



REC GROUP SOLAR MARKET INSIGHT

Q3 2017



SOLAR'S MOST TRUSTED

November 2017

Major REC Q3 2017 Highlights



- REC achieved its **best third quarter result ever** in the **EMEA** thanks to a strong demand pull for high quality high efficiency panels
- REC was **awarded the prestigious Solar + Power SILICON MODULE AWARD 2017** for its TwinPeak 2 technology
 - This is one of the most prestigious awards in the solar industry
 - Recognition for “**Pushing multicrystalline module performance to be competitive with monocrystalline and industrializing world-record power levels** in the 60 and 72-cell module classes”
- REC **expanded** its successful **channel program** further into the **APAC region**
- REC and Ciel & Terre announced the **grid connection** of a 973 kWp **floating solar plant** on an irrigation pond in Japan



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573 kW, Dubai, UAE

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REC Highlights – Q3 2017



REC receives prestigious Solar + Power SILICON MODULE AWARD 2017

- REC Group received the prestigious **Solar + Power Award 2017** in the category “**Silicon Module Award**” for its **TwinPeak 2** solar panel
- The award marks the second time REC is recognized for its industry-leading TwinPeak technology as it was honored already in 2015 with the **Intersolar Award for Photovoltaics panel** shortly after its market launch
- **Jury remarks:** “REC’s TwinPeak 2 exemplifies efforts to **increase multicrystalline silicon efficiency** to the point where it **rivals that of monocrystalline PV products**, all while reducing the number of modules needed to generate energy, or increase yields by utilizing a similar surface area.”



REC expands its successful channel program into the APAC region



- In India, **REC is recognized as strong and trusted brand** and has been able position itself as the #1 European brand of solar panels in the market thanks to more than 250 MW of REC panels shipped to India to date
- The channel programs includes the **REC Partner Program** for distributors and **REC Solar Professional Program** for solar installers and system integrators
- **REC created those programs to promote and reward long-term alliances** between REC and the different industry players along the downstream value chain
- The channel programs prove successful already in Europe, Japan, Australia, and other APAC markets such as Sri Lanka

As India's first REC Platinum Partner, Redington has been honored during the REI Expo trade show in October 2017



From left: Rohit Kumar, Head of Indian Subcontinent at REC Group, Pradeep Srikanthan, Vice President Solar Equipment Group at Redington India Ltd, Kasturi Rangan, Whole Time Director at Redington India Ltd, Milan Koev, Vice President Sales & Marketing for Asia Pacific at REC Group, Somnath Yogi, Technical Manager for Asia Pacific at REC Group

REC - Making Waves in Floating Solar, partnering with Ciel & Terre



- As floating PV is spreading globally, REC and Ciel & Terre are pleased to announce the **grid connection** of a **973 kWp floating solar plant** on an irrigation pond in **Nara prefecture, Japan**
- Key **benefits** of floating PV: **ecological, reliable** and **cost-effective** way to generate clean, renewable energy while **conserving land** and **water resources**
- Based on IHS Markit¹, there are over 300 MW of floating projects already installed globally and a pipeline for completion amounting to approx. 2.3 GW





15.53 MW, Kaua'i, USA

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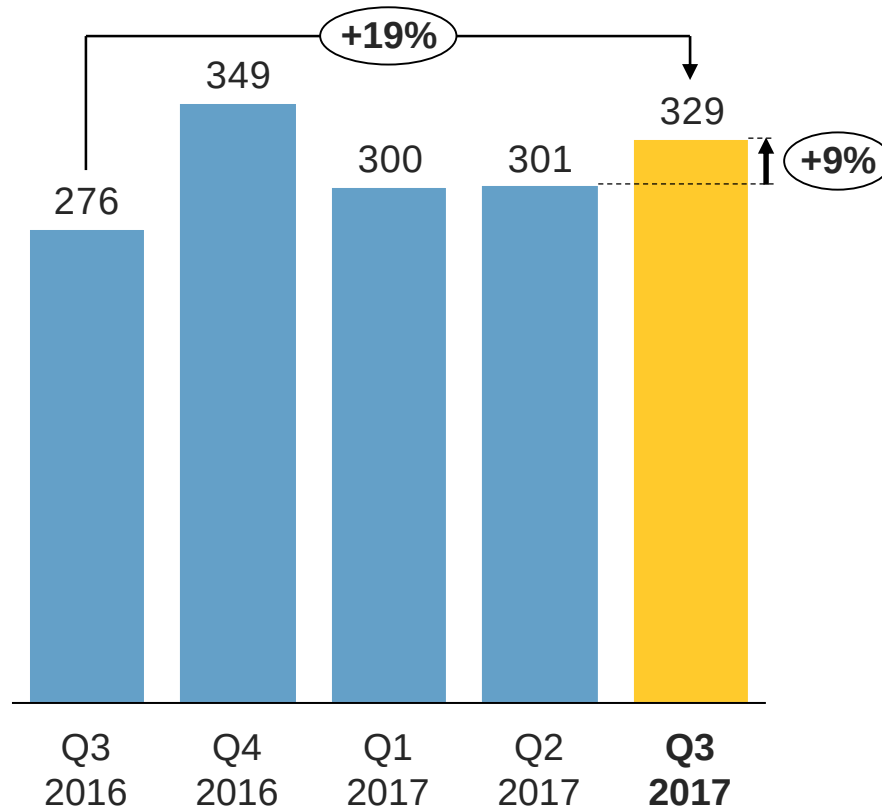
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Global Performance – Q3 2017

REC's quarterly shipments grew by 19% year-over-year and rose by 9% compared to the previous quarter

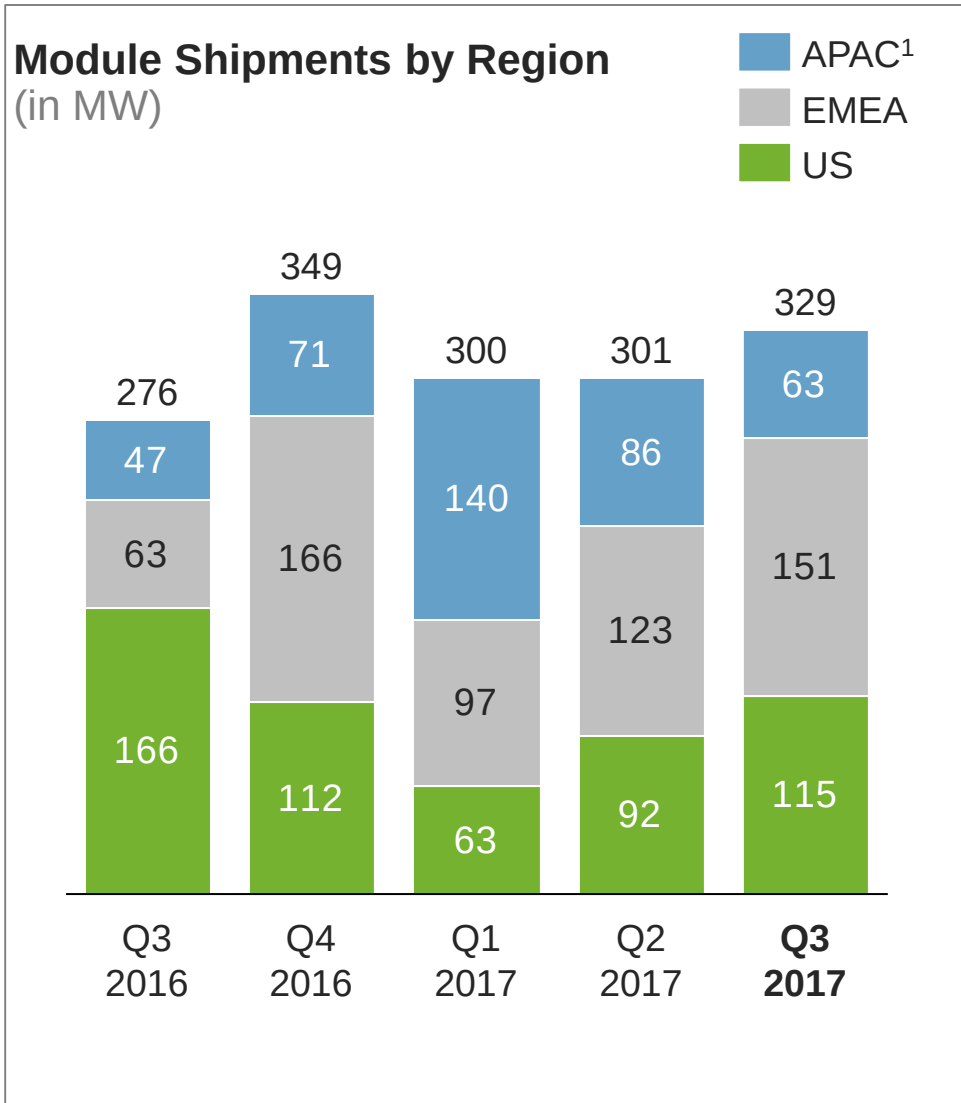


Module Shipments by Quarter
(in MW)



- Shipments in Q3 2017 totaled **329 MW globally**
 - Increase of **19%** year-over-year and
 - **9% growth** compared to Q2 2017
- The company has **enlarged** its **customer base by 66%** from Q1-Q3 2017 compared to the same period in 2016
- REC enjoys **continuous** strong **demand** for its high efficiency products **across all market segments**
- The company is actively **diversifying** its geographical reach (e.g. Turkey)

EMEA accounted for the largest share of Q3 2017 shipments



- The **EMEA** region accounted with 46% for the **largest share of REC shipments in Q3**
 - **Best third quarter result ever**
 - Strong performance with **23% shipments growth quarter-over-quarter**
- **Japan and APAC** saw a solid quarter performance with sales being driven by India and Australia
- Thanks to its **growing** and **diversified customer base**, the **US** enjoys **rising shipments** with a **25% growth over Q2'17** following a strong +46% growth already in **Q2 compared to Q1'17**

¹ Including Japan, Excluding China



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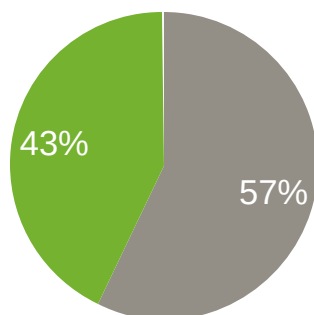
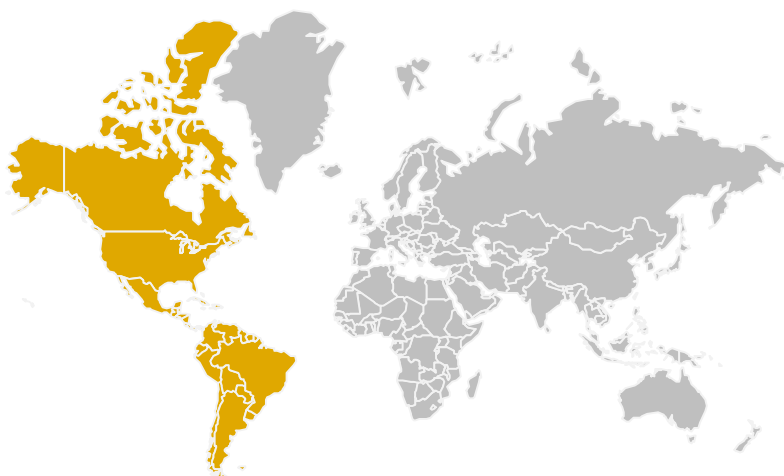
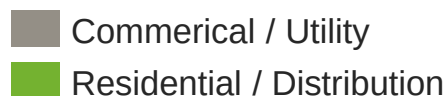
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24 MW, Canino, Italy

Regional Performance Q3 2017

Q3 2017 Module Shipments split by Segment¹

(in %)



REC Performance Highlights

- REC ranks amongst the Top 5 **most popular panel brand** for **residential** installations in the **entire U.S. in the 1st half of 2017²**
- REC is placed **amidst** the **top suppliers** in **each of the largest 5 residential solar PV markets** in the US³

U.S. Market Development Highlights

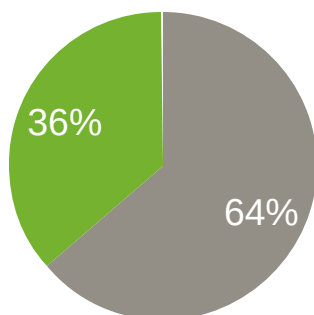
- In **residential PV** the **trend of switching away from third-party ownership** continues due to declining cost of solar with large installers adjusting their product offerings
 - Example **California**: Latest numbers from SEIA and GTM see **only 33%** of new installed capacity being third-party owned in Q2 2017 **compared to 47%** in Q2 2016
- Growing interest in **energy storage** in the US market due to price declines and increasing the cost effectiveness of storage technology in both, **utility- and behind-the-meter applications**

¹ REC market segment module shipment volume splits are best estimates; ² Based on 1H 2017 data by GTM, published September 2017; ³ Top 5 residential markets which are tracked by GTM for supplier ranking

Q3 2017 Module Shipments split by Segment

(in %)

■ Commerical / Utility
■ Residential / Distribution



1 REC market segment module shipment volume splits are best estimates

Source: REC

REC Performance Highlights

- **Best third quarter** shipment results **ever** for REC in EMEA
- **Germany** was once again the **top market** accounting for the **largest share of EMEA shipments**
- **Netherlands**, which faces a very positive growth outlook for PV is amongst the top REC markets as well
- REC has been **hugely successful in entering the Turkish market in Q3'2017**
- The company sees increasing interest especially from **Scandinavian countries** in the **Commercial & Industrial rooftop segment** based on self-consumption
- The company is actively screening **business opportunities** in the emerging **Eastern European markets**

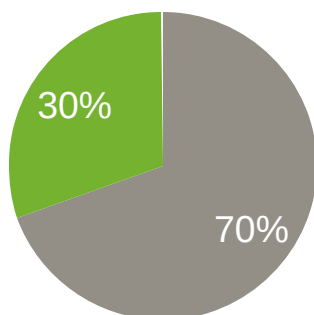
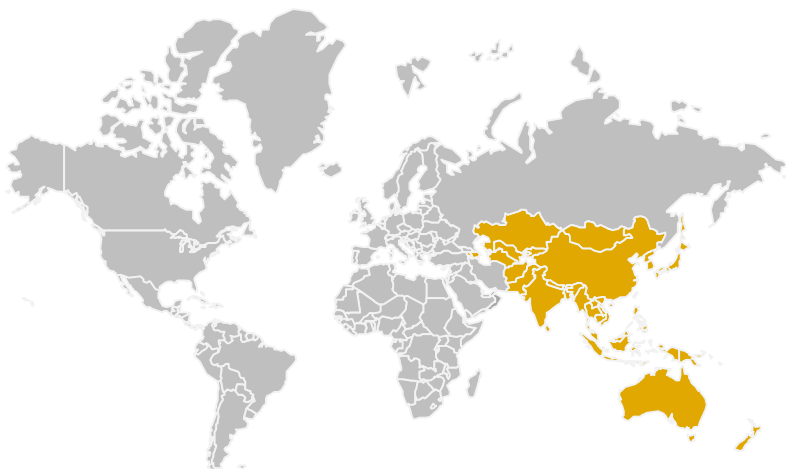
EMEA Region Development Highlights

- Irish government launched a public consultation running until November 3 on its new Renewable Electricity Support Scheme (RESS), **aiming at supporting large-scale solar and renewables through competitive auctions**
- European Commission agreed to a **new price mechanism**, it published a **fixed schedule with quarterly reduction of the MIP for mono and multi panels** until Sept. 2018 imported from China

Q3 2017 Module Shipments split by Segment

(in %)

- Commerical / Utility
- Residential / Distribution



1 REC market segment module shipment volume splits are best estimates

Source: REC; IHS Markit, Bloomberg

REC Performance Highlights

- **Japan** - continuous solid demand from **partner distributors** in the **Commercial & Industrial** as well as **residential segment**, with the latter having seen the successful launch of the **PE50 2S mono**; REC also delivered into **utility scale projects in Q3**
- **India** - top market with a **strong brand recognition** for REC across all market segments despite the tough pricing environment
- **Australia** – serving **successfully** the **distribution segment** with long-standing partnerships
- As the importance of panel quality is widely recognized among industry stakeholders, REC faces growing demand from several APAC countries (**i.e. Thailand and Taiwan**)

APAC Region Development Highlights

- India's **utility sector faces uncertainty** following PPA signing delays due to rising module prices, PPA renegotiations by several states, slowing auction activity and the ongoing Antidumping investigation against Chinese PV imports
- **Australia** reached **5.9 GW cumulative installed PV rooftop** as of the end July 2017, according to figures provided by Australia's Clean Energy Regulator
- **Japan** will hold its **1st renewables auction** for up to 500MW of PV projects larger than 2MW in **Q4'17**



3.2 MW, Indianapolis, USA

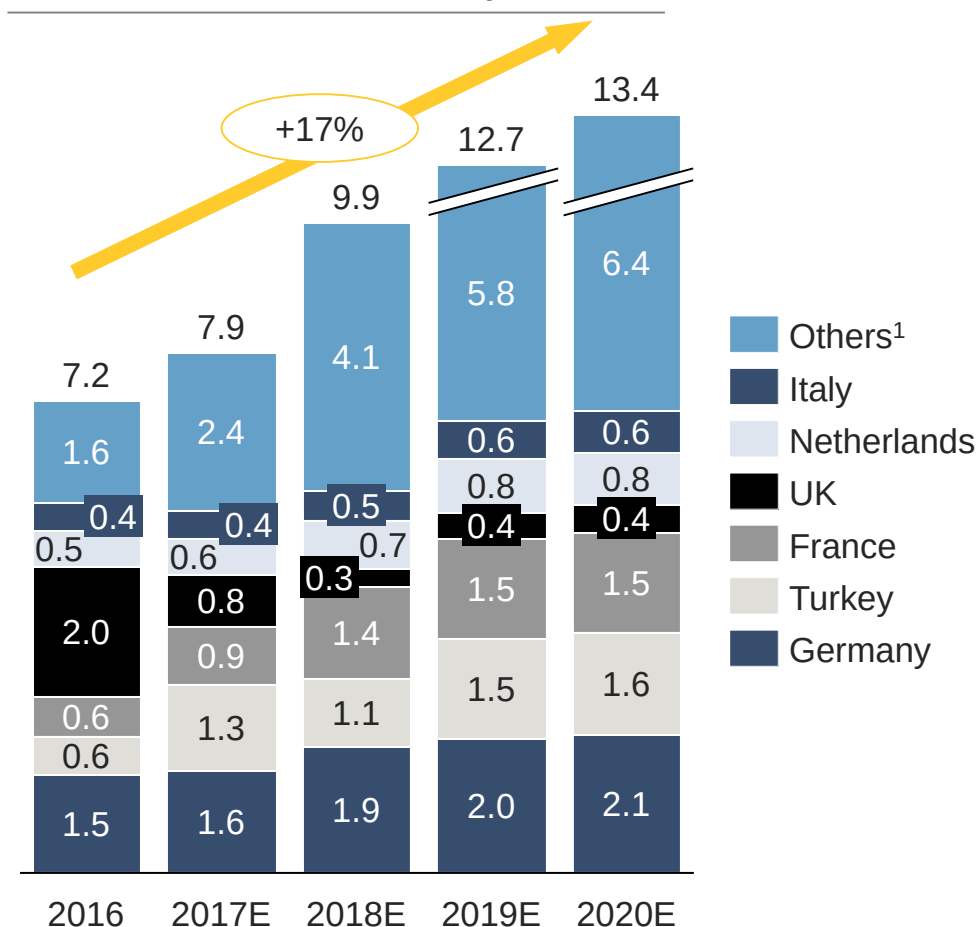
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European Market Outlook

After years of decline, Europe will return to growth due to demand via tenders and self-consumption

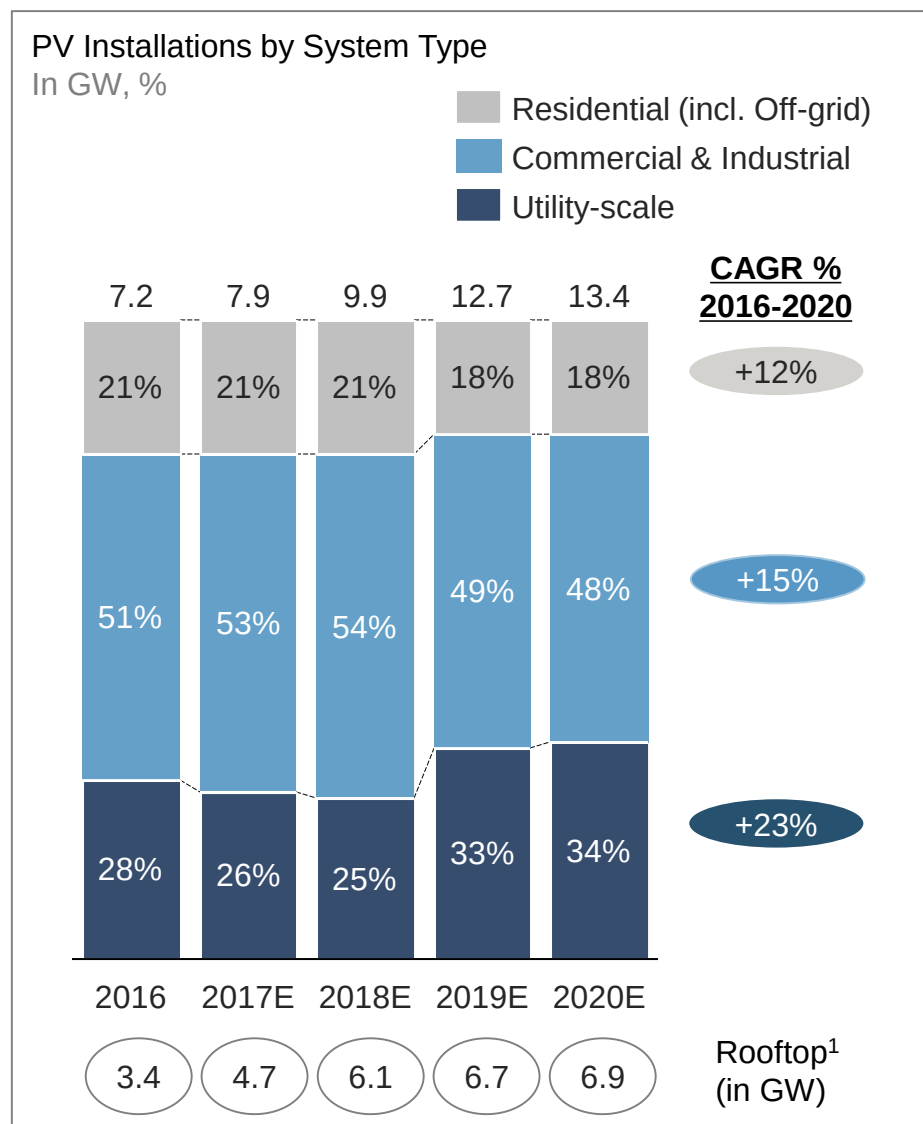
PV Installations by Country

In GW, 2016-2020E, Ranked by 2017E



- By having mostly **transitioned from pure government-based support schemes to utilizing market based instruments like auctions**, REC expects Europe will return to PV growth in the years ahead
- **Demand facilitators** are mainly:
 - **Auctions** for large-scale PV
 - New business models via **self-consumption**
 - Market **growth** will be **driven** by both, **established** (i.e. Germany, France, Netherlands) and **new PV markets** (i.e. Turkey, Hungary, Ireland)
- A positive outlook also exists on **subsidy-free solar farms** planned, i.e. in Italy and the UK

Europe remains mainly a rooftop market, but the growing number of tenders fuels utility growth



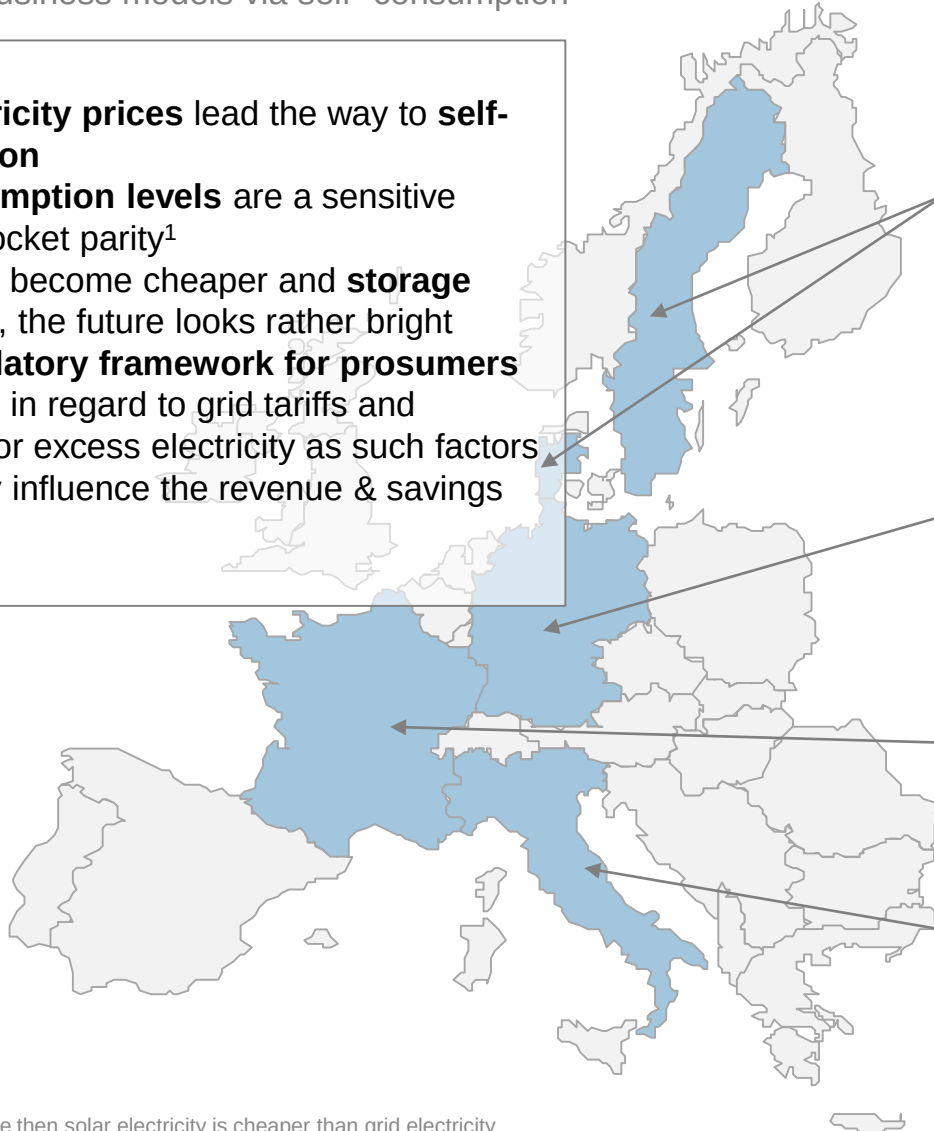
Source: REC, IHS Demand tracker Sept. 2017 & Europe Residential PV Report – April 2017

- **Commercial & industrial segment** is a key driver for installations across Europe
 - Top markets for C&I installations are markets with **high electricity prices** making PV a very attractive option for energy cost savings (i.e. Germany, Denmark)
- **Introduction of tenders & auctions** in several countries → strong **growth of utility scale** segment in the years ahead
 - Examples: Germany, France, Poland, Turkey and possible Ireland (from 2018 onwards)
- Despite facing some decline in market share, by **absolute terms residential PV demand** also **grows meaningful** 2017 to 2020
 - Most residential PV markets rely on self-consumption as demand driver - currently often only viable if supported by some sort of regulatory framework i.e. net metering or FiT for surplus electricity
 - Examples: Germany, Denmark, Italy, Switzerland

Self-consumption to spur stable growth of residential PV across Europe, avoiding FiT volatility

Examples for business models via self-consumption

- **High electricity prices** lead the way to **self-consumption**
- **Self-consumption levels** are a sensitive factor for socket parity¹
- As systems become cheaper and **storage accessible**, the future looks rather bright
- **Clear regulatory framework for prosumers needed** i.e. in regard to grid tariffs and payments for excess electricity as such factors significantly influence the revenue & savings model



Sweden – self-consumption tax scrapped

- Increase of attractiveness for PV due to nearly eliminated tax
- Introduction of storage funding

Denmark – self consumption

- High retail electricity prices are in favor for the pick up of residential and small-commercial PV

Germany – “Mieterstrom” model

- Neighbor solar supply model
- Involves multiple mini onsite direct wire PPAs

France – “collective self-consumption”

- PV installation(s) and consumers need to be located near to one another

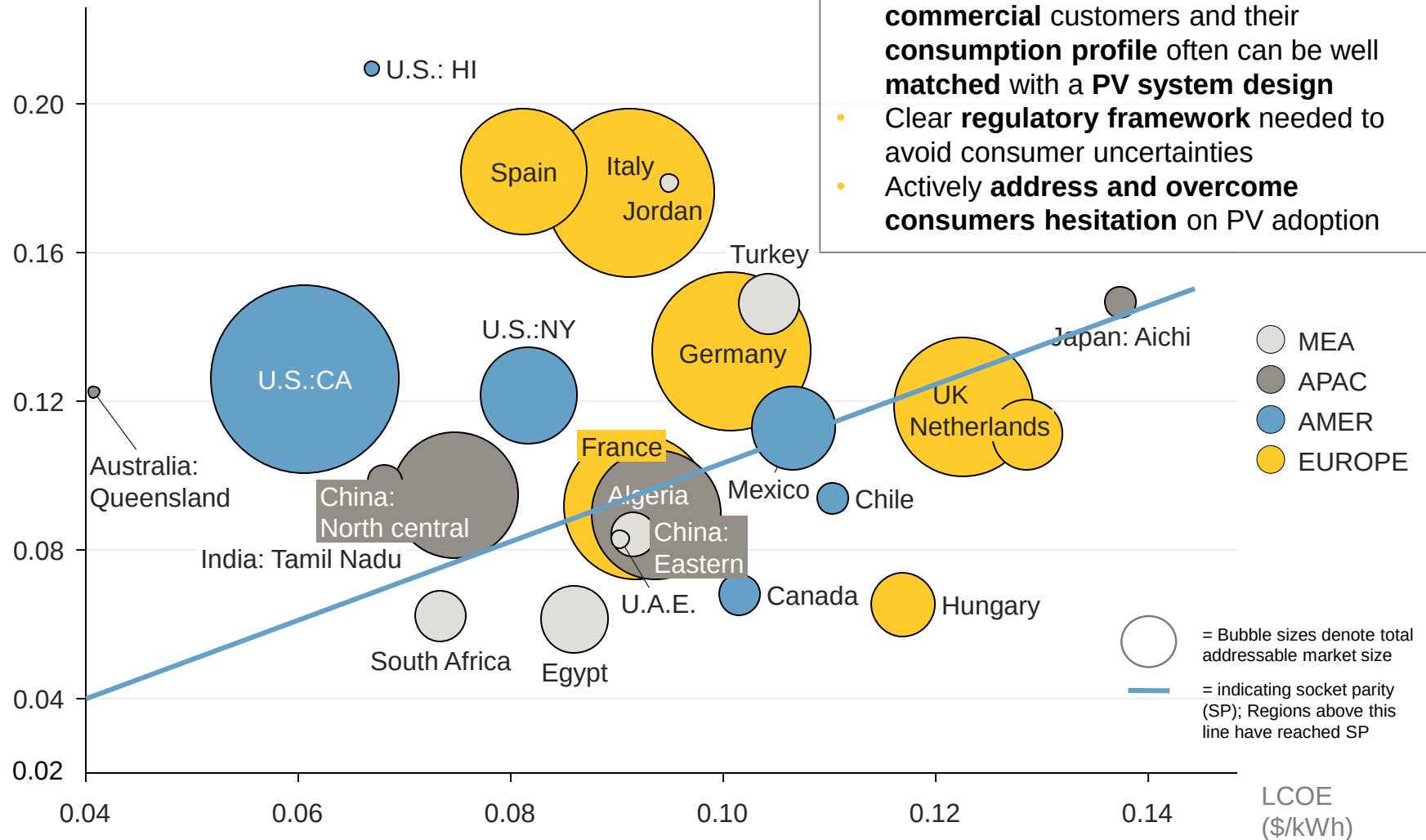
Italy – “Sistemi Efficienti di Utenza”

- Power Purchase Agreements are governed by the “Sistemi Efficienti di Utenza” (SEU) regulatory framework

Commercial socket parity is already widely spread in Europe in 2017 but it needs to be leveraged more

Commercial SP in 2017, 75% on –site consumption

Value from solar energy, (\$/kWh)

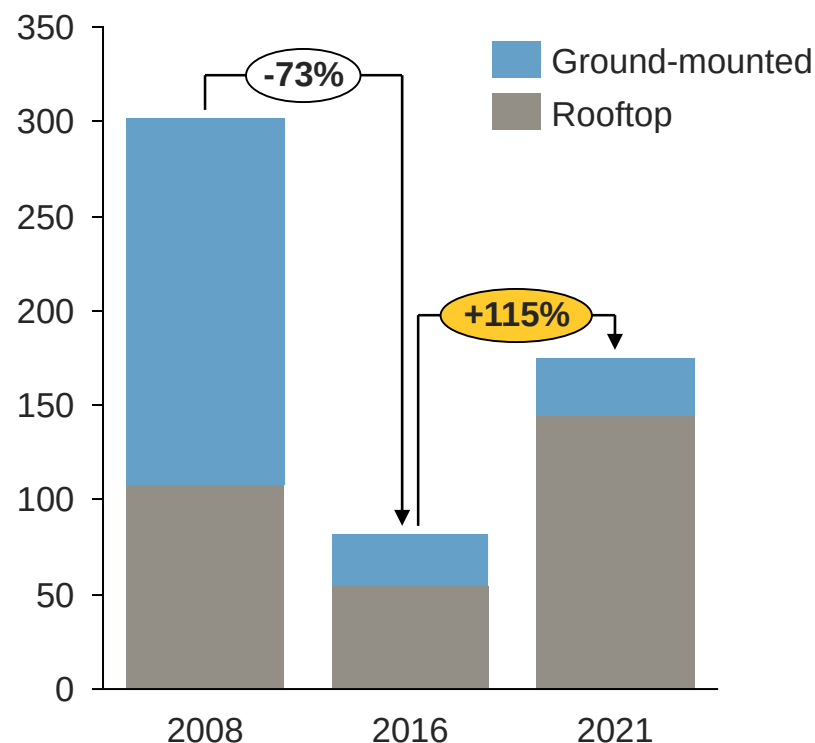


Rising PV installation levels in Europe will trigger significant job creation based on SolarPower Europe

- Europe is entering into a new PV growth phase after years of decline due to market mechanism adjustments
- Significant positive impact of **direct and indirect job** creation in the EU in the years to come
- Latest job study by SolarPower Europe¹ and EY has found that
 - **By 2021 the EU should have around ~175.000 jobs** connected to PV (+115% compared to 2016)
 - Due to efficiency gains in manufacturing and services, employment levels like in 2008 are only realistic under a massive PV ramp-up scenario – like a much higher RE target by the EU
 - **Rooftop PV installations support almost 3 times as many jobs** than ground-mounted installations due to higher labor needs for installation, maintenance and operations
- Based on a countries installation growth as well as installation mix, the job creation can vary significantly among EU member states

The EU could see a 115% increase of jobs created by PV in 2021 compared to 2016 with rooftop installations supporting the vast majority of FTEs

Jobs² supported by PV industry in EU-28
In '000 FTE (Full-time Employees) by segment

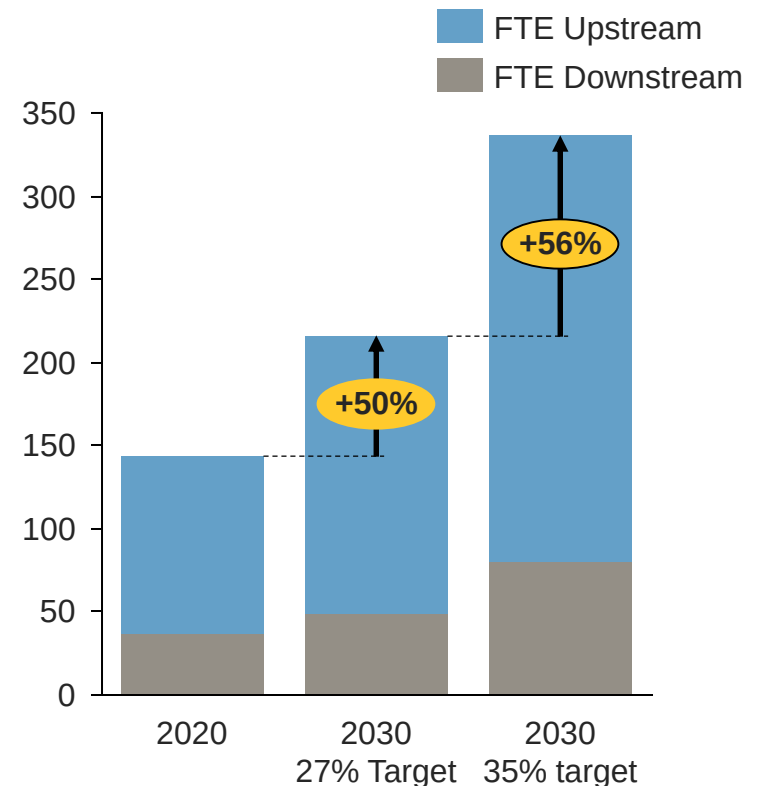


SolarPower Europe¹ latest report highlights the positive impact of a more ambitious EU RES target for job creation

- There is much **more potential to explore** if the EU would increase its **current renewable energy (RE) target** of at **least 27%** of final gross consumption by **2030 towards 35%**
- Achieving the 27% RE target requires additional PV installations of 110GW between 2016 to 2030
 - Roughly 8 GW p.a., which is not too ambitious
 - PV would account for 7% of total electricity consumption in 2030
- An revised RE target of 35% requires further additional 118 GW of PV capacities
 - This would in total add up to required 228 GW of additional PV (**~16 GW p.a. from 2016-2030**)
 - This is feasible due to the competitiveness of PV against other technologies in adjusted power markets which account for a higher share of RES
 - Under the 35% RE Target, it's assumed that PV accounts for 10% of electricity demand
- REC highlighted already in 2016 the need for higher installation levels globally to achieve the COP21 target

A RE target change from 27% to 35% could trigger an additional job creation of up to 56%

Jobs² supported in 2030 by EU-28-RE targets
In FTE (Full-time Employees) by sector



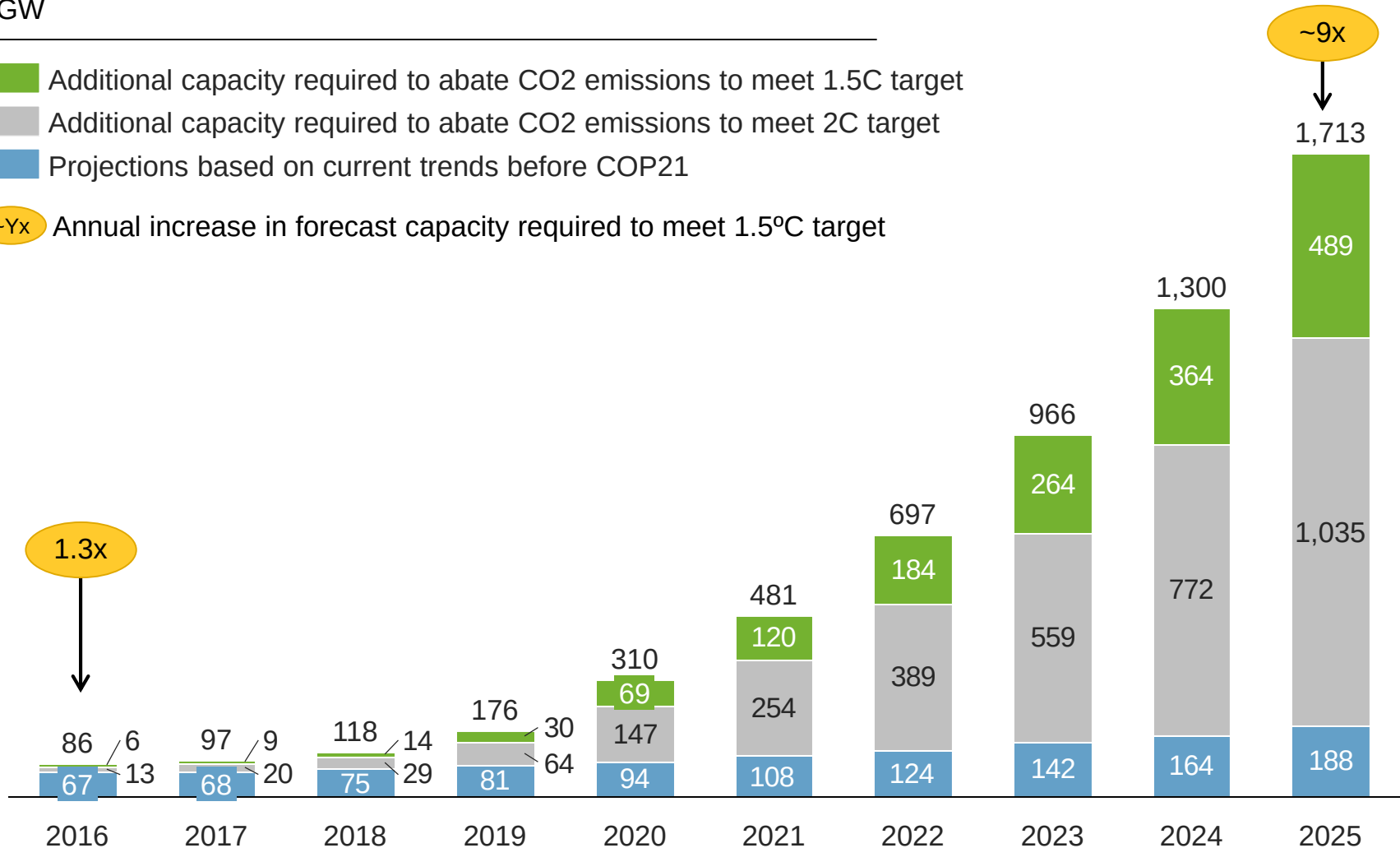
The temperature increase targets mean up to 4.8 TW of PV capacity is needed in addition to current trend by 2025

Forecast annual solar PV installations

GW

- Additional capacity required to abate CO2 emissions to meet 1.5C target
- Additional capacity required to abate CO2 emissions to meet 2C target
- Projections based on current trends before COP21

~Yx Annual increase in forecast capacity required to meet 1.5°C target





2.2 MW, Singapore

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REC Global Outlook Q4 2017 & 2018

- **REC Q4 2017 outlook**
 - Expected sequential **volume growth** of approximately **12 - 18%**
 - **Nearly fully** booked for Q4 2017 – strong **demand pull** from all regions
- **Outlook beginning 2018:**
 - **Strong order books** going into **Q1 2018**
 - Continuous **investment in technology** ensuring technology leadership and a competitive cost position
- **PV market outlook - Strong PV demand fueled by several factors across all segments:**
 - **Auctions / tendering** for large-scale PV supporting demand creation via declining pricing
 - **New business models** via self- consumption and an increasing number of consumer who want to actively participate in the electricity market by selecting the right supplier or become a producer themselves (“prosumer”) - Example: **in 2017, around 30 regions globally have already reached commercial socket parity¹**
 - **Declining LCOE of PV and storage** leading to increasing attractiveness and competitiveness providing cheap and clean electricity 24/7
 - Rising interest and demand for **corporate PPAs** also in **Europe**, following the US example, where such agreements are well recognized

¹ assuming 75% on-site consumption, “Socket Parity Is Here, But Solar Adoption Needs More”, BNEF, Oct.16,2017)

Thank you!

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