# COMPANY BROCHURE 2020

Q CELLS
Engineered in Germany

CONTENTS



# YOUR PARTNER FOR ENERGY SOLUTIONS

Q CELLS is a pioneer in PV technology and a fully bankable energy solutions provider with a global footprint. We strive to lead the world's energy industry with our cutting-edge technology and superior product quality. This is why we are favored by the market as the best choice and a trustworthy partner to our investors, installers, and end consumers.

Q CELLS is a renowned total energy solutions provider in solar cells and modules, energy storage, downstream project business, and energy retail. It is headquartered in Seoul, South Korea (Global Executive HQ) and Thalheim, Germany (Technology & Innovation HQ) with diverse international manufacturing facilities in the U.S., South Korea, Malaysia and China. Through its growing global business network spanning Europe, North America, Asia, South America, Africa and the Middle East, Q CELLS provides excellent services and long-term partnerships to its customers in the utility, commercial, governmental and residential markets.

As an affiliate of the Hanwha Group, seventh largest conglomerate in South Korea with total assets over $185 billion, Q CELLS is both a trusted and bankable solar partner for our customers worldwide. In addition to our Tier 1 Bloomberg rating and recognition as a BNEF Top Tier module supplier, our module production capacity of 11.3 GW* makes us one of the largest solar solutions providers in the world."

*As of December 2020

# TOTAL ENERGY SOLUTIONS PROVIDER

Q CELLS is a renowned total energy solutions provider in solar cells and modules, energy storage, downstream project business, and energy retail.


## FACTS & FIGURES

Total Sales (2019) **USD 3,050 Million**

Company Establishment **1999 Year**

Operating Profit (2019) **USD 192 Million**

Module Capacity (2020) **11.3 GW**

Module Shipment (2019) **7.7 GW**

Exchange Rate: 1,165.65

## GLOBAL AWARDS

Q CELLS is recognized in brand, technology, quality and bankability.
We always strive to provide the best products and services.

# OUR HISTORY

Q CELLS has a strong heritage that dates back to its foundation as Q-Cells AG in Germany in 1999, when it began as a true pioneer of advanced solar cell technology. Since then, Q CELLS quickly became one of the solar industry's leaders for its technology innovations.

Today, Q CELLS is one of world's top Silicon Module Super League members. We are the only solar company in the world with four global R&D networks, four manufacturing plants in the U.S., South Korea, Malaysia, and China, and a sales network in more than 60 countries worldwide. Our comprehensive business portfolio includes solar cells and modules, energy storage and systems, downstream project business, and energy retail.

## 2020

**2020**
Reached new production milestone of 23 GW Q.ANTUM solar products

**2019**
- World-record efficiency of 20.4 % in multicrystalline module
- Inaugurated the single largest module facility in Western Hemisphere (1.7 GW, USA)
- Started energy retail business

**2017**
Started energy storage system business

**2015**
- Signed 1.5 GW module supply agreement with NextEra Energy
- World-record efficiency of 19.5 % in multicrystalline module
- Commenced production in Korea

**2012**
World's first company to commercialize Q.ANTUM Technology

**2011**
World-record efficiency of 19.5 % in multicrystalline cell

**2008**
World-first company ensuring hot-spot-free cells with Hot-Spot Protect

**2004**
Set new standard with Q6L 6-inch cell

**2001**
Set new standard with Q6M cell

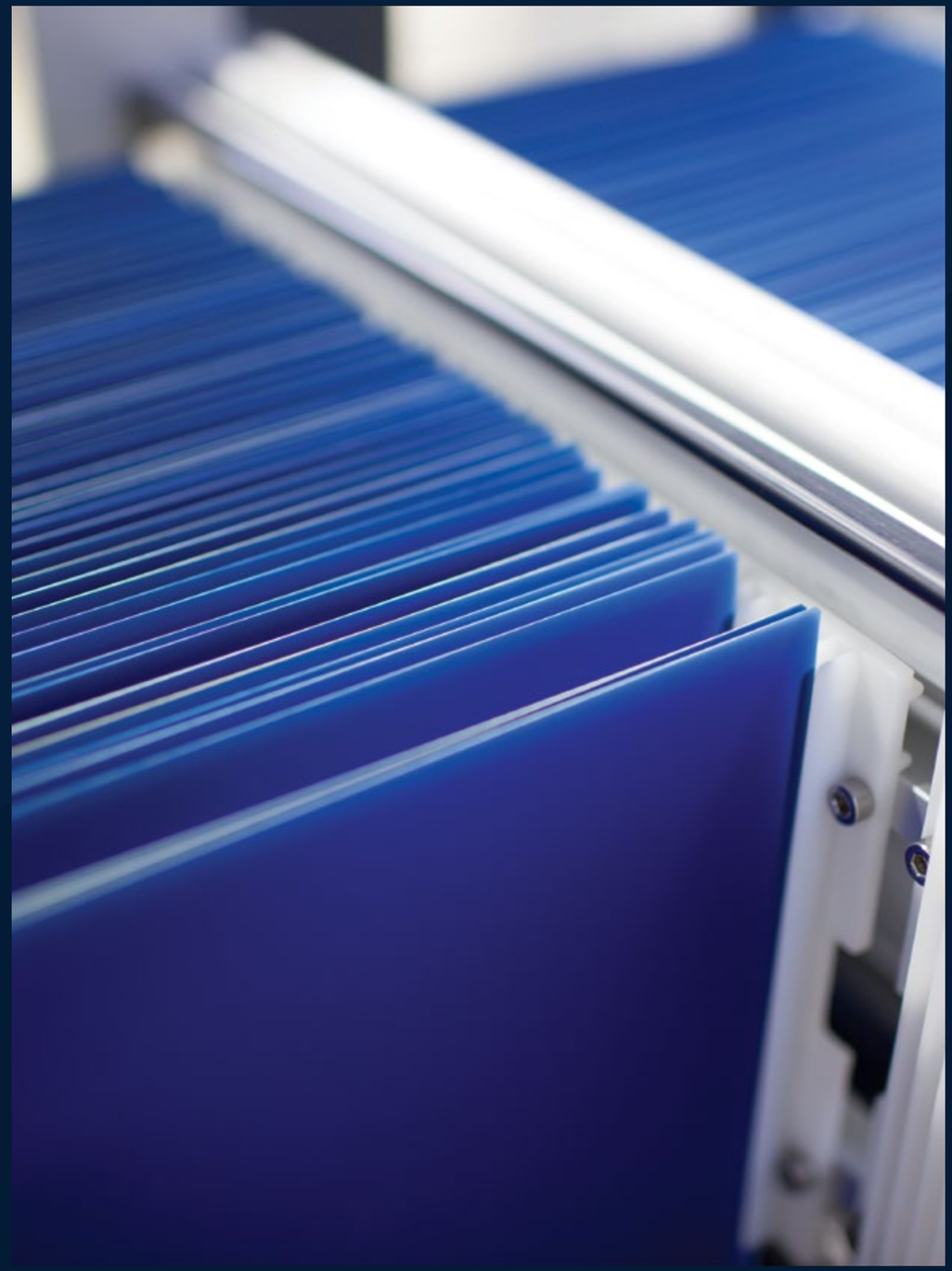
**1999**
Q-Cells AG was founded in Germany

Q CELLS

# THE SMART CHOICE

**Q CELLS is a global leader in the solar industry, differentiated across three categories:**

- Technology Leadership
- Quality Management
- Manufacturing Excellence



# TECHNOLOGY LEADERSHIP

We are a leading global solar company constantly exploring new approaches and technologies. Our heavy investments and deep commitment to R&D continue to advance both our products and the methods we use to manufacture them — allowing us to stay ahead in the industry. In fact, we are setting new standards in technology for the industry at our four state-of-the-art R&D centers in Germany, South Korea, Malaysia and China.

**INNOVATIVE TECHNOLOGY**

**Intersolar Award**

inter solar award 2017 WINNER

inter solar award 2018 WINNER

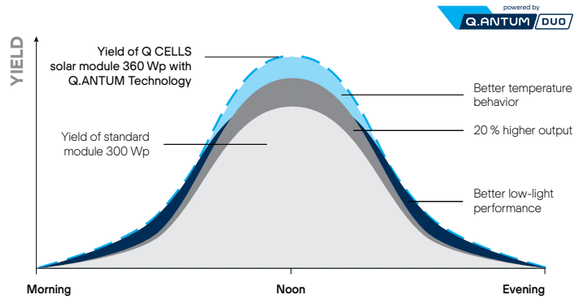
For our innovative solar modules Q.PEAK RSF L-G4.2 and Q.PEAK DUO-G5

# TECHNOLOGY LEADERSHIP

At our headquarters for Technology & Innovation in Thalheim, Germany, Q CELLS employs a unique combination of R&D, pilot productions, and testing to develop and apply innovative manufacturing methods for high-tech products. In 2012, Q CELLS became the first company to mass produce PERC cells, and achieved more than 23 GW of production volume until May 2020.

Q CELLS continues to set industry standards with the six-inch solar cell, the full-square monocrystalline solar cell, Q.ANTUM cell technology, and Q CELLS Yield Security featuring Anti PID, Anti LID, Anti LeTID, Hot-Spot Protect, and Tra.Q™ traceable quality technology. Our renowned Q.ANTUM Technology has been validated through internal tests and with a variety of external tests including the California Energy Commission's PTC test, the VDE Quality Tested Program, Photon module measurement tests, and the CQC Top Runner Program. Our products perform exceptionally well, producing extremely high yields under real-world conditions.

## Q.ANTUM DUO SOLAR MODULE YIELD

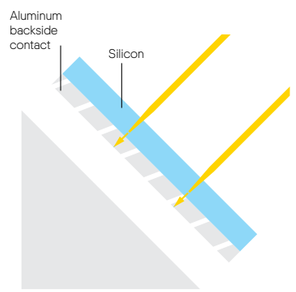


Our Q.ANTUM solar cells are treated with a special nano coating that allows more sunlight to be reflected back through the cell to generate more electricity. Q.ANTUM Technology combines our patented passivation technology, resulting in new world records in solar cell and module efficiency. We increased the production of Q.ANTUM solar cells and have now manufactured more than 23 GW of Q.ANTUM solar cells as of May 2020.

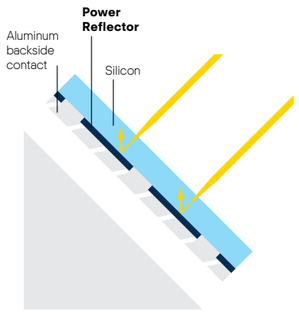
In 2017, Q CELLS introduced Q.ANTUM DUO Technology. It combines several innovative approaches such as half-cells, multi-busbars and round wiring design in order to significantly reduce both electrical and optical losses. Through monocrystalline Q.ANTUM solar cells, Q CELLS can achieve module efficiency of over 20 %. On top of the increased module power, Q.ANTUM DUO offers additional advantages which enable a higher energy yield throughout the module lifetime. Improved temperature stability pays off on hot days while half-cell technology lowers the likelihood of cell cracks, improving long-term performance.

Q CELLS Yield Security contributes to minimizing various degradation effects to facilitate best-in-class energy yields in the long term. Q CELLS stands by its technology and underscores its commitment by offering the Q.PEAK DUO module series based on Q.ANTUM DUO with a performance warranty of at least 85 % in the 25th year, one of the lowest degradation rates in the industry.

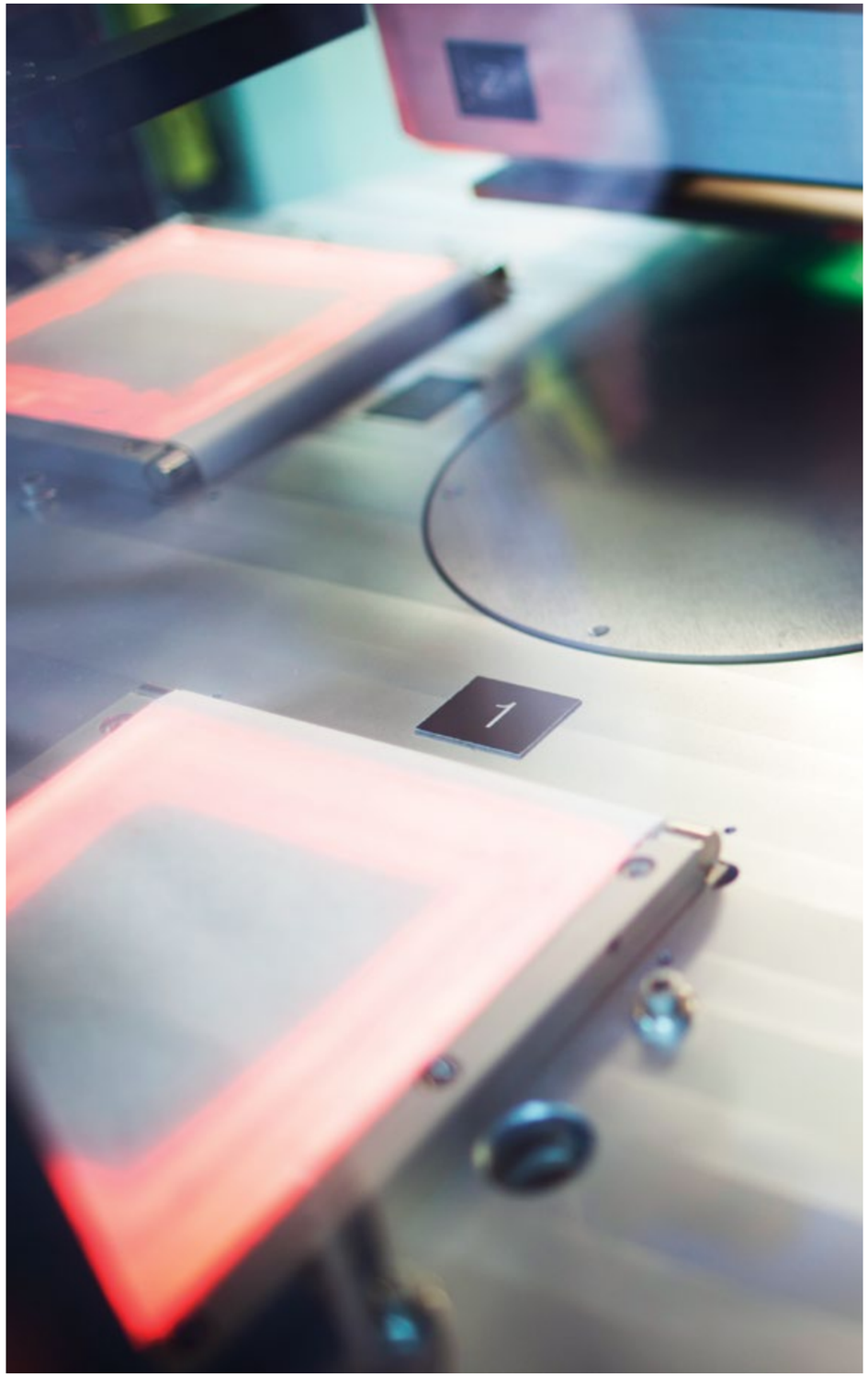
## FUNCTION OF Q.ANTUM CELL TECHNOLOGY




Standard Crystalline Solar Cells




Q.ANTUM Solar Cell Technology




# QUALITY MANAGEMENT

Our products have been independently tested and verified by the rigorous and independent quality assurance program of the world-renowned certification institute, VDE. We have raised the bar even higher by implementing internal quality testing programs with higher standards than those of the industry. Our testing standards are likely the reason we have passed all initial registration tests, including those of the IEC. All in all, Q CELLS is recognized and renowned across the global PV industry as a brand with a superior level of quality.

# QUALITY MANAGEMENT

Q CELLS' uncompromising quality and reliability are maintained and validated by four levels of rigorous tests.

## LEVEL 1

### INITIAL REGISTRATION TESTS

By participating in global certification testing (IEC, UL, MCS, JPEC, and KEMCO), we guarantee the electrical and constructional safety of our solar modules in accordance with international standards.

## LEVEL 2

### Q CELLS YIELD SECURITY

Our internal Yield Security Program for all products combines the guaranteed resistance to Light Induced Degradation (LID), Light & Elevated Temperature Induced Degradation (LeTID), and Potential Induced Degradation (PID) with protection against Hot-Spots (HSP) and product forgery (Tra.Q™).

Q CELLS
Yield Security

PROVEN QUALITY

## Top Performer

2020 TOP PERFORMER
PVEL | DNV·GL
PV MODULE RELIABILITY SCORECARD

In the 2020 PV Module Reliability Scorecard, DNV GL & PVEL confirmed that Q CELLS modules achieved a "Top Performer" status for five consecutive years.

## LEVEL 3
### VDE QUALITY TESTED

The VDE Quality Tested Program considerably supplements the initial registration tests. It is run repeatedly on a quarterly basis to ensure consistent quality and strong product security.

## LEVEL 4
### INTERNAL QUALITY PROGRAM

Our own quality test, called Q.TESTED, is 2 to 3 times stricter than the global testing standard. We constantly check our products daily to make sure they meet or exceed our highest safety requirements and that they are all free of defects.

Our testing ensures outstanding durability and world-class performance even in the harshest conditions: strong wind, heavy snow loads, salt stress, aridity, high temperatures, or humidity. Accordingly, the 2020 PV Module Reliability Scorecard published by DNV GL and PVEL confirmed that Q CELLS modules achieved a “Top Performer” status for five consecutive years. Thus, we not only offer best-in-class solar modules, but also best-in-class warranties against annual performance degradation.

## REQUIRED TESTS

| | IEC CERTIFICATION | VDE QUALITY TESTED | Q CELLS Q.TESTED |
|---|---|---|---|
| TEST FREQUENCY | Once, only for initial certification | Continuous sampling, quarterly monitoring | Continuous sampling and monitoring |
| THERMAL CYCLING TEST (TC) | 200 cycles | 400 cycles | Additional tests |
| HUMIDITY TEST (DH) | 1,000 h | 1,500 h | Additional tests |
| HUMIDITY-FROST TEST (HF) | 10 cycles | 10 cycles | 30 cycles |
| LOAD TRIAL | • | Dynamic load test (after UV test, before TC and HF) | Additional tests |
| HOT-SPOT TEST | • | • | 100 % of cell production |
| EL TEST | Only certification module | 100 % of module production | 100 % high-resolution, EL inspection |
| PID TEST | - | - | Monitoring of weekly production |

# MANUFACTURING EXCELLENCE

Q CELLS has minimized human errors to achieve high quality through leveraging fully automated manufacturing factories, and employing an onsite communication system that ensures realtime communication between our manufacturing sites and our R&D centers all over the world. Our Smart Manufacturing Execution System (MES) installed in the plants allows for full traceability of all products, from procurement to logistics. Furthermore, our system optimizes the entire production process by maintaining an optimum balance between production scheduling, inventory holding, manufacturing, and product delivery.

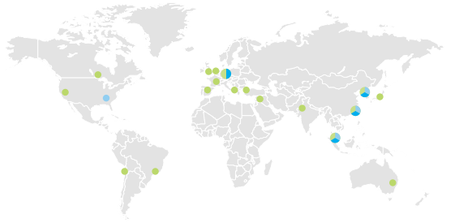
# MANUFACTURING EXCELLENCE

## Tra.Q™ and the Smart Manufacturing Execution System track and inspect every single solar cell manufactured.

Our Smart Manufacturing Execution System not only guarantees 100 % traceability of cells and modules, from procurement to logistics, but also maintains artificial neural networks. These features are important for cell inspection, because they enable us to evaluate and assess all relevant quality criteria. Furthermore, our system optimizes the entire production process by maintaining an optimum balance between production scheduling, inventory holding, manufacturing and product delivery. From R&D to manufacturing and region to region, we are fully committed in active communication in order to encourage synergies across the related departments. To date, we have successfully mass-produced more than 23 GW* of Q.ANTUM solar cells.

*As of May 2020

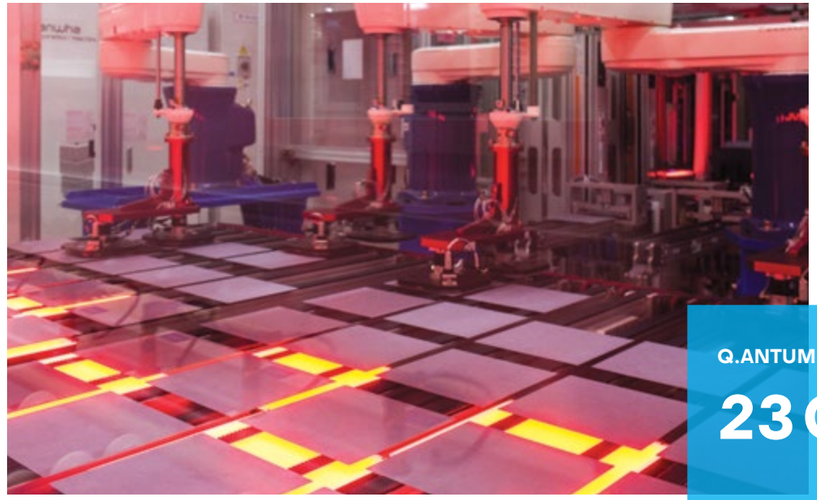
### Q CELLS GLOBAL NETWORK

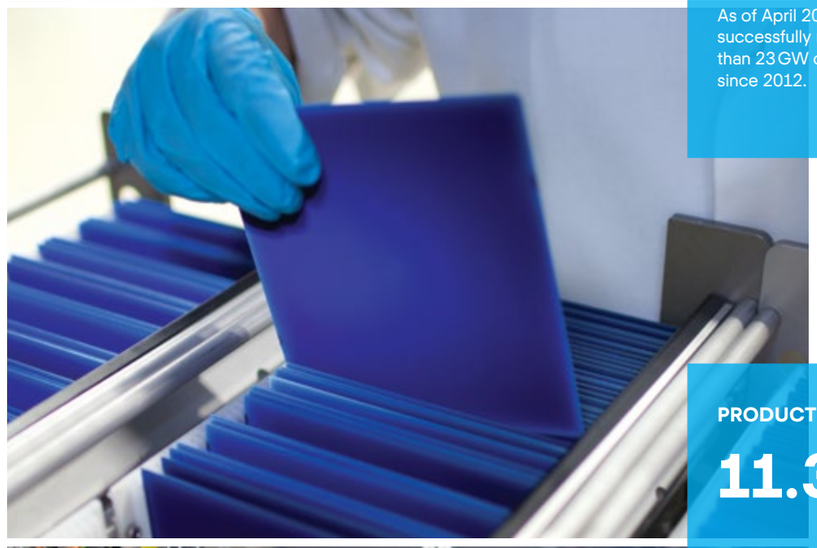


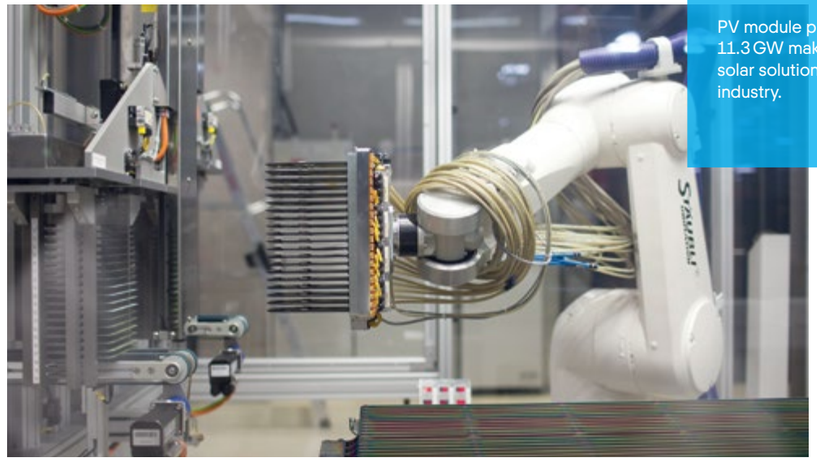
**R&D Network**
4 Countries

**Manufacturing Sites**
4 Countries

**Sales Network**
60+ Countries







**Q.ANTUM SOLAR CELLS**

**23 GW**

As of April 2020, Q CELLS has successfully mass-produced more than 23 GW of Q.ANTUM solar cells since 2012.

**PRODUCTION CAPACITY**

**11.3 GW**

PV module production capacity of 11.3 GW makes us one of the largest solar solutions manufacturers in the industry.

# WHAT MAKES OUR PRODUCTS PREMIUM?

## ONE-STOP ENERGY SOLUTIONS PROVIDER.

Q CELLS offers solar system solutions and energy services that bring benefits for you and the future of this planet.

## SOLAR CELLS & MODULES


1 Q.PEAK DUO-G5
2 Q.PEAK DUO-G6
3 Q.PEAK DUO-G7
4 Q.PEAK DUO-G8
5 Q.PEAK DUO BLK ML-G9 (ZERO-GAP)
6 Q.PEAK DUO L-G8.3/BFG (BIFACIAL)

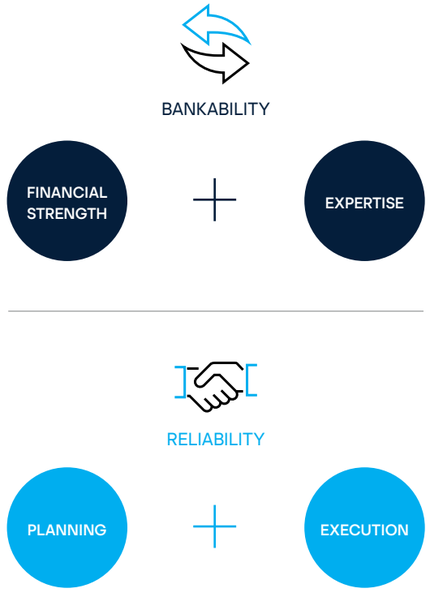
Equipped with award-winning Q.ANTUM cell technology, Q CELLS solar modules provide high performance and quality at a reasonable price, maximizing energy yields and ensuring low LCOE. With the larger M4+ wafers, G6 and G8 modules provide higher power classes than G5 and G7 modules. Q CELLS provides even higher power output with G9 solar modules which fit more cells by eliminating gaps between cells, and bifacial solar modules that can produce power from both sides of the module.

## COMPREHENSIVE SYSTEMS


1 Q.HOME+ ESS HYB-G2
2 Q.FLAT-G5, Q.MOUNT

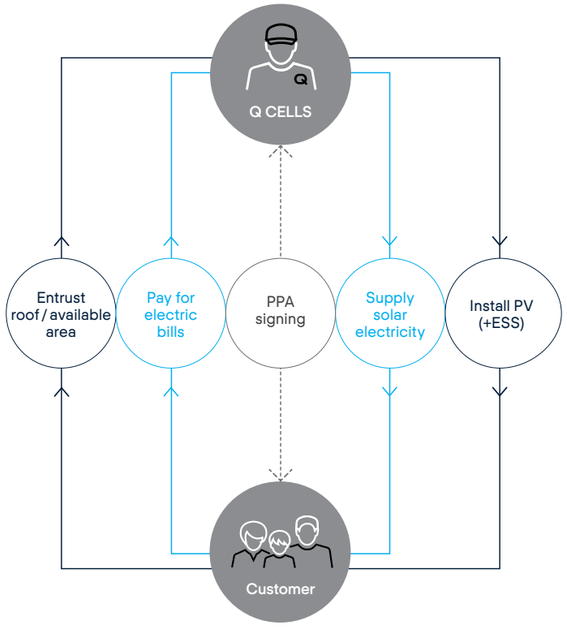
Our Q.HOME+ ESS storage systems is the ideal solution for the environmentally-friendly reduction of electricity costs for private homes, while ensuring a reliable long-term operation and high output. Q.FLAT-G5 is the perfect flat roof system for rapid, simple and reliable installations without roof penetration. Quick assembly minimizes installation effort, while the floating suspension of the modules also increases long-term stability and safety. With a power density of 180 Wp / m² Q.FLAT-G5 is the bi-directional solution for maximum yield on flat roofs.

## DOWNSTREAM BUSINESS

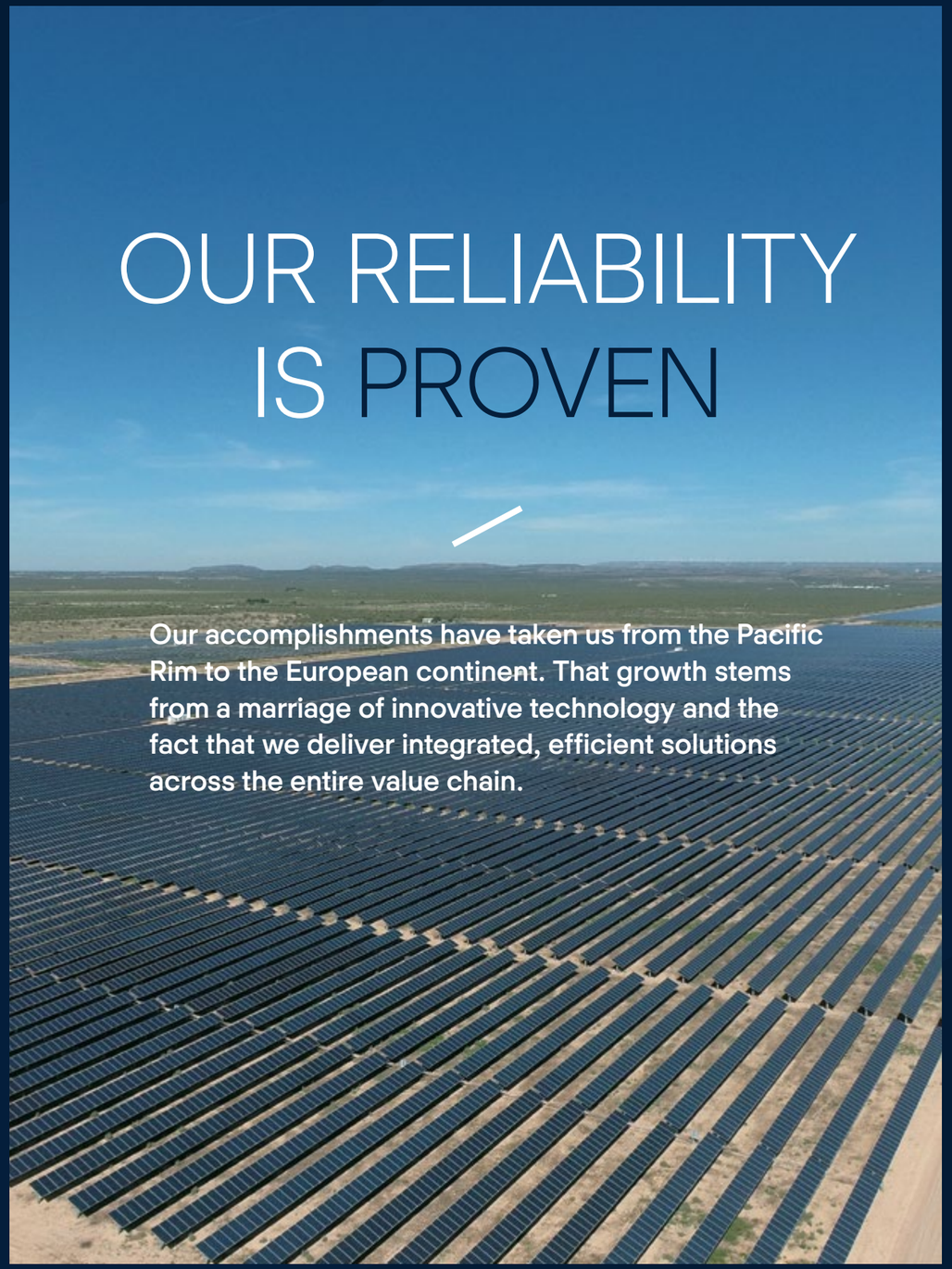



We stand at the highest level in the solar business through financial strength, expertise, top-class products and excellent EPC services. These factors materialize to demonstrate our value in bankability and reliability, the key foundations necessary to provide the highest level of EPC business services possible. A solar power plant can be both a highly reliable source of energy supply and a competitive economic investment. Q CELLS' expertise is your key to a sustainable investment in solar energy.

## ENERGY RETAIL




Our new energy service needs zero investment from customers but just a rooftop space. Through a corporate PPA (Power Purchase Agreement) with Q CELLS, businesses can directly enjoy clean and reduced-cost energy with a system installed and managed by energy professionals. Even without a solar system, with Q.ENERGY tariffs, Q CELLS can provide 100 % renewable energy for homeowners and businesses in Germany.



# OUR RELIABILITY IS PROVEN

Our accomplishments have taken us from the Pacific Rim to the European continent. That growth stems from a marriage of innovative technology and the fact that we deliver integrated, efficient solutions across the entire value chain.



## NORTH AMERICA

Bancroft Station Solar Farm

**Q.PEAK DUO L-G5.2**

138 MWp

2019
Early County, Georgia, USA

**Owner / Operator:** Silicon Ranch
**Offtaker:** Walton EMC
**End User:** Facebook

Laguna

**Q.PLUS L-G4.2**

125.5 MWp

2019
Torreón, Mexico

Midway

**Q.PLUS L-G4.2**

235.7 MWp

2018
Pecos County, Texas, USA

Beacon

**Q.PLUS L-G4.2**

107.8 MWp

2017
Kern County, California, USA

## EUROPE

RB Leipzig Stadium & Academy

**Q.FLAT-G5, Q.PEAK DUO-G7**

102.3 kWp

2020
Leipzig, Germany

Zoo Kopenhagen

**Q.PEAK DUO BLK-G5, Q.PEAK DUO-G5**

273 kWp

2019
Copenhagen, Denmark

Gehrer Riding Centre

**Q.PLUS-G4**

430 kWp

2019
Durmersheim, Germany

Kärcher UK Headquarters

**Q.PEAK-G4.4**

300 kWp

2019
Banbury, UK




## AUSTRALIA

Clifton Hill

**Q.PEAK DUO-G5**

7.8 kWp

2019
Melbourne, VIC


North Sydney

**Q.PEAK DUO-G5, Q.HOME+ ESS HYB-G2**

6.6 kWp

2019
Sydney, NSW

Woodend

**Q.PEAK DUO-G5, Q.HOME+ ESS HYB-G2**

6.6 kWp

2019
Woodend, VIC

## SOUTH KOREA

Gunsan Saemangeum

**Q.PEAK L-G4.1**

5.0 MWP

2019
Gunsan

Gongam Floating PV

**Q.PRIME L-G5**

1.0 MWP

2018
Ulsan

Gunsan Floating PV

**Q.PEAK L-G4.1**

18.7 MWP

2018
Gunsan

Southwest Water Treatment Center

**HSL60P6-PB-5-250**

3.0 MWP

2014
Seoul



## CHINA

CGN Project in Qinghai

**Q.PEAK-G5**

65.97 MWp

2018
Delingha

CGN Project in Hubei

**Q.PEAK-G5**

100 MWp

2018
Tongshan

CGN Project in Yunnan

**Q.PEAK-G5**

1.03 MWp

2018
Shangri-la

C&I Project in Shanghai

**Q.POWER-G5**

2.2 MWp

2017
Shanghai

## MALAYSIA

Mattan Engineering

**Q.PLUS L-G4.2**

60.4 MWp

2018
Rembau

Gading Kencana Development

**Q.PLUS L-G4.2**

36.7 MWp

2018
Bidor

China Machinery & Equipment

**Q.PLUS L-G4.2**

36.5 MWp

2018
Kota Tinggi

Asia Meranti Solar

**Q.PLUS DUO L-G5.2**

13.05 MWp

2019
Kampar



## VIETNAM

SH Site Solar Farm

**Q.PLUS L-G4.2**

49.5 MWp

2019
Vung Tau

KN Site Solar Farm

**Q.PEAK DUO L-G5.3**

49.6 MWp

2019
Ninh Thuan

VN Site Solar Farm

**Q.PEAK DUO L-G5.3**

49.6 MWp

2019
Ninh Thuan

Minh Khue Garment Factory

**Q.PLUS DUO L-G5.2**

880 kWp

2019
Than Hoa

# A BRIGHTER TOMORROW

**We are committed to fulfilling our corporate social responsibility in areas including social welfare, arts and culture, sports, public services, and foreign aid. Q CELLS strives to share energy for life with our neighbors, communities, and the world.**

# SOLAR SHARING

**Building on our world-class solar energy business, we set the standards for corporate responsibility and environmental sustainability by donating solar energy facilities to our communities.**

### ENERGY SELF-SUFFICIENT ISLAND JUKDO

The island of Jukdo off the coast of Hongseong county is a small island with 70 residents in 31 households. The residents have historically depended entirely on diesel fuel for electricity. However, with the Jukdo Island project, led by our CSR activities along with participation from ten smaller enterprises, the island's main energy source – diesel fuel – was replaced with 100 % renewable energy. The emission-free convergence power generation system produces 210 kW of electricity using solar and wind power. The surplus energy is then stored in a 900 kWh energy storage system (ESS) until it is needed at night or during inclement weather to serve as a stable and consistent supply of electricity. The desalination facilities that provide the drinking water for the residents will also be powered by the renewable energy. When the project is fully implemented, Jukdo will be able to reduce its carbon dioxide emissions by 200 tons per year, equivalent to the job of 41,000 trees.

### CLEAN UP MEKONG

The Mekong is a trans-boundary river that runs through China, Myanmar, Laos, Thailand, Cambodia, and finally Vietnam before discharging into the sea. It moves 475 $km^3$ of water annually and supports over 70 million people who rely on it as their main source of water. However, indiscriminately disposed waste and sewage discharge along the river's length has turned the Mekong into one of the world's 10 most polluted rivers. The pollutants ultimately float into the ocean and threaten marine life. As Vietnam is the last country the river runs through, the Clean Up Mekong campaign aims to remove waste before it enters the ocean, at the riverside city of Vinh Long. The key to the campaign's clean-up efforts are solar-powered boats. Powered and propelled by Q CELLS' Q.PEAK DUO solar modules, the boats are used to scoop up waste in the Mekong River without emitting any greenhouse gases or other pollutants. The boats are also silent, resulting in minimal disturbance to local wildlife and communities.

### SOLAR FOREST

The Solar Forest Campaign is an initiative to create new forests with trees grown in solar-powered nurseries to fight against desertification and air pollution, supporting the UN SDGs. A total of seven Solar Forests were formed in China, Mongolia and South Korea, where more than 500,000 trees were planted in an area of 1,350,000 $m^2$ combined. This is the world's first practice known for utilizing solar energy to fight desertification and recognized at the United Nations Conventions to Combat Desertification (UNCCD) COP Summit in 2011.

### GREENER DAVOS INITIATIVE

Q CELLS is supporting the Greener Davos Initiative introduced by the municipality of Davos and the World Economic Forum. Q CELLS has installed its highly efficient Q.PEAK photovoltaic system capable of 340 kWp on the rooftop of the Davos Congress Center. The solar system helps to decrease environmental impacts by generating enough energy to reduce more than 20 tons of $CO_2$ emissions per year. This project is only one of our efforts to address dynamic issues surrounding our world today: climate change and the depletion of our energy resources.

Jukdo: A 100 % renewable energy self-sufficient island

Clean Up Mekong: Solar-powered boats remove waste without pollutants

Solar Forest: Helping to combat desertification around the world

Davos Congress Center: Reducing more than 10 tons of $CO_2$ emissions

# SPORTS SPONSORSHIP

**Q CELLS is committed to supporting sports around the world. We believe that sports are an essential part of a healthy lifestyle among those who pursue success and communities that foster them. Q CELLS has actively supported sports for many years including baseball (Los Angeles Dodgers), European football (RB Leipzig), and golf (Team Q CELLS).**

### RB LEIPZIG SPONSORSHIP

Q CELLS has become an international partner of the football club RB Leipzig starting with the 2017/18 season. RB Leipzig is a young and aspiring football club located in the eastern part of Germany, about two hours southwest of Berlin. The club was founded in 2009. Since then, RB Leipzig has made its way from the amateur fifth division to the highest professional division Bundesliga 1 in Europe by winning four promotions within seven years. The partnership with RB Leipzig is intended to increase Q CELLS' brand awareness among power consumers in Germany, Europe, and the rest of world to expand our customer base and partnership network.

### PROFESSIONAL WOMEN'S GOLF TEAM SPONSORSHIP

The professional women's golf team was established in 2011. In 2018, Q CELLS became the team's main sponsor. After its foundation in 2011, the team reached a record of 36 wins up until 2019 (16 wins in LPGA, 13 in KLPGA, 5 in JLPGA, and 2 in LET). In 2020, the team consists of 4 LPGA, 4 KLPGA, and 1 JLPGA professional golfers and the team looks forward to breaking records and increasing its number of wins. The partnership with the golf team would enhance Q CELLS' brand positioning around the world, particularly in US, Korea, Japan, and Europe while the team extends its value over LPGA, KLPGA, JLPGA, and LET.

### LOS ANGELES DODGERS SPONSORSHIP

Q CELLS has become the Official Solar Partner of the Los Angeles Dodgers starting with the 2019 season. The Los Angeles Dodgers franchise, with six World Series championships and 23 National League pennants, is dedicated to supporting a culture of winning baseball, providing a first-class, fan-friendly experience at Dodger Stadium, and building a strong partnership with the community. With the highest cumulative fan attendance in Major League Baseball history, and a history of breaking records, the Dodgers are one of the most cherished sports franchises in the world.

Q CELLS is further cementing its position as a leading solar company in the United States while developing a home-run partnership – a perfect blend of market-leading PV technology and chart-topping sporting excellence.


© Los Angeles Dodgers

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