

THE SMART CHOICE

Q CELLS Company Introduction



Contents

1. Hanwha Group and Q CELLS
2. Comprehensive Value Chain
3. Proven Quality
4. Global Market Leadership
5. Leading Technology

VISION

Q CELLS provides **affordable** and **smart** energy solutions through technology and innovation to create a **sustainable** future for the planet.

STRONG BACKING FROM HANWHA GROUP

Q CELLS is one of the core affiliates of Hanwha Group, which is Fortune Global 500 Company and 7th largest conglomerate in South Korea.

The infographic is a collage of images and text. On the left, a vertical strip contains five images: a purple grid, a blue acoustic panel, a green and blue cellular structure, an orange and white circular graphic, and a tan grid. Below this strip, two blue boxes contain financial data. The center features a dark blue box with '76 Affiliates' and a larger dark blue box with '351 Global Networks' over a satellite view of Earth. The right side shows a tall glass skyscraper with the Hanwha logo, with statistics '261 Fortune® Global 500 Company' and '7 7th Largest Conglomerate In South Korea' overlaid on a blue sky background.

Manufacturing & Construction, Finance, Services & Leisure
Main Industries

USD 63.5 Billion
Revenues 2019(E)

USD 185.7 Billion
Total Assets 2019(E)

76
Affiliates

351
Global Networks

261
Fortune®
Global 500 Company

7
7th Largest Conglomerate
In South Korea

Q CELLS FACTS & FIGURES

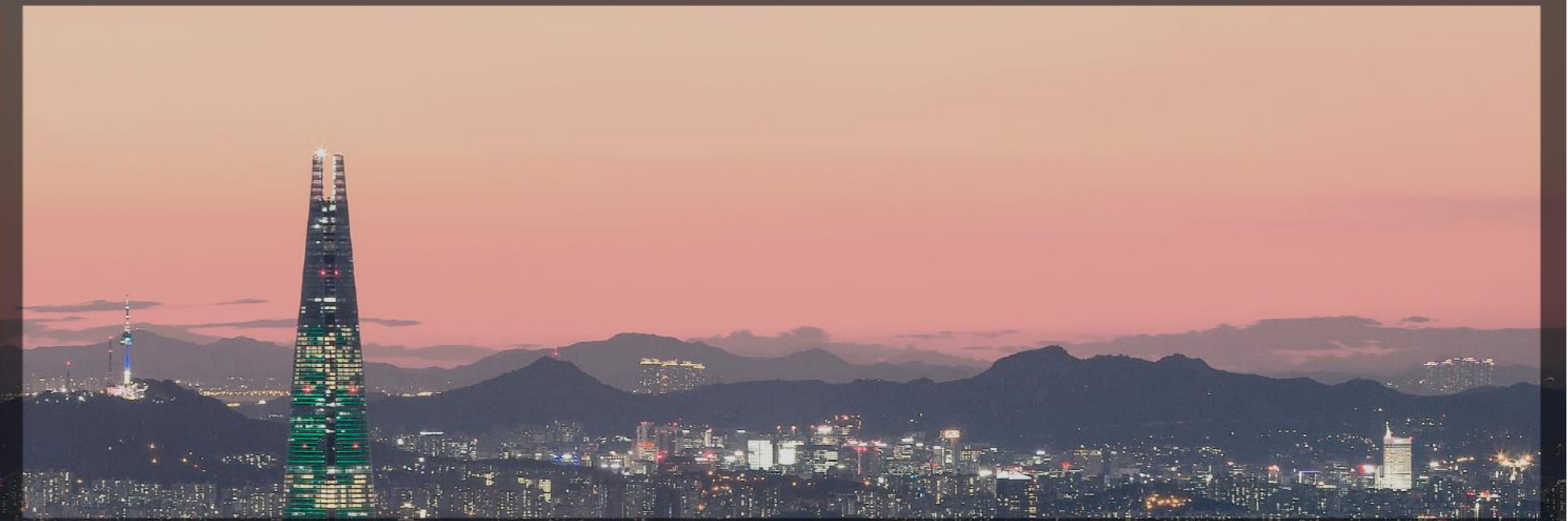
Q CELLS is a global leading and fully bankable energy solution provider with over 20 years history and financial stability.

1999 Year
Company Foundation



11.3 GW
Module Capacity (2020)

7.7 GW
Module Shipment (2019)



KRW 3,555 Billion USD 3,050 Million
Total Sales (2019)

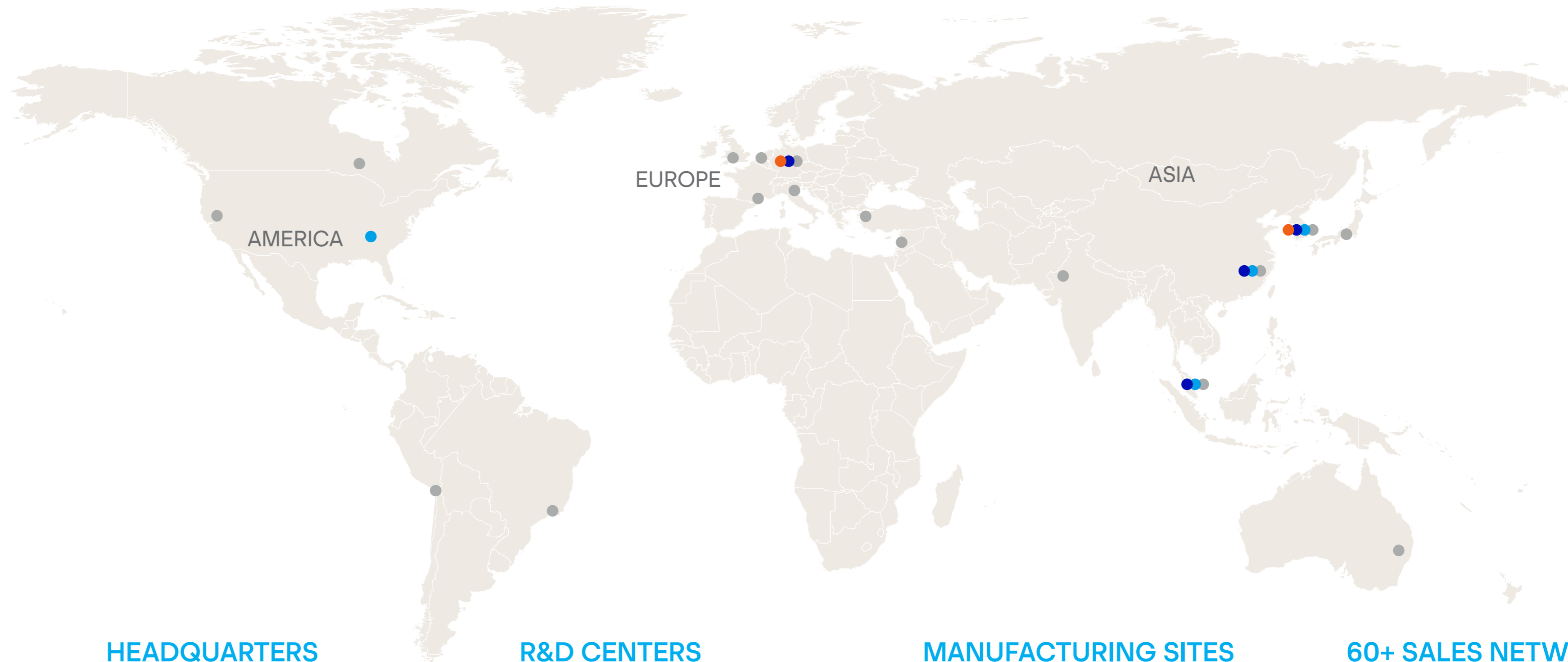
KRW 224 Billion USD 192 Million
Operating Profit (2019)



*Exchange Rate: 1,165.65

GLOBAL NETWORK

Q CELLS works closely with global R&D and manufacturing sites to keep the highest level of quality in the manufacture, sales and support.



2 Countries
HEADQUARTERS

4 Countries
R&D CENTERS

4 Countries
MANUFACTURING SITES

60+ Countries
SALES NETWORK

HEADQUARTERS

In Seoul, South Korea (Global Executive HQ) and Thalheim, Germany (Technology & Innovation HQ)

R&D CENTERS

R&D Centers in 4 countries (Germany, South Korea, Malaysia, and China)

MANUFACTURING SITES

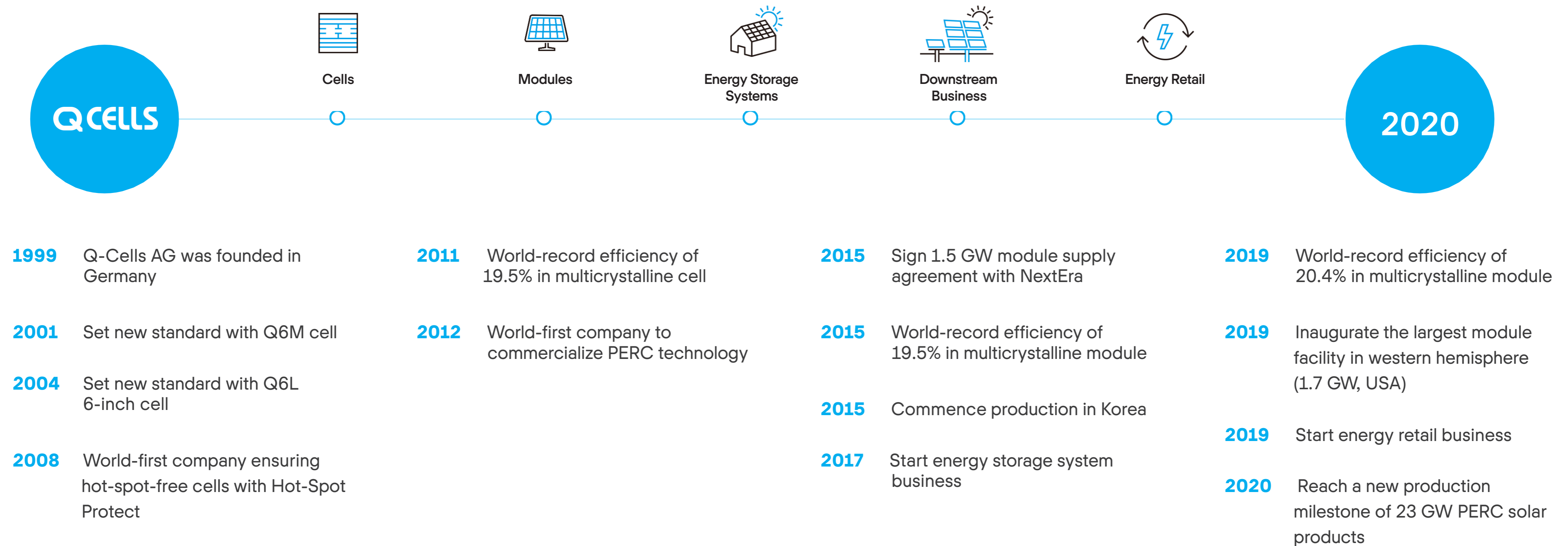
Manufacturing Facilities in 4 countries (South Korea, Malaysia, China, and USA)

60+ SALES NETWORK

Spanning Europe, North America, Asia, South America, Africa and the Middle East

1. COMPREHENSIVE VALUE CHAIN

From the foundation in 1999 to current status as a total energy solution provider, Q CELLS continues the innovation to set the standards for the energy industry.



2. PROVEN QUALITY

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

TOP BRAND



TOP BRAND PV

- 7 consecutive year in EU
- 5 consecutive year in Australia



LIFE & LIVING AWARD

- Germany's most popular provider

TOP TECHNOLOGY



INTERSOLAR AWARD

- Q.PEAK RSF L-G4.2 (2017)
- Q.PEAK DUO-G5 (2018)



SOLAR+POWER AWARD

- Q.PEAK DUO-G5 (2017)
- Q.FLAT-G5 (2018)

TOP QUALITY



TOP PERFORMER

- 5 consecutive year

TOP BANKABILITY



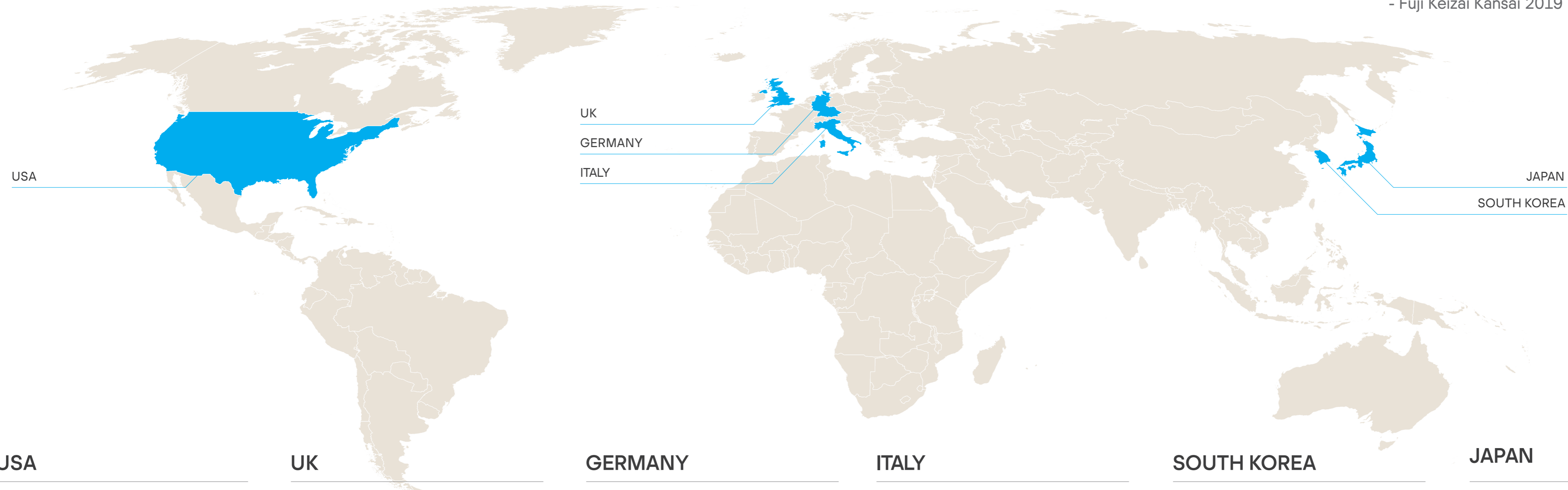
BNEF TOP-TIER BANKABILITY

- Top-tier company since 2012



3. GLOBAL MARKET LEADERSHIP

*Source
 - U.S. PV Leaderboard (2020-1Q), Wood Mackenzie
 - PV InstallerMonitor 2018/19, EuPD Research
 - Fuji Keizai Kansai 2019



USA

Residential

- 1. Q CELLS (25.2%)**
2. LG Electronics (13.3%)
3. SunPower (12.4%)

Commercial

- 1. Q CELLS (13.3%)**
2. SunPower (12.1%)
3. LG Electronics (10.3%)

UK

- 1. Q CELLS (13.6%)**
2. JA Solar (13.1%)
3. Sharp (10.1%)

GERMANY

- 1. Q CELLS (11.5%)**
2. Heckert Solar (8.2%)
3. IBC Solar (7.0%)

ITALY

- 1. Q CELLS (16.5%)**
2. SunPower (12.7%)
3. SolarWorld (7.0%)

SOUTH KOREA

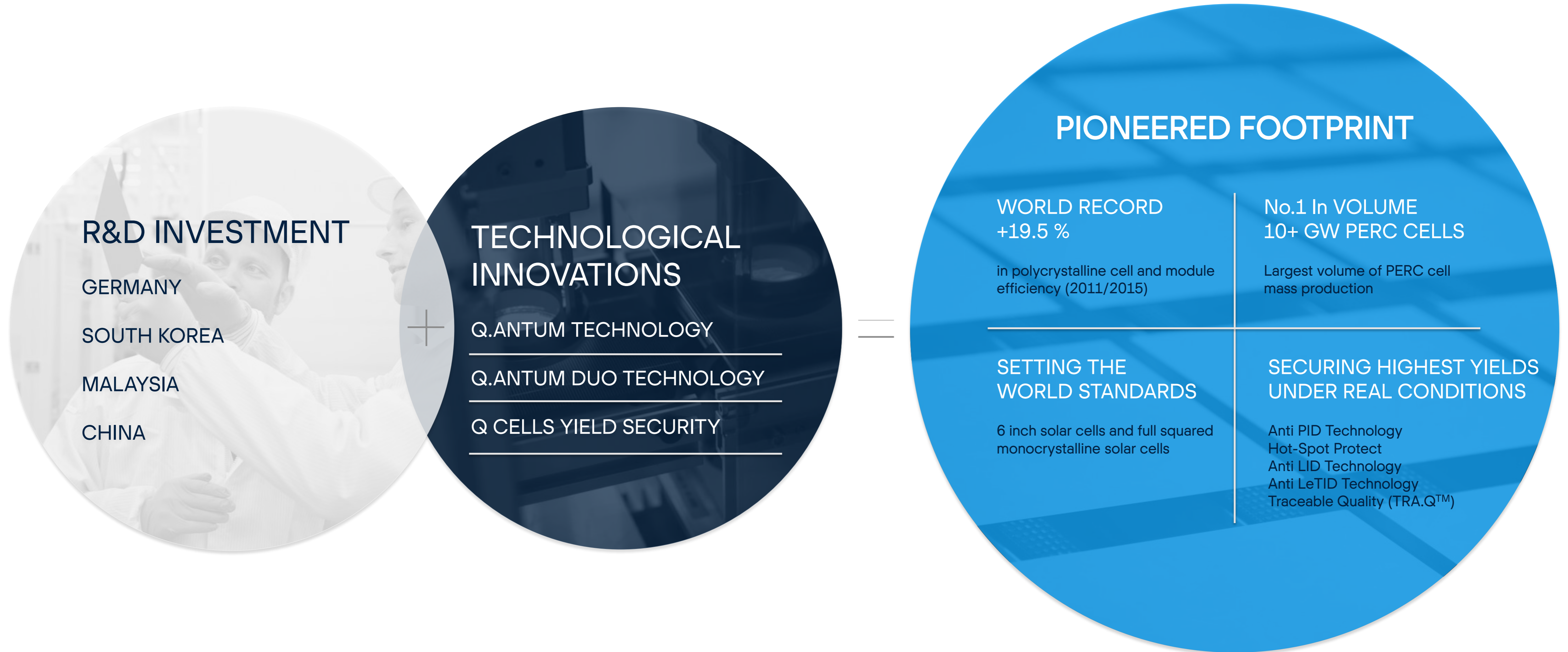
- 1. Q CELLS (59%)**
2. Chinese Manufacturers (21%)
(Major 3 & Others)
3. Other Korean
Manufacturers (20%)
(Major 4 & Others 17)
** Internal Analysis*

JAPAN

- 1. Q CELLS (11.5%)**
2. JinkoSolar (10.2%)
3. Canadian Solar (10.1%)

4. LEADING TECHNOLOGY

At its diverse R&D locations, Q CELLS employs a unique combination of R&D, pilot productions, and testing to develop and apply innovative manufacturing methods for high-tech products.



Contents

1. Quality
2. Warranty Conditions
3. Field Performance
4. Patent Ownership
5. Bankability



1. Quality (Spec comparison)

Q CELLS ONLY STICK TO IN-HOUSE CELL & MODULE PRODUCTION AND GUARANTEE GREATER PRODUCT AND PERFORMANCE WARRANTY

| | | Hanwha Q CELLS | | Company C | Note |
|------------------------------|------------------------------|---|--------------|--|--|
| BOS Saving | Type | Mono PERC H/C | = | Mono PERC | |
| | Cell | 144 | = | 144 | |
| | Output | 420 | > | 430 | |
| Minimization of Quality Risk | Cell/Module Production | Hanwha Q CELLS use 100% in-house production for highest quality. | > | Cell or Module are estimated to be OEM <i>*total shipment in 2018 was 8.1GW and cell production was 6.7GW. This means SEA module supply is OEM-heavy.</i> | Hanwha Q CELLS believe in product quality by upholding only in-house production for highest quality. Other major module vendors make excessive use of outsourcing for cell production. |
| Maximization of Net Revenue | Warranty | Product: 12 years | > 2 years | Product: 10 years | The biggest difference in warranty condition is Q CELLS' superior product warranty of 12 years compared to competitors' 10 years. Additionally, Q CELLS has an annual degradation of 0.54% which is lowest degradation rate among the tier-1 companies. This amounts to a guaranteed 85% after 25 years, which displays highest performance. |
| | | Performance: 25 years | = | Performance: 25 years | |
| | | annual degradation: 0.54% | > 0.16% | annual degradation: 0.7% | |
| | | 98% after 1st year | > 0.5% | 97% | |
| | | 85% after 25 years | > 4.3% | 80.7% after 25 years | |
| | Temperature Coefficient(%/K) | -0.36 | > | -0.39 | |
| Low Irradiance | 96.5% at 200W/m2 | > | N/A | Q CELLS is the only supplier with a guaranteed low irradiance. This means that when the modules are exposed to even low sunlight (as low as 200W/m2) Q CELLS guarantees 96.5% of its normal power generation. This enables maximum power output under a given source of sunlight in a day. | |

2. Quality(Non-OEM Cell and Module)

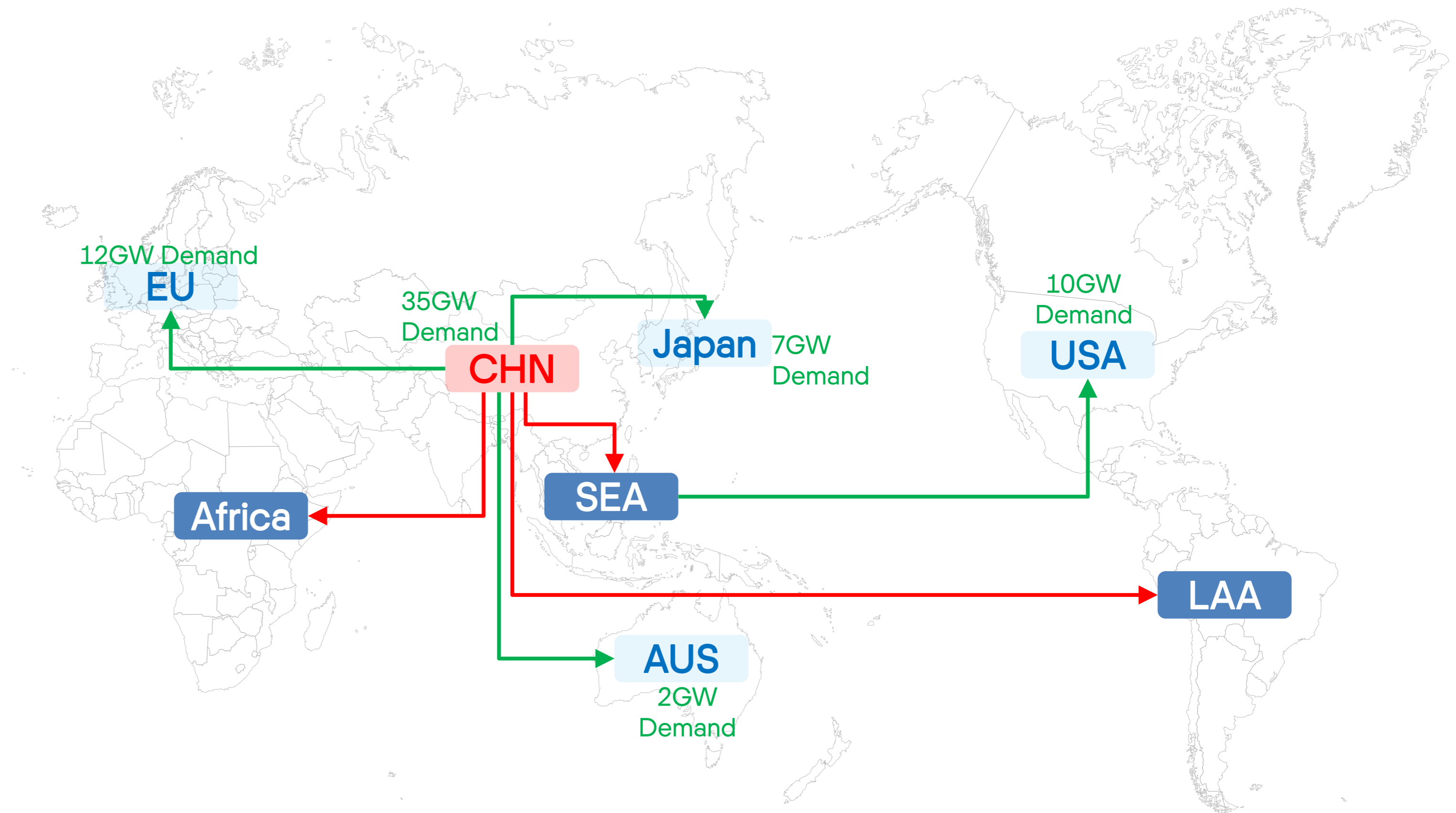
Major module vendors make excessive use of outsourcing for cell and module production. However, Q CELLS believe in product quality by upholding only in-house production for highest quality.

Module Supply trend

China Production

| [MW] | Cell | Module | Gap |
|-------|--------------------|--|--------------|
| Total | 89,511 | 78,005 | 11,506 |
| Tier1 | 39,405 1 | 59,846 2 Supplied by 3 rd Party | -20,441 ▲ |
| Tier2 | 50,106 3 | 18,159 4 Supply to Overseas | 31,947 ▲ |

- **1** + **2** : Own cell & Own Module
=> Major Market
- **3** + **2** : OEM cell + Own Module
=> Major Market
- **3** + **4** : OEM cell + OEM Module
=> Low ASP market



[Source : IHS Markit, 3Q]

3. Quality (Stricter Quality Control)

Q CELLS' 4-step quality test guarantees uncompromising product quality and reliability. Our own quality test, called Q.TESTED, is 2 to 3 times stricter than the global testing standard.

1 Initial Registration Tests

IEC, UL, MCS, JPEC, KEMCO

- Meet global certification standard
- Guarantee the electrical and constructional safety

2 Q CELLS Yield Security

ANTI PID/LID/LETID, HSP, TRA.Q™

- Minimize the degradation phenomena
- Trace and monitor every single cell

3 TÜV Quality Tested

TECHNICAL BANKABILITY

- Ensure consistent quality
- Strong product security

4 Q.TESTED

Q CELLS QUALITY TEST PROGRAM

- 2 to 3 times stricter than the global testing standard
- Excellence in safety and quality

REQUIRED TEST

| | IEC Certification | TÜV Quality Tested | Q.TESTED Program |
|---------------------------|--------------------------------------|---|--------------------------------------|
| 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 |

3. Warranty Condition

Q CELLS ONLY STICK TO IN-HOUSE CELL & MODULE PRODUCTION AND GUARANTEE GREATER PRODUCT AND PERFORMANCE WARRANTY

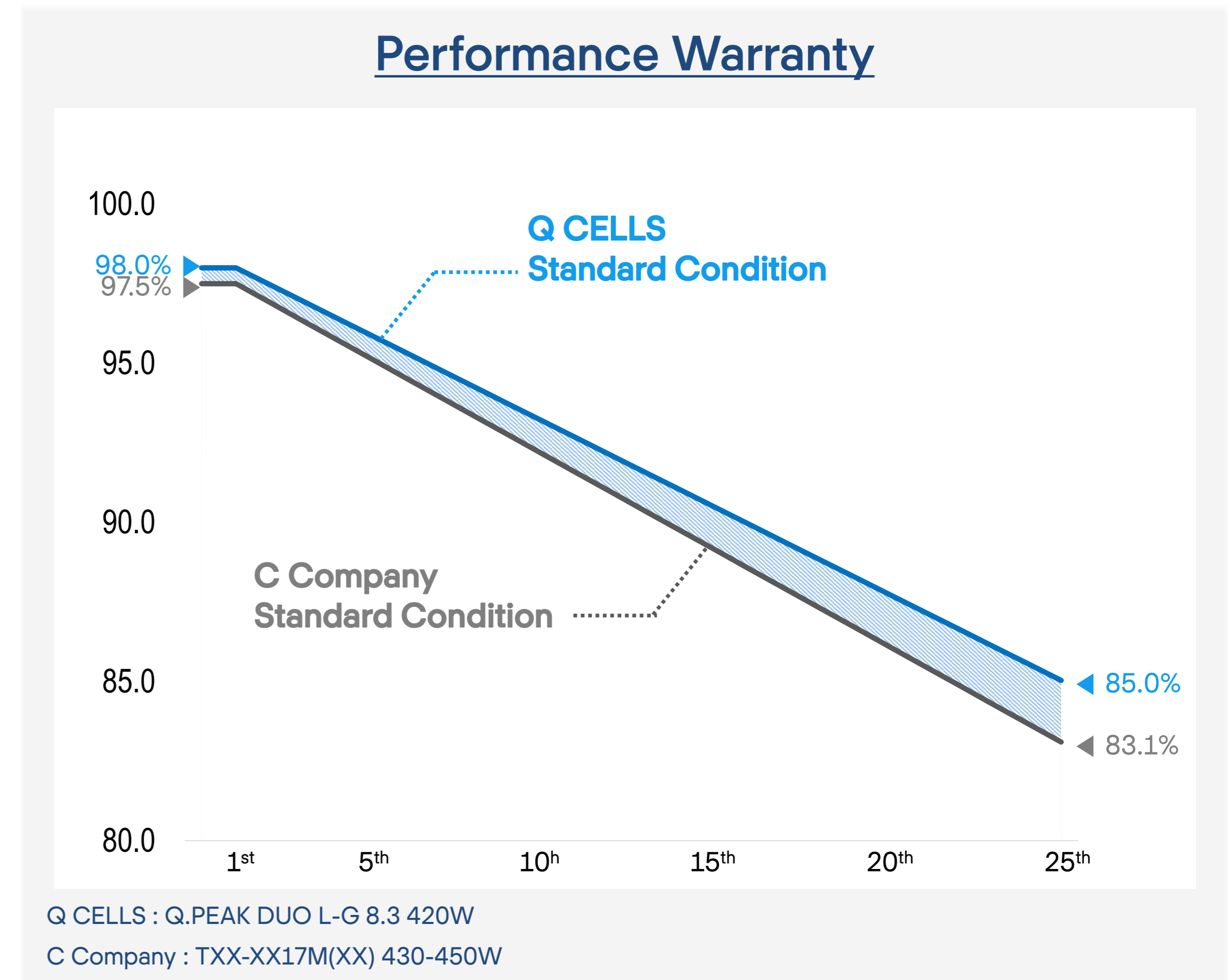
Technology = Superior warranty conditions

Q CELLS Warranty Condition

1. Product : 12 years
 2. Performance : 25 years
- lowest annual degradation : 0.54%
- a. 98% after first year
 - b. 85% after 25 years

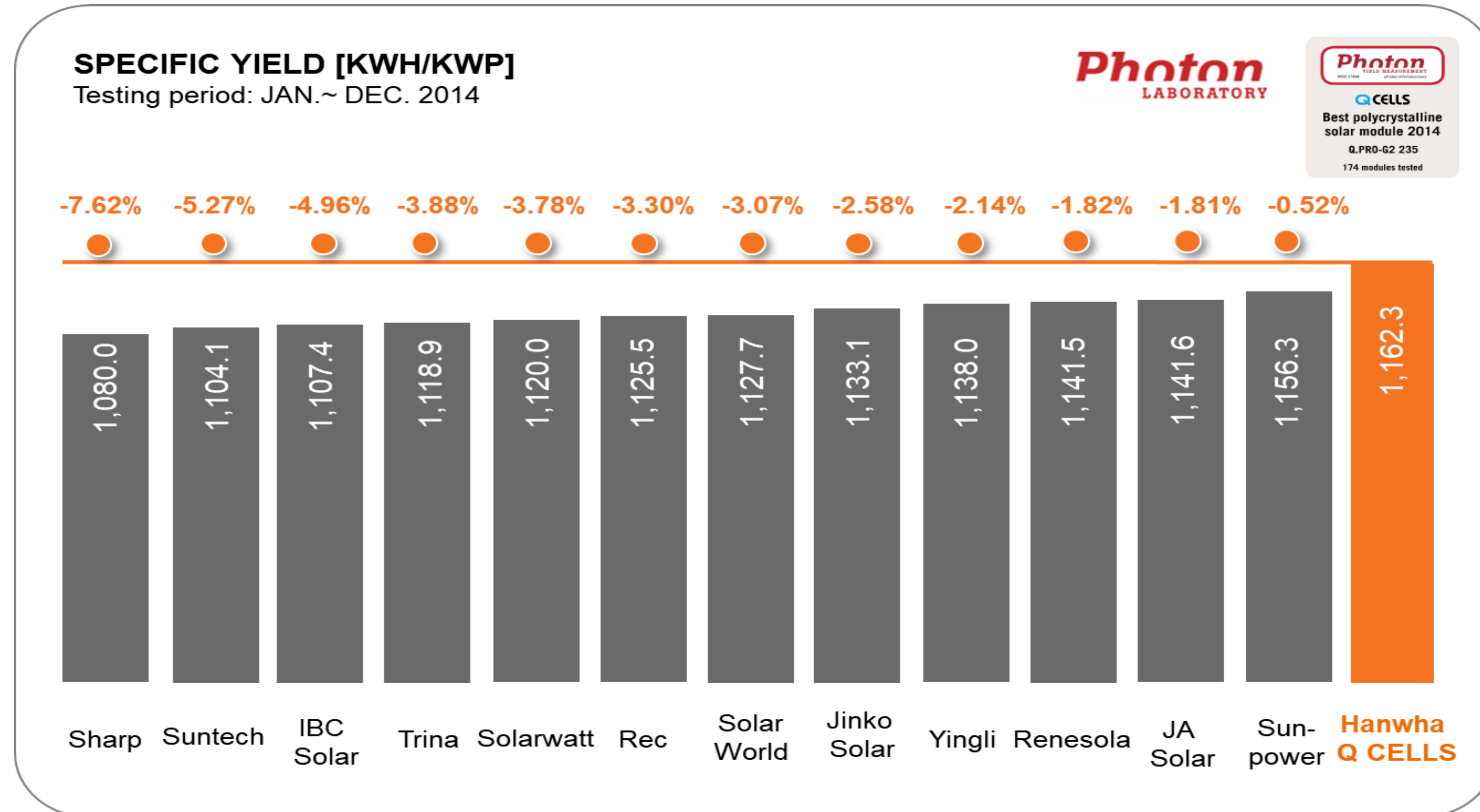
2 year longer product warranty
1.9% greater performance warranty at 25th year

👉 1.04% higher performance warranty
During the first 20 years



4. Field Performance

PHOTON YIELD MEASUREMENT 2014



5. Patent Issue (PERC Technology)

Q Cells has PERC(Passivated Emitter Rear Cell) technology patent.

Q CELLS PERC Patent

powered by **Q.ANTUM**

HOW Q.ANTUM WORKS

STANDARD SOLAR CELL

Silicon
Aluminium back contact
Sunlight

Q.ANTUM SOLAR CELL

Silicon
Special nano coated power reflector
Aluminium back contact
Sunlight

Generate More Electricity

STANDARD SOLAR CELL

Light
Lost Electrons
Absorbed Light

Q.ANTUM SOLAR CELL

Light
Local Contacts
Power Reflector

Hanwha Q-Cells wins patent litigation against JinkoSolar, REC Solar and Longi in Germany

The Düsseldorf Regional Court has agreed rivals of the Korean manufacturer illegally used its patented passivation technology. The judges granted Hanwha Q-Cells an injunction which requires Jinko, REC and Longi to retrieve all modules featuring the patented technology distributed in Germany since late January last year. Hanwha can also opt to have the offending products destroyed.

JUNE 18, 2020 **SANDRA ENKHARDT**

LEGAL | MODULES & UPSTREAM MANUFACTURING | TECHNOLOGY AND R&D | AUSTRALIA | GERMANY | UNITED STATES | WORLD

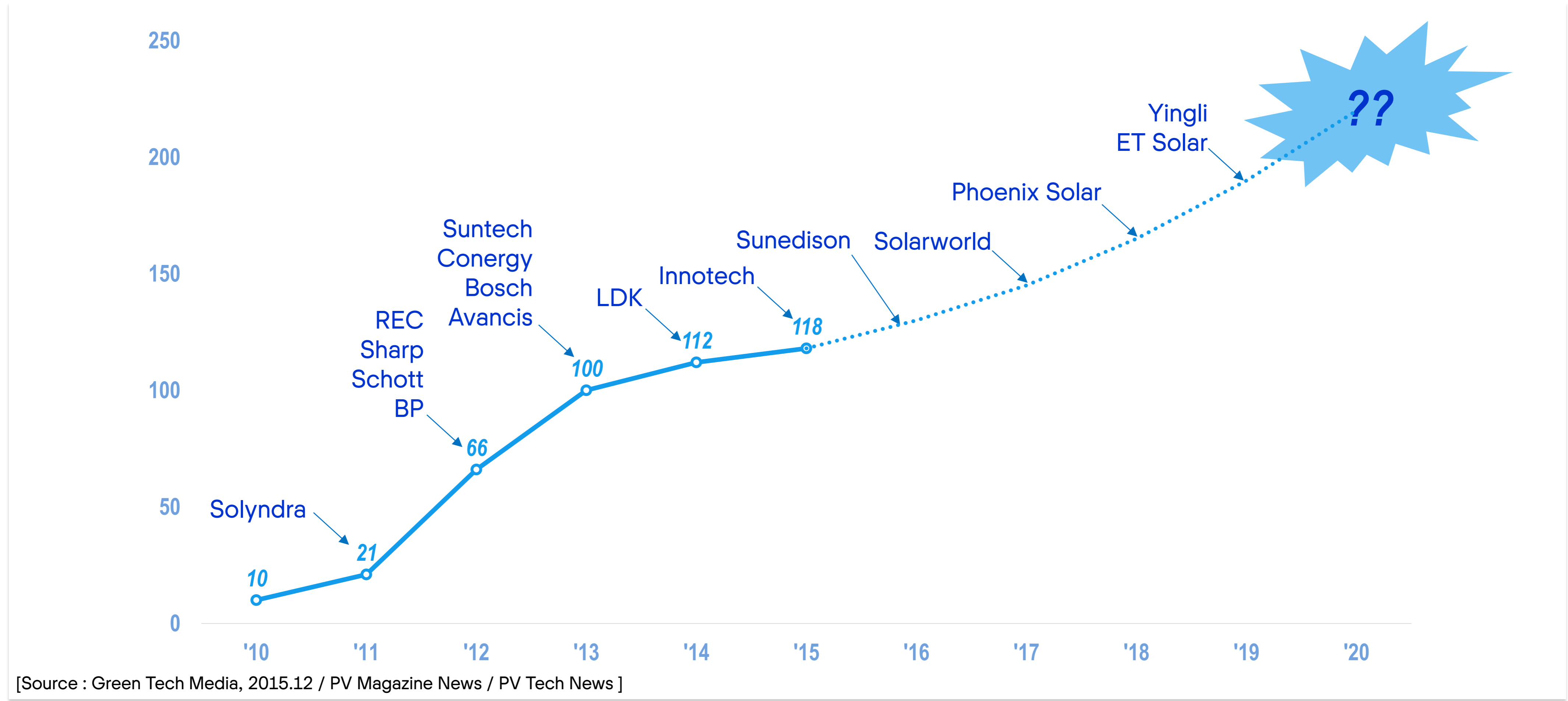


Judges in Germany have agreed with Hanwha.

Image: qimono/Pixabay

6. Bankability

Numbers of Disappeared Solar Company



[Source : Green Tech Media, 2015.12 / PV Magazine News / PV Tech News]

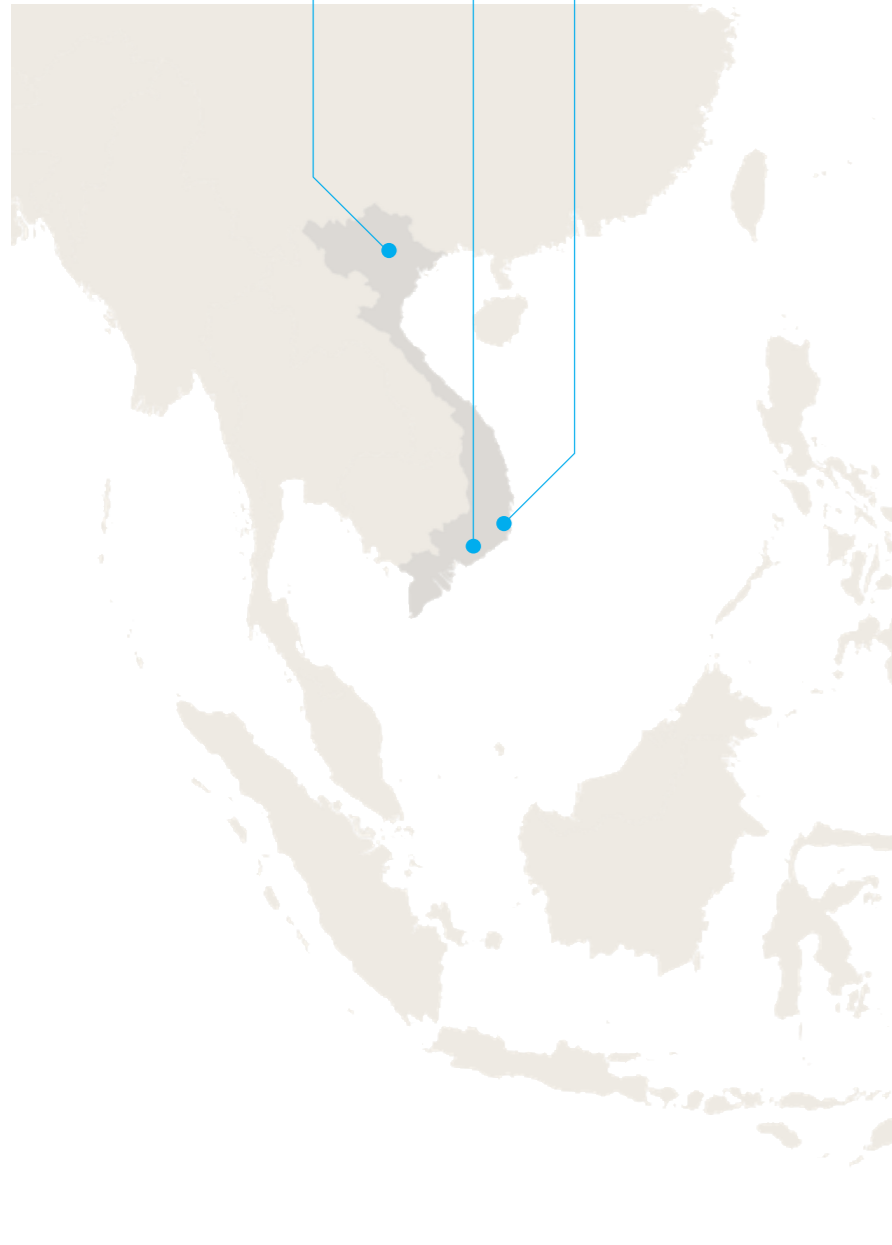
MALAYSIA

Rembau, Malaysia
Kampar, Malaysia
Bidor, Malaysia
Kota Tinggi, Malaysia



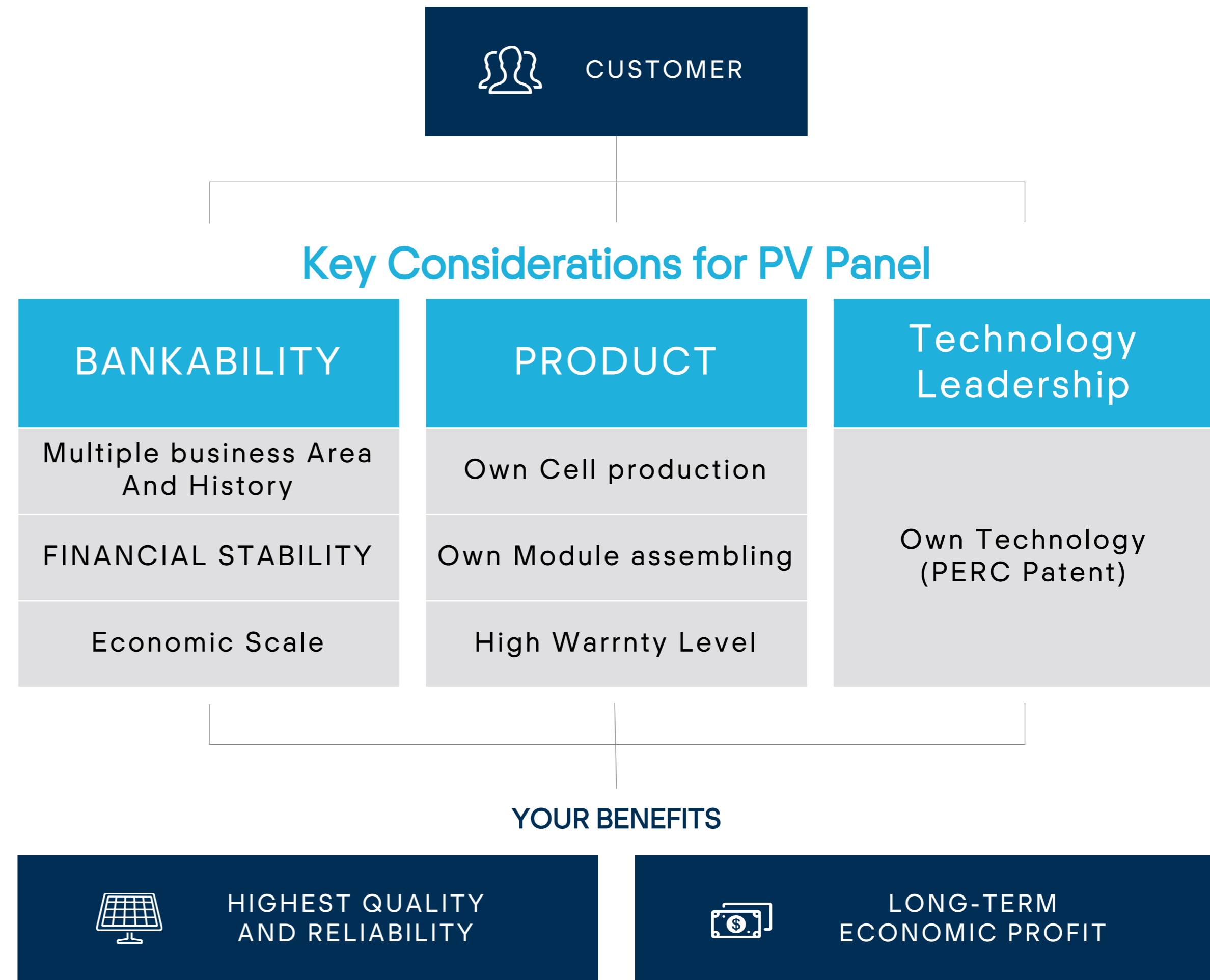
VIETNAM

Than Hoa, Vietnam
Ninh Thuan, Vietnam
Vung Tau, Vietnam



MAKING THE PERFECT CHOICE

Q CELLS is fully bankable solar solution provider with a global footprint and market access. We expect to lead the world's solar industry with our cutting-edge technology and superior product quality. It's why we're seen as the best choice for the future and trustworthy to our investors, installers and end consumers.



Solar energy can both be a highly reliable source of energy supply and a competitive economic investment.

Q CELLS' expertise will make you benefit from the advantages of solar energy.



Q CELLS