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Possibilities and barriers for using electric-powered vehicles in city logistics practice

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Abstract

This paper discusses the current developments, as well as the barriers and opportunities for using electric freight vehicles in daily city logistics operations based on the experiences from a number of running demonstrations. This paper discusses results from other studies and demonstrations that were published on electro mobility in city logistics in the last three years, as an update of an earlier state of the art review. Next, we present recent narratives based on the more than 100 electric freight vehicles (EFVs) deployed in the European project FREVUE and the experiences of TransMission in using four battery electric Cargohoppers to perform their urban deliveries in Amsterdam. Over the years the attention shifted from a focus on the limitations of EFVs in comparison to conventional vehicles, such as the limited range, towards the question how to better adapt the operations to deal with the EFV characteristics. Although, the business case for using EFVs, in comparison to conventional vehicles, is still suffering from high vehicle purchase price and uncertainty about its residual value, the use of EFVs in daily operations shows that in the majority of cases the current generation of EFVs have a good technical performance. Companies using EFVs are generally satisfied with these vehicles. Obviously still a number of barriers has to be levelled, but large scale EFV usage seems more feasible than before.

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Keywords: electromobility; electric freight vehicles; zero emission; city logistics; FREVUE

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1. Introduction

Urban freight transport is a serious contributor to local emissions (i.e. NOx, elemental carbon and organic carbon) affecting the urban air quality and to global emissions (i.e. CO2) affecting global warming. Poor air quality is a pressing problem in many urban areas as it directly affects the health of people and as a result the life expectancy of citizens. World Health Organisation states that poor air quality is a serious health risk. Next to that, many European cities are not meeting the agreed European standards for air quality (Directive 2001/81/EC), which can result in penalties. Therefore, it is not surprising that one of the major short term concerns for local authorities is to improve local air quality. On the longer term, the European Commission formulated the ambition to make urban freight transport emission free by 2030 (EC, 2011).

Albeit that urban freight transport has these effects, it is of major importance to sustain urban life by providing both the supply of all goods (including the necessities of life) and the removal of all waste from the locations where people concentrate, i.e. the cities. Therefore it is necessary to continuously examine the possibilities of how to reduce the negative impacts while maintaining an efficient urban freight transport system. The use of zero emission vehicles could be one key element. One of the most promising technical solutions existing at this moment is the electric powered vehicle: it does not produce local emissions (from the tailpipe), and – depending on the way electricity is generated – has huge potential in reducing CO2 emissions (see for example Quak and Nesterova, 2014).

However, the transition from conventionally powered diesel vehicles towards electric vehicles in urban freight transport is not an easy one. This paper examines the barriers and opportunities to use electric freight vehicles in city logistics operations. We first provide a short description of the sources we used to identify current barriers and opportunities as well as the direction these barriers and opportunities are moving (in comparison to an earlier review presented in Nesterova et al., 2013). Specifically we introduce FREVUE, a large European demonstration project of electric vehicles in city logistics and the case of Cargohopper in Amsterdam. The remaining part of this paper examines the trends and current state of implementation of electric vehicles in urban freight transport based on information received from recent demonstrations, trials and daily operations. Finally we define what are the main strengths and weaknesses in the business case of electric freight vehicles in city logistics.

2. Electric freight vehicles in city logistics operations

Zero-emission city logistics operations, although often still in the form of small scale demonstrations rather than large implementations, are performed more and more in practice. This contribution examines the barriers and possibilities that arise when actually using EFVs in daily operations. This contribution is a continuation on the state-of-the-art study on electric freight vehicles from 2013 (see Nesterova et al., 2013), where we identify the trends and changes that occurred the last two years. For this, we use three main sources: i) we review the recently published results (2013-2015) from the projects and demonstrations that include freight electro mobility in city logistics, ii) we present the first insights from FREVUE (Project acronym VALIDATING FREIGHT ELECTRIC VEHICLES IN URBAN EUROPE) and iii) we discuss the case of the four electric Cargohoppers operated by TransMission in Amsterdam. These main sources are introduced in more detail in the following paragraphs.

2.1. Overview of the reviewed projects and demonstrations (2013-2015)

We selected relevant projects and demonstrations to be included for the review based on a set of specific criteria, i.e.: i) papers or reports that are published between 2013 – 2015 presenting from the field of electric powered vehicle implementations in city logistics or other relevant research papers on electro mobility and city logistics, ii) reports and articles are written in English and focusing on implementation of EFVs, and iii) projects and research that focus only on electric freight vehicles such as trucks and vans. This resulted in a review of the following projects and the corresponding deliverables, papers and reports: C-Liege, e-mobility NSR (2011-2014), ENCLOSE (2015-2015), LAMILO (2011-2015), Molecules (2011-2014), Pelletier et al. (2014a and 2014b), SELECT (2012-2015), SMARTFUSION (2012-2015), STRAIGHTSOL (2011-2014), Taefi et al. (2014), and Tide (…-2015).