„Das Obussystem der Stadt Gdynia – erste Erfahrungen mit stationären und mobilen Energiespeichertechnologien“

Trolleybus system of Gdynia City: First experiences with stationary and mobile energy storage technologies

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Eberswalde, 8.09.2014

Trolleybus: an oldtimer or modern platform for different innovative solutions?

- Checked technology since 1882;
- 100 years of continuous operation (Shanghai, China);
- Different status of development in many countries;
- Flexible system for cities of different size (i.e. Swedish Landskrona or German Eberswalde vs. Beijing, Shanghai, Moscow or Rome);
- Design and functionality of the body is the same as in case of a bus;
- Current development of energy storage technology brings a new breakthrough for existing and new (i.e. Leeds, UK) trolleybus systems;
- Fundament for electromobility in smart city.

Introduction of modern vehicles in Gdynia

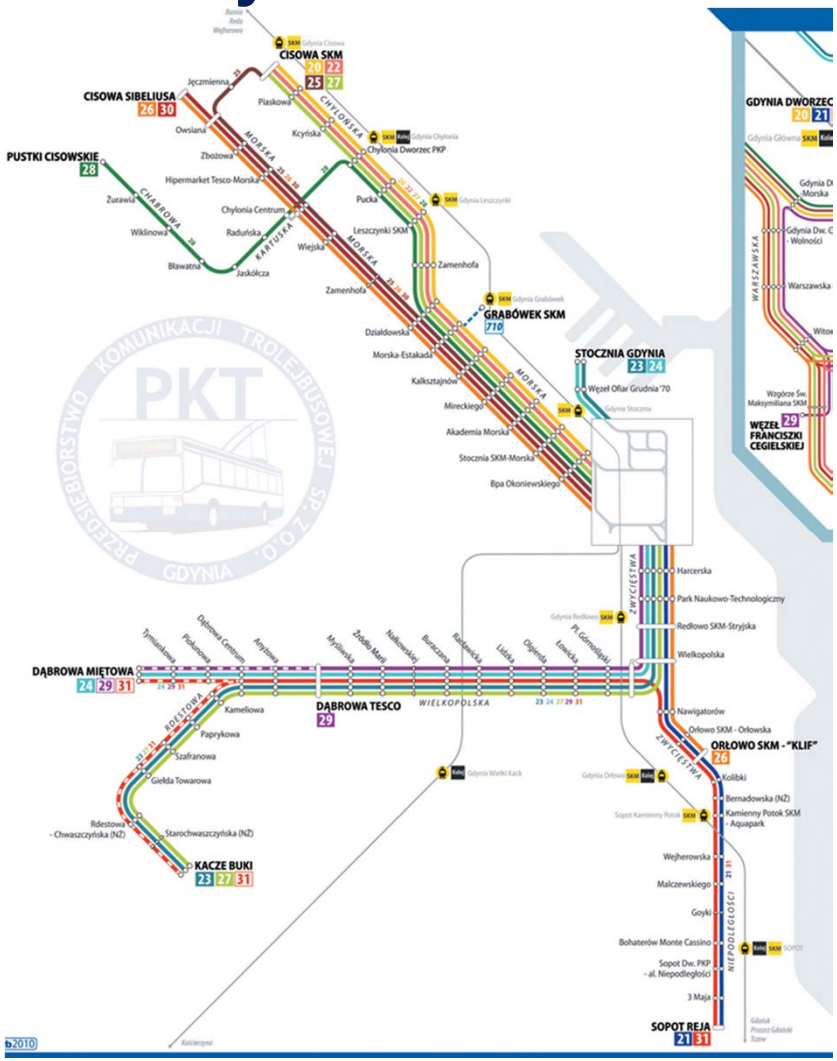
and in Parma (Italy)…

Mobility picture of Gdynia, Poland

- Modern city created in 1926;
- 250 000 people, part of 1 milion inhabitants metropolitan area;
- Dynamic economy with important role of maritime business;
- Regulated competition on public transport market with one organizing body – Public Transport Authority;
- Public transport still has strong position (ca. 50% of mechanised trips);
- Dynamic growth of car ownership (>500 per 1000 inh.);
- Structural change of public transport passengers (seniors, more reduced fares);
- Trolleybuses since 1943 (71th anniversary!);
- „Hard” investments supported with soft measures focused on education of passengers and citizens;
- Developed marketing information system for public transport.

Present status of trolleybus transport in Gdynia

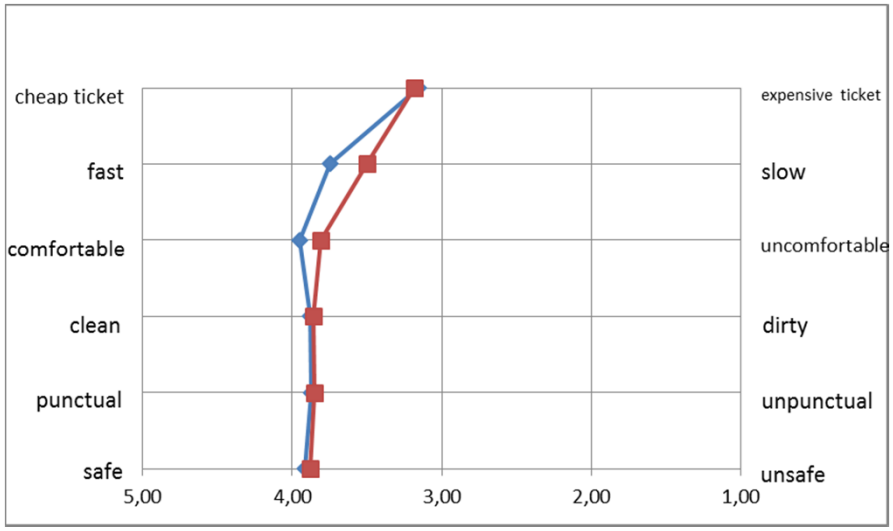
- 81 trolleybuses (mainly Solaris Trollino);
- 12 regular lines, 44 kms of network;
- „traditional” layout of network with all operations „under the cable”;
- 5 mio. of vehicle-kilometrs in 2013;
- servicing Gdynia and neighbouring Sopot;
- To boost fleet modernisation, a convertion of diesel buses into low-floored trolleybuses has begun in 2004;
- 2/3rd of citizens with access to trolleybus;
- Almost 30% of share in supply of public transport in Gdynia;
- 1 old-timer line (May to October);
- RegioStars Award in 2013.



Vehicle structure

- Mass fleet renovation – 1/3rd of vehicles are below 3 years old;
- First trolleybus of Solaris Trollino ever produced is operational in Gdynia since 2001;
- Mixture of new and converted vehicles;
- Decreasing „quality gap” between modern buses and „old-fashioned” trolleybuses;
- 50% of vehicles with onboard batteries (Ni-Cd, Li-Ion in near future).

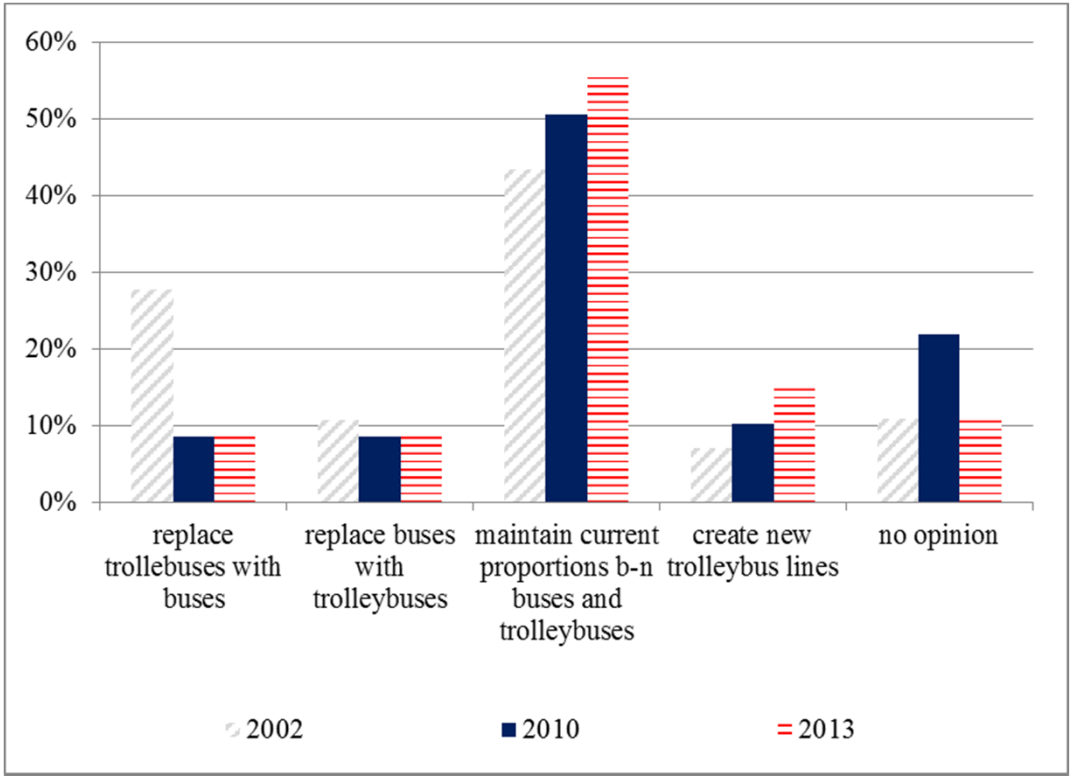
From Solaris diesel bus to trolleybus at 40% of of costs of new vehicle



Quality profile of trolleybus and bus in Gdynia in 2010

Research on perception of trolleybus transport among citizens of Gdynia

- Regular marketing research on transport behaviour and preferences (sample ca. 2000 inhabitants in age 16-75);
- Growing acceptance of trolleybuses among citizens;
- Share of people expecting maintaining current proportions between trolleybuses and diesel buses exceeded 55% in 2013 with growing numer of people expecting creating new trolleybus lines;



Trolleybus: an integrated concept of urban electromobility

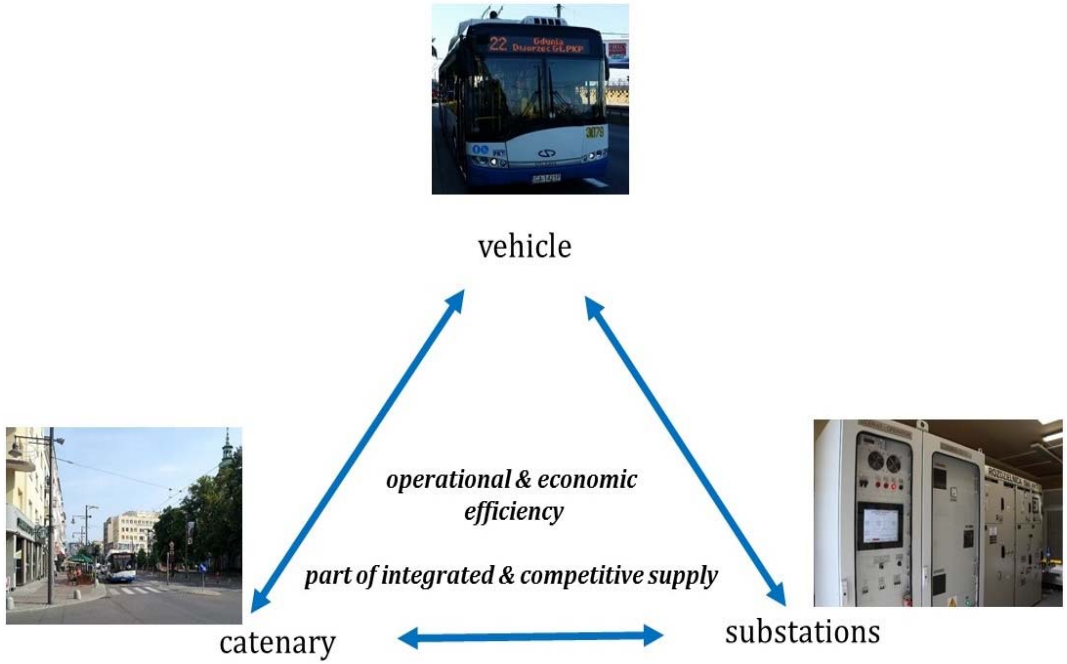
Current status:

battery used for extra events (like Opener's Festival, Red Bull Air Race, New Year, etc…).

Future status:

- Vehicles with batteries supported by supercapacitors on substation (starting in March 2015);
- Partial use of catenary;
- Improved energy efficiency;
- Possible multiple use of substations for development of electromobility services (pedelecs, e-cars);

Supercapacitors on substations because of unified size of all current vehicles (standard 12m length trolleybus) and limited space because of battery onboard.



Future of trolleybuses in Gdynia: „In batteries we trust”

Two scenarios of trolleybus system development in Gdynia:

- **stabilisation** (ca. 5 mio. veh-km per annum);
- **development** – spatial expansion for vehicles with batteries to service two new districts and to extend one line to Gdansk;

Regardless of scenario is chosen an existing trolleybus route will be reconfigured in March 2015 to service city centre (additional 2 kms without catenary).

New trolleybuses with Li-Ion batteries will create new possibility to increase trolleybus supply without infrastructure investments.

Basic vehicle: Solaris Trollino 12

An old-timer Skoda 9TR on special line

Summary: In trolleybus we trust

- The future of trolleybus in Gdynia is the combination of onboard batteries and supercapacitors on substations;
- Test of articulated trolleybus in Gdynia in spring 2014 – ca. 15 kms without catenary and still 7% of battery left…;
- Among different advantages is „technological capacity” of trolleybus: Technological capacity of trolleybus with batteries:

Lifecycle of trolleybus: 17-23 years; Lifecycle of battery: 4-7 years.

- Substations present high technological potential for integrated electromobility concept.

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