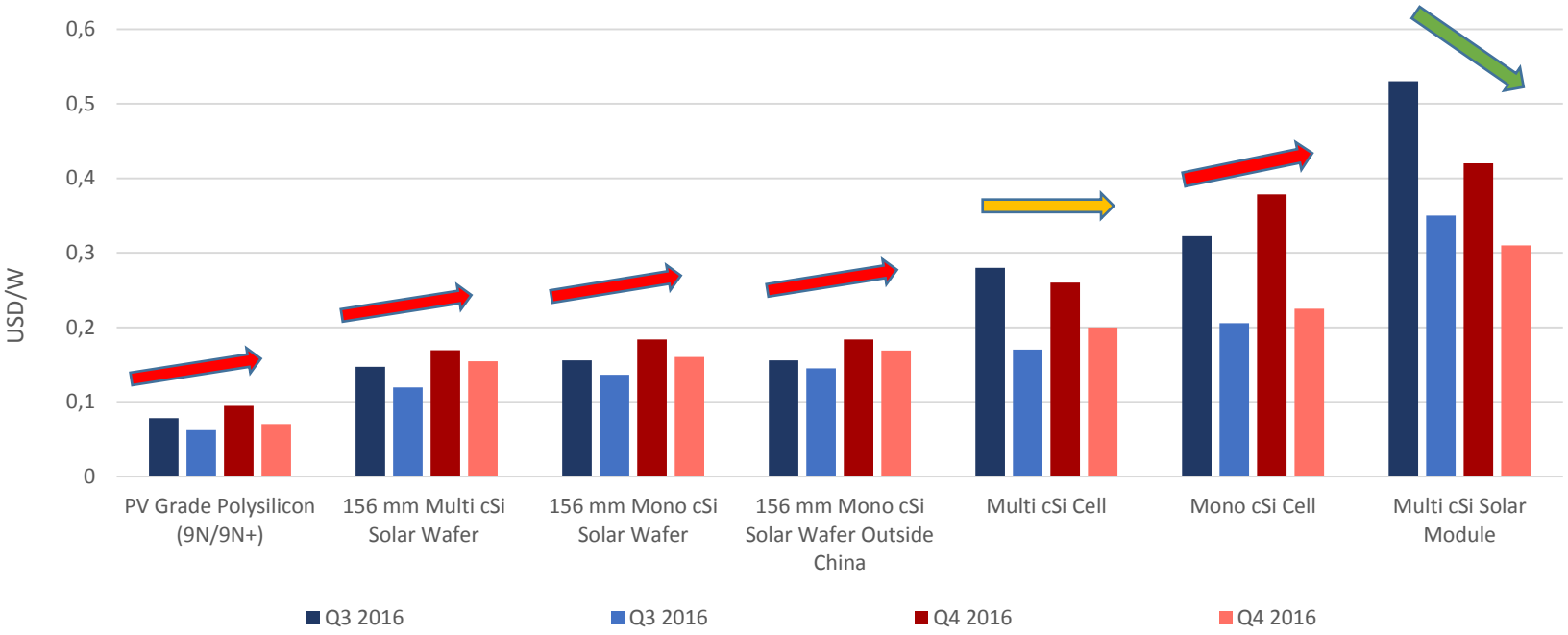
Source: Becquerel Institute 2016

4.2. THIN FILM LEARNING CURVES



Source: Becquerel Institute 2016

PRICE EVOLUTION OF PV COMPONENTS

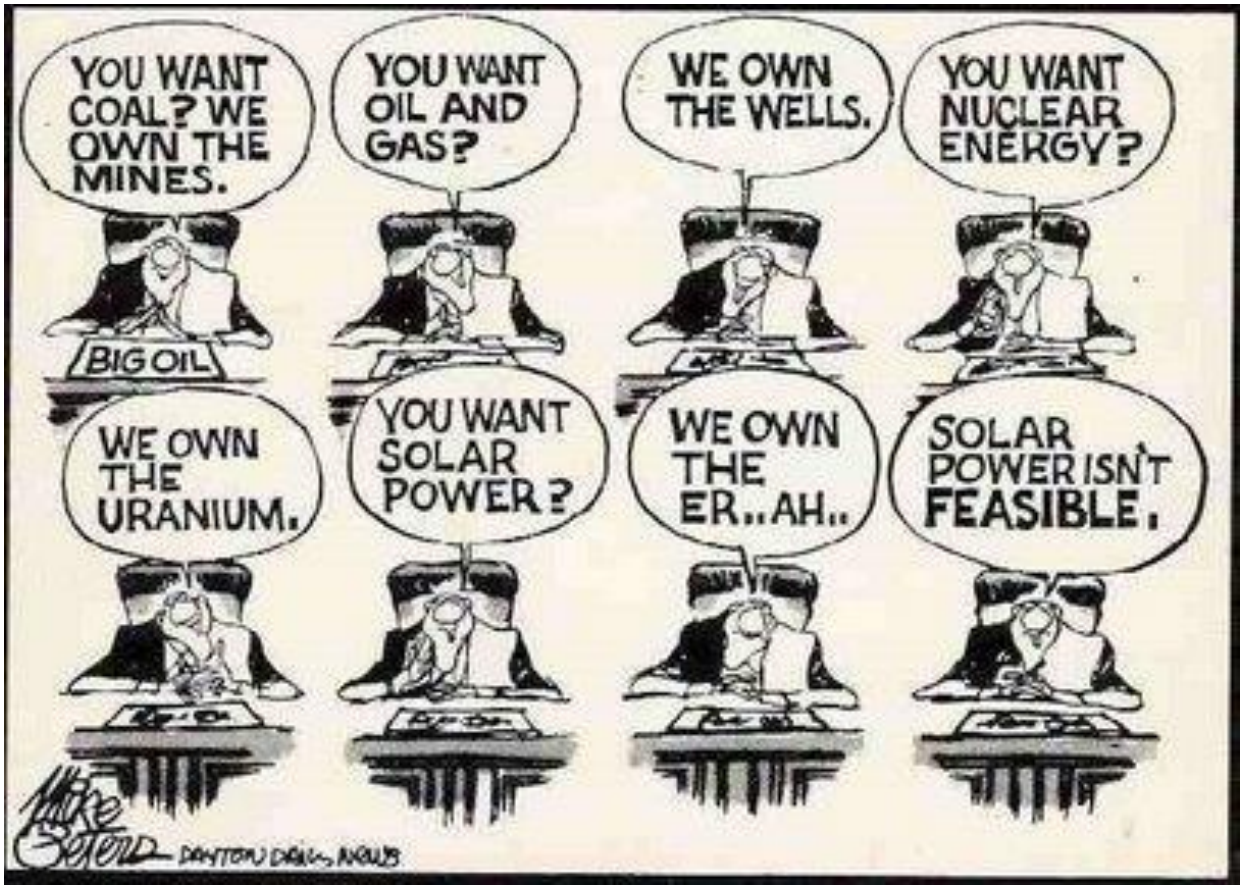


Source: Becquerel Institute 2017

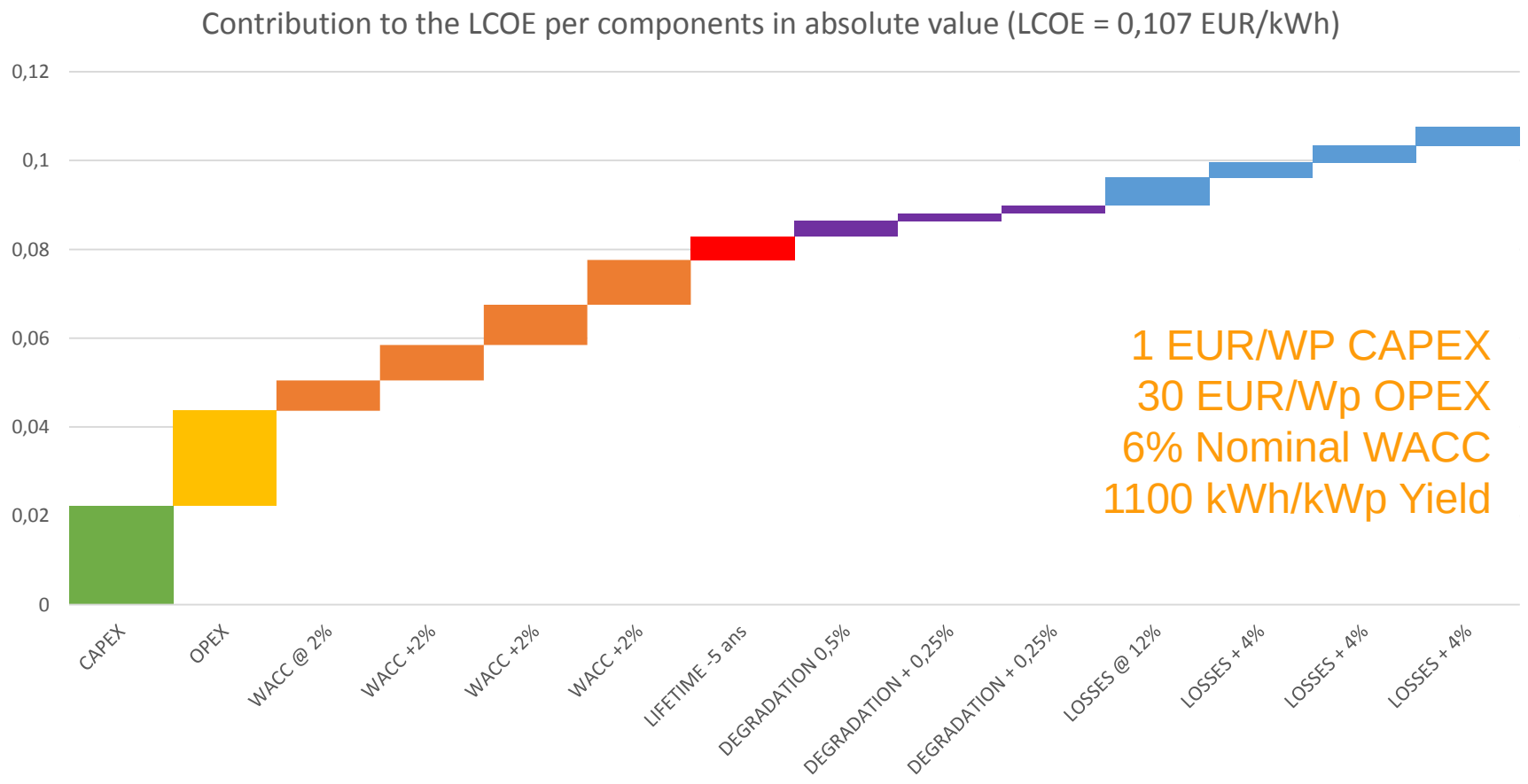
PRICE AND MARKET SITUATION

- Low module prices reflect uncertainty and overcapacities. But what over the other steps of the value chain?
- High demand in Q1 2017 in China could mean a growing market depending on Q3-Q4. Uncertainty again.
- Time to unlock new markets if demand goes down is > 1 year. Faster this time? Non-tier-1 markets are not growing fast.

FOOD FOR THOUGHTS



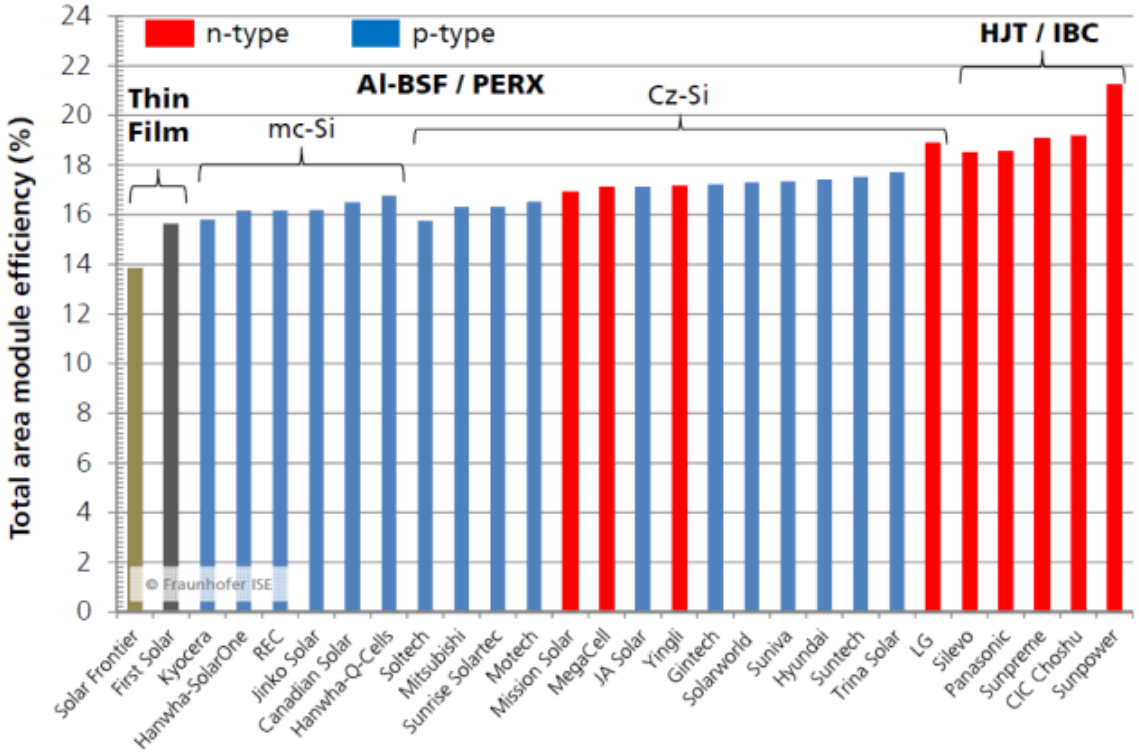
SENSITIVITY OF LCOE



Source: Becquerel Institute 2016

TECHNOLOGY VIEW

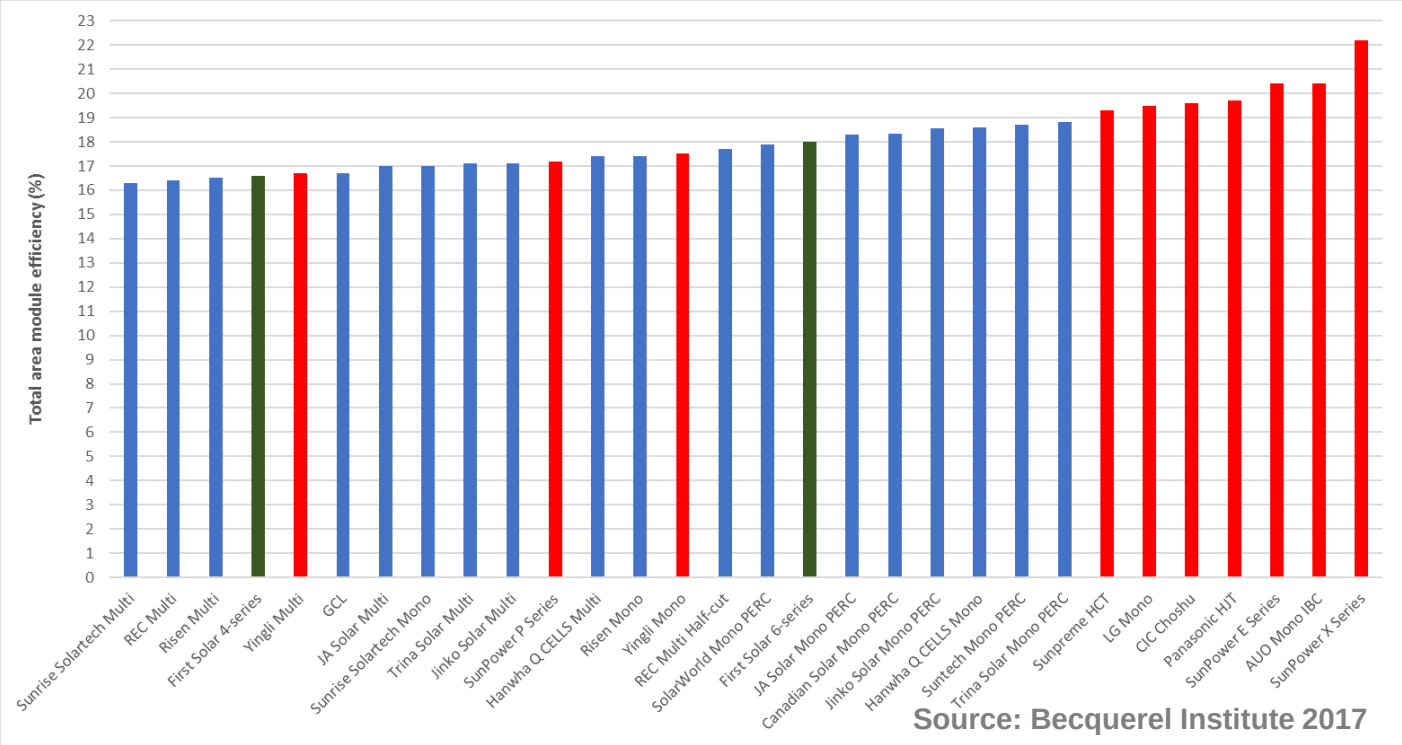
Evolution of efficiencies change the market conditions: from nov 2015



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.



CONCLUSIONS

Will we reach more than 75 GW ? Yes but when?

China is the key market to follow.

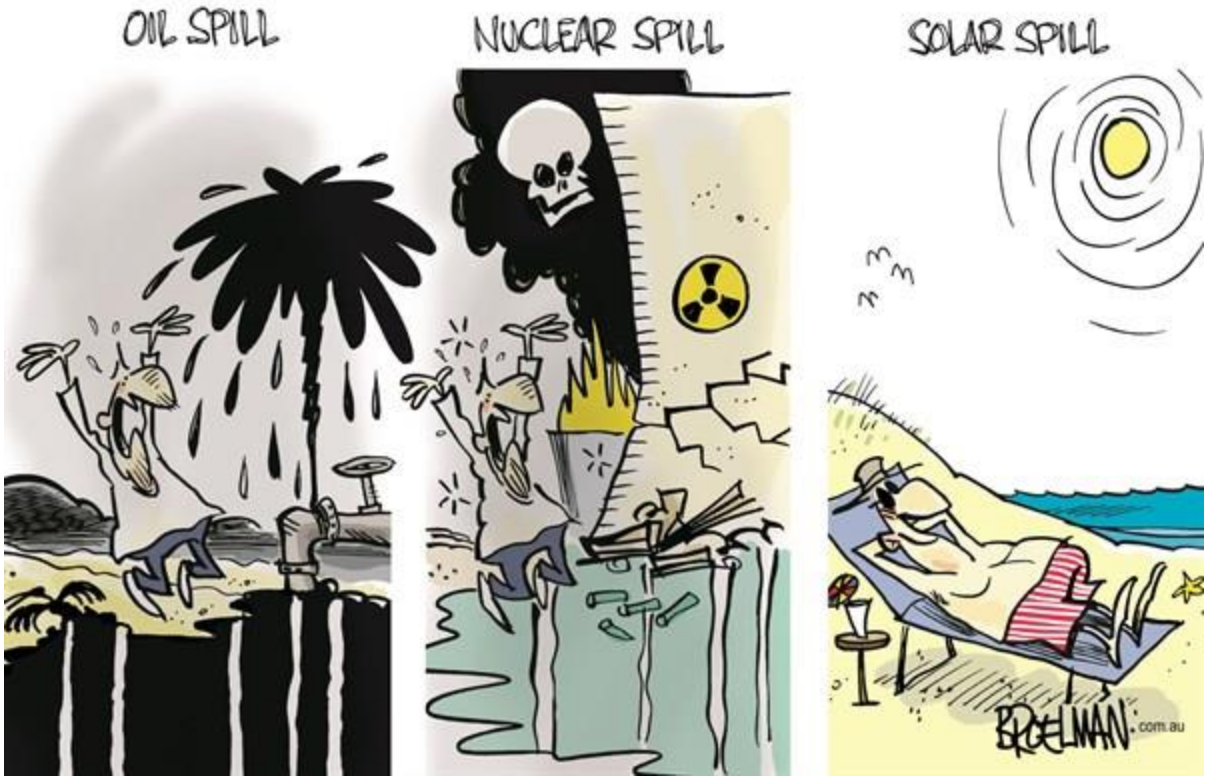
And the speed at which the market can develop.

Technologies are not eternal.

Leaders are also under pressure.

The future is open ☺

ENJOY THE SUN EVEN IF…



Thank you for your attention

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