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Group of Experts on Improving Safety at Level Crossings

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Programme of Work:
A summary of good practices including education and technology

This paper, prepared by the Chair, is intended as a first draft to be refined and expanded upon for inclusion in the first draft strategic report planned for initial review at the Seventh Session of GE1 in March 2016.

Discussion Paper /Summary of Technology at Level Crossings for GE.1 Members

1. Recent statistics have shown that annually there are often more than 300 people killed in more than 1200 accidents at level crossings just in the European Union. This is a small percentage of the total global statistics but it represents a readily available and reliable data set for discussion.

2. The traditional approach to improving safety has been to upgrade the type of level crossing protection system often irrespective of the causal factors of an accident or accidents or any technical rail based issue.

3. Automatic level crossing systems have become the favoured method and technology but the desire to reduce delays and congestion has created a number of challenges that technology has struggled to overcome.

4. The trade-off between improving safety but increasing warning times or negatively impacting train regulation has been a constant challenge.

5. A complex set of technical and non-technical requirements and high safety requirements for level crossing systems in many railway sector standards create a high cost hurdle for developers and customers.

6. Common approval processes do not necessarily negate the requirement for many local testing requirements which is a further consideration for developers and manufacturers. Achieving the highest safety integrity level with a product robustly and independently tested on sovereign infrastructure often only really creates a local market opportunity. However, other than creating a level of confidence in the capability of any new technology it does not necessarily remove the requirement for testing and product approval in a similar but different environment. This is a major consideration for innovators and investors.

7. The duration for approving a product that may already have a high safety integrity level is dependent on the pace of the customer and may be in excess of two years. This creates a huge disincentive to manufacturers and reduces the opportunity for many SME’s to become involved in a high risk, high cost development. The unintentional consequence of the processes is to stifle innovation and often to restrict this to only the largest organisations.

8. Many attempts have been made to introduce new technology but there is not huge evidence of this at the asset level. What we mean by this is the look and feel of Level Crossings has not changed very much in the last 20 years or more.

9. New types of lighting, both on the rail and roadsides has been introduced along with vehicle activated signage and better road control measures to slow and channel both vehicles and pedestrians and to address issues such as attention or motivation. Low tech measures on road surfaces and approaches to crossings have been developed in conjunction with Human Factors experts.

10. Radar based obstacle detection systems and enforcement systems have also been introduced. New types of audible warnings, barriers and barrier machines and improvements to the materials used for crossing surfaces and innovations to aid installation and maintenance are largely anonymous to the end user but have realised greater efficiencies.

11. GPS technology has been used for improved information on train position and communications to train and road vehicle drivers.

12. Generally, there is not a collaborative, strategic, borderless approach to setting requirements and this inevitably leads to bespoke requirements. Manufactures would typically be looking at the international level crossing customer market and not an individual state but the sovereign approach may also have this effect on the appetite of many to become involved in technology development to improve safety at level crossings.

13. This reticence can extend to the customer and operational side also. Business planning and investment cycles are often shorter than technology development timescales and unless a particular strategic vision or objective is driving innovation then development can become fragmented or stalled or not receive the levels of continued investment required to commence or complete such a project. It is relatively unusual to find many examples of such long term visions which often leads to product led and not customer led technology development.

14. The capability of companies with expertise primarily in railway operations using traditional railway technologies is also a major consideration when reviewing the landscape of level crossing safety technology.

15. Solutions are often restricted to track based train detection concepts that subsequently generate an output at the crossing. This is familiar and a comfort zone for many infrastructure or signalling engineers but it is also expensive and can be inflexible. Testing, installing, maintaining fixed or semi-permanent infrastructure is a complex and convoluted process for many. It is also costly and often more costly than the threshold at which a business case can be generated.

16. The consequence of this is to maintain the status quo. The list of requirements combined with the whole life cost of many proposed technology solutions create gold plated solutions that cannot meet investment justifications for many fairly low risk locations. This is where a major disconnect appears between engineers and operators. Incremental improvements are pragmatic for operators but it is a compromise that many engineers will not sign off on.

17. In 2008 the Safer European Level Crossing Appraisal Technology (SELCAT) Project created a vision of what a future technology roadmap may look like. Video Analytics and GPS were part of this vision. However, in the intervening years these technologies have become widely used in all sectors from aviation and military to retail and security but they have largely failed to become established at the road rail interface. Some of the reasons already discussed are key to this lack of development.

18. Intelligent Transport Solutions (ITS) has also moved on significantly in the last ten years but the low numbers of accidents compared to road accident statistics mean that it is only the rail side that is truly concerned with the development of technology to improve safety at level crossings in many cases. It is not generally a priority issue for the road side.

19. A general lack of evaluation in relation to new products introduced to improve safety as opposed to the evaluation of their technical performance has also constrained the development of technologies. It is difficult to measure the specific safety benefits of many products and innovations which in turn reduces the justification for further deployment.

20. The end result of this appears to be a world where there is a huge renaissance in rail, and a constant desire to introduce more trains, faster trains, lighter trains, longer trains, coupled with far more road vehicles; and larger road vehicles traversing borders. The impact of this on level crossing safety does not always seem to be fully considered and aligned to long term solutions.

21. With huge predicted growth in these numbers as populations increase and wealth increases, in many poorer nations, and the introduction of super-size agricultural machinery, more migrant workers and contractors, and new ways of working more

intensively to meet growing consumer demands. Juxtaposed with a technological revolution that has advanced society in so many different ways, increasing capability but creating different and new challenges and risks and creating greater tolerance to risk and perceptions of risk.

22. However, advancements have not necessarily translated to the road rail interface where mitigating technology is not being introduced at the rate of change and is not generally part of a long term vision. Hence a very large number of passive crossings with very basic, sometimes ineffective roadside 'protection' that already require low cost technological solutions. It is important to remember this is in an environment where requirements are often driven by stakeholders' perceptions and not always prioritised based on risk. This may create a greater demand either genuinely or artificially and require something far more sophisticated and unplanned to sit alongside many long term legacy issues.

23. Recommendations (for discussion):

- For the responsible organisation within individual states to create a long term [10/20 year] technology roadmap for level crossings;
- To share this technology roadmap with international peers with the objective of discussing possible collaboration opportunities for high cost development projects that are common and strategically aligned to the visions of both / all;
- To consider / identify the most appropriate and effective process for disseminating or hosting information on proposed technology development for level crossings;
- To consider identifying a multi-national technology development project where requirements can be jointly agreed and testing and approvals shared along with costs;
- To baseline the risks, the introduction of a new intervention is seeking to mitigate prior to installation. Then to measure this post implementation to quantify the benefit achieved [or not] and evaluate the outcome.