

ECO-Drive: An Energy Strategy Project

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Outline



- The road to the 'Carbon & Energy Strategy'
- ECO-Drive, a sustainable development project
- Ecodrive initiatives in the STIB
- Focus on the ECO-Drive Metro
 - Training
 - Technical means and measures
 - Testing
 - Implementation
- Evolution of metro consumption
- Conclusions

The Road to the 'Carbon & Energy Strategy'



UITP charter on sustainable development

2003

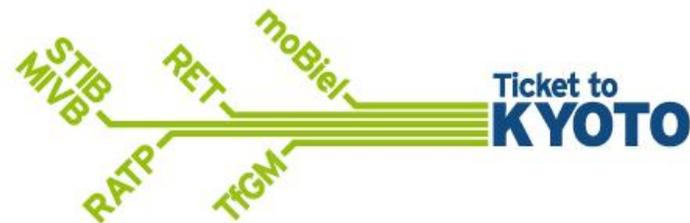


Master plan for sustainable development

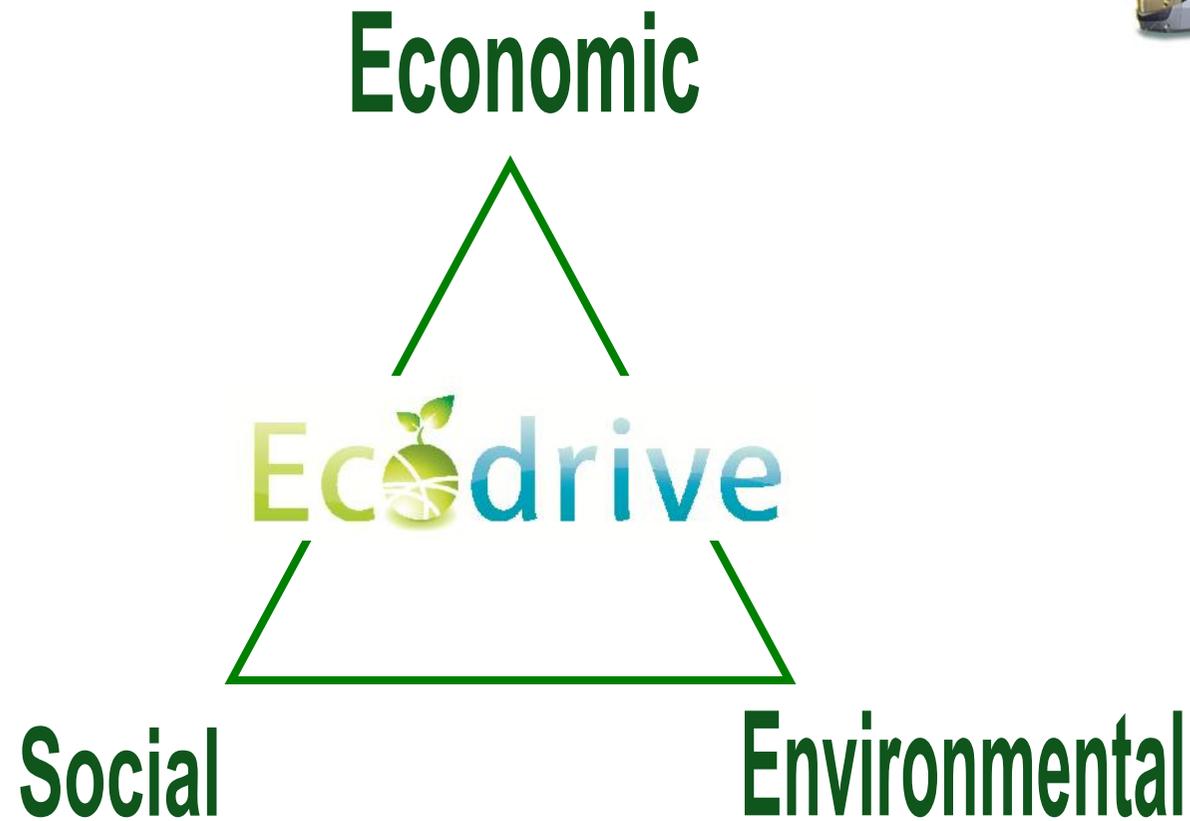
2006-2010



Company plan
2008-2012



ECO-Drive: a sustainable development project



Eco-Driving initiatives in the STIB



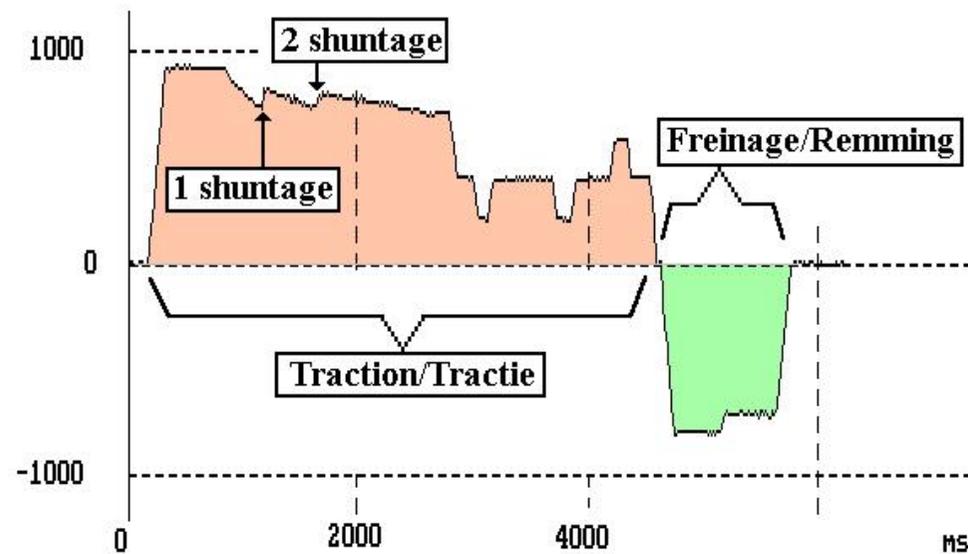
- Eco-Drive Metro
 - Implemented in 2008-2009
- Eco-Drive Bus = 'SecureDrive' Project
 - Implementation in progress
 - Indicators and training to bus drivers
- Eco-Drive Tram
 - To be implemented



Eco-Drive Metro: Pre-feasibility study



- Tractabel engineering study: identifying key factors in energy consumption.
 - Braking energy recovery
 - Acceleration and deceleration rate
 - Max. speed
 - Vehicle mass



ECO-Drive Metro



2 issues

Network control based on 'Just-In-Time' schedules.

Wish to diminish the energy consumption



Combined solution

Introduction of an extra train
&
Decrease of maximum speed



Ecodrive



Technical means & measurements



- ✓ Specific signalization in the network
- ✓ Installation of indicators in the stations
 - ✓ Mode ECO
 - ✓ Mode MAX
- ✓ Onboard measurement device from National Instruments during the measurement campaign
- ✓ Substations equipped with energy meters (Long-term observation)

Training



Comfort

Ecology



Savings



- **Staff: 300 drivers**
- **50 working days (1h/driver + organization)**
- **Refresher course: 2/year**

Eco**drive** → **Driving Standard**



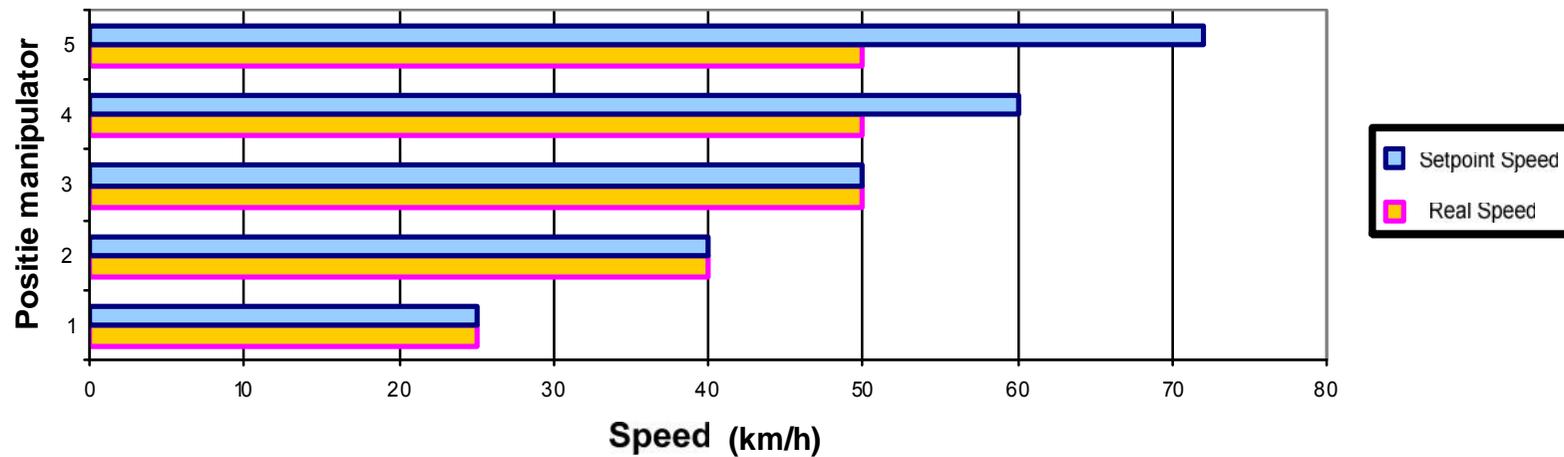
Test-Phase



Phase 1 : ECO-Drive 50 - Line 2 - February 2008

Principle : $V_{\max \text{ ECO-Drive}} = 50 \text{ km/h}$ - In case of delay, $V = V_{\text{setpoint}}$

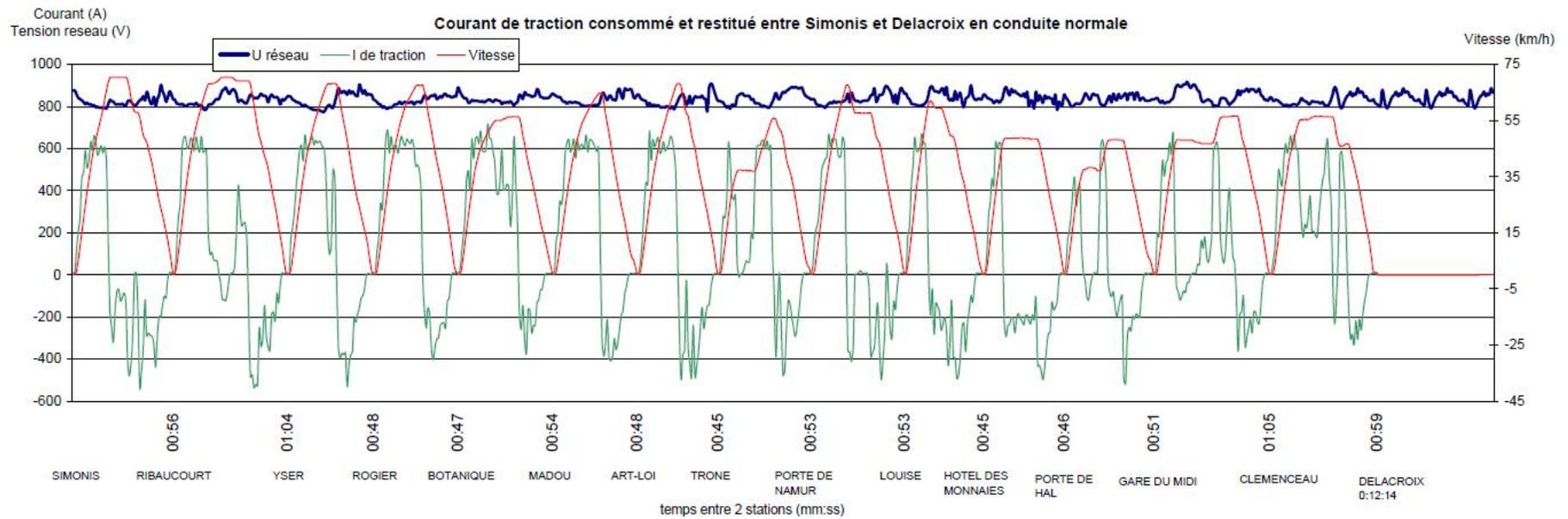
ECO-Drive Lijn 2



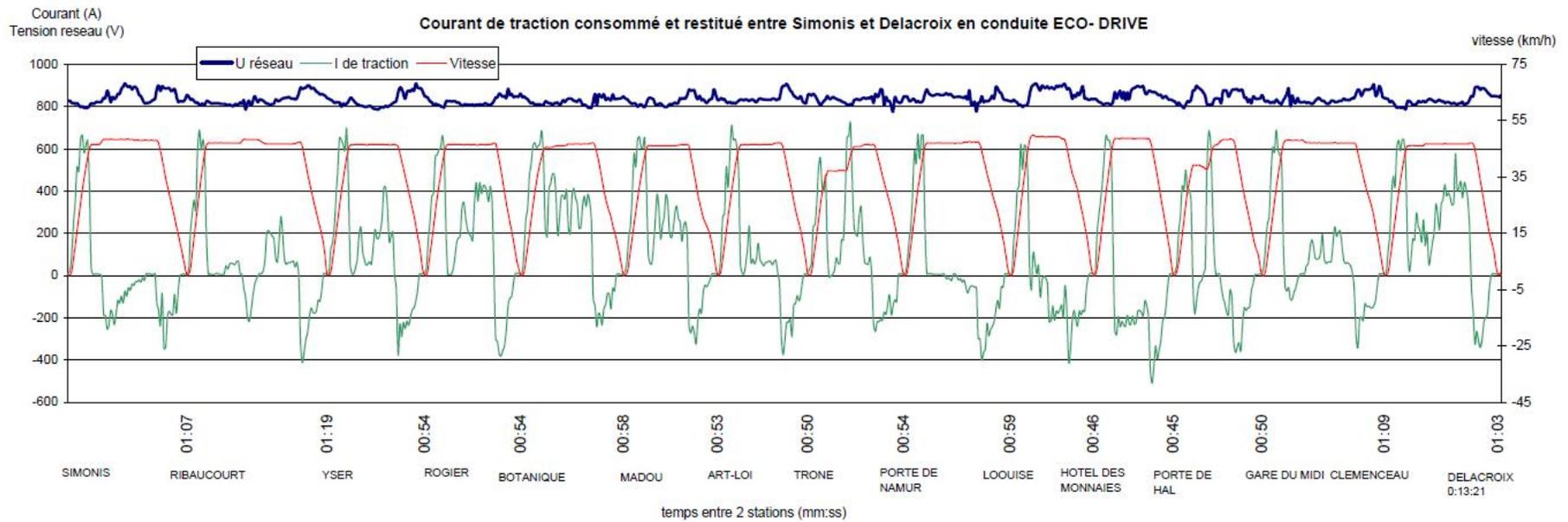
Results in 12 months : Consumption reduction= -10,6 %



Test-Phase: Normal Driving Example



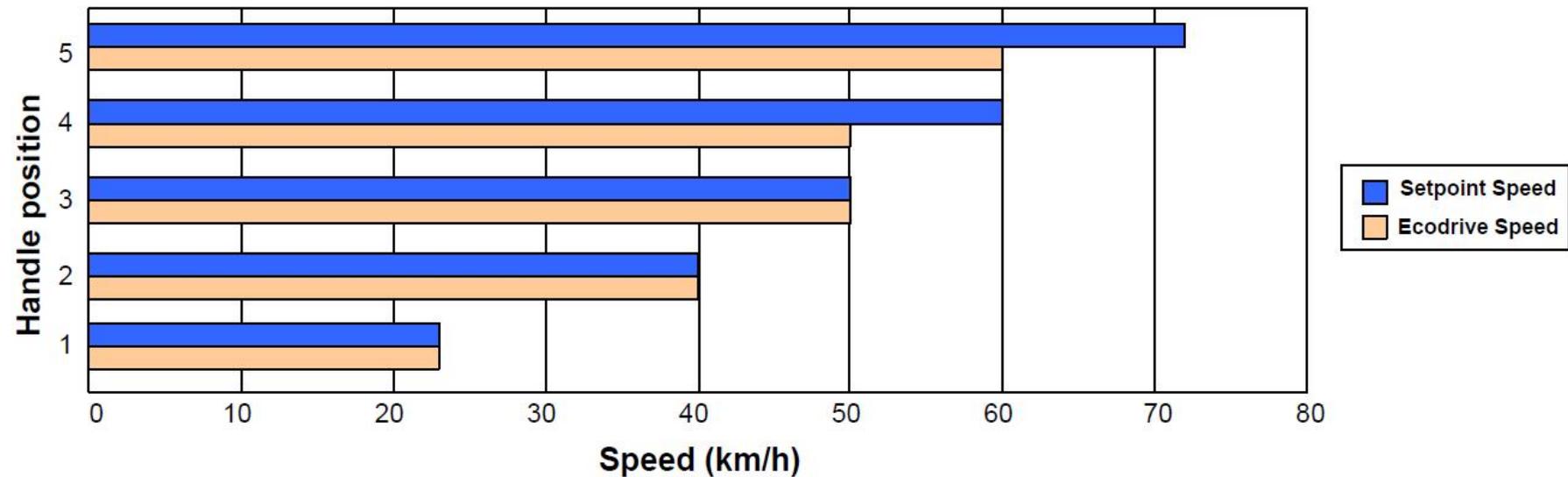
Test-Phase: ECO Driving Example



Implementation Phase



- Implementation in lines 1, 2, 5 & 6 - From April 2009
- Principle : One 'handle position' below



Eco-Drive Impact



- Reduction of energy consumption (11%)
- Positive impact for the drivers (less stress)
- Globally less delay on the network
- Improved metro regularity
- Passengers feel more comfortable (less vibrations & shorter accelerations)
- Less material wear

Eco-Drive Summary



Energy saved	10.5 GWh/year
Money saved	856,000 €/year
CO ₂ emissions avoided (tons)	1,960 TCO ₂

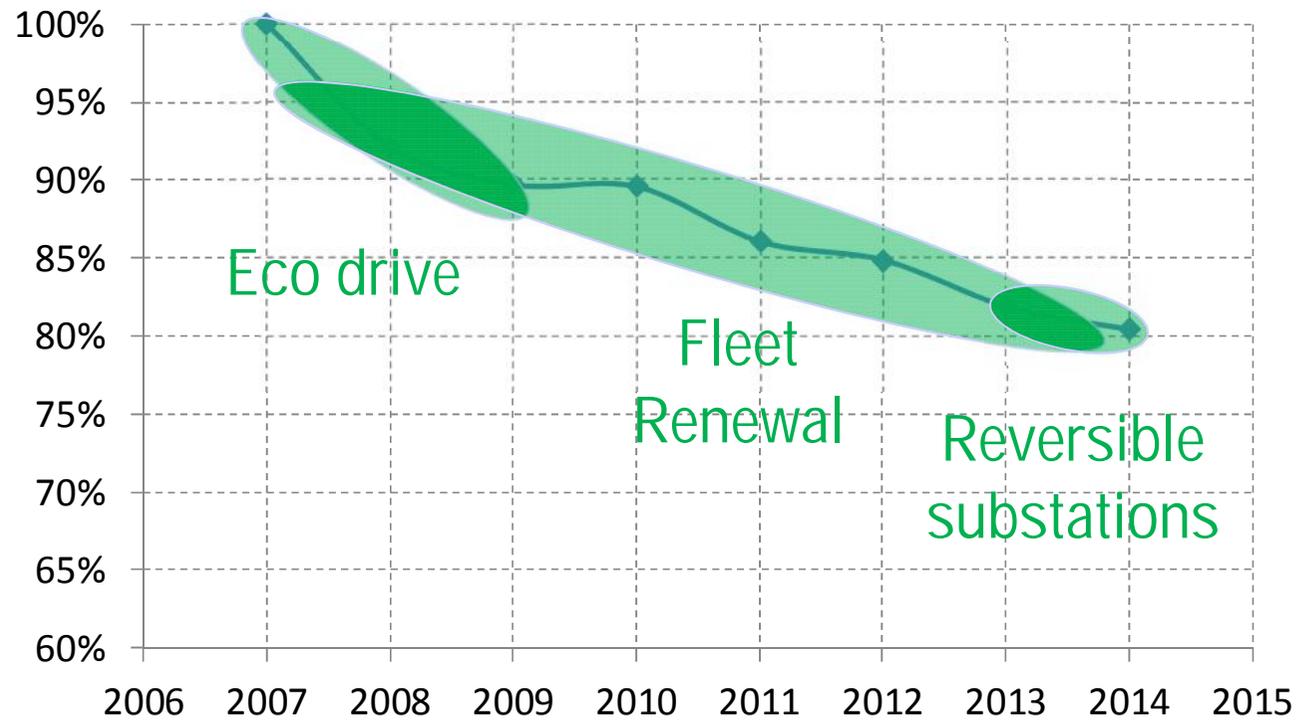
People affected	300 metro drivers
Staff needed	50 working days (1 hour of training for each driver + organisation of the project).
Budget	35,000 Euros (for training) 30,000 Euros (for measurements)



Evolution of Metro Specific Consumption



kWh/place*km since 2007



Conclusions



- Strong reduction of energy consumption with low investment
 - Economic impact
 - Environmental gain
- Good feedback from drivers
- Improved metro regularity
- Need to continue improving our energy efficiency
- Commitment to reduce by 40% the GHG emissions (direct and indirect) caused by the journeys in our transport network
 - Compared to 2010 - gCO₂ per place-kilometer



