Issue 1 - Spring 2008

TSAG
Technical Strategy Advisory Group

Implementing the Rail Technical Strategy: delivering a better railway

This leaflet explains how the Department for Transport (DfT) and the rail industry are working together to implement the Rail Technical Strategy (RTS). The aim of the RTS is to deliver a more cost-effective, reliable and efficient railway offering greater capacity and a better service for passengers.

Why do we need a technical strategy?

The Rail White Paper "Delivering a Sustainable Railway" published in July 2007 set out the key challenges likely to face the railway over the next 30 years. These can be broadly summarised as:

- Expanding capacity to meet increased demand;
- Reducing environmental impacts;
- Meeting higher customer expectations; and
- Improving cost efficiency.

The Rail Technical Strategy was published alongside, and in support of, the White Paper. It considered how a combination of existing and future technology can help the railway meet the challenges set out in the White Paper over a 30 year time horizon. This time period was chosen both for consistency with the Rail White Paper and because this is a reasonable figure for the average life of rail assets.

The RTS explored how existing and emerging technologies could increase capacity whilst improving sustainability and affordability. It concluded that:

- **Capacity** can continue to be enhanced through conventional incremental upgrades such as longer trains and platforms. But to get the most out of existing infrastructure, cab-based signalling systems such as ERTMS – the European Rail Traffic Management System – are needed together with high-reliability trains and infrastructure.
- **Rail carbon emissions** can be reduced in the short term through better housekeeping such as driver training, intelligent use of heating and lighting as well as the roll out of regenerative braking. (Regenerative braking is a way of slowing an electric train by using the motors as brakes. Instead of the surplus energy of the vehicle being wasted as unwanted heat, the motors act as generators and return it as electricity into the supply rail or overhead wire. This electricity can be re-used by trains locally or fed back into the national grid.) In the medium to longer term, lighter trains using new energy storage technologies combined with intelligent systems for controlling the movement of trains through the rail system offer significant opportunities to reduce carbon emissions.
- **A better "door-to-door" service for passengers** can be delivered through improvements to safety, security and accessibility on stations and trains, better integration between modes, real-time information on train services and improved ticketing systems.
- **Improvements in cost efficiency** can be achieved through taking a "whole-life, whole-system" approach to costs and by the application of appropriate standards (rather than assuming all trains and infrastructure must be built and maintained to the same level). The introduction of cab-based ERTMS signalling will reduce the need for installing and maintaining

Although DfT published the RTS, it was developed through an open process of engagement with the rail industry. The Technical Strategy Advisory Group (TSAG), which comprises senior rail industry stakeholders and is chaired by DfT, has been set up to develop and implement the RTS. Over the coming months, TSAG will focus on a number of key areas notably:

- **Communication:** ensuring that the technical strategy, its benefits and implications are understood by all key industry staff.
- **Sustainability:** reviewing the longer term sustainability challenges facing transport and considering how rail can best respond to these.
- **Quantification:** quantifying the benefits that the technical strategy can deliver over the 30 year planning horizon and establishing the targets that industry should aim to achieve at engineering level.
- **Mapping and gap analysis:** mapping how existing programmes, research and initiatives are contributing to the delivery of the RTS, identifying gaps and assign priorities.
- **Opportunities:** identifying opportunities to implement RTS, for example through renewal and enhancement projects and the introduction of new rolling stock.
- **Encouraging innovation:** considering how to overcome barriers to innovation within the rail industry which is traditionally quite conservative in culture. This will build on the outputs of the Innovation Forum that Tom Harris held with the rail industry in December last year.
- **New initiatives:** initiating new projects or research needed to deliver and/or inform the technical strategy.

To inform future research priorities, TSAG will develop technology "route maps" setting out the transition from today's railway system to the railway of the future. This will involve quantifying targets for improvement, understanding what can be delivered with existing or emerging technologies and assessing the gaps to be met by further technological innovation.

So the overall challenge facing TSAG and the rail industry is to work out how to deliver the high-level aspirations set out in the Rail Technical Strategy to deliver a more sustainable railway. This will require a combination of incremental change in the shorter term and the introduction of new technologies and systems in the longer term.

Characteristics of the future railway as identified in the Rail Technical Strategy

Key technical themes	Description
Optimised track-train interface	Light but strong trains running on precise, well maintained track. This will help to reduce noise, energy consumption and track maintenance costs.
High reliability, high capacity	Very reliable trains and infrastructure with minimal equipment alongside the track. Intelligent infrastructure and trains, each able to monitor the condition of the other to predict and prevent problems.

Key technical themes	Description
Simple, flexible, precise control system	In-cab signalling to reduce the need for lineside signalling. Intelligent management of trains through the network to maximise capacity and energy efficiency (for example by enabling trains to run closer together and reducing how many times they have to stop between stations).
Optimised traction power and energy	Regenerative braking on all trains. Better use of existing electrification and additional electrification where justified by business need.
Integrated approach to safety, security and health	Improved safety through full automatic train protection, reduced level crossings and better obstacle detection. Better security through wider use of gating and systems for detecting abnormal behaviour and intrusion. Public health concerns may result in improved air conditioning with active filtration, the elimination of uncontrolled emission toilets and anti-bacterial/viral coatings.
Improved passenger focus	High quality information for passengers based on up-to-date data on train location and crowding levels. Improved ticketing systems based on smart cards and enabling the use of mobile phones. Better understanding of passenger travel demand to inform train and timetable planning and integration with other modes. Improved accessibility to stations and trains with high levels of security and support for passengers.
Rationalisation and standardisation of assets	A reduction in the number of different types of rolling stock to deliver economies of scale and improved performance and compatibility. Greater use of modular and off-the-shelf equipment including high-quality, modular stations based on standard building units that can be assembled quickly with minimal disruption to the railway.
Differentiated technical principles and standards	Applying appropriate risk-based standards to different parts of the railway to improve cost efficiency. For example, rural lines that have relatively few services may not require the same level of regulation as heavily used commuter routes.

Initiatives underway in support of the Rail Technical Strategy

- **Regenerative braking** – good progress has been made in enabling electric trains to recover some of the braking energy that would otherwise be lost as heat. All of the AC electrified network will be capable of supporting regenerative braking by the end of 2008 and all capable AC trains are already able to regenerate. A significant proportion of DC electric trains should be regenerating by the end of 2008.

- **Intercity Express** – this programme will deliver a new generation of high speed diesel and electric trains. It specifies a light, energy efficient, reliable and high capacity design together with improved track quality. The new electric trains will need to be up to 37 per cent more energy efficient than the trains they replace. The diesel trains will be up to to 33 per cent more efficient. A combination of increased carrying capacity and the ability to run longer and more frequent services will deliver an increase of between 15 and 70 per cent more seats on the initial routes. The trains will start working trials in 2012, and enter full service from 2015.

- **Family of trains** – beyond the Intercity Express programme there are significant opportunities to introduce improved designs of diesel and electric trains. The "family of trains" approach set out in the RTS, proposes a limited number of train designs to replace the myriad of different types of rolling stock currently in use. The new designs will deliver economies of scale, offer significant improvements in energy efficiency and provide opportunities to use common body shells, traction packages etc. This concept is now being developed through the Network Route Utilisation Study and is already influencing future thinking:
    - The introduction of new Thameslink trains from 2012 provides an opportunity to introduce a lighter, more energy efficient electric train design; and
    - A project is starting to develop a replacement for the Pacer and Sprinter diesel fleets reaching the end of their operational lives from 2012 onwards.

- **Electrification** – Although electrification can deliver significant benefits, such as greater reliability, higher capacity and lower carbon emissions, it is very expensive to introduce. Network Rail is leading work on improving the business case for electrification, for example by reducing costs. This could inform an electrification programme starting in CP5 (2014 – 2019).

- **ERTMS** – This is a communication-based train control system that provides Automatic Train Protection. It replaces traditional lineside signalling with a signalling system based in the cab of every train. It ensures trains operate within safe limits and speeds at all times, and will stop trains that pass red lights. Potential benefits include improved capacity, possibly reduced costs as a result of removing lineside signals and a minor safety benefit as a result of wider ATP provision. TSAG is considering how future developments of ERTMS could bring further capacity and reliability benefits. An operational trial of ERTMS will begin next year on the Cambrian line in mid-Wales. ERTMS will then be applied to major re-signalling schemes from approximately 2014 onwards, starting with the East Coast and Great Western Main Lines.

- **Smart ticketing.** DfT and industry have embarked on a seven-year programme of modernisation to allow passengers to buy their rail tickets when and where they want. Further benefits will include better data on passenger flows, freeing-up staff to assist passengers and cutting the high currently excessive £0.5 billion transaction cost of selling £5 billion worth of tickets. The programme will involve:
    - The introduction of ITSO smartcards on rail in the major cities allowing facilities like 'pre-pay' that have proved popular in London.
    - The integration of the new ITSO ticketing with Oyster in London, so that Oyster is accepted for rail travel in London, and ITSO smartcards are accepted for bus and Underground travel.
    - The roll-out of ITSO smartcards more widely across the network.
    - The ability to purchase tickets that can be sent to mobiles, or printed out remotely, for long distance routes.

- **Energy metering** – the industry is trialling on-train energy meters. These will provide train operators with better information on the amount of electricity they use and facilitate the introduction of energy efficiency measures such as driver training. The ultimate aim is to ensure that all new rolling stock in the UK is fitted with energy meters as standard.

- **Advanced engine and fuel technologies** – the industry is trialling biofuels to understand their potential costs and benefits. Other demonstration projects are being developed to trial technologies that may offer significant environmental benefits such as hydrogen fuel cell and hybrid trains (which, in the same way as a Toyota Prius, combine an engine with some form of on-board energy storage such as a battery or flywheel to reduce overall energy consumption).

Technical Strategy Advisory Group Membership

Clive Burrows (Chair)	Director of Rail Technical and Professional, Department for Transport
Derek Chapman/David Clarke	Head of Rail Systems, Department for Transport
Tim Gilbert	Engineering Director, Porterbrook Leasing / Vehicle-Structure System Interface Committee
Richard Gostling	Technical Director, Railway Industry Association
Michael Lee	Director of Industry Monitoring and Analysis, ORR
Andrew McNaughton	Chief Engineer, Network Rail
Len Porter	Chief Executive, RSSB
Steve Bence	Director Production Support, ATOC
Andy Doherty	Director, Railway System Engineering Network Rail / Vehicle-Track System Interface Committee
Roger Goodall	University of Loughborough / Rail Research UK
Phil Hinde	Engineering Strategy Manager, ATOC / Vehicle-Vehicle System Interface Committee
Tony Mercado	Alstom / Vehicle-Traction Supply System Interface Committee
Ian Papworth	Engineering Director, ATOC
Graham Smith	Planning Director, EWS
Bill Reeve	Director, Rail Delivery, Transport Scotland