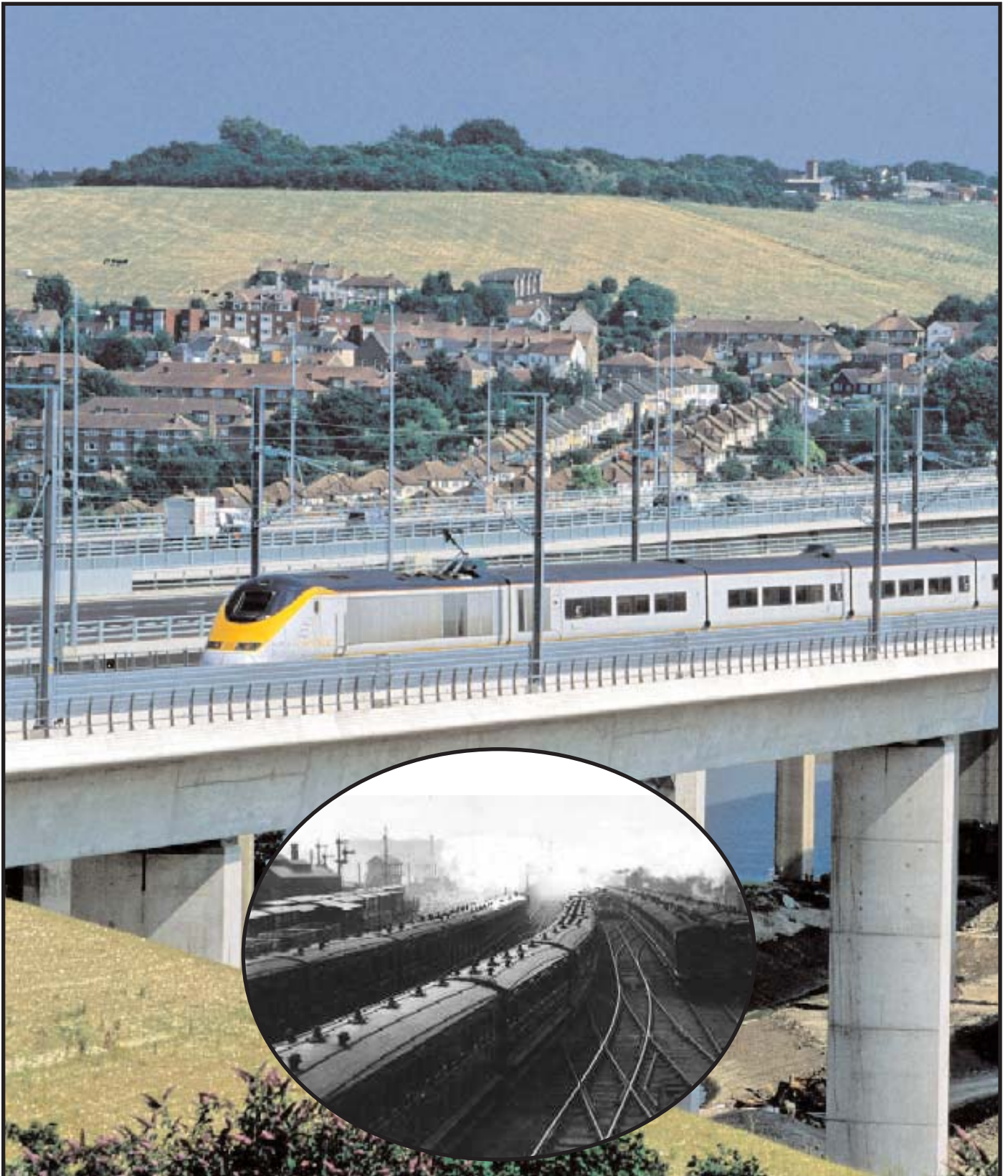


The Billion Passenger Railway

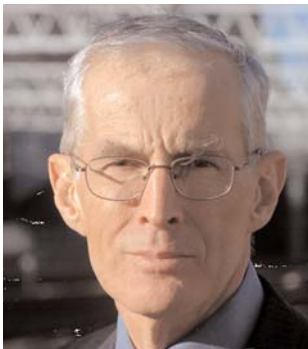
Lessons From The Past: Prospects For The Future



Front Cover:
Above: Eurostar on Medway Bridge
Below: Rush hour at Bethnal Green. Forerunner of the "Jazz service"

Foreword

April 2008



George Muir
Director General, ATOC

2007 was a record year for the railway, and this booklet celebrates that achievement. Our business is to bring people together and last year, as measured by passenger miles, we did more even than in 1946, the previous record year, and more than in the great days of the railway in the 20s and '30s; and on a railway half the size.

This is a huge achievement, and it has been delivered by the one hundred thousand people who work in the railway. It has been delivered by the train operators, but equally it has been delivered by Network Rail and it has been delivered by train leasing companies, by the supply industry, by Government, trades unions, regulators and many other organisations. They have all, year after year, worked to serve passengers and deliver more and better train services.

To celebrate this 2007 record, this booklet looks back to the great achievements of the 19th century and Edwardian railway engineers. And it then tries to peer forward to see what might be in store for us fifty or a hundred years from now.

What strikes me about that period 100 years ago is what stunning skill and knowledge there was. They were very, very good at running a railway. Look at the description of the Jazz service - 24 trains an hour each way on a two track railway. For integrated transport, look at the design of the Waterloo & City drain. We do lots of good things now, but could we do either of these?

The task of looking forward is particularly high in my mind right now for the year 2007 was extra special for me. It saw the birth of my first grandchild, a wonderful little boy called Kalyan. That's him in the picture. This set me thinking. What is the world going to be like when Kalyan himself is a grandfather? Many years from now, when his lovely eyes become old and grey, what world will he look out and see? What will it be like?

There are lots of views about the next ten or twenty years; but getting contributors to this booklet to look forward for a longer period has been like pulling teeth. But we got the pliers out and pulled and pulled. But even so, it is not a very clear picture which has emerged - whether it's right or wrong.



George Muir with Kalyan, The next generation

To stick my own neck out, I don't think much will change in 50 years, but in a 100! Or 200! Now, that's scary or possibly exciting. Proper artificial intelligence will be delivered one day through robotics. Nanotechnology will allow the making of molecules and physical things impossible to build now. Genetic engineering will change what it means to be human. And hovering over these floats the threat of climate change.

Kalyan's old, grey eyes will see these things taking shape. And his grandchildren, they will make and see a new world beyond our imagination.



Bringing People Together: Intelligent Infrastructure for the Twenty First Century

A generation ago, perhaps less, Britain's railways were widely dismissed as transport fit only for the nineteenth century. Now, all that has changed, and rail is seen as key to the twenty-first century transport vision.

In fifty years, the populations of our major cities will have grown substantially. People will be more affluent, older and, as passengers, more demanding. They will want to travel at times convenient to them, and will rightly have much higher expectations in terms of the overall quality of their experience.

Iain Coucher
Chief Executive,
Network Rail

What will the railway look like to the passenger of 2057? Many of the elements are already being put into place. The passenger of 2057 can expect a complete transport system – 'whole journey', driven by passenger demand, on-time, low maintenance, sustainable and affordable. New modular infrastructure components will be more reliable and easier to install and maintain. By 2057, we will have 'intelligent infrastructure'; technology will allow us to monitor the condition and performance of the railway, so we can spot things before they affect the travelling public. New materials, new working methods, new technology: All will contribute to our industry's shared vision of delivering the rail network its customers deserve.

The passenger of 2057, looking back fifty years, will see 2007 as the moment when Britain committed to rail as the choice for the twenty-first century.

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Bringing People Together in 2007

In 2007, the passenger railways in Britain carried 1,213,000,000 passenger journeys generating 30,103,000,000 passenger miles (30 billion). This is a record, the highest ever for normal passenger service.

The next highest total is for the year 1946, demobilization and civilian life getting back together, when the railways carried 29,231,000,000 passenger miles (29 billion).

For years before 1947, data has been difficult to find, but with the help of the transport historian, Tim Leunig, we have generated good information going all the way back to 1840, soon after the famous *Rocket* won the Rainhill Trials in October 1829.

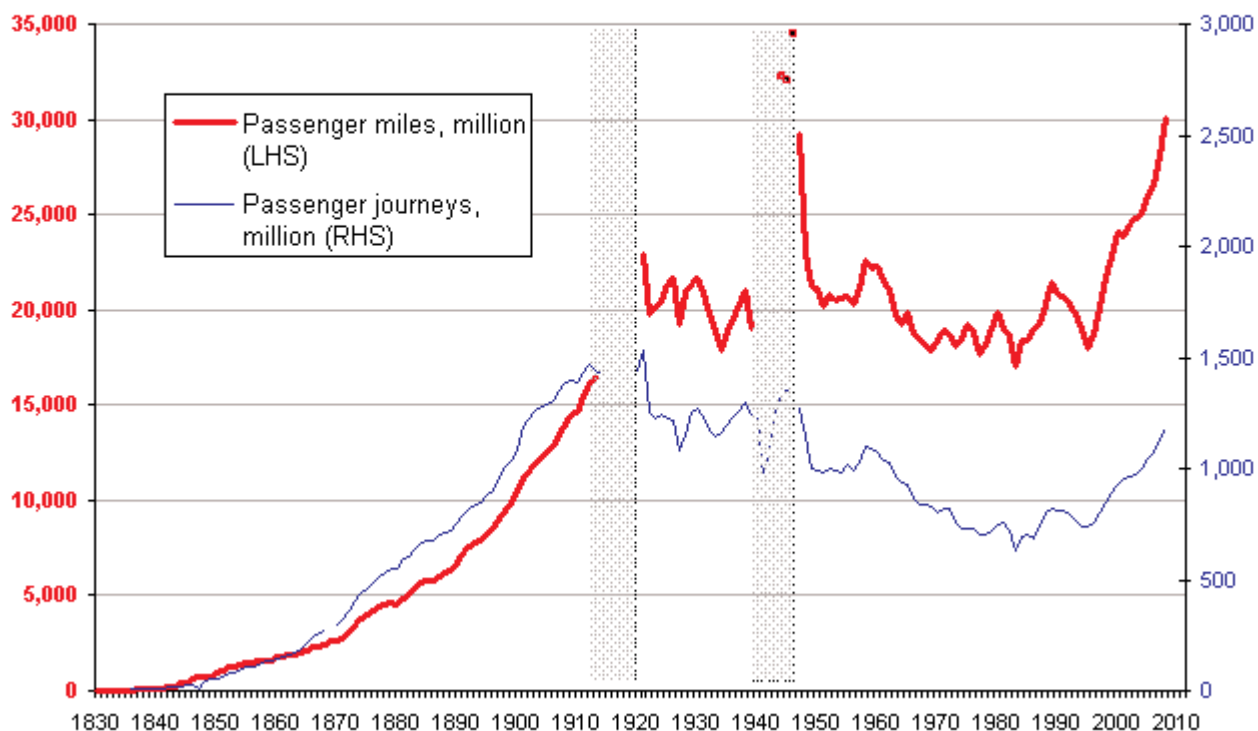
The data is drawn from Leunig *Journal of Economic History* 2006, Mitchell, *British Historical Statistics* 1988 and Munby, *Inland Transport Statistics*, 1978. (See Appendix.)

Though last year saw the highest traffic for normal passenger service we must recognise, as we do on the chart, the heroic feats of service during the war when full troop trains ran day and night and a 20 car train is said (unverified) to have pulled into a Kings Cross platform with its rear carriages still in the tunnels.

What leaps from this chart is that for as long as 80 years from 1919 to 1996, passenger miles hardly changed; they hovered around 20 billion. And then something happened, the figure became 30 billion and it is still rising.

Figure 1

**The Passenger Railway since the beginning -
Passenger Miles and Journeys**



Resourceful, Resilient and Respected

The old railwaymen may have worn funny hats



Chris Austin, OBE
ATOC, Director Public Policy

100 years ago, Britain's railways carried huge numbers of people. There were as many passenger journeys then as there are now, and this was achieved on a railway that was almost entirely worked with steam engines. Points and signals were worked by rodding and wire, with paraffin lamps at night. Communications systems were limited to the single needle telegraph. It is true that the network was twice the present size, and it required 534,000 staff to run it, more than four times the numbers employed by the railway today. Nonetheless it demonstrated a level of railway knowledge and a talent for organisation which we can only envy.

Here are three examples showing how exceptional railwaymen were at running trains a century ago.

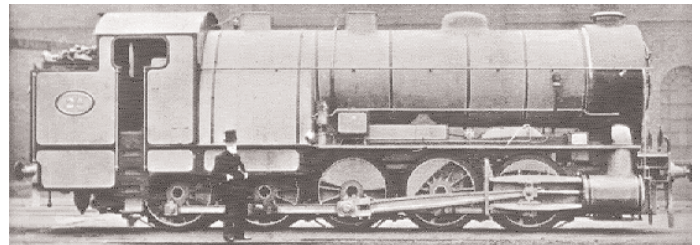
End of the Broad Gauge.

The most famous Victorian railway feat was the switch, over one single weekend, of 177 miles of railway from broad gauge to standard gauge. They didn't close the railway for weeks on end. No, in one 52 hour possession they did the whole job.

The legacy of Brunel's broad gauge (7' 0¼" between the rails) is still apparent. It is the larger structure gauge on much of today's Great Western main line from London to Bristol and on to Penzance. The speed and capacity benefits of the wider gauge were offset by the need to tranship goods or change trains where the Great Western met other (standard gauge) lines, and the chaotic scenes at Gloucester persuaded Parliament that the lines should be converted.

Mixed gauge track had been provided over much of the network, but the 131 mile section from Exeter to Penzance was converted over the space of a single weekend from broad gauge to standard in 1892. The logistics of this incredible feat were awesome. The last broad gauge train left Penzance at 9.45 pm on Friday the 20th

of May, 1892, and the rolling stock was moved to Swindon for conversion or scrapping. With no lighting available, the engineers moved in at daybreak on Saturday, cut the transoms between the longitudinal timbers supporting the rails, slewed the rails to the new gauge of 4' 8½" bolted them in position and packed the ballast. Some of the narrow gauge pointwork had been assembled on site the week beforehand, ready to move into position to replace the broad gauge connections. When the track was complete, the new rolling stock was moved into position and the first train left Plymouth for Penzance as planned, at 4.40 am on Monday the 23rd May.



Pulling power: GER locomotive that could out perform electric trains, and engineer, James Holden.

4,200 men were involved in a tightly controlled operation that was delivered on time and achieved by sweat and sinew with little mechanical equipment to help.

Jazz Trains.

A less well-known but equally extraordinary feat of railway operations was the Jazz service.

Faced with growing commuting demand in East London, and with competitive pressure from the expanding electric Underground, the Great Eastern Railway built a powerful steam locomotive that could accelerate a 355 ton suburban train to 30mph in 30 seconds, the same as an electric train. The experiment demonstrated the capability of steam, and the lines were not electrified for another 40

but they certainly knew how to run a railway

years. But no more of these Decapod (ten-wheeled) steam engines were built and, after the First World War, it was the small GER tank engines that ran the most intensive steam suburban service in the world from 1920. Ten coach trains carried 1,100 passengers, racing from Enfield to Liverpool Street in just 31 minutes with 14 stops.

At Liverpool Street, the engine was uncoupled, a second was attached at the other end, passengers alighted, new passengers boarded, a brake test was carried out and the train was on its way back within ten minutes. The incoming engine ran to the engine spur, took on water, the fire was cleaned and within minutes, it would be backing onto its next train. Day after day, 51 trains carried 40,000 passengers into Liverpool Street in the peak hours providing 40% more capacity than before.

To speed up boarding, the first and second class doors were colour coded, leading to its nickname of the 'Jazz' service, which stuck with the trains until the 1980s. On the route from Liverpool Street the combined service totalled 24 trains in the peak hour, a frequency that is stunning, even by today's standards.

Waterloo & City Line.

City workers from the South West are still benefiting from another feat of Victorian railway talent.

Travel to and across London had always involved transfer to tube, bus or cab because, with the exception of Charing Cross, the main line termini were kept out of the West End. The London & South Western Railway reached Waterloo in 1848, and had a tenuous single line connection to Cannon Street from 1864 (today this link supports the walkway from the main line station to Waterloo East). The real need was for a high capacity link to the City but land prices made this unaffordable.

The LSW's solution was a new tube line direct to Bank, opened in 1898. The clever part was the interchange built into the main line station at Waterloo when it was rebuilt between 1900 and 1922. Steps direct from the main line platforms led down to a cross passage which fed into ramps to the W&C platform below. Every four minutes the little trains cleared the platform, leaving room for the next group of arrivals. The transfer was not only under cover, but avoided congestion on the concourse.



100 mph GWR's "City of Truro" in 2007 on the West Somerset Railway

Equally ingenious was the hydraulic lift which was used to move rolling stock onto the line and also for coal wagons moving to the power house in Lower Marsh which provided electricity for the trains.

Competition.

These achievements were delivered despite, or perhaps because of, competition and around 123 private railway companies, with their own competing routes and range of through services, make our present railway a model of clarity. Cities like Nottingham and Leicester had three stations each, owned by competing companies, while even small towns like Fakenham or Appleby or Stratford on Avon had at least two. A huge range of fares was offered from the 'penny a mile' Parliamentary trains and workman's tickets to first class fares that were 20 times that amount. With three classes of travel and competing routes to choose from, fares were not simple, and there was no website to help!

Massive conglomerates.

Railway companies did not just run trains, they were huge businesses. They ran steamships and harbours, hotels and refreshment rooms, a huge cartage fleet and in 1903 had started running buses. In 1934, Railway Air Services even started running domestic flights. It was owned by the 'Big Four' railway companies and was subsequently sold to Imperial Airways, eventually being taken over by BEA and then to British Airways.

Sherlock Holmes and Moriarty.

In the competition for business, special trains were easy to arrange and were commonplace, both for goods and for passengers. Mail trains were run in connection with transatlantic liners, while passenger specials were used by the rich and famous, and were glamorised in the popular fiction of the time.

In *Sherlock Holmes' Final Adventure*, the detective is pursued by Moriarty on the way to their final meeting at the Reichenbach Falls. Holmes escapes him and boards the boat train at Victoria, which leaves just as his adversary reaches the platform. Nothing daunted, Moriarty hires a special train on the spot to pursue him, but is given the slip when the hero alights at Canterbury, and watches Moriarty's train thundering past.

Far away, from among the Kentish woods, there rose a thin spray of smoke. A minute later a carriage and engine could be seen flying along the open curve which leads to the station. We had hardly time to take our place behind a pile

of luggage when it passed with a rattle and a roar, beating a blast of hot air into our faces.

"There he goes," said Holmes, as we watched the carriage swing and rock over the points.

Trains are expensive assets to own or lease and so are in constant use today. We can only wonder at the economics of the Victorian railway that could support a level of resource that allowed a train to be whistled up at Victoria to be despatched at a moment's notice to Dover!

Bringing People Together

180 years of service

The Time Chart (see centre spread) encapsulates the history of the railway over almost two centuries. Starting in the reign of William IV, it covers the period of economic growth and social change which the railways themselves brought to Britain. Rail supported the growth of the manufacturing base, formed part of the trade routes of the British Empire and underpinned Britain's dominance of the World economy.

The railway also encouraged the expansion of cities, the start of commuting and opened up tourism for the many, whereas it had hitherto only been possible for the few. It carried the bulk of Britain's freight in an age when the only competition was the coastal steamer or the carrier's cart. It is true to say that the railway, together with the steamship and the telegraph, shrunk the World in a way which the jet plane and the internet did a century later.

The nineteenth century railway had a virtual monopoly on the movement of goods and people for some fifty years, and was therefore closely regulated by Parliament. At the peak, some 150 MPs represented the 'railway interest' at Westminster.

The Time Chart shows the highlights of rail development from the *Rocket* in 1829 to today, while the graphs in figure 1 plot the changes in passenger numbers and the total distances travelled by passengers during that period. Ten key points are:

1. The railway arrived earlier in Britain than elsewhere in the World. By 1870, most of today's main line network had been built.
2. Communications systems also started very early, with the first use of the telegraph on the railway as early as 1839, just 6 years after it was invented in Germany.

3. The elements of today's express train (through corridors, catering and sleeping cars) at the end of the nineteenth century meant heavier trains, needing larger loco motives and better braking systems. The technology was driven by the commercial requirement.
4. 100 years later, the need for faster acceleration and air conditioning also brought an increase in train weight and a commercial requirement for higher power supplies.



Virgin Pendolino Train, the surface airline

5. Electric trains were well established 100 years ago, but today only a third of the network has been electrified.
6. 40 years before electrification of the lines from Liverpool Street, the 'Jazz trains' (see above) are just one example of the ingenuity of railway staff in delivering effective and affordable solutions.
7. The first form of automatic warning system for drivers goes back as far as 1906.
8. In Britain the first train, hauled by GWR "City of Truro," reached 100 mph over a century ago. The first to exceed 125 mph was 70 years ago, 148 mph was reached twenty years ago, and 200 mph just five years ago.
9. Technical developments and commercial initiatives are not limited to one period. The Time Chart shows continuous development over almost 200 years.

10. Airport links, tilting trains, the Channel Tunnel and high speed lines in the last decade, show the continuing scope for technical development of a railway with 180 years of history.

The final point that shouts from the Time Chart is that the energy of the industry, manifest in its achievements and developments, does not tail off over time. This is not an industry that, like the canals or the stagecoach, had a natural life cycle, and was replaced. It is as vibrant today as in the nineteenth century, and still has huge untapped potential. The role of this booklet is to reveal some of this potential and suggest how it might be developed.

Chris Austin

Bringing More People Together

A decade of strong growth begs the question "Why?"

ATOC has twice commissioned the specialist transport consultants Steer Davies Gleave to study the causes of the recent growth. The most recent work is only part done, but David Shilton summarises his thinking so far.

Economic growth is a key driver of rail demand – leisure travel increases as real incomes rise, business travel with economic activity, and commuting with employment growth in white collar city centre jobs. This growth was offset for most of the post-war period as car ownership increased, the road network improved and expanded, and motoring costs declined in real terms.

The competitive position has now reversed with increased road congestion and higher motoring costs boosting rail demand. Car passenger-kilometres continue to increase, but with a markedly slower growth rate from the beginning of the 90s, while rail is now growing at a much faster rate, and the alternatives to rail cannot easily be expanded.

Population dispersal to smaller towns and cities with associated re-location of employment also reduced accessibility to the rail network in the post war peri-

od, but again more recent trends such as the rejuvenation and gentrification of inner city areas have favoured rail.

Rail has continued to improve over the last decade, with more train-kilometres operated, improved punctuality and more modern trains. Softer factors have also improved, as evidenced by improvements in National Passenger Survey satisfaction scores.

Information and booking are more accessible through National Rail Enquires and on-line booking sites. Regulated fares are no higher in real terms than before privatisation though some unregulated fares have increased substantially. Some long distance off-peak fares are lower in real terms than for many years.

The main constraint on growth is overcrowding, but even so rail demand has been particularly strong over the last two

years. It remains to be seen whether this is a temporary or permanent phenomenon, but even if the former, the competitive conditions outlined above favour continuing strong growth in the longer term, with short term trends dependent on the performance of the economy.

While economic growth and competitive factors have been favourable to rail in recent years, **rail's success has also been driven by its ability to respond to changing market conditions and expectations, for example in the areas of customer service and the use of the internet for information and sales.** Rail will need to continue to innovate and adapt in future if growth is to be sustained.

Looking Forward

What the past tells us about the



Dr. Tim Leunig

There is an exciting future for Britain's railways, but it is one that will only be realised if the industry is prepared to think hard about how it fits into the Britain of the future

Britain today looks very different from the Britain of fifty or a hundred years ago, and there is no doubt that Britain will look different again in another fifty or a hundred years time. Many of those changes are predictable, either as simple extrapolations, or by understanding the underlying forces that are at work in the economy and in our society. But others will surprise us, just as today's world contains things that could not be imagined even relatively recently.

Britain's population has grown in every 50 year period since the monarchy was restored in 1661, and there is little doubt that it will continue to grow in the next 50 years and beyond. Historical experience suggest that there will be 10 million more people in Britain in 50 years time than there are today, in line with the estimates of the Office of National Statistics. Greater life expectancy means that, on average, people will live longer in 50 years time than they do today. Furthermore, the ability to leave home at a younger age, caused by greater affluence combined with fewer marriages lasting a lifetime, mean that there will be far more single person households as time goes on.

The last 50 years have seen the material standard of living treble and there is little doubt that living standards will continue to improve. Given the improvement in our understanding of how economies work, it is plausible to imagine that we will be four times as rich in 50 years time as we are today. Indeed in a century's time it is likely that the average person in full time employment will have earnings close to those of a Premier league footballer today while



Clean and Green: Regenerative braking gives an 18% energy saving on Virgin's Pendolino trains

Premier league footballers in a century's time will be rich beyond even their own imaginations.

A richer society is able to enjoy more of life's good things: more goods, more services, more travel and also more leisure. This year Britain's railways carried more people further than at any point in our peacetime history. But that record will not last for long: it is destined to be broken time and time and time again.

The richer economy of Britain in 2057 will also be a different economy. The last 50 years have seen the centre of economic activity move south, and particularly towards London. This trend will continue as the greater connectivity of London and the southeast, which offer better proximity to Europe and, via London's airports, to the wider world, becomes ever more important to high value added business in a globalised world.

A comment from George Muir

Ok, so in fifty years time to attract someone to join the railway we may offer an average wage of £100,000. That is good news, but what on earth will the railway do to afford this?

It's obvious: it must plan a MASSIVE gain in productivity. There will be no cut in passenger facing staff, perhaps the opposite; but everything else that can be automated will be. Metro services around the world are already showing us how. What will remain? For a start, maintenance staff, project management, planners, and passenger facing staff. The railway will still be a big employer.

prospects for the future

More generally, big cities have outperformed smaller places particularly in the last 10 years. Partly this has been a result of government policy, with its emphasis on redeveloping brownfield sites in city centres in preference to greenfield sites on the edge of our towns or along our motorway network. But more fundamentally, agglomeration economies mean that large towns are

outperforming smaller towns the world over: the prospects for our largest cities remain good.

One reason is the changing nature of the workforce. The last few years have seen not only a big rise in the number of graduates, but also of the number of graduate couples within which both members pursue careers. Two career families generally prefer to live or at least work in large

A Europe of City States

High-speed rail travel could change the political landscape of Europe

Andrew Curry looks forward and imagines a news report in "Europedia Le Monde" in September 2083

Le Monde



Dateline: Mayors' Convention, Vienna

The annual gathering of the Mayors' Convention in an ICE* terminus complex in a leading European city

Andrew Curry, Director
Henley Centre
HeradlightVision

is always a good time to take the mood of the modern Europe. For the Mayors are both the beating heart and the economic engines of the re-shaped Europe, in which nation states have largely lost all but administrative powers.

If co-operation is the public face of the Convention, the smell of competition is always in the air. These women and men know that membership of the Convention is not bestowed lightly; it goes only to the 30 cities which have the most dynamic economic, social, and cultural influence across the Union as a whole. A year or two of poor performance and another contender is knocking at the door.

With the internet long hamstrung by crime and fraud, and air travel the pre-

serve of the hyper-rich, the cities which keep their place at the table are those which have solved four problems, according to Vienna Mayor, Kristal Stangl, the host of this year's event.

"We must make sure that our cities have enough energy to function, to be sure, and that resources like water are secure. There must be enough food. They need to be good places to live. A lot of cities can make these things happen, even in our present conditions of scarcity. But the economic part is about getting the best brains to work on the complex problems which need to be solved to build new knowledge and value. That needs good transport links, and the cities which invested in high speed rail in the first part of the century are the best placed to compete."

Some cities have slipped off the map as the European periphery has grown and the core shrunk. Most of the 'Euro-30' come from the 'Golden Diamond' between London, Hamburg, Krakow, and Marseilles. Some long-standing rivalries have been settled; Madrid is no longer a member, while Barcelona holds on to its Convention status. Rome plays second fiddle to Milan. Manchester's high speed link to the tunnel has helped

it stay in the club, while Glasgow's failure to gain one has exiled it to the fringes.

Public policy professor Regis Bertrand argues that nations are no longer the right size. "Europe has taken over migration and manages the single currency. Solving the energy and food issues has required a much more local focus. But the economic aspect needs both good local environments and long-distance connections. The fact that ICE sponsors the Convention isn't just good marketing. It is a shared interest."

London's representative at the Convention, Mayor Nasr Hysen, an economist by background, says it comes down to labour markets. "With closed borders and a single economic framework, labour has to be able to move around, to follow work. But often this migration is temporary, for a few weeks or months, for a project. That's why rail links are so central. But you need to remember that a lot of the money that's earned goes back to their homes. It's not perfect, but it helps to equalise incomes across Europe."

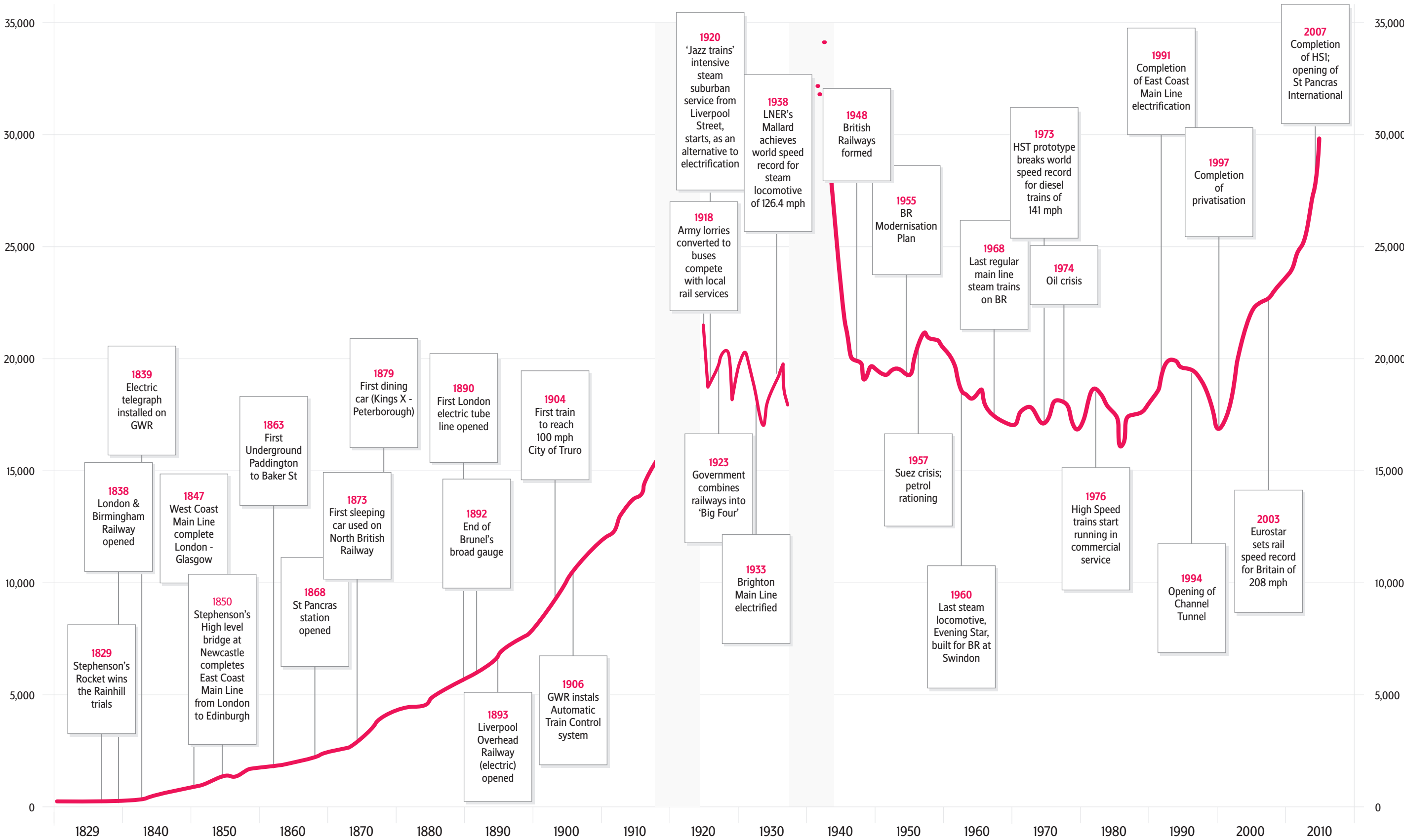
* Intercity Express Train

ATOC: Bringing People Together

Passenger Growth and Rail Developments

Passenger Miles (Millions)

Passenger Miles (Millions)



cities that offer opportunities for both partners: the future for our cities is a good one.

A richer Britain involves new challenges for everyone in the economy. Rising labour costs increase the pressure on all firms to economise on labour, both via mechanisation and by outsourcing to lower wage economies. One aspect that is currently unappreciated is that companies will be ever more prepared to pay for better products that do not need servicing or repairing: it is better to pay for more low-cost



You can't build your way out of congestion

labour in the initial production process, than to be forced to pay for high cost British labour later to repair or service items. As a result all products that are not disposable will become more reliable and service intervals for mechanical goods, including cars and trains, will increase.

Labour is not the only cost that will increase over the next 50 years: the cost of energy is bound to rise. There are some

who predict that we will run out of energy within 50 years, although it is worth remembering that such predictions have been made for over 100 years without ever coming true. The world has proven itself very good at finding new sources of energy and using that energy more efficiently; as energy prices rise, we will continue to do both with ever greater enthusiasm. Nevertheless the world of \$20 oil is over: prices are more likely to be between \$60 and \$150 in the medium term.

Energy conservation is necessary, not because we will otherwise run out of energy, but because fossil fuel use causes global warming. There are, in essence, two alternative ways to combat global warming. First, we can simply do less, be poorer, and so use less energy along the way. There is no doubt that this alternative would work, but it is extremely unappealing. The alternative is to do more while using less energy. At first sight this seems impossible, but in fact we have achieved it for many years. Britain today is richer than it was 50 years ago, but not because we all work longer. Indeed, on average we work for fewer hours of the day, fewer days of the year, and for a lower proportion of our lives. Nor are we richer primarily because we have more machinery to help us with our work, although that is part of the story. Instead we are richer because of a productivity revolution driven by technology and education. Just as we have used technology and education to increase the amount that we produce per person, so we can use them to increase the amount that we produce per unit of energy. In the future, increases in "carbon productivity" may prove to be as important as increases in "labour productivity".

We can increase carbon productivity in two ways, both of which will prove important. First we can increase energy

efficiency. The last 10 years have, for example, seen the energy used in typical fridge-freezers reduced by half, without any effect on their effectiveness. But energy efficiency alone will not be sufficient to reduce Britain's carbon footprint by the 80% that many writers have argued is necessary. Britain will need to develop non carbon energy sources, such as nuclear power and renewable energy. Since it is easier to decarbonise energy used in static situations, we can expect to see carbon free houses and carbon free businesses long before we see carbon free transport and particularly long before we see carbon free aviation. It is worth noting, however, that it is far easier to decarbonise rail transport than it is to decarbonise either car or air transport, because we already know how to decarbonise electricity production whereas efforts to replace petrol with non carbon sources of energy are in their infancy.

In some ways transport has changed so little in the last 50 years. 50 years ago cars were steel bodied with petrol engines, doors on the sides and seats facing forward. The same is true today. Buses and coaches look much the same too: single and double decker buses were well-established 50 years ago. The same is true for trains. In 1957 long haul trains had a locomotive at the front and a set of carriages behind, while electric commuter trains were already well established. For sure, there had been changes: diesel and electric power have replaced steam, but this was foreseen 50 years ago. Even flying has not changed dramatically although it has become dramatically cheaper: the 1950s was the decade of the civilian jet with the launch of Boeing's 707 and the Douglas DC8.

But if today's means of transport look similar to those that our grandparents knew, our choice of which to use has changed dramatically. The reason for that change is simple: we are richer. Those who travelled by bus or bicycle 50 years ago did not do so because they preferred the bus or bicycle, they did so overwhelmingly because they could not afford other options.

Since 1950 average incomes have more than trebled and it seems likely that they will treble or quadruple in the next



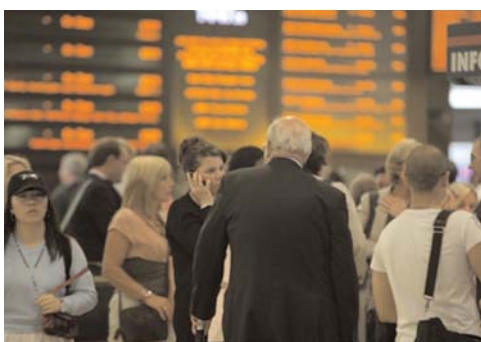
Heart to Heart: rail is the backbone of the City Regions

50 years. The price of physical goods, such as cars, increase at most in line with retail prices, which means they become less costly relative to earnings. In 50 years time a new small car will cost the average employee about one month's gross wage. At that point anyone who wants a car, will have a car.

Within 50 years, therefore, we will live in a world in which people use the mode of transport that is most convenient for them, not the mode of transport that they can afford. The car will continue to be a popular choice, but as now other modes of transport will have their own advantages. Those making journeys into major cities, like London, Birmingham, Manchester or Leeds, will find the train extremely attractive, especially as congestion increases in city centres, and parking becomes more expensive.

Technology will improve all modes of transport, but the improvements are likely to be most rapid in cars, because car sales are larger, and because of their considerable potential for improvements. The biggest will come in communication between cars. Already many have satellite navigation, and future satnav systems will not only receive information but will send it. They will send information back to a central point which will then know exactly how crowded each route is, and how fast the traffic is moving in real time on every possible route that they could take. That knowledge will be of benefit to other motorists as well: satnav of the future will be able to predict how long a journey will take with great accuracy before the motorist sets out. Future satnav systems will also talk to each other. Your car will know whether there is anyone around the blind bend ahead and will allow you to overtake if there is not. And cars will certainly be able to drive themselves on motorways: indeed a combination of satnav, intelligent cruise control and lane departure warning systems means that we are very close to this day already. Within 50 years, drivers will drive to the motorway as now, the car will then drive them along the motorway, before the driver again takes the controls for the last bit of the journey. Long-distance driving will be far more relaxed than it is at present.

With 10 million more people in Britain, and with more people than ever able to afford a car, there will clearly be far more cars in Britain than ever before. And, given that cars will drive themselves on long distance journeys, they will become ever more attractive as a way of getting around. The challenge for those in charge of our trans-



Bringing People Together

Pessimism and the need for a new economic order

By Professor Rod Smith

The supplies of natural resources of our planet are finite and are being depleted at an alarming rate. Substitution and recycling offer limited amelioration of the problem.

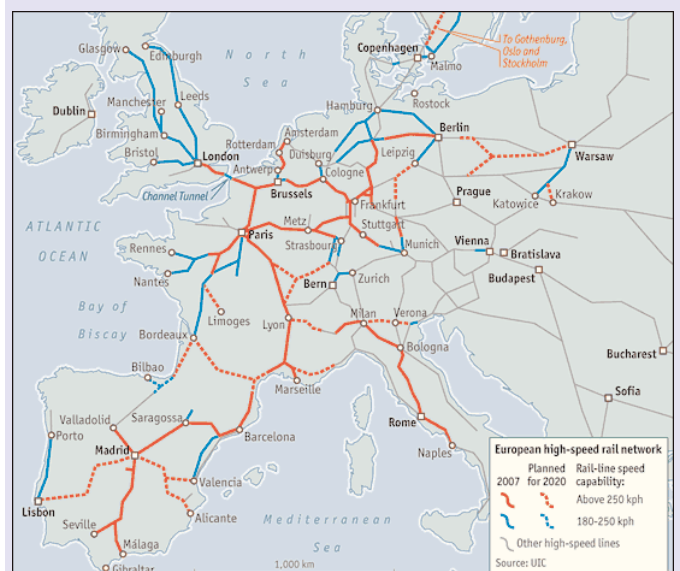
Given the rapid growth rates of the developing world, and the "given wisdom" that all economies must expand continuously, this is arguably the most severe problem we face.

It is most probable that climate change will further concentrate this population, leading to friction in competing demands for resources, in short the recipe for conflict.

These are not problems which can be overcome by some as yet specified technological breakthroughs: and indeed some pessimism must rule the 50 to 100 year outlook.

Any solution must first recognise this and invent a new economic order which recognises the finite nature of our primary supplies.

Bringing People Together Across Europe



Capital Gains: Developments that will keep London a world class city



Ian Brown
Managing Director
London Rail, TfL

As long as London continues to thrive as a key financial and business centre, travel to work, education and leisure will continue with public transport providing high density trans-

port capacity. In many work areas, face to face contact will be necessary for social and economic reasons, although not on a daily basis. People will continue travelling to work but increased organisational flexibility will mean that many people no longer travel every day of the week. The commuting week will become shorter or commuter travel will be spread across the week with different sectors travelling on different days,

enabled by technology and encouraged by pricing structure.

Greater integration of public and private transport services can be expected with new modes combining with existing modes. The benefits of Crossrail will become apparent and new tunnels including Crossrail 2 will be built. These, combined with a series of outer London hubs, will reduce the need for interchange in central London and enable seamless journeys.

There is no reason why the trend towards longer journeys should continue. Even with high speed long distance rail services, access to and from stations will be a constraint for all but those within walking or cycling distance. Road speed limits will be reduced in an effort to reduce road fatalities to zero, and people will come to accept longer

journey times even if road congestion is controlled through charging or otherwise. Car mode shares will fall and walking and cycling shares increase. The issue of providing adequate capacity remains central.

With increasing emphasis on sustainability and passengers paying the true cost of travel, air travel will become increasingly expensive and more of a luxury item concentrating on long haul.



Crossrail

port infrastructure will therefore be to avoid gridlock on our roads. Part of the solution will almost certainly be a significant road building programme, since the level of fuel prices necessary to price people off the road in sufficient numbers to avoid gridlock over the next 50 years will prove politically impossible. Nevertheless, the extent to which we need to increase capacity on the motorway network can be reduced if we are successful in moving freight from road to rail. Here the planning system will be crucial: there is spare capacity on the rail network between ports such as Southampton and Felixstowe and the Midlands, what is needed is for the planning system to favour the construction of logistics hubs on the rail network so that big shipments of freight travel from the port to the depot using trainload rail freight, before onward dispatch by both road and rail. As is well known one freight train takes 35 lorries off of the motorway, releasing capacity for motorists.

Whilst it is feasible to widen roads outside urban areas, it is much harder and much more expensive to increase road capacity within towns and cities. It is therefore inevitable that congestion charging will be widespread in urban areas. For this reason, the bus will be reborn as a means of getting around our city centres, as it has already has been in London, while trams will be rightly seen to offer real advantages in areas without underground train systems.

Superficially at least, trains will look very similar to those that we experience today. But underneath things will change quite dramatically. Trains of the future will be

considerably lighter than today's trains, reducing energy use per passenger, and allowing faster acceleration and braking. Improved signalling will allow trains to run more closely together, particularly valuable on high-density commuter routes into major conurbations which otherwise face severe capacity constraints. For commuters into London, however, the biggest change will be the replacement of the current terminals with Cross London services. Crossrail One and Crossrail Two are just the beginning: in the future railway services will not be constrained by decisions made by the Victorians. Instead, tunnels from Waterloo to Liverpool Street, from Euston to Victoria, and so on will save many commuters the need to transfer onto the tube: instead they will be able to go far closer to their final destination on the train itself. This sort of investment will be costly but it will also save commuters considerable time each day. The time and hassle cost of interchanging means that we will cease building new tube lines, and ensure that future new tunnels in central London are built to mainline standards, allowing through trains, rather than requiring a change of train on arrival in the city.

From, Motoring Towards 2050 - The Fact File for the RAC Foundation (May 2002) - Edmund King

"The 2050 car will be quiet, safe, clean and easy to drive."

"And about time too!" - George Muir, 2008

How fast is high-speed?

By Professor Rod Smith

The world record for steel-wheel-on steel-rail now stands at 574.8 kph (357 mph). But this is not achieved in everyday performance because of the high cost of maintenance of track and overhead current supply.

It is unlikely that the present maximum operating speeds of 350kph (220 mph) will increase by more than a few tens of kilometres per hour. This is still very fast - half the speed of commercial aircraft which typically fly at 500mph.

Maglev offers the possibility of considerably higher speeds, but at high energy cost because air resistance increases with the square of the velocity. But the current Maglev record so far at 581kph is just 6 kph more than steel on steel.

As society gets richer, people are more able and more willing to pay to save time. Affluent people today save time by hiring others to clean their houses and do the ironing, and by buying pre-prepared food. In the future they will be willing to pay higher fares for a train service that allows them to get up later but still get to work on time, a train service that allows them to do a full day's work but still get home in time to see their children before they go to bed. Time is money and as people have more money so they are prepared to pay more to save time.

Notwithstanding increased wealth, many commuters will look for cheaper services, just as many have flocked to low cost airlines in the last decade. Privately run train companies could respond successfully in the way that they did over a century ago, by offering a lower cost option on commuter trains. In addition to high quality first and standard classes, they could offer new, lower-cost, standing room only carriages. A standing passenger takes up about half the space of someone sitting in standard class, allowing prices to be halved. Although everyone likes a seat, some will decide that it is just not worth paying extra for. That willingness to stand, as on the Tube, has benefits for everyone since it means that existing infrastructure can be used to carry more people into our city centres than would otherwise be possible.

In other major cities such as Birmingham and Leeds the challenge for the train is not to reach into the centre because it already does that. Rather the challenge for rail in such towns is to make light rail a success. Lower cost, standardised systems offer considerable potential to bring relatively rapid within city transport to many medium-sized towns in Britain.

Privatised rail companies have proven to be extremely good at selling tickets, particularly for long distance journeys. Far fewer trains run empty today than ever before. The challenge for the industry is to make the pricing policies that have worked so well for long distance trains work well for short distance trains.

The challenge for government is to recognize the success of the companies that run our railway system and to step back. It is quite simply madness for a franchise document to state the exact form of wording that a guard must use on the train, or to specify that a platform vending machine must be moved. If we are to get the most from the ability of the private sector to run our railways then we must give the private sector room to innovate.

Governments will also need to think more about the role of franchise payment. Today some railway companies, particularly London commuter companies, are paying signifi-

David Sindall looks forward to the railway being truly accessible to everyone



David Sindall
ATOC, Head of
Disability &
Inclusion

In 50 years time I think people will marvel at the narrowness of our current approach to accessibility. We will look back on the 2007 White Paper measures as primitive. Accessibility now seems only to mean access for disabled passengers - not for older people, parents travelling with children in buggies or even people whose first language isn't English. We will have a much broader focus, giving us a much broader reach into the marketplace.

The main driver will be in demographics and an ethical view of what is acceptable and not acceptable. By 2031 a quarter of the population will be over 65 and there will be three times as many centenarians. The cost of motoring will be prohibitive. The railway will be made to be accessible to everyone.

Service will be much better with help or assistance booked immediately in one step. Station based staff will spend less time retailing tickets and more time delivering customer services that accommodates everyone's needs.

The question will not be 'what does this cost?' but 'why on earth didn't we realise this sooner?'

Where will our electric power come from?

Rod Smith is clear:

Though it brings problems in its wake, the immediate solution to the world's electrical supply problem already exists and is the rapid growth of nuclear generation, to which renewables will form an important but relatively small, perhaps less than 30%, addition.

cant premiums to the government for the right to run a railway. This amounts to little more than a tax on commuters using an environmentally friendly method of getting to work: it is hard to see how such a system is compatible with government policy objectives.

The plane will obviously remain dominant for international journeys, although as we have seen with the Channel Tunnel the train can compete on certain relatively short distance international journeys. Perhaps more surprisingly the plane will remain important within Britain: remaining dominant for domestic cross country routes that have insufficient passenger numbers to warrant high speed rail lines, such as Exeter to Norwich or Bristol to Newcastle. In addition, the cost of extending a very high speed railway line to Scotland means that aviation is likely to remain more important than rail for the these journeys. But journeys from London to Manchester, Leeds and even Newcastle will remain the preserve of land based transport, of the train and the car. For intercontinental journeys the plane could usefully learn from the train and offer couchette style flat beds for overnight flights in economy class.

Transport of the future will, therefore, look very similar to transport today. We will still have buses and cars, trains and planes. But how we use them will change. Trains will be used even more for commuting into urban areas, continuing a trend that has gradually developed over the past hundred years, and a trend that will be emphasised by the growing importance of London and other large cities in the UK economy. Rail's role in intercity transport will remain important, even as cars learn to drive themselves for much of the journey. Buses will undergo a revival in cities as congestion charging is introduced, but they will all but disappear outside of these areas as cars become so cheap that all adults can afford them. They will be joined in larger urban areas by extensive light rail systems. The plane will remain an important niche player in domestic transport, and will, of course, be dominant internationally. Outside of our largest cities the car will remain for most people their single most important mode of transport. Its ability to travel both long and short distances, and its ability to take people from door to door means that, where parking is available at both ends, and congestion limited, it will remain the most convenient means of getting around.

Tim Leunig



How technology will assist car drivers

Fujitsu Group Joint Research with Toyota has developed an approach to in-car technology which attempts to realise the ideal coexistence of people, vehicles and roadways.

Vehicles will be designed with in-built wireless internet connections allowing information on traffic and routing to be passed directly to the car.

Car to car communication will be possible, creating a safer driving environment. This ensures that all vehicles are aware of the positioning and location of other vehicles in their vicinity. e.g. on narrow roads, blind corners.

From "Passive Safety" involving post-crash measures such as airbags and seatbelts there will be a move to "Active Safety"; pre-crash measures which identify obstacles and risks before they are encountered.

Pre-crash system - detects other vehicles on the road, traffic signal changes and may also detect pedestrians through RFID tags on their person. The car can then alert the driver or in the future it may take avoidance measures automatically to avoid an incident.

Adaptive Cruise Control - adjusts the speed of the vehicle based on traffic conditions surrounding the vehicle. Sensors embedded around the vehicle, combined with radar, detect where other vehicles are on the road.

Lane-Keep systems - prevent the vehicles from deviating from their current lane through inadvertent actions e.g. falling asleep. Road surface sensors communicate to the vehicle to identify location.

Signal light recognition systems - uses cameras built into the front of the vehicle to identify when vehicles ahead of the car brake or signal to change lanes.

Night vision cameras embedded into the vehicle will allow much clearer vision of dark roads leading to safer driving.

In built traffic sensors (cameras and Millimetre-Wave radar) - identifies where other vehicles are on the road and inform the driver via display units in the passenger compartment, removing blind spots and increasing driver awareness.

Summarised from information provided by Alan Clare, Fujitsu.

Bringing People Together Faster

New lines will add capacity and shrink journey times

"Be brave" we said to Jim Steer. "What do you really, really think would be the right thing to do?"



Jim Steer
Director of the Greengauge Project

Fifty years out, we can expect the rail network to have been transformed, step-by-step in response to the twin pressures of economic competitiveness and the carbon efficiency imperative.

Population will have increased by 18 million over 2007 levels. At some stage, government will have to recognise the sheer implausibility of this increase being predominantly accommodated in the wider south east, as it has been for the last 50 years (a period with much lower growth rates). Instead it will have to foster expansion across the whole country.

It is therefore likely to see high-speed rail as one of a number of key instruments to achieve this economic shift (while also reducing dependence on aviation for short-haul flights). Ensuring that the Midlands and the North and Scotland and Wales are all perceived to be sharing in the new economy would be the aim. High-speed access to central London and the key international gateway airports (probably still Heathrow) and at the same time transforming the accessibility of the major provincial cities is what's needed to create a sustainable development path.

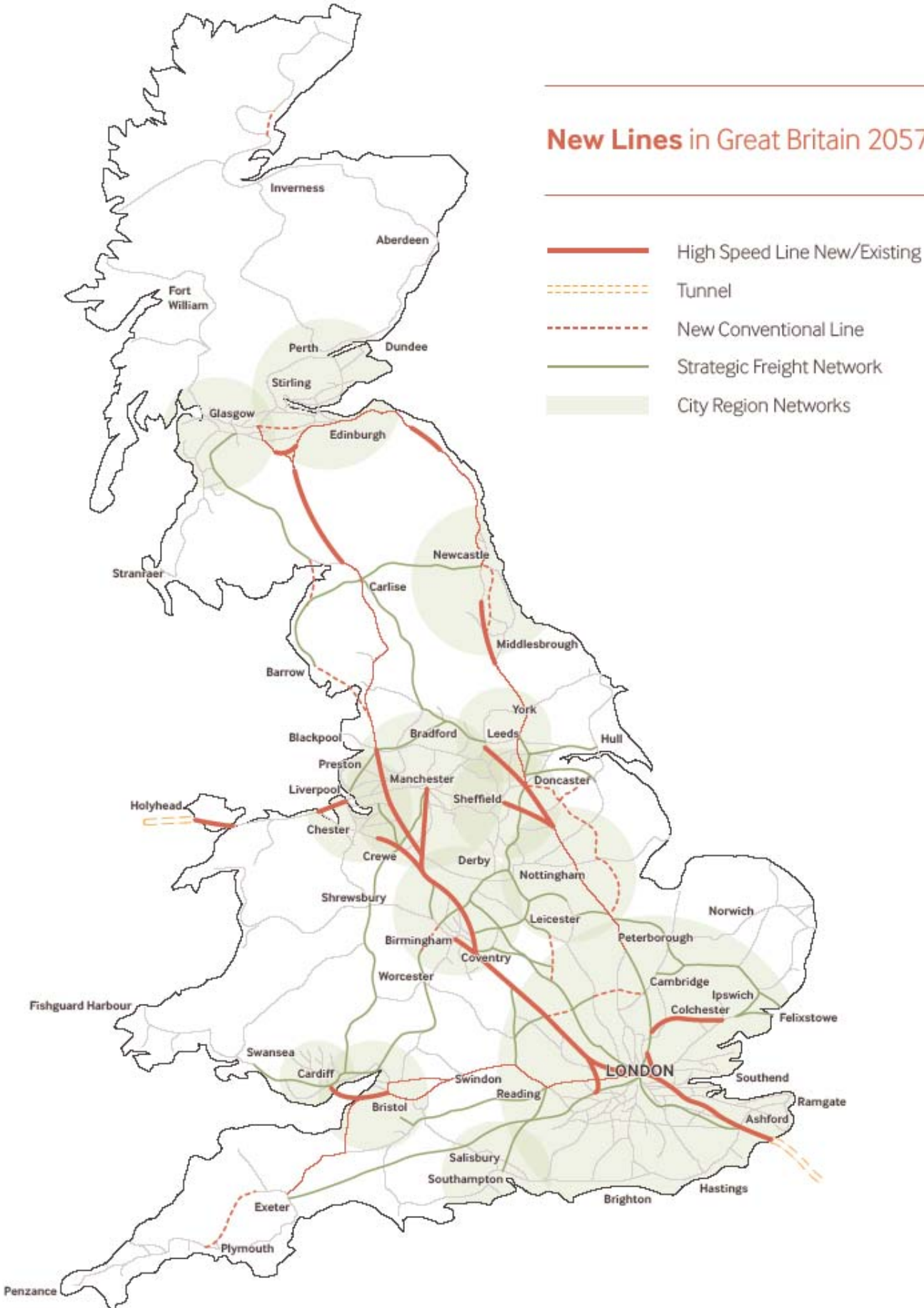
There will then need to be a set of overlapping city-region rail networks to allow the core cities to expand in a high-density, high quality format, with sustainable access over very wide catchments, matching London in their appeal to a set of businesses with much more fluid work practices. In the new national economy, the rush hour won't exactly be over, but for many, optional. Some critical new links and a comprehensive electrification programme will be needed to fashion these networks, with light rail and other newer transit systems creating the comprehensive coverage essential to community and social cohesion and to achieving the fundamental shift away from a car-dependent and hence a carbon-dependent life-style.

Some of the new high-speed network will entail new line construction. Other parts can be created as higher speed



TGV: 574.8 kph

New Lines in Great Britain 2057



Rail Network: Developments by 2057

<p>High-Speed Rail (300km/h+ new lines/250 km/h+ upgraded lines)</p>	<p>HS2 London/Heathrow- Birmingham/Manchester/Liverpool/Glasgow/ Edinburgh HS3 London/Stansted-Cambridge/Nottingham/ Sheffield/Leeds/Newcastle/Edinburgh HS4 London – Bristol/Cardiff HS5 Manchester-Sheffield/Leeds</p>
<p>City-region (electrified networks)</p>	<p>Edinburgh, Glasgow, Newcastle, Leeds-Bradford, Manchester, Liverpool, Sheffield, Nottingham, Birmingham, Bristol, Cardiff, Southampton- Portsmouth & London Electrification Cross-city links Integrated with LRT networks</p>
<p>Multi-functional Estuarial Crossings</p>	<p>Solway, Morecambe, Severn (high-speed passenger) Dee, Dornoch Firth (passenger and freight) East Thames (Strategic Freight Network)</p>
<p>Critical new connections</p>	<p>Irish Sea tunnel Second Channel crossing Oxford – Cambridge Stansted – Colchester Heathrow – Staines New route to Plymouth/Cornwall (bypass coastal route) Daventry – Market Harborough (freight) Cross London freight route</p>
<p>Strategic Freight Network</p>	<p>Channel Tunnel – London – North West England – Glasgow Irish Sea tunnel - Liverpool – Hull/Immingham Daventry – East Midlands – Yorkshire – North East - Carlisle Felixstowe – West Midlands South Wales – Midlands South West/Southampton – Daventry & Cambridge</p>

routes by suitable upgrades to existing lines, with freight diverted away on to its own national grid which might emerge from the embryo of the recently announced Strategic Freight Network. This freight network needs to link the ports and of course the Channel Tunnel, which by 2057 will need to have been duplicated, as well as an Irish Sea tunnel, to the key distribution centres, and be designed around parameters that allow rail freight to reduce further the need for carbon-intensive road haulage.

An opportunity will arise to combine new estuarial crossings linked into tidal power schemes in a way that is designed to protect wild-life habitats and achieve significant transport efficiencies at the same time.

(For clarity, not all lines are shown on the map.)

Because of its relative carbon and space efficiency and its ability to achieve very high levels of reliability and public safety, rail market share can be expected to rise (as it has been doing for the last 10 years). Car ownership levels, 50 years out, may remain very high, but usage rates, we can expect, should be much diminished.

Jim Steer

Bringing People Together in London

Parisian RER type rail services will transform travel in the capital

ATOC looks forward to key investment decisions which could create four cross or round London links and cut the bottlenecks at terminal stations.

1. Crossrail 1 will revolutionise east-west links in London, relieving many Tube and rail lines, and connecting the City, Docklands, West End and Heathrow - some of the most productive parts of the UK economy. Crossrail services start in 2017.
2. New Thameslink will provide the north-south links and a strategic interchange with Crossrail at Farringdon and now has the green light for a huge capacity upgrade.
3. The East London Line extension will be open in 2010, and be linked to the North London Line a year later. With a further project in South London, it will create an orbital route round London. This will be connected to the major radial routes allowing passengers to reduce the need for interchange in Central London and allow seamless journeys.
4. Crossrail 2, not yet exactly specified, is the next big project London will need. Possible corridors include a south west - north east axis, relieving the Victoria and Piccadilly lines, and a 'South West - City' alignment, possibly extended to south east London, to relieve the Waterloo & City line and providing through metro services from the National Rail network.
5. Crossrail 1, Thameslink, and Crossrail 2 are fundamentally different from the other rail services into London which terminate at major stations. They dive underground and continue below the streets of London to the other side, like the Paris RER services. These new London railways have huge advantages. They have much more capacity than terminating services and deliver passengers closer to where they want to go.

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