



LONGi

Propelling the transformation

# Program Behind AAA Rated Bankability

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Hi-MO 4  
7.4MW

Solar + Transportation  
Pujiang Town Metro Terminal, Shanghai, China



# AAA Bankability Rating in Q1, 2022

## PV ModuleTech Bankability Ratings Pyramid

February 2022

**70 GW+**

Wafer Shipments, 2021

**\$ 12.7 Billion**

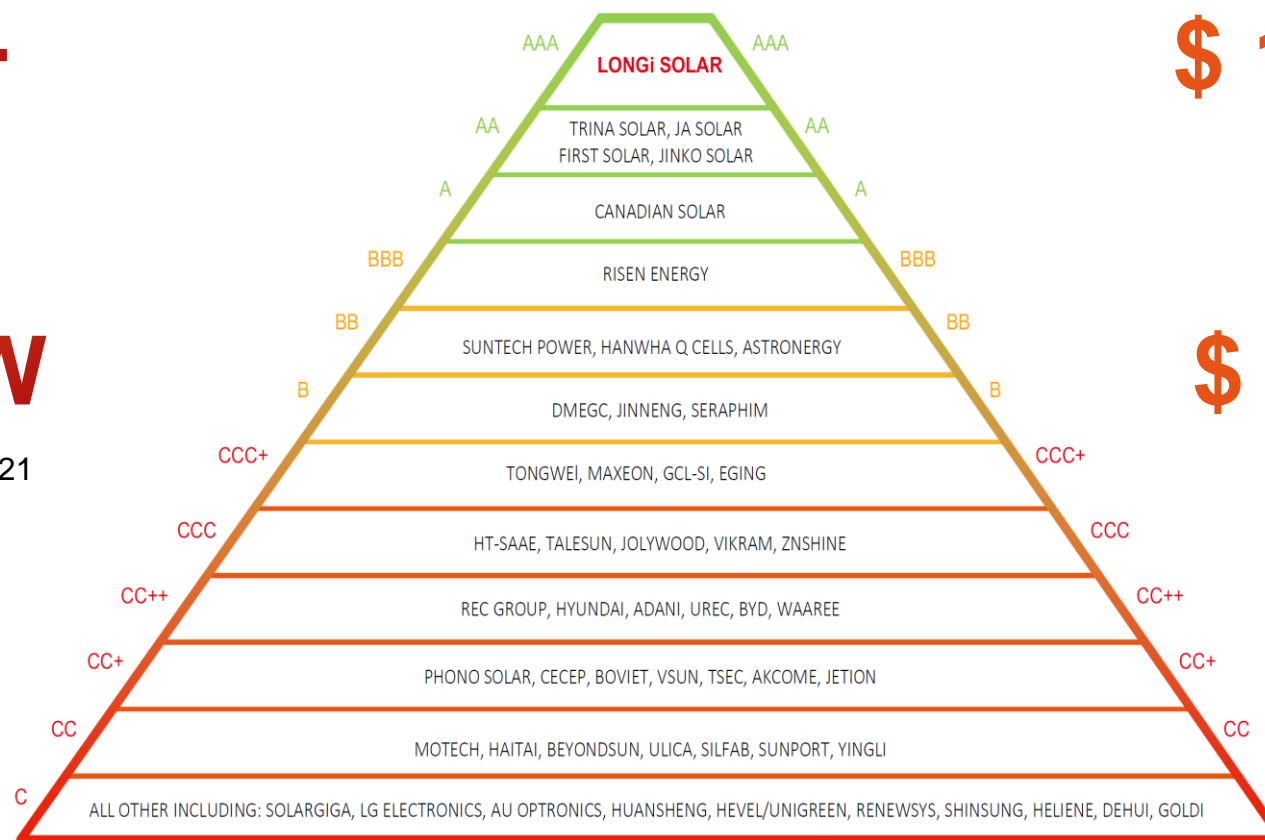
Operating Revenue, 2021

**38.5 GW**

Module Shipments, 2021

**\$ 689 Million**

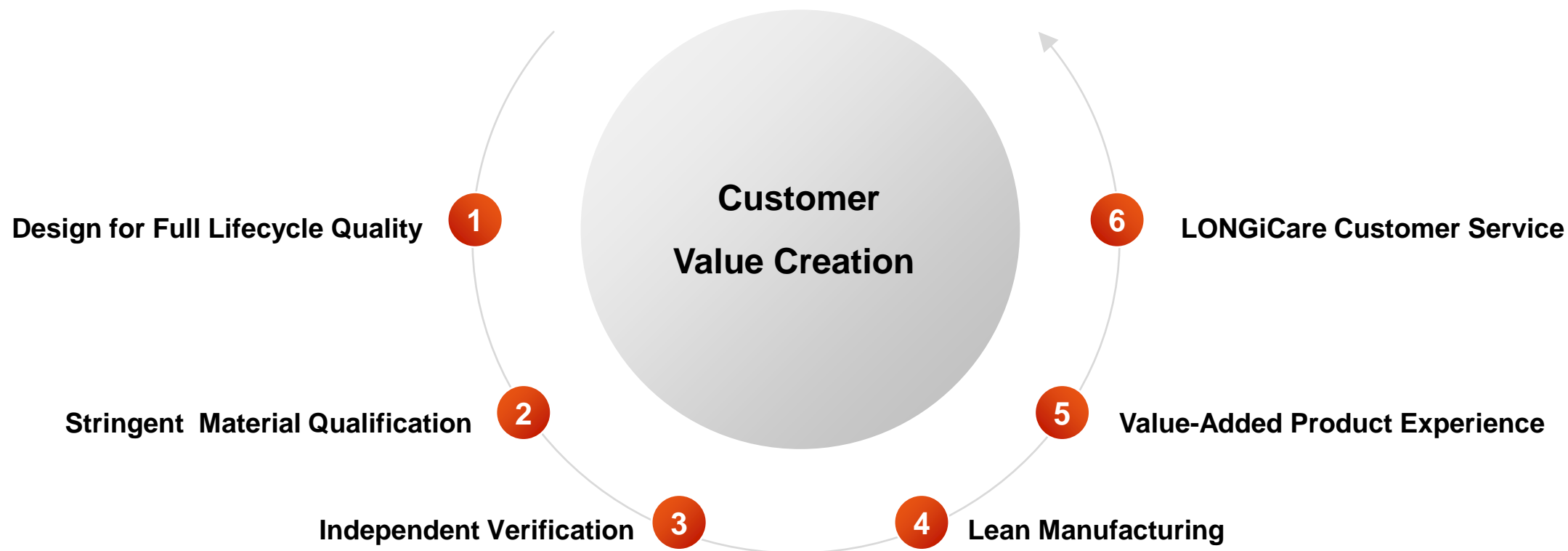
R&D Investment, 2021



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Source: PV ModuleTech Bankability Quarterly report.

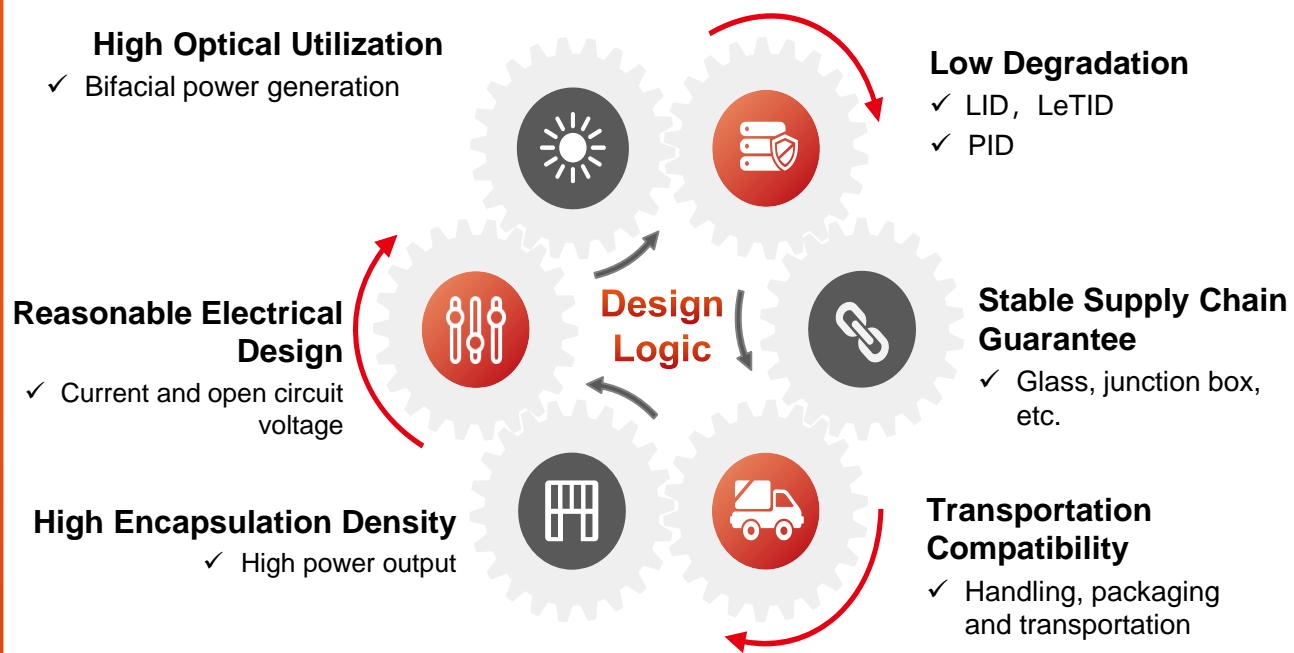
# Industry Benchmark for Quality and Reliability



# 1 Design for Full Lifecycle Quality

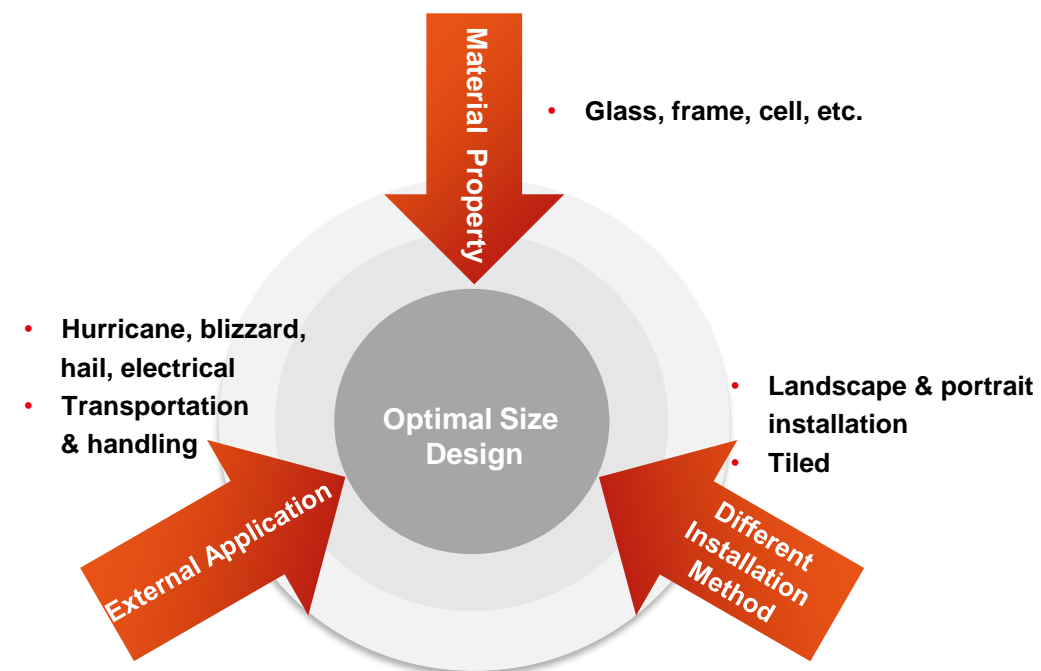
## Module design and planning

Customer value driving



## Case Study

### M10(182mm) Ultra module size



## 1 Design for Full Lifecycle Quality

# All-Scenario Reliability Program

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### All-Scenario Reliability

#### Various Climate conditions

Highly Accelerated Thermal Cycling  
(HATC)

DH +UV Aging

TC + UV Aging

Performance at Low Irradiance

Cold conditioning + Dry heat + HF  
sequence test

UV + TC + HF sequence test

LeTID

PID

Salt Mist  
Ammonia Corrosion

.....

#### Catastrophic Conditions

##### Hail Test

Enlarge the hailstone  
to 35mm

##### Low-temperature Mechanical Load

Apply low temperature and static  
mechanical load to modules  
simultaneously

##### Wind Tunnel Thresher Test

Subjected to a maximum wind  
speed of 60m/s (~Category 4  
hurricane)

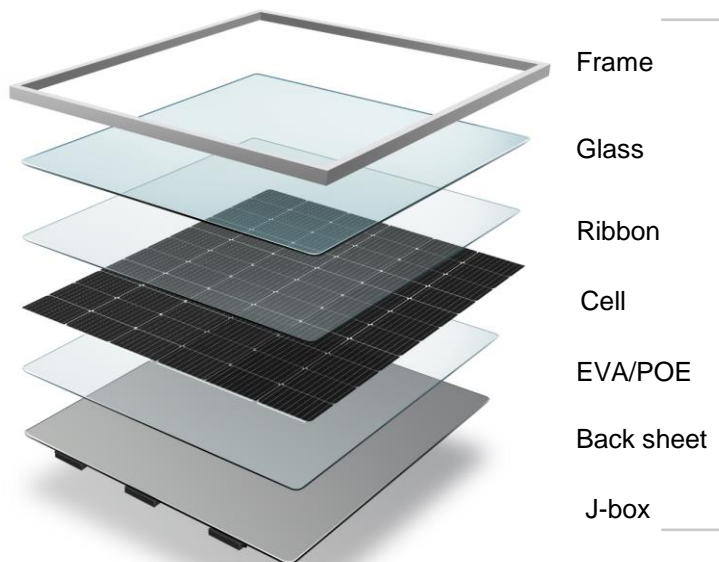
##### Fire Resistance Test

LONGi modules passed the  
highest fire resistance test  
(Italy UNI 9177 Class1)

## 2 Stringent Material Qualification

# 3Q+3A Program to Qualify LONGi Standard BOM

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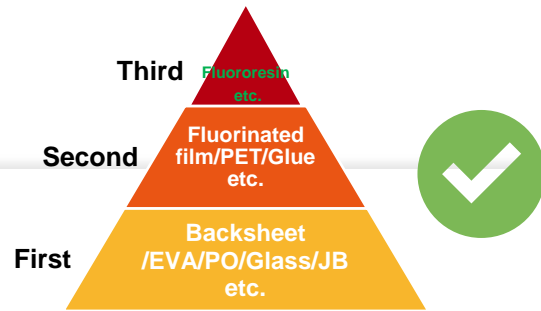


### Rigorous material introduction criteria:

- All raw materials sourced from LONGi qualified suppliers & production lines
- Thorough analysis of material properties based on composition and structural characteristics
- Dedicated BOM test center to test critical materials
- Industry leading LONGi material standards

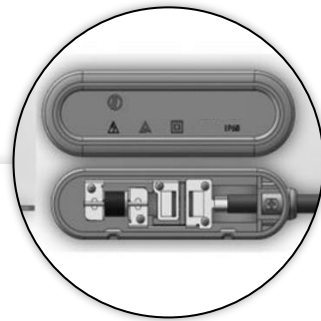
## 2 Stringent Material Qualification

# Case Study: Strict Screening to Ensure Product Reliability



### Three-level source control

LONGi strictly screens up to three levels of raw materials suppliers.



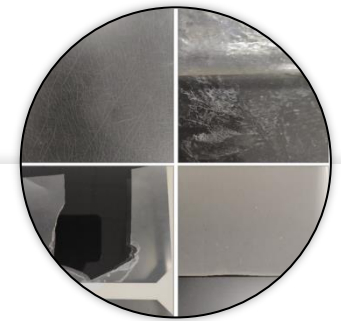
### High Current Junction Box

LONGi engaged with suppliers to develop a 25A junction box using a single diode instead of two diodes for M10 bifacial modules.



### White EVA

LONGi addressed reliability issues with supplier during qualification process before introducing to standard BOM



### Transparent Backsheet

Failure such as yellowing, cracking, delamination were identified when screening transparent backsheet from several suppliers.

### 3 Independent Verification

## Top Performer in PVEL's All 6 Reliability Programs



### 2017-2022 PVEL Top Performer

Less than 2% degradation for PQP reliability tests

Manufacturer	TC600	DH2000	SML+DML+TC50+HF10	PID	LID&LeTID	Pan Performance
<b>LONGi</b>	●	●	●	●	●	●
Manufacture A	●	●	●	●	●	
Manufacture B	●		●	●	●	
Manufacture C	●	●	●	●	●	●
Manufacture D	●	●		●	●	●
Manufacture E				●	●	
Manufacture F	●		●	●	●	
Manufacture G	●	●	●	●	●	●
Manufacture H	●	●	●	●	●	●

Note: Above manufacturers are from 2021 TOP10 shipments list



### 3 Independent Verification

## RETC High Achiever in All 9 Reliability Programs



### 2019-2021 RETC High Achiever

Achieving Top performance in all 3 categories and 9 programs (2021)

Manufacturer	2021 'High Achiever'	Reliability			Performance					Quality
		DH 2000	DML	PID Test	Module Efficiency	PTC-to-STC	Pan File	LID	LeTID	Thresher Test
<b>LONGi Solar</b>	•	•	•	•	•	•	•	•	•	•
Manufacturer A	•						•	•	•	•
Manufacturer B	•	•	•				•	•	•	•
Manufacturer C	•	•	•		•	•	•	•	•	•
Manufacturer D	•				•	•		•	•	•

Note: Above manufacturers are from 2020 TOP10 shipments list

### 3 Independent Verification

## Third Party Evaluation of Energy Yield Performance



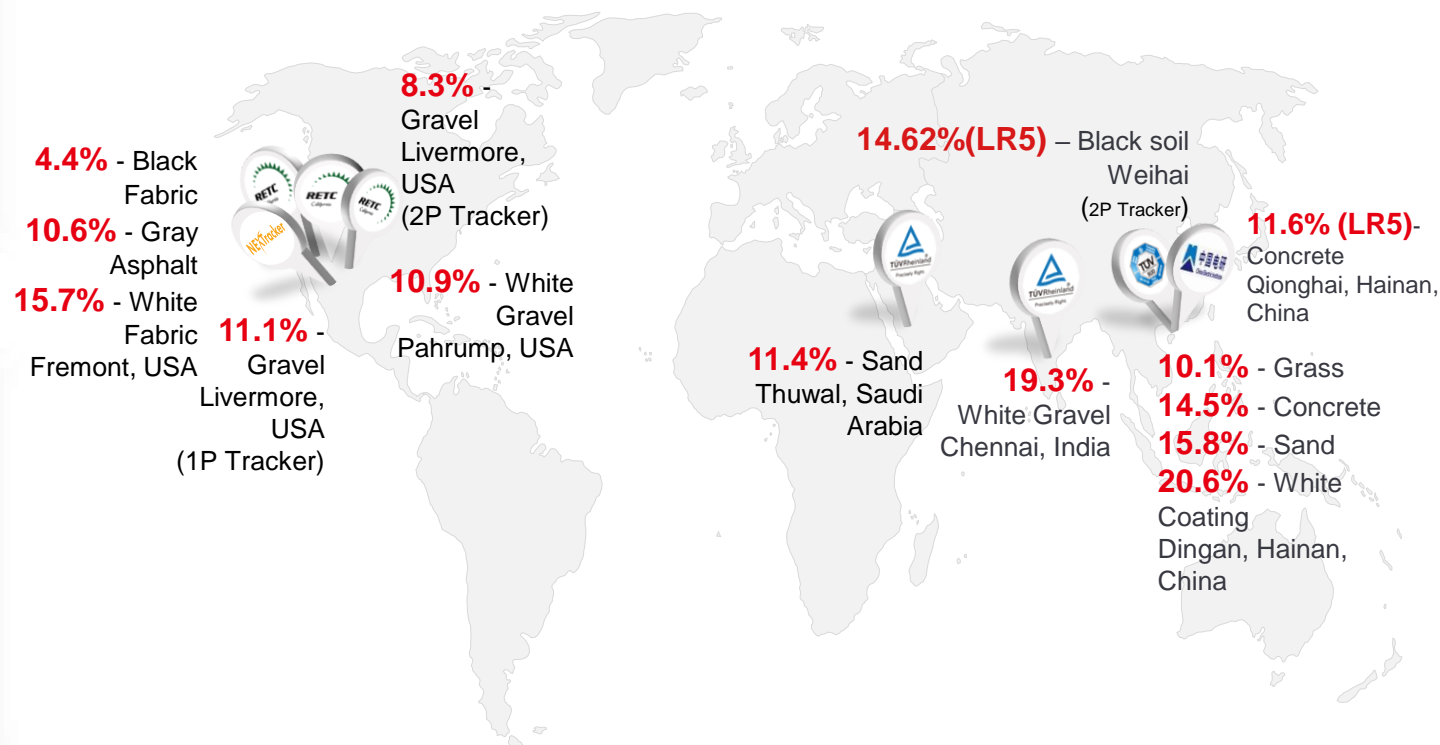
### TÜV 'All Quality Matters'

- 2017, 2018 | Energy Yield Simulation Winner
- 2019, 2020, 2021 | PV Module Outdoor Power Generation Winner



### PV Magazine Test

- Since June 2018 | Excellent Performance in Energy Yield



## Smart & Comprehensive Quality Management

Product Quality Certification: ISO9001, ISO45001, ISO14001, IEC TS 62941



Supplier Material Inspection



Manufacturing Process Control



Product Reliability Monitoring

Industry benchmark for material introduction & inspection standard, and material performance monitoring

Automatic and intelligent workshops  
338 process control/153 quality check

Monthly, quarterly and annual reliability test, covering every BOM for every product

**MES&DQMS&LIMS Digital Manufacturing Management**  
Transparency and Traceability



## 4 Lean Manufacturing

# Extensive Reliability Monitoring

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### Raw Materials Monitoring

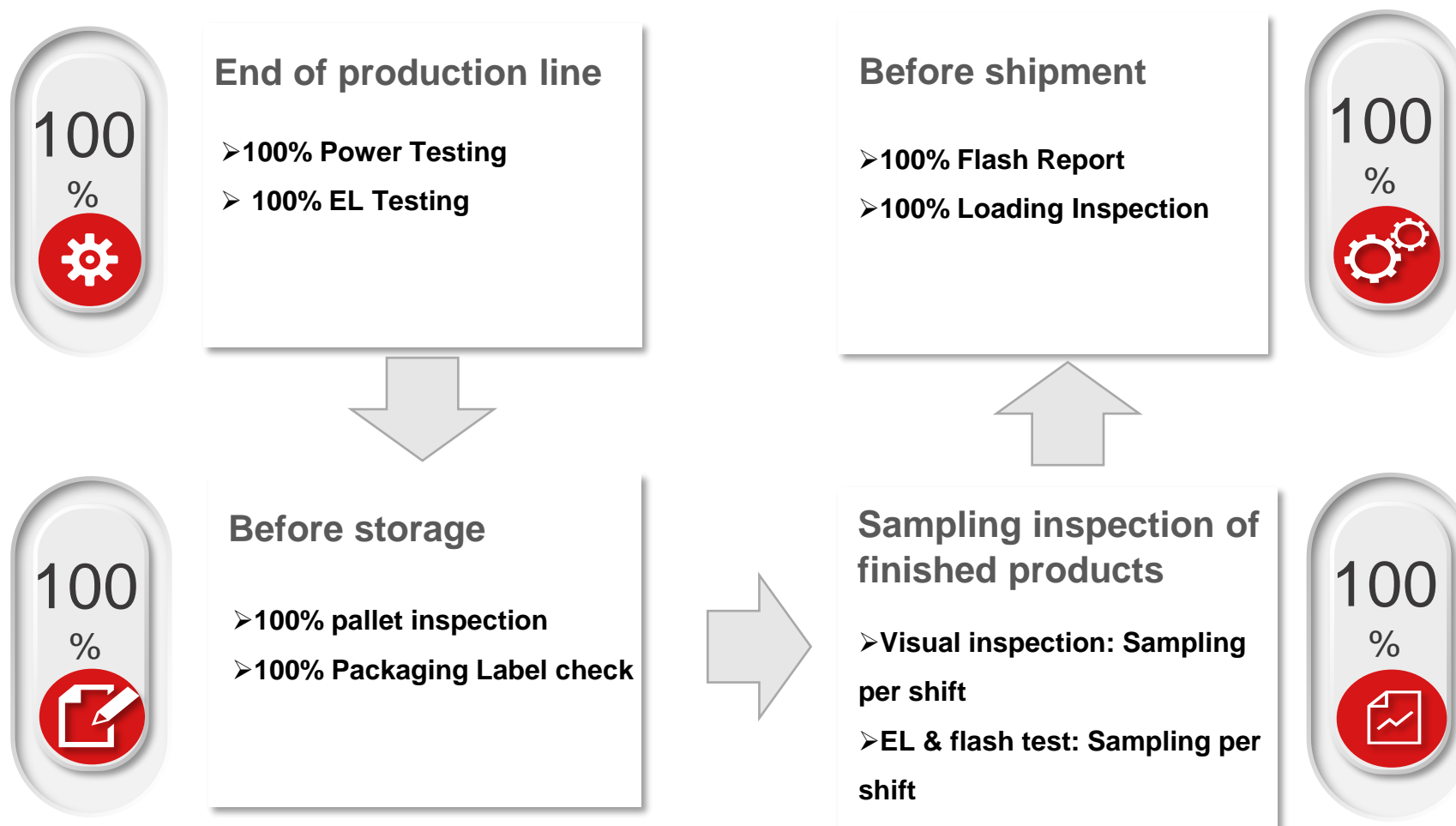
Key items for material inspection	Industry test frequency	LONGi test frequency
(Glass) TC100/HF10	Only during import process	Semi-annual
(Glass) Quench test	Few	Semi-annual
(Glass) Static pressure resistance	Few	Semi-annual
(Cell) High-temperature tension	Few	Monthly
(Cell) LID	Quarterly	Monthly
(Backsheet) EVA adhesion	Quarterly	Monthly
(Backsheet) Interlayer adhesion	Quarterly	Monthly
(EVA) Vulcanization curve test	Only during import process	Quarterly
(Frame) CASS Salt mist test	Only during import process	Quarterly
(JB) Low temperature impact test	Few	Semi-annual
(JB) DH1000/HF10/TC20	Only during import process	Semi-annual

### End-product Monitoring

Module test items	Industry test frequency	LONGi test frequency
PID	Quarterly	Monthly
LID	Quarterly	Monthly
LeTID	Quarterly	Monthly
UV15+DML+TC50+HF10	Few	Quarterly
TC200	Only during import process	Quarterly
DH1000+SML	Few	Quarterly
Hail test	Only during import process	Annual
Salt mist 6	Only during import process	Annual
Fire-resistant	Only during import process	Annual

## End-Product 100% Quality Inspection

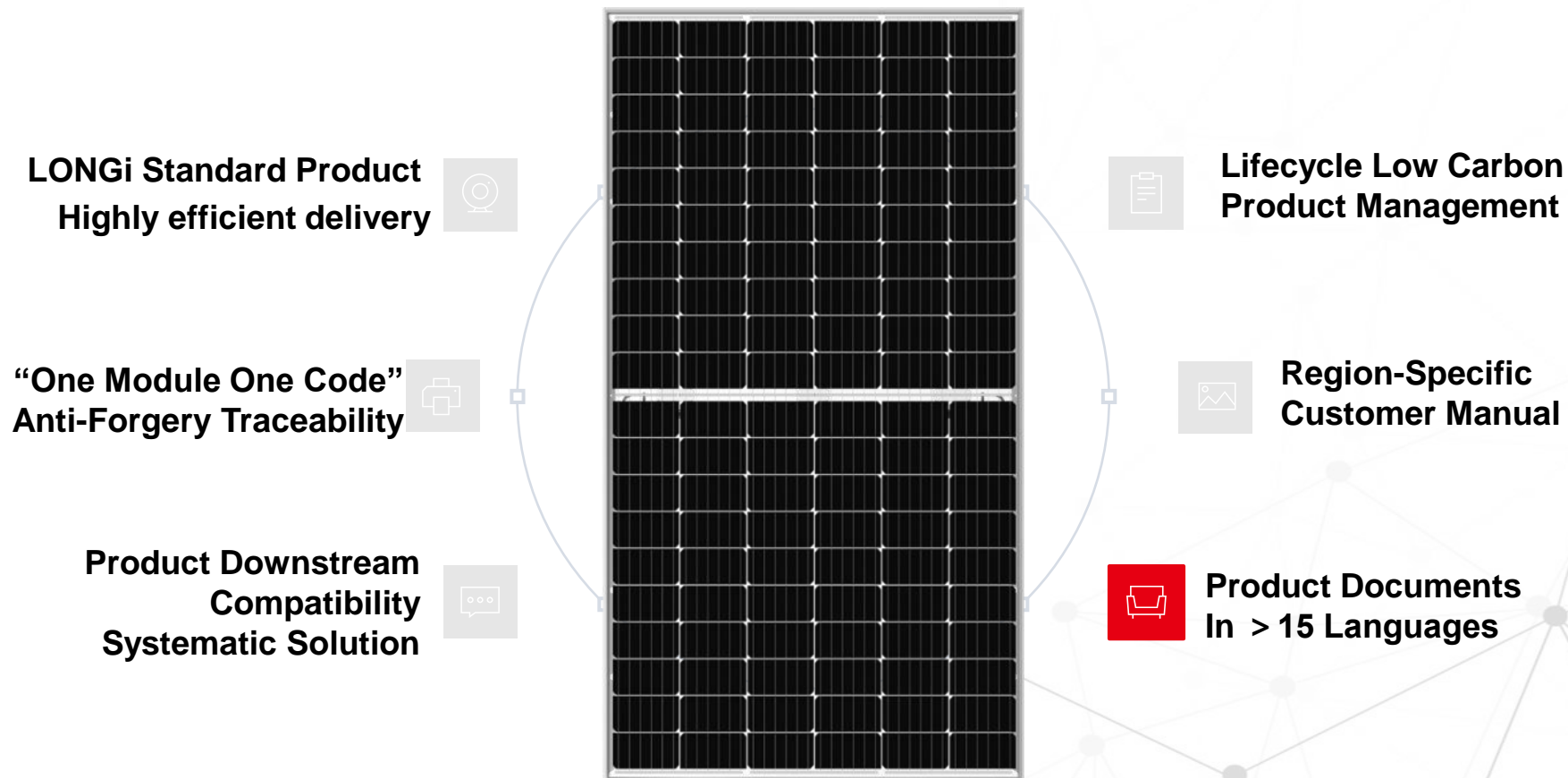
Products undergo **4** rounds of **100%** inspection from production to shipment, to minimize delivery risks and improve customer satisfaction



## 5 Value-Added Product Experience

# Lifecycle Accessible Product Experience

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## 6 LONGiCare Customer Service

# Global Customer Service to Maximize PV Plants Lifecycle

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### Customer Service Commitment

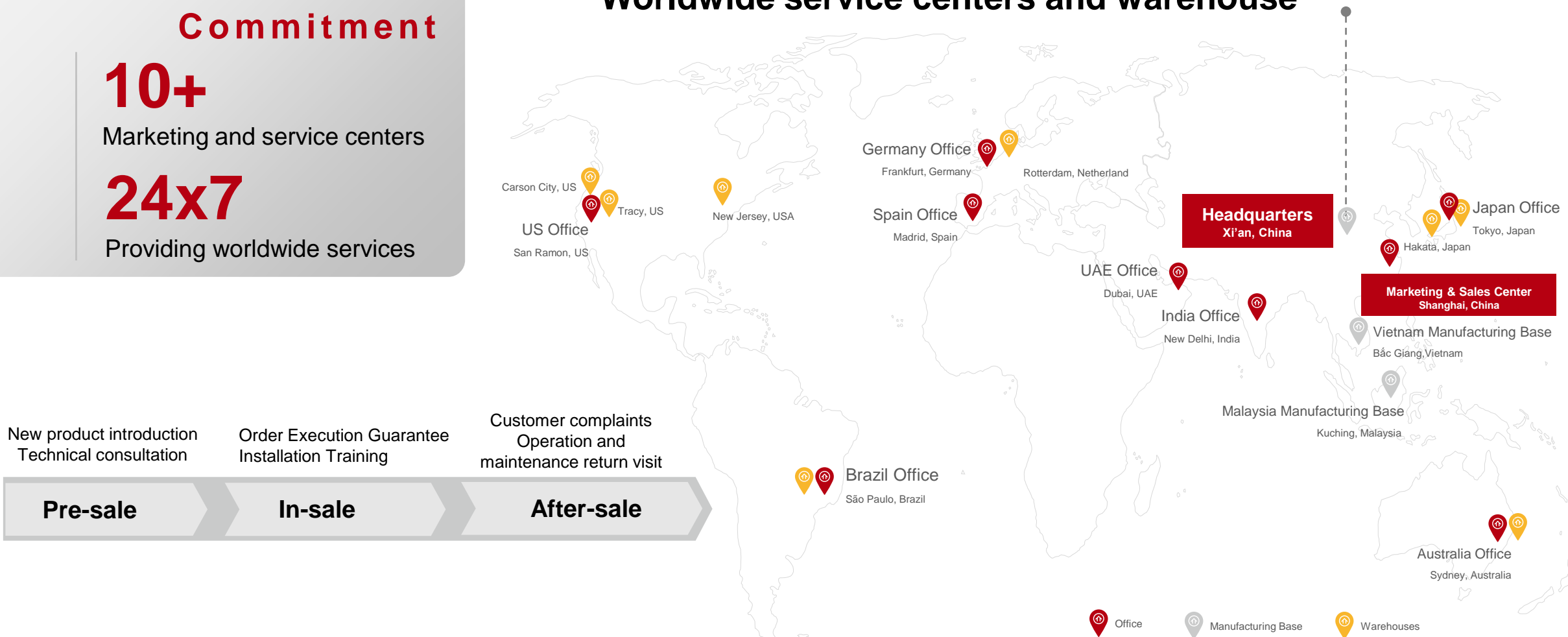
**10+**

Marketing and service centers

**24x7**

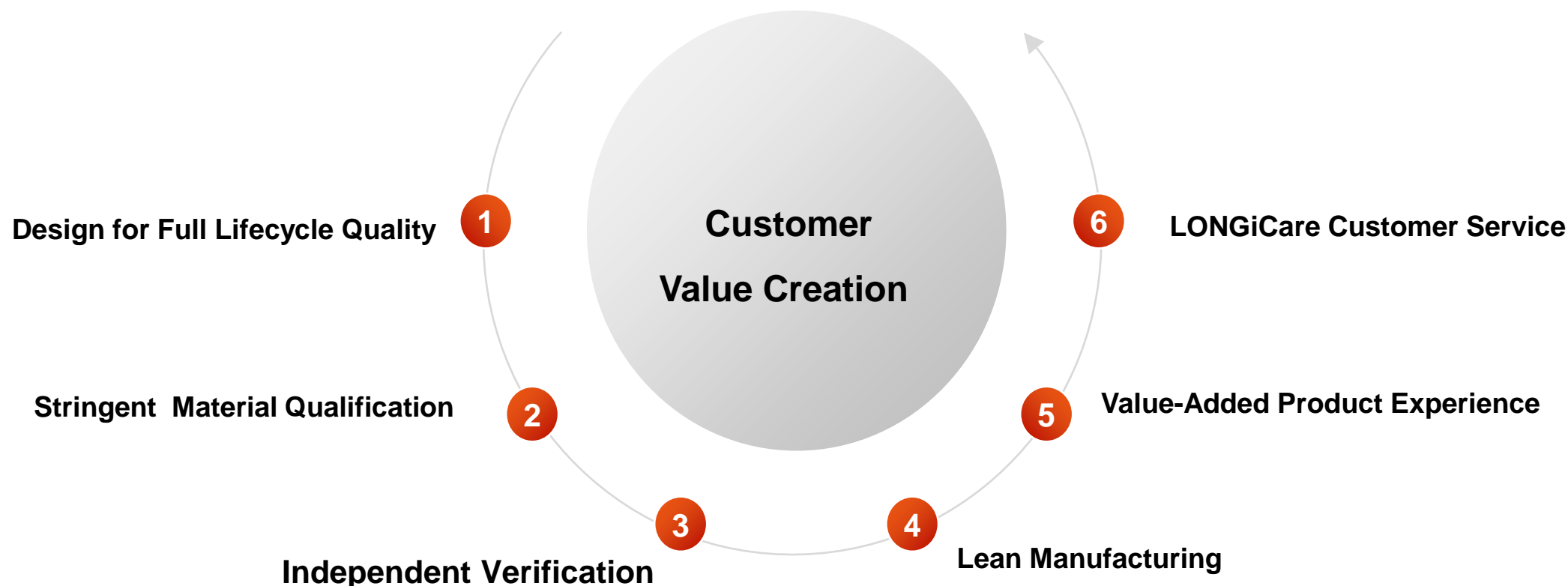
Providing worldwide services

### Worldwide service centers and warehouse



# Summary

- LONGi is the only company that received AAA bankability rating by PV tech in Q1, 2022
- LONGi has established industry leading Lifecycle quality system to ensure quality and long-term reliability





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