trolley:2.0
for smart cities

New developments of modern trolleybus systems for smart cities

www.trolleymotion.eu

trolley:2.0

OUR MISSION

Trolleybus systems provide modern, zero-emission public transport for urban areas, however, lack the flexibility that battery-equipped electric buses provide. trolley:2.0 will combine the advantages of both systems, developing trolleybuses further into hybrid-trolleybuses that allow for the partial off-wire operation while making more efficient use of the trolleybus catenaries to charge the batteries in-motion. The nine trolley:2.0 partners from public transport, industry, and research will aim to prove that battery-supported trolleybuses are a way forward towards electric public transport systems in European cities by demonstrating the new charging concept in-motion charging (IMC), that allows for the partial off-wire operation of hybrid-trolleybuses in remote sections of the networks. The trolley:2.0 use cases will be located in four cities with existing trolleybus systems from different EU-countries, Szeged (HU), Arnhem (NL), Gdynia (PL) and Eberswalde (DE). Efficient public transport, flexible operation and simplified extension of trolleybus networks as well as the combined use of the existing trolley grid infrastructure for further electrification of mobility in cities will be supported by trolley:2.0.

The implementation of national and cross-country use cases are the core activities in the EMEurope partner countries NL, DE, HU and PL. The use case work projects are structured in the following areas: in-motion charging concepts, multi-purpose charging infrastructure and innovative energy storage systems as well as the integration of renewable energy sources (RES).

Automatic Wiring and De-Wiring Systems

Source: DiaLOGIKa

Multipurpose Charging Infrastructure

Smart trolley grid, Fransen TS

Integration of Renewable Energy

Direct charging of electric cars with photovoltaics, TU Delft

Buffer Stations and Energy Storage Systems

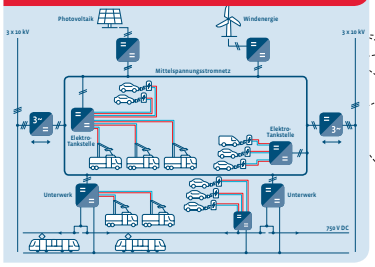
Source: Electroline

In-motion charging system, Kiepe Electric

New Trolleybus Operation Models: Feeder Bus Systems

Source: Evopro midi-bus prototype

Smart Grid Concepts



Source: ELIPTIC, Prof. Müller Hellmann

Zero-emission Public Transport

Source: ZeUS Poject, TMB

FOUR USE CASES

WILL BE STUDIED AND DEMONSTRATED IN CITIES WITH EXISTING TROLLEYBUS SYSTEMS

ARNHEM

The municipality has the ambition to be a global leader in trolley grid technology and be the first city in the world with a smart trolley grid. Arnhem also wants to become an 'energy'-city, for which a smart trolley grid is indispensable. These two ambitions come together as one within the trolley:2.0 project. The overall goal of this use case is to investigate and demonstrate the potential of trolley grids to become urban DC backbones for the charging of electric vehicles as well as the integration of PV's. This will also involve the mathematical modeling of the Arnhem trolleybus network and the development of a new generation of DC-DC converters.

SZEGED

The objective is to prove that trolley- battery-hybrid buses are the proper technology for the extension of trolleybus networks and the replacement of diesel bus lines in remote areas. Furthermore, Szeged will put into service an existing composite frame midi e-bus/trolleybus prototype. This will include exhaustive operational trials in Szeged as well as the demonstration in other trolleybus networks (Gdynia, Eberswalde). Within the trolley:2.0 project it is planned to develop - together with the local manufacturer "evopro" - a prototype midi-battery-trolleybus with longer range and lower energy consumption.

GDYNIA

Based on the current status of the battery and e-charging infrastructure Gdynia will analyse the future potential for in-motion charging. University Gdansk will also further test different battery-hybrid vehicle types and develop new functions for Stationary Energy Storage (SES) systems as a key element in smart trolley grids. The next stage of spatial development of low-emission trolleybus transport could be made in Gdynia and neighbouring cities. Thanks to the previous experience and analysis within the CIVITAS DYN@MO and the ELIPTIC project, trolley:2.0 will now enable Gdynia to develop new trolleybus services and smart trolley grid solutions in Gdynia and its urban functional area.

EBERSWALDE

Barnimer Busgesellschaft mbH will continue the research work done in the Horizon 2020 project ELIPTIC in trolley:2.0, in which it was confirmed that the conversion from existing diesel bus lines to an emission-free regular service is feasible. The aim of the project is to convert the existing trolleybus fleet into a battery-trolleybus fleet, which can operate on routes without an overhead line. This will be done by establishing the 910 line as a pure electric bus line, thereby contributing further to environmental protection, local, emission-free driving in public transport and aid in gaining practical experience with the conversion from diesel to electric buses using the dynamic charging concept.

trolley:2.0 key outputs

trolley:2.0 contributes to the Key Areas concerning:

- the efficiency of public transport based on battery supported trolleybuses, the ability of trolleybus networks to extend beyond their catenary limits, the accessible connection of tram and trolleybus networks,
- a higher acceptance of trolleybuses due to the ability to pass catenary gaps in architectural critical areas,
- a better economical evaluation of battery supported trolleybuses due to a larger number of units and
- the integration of trolleybuses and other electro mobility services based on a smart trolley grid as the basis for a DC charging backbone of a smart city.

More Information:
https://www.trolleymotion.eu/trolley2-0/

Contact details:
Alexandra Scharzenberger
scharzenberger@trolleymotion.eu
Wolfgang Backhaus
backhaus@trolleymotion.eu

Follow us on Facebook:
trolley:motion
Join the trolley:motion LinkedIn Group:
trolley:motion

trolley:2.0 team

The trolley:2.0 consortium is composed of 9 partners from 5 EU member states and includes the experience of 2 public transport operators, 2 industry partners, and 4 research partners. Further city authorities and public transport operators are involved as associated partners to enable industry and research partners to demonstrate new innovative solutions for electric public transport in their trolley networks.

trolley:2.0 in brief

The project started on the 1st of April 2018 and will last until September 2020 with an overall budget of 3 million Euro. This project has received funding from the ERA-NET COFUND Electric Mobility Europe (EMEurope).

trolley:2.0 project partners

trolley:motion urban e-mobility

Barnimer Busgesellschaft BBG

UNIWERSYTET GDAŃSKI

TECHNISCHE UNIVERSITÄT DRESDEN

PRE power developers

evopro

TU Delft

SZEGEDI KÖZLEKEDÉSI TÁRSASÁG

University of Szeged

Associated Cities

Salzburg AG | AT
Stadtwerke Solingen | DE
City of Arnhem | NL
BKV Budapest | HU
MPK Lublin sp. zo.o. | PL
PKT Gdynia | PL

User Forum

Hordaland AG, Bergen | NO
Municipality of Maribor | SLO
Berliner Verkehrsbetriebe (BVG) | DE
OSY S.A. Athens | GR
Pilsen city transport company | (CZ)
TPER SpA, Bologna | IT
Verkehrsverbund Klagenfurt | AT
Verkehrsbetrieb Zürich | CH
Marburger Verkehrsgesellschaft | DE

European Commission

Electric Mobility Europe

Imprint:
Reading: October 2018
Publisher: trolley:motion
Responsible for the content: trolley:motion