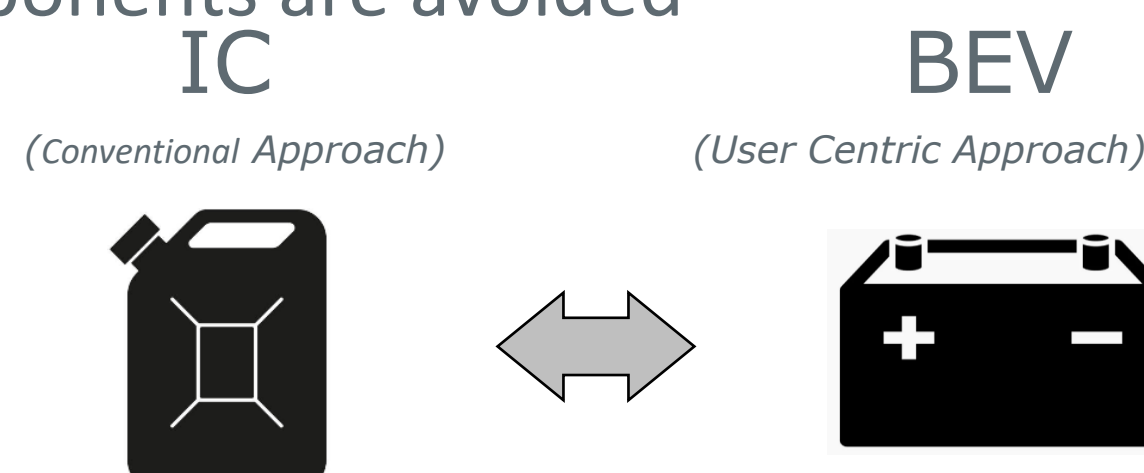
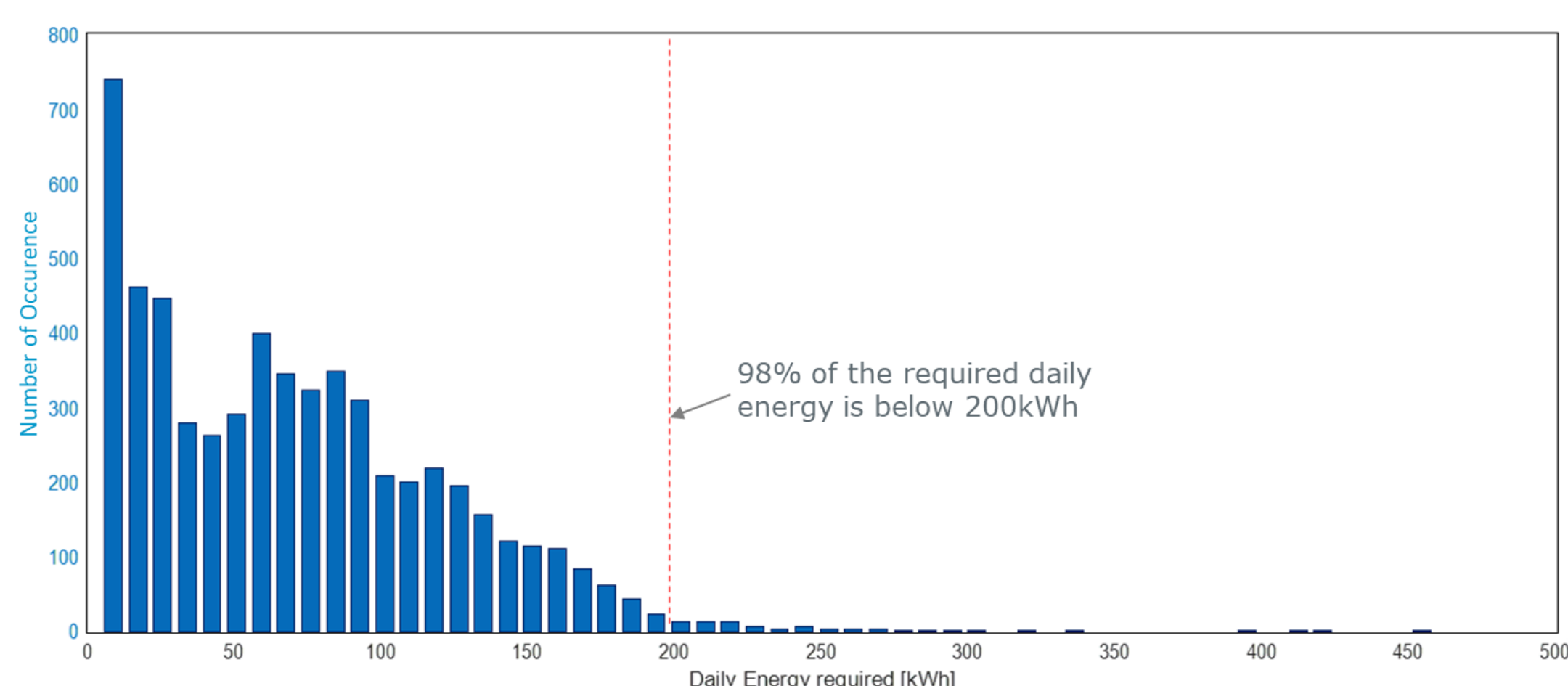


USER CENTRIC APPROACH

In contrast to the conventional approach, attractive functions are developed, and over-sized components are avoided



Big data analyses were used to support the selection of driving profiles for the use cases



Define Usage Scenarios & Use Cases

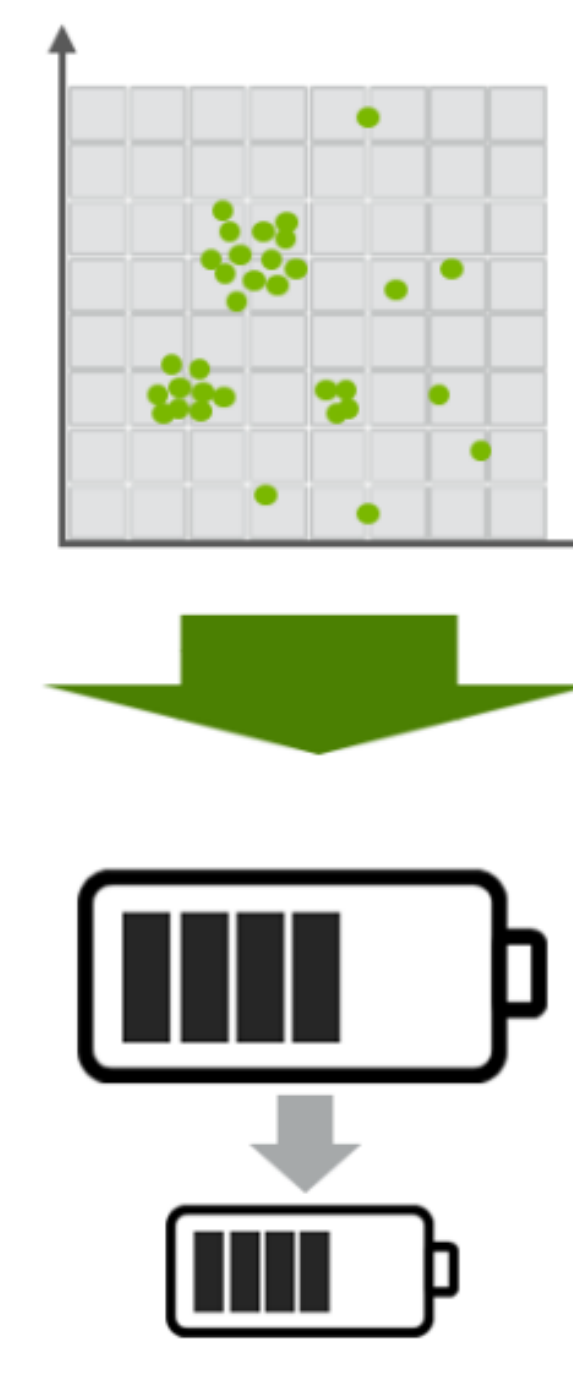
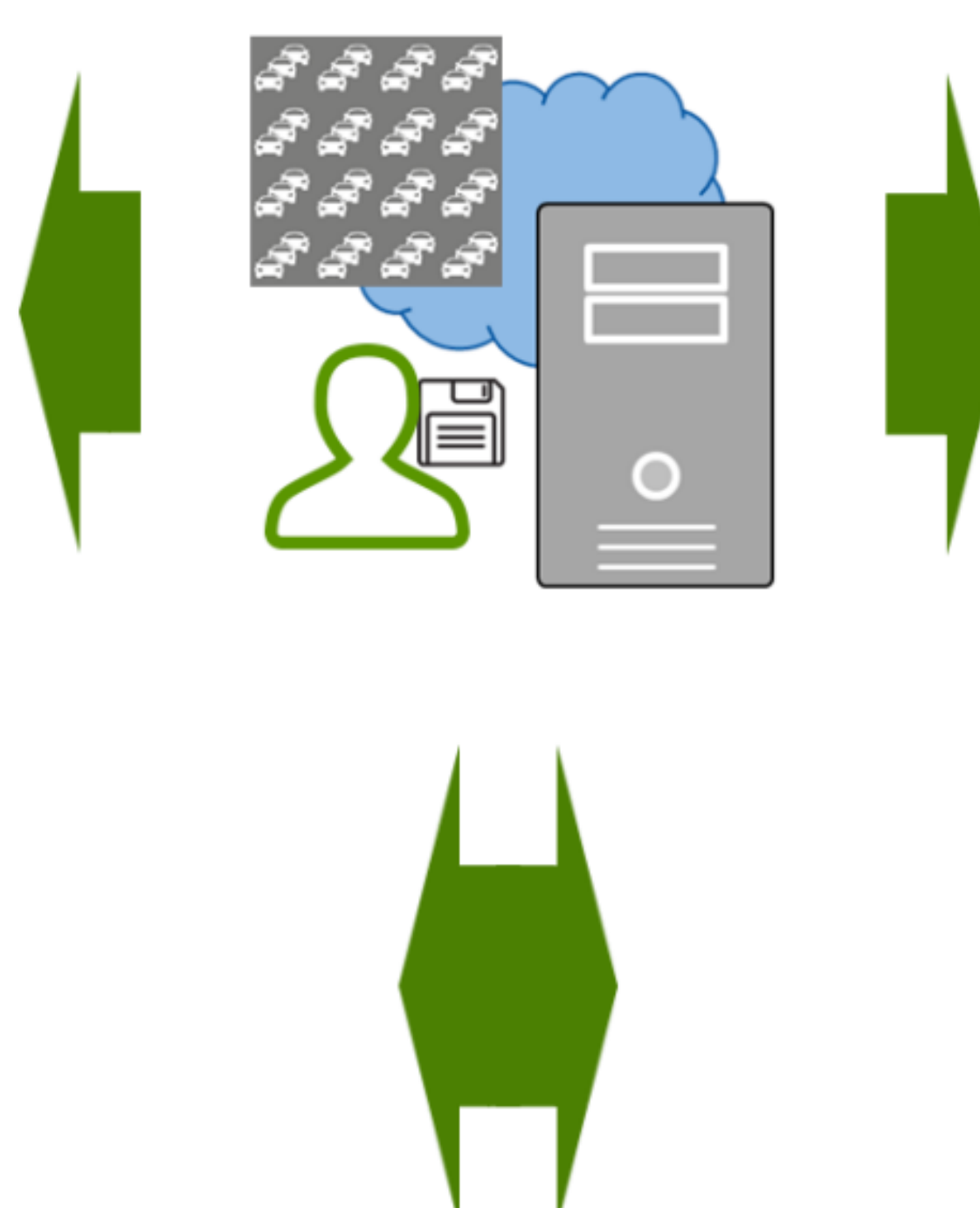
Analyze user behavior and user data

Estimate load profiles using simulation based on fleet velocity profiles

UC_ID	Use Case	Use case description
UC_1.1	Parcel service daily job standard conditions	Parcel service with multiple stops for (on-) loading/delivery in urban areas and loading out of the city at standard conditions, 11 kW or 22 kW charging after returning to the distribution centre. Same as standard conditions, but additionally snowy roads, low ambient temperature and lower average speed
UC_1.2	Parcel service daily job cold/winter condition	
UC_1.3	Parcel service daily job hot/summer condition	



Define requirements, functional architecture, and functions



Right-sizing components

This approach puts the user needs in the middle in order to identify attractive features for typical usage scenarios for different vehicle types and classes.

Defined Use Cases

Usage Scenario	Use Case ID	Use Case
Parcel delivery service	UC_1.1	Parcel service daily job standard conditions
	UC_1.2	Parcel service daily job cold/winter condition
	UC_1.3	Parcel service daily job hot/summer condition
Private & commercial traveller	UC_2.1	Commercial agent daily customer visit usage
	UC_2.2	Special Goods Delivery daily usage w/o intermediate charging
	UC_2.3	Special Goods Delivery special usage with intermediate charging
	UC_2.4	Private visit of 350 km (distance) away living relatives
	UC_2.5	Craftsman's one-day job 350 km away standard conditions, one stop per each 350 km trip
	UC_2.6	Craftsman's one-day job 350 km away standard conditions, two stops per each 350 km trip
	UC_2.7	Craftsman's one-day job 350 km away with traffic jam at cold condition, two stops per each 350 km trip
	UC_2.8	Holiday trip (>700 km)
Short city trip	UC_3.1	Short urban trip(s) (approx. 5 km)
Short range commuter (approx. 30 km distance)	UC_4.1	home => job => home (approx. 30 km distance)
Long range commuter (approx. 60 km distance)	UC_5.1	home => job => home (approx. 60 km distance)

Different boundary conditions result in different use cases

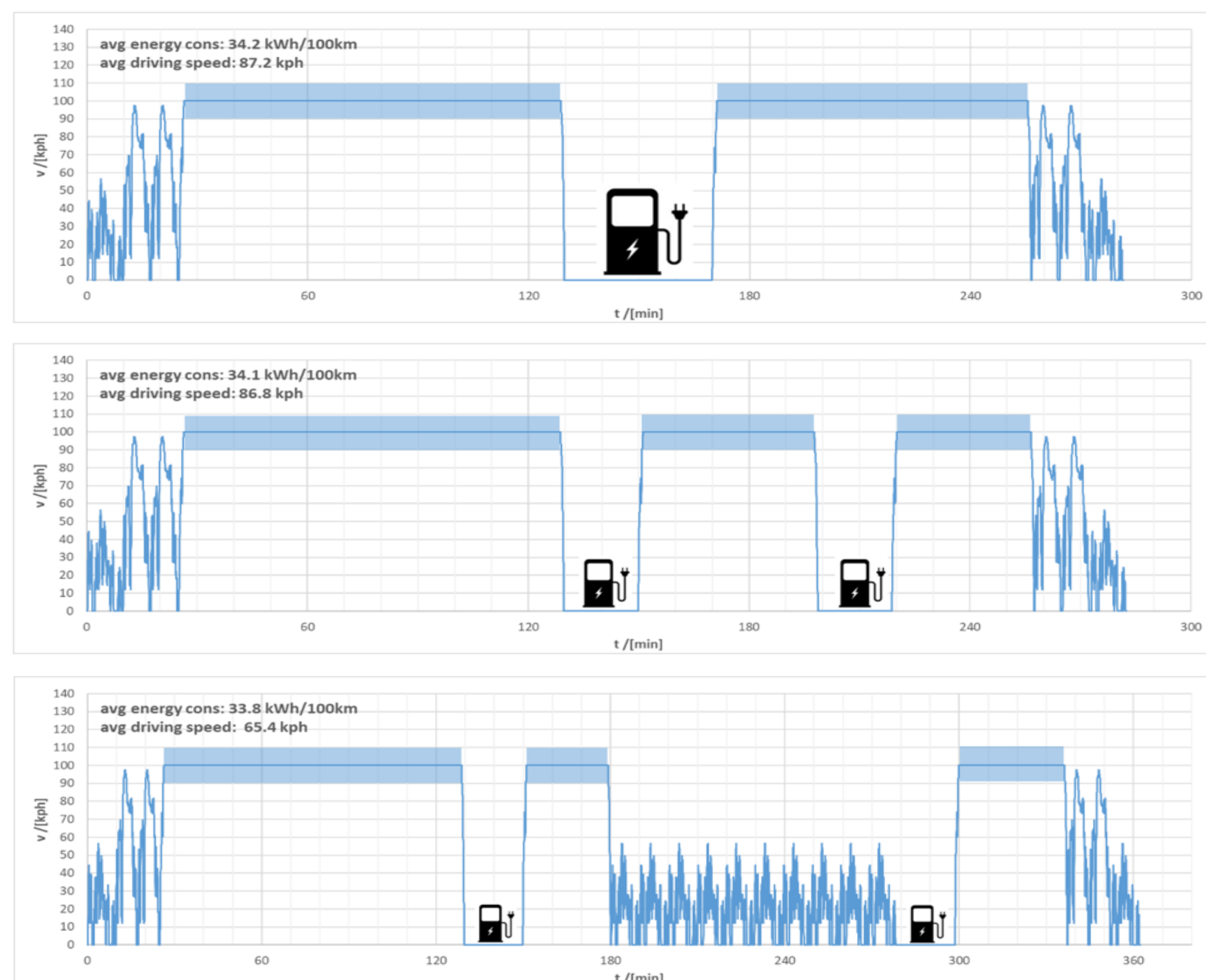
UC_2.5

UC_2.6

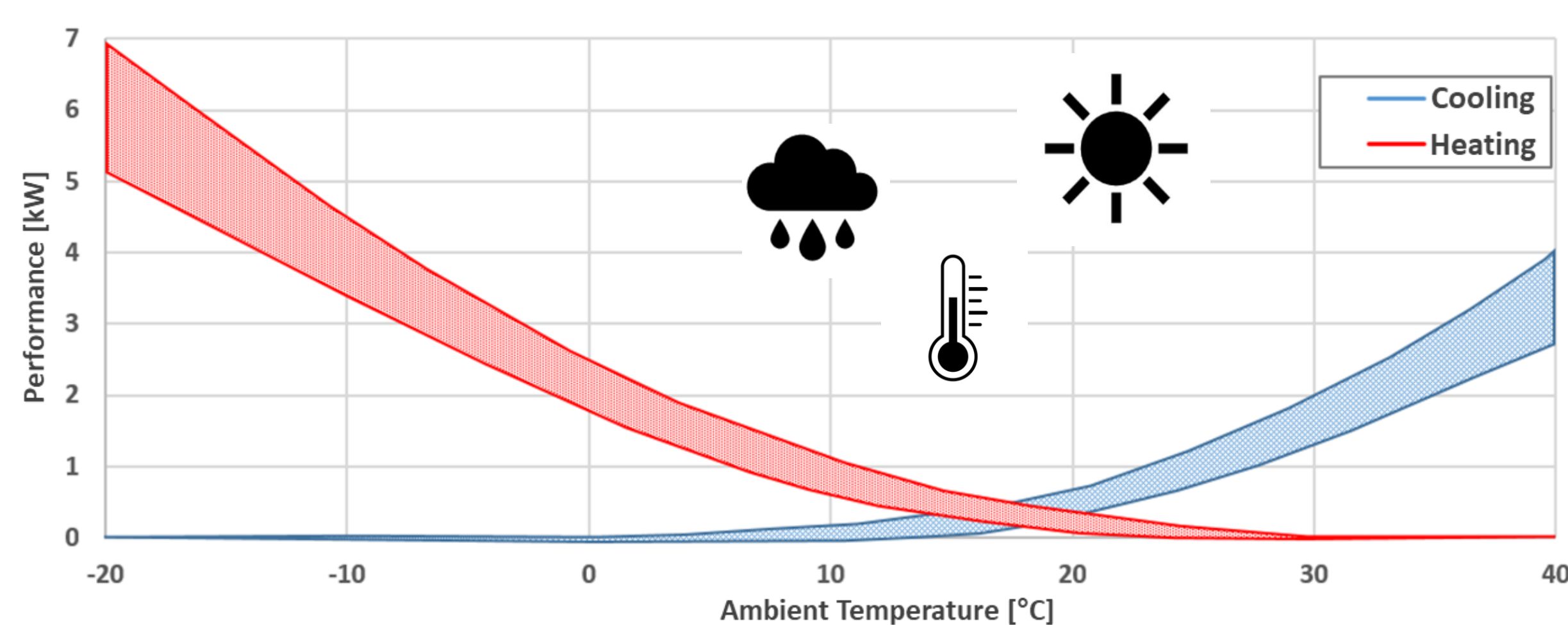
UC_2.7

Development of driving profiles for specific use cases

"Craftsman's one day job 350km away"
Use cases derived from customer data



Use Case Boundary Conditions



Significant amount of power required for interior climatization especially at cold ambient temperatures

Reduced vehicle range



Example for "Rightsizing" or selection:

A heat pump system is a high efficient system for interior heating, but does it make sense for all BEV applications and use cases?

⇒ See also Thermal Management section

appropriate component

