

Automotive industry faces a revolution

Rémi BASTIEN
VP automotive prospective



THE DRIVING FORCES FOR THE AUTOMOBILE FUTURE



Mobility and Living



Customer Values



Energy and Environment



Global Economic and Demographic Changes



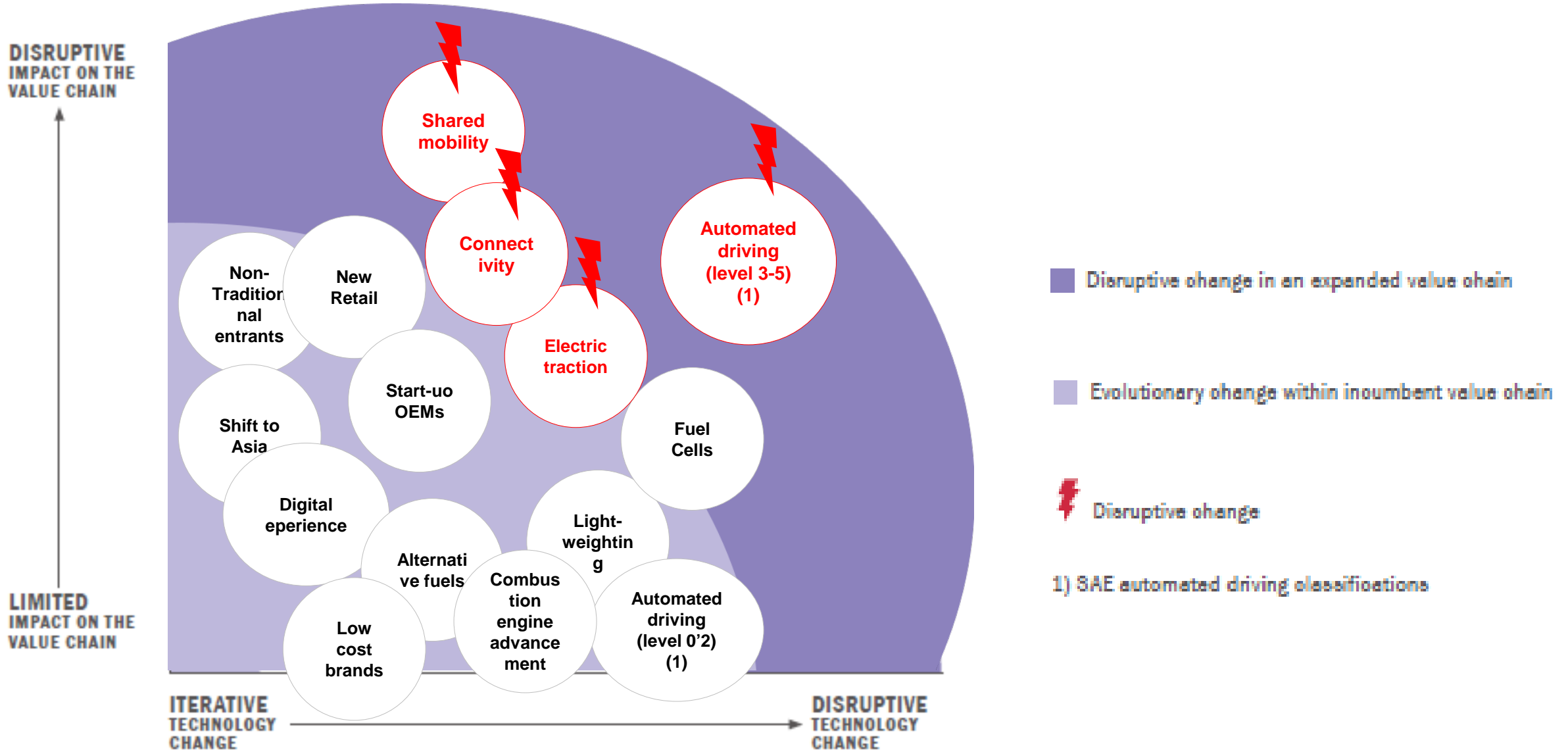
Technical Disruptions



Transport Infrastructure



DISRUPTIONS IN VALUE CHAIN AND TECHNOLOGIES

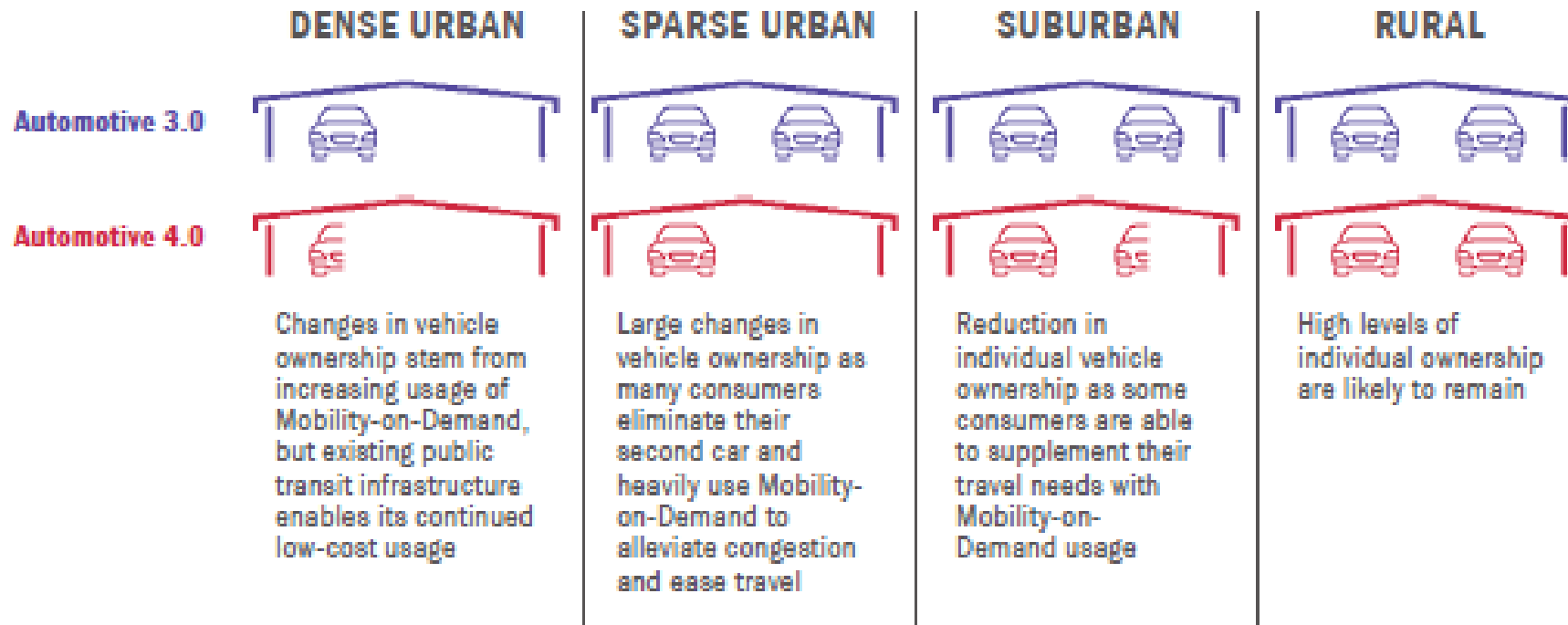


AUTOMOTIVE 4.0

F

VEHICLE USAGE IN AUTOMOTIVE 4.0 FOR REPRESENTATIVE HOUSEHOLDS

Vehicle ownership and usage varies by geographic region



 Illustrative individually owned vehicles per household

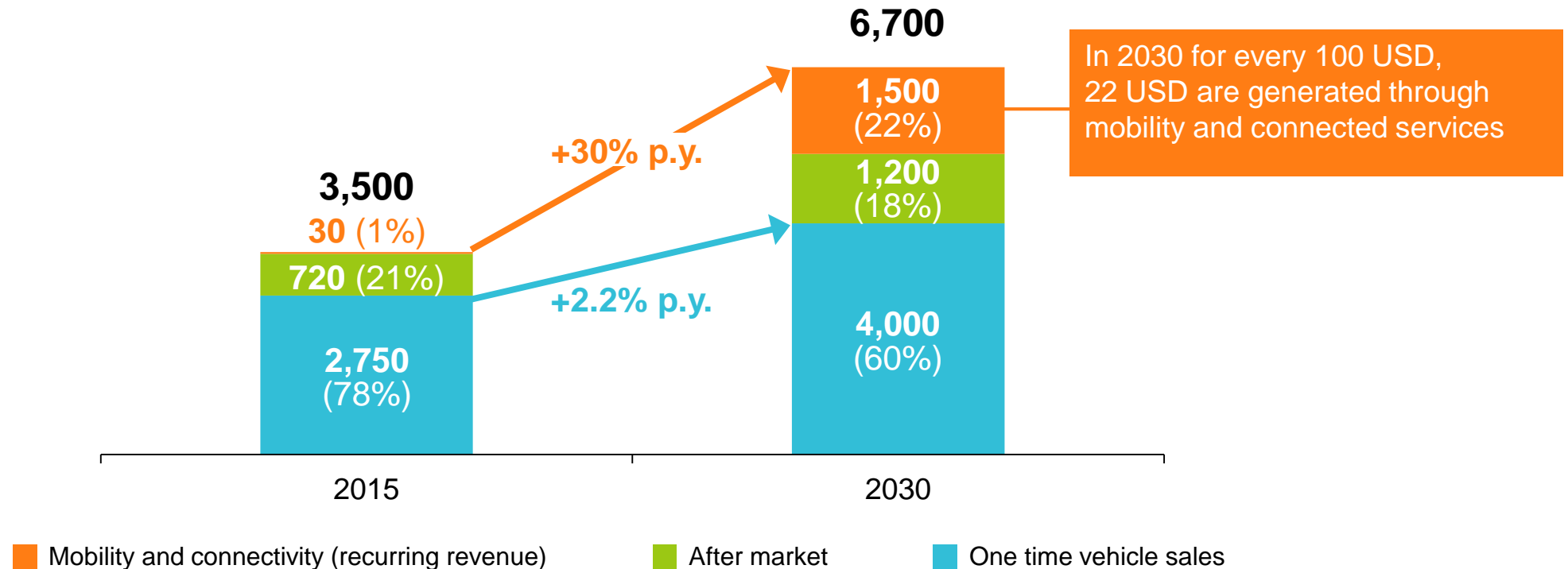
Source: Roland Berger

MOBILITY AND CONNECTIVITY SERVICES to grow by 30% p.y. and become a major revenue pool by 2030 (>50% of today's vehicle sales)

AUTOMOTIVE REVENUES 2015 ▶ 2030

In USD B.

Source: McKinsey, Goldman Sachs



NEW COMERS : EV OPENS THE MARKET

ICE CAR



ELECTRIC CAR



ELECTRIC CAR



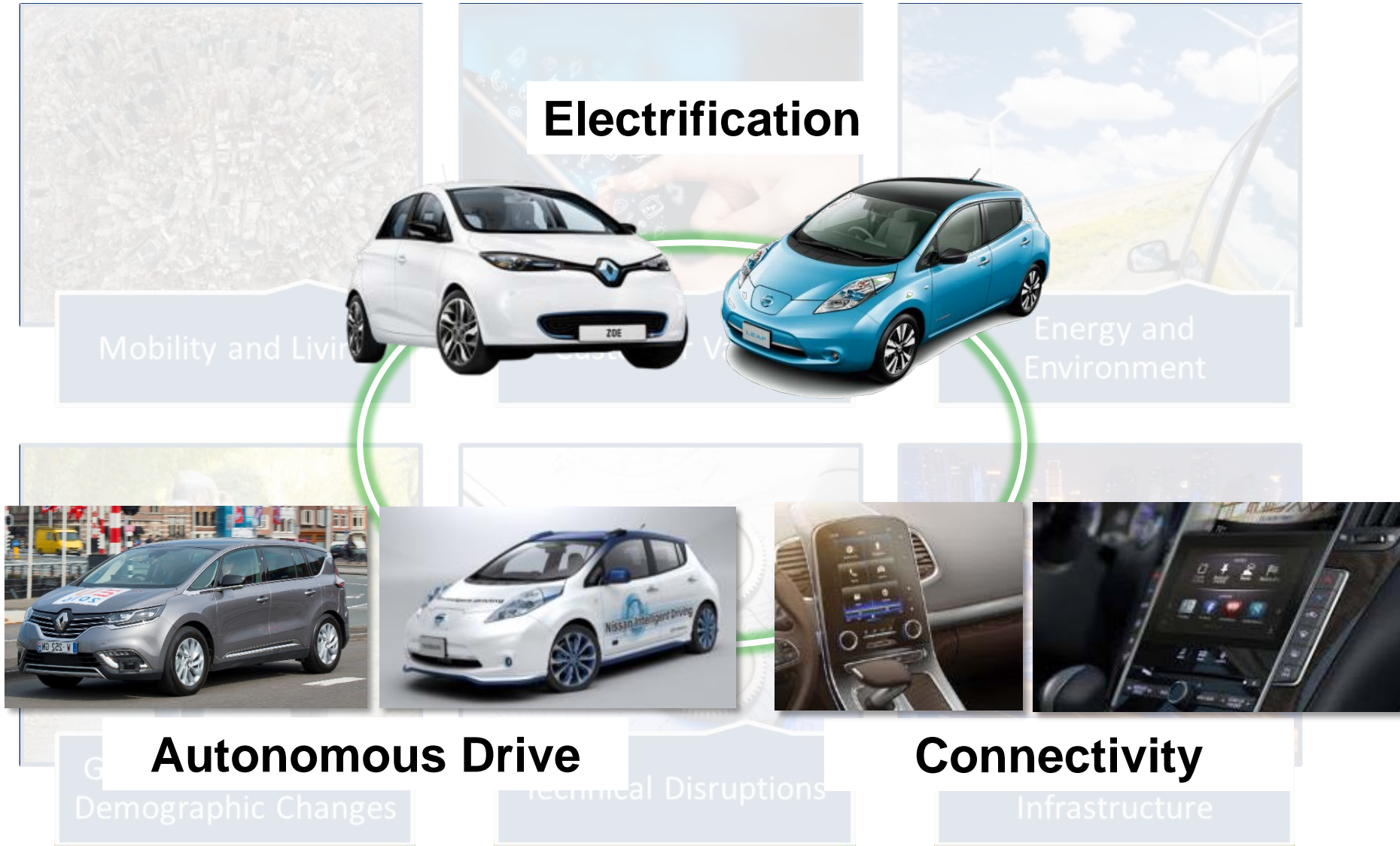
Traditional car makers



New comers focusing datas & software



THE AUTOMOTIVE ANSWER





ELECTRIC VEHICLES



RÉMI BASTIEN

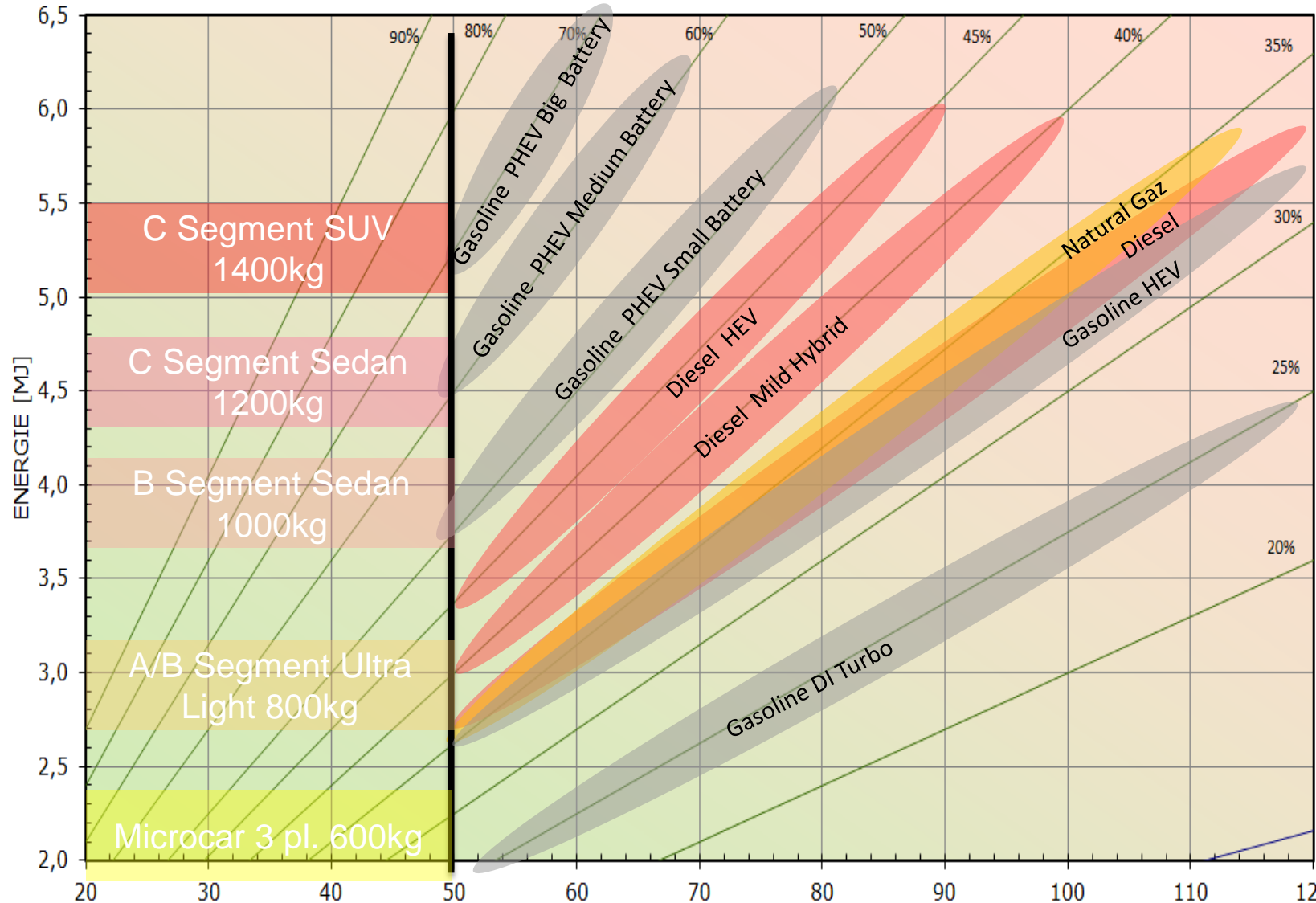
2018, JUNE

CONFIDENTIAL B
PROPERTY OF GROUPE RENAULT

8

GROUPE RENAULT

ELECTRIFICATION IS MANDATORY *Efficacité Energétique sur cycle NEDC*



RÉMI BASTIEN

2018, JUNE

RENTY OF GROUPE RENAULT

9


CO2 (g/km)

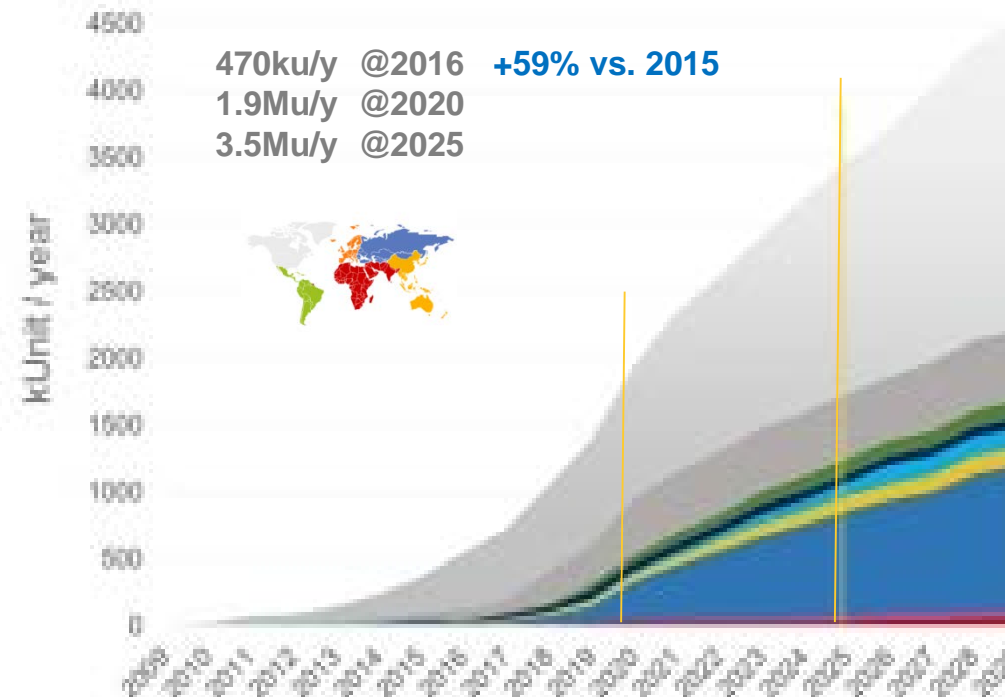
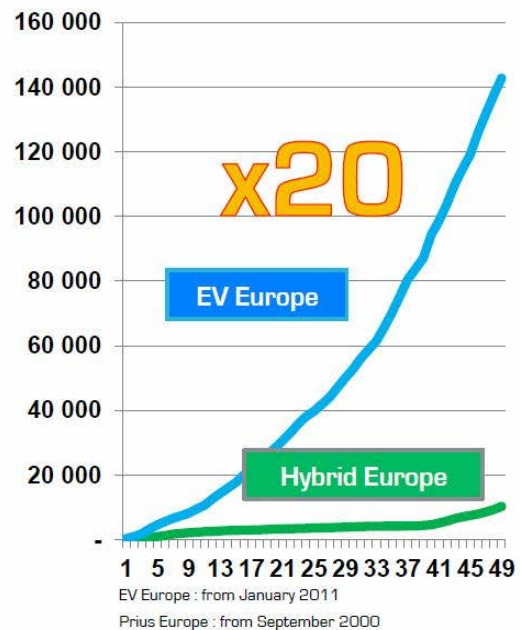
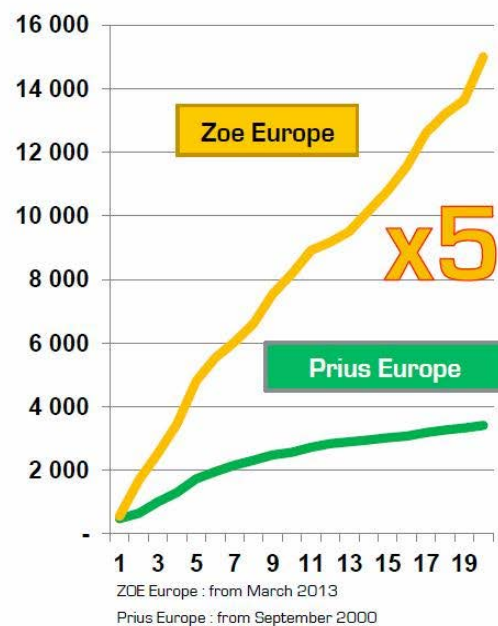
RENAULT

BENEFITS OF ELECTRIC VEHICLE



ELECTRIC VEHICLES ARE ACCEPTED MORE AND MORE RAPIDLY

 EV vs. HV: comparison of sales



*Faster Take-off
than start of HEV*

*Huge Volume expansion
in the coming years*

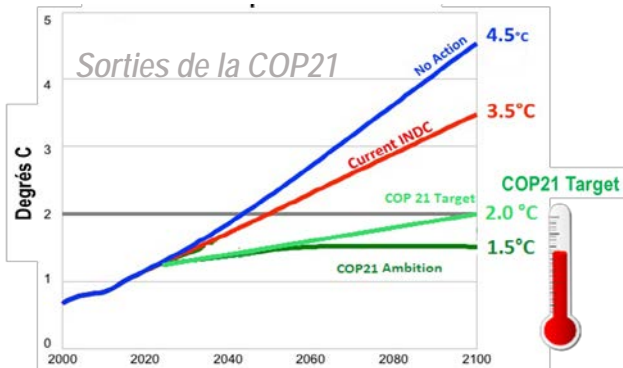
Europe 2017 EV sales

1 - Renault Zoe	(31.302)
2 - Nissan Leaf	(17.293)
3 - BMW i3	(14.785)
4 - Tesla Model S	(14.319)
5 - Volkswagen e-Golf	(12.663)
6 - Tesla Model X	(10.396)
7 - Nissan e-NV200	(4.419)
8 - Smart ForTwo	(4.239)
9 - Renault Kangoo ZE	(4.232)
10 - Volkswagen e-Up!	(2.981)
11 - Opel Ampera-E	(1.942)
12 - Smart ForFour	(1.423)



THE ENERGY INDUSTRY FACES ALSO A MUTATION AND EV CAN CONTRIBUTE

COP21: MOVING TO RENEWABLES

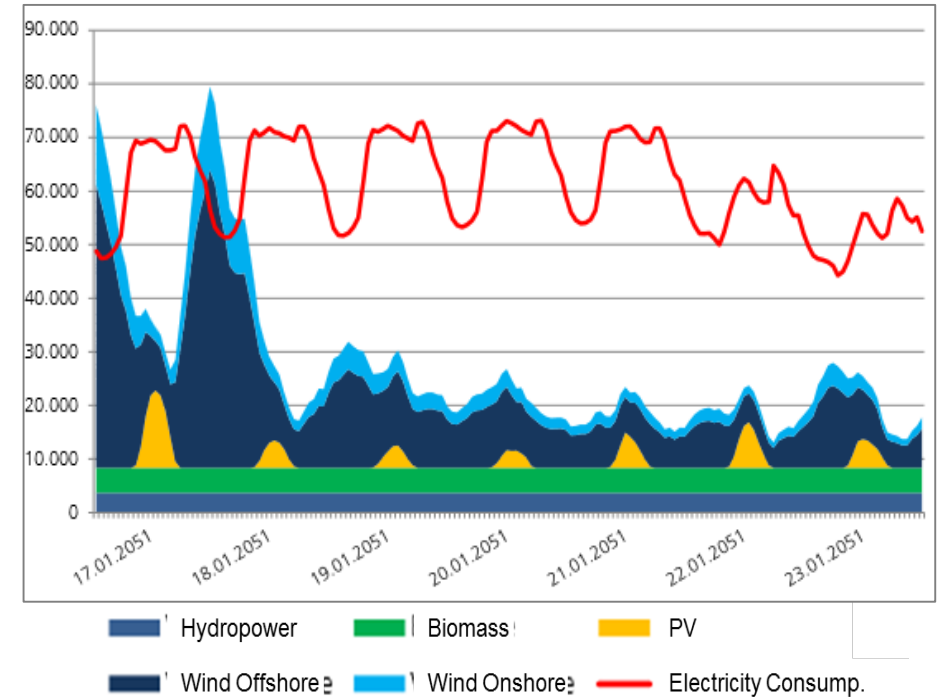


Domaine	Contribution
Agriculture	0%
Services	2%
Résidentiel	3%
Transports	19%
Industrie	15%
Autres	9%
Energie	52%

2050 contribution to reach + 2°C (IEA)

- Worldwide acceleration of RNW
- COP21: more than 50% contribution in Energy

A NEED FOR FLEXIBILITY IN RENEWABLES



- Cyclic and irregular consumption
- Intermittent and distributed RNW production

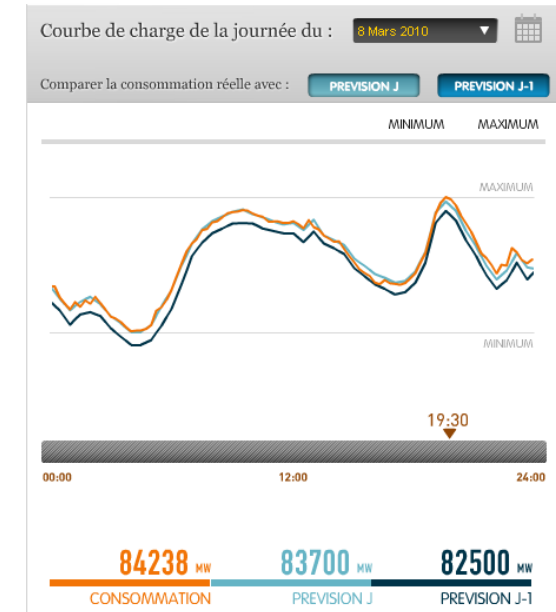
ELECTRIC VEHICLE BELONGS TO A LARGE ECO-SYSTEM !



Versatile production

La consommation en temps réel

RTE fournit le niveau de la consommation d'électricité française à tout instant.



Storage capacity

Real time supply



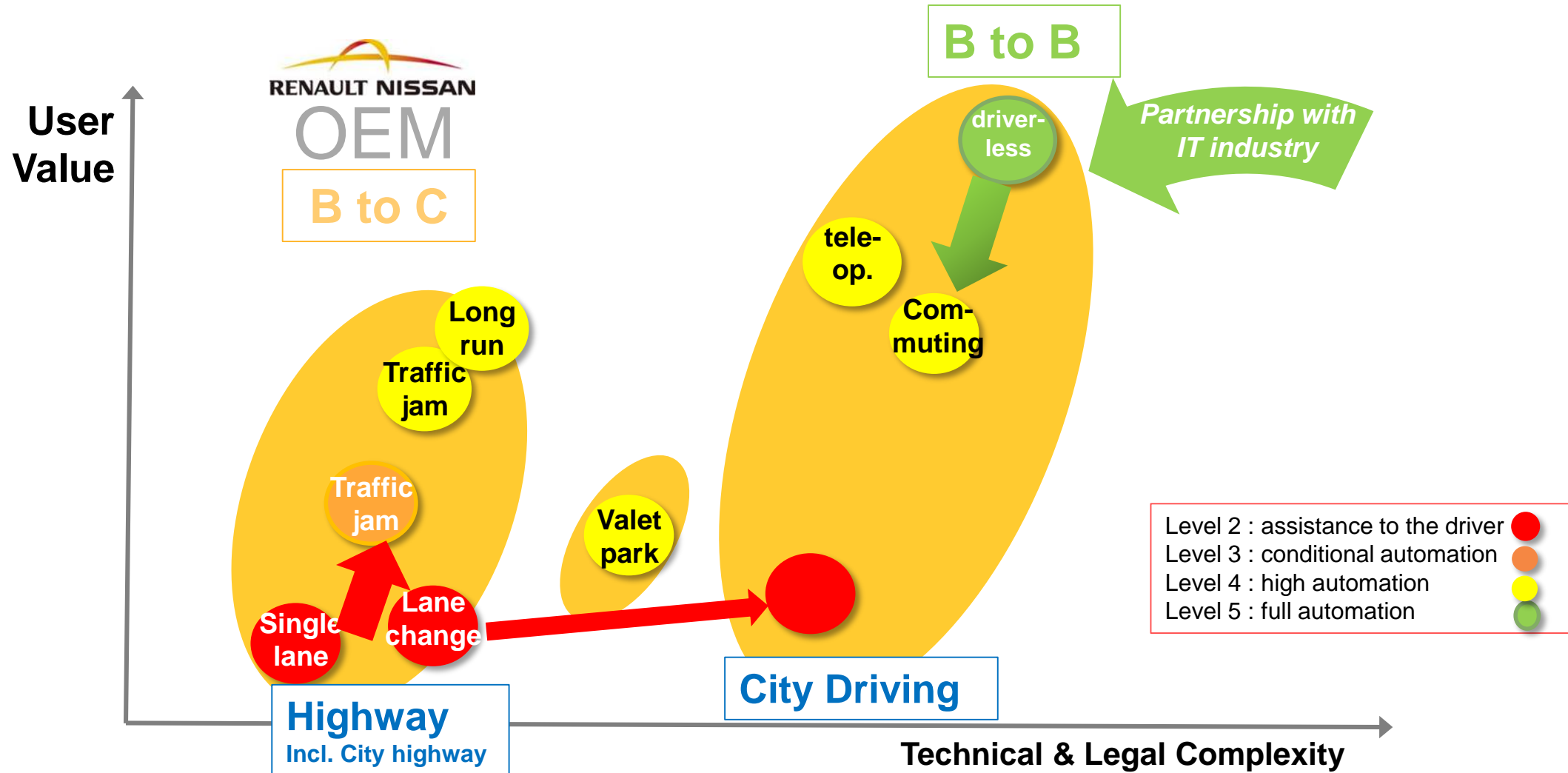


AUTONOMOUS DRIVE



TWO MAJOR FIELDS FOR AUTOMOTIVE CAR MAKERS


Big Data Collection + Deep Learning




BENEFITS OF AUTONOMOUS DRIVE




Safety



Stress-free



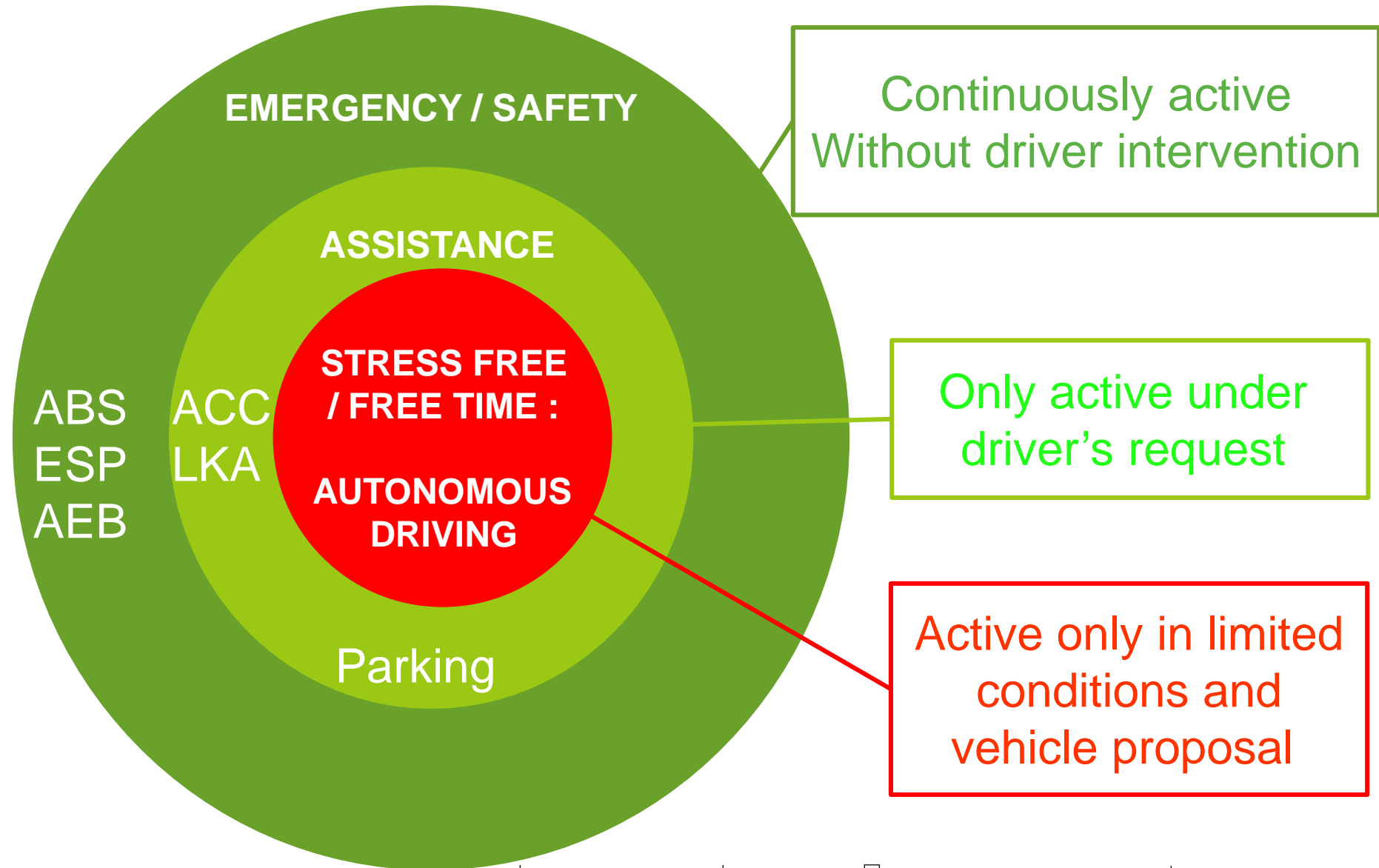
Free time



Driving pleasure

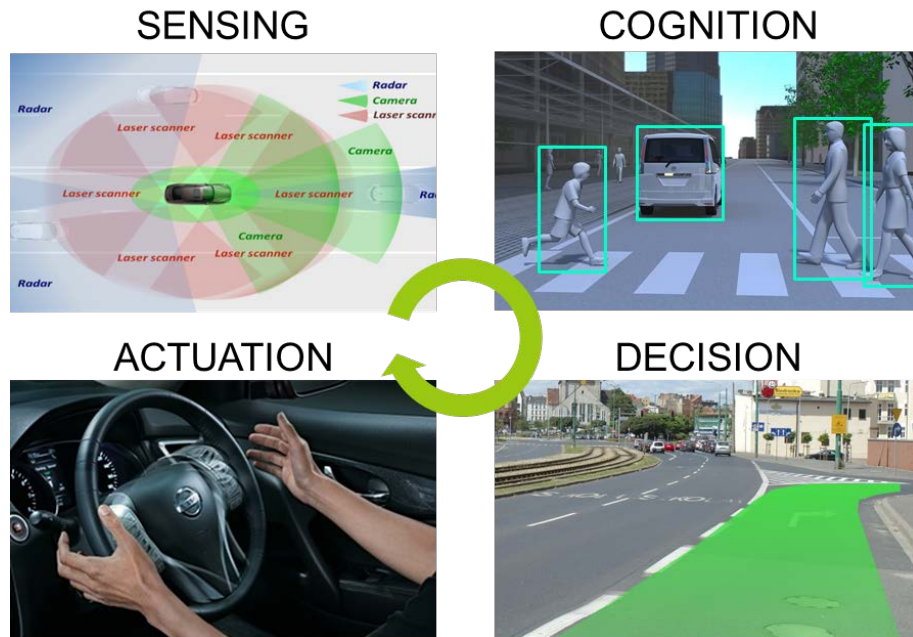


AUTONOMOUS DRIVING BEYOND ADAS



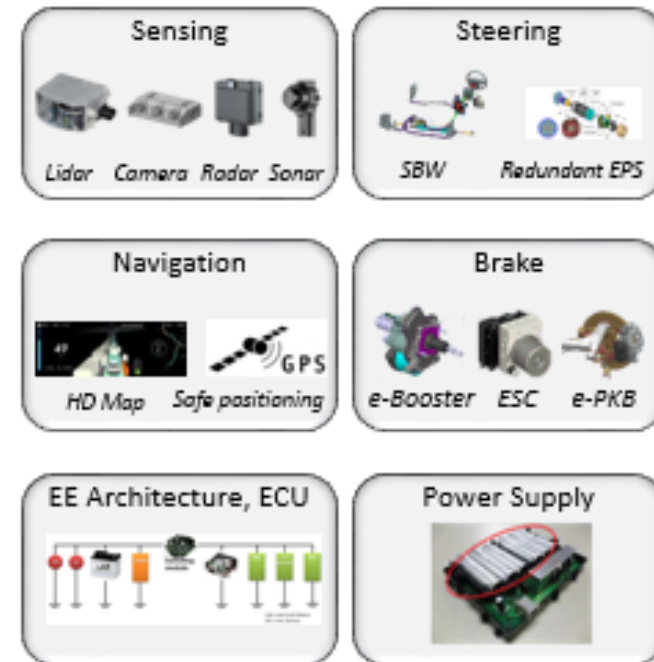
THE TECHNOLOGY IS MANDATORY BUT ... IS NOT ENOUGH

Core technologies



Platform enhancement

Redundancy



KEY SUCCESS CONDITIONS : SOCIAL ACCEPTANCE

Social acceptance

Experimentation

- Regulations
- Product Liability
- Infrastructure
- Insurance
- Consumer awareness
- Driver Education

- Proof by FOT on certified roads

The infographic displays six countries with their respective FOT programs:

- Sweden:** Drive Me program (2013-2018) featuring Volvo. Includes a map of Sweden and a photo of a self-driving car on a road.
- France:** FOT program (2015-2020) featuring PSA Peugeot Citroën, Valeo, and Continental. Includes a map of France and the text "On-road test permission was issued.".
- Germany:** Ko-HAF program (2015-2018) featuring Mercedes-Benz, BMW, Audi, and Opel. Includes a photo of a self-driving car on a road.
- Japan:** SIP program (2017-2020) featuring Nissan, Toyota, and Honda. Includes logos for Japanese government agencies and a photo of a self-driving car on a road.
- Korea:** MOTIE program (2015-2021) featuring Hyundai, KIA, LG, and Valeo. Includes a photo of a self-driving car on a road.
- USA:** US Automation Program (Term: TBD) featuring FHWA and NHTSA. Includes a photo of a self-driving car on a road.

➔ THE BIGGEST STAKE IS SAFETY

AD IS A MAJOR DISRUPTION

ADAS

(L1, L2, L3)



Driver is the last resort

Driver reliability proof



Driver training + experience

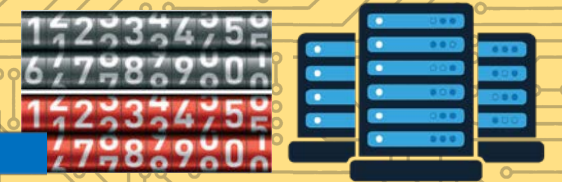
AD

(L3+⁽¹⁾, L4, L5)



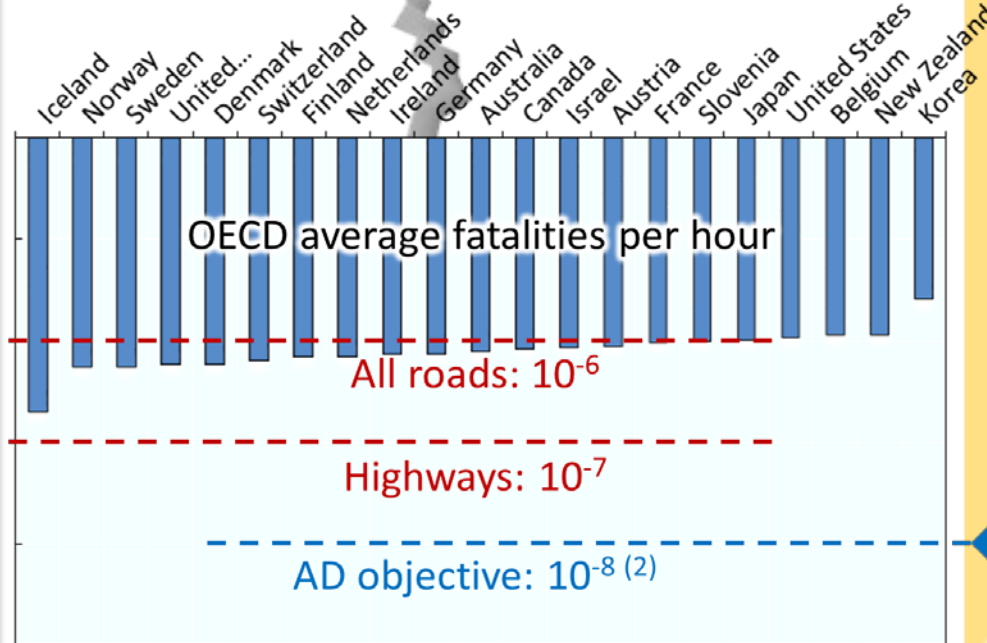
System is the last resort

System reliability proof



Massive mile accumulation + resimulation

- (1) *Emerging German L3 standard (Audi, BMW, Daimler)*
- (2) *Emerging consensus among European OEM*



RENAULT AND NISSAN ON TRACK FOR AD



AUTONOMOUS DRIVE





CONNECTED CAR



BENEFITS OF CONNECTED CAR

In-Car Experience



Improved Customer Experience



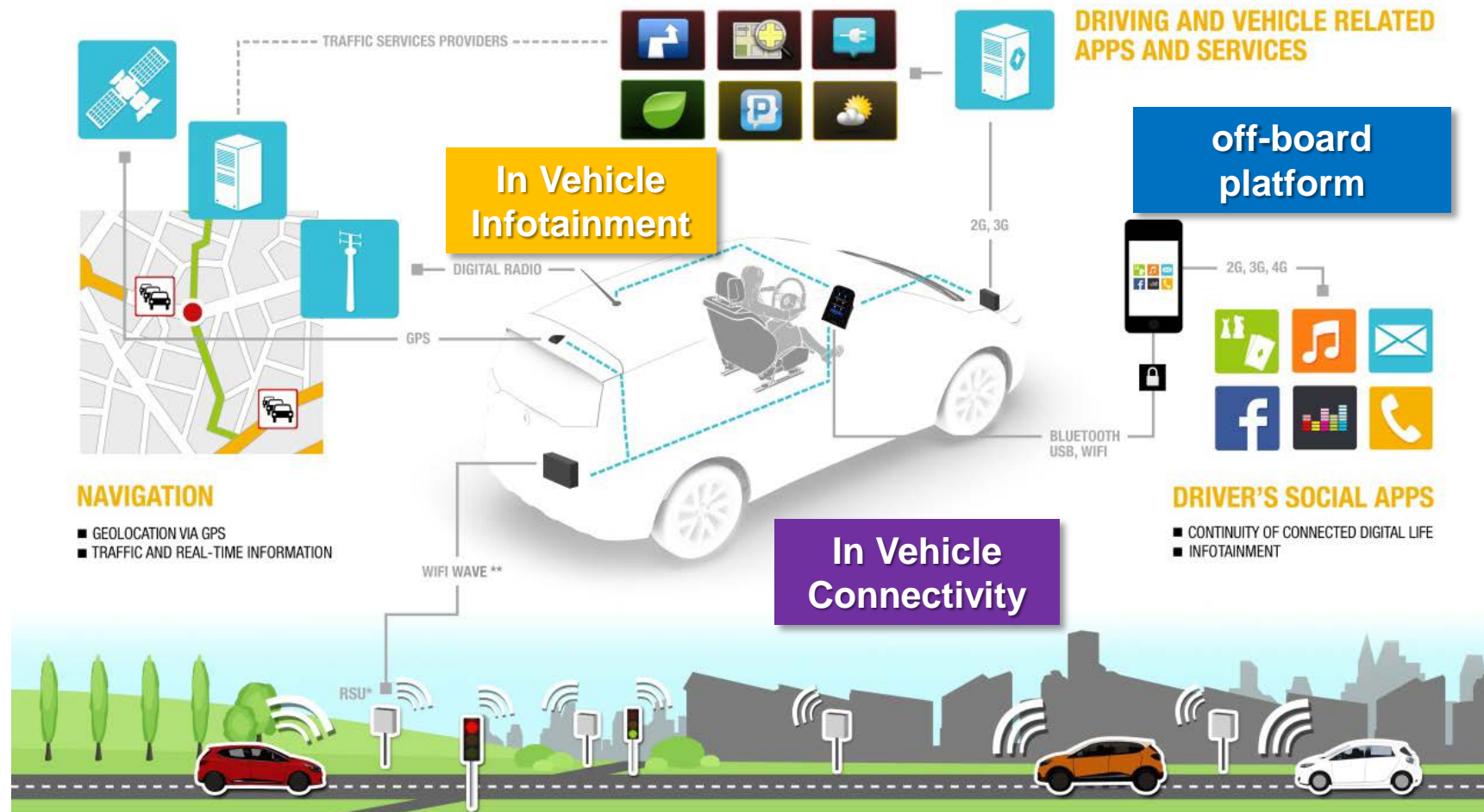
Autonomous Drive Support



Big Data Utilization



ALLIANCE CONNECTIVITY PLATFORM



*RSU: ROAD SIDE UNIT
 ** WAVE : WIRELESS ACCESS IN VEHICULAR ENVIRONMENTS:
 WIFI WITH IMPROVED RANGE (1KM), ADAPTED TO FAST MOVING VEHICLES

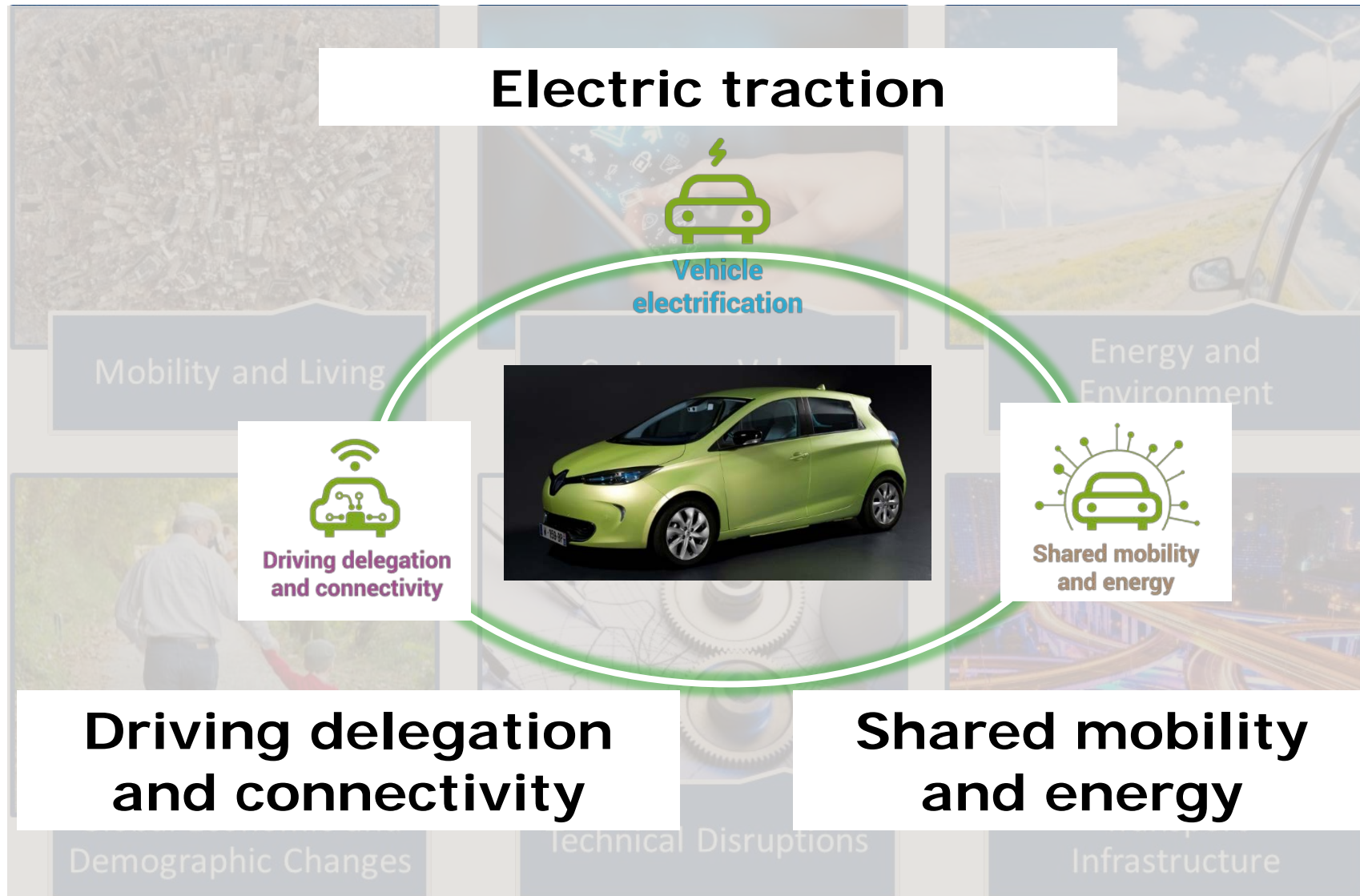




DIGITAL & HPC ARE KEY ENABLERS FOR THESE DISRUPTIONS

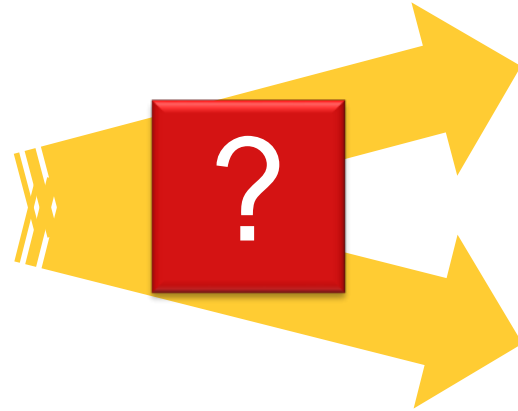


THE „MOBILITY ON DEMAND“ : THE NEW HORIZON

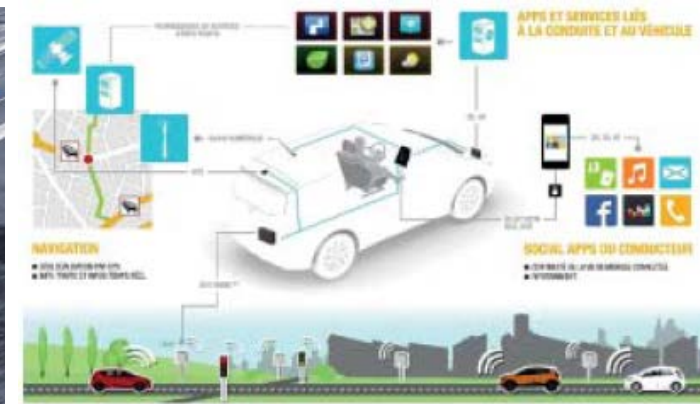
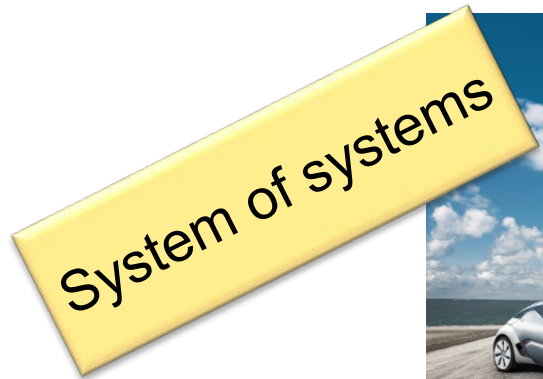


CAR INDUSTRY FACES DEEP DISRUPTIONS

new business for car with AD, CC, ZE

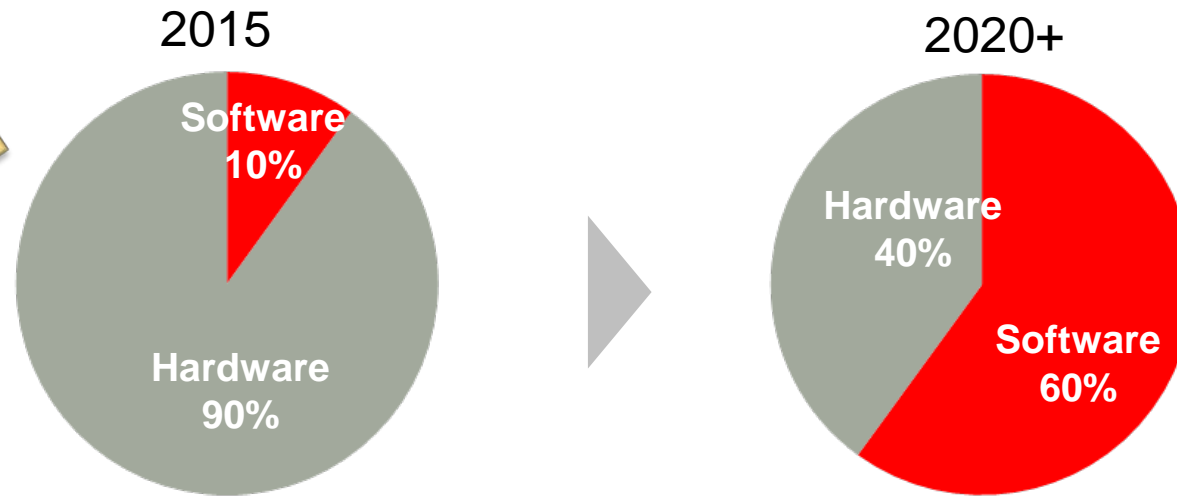


CC, AD, ZE : car in a global ecosystem



SOFTWARE & EMBEDDED/« IN THE CLOUD » INTELLIGENCE ARE STRATEGIC

New skills



Source of Automobile Value

Source : Morgan Stanley Research



Toyota invests \$1 billion in artificial intelligence in United States

By AP | Nov 06, 2015, 12:02 PM IST

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TOKYO: Toyota is investing \$1 billion in a research center

Honda Chooses Tokyo Over Silicon Valley for Research Center

Toyota invests \$50 million in AI centers, partners with Stanford, MIT

By Matt O'Brien | September 4, 2015 at 10:25 AM

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Renault takes control of Intel's R & D in France
En savoir plus sur <https://www.lesechos.fr/>

AI); autonomous driving and the

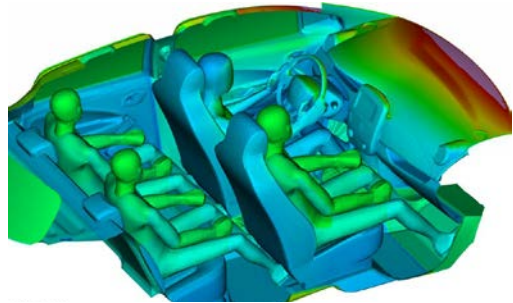
Volkswagen Group expands its competence in artificial intelligence

• Prof. Patrick van der Smagt to strengthen Data Lab team in Munich

DIGITAL SIMULATION BECOMES MANDATORY



« AD Car validation will request 15.000.000.000 kms »



- System Simulation
- Multi-physical Simulation
- Software Simulation



SYNTHESIS

- **The game is changing : from car business to mobility solutions**
- **The vehicle of future will be zero emission, connected and autonomous**
- **Digital transformation will ensure the success of this mutation**
- **High power computing strength will be a key factor of success**





THANK YOU FOR YOUR ATTENTION !

