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# Drivers and barriers in e-bus Practical examples and recommendations

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**Final Seminar**  
**18-20 May 2022 | Hamburg**

# About

# AUTOLINEE TOSCANE

Autolinee Toscane manages the whole public road transport in Tuscany region.



# About

# AUTOLINEE TOSCANE

Connects 11 Provinces, among which:



Firenze



Pisa



Lucca



Sienna



# About

# AUTOLINEE TOSCANE

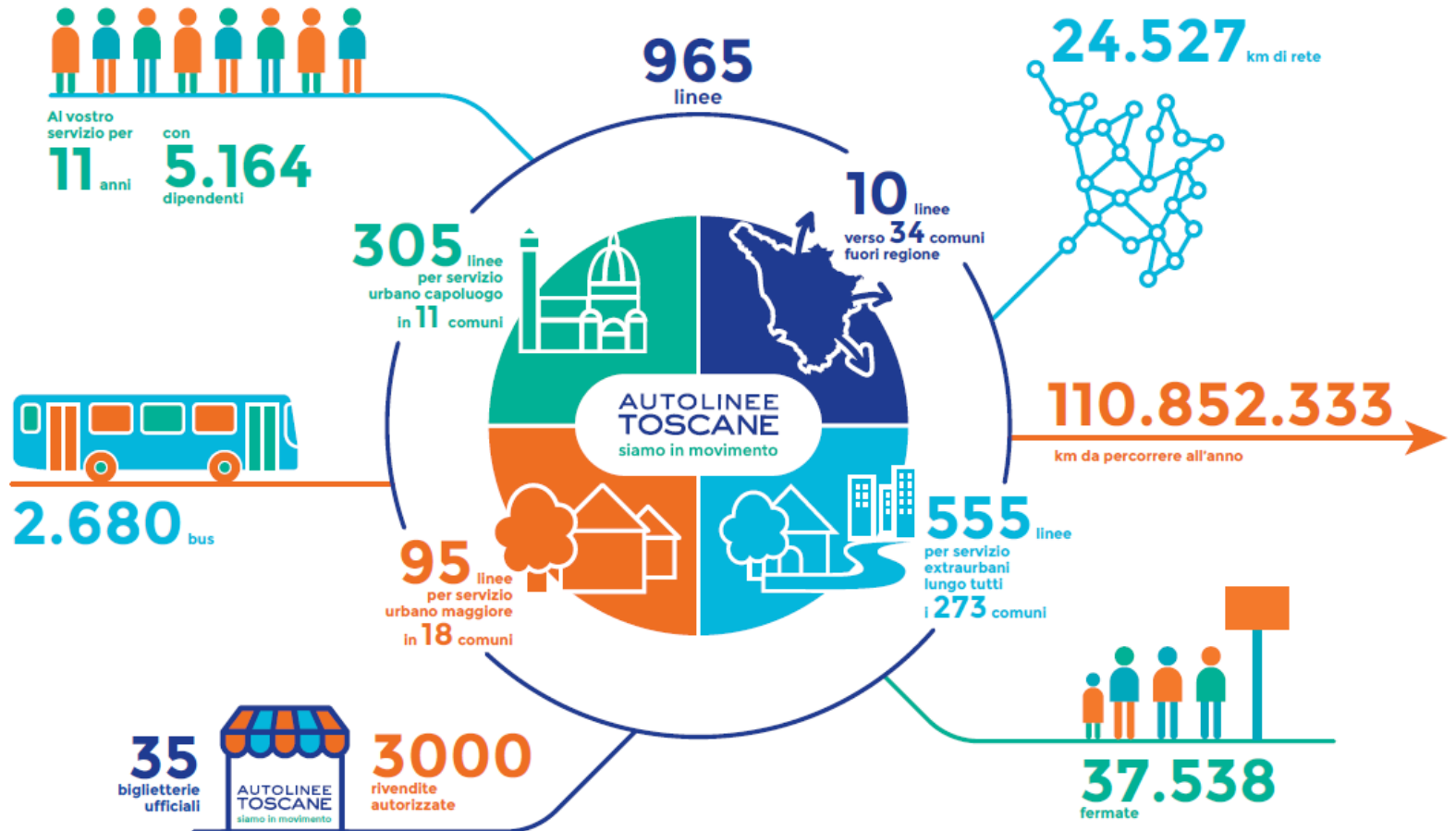
Some relevant numbers:

- 110 millions kilometers per year
- 11 Provinces
- 2680 bus
- (Drivers) staff n° 3714
- (Other than drivers) staff n° 1423
- Total staff n° 5164



# About

# AUTOLINEE TOSCANE




# Drivers and barriers in e-bus

## Practical examples and recommendations

### Definitions:



**DRIVER:** an element (such as a policy or an action) that can help transit agencies and governments initiate, continue or expand their fleet of e-buses



**BARRIER:** an obstacle or circumstance that can prevent transit agencies and/or governments from initiating, continuing or expanding their fleet of e-buses

## Technological:

Title:

E-bus is great for low commercial speeds because no DPF regeneration is needed

### Lucca



Example n°1: in LUCCA historical centre the commercial speed is 5 km/h

E-bus is excellent for **low commercial speeds** where the Euro VI diesel buses cannot regenerate the **DPF, (Diesel Particulate Filter)** or the methane buses have high engine temperature requiring greater stops or forced regeneration at workshop

Forced regeneration at workshop

High costs and reduced efficiency



## Technological:

Title:

E-bus is great for low commercial speeds because no DPF regeneration is needed

### Lucca



Solution : LUCCA mini e-bus into Lucca centre

Encourage the deployment of small electric buses suitable to carry people in the historical urban centers, then transfer the know-how from standard 12 meter e-bus to small 7 meter e-bus



## Technological:

Title:

**E-buses reduce noise nuisance in the bus depot**

### Lucca



Example n°2: Lucca **Noise disturbances to homes near bus depots**

The **low noise impact of e-buses** allows to substantially reduce noise disturbances to homes near **bus depots**. In Italian cities, bus depots are frequently engulfed within the metropolitan area and civil lawsuits from sound pollution are on the rise. **The e-bus is a smart solution to reduce the sound pollution in critical areas, thus contributing to e-bus acceptance by residents**

## Technological:

Title:

E-bus helps reducing noise nuisance in a bus terminal

### Florence



Example n°3: Firenze S.M.Novella Terminal bus **noise disturbance**

The **low noise impact of e-buses** allows to substantially reduce noise disturbances to residential buildings near a bus terminal.

**The e-bus is a smart solution to reduce sound pollution in critical areas**

## Technological:

Title:

Reduction of diesel consumption | reduction of spill risk



1.000.000 km



400.000 lt diesel

Example n°4: estimated diesel consumption for the useful life of the bus

Reduction of diesel consumption contains the possible spills during the storage phase of the tanks or during bus refueling. In Tuscany alone, 50 million liters of diesel are consumed every year



**Versato gasolio, finisce in mare**

Il Comune: dall'autocisterna ribaltata fuoriusciti 14.000 litri di carburante  
Corsa contro il tempo per tamponare il danno con metri di panni assorbenti

## Technological:

Title:  
Reduction of pollutants from e bus maintenance



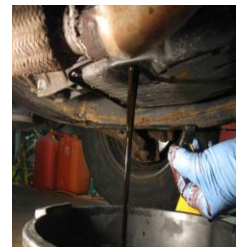
maintenance needs



60 oil filters



1000 lt engine oil



Example n°5: reduction of pollutants from the maintenance of endothermic engines

Reduction of 1000 liters and 60 filters for each e-bus versus a diesel bus

# Drivers and barriers in e-bus

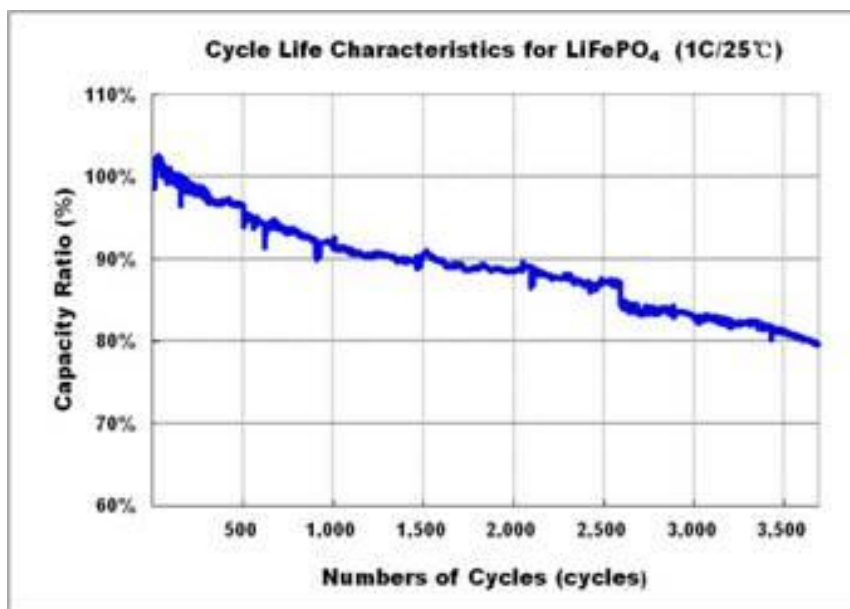
## Practical examples and recommendations



**BARRIER:** an obstacle or circumstance that can prevent transit agencies and/or governments from initiating, continuing or expanding their fleet of e-buses

## Technological-Economic:

**Title:**  
**Battery pack performance, theoretical level confirmed only by the real use of the bus**



The main risk in an e-bus tendering process is to involve additional cost for changing a battery after 6 years only.

This cost is not covered by Public capital, therefore it will be a direct risk for the operator (unwanted cost).

For AT we estimate for the year 2025-2026 at least 14 Millions of Euro alone to substitute batteries.

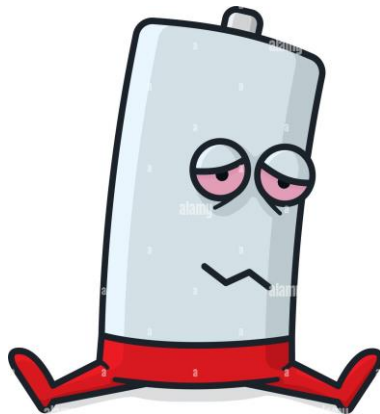
To avoid such unwanted costs we are working on tenders for promoting formulas different from those in the standard tendering process.

**This efficiency will be deteriorated by improper habits of drivers in mismanaging air cooling in summer or heating in winter, thus resulting in an improper utilisation of electric appliances: for example interior lighting or ventilation.**

## Technological-Economic:

### Title: The market for traction batteries

The market for traction batteries of second life is still in its infancy, as the e-bus manufacturers at present are only responsible for battery collection and disposal



In addition, second life projects concerning LTO batteries require the e-bus to use an opportunity and not an overnight charge (source: Autobus web of April 2022)

# Barrier in e-bus Practical examples and recommendations

## Service management :

Title:

### Service design

The theme of service organization is central:

- More bus changes during services
- Opportunity charging and overnight charging dependent on planning structure
- Planning tight schedule is risky in case of delays, breakdowns and failures
- Different bus types cannot always be switched (combi loading and bus)



Nowadays there are no developed software yet to arrange bus-shifts based on the actual autonomy (battery charge) of electric vehicles.

**A smart E service device is needed to plan in real time the use of the most appropriate bus based on actual charging level**

Such need is utmost felt by those operators having already purchased a large fleet of e-buses with overnight batteries.



## Service management :

### Title:

**Plug-in or out operations are passed on to technical personnel**, as drivers are reluctant to carry out such operations because of possible associated recharging errors. This entails more time needed for duplication of roles, possible delays or shift rearrangements and consequent costs.



The mayor of Milan city, Mr. Sala, at the charging station for electric vehicles in San Donato (LaPresse)

# Barrier in e-bus Practical examples and recommendations

## Service management :

### Title:

In Italy, recharging installation using outdoor columns are not acceptable to personnel unless a canopy cover is provided



# Barrier in e-bus Practical examples and recommendations

## Environmental:

Title:

**Ban on pantograph installations as street new fittings**

Cities that in the past did dismiss trolleybuses or trams will never accept new installations of pantographs in the historic centre.

Example of Pisa years ago, with trolleybus.





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# Thank you!

Questions welcome



*Project smedia*