

CHEMISTRY THAT MATTERS™



ELECTRICAL VEHICLE CHARGING EQUIPMENT

SABIC ENGINEERING THERMOPLASTIC SOLUTIONS

May 6th 2021



AGENDA AND SPEAKERS

- SABIC – introduction
- EV charger market and regulatory information
- SABIC solutions for EV chargers
- SABIC's TRUCIRCLE™ sustainability solutions



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WHO WE ARE

SABIC, WHO WE ARE

WHO WE ARE

SABIC IS A GLOBAL LEADER IN CHEMICALS

From making cars and planes more fuel-efficient, to contributing towards water conservation, and helping enable colorful smartphone cases, we find solutions to the challenges of today to help our customers achieve their ambitions and build a better tomorrow.



SABIC AT A GLANCE



1976

Company established



32,000

Employees around the world



50

Countries of operations



212th

Largest public company in the world*



Top 2

Chemical Brand Value**

4.017

US\$ bn

Estimated Brand Value**

79

US\$ bn

Total assets

17.8

US\$ mn

Net income

31

US\$ bn

Annual revenue



≈ 150

New products each year



9,946

Global patent filings



68

World-class plants worldwide

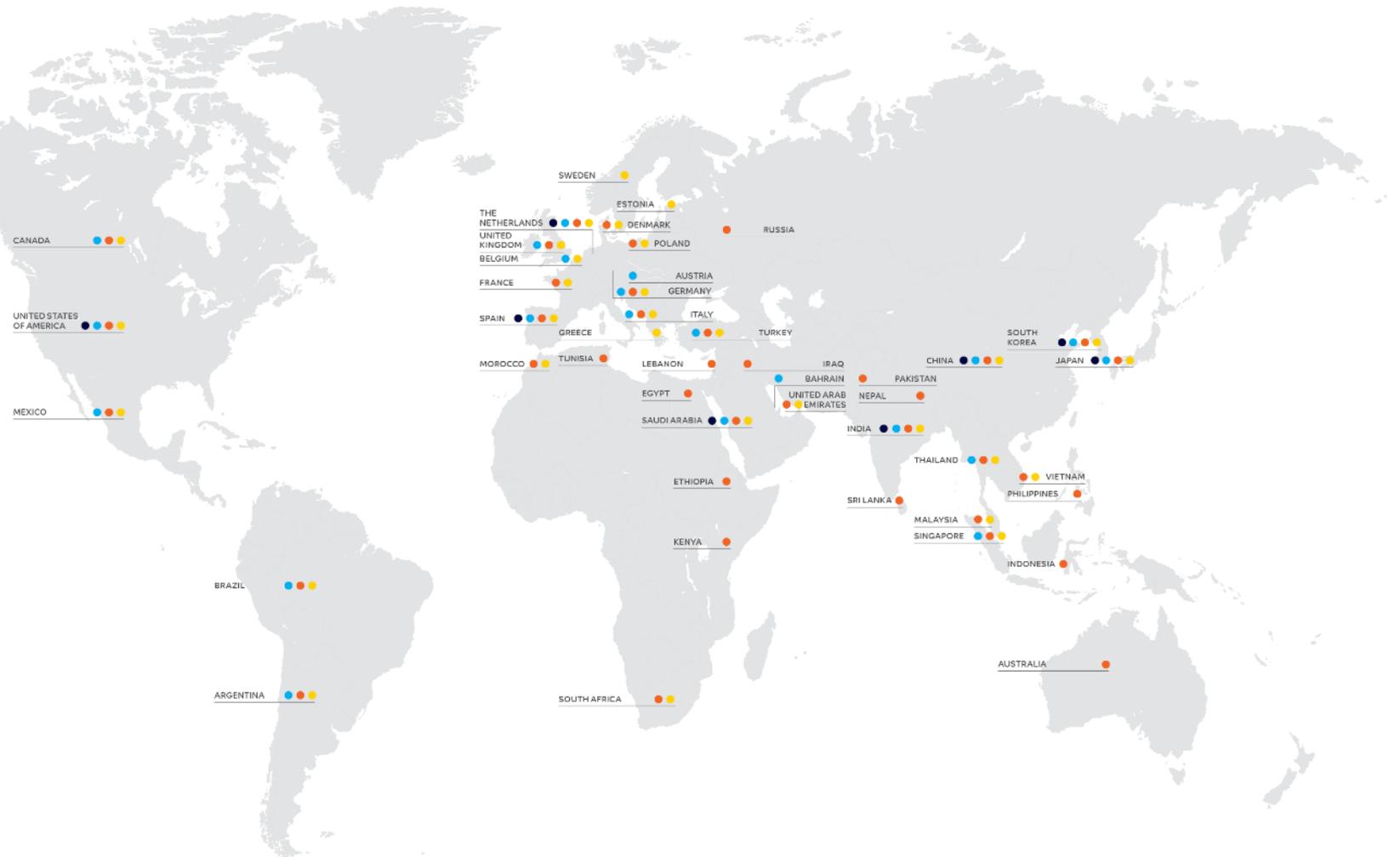
OUR STORY: A HISTORY OF CHEMISTRY

<p>1976</p>  <p>SABIC established</p>	<p>1980</p>  <p>Hadeed founded</p>	<p>1980</p>  <p>JVs with Shell and ExxonMobil</p>	<p>1981</p>  <p>JV with Mitsubishi</p>	<p>1983</p>  <p>First products exported out of KSA</p>	<p>1984</p>  <p>First Public Shares</p>	<p>1996</p>  <p>Middle East's largest Joint Stock company</p>
<p>1997</p>  <p>New Logo introduced</p>	<p>2000</p>  <p>Selling in 100 Countries</p>	<p>2002</p>  <p>New Global Headquarters</p>	<p>2002</p>  <p>Acquired DSM Petrochemicals</p>	<p>2006</p>  <p>Acquired Huntsman Petrochemicals UK</p>	<p>2007</p>  <p>Acquired GE Plastics</p>	<p>2009</p>  <p>JV with Sinopec in China</p>
<p>2012</p>  <p>Inauguration of SABIC Academy</p>	<p>2015</p>  <p>JV with SK global chemical in South Korea</p>	<p>2016</p>  <p>Inauguration of Home of Innovation™</p>	<p>2017</p>  <p>Gulf Coast Growth Ventures JV with ExxonMobil</p>	<p>2018</p>  <p>Acquired 24.99% of stake in Clariant AG</p>	<p>2020</p>  <p>Saudi Aramco acquires a 70% stake in SABIC</p>	<p>2021</p>  <p>SABIC is #2 most valuable brand in chemicals industry. (Brand Value US\$4.017bn)*</p>

*According to 2020 report "Brand Finance Chemicals 25"

OUR GLOBAL PRESENCE

Headquartered in Riyadh, Saudi Arabia, SABIC employs more than 32,000 people in around 50 countries, working together to make the building blocks of the modern world ever better, ever more efficiently, and ever more sustainably.



- Technology and application facilities
- Manufacturing and compounding companies
- International subsidiaries and sales offices
- Distribution, storage facilities and logistical hubs

STRATEGIC INDUSTRIES WE SERVE



AGRI-NUTRIENTS

Our portfolio of high quality agri-nutrients play a vital role in helping to secure adequate global food supply and make it possible to produce more food from less land.



CLEAN ENERGY

SABIC's specialty and polymer products can help create sustainable renewable-energy solutions for the future.



ELECTRICAL & ELECTRONICS

Manufacturers need to make products in a cost-effective manner, yet meet consumers' expectations for style, ease of use and sustainability. Our materials are the foundation for the next generation of electronic devices.



CONSTRUCTION

We provide products to architects and builders who seek solutions to satisfy public demand for environmentally responsible structures while providing design freedom.



MEDICAL DEVICES

We help customers successfully address the challenges facing the industry by providing advanced technologies, a broad product portfolio, and a healthcare policy.



PACKAGING

SABIC polymers seek to help food and drink producers meet their goals while still providing sustainable benefits like lightweighting and environmentally-focused initiatives.



TRANSPORTATION

Automobiles, aircraft, rail interiors, heavy-duty trucks and other vehicles require new approaches to meet ever-rising requirements. We put our material, design and technical expertise to work to help OEMs meet this challenge and drive innovation to new levels.

POLL QUESTION 1

DO YOU OWN A BEV, PHEV?

a. Yes

b. No

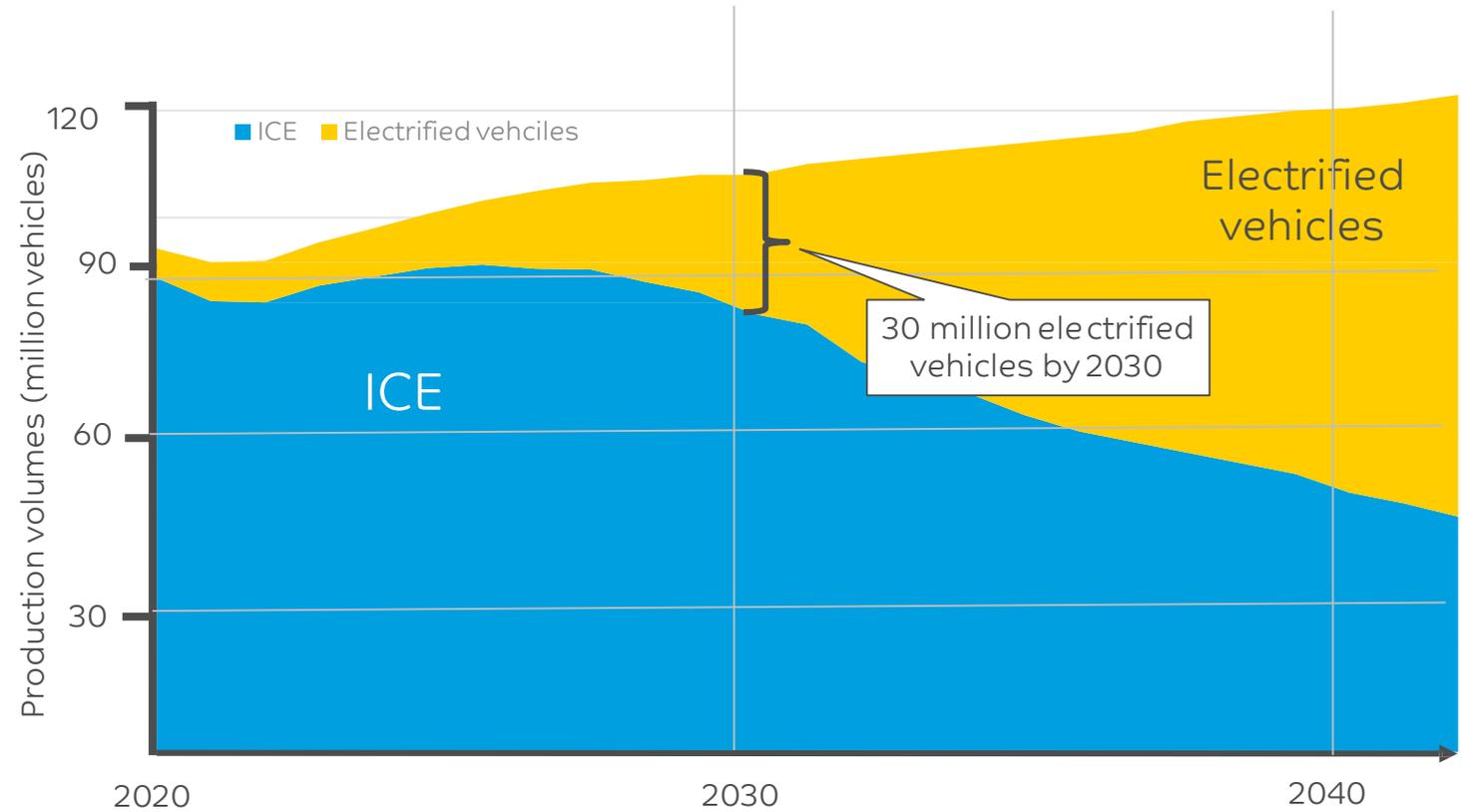
c. Soon

d. No interest

PUBLIC CHARGING POINTS

MARKET INFORMATION

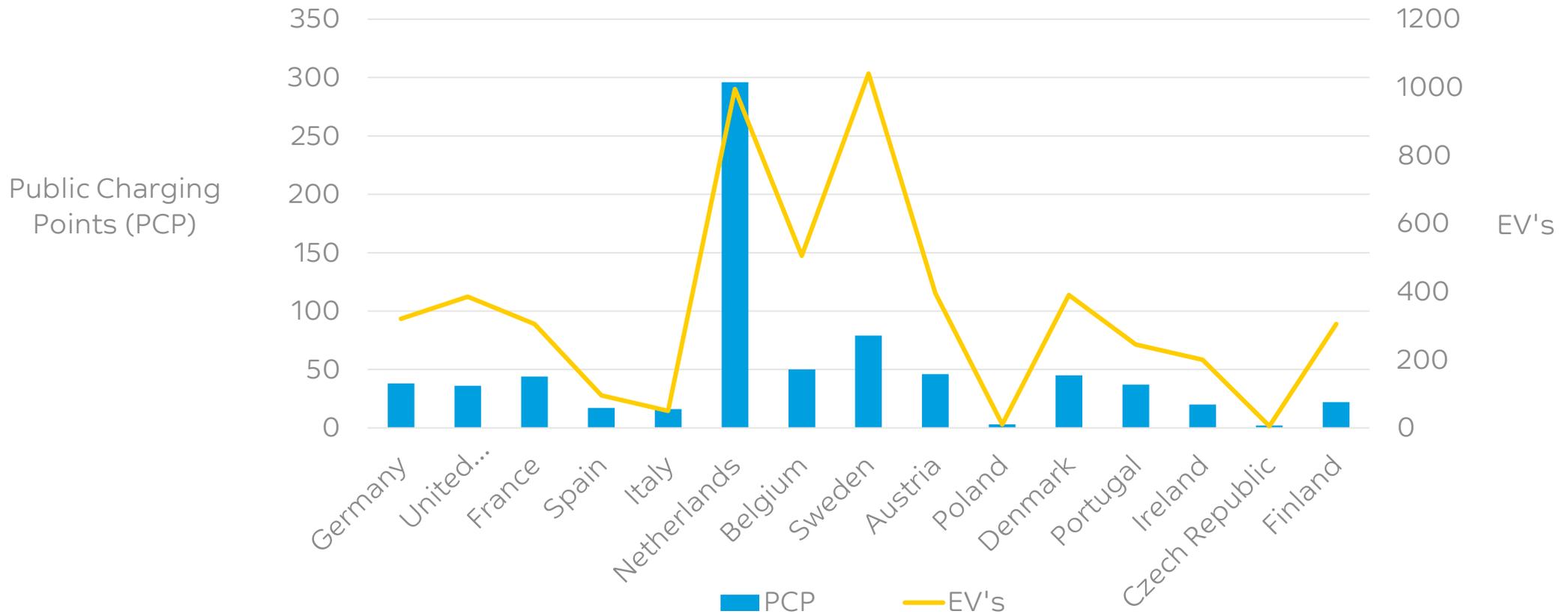
AUTO TRENDS : ELECTRIFICATION



➤ By 2030, 30 million vehicles will be electrified (BEVs and Hybrids)
In Europe approx. 11 million

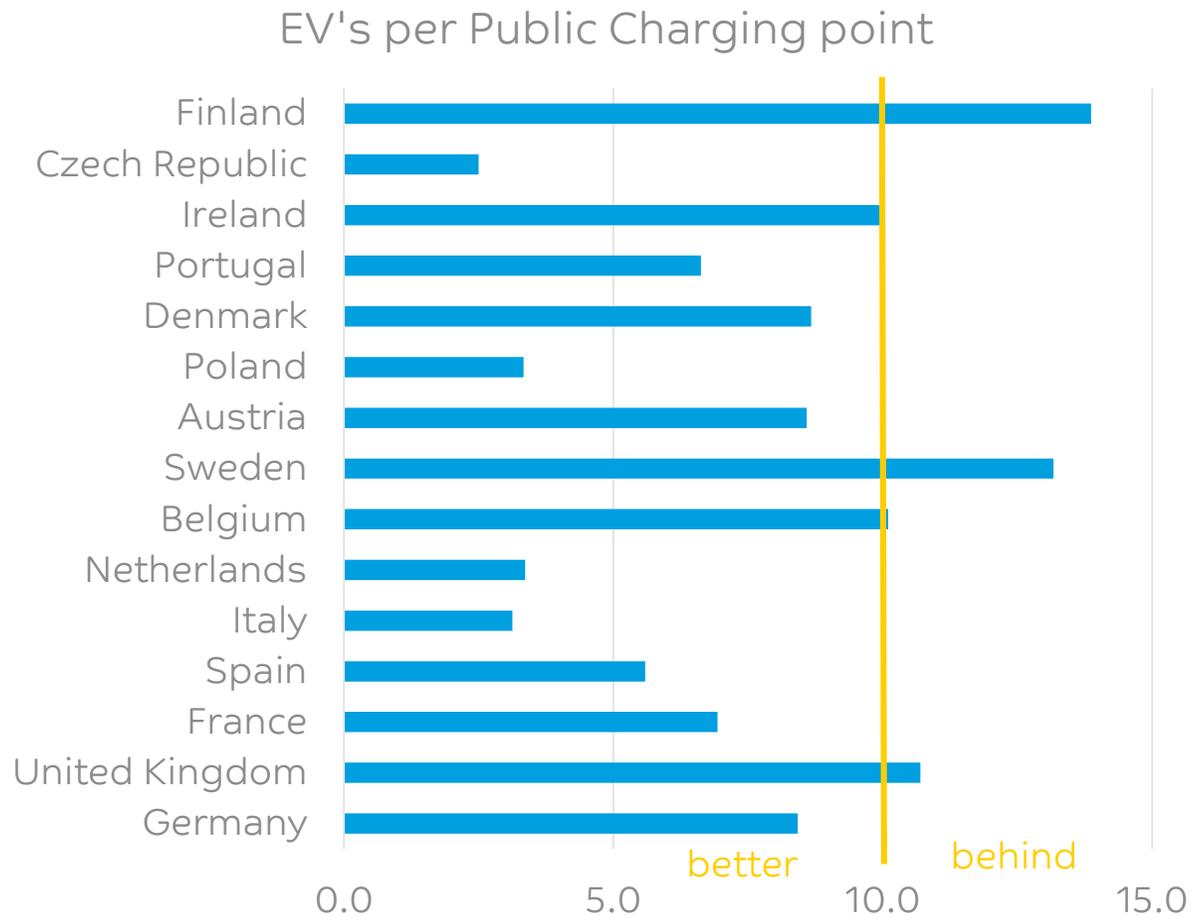
PUBLIC CHARGING POINTS (PCP) AND ELECTRICAL VEHICLE DENSITY EU.

PCP and EV's density EU country [per 100.000 inhabitants]



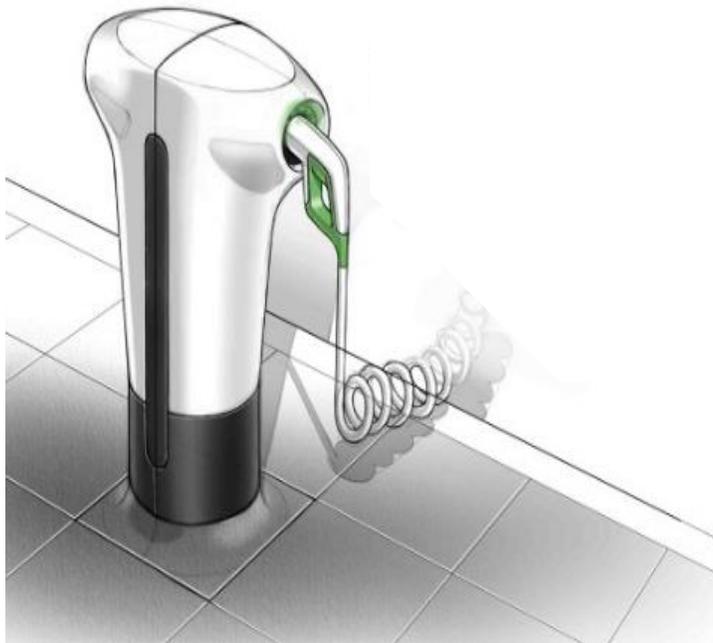
➤ Different PCP and EV density per country requires other focus.

PUBLIC CHARGING POINTS AND ELECTRICAL VEHICLE DENSITY EU.

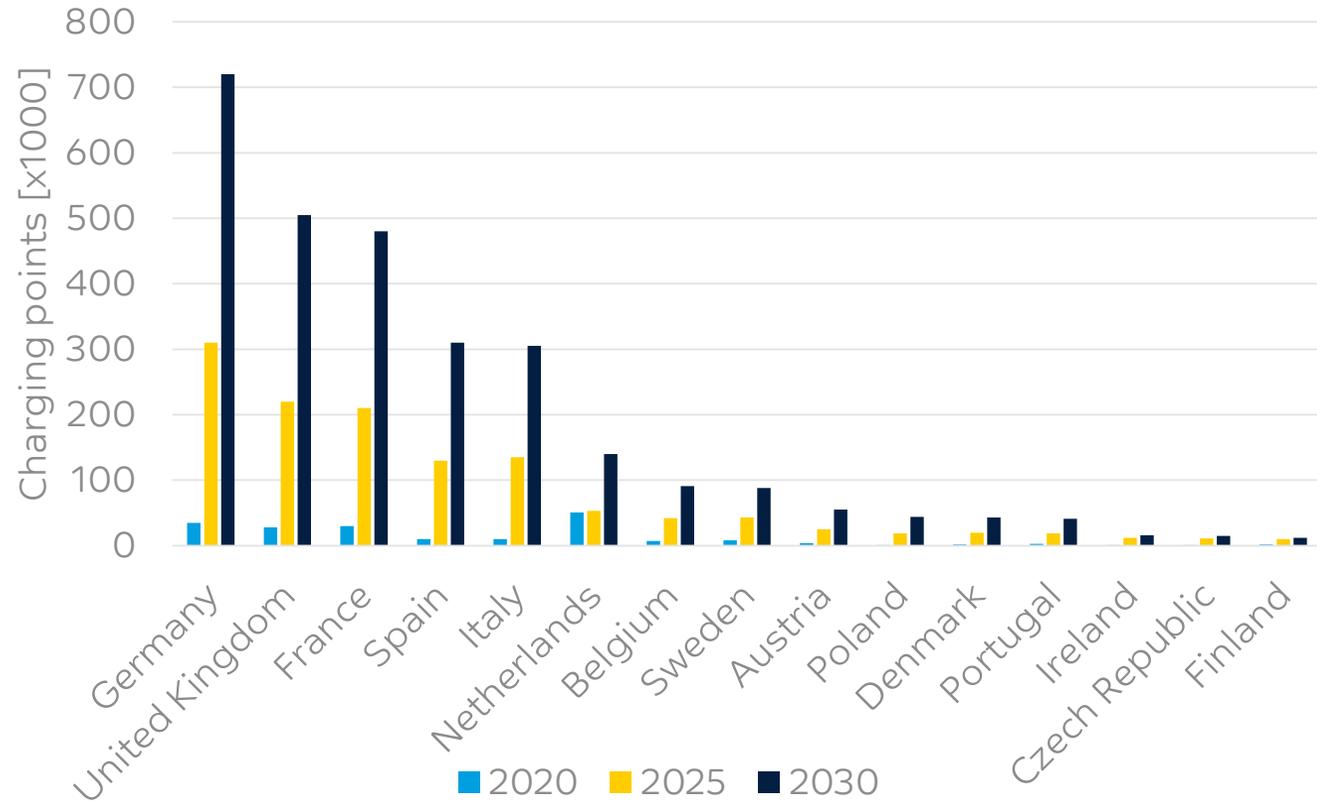


➤ EU guideline is 1 public charging point per 10 electric vehicles

ELECTRICAL VEHICLE CHARGING INFRASTRUCTURE EU.



Public charging point EU Countries top 15



➤ Estimated public chargers in EU: 1.5 million in 2025 and 3 million in 2030

DEFINITION AND DIFFERENTIATION OF PUBLIC CHARGE POINT



Single phase AC chargers

(3-7 kW): charges an EV in about 7 to 16 hours



Tri-phase AC chargers

(11-22 kW): charges an EV in about 2 to 4 hours

Fast DC chargers

(50-100 kW): charges an EV in 30-40 minutes



Ultra-fast DC chargers

(above 100 kW): charges an EV in 10-20 minutes or less

POLL QUESTION 2

WHAT CHARGING STATION DO YOU USE?

a. Private

b. Public

c. Both

d. None

REGULATORY EVSE

EVSE REGULATORY



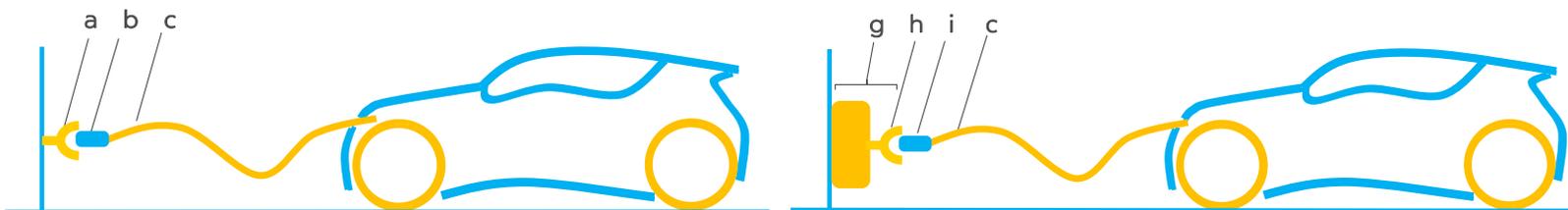
	International /Europe	America	Japan	APAC China	Taiwan
General Requirements	IEC/EN 61851-1 IEC/EN 61980-3	NEC625(a) SAE J1772 UL 2231-1 UL 2231-2	JEVS G109	GB/T 18487.1	CNS 15511-2 CNS 15511-3
EV Requirements for connection to an EVSE	IEC/EN 61851-21			GB/T 18487.2	CNS 15511-3
AC Charger, AC Charging Station	IEC/EN 61851-22	UL 2594		GB/T 18487.3	CNS 15511-3
DC Charger, DC Charging Station	IEC/EN 61851-23 (b)	UL 2202	JEVS G 101 JEVS G 103 CHAdeMO	GB/T 18487.3	CNS 15511-3
Plugs, socket-Outlets, couplers and cable assembly	IEC/EN 62196-1 IEC 62196-2 IEC 62196-3 (b)	SAE J1772 UL2251	JEVS C 601 JEVS G 105	GB/T 20234.1 GB/T 20234.2 GB/T 20234.3	CNS 15511-2 CNS 15511-3

- Table mentions the most relevant norms. Might be other norms not mentioned.
- National regulations not included in above table

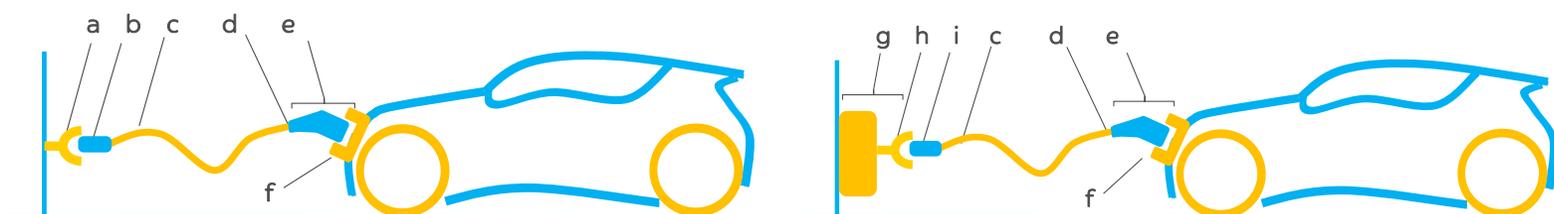
REGULATORY IEC 61851 CONNECTION CASES TO EV CHARGING NETWORK

IEC 61851 Connection types to EV Charging Network:

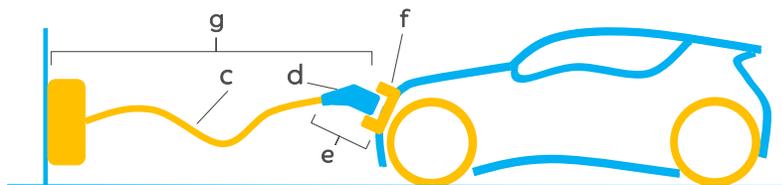
Connection Case A



Connection Case B



Connection Case C



#	Part	Sketch
(a)	Socket-outlet	
(b)	Plug	
(c)	Cable	
(d)	Vehicle connector	
(e)	Vehicle coupler	
(f)	Vehicle inlet	
(g)	Charging station	
(h)	EV socket-outlet	
(i)	EV plug	

REGULATORY: EV CHARGING CABINETS REQUIREMENTS

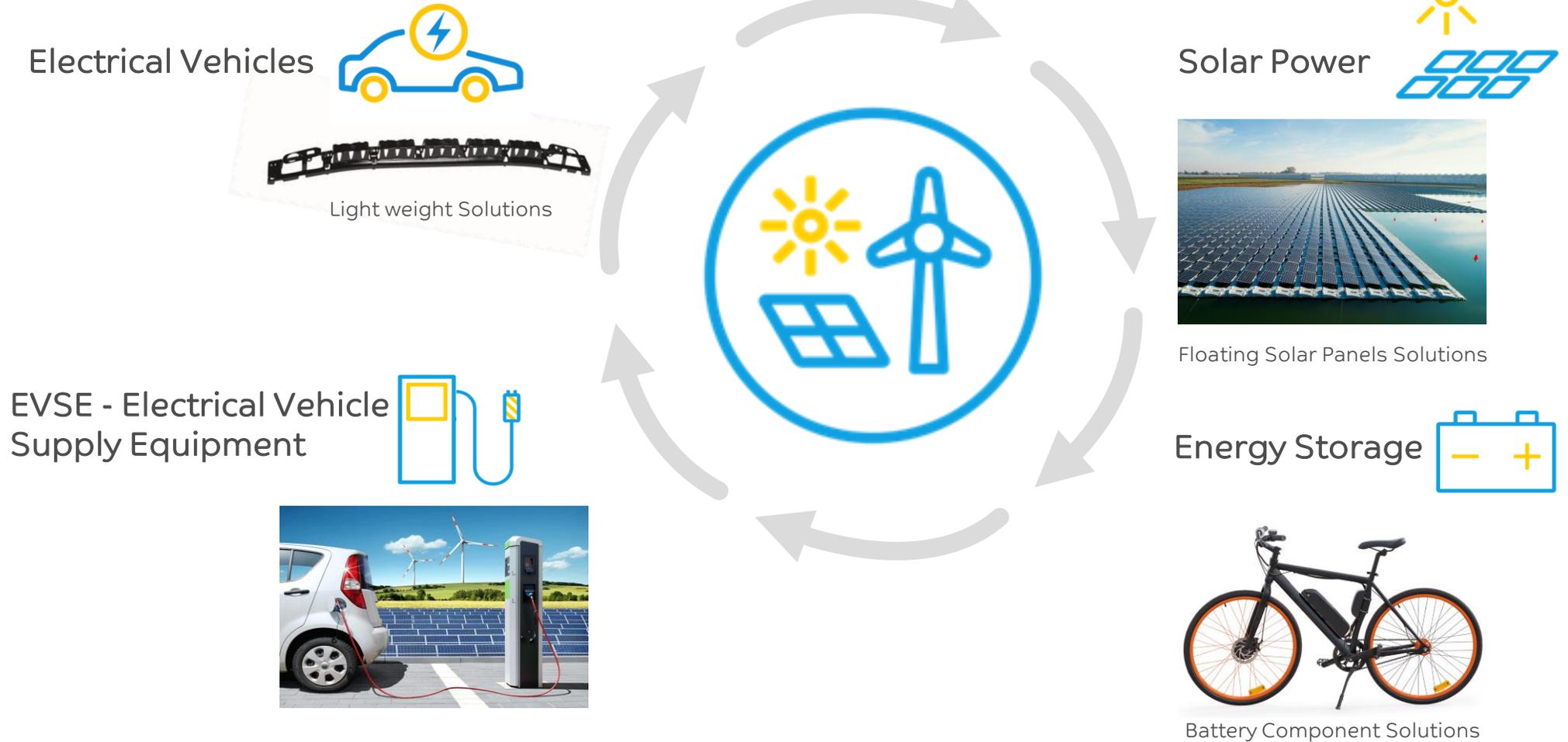
EV Charger Cabinets		
EUROPE	ASIA	AMERICA
<p>IEC 61851-1 & 22, 23: 2017 (AC/DC):</p> <ul style="list-style-type: none"> ✓ Degree of Protection: <ul style="list-style-type: none"> • IP 41 indoor • IP 44 outdoor and IPXXC ✓ Mechanical: ✓ Impact: <ul style="list-style-type: none"> • Station body not damaged, IK08 ✓ Environment test (for charging station): <ul style="list-style-type: none"> • Ambient air temperature test • Dry heat test • Damp heat test (56days 40°C @95%RH) • Cold test ✓ Service Temp: (Max permissible surface temp) <ul style="list-style-type: none"> • 60°C for non-metallic part grasped • 85°C for non-metallic part touched ✓ Flammability: <ul style="list-style-type: none"> • GWFI 650°C non active parts • GWFI 850°C current carrying 	<p><u>GB/T 18487.1 general</u> equal to IEC 61851-1 2001</p> <p><u>GB/T 18487.3</u> equal to IEC 61851-22:1999 AC & IEC 61851-23:1999 DC</p> <p>Japan adopting <u>IEC 61851-1 & 22: 2010</u></p>	<p><u>UL 2594 (AC)/UL 2202 (DC)</u></p> <ul style="list-style-type: none"> ✓ Flammability: <ul style="list-style-type: none"> • Portable Charger: UL94V0-V1 Enclosure • Fixed Charger: UL94 5V Enclosure • Inner part: UL94 V2 non active part • Aesthetic enclosure part: UL94 HB • CTI: 175V (PLC 3 or better) • HWI and HAI: depend on FR ✓ Mechanical strength: <ul style="list-style-type: none"> • Impact: after aging at -30C / 24hr • Drop test 100cm Portable charger • Ball Impact (Vertical/Pendulum) 0.54kg-1.3m @ Room Temp • Drive over Test ✓ Environmental (UL 50E): <ul style="list-style-type: none"> • UV exposure: F1, UL746C • Solvents test ✓ Thermal <ul style="list-style-type: none"> • RTI: Higher than the temp observed on Temp. Rise Test • Max service Temp 95°C

REGULATORY: EV CHARGING COUPLERS REQUIREMENTS

EV Charger Couplers		
EUROPE	ASIA	AMERICA
<p><u>IEC 62196-1/2 (AC), IEC 62196-3 (DC)</u></p> <p>✓ Degree of Protection:</p> <ul style="list-style-type: none"> IP 21 (indoor) IP 44 (outdoor) and IPXXD <p>✓ Thermal</p> <ul style="list-style-type: none"> BPT: 125°C (live parts); 80°C (other part) RTI 85°C <p>✓ Aging:</p> <ul style="list-style-type: none"> Thermal resistance after heat aging (80°C/168h) Hydro-aging 95%RH 80°C/168h no crack <p>✓ Electrical:</p> <ul style="list-style-type: none"> CTI: 175V (CTI PLC 3 level) Isolation test acc IEC62196-1 <p>✓ Flammability:</p> <ul style="list-style-type: none"> Glow Wire Flame Index : 850°C active parts Glow Wire Flame Index: 650°C non active parts <p>✓ Mechanical:</p> <ul style="list-style-type: none"> Ball impact & mechanical impact test at -30°C 	<p>ASIA</p> <p><u>JAPAN JARI A 0101 (AC)</u></p> <ul style="list-style-type: none"> Harmonized with IEC 62196-1/2 Electric law (DENAN) <p><u>JEVS G105 (DC, CHAdeMO)</u></p> <ul style="list-style-type: none"> V-0 material Dielectric withstand >2200V >1min <p><u>CHINA GB/T 20234.2 (AC)</u></p> <ul style="list-style-type: none"> Same requirement as IEC 62196-1 <p><i>other than:</i></p> <p>Pendulum impact test: -25°C/16hr aging</p> <p><u>CHINA GB/T 20234.3 (DC)</u></p>	<p>AMERICA</p> <p><u>ANSI/UL 2251 / (AC)</u> <u>CSA C22.2 No 282-13</u></p> <p>✓ Thermal</p> <ul style="list-style-type: none"> RTI: 100/100/100°C <p>✓ Electrical / Flammability:</p> <ul style="list-style-type: none"> UL 94V0 → CTI 175 PLC3 /HWI PLC4 / HAI PLC3 UL 94V1/V2 → CTI 175 PLC3/HWI PLC3 / HAI PLC3 UL 94HB → CTI 175 PLC3/HWI PLC2 / HAI PLC1 <p>✓ Environmental:</p> <ul style="list-style-type: none"> UV exposure: F1, UL746C <p>✓ Mechanical:</p> <ul style="list-style-type: none"> Impact 1m Drive over test <p>✓ SAE J1772 (DC)</p> <p>✓ UL2251</p> <ul style="list-style-type: none"> Safety testing method and requirements

SABIC SOLUTIONS

SABIC NEW ENERGY SOLUTIONS



MATERIAL SOLUTIONS FOR EV CHARGERS



ICE - Internal combustion engine vehicles

- Downsizing for energy efficiency
- > 600 km range
- Fueling : minutes
- Greenhouse gasses



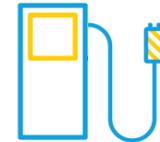
Fuel station

- ATEX requirements
- Chemical resistance (Fuel)
- Impact resistance nozzle-boots
- Supervised area
- Spill protection



ECV - electrically-chargeable vehicles

- Lightweight for energy efficiency
- > 300 km range
- Charging: 20 minutes – several hours
- No tailpipe emissions



Charging station

- UL 94 V0, 5VA rating
- IP Ingress Protection
- Weatherability (UV, humidity, temperature)
- Impact resistance – drive over testing (connector)
- Unsupervised charging (risk of vandalism)

➤ EV market is evolving: EV Supply Equipment has to catch up with developing smart solutions

MATERIAL SOLUTIONS FOR EV CHARGERS

Applications:

Wall-boxes



Value:

Impact resistance
Aesthetics / color
Flame retardant
Design freedom
Weatherability



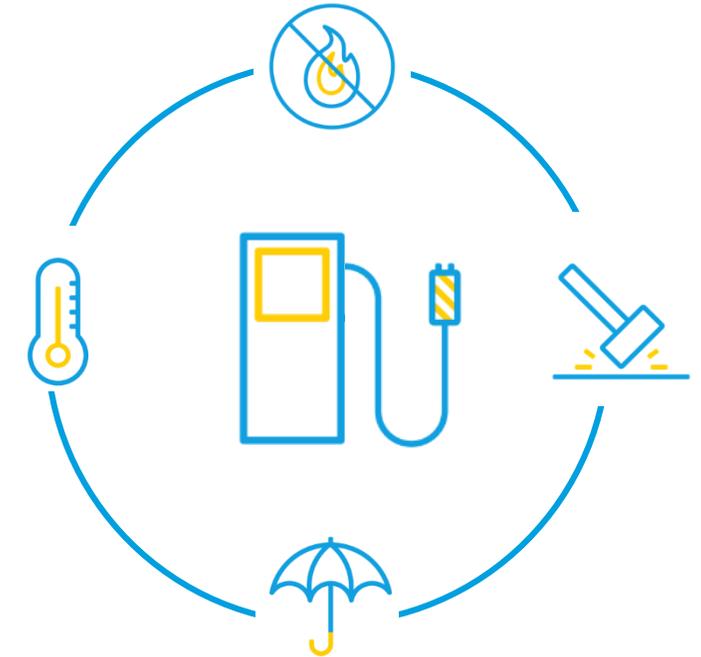
Connectors

Electrical properties
Impact resistance
Flame retardant
Chemical resistance



Charging stations

Metal replacement
Mechanical strength
Flame retardant
Heat resistance
Weatherability



➤ Each application and component needs to fulfill several technical and regulatory requirements

MATERIAL SOLUTIONS FOR EV CHARGERS

PC/ASA	PC/ABS	PC	PBT (PBT/PC, PBT/PET)	PP SGF FR / PP LGF FR
<p>GELOY™ resin</p> <p>Grades for:</p> <ul style="list-style-type: none"> - Outdoor cabinets 	<p>CYCOLOY™ resin</p> <p>Grades for:</p> <ul style="list-style-type: none"> - Indoor cabinets - Consoles 	<p>LEXAN™ resin</p> <p>Grades for:</p> <ul style="list-style-type: none"> - Cabinets - Facias - Displays 	<p>VALOX™ resin</p> <p>Grades for:</p> <ul style="list-style-type: none"> - Connectors - Sockets - Plugs 	<p>SABIC® PP / STAMAX™ resins</p> <p>Grades for:</p> <ul style="list-style-type: none"> - Structural parts - Frames
<p>Typical Features¹ and Benefits:</p> <ul style="list-style-type: none"> • Aesthetics • Weatherability • Dimensional stability • Balanced impact and flow • Non-brominated & non-chlorinated flame retardant • Molded in color 	<p>Typical Features¹ and Benefits:</p> <ul style="list-style-type: none"> • Aesthetics • Dimensional stability • Thin wall FR capability • Balanced impact and flow • Non-brominated & non-chlorinated flame retardant portfolio incl. Blue Angel & TCO99 • Molded in color 	<p>Typical Features¹ and Benefits:</p> <ul style="list-style-type: none"> • High impact & ductility • Transparency • Higher thermal stability than CYCOLOY™ • Dimensional stability • Non-brominated & non-chlorinated flame retardant • Broad color capability 	<p>Typical Features¹ and Benefits:</p> <ul style="list-style-type: none"> • Electrical properties • Improved chemical resistance vs amorphous resins • Lower water absorption compared to PA • RTI 130°C • High CTI performance 	<p>Typical Features¹ and Benefits:</p> <ul style="list-style-type: none"> • Electrical properties • Improved chemical resistance vs amorphous resins • Lower water absorption compared to PA • High CTI performance • High stiffness with high impact (STAMAX)



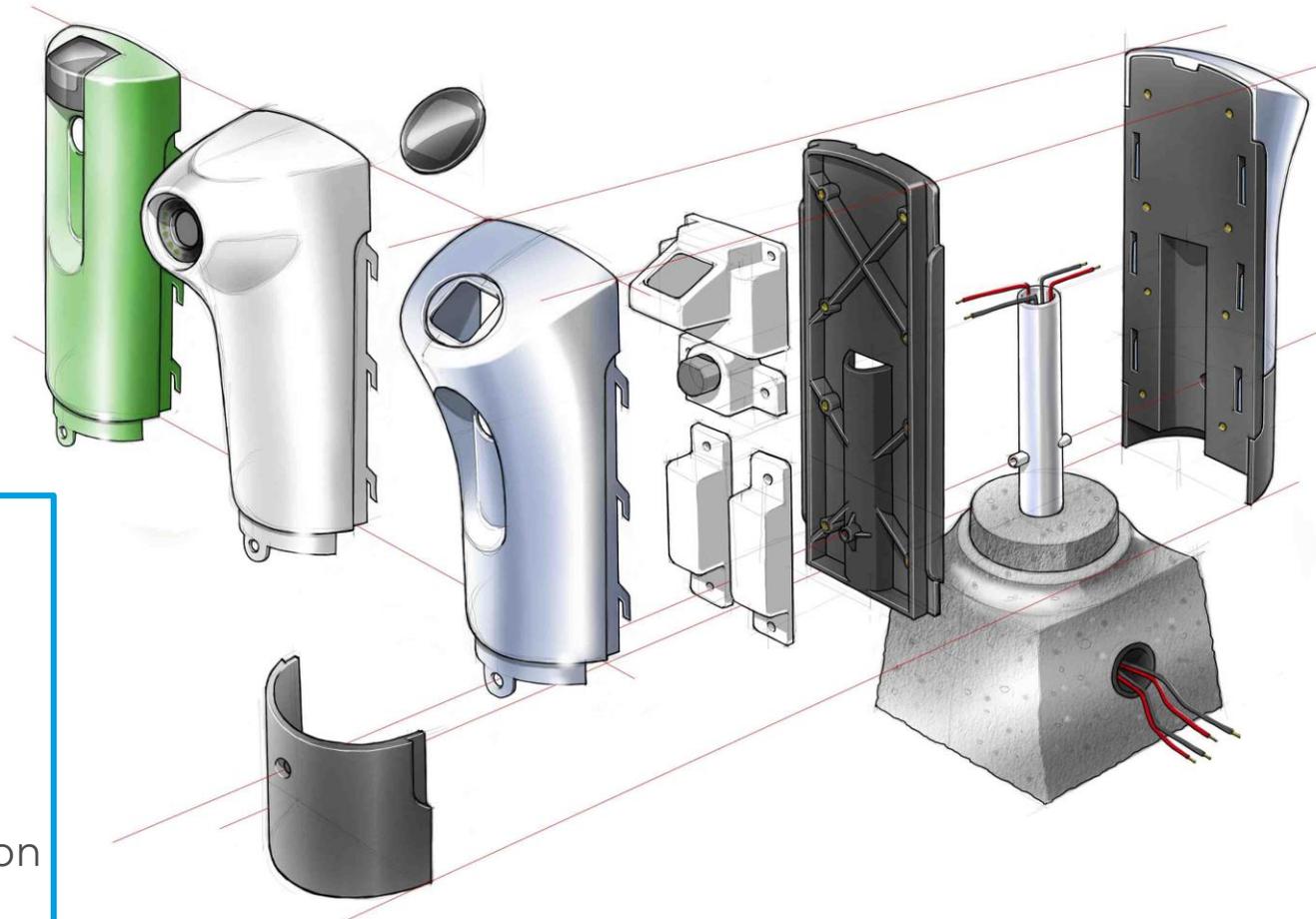
Versatile portfolio for the EV Infra Structure market.

¹ to be evaluated by customer

MATERIAL SOLUTIONS FOR EV CHARGERS

	GELOY™ resin PC+ASA	CYCOLOY™ resin PC+ABS	LEXAN™ resin PC	VALOX™ resin PBT, PC+PBT, PBT+PET	SABIC® SGF PP / STAMAX™ resin LGF PP
Flammability & Glow wire	+++	+++	+++	+++	++
Electrical	++	++	++	+++	+++
Chemical Resistance	++	+	+	++	+++
Impact Resistance at low temp	++	++	+++	+	++
UV resistance	+++	++	++	++	+
Thermal	++	++	++	+++	++
Aesthetics & colors	+++	+++	+++	++	+
Dimensional stability	+++	+++	+++	++	++

DESIGN CONCEPT FOR PUBLIC CHARGING SYSTEMS



- Design freedom
- Part consolidation
- High aesthetics
- Transparency
- Impact performance
- System cost
- Functionality integration

DESIGN CONCEPT FOR PUBLIC CHARGING SYSTEMS

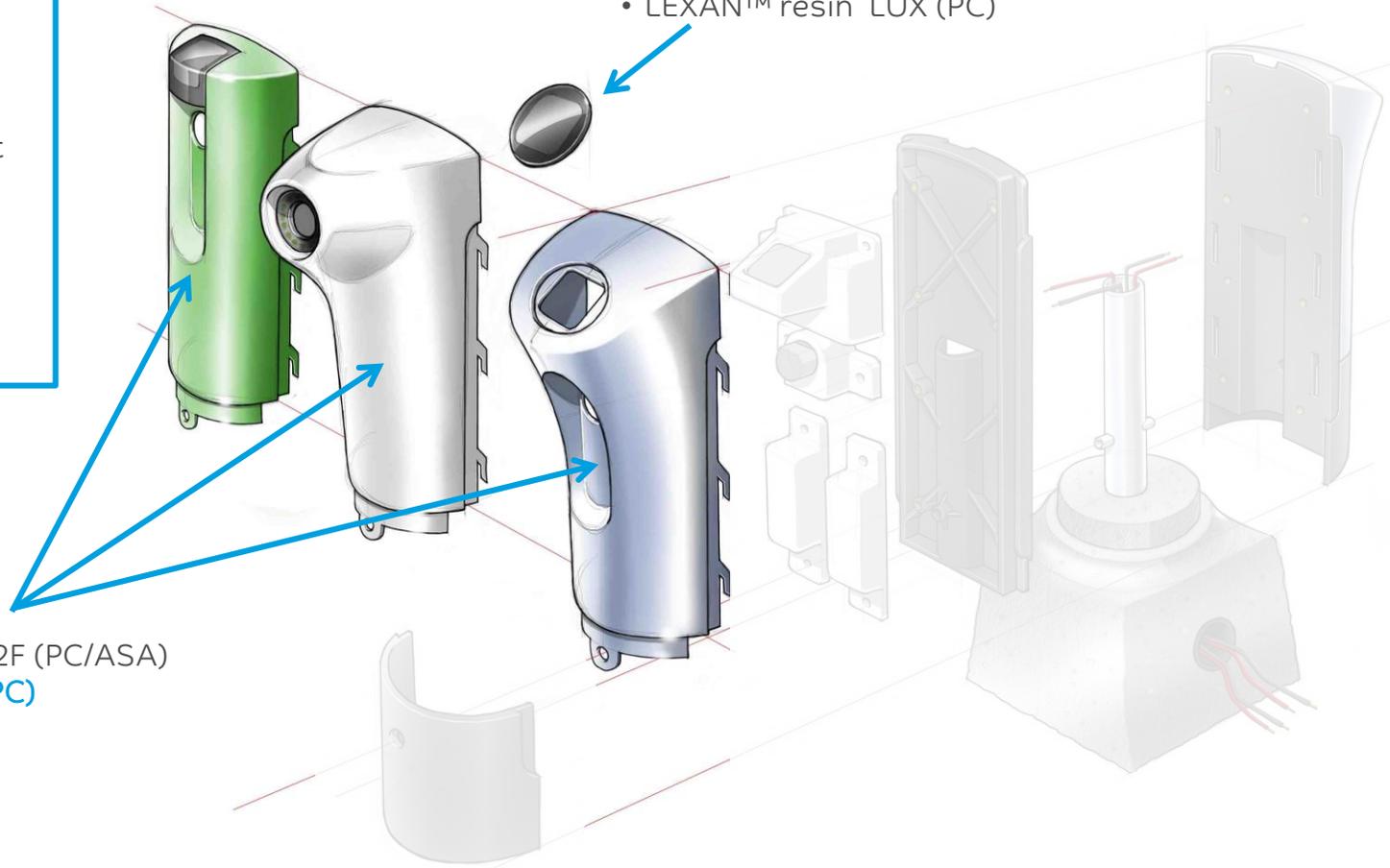
- UL746C f1
- UL94 V0 @ 1.5mm
- UL94 5VA @ 3.0mm
- CTI PLC 3
- Non Cl & Br content
- ISO179 Charpy impact at -30°C: No break (Unnotched)
- UL 746B RTI: 120°C (with impact)

Display

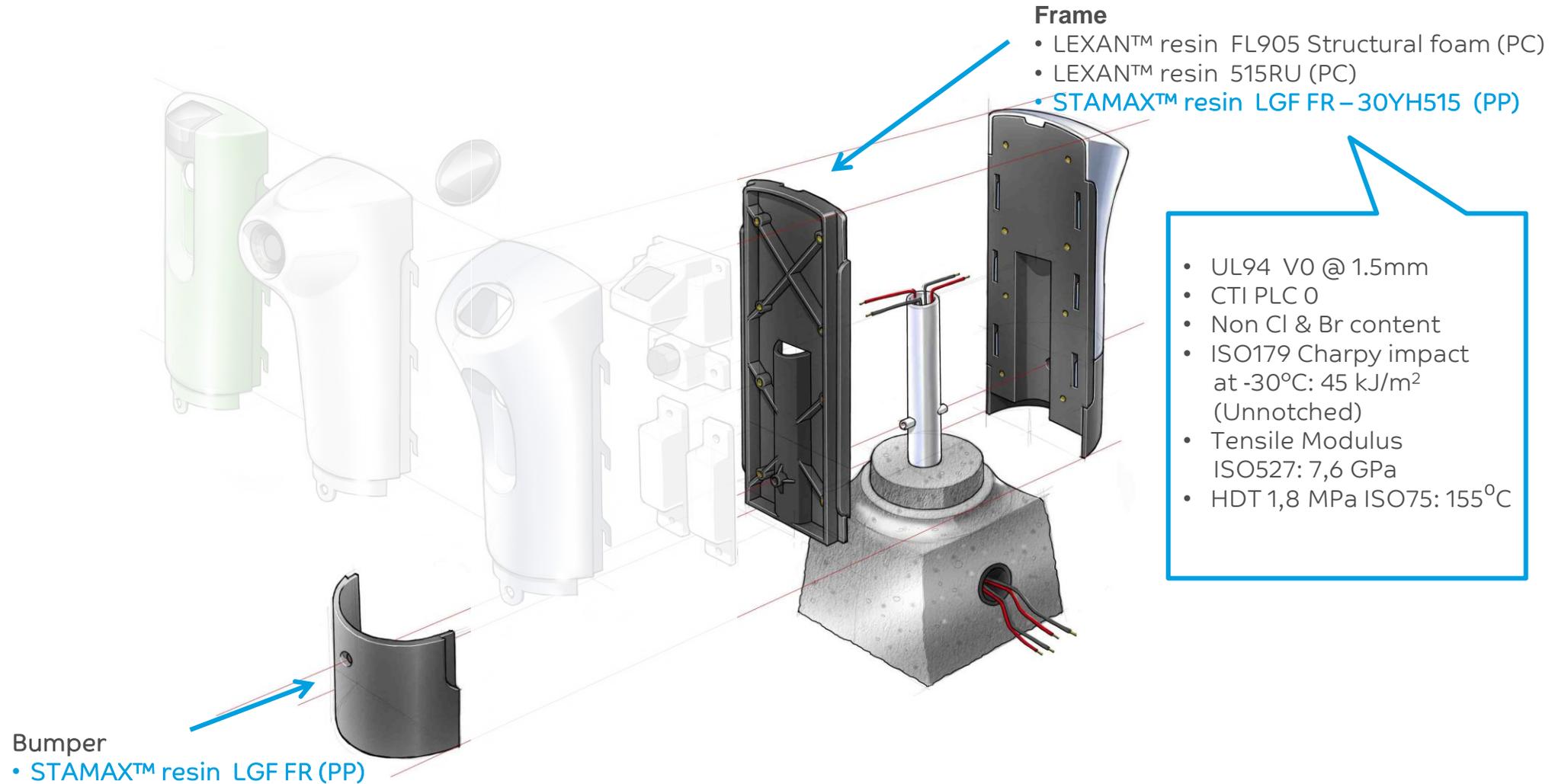
- LEXAN™ resin 945A (PC)
- LEXAN™ resin LUX (PC)

Fascia

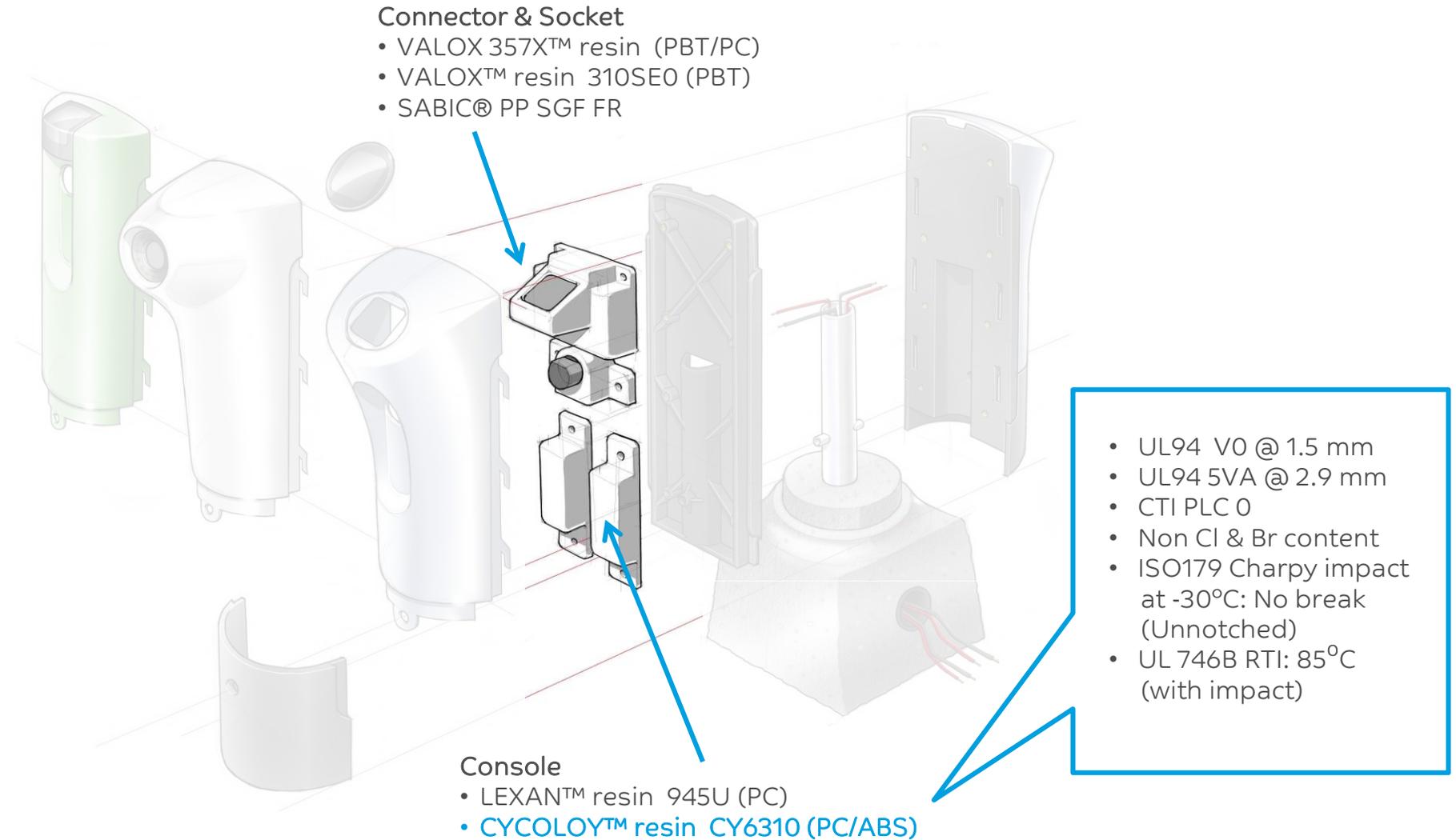
- GELOY™ resin HRA222F (PC/ASA)
- LEXAN™ resin 945U (PC)



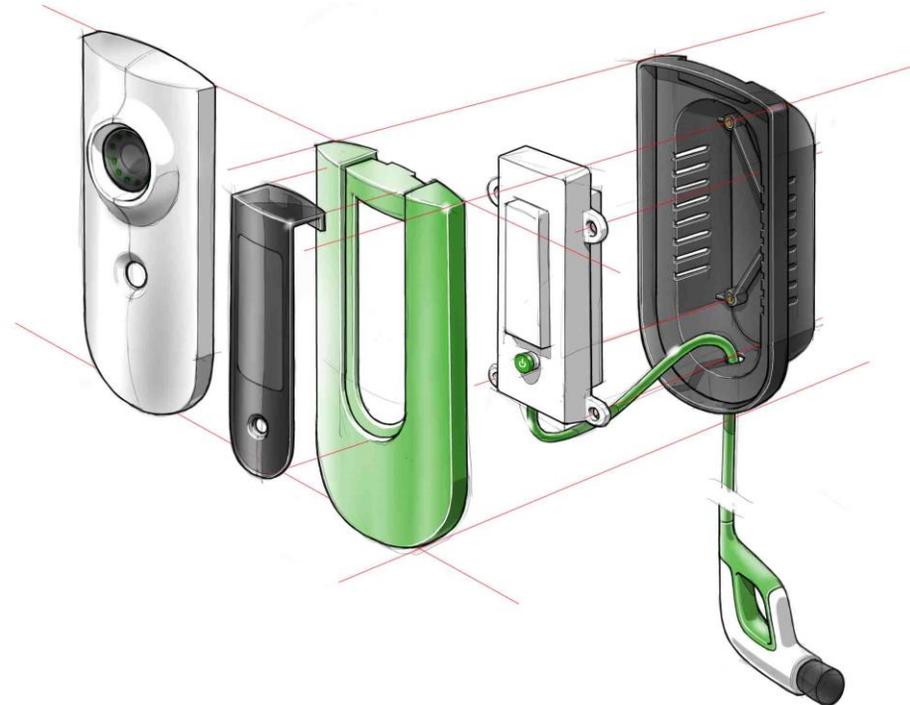
DESIGN CONCEPT FOR PUBLIC CHARGING SYSTEMS



DESIGN CONCEPT FOR PUBLIC CHARGING SYSTEMS



DESIGN CONCEPT FOR RESIDENTIAL CHARGING SYSTEMS



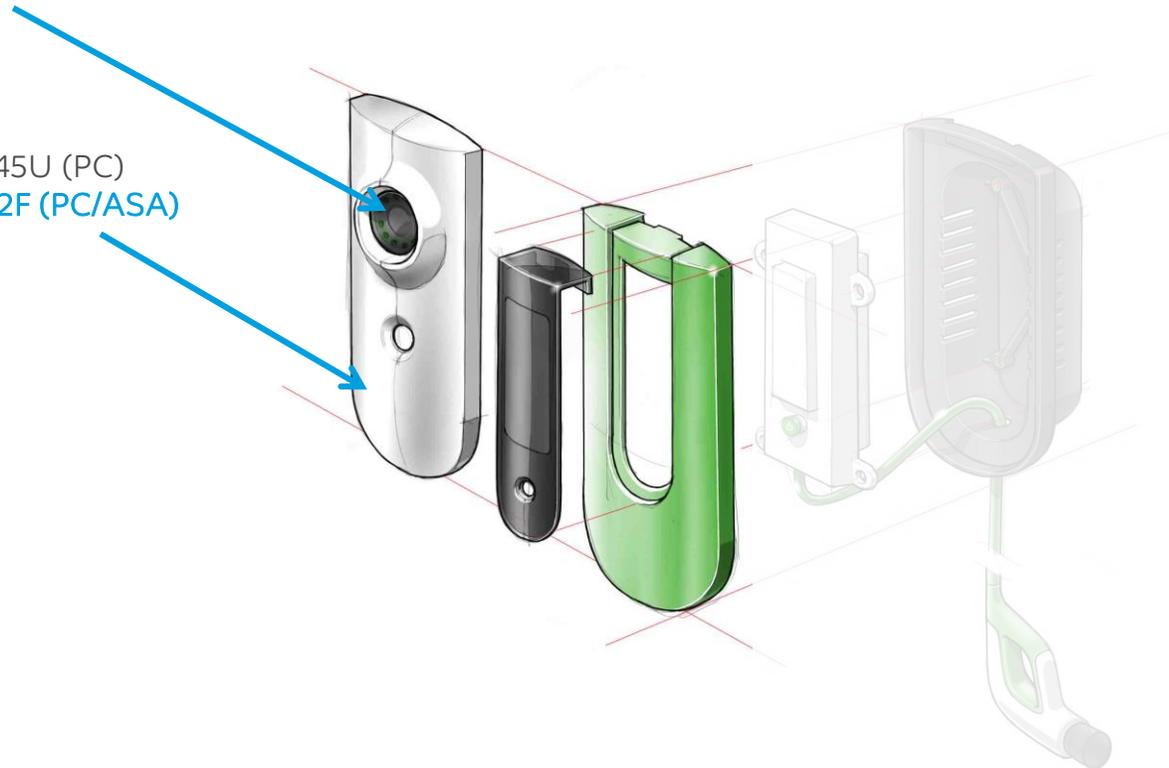
DESIGN CONCEPT FOR RESIDENTIAL CHARGING SYSTEMS

Display

- LEXAN™ resin 243R (PC)
- LEXAN™ resin LUX 2110T (PC)

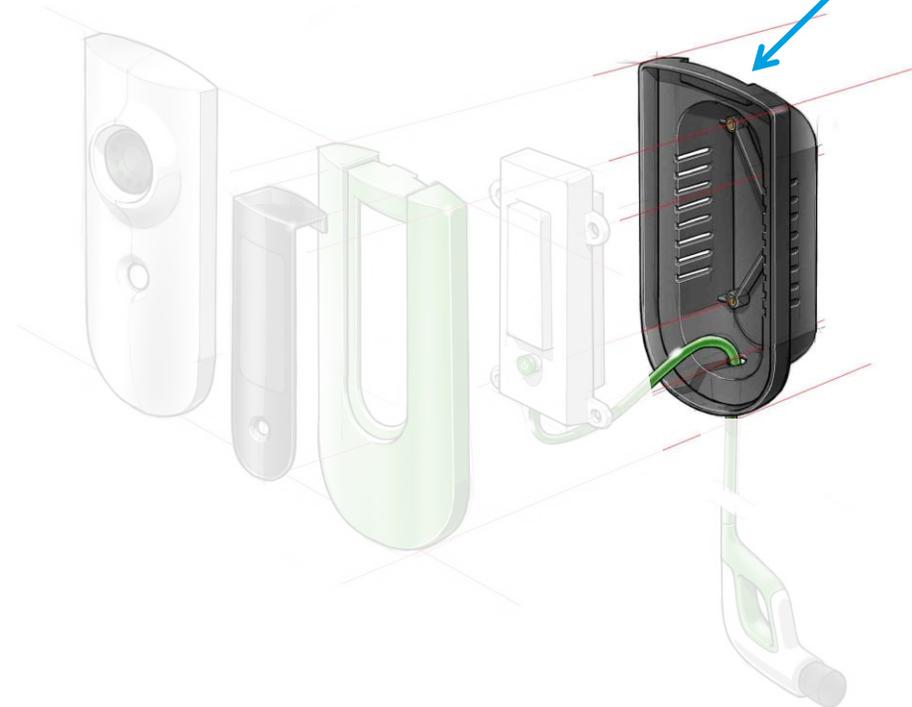
Fascia

- LEXAN™ resin 243R/945U (PC)
- GELOY™ resin HRA222F (PC/ASA)



- UL746C f1
- UL94 V0 @ 2.0mm
- CTI PLC 0
- Non Cl & Br content
- ISO179 Charpy impact at 23°C: 15 kJ/m² (notched)
- UL 746B RTI: 90°C (with impact)

DESIGN CONCEPT FOR RESIDENTIAL CHARGING SYSTEMS



Frame

- LEXAN™ resin FL905 Structural foam (PC)
- LEXAN™ resin 515RU (PC)
- STAMAX™ resin LGF FR (PP)

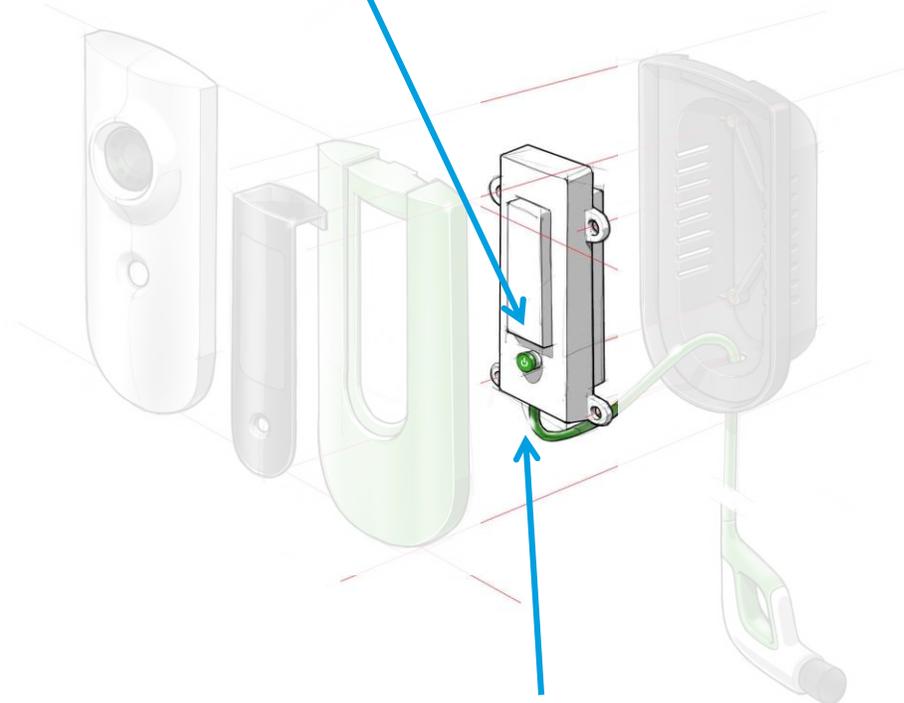
- UL94 V0 @ 3.0mm
- Non Cl & Br content
- ISO179 Charpy impact at -30°C: 313 kJ/m² (unnotched)
- HDT 1,8 MPa ISO75: 134°C

DESIGN CONCEPT FOR RESIDENTIAL CHARGING SYSTEMS

- UL94 V0 @ 1.5 mm
- UL94 5VA @ 3.0 mm
- CTI PLC 0
- Non Cl & Br content
- HDT 1,8 MPa ISO75: 148°C
- Tensile Modulus ISO527: 8,7 GPa

Connector & Socket

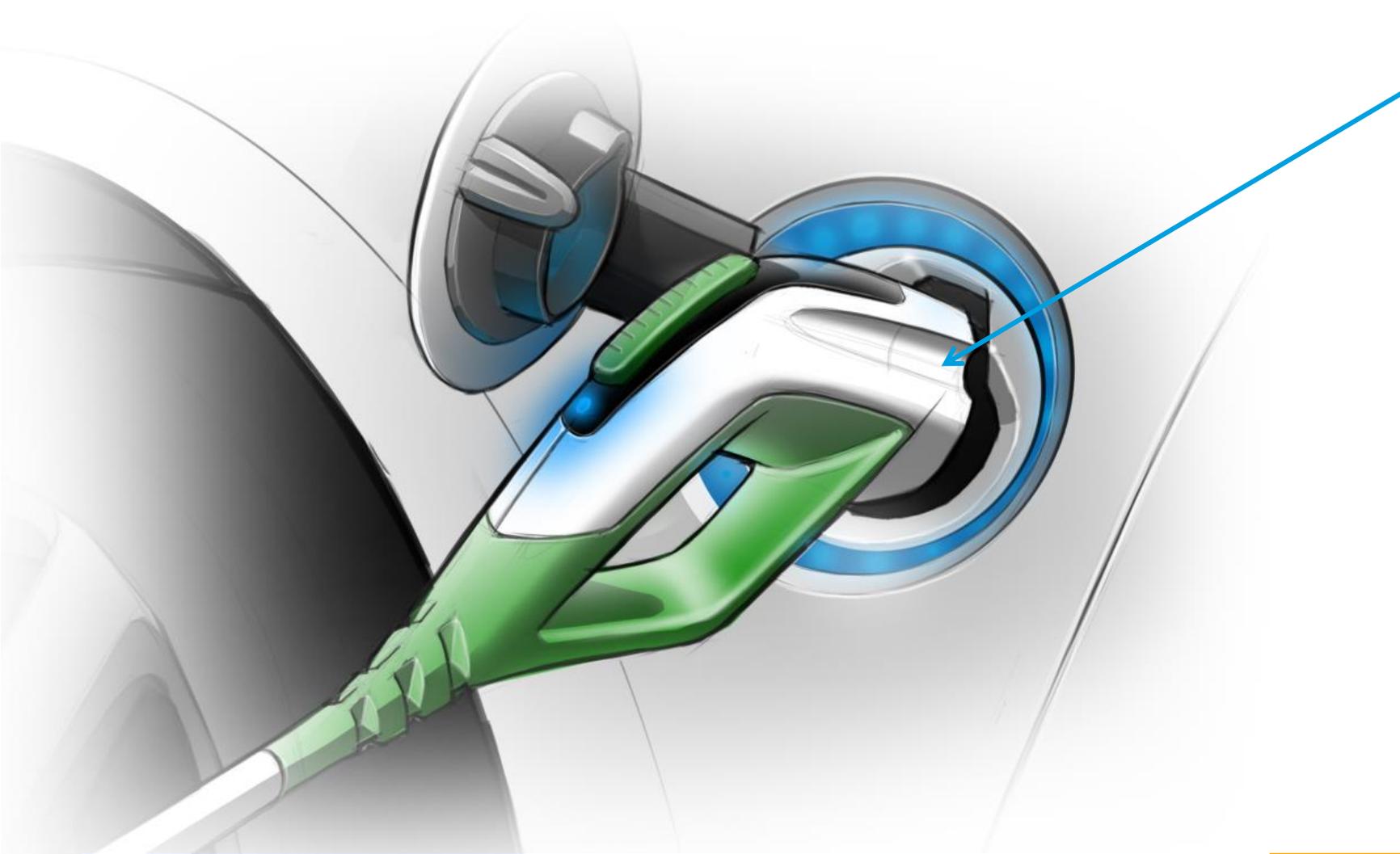
- VALOX 357X (PC/PBT)
- VALOX 310SE0 (PBT)
- **SABIC® PP SGF FR – H1030**



Console

- LEXAN 945U (PC)
- CYCOLOY CY6310 (PC/ABS)

SABIC MATERIAL OFFERING FOR PLUGS AND CONNECTORS



Connector
• VALOX™ resin 357X(U)

- UL94 V0 @ 0.75 mm
- UL94 5VA @ 2.5 mm
- UL746C f1 rating
- GWIT 825°C
- RTI 120°C
(Elec/impact/strength)
- BPT 125°C
- ISO179 Charpy Impact -30°C:
No break (Unnotched)
Passes drive over test

SABIC SOLUTIONS FOR FUTURE CHALLENGES



- More stringent legislation & requirements:
 - Flammability : UL94 5VA
 - Impact : EN62262 IK10, drive over tests
 - Electrical : CTI \leq PLC Class 3
 - Weathering : ISO4892, UL746C
 - Chemical : UL2594
 - Temperature : Long term heat resistance (RTI UL746B) $> 100^{\circ}\text{C}$

- SABIC developments to meet these challenges:
 - High impact LEXAN™ resin at sub-zero temperatures
 - LEXAN™ resin UL94 V0 all colors for thin wall developments
 - Low halogen content materials
 - Renewable materials

➤ Smart material solutions support the new developments and applications of our customers

TECHNICAL DOCUMENTS



LEXAN™ FR RESINS 945U

REGION EUROPE

DESCRIPTION

LEXAN™ 945U resin is a 10 MFR polycarbonate, MVR of 10, UV stabilized. Mold release. Non-chlorinated, non-brominated flame retardant, UL94 V0 rated. UL746C F1 rated. Available in opaque colors.

TYPICAL PROPERTY VALUES

Revision 20201125

PROPERTIES	TYPICAL VALUES	UNITS	TEST METHODS
MECHANICAL			
Tensile Stress, yield, 50 mm/min	63	MPa	ISO 527
Tensile Stress, break, 50 mm/min	60	MPa	ISO 527
Tensile Strain, yield, 50 mm/min	6	%	ISO 527
Tensile Strain, break, 50 mm/min	85	%	ISO 527
Tensile Modulus, 1 mm/min	2350	MPa	ISO 527
Flexural Stress, yield, 2 mm/min	90	MPa	ISO 178
Flexural Modulus, 2 mm/min	2300	MPa	ISO 178
Ball Indentation Hardness, H358/30	95	MPa	ISO 2039-1
IMPACT			
Izod Impact, unnotched 80°10'3 +23°C	NB	kJ/m²	ISO 180/1U
Izod Impact, unnotched 80°10'3 -30°C	NB	kJ/m²	ISO 180/1U
Izod Impact, notched 80°10'3 +23°C	70	kJ/m²	ISO 180/1A
Izod Impact, notched 80°10'3 -30°C	12	kJ/m²	ISO 180/1A
Charpy 23°C, V-notch Edgew 80°10'3 sp=62mm	73	kJ/m²	ISO 179/1eA
Charpy -30°C, V-notch Edgew 80°10'3 sp=62mm	14	kJ/m²	ISO 179/1eA
Charpy 23°C, Unnotch Edgew 80°10'3 sp=62mm	NB	kJ/m²	ISO 179/1eU
Charpy -30°C, Unnotch Edgew 80°10'3 sp=62mm	NB	kJ/m²	ISO 179/1eU
THERMAL			
Thermal Conductivity	0.2	W/m·°C	ISO 8302
CTL 23°C to 80°C, flow	7.605	1/°C	ISO 11359-2
CTL 23°C to 80°C, aflow	7.605	1/°C	ISO 11359-2
Ball Pressure Test, 125°C +/- 2°C	PA335	-	IEC 60695-10-2
Vicat Softening Temp, Rate B/50	141	°C	ISO 306
Vicat Softening Temp, Rate B/120	142	°C	ISO 306
HDT/Be, 0.45MPa Edgew 120°10'4 sp=100mm	136	°C	ISO 75/Be
HDT/Ae, 1.8 MPa Edgew 120°10'4 sp=100mm	125	°C	ISO 75/Ae
Relative Temp Index, Elec	130	°C	UL 746B
Relative Temp Index, Mech w/ Impact	120	°C	UL 746B
Relative Temp Index, Mech w/o Impact	130	°C	UL 746B
PHYSICAL			
Mold Shrinkage on Tensile Bar, flow	0.5 - 0.7	%	SABIC method
Density	1.2	g/cm³	ISO 1183
Water Absorption, (23°C)(saturated)	0.35	%	ISO 62-1
Moisture Absorption (23°C / 50% RH)	0.15	%	ISO 62

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CHEMISTRY THAT MATTERS™

Technical data sheet

UL Yellow-card

PROSPECTOR®

CLICK TO CONTINUE

The information presented on the UL Prospector datasheet was acquired by UL Prospector from the producer of the material. UL Prospector makes substantial efforts to assure the accuracy of this data. However, UL Prospector assumes no responsibility for the data values and strongly encourages that upon final material selection, data points are validated with the material supplier.

View additional material information including performance and processing data

E45329

Component - Plastics

Guide Information

SABIC INNOVATIVE PLASTICS B V

EUROPE - RESIN, PLASTICSLAAN 1, BERGEN OP ZOOM 4612 PX NL

925U(f1)(GG), 945U(f1)(GG), 955U(f1)(GG)

Polycarbonate (PC) "Lexan", furnished as pellets

Color	Min. Thk (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str
AO	1.5	V-0	3	0	130	115	125
	3.0	V-0	2	0	130	120	130
	6.0	V-0	1	0	130	120	130

Comparative Tracking Index (CTI): 3

Dielectric Strength (kV/mm): 24

High-Voltage Arc Tracking Rate (HVTR): 3

Dimensional Stability (%): 0.1

Inclined Plane Tracking (IPT) kV: -

Volume Resistivity (10⁸ ohm-cm): 15

Surface Resistivity (10⁸ ohms/square): -

High Volt, Low Current Arc Resis (D495): 7

(GG) - Denotes a global grade formulation previously in File E161759.

(f1) - Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C.

NOTE - Material designation may be followed by a color nomenclature consisting of either an alpha/numeric or a numeric/alpha combination.

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Report Date: 1977-11-21

Last Revised: 2020-06-09

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IEC and ISO Test Methods

Test Name	Test Method	Units	Thk (mm)	Value
Flammability	IEC 60695-11-10	Class (color)	1.5	V-0 (AO)
			3.0	V-0 (AO)
			6.0	V-0 (AO)
Glow-Wire Flammability (GWFI)	IEC 60695-2-12	°C	1.5	960
			3.0	960
			6.0	960
			1.5	800
Glow-Wire Ignition (GWIT)	IEC 60695-2-13	°C	3.0	850
			6.0	850
			1.5	-
IEC Comparative Tracking Index	IEC 60112	Volts (Max)	-	-
IEC Ball Pressure	IEC 60695-10-2	°C	-	-
ISO Heat Deflection (1.80 MPa)	ISO 75-2	°C	-	-
ISO Tensile Strength	ISO 527-2	MPa	-	-
ISO Flexural Strength	ISO 178	MPa	-	-
ISO Tensile Impact	ISO 8256	kJ/m²	-	-
ISO Izod Impact	ISO 180	kJ/m²	-	-
ISO Charpy Impact	ISO 179-1	kJ/m²	-	-

POLL QUESTION 3

WHICH SOURCE DO YOU PREFER TO USE TO SELECT A POLYMER PRODUCT FOR DEVELOPING A EVSE APPLICATION?

- a. Material supplier
 - b. Material search platforms
 - c. Direct contact current supplier
 - d. Ask mold maker/machine manufacturer for recommendation
-

SABIC'S COMMITMENT TO SUSTAINABILITY

LINKING UN SDG'S TO SABIC'S TOP SUSTAINABILITY PRIORITIES

Resource Efficiency

SABIC's ambitious goals are to reduce Material Loss intensity 50% and Water Intensity 25% by 2025 since 2010.



Innovation & Sust. Solutions

Sustainability is the guiding light for SABIC's product and process innovation – to support the development of effective solutions to some of the world's greatest challenges.



Climate Change & Energy

SABIC's ambitious goals are to reduce GHG and energy intensity 25% by 2025, from 2010 levels.



Circular Economy

Circular economy inspires SABIC to adapt our processes to the use of renewable and recycled feedstock, and to create durable, recyclable product design solutions for our customers.



Environment, Health, Safety

SABIC is committed to our core EHSS values, with a supportive culture and focus on continuous performance improvement.



Governance & Integrity

Integrity is a core value and helps to maintain stakeholder trust. SABIC's Code of Ethics provides guidance to meet stakeholder expectations.



LINKING UN SDG'S TO SABIC'S TOP SUSTAINABILITY PRIORITIES

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Sustainability is the guiding light for SABIC's product and process innovation – to support the development of effective solutions to some of the world's greatest challenges.



TRUCIRCLE™ trademark has been introduced as an umbrella to collectively showcase SABIC's existing and new circular solutions and initiatives

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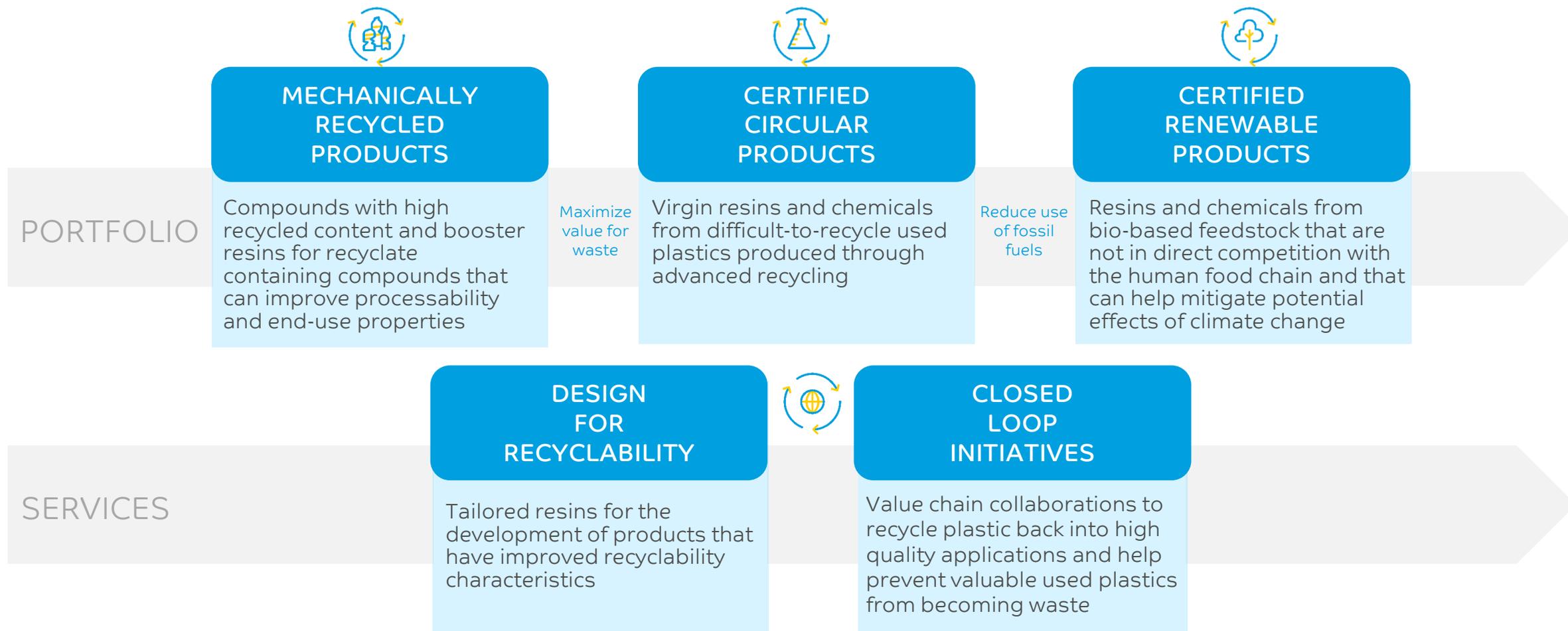


Governance & Integrity

Integrity is a core value and helps to maintain stakeholder trust. SABIC's Code of Ethics provides guidance to meet stakeholder expectations.



SABIC'S TRUCIRCLE™ PROGRAM – COMPLEMENTARY SOLUTIONS



WORKING SIDE BY SIDE WITH PARTNERS ACROSS THE ENTIRE VALUE CHAIN TO DEVELOP CIRCULAR SOLUTIONS AND FULFILL SABIC'S AMBITION FOR A NEW PLASTIC ECOSYSTEM

BIO-BASED FEEDSTOCK USED BY SABIC



Bio-based feedstock used by SABIC:

CRUDE TALL OIL

- Derived from forestry residue
- Replacing fossil based feedstock e.g. naphtha
- Second generation renewable feedstock not in competition with the human food chain
- Animal free feedstock
- Palm oil free feedstock
- Lower carbon footprint compared to fossil alternative
- ISCC PLUS certified value chains

SABIC'S CERTIFIED RENEWABLE POLYCARBONATE



➤ All players in the value chain have to be ISCC certified

SABIC'S POLYCARBONATE BASED ON CERTIFIED RENEWABLE FEEDSTOCK



61% CO₂ FOOTPRINT REDUCTION
FOR EACH KG OF POLYCARBONATE
BASED ON CERTIFIED RENEWABLE
FEEDSTOCK

WITH FOSSIL DEPLETION REDUCTION
POTENTIAL OF UP TO 35%

SABIC'S SUSTAINABILITY YOU TUBE CHANNEL

NEW SABIC'S POLYCARBONATE BASED ON CERTIFIED RENEWABLE FEEDSTOCK

<https://youtu.be/2F8bAteNkP4>

TRUCIRCLE™ SOLUTIONS PERSONAL AND PROFESSIONAL HYGIENE APPLICATIONS

<https://www.youtube.com/watch?v=sH7h0kkWrwE>

CLOSED LOOP COLLABORATION

= animation to explain closed loop initiative with Tesco

<https://www.youtube.com/watch?v=5NVEMplvi5Y>

SABIC TRUCIRCLE™ ANIMATION

= short introduction to TRUCIRCLE™ initiatives

<https://www.youtube.com/watch?v=AlcCUCmGrmg>

SABIC TF BOPE POLYMER

<https://youtu.be/z5q3NxrBoeA>

SABIC'S CERTIFIED CIRCULAR POLYMERS FROM MIXED PLASTIC WASTE

https://www.youtube.com/watch?v=qf_4jxcP2sY

SABIC – MASS BALANCE METHOD

<https://www.youtube.com/watch?v=-imvDD6i6Lo>

TRUCIRCLE™ - THE JOURNEY SO FAR

<https://youtu.be/wYK5JW6gegs?list=PLvrbA1nA2I8oQYw0o-xq16Qou4cNLeU69>

SABIC'S CERTIFIED CIRCULAR PRODUCTS THROUGH FEEDSTOCK RECYCLING

= attractor film from booth at K-show

<https://www.youtube.com/watch?v=REamRj4xXPp>

SABIC'S CERTIFIED CIRCULAR PRODUCTS FROM MIXED PLASTIC WASTE

= 2D animation movie explaining advanced recycling

<https://www.youtube.com/watch?v=WbEh2NtLrb0>



<https://www.youtube.com/c/SABIC/featured>

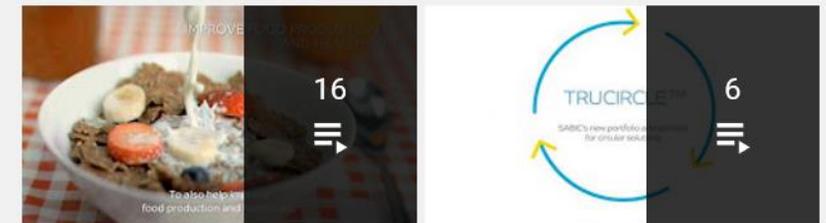
TRUCIRCLE PLAYLIST

OR

SUSTAINABILITY & CIRCULARITY PLAYLIST

<https://www.youtube.com/playlist?list=PLvrbA1nA2I8oQYw0o-xq16Qou4cNLeU69>

Sustainability & Circularity



Sustainability

SABIC

Updated yesterday

VIEW FULL PLAYLIST

TRUCIRCLE™

SABIC

VIEW FULL PLAYLIST

POLL QUESTION 4

WHAT IS THE PRIMARY CRITERIA WHEN YOU SELECT A MATERIAL FOR YOUR APPLICATIONS, IN ADDITION TO THE PROPERTIES?

- a. Supplier support
 - b. Sustainability
 - c. Price
 - d. Global availability
-

HOW SABIC CAN SUPPORT YOUR DEVELOPMENT

- Broad material portfolio covering application requirements
- Innovation in material development to prepare for future needs
- Technical support for application development.
- Sustainable portfolio in circular, renewable and mechanical recycling
- Technical documentation and moldflow .udb files for simulation.
- www.sabic.com for more information.



OTHER AVAILABLE INFORMATION

PLEASE CONTACT OUR TEAM OR YOUR SABIC COMMERCIAL REPRESENTATIVE FOR:

- > DATASHEETS
- > CERTIFICATIONS
- > PRODUCT INFORMATION
- > BROCHURES
- > SAMPLES



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WE LOOK FORWARD TO WORKING WITH YOU!

BROCHURES



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Q&A

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THANK YOU



ANNEX

GLOSSARY TERMS

Term	Definition
A	Ampere
AC EV charging station	EV charging station that supplies alternating current to an EV
AC EV supply equipment	EV supply equipment that supplies alternating current to an EV
Cable management system	Device which is intended to protect a cable assembly from mechanical damage and/or to facilitate its handling
CCS	Combined Charging System
Charging	All functions necessary to condition voltage and/or current provided by the AC or DC supply network to assure the supply of electric energy to the RESS
Charging mode	Method for connection of an EV to the supply network to supply energy to the vehicle
COMBO: Combined Charging System or CCS	Combined Charging System or CCS
Connecting point	Point where one electric vehicle is connected to the fixed installation
DC EV charging station	EV charging station that supplies direct current to an EV
DC EV supply equipment	EV supply equipment that supplies direct current to an EV
ECV	Electrical Chargeable Vehicles
Electric vehicle	Any vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable using energy from a source off the vehicle such as residential or public electric service), which is manufactured primarily for use on public streets, roads or highways
Electric vehicle connector	Part of a vehicle coupler integral with, or intended to be attached to, one flexible cable
Electric vehicle coupler	Means enabling the connection at will of a flexible cable to an electric vehicle
Electric vehicle inlet	Part of a vehicle coupler incorporated in, or fixed to, the electric vehicle
Electric Vehicle Supply Equipment	Conductors, including the phase, neutral and protective earth conductors, the electric vehicle couplers, attachment plugs, and all other accessories, devices, power outlets or apparatuses installed specifically for the purpose of delivering energy from the premises wiring to the electric vehicle and allowing communication between them if required
EV	Electrical Vehicle
EV charging station	stationary part of EV supply equipment connected to the supply network
EV charging system	complete system including the EV supply equipment and the EV functions that are required to supply electric energy to an EV for the purpose of charging
EV supply equipment	equipment or a combination of equipment, providing dedicated functions to supply electric energy from a fixed electrical installation or supply network to an EV for the purpose of charging

GLOSSARY TERMS

Term	Definition
EVSE	Electical Vehicle Supply Equipment
Hz	Hertz
ICCB	In-Cable Control Box
IC-CPD	In-Cable Control and Protection Device
IC-CPD	In-Cable Control and Protective Device
ICE	Internal Combustion Engine
In-Cable Control and Protective Device	an assembly for supplying electric vehicles in charging mode 2, which performs control functions and safety functions.
In-Cable Control Box	Device which is incorporated in the cable assembly and which performs control functions
Insulated end cap	Part made of insulating material, located at the tip of a contact, ensuring a protection against access to hazardous parts with a standard test finger (IPXXB)
Interlock	Device or combination of devices that prevents the power contacts of a socket-outlet/vehicle connector from becoming live before it is in proper engagement with a plug/vehicle inlet, and which either prevents the plug/vehicle connector from being withdrawn while its power contacts are live or makes the power contacts dead before separation
Ip ^{xxx}	Degrees of protection against access to hazardous-live-parts (3 rd x suffix: against to hazardous parts with: a: back of the hand; b: finger; c: tool; d: wire)
Latching device	Part of the interlock mechanism provided to hold a plug in the socket-outlet or to hold a vehicle connector in the vehicle inlet and to prevent its intentional or unintentional withdrawal
Lid	Means to ensure the degree of protection on an accessory
Locking mechanism	Means intended to reduce the likelihood of tampering with, or an unauthorised removal, of the accessories
PCP	Public Charging Points
Plug	Part of a plug and a socket-outlet integral with or intended to be attached to one flexible cable connected to the electric vehicle or to a vehicle connector
Rated operating voltage	Nominal voltage of the supply(ies) for which the pole of the accessory is intended to be used
Shutter	Movable part incorporated into an accessory arranged to automatically shield at least the live contacts when the accessory is withdrawn from the complementary accessory
Socket-outlet	Part of a plug and a socket-outlet intended to be installed with the fixed wiring or incorporated in equipment
Terminal	Conductive part provided for the connection of a conductor to an accessory
V	Voltage
Vehicle connector electric vehicle connector	Part of a vehicle coupler integral with, or intended to be attached to the cable assembly
Vehicle coupler electric vehicle coupler	Means of enabling the connection at will of a flexible cable to an electric vehicle
Vehicle inlet electric vehicle inlet	Part of a vehicle coupler incorporated in, or fixed to, the electric vehicle