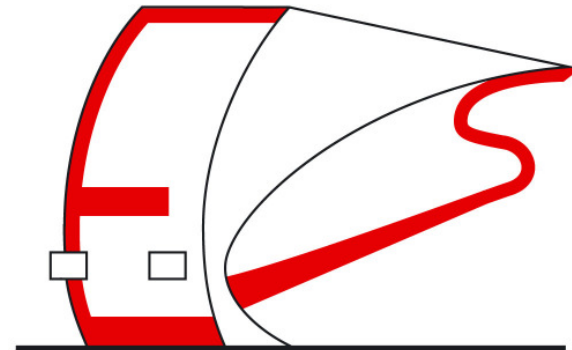


Energy-efficient driving

A change management programme of Deutsche Bahn's
Passenger Transport Division

International Transport Forum,
Workshop on Ecodriving,
Paris, 22nd November 2007



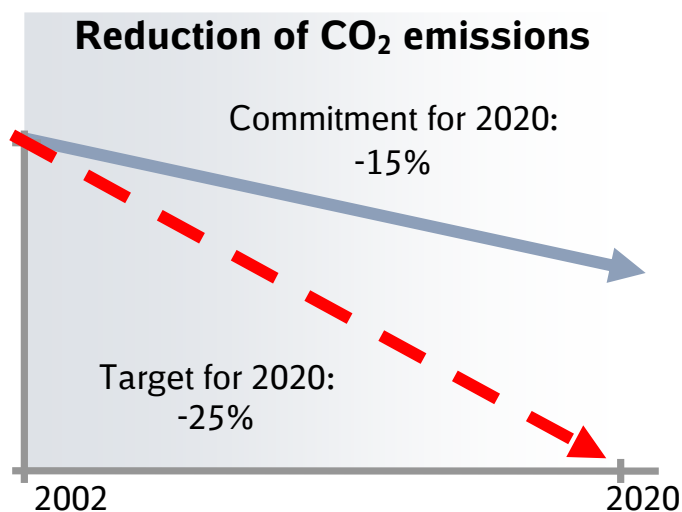
Deutsche Bahn AG
DB Regio AG /P.RBZ 3
Energy Cost Management

Virginia Schaal



Climate impacts and energy costs were the driving forces for setting up a process focussing on energy-efficient driving

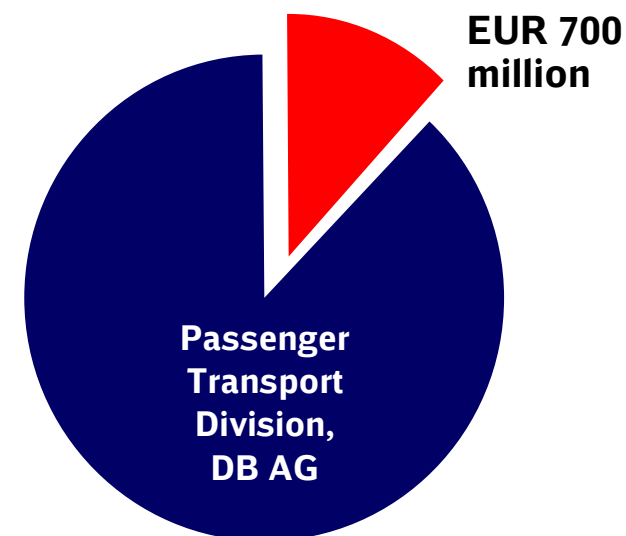
Climate Protection Programme 2020



Contrary to trends in the transport sector, Deutsche Bahn achieved its targets to reduce carbon dioxide emissions in 2002 and continues its climate protection programme.

* Source: Deutsche Bahn AG, Rail Environment Centre, 2005; DB Energie 2005.

Share of annual energy costs in total costs

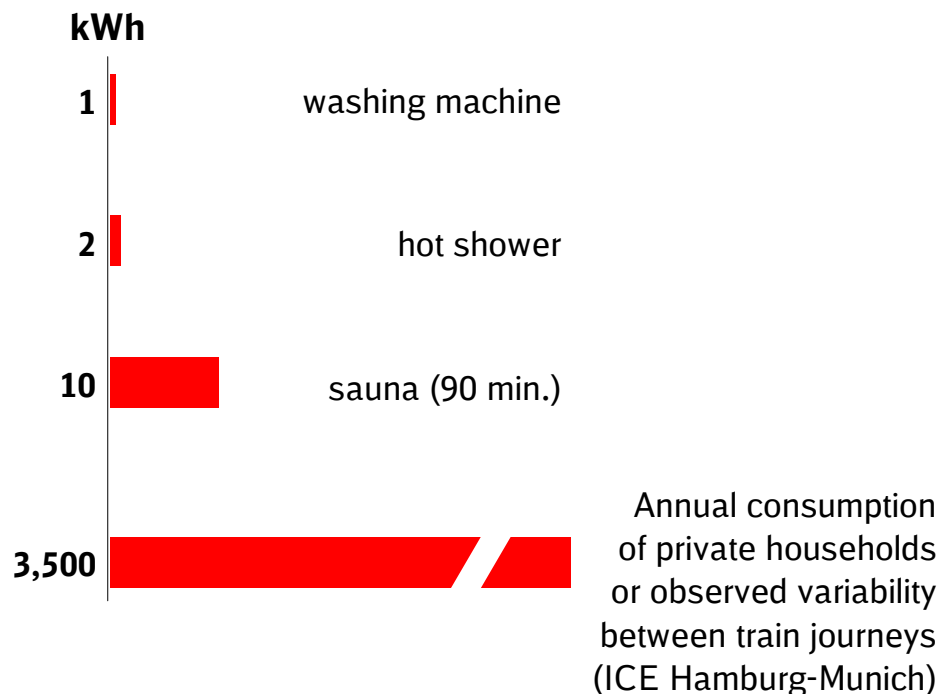


Deutsche Bahn as Germany's biggest energy consumer is very strongly affected by the development of energy costs.

Energy-efficient driving involves large numbers



Different levels of energy consumption



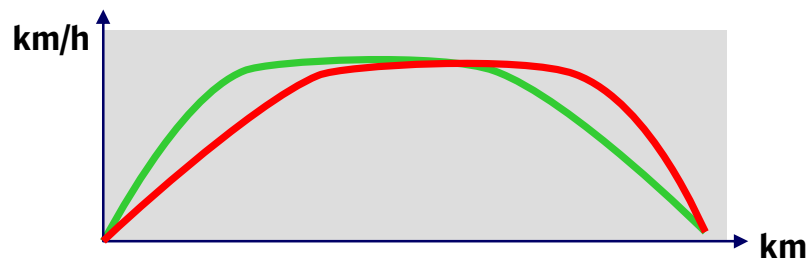
Energy-efficient driving programme

- ✓ All 12,000 drivers qualified (theory, training simulator and coaching trips)
- ✓ All 3,500 traction units equipped with electricity meters
- ✓ Data warehouse on traction energy consumption implemented (> 150 Gb)
- ✓ 300 train drivers' team leaders trained in analysing data and conducting feedback talks
- ✓ EUR 32 million saved through energy-efficient driving from 2002 to 2005
- ✓ Energy-efficient driving coordinated by 15 regional teams

Safety and punctuality retain their priority even when energy-efficient driving patterns are used

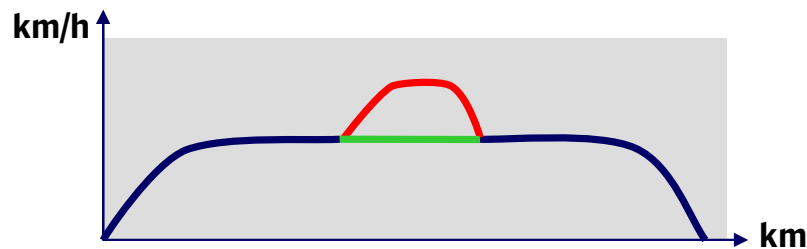


Timetable recovery margins are the basis of energy-efficient driving patterns



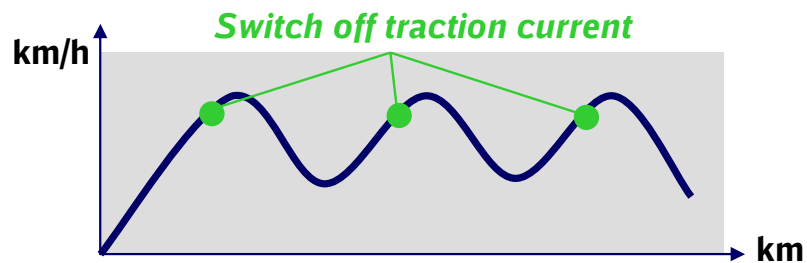
Let it roll:

Once a train has reached maximum speed, it can coast for long sections without significantly losing speed.



Avoid top speed:

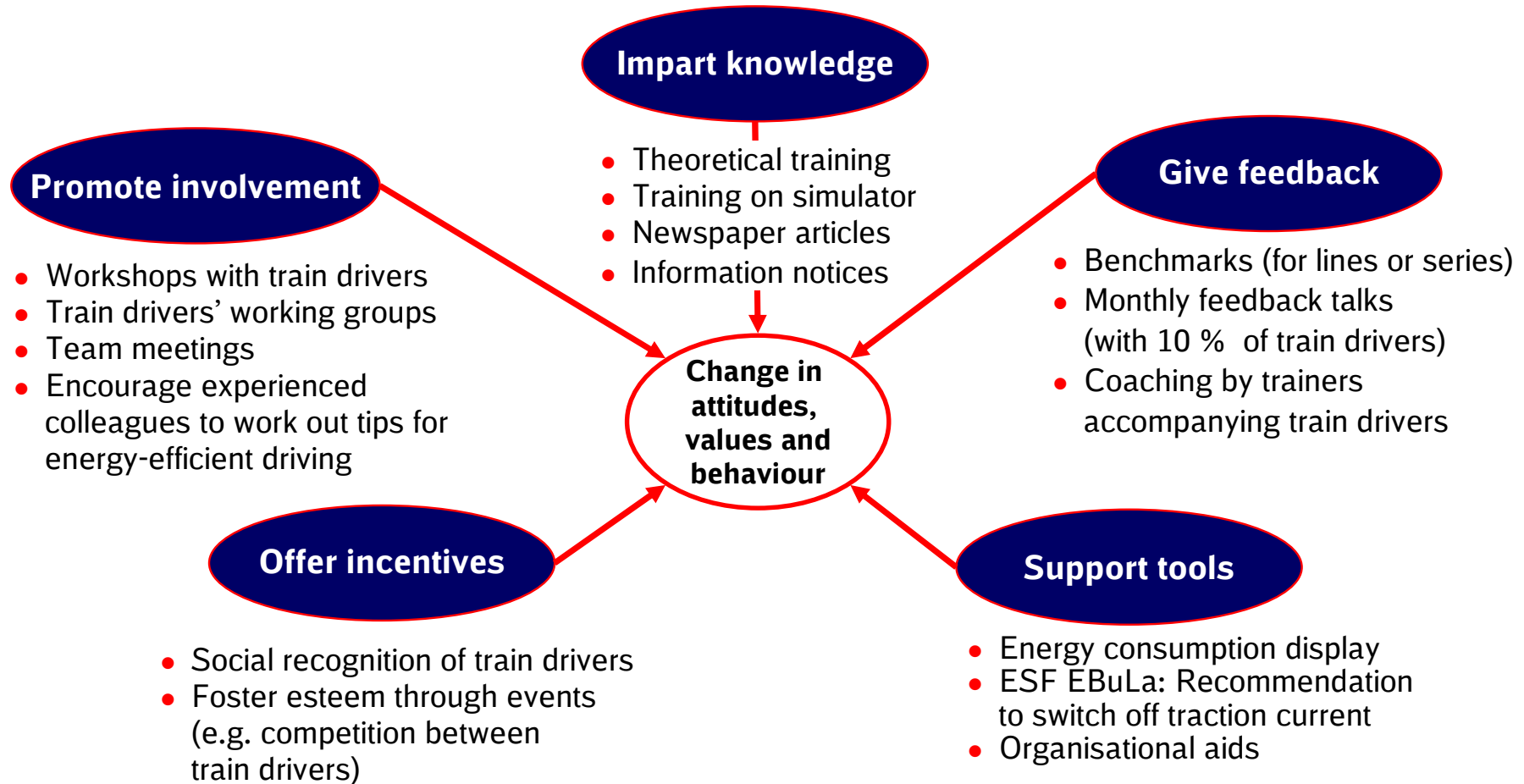
Due to timetable recovery margins, trains often arrive on time without running at maximum speed.



Use valleys and hills:

Switching off traction current before reaching the summit and coasting down hills reduces energy consumption.

We aim at a sustained change in the driving patterns of our 12,000 drivers in the Passenger Transport Division



Qualification on energy-efficient driving starts with theoretical seminar and is practised on the job and on the simulator



Qualification on energy-efficient driving

Theory seminar



- **Methods:**
 - Presentation
 - Working groups
 - Discussion
- **Content:**
 - Importance of energy-efficient driving
 - Achievements concerning energy-efficient driving
 - Driver's impact on energy consumption

Coaching on the job



- Coaching by experienced trainers accompanying train drivers
- Stabilisation of training effects by offering tips on energy-efficient driving

Training on simulator



- Training starts 6 weeks after theory seminar
- Simulator session accompanied with tips on energy-efficient driving and follow up simulator session to practice driving style
- Display of total energy consumption, average energy consumption and best in class

To achieve sustainable knowledge, a variety of media is used to inform train drivers on energy-efficient driving



Information on energy-efficient driving *

Journal on energy-efficient driving

ESaktuell
railion

INTERNE INFORMATIONEN FÜR LOKFÜHRER RAILION DEUTSCHLAND AG JULI 2008

Inhalt

Experten-Workshop 1

Technisches 2

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Fehlerzufeld Wandlerfehler 4

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ES tut sich was im Projekt ES!

Zwischenbilanz nach einem halben Jahr

Liebe Lokführerinnen und Lokführer, liebe Kolleginnen und Kollegen,

sechs Monate nach Projektstart von ES sehen wir eine kurze Zwischenbilanz: die Trainings in den Regionen werden planmäßig durchgeführt, nur die ES-Begleitfahrten sind leicht im Rückstand. Die Rückmeldungen zu den Trainings waren durchweg sehr positiv, was auch die beiden Experten-Workshops mit Lokführern aus allen Regionen bestätigt haben.

Technik

Auf sechs Fahrzeugen der BR 150140 und 150 sind Anfang Juni Energieverbrauchsanzeigen eingebaut worden, für die BR 146 und 155 wurde die Fernsichtbildler mit der Realisierung beauftragt. Für die BR 152 und 150 wurde ein Lastenheft erstellt und ein Angebot bei der Firma Siemens angefordert.

EIS und Aushänge

Nachdem das Energieeffizienzsystem (EIS) in Betrieb genommen wurde, sind wir nun in der Lage, unseren Energieverbrauch, Auswertungen und Aushänge zur Verfügung zu stellen. Die ersten Aushänge in den Einsatzstellen sind voraussichtlich Ende Juli geben.

Zusammenarbeit Netz

Gespräche, Mifahrten und auch die Rückmeldungen aus dem Training zeigen, dass wir die Zusammenarbeit mit dem Netz deutlich verbessern müssen.

Hierzu, Ihr
Thomas Thul

Die Meinung der Lokführer ist uns wichtig!

Bad Homburg, Am 30. März 2008 startete im DB Bildungszentrum in Bad Homburg die erste alltagstaugliche Experten-Workshop mit 11 Lokführern (TH) aus unterschiedlichen Regionen. Neben dem Erfahrungsaustausch der Lokführer zum Thema Energie sparen standen vor allem Möglichkeiten zur Verbesserung der Arbeitsbedingungen im Fahrbetrieb für eine energiesparende Fahrweise sowie die Rückmeldung zu den durchgeführten ES-Maßnahmen im Vordergrund.


Hilfreicher Erfahrungsaustausch

Insgesamt kam der Workshop bei den Lokführern gut an, speziell der Austausch zu ES mit anderen TH aus verschiedenen Regionen sowie mit Herrn Thul empfanden die Teilnehmer als sehr positiv und hilfreich. Es zeigte sich in der Veranstaltung, dass vor allem die Zusammenarbeit mit dem Netz dazu führt, dass sich der Arbeitsalltag für die TH herausfordert gestaltet. So berichteten die Teilnehmer von typischen



Teilnehmer vom ersten Expertenworkshop

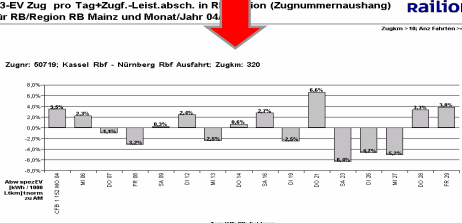
Information notice



S3-EV Zug pro Tag+Zugf.-Leist.absch. in R... (Zugnummernaushang) railion

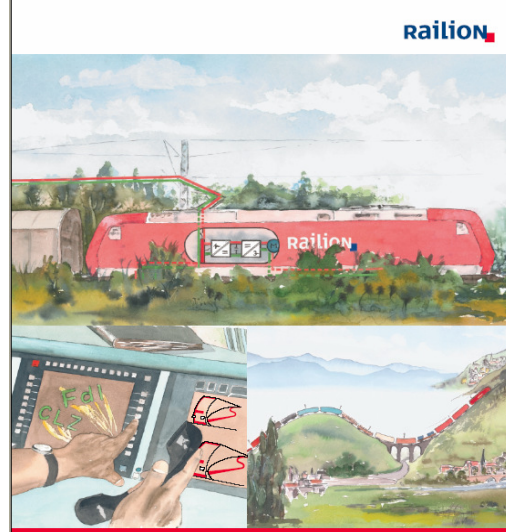
Zugnummernaushang

Zugnr: 60719; Kassel Rbf - Nürnberg Rbf Ausfahrt; Zugkm: 320



Tag: W1 (BR) - 04 kurz

Poster



ES ist (k)eine Kunst

* Examples from freight transport division Railion

Challenging the train drivers on the simulator by competition

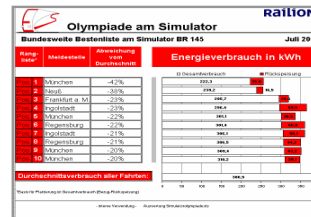
Incentive: Olympic Games on the simulator

Simulator Session



- Training on the simulator at 11 locations all over Germany
- All train drivers absolved the training under same conditions

Notice on Best in Class



- The top twenty results of the sessions on the simulator are published monthly

Final Competition



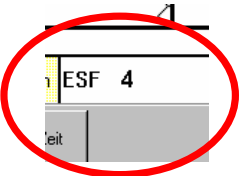
- Train drivers with the best results fight for the title of the “Most energy-efficient driver on the simulator” and gain prices for their region

ESF EBUla calculates a recommendation to switch off traction current so that trains still arrive at their destination on time

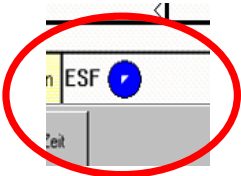
Electronic timetable with “ESF EBUla” function and energy consumption display

150	EBUla-Karte gültig bis 20.08.2003	19.08.03	18:00:50
Neusorg			
	116,5		
	117,3	Langentheilen-Tunnel	
	120,1	Sbk 378	18:06.1
	121,2	Waldershof Hst	18:05.2
120	123,8		
	124,0	Asig Ri K A50	
	124,2	Marktredwitz	18:00.3 18:02.3
		- ZF A 65 -	
80	125,5	Esig E60	
110	130,5		
Arzberg (Ofn)			
110	RW/r	- ZF A 64 -	-1 min ESF +1613 kWh -366 kWh
Zug	FSD	GW	Zeit
			G

ESF EBUla symbols

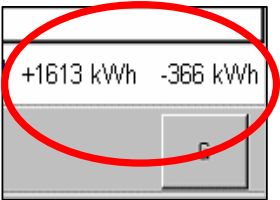


Recommendation in 4 seconds (countdown 10-1)



Switch off traction current now!

Energy consumption display



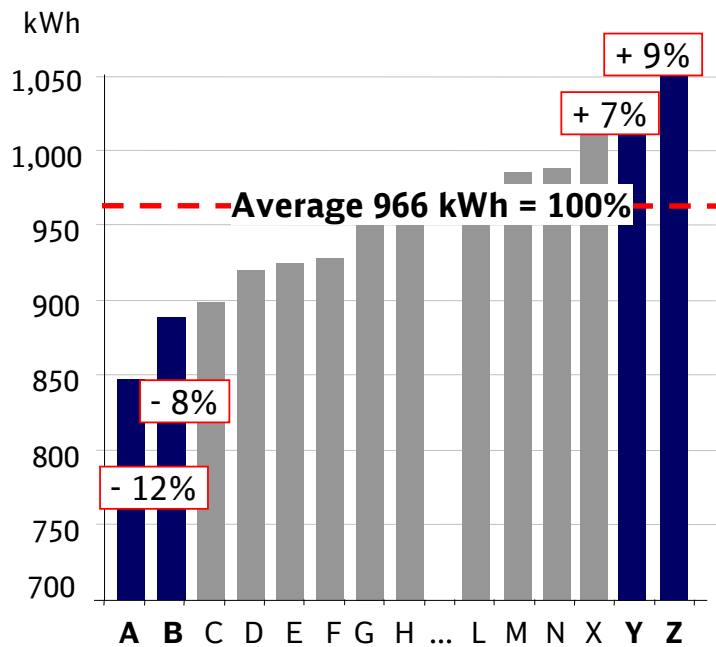
Display of supplied and regenerated energy

Train drivers with very high or low energy consumption are identified for monthly feedback talks on their individual driving patterns



“Top flop report” shows all journeys of one train number within a month

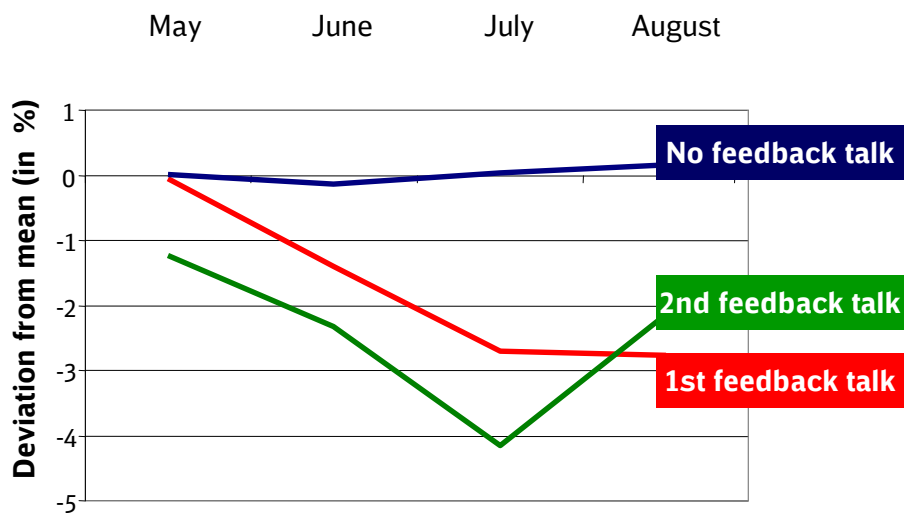
“Train number report” shows selected journeys of one train driver



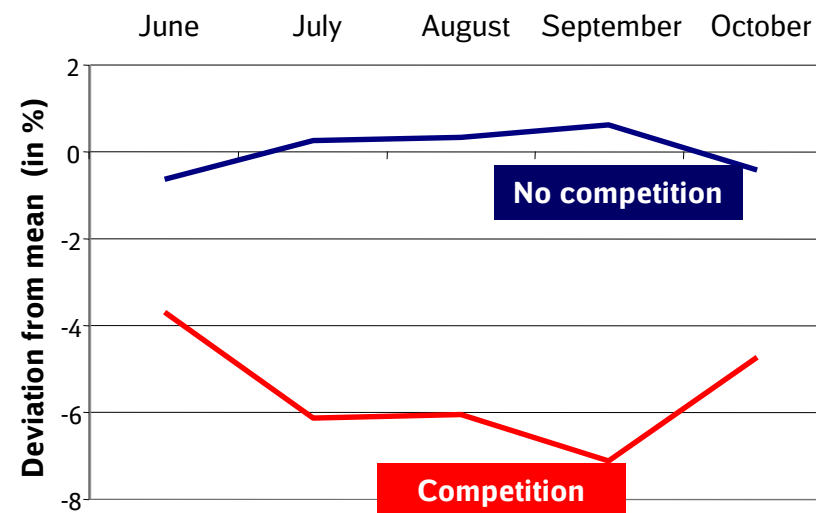
Day	Train no.	Series	Depart.	Arrival	From ...	To ...	kWh (driver)	kWh Ø journeys	Deviation Ø
Mo	4711	143	14:28	14:43	NN	NFT	140 kWh	159 kWh	-12.1%

Train drivers who have feedback talks or participate in energy-saving competitions achieve significantly lower energy consumption figures

Effect of feedback talks on energy consumption
(group monitored versus control group)



Effect of participation in energy-saving competition on energy consumption
(group monitored versus control group)



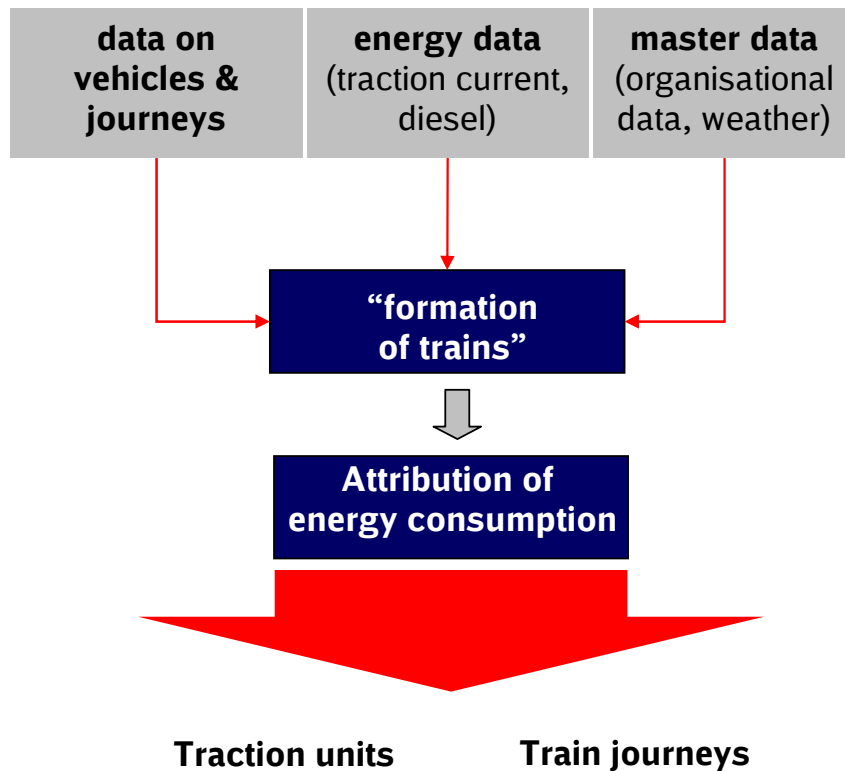
Source: HRevolution 2006 / Philipp Terlinde

Deutsche Bahn 2007, Energy-efficient driving programme

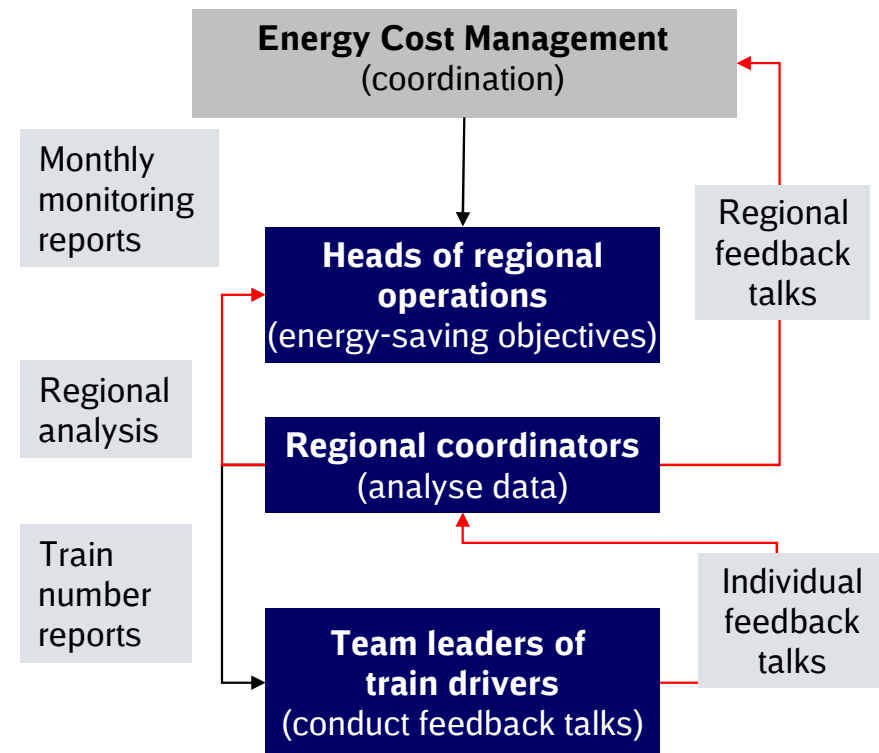


The transparency of energy consumption (electricity meters and EIS) allows energy-saving objectives to be integrated into the leadership process

Energy information system (EIS)



Monitoring process

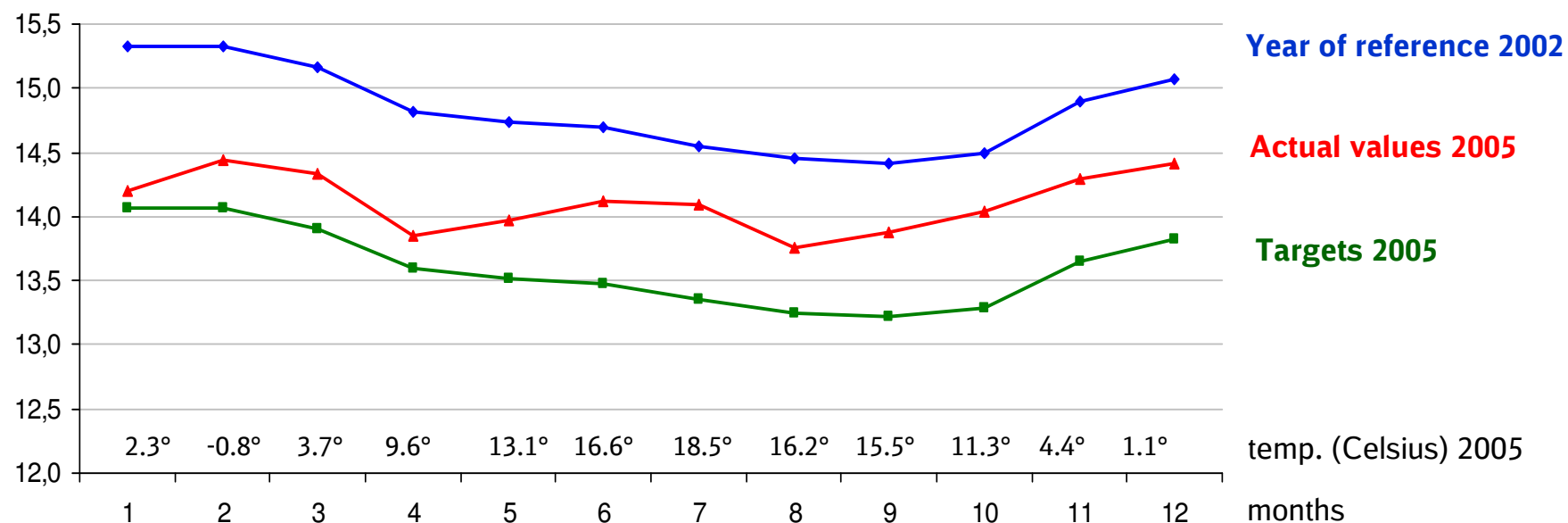




The change management process is based on a monthly monitoring of traction energy consumption at regional level

Development of specific energy consumption (long-distance trains) in 2005 (Passenger Transport)

[kWh/train-unit km]



Source: EIS 3.2 (timetable changeover effects excluded)

Deutsche Bahn 2007, Energy-efficient driving programme

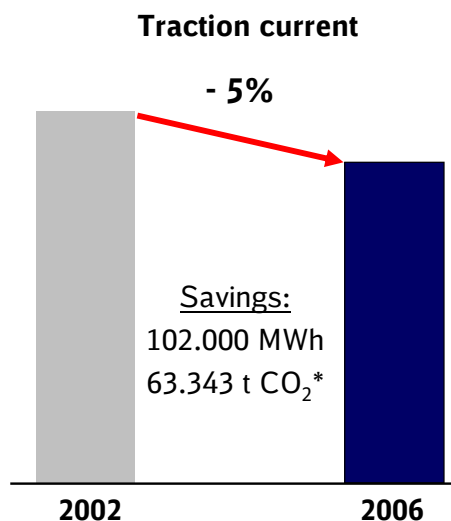


Energy-efficient driving: A change management programme of Deutsche Bahn's Passenger Transport Division

Savings of energy consumption 2002/2003 to 2006

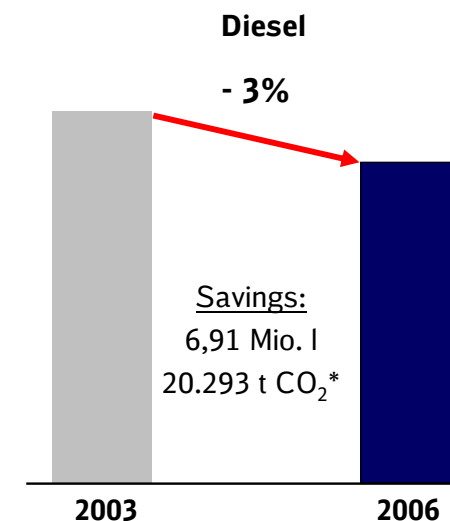
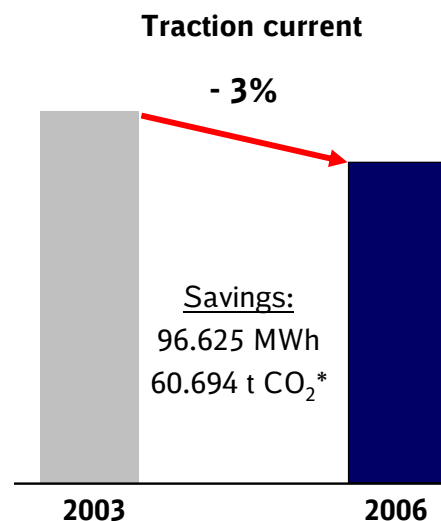
DB Fernverkehr AG

(long-distance transport business unit at Passenger Transport Division savings during train journeys, reference year 2002)



DB Regio AG

(regional transport business unit at Passenger Transport Division savings during train journeys, reference year 2003)



Source: P.RBZ 3 - Energy cost management (2006); measured savings due to energy-saving driving patterns - other savings effects are not taken into account
* Source: VUM 3

Convincing 12,000 train drivers and their superiors as well as aiming at sustainability has proved to be successful



Key factors:

- Increasing awareness of the importance of energy-saving
- Convincing all stakeholders to take part in the process (employees, works councils, executives etc.)
- Systematic qualification of all employees involved (train drivers, trainers, regional coordinators etc.)
- Grassroots activities showing a great esteem towards employees
- Using incentives to motivate train drivers (e.g. energy-saving competitions)
- Institutionalising a learning process with individual feedback talks
- Focussing on a sustained process (e.g. energy consumption display)

