ROUTES DE FRANCE

Electric Road Systems

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Routes de France

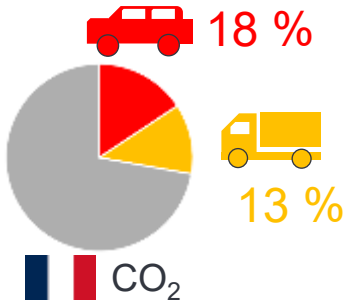
Context

French Energy and Climate law (2019) and European Climate law (2021)

→ Carbon neutrality in 2050

Transport's share in greenhouse gas (GHG) emissions

→ In France, transport domain is one of the main GHG emitter with 34% in 2024 including 18% for cars and 13% for heavy goods vehicles (HGV) and light commercial vehicles



Solutions for decarbonising road freight

- Rail-road transport
- Biofuels
- Battery Electric Vehicle (BEV)
- Hydrogen
- Electric Road Systems for BEV (catenaries, ground power supply or induction)

Ground Power Supply technology

Alstom technology

Advantages

+ High power
+ Compatibility with all vehicles

Disadvantages

- Wearing parts
- Inserted in the pavement

Multiple technologies demonstrated in France : Alstom (2024), Evias (2024), Elonroad (planned in 2026)

eRoadMontBlanc project

Phase 1: 2023-2026

Transpolis

- Demonstration of the GPS system on a closed road
- Research and development
- TRL 3 → TRL 5-6

Phase 2: 2026/2029

RN 205

- Demonstration of the GPS system on an open road section
- Research and development
- TRL 5-6 → TRL 7-8

Project supported by the French state in the *France 2030* program and by Next Generation EU in the *France Relance* program

eRoadMontBlanc consortium

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ATMB (*Autoroutes et Tunnel du Mont Blanc*)
Highway concessionaire providing the open road site

Alstom
GPS ERS technology provider

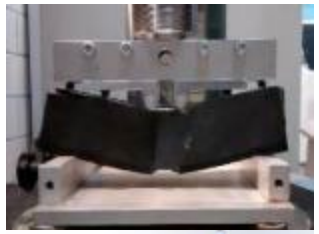
Greenmot
Industrial vehicles retrofit company (HVG and buses)

Pronergy
Supplier of embedded power electronics equipment

Université Gustave Eiffel
Expertise on pavement structures, energy consumption optimisation, digital twin, skid resistance, user acceptability

Phase 1

Trials on the pavement structure (Université Gustave Eiffel)

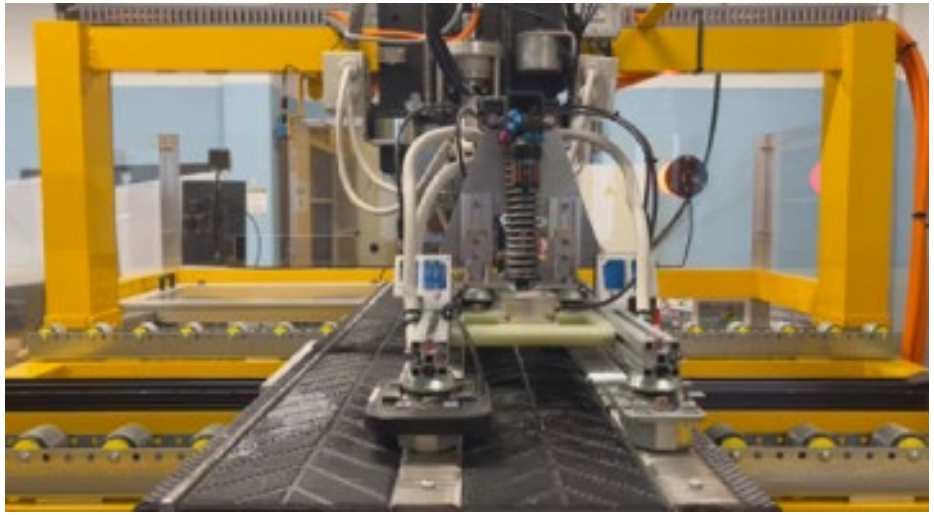


Binding resin

Accelerated Pavement Testing

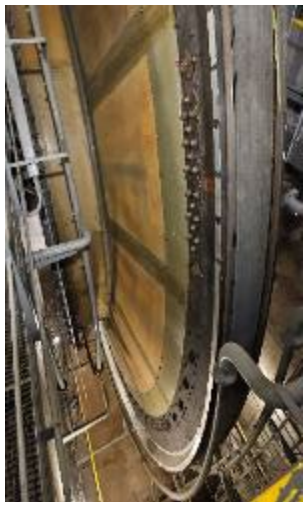
Skid resistance

Development of the retractable current sensor (Pronergy - Mersen)



Phase 1

Wearing tests on conductive segments



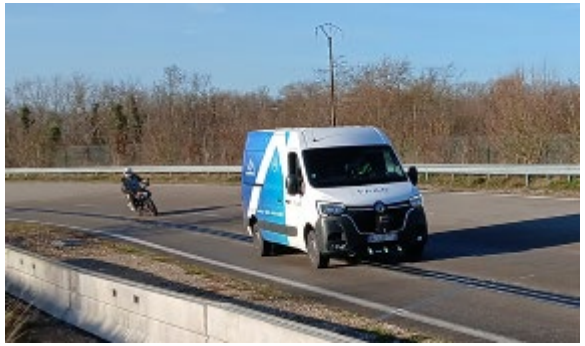
User acceptability tests (Université Gustave Eiffel)

Phase 1

440 m long demonstrator built in Transpolis (France) in 2024

Phase 1

Charging tests on Transpolis demonstrator



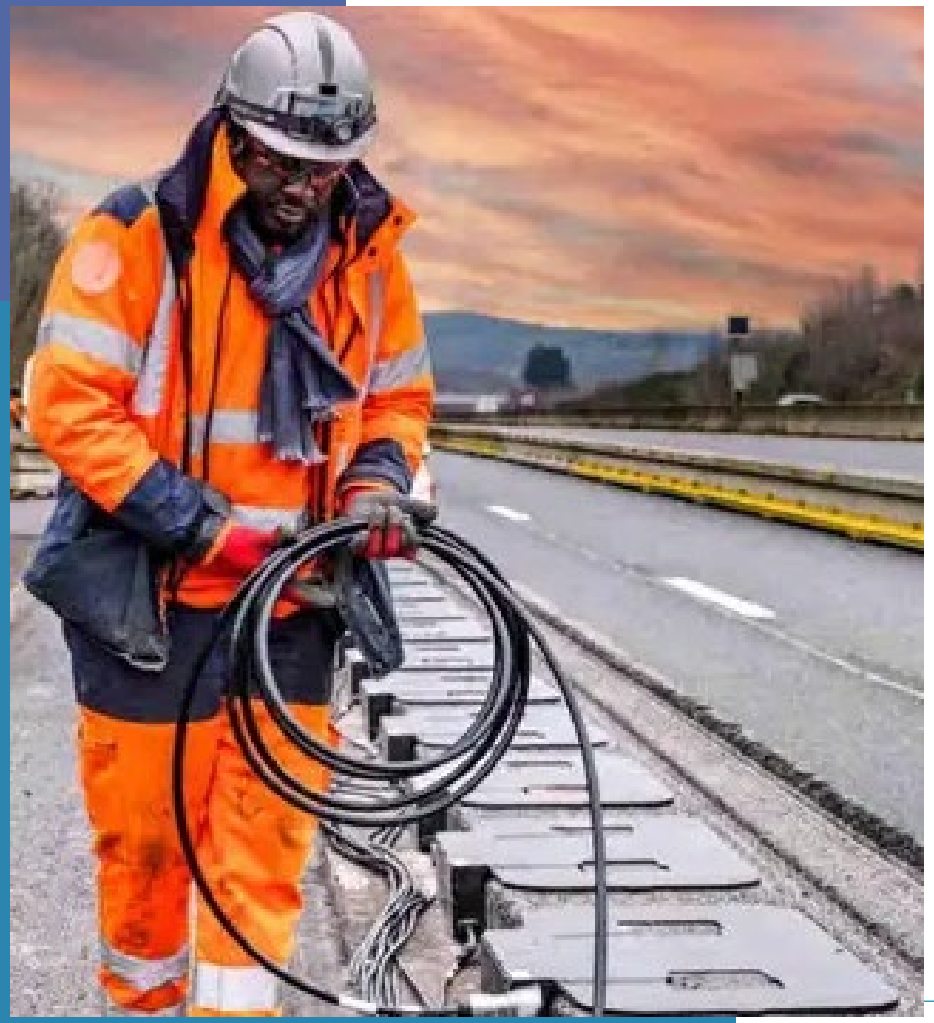
Safety
- Other users on the road
- Overtaking
- Speed threshold

Winter conditions
- Salt brine
- Snowplough blades

Electro-magnetic field measurement

Charging up to 150 kW (Light Commercial Vehicle)
Average efficiency of 94%

Phase 2 (open road demonstrator) will start after the validation tests on HVG



« Charge as you drive » sur l’autoroute A10 | VINCI Autoroutes

Electric Road System

Charge As You Drive

Charge As You Drive

Charge As You Drive
Less Battery. More Range. For All

2023 - 2026

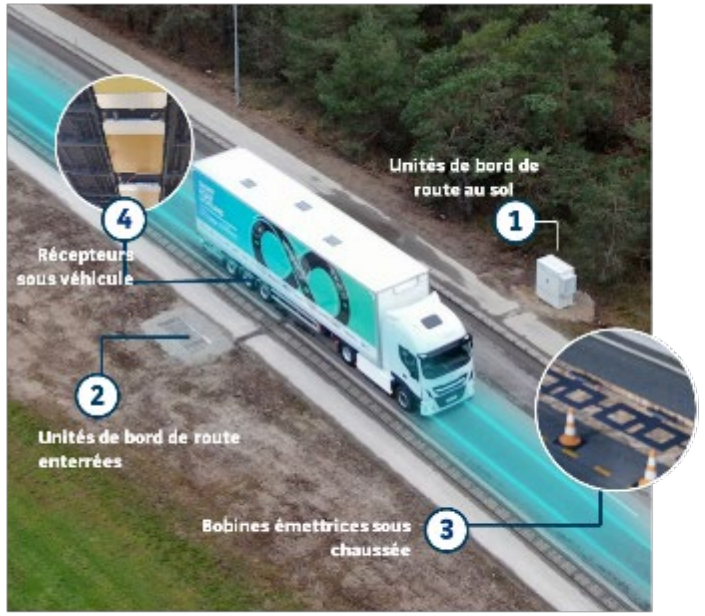
Proposition

- Expérimentation de 2 technologies de recharge dynamique sur l'A10
- En conditions opérationnelles

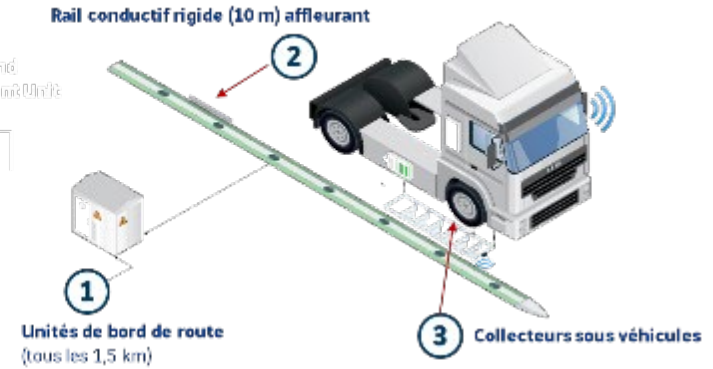
Partenaires

VINCI AUTOROUTES
VINCI CONSTRUCTION
electreon
HUTCHINSON
Université Gustave Eiffel

Induction



Conduction



Challenges

- Puissance
- Electromagnétisme
- Adhérence

VINCI CONSTRUCTION

Laboratory testing - challenges

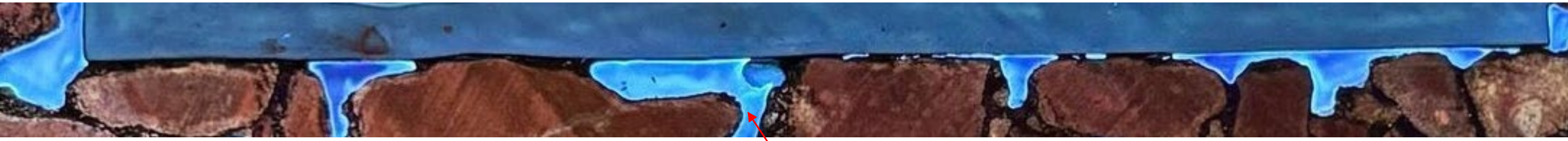
Bonding

→ Need good contact to provide sufficient bonding

→ Adapt material selection

Surface course

Coil

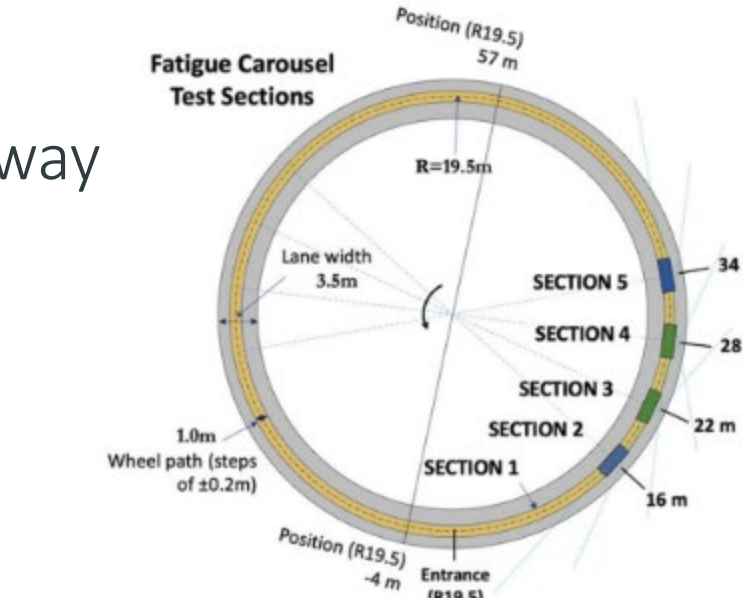


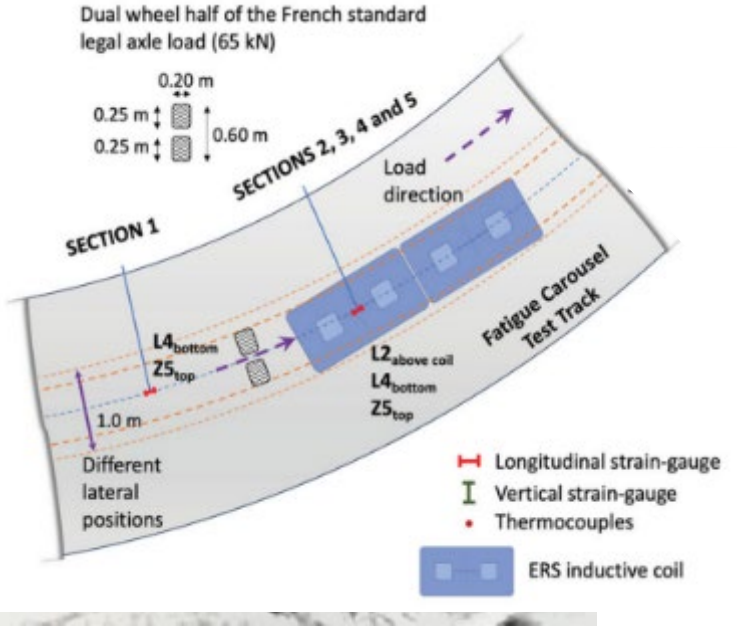
Base layer

Porosity is made more visible by the test - filled with fluorescent resin

Accelerated Pavement Testing

200 000 loads - 13 years of HGV traffic on the motorway



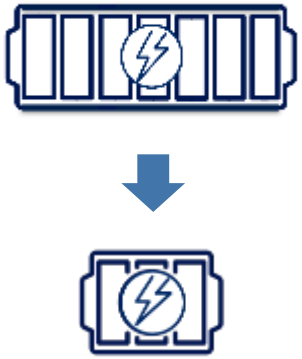


World first on a French motorway: Charge As You Drive

Successful trial of contactless dynamic charging on a motorway. An electric heavy vehicle travelling at 90 km/h was charged via induction at up to 300 kW over 1.5 km of the A10 motorway in the Île-de-France region.

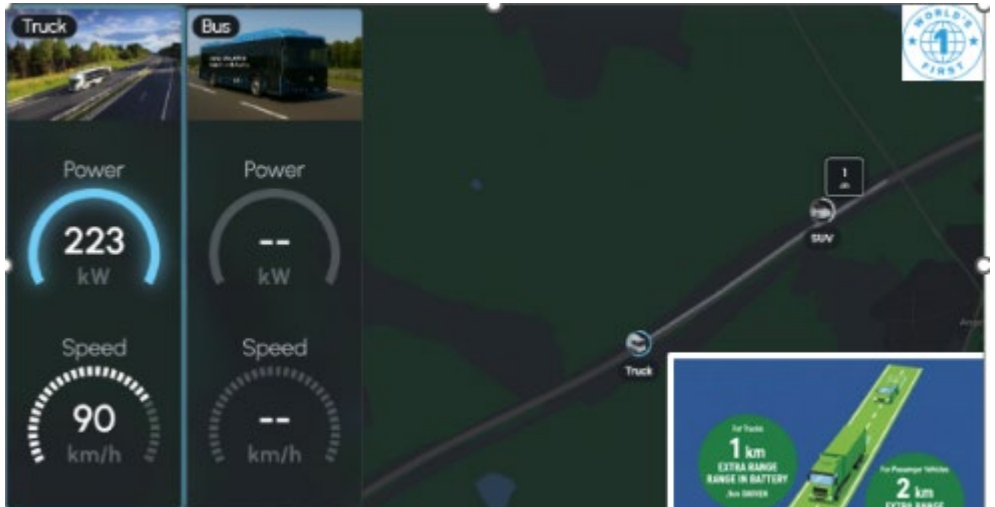
Solution

Dynamic induction charging - *Less battery for unlimited range*



Cheaper vehicles, unlimited range, no stopping to charge, increased payload, & consumption…

Energy transfer targets : > 200 kw – efficiency 85%



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Thank you for your attention !
Merci de votre attention !