



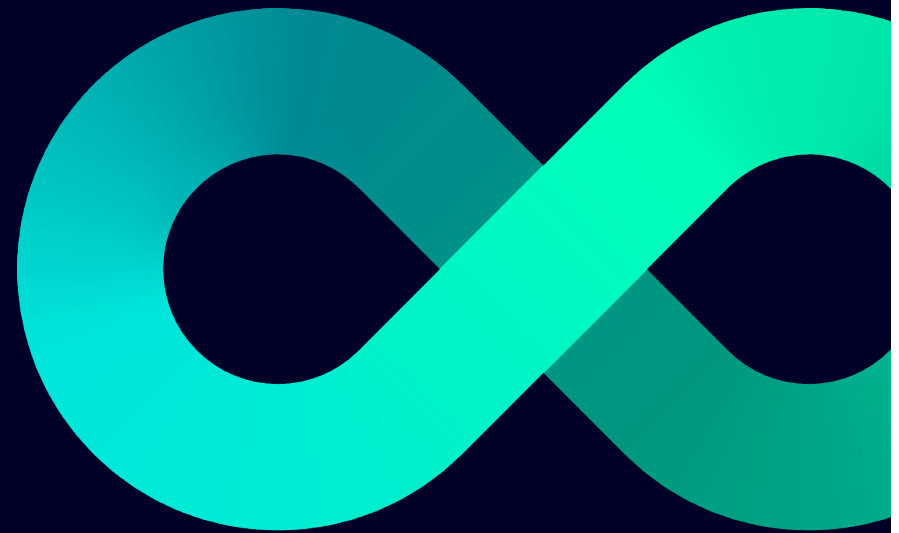
# Connected Train Operation Next Level

Using the example of the digital S-Bahn Hamburg



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# Digital S-Bahn Hamburg 2.0

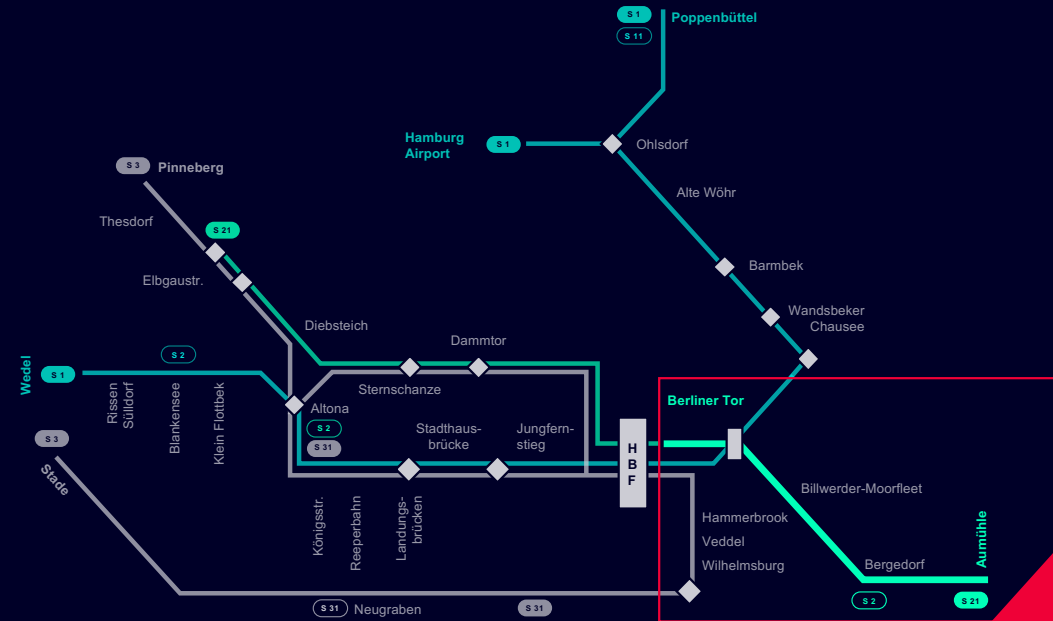
Highly automated rail operations enable energy optimization

## Interplay of technologies

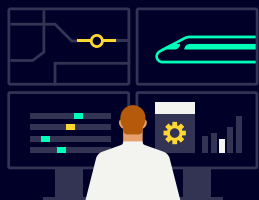
**ATO over ETCS:** Precise and automated train control + increased safety and optimized capacity

**TPS Live:** Use of real-time data for dynamic timetable adjustment and resource optimization

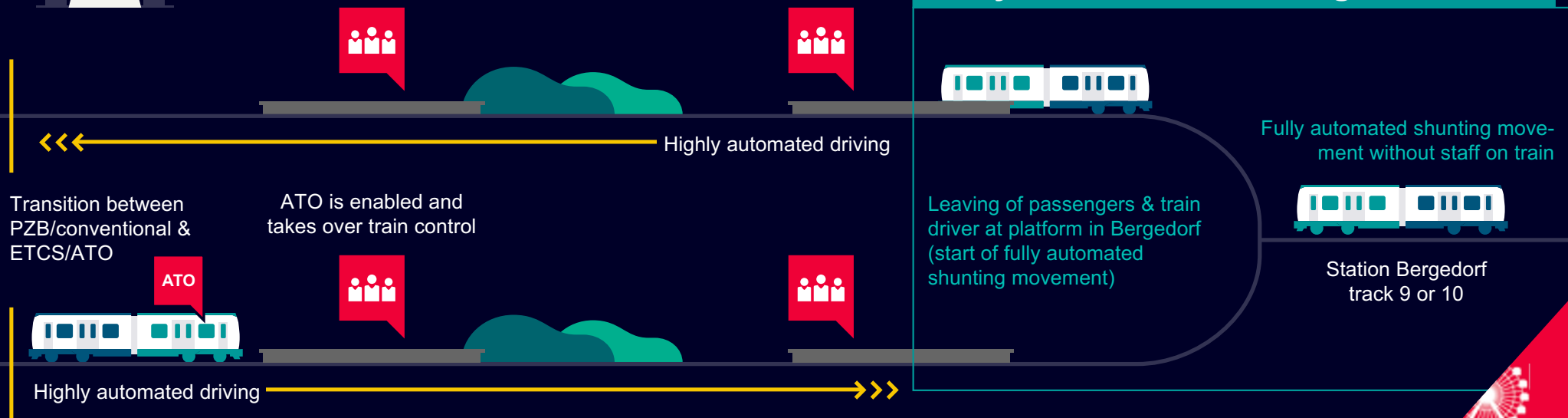
**Sidytrac:** Monitor forecasts and predict energetical conflicts



# In the „Digital S-Bahn Hamburg“ project the applications highly automated driving and fully automated shunting movement are realized

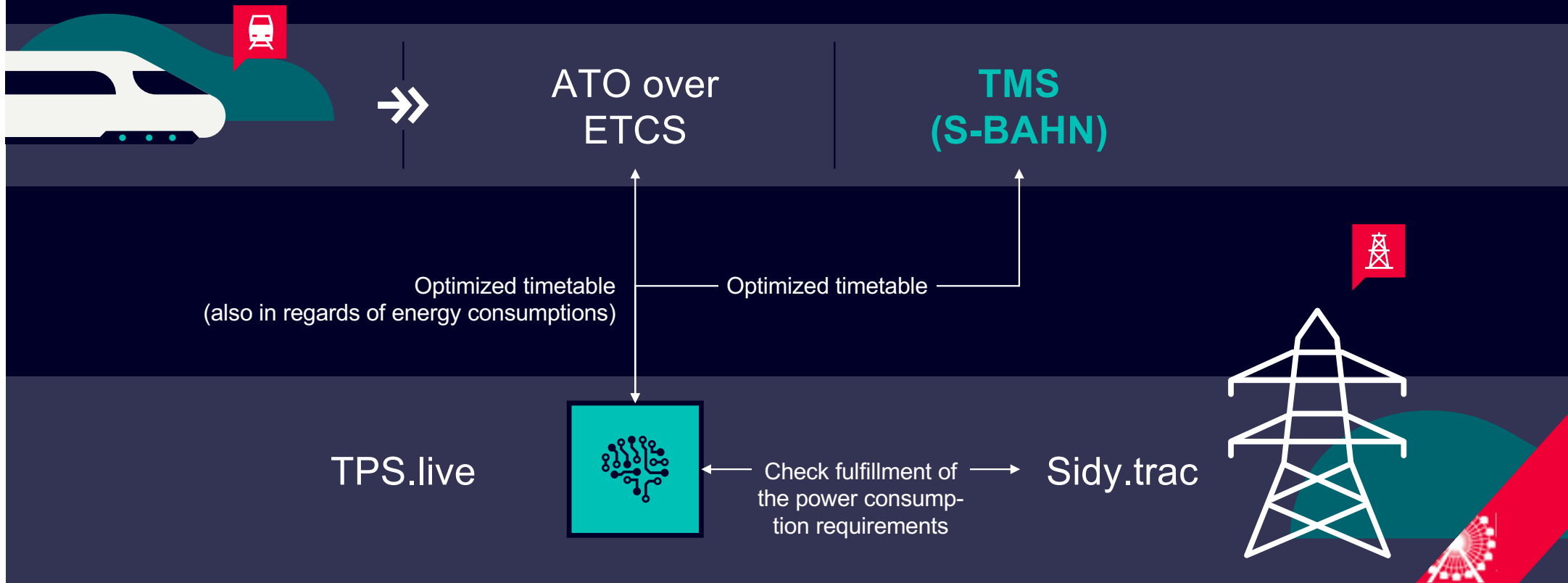


**Traffic Management System**



# Digital S-Bahn Hamburg 2.0

## Interplay of technologies



## TPS.live as the foundation for automation and energy efficiency

As a networkwide operating system, TPS.live delivers to ATO coordinated timings to increase punctuality and in addition save energy



Standardized interfaces



Networkwide coordinated real-time calculation for ATO



Additional energy savings with an energy optimized timetable



TPS.live



**SIEMENS**

# Sitras Sidy.trac Live Connected systems

## Digital Twin

as a physical model – Process coupling to driving operation and power supply

## Electrical network (SCADA – via control technology or emulation)

- Input of current electrical system status
- Protection parameters, limit values



## Driving operation (timetables, signaling)

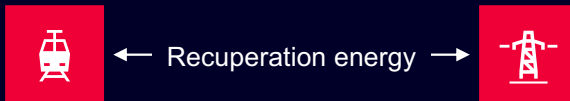
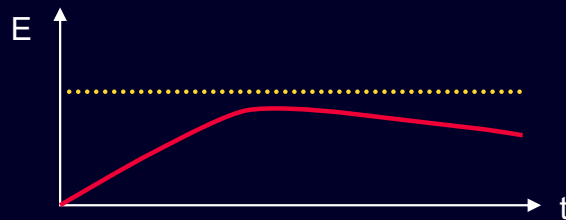
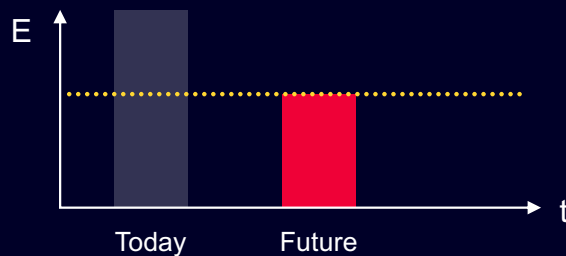
- Current situation, driving orders
- Real-time timetable adjustments

## Dashboard

- System behavior
- Power supply, driving operation live or as preview

## Digital S-Bahn Hamburg

### Energy optimized operation



In conjunction with **automated driving**, we are reducing the **overall energy consumption** of train operations.

Thanks to the **intelligent operations control system**, we can control trains precisely so that we avoid **peak loads in power consumption**. This means that less energy needs to be fed into the grid.

As part of a study, we are creating a simulation that quantifies the potential to use inverters for feeding energy back into the public power grid and enables the implementation.



Sidytrac

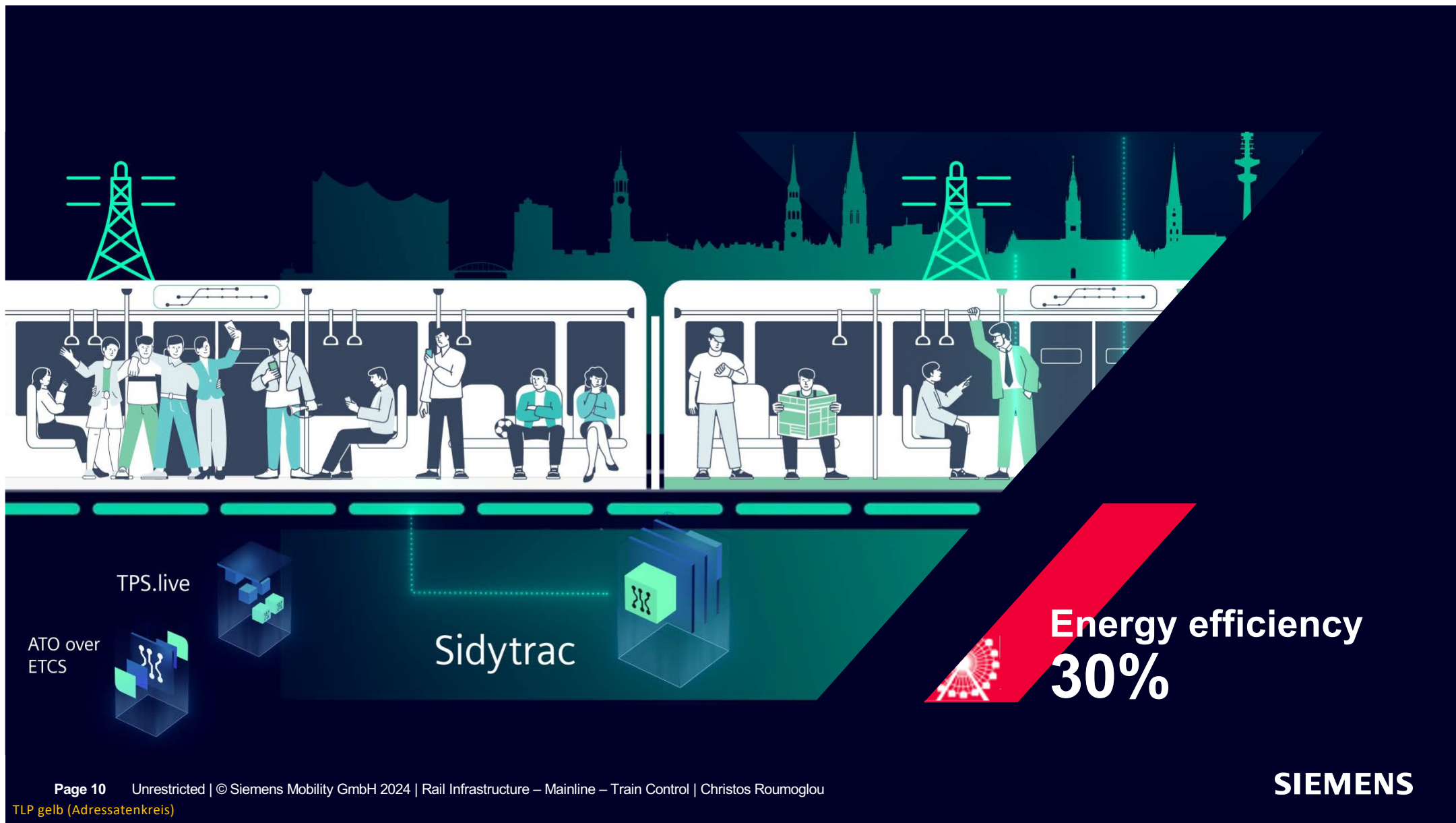
TPS.live

ATO over ETCS

Capacity increase  
**30%**







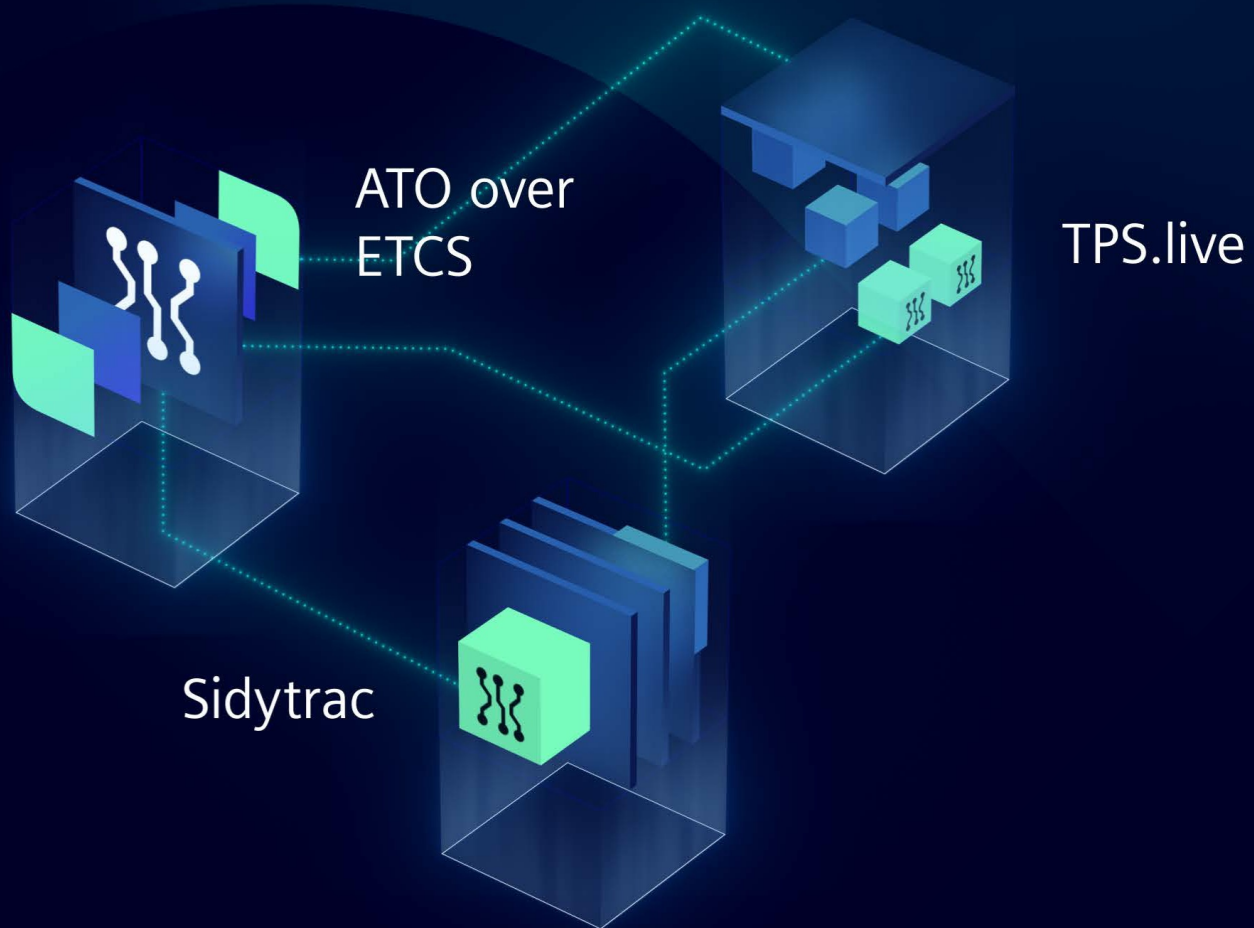
TPS.live

ATO over ETCS

Sidytrac

**Energy efficiency  
30%**

**SIEMENS**







# Thank you for your attention!

