

Hidden obstacles to electric trucks: How to evaluate markets for expansion

A popular science article based on the Master Thesis study “*A qualitative framework for market evaluation: Identifying key categories and factors for assessing market attractiveness and feasibility in the electrification of heavy-duty road freight*”

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The transition to electric heavy-duty road freight is not just a technological challenge. Actors need to take several considerations into account before entering a market. By using a new market evaluation framework tailored for the heavy-duty segment, different actors can map out key categories and corresponding factors to deploy electric trucks in the most effective markets.

Heavy-duty road freight is a major contributor to global carbon emissions. At the same time, the road freight industry operates under intense competition with very narrow profit margins of only a few percent. While transitioning to battery-electric trucks is essential to reach climate targets, it introduces high financial risks for transport operators. A heavy-duty electric truck currently costs two to three times more than its combustion engine counterpart.

To make fleet electrification viable, companies cannot look at vehicle technology in isolation. The transition is highly dependent on a complex system where aggregate market factors, transport operations, charging infrastructure, regulations, actors, and TCO must align.

Market evaluation framework for heavy-duty electric road freight

This study developed a tailored market evaluation framework designed specifically for the heavy-duty electric road freight industry. This is shown in *Table 1*. The framework was tested through a case study with a transport technology company to evaluate selected European countries and test the framework.

Table 1: Market evaluation framework

Categories	Factors
Aggregate market factors	Total transport market size
	Total transport market growth
	Electrification adoption
	Freight clusters
Transport operations	Weather conditions
	Terrain conditions
Charging infrastructure	Public charging availability
	Grid connection
	Grid mix
Regulations	Taxes
	Financial incentives
	Operational and technical regulations
	Public procurement
	Policy predictability
Actors	Logistics companies and hauliers
	Shippers
	OEMs
	Energy providers and grid operators
	Governments and local authorities
TCO	Fuel price delta
	Vehicle purchasing price

The final tool consists of a dual-layered application: a narrow, quantitative Mutli-Criteria-Decision-Anlaysis to screen countries and steer analysis focus, complemented by a broader, qualitative model to capture the unique context of individual markets.

The application of the framework demonstrated that the primary barriers to market entry are rarely just about technology, but rather about structural and systemic challenges between framework components and within each country.

France as a case application: Promising frontier, although some pain points remain

A clear example of the framework's value is the insights generated through both its quantitative and qualitative application. While the quantitative application highlights differences in market attractiveness and feasibility across European countries, the qualitative application provides in-depth nuances beyond the figures.

France stands out as an attractive market for heavy-duty electric road freight. It is one of Europe's largest freight networks and features a very low-carbon electricity mix dominated by nuclear and renewable energy. Freight activity is concentrated around major logistics and production hubs (Île-de-France, Auvergne-Rhône-Alpes, and Hauts-de-France) supporting domestic and international freight corridors while creating conditions for electric adoption through predictable routes and expanding charging infrastructure. Furthermore, the French government offers substantial financial incentives, providing direct purchasing subsidies of up to €100,000 per electric truck.

However, the qualitative layer of the framework identified critical operational frictions:

Rigid road toll structures: Unlike countries like Germany, France has not implemented CO₂ differentiated road tolls. In addition, the French highway network is managed through long-term

private concessions. Because these private operators rely on toll revenues to service heavy debts, rates are legally locked, making it difficult to introduce the toll exemptions that could significantly accelerate TCO parity for electric trucks.

Grid connection delays: Installing the high-power charging infrastructure necessary for heavy-duty vehicles is constrained by the electrical grid. In France, administrative and technical lead times to secure a grid connection from the main network operator can take between 12 to 24 months.

Final remarks

Ultimately, market attractiveness and feasibility in a transforming industry depend on coordination across the entire value chain. This evaluation framework provides a structured methodology to balance general market metrics with industry-specific realities, enabling robust commercial decision-making.