

# Innovation and technology for tomorrow's highways

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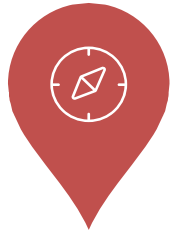
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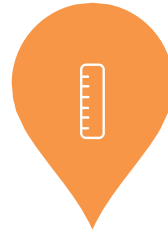
# Overview



**Autonomy**



**Connectivity**



**Alternative  
vehicle power**



**Renewable  
energy**

# Vehicle autonomy



## The Target/impetus

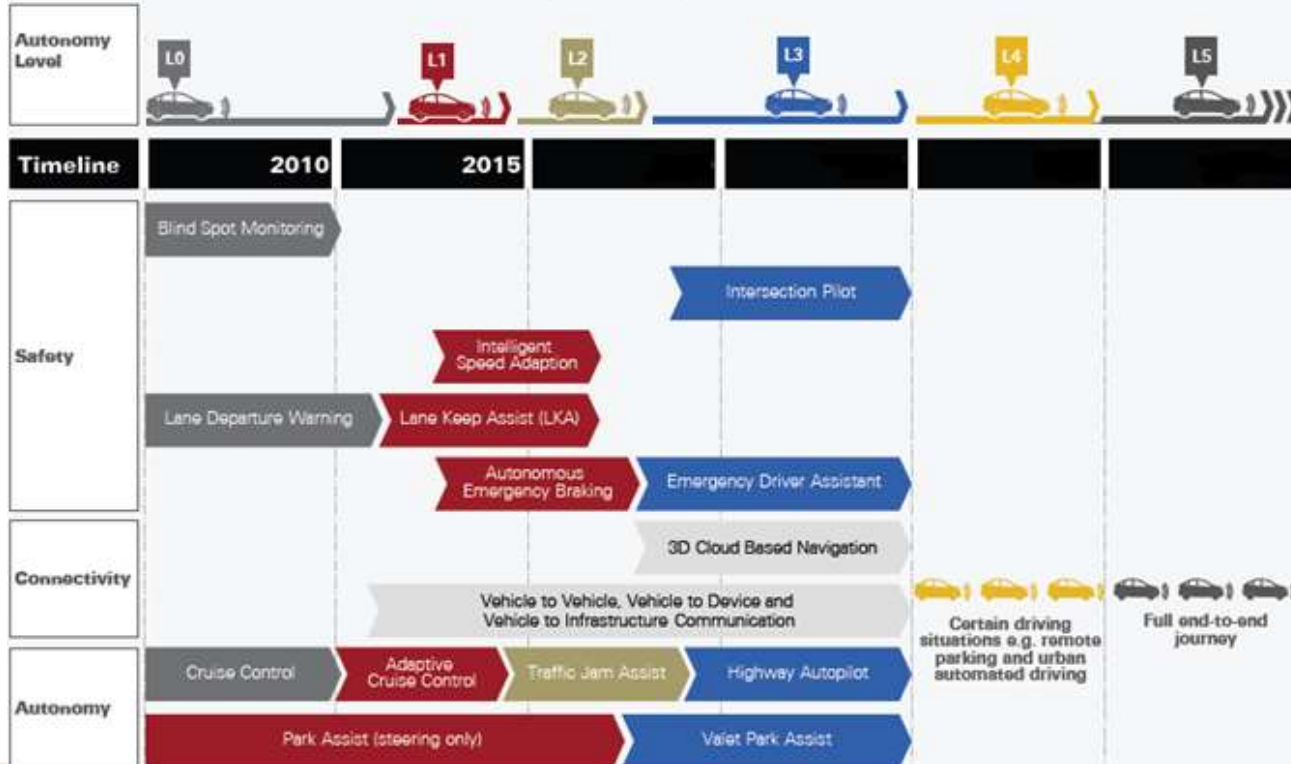
- Supporting “Vision Zero”
- 3,287 deaths/day worldwide (WHO, 2015)
- 94% human error causation (NHTSA, 2015)
- Volvo: by 2020, nobody is seriously injured or killed in one of its new cars

## The Challenge

- Legislation – ETSC
- Liability
- Technical viability/performance – Prediction/decision
- Ethics
- Security

# Autonomy roadmap

Connected and autonomous vehicle technology road map



# Colas Autonomous IPV

Conditional automation: Specific use cases (L3 – L4)

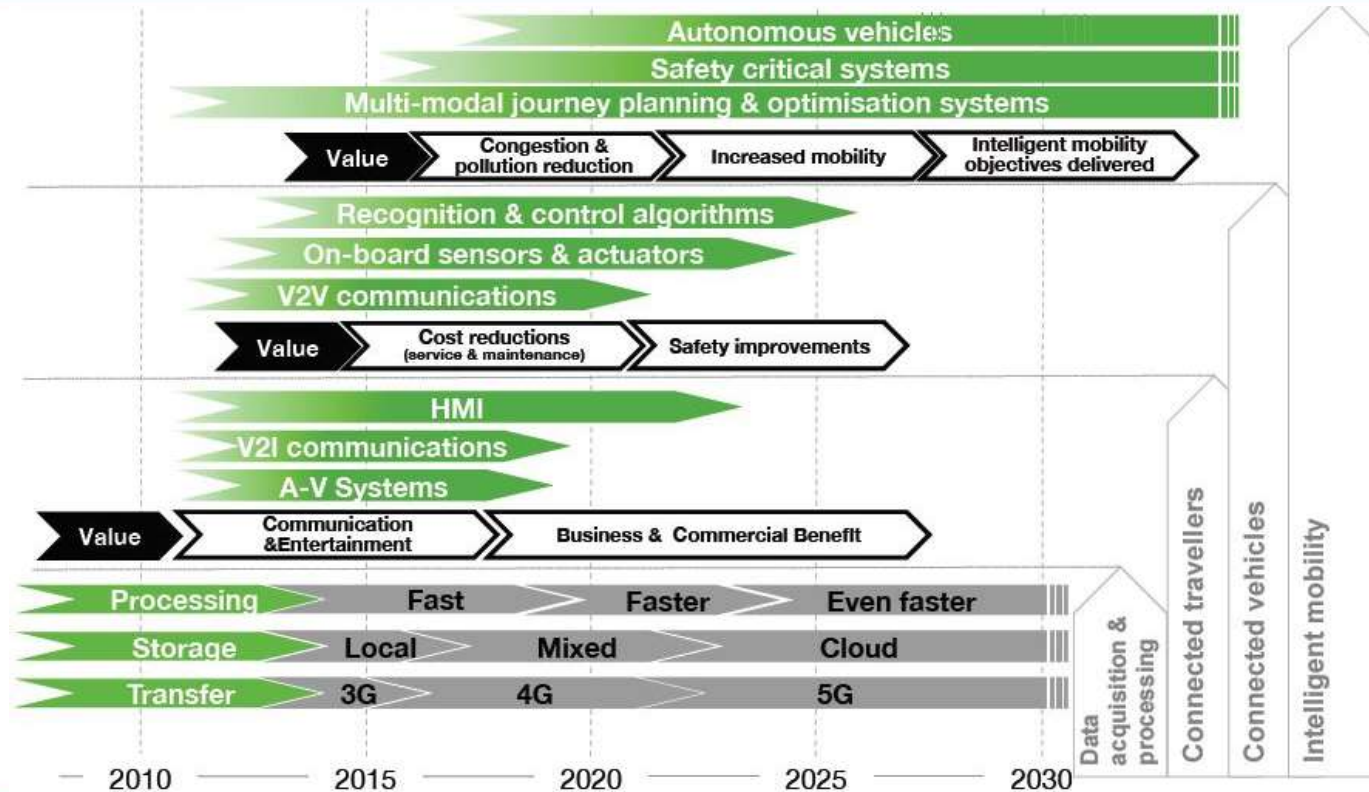
- Remove high risk driver exposure cases
- Leader – Follower foundation
- Military technology
- Forward and rear sensor array and full control system



# Colas Autonomous IPV

THE ATMA  
AUTONOMOUS TMA

# Connectivity



# Connectivity at Colas/Bouygues

## LoRa

- Long range radio communication technology
- 'Deep indoor' connectivity
- Low energy device connectivity
- Small packet data
- Focused on IOT
- Infrastructure connectivity
- Pilot in France -> 15,000 base stations covering most major conurbations





# Electric vehicles



**215 miles**  
Range per charge



**Autopilot Hardware**



**Supercharging**



Seating for  
**5 Adults**



**Under 6 seconds**  
Zero to 60 mph



**\$35,000**

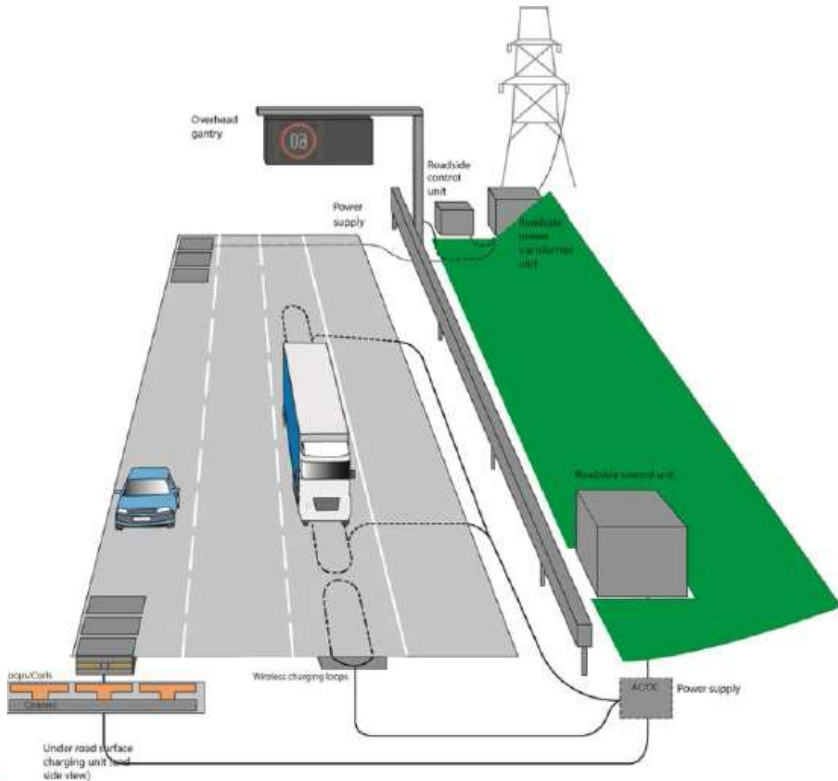
# Infrastructure supporting EVs -Dynamic Wireless Power Transfer (DWPT)



- Dynamic power supply/charging
- Range anxiety alleviation
- Higher mass EV assistance
- Supports smart infrastructure
- Trials ongoing



# Dynamic Wireless Power Transfer (DWPT)



- Induction “loops” in carriageway
- Extensive infrastructure support
- >200kW Power Delivery
- Infrastructure requirement
- Chicken/egg
- Efficiency to improve
- EV compatibility
- Cost
- Location/application

# DWPT in use



Source: KAIST, Korea  
(2015)

# Alternative Energy: Wattway Solar Road



- Renewable energy solution – cover 10% of roads to generate global energy requirement
- Load bearing
- Frictional coating
- Foundation for intelligent infrastructure
- Minimal planning





# Alternative Energy: Wattway Solar Road

Pre-treatment surface



Post-treatment surface



Rollovers (13T)



Thermal test  
(INES)



Fire test  
(CSTB)



Braking resistance test  
(CST)

so many things  
yet  
so little TIME



**Thank you for listening**