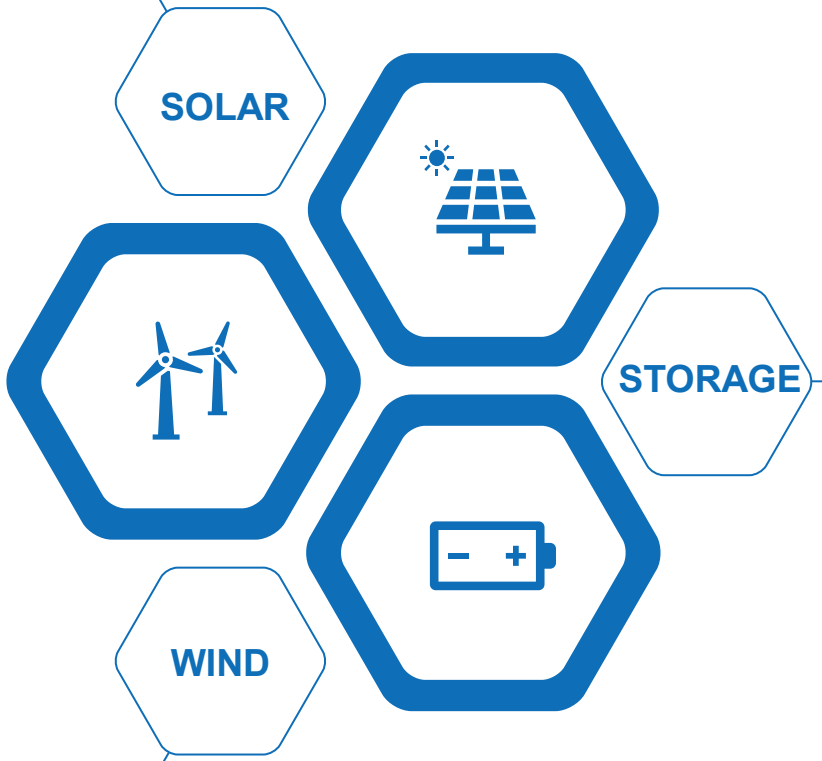
PROCUREMENT OF BACK CONTACT PV MODULES – BEST PRACTICES

PV MODULETECH CONFERENCE EUROPE



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Malaga, Spain, 02nd December 2025

Leading technical advisor and quality assurance provider
Safeguarding buyers' investments in renewables since 2010.

TECHNICAL ADVISOR & QUALITY ASSURANCE SOLUTION PROVIDER

- Accredited Inspection Body ISO17020 Type A

EXPERT IN RENEWABLES

- PV modules
- BESS
- Electrical Conversion System
- Structures and trackers
- BOS components

SERVING BUYERS, NOT SELLERS

- Utilities
- IPP, developers
- EPCs
- Distributors and Installers

AVAILABLE GLOBALLY

- 60+ inspectors, auditors and engineers
- Present across Europe, Americas, Asia, and Africa.

75+GW
SOLAR
Conformity assessment

13+GWh
BESS
Conformity assessment

280+
RENEWABLES
Manufacturing sites audited

350+
Annual quality assessment projects

35+
Countries with assets quality assured by STS

Supply Chain Assurance

PV Modules

Crystalline Silicon / Thin Film

Source and operate high-quality PV modules from sustainable and resilient supply chains

- Market Intelligence
- Tendering Support
- Suppliers & Products Due-Diligence
- Contracting Support
- Conformity Assessment
- Performance Monitoring & Analysis
- Claim Management

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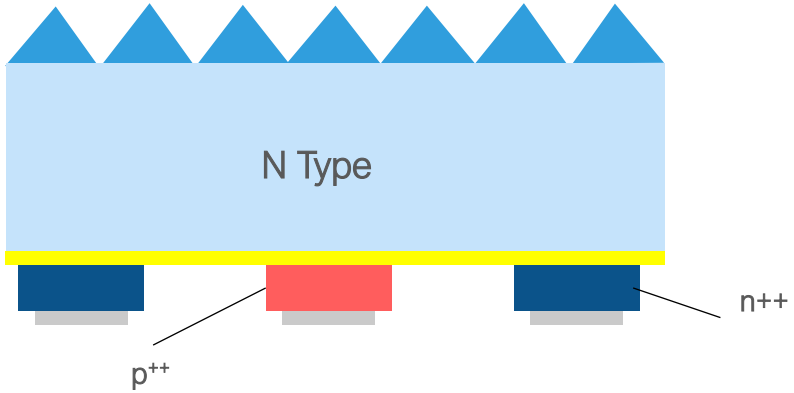
Back Contact Modules vs Mainstream Modules

Back Contact is a cell structure, compatible with TOPCon and HJT technologies that allows for higher efficiency in exchange of a more complex manufacturing process.



Back Contact vs Front/Rear Contact (TOPcon)

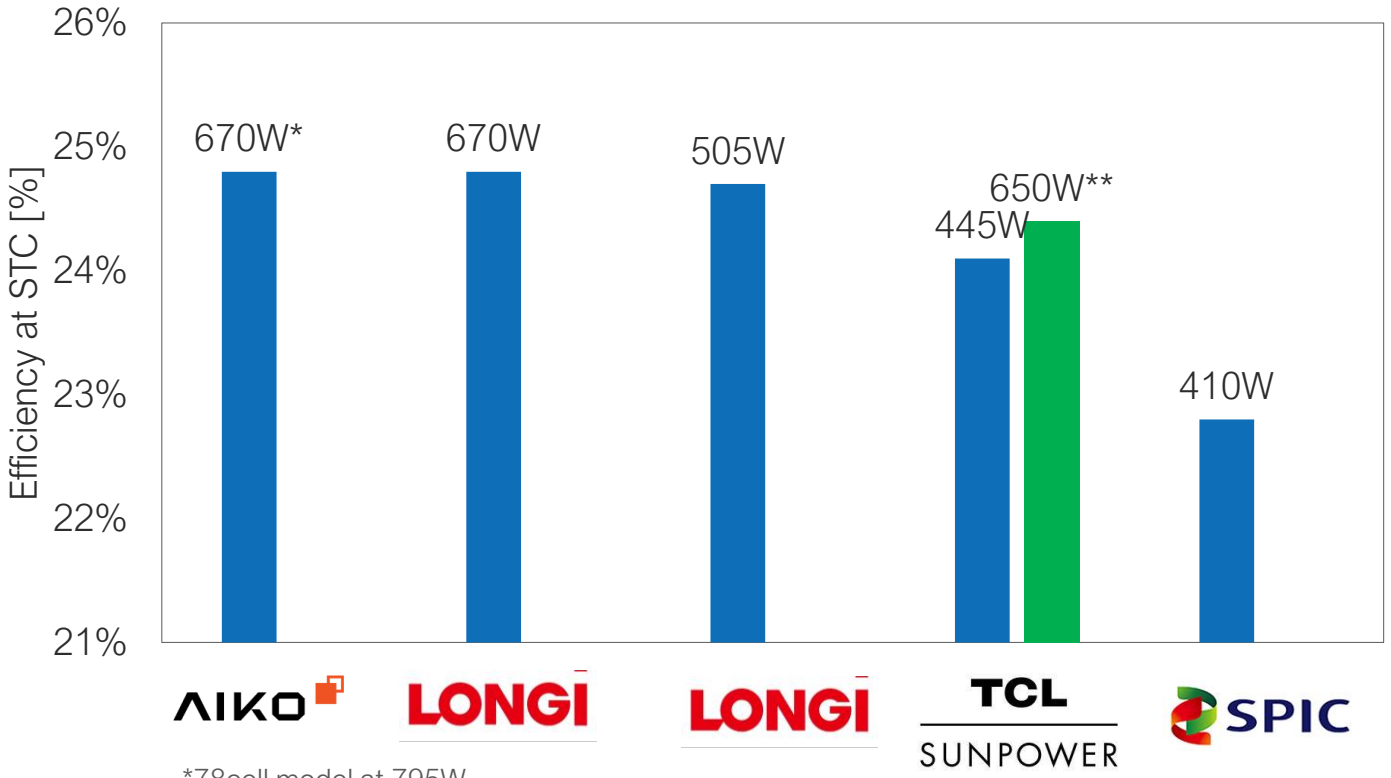
- ⇧ Cell efficiency
- ⇩ Guaranteed yearly degradation
- ⇧ Partial shading resilience
- ⇩ Edge stress
- ⇧ Silver-free contacts compatibility
- ⇧ Gapless module compatibility

- ⇩ Bifaciality
- ⇧ Wafer contamination lever requirements
- ⇧ Unknown degradation mechanism risk
- ⇧ Manufacturing complexity
- ⇧ Premium price
- ⇩ Manufacturing actors and capacity

Commercially Available Back Contact modules

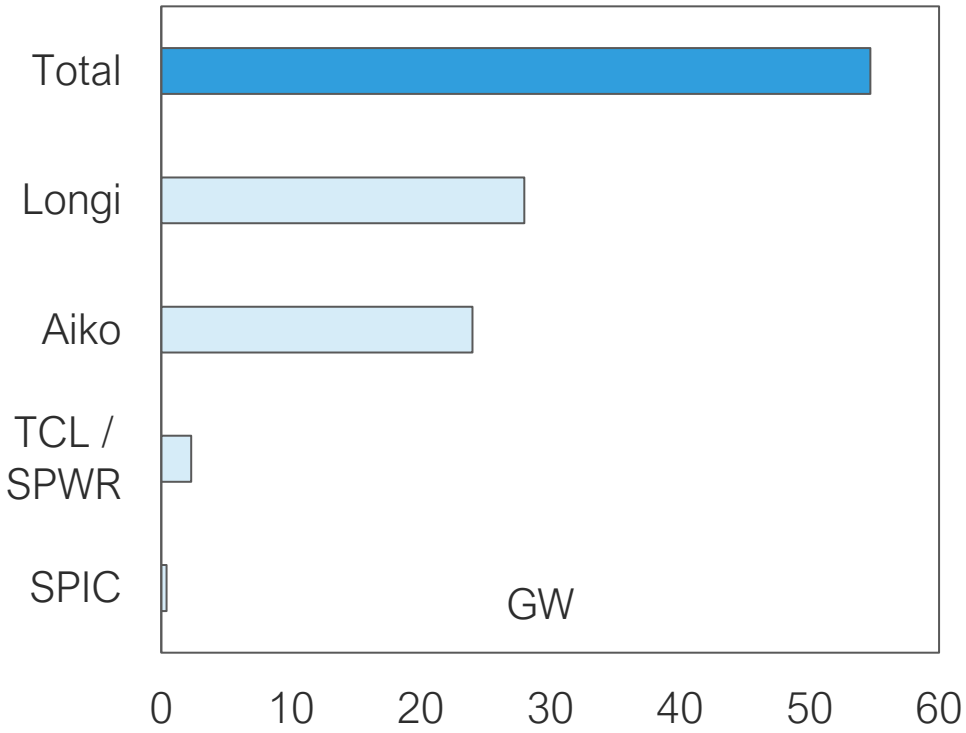
Limited manufactures offer back-contact modules, and their manufacturing capacity is limited compared to mainstream front/rear contacts modules.

Max. efficiency and power of commercial BC modules



*78cell model at 795W
** Announced

BC Manufacturing capacity (H1 2025)

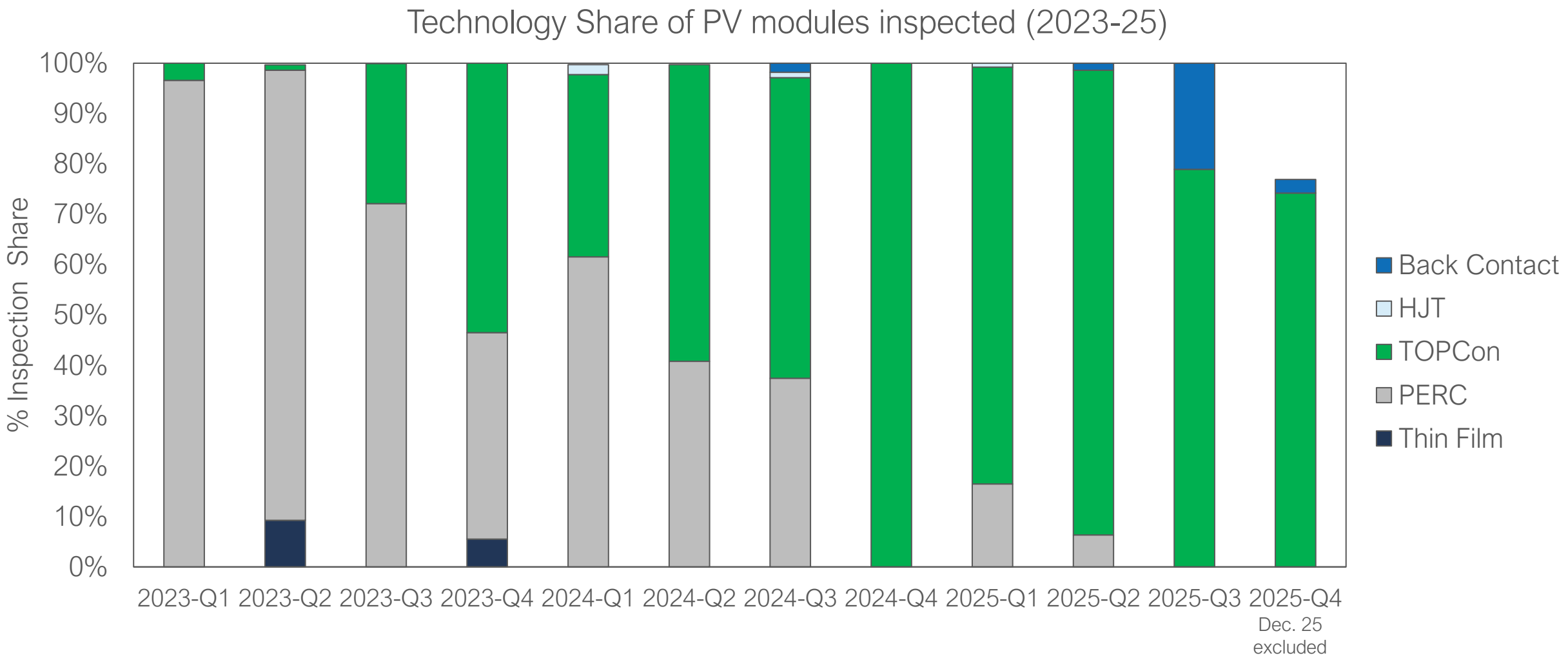


Notes:
Top 10 Manufacturers' shipment q1-q2 2025: 361GW (all tech).
Approximate Total World Manufacturing Capacity: 600-650GW.

Source: STS Market Intelligence Database

Back Contact share in STS projects

Back Contact represented around 5% of the PV modules STS inspected in 2025 (YTD), and a gradual uptake is foreseen.



Source: STS Inspection Database

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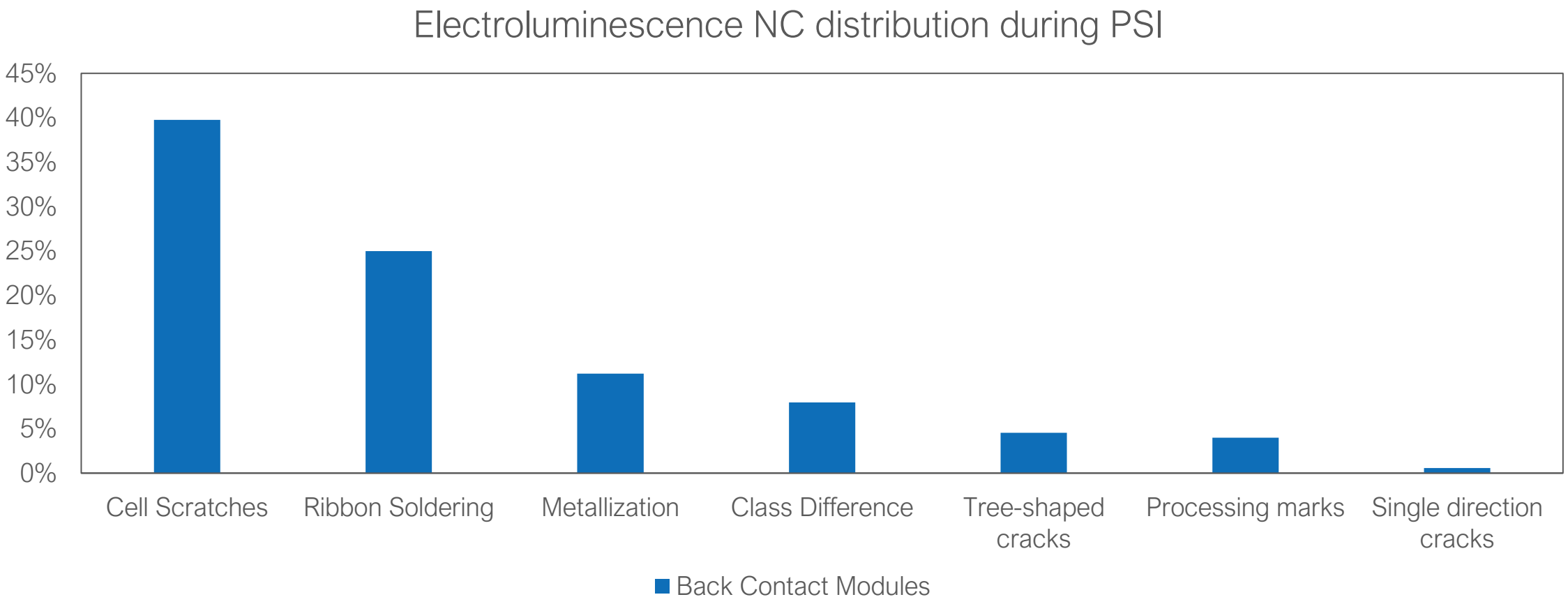
Non Conformities (NC) in BC modules at PSI (EL)

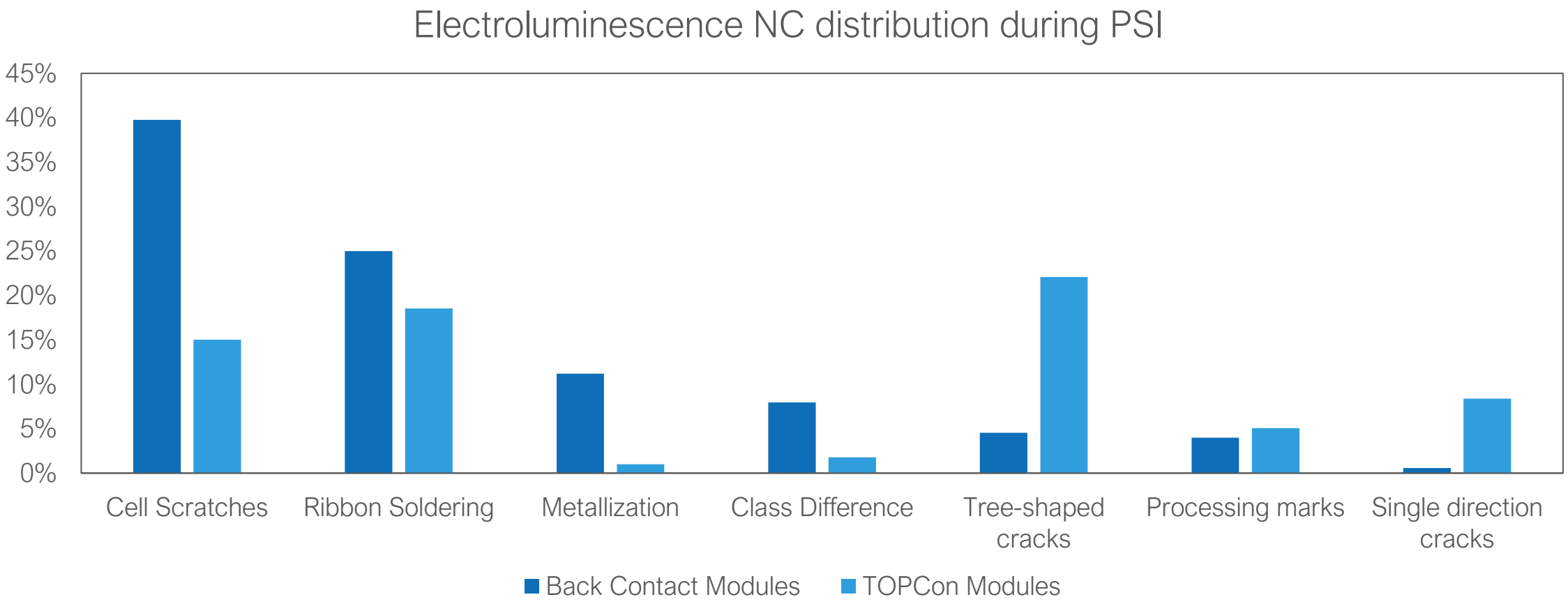
Cell scratches, ribbon soldering and metallization represent the most common Electroluminescence NC categories found during Pre-Shipment Inspection (PSI) of BC modules.



Source: STS Inspection Database

Non Conformities (NC) in BC modules at PSI (EL)

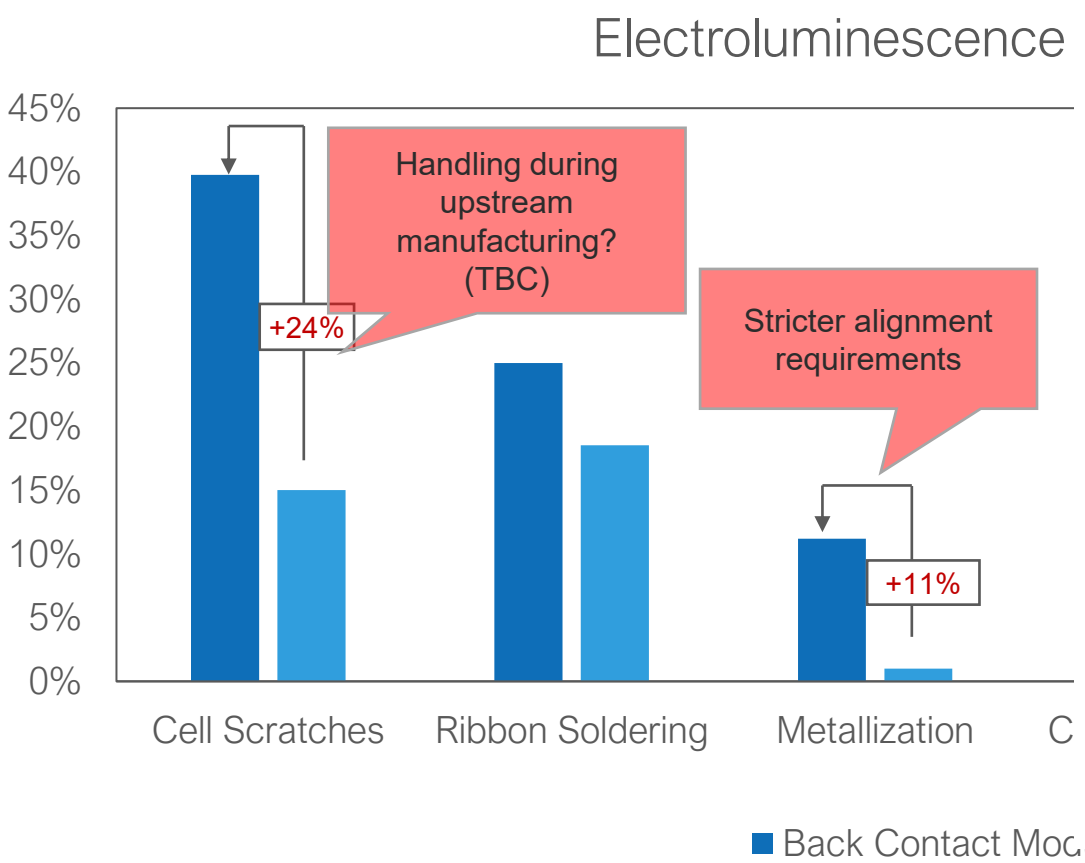
BC modules show higher cell scratches and metallization NC and lower cracks than TOPCon.

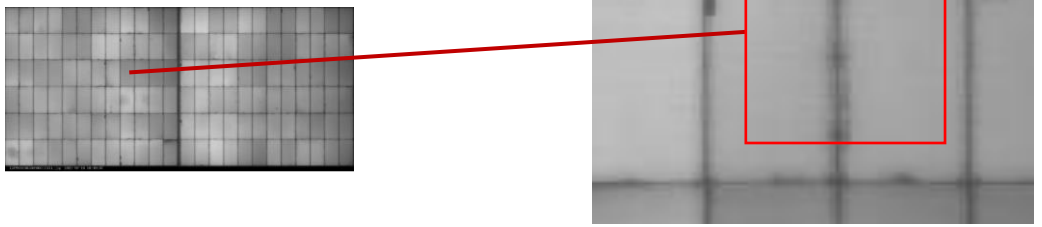


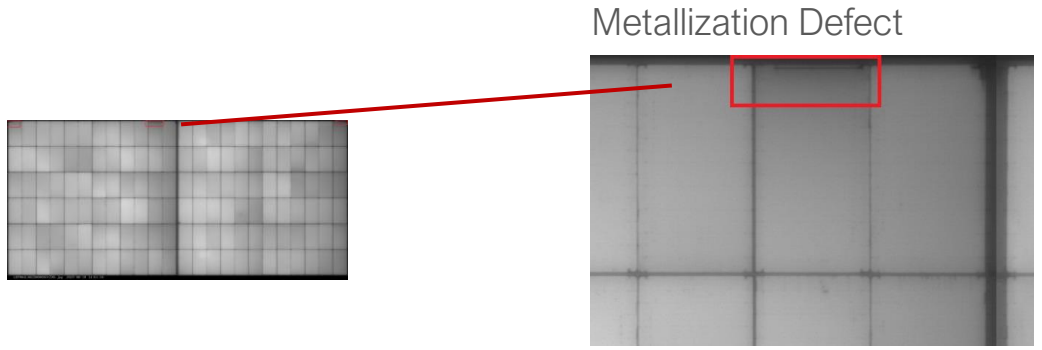
Source: STS Inspection Database

Non Conformities (NC) in BC modules at PSI (EL)

Higher cell scratches and metallization defects NC might be attributed to the additional BC modules manufacturing process steps.







Source: STS Inspection Database. TOPCon and BC pictures sampling are not the same size

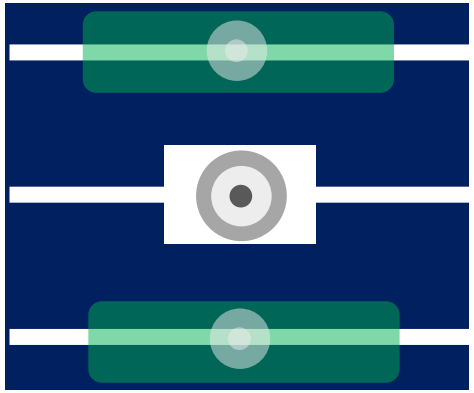
Finger insulation for BC metallization

Process parameters deviation during finger insulation on patterned BC presents higher risks of metallization NC. (insulation and soldering failures)

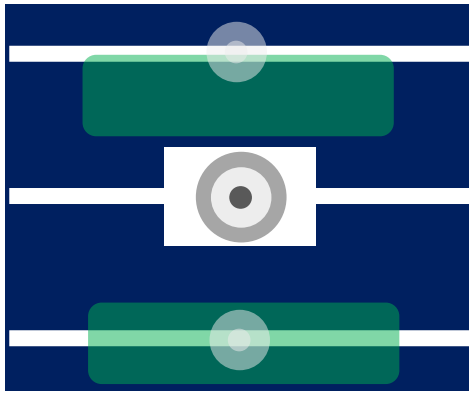
Step-by-step process for BC metallization:

1. Application of Insulating Glue (Solder Resist Ink or Solder mask)
2. UV- or Heat- curing of Insulating Glue
3. Application of solder paste on rear contact pads
4. Alignment and soldering

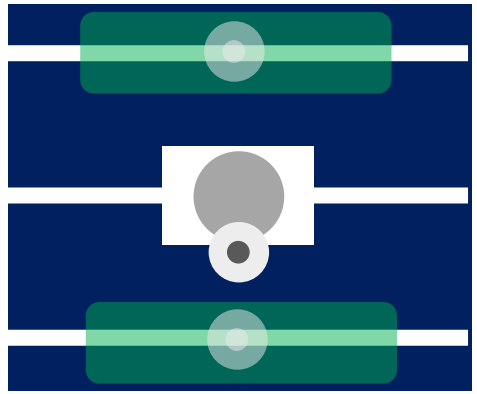
Conform Manufacturing



Insulation failure

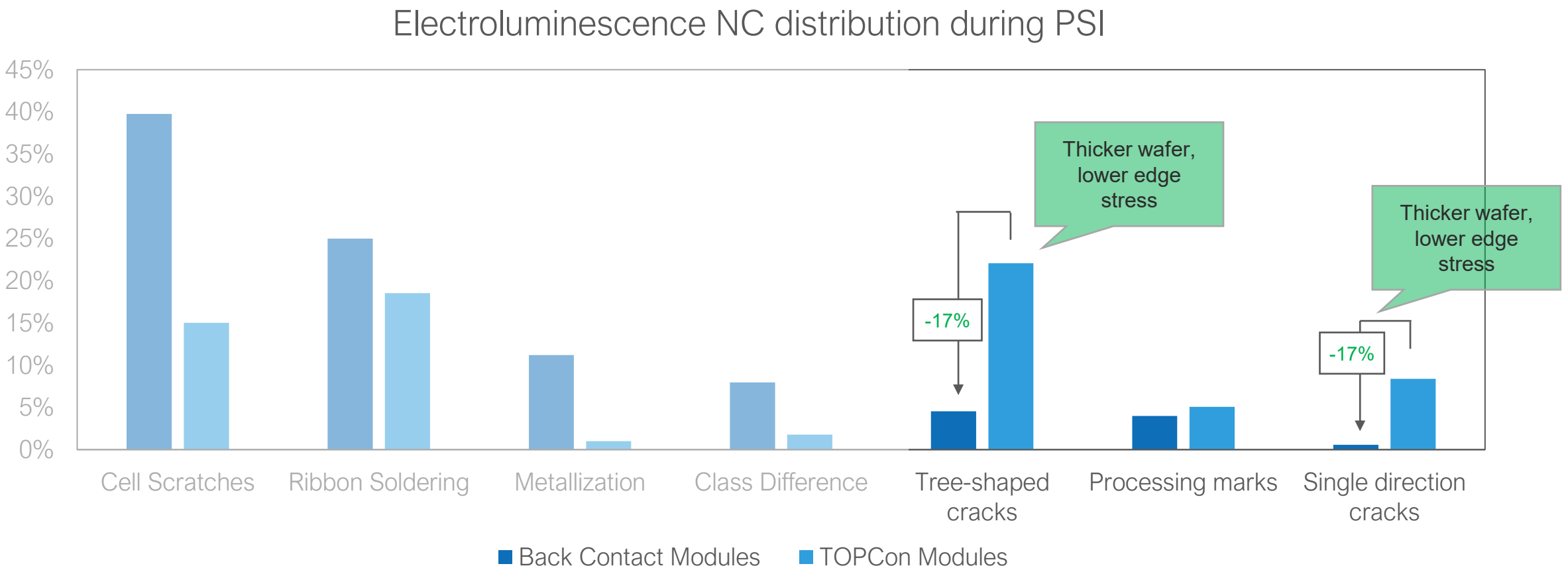


Soldering failure



Non Conformities (NC) in BC modules at PSI (EL)

BC design with thicker wafers and lower edge stress reduces the risk of cell cracks



Source: STS Inspection Database. TOPCon and BC pictures sampling are not the same size

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KEY TAKEAWAYS

#1 BC modules are gradually entering the market

✓ **STS Recommends to**
Update your PV Module purchase contract to BC requirements

#2 BC manufacturing capacity is <10% of totally available

✓ **STS Recommends to:**
Select a manufacturing partner able to deliver for your project

#3 BC Non-Conformities distribution differs from TOPCon

✓ **STS Recommends to:**
Include BC-specific In-Production Quality Checkpoints (e.g. insulation)

Leading Provider of Technical and Advisory Solutions in Renewables

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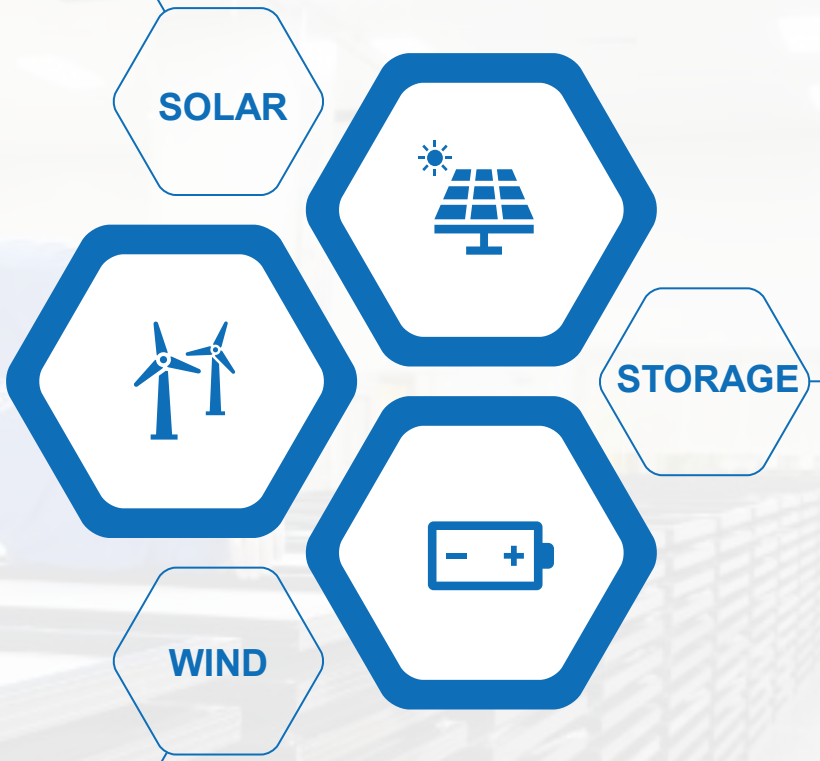

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