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Future freight locomotives in Shift2Rail – development of full electric last mile propulsion system

According to most studies on the topic hybrid propulsion systems are of high relevance as they increase operational flexibility and reduce the operational costs.

Locomotives equipped with such systems enable operators to run on partly electrified lines without having the need to change locomotive at the transition point. Present mainline electric locomotives with last mile feature propulsion system usually rely on small diesel engines with about 200-300 kW power output.

Full electric last mile propulsion systems, based on Li-Ion batteries, with up to 500 kWh energy and power in the range of 1 MW, will bring the innovation to a next level. Operators will be able to run trains on short non-electrified lines and restricted areas, with zero exhaust gas and low noise emissions. Furthermore, recuperation of braking energy will lead to increased system efficiency.

The research addresses the challenges of the integration of such batteries by focusing on system design and homologation. It also highlights the advantages of full electric propulsion over systems relying on diesel engines and provides simulation results of load profiles of various trains, introducing advanced mission management concepts and charging schemes.

The consequence is an increase in competitiveness which is a target vision of the Shift2Rail pillar “Technologies for attractive and sustainable European Freight” (IP5).

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