

# System Optimization on the rolling-stock of SBB

Subject: Energy and Environment

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External project partner: SBB, Bern

The Swiss railway company SBB has the ambitious target to save 600GWh/a until the year 2025. It is the task of Mr. Ueli Kramer within the Energy-Saving-Program to analyse the energy consumption of the rolling stock at SBB-P. The output of this work is a catalogue of projects and a systematical analyse-procedure to develop and evaluate new projects ideas. The output today is an overall potential in total of 75GWh of which 27GWh have a payback time of less than six years.

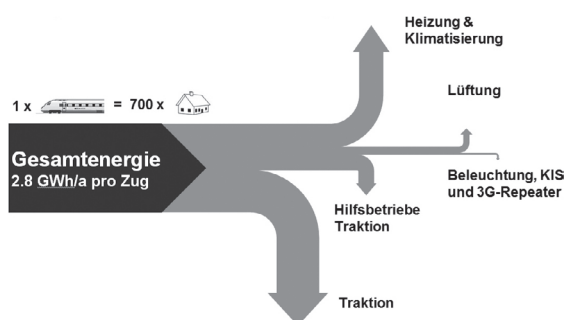
## Motivation

The SBB rolling-stock has over 2400 passenger carriages, more than 560 railway-traction vehicles and around 500 multi-unit train coaches. Each year, the fleet travels over 180 million kilometers and carries over 366 million passengers. In such a complex environment with different divisions and objectives, it is very important to have a methodical concept for analyzing and evaluating the different systems. Getting a feasible output based on all the necessary information for creating project prospects out of ideas is crucial.

## Methodology and Results

A structured overview from the identification up to the realization of projects has been realized due to a systematical methodology. The result is a detailed analysis summarized in a structured matrix sorted by the type of rolling-stock (locomotives, coaches, multi-unit train coaches) and systems like HVAC (Heating, Ventilation and Air Conditioning), traction and auxiliary systems as well as comfort-systems. This classification has been detailed by creating four main subject-groups:

1. Consequent shut-off of devices while rolling-stock is not in service
2. Energy optimized controlling while rolling-stock is in service
3. Energy efficient components
4. Optimized driving resistance



### Energy flow of an ICN (electrical multiple unit train)

A bottom up approach from the system view to the different type of rolling-stock lead to a model for each coach and locomotive in which all the projects have been consolidated. On top of that each project has a one-pager to summarize the optimization potential. The structured summary of optimizations is an ideal tool for management decision and communication purposes as well as for discussions about financial and resource impacts.

The methodology of the energy saving potential has been done in a model for each vehicle separately. Several projects have already been launched, as the economic potential is positive. For several projects it was necessary to create detailed specifications and test procedures as well as sequence diagrams for software development, simulations and etc.

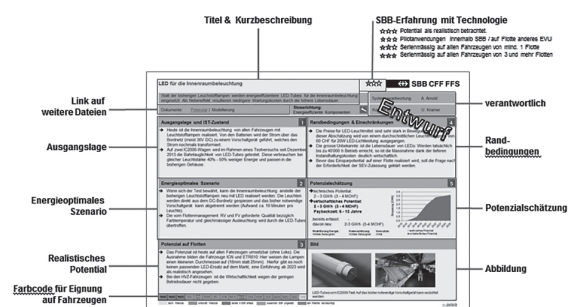
## Outlook

This work will be continued and the models will grow further. On top of that, the developed procedure will be integrated in the process landscape of the organization. Furthermore, general requirements will be identified and taken into the requirement-catalogue of future rolling-stock procurement.



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fact sheet for an energy efficiency optimization