

Intelligent Energy  Europe



TRAINER

Energy Efficient Driving
implementation in the Netherlands



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introduction

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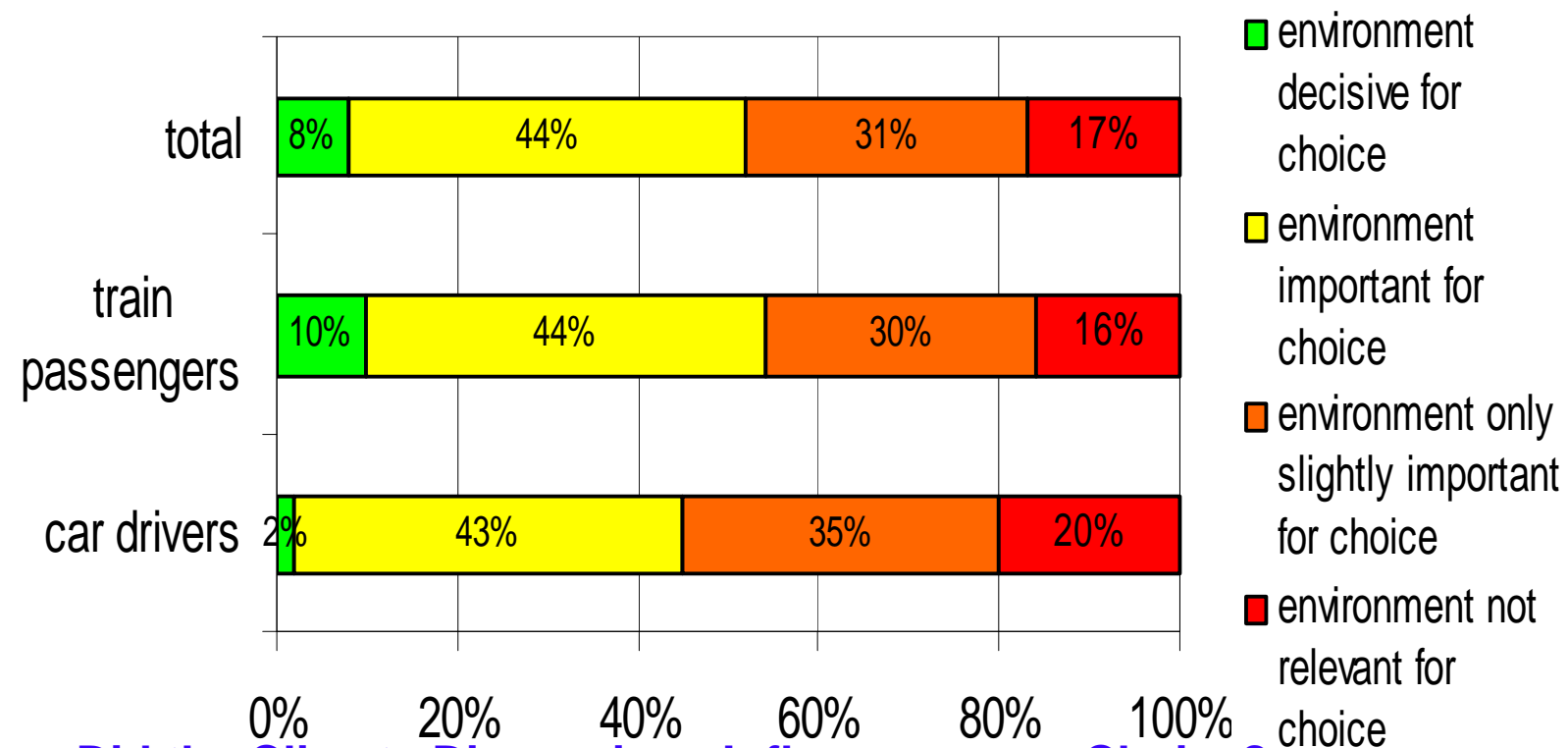


Europe

Duurzaamheid	
Onderneming	NS
Schoon	A
A	
B	
C	
D	
E	
F	
G	
Vervuilend	
CO ₂ uitstoot per reizigerskilometer	41 gram
Papier treinkaartjes uit automaat	Duurzaam FSC-papier
Wekelijkse wasbeurt	Biologisch afbreekbare zeep
Groene stroom	1 van de 10 grootste afnemers van Nederland

Voor NS is duurzaamheid geen hype.

We zijn er immers al jaren mee bezig. Zo zijn onze treinen steeds schoner en energiezuiniger. We hebben onze CO₂-emissie sinds 1990 met 10% weten te verminderen, terwijl het aantal reizigers is toegenomen. De uitstoot van de trein is nu 41 gram CO₂ per reizigerskilometer (tegenover 126 gram bij de auto). De trein is er nog niet. Maar we zijn aardig op weg.



Did the Climate Discussions Influence your Choice?

YES 44%

NOT YET 56%

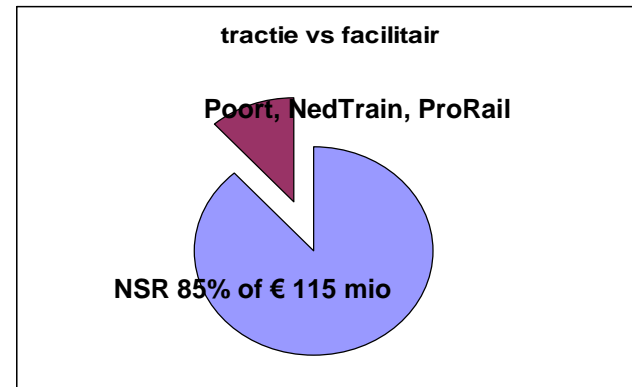


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Reduction possibilities traction energy NS

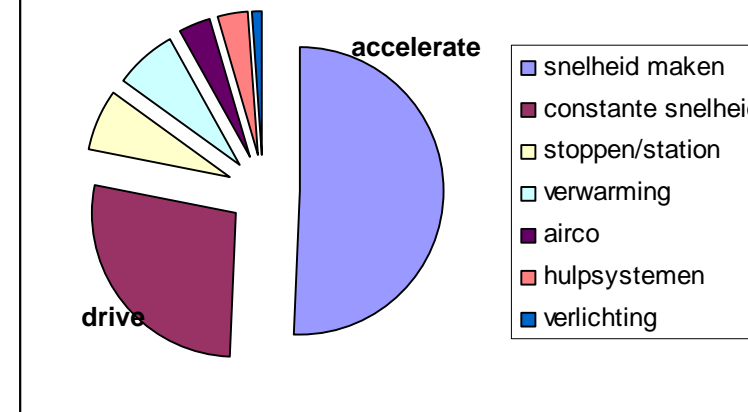
Energyconsumption NS



Three most important proces parameters:

1. Occupancy rate (reduce scheduled trains)
 2. Energy Efficient Driving
 3. Reduce unplanned stops
- ...and energy efficient trains

verdeling elektriciteitsgebruik





Expert estimates energy efficiency NS Reizigers

1. Increase occupancy rate 5-10%
- 2. Energy Efficient Driving 5%**
- 3. Reduce unscheduled stops; RouteLint 2,5%**
4. New and existing fleet 5%
5. Energy saving on parked trains 0 – 5%
6. Energy Infrastructure 0 – 5%

More or less 25% potential energysaving!

For a 2% per year target.

Management commitment alone brings for 5%.



Top management commitment

During the first half of 2009 we had:

- A workshop with the new CEO of NS
- A presentation with the Operations Management Team of NS Reizigers
- Several workshops/meetings with second level management (young executives) on sustainability

This resulted in:

- An energy efficiency target as strategic company target
- Acceptance of a process/chain approach of Energy Efficiency
- A task force of managers of drivers, planning, traffic management to speed up our energy saving activities

But most importantly it confirmed what we all know:

'Bottom up brings you only so far. Without top down commitment any project in your organisation is definitely going to fail'.



audit

In 2007 the Corporate Audit Departement of NS audited the attitude of traindrivers towards energy efficient driving

conclusions:

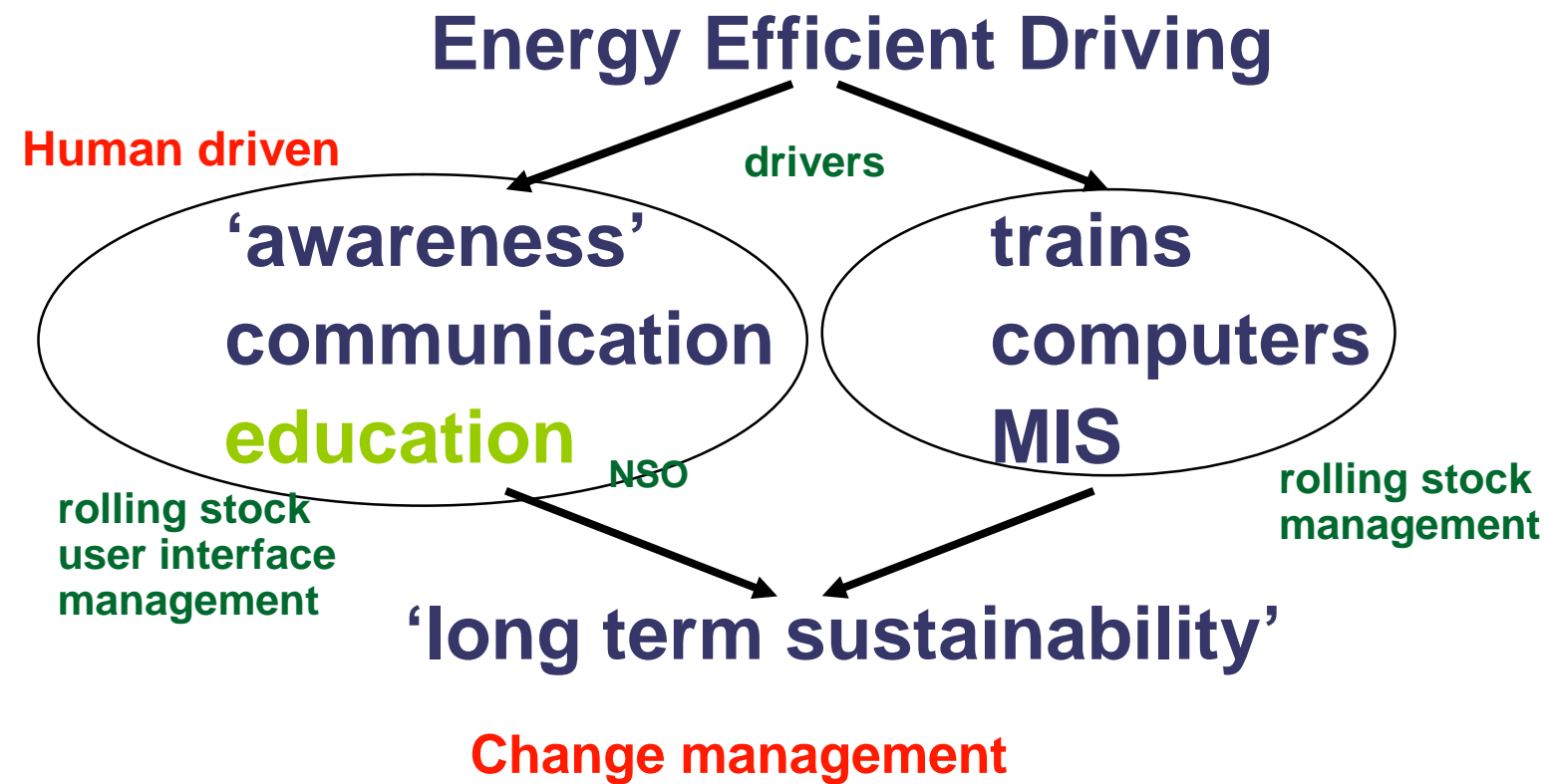
- 91% tries to drive energy efficient
- 71% knows all possibilities for energy efficient driving
- 60% uses all these possibilities
- 70% say it is a very important part of the job
- 71% hardly ever talks with colleagues/boss about energy efficient driving
- 39% would like support/advice from an onboard computer

An expert group did a test on a track between Amsterdam and Rotterdam and drove 10 - 20% more energy efficient than average.



our approach

bottom up through a driver expert team



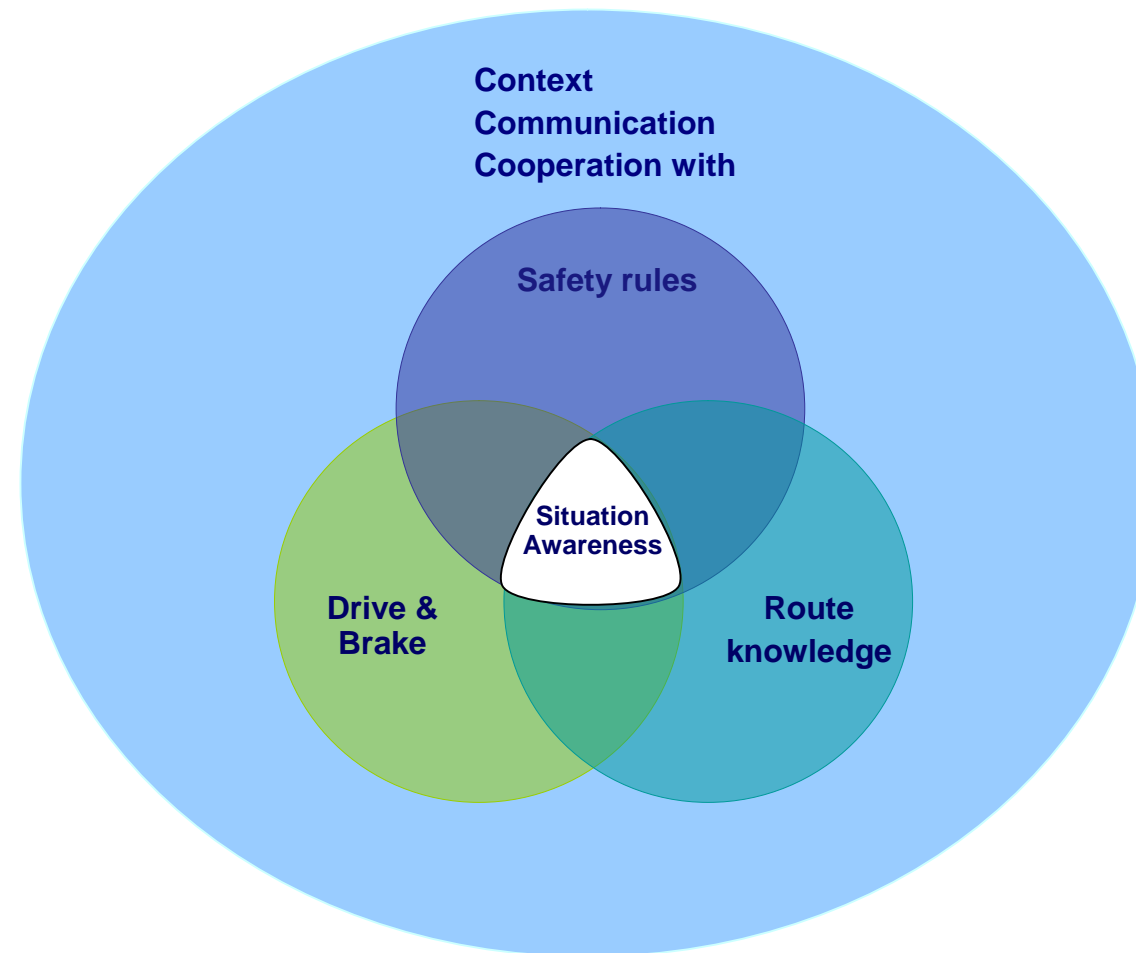


Insights gained into ecodriving

- Ecodriving is a choice! (awareness, acceptance, action, retaining)
- Training programme must cover both technical ('tips and tricks on ecodriving' 'mmi interface instruction) and behavioral change aspects (change management).
 - *30% of all trains arrive to early*
 - *Myth: ecodriving and punctuality cannot be combined*
- Ecodriving must be made attractive
- By continuous attention ecodriving must become part of the craftsmanship of a train driver
- Providing feedback on (individual) ecodriving results is essential for lasting results → metering



Learning concept: situational awareness



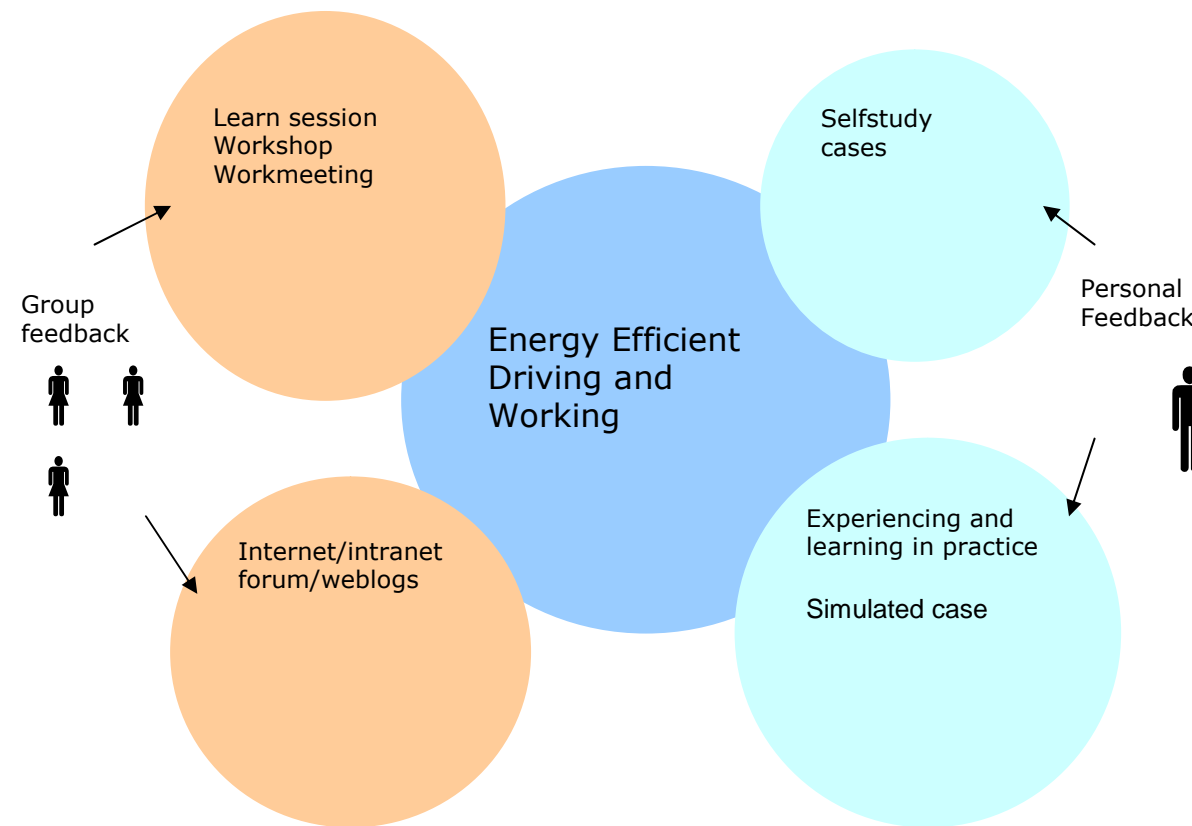


Training programmes





Developing Training Programmes





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TRAINER training modules developed

Target group	Student driver	Reinstruction	Experienced	Driver
level	Aquiring basic skills	Aquiring required skills	Applying required skills	Working within context with the required skills
EZR modules	Basic driver modules	Individual learning	Group learning	Group learning
Energy efficient parking en preparation	X			
Breaking (module 12)	X			
Driving (module 5)	X			
Route knowledge (module 14)	X			
Energy efficiency during parking		X	X	
Energy efficient driving of diesel trains		X	X	
Energy efficient driving of electric trains		X	X	X
Sustainable management	1st level mgmt			Top management



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Trainsimulator training





Energy efficient driving – the UZI method

Hoe werkt de UZI methode?

Stoptreinen

Rijtijd (in minuten)	Opschakelen 1 x
2	80 km/u
3	90 km/u
4	100 km/u
5	110 km/u
6	120 km/u
7	130 km/u
8	140 km/u

Stel je rijdt met trein 5857 stoptrein van Hilversum naar Baarn. Vertrektijd Hilversum staat gepland om 11.40 uur, de aankomsttijd Baarn om 11.46 uur. Je hebt een rijtijd van 6 minuten. Om zo zuinig mogelijk te rijden schakel je 1 x op naar de 120 km/u en schakel de tractie vervolgens uit. Je merkt dat je rustig Baarn kunt binnen rijden.

Meer dan 9 minuten

Wanneer je rijtijd meer dan 9 minuten is draai de tabel om en trek je de b.a.u. (baanvaknelheid afhankelijke uitrijtijd) van de aankomsttijd af.

Baanvaknelheid	b.a.u. aftrekken van aankomsttijd
140	8 min
130	7 min
120	6 min
110	5 min
100	4 min

Je rijdt sneltrein 2216 van Haarlem naar Amsterdam Sloterdijk. Vertrektijd uit Haarlem is 8.36 uur, de aankomst is om 8.45 uur. Rijtijd is onder normale weersomstandigheden in totaal 9 minuten. De baanvaknelheid op dat traject is 130 km/u. Dat betekent dus dat je 7 minuten kunt aftrekken van de aankomsttijd. Als de omstandigheden buiten normaal zijn kun je om 8.38 uur de tractie uitschakelen. Je hebt dan genoeg snelheid en tijd om rustig Amsterdam Sloterdijk te bereiken.



Energy efficient driving – driver timetable

Dienstkaartje 07:24

Overzicht Gestrand ?

UZI: NVT VERTRAGING

DDAR 3918 Lls Hfd vtg 2 + -

Lls	V	07:15	140	1
Llszo	-	07:18		
Almo	-	07:24		
Almb	+	07:27		1
Almp	-	07:30		
Alm	+	07:33		1
Almm	-	07:35		
Almmo	-	07:36		
Mbga	-	07:40		
Wv		07:42	120	
DDAR	73918	Hfd	HFD	08:28

Dienstkaartje 07:22

Overzicht Gestrand ?

UZI: Uitschakelen gewenst

DDAR 3918 Lls Hfd vtg 0 + -

Lls	V	07:15	140	1
Llszo	-	07:18		
Almo	-	07:24		
Almb	+	07:27		1
Almp	-	07:30		
Alm	+	07:33		1
Almm	-	07:35		
Almmo	-	07:36		
Mbga	-	07:40		
Wv		07:42	120	
DDAR	73918	Hfd	HFD	08:28

Dienstkaartje 09:49

Overzicht Gestrand ?

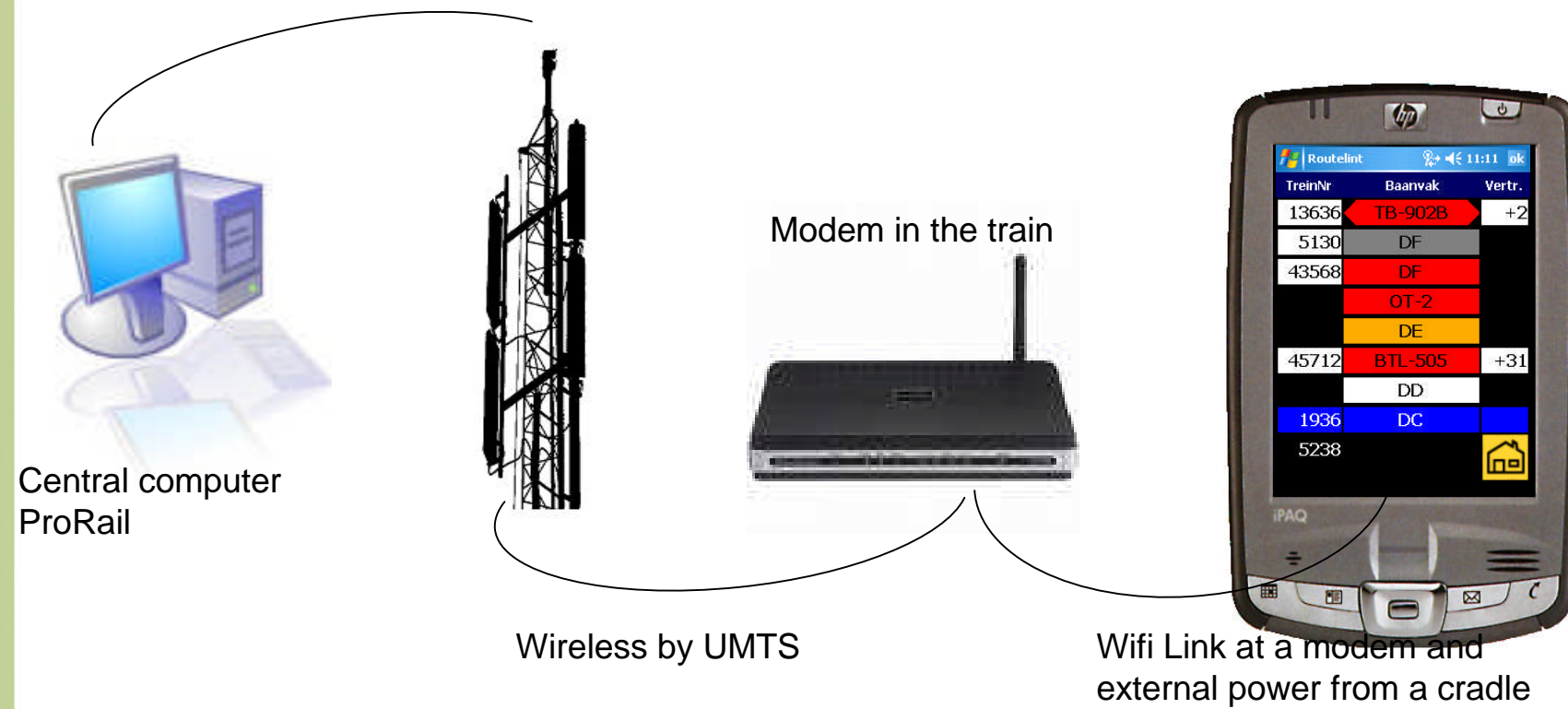
UZI: Eenmalig 100 km/h

4328 Lls hfd vtg 0 + -

almo	+	09:42		1
almb	+	09:45		1
almp	+	09:49		1
alm	+	09:53		2
almm	+	09:56		1
wp	a	10:05		6
wp	v	10:07		6
dmnz	+	10:13		2
dvd	+	10:17		4
rai	+	10:21		2
vdv	+	10:22		4
Einde dienst				21:46



Wireless link Routelint information





Working Routelint

Leaving the planned itinerary

Delay (minutes)

Trains in front route

Routesetting other trains

Routesetting steps

Routesetting train

First train behind

Information inherent train

Trainnumber	10:31	Delay
	RTZ-2	
608	RTST-KF	-3
	RTST-KG	
2228	RTLB-2	-5
	KJ	
	BRD-2	
	KFHAZ-KR	
5030	ZWD-2	+1
1930	DDR-1	-2



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Europe

RouteLint Game supports EED

Missie : Route 7
 Naam : Bas Menheere
 Team : IJsfontein

Punctualiteit : 30 s vertraging
 Energie : 2532 KWh
 Communicatie : 0 punten

12:06:00 X: 1x 2x 4x 8x

Dienstkaart		Routelint	
Treinnr	10:51	Vertr.	
	Rib-1		
618	Wiltz-LC		+20
	Wiltz-LD		
	Rtz-1		
	Rh1-LF		
	Rjb-1		
	U		
1934	Kfhaz-LR		-1
9333	Zwd-LT		+1

Deuren dicht
 Uitleg Routelint
 Uitleg UZI
 Pauze Stappen
 20 40 60 80 100 120 140 160
 Rijden
 Neutraal
 1 2 3 4 5 6 7



The effect of using Routelint (1)

Punctuality/Path adherence:

- Getting back on path, also when rescheduled
- Not getting too far ahead of their path (LOSING ENERGY!)

Energy savings:

- Using timetable margins to start coasting earlier
- Anticipating conflicts by coasting and waiting for improvement of signal
- Quicker switch off and break-in the traction

Trust

- Even in the undisturbed situation RouteLint will give the traindriver the certainty that he will encounter no other trains, that he can switch his traction off and easily be on schedule



BEA Online

BEA Online (Summer 2009) TU Dresden for ProRail

File Display Options

BEA Route Time-Speed

BEA Route

Speed in km/h vs Position in m (10³)

Real Speed (orange line), Optimal Speed (blue line)

MAX Speedometer: 0-180 km/h, TECHNISCHE UNIVERSITÄT DRESDEN ProRail

Graphical Timetable Timetable (Table) GPS Visualisation POI List

3507 7:51:00 Set Start Time

Name	Position	Arrival	Departur	Passing	Earliest	Latest	MinSpeed	TargetSpeed
Signal 743	44504						20	
downspeed 60	45790						20	60
Signal 10	46280						20	60
speed 60	46656						20	
's-Hertogenbosch Diezebrug...	47118						20	
speed 80	47252						20	
Signal 96	47277						20	
speed 40	47767						20	
Signal 138	47791						20	
's-Hertogenbosch	48030	8:21:00					20	

Mode: Init Train

GPS EDM4 CONNECTED Disconnect!

Train Data GPS Data

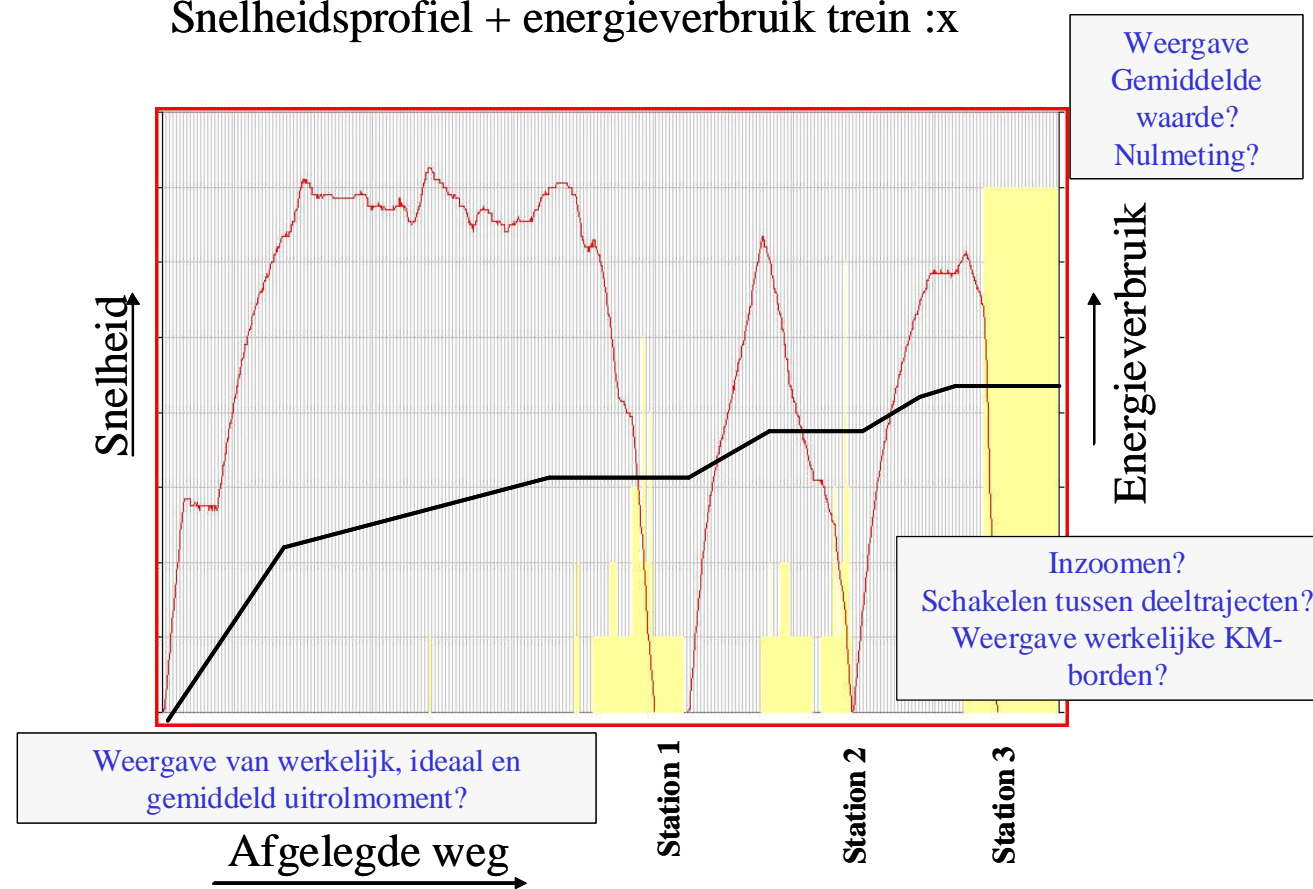
Time: 31-8-2009 8:24:56
Latitude: 51° 41' 25,57"
Longitude: 5° 17' 36,11"
Satellites: 9
HDOP: 0,85
GPS Status: GPS, Data valid

Utrecht - s Hertogenbosch 2009 [dienstregeling].xml(Matrics Format) 0,7 km/h | 48145,9 m(Oud Zaltbommel->'s-Hertogenbosch) | 8:24:56 | Utrecht Centraal -> Brake



Feedback for drivers

Snelheidsprofiel + energieverbruik trein :x





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Questions?

