



COMMISSION OF THE EUROPEAN COMMUNITIES

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**COMMUNICATION FROM THE COMMISSION
TO THE EUROPEAN PARLIAMENT AND THE COUNCIL**

on the deployment of the European rail signalling system ERTMS/ETCS

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(Text with EEA relevance)

1. INTRODUCTION

Technical barriers to trade and to interoperability – the ability of trains to run on any section of the network – are continuing to hamstring competitiveness in the railway industry.

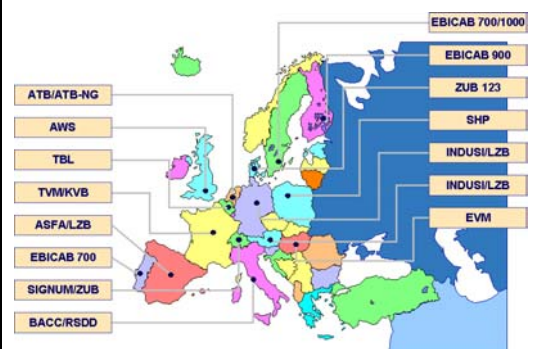
Today, for example, there are more than twenty signalling and speed control systems operating at the same time in Europe. The Thalys, linking Paris and Brussels in particular, has to be equipped with seven different signalling and speed control systems, entailing extra cost and increased breakdown risk and rendering drivers' jobs more complicated as they have to familiarise themselves with each system. These technical barriers are hampering the development of rail transport at the European level, while road transport is free to develop without such barriers.

Removing these barriers is fully in line with the Lisbon strategy since it will make it possible to increase the competitiveness and dynamism of the rail sector, promote the integration of the rail freight and passenger services markets and stimulate the European rail equipment market. Cost reductions and quality improvements in rail transport are also factors underpinning the growth of the economy as a whole and bolstering the dynamism of the internal market.

This Communication looks at the key challenges of harmonisation of rail signalling and its costs and benefits for the different stakeholders, and presents the Commission's strategy for achieving it. It shows in particular how the deployment of the European Rail Traffic Management System (ERTMS) constitutes a major European industrial project just like Galileo in the field of satellite navigation. ERTMS is also an essential component of priority Community rail projects, and investment in equipping about 20% of the trans-European network and the rolling stock with ERTMS could reach €5 billion in the period 2007-2016.

2. SIGNALLING: UN OBSTACLE TO AN INTEGRATED RAILWAY AREA

2.1. The importance of a harmonised signalling system in Europe

	<p>There are currently more than twenty different signalling systems coexisting in Europe. These systems, generally developed on the scale of a national network, are very heterogeneous as regards performance - optimisation of the distance between trains and therefore of line capacity – and the level of safety. The high cost of existing systems helps to explain why part of the network is not yet equipped with speed control systems.</p>
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Lethal accidents due to signalling

A collision in fog near Bologna in Italy on 7 January 2005 resulted in 17 victims. This accident follows a number of collisions which have taken place in Europe in recent years, notably in Spain (19 dead near Albacete in June 2003), Belgium (8 dead at Pérot in March 2001) and the United Kingdom (31 killed in London in October 1999). Even though all inquiries are not yet over, it does seem likely that an effective signalling system with automatic train speed control might have helped avoid such accidents and thereby improve still further the safety level of rail, which is already much higher than that of road transport.

Locomotives capable of crossing borders even now have to be equipped with a variety of on-board systems able to process the information transmitted by the different systems on the track. Once the locomotive has been designed it is extremely expensive and sometimes impossible to add more on-board systems. This is why in most cases trains still have to stop at the first frontier station to change locomotive.

In this context, the deployment of ERTMS, first developed in the early 1990s thanks to the Community research framework programmes and subsequently supported through the funds available for trans-European networks, represents a major advance in improving the interoperability and safety of the networks.

The importance of the deployment of ERTMS as a priority of the trans-European networks has thus been underlined on several occasions, notably in the proposal for a regulation determining the general rules for the granting of Community financial aid in the field of the trans-European transport networks¹.

Derived from the Treaty provisions relating to trans-European networks (Title XV, Articles 154, 155 and 156), Directive 96/48/EC establishes a legal framework requiring in particular, since November 2002, the use of ERTMS on any new high-speed line in the trans-European network or when the signalling system is to be renewed. For conventional rail, similar requirements will take effect six months after the entry into force of a decision relating to the technical specifications for

¹ COM(2004) 475 final.

interoperability (TSIs)² adopted pursuant to Directive 2001/16/EC. The use of ERTMS will in particular be compulsory³ for any new installation or renewal of signalling in the priority projects listed in Decision 884/2004/EC.

The TSIs have been the subject of various consultations of users and the social partners (management and labour), who are in favour of the development and deployment of ERTMS.

2.2. The European Rail Traffic Management System (ERTMS)

Today this system has two basic components:

- GSM-R, based on standard GSM but using various frequencies specific to rail as well as certain advanced functions. It is the radio system used for exchanging voice and data information between the track and the train;
- ETCS⁴, the European Train Control System, which makes it possible not only to transmit permitted speed information to the train driver, but also constantly to monitor the driver's compliance with these instructions.

The three “levels” of the ETCS system

With ETCS, information is transmitted to the train driver from the track, allowing the driver to calculate continuously the maximum speed allowed. Where there are lineside signals (lights and signboards showing the driver the permitted speed), this information can be transmitted by standard radiobeacons known as “eurobalises” positioned along the track. This is called ETCS Level 1.

The information can also be transmitted by radio (GSM-R). This is then called ETCS Level 2 and it is no longer necessary to have lineside signals, which allows substantial savings in investment and maintenance. The position of trains continues to be detected from the track. An ETCS train equipped with GSM-R radio can run on Level 1 and Level 2 lines indiscriminately.

Finally, at Level 3 trains have to be able to transmit their precise position themselves, which makes it possible in particular to optimise line capacity and to reduce still further the amount of equipment on the track.

At all three levels Eurocab, an on-board computer, compares the train speed with the maximum speed allowed and applies the brakes automatically if it is exceeded.

² An agreement has been reached by comitology on these TSIs and their adoption by the Commission is imminent.

³ Exemptions may be allowed, however, for projects already at an advanced stage of development when the TSIs are published.

⁴ European Train Control System

3. THE DEPLOYMENT OF GSM-R

The Member States are currently replacing their radio systems, rendered obsolete by the advent of digital technologies like GSM, with GSM-R. This change is rapidly taking place in virtually the whole of Europe. Based on the same standards as public GSM, this system offers a quality and cost unattainable by the old systems, which had generally been developed on a national scale.

The deployment of GSM-R needs to be guided at Community level, however, in order to ensure cohesion between the national deployment strategies and continuity of service and to avoid gaps in the trans-European network. GSM-R deployment remains, in particular, a strategic priority in most of the new Member States.

On a more technical level, it is also essential to continue ensuring interoperability of applications developed by different manufacturers, particularly so that trains can continue to cross borders unimpeded by the change of mobile telecommunications operators.

4. THE DEPLOYMENT OF ETCS

The deployment of ETCS is taking place more slowly than that of GSM-R. It was developed specifically for rail and so has not benefited as much as GSM-R from standards developed for other sectors.

This is why its development phase, supported by Community research framework programme funding in the mid-90s and later receiving trans-European network funds in the testing and pre-series phases, took longer to come up with stable specifications.

With its stable specifications and tested products, ETCS now seems indispensable when renewing signalling equipment. The obsolete nature of the traditional signalling systems, their high costs, especially as regards maintenance, and their incompatibility mean that all the stakeholders see ETCS as the only signalling option with a future on the trans-European rail networks.

The cost of having so many on-board systems: the case of the Thalys

The Thalys PBKA trainsets on the Paris-Brussels-Cologne and Amsterdam runs are equipped for 7 types of signalling. Various factors, including the constraints of having different systems present and the “non-standard” character of trainsets produced in small series for a specific route, push up the cost of each trainset by 60%. And in the driver’s cab there has to be a screen for each signalling system.

4.1. Obstacles to the deployment of ETCS

For the deployment of ETCS there has to be an ETCS “module” installed on board the locomotives while the track has to use the “ETCS format” for sending the information to the train which will enable it continuously to calculate its maximum permitted speed. As it is impossible to install the ETCS system on all trains simultaneously and the whole network cannot switch from the old signalling system to the new one overnight, it is inevitable that there will often be at least one old system coexisting with ETCS on board and/or on the track.

In a project like the renovation or extension of a line, it will be necessary to have a large number of traction units operating on the line. Limiting line access to trains fitted with ETCS is often thought to be restrictive and economically unacceptable as long as only a small number of trains are equipped. And for the time being the traction units have to be equipped with the old system anyway to get to the extended or renewed section of the line.

There is therefore a risk that, in the case of upgrading an existing line, an analysis which is carried out in isolation and fails to take account of the benefits of interoperability and the impact on the whole network will argue against using the ETCS system since the old system will have to be kept on the track anyway for a more or less long transitional period.

However, if the installation of the new European signalling system is not made an integral part of the construction of a new line or major renovation works, it will be much more difficult to install it subsequently because this would have to be done on a line already in service, involving extra costs which would depend on the individual case but which could amount to 80% more.

Similarly, if a substantial part of the network is not equipped with ETCS, ETCS may sometimes be considered by railway undertakings as an additional system which is not absolutely necessary right now since the majority of lines will have to continue to be equipped with one or more traditional systems for a transitional period.

If, however, ETCS is not designed into the traction unit from the outset, the cost of retrofitting it later will be much higher (by a factor of about 3).

The long service life of signalling equipment: an obstacle to the rapid deployment of ETCS.

Even if ETCS were to be systematically used on new lines and rolling stock from now on, the long service life of trackside signalling equipment and traction units, generally more than 20 years, would mean that the major part of the trans-European network would still not be equipped with ETCS ten years from now. Assuming a renewal rate of 2.5% per year, it would be 20 years before even half of the network was equipped. The majority of locomotives built in 2025 would therefore still have to be fitted with national systems, in many cases already regarded as obsolete even today.

The legislative framework which requires ETCS to be used in new signalling equipment for the lines and rolling stock of the high-speed network and which will lay down similar obligations for priority projects of the conventional network is not enough on its own to guarantee that in ten or twelve years' time there will be a real network on which ETCS-only trains can run.

If deployment were to be carried out only as and when required by the legislation the costs would certainly be lower since it would be done in the course of renewal work, but only in the long term would it result in a real joined-up network. The first companies and networks to equip themselves would be at a particular disadvantage because they would have to bear the costs of dual equipment for longer.

4.2. The main benefits of deploying ETCS

The ETCS system is part of a strategy for revitalising the railway industry. ETCS will contribute in particular to a boom in international rail traffic for both goods and passengers, by helping to allow locomotives to cross borders more easily. There is a lot at stake, especially as regards reducing external costs like those of pollution, noise, safety and congestion, and any factor which helps to readjust the balance of the different modes of transport makes it possible to reduce these costs.

Even though it is difficult to make global analyses, in so far as there are different strategies for implementing ETCS on the track and every system that exists has its own costs and performances, it is generally recognised that the costs of ETCS, used on its own, are appreciably lower than those of conventional systems. Also, as the latter are often old and obsolete, their maintenance costs rise very quickly.

The cost of ETCS on board the trains is equivalent to that of the existing systems, but at present at least one signalling system has to be installed on board the locomotives for each country a train has to pass through. The driver has to know each of these systems unless a new driver takes over at the border. Having just a single system will therefore reduce the complexity of the equipment by simplifying operations and maintenance. The human factor in general and the implications of this new system for train drivers in particular were taken into account right from the time the specifications were devised for the system, which facilitated its acceptance.

In addition, having a European standard which will be deployed quite quickly on the European scale in a context of free competition between the railway industrialists will give the latter a competitive edge when exporting their products outside the European Union, which will in turn help to reduce prices within the EU.

ETCS: an export contract

In spring 2004 a manufacturer won a contract of some €32 million for equipping 414 trains and 760 kilometres of lines with ETCS in Korea. This contract follows another one signed with Taiwan for 756 trains and 1200 kilometres. India and China have also placed substantial orders.

With ETCS it will be possible to provide secondary lines with a signalling system offering a standard of safety at least equivalent to that of the systems currently used on high-speed lines.

According to UNIFE⁵, in terms of infrastructure use (number of trains per hour) ETCS will be on a par with the most efficient of the current systems and will thus bring a capacity gain of 2 to 15% and even up to 20% compared with the existing less efficient systems. In cases where there is a significant increase in capacity, appropriate steps will have to be taken to prevent any adverse effects, in particular pollution of the environment.

4.3. A rapid and coordinated migration strategy

Accordingly, if the European ETCS system is not put in place in a project for the upgrading of an existing railway line or the construction of a new one, interoperability will be made more difficult on that line for the entire service life of the equipment. The problem is the same for on-board equipment.

As long as a proper ETCS network has not been set up and a significant number of traction units have not been equipped with ETCS, the old systems will have to remain in use for trackside and on-board equipment, which represents an extra cost, as illustrated by the example of the Thalys. In addition, on the track, ETCS will be able to generate savings from getting rid of certain fixed installations, such as lineside signals, only if a large proportion of the rolling stock is equipped with ETCS.

Shortening the period of migration in order to set up the ETCS network and equip a sufficient number of traction units over a period of ten or twelve years, while at the same time creating large interoperable international corridors, would therefore make it possible to reduce substantially the costs due to the coexistence of different systems. With this strategy it would also be possible to profit more quickly from the abovementioned benefits.

Such a rapid and coordinated migration strategy is desired by the whole of the railway industry, which has endorsed a Memorandum of Understanding establishing the basic principles of such a strategy. This MoU was signed on 17 March 2005 by Vice-President Barrot on behalf of the Commission.

5. ETCS: TOWARDS A RAPID AND COORDINATED MIGRATION

The technical annex to this Communication shows how this rapid migration strategy aims to achieve a critical mass, i.e. a situation in which there are so many lines and trains equipped with ETCS that the rest have to be equipped with it as well.

This deployment strategy for a new European standard will therefore allow the rail sector gradually to overcome technical barriers which do not affect its competitors. Most of the benefits will not be felt until a critical mass is reached and the “old” equipment on the track can be taken out of service and a single system can be put on board the trains. All the same, the cost to the various stakeholders will be immediate.

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Union of the European Railway Industries (Union des Industries Ferroviaires Européennes).

In concrete terms, the technical annex shows how, according to the initial estimates, investments amounting to approximately €5 billion will make it possible to achieve this critical mass by 2016. The Commission proposes to support about 50% of the investments, including those relating to adaptation of rolling stock, to back up this project, the Community dimension of which is indisputable. Community support may diminish as time goes by in order to speed up the migration.

6. GUARANTEEING INTEROPERABILITY

The Commission therefore proposes putting a substantial financial effort into the promotion of interoperability in general and the deployment of ETCS in particular. In this context, it therefore has to be ensured that Community funds allocated elsewhere in the sector, and especially in infrastructure projects, do not work against the completion of an interoperable trans-European network.

Meeting the requirements of interoperability

In general, the Commission receives proposals for many good projects with a very high added value for the Community and it is not possible to finance all of them. Accordingly, priorities have to be set. Failure to comply with the technical specifications of interoperability in general, and the use of signalling systems other than ETCS in particular, even when legally justified, will in principle be considered to be minus points when evaluating the different projects.

More specifically, in projects for implementing ETCS or GSM-R, it has to be guaranteed that trains equipped with an ETCS module and GSM-R made by one manufacturer can actually run on a network equipped by another manufacturer. It also has to be ensured that all the studies have been carried out to make crossing borders as easy as possible, including rapid transfer from one GSM-R network to another.

The industrialists are working from common specifications, listed in particular in the technical specifications for interoperability (TSIs)⁶ which were adopted by the Commission for the high-speed rail system in 2002 and which are now stabilised. For conventional rail, the TSIs were approved by the competent Committee on 23 November 2004 and will shortly be adopted by the Commission.

These specifications will of course need to be adjusted in order to take account in particular of technological development or any inaccuracies that may come to light during development work.

Such inaccuracies might, for example, lead to the development of software that is incompatible in some areas. To guarantee interoperability, the European Railway Agency (ERA) will have the task of amending the specifications. In accordance with its work programme, beginning in the second half of 2005 the ERA will therefore start increasingly to fulfil its role as the systems authority for both ETCS and GSM-R.

⁶ 2002/731/EC.

The European Railway Agency: guardian of the technical specifications

The ERA, based at Lille/Valenciennes (France), is gradually becoming operational. It is in charge in particular of updating the technical specifications for interoperability.

Apart from the specifications, it is also necessary to ensure that prototypes are tested before going into service in order to check that they conform entirely to the TSIs. In practice, the use of environment simulators recognised by the whole of the sector seems indispensable for evaluating the conformity of the on-board equipment.

Validation of compliance with the interoperability requirements

For any project supported by Community funds and involving the implementation of ETCS or GSM-R, the final payment will be made subject to demonstration of compliance with the TSIs. For on-board equipment, this demonstration will have to be carried out in particular by means of tests on environment simulators in the laboratory and *in situ*. For trackside equipment, discussions will be held with the industry in order to determine how any interoperability problem can be detected as early as possible. A standard clause will be inserted in the individual financing decisions in order to make the final payment subject to presentation of a certificate stating that interoperability tests have been successfully passed.

When a line is upgraded with ETCS, all the on-board ETCS manufacturers, even if their locomotives are not immediately required to run on that line, will be able to test whether there is an interoperability problem between their on-board module and the technical solution adopted for the line.

7. ENSURING COHESIVE DEPLOYMENT OF THE ETCS SYSTEM

For an infrastructure manager, the decision to install ETCS on a line or on part of his network depends on the strategy followed by his neighbour or neighbours. At the same time, a railway company will not engage in a migration strategy without having certain assurances with regard to the strategy being followed by the managers of the infrastructures it is using. In turn, the railway companies' migration strategy will have an appreciable influence on the strategy of the infrastructure managers. There is therefore a clear need for coordination.

7.1. The Memorandum of Understanding between the Commission and the railway industry

A Memorandum of Understanding was signed on 17 March 2005 by the Commission and the railway industry in the broadest sense (i.e. the European associations of industrialists in the sector, infrastructure managers and railway undertakings) to promote the cohesive and coordinated deployment of ERTMS in general and ETCS in particular. The railway industry undertook to assist Member States in the preparation of national plans for the deployment of ERTMS and the Commission in its work of consolidating these national plans into a European plan. The Commission expects the railway industry to collaborate fully on preparing studies for working out, in particular, the costs of migration to ETCS in the main corridors of the trans-European network.

7.2. The European coordinator

In this context it seemed appropriate to appoint a European coordinator, to facilitate the coordinated deployment of ERTMS in general and of the ETCS signalling system in particular. Its role will consist particularly in facilitating the preparation of coherent and economically viable national deployment plans and pinpointing any problems in the implementation of these plans. It will also ease the implementation of the Memorandum of Understanding mentioned above and will make financing proposals for the placing of ETCS equipment on board trains. It will also work in close collaboration with the other European coordinators in charge of corridors for which major delays or coordination problems have arisen.

7.3. Training and certification of drivers

On 3 March 2004, the Commission, in the framework of the "third railway package", presented to the Council and the European Parliament a draft Directive⁷ on the certification of train crews. Prepared in close consultation with the industry and the social partners, this document provides in particular that train drivers must hold certificates of their general competence, valid throughout the Community. These certificates would be accompanied by a certificate issued by the railway undertaking, recognising training specific to the line covered, the equipment used and the undertaking's own operational and safety procedures.

With the standardisation of equipment and procedures permitted by ETCS, less specific training will eventually be necessary. ERTMS already allows drivers to display information in their own language. The aim will be to standardise training and improve the mobility and employability of drivers. The European Railway Agency will also promote exchanges of drivers and trainers between railway companies in different Member States.

⁷ COM(2004) 142 final, 3.3.2004.

8. CONCLUSIONS

The Commission considers that the rapid and coordinated deployment of ERTMS over a strategic part of the trans-European rail network will have a snowball effect and that the use of ERTMS will quickly become the rule throughout the trans-European network. Such a rapid deployment is part of the logic of revitalising the railway industry by stepping up network interoperability.

In order to speed up and better coordinate deployment, this Communication shows how the financial resources available through the existing financial instruments can be mobilised, particularly to help the first infrastructure managers and the first railway undertakings introducing ERTMS. At the same time, the Commission will see to it that the specifications for interoperability are strictly complied with in the projects it is financing. The Commission invites the European Parliament and the Council to support the guidelines contained in this Communication.