

Electrification of Geneva bus fleet



18th Session of the Group of Experts on Cleaner Electricity Systems

Session II - Deep electrification of the energy system

Electrification of transport sector in Geneva

September 19th 2022

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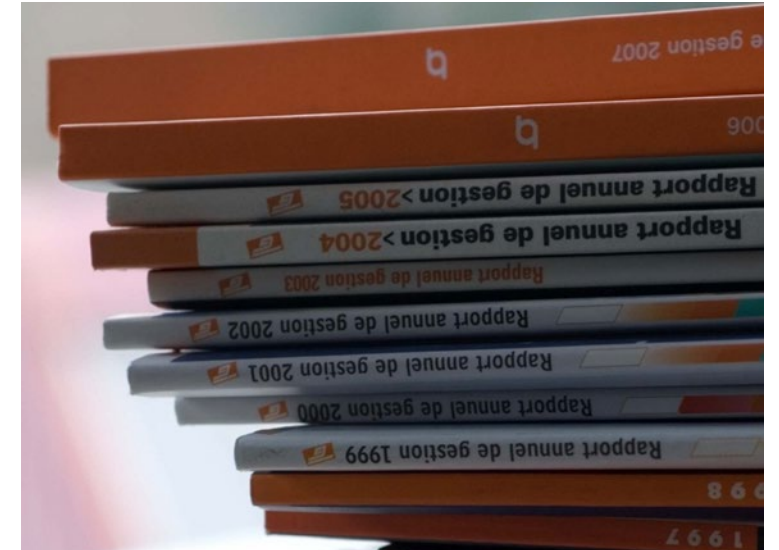


transport publics genevois



Key numbers as of 2021

- 2'180 Collaborators
 - Operation: 1'547 (1'327 drivers)
 - Technical: 348
 - Administration: 285
- 476 vehicles (Trams, Trolleybuses and Buses)
- 75 lines
- 31'486'000 km annual fleet mileage (~ 86'000 km/day)
- 421 millions passenger.km/year (~1'150'000 passenger.km/day)
- 7/7
 - 22/24 week days
 - 23/24 week-end



Fleet overview as of 2022

Tramways, Trolleybuses, Buses and Electric Buses

124 Trams



104 Trolleybuses



12 Electric Buses



232 Diesel Buses



4 Autonomus Buses

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Innovation

Energy transition challenge

Electric Bus - History and Innovation



Private public partnership



- World premiere of electric articulated bus (132 passengers)
- A very small battery : 38 kWh
- Flash charging in 20 secondes @ 600 kW

- The goal is to carry passengers, not batteries
- Inauguration during the UITP World Congress 2013 in Geneva



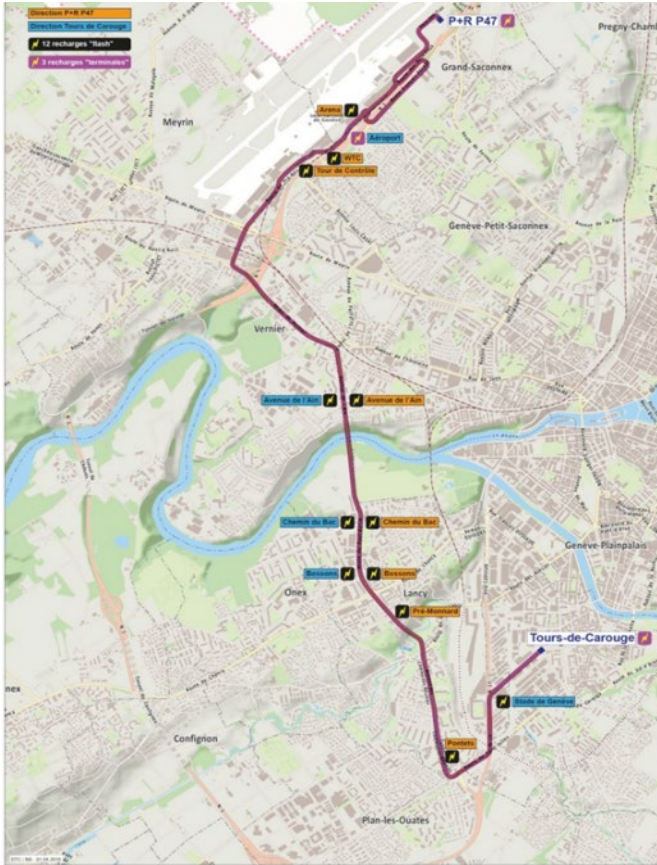
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Industrialization

Full-line Deployment

Full-line Deployment

Line 23 – Energy transition of a diesel line



- After the prototype, the line
- Flagship project supported by the Swiss Confederation
- 12 articulated buses (18m75)
- 2 terminus (400 kW, < 5 min)
- 12 flash s/s (600kW, 20 seconds)
 - Peak shaving (40kVA grid connection)
- 2.5 Mkm travelled since March '18
- ~50'000'000 passagers.km since March '18
- Availability >98.7%



Full-line Deployment – L23

Sustainable development aspects – Capacity/Operation/Battery

- Very large capacity for passengers
(all the technology is on the roof)
- No additional driving cost
(dwell time identical to diesel buses)
- 10 years battery lifetime
(500'000 km/ebus → ~10'000'000 passenger.km/ebus)
So, before recycling, each kWh of the battery pack (72 kWh)
will have enabled > 140'000 passenger.km
- 20 years Ebus lifetime (as for trolleybuses)



Full-line Deployment – Line 23

Sustainable development aspects – Efficiency/Infra./Renewable

- High energy efficiency
 - thanks to synchronous motor and low bus weight
- Light and secure infrastructure at depots.
 - Quick (2-5 min) recharge at the entrance to the depot before parking.
 - No charging at the bus storage location at the depot
 - Fire safety concept facilitated by the battery size, its LTO technology and non-charging at parking.
- Distributed grid connection and direct use of renewable energies
 - Recharging takes place during the day during operation. Thus, solar energy can be directly used.
 - tpg as a 100% renewable electricity contract with SIG



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CAP2030

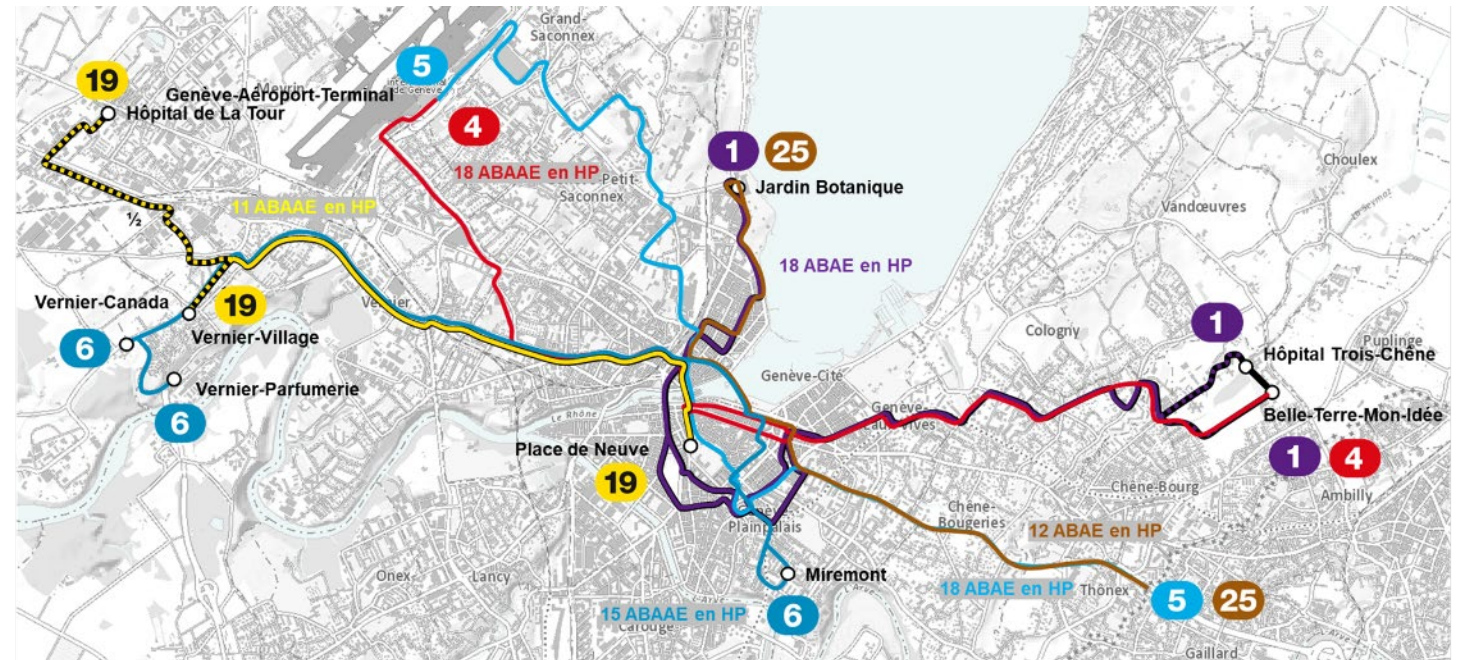
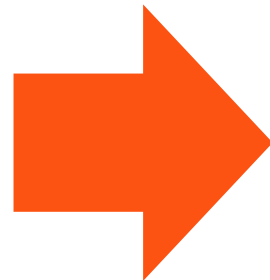
The Electrical Roadmap

Large scale projet

CAP2030 1st step : Projet of 6 lines

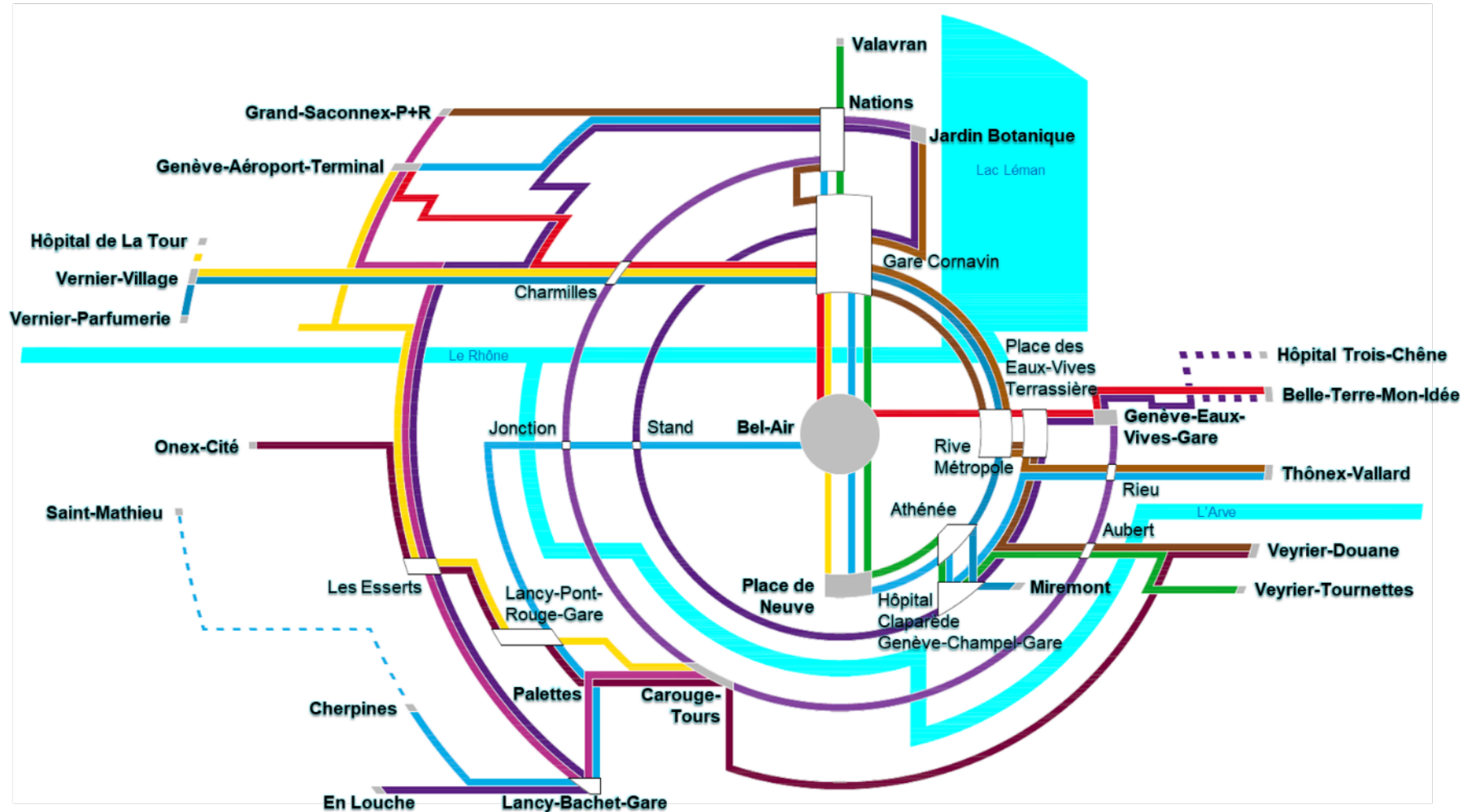
After the prototype and the line, now the network in 2025

- A network approach
- 6 lines, 50 articulated buses and 54 double-articulated buses
- An optimized concept based on our line 23 experience and technological developments



Urban Public Transportation Network

Geneva Electric Bus Network by 2030



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