



**ΚΑΠΕ
CRES**

CENTRE FOR RENEWABLE
ENERGY SOURCES AND SAVING

Experiences and lessons learned from Ecodriving trainings in Greece

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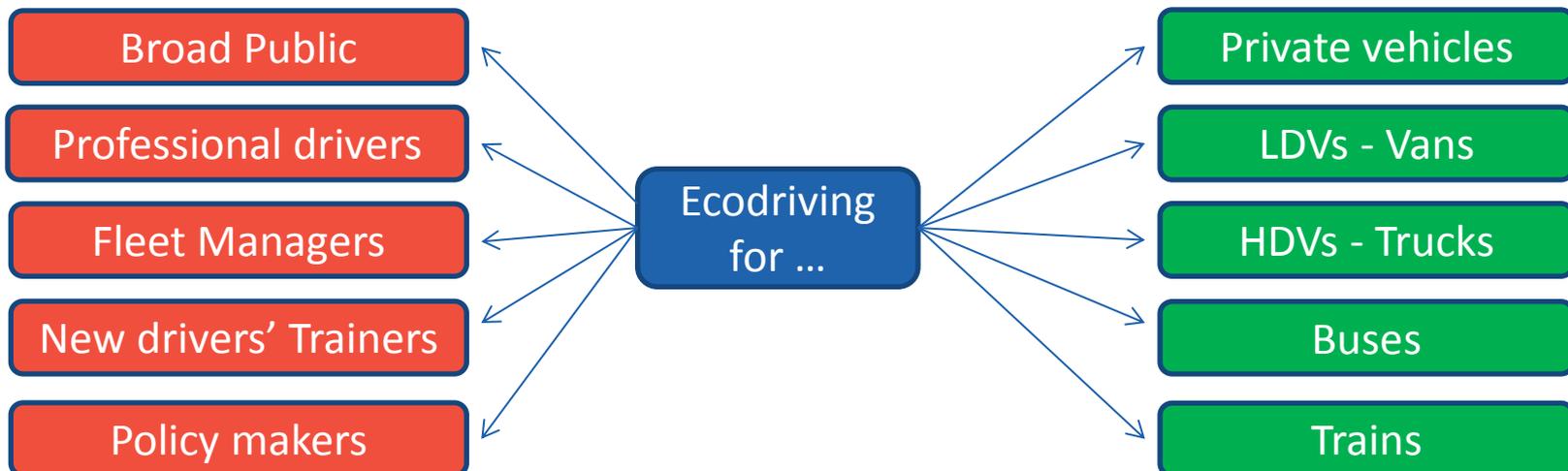
INTERNATIONAL KLIMAAKTIV MOBIL - THE PEP RELAY RACE CONFERENCE

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INTRODUCTION

- The Centre for Renewable Energy Sources and Saving (CRES) is the Greek national entity for the promotion of renewable energy sources, rational use of energy and energy conservation
- The Transport dept. is dealing with ecodriving for more than 15 years, participating in some of the most important European projects – mainly road and rail since maritime and aviation already practice ecodriving
- Why Ecodriving?
 - Three-in-one: Economy, Environment, Safety
 - Important side-effects: Less stress, reduced maintenance cost
 - Part of National Policy for targets of Energy Efficiency Directive
 - Ecodriving has one of the best cost/benefit ratio comparing to other measures



LDVs – Courier Vans

- **Project: FLEAT (on fleet management)**
- **Pilot Ecodriving training for drivers of courier vans**
- **4 trained drivers from TNT courier company**
- **Results: 16.4% reduction in fuel consumption with Ecodriving combined with an increase of speed by 15.6% (which is important in this case)**



HDVs – Fuel trucks

- **Project: INTERACTION (on freight transport)**
- **Pilot Ecodriving training for drivers of fuel trucks**
- **3 companies: BP, Avinoil, Revoil**
- **6 trained drivers**
- **Results: 13-17% reduction in fuel consumption with Ecodriving without loss of speed (which is not so important in this case)**





Ecodriving for electric buses (trolleys)

- **Ecodriving program including pilot training for ILPAP company (public transport – electric trolleys in the wider Athens area)**
- **The fleet consists of 356 electric vehicles operating in a network of 404 km and 23 lines**
- **Servicing about 83 mil. passengers annually**
- **3-phase ecodriving program**
 - Phase I – Monitoring data 4 months prior to pilot training
 - Phase II – Pilot ecodriving training
 - Phase III – Monitoring data for 2 months after pilot ecodriving training
- **5 drivers were trained using 2 vehicles**



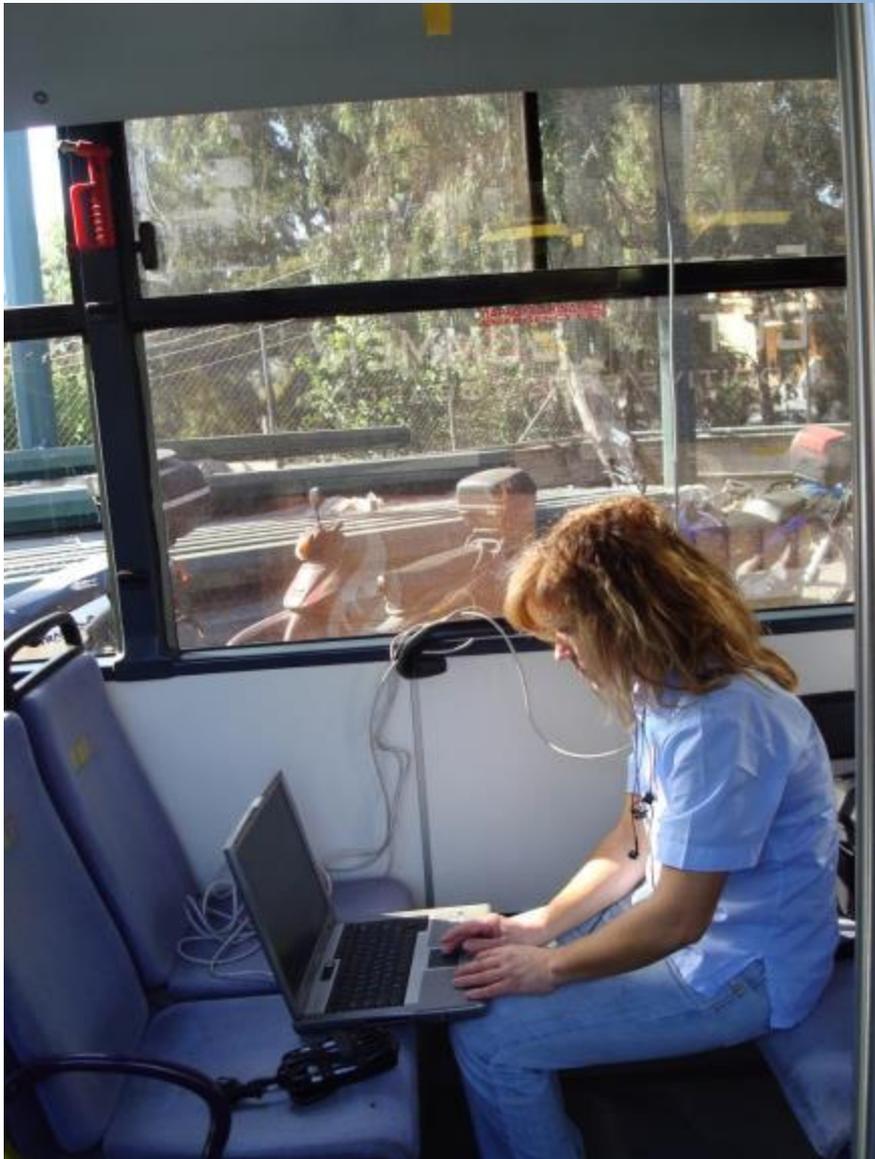


Ecodriving for electric buses (trolleys)

- **Current situation:**
 - Nervous driving with unnecessary sudden braking and acceleration
 - Great difficulties while driving especially in the centre of Athens – Traffic congestion and illegally parked vehicles have an effect in service speed – Trolleys are less “flexible” comparing to diesel buses when moving because when overtaking another vehicle with a trolley bus, this may lead to disconnection from the power grid and inability to move
- **Ecodriving tips:**
 - Smooth acceleration and braking
 - Keep safety distance from other vehicles to enable coasting and prevent unnecessary braking
 - Keep constant speed
 - Use coasting as much as possible (this is a heavy vehicle!)



Ecodriving for electric buses (trolleys)





Ecodriving for electric buses (trolleys)

TABLE 1 ECODRIVING TRAINING RESULTS (STAGE II)

Driver	Energy consumption (kWh/km)			Average speed (km/h)		
	Tour #1 (Before training)	Tour #2 (After training)	Difference (%)	Tour #1 (Before training)	Tour #2 (After training)	Difference (%)
1	1.84	1.41	- 23.4	10.1	10.3	+ 2.0
2	2.10	1.35	- 35.7	10.2	10.9	+ 6.9
3	1.75	1.37	- 21.7	8.6	11.1	+ 29.1
4	2.37	1.28	- 46.0	10.5	11.3	+ 7.6
5	1.54	1.26	- 18.2	10.4	10.6	+ 1.9
Average	1.92	1.33	- 29.0	10.0	10.8	+ 9.5

TABLE 2 ENERGY CONSUMPTION RESULTS BEFORE AND AFTER THE ECODRIVING TRAINING (STAGE I AND STAGE III)

Driver	Energy consumption (kWh/km)							Difference before and after the training (%)
	Before the ecodriving training (Stage I)				After the ecodriving training (Stage III)			
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6		
1	2.05	2.21	1.74	1.61	1.50	1.69	- 15.8	
2	2.60	2.07	1.92	1.67	1.49	1.66	- 23.7	
3	2.21	1.73	2.08	2.00	2.00	1.80	- 5.0	
4	1.95	2.07	1.98	1.83	1.81	2.15	+ 1.0	
5	1.93	1.90	2.03	1.99	1.74	1.75	- 10.7	
Average	2.15	2.00	1.95	1.82	1.71	1.81	- 10.8	



Ecodriving for electric buses (trolleys)

- In addition, regenerative braking was measured to be 28% of the total energy that the trolley consumed –currently not possible to use that energy due to network limitations
- ILPAP could potentially save more than 300,000€ and reduce CO₂ emissions by ~ 3,000 tn annually, due to ecodriving only (with moderate savings 5%), **IF** ...
- ... there was continuous commitment from the top management
- ... an integrated ecodriving program was installed including long-term monitoring and training for all drivers and managers
- ... adequate incentives were offered to guarantee success



Ecodriving for trains

- **Ecodriving trainings for train drivers of OSE company (the public rail company)**
- **Eventually 600 train drivers were trained, 6 drivers were trained during the TRAINER project**
- **Trainings using electric trains (Desiro Electric' suburban railway EMUs)**



Ecodriving for trains

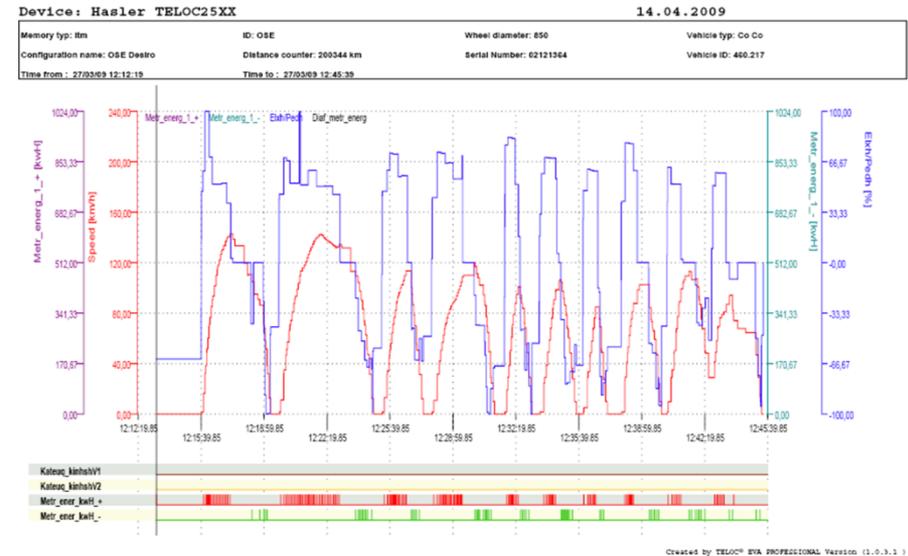
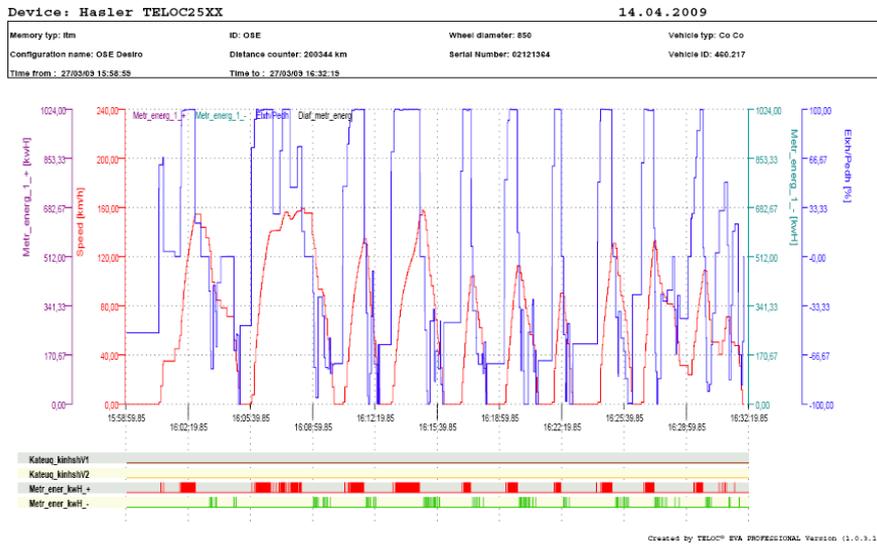
- **The following techniques of energy efficient driving were applied on the test drives with Desiro Electric EMUs**
 - *Lowering train maximum speed*
 - *Reducing train acceleration rate*
 - *Rolling as much as possible*
- **Test drives on energy efficient driving were carried out on electrified (AC: 25kV, 50Hz) route 'Athens airport' – Ano Liossia).**
- **It is a 2-track standard gauge (1.435mm) line, of 33 Km length. It includes sections of up to 27,5‰ (maximum) gradient. Maximum allowed speed on route is 160 Km/h. The line infrastructure is constructed (UIC) for up to 200 Km/h speed.**



Ecodriving for trains

- Non – energy efficient driving on Airport – Ano Liossia route. (total energy consumed: **200 Kwh**)

- Energy efficient driving on Airport – Ano Liossia route. (Total energy consumed: **140 Kwh**)





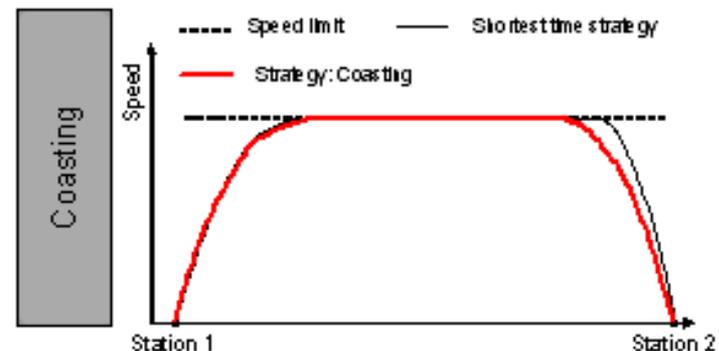
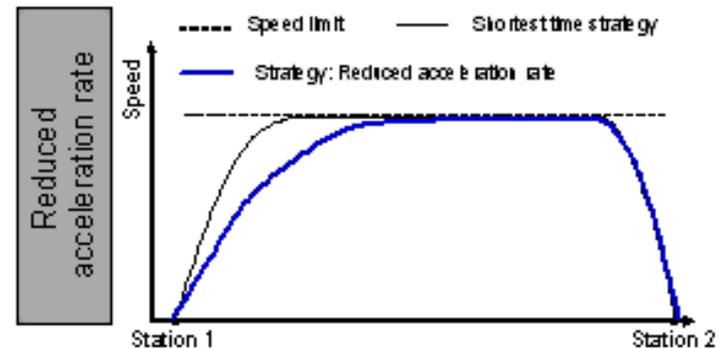
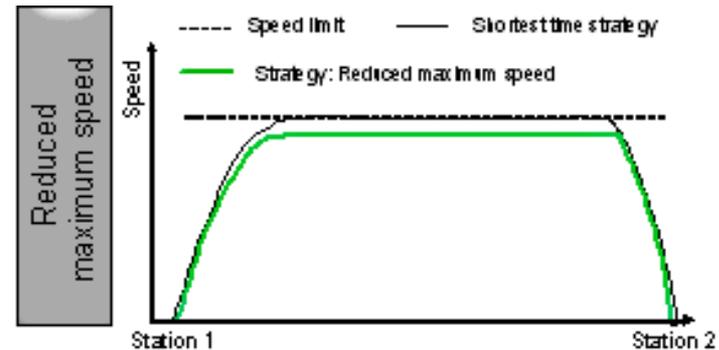
Ecodriving for trains

- After practical training, the examination of Teloc 2500 data recordings, has established that it is feasible to achieve **15%** energy savings on the aforementioned route (Airport – Ano Liossia – Airport)
- Drivers who underwent training generally projected a positive outlook towards eco-driving and were willing to contribute into making railway even more energy efficient and environment-friendly
- In total 600 train drivers were gradually trained in ecodriving techniques
- Energy Efficient Driving can be applied in all passenger & freight trains with diesel or electric traction
- Energy efficient driving strategies may slightly increase travel time, however with energy efficient timetabling train companies can save large amounts of energy without train delays

Ecodriving for trains

Ecodriving tips for trainer drivers

- Accelerate and brake economically
- Avoid peaks in speed if possible
- Use electrical brakes that regenerate energy
- Keep freight-trains running in timeslots just between passenger trains
- Keep a good balance in traction when the rails are slippery
- Do not accelerate too quickly with diesel locomotives
- Turn off traction of the second and third locomotive when the train is at speed
- Know your equipment and your route so you can avoid unnecessary braking or accelerating
- “Schwungfahren”: Turn traction off shortly before reaching the top of the hill



Why Ecodriving programs fail

So, Ecodriving seems to work everywhere in the short-term

But, why does it occasionally fail in the long-term?

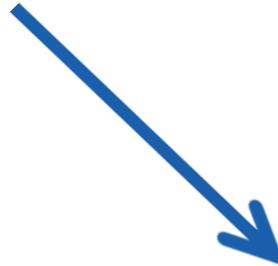
- **Mistrust/Low credibility of the program supervisor**
- **Contradiction of priorities (for instance, for courier services, fast or eco?)**
- **Humans have a healthy degree of skepticism and want to be sure that new ideas are sound**
- **What's in it for me? Why do it?**
- **Better the devil you know/ Routine is comfortable**
- **Can I do it?**
- **More work??**
- **No obvious need**
- **Unwillingness to learn**



Why Ecodriving programs fail (*in Greece especially*)

- No continuous top management commitment (especially in the public sector)
- No adequate number of trained and certified ecodriving trainers in Greece
- New drivers difficult to be trained in ecodriving principles
- Incentive programs to promote ecodriving difficult to introduce due to financial crisis
- Currently no serious promotional activities on ecodriving
- “Hard” (costly) measures often more “catchy” than “soft” ones
- Successful Ecodriving application is about changing mentality and driving behaviour - **Changing mentality** and driving behaviour **is slow and difficult**

Mentality and Integrated planning





What to do

So what to do? Keep an integrated approach

- Engage policy makers to stimulate interest on ecodriving (*EU and national funded programs, mayors to include ecodriving in their plans, go for LTAs, build consortiums with members from all interested parties ...*)
- Organise long-term, broad promotional activities for the broad public and dedicated ones for professionals (*driver trainers, fleet managers etc*)
- Reform current legislation to include trainings for new drivers and trainers. Introduce incentives and disincentives. Include ecodriving in NEEP
- Install successful long-term ecodriving programs in companies by:
 - Adequate monitoring of data
 - Giving adequate incentives (*share gains with good drivers*) or disincentives
 - Publicising results
 - Integrating them in ISO procedures of the company
 - Providing with adequate training
 - Listening to the experts / Encouraging participation
 - Involving volunteers / employees willing to participate

EMOBILITY WORKS

Integration of e-mobility in European municipalities & businesses

- **Duration:** March 2014 – August 2016
- **Funding:** Co-funded by IEE
- **Consortium:** 12 partners from 9 countries
- <http://emobilityworks.com/>
- **Objective:** Increase e-mobility in municipalities and businesses across Europe, Electricity from renewable energy sources, Increase knowledge & awareness regarding e-mobility among the general public
- **Special Outcome for Greece:** E-mobility works triggered the establishment of the National E-mobility Committee for Greece at which CRES officially participates. It has already started working on the integration of 2014/94/EU Directive in our national law, as well as on the national policy framework (Article 3 of the 2014/94/EU Directive) for the development of alternative fuels infrastructures.



Thank you for your attention!



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