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# **ANALYSIS OF BENEFITS AND DRAWBACKS OF USING HYBRID DRIVE SPECIAL PURPOSE VEHICLES**

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# Comparison of selected drive systems for rail vehicles

## SWOT analysis of a rail vehicle hybrid drive

	Positive	Negative
Internal	<ul style="list-style-type: none"> <li>• Longer combined range</li> <li>• Lower travel cost</li> <li>• Better environmental indicators</li> <li>• Drive system redundancy</li> <li>• More economically viable</li> </ul>	<ul style="list-style-type: none"> <li>• Higher purchase cost</li> <li>• Greater weight due to batteries</li> <li>• More complexity</li> <li>• More difficult and costly maintenance</li> </ul>
External	<ul style="list-style-type: none"> <li>• High access to overhead power infrastructure</li> <li>• Reduced environmental impact compared to conventional vehicles</li> <li>• Less harmful when operated in urban areas and agglomerations</li> <li>• Less difficult to manage than hydrogen drive</li> <li>• Isn't fully reliant on fossil fuel imports</li> </ul>	<ul style="list-style-type: none"> <li>• Requires more skilled maintenance crew</li> <li>• Electric Energy drawn from the grid is not usually green</li> <li>• Battery size and charge limitations</li> </ul>

Future changes in costs of electric energy and diesel fuel and hydrogen are likely to change the overall analysis results, however, hybrid vehicles seem to perform better than conventional vehicles in almost all analyzed scenarios.

# Comparison of selected drive systems for rail vehicles

## Combustion engine

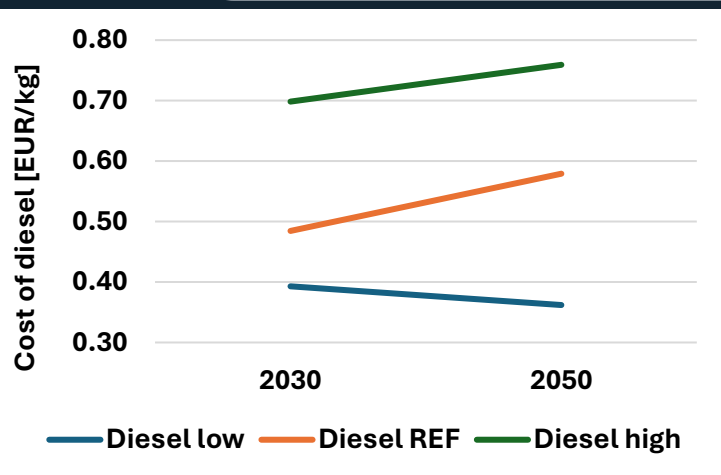
Diesel fuel consumption:  
**0,25 kg/km**  
Cost per km:  
**0,41 EUR/km**  
Range: **>1000km**

## Hybrid drive

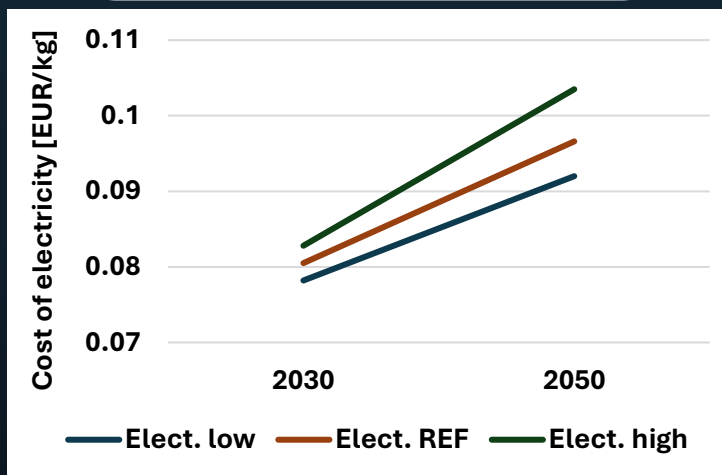
Fuel/energy consumption:  
**0,25 kg/km**  
**1,1 kWh/km**  
Avg. cost per km:  
**0,27 EUR/km**  
Range: **>2000km**

## Hydrogen fuel cells

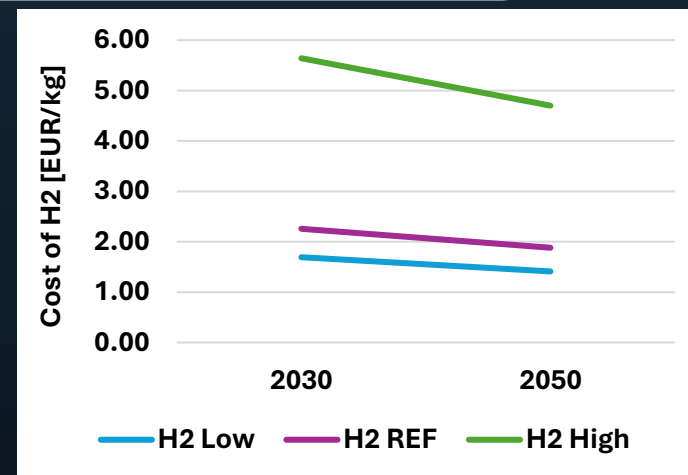
Hydrogen fuel  
consumption: **0,07 kg/km**  
Cost per km:  
**1,1 EUR/km**  
Range: **~1000km**



[2050 Heat Roadmap of Europe – EU28 fuel prices for 2015, 2030 and 2050]



[G. Wiśniewski, A. Curkowski, B. Pejas The scenario of average costs of electricity up to 2050 in Poland and forecast of electricity prices in tariffs for selected groups of consumers up to 2030]



[DNV - HYDROGEN FORECAST TO 2050 - Energy Transition Outlook 2022]

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