

What is the situation?

In order to facilitate maintenance works NR takes more than 35,000 isolations per year, approximately 2/3 on the AC network and 1/3 on the DC network. The railway electrical environment provides some unique electrical safety challenges,

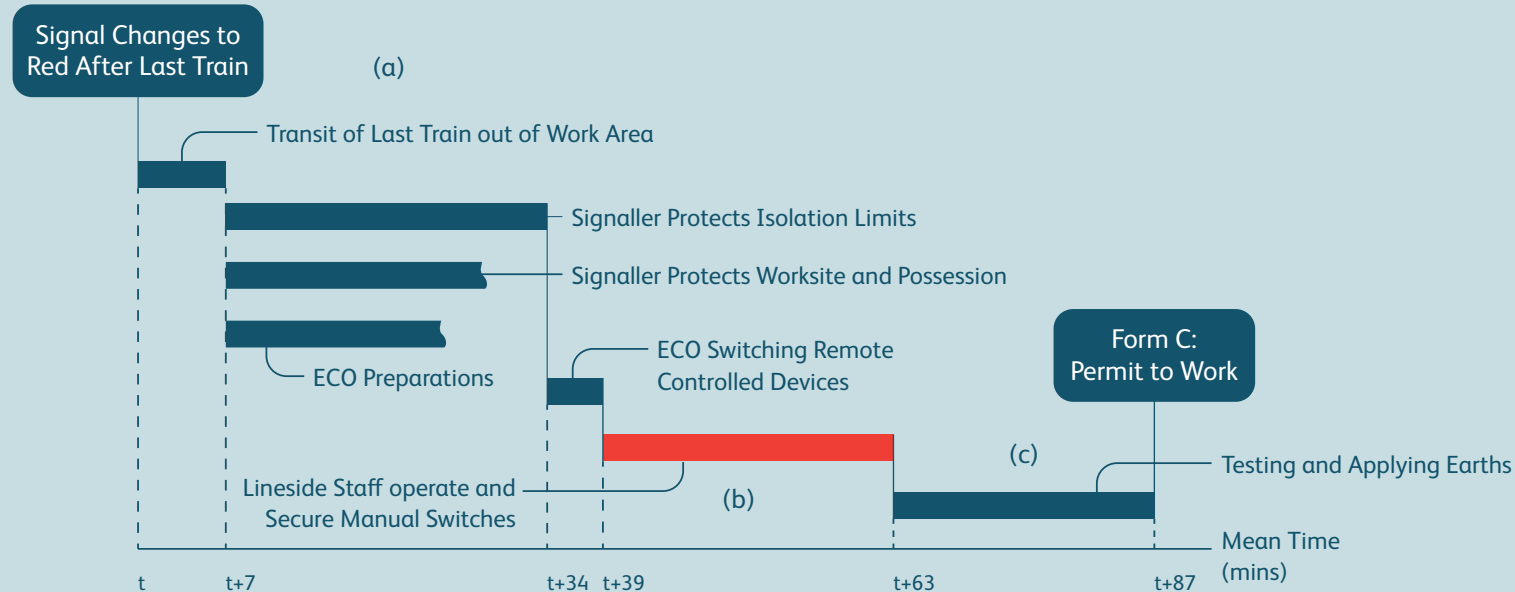
from the number of parallel circuits, to the arrangement of cross-track feeds and discrete overhead line features such as Section Insulators and Insulated Overlaps, the electrical environment is complex.

Without a technology pathway for development for new tools, equipment and Automatic Isolations and Earthing (AIE) new a.c. electrification projects will be exposed to unnecessary safety and compliance risk and extended isolation process on a piecemeal basis, leading to increased staff requirements, or else, reduced maintenance access windows.

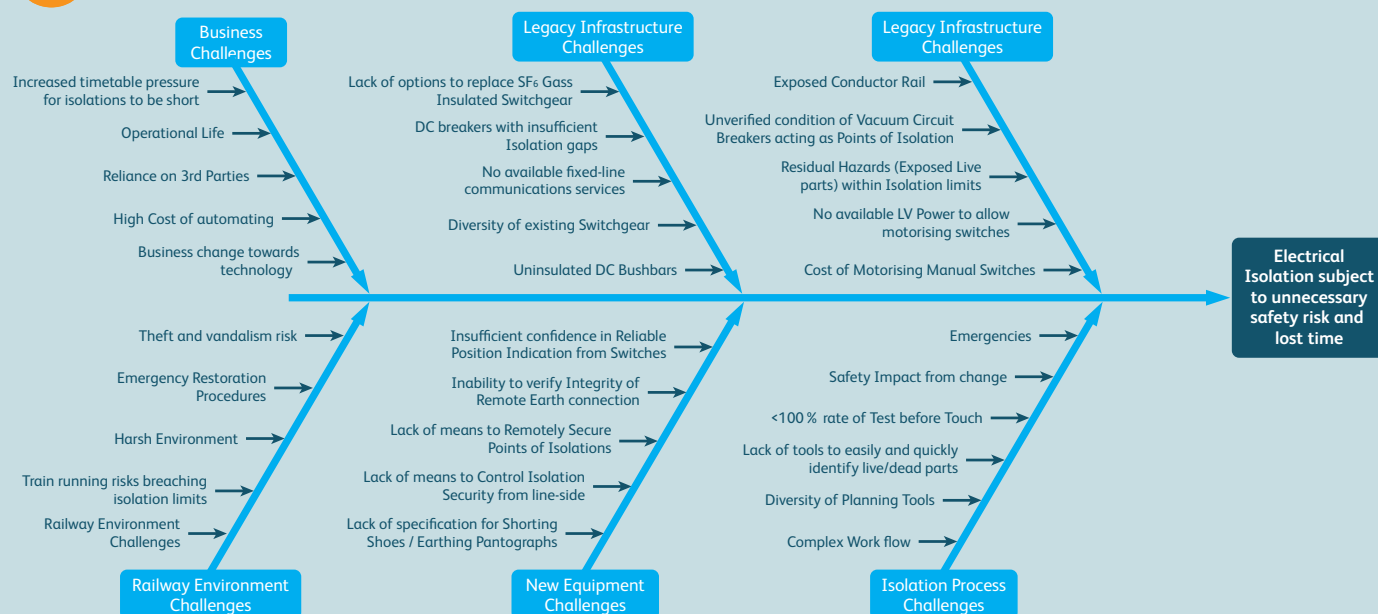
In terms of tools, improvements in live line testers may offer the opportunity to reinforce process and support better identification of live parts; likewise development of innovative means of identifying live parts can contribute to improving electrical safety.

As for equipment, the historical use of Vacuum Circuit breakers as points of isolation, and use of other switches without security, will not be acceptable in future. A reversion to manually operated switches and padlocks alternatively presents an extension to the mean time it takes to set up an isolation and consequently a loss of maintenance access time.

Automation can unlock significant benefits compared to today's manual isolation processes, in terms of the safety and speed at which a compliant isolation can be implemented, thereby helping NR to achieve greater access time to undertake works, however, its deployment comes with a number of challenges.



Analysis of causes



Scope

The overall scope of the challenge is to explore the potential for new technologies to support enhanced safety across the electrified network.

Supporting this are:

- Developing improved knowledge of discrete contact system features and developing new components to reduce the prevalence of exposed, live parts.
- Enablers to support the widespread deployment of improved isolation processes and technologies, across both new and legacy electrification systems. These enablers include retrofitting automation to existing non-motorised disconnectors at remote locations.
- New tools to support improved isolation processes and assist in the demarcation of safe working limits.

Priority problems

Specific priority problems

- Develop new techniques, equipment and understanding to improve the electrical safety of legacy assets.

Related goals

- Improve the industry's understanding and optimise the dynamic performance of discrete features in the OLE, i.e. Section Insulators and Neutral sections.
- Design and development of a Section Insulator with Basic Insulation for 25kV (Compliant to BS EN 50124).
- Design and development of Conductor Rail with Basic Insulation (apart from Contact Surface).

Benefits

- In the a.c. system: improved reliability of the contact system, fewer de-wirements, in conjunction with a new Section Insulator contributes to the improved electrical safety.
- In the d.c. system contributes to improved electrical safety by reducing the risk of contact with exposed live parts.

- Development of technologies to support automated isolations and Earthing.

- Development of Remote Securing for a.c. and d.c. Points of Isolation.
- Retrofit position indication and motorisation for 25kV switches.
- Identification of Power and wireless communications technologies for switches at remote sites (e.g. power harvesting).
- Remote Earth Circuit verification, to prove the effective application of a remote earth.

- Allows isolations set-up to be automated, thereby achieving faster set-up.
- Contributes to improved safety and compliance by allowing isolations to be secure and with confirmed operation of circuit main earths, thereby avoiding potential safety risks from inadvertent re-energisation.

- Development of Supporting Tools and Equipment for Isolations.

- Design and development of Live line testers with data logging facilities (i.e. GPS, time stamp, etc.).
- Design and development of Augmented reality system for identifying live/earthed & isolated conductors.

- Ensures life-saving rules are followed by supplying an easily used and effective toolkit for isolations.
- Ensures people do not inadvertently encroach live parts by making identification of live components simple.

Expected impact & benefits

- Improved safety and reliability performance from the contact system.
- Reduced likelihood of electrical safety incidents during maintenance or project works.
- Improved compliance to the Electricity at Work Regulations (EaWR, 1989).
- Improved safety and compliance with faster isolations.