

PIUBAES



Programa Interdisciplinario de la
Universidad de Buenos Aires
sobre Energías Sustentables

MOVILIDAD ELECTRICA EN ARGENTINA Y EL SISTEMA ELECTRICO

Ing. Claudio Damiano

Buenos Aires, AGO 19

Entorno de la movilidad sostenible

- Ambiente – Descarbonización, Financiamiento, GHG.
- Electricidad – Generación, redes, cargadores, V2X.
- Baterías – Li, Co, Reciclado y Disposal.
- Motores eléctricos – Lantánidos.
- Motores ICE – Híbridos, biofuel, GNC, GLP – Hidrogeno.
- Transporte publico – Buses eléctricos.
- Movilidad Compartida – Ride hailing, alquiler, MaaS.
- Movilidad no motorizada – Bicis, patinetas.
- Comunicaciones – Conectados y autónomos, protocolos de comunicación, celulares, dockless.
- Digitalización – Ciberseguridad, propiedad de los datos y el software.
- Accidentes - Primera respuesta, Bomberos, Salud, Policía

Movilidad Sostenible Multidisciplinaria:

- Mecánicos
- Electricistas
- Químicos
- Electrónicos
- Industriales
- Informáticos
- Sistemas

Historia

1896

EVOLUCION LENTA

American Electric Vehicle Co.

MANUFACTURERS OF

FINE ELECTRIC CARRIAGES.

Maximum
Speed,
14 Miles
per
Hour.



Cost of
Operation
per Mile,
1
Cent.

ELECTRIC MAIL PHAETON.
IN DAILY USE ON THE STREETS OF CHICAGO.

For Catalogue and Prices, address

447 Wabash Avenue, Chicago, Illinois, U. S. A.



NO. 3 ELECTRIC DRAY.



NO. 4 ELECTRIC DRAY.



NO. 2 LIGHT ROAD BUGGY.



NO. 1 ELECTRIC BUS.



Vehículos actuales

Primera generación:

Con leves cambios en modelos existentes, se acomodan el motor y el almacenamiento energía.

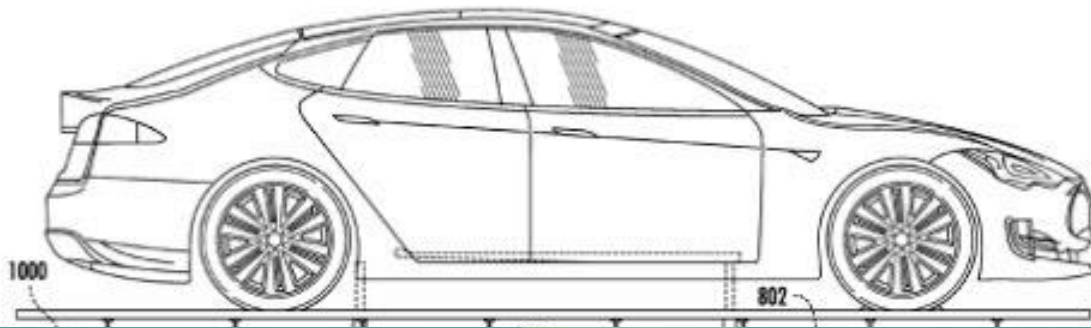
Recargas fuera del vehículo: batería intercambiable



Recargas

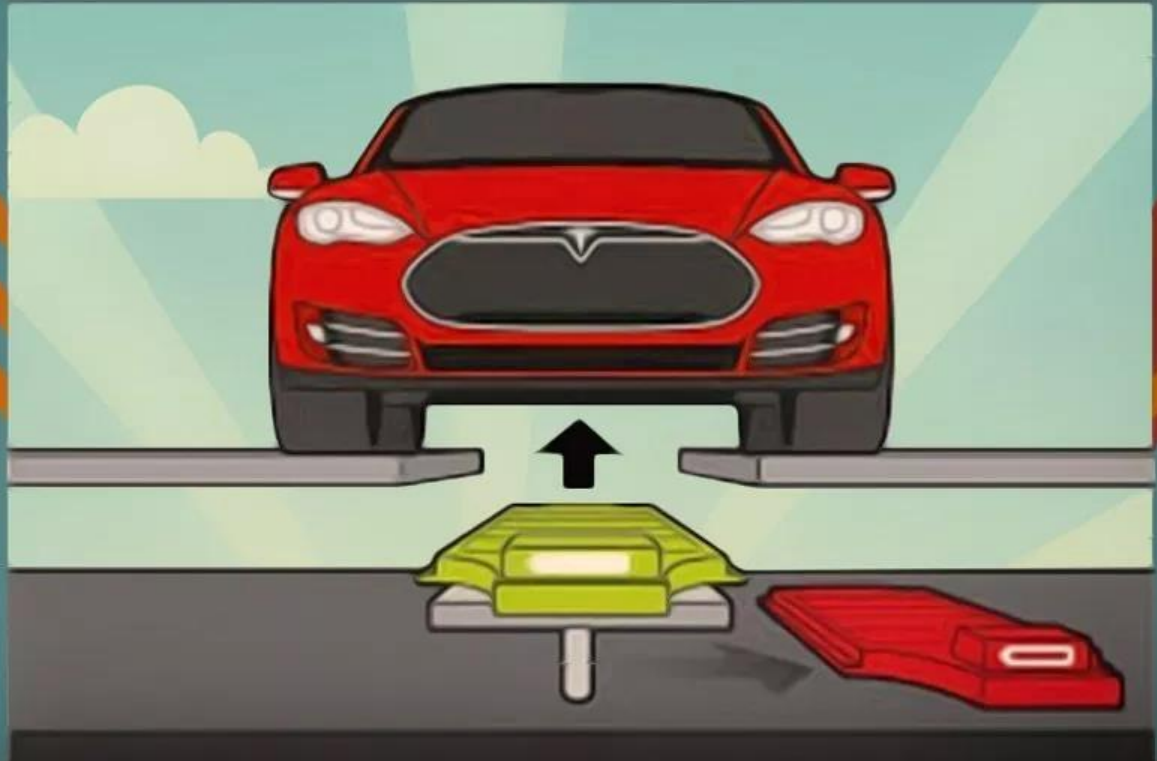
cambiable

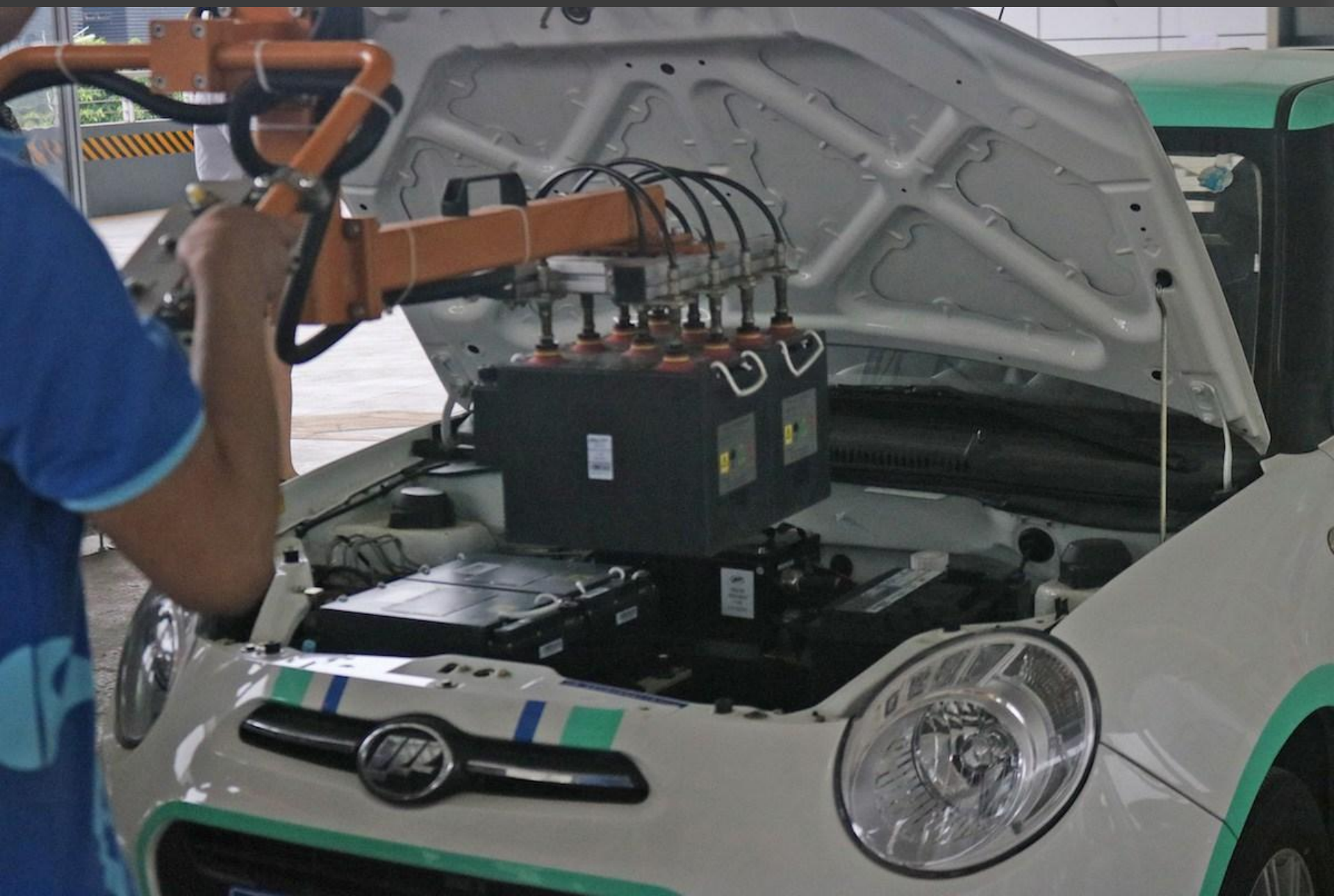




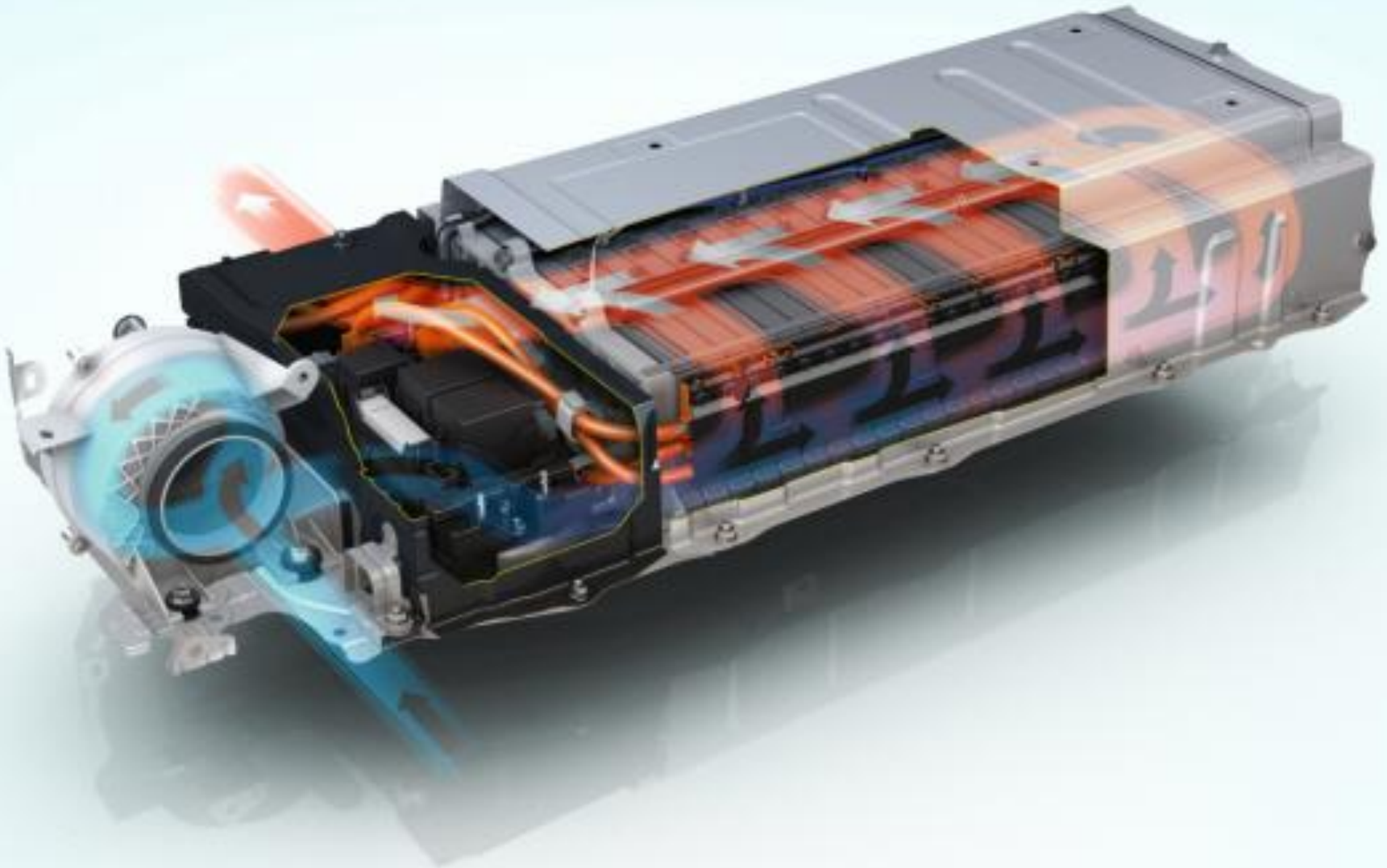
BIDNESS ETC

Battery-Swap Station





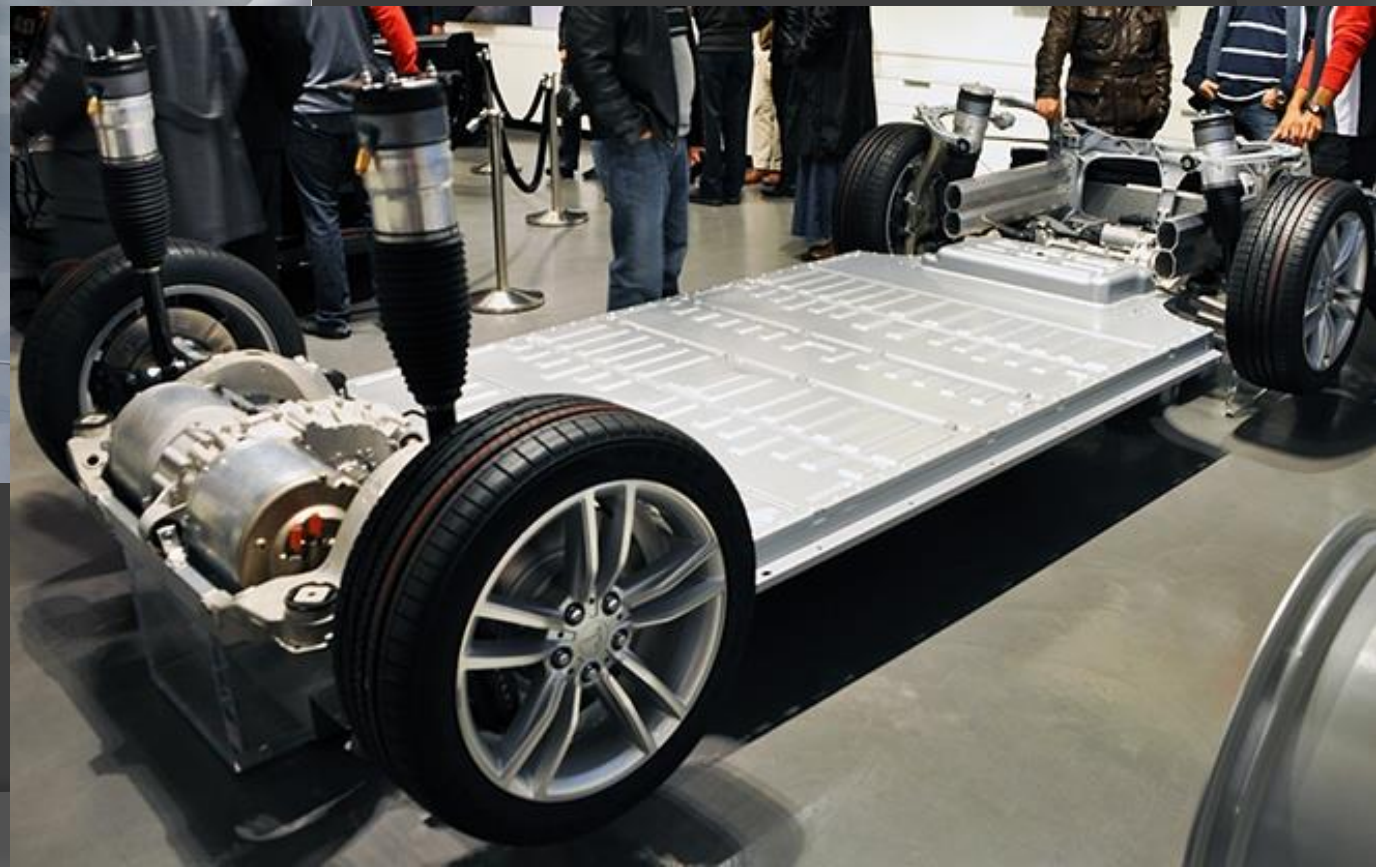
Gerenciamiento térmico del pack de baterías:



Vehículos actuales

Segunda generación:

vehículos nacidos para el accionamiento a baterías



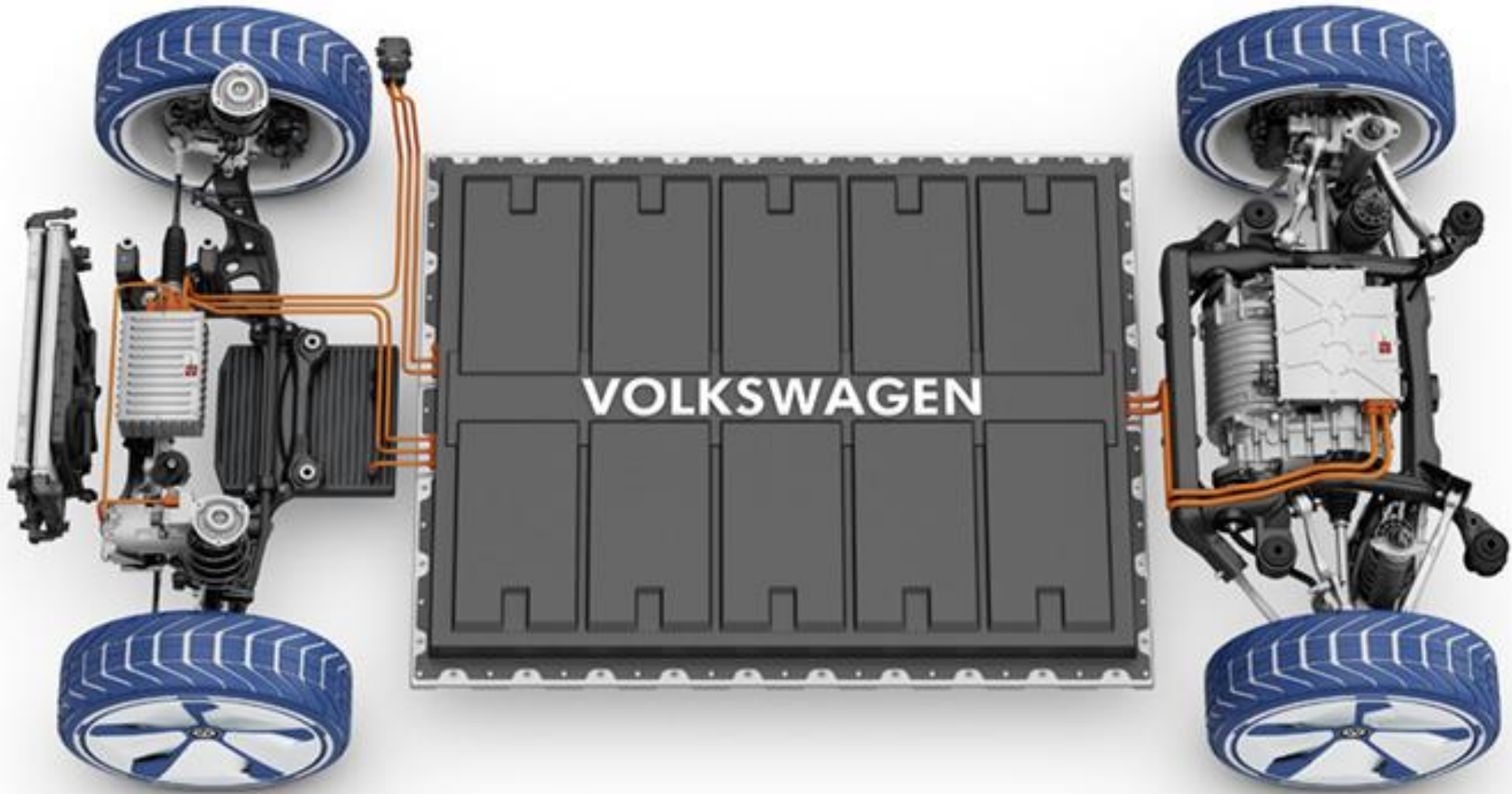
NISSAN LEAF – AUN CON VANO MOTOR



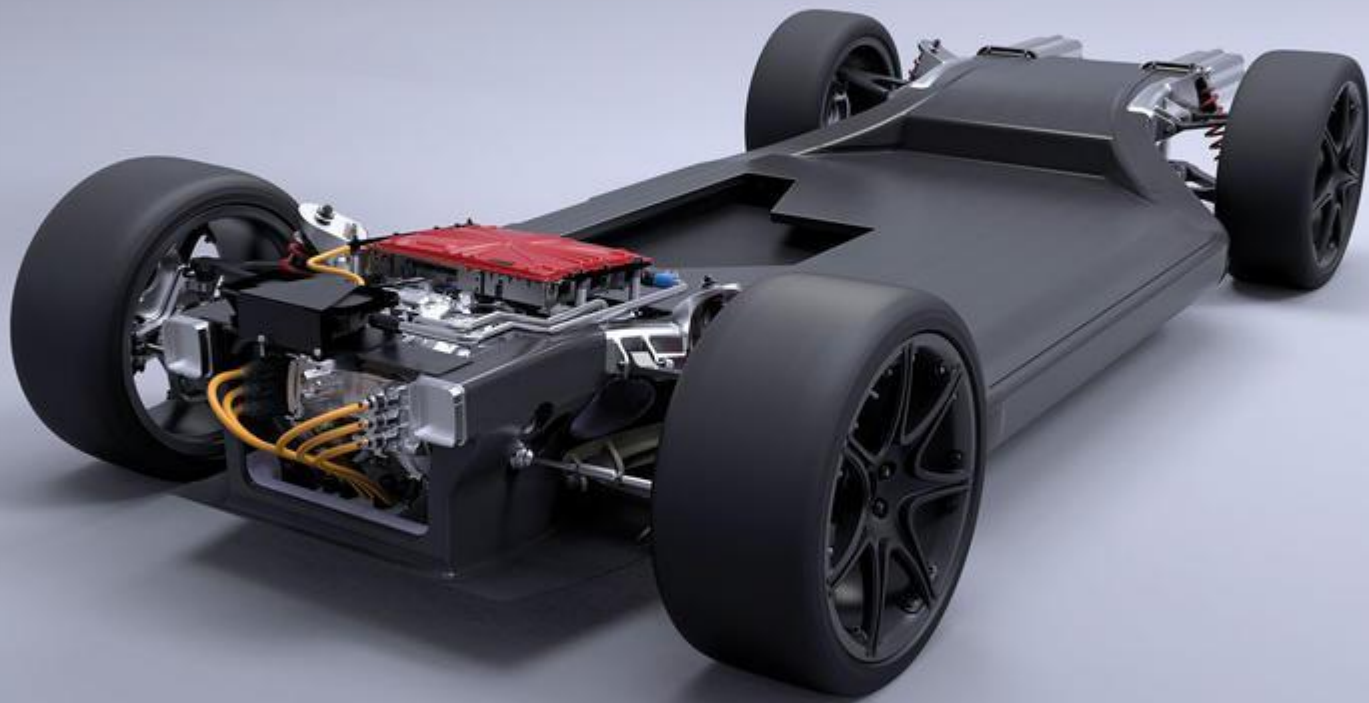
BMW i3



VW ID



Skate para carrozar



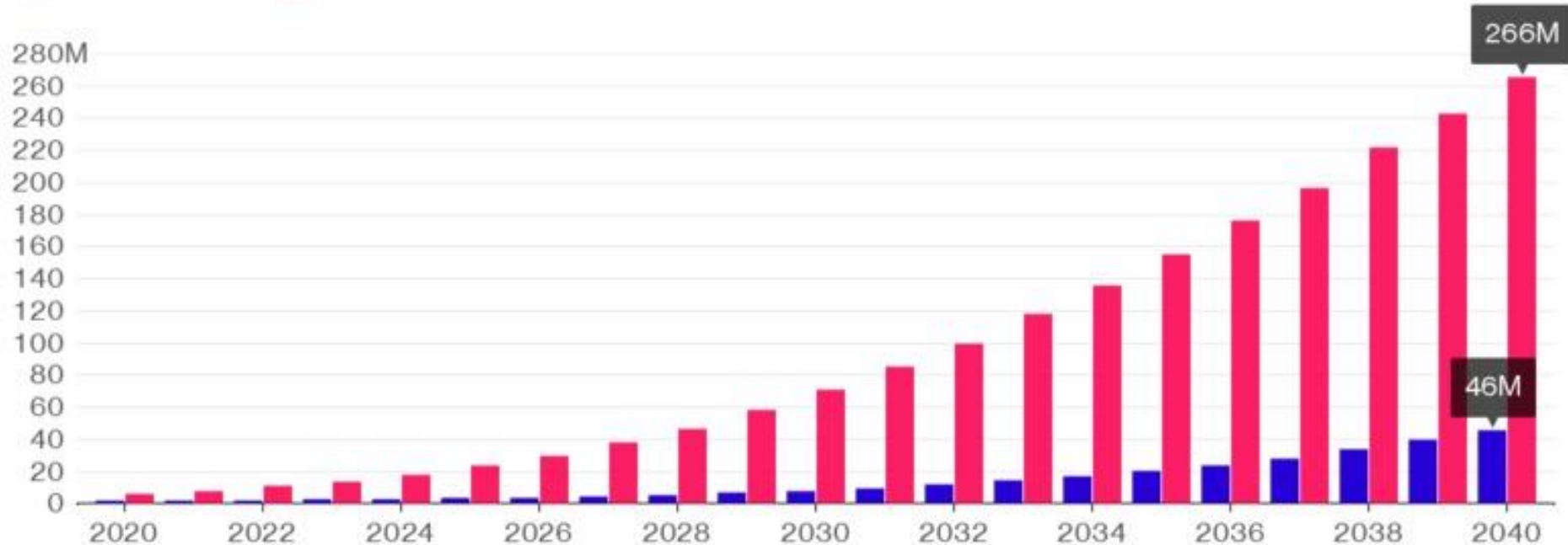
Ventas mundiales de autos eléctricos

Growing Expectations

OPEC's electric vehicle forecast grew by almost 500% last year

■ 2015 Forecast

■ 2016 Forecast



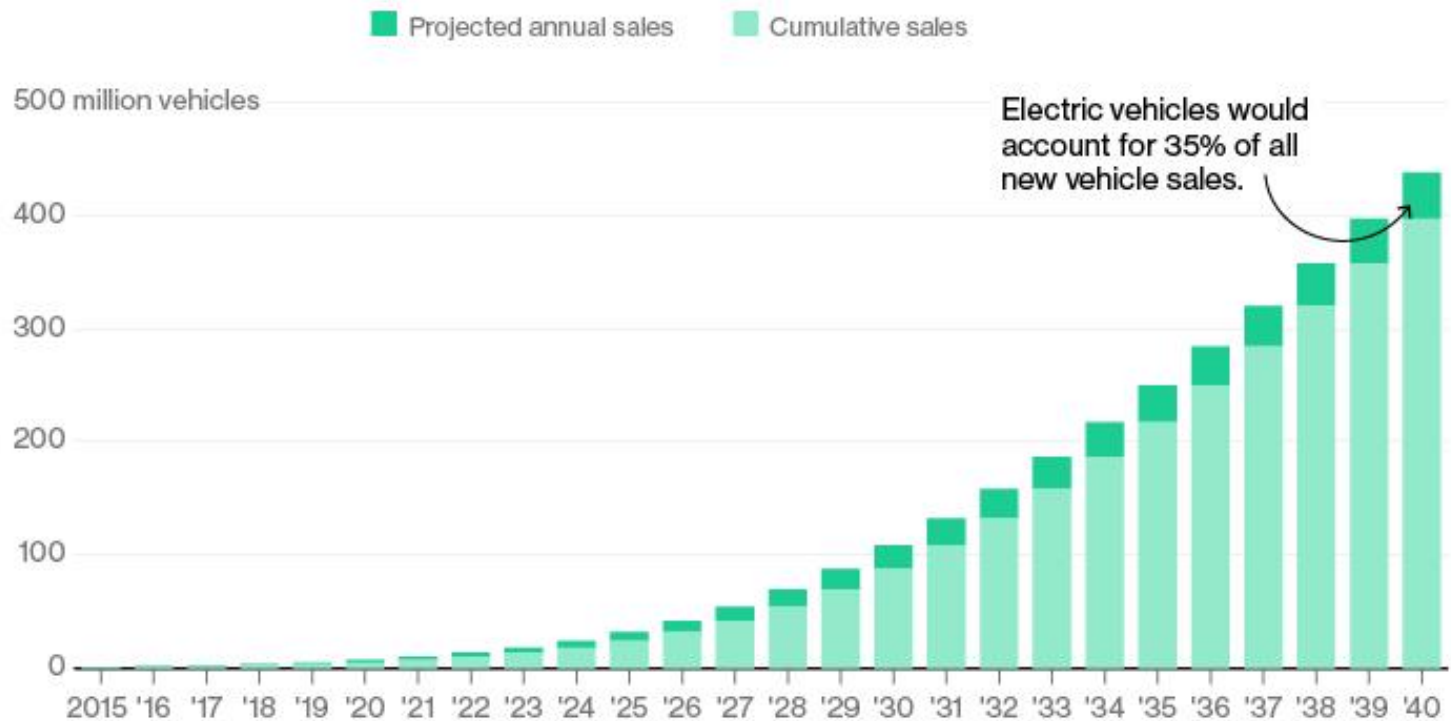
Source: Bloomberg New Energy Finance

Bloomberg 

Ventas mundiales de autos eléctricos

The Rise of Electric Cars

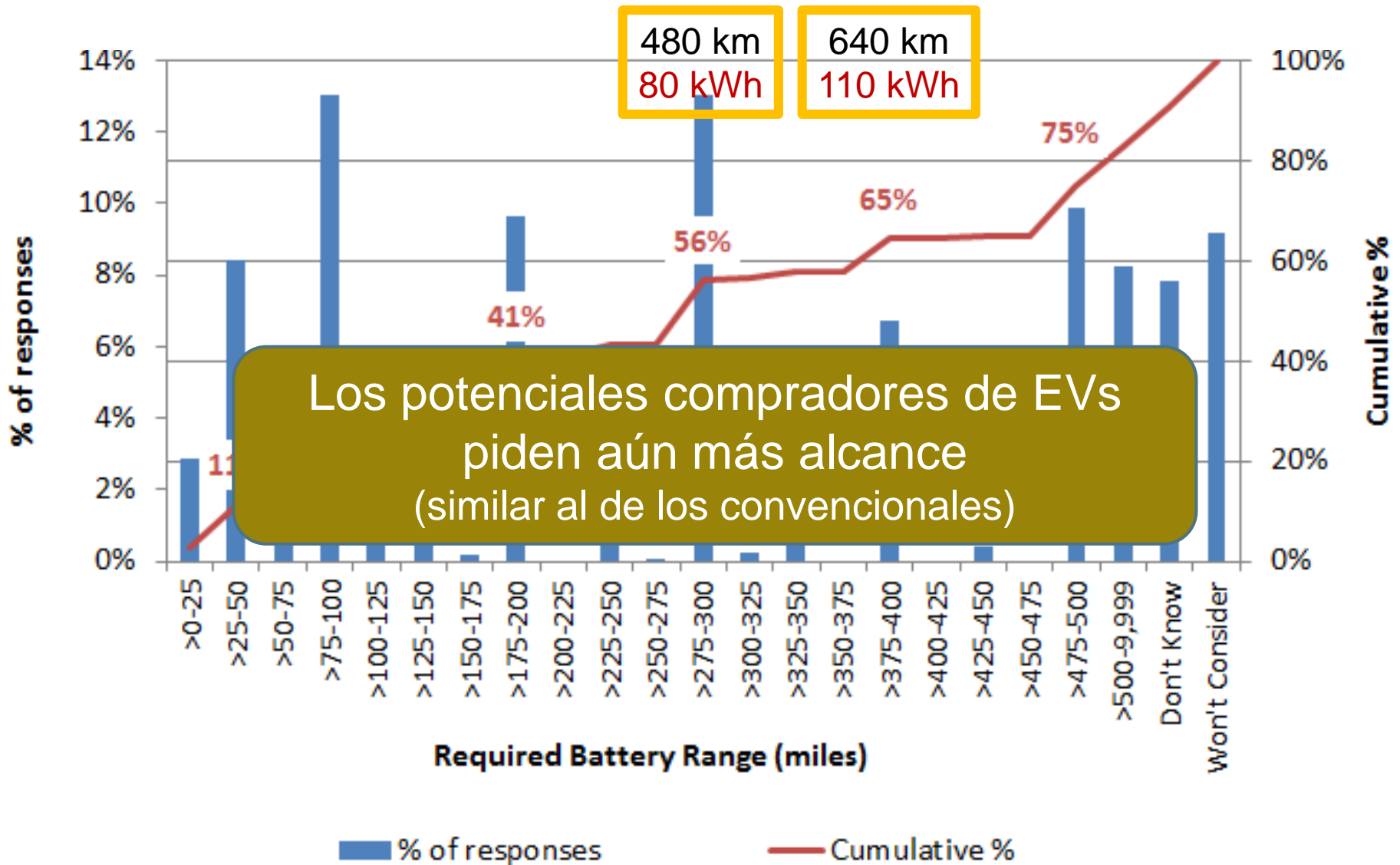
By 2022 electric vehicles will cost the same as their internal-combustion counterparts. That's the point of liftoff for sales.



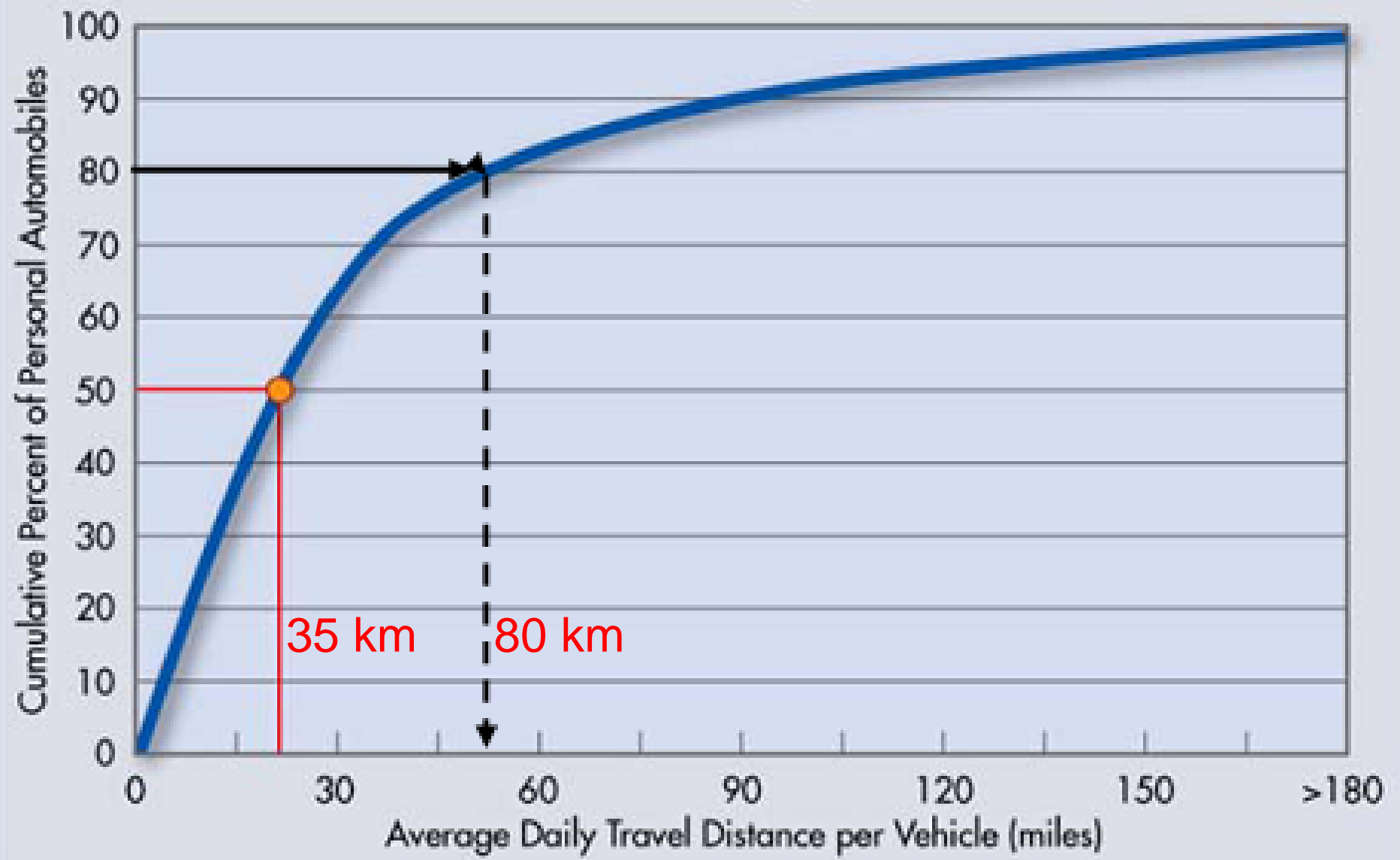
Sources: Data compiled by Bloomberg New Energy Finance, Marklines

Bloomberg 

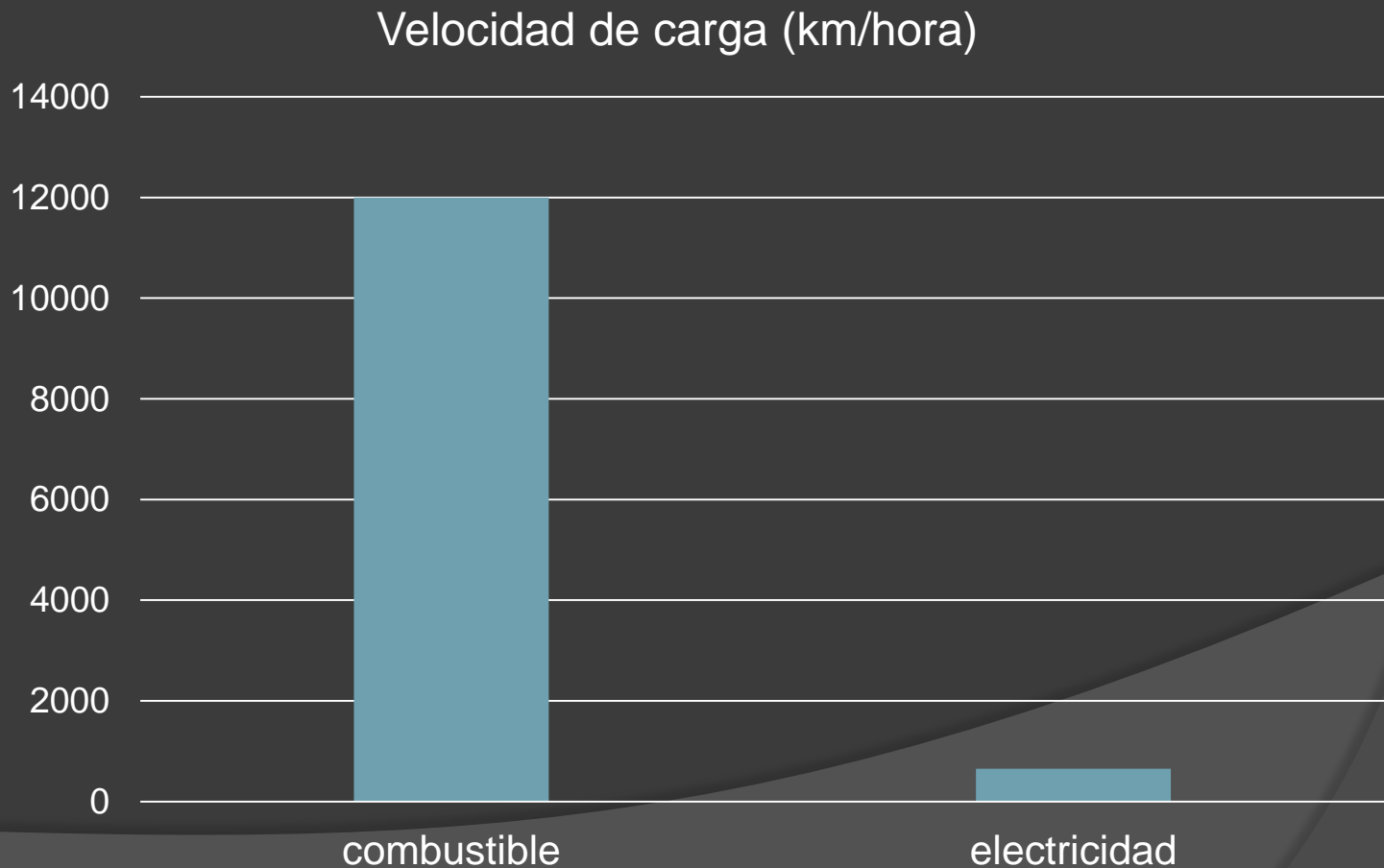
Encuesta: cuántas millas debería recorrer un automóvil a baterías para que Ud. considere comprarlo?



American Driving Patterns



Y también piden cargas más rápidas
=
MAS BATERÍA Y MAS POTENCIA DE CARGA



Baterías actuales:

El 70% de las baterías de Li fabricadas actualmente son LFP

Cell Level Data	LpTO™	LFP	NCM	Ni-Mh
Nominal Voltage	2.3	3.2	3.7	1.2
Max/Nominal Cell Charge Rate	+20C/+6C	+2C/+0.5C	+1C/+0.2-0.5C	+0.5C/+0.1C
Max Cell Discharge Rate	-20C	-10C	-3C	-2C
Max Operating SOC	95%	90%	90%	90%
Min Operating SOC	15%	20%	20%	30%
Typical Cell Energy Density (wh/Kg)	85	110	140	45
Typical Cycle Life @ 100% DOD	20,000 (At 6CC/6CD)	2,000	1,000	600
Temperature Tolerance	Excellent	Good	Fair	Poor
Chemistry Safety Mechanism	Excellent	Poor	Poor	Fair



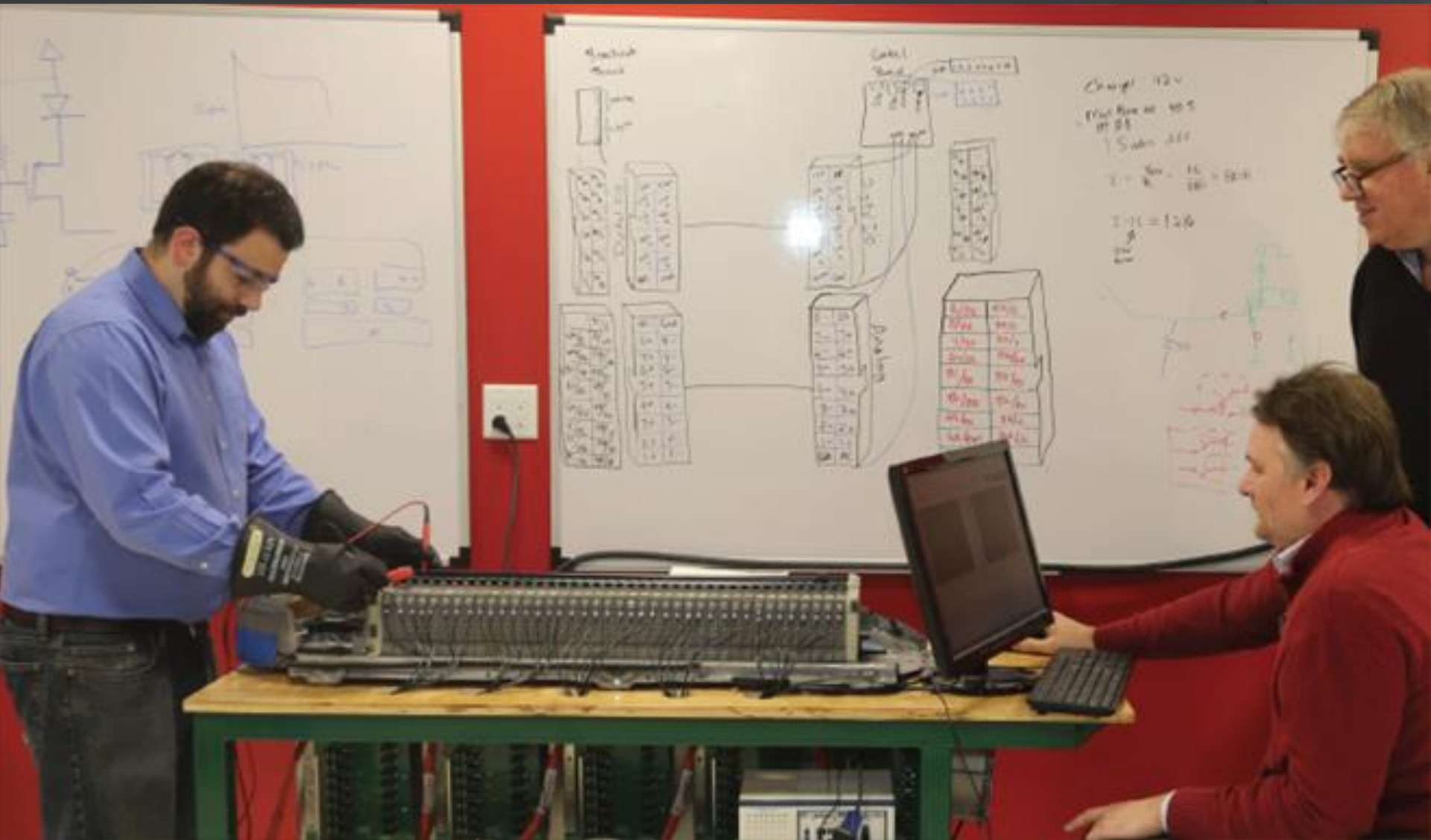
DE LA CELDA AL PACK



BMS



Reciclado – Segunda vida



Almacenaje residencial



Baterías de segunda vida



Almacenaje residencial



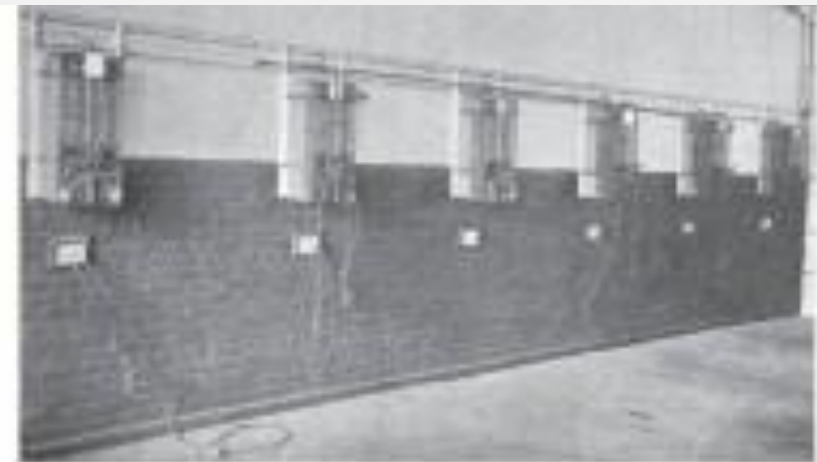
LA RECARGA DEL AUTOMOVIL ELECTRICO.



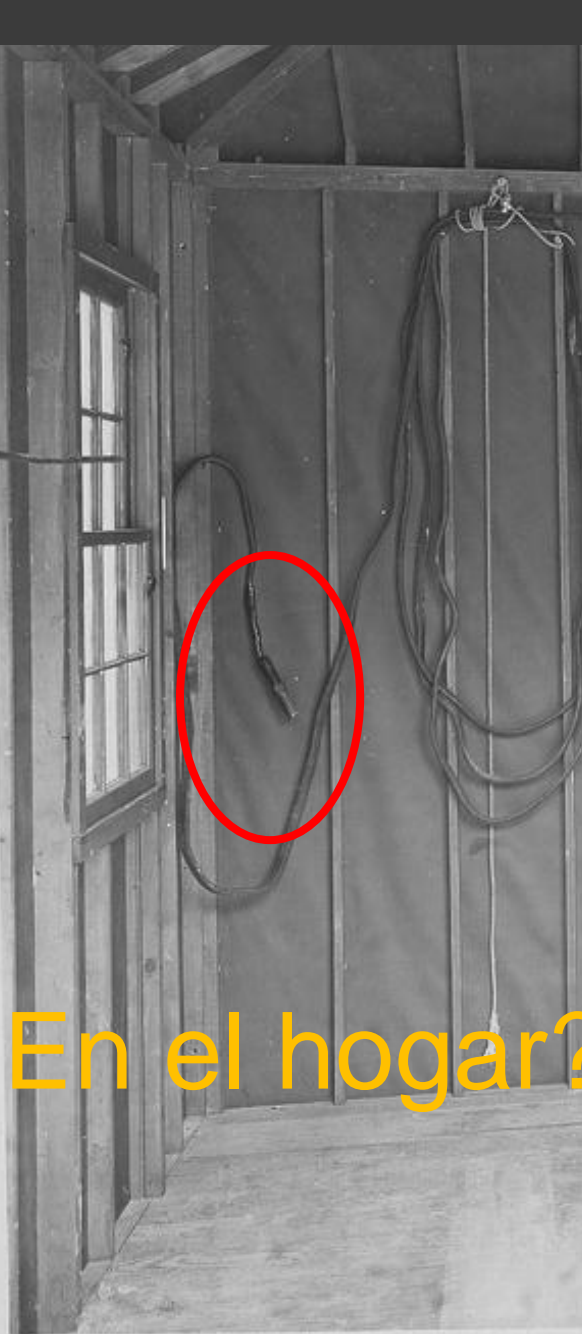
Battery swapping ... o recarga en el auto?



LATERAL BATTERY BANK



CONNECTIONS IN READY TO BECH CHARGED

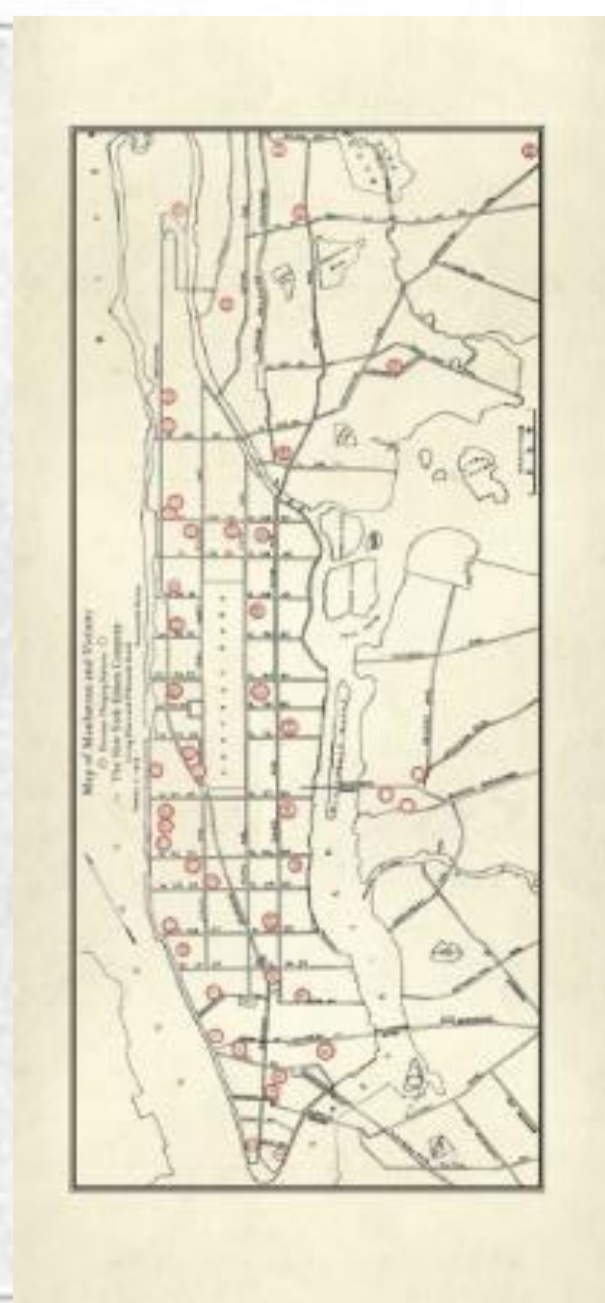


En el hogar?

207418



O en la
via pública?

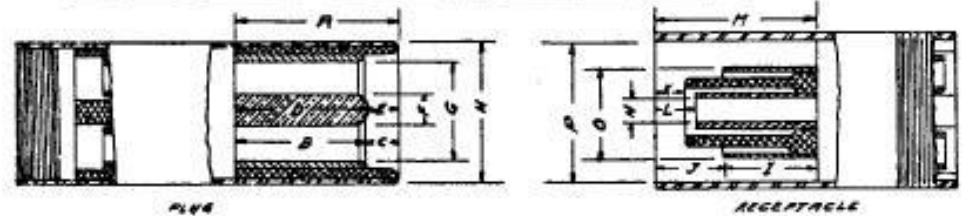


FIGS. 1 AND 2—CURB CHARGING STATION FOR ELECTRIC
AUTOMOBILES



124 W. 42ND ST.
NEW YORK

Standard Charging Plugs and Receptacles.



contacts must be accurately concentric to insure interchangeability.



Figure 3.25: 150 A charging plug with handle²⁰²

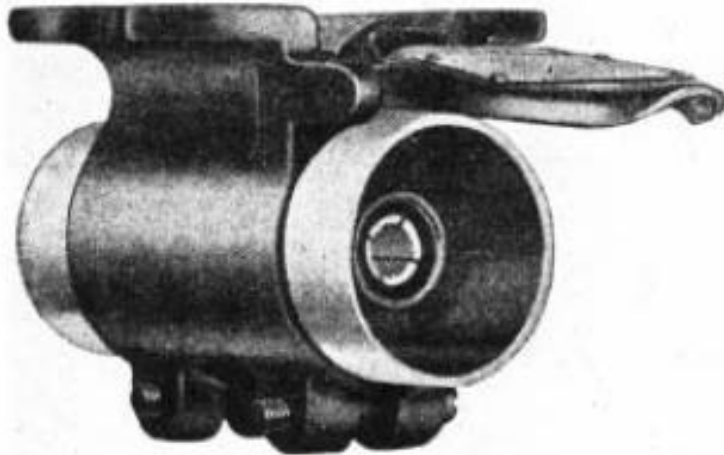


Figure 3.26: 150 ampere-hour (sic) charging receptacle²⁰²

CAPACITY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
50 AMP	1 1/8	1 1/8	3/8	1 1/8	5/16	.575	1.125	1.125	1 1/8	7/8	2/8	2/8	2	.375	.360	1.125
150 AMP	2 1/8	1 1/8	1 1/8	2 1/8	5/16	.935	1.406	2.100	1 1/8	1 1/8	3/16	7/16	2 3/8	.427	.427	1.406

The National Board of Fire Underwriters have approved plugs of the above dimensions for these ratings with an allowable overload of 50%.

Polarity— Outside contact positive, inside contact negative.

Terminals— Should be large enough to receive cable having a rating, according to the Underwriter's Code "Table B," at least equal to the normal rating of plug.

Terminals are to be marked + and - to correspond to polarity of contacts as above.

COMMITTEE ON STANDARDS

E.R. Whitney, Chairman.
Alexander Churchward.
J.R.C. Armstrong
H.H. Rice.
W.E. Holland.
E.J. Ross Jr
E. Gruentfelt.
Charles Blizard.
J.H. Hertner.
Louis Burr

Dec 10th 1913

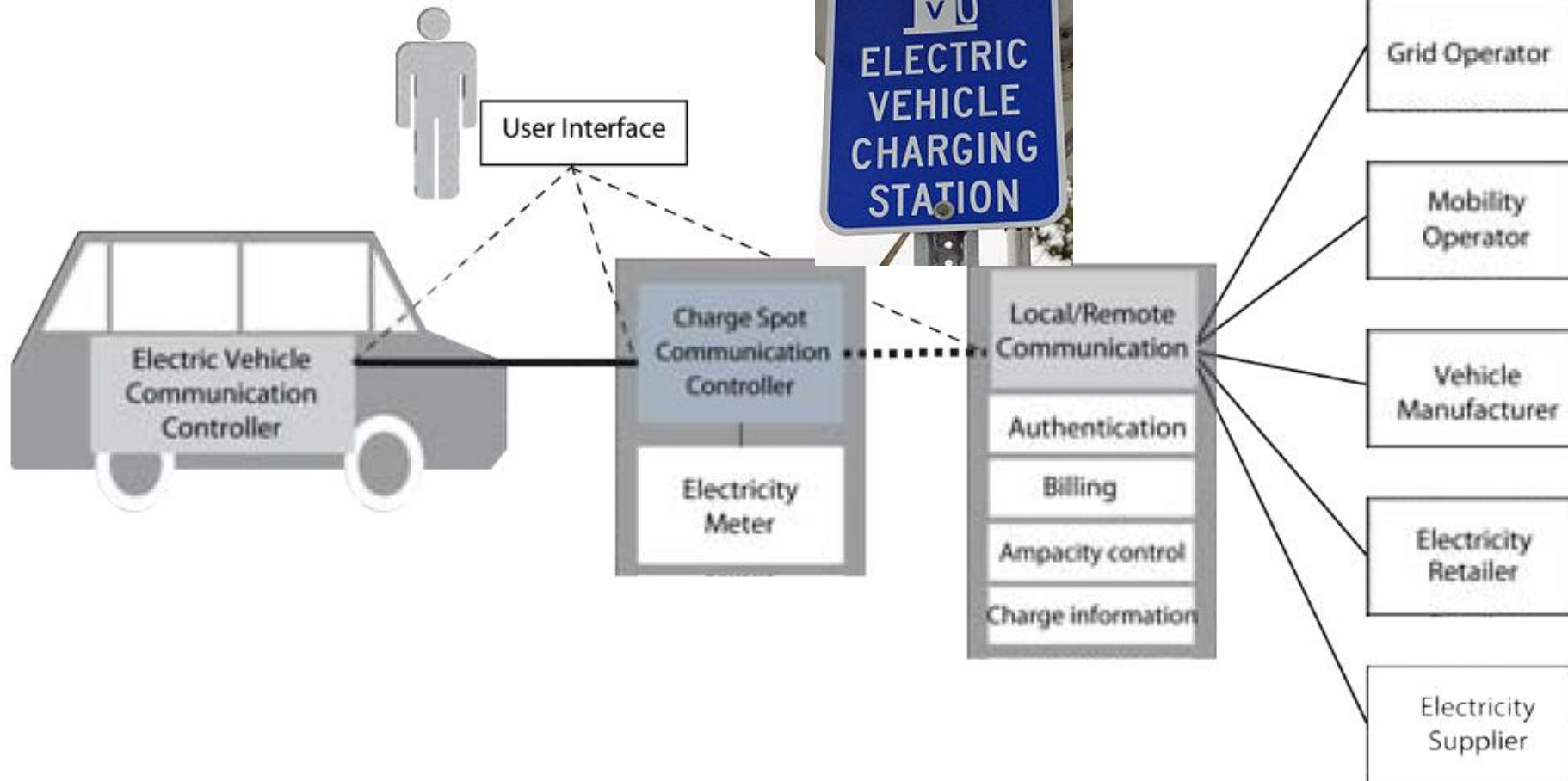
Recommended by Standardization Committee and accepted by N.B.F.U. Oct 1912 and Oct 1913.

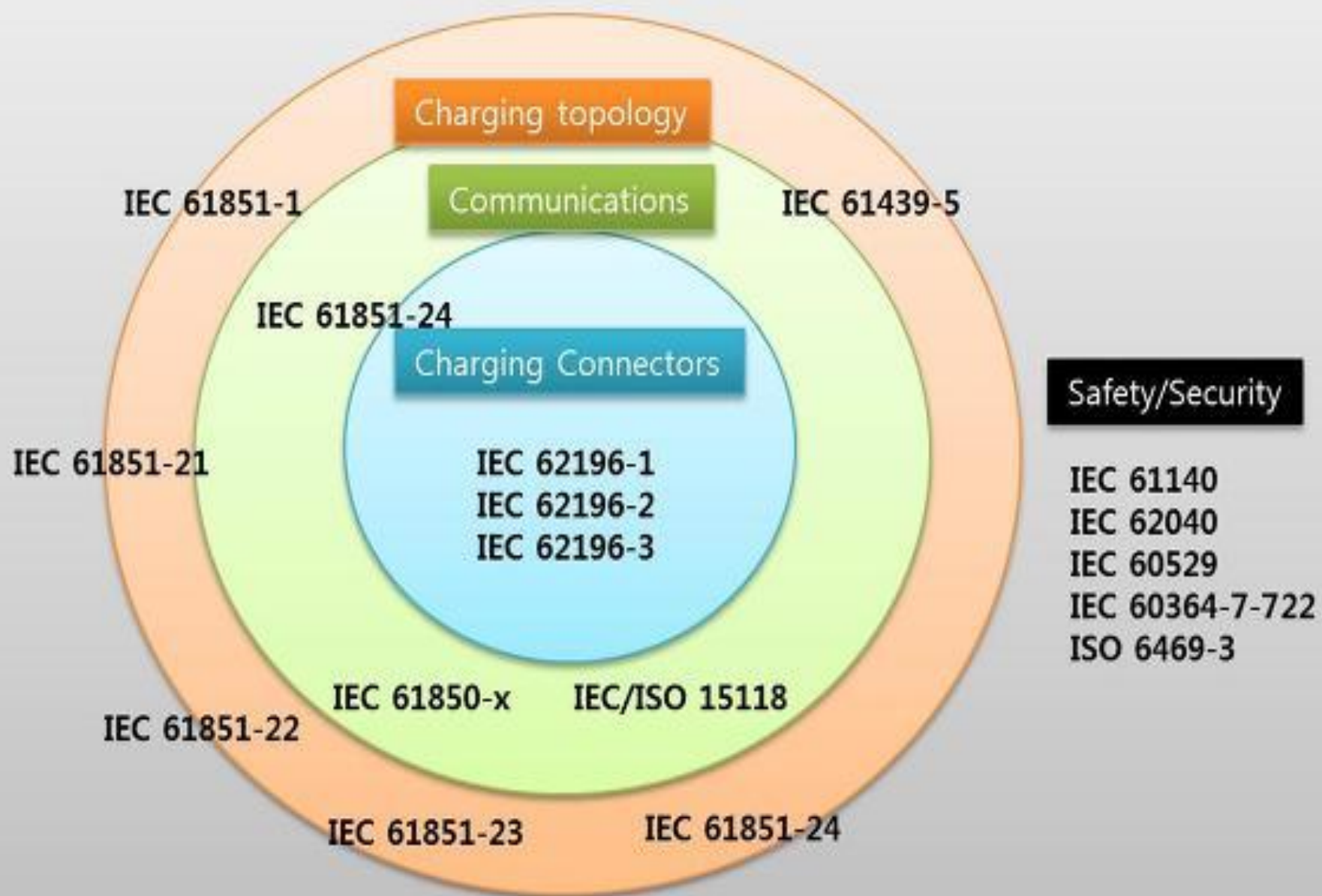


**INTEROPERABILIDAD
Y SEGURIDAD
IEC 61851**












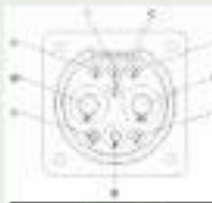



Interoperabilidad Recarga en vía pública Actores involucrados





















Interoperabilidad - Conectores

	US	EU	CHINA	JAPAN	
AC Charging  	Single-Phase (1Ø)	 SAE J1772™	 IEC 62196-2 Type 1	 Type 2	 SAE J1772™ *
	Single- or Three-Phase (1Ø or 3Ø)		 IEC 62196-2 Type 2  IEC 62196-2 Type 3	SAE and IEC AC standards have common control signals	China charge couplers (not standard yet) have unique control signals and overall physical shape
DC Charging 	 SAE J1772™ 'Hybrid'	 IEC 62196-2 Type 2 'Hybrid'	SAE and IEC working toward harmonization of DC 'Hybrid' charge couplers	 Mode 3	 JEVS G105-1993 (ChADeMO)

* SAE J1772™ AC connector has also been adopted by Korea and Australia

	AC Level One	AC Level Two	DC Fast Charge	DC High Power
				
Power required	 1.9kW	 2.5 to 19.2kW	 50kW	 350kW
Charge time	 ~16 hours	 ~2-12 hours	 ~20-40 minutes	 ~6-8 minutes
Grid connection	 Residential	 Residential	 Public	 Direct to grid

Note: Charge time based on a 40kWh battery size. DC High Power — Charge time is applicable when EVs are capable of this charging speed

Source: L.E.K. and Tritium analysis

Multi-standard charger solution

AC



RENAULT

DAIMLER

TESLA

CHAdeMO



NISSAN

mitsubishi

KIA

PEUGEOT

CITROËN



CCS



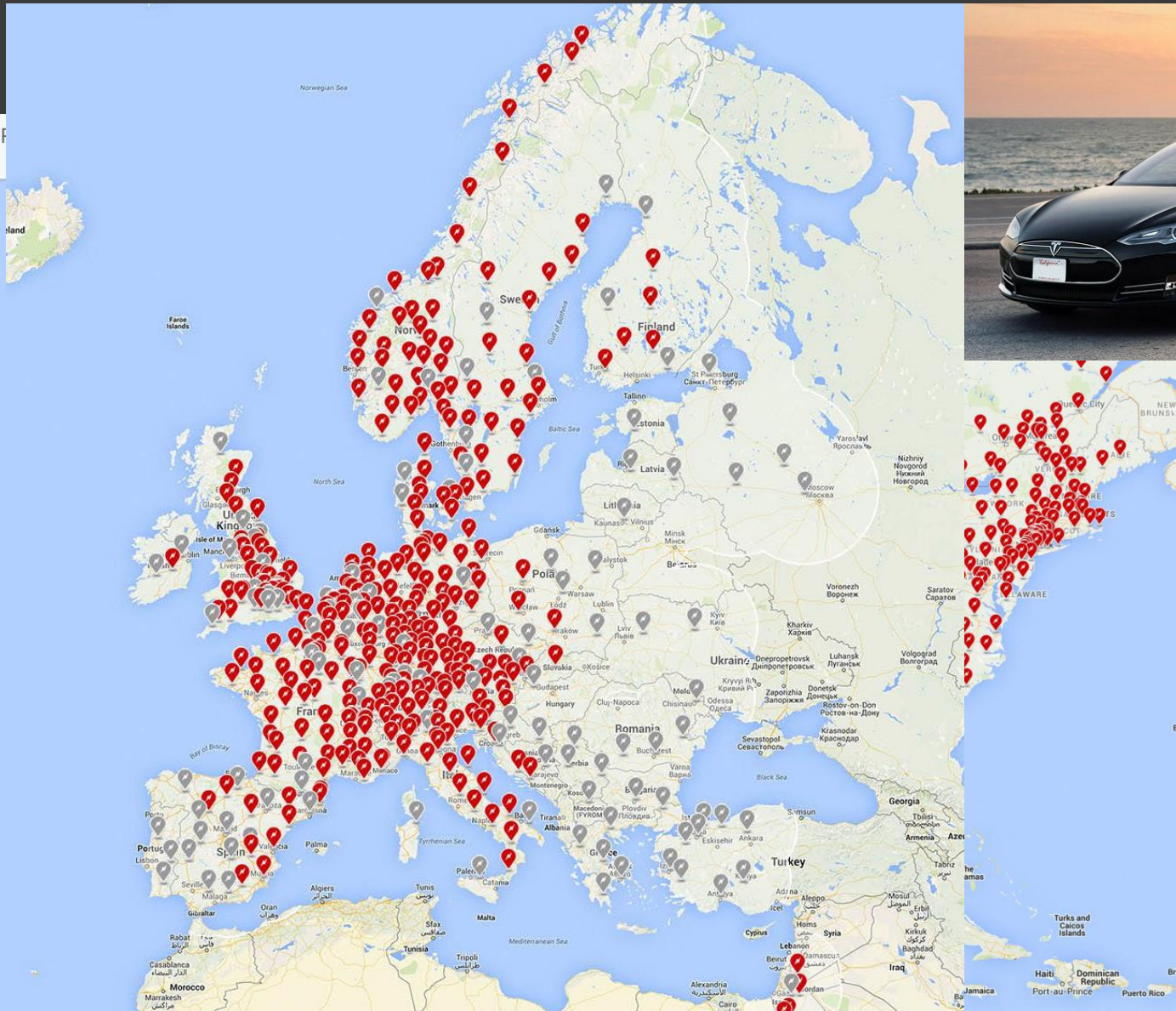
BMW

VW

GM

DISTINTOS TIPOS DE RECARGA

Recarga rápida (y gratis!) – 13000 chargers en USA



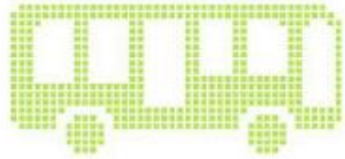




◀ Asia-F

Recarga rápida a 350 kW



RECARGA EN VEHICULOS PESADOS Gotemburgo (Volvo)

- 10 minutes fast charge 
- Long-life battery 
-  Fast Charging Pure Electric Buses
- Intelligent traffic management 
- Thermal Management System 



RECARGA EN CARRETERA PANTOGRAFO

SIEMENS' eHIGHWAY
TEST TRACK
GERMANY



RECARGA EN CARRETERA

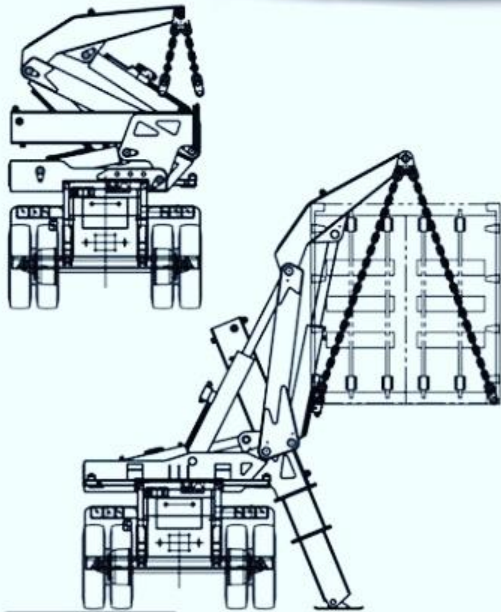


Cargadores a baterías



Cargadores a baterías

E-TRUCK
SIDELIFTER



Carga de emergencia



Otros sistemas de Recarga: sin cables. (IEC 61980)



Qualcomm Halo
3.3kW - 6.6kW



3 Wireless power & data transfer

4 Vehicle pad

5 On board controller

6 Battery

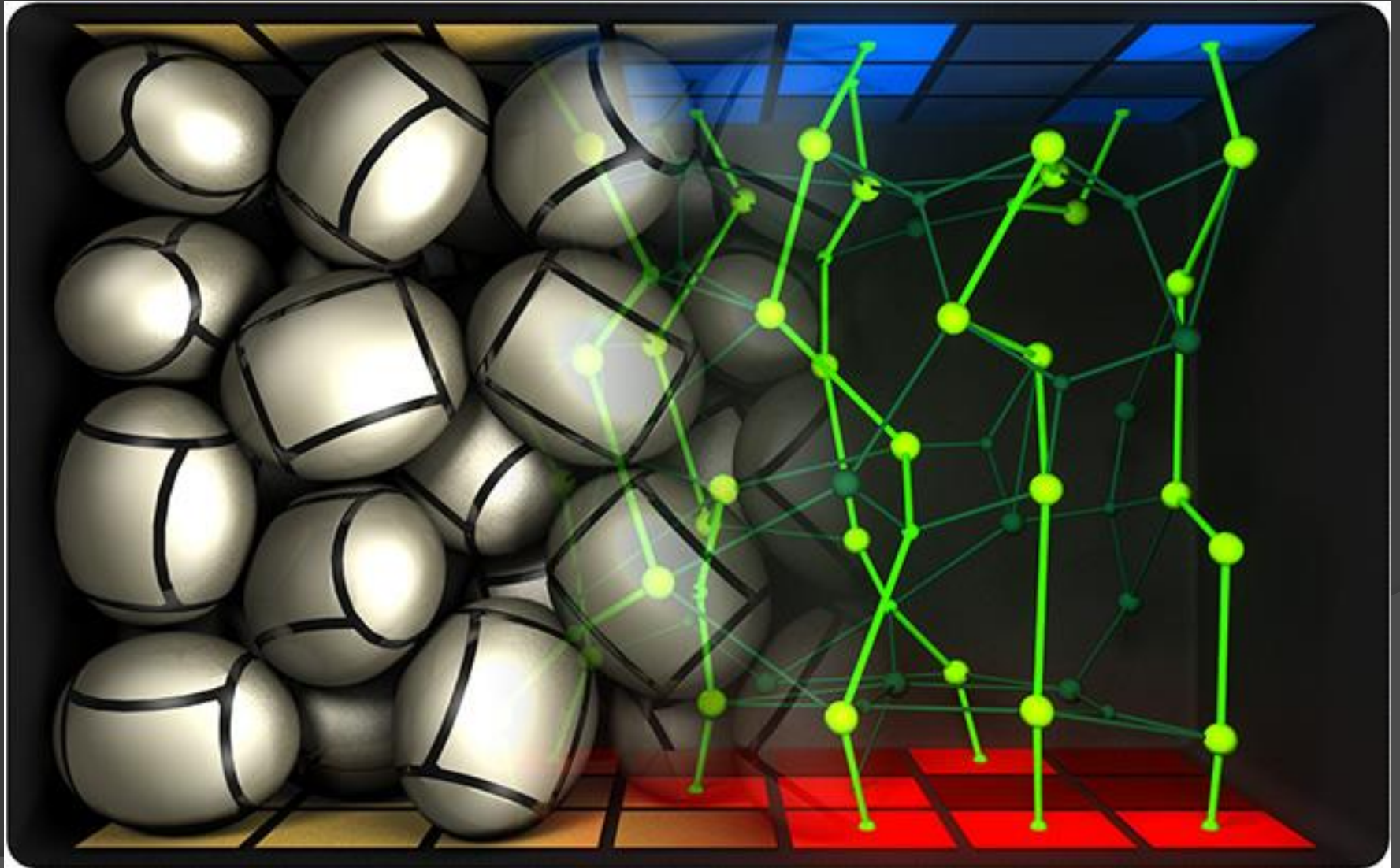
Otros sistemas de Recarga: sin cables (IEC 61980)



Otra clase de recargas rápidas: String cell



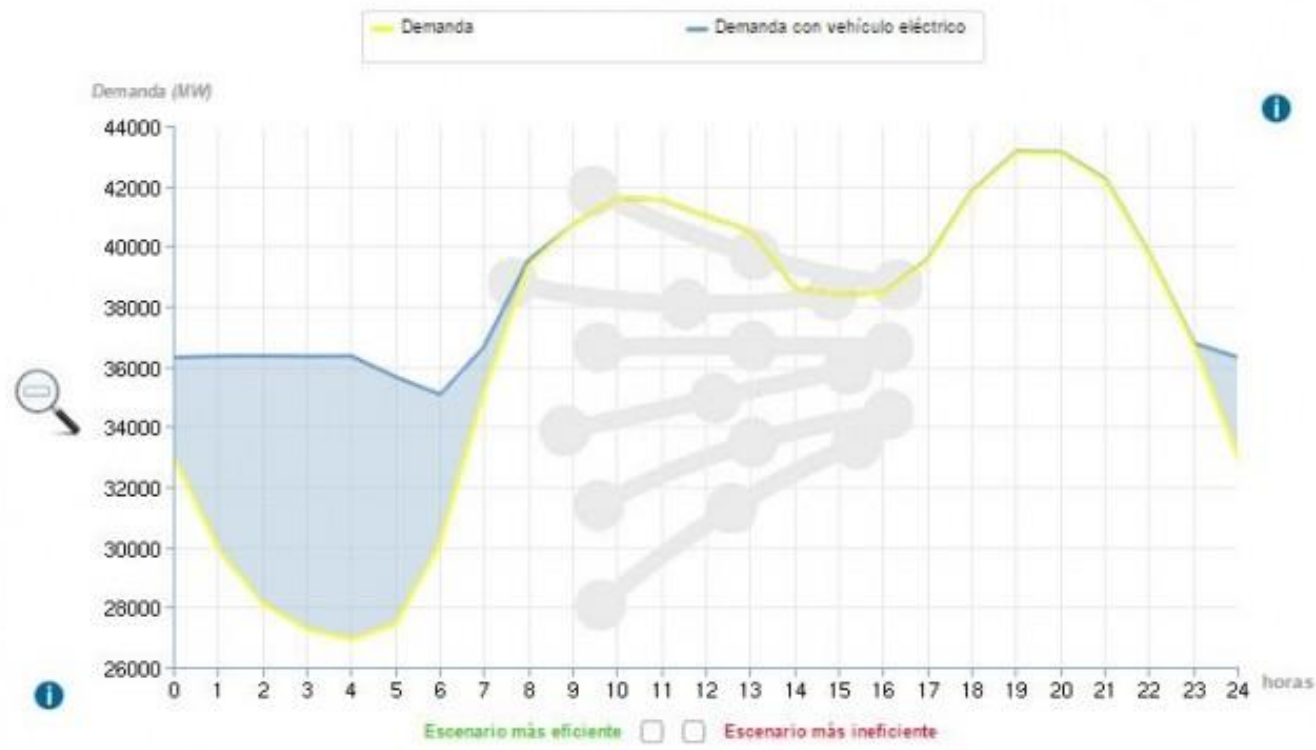
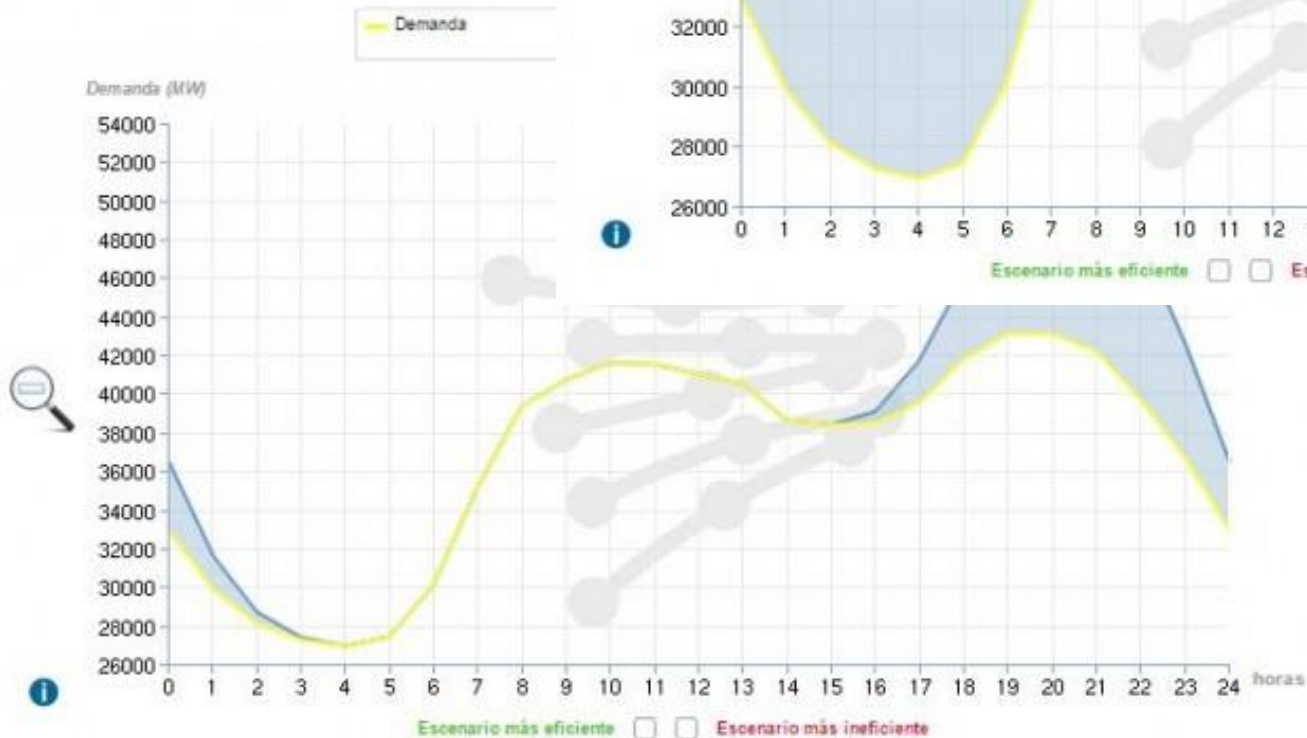
Otra clase de recargas rápidas: String cell



Vehículo eléctrico sin baterías (y autónomo)

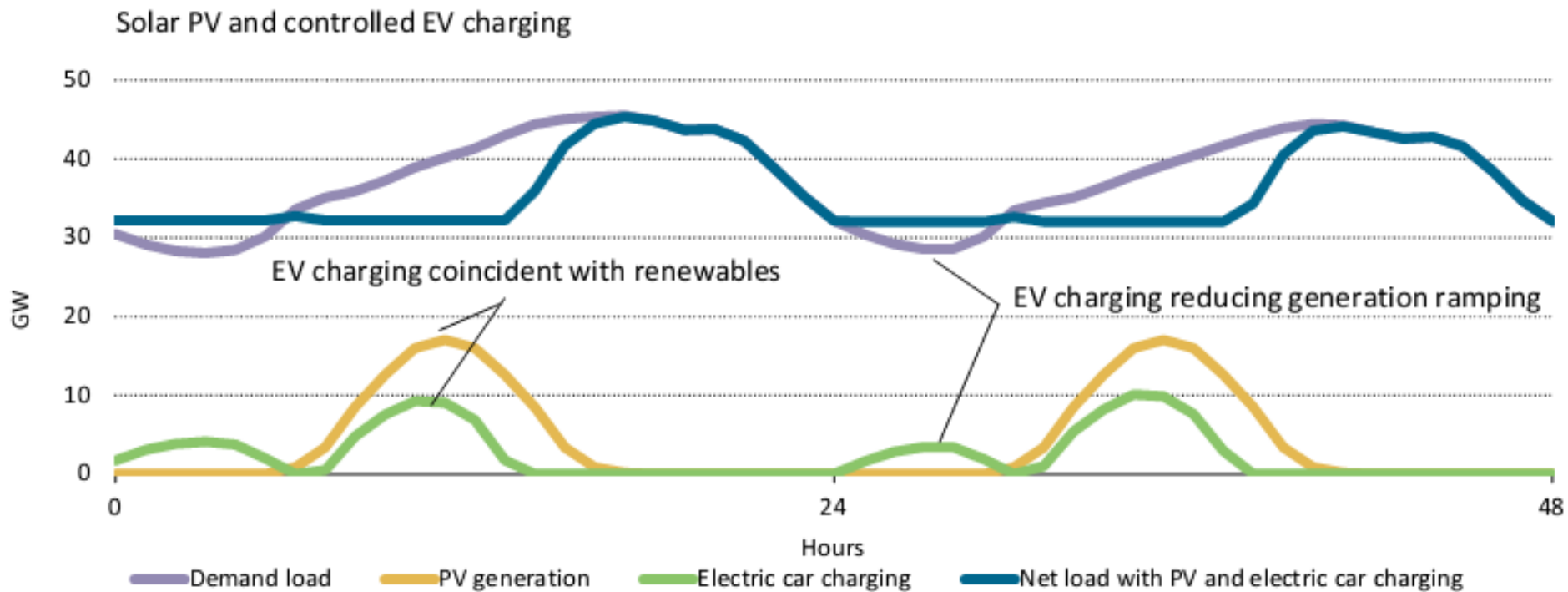


Impacto en los sistemas eléctricos



Recarga de baterías

La interconexión con la red eléctrica y las renovables



Sources: IEA (2017b).

Recarga de baterías

La interconexión con la red eléctrica y las renovables



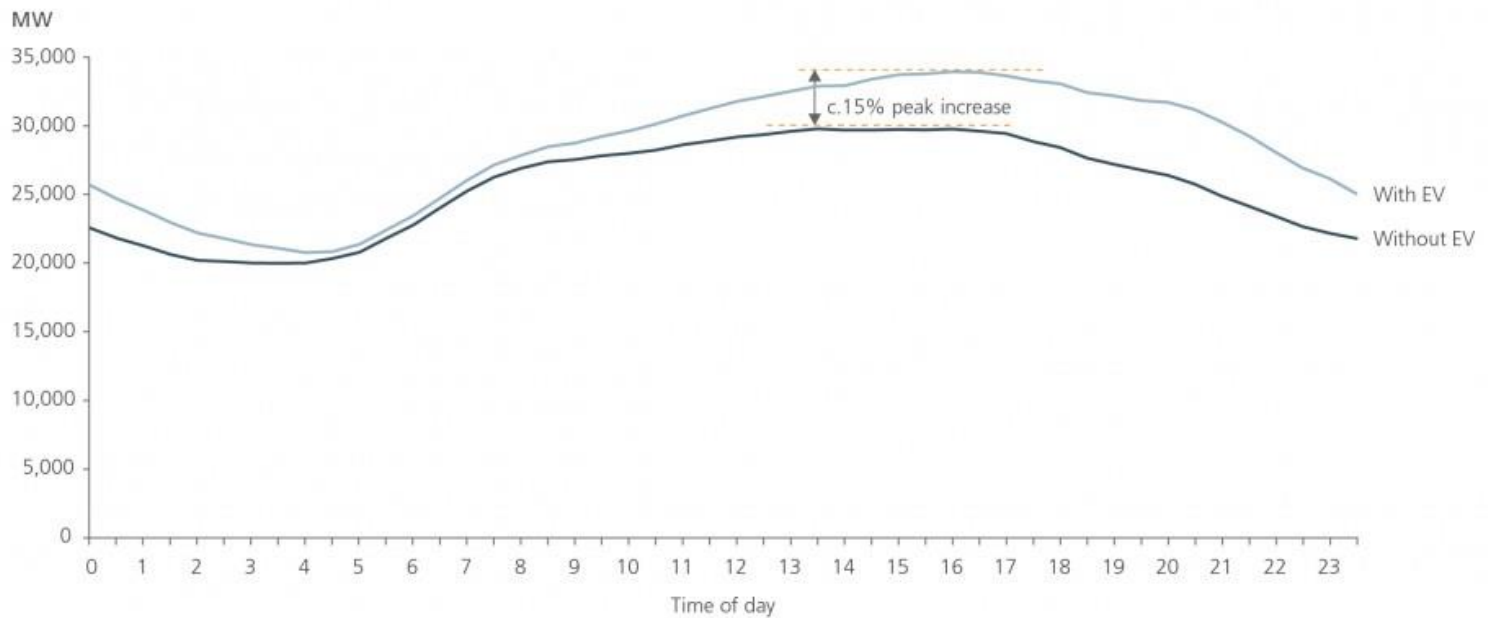


Workplace
Charging Challenge

U.S. DEPARTMENT OF ENERGY

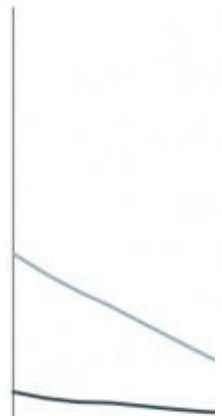
Impacto en las redes eléctricas

Figure 3
EV impact on the Australian electricity network (50% EV adoption)⁶



Source: L.E.K. and Tritium analysis

Illustrative daily



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Time of day

Source: L.E.K. and Tritium analysis

)

t EV)

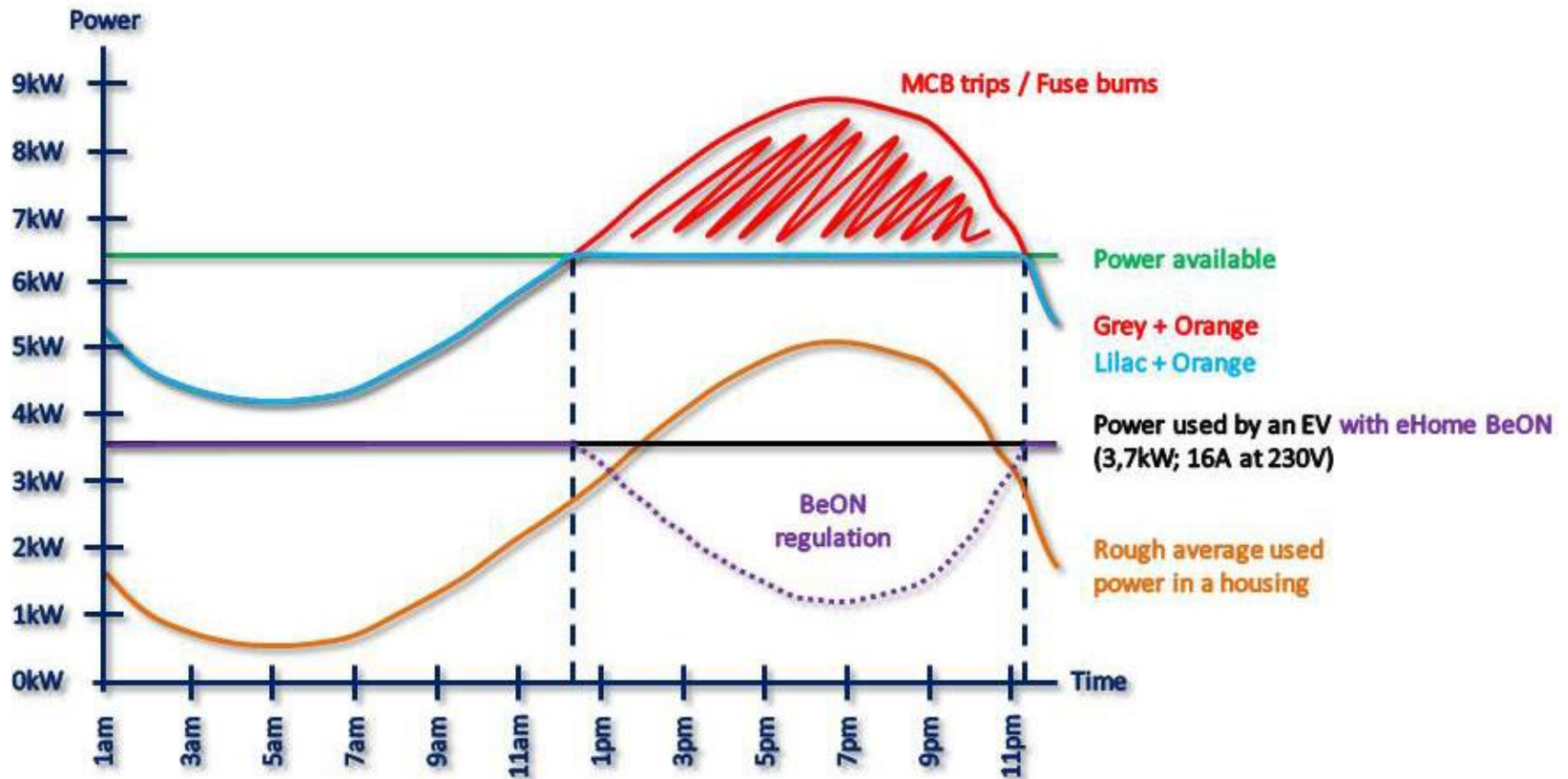
Guías de apoyo a distribuidores

Figure 4
Five-step action plan for utility companies



La recarga en Tarifa 1

Intelligent sensor eHome BeON; principle of operation





FILED

3-13-15

04:59 PM

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

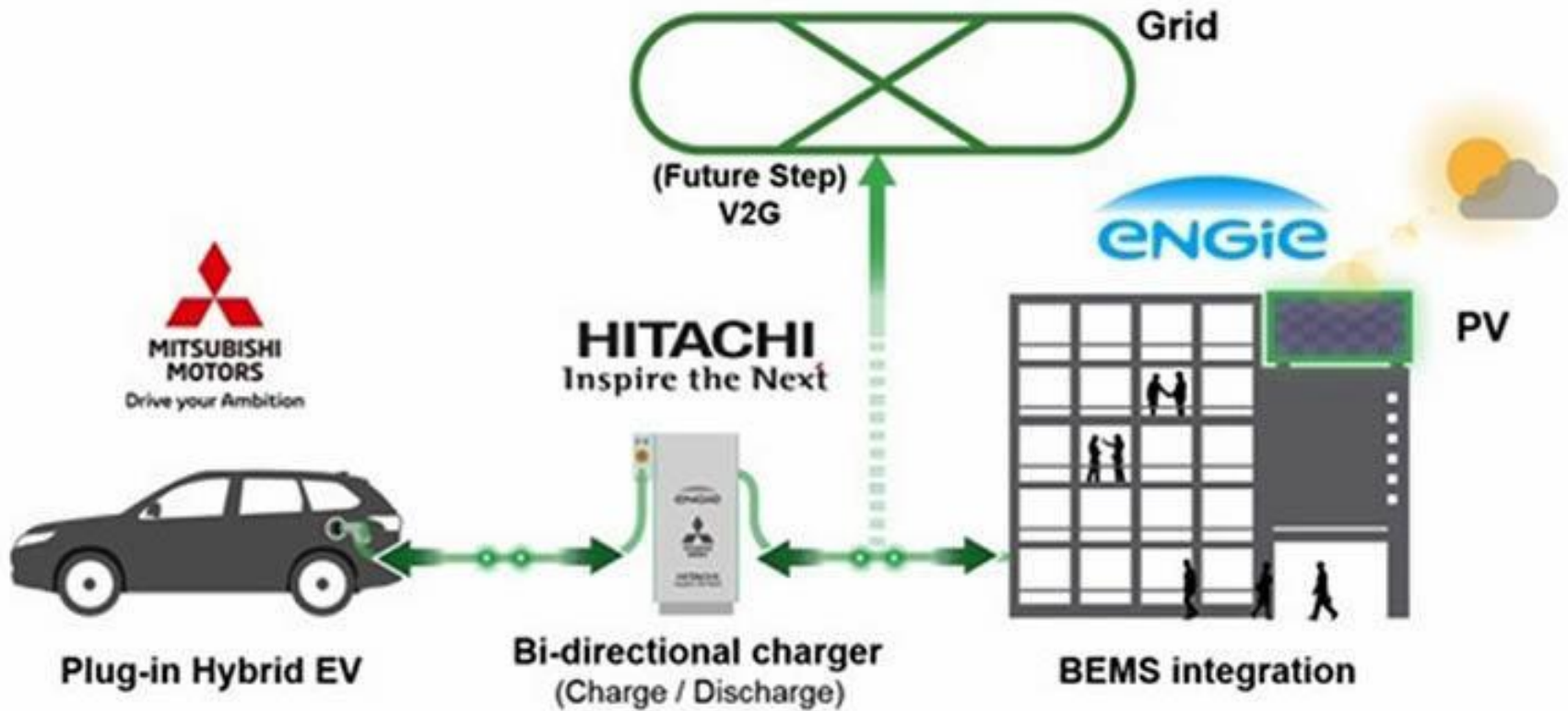
In the Matter of the Application of Pacific Gas
And Electric Company (U 39 E) for Approval of
its Electric Vehicle Infrastructure and Education
Program.

Application 15-02-009
(Filed February 9, 2015)

25.000 puntos de carga
a U\$S 26.000 cada uno
Total U\$S 638 millones

**PROTEST OF CONSUMER WATCHDOG TO
PACIFIC GAS AND ELECTRIC COMPANY'S (U 39 E) ELECTRIC VEHICLE
INFRASTRUCTURE AND EDUCATION PROGRAM APPLICATION**

V2G



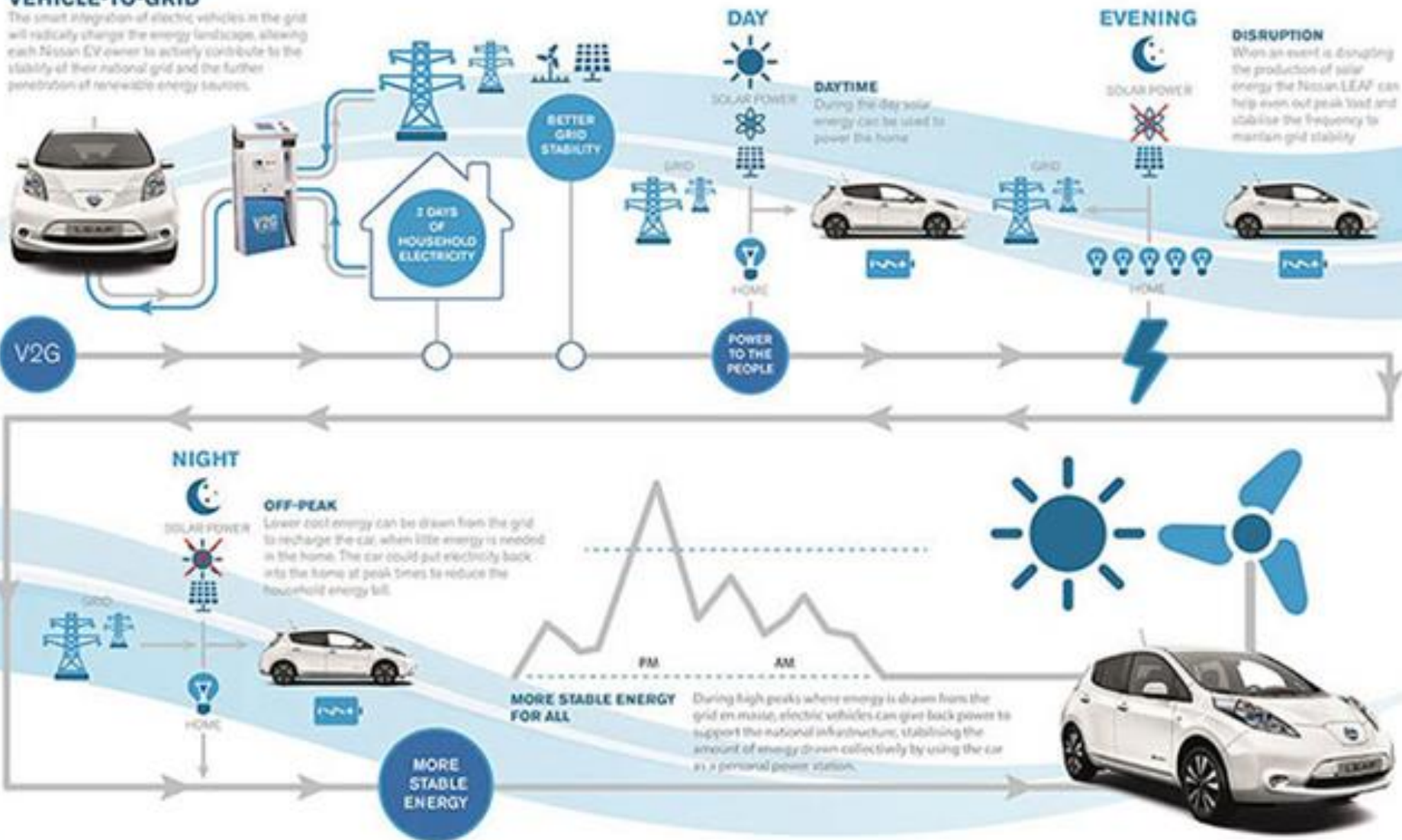


POWER TO THE PEOPLE

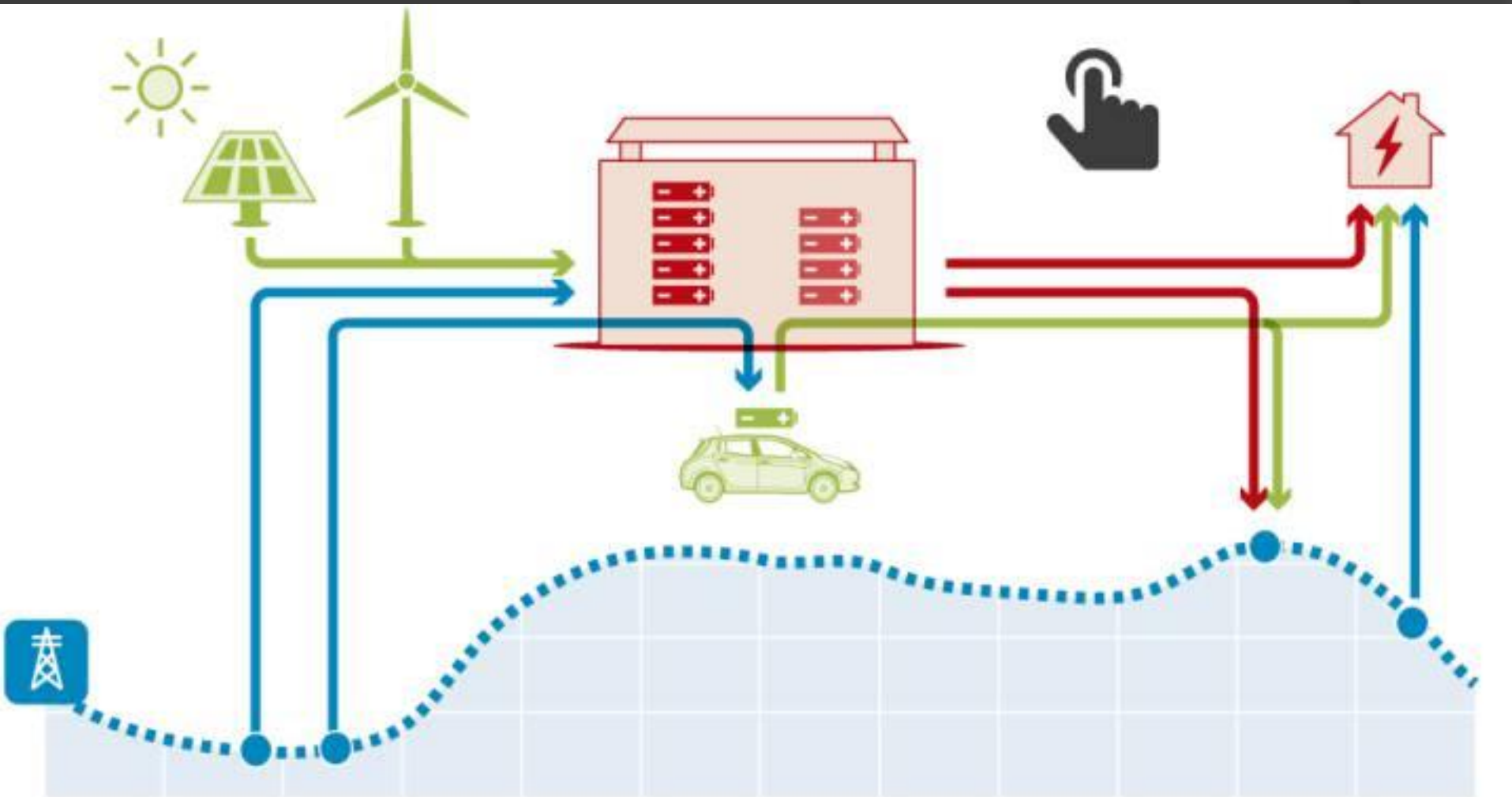
NISSAN'S VISION FOR THE ENERGY GRID PUTS THE POWER IN YOUR HANDS

VEHICLE-TO-GRID

The smart integration of electric vehicles in the grid will radically change the energy landscape, allowing each Nissan EV owner to actively contribute to the stability of their national grid and the further penetration of renewable energy sources.



La interconexión con la red eléctrica y las renovables



Muchas gracias!

Ing. Claudio Damiano
cladamiano@yahoo.com