



ERS for Decarbonized Freight Transport

Bernard Jacob

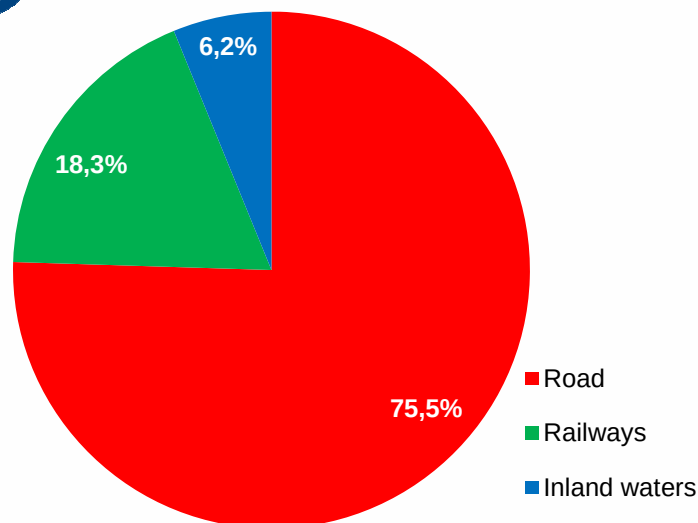
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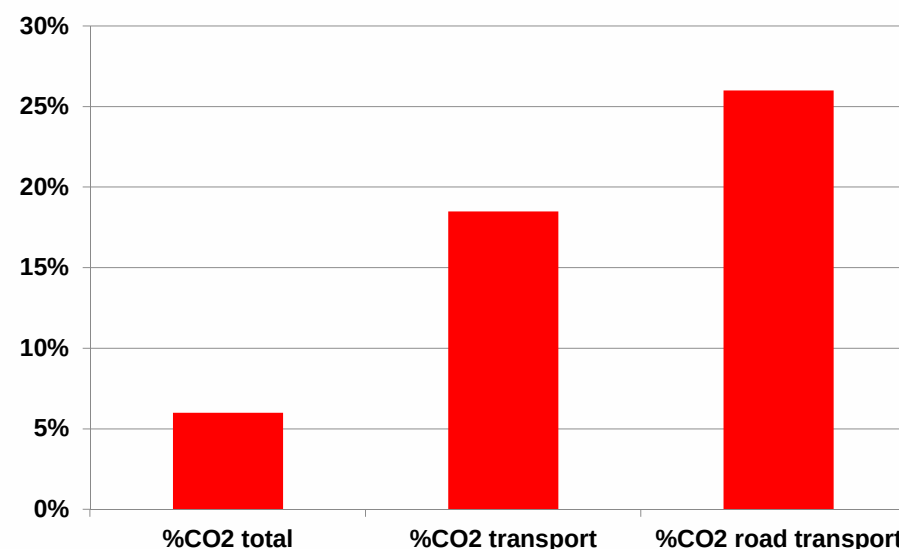
PIARC - ERS Workshop
Lisbon, April 17, 2019



Context



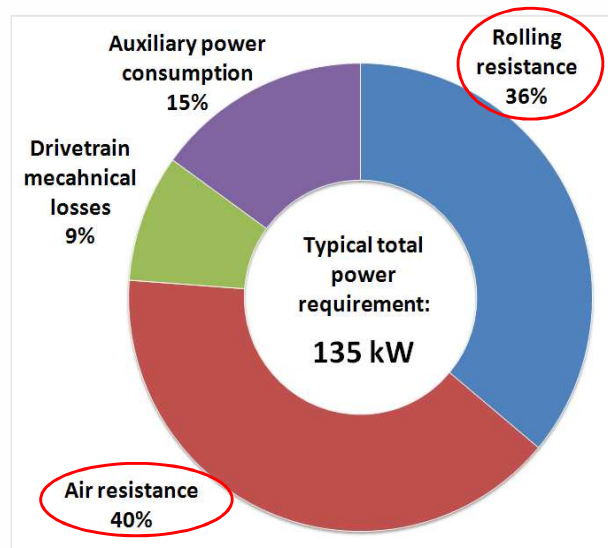
Freight transport in the EU28:
modal share (2013)



Road freight transport: CO2 emission share (EU28)

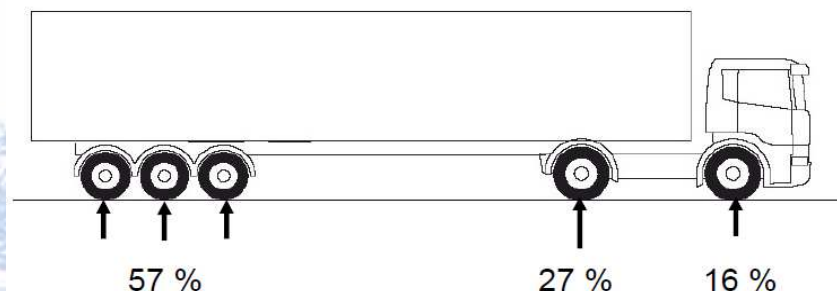
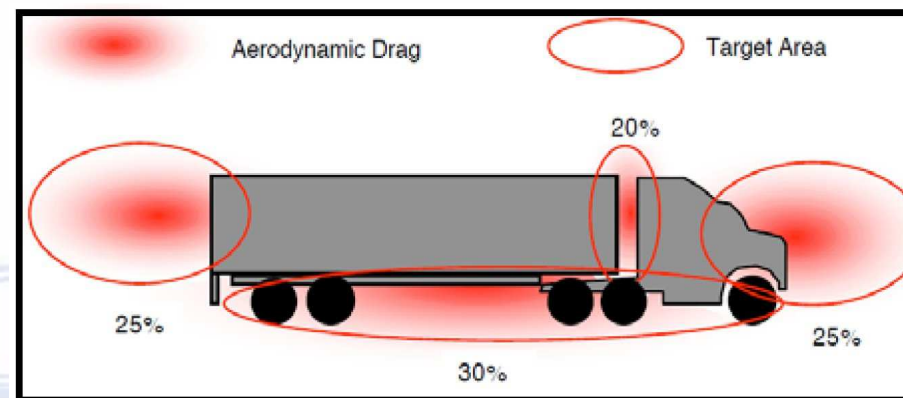
- High share of the road in freight transport
- Fuel consumption and CO2 emission by heavy good vehicles
- Objectives: EC White paper 2011, COP21 (Paris 2015)...
- Fuel cost = 30% of operating cost

Challenges



- EU White Paper (2011):
 - - 20% CO₂/fossil energy by 2020
 - - 60% by 2050
- Paris COP21 agreement (2015):
 - - 50% CO₂ by 2030
 - toward no fossil energy

Air resistance



Rolling resistance

Objectives of ERS

- To ensure a **continuous energy supply** on the **equipped road network**
- **Reliability** and **efficiency** of the system
- **Resilience** to the weather, traffic and **infrastructure** conditions
- **Safety** of other drivers/users
- Affordable transformation **of vehicles**, electricity/fuel in parallel
- **Infrastructure electrification** : technical issues and **business model**
- System **operation**
- IRU recommends **40-45%** of long haul road transport **on ERS by 2050**

ERS Technologies

➤ Catenary solution



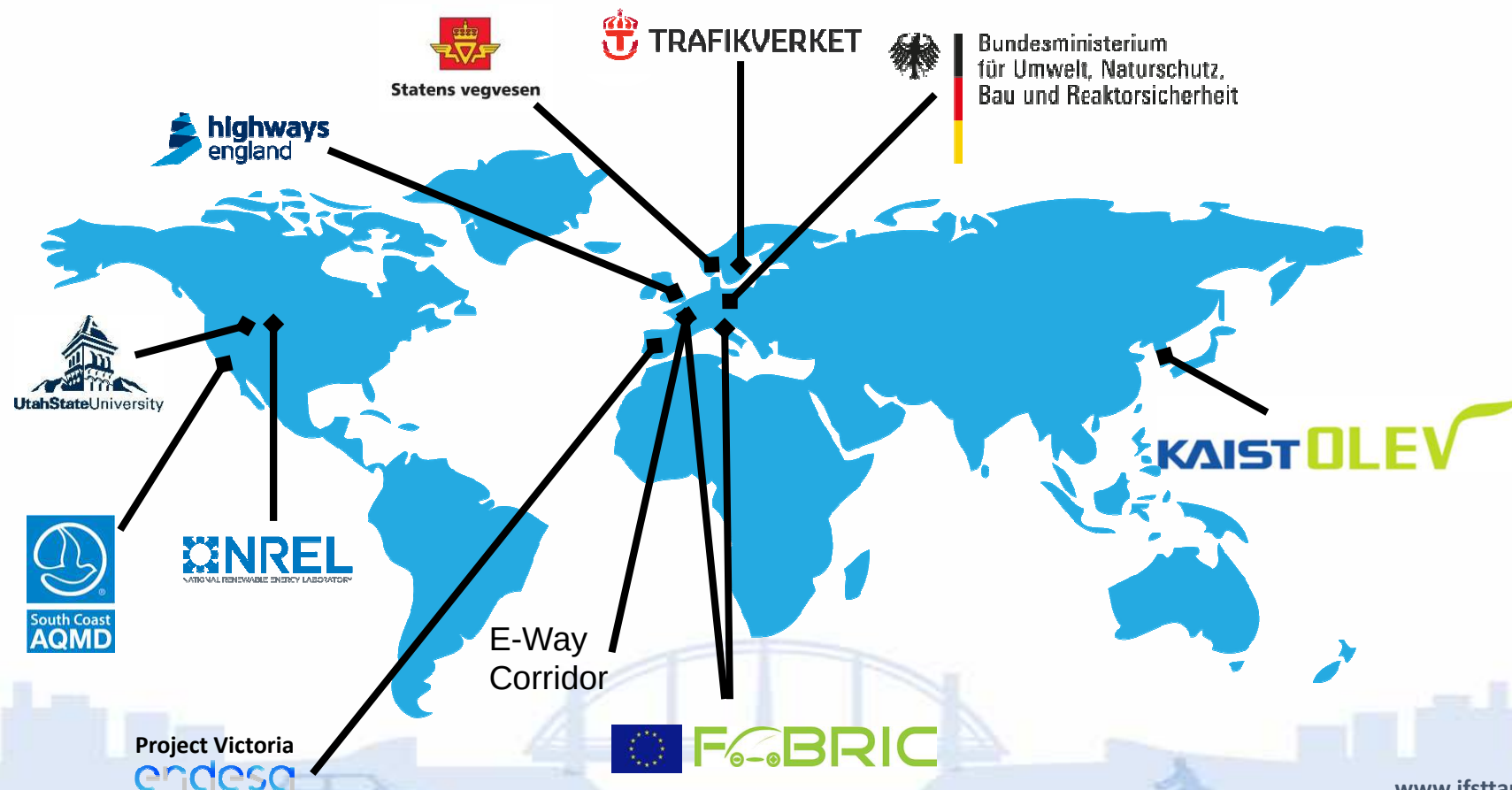
➤ Ground conductive solution



➤ Ground inductive solution

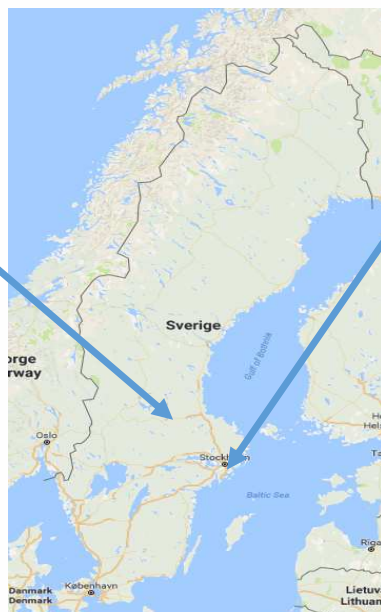


ERS Projects Worldwide



ERS Projects in the EU

Rosersbergs
Utveckling AB:
Arlanda



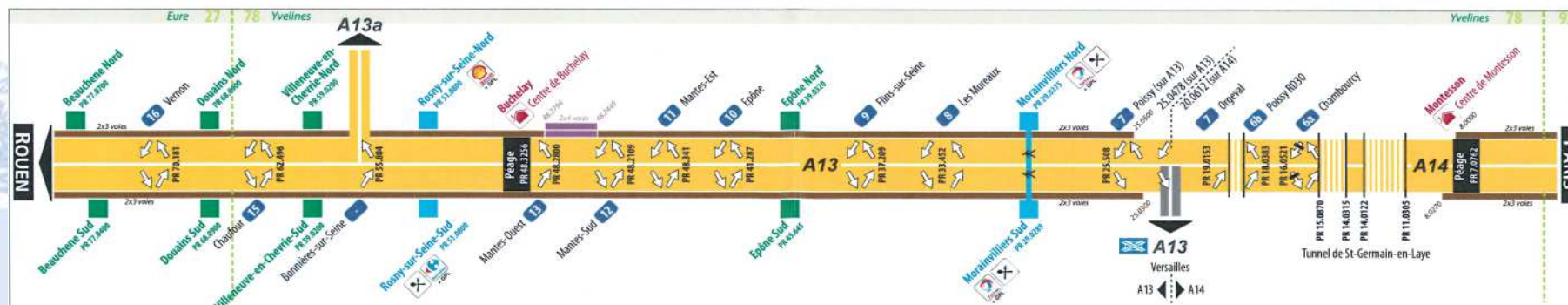
Region
Gävleborg:
E16



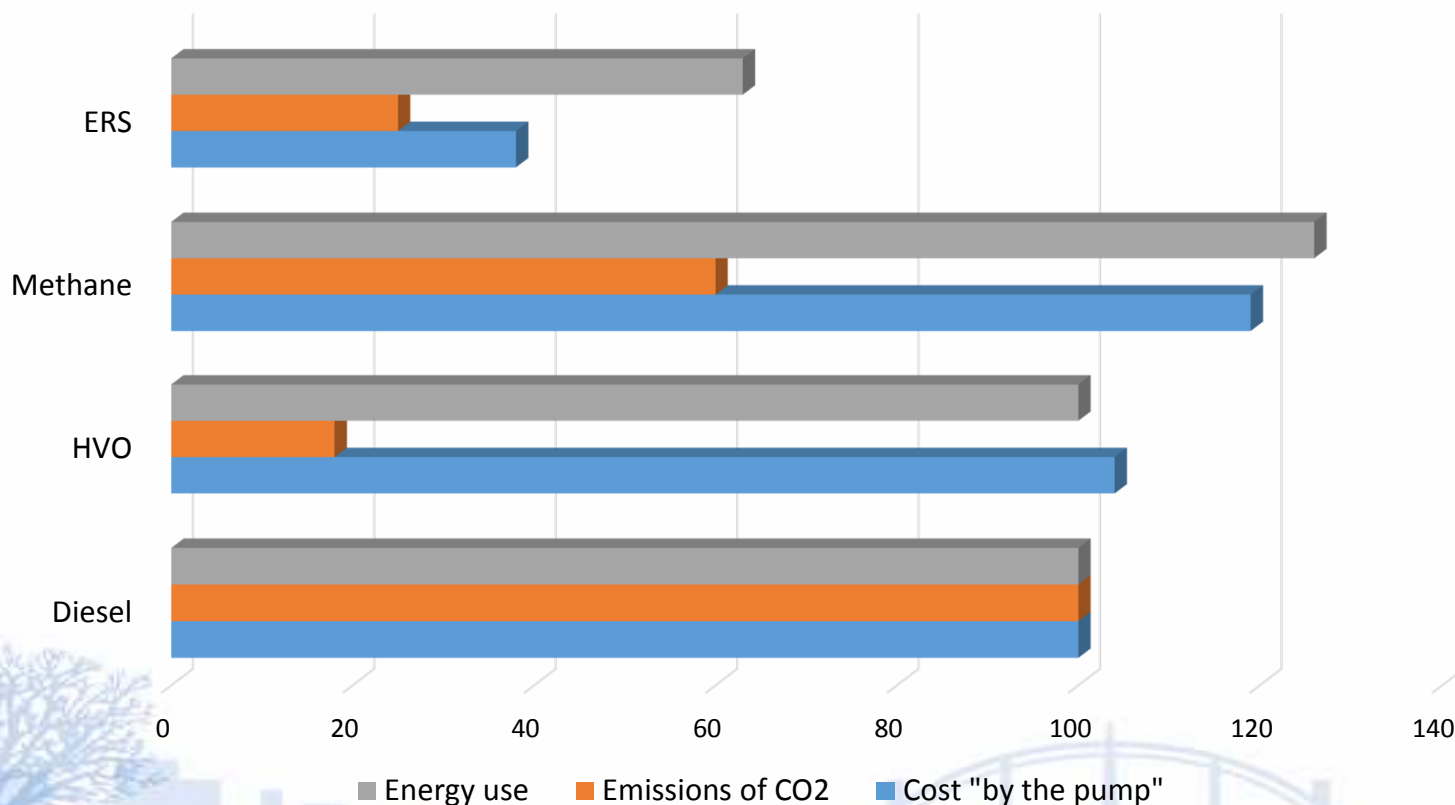
+ Germany
Catenary

E-Way Corridor (France):

- Paris-Le Havre (A13)
- Feasibility study
- Multi-technology
- Techno-economical
- ADEME: "Road of the future"
- OIE, IFSTTAR, SANEF, SPIE, AFNOR, Accenture...



Benefits of ERS



Including taxes and subsidies based on average data and specification of fuels sold in Sweden

- reduces energy use
- reduces CO2 emissions
- utilizes existing infrastructure
- creates new field of knowledge and industrial branch
- is a field for cooperating between the political, administrative and industrial entities

Assessment by Carbone 4

France

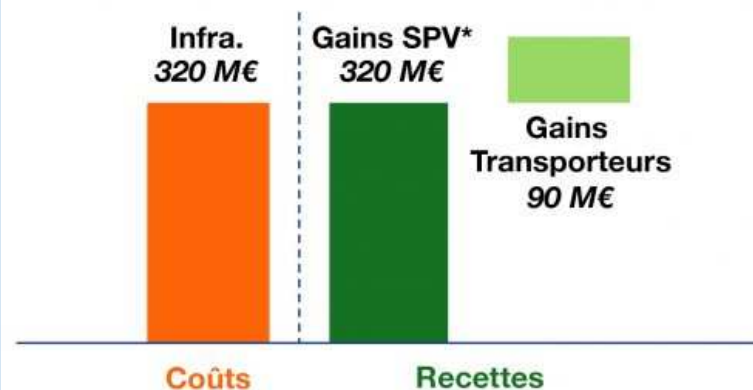


Évaluation économique de l'autoroute électrique sur 20 ans Deux cas de figure

Rentabilité intrinsèque

Section de 210 km

Trafic de ~ 14 000 PL / jour

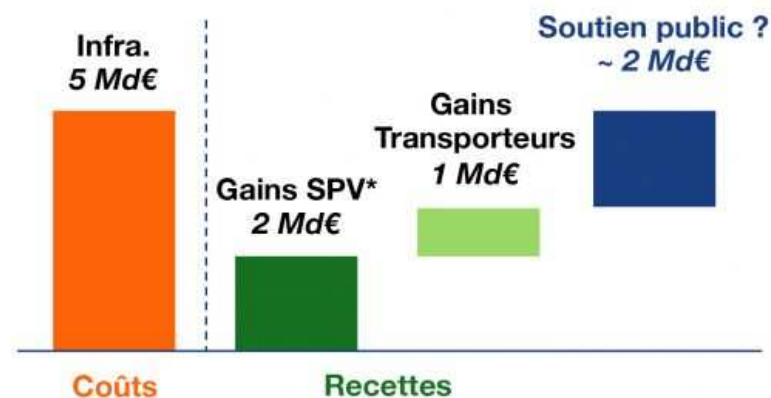


5 MtCO₂ évitées **850** Millions d'€ d'économies sur la balance commerciale

Cas avec soutien pub 100 € / tCO₂

3 200 km d'autoroutes, 1/3 du réseau

Trafic moyen de ~ 8 100 PL / jour



30 MtCO₂ évitées **5** Md€ d'économies sur la balance commerciale

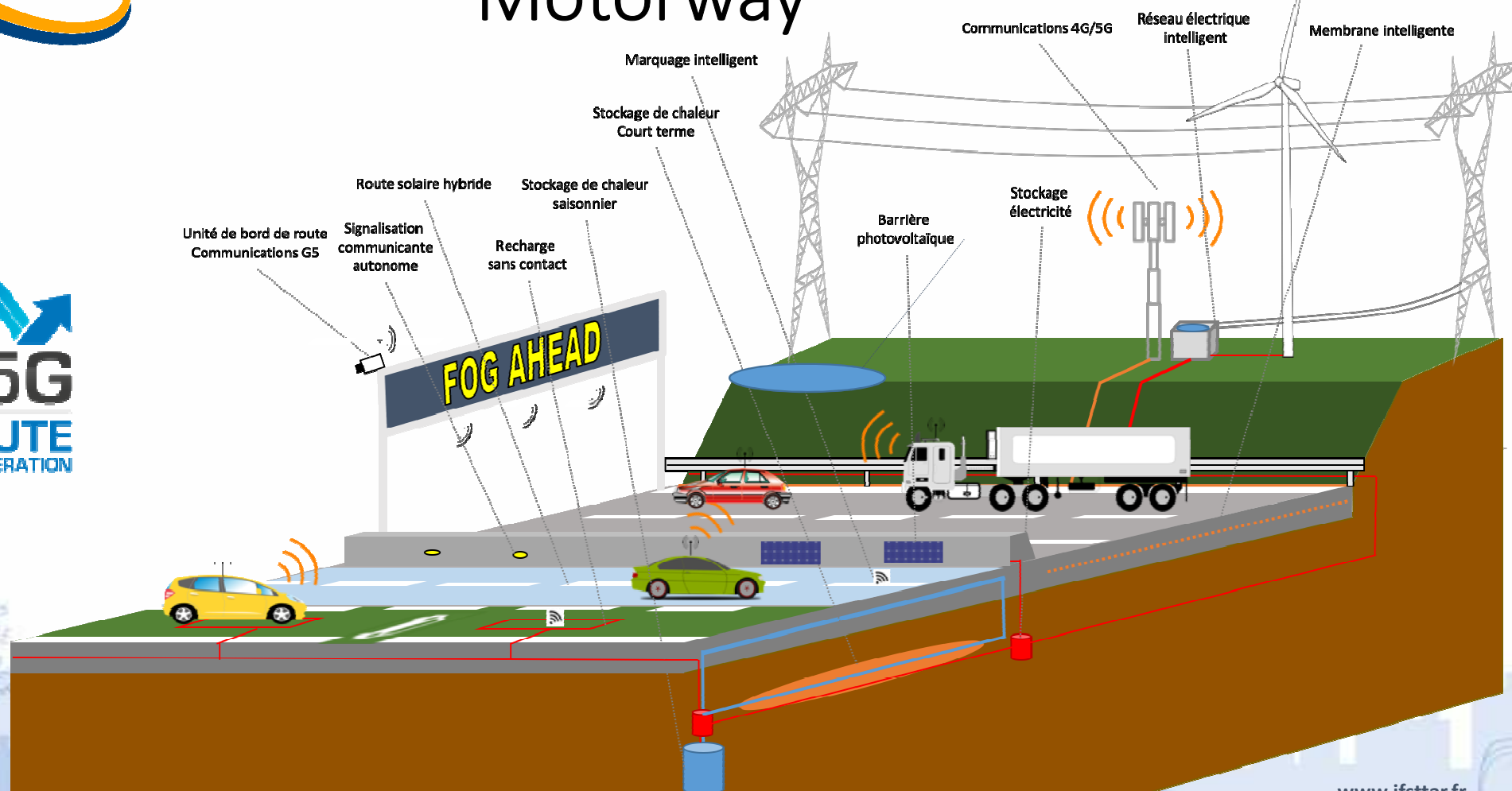
* SPV : Special-Purpose Vehicle, ou société de projet. Il s'agit de la société dédiée qui construira et exploitera les infrastructures de distribution d'électricité le long de l'autoroute.

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Conditions and locks

- At least 20-30 km transport distance
- About 60% of the distance needs to be on electric road
- The average daily number of electric transports should be 3 times the length of the mean transport distance in km
- At least 20% (preferable 50%) of the annual distance driven by each electric truck should be on the electric road
- Preferably several operators running on the same electric road
- Elements of shuttle like operation
- High/long-term investments + cost share → Business model !
- Some safety issues to be mitigated + standardization

Energetically Integrated Motorway



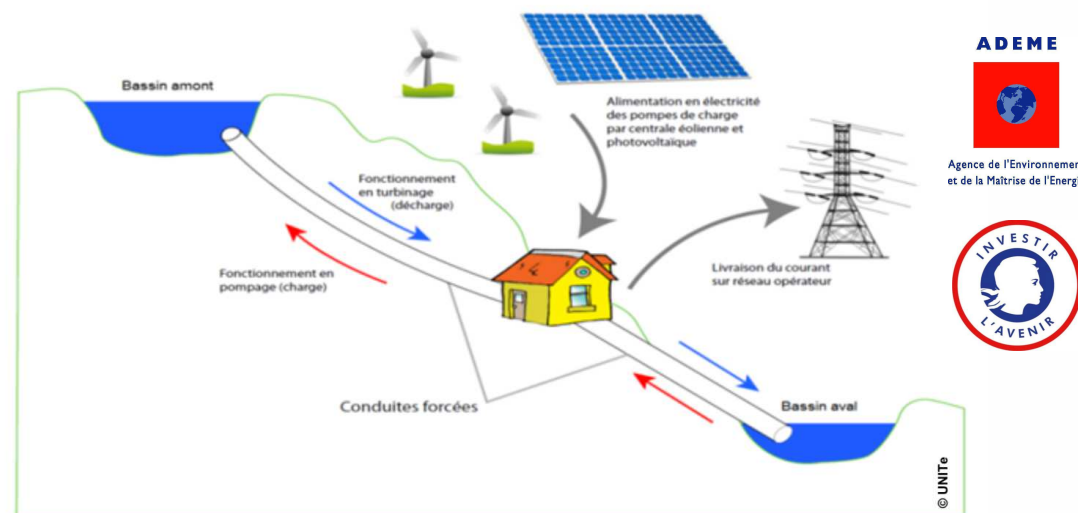
Bridges as Potentially Energetically Integrated Infrastructures?

Bridge as a wind farm



Ó. Soto Hernández K. Volkov, A.C. Martín Mederos, J.F. Medina Padrón, A.E. Feijóo Lorenzo. Power output of a wind turbine installed in an already existing viaduct. [Renewable and Sustainable Energy Reviews](#), Volume 48, August 2015, Pages 287-299

Micro pumped hydro storage



PSH of Berrien - ADEME

Ongoing work: adaptation of this concept for bridges?

Conclusion and Perspectives

- The electric road is an essential component of the energy transition.
- Interest and hopes expressed for the ERS and EVs.
- These projects may require significant subsidies to become viable and imply significant additional costs for carriers to acquire or adapt hybrid trucks.
- With the progresses of batteries, a rather optimistic assumption suggests that equipping 10-30% of the motorway mileage would be enough.
- Various socio-economic evaluations show different conclusions, highly depending on uncertain factors such as the future oil prices, the CO2 charging system/level, the incentives...
- Data are missing at European level to tackle transnational investigations, above all the impact of the different national energy mixes.
- At European level, Ifsttar and its FEHRL's partners are working together to further develop these concepts.

