



Energy savings with ERTMS Level 3

EBI Drive 50

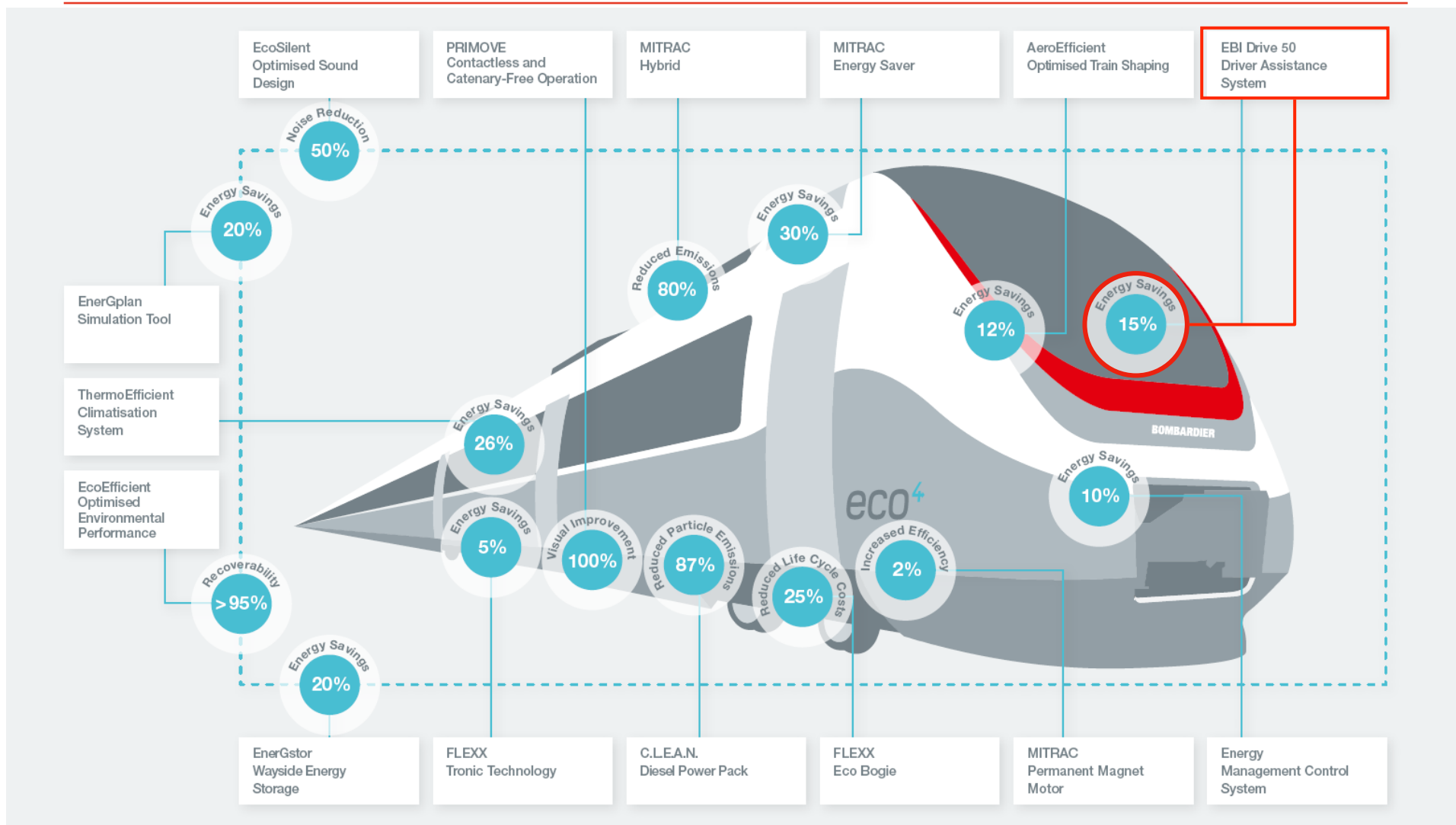
Driver Assistance System

ERES Customer Forum 2011 “Energy Efficiency – Smart Metering & Billing”

16 June 2011 – Brussels

BOMBARDIER

eco⁴ - a strong portfolio of technologies and solutions



What is ERTMS/ETCS Level 3

- **Train detection and track occupancy is based on train length and position report from train.**
- **Train integrity is ensured within the train**
- **Route locking and route release is virtual and handled within the Interlocking/RBC**

- **Level 3 opens for the possibility to manage “Moving Block”**

Moving and flexible block

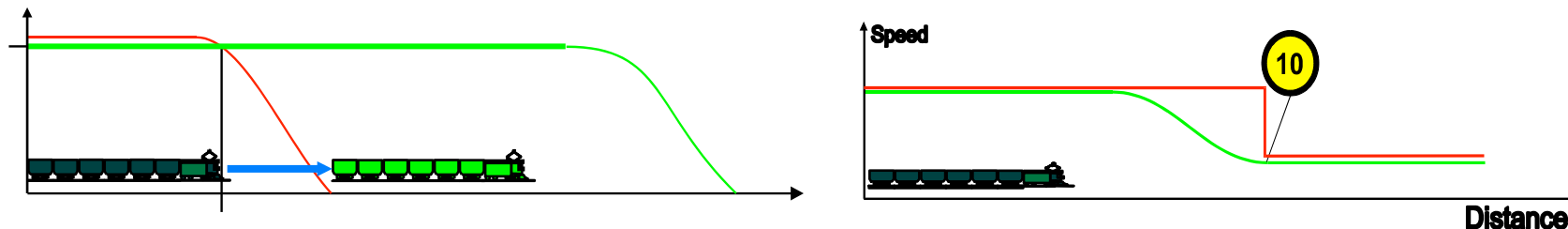
Compared to fixed block systems,



moving and flexible block gives more efficient traffic,



adaptability, and thereby saves energy.



Moving and flexible block

Cars at high speed keeps a longer distance,



than what they do at low speed,



or when stopping at a red light.



Imagine the throughput in a city, if cars at a red light would stop maintaining the same distance they have at high speed.

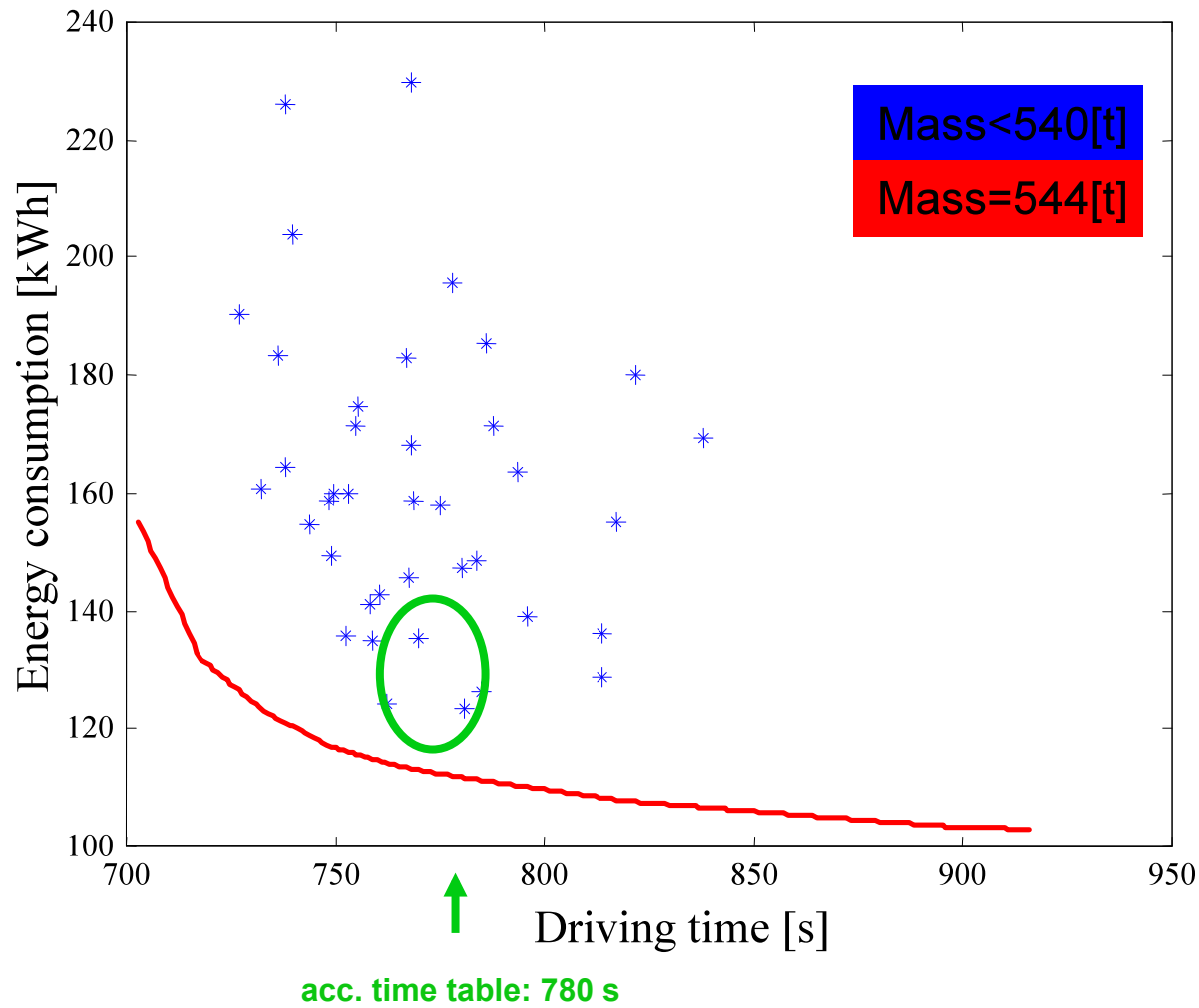


That is how traffic is controlled in a fixed block system

ERTMS Level 3 - Conclusions

- **With moving block**
 - Traffic capacity can be increased
 - Each train is controlled to its best ability not according to the longest train or with worst breakability.
- **Energy consumption is reduced**
 - Trains can fleet at breaking distance, less stop and start
- **Wear and tear on brakes, wheel and track is reduced**
 - Less breaking to stop
 - Stop and start at arbitrary positions

EbiDrive 50 - Energy consumption of different drivers



Blue: measurements, same track, same train, same time table; but different drivers

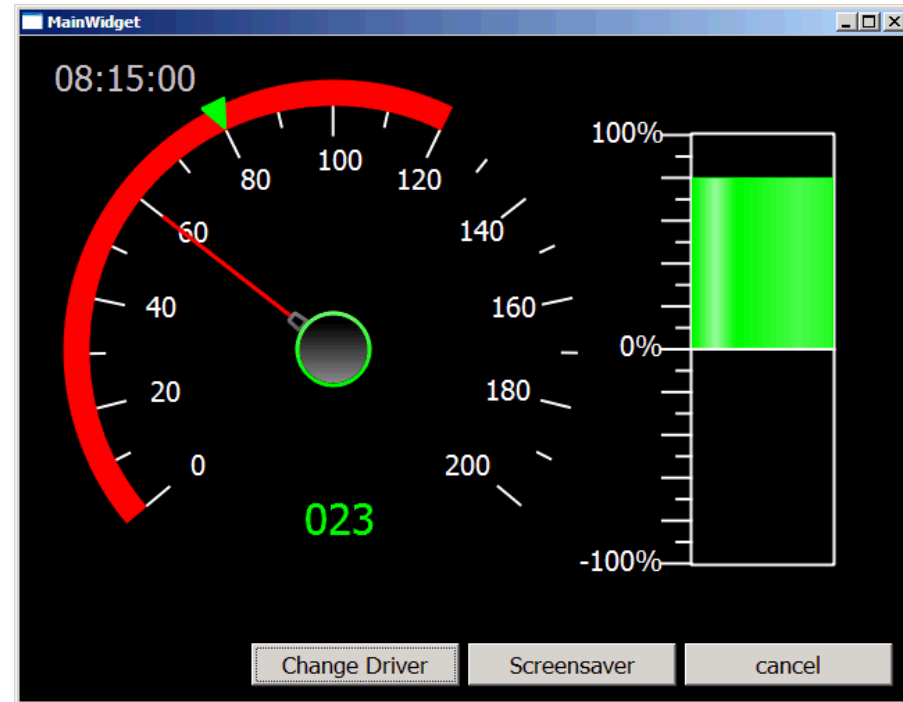
Red: simulation with EBI Drive 50 algorithm

Green: expected variation when following EBI Drive 50 recommendations

EBI Drive 50 helps to make use of the full technical potential of trains.

EbiDrive 50 - The Principle

- **Ebi Drive calculates energy-optimized driving profiles based on:**
 - Time tables and track data
 - Speed restrictions
 - Train data
- **Actual position, speed and deviations from the time table are considered at any time**
- **Ebi Drive recommends**
 - traction force
 - speed
- **With this Ebi Drive positively influences the driver's driving style**



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→ **Trains arrive** **a) in time**
 b) with minimum energy consumption

EBI Drive 50 – Upptåget

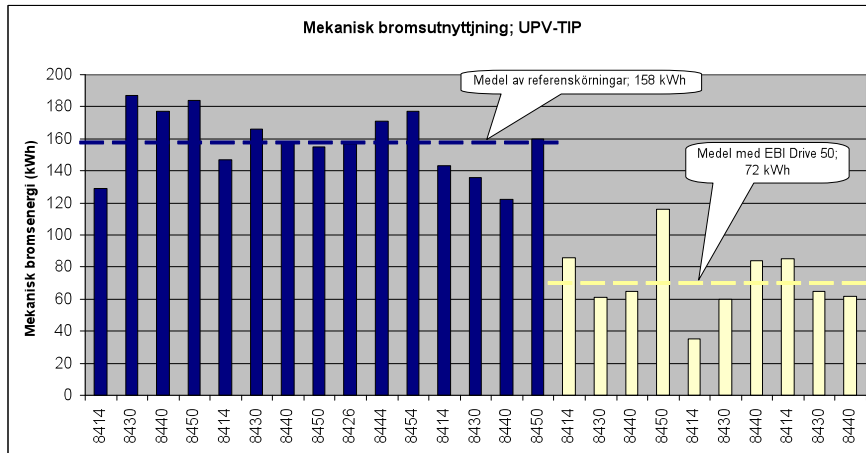
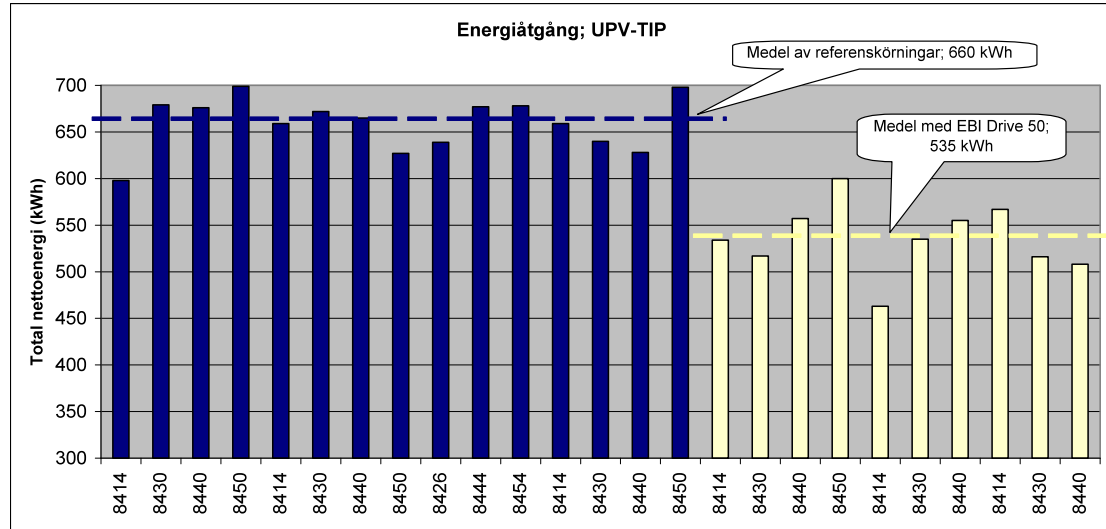
- **Autumn 2009**
 - Test on Upptåget between Upplands Väsby and Tierp in ordinary traffic
 - 31 reference runs without EBI Drive 50
 - 21 runs with EBI Drive 50
- **Track length:** 107 km
- **Run time:** 1h 5min
- **Test train:** 2-car Regina



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SJ test results

16-17% energy saving, 50% mech brake energy reduction



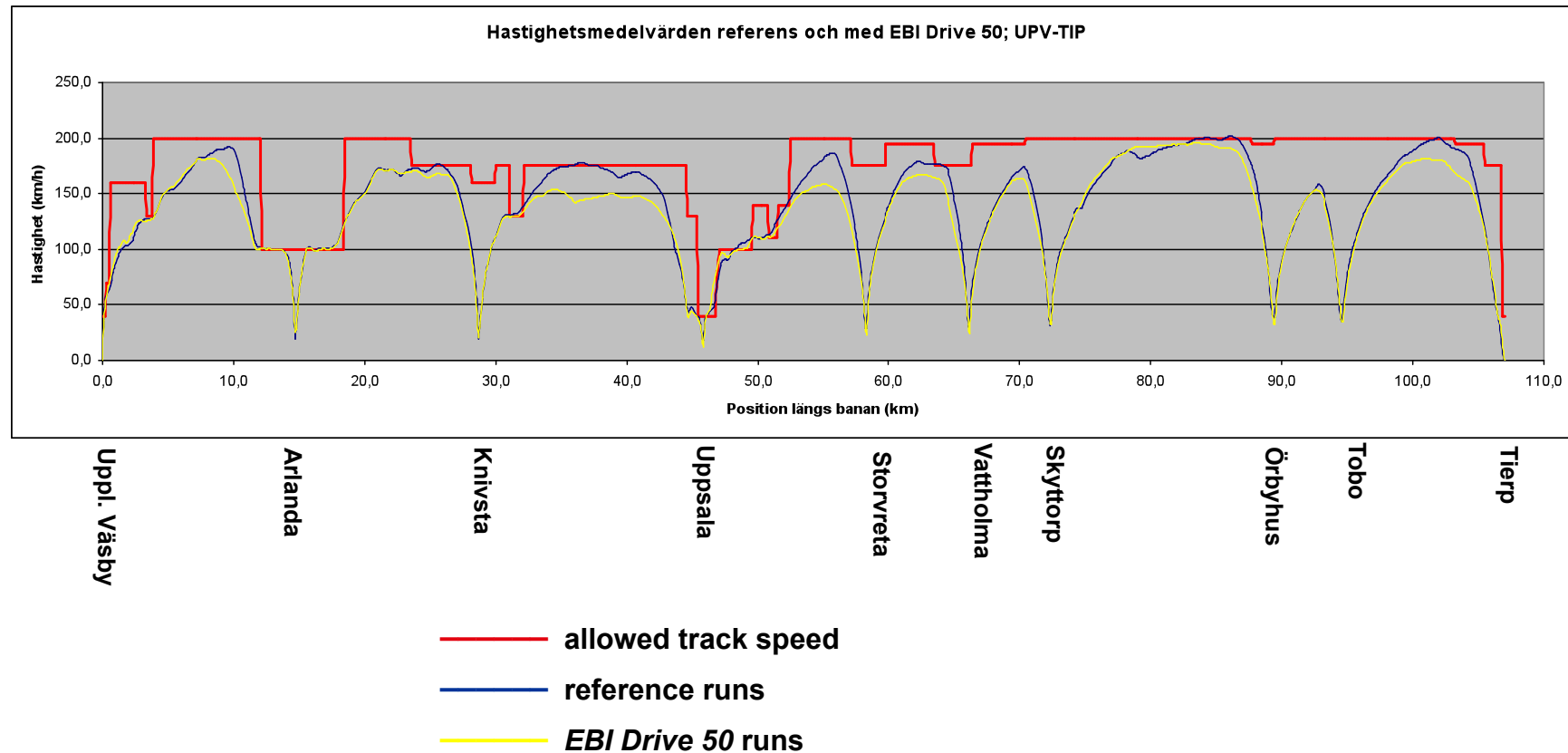
Reference runs
4 days between 13/8 – 10/9

EBI Drive 50 runs
15-17/9



Track speeds

Lower top speed using the *EBI Drive 50*



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EBI Drive 50 - References

- Campaigns for customers in Denmark, England, Finland, France, Germany, Sweden and Switzerland have shown energy savings in the range of 15%
- End 2012 EBI Drive 50 will be delivered for the new BOMBARDIER TWINDEXX double deck trains of SBB



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Integration of Driving Style Manager with ETCS 3

- **Moving Block with Integrated DSM can save more energy**
 - Train performance can be optimised not only to position and time table but also to surrounding traffic, such as following train in front at breaking distance.
 - Control trains continuously while approaching meeting loops, to make trains arrive at optimum time (Golden run) not according to planned arrival.
 - Optimize all trains to the current situation and not to the planned.

Interested in Energy-efficient Driving?

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