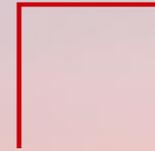


V2X,

The EV Powertrain at the Heart of the Power Grid

Olivier Lobey,

Huawei, Nuremberg Research Center, EV Lab



November 24, 2020 – IFPEN – ECAV 2020

V2X, The EV Powertrain at the Heart of the Power Grid

1. Energy & Transportations

Overlapping Means & Objectives

2. Huawei

From Information Technology to Automotive

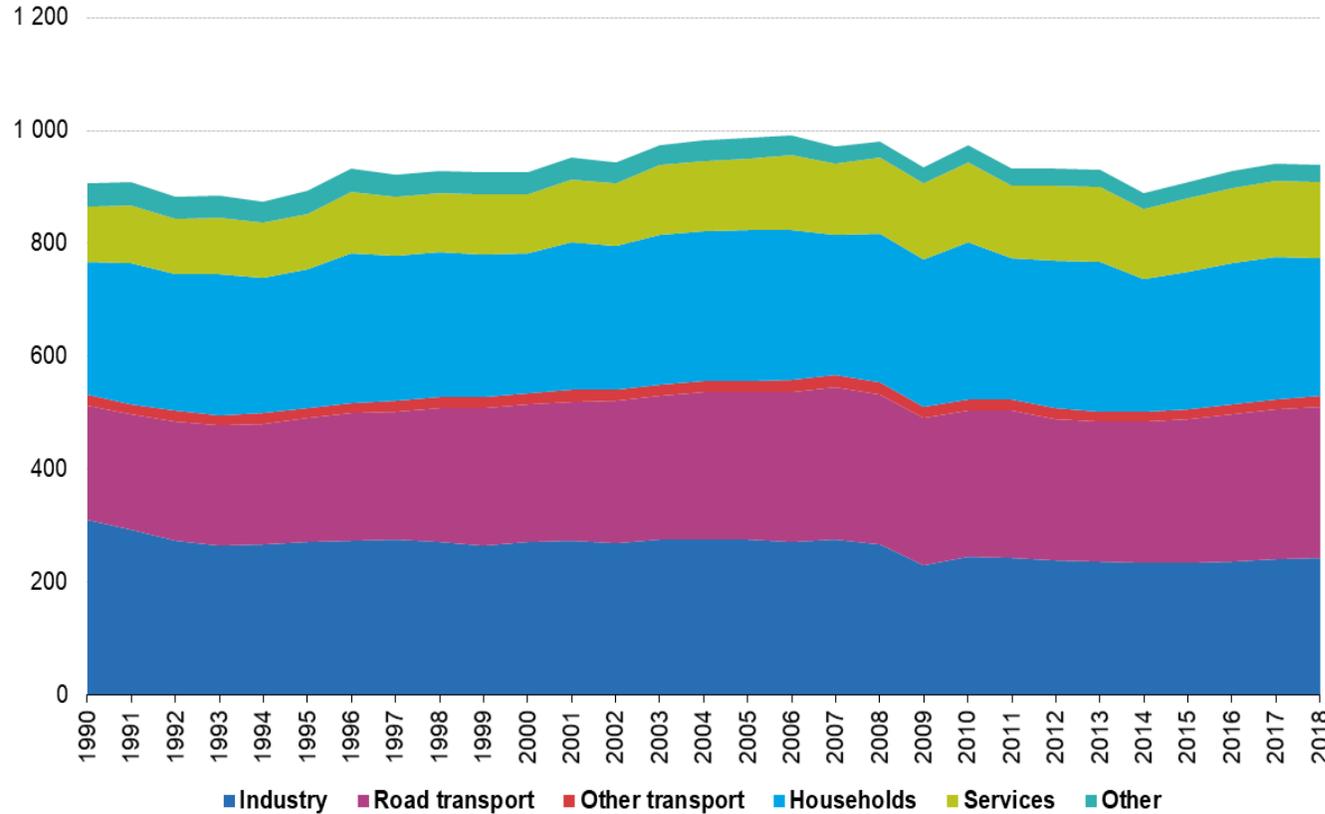
3. V2X

Use Cases & Solutions

1. Energy & Transportations

Energy by Sector

Final energy consumption by sector, EU-27, 1990-2018
(million tonnes of oil equivalent)



⇒ **Transports, and Households, represents more than 60% of Human Energy Needs**

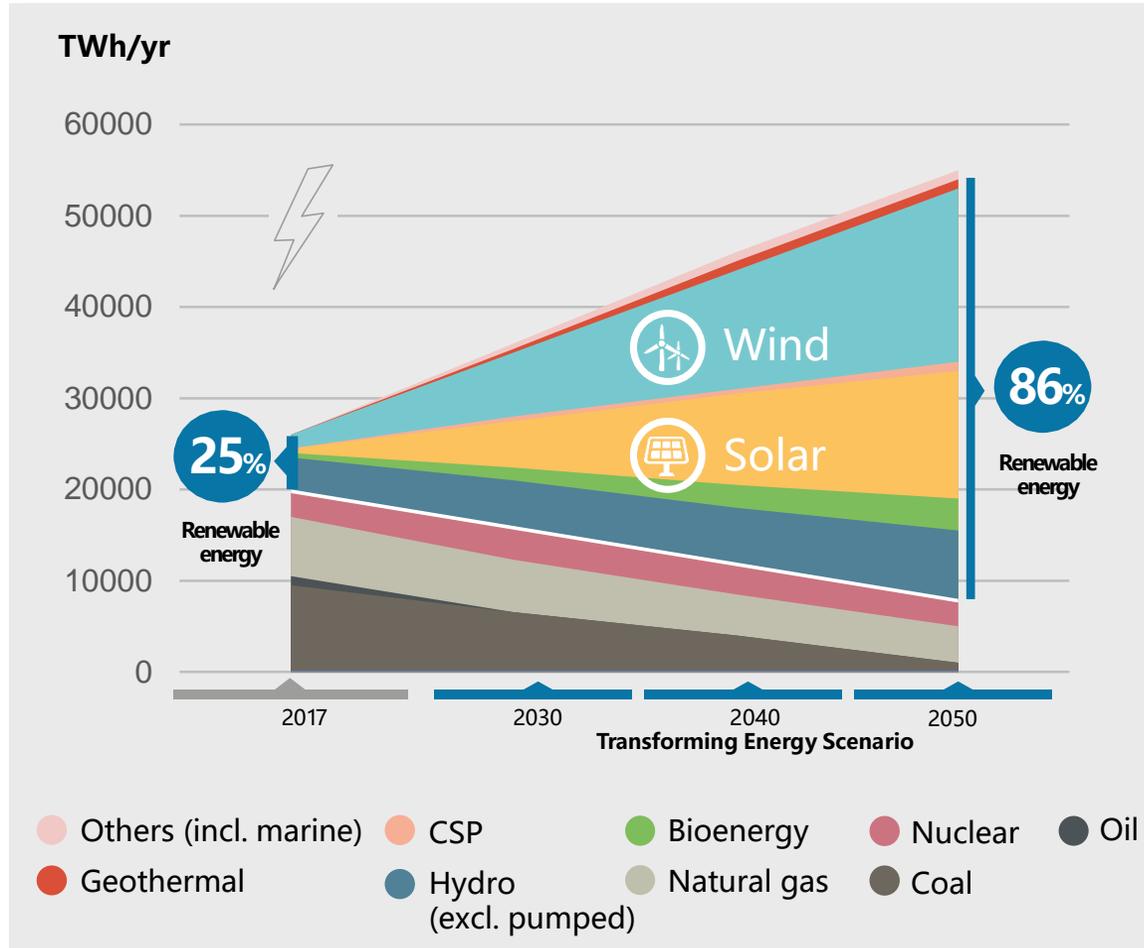
Source: Eurostat (online data code: nrg_bal_c)



Remarks: 1 tonne of oil equivalent = 11,63 Megawatt hour

1. Energy & Transportations

Energy Strategy Transformation



⇒ Solar & Wind to Become the Major Energy

Sources: Bloomberg, New Energy Outlook

1. Energy & Transportations

Energy Strategy Transformation



China

Carbon neutral realized **in 2060**

Peak value **by 2030**, 20% renewable energy



EU

Carbon neutral realized **in 2050**

GHG emission reduced 60% **by 2030**, 32% renewable energy

Strategic transformation of energy giants
Accelerate Carbon Neutral realized

Various Power consumption companies join
RE100

Promised to achieve 100% renewable energy
power consumption

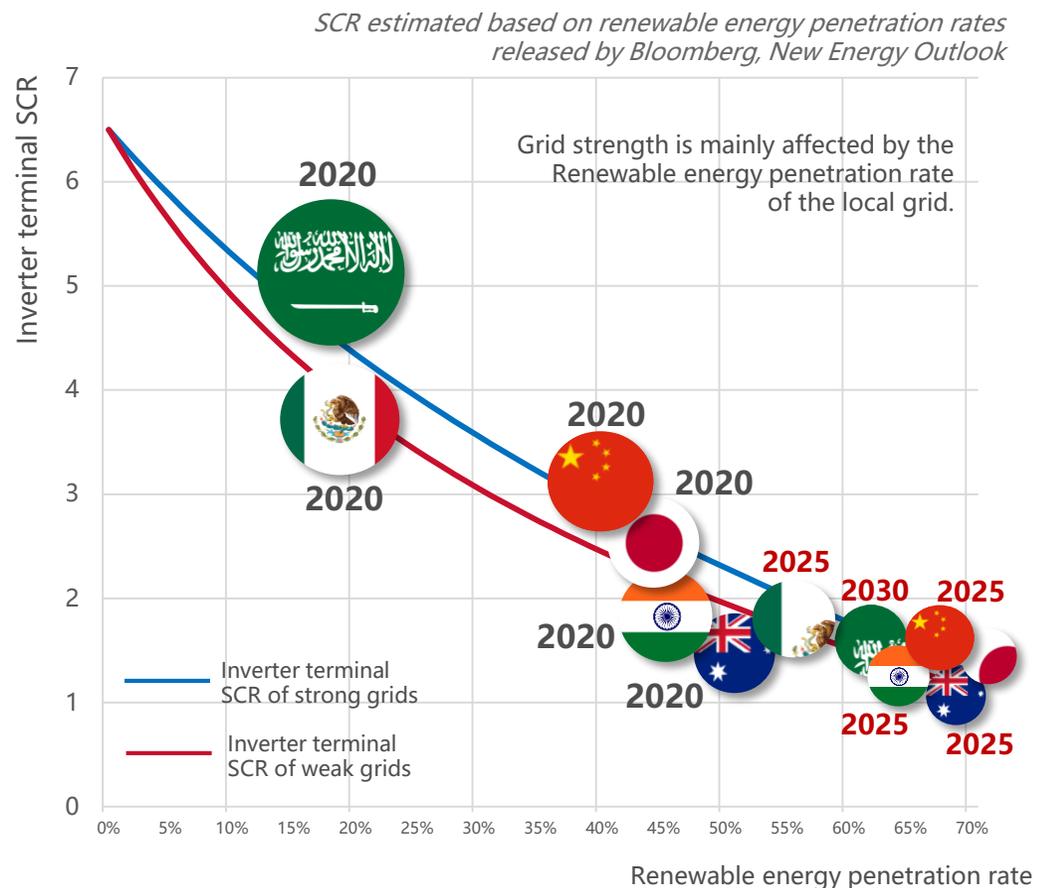


⇒ The Governments & Large Corporations
continuously specify low carbon targets

1. Energy & Transportations

Renewable Energy Penetration Rate & Weakened Grid Strength

Grid strength weakened by mass RE installation



Limited Grid support capability of existing Inverters

	Traditional Energy	Traditional PV
Response time of Vol. adjustment	~ 5ms	~ 30 s
Response time of Freq. adjustment	10s-level	Minute-level
Min. supported SCR	Synchronous Generator	Avg. SCR ≈ 2
Power quality - THDi	< 1%	< 3%



2019.08 UK
Black out caused by Lighting



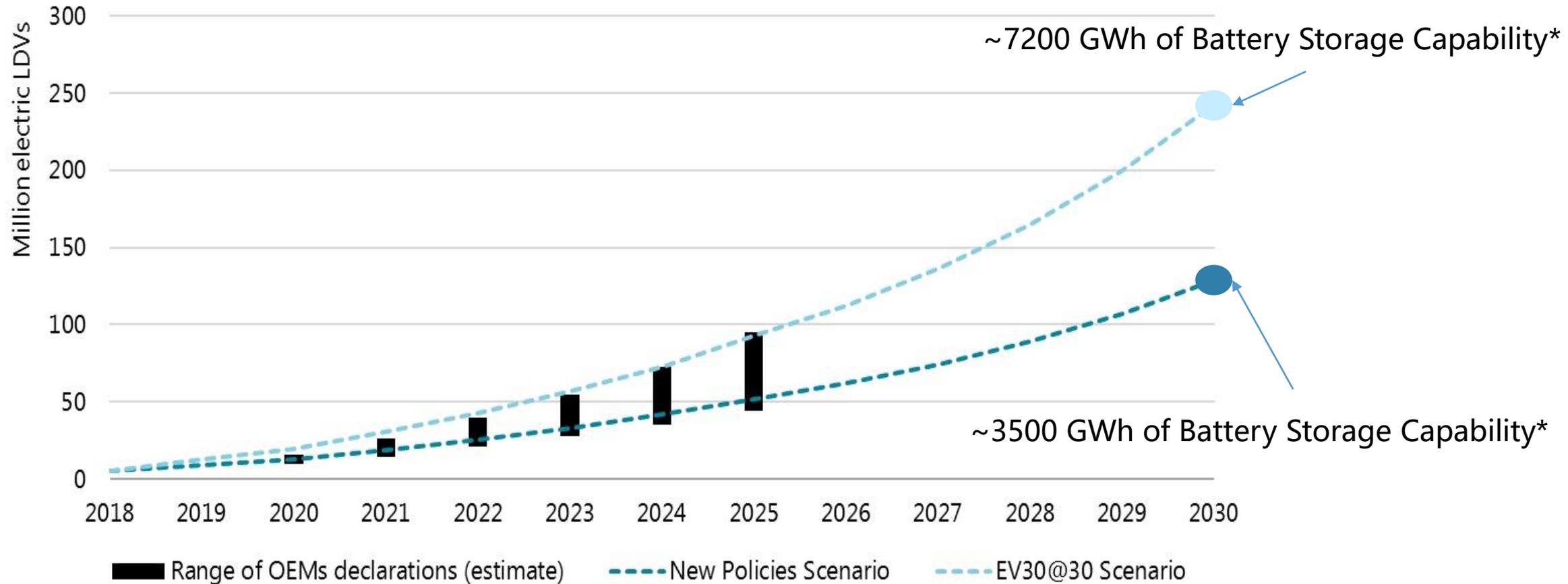
2020.05 India
New grid code put into effect



2020.06 Spain
NTS required terminal to support SCR=1.5

1. Energy & Transportations

Electrification Outlooks



Source: IEA 2019. All rights reserved. Notes: The cumulative sales shown in this figure are based on OEMs announcements on the number of EVs deployed in a target year and then extrapolating these values for the following years using a range of assumptions. The number of electric vehicles deployed by each OEM in its target year is calculated taking into account three possible inputs: i) an absolute target value of EV sales given by an OEM; ii) a target value expressed in terms of models deployed; or iii) a targeted percentage of the OEM sales.

* With an average of 30kWh/vehicle

<https://www.iea.org/reports/global-ev-outlook-2019>

V2X, The EV Powertrain at the Heart of the Power Grid

1. Energy & Transportations

Overlapping Means & Objectives

2. Huawei

From Information Technology to Automotive

3. V2X

Use Case & Solutions

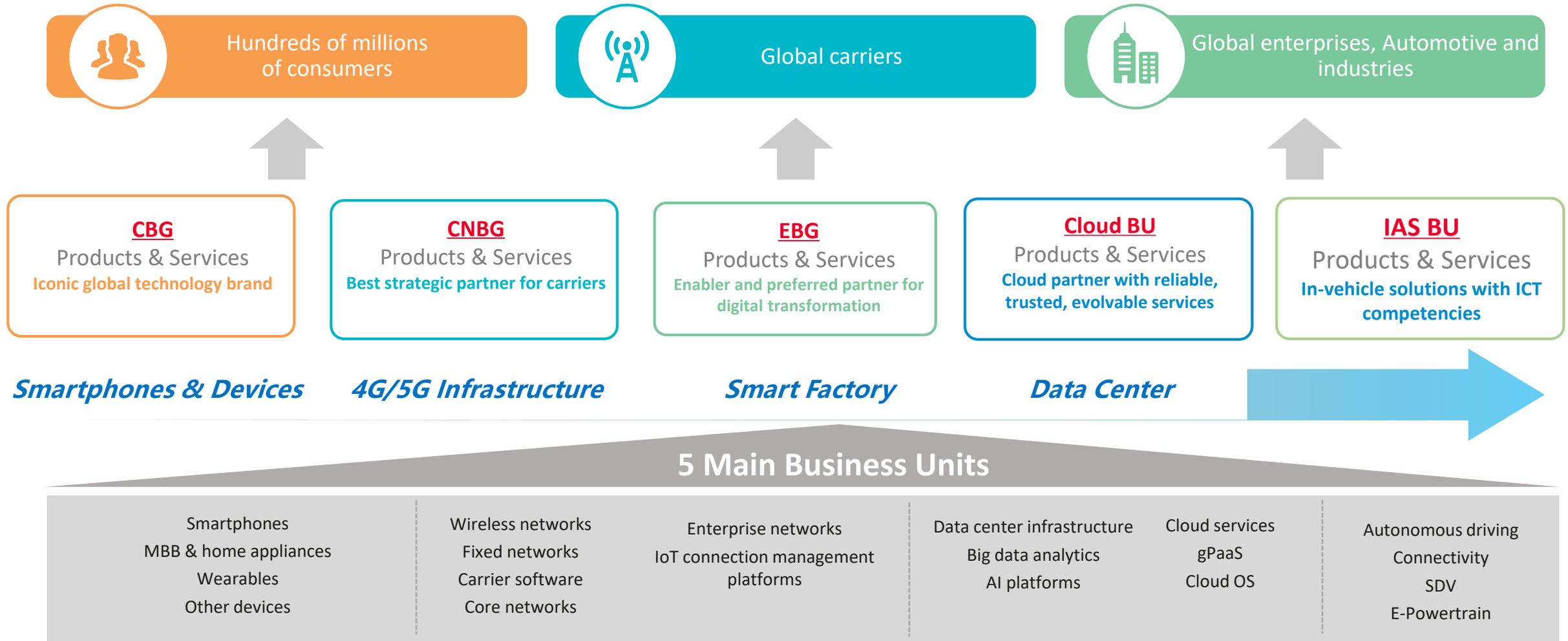
2. Huawei: Part of 50 Most Innovative Companies of 2020

Rank 1-10	 (+2)	Alphabet (-1)	amazon (-1)	 Microsoft (+0)	SAMSUNG (+0)	 HUAWEI (+42)	 (+16)	IBM (-1)	SONY -	facebook (-2)
Rank 11-20	 TESLA (-2)	 cisco (+5)	 Walmart (+29)	Tencent 腾讯 -	 hp (+29)	 -	NETFLIX (-11)	 (+0)	 -	 DELL (+21)
Rank 21-30	SIEMENS (-5)	 -	 PHILIPS (+6)	 -	ORACLE® -	 (-12)	SAP (+1)	 adidas (-18)	HITACHI -	COSTCO WHOLESALE -
Rank 31-40	 JD.COM -	 (+6)	 BOSCH -	AIRBUS -	 salesforce (-2)	JPMORGAN CHASE & CO. (-16)	Uber -	 BAYER (-14)	P&G -	 (-10)
Rank 41-50	 TOYOTA (-4)	 Nestlé -	ABB -	3M (-5)	 Unilever (-13)	 -	 NOVARTIS -	 Coca-Cola -	 VOLVO -	 (-29)

Remarks: (+/- N) indicates change in position from MIC of 2019, no change noted for new entrants.

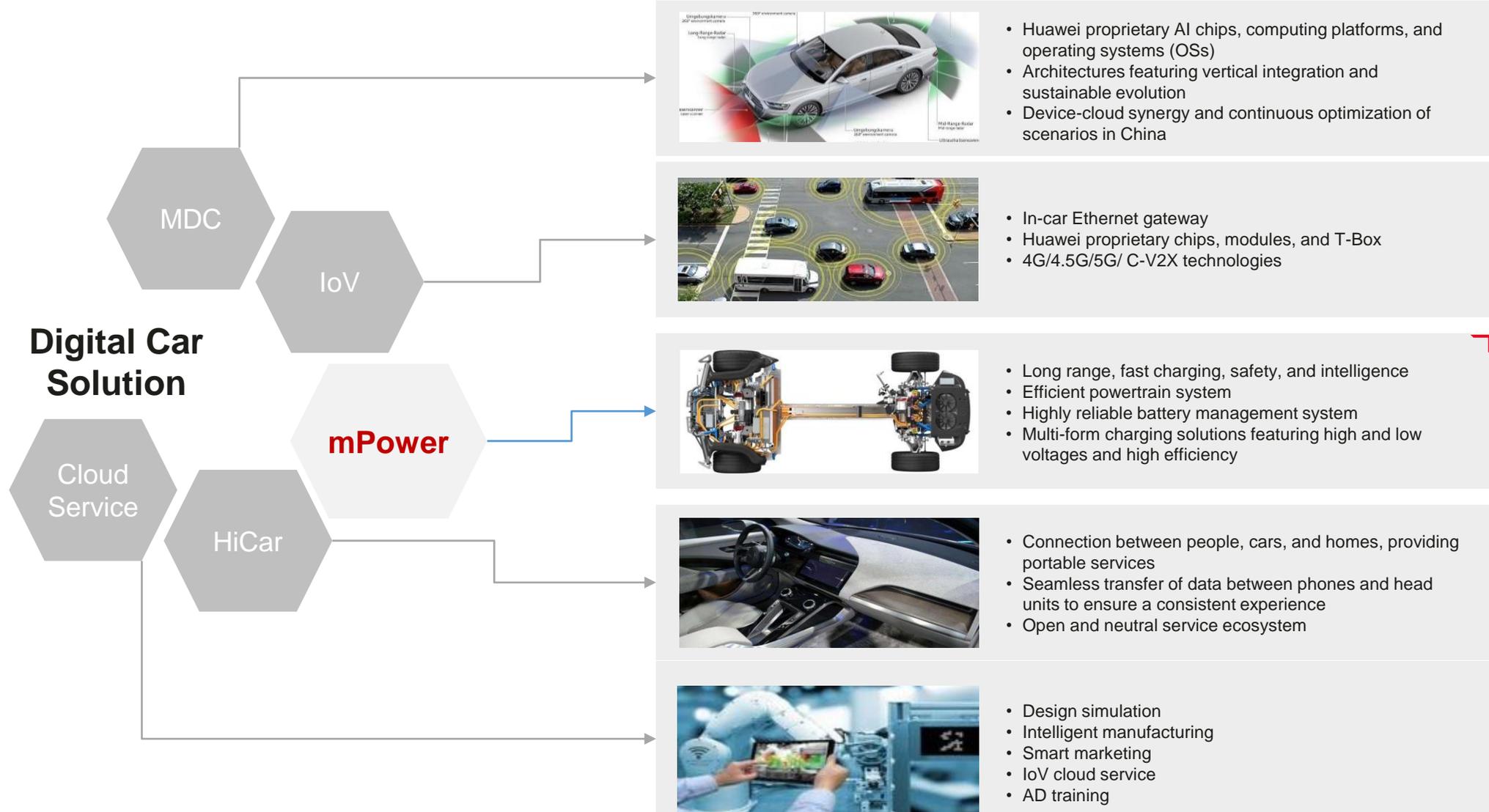
Source: BCG Global Innovation Survey

2. Huawei: Business Scope



Remarks: CBG: Consumer Business Group , CNBG: Carrier Networking BG , EBG: Enterprise BG , IAS BU: Intelligent Automotive Solution BG

2. Huawei: Intelligent Automotive Solution



2. Huawei: mPower, Extension of Mature Products and Technology



Telecom power& BMP/CP

AC→DC Module
DC→DC Module



+ Automotive grade design and verification



OBC



Solar Inverter

DC→AC Module



+ Automotive grade design and verification



MCU



Telecom Blade Li-Battery Huawei Cell Phone Battery Management

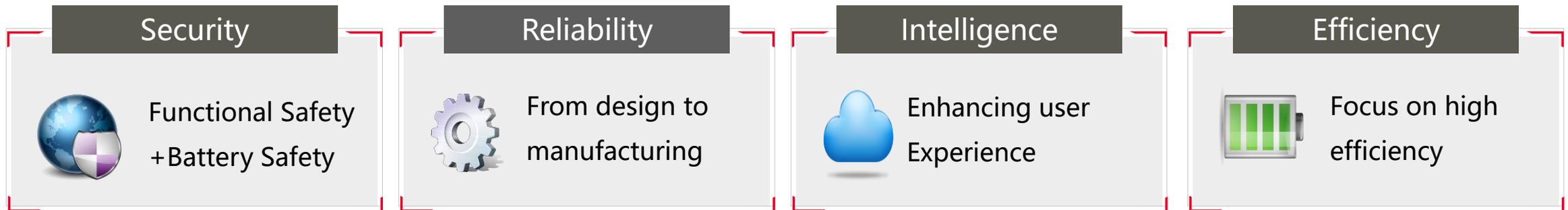
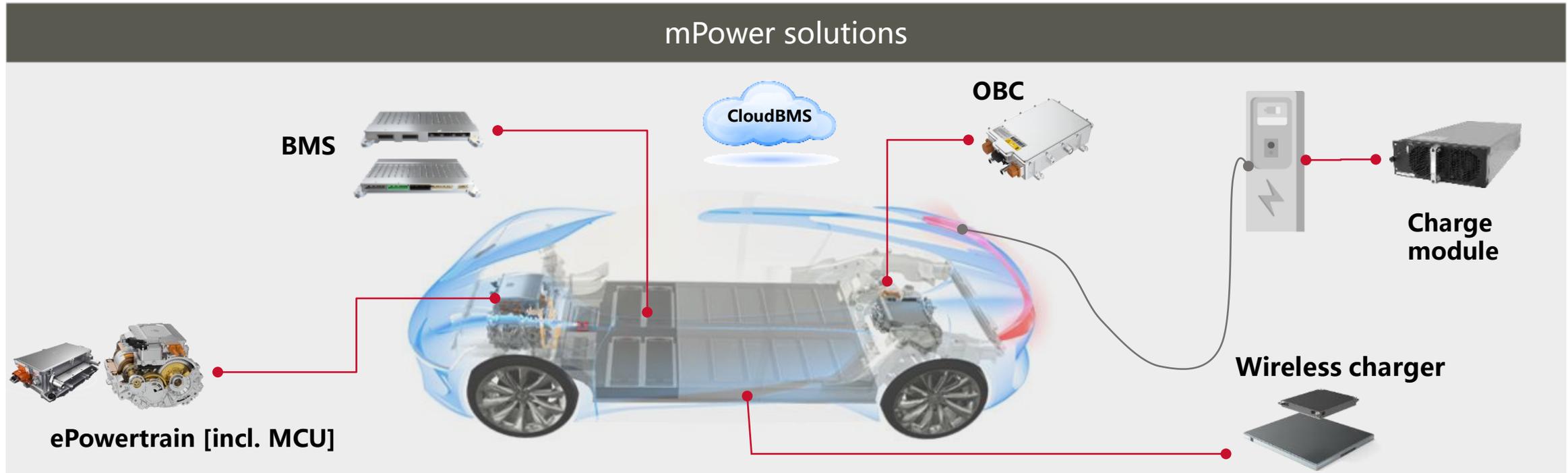


+ Automotive grade design and verification



BMS

2. Huawei: mPower Portfolio



V2X, The EV Powertrain at the Heart of the Power Grid

1. Energy & Transportations

Overlapping Means & Objectives

2. Huawei

From Information Technology to Automotive

3. V2X

Use Case & Solutions

3. V2X

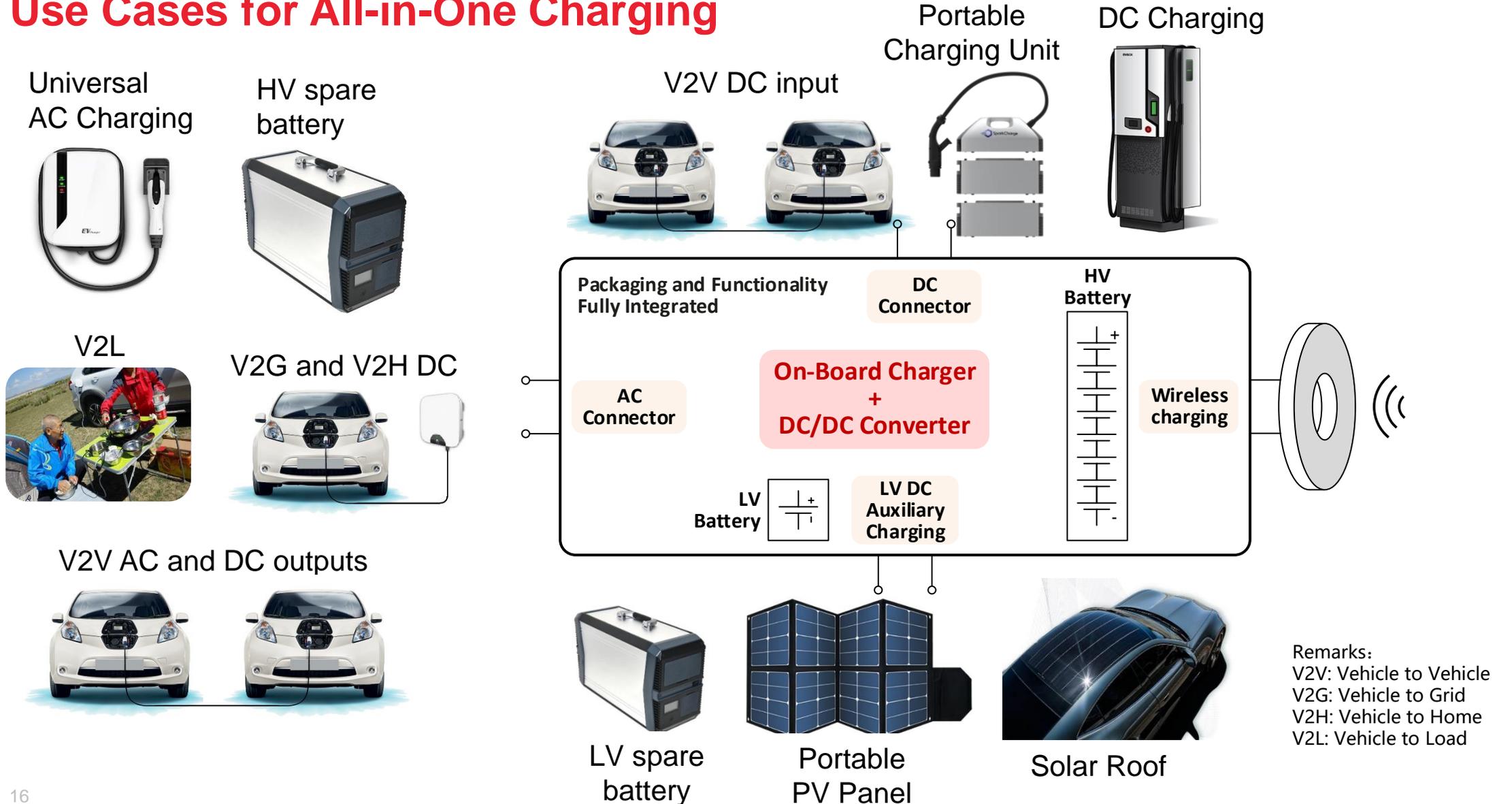
Automotive Powertrain Market Drivers

- a. **7 Market Drivers defines Automotive Powertrain;**
- b. **Priorities can change over time,**
- c. **as long as thresholds are achieved for the others,**
- d. **with only one exception:**
- e. **Highest Appealing Factor is a must.**



3. V2X

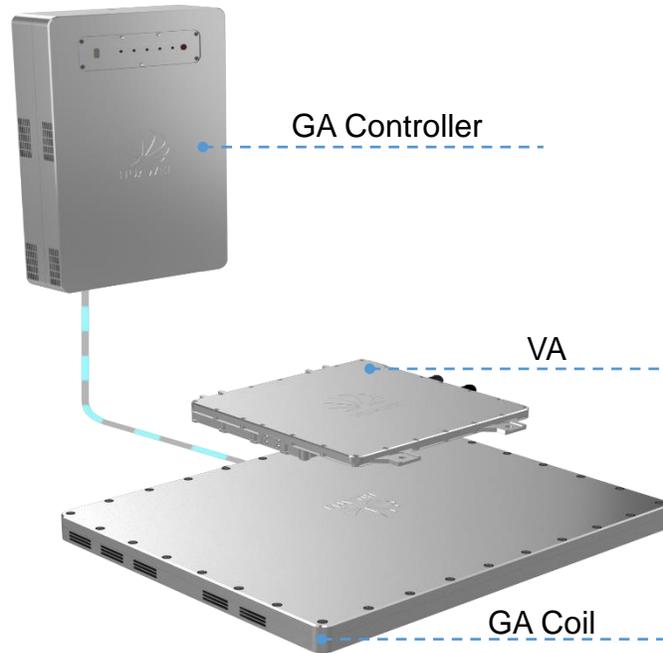
Use Cases for All-in-One Charging



3. V2X

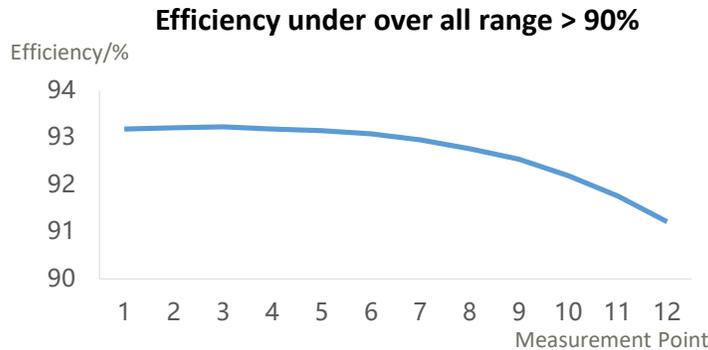
Efficient & Safe Wireless Charging System for Easier EV Adoption

Wireless Charging System



- Power level: 11 kW
- Output voltage: 280–450 V
- VA power density: 2.1 kW/L

Efficient: Up to 93% charging efficiency



- Reduce power transformation stages
- Efficiency optimization algorithm
- Constant frequency control

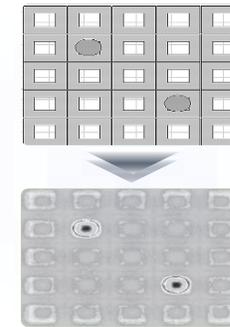
Accurate: Position detection error ≤ 2 cm*

- Wireless charging and automatic parking convergence
- Intelligent algorithm adaptive to metal/non-metal shielded environments

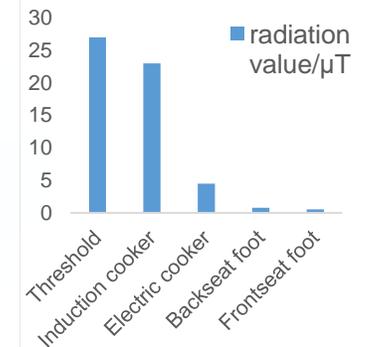


Safe: detection of live objects/metals, low radiation

- Multi-effect recognition algorithm can detect metal: diameter ≥ 2mm

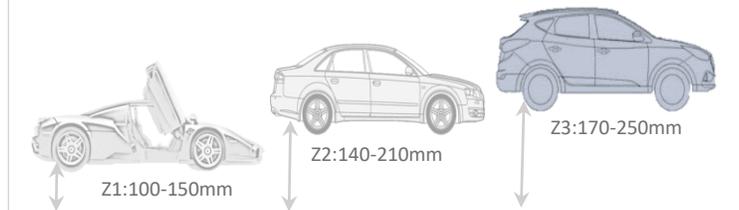


- Less electromagnetic radiation than household appliances



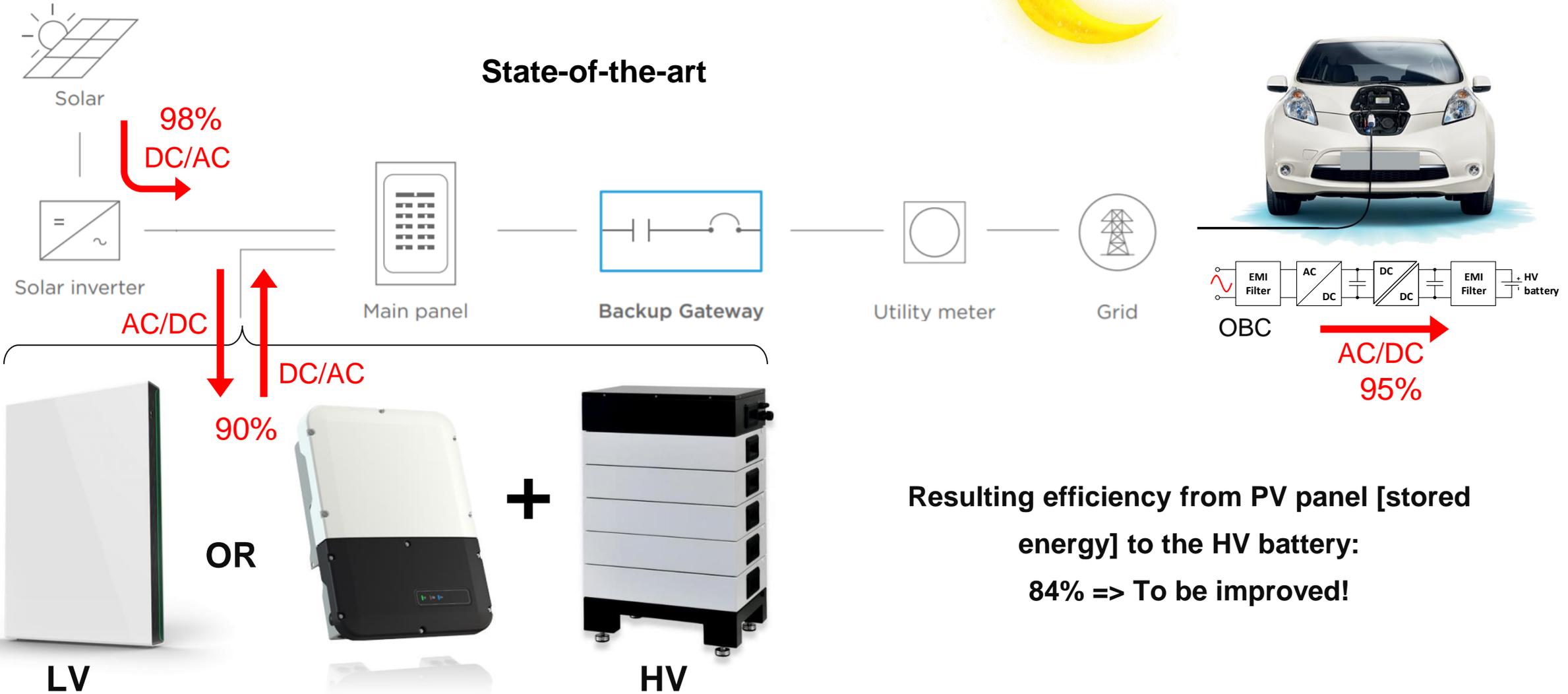
Better compatibility, multiple adaptations

- GA designed for VA among 3.7~11kW
- GA designed for Z level among 100~250mm



Note: The horizontal distance between VA and GA Coil is less than 30 cm, and the avg. detection error is less than 2 cm.

3. V2X V2H, in a smarter way?

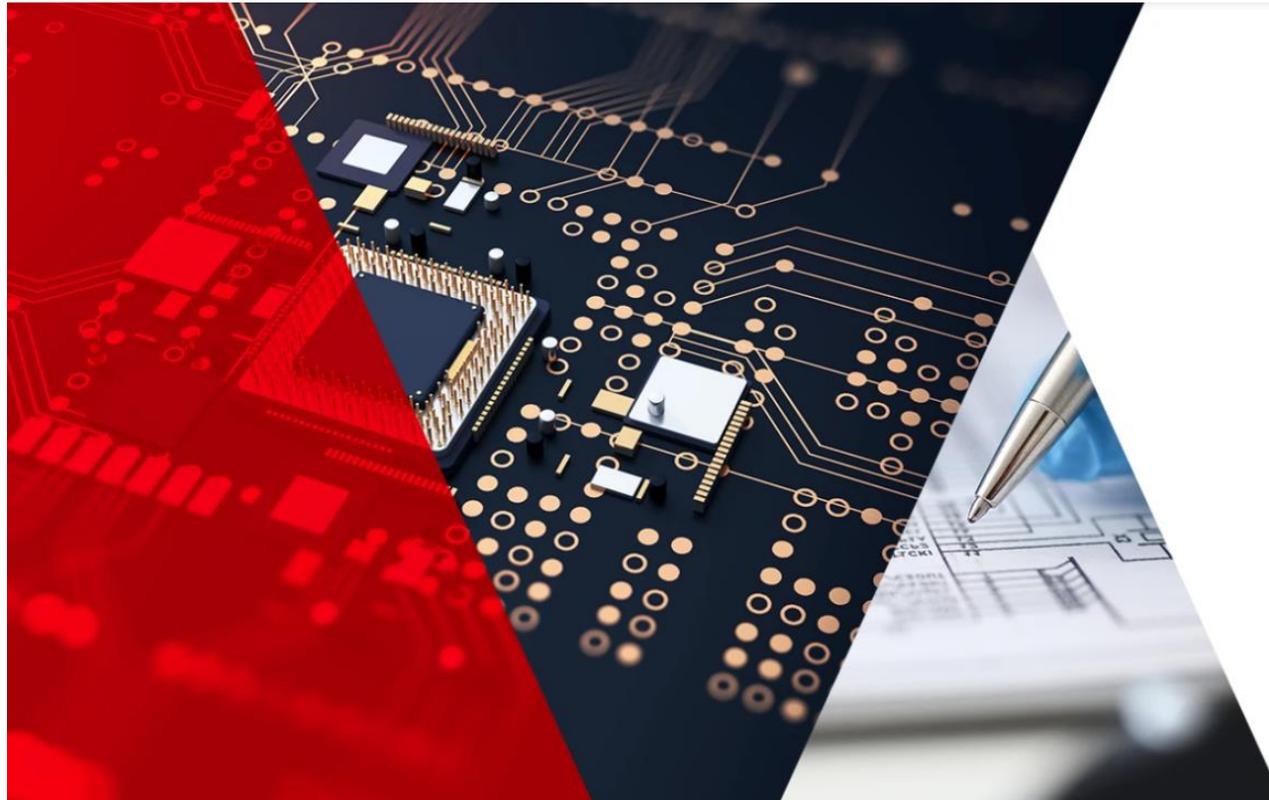


**Resulting efficiency from PV panel [stored energy] to the HV battery:
84% => To be improved!**

	Capacity (DC)	Inverter	Yields of April / Wh	Unit Yields	Huawei Advantage
Phase I	11MW	Central	1417290	809.325	/
Phase II	12MW	Huawei SUN2000-28KTL	1569040	854.596	5.59%

Shimane, Japan

- Capacity: 11MW
- COD: 2017. 03.01
- EPC : Power Max Co., Ltd



POWER UP
- WITH -



HUAWEI

SPARK YOUR INNOVATION.
CONVERT YOUR IDEAS.
LEAD THE CHARGE.

15 000 € in cash prizes



1. High-Efficiency DC-DC Converter for Automotive Applications



2. High-Efficiency Isolated Boost Inverter Design



3. Medium Distance Wireless Charging



4. Parallel Connection and Control of SiC MOS and IGBT

<https://powerup-huawei.bemyapp.com/#/event>

Thank you!

Acknowledgments:

- **Eduardo Facanha de Oliveira**
- **Siddharth Agrawal**
- **Roland Huempfner**
- **Hariram Subramanian**
- **Chen Chen**
- **Gao Jing**

For More Information:

- **Olivier Lobey**
奥礼文
Technical Lead, EV Powertrain Lab
Nuremberg Research Center
HUAWEI TECHNOLOGIES Duesseldorf GmbH
Suedwestpark 48, 2G, 90449 Nuremberg
Email: olivier.lobey@huawei.com
Fax: + 49 89 1588344134
Mobile: +49 159 0445 0781



Copyright © 2016 Huawei Technologies Düsseldorf GmbH. All Rights Reserved.

The information in this document may contain predictive statements including, without limitation, statements regarding the future financial and operating results, future product portfolio, new technology, etc. There are a number of factors that could cause actual results and developments to differ materially from those expressed or implied in the predictive statements. Therefore, such information is provided for reference purpose only and constitutes neither an offer nor an acceptance. Huawei may change the information at any time without notice.