



# REC GROUP SOLAR MARKET INSIGHT

Full-Year 2018 Results



SOLAR'S MOST TRUSTED

May 2019

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573 kW, Dubai, UAE

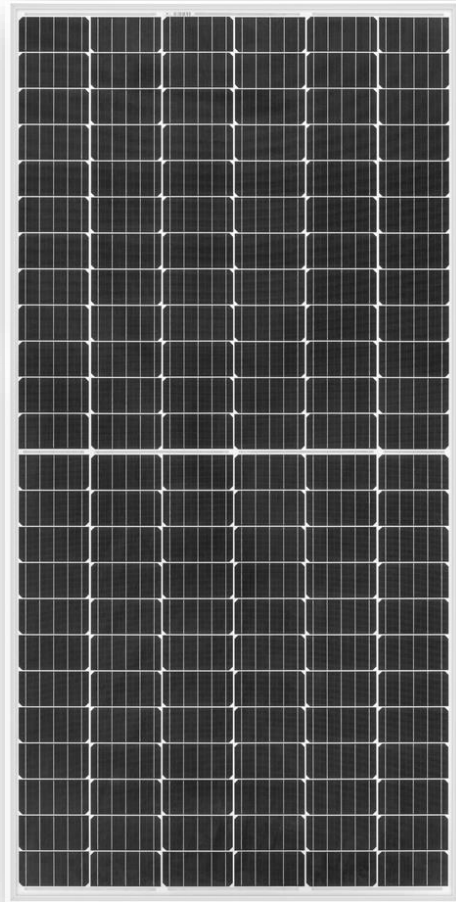
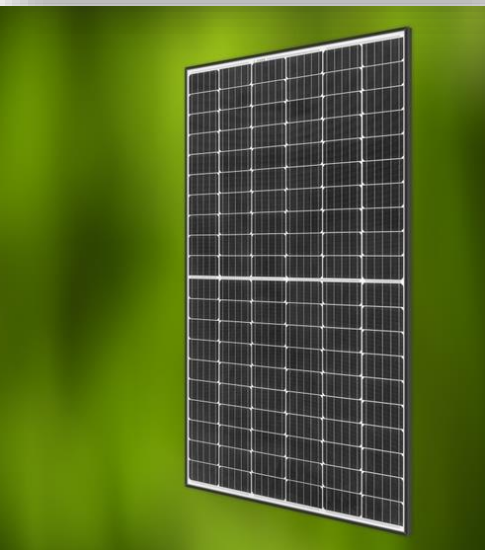
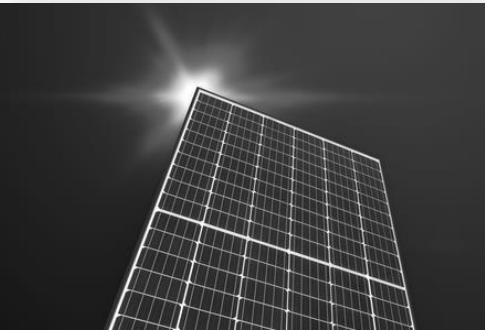
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# REC Highlights

## Full-year 2018



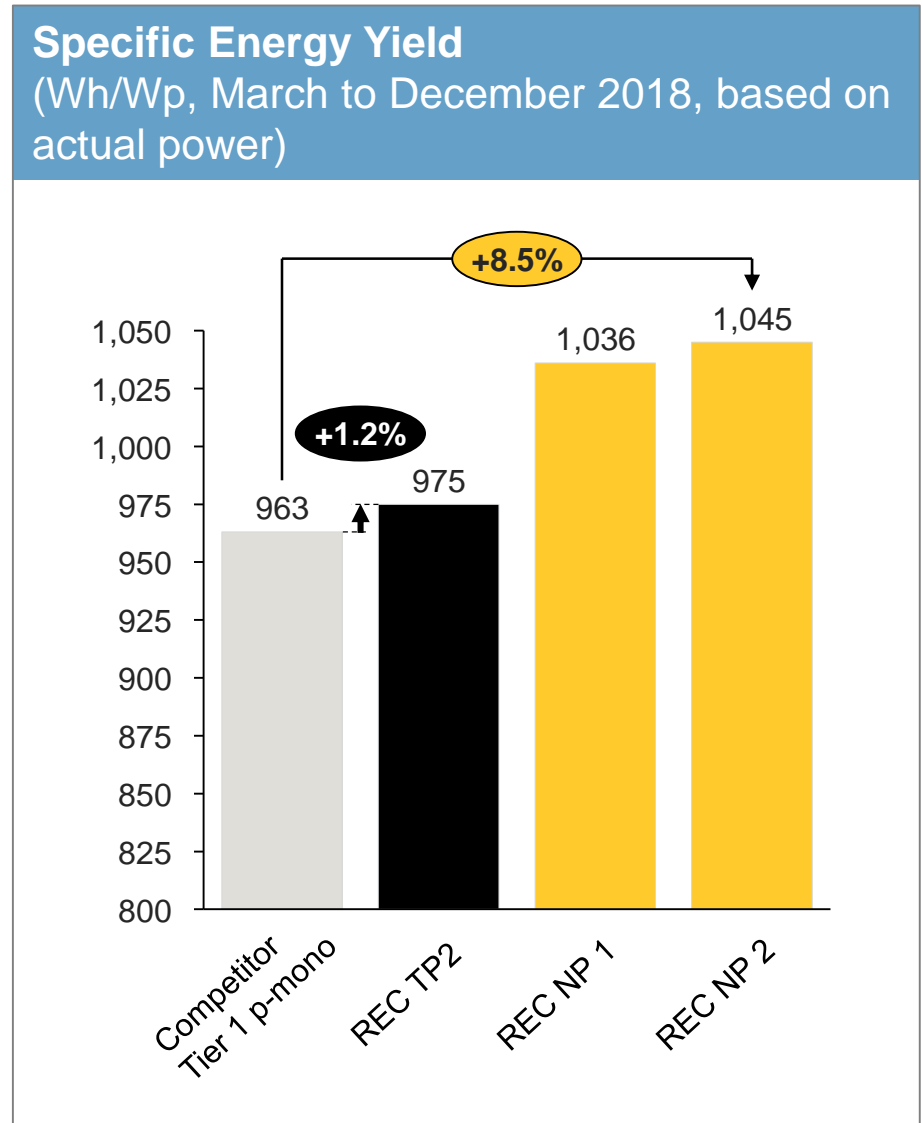
# Expansion of REC's technology leadership into mono products



## Three new products launched in 2018:

- **N-Peak**
  - The world's **first n-type mono** solar panel with **half-cut cells** and **twin design**
  - **60-cell** panel with **up to 330 Wp**
- Two new **p-type monocrystalline PERC** products based on REC's award winning **TwinPeak technology**
  - **60-cell TwinPeak 2 Mono** is rated up to **320 Wp**
  - **72-cell TwinPeak 2S Mono 72** up to **380 Wp**

- REC's N-Peak demonstrates **consistently higher performance** in field testing by SERIS, both in terms of Performance Ratio (PR) and Energy Yield (EY) over competitive Tier 1 p-mono products
- **N-Peak outperformed** the tested Tier 1 competitor p-mono products by
  - **+8.5% higher energy yield**
  - **95% Performance ratio** (vs. 88% by competitor)





The world's first REC N-Peak solar panels went to Australia. The Perth-based Solaire Connect, completed the 3.2 kW rooftop project in Perth, Australia, benefiting from the super-strong frame design as well as the power efficiency of the 320 Wp modules to create a stable and efficient system. Ben Towers, Managing Director at Solaire Connect, says "We are very excited and proud to be a part of the first ever N-Peak installation, and are looking forward to many more over the years."



© Solaire Connect

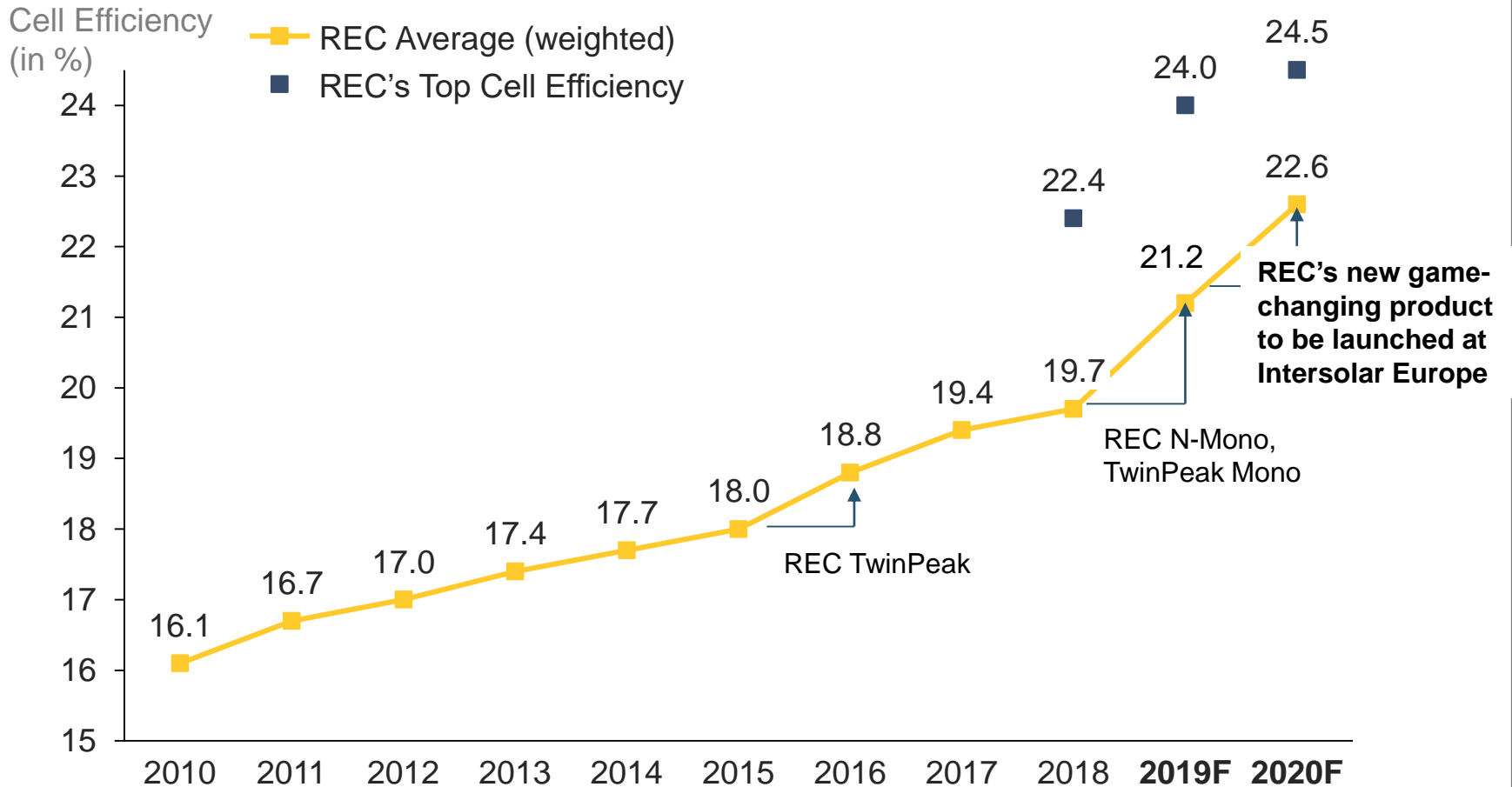


© Solbære AS

System size: 10.24 kW  
Annual capacity: 7,000 kWh  
CO<sub>2</sub> saved annually: 4 tons  
Number of panels: 32  
Installer / EPC company: Solbære AS  
Location: Frekhaug, Bergen, Norway

# Technology innovations pushing REC's cell efficiencies REC

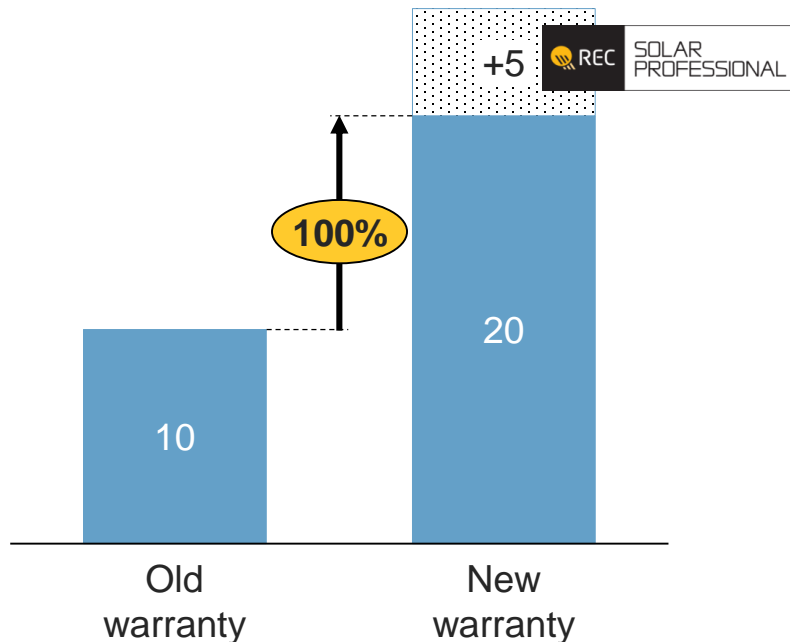
## REC Cell Efficiency Trend since 2010



## New Product Warranty

- **20 years** warranty for all products
- **Extra 5-year** product warranty for installations carried out by **REC-certified Solar Professionals**

### REC Product Warranty Duration (in years)



## New Power Output Warranty

- **Guarantees** REC customers even **greater output** over the full 25-year duration

### Overview Power Output Warranty (by REC product)

Product Series	POWER OUTPUT WARRANTY		
	Minimum power in year 1	Year 2-25 warranted annual degradation	% of nameplate power after year 25
REC N-Peak	98.0%	0.5%	86.0%
REC TwinPeak 2 Mono	97.5%	0.7%	80.7%
REC TwinPeak 25 Mono 72	97.5%	0.5%	85.5%
REC TwinPeak 25 72			



# REC's Quality is recognized year after year

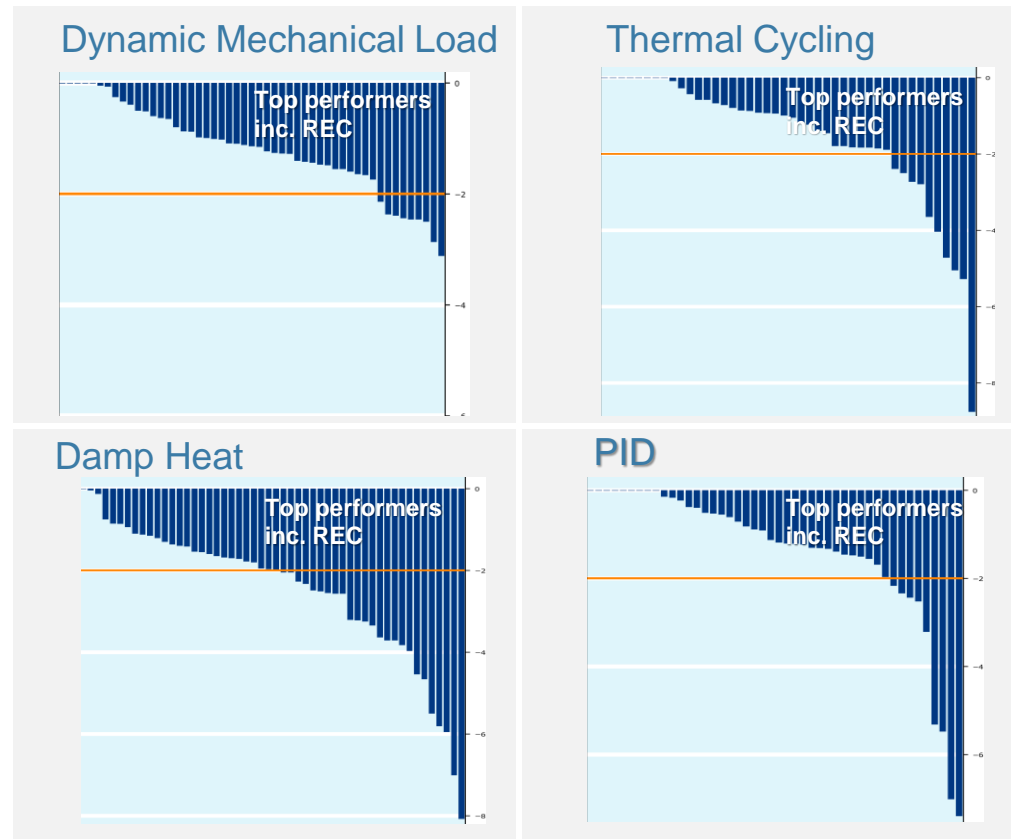


- REC has been named a **Top Performer by DNV GL** in its PV Module Reliability Scorecard – for the **3<sup>rd</sup> year in a row**



- REC competes against 9 of global top 10 brands
- Program compares long term module reliability by vendor quality
  - Testing in excess of IEC standards
  - Accelerated lifetime tests
- Extended light soaking before testing to better quantify LID

Reliability Test	Duration
Thermal Cycling	600 cycles of -40 to +85°C
Damp Heat	2000 hours at 85°C & 85% RH
Humidity Freeze	30 cycles of 85°C & 85% RH for 20 hours, -40°C for 30 min
Dynamic Mechanical Load	1000 cycles of 1000 Pa then 50 TC cycles + 10 HF
PID	96 hours, 85°C & 85% RH, negative system voltage rating



## 2018 in Figures

**>10**

New Partners  
globally

**~50**

REC Partners  
globally

**32**

Certification  
trainings carried out

**~ 450** REC

Solar Professionals  
certified

**>1,600**

Solar Professionals  
(total)



# REC follows its vision by bringing clean energy to remote Himalayan communities



## Better light, better education, cleaner air

- REC provided its panels to generate clean energy to remote villages and schools in the Ladakh and Zaskar regions of India
- Cooperation with Global Himalayan Expedition (GHE)
  - **>1,500** people directly impacted
  - **12 kW** clean solar energy replaced polluting sources
    - **9,000 liters** of kerosene per year eliminated
    - **22.8 tons** of CO2 emissions avoided
  - **100%** of the population now have basic energy access for lighting
  - PV installations power computers and displays at schools
    - **30%** increase in learning aptitude report by schools



Our Vision: **We want every person to benefit from electricity directly from the sun.**





15.53 MW, Kaua'i, USA

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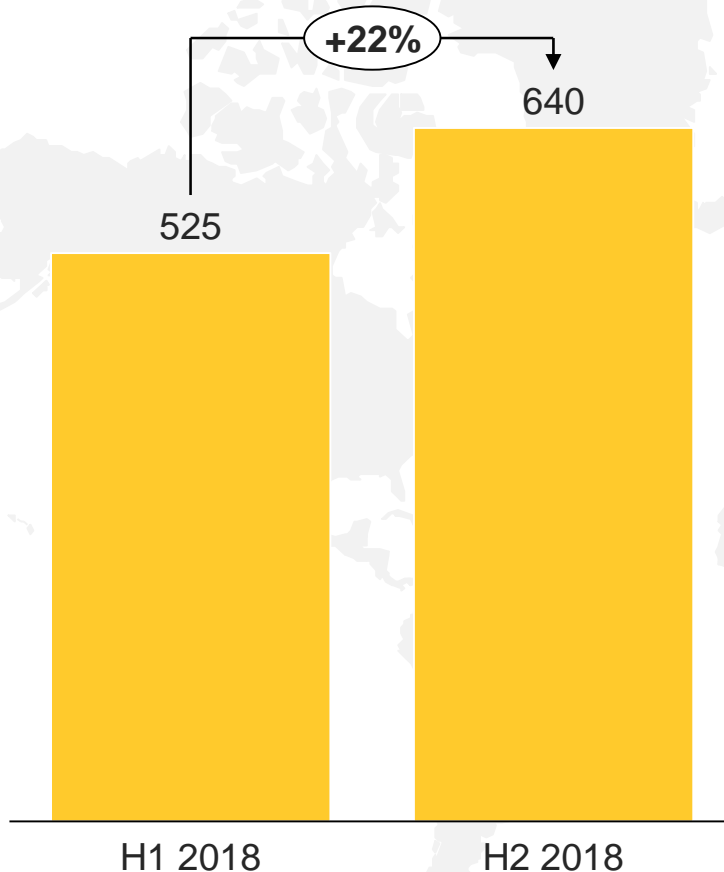
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# Global Performance

## Full-year 2018



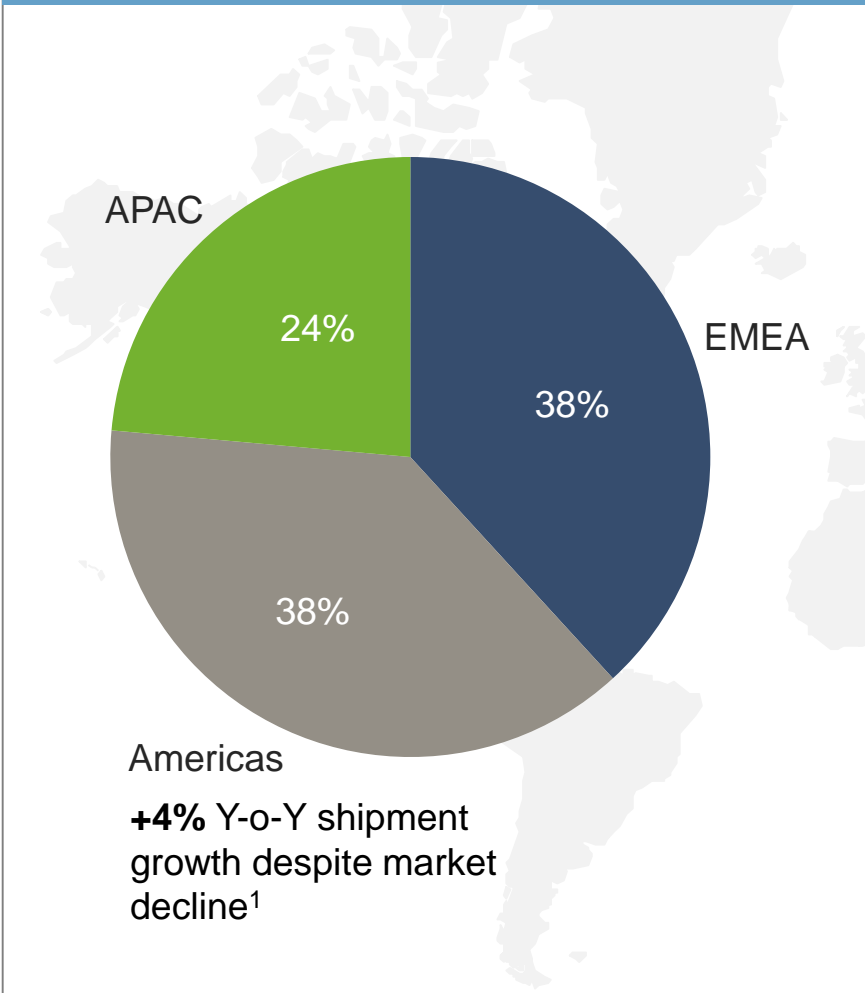
## REC Module Shipments 2018 (in MW)



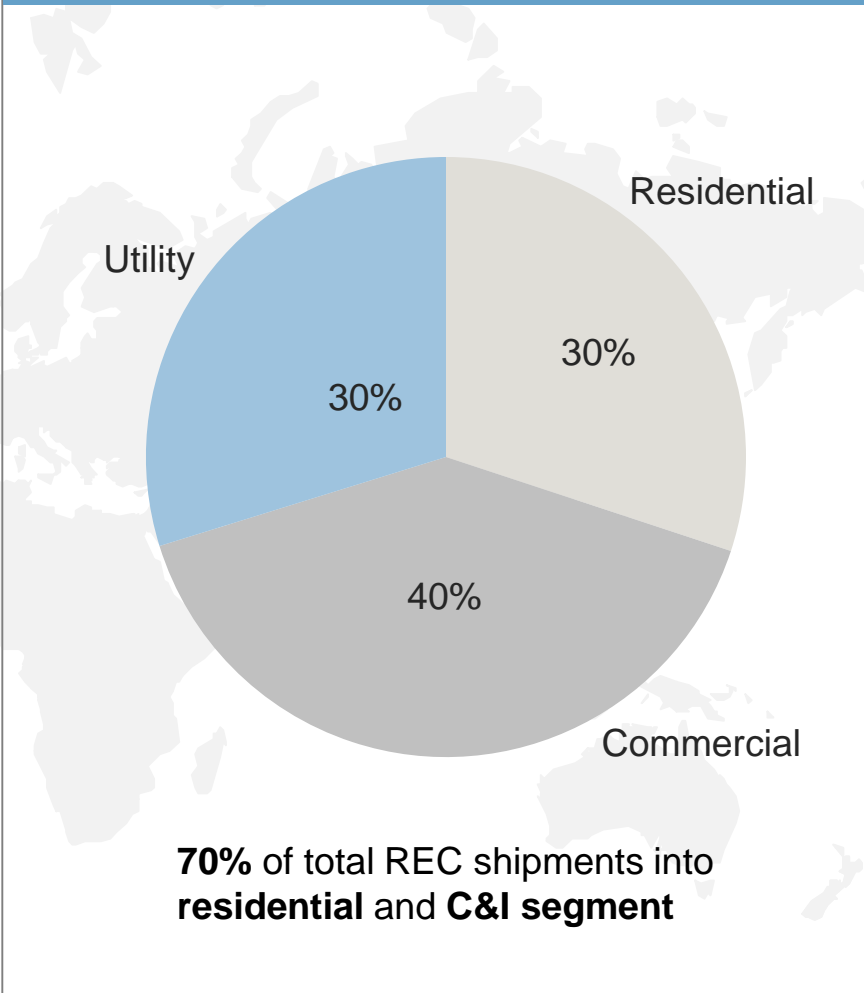
- **Sold out** in 2018, with total shipments at 1,165 MW and **strongest 3<sup>rd</sup> quarter** ever
- **Upgrade and expansion** of manufacturing lines
- **Three new products** launched
  - N-Peak
  - TwinPeak 2 Mono
  - TwinPeak 2S Mono 72
- **>2.3 GW** of award-winning REC TwinPeak modules installed globally
- **+20%** customer base growth from end 2017 to end of 2018

# REC's 2018 shipments are driven by the rooftop segment

## REC Module Shipments by Region (in %)



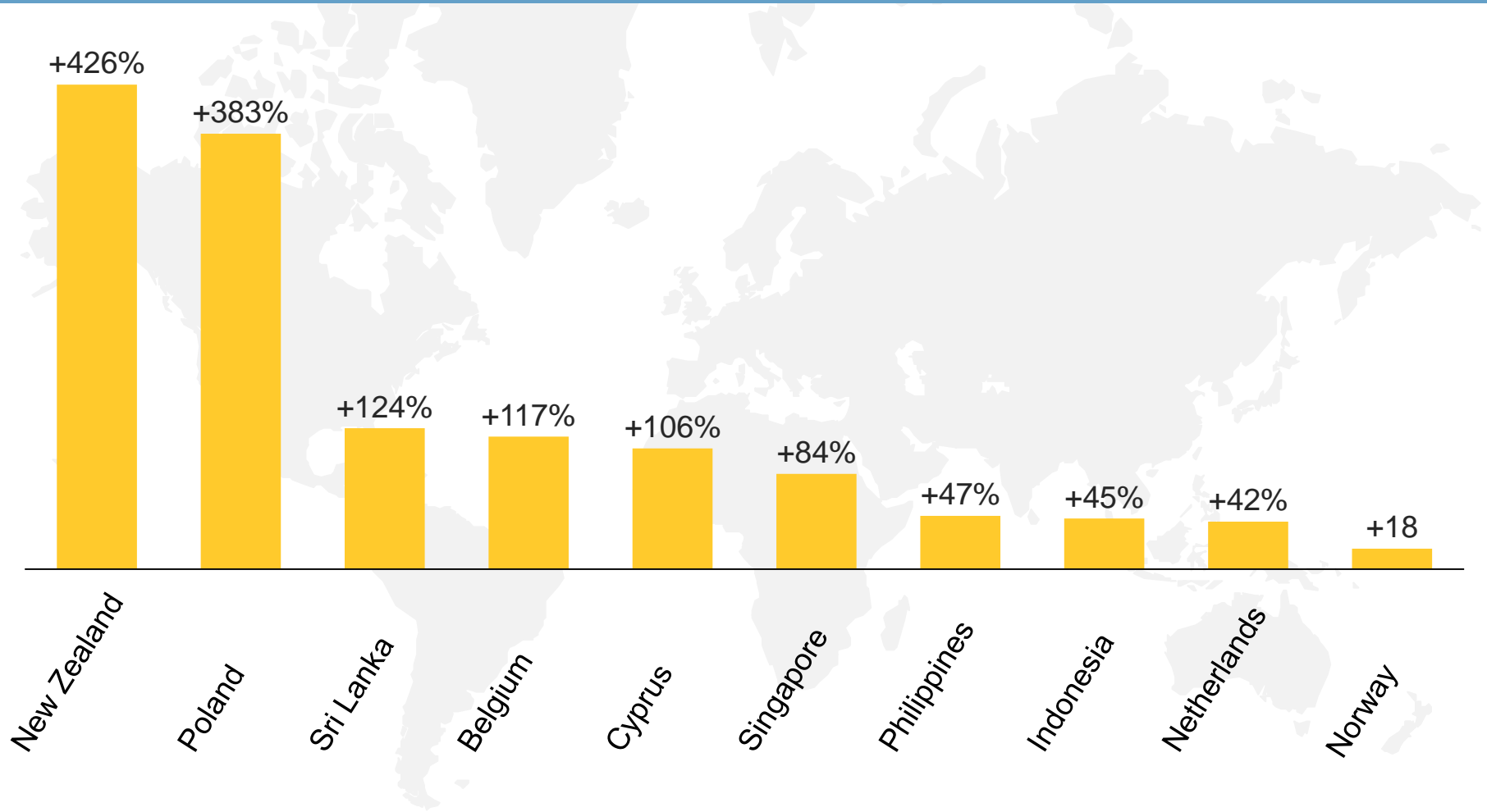
## REC Module Shipments by Segment (in %)





# REC drives sales diversification, serving >40 countries

## REC Growth markets 2018 vs. 2017 (based on REC shipments, in %)





24 MW, Canino, Italy

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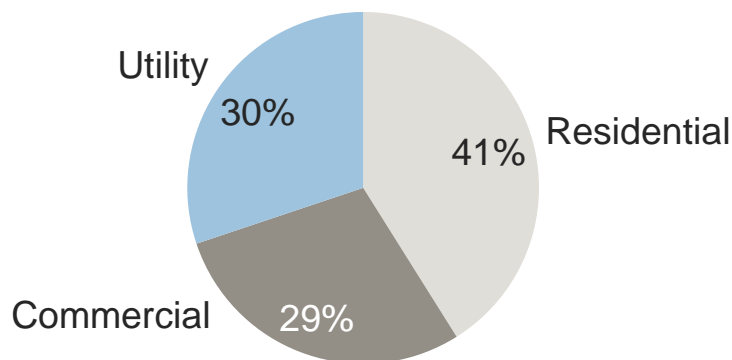
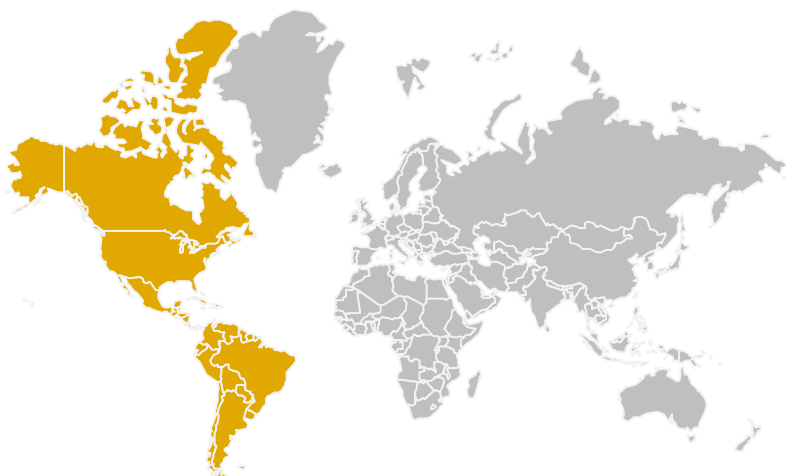
# Regional Performance

## Full-year 2018



# REC Americas shipment growth outperformed the total U.S. PV market

## 2018 Module Shipments split by Segment (in %)



## REC Performance Highlights

- **+45%** customer base growth for REC Americas from end 2017 to end 2018
- **+4% REC shipments growth Y-o-Y, outperforming the total U.S. market** which saw a slight decline to 10.6GW in 2018 (down from 10.8GW in 2017)<sup>1</sup>
- **>200MW** initial order volume for REC's **TwinPeak mono** within days after starting production in December 2018
- **>1GW** of **award-winning REC TwinPeak** modules installed in the U.S. since 2015

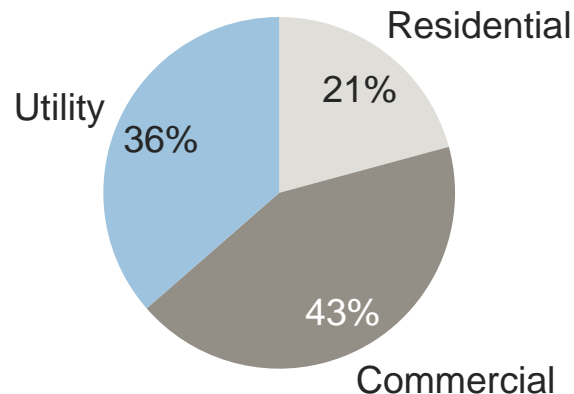
## Key regional trends

- **4%** of distributed solar capacity in **2018** were **solar-plus-storage** installations; This share is forecasted to grow to **23% by 2024**<sup>1</sup>
- Investment activity for **utility-scale project** continues to strengthen to secure 30% Investment Tax Credit (ITC) ahead of its decline from 2020
- **Corporate PPAs** will continue to be strong demand pillar



# REC expanded its customer base and country reach in the EMEA region

2018 Module Shipments split by Segment  
(in %)



## REC Performance Highlights

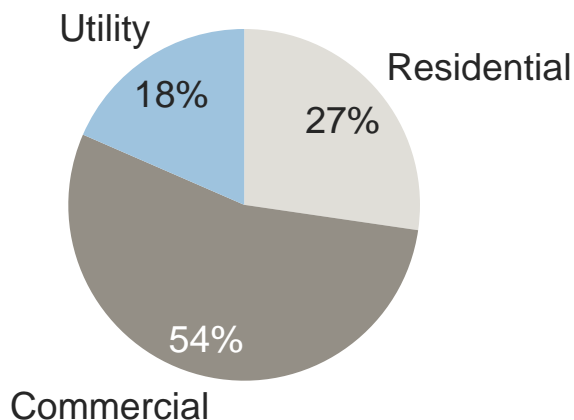
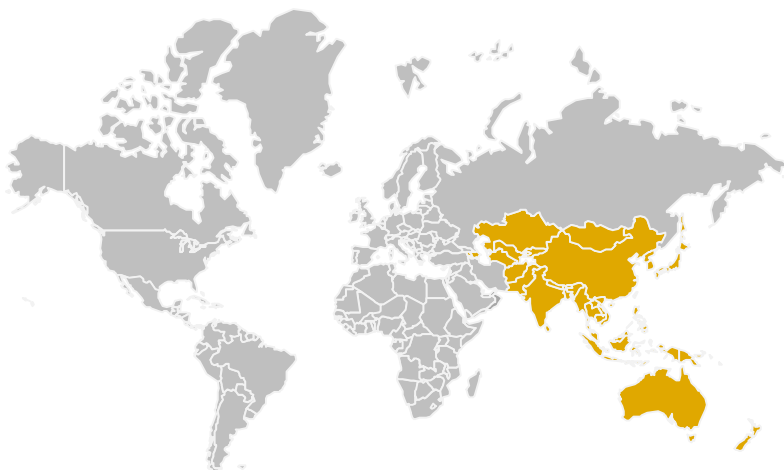
- **+37%** customer base growth for REC in the EMEA region from end 2017 to end of 2018
- **>20 markets** are served by REC in the region
- **Top 6** markets for REC were Germany, the Netherlands, France as well as Belgium, Spain and Italy
- Belgium and the Netherlands saw the highest **Y-o-Y shipment growth** amongst top markets of REC
  - **+117%** in Belgium
  - **+42%** in the Netherlands

## Key regional trends

- European PV market is set to double to **20GW** by 2020 compared to its 2017 level
- Thanks to PV's increasing **cost competitiveness**, there is vast potential for **Corporate PPAs** and **unsubsidized utility scale projects**
- **PV** is given a more **prominent role** in the future energy strategies by several large **European markets**
  - France targets 45 GW of PV, Italy 50 GW, Spain 77 GW, all by 2030

# 2018 saw several of REC's top 10 growth markets being located in the APAC region

2018 Module Shipments split by Segment  
(in %)



## REC Performance Highlights

- **Top 5 markets** for REC in APAC: India, Japan, Australia, Singapore and Thailand
- In India, REC Group became the **1<sup>st</sup> European brand** of solar panels to be **certified by BIS**
- Upsurge in number of REC-certified installers in Australia with **>70 installers** completing the certification training in 2018, bringing the total number to 255
- **Seven new partners** joined in 2018 **REC's Partner Program** across the APAC region
- Increasing footprint in emerging markets such as Philippines and Indonesia

## Key regional trends

- Japan - strong outlook for residential driven by increasing attractiveness of self-consumption and government focus for Zero Energy Homes
- India - Strong growth prospects as India steadily transitions from fossil fuels towards renewable energy; Solar represented ~51% of all new power capacity in 2018<sup>1</sup>
- Corporate PPAs enjoy a strong interest, the PPA volume grew by +200% from 2017 to 2018<sup>2</sup>



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2.2 MW, Singapore

# REC Global Outlook 2019 & Onwards

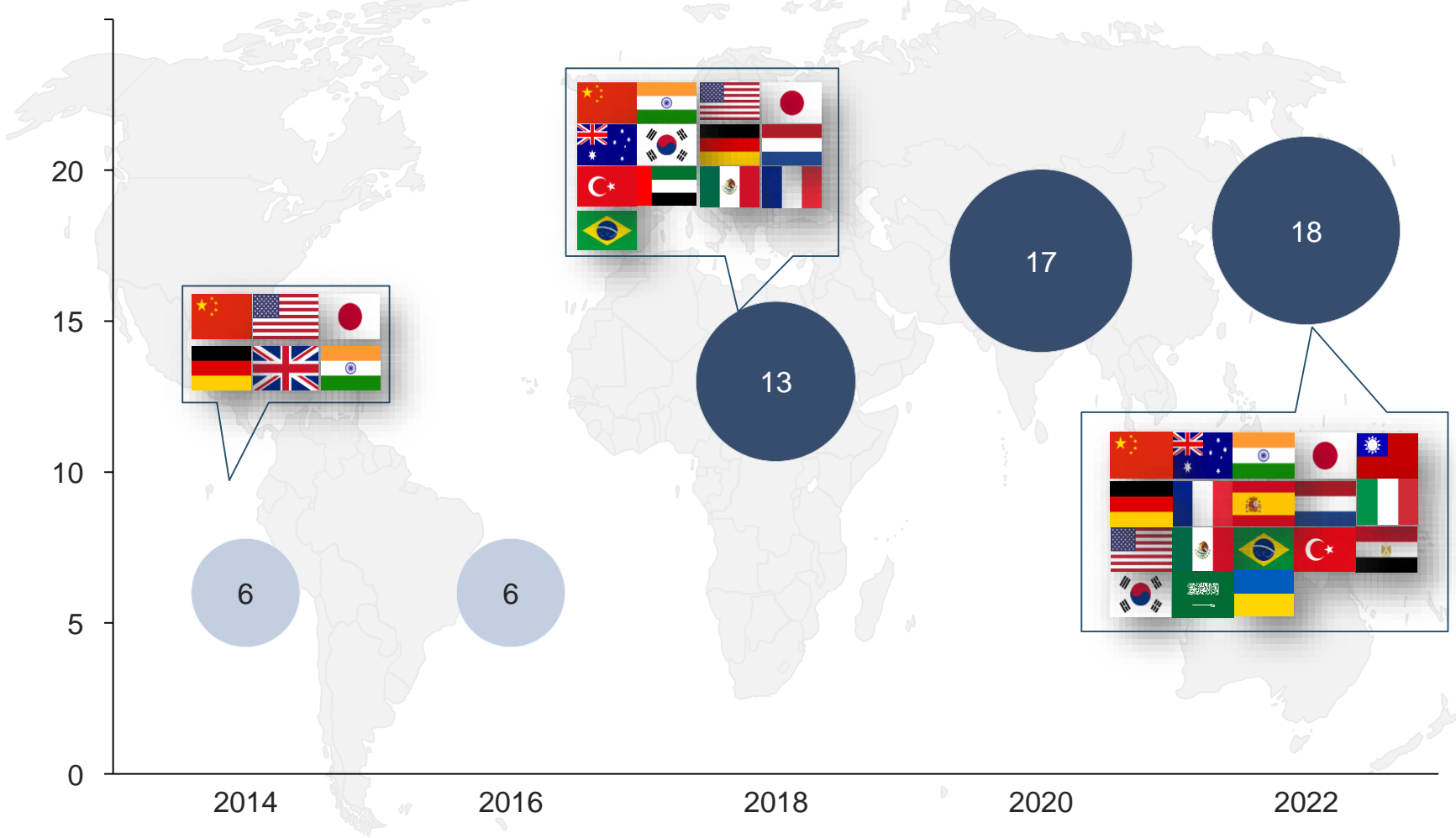




# The number of Gigawatt-scale markets is continuously growing thanks to strong economics of solar PV

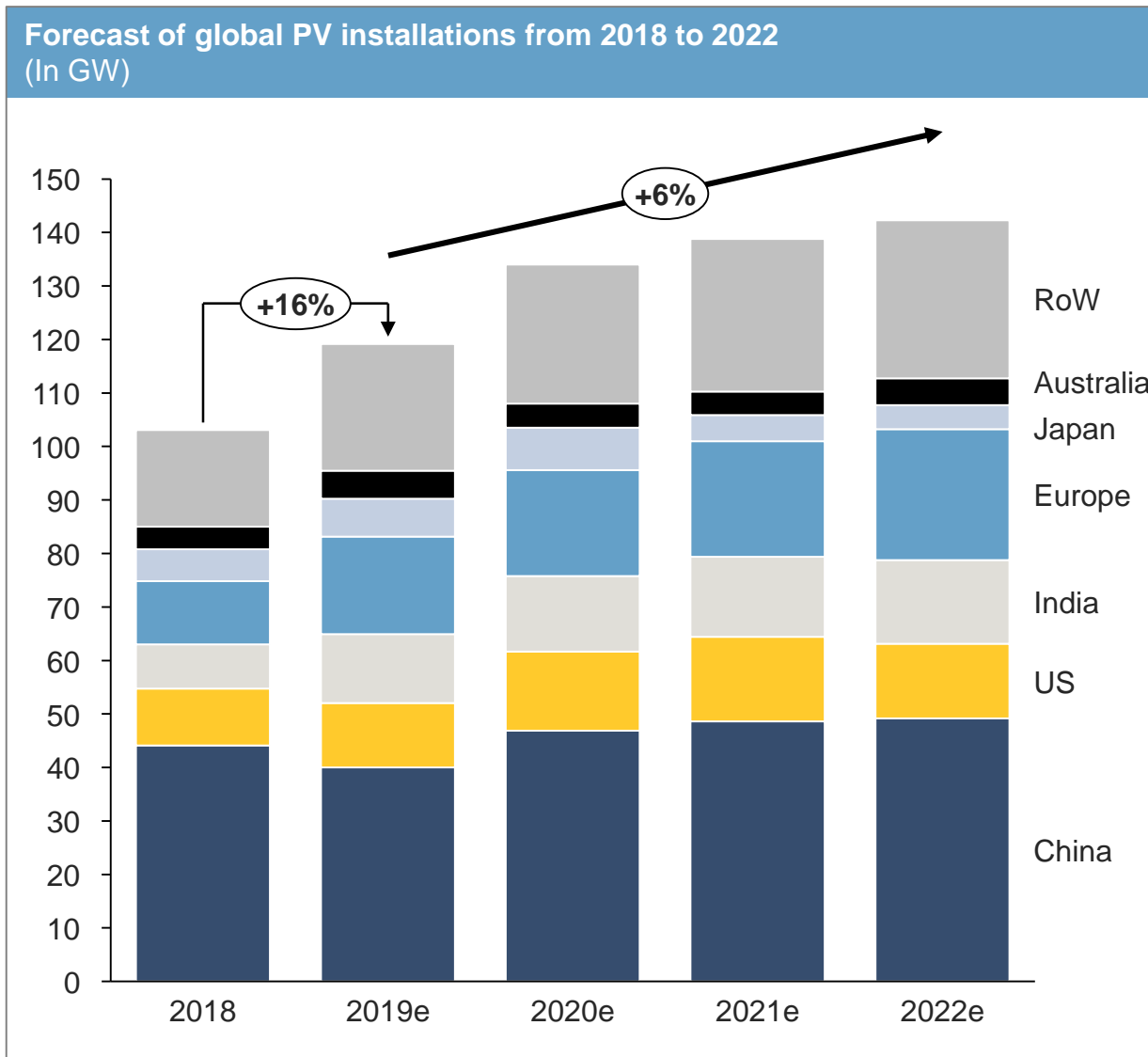


Number of Solar PV GW-Scale Markets



Source: IHS Markit Q4 2018 (Dec.2018)

# From 2019 to 2022, global demand is forecast to grow at an annual average rate of 6%

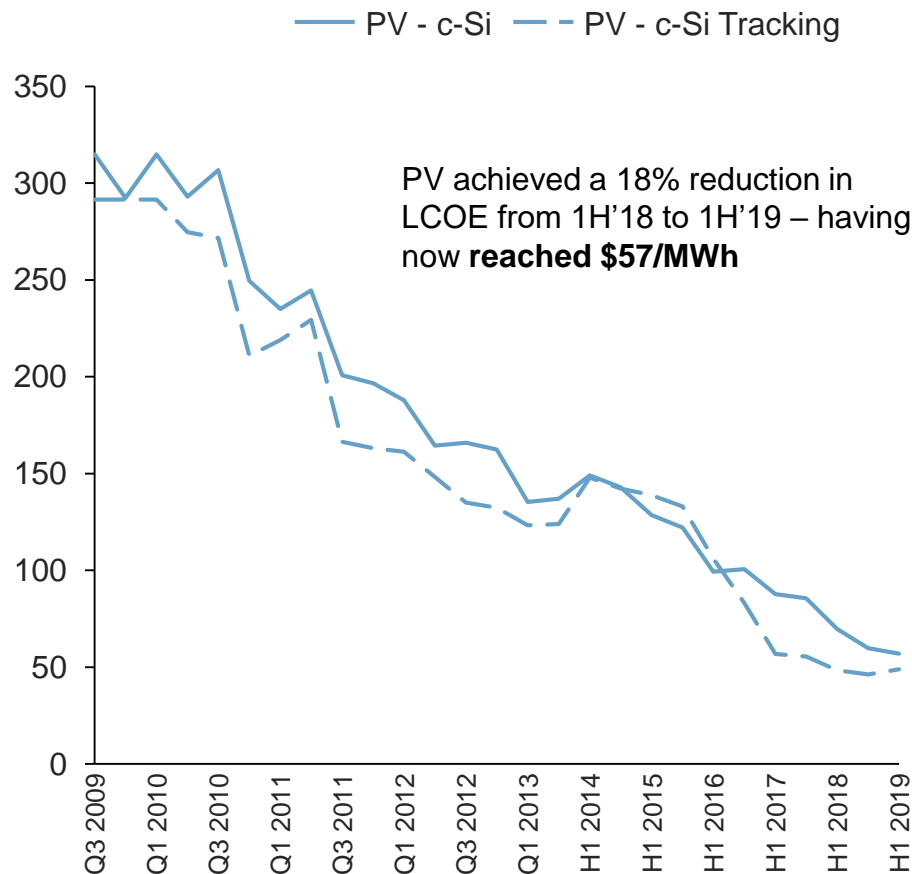


- Globally is expected to **grow** by around **6% per year from 2019 to 2022**
  - Challenging 2018 due to regulatory decisions (i.e. US, China, India)
  - 2019 likely impacted by new Chinese policy driving towards a subsidy-free PV market demand
- Growth **drivers going forward**:
  - Demand **diversification**, Rise of emerging markets
  - Strengthening of **Prosumers**
  - Declining LCOE's leading to acceleration of **economics- based** deployment
  - Solar + **storage**
  - **Electrification** in transportation

# Corporate Solar PPAs are booming, driven by PV cost competitiveness

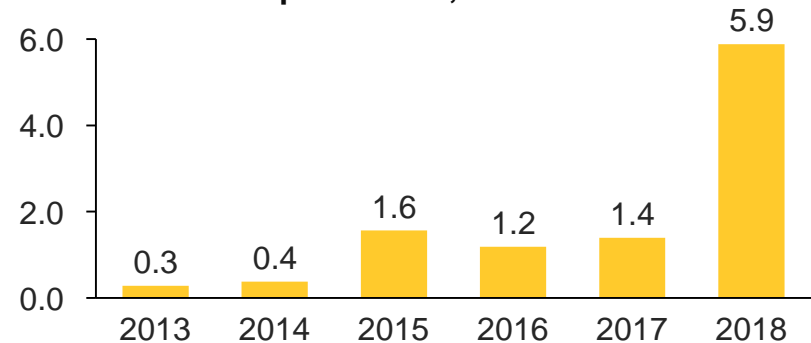


**Solar PV LCOE development**  
(in \$/MWh)

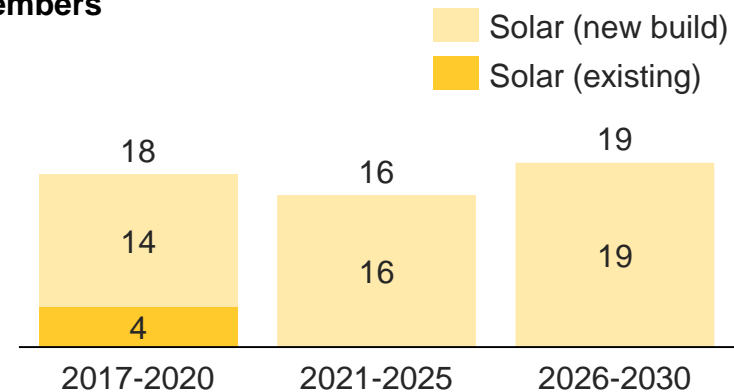


**PPA volumes for Solar**  
(in GW, per Year)

**Global Solar Corporate PPA, until 2018**



**Outlook potential solar build by global RE100 members**

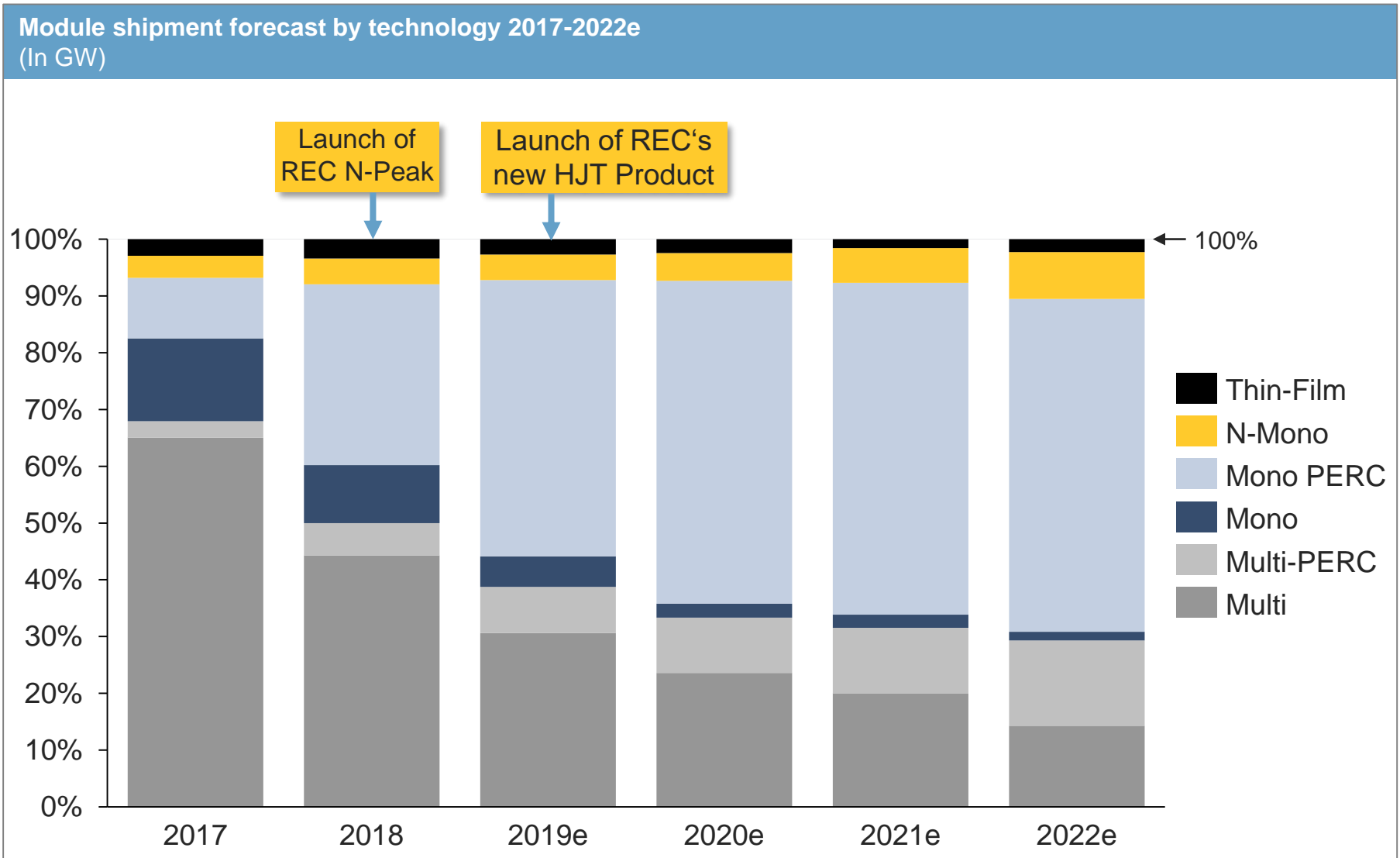


Note: All LCOE calculations are unsubsidized.

Source: Bloomberg NEF, 1H 2019 LCOE Update – Solar, March 2019; Bloomberg NEF 1H 2019 Corporate Energy Market Outlook



# >50% of module shipments in 2019 expected to be mono-based



# REC Group to unveil game-changing solar panel at Intersolar Europe 2019



The world's highest power  
60-cell solar panel

Leading technology expertise  
from Europe and Singapore

Unique cell technology and  
patented panel design

A 'best choice' product for  
growing solar rooftop  
markets worldwide

**Something exciting is coming.**  
REC Group's big launch event at Intersolar Europe  
on May 15, 2019 at 4PM. Booth A2.380.

[www.recgroup.com/excitement](http://www.recgroup.com/excitement)



**For more information, please contact:**  
Agnieszka Schulze  
Head of Global PR, REC Group  
E-mail: [agnieszka.schulze@recgroup.com](mailto:agnieszka.schulze@recgroup.com)



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