

National Signalling Plan 2023

Renewal of the railway's signalling systems



A significant proportion of the signalling systems on the Norwegian railway network are approaching the end of their expected lifetime. This is an overall plan for renewing the signalling systems and introducing the common European signalling system ERTMS.

National Signalling Plan 2023

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1 INTRODUCTION AND SUMMARY

1.1 Background

A large proportion of the signalling systems on the Norwegian railway network are approaching the end of their expected lifetime, and some have already exceeded it. The need to renew signalling systems is therefore increasing, and in a number of places it is starting to become a matter of urgency.

At the same time, many ongoing and planned infrastructure projects will require new signalling systems in order to use new and improved infrastructure.

The National Signalling Plan provides a comprehensive overview of the renewal and construction of signalling systems across the entire national railway network. The plan saw the light of day in 2013, in connection with input to the NTP 2014-2023. The plan has been updated in 2017, 2020 and 2022, and is available here in an updated version as the National Signalling Plan 2023.

Due to the late commissioning of the new signalling system for the first two ERTMS sections (Nordlandsbanen North and Gjøvikbanen North), the delivery capacity of the ERTMS Programme has been assessed. This has in turn created a need to update the National Signalling Plan.

1.2 Purpose

The National Signalling Plan provides guidelines for all acquisitions of signalling systems for the national railway network. The signalling plan includes new signalling systems for both infrastructure renewal and for new infrastructure.

The National Signalling Plan is based on an assessment of Bane NOR's overall need for signalling systems across the national railway network, as well as the ERTMS Programme's implementation capacity.

The plan indicates when ERTMS will be completed on the various lines and also indicates which projects must be realised using Class B systems and when these will be migrated to ERTMS at a later date.

The plan is based on the need to renew signalling systems and coordinates this with other needs such as the need for technical barriers on lines that are not currently controlled remotely, the construction of new infrastructure, retrofitting rolling stock with ERTMS and training personnel.

The National Signalling Plan uses the terms Class A (ERTMS) and Class B (ATC).

The National Signalling Plan provides a basis for fulfilling the requirements of the Railway Infrastructure Regulations, Section 3-7, and details the overall renewal and construction of new signalling systems, both Class A and Class B.

The plan is limited to the construction of new signalling systems and does not address the subsequent AOM of the systems, such as upgrading/modification, after they have been put into operation.

1.3 Ownership of the plan and relationship to projects

The National Signalling Plan is owned and managed by Bane NOR via the Group Executive Vice President of Operations and Technology. The ERTMS Programme is responsible for planning and implementing ERTMS across the entire national railway network.

The National Signalling Plan provides the basis for Bane NOR's input to the NTP and for Bane NOR's other planning work. Financial matters, budgetary needs and frameworks are dealt with in the individual projects and in the impact package agreements.

New signalling systems require access to a transmission system and a telecommunications system (GSM-R) along the track. Today's GSM-R train radio system will eventually be phased out in favour of the next generation train radio (FRMCS). Therefore, the National Signalling Plan is also an important premise provider for the development of communication solutions at Bane NOR.

1.4 Basis for revision of the plan

The need to update the National Signalling Plan is primarily triggered by the following:

- Changes in the renewal needs/spare parts situation for critical signalling systems, changes in the progress of the ERTMS Programme, the status of ongoing projects in Bane NOR's project portfolio or budgetary matters.

In addition to coordinating the plan with changes in the project portfolio, the process must be designed to ensure that the rollout volume per year is manageable.

1.5 Changes in scope

1.5.1 Uncertainty in projects and scope

The main reasons for this update:

- The ERTMS Programme's commissioning of ERTMS on the first lines, Nordlandsbanen North and Gjøvikbanen North, has been delayed.
- Increased ERTMS rollout volume due to lines that were previously part of the IC initiative and that will not be completed as planned.

E11 ERTMS does not include re-signalling (ERTMS) on lines that were part of plans for double track development in the Østlandet area (IC). These lines must be re-signalled with ERTMS on existing infrastructure and are an additional volume that must be absorbed by the overall implementation of ERTMS.

Re-signalling existing infrastructure will involve more extensive work than signalling on new infrastructure. The existing station areas are relatively extensive, designed for a different traffic pattern and will require major infrastructure measures in their conversion to a new signalling system and remote control.

NSP 2023 requires funding for ERTMS across the entire national railway network.

The end date for completing the rollout of ERTMS across the entire national railway network has been changed to 2034.

1.5.2 FRMCS replacing GSM-R

FRMCS (Future Railway Mobile Communication System) will eventually replace GSM-R, and the system will allow new mobile services, also in relation to an expected further development of ERTMS (including ATO and Level 3). The specification for FRMCS has not been finalised yet, although the common European standard for ERTMS (TSI-CCS) will be used to facilitate the transition to this system.

A KVVU for the next generation communication system is being prepared under the auspices of the Norwegian Railway Directorate. We assume that a transition to a new communication system will not affect existing plans for the development of ERTMS across the entire railway network.

1.6 Retrofitting rolling stock

The ERTMS Programme is working closely with rolling stock owners regarding their retrofitting of rolling stock to ensure that a sufficient number of units are converted to ERTMS to enable use of the infrastructure.

In order to address the fact that migration to ERTMS will take a long time, rolling stock will be equipped such that it can run on both line sections with ERTMS (Class A) and line sections with ATC (Class B), which will provide flexibility when it comes to the implementation of ERTMS.

1.7 Priorities

The following prioritisation has been used as a basis for preparing and updating the National Signalling Plan:

1. Need for renewal, ref. "Strategic plan, renewal of signalling systems and introduction of ERTMS", Case: 201302418-2 [1].
2. Need for technical barriers/remote control.
3. Signalling systems for new projects.

Lines with a pressing need for renewal (old signalling systems) will have priority over lines that need remote control implemented. Furthermore, sections that need ERTMS in order to implement remote control will have priority over infrastructure projects that need new signalling systems.

Other guidelines:

- During the rollout of ERTMS, the construction of conventional signalling systems (Class B) must be minimised.
- The rollout of ERTMS must be as coherent as possible to avoid operational 'islands' and to avoid technically complicated interfaces between the various systems.

1.8 Timing of ERTMS commissioning

The National Signalling Plan indicates the year in which ERTMS will become operational on the respective lines. ERTMS will primarily become operational towards the end of the year, although the actual commissioning timing may be affected by, for example, operational traffic and climate factors.

1.9 Summary

The National Signalling Plan addresses the need for renewal as set out in the Strategic Plan for Renewal [1]. In addition, the early introduction of technical barriers/remote control has been planned for three sections of track.

The plan is well coordinated with project needs in other impact packages and only requires the implementation of some Class B systems due to the timing of the planned commissioning of these systems.

Avoiding 'islands' where operations differ in nature is an operational advantage and is well addressed in the plan, although there will inevitably be areas with different types of signalling systems during a transition period before ERTMS has been fully implemented.

The implementation of ERTMS across the entire railway network will require good coordination throughout Bane NOR. Once the most important priority sections have been completed, the order in which implementation will take place will be determined by project needs. Important and required results must be achieved without the use of expensive temporary solutions.

2 NATIONAL SIGNALLING PLAN

2.1 ERTMS – Class A

Strekning	Parsell	24	25	26	27	28	29	30	31	32	33	34
Gjøvikbanen	(Roa) – Gjøvik	24										
Nordlandsbanen	(Grong) – Bodø	24 / 25										
Vestfoldbanen	(Drammen) - Tønsberg		25									
Bergensbanen	(Hønefoss) - (Arna)			26								
Flåmsbana	(Myrdal)-Flåm			26								
Rørosbanen	(Hamar) – Røros – (Støren)				27							
Solørbanen	(Kongsvinger)-(Elverum)				27							
Dovrebanen	(Eidsvoll) – Åkersvika				27							
Oftobanen	Narvik - Bjørnfjell					28						
Nordlandsbanen	(Trondheim) - Grong					28						
Meråkerbanen	(Hell) – Riksgrensen					28						
Østfoldbanen	(Oslo) – (Ski)						29					
Dovrebanen	(Åkersvika) - Hamar						29					
Gjøvikbanen	(Oslo S) – Roa						29					
Kongsvingerbanen	(Lillestrøm) – (Charlottenberg)						29					
Randsfjordbanen	(Hokksund) – (Hønefoss)						29					
Roa-Hønefossbanen	(Roa) – (Hønefoss)						29					
Bratsbergbanen	(Skien) – (Nordagutu)							30				
Sørlandsbanen	(Hokksund) – Stavanger							30				
Tinnosbanen	(Hjuksebø) – Notodden							30				
Arendalsbanen	(Nelaug) – Arendal							30				
Vestfoldbanen	(Tønsberg) - Skien							30				
Østfoldbanen	Sandbukta– Moss – Såstad							30				
Dovrebanen	(Hamar) – Trondheim, Stavne – Leangen								31			
Raumabanen	(Dombås) – Åndalsnes								31			
Østfoldbanen	(Ski) – Kornsjø (Ø/V linje)									32		
Bergensbanen	Arna – Bergen og Hønefoss stasjon										32 – 34	
Oslo-korridoren	Se definisjon i endringsbeskrivelse										32 – 34	

The table shows the years in which ERTMS (Class A) is planned to be put into operation (orange indicates coordination with larger development projects).

2.2 Temporary signalling systems – Class B

Strekning	Parsell	24	25	26	27	28	29	30	31	32
Bergensbanen	(Arna) – Bergen	24								
Dovrebanen	Hove hensetting		25							
Østfoldbanen	Kolbotn stasjon			26						

The table shows the years in which temporary signalling systems (Class B) will be commissioned.

2.3 Change description

The changes in the National Signalling Plan 2023 can be summarised as follows:

- a) The most important change is that the Oslo corridor has been moved to the end of the plan. The remainder largely follow the same implementation order as in NSP 2022.

The Oslo corridor comprises the following railway lines:

- Hokksund – Drammen – Asker – Oslo¹ (incl. Spikkestadbanen)
- Oslo – Ski (Follobanen)
- Oslo – Eidsvoll (Gardermobanen/Hovedbanen)
- Alnabru, Lodalen and Filipstad

Given that the Oslo corridor has now been moved to the end of the plan, Bane NOR will increase its focus on the spare parts situation/criticality of the existing signalling systems in this area to ensure that the availability of the signalling systems can be maintained.

- b) Changed the start-up date for Gjøvikbanen North (2024) and Nordlandsbanen North (2024/2025). The timing of the commissioning of Nordlandsbanen may be affected by, for example, climate factors.
- c) Changed the end date of the plan to 2034
- d) New double track (Drammen) – Tønsberg will become operational with ERTMS in 2025.
- e) Lines that require re-signalling with ERTMS on existing infrastructure and that were originally covered by IC projects:
- (Moss) – Halden
 - (Hamar) – Lillehammer
 - (Tønsberg) – Skien
 - Hønefoss

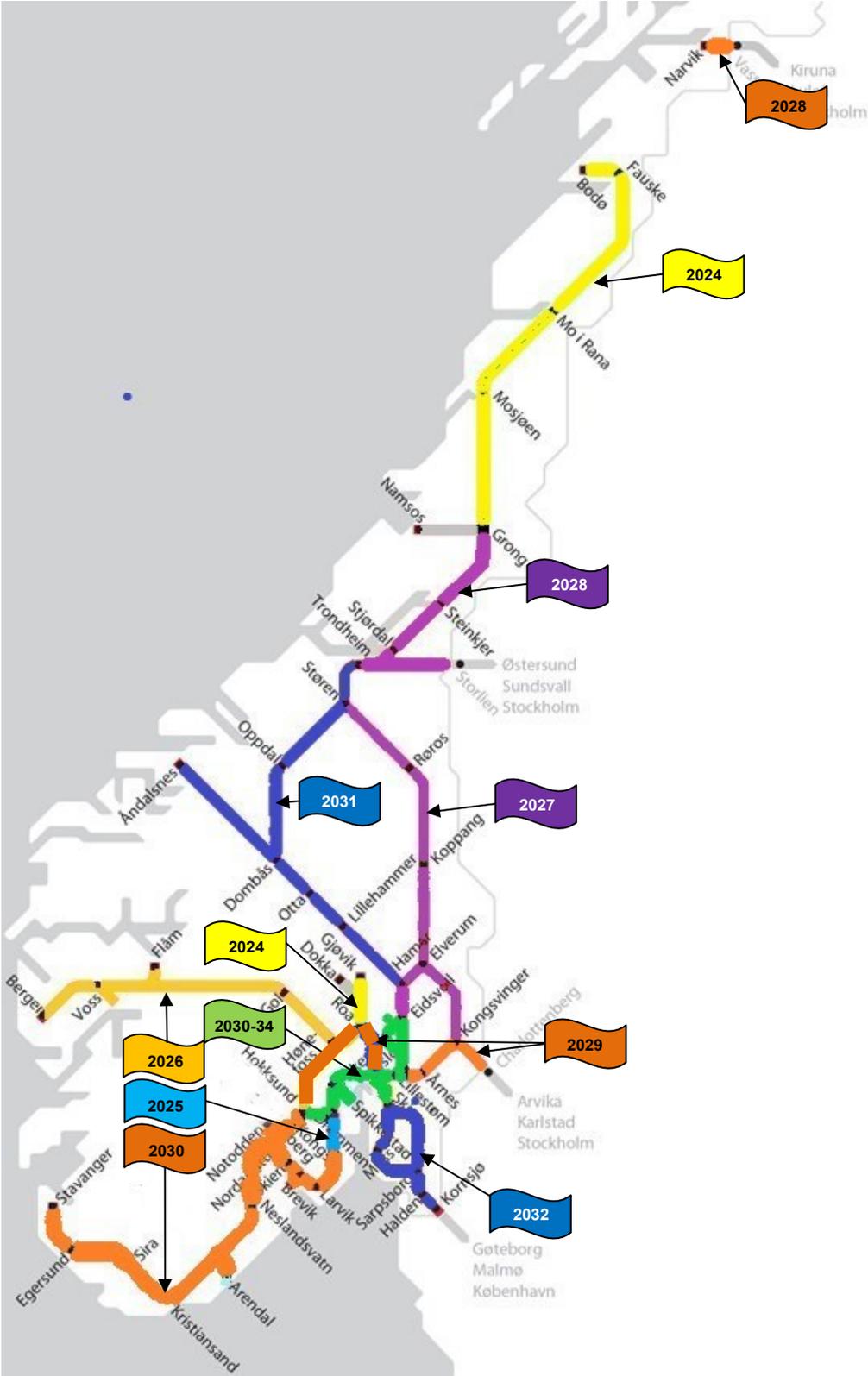
The changes improve the coordination between ERTMS rollout and other projects (impact packages) on the Norwegian rail network, such that the need for expensive temporary solutions before ERTMS is commissioned is reduced. Most impact packages are located outside the Oslo corridor.

The changes provide more time to prepare for the technical and operational transition to ERTMS on the busiest part of the Norwegian railway network.

- a) Eliminates the need for the coordinated commissioning of ERTMS on the sections (Roa) – (Hønefoss), (Hokksund) – (Hønefoss) since the Oslo corridor can be used to transport train sets without ERTMS for repair/servicing at Sundland.
- b) Provides increased flexibility with regard to retrofitting trains with ERTMS since the Oslo corridor has been put back in time.

¹ This signalling system was previously assessed as critical in terms of lifetime but its projected access to spare parts has now been improved.

3 MAP OF THE ROLLOUT



The figure shows the main features of the National Signalling Plan.

4 NETWORK STATUS

Response to information requested in TSI CCS 2023.

4.1 Current status

- ERTMS: Level 2 B2 / 2.3.0d is in operation on 80 km of the railway network.
- GSM-R: In operation across the entire railway network
- ATO: None
- Train detection:
 - Track circuits type for train detection type 95/105Hz, DC, TI 21 and FTGS.
 - Track circuits for activation/deactivation of level crossing systems type 10/50 kHz.
 - Axle counters type Az LM (Thales) and Zp 43 (Siemens).

4.2 Future status

- ERTMS Level 2 B3R2 / 3.6.0: Planned for the complete railway network by 2034.
- FRMCS: Planned for the complete railway network by 2035.
- ATO: Planned for the complete railway network by 2035.
- Train detection: Axle counters type Zp 43 planned for the complete railway network by 2034.

4.3 ETCS and radio system compatibility checks

Compatibility checks that have been produced and that have been performed:

- ERTMS: Level 2 B2 / 2.3.0d.
- ERTMS: Level 2 B3R2 / 3.6.0.
- GSM-R

5 DOCUMENT INFORMATION

5.1 Change history

Rev.	Beskrivelse av endring	Dato	Utført av
01E	Endringene er i beskrevet i fht. tidligere dokument IUP-00-A-04278-00E. <ul style="list-style-type: none"> Dokumentnummer endret til å bli et STY-dokument og blir en del av styringssystemet. Ny anslått dato for første ERTMS strekning i drift. Endring i prioriteringsrekkefølge som resultat av ny tidsplan for ERTMS NI. Informasjon om kostnadsestimat fjernet. Oppdatert beskrivelse av mål, forutsetninger og føringer. 	21.11.2015	xloas
02E	Oppdateringer som følge av: <ul style="list-style-type: none"> Endringer i prosjekter som følge av ny NTP Endret framdrift for ERTMS nasjonal implementering som medfører at første strekning kan tas i bruk i 2022 Endret årstall for tilgjengelige kjøretøy for Ofofbanen Oppdatering av forutsetninger 	28.11.2017	kly
03E	Oppdateringer som følge av: <ul style="list-style-type: none"> Endringer i Bane NORs prosjektportefølje Justering iht ERTMS-programmets utbyggingsvolum Redusere kostnader mhp bygging av midlertidige klasse B-anlegg 	14.10.2020	KJHO
001	Oppdateringer som følge av: <ul style="list-style-type: none"> Endringer i Bane NORs prosjektportefølje Justering iht ERTMS-programmets utbyggingsvolum Redusere kostnader mhp bygging av færre midlertidige klasser B-anlegg 	25.08.2022	KJHO
002	Oppdateringer som følge av: <ul style="list-style-type: none"> Endringer i Bane NORs prosjektportefølje Justering iht ERTMS-programmets framdrift. Redusere risiko mht ERTMS utbyggingen da strekninger med enhetlig struktur bygges ut i rekkefølge, hvor Oslo-korridoren skyves ut i tid Bedret samordning av ERTMS-utbyggingen med andre effektpakker på jernbanenettet (da de fleste av disse ligger utenfor Oslo-korridoren). 	16.10.2023	KJHO

5.2 Terminology

Term/abbreviation	Definition
ERTMS	European Rail Traffic Management System. Common European standard for signalling systems (defined as a Class A system)
Class A	Systems for automatic speed monitoring that comply with the common European standard as described in TSI CCS [2].
Class B	National systems for automatic speed monitoring, limited to what is described in Annex B of TSI CCS [2].

5.3 Reference list

- [1] Strategisk plan, Fornyelse av signalanlegg og innføring av ERTMS, Sak:201332418-2
[2] TSI CCS, Vedtak 2016/919/EU implementert i Forskrift om TSI-styring, kontroll og signal - FOR-2017-05-10-600