

Update on Electric Road Systems: practice and research

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Context: the battery-electric truck landscape is emerging

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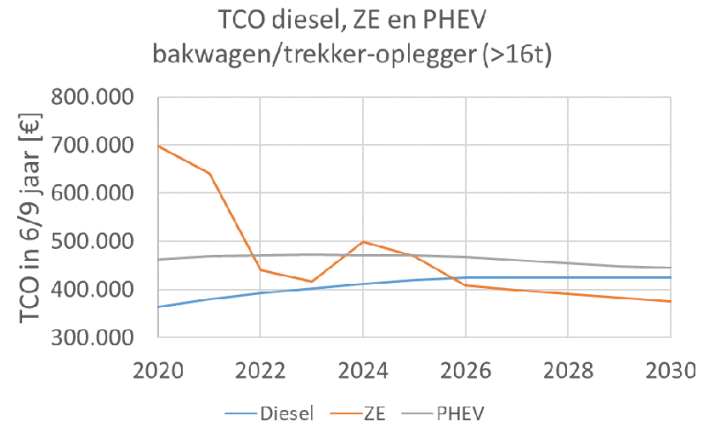
CLIMATEWIRE

Electric trucks to hit cost parity with diesel rigs by 2030 — report

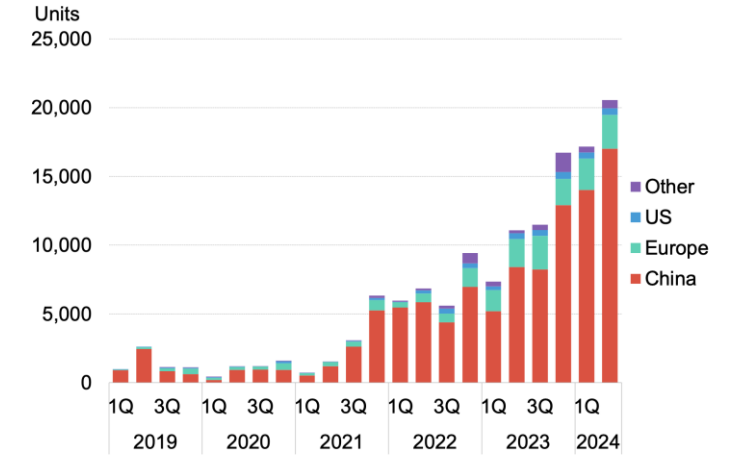
By MIKE LEE | 05/19/2025 06:19 AM EDT

But the trend could be disrupted if state and federal officials pull their support for the nascent industry.

Total costs of ownership
= competitive



Global sales of zero-emission medium- and heavy-duty trucks by region



Source: BloombergNEF; see full list of sources in the Appendix. Note: Europe is the EU 27, the UK, Norway, Switzerland, Iceland and Liechtenstein.

BET range 1000 km

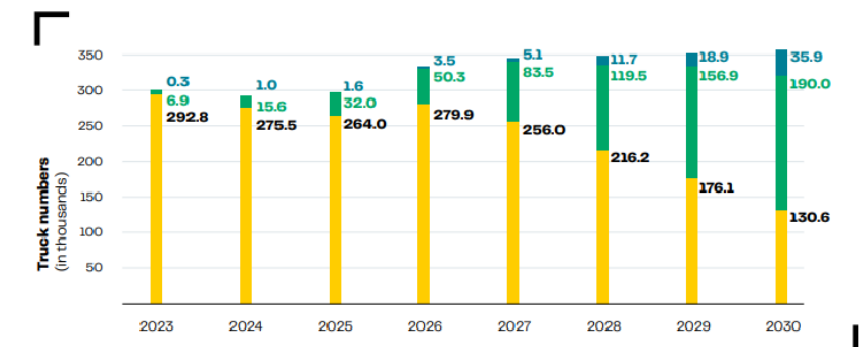
BET = by far the cheapest option

BET in EU to catch up with diesel in 2030

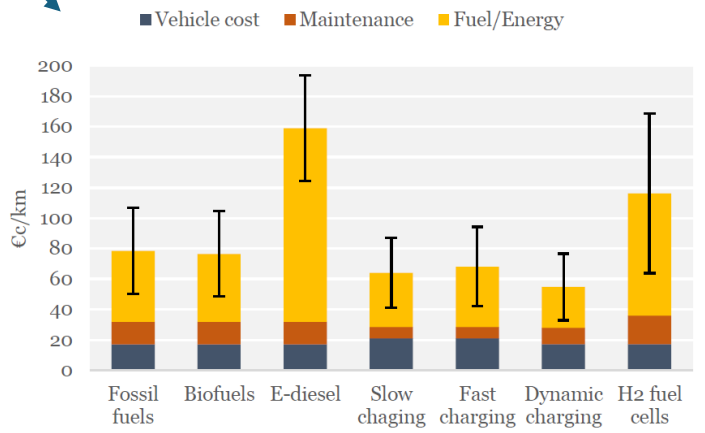
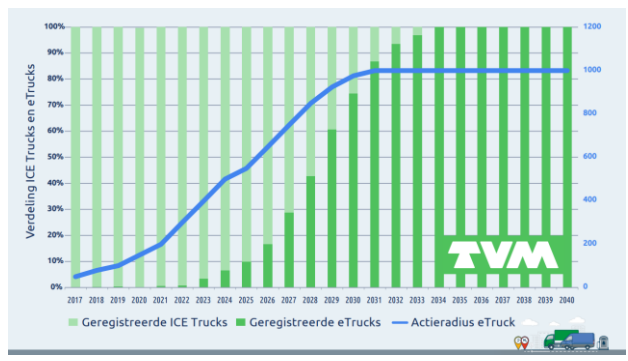
Fleet conversion

China leading sales

Forecast sales figures for heavy-duty vehicles (> 12 t)
In Europe according to manufacturer data

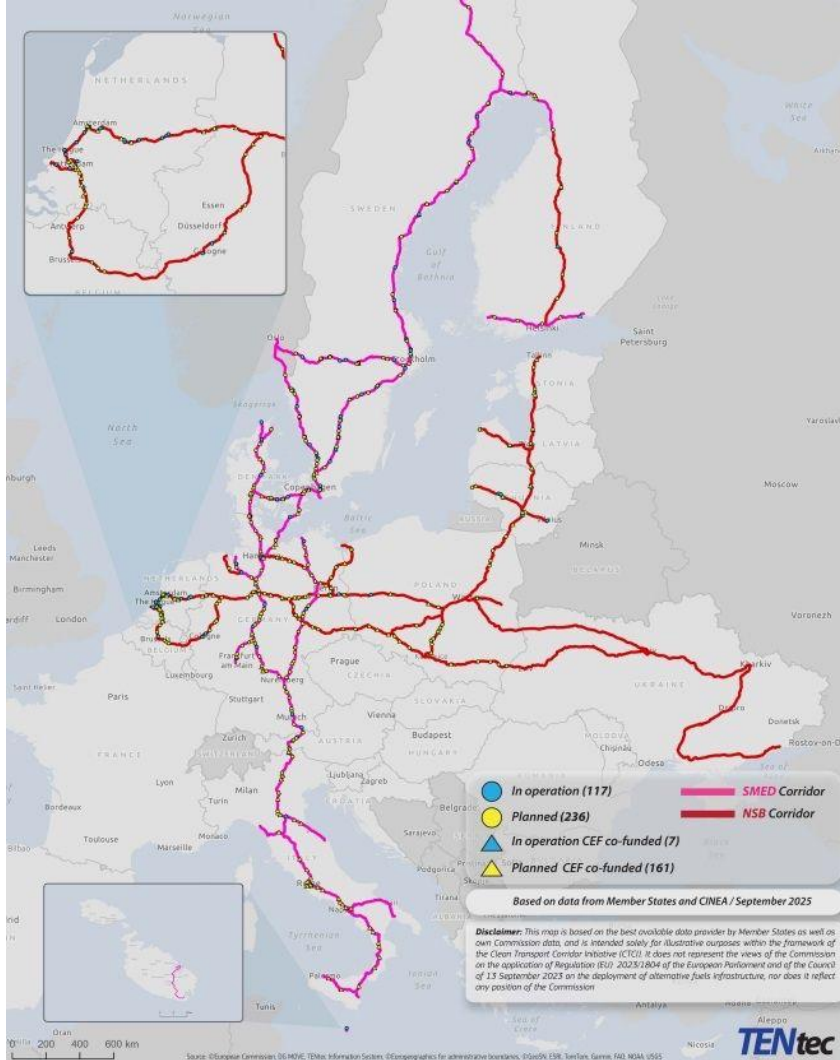


Notes on uncertainty due to incomplete market coverage:
 - Data is not available for all drivetrain types, manufacturers and years.
 - For the second half of the decade, the response rate in terms of current market shares is 90%.
 - For fossil fuel-based drivetrains, the response rate was between 70% and 90% by 2025.



Rise, 2023

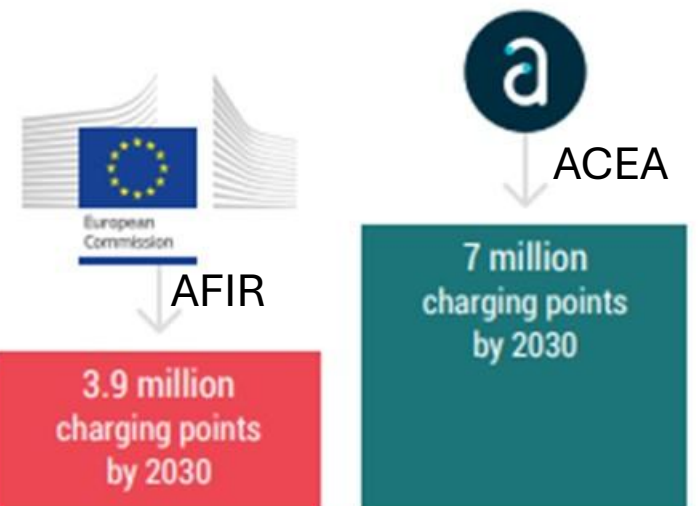
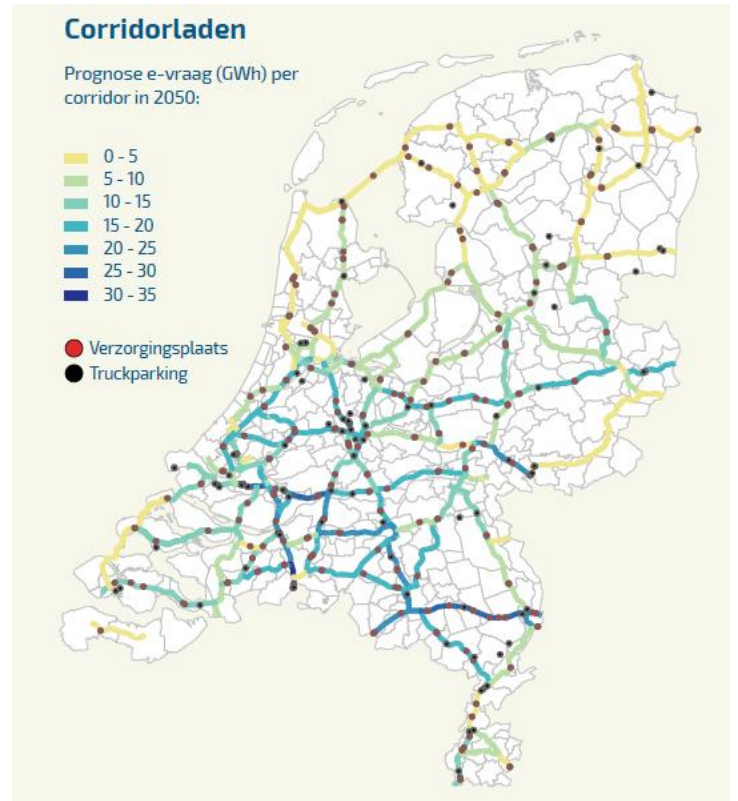
Planned charging landscape: sufficient?



From Sweden to the South of France: Europe's diagonal charging infrastructures for electric trucks
Map of charging hubs dedicated to HDV in Europe



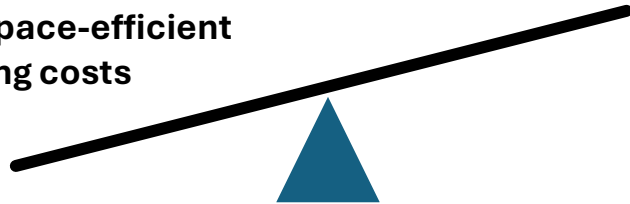
AFIR: Alternative Fuels Infrastructures Regulation
Every 60 km charging for HDVs on core TEN-T network by 2030



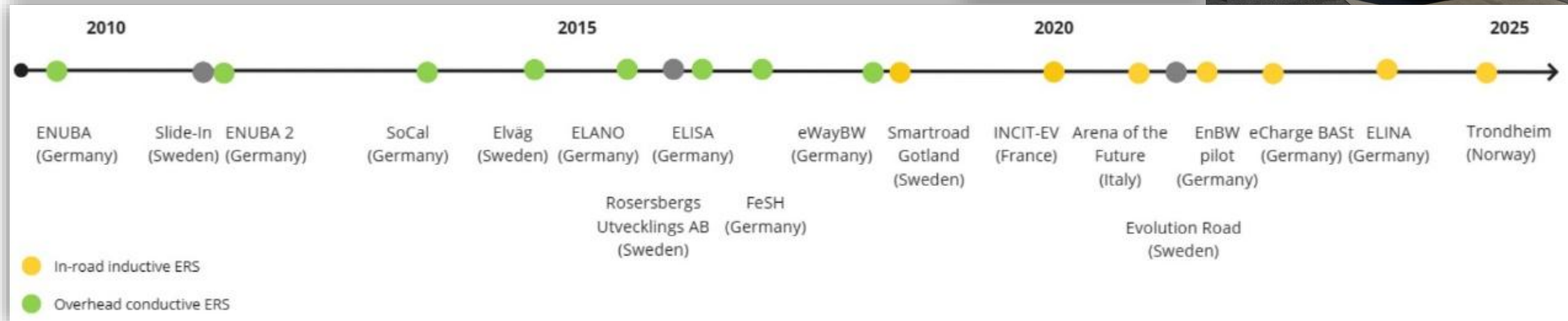
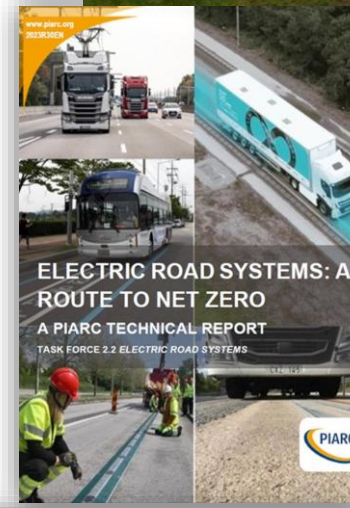
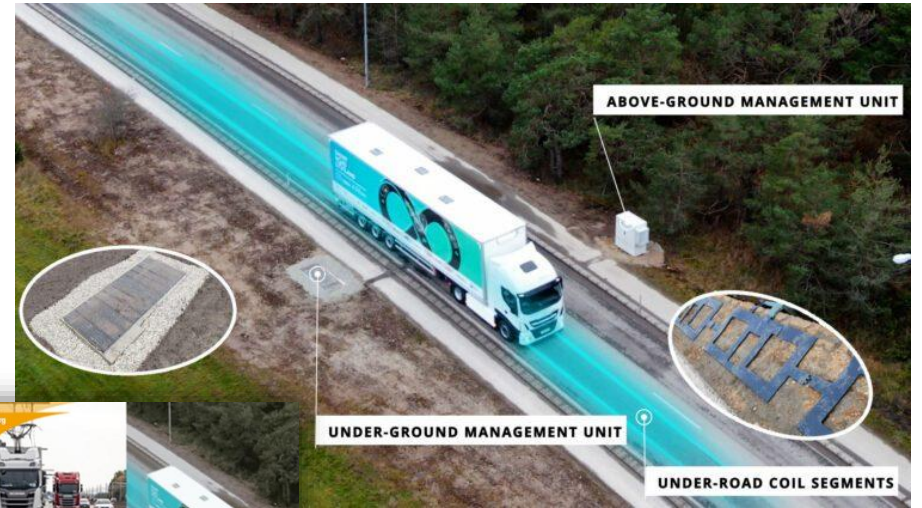
Electrified Road Systems (ERS)

Smaller batteries
 => Cheaper & fuller trucks
 No charging breaks
 Much more space-efficient
 Lower charging costs

ERS
 Infrastructure
 investment &
 maintenance
 costs

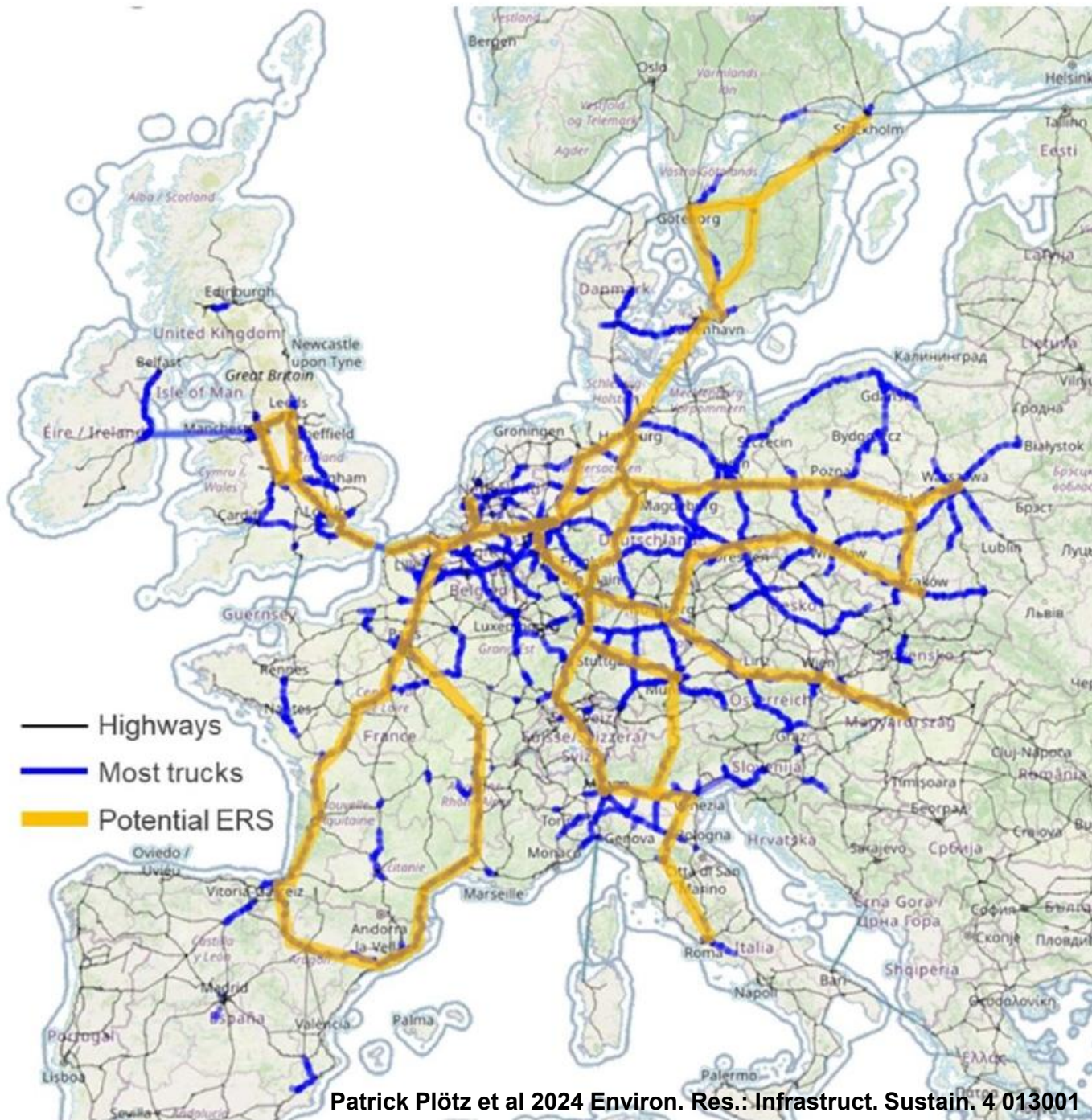


Payback times 7-15 years



E-CORE project

- ERS Corridor Rotterdam-Budapest
- NL, D, A, H collaboration, national funding
- Project lead = Germany (IKEM)
- Hungarian project completed early 2026 (KTI)
 - Corridor and user identification
 - Prerequisites for construction and operation
 - Integration Hungarian toll system & European system

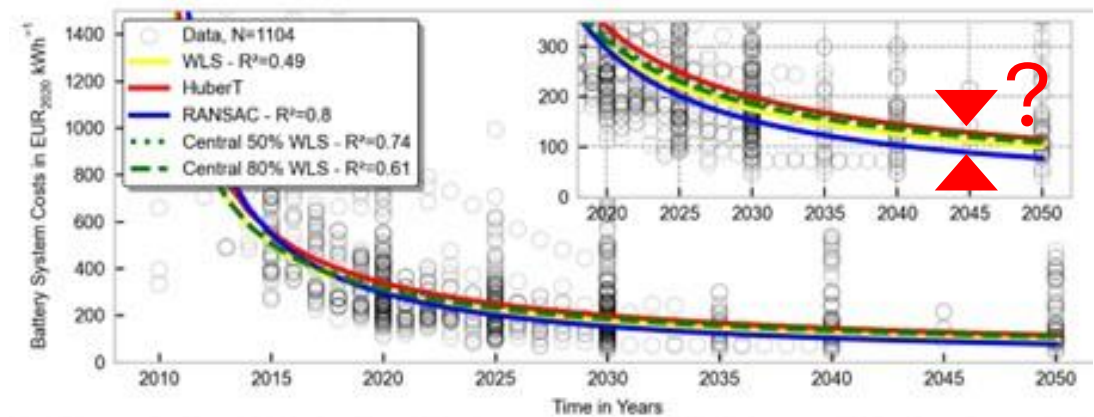


NL part of E-Core: CBA of corridor investments (TNO project)

- ERS breaks even after 20-25 years
- Uncertainties exist, especially regarding:
 - Infrastructure costs
 - Charging price
 - Battery price
 - Traffic and ERS uptake
- These may shorten or lengthen break-even period
- A full network has better payback times

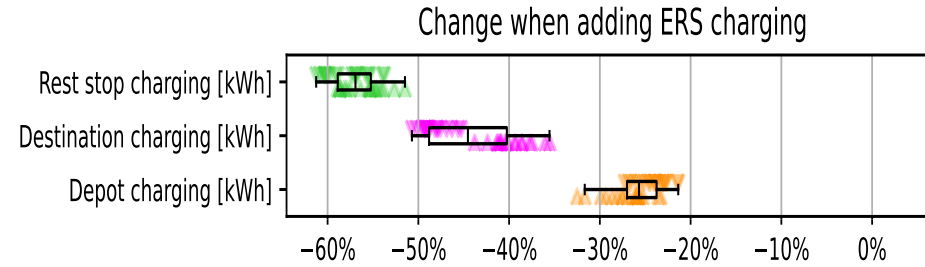
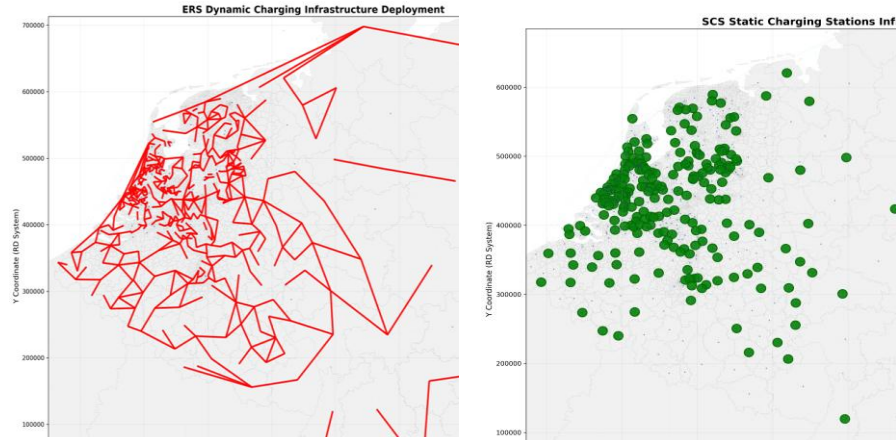


Figure 4.2: Map of Corridor_2 Port Rotterdam - Belgium. Source: TNO



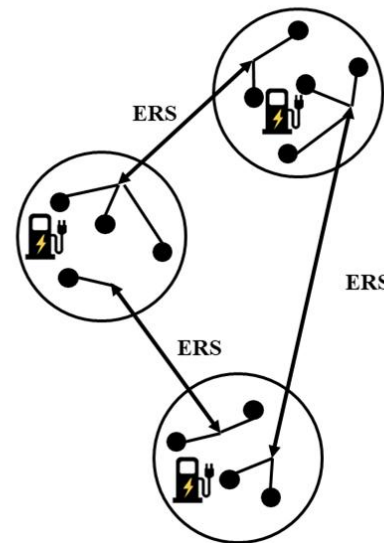
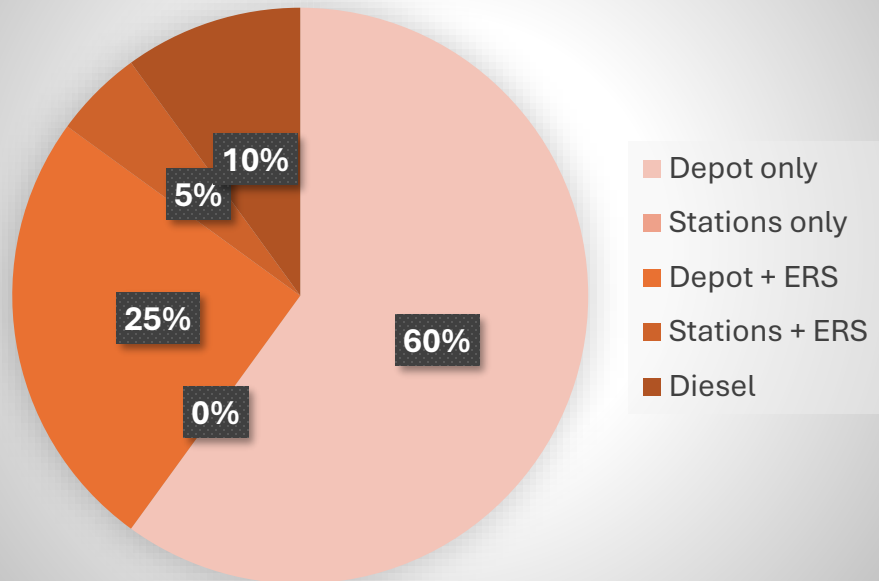
Battery prices (Link et al. 2024)

Understanding demand: which charging options will carriers prefer?



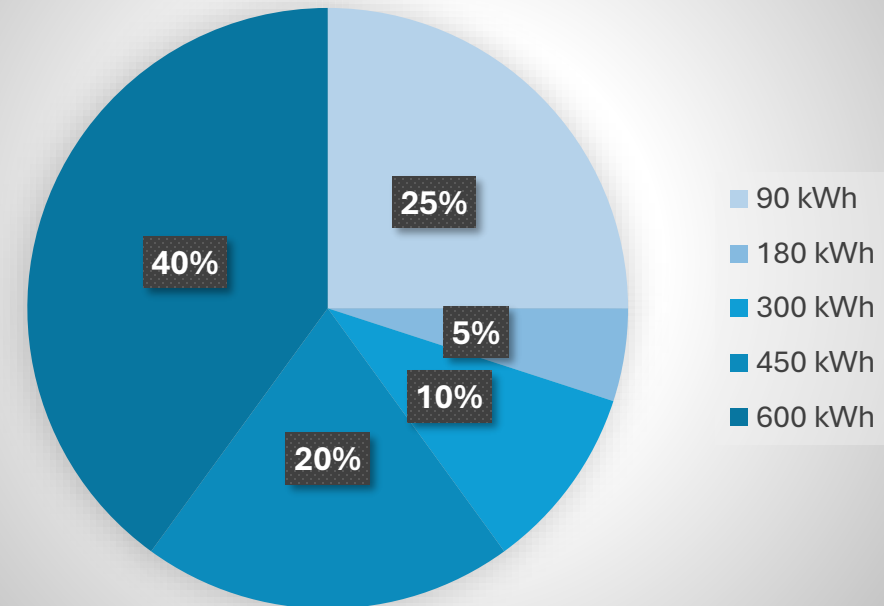
Jakob Rogstadius, RISE (2023)

Charging methods



Mingyan Jin, 2025

Battery size distribution



Dynamics of energy consumption & trade-offs with static charging

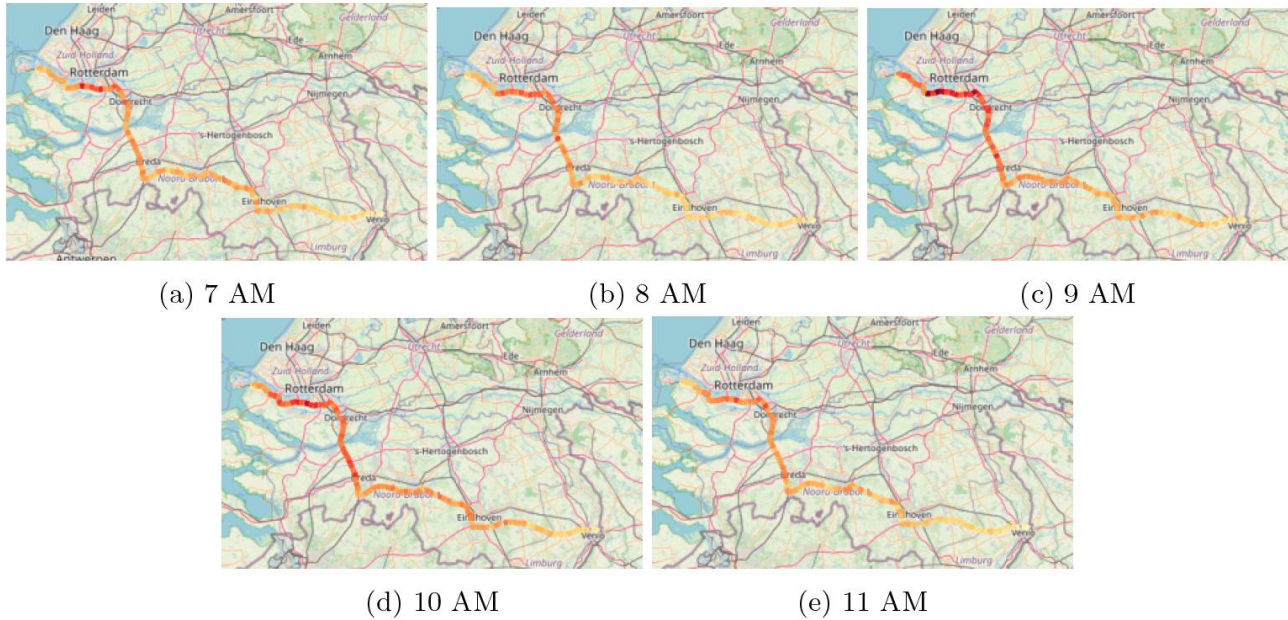
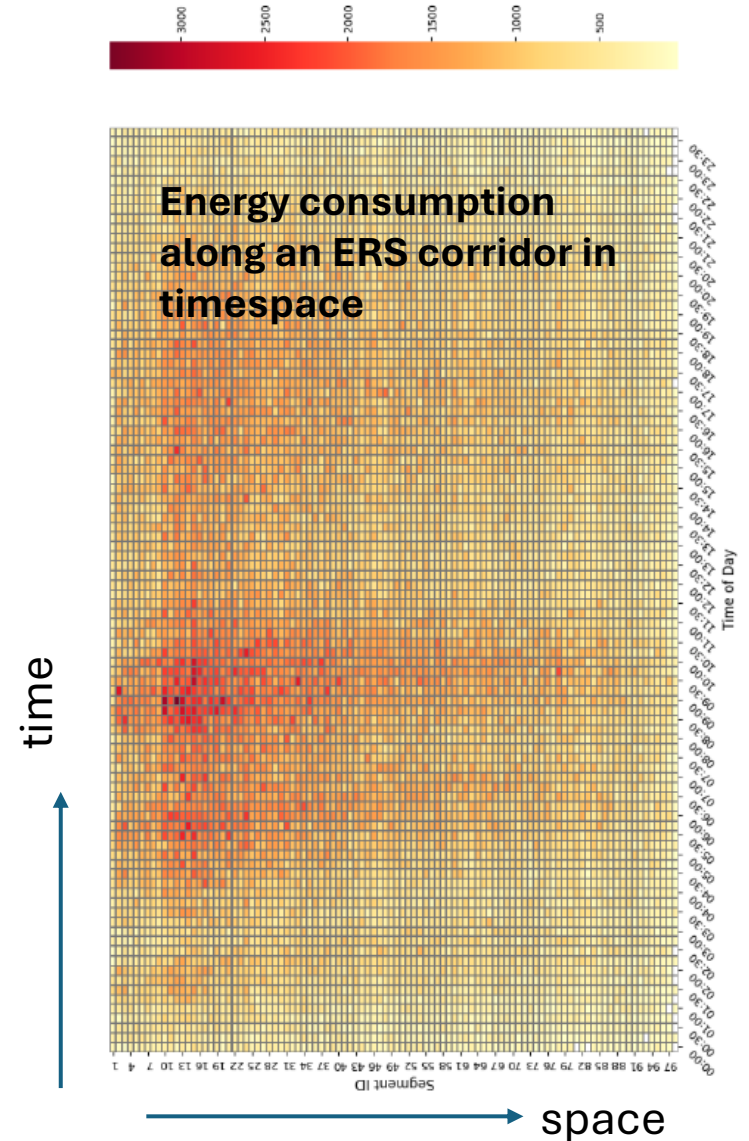
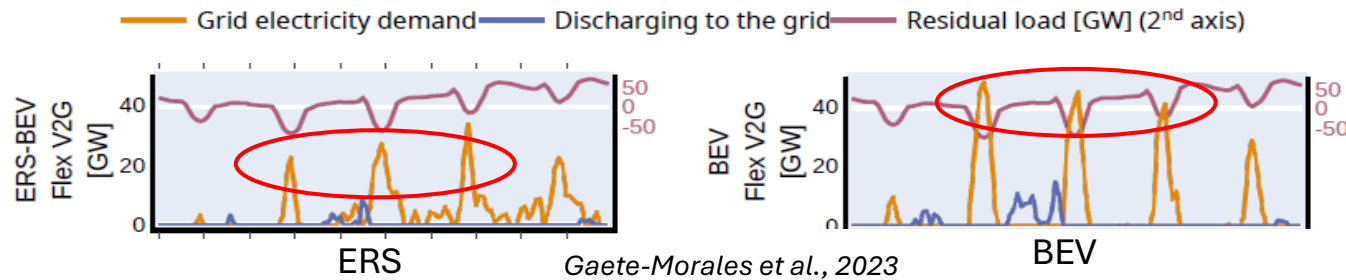
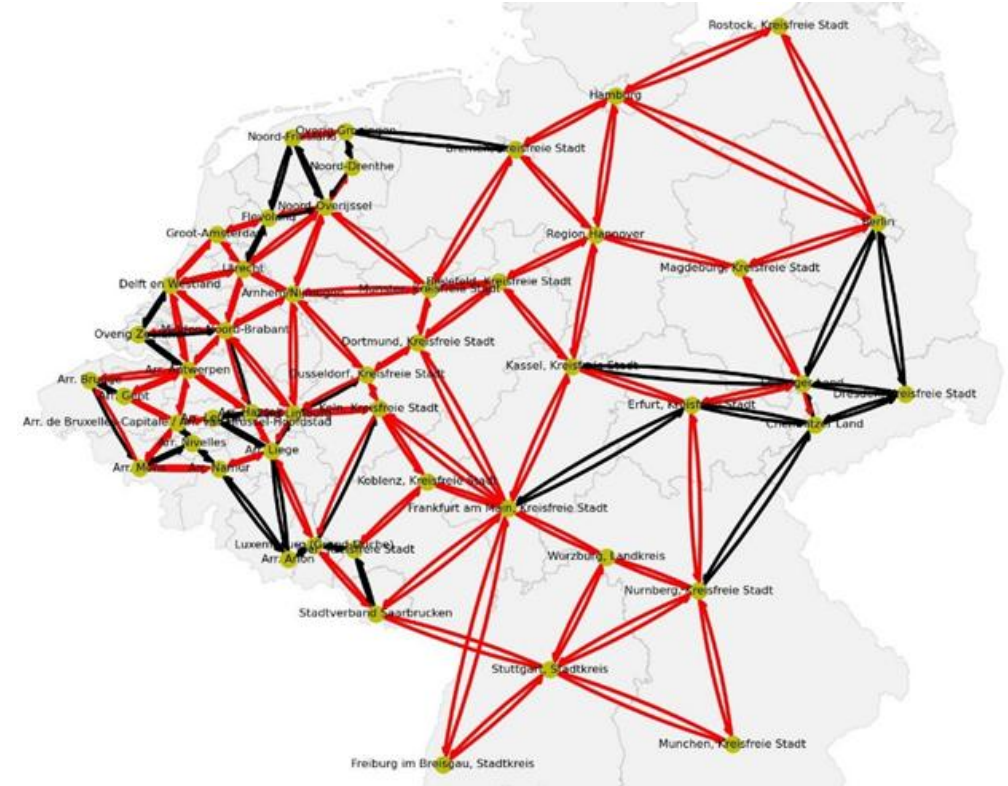
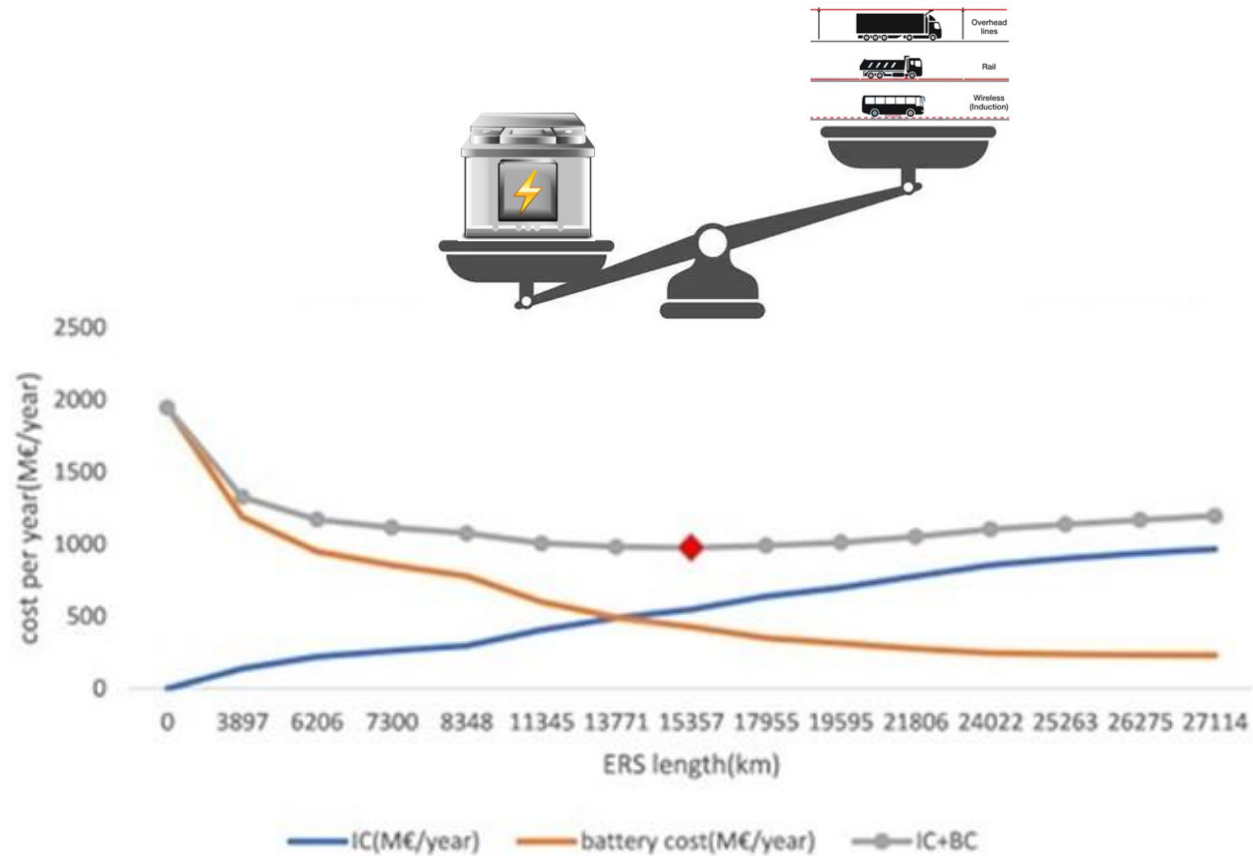


Figure 31: Spatial distribution of ERS power demand during the morning peak (7 AM – 11 AM)



Battery/ infrastructure trade-off: case for Benelux + D network

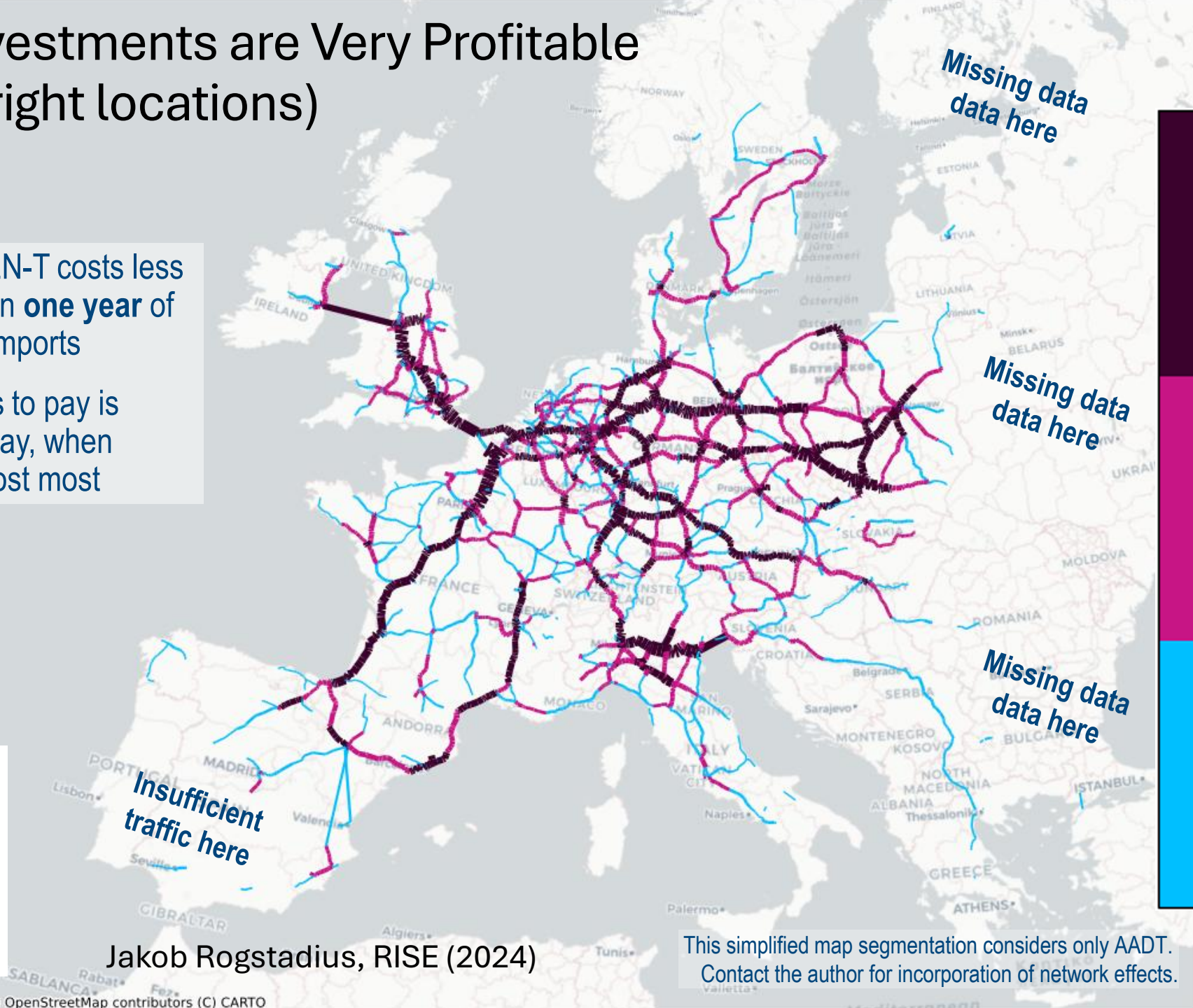


ERS Investments are Very Profitable (in the right locations)

- ERS on TEN-T costs less to build than **one year** of fossil fuel imports
- Willingness to pay is highest today, when batteries cost most



Jakob Rogstadius, RISE (2024)



This simplified map segmentation considers only AADT.
Contact the author for incorporation of network effects.

The case for ERS: summary

FINANCIAL

1. Lower truck TCO + *cost of operations*
2. Strong investment case for heavy routes
3. Wireless ERS: all traffic!

FLEET CONSTRAINTS

4. Grid congestion and space constraints circumvented
5. Weight/size limits not critical
6. Lower adoption threshold (retrofits)

SUSTAINABILITY

7. Large economies of scale for chargers
8. More charging on green energy, V2G
9. Critical materials savings/independence

Concluding

- ERS has clear rational, strategic advantages
- It comes late into the electrification game
- Relies on clear and coordinated public support
- No easy point of entry into the political discourse
- AFIR: Re-focusing needed (no H2, add ERS)
- Future: in-road charging for all vehicles?