

ACTUATE – final partner meeting

11 December 2014

Brussels, Belgium



Main project activities – I



- 2012 minimum criteria for the trainings developed
- 2013 Training plan and training material developed for the bus drivers and multipliers
- 2013 about 650 bus drivers and 30 multipliers trained and energy saving potential evaluated for bus and tram
- 2013 evaluation based on the feedback of the trainings
- 2013 compilation of training material for the “direct tram-driver-training”
- 2013 development and production of the “Grüner Führerschein” (green-driving licence)



What has been done?

Main project activities – II



2014 “direct tram-driver-training” in 144 trainings till the end of the year with about 600 drivers

2014 development and production of the tram- and bus brochure as well as the pocket guides for trouble shooting for the tram

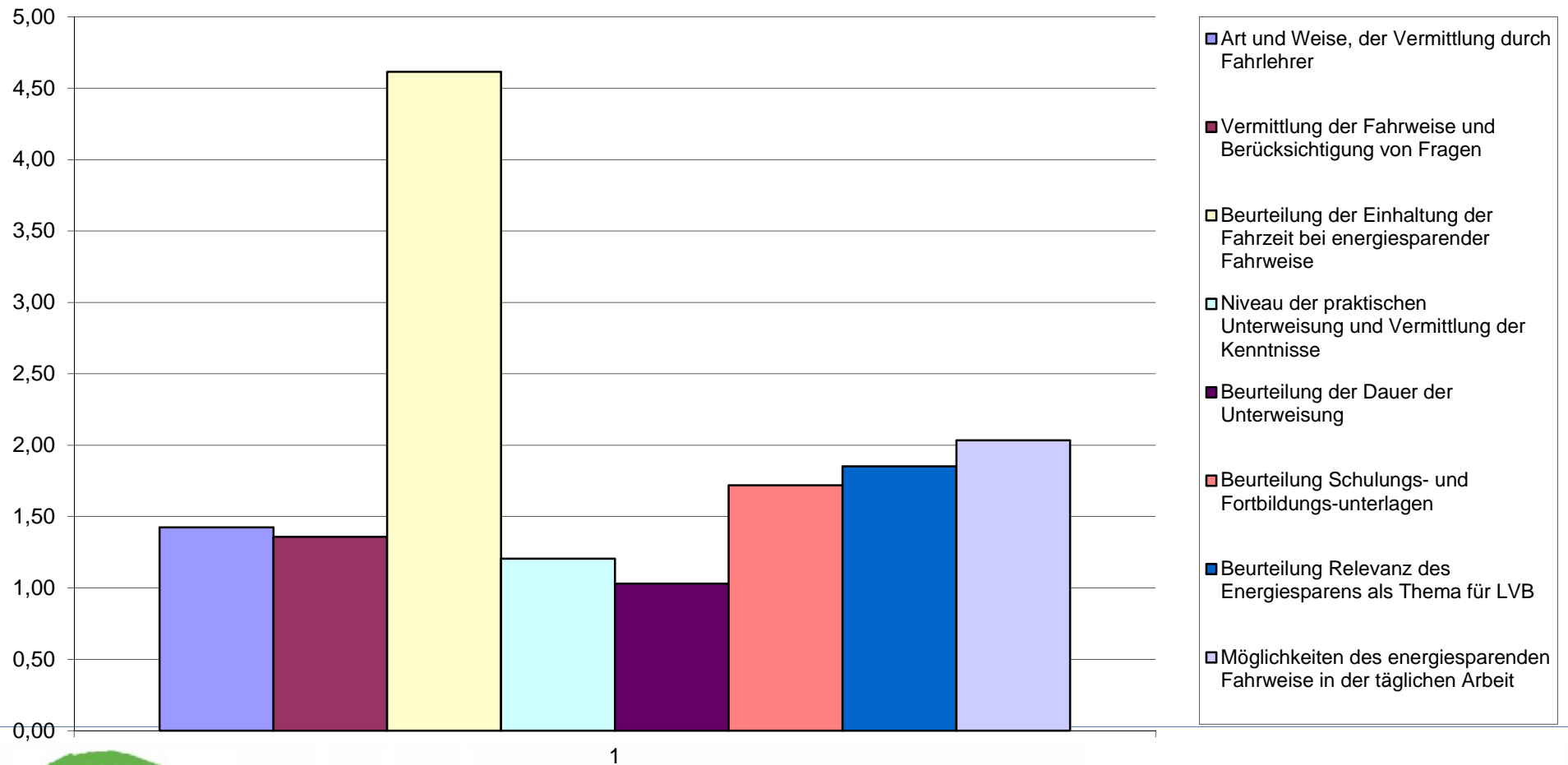
2014 Workshops and evaluation with tram instructors in May, September and December from all over Germany and Austria

2014 Evalution of the training with an external partner from Zwickau.



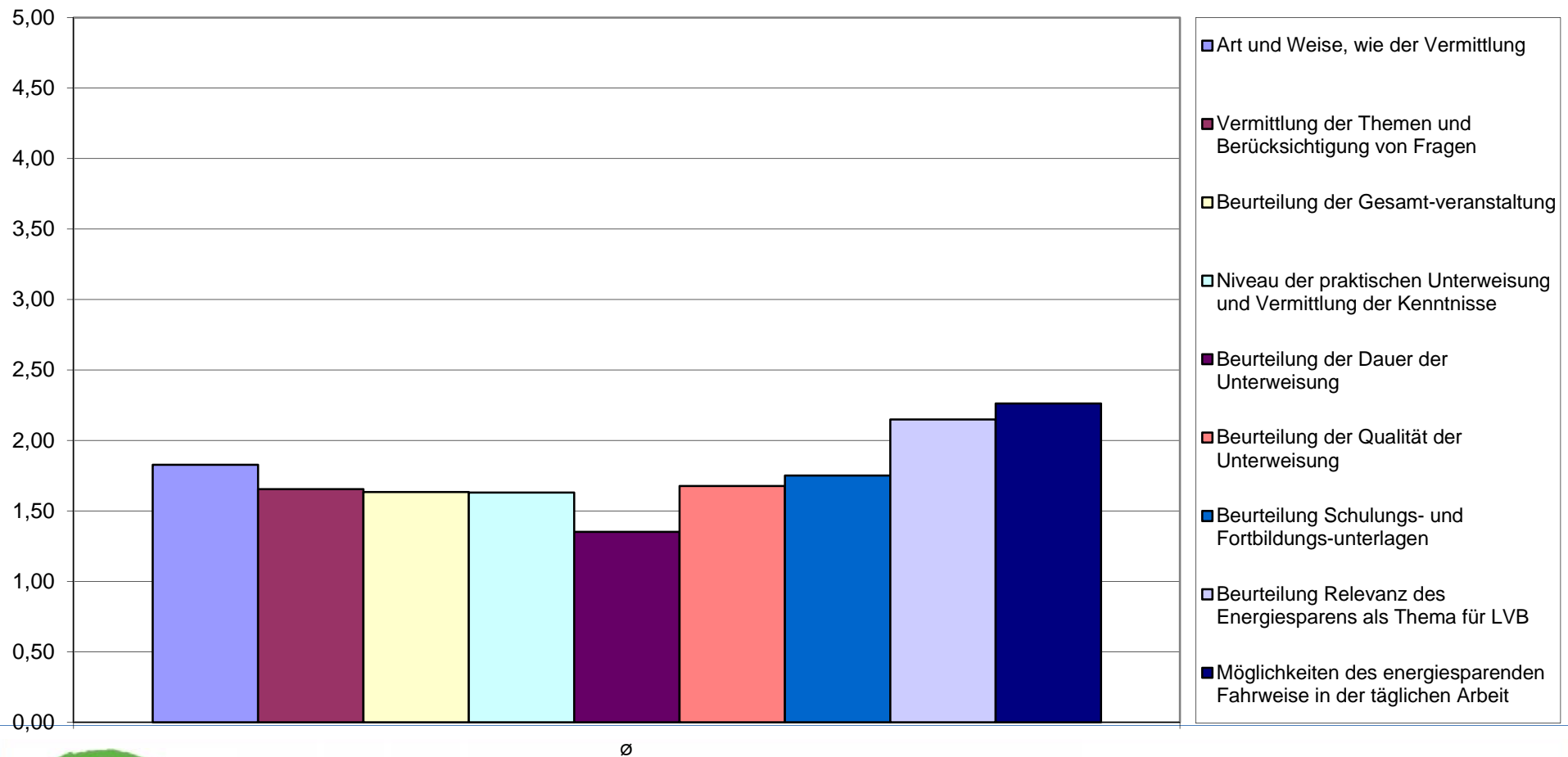
What has been done?

Drivers Feedback - Tram



Evaluation Results

Drivers Feedback- Bus



Evaluation Results

Drivers Feedback



besides the shown results, the drivers said:

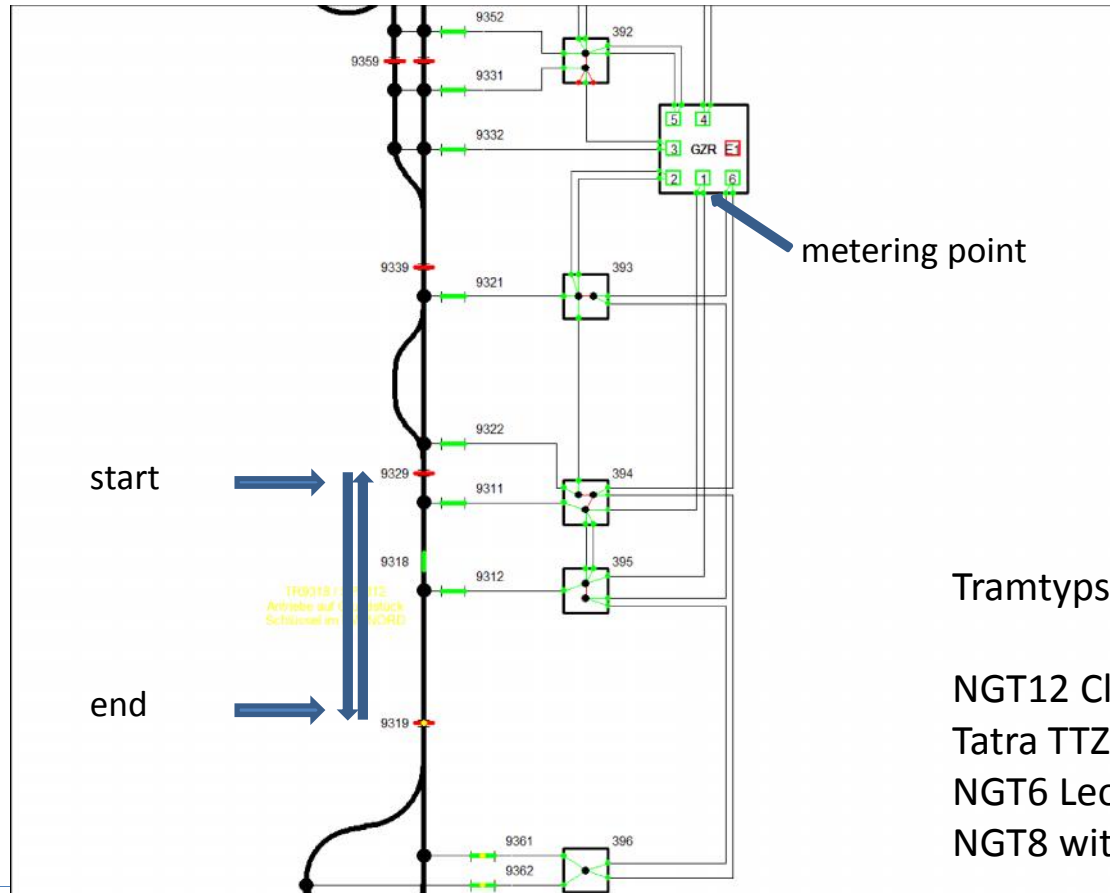
- that they drive more relaxed
- that they drive more foresighted, balanced and customer friendly
- that of course it's more comfortable to drive on a separate track than in public traffic (examples shown on photos) **BUT eco driving can reduce stress!**
- that the little trouble shooting booklet for the tram was a very good idea



Evaluation Results

Tram Evaluation

Measurement



Overview

Part of
LVB-tram-network

prepared for Measurement

Length of section: 874,5 m
2 tram-stops in each direction

Tramtyps 45m:

NGT12 Classic XXL
Tatra TTZ (T4D/T4D/NB4)
NGT6 Leoliner (TT)
NGT8 with NB4



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Tram Evaluation T4D/T4D/NB4 before trainings (example)



Part of Leipzig Tram- Network

Measurement in a
section
of tram line 3



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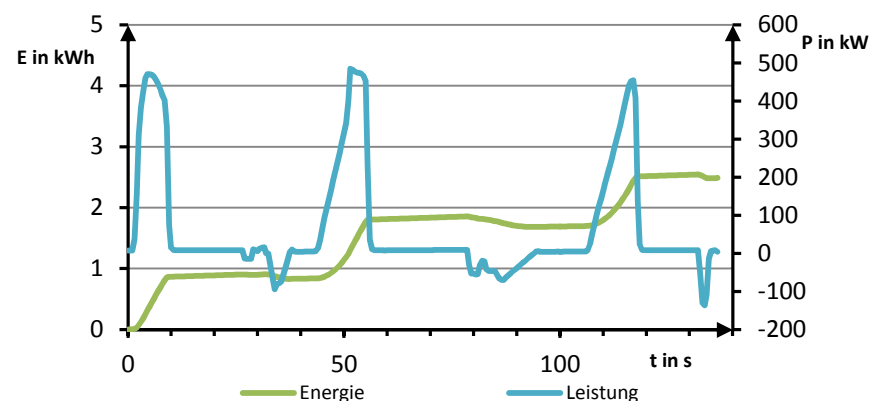
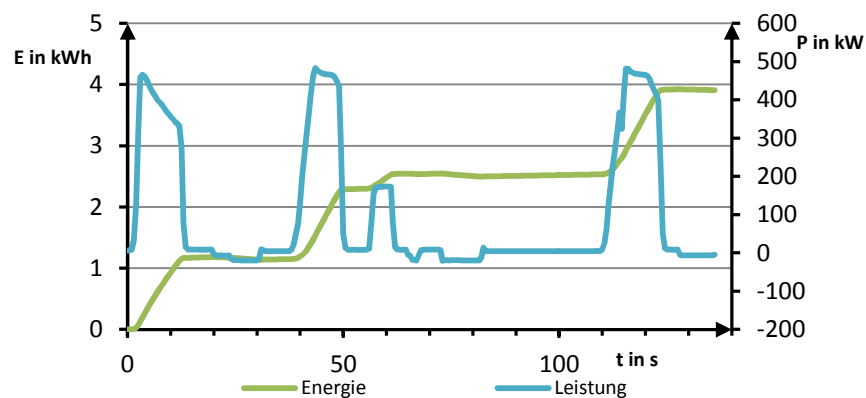
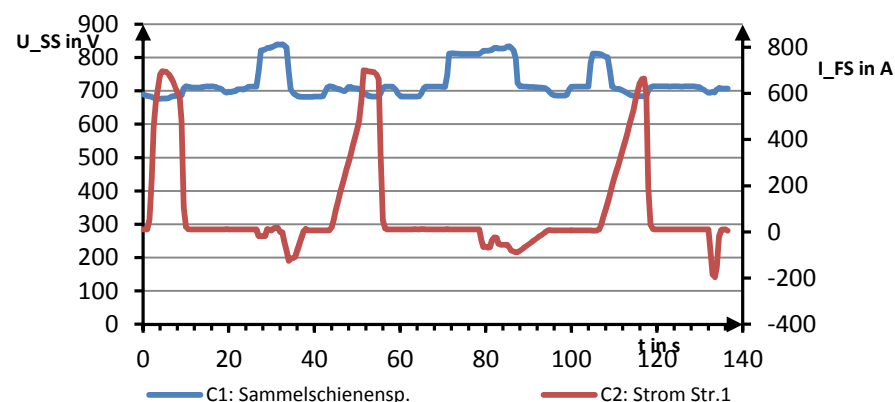
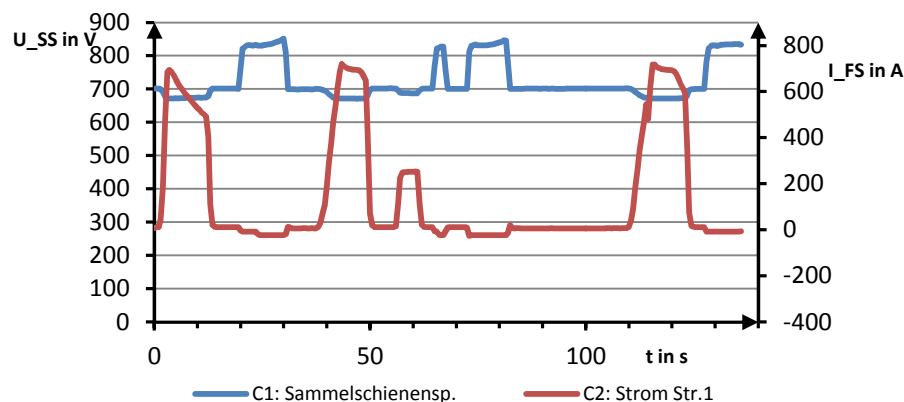
Tram Evaluation T4D/T4D/NB4 Tatra/Bombardier



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Tram Evaluation T4D/T4D/NB4 before and after trainings



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Energy consumption T4D/T4D/NB4 Comparison

	kWh	kWh/km	t/s
before training	3,98	4,55	137
after training	2,49	2,98	138
effects		-44,5%	+0,7%



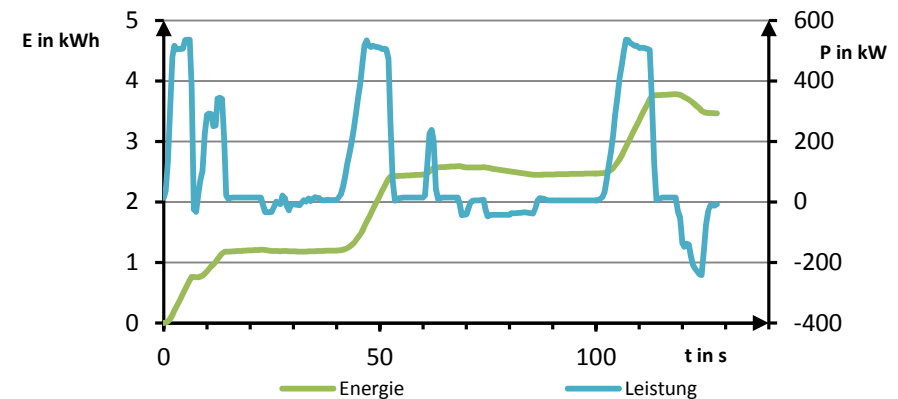
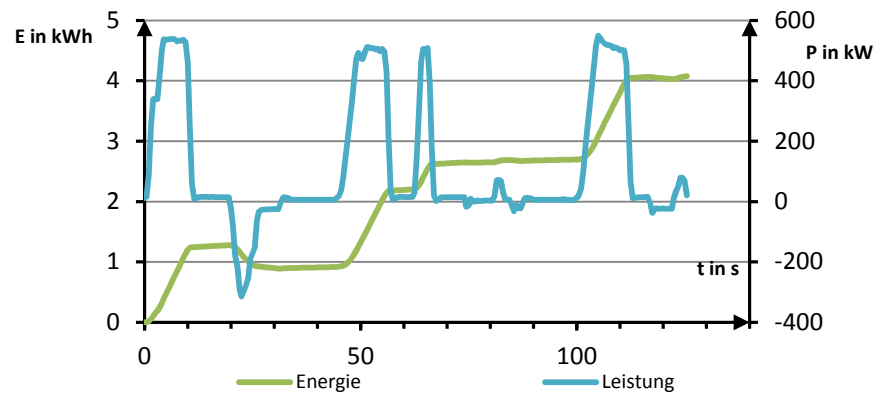
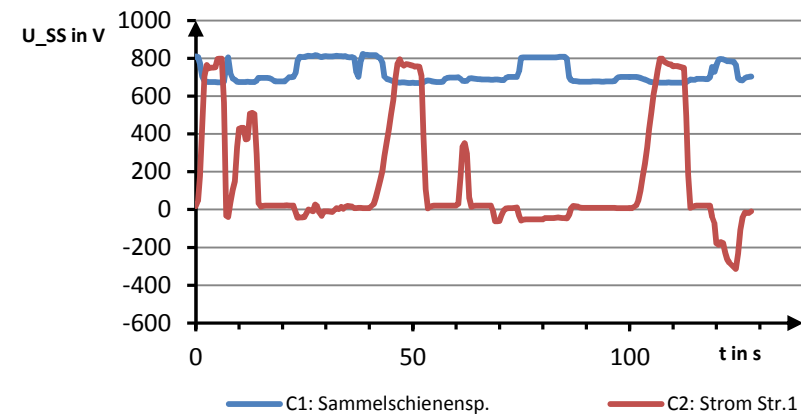
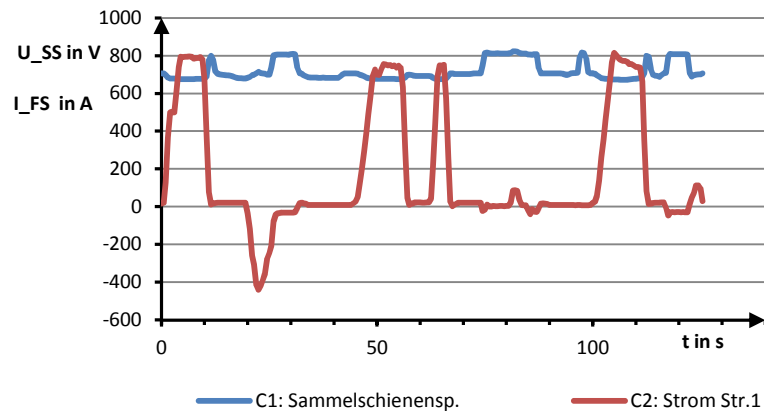
Tram Evaluation NGT12 Bombardier Classic



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Tram Evaluation NGT12 before and after trainings



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Tram Evaluation

Energyconsumption XXL

Comparison

	kWh	kWh/km	t/s
before training	4,02	4,60	127 s
after training	3,48	3,98	128 s
effects		-14,5%	+0,8%



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Tram Evaluation NGT8/NB4 Duewag/Siemens/Adranz

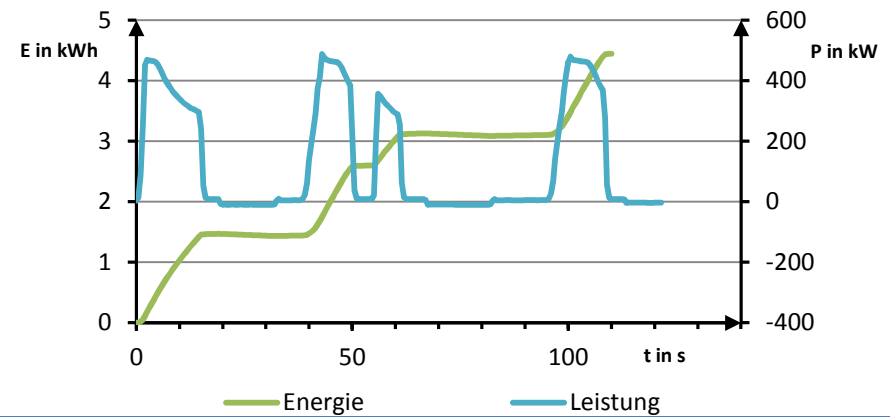
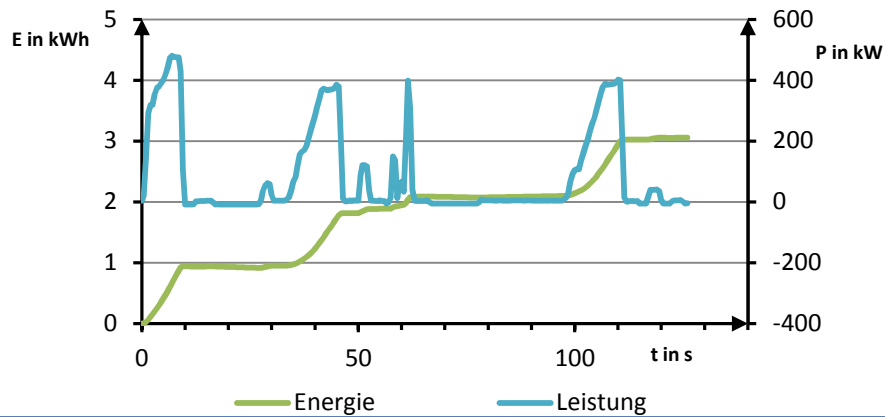
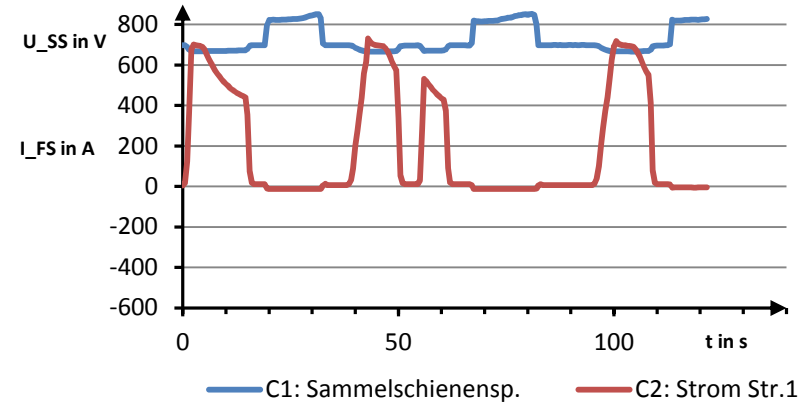
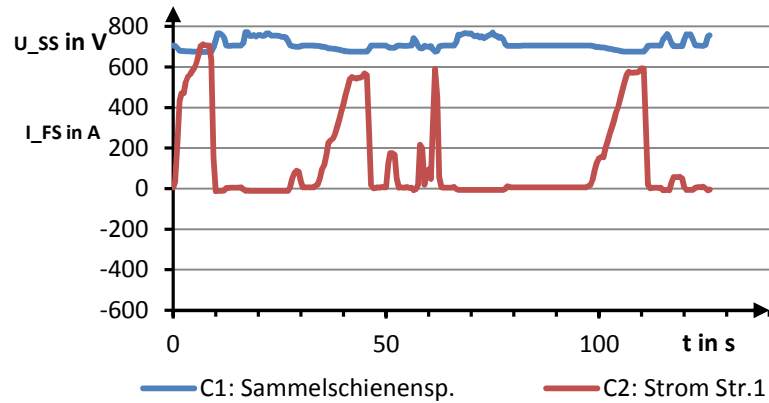
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Tram Evaluation NGT8/NB4 before and after trainings



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Energy consumption NGT8/NB4 Comparison

	kWh	kWh/km	t/s
before training	4,57	6,36	124
after training	3,02	3,45	125
effects		-45,8%	+0,8%



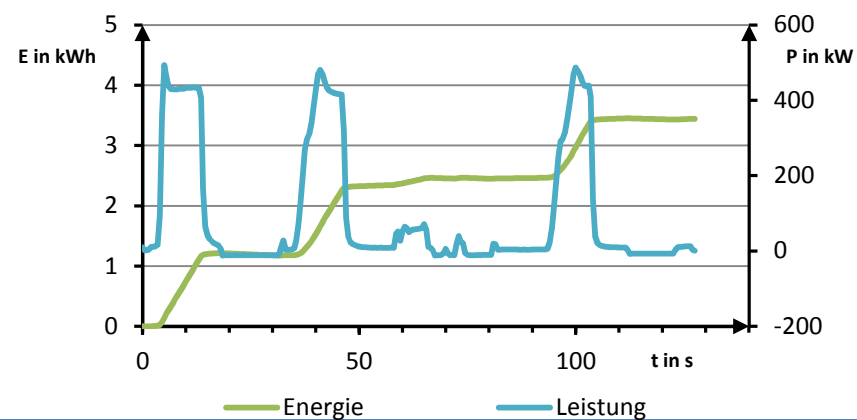
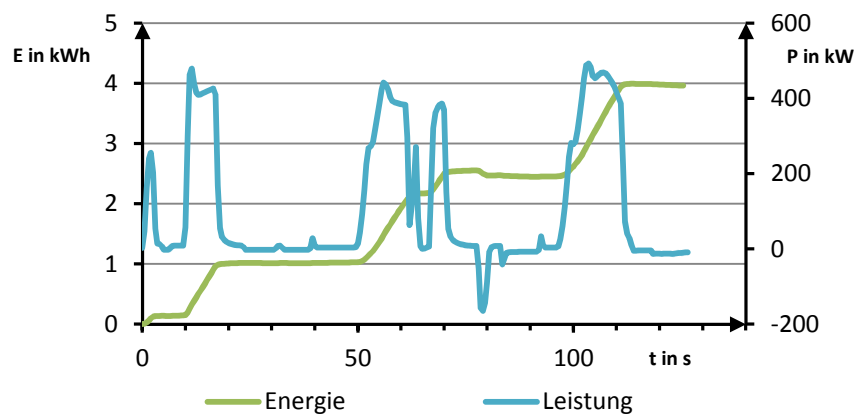
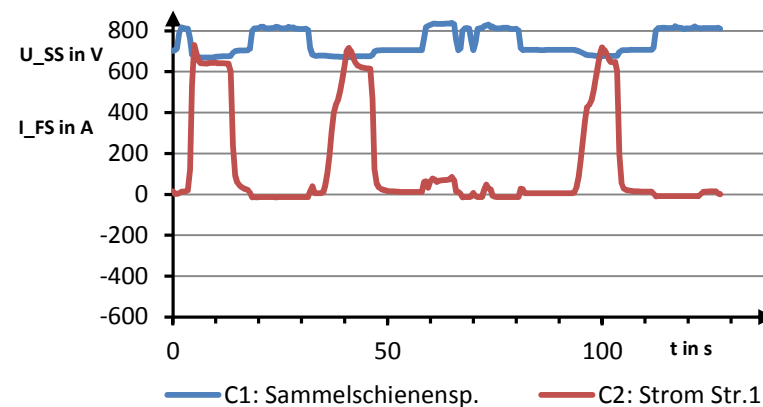
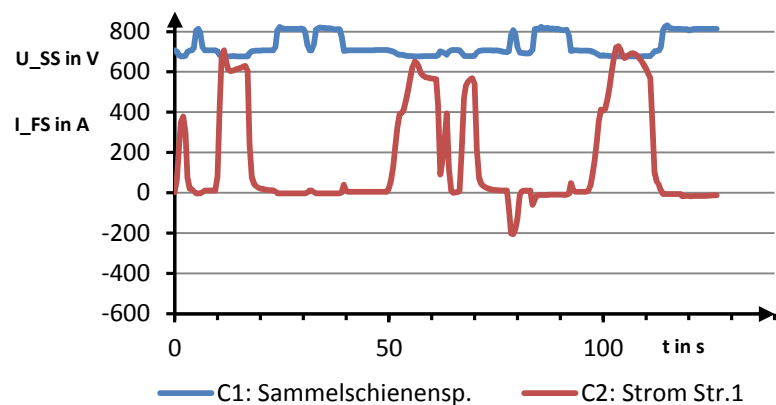
Tram Evaluation NGT6/NGT6 Heiterblick GmbH



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Tram Evaluation NGT6/NGT6 before and after trainings



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Tram Evaluation

Energyconsumption Leoliner Comparison

	kWh	kWh/km	t/s
before training	3,99	4,56	128 s
after training	3,51	4,01	129 s
Saving potentials		-13,1%	+0.8%



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Tram Evaluation Summary

General target

Minimizing energy consumption

3% = 210000 € p.a. 1,7 GWh (LVB) in Germany 0,10-0,18 €/kWh

Additional effects:

- Less abrasion (tram components and infrastructure)
 - e.g. wheel flats, transmission failures, switches and crossings of tracks (frogs),
 - less braking sand consumption
- customer satisfaction
 - More comfort, minimized side acceleration,
- Minimizing the absence due to illness
 - (LVB: drivers number of staff ill 12-13% (peak level))



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Opposites

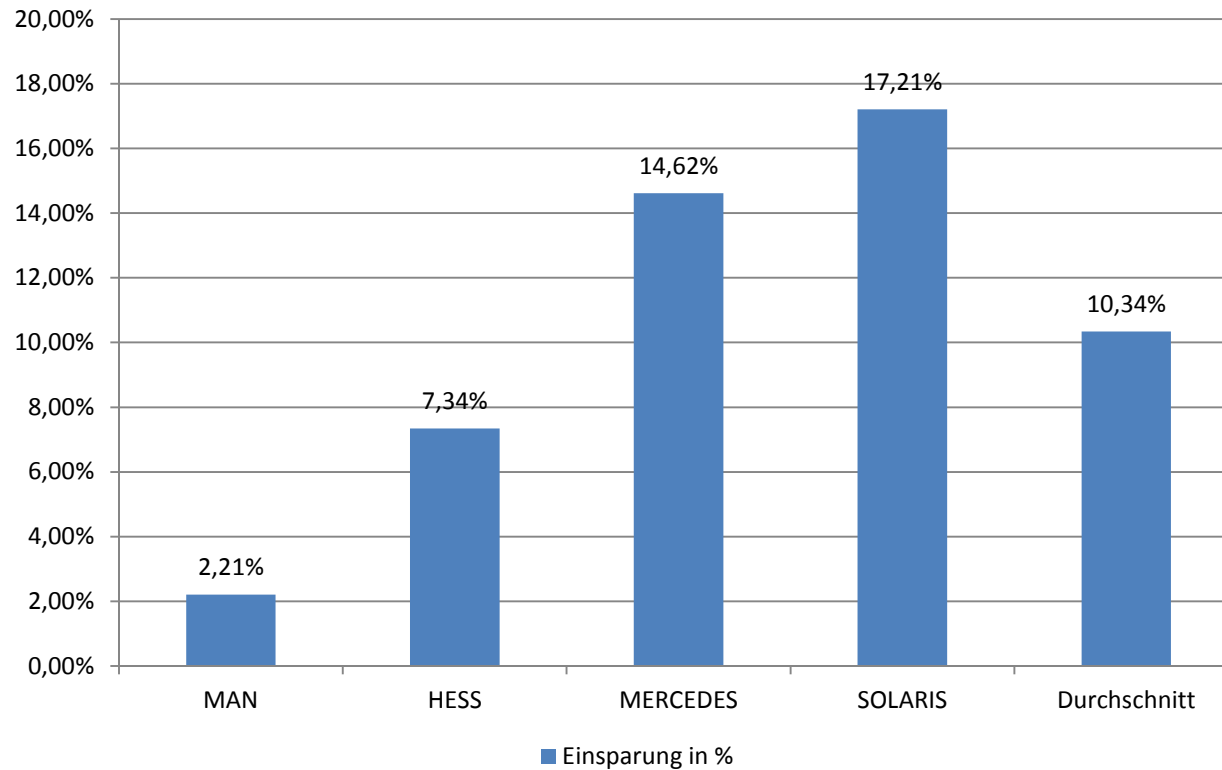
- efficiency factor of schedule(timetable)
 - Change of timetable often needs more drivers and busses or trams
 - Personal costs (40 T€ p.a) amount 120T€ p. additional course
 - more busses or trams (3-3,5 Mio € p. tram, 700-800 T€ p. ebus)
- All these costs are immediate costs
- Cost minimizing in long term
- The demand of maintenance costs are often higher than budgets



Energy measurements / savings



Energieeinsparung nach Bustypen im Training



	Einsparung in %	Verbrauch abs.
MAN	2,21%	49,88
HESS	7,34%	47,26
MERCEDES	14,62%	43,54
SOLARIS	17,21%	42,22
Durchschnitt	10,34%	45,72



Evaluation Results

Energy measurements / savings



The measurement of the realistic energy consumption in the hybridbus fleet produced a result of 4%

The target was already achieved!



Evaluation Results

Feedback in-house campaign (incl. eLearning & passenger survey)



- August 2014: e-mail to participating drivers
- October 2014: reminder e-mail
- Hardly any feedback
- Conclusion: make eLearning easier accessible (i.e. from work stations at the depots); in-house software in the familiar system (intranet)



Evaluation Results

Feedback in-house campaign (incl. eLearning & passenger survey)



Evaluation Results

Main project activities - III



- One workshop for tram instructors
- Trainings for bus and tram drivers who could not participate
- Standardisation of the bus brochure
- Developement of a communication plan for the top management und the rest of the company



What will be done (till 31.01.2015)?

What went well & what did not go well?

What needs to change?



Went well:

- The practical trainings
- The train-the-trainer-workshops
- The pocket guides for trouble shooting
- The green-driving licence
- The measurement on the hybrid bus
- The duration and content of the trainings
- The customers appreciate the energy efficient driving



Lessons Learned

What went well & what did not go well?

What needs to change?



Did not go well:

- The communication:
 - with the top-management, because they should have been convinced at the beginning of the project
 - to the green-driving licence, because we have no agreement with our top-management what should happen with it after the trainings
 - with posters and brochures, because they came too late for first trainings
- The eLearning tool, because it was only available from home computers, not the work stations at the depots
- The indirect measurement on the tram
- The multiplier trainings, because the multipliers did not have enough time



Lessons Learned

What went well & what did not go well?

What needs to change?



- **Secure the support and the conviction of the top management!**
- **make a well constructed communication plan with the top management first , then start with the trainings!**
- **Communicate on time, sensibilize the entire company for the trainings!**
- **more practical trainings than theory!**
- **Use measurement equipment on the vehicle to make the results and efficiency visible!**



Lessons Learned

Exploitation activities



- Continuation of the subject as part of future trainings
- Standardized bus brochure
- Communication concept for our top management
- Developement of a communication plan for the top management und the rest of the company



What will go on (after 31.01.2015)?

Exploitation activities



**Thank you for
your attention!**



What will go on (after 31.01.2015)?