

# Peaks and policies

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M. Sc. Engineering Physics

PhD in Energy and Environment, at Chalmers University of Technology,  
Gothenburg, Sweden.

Short Post-doc at the Bavarian School of Public Policy, München, in 2019

Enquiry secretary in the investigation on biogas markets for the Swedish  
Government 2019

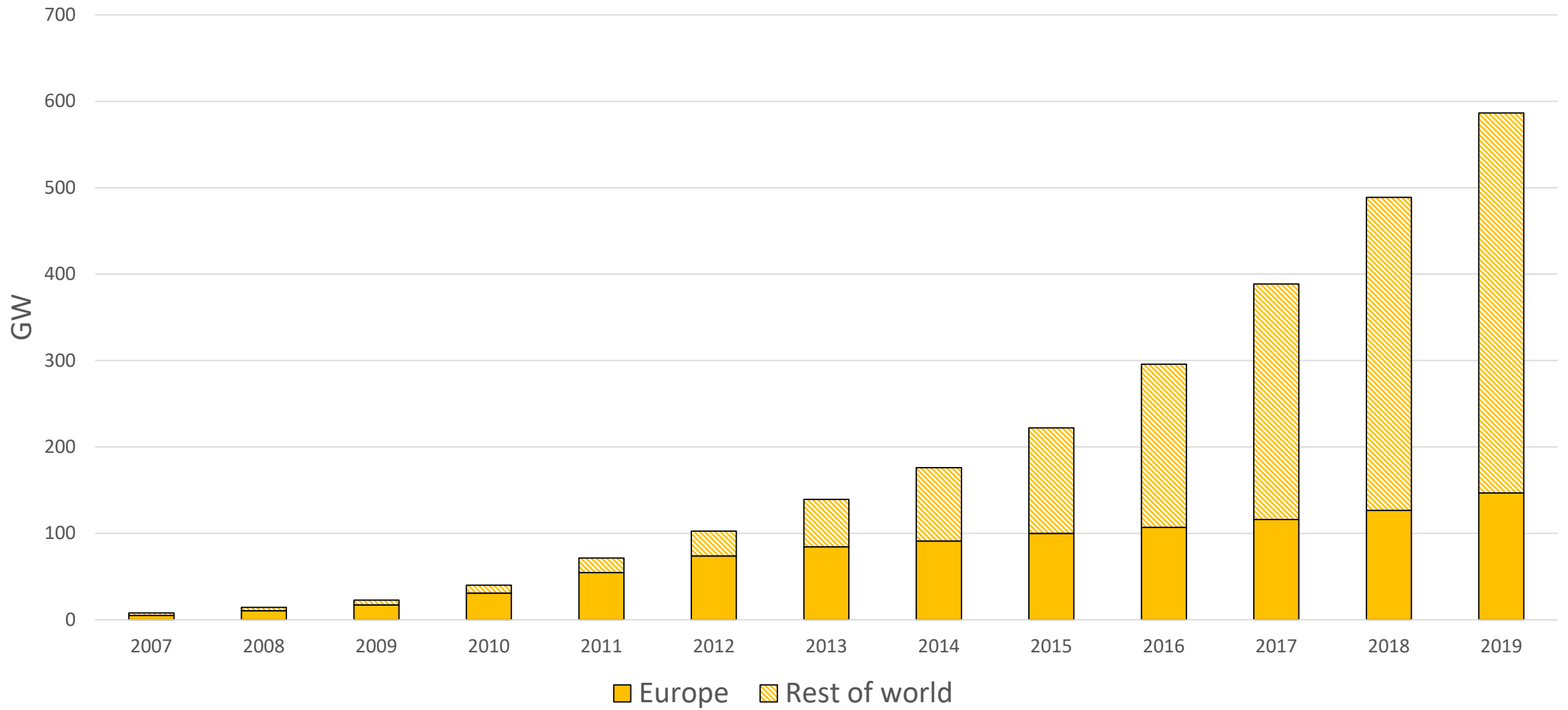
Currently a researcher, working with energy systems, modelling, and policy  
analysis at RISE (Research Institute of Sweden).



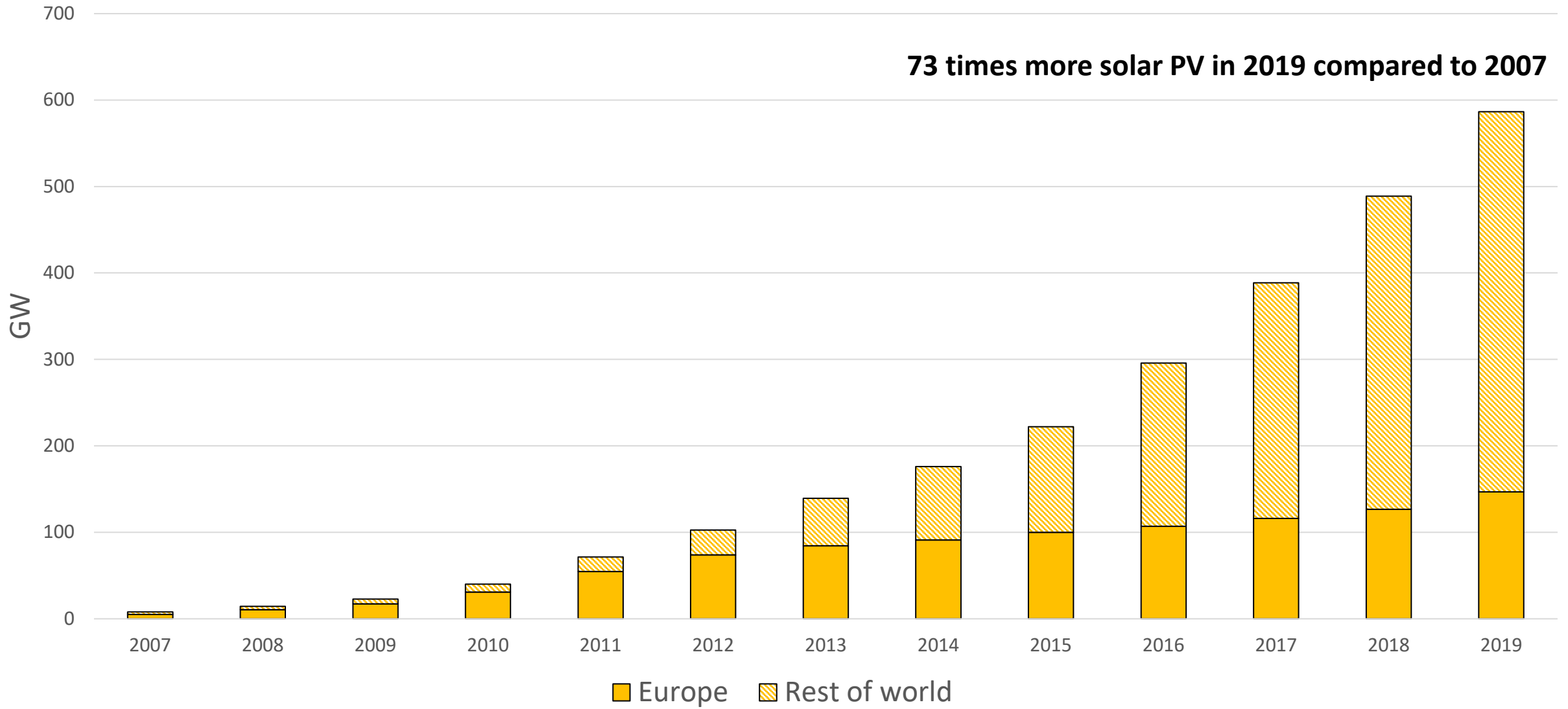
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To keep global warming below 1.5 °C electricity generation from solar and wind power is assumed to grow by a factor of somewhere between **5 and 170-times** from **2020 to 2050**, in the mitigation pathways presented in the IPCC report “Global Warming of 1.5 °C

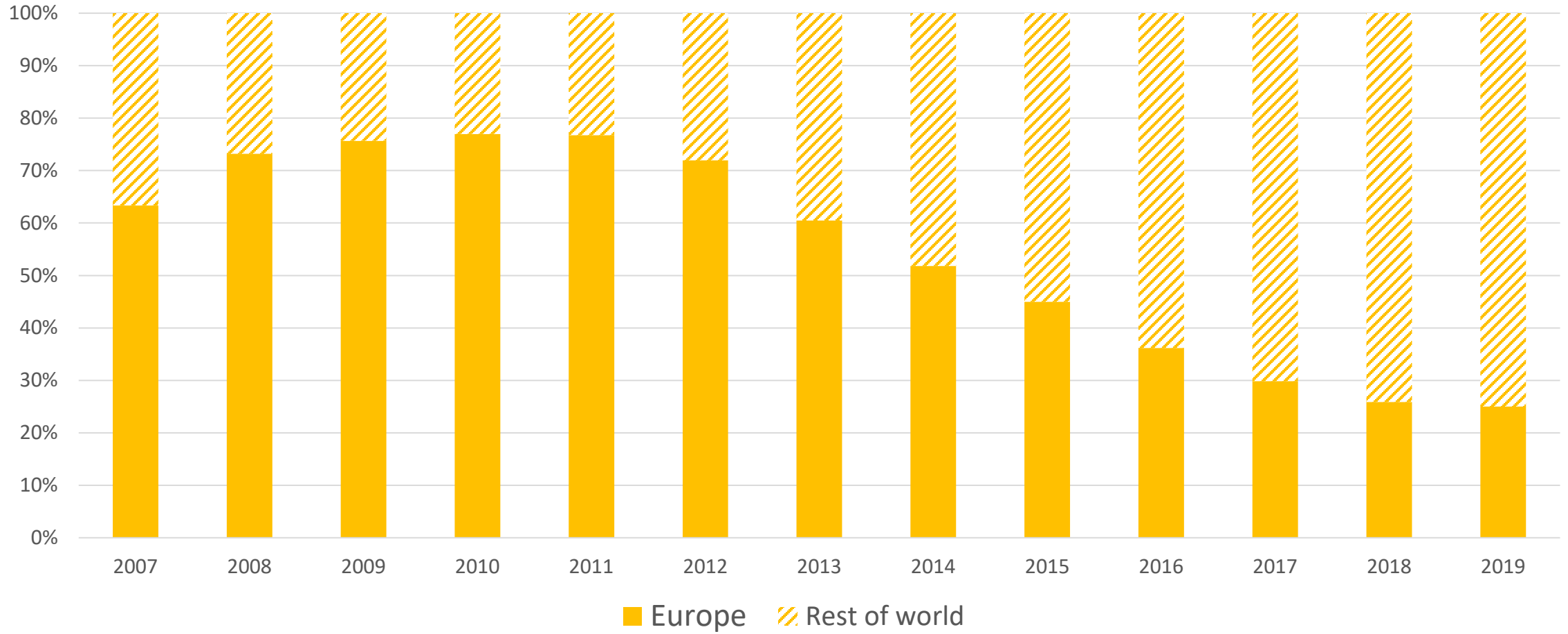
# Cumulative installation of solar PV



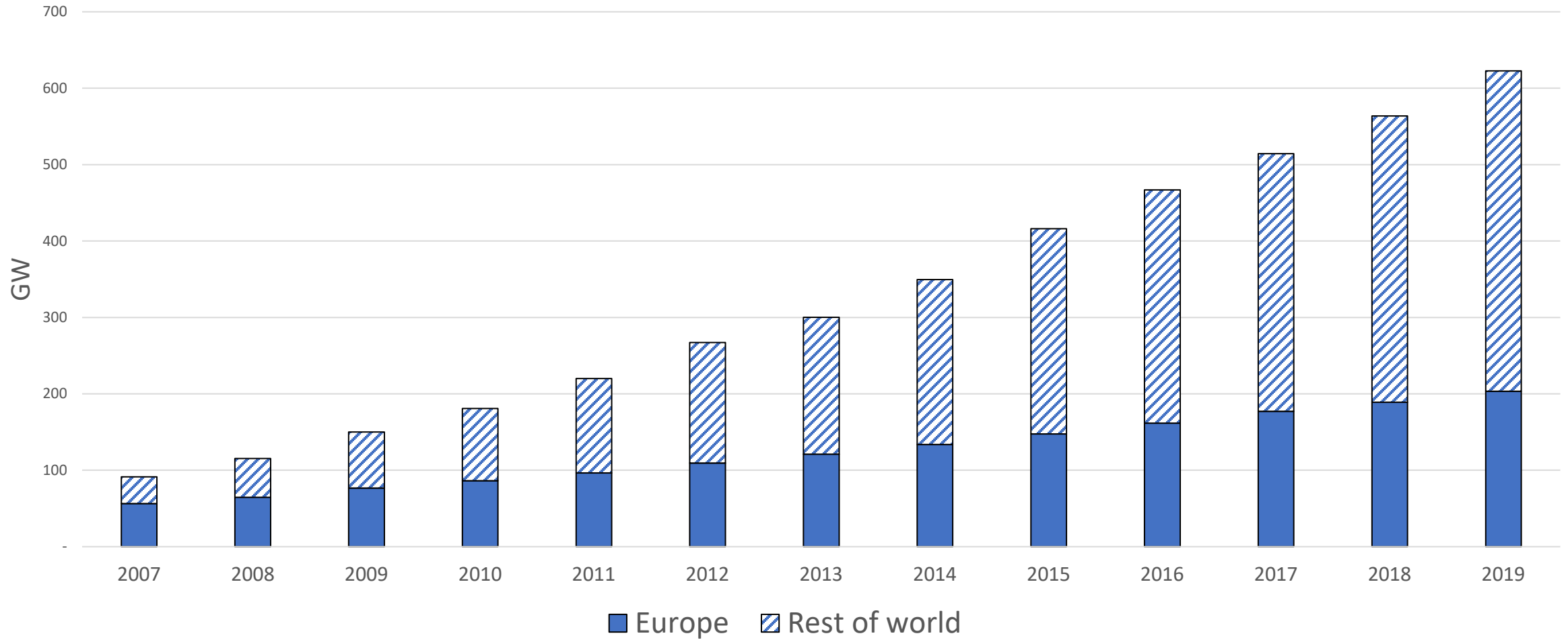
# Cumulative installation of solar PV



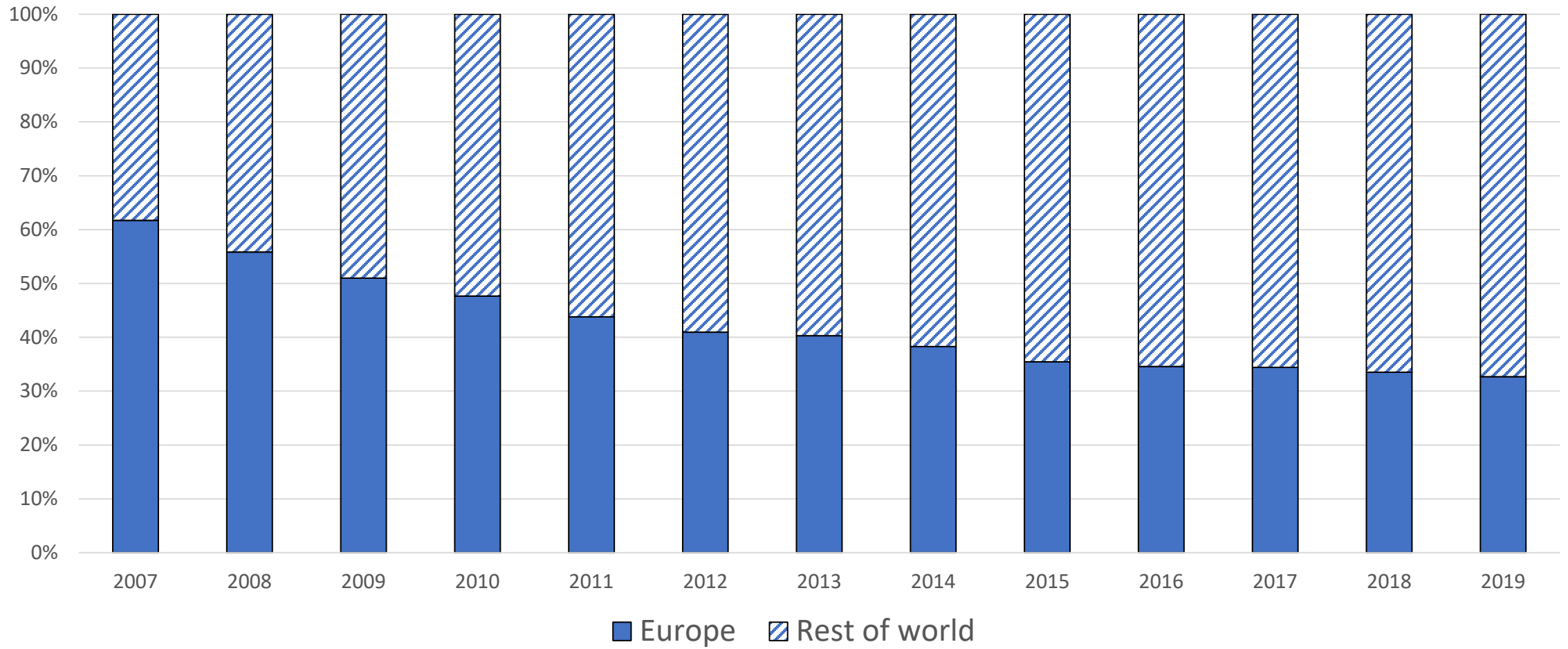
## % of installed solar PV



# Cumulative installation of wind power

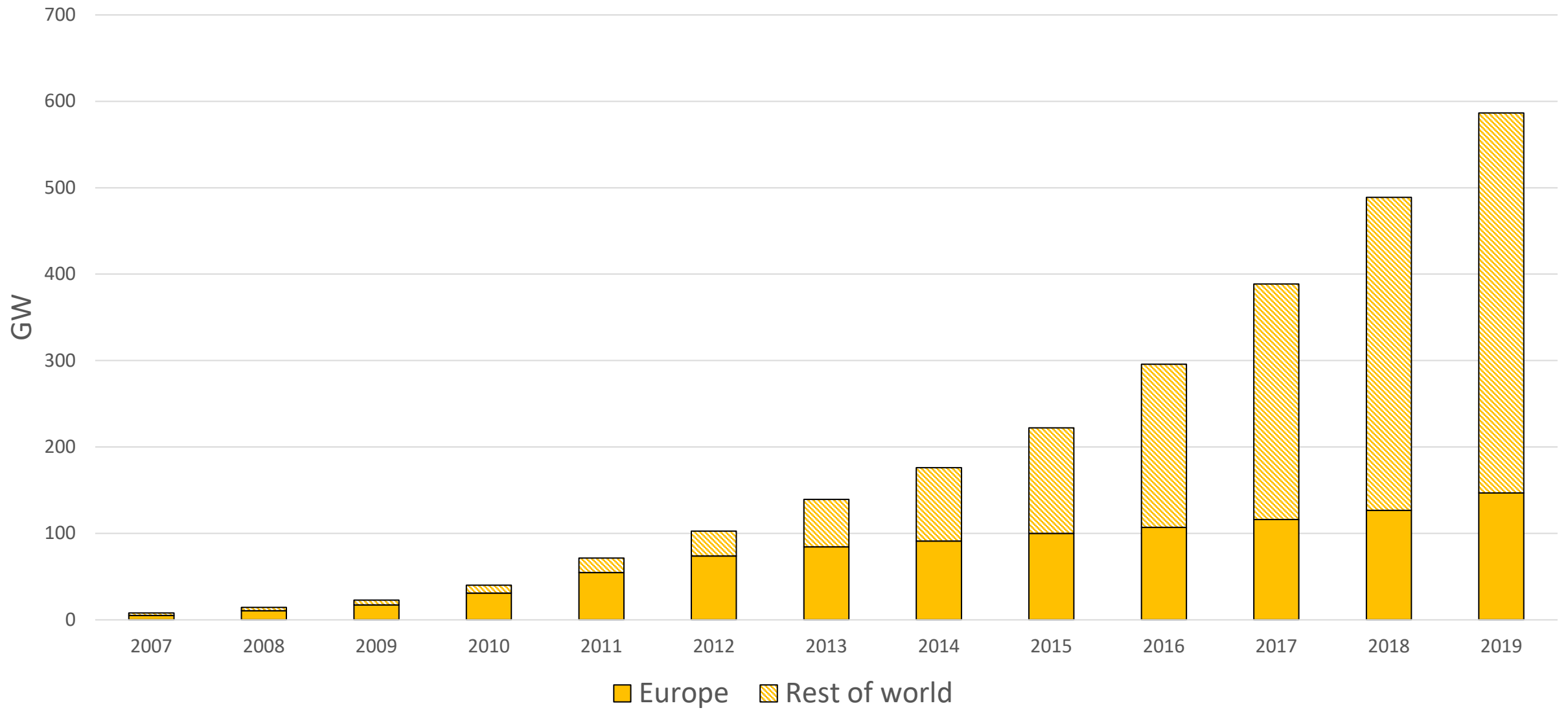


% of installed wind power



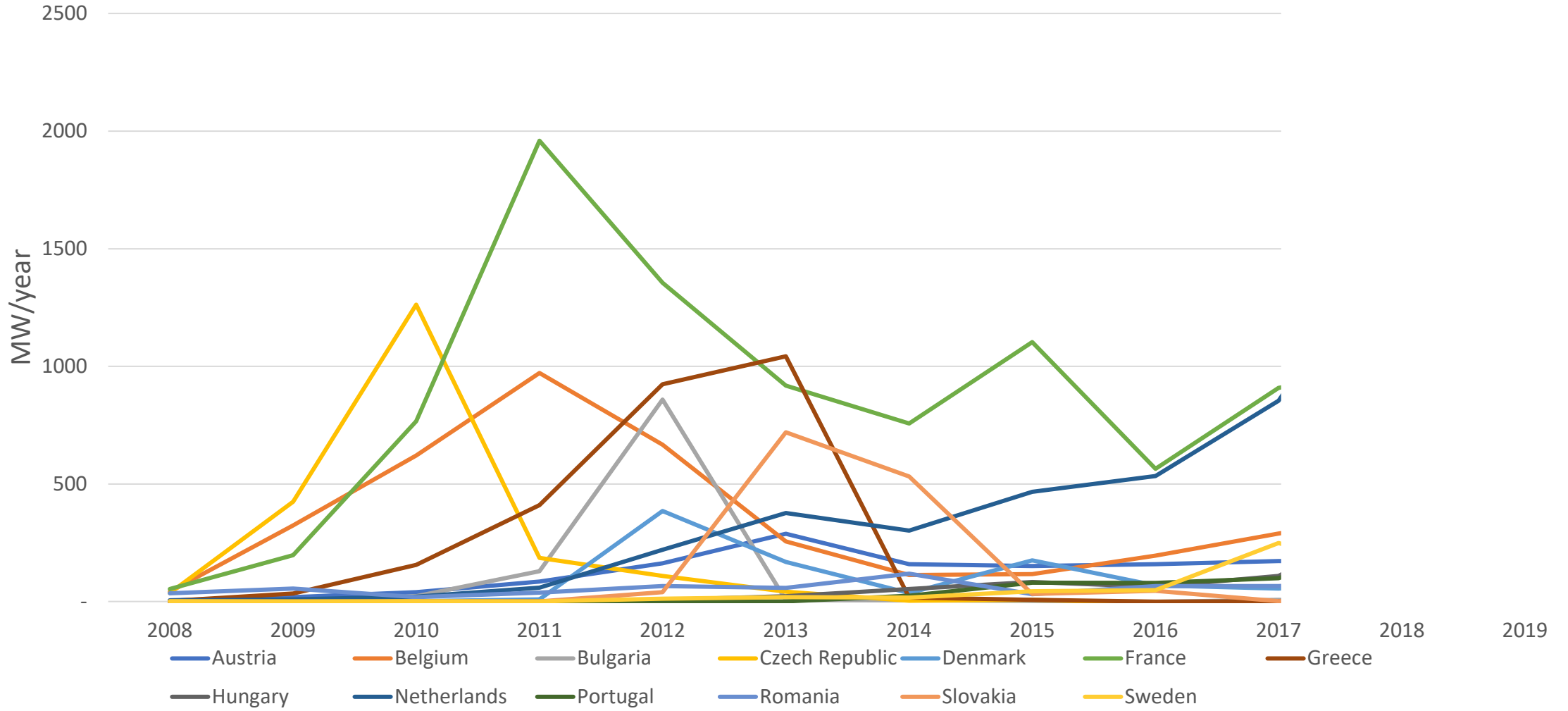


# Cumulative installation of solar PV



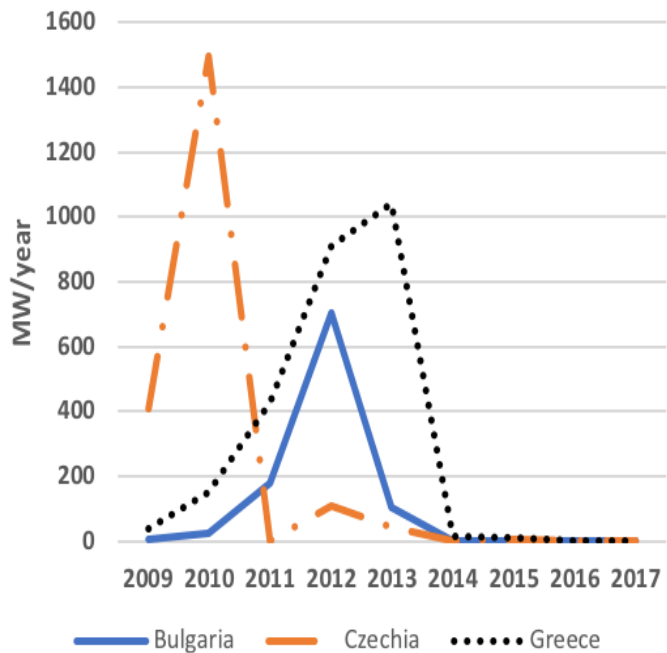


# Yearly installation rates of solar PV in Europe

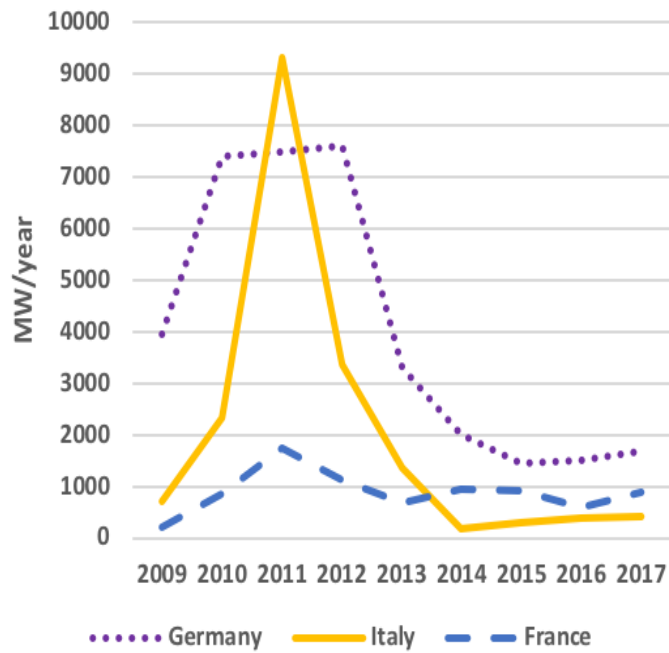




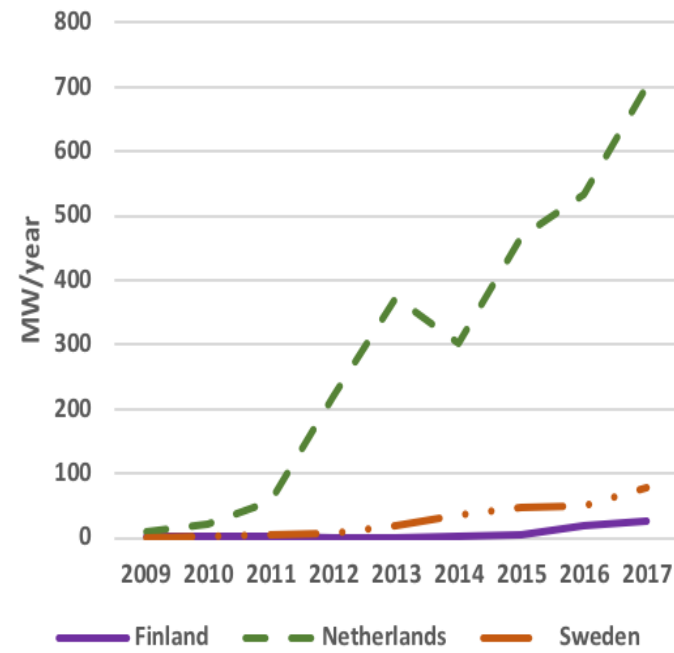
### Peak-and-Crash countries



### Peak-and-Plateau countries



### No-Peak-(Yet) countries



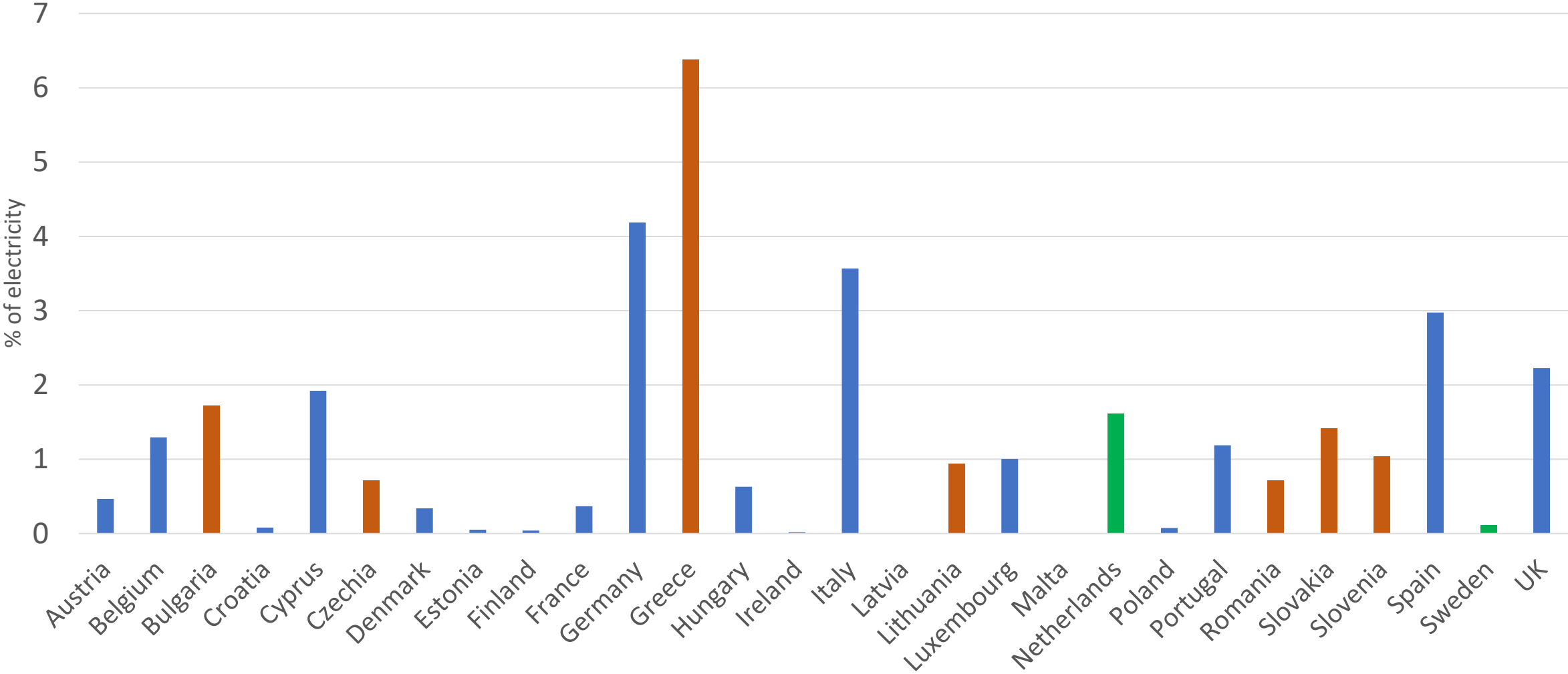
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Why did installation rates of solar PV peak in so many European countries between 2008 and 2015?

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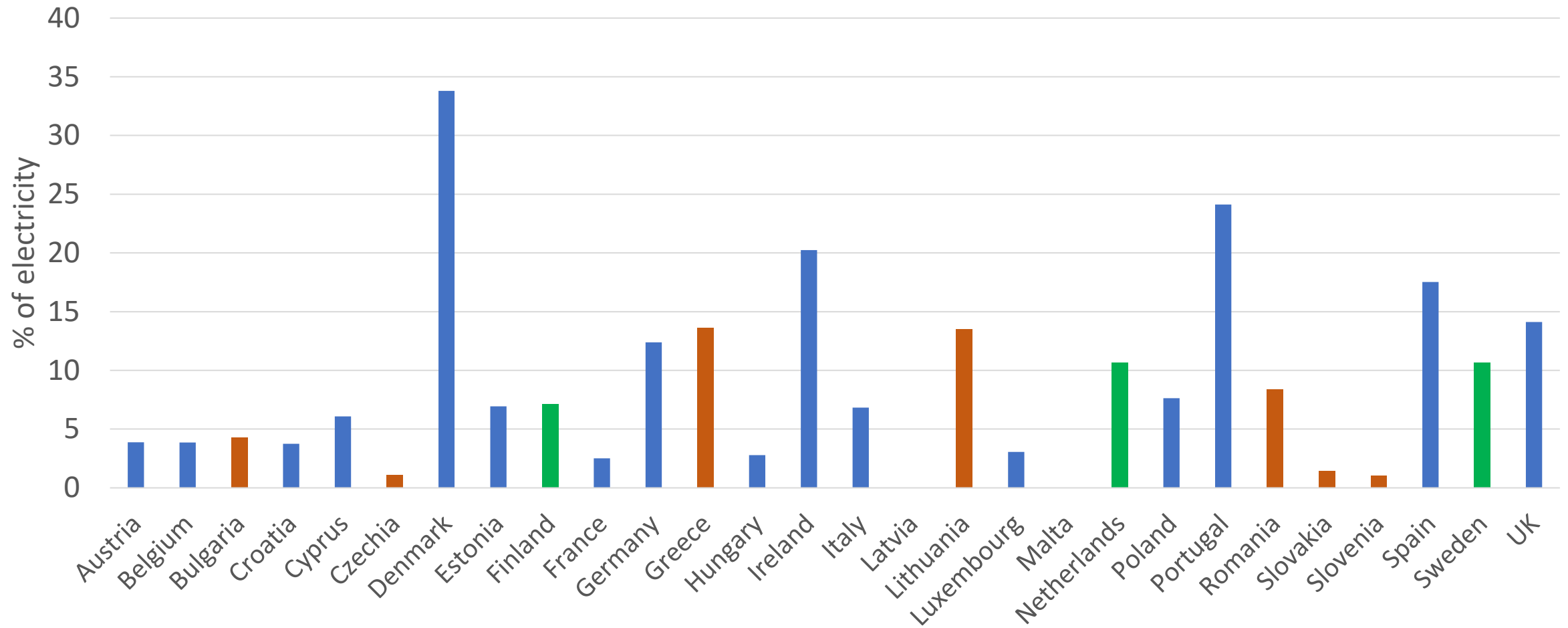
Are there limitations to how much PV can be installed?

# % of electricity from solar PV the year of the PV installation peak



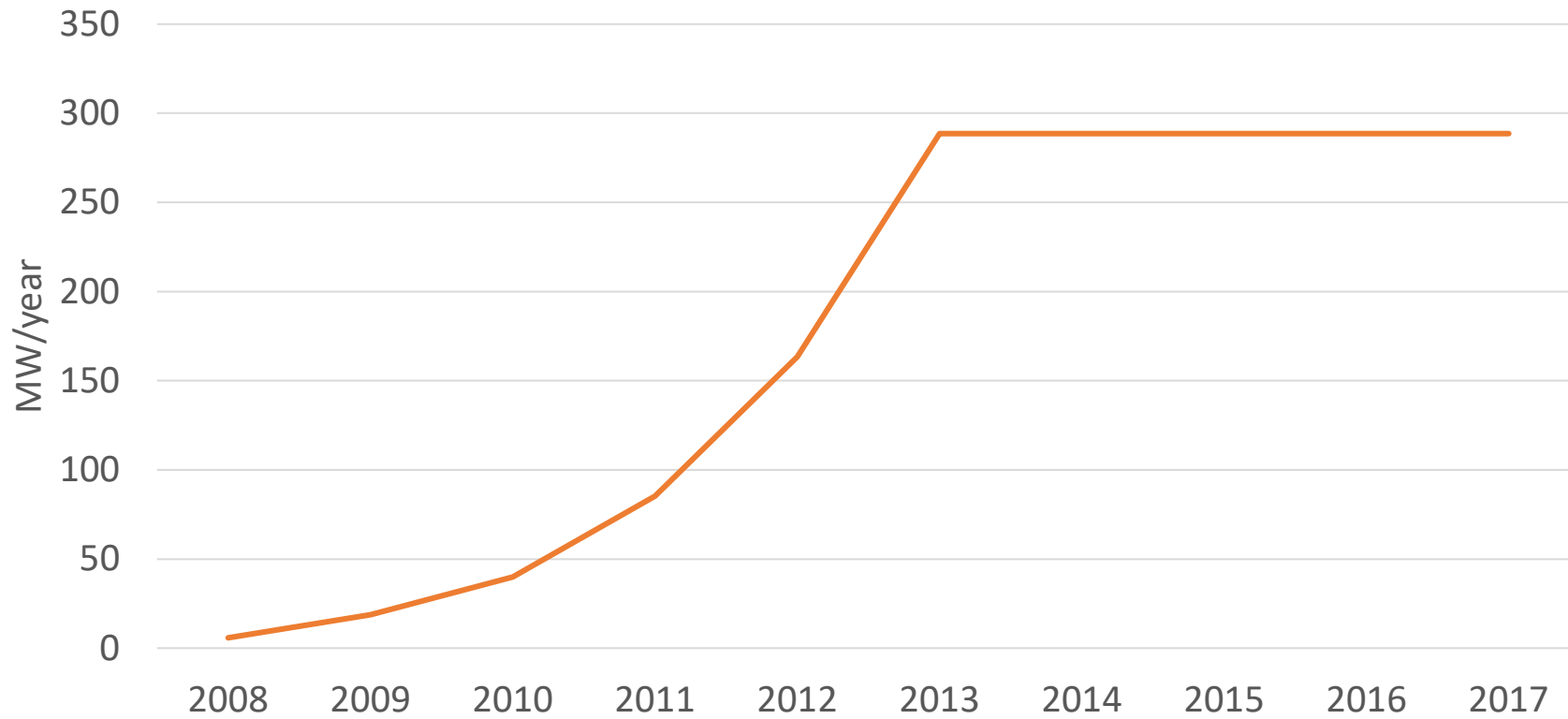


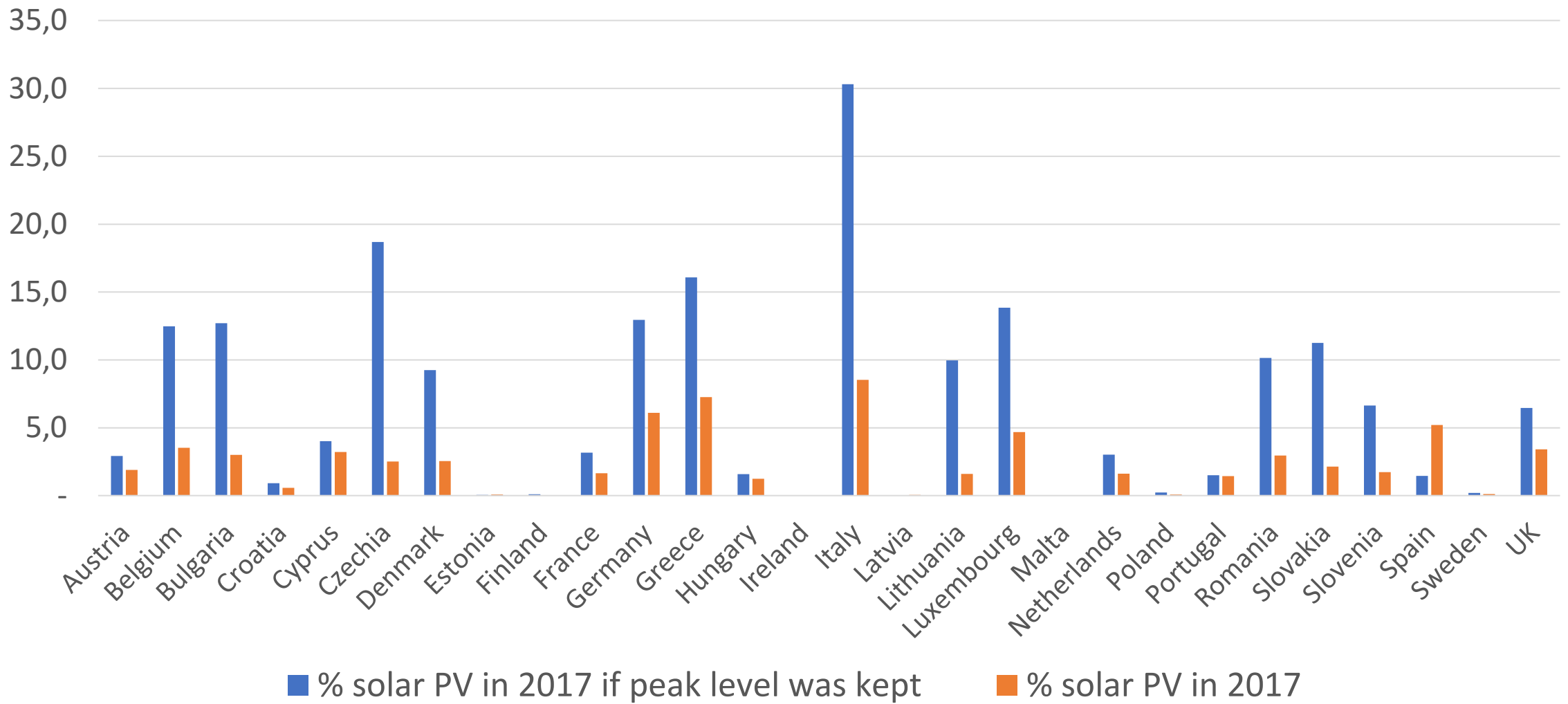
# % of electricity from solar PV and wind power the year of the PV installation peak

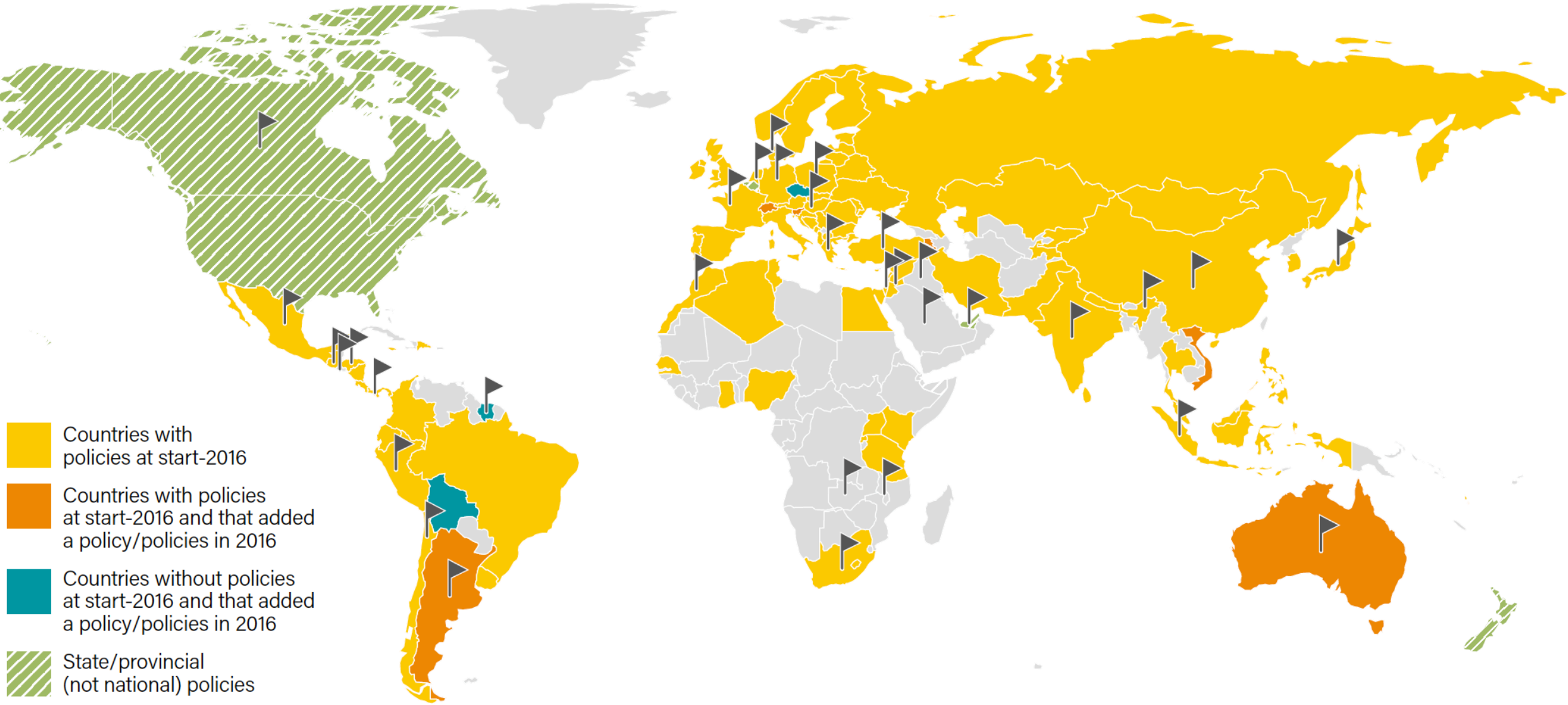


# What would have happened if the solar PV installation pace of the peak year was continued?

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- Countries with policies at start-2016
- Countries with policies at start-2016 and that added a policy/policies in 2016
- Countries without policies at start-2016 and that added a policy/policies in 2016
- State/provincial (not national) policies
- Countries that held renewable energy-only tenders in 2016
- Countries with no policy or no data

Source: REN21 Policy Database

# Development of economic policies for solar PV in the EU

# Economic policies

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Feed-in tariffs – producers of renewable electricity are paid a fixed tariff

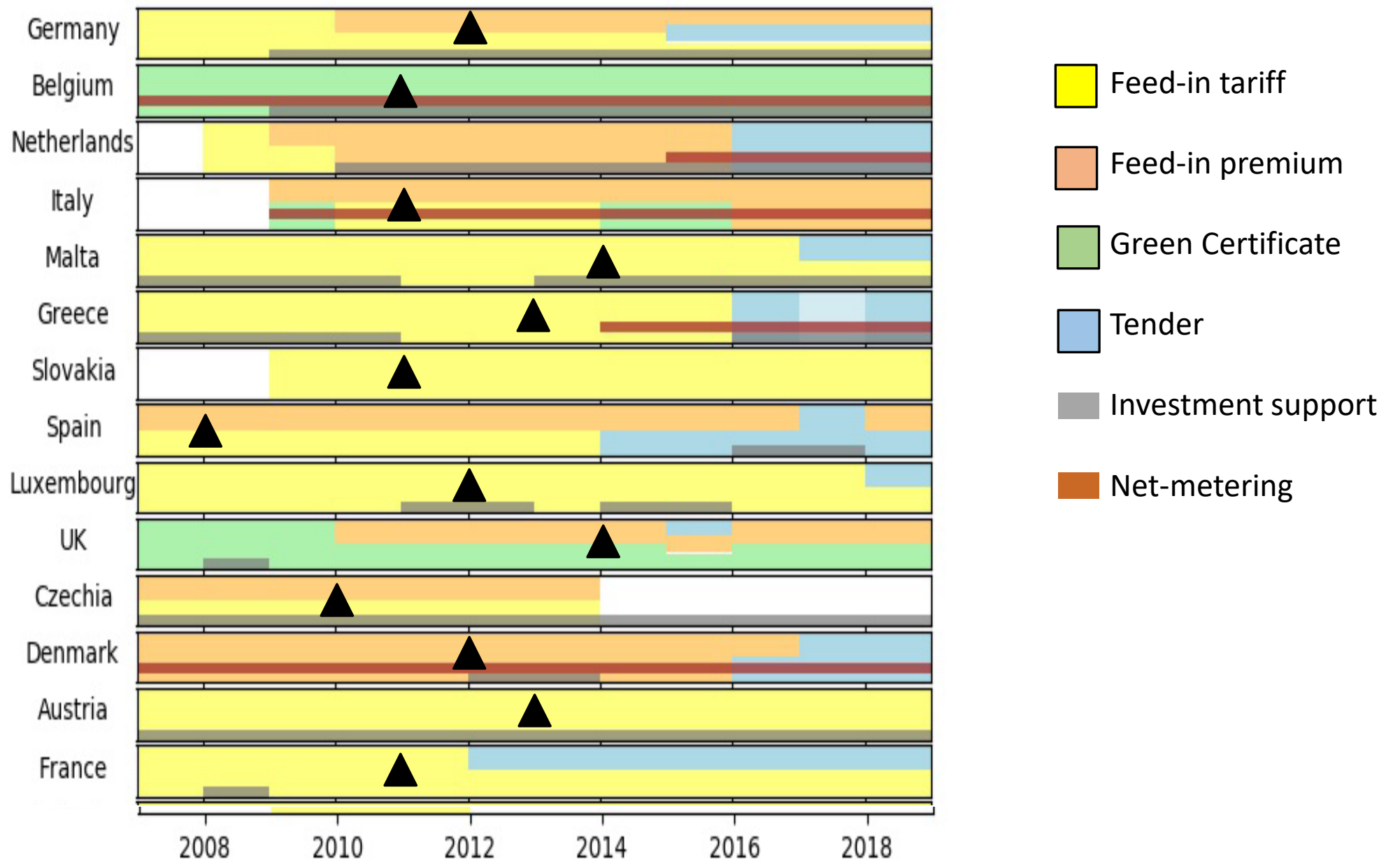
Feed-in premiums – producers of renewable electricity are paid a premium on top of the electricity price

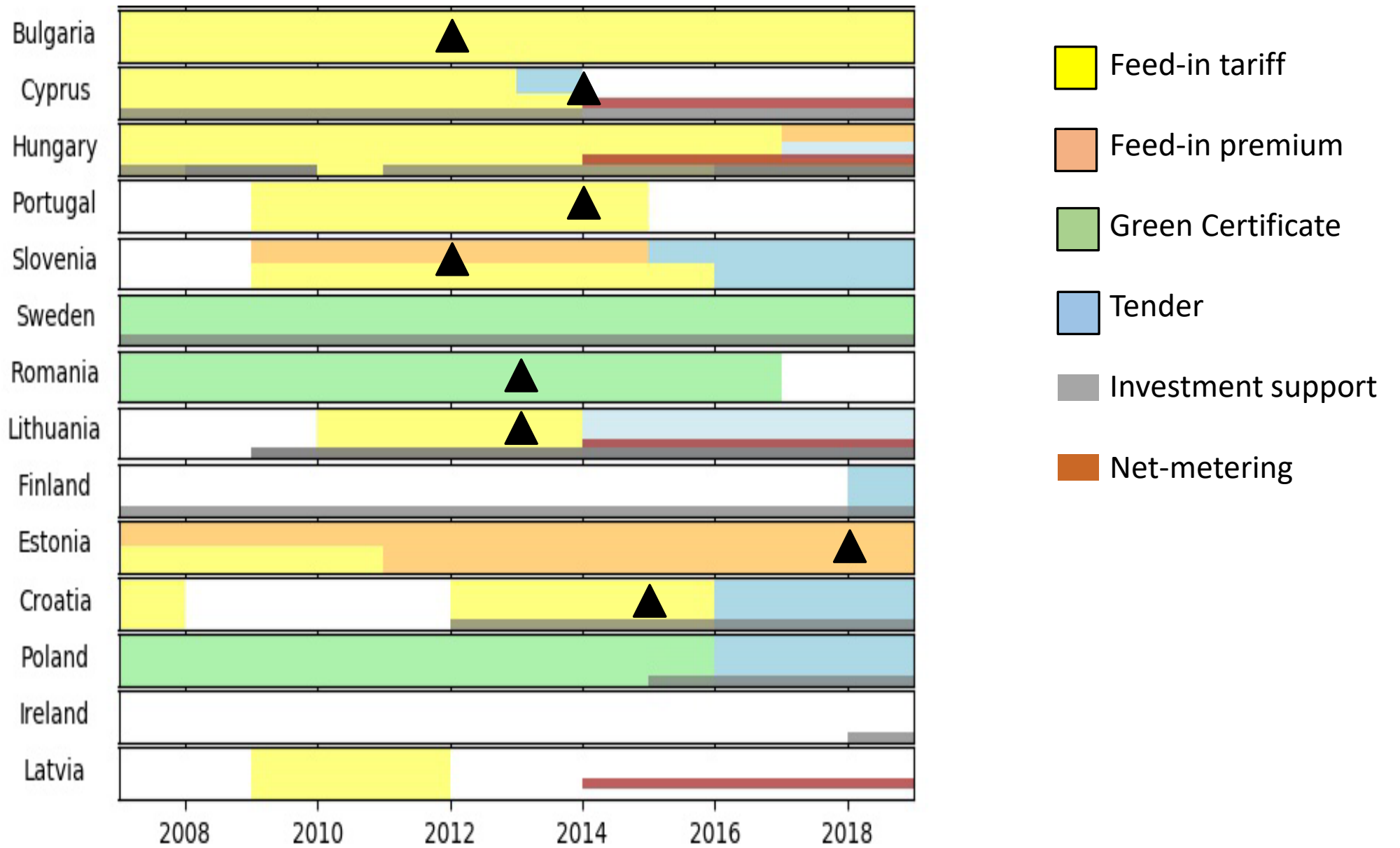
Green certificates/Renewable Energy Portfolio Standards– producers are given a “certificate” for each unit of electricity produced. Consumers are obliged to buy a certain amount of certificates per year.

Reverse auctions/Tenders– producers are submitting bids for the tariff/premium level that they want to be paid for producing electricity. The lowest bids win.

Investment support – producers are given subsidies that covers part of the investment cost.

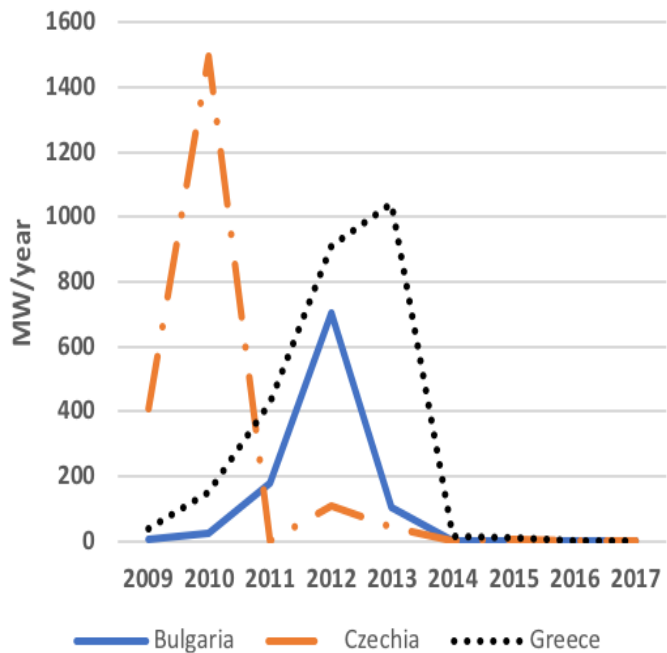
Net-metering –prosumer (for example homeowner) is only billed for the “net” energy used



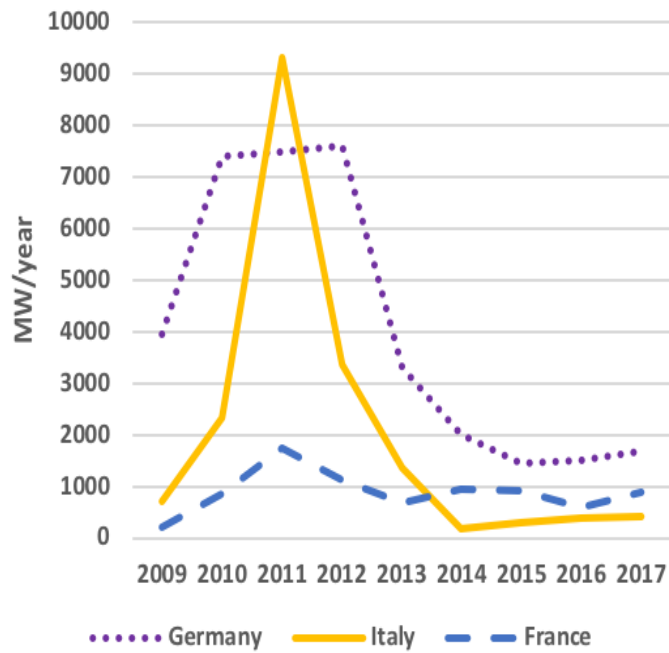




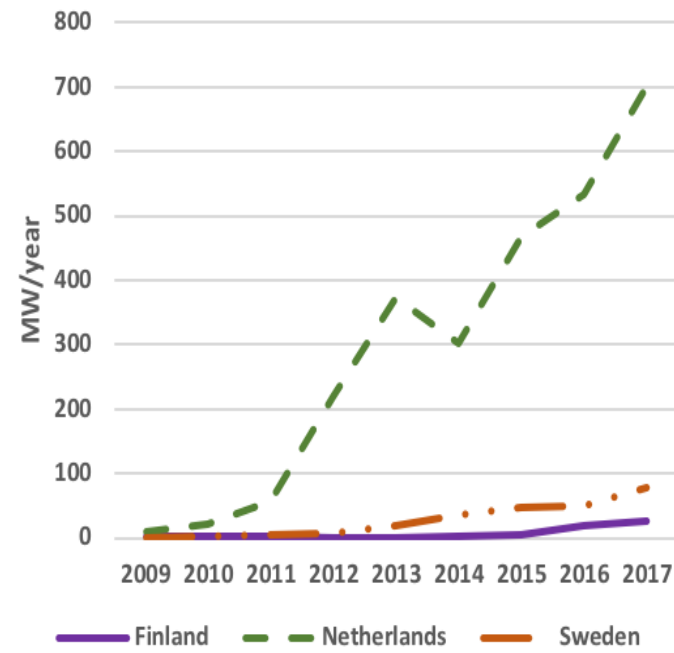
### Peak-and-Crash countries



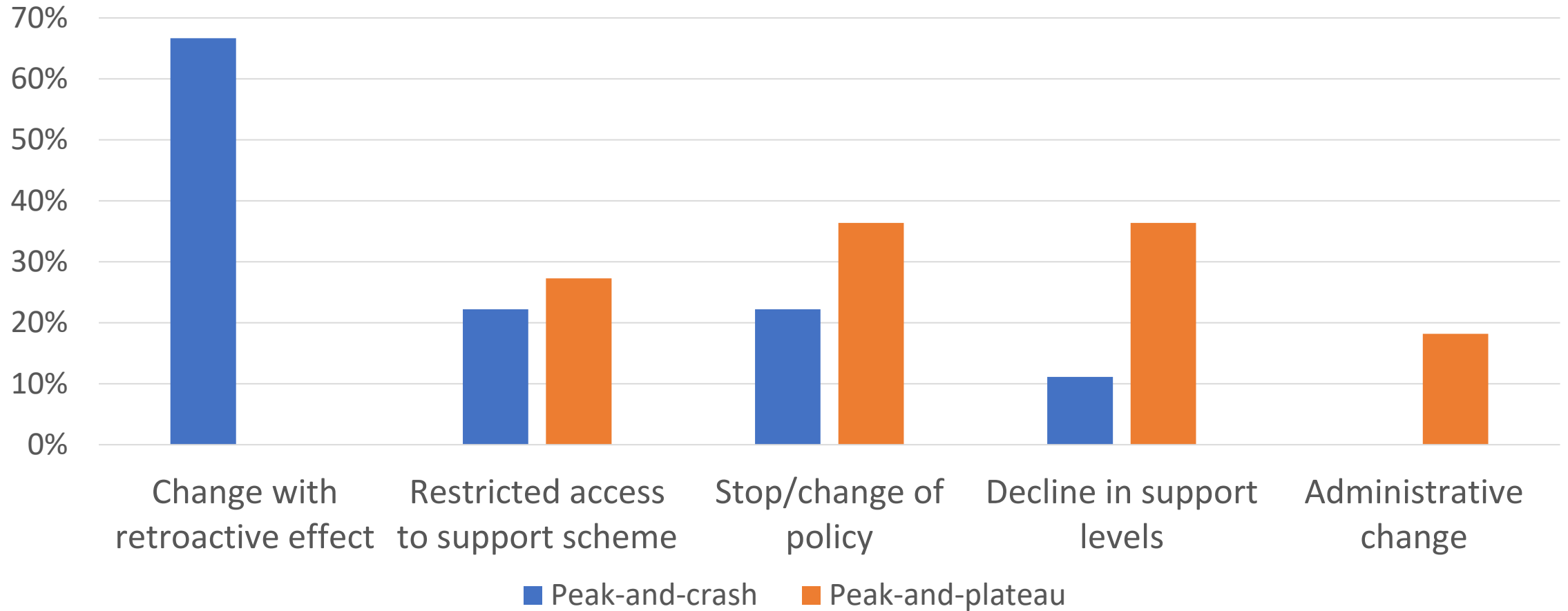
### Peak-and-Plateau countries



### No-Peak-(Yet) countries



# Types of policy changes



## Spain 2013

### 'Let's tax the sun': new law shocks world press



'Let's tax the sun': new law shocks world press

Some homeowners have removed their solar panels rather than face fines of up to €30 million. Photo: JOHN MOORE/GETTY IMAGES/AFP

**A new tax on solar power introduced two weeks ago by the Spanish government has been described as "ludicrous" and "stupid" in two leading international publications.**

<https://www.thelocal.es/20130821/spanish-solar-law-hits-international-headlines>

## Greece brings new retroactive measures; cuts FIT by 30%

After a prolonged delay, the Greek government published anticipated new retroactive measures last Friday. On average, the new measures slash FITs of operating PV plants by 30%.

MARCH 11, 2014 **ILIAS TSAGAS**

[https://www.pv-magazine.com/2014/03/11/greece-brings-new-retroactive-measures-cuts-fit-by-30\\_100014491/](https://www.pv-magazine.com/2014/03/11/greece-brings-new-retroactive-measures-cuts-fit-by-30_100014491/)

## Czech Republic 2010

the Czech Republic's centre-right government slapped a 26-percent tax on solar power last November in a bid to prevent the soaring costs of the subsidies from eventually burdening consumers.

<https://phys.org/news/2011-03-czech-solar-power-boom-expert.html>

# EU Told To Crack Down On Governmental Changes

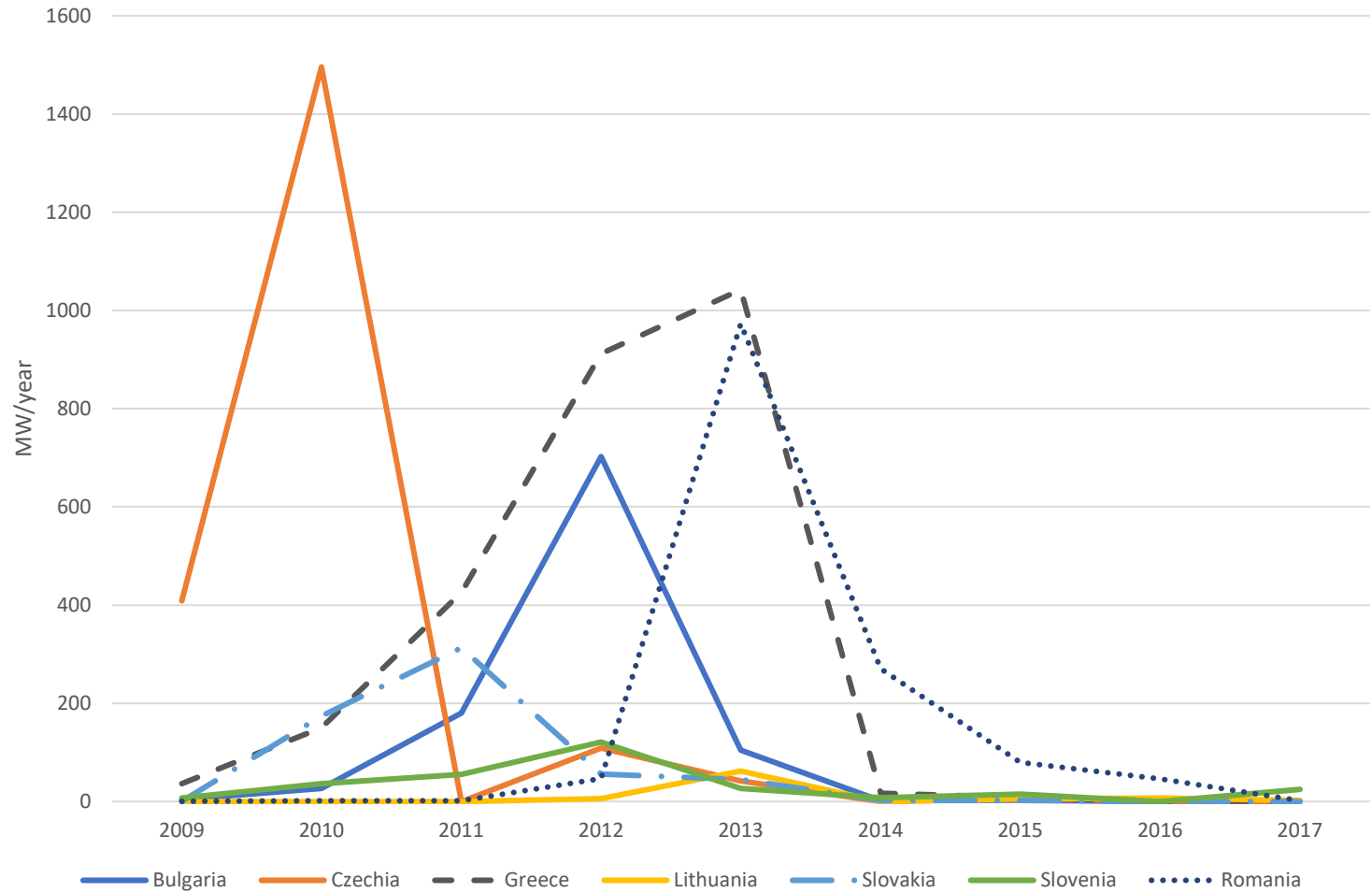
Friday 8th March 2013

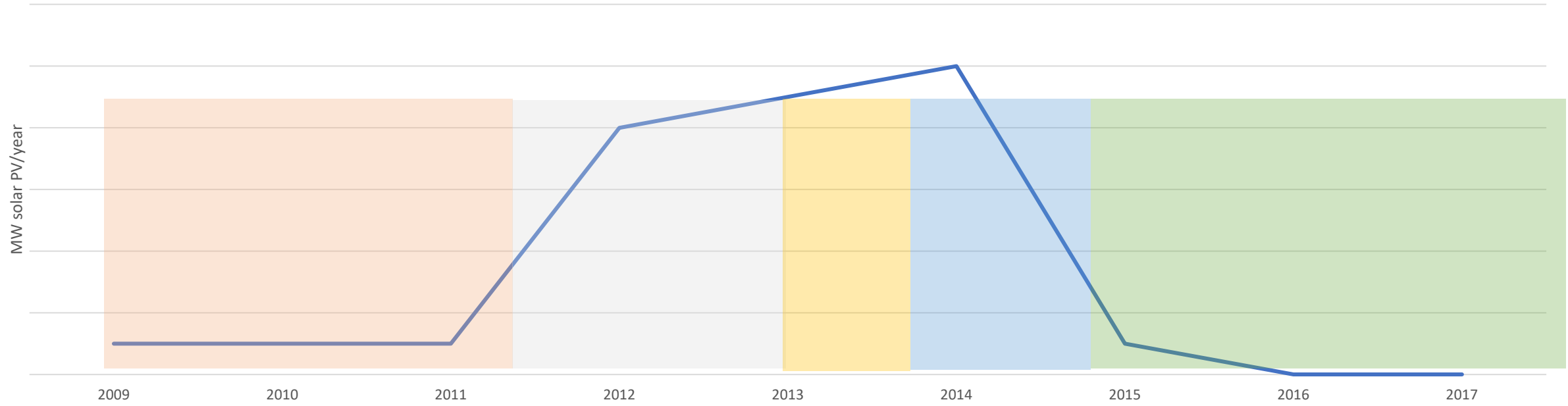
More than 70 companies and associations in the solar photovoltaic (PV) electricity sector have co-signed a letter to European Energy Commissioner Gunther Oettinger, calling on the EU to take action against Member States that are enacting **retroactive measures** or moratoria on support schemes for renewables.

**"Such measures seriously damage the investment climate** in general and for renewables in particular, not only in the countries where they occur, but also throughout Europe,"

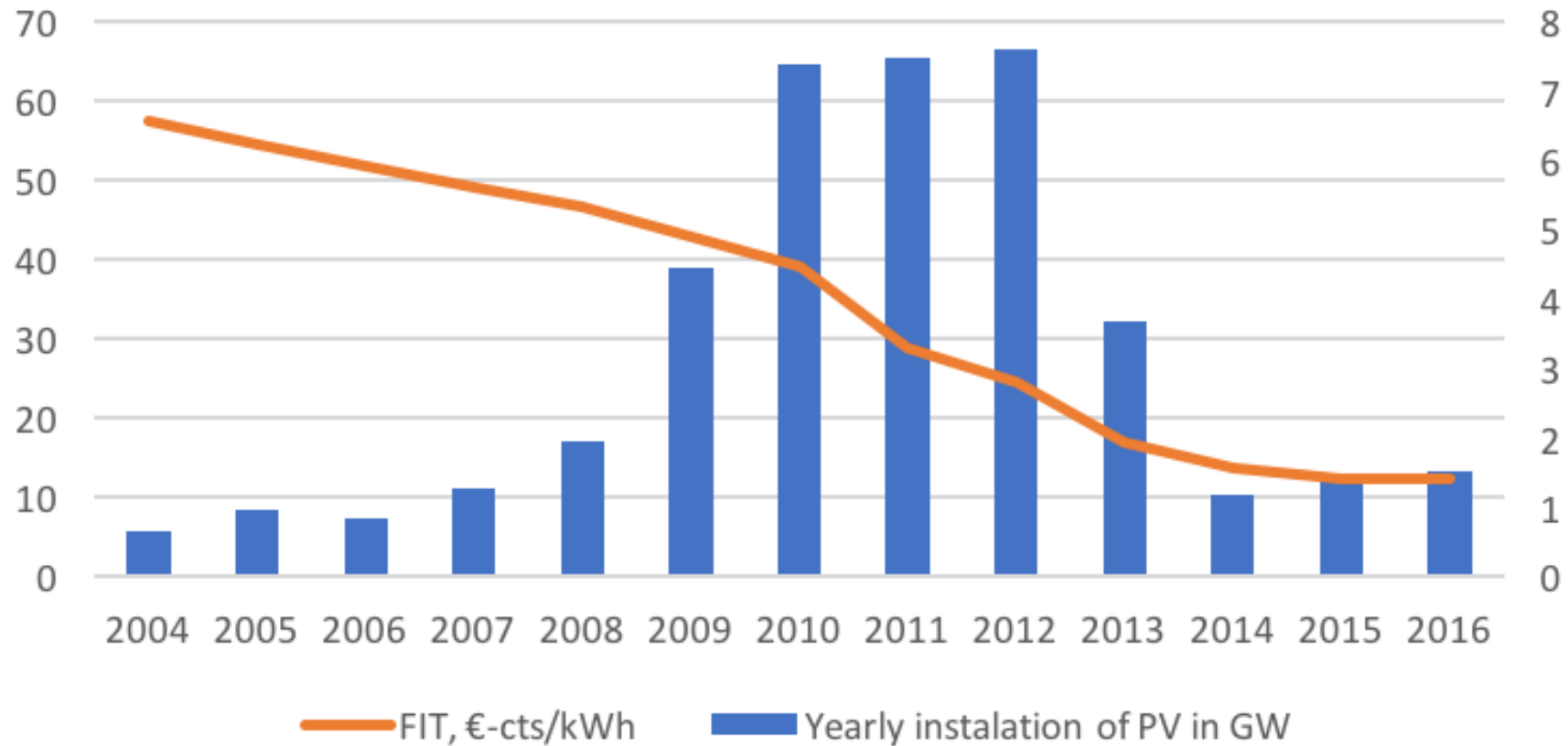
The signatories also point out that these **actions can "heighten the perceived risk in investments in renewables, and PV in particular, thus unnecessarily increasing the cost of capital for private operators.** In the transition to a power sector that will require more CAPEX-intensive investments, retroactive measures will seriously endanger the achievement of 2020 targets."

# Peak and crash





## Solar power in Germany



# Why were the policies changed?

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## Out Of Ideas And In Debt, Spain Sets Sights On Taxing The Sun, **Forbes** – August 2013

Spain is generating so much solar power, according to its government, that [production capacity exceeds demand](#) by more than 60%. That imbalance has created a problem for the government which now finds itself in debt to producers. And not by a little bit. The debt is said to have grown to [nearly 26 billion euros](#) (\$34.73 billion U.S.).

<https://www.forbes.com/sites/kellyphillipsrb/2013/08/19/out-of-ideas-and-in-debt-spain-sets-sights-on-taxing-the-sun/#36e3ba9394e5>

## Bulgaria's renewables market goes from boom to bust - July 10, 2012

“Energy Minister Delian Dobrev blamed the 13% **increase in retail power price** from July 1 on the development of green energy and stated that the government had avoided an even larger increase by taking action to slow down renewable energy growth.”

<https://renewablesnow.com/news/overview-bulgarias-renewables-market-goes-from-boom-to-bust-287990/>



# Why were the policies changed?

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Subsidy program without a cap.

Explosive growth of solar

Concerns about:

- Costs of the program
- Electricity prices
- Grid stability

# Policies and the EU-2020 goals.

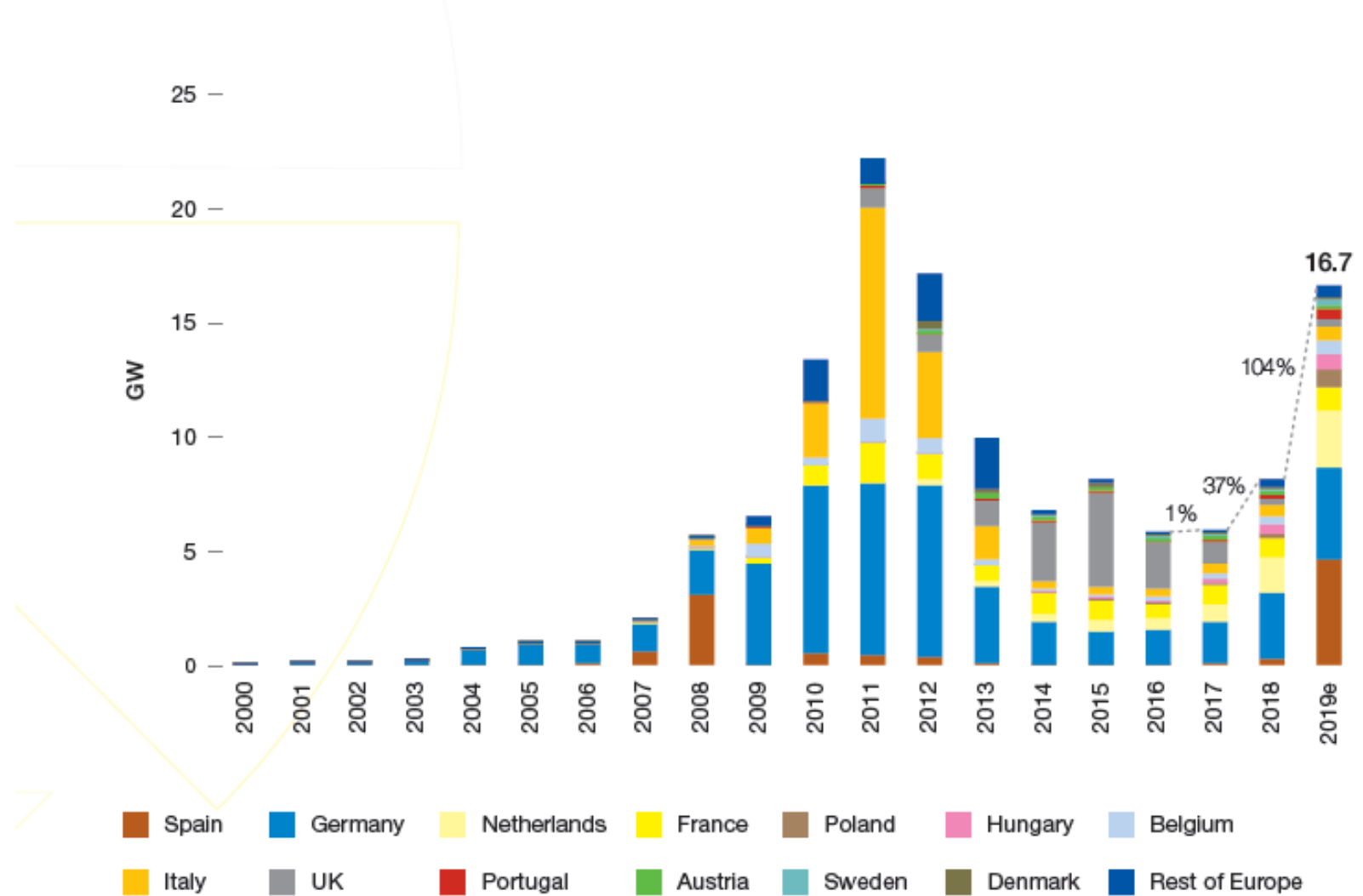
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# EU Market Outlook

For Solar Power / 2019 - 2023



FIGURE 1.2 EU28 ANNUAL SOLAR PV INSTALLED CAPACITY 2000 - 2019



# EU Market Outlook

For Solar Power / 2019 - 2023



## Spain -

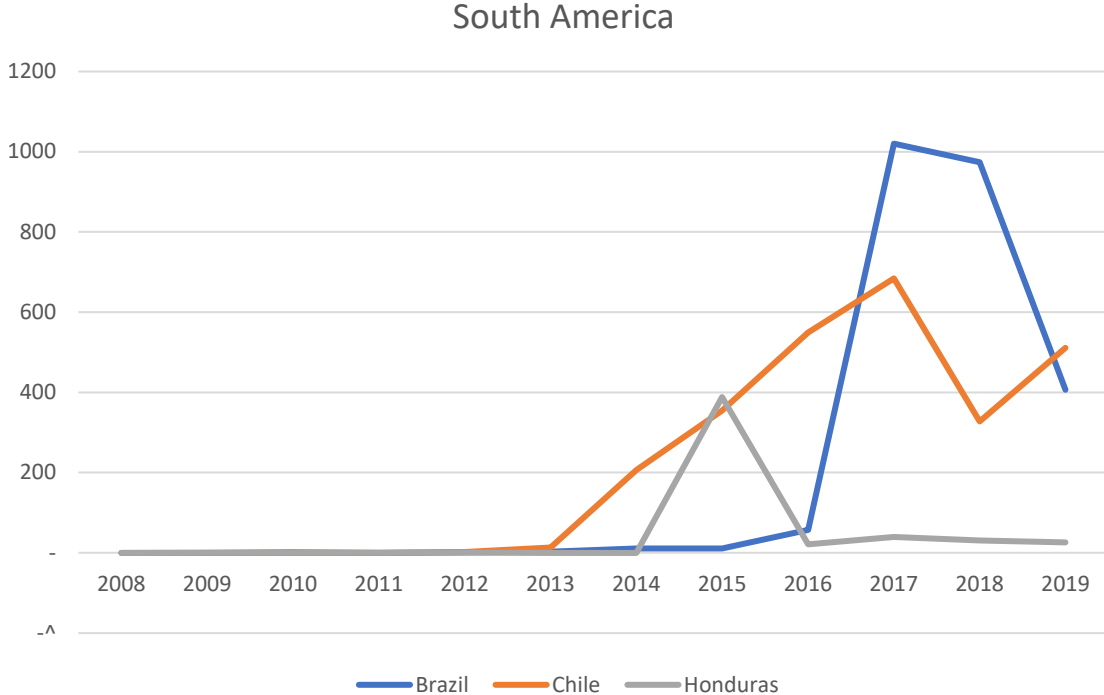
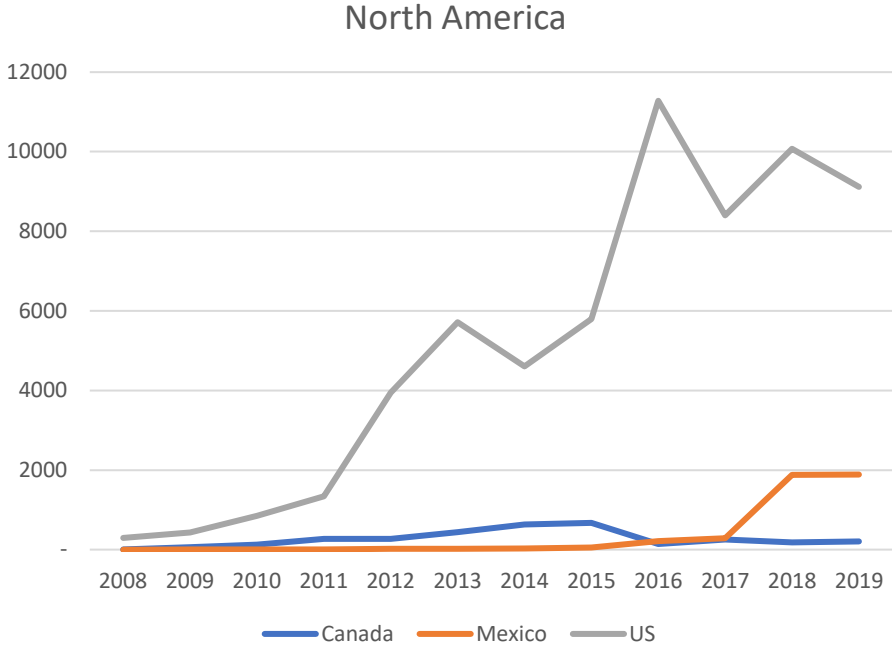
“The main driver for Spain’s 2019 solar boost were its **auctions** in 2017, when around 4 GW of solar was awarded with a grid-connection deadline at the end of 2019.

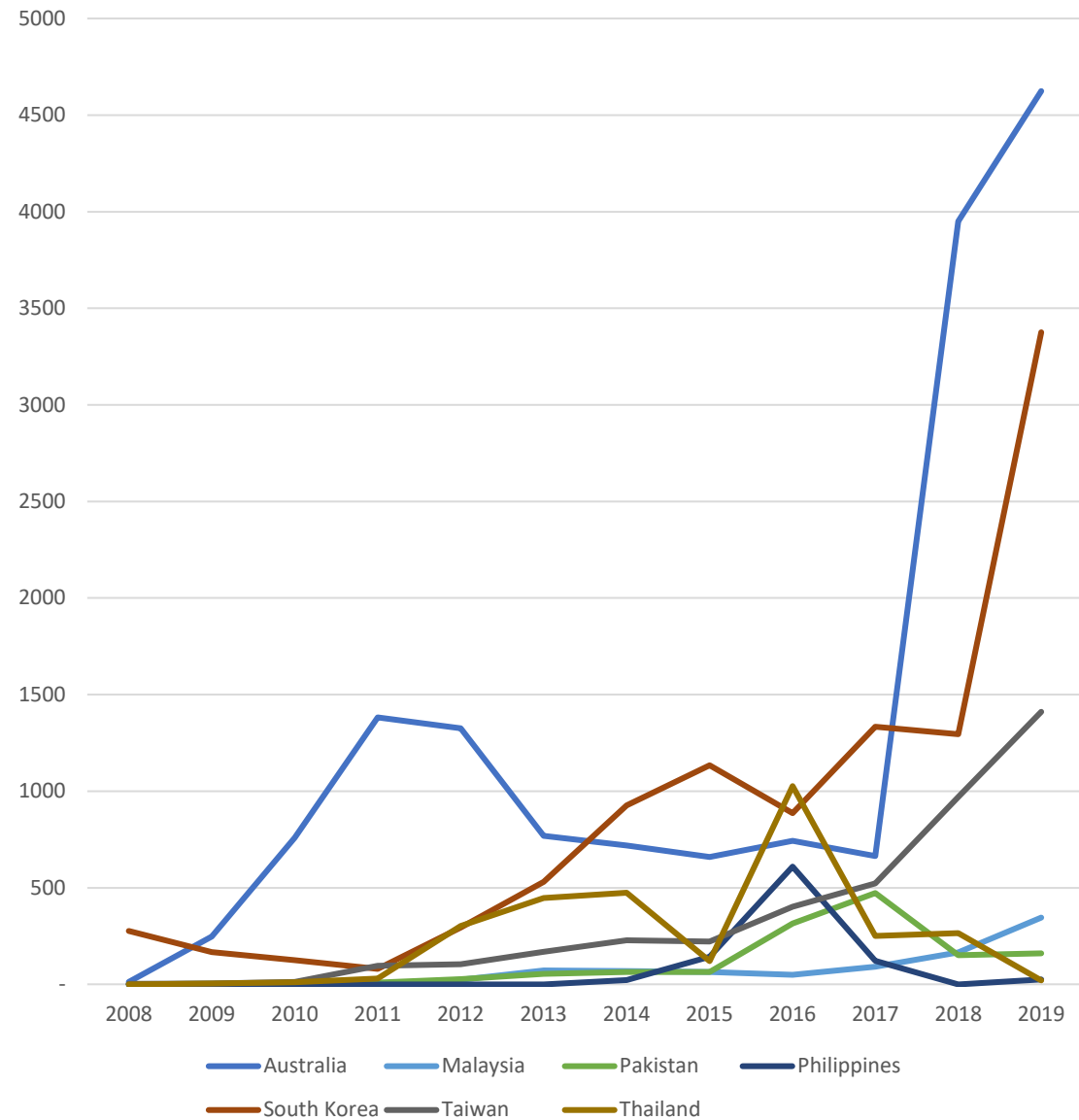
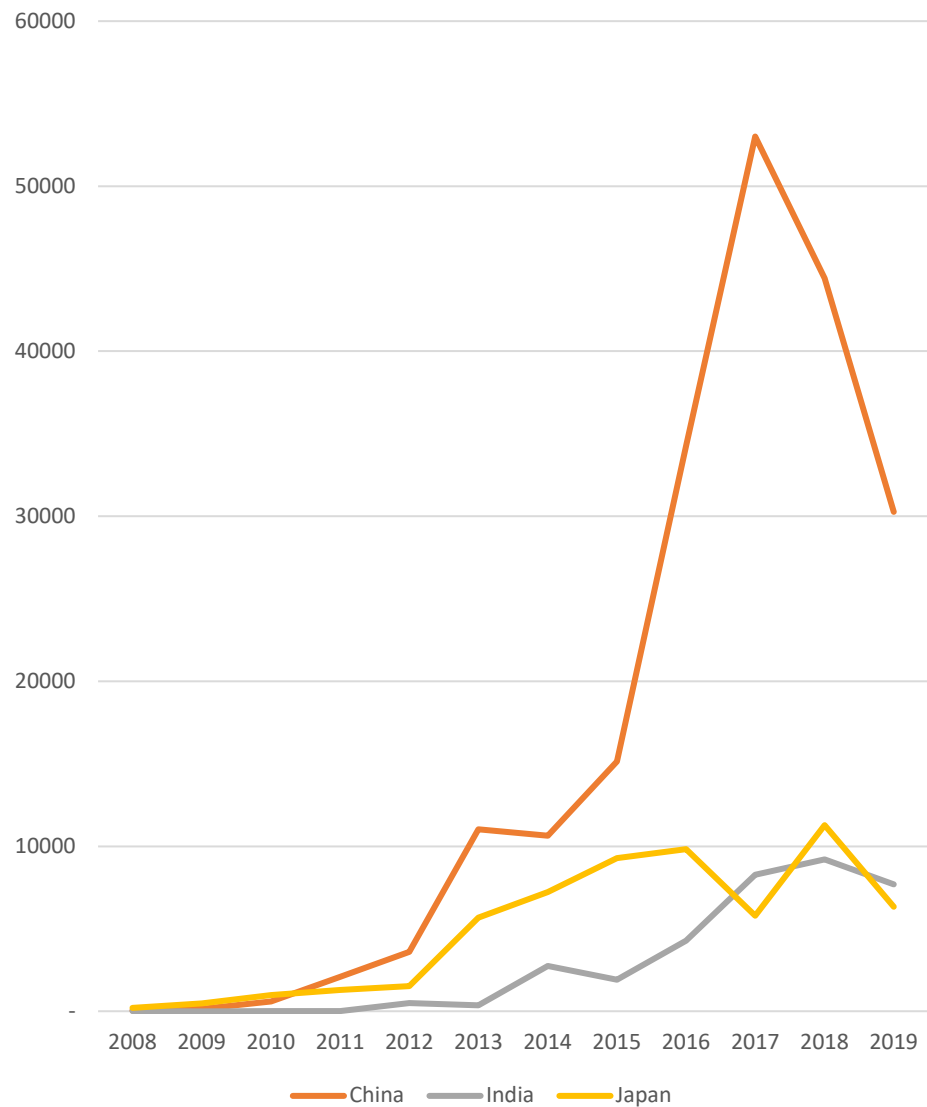
In addition, the first PPA/wholesale-based solar power plants came into the picture, from an over 100 GW large pipeline under development, as well **as solar rooftop systems based on self-consumption which became attractive after the Spanish ‘Sun Tax’ was eliminated.”**

## Germany

“the main drivers for the country’s solar boost in 2019 were self-consumption/feed-in premiums for medium- to large-scale commercial systems ranging from 40 kW to 750 kW. Tender-based, ground-mounted systems above 750 kW were responsible for less than 20%.”

# Rest of the world





# CHINA

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**Feb 19, 2018**

## China adds record 53.06 GW of solar in 2017

At the end of **2017, China's cumulative installed solar capacity amounted to 130.25 GW**, with solar PV accounting for 7.2% of the country's total power generation capacity. According to AEECA, the total for solar could reach about 250 GW by end-2020 in view of the fact that **China already exceeded by 24% its goal for 2020 of having 105 GW of PV parks.**

<https://renewablesnow.com/news/china-adds-record-5306-gw-of-solar-in-2017-602234/>

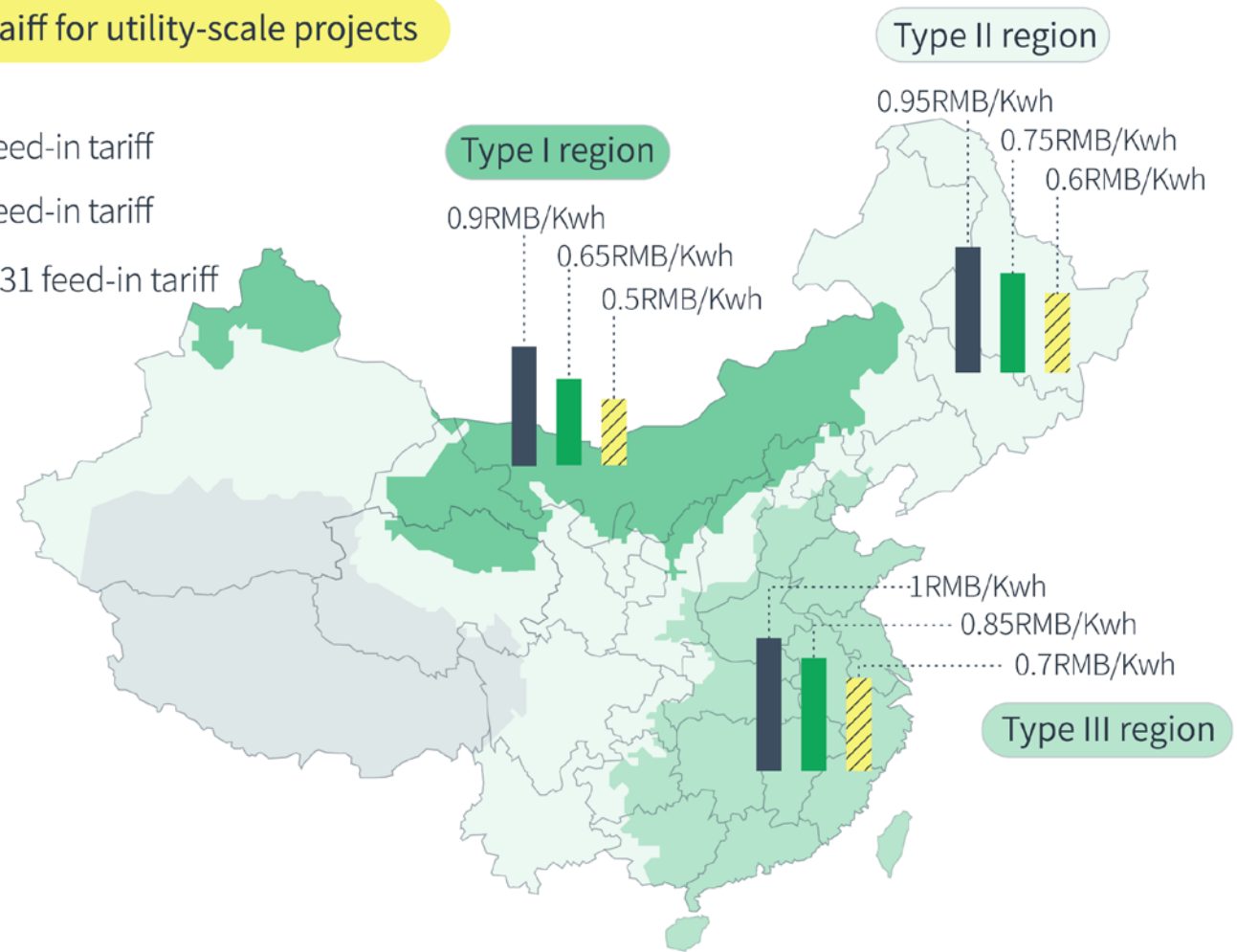
# China's shrinking subsidies for solar PV

On May 31, the National Development and Reform Commission, the Ministry of Finance, and the National Energy Administration issued a joint notice on controlling growth in new solar installations and accelerating the removal of subsidies:

- No new installation of solar farms eligible for subsidies in 2018
- Up to 10GW of new distributed solar installations eligible for subsidies
- Reduced electricity price subsidies

## Feed-in tariff for utility-scale projects

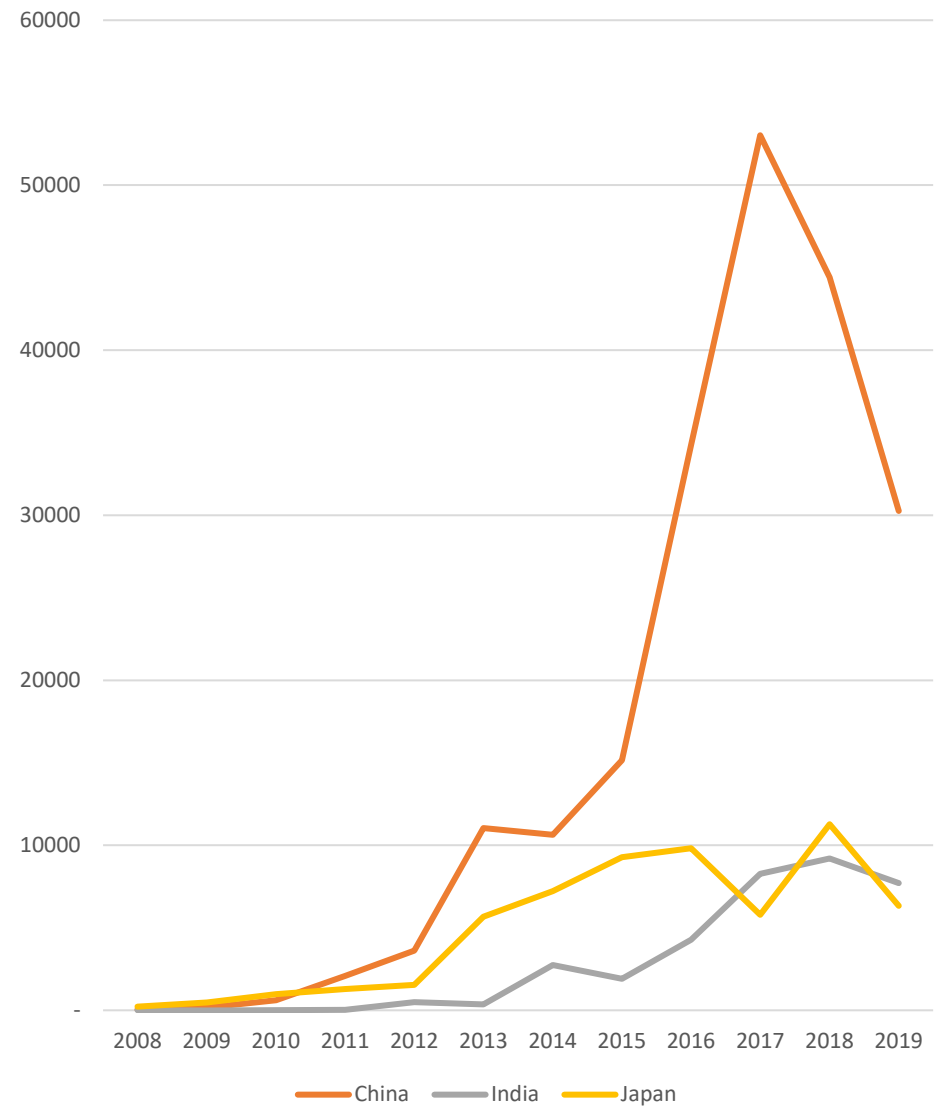
- 2013 feed-in tariff
- 2017 feed-in tariff
- ▨ Post-531 feed-in tariff



## Electricity price subsidies for distributed solar







# Summary

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The importance of political goals

Given the right economic incentives solar PV can grow very fast

Lack of caps to subsidy program risks back-lash

Changes to subsidy program, especially retro-active measures, can have a devastating effect

# Thank you!

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