

AuRa – Autonomes Rad

Flexibler Einsatz autonomer Fahrradsysteme für Logistik- und Beförderungsaufgaben

Evaluation of Energy Supply Technologies for AuRa System

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Objective and Methodology

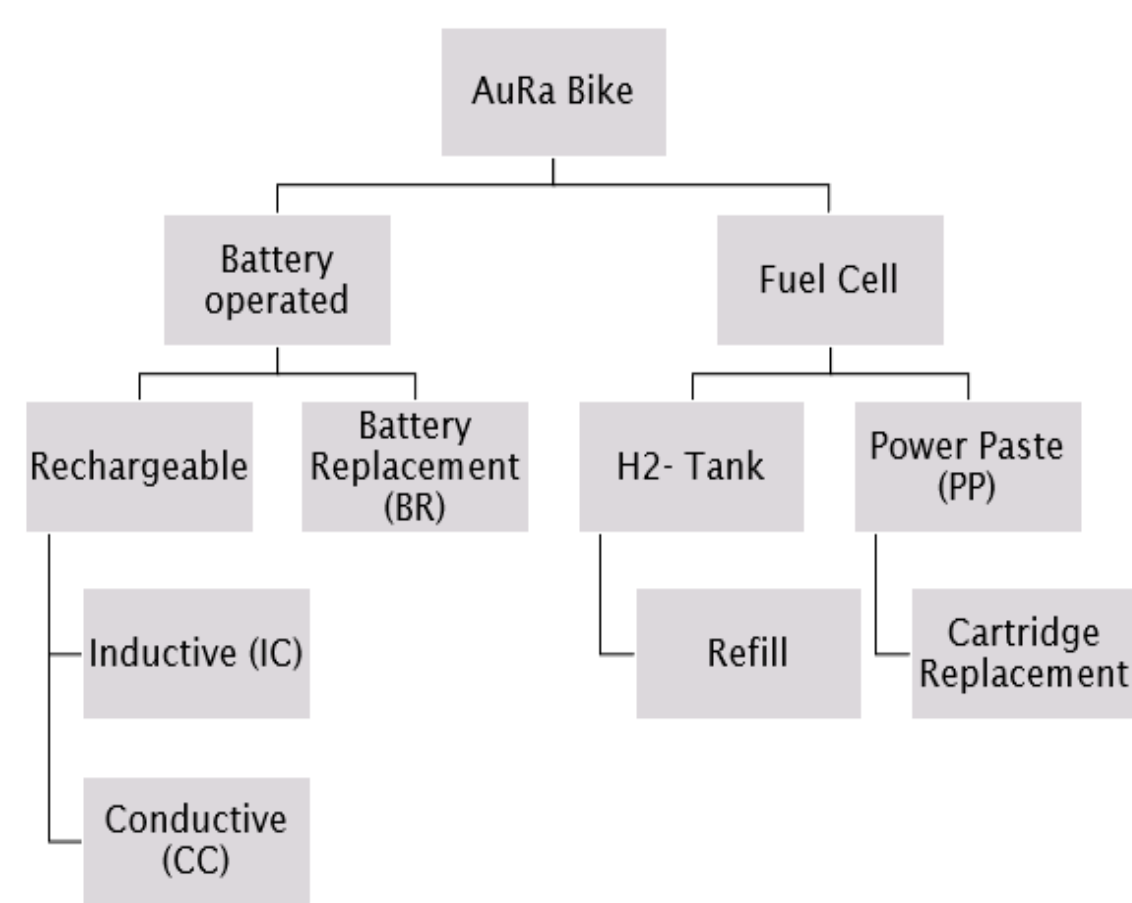


Fig. 1 - Energy Sources for AuRa bike

The Key Performance Indicators (KPI) to identify the suitable energy supply technology for AuRa system.

- Hourly Service level greater than 94%
- Charging Station Infrastructure Cost
- Energy Consumption Cost
- Charging Time vs Type of Energy Source

Simulation modelling methodology is used for evaluation of energy sources (see Fig. 1) for AuRa system. We implemented Agent-based Simulation Testbed for AuRa system to conduct experiments.

Simulation Model and Outcome

- AuRaBike fleet: 256
- Charging stations: 24 with 10 slots each.
- Demand data: one statistical day
- Simulation Animation window represents the AuRa bike agents moving on the operational area. waiting stations and charging stations (see Fig. 2) .
- The comparison of KPIs (see Table: 1) provides an overview of various energy sources. Also, Profit analysis (see Fig. 3) suggest Battery Replacement with **GreenPack** is suitable energy solution for AuRa system.
- For IC and CC the fleet size should be 485 to get a service level above 94%. Moreover, the costs are double.

Table: 1 KPI Comparison

KPI	BR	PP	H2	CC	IC
Service level (%)	> 94 %	> 94 %	> 92 %	Peak hour < 30 %	Peak hour < 30 %
Total Cost (€)	26.200	29.374	30.035	21.318	21.697
Energy Cost (€)	395	1639	1974	295	295
Charge Time (h)	0.05	0.03	0.1	3.5	3.5

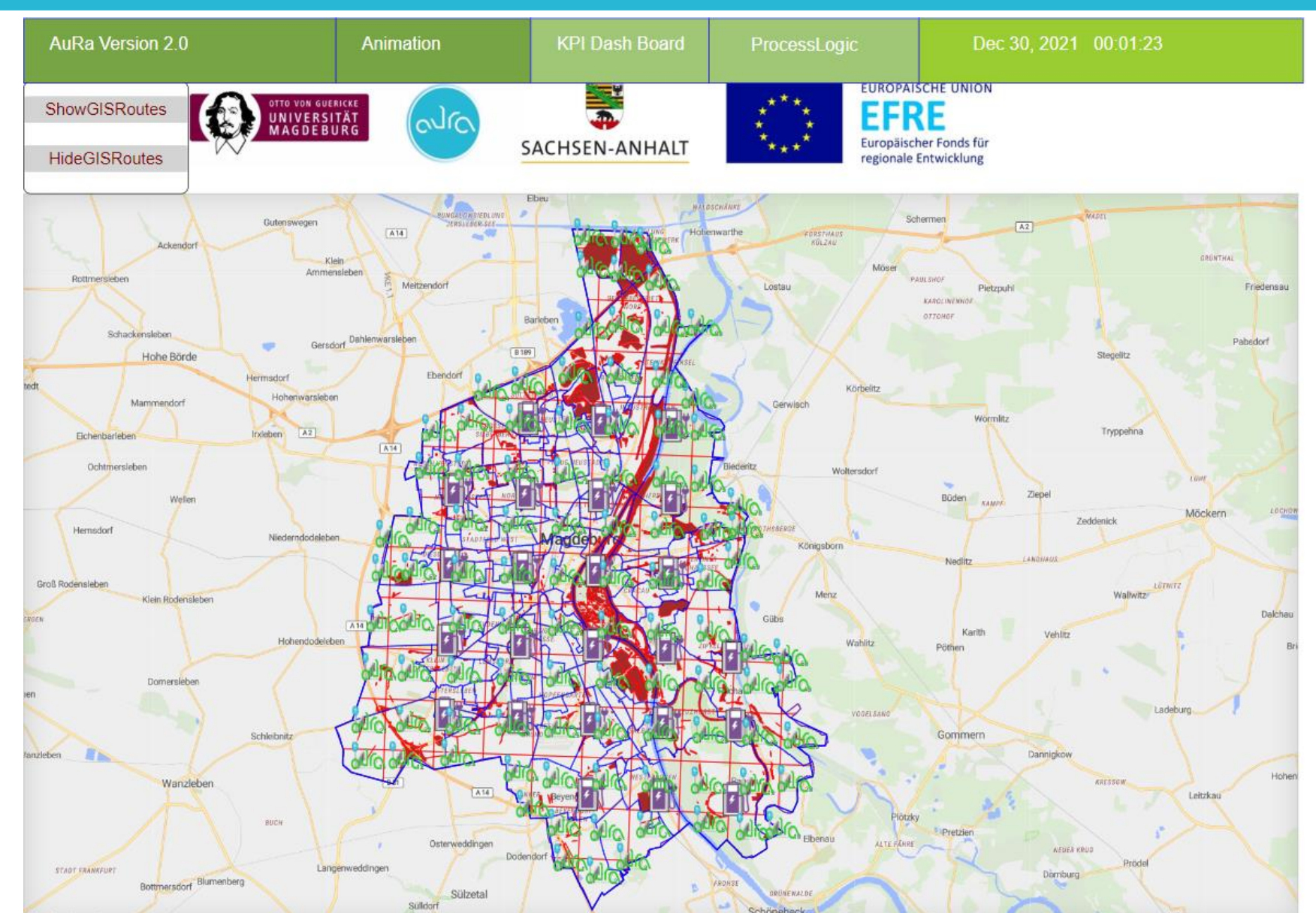


Fig. 2 - Simulation Animation Window

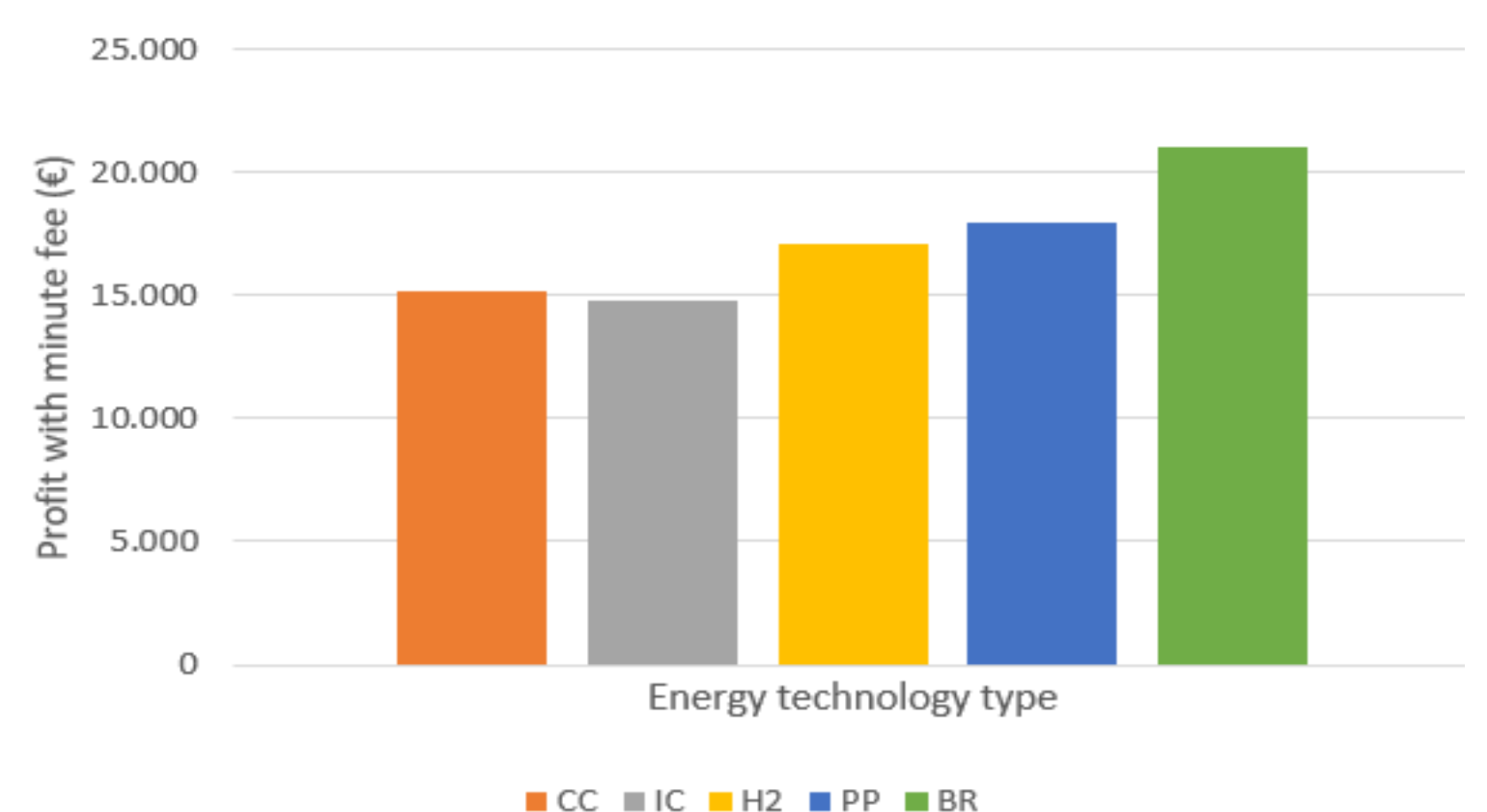


Fig. 3 - Profit Analysis