INTERNATIONAL UNION
OF RAILWAYS

Welcome to the best practice workshop

ECO STABLING

Proposed by
the UIC Energy efficiency and CO_2 Emissions Sector

Organised by the Sector's core members:

Christophe Gueudar Delahaye
Bart Van der Spiegel, Infrabel
Gerald Olde Monnikhof, ProRail
Rob Schopman, NS
Sabine Mooij, NS

Philippe Stefanos, UIC

30 JUNE 2022

INTERNATIONAL UNION OF RAILWAYS

ECO STABLING

- Please rename yourself in the list as [Name Surname, Company]
- The meeting will be recorded.
- Please remain on **mute** while the speaker is active.
- Please keep your **camera off** while the speaker is active.

Workshop timeline

10 h	• Overview of questionnaire answers	**SNCF/UIC**	
	• Energy accounting of parked trains	**Bart Van der Spiegel**	**Infrabel**
	Best practices and challenges		
	• SNCF – Eco Stabling	**Christophe Gueudar Delahaye**	**SNCF**
	• NS – Eco Stabling project	**NS**	
	• NS – Smart Thermostat	**NS**	
	• NS – Energy measurement data	**NS/ProRail**	
12 h	• Tour de table / Discussion	**Participants**	

INTERNATIONAL UNION
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OVERVIEW QUESTIONNAIRE

SNCF/UIC

Survey April-June 2022

Christophe Gueudar Delahaye
Clémence Forgeot d'Arc
SNCF Voyageurs

Philippe Stefanos

14 COMPANIES REPRESENTED

→ 12 RUs
→ 2 IMs

→ 10 PASSENGERS Rus
→ 2 FREIGHT Rus

→ 14 in Europe
→ Japan

- JSC (Lithuanian railway)
- SNCF Voyageurs (French railway)
  - Transilien
  - TER
- ADIF (Spanish railway)
- DB Cargo AG & Fernverkehr AG (German railway)
- CP (Portuguese railway)
- NMBS/SNCB (Belgian railway)
- Infrabel (Belgian railway infrastructure manager)
- NS (Dutch railway)
- ProRail (Dutch railway infrastructure manager)
- Thalys (high-speed train service between France, Belgium, Germany and the Netherlands)
- East Japan Railway Company
- Crossrail Benelux NV (Belgian private provider of rail freight services)
- CFL cargo (international rail freight services in Europe)

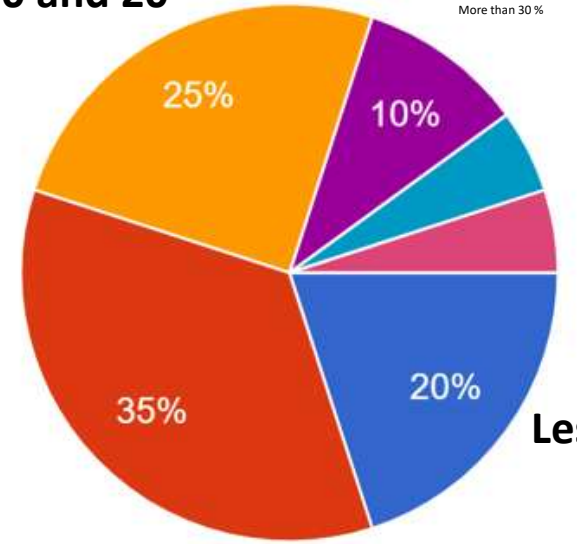
AGENDA

1. ISSUES
2. OBJECTIVES
3. STRATEGIES
4. ORGANISATION
5. INCENTIVISE
6. BEST PRACTICES
7. MAIN OBSTACLES

Some parallels with :
- 2009's survey
- 2016's workshop

ISSUES to reduce parked train's energy consumption

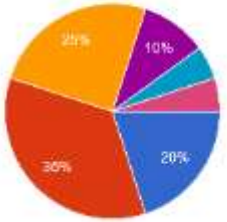
Between 10 and 20 %



Share of parked trains energy consumption over the total year consumption (electric+diesel)

1.1 Without considering empty trips to stabling location, what is the share of parked trains' energy consumption over the total yearly energy consumption (Electric+Diesel)?

20 responses



- Less than 5%
- Between 5% and 10%
- Between 10% and 20%
- Between 20% and 30 %
- Over 30%
- Stabled trains are priority for railway undertakings active in passenger transport. They should reply to this qu...
- Because we're an IM, we don't have any parked trains.

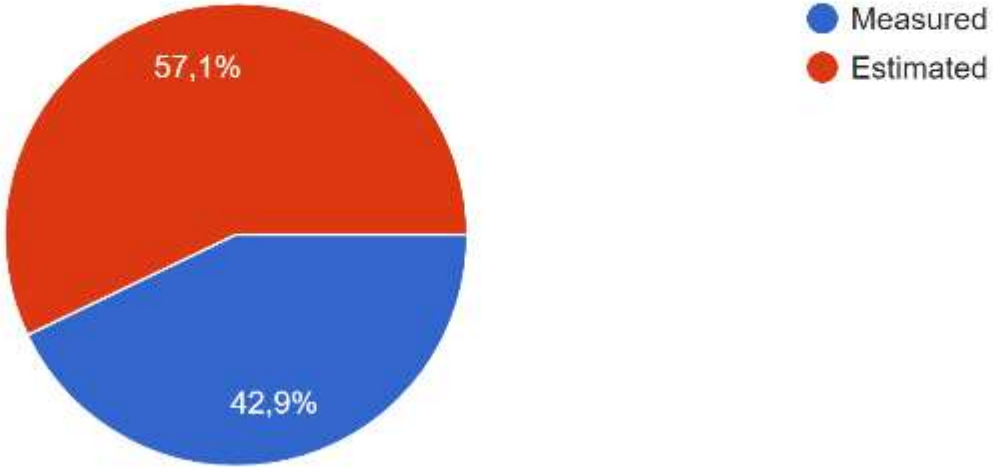
Less than 5 %

Between 5 and 10 %

ISSUES to reduce parked train's energy consumption

1.2 Is the energy consumed measured and/or estimated?

21 réponses



1.3 How is it measured or estimated?

Feedback other RU and UIC workshop 2016

Standing times of the trains

estimation based **on average hourly consumption * nb of hour en maintien de service**

Extrapolated from EMS

Both

measured with **energy metering systems (EMS) on board**

Accounting

Change of fuel level in the tank

Standing times of the trains

Estimated:

- Our OTM and locomotives are generally stabled without active onboard or offboard power supply. The two notable exceptions are during long periods of freezing temperatures, which are exceedingly rare, and while maintenance work is carried out on the machines in the field. In these cases, priority is given to the onboard genset; the main diesel engine is only turned on in a stabling situation when no alternative exists.
- relating meter of hours on of rolling stock and timetable/commercial speed
- It is estimated bij consumption factors and train kilometers and coach kilometers.

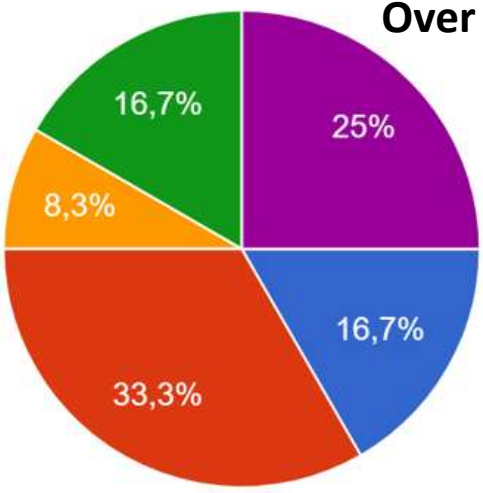
Measured:

- Measured concerning thermal energy (Measure of gasoil volume RFID chip) Measured concerning electrical energy for rolling stock fitted with an energy meter - Collecting data
- With sensors
. Based on the GPS location of the measures, we assign consumption to the train yards.
- EMS => DCS => Exchange => DCS EREX/DB E (country dependent)

Both:

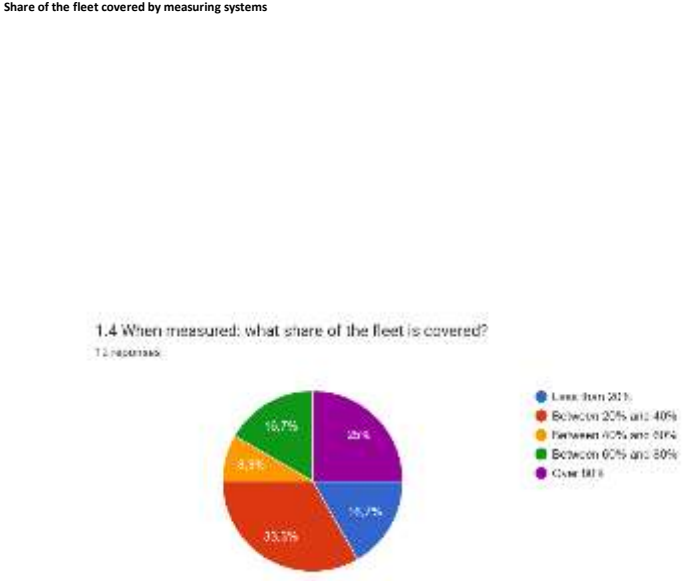
- **measured AND estimated** (wasn't able to select both in previous question) measured via energy meters on board of recent rolling stock (which account for +/- 40% of total consumption) calculated: not calculated as such but included in calculation formula to calculate total consumption of train
- partially measured (for 30% of our trains) with aboard energy meter; estimated for the other 70%, based on average hourly consumption * nb of hour en maintien de service

ISSUES to reduce parked train's energy consumption



Over 80 %

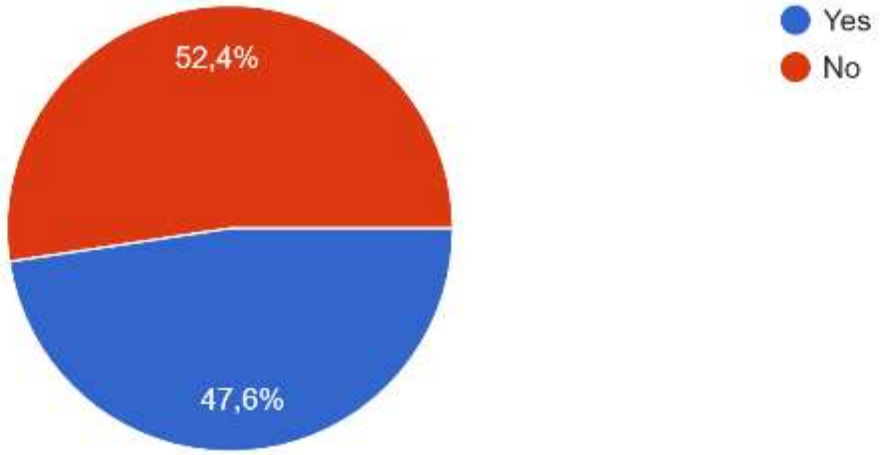
Between 20 and 40 %



OBJECTIVES to reduce parked train's energy consumption

2.1 Do you have company objectives/targets to reduce parked trains' energy consumption?

21 réponses



OBJECTIVES to reduce parked train's energy consumption

Equipping locomotives with the START & STOP system - Deployment target:
- 100% of DE18s equipped by mid-2022,
- 30% of G1000s by end of 2022
- 100% by mid-2023

We have an objective related to the consumption for each hour the rolling stock is parked

At least reduce by Half our parked trains' energy consumption since 2025

Pantograph down when stabled aim to reduce consumption while stabled by 15%

- 33 %

- Global reduction targets for 2030
- The energy consumption of parked trains should be reduced to a minimum. Operational specifications are defined for this purpose
- activate eco-stabling option as much as possible (for recent rolling stock this means when T° is > 5°C train is not heated, lights off, etc..) for older rolling stock and depending on T°
- We have CO2 goals for 2030 (-35% compared to 2019) and 2040 (zero emissions on scope 1 and scope 2 emissions). Electricity needed at standstill is important for work trains. We investigate to use batteries and/or hydrogen for this electricity needed to do the maintenance work at the infrastructure.
- We have the objective to increase the percentage trains that are parked in an eco stabling mode. We have defined the criteria of eco stabling. We have translated this percentage to kWh savings.

No targets – why?

Waiting for EMS installation in 2023

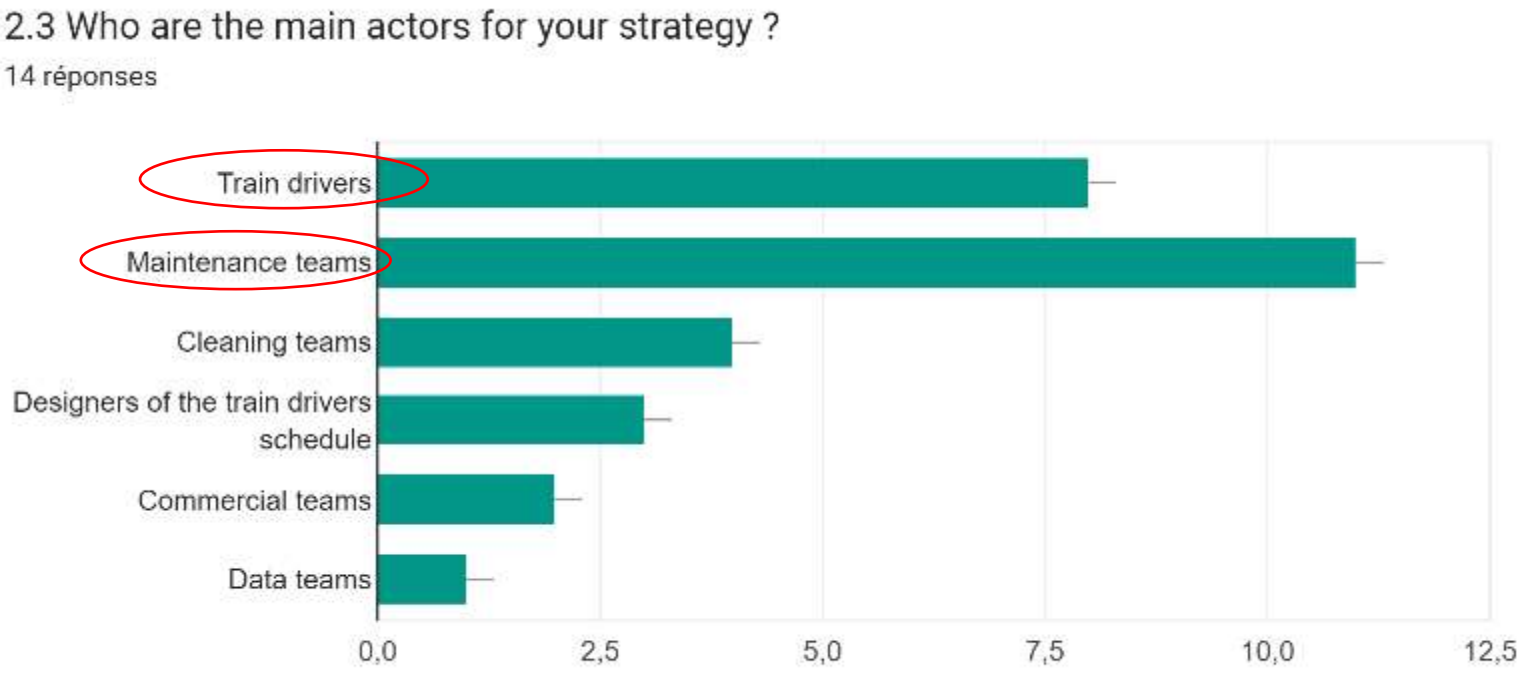
No state strategy for railway

Too low consumption

it's a subtopic of energy consumption reduction

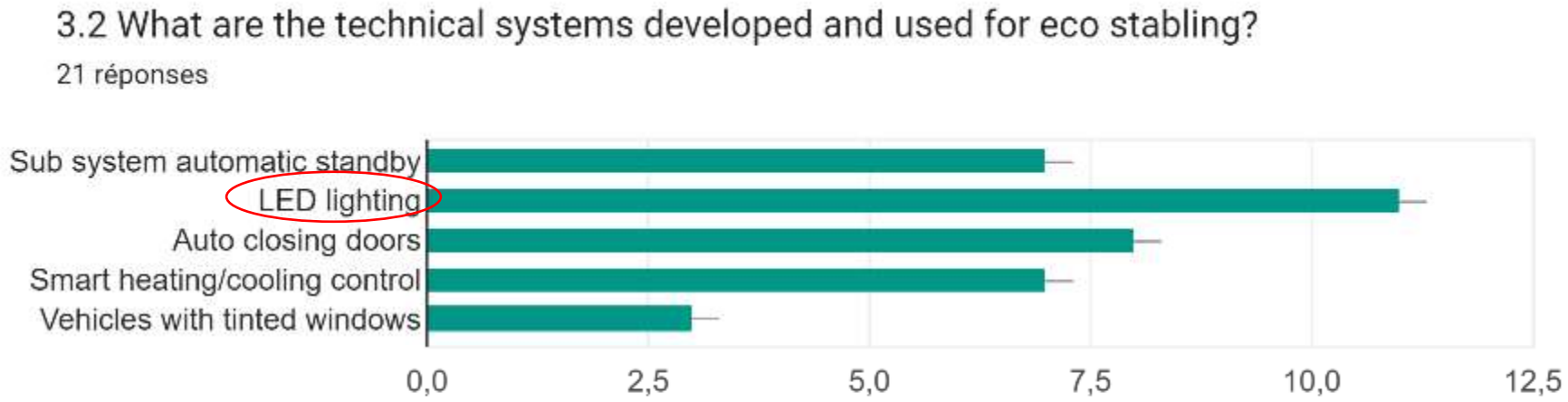
- Planning value is target and is specified by the vehicle owner
- Locomotives are parked at the end of their use/service (parking)

STRATEGIES to reach the objectives?



STRATEGIES to reach the objectives?

TECHNICAL SYSTEMS

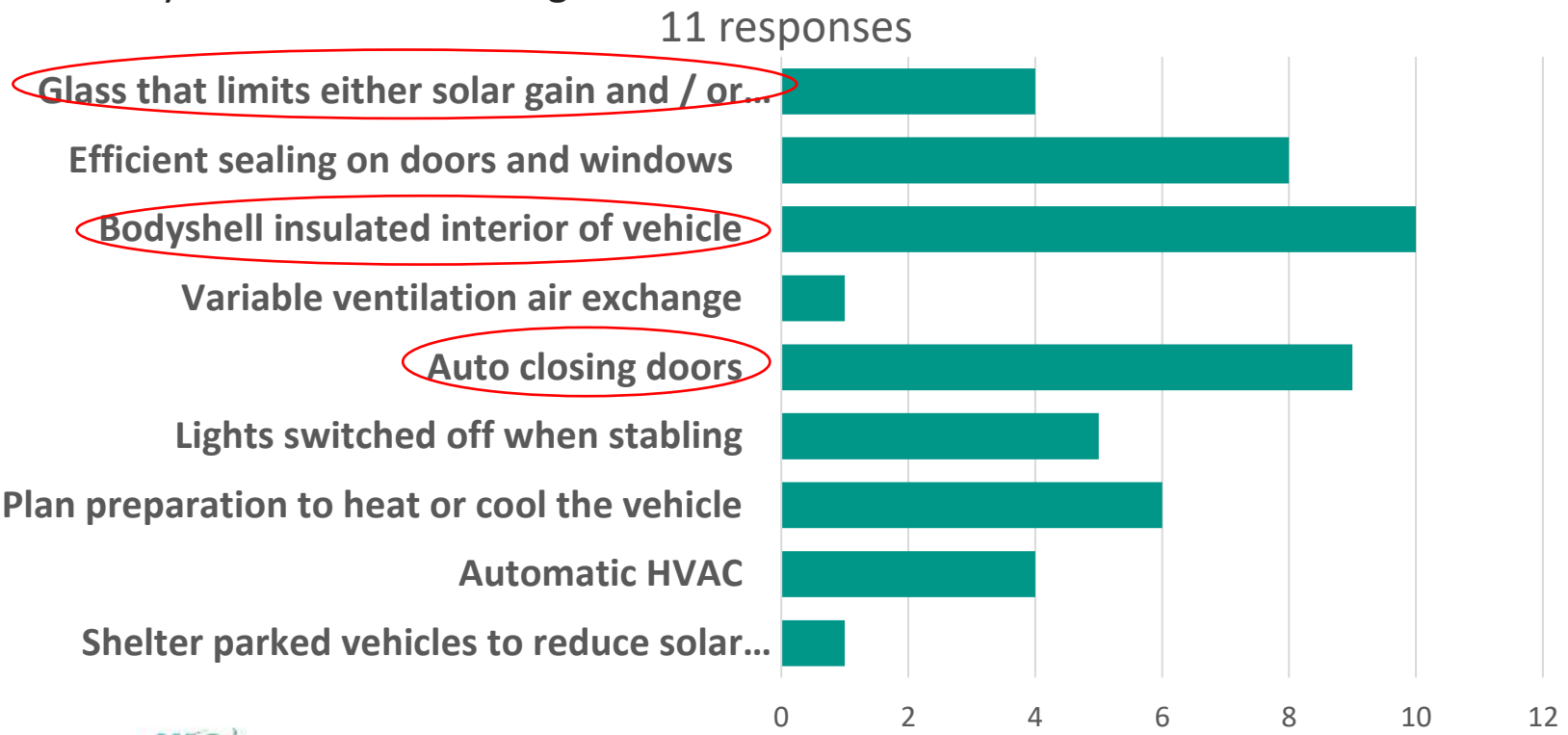


Other techniques?

- Method based on change management
- Frost protection
- **Adding batteries and/or hydrogen + fuel cell** to have electricity for maintenance work at infrastructure
- **Automatization of eco stabling and pre-heating and pre-cooling**
- Development of monitoring data, predictive maintenance data
- **Start & stop system**
- Development of **tools to monitor the energy consumption in real time** (to be developed), avoiding to switch on all the train for cleaning purpose, temporized lighting by vehicle
- **5°C button**: activates eco-mode only if outside T° is not below 5°C and this to ensure optimal conditions for the locomotive and electrical components and to ensure that in the morning the train is ready in time to accommodate passengers

In 2009:

Technical systems for Ecostabling:



In 2016:

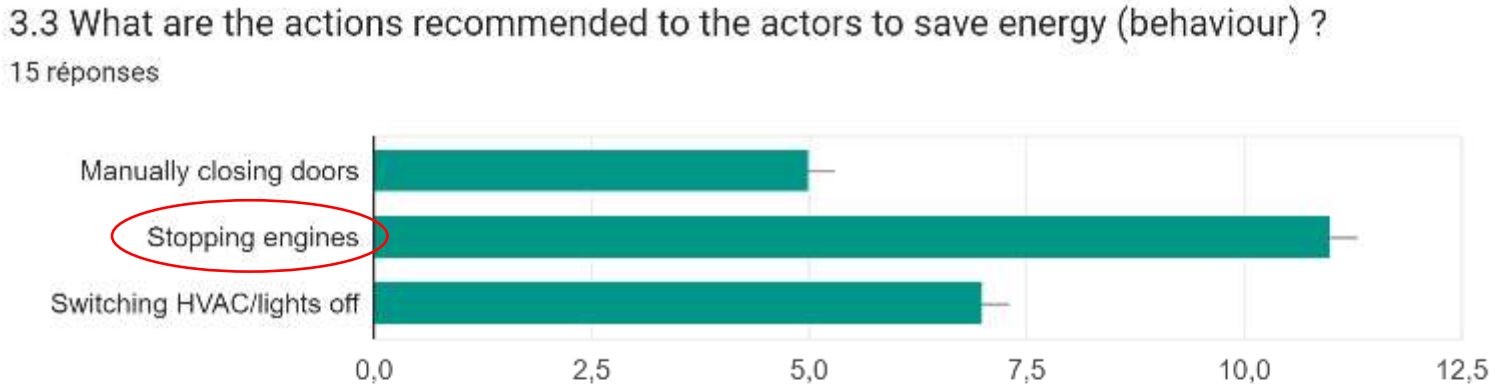
TECHNICAL SYSTEMS

Active measures to reduce Parked Train energy use

- **Auto Stabling Mode**
- **Door Auto Close**
- **Automatic shut down of vehicles and sub systems on the vehicles**

STRATEGIES to reach the objectives ?

BEHAVIOUR



Others:

- Put train in doze manually
- Closing windows, doors
- **Start&Stop activation**
- **Activate 5°C button**

Other behaviours ?

Mitigation strategy, based on self-consumption, renewables and a culture of awareness

Management of human behavior through awareness

Training and established rules and regulations

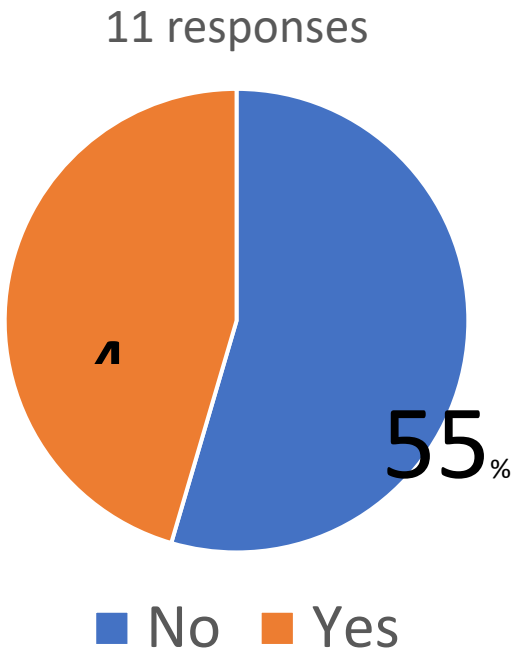
3 Means to reach the objectives : to measure, to act and change management

- Mostly behavior and organizational changes, instructions for maintenance and cleaning personnel and train drivers
- **Frequent checks** of all the rolling stock in the train yards to ensure no rolling stock is left in service.
- When the maintenance times have been reduced to a minimum, we will activate other levers (e.g. turning off the heating)
- Use the "Switching off setup" operating mode

In 2009:

BEHAVIOUR

Do you run public/staff educated campaigns to close doors/windows to save energy?



In 2009:

BEHAVIOUR

Do you think there are other ways the efficiency of parked trains can be improved?

- **Use of measurement and trend analysis across fleet**. Target maintenance and repair work
- Possible consideration of renewables to power shore supplies.
- **Considering reducing 20 minutes run time after train berthed**.
- **Supports variable HVAC air volumes for passenger trains.**

In 2016:

BEHAVIOUR

Passive measures to reduce Parked Train energy use

- **Sheltering Parked Trains**
- **Closing Doors and Windows**
- **Manually isolating equipment**
- **Shutting down engines**

  - Possible to reduce fuel consumption by switching off engines in service eco cruise and when parked (TPE, 11% saving in fuel)

Gabriel Castanares Hernandez castanares@uic.org

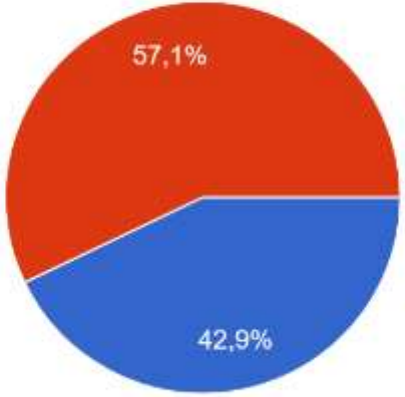
STRATEGIES to reach the objectives ?

MEASURING SYSTEMS

3.4 Do you have measuring systems / methods to assess the efficiency of a saving action?

21 réponses

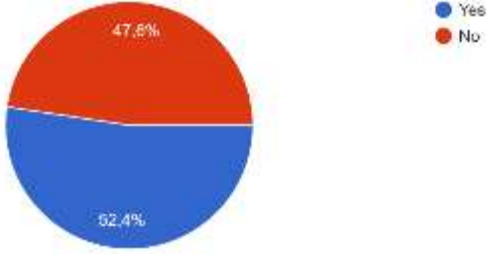
Identify energy saving potentials



Assess the efficiency

3.1 Do you have measuring systems to identify energy saving potentials?

21 réponses



STRATEGIES to reach the objectives ?

MEASURING SYSTEMS

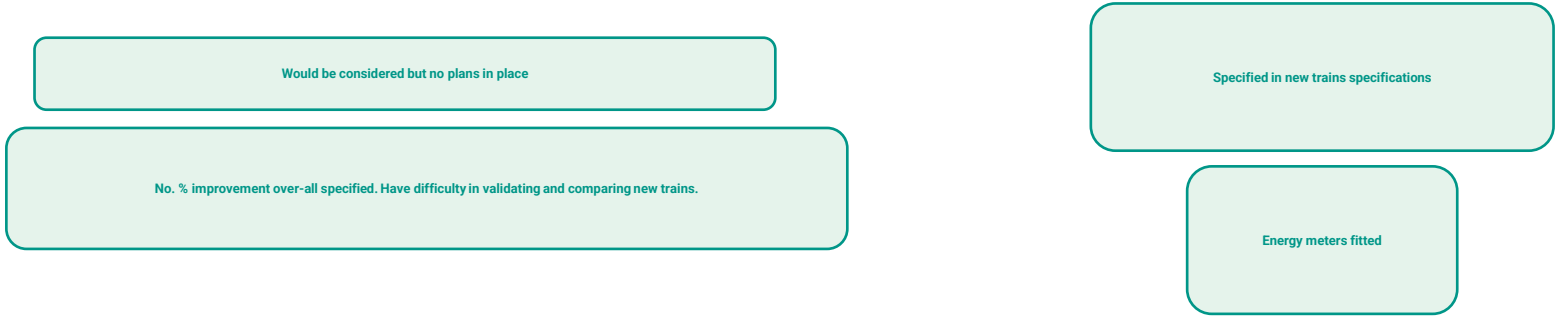
Identify energy saving potentials
The consumption of parked trains **can be identified in our energy information system and assigned to a location**.
Remote control and stand-by mode in some fleets.
A **dashboard monitoring** train modes that calculates the percentage of eco stabling as part of the potential eco stabling time.
A model that analyses energy savings.
Via **Railnova on battery and coolant temperature alerts**.

Assess the efficiency
Through **energy audits.**
Regular checks in the bundles are in place to make sure the instructions were followed.
Remote monitoring of TCMS mode and energy meter, data analysis.

In 2009:

MEASURING SYSTEMS

Do you ensure trains are specified at purchase to minimize their parked energy consumption? Do you test against this specification and **how do you validate the actual energy saving?**



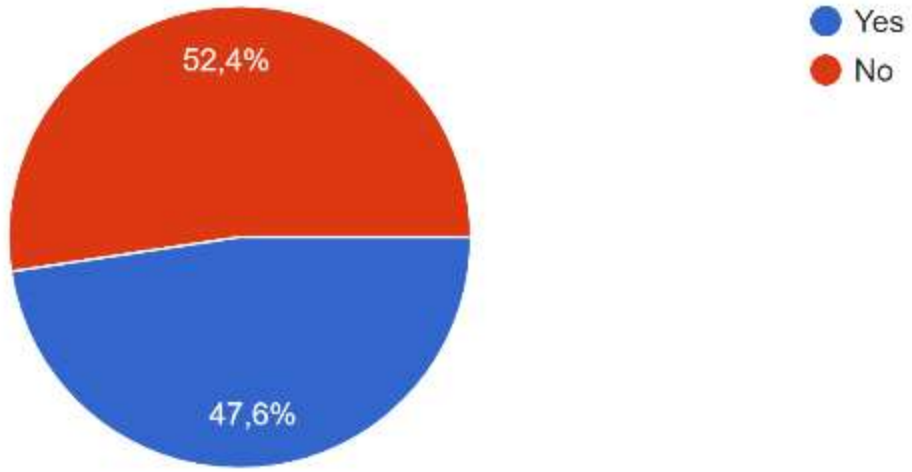
Others:

- Specific duty cycle specified and verified later by measurement. This is in accordance with Railenergy proposals.
- **Yes, and systems checks electrical consumption when train stationary to identify faults**
- Set insulation values and a requirement for less heat when train at standstill

Eco-stabling ORGANISATION

4.1 Does the company have guidelines, protocols, standards, reference to achieve eco stabling?

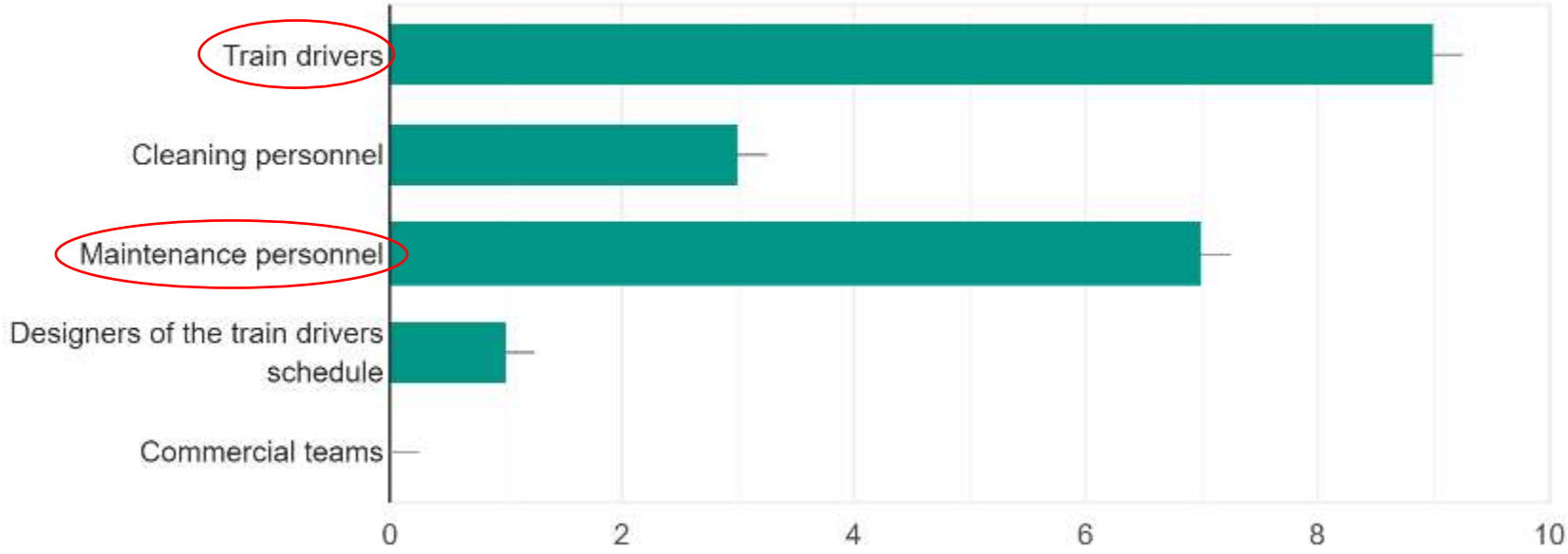
21 réponses



Eco-stabling ORGANISATION

If yes, to what personnel it is applicable to?

9 réponses



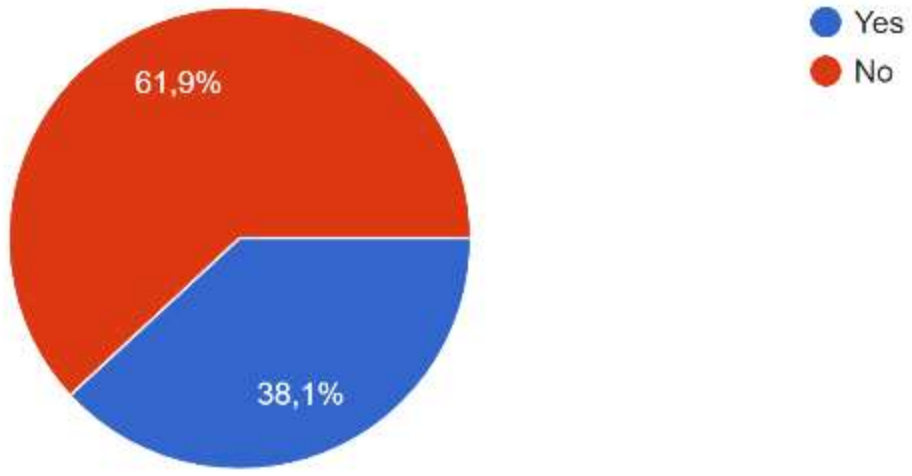
What type of protocols ?

Protocols	Details according to temperature
Engine shutdown	There are usually local **instructions to maintain the engines on when T<0°C**
Plan to Fight Climate Change	If temperature is below 0 degrees, some train types should not be put in doze mode, but in ready mode.
- the **train drivers manuel** - the **daily service instruction manuels for service personnel** - manuel for cleaning personnel	**The durations are defined according to the outside temperature and depends on the type of rolling stocks**. Generally, 60 min of preconditioning is globally enough
Memorandum during winter Periods – Annually	**Duration of activation of HVAC before train ride is related to outside temperature.**
National and local organization instructions	Measures implemented according to the temperature and the machine (electric or diesel) before and after the shift.
Clear rules on activation of HVAC, putting in service rolling stock, switching off lights, closing doors/windows	
Ril 493.xxx	

INCENTIVISE the actors to save energy

3.5 Do you have any programme / means to incentivise the actors to save energy?

21 réponses



INCENTIVISE the actors to save energy

PROGRAMS / MEANS

- **Financial, for drivers**
- **financial compensation** in the form of eco vouchers

- it's part of our Environnemental program. **But there is no reward nor punishment**
- It is a **strategic pillar of the company, culture and awareness**

- We first need other work trains.
- Environmental Protection Unit
- Inactivity management personnel management - follow-up via KPI and awareness

Main successes and BEST PRACTICES 1/2

Best practices (3.6)	Benefits (3.7)
A bottom-up approach; management attention; good monitoring data	**Behavioral effort: 1,5-2% energy savings** of total energy consumption **Technical automatisation; 1,5-2% energy savings** of total energy consumption
Monitoring and motivated staff **Sensitization through staff training**	Communication via our dynamic screens Animation of safety crosses by operational managers
Eco driving lessons for train drivers; theft prevention in general	No data
Reduced consumption, efficient fleet management	Reduction of company emissions
Rules and regulations for parked trains	Conserving resources
The most useful is to be able to measure consumption. Then, the more efficient to reduce consumption is to completely stop the engines.	We expect **8% of saving with stopping the engines**
HVAC and standby specific regulations of systems	**Around 5%**
New trains	Less energy consumption

Main successes and BEST PRACTICES 2/2

3.8 Has any of the actions had better or worse results than expected?

> **It is harder than expected to reach the results by behavioral actions. It is hard to find a positive business case** for technical automatization and to manage risks, for example cyber security risks

Main OBSTACLES

Others:
- Low temperatures in winter
- Prejudices from the past

What are the most important reasons for train drivers not to apply ecostabling actions ?

To avoid restarting certain necessary operations after the machine has been stopped

Lack of confidence in the equipment

Operational situations

Old habits

Forgetfulness

No stimulation

Others:

- Most of the time, train-drivers apply what they are said to do ... after some time. It happens that they refuse a change. Reasons are not clear
- Not yet having adequate tools on-board.
- **No clearance about the prescriptions about eco stabling**, there were exceptions in the past for trains that in some circumstances were not allowed to put in eco stabling mode - **It takes significantly more time to wake up trains from eco stabling mode - there is no time to pre-heat of pre-cool trains**
- agents are convinced of the need to act

2009 survey recommendations

- Train Operators should develop a high level policy on parked train energy use. The steps outlined in "Process, Power, People" should be used as guidance.
- Train operators should also consider which techniques highlighted above have potential to reduce energy consumption and try to create a business case for investment.
- UIC standard XXX needs to be revise to mandate more challenging targets for vehicle insulation based on what can be achieved with modern materials, drawing from other industry sectors as appropriate.
- Clear instructions should be created for maintenance and operational staff indicating what equipment should be isolated, when, how and where.
- CEN standard XXX should mandate the installation of Auto-close on all new trains.
- The rail sector should consider an EN specifying systems on new trains to minimise energy consumption by hibernating ancillary equipment whenever possible.

→ what about in 2022 ?

Important issues
validating next technical workshops ?
(work on standards, share best practices,…)

If you are interested, please notify in the chat

INTERNATIONAL UNION OF RAILWAYS

ENERGY ACCOUNTING FOR PARKED TRAINS

Infrabel
(IM side)

INFRABEL

Settling of stabling energy

UIC Energy Efficiency Workshop

Bart Van der Spiegel

30 June 2022

Regulatory framework: European directives

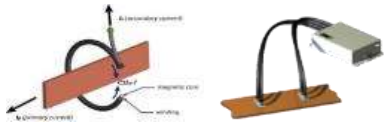
- Directive 2009/72: European Electricity Market:
  - Each customer is free to purchase electricity from the supplier of his choice (art. 2.12)
  - Different kind of grid operators: Transmission, Distribution and Closed Distribution

- Directive 2012/34: European Railway Market
  - Services to be supplied to the Railway Undertakings by the Infrastructure Manager:
    - 1. The minimum access package shall comprise:
      (e) use of electrical supply equipment for traction current, where available;
    - 3. Additional services may comprise:

      (a) traction current, charges for which shall be shown on the invoices separately from charges for using the electrical supply equipment, without prejudice to the application of Directive 2009/72;

Rolling stock – Locomotives & Passengers TSI

Sensors and transformers measure voltage and current and this for all traction systems.



An energy meter calculates the consumed energy and also the energy returned during braking.

A data logger adds GPS-positions and stores all data.

By recording a location at least every 5 minutes, consumptions can be allocated to the country where it took place.

Commission Implementing Regulation 2018/868 introducing changes to LOC&PAS TSI and referring to EN 50463:2017

On-board Energy Measurement System (EMS)

Railway Undertaking

commodity (€)

Energy market

grid fee (€)

operate s trains

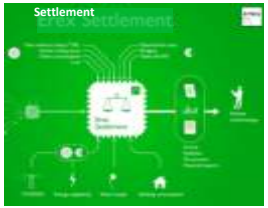
request s train-runs

Infrastructure Manager

kWh

kWh

data for validation, estimation and allocation



Requested by EC/2018/868.

Allocate:

- allocate consumptions to the correct end user
- distribute to correct actors in energy market

Validate/estimate:

- validate data coming from EMS
- estimate missing data

EMS

On-board Energy Measurement System (LOC&PAS TSI)

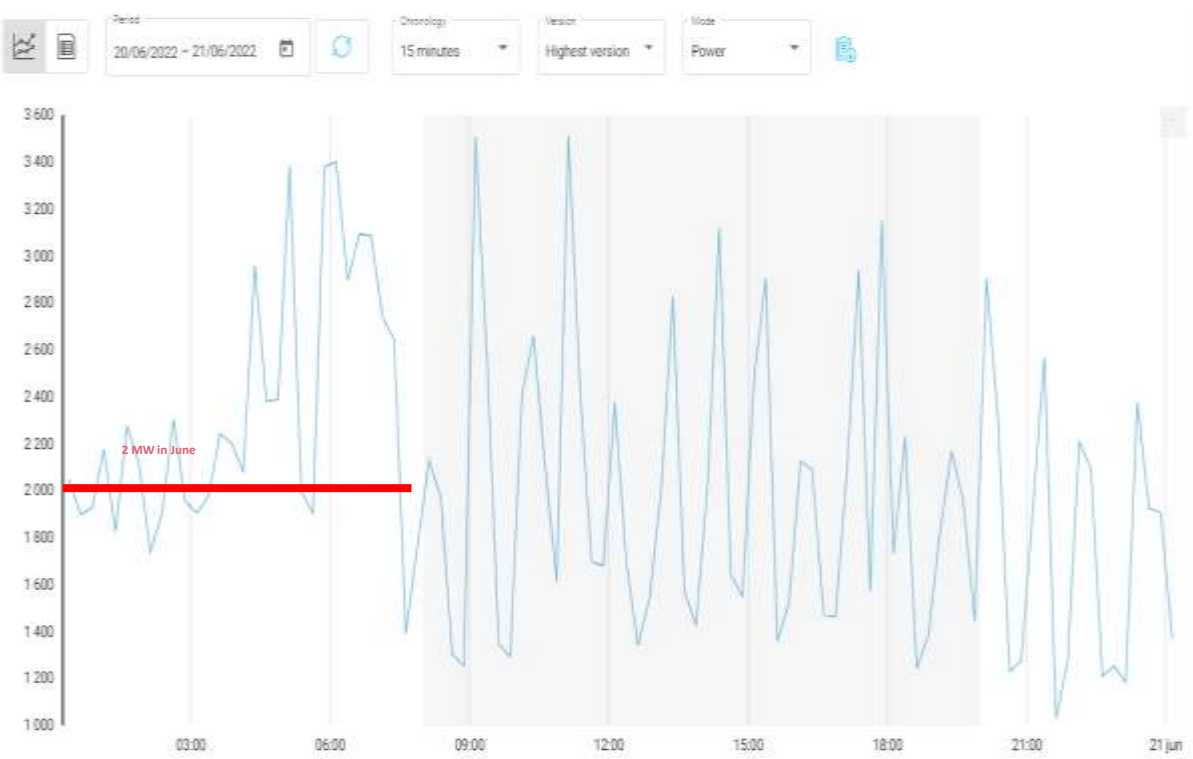
DC

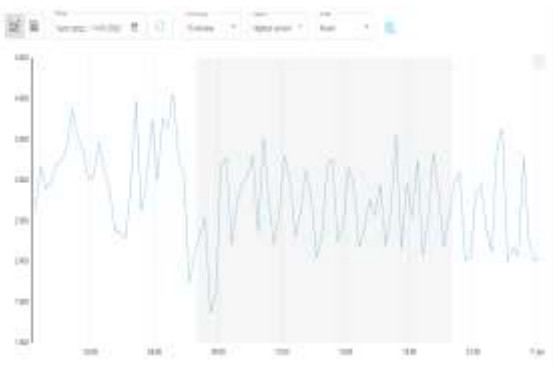
Data Collecting System on ground (ENE TSI)

Exchange:

- allocate consumption to country where consumption took place
- distribute to correct settlement system

Requested by EC/2018/868. See next presentation.





And even more power is used in winter months.

In Oostende Infrabel injects more electricity in the overhead contact line during night hours to feed parked trains then during the day when these trains are running over our network. Stabling electricity consumption is not negligible.

30% of traction electricity invoiced based on meters

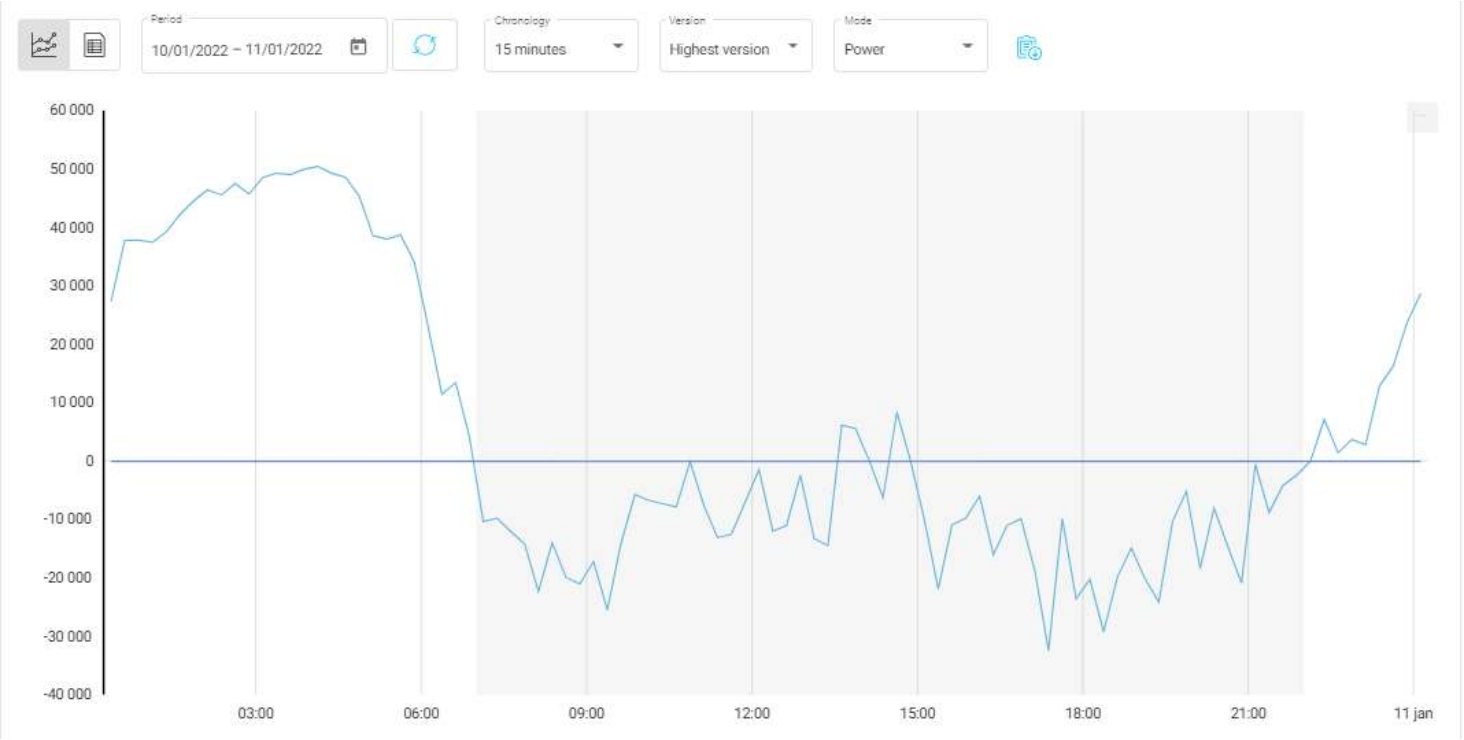
- 70% of traction electricity consumption in Belgium is still estimated.
- We estimate based on easy formulas in our Network Statement:

Passengers:	(36 + 0,8 * D1 + 0,8 * D2) Wh/tonne-km
High speed:	(42 + 0,8 * D1 + 1,0 * D2) Wh/tonne-km
Freight:	4 kWh/km + 12 Wh/ton-km

D1 are degree days for heating (<16,5 °C) D2 are degree days for cooling (>20°C)

- We overestimate consumption for passengers and high speed during the train-run.
- So we overestimate consumption during peak hours (causing more electricity allocated to trains then injected in the overhead contact line) and underestimate during night hours (causing “huge losses” in the overhead contact line).
- We can’t allow free choice of supplier if we can’t allocate the consumption on the right moment!

Calculated energy losses



So how should we settle consumption during stabling?

- We need to make a distinction between trains with on-board Energy Measurement System and those without.
- What about battery trains?
- What if carriages are disconnected from their locomotive and connected with plugs for stabling?

Trainsets (EMUs/BEMUs/…) with meters

- If pantograph remains up during stabling, the on-board Energy Measurement System will keep measuring the consumption during stabling.
- So we exactly know when the electricity was consumed and also by which traction unit.
- We already invoice this consumption to the Railway Undertaking using this traction unit in its train-runs.
- So this works perfect.

Trainsets (EMUs/BEMUs/…) without meters

- We should estimate the stabling consumption when these trains are stabled.
- If we know the train composition, we know when and where the traction units are stabled. We also know there traction unit type.
- So we could estimate a consumption based on a coefficient by traction unit type and the stabling duration.
- We could even use different coefficients for the last x minutes when preheating or precooling just in front of the train-run is applied.
- Railway Undertakings agreed in the Sector Declaration of November 2020 to be able to deliver the train compositions by 2023. This shall be done preferably at departure of train-run.
- As BEMUs are new trains, they will all have meters. If meter is not working, the same procedure can be applied.

Carriages using plugs

- We should estimate the consumption when these carriages are stabled.
- We also need to know if they will use the locomotive (and if this locomotive is equipped with an on-board Energy Measurement System) or if they will use plugs during stabling.
- To be agreed with Railway Undertaking if a solution can be regarded as standard for all carriages that have used a locomotive of a specific traction unit type or if this is also dependent on location, time and carriage type.
- Stabling consumption can be dependent on the total mass of the carriages or of the amount of carriages and the carriage type.

Possible problems with such new methods

- It is impossible to take into account if train is stabled with full power for heating or cooling and with lights on or if trains is correctly stabled.
- If no composition of trains is not delivered to the Infrastructure Manager, this method can’t be applied.
- The procedure adjusts the model significantly. A lot of testing and finetuning will be needed.
- If we want to differentiate by carriage type while using plugs, we also need to know the composition of the carriages in the train runs. And we need to know when the plugs are used.

Driving Advisory Systems are easy tools that can result in important energy savings.

UIC invites you on October 10th in Paris for a workshop on Driving Advisory Systems.

Contact sfera@uic.org.

Thank you for your attention
bart.vanderspiegel@infrabel.be

Workshop timeline

10 h	• Overview of questionnaire answers	**SNCF/UIC**	
	• Energy accounting of parked trains	**Bart Van der Spiegel**	**Infrabel**
	Best practices and challenges		
	• SNCF – Eco Stabling	**Christophe Gueudar Delahaye**	**SNCF**
	• NS – Eco Stabling project	**NS**	
	• NS – Smart Thermostat	**NS**	
	• NS – Energy measurement data	**NS/ProRail**	
12 h	• Tour de table / Discussion	**Participants**	

INTERNATIONAL UNION
OF RAILWAYS

SNCF
NS

Best practices

INTERNATIONAL UNION OF RAILWAYS

ECO STABLING STRATEGIES

SNCF Voyageurs

Christophe Gueudar Delahaye
Julia Aveline

ENERGY EFFICIENCY

ECOSTABLING

SNCF Voyageurs – France

Christophe GUEUDAR DELAHAYE – ENERGY and CARBONE Program Manager
Julia AVELINE – chargée de projet ecostationnement TER BFC

Cap Énergies !

PLANÈTE VOYAGES

PLANETER

SNCF

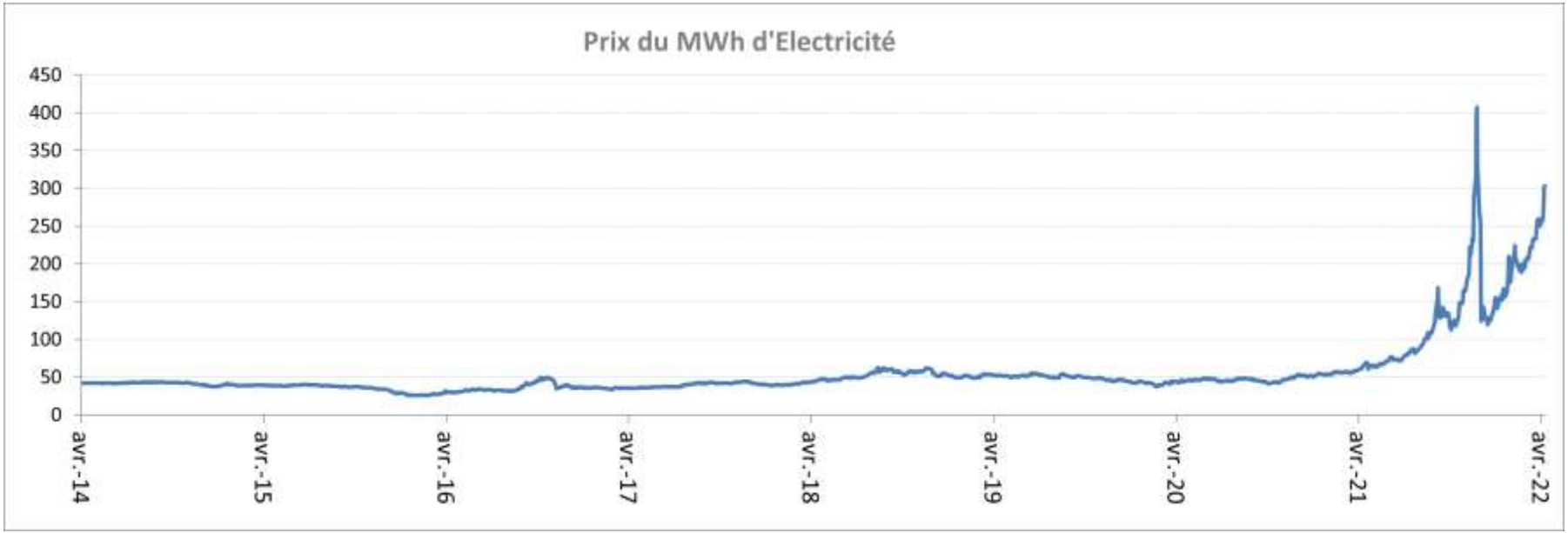
AGENDA

CONTEXT

ECO-STABLING at SNCF Voyageurs

FOCUS on BEST PRACTICES

ELECTRICITY PRICE INCREASE



2 GOALS FOR SNCF VOYAGEURS

- **Reducing our energy consumption** (-20 % in 2025 /2015)
- **Developing post-carbon technologies** (-30 % CO2 emissions in 2030/2015)

→ ENERGY EFFICIENCY PROGRAMS OVERVIEW

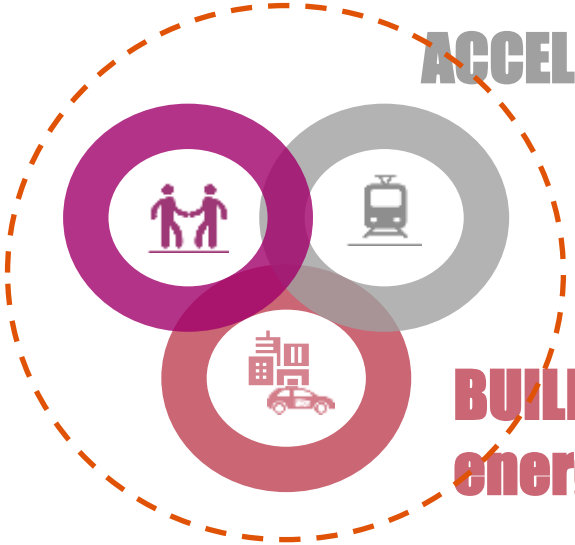
- Driver advisory system (DAS and C-DAS)
- **Eco-stabling**
- Others technical projects (aerodynamic, fresh air rate regulated with passenger occupancy,…)
- Post-carbon projects
- Efficiency on building

A SPECIFIC PROGRAM TO ACCELERATE
→ END OF 2023!

Cap Énergies!

ACCELERATE ACTION LEVERS

INCENTIVISE



BUILDINGS saving energy

→ **ECOSTABLING : the main lever !**

AGENDA

CONTEXT

ECO-STABLING

FOCUS on BEST PRACTICES

ECO-STABLING

1. MEASURING to fix priorities for actions

- Studies on theorical data
- Real data from EMS and fuel station

2. Concrete ACTIONS

Top-management awareness-raising

Technical systems

- → Lighting reduction
- → Engine stop/start : activated manually by driver or automatically >30min
- → Door openings systems
- → …

Human and logistic management to overcome fears

- → Impact on ponctuality
- → Change management with operational team
- → Engine or battery fatigue
- → …

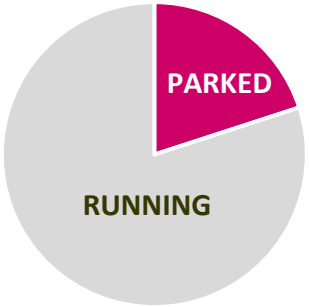
3. SHARING good practices

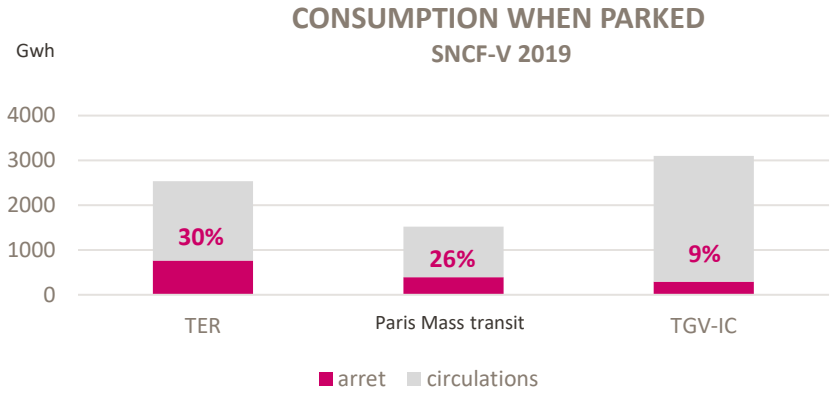
- Regular meeting
  - Regional
  - National
- Operational instructions
- Global Communication

ECO-STABLING

ISSUE : 20% total energy is consumed when the trains are parked

GOAL : - 6% total consumption in 2025

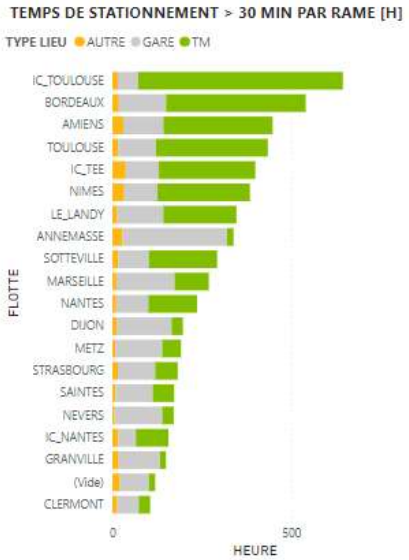


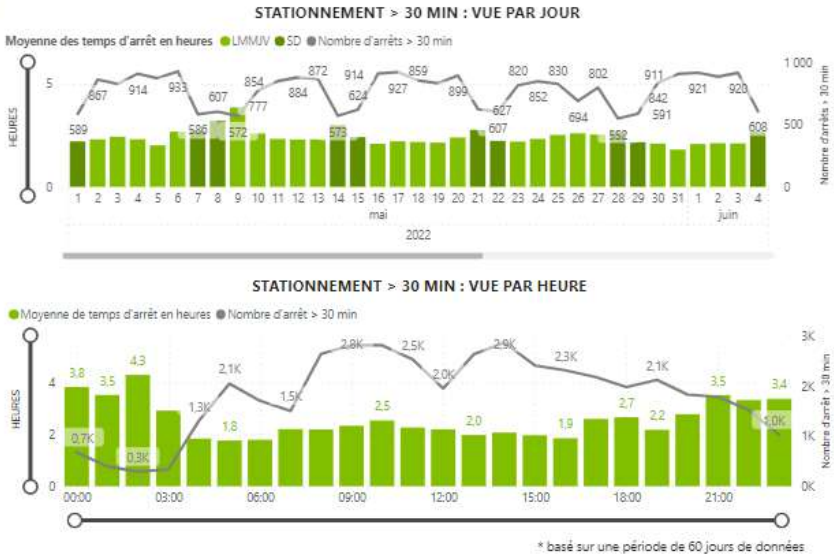


ECO-STABLING

DEVELOPMENT OF ENERGY DATA MANAGEMENT TOOLS → using **PARKED TIME DATA**

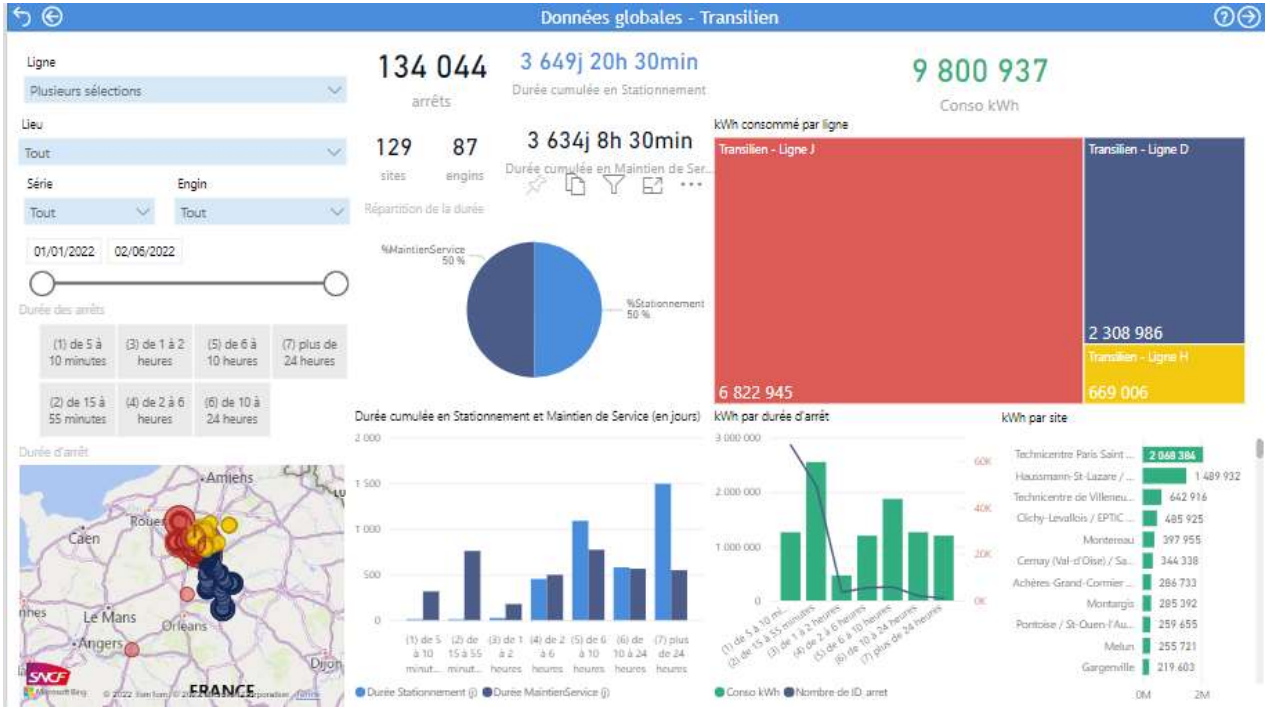
LiveMAT Energie
PLANETER REGIOLIS - TENDANCE





ECO-STABLING

DEVELOPMENT OF ENERGY DATA MANAGEMENT TOOLS → using **EMS DATA**



FOCUS ON BEST PRACTICES

Regional Train – PLANETER Project

GOALS

PLANETER

01 ▸ Reduce passenger CO_2 density by one third

02 ▸ Reduce our annual CO_2 emissions by 100,000 tons

03 ▸ Avoiding 500,000 tons of CO_2 emissions by convincing car drivers to take the train

04 ▸ Lowering the energy bill of TER

FOCUS ON BEST PRACTICES

Regional Train – PLANETER Project

LEVERS OF ACTION FOR LESS CO_2

Operation	Equipment	Other levers	Buildings
Ecostabling = 50% of savings targets	Biofuel	Service vehicles	Technicenters
Opti-conduite	Hydrogene	Transportation plans	Offices
Regularity	Hybrid	Information system	Stations
Temperature on board the trains	Battery	Commuting	

FOCUS ON BEST PRACTICES

Regional Train – PLANETER Project

Ecostabling project leaded by stephane CHWALIK

SOME CONCRETE ACTIONS

- ✓ Follow-up of extended maintenance times
- ✓ Monitoring of overall performance of thermal and electrical consumption
- ✓ Equipment engineering studies: consumption at standstill, recommendations

- ✓ Ecostationing maturity grid
- ✓ Commissioning and extinguishing of trains by cleaning staff
- ✓ Systematic extinction of the machines
- ✓ Modification of the organization of the site movement

- ✓ Communication kit for the implementation of Ecostationing Forums / Point 5
- ✓ SharePoint PlaneTER
- ✓ Sharing best practices in monthly COTECH
- ✓ Classroom (S2 2022)
- ✓ Continuous improvement process
- ✓ Thematic chat (H2 2022)

FOCUS ON BEST PRACTICES

Regional Train – local actions : Bourgogne/Franche-comté

WHAT IS ECO-PARKING ?

Eco-parking : Action to shut down trains whose engine remains on unnecessarily when stationary

Why it is important to do eco-parking?

- To reduce noise pollution
- To reduce the consumption of fuel
- To reduce our emissions of carbon dioxyde
- To develop the train's ecomobility image

Currently: energy spent on stationary trains = 1/3 of the total traction energy

The goal for 2025 : reduce these emissions by a third

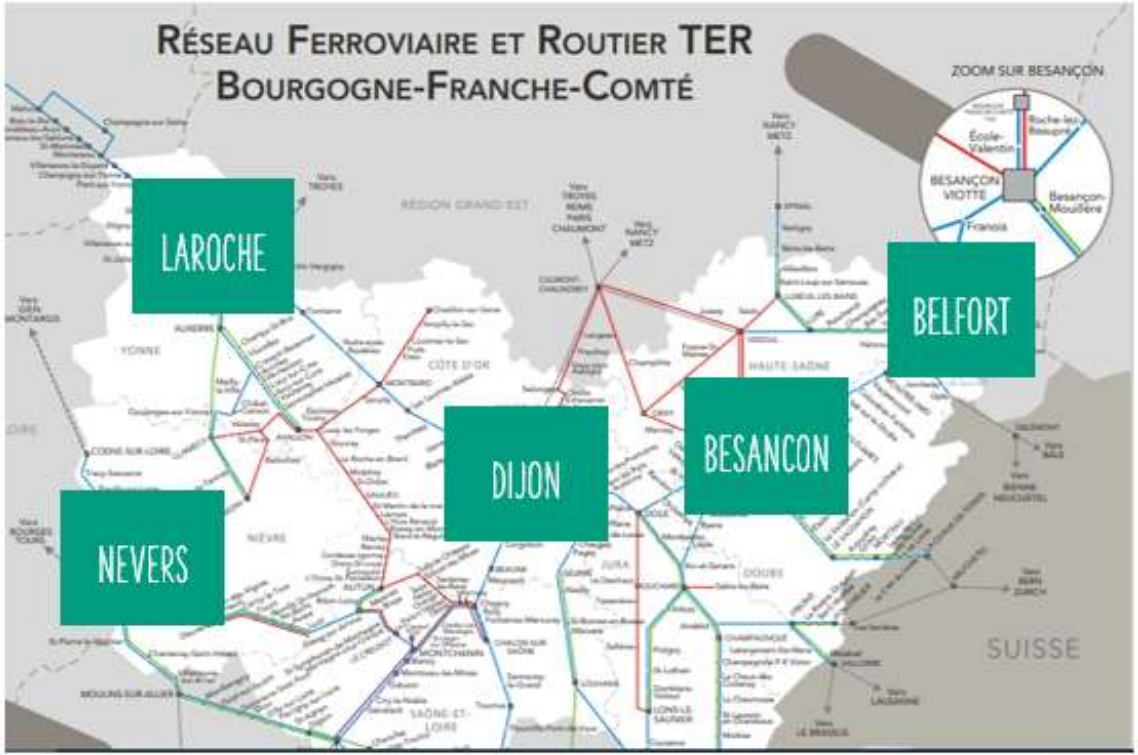
FOCUS on BEST PRACTICES

WHAT HAPPENS IN BURGUNDY FOR ECO-PARKING ?

WHAT HAPPENS IN BURGUNDY FOR ECO-PARKING ?

- Following of the emissions and the consumption thanks to the software LiveMAT
- Creation of the eco-parking « Newsletter » and « Gazette »
  - The « Gazette » which lists all the costs (ecological, economic, energy consumption) of all the sites by type of train (Régiolis and AGC) and type of energy
  - One « Newsletter » each month per site (Nevers, Belfort, Besançon, Dijon and Laroche-Migennes) which is a kind of zoom of the « Gazette »

WHERE ARE LOCATED OUR FIVE TRIAL AREAS ?



N°7 Mai 2022

La Gazette PlaneTER BFC

Quel bilan pour l'éco-stationnement au mois de mai ?

Grâce à l'utilisation du logiciel LiveMAT Energie, il est possible d'avoir accès aux durées de fonctionnement des engins à l'arrêt. Ces informations sont disponibles pour le matériel Régiolis et également depuis peu pour le matériel AGC.

Le point météo, quelles ont été les températures ce mois-ci ?

Nevers	Dijon	Besançon	Belfort
Moyenne: 19,8°C Min: 7°C Max: 39°C	Moyenne: 21°C Min: 5°C Max: 40°C	Moyenne: 20°C Min: 7°C Max: 38°C	Moyenne: 19,5°C Min: 0°C Max: 34°C

Quels sont les coûts du stationnement pour mai en BFC ?

Avec la situation géopolique actuelle **les prix du gazole ont augmenté de près de 20% !**

- **3126 heures** soit l'équivalent de 130 jours
- **7 190 Litres** consommés
- **112 469 KWh** consommés
- **27,1 Tonnes de CO_2** émises
- **17 500 €** dépensés

Quelles anomalies moyennes ?

Afin de donner un nouvel indicateur, nous avons choisi d'indiquer chaque mois la durée d'une anomalie moyenne pour chacun des sites.

Nevers	Laroche-Migennes	Besançon	Belfort	Dijon
Durée moyenne d'une anomalie: **1,1 heure**	Durée moyenne d'une anomalie: **1,1 heure**	Durée moyenne d'une anomalie: **1,2 heure**	Durée moyenne d'une anomalie: **1,1 heure**	Durée moyenne d'une anomalie **2,7 heures**

During may in Burgundy

- 3 126 hours of parking
- 7 190 Liters of diesel fuel
- 112 469 kWh
- 27,1 tons of carbon dioxyde
- 17 500 €

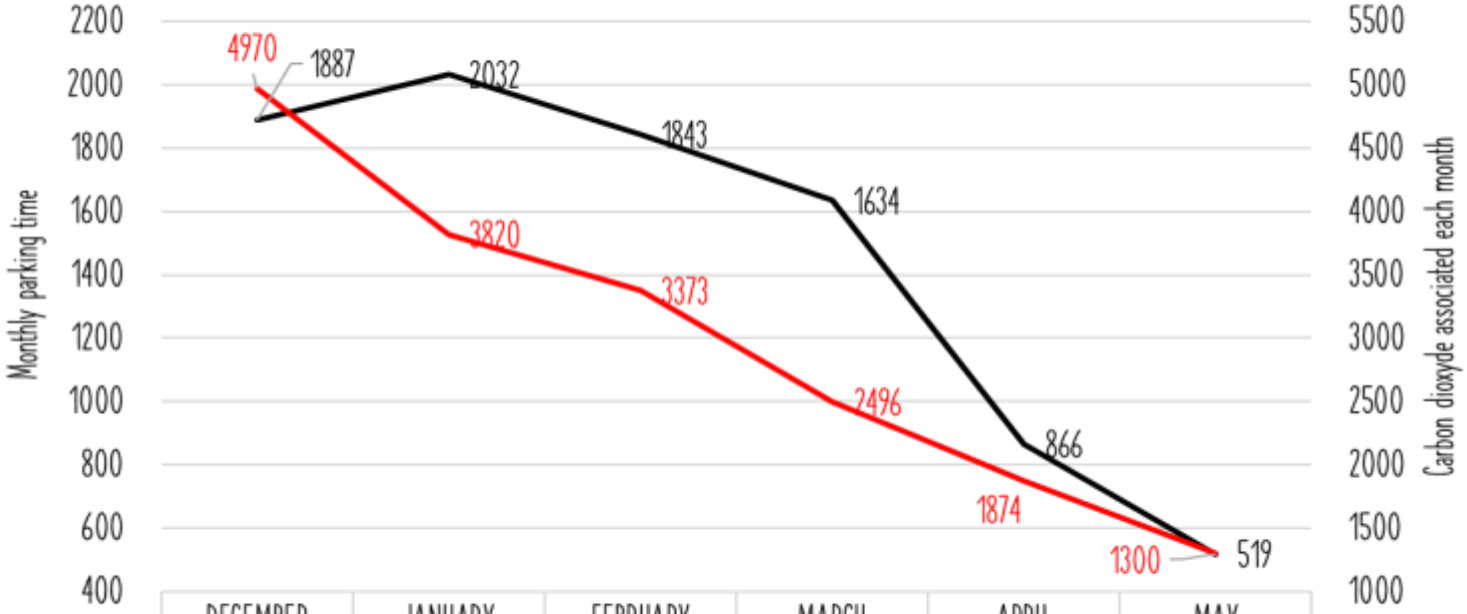
The duration of an average irrégularité

Irrégularité : duration of maintenance in service greater than 30 minutes

- 2,7 hours for Dijon whereas 1,1 hours in Nevers or Belfort

FOCUS on BEST PRACTICES

A CASE STUDY : EVOLUTION OF PARKING TIMES AND ASSOCIATED CARBON DIOXIDE EMISSIONS SINCE DECEMBER IN BELFORT



	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY
Total monthly parking time	1887	2032	1843	1634	866	519
Total of carbon dioxyde emissions	4970	3820	3373	2496	1874	1300

FOCUS on BEST PRACTICES

HOW IT WORKS ?

Convaincue que le gaspillage d'énergie n'a plus lieu d'être dans les contextes environnementaux et économiques actuels, une équipe de Belfort s'est emparée pleinement de la démarche éco-stationnement avec des résultats très significatifs. Félicitations à ces agents de la BU Bourgogne-Franche-Comté pour leur engagement dans ce programme qui répond pleinement au programme d'accélération des économies d'énergie.

THANK YOU FOR YOUR ATTENTION !

Christophe GUEUDAR-DELAHAYE

Energy Carbone Program Manager

Christophe.gueudar-delahaye@sncf.fr – 00 33 6 16 68 26 92

ECO STABLING PROJECT

PILOT FOR MONITORING
IMPROVED MONITORING AND DATA
SMART THERMOSTAT AS AUTOMATED SOLUTION
DATA ANALYSIS FOR ECO STABLING

NS

Sabine Mooij
Luuk Platvoet
Roshan Khodabaks
Amon Schrama
Inge Kalsbeek

Eco stabling at NS

An update 2022

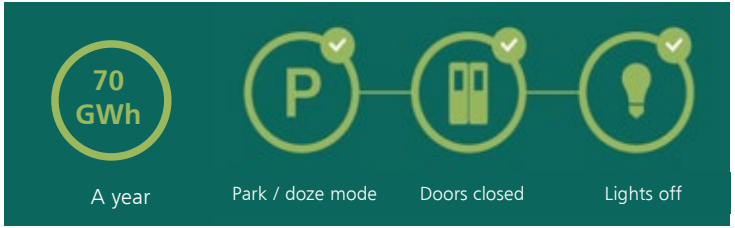
Sabine Mooij (Asset Director Energy)
30th June 2022

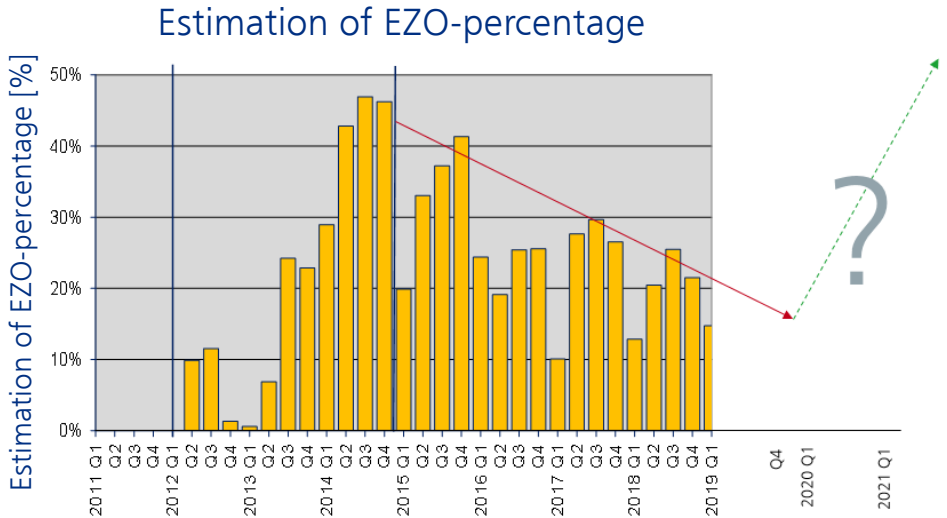
Contents

- Eco stabling; still high potential
- Focus points last 2 years
- 1. Commitment in de organisation
- 2. Results Eco Stabling pilot
- 3. Improved monitoring
- 4. Data experiment
- 5. Technical solution eco stabling
- Summary

Eco Stabling; still high potential

- Last 3 years, 30-35% of trains in eco stabling
- Potential annual savings of ca. 70 GWh
- How to increase % of trains in eco stabling?
  - Eco stabling instructions in procedures are implemented
- Chances nowadays:
  - More urgency on noise reduction
  - More urgency because of increasing energy prices

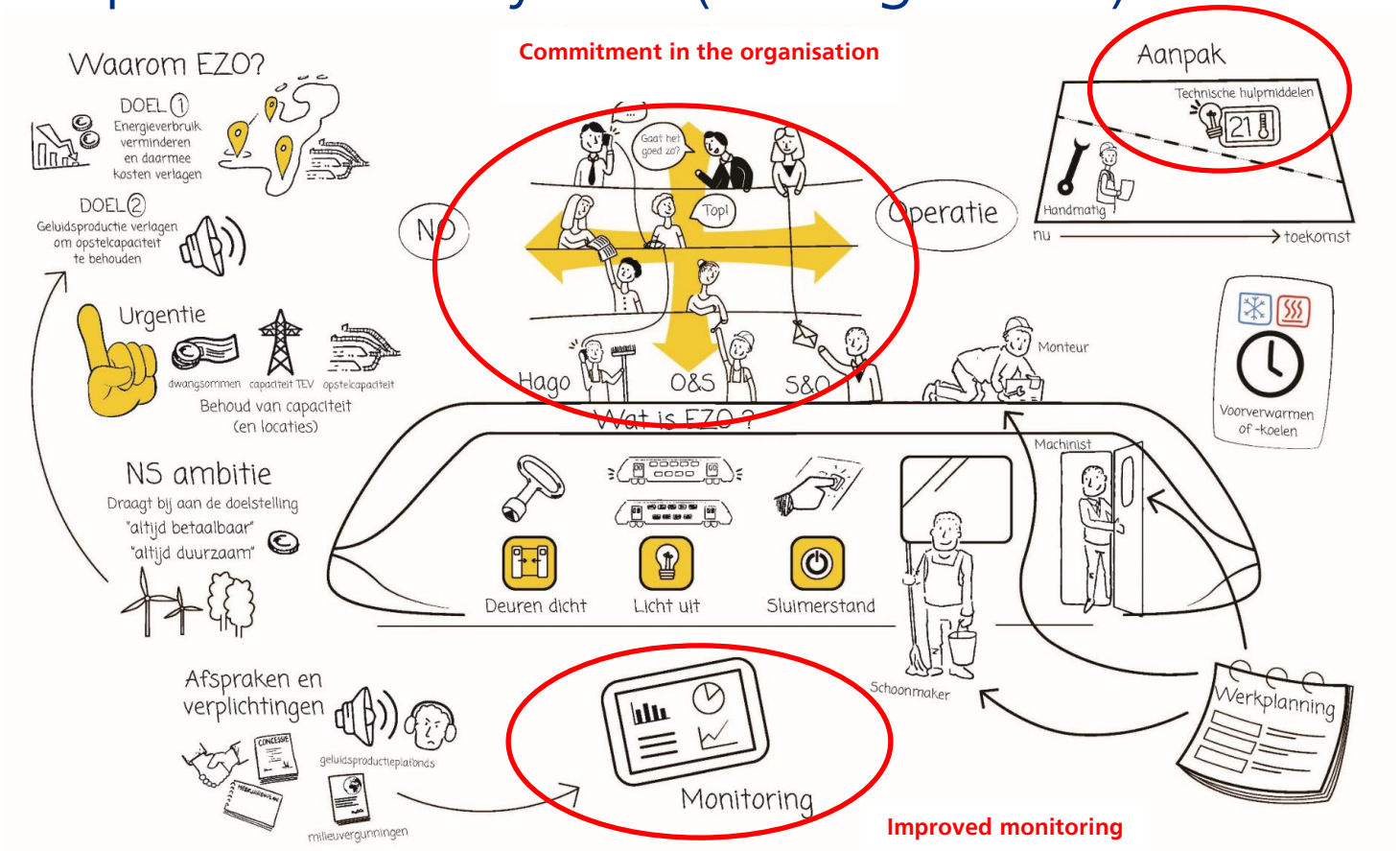




Focus points last 2 years (during Covid)

Development of an automated solution

Commitment in the organisation



Improved monitoring

1. Commitment in the organization

Sabine Mooij

Commitment in the organisation

- Challenge: We support the project, because we understand the benefits and the urgency, BUT…
  - We already face challenges to achieve our primary goals
  - We are short on capacity
  - We first want to have perfect data
  - ……

- Actions to increase commitment:
  - Having a sponsor at senior management level
  - Qualitative goals in the strategic business plans
  - Designate owners at different management levels
  - Project team with ‘implementers’ who have broad practical experience and who think in chances instead of restrictions

2. Results Eco Stabling pilot

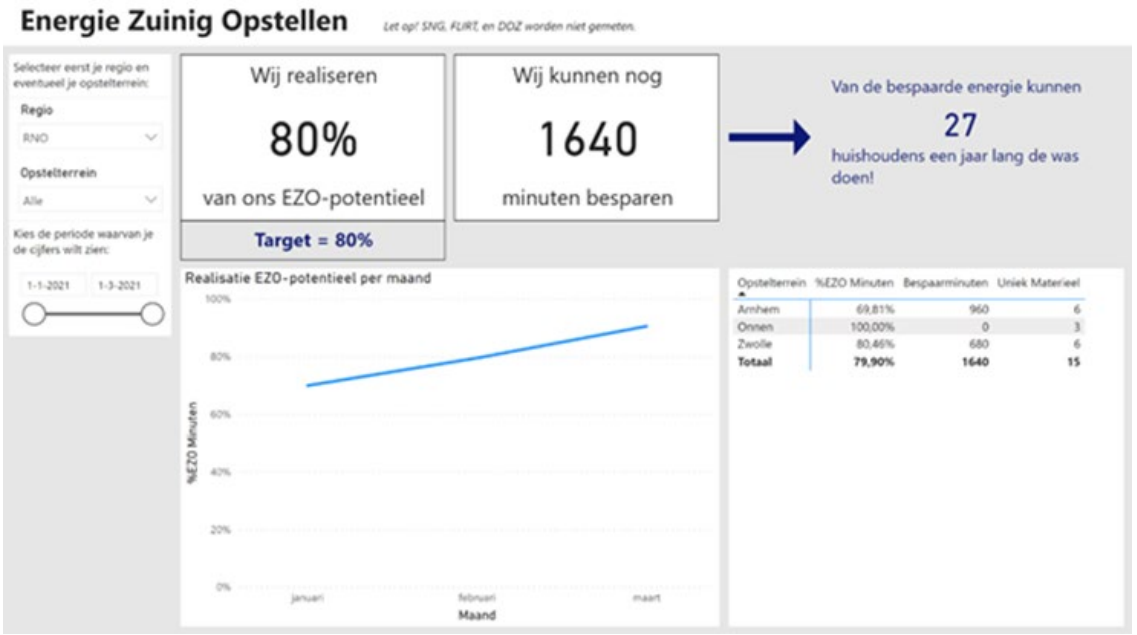
Luuk Platvoet
Roshan Khodabaks
Amon Schrama

Background pilot

- Business Case NS Trainees
- Eco Stabling (EZO)
- Our research:
  - Focus on steering of day to day management Eco Stabling
  - Interviews with stakeholders
    - Train drivers, planner, teammanager train drivers, mechanics etc.
  - How to set up the pilot at the Binckhorst
  - Data monitoring

Set up pilot - monitoring

- Use of data
  - Existing dashboard -> our own dashboard
  - RTM data



* This is fictitious data

Pilot - Binckhorst

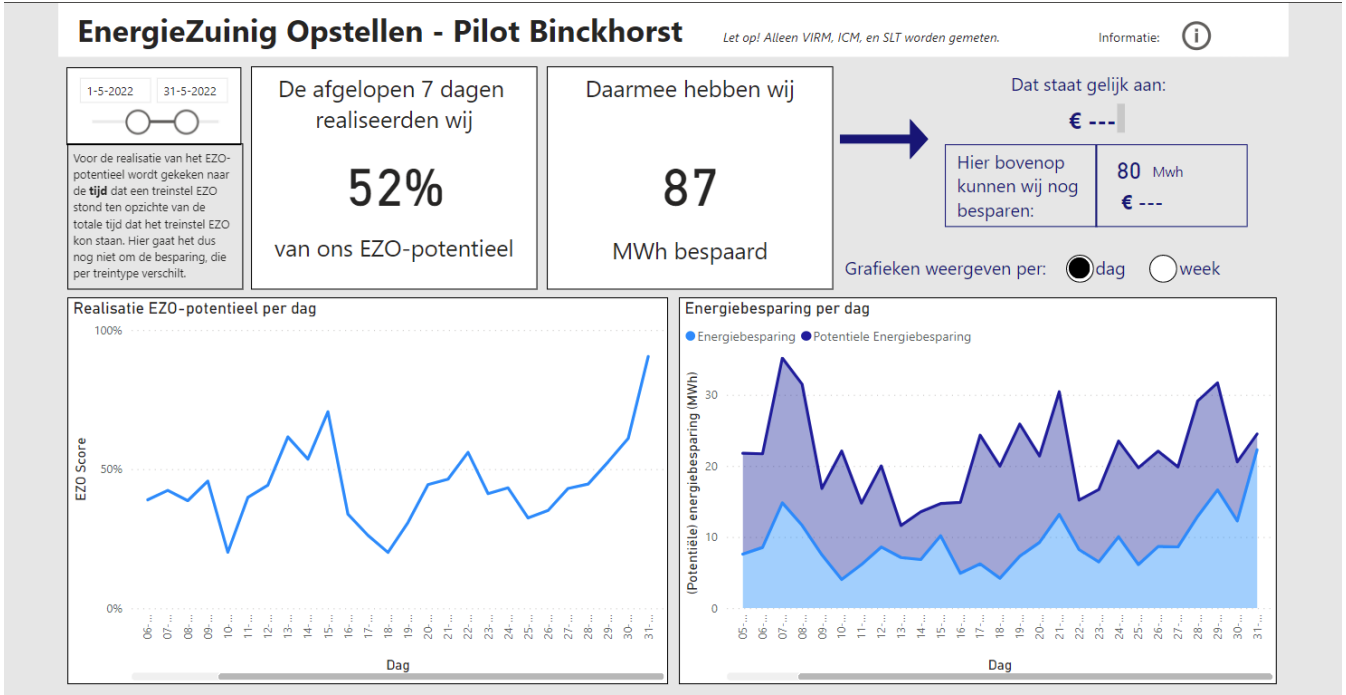
During the month May:

- Communication to train drivers
  - Train always has to be put away in Eco stabling mode, unless you hear otherwise!
  - News letter, Posters, Email address
- Communication to mechanics, cleaners and planners
  - Information about the existence of Eco Stabling and what it meant for them
- Provide tools for the teammanagers of train drivers to help with communication
  - Discussions during their two-weekly meetings
  - Provided them with data from the dashboard

Challenges during the pilot

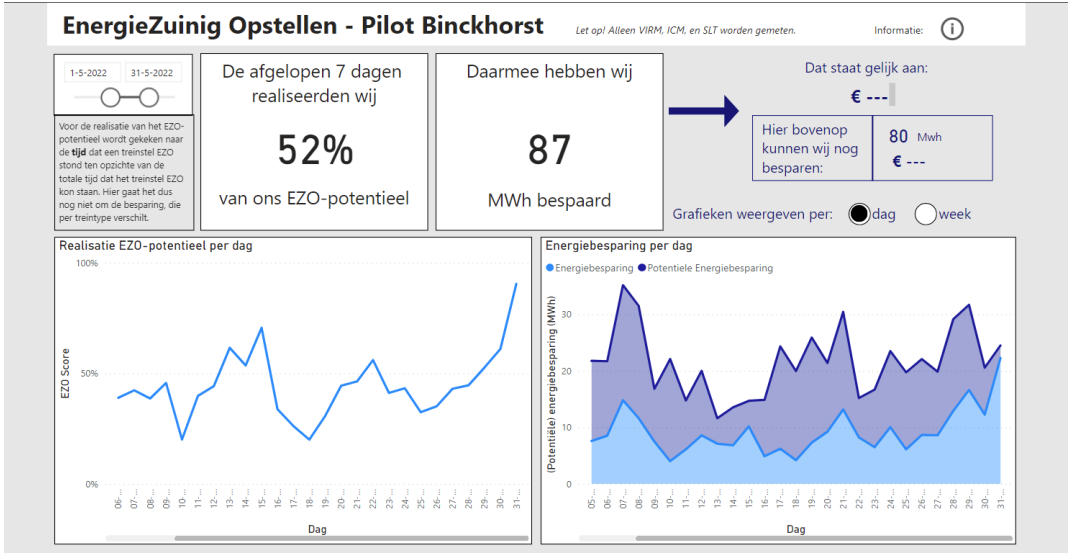
- Hard to reach and motivate the train drivers
- Not all planners knew about Eco Stabling
- Data was not complete

Results Pilot



Results Pilot

- Slight increase in realised potential from 40% to 52%
- Realised Eco stabling score of newer trains stable
  - Automatic Eco stabling mode
- Improvement in eco stabling score for older train types



Conclusion

- Not possible to tell if the results of the pilot are significant
  - Data is not complete
  - Restrictions that prevent a train from being put in Eco stabling mode are not included in data
  - External temperature affects Eco stabling potential
- Not always clear for train drivers when certain restrictions are active
  - They sometimes decide themselves when to put a train in Eco stabling mode
- A user friendly dashboard helps the teammanagers with steering
- Skeptical attitude towards Eco stabling due to previous projects

Recommendations

- To improve the Dashboard
  - Add the daily active restrictions to the data
  - Add all the train types to the data

- For the train drivers
  - Train always has to be put away in Eco stabling mode, unless you hear otherwise!
  - Use concrete data to motivate the train drivers

- For the teammanagers
  - A user friendly dashboard to monitor Eco stabling and to communicate with the train drivers
  - Keep actively encouraging ECO stabling

- Integrate the planners in the Eco stabling proces

3. Improved monitoring

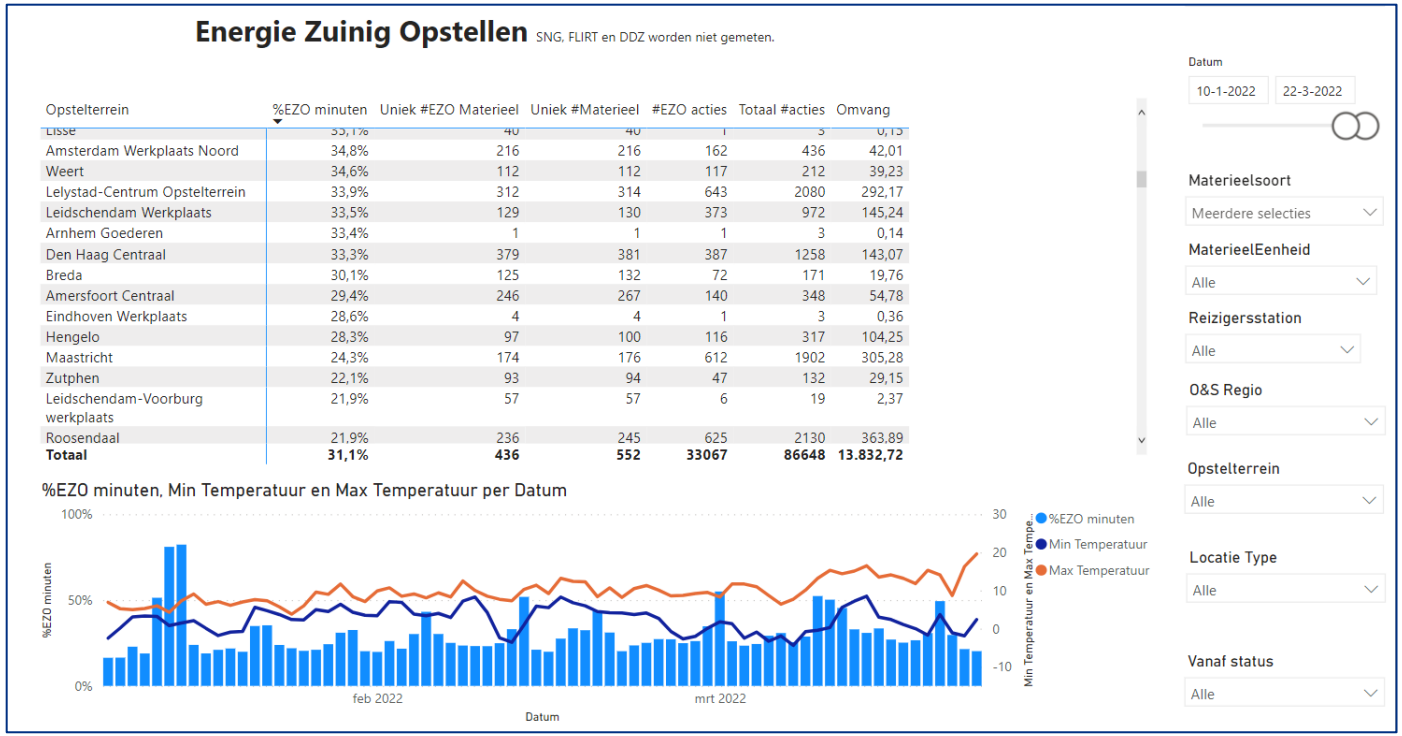
Sabine Mooij

3. Improved monitoring

- Challenge: available and reliable data
  - Data about eco stabling performance in practice was collected in an app by a few eco-stabling ambassadors
  - Only a few locations were covered
  - The number of measurements was too low to be statistically significant
  - App was not supported anymore

- Actions to improve monitoring
  - Using measured data from the train
  - Calculating the potential eco stabling time
  - [Calculating the potential eco stabling energy savings]
  - Data experiment with sensor data

Concept EZO monitor



- ORBIT data
- Insight per location
- Validation needed in practice
- Only monitors whether train is in doze mode or not
- Represents 60% of total fleet, because data not available for all types of rolling stock

4. Data experiment

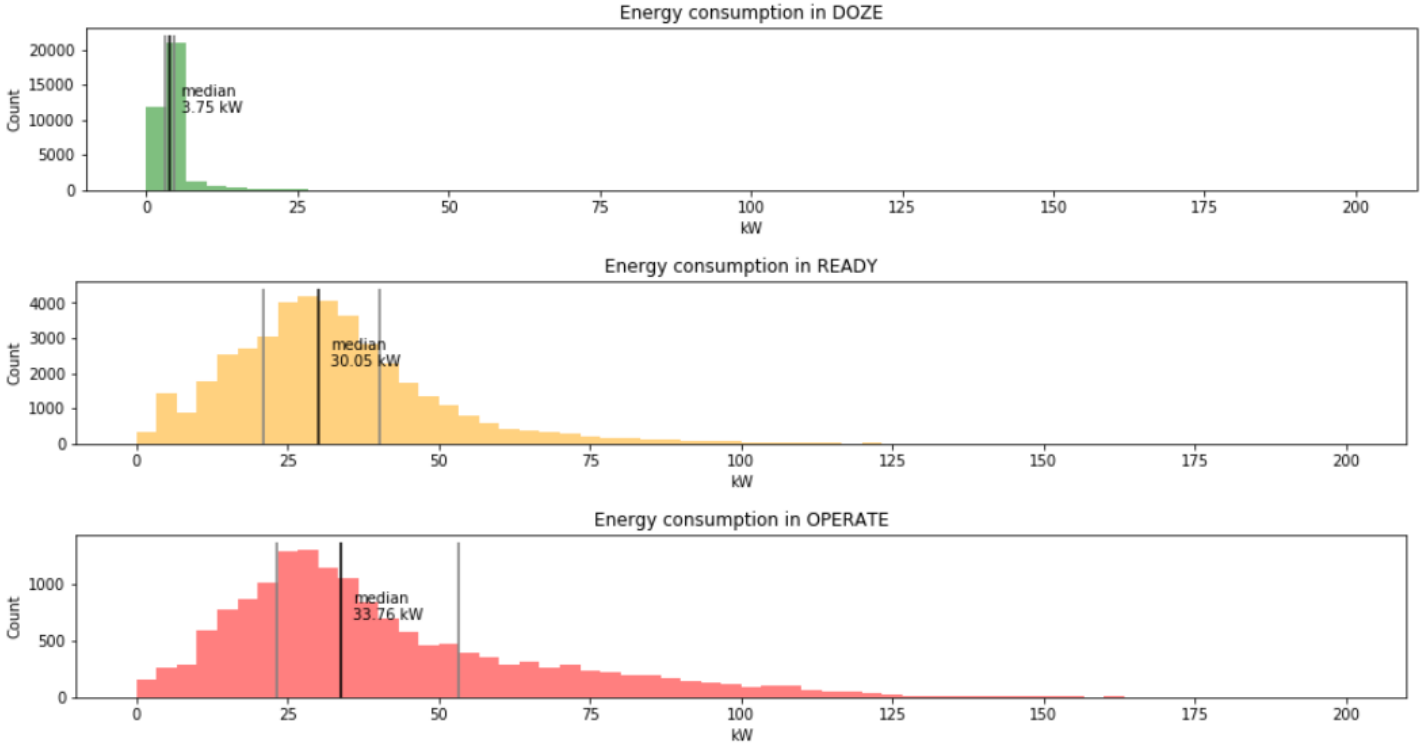
Inge Kalsbeek

Data experiment

- Goal: find out whether sensor data is useful to:
  - measure whether a train meets the 3 eco stabling criteria
  - analyse for energy savings during stabling

- Results:
  - Data at the moment is only suitable to monitor whether a train is in doze mode
  - Potential energy savings:
    - Switch actively to doze mode (annual savings up to 638 MWh)
    - Unnecessary auxiliary consumption in AC/DC

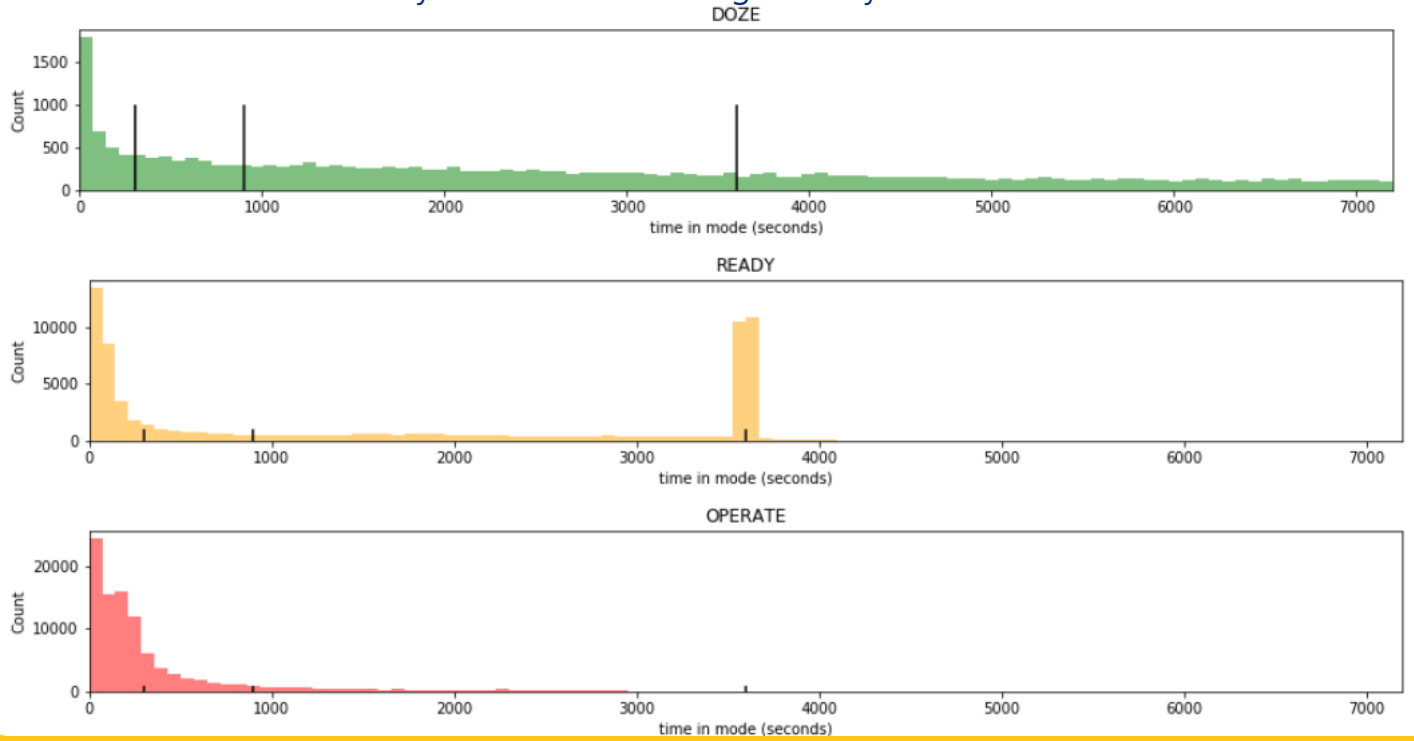
Energy consumption per mode



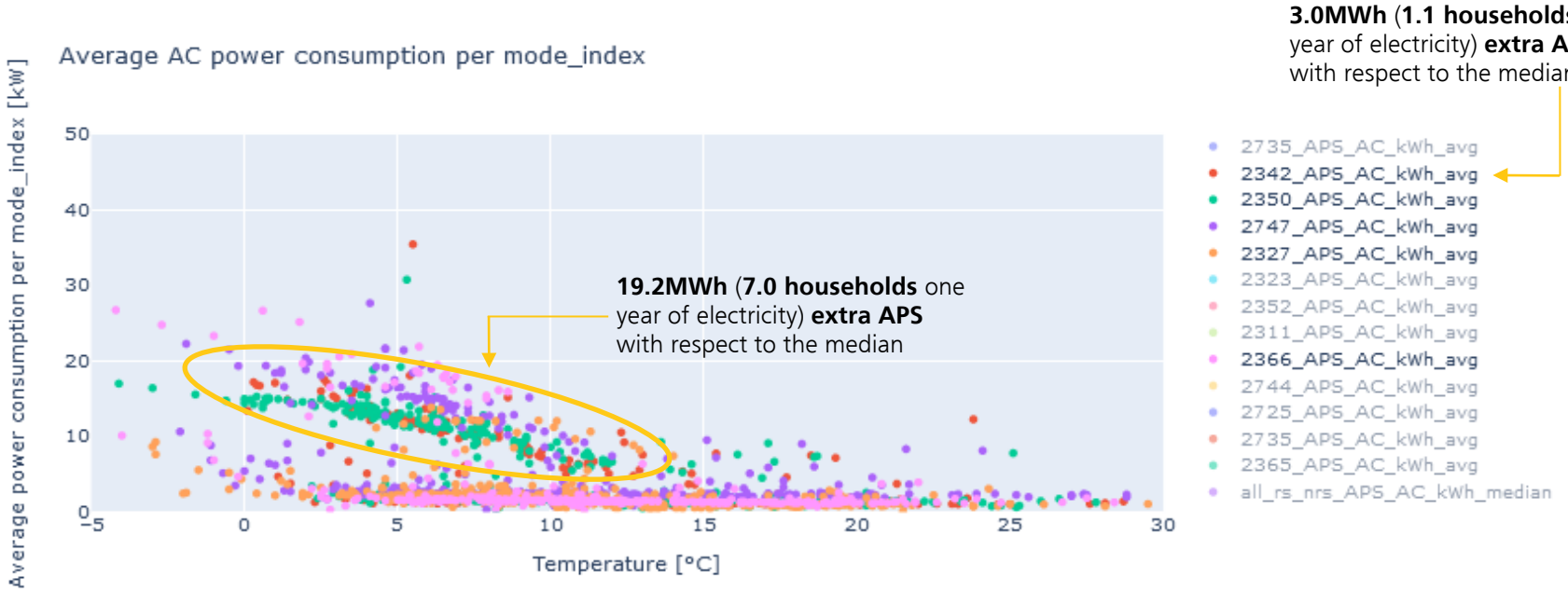
* Period: 2021-01-01 until 2021-06-30

Time spend in train mode (during stabling)

- 76% of train turns automatically in doze mode after exactly 60 minutes
- ±27kW could be saved every hour when turning directly to doze mode

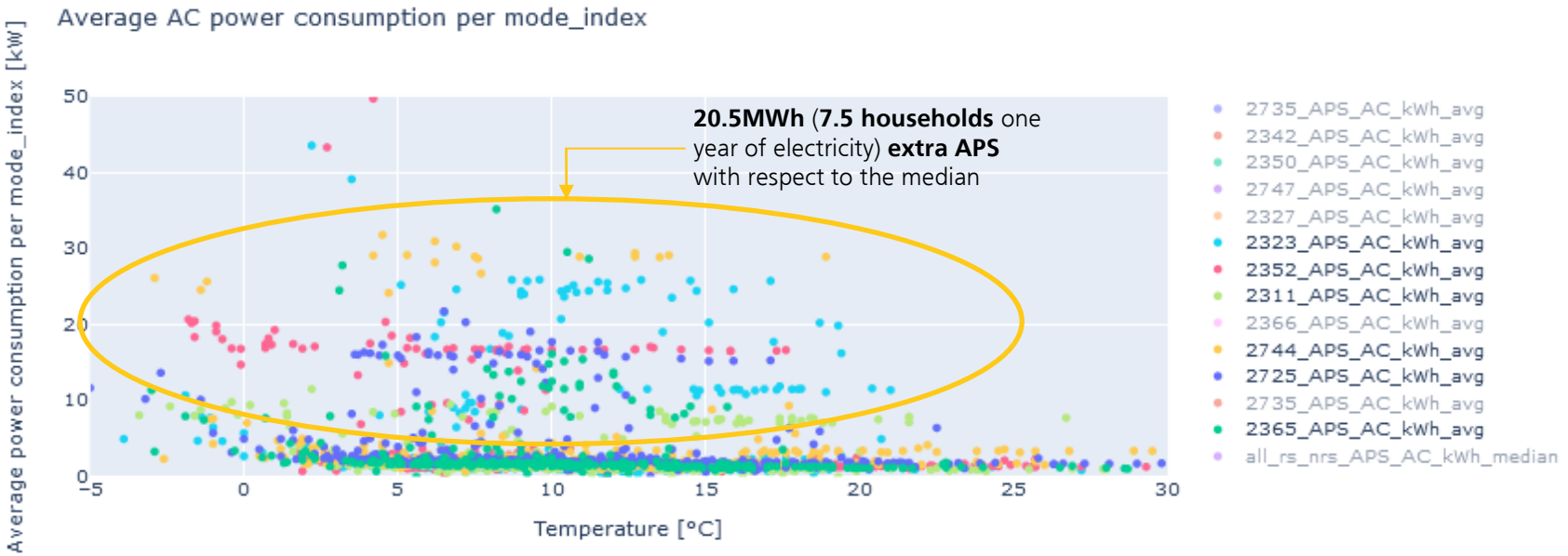


AC energy usage vs temperature – defect detection



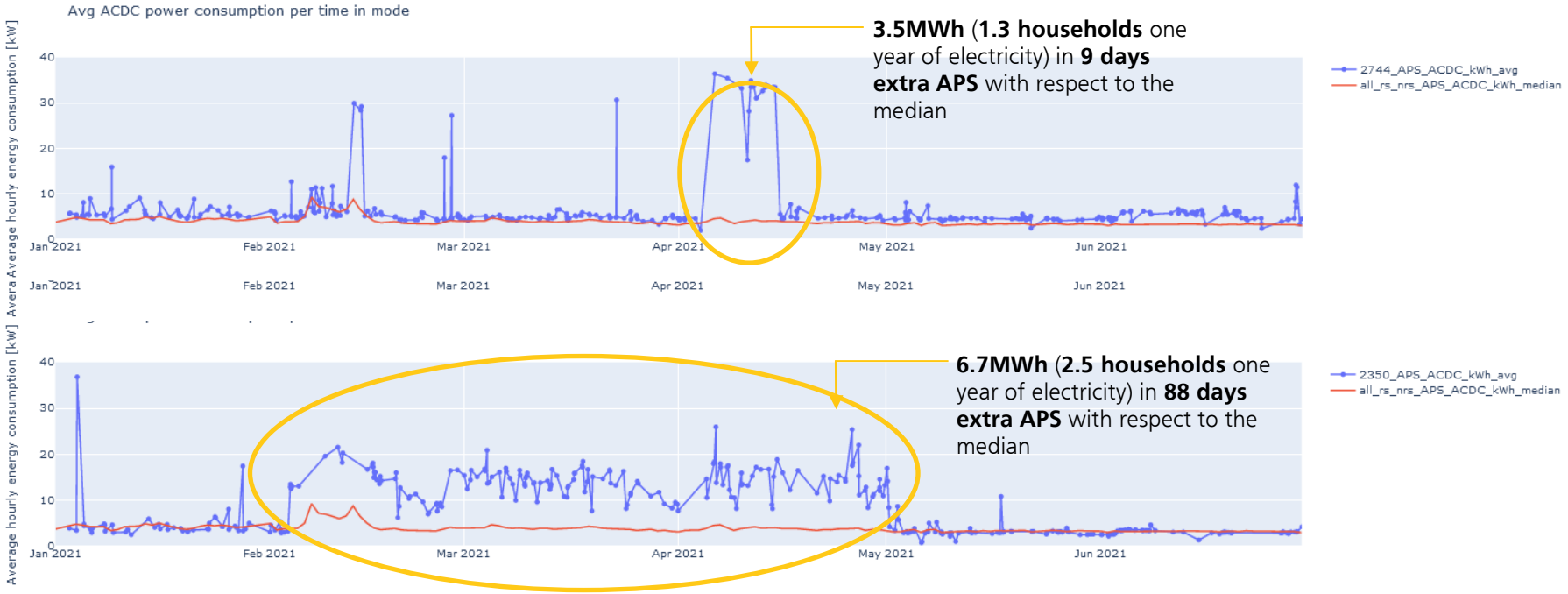
- 5 trains with increased energy consumption (19.2MWh) at lower temperatures
- Potential energy savings?

AC energy usage vs temperature – defect detection



- 5 trains with increased energy consumption (19.2MWh) at lower temperatures (heating defect?)
- 6 trains with a constant high energy consumption (20.5MWh) over different temperatures

AC/DC deviation from median energy usage – defect detection



- At least 2 trains with suddenly increased energy consumption (10.2MWh, 3.8 households).

5. Development of an automated solution

Sabine Mooij

Development of an automated solution

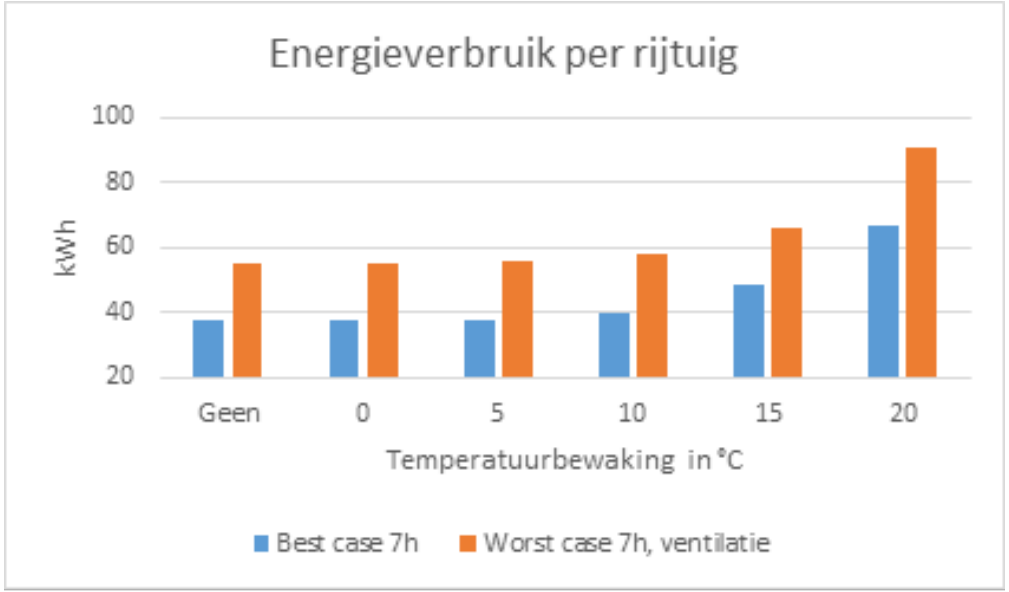
- Challenge: what is the integral optimal technical solution for eco-stabling?
  - Modern trains turn automatically to doze mode after 1 hour
  - Modern trains have a hold temperature, at different levels
  - No automated pre heating or cooling function

- Trade off between:
  - Energy consumption
  - Comfort temperature at start service
  - Noise impact
  - Power and dimensions climate system
  - Catenary power demand limits

- On the follow slides some preliminary results of this study

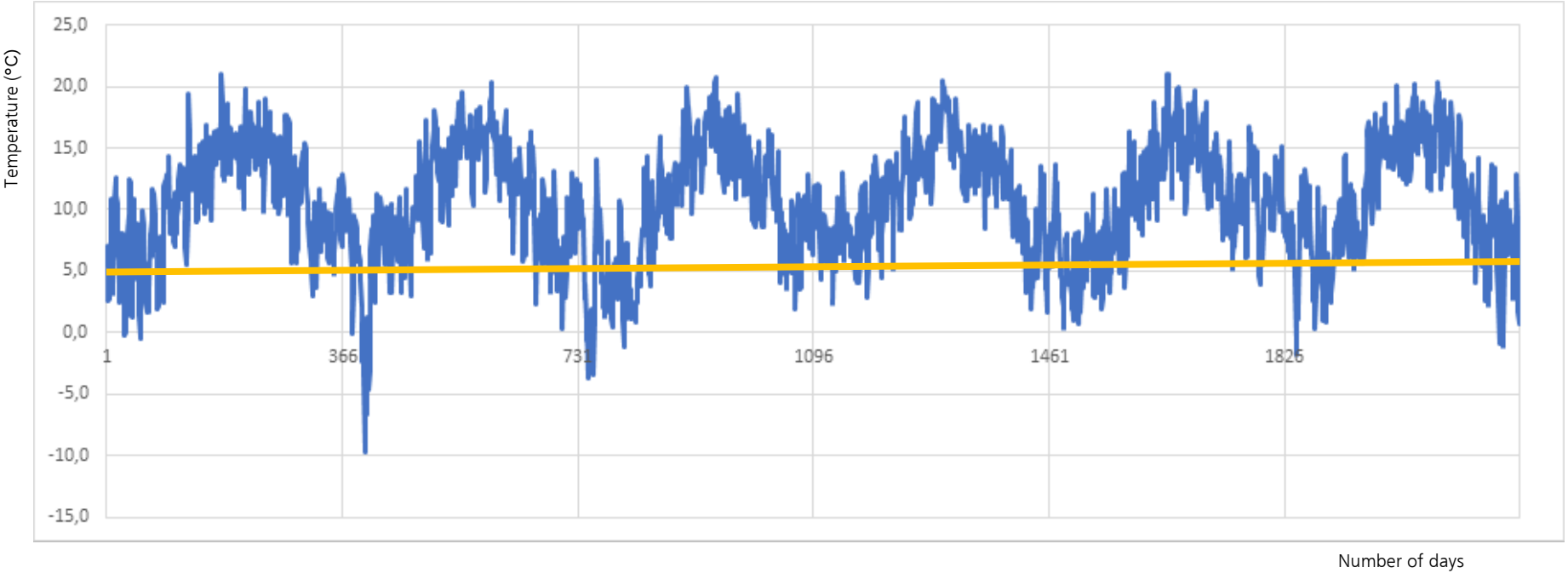
Energy consumption

- With a hold temperature of 5 degrees or below or no hold temperature, there is no significant decrease in energy consumption



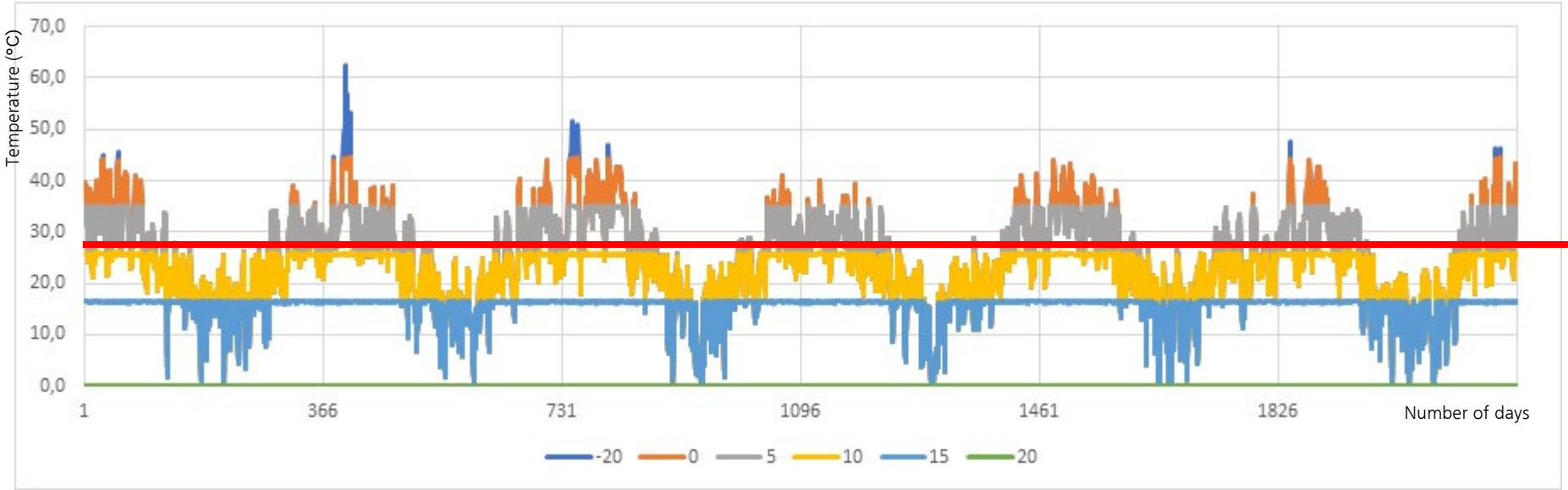
Minimal inside temperature

- The number of days temperature drops below 5 degree during 7 hours of stabling are limited



Pre heating times

- With a hold temperature of 10 degrees, pre heating times never exceed 26 minutes
- However, for modern trains this time is longer, because of less heating power



Summary

The potential for energy saving with eco stabling is still there

The last 2 years we were working on 3 challenges to cash the energy saving potential:

- Finding the right commitment in the organisation
- Improving monitoring tools
- Analysing for developing an automated solution

We are making progress on the improvement of monitoring tools

Next year we expect a break through in organisational commitment

We continu working on finding a business case for an automated solution

INTERNATIONAL UNION
OF RAILWAYS

Tour de table

Questions

Discussion

Thank you for your attention.

INTERNATIONAL UNION
OF RAILWAYS

Questions
Discussion

Thank you for your attention.

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Stay in touch with UIC:

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Medias to be made available on the event page
https://uic.org/events/eco-stabling
And forthcoming Sustainability online library
Opt-in P767

Thank you for your attention.