



# Innovative traction energy accounting at MAV

Budapest, 18th October, 2017



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2 910 km

Electrified railway line  
40% of the total network length

1 300 pcs

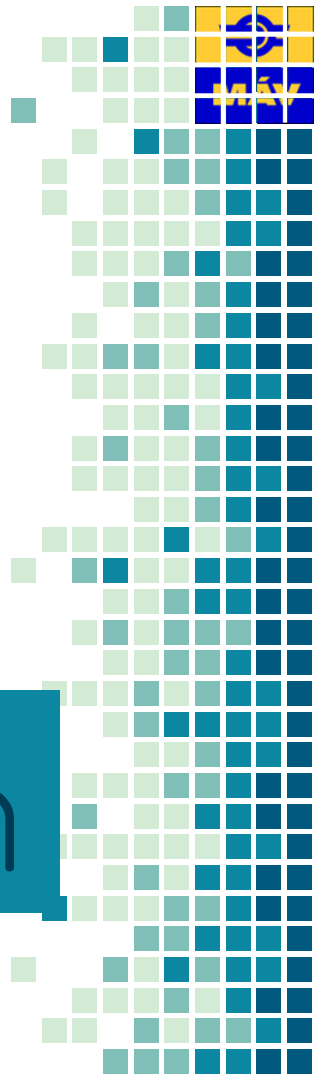
Electric locomotive  
45 RUs operate in 2017

Energy data...



849 GWh

Energy consumption  
Value: 70 million EUR/year



# Energy accounting possibilities

## Estimation

Locomotive type parameter (L)  
Train type (T)  
Grosstonnekm (G)  
Seasonal Coefficient values (C)

$$E_{\text{energy}} = G * C (L, T)$$

Y2006 –

## Measuring

### *Received data*

Only for locos with  
foreign meters

Based on the other  
IM's data service

No-Bo certificate  
must be given

Y2016 –

### *Own data*

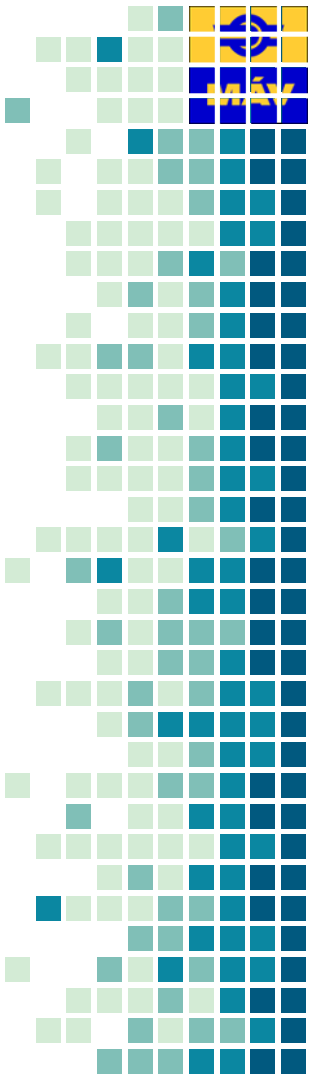
For all locos with  
national meters

Based on the MÁV's  
data collection

No-Bo certificate  
must be given

Y2019 –





# What necessary?



## RUs

„Would like” to measure!

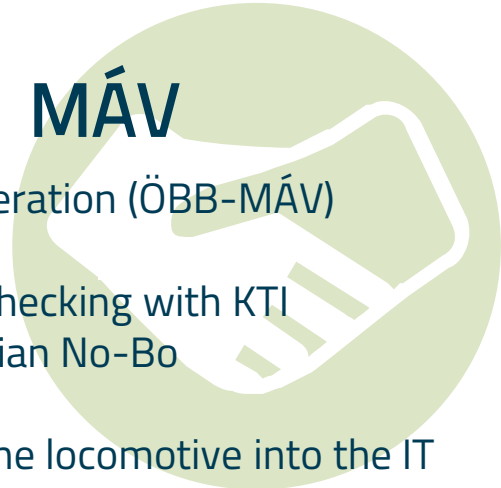
No-Bo certificate about its measuring system

and...

Sit tight and relax 😊



## MÁV



IM-IM cooperation (ÖBB-MÁV)

Certificate checking with KTI as a Hungarian No-Bo

Setting up the locomotive into the IT system

Accounting process based on measured data



# Lead time months

# 2



# Registering the Energy

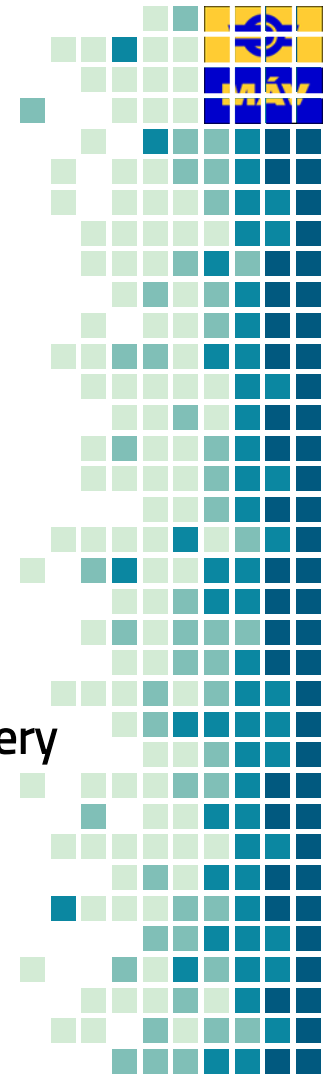


## Integrated MEasuring System

**Collect** the train run **data**

**Calculate** the energy **consumption** for every **train** which runs with electric engine

If measured data exists, **overwrite** the calculated values with it.



# Theoretical calculations

Engine type: Taurus (1116) , total weight (with loco): 2000t



Ferencváros

Tatabánya

Győr

Hegyesalom

178,2 km



Gross tone-km

(gtkm)

356,400

Coefficient value

(kWh/100gtkm)

1.46

Calculated energy

(kWh)

5,203 kWh

Starting kWh

1235645

Ending kWh

1240498

Measured energy

(kWh)

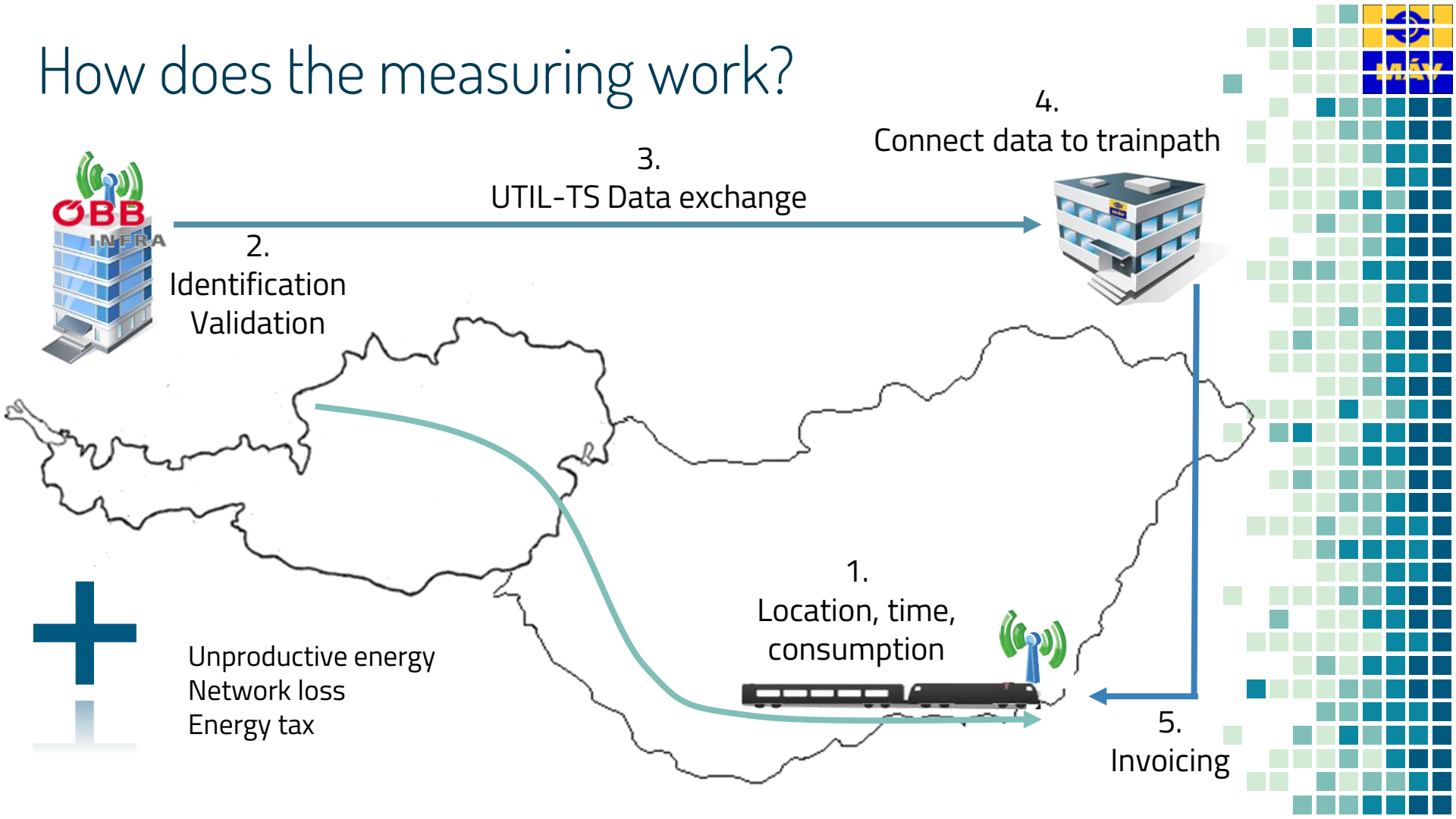
4,853 kWh

# 350 kWh

Savings, in 1 train path



# How does the measuring work?



# Type of the Energy

We identify 3 main types of measured consumption

● Assign to trainpath

● Assign to shunting service

● Unproductive

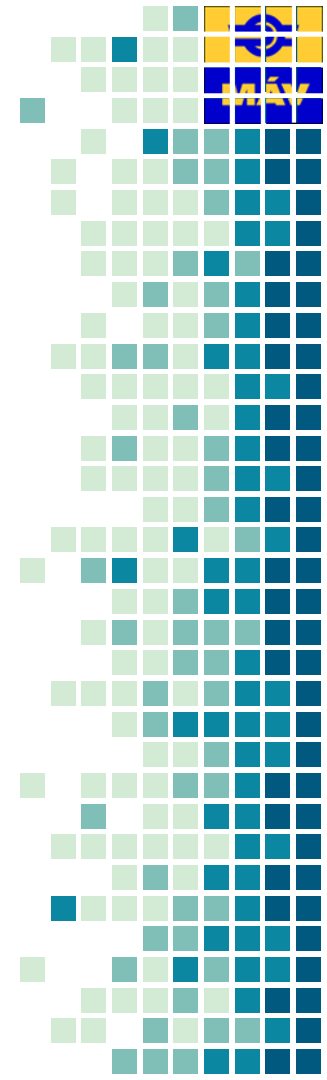
83%

9%

8%



Dividing it among the RUs, using the locomotive in actual time period





# Measuring 2.0 - from 2019



# Statistics of measuring - 2016

12

Railway Undertakings

**Rail Cargo Hungaria**  
Member of OBB

**LTE**  
logistics & transport



**MÁV-START**

**AWT**

RTS RAIL TRANSPORT SERVICE GMBH

**RTT**

**FLOYD**

**MVA**  
Magyar Vasúti Áruszállító Kft.

**GYSEVCARGO**

**GYSEV**  
Raaberbahn



**boxXpress.de**

45 pcs

Locomotives



46 GWh

Measured energy



6%

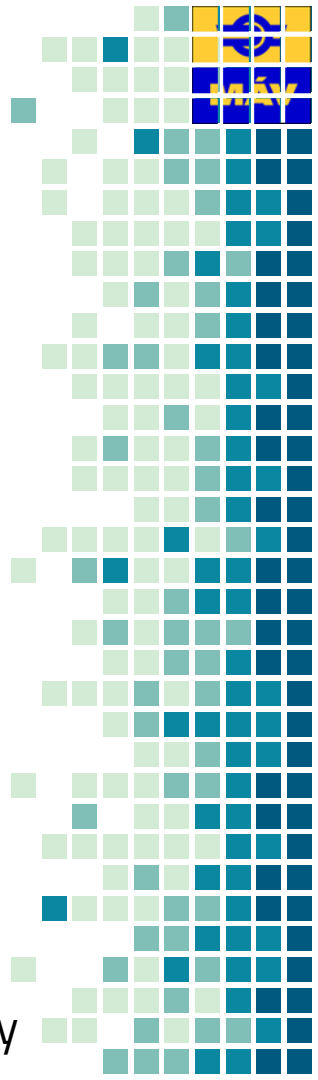
total consumption

10%

regenerated energy

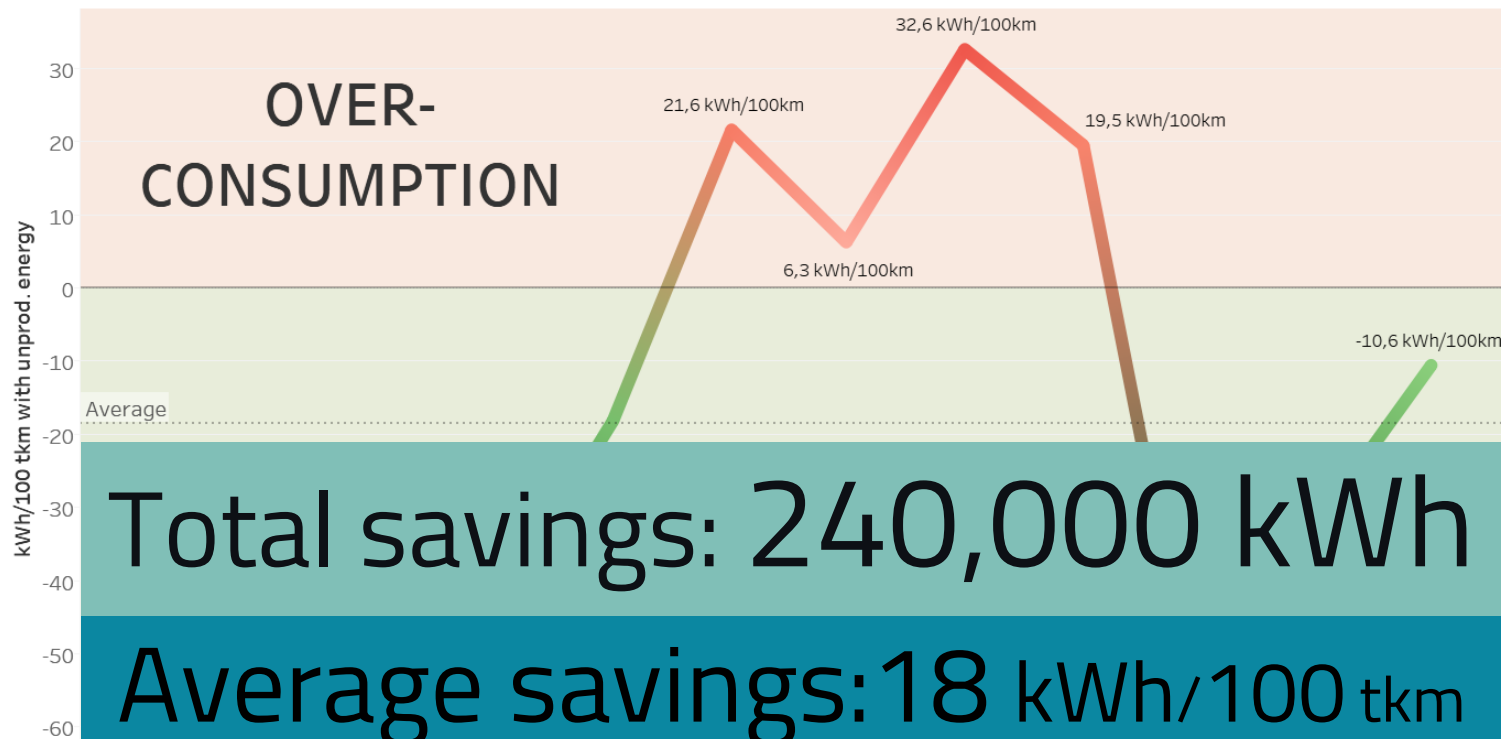
8%

unproductive energy



# Data analysis - 2016

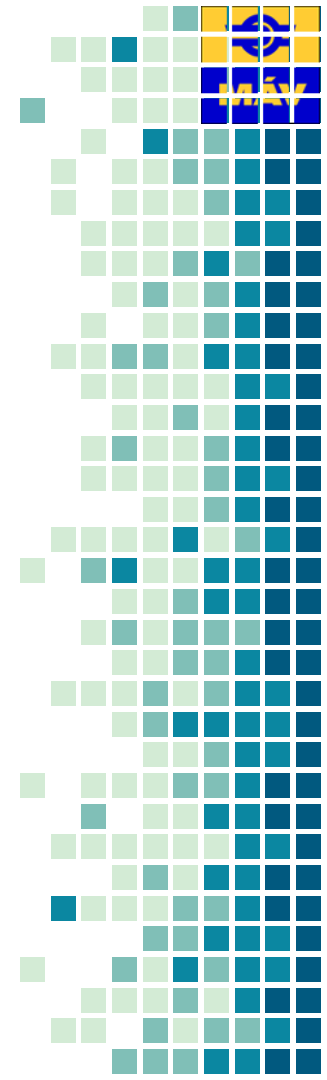
Monthly balance between two accounting methods



**Total savings: 240,000 kWh**

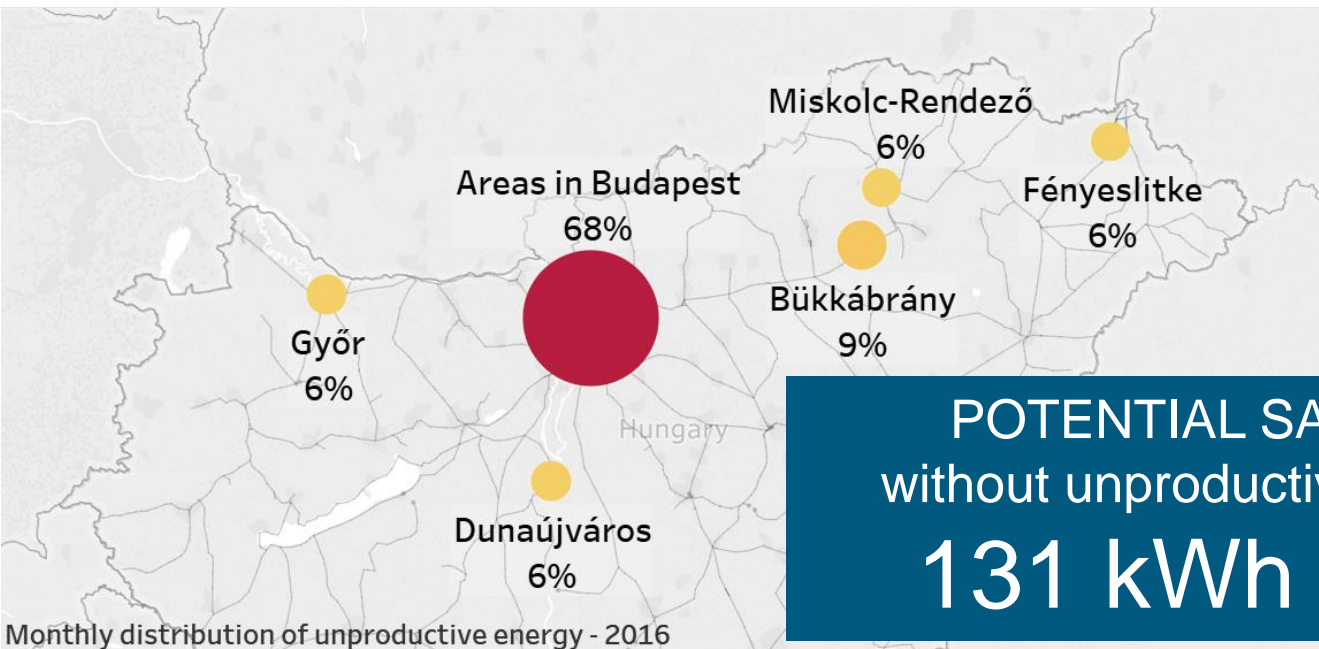
**Average savings: 18 kWh/100 tkm**

**1.2 € / 100 train-kilometre**



# Unproductive energy analysis - 2016

The unproductive energy consumed of TOP stations in Hungary - 2016

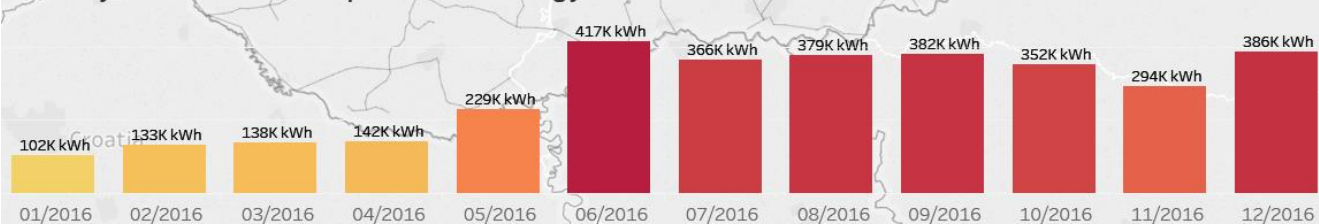


means:  
3.5  
million  
kwh

POTENTIAL SAVINGS  
without unproductive energy:

131 kWh /100 tkm

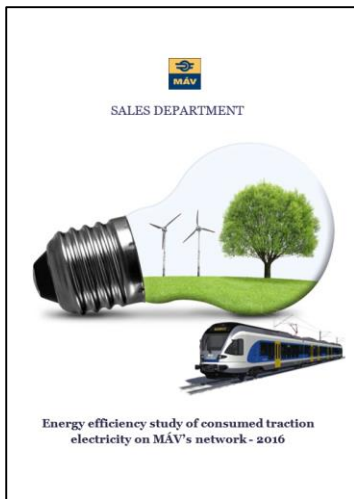
Monthly distribution of unproductive energy - 2016



of total  
consumed



# Data sharing – Energy study and certificate – 2016



Energy Efficiency Certificate  
on electric traction performance at MÁV's network  
- 2016 -

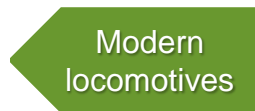
Consumption	All RUs	One of the RUs	
Consumed traction energy	808 843 781 kWh	9 816 753 kWh	
Rate of RU's consumed		1,22%	A
Rate of the modern locomotives	36,08%	48,24%	A+
Rate of the measured energy	5,38%	2,89%	B
Rate of the unproductive energy	6,75%	8,73%	A+
Rate of the green energy	9,24%	13,29%	A+

According to above-mentioned data we inform you, that classified your company  
**Better than average (A+)**  
category on energy efficiency.

Krisztián Urvald  
head of performance  
accounting

Péter Rónai Ph.D.  
head of sales department

**A++** Much better than average   **A+** Better than average   **A** Average   **B** Lower than average   **C** Much lower than average



Most RUs



# Goals for the future



**Developing**  
the energy  
accounting system



Until 2019



**Extension**  
the measurement  
based accounting



For all  
RUs



**Deep analysing**  
with detailed data and  
self service BI tool



Used external  
factor information:  
- Speed limit  
- Traffic control  
- Weather and terrain  
conditions



**Sharing**  
information  
with RUs



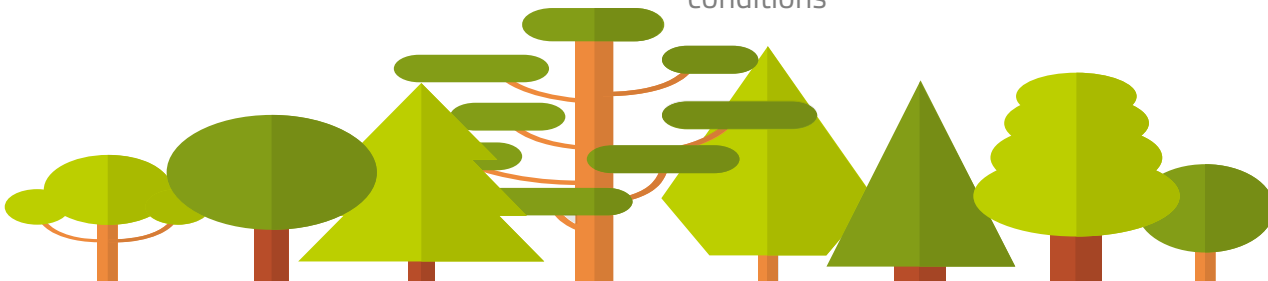
Continuous  
and direct  
information  
from the system



**Encourage**  
to save  
energy



For the energy  
efficient rail  
transport





Thank you for your attention!

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