Status report and background information on noise-related track access charges

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Summary

Noise on Europe's rail routes is increasingly resented by the population, leading to demands for operational restrictions. The main sources of noise are freight wagons fitted with cast iron brake blocks. This braking technology produces rough running surfaces on wheels which cause the noise. A solution would be to convert the European fleet of freight wagons to synthetic brake blocks, but this involves total costs of €1 - €3 billion, which the railways cannot meet. Possible finance models are either direct subsidy for the conversion or indirect subsidy in the form of a noise-related bonus on track access charges. This status report intends to summarize the processes and conditions to be taken in account when discussing the introduction of noise-related track access charges in order to make them both efficient and effective.

Track access charges are imposed on all European rail networks on the basis of EU Directive 2001/14/EC. These charges differ greatly in amount and type between the different rail networks. The charges are imposed for whole trains, not for individual wagons; the types of vehicle or their equipment play practically no role. Switzerland is acquainted with noise-related track access charges: In a pragmatic approach a noise bonus of ~5% of the track access charge is credited. The Netherlands are planning to introduce noise related track access charges and Austria is considering it. For single wagons, the administrative cost of determining the noise refund is practically the same as the refund itself. However, the costs may be justifiable for whole trains.

A variety of parties, in clearly defined roles, are involved in operating the railway transport system. Liberalisation of the railways has led to a multitude of transport undertakings being established in place of the state railway in practically all states, thus also generating new roles: wagon rental companies, as logistics companies, offer whole rail transport and thus take over roles previously reserved for the railways. Nowadays, the "freight train" system is a complex method of transport with a high number of participants and the image of a freight train belonging to *one* railway and running on *one* rail network is a thing of the past. Today there are three levels involved: the infrastructure operator, the RUs providing the train and motive power and the wagon leasers/owners. Various stakeholders or businesses are frequently represented on each of these levels. Correspondingly, the party paying the track access charge is seldom the owner of the railway wagons. There is a lack of railway sector-wide systems determining which vehicles operate where.

The clarifications made by this study give rise to the following results:

- **The introduction of noise-related track access charges is not easy:** Allowance must be made for the complexity of existing freight traffic and all its processes which prevents the introduction of "simple" systems.
- **If noise-related track access charges are to be introduced, they must be harmonised across Europe:** Only harmonisation can ensure that the administrative and technical outlay remains within reasonable limits.
- **Preparation of vehicles is essential:** Noise-related track access charges are the only track access charges which are linked to specific individual vehicles and the routes on which they operate. Preparations and installations on vehicles are essential for efficient, effective application.
- **The introduction of noise-related track access charges must be well prepared and takes time:** The probable time frame is at least 4-8 years.
- **Direct subsidy could be introduced more quickly as an incentive system:** However, direct subsidy of low-noise vehicles does require administrative preparation but could be achieved more quickly overall and thus rapidly reduce rail noise in Europe. It can then be replaced by noise-related track access charges later.

1. Introduction

Rail is generally recognised as the most environmentally friendly mode of transport. Its only negative environmental effect is noise, of which people are increasingly intolerant. For this reason extensive structural noise abatement measures have had to be taken along railway routes in many countries. According to a UIC study, this currently annually costs between €150 and €200 million across Europe[1]. However, people in particularly badly affected areas are demanding more and more operational restrictions.

The principal source of noise is the existing large freight wagon fleet. The noise stems from the wagons still being fitted with cast iron brake blocks. Whenever braking takes place, these blocks abrade the running surface of the tyre, which then generates most rail noise when moving off. This can be remedied by preventing abrasion of tyre surfaces, in particular by using synthetic brake blocks. Railway operators are aware of this problem and of potential solutions. This led to the UIC launching its "Action Program Noise Abatement freight trains" in 1999, with the intention of fitting new wagons with such brake blocks and converting the existing fleet to this technology.

Converting the approximately 600,000 older freight wagons, which will remain in use for a long time, to synthetic brake blocks costs €1000-5000 per wagon or between €1 and €3 billion for the whole fleet. The difference in range is due to the different types of synthetic brake block material, making conversion to a greater or lesser extent necessary.

The railway undertakings cannot absorb these costs themselves. They would have to pass them on to freight customers, resulting in massive competitive disadvantages compared to other modes of transport. This would result in traffic and noise shifting on to roads, which is undesirable from the point of view of both transport and environmental policy.

There are various methods of and opinions on how to bear the conversion costs of existing freight wagons. Firstly, direct finance of the conversion work for the sector is under discussion. Secondly, however, incentive systems are conceivable which could offer the sector the desired support in undertaking the conversion. One particular incentive is noise-related track access charges, which would charge quieter wagons a lower track access charge (bonus) than noisy wagons still fitted with cast iron brake blocks.

There is currently[2] no comprehensive summary of which processes and conditions are required for such noise-related track access charges in order to make them both efficient and effective. This status report is intended to collect the necessary information. As a basis, the bibliography was studied and meetings held regarding current procedures and existing experience with regulatory authorities, railway undertakings and private wagon owners. Despite the fact that these meetings could only include a restricted number of businesses and authorities, they still produced a reliable illustration of the problem.

2. Brief summary of track access charges in Europe

2.1 EU legal basis

Directive 2001/14/EC of the European Parliament and of the Council of 26 February 2001, to be implemented into Member States' national law by 15 March 2003, forms the legal basis for imposing track access charges. This directive was subsequently amended by Directive 2004/49/EC on railway safety, but the amendments only affect articles on railway safety certification, which were removed from Directive 2001/14/EC and transferred to Directive 2004/49/EC.

Directive 2001/14/EC covers the use of railway infrastructure for domestic and international rail services. It stipulates that infrastructure operators must specify and publish conditions for using

[1] 2007 Status report "Noise abatement on European rail infrastructure", UIC, Paris, 2007
[2] Summer 2007

infrastructure. The conditions of use must expressly include the charging framework and the charges must be specified by an agency independent of any railway undertaking. In principle, charges for using infrastructure should be paid to its operator, which uses them to finance its corporate activities. The charges should cover the direct costs of train operation. They may also take account of the shortage of paths or the environmental costs of train operation.

Notwithstanding these principles, infrastructure operators are permitted to charge supplements based on the principles of efficiency, transparency and non-discrimination, insofar as the market will withstand them, but expressly guaranteeing the competitiveness of cross-border rail freight traffic. Under certain circumstances, railway undertakings may be granted reductions on charges, particularly for environmental costs which are not imposed on competing modes of transport. In general infrastructure charging schemes shall through a performance scheme encourage railway undertakings and the infrastructure manager to minimise disruption and improve the performance of the railway network.

2.2 National implementation of Directive 2001/14/EC

An EU Task Force Track Access Charges report of 30 June 2005[3] provides a summary of the track access charges used in the EU. Following these clarifications, there remain great differences in Europe in the extent to which track access charges cover infrastructure costs, as the figure below from this report shows:

Target percentage of total cost covered by infrastructure charges in 2004

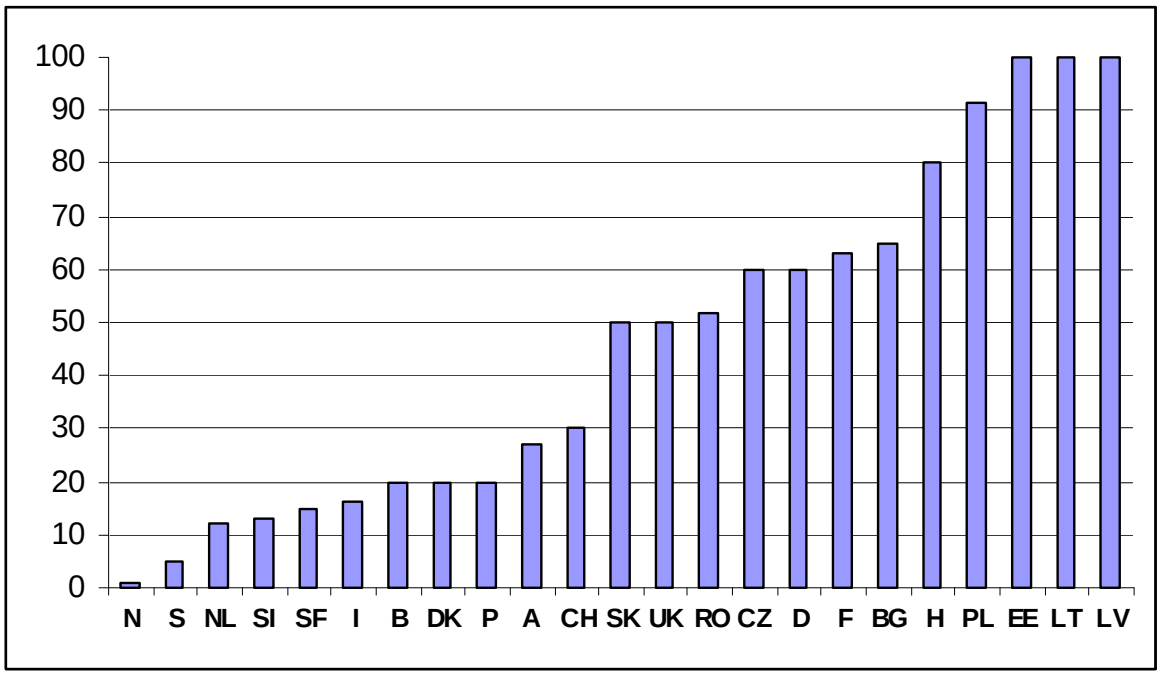

Figure 1: Desired total cost coverage by track access charges (Source: Task Force Track Access Charges report)

The differences may firstly be explained by differing network capacity utilisation and secondly, in some countries, by track access charges being structured so that freight traffic covers the costs of passenger traffic. This is particularly the case if the infrastructure operator expects full cost

[3] http://ec.europa.eu/transport/rail/rb/doc/report-track-access-charges-tf.pdf (the report is labelled as a draft but is in fact the concluding TF Track Access Charges report)

coverage but the network is operating below capacity. There are also, of course, political reasons for different application of track access charges.

Track access charges and the conditions for their use are published by the respective infrastructure operators. As infrastructure is state-owned in almost every country, its conditions of use and revenue must also be reconciled with the financial policy targets imposed on the infrastructure operator. As a rule, conditions of use are therefore subject to approval by the respective national ministry of transport.

The following brief description of some national examples is intended to provide an overview of the variety of configurations of track access charging systems.

In **Germany**[4]**,** the track access charge depends on three components: the use-dependent route category and track (train) quality, the performance-related incentive systems, which include the prevention of malfunctions or enhancement of performance, and additional factors such as the regional factor or load constituents. The track access charge is the product of factors dependent on the aforementioned constituents. Train kilometres are the crucial measurand. In Germany, DB Netz AG is the principal network operator for the purposes of freight traffic, but many secondary railways and Scandlines are also active as infrastructure operators, the latter as a ferry operator without its own infrastructure.

In **Austria**[5] (ÖBB network) track access charges are composed of the relevant access charge for each specific line category (basis price per train-kilometre travelled) and the basis price per total gross tonne kilometre travelled. In the case of the train-kilometre access charges, service-related supplements and discounts are also taken into account, based on the type and configuration of the locomotive, line-specific features (e.g. bottlenecks) and the type of traffic (market segmentation). In general, freight traffic tends to attract supplements or smaller reductions and passenger traffic receives reductions only. From the timetable change in December 2009, with the abolition of market segmentation, traffic supplements and reductions will be discontinued. The Infrastructure Managers in Austria are ÖBB and RAABERBAHN/GYSEV.

In **France**[6]**,** charges for minimum services, access charges and charges for supplementary services are imposed. The track access charge for minimum services composed of the following three constituents: the access charge for the main sections of the route (variable according to category), the path reservation charge (variable according to the time of day) and the traffic charge (variable according to the type of train). The measurands are the length of principal route reserved and the number of train kilometres travelled. Configuration access charges are payable for traction current systems or special rail systems (intermodal traffic, marshalling yards, etc.). Fees for additional services include traction power and special services. RFF is responsible for the entire infrastructure in France.

In **Switzerland**[7]**,** basic and additional services are charged. The basic service charge consists of the minimum price and the contribution margin. The minimum price contains constituents for maintenance and power consumption (measured by gross tonne kilometres), train operating/ energy services (measured by train path kilometres) and hub supplements. The freight traffic margin contribution is set by the owner of the infrastructure. For passen-

[4] The DB Netz AG track access charging system, valid from 9 December 2007 to 13 December 2008; http://www.db.de/site/shared/de/dateianhaenge/infomaterial/sonstige/db__netz__trassenpreisbroschuere.pdf

[5] ÖBB product catalogue ÖBB-Infrastruktur Betrieb AG network access 2008; http://www.oebb.at/vip8/betrieb/de/OneStopShop/Schienennutzungsbedingungen_Anhaenge/Anhaenge/7_5_3_PK_2008.pdf

[6] Conditions of use of the RFF national rail network: http://www.rff.fr/biblio_pdf/de_docref_0_somm.pdf

[7] List of Infrastructure Services 2007 from BLS and SBB Infrastructure http://mct.sbb.ch/mct/en/infrastruktur-old/infrastruktur_dienstleistungen/onestopshop-old/onestopshop-leistung.htm

ger concession authority is usually responsible. Path provision is not charged unless application is made at short notice. Switzerland is currently the only country to grant low-noise trains and vehicles a bonus on the access charge (see section 4 for details). Ancillary services include marshalling, stabling vehicles and supplying water and energy. SBB and BLS are the infrastructure operators responsible for freight traffic in transit through Switzerland.

Italy[8] has a track access charge consisting of a basic package, composed of mandatory and supplementary services. The basic package includes reservation of capacity, path use and the use of energy supply systems. For this purpose, the Italian network is divided into 50 tariff zones, the use of which is charged according to their network function. Other variables in charging are existing route utilisation capacity, deviation from the average route speed or wear factors such as high weights or speeds. The final track access charge is determined by an algorithm which other publications do not consider as transparent[9]. Mandatory services are, for example, access to (goods) stations, maintenance facilities or marshalling. Supplementary services are, for example, traction current and train heating. RFI (Rete Ferroviaria Italiana) is responsible for Italy's entire rail network.

In the **Netherlands**[10]**,** track access charges are imposed for service packages: Service Package 1 includes reservation, handling and use of paths. Service Package 2 covers access to facilities such as catenaries, stations, freight and marshalling facilities; this fee is charged on the basis of variable operating services such as train and tonne kilometres. The same tariff applies to the entire network. If used, services in service packages 3 and 4, such as the supply of electricity or heat, marshalling and the use of telecommunications systems (GSM-R network) are charged at cost.

2.3 Some conclusions from this summary

This short summary of the situation in some countries shows that there are fundamental differences concerning charging.

One common feature of every charging system is that the fee is imposed on whole trains and not on individual wagons.

Another common feature is that the railway undertaking (RU) must pay the fee independently of whoever owns the vehicles making up the train. The only qualitative characteristic of trains which could influence use of infrastructure is their weight or speed. In some countries, the electrical or signalling configuration of the locomotive is used, but not mechanical features such as the type of bogie.

The EICIS[11] calculation program, available on the Internet to the infrastructure operators who make up RailNetEurope and used to obtain a digital impression of the fees effectively levied on a train, has been used to calculate track access charges for a theoretical freight train consisting of one locomotive and 20 wagons with a total weight of 1480 tonnes. The track access charges shown in the table below were determined for three corridors running from Sweden, Poland and the Netherlands to Naples:

[8] RFI Network Statement 2006 Edition; http://www.rfi.it/pagine/rfi_04/rfi_04,01,03.asp
[9] "Study of a new Swiss track access charge system" by Swiss Federal Institute of Technology Zurich (January 2007)
[10] Prorail Network statement 2008; http://www.prorail.nl/NR/rdonlyres/E6A23822-A792-4B4E-A8B2-DD92AB8D064C/0/20544111v1NV2008EN.pdf
[11] European Infrastructure Charging Information System, operated by RailNetEurope

Sweden-Italy corridor

Infrastructure owner	Route	km	Costs	Cost per km
BV Sweden	Charlottenburg-Peberholm	632	€589.04	€0.93
Bane Denmark	Öresund-Padborg	358	€1,094.38	€3.06
DB Netz Germany	Flensburg-Mittenwald	1,029	€3,497.00	€3.40
ÖBB Austria	Scharnitz-Steinach	71	€258.00	€3.63
RFI Italy	Brenner – Naples	642	€1,530.00	€2.38
Total		**2,732**	**€6,968.42**	**€2.55**

Poland-Italy corridor

Infrastructure owner	Route	km	Costs	Cost per km
PKP Poland	Gdynia-Zebrzydowice	643	€3,452.54	€5.37
CD Czech Republic	Petrovice-Breclav Stat. Hran	211	€553.02	€2.62
ÖBB Austria	Bernhardstal-Thöri-Maglern	461	€1,445.00	€3.13
RFI Italy	Tarvision-Naples	665	€1,562.00	€2.35
Total		**1,981**	**€7,012.56**	**€3.54**

Netherlands-Italy corridor

Infrastructure owner	Route	km	Costs	Cost per km
ProRail	Rotterdam - Venlo	167	€191.70	€1.15
DB Netz Germany	Kaldenkirchen- Basel	570	€2,225.11	€3.90
SBB Switzerland	Basel-Thun	141	€1,101.76	€7.81[12]
BLS Switzerland	Thun-Brig	84	€671.53	€7.99[12]
SBB Switzerland	Brig-Iselle	22	€171.53	€7.80[12]
RFI Italy	Iselle-Naples	646	€1,517.00	€2.35
Total		**1,630**	**€5,878.63**	**€3.61**

This confirms the relatively large differences in charging between the various infrastructure operators identified in the Task Force Track Access Charges report.

3. Noise-related track access charges planned or introduced

3.1 Track access charges introduced: Switzerland

A comprehensive programme of noise reduction measures has existed in Switzerland since about 2001. As a first priority, all Swiss railway vehicles are being converted to low-noise systems, with the state bearing the costs of conversion. As a second priority, those noise abatement walls still necessary are being installed. If these measures are insufficient, noise insulation windows may be installed. To support this programme, Swiss legislation on railway noise abatement[13] stipulates that railway vehicles which meet the new noise standards will be accorded preferential treatment when calculating the margin contribution. It is being implemented by the infrastructure operator awarding a bonus of CHF 0.01 per axle kilometre travelled by vehicles which are not fitted with cast iron brake blocks.

[12] The track access charges for Switzerland also include the supply of traction current, which accounts for about 30% of the price. The train kilometre price without the energy supply would be approximately €5.00

[13] Article 5.2 of the Federal Act on Railway Noise Abatement of 24 March 2000

Practical implementation is based on a system of audited self-assessment. The railway undertaking (RU) must submit a detailed application[14] for the noise bonus to the Federal Office of Transport (FOT). Following confirmation of entitlement by the FOT, the RU may submit an application for a refund to the respective infrastructure operators. Although this reduces the income of the infrastructure operator, the taxpayer meets the costs of infrastructure which are not covered by revenue, which includes revenue lost because of the noise bonus. Whether and how the RUs have to pass the bonus they receive on to the wagon owners is not specified.

In practice, the RUs give the FOT a list of kilometres travelled per vehicle, which can be obtained from the wagon management system. Scope for audit by the FOT is *de facto* very restricted and is limited to plausibility checks. Those railway undertakings contacted for the purposes of this report[15] consider as feasible the method for claiming the bonus for homogenous trains crossing Switzerland on the basis of their experience. The sole criterion for the refund being the type of brakes is also attractive for the RUs. This includes, for example, eight-axle low-platform wagons with disc brakes which give an attractive refund due to their high number of axles. The refund is less attractive for mixed trains because the outlay for applying for the refund for a single wagon is approximately the same as the amount of the refund itself. The method is also too complicated to use on mixed trains in domestic Swiss traffic. In Switzerland, the entire process is facilitated because both the RUs and the infrastructure operators use the same software and the same databases; the Cargo Information System (CIS).

The actual refund is about 5% of the access charge. In the specimen EICIS calculation in section 3.3 using the theoretical train[16], application could be made for the following refunds if the whole train was configured for low noise:

Basel –Thun section (SBB): approximately €53
Thun-Brig section (BLS): approximately €32
Brig-Iselle section (SBB): approximately €8

The refund for the entire Basel-Iselle route thus amounts to approximately €93, or about 5%, for a total charge of €2,065. The refund for an individual four-axle wagon for the entire Basel-Iselle route amounts to approximately €6. This amount illustrates the observation above that the expense of obtaining the bonus exceeds the yield.

3.2 Planned noise-related track access charges: Netherlands

Railway noise abatement is a prime concern in the Netherlands. It is already possible to restrict noise emitted on a route by setting a noise ceiling. Studies in the Netherlands have also shown that noise reduction measures on vehicles are much more efficient than simply constructing noise barriers. It is therefore intended to create incentives for vehicle conversion via the introduction of noise-related track access charges.

For this purpose, a bonus for low-noise vehicles is intended to be introduced from about 2008, based on the vehicle kilometres travelled. It could be €0.02-0.05 for passenger cars and €0.01-0.02 for freight wagons. An additional penalty could be introduced for noisy vehicles from about 2011. The Ministry of Transport would finance the bonus for Prorail, the infrastructure operator. Direct financial transactions are only anticipated between the infrastructure operator (Prorail) and the TOCs. Other stakeholders, such as wagon owners or wagon rental companies are to be involved by market forces alone. Any noise bonus to be introduced must be included in the annual conditions for use of the infrastructure. A preliminary announcement was made in 2006 in the Prorail Network statement 2007[17].

[14] Stating the type of vehicle, actual sound levels and distance travelled (proportion of axle kilometres of that category of train),
[15] SBB Cargo, BLS Cargo, AAE and HUPAC
[16] Ten two-axle and ten four-axle wagons are assumed.
[17] Article 6.6 of the Prorail Network Statement 2007, version 1.0, dated 1 February 2006

3.3 Noise-related track access charges under discussion: Austria

Noise-related track access charges are under discussion in Austria. Research into a basis is currently being carried out. A dissertation at Graz University of Applied Sciences is examining the subject. The Federal Ministry of Transport, Innovation and Technology is also holding a workshop in autumn 2007 on "noise-related charges for infrastructure use" at which different opinions are to be discussed. A system was proposed in which vehicles would initially be classified by their type test. This noise classification is then to be used as a parameter for the track access charge. Low-noise vehicles are to receive a bonus. According to this proposal, the amount of the bonus is to depend upon the best available technology, which is itself defined by the TSI[18] noise. Vehicles which comply with this standard for a low outlay (particularly new vehicles) would not receive a bonus, but those which require a considerable outlay (conversion of the existing vehicle fleet) would receive one.

3.4 Consideration of the financial effects of noise-related track access charges

In Switzerland, an approach to the noise bonus has been adopted which corresponds to about 5% of the normal track access charge. Scaling of the noise-related constituents of a track access charge has, of course, far-reaching effects for both the vehicle owners in terms of the incentive (bonus) or competitiveness (penalty) and for the infrastructure owners, for which a bonus entails a loss of revenue which usually must be compensated for by the state.

To illustrate these different aspects, several specimen calculations have been made below, on the basis of a noise constituent of 5% of the track access charge, or €0.01 per wagon kilometre[19]:

- Single vehicle, distance travelled 40,000 km/year[20]: noise constituent €400 p.a.
- Vehicle fleet size of 8,000 wagons[21], 40,000 km/year: noise constituent €3.2 million p.a.
- Half the European fleet: 300,000 wagons, 30,000 km/year: noise constituent €90 million p.a.

These amounts would apply if the same type of noise-related track access charge was introduced everywhere. However, in order to impose or adjust it, records of the use of every vehicle must be kept, accounting for the kilometres travelled and the network used. In the single-vehicle example, use of the wagon every three days would entail 100 invoices with an average amount of €4 which would have to be apportioned to the different infrastructure operators. The administrative outlay cannot be ignored.

What applies to the individual vehicle also applies to the fleet. In this case too, the noise-related constituents would have to be recorded at considerable outlay and apportioned and allocated to the owners and infrastructure operators. In the event of a bonus, the infrastructure owner - usually the state - would have to provide the necessary finance. Such high administrative outlay may make the objective of introducing a noise bonus as an incentive appear questionable. Direct subsidy may be a simpler, more efficient way of creating an incentive system.

The question of the amount at which a noise bonus would have to be set to produce an incentive for vehicle conversion remains unanswered. As demonstrated above, a considerable proportion of the bonus may fall victim to bureaucracy. It must therefore be expected that the gross annual yield of €400 for a single wagon emerging from the specimen calculation would be an insufficient incentive.

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[18] Technical specification for interoperability, subsystem rolling stock 'noise'; EU Official Journal L 37 8.2.2006

[19] Access charge per train kilometre for a 20-wagon train: approximately €3; per wagon: approximately €0.15, of which 5% = €0.0075

[20] The average distance travelled by a European freight wagon is approximately 25,000 km/year. The assumed 40,000 km/year is the average distance travelled by vehicles which carry most of the traffic.

[21] 8,000 wagons in Europe are currently fitted with synthetic brake blocks.

3.5 Summary of the status[22] of noise-related track access charges

Switzerland is the only country with any experience of noise-related track access charges. The Swiss system has a practical structure, but nevertheless demands considerable outlay from both the carrier and infrastructure operator. Data such as the mileage for each individual vehicle, not only the whole train, has to be determined and allocated to the various infrastructure operators in both the planned systems for noise-related track access charges and the system already introduced. In every case, the railway undertaking benefits directly from the bonus, which thus constitutes an incentive to use low-noise vehicles if the railway undertaking and the wagon owner are identical or closely associated. The extent to which the bonus constitutes an advantage on the leasing market for owners of low-noise wagons is not yet known. No precedents are yet known (in 2007). The amount of a noise bonus necessary to constitute an incentive sufficient to encourage the active conversion of the existing freight wagon fleet into low-noise vehicles has also yet to be identified.

4. The stakeholders affected and their roles

The following sections summarise and characterise the parties involved in the issue of track access charges. On the one hand, these are government agencies and on the other they are the railways, now consisting of infrastructure operators, railway undertakings, vehicle or locomotive rental companies and freight customers. This presentation is intended to provide a basic understanding of the interplay between all the stakeholders involved in the rail transport system. However, this interplay is very complicated, so the details in this report can and will be considered only inasfaras theirconnection with noise-related track access charges.

4.1 Government agencies

The railway infrastructure is owned by the state in almost every country in Europe. On the one hand, states therefore have an interest as proprietors of the network and on the other obligations as the regulatory body. As network proprietors, they have expectations in respect of covering the costs of infrastructure use. These expectations themselves are dependent on national transport policies, which must be based on EU law. The obligation as a regulatory body consists firstly of supervising safe railway operation and secondly of ensuring non-discriminatory access to the railway infrastructure pursuant to the rules of Directive 2001/14/EC. These responsibilities are usually assumed by national ministries of transport, which also approve the access requirements of the respective infrastructure operators.

The licensing of new types of vehicle by national safety authorities (NSAs) is a major responsibility within the scope of the safety-oriented regulatory obligation. In particular, observance of the requirements of the TSI must be substantiated[23]. These include the maximum permissible noise level of new vehicles in their various operating modes. The noise level determined on licensing could play a role in the establishment of noise-related track access charges. Since 1 July 2006, not only railway undertakings but also wagon owners have been able to apply for vehicle licences.

In addition, ministries responsible for railways or NSAs grant operating licences to railway undertakings, based on their safety certificates and certification of economic and financial efficiency.

[22] Summer 2007

[23] Auditing may be delegated to a licensing agency ("notified body").

4.2 Infrastructure companies/administrators

In most European countries, there is at least administrative separation between railway operation and railway infrastructure, as required by Directive 91/440/EEC.[24] In all European states this led to to one, or frequently more, infrastructure operating companies or organisations assuming responsibility for the provision, operation and maintenance of the railway infrastructure. The length of an infrastructure operator's network may extend from a few tens of kilometres to a few tens of thousands of kilometres. To simplify network access for customers of trans-European freight corridors, the various network operators have created RailNetEurope, whose website[25] provides direct access to the respective infrastructure operators of the trans-European network. The illustration on the right shows the network covered by RailNetEurope.

The infrastructure operator produces the annual schedule of infrastructure use and organises the sale of the possible trainpaths which emerge. Railway undertakings can use the network access to obtain trainpaths. The infrastructure operator must be non-discriminatory in his allocation of trainpaths. In practice, this means that in most cases RUs can only run trains on the paths scheduled by the infrastructure operator and not just at any time they like. The insertion of train paths at short notice is only possible to a very limited extent, particularly on infrastructure (routes or nodes) with high capacity utilisation.

Every infrastructure operator must publish its network access conditions, which contain the track access charges. It must allocate the paths to be used to the railway undertakings and invoice them for use of the path. As stated in section 3, there are currently[26] no uniform conditions or rules on track access charges. Efforts are being made at harmonisation.

4.3 Railway undertakings

In European countries, rail transport is provided by railway undertakings, which must maintain separate accounts for freight and passenger traffic under Directive 91/440/EEC or have them provided by separate undertakings. As a condition for providing freight services on the trans-European railway network, railway undertakings require a licence with conditions[27] laid down in Directive 2001/13/EC[28] under which undertakings may obtain a licence. The licensing authority in EU Member States or their constituent states grants licences, of which the European Commission are notified, and which are then published. They are then valid throughout EU territory. As mentioned in the preceding paragraph, RUs not only require this licence, but also the allocation of capacity, i.e. paths, to allow trains to actually run on the network. Such paths must be scheduled by the infrastructure operator, as mentioned above.

As a full service transport undertaking, a railway undertaking involved in freight traffic meets the transport requirements of its customers (industry, hauliers and also other RUs). The majority of carriage contracts cover longer periods and are frequently annual contracts. To do this, the un-

[24] Council Directive 91/440/EEC of 29 July 1991 on the development of the Community's railways
[25] http://www.rne.at/cont/country.aspx
[26] Summer 2007
[27] Financial, economic and safety conditions
[28] Directive 2001/13/EG on the licensing of railway undertakings

dertaking must firstly be able to offer the customer total carriage services in order to win the contract. In order to execute transport services, the railway undertaking organises:

- the paths necessary for carriage, possibly over different national or international infrastructures;
- the rolling stock required, which may be from the RU's own fleet, leased from third parties or belong to the customer;
- the necessary motive power, which may be the RU's own or leased locomotives, or motive power purchased from another RU.

Once carriage has been completed, the RU pays the infrastructure operator for use of the infrastructure, either on a case-by-case basis or at longer intervals (e.g. annually). Of course, the costs of using the infrastructure must ultimately be included in customer invoices.

In practice, railway undertakings take many forms: In freight traffic, there are RUs with hundreds of locomotives and tens of thousands of freight wagons. There are RUs which are purely motive power undertakings and which only own locomotives and there are also RUs which own several thousand freight wagons and no locomotives. One characteristic of the development is that smaller RUs operate throughout Europe, as the Rail4Chem route map shows:

The number of licensed RUs (passenger and freight traffic) per country varies greatly, as the following examples from several countries chosen at random shows[29]:
Sweden: 23,
Austria: 15;
Czech Republic: 19;
Germany: 24 RUs with federal licences (and over 300 licensed by the federal states);
France: 9;
Spain: 8;
United Kingdom 68.

The variety of railway undertakings is also proof of the pronounced liberalisation of the railway transport market, which was the intention of the various railway packages and policy pursued by the EU. Many of the large RU's also establish subsidiaries in the various states, in order to benefit from unimpeded access to the network in respective countries.

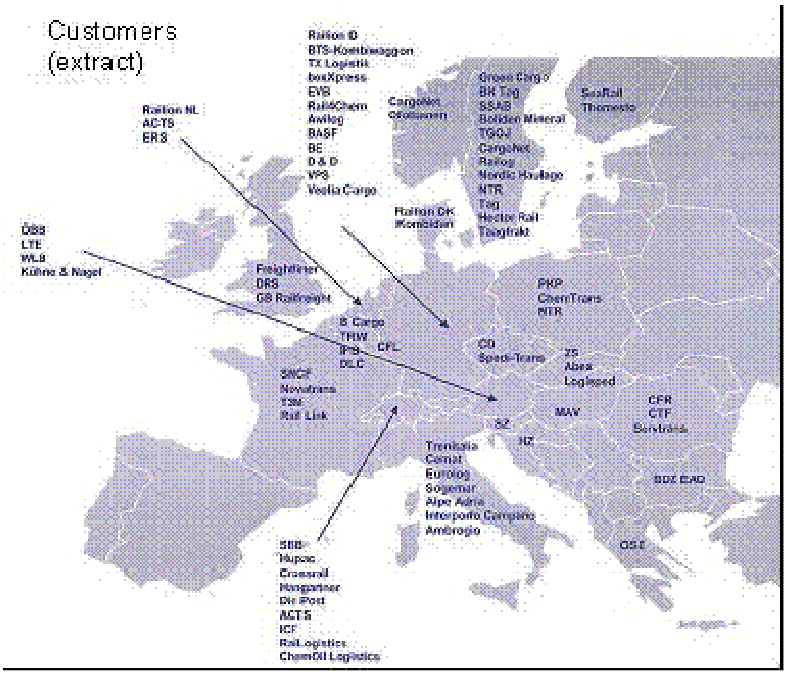
4.4 Wagon and locomotive rental companies

Private-sector wagon rental companies are very important in European freight traffic: they own about 20% of the wagons. These vehicles usually have a high annual mileage. The contractual relationships between wagon rental companies and railway undertakings were redefined by the COTIF[30]convention on 1 July 2006. Vehicles belonging to RUs and wagon rental companies are treated equally under this convention. This means that private wagon owners no longer need to register their vehicles on one particular railway, but rather a national authority is responsible for licensing and issuing a wagon number.

[29] Source: List of licensed TOCs at http://www.era.europa.eu/public/Safety/licences/Default.aspx
[30] **Co**nvention relative aux **T**ransport **I**nternationaux **F**erroviaires

Large rental companies such as VTG, AAE and Transwaggon own several tens of thousands of wagons of various types which they can make available to their customers. The rental company may own its fleet, but it may also belong to finance companies under leasing or other agreements. There is a tendency for the rental companies to provide not only wagon rental, but the full range of logistics, for which purpose they cooperate with TOCs. Some wagon rental companies are also licensed as RUs.

The customers of wagon rental companies are on the one hand RUs, which rent vehicles to cover traffic peaks, and on the other hand industry and shippers. The major rental companies have between 100 and 1000 large customers, who may be distributed across Europe, as the following map from a rental companies catalogue shows:



Wagon rental stipulates terms of between one and 24 months for more than half the vehicles, although wagons are sometimes rented for single consignments. The number of vehicles, their type and rental terms are agreed in the rental contract. The rent usually consists of the capital rent (which also includes overhauls, which themselves depend upon the planned and actual mileage) and maintenance (repairs between scheduled servicing). Of course, maintenance depends on use, but also on the area of use, the motive power and, if agreed, availability. Typically rentals are charged in daily fees (€/day).

During the rental term, the customer has full discretion regarding where and on which network it uses the wagon. The rental company has no knowledge, and indeed requires no knowledge, of where the wagon is used or its whereabouts. Accordingly, however, it is difficult for the rental company to allow for different track access charges in the rental fee, or, for example, to implement the refund of a noise bonus. In contrast, the rental company needs to know the total mileage of the wagon in order to be able to schedule and manage servicing and also to verify the rental agreements.

Locomotives may also be rented. Not only pure rental models are available, but also the purchase of locomotive use and traction. For example, Dispolok and other companies belonging to its parent, Mitsui & Co Ltd, operate about 150 locomotives for 30 customers in nine countries.

4.5 Wagon and locomotive owners

Rolling stock is usually owned by a railway undertaking or a leasing company. However, it is increasingly the case that less capital is being committed and that rolling stock is being procured by means of leases and other financial instruments to reduce the capital commitment, meaning that the vehicles are ultimately owned by the financing institution. Such conditions of ownership must also be considered when introducing noise-related track access charges, as the investor has to be able to profit from any bonus.

4.6 Freight customers

Freight customers now enjoy multiple accesses to the rail transport market. This is one of the desired consequences of the liberalisation of railway freight traffic. The primary customer requirement remains having goods delivered to the right place and at a price and with a transport time which are competitive. The customer does not care that the entire rail transport logistics system is extremely complicated. Neither is the customer prepared to pay a premium for the environmental effects of carriage, particularly for the noise generated. The railway freight sector has adapted to these customer requirements by establishing one-stop shops, which can make the customer a single inclusive offer, and by buying in all the constituent services. Railway freight is, of course, always in double competition with other railway service providers on the one hand and with other modes of transport, particularly road, on the other.

4.7 Summary

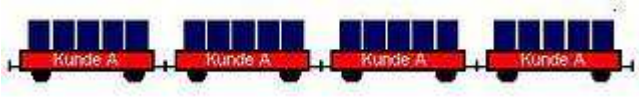
A large number of stakeholders playing clearly-defined roles are involved in the operation of the railway transport system. It is evident that particularly liberalisation of the railways has made the state-run railway, using its own rolling stock on its own infrastructure, a thing of the past. It has been replaced by a large number of transport undertakings in almost every country. Railway liberalisation has also made new roles possible: wagon rental companies can operate as logistics undertakings offering rail carriage, thus taking over roles previous reserved for the railways. On the other hand, liberalisation has also exponentially increased the complexity of the system.

5. Typical freight train consists and their contractual background

Most railway freight undertakings provide two products (with sub-categories): trainload and wagonload. These products are outlined briefly below and the contractual connections between TOCs, infrastructure operators and wagon owners, which are important to the subject of noise-related track access charges, are explained.

5.1 Trainload services (block, intermodal and shuttle trains)

Trainload services means freight trains which operate as a single unit from a departure terminal to a destination terminal, without the intermediate picking up or dropping off of wagons. They are called block trains. They characteristically consist of a single type of wagon, as shown in the drawing on the right. They are used for the carriage of high volumes of freight. Typical loads are steel, timber, coal, ore, petroleum products and new cars. Multimodal traffic accounts for a significant market segment of trainload freight. A particular type of block train, known as a shuttle train, always serves the same departure and destination terminals. A typical example of a shuttle train is multimodal traffic with its terminals.



Block trains may be made up of wagons from the railway undertaking which owns them (e.g. a Railion train with Railion wagons), but frequently consist of leased wagons (e.g. an SBB train with Transwaggon vehicles). However, freight wagons may also belong to, or be rented by, the freight customers (e.g. for cars). Even if a block train consists of the same wagons or type of

wagon, the individual wagons may belong to different owners. Trains running regularly will not always have identical wagons (or wagon numbers).

The same type of wagon, e.g. a Railion Shimmns wagon (a 4 axle vehicle with a cradle and sliding roof) may be fitted with different braking systems (low-noise or cast iron blocks). Block trains may be domestic or international, depending upon their destination. Accordingly, track access charges are payable to one or more infrastructure operators. The number of terminals for block trains on a network is limited by the very nature of the trains. Depending on the size of the network, it amounts to a few dozen.
In simple terms, the contractual provisions are stipulated in - usually long-term - agreements on several levels.

- Track access agreement between the RU and the infrastructure operator for use of the route.
- Contract for carriage between the RU and the freight customer for operating the block trains;
- In addition, general COTIF wagon use contracts between wagon rental companies and the RU or freight customer may be involved.

Liberalisation of railway freight traffic has also made it possible for wagon rental companies to act as logistics undertakings and offer freight customers all carriage services, purchasing haulage from the RUs. As stated in section 5.5, the owner of the wagon may be a finance company, resulting in further contractual arrangements.

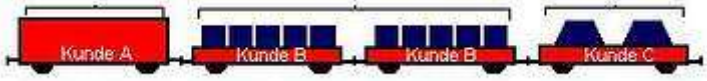
The following table shows some of the various contractual relationships.

Configuration	**Freight customer**	**Railway undertaking**	**Wagon rental company**	**Infrastructure operator(s)**
RU as carrier; RU rolling stock	Contract for carriage with RU	***Principal carrier***	RU rolling stock	Track access agreement with RU
RU as carrier + privately-owned wagons	Contract for carriage with RU	***Principal carrier***	Wagon use agreement with RU	Track access agreement with RU
Wagon rental company as carrier	Contract for carriage with wagon rental company	Haulage contract with wagon rental company	***Principal carrier***	Track access agreement with RU
RU as carrier, customer's wagons	Contract for carriage with RU	***Principal carrier***	Customer's rolling stock; possible wagon leasing agreement with freight customers	Track access agreement with RU

In cases of carriage over longer distances, several RU's may be involved from which the principal carrier purchases haulage. This, of course, entails another level of contractual relationships, which is not included in the simplified table above.

5.2 Wagonload systems

Whilst the trainload system is designed for large volumes with a restricted service, wagonload systems make it possible to cover small to medium volumes much more densely, with up to several thousand terminals, depending upon the railway network. Wagonload systems permit regular or occasional carriage between varying destinations. Wagonload system trains typically



consist of a number of different wagon types. The individual wagons of a freight train may belong to the carrying RU, another RU or the customer. However, they may also belong to a wagon rental company and be rented by the RU or the customer. In an extreme case, this means that every wagon of a freight train may belong to a different owner.

In wagonload systems, the customer usually loads the vehicle itself, either on a private siding or at an infrastructure operator or RU's terminal. The RU assumes responsibility for marshalling the wagon or rake of wagons into freight trains, running the train, removing the wagons from the train and delivering them to their destination. As well as carriage only, railway undertakings provide a number of logistical services, which may extend from organising feeder and delivery transport to warehousing the goods. In particular, road feeder and delivery services may be organised. Various RUs also offer freight and wagon tracking en route, but these services are company-specific and usually not (yet) harmonised.

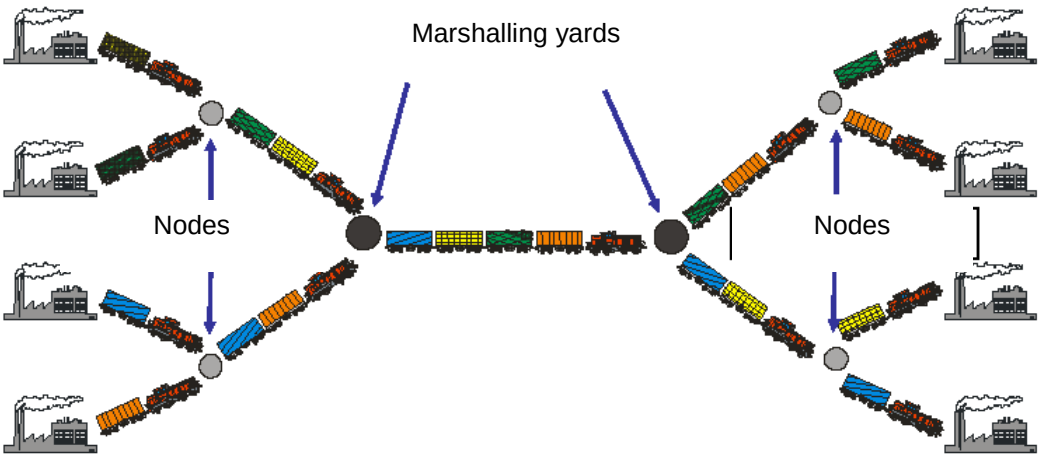
Actual rail freight carriage may take place over one or more railway networks. Responsibility for carriage may also be transferred to other RUs at network borders. An RU is usually the principal carrier. Under COTIF[31], a distinction must be made between different types of carrier in railway carriage:

• **Contractual carrier** (previously managing railway or principal carrier): this carrier concludes the carriage contract with the client and may carry goods alone or by appointing executive carriers. It is liable to the customer for the entire contract for carriage.

• **Executive carrier** (formerly sub-carrier): this carrier does not conclude a carriage transport contract with the client, but operates the train under contract to the contractual carrier, has no contractual relationship with the customer and bears no liability to the customer, but only to the contractual carrier. It pays the track access charges to the infrastructure operator.

• **Subsequent carriers** (formerly partner railway as joint haulier or pooled traffic): the carriage contract is only concluded between the client and the contractual carrier. Other subsequent carriers assume the carriage contract when they accept the waybill and freight entered on it. Every carrier may purchase the carriage service from an executive carrier, in whole or in part. Only the contractual carrier bears liability to the customer.

The freight train may be re-marshalled more than once over the entire distance of carriage. The individual wagons therefore run as part of several different freight trains, particularly over long distances, as the following illustration[32] shows,



As with block trains, contractual provisions are required at different levels for wagonload systems:

[31] **Co**nvention relative aux **T**ransport **I**nternationaux **F**erroviaires; (Details from the May 2006 SBB cargo brochure)

[32] From a publication by Railistics GmbH, Wiesbaden

- A track access agreement between the railway undertaking and the infrastructure operators for use of the routes. Such agreements are concluded for entire timetable periods;
- A normally long-term carriage agreement between the RU and the freight customer for actual handling of the wagonload. The actual contract for carriage takes the form of a waybill;
- The waybill (all the waybills for freight wagons) is also the carriage document which accompanies the freight train along its route. It may be passed on to other RUs;
- In addition, COTIF-compliant wagon use agreements (AVV) may be concluded between wagon leasors and the RU or freight customer.

5.3 Summary

The "freight train" system emerges as a highly complicated mode of transport with a large number of participants. The freight train belonging to *one* railway and running on *one* railway network is a thing of the past. Three levels of users and operators are usually involved: the infrastructure operator, the RUs providing the train and motive power and the wagon rental/owner company. Various stakeholders or businesses are frequently represented on each of these levels. Correspondingly, the party paying the track access charges is seldom the owner of the railway wagons.

No inter-company systems have yet been introduced which could detect the locations of the vehicles. Whilst GPS technology is relatively easy to install on road vehicles, freight wagons do not usually have the necessary power supply, as, unlike passenger trains, freight trains do not have continuous power cables.

6. Resultant contractual configurations between RUs and wagon owners

Noise-related track access charges could constitute an incentive system for wagon owners to convert their fleets to low-noise systems, especially if the owners can see an immediate change in the track access charges. The relationship between the RU paying the track access charges and the wagon owners is therefore important. Contractual configurations between the RU and wagon owners arising from the freight train systems described in section 5 are therefore summarised in the sections below.

6.1 RU identical to wagon proprietor

Whilst the railway undertaking was formerly frequently the owner of the wagons making up its trains, this is now only true in a minority of cases, which may well be block trains. In mixed trains made up of single wagons, some wagons are frequently owned by the RU operating the train, but other wagons belonging to other owners are frequently marshalled in the same trains. An entire wagonload train belonging only to the RU operating it is now an extremely rare occurrence. If the RU is identical to the wagon owner, noise-related track access charges will have a direct effect upon it in its latter role. In cases of mixed trains, the direct effect will usually only apply to part of the train.

As a proportion of all traffic, a case in which all the wagons of the entire train are owned by the RU operating the train should only occur rarely.

6.2 RU in a direct contractual relationship with the wagon proprietor

Typical examples of such a contractual relationship are:

- Extra vehicles rented by an RU over a longer period to expand its fleet;
- The running of block trains consisting of rented wagons;
- Or the haulage of wagons belonging to customers, on freight trains

It is not known in advance where fleet reinforcements will be used. Accordingly, it is difficult to make allowance for the effects of noise-related track access charges when calculating leases and thus involving the wagon owner. In the case of block trains, which run between specific ter-

minals, e.g. in intermodal traffic, it is possible to include these effects in quotations for haulage. The same may apply to customers' wagons.

Such a case should arise at a moderate frequency as a proportion of all traffic.

6.3 RU not in a direct contractual relationship with the wagon proprietor

Typical examples of such a contractual relationship are:

- The provision of haulage on behalf of another railway undertaking
- The provision of haulage for a wagon rental or logistics business, if the latter is handling third-party wagons.
- The haulage of wagons which belong to a financing or leasing company.

In such cases, the type of rolling stock to be hauled is not usually known in advance. Calculation can only take the effects of noise-related track access charges into account with difficulty, or not at all. Their ramifications must also be taken into effect and agreed in the various contracts, which may be complicated. Accordingly, it is unlikely that noise-related track access charges could constitute an incentive for low-noise freight wagons in this case.

This case is more likely to arise with smaller RUs than larger ones. The overall frequency of its occurrence is moderate.

7. Summary of results of the study

- **Railway freight traffic: complicated interplay between various stakeholders**
  Railway freight traffic emerges as a complicated interplay between the various stakeholders. In principle, five types of stakeholder can be identified:
  - The railway infrastructure(s), for the use of which charges are payable,
  - The railway undertaking which runs train on the infrastructure(s), pays fees and issues invoices for its haulage services,
  - The rolling stock used for carriage, which may belong to a RU, a wagon rental company, a vehicle finance company or a freight customer; the use of which is also invoiced,
  - The RU or logistics business organising the carriage of freight for the freight customer, invoicing the latter for all carriage costs,
  - The freight customer which wishes to have its freight carried on favourable terms.

  Above all, the railways are a method of transport in intermodal competition with road, water and air.
- **Track access charges for trainload freight: not a fundamental problem**
  The imposition of track access charges does not in principle represent a problem for railway infrastructure operators and railway undertakings and is universally introduced. However, it must be noted that track access charges introduced to date always apply to entire trains and do not use any vehicle-specific data (with the exception of the noise bonus in Switzerland). In Switzerland, the vehicle-specific data is obtained from the existing cargo information system, which gives the infrastructure operator and the RU access to the same data.
- **Configuring noise-related track access charges as an incentive scheme for low-noise vehicles is difficult**
  In principle, it is easy to invoice the RU operating the specific train for noise-related constituents of track access charges. A requirement is that each train wagon and its brake configuration be known. It becomes more difficult if the brake configuration is intended to penalise or reward the wagon owner within the scope of an incentive scheme. As demonstrated in section 6, the RU is now seldom the wagon proprietor. This means that the financial noise-related components of track access charges must be charged or further credited in several stages. The whole procedure is complicated. Even in the case of block trains, in which rolling stock belonging to the same proprietor is frequently used, it is only feasible if every wagon of a train and its brake configuration are known. In wagonload traffic, involving many wagon proprietors, the financial outlay per wagon may reach the same amount as the financial noise constituent of the track access charge.
- **The threshold at which a noise bonus acts as an incentive must be determined**
  The level at which a noise bonus must be set in order to function as an incentive for fitting and converting wagons to low-noise technology is currently unknown. The administrative outlay may outweigh its benefit, depending upon how the bonus is charged and adjusted.
- **European harmonisation of the method is essential**
  The greater the differences between the application of noise-related track access charges on each network, the more complicated their introduction becomes. A harmonised European method is therefore indispensable for efficient application.

- **Harmonised vehicle data acquisition is essential, but expensive**
  In early 2006, the EU adopted TSI for railway freight telematic applications[33]. TSI provides for wagon licensing data being acquired in accordance with TSI Noise. The extent to which this data could fulfil the purpose of noise-related track access charges would have to be examined. The data would probably need to be expanded, as TSI Noise only covers newly-licensed wagons. An international system would also be required for the necessary acquisition of noise data and wagon mileage in the train. One of the existing methods (GPS, RFID, EAN, etc) could be used. The establishment of such a system (installation on the wagon, acquisition and analysis systems) demands investment of millions of euros, without this investment producing a reduction in noise as a direct result. Implementation of such a system would also take a number of (5-10) years.

- **Compensating for financial effects on the infrastructure**
  It must be noted that the introduction of noise-related components of track access charges will also naturally have effects on the income of the infrastructure operator. Politically, there is currently a greater likelihood of a bonus for low-noise vehicles, to encourage their procurement or conversion. However, a bonus would entail a loss of revenue for the infrastructure, which would ultimately have to be borne by the infrastructure operator, which, in Europe, is usually the state.

- **Preventing competitive disadvantages for rail and the shifting of noise and traffic to the roads**
  Under no circumstances must noise-related track access charges disadvantage the competitiveness of rail compared to road, particularly because this instrument does not exist for road traffic. A competitive disadvantage for rail would also entail a shift of traffic to the roads and thus an increase in road noise, which is neither practical nor desirable.

- **More efficient incentive systems than noise-related track access charges.**
  The application of noise-related track access charges is associated with a considerable logistical and administrative outlay. If it is a matter of introducing noise-related track access charges as incentive systems for the use of low-noise vehicles, it should be noted that there are also more direct incentive systems, which are probably more effective. These include, in particular, the direct financial subsidy of vehicle conversions to low-noise systems.

[33] Commission Regulation (EC) No 62/2006 of 23 December 2005 concerning the technical specification for interoperability relating to the telematic applications for freight subsystem of the trans-European conventional rail system (Official Journal L 13 of 18 January 2006)

8. Conclusions

- **The introduction of noise-related track access charges is not easy.**
  Allowance must be made for the complexity of existing freight traffic and all its processes, which prevents the introduction of "simple" systems.
- **If noise-related track access charges are to be introduced, they must be harmonised across Europe.**
  Only harmonisation can ensure that the administrative and technical outlay remains within reasonable limits.
- **Preparation of vehicles is indispensable.**
  Noise-related track access charges are the only track access charges which are linked to specific individual vehicles and the routes on which they operate. Preparations of vehicles and installations (TAF-TSI) are indispensable for efficient, effective application.
- **The introduction of noise-related track access charges must be prepared well and needs time.**
  The probable time frame is at least 4-8 years.
- **Direct subsidy could be introduced more quickly as an incentive system.**
  However, direct subsidy of low-noise vehicles requires administrative preparation, but overall could be achieved more quickly.
- **Direct subsidy first, noise-related track access charges later.**
  In order to quickly reduce noise in Europe, direct subsidy, which can be introduced more quickly, should be implemented. Direct subsidy can be replaced by noise-related track access charges later. Benefit from direct subsidy should be recorded in the vehicle data. Such vehicles could not benefit from a noise bonus.

Appendix: Bibliography

Links to the quoted literature can be found in the respective footnotes in the text.

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