



INFRABEL

ERTMS Infrabel

**ERTMS-infrastructure deployment in
Belgium**

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7/6/2023



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- 1. History of ERTMS**
 - 2. ETCS masterplan**
 - 3. Future after the masterplan**
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About me

Bavo Lens

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I-B.131 Signalling projects

Teamlead design and test engineer ETCS-projects

11 years experience @ Infrabel

 @bavotrompet



History of ERTMS in Belgium



2001-2010: GSM-R

- Since 2001
- 99% coverage
- Analog radio decommissioned
- Voice and data



2007: ETCS 2 (+L1 fallback) on HSL3 and HSL4

- Subset 2.2.2
- Long period of testing
- Fallback hardly ever used



2008-2015: TBL1+ rollout

- ETCS1-hardware
- Very simple software
- Quick and cheap
- Safety-level between crocodile and ETCS



2010-2019: ETCS 1 FS large scale



Situatie op
Situation au 30/06/2019

	km in dienst en service	km einde Masterplan prévu par Masterplan	% al uitgerust déjà équipé
ETCS1 FS	1.399	2.235	62%
ETCS2	30	2.835	1%
ETCS1 LS	0	1.187	0%
ETCS1+2	142	142	100%
Tota(a)	1.571	6.399	25%

% HOOFDSPOOR
UITGERUST MET ETCS



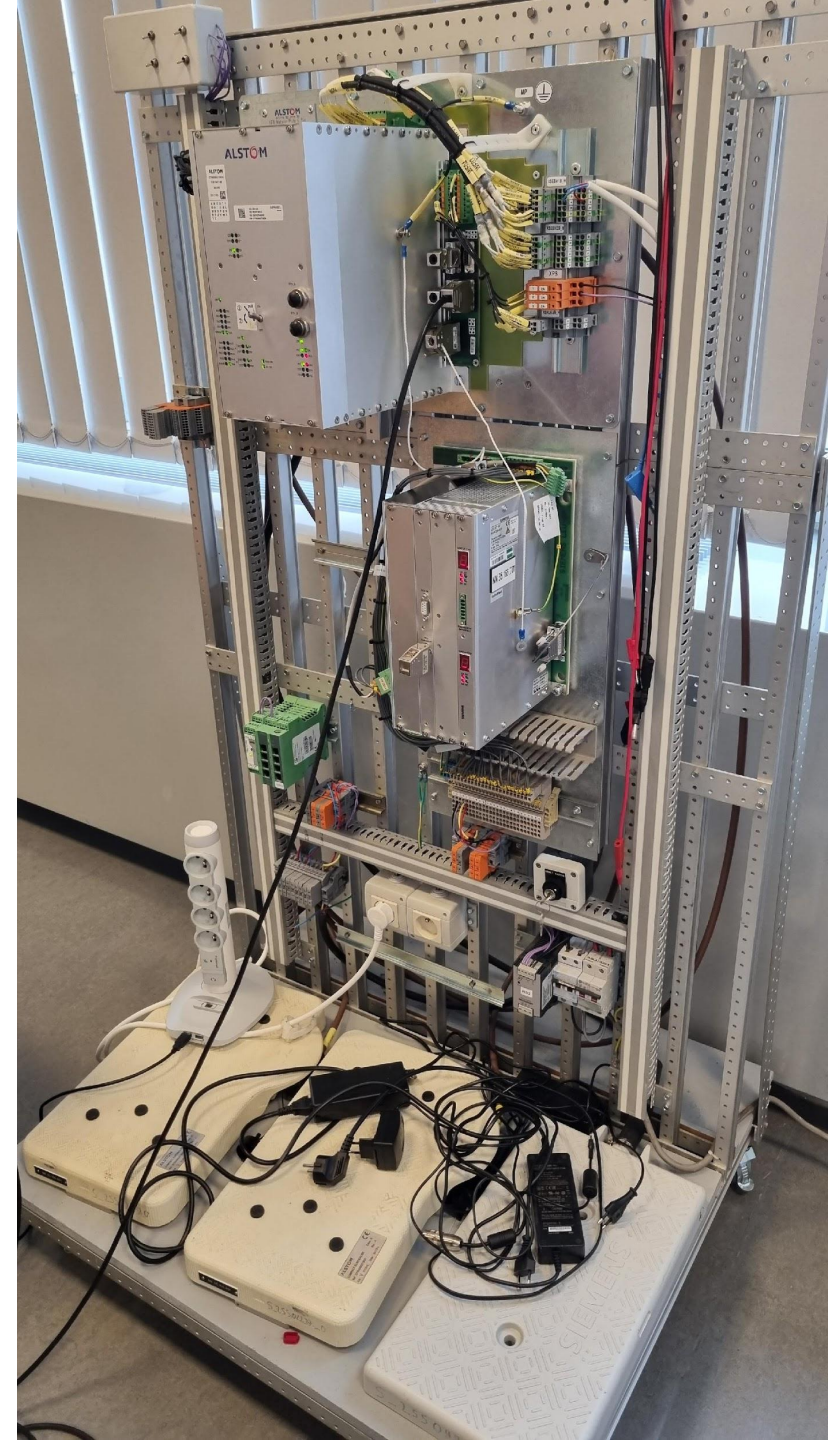
% DE VOIES PRINCIPALES
ÉQUIPÉES DU SYSTÈME ETCS

Focus on ETCS 1 FS

- TBL1+ hardware available
- Interface with digital-interlocking
- Transfer complexity to interlocking
- Full mastering of the process
- Lots of experience
- No capacity loss

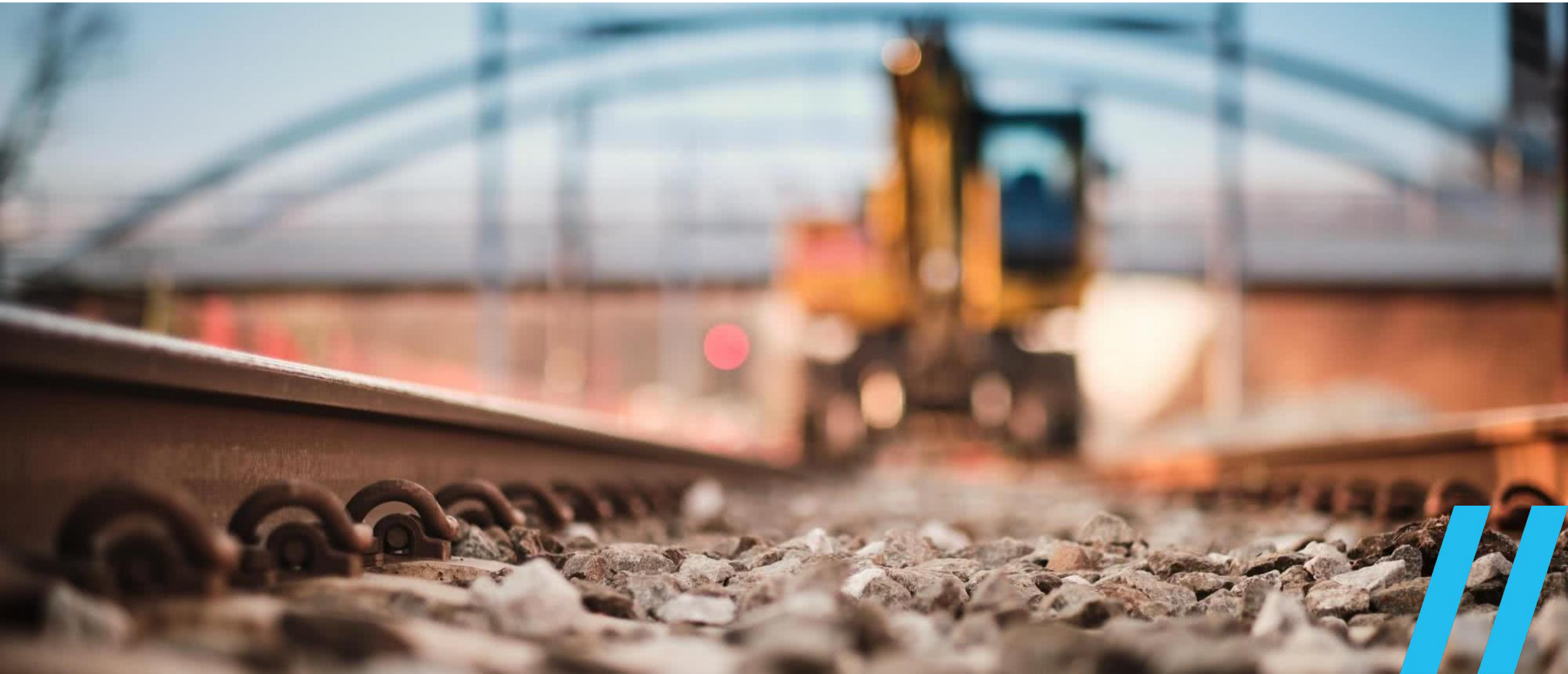
ETCS1 without signals

ETCS1 300 km/h



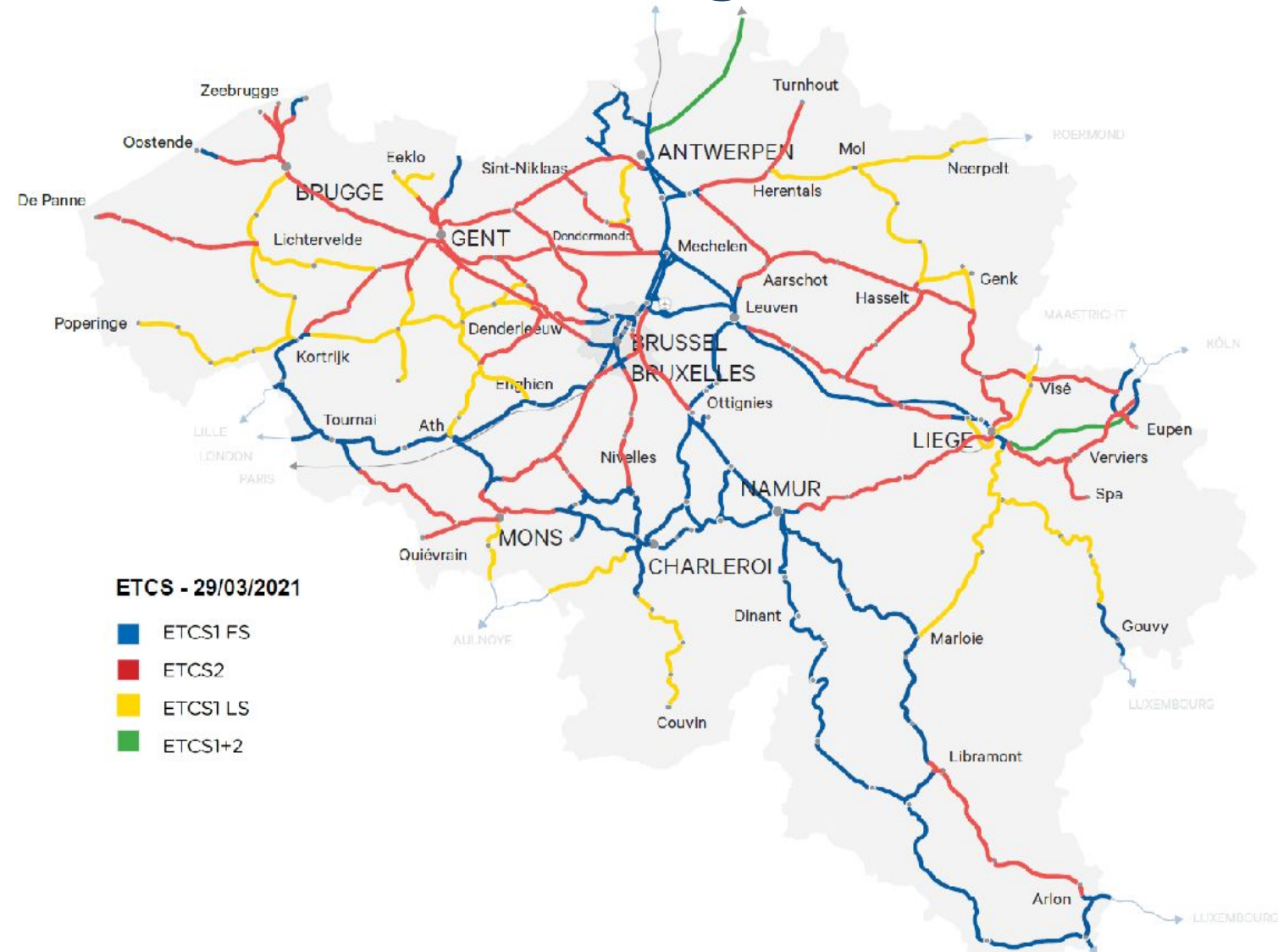


Masterplan ETCS

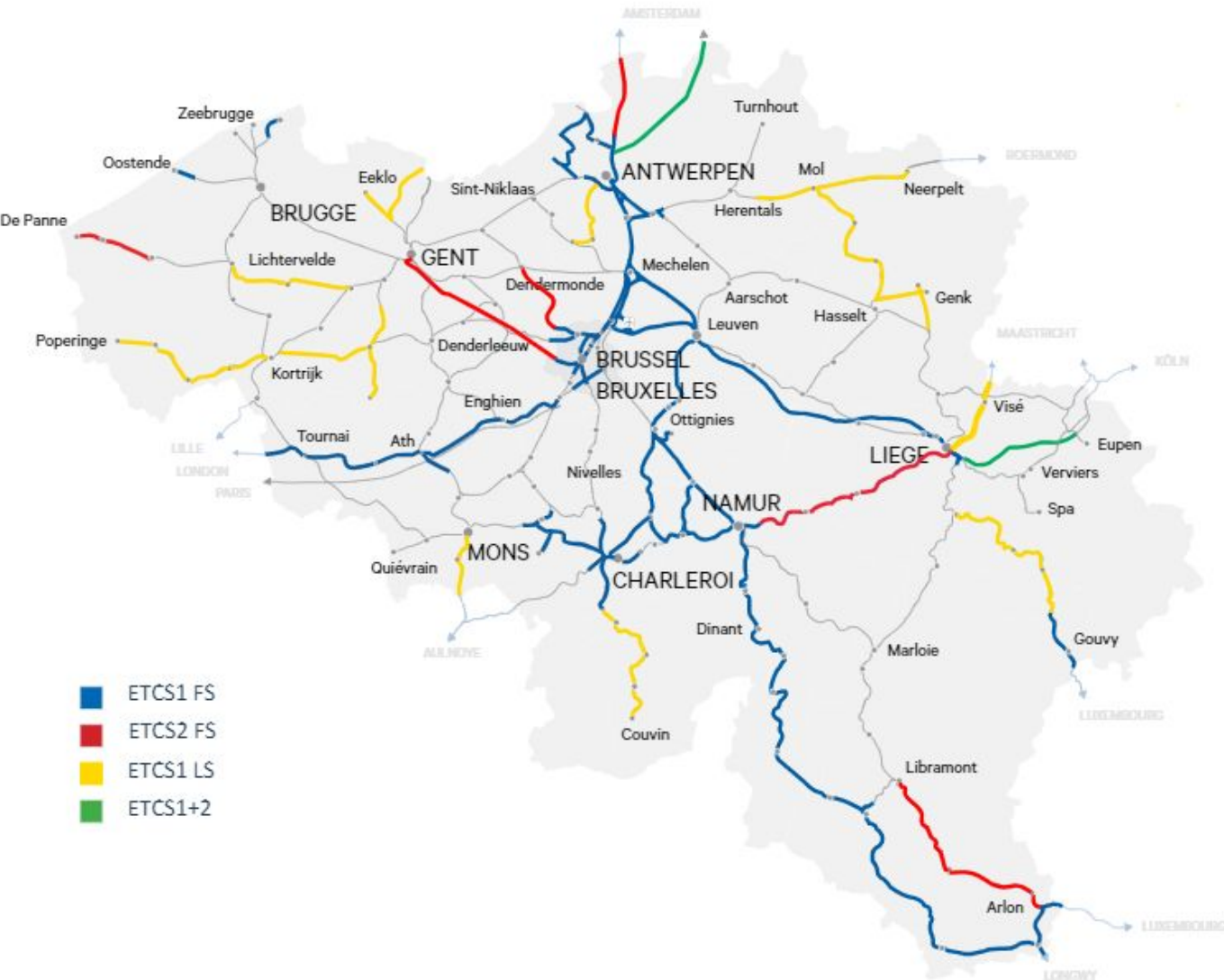


December 2025: 100% ETCS-coverage*

- In Belgian law
- Dual signalling
- ETCS1FS (40%)
- ETCS1LS (20%)
- ETCS2 (40%)
- 1.000.000.000€



*of main lines



Situatie op
Situation au **04/06/2023**

	km In dienst en service	km einde Masterplan prévu par Masterplan	% al uitgerust déjà équipé
ETCS1 FS	2.186	2.783	79%
ETCS2 FS	468	2.361	20%
ETCS1 LS	666	1.113	60%
ETCS1+2 FS	142	142	100%
Tota(a)l	3.462	6.399	54%

**% HOOFDSPOOR
UITGERUST MET
ETCS**

54%

**% DE VOIES
PRINCIPALES
ÉQUIPÉES DU
SYSTÈME ETCS**

ETCS 1LS (2020-2024)

- Fast to deploy
- Independent from suppliers
- Cheaper
- Small capacity loss
- No TCS

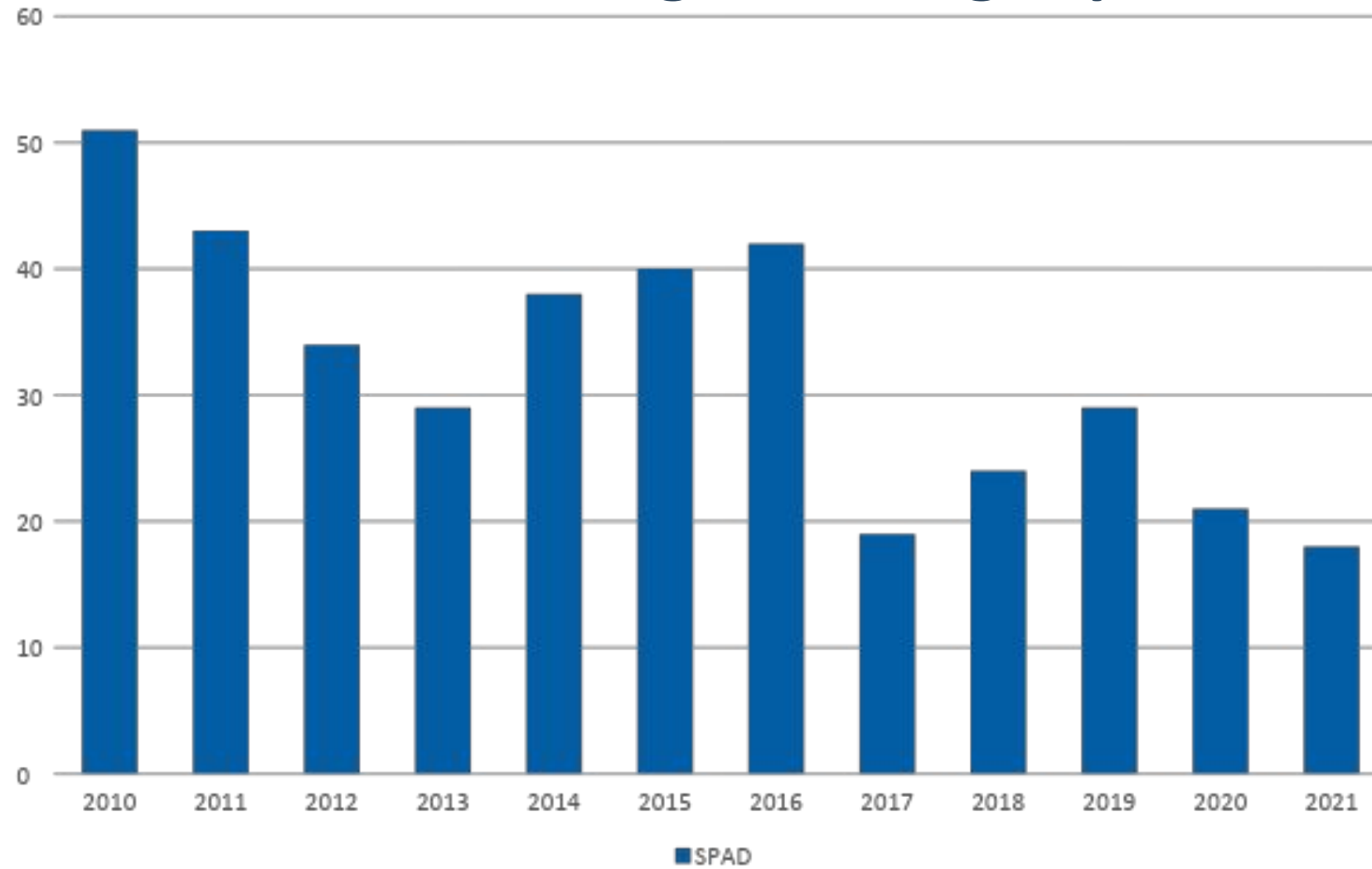


ETCS 2 (2019-....)

- Best ETCS
- Dependency on supplier
- Experience growing
- Small capacity gains



Evolution of reaching the danger point

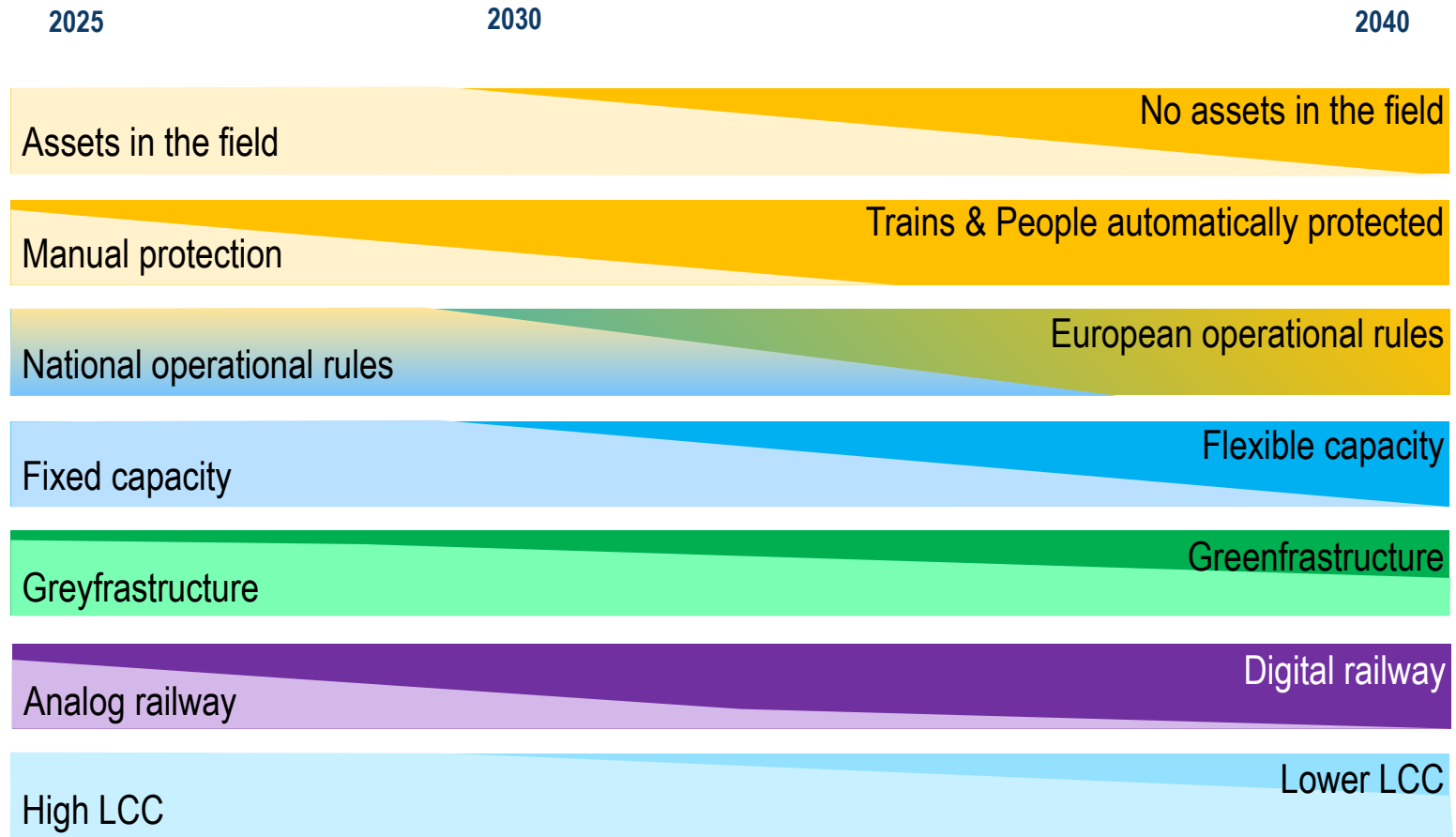




Future after the masterplan



2026- ... : Future evolutions



2026- ... : Replace ETCS1LS

- Interlocking renewal
- Other replacements
- ETCS1 LS => ETCS2
- ETCS1 LS => ETCS1 FS



2026- ... : ETCS2 without lateral signalling

- Reduce assets
- Enhance capacity



2028- ... : TVM => ETCS2

- Maintenance
- Interoperability



2030- ... : GSM-R => FRMCS

- GSM-R obsolete
- Future functions?



2030- ...

- ATO ?
- ETCS3 ?
- ETCS1 FS => ETCS2 ?



Questions ?

