EVC

Electric Vehicle Charging

Infrastructure Cable Solutions

Top Cable

Top Cable EVC **infrastructure cable solutions**

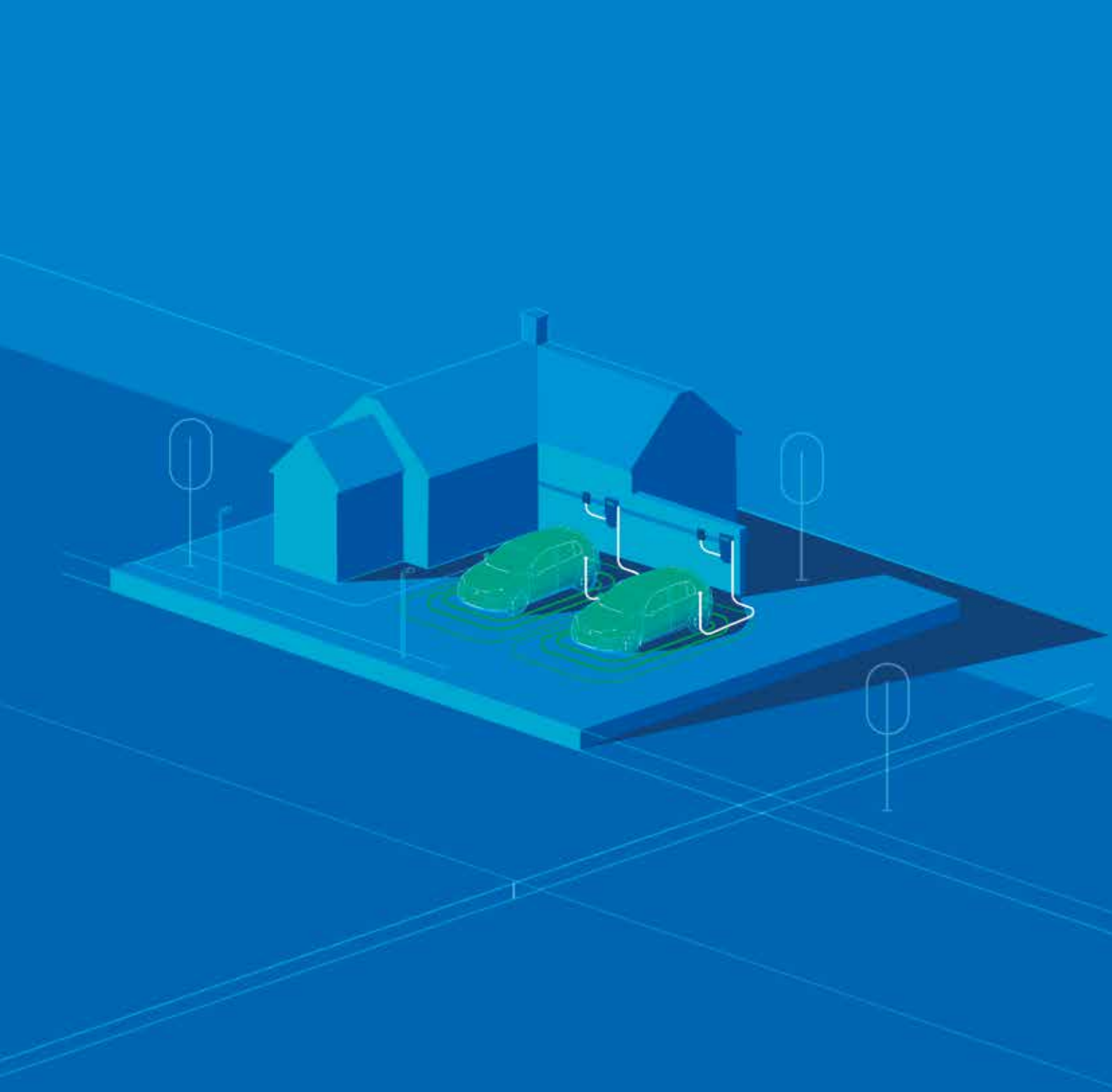
Charging cables for electric vehicles are now covered under the new European Standard EN50620.
Top Cable EVC cables are approved in accordance with the EN50620 and IEC 62893.

Top Cable EVC range of cables have been designed and manufactured specifically to power efficiently for Electric Vehicles Charging Stations installed on both residential and/or commercial buildings such as:

- Electric vehicle charging stations.
- Public parking in cities, airports, train stations, etc.
- Parking in shopping centers, hotels, supermarkets, etc.
- Parking in office buildings, industrial companies.
- Private parking in residential buildings.

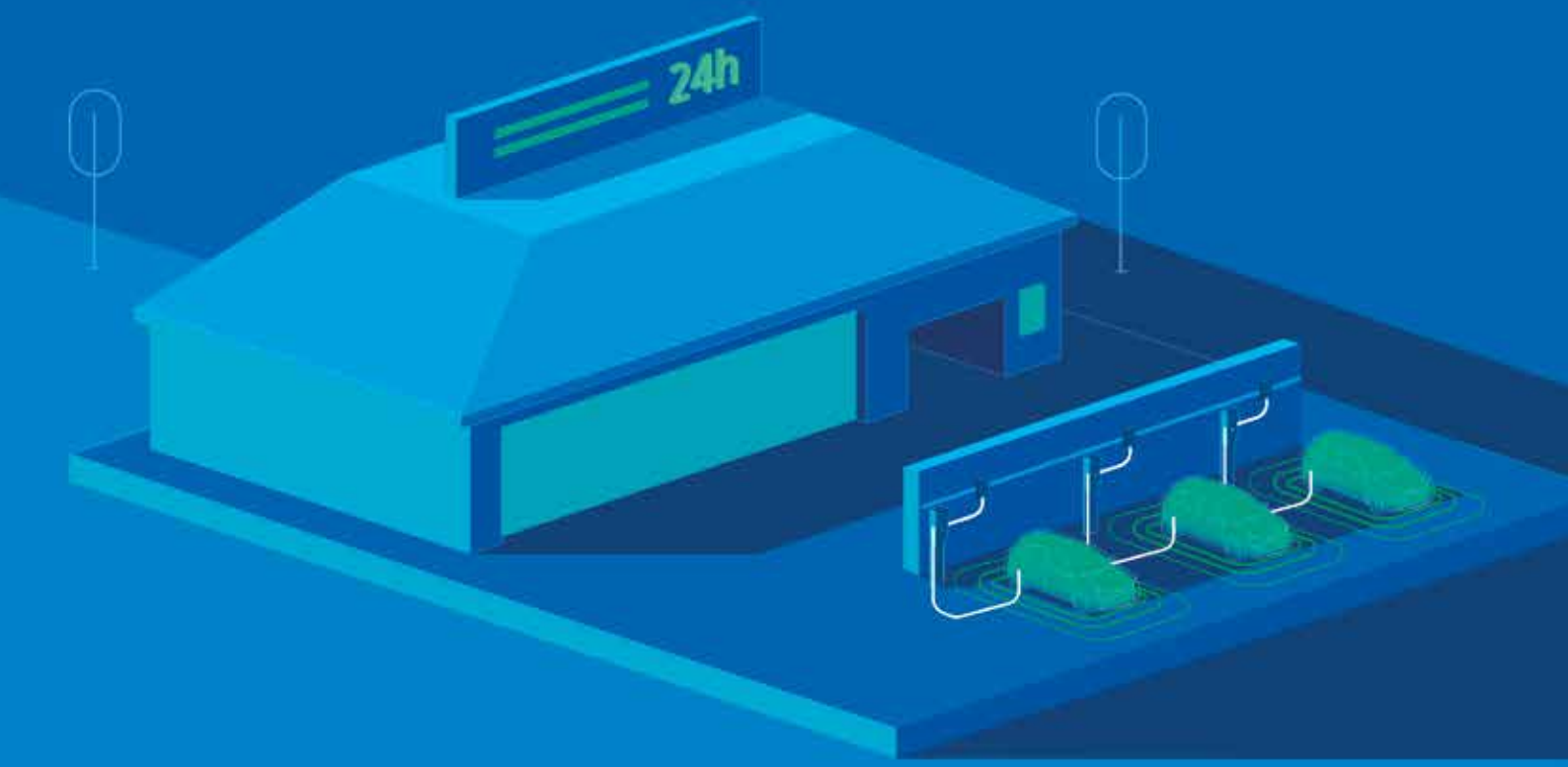
The correct power supply is the main application to a functional EVC system. Ease of use, reliability, flexibility and optimum cost-effectiveness are the main requirements of builders and investors as far as EVC infrastructure cables are concerned.

Top Cable EVC cable are designed to optimize and improve the efficiency and profitability for your EVC installation. They are the most efficient solution for the environment today and thus allowing for growth and advancement for future EVC technology. Because it all starts with choosing the best performance EVC cable.

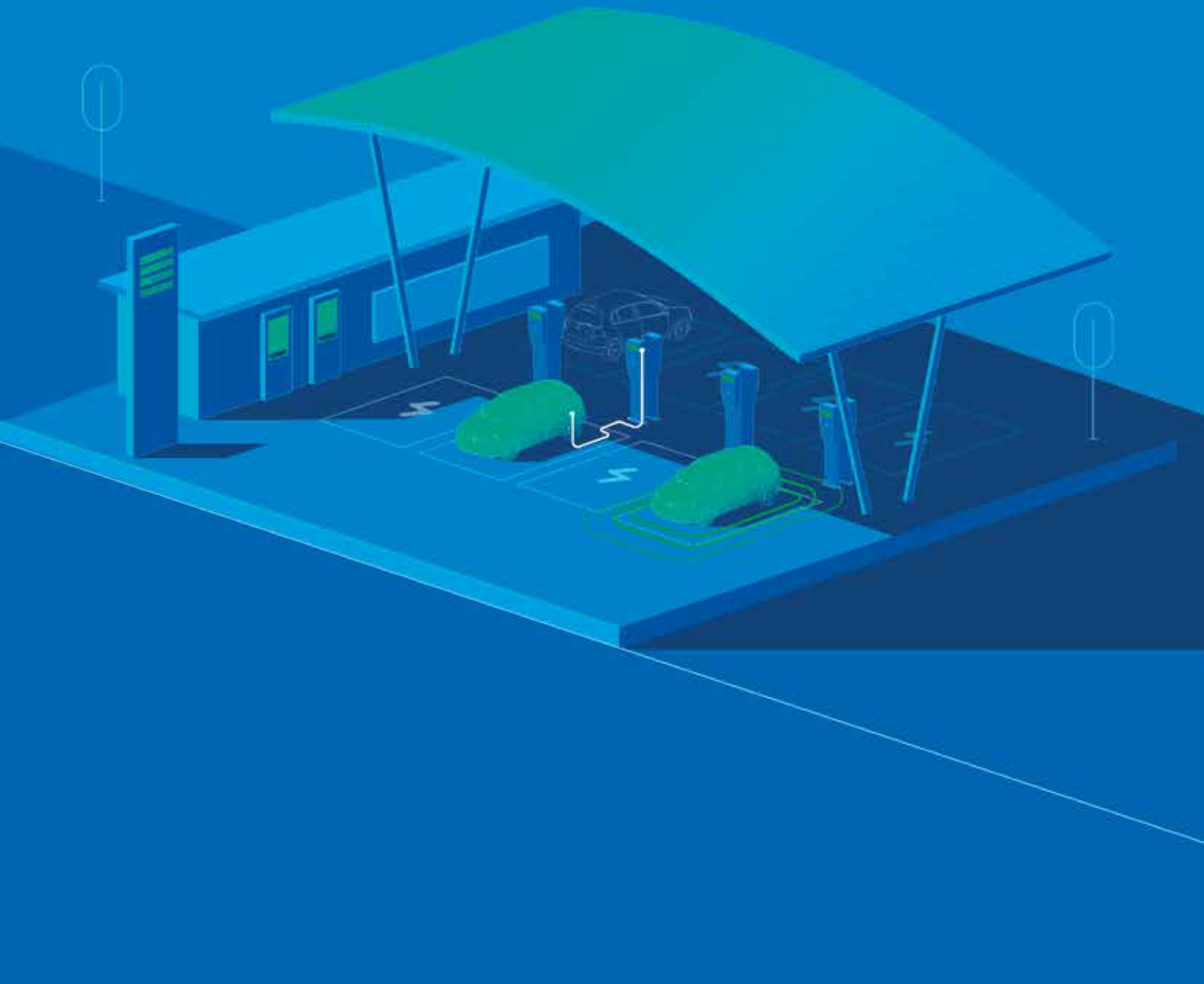


Cable infrastructure for private parking in residential buildings

Cable infrastructure for public parking in shopping centers, supermarkets, office buildings, airports, etc.



Cable infrastructure for Electric Vehicle Charging stations



Electric vehicle
Charging (EVC) Cables

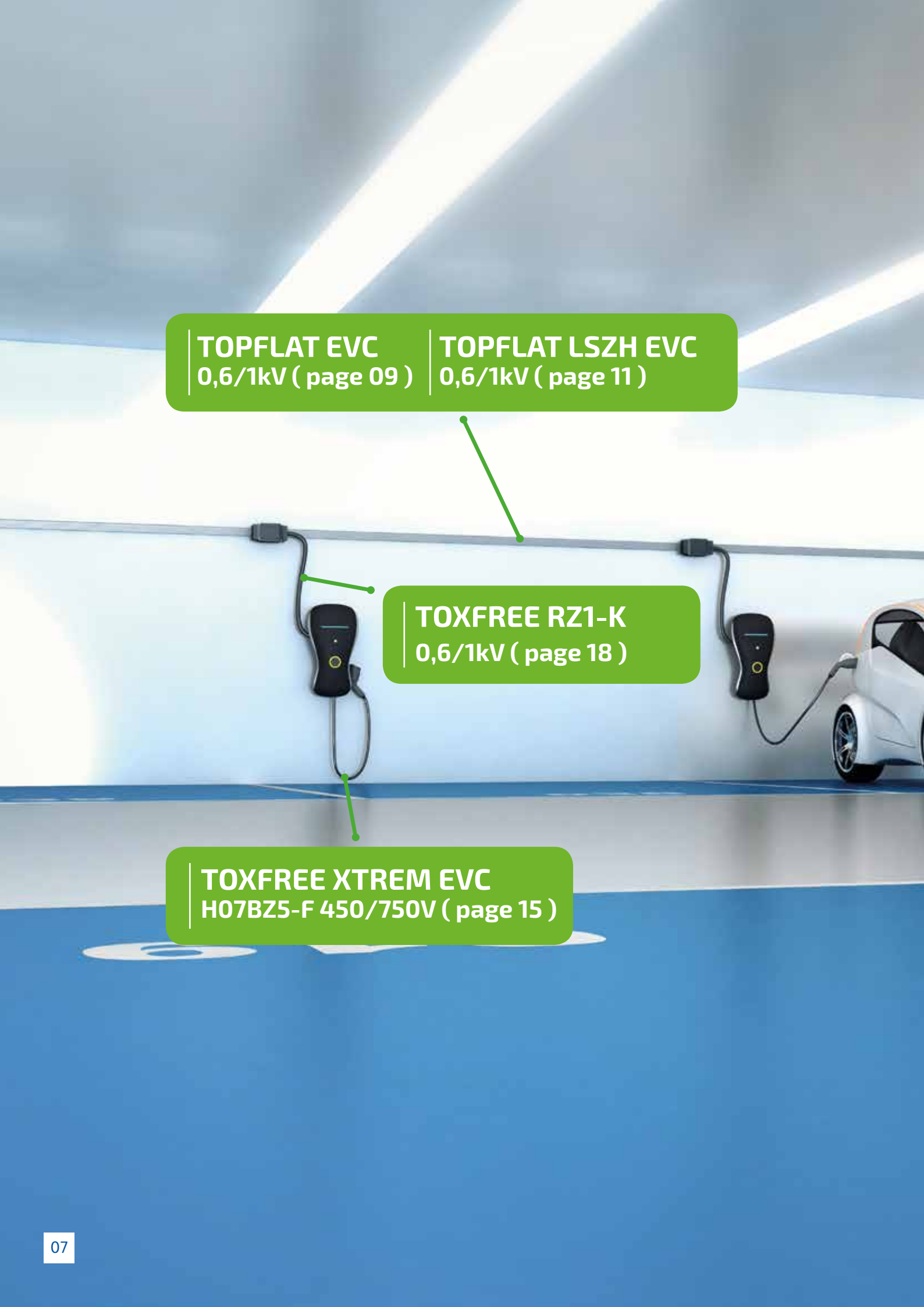
The demand for electric vehicles and a target for zero emission will have significant growth impact in the coming years.

Global electric car stock is expanding rapidly, crossing the 3 million vehicle threshold in 2018. Sales of new electric cars worldwide surpassed 1 million units in 2018 – a record volume. This represents a growth in new electric car sales of 54% compared with previous years.

The demand for electric vehicles is still largely driven by the policy environment. For instance, electric cars accounted for 39% of new car sales in Norway in 2018 – the world's most advanced market of electric cars in terms of sales share.

A growing number or governments are setting objectives for EV deployment, providing increasingly clear signals to manufacturers and other industrial stakeholders, building confidence on the future policy framework and enabling the mobilization of investment.

With growing consumer acceptance of electric vehicles, the time now is for building owners to decide if they want to take the wheel and install EVC charging infrastructure that is flexible and extendable, as needs in charging stations evolve.


TOPFLAT EVC
0,6/1kV (page 09)
TOPFLAT LSZH EVC
0,6/1kV (page 11)
TOXFREE RZ1-K
0,6/1kV (page 18)
TOXFREE XTREM EVC
H07BZ5-F 450/750V (page 15)


Top Cable
3526 EVC
2020 EVC

TOPFLAT EVC
0,6/1kV

Flat flexible cable for electric vehicle charging infrastructure.

DESIGN

Conductor

Electrolytic copper conductor, class 5 (flexible) based on EN 60228/ IEC 60228.

Insulation

PVC.

Assembly of cores

The cores are parallel in only one layer, forming a flat cable. Colours and position are the following: brown + blue + green/yellow + black + grey.

Outer sheath

PVC outer sheath, grey colour.

APPLICATIONS

Flat flexible cable for EVC infrastructure in parkings. For residential or corporate electric vehicle charging installations. The flat cable system allows you a hassle-free installation & easy expansion, all along the installed length of the cable. The electrician simply connects the new charging stations to the existing infrastructure.

CHARACTERISTICS

Technical Properties

Nominal voltage: 0,6/1 kV.
Maximum conductor temperature: 70 °C.
Minimum service temperature: -15 °C .
Maximum short-circuit temperature: 160 °C (maximum 5 s.).
Minimum bending radius: 5 x smaller dimension.
No flame propagation: according to EN 60332-1/ IEC 60332-1
CPR Construction Products Regulation.

Nominal current-carrying capacities

The table shows the current-carrying capacities and voltage drop detailed for every cable. Current-carrying capacities, in amperes, are calculated according to IEC 60364-5-52, and for the following conditions:

• Open air installation: one vertical cable with adequate ventilation and ambient temperature of 30°C (referent method F).
• Supposed three-phase circuit.

For conditions other than this, please apply the adequate correction factors. Voltage drop, in volts per ampere and km, is the maximum that may occur. It is calculated for the maximum service and for cos phi = 1.

Cross Section (mm2)	Open Air Intensity (A)	Voltage drop (V/A km)
5G16	90	2,51

DIMENSIONS

The current Table shows nominals dimensions and weight detailed for every cable.

Cross Section (mm2)	Open Air Intensity (A)	Weight (kg/km)
5G16	48,2 x 12	1.330-1.370

COMPATIBILITY

Cable compatible with all major flat connection modules.

See more technical data on the particular cable specification. Top Cable reserves the right to carry out any modification to the data sheets whatsoever without giving previous notice.
For more information please contact: sales@topcable.com

TOPFLAT LSZH EVC 0,6/1kV

Flat LSZH flexible cable for electric vehicle charging infrastructure.

DESIGN

Conductor

Electrolytic copper conductor, class 5 (flexible) based on EN 60228/ IEC 60228.

Insulation

XLPE.

Assembly of cores

The cores are parallel in only one layer, forming a flat cable. Colours and position are the following: brown + blue + green/yellow + black + grey.

Outer sheath

Low Smoke Zero Halogen (LSZH) polyolefin outer sheath. Grey colour, non toxic and fire retardant.

APPLICATIONS

Flat LSZH flexible cable for EVC infrastructure in parkings. For residential or corporate electric vehicle charging installations. The flat cable system allows you a hassle-free Installation & easy expansion, all along the installed lenght of the cable. The electrician simply connects the new charging stations to the existing infrastructure.

CHARACTERISTICS

Technical Properties

Nominal voltage: 0,6/1 kV.
Maximum conductor temperature: 90 °C.
Minimum service temperature: -40 °C.
Maximum short-circuit temperature: 250 °C (maximum 5 s.).
Minimum bending radius: 5 x smaller dimension.
No flame propagation: according to EN 60332-1/ IEC 60332-1
CPR Construction Products Regulation.

Nominal current-carrying capacities

The table shows the current-carrying capacities and voltage drop detailed for every cable. Current-carrying capacities, in amperes, are calculated according to IEC 60364-5-52, and for the following conditions:

• Open air installation: one vertical cable with adequate ventilation and ambient temperature of 30°C (referent method F).
• Supposed three-phase circuit.

For conditions other than this, please apply the adequate correction factors. Voltage drop, in volts per ampere and km, is the maximum that may occur. It is calculated for the maximum service and for cos phi = 1.

Cross Section (mm2)	Open Air Intensity (A)	Voltage drop (V/A km)
5G16	110	2,68
5G25	141	1,73

DIMENSIONS

The current Table shows nominals dimensions and weight detailed for every cable.

Cross Section (mm2)	Open Air Intensity (A)	Voltage drop (V/A km)
5G16	48,2 x 12	1.250-1.290
5G25	48,2 x 12	1.555-1.595

COMPATIBILITY

Cable compatible with all major flat connection modules such as:

See more technical data on the particular cable specification. Top Cable reserves the right to carry out any modification to the data sheets whatsoever without giving previous notice.
For more information please contact: sales@topcable.com

TOXFREE XTREM EVC
DC 1.000 V

Flexible halogen free cable for DC fast charging stations.

DESIGN

Conductor

Electrolytic copper conductor, class 5 (flexible) based on EN 60228/ IEC 60228.

Insulation

Cross-linked halogen free compound, type EVI-2 according to EN 50620.

The standard identification of insulated conductors is the following:

2x + 1G + 3x2xblack + red + yellow/green + blue-orange,grey-brown and white-violet (control conductors, with non-wowen tape longitudinally applied over the pairs).

Assembly of cores

The cores are twisted together

Outer sheath

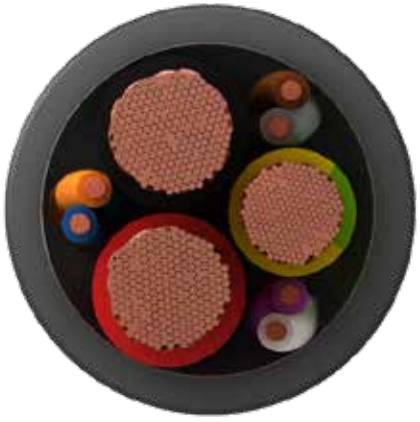
TPU elastomer compound outer sheath, type EVM-1 according to EN 50620, black colour. Other outer sheath colours available upon request.

APPLICATIONS

This halogen free flexible cable has been specially designed for the DC charging of EVC, connecting the electricity supply point to the charging station.

The cable complies with the new EVC standard EN 506020. It is a halogen free cable, suitable for both indoor and outdoor use. Excellent resistance to the effects of oil, grases, dust and water.

Excellent resistant to heavy mechanical stress. Very good cold resistant and weather influences.



CHARACTERISTICS

Standards

This type of cable is designed, manufactured and tested according to the new EVC standard EN 50620.

Technical Properties

Nominal voltage: 1.000 Volts.

Maximum conductor temperature: 90 °C.

Minimum installation and handling temperature: -35 °C.

Maximum short-circuit temperature: 250 °C (maximum 5 s.).

Minimum bending radius: 5 x outer Ø.

No flame propagation: according to EN 60332-1/ IEC 60332-1.

Halogen Free.

Nominal current-carrying capacities

The table shows the current-carrying capacities and voltage drop detailed for every cable.

Current-carrying capacities, in amperes, are calculated according to IEC 60364-5-52, and for the following conditions:

• Open air installation: one vertical cable with adequate ventilation and ambient temperature of 30°C (referent method E).

• Supposed two-phase circuit.

For conditions other than this, please apply the adequate correction factors.

Cross Section (mm2)	Open Air Intensity (A)
2x50+1G25+3x2x0,75	*225*
2x70+1G35+3x2x0,75	*289*

DIMENSIONS

The current table shows nominals dimensions and weight detailed for every cable.

Cross Section (mm2)	Open Air Intensity (A)	Weight (kg/km)
2x50+1G25+3x2x0,75	*225*	*1.555*
2x70+1G35+3x2x0,75	*289*	*2.105*

(1) The tolerances on the nominal outer diameters are:
Cables with outer diameter d ≥ 10 mm. --> -0,2 +0,5 mm

COMPATIBILITY

Cable compatible with all major flat connection modules.

See more technical data on the particular cable specification. Top Cable reserves the right to carry out any modification to the data sheets whatsoever without giving previous notice.
For more information please contact: sales@topcable.com

TOXFREE XTREM EVC H07BZ5-F

Flexible halogen free cable for AC charging stations.

DESIGN

Conductor

Electrolytic copper conductor, class 5 (flexible) based on EN 60228/ IEC 60228.

Insulation

Cross-linked halogen free compound, type EVI-2 according to EN 50620.

The standard identification of insulated conductors is the following:

3G + 1 x blue + brown + yellow/green + red (control conductor).

5G + 1 x blue + brown + black + grey + yellow/green + red (control conductor).

Assembly of cores

The cores are twisted together.

Outer sheath

Halogen free TPU elastomer compound outer sheath, type EVM-1 according to EN 50620, black colour. Other outer sheath colours available upon request.

APPLICATIONS

This halogen free flexible cable has been specially designed for AC charging stations. The cable complies with the new EVC standard EN 506020. It is a halogen free cable, suitable for both indoor and outdoor use. Excellent resistance to the effects of oil, grases, dust and water. Excellent resistance to heavy mechanical stress. Very good resistance to cold and other weather influences. Compatible with all major connectors.

CHARACTERISTICS

Standards

This type of cable is designed, manufactured and tested according to the new EVC standard EN 50620.

Technical Properties

Nominal voltage: 450/750 V.
Maximum conductor temperature: 90 °C.
Minimum installation and handling temperature: -35 °C .
Maximum short-circuit temperature: 250 °C (maximum 5 s.).
Minimum bending radius: 5 x outer Ø.
No flame propagation: according EN 60332-1/ IEC 60332-1.
Halogen Free.

Nominal current-carrying capacities

Current-carrying capacities, in amperes, are calculated according to EN 50620, and for the following conditions:

Open air installation: one vertical cable with adequate ventilation and ambient temperature of 30°C. For conditions other than this, please apply the adequate correction factors.

Cross Section (mm2)	One-phase circuit (A)	Three-phase circuit (A)
2,5	25	20
4	35	30
6	44	38
16	82	71
25	109	94

DIMENSIONS

The current table shows nominal dimensions and weight detailed for every cable.

Cross Section (mm2)	Diameter (A)	Weight (kg/km)
3G2,5 + 1x0,5	9,2	140
3G4 + 1x0,5	10,6	195
3G6 + 1x0,5	12,0	260
3G16+ 1x0,5	16,8	595
5G2,5 + 1x0,5	11,4	220
5G4 + 1x0,5	13,1	310
5G6 + 1x0,5	14,8	425
5G16 + 1x1	20,7	975
5G25 + 1x1	26,1	1.520

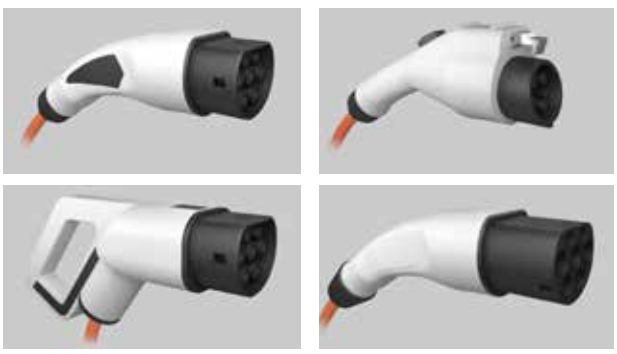
(1) The tolerances on the nominal outer diameters are:
Cables with outer diameter d ≤ 7 mm. --> -0,1 +0,2 mm
Cables with outer diameter 7 < d < 10 mm. --> 0,1 +0,3 mm
Cables with outer diameter d ≥ 10 mm. --> -0,2 +0,4 mm

(2) All the pilot cables have been improved up to 0,75 mm2 for a better cable performance.

COMPATIBILITY

Cable compatible with all major connectors:

AC type 1 and type 2.



See more technical data on the particular cable specification. Top Cable reserves the right to carry out any modification to the data sheets whatsoever without giving previous notice.
For more information please contact: sales@topcable.com

OTHER CABLES FOR **EVC INSFRASTRUCTURE**

X-VOLT® RHZ1

XLPE Medium Voltage cable for connecting:

· Grid to MV station.

XTREM® EV CHARGING STATIONS (EMC TYPE)

Flexible shielded power & communication cable for connecting:

· Inverter station to 1 or 2 charging posts.

XTREM® H07RN-F

Flexible rubber cable for connecting:

· MV station to inverter station
· Inverter station to charging post.

XTREM® H07ZZ-F

Flexible rubber LSZH cable for connecting:

· MV station to inverter station
· Inverter station to charging post.

Top Cable

POWERFLEX® RV-K

Flexible power cable for connecting:

· MV station to inverter station
· Inverter station to charging post.

TOXFREE® RZ1-K

Flexible power LSZH cable for connecting:

· MV station to inverter station
· Inverter station to charging post.

POWERHARD® M RVMV-K

Power armoured cable for ATEX environments. For connecting:

· MV station to inverter station

TOXFREE® H07Z1-K

Flexible earthing LSZH cable

TOPFLEX® H07V-K

Flexible earthing cable

Top Cable, **leading manufacturer** of electric cables

Top Cable is an internationally trusted manufacturer of electric cables, and is highly thought of by professional engineers & electricians around the world, with a large number of **successful electric cable installations in many sectors over the last 30 years.**

All Top Cable's manufacturing plants are based around Barcelona, Spain. The organization is a medium-sized, family-owned company manufacturing electric cables on an international scale, with offices and warehouses located around the globe. Therefore, we guarantee customer proximity on a global level.

Customers around the world appreciate Top Cable as a technically leading manufacturer of wires and cables of outstanding quality. Experience and innovation leads us to provide the best products and services to our clients worldwide.


Top Cable

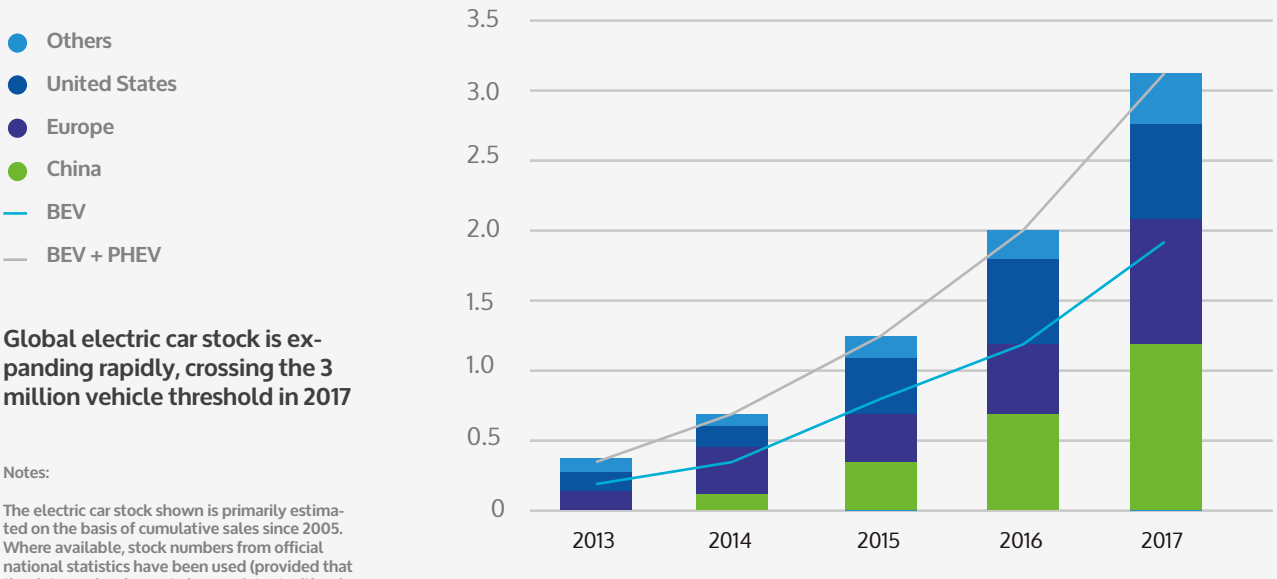
Innovation

Our Top Cable Design & Development Centre and research laboratories were established to provide research work and to enable us to constantly provide **high performance cables** that are suited for multiple applications in various industries.

Being conscious of the importance of optimal costing, our company has opted for the integration of our processes, through focusing each of our production centers into a specialized production unit, while coordinating with one another to optimize common resources.

Our technical personnel are professionally trained and assure the highest level of quality in the cable production process.

Evolution of the global electric car stock, 2013-17



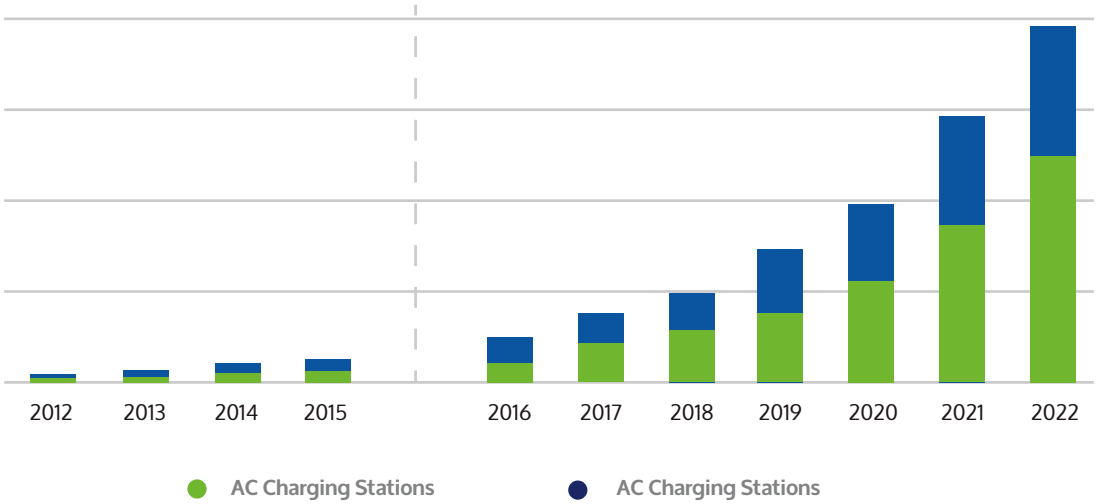
Global electric car stock is expanding rapidly, crossing the 3 million vehicle threshold in 2017

Notes:

The electric car stock shown is primarily estimated on the basis of cumulative sales since 2005. Where available, stock numbers from official national statistics have been used (provided that the data can be shown to be consistent with sales evolutions).

Sources: IEA analysis based on country submissions, complemented by ACEA (2018); EAFO (2018a).

Global EV charging stations market size, by product, $M (2012-2022)



Notes:

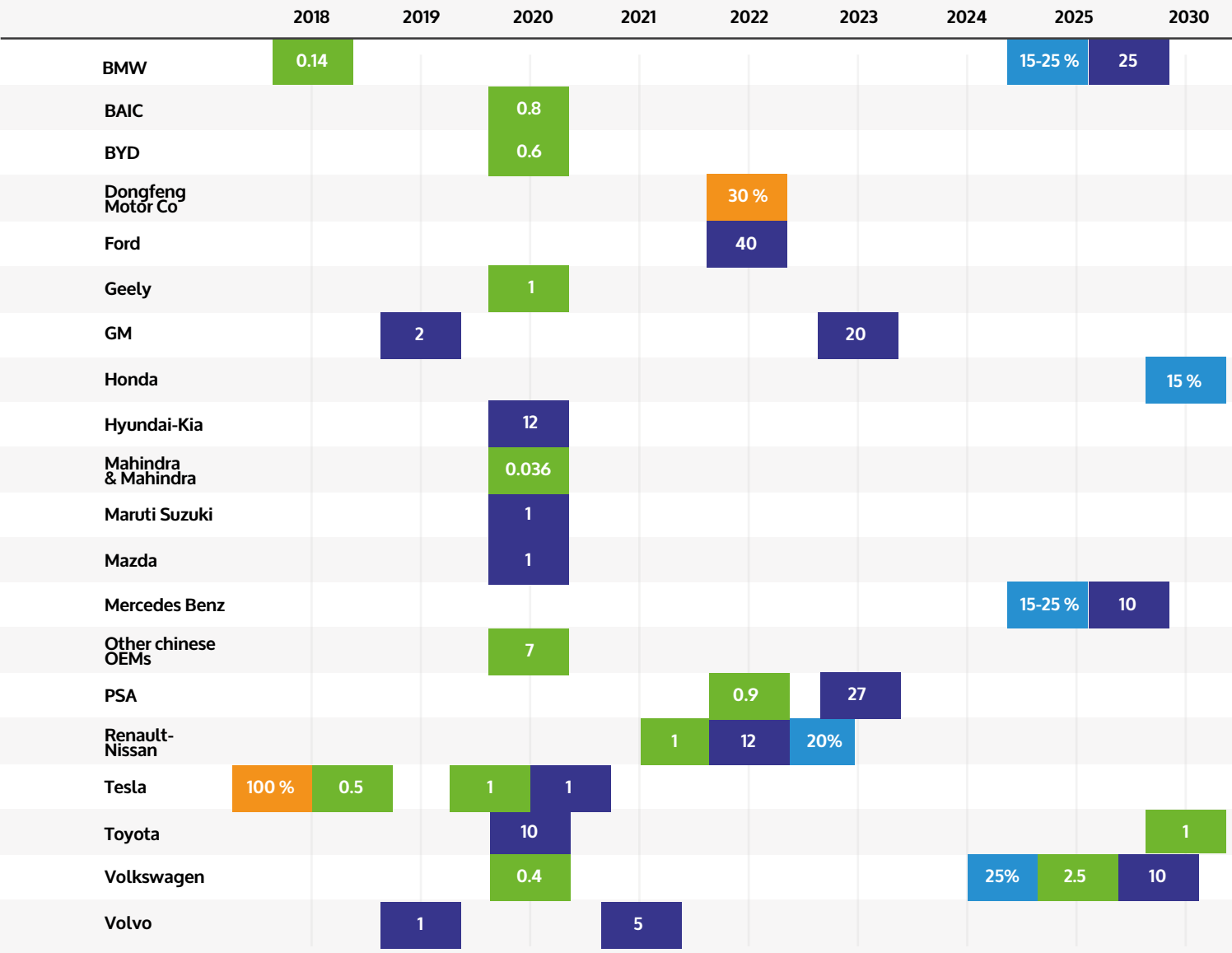
- Private chargers are estimated assuming that each electric car is coupled with 1.1 private chargers (level 1 or level 2), either at home or the workplace, in all countries except China and Japan. The estimates for China and Japan are based on 0.8 chargers per EV, based on the information reported by a survey (looking at a sample of roughly one third of the Chinese electric car owners) by the China Electric Vehicle Charger Infrastructure Promotion Alliance, suggesting that the fraction of chargers sold to private electric car owners was close to 80% in China (Sohu, 2018b; EVCIPA, 2018) available on the electric car stock and private EVSE installations.

- Electric two-wheelers are assumed to charge primarily at level 1 outlets and have not been included in this assessment.

- Private fast chargers are calculated here assuming that there is one outlet available per every three buses deployed in China. This is based on the ratio reported for Shenzhen (Lu, Lulu and Zhou, 2018) and generalised to the national level..

- Chargers can come with different connectors (e.g. DC CCS and CHAdeMO); it is possible to charge two vehicles simultaneously if the charger is equipped with one AC connector and one DC connector. However, this is not usually the case if the charger has two different DC connectors. This assessment accounts for the number of outlets on the basis of the number of cars that can charge simultaneously at maximum power.

OEM announcements related to electric cars



Several OEMs have announced increased EV production and development of new EV models.

Number of sales millions

% of electric sales

Number of new EV models

Share of models with an electric version

Sources: Electric Cars Report (2018) for BMW; BMW Group (2017) for BMW; Mitchell (2017) for BMW; Tabeta (2018) for Dongfeng Motor Co; General Motors (2017) for GM; Carey and White (2018) for Ford; Healey (2016) for Honda; Jin (2017) for Hyundai-Kia; The Economic Times (2018) for Mahindra & Mahindra; Charged Electric Vehicles Magazine (2017) for Mazda; Liu (2018) for Other Chinese OEMs; Daimler (2018c) for Mercedes-Benz; Reuters (2016) for Mercedes-Benz; Welch (2018); Nussbaum (2017); Cobb (2015); Voelcker (2017); Marklines (2018) for Tesla; Sheehan (2017) for Tesla; Reuters (2017c) for Volkswagen; Volkswagen (2016) for Volkswagen; Volkswagen (2017); Autocar (2018); Tesla (2018b); Maruti Suzuki (2018); Korosec (2017) for Volvo; Volvo Car Group, (2017) for Volvo; China Economic Net (2018) for Volkswagen; Xinhua (2018) for Geely; The Beijing News (2017) for BAIC; NBD (2018) for Geely; Groupe Renault (2017a) for Renault-Nissan; Toyota (2017) for Toyota; (China Economic Net, 2018) Groupe Renault (2017a 2017b) for Renault-Nissan; Reuters (2017d) and InsideEVs (2017) for PSA; Tabeta

Notes:

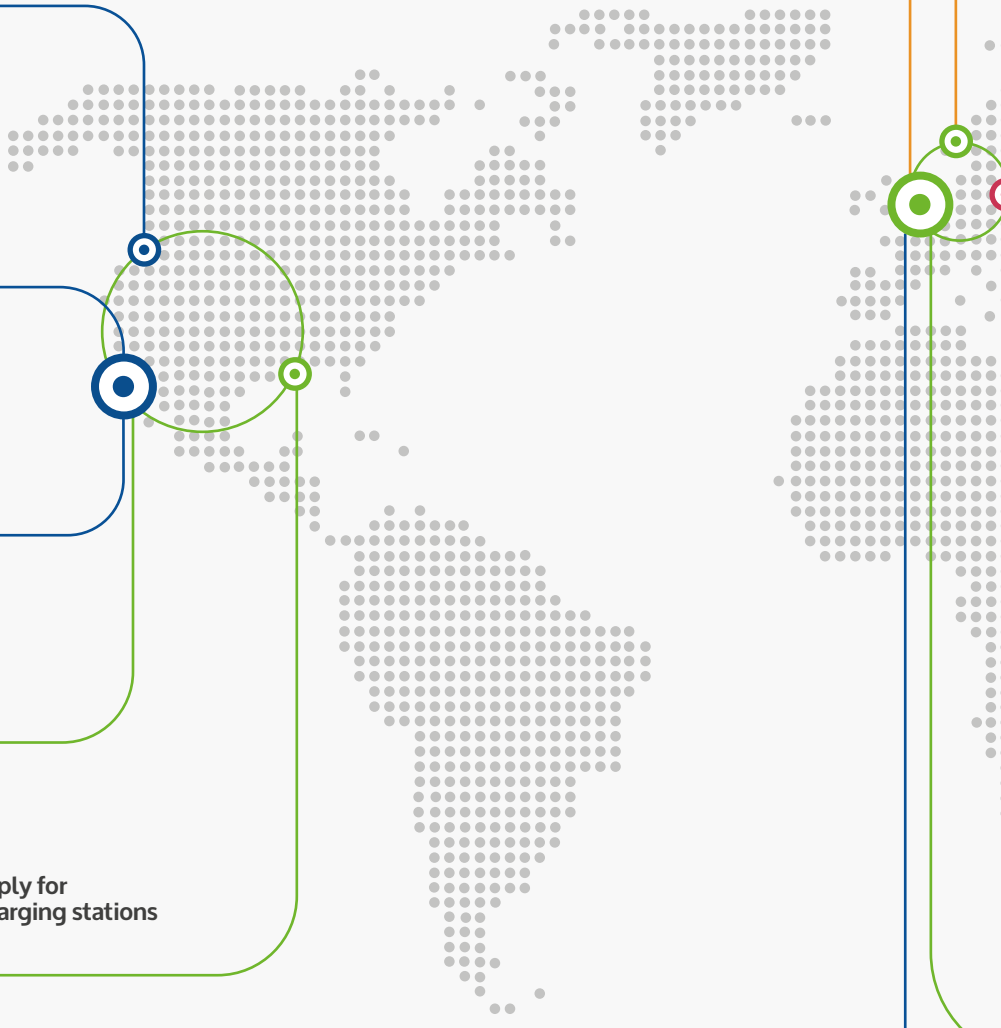
This table presents an overview based on the IEA's understanding of companies' announcements and may not be complete. It intends to present announcements only related to electric cars (PHEVs and BEVs), therefore other announcements by OEMs that also include HEVs and give no specific indication regarding the PHEVs/BEV share are not included in this table. Instead, they are highlighted in these notes. Audi, part of the Volkswagen Group, announced that three new electric car models will be released in 2020 (Audi, 2017). Toyota announced an objective of 4.5 million sales of HEVs and PHEVs in 2030 (Toyota, 2017). Jaguar Land Rover announced that an electrified version of all new models will be available as from 2020 (BEV, PHEV or HEV) (Jaguar Land Rover, 2017). Renault Nissan announced an aim of 20% of its sales to be zeroemission

Examples of **recent policy instruments** promoting charging infrastructure deployment in major cities.

Cities are using a variety of measures to promote the development of charging infrastructure.

Utrecht and Amsterdam (The Netherlands): 100 euro subsidy for semi-publicly accesible charging points.

Vancouver (Canada): 20% of the parking stalls in multifamily buildings must be equiped with wire conduits.



San Francisco (US): 10% of parking spaces in new construction must have Level 2 chargers.

San Jose (US): Simplify local charging permitting process.

Los Angeles (US): Deploying charging stations on streetlights.

New Orleans (US): Residents can apply for permits to install electric vehicle charging stations on the road in front of their homes.

London (UK): Charging point planning requirements for all new real estate developments.

- Target number of charging points to be built.
- Financial incentives.
- Building codes.
- Direct EVSE deployment.

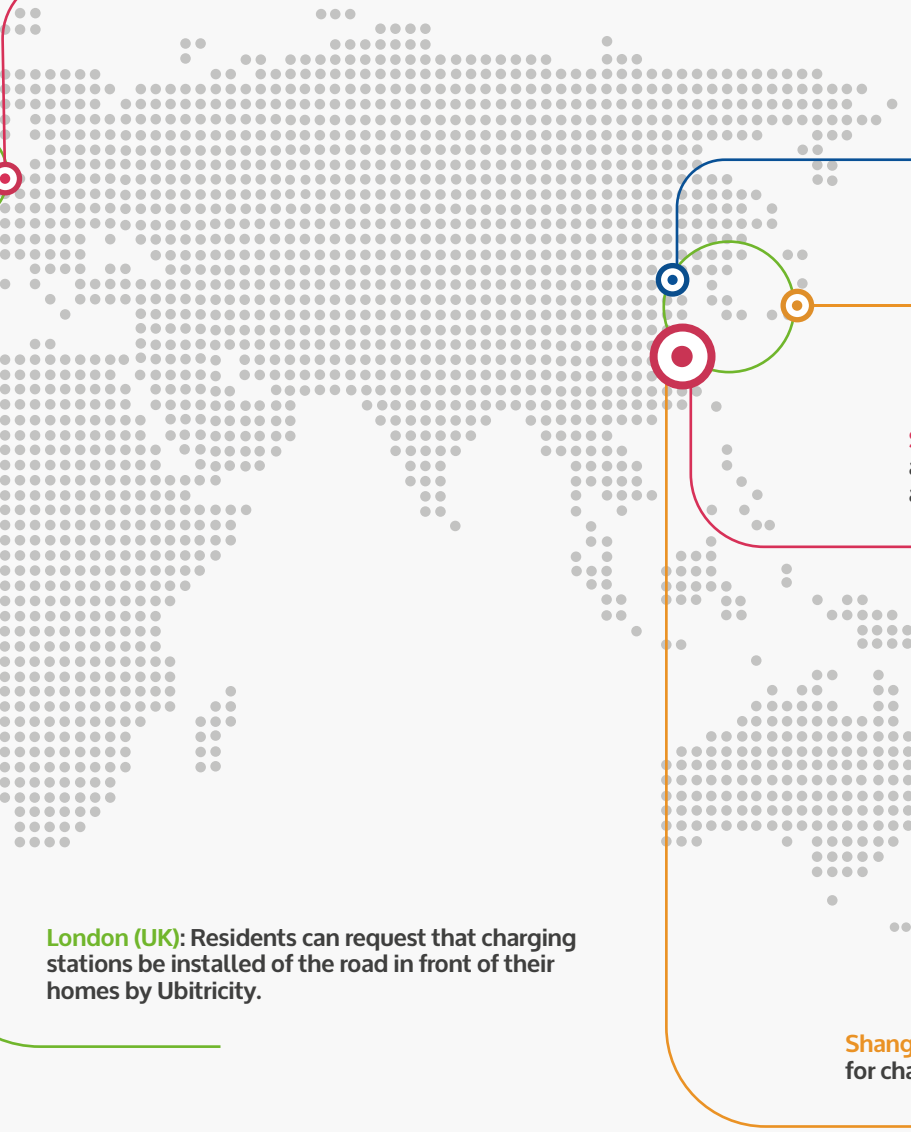
Oslo (Norway): Grants for up to 60% of installation cost of a charging point .

Oslo (Norway): Building two large parking garages for electric vehicle.

: 500-1.000 publicly available charging stations and 5.000 semi-public charging stations by 2025.

Beijing (China): 100% of new residential buildings and 15-25% of new commercial buildings required to be fitted with wire conduits.

Tokyo (Japan): Subsidy of approx. JPY 1.5 million for charge points in condominimums.



Shanghai (China): Plan to build 28.000 publicly available charging points by 2020 - 210.000 publicly available + private charging points by 2020.

London (UK): Residents can request that charging stations be installed of the road in front of their homes by Ubitricity.

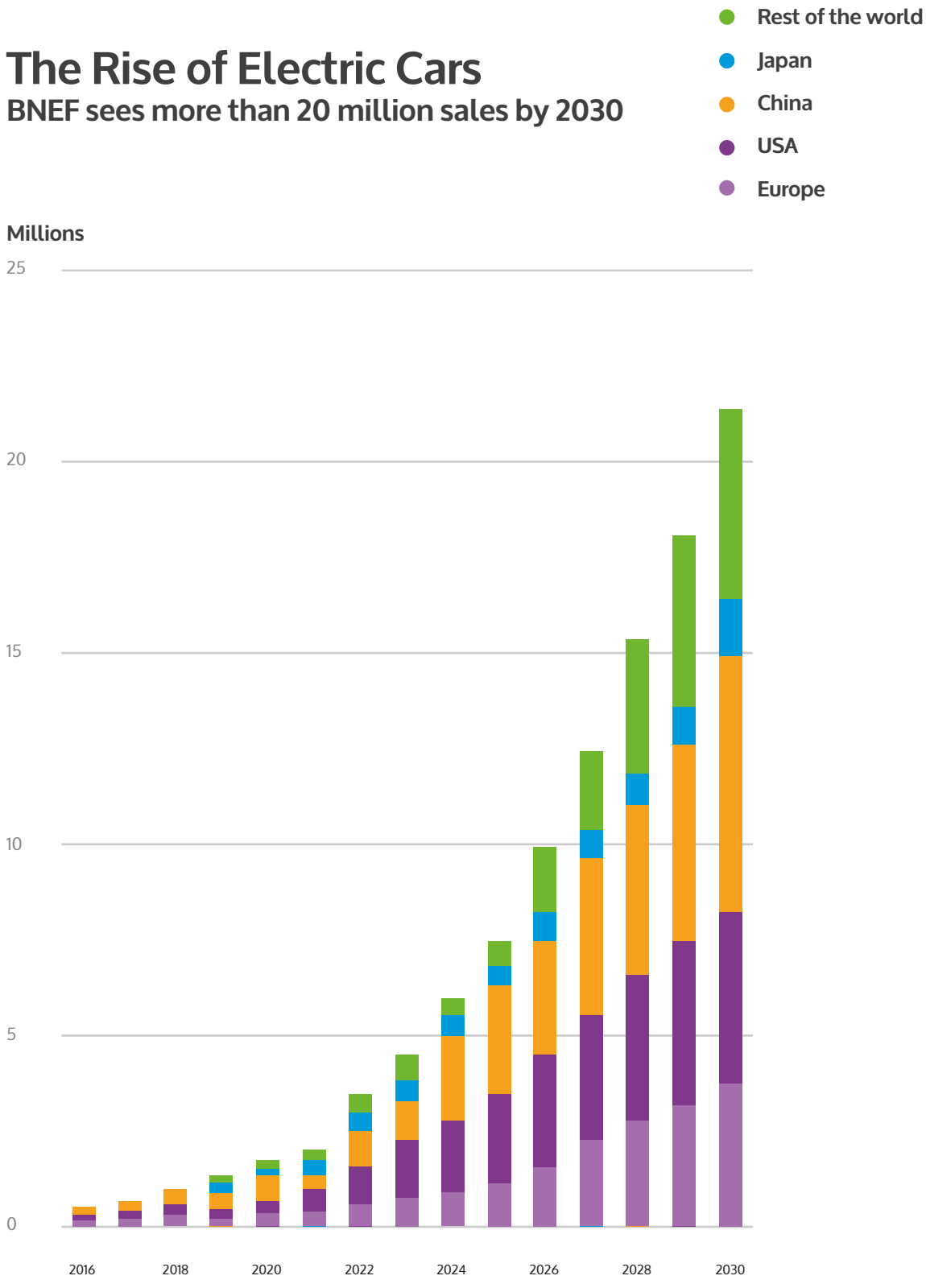
Shanghai (China): 30 % capital subsidy for businesses for charging infrastructure.

Notes:

This is not an exhaustive list of policies, but an illustration of examples of cities where EVSE policies have been implemented. Sources: ICCT (2017e); ICCT (2017f); Japan News/ANN (2018); Lambert (2017); Miller (2018); PluginBC (2018); Urban Foresight (2014); Xiaowen (2018).

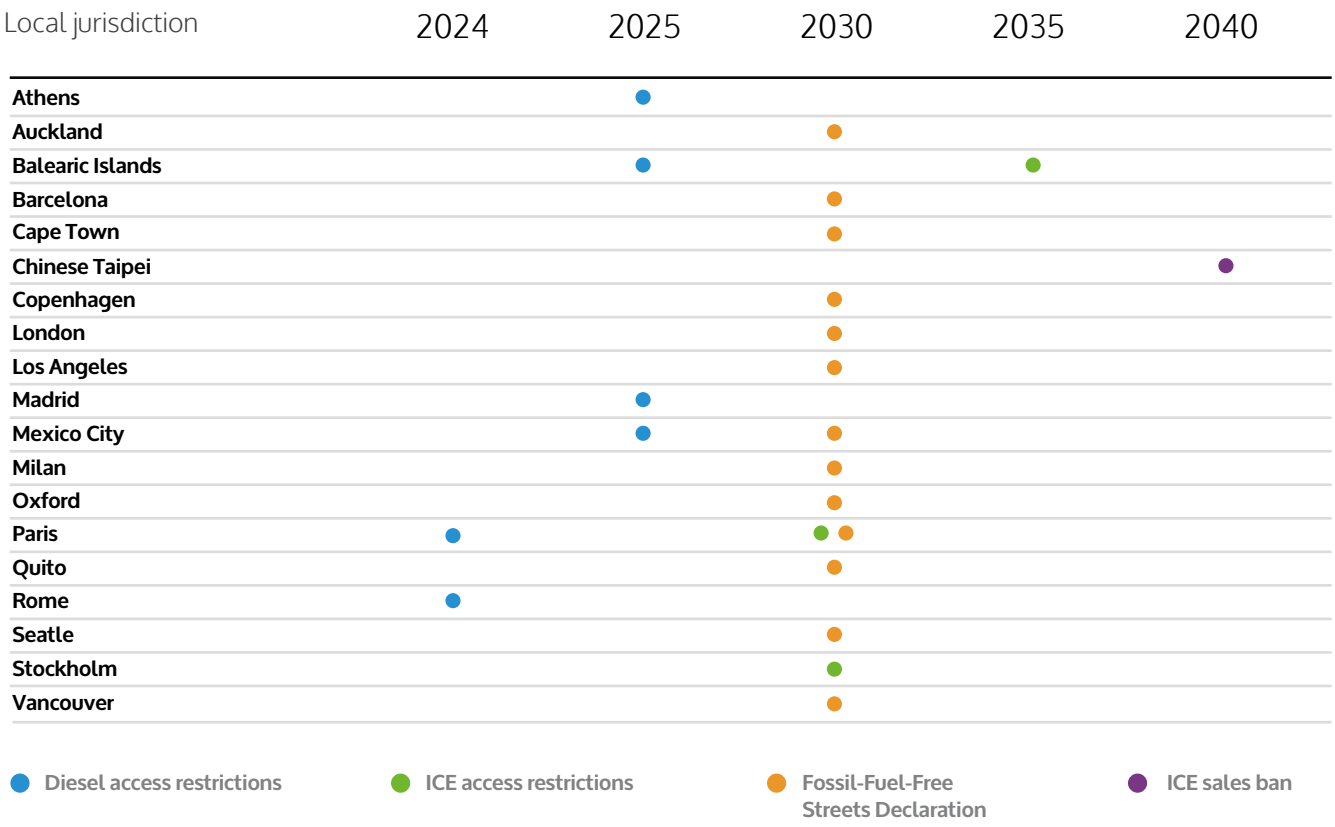
The Rise of Electric Cars

BNEF sees more than 20 million sales by 2030



EV penetration by 2040 35-47% of new cars

Announced access restriction mandates in local jurisdictions



Electric car stock (BEV and PHEV) by country, 2005-17 (thousands)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Australia							0.05	0.30	0.60	1.92	3.69	5.06	7.34
Brazil										0.06	0.15	0.32	0.68
Canada							0.52	2.54	5.66	10.73	17.69	29.27	45.95
Chile							0.01	0.01	0.02	0.03	0.07	0.10	0.25
China					0.48	1.91	6.98	16.88	32.22	105.39	312.77	648.77	1.227.77
Finland							0.06	0.24	0.47	0.93	1.59	3.29	6.34
France	0.01	0.01	0.01	0.01	0.12	0.30	3.03	9.29	18.91	31.54	54.49	84.00	118.77
Germany	0.02	0.02	0.02	0.09	0.10	0.25	1.89	5.26	12.19	24.93	48.12	72.73	109.56
India				0.37	0.53	0.88	1.33	2.76	2.95	3.35	4.35	4.80	6.80
Japan					1.08	3.52	16.14	40.58	69.46	101.74	126.40	151.25	205.35
Korea						0.06	0.34	0.85	1.45	2.76	5.95	11.21	25.92
Mexico								0.09	0.10	0.15	0.25	0.66	0.92
Netherlands				0.01	0.15	0.27	1.14	6.26	28.67	43.76	87.53	112.01	119.33
New Zealand						0.01	0.03	0.06	0.09	0.41	0.91	2.41	5.88
Norway			0.01	0.26	0.40	0.79	2.63	7.15	15.67	35.44	69.17	114.05	176.31
Portugal													1.78
South Africa									0.03	0.05	0.29	0.67	0.86
Sweden							0.18	1.11	2.66	7.32	15.91	29.33	49.67
Thailand		0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.10	0.37	0.38	0.40
United Kingdom	0.22	0.55	1.00	1.22	1.40	1.68	2.89	5.59	9.34	24.08	48.51	86.42	133.67
United States	1.12	1.12	1.12	2.58	2.58	3.77	21.50	74.74	171.44	290.22	404.09	563.71	762.06
Others	0.53	0.53	0.53	0.61	0.64	0.81	2.60	5.31	9.35	18.73	37.17	61.63	103.44
Total	1.89	2.23	2.69	5.15	7.48	14.26	61.33	179.03	381.30	703.65	1.239.45	1.982.04	3.109.05

EVC infrastructure cables for the **future of e-mobility**

Constant innovation of materials and processes for the manufacture of cables has allowed Top Cable to maintain the technological leadership that sets us apart. The construction and materials used in Top Cable EVC range are specifically designed and manufactured to meet these demanding needs.

Our choice of materials and constructions ensure that Top Cable's EVC infrastructure cable range will meet both EVC charger manufacturers and end user demand in quality.

Top Cable develops and manufactures cables that provide high reliability and durability under EVC operating conditions: our cables are halogen free and flame retardant, suitable for both indoor and outdoor use, they have excellent resistance to the effects of oil, greases, dust and water, they are flexible at low temperatures and able to withstand mechanical impacts.

For more information visit:
www.topcable.com/evc/

Top Cable

Top Cable EVC Sales

Leonardo Da Vinci nr.1
08191 Rubí (Barcelona) Spain
Tel + 34 93 586 21 68
+ 34 93 586 21 69
Fax + 34 93 586 21 65
sales@topcable.com