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**ECORails –  
Energy efficiency and environmental criteria in the awarding of regional rail transport vehicles and services**



**Legal frames and awarding procedures**

**Deliverable 10:**

**Integration of legal and economical feedback from the User Platform and the consortium into the guidelines**

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## **Annex**

Annex 1 – Legal and Economic Country Reports

## 1. Executive summary

Work package 3 aims at analysing awarding procedures and their legal and economic frameworks and describing how to include energy efficiency and environment-friendly (EE/EF) criteria in the awarding of services and rolling stock in a legally secure way. Work Package 3 has an input-oriented objective (state-of-the-art and future developments of legal norms and awarding procedures) as well as a process-related objective (compilation of the technical – technological, economical and legal – inputs into a Europe-wide applicable, legally-secure guideline).

To be in compliance with European legislation, awarding of regional railway services can be done through *competitive tendering* or through a *direct awarding* procedure. In a *competitive tendering* procedure the competent authority (PTA) may evaluate the offers of a number of interested Train Operating Companies (TOCs). Within a *direct awarding* procedure, the PTA may award the transport services to a public service operator without entering a competitive tendering procedure. The use of direct awarding is an optional exception for rail services (other than metro and tram) while for other passenger transport modes this is only allowed under special circumstances. National legislation can still prohibit the use of direct awarding of rail services.

When the railway service has been awarded, a Public Service Contract (PSC) between the responsible authority and the TOC has to be established. The PSC is the legally binding act that confirms the agreement between the two contractors and in which the competent authority requires the public service operator to comply with quality standards and technical specifications. The PSC must be in accordance to national law, but the actual standards and requirements may be stricter, e.g. in terms of environmental effects, than required by national or European legislations.

The ECORailS User Platform agreed upon the statement that it is legally secure to implement EE/EF criteria in the awarding of services and rolling stock. However it was stated that being too specific regarding technologies to be implemented should be avoided since it could impose a risk for discrimination.

The inclusion of EE/EF criteria in awarding can from the PTA point of view be included either in 1) the Public Service Contract or, 2) in the case of PTA owning the vehicles, in the awarding of vehicles. Depending on how and what to award, EE/EF criteria can be included either as strict **Requirement** (the TOC/Manufacturer is required to fulfill the specified criteria), as **Bonus/Malus** (during the contract period, the TOC can be awarded with a bonus if they manage to fulfill the specified criteria or provide penalties for non-compliance to the criteria included in the contract) or used as **weight in the evaluation of tenders** (together with other parameters like price and quality). Requirements, bonus/malus, weights, how to monitor its compliance and penalties for non-compliance must be described both in the PSC and in the awarding documents. Requirements are recommended to be used for minimal standards that are not too far reaching or innovative while bonus/malus systems and weights for evaluation of tenders are recommended for implementing more advanced ecological standards in order to go further.

## 2. Introduction and project framework

### 2.1. WP3 activities and D10 aims

Work package 3 aims at analysing awarding procedures and their legal and economic frameworks. The WP has an input-oriented objective (state-of-the-art and future developments of legal norms and awarding procedures) as well as a process-related objective (compilation of the technical – technological, economical and legal – inputs into an Europe-wide applicable, legally-secure guideline). Work package 3 is to:

- Give an overview of the legal situation today and anticipated changes on the European level and in the participating countries providing a basis for the guidelines. Therefore the legal situation of setting standards in awarding and negotiating processes will be analysed both on European and national level;
- Describe the different economic situations and starting points in the participating countries including the market access and key actors;
- Describe the chances but also the risks that go along with the use of ecological standards in awarding procedures;
- Describe the different possibilities of integrating ecological standards in awarding documents and point out critical issues and requirements for the successful formulation of awarding texts;
- Compile the task results into the technical draft and later technical chapter of the final guidelines version.

This deliverable (D10) is the second of three WP3 deliverables. It is mainly an updated version of the previous deliverable (D9) based upon comments from the ECORailS consortium and second ECORailS User Platform. The compilation is also based on technological results from Work Package 2 (Deliverable 6 and 7). The deliverable includes project results from the following WP3 tasks:

1. Good practice examples of awarding involving environmental standards
2. Legal framework on the European level
3. Legal frameworks in the participating countries and regions
4. Economic frameworks concerning passenger rail services
5. Chances, risks and risk handling concerning ecological standards in awarding
6. Options of integrating ecological standards in award procedures.

Subtasks 1-4 can be seen as mainly concluded with only some minor amendments for the final deliverable (D11). Task 5 and 6 will also be further elaborated based on results from using the ECORailS guideline draft at the test sites.

The document also includes a catalogue consisting of how steps describing how to include energy efficiency and environmental indicators, technologies and operational measures into the awarding procedure. The catalogue is the main input for the ECORailS guidelines which will be tested at four test-sites. Based upon the test, the catalogue will be further elaborated in order to describe how energy efficiency and environmentally friendly (EE/EF) criteria should be integrated into awarding texts to be used in real-life awarding.

The deliverable has been coordinated by TFK together with KCW. Input for this deliverable has also been provided by TSB FAV, ApS, TUB, TSY, PoB, CBO, ULS, PUT and BME.

### 2.1.1. Sources and references

The sources are included as footnotes within the document. A large part of the results has been collected through interviews with responsible authorities and train operating companies from the countries participating in the ECORailS project. The interviews have been conducted by the respective regional partners in cooperation with WP2 for technological input. For the legal and economical part of the interviews, the topics aimed at covering the national legislation for awarding and national laws and standards concerning environmental issues and energy efficiency in rail transport, today as well as for the expected situation in the future. Another topic was to collect a picture regarding the market situation in the countries and get an understanding of the users' needs, requirements and expectations regarding energy efficiency and environmental criteria in awarding. The interviews were not intended to give a representative European picture. The reason for this is that during this part of the project, it was considered most important to be able to test to include energy efficiency and environmental criteria at the four different test sites. However information from more countries will be collected in order to get a Europe wide applicability.

External sources include results from previous or ongoing European projects like Railenergy and PROSPER. In the UIC project PROSPER ("Procedures for Rolling Stock Procurement with Environmental Requirements") a leaflet was produced in which all relevant aspects for the integration of environmental aspects into the procurement process was addressed. The Leaflet ("Environmental specifications for New Rolling Stock") aimed at:

*"...contribute to harmonisation of the environmental procurement framework in the rail sector at European, and in the long-term global level. By doing so the process of procurement will become more efficient, enabling railways to procure new rolling stock with a sound environmental performance more cost effectively."*

The work within ECORailS and WP3 differs from the PROSPER project by dealing with environmental specifications and energy efficiency from a Public Transport Authority (PTA) perspective. Therefore, only awarding of vehicles is only covered when procured by a PTA.

### **3. State of the art, present and foreseen trends**

#### **3.1. Good practice examples of awarding involving environmental standards**

First of all, it has to be acknowledged that currently there are only first approaches for awarding with environmental standards. And with regard to the specific awarding, all of these approaches are only minor in relation to the overall awarding and their criteria. Economic criteria are still the most important criteria for the PTA. Nevertheless there are some good practice examples which are initiations on which further awarding can build on.

The mentioned examples below show that there are positive approaches towards integrating environment-related criteria in tenders of regional rail services or the procurement of new rolling stock. The shortly described examples illustrate the different elements, which can be adopted in future awarding.

Nevertheless, such good practice examples are still rather the exception than the standard procedure. Indeed the necessity and usefulness of environmental measures are generally accepted; nevertheless economic reasons are already the main criterion for decisions concerning the procurement of rolling stock and awarding regional rail services. Thus the potential – even on the economic side – that environmental measures could have (besides positive effects on the environment and the public opinion) has to be explained to the PTA and the TOC.

##### **3.1.1. Netz Stadtbahn of Berlin and Brandenburg, Germany**

In May 2009 the so-called ‘Netz Stadtbahn’ in the Capital Region was awarded in a tender to the only two bidders Deutsche Bahn (state-owned) and ODEG (an indirect subsidiary of the federal state-owned Hamburger Hochbahn). The tender was operated by the VBB on behalf of the Federal states Berlin and Brandenburg. Some of the lines were crossing the border to the federal states ‘Saxony-Anhalt’ and ‘Mecklenburg-West Pomerania’. The tender of the overall 16 regional lines was divided into four lots. At the end, Deutsche Bahn and ODEG both won two lots.<sup>1</sup> The contract period is twelve years from 2011 to 2022.

Netz Stadtbahn is a good practise example for including environmental criteria in the tender process. The main awarding criterion was the price. The weighting of this parameter was 70%. The remainder 30% were quality criteria. Included in these quality criteria were – besides rolling stock, timetable features and service elements – environmental criteria. The weighting of these environmental criteria was 6% (of the 30% of the quality criteria). Thus the total weighting of the environmental criteria was about 2%.

The environmental criteria as defined in the tender comprise of the need of an environmental concept as well as values concerning noise and emission. The demanded environmental concept should include information on aims, technical measures, measurable achievements e.g. for energy retrieving, environmental management and recycling.

The values for noise, which were defined in the tender, lay considerably beneath the specified values of TSI Noise and therefore made higher demands on TOC. The values were specified against the specific type of vehicle and were divided in the categories traction noise if vehicle stands still (motor noise, ventilation noise) traction noise during starting and rolling

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<sup>1</sup> It has to be noted that the rules of the tender were constructed in a way that one bidder could win a maximum of two lots. Since there were only two bidders, this decision was consequentially.

noise at speed levels of 80 km/h But as these values for noise were no criteria for exclusion, they were not in all cases fulfilled completely by the bidders. Concerning emission, the offered pollutant category was evaluated.

All in all, the tender procedure, which was used for Netz Stadtbahn included the incentive for TOCs to integrate environmental aspects in their offer, as these aspects were considered positive in the evaluation.

### **3.1.2. Regional rail network of Lombardy, Italy**

Since 2001 the regional government of Lombardy is financing the renewal of the fleet used for the regional rail services. The rolling stock is usually bought by FerrovieNord, the IM of part of the rail network of Lombardy. The ownership belongs to the regional government, while the rolling stock is rented for free to the TOC that is in charge of the service. The TOC is responsible for the daily and planned maintenance.

The good practice example is related to a call for tender for 11 Diesel Multiple Units (DMU) to be used for the service on the S7 Milan-Lecco line. The contract amount was 65 million Euros. The call had also an option for additional 20 DMUs. Two builders took part in the tender: Stadler and Bombardier. The procedure started on 16<sup>th</sup> December 2008 and it was awarded in May 2009 to the Swiss manufacturer Stadler. The first DMUs will be delivered in 2011.

The DMUs will run on a busy commuting route in the polluted Milan metropolitan area. Stops are very close and a good speedup is needed with relevant energy consumption. About 3 km of the route are in a tunnel under the city and also the terminal is partially underground, so the exhaust gases have to be carefully checked. Energy-efficiency and environmental criteria were therefore considered in the awarding, as follows:

Concerning energy efficiency:

- use of diesel-electric engines was compulsory
- reduction of energy consumption was evaluated

Concerning emissions, Euro IIIA diesel engines were compulsory as minimum requirement.

The criteria to evaluate the tenders and their weights were the following:

1. Rebate: 60%
2. Time to deliver the rolling-stock: 4%
3. Energy efficiency
  - lowered weight (measured by the Kilo/seat rate): 3%
  - on-board use of braking energy: 3%
4. Other technical features
  - increased power of the engines: 6%
  - RAM (Reliability, Availability, Maintainability) clauses and standards: 6%
5. Quality:
  - increased number of seats (the minimum requirement is 200): 6%
  - lay-out of the floor: 6%
  - increased spacing of the seats (the minimum requirement is 1,600 mm): 3%
  - placing of the seats that makes it easier to clean the floor: 3%

The global weight of the energy efficiency criteria was 6%, not decisive for the awarding, but able to well promote the proposal of innovative rolling stock.



### **3.1.3. The Swedish part of Oresundstrafiken, Skånetrafiken**

At the Swedish part of the contract for the railway services in the Öresund area the following environmental requirement was included in the contract:

- Demand on renewable energy source
- Routines for recycling of waste disposal
- Vehicle washing
- Staff is to be educated in how to reduce the environmental impact from service operation, onboard services and vehicle maintenance.

For compliance to these environmental demands the TOC has to annually deliver an environmental report. The PTA has the right to monitor the compliance through an external inspector and also has the right to change the environmental demands during the contract period, however the TOC must then be compensated if this means increasing costs. This proceeding is similar in other countries or regions, e.g. in Germany.

## 4. European legal framework

### 4.1. European law relevant for awarding and tendering

#### 4.1.1. Primary legislation

Currently the Treaty of Lisbon is the relevant Treaty of the European Community. The Treaty came into force 1<sup>st</sup> of December 2009.

Basically the principles of the European Treaty have to be observed at awarding procedures. This applies for awarding of regional rail transport as well.

The main principles of the European Treaty are:

- Non-discrimination;
- Proportionality;
- Transparency;
- Equal treatment.

The European procurement directives or the minimum standards for awarding expressed in the regulation (EC) No. 1370/2007 follow these principles. This means that the principles of the European legislation can be used for interpretation or for the closure of regulatory gaps.

#### 4.1.2. Secondary legislation

##### *European legislation for railways*

The goal of the common transport policy is to remove obstacles at the borders between Member States so as to facilitate the free movement of persons and goods. To that end its prime objectives are to complete the internal market for transport, ensure sustainable development, manage funding programs and develop international cooperation. It is also concerned with laying down the conditions under which non-resident carriers may operate transport services within a Member State.

The main focus of European railway policy is the opening of the transport market, interoperability and harmonisation of safety requirements of the national networks and the development of (trans-European) networks.

The instruments of the Commission to realise their objectives are:

- Legislation;
- Compilation and provision of data and knowledge;
- Exchange of 'best or good practice'-examples;
- Development of guidelines;
- Encouragement of innovations in the field of science and research;
- Harmonisation of standards [e.g. TSI (Technical Specifications of Interoperability)].

Concrete legislative measures are derived from Green- and White Papers, which are summaries of different discussion levels and give basic orientation for the transport sector and which are further substantiated to directives, regulations and decisions.

Essential legislation in the field of railways at present:

- Regulation (EC) No 1370/2007- substantial level of transposition in Member States necessary,
- Directive 2001/14/EC – only basic regulation concerning network access, crucial level of transposition in Member States necessary,
- TSI (Technical Specifications of Interoperability) - several harmonized standards [e.g. Commission Decision 2006/66/EC concerning the technical specification for interoperability relating to the subsystem 'rolling stock - noise' of the trans-European conventional rail system – high level of concretization of the regulation.]

Further existing regulations regarding environmental aspects can be found in the COMMISSION STAFF WORKING DOCUMENT *accompanying the COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL Greening Transport* {COM(2008) 433 final}. With this Communication the Commission emphasises the protection of the environment in the transportation sector.

As a general rule for the policy area of transport, the particular negotiation process of the organs of the Community (i.e. especially the Commission, which intends to protect and develop the Common Market and the individual policies for further integration, whereas the Member States intend to protect their right of subsidiarity) is crucial to the assessment of the influence of the Community, universal statements are not possible in the end.

*Relevant legal framework for the award of transportation services (regional rail transport)*

The relevant legal framework for the award of transportation services in regional rail passenger transport – i.e. basically “how” to award – in the EC found expression in

- the European secondary legislation regarding the financing and awarding of public passenger transport services by rail and by road (Regulation (EC) No 1370/2007),
- the European secondary legislation regarding public procurement (Directive 2004/17/EC – Utilities Directive and Directive 2004/18/EC - Services Directive = European procurement directives),
- the European primary legislation, here, the basic principles of the Treaty establishing the European Community (EEC),
- national (regional and/or local, if any) provisions regarding the awarding of public transportation services, especially resulting from transposition or concretization of European secondary legislation,
- existing jurisdiction, primarily of the European Court of Justice (ECJ),
- the interpretation of European Community Law by the Commission Interpretative Communication on the Community law applicable to contract awards not or not fully subject to the provisions of the Public Procurement Directives (2006/C 179/02).

The succeeding explanations focus solely on European legislation. Transpositions in national law and concretizations remain out of consideration.

**a. Regulation on public passenger transport services by rail and by road (Regulation (EC) No 1370/2007)**

The „Regulation of the European Parliament and of the Council on public passenger transport services by rail and by road” has its legal basis in the guidelines of the Treaty establishing the European Community (EEC) regarding the common transport policy (Art. 91 EEC-Treaty) and the common competition policy (Art. 109 EEC-Treaty) and replaces the predecessor rules Regulation No (EEC) 1191/1996 and Regulation (EEC) No 1107/1970. The regulation intends to raise the efficiency and attractiveness of public regional passenger transport. For the first time, the regulation includes provisions which regulate the allowable financing and the awarding of public services in the sector of passenger land transport in the European Union on an area-wide basis. The directive comes into force on 03.12.2009. Considering the awarding of services in regional rail transport the regulation rules in Art. 5 par. 1 that the procedure has to be executed according to the guidelines of the regulation. However, the depth of control is quite small. Art. 5 par. 3 specifies merely that:

*“The procedure adopted for competitive tendering shall be open to all operators, shall be fair and shall observe the principles of transparency and non-discrimination.”*

As long as the provisions of the European procurement directives (see No. 2) are applied in awarding procedures, the provisions are observed automatically. On the other hand, the wide guidelines of the regulation offer a far greater scope for the Public Transport Authorities (PTA) considering the design of the awarding procedure compared to the stricter European procurement directives. At the same time PTAs are able to procure transportation services in regional rail passenger transport by direct awarding as long as national legislation does not forbid. In this case the maximum contract period is reduced from 15 to 10 years. A prolongation up to 50% with regard to longer amortisation periods is possible.

Generally, the regulation applies to the Member States directly without legislative transposition. However, a large room to manoeuvre remains. Those wide scopes, e.g. regarding the awarding procedures or possible restrictions of direct awarding through national legislation, are a manifestation of the general principle of subsidiarity according to Art 5 EEC-Treaty. This article rules that the European Community takes action only in those areas (also by legislative means) if and as far as it is not possible to the achieve aims of the considered measures by the Member States themselves.

Considering the subject of the service contracts in regional rail transport to be awarded (the „what“) the regulation contains only compulsory statements on how the contract has to be specified regarding financing especially to avoid overcompensation. The regulation allows in Art. 4 par. 6 explicitly the inclusion of environmental criteria into the contract:

*“Where competent authorities, in accordance with national law, require public service operators to comply with certain quality standards, these standards shall be included in the tender documents and in the public service contracts.”*

**b. European procurement directives (Directive 2004/17/EC – Utilities Directive and Directive 2004/18/EC - Services Directive = European procurement directives)**

Objective of the European procurement directives is to guarantee a transparent and non-discriminatory public procurement ensuring of the fundamental freedom of the Community on the basis of a common competition policy and the regulations of the Single Market (Art. 53,

62 und 114 EEC-Treaty). Contrary to Regulation (EC) Nr. 1370/2007 the awarding procedure is regulated in great detail. However, attention should be paid to the fact that the European awarding procedures apply only for contracts in the sense of those directives. Unlike with the Regulation (EC) No 1370/2007, the awarding of concessions is not included. A concession guarantees a right, for instance of an operator of a public service, to offer a specified service for a specified period of time to customers. The concessionaire also bears the economic risk of the customer relations, e.g. by generating revenues through compensation for services rendered. Generally, the concessionaire receives no payments for the provision of services from the licensor, the public administration. The following aspects are relevant for the awarding of regional rail passenger transport:

- For the most part, application of the directives is not compulsory: According to category 18, rail services are non-priority services (Art. 21),
- The Regulation (EC) No 1370/2007 governs the awarding of public service contracts (including concessions) in regional rail transport starting 03.12.2009.

As far as the guidelines of the European procurement directives serve as a rule for awarding procedures, also the (far less strict) specifications of the Regulation (EC) No 1370/2007 are met (see above in section 1). Opposite to Regulation (EC) No 1370/2007 transposition of the European procurement directives into national law in the sense of a standardization of national legislation has to be achieved in 2006.

There are no statements with regard to the subject of the service to be awarded. On the other hand, the directives basically allow freedom of manoeuvre for the contracting authority to specify the subject of the award, e.g. considering energy-efficiency or pollution. In general, the requirements have to be non-discriminatory. For example, the specification of a particular pollution filter (in the sense of a specific producer) would not be allowed. However, the specification of a maximum level of pollution or cleaning method would be permitted, even if these limits were stricter than required by European or national regulations of emission limits.

The establishment of specific environmental evaluation criteria for the appraisal of the offers is possible. The procurement directives define that the environmental standards

- can be associated with the subject of the contract,
- do not admit unlimited scope of action for the public authority,
- have to be mentioned explicitly in the contract notice and the tender documents,
- have to be consistent with the basic principles of EU-legislation.

At an earlier stage of bid assessment it is also feasible to assess the reliability of the bidder and, if necessary, to exclude bidders, e.g. because of registered violation against environmental law or the lack of expertise with regard to the implementation of environment management systems (EMAS<sup>2</sup>).

Recital 5 of Directive 2004/18/EC shows the prominent position of environmental aspects in the directive:

*“This Directive therefore clarifies how the contracting authorities may contribute to the protection of the environment and the promotion of sustainable development, whilst ensuring the possibility of obtaining the best value for money for their contracts.”*

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<sup>2</sup> Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS).

Recital 29 describes the freedom of the public authority with regard to the subject of the contract (the „how“):

*“Contracting authorities that wish to define environmental requirements for the technical specifications of a given contract may lay down the environmental characteristics, such as a given production method, and/or specific environmental effects of product groups or services. They can use, but are not obliged to use appropriate specifications that are defined in eco-labels, such as the European Eco-label, (multi-)national eco-labels or any other eco-label providing the requirements for the label are drawn up and adopted on the basis of scientific information using a procedure in which stakeholders, such as government bodies, consumers, manufacturers, distributors and environmental organisations can participate, and providing the label is accessible and available to all interested parties. Contracting authorities should, whenever possible, lay down technical specifications so as to take into account accessibility criteria for people with disabilities or design for all users.”*

Finally, Art. 27 par. 1 of the Directive RL 2004/18/EC specifies further responsibilities with regard to environmental aspects:

*“A contracting authority may state in the contract documents, or be obliged by a Member State so to state, the body or bodies from which a candidate or tenderer may obtain the appropriate information on the obligations relating to taxes, to environmental protection, to the employment protection provisions and to the working conditions which are in force in the Member State, region or locality in which the works are to be carried out or services are to be provided and which shall be applicable to the works carried out on site or to the services provided during the performance of the contract.”*

The European lawmaker underlines by the guidelines mentioned above the high relevance of environmental protection for the Community. The guidelines express the obligation to incorporate environmental aspects in the definition and execution of common policy and measures (especially to promote sustainable development) stated in Art. 11 EEC-Treaty.

## **4.2. European legislation in the areas environment and energy-efficiency**

As illustrated above, Community Law contains different requirements on “how” to award. The subject of the awarding is left to the discretion of the contracting authority. The contracting authority has to define, describe and procure the services needed. In principle, the Community does not regulate by law the subject of the provisions. This is prohibited explicitly by the EEC-Treaty and would violate the basic principle of subsidiarity. It is possible, though, that the Community develops and discusses their own positions and applies pressure and influences social debates by their actions respectively. This becomes apparent in the above mentioned possibilities of the Member States to focus on environmental aspects in their procurement activities, for instance the environmental guidelines with regard to awarding procedures. Eventually, the Community has a broad field of activity concerning environmental and railway policy. This is mostly done by the Commission.

The Community pursues the following goals with regard to the common environmental policy according to Art. 191 par. 1 EEC-Treaty:

- The conservation and protection of the environment and the improvement of its policy;
- The protection of human health;
- The sustainable and rational use of natural resources;
- The promotion of measures to solve environmental problems on a regional or international level.

The environmental policy of the Community is targeted according to Art. 191 par. 2 subsection 1 page 1 EEC-Treaty on a high level of protection, considering the different circumstances of the individual regions of the Community, i.e. their productivity as well. The environmental policy is based on three guiding principles (Art. 191 par. 2 subsection 1 page 2 EEC-Treaty):

- Precautionary Principle;
- Abatement of environmental impairments prior at their source;
- Polluter-Pays-Principle.

To achieve their goals, the Community applies Environmental Action Programs which determine the basic targets of the common environmental policy, taking into account the guiding principles. Different legislative measures, i.e. directives and regulations (currently 668) result from those Environmental Action Programs. Examples:

- Directive 2004/26 on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery
- Directive 2002/49/EC relating to the assessment and management of environmental noise
- Directive 2008/50/EC on ambient air quality and cleaner air for Europe
- Directive 2003/4/EC on public access to environmental information
- Regulation (EC) No 761/2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS II)
- Directive 2005/32/EC establishing a framework for the setting of ecodesign requirements for energy-using products (Ecodesign-Directive – the directive does explicitly not apply to means of transport for persons or goods, Art. 1 par. 3).

However, the Member States play usually a crucial part in the implementation of the guidelines of the Community, regardless of the character of the guidelines as regulation or directive. The Member States are responsible for the financing and implementation of the environmental policy according to Art. 192 par. 4 EEC-Treaty. The virtual influence of the Community becomes apparent: To implement the common goals of environmental policy the Commission can and may take up topics legislatively, notably if a disparity in law-making threatens to thwart those goals or leads to a distortion of competition. Occasionally, the framework established by this legislation can be very detailed. The Member States are responsible for the further transposition, financing and monitoring according to the subsidiarity principle. In particular cases, legislation by the Community has immediate effects on the EU-citizens, e.g. the so-called light bulb ban<sup>3</sup>. It is not possible to tell abstractly, when exactly legislative actions of the Community show indirect or direct consequences to the EU-citizens. Rather, it is the result of a negotiation process where the organs of the Community, especially the Commission, intend to protect and develop the Common Market and the individual policies for further integration, whereas the Member States intend to protect their right of subsidiarity. Attention has to be paid to the fact that “energy-efficiency” is not an independent policy field of the EC but rather part of the common environmental policy of the Community. Additional (indirect) instruments of the Commission (in order to apply political pressure) in the area of environment and railways are for example:

- Compilation and provision of data;
- Compilation and dissemination of knowledge;

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<sup>3</sup> Regulation (EC) No 244/2009 with regard to ecodesign requirements for non-directional household lamps (as a consequence of the Ecodesign-Directive).

- Exchange of „best-practice“ examples;
- Development of guidelines (see „Buying Green! - Handbook on green public procurement“ or the European Commission Green Public Procurement (GPP) Training Toolkit for example);
- Support of innovative activities in the area of science and research;
- Easing of harmonisation of standards;
- Easing of the promotion of projects by the Member States or individual promotion respectively.

#### 4.2.1. Directives for non-road mobile machinery (NRMM)

Altogether 4 directives regarding NRMM are in force:

- Directive 97/68/EC
- Directive 2002/88/EC
- Directive 2004/26/EC
- Directive 2006/105/EC

The main purpose of the NRMM-directive is to define the maximum exhaust emission respectively the definition of limit values for different non-road mobile machineries. The amount of the values depends on the kind of engine used in the respective vehicle. The definition of NRMM includes all vehicles for passenger transport or transport of goods with an internal combustion engine. Road vehicles are not scope of the directive. Beside separation into vehicle classes there is a development of exhaust emission values. This means that the maximum values are lowered by time in order to force the manufacturers to advance their engine technologies. One of the reasons for the directive is to define standards in order to keep the non-road modes of transport eco-friendly. The directive also defines the test methodologies. In case of railway vehicles a NRSC-the test cycle has to be applied. The limit values presented in the table below apply to new railway vehicles (DMUs or locomotives), but also to new engines replacing older engines in existing vehicles.

Vehicle category	Stage	CO	HC	NOx	Particles
<b>Railcars / DMUs</b>	IIIa (2006)	3,5	4,0		0,20
<b>Railcars / DMUs</b>	IIIb (2012)	3,5	0,19	2,0	0,025
<b>Locos (130 kW &lt; P &lt; 560 kW)</b>	IIIa (2007)	3,5	4,0		0,2
<b>Locos (560 kW &lt; P &lt; 2.000 kW)</b>	IIIa (2009)	3,5	0,5	6,0	0,2
<b>Locos (P &gt; 2.000 kW)</b>	IIIa (2009)	3,5	0,4	7,4	0,2
<b>Locos (P &gt; 130 kW)</b>	IIIb (2012)	3,5	4,0		0,025

Table 1 Emission levels for rail vehicles as defined in the NRMM-directive<sup>4</sup>

#### 4.2.2. TSI Noise (2006/66/EC)

The so-called TSI Noise (Technical Specification for interoperability relating to the subsystem ‘rolling stock – noise’ of the trans-European conventional rail system) came into force in June 2006. All TSI are in accordance with the directive 2001/17/EC [resp. revised version 2008/57/EC] which is the basis for the TSI-development. The TSI Noise regulates noise-emission limits for rail vehicles on the trans-European conventional rail network. Also the relevant test procedures are defined within the TSI. Usually networks for regional rail

<sup>4</sup> Source: directive 2004/26/EC; p. 15 et sqq.



services are not part of the trans-European conventional rail network. But article 1 paragraph 4 of the directive 2008/57/EC announces that the scope of the TSI may be extended in the future. Thus also networks for regional rail service could be scope of TSI Noise eventually which is already the case in some member states.

With regards to the content the TSI Noise sets noise emission limits for rail vehicles for freight transport and passenger transport. Concerning passenger transport, locomotives, multiple units and coaches are mentioned. In the field of passenger vehicles the noise emission values apply only to new vehicles. In case of refurbishment the TSI just requires that the noise emission after modernisation is not higher than before. It is not required to modernise existing vehicles in order to fulfil the values for new rolling stock.

Type of value [dB (A)]	DMU	EMU	Diesel loco	Electric loco
<b>Pass-by noise (80 km/h)</b>	82	81	85	85
<b>Starting noise</b>	83/85 </> 500kW	82	86/89 </> 2.000kW	82/85 </> 4.500kW
<b>Stationary noise</b>	73	68	75	75

**Table 2 Noise emission limits for rail vehicles for passenger services<sup>5</sup>**

The pass-by noise has to be measured at 80 km/h and at maximum speed and then re-calculated to 80 km/h. Both values must fulfil the required limits given in the chart above. In the case of noise it is essential that the requirements in terms of measuring, definition of noise values and track conditions are respected. Noise values which are measured according to previous national regulations may deviate significantly from values measured according to TSI Noise standards.

#### **4.2.3. Jurisdiction for interpretation of Common Law**

Especially the European Court of Justice (ECJ) emphasised the permissibility of environmental assessment criteria in awarding, as long as they are non-discriminatory and they are associated with the subject of the contract (see ECJ on the legal matter C-513/99 - *Concordia Bus* and ECJ on the legal matter C-448/01 – *Wienstrom*). The jurisdiction of ECJ leads to the guidelines of the European procurement directives as described above.

#### **4.2.4. Summary – European legal framework**

The Community is able to realise the aims of the EC Treaty in a legislative way through having an instrument for operations in the political fields of transport and environment. The range of the legislation is the result of the negotiations between all involved parties. General assignments of task and competence as “commission = guardian of the contracts and the development of integration” and “member state = guardian over the subsidiarity” are only qualified arrangements for highlighting the area of conflict regarding the interests, not for describing the effects of legislation processes. In the range of awarding services through the public authorities the legislative enactment of the EC Treaty describes “how” to get the award rather than the “what”. Although it is possible for the Community to ban or to regulate certain products, methods etc., the awarding authority on site can make its own decision within these parameters. Thus, as long as vehicles with certain emissions or specific technologies are not prohibited, the awarding authority is able and allowed to provide services using vehicles that incorporate these technologies. Furthermore the Community is not restricted to implement incentives for TOCs within the common law.

<sup>5</sup> Source: TSI Noise (2006/66/EC); table 3 et sqq.

## 5. National law for awarding and tendering and legislation for energy efficiency

In the countries participating in the ECORailS consortium, there are no prohibitions regarding the use of a certain procedure of awarding for regional railway services. In Italy there has been a governmental decision that by the end of 2007 all regional rail transport has to be awarded by tender. However, partly because of some bad experiences very few competitive tenders have in reality been conducted. Therefore the legislation will now leave it to the regions to decide which awarding procedure to use.



In Romania and Hungary the organisation of railway services is centralised and nearly all railway services are conducted by the national owned railway company which is awarded directly. Also in Sweden and Denmark, part of the regional railway services is operated by the national railway company. However in Sweden, the counties are responsible for awarding of the railway services within the respective county border and some regional PTAs also cooperate with cross countyborder traffic systems. In Denmark, about 27 % of the railway services are today awarded through competitive tendering organised by the national PTA Trafikstyrelsen, while the remaining services are directly awarded by the government to the national operator DSB. In Germany regional rail service is awarded by regional PTAs through competitive tendering although direct awarding also occurs.

Results from the interviews conducted with PTAs indicate that the national legal framework regarding awarding is adapting to the European legal framework. Although, since the 1370/2007 EU regulation can be said to have a rather flexible approach where the general legal regulation is to be decided on a national level, it could also be said that for rail services the European legal framework is adapting to the needs of the national and regional level. This means that it will be to the member countries, or even regions if the awarding is to be done through competitive tendering or through direct awarding.

Based on the interviews, longer contracts between the PTA and TOC can also be expected in the future. Longer contracts can facilitate investment in the rolling stock, since technologies/measures that give lower operation costs, but higher investment costs, will be more profitable. This development also complies with the 1370 regulation which, although stating that contracts should be of limited extension (up to 15 years or 10 years depending on awarding procedure), opens up for using even longer contracts, if a public service operator makes high cost investments in infrastructure or in rolling stock and vehicles.

It is also obvious that in several countries, a process has been initialized in order to strengthening the regional perspective. In some countries, for example Germany and Italy, there are already strong regional authorities present and have a legislative role. They can apply regional regulations in compliance with the national legal framework. Therefore, not only national and European regulations need to be taken into consideration but also a regional level. Even though stronger regional authorities could make it easier to take the specific regional characteristics into consideration, there is also a risk that the regional level

can be an administrative barrier. Especially when the functional regions do not match the administrative borders.

Regarding energy efficiency legislation and policy on the national level there is no legislation directly concerning railway transport in the participating countries. General environmental strategies also concern the transport sector as a whole and not the railway sector specifically. There are examples of some countries which have funding programs for rolling stock in order to modernize the fleet. In Sweden there is a policy (but not legislation) that all energy for electric traction should come from renewable energy source.

A summary of the current national legislation for awarding and policies regarding EE/EF criteria is given in the tables below. More detailed information concerning the respective country can be found in annex 1.

Country	Legal framework for awarding of services
<b>Denmark</b>	<ul style="list-style-type: none"> <li>• Majority of the services is awarded through direct awarding between government and state owned TOC DSB.</li> <li>• About 27 % of the services is awarded through competitive tendering by national PTA “Trafikstyrelsen”.</li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• Regional PTAs responsible for awarding of services.</li> <li>• Increasing number of competitive tenders, but currently most of the service contracts awarded directly.</li> </ul>
<b>Hungary</b>	<ul style="list-style-type: none"> <li>• All services except for the Budapest area is awarded through direct awarding between government and state owned TOC MAV.</li> <li>• Competitive tendering not used (but legally possible).</li> </ul>
<b>Italy</b>	<ul style="list-style-type: none"> <li>• Regional authorities responsible for choosing awarding procedure.</li> <li>• Direct awarding most common but competitive tendering also occurs.</li> </ul>
<b>Romania</b>	<ul style="list-style-type: none"> <li>• CFR-SA functioning as PTA and TOC (Internal operator) under contract with the Ministry of Transport and Infrastructure (under the name “CFR Calatori” and its 8 regional branches).</li> <li>• For parts of the network that are considered non-interoperable, private companies participate in auction tenders.</li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>• State owned TOC “SJ” has exclusive rights to operate profitable interregional services.</li> <li>• Regional PTAs award rail services within county borders, usually through competitive tendering however direct awarding also occurs.</li> <li>• Non-profitable interregional services are awarded through competitive tenders by the national authority Rikstrafiken.</li> </ul>

**Table 3 Summary of current legal framework for awarding of services in the ECORailS countries**

Country	Examples of legal use or policy regarding EE/EF criteria in regional rail services
<b>Denmark</b>	<ul style="list-style-type: none"> <li>• No energy- or environment-related legislation/policies regarding rail transport – except for noise.</li> <li>• Diesel engine emissions have to some extent been covered in some invitations to tender.</li> <li>• General (transport) climate strategy includes further electrification of the railway network and energy efficient driving.</li> </ul>
<b>Germany</b>	<ul style="list-style-type: none"> <li>• No legal requirements or minimum standards regarding environmental regulation on national level.</li> <li>• No energy consumption regulations.</li> <li>• “Non-existing” specified environmental strategies regarding railway transport, only abstract targets stating that “railways should be more environmentally friendly”</li> </ul>
<b>Hungary</b>	<ul style="list-style-type: none"> <li>• General environmental regulations for TOCs are defined in the National Railway Regulation and include emission levels for pollutants of diesel traction and noise.</li> <li>• No further environmental requirements/recommendations are included in the contract with the TOC “MAV”.</li> </ul>
<b>Italy</b>	<ul style="list-style-type: none"> <li>• No national or regional regulations/policies to improve energy savings.</li> <li>• Grants assigned to regions and PTAs aiming at introducing more environmentally friendly DMUs and diesel locomotives.</li> <li>• TOC has to comply with legal rules according to the community law and general environmental regulations.</li> <li>• National regulations for noise emissions of railway vehicles.</li> </ul>
<b>Romania</b>	<ul style="list-style-type: none"> <li>• Modernization program of rolling stock, financed by EU funds (88,51%), state budget (6,5%) and CFR Călători (5%).</li> <li>• Contract between ministry and CFR Călători includes the acquisition program for new rolling stock (multiple electric units, new locomotives and passenger cars).</li> <li>• Real time monitoring of fuel consumption for diesel engines (ICL) used as basis for calculation of the tariff rate for fuel prices.</li> <li>• CFR Călători’s modernization and development strategy is to be in accordance with the European legislation.</li> </ul>
<b>Sweden</b>	<ul style="list-style-type: none"> <li>• Policy from the main IM that only renewable energy source to be used for electric traction.</li> <li>• Environmental criteria explicitly allowed to be used by national law but must be clearly specified.</li> <li>• National goal to increase energy efficiency by 20 % to 2020.</li> </ul>

**Table 4 Summary of current legal use or policies regarding EE/EF criteria in the ECORails countries**

## 6. Economic framework

There are some main characteristics that are the same in all analysed countries; regardless the different steps of liberalisation process. Otherwise there are of course also some differences. In all countries there is one major TOC. And this is in any case the state-owned TOC. Even in the apparently liberalised rail market in Germany the incumbent has an outstanding market share. This situation is not expected to change within the next years. State-owned companies imply in most cases also strong dependency on authorities or ministries. This cannot be fully excluded, even though it might contradict European law.

The networks are also mainly owned and operated by state-owned Infrastructure Managers (IM). Due to different sizes of territory there are of course different network sizes. Thus a large country like Germany needs more responsible PTAs. This could result in a competition between PTAs. Positive – and of course negative – impacts of awarding in one region can be reflected on other regions. More PTAs also mean more awarding procedures: Thus the chances of using rolling stock in other regions are better.

The incumbent TOC and the incumbent IM are in four of the six countries linked in any way. In Romania, “CFR Infrastructura” (IM), “CFR Freight” and “CFR Passengers” (the two major TOCs) are separate companies, with separate budgets even if they are owned by the State (Transport Ministry). Only in Sweden and Denmark a real separation is implemented. The strong position of one major TOC is also reflected in the ownership of rolling stock. Most of the vehicles are owned by the major TOC. But the ongoing liberalisation with the awarding of other TOCs slowly changes the situation: Smaller TOCs are often not able to procure rolling stock due to insufficient capital base. Therefore rolling stock is rented from renting companies or allocated by the PTAs. This reflects the situation of renting companies: In Germany or Sweden with a lot of competitors, renting companies are more usual .

The process of liberalisation is starting or ongoing in all countries: For example in Romania or Hungary the beginning of liberalisation is intended and Germany or Sweden want to extend their open market strategy. Thus the number of TOCs in the single countries will increase within the next years with assumed impacts on the market of rolling stock.

In countries where competition is realised and alternatives to the offers of the incumbent TOC are available, positive impacts can be seen: The incumbent is forced to respond to this challenge: Not only by reducing prices, but rather by improving its performance – without any guarantee of winning the contract. The changing conditions strengthen the PTA’s position. Compared to former times they have more options to award rail services. This could improve the impact of costs and the quality of the services.

Regarding EE/EF criteria the negotiating power of the PTAs has also increased: More competition between the TOCs enables them to implement more requirements in the awarding procedure. If there was only one potential bidder, this would not be possible in this way. This means at the same time, that any barrier on competition would weaken the PTAs position again. Therefore tenders should be – from the economic point of view – the preferred option for awarding regional rail services with EE/EF criteria. However, competition could also have an impact on direct awarding. The negotiations with the respective TOC could be better if the PTA also had the option to do a tender if negotiations failed. The situation in the liberalised countries illustrates that more liberalisation will open the national rail market for private and foreign TOCs (a good example is Germany with a lot of participating TOCs, whereas in Hungary or Romania only a few TOCs provide rail services).

Today the impact of the current worldwide economic crisis cannot be foreseen. But it is estimated that there is a risk on competition due to declined possibilities for private TOCs to get capital. A tender in Germany (Capital region Berlin Brandenburg) could be an indication: Just two bidders had taken part in this tender – state-owned Deutsche Bahn and BeNex (indirectly owned by the Federal state of Hamburg and a foreign financing company). This tender dealt with a relatively big network and quite big fleet which would have to be newly procured by the not-incumbent bidder(s). The following tenders will clarify the situation more properly. State-owned companies can get capital easier due to theoretical or practical debt guarantees by the state. But a real rollback in times of direct awarding is not expected for the liberalised countries since the PTAs in these countries acknowledge the advantages of competition. But the impact on the liberalisation process in currently not liberalised countries is uncertain.

If PTA or state authorities procure rolling stock there is no real problem in financing. “Structural European Funds and Regional Development Funds can also be accessed for co-financing the rolling stock’s acquisition.” This raises a possibility for considering environmental aspects when deciding to purchase. If TOC or renting companies have to procure the rolling stock, the situation is – in all countries – different. They can only get capital for their investments if they can finance the rolling stock.

Since rolling stock can be used for at least 20 years there is a problem if PTAs award their services for a maximum of only 10 or 15 years. But this situation can be eased if approaches to solve these problems can be found. Next to the procurement of rolling stock by the PTA or state authorities, a so-called re-deployment guarantee could also help the TOC. This means that the rolling stock can be used after the contractual period, regardless who will be awarded in the next period.

Thus economic problems, e.g. financing rolling stock, have to be considered but it is possible to find a solution for them. It is even more important that TOC or – in the case of procurement of rolling stock – manufacturers get the same chances for providing their services and products. This is necessary with regard to the European legislation, too and their principle of non-discrimination or equal treatment. Thus the implementation of environmental criteria is – at first sight – non-discriminatory if the design does not give advantage to one stakeholder. But – with regard to the economic crisis – it has to be considered that the formal equal treatment may be a disadvantage for some stakeholders. This can be the case when incumbents can profit of their better financial situation when applying for tenders with demand for high investments in rolling stock.

More detailed information can be found in Annex 1 (Legal and Economic Country Reports)

## **7. Chances, risks and risk handling concerning ecological standards in awarding**

### **7.1. Including energy efficiency and environmental criteria in awarding - the PTAs' point of view**

Almost all interviewed PTAs stated that environmental criteria should play a more important role in the future. Although there are some concerns – e.g. more bureaucracy – that this cannot be realized only through tendering but needs legal regulations and that including this in awarding can have the results that the most “tricky” bidder wins the tender. However, the general attitude is that environmental criteria should be included in the awarding process and that it could be used as an incentive to enhance the regional rail business, trigger the rolling stock modernization process and increase the ecological consciousness and acceptance for public funding of transport.

In order to include environmental criteria in awarding procedures, attention should be paid to create guidelines that PTAs can use in a simple way. Furthermore, criteria should be included and the targets need to be measurable and easy to monitor and report. It was also mentioned that this type of criteria should not restrain the bidders' options too much. There should be room for the bidders for own suggestions regarding how to get better environmental performances. It was also stated that the weighting of the different requirements/criteria (i.e quality, punctuality etc. vs. energy efficiency) is important.

All of the interviewed PTAs agreed that it is relevant for them to take environmental effects into consideration. Reasons for this can be that measures for prevention are more effective than penalties for violating environmental laws and that it is important for the PTAs' (and also for the TOCs') profile and goodwill. If energy consumption is subsidized, this may need to be decreased or ceased. The PTAs mentioned that thus energy efficiency would be increased. However, it was also mentioned that this needs to be seen as a political responsibility. Thus the political level and environmental authorities should be included in the process. Financial limits may also mean that only a gradual approach is possible.

Results from the Railenergy project indicate that energy efficiency is viewed also by other stakeholders – manufacturers, operators and infrastructure managers, as an important and strategic theme and field of action<sup>6</sup>.

The ECORailS User Platform agreed upon the statement that it is legally secure to implement EE/EF criteria in the awarding of services and rolling stock. However it was stated that being too specific regarding technologies to be implemented should be avoided since it could impose a risk for discrimination. Additionally, the requirement or rewarding of too specific technologies could lead to the exclusion of more efficient solutions or offers even if it was not discriminatory in the legal sense.

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<sup>6</sup> Railenergy, SP1 Results reprot WP1.1, 1.2, 1.3 Final report (draft version)

## 7.2. Chances and risks for the use of energy-efficiency criteria in the awarding process

### 7.2.1. Legal, administrative and market risks

In general, based on the preliminary results from WP2, the ECORailS User Platform, interviews with stakeholders and analysis of European and national legislation, we can state that any major legal barriers for PTAs in terms of including energy efficiency and environmental criteria do not seem to exist when awarding rail services or rolling stock. At least in the participating countries no changes in current legislation are needed. However, measures could be necessary in some of the countries in order to facilitate this process. Increased use of competitive tendering was mentioned as well as a stronger harmonisation of national legislation with European law. It was also expressed that there is a need for enhanced requirements and establishing of standards regarding noise, emission levels and energy use which also should be possible to change incrementally according to technological progress. For rolling stock the contract authority is basically free to determine the requested scope of performance through its procurement autonomy. The awarding party determines the decisive criteria for the evaluation of the tender but the awarding process must be in compliance with the central principles. The use of environmental issues in the awarding procedures is, according to the new “Utilities Directive” (2004/17/EC), permissible and desired.<sup>7</sup>

However, even though it is legally possible to include such criteria in awarding there have just a few cases been found, where this has been done. Main priorities still concern passenger requirements or load factor optimisation. The situation is rather different when the TOC procures new vehicles. In this case, energy efficiency requirements for rolling stock are standard although not necessarily basis of the decision to purchase a given vehicle or not<sup>8</sup>.

Examples of identified legal, administrative and market barriers for implementing EE/EF criteria include:

- Risk of complicated tendering procedures and appealing processes
- Economic situation, awareness of increased investment costs
- Limited or lack of economic incentive for TOC
- Charging system for energy prices
- Timeframe of awarding in relation to timeframes of research and development
- Limited competition
- Quality of rolling stock and/or infrastructure
- Costs and problems in case of modernisation of existing rolling stock, including authorisation problems
- Insulated market for vehicles

#### *Risk for complicated tendering procedures and appealing processes*

For the PTA the tendering process can be a rather costly and time consuming procedure. It may also be quite common to be confronted with appealing processes, especially if other criteria than the price are involved in the evaluation process. Thus, there can be a risk that

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<sup>7</sup> PROSPER II – Draft 3b (final) of UIC Leaflet Environmental Specifications for New Rolling Stock, UIC July 20th 2005

<sup>8</sup> Railenergy, SP1 Results report – WP1.1, 1.2, 1.3 Final report, Draft version



PTAs will be hesitant to further complicate the awarding process. Hence EE/EF should be as transparent as possible leaving minimal room for misinterpretation.

### *Economic situation, awareness of increased investment costs*

As mentioned above, the legal situation doesn't seem to be a main barrier for including EE/EF criteria in awarding of services or rolling stock. Maybe the most important reason for the limited use of EE/EF criteria for awarding services is economic issues. Regional rail services are mainly publicly financed, through subsidies or contract-based, and usually not operated on a purely commercial basis. This means that public funds are needed, either directly or indirectly, for financing the investment to apply to environmental demands. Therefore, it is important to show the economical effects for the PTA which may be caused by including EE/EF criteria in the contract. One approach for doing this is using a life cycle cost (LCC) approach. LCC covers the total cost for a product during its period of use, hence covering not only the investment cost but also the operating and maintenance costs. Other parameters can include taxes, subsidies and residual value. Even though a product has high initial costs, low operating and maintenance costs can imply that the product during the contract period can be profitable. This effect can be further enhanced if the operating costs, for example the energy or fuel prices are expected to increase. For a product with high investment costs, the expected period of use is therefore of importance. Contract periods can be one instrument to overcome high initial costs<sup>9</sup>. The European regulation 1370/2007 opens up for contract periods up to 15 years and even longer periods if a public service operator makes high cost investments in infrastructure or in rolling stock and vehicles (as long as the awarding has been done in a fair competitive tendering process).

### *Limited or lack of economic incentive for TOC*

There can also be a risk of limited economic incentive for TOC to decrease the operational costs. For example, in the case of direct awarding, the compensation can be calculated through the differences between operational cost and the incomes from the services. Therefore if the TOC lowers its operational cost, for example through a more energy efficient driving, the compensation may be reduced by the same amount<sup>10</sup>. This could mean that even though the TOC in the contract is bound to educate its drivers in energy efficient driving, there is a risk that, without an economic incentive, the commitment will be limited. This can be solved by introducing an incentive system by which the TOC is rewarded if the energy/fuel use is reduced. However this also needs a monitoring and reporting system, which, at least in case of electric traction and network with free access, requires that the vehicles are equipped with energy meters.

### *Charging system for energy prices*

Another market barrier is the charging for energy use. Energy prices are in some countries included in the overall track access charge and not charged separately. In some countries, the TOC does not bear the real costs for the electric traction, since the energy prices for the railway network are subsidized. Additionally, existing charges are often not based on actual energy use and therefore independent of the type of the train. All these factors can have the effect that reduction of operational costs through use of less energy will be of less importance. These problems are harder to solve through contracting measures. For the PTA, one way to overcome this problem could be to include an incentive system with higher

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<sup>9</sup> Buchanan and Partners, Guide to Contracts and Contracting in Public Transport

<sup>10</sup> For example, if the operational costs within a contract are estimated to 1 million € and the fare income to 0,6 million €, the compensation paid to the TOC should be 0,4 million €. The introduction of energy efficient driving is supposed to be able to give a reduction of the operational costs by 0,1 million €. This could then mean that the compensation to the TOC would decrease to 0,3 instead of 0,4 million €.

compensation levels for the reduction of energy use. However, this can be rather costly. Instead a national policy change could be necessary which would involve infrastructure managers and the responsible government.

### *Lack of competition*

One potential market risk is that, when the awarding process is done through competitive tendering, there may be only a few contenders taking part in the tender process. As identified in the previous chapter, in all countries there is one major TOC. And this is in any case the state-owned TOC. Even in the apparently liberalised rail market in Germany the incumbent has an outstanding market share. This situation is not expected to change within the next years. Even though lack of competition is a problem that originates from other reasons than introducing environmental criteria, there might be a risk that including environmental criteria in the process could be a barrier for newcomers or minor TOCs to enter the market, hence further reducing the number of contenders. Reasons for this can be that the tender process can become more complicated and lead to increased commercial risks for the TOC. The latter can especially be the case if the rolling stock is to be provided by the TOC. A small number of contenders can reduce the impact of including EE/EF criteria, especially if using only non-mandatory criteria for the evaluation of tenders. It is therefore important to present necessary information regarding the baseline in order to facilitate for non incumbent operators to take part in the tender.

### *Quality of infrastructure and rolling stock*

The quality of rolling stock and infrastructure can also be a barrier. This can influence the use of EE/EF criteria from several perspectives. For example that a modernisation process is seen as more important for the environmental impact than specified EE/EF criteria for the rolling stock since modernisation can be considered necessary in order to increase the modal split for railways. In several of the studied countries there is an ongoing modernization process of both the rolling stock and the infrastructure. This is, of course, a much needed development. A possibility could be that if the purchasing of rolling stock that is done through EU-funding or other national or international funding programs or through lending, EE/EF criteria should be included in these projects. Low quality regarding infrastructure can itself be a barrier through making it hard to use certain types of rolling stock, technological solutions or operational measures.

### *Insulated market for vehicles*

Another market barrier could be that an insulated vehicle market can make it difficult or expensive (because of limited market potential) to introduce new technologies. This can be due to special technical standards, for instance a different railway electrification system in a very small network of one country.

### *Rail access liberalization*

The main risks that really affect the progress of the liberalisation process are mainly rooted on rather “how” and not “what” EE/ENV measures are handled, i.e. set of the right implementation pathway is a crucial point. Centralised decisions generally represent common objectives over the individual, where market actors are either not interested in these objectives or stand for particular interests. Many of the EE/ENV regulations are centrally initiated by the European Commission or industrial/societal lobbyists, thus this kind of measures shall be in focus in the further analysis.

Within the technological clusters as presented by WP2 a couple of measures from the cluster “Reconditioning / revamping of vehicles that already exist” may have the largest internal impact on the railway market. Reconstructing the combustion and braking systems to reduce exhaust pollutants and noise annoyance, thermo-efficient construction of vehicles, may substantially influence the newcomers’ potential to the market access. Particularly if they lacked capital that could be invested in such fields. The other selected clusters (“Optimisation of comfort functions”; “Improvement of traction equipment efficiency”; “Reduction of energy consumption”) are expected as groups of optionally applied measures in awarding processes. In this case the access to network for newcomers is not depending on possessing these attributes, but this can be a ranking factor in the awarding process. Any hinderance of new comers through regulations shall be eliminated.

The selected clusters of operational measures show a diversified picture. While training programs expectedly have no impact on the network access, management and organisation initiatives partly may lead to decreased operational costs and indirectly to strengthening competitiveness of the railway sector – important to note that lack of proper financial resources may lead to a converse situation in the rail market. For example noise reduction via differentiated track access fees may have a large impact on investments and operation of “noisy” TOCs but, due to higher service fees, worsen the cost competitiveness of the railway sector compared to other transport modes. The so created additional financial sources shall finance mitigation actions in railway sector. Rather incentive than restricting measures are in need.

All the risks revealed in the analysis can be handled by proper risk management techniques. If this was not a realistic demand from this side, efficient and dedicated financial support programs for the railway sector could ease reaching the EE/ENV objectives (similar to some initiatives for transport mean reconstruction in the inland waterway sector). Preliminary market research and survey may reveal readiness and resolve of TOCs to achieve such conditions. When the market acceptance of any measure reaches a defined level, it is expected that fulfilling such a requirement will become a norm among market actors. Therefore, building up the implementation pathway needs a careful planning, including the preparation of a risk mitigation plan. By all means, showing up direct cost saving may contribute to higher acceptance of these measures at companies.

### **7.3. Chances and risks related to technological issues**

#### *Environmental and safety consequences*

A relation between the presence of safety risks and the technology’s status of development is observed: the solutions with safety risks are often under testing or R&D technologies. For these solutions, safety problems are probably not yet worked out. Environmental risks are mainly related to recycling matters of new materials involved. One must also consider that some of the analyzed technologies are not already in use but only advertised by manufacturers. So it’s important to keep into account that some risks (for safety and environment) could have been voluntarily left out. Consequently, the PTAs should focus on technologies whose risks have already been sufficiently assessed. Such technologies should not be required as compulsory standards, but encourages by other types of incentives, leaving the responsibility for risks mainly to the TOC or manufacturer.

#### *Market availability*

At least the 43% of the technologies refer to technical solutions which are already available on the market or even used. Cluster 11 (unconventionally propelled vehicles) represents an

exception: the technologies in this cluster refer to recent studies so the majority of them are still under testing. Anyway, this kind of technologies does not seem to have so much future success in regional or suburban transport.

*When it comes to the operational measures, a majority is already available in the market. Cluster 8 (noise reduction) represents an exception: in this cluster there is the measure “Identification of noise and wheel flats by trackside check points”. Such a measure is under testing in several countries because it is quite particular: it is an operational measure with technical implications and it is complicated also from the monitoring system point of view. This cluster contains also the measure “noise-driven procurement”, and for that no data about its “status of development” are available: this can be explained by the ambiguity of such solution. It is not so clear if and how the interest in noise emissions beyond the legal limits is pursued by local authorities.*

### *Economical consequences*

Analysis of the technologies and operational measures within WP2 shows that only one third of the short-term technologies and 6 % of the operational measures will mean medium or high operating and/or investment costs. When it comes to long term horizon technologies the share is somewhat higher with about 46 % meaning medium or high operating and/or investment costs. At the same time about 2/3 of the technologies (short term as well as long term horizon) and operational measures will give significant reduction in the vehicle running costs.

The results within WP 2 also show a significant relation between the use of technologies in the real environment (i.e. the local rail transport market) and the absence of economic risks. The potential future technologies, although very promising, need a certain amount of work to be done, e.g. further granting for R&D and study phases, or have to be accepted by the market, which until now revealed a low potential. Furthermore, the analysis has evidenced that some of the technologies and measures can arise economic risks for the TOC, among which the rise in operating costs and less attractiveness to new comer operators of the rail market itself. Finally, a small part of technologies may have negative effects on the attractiveness to the public of rail transport.

### *Legal consequences*

The results within WP2 show a significant relation between the use of technologies in the real environment (i.e. the local rail transport market) and the absence of legal constraints. The potential future technologies, although very promising, need a certain amount of work to be done, e.g. towards reaching the consensus of the infrastructure managers. When it comes to operational measures, the legal consequences should not be neglected, some measures with a low requirement for investment can nevertheless show requirements for agreements with trade unions and/or the necessity to verify safety issues, up to the necessity to modify the safety certificates.

## **7.4. Lifecycle cost and cost benefit analysis**

In order to compare the trade-off between investment and operational as well as maintenance costs of different technologies and to find the best solution for a specific use case, all costs that occur during the lifecycle, or at least the duration of the respective contract, should be considered when selecting technologies or operational measures.

For these calculations two related methodologies with different focus exist:

- Calculation of lifecycle cost (LCC) which focuses on the whole lifecycle of a product;
- Cost benefit analysis (CBA) concentrating on the effects during a contractual period.

LCC Analysis can be applied to the vehicle, to specific equipment (e.g. an aggregate), or to operational measures for which changes of the vehicle, the infrastructure or the maintenance facilities are required.

The aim of **lifecycle cost** analyses is the calculation of all costs of a specific product during its lifecycle including production/investment costs, costs for operation and maintenance as well as recycling and disposal costs. All costs are added up. The total sum of all accrued costs for a specific product is the relevant parameter for comparison purposes with other products. LCC analyses concentrate on the costs during the lifecycle of the evaluated technology independent of the parties involved.

The main difficulties are the determination of the operational conditions and the failure rate beforehand. For calculation purposes assumptions are made about the operating program and operational conditions for a specific usage scenario. Similar the failure rate is estimated based on available experiences.

In contrast to a LCC a **CBA** focuses on the monetary effects of a given technology or operational measure in comparison to other technologies/operational measures from the point of view of a specific involved party, e.g. the PTA, the infrastructure manager or the operator, during a given period, i.e. in most cases the duration of the contract.

The aim of a cost-benefit analysis is the identification of the additional costs and benefits of the analysed technologies and operational measures for the involved parties (PTA, TOC, IM). In the analysis only monetary benefits should be considered. These are mostly reduced operation and maintenance costs as well as avoided investment costs (e.g. not necessary sound protection measures for residents, avoided depot extension for additional vehicles due to lower specific maintenance demand, etc.).

Similar to LCC analyses it should be noted that especially the operational costs and to a lesser degree the maintenance costs are variable and strongly dependent on the operating program and fielding conditions. Therefore the calculation should be made for specific operating scenarios corresponding with the planned usage conditions during the investigated period.

For lifecycle cost analyses as well as cost benefit analyses the relevant costs are mainly:

- Investment costs for infrastructure, vehicle equipment as well as supplementary equipment
- Operational costs
- Maintenance costs
- Refit costs (only CBA with analysis period greater than lifespan of specific item)
- Recycling costs (only LCC where necessary)
- Disposal costs (only LCC where necessary)

These costs have to be matched for the specific use case or scenario. Therefore the important operational characteristics (e.g. number of vehicles used, mileage per vehicle, service profile, etc.) should be collected for the respective scenario, so that common indicators (e.g. time-dependent and mileage-dependent maintenance cycle, operational costs per train-km, etc.) can be used.

Today most of the necessary indicators for future technologies are yet undetermined. Some estimates can be found in the literature but the main source for the necessary data will be the suppliers. For technologies that are already in use the individual operators should have the relevant data for their specific use cases.

The analysis of the technologies and operational measures shows that only 33 % of the short-term technologies and 6 % of the operational measures will mean medium or high operating and/or investment costs. When it comes to long term horizon technologies the share is somewhat higher with about 46 % meaning medium or high operating and/or investment costs. At the same time about 66 % of the technologies (short term as well as long term horizon) and operational measures will give significant reduction in the vehicle running costs.

The combination of low vehicle and infrastructure fix costs with a significant reduction of vehicle running costs, a situation that gives the best results for the purpose of a cost-benefit analysis can be found in 36% of the technologies and 38% of the operational measures. Mainly these are technologies to improve traction equipment efficiency (technology cluster 5), for train formation and typology (technology cluster 1) and to optimise comfort functions (technology cluster 3) as well as operational measures regarding training programs (operational cluster 1), energetic optimisation of timetable (operational cluster 2) and the use of energy meters (operational cluster 5).

In some cases, the TOC don't bear the real costs for the electric traction, since the energy prices for the railway network, could be more or less heavily subsidised. In these cases, introducing EE/EF criteria that lead to energy savings, will have limited effects when it comes to reducing the costs. This means that it can be harder to reach the return on investments.

## 8. Options of integrating ecological standards in awarding procedures

### 8.1. Awarding procedures

Integrating ecological standards in awarding procedures demonstrates that quality and awarding procedures go well together. Awarding procedures can ensure that technical standards which are available in the market will be established to guarantee ecological improvement, e.g. reduction of noise, toxic exhaust emissions and energy consumption. The awarding procedure will be described in the following section. In compliance to European law the awarding of public transport services can be provided through *competitive tendering* or through a *direct awarding* procedure.

In a *competitive tendering* procedure the competent authority (PTA) may evaluate a number of interested Train Operating Companies (TOCs) in an *open*, *restricted* or *negotiated* procedure. In the open procedure any operator may submit a tender while in a restricted procedure any operator may request to participate in the tender process, however, only candidates invited by the contracting entity may submit a tender. In a negotiated procedure the contracting entity consults one or more selected TOCs and negotiates the terms of the contract with these companies. In case of *direct awarding* the PTA may award the transport services to a public service operator without entering a competitive tendering procedure. The use of direct awarding is an optional exception for rail services (other than metro and tram) while for other passenger transport modes this is only allowed under special circumstances. National legislation can still prohibit the use of direct awarding of rail services.

When the railway service has been awarded, a Public Service Contract (PSC) between the responsible authority and the TOC has to be established. The PSC is the legally binding act that confirms the agreement between the two contractors and in which the competent authority requires the public service operator to comply with quality standards and technical specifications. The PSC must be in accordance to national law, but the actual standards and requirements may be stricter, e.g. in terms of environmental effects, than required by national or European legislations. The requirement concerning standards and techniques has also to be included in the tender documents. The Public Service Contract is to:

- define the *public service obligations*<sup>11</sup> to which the public service operator has to comply;
- establish in advance, in an objective and transparent manner, the parameters on the basis of which the *compensation*<sup>12</sup> if any, is to be calculated, and the nature and extent of any exclusive rights granted, in a way that prevents overcompensation;
- determine the arrangements for the *allocation of costs* connected with the provision of services.

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<sup>11</sup> a requirement defined or determined by a competent authority in order to ensure public passenger transport services in the general interest that an operator, if it was considering its own commercial interests, would not assume or would not assume to the same extent or under the same conditions without reward.

<sup>12</sup> any benefit, particularly financial, granted directly or indirectly by a competent authority from public funds during the period of implementation of a public service obligation or in connection with that period.

### **8.1.1. Pros and cons for including EE/EF criteria**

In general it is possible to include EE/EF criteria in the Public Service Contract regardless the type of the awarding procedure. One difference is that within a competitive procedure EE/EF criteria could also be used for choosing between TOCs through including the criteria as a weight for the evaluation of the tenders.

A competitive tendering procedure should also, at least in theory, lead to a more efficient use of energy also without including this as a requirement. The contract is usually awarded to the contender demanding the least compensation for operating the services. Operational costs are one factor that the competing TOCs have to play with in order to increase their competitiveness and increase the chance to win the tender. However, because of technical reasons, charging systems for energy costs, lack of competition etc. energy costs may sometimes have only minor influence. More competition between the TOCs enables the PTAs to implement more requirements in the awarding procedure. If there was only one potential bidder, this would not be possible in this way. This means at the same time, that any barrier on competition could weaken the PTA's position again.

Within a direct awarding procedure there is (in general) already a well established relation between the competent authority and TOC. Direct awarding also gives the possibility to establish a regional TOC. This has been done for example in Italy. Within a direct awarding procedure, the PTA and the TOC can also arrange the inclusion of EE/EF criteria during the negotiation process. This may also be possible within a competitive tendering procedure, depending on national legislation; however the options will then be more limited.

A direct awarding procedure may be less non-discriminatory than a tender. However, it should be done in a transparent way with regard to formal requirements of European and national law. Nevertheless, the PTA is permitted to require EE/EF criteria also in direct awarding. Either the respective criteria are mandatory or the PTA and the TOC arrange them during the negotiation process. The publication of the applied EE/EF criteria in the tender documents and their evaluation is often substituted by the negotiation process if direct awarding is applied. But the monitoring is in both cases identical.

In general, the success of including EE/EF criteria may more depend on the overall market situation, e.g. political, economical and legal strength of the PTA, availability of TOC (and their commitment) and availability and quality of rolling stock than on the type of awarding procedure.

## **8.2. How energy efficiency and environmental criteria could be used in the different awarding methods**

The inclusion of EE/EF criteria in awarding can, from the PTAs point of view, be included either in 1) the Public Service Contract or, 2) in the case of the PTA owning the vehicles, in the procurement of vehicles. How to include EE/EF criteria will therefore depend on the following situation:

1. Awarding of services, rolling stock provided by TOC
2. Awarding of services, rolling stock provided by PTA
3. Awarding of rolling stock by the PTA
4. Awarding of rolling stock by the TOC



Although the case of number 4 is not within the main scope of the ECORailS project, some of the examples covered in case 3 are of course relevant also when TOC are awarding vehicles. Options to include environmental criteria when awarding rolling stock, from a TOC:s perspective have also been well covered by the PROSPER project.

In order to include EE/EF criteria in awarding of services the following options are available.

- Requirements – The TOC or the manufacturer is required to fulfil the included criteria.
  - Applicable by PTA after they have checked that these requirements can be fulfilled by TOC and manufacturers;
  - Mainly recommended for detailed monitoring system for energy consumption, eco-driving and drivers training, parked train control systems, onboard equipment for energy recovery/storage, maintenance procedures;
- Bonus/Malus –The TOC can be granted an incentive or must provide a penalty if it manages to fulfil the criteria or for non-compliance to the criteria respectively. Although the bonus/malus is only used during the contract period the compensation/penalty also need to be described in the tender document.
  - Optionally used as incentive for good real life performances;
  - Penalties requiring a very rigorous monitoring of the operator's actual performance.
- Weight – In a competitive tendering procedure, criteria can also be used for evaluation of tenders and be weighted together with other parameters (e.g. price and quality)
  - Applicable for assessing and selecting offers (e.g. additional scores for offers with good environmental quality);
  - Used when availability and costs are unclear and the reliability of technologies is to be checked;
  - Recommended for advanced energy consumption limits/objectives and mainly for innovative technologies (e.g. onboard energy storage);

In general, the PTA as a contracting authority has procurement autonomy. This means that it is basically free to determine the requested scope of performance as long as direct and indirect discrimination do not occur while transparency and equal treatment are ensured (for legal requirements see chapter 4).

If the service – or vehicles – are awarded by direct awarding instead of tendering the preparation of awarding documents and the tender phase is quite different or even does not apply. But even in the case of direct awarding the PTA has to prepare documents as the basis for the negotiation period. The negotiation between the PTA and the chosen operator (TOC) or manufacturer is the essential phase at a direct awarding. Due to the lack of comparability of different offers the PTA has to enforce its interests and demands primarily during the negotiation process.

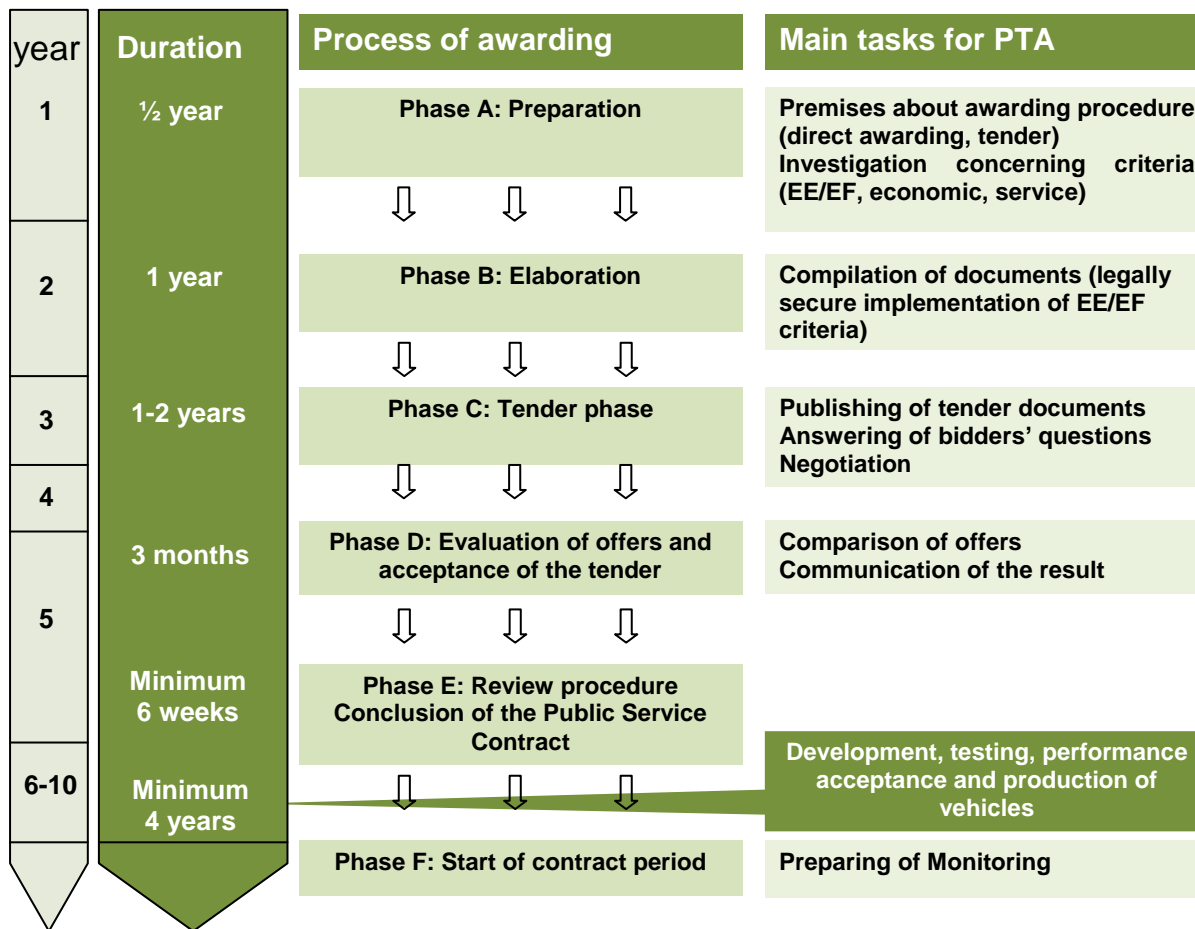


Figure 1 Main phases and duration of an awarding procedure, if innovative ecological standards are desired

### 8.2.1. Phase A - Preparation

Firstly, the PTA has to, based upon national legislation, decide whether it will do a competitive tender or award the service (or vehicle procurement) directly.

Before starting the awarding procedure the PTA also has to come to a decision regarding e.g. the operational area, the type of vehicles, the kind of services and appropriate limit values. In all cases the criteria have to be just and reasonable for all bidders or the preferred service operator.

As a precondition, availability and affordability of suitable vehicles to satisfy the limit values must be given. A disadvantage for a potential service operator could arise if a TOC was bound by contract or tradition to a special vehicle manufacturer and if this manufacturer was not able to deliver rolling stock with the required specifications. This clearly points to a functional tender which does not specify a certain technology to reach the standards and which gives ample scope for technical options for the bidders and vehicle manufacturers. A specification of certain technologies makes a justification by the PTA necessary. However, a non-binding indication of filter technologies to comply with limit values is generally non-critical for the PTA.

The integration of ambitious environmental standards raises the costs and the time required for the preparation of the bid by the bidders or the preferred service operator. However, if the awarding sets innovative environmental standards and if fulfilment of the standards cannot be proven by previous awarding procedures, it is essential that the PTA thoroughly and in time acquaints itself with the relevant technology with regard to the preparation of the awarding documents.

To monitor and evaluate the standards, the complexity and costs of the measurement of the vehicles have to be quantified. For the PTA it is also important to be informed about the terms and conditions of loan programmes for vehicles with high ecological standards from other public institutions, national or European authorities. Also potentially raised questions concerning admission premises e.g. from the railway supervisory authority might be relevant and have to be considered by the PTA. To ensure a fair tender procedure the advantages of vehicle grants have to be considered for the assessment of bids

This knowledge enables the PTA to keep the standards up during the whole awarding procedure. Furthermore, the definition of services and standards enables the PTA to avoid the trade-off between low-priced bids and low environmental or social standards.

In summary it can be stated that

- ambitious ecological standards can be set and enforced by awarding procedures;
- transparent assessment criteria allow for an assessment of the environmental quality offered in a legally compliant way;
- grant programmes and fair competition are compatible if grants are made available to all participants of a competitive awarding procedure in a non-discriminatory way.

When questions have been clarified adequately and preliminary considerations have been made, awarding documents can be prepared. It has to be noted that regulation (EC) No. 1370/2007 demands a letter of indication in the run-up of the planned awarding. But the PTA is not forced to tender, even if a tender is announced in the letter of indication (article 7 paragraph 2).

### **8.2.2. Phase B – Elaboration (of awarding documents)**

In order to establish ambitious ecological standards in the tender procedure, it is important to stipulate two elements in the awarding documents: Firstly, certain ecological standards are defined as minimum standards.<sup>13</sup> The minimum standards base on the state of the art, prices and the prospective limit values. Compliance with these standards is mandatory for the bidders and has to be monitored strictly during the duration of the service contract. It has to be clear to the bidders that a breach of the minimum standards will cause sanctions which will be fixed in the service contract. A draft of the contract is a mandatory part of the awarding documents. Secondly, tender responses with advanced ecological standards, compared to the mandatory requirements, receive a higher scoring due to bonus points at the assessment. These advanced ecological standards have to be monitored as well.

The criteria for the assessment have to be described in the awarding documents. Usually the price per year (extrapolated from the length of the service contract) is the most important parameter. One possibility to include ecological standards in the assessment is to monetise and weight these standards and to add them to the assessment criteria. Therefore, the PTA

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<sup>13</sup> Minimum standards concerning ecological standards are elements of the direct awarding documents as well.

has to differentiate between the minimum standards and advanced ecological standards. A bonus is given if the minimum and/or advanced level is exceeded. Experience shows that the requirement of ecological standards, which exceed the current regulations is generally accepted by the bidders. Also the better assessment of those bids with ambitious environmental standards in the bid evaluation is commonly accepted, if the tender documents give a clear and calculable picture on the assessment criteria and reflect, to a reasonable extent, availability, reliability and costs of the respective technologies.

Incentives and/or penalties are rather commonly used today in service contracts and usually include criteria like punctuality, growth in number of passengers etc. The argument for including incentives or penalties is to promote (or prevent) a certain behaviour. This could be a way to reduce energy consumption or to reduce the emissions from diesel vehicles.

Requirements are criteria that the TOC or manufacturer need to fulfil as minimum standard in order to be qualified for the contract. The evaluation of a requirement is easier compared to the evaluation of incentives and weights since the TOC either fulfils the criterion or not. From a technological point of view three cases of applying requirements should be considered:

- inclusion of requirements for operational measures in the awarding procedure for services
- inclusion of requirements for vehicles in the awarding procedure for services
- inclusion of requirements for vehicles in the awarding procedure for vehicles

In case of the third option, PTAs could specify the requirements for the implementation of a specific solution as it happened in the past in some countries, when the railway companies defined technical specifications on rolling stock and the industry just maintained manufacturing responsibility. Today PTAs could just request compliance with some parameters (e.g. LCC, weight, energy consumption) leaving it to the industry to find the appropriate solutions or stimulate the manufacturers to achieve better performances for well defined parameters.

When the rolling stock belongs to the PTA and the TOC operates these vehicles, it is also relevant from a technological point of view how the maintenance aspects can be integrated into the service contracts, in particular who performs the general overhaul of vehicles and who pays for this. These aspects could be relevant in particular for diesel engines where bad maintenance by the TOC could cause more emissions, energy consumption and costs for the general overhaul. An option to deal with it could be a maintenance contract between PTA (as fleet owner) and a service operator or – as already done in some cases – the manufacturer of the vehicles.

Part of the awarding documents is the request that the bidder has to prove the compliance with environmental standards (if the rolling stock is not provided by the PTA). This can be done e.g. by documented evidence of the vehicles to be used, by confirmation of the manufacturer that the vehicle technology is effective and limit values will be adhered to. If innovative ecological standards are desired which are not fulfilled by vehicles which are already in service, the PTA has to keep in mind that a long period of time is required for developing, testing, manufacturing and authorisation of these vehicles, which will take at least 4 years, depending on the number of vehicles. This time period would start with the signing of the Public Service Contract. Accompanying measures could also include a professional training for energy-efficient driving

### **8.2.3. Phase C – Tender or negotiation phase**

After developing the awarding documents the PTA has to publish the tender-documents in the Official Journal of the European Union. In addition to the specification of services and the assessment criteria, the tender floating period and the bid adjudication period are part of the publication. The PTA should consider that depending on the required or desired environmental standards, bidders might need additional time for preparing their offers with respect to these standards. This applies to the direct awarding procedure with only one bidder, too.

Within the bid adjudication period questions from the tenderers are allowed. The answers must be communicated to all bidders at the same time.

Irrespectively of the awarding form (direct awarding or competitive tender), usually the tender phase includes a negotiation period, where, for example, details of the Public Service Contract are argued. In particular this is usual in case of a restricted call for tender, when a certain number of preferred bidders are involved. The negotiations have to be done in a fair and transparent way. The result of the negotiation with one bidder has to be circulated to all preferred bidders.

In principle negotiations can deal with the service and its organisation (operational, legal) but may not change the object of awarding basically.

### **8.2.4. Phase D - Evaluation of the offers and acceptance of the tender**

Once the bids have been received they are reviewed with regard to the financial and technical qualification and certifications. The assessment of the bids also includes the prices and the compulsory ecological standards depending on the requirements and weighting scheme defined in the tender document. As a result the most economical bid (in terms of cost-performance ratio) is accepted. It is important that the accepted tender not necessarily is the cheapest tender in terms of the “real price”. If a tender wins many bonus points due to its advanced ecological and quality standards it may perform better in the assessment than cheaper tenders. In order to ensure a fair and transparent assessment of the offers, a scoring model or matrix should be developed. This model has to include all relevant criteria and their final weighting.

### **8.2.5. Phase E - Review procedure**

Before the Public Service Contract is concluded with the winner of the award, the decision of the PTA has to be sent to the other tenderers. The communication of the contracting authority's decision to each tenderer or candidate shall be accompanied by a summary of the relevant reasons. Within a time period of at least 10 days the tenderers can make an application to review the contracting authority's decision.

After this time period (if no review is applied) the bidder with the most economical bid is notified that his bid has been accepted. The notification also has to be published in the Official Journal of the European Union.

Before the start of the contract period there may be a need of verification of energy consumption or testing of the included technologies.

### **8.2.6. Phase F - Contract period**

When the TOC starts its service, an accurate monitoring of fulfilling the contract is needed. Otherwise there is a risk of malperformance or even noncompliance with terms of the contract. The monitoring should be adequate for the respective service. Depending on the character of the appointed service, different instruments for monitoring are advisable. The main ones are:

- Data evaluation
- Sample checks by PTA
- Surveys (done by PTA or TOC).

If monitoring reveals malperformance or non-performance, the respective stipulation of the contract must be applied. Thus monitoring the fulfilment of the terms of the contract is crucial. In case that the terms of the contract are not fulfilled at least the execution of stipulations is needed.

It has to be noted that the form of the awarding (by tender or direct) usually does not make any difference to the monitoring process. In any case the PTA should pay attention to accurate monitoring of the services provided by TOC or manufacturer. In no case non-compliance means that the awarding decision was incorrect. This question has to be answered during the awarding process. However, in case of repeated malperformance or non-compliance, there may be a reason for the PTA, to analyse if the awarding procedure is the reason for this.

## 9. Legal input for the Guidelines Pilot Catalogue

### 9.1. How to include in the awarding process

How to include EE/EF criteria in awarding depends on what to award (services or rolling stock), how to award (competitive tendering or direct awarding) and what to include in the awarding (for the ECORailS pilot catalogue four technologies and one operational measure have been chosen along with including energy efficiency as a direct or indirect indicator).

The first step that the PTA has to take is to decide upon an appropriate strategy which best suits to its needs and prerequisites. In this preliminary considerations phase mandatory and non-mandatory target levels regarding energy efficiency and environment must be identified. This includes European and national legislation as well as internal organisational goals. Currently no mandatory levels exist for energy consumption however target levels for noise and exhaust emissions do and may need to be required (depending on national legislation) when awarding vehicles or services and the TOC is to provide rolling stock. However, the levels concern only when new rolling stock is required. After that the technical and operational possibilities need to be analysed. Besides the availability of technologies on the market, their economic and environmental potential for the current services need to be analysed in detail in order to calculate a baseline. The baseline includes description of the service profile and the current energy consumption and is a prerequisite for setting up required levels for energy consumption and for a TOC/Manufacturer to calculate the effects of the technological solution/operational measures in their bids. There may be cases where a current operator is unable or not willing to present the current energy consumption. It could therefore be necessary to specify in the contract that the TOC is required to deliver this kind of information (or require measures in order to do so). The results of the steps above are then analysed and used as input for pre-calculations in order to establish relevant scenarios for reducing energy consumption. The preliminary considerations could (and for several PTAs probably need) to be conducted or supported by external consultant(s). The relevant steps are summarised below.

The relevant steps is summarised below in table 5 and 6.

In table 6, Phase B – *Preparation of awarding documents*, is dependent upon the respective technology, operational measure or indicator which is to be included in the awarding. Although the main steps are presented in table 6, the procedure is therefore in more detail described in the chapter concerning the respective criteria. The other steps in the awarding procedure, as described in chapter 7.2 and presented in table 6, generally follows the same structure regardless of the inclusion of EE/EF criteria.

Phase A: Preparation	ECORailS Reference
1. Identification of mandatory (legislative) and non-mandatory target levels of energy consumption. <ul style="list-style-type: none"> <li>○ Minimal levels (as defined by legislation) for the relevant regarding emissions and/or energy consumption</li> <li>○ Non-mandatory levels - can include the existence of national or organizational target goals (e.g.. reduction of energy consumption by 20 % until 2020).</li> </ul>	D10, chapter 4  D10 Chapter 5 Internal or national documents
2. Identification of technical and operational possibilities <ul style="list-style-type: none"> <li>○ Identification of technological possibilities (analysis of availability, economic and environmental potential).</li> <li>○ Calculation of baseline               <ul style="list-style-type: none"> <li>▪ Current consumption need to be calculated</li> <li>▪ Analyse service profile</li> <li>▪ Identify method for monitoring the consumption</li> </ul> </li> </ul>	D10 Chapter 4 D6 Electronic Annex II  D7 5.2 D7 3.2 D7 5.5
3. Pre-calculation of baseline in order to establish an appropriate baseline for the services to be awarded	D7 5.2
4. Pre-calculations to establish scenarios for energy consumption. Using new or existing vehicles, identify plausible levels for energy saving for the services in question, decision regarding technologies and/or operational measures to implement, awarding procedure.	D7 chapter 5 - 7
5. Validation and reporting of results, choosing technologies/operational measure and/or indicator to include in the awarding of rolling stock and/or services.	

**Table 5 Main steps, Phase A Preliminary considerations,**



### Phase B: Elaboration

1. Drafting text describing the baseline calculated in the preliminary considerations phase.
2. Drafting text for minimum requirements
3. Drafting text for advanced ecological criteria (criteria used for evaluation of tenders, bonus/malus systems)
4. Drafting text for how to evaluate the tenders (yes/no, weight scheme)
5. Drafting text for preparation before the contract period (i.e. testing of rolling stock, technologies, eco-driving training etc.)
6. Drafting text for the monitoring activities (and penalty scheme) during the contract period
7. Validation and reporting of text modules for all above items

### Phase C: Tender or negotiation phase

1. Understanding the requirements and proposing first ideas for response(s). Including asking questions to the PTA (by TOC/Manufacturer)
2. Negotiations/clarifications of some points from point 1 (if necessary)
3. Finalisation of awarding documentation (by PTA, if necessary based upon point 2)
4. Draw up of offers (by TOC/Manufacturer) including calculating energy consumptions for the identified operational solutions, based upon the requested ecological and quality parameters from the PTA.
5. Validation and submission of material to the PTA (by TOC/Manufacturer).

### Phase D: Evaluation of the offers and acceptance of the tender

1. Compilation and screening of tenders (including pre-qualification if mandatory requirement is included)
2. Preliminary quantitative evaluation of tenders (on the basis of criteria prioritisation) and comparisons with pre-calculations including possible questions to TOC:s
3. Final evaluation and ranking\*
4. Validation of evaluation and ranking\*
5. Final choice of selected operator
6. Planning of verification of energy (and environment) data possibly by field tests if necessary

### Phase E: Rewiew procedure

*Table continues in next page*

**Phase F: Contract Period (Preparation and following up)**

1. Preparation of contract period
  - a. Execution of verification of energy (and environment) data possibly by field tests if necessary (TOC/Manufacturer)
  - b. Validation of results (TOC and PTA together)
  - c. Compliance check (PTA)
  - d. First reporting scheme and corrective actions if needed (PTA)
2. Submission of performance values (by TOC)
3. Monitoring of the performance (PTA)
4. Enforcement of contract conditions (PTA)
5. Corrective actions if relevant (by TOC) – either operational and/or economically
6. Corrective actions if relevant (by PTA)

**Table 6 Main steps, phase B-F**

**9.1.1. How to design systems of bonus/malus and weights for evaluation of tenders**

To fulfill the European principle of transparency requirements, bonus/malus, weights used for evaluation of tenders and penalties need to be defined in awarding documents as well as in the public service contracts including the method for calculation of this. Also, in order to be in compliance with the European legislation it is important that bonus and penalty levels are proportionate.

It is difficult to define a standard method since how to value energy efficiency is largely dependent upon case-specific financial and political parameters. However, a basic approach is to start with the (estimated) energy cost in relation to the total cost of the (current) contract for the services that is to be awarded and relate this to the energy saving that is to be achieved or the energy saving potential of a certain technology or operational measure. For example, if the energy cost is estimated to be 25 % of the total cost for the services, a proportionate bonus level for reduction of energy consumption with 10 % should be 2,5 % ( $0,25 \cdot 0,1$ ). The same method could apply for calculating the weight that is to be used for the evaluation of tenders. Based upon this calculation, the levels need to be further calibrated depending on case specific parameters. Reducing the bonus/weight levels may for example be relevant if the TOC are the bearer of energy cost since this means that there is already an inbuilt incentive for the TOC to reduce its energy cost. Also how much to decrease the compensation/weight will depend be based on the existence of subsidies for energy prices or if the TOC pays the real market price. In the latter case there may be no need for an bonus/malus system at all. Increasing the bonus/weight levels can then be relevant if the PTA are the bearer of energy costs or if there is strong political and financial support for ambitious environmental goals. A simplified example of a bonus/malus scheme is presented in the table below.

Level	Monitored energy consumption in relation to the required baseline	Penalty/Incentive (in relation to annual compensation)
<b>Penalty Level 2</b>	> 7,5%	2,5 %
<b>Penalty Level 1</b>	2,5 to 7,5 %	1,25 %
<b>Incentive Level 1</b>	-2,5 to -7,5 %	1,25 %
<b>Incentive Level 2</b>	< -7,5 %	2,5 %

**Table 7 Example of bonus/malus scheme, energy cost estimated to 25 % of total cost**

## 9.2. Direct and indirect indicators

### 9.2.1. General description

#### *Direct indicator*

Direct indicators<sup>14</sup> describe the overall result of all efforts to reduce the energy consumption of specific train services. Using direct indicators means that criteria regarding energy efficiency and environment are included in the awarding procedure without referring to a single technology or operational measures, although requirements in terms of equipment and/or operational measures might be used additionally. In the context of ECORails, a direct indicator shows the energy consumption of a traction unit in relation to a unit which refers to transport or operational performance. WP2 recommends using energy consumption per offered capacity (kWh / seat km) with the specification about the number of passenger per m<sup>2</sup> considered to calculate the standing seats<sup>15</sup> or end energy consumption per passenger km<sup>16</sup> (satisfied demand) (kWh or l / passenger km). For environmentally friendly, direct indicators could be: the total amount of emissions (in eq.CO<sup>2</sup>) and maximum noise level admitted L<sub>den</sub> in dB(A).

#### *Indirect indicator*

In the context of ECORails, an indirect indicator describes a parameter which has a major or substantial influence on the energy consumption of a train but does not describe the energy consumption itself. The most relevant indirect indicator is “weight per seat”. The mass of a vehicle is especially decisive in regional passenger transport with its frequent stops and a high share of energy consumption for acceleration.

### 9.2.2. Compliance to legal framework

Using a direct or indirect indicator is in general more legally secure than referring to single technologies since there will be less risk for discrimination. In order to be legally compliant to European legislation, the indicator needs to be described in the awarding document and public service contract as well as the baseline and the methodology for calculating this. Methods for calculation of incentive and/or weight for evaluating also need to be defined and described in order to fulfill the principle of transparency.

### 9.2.3. How to include in the awarding procedure

A direct indicator can be included in the awarding of services and rolling stock. The indirect indicator “weight per seat” can be used for the procurement or description of passenger carriages for loco-hauled trains, especially when it is intended to procure or operate them independently from the locomotives. When it comes to multiple units or the comparison between entire train sets, the direct indicator “kWh per seat km” should be preferred, but the specific mass could be used additionally as it is easy to measure and verify.

A direct indicator can be included within a competitive tendering as well as in a direct awarding procedure as a requirement, used as evaluation criterion (within a competitive tendering procedure) or as bonus/malus scheme (when awarding of services). A combination

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<sup>14</sup> In the PROSPER project the term “performance value” was used. This term is to be seen as more general and could include “direct indicator” and “indirect indicator” as well as values for noise or exhaust emissions.

<sup>15</sup> KPI2 (Key Performance Indicator) as identified in the Railenergy project

<sup>16</sup> KPI4 as identified in Railenergy project

can also be considered, e.g. a minimum level can be required and the TOC/Manufacturers that reach a certain level below the required can score more points in the evaluation of the tenders or compensated during the contract period.

When requiring a certain level of energy consumption, too far reaching requirements should be avoided and instead be included as evaluation criteria or incentives. A reason for this is that it may reduce the number of contenders in case of competitive tendering which may lead to increasing costs for the PTA. Also, for a good relationship between the PTA and TOC it is generally better to motivate through incentives instead of a situation where the TOC has to pay penalties on a regular basis.

Requirements or incentives call for the need to monitor the real consumption. For this a penalty scheme needs to be implemented in order to monitor the compliance to the required or agreed consumption level. Methods for monitoring need to be identified and described along with the necessary measures (i.e. implementation of energy meters). In case of awarding of rolling stock, it is not recommended to evaluate the keeping of the contract during the real operation of the rolling stock because of the variability of the energy consumption due to different driving styles that could cause variation between different drivers (drivers are not under the responsibility of the manufacturer of the train). When using an indirect indicator no monitoring activities are needed although the compliance to the required indicator needs to be tested at the delivery of the vehicles.

In the awarding procedure, the indicator must be considered in most of the steps. The most important tasks are described below. Most tasks could be conducted or supported by external consultant(s).

### **Elaboration of awarding documents**

1. Describe the baseline, calculated in the preparation phase.
2. Drafting text for minimum standards
  - Drafting required criteria – example  
*“The energy consumption [according to the baseline] of the vehicles used for the services is not to exceed [specified value] per [indicator]”*
  - Drafting text for penalty scheme for non-compliance to the required energy consumption. The levels need to be proportionate.
3. Drafting text for advanced criteria (i.e. evaluation criteria, bonus/malus system).
  - Drafting text for compensation levels for incentive scheme. The levels need to be proportionate and should take into consideration energy charging systems for electric traction and the estimation of energy costs in relation to the total cost. Example:  
*“If [indicator] are lower than [baseline] for a certain year, the TOC will receive economic compensation for the year specified. Decreased energy consumption [indicator] is valued to \_\_\_\_ € per [unit below the baseline]. The maximum level of compensation is \_\_\_\_ € per [unit, i.e. train km and time period] in the awarded service package.”*
  - Drafting text for weighting scheme. Example:  
*“The energy consumption is to be presented in the tender based on energy consumption per [indicator] according to the baseline. The energy consumption will in the evaluation be valued to [weighting system].”*

#### 4. Drafting text concerning how the criteria will be evaluated

- Requirements will be evaluated through Yes/No.
- Weights for evaluation of tenders should be based upon the estimated potential to reduce the consumption and the estimated energy costs in relation to the total costs for the contract. For weighting the criteria several scoring models are available:
  - Maximum score to the best tender
  - Maximum score to tenders that reach a settled threshold
  - Proportional scoring
  - Complex functions
- Describe how the specified energy consumption will be verified. WP2 suggests a combined test with acceptance by the customer of the prototype) in controlled conditions (specified in chapter 5.5 in D7).

#### 5. Drafting text how the criteria will be monitored during the contract phase.

Drafting text for monitoring is needed if a bonus/malus system is used in the contract, i.e. if an incentive is used or a penalty scheme is implemented for non-compliance to the required indicator.

- In order to monitor the consumption the necessary technology for monitoring (e.g. energy meter) must be required.
- The awarding documents must describe the methodology for monitoring (e.g. constant monitoring there compensation/penalties is based upon the overall annual consumption or if a specific measuring period will be defined).

#### 6. Validation and reporting of results

## 9.3. Features and equipment of the vehicles to be used

### 9.3.1. General description

#### *Braking energy recovering by supercapacitors on board equipment*

By this technology it is possible to store the energy released when braking and use it during the next acceleration of the vehicle. Each time the vehicle brakes, the energy storage devices (super-capacitors) are loaded again. During the next acceleration, the stored energy is released. This additional energy lowers current demands from the network, for the same traction effort. The technology can be used for both electric and diesel traction (the latter if electric power transmission is used).

#### *Braking energy recovering by super capacitors in fixed installations*

During the braking phases some trains already in service and almost all of the new electric trains or locomotives are able to return energy to the overhead-line if this can receive it (e.g. when other trains are in traction phase and quite near to the braking train). On some networks the operational situation does not allow the reception and immediate re-use of energy. For this reason, the new energy storage technologies, such as super-capacitors, could be considered and collocated in fixed installation near stations where many trains a day stop. These or other trains could reuse the energy stored in their start phase or other use of this energy could be done. Power supply optimization system for storage in fixed installation can be in substations or along the track and it operates on purely electrical basis.

#### *On-board use of braking energy in diesel-electric stock*

Modern diesel locos or DMUs with electric power transmission can be equipped with the capacity to use some of the energy recovered during braking for auxiliary and comfort functions. In modern diesel-electric 3-phase locomotives the Diesel engine drives a generator feeding the DC link. The DC link feeds the traction inverters as well as the auxiliaries and the train bus supply. During braking, the traction motors feed the recovered power into the DC link. This additional power can either be converted into heat in braking resistors or used for other consumers, namely auxiliaries (compressors, ventilation etc.) or the train bus supply (supplying the comfort functions in passenger trains). The power management is usually performed as follows: The recovered braking power is fed into the DC link. The part of this power that can be used for auxiliaries or train bus supply is drawn from the DC link, the rest is dissipated in the resistors. The resistor is automatically "switched on" if the voltage in the DC link exceeds a certain limit value.

#### *Control of comfort functions in parked trains*

Parked passenger trains are often heated all night. This consumes substantial amounts of energy. A possible solution is the development and implementation of an intelligent control tool for parked trains (e.g. pre-heating time of rolling stock as a function of external temperature, etc). Besides the installation of an automated controlled system, simple effective solutions include timers, manual control and instructions for maintenance and cleaning personnel.

Existing solutions mainly differ with respect to the following features:

- Centralised control device for the entire train
- Possibility to operate lighting and heating at one third or half intensity
- Special programs for anti-freezing or preheating operation.

### 9.3.2. Potentials

In the table below a summary of the environmental and economic potentials together with estimating implementation time regarding the chosen four technologies can be found. A more comprehensive compilation can be found in D7.

Potential		Braking energy recovering (onboard equipment)	Braking energy recovering (fixed installations)	On-board use of braking energy in diesel-electric stock	Control of comfort functions in parked trains
<b>Energy saving potential</b>	Electric	20-30 %	5-10 % (DC-systems)	-	3-5 % (Med) 4-9 % (Nordic)
	Diesel	Up to 35 %	-	2-5 %	
<b>Pollutant emission potential</b>	Electric	Depending on energy mix	Depending on energy mix	-	Depending on energy mix
	Diesel	35 % (CO <sub>2</sub> )	-	2-5 %	3-5 % (Med) 4-9 % (Nord)
<b>Economic potential (LCC)</b>	Implementation Cost	Medium	High	Medium	Low
	Operational Cost	Lower	Lower	Lower	Lower
	Maintenance Cost	Low	Low	Low	Low
	Disposal Cost	Low	Medium	Low	Low
<b>Implementation Time</b>		5-10 years	< 5 years	1-5 years	1-5 years

Table 8 Summary of potentials, technologies chosen for pilot catalogue

### 9.3.3. Compliance to legal framework

Asking for technologies should be in compliance with European legal framework, but there is some risk involved. For example, it is not legally secure for a PTA to ask for a specific manufacturer of a technology. However, referring to the case *Concordia Bus* (C-513/99), even though only one supplier could provide rolling stock equipped with a specific technology, it is in compliance with the European legislation to require this. Based upon input from the ECORails User Platform, asking for technologies could instead be done through describing different technological solutions that could be of interest for the services in the awarding documents and leave it to the TOC how to solve the energy consumption.

When awarding of services through competitive tendering procedure it is of importance every contender receives the same information about the effect of energy saving potential in order to avoid giving the incumbent TOC an advantage. For example if rolling stock is provided by the PTA which is equipped with a system for braking energy recovering this should be clearly specified in the awarding documents together with a description of the service profile.

### 9.3.4. How to include in awarding procedure

To ask for a specific technology is relevant when awarding of services, rolling stock provided by the TOC and awarding of rolling stock by the PTA.



Technologies could be asked for as requirements or within a competitive tendering procedure also used for evaluation of the tenders. In the latter, there are two methods possible. Evaluate according to scoring model, where the TOC/Manufacturer who offers vehicles equipped with an energy saving technology will receive a bonus in the evaluation. Or the PTA could evaluate the offers according to a Life Cycle Cost (LCC) approach (see chapter 6.3). Unfortunately, the exact LCC cost for a single technology, is currently not available. However manufacturers of certain technologies usually know the LCC for their products. Also, the economic potential is described by WP2 based upon effects on implementation, operational, maintenance and disposal cost, which could serve as guidance. In general as stated by WP2 innovative technologies (like onboard energy storage) and for technologies where the reliability is to be checked, should not be required.

Regardless if vehicles are provided by TOC or PTA, the contenders need to be able to calculate the operating costs (based upon the potential energy savings) in order to avoid giving the incumbent TOC a competitive advantage. Therefore, when awarding services through a competitive tendering procedure, the characteristics of the services also need to be specified (stops, line profile etc.) in the awarding documents. Therefore when awarding of services, rolling stock provided by PTA, in the awarding documents, it is important to describe the implemented technologies.

## Elaboration of awarding documents

1. Describe in detail the technology in question
2. Drafting text for minimum standards
  - Require the relevant technological type to be installed – e.g. *“the rolling stock is to be equipped with system for braking energy recovery”*
  - Description of the required technology(s)
3. Drafting text for advanced criteria (i.e. evaluation criteria)
  - The total cost for the rolling stock will be evaluated according to a LCC approach [description of methodology]
  - The inclusion of [technology] in the rolling stock that is to be used for the services will be valued to [weighting scheme] in the evaluation of the offers
4. Drafting text concerning how the criteria will be evaluated (yes/no, LCC, weighting scheme)
  - When awarding rolling stock, criteria (minimum and advanced) can be evaluated according to a life cycle costs (LCC) approach.
  - When awarding services, the technology can also be evaluated according to a scoring model according to which a TOC which offers the specified technology will receive a bonus in the evaluation. How to weight the criteria depends upon the energy and pollutant emissions saving potential, length of the contract, estimation of energy/fuel costs in relation to the total costs, energy charging system and internal or external environmental goals. For weighting the criteria several options is available:
    - Maximum score to the best tender
    - Maximum score to tenders that reach a settled threshold
    - Proportional scoring
    - Complex functions
5. Drafting text how the criteria will be monitored during the contract phase.
  - In general, the inclusion of features and equipment for the vehicles to be used. do not call for the need for monitoring during the contract period. However it could be of interest to monitor the consumption with and without the technology for internal reasons and future procurements. If so, the TOC can be asked to deliver this data. For certain technologies, where problems with maintenance and correct application are likely to arise (for example technologies for energy storages and parked trains) the performance should be monitored during the contract period.
6. Describe the baseline, calculated in the preliminary considerations phase.
7. Validation and reporting of text modules for all above items

## **9.4. Operational measures**

### **9.4.1. Energy efficient driving by low-tech measures**

#### **9.4.2. General description**

In view of the barriers impeding a fast diffusion of advanced driving advice systems, non-technological short time efforts to promote energy efficient driving are especially promising. Many measures including training programmes for drivers can be implemented at good cost-benefit ratio and meet virtually no barriers. A considerable part of the reduction potential offered by energy efficient driving might be exploited by non-technological or low-tech measures (databases, systems based on GSM-R, laptop technology, etc). The following driving styles for energy efficient driving can be applied: Coasting, reducing maximum speed, using valleys and hills.

#### **9.4.3. Compliance to legal framework**

In general operational measures are legally secure to include in awarding. In order to be in compliance with the non-discriminative principle within a competitive tender procedure, the tendering document needs to include a description of the characteristics of the lines and services. This is important for all contenders in order to take the potential of energy efficient driving into consideration. There can also be legal issues, for example safety issues at the drivers desk.

#### **9.4.4. How to include in awarding procedure**

This criterion is only relevant when awarding of services (vehicles provided by the PTA or TOC).

The most straightforward way is to require the TOC that a certain amount of their drivers need to be educated in energy efficient driving and/or require relevant software/hardware. It can also be used for evaluation of tender where the contenders are asked to present their own strategy for educating their drivers in energy-efficient driving. Alternatively, additional scores could be offered to bidders which educate their drivers in eco-driving. Even not reducing energy consumption by itself, it could also be required that energy meters are installed in the vehicles. Through this the driver can control the energy consumption according to his driving style.

For monitoring purposes there is no need for constant monitoring. Instead relevant monitoring activities may include that the TOC are to annually report the number of drivers participating in training program and/or number of vehicles equipped with a system. However it should be mentioned that energy efficient driving could be suitable to combine with an incentive system for the TOC to reduce energy consumption (see direct indicator). It could also be interesting for the TOC to implement an internal incentive system so that the drivers may be compensated.

## Elaboration of awarding documents

1. Describe the line according to the analysis in preliminary considerations phase. This need to include an analysis of the characteristics of each line (altimetry and planimetry features, speed limits, distance between stops, etc) and of the recovery times in the timetable, the study of existing saving energy margins and definition of the most opportune driving strategies is required
2. Drafting text for minimum standards
  - Require the equipment of system for calculating the most energy efficient driving or require the TOC to educate the drivers in eco driving (or participate in training program provided by the PTA). – example:  
*“The TOC is to educate the drivers in energy efficient driving according to [specification of training program]. For a specific year, at least [%] of the drivers must have participated in training program within [number of years] years before the specific year.”*
  - Description of the required system or training program
3. Drafting text for advanced criteria (i.e. evaluation criteria)
  - Require the TOC to present its strategy for reducing energy consumption through energy efficient driving. Example:  
*“In the bid, the TOC is to present its strategy for reducing energy consumption through energy efficient driving. The strategy should include description of training program, frequency of training, number of drivers participating etc.”*
4. Drafting text concerning how the criteria will be evaluated (yes/no, weighting scheme)
  - Describe the weighting scheme for evaluation criteria. Relevant input for construction scoring model is the energy saving potential (estimated to 5-10%), estimation of energy/fuel costs in relation to the total cost , charging system for energy costs and internal or external environmental goals. Several options for weighting of the tenders:
    - Maximum score to the best tender
    - Maximum score to the tender that reaches a settled threshold
    - Proportional scoring
    - Complex functions
5. Drafting text how the criteria will be monitored during the contract phase.
  - Number of drivers participating in training program or number of systems implemented
6. Validation and reporting of text modules for all above items

## **10. Further project activities and next deliverables**

The results achieved within WP3 and presented in this deliverable will together with results from WP2, represent important input for the ECORailS Guidelines (deliverable 20). This deliverable will be updated based upon the results from the test sites and the ECORailS User Platform which will be included in the third and last deliverable within WP3 (deliverable 11).

The following steps is planned for D11.

Task 1 (chapter 3) – Good Practice Examples, more examples to be included

Task 2 (chapter 4) – An analysis of need for changes in European legislation in order to promote the inclusion of EE/EF Criteria will be included.

Task 5 and 6 (chapter 7 and 8) – Further elaboration based upon analysis of experiences and results from the test sites.

Task 7 (chapter 9) – Examples of legally secured text modules used at the test sites, further analysis of the compliance to the legal framework, examples of weights and scoring models, bonus/malus systems and monitoring methods implemented in the awarding documents at the test sites.

So far, the perspective has only been the legal and economic framework for the countries participating in the ECORailS consortium. This perspective will be broadened in D11 in order to fulfill the objective of Europe wide applicability.