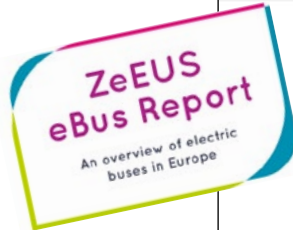


EBUSES TODAY AND TOMORROW



The 'ZeEUS eBus Report' gives an overview by UITP of electric buses usage. Around 173,000 worldwide estimated ebuses in 2015, of which 98.3% only in China

The ebus market, a developing niche sector with growth prospects in the future has been protagonist of the ZeEUS eBus Report: a study on electric buses, realized as part of the ZeEus project (Zero Emission Urban Bus System), which goal is to implement ebuses in the european public transport urban context. The UITP Report estimates around 173,000 worldwide circulating ebuses in 2015. The Asian continent is the undisputed leader and in particular China with more than 170,000 operating buses, representing almost 98.3% of the total fleet. Home to some of the biggest producers of both buses and batteries, China saw the introduction of technologically advanced 5th-generation electric buses.

The supremacy of the Asia-Pacific market is set also by the increasing production of Chinese original equipment manufacturers (OEMs).

This market is supported by government initiatives, that are playing an essential role in the growth of this sector, as for example the official programme for new energy buses, aimed at producing 1.67 million electric vehicles (including ebuses), and creating 1.2 million jobs yearly between 2010-2020.

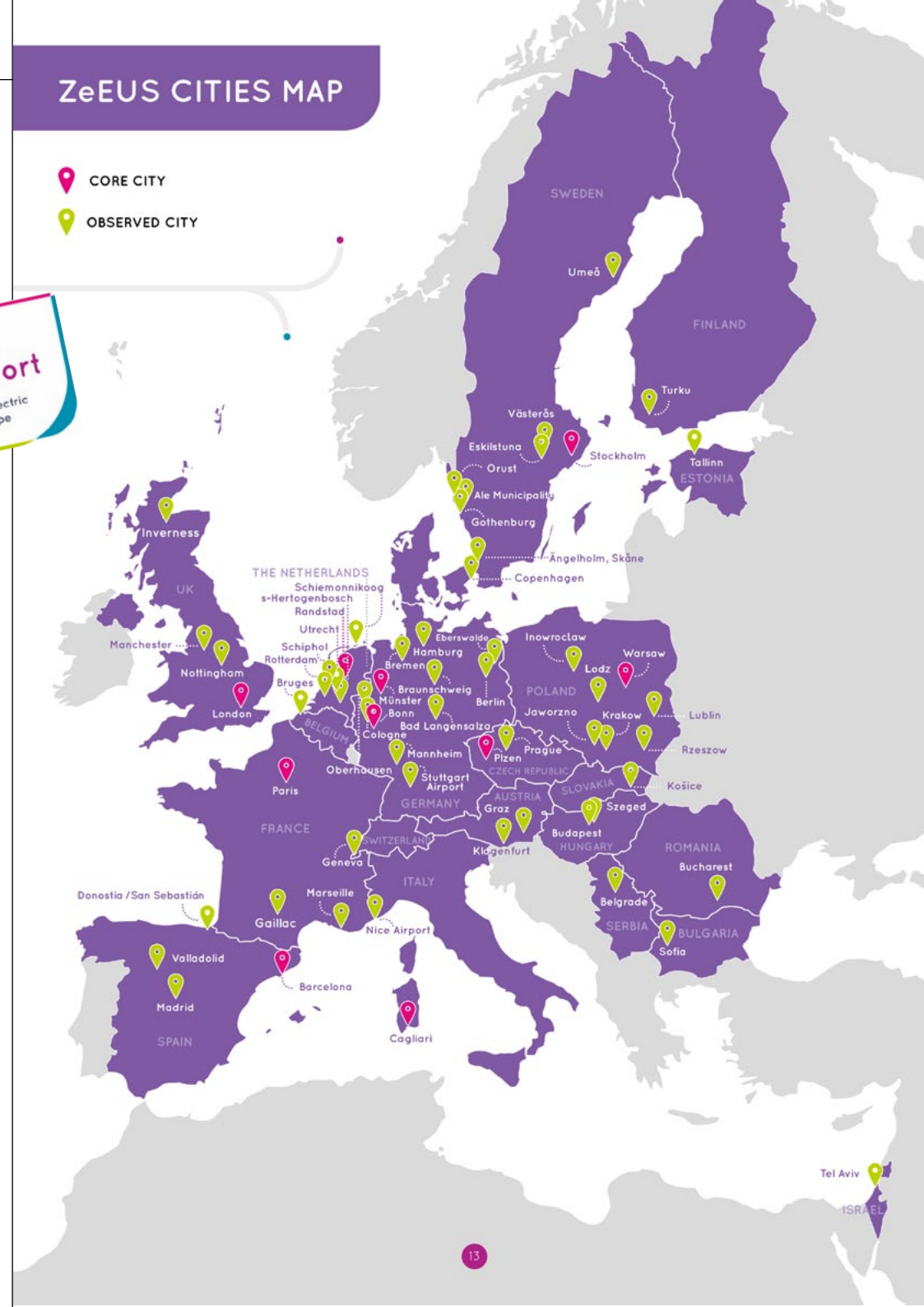
Among the measures taken by the Chinese Ministry of Transport are subsidies and tax benefits to manufacturers of low-emission buses, including subsidies for the purchase of electric buses in 2016. Particularly active in this direction is Shenzhen City, with 4,887 purely electric buses currently in operation and where by the end of 2017, all of the city buses will be fully electrified and the fleet will reach a total of 16,493 ebuses.

Some critical issues still persist. As written in the UITP report "China has been one of the few developing economies worldwide to take initiatives to curb vehicular pollution with the introduction of electric buses. However, the infrastructure for charging electric buses is currently weak in many countries, restricting the growth of the electric bus market".



ZeEUS CITIES MAP

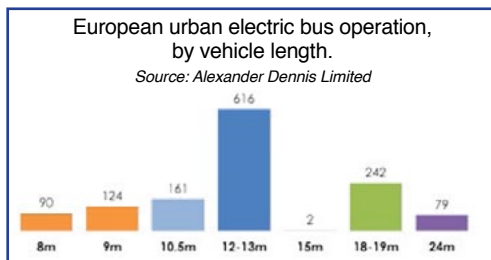
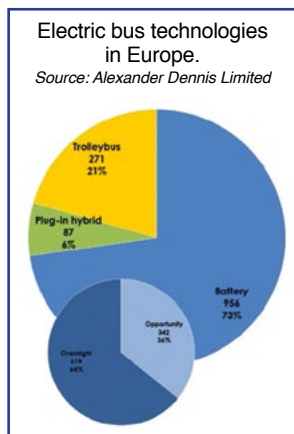
- CORE CITY
- OBSERVED CITY



Europe follows Asia, although at a long distance, with more than 1,300 electric buses delivered or on order. 73% of these vehicles (965 units) are battery buses (the majority provided with overnight charging system), 21% are trolleybuses and 6% are plug-in hybrid buses.

As far as length is concerned, almost half of the vehicles are 12-13 metres long. Most of these buses are circulating in the United Kingdom, representing more than 18% of the total European fleet. Netherlands, Switzerland, Poland and Germany follow with around 10% each.

Countries like France, Germany, Italy and the United Kingdom have set up, or are still configuring, national legal frameworks in order to promote low envi-



ronmental impact vehicles and cut down on energy consumption.

Beyond European borders, in the USA battery buses delivered by 2016 amounted to around 200, most of which are operating in the Los Angeles area, California.

Last year, the US Department of Transportation announced a subsidies scheme of 55 million dollars in order to boost zero-emission buses across the country.

Rather modest the deployment of euses in Latin America and Africa. The City of Cape Town was awarded the invitation to tender,

announced in february 2016, for the purchase of battery electric buses and auxiliary equipment for MyCiTi service, that will start in june 2017.

In North-Africa, the Moroccan company SIE will start the local production of electric buses in 2017, both for domestic and international markets.

In India there are no fully electric buses in circulation, even though pilot projects were carried out in Bangalore in 2014 and in New Delhi in 2016.

In Adelaide, Australia, a solar-electric bus service has been set up. These vehicles need 18 hours of charging and offer 6 hours of operation a day.

And what about future?

As part of the european ZeEUS project, UITP has estimated that by 2020 more than 2,500 electric buses will be operating in 25 european cities involved in the projects of 19 public transport operators and authorities (6% of the fleet composed of 40,000 vehicles).

And within 2025, over 6,100 ebuses are expected to be circulating in other 18 cities (43% of the fleet composed of 14,000 vehicles) thanks to the projects of 13 operators.

As far as offer is concerned, European series production of electric buses should reach full maturity by 2018-2020, according to a market analysis conducted among bus manufacturers reported by UITP.

“The future will see an expansion of electrified bus rapid transit”, concludes the UITP Report, «as well as the growing role of autonomous driving in speeding up the deployment of electric buses”.

The ZeEUS project partners have identified five challenges that must be faced in order to guarantee an increase in the use of electric buses in the future: the higher initial investment for the purchase of ebuses and infrastructure; technology solutions suited for specific local contexts; the need to review electrical current procurement and contractual frameworks; the standardisation of charging interfaces in order to guarantee the interoperability of vehicles; the need to develop trust and cooperation with electricity power producers and distributors, as well as with power grid owners and regulators.

ELECTRIC BUS IN OPERATION IN EUROPE						
Manufacturer	Vehicle type	Length Model (metres)				
		6>10	10>11	12-13	14-18	24
ALEXANDER DENNIS (UK)	BEV		Enviro 400			
ADL/BYD (UK)	BEV		Enviro 200	Enviro 200		
BLUEBUS (FR)	BEV			12m.		
BOZANKAYA (TR)	BEV		Sileo S10	Sileo S12	Sileo S18	Sileo S24
BYD (CN)	BEV	8.7 - 9.6m	10.2 DD	12-12DD	18m	
CAETANOBUS	BEV			e.City Gold	e.Cobus 14	
CHARIOT MOTORS	BEV			ebus 12		
EBUSCO (NL)	BEV			2.1 HV	18M HV	
EVOPRO BUS (HU)	BEV	Modulo				
CARROSSERIE HESS (CH)	BEV				Tosa	
	Trolley				Swiss	Ligh tram
HEULIEZ BUS (FR)	BEV			GX 337	GX 437	
CRRC (CN)	BEV			C12		
HYBRICON (SE)	BEV			12 LF		
IRIZAR (ES)	BEV			i2e	i2e 18	
OPTARE (UK)	BEV	Solo EV	Metrocity Versa			
OTOKAR (TR)	BEV	9m				
RAMPINI (IT)	BEV	Alè E80				
SAFRA (FR)	PHEV		10.5m		12m	
SKODA (CZ)	BEV			Perun 12m		
	Trolley			12m	18m	
SOLARIS (PL)	BEV	Urbino 8.9		Urbino 12	Urbino 18	
	Trolley			Trollino 12	Trollino 18	
SOR (CZ)	BEV		10.4-11.1m			
TEMSA (TR)	BEV	MD9		Avenue		
URSUS BUS (PL)	BEV	8.5 -10m		12m	18m	
	FCEB			12m		
VAN HOOL (BE)	BEV				Exqui.City	
	Trolley				Exqui.City	Exqui.City
VDL BU & COACH (NL)	BEV	Citea LLE		Citea SLF	Citea SLFA	
VECTIA (ES)	PHEV			12m		
VOLVO	BEV			7900		
	PHEV			7900		

BEV = Battery Electric Vehicle; PHEV = Plug-in Hybrid Electric Vehicle; FCEV = Fuel Cell Electric Vehicle.