



EUROPEAN CITIES AND REGIONS NETWORKING
FOR INNOVATIVE TRANSPORT SOLUTIONS



3IBS, THE INTELLIGENT, INNOVATIVE, INTEGRATED BUS SYSTEM



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- Project Overview
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- A step forward in the EU funded research to raise the image of urban bus systems

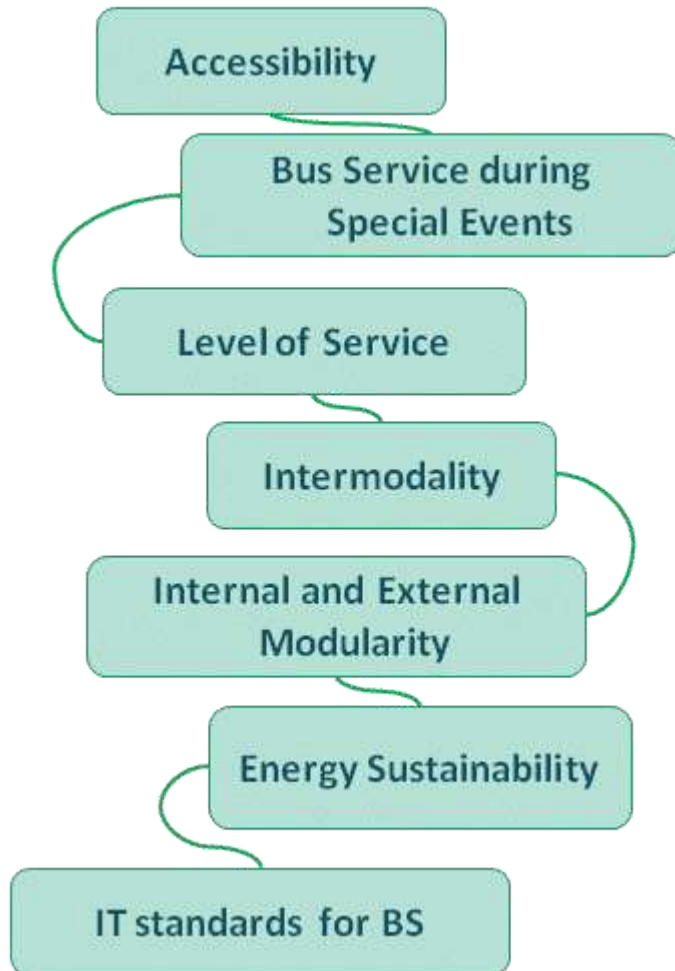


3iBS

≈ 50 companies collaborate to reach this goal



Logical approach



Recommendations for
implementation of BS solutions



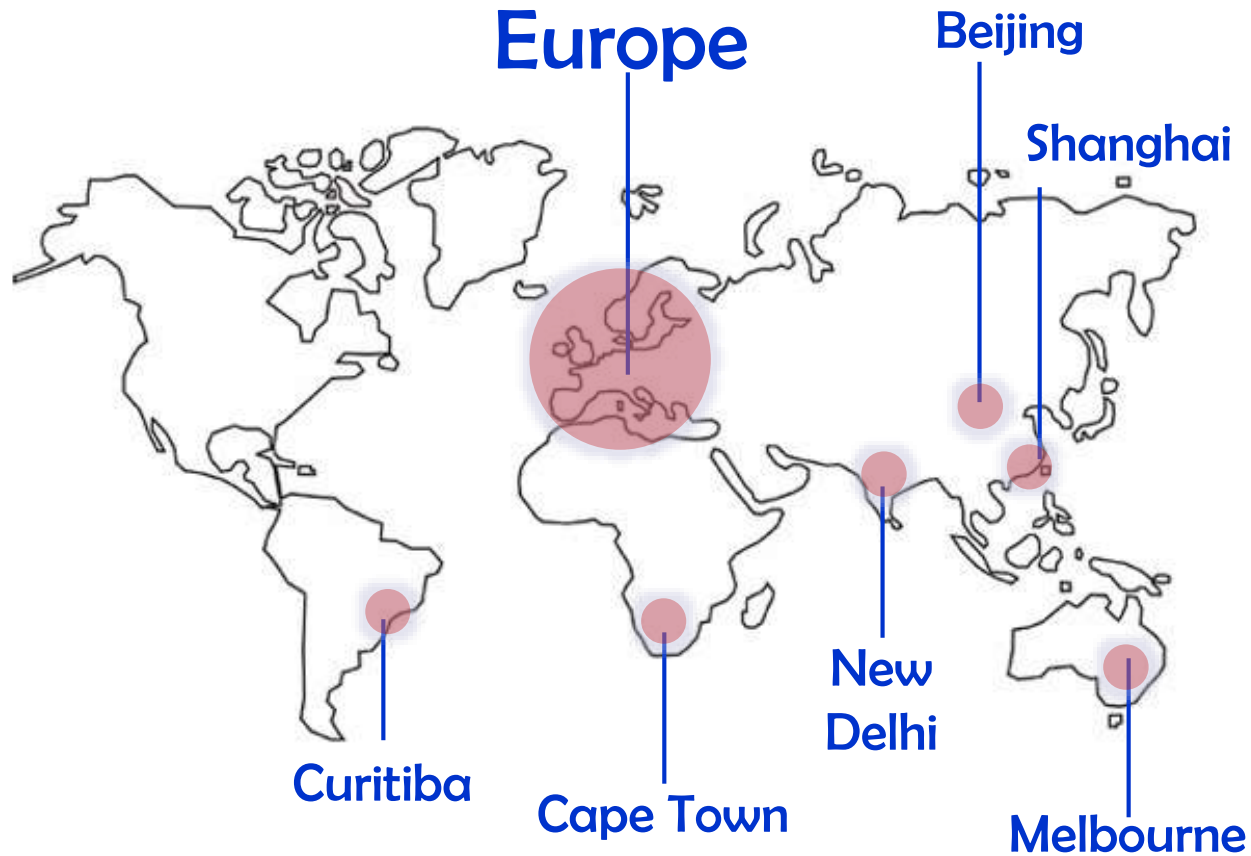
Innovative BS Roadmap



Study Cases

- ≈ 30 SC + experiences from EU Projects

- AENEAS
- CIVITAS
- MEDIATE
- NICHES+
- STADIUM
-

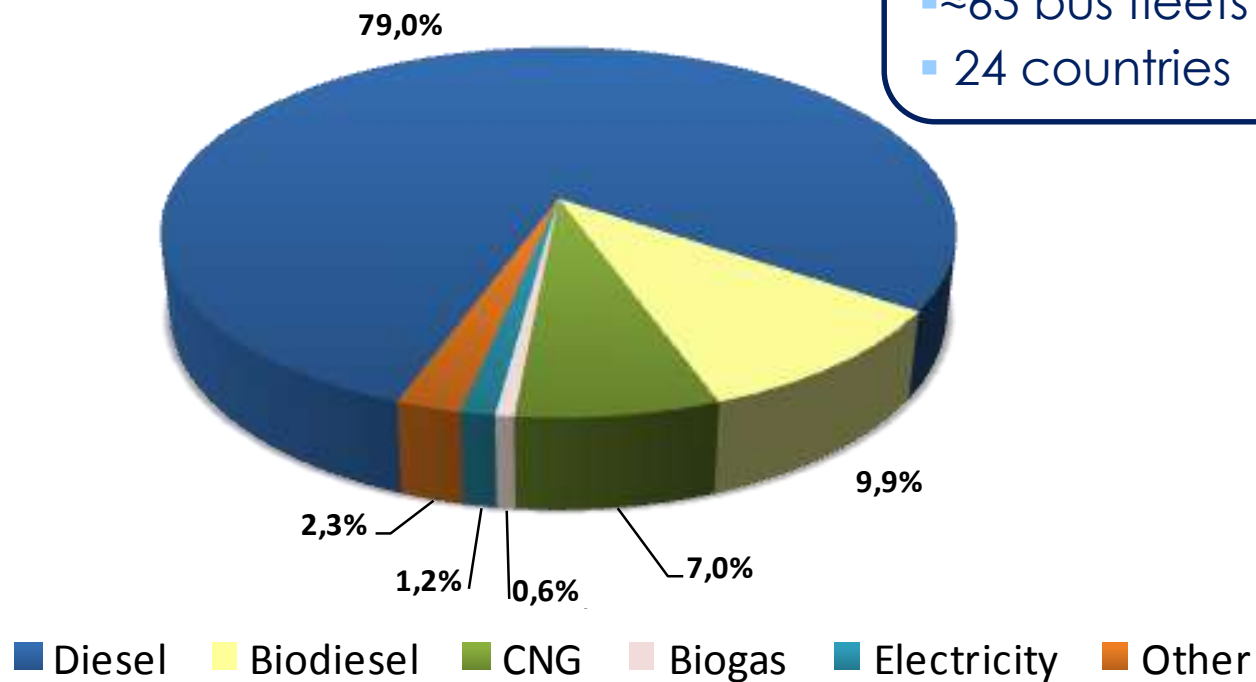


Future trends

- Fuel & energy:
current fleet

Survey on EU Bus Systems

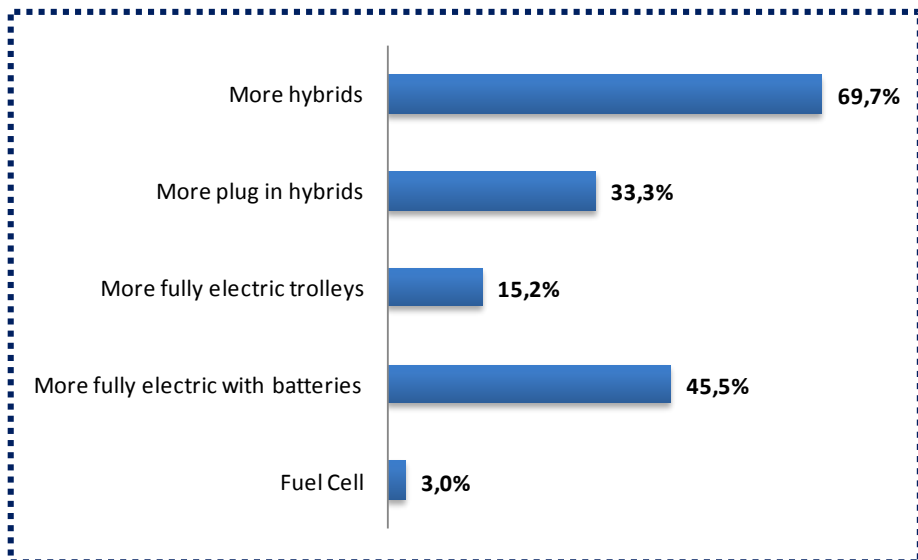
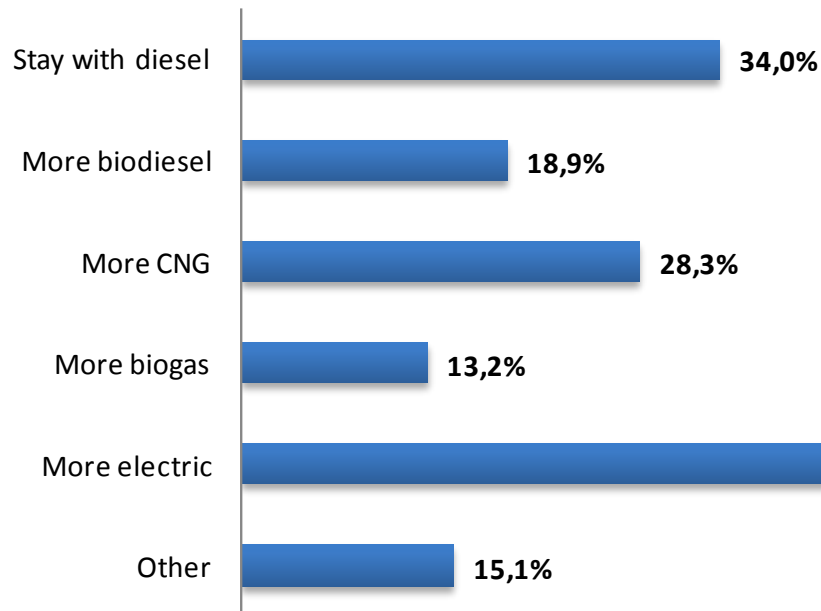
- ≈70.000 buses
- ≈63 bus fleets
- 24 countries



Respondents distribution according to future plans to change propulsion system ratio

Future trends

- Fuel & energy:
future fleet



Respondents distribution according to future plans to change propulsion system ratio



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ENERGY SUSTAINABILITY IN THE URBAN BUS NETWORK

Mario Canet Sabate – TMB



www.polisnetwork.eu/2014conference

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Objective

- Overview on different measures for increasing the energy efficiency of urban buses

Analysis of study cases on **intelligent gearboxes**, **eco-driving** and **hybrid propulsion** systems

New methodology for **measuring energy consumption** of hybrid vehicles based on a new **SORT** test

Characterization in a **real network**

Eco-driving

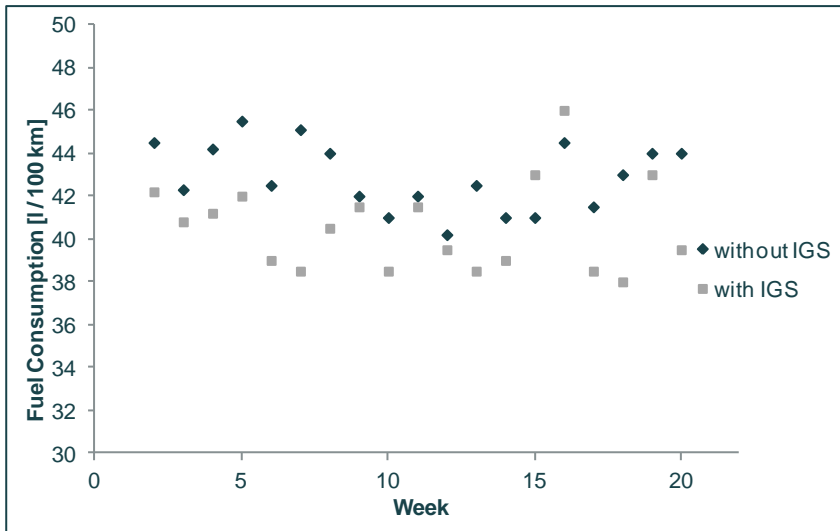
- Tests in 2 cities in France and the Netherlands
 - 6 buses equipped with an eco-driving system
 - buses running under real operational conditions
 - ≈ 390.000 km
 - “before/after” data an analysis
 - 16 to 26 months of data collection
- fuel consumption decreases between **8 and 13,5%**
 - tests on a larger fleet and over a longer period needed
 - variations due to driving styles place the emphasis on the need to have drivers properly trained to “ecodrive”.

Advanced gearbox

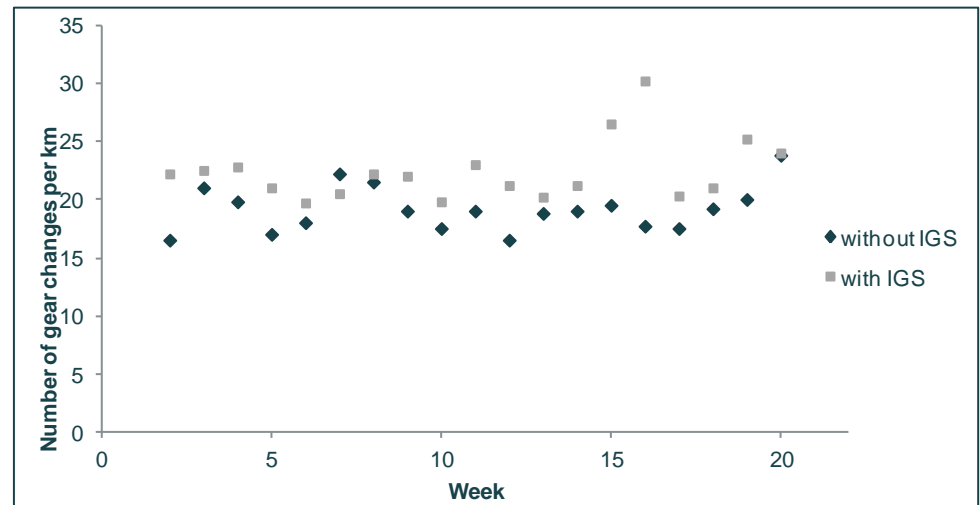
- Tests in Cagliari (Italy) - Replacement of 70% of the fleet with vehicles with advanced equipments
 - ZF EcoLife new-generation gearbox
 - 10 and 12 m buses
 - tests procedure based on the UITP's SORT 2 cycle
- fuel economy improvement:
 - ❖ between **6 and 14 %** for **10m buses**
 - ❖ between **8 and 18%** for **12m buses**
 - More tests in France confirmed advanced gearboxes efficiently influences the fuel consumption of buses **(-6,8%)**.



Advanced gearbox



Increasing the number of gear changes, the gearbox and the software strategy reduces the fuel consumption



Fleet renewal and network re-design

- Barcelona study case

Impact on energy consumption and emissions of actions impacting **fleet technology** and **network design**

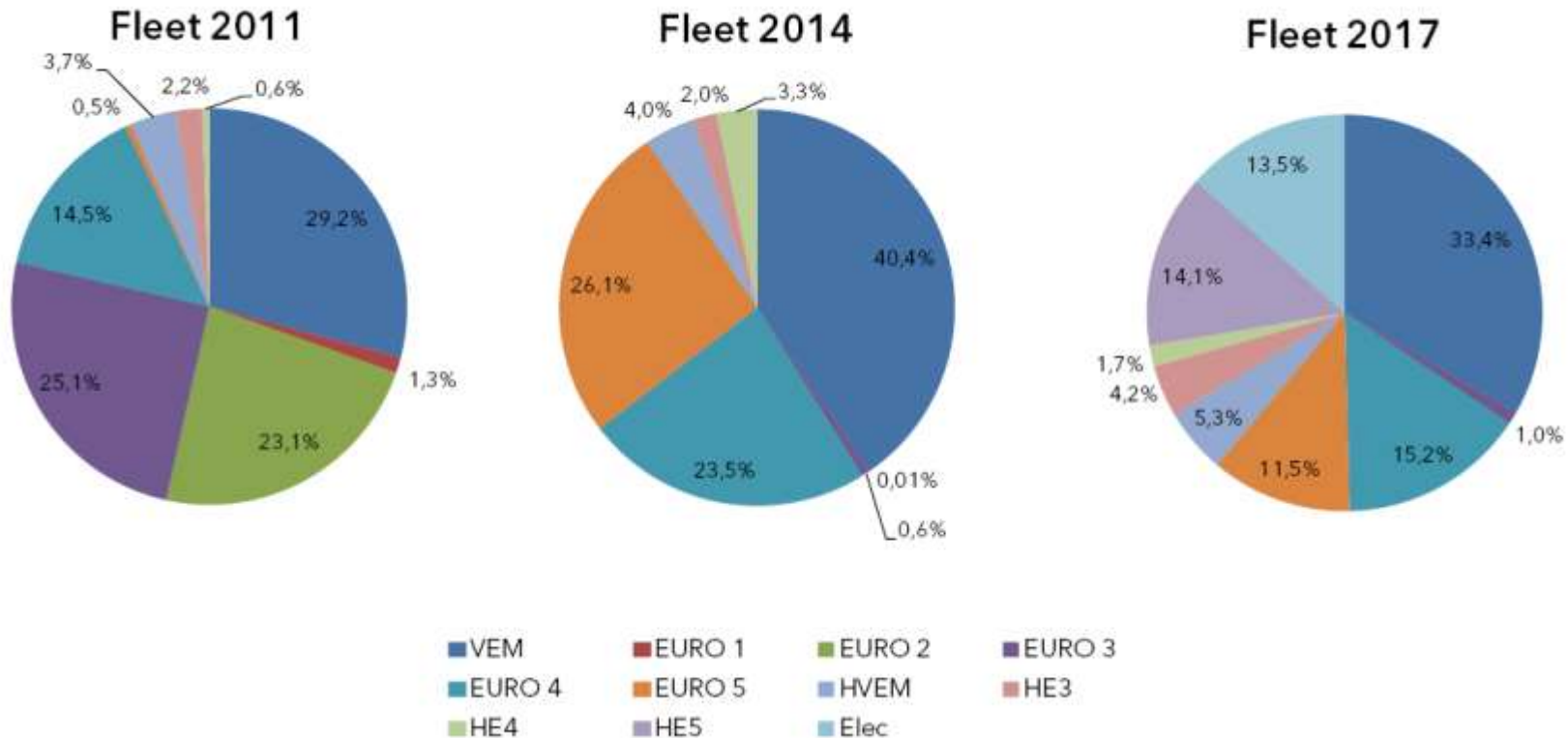
Scenario	FLEET	NETWORK	R/H	HYPHOTESYS
1	2011	Radial	Real	
2		Partial Orthogonal	Hyp.	network partially changed
3		Total Orthogonal	Hyp.	network totally changed
4	2014	Radial	Hyp.	fleet evolution
5		Partial Orthogonal	Real	fleet evolution/ network partially changed
6		Total Orthogonal	Hyp.	fleet evolution/ network totally changed
7	2017	Radial	Hyp.	new fleet
8		Partial Orthogonal	Hyp.	new fleet/ network partially changed
9		Total Orthogonal	Real	new fleet/ network totally changed

Network re-design



- Orthogonal and diagonal routes
- Easier to use
- Faster
- More frequent
- More connected

Fleet evolution

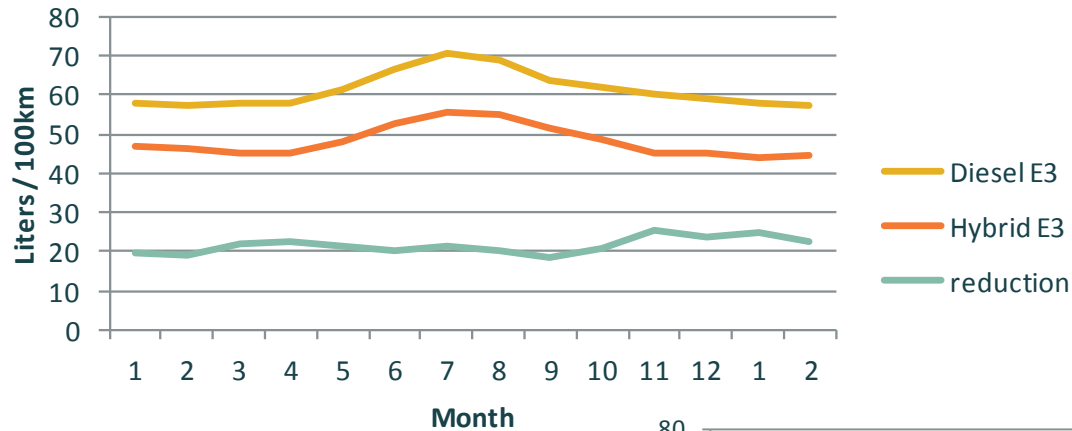


- **New hybrids**
- **Retrofitting buses to hybrid** (70 diesel and 13 CNG)
- **Increasing CNG fleet** (forecast 2015:500 buses)
- **CRT and NOx filters** (from Euro 2/3 to Euro 4/5)

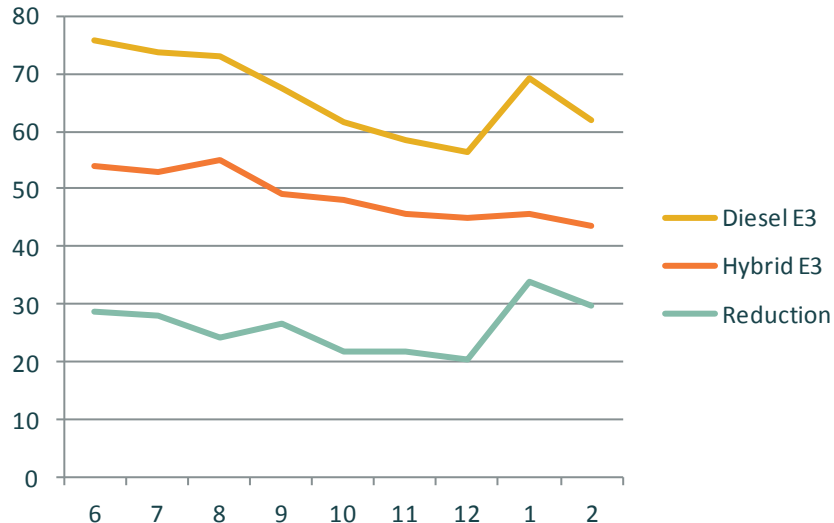


Fleet evolution

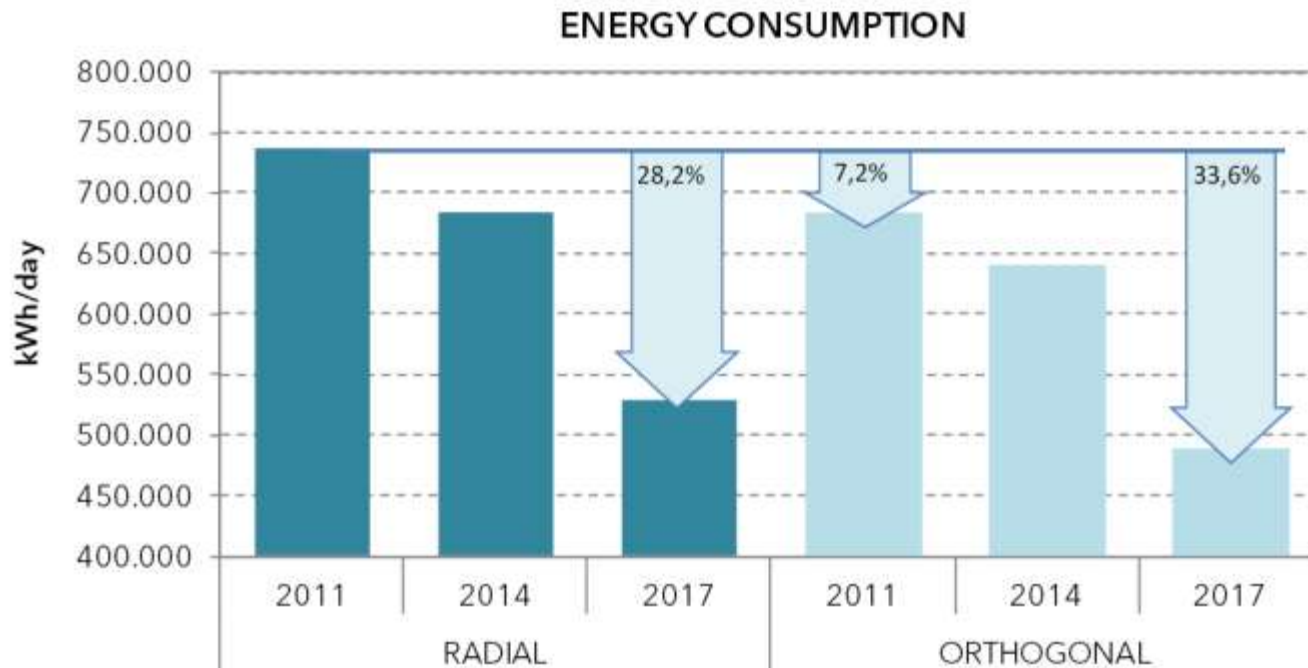
- Retrofit experience



▪ Hybrid technologies saves 20% of fuel consumption in a low commercial speeds



Energy Savings



- **28, 2 %** of reductions: only due to fleet improvements.
- **7,2 %** of reduction: only due to network improvements
- **33, 6%** both affects together (fleet and network)

Emissions

Emissions Reduction	NOx	PM
FLEET (2011-2017)	65,3%	73,7%
NETWORK (2011-2011)	10,1%	8,8%
FLEET + NETWORK (2011-2017)	68,8%	75,6%



THANK YOU FOR YOUR ATTENTION

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