

# Organisation and contact information



**VTT Technical Research Centre of Finland Ltd**

**<http://www.vttresearch.com/>**

- State-owned, non-profit limited liability company with a special task
- Based in Finland (offices in other countries, too)

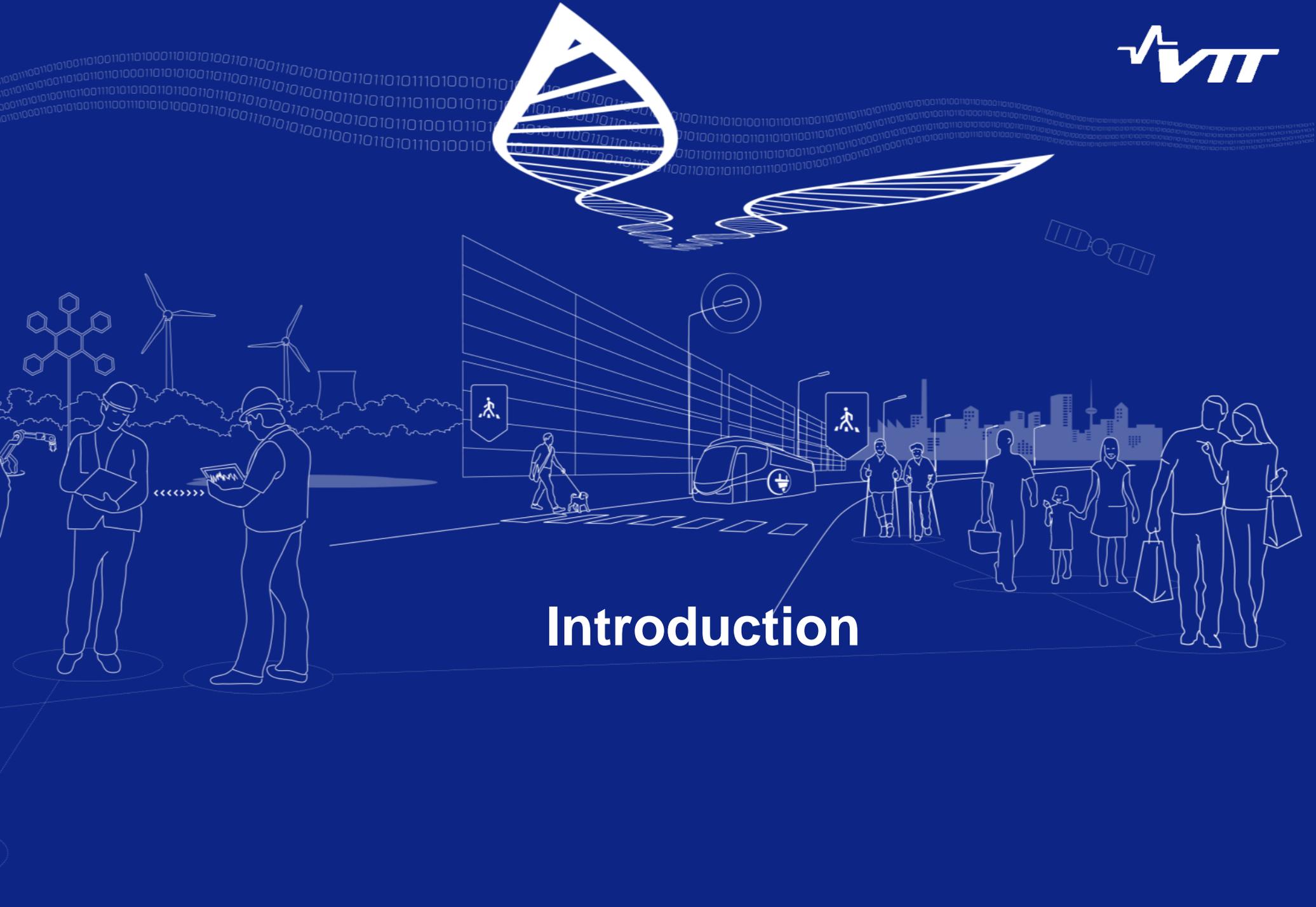
**Research area: Efficient Machines and Vehicles**

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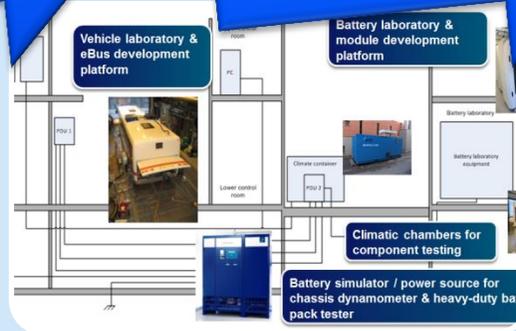
# Introduction

# Recent research activities and key outcomes

Establishment of a Finnish electrical city bus developer Linkker



Modelling tools for product development



Piloting electrical city buses in the city of Helsinki in 2015-2016



## Technology

- Development and prototyping of electrical city bus and technologies
- Computational and experimental expertise. Experimental facilities include battery laboratory, heavy duty dynamometer and electrical city bus development platform
- Involvement of bus and component manufacturers

## Operation

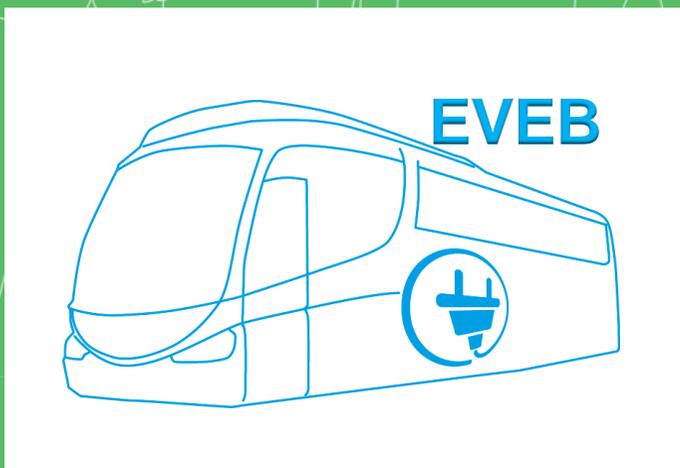
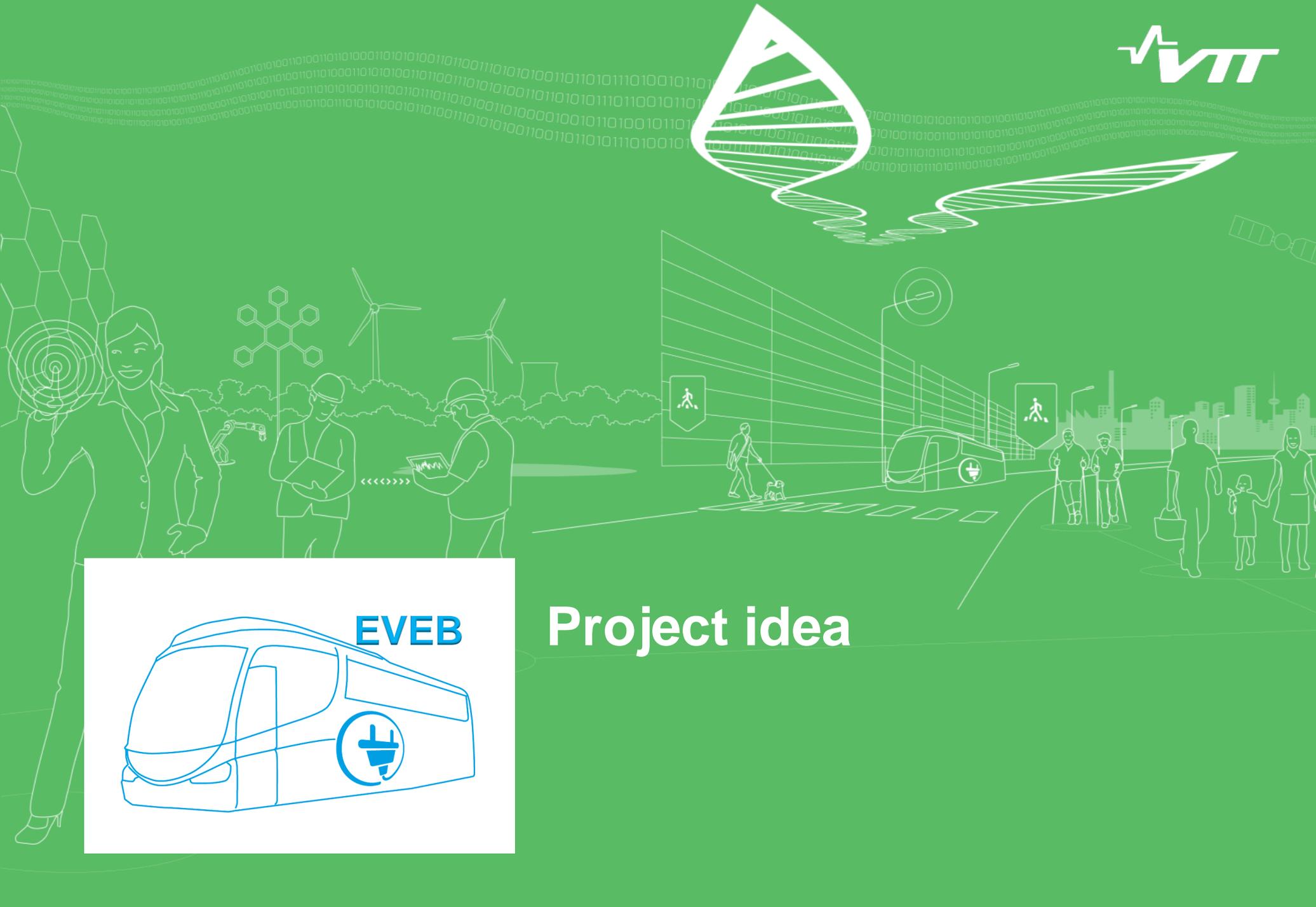
- Operation and testing of several commercial electrical buses and VTT's prototype in the city of Espoo on an actual bus route
- Running laboratory tests on these buses for further analysis of their performance and characteristics
- Involvement of bus operators in Finland

## System

- Analysis, design and development of infrastructure for small fleets of electrical buses
- Analysis and selection of charger technologies, planning of locations and installations including energy supply
- Involvement of public transport authorities in Finland

## Potential calls for VTT Efficient Machines and Vehicles

- GV-04-2017: Next generation electric drivetrains for fully electric vehicles, focusing on high efficiency and low cost
- GV-07-2017: Multi-level modelling and testing of electric vehicles and their components
- GV-08-2017: Electrified urban commercial vehicles integration with fast charging infrastructure



# Project idea

# We will design, prototype, produce, and pilot Extreme Value Electrical Bus (EVEB)

The **Extreme Value Electrical Bus** will

- have simple basic layout to fulfil most PTA and PTO needs
- be modular – scalable optimised design for the customer
- use first class innovative components and ICT solutions
- be second to none in total vehicle ownership cost
- fit different climates – climb icy Nordic hills and survive heat
- be circular – repair, replace and refurbish are among its design criteria
- simply be the electrical bus of choice for the emerging market of business-driven electrified public transport
- be the most energy efficient bus in the market

Today



Tomorrow



# PSI – Problem, Solution, Impact

## Extreme Value Electrical Bus (EVEB)

### *Problem*

- Components neither standardised nor optimised according to requirements and bus layout
- Architecture (topology) and control not optimal
- Weak modularity and scalability in vehicle design
- Replacement and refurbishment over lifecycle difficult
- Non-optimal combination performance and ownership cost

### *Our Solution*

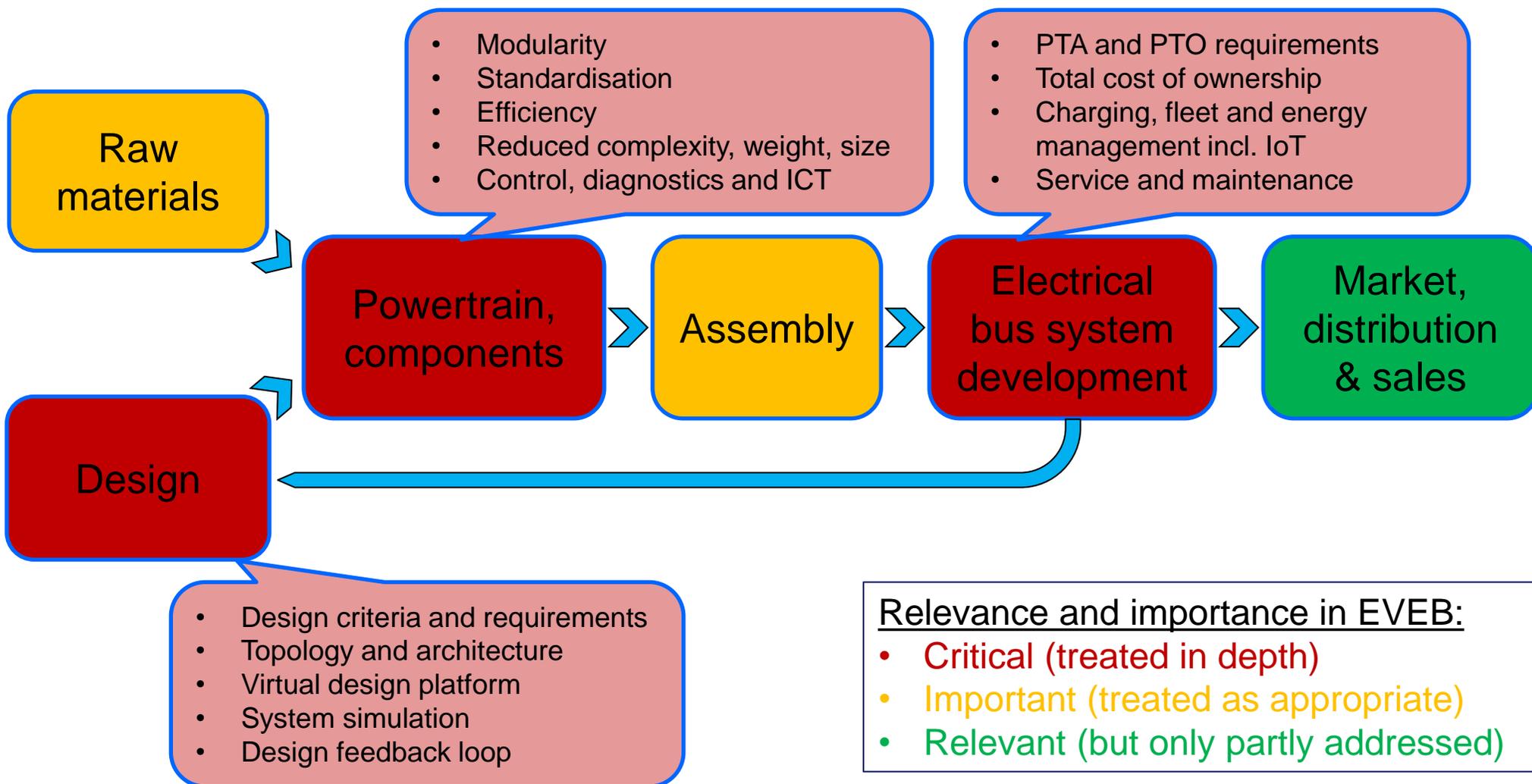
- Comprehensive model-based virtual design phase
- Component modularity and scalable powertrain design
- Management of component lifecycle and replacements / refurbishments
- Flexible tailoring to requirements e.g. Nordic vs. Mediterranean
- Interfaces to traffic system IoT and BMS

### *Impact*

- High suitability of electrical buses to customer needs
- Easy scalability and modular design
- Cost-efficient and reliable electrical bus
- Seamless integration of components, architecture and transport system
- Unbeatable total cost of ownership
- Speeding up market take-up of electrical buses

# Value chains

## Extreme Value Electrical Bus (EVEB)



Preliminary

## Partner search

# Extreme Value Electrical Bus (EVEB)

- Research
  - Electrical bus component and powertrain experts
  - Virtual design and analysis tools
  - Vehicle control, automation and ICT
  - Charging and communication experts
  - Energy distribution and system experts
- Industry/public authorities
  - Electrical bus component and powertrain
  - Vehicle control, automation and ICT
  - Charger manufacturer and integrator
  - Bus manufacturer
  - Bus operator
  - Pilot city
  - Energy company

**Extension of the project towards the medium duty trucks possible**

Common methodologies for powertrain and charging system development

Charging system planning (and realisation) for pilot fleet

Electrified bus prototype

Electrified medium duty truck prototype

Laboratory and onsite tests

Laboratory and onsite tests

# THANK YOU FOR YOUR ATTENTION



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