Circutor

Best practice:

100 kWp Solar PV Carport for self consumption at GM Food Warehouse

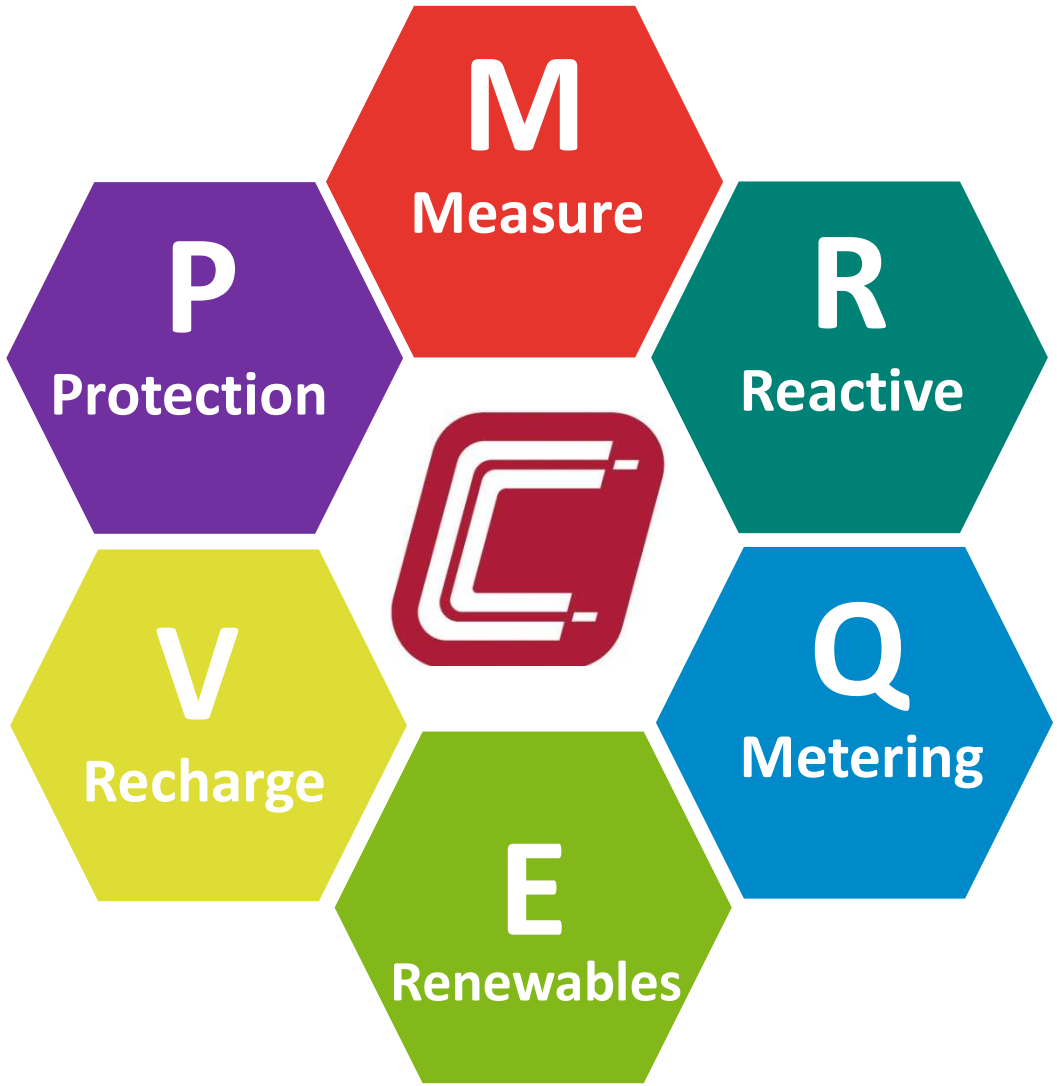
AHK Cámara de Comercio Alemana para España
Deutsche Handelskammer für Spanien

MITTELSTAND GLOBAL
EXPORTINITIATIVE ENERGIE

Barcelona, November the 5th, 2019

From 1973 innovating the Energy Efficiency technology

ˆ Headquarters in Viladecavalls (Barcelona)


M
Measure
P
Protection
R
Reactive
V
Recharge
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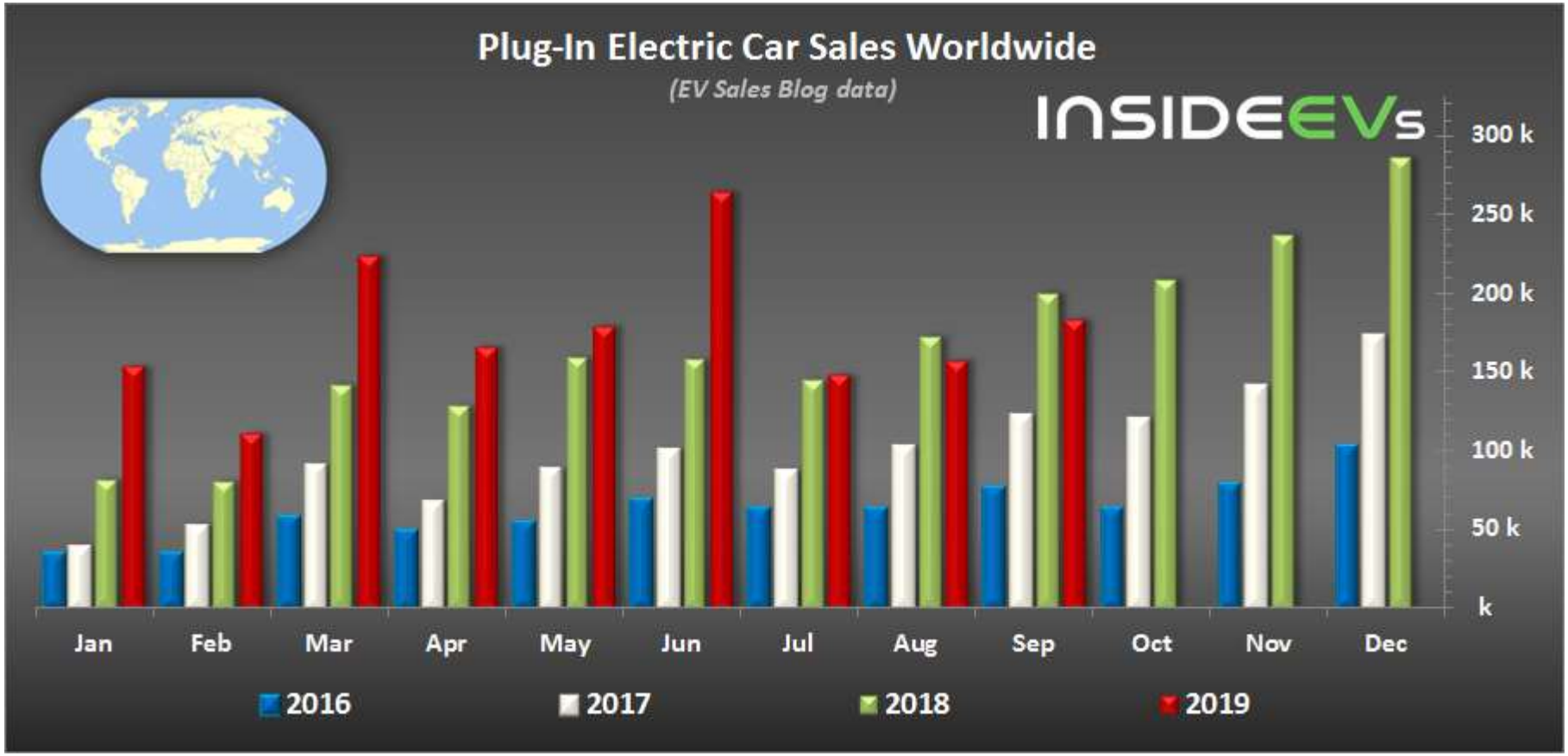
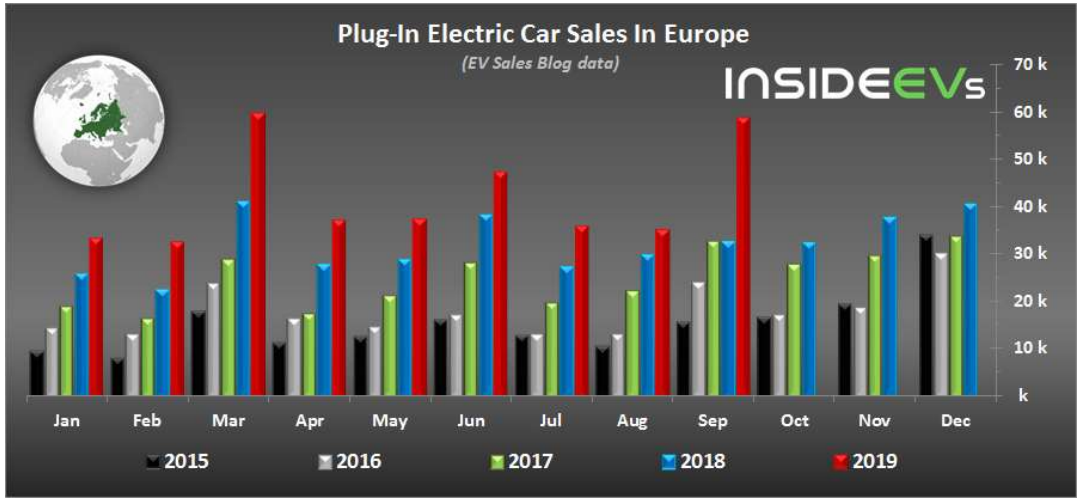
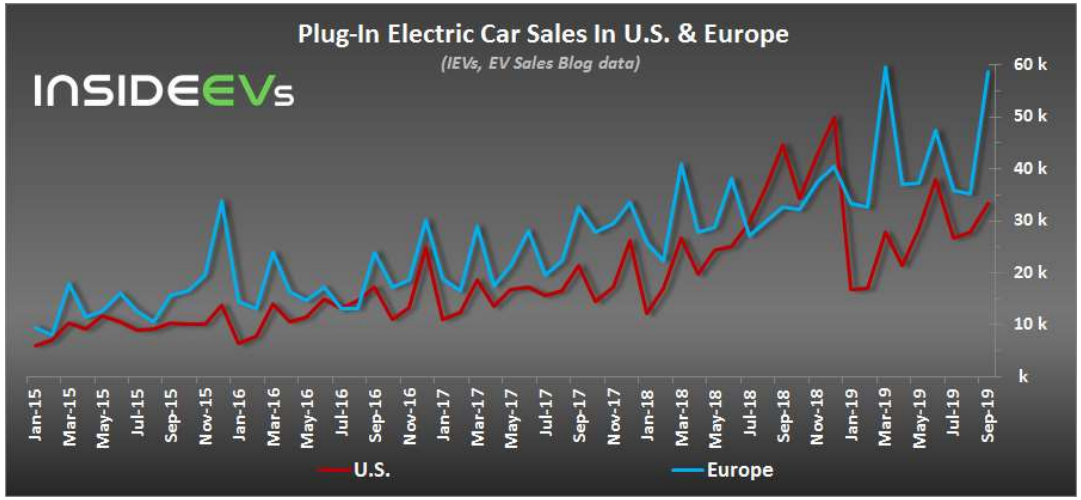
E
Renewables

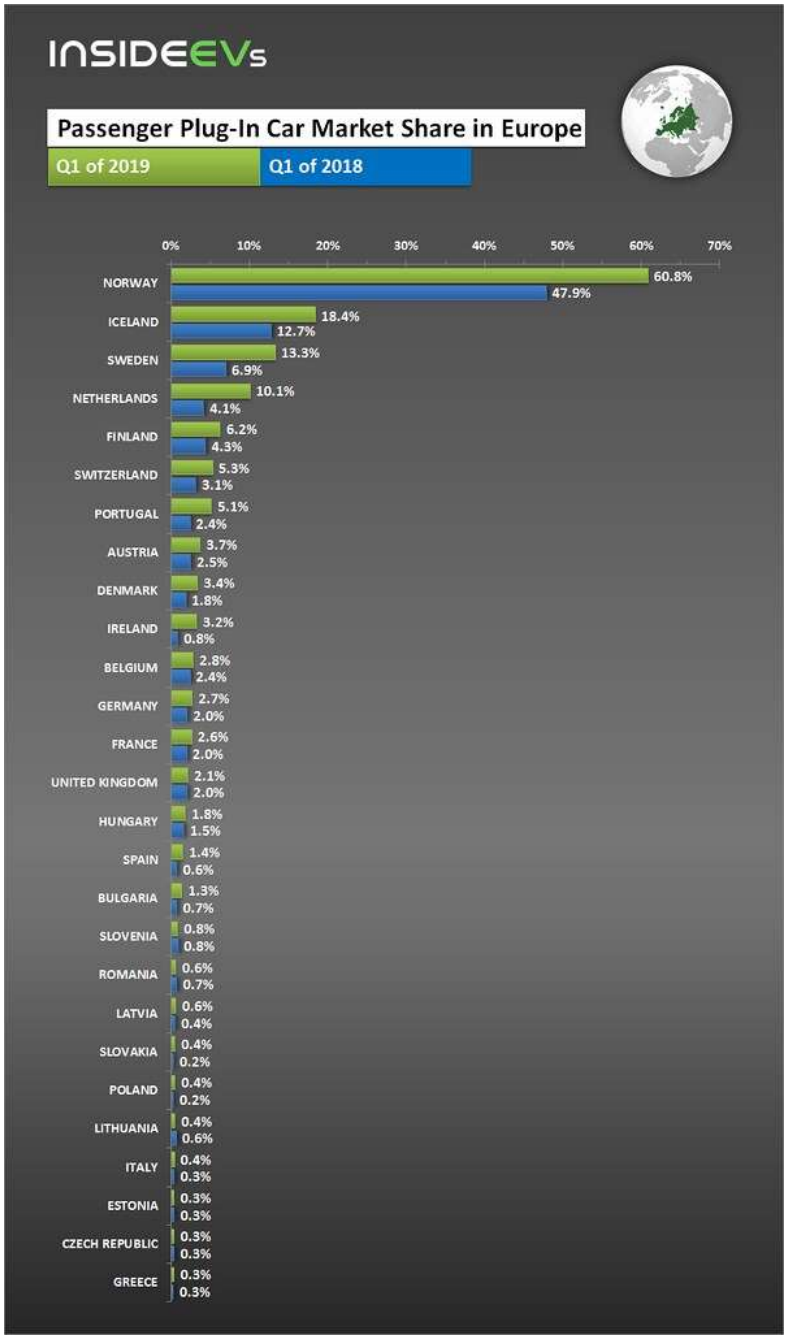
Self consumption and EV charge



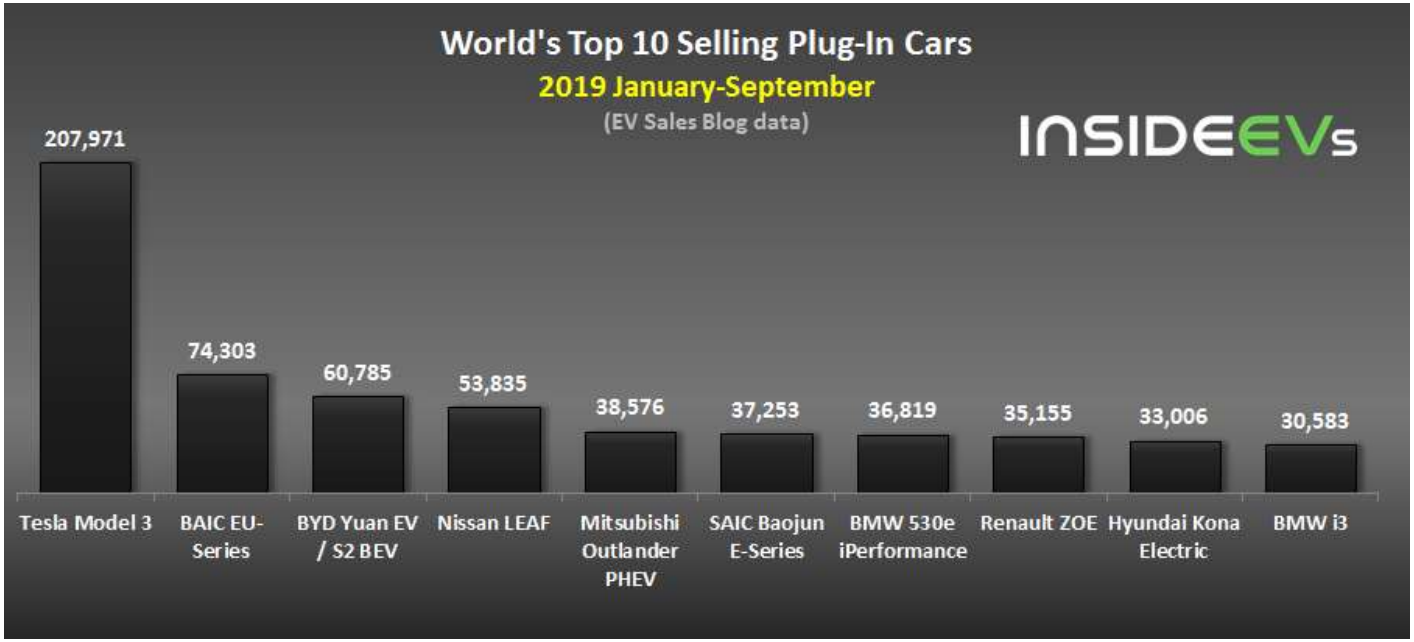
Self consumption and EV charge

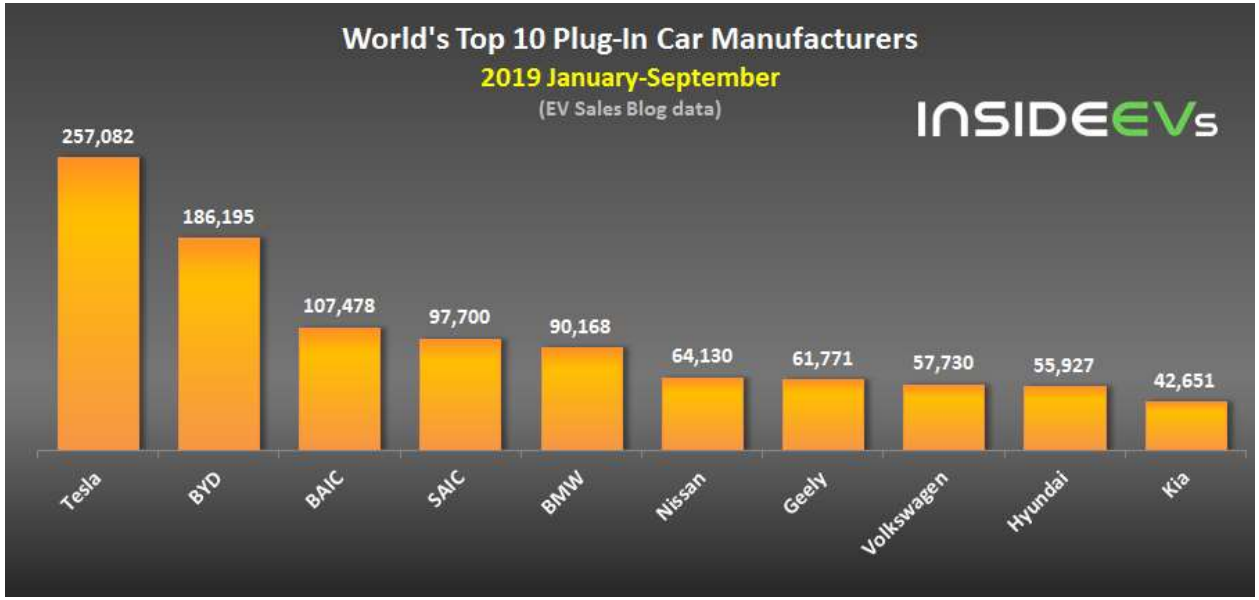




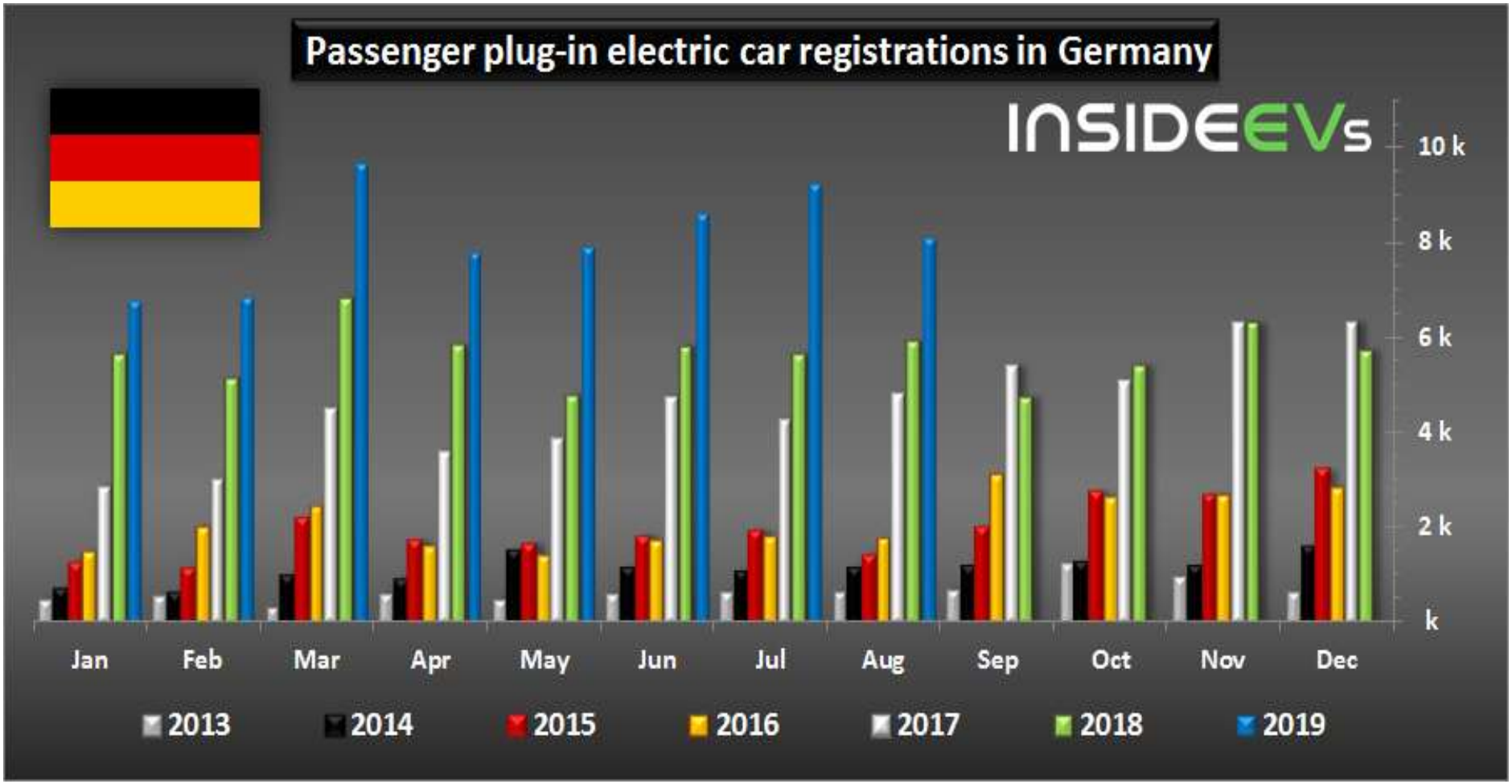


Self consumption and EV charge

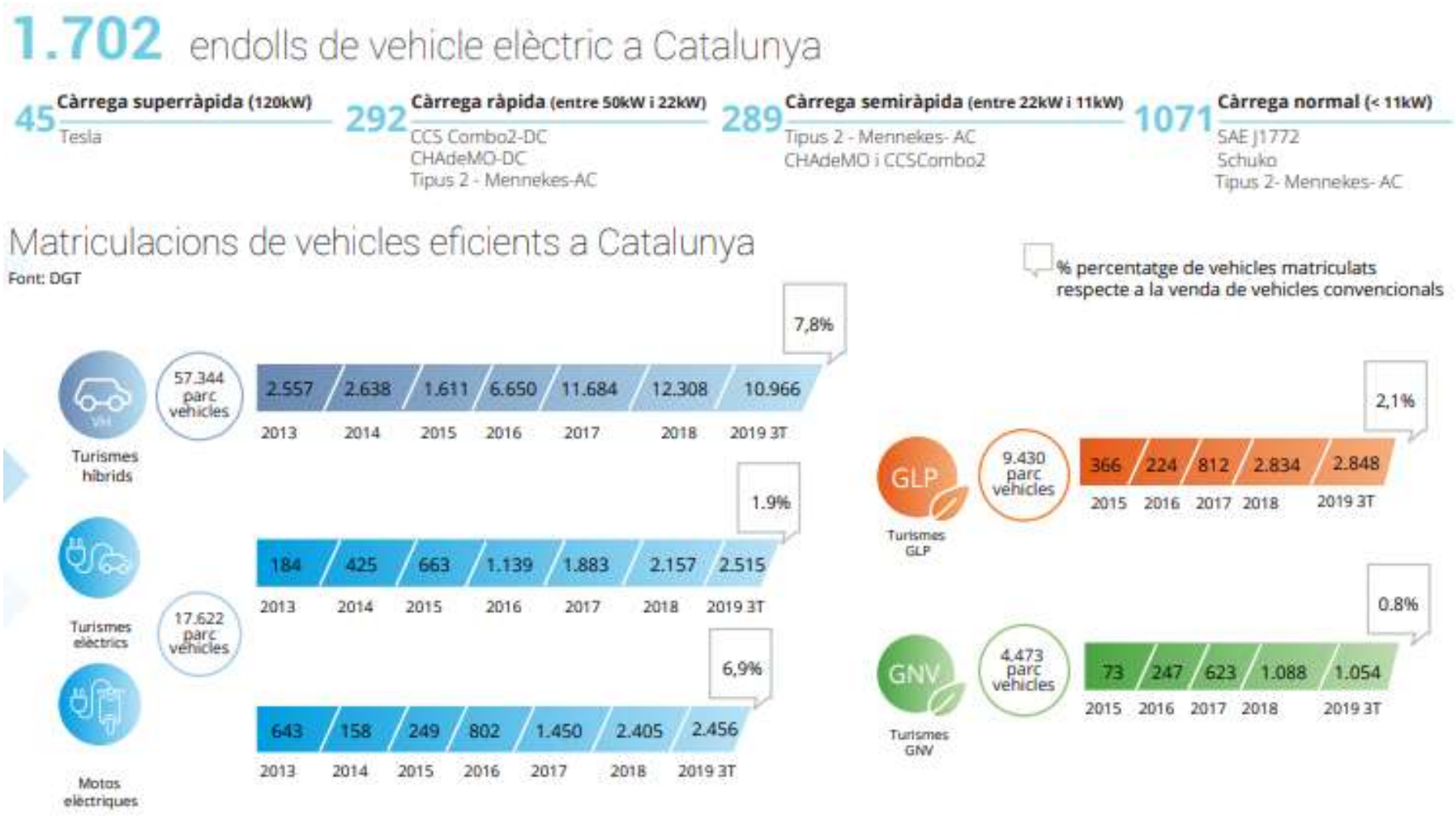




Self consumption and EV charge

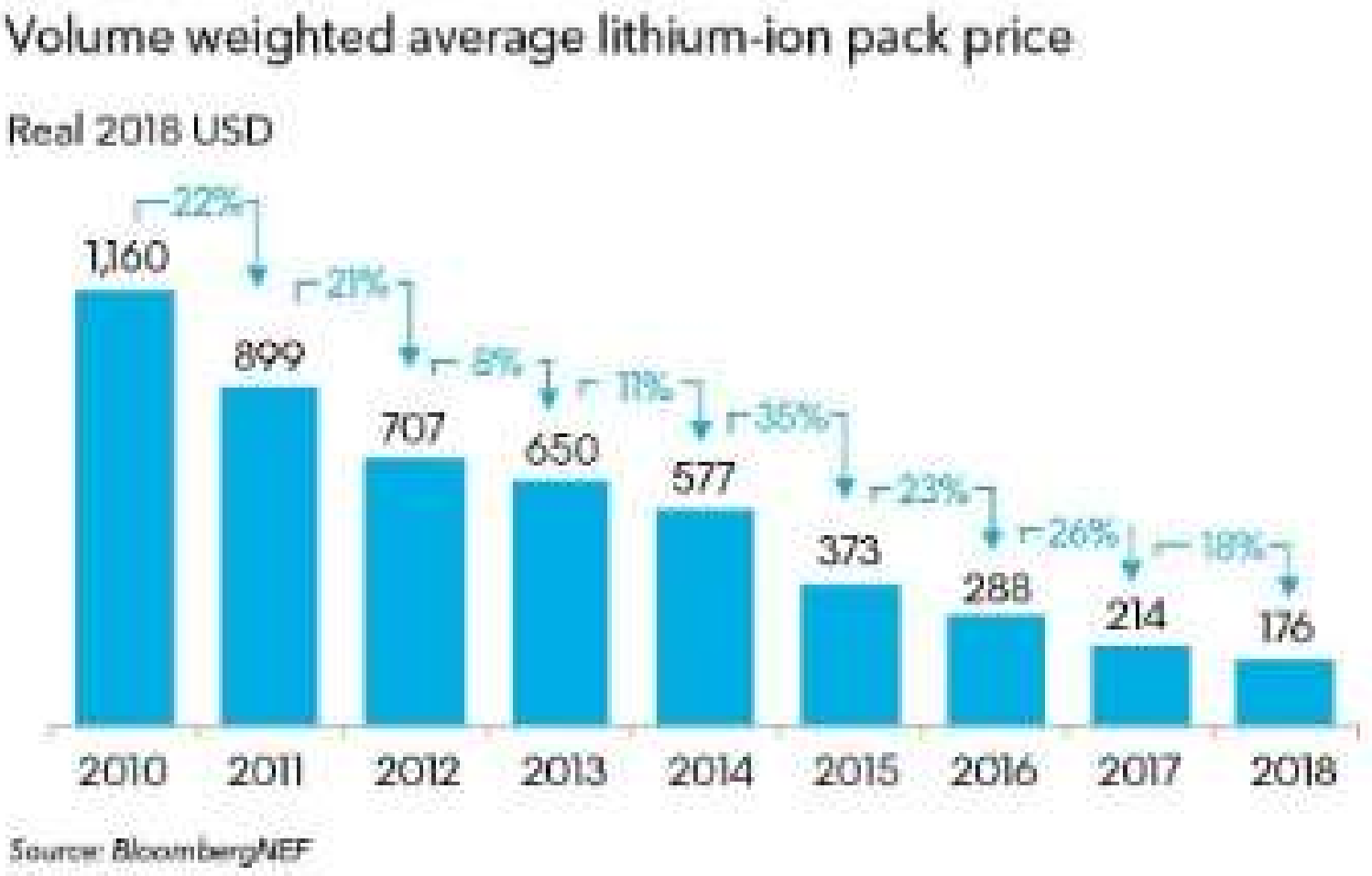


Self consumption and EV charge



Battery cost evolution

Cheaper than ever



¿Where are we and where we go?

16/24 kWh

150 Km

2016-2017

Larger battery capacity
for larger autonomy

50/90 kWh

Up to 500 Km

2019-2020

Power = Charging speed

3,7 kW

7,4 kW

22 kW

22 kW

50 kW

150 kW

EV Portfolio: 2019

Hyundai KONA
64 kWh / 415 km
38.500 € ….

Kia NIRO
64 kWh / 385 km
41.500 € ….

Kia SOUL
64 kWh / 390 km
36.500 € ….

Porsche TAYCAN
80-95 kWh / 385-450 km
75.000 € ….

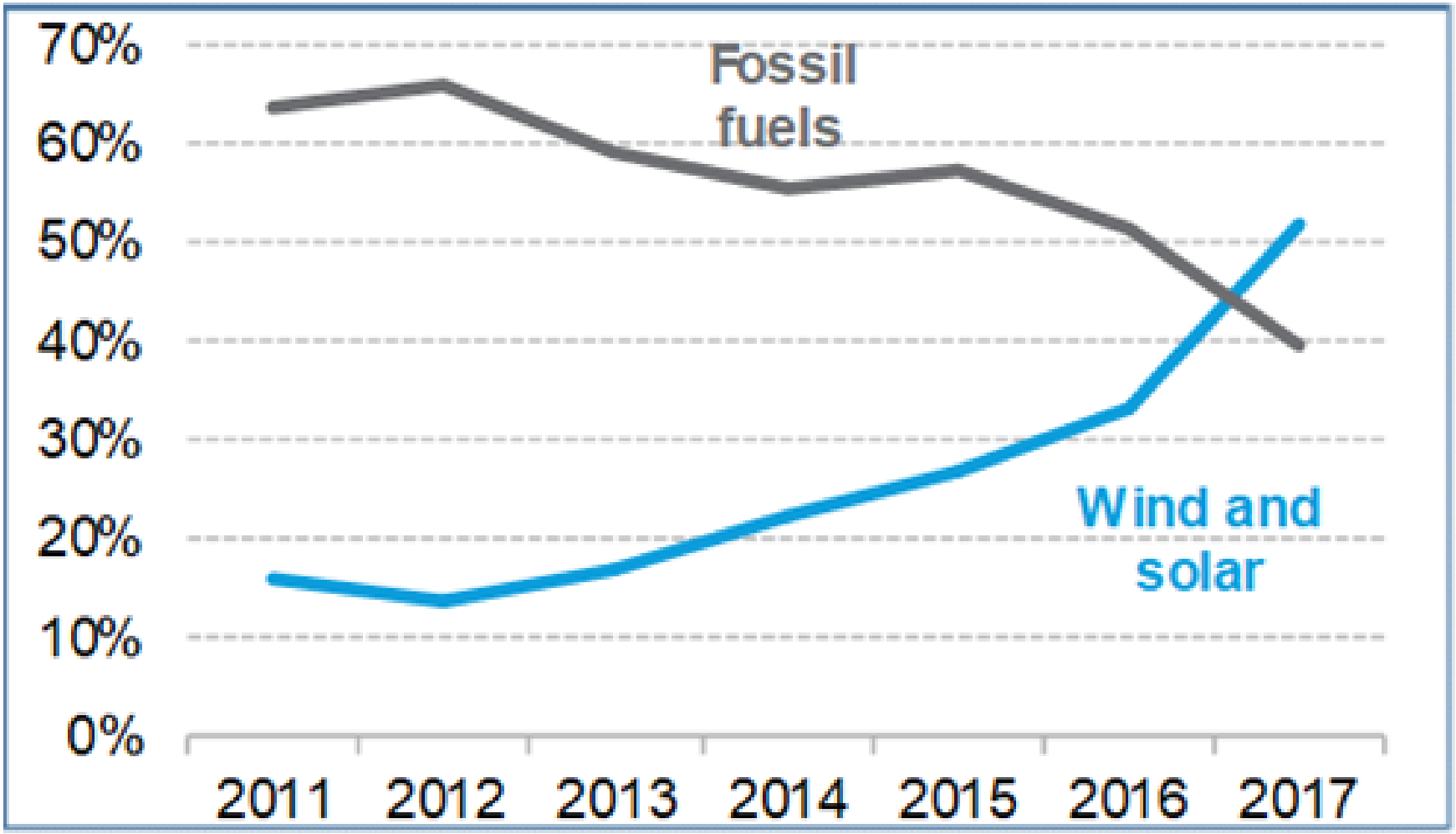
Audi E-TRON
95 kWh / 385 km
75.000 € ….

Mercedes EQC
80 kWh / 325 km
80.000 € ….

MINI-E
? kWh / 325 km
? € ….

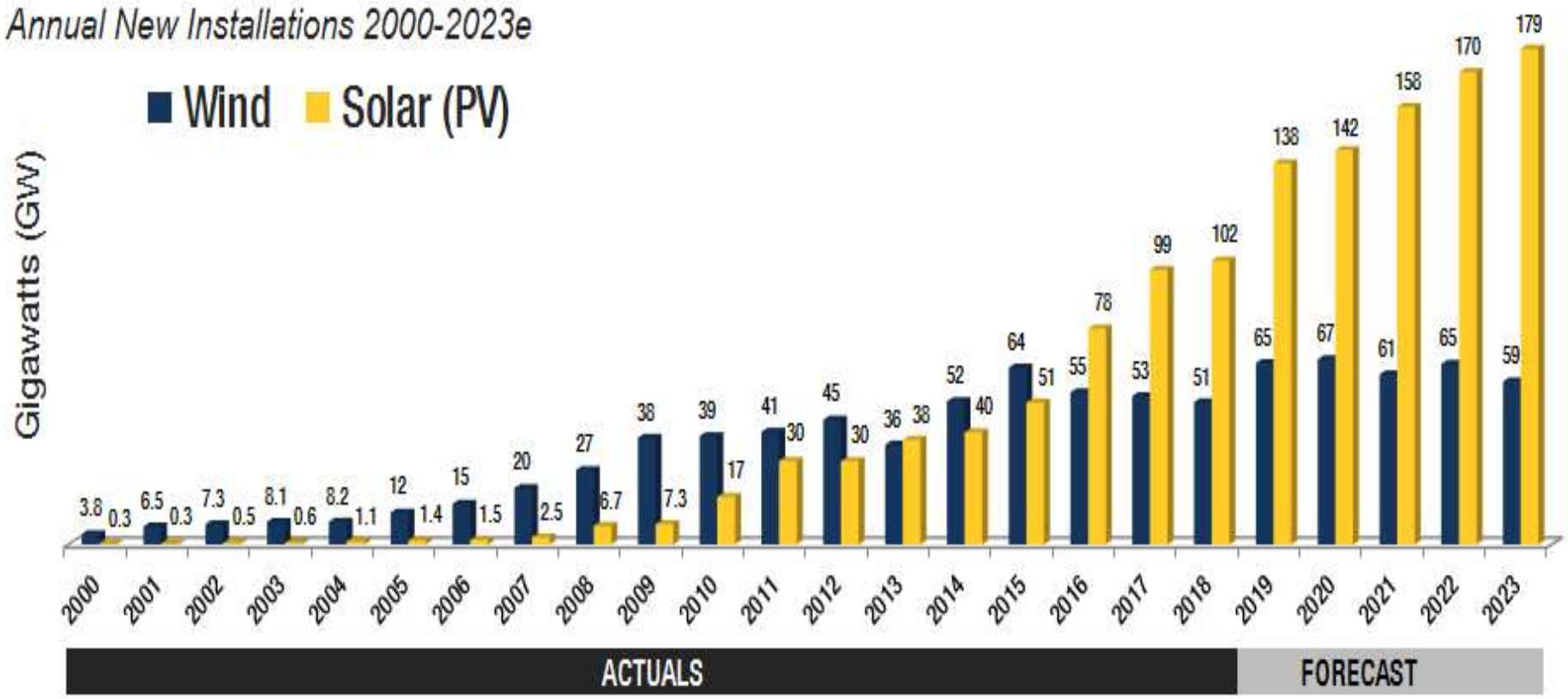
Volvo POLESTAR-1 PHEV
34 kWh / 145 km
150.000 € ….

Massive Installation brings cost reduction



Font: Bloomberg

Solar Energy will cover new demand



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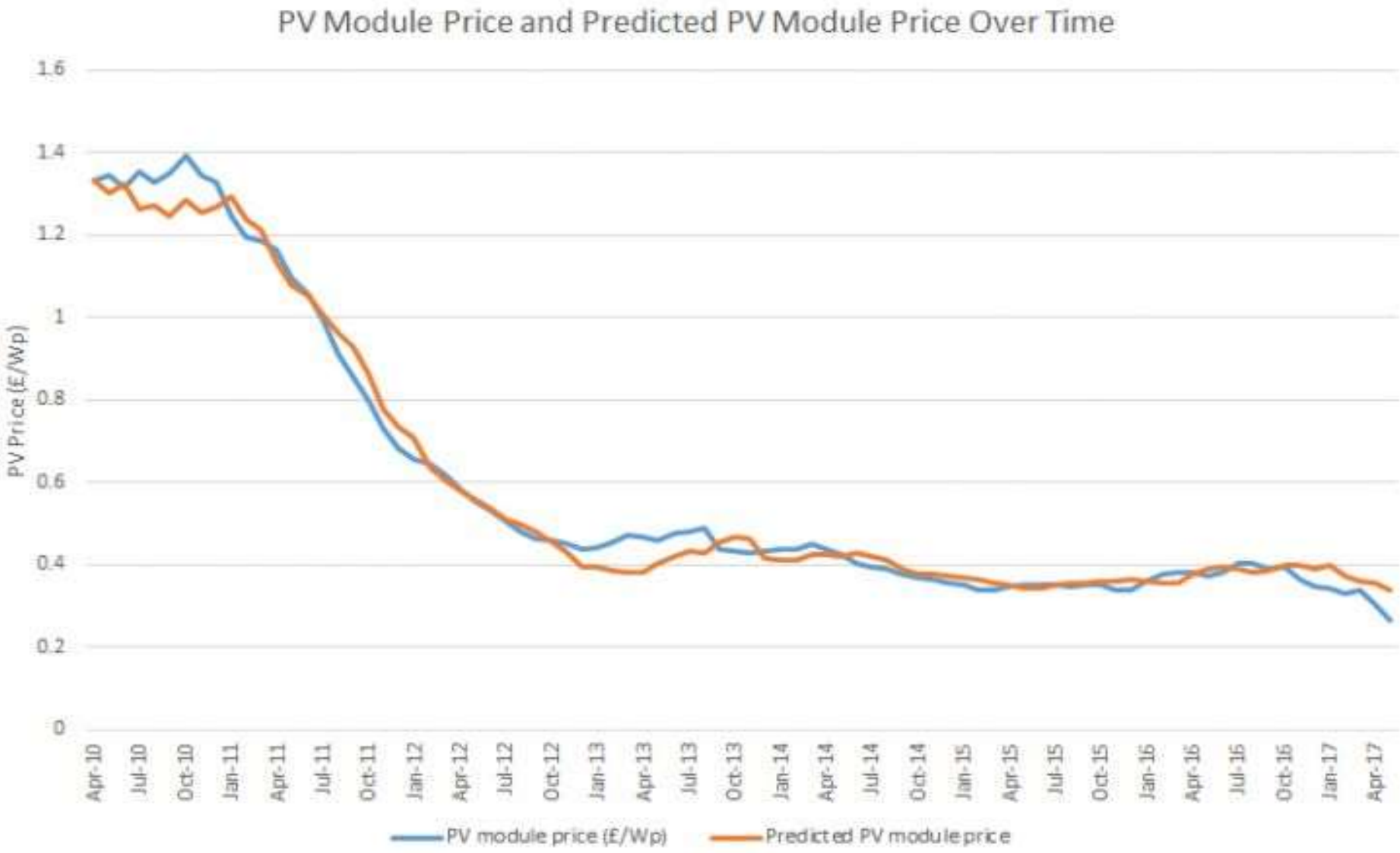
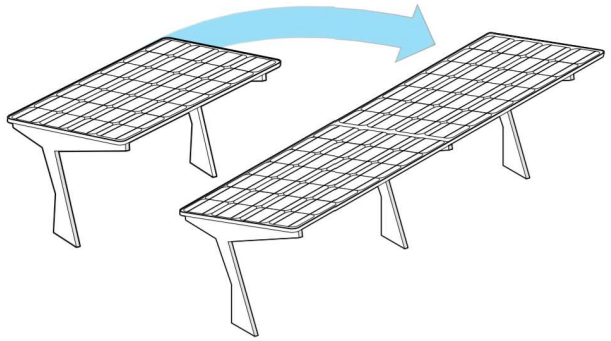
Massive Installation brings cost reduction



Self consumption
Solar PV Carport

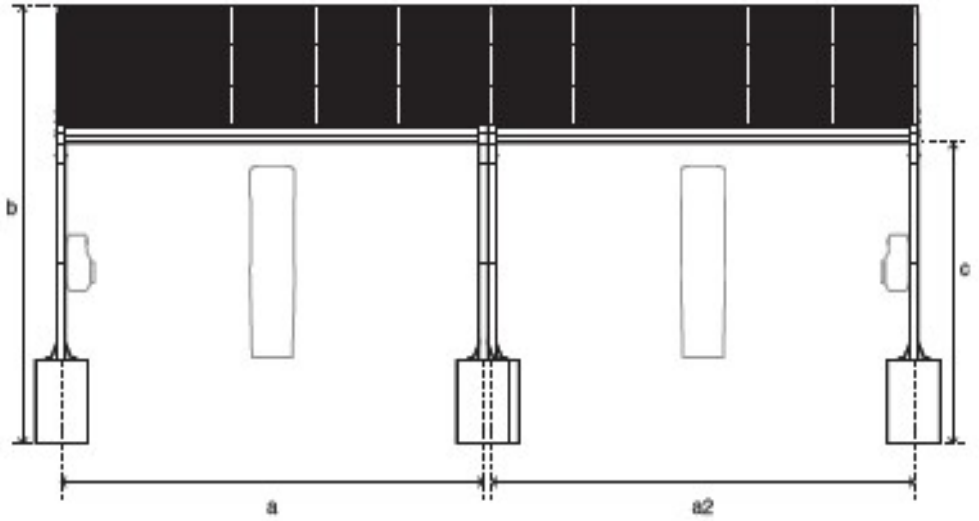


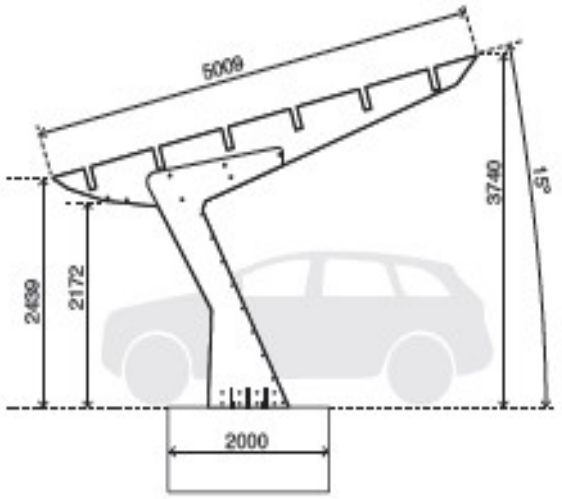
Modular solution
Covering customer needs

10 year warranty

Scalability

Self consumption. Solar PV Carport





PV, Kits PVing Park,s marquesinas solares para autoconsumo instantáneo

Tipo	Código	Potencia FV (kWp)	Tipo red	Nº inversores	Plazas	Nº Plantillas	Tamaño (mm) ancho xalto x fondo
Marquesinas simples, PV2							
PV2 C2PS	[C] E6P202.	4,20	Trifásica 3x230/400V	1 x 3,7 kW	2	2	5000x3500x4800
PV2 C3PS	[C] E6P203.	6,72	Trifásica 3x230/400V	1 x 6 kW	3	2	8000x3500x4800
PV2 C4PS	[C] E6P204.	8,40	Trifásica 3x230/400V	1 x 7 kW	4	3	10000x3500x4800
PV2 C6PS	[C] E6P206.	12,60	Trifásica 3x230/400V	1 x 12,5 kW	6	3	15000x3500x4800
PV2 C8PS	[C] E6P208.	16,80	Trifásica 3x230/400V	1 x 15 kW	8	4	20000x3500x4800
PV2 C10PS	[C] E6P210.	21,00	Trifásica 3x230/400V	1 x 20 kW	10	5	25000x3500x4800
PV2 C12PS	[C] E6P212.	25,20	Trifásica 3x230/400V	1 x 20 kW	12	5	30000x3500x4800
PV2 C14PS	[C] E6P214.	29,40	Trifásica 3x230/400V	1 x 30 kW	14	6	35000x3500x4800
PV2 C16PS	[C] E6P216.	33,60	Trifásica 3x230/400V	2 x 15 kW	16	7	40000x3500x4800
PV2 C18PS	[C] E6P218.	37,80	Trifásica 3x230/400V	3 x 12,5 kW	18	7	45000x3500x4800
PV2 C20PS	[C] E6P220.	42,00	Trifásica 3x230/400V	2 x 17,5 kW	20	8	50000x3500x4800

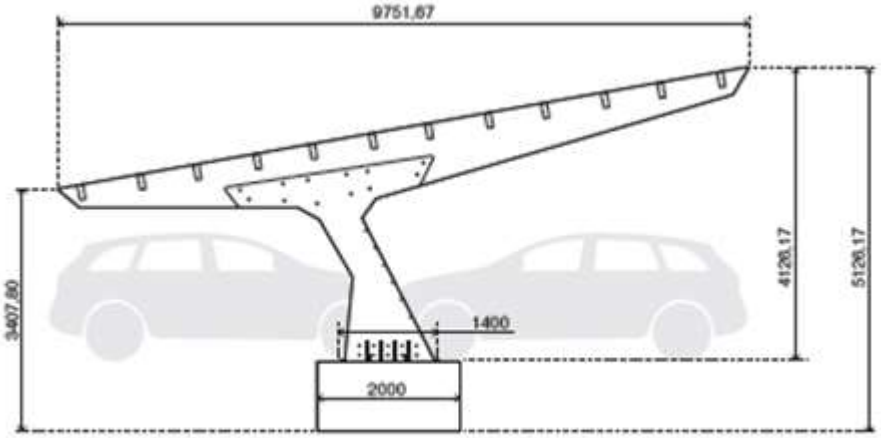
Self consumption. Solar PV Carport

Opciones disponibles:

- Color estructura marquesina y marcaje logo de empresa
- Otras opciones y configuraciones disponibles bajo pedido

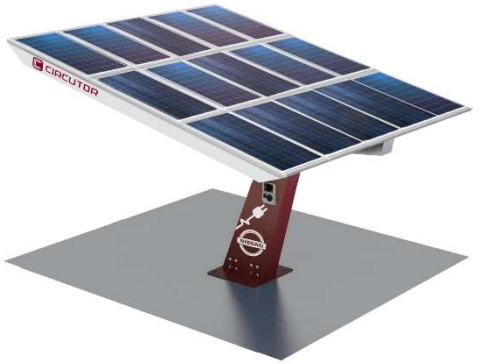
Descripción de los diferentes tipos de marquesina:

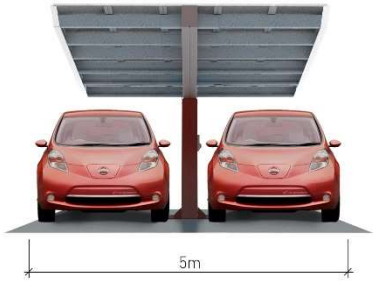
- BC = Básico
- MT = Monitorización EDS especial
- WB = Monitorización EDS especial y punto de recarga RVE-WB-CP1
- RVE2 = Monitorización Power Studio Scada Especial y punto de recarga externo RVE2P

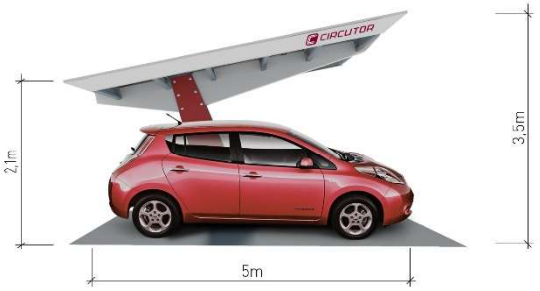


Marquesinas dobles, PV4							
PV4 C4PD	[C] E6P404.	8,40	Trifásica 3x230/400V	1 x 7 kW	4	2	5000x3600x9700
PV4 C6PD	[C] E6P406.	13,44	Trifásica 3x230/400V	1 x 10 kW	6	2	8000x3600x9700
PV4 C8PD	[C] E6P408.	16,80	Trifásica 3x230/400V	1 x 15 kW	8	3	10000x3600x9700
PV4 C12PD	[C] E6P412.	25,20	Trifásica 3x230/400V	1 x 20 kW	12	4	15000x3600x9700
PV4 C16PD	[C] E6P416.	33,60	Trifásica 3x230/400V	2 x 15 kW	16	4	20000x3600x9700
PV4 C20PD	[C] E6P420.	42,00	Trifásica 3x230/400V	2 x 20 kW	20	5	25000x3600x9700
PV4 C24PD	[C] E6P424.	50,40	Trifásica 3x230/400V	3 x 15 KW	24	5	30000x3600x9700
PV4 C28PD	[C] E6P428.	58,80	Trifásica 3x230/400V	3 x 20 kW	28	6	35000x3600x9700
PV4 C32PD	[C] E6P432.	67,20	Trifásica 3x230/400V	3 x 20 kW	32	7	40000x3600x9700
PV4 C36PD	[C] E6P436.	75,60	Trifásica 3x230/400V	3 x 20 kW	36	7	45000x3600x9700
PV4 C40PD	[C] E6P440.	84,00	Trifásica 3x230/400V	4 x 20 kW	40	8	50000x3600x9700
PV4 C44PD	[C] E6P444.	92,40	Trifásica 3x230/400V	4 x 20 kW	44	9	55000x3600x9700

Self consumption. Solar PV Carport







Single pole for 2 cars:

4,5 kWp with and without storage

Average production: 18 kWh/day
Enough for 120 km EV driving
BOS integrated in column
Charging point built-in
Kit solution

Best practice

Solar PV Carport

PVingPARKP

Success story: CIRCUTOR turnkey project: Installation of a 97.2 kWp self-consumption solar canopy in Vilamalla (Girona)

SCADA
Monitoring system

Estimated annual energy production
125 MWh per year

- 97,2 kWp solar canopy
- 360 photovoltaic modules with power up to 270 Wp
- 2 three-phase 50 kVA inverters
- Charging point for electric vehicles
- Covering a total of 48 parking spaces on 60 meters in lenght

360 photovoltaic modules
270 Wp

Reduction in CO_2 emissions
35 T CO_2 / Year

2 three-phase
50 KVA inverters

48 parking
spaces

1 charging point
of two electric sockets for EV

3.000 km/day
due to daily photovoltaic energy

Comply with **CTE**
CTE: Spanish technical building code
- ✓CTE-DB-SE Structure construction (Spanish law)
- ✓CTE-DB-AE Snow and wind load (Spanish law)
- ✓CTE-DB-A Steel construction (Spanish law)

INSTALLATION OF A 97.2 KWP SELF-CONSUMPTION SOLAR CANOPY IN VILAMALLA (GIRONA)

CIRCUTOR role

As indicated, CIRCUTOR was the main contractor and was solely responsible for the implementation and installation process, working directly on the following points:

Supplies:

- Photovoltaic material.
- URBAN model electric vehicle charging point.
- Prefabricated hut for inverter room.
- Electrical protection boards.

Work:

- Mechanical assembly of the canopy using heavy machinery (truck crane and elevation platforms).
- Electrical installation.
- Construction and project engineering.
- Develop Health and Safety plan with on-site Health and Safety Official.
- Develop SCADA application for monitoring PV generation and charging electric vehicles.
- Legalisation procedures for the photovoltaic facility in accordance with Royal Decree 900/2015.
- Legalisation procedures for the charging point in accordance with REBT-ITC-52.

CIRCUTOR brought in contractors to ensure the success of the project, meeting each of the proposed deadlines. The companies involved were:

- **Energy and Environmental Consultancy BioQuat**
- **Engineering EticEnergy**
- **Installer Masiro Instalaciones**

INSTALLATION OF A 97.2 KWP SELF-CONSUMPTION SOLAR CANOPY IN VILAMALLA (GIRONA)

Logística

Transporte marítimo

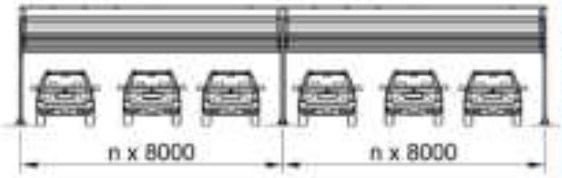
- Container 20 pies "Open Top" modelo PV2 simple
- Container 40 pies "Open Top" modelo PV4 doblw

Transporte terrestre:

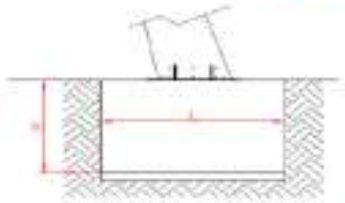
- Trailer con 7 metros de caja para modelo PV2 simple
- Trailer entero para modelo PV4 doble

INSTALLATION OF A 97.2 KWP SELF-CONSUMPTION SOLAR CANOPY IN VILAMALLA (GIRONA)

Estudio de cimentaciones – Modelo PV4



Zona de viento C (29m/s)				
	Opción 4	Opción 3	Opción 2	Opción 1
Carga de nieve máxima	50 Kg/m2			
Aspereza del terreno (CTE)	IV	III	II	I
Aspereza del terreno (Eurocógido)	III	II	I	0
Coeficiente exposición	1,3	1,6	2,1	2,4
Carga viento presión	31 Kg/m2			
Carga viento succión	-55 Kg/m2			
Peso propio de las placas solares + subestructura aluminio + correas	25 kg/m2			
Peso pie	700 kg	No instalar		
Coeficiente de obstrucción máximo	0			
Zapata (L x B x H) (1)	2,8x1,5x1,5			
Resistencia mínima del terreno requerida(2)	0,80 Kg/cm2			



(1) Se considera la zapata completamente rodeada de tierras hasta su cara superior. El terreno considerado es relleno de compacidad media con ángulo de rozamiento 20° y densidad 1,8t/m3. Para terrenos mejores se puede obtener menor dimensión de zapata. La zapata deberá estar rodeada por una franja de terreno de al menos 3 veces el canto de la misma por todas sus caras. Si se emplaza la cimentación en las proximidades de un cambio de nivel del terreno se deberá realizar un estudio especial.

(2) Se deberá verificar que el terreno donde se apoya la zapata dispone al menos de la tensión admisible indicada.

¡¡ La densidad / compactación de terreno se tiene que verificar con un estudio geotecnico en cada obra !!

La densidad de 1,8t/m3 para realizar el estudio de cimentaciones CIRCUTOR solo es una hipothesis para dar un orden de magnitud de las dimensiones de las zapatas.

INSTALLATION OF A 97.2 KWP SELF-CONSUMPTION SOLAR CANOPY IN VILAMALLA (GIRONA)

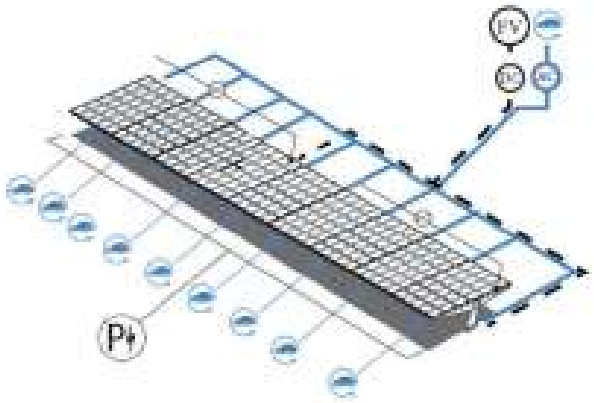
Canalizaciones

INSTALACIÓN ESTÁNDAR
CON PUNTO DE RECARGA EN PIE INICIAL

Bajada de strings (cableado DC) por pie inicial.
Alimentación de punto de recarga en pie inicial (cableado AC).

GRAN INSTALACIÓN

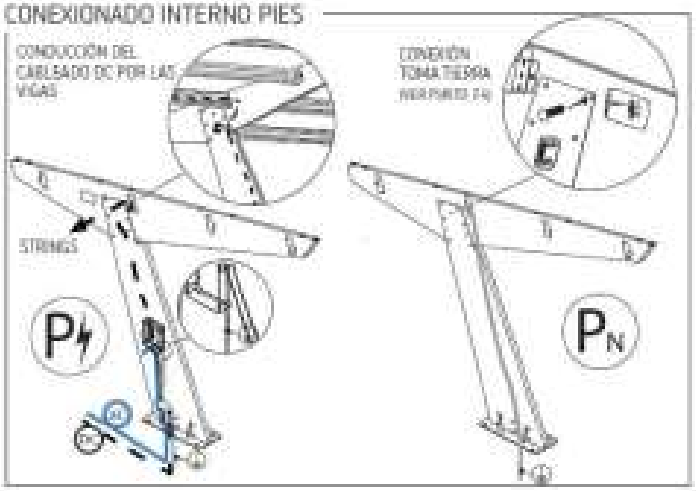
Bajada de strings (cableado DC) por pie inicial y central.
Alimentación de puntos de recarga en cada pie. (cableado AC)



INSTALACIÓN ESTÁNDAR
CON PUNTO DE RECARGA EN PIE INICIAL Y PIE FINAL

Bajada de strings (cableado DC) por pie inicial.
Alimentación de punto de recarga en pie inicial y final (cableado AC).

CONEXIONADO INTERNO PIES



INSTALLATION OF A 97.2 KWP SELF-CONSUMPTION SOLAR CANOPY IN VILAMALLA (GIRONA)

MARQUESINA PV4 – Vilamalla

INSTALLATION OF A 97.2 KWP SELF-CONSUMPTION SOLAR CANOPY IN VILAMALLA (GIRONA)

Results:

To bring the project to a successful conclusion, it was divided into three different stages, each with its own time frame.
The following results are expected once the project is complete:

- Forecast energy savings: **€10,000 in year one**.
- Estimated annual energy production: **125 MWh per year**.
- Reduction in CO2 emissions: **35 tonnes per year**.
- **Return of investment (ROI) ~5%/year**.
- Generate enough **daily photovoltaic energy** to charge electric vehicles covering **distances up to 3000 km per day** with emissions-free energy.
- Air conditioning in summer causes consumption peaks, with the consequent payment for excess power. **This new solution will avoid this excess power, bringing a direct financial saving**.

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