RPA
Railway Procurement Agency

METRO NORTH ORAL HEARING

PROOF OF EVIDENCE RAILWAY SYSTEMS

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Metro North Oral Hearing
Proof of Evidence
Railway Systems
Bernard Kernan

1 INTRODUCTION

1.1 My name is Bernard Kernan. I am Deputy Power and Systems Manager at the Railway Procurement Agency. I have a bachelor's degree in Electrical Engineering which I received in 1976, and master's degrees in Engineering and Science. I have worked for 23 years on railway electrical systems, particularly signalling, on the design, construction and maintenance of the rail lines and in the implementation of major upgrading projects. I have also worked for 8 years in private industry in telecommunications and IT.

2 GENERAL

2.1 A range of state of the art systems will be provided on Metro North to fulfil a number of functions:

- to ensure that vehicles run in a safe and efficient manner;
- to enable controllers to monitor all activities on Metro North and to intervene if necessary;
- to provide information to passengers as they make their journey through the network and to enable them to talk to an operator if they need assistance;
- to help maintain a high level of security throughout Metro North.

2.2 Metro North will be controlled from a central control room located at the depot in Belinstown. The central control room is the central point where the systems and staff are located to control and monitor the service during normal and emergency operations, and initiate and respond to communication with staff and passengers

2.3 Below grade stops will each have a manned local control room. Staff at these local control rooms will be able to monitor activities at all levels of the stop and are on hand to deal directly with any passenger needing information or assistance.

3 CENTRAL CONTROL ROOM

3.1 The central control room (CCR) will be permanently manned by a number of controllers and supervisors. Each will have a workstation position consisting of a range of computer screens and CCTV monitors. These will allow the controllers to monitor the position of every vehicle running on the system and to see passenger movements at every platform and at every level of below grade stops.

3.2 The CCR will also have a radio system to provide two way communication with all drivers on the system. The controllers can also make public address announcements or can display text messages on the passenger information displays located throughout the line.

3.3 Emergency telephones located at strategic positions throughout will immediately connect passengers to the CCR in case they need immediate assistance. The CCR room will have an associated call centre to respond to information requests from passengers.

3.4 The CCR will have direct telephone lines to the emergency services and to other key organisations such as DAA, Irish Rail and the local authorities. The CCR will also have a desk for the emergency services to act as a central command post in the event of an incident or emergency.

4 LOCAL CONTROL ROOMS

4.1 Each below grade stop will have at least one local control room (LCR) which will be manned whenever the stop is open for passenger traffic. The LCR will overlook the gate line in the stop to help any passengers who are in need of assistance.

4.2 The LCR will also have CCTV screens so that staff can monitor passenger movements and help ensure a safe environment. LCR staff can also make public address announcements and display text messages on the passenger information displays.

4.3 The LCR will also function as local command post for the emergency services to deal with any incident or emergency that may arise at the stop.

5 SIGNALLING SYSTEM

5.1 North of the airport the line will not be a fully segregated system and the alignment will not be fully fenced off from its surroundings. In this regard will be very similar to the existing Luas system and the system in this section is designed to operate on “a line of sight basis” in the same manner as Luas. This is the standard method of operation for a light rail or light Metro system in this type of environment. The driver has control and is responsible for the avoidance of collisions. Metro North is much more accessible because of this operating philosophy. Access to stops is at grade and passengers can cross the lines without using footbridges.

5.2 In the tunnelled sections of the line a more sophisticated signalling system is required, for two reasons. One is that the visibility available to the driver in a tunnel is more limited that at surface level and therefore the driver needs additional information telling him about the condition of the line ahead. The second reason is that the fire strategy that has been developed for Metro North has dictated that there be only one vehicle in any ventilated tunnelled section of the line at a time.

5.3 The signalling system proposed for the tunnels will therefore continuously detect the position of every vehicle in the tunnels and will provide signals to inform the driver if a section ahead is already occupied. This type of system is known as a block signalling system and is the standard method of operation on heavy rail systems and on light rail and light Metro systems where line of sight operation is not sufficient to ensure vehicle separation.

5.4 The system will be further enhanced by an Automatic Train Protection (ATP) system which will prevent vehicles from passing any signal that instructs them to stop. The ATP system will also prevent drivers from exceeding permitted speed limits within the tunnels.

5.5 The short section of line between the main tunnel and the airport tunnel will also be controlled by block signalling to ensure that there will be only one transition point between block and line of sight methods of operation. This will also assist the control of the future connection with Metro West, which will lie within this section.

5.6 The entire line will be overlaid with an automatic vehicle location system (AVLS). This is a system to determine the location of any vehicle on the line and display it in the Central Control Room (CCR). The information from this system is also used to provide information to passengers and for regulating the service. The AVLS system on Metro North will be designed to be interoperable with similar systems on the existing Luas network so that future connections between Metro North and other lines will operate seamlessly.

6 ELECTRICAL POWER SYSTEM

6.1 The electrical power to the vehicles is supplied using an overhead cable known as contact wire. This cable is strung along the length of the route roughly over the centre line of the each track. Power is supplied to the electric motors on the vehicle through a device known as a pantograph which is pushed up from the roof and slides along the contact wire as the tram moves. This line is energized at 750 Volts DC which is the same operating voltage as the Luas system.

6.2 On the surface sections of the line the overhead wires are supported mainly using poles, while in the tunneled sections the overhead wire takes the form of a fixed conductor rail attached to the roof of the tunnel.

6.3 Power from the system will come from the national grid which will feed 110kV circuits to three high voltage (HV) substations located at St Stephen's Green, Dardistown and Belinstown depot. At each of these HV substations voltage is transformed down to 20kV and distributed on a ring system throughout the line.

6.4 Medium voltage (MV) substations are then provided in order to take the power from the 20kV ring and to transform and rectify the current to 750 V DC for output to the overhead line. These substations must be located evenly along the route in line with the power demand which is largely determined by the size of the vehicles, by the spacing between them and by the operating environment - for example, frequent starting consumes more power.

6.5 MV substations will also provide power to each of the stops along the line in order to operate the many ancillary services required. At grade stops will require much lower power than below grade stops as the latter will have range of additional systems such as lifts, escalators, ventilation systems etc.

6.6 The system is designed such that the loss of one HV substation or any one MV substation will not prevent the line from operating. In addition, a range of uninterruptible power supplies (UPS) will provided to ensure that power is maintained to all essential systems in the unlikely event of a complete power failure.

7 TELECOMMUNICATIONS SYSTEMS

7.1 Many telecommunications systems will be provided to enable the system to function in a safe and reliable manner and to provide information and assistance to passengers. The systems will also be used to help make Metro North a secure and safe place to travel. Equipment for these systems will be housed in lineside cabinets or in special equipment rooms built into the below grade stops.

7.2 The main systems are:

- A CCTV monitoring system. This is provided at all levels of all stops and at other location such at tunnel cross passages and portals. The images from this system are displayed in the CCR and LCR and are recorded.
- A Supervisory Control and Data Acquisition System (SCADA). The function of this system is to monitor and in some instance allow remote control of fixed equipment along the line
- A radio system to provide communications with CCR and operating personnel. The radio system will operate throughout the whole length of the line, including the tunnels and will include interfaces to ensure that the emergency services radio systems will also operate throughout the line. The radio system will be designed to

be interoperable with the radio system on the existing Luas network. This system can also transmit data.

- An emergency telephone system. This is linked to the emergency help points at the stops and is used by passengers if they need immediate assistance.
- An information telephone system. This is linked to the information help points at the stops and is used by passengers if they need information.
- A passenger information system. This will display the arrival times of the next three vehicles to arrive at a stop and is also used to display information messages.
- A public address system. This is used to broadcast specific announcements to passengers.
- A building management services system. This is used at below grade stops to control and monitor the operation of lifts, escalators, lighting and ventilation systems and to provide a comfortable and energy efficient environment.

8 FARE COLLECTION SYSTEM

8.1 The fare collection system on Metro North is designed to be fully compatible with the Integrated Ticketing System (ITS) being developed for all transport systems in Dublin. This means that passengers will be able to buy tickets on Metro North that will enable them to continue their journey on other systems such as Luas, Irish Rail or Dublin Bus. ITS tickets bought on these systems will also be valid on Metro North.

8.2 At grade stops on Metro North will be very similar to the existing Luas stops, with open and accessible platforms. Fare evasion will be discouraged by a combination of regular ticket inspections and punitive penalties for offenders.

8.3 Below grade stops will be protected by gatelines through which all passengers must pass. The gatelines will validate all tickets when passengers are exiting the stop and will act as a significant deterrent to fare evasion.

8.4 The gatelines are designed to be accessible to all members of society and will be monitored by the LCR to provide assistance to passengers as necessary.

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Responsible for LUAS METRO Integrated Ticketing System

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