THE FUTURE OF THE CAR

- Claire MARTIN
  VP Corporate Social Responsibility, MD Renault Fondation

RENAULT GROUP
MOBILITY, THERE IS STILL A LONG WAY TO GO...

PARIS, WORLD EXPO 1900

THE FUTURE OF THE CAR
MAJOR GLOBAL CHALLENGES

1. CLIMATE
   - CO₂
   - Raw materials

2. RESOURCES
   - Petrol, water

3. HEALTH / AIR QUALITY
   - PM, NO₂

4. CONGESTION

5. SAFETY

6. ECONOMIC & TIME OPTIMIZATION
CAR MANUFACTURERS ARE THE SOURCE OF 15% OF GREENHOUSE GAS EMISSIONS
CARBON FOOTPRINT

-3.3% / YEAR

BETWEEN 2010 / 2014

10.1 MILLION TONS
CO₂ EQUIVALENT AVOIDED
CLIMATE

RENEWABLE ENERGIES

90%

TANGIER PLANT
CLIMATE

RECYCLED MATERIALS

30,4%

TARGET 33% FOR 2016
2 LITERS OF OIL
GLOBAL AVERAGE CONSUMPTION
PER DAY AND PER PERSON

25% FOR THE TRANSPORT SECTOR
INCREASED DISTANCES

- 1995 LEIPZIG > SAARBRÜCKEN
- 2015 LEIPZIG > ROME
# Progress in 20 Years

<table>
<thead>
<tr>
<th></th>
<th>1995</th>
<th>2005</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emissions</strong></td>
<td>195 g CO₂/km</td>
<td>139 g CO₂/km</td>
<td>97 g CO₂/km</td>
</tr>
<tr>
<td><strong>Barrel Price</strong></td>
<td>&lt; 20 $</td>
<td>&lt; 60 $</td>
<td>44 à 60 $</td>
</tr>
<tr>
<td><strong>Recycled Plastic</strong></td>
<td>4 kg (CLIO)</td>
<td>14 kg (MÉGANE)</td>
<td>34 kg (CAPTUR)</td>
</tr>
<tr>
<td><strong>Particle (by mass)</strong></td>
<td>140 (EURO 1)</td>
<td>50 (EURO 3)</td>
<td>4,5 (EURO 6)</td>
</tr>
</tbody>
</table>
IN 2011…
1 CAR IN 1,000
WAS AN EV

TODAY…
1 IN 160
ONE SOLUTION: THE ELECTRIC VEHICLE

→ Success conditions

- RENEWABLE ELECTRICITY
- POLITICAL DETERMINATION
- CHARGING INFRASTRUCTURE
- ENGAGEMENT OF ALL
THE EV ECOSYSTEM

Smart grids
Recycling
Public fleets
Financial incentives
Public charging points
Home charging points
Benefits

INTERNATIONAL TRANSPORT FORUM – LEIPZIG
18.05.2016
THE FUTURE OF THE CAR
GROUPE RENAULT
THIS WILL CONTINUE... ENVIRONMENT = MORE THAN 60% of R&D INVESTMENTS
AUTONOMOUS DRIVE
WHAT DOES DELEGATION MEAN?

Legal (Vienna convention)
Human Driver / No side task allowed

Not legal yet
Driver can be an homologated System

Level 0
Driver Only

Level 1
Assisted

Level 2
Partially Automated

Level 3
Conditionally Automated

Level 4
Highly Automated

Level 5
Fully Automated

ENJOY FREE TIME

Robot Taxi

Driver will respond if a request to intervene

Driver not required during defined use case

1968 Vienna Convention

LEGAL (Vienna convention)
Human Driver / No side task allowed

No Driver Assistance System

Longitudinal OR Lateral driving control possible

Longitudinal AND Lateral driving control possible

Driver not required during defined use case

No Driver Assistance System

Eyes On

Hands On

Eyes Off

Hands Off

ENJOY FREE TIME

Robot Taxi
April 14th: 28 EU-transport ministers signed Amsterdam Declaration for development and harmonization of connected, autonomous driving in Europe... and had a real demonstration!

"Ongoing cooperation between governments and industry is key."

Mélanie SCHULTZ (Dutch Minister of Infrastructure and the Environment)
TWO MAJOR FIELDS FOR AUTOMOTIVE CAR MAKERS

CAR MANUFACTURERS

B to C

User Value

Deterministic environment (highway, etc.)
Traditional automotive system

Traffic jam

Long run

Single lane

Lane change

Highway

Incl. City highway

B to B

Big Data Collection + Deep Learning

data platform

driver-less

Commuting

tele-op.

City Driving

Technical & Legal Complexity

NEWCOMERS

Probabilistic environment (city road, etc.)
Artificial intelligence
Outside auto industry

Partnership with IT industry

B to B

Level 2: assistance to the driver
Level 3: conditional automation
Level 4: high automation
Level 5: full automation

Level 2: assistance to the driver
Level 3: conditional automation
Level 4: high automation
Level 5: full automation

Level 2: assistance to the driver
Level 3: conditional automation
Level 4: high automation
Level 5: full automation

GROUPE RENAULT

21

INTERNATIONAL TRANSPORT FORUM – LEIPZIG

18.05.2016

THE FUTURE OF THE CAR
TECHNOLOGY DEVELOPMENT PLAN

4 MAJOR STEPS BEFORE ACTING

CAPABILITY of HARDWARE/SOFTWARE vs. HUMANS

Sensing

Cognition

Actuation

Decision

1 s

0,01 s
VALUE / BENEFITS OF AUTONOMOUS DRIVING

AUTONOMOUS DRIVE

SAFETY BENEFIT

ACCESSIBILITY
juniors / seniors / impaired mobility

STRESS-FREE BENEFIT

AFFORDABILITY
Mobility for all - developed & developing countries

FREE TIME BENEFIT

… & MANUEL DRIVE

DRIVING PLEASURE
SUCCESS CONDITIONS: SOCIAL ACCEPTANCE & EXPERIMENTATION

Social acceptance

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

Experimentation

- Proof by follow-on test on certified roads

- Sweden
  - Drive Me
  - Term: 2013-2018
- France
  - Term: 2015-2020
- Germany
  - Ko-HAF
  - Term: 2015-2018
- USA
  - US Automation Program
  - Term: TBD
THE 3 CHANGES THAT TRANSFORM THE BUSINESS

TECHNOLOGICAL CHANGE
- ELECTRIC VEHICLE: A TECHNOLOGICAL BREAKTHROUGH
- CHARGING INFRA: A NEW ECOSYSTEM AND NEW PLAYERS
- AUTONOMOUS & CONNECTED VEHICLE: SIGNALING INFRASTRUCTURE

ECONOMIC TRANSFORMATION
- CIRCULAR ECONOMY: INFINITELY RENEWABLE CONTENTS
- SAVING FUNCTIONALITY: BATTERY RENTAL
- TIME SAVING: NEW USAGE IN CAR

CHANGE OF USE
- CAR-POOLING: MOBILITY BECOMES A SERVICE
- CAR-SHARING: MOBILITY AT THE HEART OF COLLABORATIVE ECONOMY
- MICRO COLLECTIVE TRANSPORT: ROBOT TAXI, DRIVER LESS
The car market collapses!

Shut up you scare me!

THANK YOU FOR YOUR ATTENTION!