COVEME **PHOTOVOLTAIC**

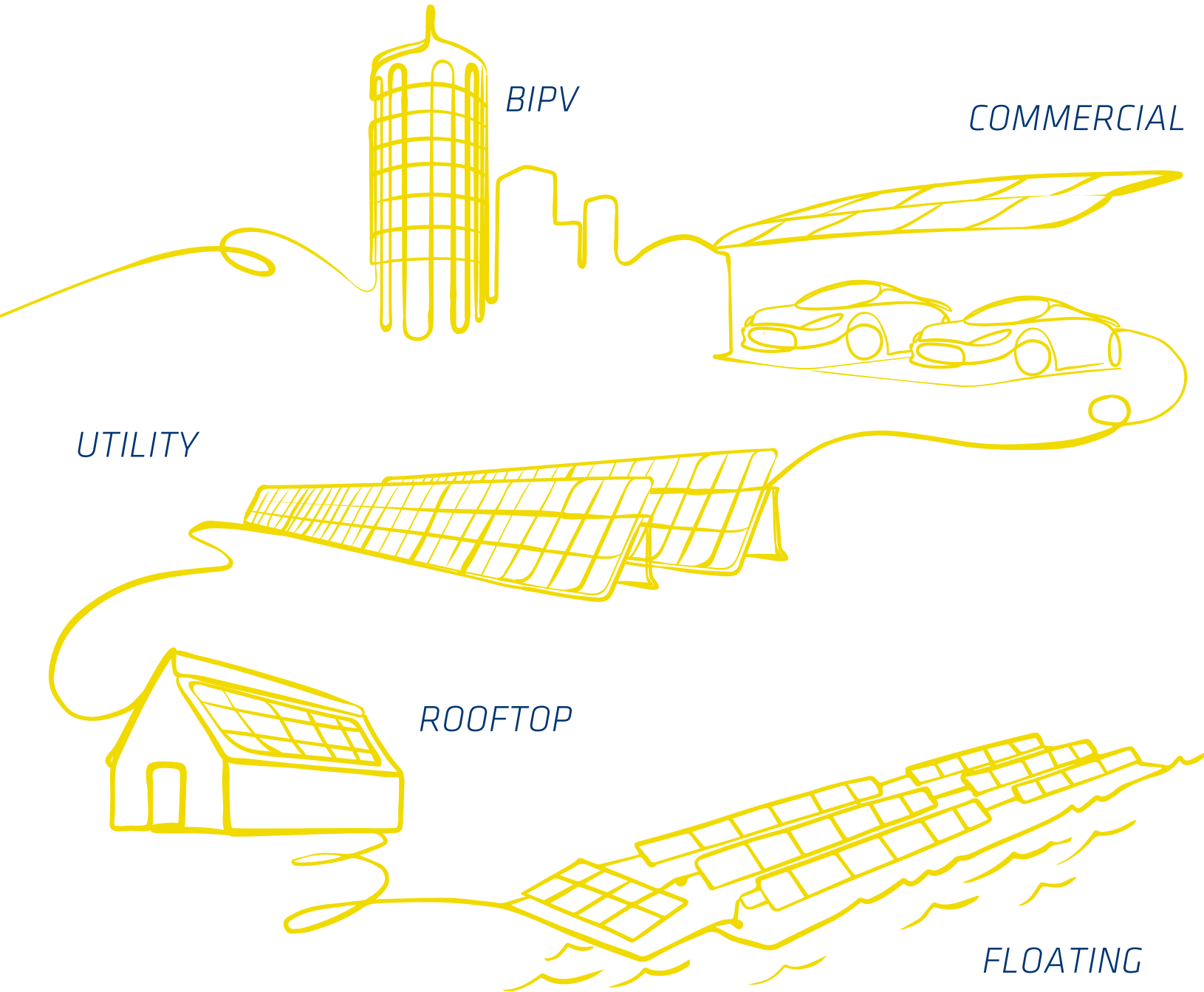
2023

Backsheets and Frontsheets for PV modules

coveme

THE VALUE OF INNOVATION

HIGH QUALITY BACKSHEETS FOR:



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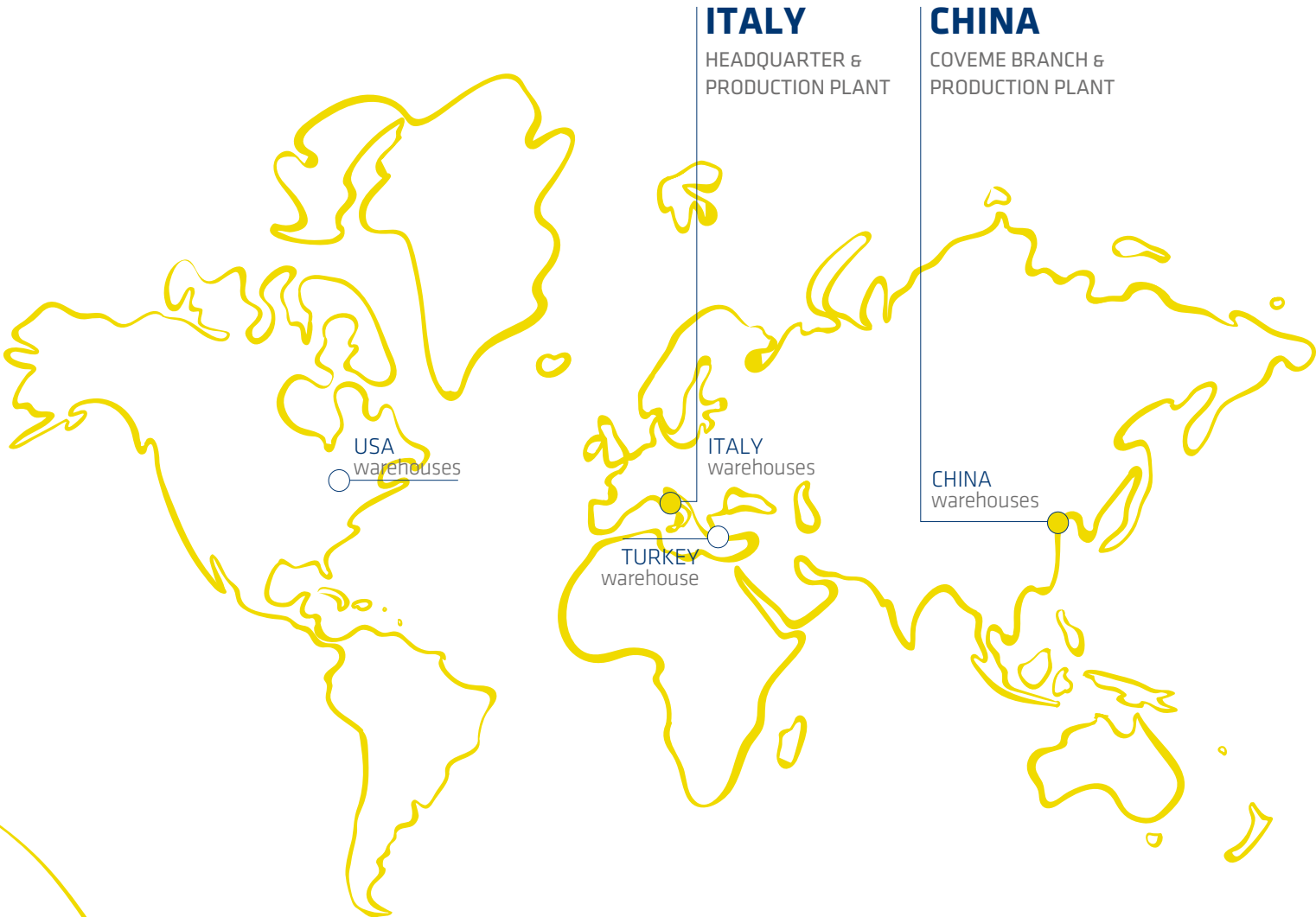
COVEME TODAY



OVER 55 GW OF INSTALLATIONS WORLDWIDE IN 20 YEARS OF ACTIVITY AS BACKSHEET AND FRONTSHEET PRODUCER

OVER 50 YEARS
of know-how in converting polyester film.

15 GW BACKSHEET AND FRONTSHEET PRODUCTION
capacity per year

Worldwide
COMMERCIAL AND LOGISTIC NETWORK

HIGH TECH R&D LABS
in Europe and Asia.

CERTIFIED QUALITY, SAFETY AND ENVIRONMENTAL
standards.

PRODUCTION

Coveme has been converting polyester film for over 20 years and has successfully developed sophisticated technologies in the production of high-tech films for various industries. Clients' specifications are defined individually and monitored throughout the whole production chain, including suppliers, logistics and service process.

- **15 GW LAMINATION AND COATING** proprietary production capacity
- **FULLY AUTOMATED** processes
- **CUSTOMIZED** rolls, sheets and **PUNCHED** formats
- **14** production lines
- **LAMINATION, SURFACE TREATMENT, HEAT STABILIZATION, COATING, SLITTING**

RESEARCH & DEVELOPMENT

Our laboratories have always been one of the most advanced and strong points of the company, where our technological and operative know how is at complete disposal of the clients' needs. Coveme's research in photovoltaics focuses on the reliability of our products that guarantee our customers higher productivity,maximum module power output and the best cost efficiency.

- **3 R&D LABORATORIES** in Europe and Asia
- Highly **SOPHISTICATED EQUIPMENT**
- **CUSTOMIZED RESEARCH PROJECTS** for clients
- Dedicated **INNOVATION TEAM**
- Strong academic and industrial **PARTNERSHIPS**

QUALITY

The choice of a quality backsheet or frontsheet is fundamental for the performance and durability of a PV module. Coveme's dyMat® products are made of specifically developed polymers, adhesives and coatings to guarantee full protection and insulation of the module during its entire lifetime. Coveme's production processes are subject to rigid and well defined quality protocols and are ISO 9001:2015 certified. 20 years of continuous investments in product and process innovation dedicated to the photovoltaic industry make Coveme the most reliable and longstanding supplier of quality materials in the market today.

- **LONG HISTORY OF HIGH QUALITY** backsheets and frontsheets
- Guaranteed **DURABILTY AND PERFORMANCE**
- **SPECIFIC AND EFFICIENT** base materials
- International **CERTIFIED STANDARDS** through **ISO 9001:2015**
- **CONSTANT INVESTMENT** in product and process innovation

SUSTAINABILITY

Coveme is well aware of its responsibility in terms of environment and social wellbeing. This is reflected not only in what we produce but also how we produce, which means a lean and green production technology and strategic partnerships with our customers and suppliers. The company continuously optimizes its emission treatments, waste disposal and energy resources and actively pushes forward sustainability.

- **ENERGY SELF-CONSUMPTION** through installed solar panels
- **PARTIAL SELF-POWERING** production lines
- **RECYCLING AND REUSE** of packaging material
- **REPLACEMENT OF SINGLE-USE** plastic materials
- **TREATMENT AND CLEANING** of harmful fumes and water
- **TAKE BACK SCHEME OF CORES AND END CAPS** with clients
- **DIFFERENTIATION AND RECYCLING** of production scrap and office waste
- **ZERO-MILE CANTEEN** with organic food

OUR GREEN SOLUTIONS

Coveme has made sustainability one of its top priorities not only on a corporate level but also applied to its single Business Units.

For its clients in the photovoltaic industry Coveme's roadmap of green solutions starts from polyester-based back- and frontsheets suitable of the most virtuous disposal and latest recycling technologies, offers module manufacturers - unique on today's market - backsheets made of recycled polyester film, and last but not least sees the company's continous investments and investigations in EOL and LCA studies in order to promote a circular economy model.

1. DYMAT® GREEN PRODUCT

The polyester film inside dyMat® backsheets and frontsheet have more sustainable end-of-life (EOL) possibilities, compared to fluorinated products for which the only viable disposable method is landfill. dyMat® PET based backsheets meanwhile can be disposed of in different ways:

INCINERATION: during the combustion process new energy is generated but there are still risks of toxic substances being release into the environment.

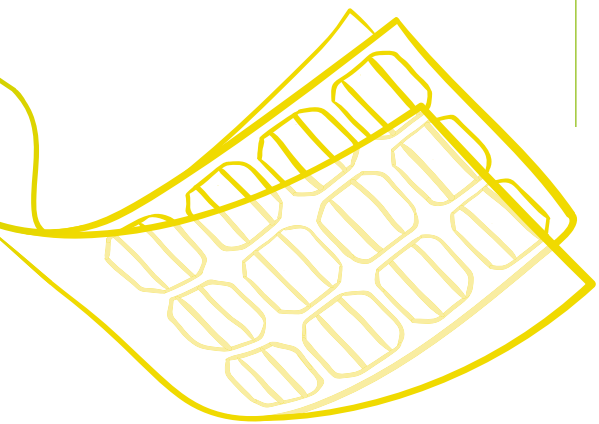
PYROLYSIS: during this more virtuous process new electricity and also new fuel are generated.

MONOMER RECYCLING: at the end of their life cycle the backsheets undergo a recycling process bring the PET back into a monomer state which can then be repolymerized to become recycled polyester (rPET). See chapter 3: dyMat® Circular economy project.

LCA AND CARBON FOOTPRINT STUDY ON DYMAT® PYE BACKSHEET:

Coveme has commissioned a study on the LCA of one of its backsheets which will aim to demonstrate that the amount of CO2 generated during the life cycle of a PET-based backsheet is much lower than that containing a fluorinated material.
If this study were carried out on a backsheet containing rPET, the amount of CO2 generated would clearly be even lower, precisely due to the nature of the origin of the recycled PET.

2. DYMAT® ECO RECYCLED PRODUCT



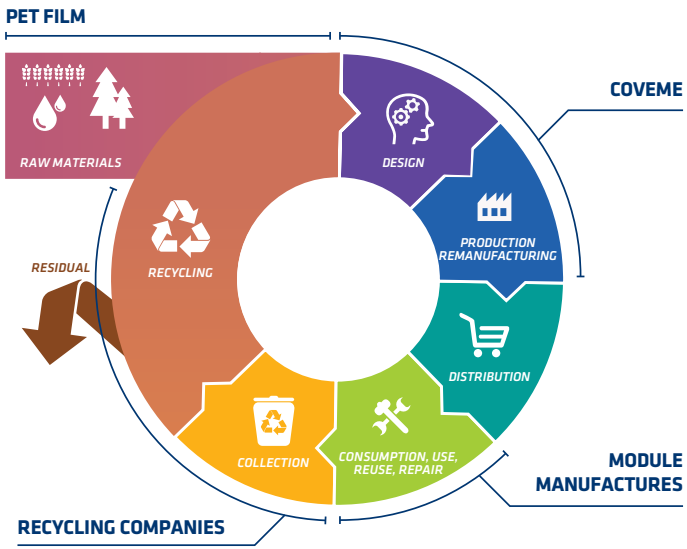
dyMat® ECO is a revolutionary range of backsheets composed of 33% recycled polyester (rPET) . This rPET derives from an innovative upcycling process in which post-consumer plastic waste (plastic bottles, food trays, caps, etc) is processed for the production of rPET.

dyMat® ECO for 1000 or 1500 VDC are the very first backsheets made with rPET availabe on the market today and has the same guaranteed performances as Coveme standard products.

See dyMat ECO >>pagg.18-19

3. DYMAT® CIRCULAR ECONOMY PROJECT

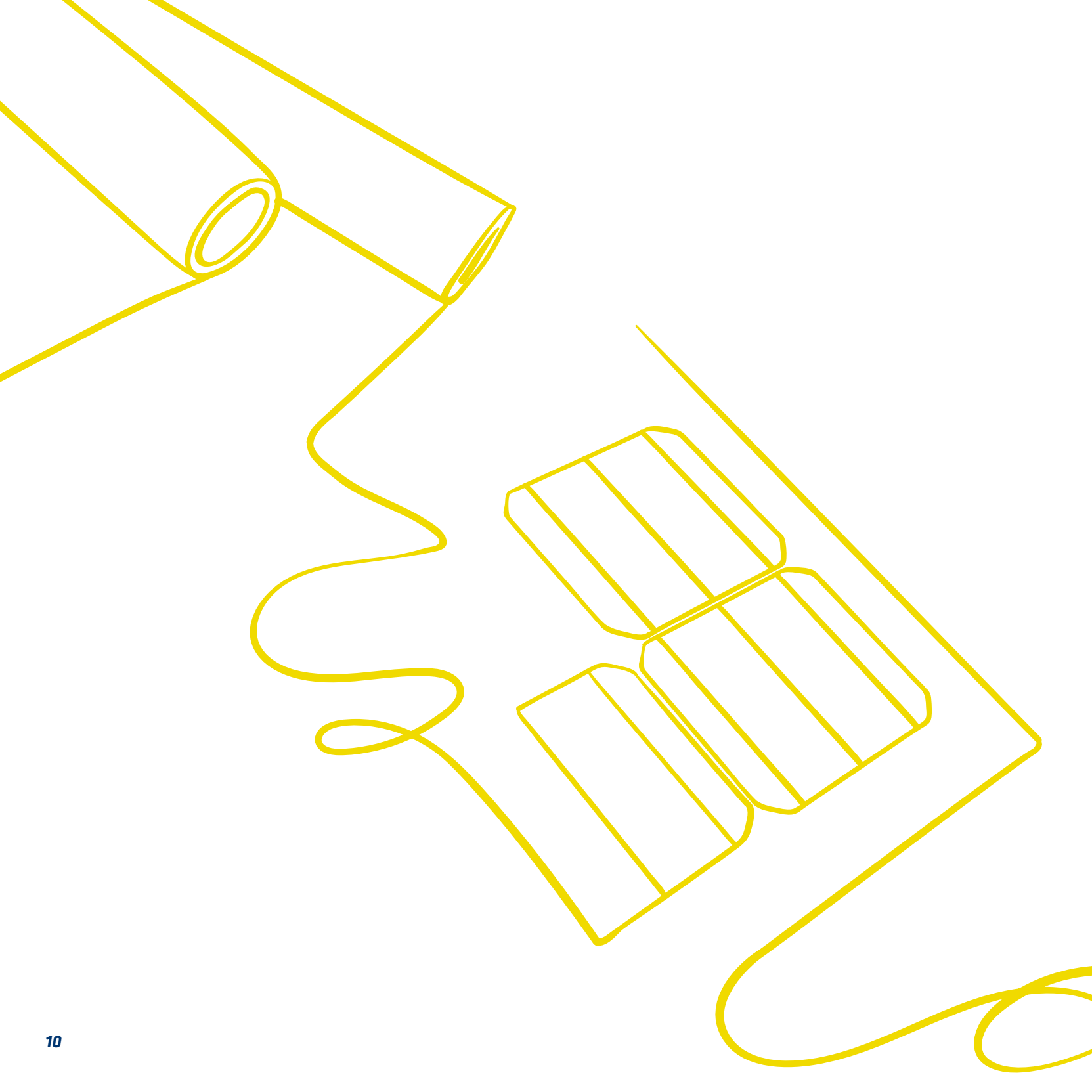
Coveme, in collaboration with important international partners, has studied the feasibility of a circular process for the recovery of the PET based Backsheet at the end of life of the solar module:



PHASES OF THE PILOT PROJECT:

1. The backsheet and the encapsulant were separated through mechanical processes of delamination of the various layers through successive steps of surface abrasion.
2. Through a process of glycolysis the pure BHET was separated and recovered. The BHETconstitutes the starting monomer for the production of PET.
3. The BHET monomer was subsequently repolymerized to become recycled polyester (rPET): this process is called monomer recycling.

This pilot project was successfully carried out and completed, proving that it is possible to implement a circular economy process on the backsheet used inside the photovoltaic module.



COVEME PHOTOVOLTAIC DIVISION

Coveme develops and manufactures multilayer polymer laminates for solar panels which provide electrical insulation and protect solar cells from humidity and other atmospheric agents. This guarantees the duration and correct functioning of the solar module for up to 30 years.

With an internal production capacity of 15GW and a 20 year long experience in supplying the photovoltaic industry, Coveme is today one of the top three suppliers of backsheets and frontsheets for pv modules in the market. The company's dyMat® range of solar panel films offers solutions for all types of pv modules in any installation environment. dyMat® photovoltaic laminates feature a wide choice of polyester and fluorinated materials, mono and multilayer structures and several output enhancing options. The use of recyclable materials as well as the recent introduction of recycled polyester film (rPET) as base materials are the result of specific research projects in collaboration with suppliers and scientific institutes and complete the range from a sustainable point of view.

Today over 55 GW of solar panels installed worldwide are protected by dyMat® pv backsheet and frontsheet and confirm the guaranteed and certified product performance of Coveme's photovoltaic materials.

- **BACKSHEET AND FRONTSHEET SOLUTIONS** for any module type
- **20 YEARS OF EXPERIENCE** in supplying the PV industry
- **15 GW** current internal **PRODUCTION CAPACITY**
- Certified insulation and protection for **UP TO 30 YEARS**
- **55 GW OF SOLAR PANELS INSTALLED** worldwide protected by dyMat®

dyMat® OVERVIEW

BACKSHEETS AND FRONTSHEETS FOR PV MODULE SOLUTIONS

FUNCTION

DYMAT® BACKSHEETS AND FRONTSHEETS ARE EFFICIENT MATERIAL COMBINATIONS FOR HIGHLY PERFORMING MODULES:

- Electrical insulation **UP TO 1500 VDC**
- **HIGH HUMIDITY RESISTANCE**
- **STRONG UV** protection
- **CHEMICAL AND PHYSICAL** durability

ADDED VALUE

DYMAT® IS A VAST RANGE OF DIFFERENT MATERIALS FOR A TOTALLY CUSTOMIZABLE BACKSHEET AND FRONTSHEET:

- **POLYESTER AND FLUORINATED** based versions
- **TRANSPARENT VERSIONS** as alternative for glass
- **MONO AND DOUBLE LAYER** solutions
- **LARGE RANGE OF WIDTHS** for rolls and sheets
- **SPECIAL COATINGS** for extra protection
- **EXTENDED LIFE TIME** up to 30 years available
- **SPECIAL PRIMERS** for higher module performance
- **RECYCLABLE AND RECYCLED** products

QUALITY

DYMAT® PRODUCTS ARE CERTIFIED BY THE WORLD'S MAJOR CERTIFICATION BODIES:

- **TÜV RHEINLAND CERTIFIED**
- **UL REGISTERED**
- **TÜV SÜD CERTIFIED**
- **JET CERTIFIED**

MODULE TECHNOLOGIES

DYMAT® SOLUTIONS SATISFY THE SPECIFIC REQUIREMENTS OF ALL KIND OF MODULE TYPES:

- **STANDARD**
- **SEMI-FLEXIBLE**
- **BIFACIAL**
- **THIN FILM**

APPLICATIONS

DYMAT® BACKSHEETS AND FRONTSHEETS ARE SPECFICALLY DESIGNED FOR DIFFERENT TYPES OF INSTALLATION:

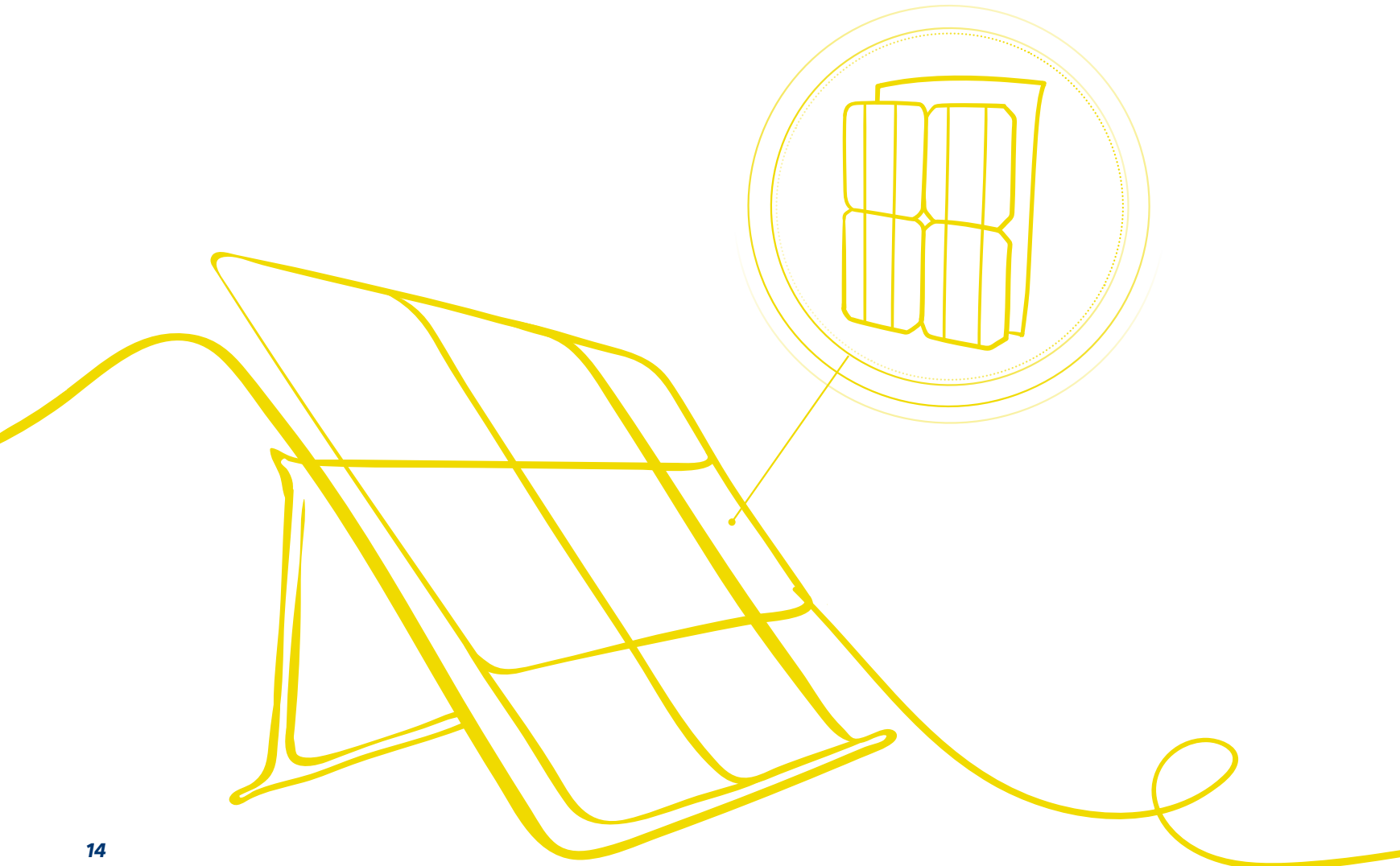
- **UTILITY POWER PLANTS**
- **RESIDENTIAL ROOFTOP**
- **COMMERCIAL AND INDUSTRIAL** buildings
- **FLOATING SYSTEMS**
- **BUILDING INTEGRATED** photovoltaics
- Integrated PV in **AUTOMOTIVE AND NAUTICAL**

SPECIALITIES

COVEME DEVELOPS MATERIALS WITH HIGHLY INNOVATIVE FILMS AND COATINGS FOR LEADING-EDGE APPLICATIONS:

- **HIGH BARRIER** Backsheets
- **BLACK HIGH REFLECTIVITY** Blacksheets
- **FLEXIBLE, PRINTED** and **ORGANIC PV**
- **RETRO-FITTING** PV plants

PRODUCT RANGE



1000/1500 VDC PET BASED BACKSHEET

dyMat® ECO 33% rPET INSIDE

HIGH GRADE PET

CERTIFIED QUALITY

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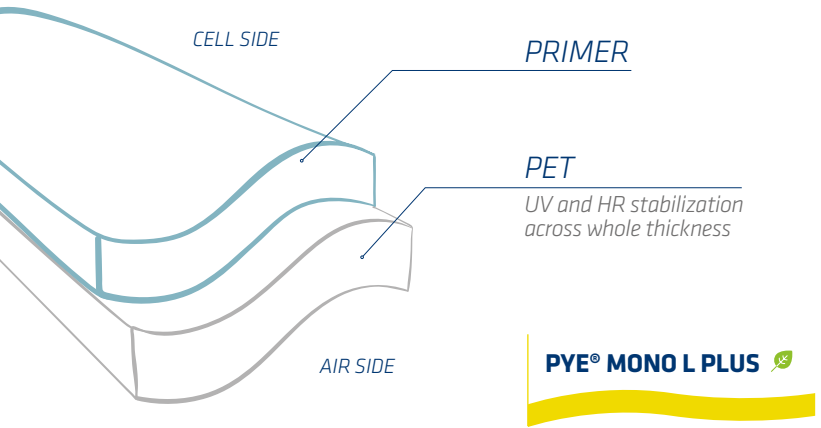
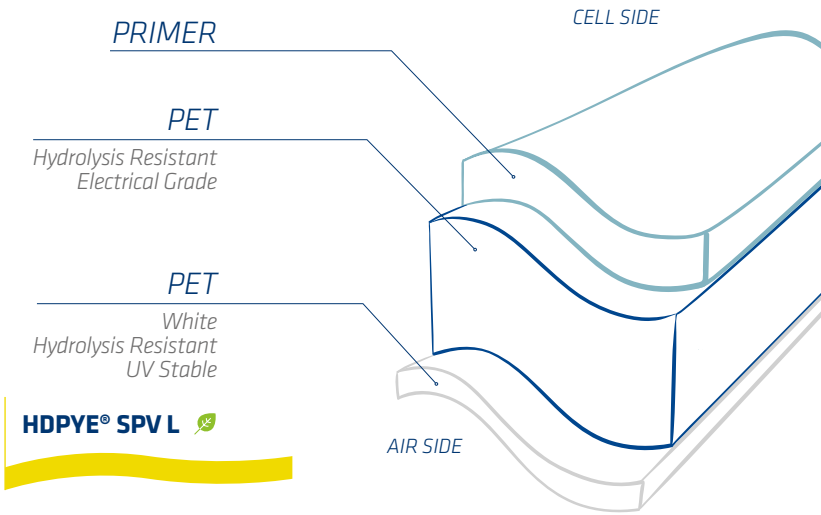
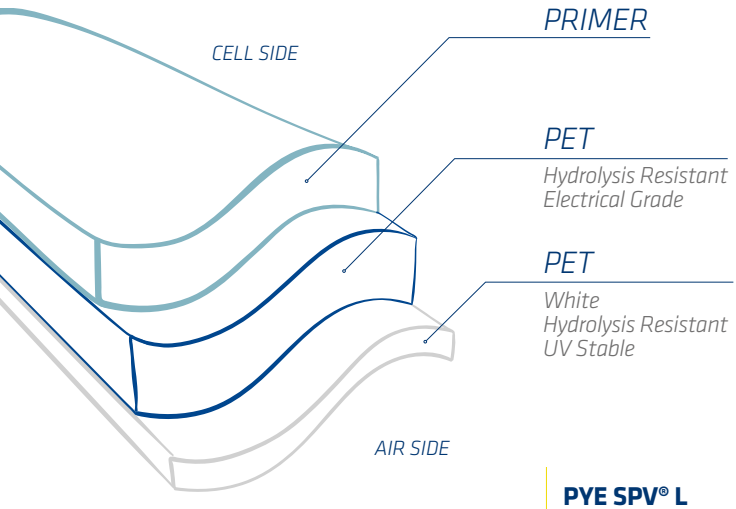


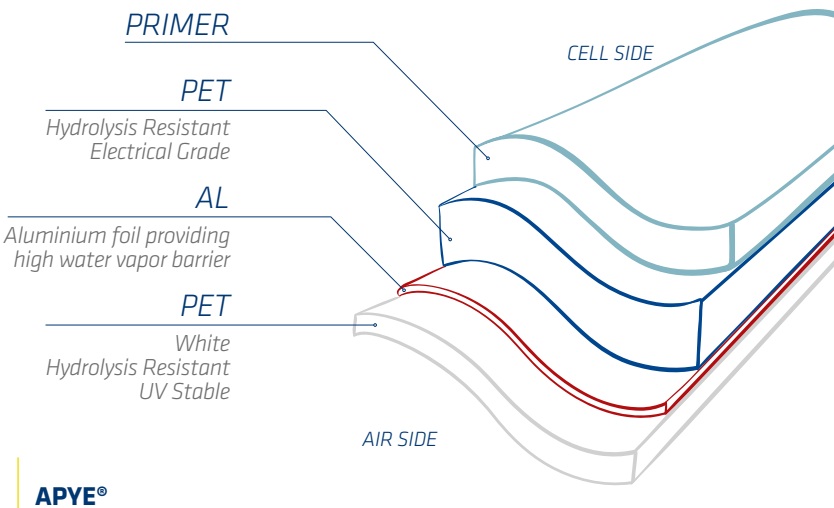
PYE® MONO L PLUS



HDPYE® SPV L



PYE SPV® L



APYE®

BEST SELLING BACKSHEETS

Coveme's most selling backsheets for 1000 or 1500 VDc installations feature a special high-grade PET able to guarantee more than DHT 2500 hrs, PCT(HAST) 72 hrs and more than 400 kWh/m2 of UV irradiation resistance. Additionally, the dyMat® PYE series provides a high adhesion strength to all types of encapsulants, excellent resistance to sand, salt mist, ammonia and chemical solvents corrosion. The mono layer version features superior resistance to UV and hydrolysis thanks to its bulk technology and shows excellent performances in the combined UV+DHT tests together with an intrinsic high reflectivity. Coveme's Aluminum backsheet version, with a special special Al layer inside, guarantees an extra low WVTR and a superior moisture protection for humidity sensitive cells and installations near water. The PYE and HDPYE dyMat® are available in white or black PET, furthermore they are also available with the 33% of recycled PET.

Best Performance Price/Ratio

PYE® MONO L PLUS

Extra Low WVTR

1500 VDC

HDPYE® SPV L

1500 VDC

Standard product

PYE SPV L®

Very Low WVTR

APYE®

Additional upgrades

LO	Extra UV protection on cell side
LD	High humidity barrier
LDO	High humidity barrier + UV protection
SHR	Super high reflectivity
LBk	Black on cell side

Available with 33%rPET

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1000/1500 PET BASED BACKSHEET

dyMat® ECO 33% rPET INSIDE

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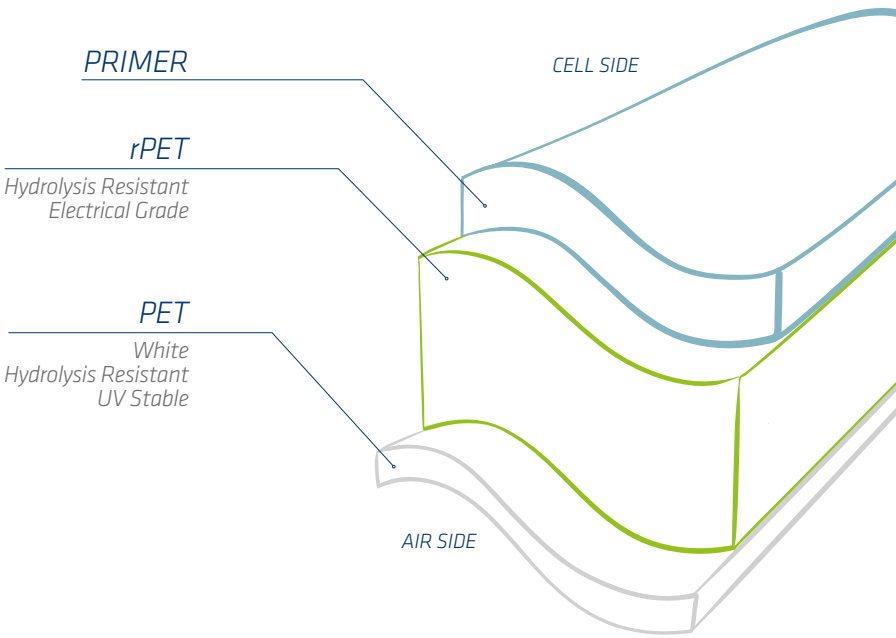
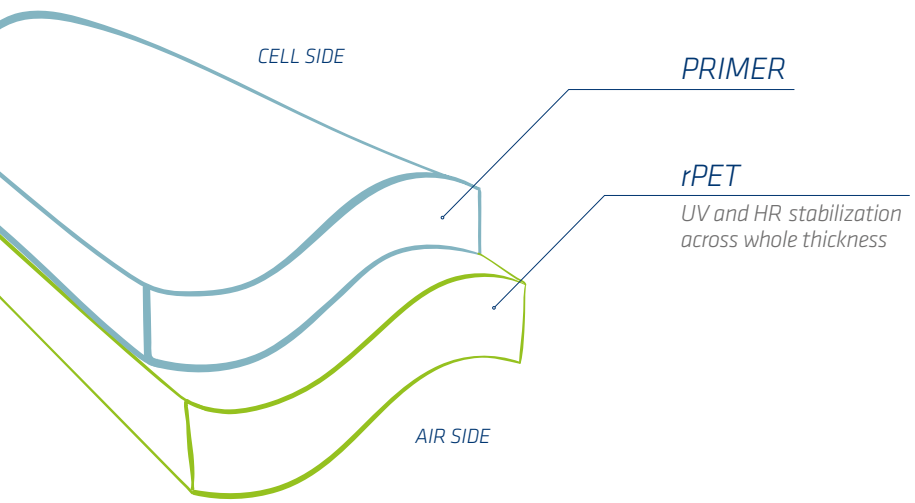
CERTIFIED QUALITY

HIGH GRADE PET



HDPYE® r33 SPVL
HDPYE r33 SPV LDO



PYE® r33 MONO L PLUS

DYMAT ® ECO BACKSHEET WITH rPET

Coveme has developped a revolutionary range of dyMat® ECO backsheets composed of 33% recycled polyester (rPET), coming from post-consumer waste recycling. The range consists of a single-layer rPET backsheet for 1000VDC installations, a double-layer white rPET backsheet for 1500VDC installations and an rPET extra moisture barrier backsheet. DyMat® ECO products are the very first rPET backsheets available on the market today.

Mono layer rPET 33%

PYE® r33 MONO L PLUS

1000 VDC

Double layer rPET 33%

HDPYE® r33 SPVL

1500 VDC

Double layer rPET 33%

High WVTR barrier film

HDPYE® r33 SPV LDO

1500 VDC

Available with 33%rPET

Additional upgrades

- **LO** Extra UV protection on cell side
- **LD** High humidity barrier
- **LDO** High humidity barrier + UV protection
- **SHR** Super high reflectivity

1000 VDC PET BASED BACKSHEETS

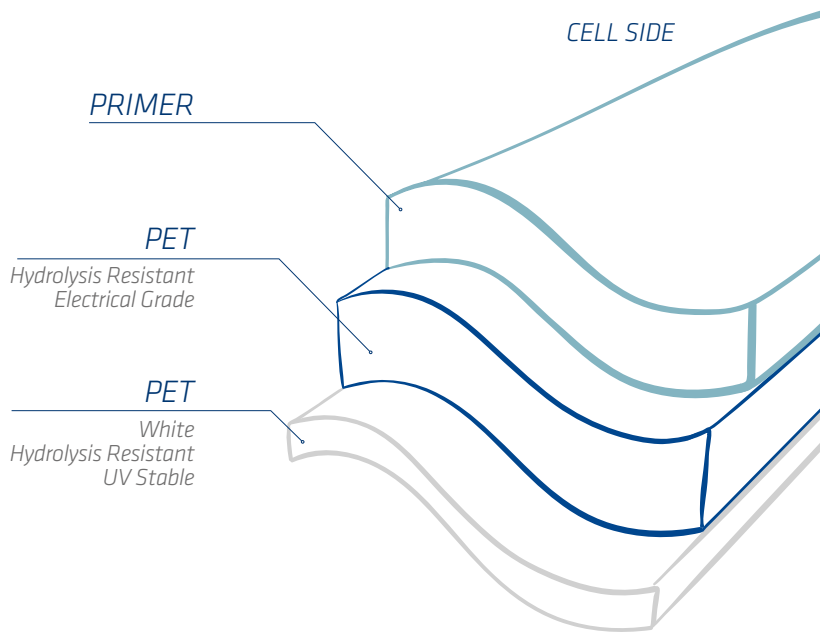
dyMat® ECO 33% rPET INSIDE

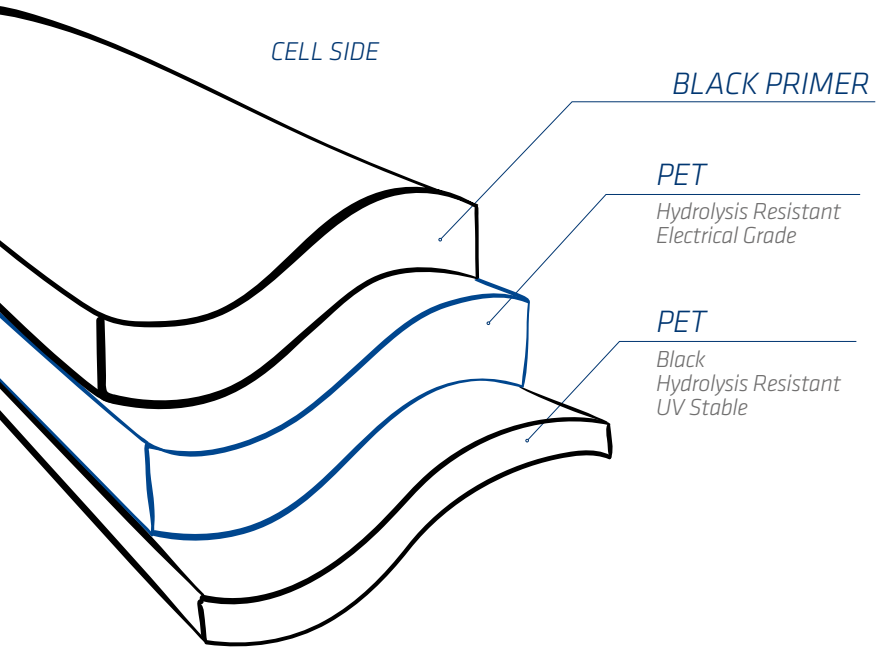
CERTIFIED QUALITY

>>pag.8

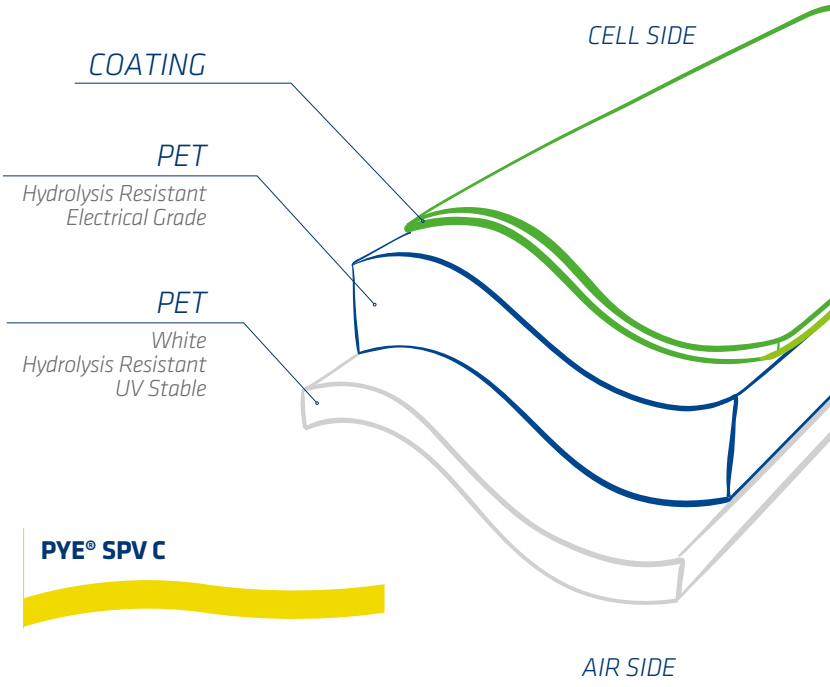
HIGH GRADE PET

PYE SPV® - SPV-L®
PYE 3000® - 3000 L®
PYE SPV® L 305





BK PYE SPV L®



PYE® SPV C

dyMat® DOUBLE LAYER PET

Coveme's standard backsheet has been successfully tested on the market for more than 15 years. It features a special high-grade PET able to guarantee more than DHT 2500 hrs, PCT(HAST) 72 hrs and more than 400 kWh/m2 of UV irradiation resistance. Additionally, the dyMat® PYE series provides a high adhesion strength to all types of encapsulants, excellent resistance to sand, salt mist, ammonia and chemical solvents corrosion.

Standard product

PYE SPV® - SPV L®

Extra Thick > 300µm

PYE SPV® L 305

Totally Black

BK PYE® SPV L

Coating primer side

PYE SPV® C

DHT > 3000h

PYE 3000® - 3000L®

Additional upgrades

LO	Extra UV protection on cell side
LD	High humidity barrier
LDO	High humidity barrier + UV protection
SHR	Super high reflectivity
LBk	Black on cell side
Bkhr	Black high reflectivity (only for PYE SPV C)

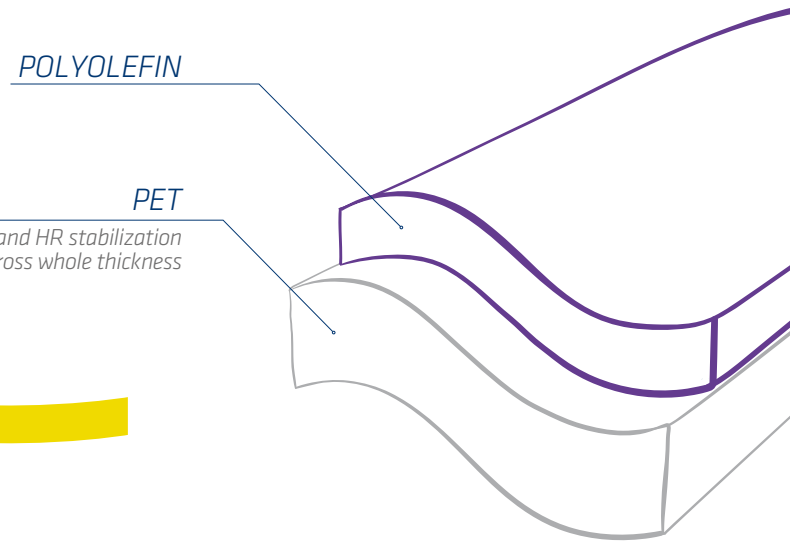
1000 VDC PET BASED BACKSHEETS

dyMat® ECO 33% rPET INSIDE

HIGH GRADE PET

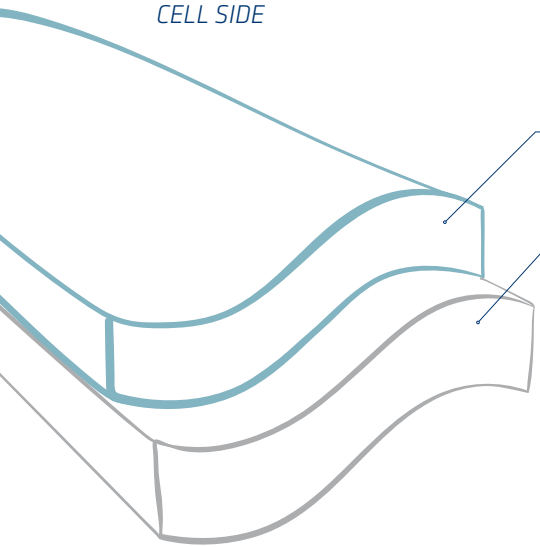
>>pag.8

CERTIFIED QUALITY



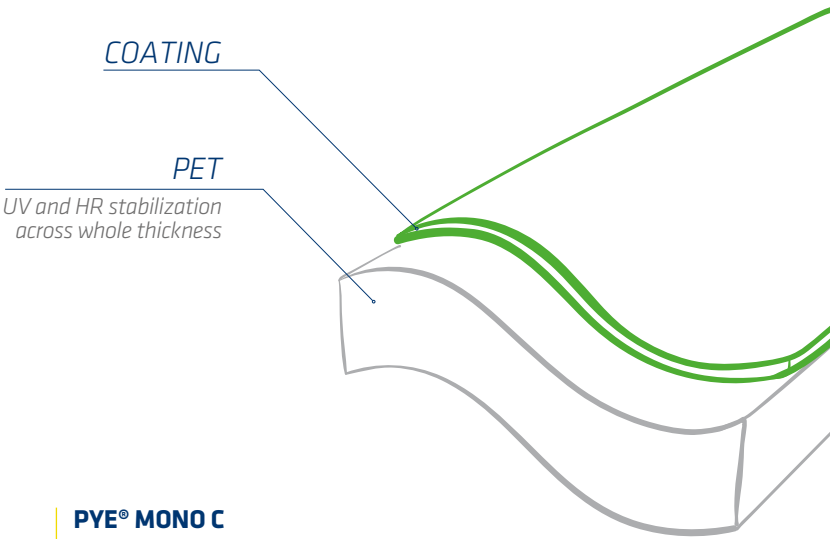
PYE® MONO O PLUS

CELL SIDE



AIR SIDE

PYE® MONO L
PYE® MONO L PLUS



PYE® MONO C

dyMat® MONOLAYER WHITE PET

This new generation of backsheet from Coveme is based on a single PET layer (Mono Layer) that features superior resistance to UV and hydrolysis thanks to its bulk technology. Contrarily to the co-extrusion technology, the bulk technology features the UV protection all across the whole thickness of the single PET layer. Coveme's monolayer backsheet shows excellent performances in the combined UV+DHT tests, and features an intrinsic high reflectivity. The PYE MONO C is available with white , black or black high reflectivity coating, furthermore the PYE MONO L PLUS is also available with the 33% of recycled PET.

High Reflectance

PYE® MONO L

Polyolefin primer side

PYE® MONO O PLUS

Best Performance Price/Ratio

PYE® MONO L PLUS

Coating primer side

PYE® MONO C

Additional upgrades

- **LO** — Extra UV protection on cell side
- **LD** — High humidity barrier
- **LDO** — High humidity barrier + UV protection
- **SHR** — Super high reflectivity
- **LBk** — Black on cell side
- **Bkhr** — Black high reflectivity (only for PYE MONO C)

Available with 33%rPET

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1000 VDC PET BASED BACKSHEETS

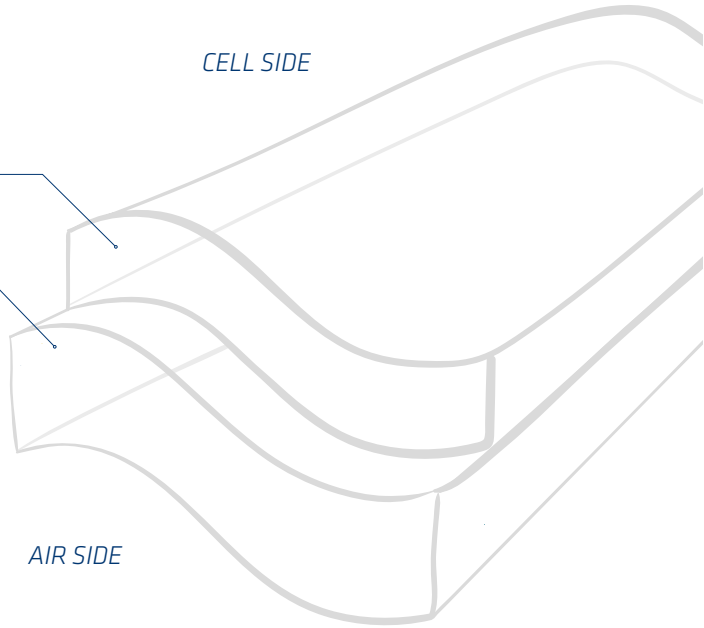
dyMat® ECO 33% rPET INSIDE

HIGH GRADE PET

>>pag.8

CERTIFIED QUALITY

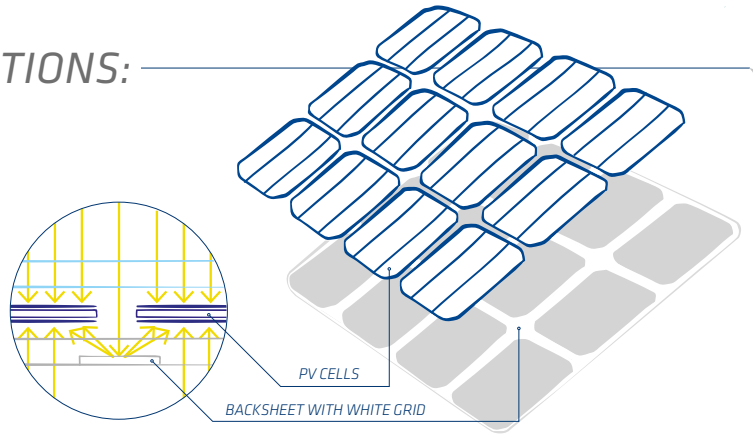
ClrPYE® MONO



OUTPUT INCREASING OPTIONS:

DYMAT® SELECTIVE

Optional white grid incorporated in the backsheet that turns the space in between the cells and the borders into a highly reflective area for significant output improvement. The grid layout is defined according to customer's cell shape and size.

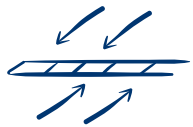


DYMAT® HMIRROR LR >>pag. 50

It is possible to use dyMat®HMirror LR reflective laminates for retro-fitting of PV installations to increase the final output.

dyMat® CLEAR MONOLAYER PET

Totally transparent high grade polyester backsheets for bifacial or standard modules in BIPV, utility, greenhouse, commercial installations, and grid or off grid application. This new generation of clear backsheets with special UV primer allows to replace standard backsheets for high transparency solutions. dyMat® Clear Monolayer for 1000 VDC features superior resistance to UV and hydrolysis thanks to its bulk technology which features UV protection all across the whole thickness.



Bifacial Cells

Totally Transparent

ClrPYE® MONO

Features

- UV stable
- Hydrolysis resistant
- Engineered adhesive
- Higher output
- High mechanical resistance

PRIMER TYPES

LO	Extra UV protection on cell side
LD	High humidity barrier
LDO	High humidity barrier + UV protection

1500 VDC PET BASED BACKSHEETS

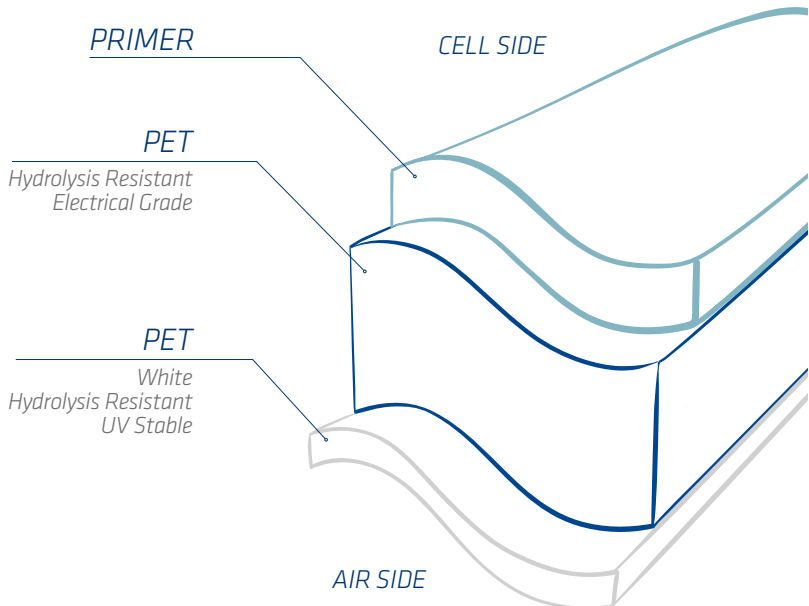
dyMat® ECO 33% rPET INSIDE

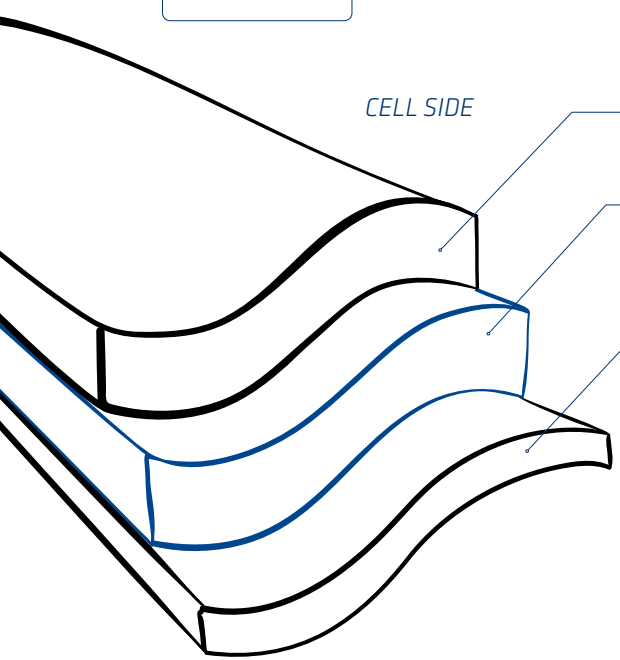
HIGH GRADE PET

>>pag.8

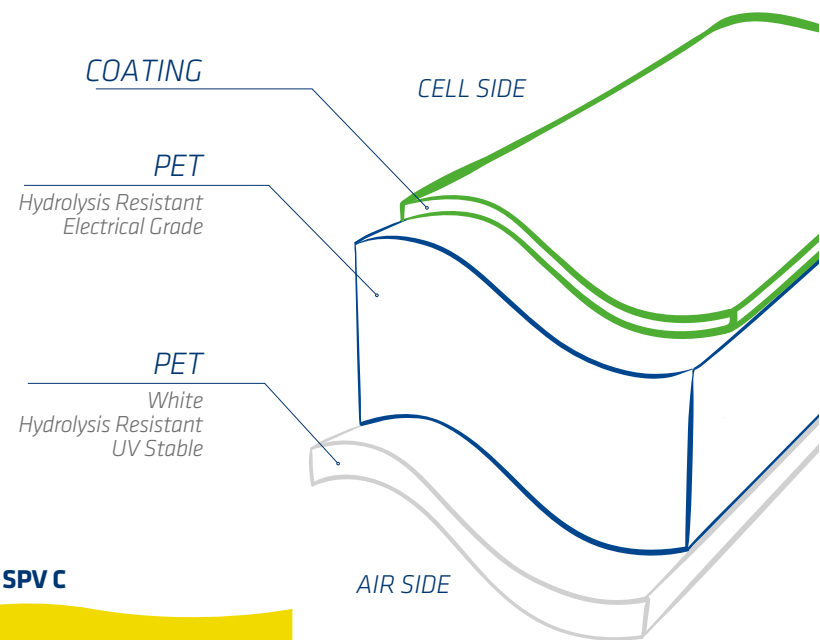
CERTIFIED QUALITY

HDPYE® SPV L





BK HDPYE® SPV L



HDPYE® SPV C

dyMat® DOUBLE LAYER PET

Coveme's PET backsheets for 1500V have a proven track record being employed in the world's first 1500V project and further major ongoing 1500V plants. It features thicker inner PET layers in order to comply with the new IEC rules for 1500V insulation. It guarantees more than DHT 2500 hrs, PCT(HAST) 72 hrs and more than 400 kWh/m2 of UV irradiation resistance. Additionally, the dyMat® HDPYE series provides a high adhesion strength to all types of encapsulants, excellent resistance to sand, salt mist, ammonia and chemical solvents corrosion. The HDPYE SPV C, is available with white , black or black high reflectivity coating, furthermore the HDPYE SPV L is also available with the 33% of recycled PET.

Extra Low WVTR

1500 VDC

HDPYE® SPV L

Extra UV protection

High Reflectance

1500 VDC

HDPYE® SPV C

Totally Black

1500 VDC

BK HDPYE® SPV L

Additional upgrades

- **LO** — Extra UV protection on cell side
- **LD** — High humidity barrier
- **LDO** — High humidity barrier + UV protection
- **SHR** — Super high reflectivity
- **Bk** — Black polyester on air side and black on cell side
- **LBk** — Black on cell side
- **Bkhr** — Black high reflectivity (only for HDPYE SPV C)

Available with 33%rPET

>>pagg.18-19

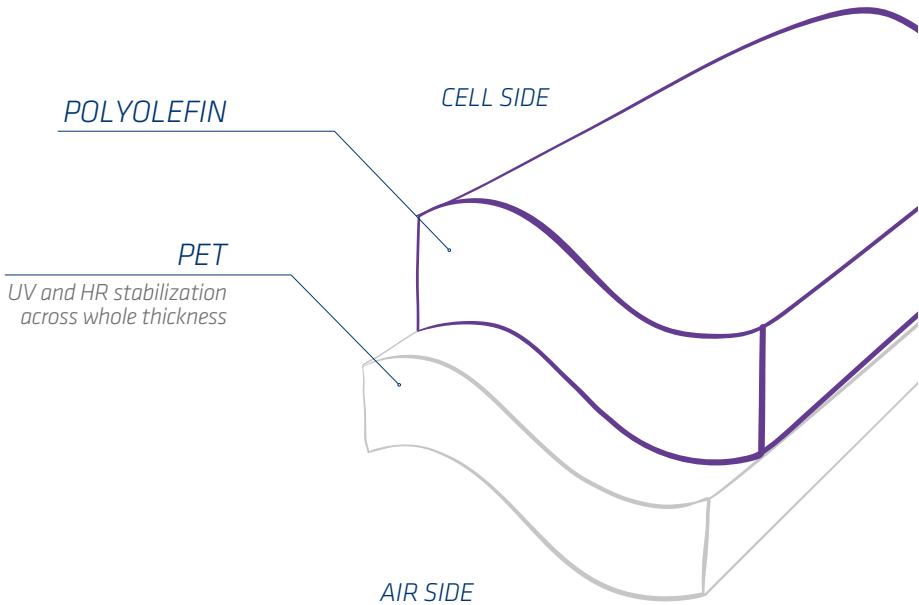
1500 VDC PET BASED BACKSHEET

dyMat® ECO 33% rPET INSIDE

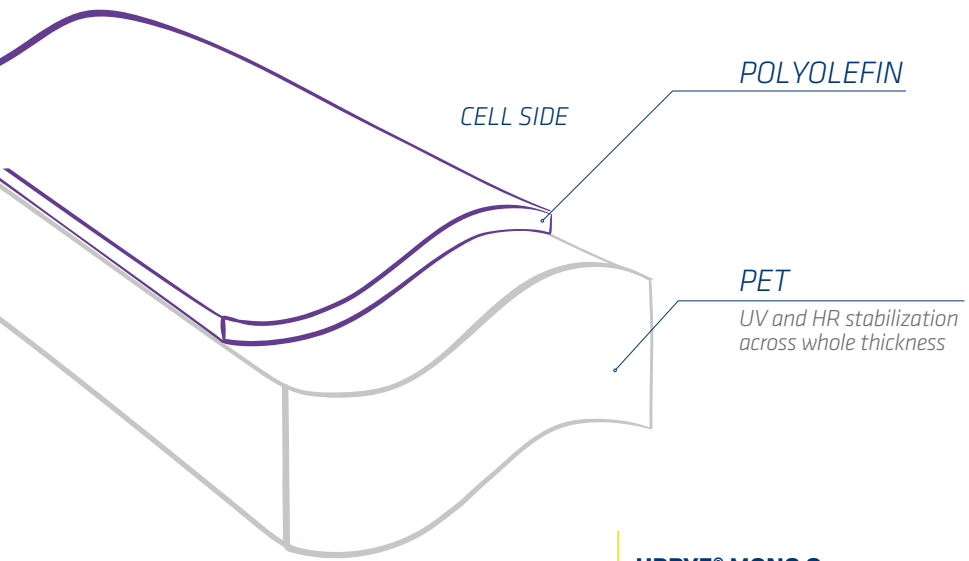
>>pag.8

HIGH GRADE PET

CERTIFIED QUALITY



HDPYE® MONO O PLUS



HDPYE® MONO O

dyMat ® MONOLAYER WHITE PET

This new generation of backsheet is a laminate based on 2 layers, single PET and PO layers. High quality monolayer PET with UV and HR stabilization across whole width with extended life and superior abrasion resistance.
The Primer side is treated with a special PO primer with high DTI and UV resistance to improve performance. The laminate thickness has been designed to provide the best combination of properties in terms of electrical insulation and weatherability.

Polyolefin primer

DTI

High DTI value

HDPYE® MONO O PLUS

Polyolefin primer

DTI

High DTI value

HDPYE® MONO O

Additional upgrades

- **LO** — Extra UV protection on cell side
- **SHR** — Super high reflectivity
- **Bk** — Black polyester on air side and black on cell side

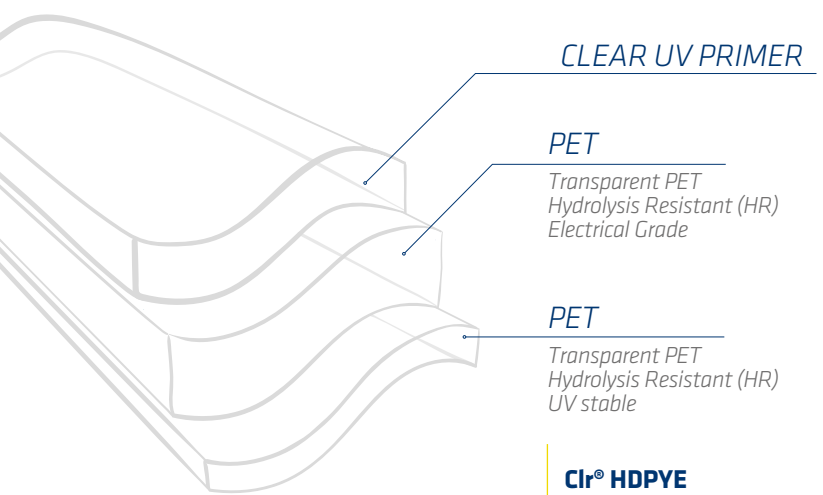
1500 VDC PET BASED BACKSHEET

dyMat® ECO 33% rPET INSIDE

HIGH GRADE PET

CERTIFIED QUALITY

>>pag.8



CLEAR UV PRIMER

PET
Transparent PET
Hydrolysis Resistant (HR)
Electrical Grade

PET
Transparent PET
Hydrolysis Resistant (HR)
UV stable

Clr® HDPYE

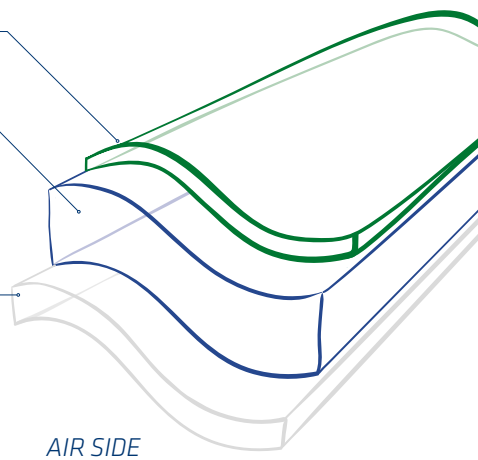
CELL SIDE

COATING

PET
Transparent PET
Hydrolysis Resistant (HR)
Electrical Grade

PET
Transparent PET
Hydrolysis Resistant (HR)
UV stable

Clr® HDPYE F

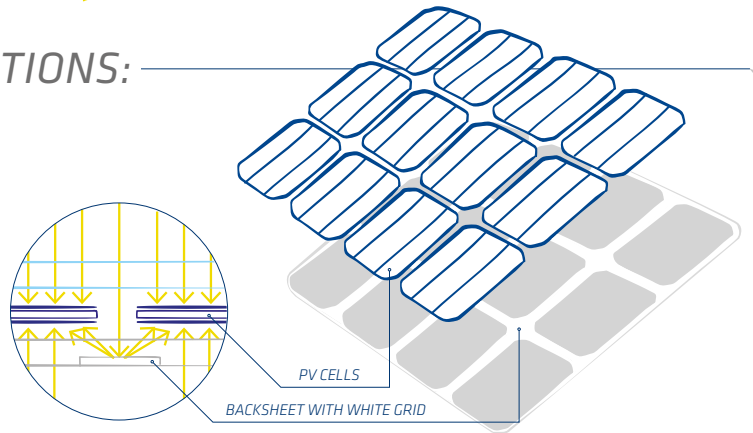


AIR SIDE

OUTPUT INCREASING OPTIONS:

DYMAT® SELECTIVE

Optional white grid incorporated in the backsheet that turns the space in between the cells and the borders into a highly reflective area for significant output improvement. The grid layout is defined according to customer's cell shape and size.

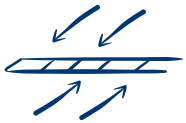


DYMAT® HMIRROR LR >>pag. 50

It is possible to use dyMat®HMirror LR reflective laminates for retro-fitting of PV installations to increase the final output.

dyMat® CLEAR DOUBLE LAYER PET

Totally transparent high grade polyester based backsheets for bifacial or standard modules in BIPV, utility, greenhouse, commercial installations, and grid or off grid application. This new generation of clear backsheets with special UV primer allows to replace standard backsheets for high transparency solutions. dyMat ® Clear Double Layer for 1500 VDC features a thicker inner PET layers in order to comply with the new IEC rules for 1500V insulation and has a proven track record being employed in the world's first bifacial 1500V installation.



Bifacial Cells

Totally Transparent

1500 VDC

Clr® HDPYE

1500 VDC

Coating cell side

Clr® HDPYE F

Features

- UV stable
- Hydrolysis resistant
- Engineered adhesive
- Higher output
- High mechanical resistance

PRIMER TYPES

LO	Extra UV protection on cell side
LD	High humidity barrier
LDO	High humidity barrier + UV protection

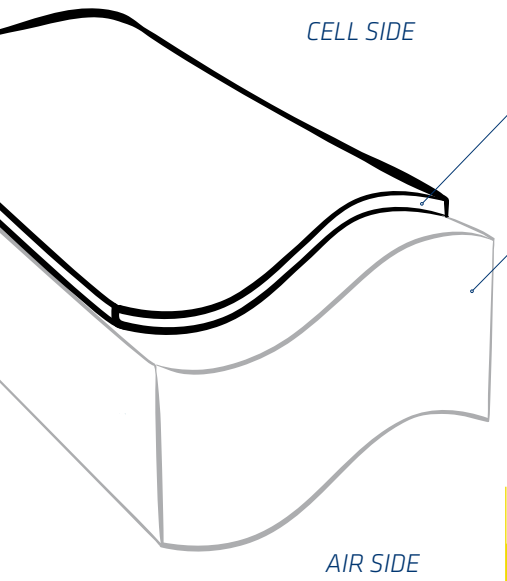
1000/1500 PET BASED BACKSHEET

dyMat® ECO 33% rPET INSIDE

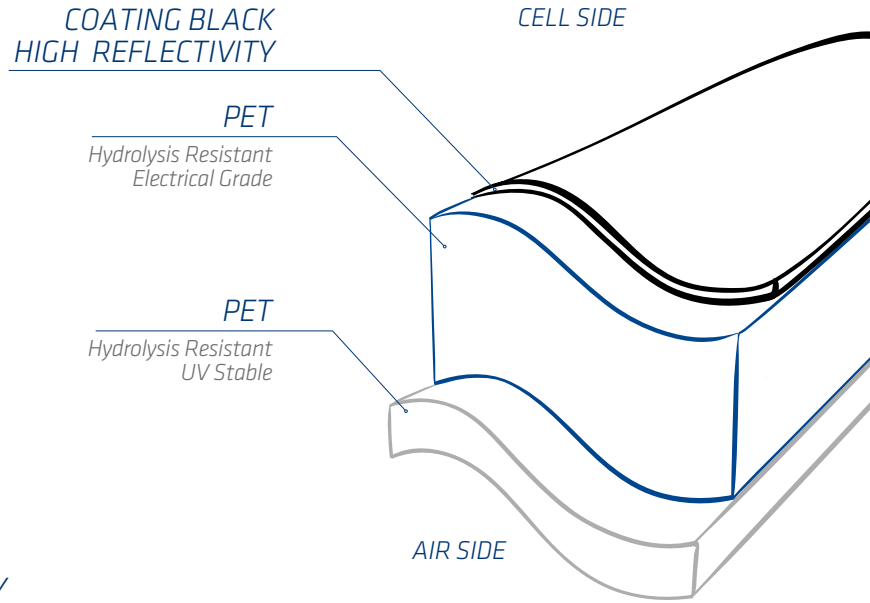
HIGH GRADE PET

>>pag.8

CERTIFIED QUALITY



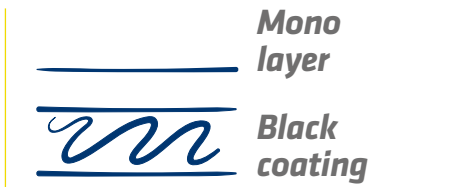
PYE® MONO CBK HR



HDPYE® SPV CBK HR

dyMat® BLACK HIGH REFLECTIVITY

dyMat® PYE MONO CBK HR is a mono-layer PET based laminate with an high reflectivity black coating for 1000 VDC installations, whereas HDPYE SPV CBK HR is a two layer PET based laminate with an high reflectivity black coating for 1500 VDC installations. The high reflectivity feature was studied and developed by Coveme in order to balance the intrinsic light absorption of black colour. This is obtained through an innovative black coating on the backsheet's cell side providing a reflectance of >55%. Together with a high bonding capacity to encapsulate, excellent protection from atmospheric agents and a long term resistance to hydrolysis dyMat ® Black High Reflectivity is a highly performing and aesthetically appealing solution for pv module producers and end customers alike. The BkHR coating can be applied also to other dyMat® backsheet compositions.



PYE® MONO CBK HR

HDPYE® SPV CBK HR

Additional upgrades

- **LO** — Extra UV protection on cell side
- **LD** — High humidity barrier
- **LDO** — High humidity barrier + UV protection
- **DB** — Double side black availability

1000/1500 PET BASED BACKSHEET

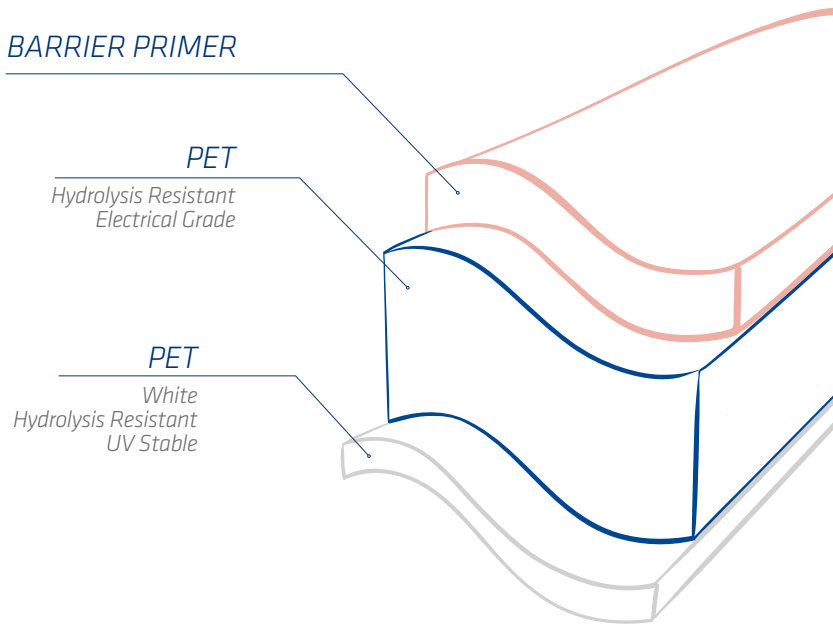
dyMat® ECO 33% rPET INSIDE

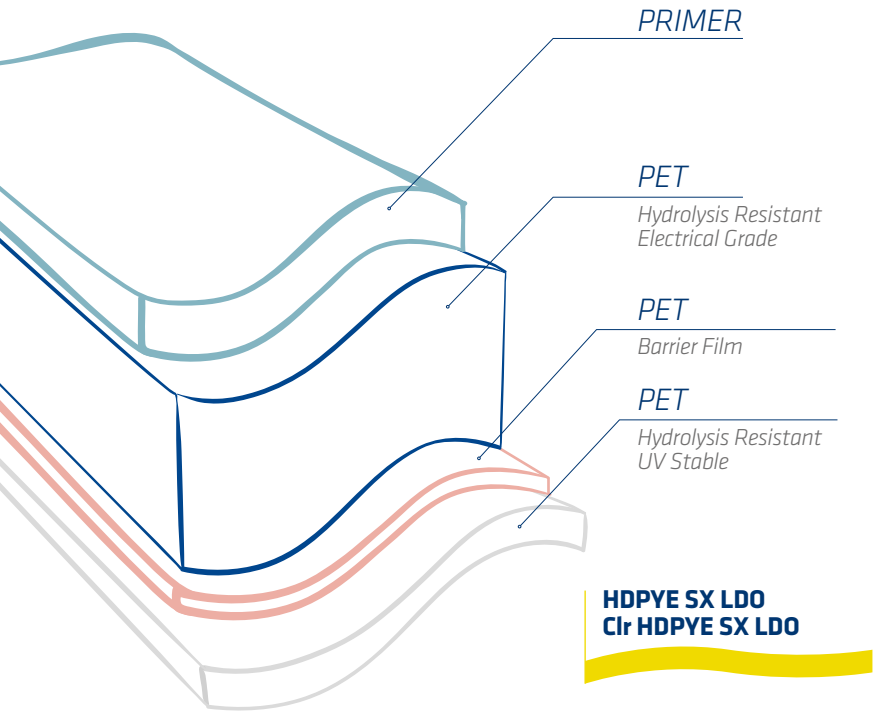
HIGH GRADE PET

>>pag.8

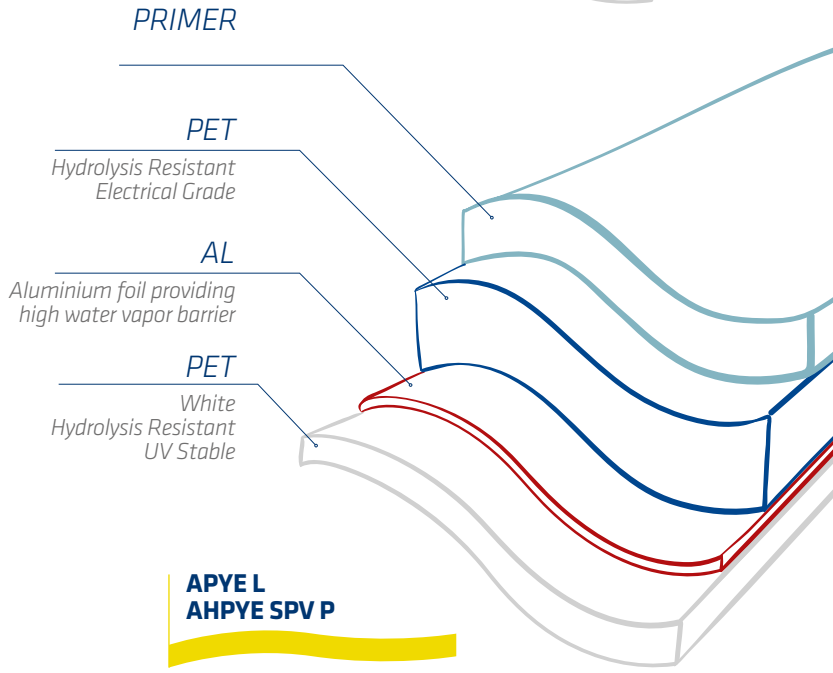
CERTIFIED QUALITY

Clr HDPYE LDO
HDPYE SPV LDO





HDPYE SX LDO
Clr HDPYE SX LDO



APYE L
AHPYE SPV P

dyMat® HIGH BARRIER BACKSHEET

Coverme has developed a range of revolutionary backsheets specifically designed for photovoltaic modules that requires a high moisture barrier for different technologies .The range includes both backsheets with an aluminum layer, and backsheets with a barrier film, without the aluminum layer. The aluminum-based dyMat® backsheet has an extremely low WVTR value and it is the right solution for thin film (CIGS, a-SI and Perovskite), flexible and even c-SI photovoltaic modules installed near water. DyMat® barrier film backsheets are manufactured with an innovative integrated barrier layer which results in a low WVTR value. These laminates have been specifically designed to be used in pv modules with heterojunction cells and floating systems with all types of cells. Furthermore, these laminates, not having an aluminum layer, facilitate the production process of assembling the module. The dyMat ®HDPYE SPV LDO is available with 33% rPET inside. They are available in white, black or transparent versions (only barrier film without Aluminium)

Barrier Primer

UV Protection

HDPYE® SPV LDO

Clr® HDPYE LDO

1500 VDC

Alu Layer

Extra Low WVTR

APYE L

AHDPYE SPV P

1000/ 1500 VDC

Barrier Film

HDPYE® SX LDO

Clr® HDPYE SX LDO

1500 VDC

Additional upgrades

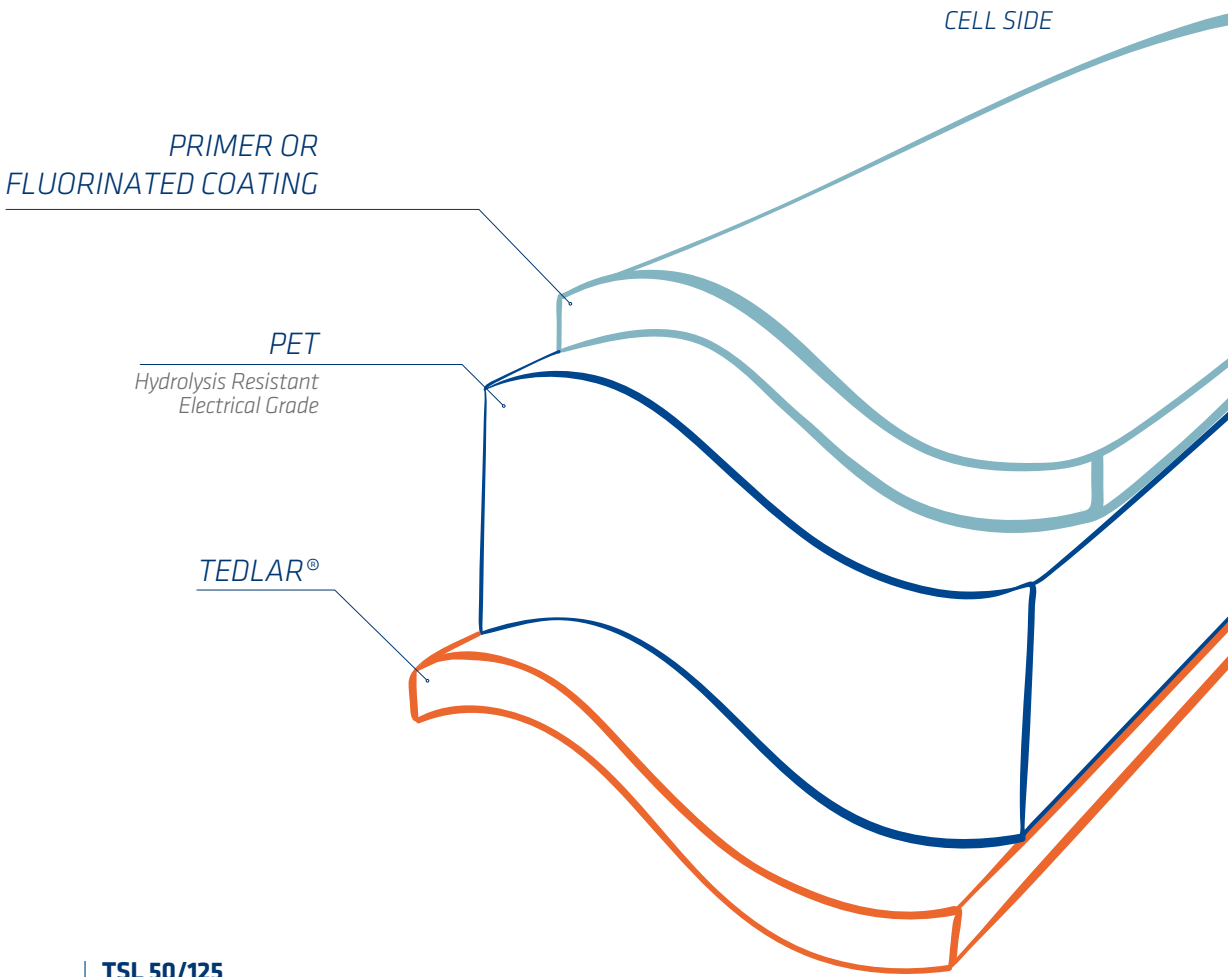
- *LO* — Extra UV protection on cell side
- *SHR* — Super high reflectivity
- *Bk* — Black polyester on air side and black on cell side
- *LBk* — Black on cell side
- *Bkhr* — Black high reflectivity

Available with 33%rPET

>>pagg.18-19

1000 VDC TEDLAR BASED BACKSHEETS

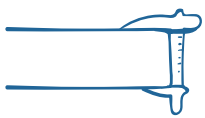
CERTIFIED QUALITY



TSL 50/125
TsL 50/250
TsL 75/150
TsL 100/190

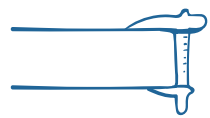
dyMat® WHITE TEDLAR® BASED

Coveme's Tedlar® based backsheet for 1000 VDC features a PVF layer of 25µm thickness combined with several options of inner PET thickness ranging from 150µm up to 250µm. As for the excellent Tedlar® weatherability properties, Coveme dyMat® TsL series exhibits outstanding resistance to UV irradiation.
Fluorinated coating on cell side available.



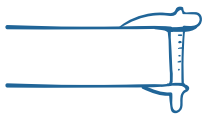
Primer 50µm or fluorinated coating / PET 125µm

TsL 50/125



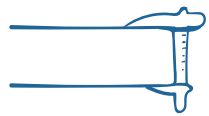
Primer 50µm or fluorinated coating / PET 250µm

TsL 50/250



Primer 75µm or fluorinated coating / PET 150µm

TsL 75/150



Primer 100µm or fluorinated coating / PET 190µm

TsL 100/190

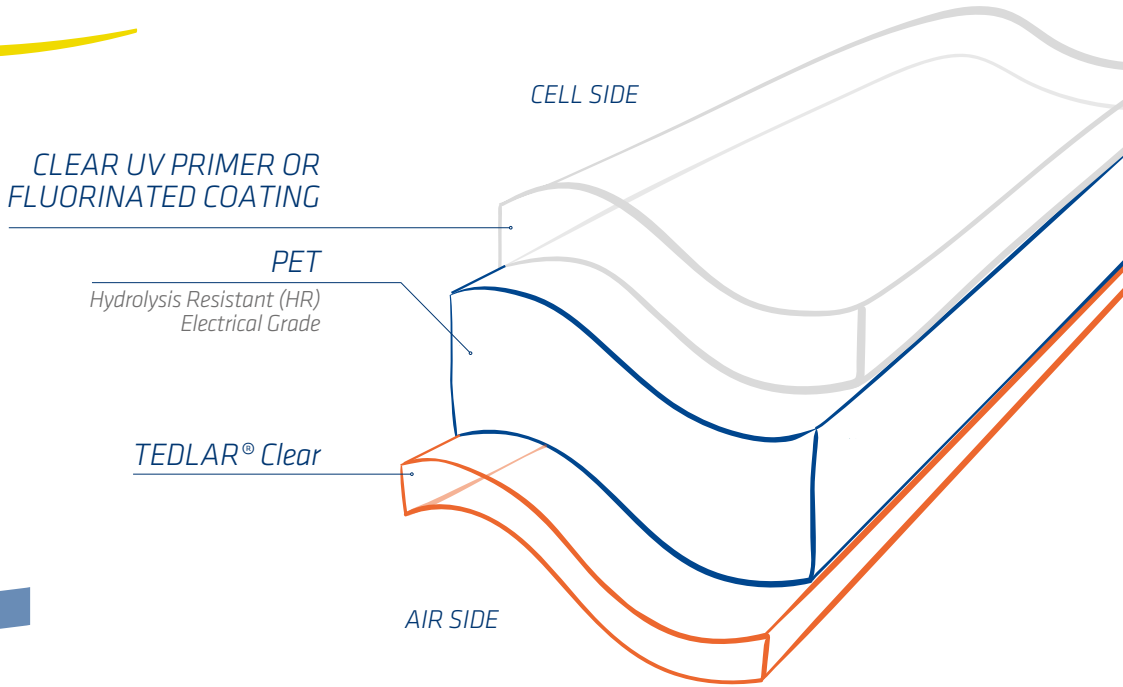
Additional upgrades

- **LO** — Extra UV protection on cell side
- **LD** — High humidity barrier
- **LDO** — High humidity barrier + UV protection
- **SHR** — Super high reflectivity
- **LBk** — Black on cell side
- **Bkhr** — Black high reflectivity

1000 VDC TEDLAR BASED BACKSHEETS

CERTIFIED QUALITY

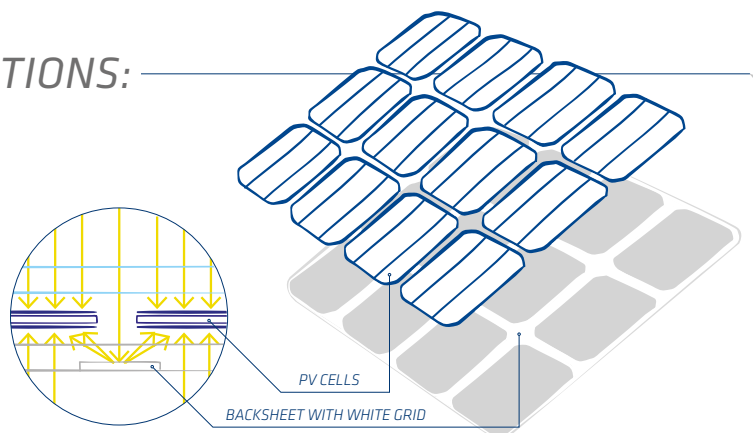
Clr TsL 50/158



OUTPUT INCREASING OPTIONS:

DYMAT® SELECTIVE

Optional white grid incorporated in the backsheet that turns the space in between the cells and the borders into a highly reflective area for significant output improvement. The grid layout is defined according to customer's cell shape and size.

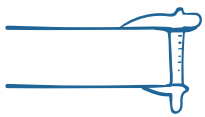


DYMAT® HMIRROR LR >>pag. 50

It is possible to use dyMat®HMirror LR reflective laminates for retro-fitting of PV installations to increase the final output.

dyMat® CLEAR TEDLAR® BASED

Totally transparent Tedlar® based backsheets for bifacial or standard modules in BIPV, utility, greenhouse, commercial installations, and grid or off grid application. This new generation of clear backsheets with special UV primer allows to replace standard backsheets for high transparency solutions. The primer and adhesives specifically developed for these products provide an extra high resistance to UV and humidity. Fluorinated coating on cell side available.



Primer 50µm or fluorinated coating / PET 158µm

Clr TsL 50/158

Features

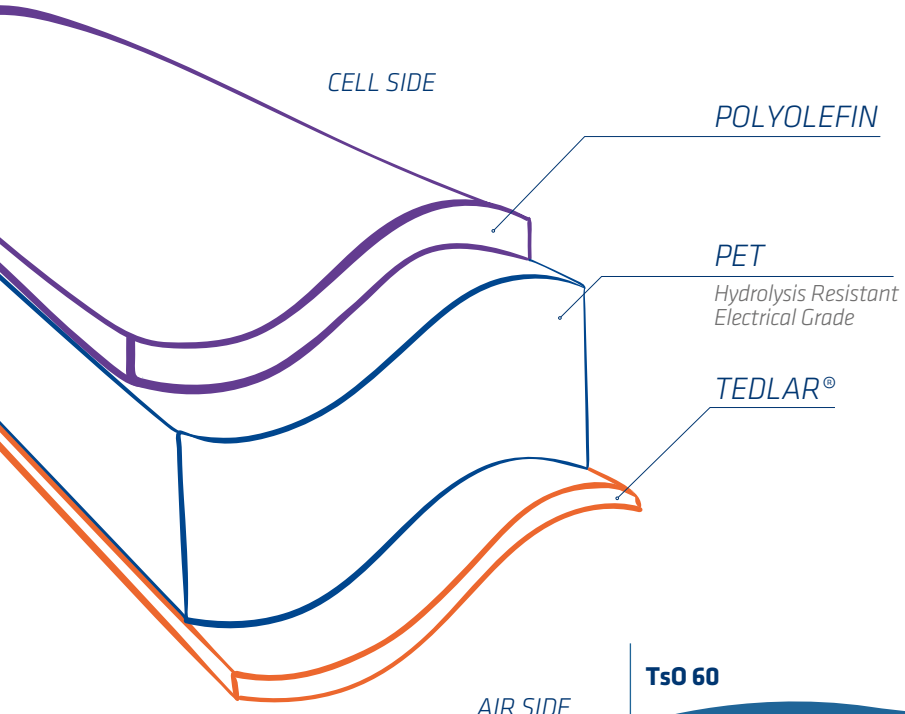
- UV stable
- Hydrolysis resistant
- Engineered adhesive
- Higher output
- High mechanical resistance

PRIMER TYPES

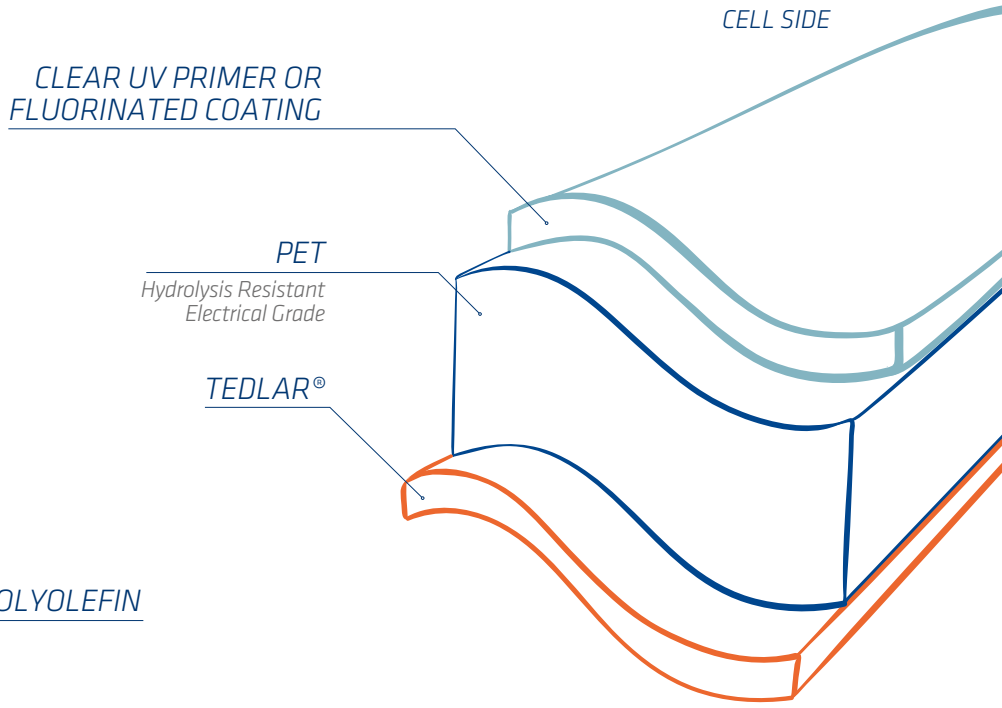
LO	Extra UV protection on cell side
LD	High humidity barrier
LDO	High humidity barrier + UV protection

1500 VDC TEDLAR BASED BACKSHEETS

CERTIFIED QUALITY



TsO 60



TsL 50/285
TsL 50/350

dyMat® WHITE TEDLAR® BASED

Coveme's Tedlar® based backsheet for 1500 VDC features a PVF layer of 25µm thickness combined with two options of inner PET thickness, 285µm or 350µm. As for the excellent Tedlar® weatherability properties, Coveme dyMat® TsL series exhibits outstanding resistance to UV irradiation.
Fluorinated coating on cell side available.

> 1500 VDC

TsL 50/285

> 1500 VDC

TsO 60

Extra Thick
PET 350µm

> 1500 VDC

TsL 50/350

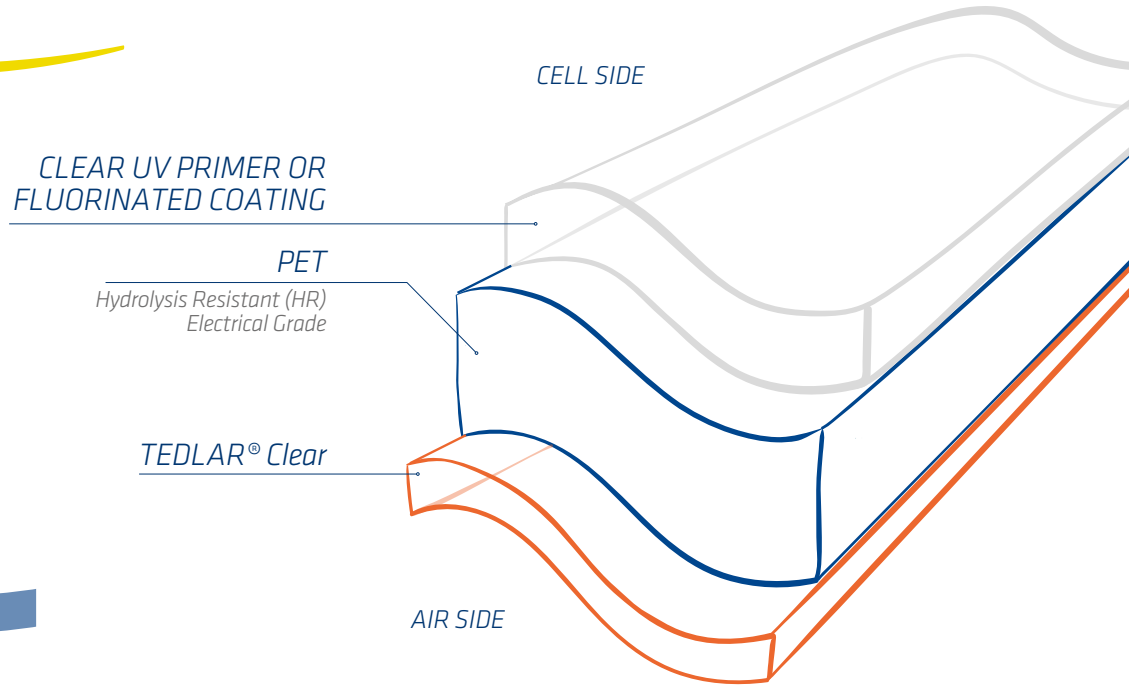
Additional upgrades

- **LO** — Extra UV protection on cell side
- **LD** — High humidity barrier
- **LDO** — High humidity barrier + UV protection
- **SHR** — Super high reflectivity
- **LBk** — Black on cell side
- **Bkhr** — Black high reflectivity

1500 VDC TEDLAR BASED BACKSHEETS

CERTIFIED QUALITY

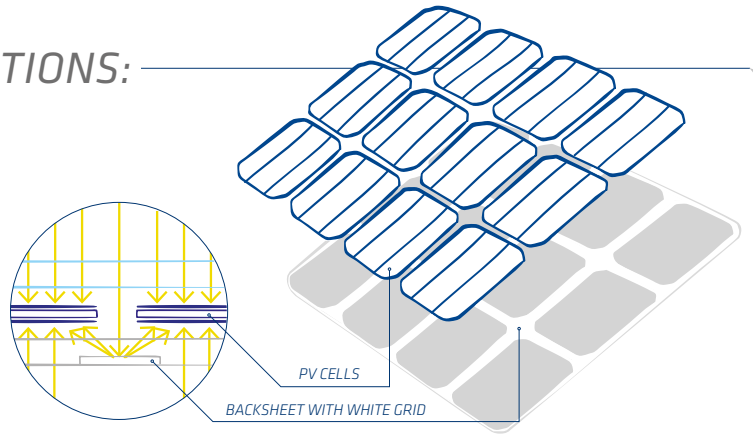
Clr TsL 50/285



OUTPUT INCREASING OPTIONS:

DYMAT® SELECTIVE

Optional white grid incorporated in the backsheet that turns the space in between the cells and the borders into a highly reflective area for significant output improvement. The grid layout is defined according to customer's cell shape and size.



DYMAT® HMIRROR LR >>pag. 50

It is possible to use dyMat®HMirror LR reflective laminates for retro-fitting of PV installations to increase the final output.

dyMat® CLEAR TEDLAR® BASED

Totally transparent Tedlar® based backsheets for bifacial or standard modules in BIPV, utility, greenhouse, commercial installations, and grid or off grid application. This new generation of clear backsheets from Coveme with special UV primer allows to replace standard backsheets for high transparency solutions. dyMat ® Tedlar® Clear for 1500 VDC features a thicker inner PET layer in order to comply with the new IEC rules for 1500 VDC insulation. Fluorinated coating on cell side available.

> *1500 VDC*

Clr TsL 50/285

Features

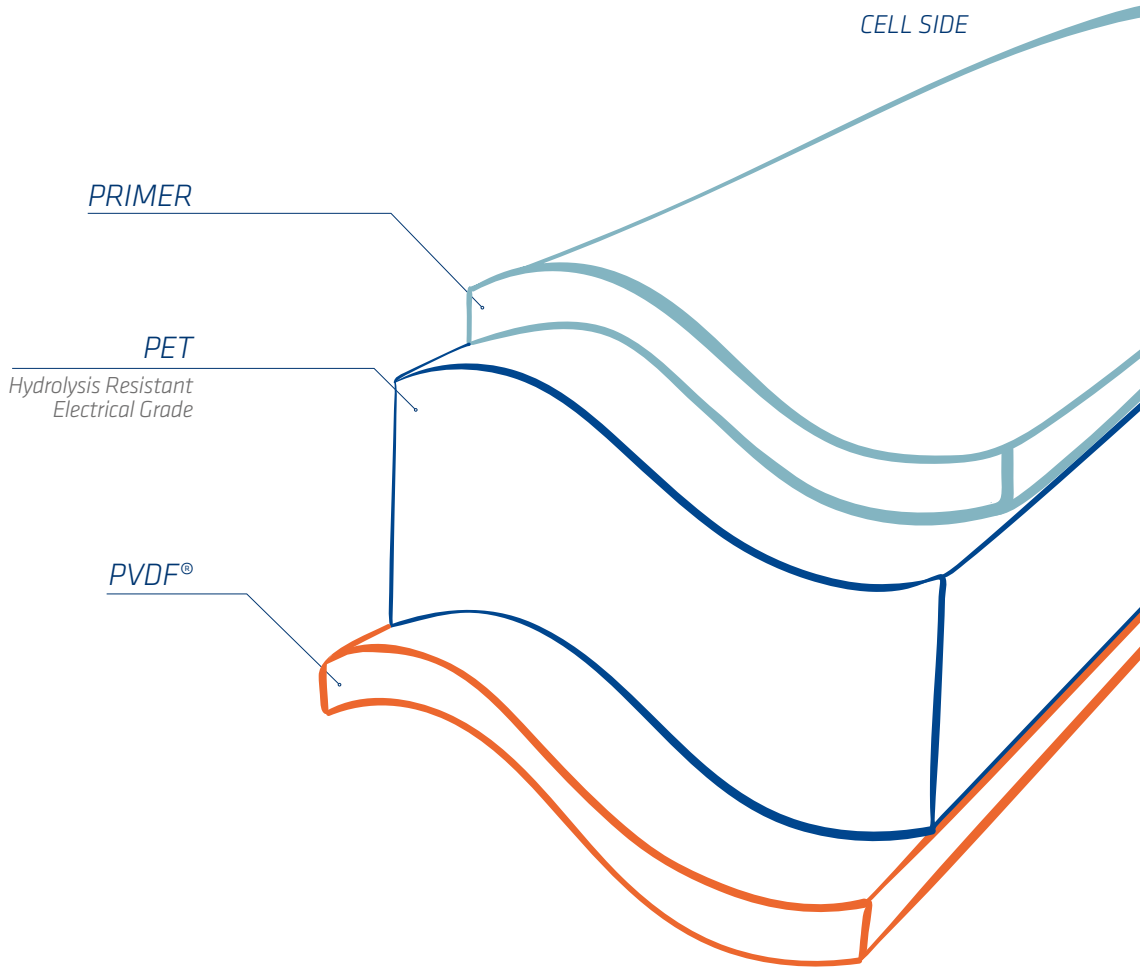
- UV stable
- Hydrolysis resistant
- Engineered adhesive
- Higher output
- High mechanical resistance

PRIMER TYPES

LO	Extra UV protection on cell side
LD	High humidity barrier
LDO	High humidity barrier + UV protection

1000 VDC PVDF BASED BACKSHEETS

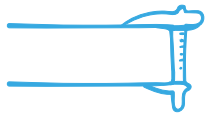
CERTIFIED QUALITY



KL 50/250
KL 75/150
KL 100/190

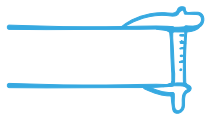
dyMat® PVDF BASED

Coveme's PVDF based backsheet for 1000 VDC features a PVDF layer combined with several options of inner PET thickness ranging from 150µm up to 250µm. This Coveme fluoro-based backsheet, dyMat® KL series, features a superior resistance to UV irradiation. Clear version available upon request.



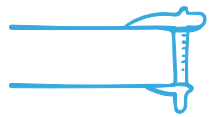
Primer 50µm / PET 250µm

KL 50/250



Primer 75µm / PET 150µm

KL 75/150



Primer 100µm / PET 190µm

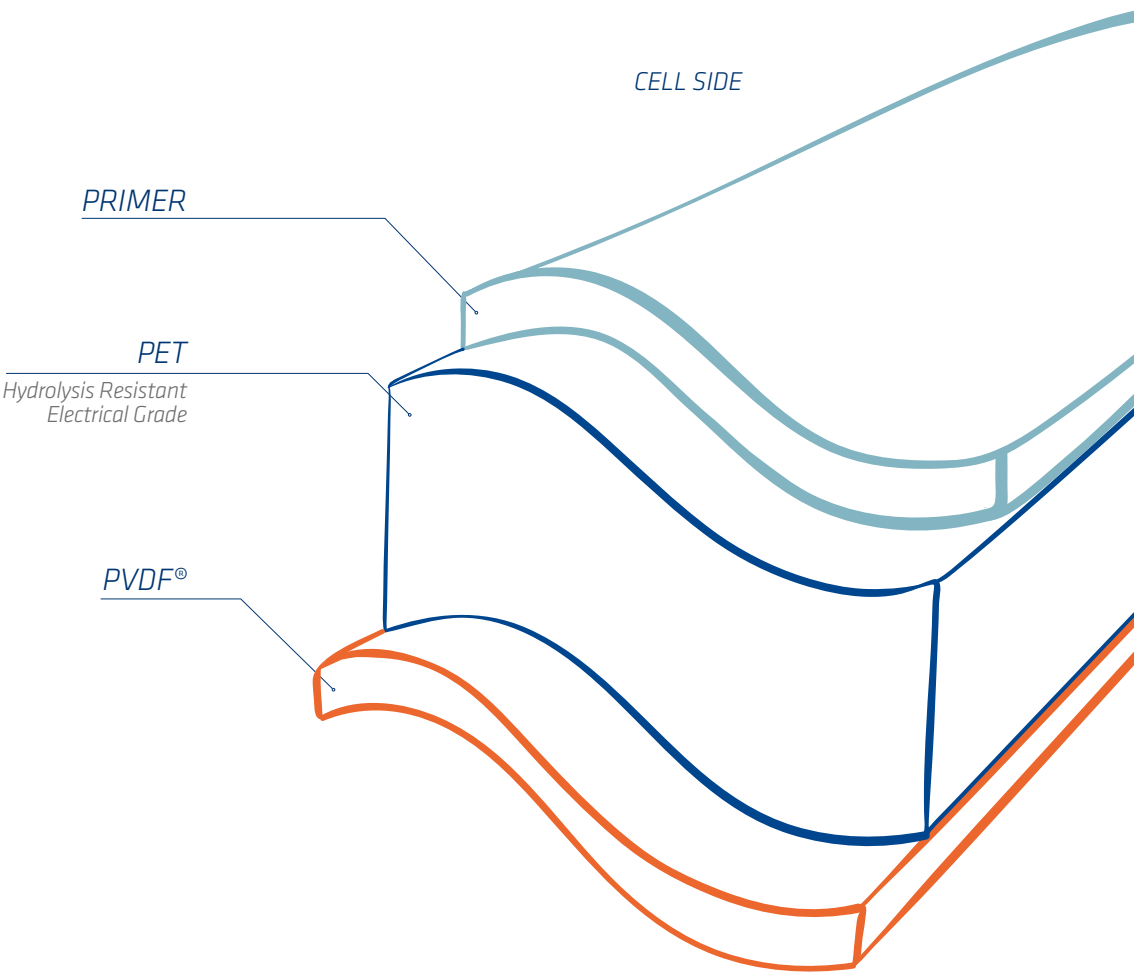
KL 100/190

Additional upgrades

- ***LO*** Extra UV protection on cell side
- ***LD*** High humidity barrier
- ***LDO*** High humidity barrier + UV protection
- ***SHR*** Super high reflectivity
- ***LBk*** Black on cell side
- ***Bkhr*** Black high reflectivity

1500 VDC PVDF BASED BACKSHEETS

CERTIFIED QUALITY



KL 50/250
KL 50/285

dyMat® PVDF BASED

Coveme's PVDF based backsheet for 1500 VDC features a PVDF layer combined with a thicker inner PET layer. This Coveme fluoro-based backsheet, dyMat KL series, features a superior resistance to UV irradiation.
Clear version available upon request.

KL 50/250

>1500 VDC

KL 50/285

>1500 VDC
NEW IEC Standard Compliant

Additional upgrades

LO	Extra UV protection on cell side
LD	High humidity barrier
LDO	High humidity barrier + UV protection
SHR	Super high reflectivity
LBk	Black on cell side
Bkhr	Black high reflectivity

1000 - 1500 VDC dyMat® FRONTSHEETS

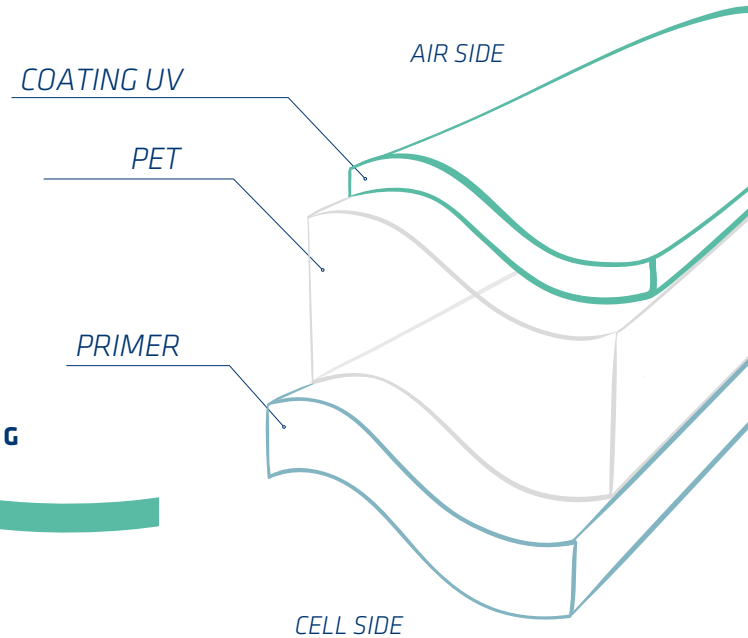
dyMat® ECO 33% rPET INSIDE

>>pag.8

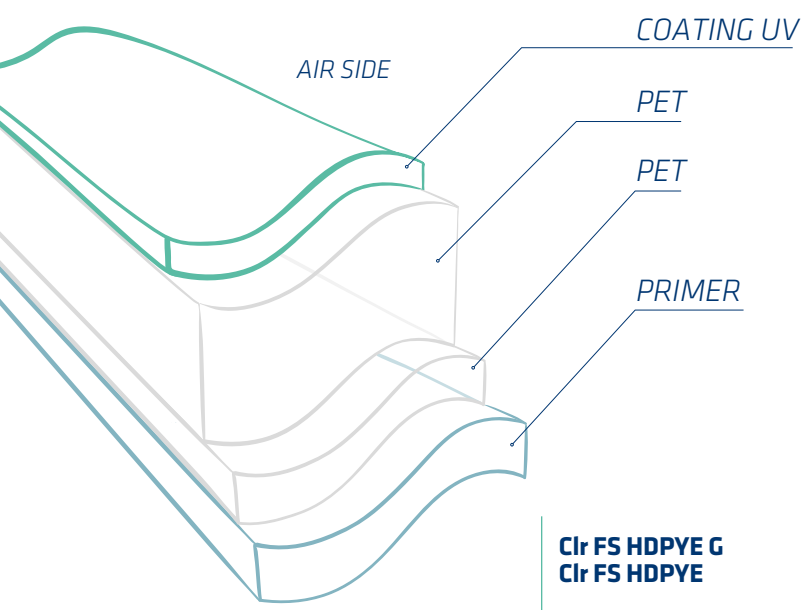
CERTIFIED QUALITY

HIGHLY TRANSPARENT

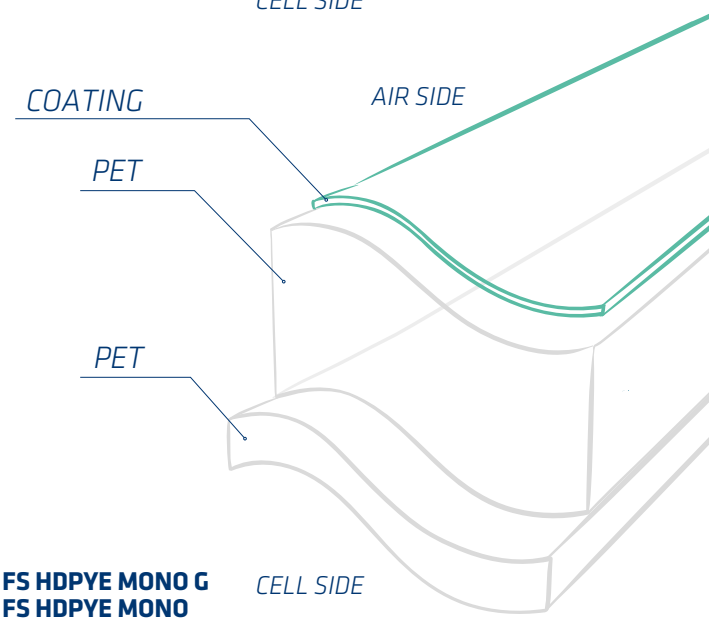
HIGH GRADE PET



Clr FS PYE MONO G
Clr FS PYE MONO



Clr FS HDPYE G
Clr FS HDPYE



Clr FS HDPYE MONO G
Clr FS HDPYE MONO

dyMat® CLEAR FRONTSHEETS

This new generation of clear frontsheets developed by Coveme features an extra high UV and hydrolysis resistant polymer and is employed instead of glass, in semi-flexible and lightweight module. These highly transparent frontsheets are characterized by a specific coating with outstanding anti-scratch and anti-abrasion properties. dyMat® frontsheets are designed for up to 1500 VDC for pv modules in rooftop, automotive or nautical installations and grid or off grid application. Matt anti-glare versions are available.

Anti Scratch

Extra High UV Resistance

Clr FS PYE MONO G
Clr FS PYE MONO

1000 VDC

Anti Scratch

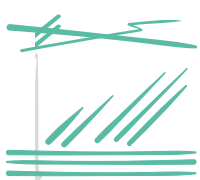
Extra High UV Resistance

Clr FS HDPYE G
Clr FS HDPYE

1500 VDC

Features

- Anti scratch
- Anti abrasion
- Hydrolysis resistant
- Engineered adhesive
- Highly UV resistent



Anti Scratch

Extra High UV Resistance

Clr FS HDPYE MONO G
Clr FS HDPYE MONO

1500 VDC

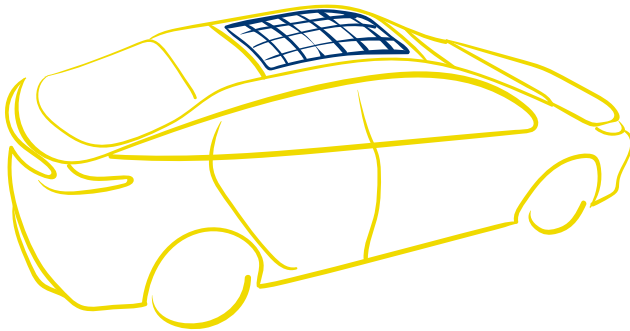
COATING TECHNOLOGY

dyMat® Clear Frontsheets feature an innovative coating, proprietary of Coveme, that has been developed by the company's R&D departments. It is applied in an ultra- modern coating process that guarantees an elevated standard and combines the latest UV coating and EB curing technologies for dyMat® backsheets and frontsheets of constant and reproducible quality.

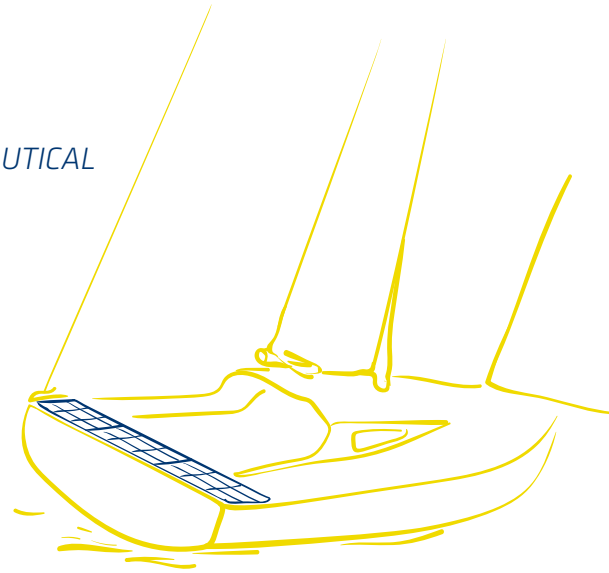
dyMat® SPECIALITIES

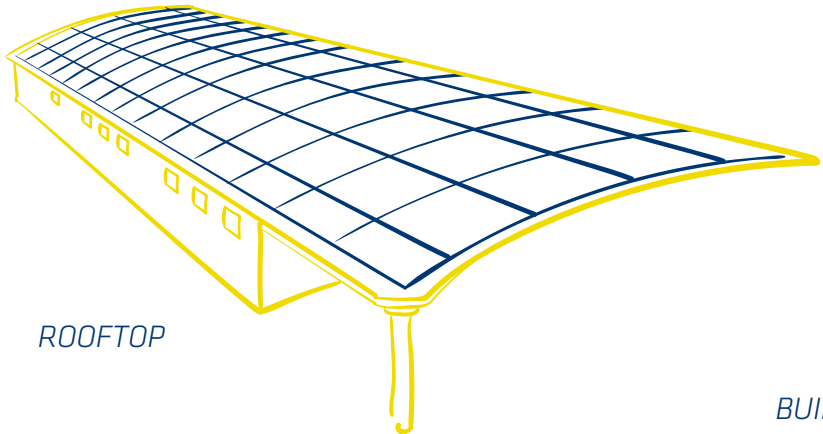
Coveme has developed specific dyMat® films and laminates that are employed as frontsheet or backsheet in flexible lightweight photovoltaic modules. For printed solar cells Coveme offers special films with printable coatings and high dimensional stability. Applications include rooftop, building integrated , automotive , nautical and all surfaces with limited loading capacity.

AUTOMOTIVE

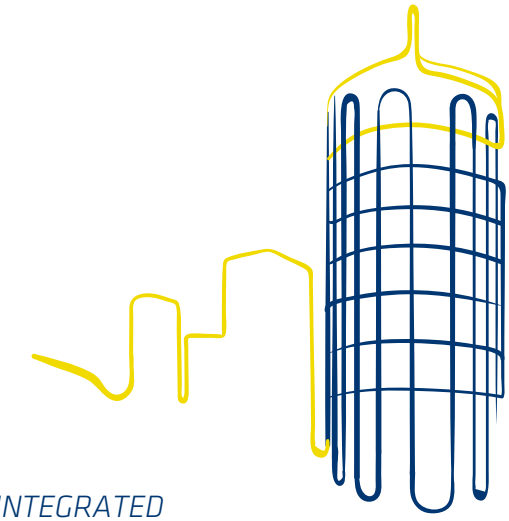


NAUTICAL





ROOFTOP



BUILDING INTEGRATED

dyMat® FOR FLEXIBLE, PRINTED AND ORGANIC PV

dyMat® Clr Frontsheet is a totally transparent laminate with a special coating for enhanced UV and scratch resistance combined with UV filtering properties. These characteristics make it particularly suitable to be employed as a frontsheet in flexible photovoltaics. For the back protection of these modules Coveme offers a range of high performance dyMat® Backsheets in different colours that guarantees durability over the years, electrical insulation and high resistance to weathering agents such as moisture and extreme temperatures .
In the field of printable and organic photovoltaics Coveme offers its dyMat® Printable, a heat stabilized and surface treated polyester film suitable for roll to roll and sheet printing processes.

dyMat® Frontsheets

- Totally Transparent
- Enhanced UV Resistance
- Scratch Resistance

dyMat® Printable

- Dimensionally Stable
- Printable

dyMat® Backsheets

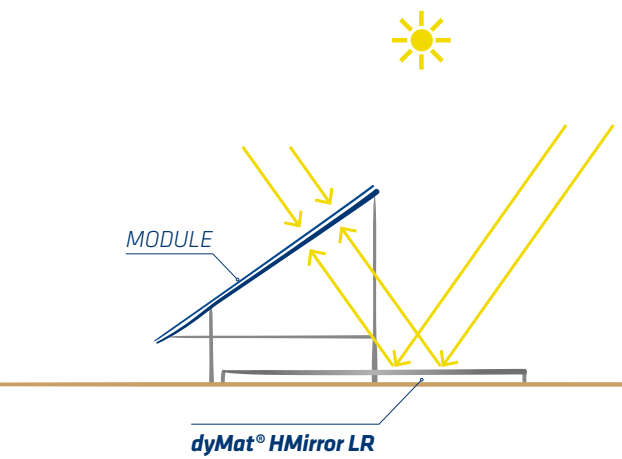
- Low WVTR
- PDT > 1500 VDC

dyMat® SPECIALITIES

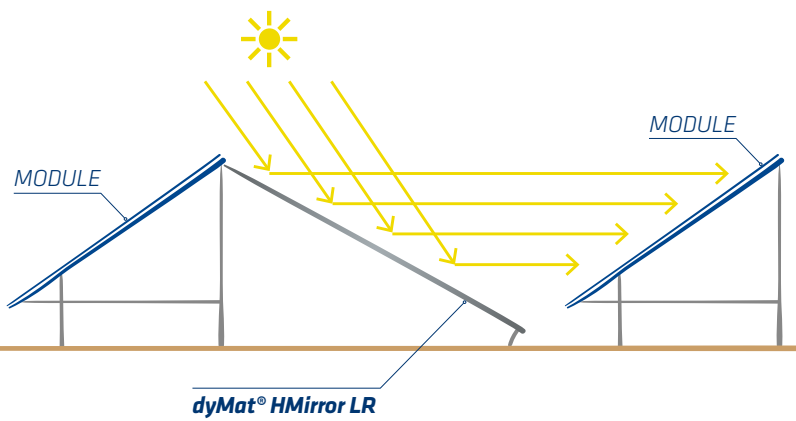
Coveme has developed a highly reflective laminate developed for the retrofitting of Bifacial and standard PV modules. dyMat® HMirror LR is installed between the module rows and reflects the sun light back onto the module, thus increasing the average energy output of the installation.

- ✓ **Significant average energy output gain +10-15%**
- ✓ **Set-up possible in already existing installations**
- ✓ **Works within plant peak power**
- ✓ **No temperature increase on module side**

RETRO-FITTING OF BIFACIAL MODULES



RETRO-FITTING FOR STANDARD MODULES



dyMat® FOR RETRO-FITTING OF PV INSTALLATIONS

dyMat® HMirror LR polymeric mirror film is a multilayer metallized laminate with a special scratch abrasion and UV resistant coating. The product is specifically designed for retro-fitting and features strong durability and high reflectance.

High Reflectance

UV Resistance

Increased Output

dyMat® HMirror LR

ACCESSORIES

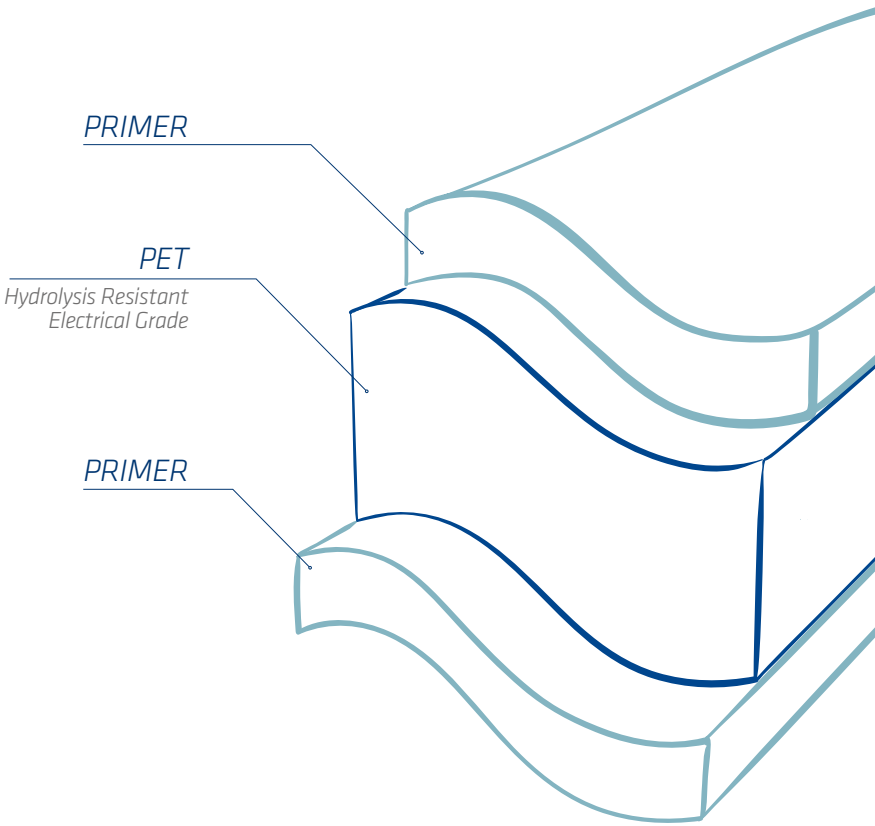
dyMat EPE®

dyMat EPE® is designed to be used as electrical insulator in between ribbons and bus bars in PV module fabrication. The material has a perfect bonding with both encapsulation EVA and whichever backsheet, thanks to its structure with a double layer of Primer.

CERTIFIED QUALITY

dyMat® ECO 33% rPET INSIDE

>>pag.8



- ***Multilayer component made of PRIMER/PET/PRIMER***
- ***Enhanced adhesion with encapsulant***
- ***White, black and transparent versions available.***

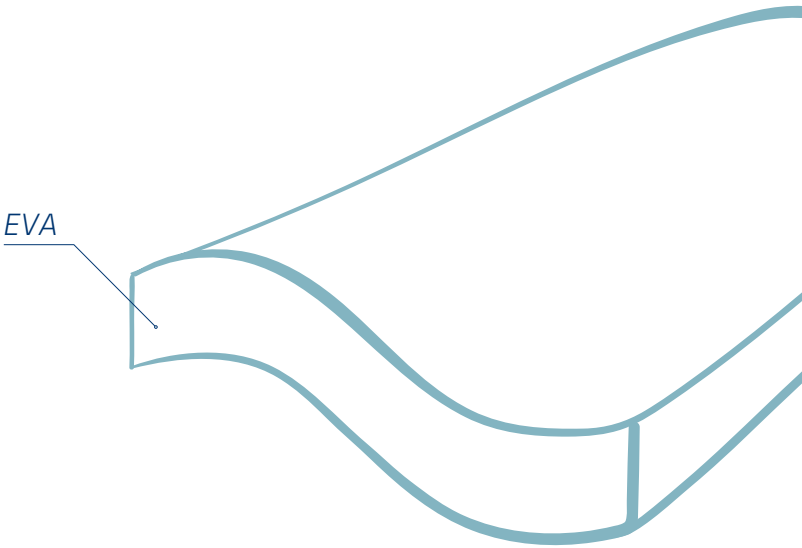
dyMat E®

Transparent adhesive tape made of EVA. It is used to fix components such as cells, ribbons etc. during PV module fabrication. In the lamination process the substrate melts and becomes totally embedded with encapsulating EVA.

CERTIFIED QUALITY

dyMat® ECO 33% rPET INSIDE

>>pag.8



- ***Transparent EVA***
- ***Modified acrylic emulsion adhesive***

CERTIFICATIONS & MEMBERSHIPS

Coveme is certified ISO 9001: 2015 for quality management standards, ISO 14001: 2015 for environmental management and ISO 45001:2018 for occupational health and safety.

COVEME ITALY CERTIFICATES

ISO 9001:2015

ISO 14001:2015

ISO 45001:2018

COVEME CHINA CERTIFICATES

ISO 9001:2015

ISO 14001:2015

ISO 45001:2018

Coveme has received the Silver Medal Ecovadis certification as the result of a corporate sustainability performance evaluaton.

Coveme is honoured to be member of the most prestigious associations and bodies in the photovoltaic industry around the globe, believing strongly in the benefit of a continous cross-fertilization among peers

esmc European Solar Manufacturing Council

CPIA 中国光伏行业协会 China Photovoltaic Industry Association

TÜVRheinland® Precisely Right.

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