INNOVATION NEEDS FOR THE INTEGRATION OF ELECTRIC VEHICLES INTO THE ENERGY SYSTEM

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EVS 32, Lyon, 22nd May 2019

KEY MESSAGES

- Electric vehicles will dominate the car market by 2030
- The quick adoption of electric vehicles is a key success factor for a successful energy transition
- Controlled charging needs to be implemented to reduce the need for grid expansion
- Communication interfaces between EVs and charging infrastructure need to be standardized and implemented
- Grid connection and billing processes need to be standardized to speed up the installation of charging infrastructure

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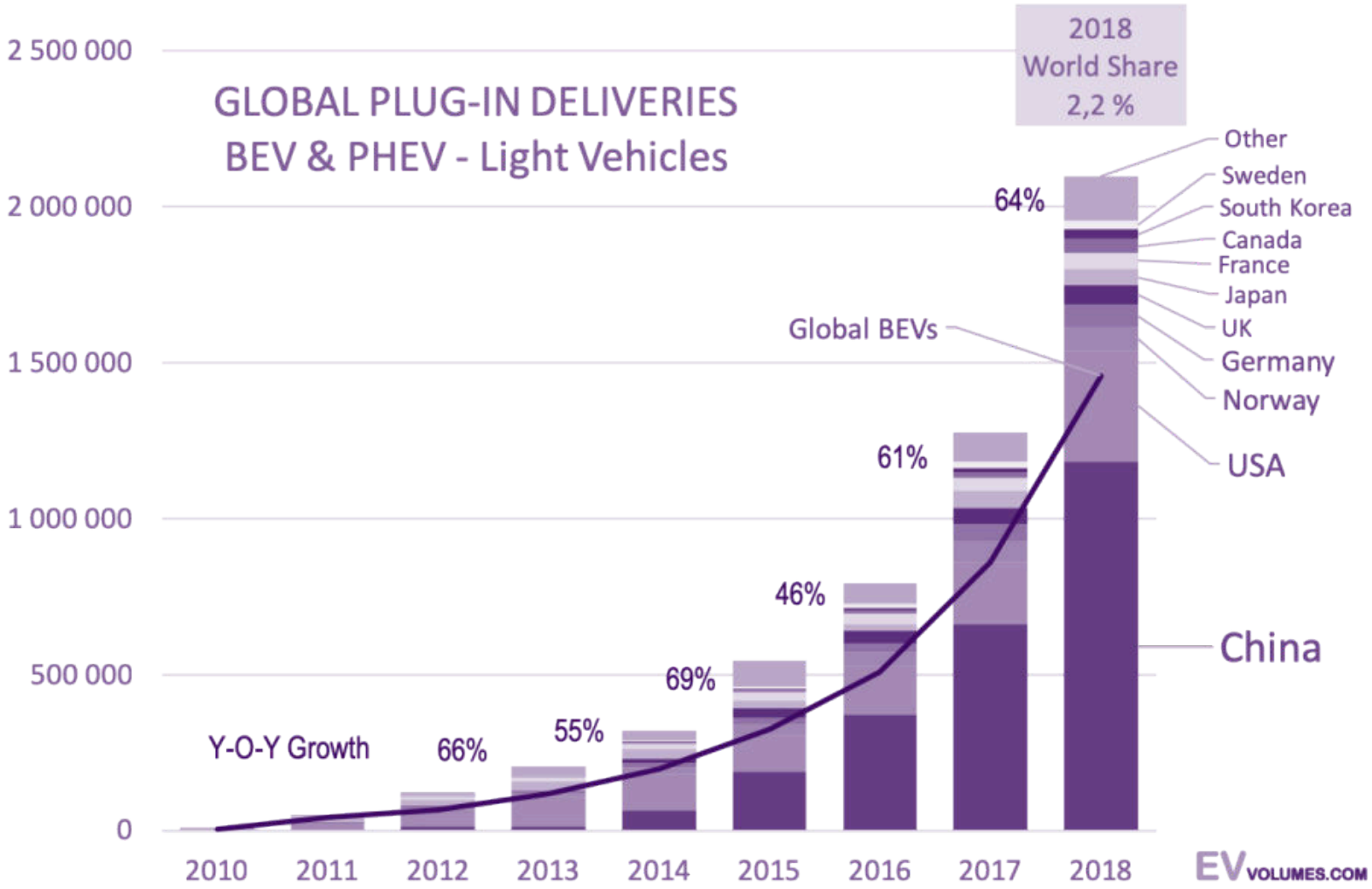
STATUS QUO

DEVELOPMENT OF ELECTRIC VEHICLE SALES



98%!

fossil fuel cars

Source: http://www.ev-volumes.com/country/total-world-plug-in-vehicle-volumes/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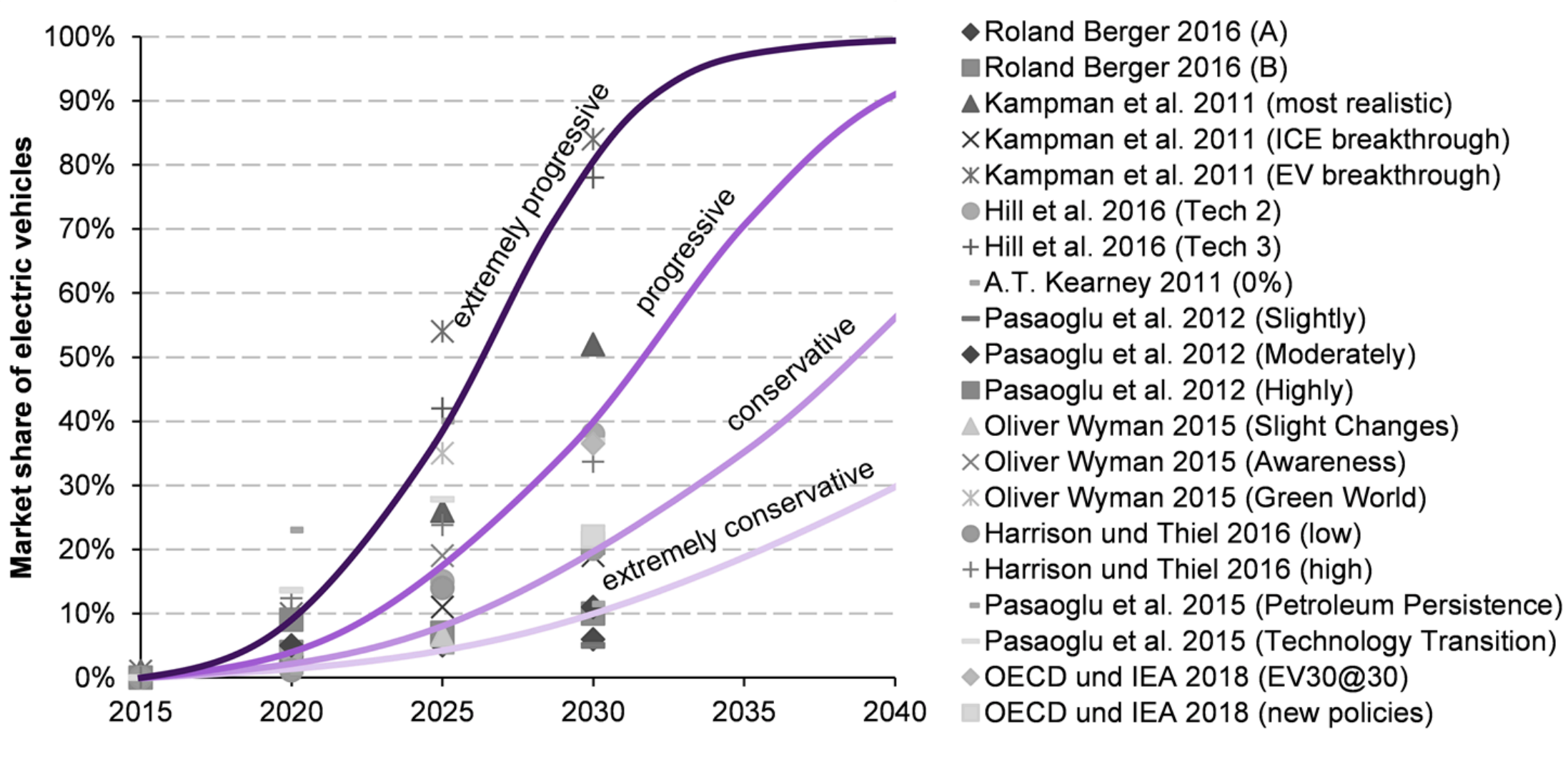
VISION
Electric
Vehicles
Only

MARKET DIFFUSION OF ELECTRIC VEHICLES



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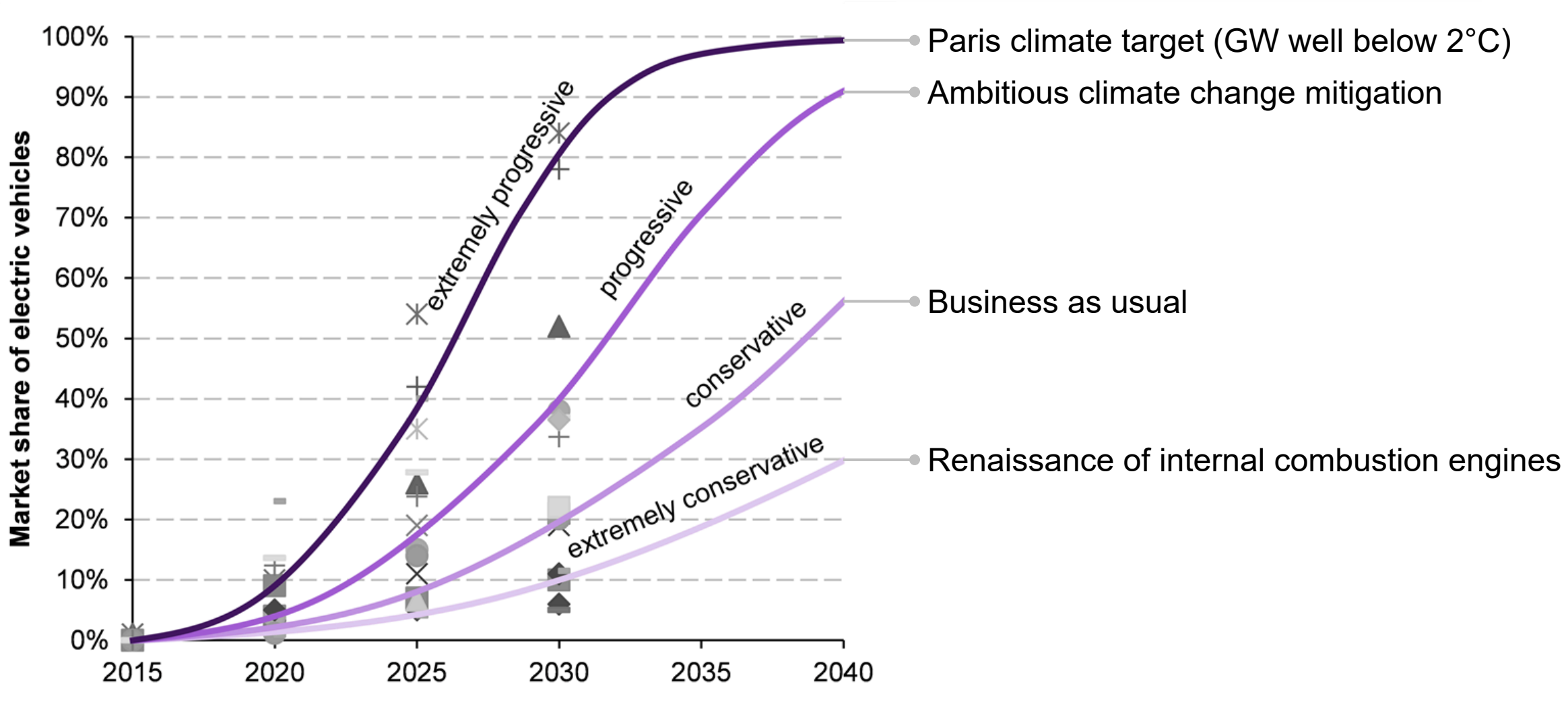
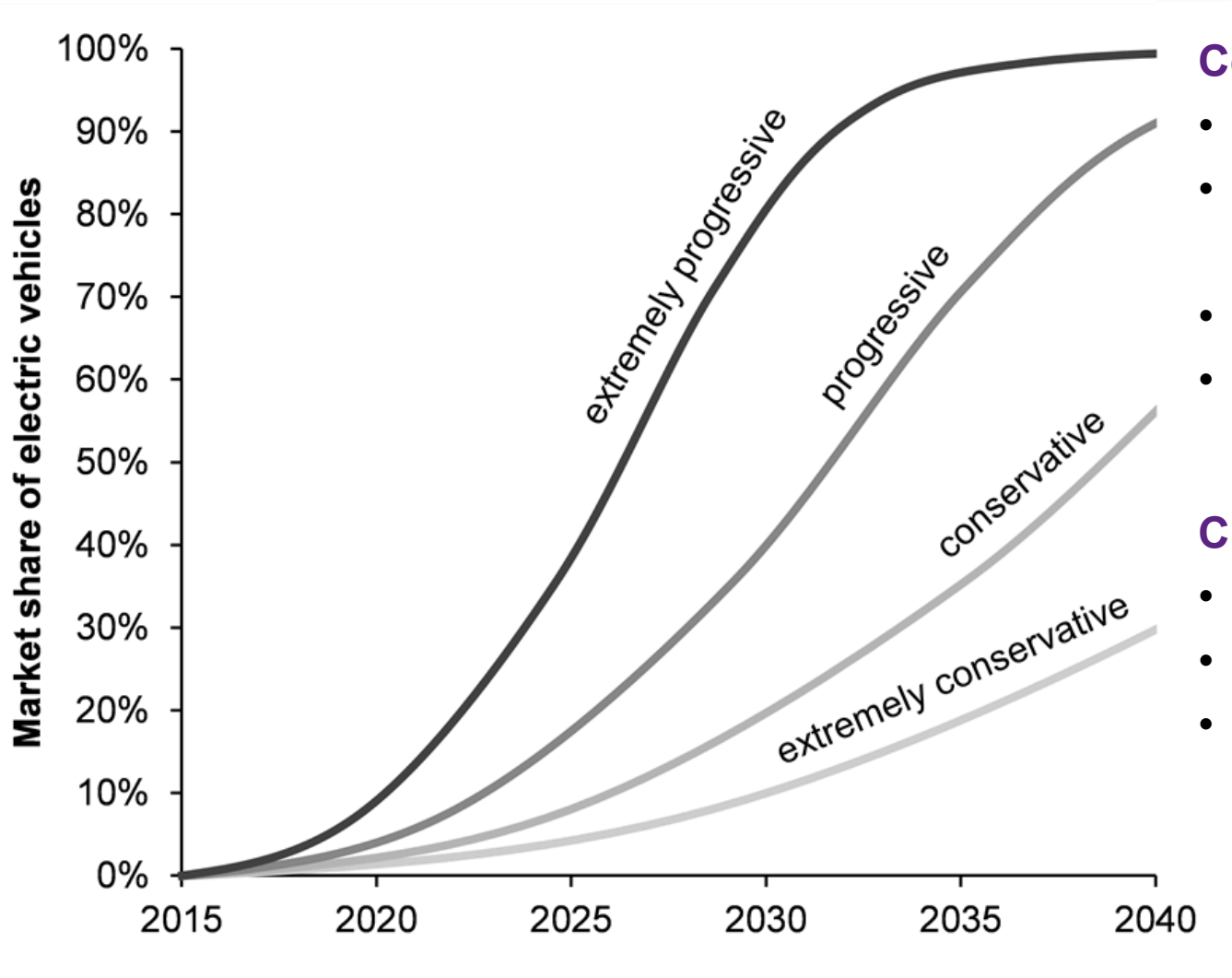


BANS ON FOSSIL FUEL CARS



Country bans on fossil fuel car sales:

- 2025: Norway
- 2030: Denmark, India, Ireland, Israel, Netherlands, Slovenia,
- 2032: Scotland
- 2040: China, France, UK (excl. Scotland)

City & regional bans on fossil fuel car usage:

- 2020 to 2035: Oxford
- 2025: British Columbia
- 2030: Amsterdam, Auckland, Barcelona, Cape Town, Copenhagen, Hainan, Heidelberg, London, Los Angeles, Milan, Quito, Seattle, Vancouver

Plans and aspirations expressed by cities, regions and countries.

Source: IEA (2018): Global EV Outlook 2018; Bruch I., Gilchrist J. (2018): Survey of Global Activity to Phase Out Internal Combustion Engine Vehicles

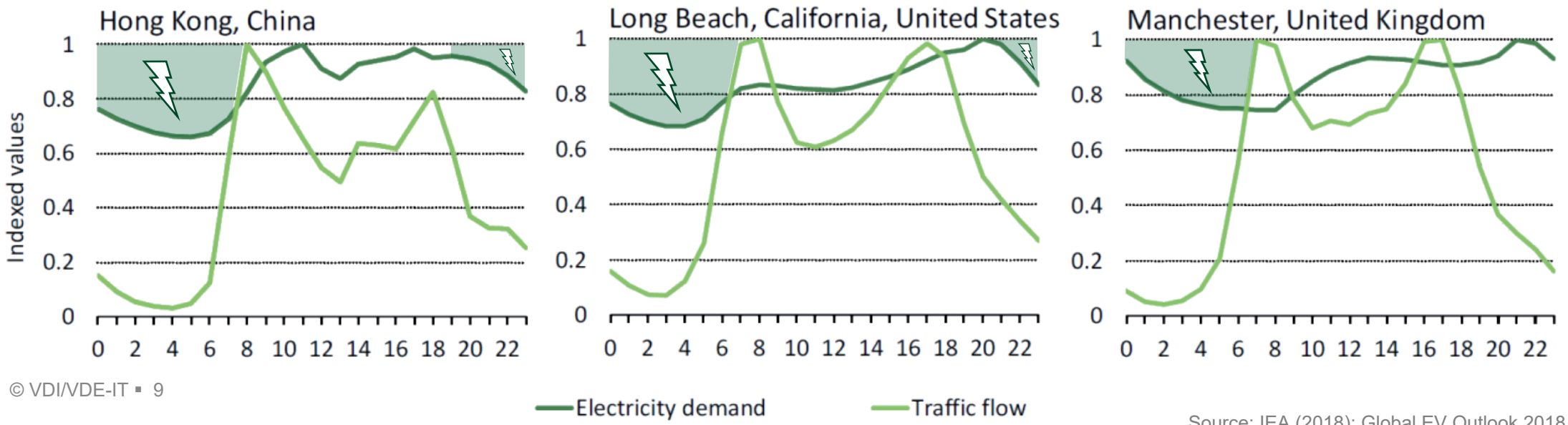
IMPLICATIONS FOR THE ENERGY SYSTEM

Electricity demand generated by electric vehicles will increase by less than 10%.

Grid capacity is the limiting factor in serving the charging infrastructure.

High simultaneity of power demand for charging endangers the stability of the electric grid.

→ Electric vehicle charging needs to be shifted to times of low grid utilization.



Source: IEA (2018): Global EV Outlook 2018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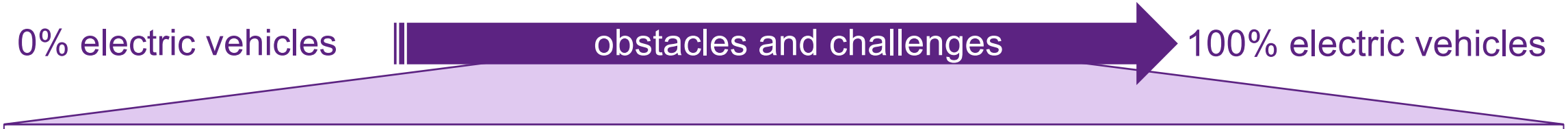
GAP

GAP ANALYSIS



No clear **long term strategy** for the energy transition in the transport sector.

Many different actors need to be involved to install public charging infrastructure.

Many different **billing schemes** for public charging confuse electric vehicle drivers.

Simultaneous charging of electric vehicles may exceed **grid capacity** and lead to outages.

No standardized **communication infrastructure** in place. SMGW[1] roll-out expected for 2020.

Few incentives for DSM[2] of the charging infrastructure.

1) SMGW: Smart Meter Gateway 2) DSM: Demand Side Management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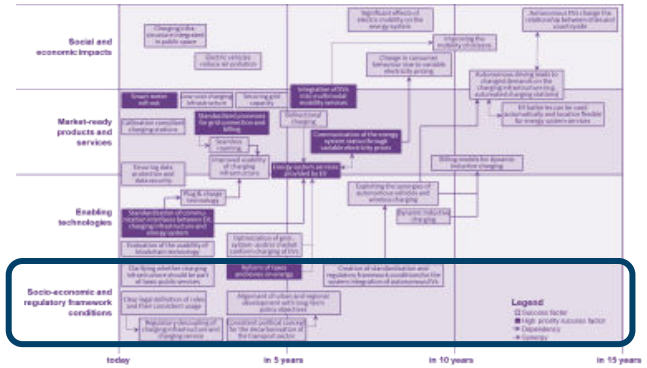
INNOVATION

RECOMMENDED ACTIONS I

Technology roadmap developed in a workshop with 20 experts from the field of charging infrastructure for electric vehicles.



Improve socio-economic and regulatory frame work conditions:

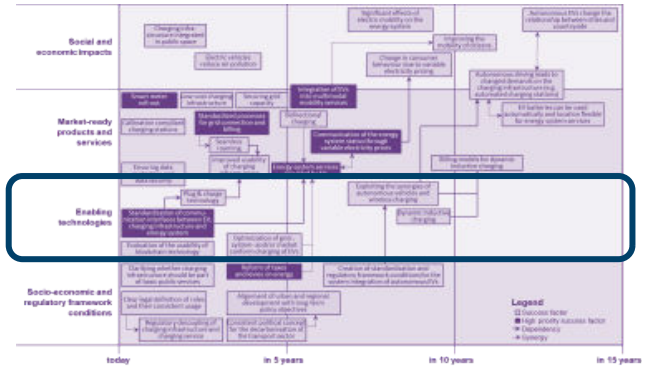
→ Develop a long term strategy for the energy transition in the transport sector to reduce risks for investment decisions and to enhance the market diffusion of electric vehicles.

→ Align urban and rural development with long term policy objectives.

→ Create incentives for grid conform energy management of vehicle charging e.g. through dynamic electricity pricing and reduced taxes and levies.

RECOMMENDED ACTIONS II

Technology roadmap developed in a workshop with 20 experts from the field of charging infrastructure for electric vehicles.



Develop enabling Technologies:

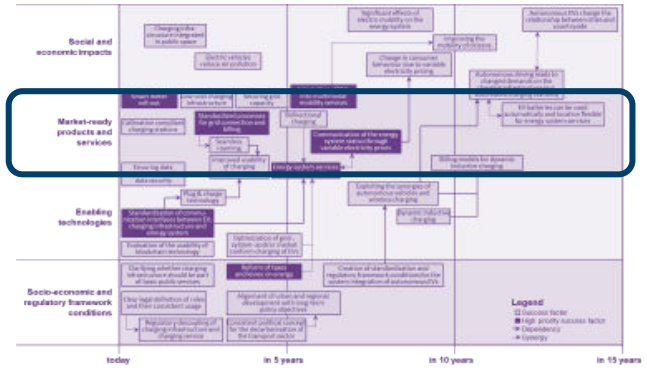
→ Enhance and implement standardized communication interfaces between electric vehicles and charging infrastructure to enable plug&charge and v2g functionality.

→ Development, testing and implementation of grid conform energy management for the charging infrastructure.

→ Develop inductive charging technology and unlock synergies with automated driving.

RECOMMENDED ACTIONS III

Technology roadmap developed in a workshop with 20 experts from the field of charging infrastructure for electric vehicles.



Market-ready products and services:

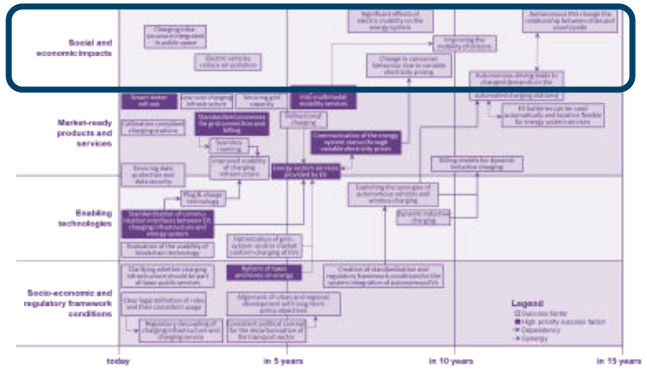
→ Roll out of smart meter gateways to enable secure communication between charging infrastructure and system operator.

→ Create transparency for charging prices and billing schemes e.g. with a web based platform.

→ Implement a mechanism to communicate the status of the energy system e.g. by flexible pricing of electricity as a function of grid status.

RECOMMENDED ACTIONS IV

Technology roadmap developed in a workshop with 20 experts from the field of charging infrastructure for electric vehicles.



Social and economic impacts

→ Reduce local air pollution through sped up market diffusion of electric vehicles.

→ Integrate public charging infrastructure into public spaces seamlessly.

→ Change charging habits comply with fluctuating energy supply.

SELECTED ACTIVITIES IN GERMANY

- National Platform Future of Mobility (NPM) aims to develop paths that cross and link modes of transport for a largely greenhouse gas-neutral and environmentally friendly transport system that enables efficient, high-quality, flexible, available, safe, resilient and affordable mobility in both passenger and goods transport.
- Immediate program for clean air is supporting polluted cities and municipalities with new funding guidelines for more low-emission vehicle fleets, the switch to alternative drive systems and more infrastructure for electric mobility.
- Battery manufacturing with the aim to create an IPCEI for the production of battery cells for high-capacity, sustainably produced and cost-effective batteries. This objective is central to the electrification of automotive drives and thus to the future success and competitiveness of German and European automobile manufacturers.

ACKNOWLEDGEMENT AND FURTHER INFORMATION

- Research Program: ELEKTRO POWER II
  - 13 R&D Projects
  - 29 Million Euro public funding
  - Program manager: DLR Project Management Agency
  - Accompanying research: Institute for innovation and Technology
- Latest Publication:
  - Perspektiven der Elektromobilität für Energiewende, Produktion und Ladeinfrastruktur (German)
- Acknowledgement:

Supported by:

Federal Ministry for Economic Affairs and Energy

on the basis of a decision by the German Bundestag

THANK YOU!

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