Low Carbon Mobility Platforms and their value for Corporate Branding

Public Private Partnership Project by
Deutsche Telekom RO China, CSR Bonn, T-Systems and GIZ

I.T.S. World Congress, Orlando

Ralf Willenbrock, Oct. 2011

德国电信－低排放出行的全球合作伙伴

Deutsche Telekom – Global Partner for Low Carbon Mobility

家庭消费者	移动通信	商业客户
T-Home	T-Mobile	T-Systems

德国电信集团公司是一家世界领先的综合电信运营商。

Deutsche Telekom AG is one of the world's leading integrated telecommunications and information technology service providers.

每年617亿欧元收入和全球24万员工同时意味着对下一代人和环境的高社会责任。

Because 65 Billion Euro revenue and 240.000 employees worldwide means social responsibility for future generations and environment.

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DT wants to be ICT enabler for climate protection projects based on our core beliefs and branding strategy: Social Responsibility and Sustainable Development

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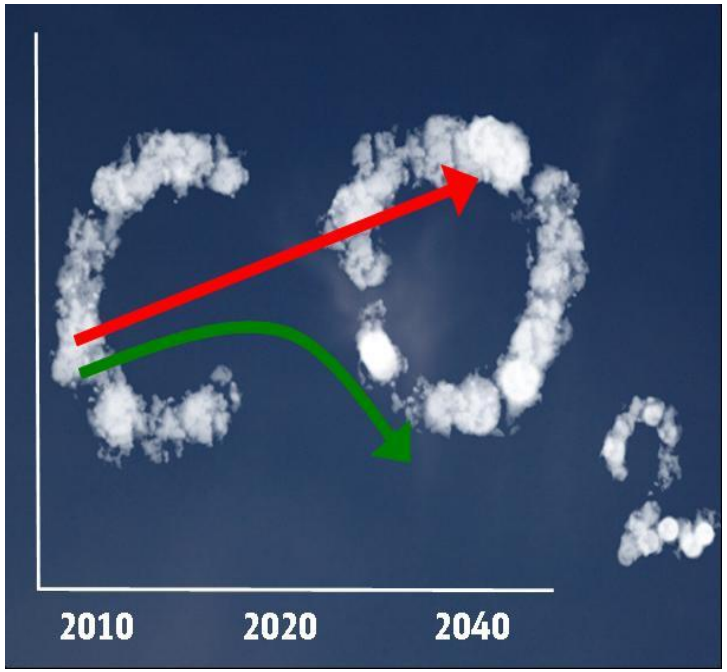
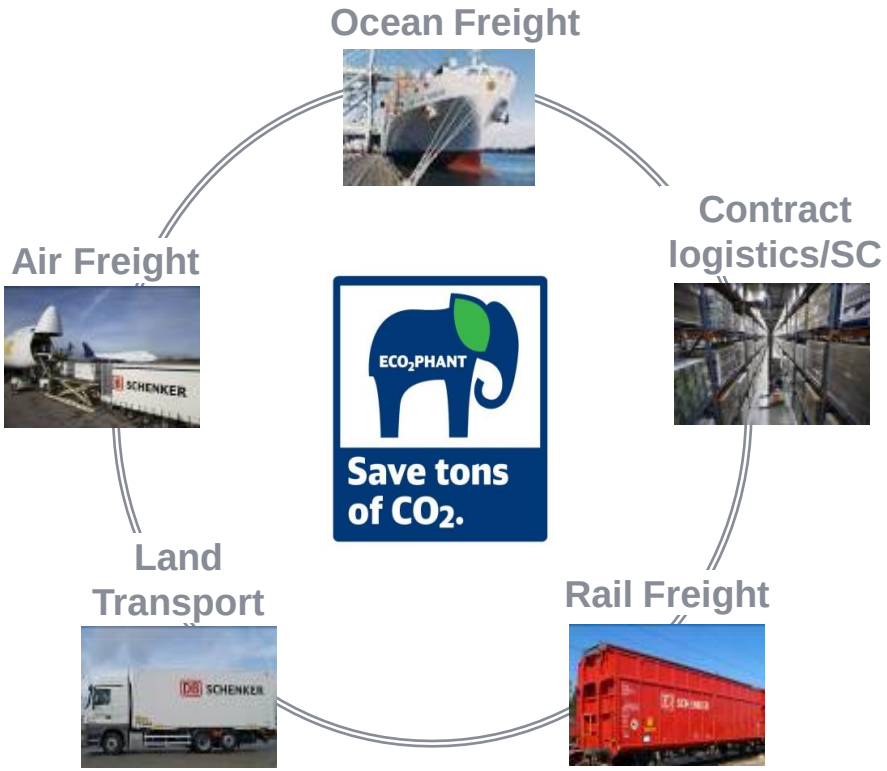
We decouple CO_2-emissions from transport growth…



- Transport growth
- CO_2 by transports

…based on our network



Source: GSL

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Example of our global vision for Corporate Branding: EXPO 2010 Pay-as-you-Pollute Project in Shanghai

south pole
Carbon Asset Management Ltd.

DB SCHENKER

DB Schenker in Hong Kong and China

EDAG

BMW
Sheer Driving Pleasure

BMW Brilliance Automotive

CHN-GER 2009

Best Tone

同濟大學
TONGJI UNIVERSITY

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CO2 Emissions mapped during Shanghai EXPO in 2010

DB Schenker, DT and GIZ initiate a cooperation with strong partners to realize low carbon mobility

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Low Carbon Mobility Management

- Project Duration: 36 Month (11.2010-10.2013)
- Project Type: Public Private Partnership (PPP)
- Public funding: developed by German Ministry for Economic Cooperation and Development (BMZ)
- Technology, Platform Provider and System Integration: T-Systems International

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Results and Next steps of LCMM project

Achievements 2011

- MoU with Schenker and DLR signed
- Small scale field trial evaluation

Milestones 2012

- 50 Schenker trucks equipped with ATP
- Fuel data of Beijing / Shenyang available
- Report and Bonus implemented via Web
- Taxi-fleet of 10.000 vehicles connected
- Travel time, fuel and CO2 available
- Route, Traffic and Eco-Drive analyzed
- Saving Potential quantified

Draft Business Case Analysis for C.P.P.

- **Saving potential 1000 trucks per year:**

  30*100,0(00)*1TEUR * 20% lph=**6MEUR**
- **Saving potential Carbon/GHG market:**
- 1 litre of fuel equals 2,4 kg CO2 (2-3%)
- 72* 1t(00)*10TEUR * 20% tCO2 =**144TEUR**
- **Saving potential 1000 taxis per year**

  7*100,0(00)*1TEUR * 20% lph=**1.4MEUR**
- **Saving potential Carbon/GHG market:**
- 1 litre of fuel equals 2,4 kg CO2 (2-3%)
- 17* 1t(00)*10TEUR * 20% tCO2 =**34TEUR**

All activities now linked to Sino-German Green Logistics MoU

How to quantify / monitor CO2 savings?

- Fuel consumption in litre per 100 km (lph)
- Direct measurement via CAN Bus
- Indirect measurement via fuel receipt
- Fleet operators via accounting systems
- Total value in [lph] varies 100%-200% (x3)
- Average urban/extra-urban:100%-150%
- Car (5-10) / Truck (30-60) / Bus (50-100)
- External: route, road, traffic
- Internal: psychology, time, skills
- Quantify int. & ext. by physical parameters

What has Eco-Driving to do with Kyoto?

- 1 litre of fuel equals 2.4 kg CO2
- Retrofitting: CO2 reduction per mileage
- Better engine, aerodynamics, tyres, etc.
- Cost-Benefit calculation by Kyoto mech.
- Fleet benefit by total fuel consumption
- Savings by psychology or retrofit?
- Need to quantify savings by MRV
- Kyoto projects: reliable figures, y/n?
- **Summary:**
- **Int. & ext. contributors must be clear**

Eco-Drive and psychology

- Findings of GIZ project in Colombia

	Heavy bus (24,5 tons)	
Driving Style	l/100 km	Indexed
Aggressive	101,5	145
Normal	69,9	100
Gentle	54,5	79

What is Eco-Driving?

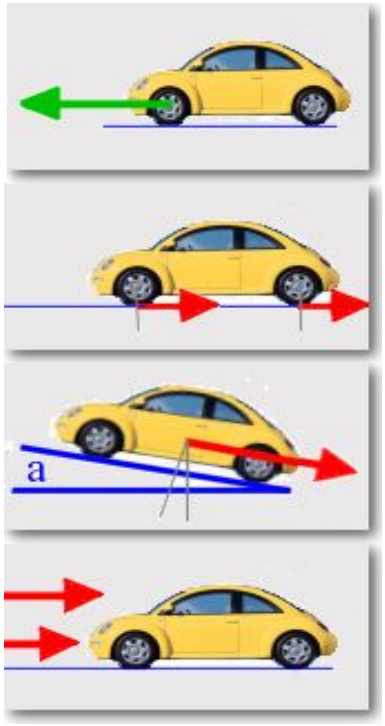
- Drive smoothly and accelerate gentle
- Drive in the highest gear possible
- Use engine brake
- Use auxiliary equipment in moderation
- Check tyre pressure
- Remove racks and unnecessary weight
- Check time schedule and maximum speed
- Plan tour and routes with little standstill
- Roll-out and drive ahead

Make energy of driving visible

The Physics of driving! $\phi_1(GPS)+\phi_2(Rest)=\phi(Iph)$

Fuel consumption given by:

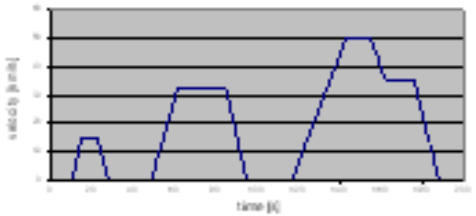
- Engine characteristics
- Aggregate (electric, air condition, etc.)
- External & internal forces:
  - Acceleration (positive)
  - Rolling Friction
  - Grade
  - Air drag (aerodynamics)
  - Standstill energy consumption



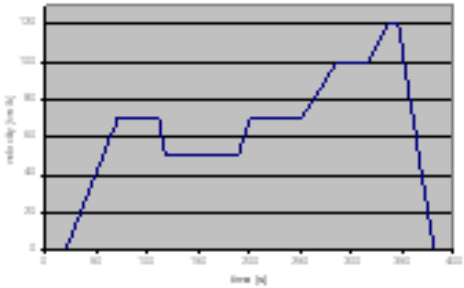
$$P = mv \cdot (a_+ + g(\mu + \sin\alpha)) + \frac{1}{2}\rho \cdot A \cdot c_d \cdot v^3 + Sts.$$

Make energy of driving visible

Relative to EC Cycle



European Commission Cycle (ECE15)



Extra Urban Driving Cycle (EUDC)

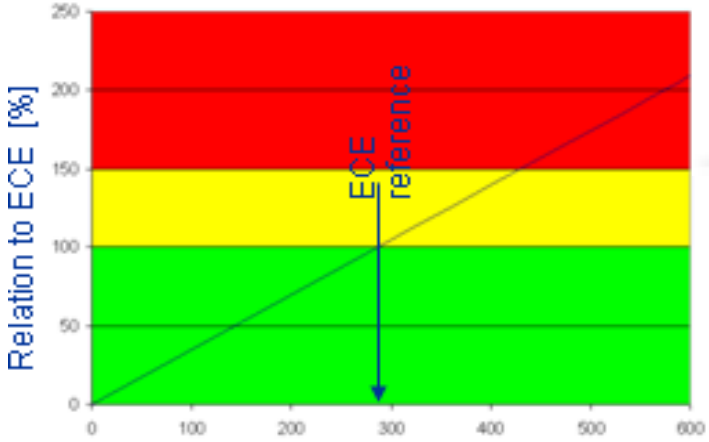
Characteristics	ECE15	EUDC
Distance [km]	1.013 (x4)	6.955
Duration [s]	195 (x4)	400
Average Speed [km/h]	18.7	62.6
Maximum Speed [km/h]	50	120

Model Car Assumptions

$m = 1200\,\mathrm{kg}$
$\mu = 0.015$
$c_d = 0.325$
$A = 2\,\mathrm{m}^2$

$$P = mv\cdot(a + g(\mu + \sin\alpha)) + 0.5\cdot\rho\cdot A\cdot c_d\cdot v^3$$

The Physics of traffic flow

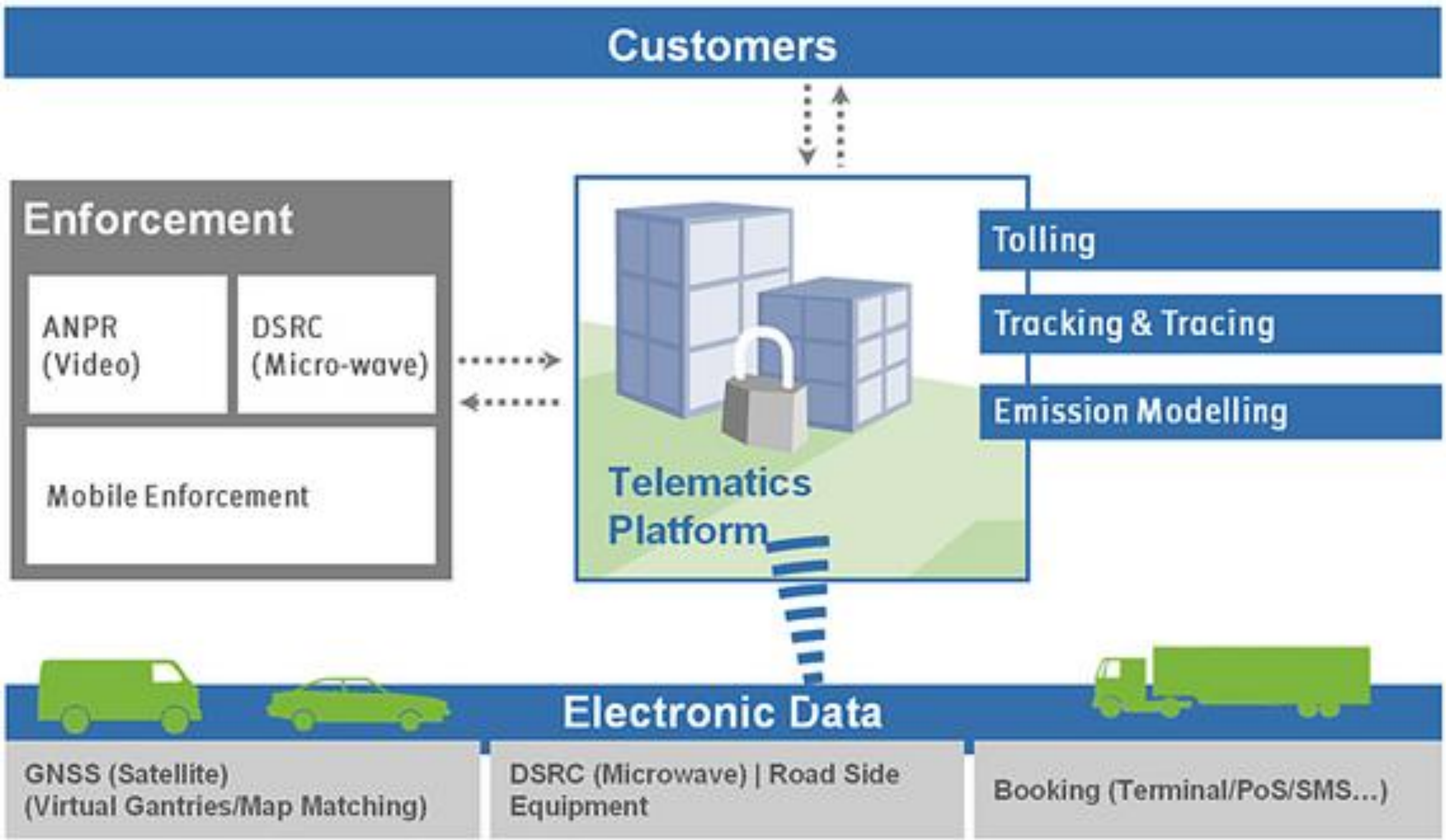


Cycle	Acceleration work	Rolling work	Aerodyn. work	Grade work	Sum
ECE15	175 kJ (45%)	174 kJ (45%)	38 kJ (10%)	0 kJ	387 kJ (100%)
EUDC	786 kJ (24%)	1189 kJ (36%)	1340 kJ (40%)	0 kJ	3315 kJ (100%)

Assume low speed regime: Neglect aerodynamic effects.

Method and derived figures © Satellic Traffic Management

Low Carbon ICT for free-flow ETC, FM and logistics: Plug&Play for Export, Open Source, runs on SAP

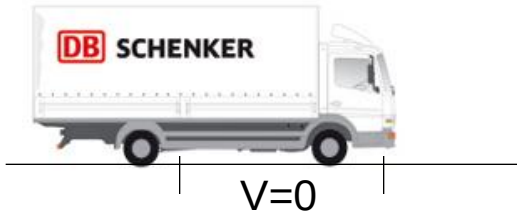


- **Acceleration**

- **Air drag (aerodynamics)**

- **Grade resistance**

- **Rolling friction & road surface**

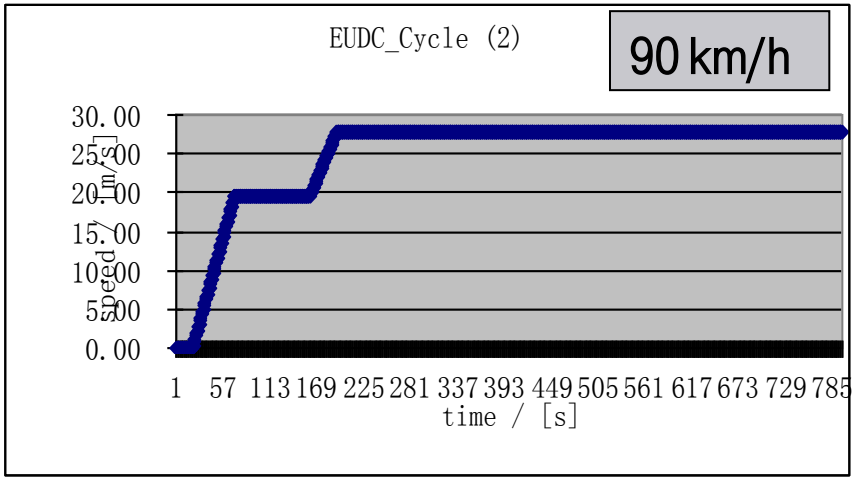


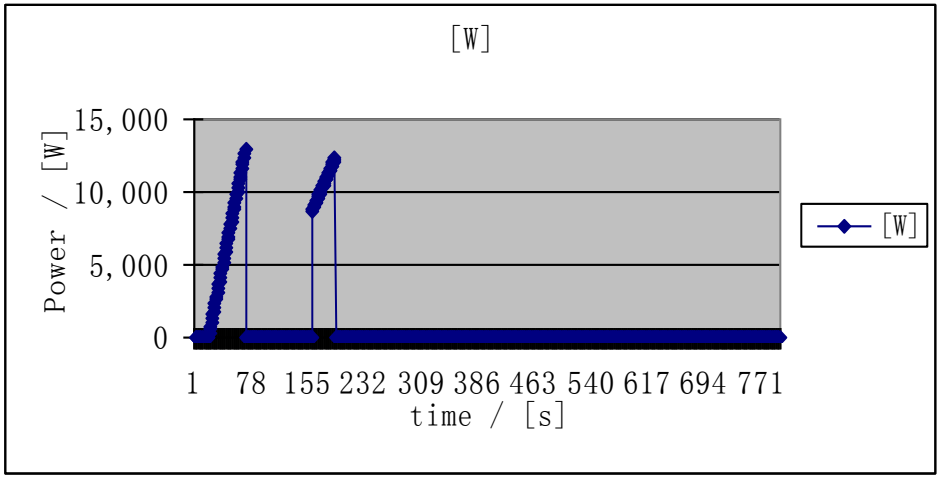
- **Standstill**

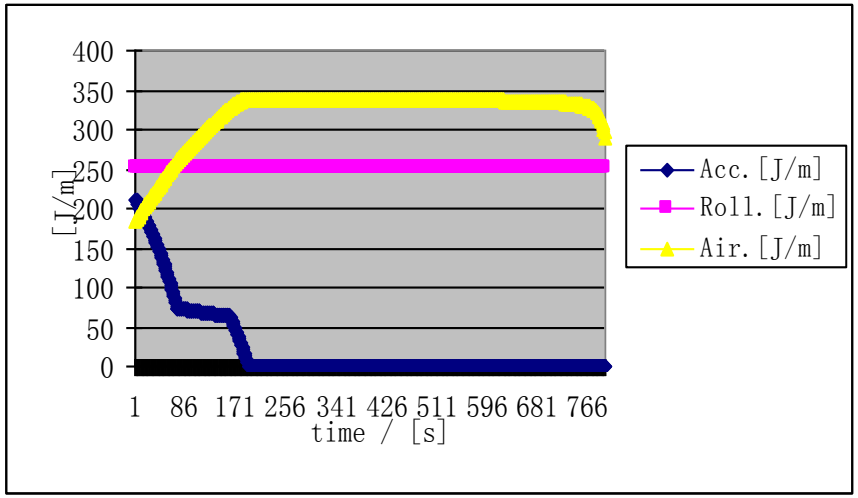
Measure ➔ Define & Calculate ➔ Visualize

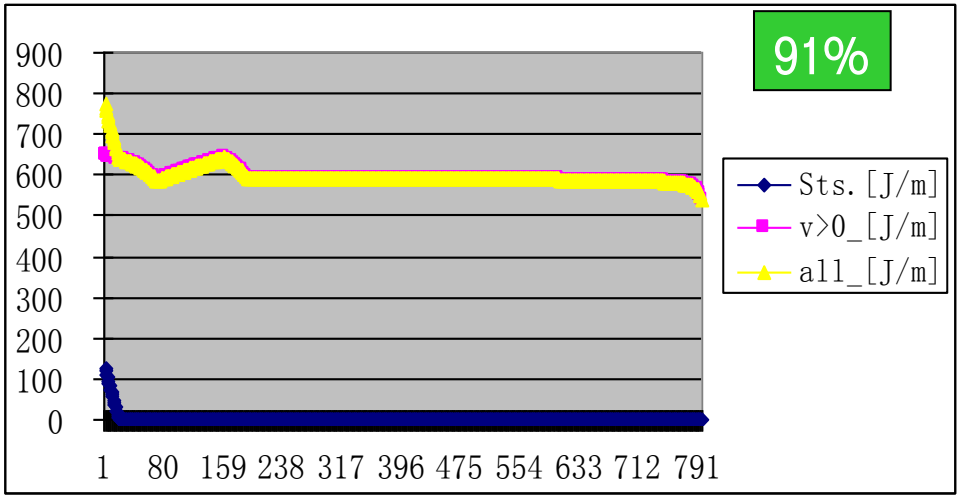
Make energy of driving visible

Low Carbon!



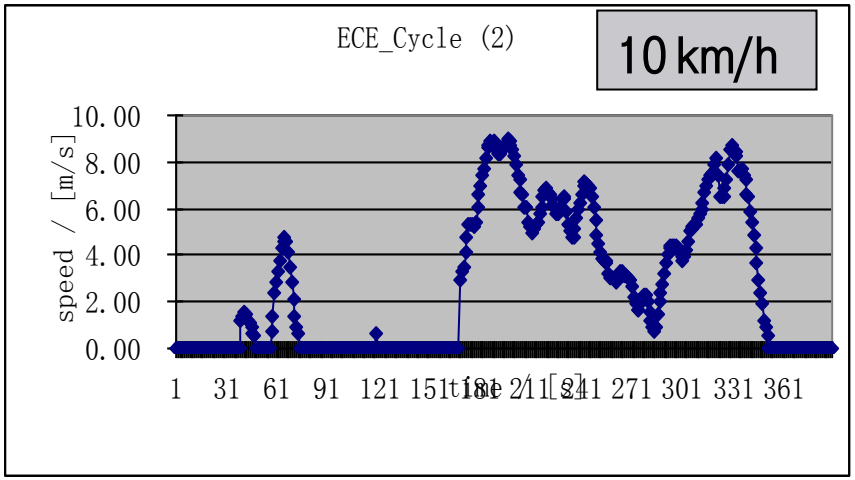


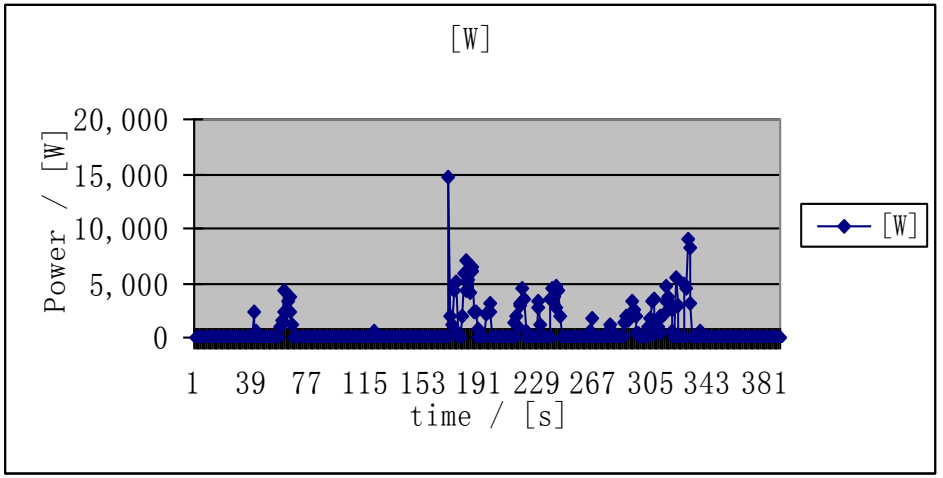


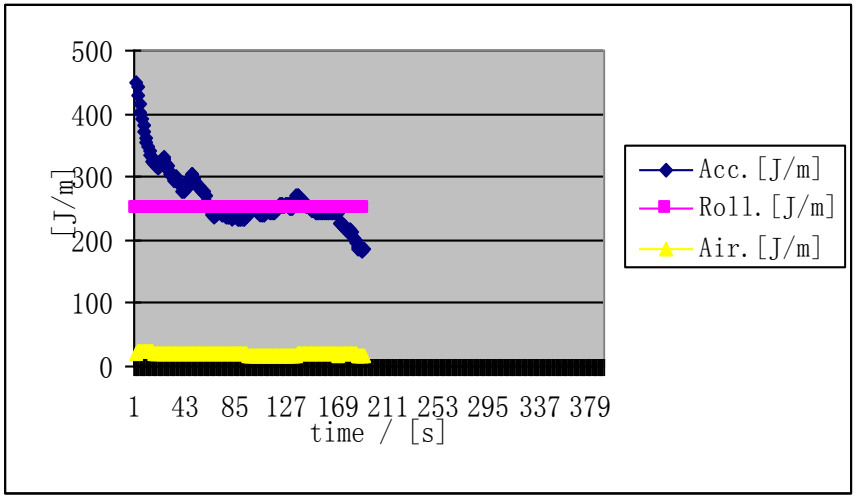


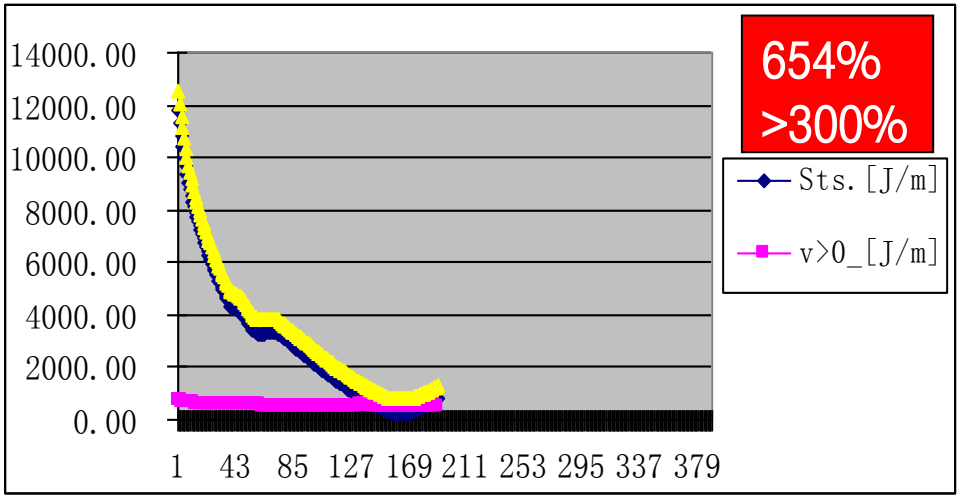
Make energy of driving visible

Beijing traffic jam: Worse even than theory!









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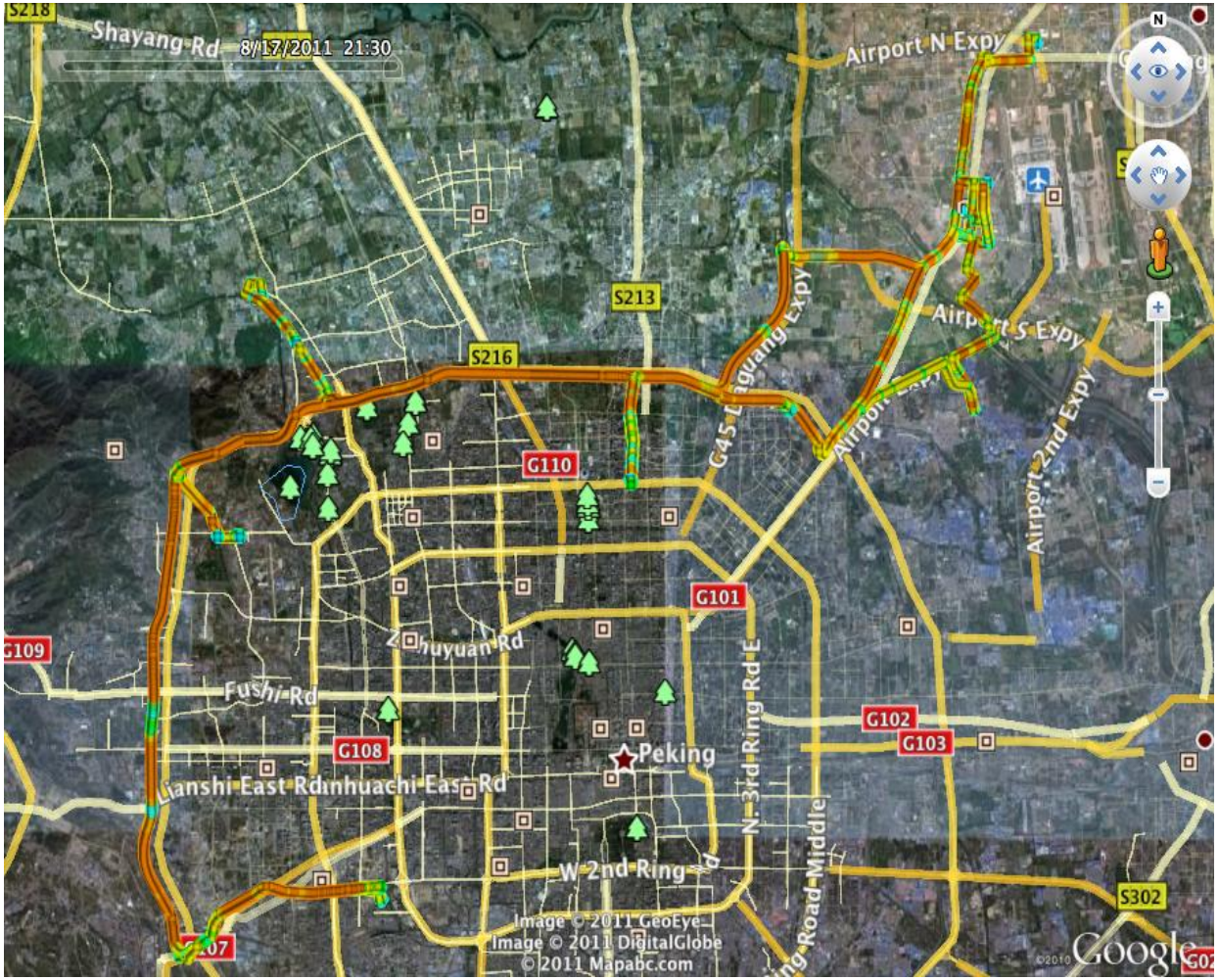
Beijing – Shenyang
Focus on Fuel efficiency

- Foton semi trailer, 35tons payload, 6 axles
- Payload each time identical (5tons)
- Extra Urban Driving cycle (highway)
- Test-run over 14 days
- One Pick up - One destination
- Load parameter configured
- Engine parameter configured for heavy truck

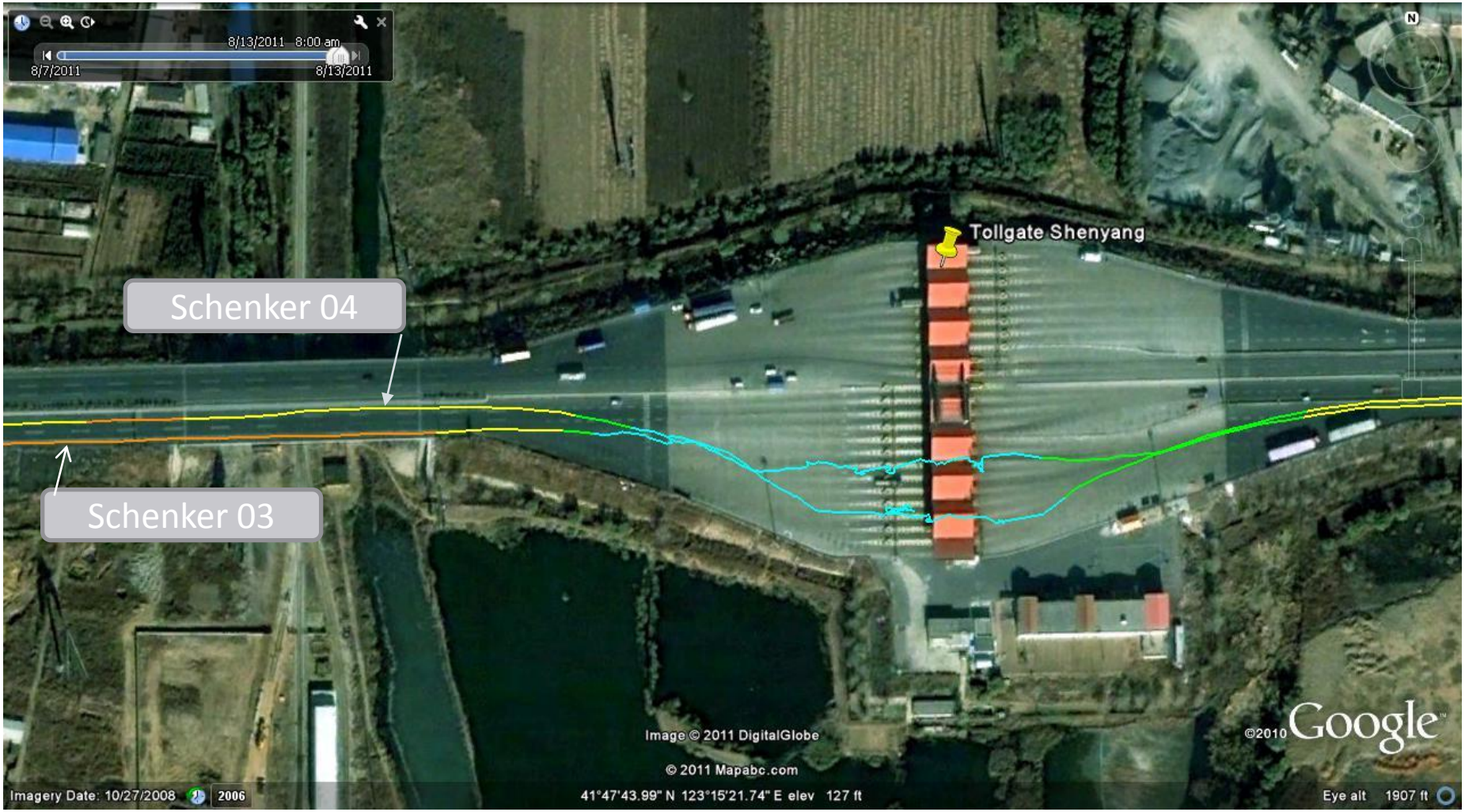
Beijing City Logistics

- Box truck, 5ton payload, 2 axles
- Payload various (1ton – 5ton)
- Urban Driving Cycle (Beijing City)
- Test-run over 7 days
- Multi-Destination
- Load parameter configures
- Engine parameter configured for city-trucks
- **Saving potential per truck and year: 30*1000(00)*1EUR * 20%=6000EUR**

Test run with EMS and ATP system installed



Test run results



From Beijing to Shenyang – approach Toll Station

Trip characteristics of Tour Beijing Shenyang – Relation between Fuel, Energy and Speed Parameter

	Sample evaluation for some test data from Schenker trail Beijing/Shenyang											
	Pre-condition:											
	Data evaluation starting all trip from Latitude: 40.868xx and longitude 120.934xx											
	Drive time: 15 minutes or 900 seconds											
	Same direction from Beijing to Shenyang											
Nr.		date	Av Speed [m/s]	time min	**Speed [km/h]**	km driven	Stand Still Work [J]	Rolling Fric. Work [J]	Aerodynamic Drag Work [J]	Avg. Rel. Normalized Work	**Avg. Fuel Consumption [l/100km]**	**CO2 emission [g/km]**
1	Schenker 03 n1	04.08.2011	16,30	15,00	**59**	14,7	0	21242,79	19376,62	62,63	**31**	**746**
2	Schenker 03 n2	07.08.2011	14,77	15,00	**53**	13,3	0	19278,33	14880,88	60,78	**30**	**710**
3	Schenker 03 n3	11.08.2011	18,52	15,00	**67**	16,7	0	24171,91	28093,00	75,77	**38**	**913**
4	Schenker 03 n4	14.08.2011	19,16	15,00	**69**	17,2	0	25005,61	30850,18	70,47	**35**	**849**
5	Schenker 04 n1	05.08.2011	17,74	15,00	**64**	16,0	0	23430,37	25736,93	70,12	**35**	**843**
6	Schenker 04 n2	08.08.2011	19,87	15,00	**72**	19,9	0	25925,24	34193,88	69,17	**35**	**834**
7	Schenker 04 n3	12.08.2011	16,51	15,00	**59**	14,9	0	21602,62	20008,32	61,17	**30**	**732**
8	Schenker 04 n4	13.08.2011	19,18	15,00	**69**	17,3	0	25035,67	31429,07	69,84	**35**	**842**

First results of field trial Urban and Extra-Urban

SAP-ERP

Fuel.total

CAN-BUS, Fuel Consumption

Dispatcher

1 W./ 2-3 d.
1truck→ 600l
→2000km
Go & return

Fraud
Overload
Better Route
Technology
Tyre Pressure

Phys. Model

Route

Driver

Configuration

STS

Grad

ACC

Roll

Aero

EUDE/UDC
%Red, Gelb, Green

%Red,Gelb,Green

|Total-Model| > 0
Load? Fraud?
Tyre Pressure…

Interpretation of EMS data

Advantages of Advanced Telematics Platforms for Emission Reduction Projects

- Fuel costs can be reduced and monitored
- Measurement, reporting and verification for climate projects will improve
- Eco-Drive Training is no longer psychological, but also quantified

Environment and traffic authorities:

- CO2 emissions and local air pollutants can be shared with government and NGO's
- Carbon trading projects according Post-Kyoto agreements for road transportation

Logistics service provider:

- Fraud indications, route and fuel monitoring
- Eco-Drive training and control, best practise and incentive policy

Driver:

- Private: financial benefits (revenue sharing with his company)
- Work-related: company increases its competitiveness, stable job position

Next step:

Combine Climate Policy and Carbon Market with Economic Benefits!

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Thank you for your attention

Please contact us for further information

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