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Editorial

Dear Trolleybus Community,

This is our sixth (and last) TROLLEY project newsletter, as the project ended officially at the end of March 2013. In the meantime we have documented our 38-month project and can say proudly that TROLLEY will leave a respectable legacy. Since the project started (back in February 2010) we have put the trolleybus back on the political agenda in Brussels, raised the profile of the trolleybus as a future-oriented and sustainable public transport mode and developed useful tools, guides and reference documents based on the innovative local activities in our TROLLEY partner cities.

TROLLEY was and still is part of a trolleybus renaissance movement worldwide. TROLLEY made decision makers, politicians, planners and technicians around Europe aware of the benefits of trolleybus

systems and our promotion work over the last three years has encouraged many European cities to think seriously about introducing a trolleybus system as the backbone of their public transport.

The TROLLEY Roadmap process at the end of the project was a very supportive measure to communicate the future prospects of trolleybus systems, in particular for the electrification of public transport across Europe.

However, the Roadmap has also shown that the end of the development path of this technically mature electric transport system has not yet been reached and several research and development areas could still be optimised in the future. Thus, our work is not finished with the official end of the TROLLEY project, but will continue in new activities and projects. It will be interesting to see what

effect TROLLEY has and how future European programmes for clean urban transport will look. In other words, will Europe reap what we have sown?

At this point I would like to thank the TROLLEY partners for all their enthusiastic work over the project's runtime and their declared intention to continue our cooperation in a follow-up project "TROLLEY II" in the future for the sake of clean urban transport with trolleybuses. Enjoy reading and thank you for accompanying us on our TROLLEY journey for the last three years!

For more information about TROLLEY, please visit our project website www.trolley-project.eu or contact us via trolley@salzburg-ag.at.

Enjoy reading the TROLLEY journal!
Yours faithfully
Gunter Mackinger, Lead Partner
TROLLEY

TROLLEY's legacy: The trolleybus is back on the political agenda

Consultation process on the future of trolleybus systems



Handover of the TROLLEY Declarations during TROLLEY's stakeholder consultation event in Brussels: (from left to right) Frank Schneider, JTS Central Europe; Patrick Mercier-Handisyde, DG RTD, European Commission; Hugue van Honacker, DG MOVE, European Commission; Gunter Mackinger, Lead Partner TROLLEY, Salzburg AG

The TROLLEY project has prepared a Trolleybus Innovation and Research Agenda supported by external stakeholders and decision makers of European companies in the electric bus industry, public transport authorities and research institutions. The agenda is part of a capitalisation activity of the TROLLEY project to develop a Roadmap for Trolleybus promotion in the future.

The Trolleybus Innovation and Research Agenda in the TROLLEY Roadmap is the result of an ongoing stakeholder consultation process. Starting with a questionnaire-based interview with 25 stakeholders in the electric urban transport community, the first results of this process have been discussed in a cooperative dialogue with further stakeholders in round table formats in Vienna, Berlin, Gdynia and Brussels. The discussions focused on identify-

ing technology, policy or regulatory gaps and economic and environmental drivers for electric transport with trolleybuses. A highlight of the consultation process was the presentation and discussion of results of the Trolleybus Innovation and Research Agenda together with representatives of the European Commission and Central Europe Programme and electro-mobility experts from academia, the public and private sector in Brussels on 12 March 2013. During the event the TROLLEY project partners handed over to the European Commission a collection of TROLLEY Declarations signed by more than 70 stakeholders across Europe. The large number of signatories demonstrates the widespread support for trolleybuses as a sustainable electric mode of urban transportation. A list of signatories can be seen on our TROLLEY [website](#).

Altogether more than 50 stakeholders, including experts from UITP's Trolleybus Working Group, were involved in the TROLLEY Roadmap process. The feedback, advice and recommendations received during this process of strategic stakeholder consultations has been integrated into the Roadmap and Trolleybus Innovation and Research Agenda. Even though the agenda is focused on future trolleybus systems, it also complements existing roadmaps for future electric bus systems or for the electrification of (urban) public transport (such as the Electrification of Road Transport by the European Technology Platforms ERTRAC, EPoSS and Smart Grids) as trolleybuses are not considered as an electric public transport mode for the future or are only marginally mentioned in these roadmaps.



TROLLEY stakeholder consultation process at the German Federal Press Office in Berlin on 28 February 2013: (from left to right) Daniel Steiner, President trolley:motion; Arnd Stephan, Technical University Dresden; Arnulf Schuchmann, General Secretary trolley:motion; Wolfram Leyendecker, Kirsch energy systems; Michael Glotz-Richter, Free Hanseatic City of Bremen

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In a nutshell, the Trolleybus Innovation and Research Agenda shows that trolleybus systems can be an important "bridge technology" for future smart electro-mobility based on research topics such as:

- smart grids and wider urban electro-mobility infrastructure,
- smart infrastructure concepts exploiting synergies between trolleybus and tram electrical infrastructure, or
- testing advanced hybrid electric-electric drive train concepts combining wire-based and autonomous modes of operation (based on automatic wiring/ de-wiring technology).

Thus, trolleybus systems, as a backbone for urban mobility, could play an enabling role for electrified mobility in the future. The Trolleybus Innovation and



TROLLEY stakeholder consultation process at the Technical University of Vienna on 18 February 2013: (from left to right) Frank Schneider, JTS Central Europe; Gunter Mackinger, Lead Partner TROLLEY, Salzburg AG; Helmut Mödlhammer, President Austrian Association of Communities; Markus Preiner, Federal Ministry of Economy, Family and Youth, Austria; Siegfried Rupprecht, Rupprecht Consult GmbH; Daphne Frankl-Templ, Federal Ministry for Transport, Innovation and Technology, Austria; Robert Thaler, Federal Ministry of Life, Austria; Norbert Ostermann, Technical University of Vienna

Research Agenda and presentations from the event in Brussels can be found [here](#).

The consultation-based TROLLEY Roadmap process has already shown success: the document was reviewed by UITP experts and used as input for a special section on future trolleybus sys-

tems in the Innovative Bus System Roadmap, which will become part of ERTRAC's (the European Road Transport Research Advisory Council) Urban Mobility Research Roadmap.

Furthermore, the agenda was used as a basis for participation in consultation processes with regard to recommendations for research and demonstration topics in future programmes such as Horizon 2020 and the new transnational cooperation programmes for 2014-2020.

Finally, the trolley:motion member Solaris Bus & Coach represents the trolleybus community in the "Sherpa" group "Sustainable Mobility" of the European Innovation Partnership (EIP) Smart Cities & Communities (http://ec.europa.eu/eip/smartcities/index_en.htm). The strategic implementation plan for this EIP will be ready in early autumn 2013 and start of the implementation phase under Horizon 2020 will be January 2014.

TROLLEY's legacy: Increased awareness and improved image for the trolleybus

European image campaign: ebus - the smart way!



TROLLEY campaign in Salzburg

Trolleybus systems are well recognized all over the world.

More than 40,000 vehicles are operated in about 370 cities in 47 countries worldwide. They are clean, sustainable, safe and efficient and represent a well-established e-mobility solution that is capable of contributing to the EU's 2020 emission targets. To spread the word among citizens, decision makers and relevant public transport stakeholders throughout Europe, the TROLLEY project created the image campaign "ebus - the smart way!", to promote trolleybuses as a smart, clean and green solution for urban public transportation of the future.

The ebus campaign consists of:

- a print campaign with promotional material such as billboards, posters, or swing cards,
- a trolleybus movie
- a Roadshow and
- the establishment of the European Trolleybus Day

The print campaign has been adopted by all TROLLEY partner cities and can be used by other trolleybus cities free of charge. More information on its components (also available in PL, IT, FR, ES, DE, RU, HU and CZ) and its visual look (brand, etc.) can be found on our [TROLLEY website](#).

Increased awareness and image of the trolleybus European image campaign ebus - the smart way!

*TROLLEY campaign
in Eberswalde,
in Brno and in Szeged*



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The TROLLEY movie is another piece of the puzzle of TROLLEY's promotion activities to shape a new and more positive image of trolleybuses in Europe. The movie is based on interviews with local and regional stakeholders performed in our TROLLEY partner cities Salzburg, Austria, Brno, Czech Republic, Eberswalde,

ideas on raising awareness of trolleybuses as smart, clean and green solution for urban public transportation. The TROLLEY movie, available on **Vimeo** and **YouTube**, has been seen by approx. 4.000 people so far. It is also available with subtitles in Polish, Italian, German, Hungarian and Czech. If you are

through a range of TROLLEY information materials. The Roadshow was organised not only in TROLLEY partner cities but also in other Central Europe cities such as Prague (CZ) and Halle/Saale (DE) in order to promote the TROLLEY project and the benefits of electric mobility with trolleybuses.



Szeged's Roadshow stop was planned in close cooperation with the library and showed a collection of historic photos, brochures, articles and books about the trolleybus in Szeged, trolleybus models, children's drawings and ebus photos.

Germany, Parma, Italy, Gdynia, Poland, and Szeged, Hungary. The movie highlights the advantages of trolleybuses and offers

interested in receiving a subtitled version in one of these languages, please contact **us**. A local event-based promotion and communication tool of the TROLLEY project was the TROLLEY Roadshow. The Roadshow stopped in every partner city between May 2011 and February 2013, providing information on historical, technical and operational aspects of trolleybuses in general and the local context specifically. In order to create a common visual identity, all individual events were supported

The individual TROLLEY Roadshows were planned to take advantage of possible synergies with other local organisations (libraries, museums, etc.) or events (conferences, meetings, conventions, etc.) to which the local Roadshow stop could be linked. For example, the TROLLEY project partner LVB (the public transport operator in Leipzig) installed posters in several of their tram vehicles connecting the city centre to the trade fair grounds,

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Information poster campaign about the history and future of trolleybuses in a Leipzig tram



Impression from the TROLLEY Roadshow exhibition in a museum in Eberswalde

Increased awareness and image of the trolleybus European image campaign "ebus - the smart way!"

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where euregia, new mobility, the 3rd International Trolleybus and TROLLEY's Transferability conferences took place. On the trams, stakeholders from the public transport sector (and other tram passengers) were informed about LVB's historic trolleybus era



European Trolleybus Day "Lounge" in Salzburg. Trolleybus with the winning design of the "pimp my ebus" contest 2012.

between 1939 and 1975 as well as current and future e-mobility projects in Leipzig such as the study of bus line 70.

Another way to promote trolleybuses among passengers and citizens was the establishment of European Trolleybus Day Initiative. This initiative started in 2010 and reached about 75,000 inhabitants in our TROLLEY partner cities during its first three stagings. Today, European Trolley-



Reaching the younger generation: Open Days at the SZKT trolleybus depot during European Trolleybus Day



Tug of war with a trolleybus! European Trolleybus Day 2012 in Eberswalde

bus Day is a fixed annual event, taking place on the first Saturday of European Mobility Week in September (see also page 8).

For impressions and more information about the European Trolleybus Day initiative please visit our **TROLLEY website**.

eLearning modules and Knowledge Center

TROLLEY is also about knowledge exchange, competence building and competence sharing. To share knowledge with a wider audience, TROLLEY prepared four e-learning modules.

The following TROLLEY courses are available online:

- Trolleybus Basics
- Selling an Idea: (Re)introducing a Trolleybus System
- Optimising the Use of Energy I & II
- How to Convert a Diesel Bus into a Trolleybus

TROLLEY's e-learning courses allow quick and convenient learning regardless of distance and time. All courses are available in English. If you would like to participate in one of our e-learning courses, please use the login window (upper right corner) on the start page of our **TROLLEY website**.

TROLLEY also established a European Trolleybus Knowledge Centre which serves as the main European information hub on trolleybuses providing contacts to European trolleybus experts (pool of experts) and relevant links and

documents (library) to those who wish to learn more about trolleybus systems. The Knowledge Centre contains a Trolleybus Wiki section that includes technical information about key elements of trolleybus systems. Users can add or edit information. The TROLLEY Knowledge Centre is integrated into the website of our TROLLEY communication partner trolley:motion and is accessible via **trolley:motion's website**. Approx. 50 experts are currently registered in the expert pool and almost 70 expert publications have been uploaded to the TROLLEY Knowledge Centre to date.

Outputs for transport professionals

The TROLLEY partners worked not only on policy support and promotion for trolleybuses, but also on local project activities including pilot investments or feasibility studies. All these activities and their results are presented in TROLLEY's Core Outputs. These include the **Take-up Guide on Diesel Bus Replacements**, the **Reference Guide on Trolleybus-Tram Network Use** and the **Transnational Manual on Advanced Energy Storage Systems for trolleybuses**. The main local partner activities are described below. All TROLLEY project outputs can be found on our [website](#).

Salzburg AG – Lead Partner

Salzburg AG optimised the processes in electrical planning of trolleybus infrastructure. Based on feasibility studies on network extensions from Salzburg to the agglomeration, Salzburg AG developed an optimised solution for the electrical planning of trolleybus infrastructure for open land track sections. The simulation approach is focused on the preparation of energy balances and network losses (overhead contact system (OCS) losses and braking resistors), the review of the capacity limit of the electrical network and its stability for the support of the planning process for network extensions. Besides the new optimised planning approach, the feasibility studies included a business analysis of the extension line 4 in Salzburg and a general comparison between a diesel bus and a trolleybus system for the extension to Hallwang-Esch. Summaries of the studies can be found on [TROLLEY's website](#). For more information about the electrical planning approach for trolleybus infrastructure please [contact](#) us.

Szeged Transport Company (SZKT)

SZKT developed a comprehensive planning guide for modern trolleybus overhead elements. The guide is based on an exemplary reconstruction of a trolleybus junction in Szeged leading to an increased vehicle speed and a decrease in the number of de-wirings at this junction. The Szeged example includes a review of the reconstruction method,



A TROLLEY pilot investment: reconstructed trolleybus junction in Szeged

including problems, solutions and lessons learnt. The report can be found on our [TROLLEY website](#).

Parma Trolleybus Company (TEP)

With the purchase of nine Van Hool ExquiCity 18 vehicles in Parma, TEP realised the TROLLEY pilot investment of nine supercaps (Maxwell Double Layer HTM Power) to test a Kinetic Energy Recovery System (KERS). Tests with the KERS demonstrated an optimised energy use of approx. 27% compared to trolleybus operation with supercaps cut



TROLLEY investment into supercaps installed on Parma's new Van Hool ExquiCity 18

off. TEP is trying to optimise the energy efficiency of this bus by developing training for safe eco-driving of these vehicles with a supercaps-based KERS in the Intelligent Energy Europe project ACTUATE ([www.actuate-eco-](#)

[driving.eu](#)). You will find more information about this TROLLEY investment and the test series for supercap performance in the Core Output Transnational Manual on Advanced Energy Storage on our [website](#).

Barnim Bus Company (BBG), Eberswalde

The TROLLEY pilot investment in Eberswalde included the replacement of auxiliary diesel engines by a lithium-ion battery; the system now features two fully



A TROLLEY pilot investment: Europe's first trolley-battery-hybrid bus in Eberswalde

electric drive systems. This bus, Europe's first trolley-battery-hybrid bus, can receive power either via the catenary or the lithium-ion battery. Over short distances the bus can also run on supercapacitors – the third electric drive system. Tests carried out in daily operation at the beginning of 2013 demonstrate that a distance of 4 kilometres can be driven in battery mode (without catenary-connection) and this distance is ideal for an optimised life cycle of the lithium-ion battery on a total line length of 18 kilometres. The battery is char-

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ged during braking on the remaining line operating with catenary connection.

This 100% emission-free trolleybus has been fed by 100% green electricity since the beginning of 2013, thereby reducing by 95% CO2 emissions as compared to the operation of a diesel bus on the same line in Eberswalde. This was the result of a comparison study between the trolleybus system and a "fictitious" diesel bus operation in Eberswalde. More information about all TROLLEY activities by BBG can be found on BBG's website (in German) or in the Transnational Manual on Advanced Energy Storage on our [website](#).

Leipzig Transport Company (LVB)

The LVB drew up a plan for the establishment of a new electric bus system within the existing tram network in Leipzig. A feasibility study was carried out in TROLLEY for the conversion of city bus line 70 into electrical operation based on potential synergy effects from using the tram power supply. The existing infrastructure and know-how in the operation and maintenance of trams provide important synergies for the electrification of public bus transport in Leipzig. The project outline "eBus 70" has been finalised and a step-by-step conversion of Leipzig's bus line 70 into an electric-operated bus line will begin – based mainly on national follow-up projects. For more information on the feasibility study please have a look at TROLLEY's Reference Guide on Trolleybus-Tram Network Use on our [website](#).

City of Gdynia

The City of Gdynia, together with the local trolleybus operator PKT, elaborated a Handbook on the Conversion of a Diesel Engine

Bus to a Trolleybus. Based on the experience of 30 conversions in Gdynia, a best practice review of conversion principles has been carried out taking into account existing trolleybus technology.

The handbook describes a conversion process that's technically and financially optimised and leads to cost savings of up to 75% compared to the purchase of a new vehicle. The conversion approach is attractive for fleet modernisation, in particular in



Diesel bus converted into a trolleybus in Gdynia

Central and Eastern European cities that have large trolleybus fleets with a lot of old trolleybuses. The handbook is available in Polish and English on our [TROLLEY website](#).

City of Brno

The City of Brno realised two feasibility studies on the extension of the trolleybus network. One study foresees an extension of the trolleybus line of about 1 km to the intermodal transport node Starý Lískovec in the Bohunice area creating an interchange between rail, bus and trolleybus transport plus tram transport within walking distance.

This increases the public transport efficiency in this area of approx. 50,000 inhabitants, where the nearby university and hospital attract an additional 10-15,000 employees and visitors per day. The second extension foresees a 300 metres section



Feasibility study: the trolleybus extension project creates an intermodal node for tram and trolleybus transport in Brno

improving public transport access to the Zoological Garden in the north-western Bystrc district of Brno. Both extension studies are already in the phase of building permit authorisation, meaning TROLLEY had a significant influence on urban mobility planning in Brno leading to an improvement in public transport for the city. More details about the planned network extensions can be found in the Trolleybus Intermodal Compendium on our [website](#).

University of Gdansk

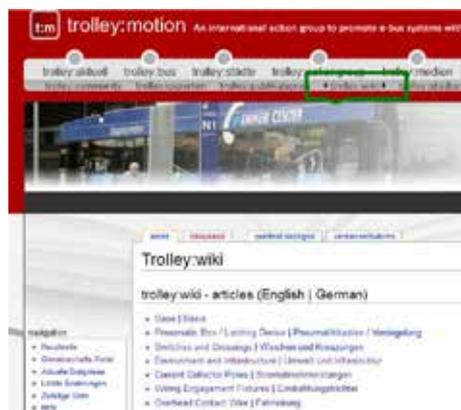
The University of Gdansk developed an efficiency model comparing diesel bus and trolleybus operation including a graphic presentation of the break-even point for the economic operation of a trolleybus system. The model is based on several indicators, including direct costs such as maintenance assets, as well as valuation of externalities such as noise and emissions. Demonstrating a very pragmatic approach, the model can be adapted easily by transport operators or city authorities to fit local conditions. The efficiency model (Excel table) as well as a description of the model can be found on our [TROLLEY website](#).

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trolley:motion

trolley:motion – an international action group to promote ebus systems with zero emissions – supported the promotion and dissemination of the TROLLEY results within its wide international network. trolley:motion set up the TROLLEY Knowledge Centre (see also page 5) the main platform for TROLLEY results in the future, as all outputs will be uploaded to its library. trolley:motion will continue the maintenance of the Knowledge Centre as an expert portal as well as the promotion of the European Trolleybus Day (see below) initiative and the TROLLEY Declaration as lobbying instruments supporting electric trolleybus mobility.

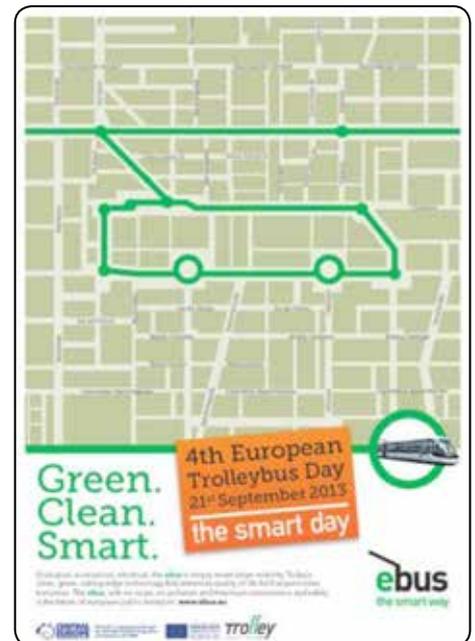


Screenshot of Trolleybus Wiki in TROLLEY's Knowledge Center

TROLLEY's work continues: The 4th European Trolleybus Day

A big success of the TROLLEY project is the European Trolleybus Day (ETD), which has been celebrated annually on the first Saturday of the European Mobility Week since 2010. It is a day fully dedicated to trolleybuses and TROLLEY invites other trolleybus cities to follow this campaign and to join the festivities across Europe in the future.

ETD 2013 will be celebrated for the fourth time across Europe. Besides our TROLLEY project partner cities of Salzburg, Gdynia, Parma, Szeged, Eberswalde, Leipzig and Brno, the following 17 cities will join us in 2013: Lublin and Tychy (PO – both cities also celebrated ETD in 2012 with us), Timisoara, Medias and Dumbrava Rosie (RO), Solingen and Esslingen (DE), Kaunas (LT), Landskrona (SE), Zilina (SK), Bergen (NO) and Arnhem (NL), Plzen (CZ), Castellón (ES), Bishkek (KG), Leeds and Sandtoft (UK). With this initiative, these cities draw attention to trolleybus transport as an important part of sustainable urban mobility in Europe. ETD activities range from information campaigns and open days at trolleybus depots to children's painting competitions or sweepstakes. The ETD is a suitable communication tool to foster dialogue with passengers. Messages can easily be spread about the environmental friendliness



Campaign poster for the 4th European Trolleybus Day

and the low noise of trolleybus transportation. And this year's European Mobility Week theme "Clean air - it's your move!" fits perfectly into TROLLEY's message about the benefits of trolleybus systems.

For more information about the 4th European Trolleybus Day in 2013 and the possibility to participate, please contact our project partner **trolley:motion**. Free premium kits with promotion material for this event are still available. Please have a look at **trolley:motion's website**.

Calendar

- ▶ **11th International Salzburg Transport Days – "More mobility – less traffic!"**, Salzburg, 14-16 October 2013
<http://www.salzburger-verkehrstage.org>
- ▶ **2013 Annual Polis Conference – Innovation in Transport for Sustainable Cities and Regions"**, Brussels, 4-5 December 2013
<http://www.polisnetwork.eu/2013conference>
- ▶ **Clean bus procurement Workshop – "Life-Cycle-Costing and the procurement of clean buses under the Clean Vehicles Directive"** Bremen, 11-12 December 2013
<http://www.clean-fleets.eu/training-and-events/workshop-bremen/>

Contact and information: www.trolley-project.eu

Lead Partner:
Salzburg AG for Energy, Transport and Telecommunication
www.salzburg-ag.at

For further Trolleybus news join the mailing list and receive the newsletter of trolley:motion:
www.trolleyemotion.ch