Rail Freight Corridor
North Sea – Baltic

Czech Republic
Ministry of Transport

CENTRUM
DOPRAVNÍHO
VÝZKUMU

Cost-benefit analysis for DAC – CZ

model operation scenarios

RAG/TAG Meeting

Date: 6th March 2024
Lukáš Soukup – CZ MoT

Funded by the
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Target: CBA analysis of the operating costs of freight trains in different DAC scenarios

Train types:

- **combined transport train, operating costs for operation on the SŽ network**
- **SWL train with priority consignments with load changes at sidings**

Variants of technology:

- **option 0 - vehicles with UIC coupling**
- **project options DAC2 (+DPC), DAC5 (+DPC) – DPC = Digital Semi-permanent Coupler**

Source of data on operating costs in the variants (notably, data for maintenance of DAC is missing):

- **EDDP**
- **railway undertakings**

Migration scenarios:

- **retrofitting**
- **new vehicles only**

Quantifiable benefits:

- **human resources savings**
- **vehicle weight savings (new vehicles only)**
- **increase in train length standard with DAC5 and EPB (only block trains)**

Efficient design option (EIRR > 5%) only in case of block train with DAC5 + DPC.

Sources of information:

- ✓ **Studies of EDDP, ERJU, and BAV Switzerland**
- ✓ **Continuous communication with RUs**

Expected time frame for CBA:

- **2030 - 2059**

Information on DAC is not always complete and verified/validated (e.g. missing maintenance plan, DAC price/costs), therefore the results are also only indicative

Input data and expectations of RUs vary widely, so multiple input options were examined.

Methodology

The study consists of a financial and economic analysis

Scenarios:

- 1: block trains in combined transport
- 2: trains with priority consignments system (load changes expected outside the marshalling yards)

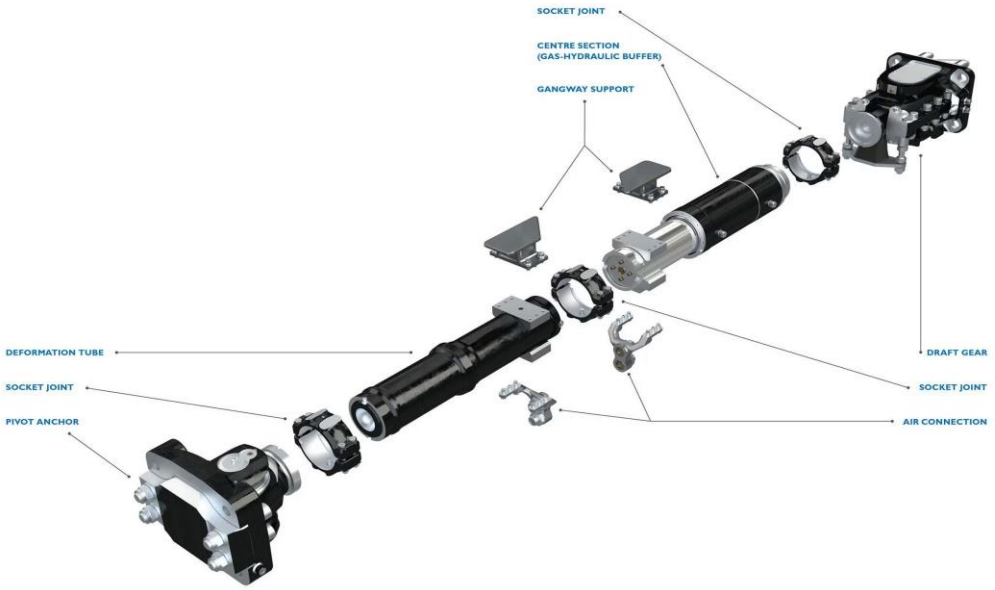
Migration strategy:

- new rolling stock acquisition
- retrofitting

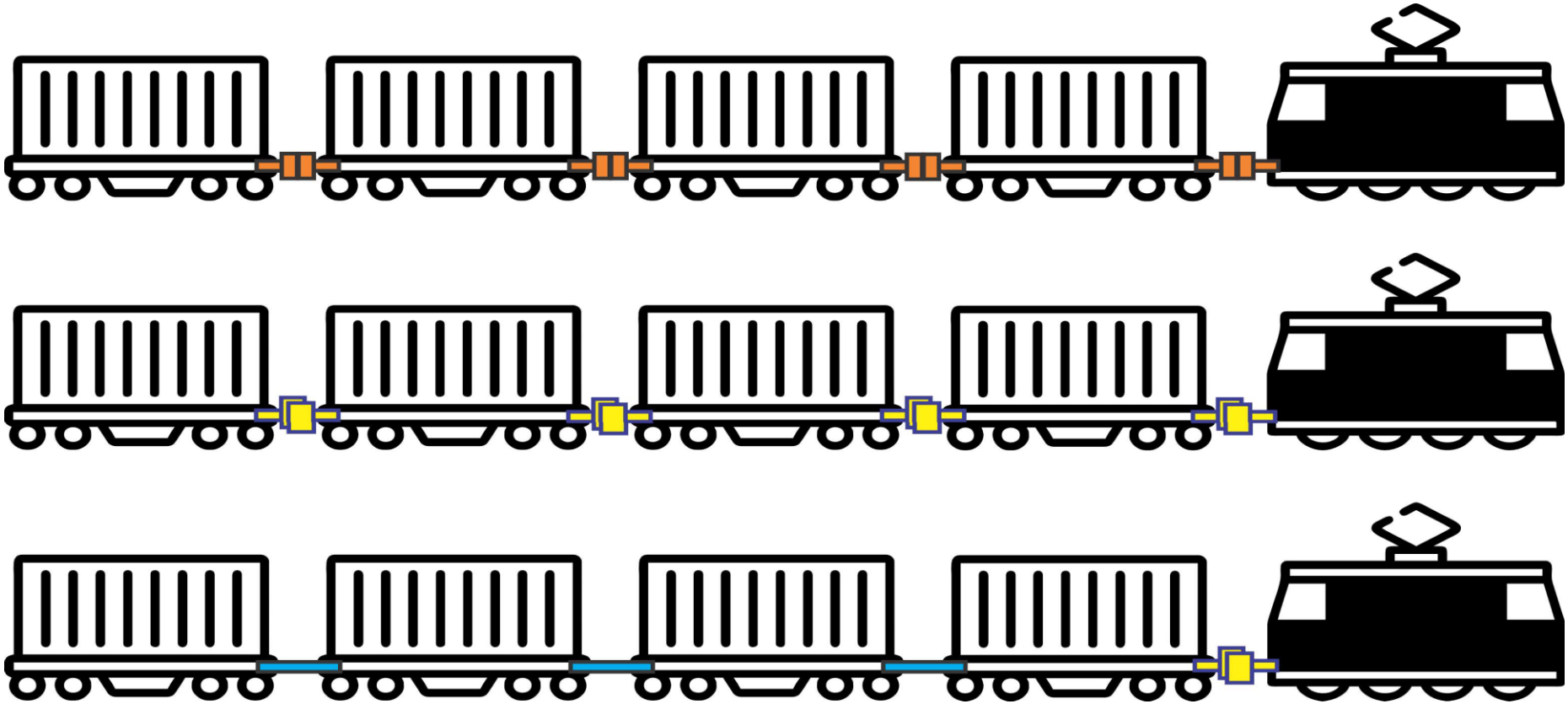
Subsidies

- without subsidies
- 50 % of the purchase price of the coupling

- Options: UIC coupler (traditional), AC2 and DAC5
- Additionally for block trains: option D (8 pcs AC2 + 48 pcs DPC):
  - Savings in investment and maintenance costs
  - DPC = Digital Semi-permanent Coupler)

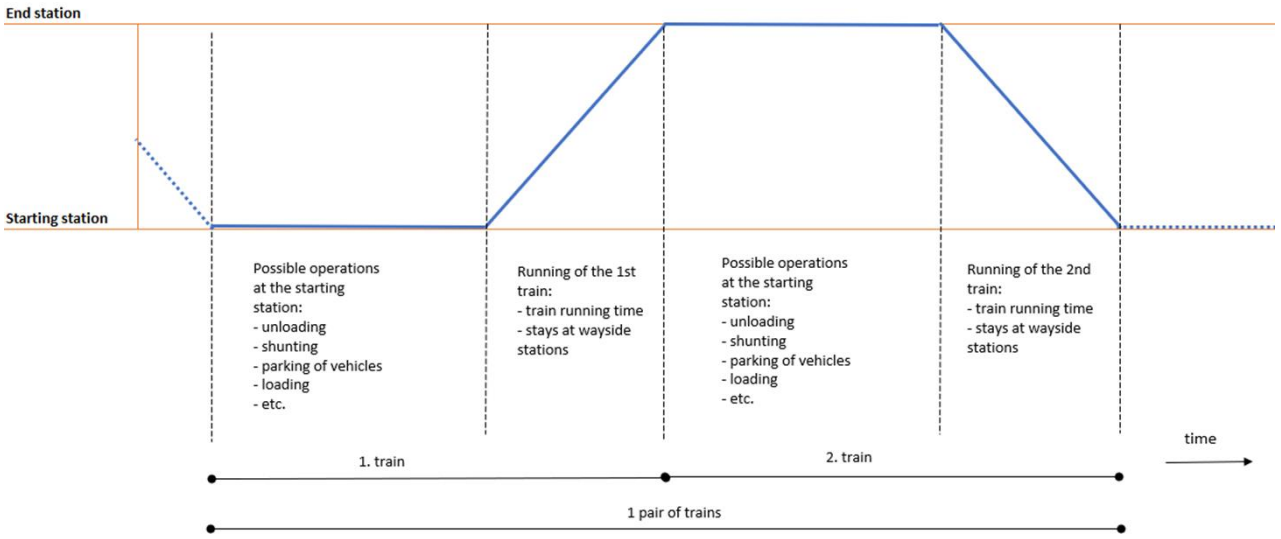


Scenario 1: Block trains



Financial analysis

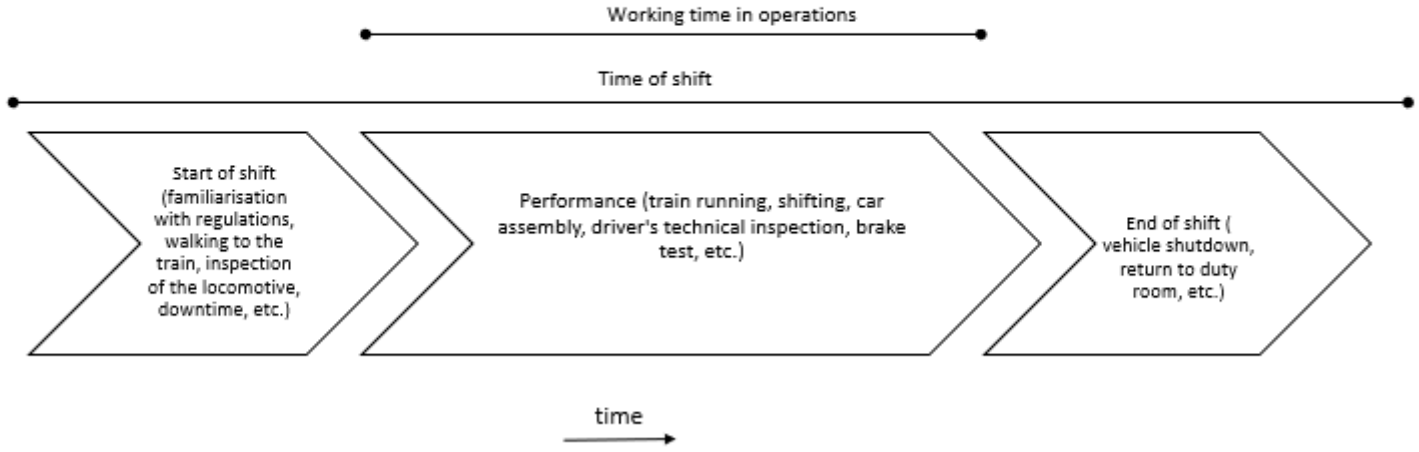
- Development of an interactive train cost model from an RU's perspective (CZK/train-km, CZK/net-tkm)
- Applies to the circulation of 1 train pair (including pre- and post-train run operations)
- Price level in 2023



- **Cost categories used:**
  - Energy consumption
  - Salary of a locomotive driver
  - Track access charges
  - Maintenance
  - Overhead costs
  - Rolling stock and DAC acquisition
  - DAC fitting
  - Intermediate stops
  - Departure, arrival of train (salaries, cost linked to shunting locomotives)

Human resources costs

- **Productivity of personnel**



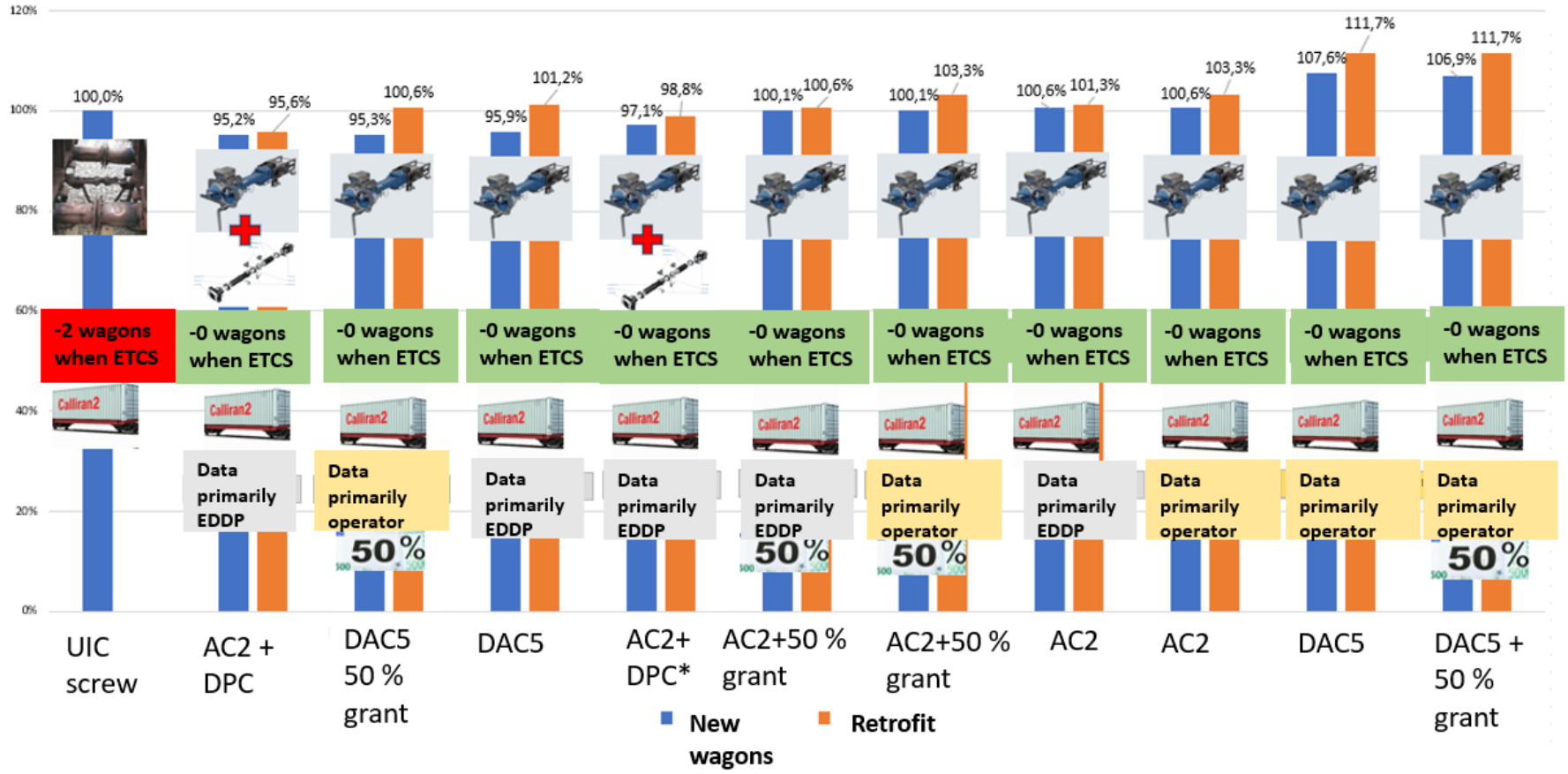
Benefits: Interactive cost model of RU (%CZK/nettkm):

- Weight reduction of 0.5 tons for all wagons (new wagons with DAC) - 0,1 to 0,3 %
- Cost savings on operational staff (current CZ labor market)
  - Block trains - 0,5% to 2 %
  - Trains with priority loads (priority stops) - 2 to 4 %
- Faster rolling stock circulation - 0 to 1 %
- Trains are expected to run under ETCS in the period 2030 – 2050
- Block trains :
  - Keeping the existing train lengths even when running under ETCS - 3 to 5 %
  - Long trains shorter by 2 wagons while keeping the traditional coupling of wagons, (consultation with SŽ and AŽD)

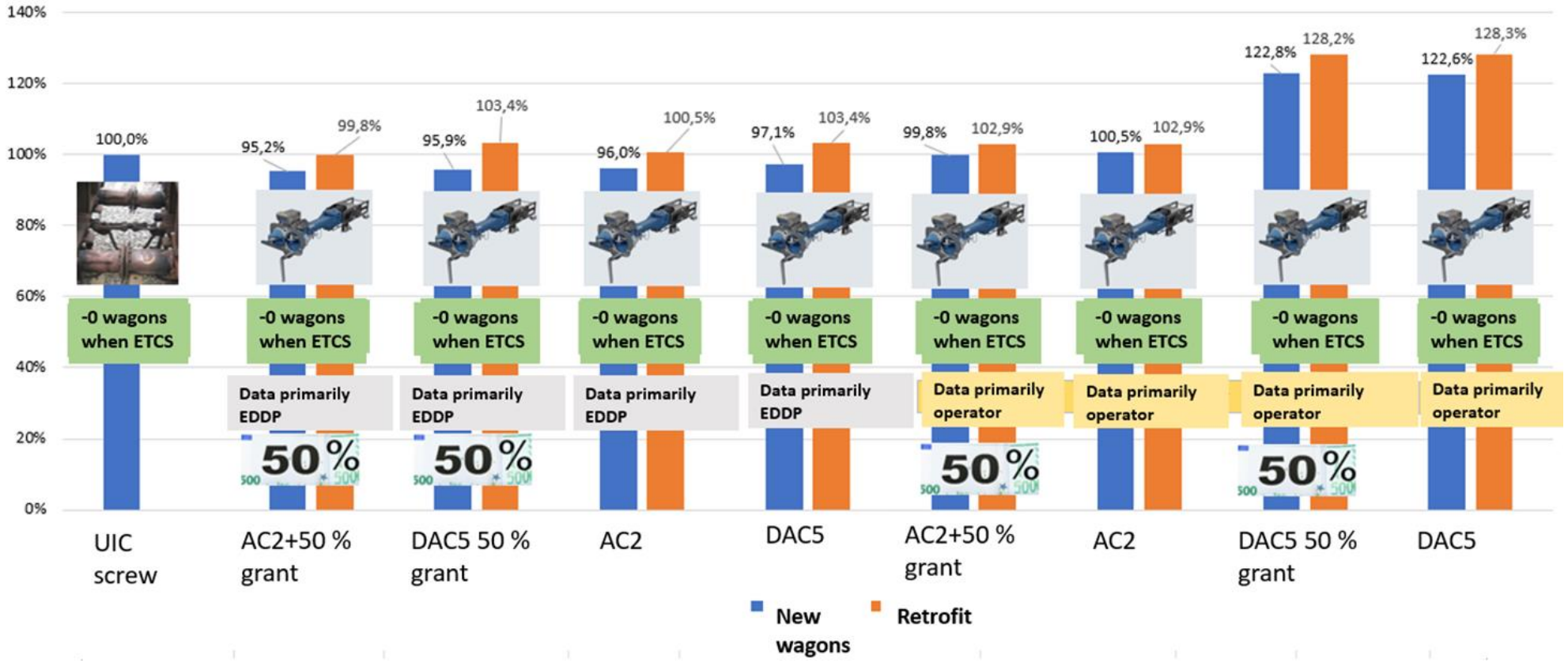
Costs: Interactive cost model of RU (%CZK/nettkm):

- Purchase price (new wagons and locomotives for 30 years)
  - DAC2 (according to BAV - Switzerland) + 1,5 to 2,5 %
  - DAC5 (according to BAV - Switzerland) + 2 to 2,5 %
  - DPC + 0,3 % (estimation)
- Additional maintenance costs:
  - ERJU: € 300 per year and wagon + 1 %
  - Railway undertakings: + 10 to 20 %
  - Negative impact on availability, costly staff for DAC5
- Pre-installation price (for 30 years)
  - DAC5 + 3 and more %
  - DAC2 + 2 and more %
  - DPC + 0,5 and more % (estimation)
- Weight increase of 0.5 ton per wagon
  - retrofit + 0,1 to 0,3 %

Financial analysis: Scenario 1 – Block train [costs per netto tkm]



Financial analysis: Scenario 2 – Domestic train with on-track handling (outside marshalling yard) [costs per netto tkm]

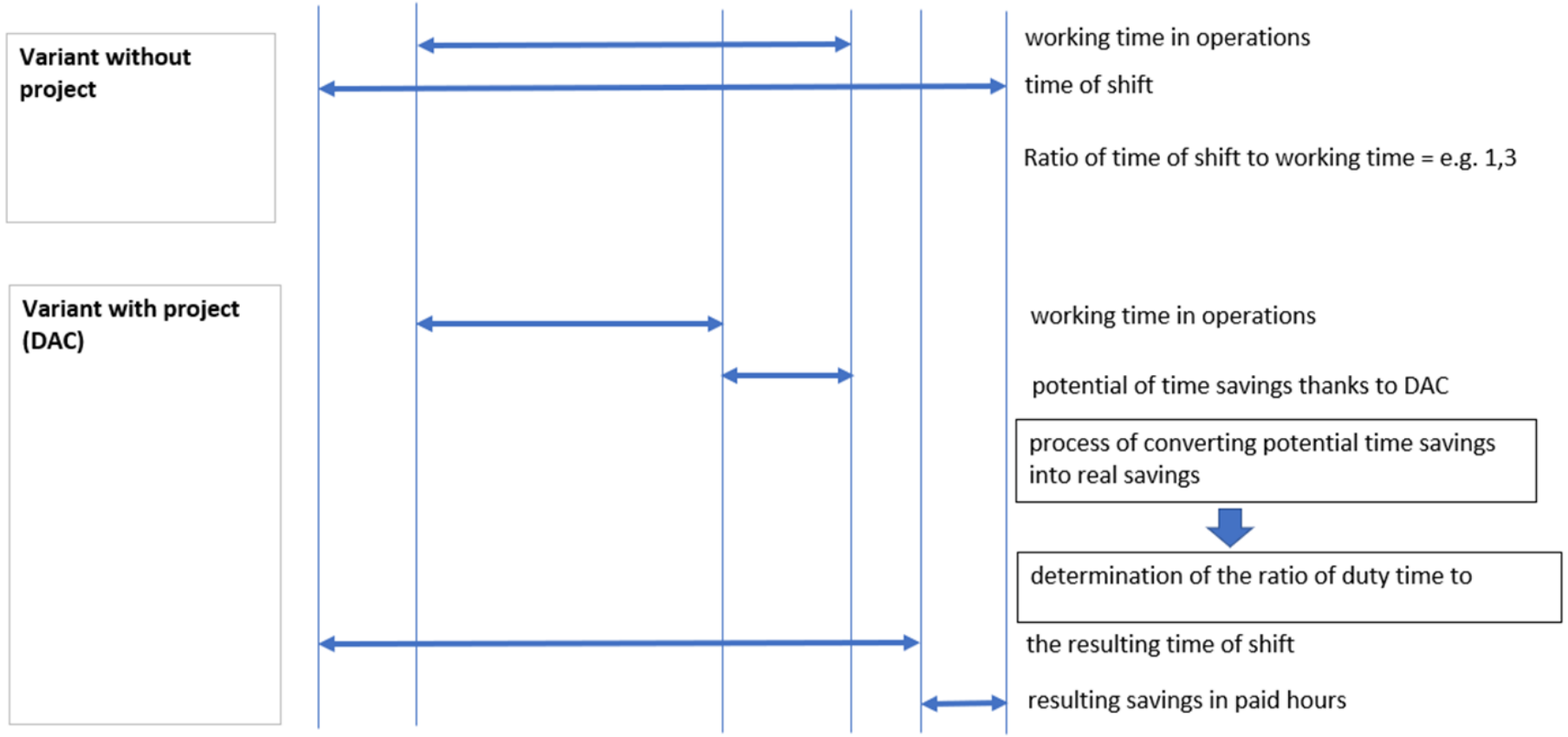


Economical analysis

- **Estimated economical benefits:**
  - **Transport modal shift and its externalities**
  - **Increase in safety during shunting operations**

- **The only option, which achieved an internal rate of return greater than 5%:**
  - **DAC and DPC on block trains (additional verification is desirable)**

Example: Rail shunter (Euro/hour)



Final Conclusions

- finding sufficient benefits from the DAC will be very difficult – there is no conclusive proof of financial and economic efficiency
- it is difficult to estimate the investment and operating costs (CZ stakeholders are not willing to accept EDDP figures)
- the best results show the variant with new vehicles, maximum automation and a long intermodal train (DAC+DPC)
- the variants with single wagonloads have potential, nevertheless the results depend on the operating technology and the possibility of saving number of staff and real labour costs
- the results of the study are available for use in the next step of finalizing the CBA prepared for EC and ERJU by EY, if a similar study is prepared by some other member states