

Rail Technical Strategy – Responses to consultation

Introduction and common response themes

Following the publication of the RTS consultation document, '*Shaping the 30-year Rail Technical Strategy*', in October 2010 and its widespread distribution, more than 70 responses were received.

This document provides a summary of these responses. Coming from a broad range of stakeholders and interests, it should be emphasised that the responses do not always fit together snugly (some may even appear to contradict others) or necessarily reflect shared rail industry thinking. Technical Strategy Leadership Group (TSLG, formerly TSAG), which includes representation from across the rail industry, does not necessarily agree with every outlook and observation reported in this document, although some of the comments reinforce ideas already on the industry's radar.

However, the point of the consultation was to collect a broad range of inputs. These will be now be considered and where appropriate followed up with consultees, with a view to helping the Technical Strategy Leadership Group with its development of the programme and the second edition of the Rail Technical Strategy.

There was strong support for the approach adopted in the consultation document, the use of the 4Cs, the 'game changers' identified and the proposed way forward. Some respondents challenged particular technology interventions, such as discontinuous electrification, or identified weaknesses, such as the description of the relationship with the ERTMS deployment plans and the need to identify technology that might become available over the next 30 years.

There was keen interest in further engagement in the process of developing and implementing a technical strategy. Some possible alliances were proposed. Wider communication of the work of TSLG to the 'coalface' was seen to be needed.

The most common themes emerging from the responses are listed below. This is followed by a summary of responses to the specific consultation questions and an analysis by subject.

Common themes among the responses were:

- Align the technical strategy with (and contribute to) a broader strategy for the railway
- Understand the technological environment beyond the railway
- Keep the strategy truly strategic; avoid too much detail
- Adopt a more customer focused approach
- Address the operations impacts, not just the engineering solutions
- Include more on themes such as security, weather, automation and commercial incentives
- Learn from other industries – the rail industry is poor at innovating because of its culture, organisation and aversion to risk
- Embrace technical risk (but not safety risk) in exploring new technical possibilities
- Include the European dimension (legal, technical, commercial)
- Include people skills - vital for the success of a technical strategy

In addition, a wide range of technology ideas was put forward for possible investigation.

Responses by Question

Q1. Have we understood the context?

Overwhelmingly yes. However:

- A common issue was that it was not clear that we understand fully the technical context – what already exists, what is being developed and will be commercially available (or not) especially beyond the rail industry. The strategy must align with the market.
- Many wanted the strategy to be set within a wider vision for transport and rail. Several referred to the McNulty review.
- A theme was that the UK is too small to be a viable market.
- We were challenged on assumptions about demand and energy and it was proposed we update scenario planning.
- The relationship with current deployment plans for ERTMS needs to be clearer

Q2. Have we got the right key interventions?

Generally, yes. Additional areas for intervention suggested, and other comments, included:

- Operational issues such as ticketing and the potential for driverless trains
- Technical approvals policy
- Data issues (not just ‘communications’) data warehousing
- Operational safety enhancement
- Commercial incentives for innovation
- Security issues – passenger ticketing, movement, terrorism , cyber security
- Software approval requirements – agent based, reasoning software
- Protection of assets from weather and external events
- Smart energy use measurement
- Reliability should be expanded to cover Availability, Maintainability and Safety
- ‘One size’ may not fit all

Q3. Do you agree industry needs to change to become better at enabling innovation?

The response was almost unanimously yes, although the suggested reasons and remedies varied:

- The overwhelming view was that the rail industry is poor at innovation because of culture and structure, with contracting and purchasing approaches often cited as particular inhibitors of innovation and system integration. Complexity and the need for safety were not regarded as justifications.
- Alignment of incentives was seen as vital, with ideas for progress based on PAS11000 and DTCs, links with academia and leveraging defence/aerospace ideas and models for using suppliers. Also the ‘Through Life Capability Management’ long-term planning tool used by MOD. Collaborative supply chains need to be developed.
- Several respondents supported change to ‘embrace technical risk’ and ‘tolerance of failure’ (innovation, not operational systems)
- Shorter life cycles were seen to bring innovation opportunities.
- Ideas to promote innovation included a central point to receive ideas, allowing local innovation, and taking a different view about risk.

Q4. What significant technology issues would you like to draw attention to?

Respondents put forward a large range of possible technologies and interventions, including:

Photovoltaics; data hubs; fault tree analysis for degraded mode operation; obstacle detection systems for level crossings; autonomous systems, position and location systems, sensing systems, image based information capture, prognostics, real-time modelling, EMC, vehicle dynamic modelling, corrosion management, network modelling, infrastructure security, situational awareness and decision making tools, train thermal management, new materials, energy/fuel management, crumple zones and like redesigns, implementing EU standard infrastructure, track friendly trains and vv; driverless trains; solar technology; mechatronics, widespread electrification, alternative fuels, fuel cells, energy storage, MAGLEV etc; gauge enhancement, real-time data, new approaches to risk (fence removal etc); reduced headways using wireless, ticketing technology; Programmable Logic Controllers to replace current interlockings; 'fly by wire' trains; social networking technology.

Q5. How would you like to engage further in this process?

Most respondents were positive about further engagement. Some suggested formal mechanisms, such as Joint Ventures for delivering next generation technology. Links to other groups, such as the Bus Rail Technology Alignment Group and existing industry asset management groups, were seen as important. Some reported that there is a very limited understanding of TSLG work in the wider industry, and it needs better communication to the 'coalface'.

Q6. Is there any other matter you would like TSAG to consider?

Many respondents identified additional subjects that could be considered as part of the work being taken forward:

- The most common response related to the need to take account of the European and international context relating to the structure of technology supply markets, particular applications available beyond UK and interoperability issues TSIs etc. ERTMS in particular was thought to be under-reported as a key part of the technology story. Several respondents proposed international benchmarking exercises. The business case for converting UK to continental gauge was mentioned more than once.
- Many considered the strategy needed to be based on an agreed vision of the railway and its role, with defined functional and operational strategies.
- There were many comments on the need for people skills to be fostered in line with developing technical capabilities.
- Many wanted more customer focus.
- There was a strong appeal for better operational focus, and involvement of TOCs and FOCs.
- Many respondents wanted TSAG/TSLG to deal with matters which are beyond its current remit, such as industry structure, franchising policy and regulation.
- Several mentioned the need for strong links between proposals and impact, the benefits of quick wins, fit with industry strategy etc.
- Other matters included the inclusion of maintenance and renewals automation, dual use trains, the value of safety, the convergence of signalling telecoms and IT disciplines.

Responses by subject

Cost

- Creative financing of electrification using long term leasing of fixed equipment
- Physical cost reduction includes using slab track to lower formation
- ERTMS is the 'elephant in the corner'
- Technology is not the cause of high railway cost
- Consider conversion to European standard railway as long term cost reducer
- Central traffic control - like NATS

Capacity

- Disruption response algorithms are well established in some European metro systems
- Building more track is the only solution to capacity
- Challenge the demand (and other) assumptions
- Take ERTMS Level3 and ATO as givens – consider deployment (including elements that could be expedited) and then autonomous trains managing collision avoidance.
- With radically improved traffic management capability devise new scheduling solutions such as adaptive timetables and 'on demand' services
- Relate to business change and the human dimension for usability and uptake
- Is doubling sufficiently challenging given rail's low share? Why not quintuple?
- Refer to the Network Rail Operating Strategy, exploiting traffic management technologies around the world and associated operations concepts, as the basis of the RTS

Carbon/Energy

- Develop the use of photovoltaics
- Consider electricity supply issue, plus pricing and taxation
- Management not technical issue (need rolling electrification programme - will halve carbon) and efficient use of energy. Discontinuous is irrelevant and at odds with reliability
- Challenge central assumptions – carbon may become hygiene factor, no competitive advantage. UK energy policy context with medium term supply shortages.
- The energy strategy section does not adequately capture the relationship with other work-streams. Most significantly work to determine optimum line speeds, future traffic regulation and train mass are all closely inter-related. A 'systems' approach would ensure that the synergistic benefits of all these related activities are achieved
- Too much emphasis on exotic solutions

Customer

- The customer is under-represented
- The strategy is too production led – it should focus more on the customer. We know customers like frequency, reduced door to door journey times, flexible ticketing, a seat, a quiet/smooth ride, electrification, and new trains.
- Consider access to/from rail – the whole door to door journey
- Focus the use of data/information to satisfy customers
- Adopt a sequential customer experience approach – behavioural and physical – leading to requirements for improved and coordinated passenger guidance and facilities, including network-wide industry practices, such as control of seat occupation and dealing with luggage
- Drop this C as it is a by-product not a standalone strand

Rolling Stock

- Add work on freight vehicle development materials, payload and resistance
- Consider issues related to winterisation
- Weight reduction of rolling stock

Reliability

- Quality (rail compares poorly with other transport industries).
- Reduce redundancy eg track layouts. Need route cause analysis of reliability issues.
- Fit for purpose freight diversionary routes
- 24/7 operation
- Critique of passenger satisfaction survey results
- Include 'Availability', 'Maintainability' and possibly even 'Safety'. Currently there is no industry strategy to share and exchange modelling and simulation data. This would minimise the multiple input of data to a multiplicity of models
- The industry badly needs an integrated, sophisticated modelling capability which addresses all current and potential future systems
- The contribution of non-technology-based interventions should also be part of the picture
- Seasonal preparedness

Data/Communications

- Ensure use of data and information to satisfy customers, manage resources and design out weaknesses
- There are situations where too much routine data is in circulation. Exception reporting to act upon disruptions or other problems is an approach that has still to find a wider application
- Refer to the Network Rail Fixed Telecommunications Network (FTN). This is already proving to be a powerful enabler, for example in the two Modular Signalling Schemes.
- The industry as a whole is relatively immature at managing data. This should be addressed as part of the strategy development to include the integrated management of Business, Operational and Safety Critical data, where appropriate
- Provide a solution that can adjust with operational challenges and changes in customer behaviour over time
- Travelling public security will require technical solutions and the overall railway strategy should address this. Cyber security is also an issue
- The current approaches of Safety Integrity levels, approval of deterministic code, are already rapidly becoming out of date – and as software methodologies develop the ability of the industry to utilise lower cost, higher technology mainstream solutions will be found wanting. Agent based, reasoning software is already starting to become viable in the safety critical applications within aerospace – is the rail industry ready to start to use these systems and techniques? Without interventions around these key areas, the technical strategy might consign the industry to 'last generation' technologies, rather than the 'next generation'

Innovation

- This approach is compelling and allows the blockers and barriers between the current situation and the new situation to be considered
- Network Rail's acceptance process inhibits change. Make the process more flexible

- Network Rail and RSSB have put processes around innovation, counter to best practice innovation management. Suggest an approach of stimulation, rather than fact finding and reporting
- The structure of industry constrains innovation
- Risk aversion is major inhibitor and cost raiser (from bespoke solutions)
- Focus on cultural and organisational barriers. Need risk based approach to safety
- Pre retirement debriefs, social networks
- There appears to be no formal system or mechanism for innovation within the UK rail sector. A lot of the research undertaken for the industry within academia is essentially highly technical and has little direct linkage to commercial applications
- Learn from the international logistics sector
- Develop the skills base
- Linkages to multiple sector research programmes
- Business and technical leadership must not be separate
- Sponsor function is not in a single place
- Remaining issues are not technological but structural: business cases which have to pay back in short periods; discontinuity of a business case where it straddles a control period or franchise boundary
- There is too little empowerment and too much control. We should concentrate on connectivity more than solutions
- Most innovation is in the hands of the multi-national engineering groups. There are existing traffic control systems in operation eg ICONIS in Bologna. Signalling majors' involvement is needed to develop NGTM.
- Train suppliers see innovation as risk

Technology Interventions

The technologies and areas for intervention, identified by respondents, included:

- Life extend existing assets
- Take weather effects seriously
- Ability quickly to modify infrastructure layouts
- Rubber-tyred wheels
- 'Plug and play' trainsets
- Use a RAMS (Reliability, Availability, Maintainability, Safety) approach
- Premium grade steels
- RFID tags
- Generic displays for cab signalling
- Existing whole system whole life tools
- Self propelled short formation self load/self discharging train concept
- Strengthen the link between the 4Cs and interventions
- Track circuit failures as key delay target
- Continuous train based train positioning
- Programmable Logic Controllers to replace the current generation of electronic interlockings
- The use of industry standard networking for the distribution of signalling information from control centres to trackside devices - points, signals, level crossings, etc.
- A new radio standard with backward compatibility.
- Joining and splitting trains while in passenger service
- Future of third rail DC electrification
- Remote switch on/off refrigerated freight container
- Technology scanning

- A programme to hybridise the diesel engine, then a replacement for it
- Include HS Rail, Tram-Train. Challenge standards that cause large costs for marginal (eg safety) benefits
- Energy supply - Scotland will continue with diesel
- Slab track; plastic sleepers
- TSI implementation plan at EU Member State level
- In some areas, optimising existing technologies may well provide better answers than the 'newsworthy'/trendy alternatives
 - Autonomous systems
 - Position and locational systems
 - Sensing systems
 - Image based information capture
- Systems must be capable and be long lived, despite rapidly changing technology components. Therefore systems thinking must dominate the 30 year timeframe
- Prognostics and Diagnostic systems
- Real time modelling and simulation will become indispensable
- Corrosion management
- The electromagnetic spectrum will become ever more polluted and in the 30 years life of the strategy, Rail may not be kept exempt from very tight EMC legislation. Tackling EMC as part of a move to the electric railway will be essential
- Network management – modelling, infrastructure security
- Situational awareness – decision support systems to manage financial, efficiency and green issues – algorithms are needed
- Cross modal decision support
- Train thermal management
- Material technologies
- Energy management
- Structural redesign – eg use redundant crumple zones
- Security
- Load factors are low today
- Passenger travel plans
- Adoption of EU standard infrastructure
- Solar power
- Differentiated standards

Other comments

- The technical context is missing. Technology is constrained within a market driven commercial context. If this context is ignored there is a risk that the technical strategy for rail may require solutions that are unlikely to be adopted in the mass market place, and the rail industry will not be able to capitalise on the very rapid developments and lowering of costs that occur elsewhere.
- A 30 year vision/objective for GB rail has not yet been set by industry or government.
- Once work is done on the wider technical agenda the document will need to expand its thinking to address the issues raised. This should address a concern that the initiatives reflect the application of current technology to a position of anticipation of future changes and options.
- It is widely expected and in some areas already evident, that the traditional signalling, telecommunications and information technology disciplines will converge. The Technical Strategy should acknowledge this and seek both opportunities by which the industry can capitalise on this and to ensure that the implications of this convergence are properly understood with respect to the existing skill base.
- As the industry develops its planning approach we consider that a clearer linkage between proposal and impact should be more strongly reflected in the document. We would also like to see a broader consideration of technical issues and challenges demonstrated.
- The document is focussed almost exclusively on technology and would benefit from consideration of the importance of appropriate (industry-wide) processes to support the various initiatives.
- It is widely expected and in some areas already evident, that the traditional signalling, telecommunications and information technology disciplines will converge. The Technical Strategy should acknowledge this and seek both opportunities by which the industry can capitalise on this and to ensure that the implications of this convergence are properly understood with respect to the existing skill base.
- Consider the role of the train operator.
- Review rail's functions as the basis for strategy.
- Engage with Crossrail and Transport for London.
- Need for a central point for collation of externally generated ideas.
- Consult community organisations.
- Quick wins are needed to build credibility and industry engagement.
- Railways in Britain should be adopting the best of European if not world thinking and practice.
- The strategy should acknowledge the "technology gap" in a 30 year horizon. That is the gap between what is technically possible now, and what we actually do.
- Focus on the technical and operational aspects of Energy Efficiency, Reliability and Communications.
- TSAG/TSLG should review its programme against the Rail Industry Sustainable Development Principles and consider running an updated futures and scenario planning exercise to reassess long term trends. This would go beyond rail to integrated transport, taking account of social, technological trends, energy issues and policy.
- Scotland has different law and requirements so consider applications in that context.
- The strategy is too short term. Identify its target audience. Cover all the 4cs. Consider the relationship with European and Far Eastern research.