

# 80 years of trolleybus transport in Gdynia (Poland)



TROLLEY90 & its sustainable future

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# Structure of the presentation

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**Stages of development of trolleybus transport in Gdynia**  
**Selected technological aspects of the trolleybus transport development**  
**Trolleybus as an element of Gdynia's transport policy**  
**Summary**

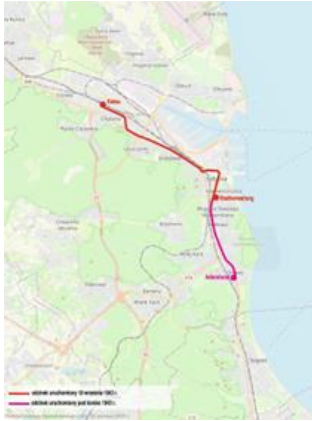


# City of Gdynia

- City established in 1926 as a result of harbour development;
- 246 thous. inhabitants;
- Part of the vibrant metropolitan area;
- Diversified economy;
- High quality of life;



# Stages of the trolleybus transport development in Gdynia



Establishment and development (1943-1957)

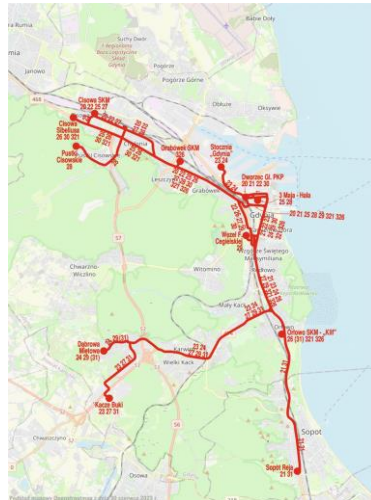
Dynamic development (1958-1971)

Limited operations (1972-1980)

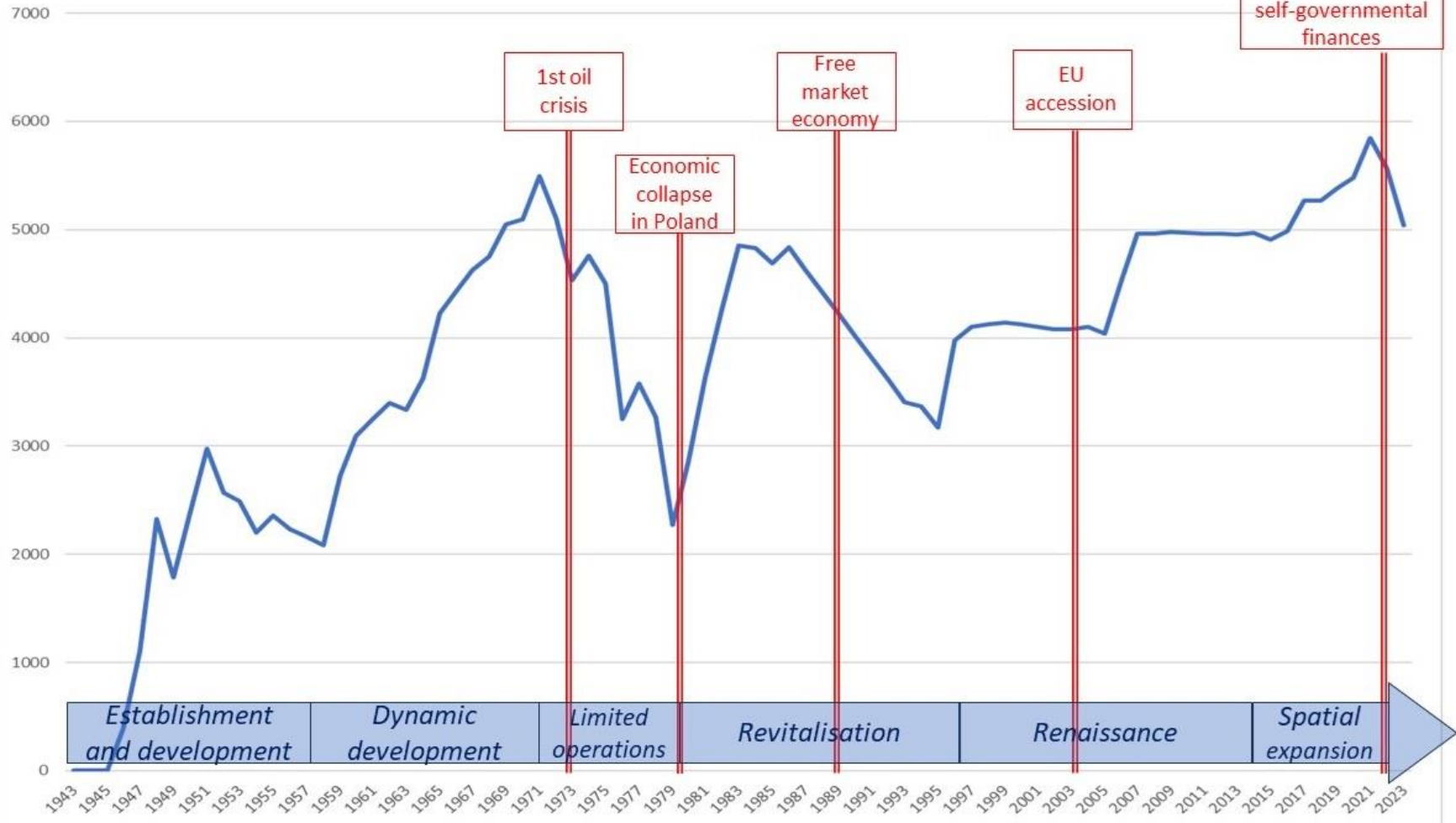
Revitalization (1981-1997)

Renaissance (1998-2014)

Spatial expansion (since 2015)



trolleybus vehicle-km in Gdynia [1000]



# Stage of establishment and development



Gdynia trolleybuses operating in the first stage of its development were (according to available data):

- Henschel (14 units in total),
- Mercedes-Benz (1),
- Büssing (5),
- Fiat (14),
- Alfa Romeo (4)
- Vetra (13 ).

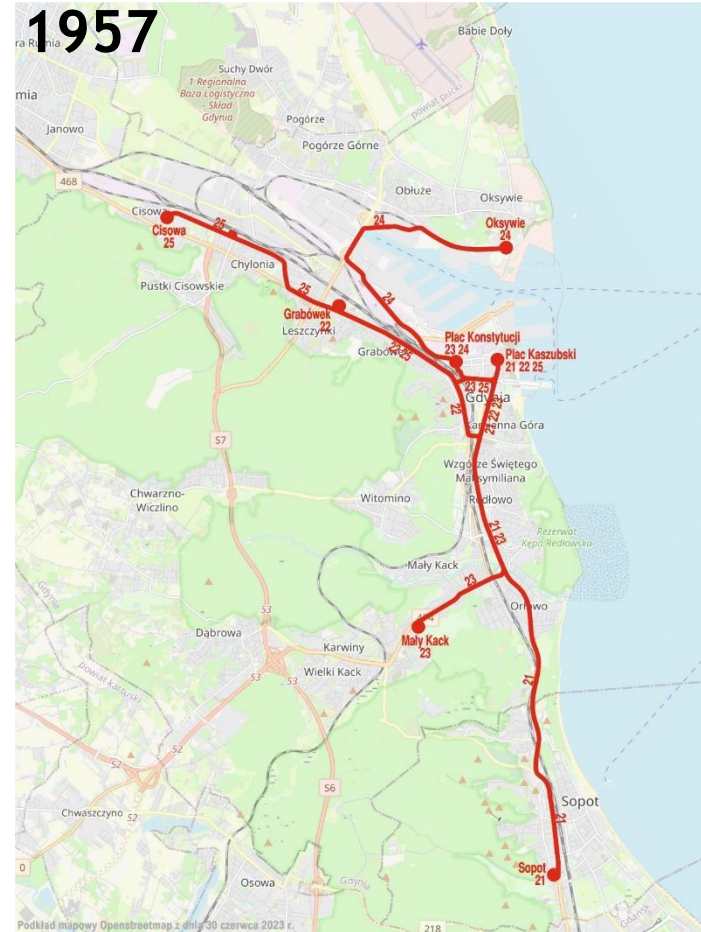
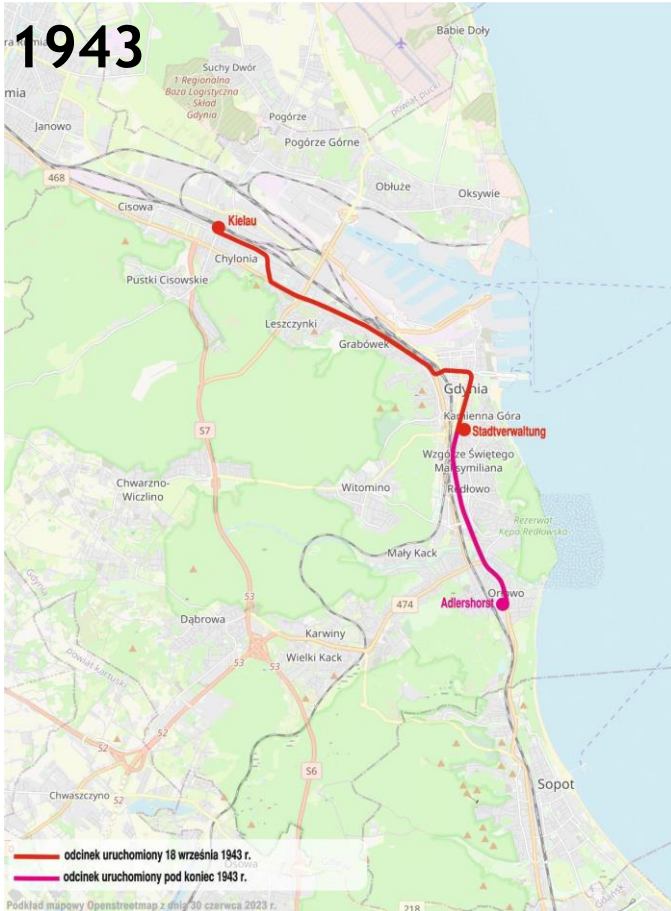


Only the latter were new vehicles. Apart from them, JaTB-2 trolleybuses were also used occasionally.

Unfortunately, there is no precise data on their number.



# Stage of establishment and development (1943 - 1957)



# Stage of dynamic development (1958 - 1971)



Skoda 8Tr

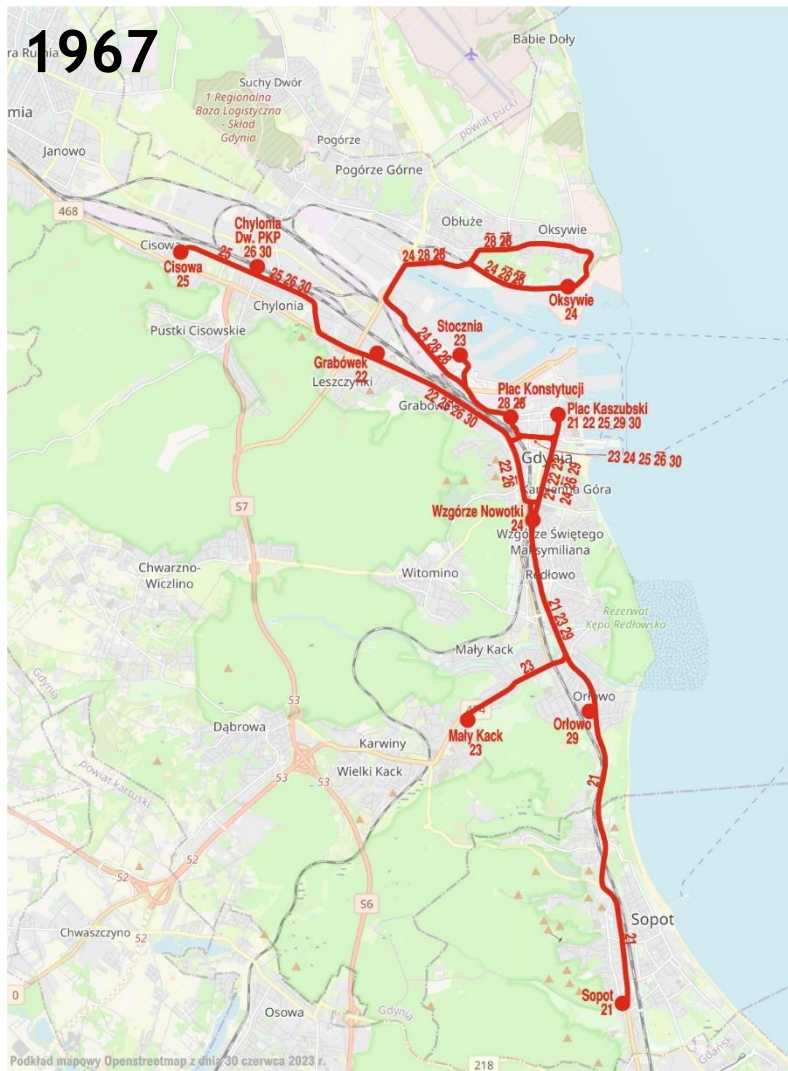


Skoda 9Tr

- In the next stage, another 5 trolleybus lines (No. 21-30) were developed, mainly using the existing trolleybus network.
- The increase in the length of the catenary was limited.
- The greatest operational work carried out by trolleybuses was in 1971 - 5,49 million vehicle-kilometres.
- It was over 2.5 times more than in 1958 - the initial year of this stage.
- A new rolling stock consisted of 42 Skoda 8Tr and 72 Skoda 9Tr trolleybuses.

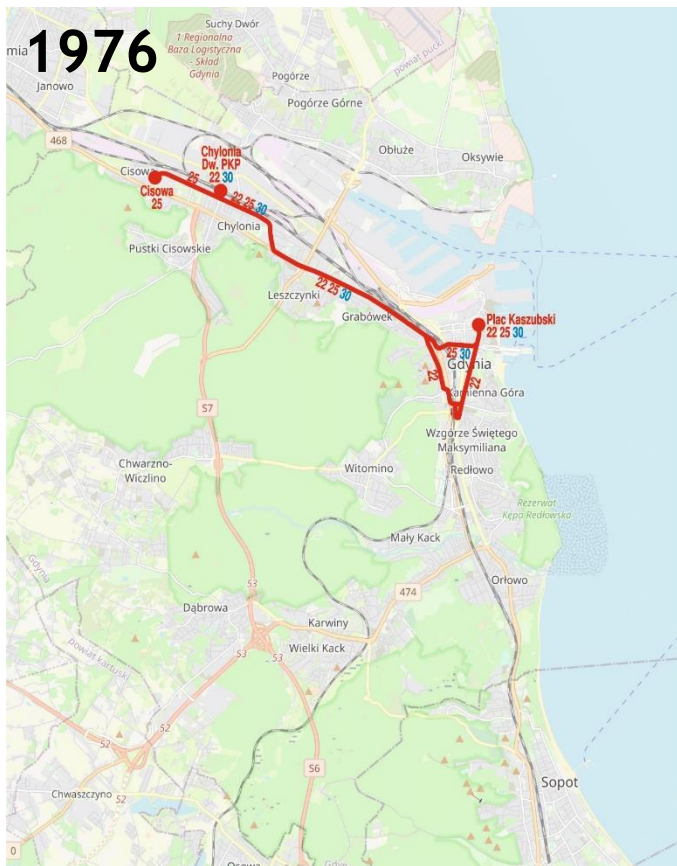


1967



Stage of  
dynamic  
development  
(1958 - 1971)

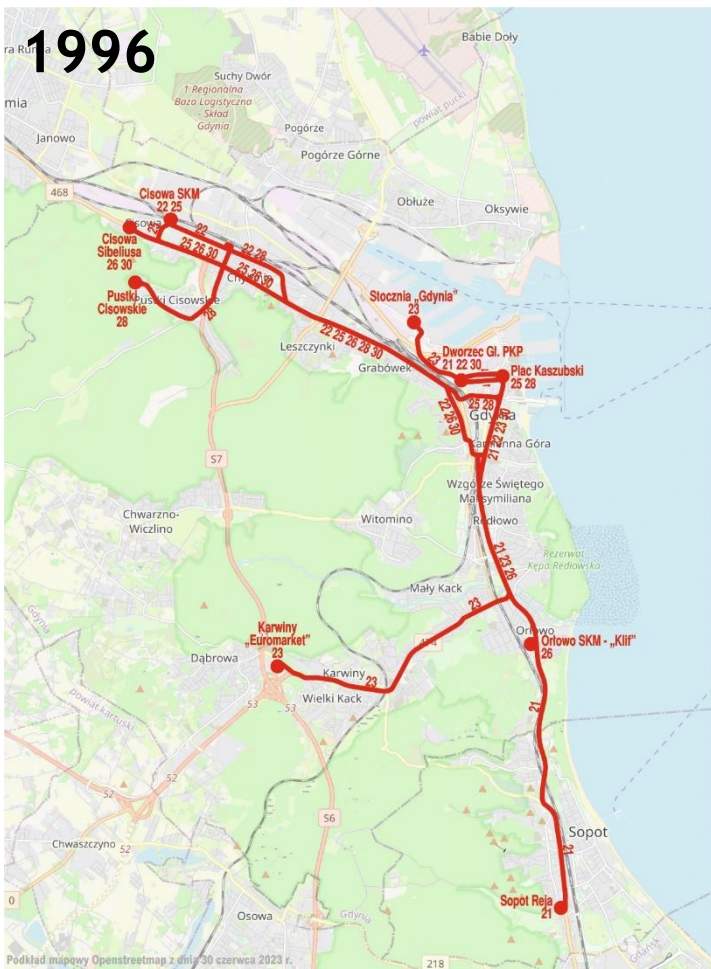
# Stage of the limited development (1972 - 1980)



- Three trolleybus lines serving one of the three district sets (no. 24, 27 and 28) were closed (together with the infrastructure);
- The operation of 4 lines (no. 21, 23, 26 and 29), including the line to the city of Sopot, were suspended;
- There were only three trolleybus lines left from the city centre to one set of districts (22, 25 and 30);
- At the end of the discussed stage, after the restoration of the line to Sopot (21), there were 4 lines in operation, all operated by trolleybuses (2,27 mio. vehicle-kms in 1979);
- The bringing of the first two new Soviet ZiU-9 trolleybuses to Gdynia in 1975 (in total - 62 vehicles) was a breakthrough - Limiting operations was stopped.
- The first 6 Jelcz PR110 trolleybuses were also introduced.



# Stage of revitalisation(1981 - 1997)



- In the first years of the revitalisation stage, eliminated routes were rebuilt, new routes were built to connect the network, and 3 suspended lines were restored.
- In 1983, there were already 7 lines in operation (no. 21, 22, 23, 25, 26, 29 and 30). They served routes from the city centre to two sets of districts and to Sopot;
- In 1990, a new traction network was put into operation for two districts without trolleybus transport. As a result, the route of one line (no. 23) was extended, and the second one (no. 24) was temporarily opened. However, at the end of the stage, in 1996, a new line (No. 28) was built on a newly built route;
- In the years 1981-97, trolleybuses covered the most kilometres in 1983 - 4,85 million.
- The period of political transformation and the public finance crisis resulted in a reduction in operational work in Gdynia's trolleybus transport. As a result, in 1995, they performed the lowest operational work at this stage - 3,17 million kilometres;



## Stage of revitalisation(1981 - 1997)



- In the first period of the revitalisation stage, another 41 ZiU-9 trolleybuses were put into operation. ZiU-9 vehicles were withdrawn from the 1980s until 1997.
- In the years 1981-1982, 17 Jelcz PR110 trolleybuses built in Gdynia were put into service. However, between 1987-1997, another 41 Jelcz PR110 trolleybuses and 10 modernised Jelcz PR120 trolleybuses were put into operation.
- Three Jelcz PR110 trolleybuses, produced in the late 1980s, had an innovative thyristor drive;
- Since 1994, Jelcz PR 120 trolleybuses have been produced in Gdynia. In total, the Gdynia trolleybus operator introduced 24 such trolleybuses into operation;
- Moreover, in the years 1990-1994, 9 Ikarus 280T articulated trolleybuses were converted in Gdynia, using the bodies of used buses.

# Stage of renaissance (1998 - 2014)



- In 1998, trolleybus transport in Gdynia was separated from bus transport, in a form of a company Przedsiębiorstwo Komunikacji Trolejbusowej sp. z o.o. (PKT);
- In 1999, two new trolleybus lines were launched, using the existing infrastructure (No. 20 and 27);
- In 2005-2006, two new lines were developed (No. 24 and 31), using the newly built trolleybus network. It was carried out to two new loops in the western districts of Gdynia as part of a project co-financed by the European Union. One of them (no. 31) provided the second trolleybus connection between Gdynia and Sopot. The new infrastructure also made it possible to extend the route of the line No. 23;



# Stage of renaissance (1998 - 2014)



- The largest number of vehicle kilometres in the period in question was carried out in the years 2007-2014, in which the annual operational work reached the level of approximately 4,9 million veh.-kilometres;
- In the years 1998-2000, 15 Jelcz 120M trolleybuses were put into operation;
- In 1999, the first low-floor trolleybus manufactured in Gdynia was put into operation - Jelcz M121.
- In 2001, the first ever produced trolleybus of the Solaris Bus & Coach, Trollino 12, was introduced (inventory no. 3001). Still in the PKT company's rolling stock;

# Stage of Renaissance (1998 - 2014)



## Economic analysis of diesel buses conversion into trolleybuses in Gdynia

Prof. Olgierd Wyszomirski  
University of Gdansk  
Board of Municipal Transportation in Gdynia

Leipzig, 10.2012



- In total, 53 Solaris trolleybuses were put into service at the Renaissance stage (incl. 30 innovative vehicles with air conditioning and a battery auxiliary drive). Most of these vehicles were purchased as part of projects co-financed by the European Union;
- In 2004, when PKT had only a few low-floor trolleybuses, an idea emerged in Gdynia to build trolleybuses based on the construction of used low-floor buses. 12-meter Mercedes-Benz O405N vehicles were selected for conversion. In the years 2004-2010, PKT built 28 such trolleybuses for its own needs, produced as buses in the years 1993-1997;
- The new trolleybus depot, put into operation in 2007, was built with financial support from the European Regional Development Fund;
- In 2012-2013, the PKT converted next 2 used Mercedes-Benz O530 Citaro buses, and 3 used Solaris Urbino 12 buses;
- The last high-floor vehicles, Jelcz 120 MT, were withdrawn from service on the lines in 2012.

# Stage of renaissance (1998 - 2014)




326

LINIA ZWYKŁA

ZARZĄD KOMUNIKACJI MIEJSKIEJ W GDYNI

KIERUNEK: Orłowo SKM - "Klif"

PRZYSTANEK: [Stocznia SKM - Morska 01](#) 

Odjazdy w niedziele i święta w okresie letnich wakacji szkolnych:

10.23	10.52	11.22	11.52	12.22	12.52	13.22	13.52	14.22
14.52	15.22	15.52	16.22	16.52	17.22			

W pozostałe dni nie kursuje.

Linia obsługiwana przez trolejbusy zabytkowe, wysokopodłogowe.

Jednocześnie linię obsługują trzy spośród pięciu pojazdów:

- Saurer 4 TIILM z 1957 r.,

- Škoda 9Tr 9Tr z 1975 r.,

- ZiU 682B z 1984 r. z 1984 r.,

- Jelcz 120MTE z 1994 r.,

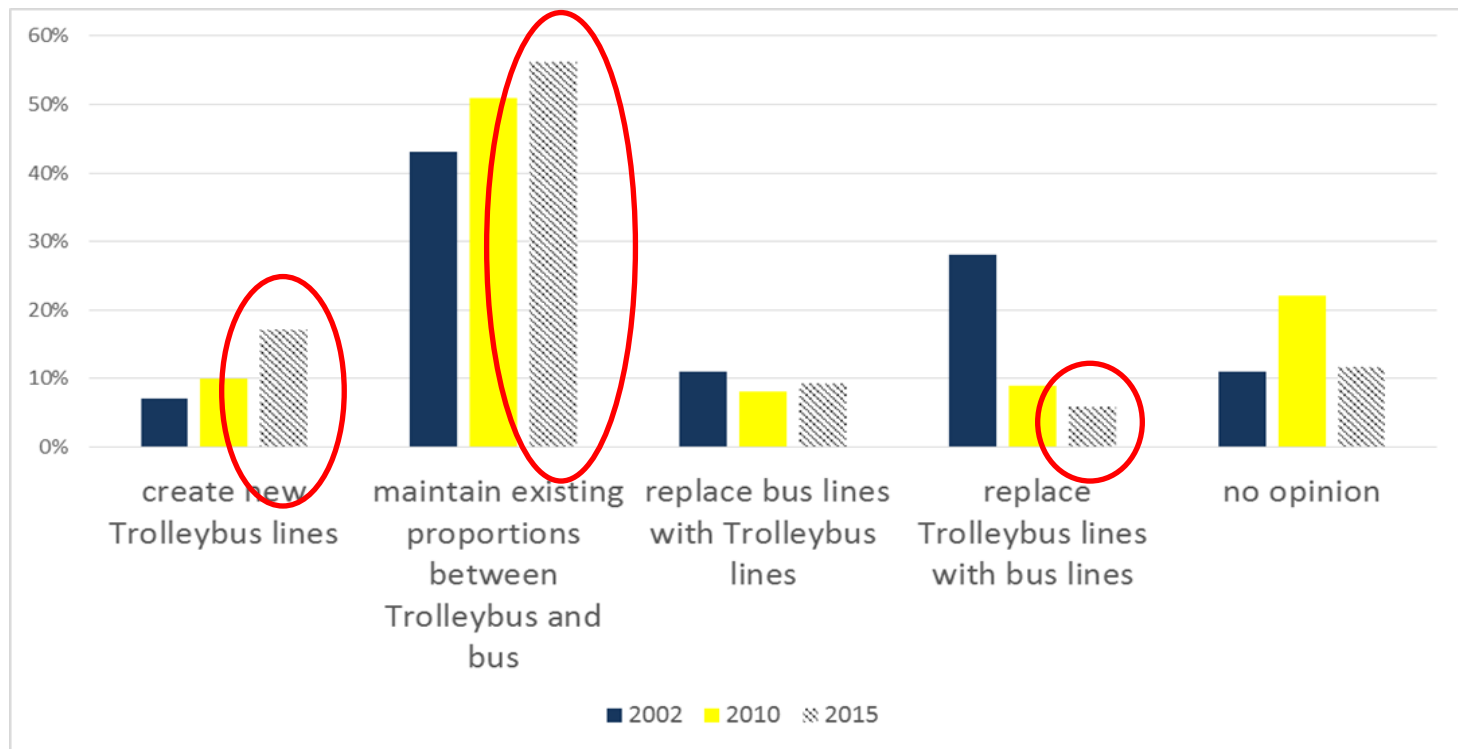
- Mercedes-Benz O405NE z 1994 r.

Rozkład jazdy ważny od 24.06.2023 do odwołania

- A characteristic feature of the Renaissance stage, apart from introducing modern vehicles, is the initiation of the creation of the historic trolleybus segment in the form of an old-timer line operated in the season;

# Stage of renaissance (1998 - 2014)

## Changing perception of trolleybuses among citizens of Gdynia



Source: based on the results of marketing research of ZKM Gdynia, 2002, 2010 and 2015



# Stage of expansion (since 2015)



- The development of technology for powering traction motors from trolleybus batteries resulted in the use of a second drive since 2009. At first, it was only used in cases of emergency (Ni-Cd batteries).
- A breakthrough in the development of Gdynia's trolleybus fleet was the introduction in 2015 of the first two new Solaris Trollino 12M trolleybuses (within CIVITAS DYN@MO project) equipped with lithium-ion batteries (max. range without catenary - 15 km).
- Between 2015 and 2023, a total of 44 trolleybuses with additional battery drives were put into service;
- Thanks to the additional drive in the form of batteries, trolleybuses began to serve new districts and housing estates. Three new lines were created (no. 32, 33, and 34). In addition, the routes of four lines (No. 21, 27, 29 and 31) were changed, partly running them through streets without overhead contact lines, including one in Sopot;

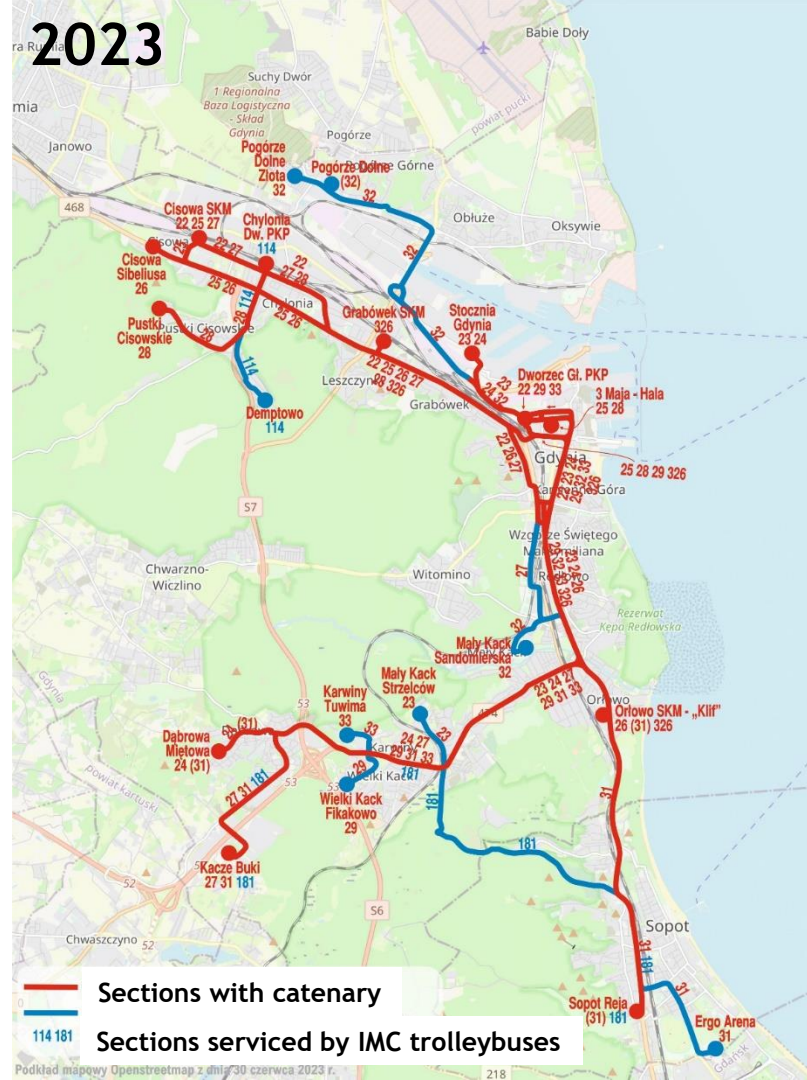
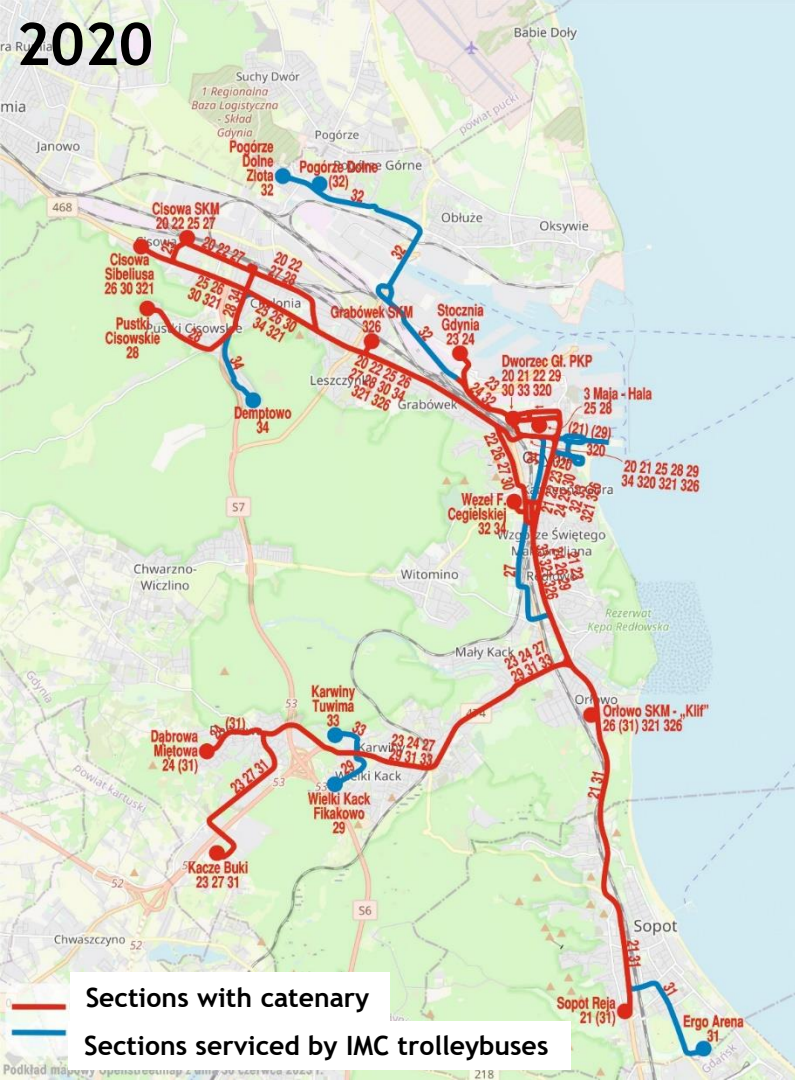




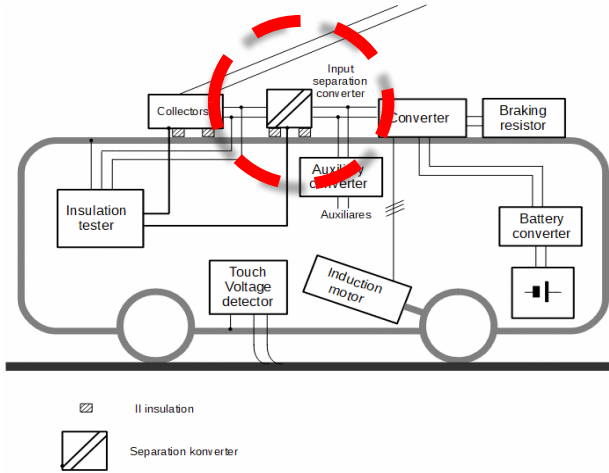
# Stage of expansion (since 2015)



- In the years 2015-2023, trolleybuses covered the most kilometres in 2021 - 5,85 million, serving 14 trolleybus lines (20-34). They ran partially without the network on 7 lines (21, 27, 29, 31, 32, 33 and 34) and with a dominant share on two bus lines (no. 181 and 114);
- Despite the limitation of operational work, spatial expansion took place.
- In the year of the 80th anniversary, trolleybuses partially without the network run on 6 trolleybus lines (23, 27, 29, 31, 32 and 33). On one of them, most of the route is without a network (no. 32). The majority of trolleybus services, partly without the network, cover two bus lines, including one from Gdynia to Sopot (114 and 181).
- In the 80th anniversary year, Gdynia's trolleybuses are scheduled to cover only 5,04 million kilometres (a decrease of 13%). This was caused by financial constraints determined by the policy of the central authorities towards municipal governments. 4 lines were suspended (no. 20, 21, 30 and 34), and the frequency of the remaining lines was reduced;

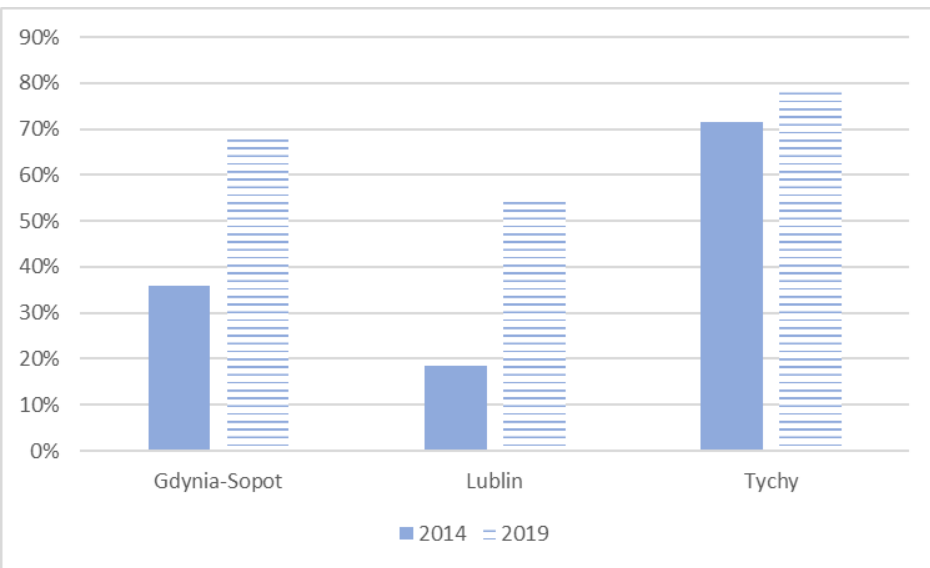


# Stage of expansion (since 2015)



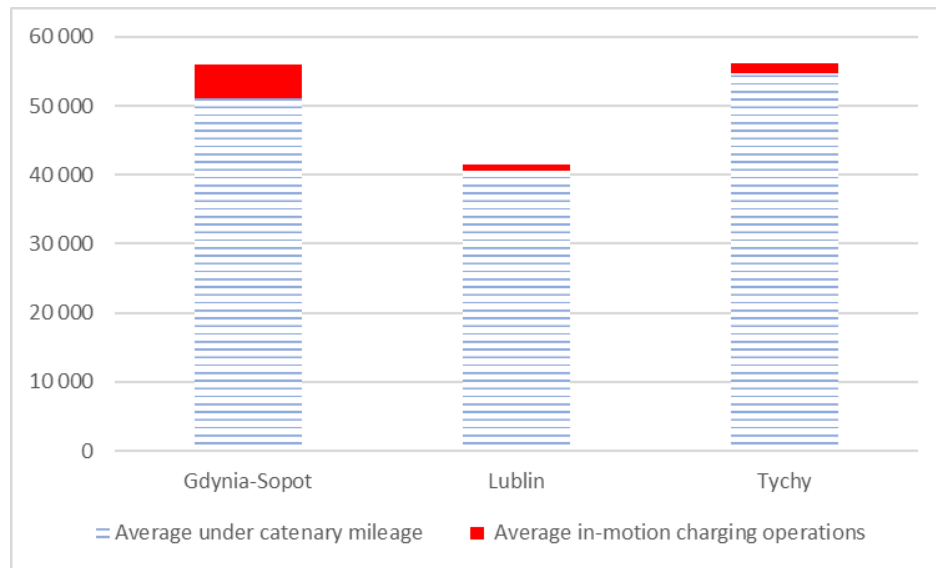
- Most vehicles put into operation in 2015-2023 were purchased with financial support from the European Union. The purchase of 6 new Solaris Trollino 12 M buses put into service in 2020 was co-financed by the Polish fund - NFOŚ.
- These trolleybuses have the most extensive range without the traction network and, therefore, mainly serve the line with the dominant share of the route without the traction network.
- Among the new trolleybuses put into operation in the discussed stage, 18 are Solaris Trollino 18 articulated vehicles;
- In order to eliminate the last converted Mercedes-Benz and Solaris trolleybuses from regular trolleybus lines, the trolleybus company leased 5 used Solaris Trollino 12 vehicles (manufactured in 2011). They were put into service in Gdynia in 2021-2022.

# Stage of expansion (since 2015): In Motion Charging as an everyday operational solution



**Share of IMC/battery trolleybuses in 2014  
and in 2019 [%]**

*Source: based on TROLLEY 2.0 findings*



**Average annual mileage of trolleybuses  
in Poland in 2019**

*Source: based on TROLLEY 2.0 findings*

# Selected technological aspects of the trolleybus transport





**COMMON  
DIRECTION**

## > Trollino 12 Electric

**Przedsiębiorstwo Komunikacji  
Trolejbusowej, Gdynia**

6 x **Trollino 12 Electric** synergy of  
trolley and e-bus

### Technical details



**IMC charger:**  
**150kW** double insulated



Traction batteries  
with capacity of **87 kWh**



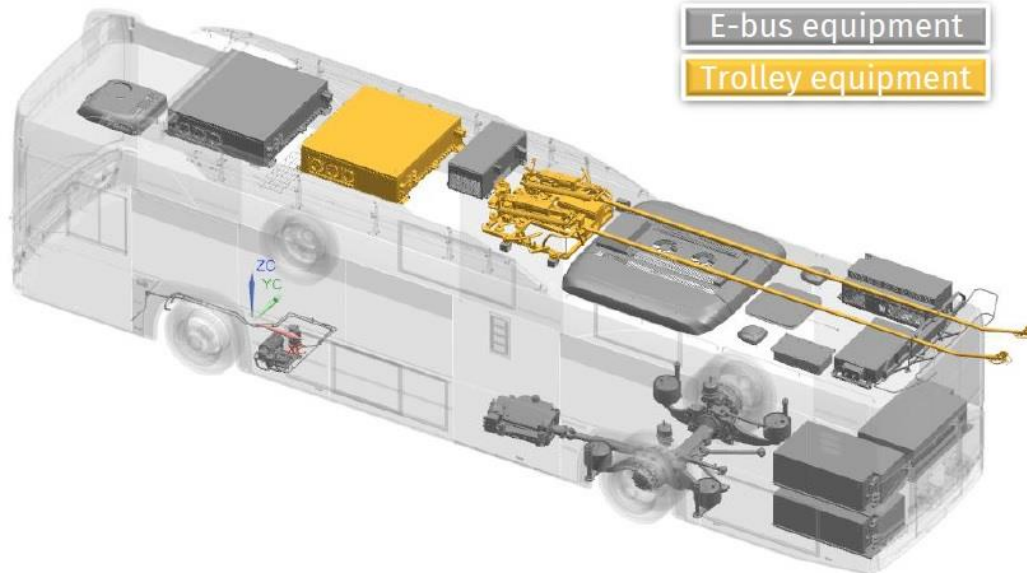
**Electric engine**  
central motor **160 kW**



Driveline  
**Medcom**



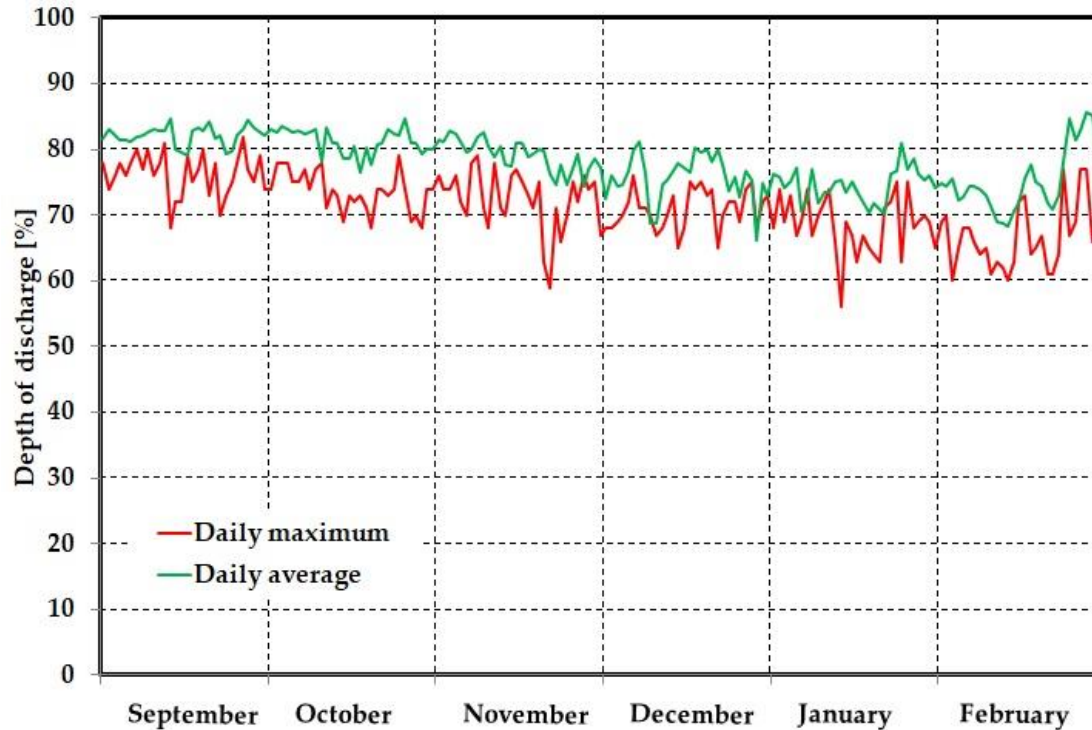
**Gdynia, Poland**



E-bus equipment

Trolley equipment

# Battery usage– nominal capacitance 87 kWh LTO

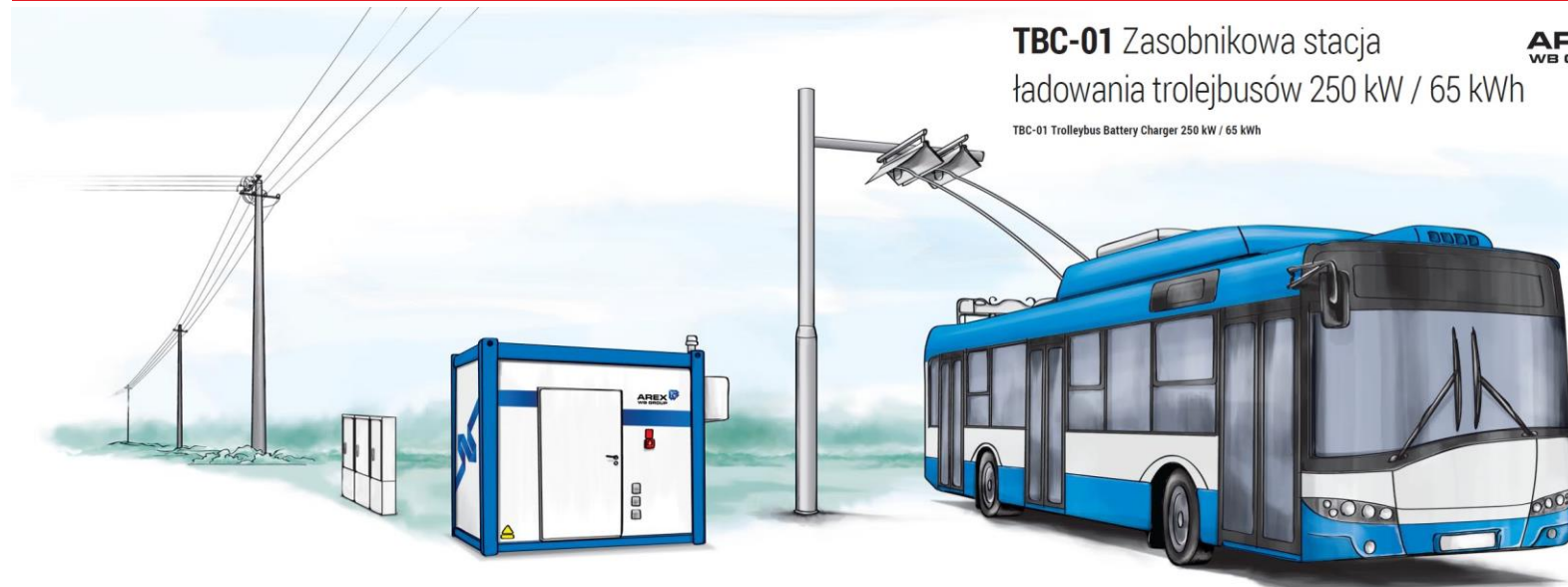


## CAR project Gdynia

**TBC-01** Zasobnikowa stacja  
ładowania trolejbusów 250 kW / 65 kWh

**AREX**  
WB GROUP

TBC-01 Trolleybus Battery Charger 250 kW / 65 kWh



- SES 65 kWh
- Supply from 400 V AV, max power 40 kW

2010-2013



Identification of trolleybus potential, i.e. Recuperation and conversion from diesel buses. Searching for „the low-hanging fruits” in existing trolleybus systems.

2012-2016

Two trolleybuses with NMC batteries purchased via DYN@MO project; First separation from catenary (1 line since 05.2015), smart grid management, 1 substation with supercap.



2015-2018



Further development of the IMC trolleybuses (analysis - model, 2nd line partially unwired since 12. 2016).



trolley:2.0  
for smart cities

2018-2021

Expansion of IMC trolleybuses. Conditions for the introduction of e-buses in cities with trolleybus fleet. Replacement of diesel bus lines with IMC trolleybuses



2018-2021

Installing and launching a portable storage charger on the trolleybus network for fast charging of battery trolleybuses and electric buses.



2019-2022

Deployment of energy inverter system to feed recuperated energy from catenaries into PKT depot building energy system in Gdynia.



2023-2025

Deployment of energy circular scenarios for electrification upscaling along an identified e-corridor (incl. delivery optimisation of existing fast-charging, trolleybus infrastructure system in Gdynia.

# Trolleybus as an element of Gdynia's transport policy

**1998** - Gdynia's Transport Policy - trolleybus confirmed as an important element of Gdynia's public transport element;

**2003** - Strategy of Gdynia Development - Development of trolleybus transport as environmentally friendly and co-creating a unique city image;

**2008** - General Spatial Master Plan - Introduction of new trolleybus lines into newly developed urban areas;

**2016** - Sustainable Urban Mobility Plan - Increase of share of low-emission vehicles;

**2017** - Strategy of Gdynia Development: Gdynia 2030 - Further development of pro-ecological public transport;

**2020** - Strategy of the Development of Electromobility - Further development of e-mobility in public transport, including trolleybuses and e-buses.



# Summary

- Well embedded in the most important strategic documents and long-term policies of Gdynia city;
- Ready-to-use and the most matured form of e-bus;
- Consequent development using external (mainly European) funding - ca. 70 mio. EUR investments over the last 18 years;
- 5,6 mio. veh-km per year, 29% of share in public transport supply organised by the Public Transport Authority (ZKM) in 2022;
- 100 vehicles;
- Qualitative transformation since 90-ties confirmed by changing perception among citizens;
- Supported by the EU projects (TROLLEY, CIVITAS DYNAMO, ELIPTIC, TROLLEY 2.0, EFFICIENCE, CAR 1, European Fund for the Regional Development);
- Gradually leaving the catenary (batteries in ca. 60% of vehicles), enabling spatial expansion of the electric public transport in Gdynia and Sopot (more than 9% of the total mileage operated without catenary);
- Catenary and substations as an asset for the expansion of the local sustainable energy system.



<https://www.interreg-central.eu/projects/ce4ce/>

<https://www.pg.edu.pl>

<https://www.ug.edu.pl>

<https://www.zkmgdynia.pl>

<https://www.pktgdynia.pl>

<https://www.facebook.com/Interreg.CE4CE>

[https://twitter.com/Interreg\\_CE4CE](https://twitter.com/Interreg_CE4CE)

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