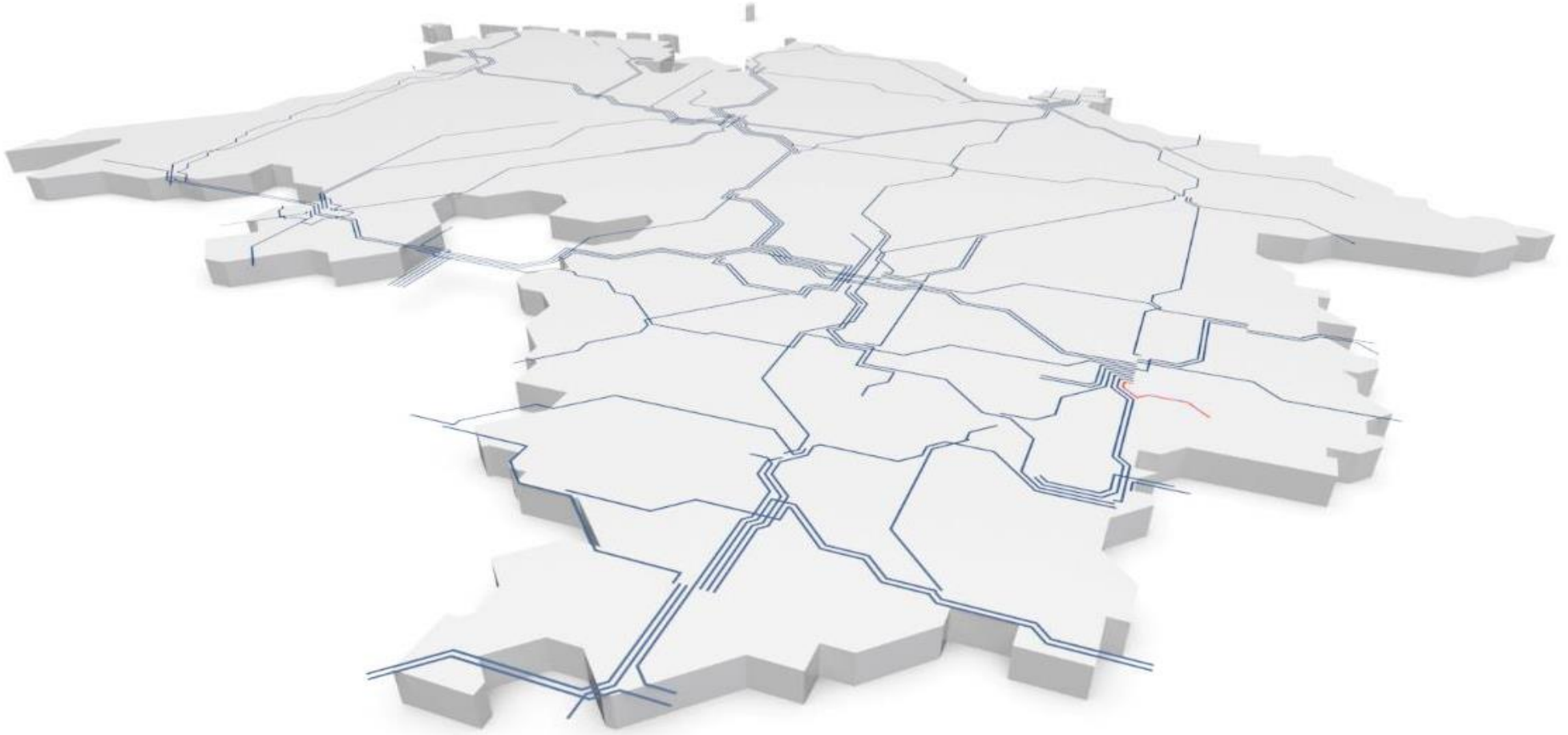

A target costing based approach for a regional line in Germany for Automated train preparation and operation

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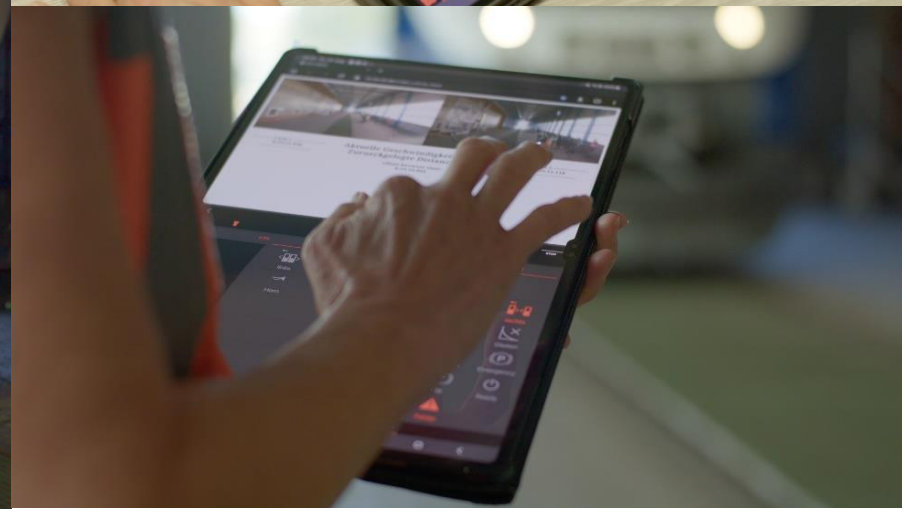
Evaluating the cost-efficient implementation of new technology

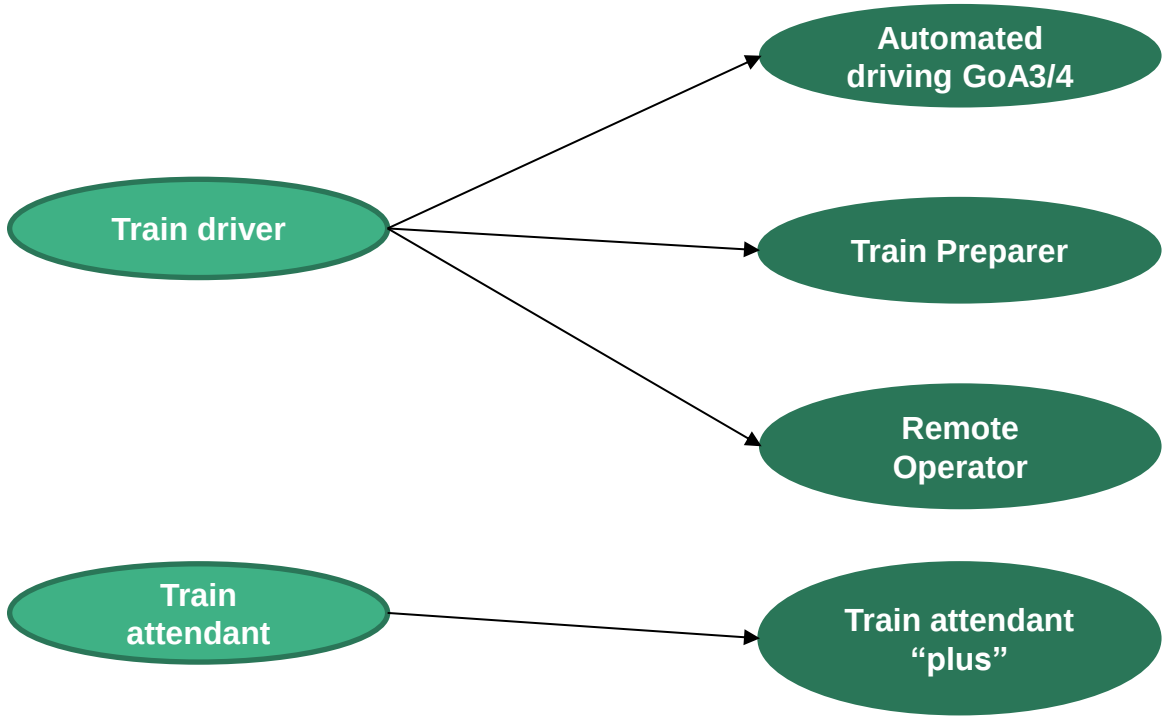


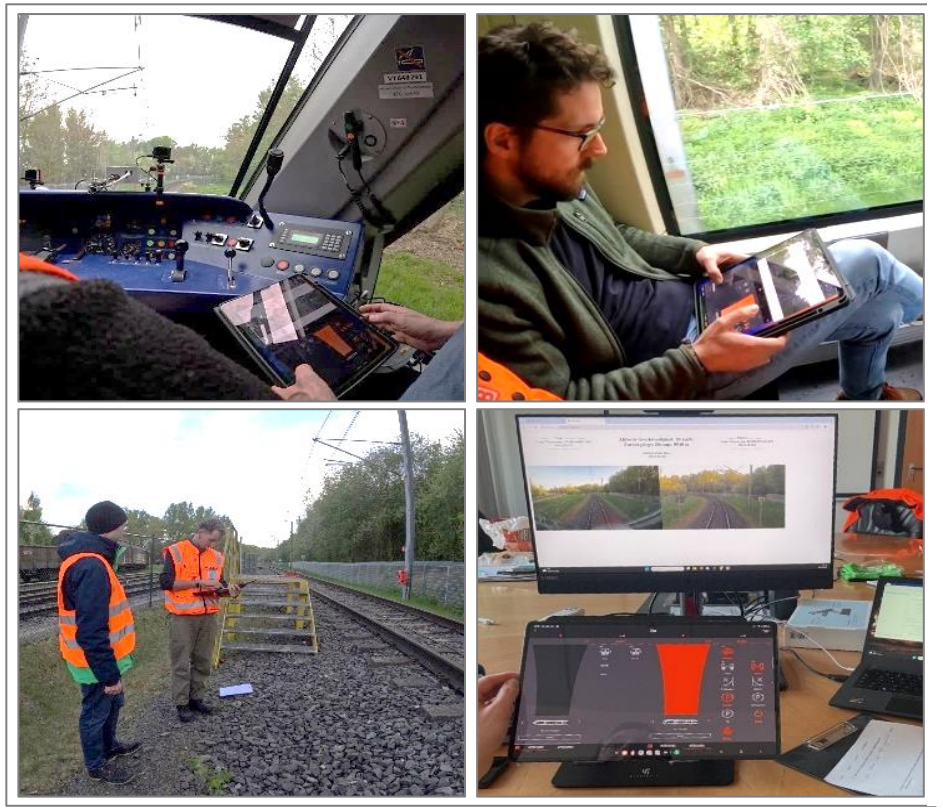
Quelle: Alstom

Rail workers‘ roles and tasks in ARTE‘s automated train operation

NOW: Human driver with technical support

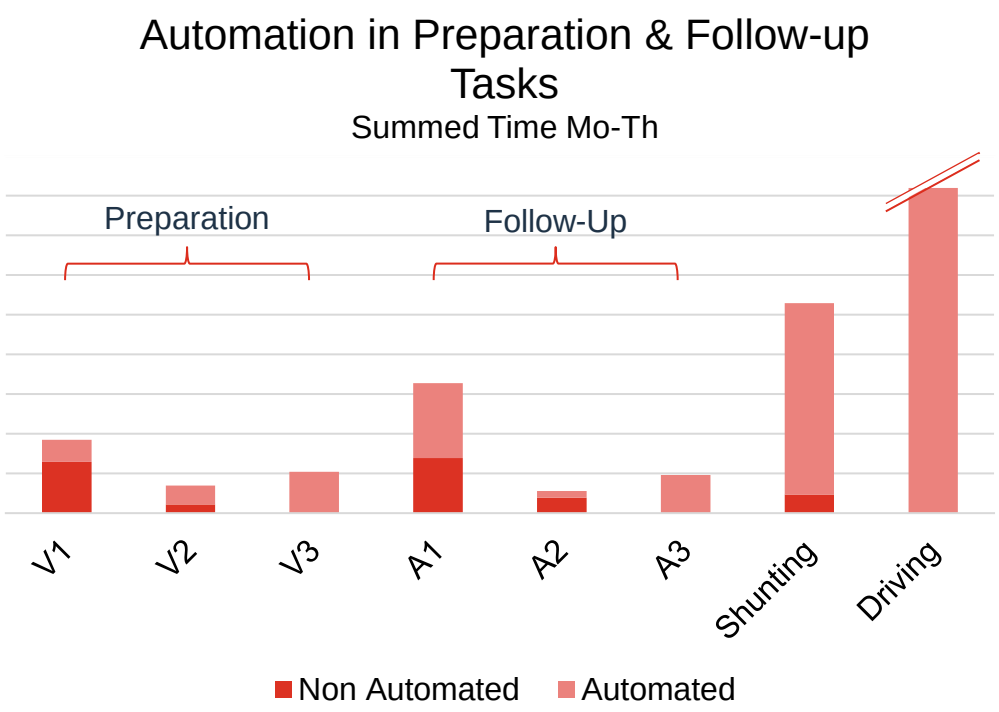
ARTE: Automated driving under human supervision, remote controlled driving





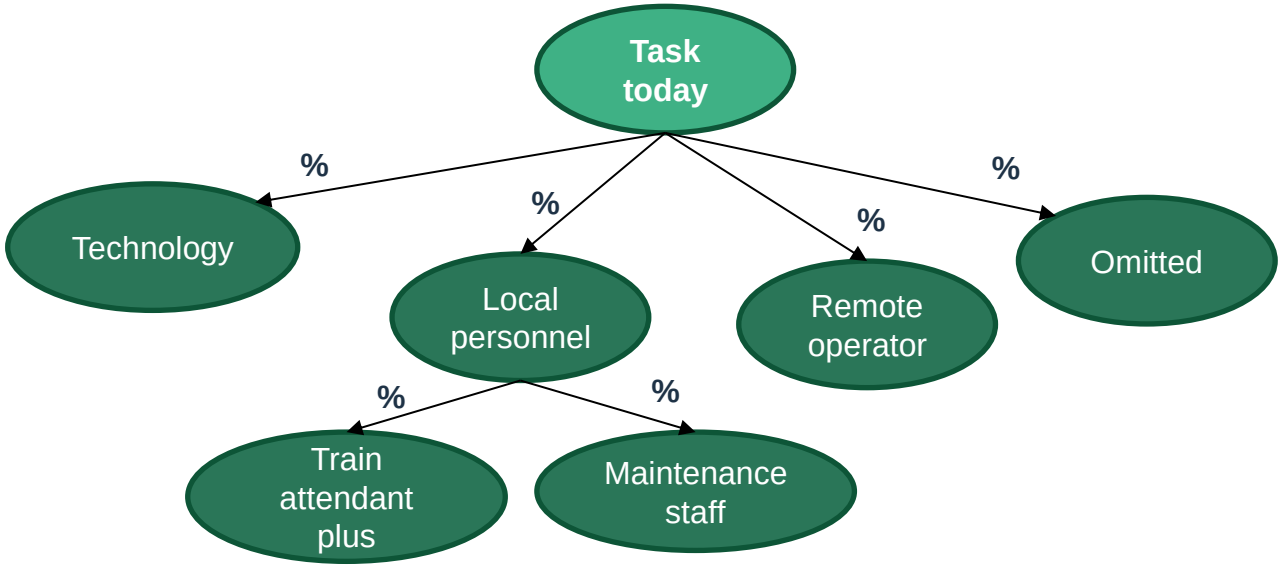
[1] Naumann, Anja und Adam, Justin (2025) *Human Factors evaluation of a tablet based train remote control.* HFES Europe Chapter Annual Meeting, 2025-04-09 - 2025-04-11, Bologna.

Which tasks can be replaced by automatization technology and to what extend?



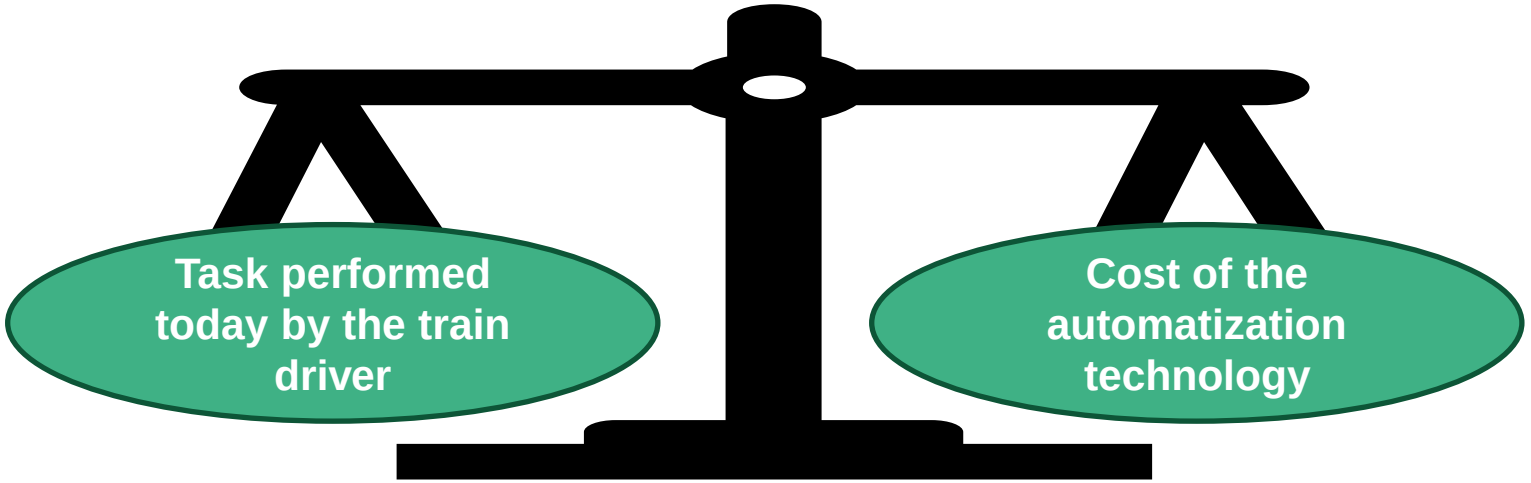
- Remote operation in case of malfunction

- Automatization possibilities analysed for Preparation, driving and follow-up tasks
- Baseline: existing staff plans analysed for time of each task
  - Regional train line in Lower Saxony
  - Mo-Th regular operation



Methodology - Target cost based approach

- How high can the automatization technology cost be to ensure that the business case is at least on the same level as the status quo?

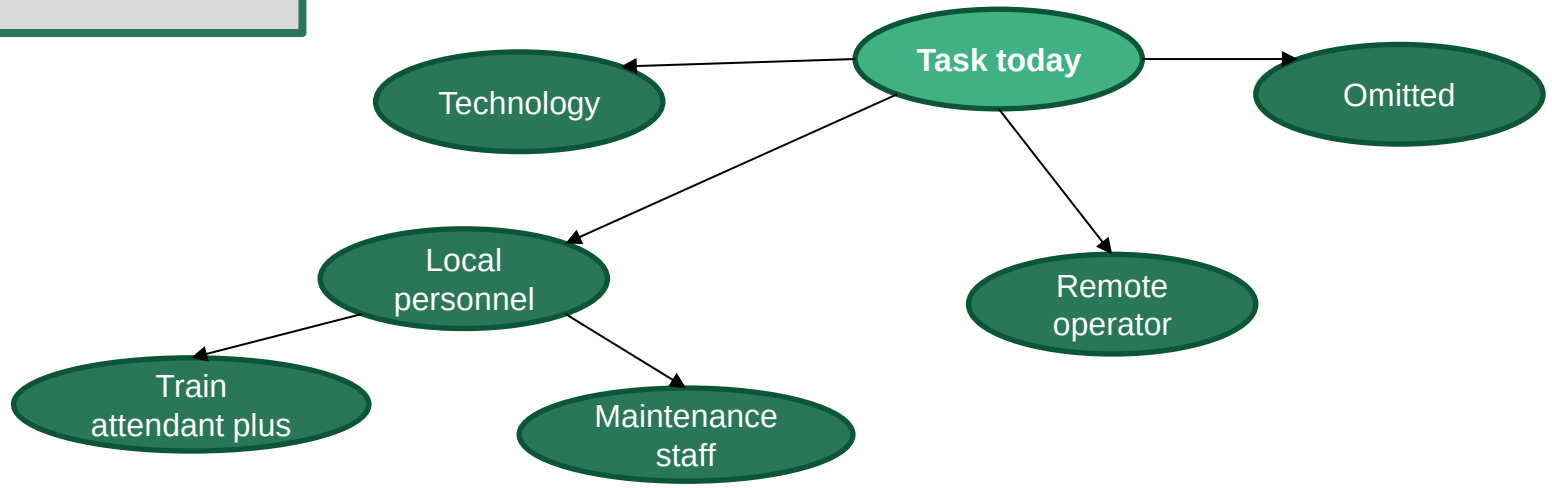


Aim: Target costs (range) for a specific application scenario

How high can the automatization technology cost be to ensure that the business case is at least on the same level as the status quo?

Aim: Target costs (range) for a specific application scenario

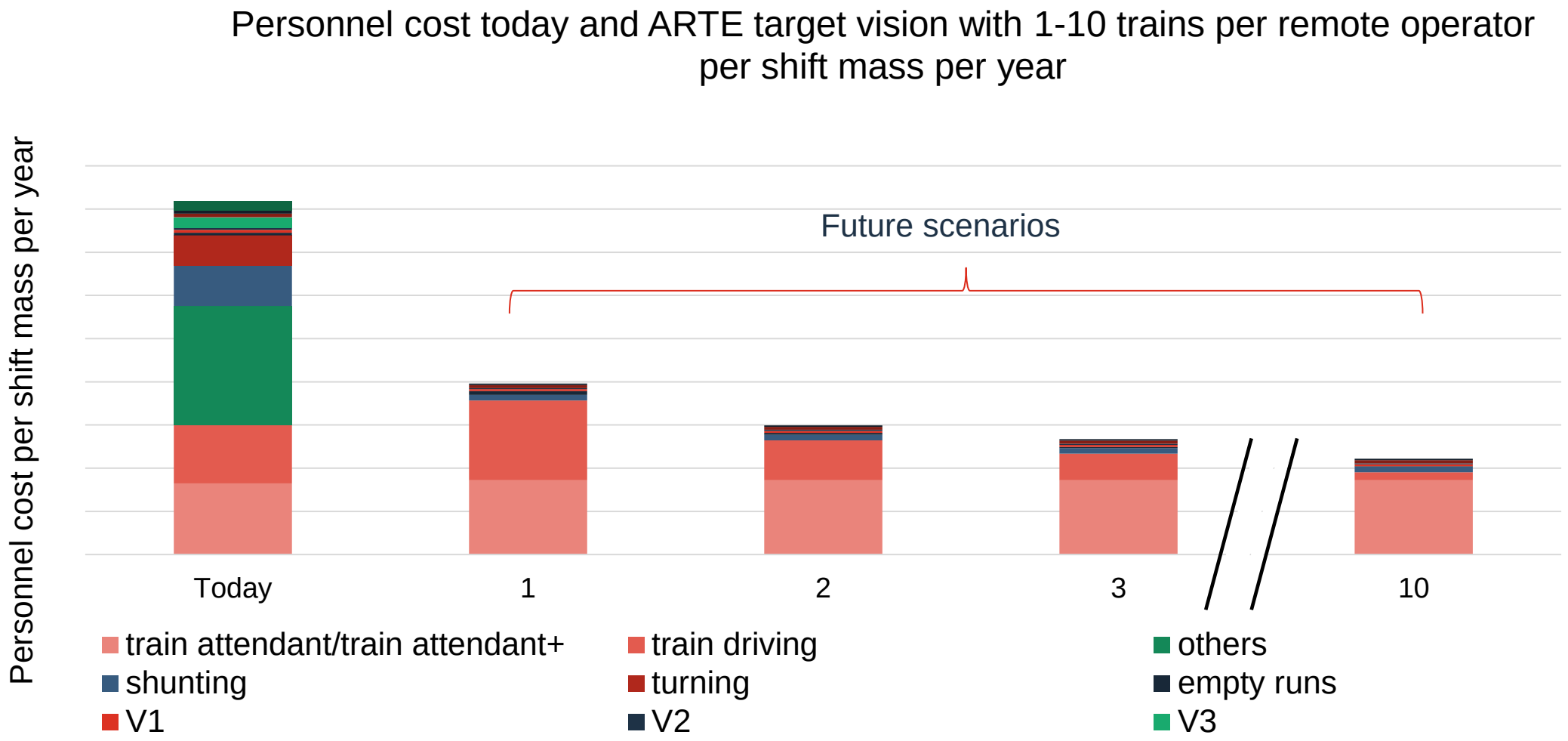
1. Relocation of activities of the train driver from today to the ARTE target vision



2. Determination of personnel costs according to actual collective agreements and values of the 2030 Federal Transport Plan of Germany.

		EVG pay scale group	Personnel cost EUR/h	
			Including working schedule efficiency	Excluding working schedule efficiency
today	Train driver	445	64.78	38.87
	Train attendant	509	47.63	33.34
ARTE	Train preparer	209	44.68	31.28
	Train attendant plus	508	49.73	34.81
	Remote operator	303	66.69	53.35

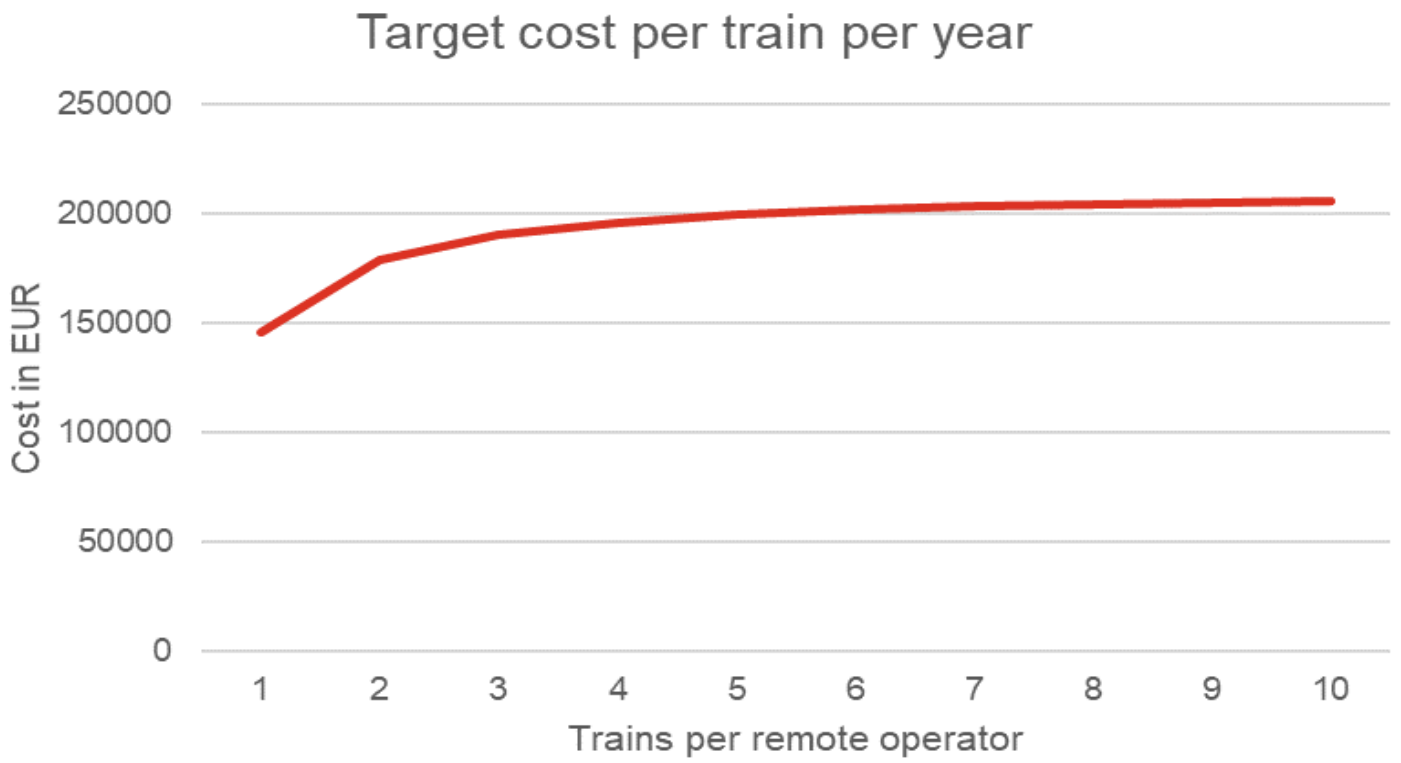
Use Case of a regional line in Germany



Aim: Target costs (range) for a specific application scenario

4. Calculation of target costs as a lower limit for automation per vehicle per year:

Operational programme incl. reserve
- number of trains
- Number of train driver
- Number of train attendants



Result: Target costs (range) for a specific application scenario: 140.000-210.000 EUR per train per year, depending on number of trains supervised by one remote operator

Conclusion and Transferability

- Approach for evaluating the cost-efficient implementation of new technology
- Target costs (range) for a specific application scenario: EUR per train per year, depending on number of trains supervised by one remote operator
- The methodological guidance is designed in such a way that it can be applied to other use cases.
- Support decision-making when assessing the economic viability of automating regional lines
- Attractiveness of the railway as an environmental mode of transport

References

1. Naumann, Anja und Adam, Justin (2025) Human Factors evaluation of a tablet based train remote control. HFES Europe Chapter Annual Meeting, 2025-04-09 - 2025-04-11, Bologna.
2. BMVI. (2016). *Bundesverkehrswegeplan2030*. Retrieved from https://www.bmv.de/SharedDocs/DE/Publikationen/G/bundesverkehrswegeplan-2030-gesamtplan.pdf?__blob=publicationFile
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