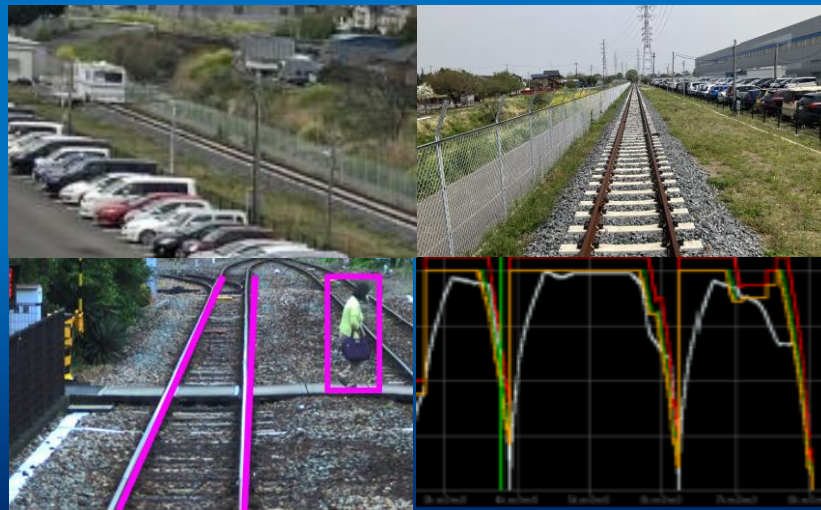


Remote Train Operation Control



Achieve remote operation to address driver shortages and reduce operating costs. Provide optimal automated driving solutions tailored to each line.

Challenges for Railway Operators

Measures to
Address Driver Shortages

Reduction of Operating Costs

Low-Cost Implementation
of Automated Driving

Optimal Automated Driving Method Selection Based on Line Characteristics

Remote Train Operation Control

For Urban Areas

GOA3

Automated Yard Transfer
Using CBTC

For Rural and Low-
Density Lines

GOA2.5

Mainline Automated Driving
Using ATS and LTE

Remote Train Operation Control

NIPPON SIGNAL

Introducing remote operation control enables cross-department centralized monitoring, contributing to smooth operations.

Introduction of Remote Train Operation Control

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graph TD; A[Introduction of Remote Train Operation Control] --> B[Centralized Monitoring at Vehicle Offices and Control Centers]; B --> C[Cost Reduction for On-Site Inspections]; B --> D[Immediate Issue Sharing Between Departments]; D --> E[Rapid Recovery from Operational Disruptions];
```

**Centralized Monitoring
at Vehicle Offices and Control Centers**

**Cost Reduction
for On-Site
Inspections**

**Immediate Issue Sharing
Between Departments**

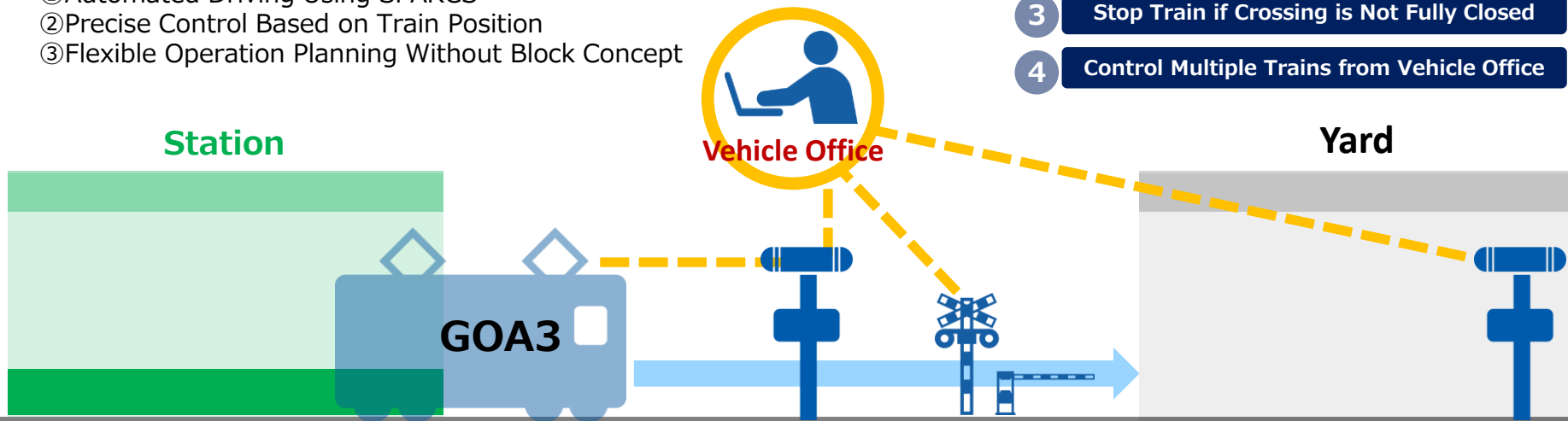
Rapid Recovery from Operational Disruptions

For urban railway operators, achieve labor savings through DX-based automated yard transfer. Automated yard transfer can be introduced ahead while keeping current system on mainline unchanged.

Automated Yard Transfer Using CBTC

- ① Automated Driving Using SPARCS
- ② Precise Control Based on Train Position
- ③ Flexible Operation Planning Without Block Concept

- 1 Wireless Control of Level Crossings
- 2 Control Based on Speed
- 3 Stop Train if Crossing is Not Fully Closed
- 4 Control Multiple Trains from Vehicle Office



Automated Driving from Crew Change Station to Yard via Remote Control from Vehicle Office

Remote Train Operation Control

NIPPON SIGNAL

For rural and low-density lines, automated driving helps resolve driver shortages.

Mainline Automated Driving Using ATS and LTE

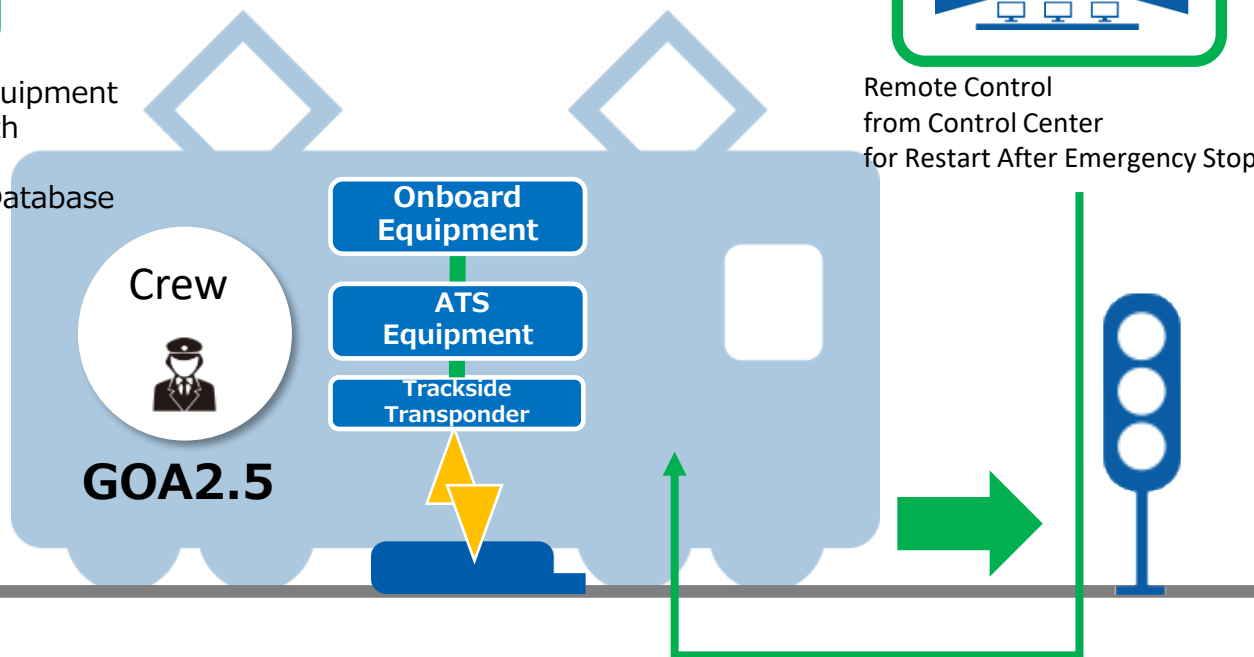
- ① Automated Driving Using Existing ATS Equipment
- ② Position Detection via Communication with Trackside Transponders
- ③ Driving Pattern Acquisition via Onboard Database

1

Reuse of Existing Equipment

2

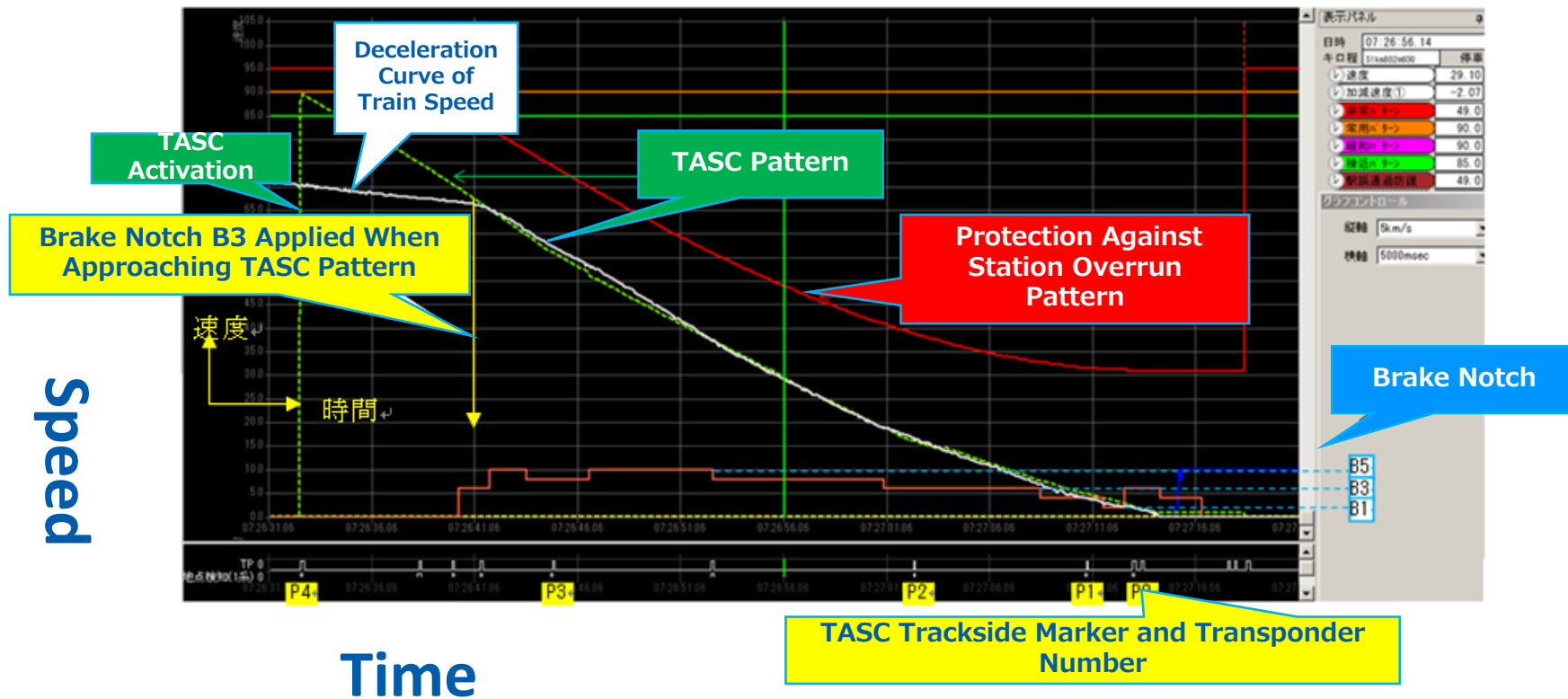
Reduced Installation Costs



Remote Train Operation Control

NIPPON SIGNAL

Our proprietary algorithm achieves high-precision train stop control (TASC).
Compatible with both all-electric command and electro-pneumatic brake systems.



Remote Train Operation Control

NIPPON SIGNAL

According to international standards, JIS E 3802 classifies as follows.

Conductor Attendant Driver

GOA 0

Manual Train Operation



No Automated Driving Installed

GOA 1

Non-Automated Train Operation



Driver Performs All Operations

GOA 2

Semi-Automated Train Operation



Driver Handles Door Operations and Departure;
System Operates Between Stations

※Note: The term GOA2.5 is conventionally used in Japan but is not yet officially defined.

GOA 3

Automated Train Operation with Attendant



Attendant Handles Door Operations Only

GOA 4

Automated Train Operation



Fully Unattended