



ACTUATE FINAL CONFERENCE
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actuate



3IBS

THE INTELLIGENT, INNOVATIVE, INTEGRATED BUS SYSTEM



Michele Tozzi – 3iBS Project Manager - UITP

CONTENTS

- Project Overview
 - Scope
 - Logical Approach
- Energy efficiency
 - Eco-driving



3iBS

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



- Bus has a major role to play

2014 UN CLIMATE SUMMIT

UITP's members commitment = -40% emissions by 2025

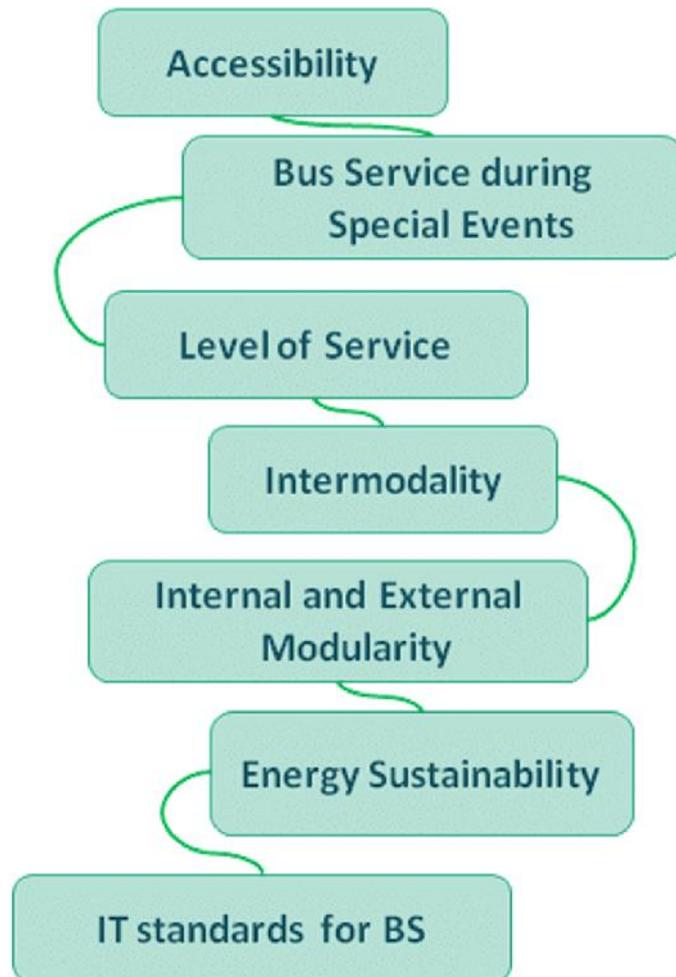
80+
cities

110+
actors

351
climate
actions

- 30% bus-related actions
- 30+ tests of hydrogen/electric buses
- 10+ test on fuel-efficient driving
- 15+ new bus lines/BRT

3iBS Logical approach



Recommendations for implementation of BS solutions

Innovative BS Roadmap

Eco-driving: test and results

- Tests in 2 cities in France and the Netherlands
 - 6 buses equipped with an eco-driving system
 - buses running under real operational conditions (passenger load, traffic, stops at stations)
 - 400.000 km
 - “before/after” data an analysis
 - 16 to 26 months of data collection

Eco-driving: test and results

- Eco-driving system tested

- in-cab visual interface showing a **real-time feedback** to the driver
- calculation based on data coming from the **BUS-FMS interface & GPS receiver**:

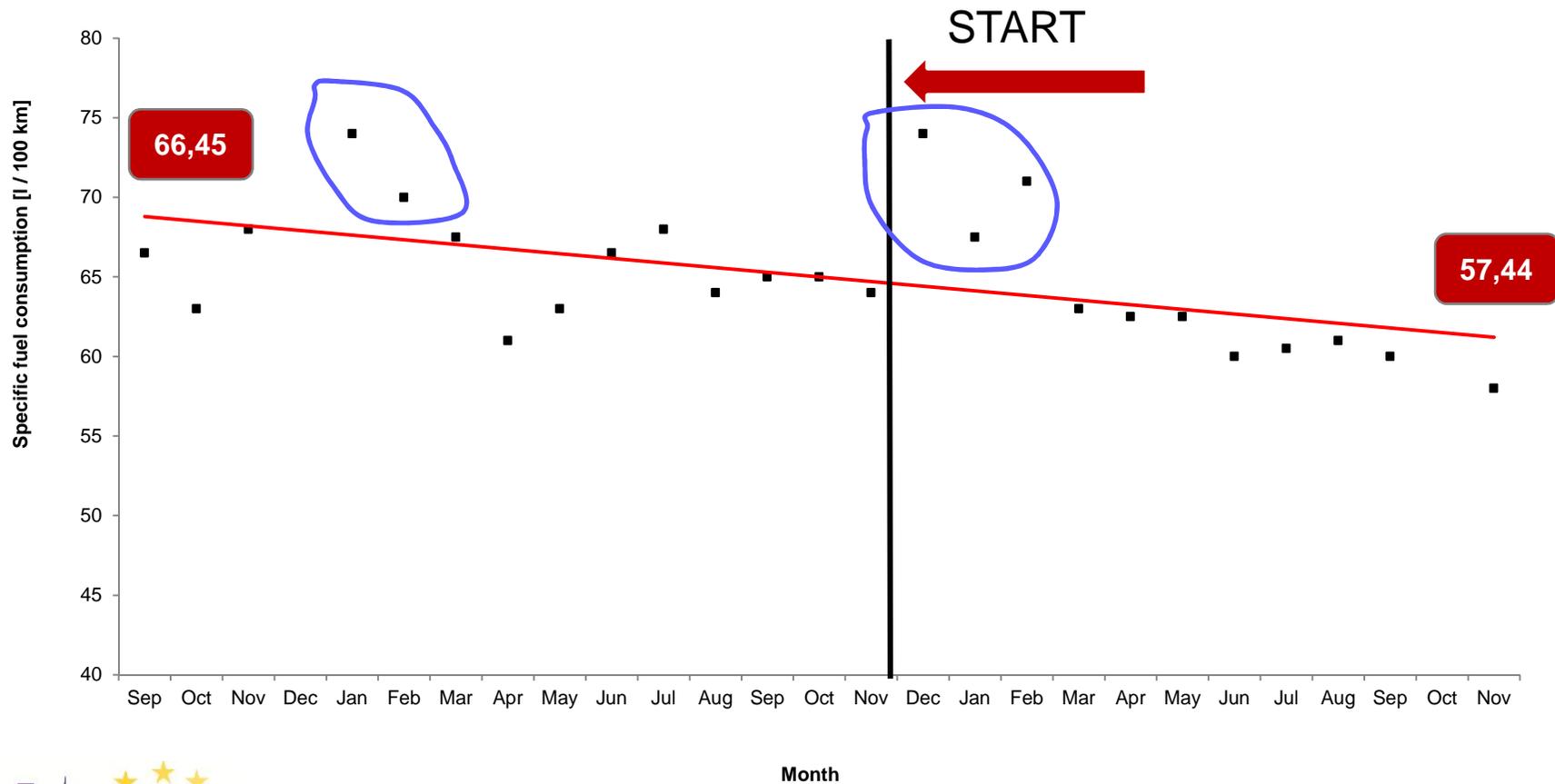
VEHICLE DATA: speed, engine speed, gearboxes changes, consumption; etc..

LOCALIZATION DATA: topology of the road



Eco-driving: test and results

- Fleet of 4 buses – 26 months: results



Eco-driving: test and results

- Fleet of 4 buses: seasonal effect

Month	Fuel consumption [l / 100 km]	Month	Fuel consumption [l / 100 km]
September-0	66.45	November+1	64.95
October-0	63.45	December+1	74.15
November-0	68.51	January+1	67.39
January-0	74.90	February+1	71.89
February-0	71.52	March+1	63.26
March-0	67.01	April+1	62.51
April-0	62.51	May+1	63.07
May-0	63.82	June+1	60.44
June-0	66.26	July+1	61.76
July-0	68.70	August+1	62.51
August-0	63.82	September+2	60.82
September+1	65.89	November+2	57.44
October+1	66.26		

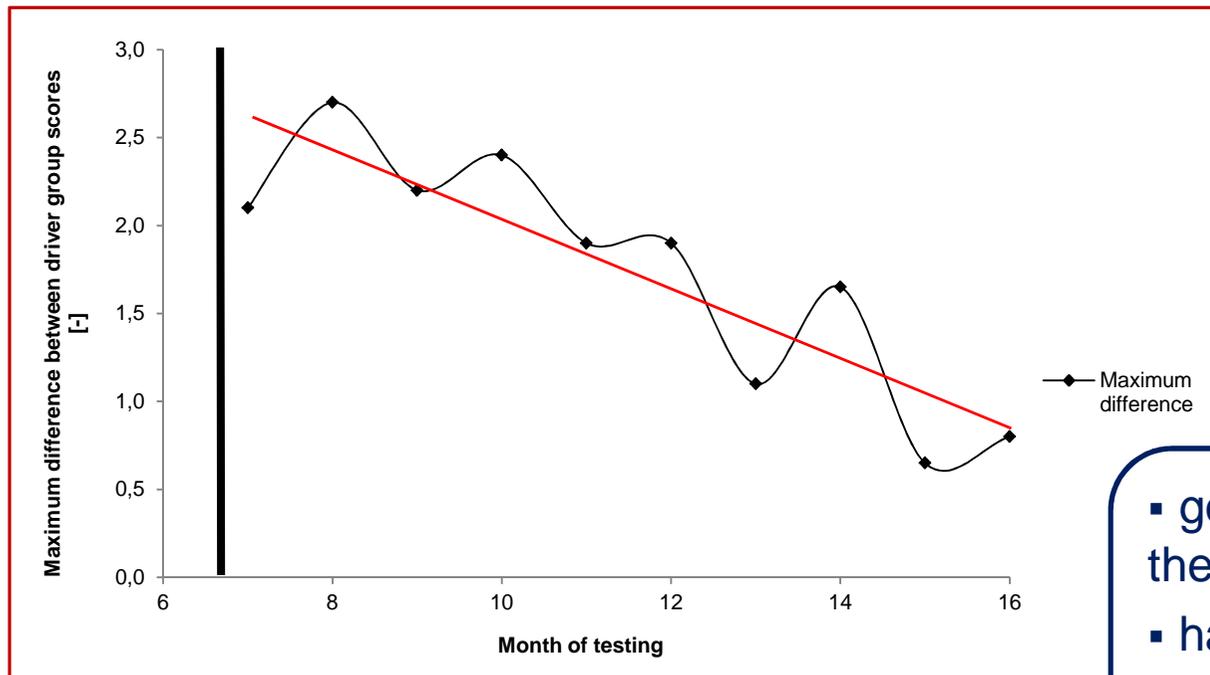
M: -10%

Min:0%

5,7%

Eco-driving: test and results

- Fleet of 2 buses: individual driving behaviour



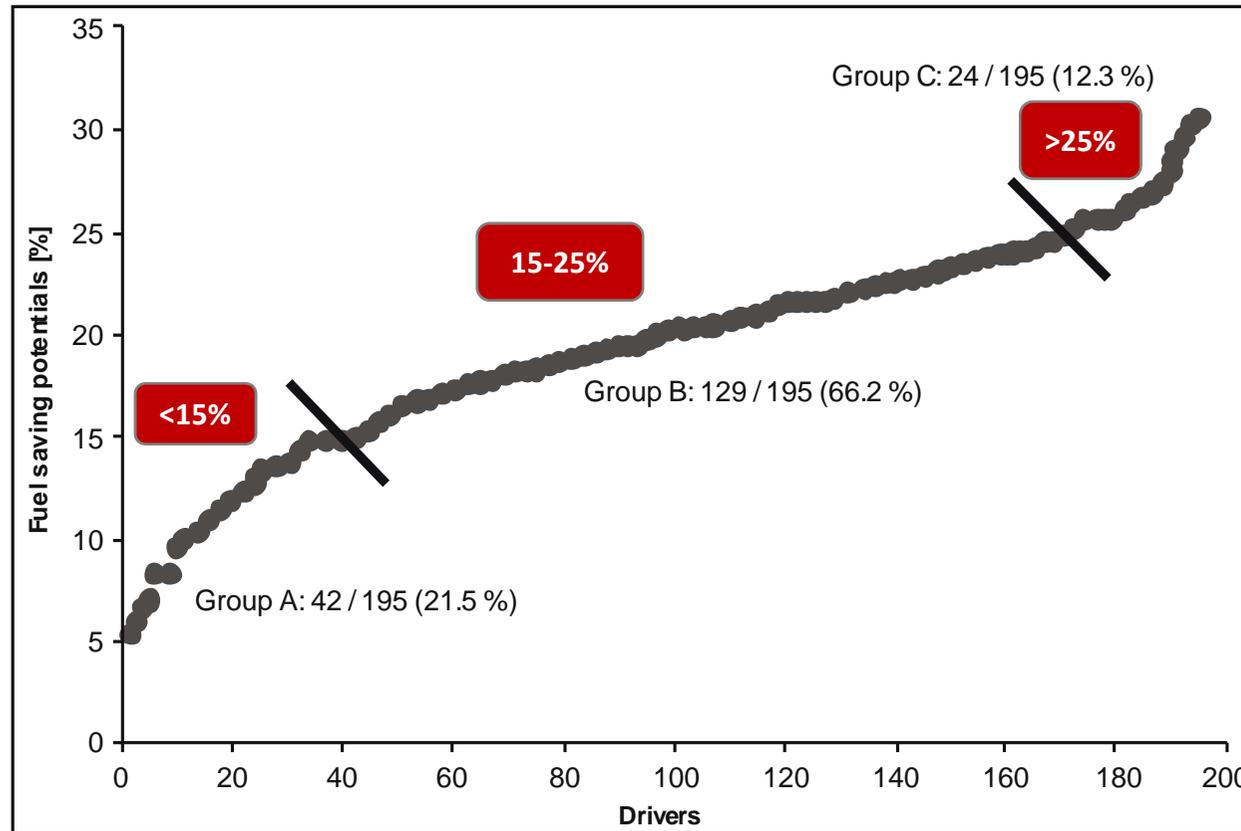
C = bad eco-score
B = medium eco-score
A = good eco-score



- good results especially on the poor eco-score drivers
- habituation effects
- homogenization of the driving styles

Eco-driving: test and results

- Potential fuel saving



Eco-driving

- **Conclusions**

The tests show a fuel consumption decrease between 5 and 10% depending of the PT network, vehicles and weather conditions.

- **Reliability of the results**

Eco-driving systems have to be validated on larger fleets and longer periods (seasonality effect).

- **Durability of the results**

The **habituation effects** decrease the initial fuel saving results after a while. Key aspect to guarantee efficient and long term results is the monitoring and controlling.

Monitoring and/or controlling?

Monitoring without associated control seems inefficient.

Eco-driving

- Final Considerations

- **Avoid «excess of technology».**

Look at smart ergonomics (HMI, HUD, tactile...)

- **Understand drivers thinking, behaviour and motivations**

Variations due to driving styles place the emphasis on the need to have drivers properly trained to “ecodrive”.

Human behaviour understanding is always key to create the right motivation. (monetary or non-monetary incentives)

Eco-driving

- Final Considerations

- Smart drive

Emphasise the correlation between eco-driving and **safety** , **comfort** and **customer satisfaction**. This could be the best motivation tool for the drivers behaviour.

- Is driving automation a solution?

like considered in cars field?

- Training protocols, retraining, use of simulators and/or cameras

Return of experience could be discussed between leading operators to rank the most efficient tools.



**THANK YOU FOR
YOUR ATTENTION**

michele.tozzi@uitp.org

www.3ibs.eu

