

# **Member State Ireland**

## **Account of the Planned Implementation**

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### **Command and Control Systems for the Irish Rail (Iarnród Éireann) Network**

22 December 2017

# **Account of the Planned Implementation of the Command and Control Systems for the Irish Rail (Iarnród Éireann) Network**

## **Overview**

The rail network in Ireland is relatively small and as an island is isolated from the rest of the EU. Furthermore the rail gauge at 1600mm is different from that in Great Britain and the rest of mainland Europe and this gives rise to the need for special rolling stock.

The entire island of Ireland was designated 'isolated network' status for the purpose of the TEN-T Regulation (Regulation (EU) 1315/2013) and is exempt from any mandatory requirements to electrify infrastructure, upgrade the signalling system to ERTMS and for the network to be built to the standard European rail gauge standard. The exemption from a requirement to deploy ERTMS is also recognised in the Work Plan for the North Sea – Mediterranean (NSMED) TENT-T Core Corridor and in Regulation (EU) 1316/2013 and, in continued recognition of Ireland's position, no deployment obligations arise under the EU Commission Implementing Regulation 2017/6 of 5 January 2017.

Accordingly, a national implementation plan for TSI-CCS is not required

## **General and Context Description.**

Iarnród Éireann (Infrastructure Manager), the sole infrastructure manager, is faced with the impending obsolescence of its existing train protection hardware fitted to rolling stock operating over the network. The current systems include:-

- Automatic Train Protection (ATP), and
- Continuous Automatic Warning System (CAWS).

A brief description of both of these systems is provided in **Appendix 1**.

Less than 5% (99 track-km) of the Iarnród Éireann network is provided with Automatic Train Protection (ATP), and this is confined to the electrified route in the Dublin region between Greystones and Howth/Malahide. Furthermore, the DART Electric Multiple Units (EMUs) are the only trains equipped to operate with this system, which automatically applies brakes if a driver fails to obey a restrictive signal aspect or a speed limit.

A further c.42% (900 track-km) of the Iarnród Éireann network is equipped with CAWS, which provides train drivers with an in-cab indication of signal aspects. All other Iarnród Éireann trains are equipped to work with Continuous Automatic Warning System (CAWS), and this requires a driver approaching a restrictive signal aspect to acknowledge a warning. However, after such acknowledgement, the CAWS does not over-ride the driver's subsequent actions if they are inappropriate, as ATP functionality is not provided. Nor does the CAWS system provide any form of speed supervision; the control of train speed is entirely in the hands of the driver.

The remaining 54% (1,166 track-km) of the Iarnród Éireann network is not equipped to operate with any form of driver warning or ATP system. Safety of train movements is therefore highly dependent on a driver's timely obedience to signal aspects and speed restrictions.

Both ATP and CAWS systems in use in Iarnród Éireann network are classified, in EU interoperability terms, as Class B systems.

The EU railway interoperability regulations are written around the premise that existing signalling systems within the EU block will ultimately be phased out over agreed timescales and will be replaced by the European Train Control System (ETCS). ETCS is the signalling and control component of the European Rail Traffic Management System (ERTMS). This 'Class A' system is intended to replace incompatible legacy 'Class B' train protection systems currently used by European railways.

## **Rail network in Ireland is exempted from mandatory deployment of ERTMS**

ETCS specifications have become part of the Technical Specifications for Interoperability (TSI) for railway control-command systems. It is a requirement that all new, upgraded or renewed tracks and rolling stock in the European railway system should adopt ETCS.

However, as set out in **Appendix 2**, as a consequence of Ireland's ERTMS deployment exemption, due to its isolated network status, the Irish Rail network is exempted from the requirement to migrate from its legacy train protection systems to ERTMS and that the effective, safe and efficient operation of rail services requires that the option to expand, renew and upgrade these Class B systems (ATP and CAWS) continues to be available on economic return grounds.

Accordingly:-

- The Irish rail network will not be migrating to ERTMS as Ireland does not have any ERTMS deployment plan obligations arising under the most recent EU Commission instrument, namely the Commission Implementing Regulation 2017/6 of 5 January 2017, in relation to deployment of ERTMS.
- The North Sea-Med Corridor (Annex I) to this Regulation does not apply any deployment timeframes in respect of the entire island of Ireland.
- Furthermore, in reflection of this, there is no provision included in the EU Innovation and Networks Executive Agency (INEA) funding allocation for the maintenance, renewal and development of signalling and control systems in the Irish rail network including ERTMS.
- In the context of the unique Irish rail isolated network circumstances Iarnród Éireann has developed a replacement command and control system. This has been supported by a business case, including a cost benefit analysis, which reflects the relatively low volume of traffic throughout the network.

The relatively modest scale of operations in the Iarnród Éireann network, which could not sustain the required level of investment in ERTMS, is highlighted by the following statistics for the 2016 financial year:-

- Passengers carried: 42.8 million
- Passenger kilometres: 1,990 million
- Passenger revenue: €193.7 million
- Freight tonnes: 0.6 million
- Freight tonne kilometres: 101.4 million
- Freight revenue: €5.2 million
- Length of lines kilometres: 2,164
- Number of station: 144
- Train kilometres: 18.4 million

No part of the Irish rail network is included as part of an EU rail freight corridor.

Ireland has no high speed passenger services.

### **Proposed measures (with provision for open access)**

Since the current on-board CAWS and ATP equipment is nearing the end of its life expectancy, Iarnród Éireann is working through the final stages of developing a replacement train protection system.

Work on the development of this system commenced in 2007 with the initial consideration of options. This system, called the **Iarnród Éireann Hybrid System (IÉHS)**, will support 'hybrid' operation by incorporating and maximising the functionality of both existing systems in a single equipment rack.

The **Iarnród Éireann Hybrid System** will:-

- replace the on-board obsolete CAWS and ATP hardware and interface with the coded track circuits in use in CAWS and ATP fitted areas, and

- utilise ETCS specification Eurobalises, fitted between the rails throughout the network, to communicate with each train and to provide control data such as signal aspect, line gradient and maximum permitted speed data.

Two additional features will permit an enhanced level of safety:-

- **Automatic Train Stop:** The IÉHS on-board hardware includes the addition of a Eurobalise antenna, designed to ETCS standards. Eurobalises are placed adjacent to signals on the network. These combined with information from CAWS or ATP coded track circuits, where available, will transmit to the train the aspect of the associated signal. Where the signal is at danger, the Eurobalise will transmit a stop message and the on-board Eurobalise antenna will receive the message as it passes over it and will command an emergency brake application.
- **Speed Control:** The IEHS on-board system continuously monitors the train speed and compares it to the maximum permitted speeds for the vehicle type, the mode in which the system operates, and the train type at the trains' location, which is obtained from trackside Eurobalises. If the train speed exceeds any of these limits the system will intervene by first warning the driver that the brake should be applied and if the speed is not reduced sufficiently in a given time, by applying the service brake, or, if need be, the emergency brake.

The Iarnród Éireann Hybrid System (IÉHS) project is expected to deliver a range of safety and reliability improvements at a relatively low cost. It has a number of key benefits for the Iarnród Éireann network including:-

1. Improve safety on lines fitted with CAWS and ATP, through the use of the additional IÉHS functionality (train stop and enforced speed limits).
2. The IÉHS functionality (in particular the Train Stop Function) can be deployed on routes without CAWS and ATP relatively cheaply, delivering a significant safety improvement. Such unprotected (uncoded) lines currently account for some 50% of the Iarnród Éireann network.
3. Address the obsolescence issues caused by ageing on-board equipment.

## **Future Open Access**

In order to ensure future open access, the IÉHS on-board solution could also be reconfigured as a Specific Transmission Module for ETCS which may be simply interfaced by a standard protocol to an ETCS on-board installation thereby allowing trains fitted with ETCS to be relatively simply modified to operate over CAWS, ATP and IÉHS networks.

## **Funding of Iarnród Éireann Hybrid System (IÉHS) – expected roll-out is up to 15 years**

It is proposed that this hybrid system will be rolled out over a period up to 15 years depending on the availability of funding. It is intended that this Iarnród Éireann Hybrid System project will be funded via the Infrastructure Manager multi-annual contract including supplementary funding. Funding of €9.6 million was allocated in 2017, an allocation of €9.6 million has also been provided for 2018 and it is planned that similar amounts will be allocated in subsequent years. This is national funding and is a non-EU source.

Iarnród Éireann, as an implementing agency, has obligations under the MS Public Spending Code which sets out rules for appraisal of capital projects and arrangements to ensure value for money is achieved in the delivery of publicly funded projects.

## **Funding of GSMR – planned completion by 2022**

GSM-R is another sub-system of ERTMS. This international wireless communications standard for railways is used for communications between train and railway regulation control centres. Iarnród Éireann has an on-going project to replace the existing analogue radio network with GSM-R voice over three phases and with a completion date of 2022. This project is being funded under the Infrastructure Manager multi-annual contract. A specific allocation of €9.0 million was allocated in 2017, an allocation of €7.0 million has been provided for 2018 and funding is planned for subsequent years to underpin the progression of the roll-out. This is national funding and is a non-EU source. Iarnród Éireann, as an implementing agency, has obligations under the MS Public Spending Code which

sets out rules for appraisal of capital projects and arrangements to ensure value for money is achieved in the delivery of publicly funded GSM-R project.

## **Elements that are not applicable**

Dates of ETCS deployment	Not applicable
Indicative dates of decommissioning of Class B systems	Not applicable
Dates when existing cross-border vehicles shall fully benefit from operation with 'ETCS only equipped on-board'	Not applicable



## **Appendix 1.**

# **Overview of existing Irish Rail (Iarnród Éireann) train protection systems.**

### **Automatic Train Protection (ATP)**

Automatic Train Protection (ATP) monitors the speed of the train and alerts the driver if the speed of the train exceeds the permissible speed. The permissible speed is transmitted from the trackside to the train by means of coded information carried on the track circuits and picked up by coils mounted under the train.

The codes are translated by the train equipment and presented to the driver on a display showing both the actual train speed and the permissible speed. If the train speed exceeds the permissible speed (either because of an increase in actual speed or a downward change in permissible speed), an audible and visual alarm alerts the driver.

If the driver responds to an alarm by moving the master controller to either the coast or brake position, the system makes an appropriate brake application and reduces the train speed until the new permitted speed is reached, at which point the brakes release. If, however, the driver does not respond and is still attempting to drive the train, a full service brake application is initiated and maintained until the driver responds.

When making an ATP-initiated service-brake application, the ATP equipment senses the train's rate of retardation. If this is found to be inadequate, the ATP system initiates an emergency brake application.

Approximately 4.6 % (99 track-km) of the IÉ network is provided with ATP. This is confined to the electrified DART route between Greystones and Howth / Malahide.

### **Continuous Automatic Warning System (CAWS)**

Continuous Automatic Warning System (CAWS) indicates to the driver each change in signal aspect, warns of a change to a more restrictive signal aspect, and initiates a brake application if the driver does not acknowledge the warning.

In the CAWS system, the aspect of the next signal ahead is transmitted from the trackside to the train by means of codes carried on the track circuits and received by coils mounted under the train. The information is decoded and displayed to a driver in the form of a miniature signal display in the cab.

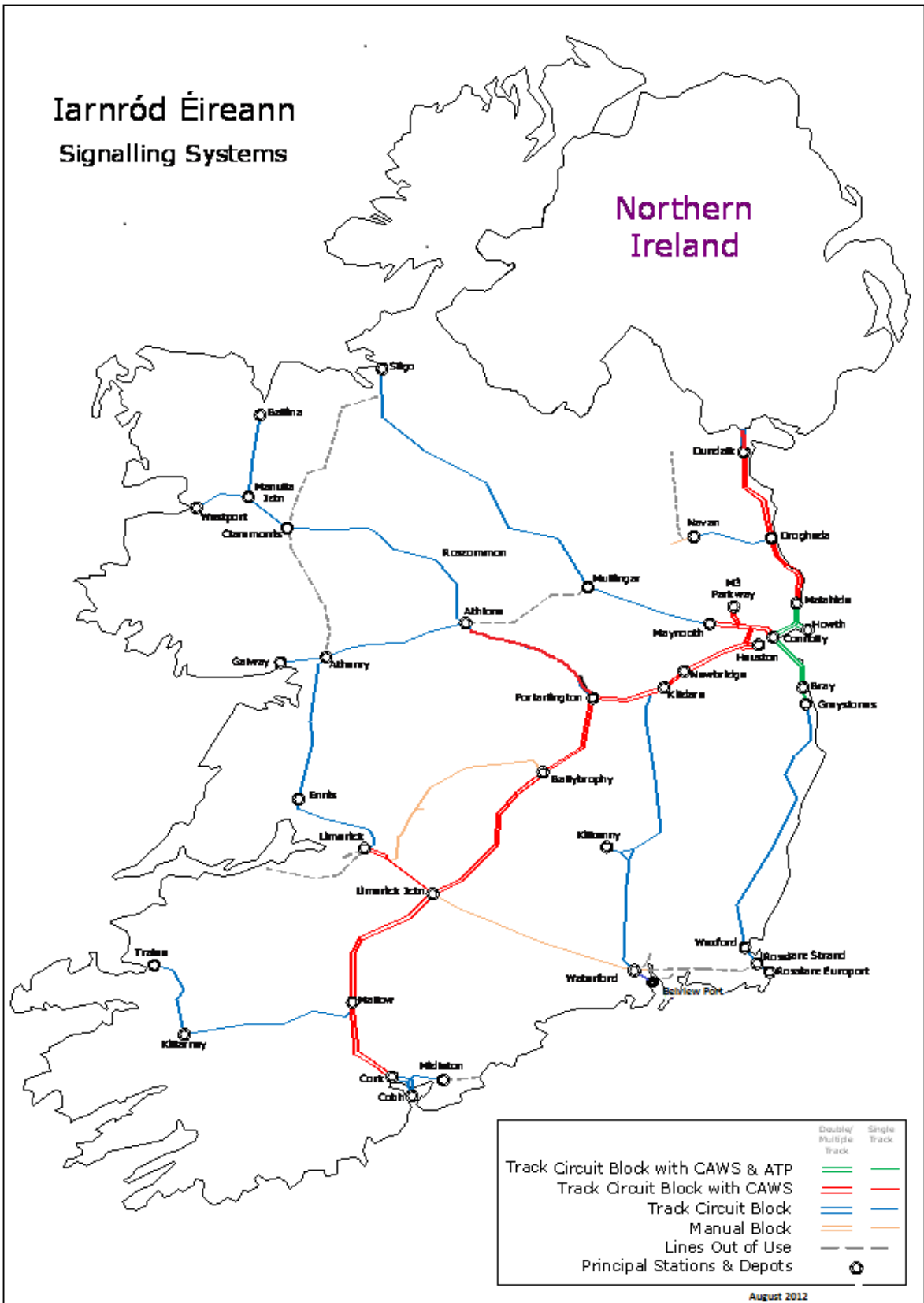
Information on the state of the next signal is received when the train is between 200 and 400 metres (normally 350 metres) from the signal. Any change in aspect from that previously displayed is announced audibly.

A change to a less restrictive aspect (e.g., double yellow to green) is termed an upgrade. This is accompanied by a momentary 'warble' which does not require acknowledgement. A change to a more restrictive aspect (e.g., single yellow to red) is called a downgrade. This is accompanied by a continuous audible tone and requires a driver acknowledgement. Failure to acknowledge results in an emergency brake application which brings the train to rest. However, CAWS does not prevent a signal being passed at danger (SPAD event) if the red aspect has been acknowledged.

Approximately 41.6% (900 track-km) of the Iarnród Éireann network is equipped with CAWS.

# Iarnród Éireann Signalling Systems

Northern  
Ireland



## Appendix 2.

### Exemption from deployment of ERTMS.

The Irish rail network has several unique characteristics which have been taken into account in the implementation of EU regulations including the interoperability aspects of the Fourth Railway Package.

The rail network in Ireland is relatively small and as an island is isolated from the rest of the EU. Furthermore the rail gauge at 1600mm is different from that in Great Britain and the rest of mainland Europe and this gives rise to the need for special rolling stock.

In addition, Ireland has a low population base and the train services are generally uneconomic in nature.

#### **Ireland has 'isolated network' status**

As a result of these unique characteristics the entire island of Ireland was designated 'isolated network' status for the purpose of the TEN-T Regulation during the negotiations of the regulations in 2011. This gave exemptions from any mandatory requirements to electrify infrastructure, upgrade the signalling system to ERTMS and for the network to be built to the standard European rail gauge standard.

The EU legislation that underpins Ireland's isolated network status and exemption from the mandatory requirements listed above is **Regulation (EU) 1315/2013 (referred to as the TENT/CEF Regulation)** and with particular reference to Articles 3 and 12. The exemption is also recognised in the Work Plan for the North Sea – Mediterranean (NSMED) TENT-T Core Corridor and in **Regulation (EU) 1316/2013**, Connecting Europe Facility - Article 2(20).

Furthermore the technical pillar of the Fourth Railway Package was adopted in May 2016, including Interoperability Directive 2016/797. The pending Brexit is still a variable factor in that the outcome as regards the potential impacts and

ramifications are unknown at this point but, on the face of it Article 3.c excuses the application of the recast directive for the Irish Rail network, including train protection systems, on the basis that the network is functionally separate from the rest of the Union rail system (which it will more so be post-Brexit when it will not have any interface with another Member State) and is intended for undertakings operating solely on the network.

There is also a fall back provision in the Directive (Article 7.e) for a Member State to submit a request to not apply one or more TSIs (or part of) in certain specific cases including *'for a proposed new subsystem or for the proposed renewal or upgrading of an existing subsystem when its rail network is separated or isolated by the sea or separated as a result of special geographical conditions from the rail network of the rest of the Union.'*

In addition, Ireland does not have any ERTMS deployment obligations arising under the recent EU Commission Implementing Regulation 2017/6 of 5 January 2017.

As a consequence of Ireland's ERTMS deployment exemption as set out above, it is logical that Irish Rail is exempted from the requirement to migrate from its legacy train protection systems to ERTMS (as applies to MS for whom migration to, and deployment of, ERTMS is mandatory) and that the effective, safe and efficient operation of rail services requires that the option to renew and upgrade these so-called Class B systems continues to be available. This is the common understanding that has been established between Iarnród Éireann and the MS and the ministry, the Department of Transport, Tourism and Sport following an exchange of correspondence.