THE E3 BUS
ENERGY-EFFICIENT ELECTRIC BUS

THE GREEN DEAL
In 2012, the Dutch government signed an agreement to work towards a zero emission bus fleet by 2025.

EFFICIENT ENERGY MANAGEMENT
TNO, HEAVAC and VDL cooperate in the E3 Bus project

E3 PROJECT GOALS

ALTERNATIVE DRIVE LINE
- Clean, silent but work in progress.

TRADITIONAL DRIVE LINE
- Reliable, familiar but noisy and not compliant with the Green Deal

HOW TO DEFINE COMFORT?
A comfortable climate inside the bus is essential. In general, 22°C is considered comfortable, but other factors influence this.

PERCEPTION
There is also a difference in perception of (and requirements for) comfort between the driver who stays in the bus for approx. 2 hours, and passengers who, on average, sit in an intercity bus for 2 hours.

MAIN ISSUES
The biggest impact on energy usage is the climate-control system, which is essential for comfort.

- The climate-control system (HVAC) consumes 30% of battery life.
- The outside temperature greatly influences the range of the battery. Currently the ideal temperature for optimal battery use is 15°C.
- A bigger battery weighs so much more that the number of passengers the bus can carry dramatically decreases.

OUR APPROACH
The E3 project investigates how to optimize the energy use of HVAC systems, in particular of heat pumps. The project team looked at:

SOFTWARE SOLUTIONS
- Integrated control
- Peak shaving: if the bus is standing, the HVAC temporarily shuts down to save power
- Intelligent air recirculation (50% reduction)

SUSTAINABLE HARDWARE
- Frangible glass, floor, roof, panels
- Glaze coating
- Personalized heating, e.g., heated seats
- Waste heat utilization

THE PROCESS
SIMULATE → Prototype → MEASURE → IMPROVE

2016 (AND BEYOND)
The E3 project team and partners are dedicated to taking the optimal route to even more energy-efficient and comfortable electric buses!

MORE INFORMATION?
Visit the website to learn more: WWW.TNO.NL/E3BUS