

Advances in materials for Back-Contact Modules

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BCworkshop**2023**

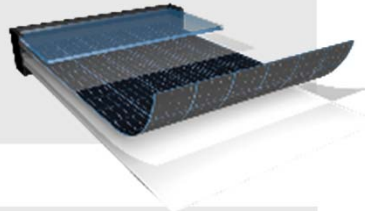


Endurans[®] Solar

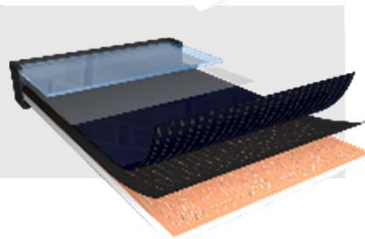
Experts in PV polymer science & manufacturing



High performance backsheets
Endurans[®] HP



Conductive backsheets
Endurans[®] CB



We believe that the solar industry has a huge role to play in creating a better, more sustainable future for our planet.

And we are making this a reality by boosting the performance of PV modules and developing solutions that are **circular by design**.

Endurans[®] Solar in a nutshell

Innovative material solutions for solar panel manufacturers

Experts
in polymer science,
co-extrusion,
solar technology

**Local production
& sales**
facilities across
America, Europe
& Asia

Market leader
in co-extruded
backsheets.
Endurans[®] HP
*All-purpose
Sustainable*

Market leader
in conductive
backsheets.
Endurans[®] CB
*High-end
performance &
aesthetics*

Pipeline of new
solar films:
Encapsulants
Flex frontsheets
Rear Perforated
Insulators



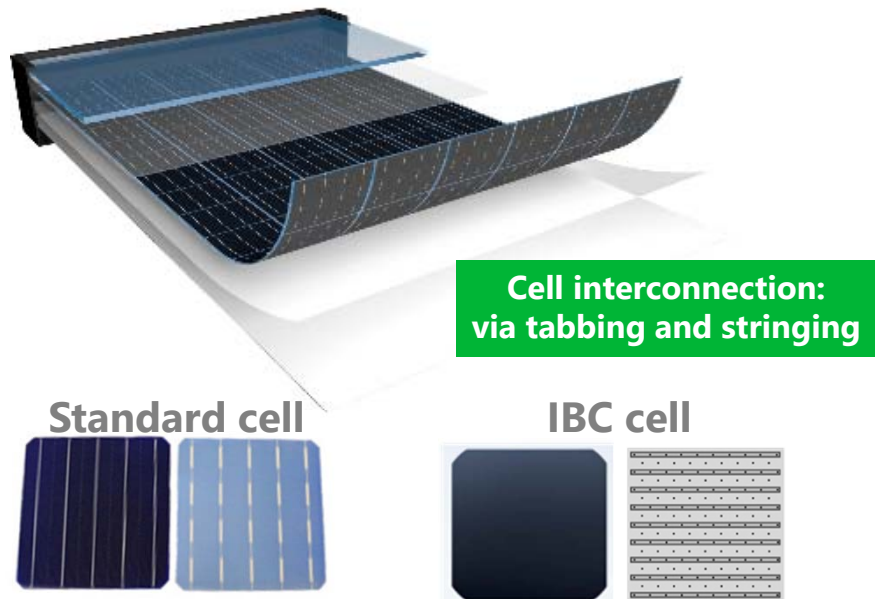
Back-contact solar technology with Endurans CB

It's all about value creation

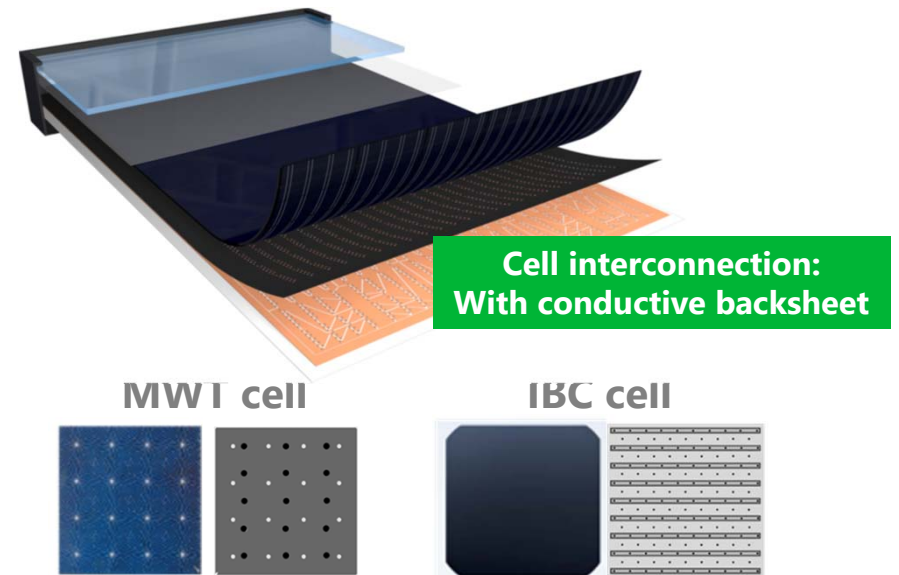
Back-contact module technology

A fast-growing market segment

Conventional module technology



Back-contact module technology



Performance

Superior power density

Superior module performance

Performance calculations using  COMSOL



- A Conductive Backsheet enables:
 - Maximal use of area → integrated bussing, small cell spacing
 - Minimal resistive losses → tapered interconnection
 - Reduced operating temperature → heat spreading

M6, Cell type → Interconnection →	PERC HC 12 BB	MWT Full Cell CBS	IBC Half Cell Ribbons	IBC Half cell CBS	IBC Full cell CBS
# Cells	120 HC	60 FC	120 HC	120 HC	60 FC
Module area (m ²)	1.86	1.76	1.80	1.77	1.76
Module power (Wp)	358	368	374	378	378
Module power density (Wp/m ²)	192	209	207	213	214
Specific yield (kWh/kWp)	1100	1138	1122	1138	1160

Value model presented in more detail at Back-Contacted workshop 2022 in Konstanz
 Presentation available at: www.endurans-solar.com



Superior reliability

With Endurans® CB

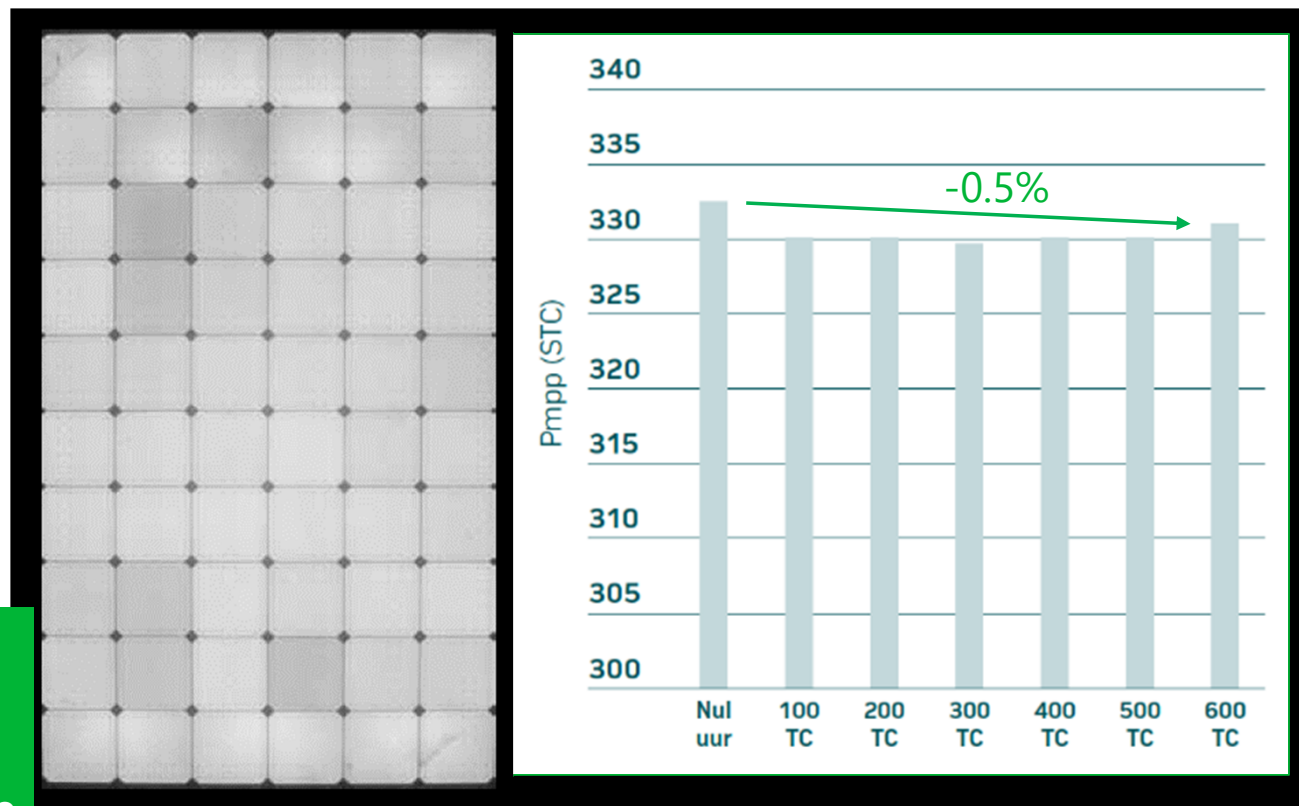
- Less risk of cell damage / microcracks
 - No ribbon stressing the cell edge
 - Highly automated module production
→ cell handled only once
 - Thickness down to 90 µm has been proven

- **Study by Energyra:**

"Impact of microcracks and temperature fluctuation on module performance"

A module with cracks was exposed to thermal cycling (TC600)

- No crack growth observed
- **Less than 0.5% power loss after TC600**



Source: Energyra ENE261236430910_Whitepaper_Thermal_Cycling_and_micro_cracks_A4_NED_01



Aesthetics

Great appearance

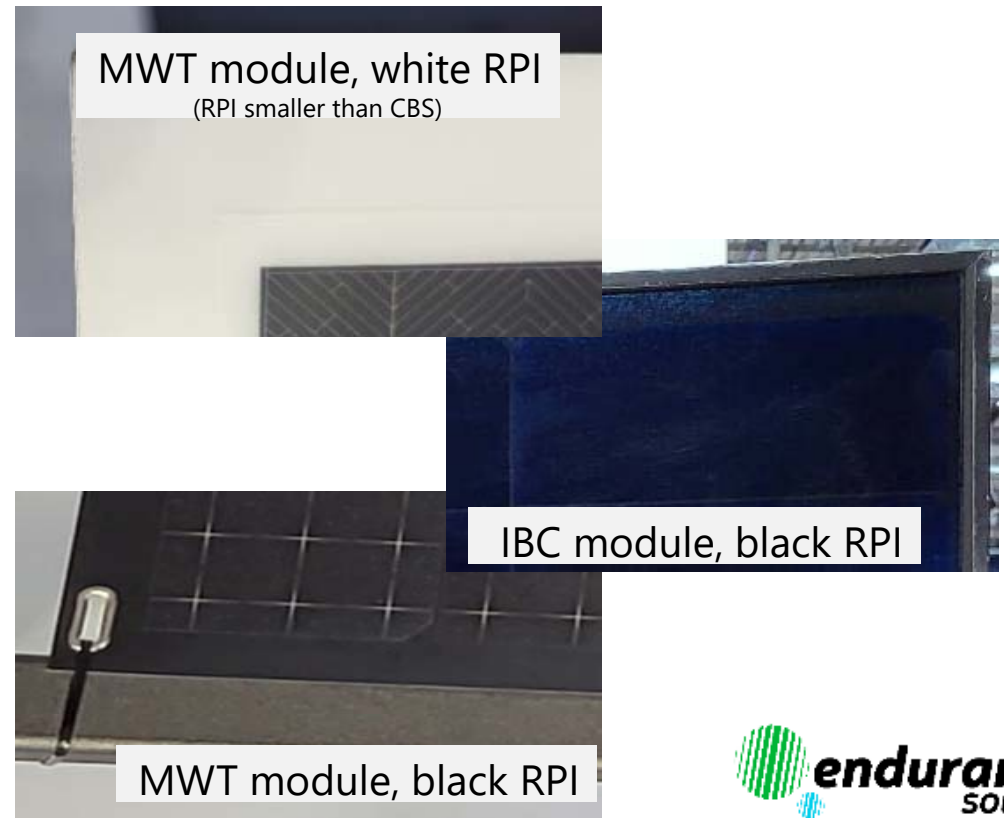
Great appearance – effortless

CBS cell interconnections is “hidden” underneath the RPI (Rear Perforated Insulator)

Stringed interconnections



CBS+RPI interconnections



Flexibility

Optimal design freedom

Flexibility

For non-standard module layout

- **Freedom to optimize string layout**
 - Bussing integrated in CBS design
 - Optimal use of area
 - Irregular shapes
 - Shading tolerance
- **Ideal for flexible modules**
 - Reduced stress on cells (no ribbons)
 - Less prone to microcracks
- **Ideal for (double) curved modules**
 - Thanks to flexibility in both design and shape



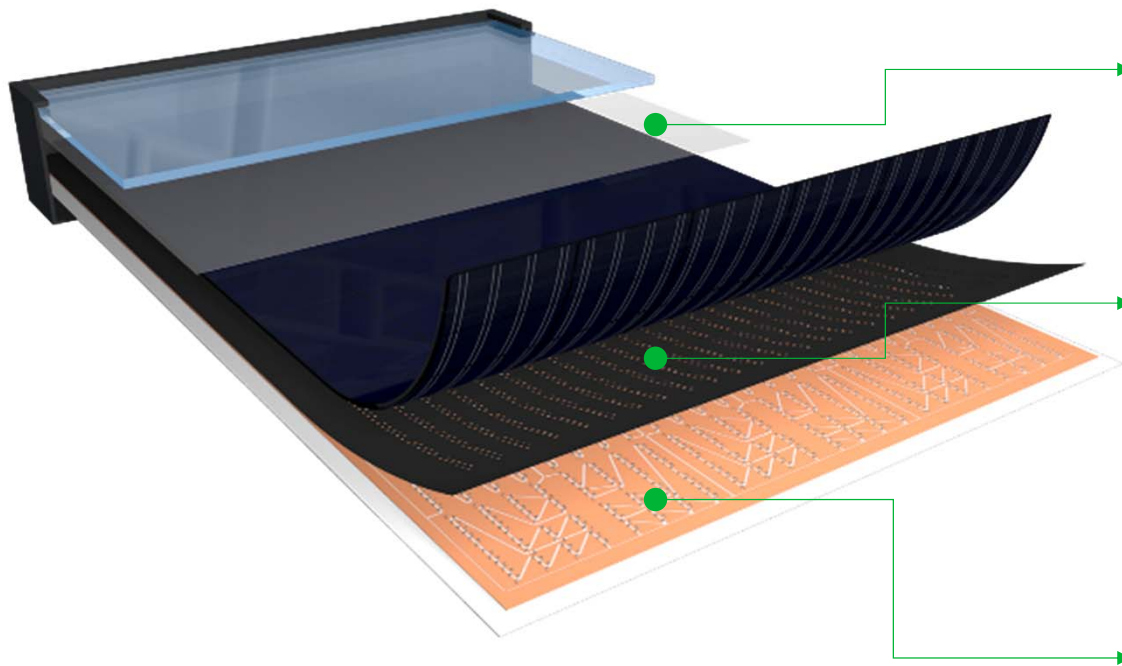
Endurans®' offering to BC industry

From one "trick pony" to multiple high-performance products



Back contact modules with CBS interconnection

Our offering: Conductive Backsheet, Rear Perforated Insulator & Encapsulant



Encapsulant

- Polyolefin-based multilayer
- Co-extruded
- Designed for recycling

Rear perforated insulator

- Internal insulation contacts (+/-)
- Holes for contact points
- Black or white

Conductive backsheet

- Rear side insulation
- Cell interconnection
- Commercial >5yrs



Rear Perforated Insulator (RPI)

Drive for cost reduction, higher performance and sustainability

- Unparalleled adhesion to cells, copper and backsheet
- Unique material concept based on the Endurans® proprietary HPO technology
 - Polyolefin based – fully recyclable
 - Dimensionally stable
 - Excellent flatness
- Unique perforation technology
 - High speed
 - High accuracy
 - No risk of chads or ridges



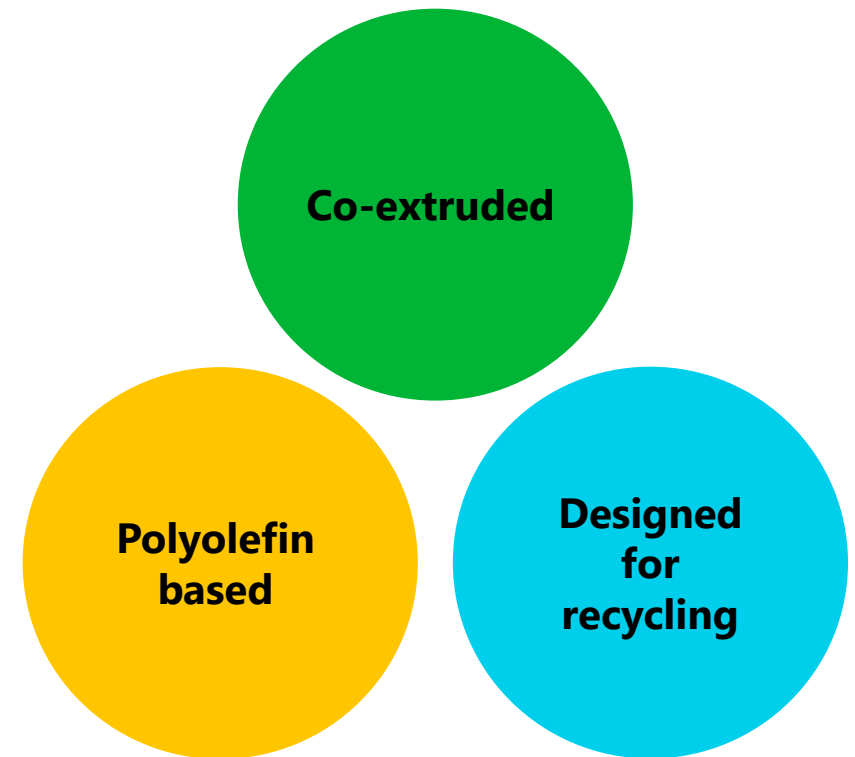
EUPVSEC
2023 in
Lisboa



Endurans® Encapsulant

Our latest development product

- Improved moisture and electrical resistance compared to conventional EVA encapsulants
- Excellent technology and market synergy with our other products
 - Unique polyolefin-based multilayer encapsulant
 - Produced by co-extrusion
 - Designed for recycling
 - Made in Europe
- Customer validation ongoing



Core competences of Endurans®



Endurans®

Your partner for performance & value back-contact modules

- One-stop-shop for eco-friendly PV polymer products
- Products engineered to work seamlessly together
- Global presence with strong base in Europe and US
- Deep-experts & technical support
- Strong eco-system network from development to prototyping to full scale module manufacturing

EUROTRON



“Our collaboration with Endurans is about accelerating the transition to a greener, more sustainable future. We welcome Endurans' innovative material solutions and their expert support in enabling the future landscape of highly-efficient back contact solar products, for vehicles and buildings, from prototyping to production.”

Bonna Newman
Head of Product Solar
Lightyear Layer



Join us. Thank you!

