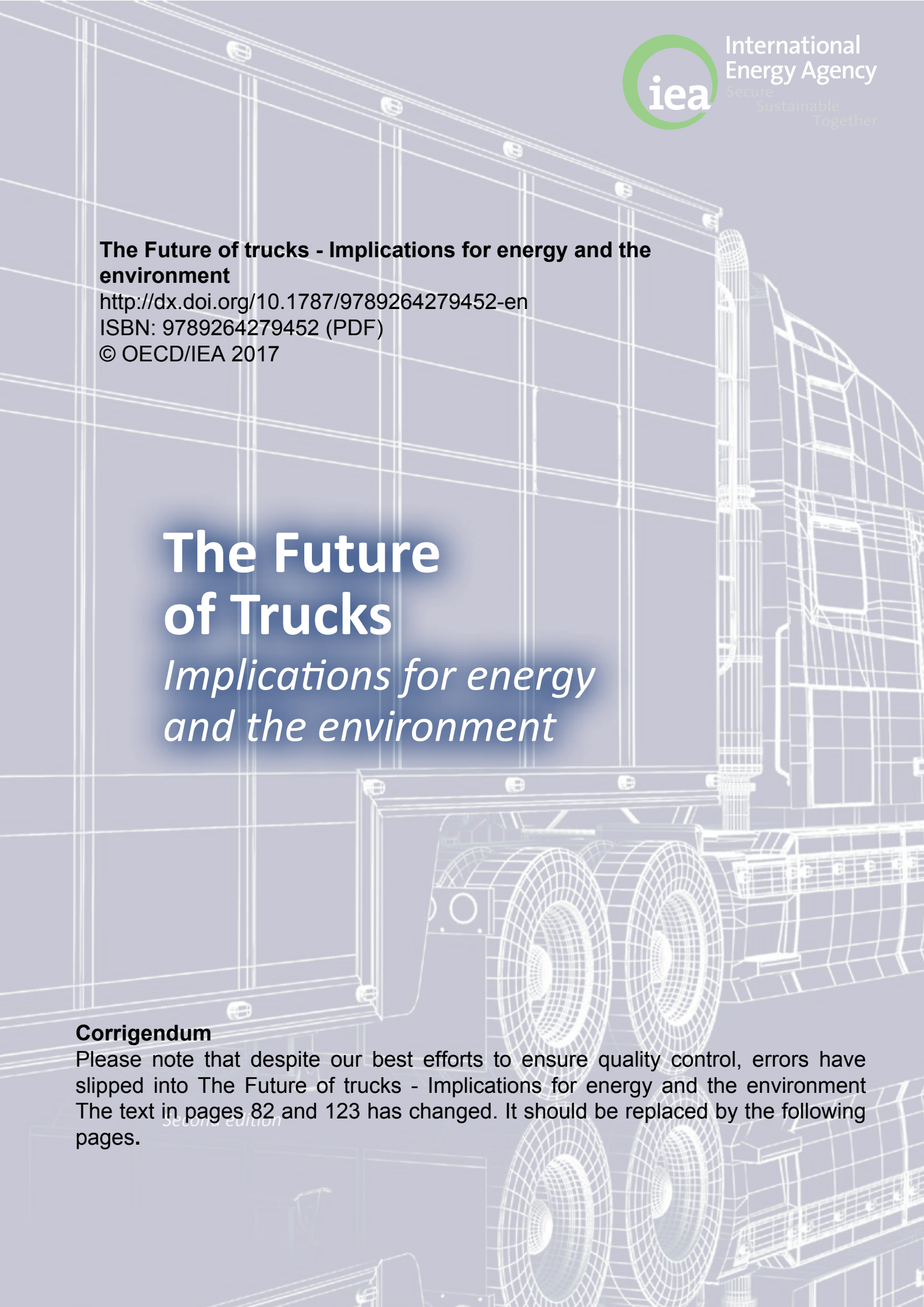

The Future of trucks - Implications for energy and the environment
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International Energy Agency
Secure Sustainable Together

The Future of Trucks

Implications for energy and the environment

Corrigendum

Please note that despite our best efforts to ensure quality control, errors have slipped into The Future of trucks - Implications for energy and the environment The text in pages 82 and 123 has changed. It should be replaced by the following pages.

companies to invest in trucks using natural gas or biomethane as a fuel, if the investment in the truck has an acceptable payback profile.

Globally, in excess of 23 million methane-driven vehicles are in use with established markets in countries such as Brazil, China, Italy and Pakistan (NGV Global, 2017). However, freight vehicles represent only a small fraction of these. Trucks fuelled by CNG or LNG accounted for about 1% of the total stock in 2015, with about half a million HFTs on the road, mostly in India and China, and about a quarter of a million MFTs. Most of these trucks are operated in developing regions and economies, including Eastern Europe, Latin America, the Russian Federation (hereafter, "Russia") and Southeast Asia.

The three regions where recent developments have favoured (or have been seen as influencing) the penetration of methane in trucking are the United States, China and the European Union. The following section reviews these developments, focusing primarily on natural gas as a supply option. Further discussion of the prospects for biomethane is included in the following section, which looks at biofuels.

In the United States, the prospect of a rapid shift to natural gas trucks arose because of booming domestic shale and tight gas production, which from 2009 led to a dramatic drop in wellhead natural gas prices. The price advantage for natural gas over products of petroleum was strengthened by rising oil prices over the following couple of years but was then undercut by the rapid drop in Brent oil prices from 2015.

From about the beginning of this decade, natural gas fuelling infrastructure in the United States has expanded at central hubs for private fleets and along main road freight highways. The build-out of natural gas stations has been promoted since 2015 by the Fixing America's Surface Transportation Act, which requires that the United States Department of Transportation sets aspirational targets for the deployment of alternative fuels infrastructure along key corridors. By the end of 2016, there were 1 741 CNG stations and 143 LNG stations operating (up by 50% and 230%, respectively, from 2012), of which only just more than half were public (NGVAmerica, 2017). The capacity for public CNG stations to service trucks is further limited by size restrictions at many CNG fuelling stations.

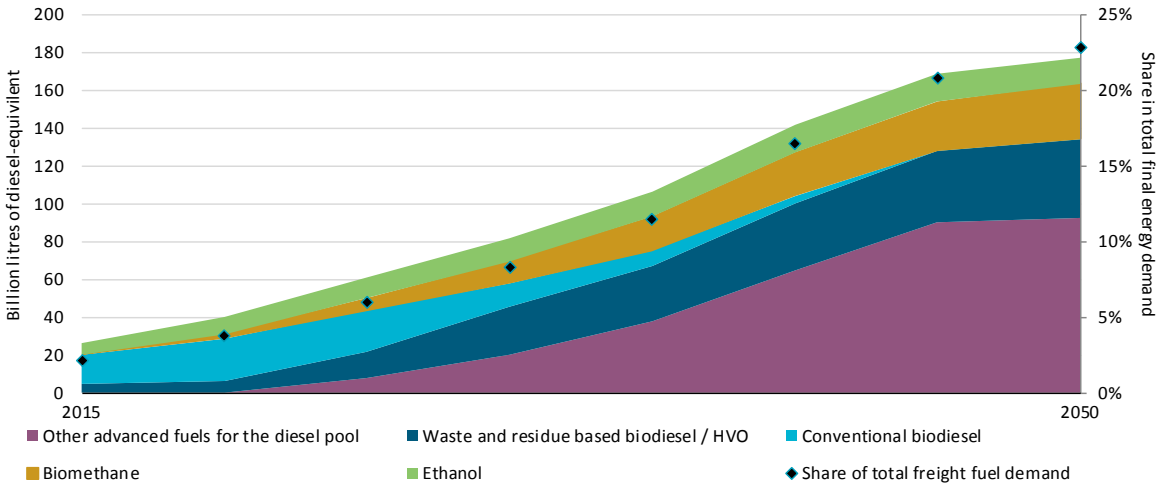
In the early 2010s, around half of waste collection trucks and a high share of buses were dual-fuel CNG vehicles (IEA, 2013). Major firms, including UPS, FedEx, Ryder Systems and Dillion Transport, have recently begun to purchase a growing share of natural gas trucks as they renew their fleets, including purchases of LNG long-haul tractor-trailers. In the North American market, the offer of heavy-duty truck models with natural gas engines (the latter built primarily by Cummins Westport) is quite large and includes the major OEMs, such as Freightliner, Kennworth, Peterbilt and Mack.

Legislative action, like the Alternative Fuel Excise Tax Credit, which transitions to tax rates based on energy content, has in recent years begun to address the tax rate disadvantages of alternative fuels, including natural gas, relative to gasoline and diesel.[41] Inconsistencies also exist, and vehicle-based taxation disadvantages CNG and LNG trucks, but there are indications that these taxes (such as the Federal Highway Excise Tax) may be reformed in the near future.[42]

[41] Historically, federal and state taxes gave preference to CNG and severely penalised LNG relative to diesel. This was revised by the Alternative Fuel Excise Tax Credit, which expired at the end of 2016. As a result of this act, federal taxes on diesel in 2016 were USD 0.0645 per litre of diesel equivalent. For the same energy content, the federal tax on CNG was USD 0.0546 and on LNG was USD 0.0642.

[42] The Federal Highway Excise Tax on heavy-duty trucks currently poses a burden for LNG trucks as it is levied based on the overall cost of LNG trucks, leading ultimately to a higher tax and thereby extending the payback period for CNG and LNG trucks. The Natural Gas Truck Tax Parity Act of 2016 was introduced in 2016 and aims to address this issue by creating a partial exclusion for alternative fuel trucks from this excise tax (NGVAmerica, 2016).

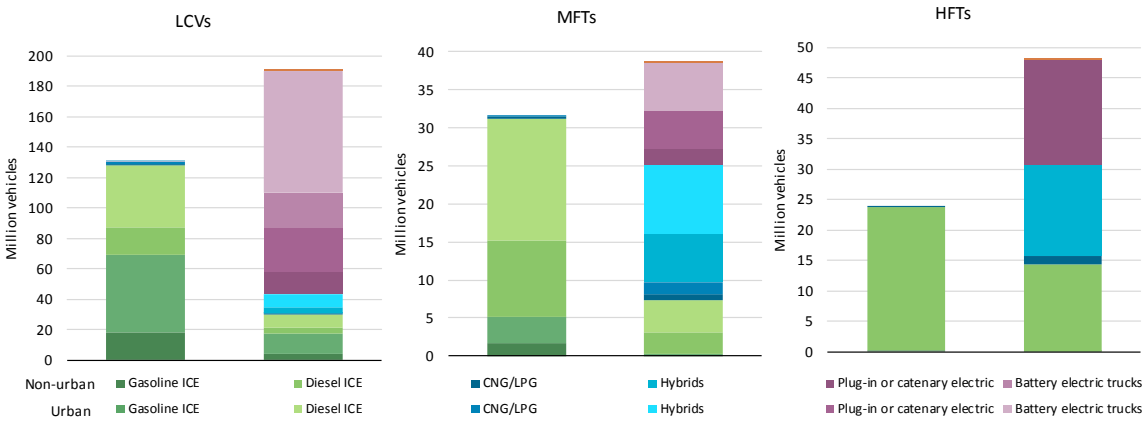
Figure 36 • Biofuels consumption in the Modern Truck Scenario



Source: IEA (2017a), Mobility Model, June 2017 version, database and simulation model, www.iea.org/etp/etpmodel/transport/.

With increasing technology maturity and infrastructure rollout, however, other low-carbon alternatives, in particular, electricity, make increasing inroads in the Modern Truck Scenario. The uptake of alternative fuels in alternative fuel trucks varies by vehicle segment (Figure 37).

Figure 37 • Vehicle stocks and fleet technology shares in the Modern Truck Scenario, 2015-50



Notes: The uptake of electricity in HFTs is primarily derived from plug-in hybrid trucks using ERS. This is the technology used in the modelling to represent zero-emissions vehicles. If cost reduction barriers are overcome and low-carbon hydrogen production is scaled up, meeting demand that is not only confined to the transport sector, and despite drawbacks in terms of life-cycle efficiency, hydrogen also has the potential to be used in fuel cell vehicles and emerge as an alternative to ERS for zero-emission, long-haul road transport, as discussed in Chapter 2.

Source: IEA (2017a), Mobility Model, June 2017 version, database and simulation model, www.iea.org/etp/etpmodel/transport/.

Hybridisation and electrification proceed most rapidly in the urban MFT fleets as both technologies are able to more effectively realise efficiency gains in short- to mid-distance transient operations. Hybrid trucks enter the truck fleet most rapidly in the MTS: by 2050, within the truck fleet, 7% of LCVs, 40% of MFTs and around 30% of HFTs use hybrid powertrains. Plug-in hybrids also grow in market shares. In the MTS, three-quarters of LCVs and 35% of MFTs are