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Retrack

REorganization of Transport networks by advanced RAil freight Concepts

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SIXTH FRAMEWORK PROGRAMME

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1 Introduction

The volume share of intra-EU freight transport for road is 44% and for rail 10%. No revenue share information is available for modal comparison. The EC estimates that the volume demand of freight transport movement will increase by 50% by 2020 where road is expected to increase its share by 55% and rail will grow by 13%. The trans-European transport networks (TENs) will provide a significant component of the physical infrastructure for its internal market (EC, 2006).

European railways have faced a declining market share since the 1960s (details in figure 1). Pietrantonio and Pelkmans (2004) think that the reasons for this decline in rail transportation can be considered in two ways: exogenous and endogenous.

Exogenous reasons

- Early and faster transformation of the competitor – road,
- Shift from conventional huge-stock-based warehousing to just-in-time production and inventory processes,
- Changes in industrial location strategies away from rail,
- Shift of cargo type from low value/high volume to high value/low volume, and

National and international policies and investments that favoured road transport ahead of rail.

Endogenous reasons

- Limited attention to customer care and no tailor-made services,
- Poor reliability and punctuality of shipments,
- Lack of or inappropriate modernisation and capital investment,
- Inappropriate technologies, equipment, working methods, a high cost base and low asset productivity,
- Limited flexibility and costly transhipments,
- Fragmented cross-border services with delays at the frontiers (as well as lack of interoperability),
- Absence of cross-border cabotage,
- Lack of service integrators for optimised logistical chains,
- Traffic priorities allocated to passenger trains (unclear slot allocation management),
- Lack of one-stop-shop in path allocation, cargo tracing and handling,
- Lack of competitive products, services and technology to accommodate shippers evolving needs,
- Non transparent cost structure on international corridors, and
- Concerns over infrastructure capacity and capability.

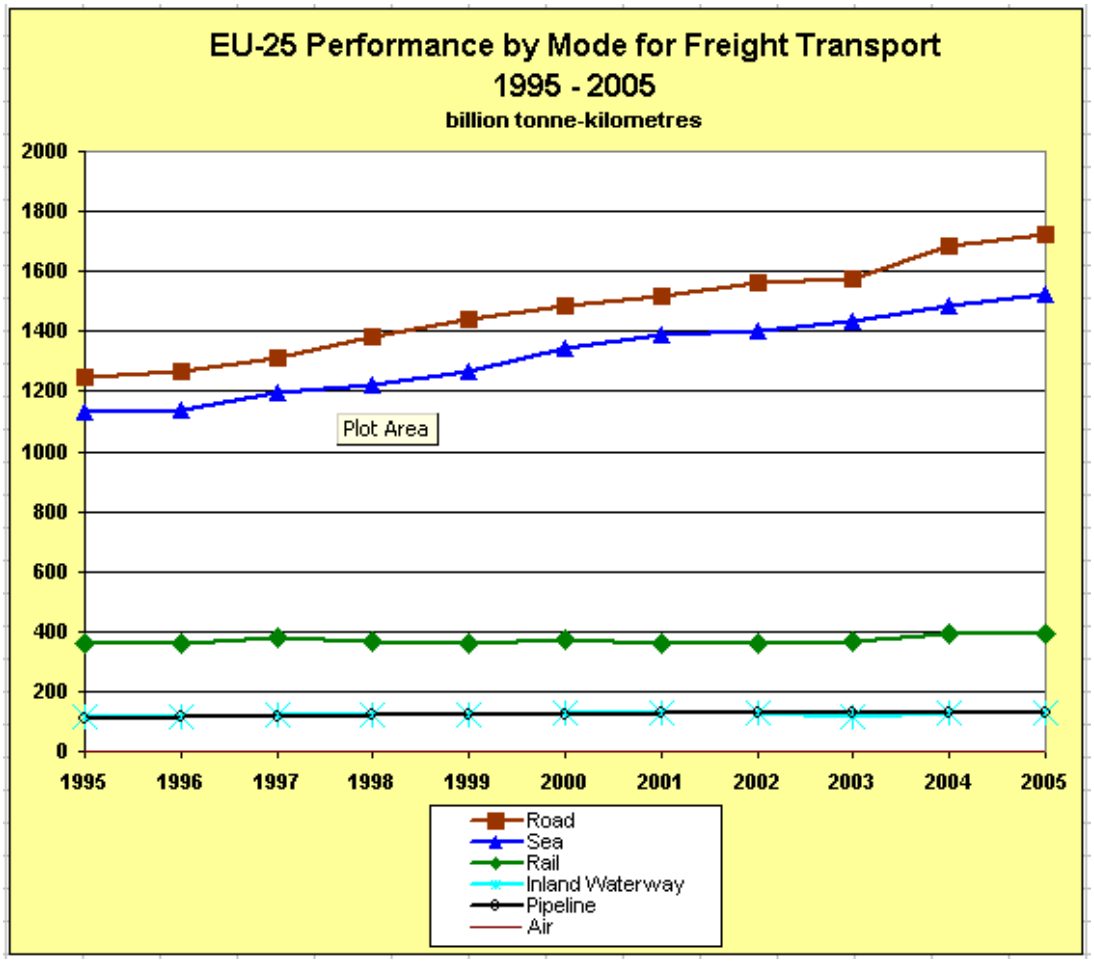
European Rail reform is preferable primarily based on three drivers:

1) the need for greater competitiveness of rail;
2) promoting the (market driven) diversion of road haulage to rail on merit by making rail services attractive and competitive, as a step towards sustainable mobility in Europe; and
3) an end to the disproportional claims on public budgets of Member States.

Three ‘Railway Packages’ of EU inspired measures have been adopted amounting to a series of directives that will be briefly discussed later. A range of complementary initiatives have been undertaken or are underway (Pietrantonio and Pelkmans, 2004). International freight services in Europe were opened for competition on the whole European freight

network in January 2006 and then in January 2007 all freight services including domestic ones were opened for competition. Market share of new entrants increased from 7% in 2003 to 10% in 2004. Thus it can be noted that the liberalisation of rail freight is progressing with increasing competition in Europe to varying degrees (Bombardier, 2005).The share of new entrants varies widely along the Retrack corridor countries and within specific traffic types. For example the incumbent rail freight operator in The Netherlands has a dominant share (~80%) of the bulk traffic activity whilst the new entrants command the greater part of the inter-modal traffic activity.

Figure 1. EU-25 Modal share of Freight Transport 1995-2005



The WP2.8 considers the tension between maintenance and track use and how recently infrastructure asset managers have sought to overcome or to intertwine the two to reach improved capacity utilization. It also shows where neglect and accidents/mishaps have had a negative effect on the quality and reliability of the rail product. The hard infrastructure choices and how they interact with the TSIs will be developed and explored within this task.

2 Background of European Rail Reform

Road transport was deregulated at an earlier stage and at a faster rate than rail transport. This has resulted in a significant drop of the freight rates and hurt rail transport in terms of loss of volume and revenue. Another advantage for road is that the optimum consolidation of road transport is one truck load. On the other hand one rail wagon equates to 2-3

truckloads, one train holds 50 - 80 truckloads. This gives road an advantage over rail to offer just-in-time and customer tailored service if the shipper requires continuous deliveries rather than intermittent large volume shipments which may require storage and warehousing before use or sale. Rail has failed to use its intrinsic productivity and energy efficiency endowment to commercial success

Road rail combined transport needs consolidation points as well as modal transfer. On average this modal transfer costs 20 - 25 percent of total point-to point-transport cost. Thus, to make rail (or rail intermodal) competitive this amount has to be saved on rail transport element - from terminal to terminal plus the "inconvenience surcharge", that a customer wants, because he has to adhere to the rail schedule and supply side offer. The only major exception to this is deep sea traffic, where containers are changing their mode of transport anyway and so the cost competition is easier to win by rail. The big advantage of rail transport is the ability to carry heavy weights and high volumes at speed in a controlled and disciplined operating environment wholly different to road transport. The rail infrastructure must not kill that advantage by leaving topographical bottlenecks intact.

European rail freight transport is facing fundamental changes. One of the priorities of the European Transport Policy is the creation of a single European market for rail freight services. The idea of Trans-European Networks (TENs) emerged at the end of the 1980s in conjunction with the proposed Single Market. TENs were proposed because it did not make sense to consider a big European market, with free of movement of goods, persons and services, unless all national networks that make up that market are properly linked by modern and efficient infrastructure (TEN-T, 2007).

The main idea is to open up the rail networks for non-governmental railway undertakings in order to raise competition and use the railway network in a similar way to roads. At the beginning, most member states maintained monopolistic rail transport organisations in the form of public administrations or state-owned enterprises. Railways were vertically integrated, meaning that the provision of transport services was combined with the provision of the infrastructure network. The prevailing model in Germany and Austria is a good example of this position. Moreover, many types of technical systems of power supply, signalling and track gauge made some Europe-wide rail operations complicated and slow particularly into the Iberian Peninsular and the railways of some of the former Communist states. This disadvantageous situation gave huge advantages to road freight transport. In contrast rail freight transport not only lost market share in a rapidly expanding freight market, but significant parts of the conventional rail freight market were lost on grounds of poor service, non-competitive pricing, inadequate products and services and a perceived remoteness ffrom shippers requirements which were more readily and rapidly fulfilled by road transport.

Despite these failings it did not take too long to realise that the European continent could not afford to abandon rail transport altogether as it faces problems of road congestion and pollution. The catalyst was the re-positioning of the rail sector into a more commercially focused position. The issue of revitalisation of the railway sector became a central issue. For this the European Commission outlined its policy as well as implementation measures in two White Papers. The first one (White paper: European Transport Policy for 2010: Time to decide, 2001) covers on all aspects of transport policies, and the second one (Revitalizing the Community's Railways, 2003) addresses the railway specific issues.

The key issues of revitalisation of railways are liberalisation of rail freight markets, harmonisation of rules, interoperability of technical systems, establishment of fair pricing between modes and infrastructure investments. These had to be implemented step by step, overcoming the inertia of existing organisations and national administrations. The main steps of this process were:

Council Directive 91/440/EEC that provided the legal framework for abolishing cross subsidy between railway operators and infrastructure managers and introducing the principle of track charging, through the separation of accounts of infrastructure operations and train operations in integrated railway organisations;

Council Directives 1995/18/EC and 1995/19/EC. Directive 1995/18/EC provides the legal framework for licensing railway undertakings established or to be established in the Community Directive 1995/19/EC took the principle of financial independence of infrastructure managers further by establishing the rules for discrimination-free access to the rail network and the charging regime.

The First Railway package Directives 2001/12/EC, 2001/13/EC and 2001/14/EC. Directive 2001/12/EC (amendment of 91/440/EEC) widened the separation between the provision of transport services and the management of railway infrastructure; it extends the right of access for railway undertakings for all modes of operation to the TERFN and as from 15 March 2008 to the entire rail network.

Directive 2001/13/EC (amendment of 95/18/EC) specifies that a licence shall be valid throughout the territory of the Community and extends the requirements of a railway undertaking must comply with when applying for a licence.

Directive 2001/14/EC provides the legal framework for the allocation of railway infrastructure capacity (e.g. defining capacity rights, capacity allocation rules and schedules, applicants, framework agreements, capacity analysis and enhancement planning), the levying of charges for the use of railway infrastructure (establishing, determining and collecting the charges), for safety certification and defines the role and the tasks of a regulatory body to be established in each Member State. Thus the key element of first railway package is an access to European rail network open that can be realised by separating four essential functions:

- The act of giving licenses to railway undertakings
- Decisions concerning an infrastructure usage fee
- The declaration of certain security standard and
- The route assignment decision (Mag. Helmut Kukacka, 2007)

The Second Railway Package consisting of Directives 2004/49/EC and 2004/51/EC. The Directive 2004/49/EC (amendment of 95/18/EC and 2001/14/EC) focuses on the development and improvement of safety of railways by defining common safety indicators (CSIs), common safety methods (CSMs) and common safety targets (CSTs); specifies the procedure for safety certification and authorisation; lays down the establishment of a safety authority and the obligations of investigation of accidents and incidents.

Directive 2004/51/EC (amending 91/440/EEC) fixes deadlines for opening access by licensed operators to national networks: April 2006 for international operators to TERFNs; 2007 for all railway undertakings, extending to cabotage.

The second railway package aimed to establish safety authority, modernise European rail network, and to open up rail networks more quickly to rail freight services of all types.

A Third Railway Package has been adopted by the European Commission on 3 March 2004 that consists of a Communication COM(2004)140 final, four legislative measures and a Working Document on an extended impact assessment for the gradual opening up of the market for international passenger services. It relates mainly to rail passenger transport and is therefore not relevant for the RETRACK project.

The European Commission has foreseen its role in the management of change from a nationally based system towards an interoperable and integrated pan-European rail freight system. In the mean time the Commission has established the European Railway Agency (ERA) in Valenciennes/Lille, France, with the mission of reinforcing safety and interoperability of railways throughout Europe, and thus adding a strong new momentum towards the shared vision of a truly integrated, competitive European railway area.

The ERA will draft technical specification for interoperability (TSI). The ERA structure, main tasks and working methods are outlined in EC Regulation No 881/2004. The Agency is governed by an Administrative Board composed by one representative of each Member State, four representatives of the Commission, and by six representatives of the Railway sector. The Executive Director is appointed by the Administrative Board. The Agency is operational, with about 90 members of staff, mostly professionals from the European railway sector (ERA, 2007).

3 Information on the Implementation of the Infrastructure Package

EC, (2007b) reports that the Directive 91/440 (mentioned before), as amended by the directives 2001/12 and 2004/51 presents that the Commission shall report by 1 January 2006 to the European Parliament and the Council on several issues in relation to the development of the European rail market, such as:

- Implementation of this Directive in the Member States and the effective working of the various bodies involved;
- Market development, in particular international traffic trends, activities and market share of all market actors, including new entrants;
- Impact on the overall transport sector, in particular as regards modal shift;
- Impact on the level of safety in each Member State, working conditions in the sector, for each Member State.

The report shall be accompanied, if necessary, by suitable proposals or recommendations on continuing Community action to develop the railway market and the legal framework governing it. The following questions could be asked in order to address these issues:

a) Market evolution related questions:
   - Is competition increasing?
   - Are prices going down?
   - Is there a modal shift in favour of rail transport?
   - Is the market for rail transport growing?
   - What are the actors which determine the market and what is their financial situation?

b) Framework conditions of the access to the network:
   - Have the directives been implemented and when?
   - What are the framework conditions of the rail market and has open access been achieved?

c) Technical condition of the railway network:
   - What is the state of the railway network, notably the information provided in the technical parts of the network statements?

d) The utilisation of access rights:
   - How are these rights allocated?
   - Has open access attracted other operators than the incumbent ones? Is the load factor prohibitive?
   - Are the available slots attractive?
   - Are all the slots used?
   - Does open access work?
   - Does a modal shift occur in favour of rail transport?

e) Barriers to more effective rail service:

●What are the barriers to entry to the railway markets in relation to technical limitations of the network or difficult access to training facilities for other than for national staff?

f) Infrastructure limitations:

●How are bottlenecks identified, on what criteria and remedial measures addressed?

●What are investments, or planned investments, to reduce infrastructure limitations? How are these ranked?

●Is there a need for new legislation on the basis of the market monitoring in relation to the effectiveness and efficiency of the goals set out in the directives, the common transport policy and the Treaty?

4 Rail Market Monitoring Scheme (RMMS)

On the basis of the questions listed above, a proposal for a Rail Market Monitoring Scheme (RMMS) has been elaborated, which enables the Commission as well as all interested parties to monitor the implementation of the directives in the Member States and to assess the impact of new market conditions. It consists of web pages with information on different aspects of the markets, such as freight rail transport developments, applicable legislation, the legal and administrative framework for the implementation of the community railway, the available infrastructure, assets (rolling stock, locomotives), the number and names of licensed railway undertakings and information on the labour market. This information will become available on a step-by-step basis with regular update of new information.

The Commission is assisted in its tasks by a Working Group of experts from the transport Ministries of the Member States. The group helps the Commission in assessing the information requirements and data availability in relation to the market monitoring. The Working Group has been set up under the Regulatory Committee created by Directive 2001/12, and one of the Member States' representatives is assisting the Commission in the implementation of policies and legal measures which have been adopted by the European Parliament and the Council of Ministers.

The Commission also appointed an external consultant (Giventis - The Netherlands) to draft a proposal for the development of the Conceptual and Organisational Aspects of a Community Rail Market Monitoring Scheme (RMMS), to be set up to comply with the provisions of Directive 2001/12. The Rail Market Monitoring Scheme is based on the proposals and suggestions made in this study.

4.1Reform/ Liberalisation Index

The study *Rail Liberalisation Index (LIB) 2004* describes the status of market opening in the European rail markets of the enlarged EU, Norway and Switzerland as of spring 2004. The liberalisation of the European rail transport which is the market for rail-bound freight and passenger transport continues to develop at a slow and differential pace. At the time, this development was driven largely by reforms which the Member States have implemented on the basis of the new European railway legislation initiated by the European Commission. The LIB (2004) suggests that the European liberalisation process is however still in the initial stage. The focus of the study was on the relative progress, and not the absolute state, of liberalisation for the countries examined in relation to each other. Overall, the rail sector still has a considerable backlog compared with other network industries, such as telecommunications or the energy sector.

In general, LIB, 2004 found that many countries, even though they grant documented, non-discriminatory access to the market, in practice do not allow this due to expensive and complex licensing and approval processes. In particular, the approval of rolling stock still

represents a considerable market access barrier. In many Member States, the structural changes announced over the last two years in essence frequently incorporate existing institutions under a different name. The regulatory bodies are frequently located in the ministries of transport of the Member States without the necessary resources, which is inadequate in regard to the functions to be exercised and the present initial stage of the liberalisation process (it is precisely the initial competition which requires effective and independent regulation). The absence of fully independent, impartial and objective rail regulation across the EU partners and the corridor countries in particular gives cause for concern.

Countries which have not yet fully implemented the first Railway Infrastructure Package can in practice in some cases offer better market access conditions than those countries which have already reported the implementation of the relevant Directives 2001/12/EC, 2001/13/EC and 2001/14/EC. Some of the accession States already have lower market access barriers than some of the existing Member States.

In spite of the distinct trend towards internationalisation being observed, the market shares of new Railway Undertakings (RUs) remain only marginal; here external RU refers to all RUs with the exception of the (former) state-run railway systems, the so-called incumbents, of the respective home markets, thus e.g. *Fertagus* in Portugal, *Connex* in Sweden or *SBB* in Germany. Only one third of the countries is, in a positive sense, clearly distinguished from the rest of Europe in regard to market access barriers. In the meantime more attempts are seen on the parts of RUs to gain a foothold as newcomers to the rail transport markets.

4.2 Reform Experience: British Rail

The LIB (2004) found that British Rail is at the top of the European railways league table in terms of market openness and is also a success story in terms of service quality and growth albeit from a low base. A similar opinion was expressed in seminar jointly organised by EIM, ERFA and ERFCP (2006). The seminar concluded that rail reform in the United Kingdom is a success and thus a possible model for other European countries**.** The seminar attempted to answer the question: 'How beneficial has the restructuring of the rail sector in the UK been, particularly for freight? ' The leaders of the British rail industry and freight customers confirmed that the British rail reform had been highly beneficial to the national freight and passenger market which has grown by 60% and 40% respectively in the last ten years and attracted over two billion Euro of private sector investment in rail freight alone. The seminar, attended by over 100 government and railway officials, customers and politicians from EU Member States and institutions, was designed to set the record straight about the success of the British railway reform, and demonstrate that this structure, on which the EU open access programme was largely based, would achieve growth, improved service quality and investment in the EU's railways.

The event had been prompted by the allegedly negative views of a number of stakeholders in several Member States regarding the structure and performance of the British rail sector. They argue against the full implementation of the EU's open access proposals. All (14) speakers of the seminar confirmed that the British rail reform had indeed benefited both the system as a whole and its stakeholders. The reform has significantly improved customer service, productivity and performance, and had triggered growth in the UK's rail freight sector. At the same time, safety and reliability have also improved, resulting in higher customer satisfaction rates. Stakeholder confidence has increased, leading to substantial private investment in the sector. Allegations of inadequate government backing or support from rail freight industry for the vertically separated model are arguable. .

The British experience affirms that the EU open access package on the railways was correct and good for the rail industry and all stakeholders. They argue that those who are seeking to prevent or delay full implementation of the open access packages, are not helping themselves or the European rail industry. Anti-competitive and monopolistic practices are not

helpful for industry growth. In other words, these restraints are preventing growth, service quality improvements, and private investment in the railways. They call on the European Commission and all Member States to urgently implement the EU open access proposals in a fair, comprehensive and transparent manner, to achieve the growth, improved service quality and private sector investment that both the industry and its customers so desperately need. (Source: Press release 23 February 2006, EIM, ERFA, ERFCP).

5 Road-Rail Terminal Management

The intermodal management process is characterised by bilateral contractual relationships at interfaces in the transport chain. Typically for an 'origin to destination' transport haul the freight forwarder is responsible for the road transport from the consignor to the originating terminal. In the terminal the cargo unit is delivered into the charge of the intermodal (i.e. rail) operator, who organises the transport between the originating terminals to the destination terminals. The intermodal operator collaborates with the terminal operator and the railway undertakings, which are contracting train paths from the infrastructure managers. The terminal operator is responsible for the handling of loading units in the terminal and is also in contractual relationship to the railway undertakings which are taking over the load in the terminal for the rail shipment. Other models are in operation whereby the train operator also offers the whole service profile including road transport, terminal handling and train operations as a composite package.

The railway operation through the transit countries for example, Germany or Austria, is carried out by a second railway undertaking and a third railway undertaking will be provided for the rail shipment between border and destination terminal. These railway undertakings are in contractual relationships with each other. The infrastructure managers are providing a one-stop shop (OSS) services. But the BRAVO report (2004) suggests that trilateral (or multilateral) negotiations directly with the management can yield faster and better results. The process of distribution follows the same procedures as the process of consolidating loads. In the destination terminal the responsibilities are changing from railway undertaking to terminal operator and then to the intermodal (rail) operator to complete the shipment between terminals. The last stretch in the intermodal transport chain – the road transport to the consignee will be in the responsibility of the forwarder. Some intermodal operators e.g. ICF organise also pre- and on-carriage by road and thus, offer a door-to-door transport service for their clients.

5.1 Schemes of cooperation between competing actors

In general collaboration with competitors does not work. This should be handled via independent rental companies, where equipment can be rented when needed. In former years, locomotive manufacturers did not enter that market without the state owned companies being their anchor customers.

In order to explore the strength and opportunities of intermodal rail freight, the railway companies as intermodal transport operators need to closely cooperate with partners such as terminal operators. But this is not an easily achievable target due to, among other things: the original purposes of the different kinds of railway undertakings, their former position in the non-liberalised markets, and the restrictive and exclusive access to the public railway network (discussed before). The main transport services were, and are still now in some countries, under a monopoly of the state-owned and operated railways, for example, in Germany. In addition to DB AG there have been a huge number of railways which were originally established to link industrial sidings and ports with the main state-owned rail network. These railway undertakings were responsible for operation in a local area and were offering feeder services.

As a result of the liberalisation process as well as European transport policy (first, second and third railway packages and related directives discussed before) the environment of the

railway sector is changing. A major part of this process is, to open up the public rail networks to any licensed railway undertaking and thus private or state-owned and local, national or international railway undertakings have to be competitive. In these new market conditions the companies have to set their objectives, in other words, they have to redefine their position in the identified market in which they wish to compete with respect to their individual strengths. The BRAVO study (2004) outlines the following strategies:

5.1.1 Cooperation with existing organisations

The relationship of private and public railway undertakings has to be revised; as such cooperation might be profitable but bears the risk of dependency for the smaller partner who might not be able to develop other market activities. The sheer scale of the market presence of DB and its wholly owned subsidiaries operating in other countries has already been the target of criticism and competitive fears. The recent acquisition of MAV cargo by Rail Cargo Austria adds impetus to these concerns.

5.1.2 Cooperation with new partners

The cooperation between private and public railways offers an opportunity for relatively small companies to take part in the long-haul sector. For such joint transport services, the responsibilities are separated for feeding and distribution according to the respective regional facilities. Any such service would be designed as a one-stop-shop with one company responsible to the customer that could improve customer services and wins new customers. International shipments would assume cooperation with international partners to whom know-how has to be transferred, as in most countries the market of rail transport has not yet been developed as in the UK or Germany (for details visit the “Liberalisation-Index 2004”). In order to meet the rising demand for logistic solutions, railway undertakings have the chance to open up new business segments and for this they need to find new cooperative partners from the logistics sector. The commitment between cooperative partners can differ as one partner can agree on single cooperative activity while others might take total approach to establish joint business ventures. However, in each case, new services and business will be developed.

5.1.3 Competition

A company can offer services on its own account against competing actors. Small scale private railway companies would probably use local facilities and therefore compete for regional services. On the other hand, the big companies can extend from a national to an international market.

5.2 Collaboration with competitors

In the changed market the companies can cooperate with and compete against each other at the same time. There are a number of possibilities and areas where they can cooperate on an operational level. Because, collaboration in businesses can bring in cost reductions for each partner in the following areas:

5.2.1 Shared use of locomotives and wagons

The total number of an individual companies own vehicles in operation can be reduced as the companies can use vehicles of another company for certain services or in an emergency situation or in a situation of high demand.

5.2.2 Mutual assistance in day-to-day businesses

The most important is the cooperation in operational businesses, as companies would assist each other, for example, in the case of technical defects by towing rolling stock or providing workshop services. Other possibilities of operational assistance are the provision of shunting services, short-term provision of locomotives or temporary assistance in the form of

personnel. Some of these aspects are embedded in Network Statements as a requirement or obligation.

In case of the training to personnel on similar topics/ disciplines, a joint training scheme would provide better value. Another possibility of saving personnel costs is the organisation of joint on-call duty. Another area of cooperation is the exchange of experienced specialists with other undertakings in the field of, for instance, financiers.

5.2.3 Joint purchasing

Companies acting in concert can order larger quantities by joint purchasing of electricity, fuel, vehicles etc and thus get better price.

5.3 Planning Processes for railway track use

In some countries the track access charges may be discriminatory. For example, if the track is owned by a company that also operate freight train, a higher charge for every body has not the same effect on every company. A private (outsider or competing) company will pay the higher rate out of pocket, but the integrated (owner cum operator) company will move a higher amount from the goods train pocket to the infrastructure pocket, but the money stays within the mother company. Energy charges have a similar potential. If the integrated company is bigger than other private ones, an advantage may be achieved through discounts or preferential charging.

The demand for quality transport services is growing consistently in the growing competitive market. The planning process for railway track use, from gathering market requirements and information up to the initial operational stage of a service, has to be established. In addition the working procedures and collaboration schemes, in particular for the timeframe of this process, have to be analysed. The intermodal operators have to be in contact with the final customers and thus, they need to set service conditions for all actors including the two terminals (origin terminal / destination terminal).

The characteristics of the desired service can determine the requirements for all parties involved in the planning process for this transport activity for example, the desired departure time and arrival time for the rail service are the major parameters for the allocation of the train path which is assigned to the infrastructure manager. Basic train parameters can be derived from the features of the respective load. The Railway Undertaking who carries out the planning process of the operational businesses, takes into account the deployment of personnel and vehicles and their suitability for the intended purpose including international stipulations on construction, certification use and crew competence. The planning processes of these two main actors, the Infrastructure Manager and the Railway Undertaking (RU), involved in the organisation of the rail service, have to be coordinated very well as train path allocation and deployment of resources (e.g. locomotives, wagon, and personnel) are directly interconnected. In addition to the train service for the interface to the road haulage, the handling of the consignment in the terminal has to be provided by the Terminal Operator.

The allocation of loading tracks and time slots for loading is governed by favoured loading slots in the terminals which depend in turn depend on the scheduled movement time of the transport. On completion of the planning process, a commercial offer is submitted to the intermodal operator, either as a package of all actors or in the form of bilateral offers. After agreeing upon the conditions and agreeing the contracts, the transport service will be put into operation, accompanied by measures for quality management and information exchange, to ensure a high quality standard. Organising the rail service is important, for example passing through the Brenner Corridor certain procedures have to be followed in addition to considering the rules of schedule planning for cross-border. The Intermodal Operators are the key actors to satisfy the market requirements with respect to terminal-to-terminal service.

Depending on the individual request, it will be offered to improve a transport service or to extend the activities beyond the existing service network some 12 months in advance to a potential initial operation of a service. The Intermodal Operator selects a Railway Undertaking or a cooperative venture of Railway Undertakings to operate the rail service of the intermodal shipment. When the conditions of the service are specified, the Intermodal Operator transmits favoured departure and arrival times to the Railway Undertaking, which elaborates a draft schedule for the rail service. In an iterative process this schedule can be modified, till both partners agree on a joint solution and thus the Railway Undertaking can submit a commercial offer to the Intermodal Operator.

The favoured draft schedule will also be transmitted to the Infrastructure Managers as input for the train path allocation, considering the Corridor (tri or a multi-lateral procedure) and cooperation between the Infrastructure Managers of the concerned countries such as Netherlands, German, Austria, Hungary and Romania. They will work out a draft train path, which again will be modified in an iterative procedure between Infrastructure Managers on the one side and Railway Undertaking and Intermodal Operator on the other side, until both parties agree on one schedule.

In 1997 the framework organisation “Forum Train Europe” (FTE) was set up as an official pan-European forum for international production planning, timetable coordination and harmonisation of train paths allocation for the European rail traffic. BRAVO (2004) reports that since then FTE organises annual conferences of national rail infrastructure managers, to prepare an international timetable for scheduled passenger and freight services:

- Conference A takes place 10 months,
- Conferences B takes place 8 months and,
- Conference C takes place about 6.5 months, before initial operation respectively.

For example, the services relating to the Brenner corridor were harmonised in advance, the joint elaborated draft train path was issued to conference C, where a concrete train path allocation was made (BRAVO study report, 2004). This was the basis for a final commercial offer of the Railway Undertaking to the Intermodal Operator. Finally a service was put into operation, when the Intermodal Operator accepted the offer no later than 4 months before a timetable period starts.

The basic procedure for the majority of scheduled international freight train services is accompanied by a process of fine tuning, investigation free train paths and finding of paths for additional trains e.g. which are not used on specific days of the week. For example at Brenner Service Centre (Brenner Servicestelle), a list of available train paths, so called catalogue train paths can be found by RUs (The BRAVO Study Report 2004).

6 Railway Maintenance procedures

Inspection and maintenance are vital procedures for safe and reliable railway operations. The procedures identify, manage and correct defects and problems that can occur in the railways and related infrastructure. Very serious accidents may occur, for example, Hatfield Crash in the UK, if the procedures are not developed and subsequently routinely followed by the parties. In the UK the minimum inspection and maintenance procedures and actions are specified in the Network Rail Line Specifications (Birmingham University and Manchester Metropolitan University, 2003). The main track standards are detailed in four Network Rail Line Specifications:

- Track Design Requirement (RT/CE/S/101
- Track Construction Requirement (RT/CE/S/102)
- Track Inspection Requirement (RT/CE/S/103)
- Track Maintenance Requirement (RT/CE/S/104)

Network Rail owns and operates Britain's rail infrastructure to provide with a safe, reliable and efficient railway fit for the 21st century (Network Rail, 2007). The last two specifications are closely related to the current task and thus discussed further in the following sections. These specifications are enhanced by other component specifications and modifications from time to time as required. For example, Inspection and repair for reducing the risk of derailment at switches RT/CE/S/053. Infrastructure maintenance contractors (IMC) in the UK undertake track inspection and maintenance works and responsibilities under contract from Network Rail. The identification and detection of defects in the rails and non-destructive testing (NDT) procedures for the rails are covered by the main rail testing to Network Rail Line Specifications.

Network Rail looks after all aspects of the railway infrastructure, including the tracks, signalling systems, viaducts, tunnels, bridges and stations. Safety is a primary concern. Network Rail developes Route Utilisation Strategies to cover the different routes across the rail network, in conjunction with rail industry partners and wider stakeholders. Its Route Utilisation Strategies (RUSs) try to balance capacity, passenger & freight demand, operational performance and cost, to meet the requirements of both funders and stakeholders. The Route Utilisation Strategies informs the development and delivery of timetables, infrastructure maintenance and renewals for the network (Network Rail, 2007).

6.1 Track Inspection

The main instruction for track inspection procedures, frequency, methods of testing etc are set out in the Track Inspection Requirement (RT/CE/S/103):

Mandatory minimum frequency (for details see table 1) for regular visual, ultrasonic and geometric recording inspection depend on the track category, type, speed as well as tonnage using the line. Switches and crossings must have a mandatory weekly visual inspection.

Details of track defects that require immediate blocking of the line or imposition of emergency speed restriction are listed. Also details of minimum actions on the finding of rail defects, breaks, and damage of fishplates are listed.

Methods for detailed inspection of certain major track components including the reporting of defective and broken rails, switches and crossings, sleepers, timber bearers and fastening, ballast etc.

Table 1. Maximum and minimum interval of inspection intervals

Visual track inspection		
Frequency of inspection	Minimum interval between inspections (days)	Maximum interval between inspections (days)
Twice per week	2	4
weekly	4	8
Once per two weeks	9	17
Once per four weeks	23	31
Ultrasonic rail inspection		
Nominal interval (months)	Minimum interval between inspections (months)	Maximum interval between inspections (months)
3	2	3.5
6	5	7
12	11	13
24	22	26
Track Recording Runs		
Nominal interval (months)	Minimum interval between inspections (months)	Maximum interval between inspections (months)
3	2.5	3.5
6	5	7
12	11	13

Source: Birmingham and Manchester University, 2003

6.2 Track Maintenance

The study conducted by Birmingham and Manchester University (2003) noted the track maintenance details. Track maintenance in the UK is specified in the Track Maintenance Requirement (RT/CE/S/104). It sets out the requirements for the maintenance of the permanent way with the intervention limits including limits of wear for rails and the minimum actions for serious defects. The contractor (IMC) is expected to maintain the track in such as way that these limits are not exceeded except in exceptional circumstances. The specification defines where and when a measurement shall take place and the maximum and target values of track geometry parameters. The study conducted by Birmingham and Manchester University (2003) noted that the track maintenance requirement covers:

- ●Track Gauge- Measurement (static and dynamic- variable with train speed) and corrective action.
- ●Rails- Defective and broken rails and cast crossings: reporting and minimum actions. Data from the replacement site is recorded in the Raildata system. The defective lines are to be monitored until the rail is changed, but if the defect is serious, then the line has to be closed until repairs/ replacement are completed.

●Side-wear – limits and minimum actions are specified with the wear set out by a minimum head width depending on the speed. The timeframe for replacement depends on the annual route tonnage with exceed causing speed restriction on the rail line. Differentially worn rail lines are matched by blending the join of the abutting rails through grinding.

●Minimum rail depths and fishplate clearance, this takes into account of the rate of increase in side-wear.

●Flame cutting- permissible and non-permissible methods (oxygen/ fuel gas method for cutting holes in all types of rail steel only permitted for specific tasks)

●Rail Joints – non-insulated fish-plated joints, non-glued insulated joints, glued insulated joints, and rail-joint straightening. The specific maintenance for each is established as well.

●Switches – positioning of switch toes, flange-ways, slide chairs and base-plates, switch and stock replacement.

●Crossings –flange-ways and gauge, diamond crossings (replacement and plain –railing).

●Adjustment switches – these are set according to the temperature at the time of setting.

●Sleeper, timber and bearer – spacing for maintenance and replacement with the maximum allowable number of defective sleepers specified.

●Switching and crossing –securing when out of use.

●Fastening pad and insulator –action for maintenance and replacement

●Chair and base-plates – action for breakage

●Ballast – maintenance of profile and removal

●Hot weather precautions – maintenance of tolerances

●Drainage – maintenance of free water flow.

●Track geometry - vertical profile and alignment are measured using the track recording coach with maximum and target values set for profile and alignment, actions for irregularities (see table 2), buckling and reporting.

Table 2: actions against irregularities in the track geometry

Irregularity	Action
Dynamic twist of 1 in 90 or worse	Stop all traffic and correct immediately
Dynamic twist of between 1 in 91 and 1 in 125	Correct within 36 hours of discovery
Dynamic twist of between 1 in 126 and 1 in 200	Correct within 10 working days of discovery
Dynamic gauge > 31 mm wide	Inspection and comply with track gauge specification and within timescales.
Cyclic top value ≥ 20mm	Depends on whether vehicles are susceptible to derailment on cyclic top run.

Source: Birmingham and Manchester University, 2003

6.3 Infrastructure Maintenance Contractor (IMC)

In the UK the IMCs are responsible for inspection and maintenance of rail infrastructure under contract from Network Rail. Most of the maintenance works are completed as normal maintenance and some are reactive.

6.3.1 Normal Maintenance

The contracted IMCs have a normal maintenance schedule, which is programmed to respond to the defects detected through: visual inspection, enhanced inspection and high speed recording coach (HSTRC) and ultrasonic train unit (UTU) reports. The visual inspections information allows correct prioritisation of defect repairs with appropriate timeframe for renewal purposes. The enhanced inspection is designed to instruct correct maintenance and replacement action. On the other hand, the HSTRC and UTU identify isolated defects or combination of defects at 2 levels:

- Track becomes a problem and may deteriorate to the level where reactive maintenance is required.
- Action required removing defects; this can be from line closure to action required within a time limit which can be within days depending on defect and severity.

Defects can be removed through either scheduled or reactive maintenance according to the Network Rail Line Specifications. The majority of defects are reactive with a removal timescale of 36 hours to 7 days. Others are prioritised as 13 weekly and are programmed into schedules.

6.3.2 Reactive maintenance

This includes action in response to defect reports from less reliable sources than those picked up from inspection and maintenance procedures such as train drivers, station staff or members of public. Many of these are incorrect but all require investigation. Examples of reported problems:

- Bumps: ballast placed on the line by vandals;
- Wet-bed condition sudden deterioration after excessive rainfall; and
- Breaks from fishplates to rails.

7 Summary of the Background to Railway Reform

The motivations behind rail reforms, to open up the rail network to private companies, are: liberalisation of rail freight markets, harmonisation of rules, interoperability of technical systems, fair pricing between modes and infrastructure investments and maintenance. To achieve these objectives, a number of EC directives notably 1991/440/EEC, 1995/18/EC, and 1995/19/EC, and their subsequent amendments: for First Railway Package - 2001/12/EC, 2001/13/EC, 2001/14/EC; and for Second Railway Package have been developed and adopted to varying degrees. The third Railway Package is for Passenger transport. The First Railway Package focused four main areas: the act of giving license to railway undertakings, decisions concerning an infrastructure usage fee, the declaration of certain security standard and the route assignment decision. On the other hand the Second Railway Package focused on establishing safety authority, modernise European rail network, and to open up rail networks more quickly to rail freight services of all types.

A very close co-operation is needed for intermodal door-to-door service among the freight forwarder (responsible for the road transport from the consignor to the originating and to the consignee at the destination terminal), the intermodal (i.e. rail) operator (responsible for transport between the originating terminals to the destination terminals), the terminal operator (responsible for the handling of loading units), and the railway undertakings which are contracting train paths from the infrastructure managers.

The planning process for railway track use, from gathering market requirements and information up to the initial operational stage of a service, has to be outlined. Also the working procedures and collaboration schemes in particular the timeframe for this process have to be analysed. The intermodal operators have to be in contact with the final customers and thus, they need to set conditions for all actors including terminals operators, freight forwarders and infrastructure managers. The desired departure time and arrival time for the rail service are the major parameters for the allocation of the train path which is assigned to the infrastructure manager. Basic train parameters can be derived from the features of the respective load.

The Railway Undertaking which carries out the planning process of the operational businesses, takes into account the deployment of personnel, vehicles and all related assets.. The planning processes of these two main actors, Infrastructure Manager and the Railway Undertaking (RU), involved in the organisation of the rail service, have to be coordinated very well as train path allocation and deployment of resources (e.g. locomotives, wagon, and personnel) are directly interconnected. In addition to the train service for the interface to the road haulage, the handling of the consignment in the terminal has to be provided by the Terminal Operator. The allocation of loading tracks and time slots for loading is governed by favoured loading slots in the terminals which depend on the time of the transport. After agreeing the conditions and concluding the contracts, the transport service will be put into operation, accompanied by measures for quality management and information exchange, to ensure a high quality standard.

Certain procedures have to be followed in organising the rail service, passing through the railway corridor considering the rules of schedule planning such as at a border. The Intermodal Operators are the key actors to satisfy the market requirements with respect to terminal-to-terminal service. Depending on the individual request, it will be offered to improve a transport service or to extend the activities beyond the existing service network some 12 months in advance to a potential initial operation of a service. The Intermodal Operator selects a Railway Undertaking or a cooperative venture of Railway Undertakings to operate the rail service for the intermodal shipment. The basic procedure for the majority of scheduled international freight train services is accompanied by a process of fine tuning, investigation free train paths and finding of paths for additional trains e.g. which are not used on specific days of the week.

There should be mandatory minimum frequency for regular visual, ultrasonic and geometric recording inspection depend on the track category, type, speed as well as tonnage using the line. Switches and crossings must have a mandatory weekly visual inspection. It should detail the tracking defects that will require immediate blocking of the line or imposition of emergency speed restriction.

Most of the maintenance works of railways are completed as normal planned maintenance which may be identified in the Network statements and some are reactive. The contracted IMCs have a normal maintenance schedule, which is programmed to respond to the defects detected through: visual inspection, enhanced inspection, HSTRC, and UTU reports. The visual inspections information allows correct prioritisation of defect repairs with appropriate timeframe for renewal purposes. The enhanced inspection is designed to instruct on correct maintenance and replacement action. On the other hand, UTU identify isolated defects or combination of defects at 2 levels: track becomes a problem and may deteriorate to the level where reactive maintenance is required and action required removing defects, this can be from line closure to action required within time limit which can be within days depending on defect and severity.

The majority of defects are reactive with a removal timescale of 36 hours to 7 days. Others are prioritised as 13 weekly and are programmed into schedules. The reactive maintenance collects defect reports from less reliable sources than those picked up from inspection and maintenance procedures such as train drivers, station staff or members of public. Many of these are incorrect but all require investigation e.g. ballast placed on the line by vandals.

8 Retrack related issues

8.1 Basic characteristics of the railway infrastructure

The Retrack corridor from Rotterdam to Constanza traverses five national railway networks all of which differ in their response to the Railway packages and also in detail in terms of their individual national rail infrastructure characteristics.

Key generic features of the entire corridor are:

- Standard 1435mm rail gauge is used throughout;
- The loading gauge varies on the route;
- The route operates under differing power supply systems for electric locomotive operation;
- Electric traction operations are feasible over the main routes over the principal lines of the Retrack corridor;
- There are varying speed, axle weight and total trailing train weight limits in force along the Retrack corridor reflecting previous national limits;
- Train control and signalling systems are based on individual national methods and patterns; and
- All the railways along the Retrack corridor are UIC members and work within its rulings and objectives.

Specific comments on national railway infrastructure and management are provided below.

8.2 The Netherlands

The rail infrastructure in The Netherlands extends over 2600 km of which 200km is electrified. The rail network is one of the most densely operated rail systems in Europe with a mix of international, inter-city, regional and stopping/commuter trains all operating on the network. The entire network is governed by signal operations controlling train movement. Much of the network has multiple lines with bi-directional signalling multi-aspect colour light signalling. Line capacity has been enhanced to accommodate the aggregate high levels of train activity and to accommodate peak travel. The maximum train speed on the main network is 160kph for passenger trains. Freight trains operate to a maximum speed of 100-120kph. Maximum vehicle gauges are specified by route sections and are the maximum permissible vehicle gauges using UIC combined traffic coding. Maximum train length for freight is 750m. A significant part of the network is able to accommodate container traffic (2.6m width) and with a height of 4.43m (ToR)

In addition to the existing national network new freight only line capacity has been developed and commissioned between Rotterdam and Emmerich on the German border to accommodate the already high levels and predicted rapid growth of inter-modal traffic. It is intended that this route will become the primary rail freight corridor between The Netherlands and Germany. The line is double tracked with an axle load of 25 tonnes per axle and has no level crossings. The theoretical design limit on the line is ten trains per hour per direction. The line formally opened in June 2007 but is still being commissioned. Linkage into the German rail infrastructure and power supply system is still not fully completed and may be subject to further operational and budget induced delay.

The line is operated by Keyrail which was specifically established for this purpose with participation by ProRail, the current infrastructure operator/manager and the port authorities of Amsterdam & Rotterdam. Keyrail is responsible for traffic control, capacity management as well as the operational management and maintenance of the new line. It also plans traffic activity for a variety of cargo interests including national and international parties, other

infrastructure managers, forwarders and train operators intending to operate over this section of the corridor.

The main railway system is electrified at 1500v d.c. although some specialised sections are now being adapted to 25kv a.c. as part of a move towards European standardised power technology, notably the High Speed lines and the Betuwe line and the linkages to Amsterdam (via 's-Hertogensboch-Utrecht) and Ijmuiden. The 1500v d.c. system poses limitations on the capability of traction using this power input and there is a strategic national plan to convert the network to the European standard voltage but over a very long transition period (2022-2032) including the use of mixed voltage operation under the slowest conversion option. Reinforcement of the existing 1500v system has been undertaken to prevent power losses and the knock on effect this has on train performance.

The railway system in The Netherlands has been significantly upgraded and modernised to accommodate a growing level of passenger and freight traffic including international traffic. Lines have been modernised with track capacity being expanded using multiple tracks, power systems have been upgraded and most main lines now use continuous welded rail to support the additional traffic. New junction arrangements have been developed in key locations to avoid trains coming into schedule conflict.

The primary freight capacity enhancement has been the Betuwe line which is now in the process of being commissioned. This will be the primary freight line serving Germany and other parts of Central and Eastern Europe. It should, when fully operational, be able to accommodate over 200 trains per day. The Rotterdam area is a very busy traffic zone for rail and there are issues identified in interviews with terminal operators relating to the maintenance of the railway infrastructure (track, signals and power supply) that constrain the ability to run trains on a 24/7 basis. The planned maintenance intentions of the infrastructure operator are advised to train operators in advance or embedded in the Network Statement. The development of further maritime container terminals in the Rotterdam area will inevitably place additional pressure on rail to service this traffic demand. No details have been made available on intentions with respect to these types of terminal development. In the short to medium term the operation of Retrack rail freight services building possibly towards at least one train per day may become a problem for the infrastructure manager (ProRail). Congestion statements have been issued covering rail yards in Maasvlakte, Europoort, Botlek and Waalhaven for 2007.

The majority of lines are governed by multi-aspect colour light signals governing train movements and speeds. A system of train protection is used (ATB) which intervenes automatically in the event of prescribed train speed limits being ignored and also failure to respond to warning signals to reduce speed. (The system underpinning this technology was developed after a serious traffic accident involving bi-directional train operations.) New control protocols built around ERTMS Levels 2 & 3 (for details see deliverable D.2.9) are being developed and will cover issues such as train detection, interlocking and speed control without external signalling.

The rail infrastructure is managed by ProRail (a private company under national law where the Dutch government is the sole stakeholder) under a management concession granted by the Dutch Ministry of Transport. The concession governs the quality, reliability and availability of the infrastructure, a fair, transparent and non-discriminatory distribution of capacity on the network and executive control of the traffic on the network in accordance with provisions established in granting the concession. In addition to the above ProRail has to ensure:

- Adequate, reliable and safe infrastructure is available for rail operations which can be used safely without excessive attrition
- To make train paths available on an equable basis through allocation and traffic control
- Risk analysis and risk management.

Lower level objectives are also prescribed.

ProRail operates its exclusive management concession under the Dutch Railways Act. The Network Statement 2008 is a document within the meaning of Section 58 of the Dutch railways Act and has been developed to ensure compliance with that act and with the EC directive 2001/14/EC. The statement lists the rights and obligations of both ProRail and titleholders/users. They contractually establish the rights and obligations in access agreements and procedures determined for capacity requests. By publishing the Network Statement 2008 ProRail has accepted its obligations as specified within the body of the statement.

Traffic monitoring is undertaken by the normal train signalling system with train operations governed by pre-planned routing, schedules, stopping points, recovery times etc. Any "out-of-course" schedule delays are resolved by individual signalling centres and the national infrastructure manager. Train schedules are developed in the form of representations to the infrastructure manager for train paths by a prescribed date (Normally April but in June in Holland) to secure a scheduled path (see Prorail Network Management statement for full details). Requests made after this period are dealt with on an ad-hoc basis by the infrastructure manager. The option to apply for an international train path through RailNetEurope or to individual national infrastructure managers is available to train operators to determine the best way of securing their requirements. The capacity allocation process is described at a generic level in 2001/14/EC. In the event of routinely congested infrastructure this situation has to be declared invoking a capacity analysis and capacity enhancement measures. Train priority rules vary by country and apply after congestion has been declared and may not always reflect the importance of international freight. No initiative to harmonise priorities is known to exist.

The Dutch rail system is a modern well equipped network which supports high levels of traffic activity. Retrack services operated by a new private rail entrant will have to be compliant with the requisite national and international technical, operational and managerial requirements before being allowed to deploy services. The position on cross border train driving operations by ex-patriate train crew is already addressed by the operation of locomotives by accredited and certificated train crew across national territorial borders within prescribed limits. The development of a position on an international driving licence is relevant to Retrack in that a model of operation exists and this could be replicated. The use of a common or near common language (e.g. Dutch and German) facilitates the position. The change of power systems should be less of an issue as the Betuwe line becomes operational and the need for 1500v d.c. power is reduced.

No information has been developed in relation to train service disruption resulting from track damage (however caused) or bad weather.

At the time of writing there are known to be at least eight train operators in the Dutch rail freight sector:

- ACTS Nederland BV
- ERS Railways BV
- Nederland BV (formerly NS Cargo)
- Rail4Chem Benelux BV.
- Dillon & Lejeune Cargo
- Rotterdam rail Feeding BV
- Hafen & Guterverker koln AG
- Veolia Cargo Nederland BV

SNCF Fret and B-Cargo are also known to be intending to operate.

The adoption and implementation of the package of reforms and liberalization measures has dovetailed with and positively reinforced changes taking place within the Dutch rail freight

sector. The various agencies have combined and collaborated to adopt the strategic requirements of the EC's directives.

The Network Management Statement is an object lesson for other countries to emulate. It underpins the method of working on the railway infrastructure manager in detail and at the strategic level.

The liberalization process and open access to the system has induced new operators into the market all of whom are compliant with the requirements of the NMS.

Infrastructure capacity issues are already in development and implementation. Further capacity enhancement in the Rotterdam area will be required as additional port capacity is developed for inter-modal traffic. International co-operation to maximise the potential of this will be needed.

8.3 Germany

The German sector of the Retrack corridor uses part of the national infrastructure (34000 km) controlled by DB Netz which is wholly owned by Deutsche Bahn. DB Netz was established in the second stage of railway reform in Germany. DB Netz acts as the provider and manager of the infrastructure covering track, power supply and signalling and communications. DB Netz operates through seven regional divisions with headquarters in Frankfurt. DB Netz is part of one of the three major subsidiaries of DB (Networks) and is a company in its own right but wholly owned by DB Holding. It is a part of the German model of liberalization and discrimination free access to the national infrastructure for domestic and international services.

DB Netz is responsible for the operation, maintenance and development of the national infrastructure (freight and passenger) and is required to publish a Network Management Statement describing its objectives and intentions and methods of working. DB Netz has developed and is implementing a programme (ProNetz) aimed at increasing capacity and reducing operational bottlenecks. The objective of the whole initiative is to adapt the infrastructure for rapid growth by significant investment in modern systems and hardware to support efficient train operations. The ProNetz programme is planned to extend for several years (unknown duration) for the existing rail network and aims to adapt the system to accommodate more traffic by technological improvements, the integration of investment and maintenance and to install developing train protection and control systems. Annual investment is projected at Euro 1.6 billion for 2007. Modernization funds (Euro 3.0 billion) are also planned for the entire network. Retrack will be an indirect beneficiary through the systems enhancements. The main focus will be in maintaining the already high integrity and standards of the track structure (rail replacement, ballast & sleepers), power supply and signalling systems.

For Retrack operations there have been expressions of concern over the capacity of the route sectors along the Rhine and the risk of being allocated less than adequate quality train paths in terms of schedule. The rail network in Germany is intensively used by a mix of passenger services (international - day and night), national passenger services, regional and local/commuter services. The development of the high speed network as a separate entity has removed some traffic onto a completely separate infrastructure.

Germany claims to be one of the most liberalised freight markets for rail in Europe. Since the market began to de-regulate nearly 300 companies have secured licenses to operate within the freight market. Of this number over a third are active in the provision of traction for train haulage or shunting. Some operations are highly localised serving a specific location or enterprise. The market in terms of volume and production (tonne km) is still dominated by DB's rail arm, Railion, which has control over the infrastructure and the huge market presence.

Trains are monitored in transit on the rail network through the active signalling and train control mechanism based on scheduled access to train paths, routing and schedules granted through the formal bid process or ad-hoc arrangements which cannot always fulfil the path requests made by specific operators. Parts of the corridor are covered by the developing ERTMS implementation. Inter-modal trains have been monitored for performance quality under the CER Quality initiative to record train movement patterns in relation to prescribed schedules and to identify any underpinning reasons for delay. The train departure related delays had increased (based on 2004/5) marginally but arrival performance had improved with over 70% of international trains arriving within the performance parameters. The absence of common protocols on IT (for details see deliverable D.2.2) and reporting makes the present monitoring methods more expensive and disaggregated.

There is no uniform formal method of passing to shippers or cargo interests real time information on cargo location and condition or any revised schedule adjustments. Cargo trains operate within UIC agreed loading gauge limits for vehicle height and width. The maximum axle load on the German portion of the train corridor is 22.5 tonnes. Maximum train speed is 120kph.

In terms of inter-operability the German main line rail system which would be used by Retrack operations is electrified at 15kv a.c. This differs from the Dutch national system (1.5kv d.c. and the Betuwe line operating at 25kv a.c. Thus the train operation will require multi-voltage locomotives. Operations into Austria and Hungary are at 15kv. Crew changes are still largely made at the borders but the opportunity to operate across borders with competent certificated train crews is in prospect. Some cross border driving activity but on a localised basis is undertaken by competent “foreign” crews.

The German railway signalling system is, like most others, distinctly different from those of other countries on the corridor. Details are attached as an appendix to this document. ERTMs is being developed on part of the route likely to be used. In the event of service disruption in terms of train priorities cross border traffic is most highly rated followed by passenger services and then national freight services.

Developing train path bids by train operators and the consolidation of these into an agreed schedule by DB Netz in a transparent process establishing schedules, routings, stopping points and related technical issues. Within the train operators key personnel are assigned for dispute resolution, related commercial negotiations and settlements. Slots not allocated by the process are available under short term rules. DB netz has to reconcile all bids to minimise schedule and route conflicts under an established disputes/reconciliation process. Options to re-bid or pay a higher fee for a preferred path is available. The short term slots are available outside the main timetable/train path position and can include declared unused or redundant slots. This may be an advantage in that some short term or spot paths may offer faster transits than the regular path. International train paths can be fixed by the national operator or through RNE.

For the purposes of Retrack the routes proposed are all double track. So there is an option with flexibility to loop around any obstruction. It is possible that a locomotive could be requisitioned to move a failed train out of the way under rules set by the network statement.

General power supply failures are rare in Germany. Some localised damage is caused by snow causing trees to fall onto power lines but these types of incident are normally easily repaired within a few hours. Point’s failures do occur and lead to local re-routing or train re-scheduling until rectification of the fault. Leaf fall in the autumn can result in train weights being lowered by about 10% to mitigate this problem. Locomotive or traction failures are rare with modern technology yielding 97% availability underpinned by lease contracts. Wagon defects are largely the result of brake valve failures. This can lead to an individual wagon or freight car being removed from the train formation to be repaired or isolated to allow it to complete the transit and then be repaired. This sort of defect is usually detected by “hot box”

detectors at the line side responding to brakes dragging. Bearing lubrication failures resulting in overheating are also detected by the hot box equipment.

Maintenance and other construction work is a significant issue on German railways and significant construction work is planned into the annual timetable. Smaller projects are notified to train operators in advance (3 months) with a resolution process driven by the rail regulator.

DB Netz and OEBB Infrastructure have the same software (Alcatel), which enables them to see, what is going on in their respective network. It is called LeiDis-N (Leitsystem der Betriebsführung - Disposition Netz) (Leading system of the operation - Disposition of the network). Every station has at least one fixed point, where trains that are passing by are registered by there individual train number. Every movement (in Germany) is entered into the system as planned. Once the train has started to move, at the predetermined points, that the train is supposed to pass, the actual time of day is filled in, next to the scheduled time. The capturing of the actual times may happen by using ETCS data, static data, or manual key entry, where no automated system is in use. The difference between scheduled and actual is displayed and resons for delays have to be keyentered by Netz personal.

Private rail companies can have access to the system, either to the Leidis - N mirror or via ARAMIS.

LeiDis - N mirror is located in Frankfurt. The schedules are copied once per day from the live system LeiDis - N to the mirror system. The actual data is "real time". As a central system, it shows only trains, that are "long-distance" are have been grouped to the code of long distance-trains manually. I.e. a locomotive only movement to get to a train, is not visible in Leidis - N mirror. The customer is connected via direct line from a dedicated computer in his office to the server of DB Netz and due to a filter, he can only see trains moving, that were constructed using the customers account number.

ARAMIS (Advanced Railway Automatisation, Management and Information System), takes its info also from LeiDis - N. The difference is that it is accessed via Internet. The customer has the choice from which DB Netz server he wants his information. This choice can be altered at any time. So if information concerning a local movement is required, the customer can chose the regional server which has all movements within his region. By logging into ARAMIS, automatically the filter is activated to prevent the customer seeing trains of his competitors.

The reason codes for additional delays are used to determine which party has to pay the penalty charge created by the stimulation system. I.e. the delay code says, 5 minutes additional delay because of a defect switch, DB Netz will pay. If the code says, locodriver late, the railway company will pay.

8.4 Austria

Access to the national rail network (Betreib AG, a part of OBB) is governed by stipulations set out in the NMS including an operating licence, safety certificate, insurance and an allocation of infrastructure capacity. Various categories of train operator are allowed to apply for access including internationally based groups intending to serve the Austrian market or requiring transit.

Additional stipulations govern the transport of hazardous goods traffic. National laws apply in relation to environmental issues including noise.

Lines on the Austrian rail system are described in detail in the NMS in relation to line characteristics, operations methods, signalling and axle box counter/hot box detector location.

All primary routes are built to 1435mm track gauge and over 70% of the system is electrified at 15kv a.c. which permits through traction operations into Germany and Hungary. Power is supplied through a mix of railway owned or partner generating plant.

The infrastructure activities are split into those responsible for the operation and maintenance of the network and a separate section devoted to the development and enhancement of the network. Betreib AG is responsible for ensuring as much of the network is available for traffic as is possible commensurate with maintenance requirements and commitments to ensure safety and efficient train operation. Infrastructure maintenance is governed by scheduled planned activity intentions for up to three years forward.

Train paths are allocated to operators on the basis of requested route, operator details, train weight, length, speed and braking characteristics, any hazardous cargo intentions, traction unit capabilities, border processes for hand over and checks, crew changes, gauges for inter-modal traffic /combined transport and connections. Deadlines for the submission of train paths in the annual timetable planning process are required by April for the following year. Ad hoc train paths can be requested on a diminishing time basis but with the risk of not being able to satisfy the request on a shorter time span. In the event of an operating incident procedures have been developed to ensure contact is established with named personnel within train operator's organizations to advise intentions to restore stability.

Train path priorities have been identified in descending order from passenger/public transport to longer haul, long terms contracted operations over shorter distance short term operations. There is a let out provision for priority to be allocated to trains that "tie in with infrastructure operating conditions". There are train monitoring processes in place and response measures in the event of disruption of disturbance of a planned train sequence.

A total of 24 railway undertakings have licences to operate although how many of these are active is not known in detail.

Line capacity for Retrack services operating through Austria will be able to take advantage of the capacity enhancements in west of Vienna between Linz and St Paulten. This section is classified as a high priority route with high passenger and freight volumes. Vienna is a busy conurbation with a major potential terminal stop to negotiate in transit to/from the Hungarian border. The route is governed by train monitoring system RZO/looplines and train radio communications. Hot box and wheel "flat" detectors are installed on the route and over the most of the main line network. OBB Betreib has issued a forecast map of major engineering works including capacity enhancements as part of the NMS. The Retrack route will be affected by some of these.

No detailed information has been developed in relation to train failures, power failures, track damage or weather related incidents disrupting train services.

8.5 Hungary

The Hungarian railway network (7700km) is dominated by the infrastructure managed by MAV, the Hungarian State Railway Company. There is a small jointly owned (Hungarian and Austrian) cross border route in Western Hungary. About 40% of the network is electrified at 25kv a.c. which complicates cross border traction operations for Retrack into Austria. The management of the infrastructure has been separated from train operations. There has been a back log of infrastructure maintenance leading to slower train operation. There are international container services operating to Budapest from Western Europe and rail in Hungary has a high level of participation in inter-modal traffic.

Only 20% of the network is double track which may create concerns over capacity in the medium term. Traffic levels are however down significantly compared to levels under the communist regime so there is in principle some capacity on the network to accommodate

new traffic. The deterioration of the network due to maintenance backlogs will need to be addressed.

At least 20% of the TERFN annual line capacity in Hungary has been allocated to railway undertakings other than the incumbent and enjoy comparable journey times to the incumbent operator investment made by the EIB since the early 1990s in infrastructure upgrades and modernization has amounted to Euro 450 million. ECTS is already in operation on the route between Vienna and Budapest and was one of the first applications of this technology.

Parts of the Retrack corridor routing in Hungary will allow freight train operations to a maximum line speed of 100-120 kph. Maximum axle loads are 22.5 tonnes. Maximum train length in Hungary is 750 m.

Access to the rail network is granted under licence and in compliance with safety, competence and insurance credentials. Capacity is allocated by a capacity allocation office nominally separated from the infrastructure manger (MAV) although this separation is opaque. A fully independent Rail Regulator is in place. Market share held by the new train operators is very low and competition is still developing. There are only a few (4) players identified capable of operating competitive train services. MAV Cargo has been sold to Rail Cargo Austria.

Traffic control and monitoring is through a mix of signalling and train control mechanisms which reflect national systems that also incorporate train speed commands to train crew. ERTMS is in operation on parts of the Retrack corridor. There is no independent monitoring of train location or cargo track and trace in place. In terms of train inter-operability rail vehicles have to be compliant with UIC loading gauge stipulations on dimensions, braking loading and speed characteristics.

No information has been developed in relation to traffic disruption caused by power failures, infrastructure induced delays including power failure or bad weather.

8.6 Romania.

The strategy for rail transport supported by the national government is to reorganize the activities of the incumbent railway operator in accordance with EU norms by splitting the functions, clarifying the financial position of the incumbent, privatising freight, removing speed restriction, enhancing technical and commercial speeds by 20% and completing works on the 4th Corridor. Separate regulatory and safety inspectorates are to be fully developed.

The total national route network comprises 11,300km of which 40% is electrified at 25 kv which will allow through operation on the same power supply as the neighbouring Hungarian system. The railway is to standard European gauge (1435 mm). The dense network of lines offers multiple routing options for Retrack corridor trains in the event of disruption or lengthy track possession for engineering work.

CFR Infrastructure manages and operates the railway infrastructure. It is also responsible for line modernization. The rail network has a high proportion claimed by the infrastructure manger to be inter-operable. The residual network is mainly low volume branch lines. The rail system to the North and West is in mountainous territory which constrains train performance. The network is being developed to allow an increase in train speed between Bucharest and Constanza. In addition significant infrastructure enhancements are being made in and around the port terminal area in Bucharest to allow additional trains to operate. These investments will enhance rail's competitive position in the port which has been eroded by the lack of adequate rail capacity.

Maximum train length is set at 620m and a gross trailing weight of 1500 tonnes. This can be raised to 2600 tonnes with additional traction resources added. Rolling stock and traction are governed by UIC stipulations on dimensions, weight and operating capabilities.

A network statement has been prepared by CFR to describe the services supplied by CFR for those customers wishing to operate trains on the railway infrastructure operated by CFR. It is for guidance and advice only and not a contractual document. The network statement includes the general rules, deadlines, processes and criteria regarding the system of levying charges and of allocating railway infrastructure capacity which is also defined in the statement. It serves to facilitate non-discriminatory access to information for existing and new market entrants.

The statement has evolved in accordance with EC directives transposed into national law. It describes the position for one timetable period only but will reflect changes and developments as these occur.

Traffic management on the network is undertaken by traffic regulators co-ordinated by regional regulators and centrally by the Central Office for Railway traffic control. An integrated rail information system is used for monitoring and control purposes. Disruption response is undertaken by increasing degrees of involvement of the hierarchy. Trains operate on allocated paths based on the annual timetable, average traffic programme (10-30 days forward) or on a spot basis with a lead time of 24 hours. There are 24 railway undertakings in Romania with sanctioned access to the network for freight traffic operations. Access is granted in accordance with government ordinances on the national rail transport policy objectives, the establishment of a national rail company, allocation and charging, safety rules and certification and licensing. The main railway system is invested in state ownership.

The public railway infrastructure is made available to railway undertakings in a non-discriminatory way based on licensing, safety certification and an access contract with CFR. This will set the scope of rail services to be offered, access to infrastructure services and any supplied services, additional and auxiliary services. Capacity allocation is made by CFR as the independent railway infrastructure manger. There is no option to swap or trade capacity allocations by the train operators without recourse to CFR. Paths are allocated for one timetable period (normally 1 year) but may be extended by mutual consent. Rights and obligations are detailed in contracts. Allocated train paths are published. The lead time for the development of train path bids includes the operation of international trains.

CFR is required to analyse periodically the available infrastructure capacity to identify bottlenecks or potential bottlenecks. Congestion can be declared and remedial options identified within 6 months. Planned maintenance intentions are required to be made available by CFR to train operators.

No information has been developed on break downs, track damage, power failure or weather induced delays.

9 Conclusions

The response to the requirements set out in the railway reform packages is mixed and varied. The model in The Netherlands is by far the most complete, well developed and compliant. Functional separation has been achieved and the new structure is in place. The models in Germany and Austria are different for a whole raft of reasons. The incumbent national operators in both countries still have an involvement in train operations and infrastructure issues with the inevitable concerns that this position invokes in terms of separation of duties and impartiality in dealing with new market entrants. The network statement in Germany is still only published in German language and thus is a cause for concern. A similar remark is also made about the latest Hungarian network statement as this can be a practical limiting factor for new entrants and international operators seeking the rules of engagement governing access to the networks.

Some comfort can be taken from the fact that there is an evolving position in relation to open and non-discriminatory access specified in each of the countries on the line of route. Issues such as power supply are well known and understood with options to mitigate this. The new train operators are fully familiar with this type of issues. There is still some uncertainty about the train weights and speeds to be resolved. Conflicting information has been given on this and this needs to be resolved as a major issue regarding commercial and operational planning. Rolling stock compliance is underpinned by UIC design and operational specifications.

The widely differing technical solutions to signalling are also a key issue for resolution. These widely vary by individual technologies and operating rules and safety criteria. Again the new train operators are aware of these issues in formulating their operating plans in relation to signalling system compliance understood by train crew and compatible on-board equipment allowing multi-country operation.

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