

Identification and justification of energy saving strategies for metro and mainline railways

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This paper will address the following topics of interest:

1. Using decision support systems to identify energy saving strategies
2. How to justify the financing of energy efficiency programs
3. Specification of energy efficient rolling stock and infrastructure

Recent experience with metro and mainline railways has identified that many energy efficiency initiatives are self financing when the wider system impacts are taken into account. This paper will describe the approach used to identify which opportunities are self financing. A summary of the opportunities identified at London Underground, by the Traction Energy Efficiency and Line Upgrade Optimisation Project, is provided, as well as a discussion of the conditions under which opportunities are likely to be self financing for other networks.

A System Optimisation Process (SOP), has been used to evaluate and optimise energy efficient initiatives and to establish self financing options. The paper describes this process and the application of the SOP to identify, justify and specify energy efficient initiatives at London Underground and take ideas from inception to execution.

To evaluate and justify energy efficient initiatives, a complete systems approach is required, looking at the bigger picture and working out what will benefit the system as a whole over its entire life cycle. The SOP provides a means to structure projects to help identify self funding energy efficient initiatives. The SOP provides a metric to sell and justify ideas and options so that they can be implemented where viable.

The main processes of the SOP are:

1. Define options and inputs;
2. Operation and engineering simulation;
3. Specification.

The SOP has been applied at London Underground to evaluate and justify energy saving initiatives including new rolling stock design concepts, more powerful rolling stock with improved efficiency run profiles, the implementation of on board and wayside energy storage, and the installation of low loss composite conductor rail. The paper will present these and other opportunities such as energy efficient train regulation systems and provide an outline of expected energy savings and under what conditions the opportunities are likely to be self financing. This will enable delegates to have an idea of which opportunities are likely to be self financing, and under what conditions, on other railway and metro systems.

In addition, work is currently being undertaken to validate the simulation processes as part of a vehicle energy monitoring program at MerseyRail, a 750V DC commuter rail. This work will be used to feedback into the SOP to ensure that the simulations used are appropriate and correct.