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Key data of "Cablecars" system

- Speed up to 10 m/s
- Drive capacity from 50 kW to 1 MW
- Inclination up to 110 %
- Energy costs about 50% of operating costs



STANDSEILBAHN BIEL - MAGGLINGEN	
BAHNLAENGE	1693 m
HOEHE TALSTATION	432 m.ü.M.
HOEHE BERGSTATION	874 m.ü.M.
FAHRZEUG	120 Pers.
FAHRGESCHWINDIGKEIT	6 m/s
FAHRZEIT	5,5 min
FOERDELEISTUNG	1050 P/h
SEILDURCHMESSER	37 mm

First measurements on site

Funicular Biel / Bienne – Magglingen / Macolin

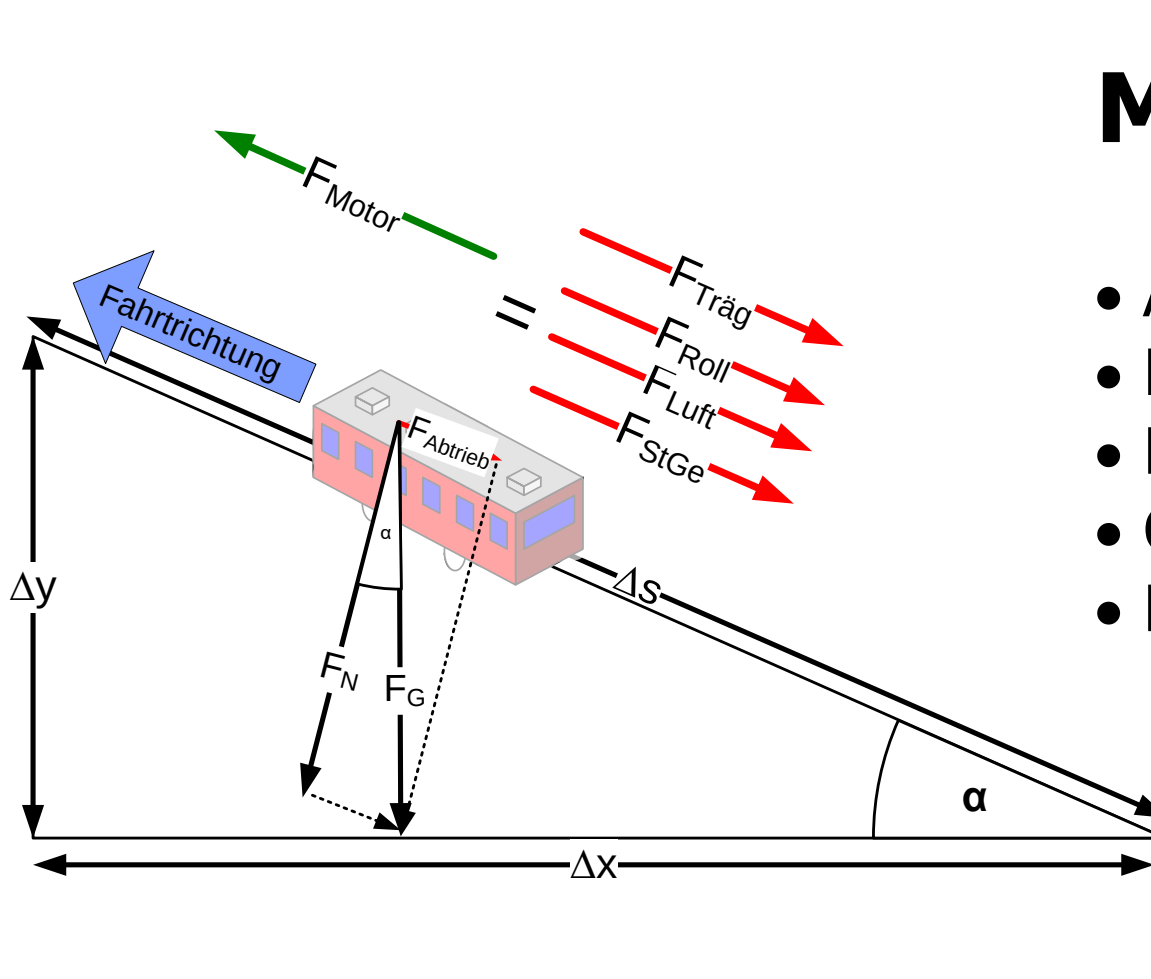
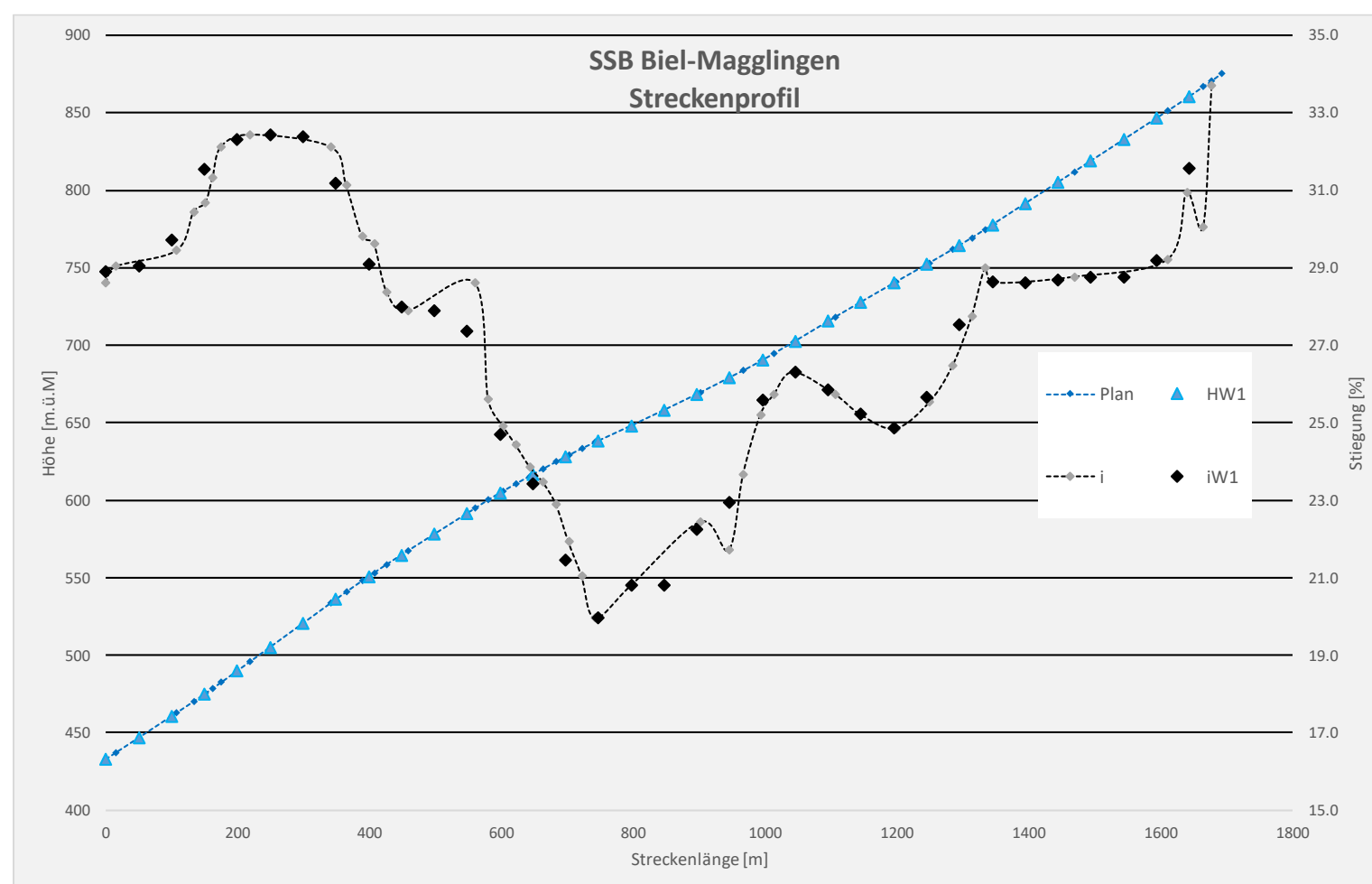
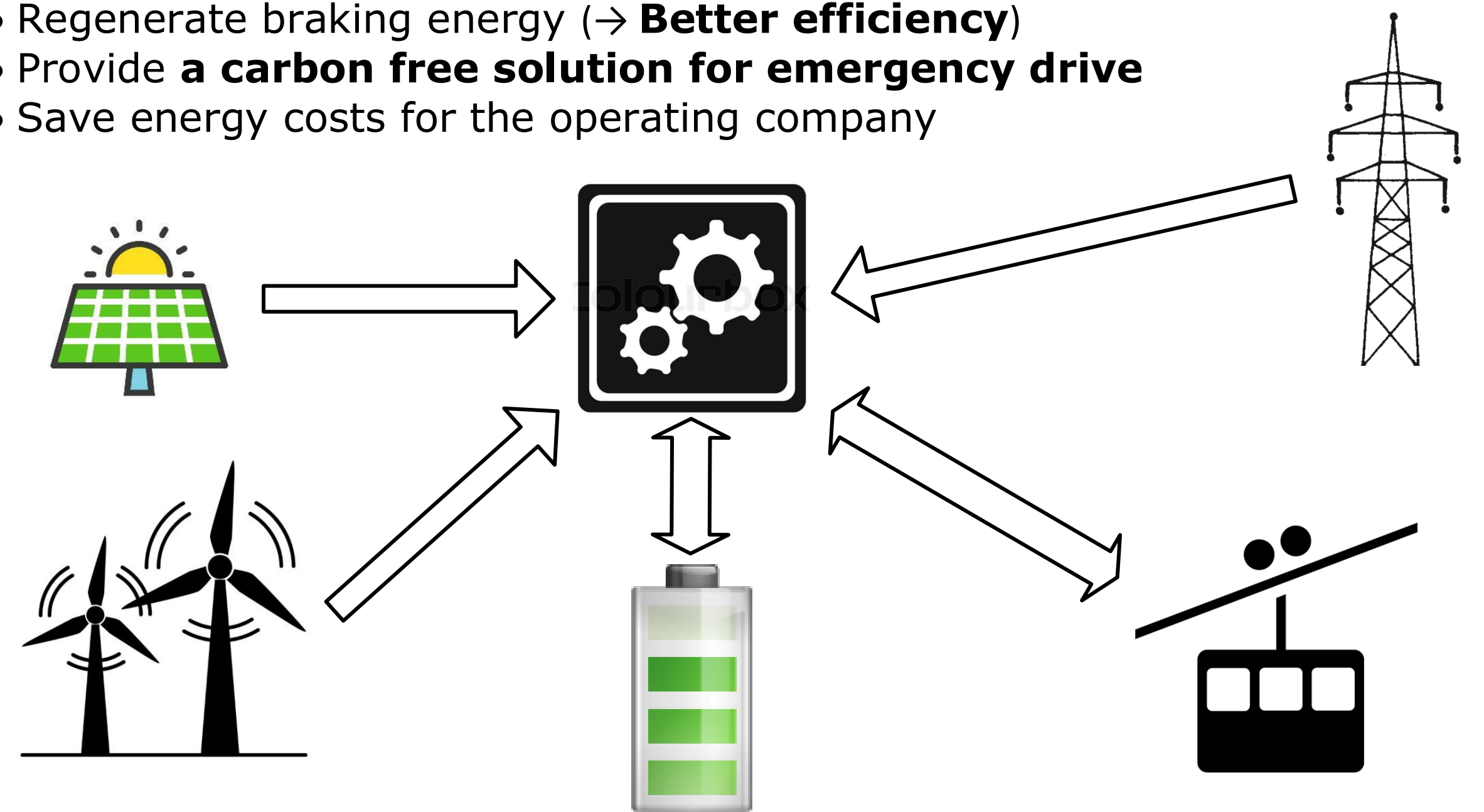
- Refurbishment of the equipment in summer 2019
- High economic potential
- New PV on the roof in spring 2020
- Need of an emergency drive
- High interest of the operating company



Project ideas for "Cablecars"

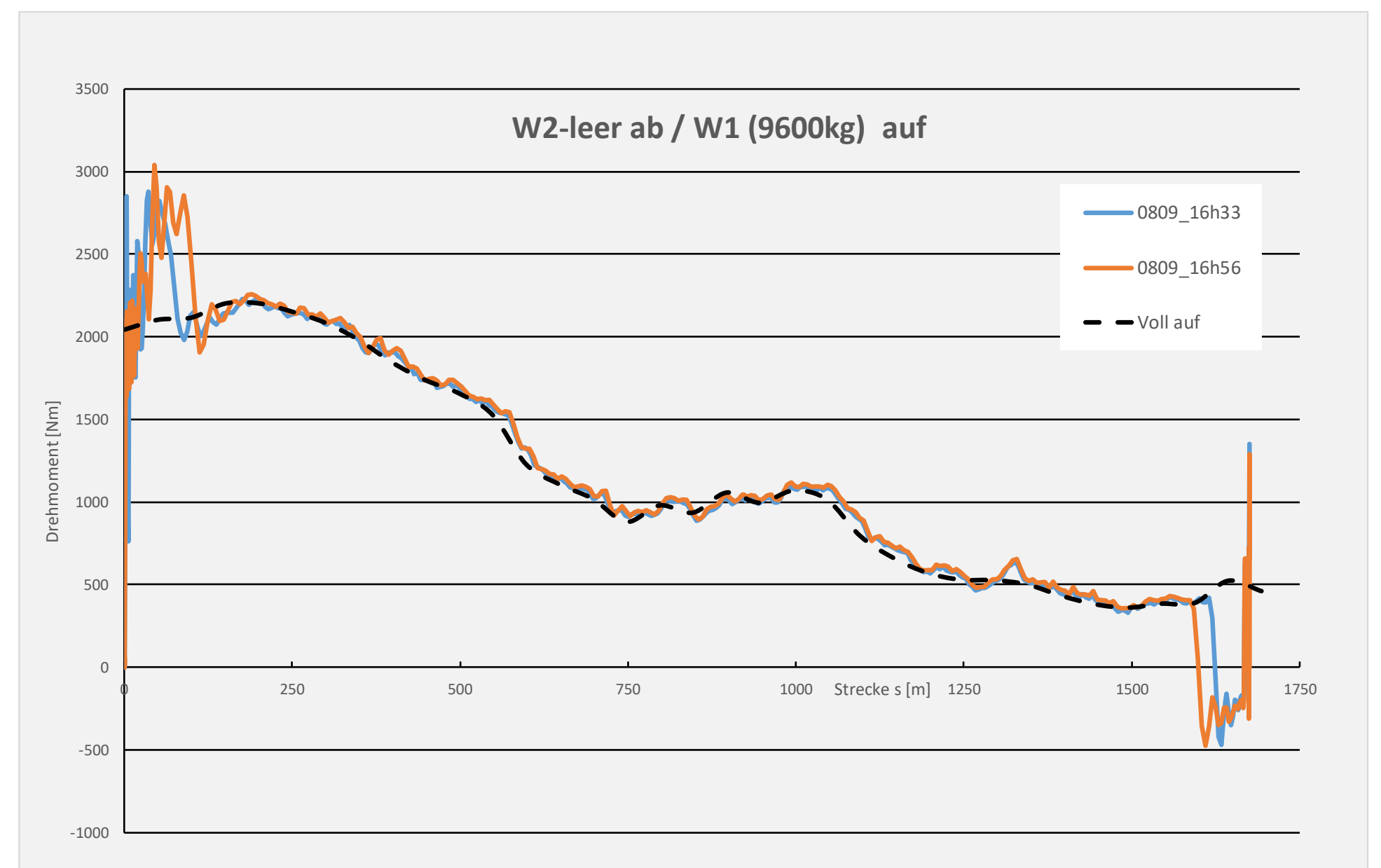
In this project, we aim to:

- Integrate **renewable energy** (→ Solar, PV)
- Regenerate braking energy (→ **Better efficiency**)
- Provide a **carbon free solution for emergency drive**
- Save energy costs for the operating company



Modelling and design

- Analysis of electricity costs
- Evaluation of the energy per trip
- Modelling of distance profile
- Calculation of forces, power and energy
- Evaluation of components
 - Storage capacity / power
 - Cell type
 - Inverter for storage
 - Connection with grid
 - Availability of the components
- Simplified financial analysis



120-er Standseilbahn Biel – Magglingen	
Befahrgewerkschaft: VB TPB	
Sollenerzieher: Doppelmayr	
Fahrgewerkschaft: CWA	
Elektronische Steuerung: FREYAG	
Seil: FATZER	
Erneuerung 2019	
Technische Daten	
Schräge Länge	1693 m
Höhenunterschied	442 m
Grobsiege Neigung	33,5 %
Fahrgeschwindigkeit max.	6 m/s
Fahrgeschwindigkeit	5,3 m/s
Förderleistung je Richtung	1050 p/h

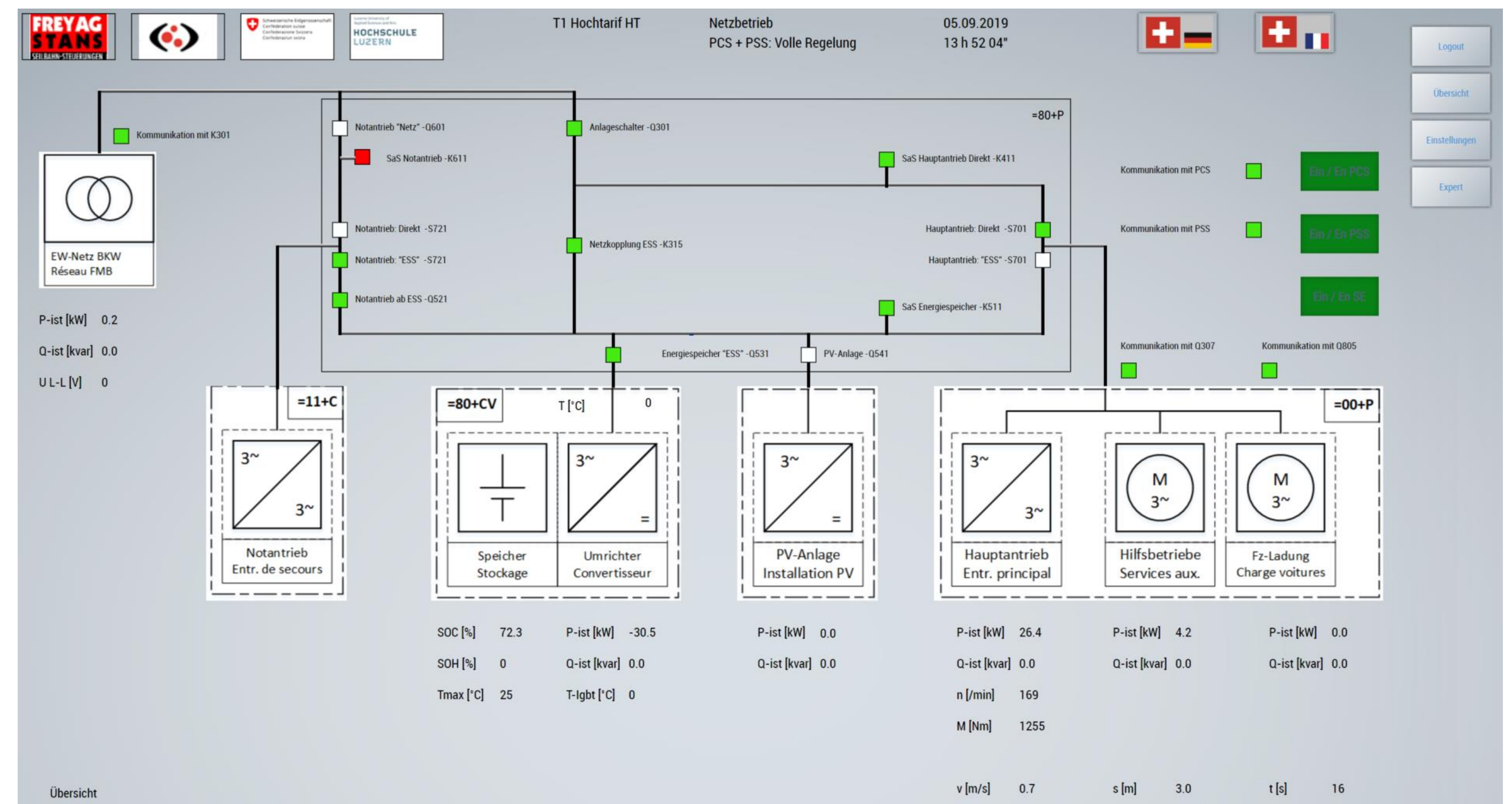


Implementation, commissioning and return of experiences

- Analyse control algorithms
- Design and program the PLC-control
- Program and design the **innovative Energy Management System (EMS)**
- Design and program the HMI
- Commissioning in factory and on site
- Operating again on **1st of September 2019**
- **Short time** for the implementation
- Many actors involved
- First return of experiences
- **80% of braking energy** can be reused
- Roof-PV will be installed in spring 2020
- **Higher benefits** for the operating company

References

- HSLU T&A, O. Duvanel, Machbarkeitsstudie, SSB Biel-Magglingen, 2017
- Verkehrsbetriebe Biel, Leistungsbeschreibung SSB Biel-Magglingen, 2017
- BAV, P-126, Energiemanagement Bergbahnen mit Zwischenspeicher für PV und Rekuperation, 2018



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