

## **Executive summary: Electrified heavy vehicles in urban traffic**

*Thomas Magnusson & Christian Berggren, Linköping University  
In collaboration with Magnus Henke, Swedish Energy Agency*

Electrification of heavy urban traffic represents a huge untapped potential to reduce emissions and noise, make public transport more attractive and improve urban environment and planning. City buses, a small fraction of the heavy vehicle market, constitute a strategic niche for this technology transition, and many promising local initiatives are reported. Swedish firms enjoy a strong international position in the new technologies, but so far, market response in Sweden has been hesitant. To realize the industrial and environmental potential, a package of market-supporting policies and regulatory initiatives are needed, both at national and city levels. These are the major conclusions in one of the chapters in a recently released report from the Swedish Energy Agency “Teknologiska innovationssystem inom energiområdet” (Technological innovation systems in the energy field) (ER2014:23). The report analyses the dynamics of five energy-related technological innovation systems<sup>1</sup> in Sweden and outlines policy implications. This summary presents the key results of chapter 6, which analyses conditions for development and diffusion of electrified heavy vehicles (hybrid-electric, plug-in hybrid and fully electric trucks and buses) in urban traffic.

The chapter starts with an overview of the European heavy vehicle industry including the six major firms Daimler/Mercedes, Volvo, Fiat/Iveco, DAF, MAN and Scania. Two of these industry incumbents – Volvo and Scania – are based in Sweden. Heavy vehicles are an industry where stringent demands on cost, reliability and robustness normally slow down the diffusion of new technologies. In spite of this tradition, however, there is now a vibrant technological activity to launch more environmentally sustainable technologies – particularly in the city bus segment. Whereas both incumbents and new niche manufacturers participate in this activity, Volvo in Sweden has surpassed the other European majors, and has introduced products and announced strategic ambitions to take the lead in this development. Also the other Swedish industry incumbent – Scania – has launched hybrid-electric vehicles commercially. Market developments during coming years will be decisive for the outcome of these initiatives. However, while many market incentives are in place to support diffusion of electrified cars, similar instruments directed at heavy vehicles are absent.

The analysis of the technological innovation system in the chapter shows that the Swedish system is strong in terms of experimentation and knowledge development. However, knowledge development has so far been concentrated to vehicle manufacturers and technical universities. To support market diffusion, there is a need to involve a variety of other actors such as vehicle operators, public transport authorities, power utilities, property owners and urban planners and these actors need support from regional and national policy.

---

<sup>1</sup> Bergek, A., S. Jacobsson, B. Carlsson, S. Lindmark and A. Rickne (2008). "Analyzing the Functional Dynamics of Technological Innovation Systems: A Scheme of Analysis." *Research Policy* 37(3): 37-59.

The analysis further suggests that electrified heavy vehicles with their silent, clean and vibration-free characteristics have the potential of becoming a highly legitimate technology in the society. Currently, however, there are a number of obstacles, which delay diffusion of the technology. Many of these obstacles are related to institutional barriers and contradictory policies. Both national and regional policies in Sweden, for example, tend to single-mindedly promote biofuels as the alternative of choice for urban buses and de-emphasise energy efficiency. By consequence, regional actors have invested in facilities and infrastructure for production and supply of biofuels, and these have captured a significant part of the Swedish inner-city bus segment. Historically, the promotion of biofuels was important to improve local air quality and reduce greenhouse gas emissions. Now these investments cause a lock-in, which tend to block market entry for electrified heavy vehicles. Moreover, the constrained financial and engineering resources of public transport authorities limit the possibilities for thorough tests and evaluations, and lengthy contract periods with private bus operators aggravate this lock-in.

Electrification of urban buses is an economically sound option due to very low operation costs, but the initial investment expenditure in vehicles and infrastructure is high. Currently this cost blocks market development in the truck segments, where the required pay-off generally tends to be much shorter than in the bus segment. This means that there are limited synergies between electrified trucks and buses.

Coordinated national and regional/local policies are required to reach ambitious targets on market diffusion and industrial competitiveness, which both public investigations and industry reports have proposed.<sup>2</sup> The chapter discusses how a combination of transitional subsidies, support systems, incentives and directives are required to overcome the identified obstacles, and facilitate a stepwise introduction of electrified heavy vehicles for urban traffic. The chapter proposes the following policy initiatives (suggested period in parenthesis):

- National procurement guidelines for public transport, which support successive electrification of inner-city buses (2015-2030)
- An Electrified Heavy Vehicle Fund, which provides subsidies for purchase of hybrid-electric, plug-in hybrid and fully electric trucks and buses (2015-2025)
- National support for investments in inner-city charging infrastructure for heavy vehicles (2015-2025)
- Support for formation and development of extended learning networks around electrified heavy vehicles (2015-2025)
- Step-wise implementation of increasingly stringent environmental zones, with extended accessibility for silent and low-emitting person- and goods transport (2015-2030)
- National support for large-scale demonstrations and field tests, beyond existing experiments with isolated bus routes (2015-2025)
- Demonstration programs and support for purchase of electrified trucks (2015-2020).

---

<sup>2</sup> Eg. SOU 2013:84 Fossilfrihet på väg Betänkande av Utredningen om fossilfri fordonstrafik, Stockholm Roadmap Sweden 2013 En färdplan för att främja elfordon i Sverige, nå klimatmålen och samtidigt stärka den svenska konkurrenskraften