The Danish Signalling Programme

National Roll-Out of ERTMS

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The Need for a modernised Signalling

In the early 2000s, a large part of Denmark's signals and interlockings systems were 40-60+ years old.

Ageing systems cause frequent failures and disruptions.

Signalling systems accounted for around 50% of all train delays.

Conclusions from a 2004 analysis:

- **Uneven safety levels**.
- **50 percent of all delays** related to signalling and interlockings systems.
- **Within 20 years, 60 percent** of the systems would be **obsolete**.

Reliability degradation was a direct consequence of obsolescence.

The Danish Strategy

In 2009, Danish parliament agreed on a migration of Denmark's entire national railway network (owned and managed by Banedanmark) to a Class A system based on ERTMS Level 2.

In 2011 and 2012 Banedanmark signed the following contracts:

- ERTMS Infrastructure East (including Traffic Management system): **Alstom**
- ERTMS Infrastructure West: **Thales-Strukton (now Hitachi-Strukton)**
- ERTMS Onboard fitment: **Alstom**
- CBTC: **Siemens**

Other projects:

- New operational rules (Banedanmark), Training (Banedanmark), STM (Siemens), GSM-R infrastructure (Nokia), GSM-R Cab Radio (Siemens), Fixed Transmission Network, 2 new Traffic Control Centers, Enterprise Service Bus (Netcompany)

BANEDANMARK

Migration of Banedanmark's network to 'ERTMS-only'

- Banedanmark is commissioning all lines with **ETCS Level 2**, removing trackside signals completely.
- The programme is now progressing well. Over **1100 route km commissioned**.
- The remaining **750 route km will be commissioned no later than 2033**.
- **Retrofitment of the white and yellow fleets** is expected to finish in 2026.

BANEDANMARK

2009

The **Green Transport Agreement**

2012

ERTMS contracts signed

2017

Political support for **revised roll-out strategy**

2018

First ERTMS line in **Western Denmark**

2019

First ERTMS line in **Eastern Denmark**

2020

100 vehicles fitted with ETCS

170 route km commissioned

2021

Original completion year in contracts

2022

200 trainsets fitted with ETCS

600 route km commissioned

2025

300 units fitted with ETCS

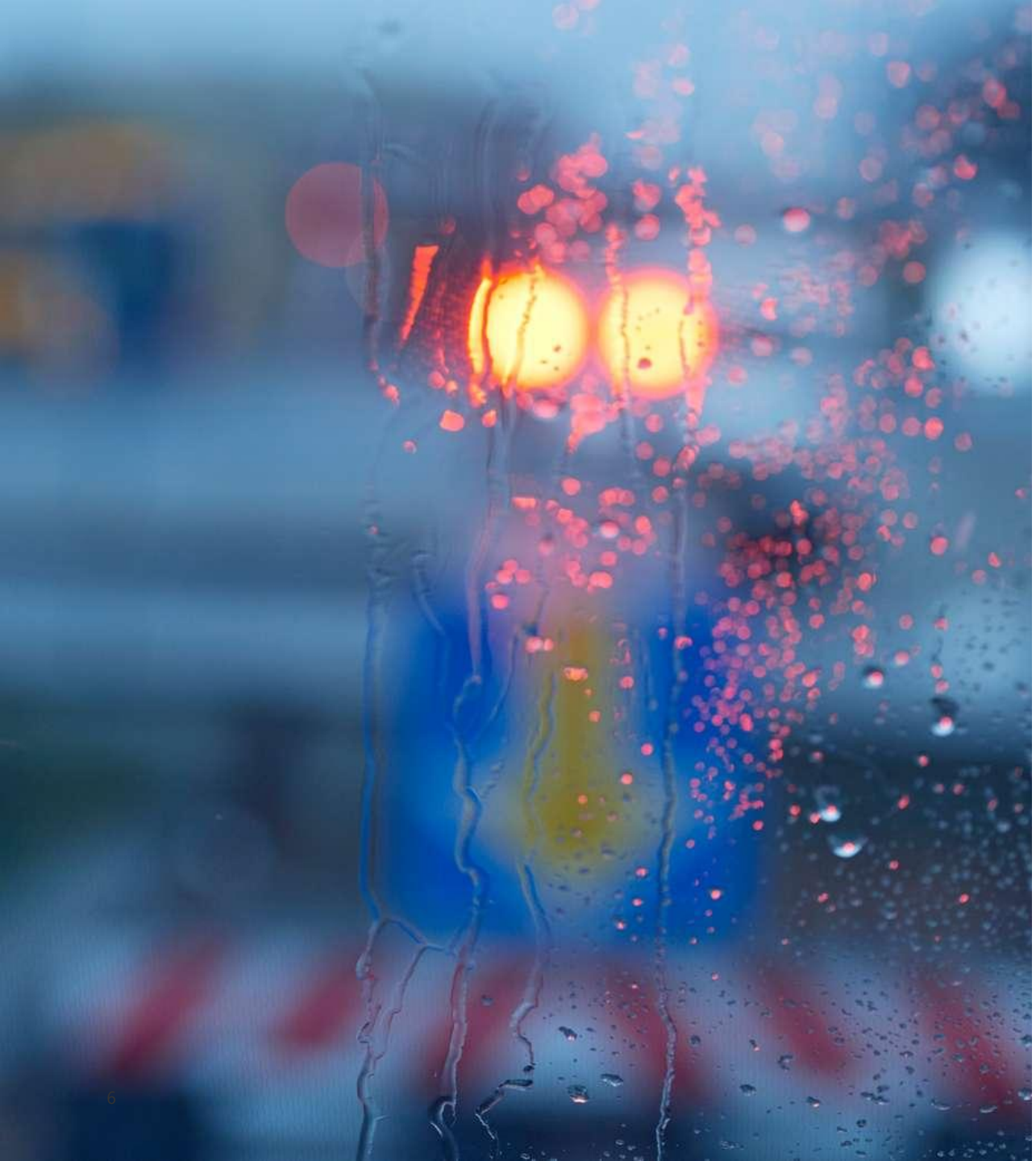
1100 route km commissioned

2027

Complete deployment in **Western Denmark** expected

2033

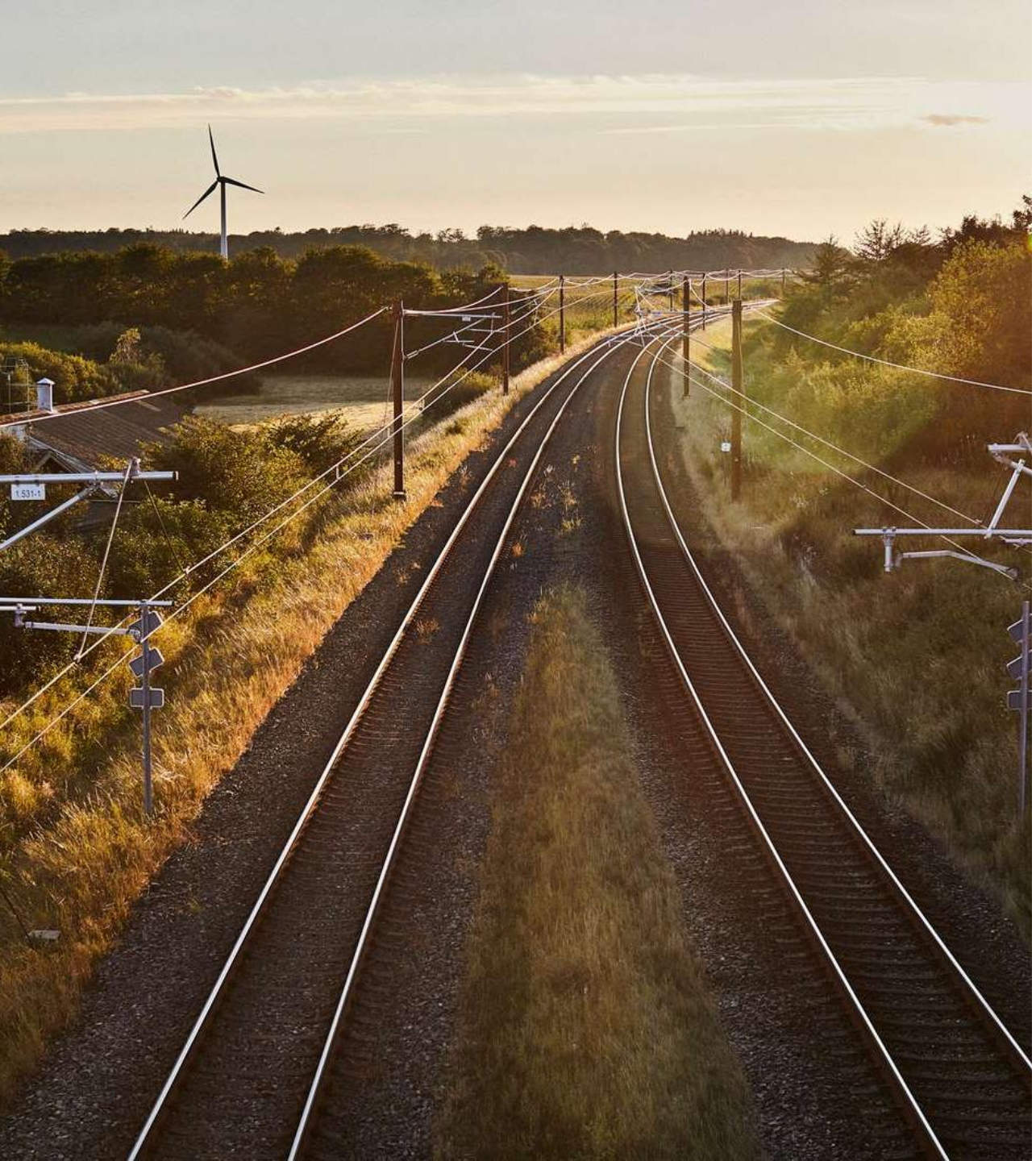
Complete deployment in **Eastern Denmark** expected



Design Phase

12 year to develop the systems to a danish context

- Maturity of the systems in a country wide context
- Adjusting the system to a Danish context and operational rules
- Experience is gained by putting things into service



Roll out Phase

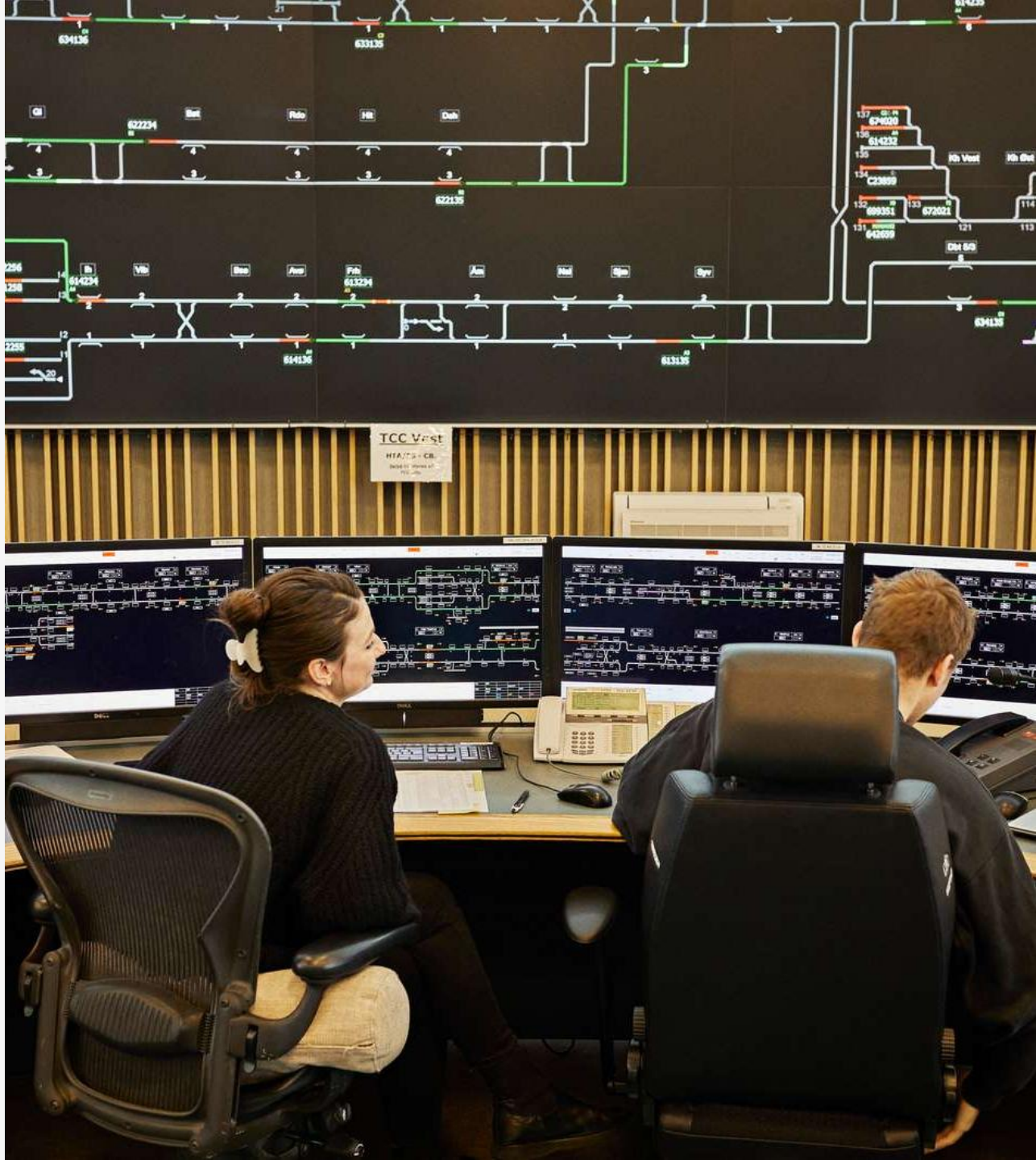
How well do you know your infrastructure and are you able to keep it stable?

- Implementation of ERTMS requires a high level of knowledge about the infrastructure – and the correctness of the infrastructure data is key.
- As the average project lengths are around 4-5 years, control of the evolution and change management is required.
- As other infrastructure projects are active at the same, data governance and processes is a must.

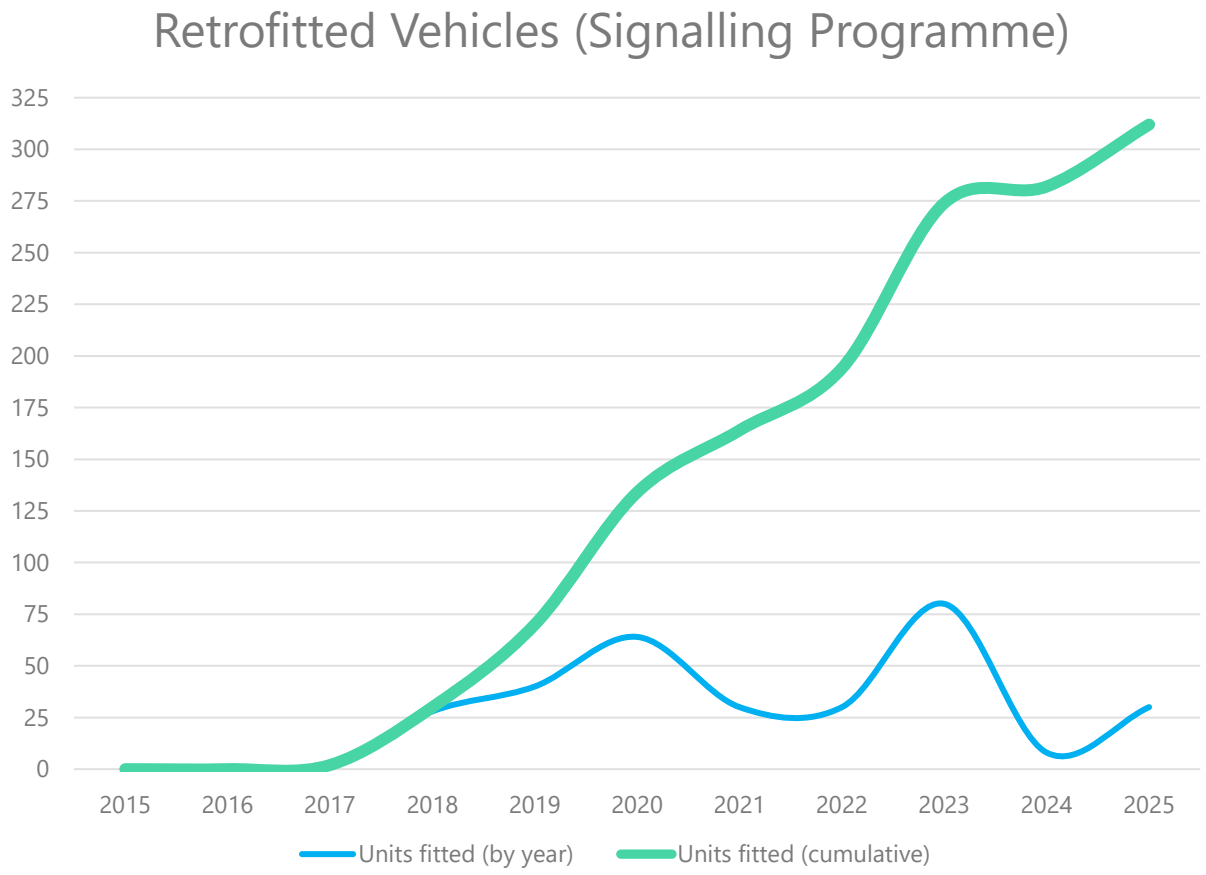
The Programme

How do you control all the prerequisites to put ONE line into operation?

- A range of different projects is required
- Planning across the programme is essential
- Organizational changes in all areas will need to be made
- Secure that you are ready for commercial operation (commissioning management)

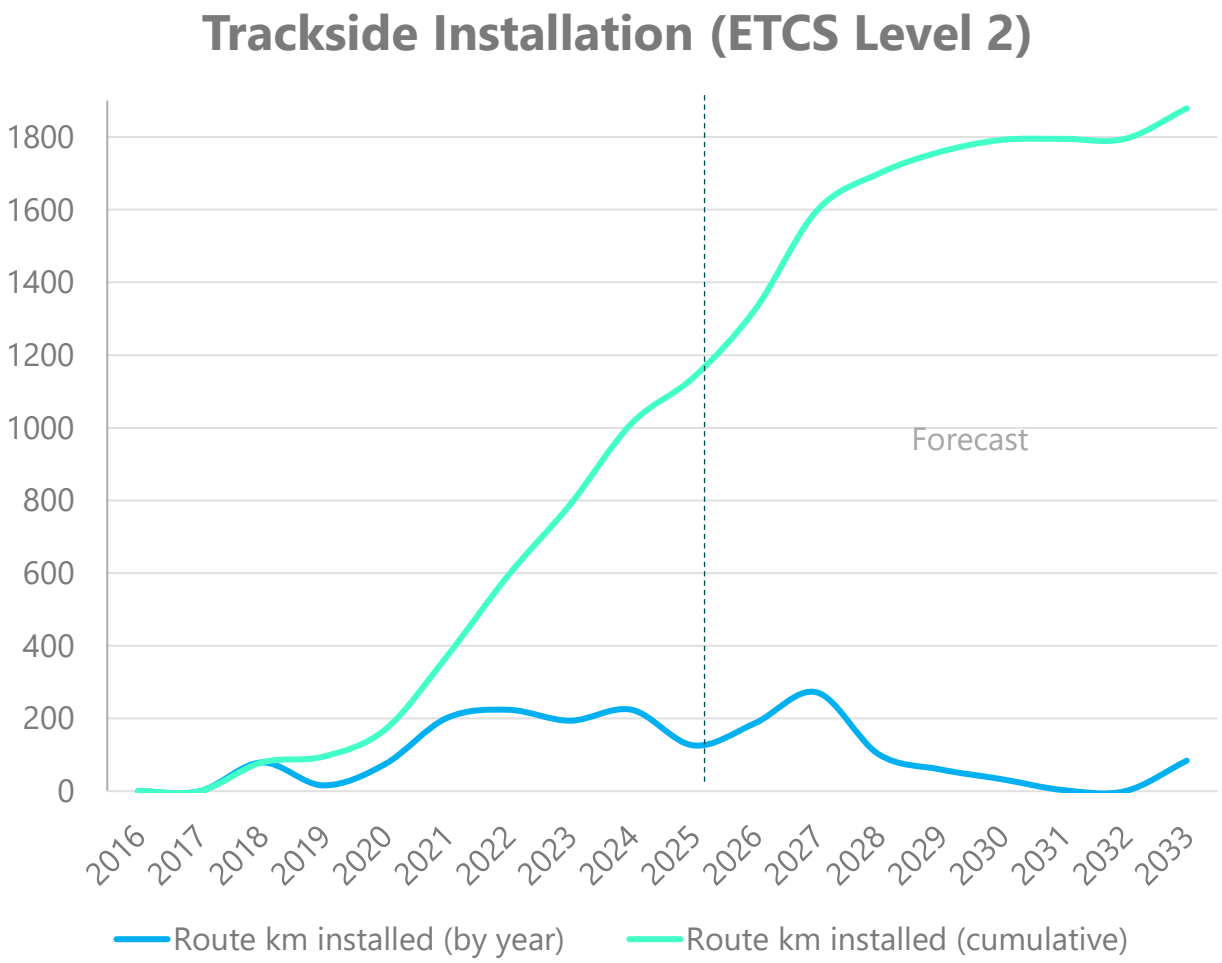


Banedanmark's Retrofitment Project



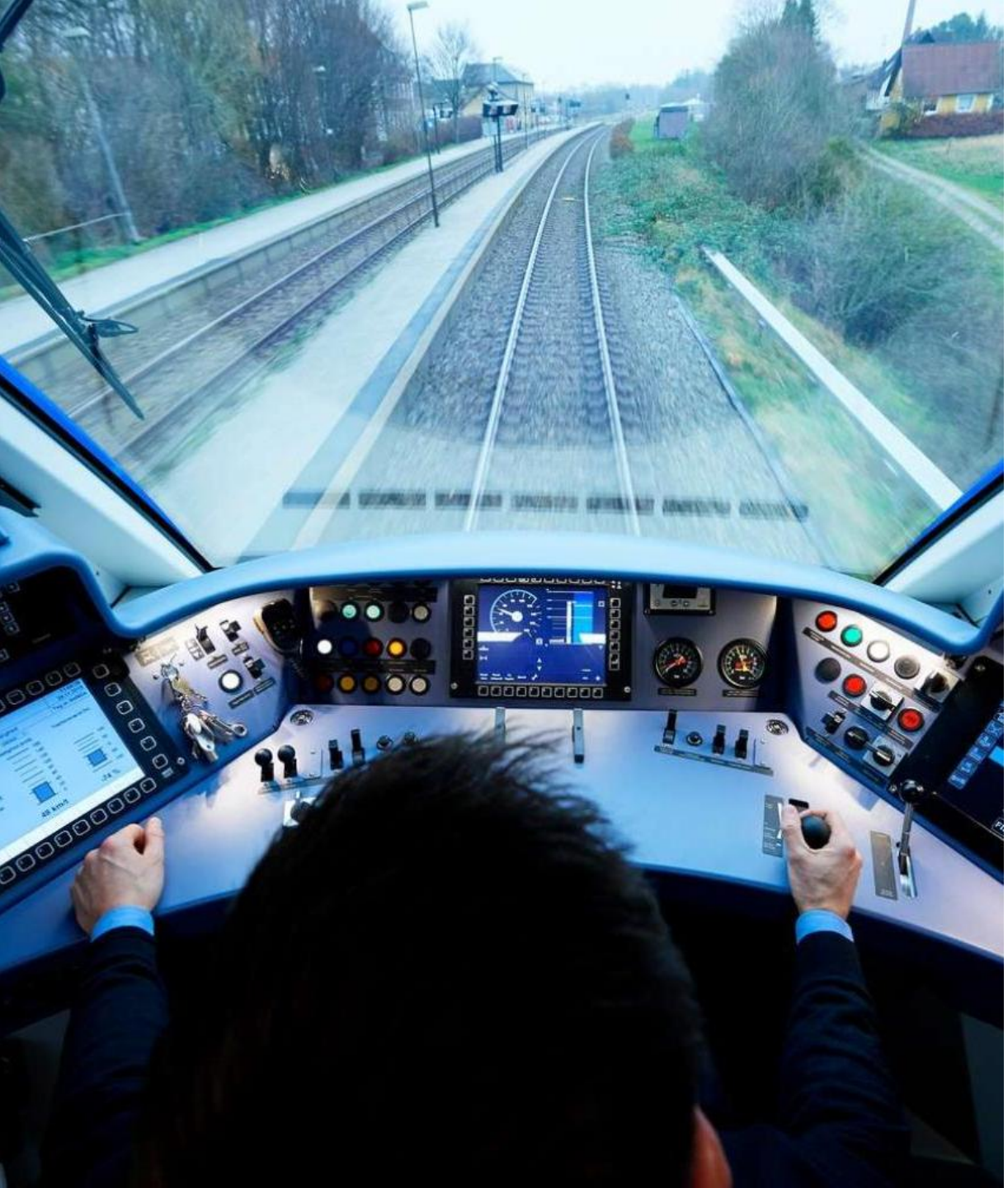
- **Main point:** industrialization has taken longer than expected but when in place it works
- Banedanmark has retrofitted the yellow fleet as well as a large part of the *existing* white fleet: **325 vehicles in total**.
- The pace of fitment has been challenged several times, particularly by **immaturity of products** and **approval procedures after the Fourth Railway Package**.
- As of October 2025, **312 vehicles** have been fitted by Banedanmark and approved for operation on lines with ETCS Level 2.
- **Banedanmark's retrofitment project finished in 2025**.

Trackside Installation



- The Signalling Programme is commissioning ETCS Level 2 on Banedanmark's network - **1880 route km in total**.
- **ETCS equipment** has been installed on **60%** of the network.
- The **expected completion year** in Western Denmark is **2027**; Eastern Denmark will be completed before **2033**.
- **Immature products have challenged the pace of trackside installation**:
  - Initially: **lack of rebuilt trains progress**.
  - Now: **immature TMS products**.

ERTMS
Benefits and Challenges



Benefits of ERTMS Deployment

- A modern, centralized, digital traffic management system
- Fewer delays on the network
- Faster return to normal operation after disruptions
- Lower headway between trains, higher capacity.
- Higher speeds and lower journey times
- A high, uniform level of safety
- Increase automation

A Look To The Future with an IT system as the central part of the infrastructure

Less Flexibility – More Stability

How often will it be possible to update the system?

How should the system be managed in the future?

What new perspectives are we looking into in regards to other infrastructure projects?


Thank you