



ERTMS DEPLOYMENT IN SWEDEN



The Swedish Transport Administration has taken a cautious but measured approach to the introduction of ERTMS into the national rail network. The well operating existing/legacy ATP system was introduced in the 1980s and is expected to last both technically and economically until around 2020.

The rail network itself consists of 11 900 track-kilometres of which 3700km are either double track or multiple track and 9800km are electrified. Sweden also constitutes a key section of the Scandinavian-Mediterranean Corridor.

The Swedish vehicle fleet impacted by ERTMS introduction consists of between 800 and 1200 vehicles with approximately 50 different vehicle types.

The Swedish ERTMS Implementation Plan, currently under review, is clearly identifying the priorities for the introduction of ERTMS:

- 1 New and/or essentially upgraded routes or lines
- 2 Routes or lines without signal plant, centralised traffic control and ATP systems
- 3 Routes or lines with major re-investment needs for existing signal plants
- 4 Routes or lines included in the corridors identified by the EU
- 5 The remaining parts of the routes in the Trans-European Network (TEN) and after that other parts of the railway network

Level 2 technology has been chosen for the whole of Sweden, with possible exceptions of a Level 1 solution being deployed at larger stations and railway yards with extensive shunting movements.

An ERTMS Regional solution (ETCS Level 3 conform but without Train Integrity function) is implemented on low traffic lines. ERTMS Regional, based on the new UIC rail control specification for less intensely used routes, is now being introduced in Sweden on the so-called TAM lines – lines that do not have an Automatic Train Control (ATC) system – on which traffic control takes place manually using telephone communication between local train dispatchers. Safety will improve substantially when ERTMS Regional is introduced on these lines. Another benefit of the new system, which will see the lines upgraded from manual to automatic control, is the creation of a cost-effective alternative for lines which otherwise might face closure due to the cost of maintaining manual operation or upgrading to traditional remote-controlled signalling. ERTMS Regional combines the ERTMS standard for onboard Automatic Train Protection (ATP) with a radio-based wayside system, thereby minimising trackside equipment. The system reduces operational costs and enables increased traffic capacity and automated operation around the clock. Sweden's low density lines account for approximately 21% of the total national network. The Västerdal Line is the first ERTMS Regional line and was selected mainly because it is typical of its type and has no through traffic. This means that a limited number of vehicles are affected and only one traffic control centre is involved.

The contracts were signed for the development of ERTMS in 2008, with the majority of Swedish lines expected to be finally equipped for full introduction of ERTMS by 2035.

What is the status of ERTMS deployment in Sweden?

ERTMS Level 2 is in commercial operation on the Bothnia Line, Ådal Line, since 2010 and Haparanda Line since 2013. According to current legislation, ERTMS must always be introduced in new construction, extensive upgrading of the railway, and signalling systems requiring reinvestment. In addition to these, priority is assigned to the lines that the EU has identified as being a part of a European strategic corridor network.

The Bothnia Line running between Umeå and Ångerman River north of Kramfors is 190 km long and comprises 25 km of tunnels and no less than 140 bridges. ERTMS Level 2 has been chosen for the Bothnia Line, and the entire line has been open for traffic since August 2010. Sections 1 and 2 were completed and ready for traffic in the autumn of 2009.



The Ådal Line carries both passenger and cargo traffic. It includes over 35 level crossings and runs between Sundsvall and Västeråsby. The line is 180 km long, of which 50 km are new (Härnösand – Mörtstal). ERTMS Level 2 has been chosen for the implementation and when the line has been completed, the capacity will increase from 8 - 10 trains per day to 50 - 60 trains per day.

The Haparanda Line running between Boden and Haparanda. ERTMS Level 2 has been chosen for the line, which is 156 km long (42 km of which is new track between Kalix and Haparanda), comprises 17 railway bridges, 40 level crossings and is intended mainly for cargo traffic. The Haparanda Line is part of the NEW corridor (Northern East West Freight Corridor by UIC/Transportutvikling AS).



The City Tunnel is a 17 km long electrified rail connection running through and under the city of Malmö. The section from Malmö C to the Öresunds Line consists of 14 km of double track, of which 6 km run in parallel tunnels. The remaining 3 km are a single track line running eastwards towards Trelleborg and Ystad. ERTMS Level 2 has been chosen for this section and will be implemented and commissioned in a later stage, approximately by 2021.



The Västerdal Line running between Malung and Repbäcken is 134 km long. The line has five stations, 33 level crossings and carries 16 trains per day. The maximum speed on the line is 90 km/h. ERTMS Regional was selected and the line went into operation on 21 February 2012. The line is the pilot in a frame agreement with the Swedish Transport Administration.



SUMMARY OF ROUTE ROLLOUT

Which lines will be equipped with ERTMS?

Sweden will gradually introduce ERTMS on the basis of a plan for the period of 2008 to 2030:

Implementation plan 2008 - 2015

Level 1 – Large stations

- Malmö C

Level 2 - Lines and medium-sized/small stations

- Bothnia Line
- Ådal Line
- Haparanda Line
- City Tunnel
- Öresund Link
- Malmö-Hässleholm

Level 3 – Low-traffic lines

- Västerdal Line
- 5 - 6 low-traffic lines

Implementation plan 2016 - 2019

Level 1 – Large stations and the Stockholm region

- Hallsberg
- City Line

Level 2 – Lines and medium-sized/small stations

- Iron Ore Line
- Mjölby-Katrineholm
- Hässleholm-Hallsberg
- Hallsberg-Järna-(Stockholm)

Implementation plan 2020 - 2025

Level 2 – Lines and medium-sized/small stations

- Hallsberg-Gothenburg
- East Coast Line
- Arlanda Line
- West Coast Line
- Norway/Vänern Line (Gothenburg-Kornsjö)

Implementation plan 2026 - 2030

Level 2 – Lines and medium-sized/small stations

- According to the TEN network



ETCS AND STM ON ALL TRAINS

ERTMS will be introduced in accordance with the vehicle strategy. The strategy indicates that the majority of the train fleet will be equipped initially, followed by a deployment trackside. Since the transition to ERTMS cannot take place overnight, trains must be able to operate on ERTMS-equipped infrastructure as well as on existing ATC lines. A Specific Transmission Module (STM) is needed to achieve this. The STM unit can read data from the existing trackside equipment and can convert it into a format that is transmittable to the new on-board system. This makes it possible for a train equipped with ERTMS to run on both ATC lines and ERTMS lines, and the system can be introduced into the infrastructure gradually.

Implementation of the GSM-R has been undertaken based on the EIRENE standard. The work started in 2008 and will continue until 2015.

On-board equipment with STM are installed in 156 vehicles running in commercial operation with different operators. The on-board equipment and STM has permanent approval with full EU certificate.

Sweden also constitutes a key section of the Scandinavian-Mediterranean Corridor. This section of line is expected to be appropriately fitted by 2030.

SUPPLIERS

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SIEMENS

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THALES