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FLASH CHARGING CATENARY-FREE RAILWAY RESTORATION PLANNING: ELECTRICITY DISTRIBUTION NETWORKS IMPACT IN AN ITALIAN-SWISS CASE

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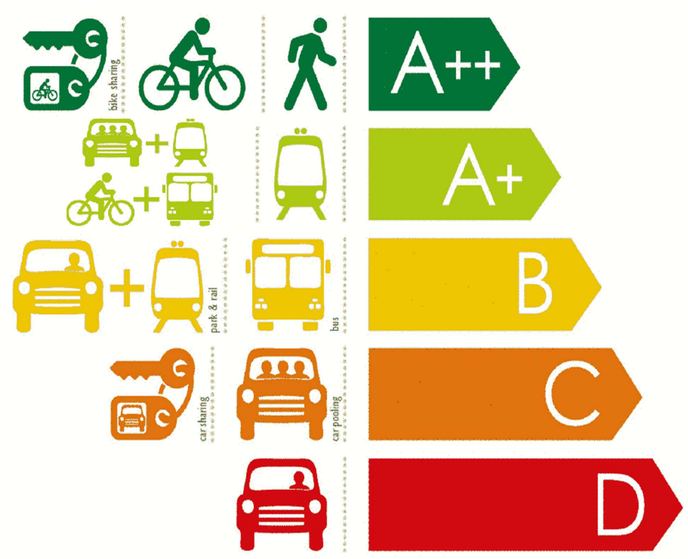
Overview

- **Air pollution** and **high traffic density** in **northern Lombardy (Italy) and Ticino (Switzerland)**.
- Intermodality, pooling & sharing, **"green" public transport** as solutions.



- Innovative electric public transport systems on the market **impacting on electricity networks** (e.g. e-Bus Rapid Transit, e-BRTs, and **flash-charging catenary-free Light Railway Transit, LRTs**).
- **Planned restoration** of the abandoned **Malnate(IT)–Stabio (CH) "Valmorea" railway**. The area is characterized by **strict environmental constraints** (presence of a regional park). Currently, new railway's **infrastructures** are **not** yet **defined.**

Aim of the activity

- **Evaluate** the **adoption** of a **flash charging catenary-free Light Railway System** in the **international "Valmorea" railway.**
- **Investigate** and **compare** the impact of the considered solution on the **Italian** and **Swiss electricity distribution networks.**

Methodology

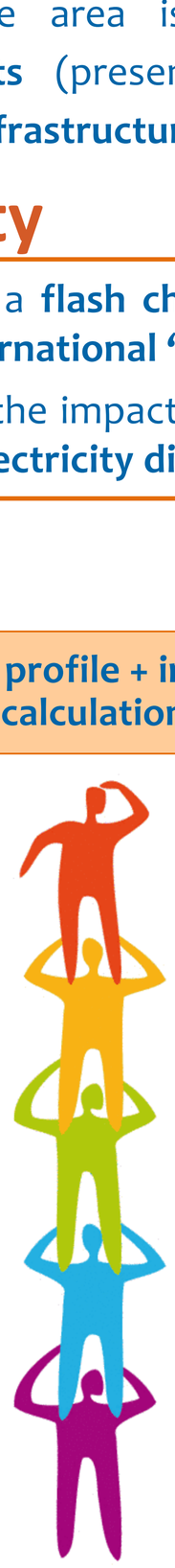
Load profile + impact calculation

Railway timetable rescue + integration

Charging infrastructure choice

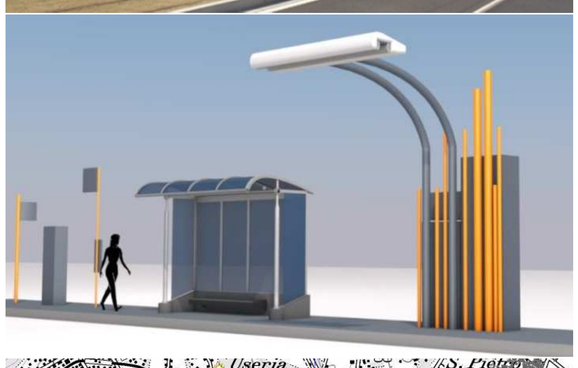
Electricity networks parameters evaluation + estimation

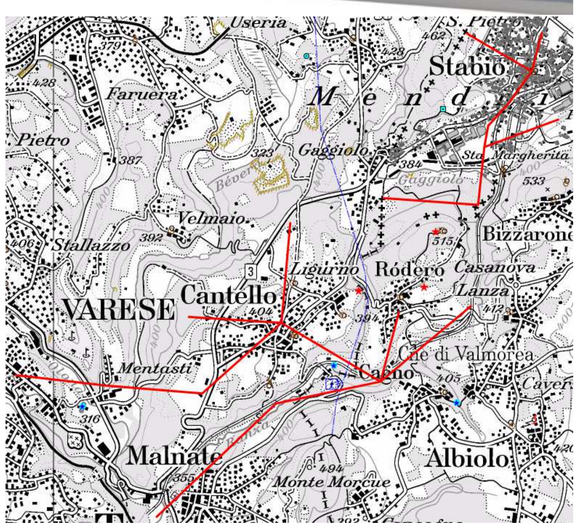
Track evaluation + vehicle type selection

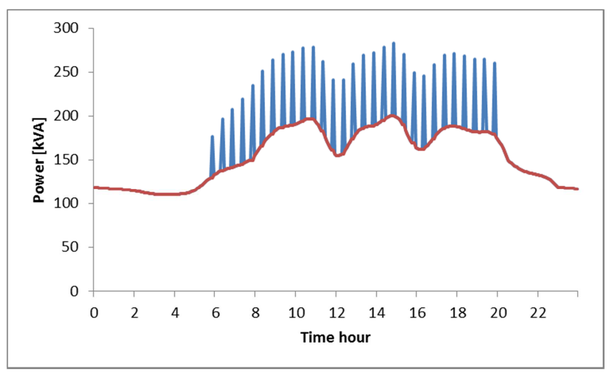


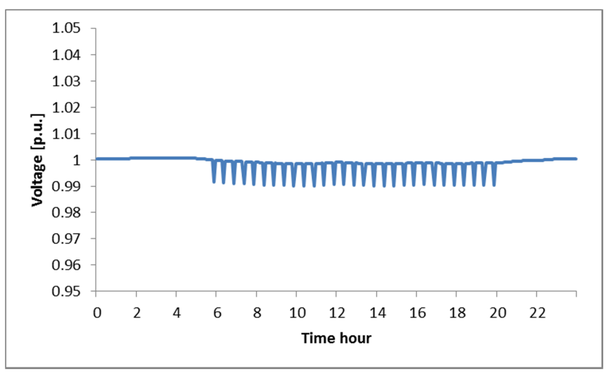
Test case

- **Vehicle type selection:** 36-m long catenary-free + **flash charging** stops (*CRRC HADDB Huai'an model* – China).
- **Charging infrastructure:** *ABB TOSA Geneva (CH) model*
- **Charging stops *vs* MV/LV substation overlap.**
- **Involved HV/MV substations:** 1 (IT) + 1 (CH).
- **HV/MV substation rated power:** 20 MVA.
- **Involved MV/LV substations:** 4 (IT) + 1 (CH).
- **MV/LV substation rated power:** 250 (IT) x 4 - 630 (CH) kVA
- **Rated voltage:** 15 (IT)-11 (CH) kV

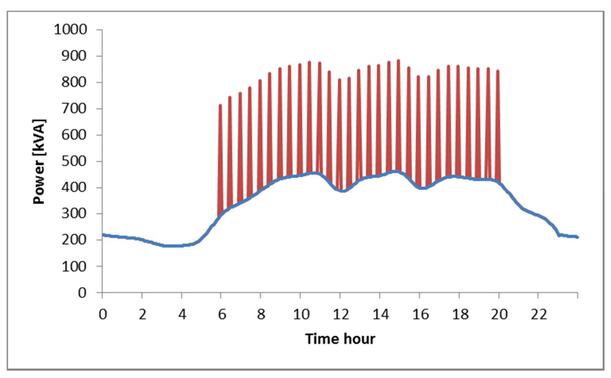


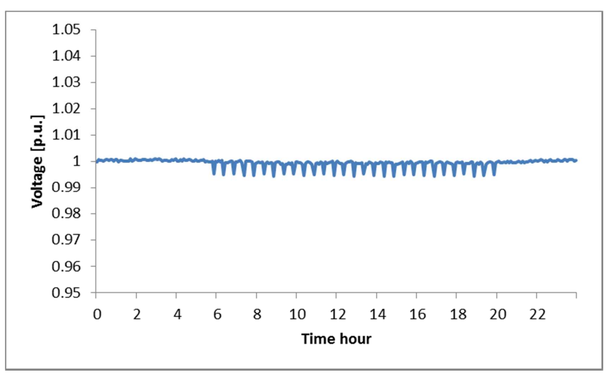






Cantello (IT) stop: Load profile (red: baseline, blue: flash charging scenario, calculated) + resultant voltage profile





Stabio (CH) terminal: Load profile (blue: baseline, red: flash charging scenario, calculated) + resultant voltage profile

Conclusion

Simulations have demonstrated a **relevant impact on the MV/LV substations load profile in both areas.** This situation **suggests** an electricity **infrastructure revamping** in case of adoption of this kind of transportation system. Following actions will address further considerations using more sophisticated transport and grid models.

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