INTERNATIONAL HIGH-SPEED RAIL SYSTEMS

(110–28)

HEARING

BEFORE THE

SUBCOMMITTEE ON

RAILROADS, PIPELINES, AND HAZARDOUS MATERIALS

OF THE

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

APRIL 19, 2007

Printed for the use of the
Committee on Transportation and Infrastructure

U.S. GOVERNMENT PRINTING OFFICE

34–799 PDF WASHINGTON : 2007

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2250 Mail: Stop SSOP, Washington, DC 20402–0001

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

JAMES L. OBERSTAR, Minnesota, *Chairman*

NICK J. RAHALL, II, West Virginia
PETER A. DEFAZIO, Oregon
JERRY F. COSTELLO, Illinois
ELEANOR HOLMES NORTON, District of Columbia
JERROLD NADLER, New York
CORRINE BROWN, Florida
BOB FILNER, California
EDDIE BERNICE JOHNSON, Texas
GENE TAYLOR, Mississippi
JUANITA MILLENDER-MCDONALD, California
ELIJAH E. CUMMINGS, Maryland
ELLEN O. TAUSCHER, California
LEONARD L. BOSWELL, Iowa
TIM HOLDEN, Pennsylvania
BRIAN BAIRD, Washington
RICK LARSEN, Washington
MICHAEL E. CAPUANO, Massachusetts
JULIA CARSON, Indiana
TIMOTHY H. BISHOP, New York
MICHAEL H. MICHAUD, Maine
BRIAN HIGGINS, New York
RUSS CARNAHAN, Missouri
JOHN T. SALAZAR, Colorado
GRACE F. NAPOLITANO, California
DANIEL LIPINSKI, Illinois
DORIS O. MATSUI, California
NICK LAMPSON, Texas
ZACHARY T. SPACE, Ohio
MAZIE K. HIRONO, Hawaii
BRUCE L. BRALEY, Iowa
JASON ALTMIRE, Pennsylvania
TIMOTHY J. WALZ, Minnesota
HEATH SHULER, North Carolina
MICHAEL A. ACURI, New York
HARRY E. MITCHELL, Arizona
CHRISTOPHER P. CARNEY, Pennsylvania
JOHN J. HALL, New York
STEVE KAGEN, Wisconsin
STEVE COHEN, Tennessee
JERRY MCNERNEY, California

JOHN L. MICA, Florida
DON YOUNG, Alaska
THOMAS E. PETRI, Wisconsin
HOWARD COBLE, North Carolina
JOHN J. DUNCAN, JR., Tennessee
WAYNE T. GILCHREST, Maryland
VERNON J. EHLERS, Michigan
STEVEN C. LATOURETTE, Ohio
RICHARD H. BAKER, Louisiana
FRANK A. LOBIONDO, New Jersey
JERRY MORAN, Kansas
GARY G. MILLER, California
ROBIN HAYES, North Carolina
HENRY E. BROWN, JR., South Carolina
TIMOTHY V. JOHNSON, Illinois
TODD RUSSELL PLATTS, Pennsylvania
SAM GRAVES, Missouri
BILL SHUSTER, Pennsylvania
JOHN BOOZMAN, Arkansas
SHELLEY MOORE CAPITO, West Virginia
JIM GERLACH, Pennsylvania
MARIO DIAZ-BALART, Florida
CHARLES W. DENT, Pennsylvania
TED POE, Texas
DAVID G. REICHERT, Washington
CONNIE MACK, Florida
JOHN R. 'RANDY' KUHL, JR., New York
LYNN A WESTMORELAND, Georgia
CHARLES W. BOUSTANY, JR., Louisiana
JEAN SCHMIDT, Ohio
CANDICE S. MILLER, Michigan
THELMA D. DRAKE, Virginia
MARY FALLIN, Oklahoma
VERN BUCHANAN, Florida

SUBCOMMITTEE ON RAILROADS, PIPELINES, AND HAZARDOUS MATERIALS

CORRINE BROWN, Florida *Chairwoman*

JERROLD NADLER, New York
LEONARD L. BOSWELL, Iowa
JULIA CARSON, Indiana
GRACE F. NAPOLITANO, California
NICK LAMPSON, Texas
ZACHARY T. SPACE, Ohio
BRUCE L. BRALEY, Iowa
TIMOTHY J. WALZ, Minnesota
NICK J. RAHALL II, West Virginia
PETER A. DEFAZIO, Oregon
JERRY F. COSTELLO, Illinois
EDDIE BERNICE JOHNSON, Texas
ELIJAH E. CUMMINGS, Maryland
MICHAEL H. MICHAUD, Maine
DANIEL LIPINSKI, Illinois
JAMES L. OBERSTAR, Minnesota
(ex officio)

BILL SHUSTER, Pennylvania
THOMAS E. PETRI, Wisconsin
WAYNE T. GILCHREST, Maryland
STEVEN C. LATOURETTE, Ohio
JERRY MORAN, Kansas
GARY G. MILLER, California
HENRY E. BROWN, JR., South Carolina
TIMOTHY V. JOHNSON, Illinois
TODD RUSSELL PLATTS, Pennsylvania
SAM GRAVES, Missouri
JIM GERLACH, Pennsylvania
MARIO DIAZ-BALART, Florida
LYNN A. WESTMORELND, Georgia
JOHN L. MICA, Florida
(ex officio)

CONTENTS

U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

April 13, 2007

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Railroads, Pipelines, and Hazardous Materials

FROM: Subcommittee on Railroads, Pipelines, and Hazardous Materials Staff

SUBJECT: Hearing on International High-Speed Rail Systems

PURPOSE OF HEARING

The Subcommittee on Railroads, Pipelines, and Hazardous Materials is scheduled to meet on Thursday, April 19, 2007, at 10:00 a.m., in room 2167 Rayburn House Office Building, to receive testimony on international high-speed rail systems.

BACKGROUND

High-speed rail (HSR) is a form of rail transport which is commonly defined as trains that are electronically propelled at speeds exceeding 150 miles per hour (mph), and many trains have been tested in excess of 320 mph. At high speeds, trains must be completely grade separated, meaning there are no at-grade crossings with roads or other types of transportation. The tracks are fenced to prevent intrusion, and the trains must run on dedicated alignments with few stops to maximize performance. High-speed trains also must have sophisticated, modern signaling and automated train control systems.

HSR was first spawned with the Japanese "bullet trains", or Shinkansen trains, which in 1964 began operating at speeds of more than 150 mph. In 1981, France inaugurated a 255-mile HSR line between Paris and Lyon, cutting travel time from four hours to two hours. In 1991, Germany unveiled a 203-mile HSR service between Hanover and Wurzburg and a 62-mile HSR service between Mannheim and Stuttgart. Since then, other nations have created their own HSR lines: in 1992, Italy and Spain started new services; in 1998, Sweden upgraded its rail lines to accommodate HSR; and in 2000, the Netherlands started HSR service between Amsterdam and Brussels. By comparison, the only American line that can approach the speed of the European and Asian HSR systems is Amtrak's Acela line, which operates between Washington, DC and Boston. The Acela is capable of achieving speeds of up to 135 mph between Washington, DC and New York and 150 mph between New York and Boston, but usually averages considerably less than that (82 mph and 66 mph, respectively), largely due to congestion and track conditions.

On April 3, 2007, a French HSR train broke the world speed record for steel-on-steel rail when it achieved a speed of 357 mph on a new train set that the French plan to soon have in regular rotation. The world's fastest train is a magnetic levitation train built by the Japanese that reached 361 mph on December 2, 2003.

Today's HSR systems fall into two categories: steel-on-steel systems and magnetic levitation systems. Steel-on-steel high-speed rail systems are the most common. They operate on exclusive rights-of-way through a combination of electrification and other advanced components, expeditious alignments, and state-of-the-art rolling stock. The systems can attain performance well above what is capable with conventional rail technology.

The bulk of steel-on-steel research and development took place after World War II in Japan, France, and Germany. Japan introduced the world's first HSR train, the Shinkansen in 1964; France followed with its *train à grande vitesse* (TGV), and Germany with its Intercity Express (ICE). Other countries have since followed, including Italy, Spain, England, Belgium, China, Korea, and Taiwan. Although adhering to sometimes divergent design principles, these systems uniformly succeeded in reducing journey times and capturing increased traffic among the major cities served.

Magnetic levitation, or maglev, is an advanced transport technology in which magnetic forces lift, propel, and guide a vehicle over a special-purpose guideway. Utilizing state-of-the art electric power and control systems, this configuration eliminates the need for wheels and many other mechanical parts, thereby minimizing resistance and maximizing acceleration, with cruising speeds on the order of 300 mph.

There are two basic types of maglev systems. One system utilizes attraction forces, where electromagnets exert force on an iron rail on the guideway to effect levitation. The second system uses repulsion forces, where superconducting magnets move across coils or aluminum plates on the guideway to levitate and propel the vehicle. Typically, the attraction-force maglev system has a gap of about one-half inch and can be levitated at zero speed. The repulsion-force maglev system has a gap of about four inches and must be in motion for levitation to occur.

The German company Transrapid has developed attraction-force maglev technology. This technology is the first maglev system in commercial use; it has been deployed in Shanghai, China, where maglev trains connect the city with its airport. The 19-mile track came online October 11, 2003 at a cost of approximately $1.2 billion. On March 23, 2007, the *Shanghai Daily* reported that Shanghai received state approval to extend the line to the Hongqiao Airport near the city of Hangzhou, the capital of neighboring Zhejiang province. The cost of the extension is expected to be $4.5 billion, and would reduce the rail traveling time from two hours to 30 minutes.

According to the Federal Railroad Administration, the initial average capital cost of available maglev technologies ranges from $40 to $100 million per rail mile. Compared to the $10 to$45 million per mile cost of steel-on-steel systems and the $1 to $10 million range for conventional rail, maglev technologies are the most expensive in terms of up-front investment.

OVERVIEW OF SELECT HIGH-SPEED RAIL SYSTEMS

The current leaders in high-speed rail systems are France, Germany, and Japan. China and Britain's Eurostar are also interesting in that China has invested an enormous amount of capital in its passenger rail system, and the Eurostar system is possible due to one of the greatest engineering feats in the world, the tunnel underneath the English Channel. Each system was developed based on different infrastructure needs, and has demonstrated different results.

FRANCE'S HIGH-SPEED RAIL SYSTEM

At the end of 2005, France had 18,144 miles of track in revenue service, of which 963 miles were high-speed rail lines. According to the Government Accountability Office, France's system comprises the largest use of high-speed trains in the world.

France's major rail companies were nationalized in 1938 and put under the direction of the newly created *Société Nationale des Chemins de Fer Français* (SNCF). In 1991, the European Union (EU) issued Directive 91/440/EEC, which directed member states to separate infrastructure from operations in the form of separate accounts. According to the EU, this was done to help improve international rail travel between EU countries. As a result, in 1997, France restructured its railways.

SNCF infrastructure assets were transferred to a new state-owned company, *Réseau Ferré de France* (RFF), which assumed responsibility for railway infrastructure investment in France. As payment for the infrastructure assets, RFF took over a large amount of SNCF debt (about $18 billion). At the same time, SNCF's debt was reduced further from a transfer of funds to a Special Debt Account, which is not recorded on SNCF's balance sheet. According to a report commissioned by the EU, France's restructuring had more to do with spreading out the historic debt of its railways than it had to do with the EU directive. SNCF and RFF have high debt levels (95 percent and 70 percent respectively). SNCF is currently adequately funded by the government, but RFF's new debt is rising sharply.

Under the new structure, SNCF, which is comprised of about 200,000 workers, is responsible for the operation of infrastructure, track allocation, timetabling, and access pricing though the infrastructure is owned by RFF. RFF, which is comprised of about 700 workers, requires SNCF to undertake all maintenance and renewal activities; this relationship is set out in a contractual agreement, which specifies the payments RFF will make to SNCF and the infrastructure quality standards that SNCF is required to deliver. SNCF determines the maintenance activities that it will undertake to meet these criteria and to satisfy the requirements of its train operations and safety standards. RFF, on the other hand, prepares investment plans for infrastructure enhancements, on which SNCF is consulted. New infrastructure projects are contracted out by RFF on the basis of competitive tender. SNCF has won many, but not all, of these contracts.

SNCF and RFF are governed by Boards of Directors. The French government appoints 12 of the 18 members of the SNCF Board of Directors, seven of whom (including the chairman) are required to be French government employees. RFF's board has a similar composition.

France's high-speed rail system is composed of high-speed track (*Lignes à Grand Vitesse*, "high-speed lines," or LGVs) and high-speed trains (*Trains à Grand Vitesse*, "high-speed trains," or TGVs). In 1981, SNCF began high-speed operations with the opening of the Paris-Lyon TGV line. SNCF reports that its TGVs command a dominant share of the air-rail travel market in several of its corridors – over 90% in the Paris-Lyon market (with a travel time of less than 2 hours) and about 60% where the travel time is 3 hours (Paris-London, Paris-Marseilles).

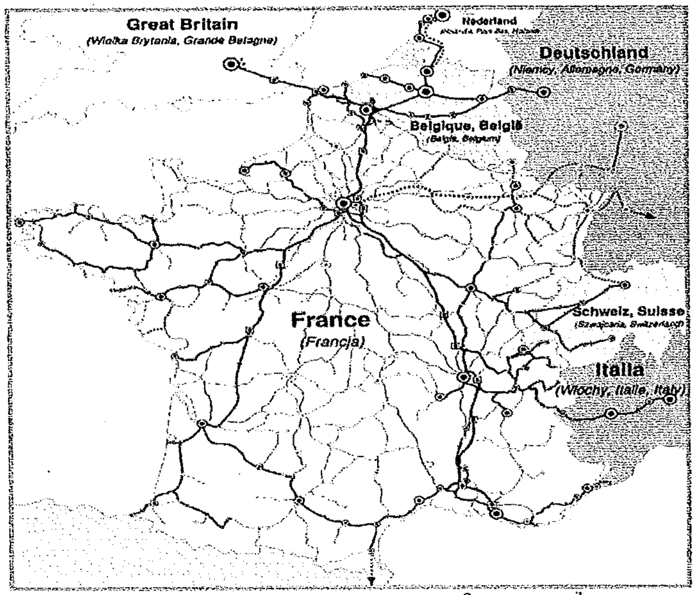
Because of France's relatively low population density and the centrality of Paris (as the capital, the largest population center, and the geographical center of the northern part of the country), the LGV network has taken the form of spokes radiating outward from the hub of Paris to other population centers (seen on next page). Several LGVs are under construction and several more are being planned. Funding for construction of domestic LGVs is largely provided by the French government; for lines crossing into other countries, funding comes from several sources, including the respective countries and European investment agencies.

On the LGVs, the maximum speed is 186 mph though some sections are limited to 168 mph. A new LGV, LGV Est Européene (East European high-speed line), running from Paris to Strasbourg, is being built to allow 217 mph operation, but will initially be limited to 199 mph. The line will be 405 km (252 miles), and is scheduled to open in 2010. The first section, linking Vaires-sur-Marne near Paris to Baudrecourt in the Moselle (186 miles), is scheduled to begin service in June 2007, cutting the travel time from Paris to Strasbourg from four hours to a little over two hours. TGV trains may also run along conventional tracks, but their speeds are limited to 137 mph on these sections.

The Nord-Pas de Calais region is proposing to develop a regional high-speed rail network, with a mix of new and upgraded lines allowing speeds of 155 to 186 mph, likely using refurbished TGV train sets.

In 2005, SNCF carried 974 million passengers, of which 95 million (10%) were TGV passengers; the remainder were regional passengers (roughly comparable to commuter rail and transit service in the U.S.).

THE TGV NETWORK



Source: www.raileurope.com

PUBLIC FINANCING OF FRENCH NATIONAL RAILWAYS

According to an April 2005 study of public budget contributions to railways in Europe, which was commissioned by the European Union, France provided, on average, about 7.3 billion euros ($9.8 billion US) per year for each of fiscal years 1995 through 2003. In 2003, for example, public budget contributions to the French railway system totaled about €9 billion ($12 billion US) in 2002 and €8 billion ($10.7 billion US) in 2003, which can be broken down as follows:

- RFF's main sources of income are infrastructure access fees paid by SNCF, and contributions from the state. Both are accounted for as operating revenue. The state contribution in 2002 and 2003 was around €1.4 billion ($1.88 billion US) a year.

- RFF has in most years received capital infusions from the state. In 2002, an equity contribution of €1.36 billion ($1.82 billion US) was received, allowing RFF debt to be broadly stabilized in that year. In 2003, no equity injection was given and, as a result, RFF debt increased by €1.5 billion ($2 billion US) in that year.

- RFF receives capital grants from central and regional authorities for infrastructure projects. In 2003, the capital grants amounted to €981 million ($1.3 billion US), up from €552 million ($741 million US) in 2002 and €264 million ($354 million US) in 2001.

- SNCF receives state contributions for tariff and public service obligations for regional and local services, for concessionary fares, and for various other services. These contributions totaled around €2.1 billion ($2.8 billion US) in 2003 and €2 billion ($2.6 billion US) in 2002. In both years, SNCF also received investment subsidies (€618 million, or $830 million US, in 2003 and €721 million, or $969 million US, in 2002).

- The state pays a retirement supplement for SNCF staff, which is not shown on SNCF's income statement, amounting to €2.4 billion ($3.2 billion US) in 2003 and €2.3 billion ($3.09 billion US) in 2002.

- The Special Debt Account is an off-balance sheet commitment containing SNCF historic debt, for which the French state makes public contributions. In both 2002 and 2003, state contributions to this account were €677 million, or $909 million US.

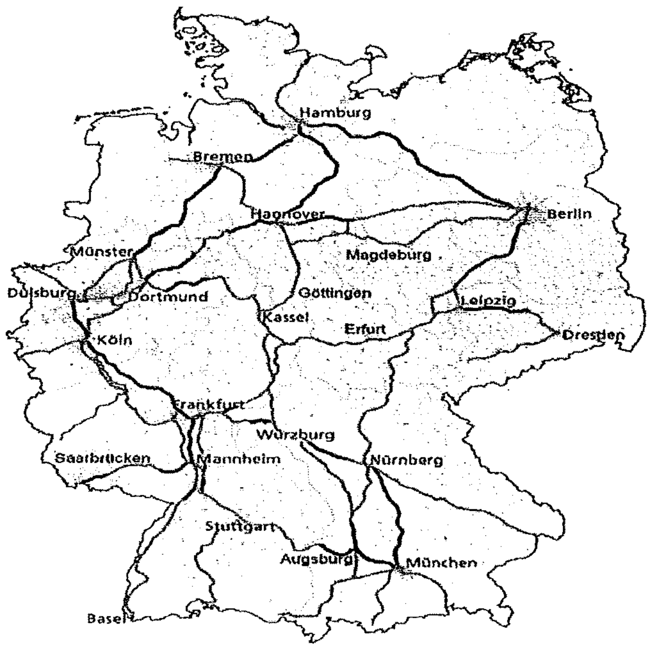
GERMANY'S HIGH-SPEED RAIL SYSTEM

Construction on the first German HSR lines began shortly after that of the French LGVs. The first generation of ICE trains were introduced in 1991, operating at a maximum speed of 155 mph on new tracks; a second generation was put into service in 1997, which operate at 174 mph on new track; and a third generation train was put into service in 2000, which can operate at speeds up to 186 mph on new track.

There are three distinct differences between the French and German HSR systems: (1) the ICE makes more stops at intermediate destinations, compared to the TGV trains, which tend to focus on connecting distant cities with few intermediate stops; (2) Germany focused on upgrading existing rail lines rather than building new high-speed rail track; and (3) most ICE services run on conventional rail lines, with the exception of the Cologne-Frankfurt line, while the TGV mainly runs on dedicated HSR lines. Speeds on the conventional rail lines are limited to 125 mph.

Running higher-speed trains with conventional trains on the same tracks has caused significant scheduling and operational difficulties for German rail operators. Often, the faster trains will catch up to the slower trains, causing significant delays. Deutsche Bahn AG, the state-owed rail operator, has unveiled a plan, Netz 21 (Network 21), to reduce delays and expand capacity on its rail network. The plan calls for upgrading existing trains, installing more modern control systems for better scheduling rail traffic, and constructing new lines and upgrading existing lines to reduce bottlenecks. Deutsche Bahn, however, states that the pace and extent of the network expansion "will depend largely on transport policy and the amount of infrastructure funding provided by the federal government."

THE ICE NETWORK



Source: http://www.ice-fanpage.de/

As noted earlier, Germany also developed a maglev train system, the Transrapid, which can reach speeds up to 340 mph. A test track with a total length of 19.5 miles is operating in Emsland, Germany. Unfortunately, 23 people died when this elevated maglev train collided with on-track maintenance equipment on September 22, 2006 near Lathen in northwestern Germany. Despite this accident, the technology has been successful in China, where it was used in building the Shanghai Maglev train.

PUBLIC FINANCING OF GERMANY'S RAILWAYS

According to an April 2005 study commissioned by the European Union, total government spending for regional rail transportation in Germany was €4.5 billion ($6 billion US) in 2003. It is unclear from documents obtained by staff whether this includes HSR investment. In addition, €2.3 billion ($3 billion US) was allocated in 2003 to all public transport modes for operations and infrastructure investment. Some of those funds were used for rail. The German government also continues to pay-down the historic debt of its two former public railways, which operated in East and West Germany prior to reunification. After reunification, the two railways merged into

Bundeseisenbahnvermoegen, out of which Deutsche Bahn (the German National Railways) was then created. The historic debt of the two railways was DEM 68 billion in 1994 (then $38 billion US). The amount allocated by the German government for debt service in 2003 was €8.7 billion ($11.6 billion US).

JAPAN'S HIGH-SPEED RAIL SYSTEM

Japan is perhaps France's biggest rival when it comes to high-speed rail. It was the unveiling of Japan's first high-speed train, the Tokaido Shinkansen (or New Trunk Line, in English), that spurred France to develop the TGV. Construction began in 1959, and in 1964, the world's first high-speed rail line was unveiled to the public on the eve of the Tokyo Olympics, then operating at a speed of 200 km/h (about 125 mph).

Japan is an extremely densely populated country: more than 70% of the land surface is mountainous and thus uninhabitable or unsuitable for road travel and parking. In fact, parking is so sparse that drivers must prove they have a parking space before they can buy a car. With such a high population density, the only practical possibility for transportation across the country is rail. In fact, after World War II, the Japanese government officially deemed rail as the preferred mode of travel.

The recognition of the interrelationship between land development and the high-speed rail network led, in 1970, to the enactment of a law for the construction of a nationwide Shinkansen railway network. By 1973, the Ministry of Transport approved construction plans for five additional lines and basic plans for 12 others. Despite the approval, financial considerations intervened; the cost of the five lines (five trillion yen, or roughly $18 billion US at the 1973 exchange rate), combined with the recession in the 1970s and early 1980s resulted in some lines being cancelled and others delayed until 1982.

Today, Japan has eight Shinkansen lines: Akita Shinkansen, Joetsu Shinkansen, Yamagata Shinkansen, Hokuriku Shinkansen, Tohoku Shinkansen, Sanyo Shinkansen, Kyushu Shinkansen, and Tokaido Shinkansen. The trains travel between 260 km/h and 300 km/h (about 160 mph and 185 mph).

Japan is planning construction of four new Shinkansens: the Tohoku Shinkansen and Kyushu Shinkansen, which will be completed by March 2011; the Hokuriku Shinkansen, which will be completed by March 2015; and the Hokkaido Shinkansen, which will be completed by March 2016. In addition, incremental improvements to the high-speed rail technology have been undertaken. Tilting trains have been introduced to take curves faster; meanwhile, aerodynamic redesigns, stronger engines and lighter materials, air brakes, typhoon and earthquake precautions, and track upgrades are among the developments. As a result of improvements, the travel time from Tokyo to Shin-Osaka (the first route opened) has decreased from four hours in 1964 to two and one-half hours, and is forecast to be less than two hours in the near future.

In addition, a new generation of conventional steel wheeled Shinkansen trains FASTECH 260 with a top speed of 405 km/h (about 250 mph) and an operational speed of 260 km/h (160 mph) is currently under development. Production trains are expected to enter service in 2011.

A Japanese consortium led by the Central Japan Railway Company has been researching new high-speed rail systems based on maglev technology since the 1970s. Although the trains and guideways are technology ready and over 100,000 people have ridden them, high costs remain the primary barrier. Test trains JR-Maglev MLX01 on the Yamanashi test line have reached speeds of 581 km/h (361 mph), making them the fastest trains in the world. These new maglev trains are intended to be deployed on new Tokyo-Osaka Shinkansen maglev route, called the Chuo Shinkansen, though the project has little political support, due to cost of deployment (10 trillion yen, or $84 billion US).

PUBLIC FINANCING OF JAPAN'S HIGH-SPEED RAIL SYSTEM

HSR lines are built through the mutual consent of the local governments and the relevant Japanese Railway (JR) Company. New lines are paid two-thirds by the federal government and one-third by the prefecture (local) government. In addition, the JR Company using the line pays a usage fee to the government, though in some cases a JR Company may purchase the line from the government and maintain the line itself. The federal subsidy for the Shinkansen in 2006 was 151 billion yen, or a little less than $1.3 billion, and the local government subsidy was 75.5 billion yen, or $633 million US.

CHINA'S HIGH-SPEED RAIL SYSTEM

China is undergoing a period of substantial economic and social growth that is necessitating a massive investment in its transportation infrastructure. According to China's Ministry of Railways, in 2006, a quarter of the world's railway transportation volume (freight) occurred in China. As such, China has embarked on a plan to upgrade and expand its national rail network through 2010.

In accordance with the plan, in 2006 alone, China invested $32 billion in expansion of its rail network. For 2007, of the $119 billion China plans to invest in transportation infrastructure, the Ministry of Railways reports that $42.6 billion will go to rail expansion. This includes 377 miles of new track, 393 of double tracking, and 1,255 miles of electric track for high-speed rail use. The total investment for rail infrastructure will be $190 billion between 2006-2010, according to China's National Development and Reform Commission, and will increase China's total rail infrastructure by 20 percent.

The Chinese government has identified HSR as the future of its passenger rail system, but China's expansion into high-speed rail travel is just beginning. It does not have high-speed rail service between major cities, but it does have high-speed rail service between Shanghai and Pu Dong International Airport. The Shanghai Maglev Train, a Transrapid maglev project imported from Germany, is capable of an operational speed of 430 km/h (267 mph) and a top speed of 501 km/h (311 mph).

China has decided to build a second Transrapid maglev rail, which will stretch 99 miles from Shanghai to Hangzhou. Construction was expected to begin in early 2007 and be complete in time for the 2010 Shanghai Expo. It would be the first intercity maglev rail line in commercial service in the world.

In addition to the maglev lines, a conventional high-speed rail line based on ICE technology between Beijing and Tianjin is expected to open in 2007. The Beijing-Shanghai Express Railway is also in an advanced phase of construction but it will only allow speeds of 200 km/h (124 mph).

SPAIN'S HIGH SPEED RAIL SYSTEM

RENFE is the national rail passenger operator in Spain and is a Government-owned company controlled by the ministry of public works (Ministerio de Fomento). RENFE is primarily funded by the federal government, although the regional governments provide some additional funding and are undertaking a greater role in planning transport infrastructure. At present, RENFE both operates trains and manages all the infrastructure, including the Madrid-Seville high-speed line. The government has recently proposed to set up a new body, ADIF, which would take over all of Spain's rail infrastructure, in order to be compliant with European law which mandates management separation of operations from infrastructure. A separate state-owned organization, GIF, is responsible for development of the high-speed lines that are under construction, but, if the new rail structure proposed by the government becomes law, responsibility for the construction and maintenance of new lines will transfer to ADIF.

In addition to RENFE, there are three other passenger rail operators but only one of these, FEVE, provides long distance services and these are all on its own dedicated narrow-gauge tracks. FEVE is also a state owned company controlled by Ministerio de Fomento.

Rail market share in Spain is very low by European standards: within the EU, it is lower only in three countries (Ireland, Portugal and Greece); 4.8% of domestic trips and 5.2% of domestic passenger kilometers are made by rail. The market share of bus transportation is more than twice this level and on some routes buses provide a faster and more frequent service than rail.

Spain has a poor quality conventional rail network, particularly if compared to countries such as France, Italy, or even the UK. Capacity is limited by long sections of single track, and line speeds are low as a result of curves and gradients. Tilting trains have long been used in Spain in order to minimize the impact of this on passenger journey times, but these can still be very long by European standards. Madrid to Barcelona, a similar distance to London to Edinburgh, takes seven hours by train at present. As a result, high-speed rail offers greater time savings in Spain than elsewhere in Europe, strengthening the case for investment.

The political decision to invest in high-speed rail was, in effect, made when the government committed that all regional capitals should be within four hours of Madrid and six hours of Barcelona by high-speed train. The first high-speed railway to be constructed in Spain was the Madrid to Seville AVE, which opened in 1992. Parts of two other major routes (Madrid-Valencia and Barcelona-Valencia) have been upgraded for fast operation and are both defined as high-speed by the Spanish government.

The Madrid to Seville high-speed line is perceived as having been very successful both in transport terms and in terms of its economic effects. Journey times are about 60% faster than via the old line, and 99.8% of trains arrive within three minutes of their scheduled arrival time (the corresponding figure for UK Intercity trains is 70% within 10 minutes). This has increased the public and political pressure to deliver the rest of the high-speed rail program, which the government is in the process of doing. Several routes are under construction, and the government has targeted 7,200km (4,500 miles) of high-speed railway along five main corridors. Only 725km of this total is complete, although another 1,146km (712 miles) is under construction, with an additional 1,182km (734 miles) in design, 920km (571 miles) in planning, and 3,227km (2,005 miles) in consultation.

The Spanish government has thus far allocated €41 billion ($55 billion US) for the construction of the new high-speed rail corridors. In addition, according to the European Union, the Spanish Government provides about €1.349 billion ($1.8 billion US) per year for passenger rail operations and infrastructure maintenance.

EUROSTAR

Eurostar is the high-speed rail service directly linking London to France and Belgium via the Channel Tunnel. It started operating in 1994. The Channel Tunnel is a 31-mile long rail tunnel beneath the English Channel starting at the Straits of Dover in England and ending in Coquelles, France. It was completed after seven years of work in 1994 at a cost of $15 billion. The tunnel consists of three interconnected tubes: one rail track each way plus one service tunnel. Its length is 31 miles, of which 23 miles are underwater. Its average depth is 150 feet under the seabed. The ninety-five miles of tunnels were dug by a workforce of nearly 13,000. Only 20 minutes of the Eurostar journey takes place in the tunnel. It is the second-longest rail tunnel in the world, with the Seikan Tunnel in Japan being longer, but the undersea section of 39km (23 miles) is the longest undersea tunnel in the world. The American Society of Civil Engineers has declared the tunnel to be one of the Seven Wonders of the Modern World.

Eurostar runs up to 16 trains to Paris and nine to Brussels daily. The fastest London-Paris Eurostar journey time is 2 hours 35 minutes, London-Brussels 2 hours 15 minutes and London-Lille just 1 hour 40 minutes. In addition, Eurostar offers connecting tickets to over 100 destinations across France, Belgium, and the Netherlands. For example, Lyon can be reached in five hours from London and Marseille from London in seven hours. The Eurostar trains can reach 186 mph, but may only travel 100 mph while in the Tunnel. In 2006, Eurostar had a ridership of approximately 8 million riders, according to Eurostar.

Since 1994, Eurostar has established itself as the leading carrier to Brussels and Paris and has the largest share of the rail/air market on its core routes despite intense competition. Eurostar has 69% of the London-Paris rail/air market and 62% of the London-Brussels rail/air market.

Originally, Eurostar was owned by the SNCF, SNCB, and British Rail. Prior to the UK privatization, a subsidiary, European Passenger Services (EPS) was created as a government-owned business which included British Rail's interest in Eurostar. In June 1996, this was sold to London & Continental Railways (LCR). In October 1996, LCR changed the name to Eurostar UK Ltd (EUKL). Today, EUKL, SNCF, and SNCB are each responsible for running Eurostar services on their own territory.

WITNESSES

Mr. Jean-Marie Metzler**
Consulting Director, TGV Development
French National Railways (SNCF)

Mr. Marc Noaro**
Commercial Director
Eurostar

Signor Cipolletta Innocenzo
President and CEO
Ferrovie dello Stato (Italy)

Mr. Hartmut Mehdorn
Chairman and CEO
Deutsche Bahn AG (Germany)

Señor Apolinar Rodriguez Diaz**
International Director
Renfe Operadora (Spain)

Mr. Jean-Michel Dancoisne
Director General
Thalys International (Belgium)

Mr. Ignacio Barron de Angoiti**
Director of High-Speed Rail
International Union of Railways

Mr. Hiroki Matsumoto**
Transportation Counselor
Embassy of Japan

Dr. Quansheng Zhao (China)**
Professor and Director
Division of Comparative & Regional Studies
School of International Service
American University

**Confirmed to attend

HEARING ON INTERNATIONAL HIGH-SPEED RAIL SYSTEMS

Thursday, April 19, 2007

HOUSE OF REPRESENTATIVES
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
SUBCOMMITTEE ON RAILROADS, PIPELINES, AND HAZARDOUS MATERIALS,
Washington, DC.

The subcommittee met, pursuant to call, at 10:00 a.m., in Room 2167, Rayburn House Office Building, the Honorable Corrine Brown [chairwoman of the subcommittee] presiding.

Ms. BROWN OF FLORIDA. Good morning. The Subcommittee will come to order.

The Subcommittee is meeting today to hear testimony on international high-speed rail systems.

Over the recess, I had the pleasure of joining Chairman Oberstar and several other members of the Committee on a trip to Europe, where we rode a high-speed train from Brussels to Paris and met with transportation officials from both Belgium and France. In fact, one of the greatest honors I ever had was driving the TGV during one of my visits to France.

This summer I plan to lead a delegation of members to several Asian countries, including Japan, to learn about the development of passenger rail and high-speed rail in those countries. Japan is particularly important since it created the world's first high-speed train in 1964. At the time, the "bullet train" was operating at speeds of 130 miles per hour. Today, Japan's high-speed trains travel at about 186 miles per hour. In fact, Japan holds the world's record for the fastest magnetic train in the world. When tested, it reached 361 miles per hour.

Japan is not the only country represented here today that has broken a world record when it comes to trains. A few weeks ago, in fact, we were in Europe during that time, France broke the world speed record for steel-on-steel rail when the TGV achieved a speed of 357 miles per hour. According to an article I read, people watching the side of the tracks barely saw the train go by. This is very impressive.

Other countries have since followed Japan and France's lead, including Spain and China, both of which are represented here today. I am looking forward to hearing about their high-speed rail systems.

Several months ago I joined Chairman Oberstar in asking the Congressional Research Service to look into the development of passenger rail in other countries and, in particular, public financing of passenger rail. CRS is still completing its work but, in the interim, has provided me with a number of studies to review, all of which show that these countries did two things the United States has not: they made passenger and high-speed rail development a top priority and they have dedicated billions of public dollars to finance it. We have not done that, and that is the reason the United States is lagging behind the rest of the world when it comes to passenger rail.

Several States in the United States are looking into high-speed rail. On the Northeast Corridor, Amtrak's Acela Express is capable of reaching speeds up to 135 miles per hour between Washington and New York and 150 between New York and Boston, but because of congestion, track conditions, and backlogging of maintenance, trains average about 82 miles per hour below New York and 66 miles per hour above New York. If we want a national passenger rail system that is more efficient and reaches higher speeds, then we are going to have to step up to the plate, stop nickel-and-diming Amtrak to death, and dedicate the resources necessary to improve the current system.

With that, I want to welcome all of our panelists and thank them for joining us today. I am honored that you all have traveled so far to meet with the Subcommittee. I am looking forward to hearing about your experiences with high-speed rail.

Before I recognize Mr. Shuster for his opening statement, I ask unanimous consent to allow 30 days for all members to revise and extend their remarks and to permit the submission of additional statements and materials by members and witnesses.

Without objection, so ordered.

Mr. Shuster?

Mr. SHUSTER. Thank you, Madam Chairman. Thank you for holding today's hearing on international high-speed rail.

The United States currently has the world's best freight railway system, and this has been a major driver in our Nation's economic success. But as we heard a couple weeks ago Mr. Mica's Forum on High Speed Rail, the United States is lagging badly in the area of high-speed ground transportation.

Our airports and highways are becoming increasingly congested and, if we don't do something soon, this congestion is going to strangle our Country's economic growth.

I believe that high-speed rail, ground transportation, including both steel wheel trains and Maglev, can be a major part of that solution.

We need to move beyond our antiquated Amtrak system, which is really just a relic left over from the 1930s. Amtrak's intercity trains average less than 60 miles per hour and their fastest, the Acela, manages only 82 miles per hour, as the Chairwoman pointed out.

But there is hope. Speeds in the Northeast Corridor could and can be increased substantially by relatively modest investments.

In my own State of Pennsylvania, the Keystone Corridor, from Harrisburg to Philadelphia, is now averaging speeds of up to 110 miles an hour. The higher speeds have already led to significantly higher ridership and I believe that higher speeds would make the service even more attractive.

One way to jump to a higher level of speed would be a Maglev. A German firm called Transrapid just completed its Environmental Impact Statement for the first segment of a futuristic Maglev system capable of operating at speeds up to 350 miles per hour. The first piece of that line we hope would be in Pittsburgh, Pennsylvania, or outside of Pittsburgh, from the airport to downtown. I guess it was in T21 that there were three sites. Baltimore-Washington, Pittsburgh, and, I believe, out in Las Vegas, were the three sites that were considered. The folks in Pittsburgh have put together a plan. Actually, they are ready to move forward if we could get the funding for it.

Of course, some people say why Pittsburgh, what makes sense in Pittsburgh? Well, Pittsburgh offers the varying different terrains, the different seasons of the year to really test a train significantly, and, as I said, they are ready to go if we have the funding in place.

So in closing, Madam Chairwoman, I would like to again thank you for holding this hearing and welcome all of our distinguished witnesses today.

Thank you for traveling, I know, great distances to be here today and help to inform us.

Thank you. I yield back.

Ms. BROWN OF FLORIDA. Mr. Mica?

Mr. MICA. Thank you, and good morning. I am pleased that the Chairwoman and the Ranking Member have chosen to conduct this rather somewhat historic hearing on international high-speed rail systems and bringing together some of the expert operators and developers of systems from across the world.

I first want to take this opportunity to again extend a formal welcome. I know Ms. Brown has done that. We appreciate your participation today. As I said earlier to you, I think we have a lot to learn from your experiences, both your successes and sometimes the problems you have incurred in developing these high-speed rail systems.

We do not have a single high-speed rail system in the United States. Some years ago the Congress authorized about a dozen corridors and there have been various efforts to develop those corridors. Probably the biggest impediment to development of a high-speed rail corridor in the United States is our own Amtrak system, which actually is charged by law with operation of all passenger long-distance service and, right now, high-speed service in the United States.

Unfortunately, their attempts in the Northeast Corridor to develop high-speed service have been a disaster after billions of dollars have been expended. They purchased equipment with dissimilar designs and technical requirements; they took a European design and made it too wide. It is supposed to be a tilt train and now, with the wider widths, if it tilts, it hits freight or other vehicles on the track; the catenary does not match. And we ended up with Acela operation that operates on average speed of 82 to 83 miles per hour. We closed down the system for nearly half a year because we bought equipment that did not have parts for it, in this case brakes, which are basically essential to operate.

So our history of operating from a Soviet style rail system has not been that good.

I am pleased to see all of those who are with us today. I have personally ridden the Shinkansen; I have visited the Maglev test track in Japan and Germany; ridden last fall the Maglev in Shanghai with German technology; Telgo; I think the ICE train in Germany; the TGV; I think just about every system that operates.

Unfortunately, most of those systems are highly subsidized by government, and I do hope that we get to find out some of the financial arrangements.

I will mention in closing that I conducted a small informal forum a few weeks ago—Ms. Brown was kind to participate—and we did have an exciting approach which is offered in the privatization of the British rail system in selling off the two north-south high-speed lines to Virgin Rail which, in 1998, acquired the two major north-south corridors. Those were acquired by Mr. Branson. The information that was provided to us, when I visited there three years ago, they had 34 million passengers a year. They now have 44 million. They have paid a dividend the last three years—we do have that information confirmed—and they have contributed, I think, some 5 billion pounds, equivalent to $10 billion, towards development of the infrastructure and totally acquired the responsibility for the cost of the rolling stock. I think that is a model that we should compare against your operations as we consider getting into that business.

So I look forward to hearing of your experiences and, again, we extend our deep appreciation on behalf of the Committee for your participation today. Hopefully, we can bring the United States kicking and screaming into the world of high-speed rail systems and operations, and do it in a cost-effective manner that benefits not only the traveler, but the taxpayer.

With those comments running only 30 seconds over, I yield back the balance of my time.

Ms. BROWN OF FLORIDA. Thank you.

Once again, we are very pleased to have such a distinguished panel of witnesses this morning. I want to welcome Mr. Metzler, who is the Consulting Director for TGV Development for the French National Railways. He is joined today by Mr. Morrell, the President of Rail Europe, who has volunteered to help us with some translations if needed. Welcome.

Next, we have Mr. Barron, who is the Director of High-Speed Rail for the International Railway Association.

We have Mr. Rodriguez, who is the International Director for Spain.

We have Mr. Matsumoto, who is the Transportation Counselor from the Embassy of Japan. He has come to the Embassy from the Ministry of Land Infrastructure and Transport in Japan, and I understand that this is the first time that the minister will testify before Congress. I hope it is not the last. I am pleased that you are here today. Welcome.

Finally, we have Dr. Zhao, who is Professor at American University and Director of the University Division of Comparative & Regional Studies, School of International Service. He is here to discuss the high-speed rail system in China. I understand he just left Tampa, Florida, so welcome to Washington.

With that, we will start.

TESTIMONY OF JEAN-MARIE METZLER, CONSULTING DIRECTOR, TGV DEVELOPMENT, FRENCH NATIONAL RAILWAYS (SNCF); IGNACIO BARRON DE ANGOITI, DIRECTOR OF HIGH-SPEED RAIL, INTERNATIONAL RAILWAY ASSOCIATION; APOLINAR RODRIGUEZ DIAZ, INTERNATIONAL DIRECTOR, RENFE OPERADORA (SPAIN); HIROKI MATSUMOTO, TRANSPORTATION COUNSELOR, EMBASSY OF JAPAN; AND DR. QUANSHENG ZHAO (CHINA), PROFESSOR AND DIRECTOR, DIVISION OF COMPARATIVE & REGIONAL STUDIES, SCHOOL OF INTERNATIONAL SERVICE, AMERICAN UNIVERSITY

Mr. METZLER. Chairwoman, distinguished Congress members, I would like to warmly thank the Subcommittee for giving me the immense honor of presenting the French high-speed system.

TGV is not only a legal trademark, but one of the 10 most highly valued brands in the mind of my compatriots.

Let me briefly introduce myself. As a young engineer, I was a project leader for the first TGV (Paris-Lyon) which went into service in 1981. Then I worked on the rolling stock industry side for four years. Returning to SNCF, as Senior Executive VP for Passenger Services, we adapted Sabre software under license from American Airlines to the passenger rail industry. It was the first successful example of yield management set up to optimize train capacity versus revenues.

The TGV network includes a little bit more than 900 miles of high speed lines operated by more than 500 train sets in France alone. The TGV network also connects France to other countries, with a total of 2,500 miles of track now, and this should double up to 2020.

Key facts now: 1.4 billion passengers since 1981, without a single casualty; continuous growth in passengers reaching currently 100 million a year.

The reasons for this success. First, a cut by half of journey time between Paris and Lyon, 2 hours instead of 4, opening new marks to rail, as with the Paris-London route; making rail a fierce competitor to other modes; enabling, in particular, rail to win significant market share over air on routes with journey time around 3 hours.

Key success factors. First, a consumer-oriented product: safe, no casualty since 1981 as mentioned, even in case of derailments—thanks in particular to the TGV's articulated design; providing the same riding comfort at 100 or 200 miles an hour; a consumer-oriented approach to suit the changing demographics and lifestyles of our clients, it concerns, for instance, seats, accessibility to the train and to the stations; a large range of fares, which increasingly attracts customers. Average load factor is now 71 percent.

An environmentally responsible product: route alignment design avoids huge earthworks and saves on land acquisition costs; high-speed lines can in fact be coupled with highway rights-of-way, as sone for Paris-Lille; TGV lines slopes and ramps are close to road standards, 3.5 to 4 percent; TGV platform is only half of that required by a 2 x 3 lanes highway.

TGV delivers higher efficiency in energy, lower energy consumption, and greatly reduced greenhouse gases emissions. We will come certainly to this point later on during the Q&A session.

Proven or carefully tested solutions is also a key of success. Conventional design for both track and rolling stock. The sentence is: "You will have a disaster if any new project contains more than 20 percent of innovation." That is a statement from Rand Corporation in the 1980s.

However, the improvements over time are dramatic: the train that beat the world rail speed record on April 3rd certainly incorporates much more than 20 percent of new technologies compared to the first sets of 1981.

I come to the key financial figures. The cost of a TGV line today is about $32 million per mile, about 70 percent higher than the first Paris-Lyon line, which was easier to build on, without densely populated areas to pass through. Most of the recent cost increases are also due to environmental protection regulations: noise, access, hydrologic precautions.

About funding. In every case, rolling stock is financed by SNCF itself. Paris-Lyon infrastructure was entirely financed by SNCF alone, as TGV North. TGV East line, Paris-Strasbourg, is the only one largely paid for with public funds, up to 76 percent: national government, European Union, states and cities served

You see here a slide of operation cost breakdown. You can remark a very low cost of energy, around 4 percent.

Concluding remarks on marketing and sales. To maximize the return of these large kind of investments, railway companies must master not only the key factors of success described above, but also forecasting methods; market knowledge, tariffs policy; and, as mentioned earlier on, sales and reservation system. So far the success lies in volume and revenue.

I will use the rest of my time to show you a two and a half minute video of the last record of the 3rd of April. You were there.

[Video played.]

Mr. METZLER. Thank you for your attention. I remain at your disposal for Q&A session afterwards.

Ms. BROWN OF FLORIDA. Impressive.

Next——

Mr. OBERSTAR. Madam Chair.

Ms. BROWN OF FLORIDA. Yes, Mr. Oberstar.

Mr. OBERSTAR. [Statement in French.]

I'll translate that later. I was just saying I want to thank Mr. Metzler, whom we saw in Paris during the Committee trip, along with Chairwoman Brown, and was just saying that we took the TGV from Brussels to Paris. When I was on my way to a graduate studies program at the College of Europe in Rouge in 1956, I made the trip by train from Paris to Brussels. It was six hours.

Two weeks ago, that same trip was an hour and 20 minutes. And I had the privilege of at least sitting at the controls, not truly running the train, but sitting at the controls, and for me it was a very nostalgic moment because it was also 50 years ago that the Common Market Treaty was signed during the year that we completed our graduate program, and now the Common Market has achieved its 50 years of operation, with great success.

We thank you very much, Monseigneur Metzler, for making the trip here to be with us and for the opportunity we had for in-depth review.

By the way, that train that took us from Brussels to Paris had 1100 passengers, a 94 percent load factor, and today and for the last seven or eight years there has been no air service between Brussels and Paris because the train is so far more competitive and so far more convenient. Once you get into Gare du Nord, Paris, it is just a few steps to the Metro and you can be anywhere in downtown Paris. Magnifique.

Thank you.

Ms. BROWN OF FLORIDA. Mr. Barron?

Mr. BARRON. Thank you, Mrs. Chairwoman, ladies and gentlemen. It is a very big honor to be here to speak about high-speed rail in this important forum. I represent the International Railway Association. I am Spanish, but I represent the International Railway Association, which is a venerable association founded in 1922 in order to promote cooperation among railways first in Europe and then all around the world.

At the present moment, we are 170 members, but soon we will be almost 200, with the incorporation of some countries in Latin America. This is a club in which members are railway companies of any kind of railway company. The mission is to promote rail transport; to spread and develop the advantages of this important transport mode; and, of course, to change best practices to solve common problems.

In the UIC, my responsibility is high-speed trains and we develop certain activities in order to solve common problems, but especially to spread and to diffuse the philosophy of high-speed.

What is high speed? High speed signifies at least 150 miles per hour, 200 kilometers per hour. Why this speed? Because there is a technical threshold, about 125 miles per hour, 200 kilometers per hour. This speed is possible to operate with classic trains and classic lines, but more than this speed is absolutely necessary to have new lines especially built for this kind of operation, special trains, and so on.

So high speed is a rail system with speeds of more than 150 miles per hour. This is the evolution of maximum speed along the last 50 years, and we can say that today the speed record is 574.8, as you have seen, and the maximum speed is operation is 200 miles per hour will be from the month of June.

This gap, this difference between maximum speed with passengers and maximum speed in experimentation is very important because it is a result of the capacity of the system in order to first give comfort and give confidence to customers, and then to have possibilities for the future.

High speed was born in 1964 in Japan, and it was created in Europe from 1981. The first line was from Paris to Lyon. Today there are, all around Europe, 3,034 miles in operation of these kind of lines. But the success of this transport mode has pushed the explosion of these kinds of lines all around Europe, and in 2010 it is forecasted 1,711 more miles, which are, at present day, under construction; and in 2020 a very important European network will be in operation. This is our present situation. You can appreciate lines are like motor ways in which speeds are able to operate at the speed of 250 kilometers per hour or more and this is the forecasting for 2020. So you can appreciate this is a very important and very complete network in which one of the more important items is the interoperability and the possibility to operate trains from one point to another point of the network.

This is the evolution of the network. This is kilometers of new high-speed lines. Today, the evolution is another range of 117 miles per year, but due to this success, the construction and the plan will push this three times more. So that is what is expecting to inaugurate from here to 2020, 2025, is more or less 246 miles per year. The impact to traffic is very dramatic, always rising. You can appreciate in this graphic it is more or less 10 percent on the average in the last 10 years, 10 percent increase per year. The effect also to motorless fleet is very spectacular because before and after the regulation of one of these transport modes or this line, the evolution is very important. This is the example from Paris-Brussels and this is the example taken into account only train and planes, between Madrid and Seville, and you can appreciate the evolution to the railway is very, very dramatic.

In a certain way, we can say that this is comparing rail travel and market share train and plane. Up to one hour and a half, two hours and a half of time travel for train, the traffic is almost 90, 95 percent for train, almost disappear. For example, between Paris and Brussels, you can appreciate almost no transport. But increasing time travel for train logically decreases the participation, but the market share remains 50 percent even up to three or more hours.

This is from the view of customers, but from the society, speed is very important and has very important advantages. First is capacity. Railways in general high speed gives very important capacity possibilities. For example, in high speed, in Japan they arrive even up to 360,000 passengers per day, which reduces traffic congestion and to boost economy development in the areas served.

Second advantage for high speed is minimal environment impact compared with air and road transport. For example, high speed uses one-third of the land area than motorways, a ninth of energy of planes, and a quarter of cars. Also helps to contain urban sprawl.

This is just a very quick overview on energy efficiency comparison with trains, and high-speed trains in particular with other transport modes. You can appreciate for one unit of energy in certain fixed distance, you can transport even nine times more passengers with high-speed trains than with planes.

Concerning primary energy and CO2 emissions, this is very valuable depending on the conditions of generating electricity, but in general we can say that it is more or less a quarter of planes and a third from private cars.

Very important, the concept of external costs, because this is the cost that you don't pay when you purchase a liter or a gallon of petrol or when you purchase a train ticket or a plane ticket. Comparing the different effects that you don't take into account, rail is still more beneficial than other transport modes.

Of course, safety is absolutely. No casualties per billion, no billion passengers from the history of high-speed. It has never occurred casualties at more than 125 miles per hour.

I am not superstitious, but I always cross my fingers when I say this.

And what about costs? It is very useful to say high-speed is a very expensive transport mode. I will say not necessarily. But it requires a very important economic resource. This is more or less the average cost of infrastructure and trains. Infrastructure requires important investments, but then maintenance is more or less cheap; not cheap, but not very expensive. Train, the cost is more or less expensive, and then the maintenance is very important.

And how is it possible to fund this system? In general, public participation is always required, but more and more, in different parts of the world, the private funds are mobilized and joined with public funds can succeed in this investment. Here are two quick examples. Between Spain and France, the PPP, public-private partnership, and BOT in Taiwan is very successful in order to build this kind of system.

In conclusion very quickly, high-speed rail is a very good transport system in order to give capacity, environment, and safety for customers and society. It is a complex system which requires important and detailed studies. It is different in each country, so it is not possible to apply exactly the same model from France to the States or to Germany or to other countries, and always requires public funds for support.

Thank you very much for your attention.

Ms. BROWN OF FLORIDA. Thank you. We will have some questions for the panelists when we finish.

Mr. Rodriguez?

Mr. RODRIGUEZ. Chairwoman and members of the Committee, ladies and gentlemen, first of all, it is a great honor for me to be invited here and have the opportunity to address this Subcommittee by presenting the guidelines of the Spanish Railway System and the state operator, Renfe.

Spanish Railways has been an integrated system for more than 150 years, until 2004. Within this long period, Renfe was born, as national railways, in 1941, unifying several private companies that had gone bankrupt.

By law, and according to the European Directives in 2005, Renfe was divided in two entities: Infrastructure Manager, called ADIF; and Railway Undertaking, named Renfe-Operator or just Renfe.

The European rules urge national railway companies to separate their activities. The Directives require a minimal level of separation between infrastructure and operation.

What is the present Spanish model? Our model is the one of the total separation between infrastructure and operation based on the idea which allows a better functioning of the railway market.

The Spanish model keeps only one infrastructure manager and fosters the existence of many operators. The process shall have two states. The first stage began in 2005 with new freight operators. The second stage, after 2010, with new passenger operators.

Currently, in the Spanish System there are Renfe and six small operators in freight.

The Strategic Plan of Government. The Spanish government deploys the Spanish infrastructure and Transport Programme for 2005-2020. This Programme, among other things, contains the most ambitious high-speed railway plan in the world, which provides for: 120 billion Euros of investment in railway system; in the year 2010, we will have more than 2,200 kilometers in high-speed tracks, a network superior to any other in the world; in 2020, there will be 10,000 kilometers of high speed or high performance tracks; thanks to this plan, 90 percent of the population will have access to a high-speed railway station within 50 kilometers reach.

Renfe, Railway Operator in Spain. Renfe is a state company operating in four distinct areas of activity: high speed and long distance, local and regional trains, freight, and rolling stock maintenance. Our staff is comprised of 15,000 professionals. The level of activity reaches more than 500 million passengers; 25 million tons in freight traffic. The overall expenses of Renfe are about 2,300 million Euros, 25 percent of which is spent on infrastructure.

The Contract-Programme Renfe-Government. Renfe has a Contract Programme with the government for the period 2006-2010. The Contract Programme stipulates the mutual commitments between Renfe and the government. According to the terms of the contract, Renfe commits itself to manage the commercial development and the quality of the services and, very important, to operate public services, such as local and regional trains.

The government makes financial contributions to public service and other transitory compensations.

The Contract Programme is the pivot of the strategic plan of Renfe and ensures the accomplishment of the growth targets set out in the plan.

The State contribution to Renfe will be 2.6 billion Euros in the current transfer during these five years, 65 percent of them for compensating public services in order to balance the stipulated activity.

Also, I would like to point out that Renfe does not receive any money for operating its high-speed long-distance services because these are considered commercial services.

Besides that, the state capitalizes on Renfe by capital contributions because the state is the owner of the company.

High Speed Services in Renfe. Renfe started its commercial operation in 1992, on the line Madrid-Seville. The service, called AVE, started with a new approach, previously unknown, I think, in Europe, in railway market, of course, clearly oriented for the customer.

AVE was awarded with the European Quality Prize.

In 1997, AVE obtained profits for the first time.

At present, we have three kinds of high-speed services: long distance, named AVE; medium distance; and double gauge services.

AVE, apart from being an acronym of high speed, also means "bird" in Spanish because the AVE trains seem to fly like birds.

This service is known for its quality. As regards this, I would like to highlight one point. In 1994, we set up in AVE services, our punctuality commitment. According to this commitment, the total ticket price is refunded immediately to the passenger in cash if the train arrives at its destination m ore than five minutes late.

This commitment produced a complete change of customer's perception. Of course, this commitment increased our market share. This commitment is unique in the world. At present, we work upon: the gradual implementation of punctuality commitment in other services; new quality commitments, including compensations in cash for lack or deficiency of board service. We refund from 25 percent to 100 percent of the ticket price for deficiencies in toilets, air conditioner, head phones, etc.

In general, these kind of commitments have positive effects of internal functioning, involving employees and suppliers in achieving the standard of quality.

Finally, may I invite you to visit and use our services. Sincerely, it would be a great honor for Renfe and for me to welcome you to Spain.

This will be all. Ladies and gentlemen, thank you for your attention.

Ms. BROWN OF FLORIDA. Thank you very much.

We had some discussion back here about the amount. Can you tell us how much you all spend on the system yearly?

Mr. RODRIGUEZ. Sorry? Yes, just in operator system, we invest more or less 1,200 Euros every year, but in infrastructure we invest more or less 4,000 million Euros or 4 billion Euros every year. But this is a period of 15 years. It means, in general, almost 1 point of the GDP in investment in infrastructure, but it is an investment to change completely the railway system in Spain.

Ms. BROWN OF FLORIDA. Mr. Oberstar?

Mr. OBERSTAR. One percent of GDP?

Mr. RODRIGUEZ. Yes. The total——

Mr. OBERSTAR. Fantastic.

Mr. RODRIGUEZ. Yes, in Europe, the average of the investment in infrastructure—in infrastructure in general, not in railway—is about less than 1 point of the GDP every year. In Spain now it is almost 2 percent every year, and half of that, a little less than 1 point of the GDP, is in railway system because we try to change the share between railway and road in Spain.

Mr. OBERSTAR. Good.

Ms. BROWN OF FLORIDA. Thank you.

Mr. Matsumoto.

Mr. MATSUMOTO. Yes. Thank you, Madam Chairwoman and members of the Committee. It is an honor for me to be here to discuss the Japanese high-speed rail system, or "Shinkansen."

[Laughter.]

Mr. OBERSTAR. Bravo.

Mr. MATSUMOTO. Thank you.

The Japanese people are very proud of this system and we are happy to share our experiences with you. In my testimony, I will test on the history of the Shinkansen, its development and financing, and, finally, the features and benefits of this system.

On behalf of the government of Japan, I would like to welcome the distinguished Committee members coming to Japan, and I am more than happy to assist you in organizing your tour to see the Japanese high-speed railway system, as well as our transit system.

Today I have a lot of information that I believe is useful for the discussion about high-speed rail in the United States. However, due to the limited time for my presentation, I would like to particularly focus on the development of Shinkansen network and the benefits from Shinkansen. I ask that my full testimony be submitted for the record.

Ms. OBERSTAR. Without objection.

Mr. MATSUMOTO. Thank you.

Also, I will use a few slides to help me explain the history and benefits of Shinkansen.

The high-speed railway system in Japan, the so-called Shinkansen, started its operation in 1964 between Tokyo and Osaka, Tokaido Shinkansen, which you can see as the orange lines on the map in the slide.

Before it was privatized in 1987, Japanese National Railways, or JNR, constructed Sanyo, Tohoku, and Joetsu Shinkansen lines.

After the privatization, Tohoku and Joetsu, the green lines on the slide, were transferred to the JR East. The orange line, Tokaido, is operated by JR Central. And JR West received Sanyo Shinkansen, shown in blue. Kyoshu Shinkansen, the newest Shinkansen that opened in 2004, is the red line in the southern part of Japan and operated by JR Kyushu. Shinkansen railways currently under operation in total are 1,352 miles.

It should be noted most of existing Shinkansen lines run through densely populated areas in Japan, connecting most of the major cities, such as Tokyo, Nagoya, Osaka, Fukuoka, and Sendai. The dense population along the lines is the geographic background of the popularity of the Shinkansen.

Compared with other modes of transportation, Shinkansen is most competitive when traveling distances between 200 and 500 miles. More passengers choose automobiles if the trip distance is less than 200 miles because of relatively cheaper cost and greater convenience. If the traveling distance is more than 500 miles, air transportation rapidly increases its share of passengers due to its shorter trip time.

Between Tokyo and Osaka, Shinkansen can complete the trip in just two and a half hours. Although the trip time is only 50 minutes for transportation, most of the passengers prefer Shinkansen because the fare is reasonable and the trip time is not very different when using the travel time for the airports.

The New Shinkansen railways are constructed and owned by Japan Railway Construction, Transport and Technology Agency, or JRTT, and operated by JRs. JRTT charges these JRs for the usage of its property, but the charges may not be larger than the profits from the operation of the New Shinkansen lines.

The cost of New Shinkansen railway construction project is shared by national government and local governments. Two-thirds of the funds are from the national government and one-third from local governments.

It can be said that New Shinkansen construction projects are based on a public-private partnership, where JR operators are supported by the funding from the governments.

Within this framework, Hokkaido Shinkansen, Tohoku Shinkansen, Hokuriku Shinkansen, and Kyushu Shinkansen are currently under development.

Shinkansen can significantly reduce travel time with its high speed operations. When Hokuriku Shinkansen started its operation in 1997, travel time between Tokyo and Nagano was cut in half.

There are many benefits of Shinkansen. The important thing is that each of these features does not stand alone. Rather, these features are integrated and support each other.

First, and most obviously, is the high speed of the rail. In 1996, the record of 275.3 miles per hour was achieved at a speed trial. Since 1997, Sanyo Shinkansen's highest operational speed has been 186 miles per hour. Even the oldest, Tokaido Shinkansen, is now operated with the maximum of 168 miles per hour.

Shinkansen is proud of the density of its operation. The system can dispatch trains every three minutes. Even with the capacity of more than 1300 seats for each train, Shinkansen carried almost 300 million passengers in fiscal year 2004.

It is worth noting that there has never been a fatal accident in Shinkansen since the beginning of its service in 1964. Shinkansen rails are totally separated from conventional railways and operate without any grade crossings. Any collisions between Shinkansen trains and conventional trains or automobiles cannot occur.

The Traffic Control System surveys and controls all the operations of Shinkansen trains, simulates the operating conditions when an operator makes a chance, and then advises to make an adjustment.

The Automatic Train Control, or ATC, System is the key in eliminating human errors. If there is an irregular movement of the train that may result in an accident, ATC automatically recognizes it and stops the train.

Shinkansen is the only high-speed railway system that was proved to be safe and manageable during severe earthquakes. When an earthquake occurs, the earthquake detection system recognizes its initial, relatively weak, waves, estimates the magnitude, and determines whether to stop the running trains.

Let me give you a piece of trivia about the punctuality of Shinkansen. When asked what you think the average delay is on Shinkansen lines, what would you think? The answer is six seconds. This means just about all of the trains departing every few minutes, as many as 300 trains daily, are perfectly under control. You would also be amazed to see all the trains stop at exactly the same position when they come to the station.

Shinkansen is a very energy-efficient mode of transportation. When comparing on a passenger-miles basis, Shinkansen's energy consumption is only a fourth of that of air transportation and one-sixth of automobiles. As to the CO2 emission from Shinkansen is only one-fifth of that from aircraft and one-eighth from automobiles.

I believe Shinkansen can be successfully introduced even outside of Japan. It can be an ideal intercity transportation for distances between 200 and 500 miles with high demand.

Finally, I would like to emphasize lessons learned by the Japanese experience. The keys of success for Shinkansen are the integrated system and the public-private partnership.

Thank you very much for listening.

Ms. BROWN OF FLORIDA. Thank you very much. Six seconds. Well, we are going to have some questions about that.

[Laughter.]

Dr. Zhao?

Mr. ZHAO. Thank you. Chairwoman, Congressmen and women, ladies and gentlemen, it is my great pleasure to be invited to make a presentation on China's high-speed rail system.

It is really impressive to hear my colleagues present their excellent examples.

I also notice our Congress members a variety of languages, so if you would like to ask questions later in Chinese, you are welcome to do so.

[Laughter.]

Mr. ZHAO. I would like to just briefly talk about the current status of the Chinese railway system and also high-speed railway and the details in funding construction, technology; and, finally, I will make an assessment of the Chinese high-speed rail system.

China's rapid economic growth for the past two to three decades has provided an excellent opportunity for China to expand its railway system. Right now, China totaling 47,000 miles in land, so now stands at number three in the world in the amount of railway track, only after the United States and Russia. However, this development has only started recently. Twenty years ago, many lines were still powered by steam, and the last regular steam line retired in late 2005, but some rural freight lines still use steam technology. Just to give you an idea that China is a latecomer, still catching up.

China's transportation is responsible for 25 percent of the world's rail passengers and freight cargo, but it only contains 6 percent of the world's tracks. So to also give you an idea how heavy is the demand in the railway system.

The role of transportation is increasingly important in China.

Now let me move to the rail administration and developmental goals. Railway administration is conducted by China's Ministry of Railways under the State Council. The Chinese government has adopted strategic goals for the railway system after studying similar systems in other countries.

MOR Minister Liu Zhijun, for example, has elaborated ambitious plans for rail development, including new lines and high-speed rails. By 2010, for example, will increase the high-speed to 200 kilometers per hour, that is, 124 miles. There will be 15,000 kilometers, and also some above 186 miles per hour.

China also has met long-term plans to add 100,000 kilometers, that is, 62,000 miles, by 2020, of which 50 percent will be two-way tracks. The high-speed rail system will reach 18,000 miles. So just to give you some rough idea. Also, there are plans nationwide to have, for example, four vertical systems running north to south, roughly from Boston to Tampa, Florida, for example; or, B, four horizontal systems, from east to west, that is, from New York to San Francisco equivalent; and, C, three metropolitan systems, including the Beijing area, the Shanghai area, and the Guangzhou area.

So let me now turn to high-speed railway development in China. As I said earlier, China is still a latecomer; it only started in the late 1990s. The high-speed railway in China is also known as China Railway High-Speed, roughly 124 to 155 miles per hour, there are also higher ones that are 217 miles per hour, with two different models. One is Japan's Shinkansen model that relies on conventional tracks, and Germany's model of magnetic-levitation, maglev. So that is another model. China has both adopted those.

China has increased six times for the railway speed. The most recent event actually started yesterday, April 14th. About 6,000 kilometers, that is, 3,700 miles, now reach 200 kilometers per hour, and there are, for example, 12 pairs between Beijing and Tianjin yesterday started to operate.

Other examples, there are Qinghuangdao and Shenyang, started in 1999 and completed in 2003, which followed the Shinkansen model; and Shanghai-Pudong Airport to the Shanghai Downtown is completed in 2004 by using German technology, maglev, about 19 miles, the speed reached to 267 miles per hour. From the airport to downtown takes only seven minutes. This is the only maglev system.

Other examples, China announced new plans, for example, Beijing to Shanghai, about 820 miles, and also pay attention to reduced noise pollution along the tracks. There are other examples. I am not going to elaborate, include Nanjing-Hefei, Shanghai-Hangzhou.

I need to say a few words about Shanghai-Hangzhou. That actually is an extension of the Pudong Airport to Hangzhou, nearby city, about 120 miles, will be completed in 2010.

Other Asian examples, this is trends. And funding primarily from the government and try to encourage private and international investment.

In conclusion, we do see great progress; however, there is still a long way to go for China to catch up, particularly like R&D.

Finally, I would like to say to the members of the Committee, welcome to China next year to the 2008 Olympics. If you cannot make it, come 2010 to the Shanghai Expo. Thank you very much.

Ms. BROWN OF FLORIDA. Thank you very much.

I want to once again thank our distinguished panelists.

We are going to start with Mr. Oberstar, but first I want to show that they got me my picture also from—I was right up there in the high-speed train from Brussels to Paris. I am not smiling because we don't have that system here in the United States.

[Laughter.]

Mr. BROWN OF SOUTH CAROLINA. Madam Chairman?

Ms. BROWN OF FLORIDA. Yes, Congressman Brown.

Mr. BROWN OF SOUTH CAROLINA. If I might request, before our distinguished Congressman from Minnesota begins his speech, could we get an interpreter?

[Laughter.]

Ms. BROWN OF FLORIDA. I am going to ask that he translate. Also, if you are going to speak in French, Mr. Chairman, we want a translator.

Mr. BROWN OF SOUTH CAROLINA. Okay, thank you, Madam Chairman.

[Laughter.]

Ms. BROWN OF FLORIDA. Mr. Chairman?

Mr. OBERSTAR. Thank you. Well, occasionally, we need a translator for Mr. Brown so we can all understand South Carolinians. He speaks one language, and that is tourism to South Carolina.

[Laughter.]

Mr. OBERSTAR. And if you are inviting us, Dr. Zhao, he will be welcoming you to South Carolina. I know that. He is a great promoter.

Mr. ZHAO. Thank you.

Mr. BROWN OF SOUTH CAROLINA. Thank you, Mr. Chairman.

Mr. OBERSTAR. Mr. Shuster will want you in Pennsylvania. He has a big rail yard; he can do the maintenance work on your trains. And Ms. Brown is our advocate for high-speed passage.

This is an impressive presentation. I thank all of you. I salute your technology. I have had, as I said at the outset, the privilege to ride the TGV, but to ride the French national rail system before it was TGV. In the aftermath of World War II, France was devastated. Three-fourths of all the rail stations were gone, bombed out in the war. Two-thirds of all the locomotives had been taken to Germany. About three-fourths of the railcars were gone. France had little or no highway system. It was paralyzed.

The United States, under the Marshall Plan, was sending 1,000 locomotives a year to France, and then later to Belgium, The Netherlands, and Germany. We were the number one producer in the world. Mr. Shuster's district was producing locomotives and railcars. And then in 1968 a revolution occurred. President de Gaulle, in 1967, commissioned a study of a high-speed rail system for France, and when the commission completed its work and reported back to de Gaulle and his cabinet, the finance minister asked how much is this going to cost, and when he was told a figure, the minister said, [statement in French] it's impossible, that will harm the finances of France, and every minister raised an objection.

President de Gaulle simply said, Is there another country in the world that has this technology? And the answer was no. And then de Gaulle said, then France will be the first.

They didn't quite become the first because Japan was there first with the Shinkansen. But as I related my experience earlier, as a graduate student, it took six hours to go from Paris to Brussels; two weeks ago, an hour and 20 minutes. From Paris-Lyon, France's second largest city, 288 miles, was 4 and a half hours in 1957; today it is 2 hours and one minute.

As I said earlier, there is no air service between Brussels and Paris, it is all rail. In 1989 there were 3 million air passengers between Paris and Lyon, and 500,000 rail passengers. Today there are 5 million rail passengers in that corridor and 1 million air passengers. International point-to-point service from Lyon to the United Kingdom has been suspended because it is better to fly from the U.K. to Paris and get the TGV and get frequent flyer miles for your rail travel to Lyon, or to Strasbourg or to Marseilles, than to fly there.

I have had the delight of riding the Talgo, not in Spain, but in Vancouver, Washington, where the Talgo is operating. It is lighter; it is less cost to move; it is highly efficient and very smooth.

On the trip from Paris to Lyon, we saw a group of school children. Well, actually, the first experience was about a quarter of the way from Paris we passed a small airfield where a twin engine aircraft had taken off and the train passed the plane. That is impressive.

On that same train were school children on a day trip to Lyon doing their homework on the train; smooth, efficient, wonderful.

On the Shinkansen in 1997, with then Chairman Bud Shuster, we traveled from Tokyo to Osaka. Then there were 264 million passengers a year on the Shinkansen; high-density population corridor, smooth ride, so close to the homes you could look inside and see people drinking tea in their homes riding through the tea fields.

Dr. Zhao, you didn't say enough. China has completed the 2500 mile line from Beijing to Lhasa, Tibet, the last sections of which are 14,000 feet altitude, with pressurized passenger rail compartments, with oxygen for the passengers at 14,000 feet. Forty-eight hour trip from Beijing to Lhasa. When I made that trip in 1956 to begin my graduate studies in Belgium, I traveled from my hometown in Northern Minnesota, which is about the distance from Paris-Lyon by bus to Minneapolis.

And then Minneapolis to Chicago on the Milwaukee 400, Milwaukee Railroad, 400 miles to Chicago in 400 minutes. You can't fly between Minneapolis and Chicago in 400 minutes anymore, given the time to park your car, go through security, check in, get on the plane, get off the plane, find your ride, and go to your destination. It doesn't happen. But it did 50 years ago.

We have regressed in the United States, instead of progressed, in passenger rail service and the construction of not only the passenger line in China from Shanghai to Beijing and the maglev to Guangzhou is an extraordinary accomplishment.

But what is significant in each of these stories and the story that isn't told is one that I started with, and that is the political will. Each country has made a decision that in the public interest you are going to make these capital investments for the public benefit, and that is what we lack in this Country, is the political will to make the investment to move the Country ahead, to invest in the public sector, and to restore passenger rail service and raise it to the next level.

Now, the lessons learned from your several presentations are along the way, and I think that one chart of the circle of the 10 factors that go into operating passenger rail service and making it work effectively to serve the public interest is instructive for us. That is where we need to begin, to attack all those costs, make the capital investments, and decide to move forward with intercity passenger rail. Our roadways are congested; our railways are congested; our trucks are overloaded on the roadways. We need to do a far better job of investing in our capital infrastructure. And I am sorry Mr. Nadler is gone, but just moments ago he lamented that we are not investing in our Internet capital as we ought to be doing, and we are falling behind in that respect.

This Committee, as its first responsibility, is investing in the Nation's infrastructure. That is our second word in our Committee title. And under the leadership of the gentlewoman from Florida and the gentleman from Pennsylvania, we are going to move ahead, and your lessons are extremely instructive.

At that, I will withhold and I will be back for some further questions.

Ms. BROWN OF FLORIDA. Thank you.

I was looking for Mr. Brown, but we'll go to Mr. Shuster.

Mr. SHUSTER. Thank you.

It is tough to follow up after the Chairman gives such a great history lesson to us and also a great vision, but it is absolutely true, we have got to do things differently when it comes to figuring out how to move people around, move products around our Nation that can stay competitive in the world. I hope that one of the things we do is not hold on to old ideas and systems that don't quite work. Let's try to figure out ways to do things new and more efficiently, like those of you in your countries have done.

I have a couple of questions. First, I think that all of you, the technology that you employ, the trains are lighter than what we use in America. Our trains, we are building tanks that roll on rail. Your systems are all much lighter. I guess the question is—and you have also, from what I can tell, your safety record is pretty remarkable. So can you talk a little bit about lighter trains and safety and why you have gone that way and the benefits?

Mr. METZLER. It is a very tough question because if I consider, for instance, the Japanese way of building the train, it is a little bit lighter even than France, clearly. In France, it is more light than the American way of building trains, you are right. The question is, first, to have appropriate static performance, static constraint performance in the car train. For instance, the maximum constraint so far—I well remember my past engineer experience—in U.S., it is more than 200 tons, instead of 150 in France. That is to give you only a flavor. I don't know exactly the figures, but, in fact, the static constraint to meet and to overcome in case of car building in this Country are more higher, and that has an impact in weight, certainly.

Regarding this aspect, this is a very key point you are raising. You have also to consider—and that is not, so far as I know, not yet done here in this Country—you have to see the crash cases, and you can have live constriction even crash resistance by certain design enabling, in case of collision, to deform the forward of the train and without engaging the static performance of the train. That is a question of the balance between static constraint—I mentioned 200 or more tons—and the crash behavior or the behavior in case of crash according to the appropriate design.

You are absolutely right, we are convinced everywhere in the world that high-speed means, to some extent, light trains and not exceed, for instance, a certain limit of axle load, which is about 17 tons per axle. That is right.

Mr. SHUSTER. And it is less to maintain the system? Is it less to maintain the train itself or the cost-savings in the rail bed itself?

Mr. METZLER. The rail bed, yes.

Mr. SHUSTER. What are the maintenance costs, are they similar to the maintenance costs on a U.S.-produced train, or is it less or more?

Mr. METZLER. I will check. If I have the figures, yes, I will give the answer.

Mr. SHUSTER. And the Japanese trains are lighter yet, did you say?

Mr. METZLER. Generally speaking, the Shinkansen trains are a little bit lighter, of course, but in every case we are in the same range as far as the axle load is concerned, between 15, in some cases, in Shinkansen, and 17 in the case of France. But I will not enter into too much detail, but to have a figure in mind, the range of axle load is between, let me say, 15 and 17 for high-speed operation.

Mr. SHUSTER. And the Japanese rail system's safety record, is it similar to the French? I understand the TGV hasn't had a casualty since 1981.

Mr. MATSUMOTO. Yes, regarding the safety record of the Japanese Shinkansen railway system, for more than 40 years, since it started operation in 1964, we do not have any fatal accidents, not one, no, zero.

Mr. SHUSTER. Thank you.

Are we going to get an opportunity to ask more——

Ms. BROWN OF FLORIDA. Yes, we are going to have another round.

Ms. Johnson?

Ms. JOHNSON. Thank you very much, Madam Chair. And thank you for your foresight in inviting our special guests.

I have a question that I would like each to respond. Is your ridership as you projected? Are the systems self-financing? And with the speed being so rapid, it does not seem that it can do any local passengers, just from major city to major city or from one country to another. Give me an overview of how you gage your investment and whether it has been worth it.

Mr. METZLER. As said, a very key question is to master forecast methods first, and to prove that over time these forecast methods are accurate. I can show you one example. I have projected the difference or the accuracy between the forecast and the result. Clearly, in case of—I have the slide; I will ask to project it. But as far as the long-term forecasts are concerned, 40 years ago we did it for south-east line, and the result are exactly in the center of the target. That is to say that today we have a disposal over the world, of course, the appropriate method to forecast the traffic, which is the key factor, the driving factor of return on investment.

But the question is also to see which part of investments you have to devote to the right-of-way. In case of France, for instance, we have only around 5 percent of the cost, cap ex, in a new line devoted to right land acquisition. That is to say it is not a huge part of investment. We have to consider, for instance, in your Country, which could be in this respect, the cost of land acquisition. But I would be very surprised if this cost would exceed more than 10 percent, or something like that, of the whole investment because, of course, the earth work to be done, the infrastructure to be installed, the rolling stock to acquire represents the majority of the investment.

Regarding the return of this investment, clearly the traffic is a value, is a key point. There is another key driving factor, your tariff policy, because if, for instance, you yield manage your train, your revenue, the return is better. And that is the reason why, as I mentioned in my lecture, all the lines of SNCF were self-financed, TGV North, South, East. In case of TGV East, conversely, due to the lack of value, we have to call from public funding infrastructure to the limit of 76 percent, as I mentioned. But that is an exception in the French case. That is the reason why we opened these lines the latest.

Ms. BROWN OF FLORIDA. We would like the answer from the rest of the panel also. We will extend the time.

Mr. Barron?

Mr. BARRON. Yes, thank you, Mrs. Chairwoman.

I would like to say there is an important threshold in which the limit for justifying this kind of investment in a corridor for high-speed traffic is more or less, at the minimum, 5 million passengers. This is the minimum. But in some conditions we can say from an economic point of view it could be 10, 12 million passengers per year could justify such construction.

But the question is if there are social advantages and social inconveniences and social costs and social benefits. I think in this case the public funds could help to paying the infrastructure, and then private funds obtain benefits and the public ensures social benefits. So I think it is interesting to consider the balance between private costs and benefits and public costs and benefits, and it is in this moment in which public authorities enter in to either financing or supporting in a strong way the private financing. So I think this kind of balance is very important, because the social benefits, even if the level of traffic is not very high, it could be very interesting for society.

Mr. RODRIGUEZ. In the same idea, I think there are corridors where the infrastructure is directly profitable, more or less, the level of the traffic, then say Mr. Barron. But when you expand a network, you need to combine the idea of the profitable corridor, even the infrastructure profitable, and others where you can provide services in all the country, so equal rights for all people in all the country, because in our plan, for example, it is very important not only the main corridors where the infrastructure is profitable, it is to establish general rights for all people.

So in all of Spain we focus the idea of all Spanish citizens must be stationed in reach of the vicinity of where they live in kilometers. This is the idea of the plan. Then some of the plan in general is profitable, but some corridors are not profitable, and we prepare two types of infrastructure: strong high-speed corridor; another, high-performance corridor, 200 kilometers per hour. I mean a corridor by 350 kilometers per hour, another 200 kilometers per hour. But all people, all population, we have a station where they live to provide high-speed services in general.

Mr. MATSUMOTO. In Japan, about the Japanese railway system, I am sorry I do not have the exact figures of the projection, but talking about the New Shinkansen project which is now going on, when we decide to start the project, we evaluate the level of the demand and also the profitability and also the agreement from the local community, and through that process evaluate the demand level. Although I do not have the exact figures today, but just one example which I definitely want to show you, the Kyoshu Shinkansen in my slide, in the left side at the bottom, after the start of the operation in 2004, the demand level was more than double, so it is obviously more than the projected level.

And about the financing, about the construction of the New Shinkansen project, as I explained, we have the government funding both from the national and the local level. But after we start the operation of the JR, we do not have any subsidization from the government to the JRs. The JR has to finance by themselves regarding the operations.

Thank you very much.

Mr. ZHAO. In China, from 2006 to 2010, the expected expense for expanding railways is $162 billion. Up until recently, it is primarily run by the central government, but now further decentralized from single funding sources now to multiple funding sources. Now there are the central government loans, railway bonds, private investment, and international investment. Let me give you one example.

The Beijing-Shanghai high-speed railway, which is 820 miles, to be completed in 2010, with a projected cost of $18 billion, most of the funding is expected from bank loans and bonds, but additional investment also from foreign investors and particularly seven provinces, equivalent to States here, that is a railway running through. So the Railway Ministry has negotiations with local government governors to let them also have burden-sharing.

Ms. BROWN OF FLORIDA. Mr. Brown?

Mr. BROWN OF SOUTH CAROLINA. Thank you, Madam Chairman.

I certainly thank this distinguished panel for coming so far to share some real innovative ideas on how we might be able to solve some of our transportation needs around the United States.

My first question would be to Mr. Metzler, but certainly anybody else might chime in with their thoughts on it. I know in the United States we use a rail system with steel wheels, and I know that there is some limit to where we might be able to go as far as acceleration and speed with that technology. I know some of you use that, and some of you use a different technology like Maglev. Could you give me an idea, Mr. Metzler or any other members of the panel, what limits do you feel you can reach with just the steel wheels?

Mr. METZLER. Today, I think that the technical limit for steel-to-steel rail system is around 600 kilometers an hour, something like that, 600, because we reached quite this limit in the record. I showed the video.

Mr. BROWN OF SOUTH CAROLINA. So I guess that would be around 350, 360 miles an hour, then?

Mr. METZLER. Yes, something like that.

Mr. BROWN OF SOUTH CAROLINA. Right.

Mr. METZLER. But the question is also an economical one, it is not only a purely technical one. It is not an engineer's dream. The question is where we have to join two cities with such a speed, where are located the dense demographic area in which such high-speed line or rapid system were, and that led us to the conclusion that, in Europe at least, in the coming years, we will stick to the limit of 360 kilometers an hour, 220 miles. Today we will operate TGV East at 200 miles an hour, as you know, in the coming month, and we discussed with the chairman of SNCF yesterday and we intend to raise this limit according to the city to be served to 220, something like that, in the coming year.

But that needs approval. To demonstrate, to give to you that this speed limit will only be employed according to our thought today, for the Paris-Bordeaux-Toulouse route, which is to be completed, as far as the high-speed line is concerned, over Tour, because we go to Tour, southwest of Paris, with a high speed line today and we have to prolong this line in the coming years at this. After having done so, it could be worth to operate this completed line at 220 kilometers an hour to reach Paris to Toulouse in three hours or a little bit less. You see that it is a marketing question more than the purely technical one.

The question of increasing the speed is noise, environmental constraints, so they are the two main aspects to overcome in this respect.

Mr. BROWN OF SOUTH CAROLINA. At those speeds, 200 miles an hour on the steel wheels, do they create a vibration that makes the ride a little bit less smooth?

Mr. METZLER. I think this problem at this speed today is overcome.

Mr. BROWN OF SOUTH CAROLINA. Okay. All right, thank you very much.

And I noticed in the route map that you have, to Brussels, the train primarily carries traffic now, but on other routes where you are competing with the airlines, are the trains competitive pricewise?

Mr. METZLER. The fares are competitive because clearly the cost of a given railway, for a lot of reasons, a high-speed system is less than plane operation today. That is, we don't exceed the fare. But I must confess, as a marketing guy, that we try to increase the fares as far as the market supports it, of course. That is the miracle of yield management. I learned here in your Country this way of behavior.

Mr. BROWN OF SOUTH CAROLINA. Thank you, Madam Chair. I see my time has expired.

Ms. BROWN OF FLORIDA. Thank you. Let me just say that the U.S. prides themselves on being first in so many areas, and we, of course, were the first with the rail system, but now we are the caboose, and we don't even use that anymore. I have your expertise here. If there was one thing that you could share with us to jumpstart our system, we would like to know what that would be. When we talk about high-speed rail, we are talking about at least 150 to 200. Now, in all of Europe that doesn't run the same. So can you share with us?

And then the other debate that goes on in the Congress is that some members want the system to pay for itself, and, of course, you can testify and share with these members that there is no form of transportation that pays for itself anywhere in the world. So, with that, we would like to hear what would you do to—we need your wisdom and your expertise. Can you believe that? We are reaching across the aisle here, across the countries to get your expertise so we can push and move America forward.

One of the issues that was discussed when we were in Europe was the greenhouse gas emissions. This is a major issue, and we in America have got to take our head out of the sand and figure out how we are going to move forward too. So, with that, would you share your expertise with us?

Mr. BARRON. I should say that probably you in the States, you have a particular idea of railways, because most of the railways in the States have freight trains with very particular characteristics, with nothing to see with passenger high performance trains. The first question is due to capacity reasons and due to some technical conditions, it is very difficult to compartmentalize high-speed trains with freight traffic. So you need specific lines. You must, in that case, build a specific infrastructure. This infrastructure costs, of course, a lot of money, but if you are not doing nothing, maybe from the social point of view—you have also costs.

So I think the first argument is what we would do. It is difficult to say because there are a lot of things and a lot of possibilities. High-speed is quite different from one country to another and, of course, if ever you do a high-speed system in the States, it will be completely different than all the other high-speed systems existing. So the first thing is to define what do you want and what do you need, and what will be the cost and what will be the consequences for society, for customers and for potential investors.

The second question is if I am doing nothing, what will be the consequences if I continue to increase traffic and air traffic, what will be the effects on the environment and so on? And the cost of all this competing with the different simulation of hypothesis in the case of adopting high-speed trains maybe will be the key for the answer of what we have to do.

I think it is very important, the implication of public powers, because there are no experiences of full private investment in high-speed with or without success. It does not exist. Maybe if you try to implement a fully private, maybe it will be a success, but today it doesn't exist. So I think it is necessary to debate. And when public and society intervenes, it is very difficult because it is very important to start.

I think the experience of Japan and France is interesting because in both cases—also in Spain—they start one single line, not very long line, 500 kilometers, 300 miles, and people test, authorities test, society tests, and then checks what is the effect. And once the success is observed, then society wants for more, and the case of Spain is very illustrative. So maybe it will be necessary to make a test line, test for society, not very long, probably, very facile, and then we can observe what is the effect.

I remember that France and Japan's high-speed systems have reached maturity and their systems have been fully in operation from 25 to 40 years, and nobody speaks about the saturation of these axles. At this moment, under planning and the idea of someone is to duplicate Tokyo to Osaka and to duplicate Paris to Lyon. So I think this is a very important demonstration that high-speed is very efficient and very good for society.

Mr. METZLER. I must precise that, for instance, the Paris-Lyon line, which was the demonstration line to some extent, was absolutely self-financed by SNCF without any public funding. Without any public funding. It was also the case with Paris North. The sole exception I know is Paris East. So it exists around the world, some corridors, certainly, in which they could be self-financed.

Ms. BROWN OF FLORIDA. I see. So you are saying that there are some areas that don't have public finance? Where is that?

Mr. METZLER. Paris-Lyon, again. Paris-Bordeaux, certainly.

Ms. BROWN OF FLORIDA. Yes, sir, Mr. Rodriguez.

Mr. RODRIGUEZ. I think the role of the railway is a question of the tracks, because the railway is able to develop new services, but you need to gain the battle of the tracks. But not only in the high-speed trains, in general, in passenger services, because the public position is more focused in passenger service than freight services, but not only in the high-speed. In our experience, after the first line, Madrid-Seville, we waited five years to make money, to make profits; not immediately.

But now the idea of one plan is the idea that generalizes successful experience, the first successful experience. So I think it is impossible for one country to generalize the idea of high-speed in the first step. It is not a question of step by step, but with a strong and successful experience previously. But not only I think in high-speed train, also in commuter trains, because in our country we are proud of the high-speed trains, but we are proud too of the computer trains.

Ms. BROWN OF FLORIDA. Yes, sir.

Mr. MATSUMOTO. About your question of what we can provide, the one thing from Japanese experience, I should definitely say that integration of the system and technology is the thing we can provide from the Japanese experience. For example, when we discussed about speed, we can have some speed trials, and the maglev system has the speed record of 581 kilometers per hour. But when we use that technology for the actual use, we have to have the integrated system concerning the level of safety, the frequency, and punctuality, and also the level of the mass transportation system.

So it is very important to consider the railway system as a system. So this is our experience from the Japanese high-speed railway system. Also, when you think about the financial system, we also involve the government commitment to have the infrastructure. But from the Japanese experience, as long as the operation starts, the JR company can finance by themselves for the operations.

Ms. BROWN OF FLORIDA. Yes, sir.

Mr. ZHAO. From the Chinese perspective, at least three points can be learned. First, at the central government level, I fully agree with Mr. Oberstar that a political will is very important since, you know, a railway system is not a local matter, but also a nationwide matter. Secondly, coordination with local governments, burden sharing is also crucial. Thirdly, since China, for example, is a latecomer, to have ready technology transfer from amongst other societies and countries is also very much necessary.

Ms. BROWN OF FLORIDA. Thank you.

Mr. Lipinski?

Mr. LIPINSKI. Thank you, Chairwoman Brown. I have had the privilege of riding the TGV with Chairwoman Brown and Chairman Oberstar, and I thank the Chairwoman for her commitment to high-speed rail in this Country. I think it is somewhat of an embarrassment that in the U.S. we like to think that we are out in the forefront of technology and innovation and at the cutting edge, and, as the Chairwoman said, we are the caboose right now on this issue. But I know that Chairwoman Brown worked with Chairman Oberstar and in SAFETEA-LU there was $100 million authorized per year for high-speed rail. Unfortunately, we have not yet appropriated any money towards that. I am very hopeful that we will do that.

I think the testimony that all of you have provided today, first of all, has been excellent testimony. It was very interesting to me to hear about your experiences, and it certainly is convincing to me that high-speed rail is something that is very valuable and could serve as an important part of our transportation infrastructure in this Country.

One of my concerns, since so much of the focus has to be on funding, is—and I will start by asking Mr. Metzler. It is good to see you again, Mr. Metzler. I will start by asking you, and then if anyone else wants to also speak about this. My concern here is to make sure that, okay, if we want to do high-speed rail, that we do not neglect everything else in rail, we do not decide we are going to fund high-speed rail and neglect the rest of the Amtrak system and we do not neglect other parts of our rail network. So I am wondering, Mr. Metzler, in France, how do you balance the funding of high-speed rail, freight rail, city-to-city passenger rail, and commuter rail? How do you balance the funding of all of those?

Mr. METZLER. The question is crucial. About the relationship between the conventional train, local train, and high-speed train, I must also point out another point, which is the properly done layout of the station on the new station and new line. For instance, the layout of Avignon or Valance, for instance, is also reason for the success of the line, regardless the connection before or regarding the connection with the conventional train.

But I come to your question. Clearly, due to the fact—exactly it was my point—due to the fact high-speed trains were, in the past, highly profitable, we devoted most of our funding to these lines. It was reproached to us to a large extent because we haven't funding enough, self-funding, for freight or maybe for local trains. The things are changing because for local trains the states, the region—we say that in France—the states are funding, today, the regional trains, which are not profitable at all because the fares do not cover the cost of it, anywhere in the world.

It is exactly the opposite, again, in high-speed train, with the exception of TGV East, I spoke about earlier on. On all the high-speed lines the fares raised by the client covers the costs, even the modernization. It is not the case in local trains. For a lot of public reasons, they are heavily subsidized, and it was for market reasons the case for freight trains exactly. In that, you are absolutely right, we did not invest enough, for a lot of reasons, in local trains in trains or in freight trains. We devoted the majority of our funding in what was, for us, profitable, the high-speed line.

Mr. LIPINSKI. Thank you.

Mr. MATSUMOTO. Thank you very much. Let me explain the Japanese government's investment to the Shinkansen on high-speed rail and also the conventional transit railway system. According to the budget for fiscal year 2007, the national government's investment level for Shinkansen and high-speed rail is 263 billion Yen. On the other hand, we have the investment for the transit railway and the local railway, which is about 118 billion Yen. So we both have the investment not only to the high-speed railway system, but also to the conventional or transit railway system.

Thank you very much.

Ms. BROWN OF FLORIDA. Mrs. Napolitano?

Mrs. NAPOLITANO. Thank you, Madam Chair.

Bienvenido otro vez. Esta es su casa. Welcome again.

I figured I would tell Mr. Oberstar he can do his French; I will do the Spanish.

It is very, very interesting to read your testimony and to hear your testimony because, as you have heard, we have focused more on other areas; and I hate to say it, a lot of is on defense, without participating a lot in developing the infrastructure to move goods and people, especially in my area, which is in California. And we are in the process of evaluating, as you mentioned earlier today, California is evaluating a statewide high-speed rail system that is going to go through Sacramento, San Francisco, all the way down to Los Angeles, in my area, and eventually San Diego.

It runs through my area, so I have a great interest in figuring out how it can be done because as most of you already probably know, Southern California—not Northern California as much as Southern—is built out; there is no more land. There is no way to put any other new system unless we elevate it, because you then have issues of taking private property, businesses, and you go into eminent domain, which puts you in courts, and it is a very expensive proposition, as has been evident in some of the California highways.

So what has been your experience in being able to develop a high-speed system in a very congested area, better below ground, elevated, on existing rail lines? Understanding that in California we have the two major lines that own the rail property. And then, of course, you also probably know that in the U.S. railroads are very autonomous, they have been given a lot of leeway from the early days of the western development.

So all of that in consideration. It is not only the cost. Believe me, Californians and many other areas of the Country are willing to put the funding in it. It is just the dedication and what is going to best service the areas and the need not only of people movement, mass transit, if you will, high-speed, but also in goods movement, because we happen to have, in our bottom line of Los Angeles, over 50 percent of the Nation's goods go through those ports and utilize the same rail lines.

So all of that in the context, that has a different perspective, if you know what I mean. Any one of you gentlemen.

Mr. METZLER. It is clear that, as Chairman Oberstar said before, it is a public decision, basically. It is a public decision in facing two highway conditions or airport conditions to build a high-speed system which will save space, energy consumption, greenhouse gas emissions, clearly. Of course, you have to consider that in case of deciding a new public investment in transportation, it is clear that the platforms need of railway is about half or a third of which is required by the highway.

My belief, my present belief is that sooner or later, due to the conditions we are facing, too, in highway or in airports, we will be forced to move some part of the transportation to a rail system. Of course, it will cost a lot of money, a lot of technique, elevation technique, underground. Fine. But that will be exactly the same case, and more expensive, if you are building a highway or new airport. That is my simple answer. That is the——

Mrs. NAPOLITANO. The bottom line.

Mr. METZLER.—common sense answer. Of course, we have to reduce and to optimize investment.

Ms. BROWN OF FLORIDA. They have called for a vote and we are not going to come back after the vote, so, Mr. Oberstar, any closing remarks or questions?

Mr. OBERSTAR. A couple of questions.

I am sure you have covered a great deal of ground, but the essential issue for us in the United States is not much different from that in each of your respective countries, and that is what are the factors that influence the passengers' decision to take rail rather than car or air? There are multiple factors: time versus distance; reliability of service; and pricing. Under which circumstances do passengers make the choice to take high-speed rail or conventional rail, classique, or to use air or drive their own car?

I think each of you would have a different experience, but probably with some of the common factors. Mr. Matsumoto.

Mr. MATSUMOTO. Yes. According to the Japanese experience, the passengers choose the mode of transportation according to the trip time, as well as the fares. As I presented, the Japanese Shinkansen system has the strengths between 200 and 500 miles of trip distance, and within this distance the trip time is—when we see trip time of this distance, Shinkansen has the strength, especially comparing with automobiles.

And when we see the air transportation, we have to consider access to the airport. So when we calculate the access to the airport, the difference between the Shinkansen system and the air transportation system according to the trip time is not very different. Also, about the fares, Shinkansen fare level between Tokyo and Osaka is 1300 Yen, approximately. On the other hand, when you buy the regular air ticket between Tokyo and Osaka, it is 20,000 Yen. So it is almost 60 percent less expensive. This is a very important figure.

So time and fare is the most important thing. But, furthermore, when we think about very demanding Japanese passengers, punctuality and also the frequency is very important to maintain the popularity of the Japanese railway system.

Thank you very much.

Mr. OBERSTAR. Thank you.

Mr. Rodriguez.

Mr. RODRIGUEZ. I think, of course, obviously, there are the factors of price, time, and reliability, but another is comfort.

Mr. OBERSTAR. Comfort.

Mr. RODRIGUEZ. Comfort, yes, because time usually is an equation, but depending on the value of the time for anybody, you know, for someone, the price of his time is more important than another. But in our case there is some movement about the fresh idea of time for other ideas is reliability and comfort, because it is very, very important, especially when you compare with the plane, because the problem with the plan is not the time, it is the reliability, and the comfort too. Comfort is very, very important. So that is a more established factor than three factors only.

Mr. OBERSTAR. Thank you.

Mr. Barron.

Mr. BARRON. I would like to point to another question relating with that said by Mrs. Napolitano. I think at the end we have a very important potential of traffic because we have a very high density area, but, finally, people will take the train from point to point, and the first thing to decide is from where to where is exactly; not from San Francisco to Los Angeles, but exactly from where to where, with how many stops.

In Europe, we have basically two models from a geographic point of view concerning high-speed. The French or the Spanish model, in which we have different areas of population with potential of traffic separated several hundreds of miles, and in between there is nothing; and the construction is very easy, it is cheaper, and you have no doubt concerning where will you stop; no stops. This is the case of French TGV or Spanish, where you travel 100 or 200 or 300 kilometers or miles without a stop.

But in the case of Germany and The Netherlands, in Belgium, in the South of England, even in Italy, you have a lot of extended area, something like California, for example, and in that case you have to decide where will be the layout, of course, internal, where is the exact road, but also what will be the location of stations, the exact placement, and this defines several possibilities. In Japan they decided to establish Shinkansen trains with and without stops in the same line, but it requires very particular characteristics of the line and very exceptional conditions for operation, which probably is the only country in the world in which it is possible to overpass trains with only three minute stops.

In Germany, the model is different. The high-speed trains have several stops, every 80 kilometers, every 100 kilometers. And even if the maximum speed is 250 or 140 miles per hour, the average speed is reduced and is less spectacular than French results.

So I think the first question to define is, from a geographical point of view, what kind of high-speed you will decide, and where exactly will be located the stations, and what will be the regime of stops, with or without direct trains. And once you decide this question, you can check what will be the cost if different alternatives will be implemented, so on and so on.

Mr. OBERSTAR. I hate to interrupt you, thank you, but I want to get to Mr. Metzler before we have to go.

Mr. METZLER. It is the kind of know-how to weigh the different factors raised by my colleagues. I do agree with them. Journey time, fares, comfort, etc. These need to be weighted in an accurate, comprehensive model, as I mentioned, forecasting model, which are working very well, like stated preferences, markets vary, and after that modeling, to forecast the market share between car and rail, air and rail. That is exactly the slide I projected.

But at the end of the day, you have to choose. You can choose. For instance, I personally decide to reduce volume between Paris and North in favor of higher revenue for getting a better return on investment. So that is to say you have to balance and finally to choose, for a lot of reasons, financial or social economical reasons, you are making volume policy or revenue policy. The miracle is to combine both, of course.

Mr. OBERSTAR. I wish we had more time. Unfortunately, we are interrupted by votes on the House Floor. I know Ms. Brown wants to have her own comments, but I want to thank each of you for the time you have taken to come and travel long distances to be here with us to help us think through the factors that are critical in developing and sustaining high-speed passenger rail. The experience of each of the systems that you represent are extremely valuable for us, and I know how critical they are in your own respective countries, and I want to congratulate each of you on the success that you have achieved and thank you for your contribution to our Committee's work.

Ms. BROWN OF FLORIDA. I want to thank you, thank you, thank you for coming, and we are looking forward to seeing you this summer in your respective countries. We have a couple of other questions that we are going to give to you in writing, if you would respond. Thank you again. The time is up for the votes, so we have to go to the Floor, but thank you again on behalf of the people of the United States of America, the caboose. Thank you.

[Whereupon, at 12:18 p.m., the subcommittee was adjourned.]

Statement by Congressman Jerry F. Costello
Committee on Transportation and Infrastructure
Subcommittee on Railroads
Hearing on International High-Speed Rail Systems
April 19, 2007

Thank you, Madame Chairwoman. I am pleased to be here today as we discuss international high-speed rail systems. I would like to welcome today's witnesses.

Since coming to Congress, I have been a strong supporter of rail. I believe it is important that our nation has a viable nation-wide railroad system. However, one of the toughest problems facing passenger rail is financing and modernization.

Examination of European and Asian rail systems demonstrate that with the right investment strategy and acknowledging the importance of rail movement of passengers and goods is necessary for prioritizing funding and modernizing the system overall.

Recently, I rode on a TGV train from Brussels to Paris and the ride took less than 2 hours. Yet, here in the US, the closest thing we have to high speed rail is the Acela train connecting Washington, DC to Boston and while it can reach speeds of 150 mph, it usually averages considerably less.

I am interested to hear from our witnesses more of how their systems are financed and what type of upgrades they are planning over the next five years to their respective systems.

I look forward to today's hearing as we discuss international high-speed rail systems.

High Speed Rail: The Big Picture

Iñaki Barrón
International Railway Association (UIC)

April 2007

International Railway Association (UIC)

Founded 1922 to promote cooperation among railways, first European focus, then global

UIC is the only global rail association:

170 members from all 5 Continents

International Railway Association (UIC)

Mission: promote rail transport globally to meet the challenges of mobility and sustainable development

Objectives:

- Exchange info on best practices
- Propose ways to improve economic performance
- Support members to develop new businesses
- Achieve interoperability
- Develop Centers of Excellence (technology, management, training, etc.)

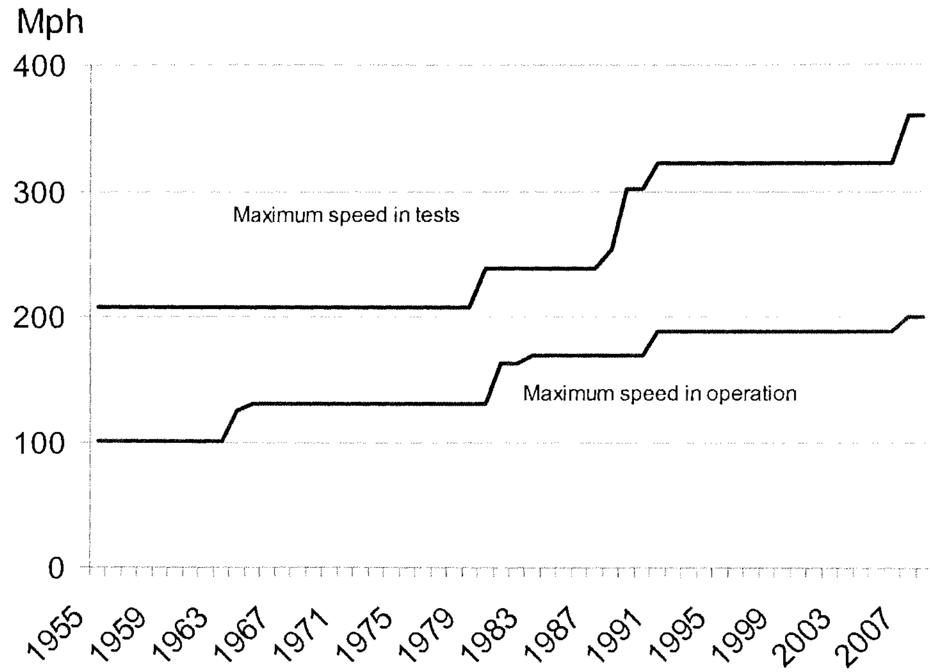
High Speed Rail: Definitions and requirements

"High Speed" signifies at least 150 Mph (250 km/h)

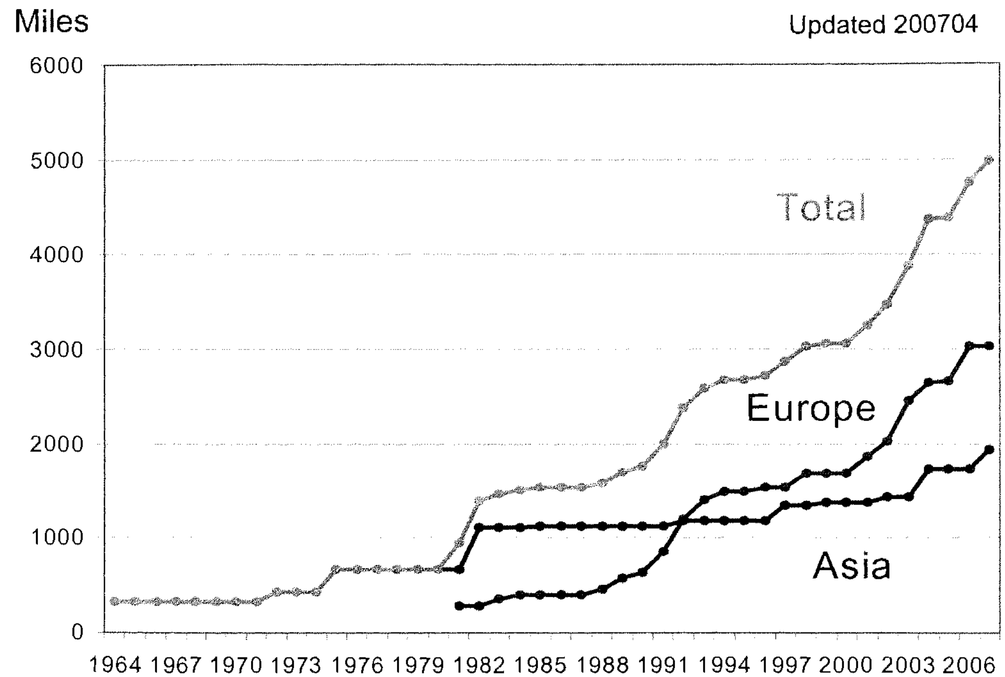
Operating at more than 125 Mph (200 km/h)
 requires special trains (train sets, instead of locomotive + cars)

Upgraded existing lines enable up to about 125 mph
 Higher speeds requires special dedicated lines

Evolution of maximum speeds



High Speed Lines around the World



UIC/BarronApril 2007

When and why did European High Speed Rail start?

September 1981: 1st European HS line (Paris to Lyons) was opened, due to:

- Transportation capacity problems
- Technical advances

April 2007: 3,034 miles are in operation in Europe

2010: 1,711 more miles are scheduled to start operating

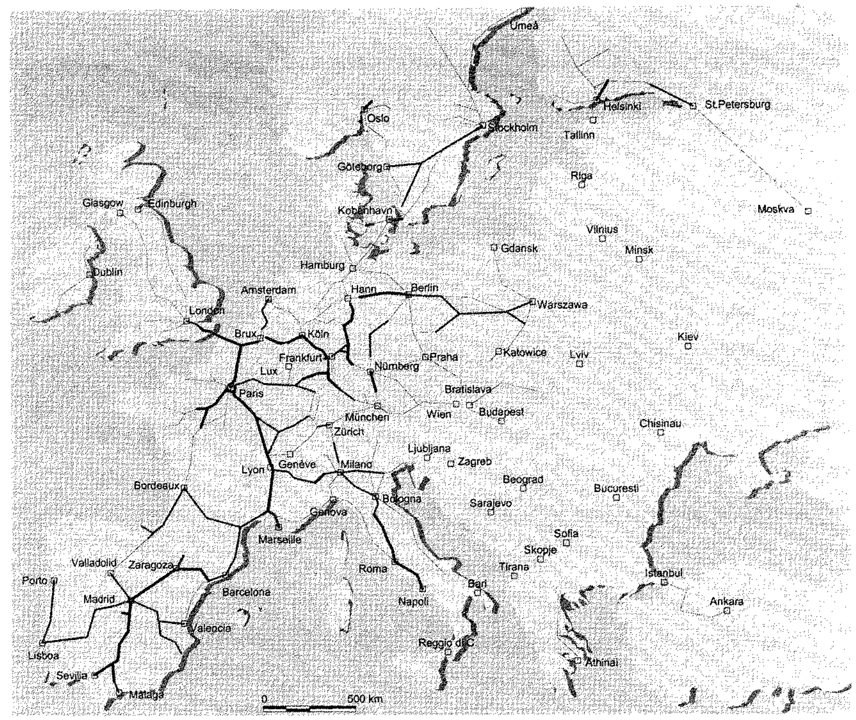
2020: An important European HS network will be in operation

European HS Network

Network in April 2007

New lines
- v ≥ 156 Mph
- v < 156 Mph
- Planned lines

Upgraded lines
- v ≤ 144 Mph
- v ≤ 125 Mph
- Planned lines



Information given by the Railways

UIC - High-Speed
Updated 04.2007 – OG/IB

UIC/BarronApril 2007

European HS Network

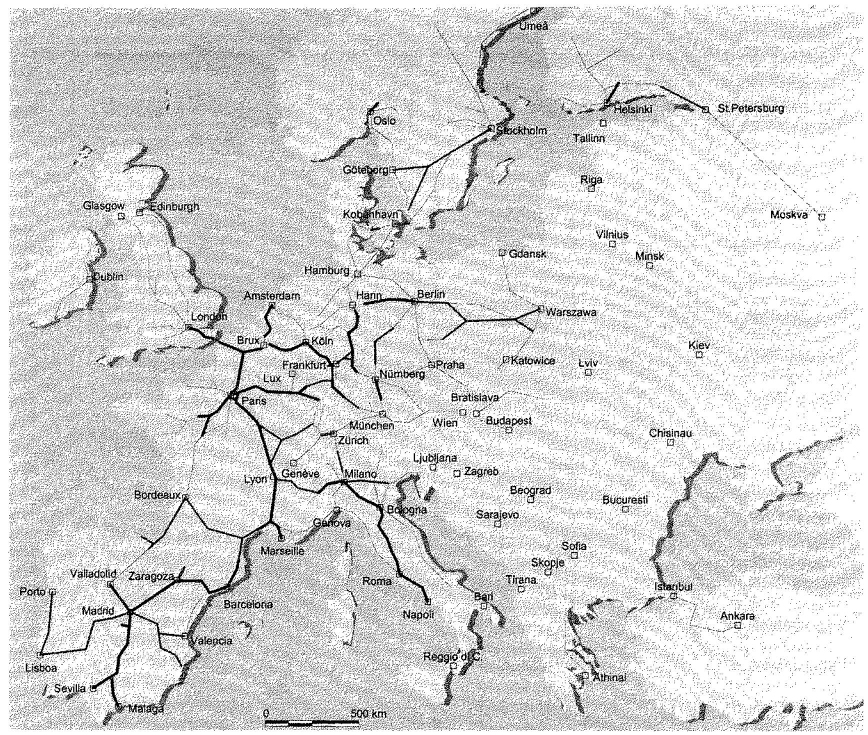
Forecast for 2010

New lines
- v ≥ 156 Mph
- v < 156 Mph
- Planned lines

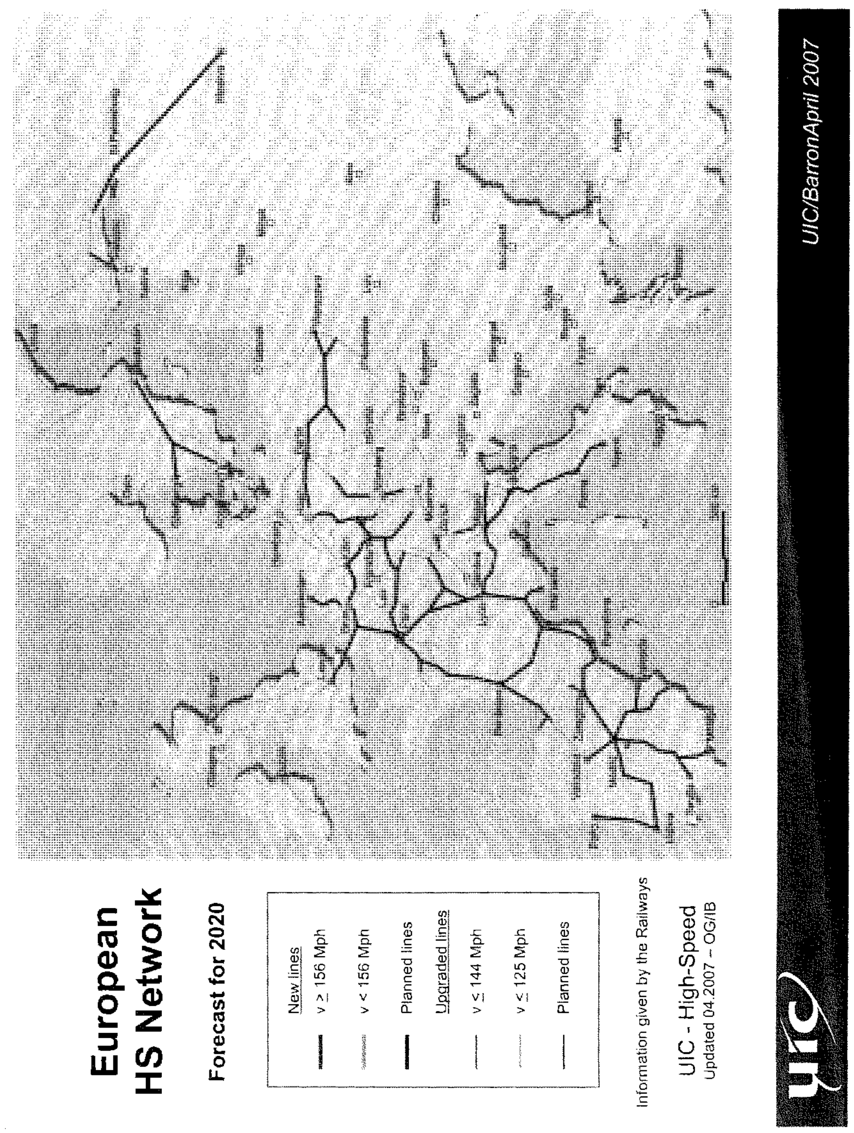
Upgraded lines
- v ≤ 144 Mph
- v ≤ 125 Mph
- Planned lines

Information given by the Railways

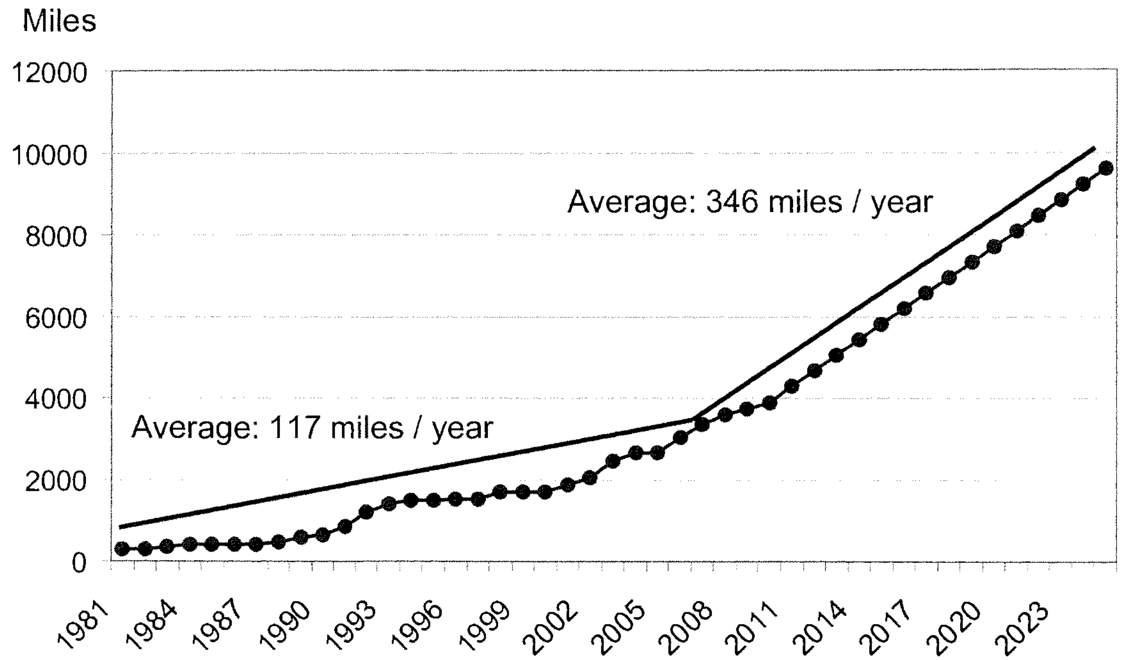
UIC - High-Speed
Updated 04.2007 – OG/IB



UIC/BarronApril 2007

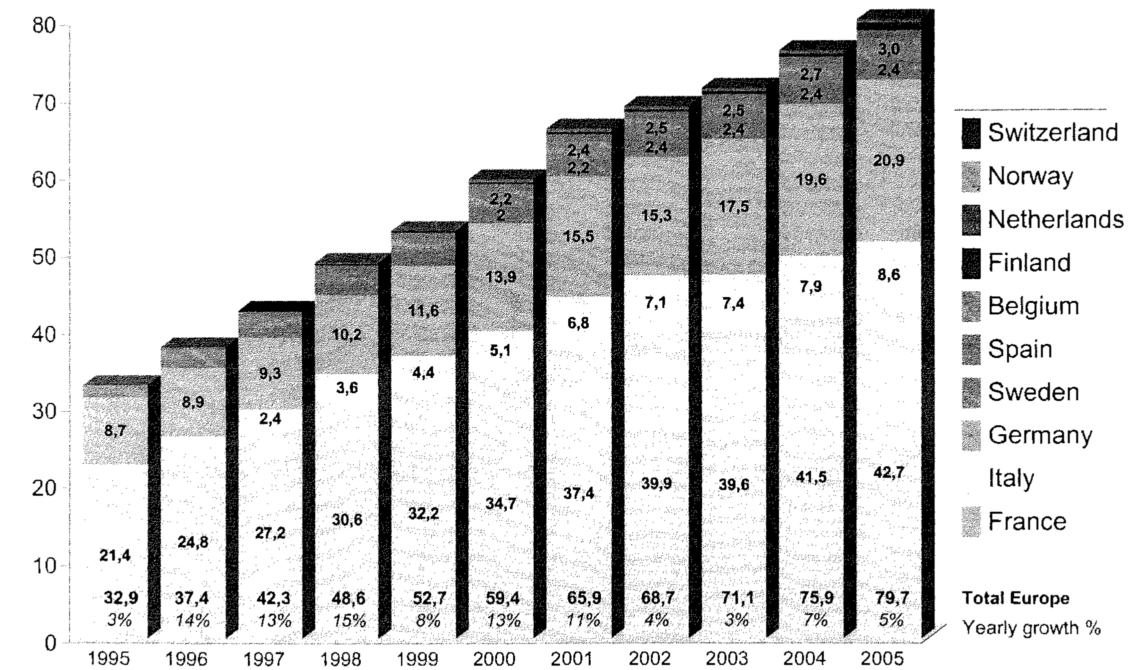

European
HS Network
Forecast for 2020
New lines
v ≥ 156 Mph
v < 156 Mph
Planned lines
Upgraded lines
v ≤ 144 Mph
v ≤ 125 Mph
Planned lines
Information given by the Railways
UIC - High-Speed
Updated 04.2007 – OG/IB
UIC/BarronApril 2007

Expansion of Europe's High Speed Network



UIC/BarronApril 2007

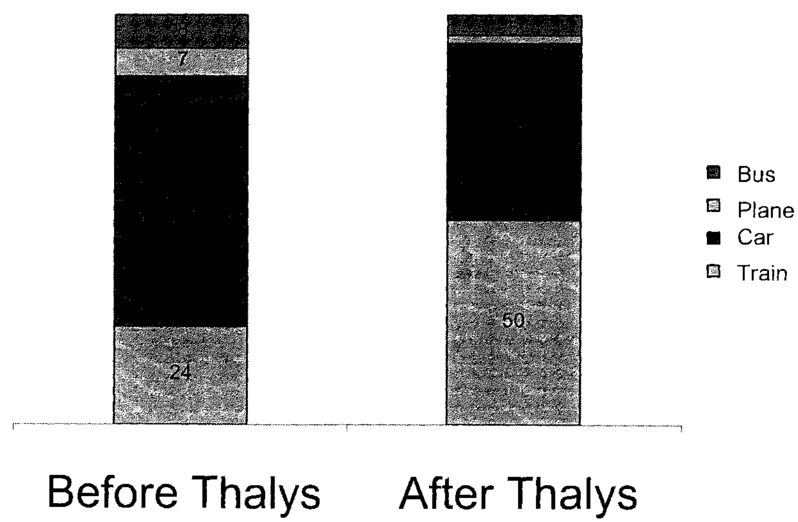
High Speed Passenger Volume Growth – Europe

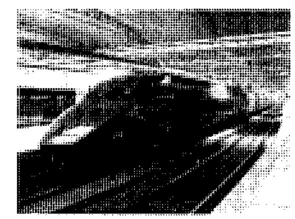


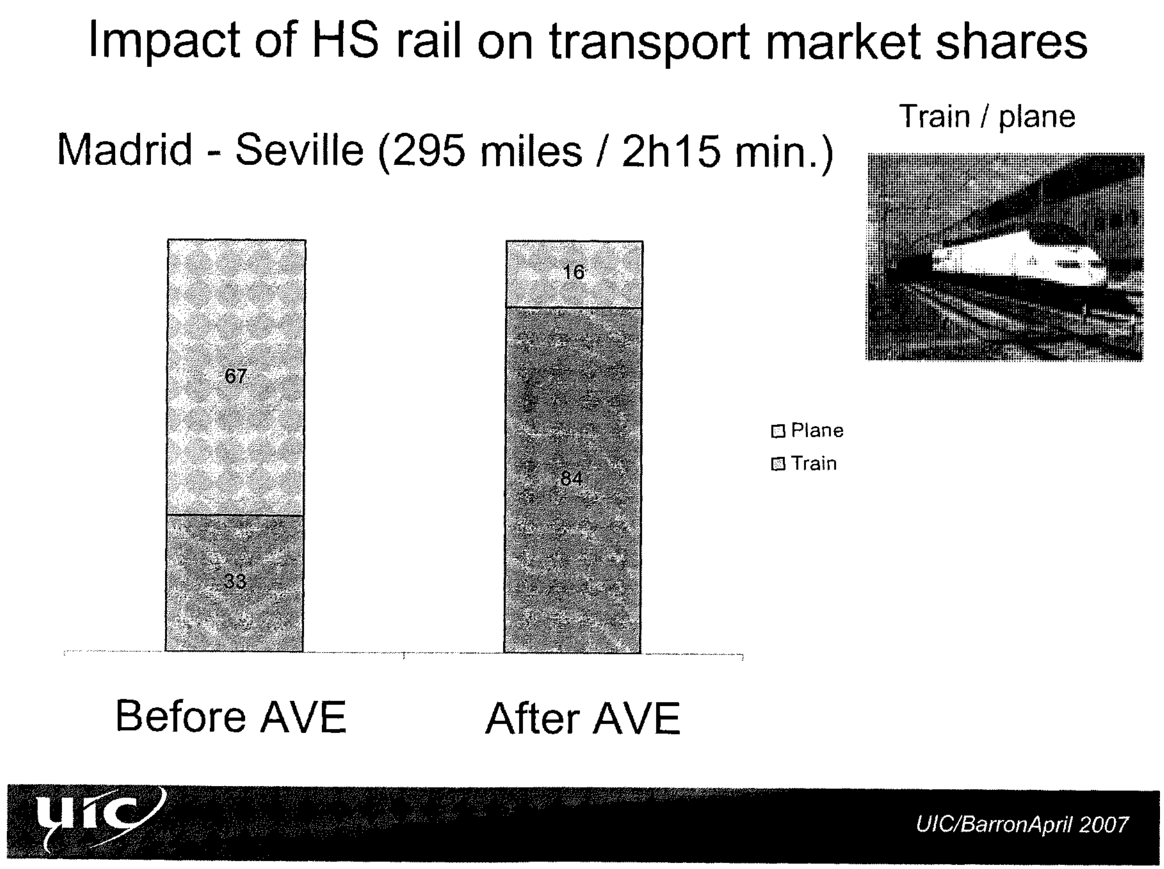
UIC/BarronApril 2007

Impact of HS rail on transport market shares

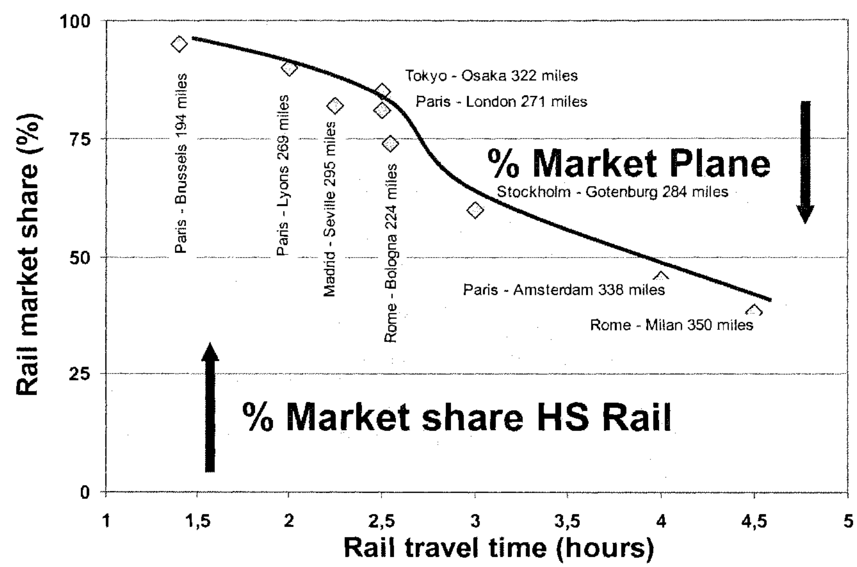
Paris - Brussels (194 miles / 1h25min.)






Impact of HS rail on transport market shares
Madrid - Seville (295 miles / 2h15 min.)
Train / plane
67
33
16
84
Plane
Train
Before AVE
After AVE
UIC/BarronApril 2007

How train travel time influences market share



For travel times of 4 hrs or less, HS rail captures 50+% of combined air/rail traffic on a route

UIC/BarronApril 2007

HS advantages for society

High capacity: up to 300,000 pax/day

- Reduces traffic congestion/wasted time
- Boosts economic development in areas served

Minimal environmental impact compared to air/road transport:

- Uses 1/3 land area of motorway
- Uses 1/9 energy of planes
- Uses 1/4 energy of cars

High Speed Rail helps contain urban sprawl

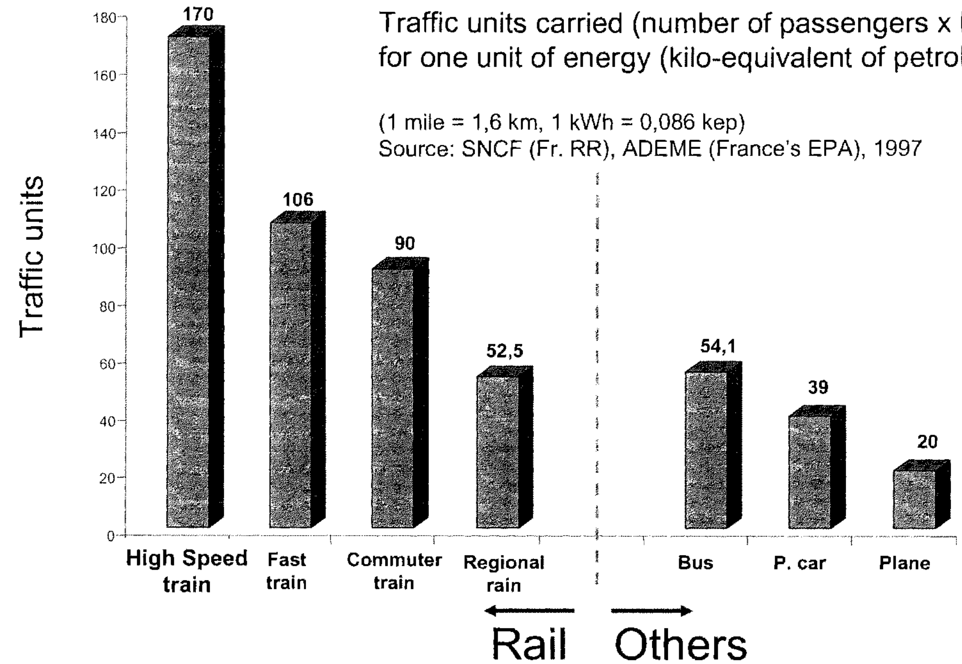
Land required

HS Railway	Motorway
Double track	2 x 3 lanes
75 ft	225 ft
12 trains per hour & direction	4.500 cars per hour & direction
666 passengers / train	1,7 passengers / car
Capacity = 8.000 passengers / hour	Capacity = 7.650 passengers / hour

Energy Efficiency Comparison

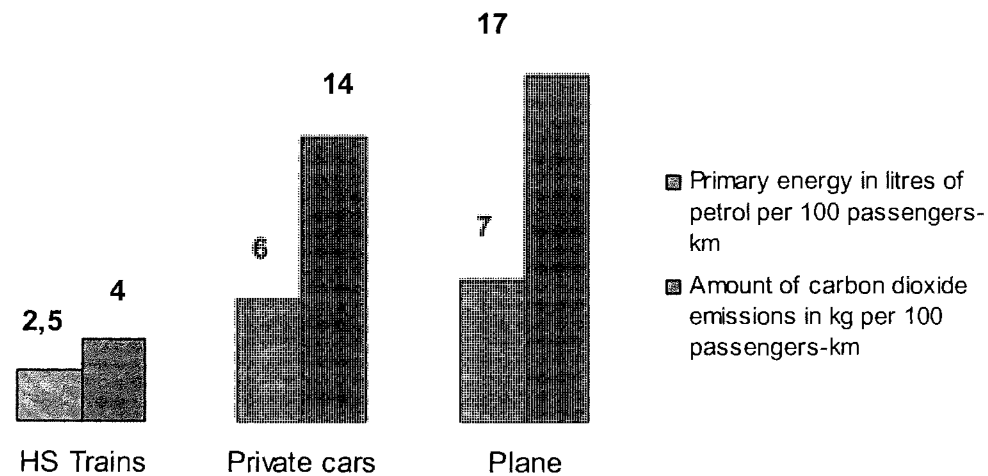
Traffic units carried (number of passengers x km)
for one unit of energy (kilo-equivalent of petrol, kep)

(1 mile = 1,6 km, 1 kWh = 0,086 kep)
Source: SNCF (Fr. RR), ADEME (France's EPA), 1997



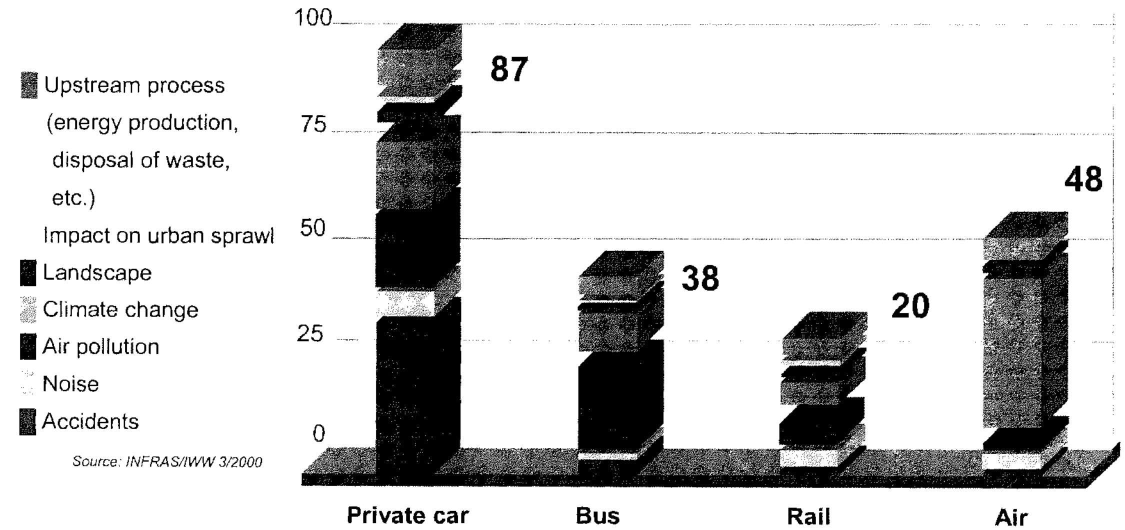
UIC/BarronApril 2007

Primary Energy and CO2 Emission



Average External Costs

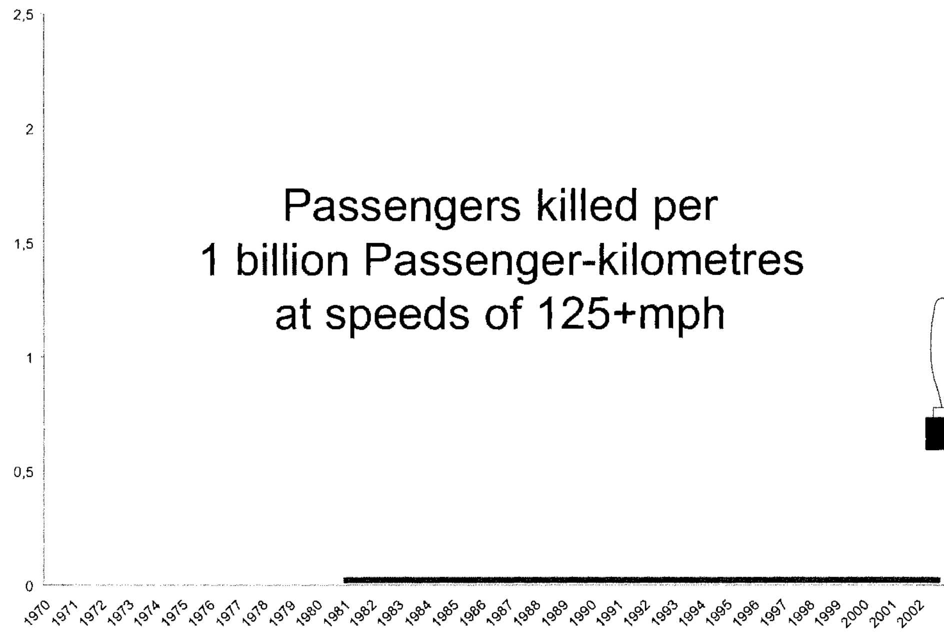
External costs = indirect costs not covered by ticket or gas paid by each traveler

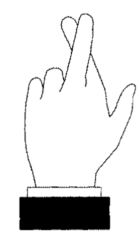


Comparison between modes in a medium-distance corridor, non-rush hour and without considering congestion (costs in € per 1000 passenger km)

UIC/BarronApril 2007

Safety record of High-Speed Rail (EU)





In USA, 40,000 Passengers per year killed in road accidents

UIC/BarronApril 2007

Different concepts of High Speed Rail

There is no uniform approach to High Speed Rail

- A variety of marketing concepts
- Many different models of operations
  (maximum speed, number of stops, etc.)
- Different models of accepting mixed traffic
  (e.g. freight)

Each country must define what HS model needs

Key performance factors for successful HS railways

- Commercial speed
- Frequency
- Accessibility
- Comfort
- Flexibility

- Total travel time
- Reliability
- Price
- Safety

Funding/Calculating Costs

High Speed requires significant investment, including public funding

Consequently, need detailed studies on traffic forecasting, costs and benefits

Examine all impacts, positive and negative (including calculating **costs of not doing it**)

HS system average costs

Cost per mile of new HSL:	$25 M
Maintenance per mile HSL:	$90,000/yr
Cost of one HS train (350 seats):	$30 M
Maintenance of a HS train:	$1.5 M/yr

Usual rolling stock ratio: 15 trains per 100 mi.HSL

1 HS train travels an average 315,000 mi./yr

Funding Costs

High Speed costs are generally paid with public funds (Japan, Europe, Korea)

The trend is to share funds and responsibilities between different public entities (French TGV)

In some cases, private funding can be attracted for part of total investment

PPP (Spain – France link) or BOT (Taiwan) are two possibilities to combine public and private resources:

- Private obtains ROI
- Public ensures social benefits

Cost examples: France TGV East

Paris – Strasbourg

200 miles, 200 mph operating speed
11.5 million passengers/yr expected

Total investment	$4.8 billion
"Classic financing"	
French State	31 %
European Union	8 %
State of Luxembourg	3 %
4 involved regions	19 %
RFF (Infrastructure owner)	17 %
SNCF (Main operator)	22 %

Cost examples: France-Spain link

Figueres - Perpignan

28 miles, 185 mph operating speed
3 million pax + 3 million ton freigh/yr expected

Total investment (infrastructure)	$1.3 billion
Concession, 50 years	
French and Spanish Govts	54 %
Private investment	10 %
Bank financing	36 %

Cost example: Taiwan

Taipei - Kaohsiung

215 miles, 185 mph operating speed
55 million pax/yr expected
Total investment $ 9 billion
Built Operate Transfer (BOT) at 35 years
- Private investment & bank financing
- Taiwan Government guarantee

For more information, comments and proposals:

Iñaki Barrón de Angoiti
Director High Speed
International Railway Association (UIC)
barron@uic.asso.fr
www.uic.asso.fr

Shinkansen (Bullet Train) System in Japan

Thank you Mr. Chairman and members of the Committee. It is an honor for me to be here to discuss the Japanese high-speed rail system, or "Shinkansen." The Japanese people are very proud of this system and we are happy to share our experiences with you. In my testimony I will touch on the History of the Shinkansen, its development and financing, and finally the features and benefits of this system.

1. Current Situation of Shinkansen

(1) History and Current Operation

The high-speed railway system in Japan, the so-called Shinkansen, started its operations in 1964 between Tokyo and Osaka (Tokaido Shinkansen), followed by the continuing construction of rails to connect the metropolitan areas of Japan.

Before it was privatized in 1987, Japanese National Railways (JNR) constructed Sanyo, Tohoku, and Joetsu Shinkansen lines..

Through the privatization, the JNR was divided into 6 passenger railway companies (JRs) and one freight railway company. The operations and management of these existing Shinkansen were transferred to JR East (Tohoku and Joetsu), JR Central (Tokaido) and JR West (Sanyo). Including newly constructed Shinkansen lines, railways currently under operation in total are 1352 miles (2176km).

(2) Competition between Shinkansen and Other Modes of Transportation

Most of Existing Shinkansen lines run through densely populated areas in Japan, connecting most of major cities such as Tokyo, Nagoya, Osaka, Fukuoka and Sendai. The dense population along the lines is the geographic background of Shinkansen's popularity.

Compared with other modes of transportation, Shinkansen is more competitive when distance is between 100 and 500 miles. For Example, as to the trip between 313 and 460 miles, 66% of the passengers choose railway, while 21% choose air transportation and 11% use automobiles. Shinkansen fare from Tokyo to Osaka is 13,240 yen, or approximately 110 US dollars. Trip time is just 2 and half hours when using the fastest train. On the other hand, regular air ticket is 20,000 yen (approx. 170 US dollars) between Tokyo and Osaka, and the flight time is 50 minutes. Most of the passengers prefer Shinkansen because the fare is more reasonable, and because the trip time is not different very much taking account of access time to airports and necessary time for check in at the departing airport. Even though the fare is as cheap as 6,000 yen for a highway bus between Tokyo and Osaka, few passengers choose it due to more than 8 hours of travel.

2. Financial Management of Shinkansen Development

(1) Tokaido Shinkansen and the other three Shinkansen Lines

The construction of Tokaido Shinkansen started in 1959, and the construction cost was 380 billion yen. The construction was financed by issuing bonds in Japan, borrowing from the World Bank and the Japanese Government.

The loans were expected to be returned through the revenues from passenger fares, and the management became profitable three years after the initiation of its operation. In 1970 the profit was more than 100 billion yen, and all of the initial investment was recovered by 1971. Since then, the revenue from Shinkansen has been an important resource to subsidize local lines.

(2) Plans and Construction of New Shinkansen Lines

To expand the Shinkansen network, the "National Shinkansen Railway Development Law" was enacted in 1970. This law required the creation of a "Development Plan" for the Shinkansen Network, and the expansion of Shinkansen Railways are being conducted according to the Plan. Currently Hokkaido Shinkansen, Tohoku Shinkansen, Hokuriku Shinkansen, and Kyushu Shinkansen are under development.

Due to financial reasons, only its southern part (between Shin-Aomori and Shin-Hakodate) of Hokkaido Shinkansen is currently being developed.

The total plan of Tohoku Shinkansen was to connect Shin-Aomori and Tokyo. In 2002 it expanded from Morioka to Hachinohe, and the line beyond Hachinohe is now under construction. Hokuriku Shinkansen goes from Takasaki to Osaka Metropolitan Area via the shore of the Sea of Japan. The operation between Takasaki and Nagano started in 1997, just a few months before Nagano Winter Olympic Games. And the railway between Nagano and Kanazawa is now under construction.

Kyushu Shinkansen is divided into two routes. The southern part of Kagoshima Route has been under operation since 2004. Its northern part is currently under construction. Nagasaki Route is another route of Kyushu Shinkansen. Its construction has not started yet because the coordination among local communities has not been finished yet.

(3) Funding of New Shinkansen Railways

The cost of New Shinkansen railway construction projects is shared by the national government and local governments along the railway lines. Two thirds of the funds are from the national government and one third from local governments. The total budget for the construction of New Shinkansen Railways in FY 2007 is 263.7 billion yen, and the national government budget is 175.8 billion yen, and that of local governments is 87.9 billion yen.

The railways are constructed and owned by Japan Railway Construction, Transport and Technology Agency (JRTT), and operated by JRs. JRTT, an independent administrative agency, charges these JRs for the usage of its property, but the maximum charge that can be made is equal to the profits from the New Shinkansen operations.

A little more than half of the national government funding comes from the payments for the procurement of existing Shinkansen Railways. The rest comes from the General Account.

It can be said that Shinkansen construction projects are based on a public-private partnership, where JR operations are supported by funding from both national and local governments.

(4) Operational Figures of Shinkansen Railways

The number of passengers at Tokaido-Sanyo Shinkansen hit its peak in the early '90s, when the Japanese economy experienced a "bubble." Throughout these fifteen years the number stagnated around slightly below 200 thousand. One of the reasons for this slow-down is the condition of Japanese economy in the '90s. The severe competition between Tokaido-Sanyo Shinkansen and air transportation is another reason. The Japanese government deregulated air transportation industries in the '90s and airlines began to introduce competitive fares targeting Tokyo-Osaka and Tokyo-Fukuoka services, between which the Shinkansen is operated. Furthermore, the expansion of Haneda Airport in Tokyo increased the number of domestic flights, thus attracting more passengers.

At Tohoku and Joetsu, on the other hand, the number of passengers continued to increase until late '90s, while growth slowed in the 2000s.

Operational Figures of Shinkansen Railways (FY 2004)

	Miles (km) of Operation	Number of Passengers (thousand)	Passenger-miles (km) (million)	Average Daily Number of Passengers
Tokaido-Sanyo	668(1,069)	195,197	34,723(55,869)	534,786
Tohoku	369(593)	80,401	8,301(13,356)	222,726
Joetsu	168(270)	35,337	2,631(4,233)	101,079
Hokuriku	73(117)	9,558	498(802)	29,849
Kyushu	79(127)	3,796	255(410)	10,400

3. Features of Shinkansen Railways

(1) High Speed

When Tokaido Shinkansen started its operation in 1964, the maximum train speed was 130 mph (210km/h). With the technical development and improvement of the railway structure, the maximum speed of Tokaido Shinkansen is now greater than 168 mph (270 km/). In 1996 one of the newest rolling stocks achieved the fastest record of

275.3 mph (443km/h) at a speed trial. Since 1997 Sanyo Shinkansen's highest operational speed has been 186 mph (300km/h).

Before 1964 conventional trains had to spend more than 6 hours traveling between Tokyo and Osaka (322 miles (515km)). With the introduction of Tokaido Shinkansen, the traveling time has been reduced to 3 hours and 10 minutes. Now the fastest Shinkansen connects Tokyo to Osaka in just 2 hours and 30 minutes.

One of the keys of its high speed operation is light-weighted rolling stocks. Aluminum alloy in a honeycomb or hollow structure is widely used, enabling a lighter weight while maintaining strength and durability.

Another key is the usage of powered rolling stocks instead of locomotives, enabling more efficient acceleration. Furthermore, removing heavy locomotives means there is better weight allocation within a train.

(2) High Density and High Level of Services

Shinkansen is proud of the density of its operation. The system can dispatch trains every 3 minutes. An ordinary Shinkansen passenger car can accommodate as many as 1,323 passengers, and the number of annual Shinkansen passengers nationwide was as high as 291,258 thousand in FY2004.

This frequent mass transit service is also fit to its commuters. Approximately 47,000 businesspersons and students commute using Shinkansen. Many residents living in local cities as far as 60 miles (100km) away from Tokyo enjoy a mere 30 minute commute using Shinkansen. To accommodate these commuters, JR East introduced double decker cars focusing on rush hours.

Responding to the needs of passengers is also very important. Since most of the passengers use local trains to access Shinkansen, reducing connection time has a high priority. In most stations, local trains start just a few minutes after the arrival of Shinkansen so that the passengers do not have to wait a long time for the connecting services. However, demanding Japanese passengers are not satisfied even with this efficient diagram. At Shin-Yatsushiro Kyushu, Shinkansen connects to the local express going to Hakata (Fukuoka). A local train waits for the Shinkansen coming into the station just across the same platform, so that passengers can change trains simply by crossing it. Furthermore, some Shinkansen rolling stocks are operated through local lines. Local lines to Yamagata and Akita, both of which are local cities in Tohoku region, has the same gauge as Shinkansen's, and the Shinkansen rolling stocks can go directly to local lines. With this feature passengers do not even have to change trains to go to local lines.

The Shinkansen service offers many benefits, but interestingly enough the speed of the trains can limit its offerings. For example, cafeteria cars had been very popular in Shinkansen. However, with the increase of speed, most of the passengers arrive at their destinations before they become hungry or would even have time to get food and eat it. Therefore there is no cafeteria in Shinkansen now. But please do not worry. Passengers can use available food cart services and enjoy lunch boxes with varieties of local foods along the railway lines.

(3) Safety

It is worth noting that there has never been a fatality due to a train accident in Shinkansen since the beginning of its service in 1964. This remarkable safety record of the Shinkansen is chiefly attributable to its basic design concepts and the ingenious ideas underlying its operations.

Shinkansen rails are totally separated from conventional railways and operate without any grade crossings. With this structure any collisions between Shinkansen trains and conventional trains or automobiles cannot occur.

All the operations of Shinkansen trains are surveyed and controlled by the Traffic Control System. This system is at the center of the traffic control of Shinkansen, enabling high-speed and high-density operations. The Traffic Control System constantly monitors the Shinkansen operation, and recognizes if the operation is not running as scheduled.

It also simulates the operating conditions when an operator makes a change in his actions and is then advised to make an adjustment.

The Automatic Train Control (ATC) System is the key system in eliminating human errors. If there is an irregular movement of a train that may result in an accident, ATC automatically recognizes it and stops the train.

Shinkansen is the only high speed railway system that was proved to be safe and manageable during severe earthquakes. A seismograph is installed every 12miles (20km) along the railway, and it is connected to the Urgent Earthquake Detection System (UrEDAS). When an earthquake occurs, the UrEDAS recognizes its initial (relatively weak) waves, estimates the magnitude of the earthquake, and determines whether to stop the running trains. Furthermore, the structures of Shinkansen facilities, such as railways, are reinforced against earthquakes.

(4) Reliability

Let me give you a piece of trivia about the punctuality of Shinkansen: When asked what you think the average delay is on the Shinkansen lines, what would you think? The answer is 6 seconds.

This means just about all of the trains departing every few minutes, as many as 300 trains daily, are perfectly under control. You would also be amazed to see all the trains stop at exactly the same position when they come to a station. Any differences are within only a few inches.

This accuracy is the result of sophisticated control systems such as the Traffic Control System as well as very skillful drivers and operators.

(5) Environment

Most of the noise from Shinkansen comes from the friction between air and train. To reduce the noise from pantographs, their number has been reduced. Simultaneously their shape was also improved. The Streamlined design of rolling stocks not only contributes to high-speed, but also to noise reduction..

Shinkansen is a very energy-efficient mode of transportation. When comparing on a passenger-miles basis, Shinkansen's energy consumption is only a fourth of that of air transportation, and one sixth of automobiles. Taking into account the fact that electricity is also generated by nuclear power, CO2 emission from Shinkansen is significantly lower than other modes of transportation. Its emissions are only one fifth of that from aircraft, and one eighth from automobiles. It can be said Shinkansen contributes to energy savings as well as the fight against global warming.

4. Conclusion

The Japanese high speed railway, Shinkansen, is an excellent mode of transportation in speed, safety, reliability, density and from an environmental point of view. These features can only be achieved through the integration of different elements of the railway system. Rolling stocks, signals and the Traffic Control System are mutually linked and work in a perfectly coordinated manner. This enables the Shinkansen operation every 3 minutes in more than 180 mph, without any fatal accidents.

It should also be noted that, even with the privatization of the JNR proven to be a success, the high speed railway network cannot be developed without the public-private partnership. Shinkansen and the conventional train network operationally and financially support each other. Passengers access Shinkansen using conventional trains, and the revenues from Shinkansen support the operation of the local railway network.

I believe Shinkansen can be successfully introduced even outside of Japan. It can be an ideal intercity transportation for distances between 200 and 500 miles with high demand. Finally I would like to emphasize lessons learned by the Japanese experience. The keys of success for Shinkansen are the integrated system and efficient private operations supported by public sponsorship. Thank you very much for listening.

Appendex

Specifications of Shinkansen Lines

- Tokaido Shinkansen
  - Operation Inauguration: 1964
  - Major Cities with Service: Tokyo, Nagoya, Kyoto, Shin-Osaka (Osaka)
  - Route Length: 322 miles (515 km)
  - Maximum Operational Speed : 169 mph (270 km/h)

- Sanyo Shinkansen
  - Sections under Operation : Shin-Osaka – Okayama (1972)
Okayama –Hakata(Fukuoka) (1975)
  - Route Length: 346 miles (554 km)
  - Maximum Operational Speed : 188 mph (300 km/h)

- Tohoku Shinkansen
  - Sections under Operation : Omiya – Morioka (1982)
Ueno – Omiya (1985)
Tokyo – Ueno (1991)
Morioka – Hachinohe (2002)
  - Route Length under Operation: 370 miles (593 km)
  - Maximum Operational Speed : 172 mph (275 km/h)
  - Section under Construction : Hachinohe – Shin-Aomori (51 miles (82 km), to be completed in March, 2011)

- Joetsu Shikansen
  - Operation Inauguration : 1982 (Omiya – Niigata)
  - Route Length : 169 miles (270 km)
  - Maximum Operational Speed 172 mph (275 km/h)

- Hokkaido Shinkansen

- Section under Construction : Shin-Aomori - Shin-Hakodate (93 miles (149 km), to be completed in March, 2016)
- Section under Planning Stage : Shin-Hakodate - Sapporo)

■ Hokuriku Shinkansen

- Operation Inauguration : 1997 (Takasaki – Nagano)
- Route Length under Operation : 73 miles (117 km)
- Maximum Operational Speed : 163 mph (260 km/h)
- Section under Construction : Nagano – Kanazawa (143 miles (228 km), to be completed in March, 2015)
- Section under Planning Stage : Kanazawa - Osaka

■ Kyushu Shinkansen

- Operation Inauguration : 2004 (Shin-Yatsushiro – Kagoshima-Chuo)
- Route Length under Operation : 73 miles (117 km)
- Maximum Operational Speed : 163 mph (260 km/h)
- Section under Construction : Hakata – Shin-Yatsushiro (81 miles (130 km), to be completed in March, 2011)
- Section under Preparation for Construction : Takeo-Onsen - Isahaya
- Section under Planning Stage : Shin-Tosu - Takeo-Onsen

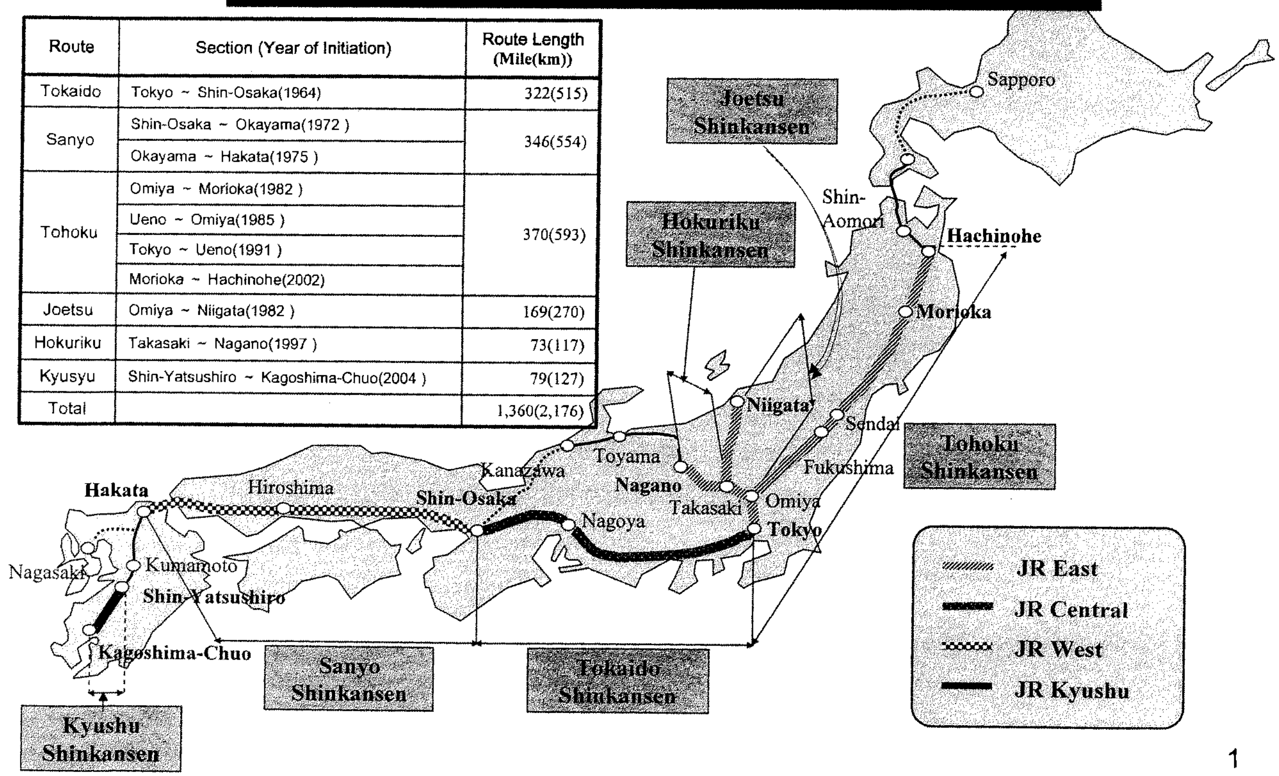
  Isahaya - Nagasaki

THE SHINKANSEN

- Japan's high-speed railway -

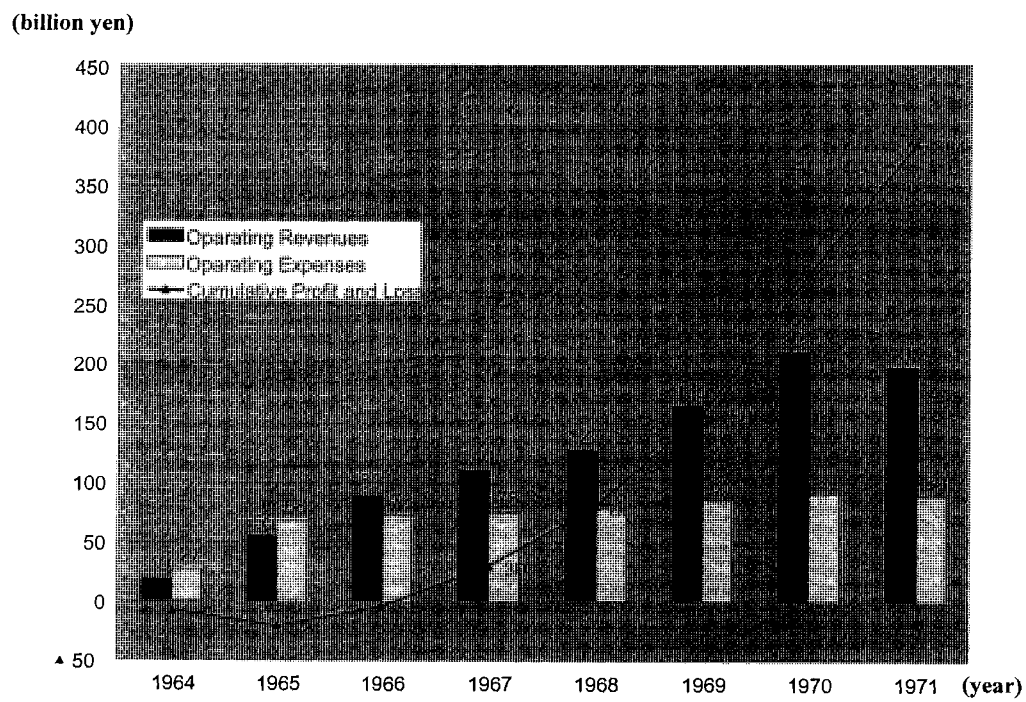
The Current Situation of the Shinkansen

Route	Section (Year of Initiation)	Route Length (Mile(km))
Tokaido	Tokyo ~ Shin-Osaka(1964)	322(515)
Sanyo	Shin-Osaka ~ Okayama(1972)	346(554)
	Okayama ~ Hakata(1975)	
Tohoku	Omiya ~ Morioka(1982)	370(593)
	Ueno ~ Omiya(1985)	
	Tokyo ~ Ueno(1991)	
	Morioka ~ Hachinohe(2002)	
Joetsu	Omiya ~ Niigata(1982)	169(270)
Hokuriku	Takasaki ~ Nagano(1997)	73(117)
Kyusyu	Shin-Yatsushiro ~ Kagoshima-Chuo(2004)	79(127)
Total		1,360(2,176)



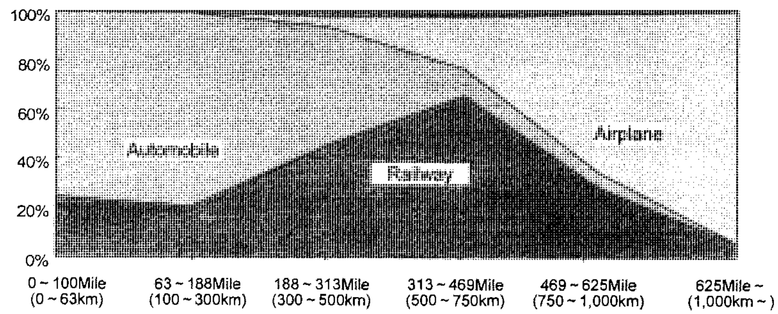
1

The Financial Balance of Tokaido Shinkansen

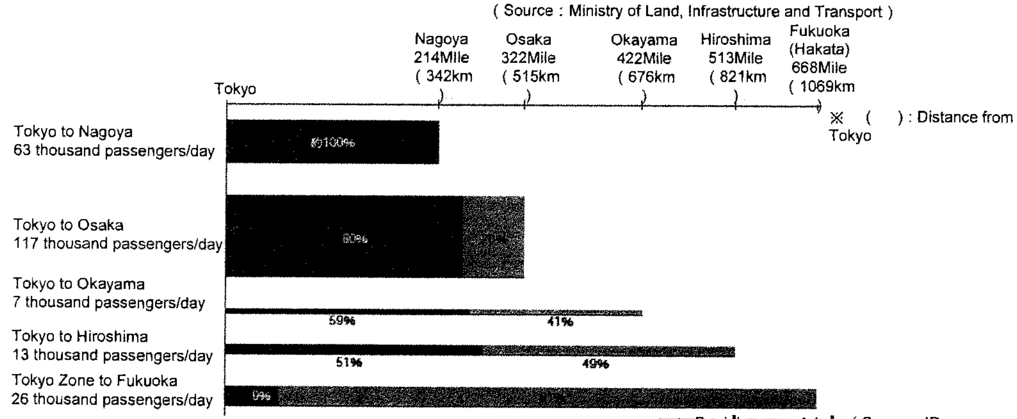


Source: JNR

Shares of Passenger Transportation Modes According to Distances



(Source : Ministry of Land, Infrastructure and Transport)



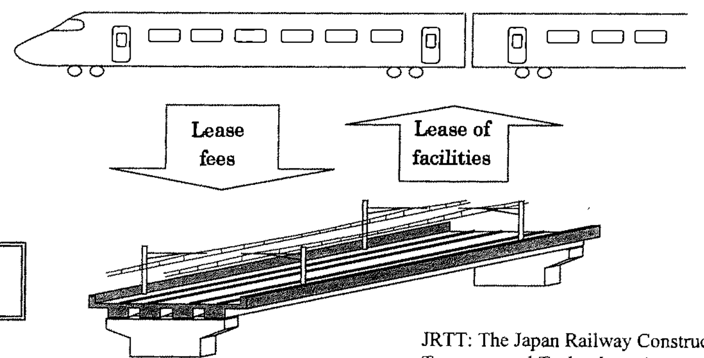
(Source: JR Central)

Development of New Shinkansen

○ Construction and Operation of New Shinkansen

JR (Private)
(Operating Shinkansen)

JRTT (Government Agency)
(Construction and Possession)



JRTT: The Japan Railway Construction, Transport and Technology Agency

○ Finance

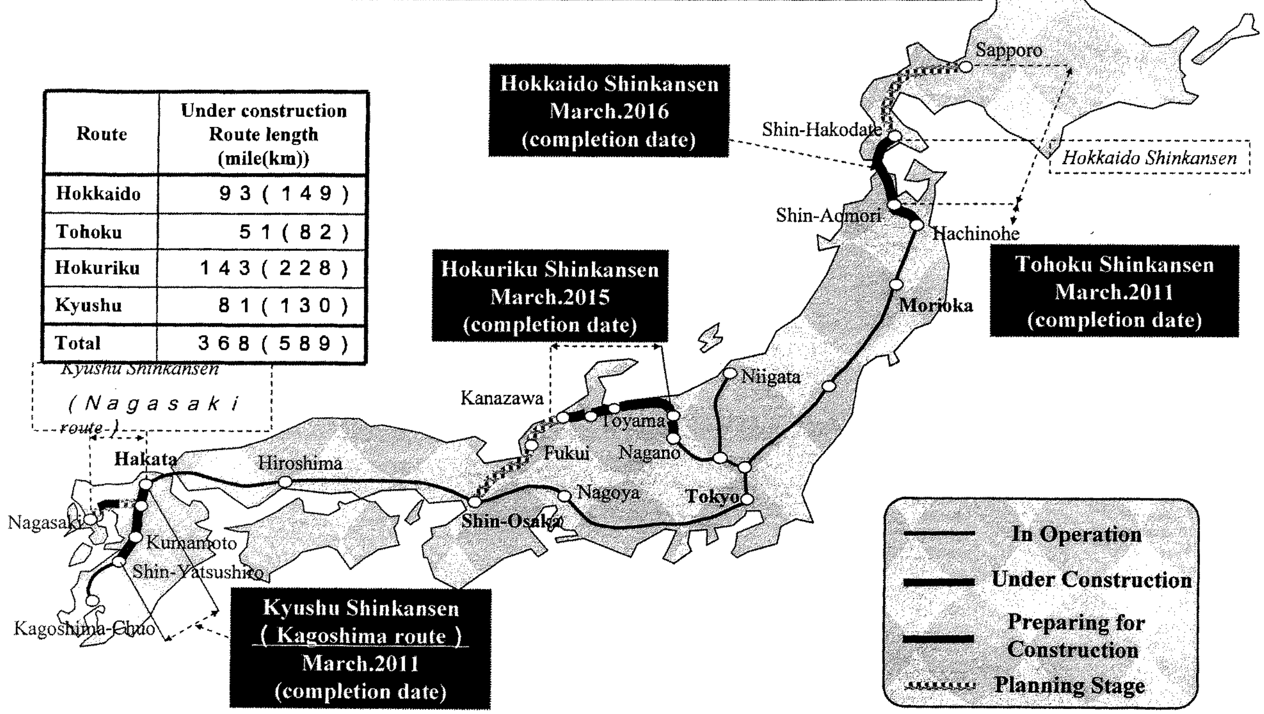
(Budget of 2007 fiscal year)

Payments for the procurement of existing Shinkansen lines ※ 105.2 billion yen	**General Account 70.6 billion yen**	**Local Governments 87.9 billion yen**
National Government 175.8 billion yen		**Local Governments 87.9 billion yen**
2		1

※ Tokaido Shinkansen , Sanyo Shinkansen , Joetsu Shinkansen , Tohoku Shinkansen(Tokyo-Morioka)

New Shinkansen Projects

Route	Under construction Route length (mile(km))
Hokkaido	93 (149)
Tohoku	51 (82)
Hokuriku	143 (228)
Kyushu	81 (130)
Total	368 (589)

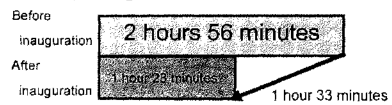


Impact of Shinkansen Introduction

Time Reduction

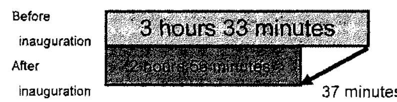
Hokuriku Shinkansen
(Takasaki-Nagano)

Tokyo-Nagano



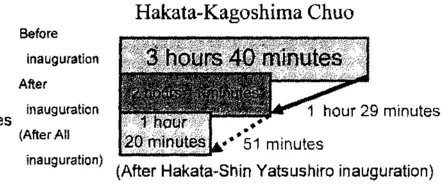
Tohoku Shinkansen
(Morioka-Hachinohe)

Tokyo-Hachinohe



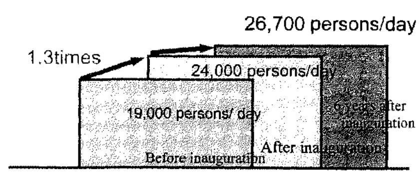
Kyusyu Shinkansen
(Shin Yatsushiro-Kagoshima Chuo)

Hakata-Kagoshima Chuo

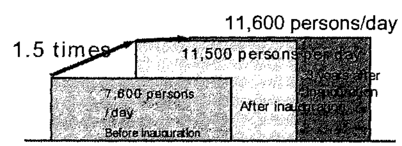


Passenger Increase

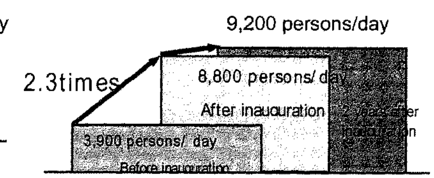
Hokuriku Shinkansen
(Takasaki-Nagano)



Tohoku Shinkansen
(Morioka-Hachinohe)



Kyusyu Shinkansen
(Shin Yatsushiro-Kagoshima Chuo)



Number of users of former express and Shinkansen lines one year before and after line inauguration

Benefits of the Shinkansen

[redacted] **188miles/h**(300km/h) Top Speed

[redacted]

2 hrs 30 min between Tokyo and Osaka (322 miles)

(Express bus takes more than 8 hrs)

Up to 15 trains leave in an hour during the business day

[redacted] **Zero** fatal accidents

Earthquake-proof

[redacted]

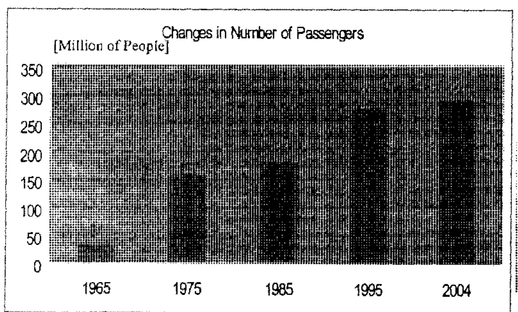
Average delay time :
6 seconds (FY2003)

[redacted] Low Energy Consumption

Low CO2 emission

Hi [redacted]

- **High density – Mass transportation**
  - ・・・High Frequency: Interval can be as small as 3 minutes.
  - ・・・Passengers carried in FY2004: 291 million
- **Services Responding to Passenger Needs**
  - ・・・Local Express trains using Shinkansen grade gauge – Passengers do not have to switch trains for local line.
  - ・・・Double Decker Cars



JR East Rolling Stocks

Fatal accidents to date: ZERO

No fatality for over 42 years since 1964

Proved to be Manageable through Earthquakes

Exclusive high-speed railway without grade

Traffic Control System

Automatic Train Control

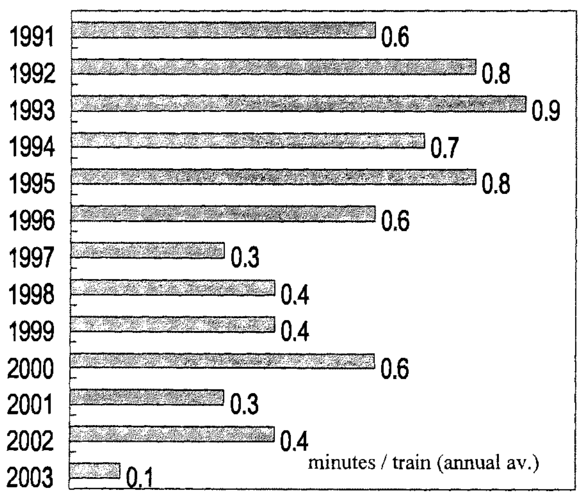
Protective system against Earthqu

[redacted]

Delay time of Tokaido Shinkansen:

<u>6 seconds</u> per train (2003)

Punctuality of Tokaido Shinkansen trains



(Source: JORSA)

- Advanced Operation Management
- Skillful Operations
- Reliable Rolling Stocks and Control System

[redacted]

Low CO_2 emission

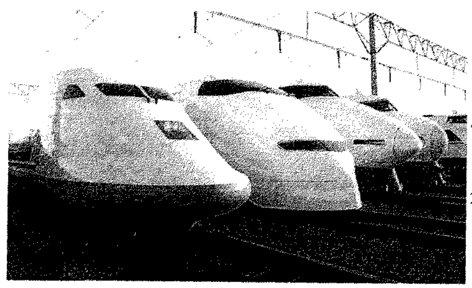
・・・ CO_2 emission from the Shinkansen is;

1/5 that of Airplanes, 1/8 that of automobiles

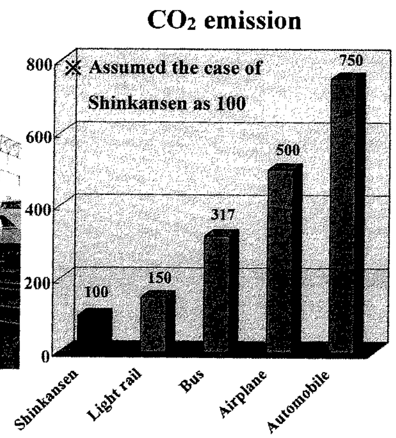
Low Energy Consumption

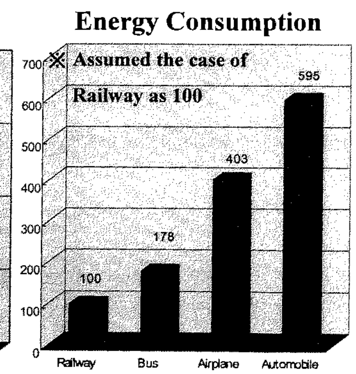
・・・ Energy Consumption of Railways is;

1/4 that of Airplanes, 1/6 that of automobiles

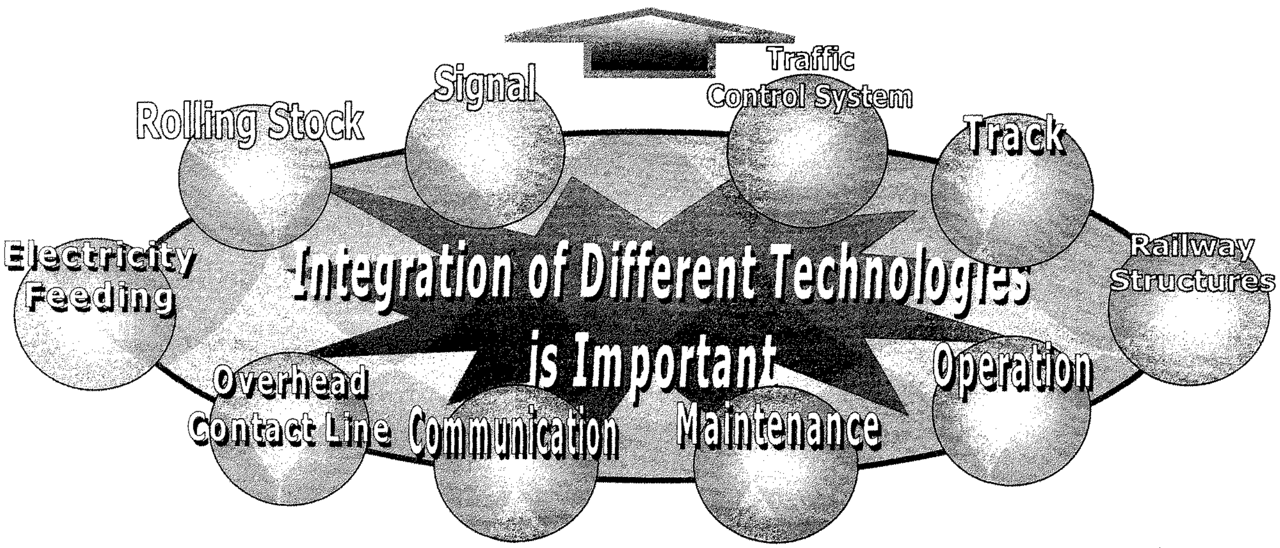


J R
Central





Safe and Reliable High Speed Train



TESTIMONY

Committee on Transportation and Infrastructure
Sub Committee on Railroads, Pipelines and Hazardous Materials
US House of Representatives

Jean Marie Metzler

Consulting Director TGV Developments
SNCF (French National Railroads)

Washington, DC
April 19, 2007

SNCF GROUPE

On Behalf of SNCF…

- I would like to warmly thank the Sub Committee for giving me the immense honor of presenting the French Railway's (SNCF's) views and achievements on High Speed Systems.

- My testimony will be based primarily on TGV™

  (Train à Grande Vitesse), which is not only a legal trademark, but one of the 10 most highly valued brands in the mind of French consumers.

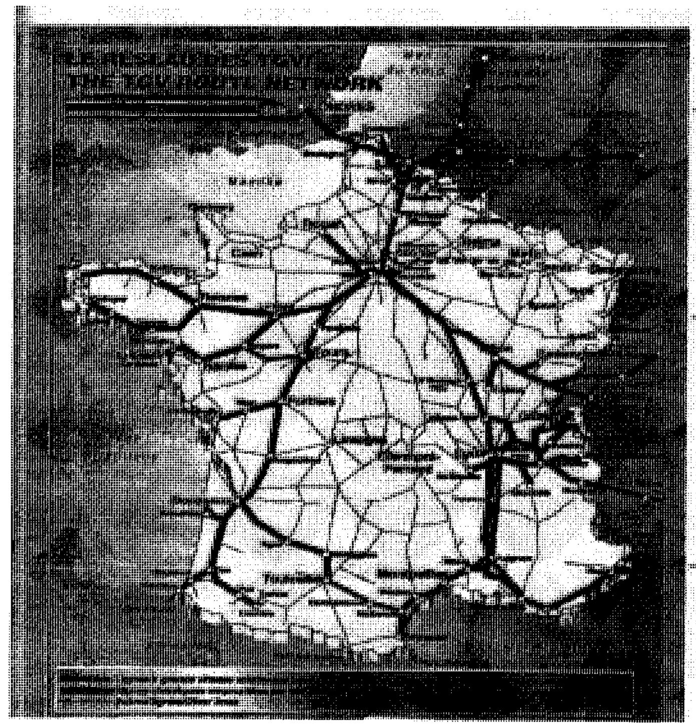
- Let me briefly introduce myself: as a young engineer I was project leader for design, delivery and commissioning of the first TGV (Paris-Lyon route), which went into service in 1981. Then I worked on the industry side for a manufacturer of rail rolling stock for 4 years.

- Returning to SNCF I was in charge of SNCF's marketing and sales policies to boost the TGV's growth by setting up a new reservation and ticketing system. We adapted Sabre software under license from American Airlines to the passenger rail industry. Together with this system we implemented the first example of yield management procedures to optimize train capacity and revenues.

SNCF GROUPE

TGV System

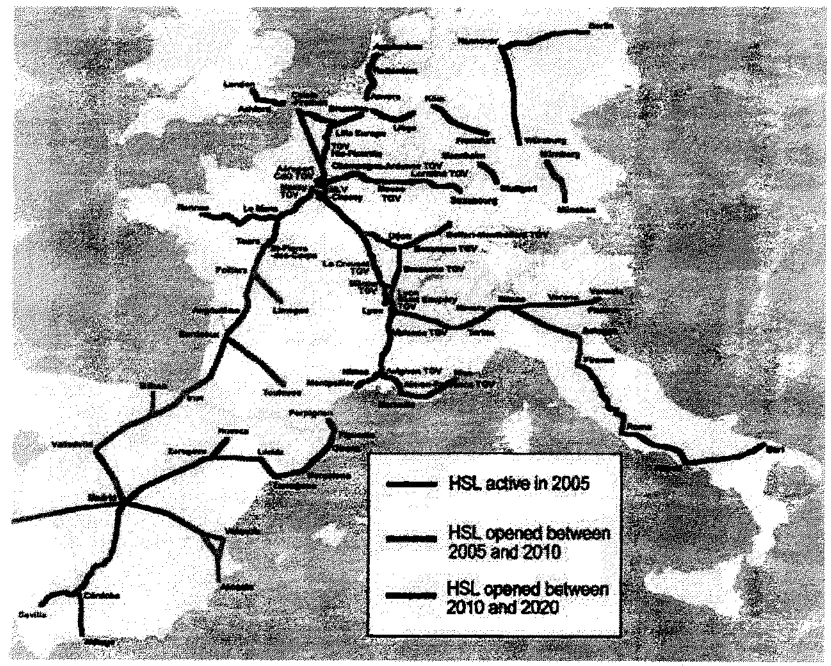
The TGV network includes 932 miles of high speed lines operated by more than 500 TGV trainsets in France alone.



SNCF GROUPE

European High Speed Network

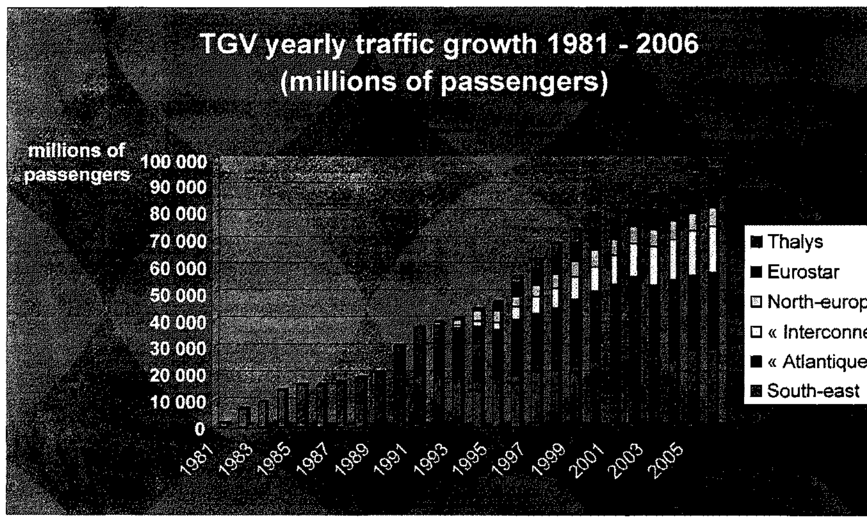
The TGV network also connects France to other countries, with a total of 2,500 miles of European high speed track in service now and plans to double that figure to 5,000 miles by 2020.



SNCF GROUPE

Key facts

- •1.4 billion TGV passengers since 1981 without a single casualty
- •Continuous growth in passengers
- •Currently 100 million passengers a year
- • 680 TGV trains circulate daily
- •250 stations served



SNCF GROUPE

Reasons for success....

Dramatic reductions in journey time:

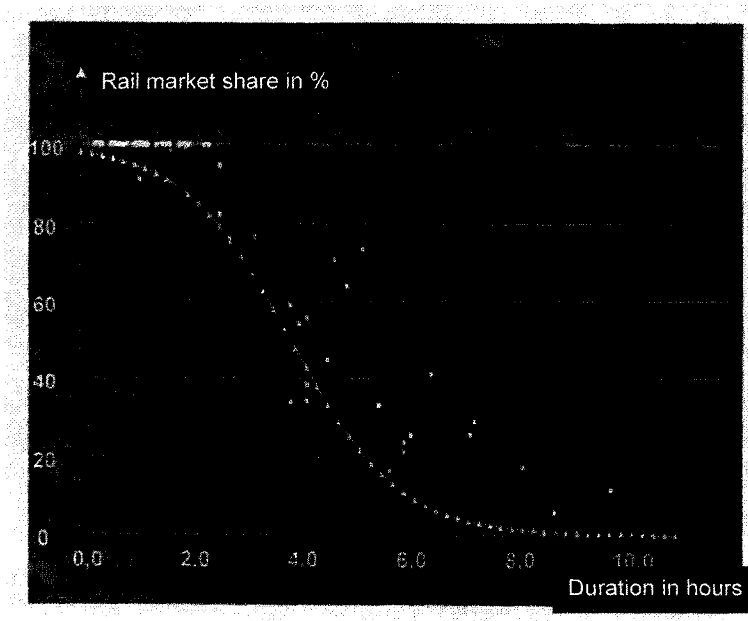
		BEFORE	AFTER
Paris to:	Lyon	4h	1h 55 min
	Bordeaux	4h	3 h
	Marseilles	4 h 40min	3 h
	London	--	2 h 15 min*

*as of 11/14/07

SNCF GROUPE

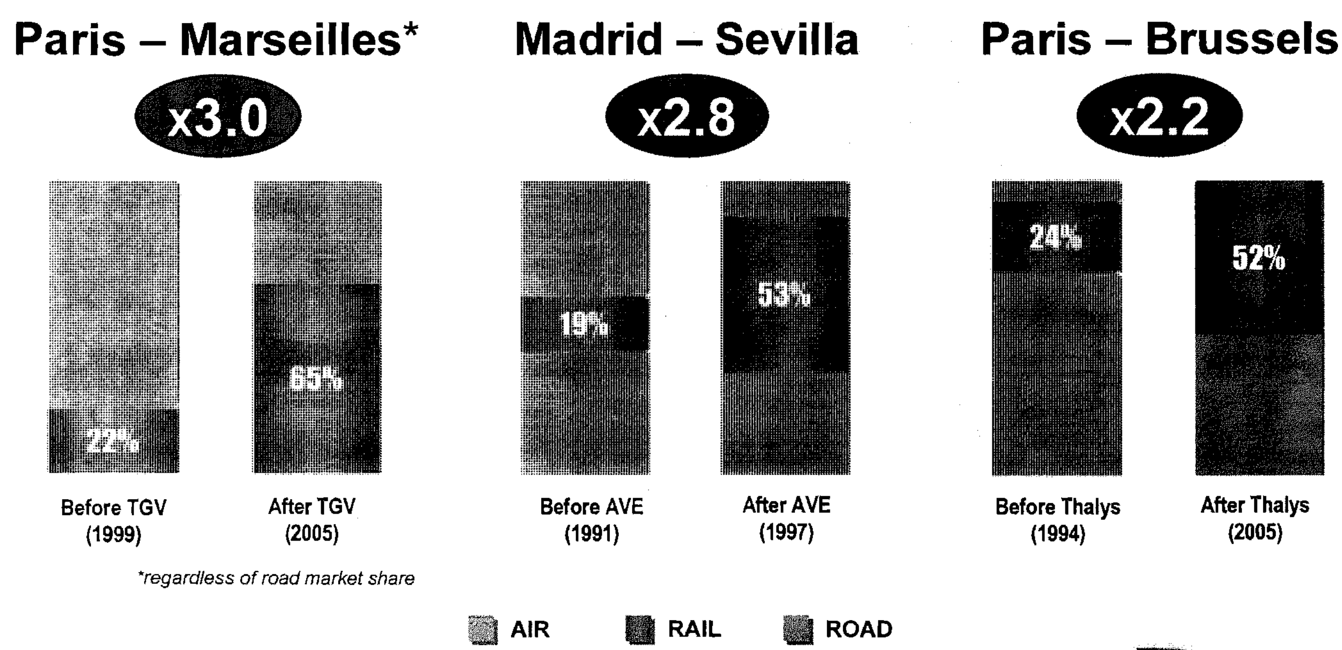
Competition with Air

- The journey time between Paris and Lyon was cut in half (4hr down to 2) opening new markets similar to Paris-London.
- Making rail a fierce competitor to air and enabling rail to win significant market share on routes with journey times of 3 hours or less.



Market share versus journey time

Rail vs. Air



Today, we see the most growth on journeys of 4 hours or less – as passengers try to avoid increasing delays and long check-in times at airports.

SNCF GROUPE

Key Success Factors

Consumer-oriented product:

- ***Safe:*** no casualty since 1981 - even in case of derailments - thanks to TGV's articulated design

- ***Comfort***: the same smooth ride whether the train is traveling at 100mph or 200mph

- ***Convenient stations:*** refurbished or new ones, with intermodal connections to other means (ground transportation, airlines)

- A large range of fares, yield managed, that attracts more customers (average load factor 71%)

TGV station/ Lyon Saint Exupéry

TGV Station/Roissy Charles de Gaulle

SNCF GROUPE

A consumer-friendly product

- A consumer-oriented but technologically conservative approach enables SNCF to build trains/rail service to suit the changing demographics and lifestyle of its passengers. For example, seats are now wider with more legroom to accommodate the larger passengers of today. And in response to the needs of an aging population, we are paying more attention to accessibility.

Over the last
30 years
the average height of a Frenchman
increased by almost 2.5 inches

Obesity will increase by 20%

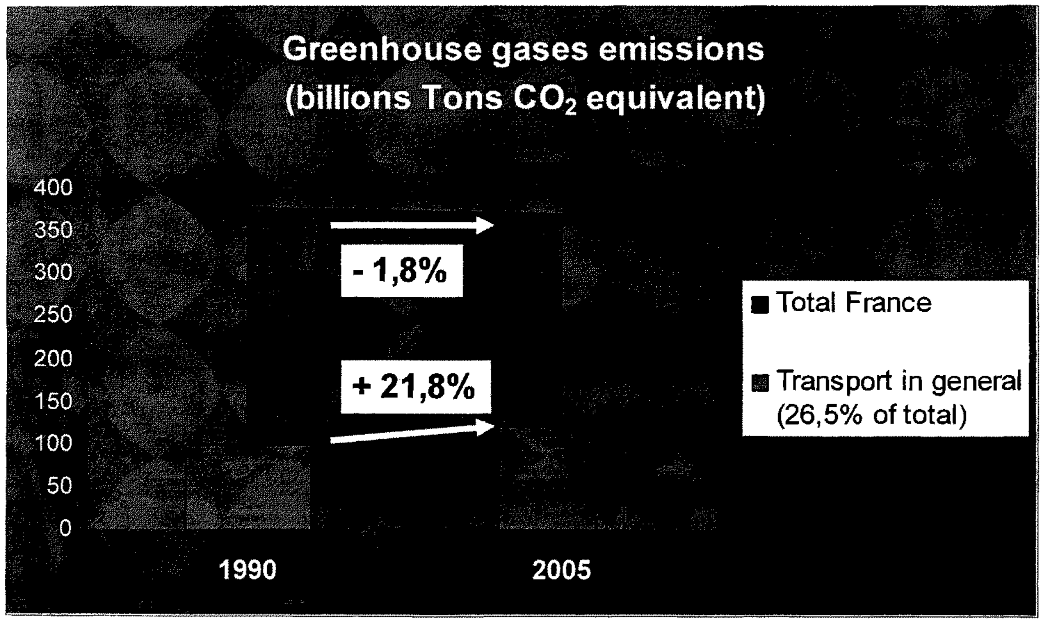
The average lifespan grows 3 month
each year

Environmentally Responsible Product

- Precise route alignment design avoids huge earthworks and saves land acquisition costs.
- High speed lines can in fact be coupled with highway right of ways because slopes and ramps used for HS rail design are close to road standards (3.5 to 4 %).
- For instance, the North Europe line in France runs along the Paris Lille highway. This saves on the cost of acquiring land, as well as the amount of land used.

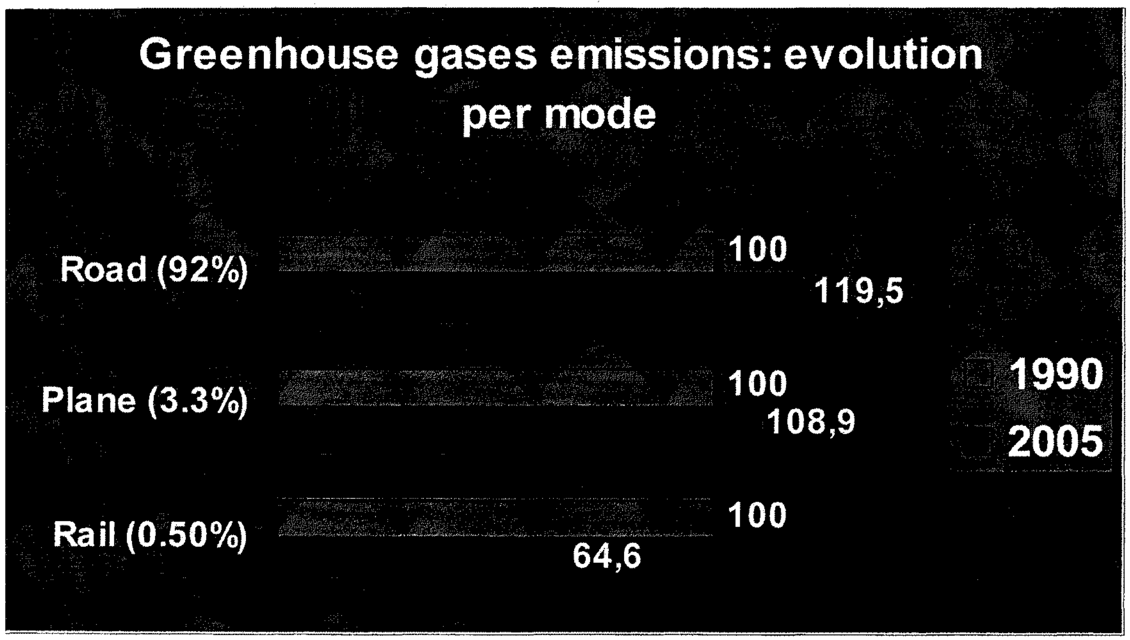
SNCF GROUPE

Environmentally responsible



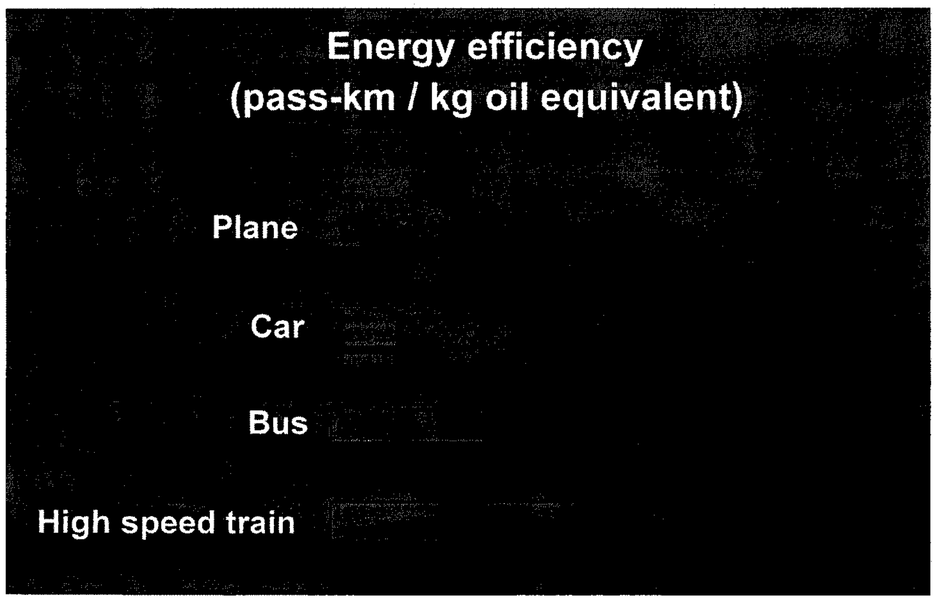
SNCF GROUPE

Environmentally responsible

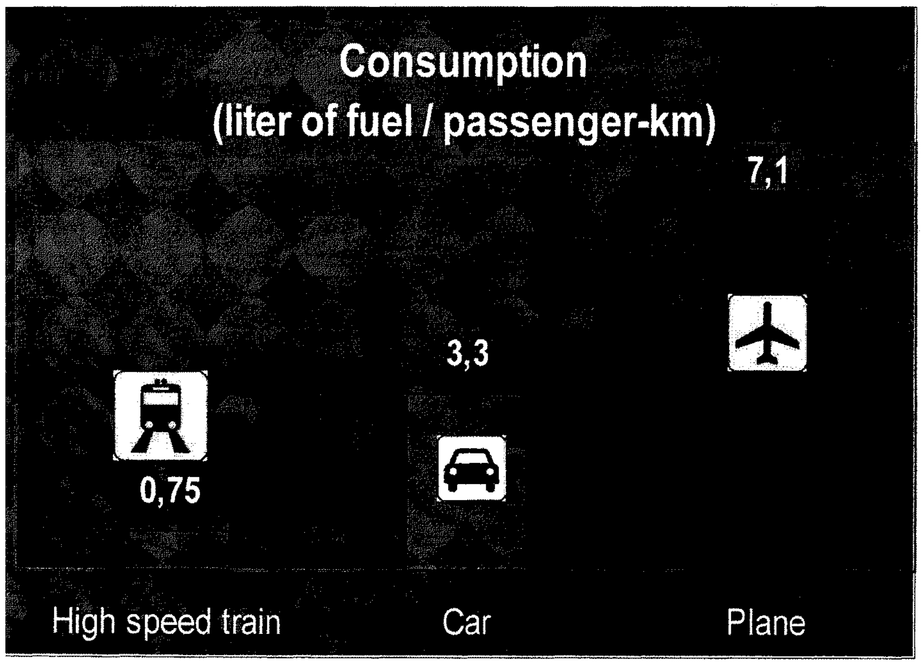


SNCF GROUPE

Higher energy efficiency



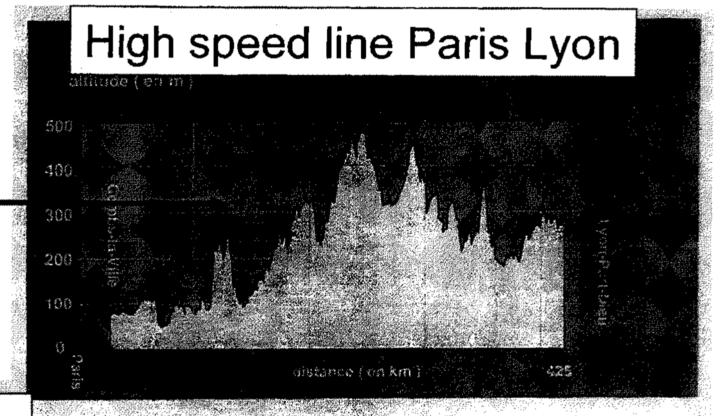
Less fuel consumption

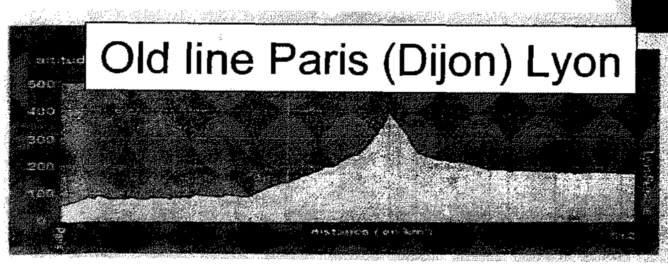


SNCF GROUPE

Alignment features

This design (ramps up to 3.5%)
saves earthwork
and minimizes (or avoids) tunnels





This design (ramps < 0.8%) requires
long tunnels

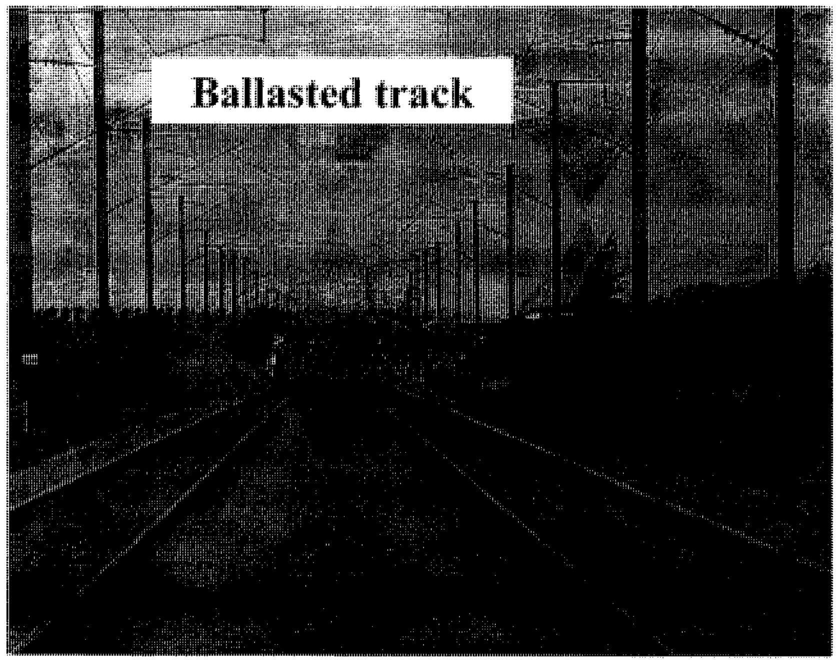
TGV platform is only 56 feet wide vs. 115 ft required by a 2 x 3 lane highway

114,83 ft

55,77 ft

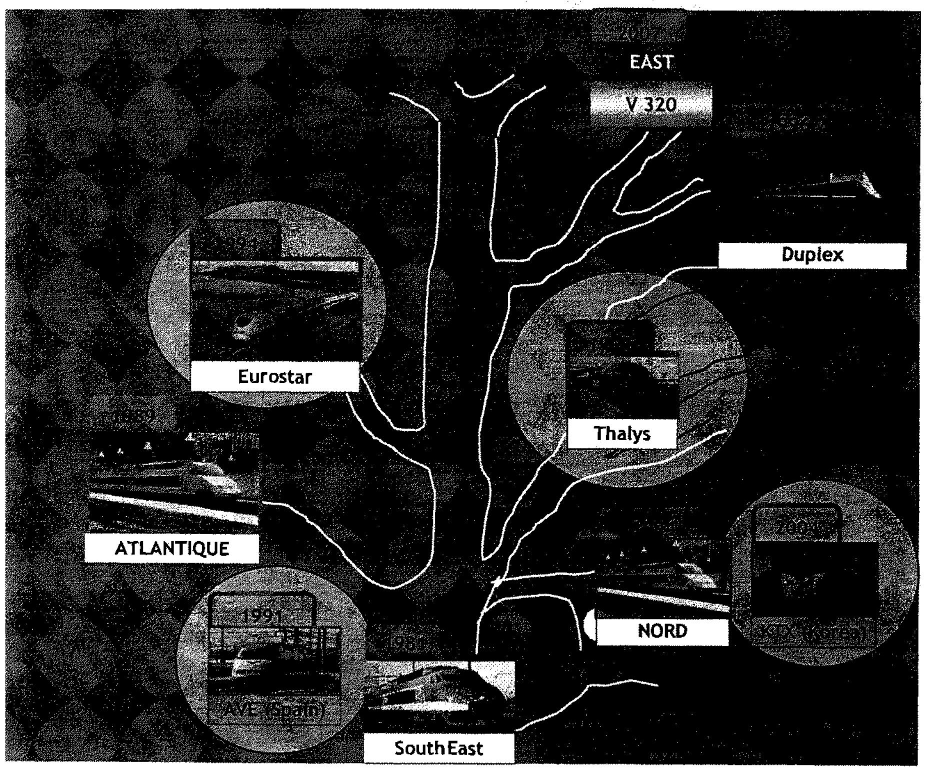
SNCF GROUPE

Conventional design for both track and rolling stock



SNCF GROUPE

TGV Family



SNCF GROUPE

TGV Family...

For each new generation of TGV's family proven we have built on proven or tested equipment/technology.

The common rule is: "You will have a disaster if your project contains more than 20% of innovation" [Rand Corporation, 1980's].

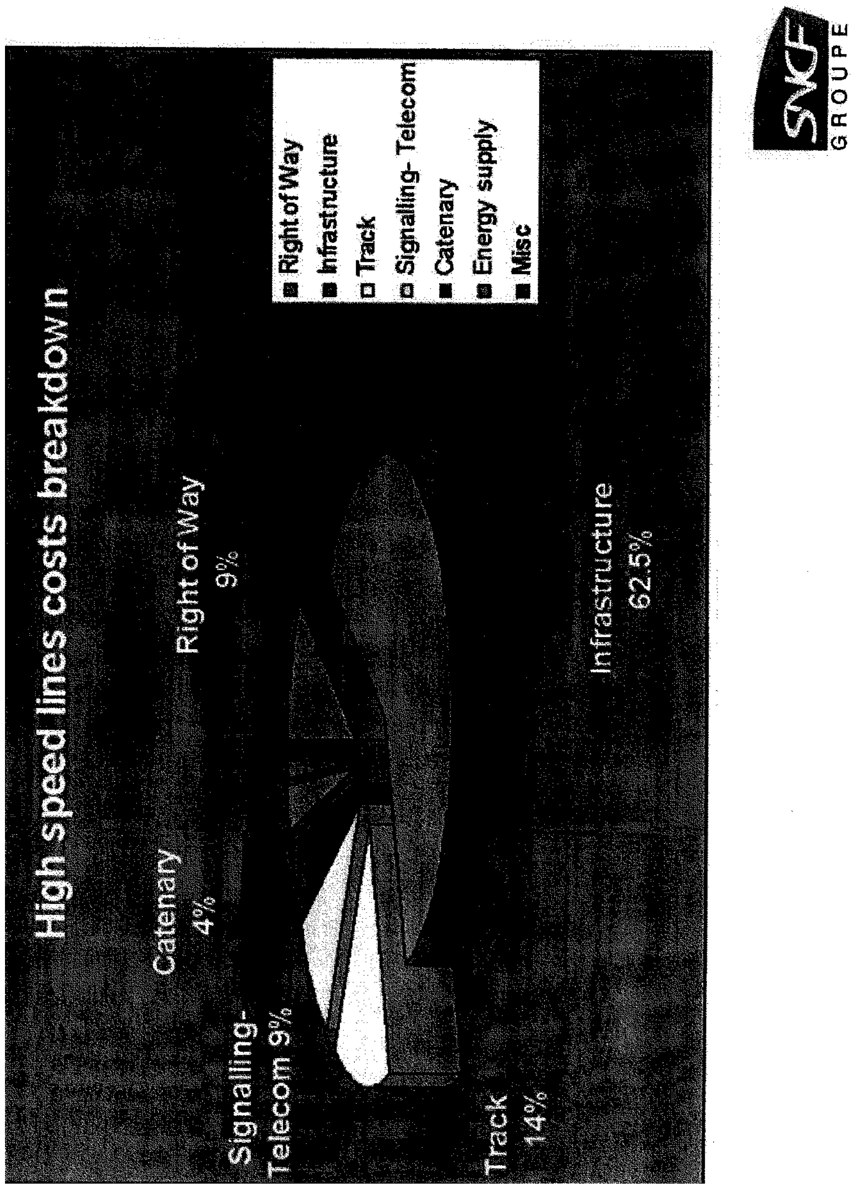
Very dramatic improvements over time: the V150 trainset, which set the world record for steel-wheels-on-steel-track on April 5, 2007 incorporates much more than 20% of new technology compared to the first TGV sets of 1981.

Investment needed to achieve success

The cost of building a new TGV line today is approximately $20 million per mile. This is significantly more than the first Paris-Lyon line that I helped to build, since it was easier to build without densely populated areas to pass through.

In addition, increases in cost are due to the need to comply with environmental protection regulations (noise, access, hydrologic precautions, etc.).

SNCF GROUPE


High speed lines costs breakdow n
Catenary 4%
Right of Way 9%
Signalling-Telecom 9%
Track 14%
Infrastructure 62.5%
Right of Way
Infrastructure
Track
Signalling- Telecom
Catenary
Energy supply
Misc
SNCF GROUPE

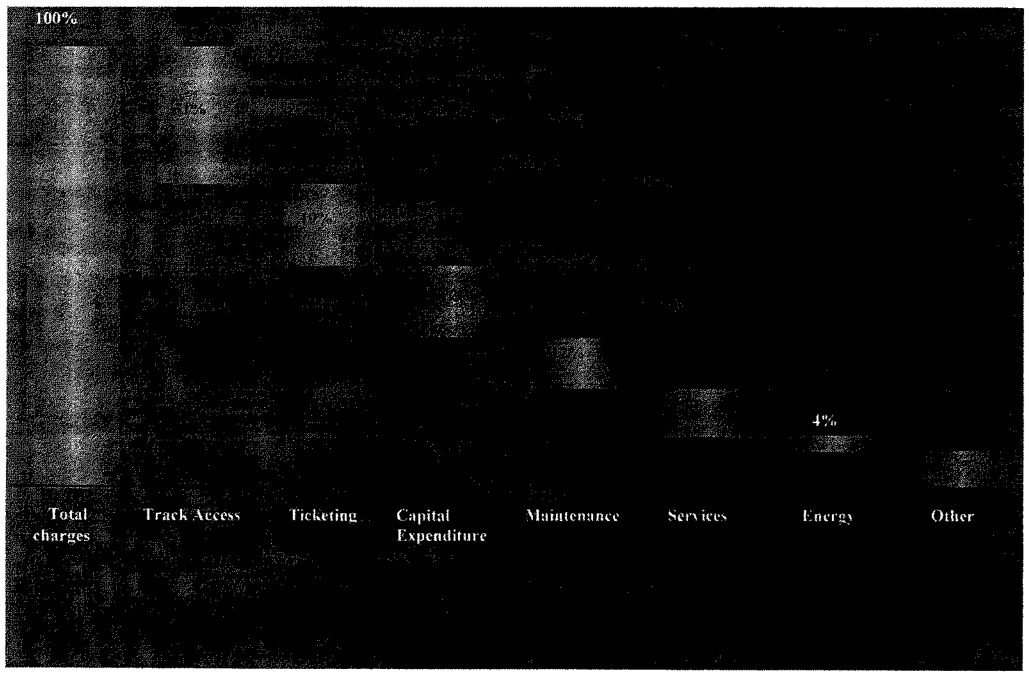
Funding New TGV Lines

In all cases, rolling stock is financed by SNCF. As far as the infrastructure itself is concerned:

1. The first TGV line, Paris Lyon (TGV Southeast) was entirely financed by SNCF itself.
2. TGV Atlantique line (Paris-Tours) benefited from a State subsidy of 30% for "superstructure" (track, catenaries, signaling…),
3. TGV North line (Paris-Lille) was built entirely without any public subsidy, (except for Lille's second station).
4. TGV Mediterranean (extension of Southeast) received a subsidy of 10% of total costs.
5. The most most important example of subsidy is the new TGV East line (Paris-Strasbourg), which was largely paid for – up to 76% - with public funds (National government, EU, and regional cities served).

SNCF GROUPE

Operation Costs Breakdown



Marketing & Sales

To maximize return on this large investment, Railway Companies must not only master technical key factors of success described above but also:

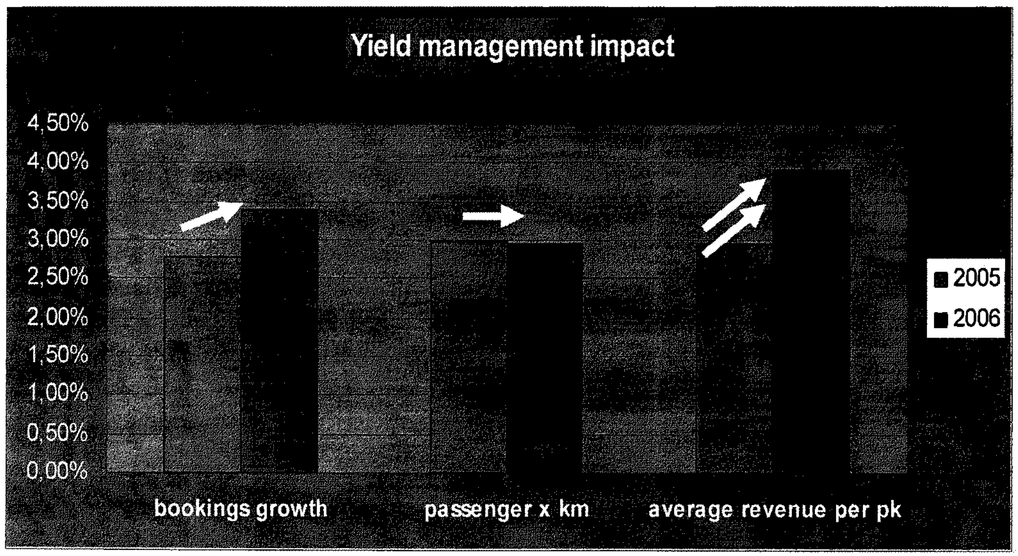
- comprehensive forecasting methods
- marketing and sales strategy, e.g. market knowledge, pricing policy
- and, as mentioned earlier, efficient and user-friendly sales and reservation systems

As example: forecasts and results for TGV South East

	Long-Term Forecast Made in 1969		
YEARS	FORECAST	ACTUAL	ACCURACY
1985 *(YEAR +16)*	15.0 MILLION	15.0 MILLION	
1995 *(YEAR +26)*	19.8 MILLION	20.0 MILLION	

SNCF GROUPE

The main focus must be on constantly analyzing load factor and revenue per seat in order to optimize volume and revenue.

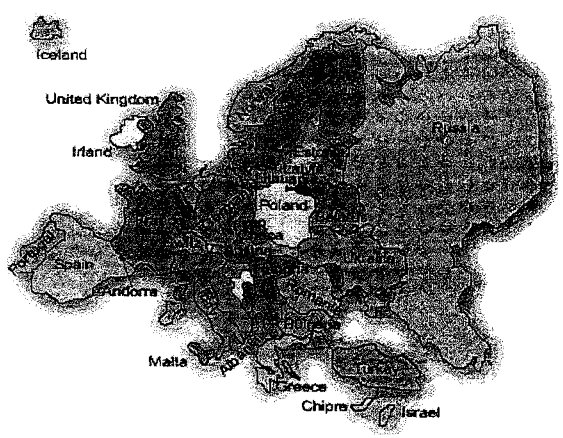


SNCF GROUPE

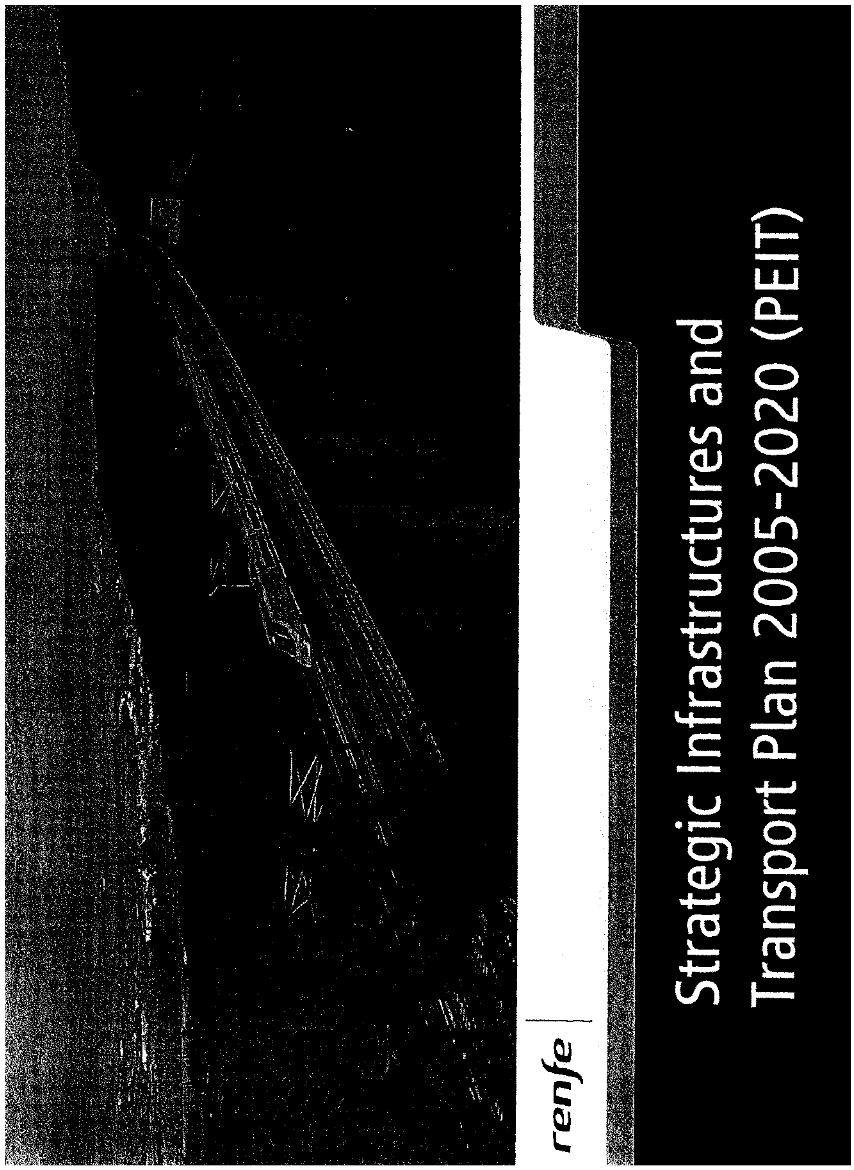

renfe
New Railway Model and
Development of High Speed Services in Spain

renfe

Facts about Spain



- Population: 43.04 millions
- Surface area: 505,997 square Km
- Population density: 85.1 people per square Km
- GDP per capita: 20,838 € (≈28,100 $)
- GDP growth: 3,4% annual
- Roads: 165,646 Km (Motorway: 13,156 Km)
- Railways:
  - General Interest Network: 12,991 Km (1,237 High Speed)
  - FEVE (metric gauge): 1,194 Km
  - Other regional railways: 905 Km


renfe
Strategic Infrastructures and
Transport Plan 2005-2020 (PEIT)

renfe

PEIT - SPANISH STRATEGIC INFRASTRUCTURES AND TRANSPORT PLAN 2005-2020

Main figures

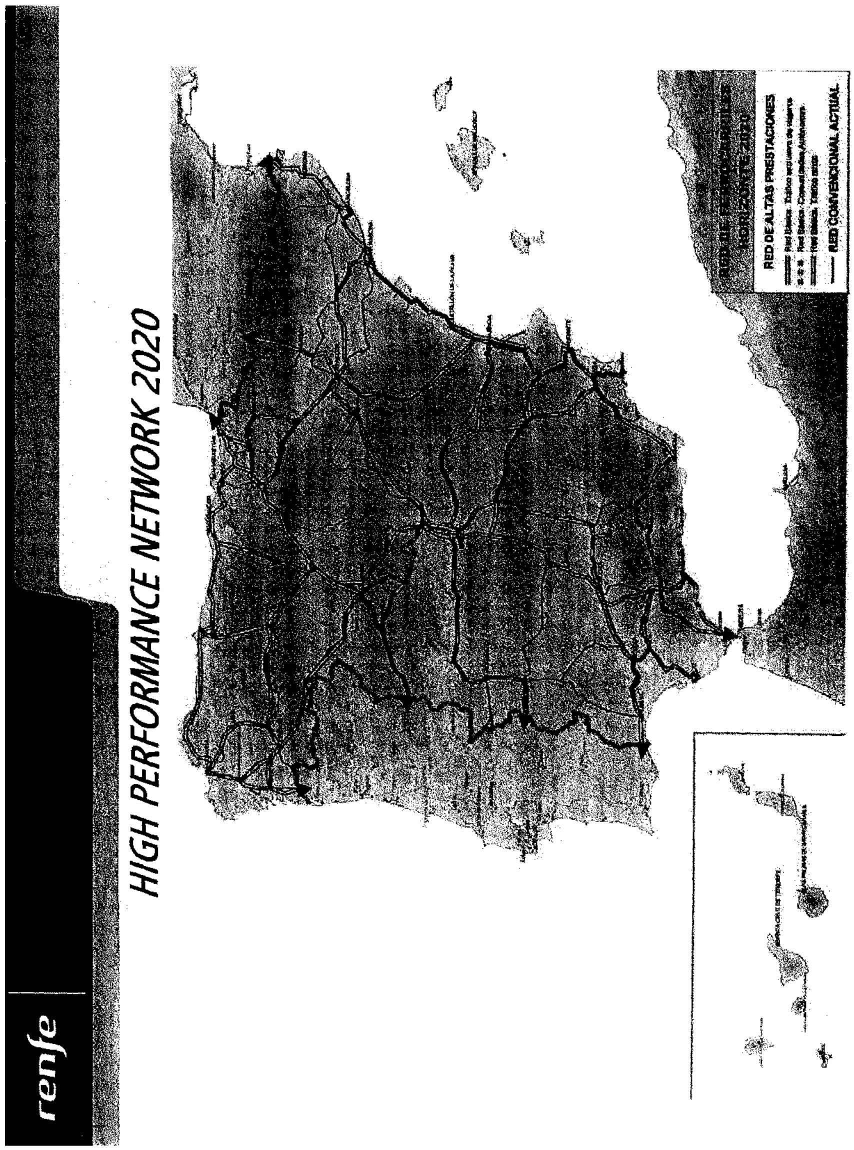
- High Speed Railway Infrastructure
  - Today: 1,237 Km of High Speed Tracks.
  - In 2010: 2,230 Km of High Speed Tracks:
    - First country in the world:
      - ➢ Japan: 2,090 Km
      - ➢ France: 1,893 Km
  - In 2020: 10,000 Km of High Speed or High Performance Tracks
    - 50% of the population will have a High Speed Railway Station in their city.
    - 90% of the population will have a High Speed Railway Station within 50 km.

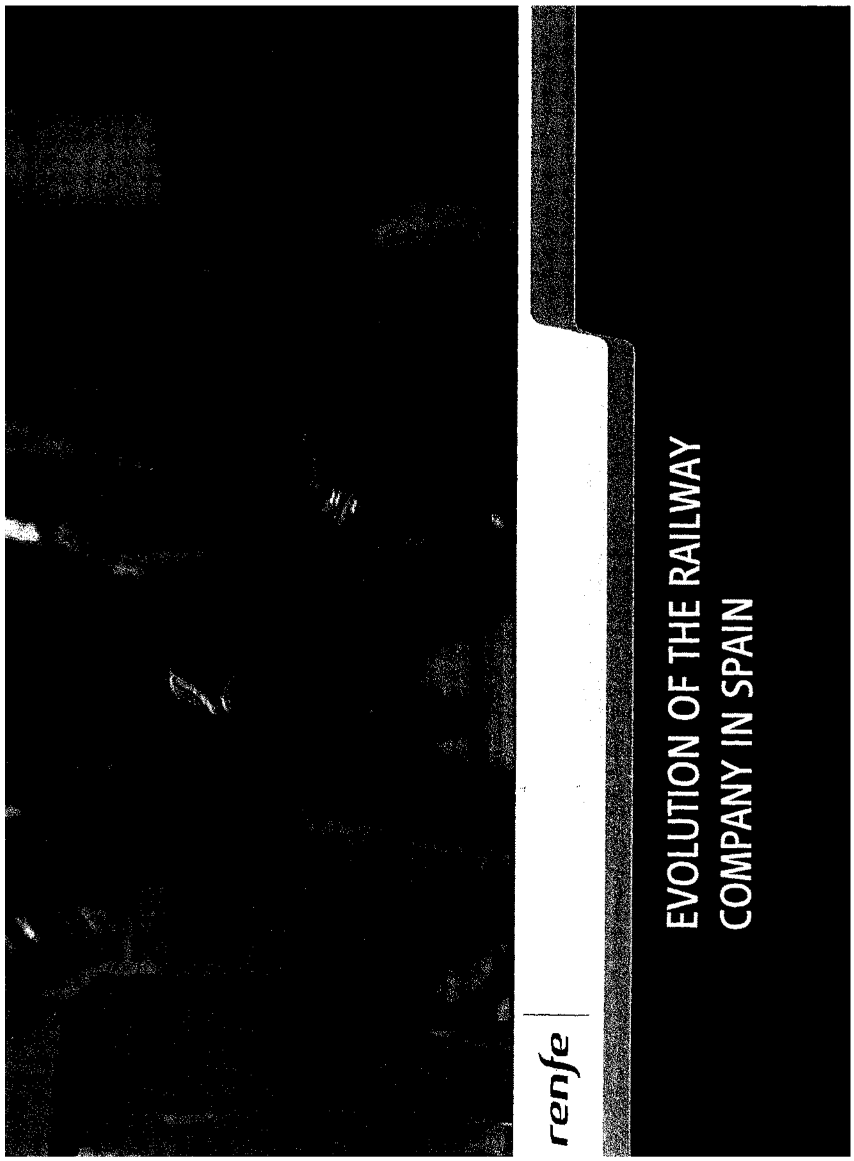
renfe

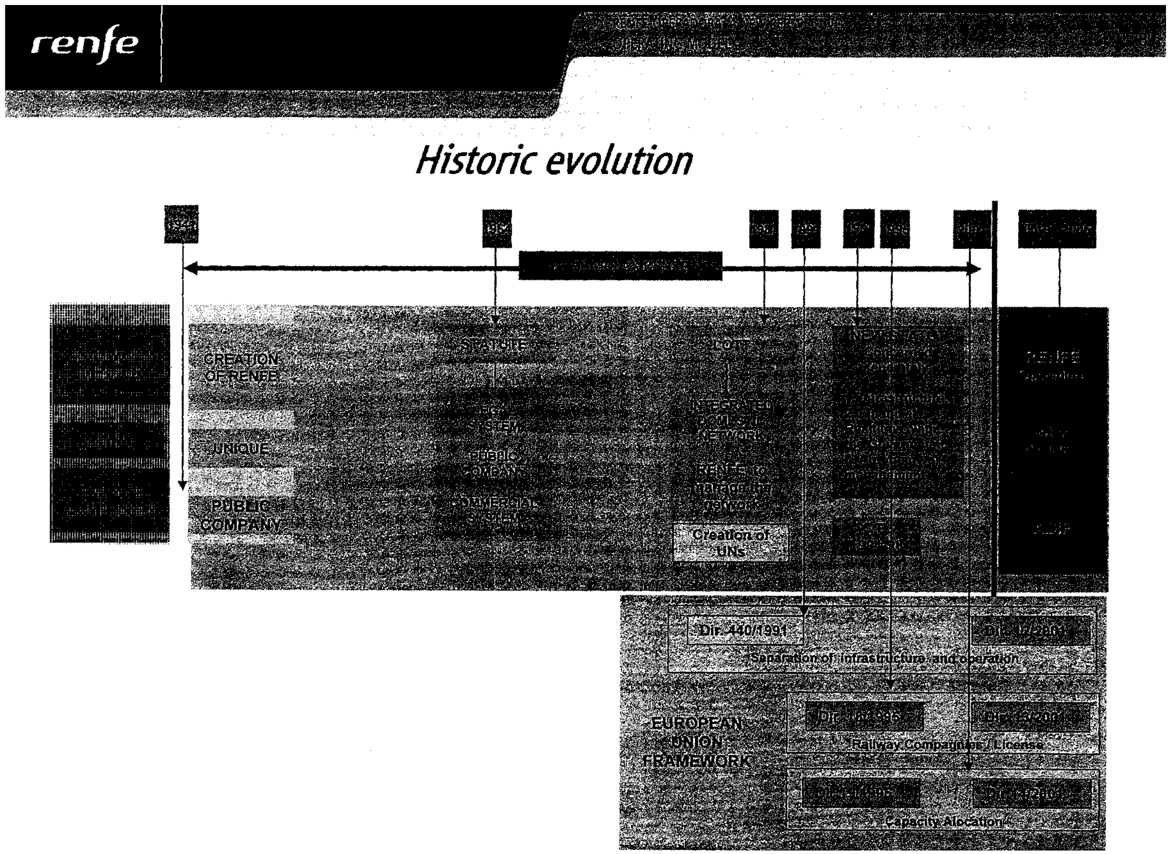
PEIT - SPANISH STRATEGIC INFRASTRUCTURES AND TRANSPORT PLAN 2005-2020

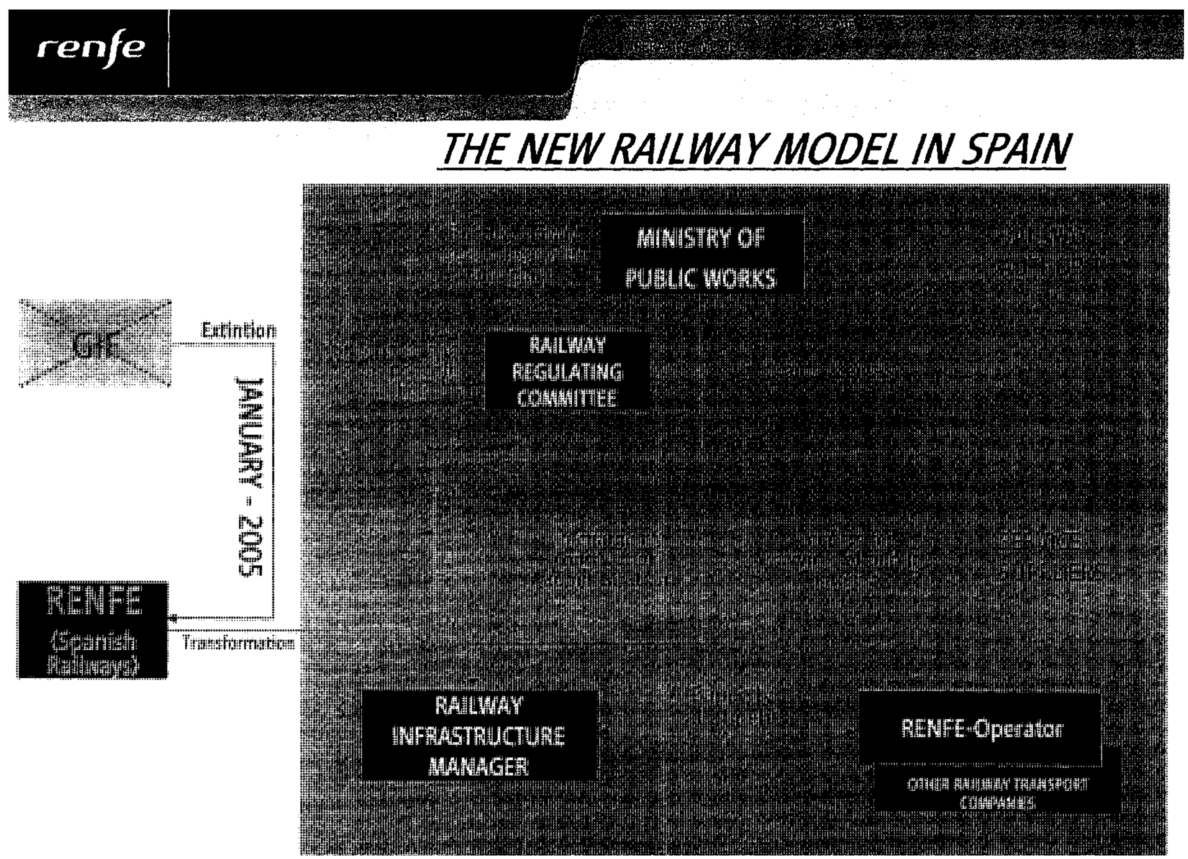
Budget

- PEIT Budget: 241,392 million euros
  - Railways: 115,860 million euros (48% of total PEIT Budget).
  - 80,500 million euros for High Speed or High Performance railway
- PEIT funding sources:
  - Budgetary: 59.5%
  - Non budgetary: 40.5%
  - Railway: 81.4% budgetary, 18.6% non budgetary
- Percentage of GDP allocated to investment in transport infrastructures:
  - 0.5-0.6% of GDP in the mid-eighties
  - 1.7-1.8% of GDP in recent years
  - Forecast 2005-2020; average: 1.5%
  - Investment in transport infrastructures in Spain is today twice the European Union average (between 1.0% and 0.85% of GDP).


renfe
HIGH PERFORMANCE NETWORK 2020
RED DE ALTAS PRESTACIONES
RED CONVENCIONAL ACTUAL

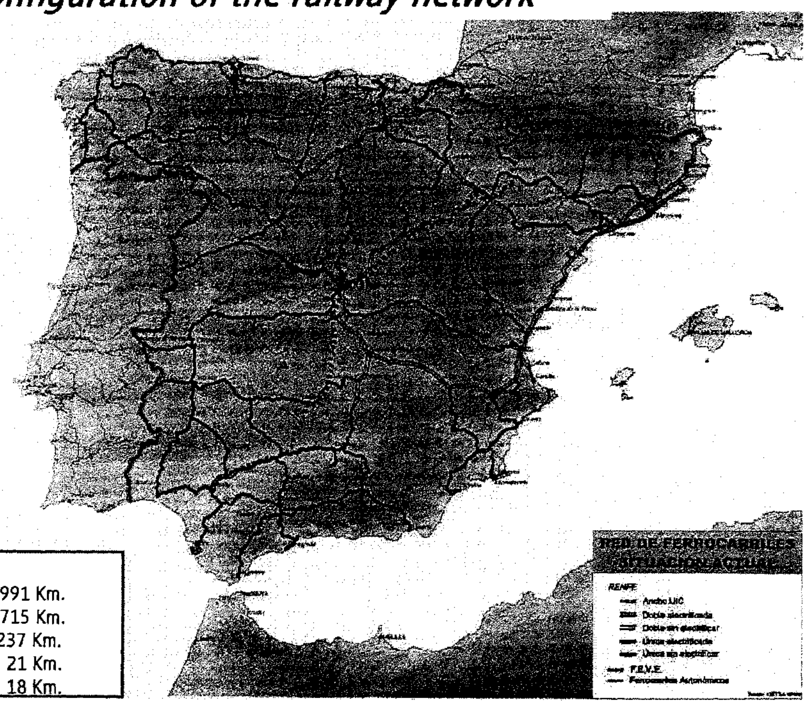

renfe
EVOLUTION OF THE RAILWAY
COMPANY IN SPAIN


renfe
Historic evolution
CREATION OF RENFE
UNIQUE
PUBLIC COMPANY
Creation of UNs
RENFE Operadora
ADIF
EUROPEAN UNION FRAMEWORK
Dir. 440/1991
Separation of infrastructure and operation
Railway Companies' License
Capacity Allocation


renfe
THE NEW RAILWAY MODEL IN SPAIN
MINISTRY OF PUBLIC WORKS
RAILWAY REGULATING COMMITTEE
GIF
Extintion
JANUARY - 2005
RENFE (Spanish Railways)
Transformation
RAILWAY INFRASTRUCTURE MANAGER
RENFE-Operator
OTHER RAILWAY TRANSPORT COMPANIES

renfe

Configuration of the railway network

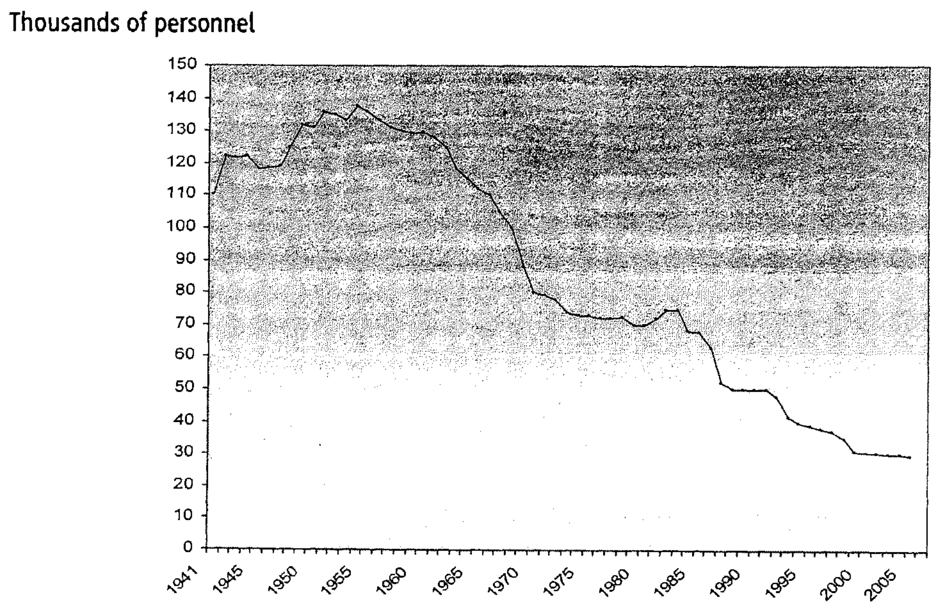


LINES:

Total	12,991 Km.
Conventional	11,715 Km.
UIC Gauge	1,237 Km.
Mixed Network	21 Km.
Metric Gauge	18 Km.

renfe

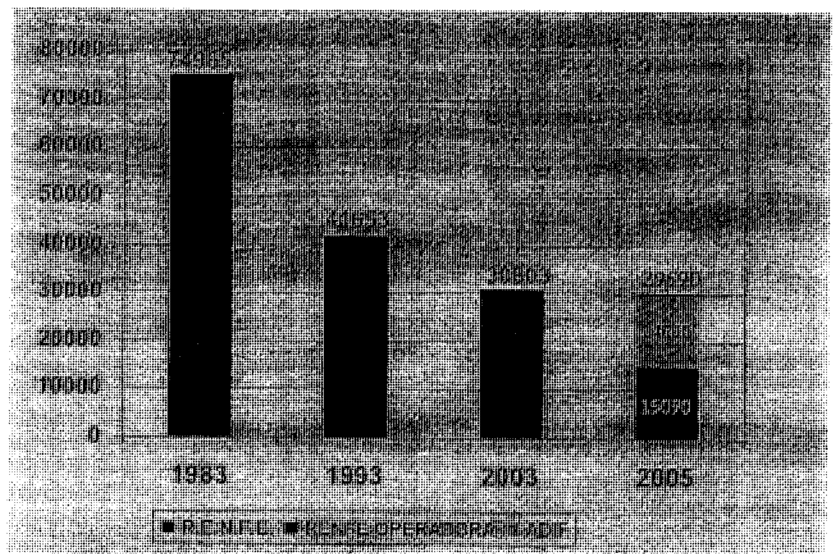
EVOLUTION OF RENFE STAFF

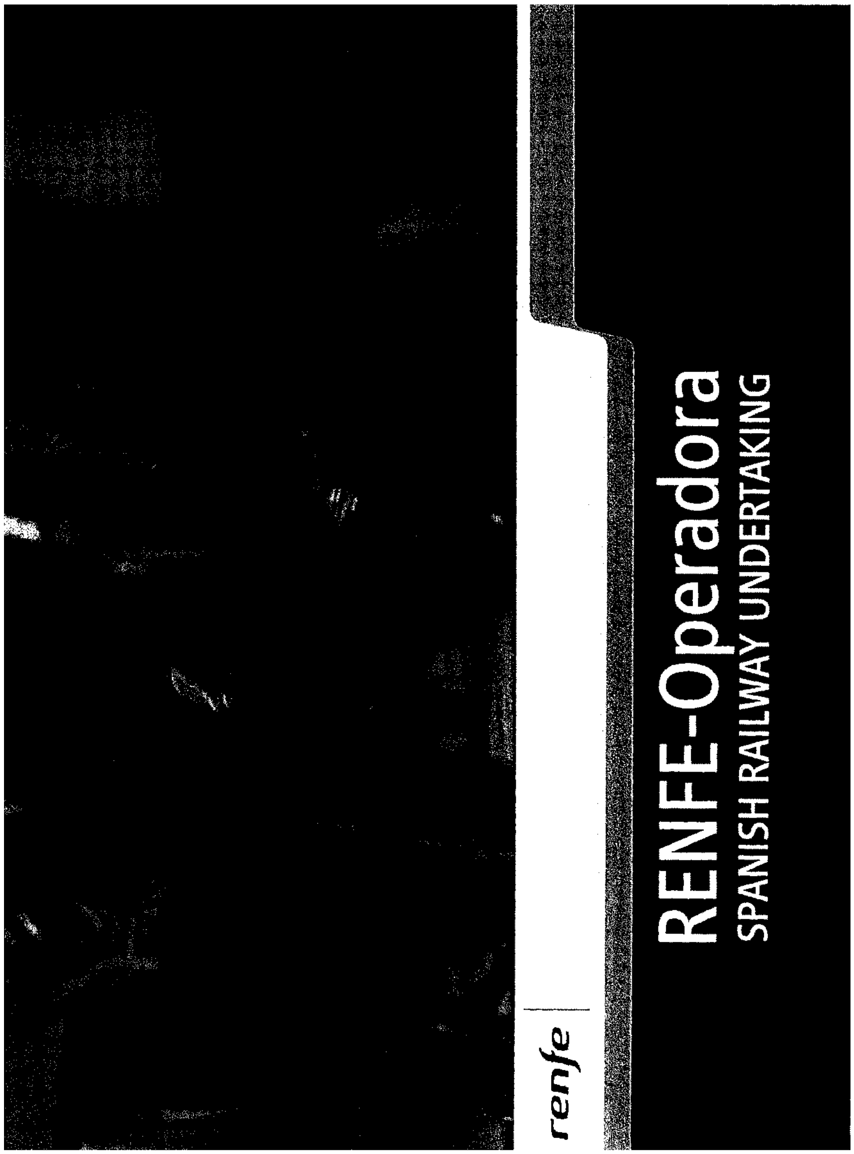


renfe

EVOLUTION OF THE RENFE STAFF IN LAST THREE DECADES

PERSONNEL




RENFE-Operadora
SPANISH RAILWAY UNDERTAKING
renfe

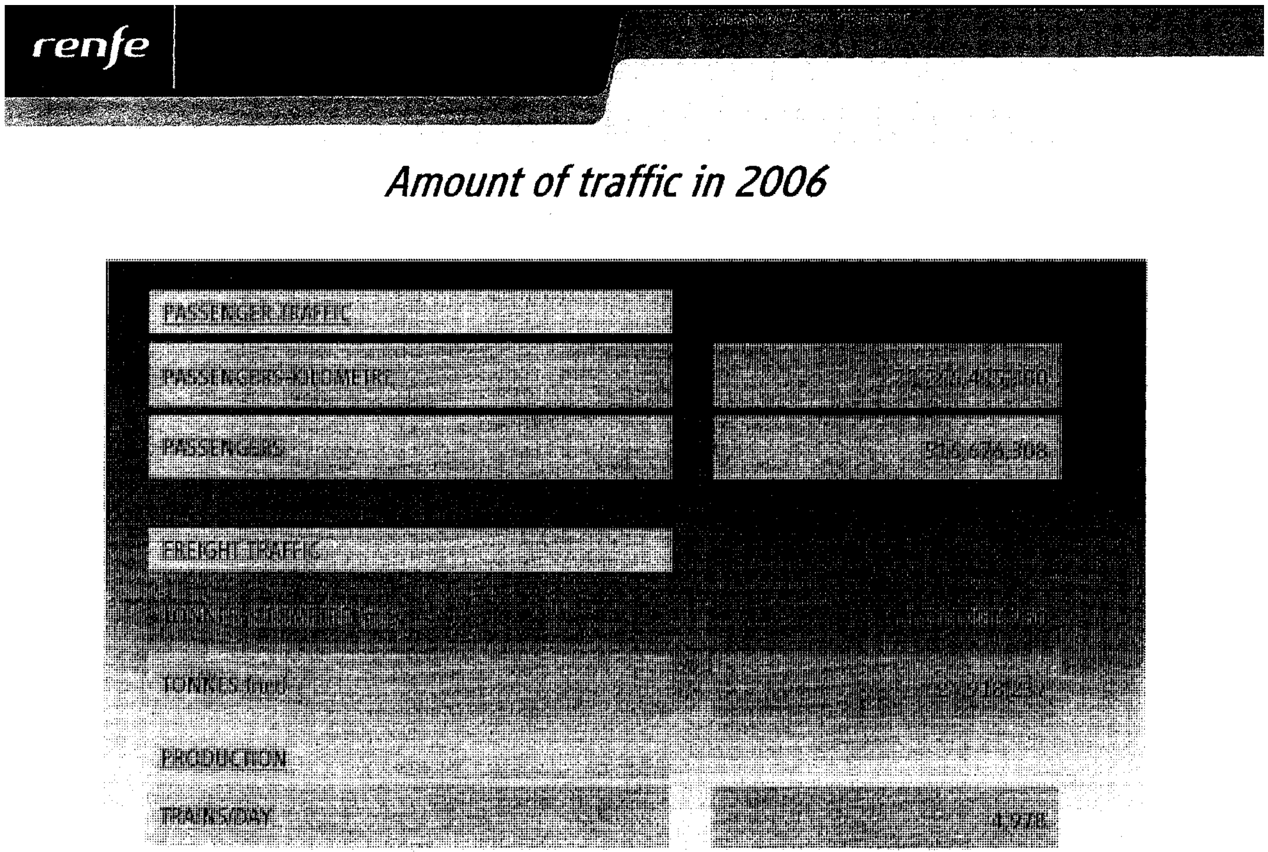
renfe

ORGANIZATIONAL STRUCTURE

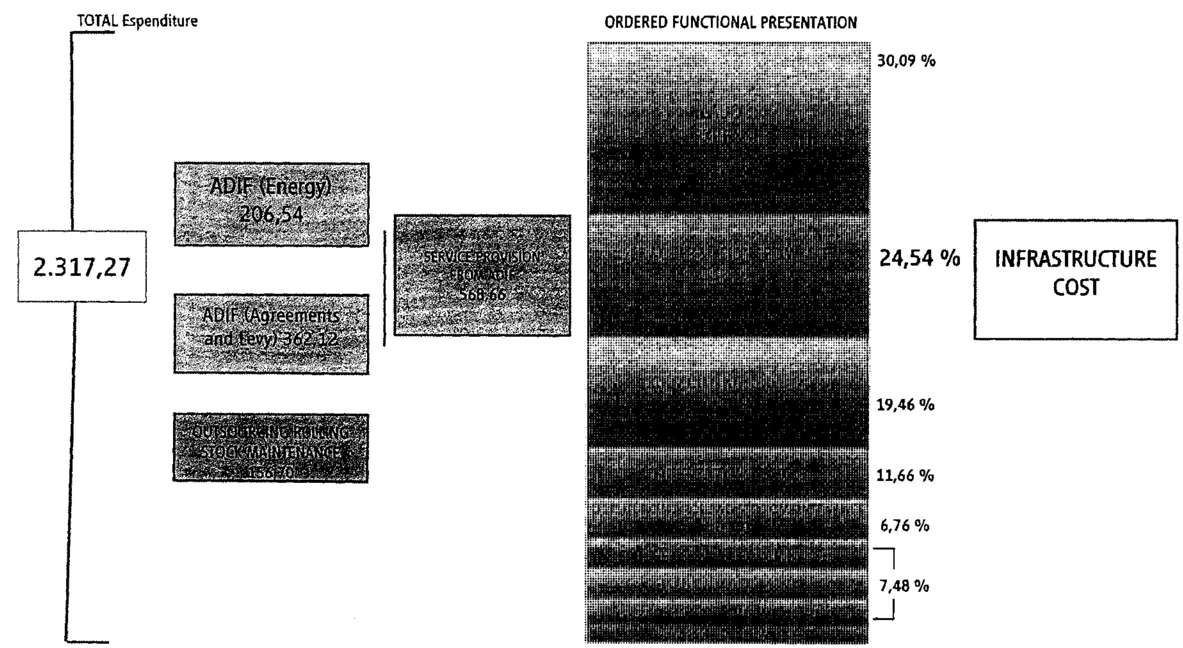
Company model with a corporate centre and with four distinct areas of activity

Renfe-Operator
Railway transport operator in Spain

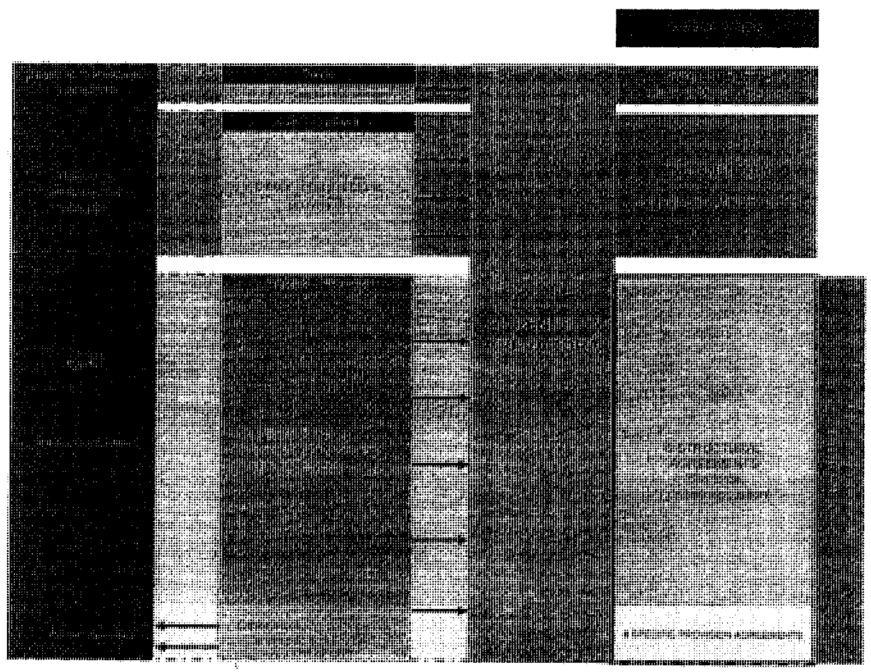
- High Speed Services -Long Distance
- Local Train Services - Medium Distance
- Freight and Logistical Services
- Production and Maintenance


renfe
Amount of traffic in 2006
PASSENGER TRAFFIC
PASSENGERS-KILOMETRE
PASSENGERS
FREIGHT TRAFFIC
TONNES (net)
PRODUCTION
TRAINS/DAY

RENFE EXPENSES AND INFRASTRUCTURE COST



INFRASTRUCTURE PROVISION TO RENFE-OPERADORA



renfe

CONTRACT-PROGRAMME RENFE-GOVERNMENT

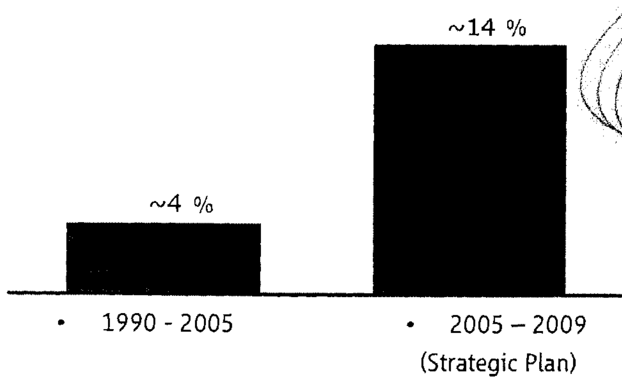
- Objectives
    - Promote the railway development, increasing the market share
    - Increase the quality of service
    - Stimulate safe and environment friendly transport
- Commitments
    - RENFE
        - Adopt measures to limit spending
        - Staff reduction
        - Invest in new trains
        - Limit the company debt
    - GOVERNMENT
        - Allow independent management of the company
        - Make financial contributions for Human Resources Plan and Public Service Transport
        - Allow a limited company debt to fulfill their commitments

renfe

A new Management Model to:

- Ensure the ambitious growth targets set out in the 2005-2009 Strategic Plan

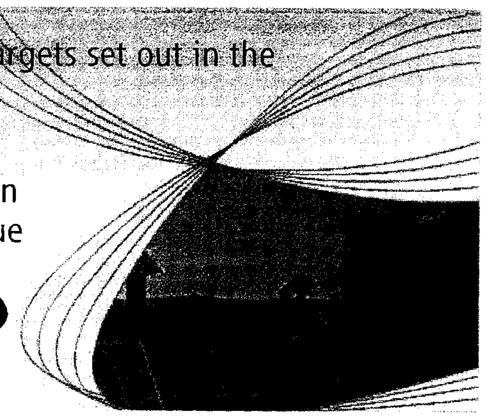
Average annual growth in revenue from traffic



renfe

A new Management Model to:

- Ensure the ambitious growth targets set out in the 2005-2009 Strategic Plan



100 million more passengers	€ 1,100 million more in revenue
+ 19.3 %	+ 79.6%
4 million more tonnes	43 million more Train-Km
+ 13.9%	+ 24.7%

renfe

Key financial-economic parameters

- Mainly in New Trains.-

Total Investment (millions €)	2006	2007	2008	2009	2010	TOTAL
	1,036	1,208	1,249	1,064	1,216	5,772

renfe

Contributions of the State to RENFE-Operadora.

State Contributions (million €)	2006	2007	2008	2009	2010	TOTAL
CURRENT TRANSFERS	558	595	585	491	396	2.624
Compensation to Commuter and Medium Distance services	*301*	*316*	*353*	*347*	*350*	*1.668*
Loss compensation	*227*	*248*	*191*	*100*	*-9*	*757*
Human Resource Plan (Reduction Staff)	*35*	*31*	*41*	*44*	*46*	*197*
CAPITAL CONTRIBUTIONS	404	404	449	479	404	2.140
TOTAL CONTRIBUTION FROM STATE	962	999	1.034	970	800	4.764

Safety.

Accidents/Mill.Km.Train	2006	2007	2008	2009	2010
Rate of Admissible Risk (TRA)	0.072	0.050	0.041	0.030	0.026

EVOLUTION OF RENFE-Operadora STAFF.

	2006	2007	2008	2009	2010
Personnel number	14,888	14,767	14,635	14,476	14,317

renfe

Fares.

Freight:

2006: +3.6%

Yearly average increase for period 2007/2010: 2.1%

Passengers:

Commuter: +5.3%

Medium distance: +4.7%

High Speed / Long Distance: +6.3%

(Many Conventional Long Distance Services will be turned into High Speed Services)

Traffic.

PASSENGERS-KM. (Millions)

	2006	2007	2008	2009	2010
Commuter	8.639	8.844	9.171	9.745	10.399
Medium Distance	3.235	3.352	3.692	4.369	4.657
High Speed – Long Distance	8.631	9.173	12.121	13.195	14.454

TONNES-KM. (Millions)

Freight	11.360	11.708	12.398	12.877	13.371

renfe

Income of RENFE-Operadora (million €)

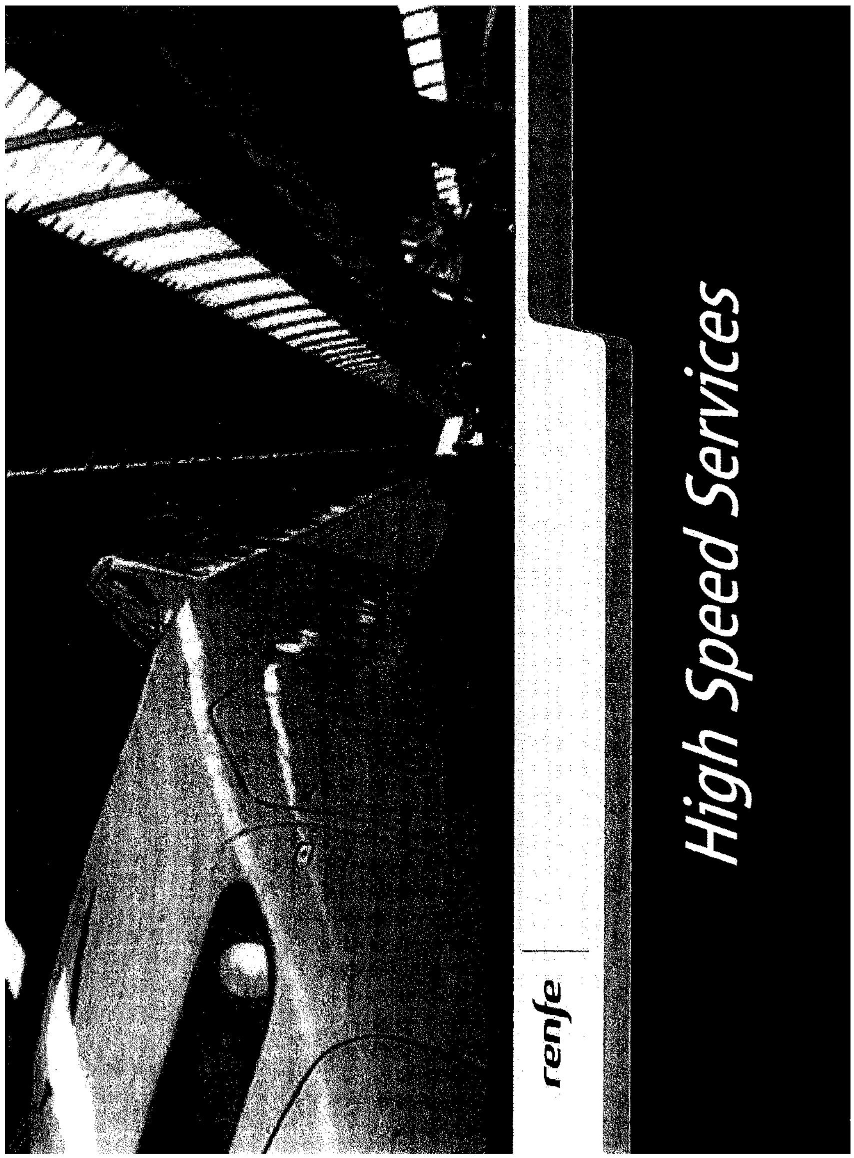
	2006	2007	2008	2009	2010
Traffic income	1,585	1,719	2,216	2,520	2,812
Compensation for Commuter and Medium Distance services	300	326	343	347	350
Other incomes	249	171	340	372	461
TOTAL INCOME:	2,134	2,216	2,899	3,239	3,623

RENFE-Operadora´s Balance Sheet.

(Million euros)

ASSETS	2006	2007	2008	2009	2010
Net assets	4,194	5,118	6,015	6,659	7,396
Establishment expenses	2	2	2	1	1
Non-current assets	173	173	173	173	173
General expenses to distribute	2	2	2	2	2
Current assets	427	430	435	482	434
TOTAL ASSETS:	4,798	5,725	6,627	7,317	8,006

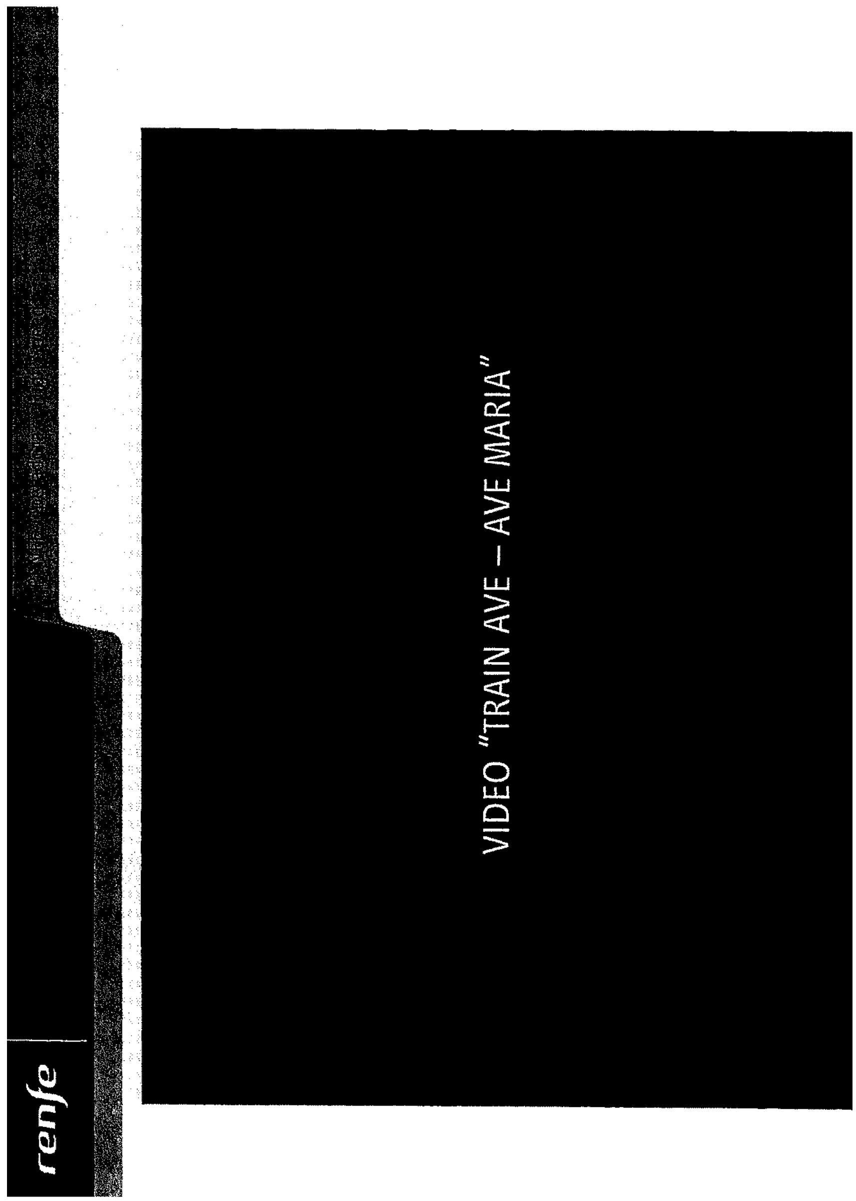
LIABILITIES	2006	2007	2008	2009	2010
Equity	1,639	2,043	2,492	2,971	3,375
Income to distribute	11	10	10	9	9
Provisions	56	58	59	60	61
Bank liabilities	2,258	2,779	3,226	3,391	3,774
Current liabilities	834	835	839	886	787
TOTAL LIABILITIES:	4,798	5,725	6,626	7,317	8,006

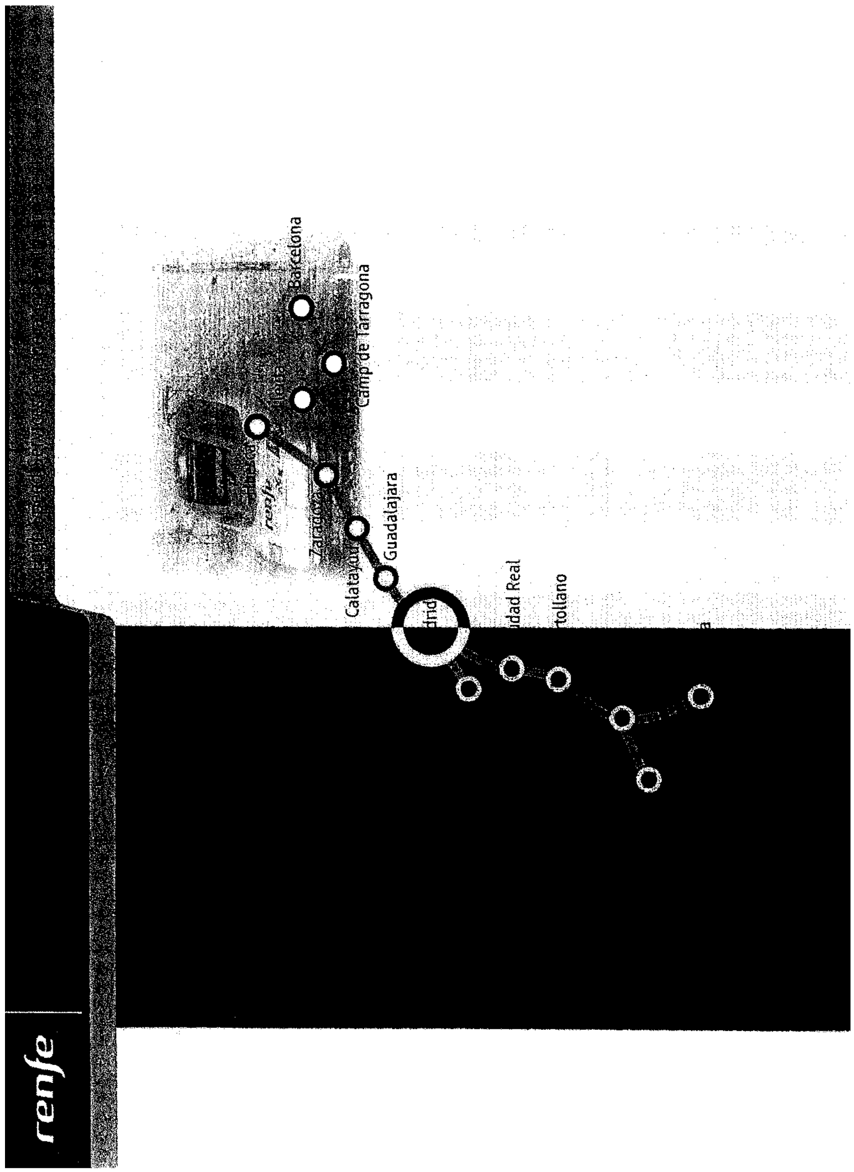

renfe
High Speed Services

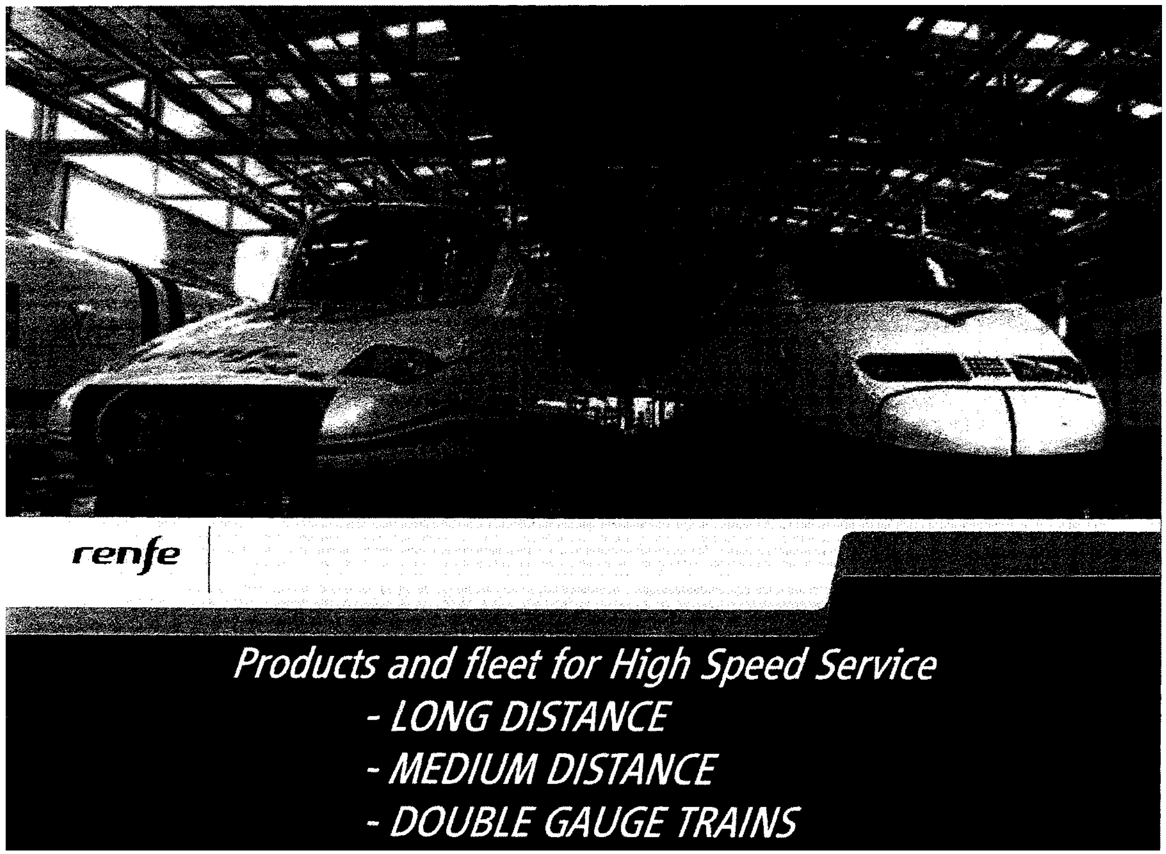
renfe

CHRONOLOGY

- The High Speed Business Unit is created in 1990.
- New approach: clear customer orientation.
- Founded as an integrated system.
- Commercial operations begin on 21 April, 1992.
- AVE infrastructure and traffic are separated at the end of 1993.
- The punctuality commitment is made on 12 September, 1994.
- In 1997, one year before the forecast, it obtains profits for the first time: 391 million pesetas (2.4 million euros).
- In October 1998 AVE obtains the European Quality Prize awarded by the EFQM.

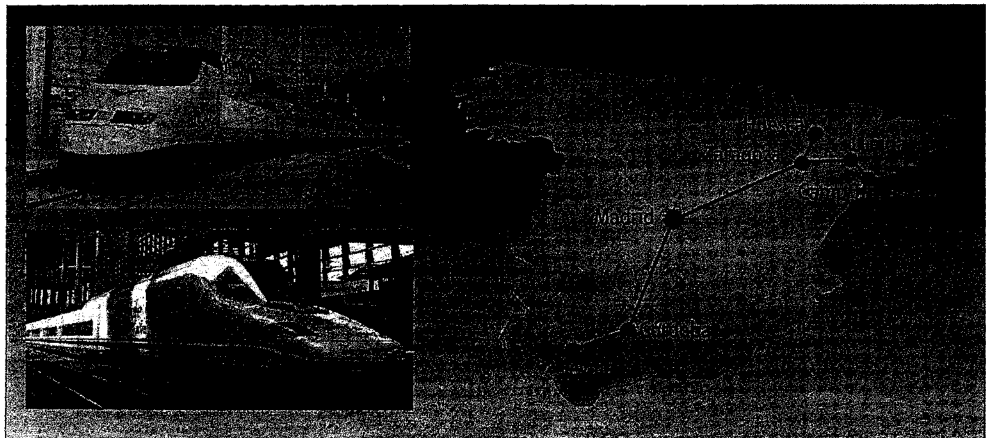

VIDEO "TRAIN AVE – AVE MARIA"
renfe


Barcelona
Camp de Tarragona
Guadalajara
Calatayud
renfe


renfe
Products and fleet for High Speed Service
- LONG DISTANCE
- MEDIUM DISTANCE
- DOUBLE GAUGE TRAINS

renfe

High Speed - Long Distance



Madrid-Córdoba / Sevilla (471 Km.):	(1992-April-21)	2h,20'	(40 trains a day)
Madrid-Zaragoza (307 Km.):	(2003-October-11)	1h,29'	(24 trains a day)
Madrid-Lleida (447 Km.):	(2003-October-11)	2h,20'	(12 trains a day)
Madrid-Huesca (390 Km.):	(2005-April-28)	2h,15'	(4 trains a day)
Madrid-Camp Tarragona (528 Km.):	(2006-December-18)	2h,43'	(16 trains a day)

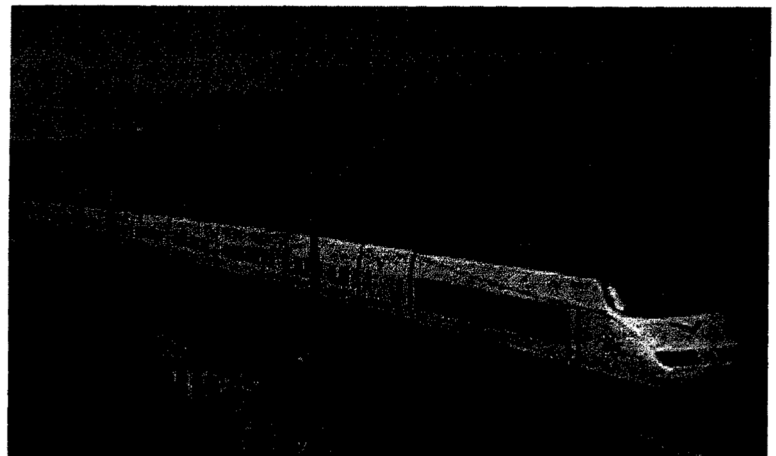
renfe

Services included in the ticket price

	CLUB	BUSINES	TOURIST
Four music channels and earphones	√	√	√
Video	√	√	√
Puzzles for children	√	√	√
Facilities for handicapped	√	√	√
Nursery	√	√	√
A la carte restaurant	√		
Free bar	√		
Catering service	√		
Access to VIP Lounges	√	√	
Daily press and magazines	√	√	
Parking (24 h. single ticket, 48 h. return ticket)	√	√	

renfe

AVE serie 100



Gauge:	1,435 mm
Maximum speed:	300 Km/h
Number of trains:	18
Length:	200 m
Number of seats:	320 (Club: 30, Business class: 78 and Tourist class : 212)
Number of seats for people with reduced mobility (PRM):	2

renfe

AVE Serie 100 - Cafetería

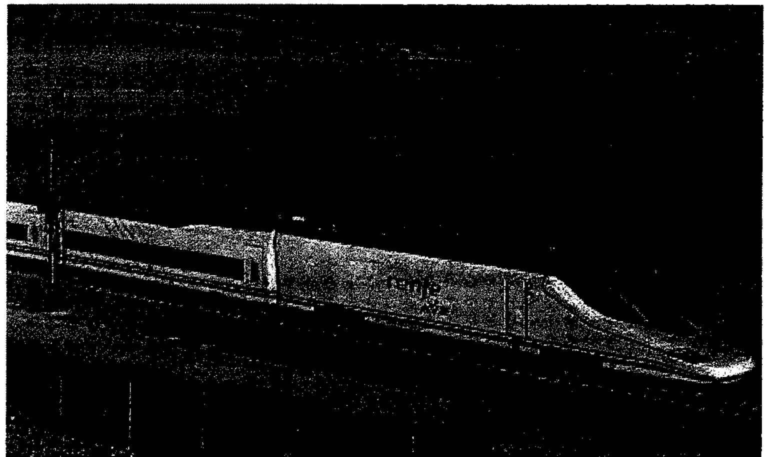
AVE Serie 100 - Tourist class

AVE Serie 100 - Class Club

AVE Serie 100 - Business class

renfe

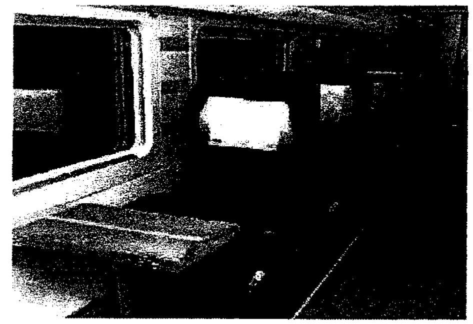
Talgo 350 serie 102



Gauge:	1,435 mm
Maximum speed:	330 Km/h
Number of trains:	16 (+30)
Length:	200 m
Number of seats:	318 (6 Club lounge, 39 Club, 78 Business class, 195 Tourist class)
Number of seats for people with reduced mobility (PRM):	2

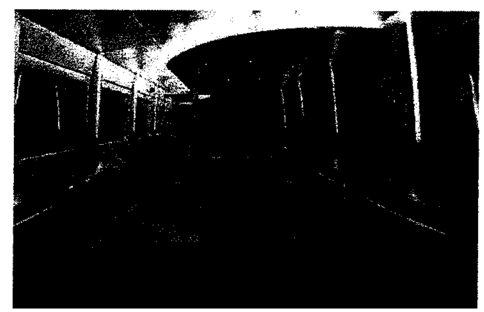
AVE Serie 102 - Class Club

AVE Serie 102 – Business Classs



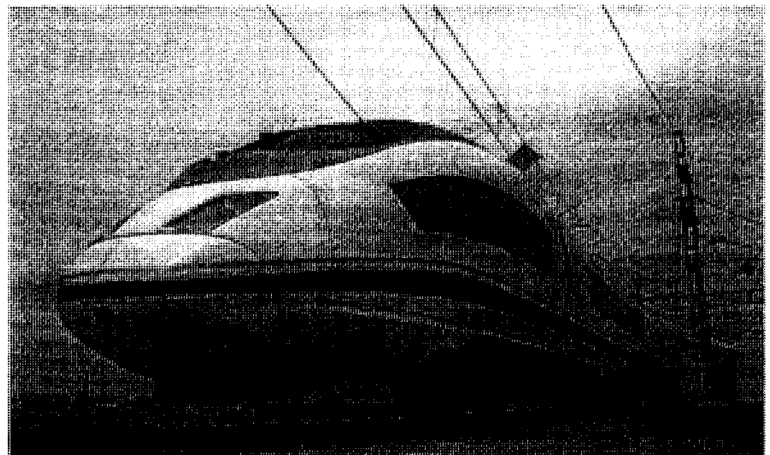
AVE Serie 102 – Tourist Class

AVE Serie 102 - Cafetería



renfe

ICE 350 serie 103



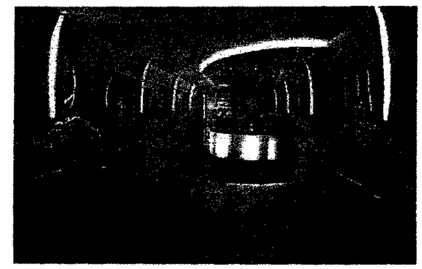
Gauge:	1,435 mm
Maximum speed:	350 Km/h
Number of trains:	16 (+10)
Length:	200 m
Number of seats:	404 (7 Club Lounge, 30 Club, 103 Business, 264 Tourist)
Number of seats for people with reduced mobility (PRM):	2

renfe

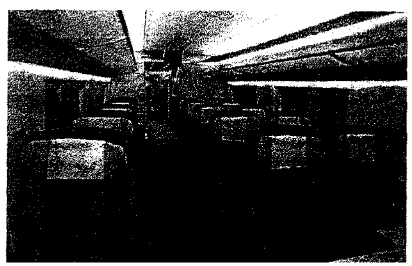
ICE serie 103 - Class Club

ICE serie 103 – Lounge Club and Cabin

ICE serie 103 - Cafetería



ICE serie 103 – Business class

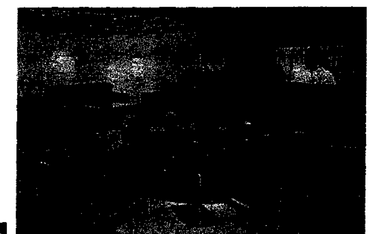


ICE serie 103 - Class Tourist

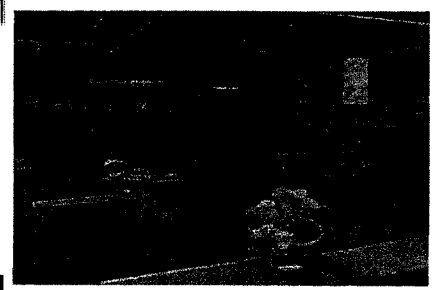
renfe

Madrid Puerta de Atocha AVE Club Lounge

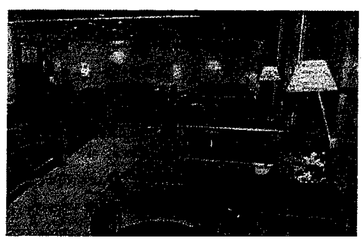
AVE CLUB LOUNGE



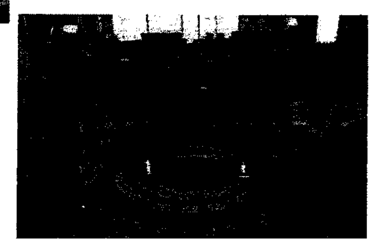
MODERNITY



DESIGN



CONFORT



renfe

High Speed Medium Distance

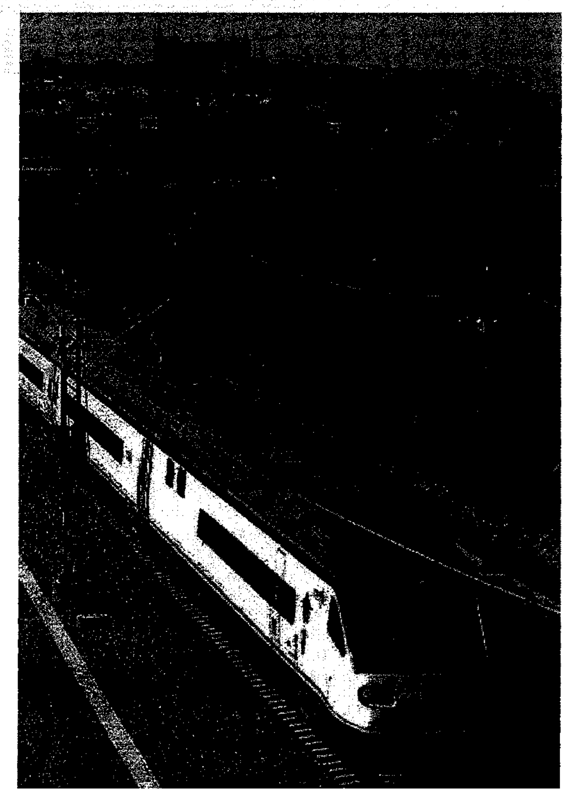
Madrid-Ciudad Real (171 Km.):	1992-October-18	0h:51'	(26 trains a day)
Madrid-Puertollano (210 Km.):	1992-October-18	1h:13'	(26 trains a day)
Córdoba-Sevilla (128 Km.):	2004-December-29	0h:45'	(16 trains a day)
Madrid-Toledo (71 Km.):	2005-November-15	0h:30'	(22 trains a day)

renfe

renfe
Avant

Serie 104

Gauge:	1,435 mm
Maximum speed:	250 Km/h
Number of trains:	20 (+13)
Length:	107 m
Number of seats:	237 (31 Business class, 206 Tourist class)
Number of seats for people with reduced mobility (PRM):	1

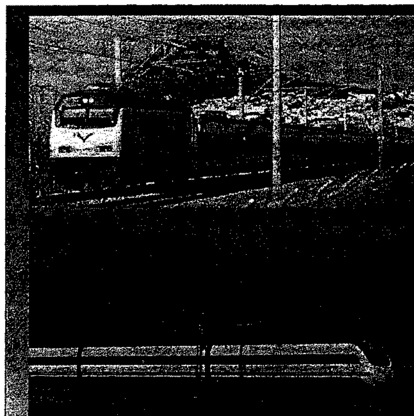


Train serie 104 Tourist clas

Train serie 104 Business Class

renfe

Alvia Serie 120 / Altaria / Talgo 200



TALGO 200	Madrid-Malaga (527 Km.):	(1998-January-1)	3h:47'	(12 trains a day)
ALTARIA	Madrid-Cádiz (626 Km.):	(1993-July-26)	5h:05'	(4 trains a day)
	Madrid-Huelva (586 Km.):	(1993-August-1)	4h:18'	(2 trains a day)
	Madrid-Algeciras (635 Km.):	(1999-June-22)	5h:18'	(4 trains a day)
	Madrid-Barcelona (616 Km.):	(2003-October-11)	4h:30'	(2 trains a day)
ALVIA	Madrid-Barcelona (616 Km.):	(2006-May-17)	3h:55'	(14 trains a day)
ALTARIA	Madrid-Granada (577 Km.):	(2006-December-17)	4h:28'	(4 trains a day)

renfe

Talgo 200

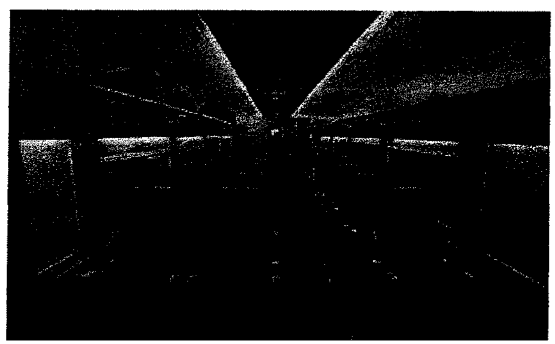
Altaria

Doble Gauge:	1,435 / 1,668 mm
Maximum speed:	200 Km/h
Length:	Variable
Number of seats for type of coach:	Tourist class: 36 Business class: 26
Number of seats for people with reduced mobility (PRM):	1

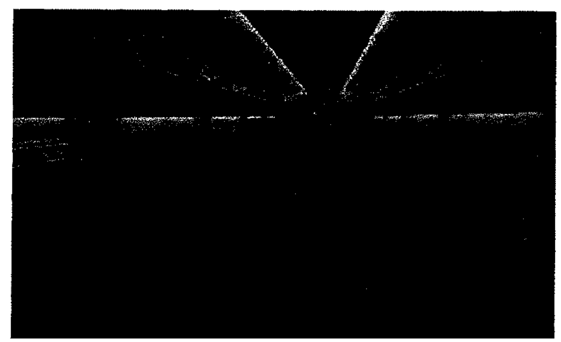
renfe

Altaria - Cafetería

Altaria – Business Class

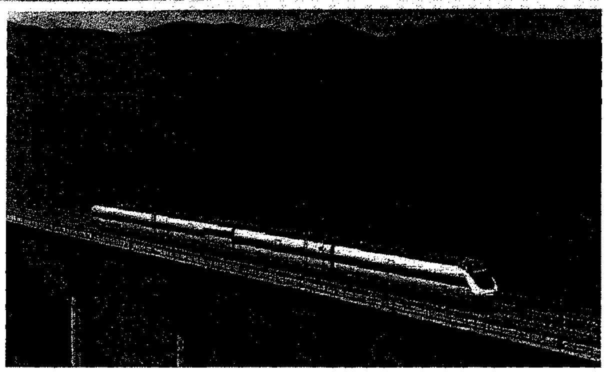


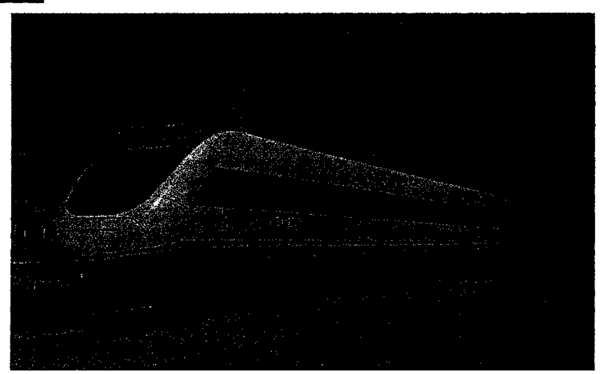
Altaria –Tourist class



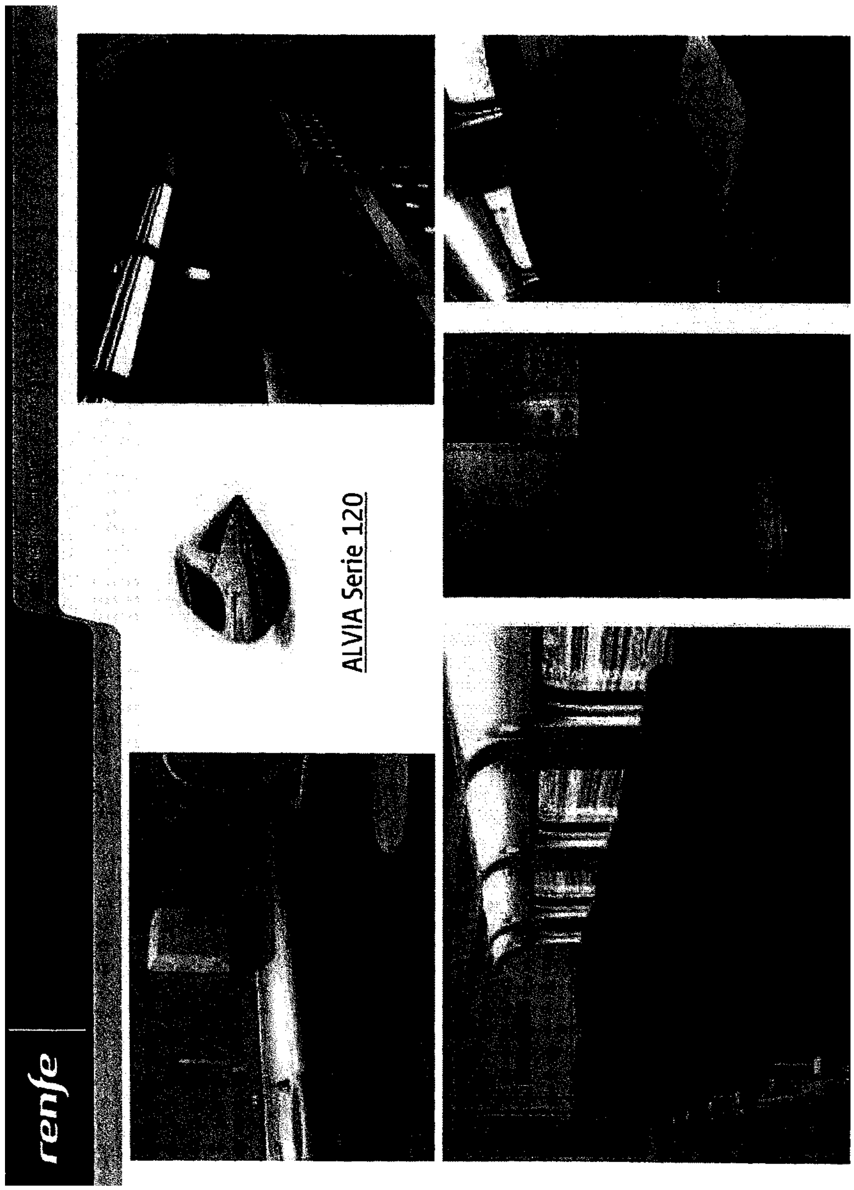
renfe

Alvia-Serie 120



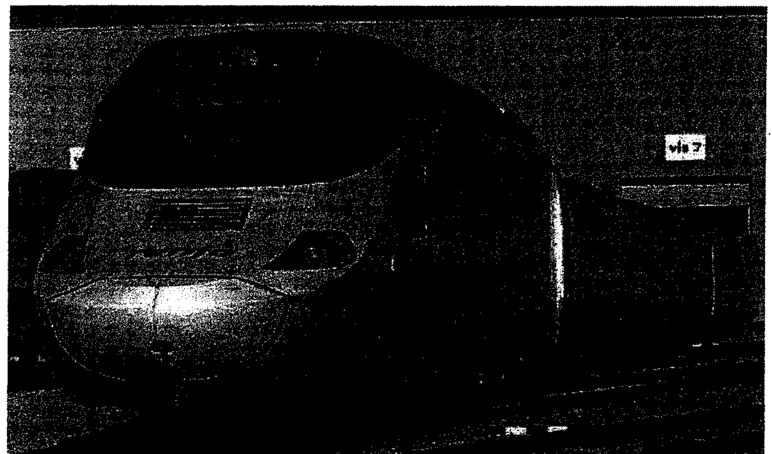


Doble Gauge:	1,435 / 1,668 mm
Maximum speed:	250 Km/h
Number of trains:	12 (+45)
Length:	107 m
Number of seats:	238 (156 Tourist, 82 Business class)
Number of seats for people with reduced mobility (PRM):	1


renfe
ALVIA Serie 120

renfe

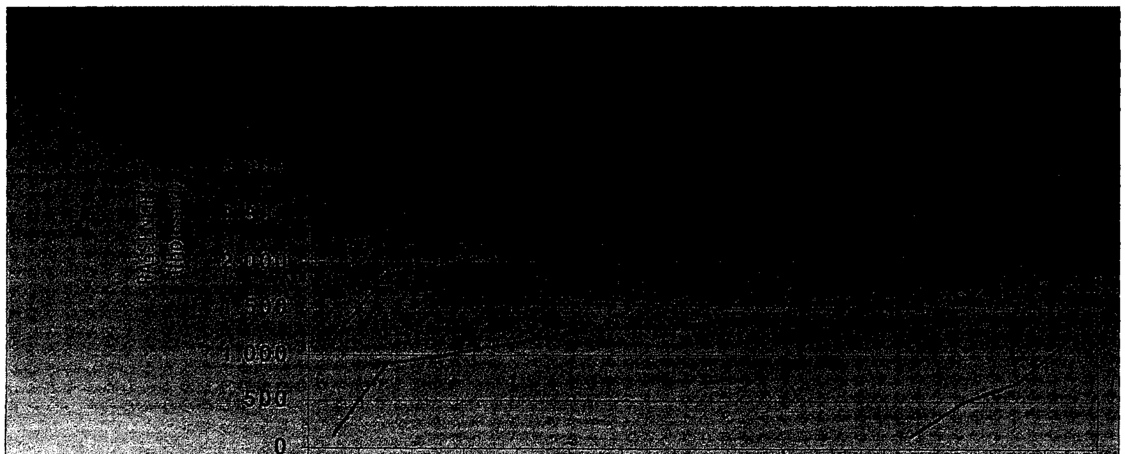
Talgo serie 130



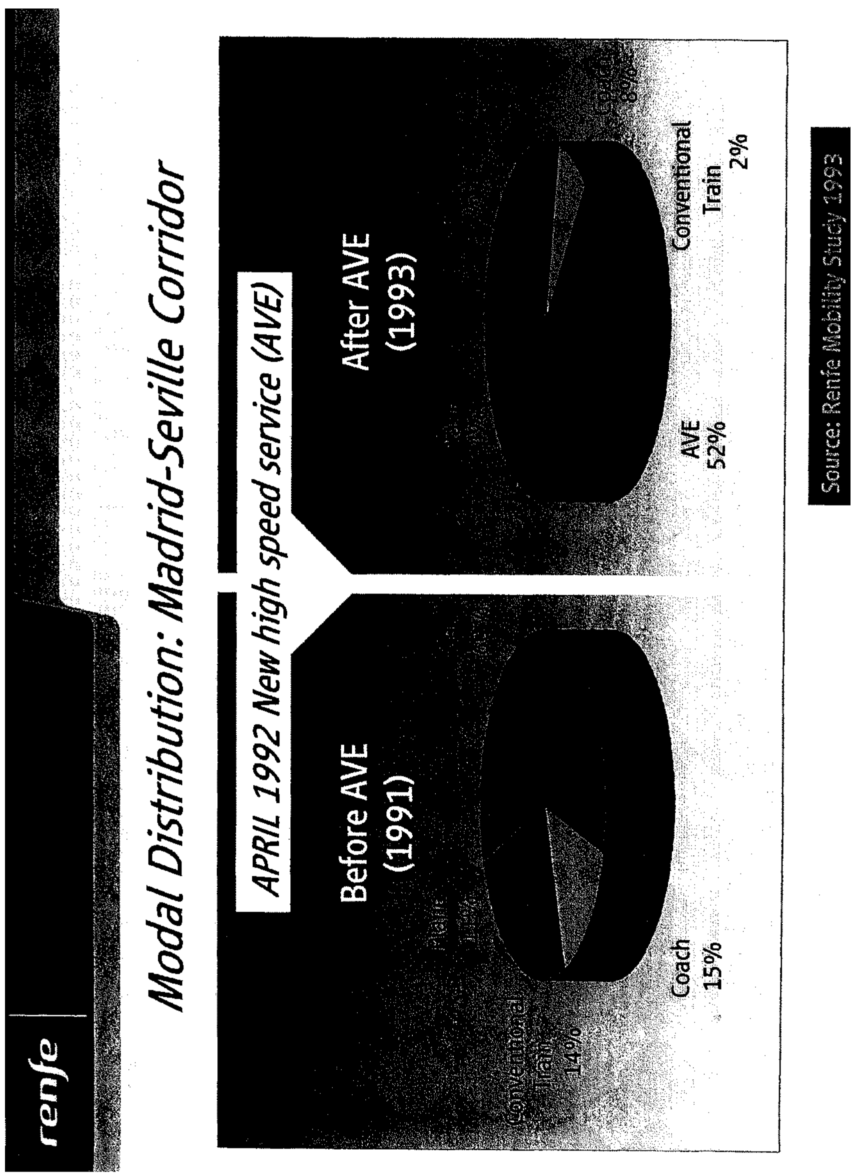
Doble Gauge:	1,435 / 1,668 mm
Maximum speed:	250 Km/h
Number of trains:	45
Length:	181 m
Number of seats:	299 (Business class: 63 and Tourist class : 212)
Number of seats for people with reduced mobility (PRM):	1

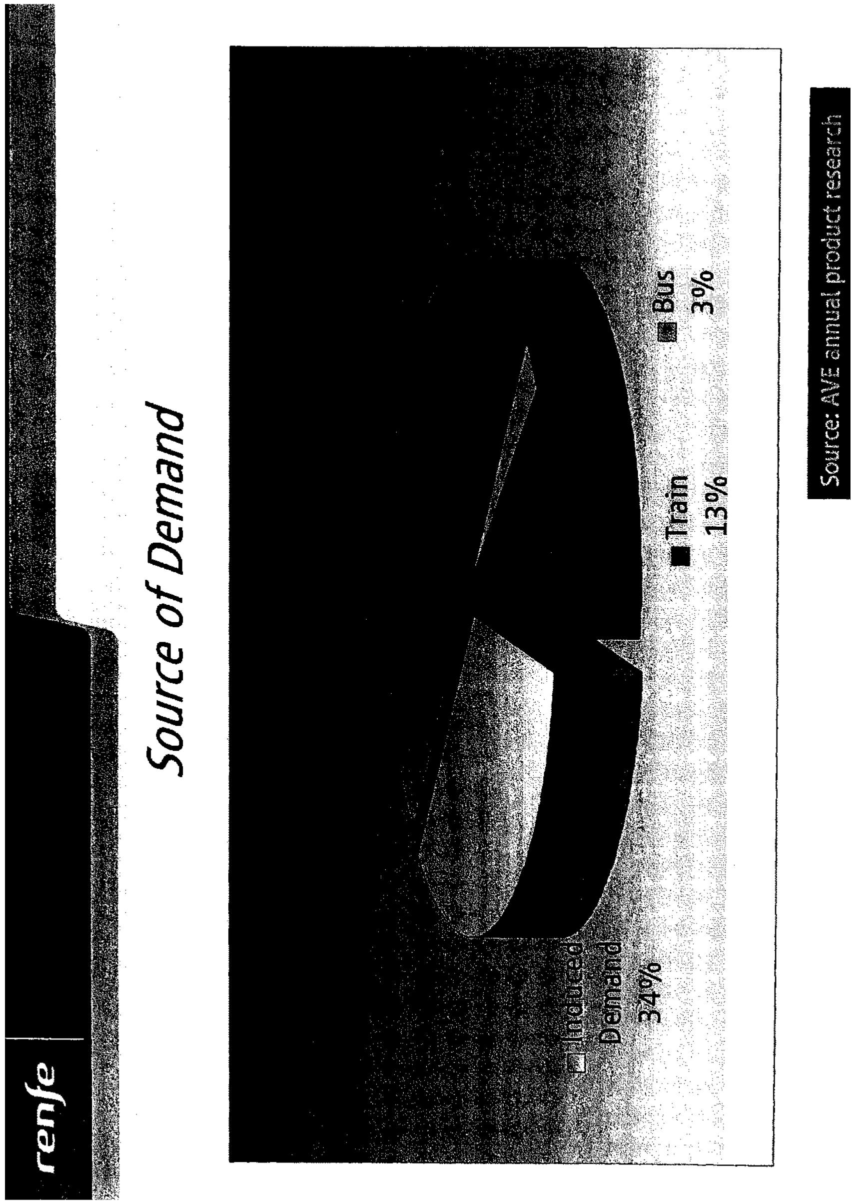
renfe

Evolution of passenger numbers



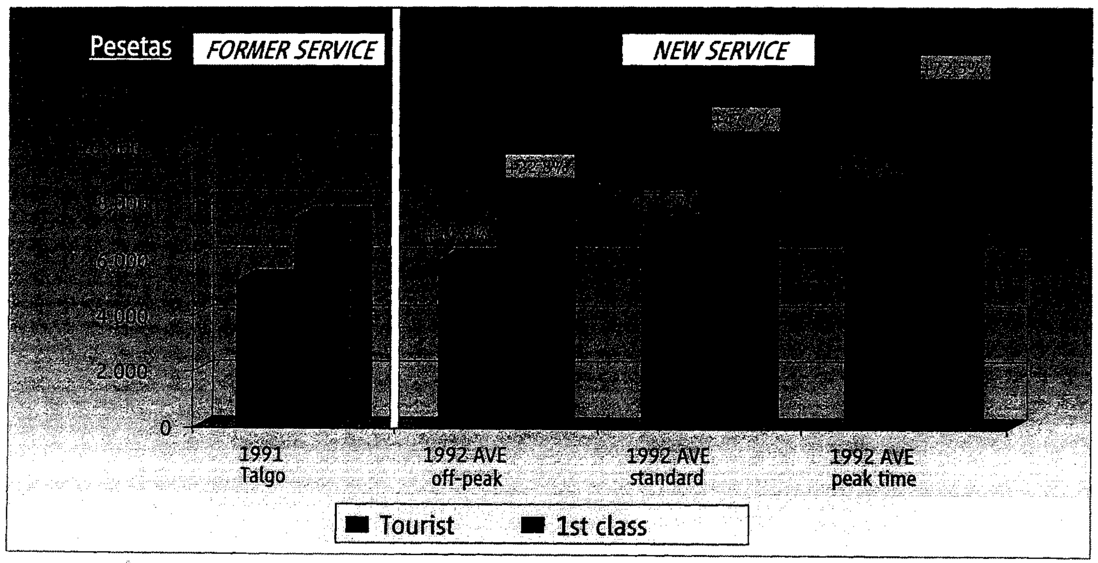
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AVE Seville	1.176	1.875	1.936	2.087	2.207	2.369	2.568	2.805	3.036	3.236	3.394	3.348	3.283	3.419	3.677
AVE Zarag./Huesca/Lleida/C. Tarragona												131	500	701	1.201
AV Medium distance	135	903	977	1.088	1.189	1.270	1.306	1.342	1.412	1.504	1.504	1.534	1.480	2.063	3.289
TOTAL	1.311	2.778	2.913	3.175	3.396	3.639	3.874	4.147	4.448	4.740	4.898	5.013	5.263	6.183	8.167
Increase			4,9%	9,0%	7,0%	7,2%	6,5%	7,0%	7,3%	6,6%	3,3%	2,3%	5,0%	17,5%	32,1%


renfe
Modal Distribution: Madrid-Seville Corridor
APRIL 1992 New high speed service (AVE)
Before AVE
(1991)
After AVE
(1993)
Coach
15%
Conventional
Train
14%
AVE
52%
Conventional
Train
2%
Source: Renfe Mobility Study 1993


renfe
Source of Demand
Induced Demand 34%
Train 13%
Bus 3%
Source: AVE annual product research

renfe

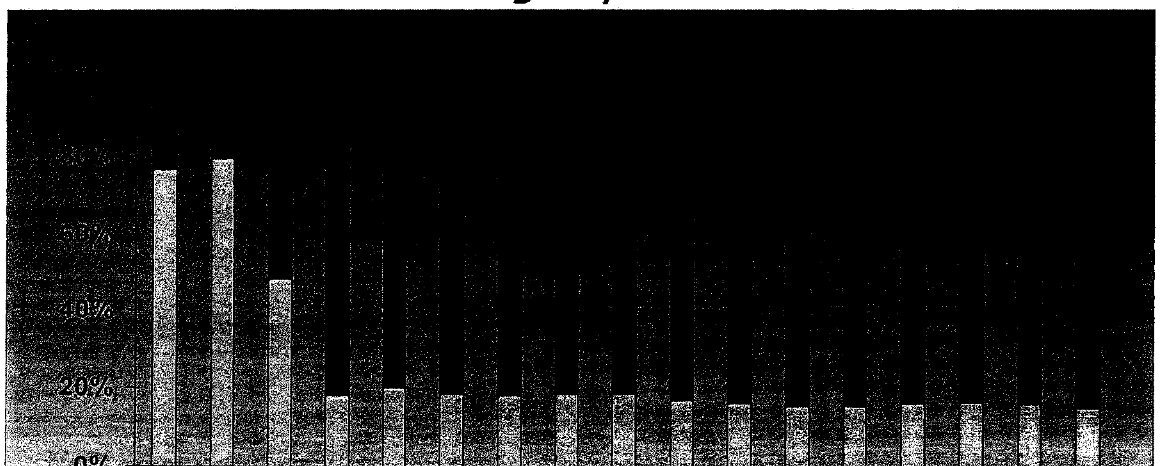
Talgo / AVE Madrid – Seville (471 Km.) Price Evolution



AVE Madrid – Seville Line

renfe

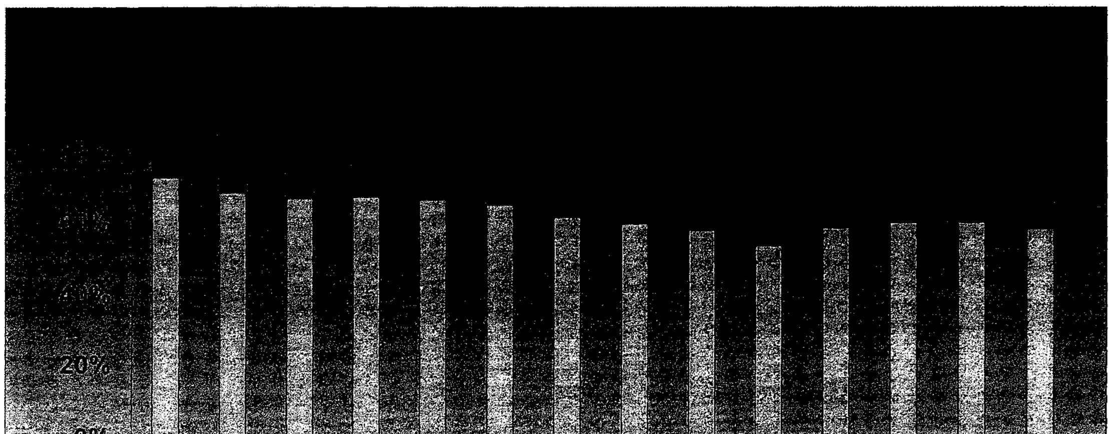
Market Share: Madrid – Seville High Speed



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
■ Train	23,7%	20,7%	51,6%	81,6%	80,0%	81,2%	81,6%	81,5%	81,2%	82,9%	83,4%	84,2%	84,1%	83,4%	83,2%	83,5%	84,4%
□ Plane	76,3%	79,3%	48,4%	18,4%	20,0%	18,8%	18,4%	18,5%	18,8%	17,1%	16,6%	15,8%	15,9%	16,6%	16,8%	16,5%	15,6%

renfe

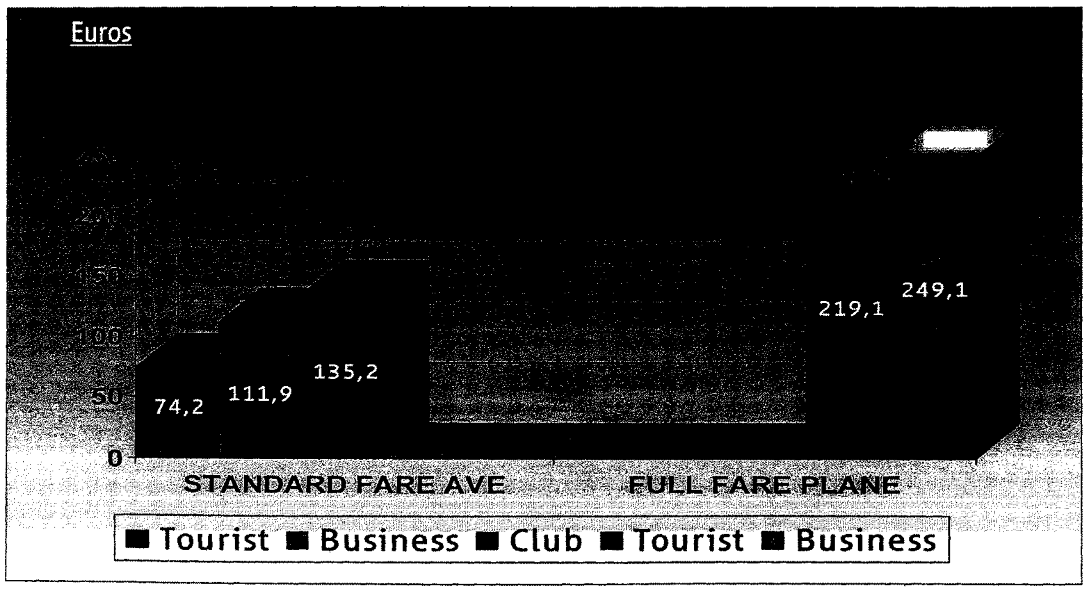
Market Share: Madrid – Málaga
Service - 200 Km/h.



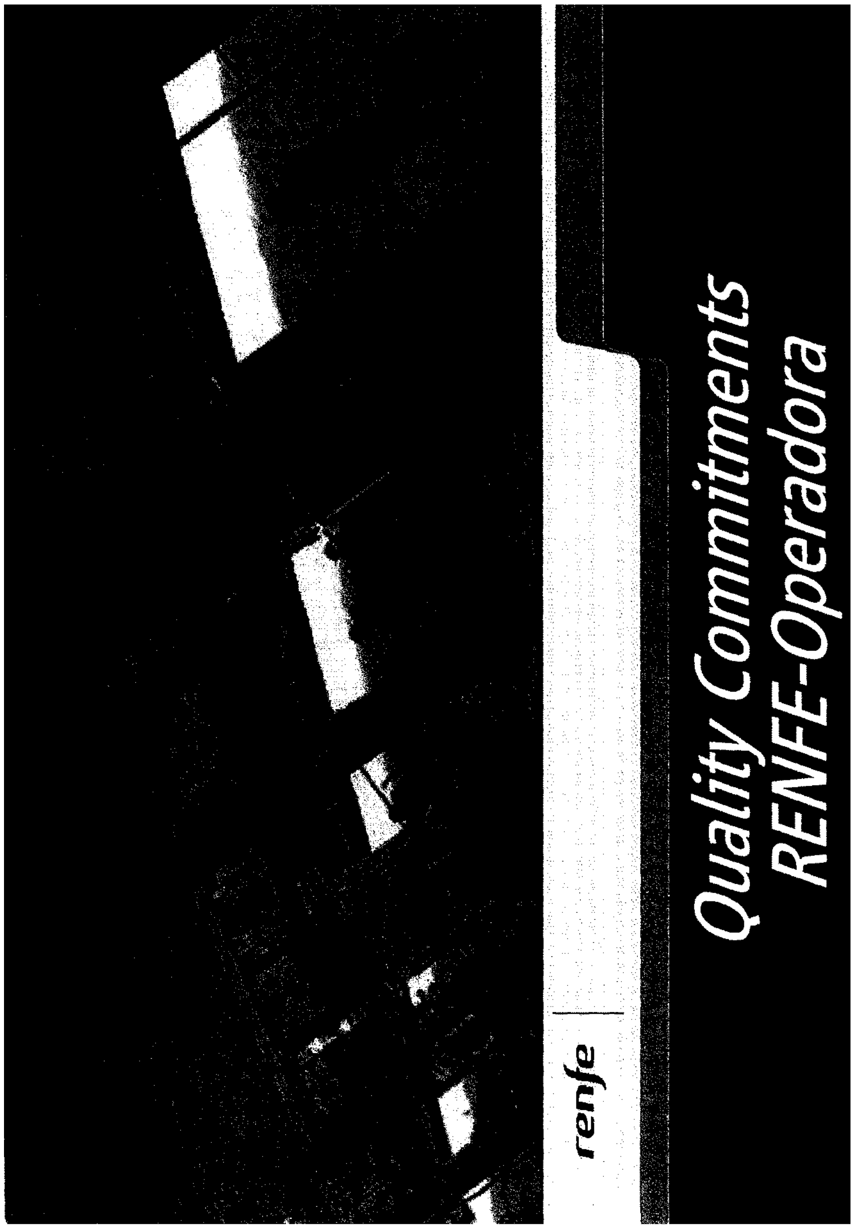
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
■ Train	27,5%	31,6%	33,1%	32,7%	33,6%	34,9%	38,6%	40,3%	42,1%	46,3%	41,6%	39,9%	40,1%	41,7%
▨ Plane	72,5%	68,4%	66,9%	67,3%	66,4%	65,1%	61,4%	59,7%	57,9%	53,7%	58,4%	60,1%	59,9%	58,3%

renfe

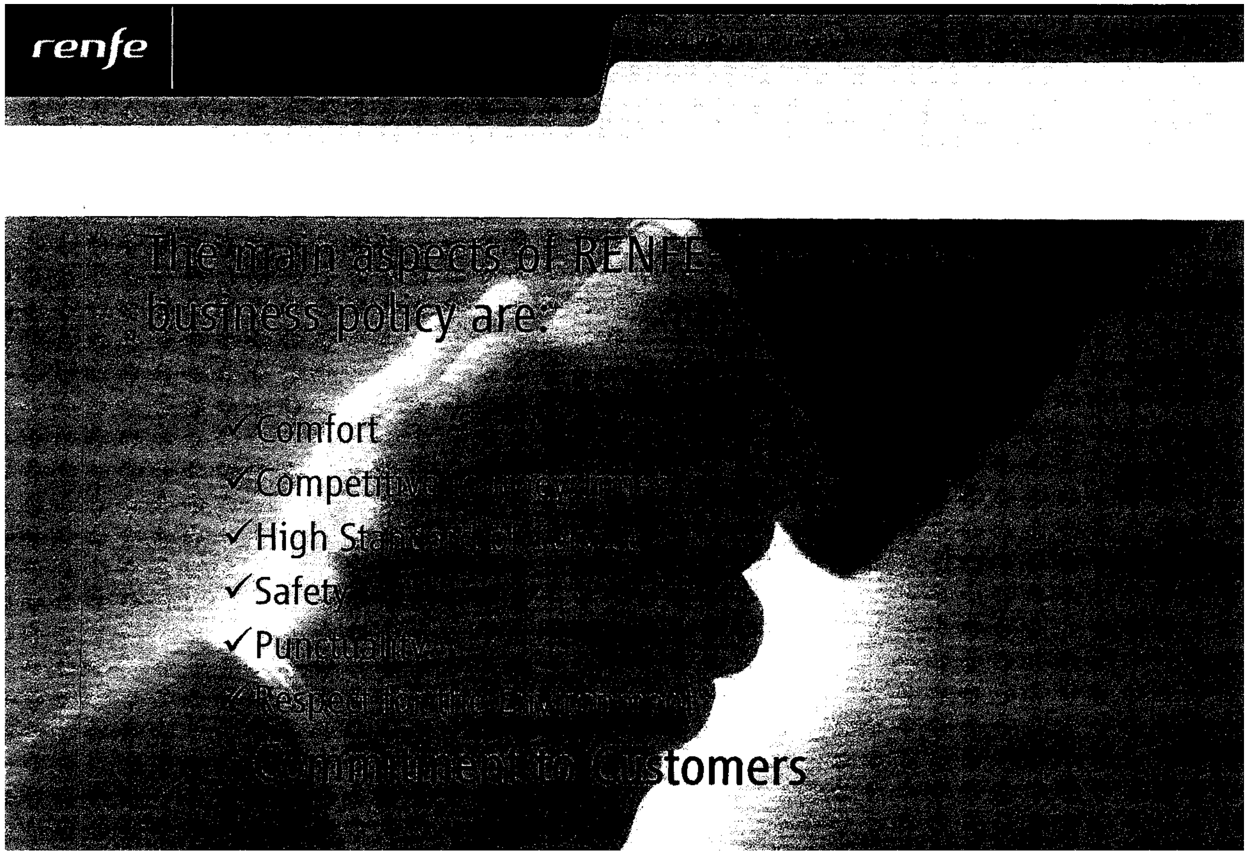
2007 Prices (AVE / Plane) Madrid-Seville (471 Km)

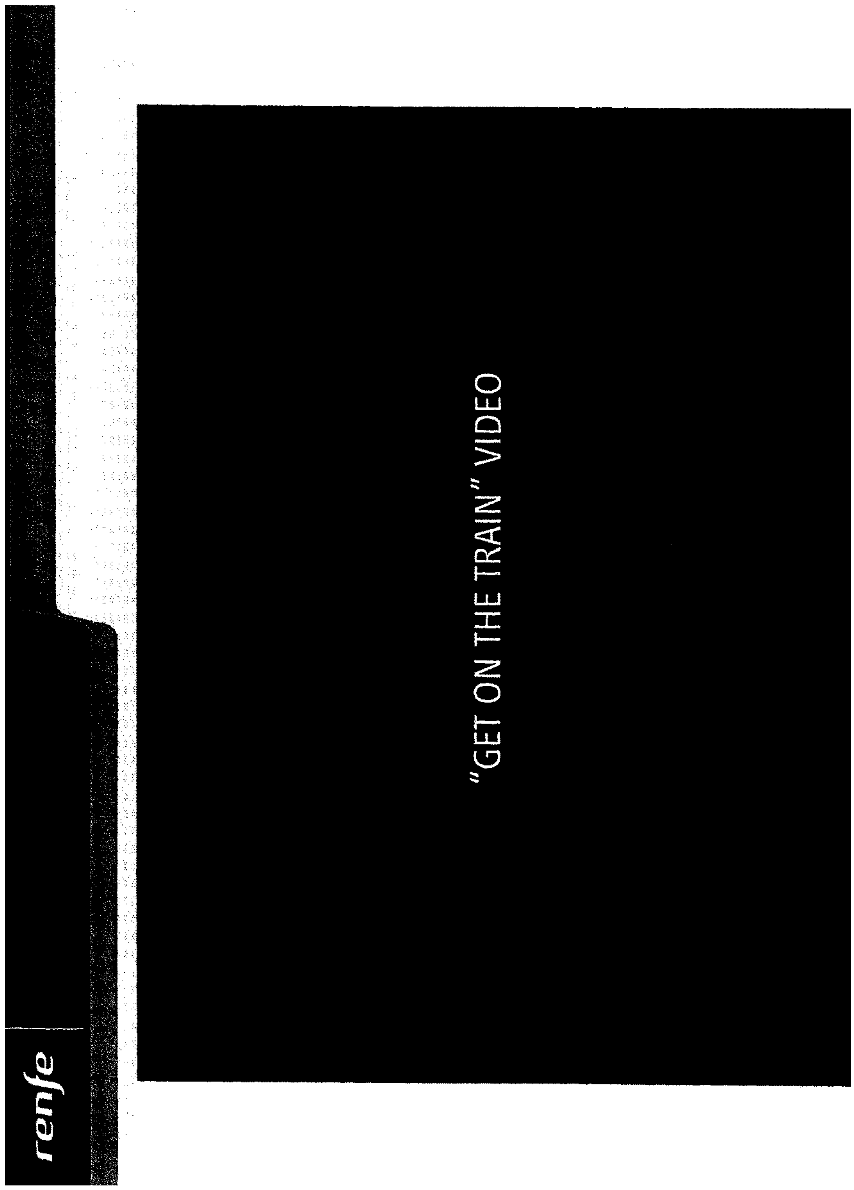


Madrid – Seville Line (471 Km)



renfe
Quality Commitments
RENFE-Operadora

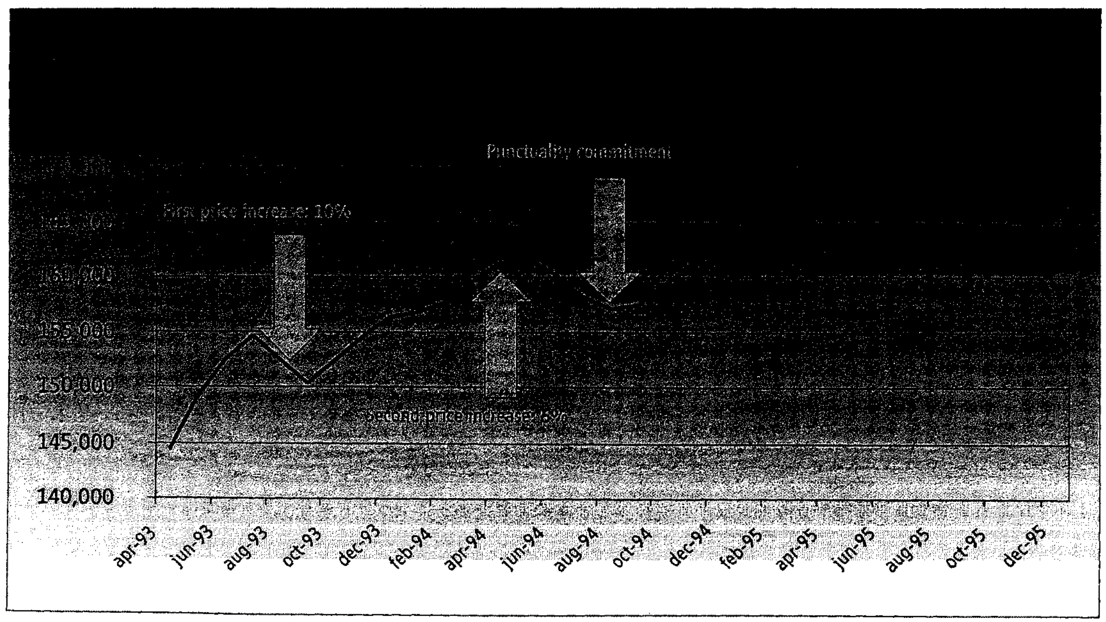

renfe
The main aspects of RENFE
business policy are:
✓Comfort
✓Safety
✓Punctuality
Commitment to Customers


"GET ON THE TRAIN" VIDEO
renfe

renfe

Evolution of the number of AVE passengers

- monthly moving average -



renfe

Punctuality Commitment

Date: September 11, 1994

Product: High Speed Trains

Commitment:

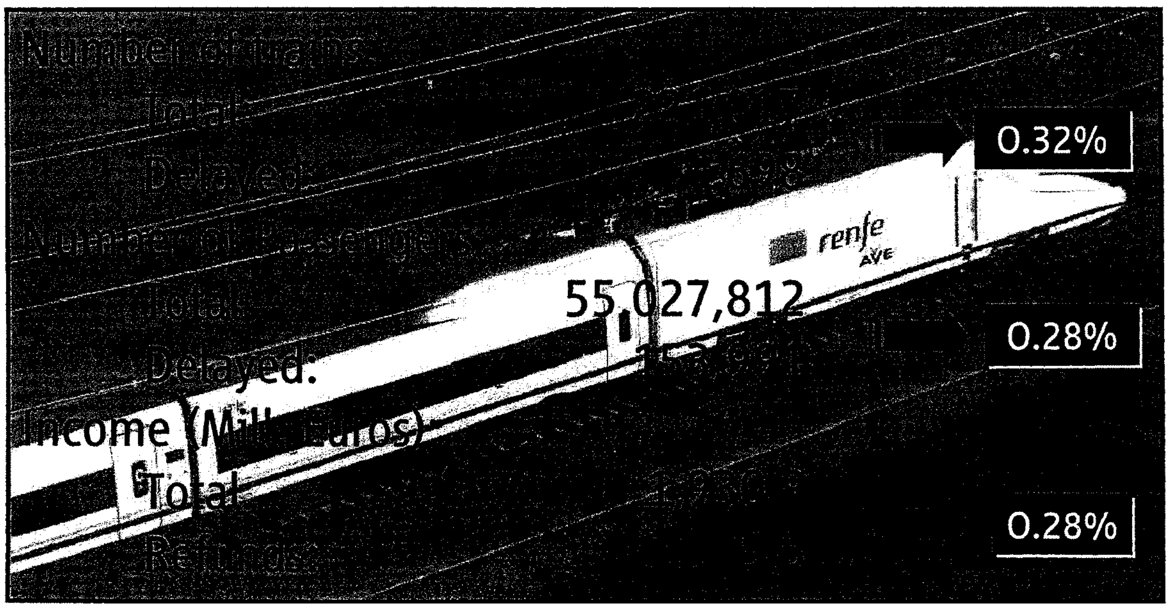
The total ticket price is refunded if a train arrives at its destination more than five minutes late.

The price is refunded in cash, from the day after de delay.

renfe

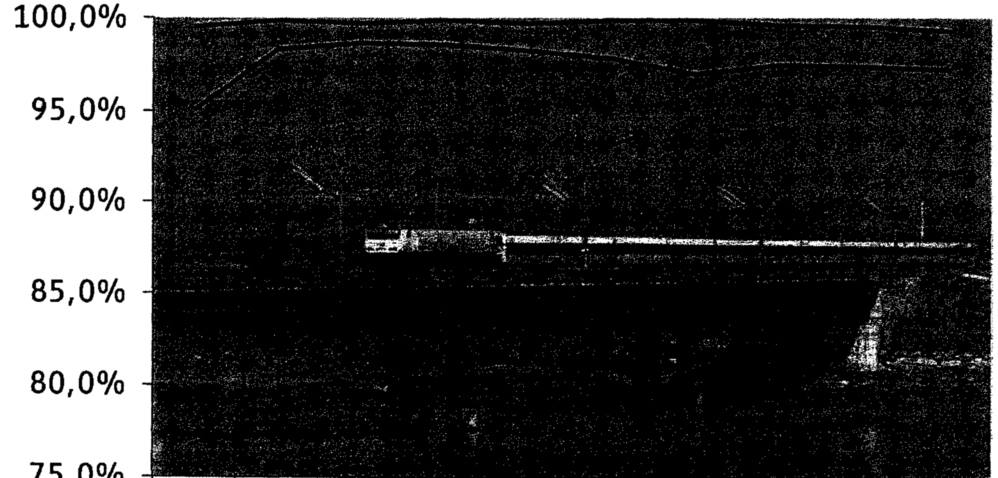
Punctuality commitment on AVE trains

from 12 September 1994 to 31 December 2006

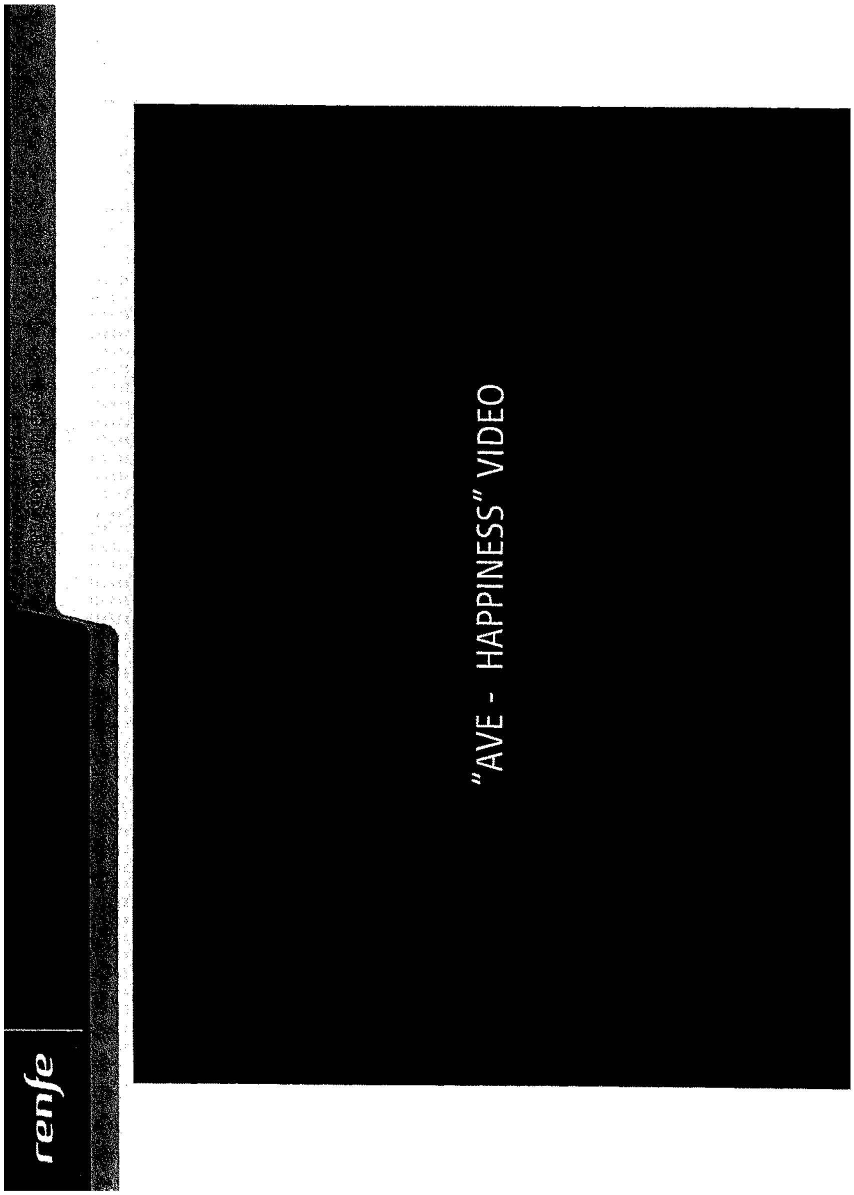


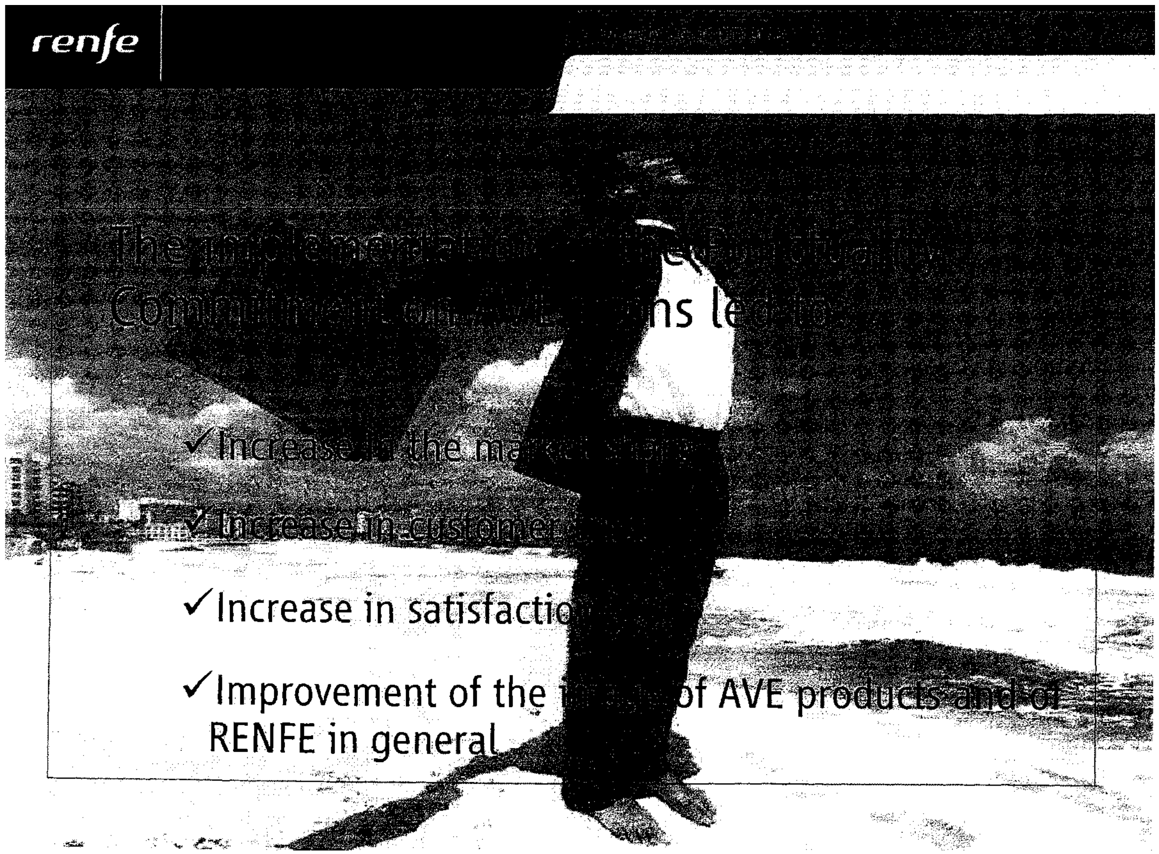
renfe

Evolution of punctuality on AVE and Talgo 200 trains



	1993	1996	1999	2000	2001	2002	2003	2004	2005	2006
AVE LD	99,5%	99,8%	99,7%	99,8%	99,7%	99,8%	99,8%	99,6%	99,5%	99,3%
Talgo 200	95,1%	98,3%	98,6%	98,5%	98,2%	97,8%	97,0%	97,5%	97,4%	97,2%


"AVE - HAPPINESS" VIDEO
renfe


renfe
✓Increase in satisfactio
✓Improvement of the
of AVE products and of
RENFE in general


renfe

renfe

Evolution of the delay return policy:
Talgo 200 (Madrid – Malaga)

	PERIOD OF VALIDITY		
Delay:	1993 - 1998	1998 - 2001	2001- Hoy
More than 20 min.	0%	0%	25%
More than 30 min.	0%	25%	25%
More than 40 min.	0%	25%	50%
More than 60 min.	25% (*)	50%	100%
More than 120 min.	50% (*)	75%	-
More than 180 min.	50% (*)	100%	-
More than 240 min.	100% (*)	-	-

(*) Other routes, different conditions, according to the scheduled duration of the journey.

renfe

Delay compensations offered by RENFE-Operadora

Minimum commitments

As a general rule, for all products, according to the stipulations of the Railway Sector Regulations, Decree Law 2387 of December 2004	Delay:	Refund on ticket price:
	More than 1 hour	50%
	More than 1 hour and 30 min.	100%

In practice, these minimum compensation commitments only apply to overnight trains and, on isolated occasions, to daytime trains

renfe

Delay compensations offered by RENFE-Operadora

More demanding commitments by products

Products:	Delay:	Refund on ticket price:
Madrid-Seville AVE trains and High Speed Middle-Distance trains	More than 5 minutes	100%
Trains Alvia and AVE, running on Madrid-Zaragoza/Lleida/Camp de Tarragona-Huesca High Speed Line	More than 15 minutes	50%
	More than 30 minutes	100%
Alaris, Altaria, Euromed and Talgo 200 trains	More than 20 minutes	25%
	More than 40 minutes	50%
	More than 60 minutes	100%
Regional Trains (Except TRD trains)	Between 30 and 44 minutes	25%
	Between 45 and 59 minutes	50%
	More than 60 minutes	100%
TRD trains	Between 15 and 29 minutes	20%
	Between 30 and 59 minutes	50%
	More than 60 minutes	100%

renfe

Delay compensations which exceed those proposed by the European Union ...

Delay:	Refund on ticket price:
Up to 119 minutes	25%
Equal more than 120 minutes	50%

Common position (CE) N° 19/2006, adopted by the Council on 24 July 2006 with a view to the adoption of a Regulation of the European Parliament and of the Council on international rail passengers'rights and obligations

renfe

…, those of other European countries …

Country:	Type of Service:	Delays:	Compensation:
France SNCF	TGV: Journeys of more than 100 km.	More than 30 minutes	1/3 of the ticket price, in "travel pass" vouchers
Germany DB	Main line trains: ICE, IC/EC, IR, MET and Thalys And CIS on national routes	More than 60 minutes (including missed connection)	20% of the ticket price, in "travel pass" vouchers
	IC- Sprinter	More than 30 minutes	Value of the IC-Sprinter train supplement, in "travel pass" vouchers
	DB NZ, Uex, CNL, EN, D	More than 120 minutes (including missed connection)	20% of the outbound ticket price (including additional prices), in "travel pass" vouchers
Italy FS	Italian Eurostar trains	More than 25 minutes	50% of the ticket price, in "travel pass" vouchers
	Intercity and Eurocity trains on national routes	More than 30 minutes	30% of the price of the ticket and used reservation, in "travel pass" vouchers
	Overnight Intercity trains and Express trains	More than 60 minutes	30% of the price of the ticket and used reservation per seat and 20% of the couchette or bed service price, in "travel pass" vouchers
Portugal CP	Quality tilting trains on the main lines and IC conventional trains	Between 60 and 90 minutes	50% of the fare
		More than 90 minutes	100% of the fare

renfe

... and those of other star High Speed products:

Company:	Type of Service:	Delays:	Compensation:
Thalys	Only international journeys	More than [illegible] minutes	[illegible]% in vouchers (cash in Germany)
		More than 60 minutes	50% in vouchers (cash [illegible])
		More than 120 minutes	100% in vouchers (cash in Germ[illegible])
Eurostar	All services, except [illegible]	Between 60 and 80 minutes	[illegible] vouchers or a free outbound journey
		[illegible]	Cash refund [illegible]

renfe

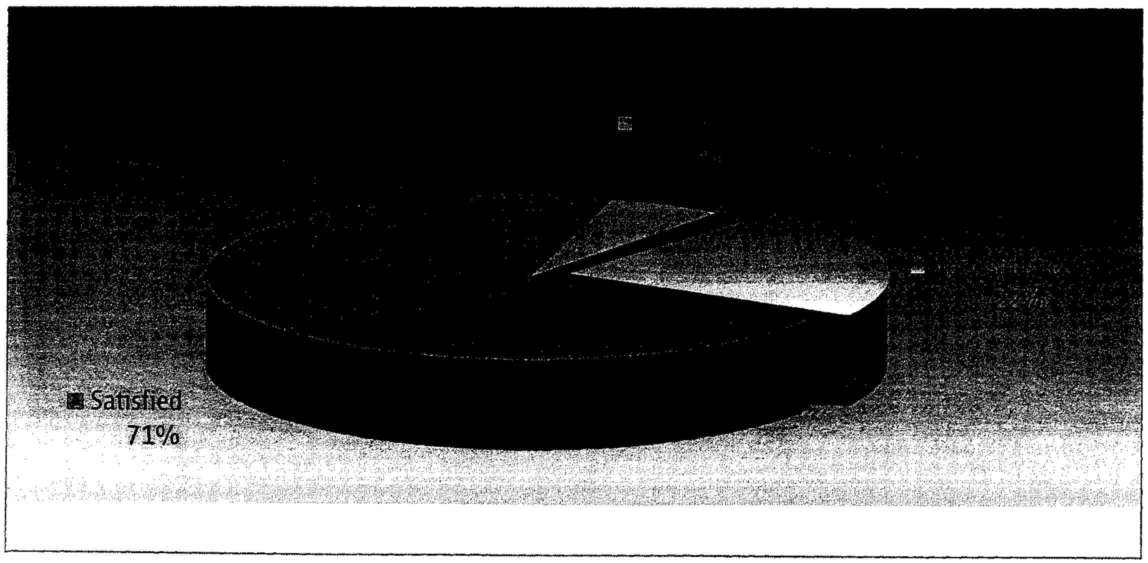
Compensations for lack or deficiency of on-board services

High Speed / Long Distance

Lack / Deficiency of:	Refund on ticket price:	
	From 01 January 2002 to 26 May 2006	Situation since: 26 May 2006
Video/Audio	25%	15%
Air-conditioning (total)	50%	100%
Air-conditioning (partial)	50%	50%
WC	-	100%
Meal service at seat	-	50%
Cafeteria / Restaurant	25%	25%

renfe

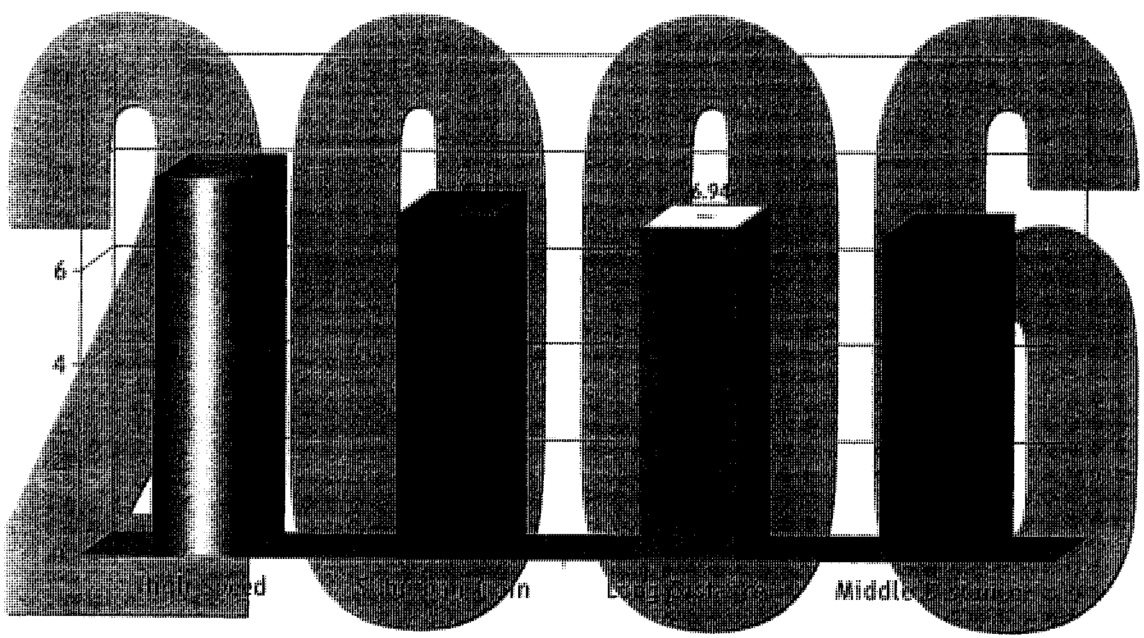
AVE Customer Satisfaction (Madrid – Seville)



Source: Annual study of AVE product

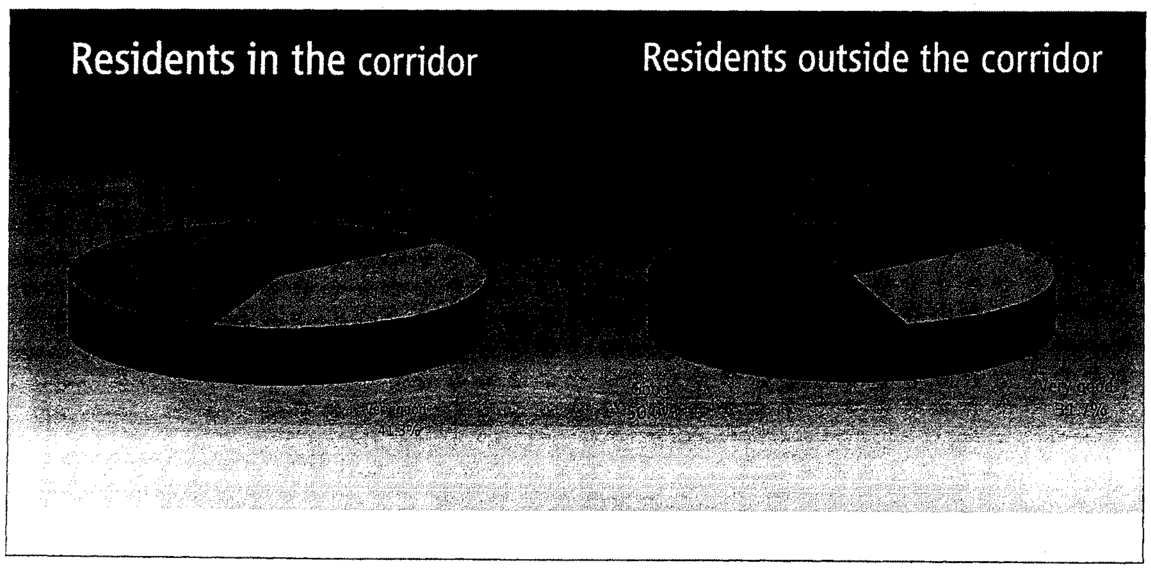
renfe

General rating of quality by the customers

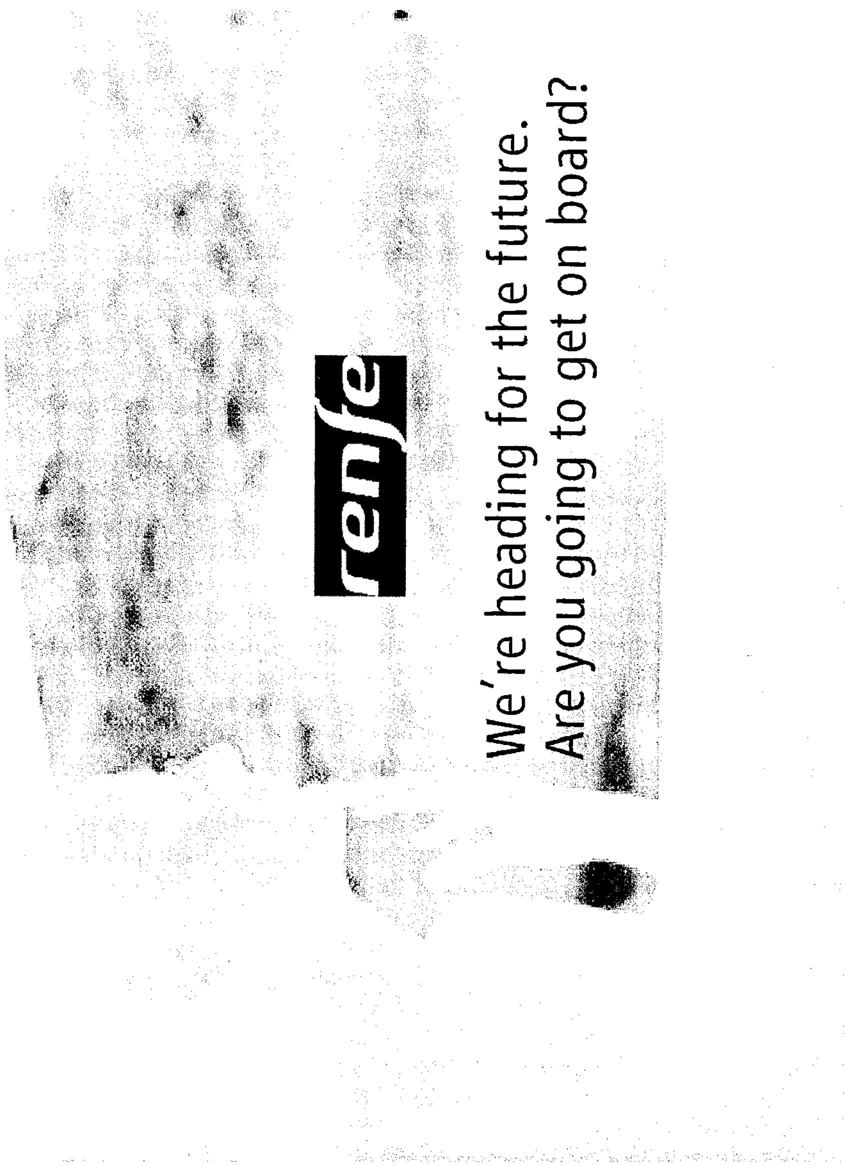


renfe

Image of AVE among the General Public



Source: Study of the image of AVE among the Spanish population, December 2004


renfe
We're heading for the future.
Are you going to get on board?

Congressional Testimony

China's High-Speed Rail System

Subcommittee on Railroads, Pipelines, and Hazardous Materials
House of Representatives of the United States

Hearing on International High-Speed Rail Systems

April 19, 2007
Room 2165 Rayburn House Office Building
Washington, DC

Quansheng Zhao

American University
School of International Service
4400 Massachusetts Ave, NW
Washington, DC 20016-8071
zhao@american.edu
(202) 885-1662

China's High-Speed Rail System

It is my great honor and pleasure to be invited by the Subcommittee on Railroads, Pipelines, and Hazardous Materials of the U.S. House of Representatives to deliver my testimony on China's high-speed rail system. I will first make an introduction on the current status of China's railway system, then move to China's railway administration system and development goals. This will be followed by a detailed analysis of the development of high-speed railways in recent years with concrete examples on a variety of projects. I will also discuss in detail funding, construction, and technology. In my concluding remarks, I will give a brief assessment of the success and lessons of China's high-speed rail system. I need to point out that due to the time limit I was unable to conduct field research in China on this project; this presentation is therefore primarily based on secondary materials from relevant journals, newspapers, and internet reports, as well as my previous frequent visits to China over the past two decades.

OVERVIEW

China's modernization drive began about 30 years ago in 1978, led by China's paramount leader Deng Xiaoping. Ever since then, economic construction has been the central focus of the Chinese government. The total area of China is similar to the United States: 5,500 km (3,418 mi) from north to south and 5,200 (3, 231 mi) km from east to west. With its more than 1.3 billion people, railway transportation has played a crucial role in China's economic development and public travel. China's rapid economic growth, with an annual GDP increase of nearly 10%, had provided an excellent opportunity for China to expand its railway system. In recent years, China has moved fast in terms of total length of railways, totaling 77,000 km (47,846 mi) in 2006, and now stands at number three in the world in the amount of railway track laid, after only the United States and Russia (see Table 1). China has made noticeable improvements in the rail system, as 20 years ago many lines were still powered by steam. The last regular steam line retired in late 2005, but some rural freight lines still use steam technology.

Table 1:

International Comparison of Railway Lengths (2005)

Country	Railway Length	
	Km	Miles
United States (2004)	226,605	140,806
Russia	87,157	54,157
China (2004)	74,408	46,235
India	63,230	39,289
Canada	48,467	30,116
Australia	47,738	29,663
Germany	47,201	29,329
Argentina	31,902	19,823
Brazil	29,252	18,176
France	29,085	18,073
Japan	23,556	14,637

CIA World Factbook, https://www.cia.gov/cia/publications/factbook/rankorder/2121rank.html, last accessed April 12, 2007.

Nevertheless, domestic demand for railway expansion far exceeds existing capacity in China. Currently, railway transportation in China is responsible for 25% of the world's rail passengers and freight cargo, but it only contains 6% of the world's tracks. Nowadays, for example, Chinese railway companies can provide approximately 2.41 million passenger seats a day, but sell 3.05-4.20 million tickets. Passengers cope with the under-supply by standing in the aisles or delaying plans. During holiday and peak travel times procuring a train ticket is usually an ordeal for travelers. In freight service, the demand for rail cars is 280,000 per day, but the current infrastructure can only provide 110,000 cars a day, meaning 60% of China's freight demand cannot be met.[1]

The role of transportation will be increasingly important in China as the nation's economy continues to change from a planned, centralized system to one that is market-based and decentralized. Provinces along China's eastern coastline have benefited from well-developed infrastructure, and have grown more quickly than the western provinces. The government is currently putting forth efforts to reduce the income disparity by attracting more domestic and foreign investment to the interior. Beijing has been rapidly developing its railway infrastructure for the past decade. This development is necessary as China's demand for both passenger and freight rail service has far outstripped supply. To solve these problems and further increase its capacity, authorities plan to provide passengers with newly built high-speed railways, and to convert all existing tracks for freight transportation exclusively.

RAILWAY ADMINISTRATION AND DEVELOPMENTAL GOALS

Railway administration is conducted by China's Ministry of Railways (MOR) under the State Council, with the Commission of Development and Reform in charge of budget approval. Also, there are a number of major railway hubs, known as railway bureaus, that play regional leadership roles, such as Beijing, Shanghai, Zhengzhou, Wuhan, Guangzhou, Shengyang, Lanzhou, Xian, and Chengdu, etc. Due to general trends of decentralization and marketization in the reform era, the central government has weakened its power over provinces. Furthermore, China's transportation sector also involves several ministries in addition to the MOR. The pace of administrative reform varies from province to province which can be problematic. In addition, government bodies have maintained a cultural reluctance to cross jurisdictional boundaries, resulting in the slow development of services that require cooperation across such boundaries.

Although primarily state-owned, China's railway governmental agencies must adapt from their old role as owners to their new roles as regulators. Since 2003, the Ministry signed an agreement with 30 provinces, autonomous regions, and municipal cities regarding joint railway development.[2] In 2004, MOR minister Liu Zhijun consulted with 20 some provincial governors for railway construction plans.[3] Some observers of China's transportation sector suggest the legal separation of the ministry from the state railway as an enterprise, particularly to level the playing field of new private and joint ventures.[4]

The Chinese government has adopted strategic goals for the railway system after studying similar systems in other countries. The goal is to make China's railways more responsive to market forces. MOR is spinning off non-transportation subsidiaries as independent companies, and in certain areas it has started experimental operations in which passenger services operate as a profitable enterprise, distinguishing it from freight services.[5]

MOR Minister Liu Zhijun has elaborated ambitious plans for rail developments including 19,800 km (12,303 mi) of new lines, modernization of 15,000 km (932 mi) existing tracks, increasing passenger speeds to 200 km/h (124 mph) (and greater than 300 km/h [186 mph] for high-speed tracks), and increasing the freight power capacity. All of these goals are to be completed by 2010, when Chinese officials hope that railway networks will carry 30 percent more passengers and freight than they do now. The projected costs for the entire project are currently put at 1.25 trillion yuan ($162 billion).[6]

The mid- to long-term plan is to add 100,000 km (62,137 mi) of railway by 2020. Within that, 50% will either be two-way tracks or electrical tracks, and the high-speed railway system will reach 30,000 km (18,641 mi). In terms of passenger lines, the speed will be 200 km/h (124 mph) and above. There will be three coverage areas:

a) four vertical systems, running north to south

b) four horizontal systems, from east to west

c) three metropolitan systems, including Bohai (centered in Beijing), Yangzhe River Delta (centered in Shanghai), and Pearl River Delta (centered in Guangzhou)

The plan is also to expand development in the Western provinces.[7]

HIGH-SPEED RAILWAY IN CHINA

High-speed railway in China is also known as China Railway High-speed (CRH), a designation given primarily to dedicated passenger lines. There are two levels of CRH in China. The 200-250 km/h (124-155 mph) level is for both passengers and freight. The higher level of CRH is designated at 350 km/h (217 mph) and above, the highest level of railway in the world. All lines at this speed are still in production, and no freight cars can run on this level. In addition, there are two main models of high-speed rail systems: Japan's Shinkansen model that relies on conventional tracks and Germany's model of magnetic-levitation (maglev). Several high-speed projects are underway as the Ministry of Railways works to catch up with growing demand. Other high-speed railways in China include Intercity Line with a maximum speed of 200-250 km/h (124-155 mph) built and updated conventional railways with some tracks currently being updated to the maximum speed of 200 km/h.

In China, high speed rail is seen as the wave of the future and a solution to China's growing rail needs. Until recently China's trains traveled at about 60 km/h (37 mph). Since 1997, however, China has increased rail speeds five times: in April 1997, October 1998, October 2000, November 2001, and April 2004.[8] The sixth speed boost began in mid April, 2007, which increased the maximum operating speed on some railways from 160 km/h (99 mph) to 200 km/h (124 mph). About 6,003 km (3,730 mi) of railway reached the 200 km/h designation, within which 846 km (526 mi) reached 250 km/h (155 mph). This increase greatly benefits the three metropolitan areas of Bohai (centered in Beijing), Yangzhe River Delta (centered in Shanghai), and Pearl River Delta (centered in Guangzhou).[9] For example, there are 12 pairs of CRH trains operating daily between Beijing and Tianjin at 200 km/h.[10]

In 2006, of China's railways, 22,100 km (13732 mi) (30% of China's total railways) were rated at 120 km/h (75 mph), 14,000 km (8699 mi) (19%) were at 160 km/h (99 mph), and 6,003 km (3,730 mi) (7%) were at 200 km/h (124 mph) or above.[11] Freight trains have also increased to 120 km/h (75 mph) on designated tracks. This latest increase in speed will increase passenger capacity by 18% and cargo capacity by 12%.

Other Examples of Completed CRH

Qinhuangdao-Shenyang

The first high-speed rail system introduced to China was the Qin-Shen railway which began construction in 1999 and was completed in 2003. This passenger-train-only railway spans 404 km (251 mi) with a designated train speed of 200 km/h (124 mph), although that speed could be upgraded to 300 km/h (186 mph). The line cost 16 billion yuan (US$2 billion) to construct. The line is part of the Beijing-Harbin line of China's Passenger Dedicated Line (PDL) network.

Only the Qinghuangdao-Shenyang portion of the Beijing-Harbin line, which travels via Tianjin, Qinhuangdao, and Shenyang, has received the upgrades.[12]

Shanghai-Pudong Airport to Shanghai Downtown

In 2004 the Shanghai Maglev Transportation Development Co. began service on a 10 billion yuan (US$1.2 billion), 19 mile, high-speed maglev train linking Pudong International Airport to Shanghai's downtown. Built in just two and a half years, the line is the first commercial, high-speed maglev line in the world. The line was built using German technology and can reach operating speeds of 430 km/h (267 mph), completing the airport to downtown trip in just over 7 minutes. Chinese officials have said that the low maintenance costs of maglev technology will bring down total lifetime costs. Officials claim that although the Shanghai line must average 7,000 riders per day to break even, it is currently servicing twice that many.[13]

Examples of CRH to be Constructed

Beijing-Shanghai

The Beijing-Shanghai high-speed railway is expected to be completed by 2010. The Ministry of Railways is striving for top speeds of 300 km/h (186 mph), which will cut the 1,320 km (820 mi) commute from 13 hours to 5 hours. There are 21 stops planned, with trains departing every three minutes during peak hours. The main goals of this project are to ease congestion and promote economic growth. In addition to Chinese producers, Siemens and Alstom will be involved in this massive project. Of note is the inclusion of a 100-200 km (62-124 mi) long barrier intended to reduce noise pollution along the tracks.[14] The introduction of new, high speed, passenger-only track will also increase freight capacity on existing tracks by 50 million tons a year.[15]

Nanjing-Anqing

Another project in the pipeline is the Nanjing-Anqing railway. This new system is expected to cut travel time from 8 to 1.5 hours and trains are planned to reach speeds of up to 250 km/h (155 mph). It is expected to stimulate economic growth near the Yangtze River delta and promote economic regional integration. Because the railway will shorten travel times between China's coast and interior, the line is expected to help support the development of China's less-advanced central provinces.[16]

Nanjing-Hefei

There is another high-speed rail project underway to carry passengers between Nanjing and Hefei, which will allow travel between the two cities to just one hour, and to Shanghai beyond in just 2.5 hours. The project, which began in 2004, will cost at least 100 billion yuan (US$12.9 billion) and is expected to be completed in 2010.[17]

Shanghai-Hangzhou

In 2006, China announced that it will extend the Shanghai Pudong Airport maglev line to Hangzhou, which would create the world's first intercity maglev link. Trains will travel at speeds up to 430 km/h (280 mph), decreasing the Shanghai-Hangzhou commute from 2 hours and 20 minutes to only 30 minutes. This project will most likely utilize the same German maglev technology from ThyssenKrupp and Siemens. Officials hope to finish the line in time for Shanghai's 2010 World Expo, but technology transfer issues have caused negotiations to drag on.

Costs are estimated at $5.5 to $7.25 billion for the 124 mile track, including China's attempt to cut construction costs on the line to $24 million per kilometer, down from China's average of $36 million.[18]

Other Asian Examples

It is necessary to point out that high-speed railway is the trend in Asia. Most well known is Japan's "bullet trains" (known as Shinkansen), but other countries are quickly adding their own high-speed systems. In 2004 South Korea launched a high speed train system that links Seoul and Pusan, cutting travel time from 4 hours 10 minutes to 2 hours 40 minutes. The train technology is based on France's TGV system and reaches top speeds in excess of 300 km/h (186 mph). This year, the Taiwan area began high speed rail service between Taipei City and Kaohsiung City, cutting what was once a 4-6 hour trip to as little as 90 minutes. The system, which utilizes Japan's Shinkansen technology, covers 335.50 km (208 mi) and costs approximately $15 billion. Vietnam has announced plans to link the northern city of Hanoi with the southern city of Ho Chi Minh City with a high speed train. The bulk of the $33 billion, 1,000 mile system will be financed by Japanese official development aid. India has also indicated it will build 6,000 miles of freight lines by 2010, to the tune of $5 billion.[19]

FUNDING, CONSTRUCTION, AND TECHNOLOGY

The Ministry of Railways directs all development and funding of the railways infrastructure. China's 2006-2010 railway expansion projects will cost a total of 1.25 trillion yuan ($162 billion). To cover part of these costs MOR has issued 16 billion yuan ($2.1 billion) in railway bonds to fund some of China's high speed rail projects, and could grow to as much as 20 billion yuan ($2.6 billion). The bonds will provide funding for the Zhengzhou-Xian line and the Beijing-Tianjin line (expected to open in time for the 2008 Olympics). The ministry has also signed an agreement with the China Development Bank for loans of 250 billion yuan ($32.4 billion) over the next five years. Private investment is still barred by the ministry's monopoly over railway operations.[20]

Regarding the high-speed rail system, authorities have announced their intention to rely mostly on domestic technology and manufacturing, but key advanced technologies will be imported for the projects. All of the engineering systems, bridges and tunnels will be developed in China using advanced foreign technologies from the United States, Canada, France, Germany and Japan. Japan's Shinkansen bullet train is one of the systems utilized in China's train projects, but France's TGV technology (from Alstom Pendolino) is also used in some areas. German maglev technology (from ThyssenKrupp and Siemens) is currently in operation between Shanghai and Pu Dong International Airport, which runs 19 miles, and will be implemented in the extension to Hangzhou, which will run 124 miles. Bombardier, a rail company from Canada, has had success in securing contracts for upcoming projects, especially for rail cars.

Until recently, MOR retained a monopoly over railway construction and funding, this prevented substantial private and foreign investment in rail projects. MOR has however recently issued new policies and plans to increase the participation of the private sector in funding. There are four main points under MOR's guideline of "government controlled operations"[21]:

1. Encourage local government participation, including investment
2. Encourage social capital investment, including the stock market to issue stocks
3. Regulate market operations and appropriate laws to safeguard investors' legal interests.
4. Ensure equal and fair treatment to all kinds of investment, and to establish and complete monitoring and administrative system

To move from a singular funding system to a plural funding system, MOR has also established a railway construction investment corporation. China has just started private investment including foreign investment, and is in the process of placing at least three railway related companies on the stock market. Annual investment needed is between 50 and 60 billion yuan (US$6.5 and $7.8 billion), but in 2004, official government funding provided only 38 billion yuan (US$4.9 billion), with money available for actual construction costs (deducting interest and smaller projects) accounting for only 23 billion yuan (US$3.0 billion). The difference in funding was covered by the Development Bank in loans. Thus, there are increasing discussions about whether the government should let some branch railway lines be privatized.[22]

The Beijing-Shanghai high-speed railway is one example. This project was approved by the Chinese government in March 2006, and it is expected to cost 140 billion-yuan (US$18 billion). Most of the funding is expected to come from bank loans and bonds. Additional investment is expected from foreign investors and the seven provinces which the train will pass through.

One potential issue that could slow foreign investment in high speed rail projects in China is that of technology transfer disagreements. Business agreements in China often demand that foreign companies share technology with their Chinese partners. The Shanghai to Hangzhou link negotiations between the German and Chinese governments were delayed for this reason on how to treat sensitive technology, although no one expects this issue would jeopardize cooperation between the countries over this highly lucrative project. Indeed, the general sentiment for many foreign companies is that "The gains to be had in this market are much greater than the very small potential of loss through technology transfer."[23]

Technology matters have also dogged the high speed project in Taiwan, including allegations of poor quality construction, unresolved safety concerns in light of three derailments during tests conducted in early November, 2006, and a consistent inability to finish the project on time and on budget. Originally, Taipei planned to use the European InterCityExpress (ICE) technology to form the basis of its network. Following the ICE Eschede train disaster in 1998 and the Taiwan "Chi-Chi" earthquake in 1999, Taiwan decided to adopt Japan's Shinkansen technology, which incorporated an earthquake detection system. This caused some concerns about the mixed use of European and Japanese technology. An official with Japan Railway Co, Tokei, one of the contractors for Taiwan's system, identified 26 major differences between Taiwan's system and the Japanese model.[24]

ASSESSMENT AND CONCLUSION

China has a reputation for completing large infrastructure projects quickly, but its reputation for rail service has not always been positive. Freight service has been characterized as slow and unpredictable. Even if China meets its expansion goals by 2010, China's rail system will still lag far behind those of other developed countries. Germany has half the amount of track China hopes to have by 2010, but Germany is even smaller than a mid-sized Chinese province such as Yunnan.[25] Nevertheless, the Chinese are making a great effort to improve rail transportation for both passengers and freight.

In conclusion, although China has made impressive progress in expanding its railway system over the past couple of decades, it has just begun to develop its high-speed railway and it has a long way to go. China continues to pay close attention to the great experience and advanced technologies of the United States, Canada, Japan, France, and Germany, and is working closely with these countries regarding both capital and technology. As the Chinese government repeatedly indicates, China welcomes cooperation with advanced industrialized countries under the principles of mutual benefit and equal partnership. Such cooperation may include dimensions such as railway transformation, dedicated passenger line construction, security management, and personnel training.

Again, the development of high-speed railways is solely for the domestic need to fulfill the huge gap between supply and demand. With high-speed development nation-wide China will soon transform its internal transportation system. It is expected that China will catch up with the Japanese and the Europeans before too long. Thus far, China's centralized administrative style has both strengths and weaknesses. Its advantage is the ability to make the project more efficient, effective, and large-scale. Yet, weaknesses are found in the lack of private funding, as well as the lack of strong incentives for foreign investment due to the system's rigidness. China will also need to further enhance its R & D since the area of technology has been a bottleneck of

China's development. This is demonstrated by the current efforts to develop China's own high-speed transportation technology since much of it is dependent on technology transfer from Germany, France, and Japan. Even though China is still in the beginning stage, the United States can certainly learn from both China's experience and its lessons.

NOTES:

[1] "Five-year leap outlined in railway development," *Xinhua*, October 7, 2006.

[2] "Ministry of Railways Encourages Investment from Domestic and Abroad for China's Railway Construction," *China Youth Daily*, Sept. 21, 2005, www.xinhuanet.com.

[3] "Multiple Modes of Investment for Railway Construction: International Investments are Welcome," *China Economic Times*, Jan. 26, 2005, Huaxia website, March 2, 2005.

[4] Alberto Nogales and Graham Smith, "China's Evolving Transportation Sector," *The China Business Review* 31:2 (2004): 24-9.

[5] Alberto Nogales and Graham Smith, "China's Evolving Transportation Sector," *The China Business Review* 31:2 (2004): 24-9.

[6] "China to issue 16 billion yuan in railway bonds," *Xinhua*, October 12, 2006.

[7] "China's Long-Mid Term Plan for Railway Might Work," China Railway Network website, Jan. 15, 2007.

[8] "'Everything ready' for faster trains," *Xinhua*, April 13, 2007.

[9] "Greatly Raised Railway Speeds," *World Journal*, April 13, 2007, A12.

[10] "The Beijing-Tianjing High-Speed Train", *The China Press*, April 8, 2007, C3.

[11] "Five-year leap outlined in railway development," *Xinhua*, October 7, 2006.

[12] "U.S. Rail Advocates Look to China for Inspiration, Learning," *Engineering News Record*

256:23 (2006): 15.

[13] "U.S. Rail Advocates Look to China for Inspiration, Learning," *Engineering News Record* 256:23 (2006): 15.

[14] "China to start work on high-speed Beijing-Shanghai train," *Xinhua*, March 13, 2007.

[15] "Five-year leap outlined in railway development," *Xinhua*, October 7, 2006.

[16] "High speed train to link Nanjing with Anqing," *Xinhua*, March 27, 2007.

[17] "High speed train to link Nanjing with Anqing," *Xinhua*, March 27, 2007.

[18] "U.S. Rail Advocates Look to China for Inspiration, Learning," *Engineering News Record* 256:23 (2006): 15.

[19] Kerry A. Dolan, "Fast Train to China," *Forbes.com*, March 26, 2007, http://members.forbes.com/global/2007/0326/024.html

[20] "China to issue 16 billion yuan in railway bonds," *Xinhua*, October 12, 2006.

[21] "Ministry of Railways Encourages Investment from Domestic and Abroad for China's Railway Construction," *China Youth Daily*, Sept. 21, 2005, www.xinhuanet.com.

[22] "Multiple Modes of Investment for Railway Construction: International Investments are Welcome," *China Economic Times*, Jan. 26, 2005, Huaxia website, March 2, 2005.

[23] As quoted by Charles Brown, director of transportation and infrastructure consultancy Lake House Group in Hong Kong, in Kerry A. Dolan, "Fast Train to China," *Forbes.com*, March 26, 2007, http://members.forbes.com/global/2007/0326/024.html

[24] Shan Shelley, "Analysis: THSRC Challenges Grow," *Taipei Times*, December 4, 2006, http://www.taipeitimes.com/News/taiwan/archives/2006/12/04/2003339022

[25] "Five-year leap outlined in railway development," *Xinhua*, October 7, 2006.

ABOUT THE AUTHOR

Quansheng Zhao is Professor and Division Director of Comparative and Regional Studies and Director of Center for Asian Studies at American University in Washington, DC. He is also Research Associate at the Fairbank Center for East Asian Research of Harvard University. Professor Zhao is author of *Interpreting Chinese Foreign Policy* (Oxford University Press, awarded "Best Academic Book" by the Ministry of the Republic of Korea) and *Japanese Policymaking* (Oxford University Press/Praeger, selected as "Outstanding Academic Book" by *Choice*). He is also the editor of *Future Trends in East Asian International Relations* (Frank Cass) and co-editor of *Politics of Divided Nations: China, Korea, Germany, and Vietnam* (University of Maryland Law School). His books have been translated into Chinese, Japanese, and Korean. He received his B.A. from Beijing Univeristy, M.A. and Ph. D. from the University of California at Berkeley.