

Development of a Multi-Criteria Analysis to Evaluate Use Cases for Shorter BEMU Branch-Line Vehicles in the German Railway Network

Background: The transportation sector is under pressure to decarbonize, with railways playing a key role. However, many Branch Lines in Germany remain non-electrified (around 350), relying on diesel trains, which contradict sustainability goals. Existing large BEMU solutions are unsuitable for branch-line operations due to high infrastructure costs, overcapacity and special characteristics of Branch Lines.

Objective: This thesis aims to evaluate the feasibility and market potential of shorter BEMU vehicles for branch lines using a structured multi-criteria analysis approach.

Methodology

Define Evaluation Criteria: Technical Feasibility, Economic Feasibility, Environmental Impact, Operational Feasibility, and System reliability.

Develop Route Scenarios: Analyse real-world data from the German Railway Network to establish representative scenarios for evaluation.

Establish BEMU Prototypes: Short BEMU (like RS1 Regio Shuttle) and Large BEMU (like Siemes Mireo Plus B).



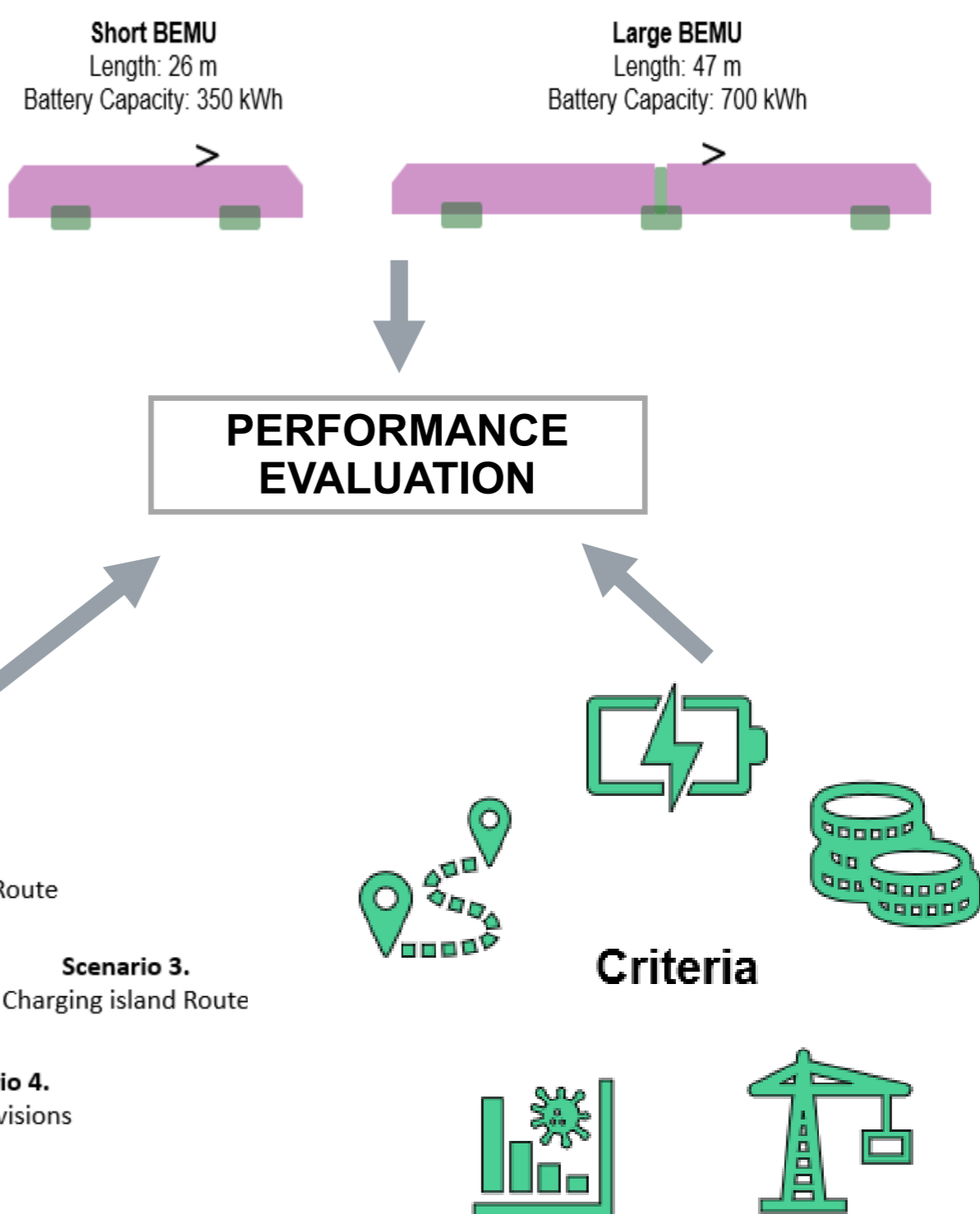
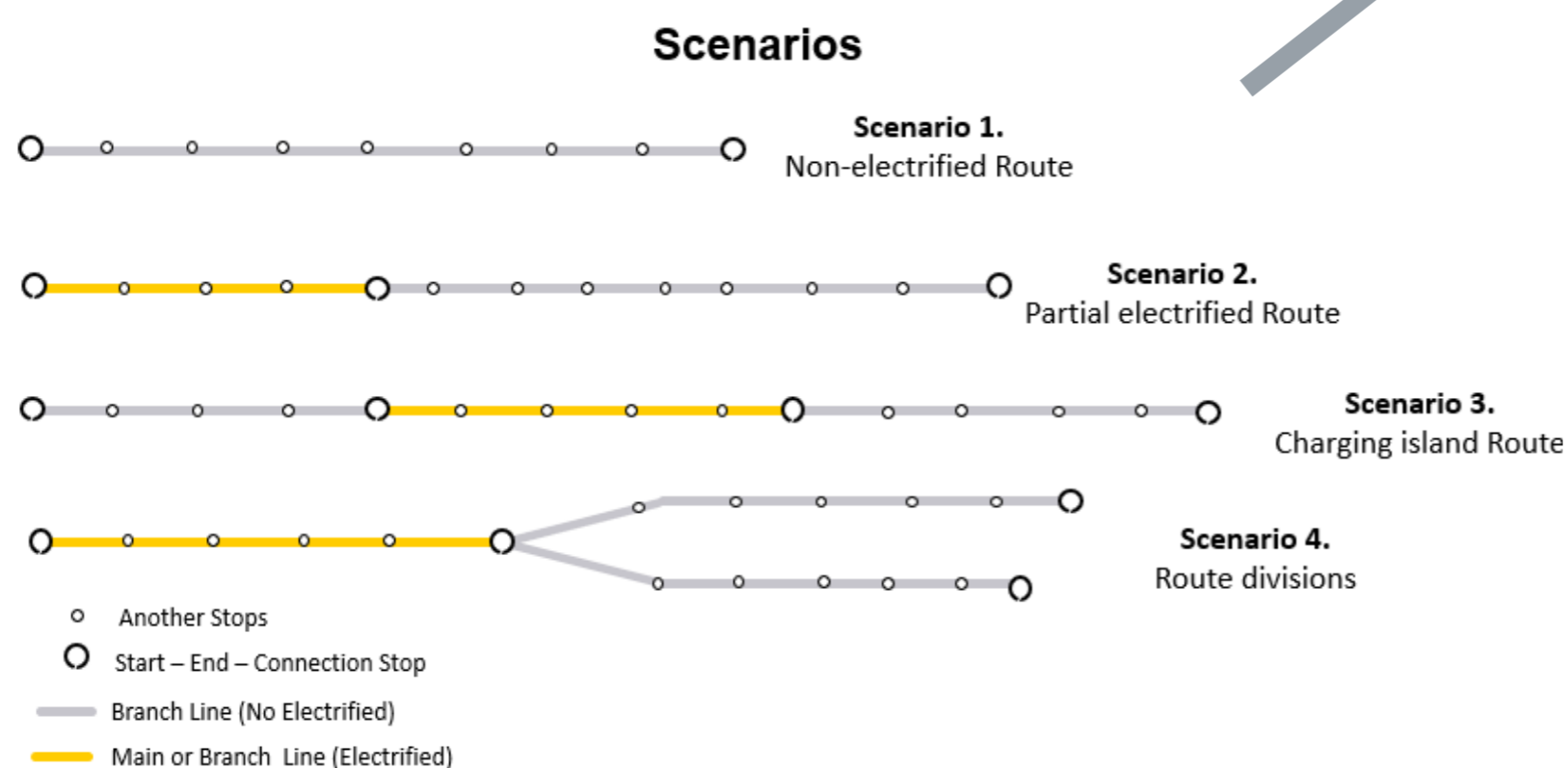
Photo: Duban Betancur Gutierrez

Conclusions

High flexibility and operational efficiency for branch lines shorter than 45 km. Minimal infrastructure upgrades required.

Significant demand for shorter BEMUs in non-electrified branch lines. Showing high potential for Market development.

Strategic location of recharging infrastructure relevant aspect to ensure reliable operations.



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Processing Period 07/2024 - 01/2025