

# Electrification of urban transport in Gothenburg

**IMPACTS 2024 Session 1 – Developing emission free city centers**

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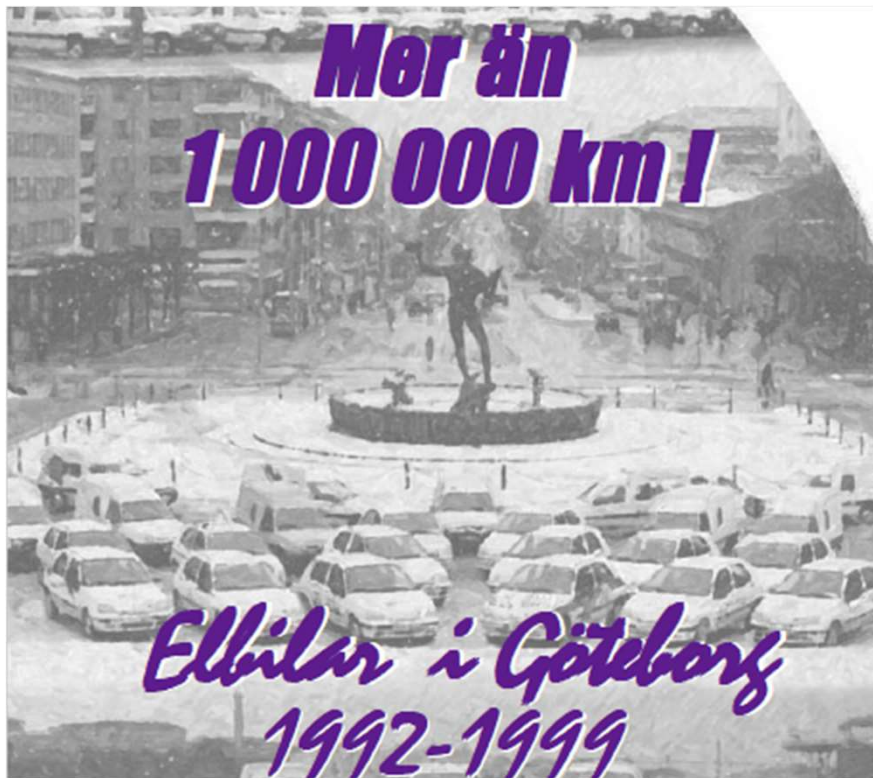
# Electric trams 1902



# Trolley buses 1940-64



# Electric cars 1989-1999



- Introduction of Evs in Gothenburg, show usability and try to establish a market
- Subsidy EUR 5000 / vehicle
- Only few brands available (Renault, PSA, Toyota)
- "Early prototypes" - Battery range 100-150 km
- Diverse user profiles
- 65 vehicles in total > 80% satisfied with usability
  
- Public fast charging stations (40 kW DC) - No charging standards in place

# Electricity 2013



Sustainable city – open to the world



# Public transport in Gothenburg



- The regional public transport authority, Västtrafik, is responsible for the public transport system in Gothenburg. This includes trams, busses and ferry's
- The goal of Västtrafik is to reduce greenhouse gasses with 90% by 2035
  - This gives an incitement for electrified buses
- The City of Gothenburg is responsible for the locations of bus stops, turning points and terminals of the bus and tram network
- The traffic operator is responsible for the traffic, including the buses, charging infrastructure and depots

# Learnings from Electricity



- Electric bus traffic works!
- The noise levels are very low at low speeds
- The local emissions are very low
- Drivers feel much better after a day in an electric bus
- Passengers and people living around the bus line appreciate it
- We need to prepare
  - Electric grid for end stops and depots with renewable electricity
  - Depots need power and they need to be near the traffic
  - The maintenance needs new facilities and educated electric mechanics

# Electrified ferries



Sustainable city – open to the world

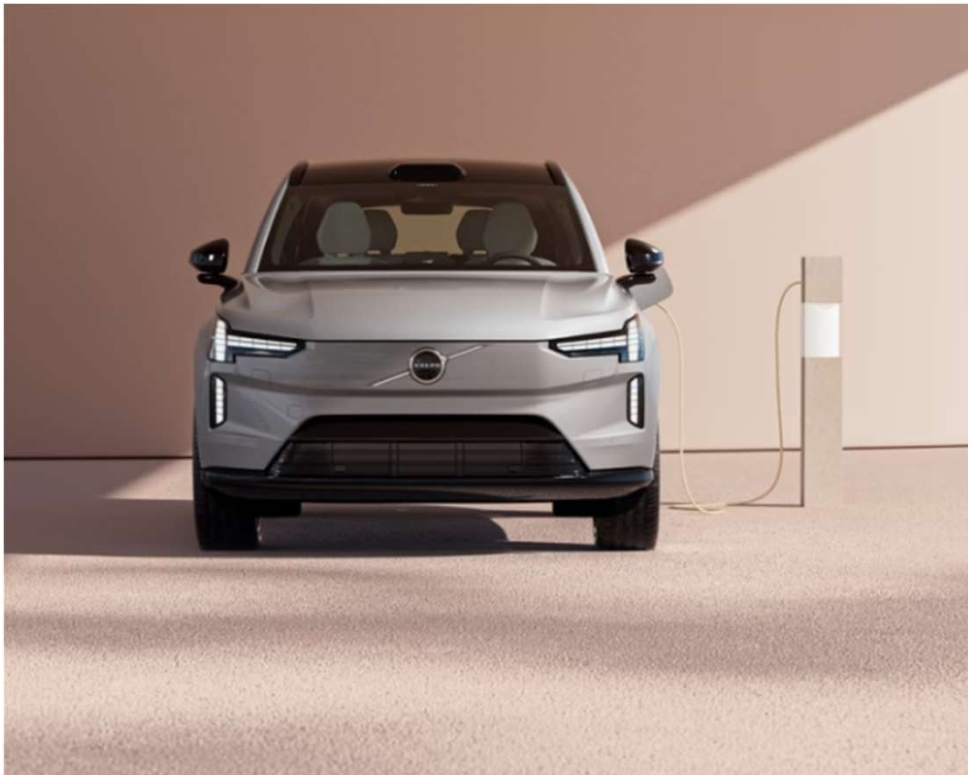


# Electrification of Heavy Good Vehicles



- Again, the infrastructure must be in place
  - One big challenge is to have electricity – where it's needed and when it's needed
    - Charging – in depots, loading/unloading places and public high-power chargers
  - All power must be fossil free
  - Hydrogen filling stations also needed when battery power isn't sufficient
  - And it must go hand in hand with other demands that need new electricity:
    - City development
    - Harbor/Industry

# Electrification of electric cars



- Develop electrification scenarios and disseminate knowledge.
- Review regulations to lower barriers
- Identify gaps where supply/demand of charging will not be in balance, though probably few publicly owned charging stations in general
- Zero emission zones would speed up the process
- National incentives (fuel tax, subsidies)

# Electrification introduces new opportunities



# Electrification – a sociotechnical transformation



- What is happening now is that the entire traffic system is being electrified
  - The number of electric cars sold is growing exponentially
  - City buses are electric and now the regional buses are coming
  - All segments of heavy vehicles are available as electric
  - Machines, ferries, aircraft is also being developed electric
- Vehicles that do not run on batteries will need hydrogen
- It is not just vehicles and electricity networks that are affected, it is a socio-economic system that needs to be replaced!
  - Depots and terminals must be adapted
  - Reformed tax system
  - Electrical mechanics must be trained
  - Workshops / car scraps are adapted
  - And much more...
- Coordination with other major ongoing trends
  - Digitization, automation, new vehicle/transport types

A scenic sunset over a coastal city, likely Gothenburg, Sweden. The sun is low on the horizon, casting a warm orange glow across the sky and reflecting on the water. In the foreground, there are large, dark rocks and a large, leafless tree on the right. The city buildings are visible in the lower left.

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