

# TECHNOLOGY IN ACTION



## All aboard for energy efficient rail transport



Orgalim's Technology in Action series showcases how the technology industries we represent are shaping a future that's good for Europe's economy and society – and how the right policy framework can help them do even more.

### Challenge

Trains are nearly 12 times more energy efficient on average than cars per passenger kilometre and eight times more efficient than trucks per tonne of freight.<sup>1</sup> Shifting more passenger and freight transport from air and road to rail is therefore a key plank in European strategy to reduce emissions from the transport sector.

However, as rail networks grow, so does the energy consumption. To promote sustainable transport such as electric trains while simultaneously balancing the expanding rail infrastructure and its energy consumption, it is crucial to make rail transport as energy efficient as possible.

And where better to drive innovation in efficient rail transport than in Switzerland, which has one of the largest rail systems in Europe. Swiss people take the train more than in any other European country, travelling some 2,400km per capita in 2019.

<sup>1</sup>ABB White Paper

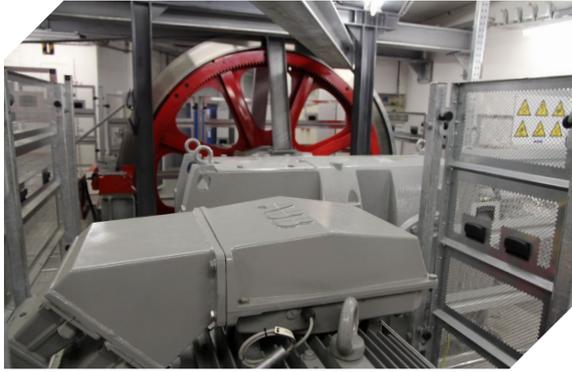
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**Energy storage systems are not only economically interesting for rail operators, but they also have a grid stabilising effect.**



**Harald Hepp**, Division Manager Traction, ABB Switzerland

### Solution

When it comes to improving the energy efficiency of rail transport, some of the biggest potential lies in recuperating the energy from braking. Capture and convert that energy and it can be fed back into the grid or stored in an energy storage system on board, where it can then be used to reduce peak power demand.



The ABB electric motor sets the seven-tonne pulley in motion

This 'peak shaving' means electrical infrastructure can be dimensioned for smaller loads, saving costs and materials, explains Harald Hepp, Division Manager Traction, ABB Switzerland. On board energy storage also allows electric trains to bridge areas where there are no overhead lines, reducing the need to build new infrastructure. In short, energy storage systems are not only economically interesting for rail operators, but they also have a grid stabilising effect, he points out.

The benefits are applicable as much for high-speed trains as for the smallest mountain railways, of which Switzerland has more than a few. For the Biel-Magglingen funicular mountain railway, ABB partnered with Frey AG Stans, Doppelmayr-Garaventa Group, and the Lucerne University of Applied Sciences and Arts to deliver an energy management system that recuperates the braking energy. The result: a 30% drop in electricity drawn from the grid, lower peak demand, and the European Solar Prize last year in the mobility category for its 'world first' energy system.

How does it work? While the individual technologies involved may not be all that new, it is the innovative and smart combination of them that makes the Magglingen energy management system unique, Mr Hepp says.

The train cars are powered as much as possible by solar panels on top of the mountain station and energy

recovered by regenerative braking, reducing the need to buy more 'expensive' electricity from the grid. The braking energy is stored in batteries, an uninterrupted power supply unit ensures the emergency operation of the rail cars, and a specialised energy management system regulates and optimises the energy flow around-the-clock. An additional plus point: back-up diesel generators are no longer needed.

## Policy implications

As this and other projects demonstrate, the technologies needed for emission-free transportation of the future are already available. Now it is a matter of putting them to use, says Mr Hepp. That means, first and foremost increased funding and investment to accelerate the uptake of these technologies. He cites Prokilowatt, a Swiss state development programme to support energy efficiency projects, as one example.

In short, the company (often state-owned or partly state-owned) must either see a clear financial advantage in saving energy through enhanced efficiency with regards to total cost of ownership, or be obligated to weigh the energy efficiency factor more heavily. And this is easier said than done, as projects incorporating energy efficiency measures are usually complex, with several parties involved, from the energy user to the utility, to the project leaders and the technology companies.

## Related Orgalim position papers

- [Energy Efficiency Directive](#)
- [Renewable Energy Directive](#)
- [Energy Taxation Directive](#)
- [Alternative Fuels Infrastructure Directive](#)
- [R&D and innovation](#)

## About ABB Switzerland



ABB is a technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. Headquartered in Zurich, Switzerland, the company's solutions connect engineering know-how and software to optimise how things are manufactured, moved, powered and operated. With a strong local presence, ABB operates in Switzerland through ABB Switzerland, based in Baden.

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