Electric road systems: Challenging the established road system and business models

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AMAA, 26 Sept 2017, Berlin.

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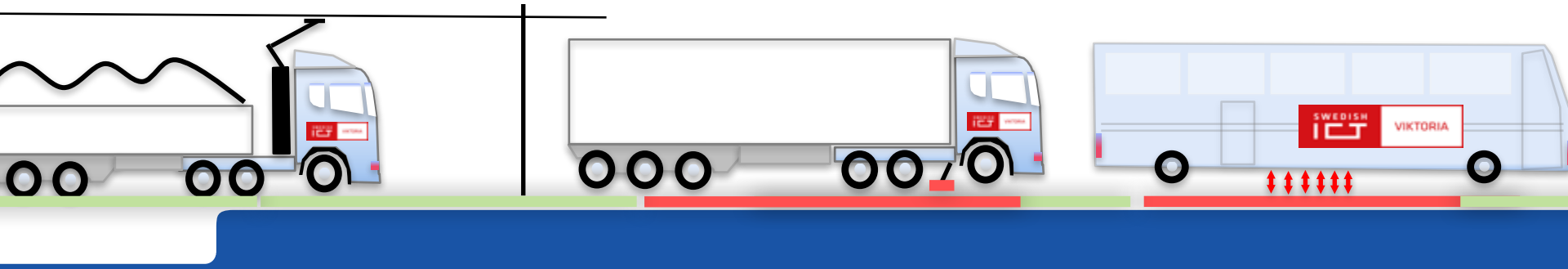
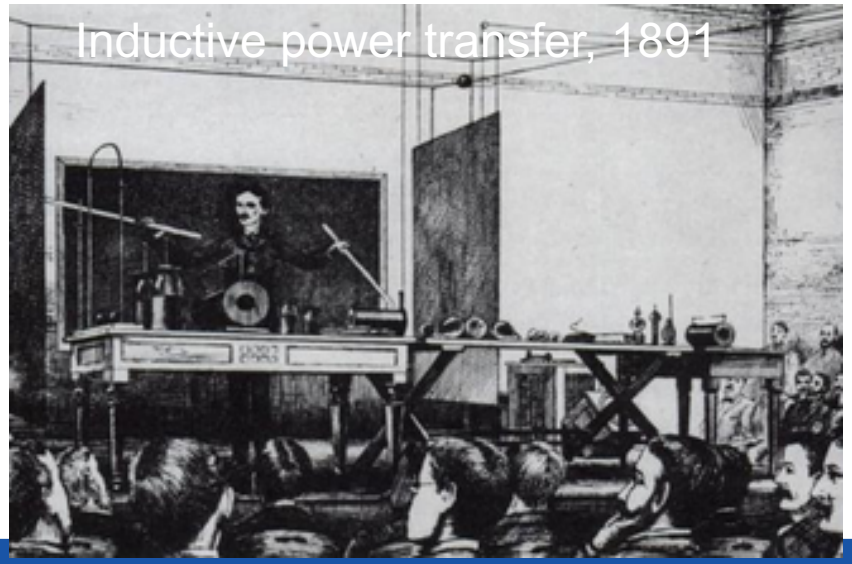
Agenda

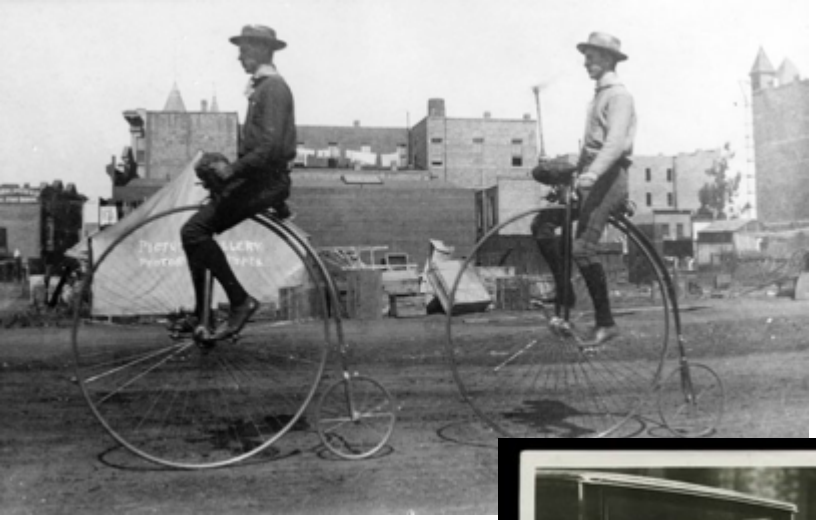
1. **Background and definition of ERS**
2. ERS demo projects in Sweden
3. Business model challenge of ERS



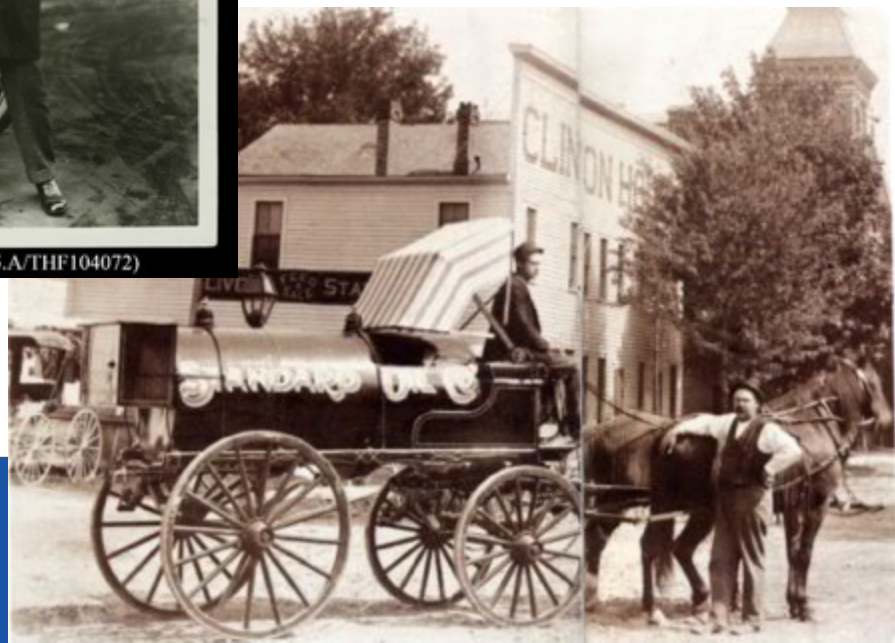
The History of ERS



Evolution of filling-up regime

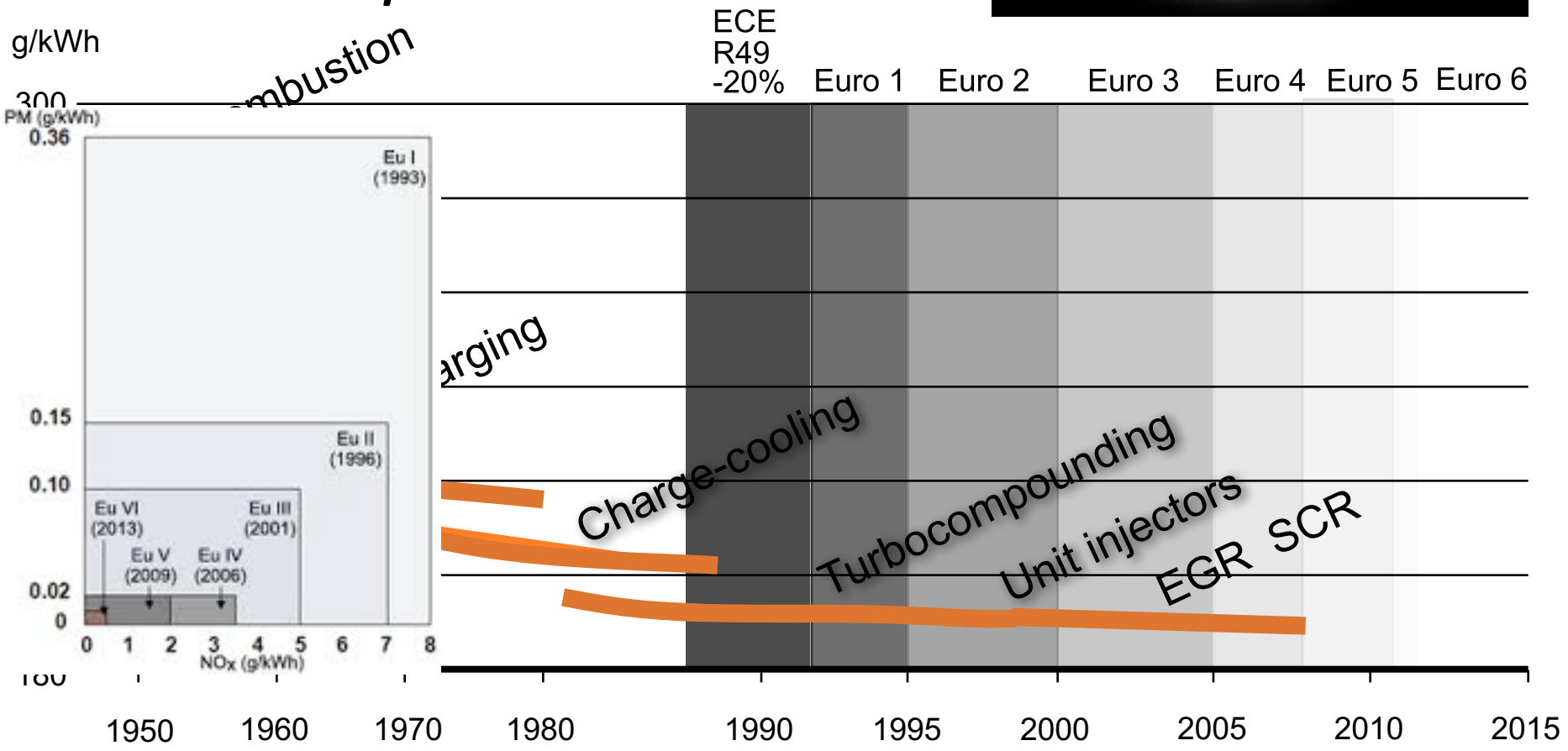


From the collections of The Henry Ford (P.O.3015.A/THF104072)



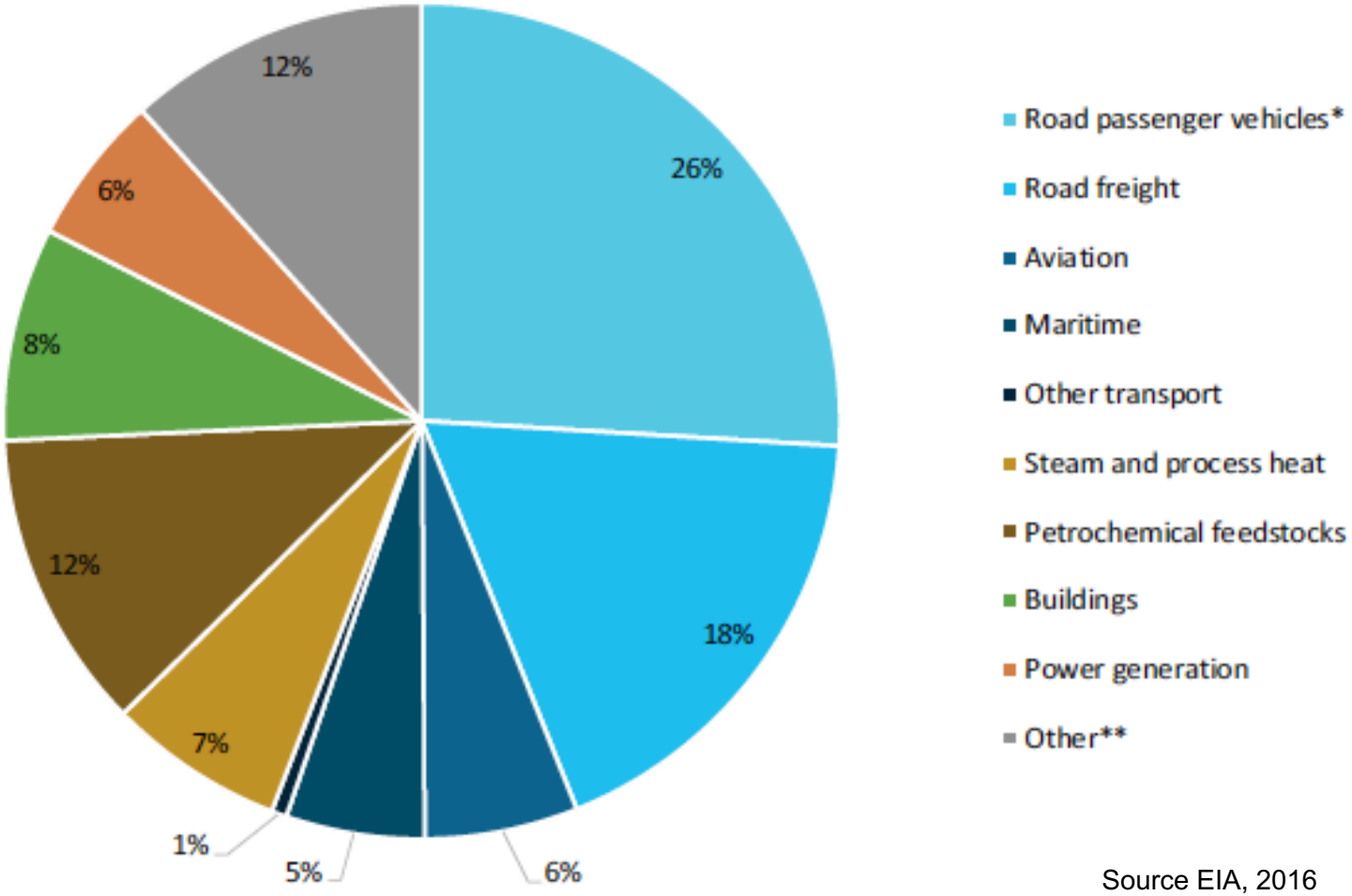
Diesel engine development

Minimum specific fuel consumption



Background for change

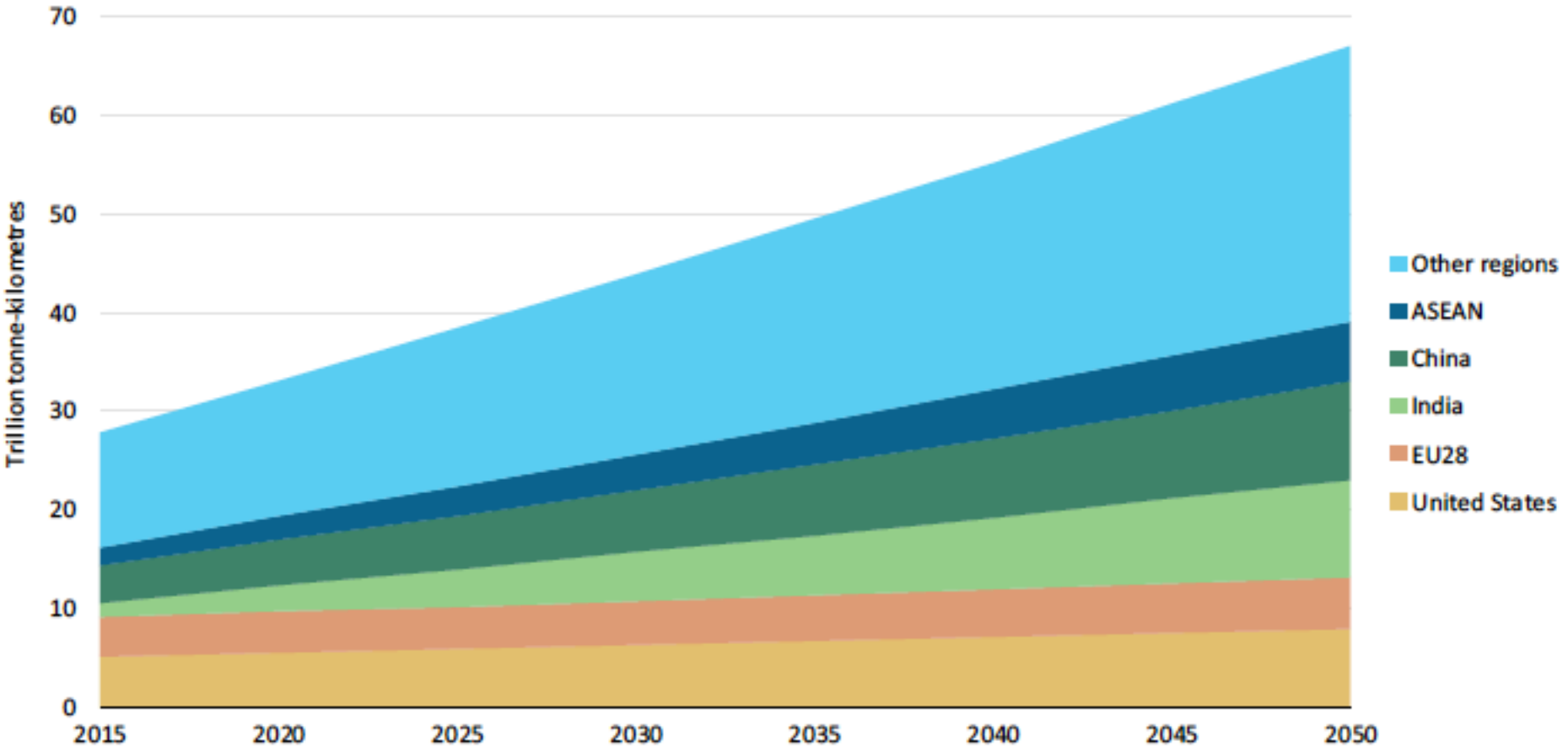
Global oil consumption per sector



Source EIA, 2016

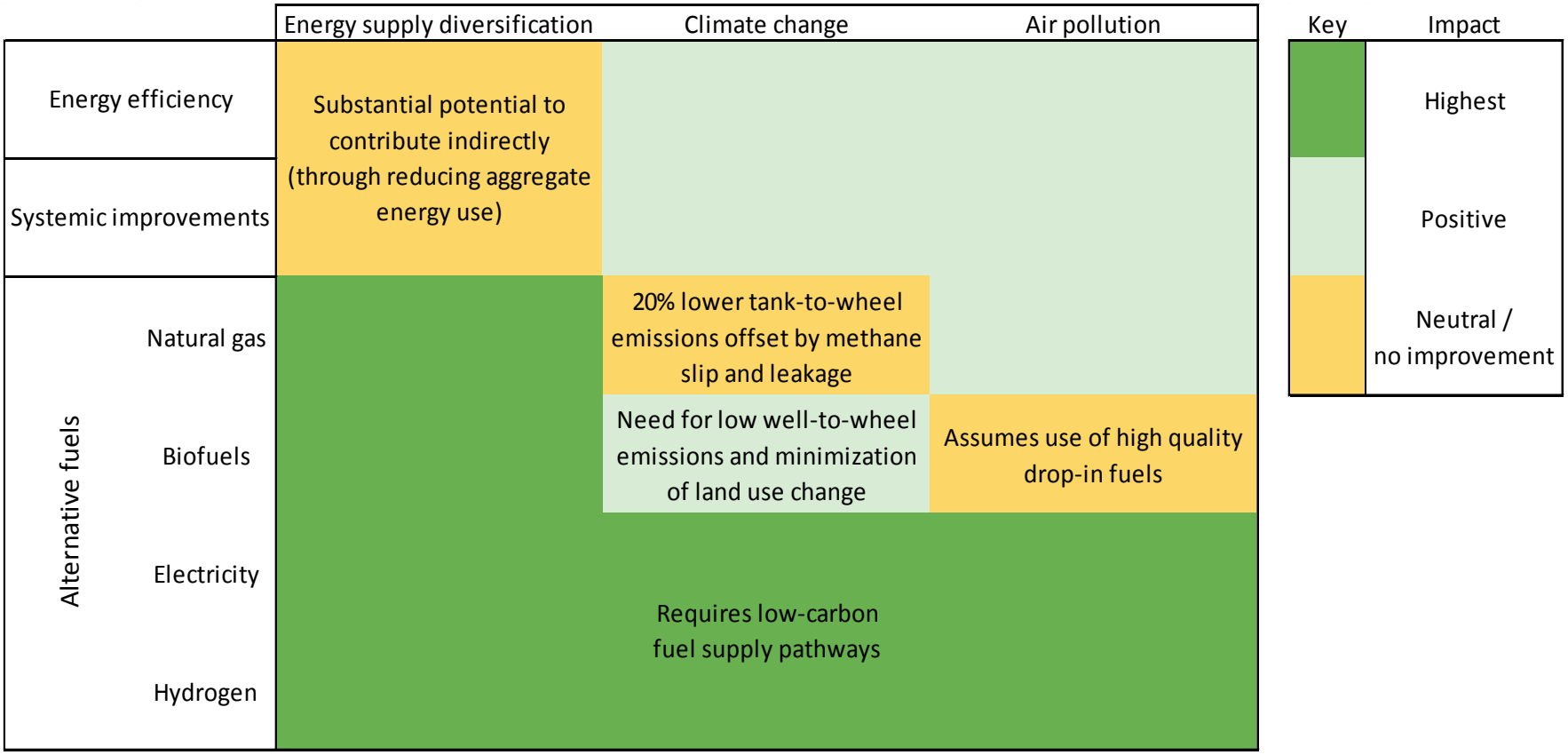
* Passenger vehicles include buses and two- and three-wheelers.

Freight sector expected to grow with economic growth



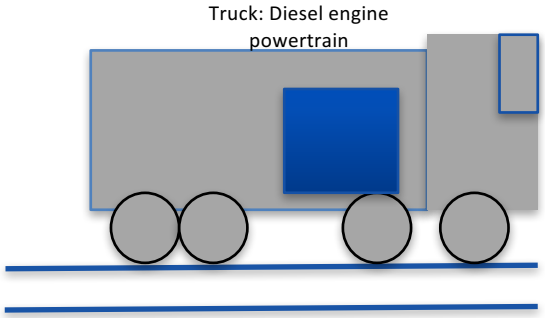
Source EIA, 2017

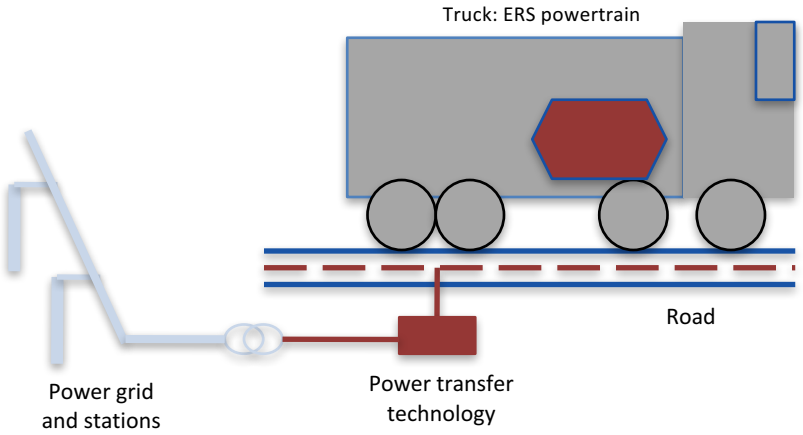
Impact of alternatives



IEA, 2017

Transition towards ERS
The Electric Road System





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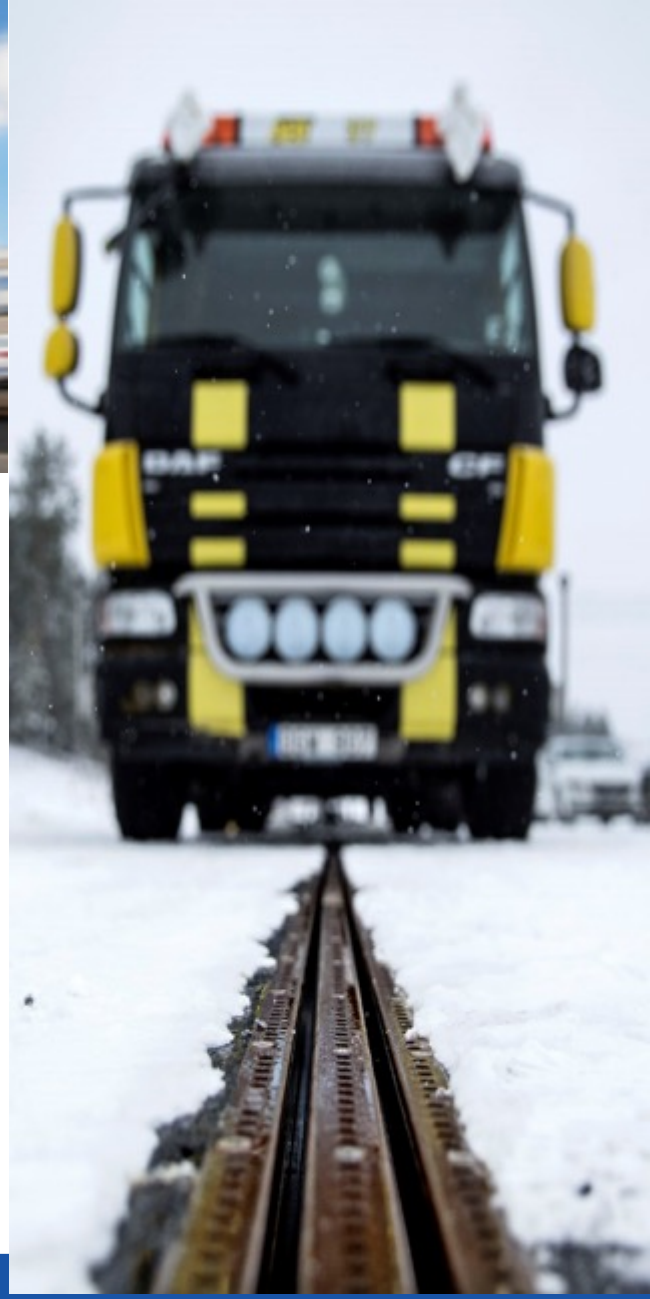
Two national projects awarded funding in a pre-commercial procurement

Arlanda - Rosersberg

Gävleborg, Project Elväg E16

eRoadArlanda

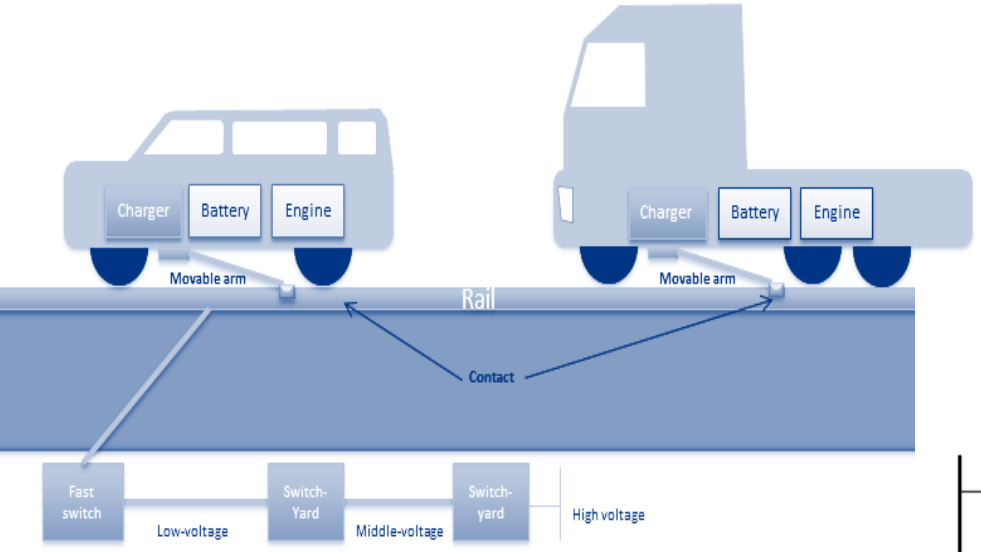


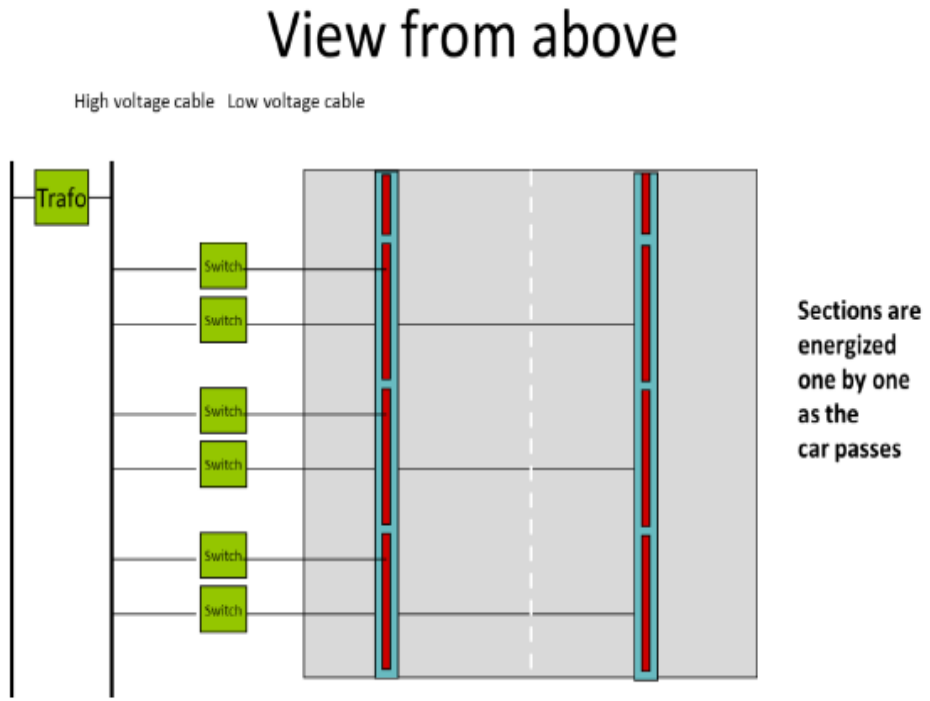
Lundberg, 2017

The facility

- Existing infra of 400 m.
- Electrifying 2 km between Airport and Freight Terminal.
- Civil works beside the road finalized in Sept 2017.
- Ongoing production of rails.
- Focusing on safety and system verification.
- Waiting for ”GO” to start mounting the rails into the road.

Technical solution of Elways





The Truck

Brand: DAF

Converted by: E-traction

Motors: Two motors built into the rear axle. Total power of 226 kilowatts (300 hp). They weigh 500 kilo each.

Battery: 80 kWh, weight 600 kilos. (Battery Tesla Model 6 close to 550 Kg.)

What does not weigh: Engine, power train and a full diesel tank

Weight: 18 tons

Load: 6.5 tons

Emissions: –

Electric Road – E16 Sandviken

The Facility

- 2 km long facility on the E16
- Region Gävleborg is project owner and builder
- Infrastructure/facility owner Siemens
- Catenary system – Built without legal dispensations
- Siemens innovative pantograph
- Power supply Sandviken Energi
- 10 kV AC
- After conversion 650-800V DC

The technical solution

... and its subsystems.

1. Electric Infrastructure
   - Substation
   - Contact Line System
2. Hybrid Vehicle
   - Pantograph
   - Drive System
   - Energy Storage
   - Control System
3. Driveway
   - Passive Protection
   - Pavement
4. Operation
   - Maintenance
   - ITS & Signalling

Åkerman et al., 2015

The Truck

Scania, Euro6 Class

Parallel hybrid power train

264kW diesel, 139kW electric engine,100kW battery

Still a test vehicle

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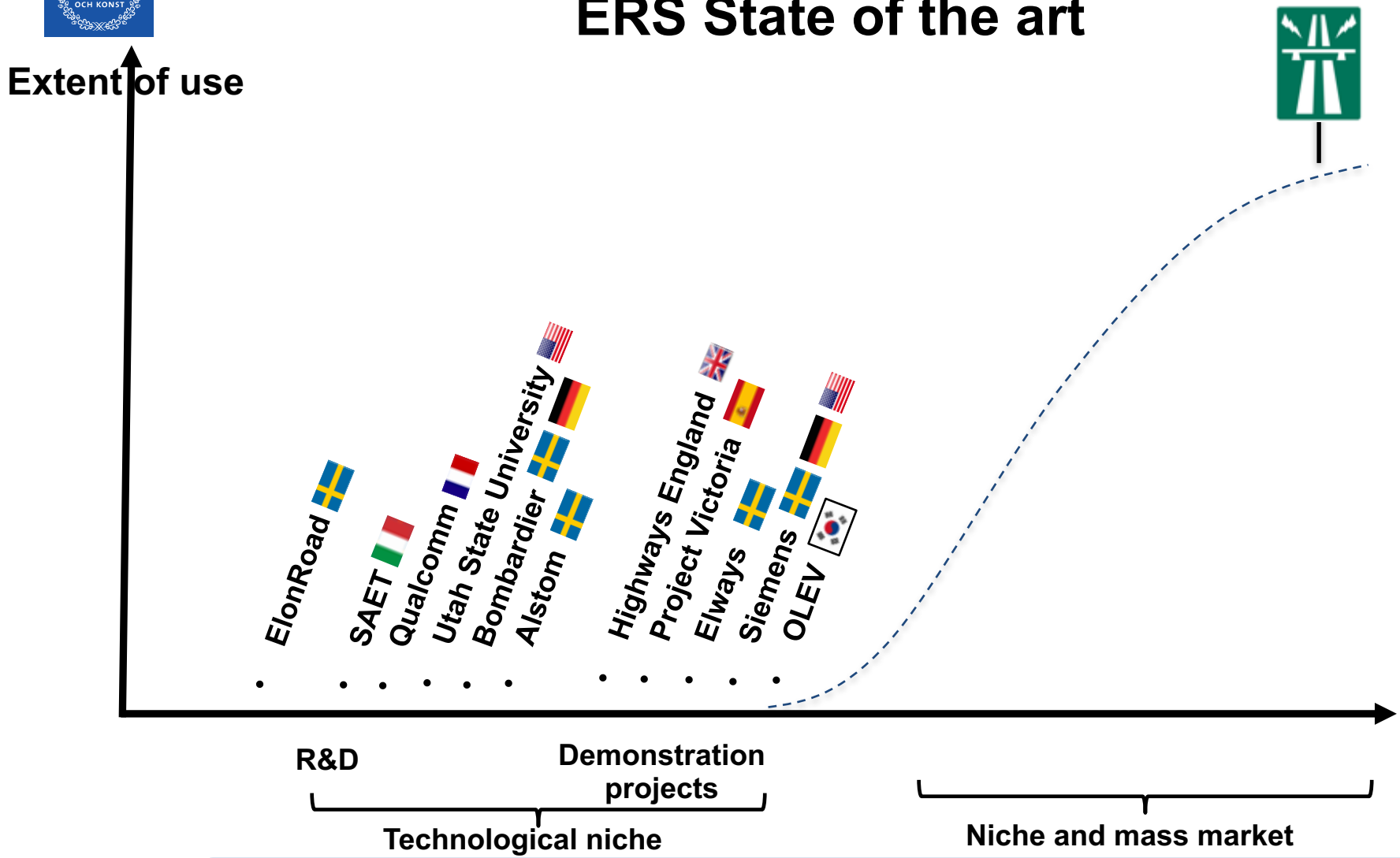
ERS State of the art



Tongur & Sundelin, 2016

“Not a technology problem, a business model challenge”

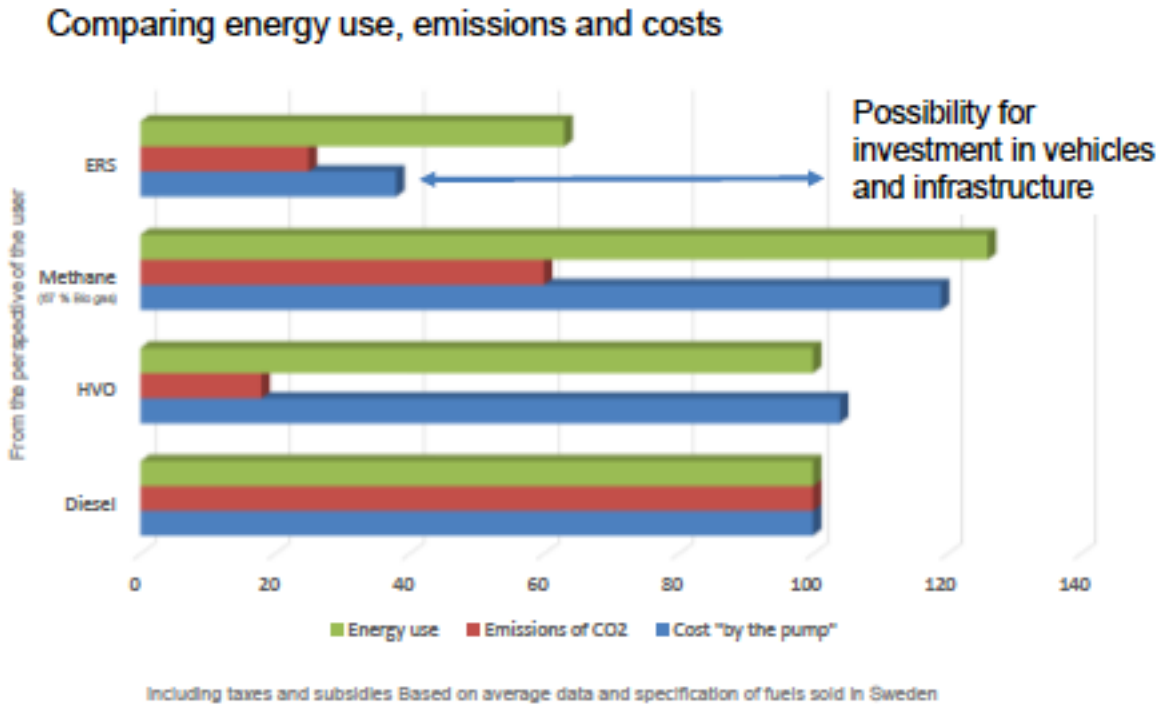
What we know:

- New business models are needed to commercialize sustainable technologies; a firm-user relationship

What we don’t know:

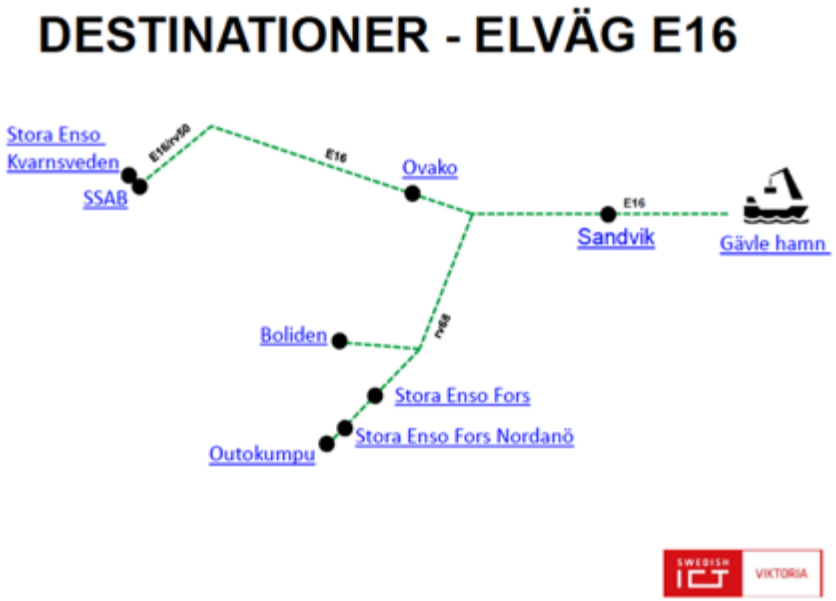
- The “right” business models for new socio-technical systems

A business model opportunity?

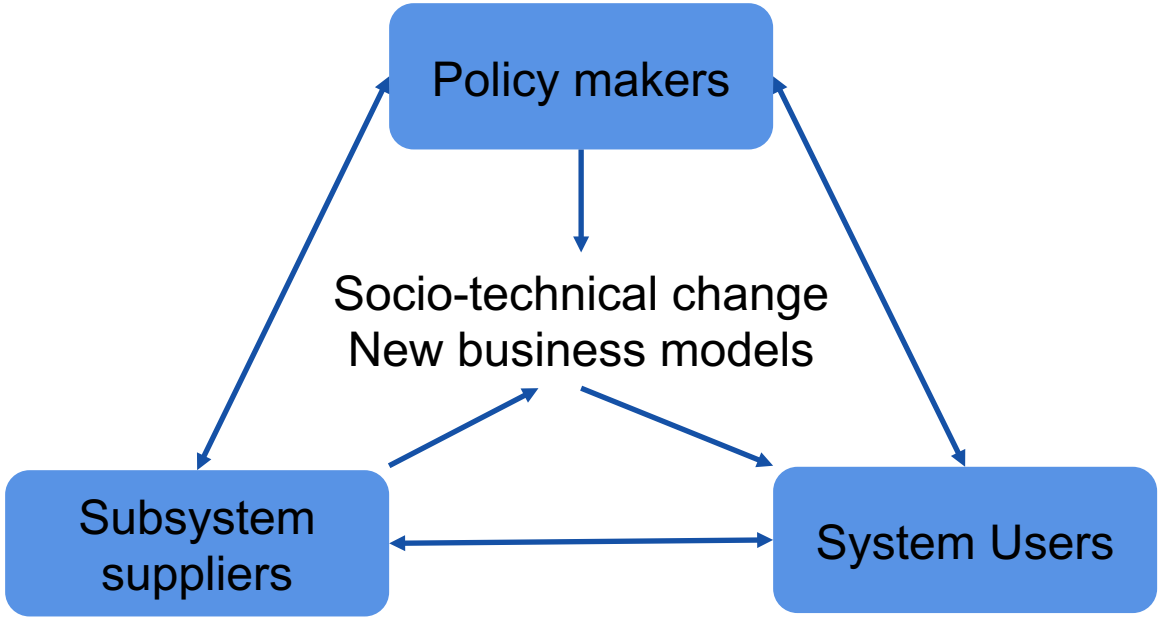


Trafikverket, 2017

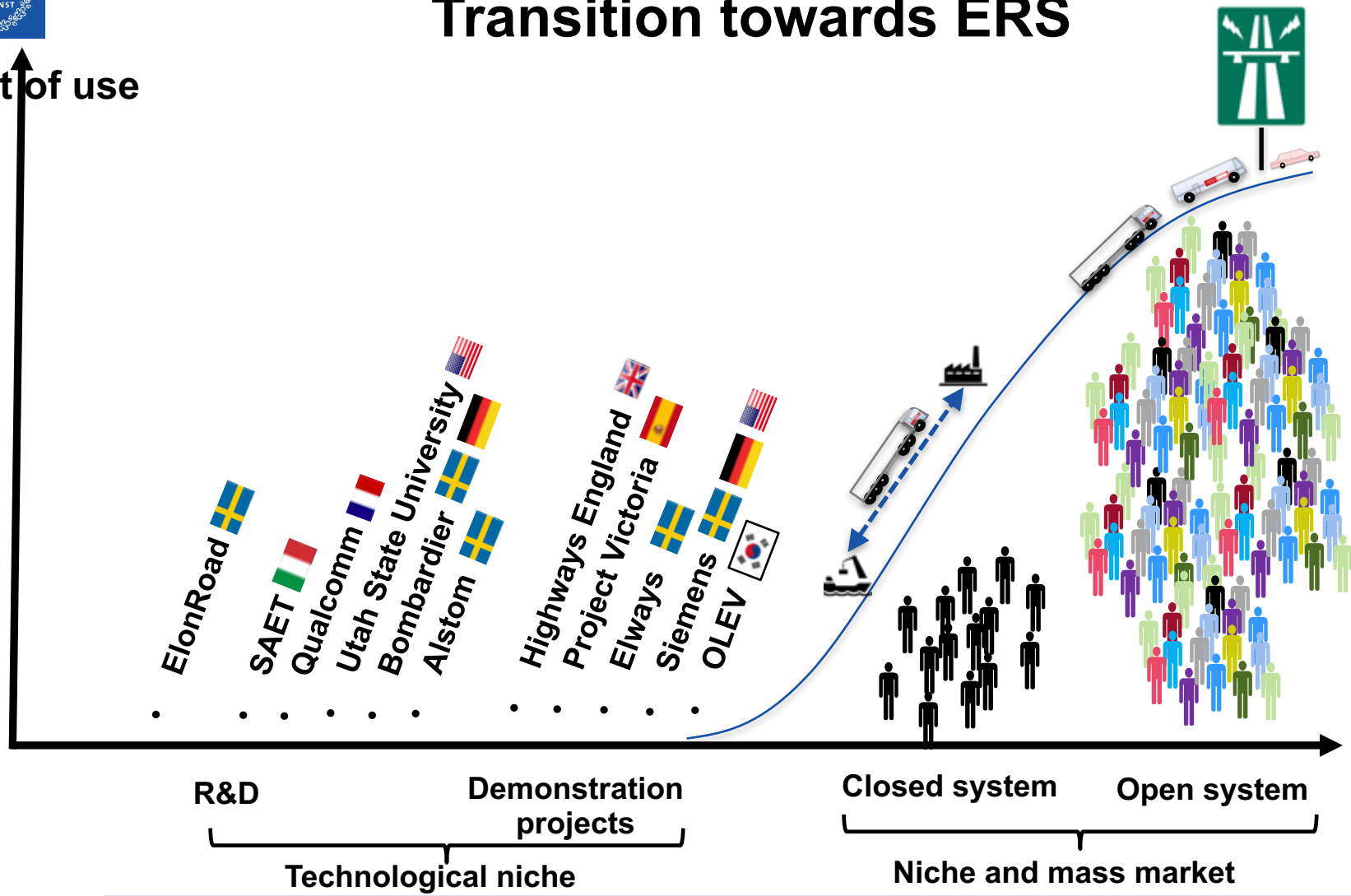
Utility of the new infrastructure is critical



Analyzing the emergent phase of transition through a BM perspective



Transition towards ERS



Tongur & Sundelin, 2016

Thank you! Questions?