

SOLAR'S MOST TRUSTED



THIS IS REC GROUP

A pioneering solar energy company dedicated to empowering consumers

Public

Hardik Patel, Technical Product Manager, REC APAC
May 2023

Munich, Germany
REC Alpha Black Series

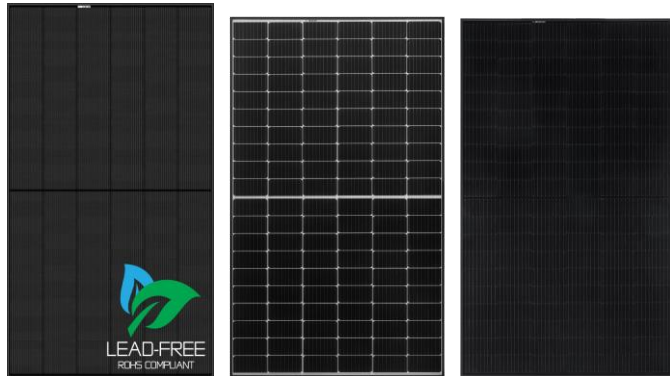


RENEWABLES
EMPOWERING
COMMUNITIES

This is our overall mission.

REC donated solar panels to empower remote Himalayan villages
© Global Himalayan Expedition (GHE)

REC manufactures and sells high quality solar panels for use in various applications worldwide



Residential



Commercial



Utility



Floating




Empowering millions people all over the world with clean solar power and in all areas of our daily lives



REC at a glimpse – 25 years of commitment to solar REC



>43M SOLAR PANELS
produced and sold



17.5M PEOPLE
Powered at home



~1,500
employees globally



NORWAY & SINGAPORE
Manufacturing facilities



~1.5 GW
2022 solar panel
production capacity



CONSISTENT HIGH QUALITY
4 million panels manufactured each year;
<400 from return from the field (PPM: <100)

History of REC



THE EARLY DAYS

- 1996** • REC established in Norway
- 1997** • First wafer washed by hand in summer 1997



INDUSTRIALIZATION

- 1997 – 2010** • Production of wafers, solar cells, and solar panels in Scandinavia (Norway and Sweden)
- 2010** • Fully automated production of wafers, cells, and panels begins in Singapore
- Launch of REC Peak Energy



GROWTH PHASE

- 2013** • Split of REC from Renewable Energy Corporation ASA (REC Silicon)
- 2015** • REC acquired by Norway's Elkem Group (Bluestar Investment Co. Ltd.)
- Launch of REC TwinPeak
- 2017** • Launch of REC TwinPeak 2
- 2018** • Launch of REC N-Peak
- Launch of REC TwinPeak 2 Mono



CHANGING THE GAME

- 2019** • Launch of REC Alpha
- 2020** • Launch of REC TwinPeak 3 Mono
- 2021** • Launch of REC Alpha Pure
- Launch of REC TwinPeak 4
- Launch of REC N-Peak 2
- REC becomes part of Reliance Industries Ltd. and accelerates expansion
- 2022** • Launch of REC Alpha Pure-R
- Launch of REC REC N-Peak 3
- Launch of REC TwinPeak 5



A global company with ~1,500 employees



● Corporate Headquarters ○ Operational Headquarters ● REC office ○ Production facilities

REC production facility in Singapore



REC Wafer Plant

REC P-Type Cell Plant

REC N-Type Cell Plant

REC Panel Plant



**REC PANEL
PRODUCTION
CAPACITY**

1.5 GW

151,000 m² of production space

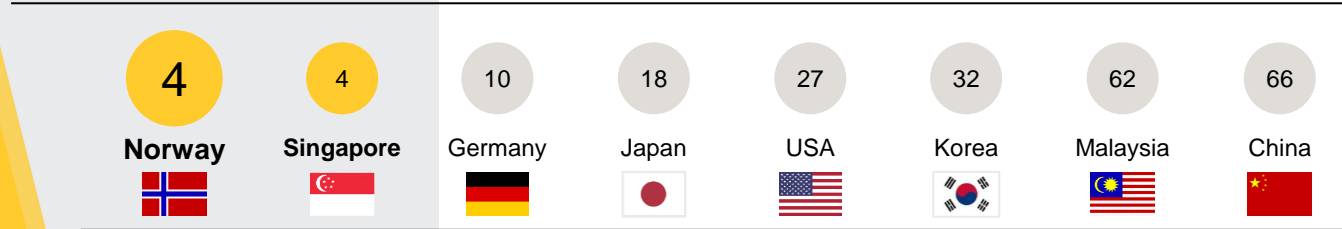
Manufacturing in both Norway and Singapore provide REC with significant advantages



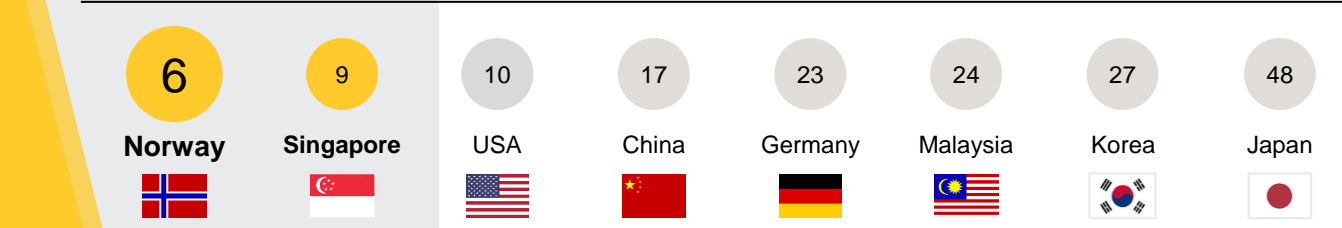
Global Competitiveness Index



Transparency (Corruption perceptions Index)



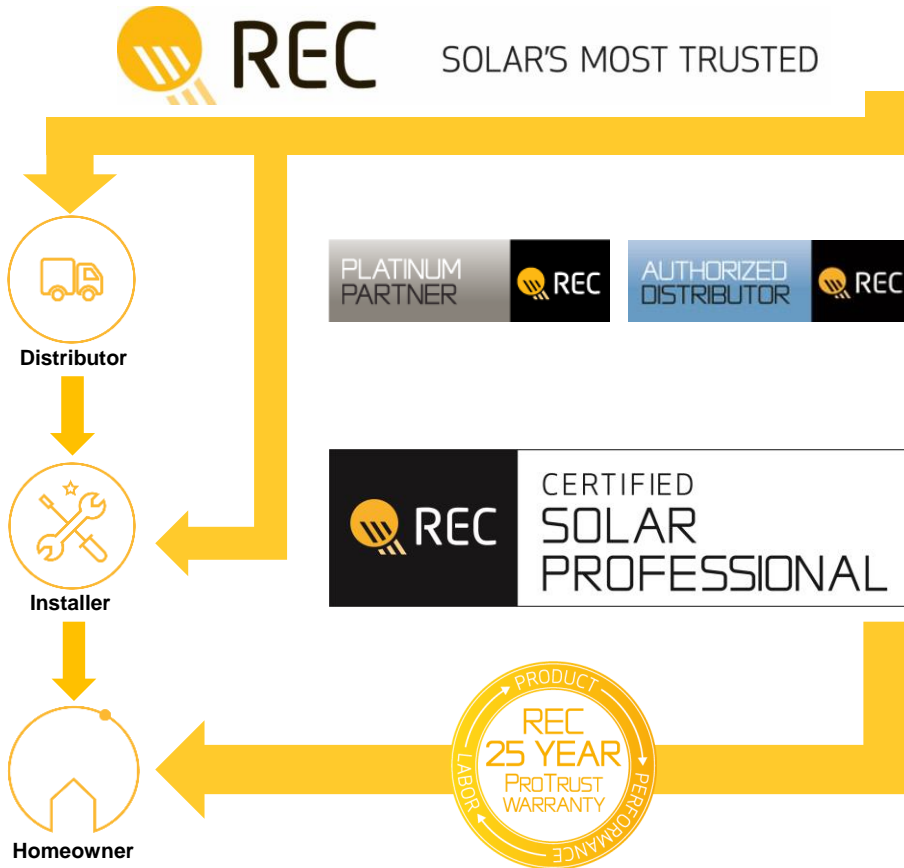
Business Efficiency



Source: <https://www.transparency.org/en/cpi/2021>; <https://www.imd.org/centers/world-competitiveness-center/rankings/world-competitiveness/>

Channel Programs going downstream

Tailored customer programs rich with benefits for distributors, installers, and end customers



Low claims, premium warranty

REC ProTrust covers product, performance, and labor – exclusively offered by REC Certified Solar Professional installers



Product Series	Product warranty		Performance warranty		
	Product warranty	Extension eligibility*	Min. power in Y-1	Max. annual degradation	Guaranteed nameplate power in Y-25
REC Alpha	20 years	+5 years	98.0%	0.25%	92.0%
REC N-Peak 3				0.5%	86.0%
REC TwinPeak 5				0.5%	86.0%

REC warranty type	REC ProTrust Warranty		REC's leading standard warranty
Installer group	Exclusive to REC Certified Solar Professional installers		All installers
System size	<25 kW	25-500 kW	Any
Product / Performance / Labor warranties (years)	25 / 25 / 25	25 / 25 / 10	20 / 25 / 0
Registration	Via REC SunSnap app or REC Certified Solar Professional Portal		Not required



* Product warranty extension eligibility is exclusive to REC Certified Solar Professional installer as part of the REC ProTrust Warranty; visit www.recgroup.com/warranty for details

Winner of multiple third-party awards



REC's industry strength has been recognized by multiple awards worldwide

- Intersolar Award for REC Alpha
- Best Solar Panel by Solar Review for REC Alpha
- PV Module Tech Award by Solar Quarter India for REC Alpha
- Top Performer Awards by PVEL (DNV GL) for 6 years in a row
- Solar+Power Award for REC TwinPeak 2 Series
- Made in Singapore Award for REC TwinPeak 2 Series
- Norwegian Climate Business of the Year Award for New Silicon Production Methods
- Intersolar Award for REC TwinPeak Series
- Singapore 1,000 Net Profit Growth Excellence Award
- IAIR Awards for Corporate Sustainability and Solar Energy Solutions
- Frost and Sullivan Best Practices Award for Customer Value Enhancement
- Solar Industry Award for Module Manufacturing Innovation



Premium brand with blue-chip customers



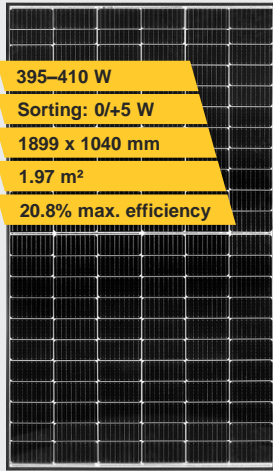
REC Product Portfolio in 2023

Products in Green box for APAC markets



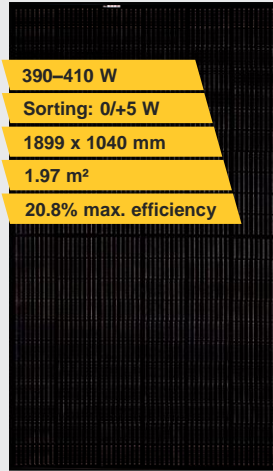
P-type mono

TwinPeak 5



Production from: Jan 2023

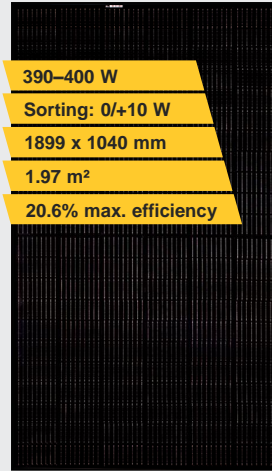
TwinPeak 5 Black



Production from: Nov 2022

N-type mono

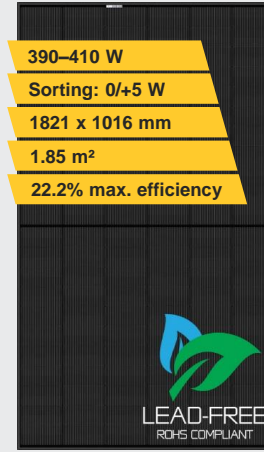
N-Peak 3 Black



Production from: Nov 2022

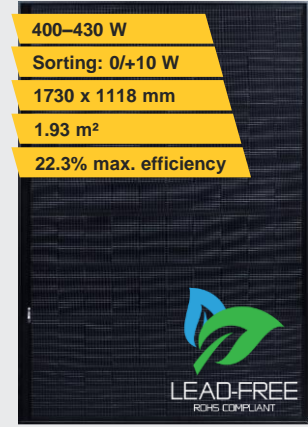
HJT

Alpha Pure



Production from: Jun 2021

Alpha Pure-R



Production from: Aug 2022

REC TwinPeak 5 Series

Video Link: <https://www.youtube.com/watch?v=n2Vr7Y319EU>



Residential & C&I Solutions

Product advantages

High efficiency and energy yield

- Mono p-type, PERC cell technology for higher power
- Lower operating temperatures for high efficiency
- Advanced cell doping technology for low light induced degradation (LID)

More power through reduced resistance

- Half-cut cells for more power
- Better electron flow for stable power

Increased yield when shaded

- REC's iconic Twin design generates more energy under shade
- When one half is shaded, the other half can still generate electricity

Darker appearance

- Monocrystalline cells for a uniform dark blue color and high efficiency

Reliable production

- Lower operating temperature for better reliability
- Reduced chance of defects due to lower operating temperature

Super-strong frame

- Improved durability for at least 25 years of high power
- 30 mm height for lightweight and compact installation



Key info.

Power:

395 - 410 Wp

Sorting:

0 / +5 Wp

Dimensions:

1899 x 1040 x 30 mm

Area:

1.97 m²

Weight:

21.6 kg

Layout:

REC's patented Twin Design with Mono-Si p-type PERC cells

Max. Efficiency:

20.8 %

Max. Power density:

208 W/m²

Max. System Voltage:

1000 V

Temperature Coefficient:

-0.34 %/°C



REC TwinPeak 5 Black Series

Video Link: <https://www.youtube.com/watch?v=n2Vr7Y319EU>



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Super-strong frame

- Improved durability for at least 25 years of high power
- 30 mm height for lightweight and compact installation

Stylish looks

- Full-black design for a seamless appearance on roofs



Key info.

Power:

390 - 405 Wp

Sorting:

0 / +5 Wp

Dimensions:

1899 x 1040 x 30 mm

Area:

1.97 m²

Weight:

21.6 kg

Layout:

REC's patented Twin Design with Mono-Si p-type PERC cells

Max. Efficiency:

20.6 %

Max. Power density:

206 W/m²

Max. System Voltage:

1000 V

Temperature Coefficient:

-0.34 %/°C



Product advantages

Substantial power advantage

- Larger G12 cells and efficient HJT technology to capture more light
- High power in a compact size for best use of rooftop space
- 4 string sections for even more power gain under shaded conditions

Lead-free production:

- RoHS compliant EU/2015/863 for minimal environmental impact

Gapless cell design with an innovative new cell layout

- Higher power density through gapless design
- Further improves output under shaded conditions

Elegant looks

- Gapless cell layout in a full-black design for an elegant feature on homes

Lowest temperature coefficient of $-0.24\%/^{\circ}\text{C}$

- More energy produced when the sun shines strongest

No LID

- No initial drop in power so customers receive the full power purchased

Outstanding level of reliability

- Eliminates invasive soldering to reduce thermal stress on cells
- Super-strong frame supports cells for lasting high power

Compatible with modern MLPE devices

- Module current of only 9 amps suits today's range of contemporary MLPE devices
- Ideal for use with micro-inverters and optimizers, or rapid-shutdown devices



Key info

Power:

400 – 430 Wp

Sorting:

0 / +10 Wp

Dimensions:

1730 x 1118 x 30 mm

Area:

1.93 m²

Weight:

21.5 kg

Layout:

Compact format with G12 HJT cells in a gapless layout

Max. Efficiency:

22.3 %

Max. Power density:

223 W/m²

Max. System Voltage:

1000 V

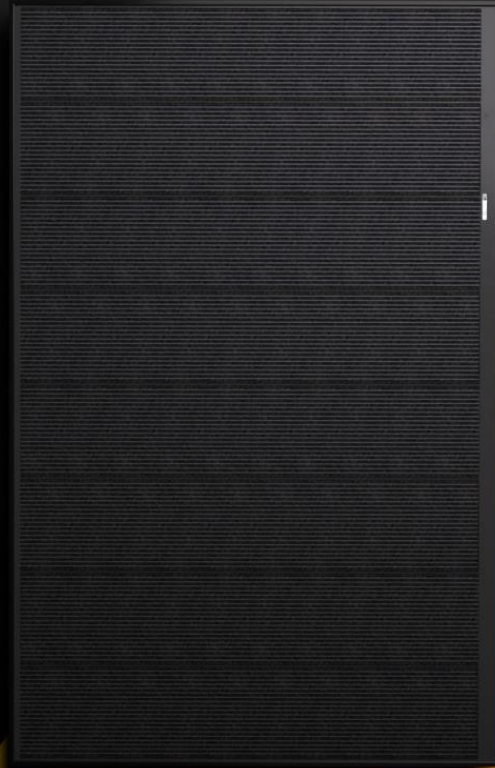
Temperature Coefficient:

$-0.24\%/^{\circ}\text{C}$



Let our video give you an introduction

<https://www.youtube.com/watch?v=mNM0ENzxir0>



Click here to watch the [video](https://www.youtube.com/watch?v=mNM0ENzxir0)

REC Alpha Pure is a powerful hybrid combination of cell technology



High power structure through technology hybrid

N-type mono crystalline silicon wafer for:

- Performance
- Reliability
- Abundance

Amorphous silicon for:

- Great absorption
- Superior passivation
- Low temperature deposition

N-type technology

- Highest crystalline cell structure efficiency
- No LID

Better for the environment

- Lead-free silver paste
- No bus bars for more cell exposure

Best passivation

- Leading temperature coefficient
- More power when sun is strongest
- More energy in hot climates

Highest bifaciality

- Captures more light
- Higher power

Transparent Conductive Oxide
Amorphous silicon
N-type mono wafer
Intrinsic amorphous silicon

REC's Advanced Cell Connections means environmentally-friendly, solder-free cells



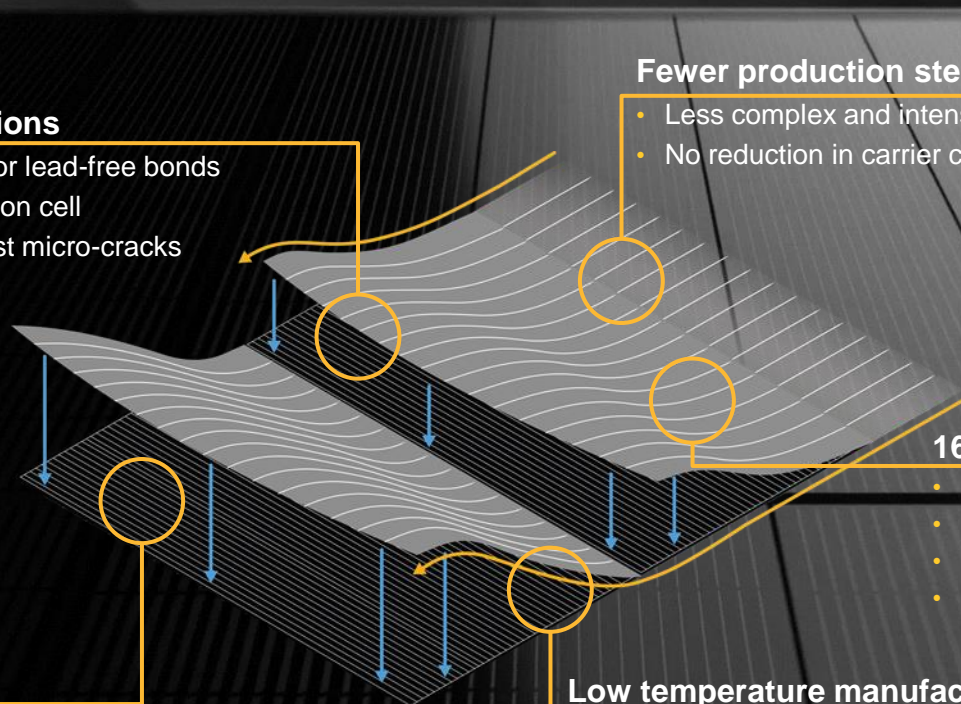
Solder-free connections

- No soldering on cell, for lead-free bonds
- Lead-free silver paste on cell
- High resistance against micro-cracks



Fewer production steps than competitive processes

- Less complex and intensive production
- No reduction in carrier collection efficiency



16 wires

- Shorter current path
- More contacts reduce resistance
- Only 390 solder points in entire panel
- Round shape to improve internal reflection and reduce shading

No busbars

- Exposes more cell area for more absorption
- Increased contact between fingers and metallization for higher power

Low temperature manufacturing

- Greatly reduces thermal stress for fewer defects
- Energy-efficient process for fewer emissions and lower CO₂ footprint

Super-strong frame design adds real performance advantages



Higher frame height

- Needed to ensure stability of panel
- Uses more raw materials
- More transport needed to deliver same power



Support only around edge of panel

- Weight of load pushes laminate downwards
- Increased deformation increases risk of cell breakage and panel deformation
- Needs specific and narrow clamping zones

Thinner frame

- Ensures stability and durability of panel construction
- Lighter weight makes panel easier to handle
- Optimizes transport for fewer trucks on the road



Support bars for better protection

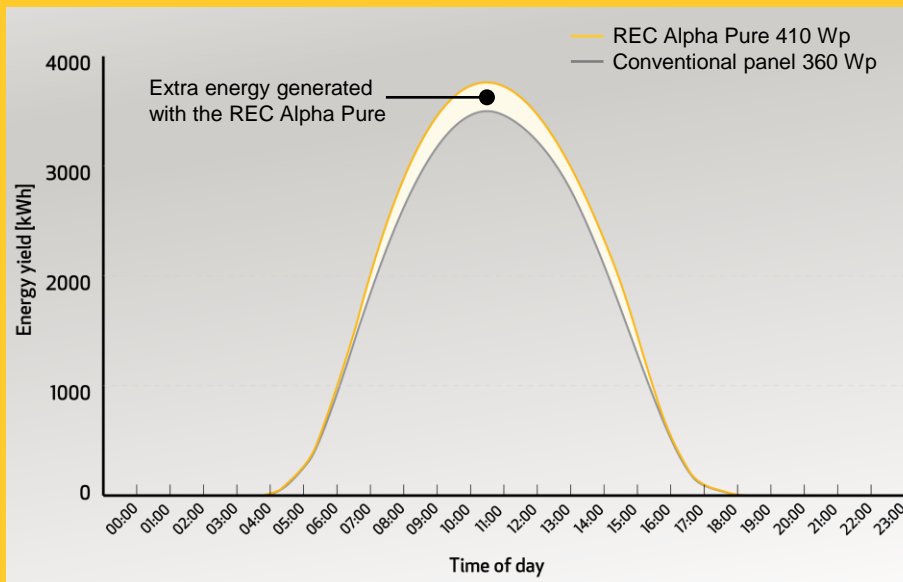
- Limit deflection of laminate under load, protecting cells from damage
- Fewer defects means higher output and a longer life
- Increase installation flexibility through wider clamping zones and higher loads

REC Alpha: Heterojunction cells produce more energy when the sun is strongest



- The REC Alpha Pure packs in even more energy generation
 - Most efficient cell technology
 - No LID
 - Lowest temperature coefficient
 - Leading power density: 222 W/m²
- Ideal for making the most of available rooftop space
- Greater annual yields for more savings on electricity bills

Average Daily Energy Production Comparison Over 1 Year shows 6 % more production when the sun is strongest



Simulation results for full calendar year, based on an 8 kWp system in Palm Springs, CA, USA.
Peak REC Alpha Pure Series energy yield difference at midday: +6%. Performance may vary dependent on location

REC's has a long history of high performance in PVEL Long-term Reliability Module Scorecard



REC is one of only five module manufacturers who have appeared in the Scorecard six or more times

Proves REC's commitment to quality across product generations:

2016 REC TwinPeak BLK

2017 REC TwinPeak BLK

2018 REC TwinPeak 2

2019 REC TwinPeak 2, REC TwinPeak 2 Mono

2020 REC TwinPeak 2 Mono

2021 REC Alpha, REC Alpha Black, REC TwinPeak 3 Mono

2022 REC Alpha Pure



- Committed to modern anti-slavery principles, and adopt a **zero-tolerance policy towards human rights violations**
- **Adhere strictly to human rights laws** in countries we manufacture, including Singapore and Norway
- Set high expectations of our suppliers upstream and undertake **regular supplier audits** to maintain the highest quality and working conditions
- Strive to empower all employees, ensuring **diversity and equality** are part of REC's responsible HR management practices



Empowering communities in need: Himalaya (IN)

- REC Alpha and TwinPeak panels power rural medical centers
- Positive impact on electrification and upgrading of local health care
 - 24/7 access to energy
 - Reduction in infant mortality
 - Improved critical healthcare, avoiding transportation to other centers
 - Better patient turnout due to higher confidence in healthcare amongst villagers
 - Higher immunization due to proper transportation of vaccines



Real life, real satisfaction



IKEA, Germany

582 kW

2,476 x REC panels

Regensburg & Freiburg, Germany

2010



Singapore National Stadium

707 kW

2,719 x REC panels

Singapore

2014



Redtag (BMA International)

537 kW

2,016 x REC panels

Dubai, UAE

2016



Dubai International Airport

635 kW

2,592 x REC panels

Dubai, UAE

2015



Kenn's Farm

100 kW

400 x REC panels

East Anglia, UK

2015



Audi Production Plant

2.3 MW

9,288 x REC panels

Brussels, Belgium

2013

Real life, real satisfaction



Pauly family home

7 kW

20 x REC Alpha Black

Munich, Germany

2019



Chosei Village

85 kW

232 x REC Alpha

Chiba Prefecture, Japan

2019



Pomeranian Voivodeship

5.4 kW

15 x REC Alpha

Gdynia, Poland

2019



I'd put my money on the sun and solar energy.
What a source of power! I hope we don't have to wait
till oil and coal run out before we tackle that.

Thomas Edison to his friends Henry Ford
and Harvey Firestone (1931)

A group of seven children are silhouetted against a bright, golden sunset sky. They are captured in various dynamic poses, jumping and playing together in a field. The children are holding hands in a loose circle, and their hair and clothing are blowing in the wind, conveying a sense of joy and movement.

THANK YOU

