Federal Ministry
of Transport and
Digital Infrastructure

Rail Freight Masterplan

Allianz pro Schiene · BDI · DB · DSLV · DVF · kombiverkehr · NEE · SGKV · Stahl · Die Bahnindustrie · VDV Die Verkehrsunternehmen · VPI

The Rail Freight Masterplan was developed jointly by the Federal Ministry of Transport and Digital Infrastructure (BMVI), the Pro-Rail Alliance, the Federation of German Industries (BDI), Deutsche Bahn AG, the Association of German Freight Forwarders and Logistics Operators (DSLV), the German Transport Forum (DVF), kombiverkehr, the Network of European Railways (NEE), the Research Association for Combined Transport (SGKV), the Association of Steel Producers, the German Railway Industry Association (VDB), the Association of German Transport Companies (VDV) and the Association of Freight Wagon Keepers (VPI).
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A | Current situation – Policy context of the initiative

In the years ahead, there will continue to be strong growth in the volume of traffic, both in the Single European Market and on a global scale. Current forecasts predict that, over the period to 2030, there is likely to be a significant increase in the volume of freight moved in Germany of over 40 percent compared with 2010. The expected growth in traffic will raise serious transport and environmental problems if no structural measures are taken to significantly improve the modal split in favour of the railways. The Coalition Agreement provides for further boosting and expanding the rail mode.

Emissions of climate-damaging greenhouse gases from traffic have risen continuously in recent years. The transport sector thus plays a key role in the 2050 Climate Action Plan adopted by the Federal Cabinet on 14 November 2016. Because of the superior physical advantages of the wheel-on-rail system, the fact that a high proportion of rail freight is already powered by electric traction, the uncomplicated conversion of electrical energy into tractive power and the unique system of regenerative braking where braking energy is fed back into the railway power grid, rail freight stands out from other forms of transport and will be energy efficient and have a low climate change impact in the long term. These inherent advantages make rail freight predestined to be a key element of a sustainable mobility and transport strategy. We must therefore succeed in combining these inherent advantages to an even greater extent with economic efficiency and the logistics capabilities of the rail freight sector in order to significantly increase the market share of rail freight in the future.

In contrast, rail freight's market share of the total volume of freight moved has decreased significantly over the past few decades. Although combined transport is developing at a quite dynamic rate, freight moved by single wagonload traffic, in particular, exhibits a declining trend. Fierce intramodal and intermodal competition has resulted in tangible quality improvements and price cuts on the railways, but the railways have not gained any lasting market share.

Moreover, in Germany, the largest rail freight market in Europe, only a few railway undertakings are recording appreciable growth and income that is just about in the black. However, these low rates of return are not

sufficient for funding the investment required to safeguard the future of rail freight on a sustained basis.

One of the main causes of the commercially difficult development of many rail freight operators is the continually rising cost burden compared with their competitors. While the price of diesel fuel has fallen, the price of electricity for the motive power used to drive electric locomotives is rising as a result of the imposition of multiple taxes and levies. In addition, the rail freight sector has to absorb, inter alia, annually rising track access charges, while the average HGV toll rate has been falling for years. The relief measures for the rail freight sector have to be implemented as quickly as possible and with a market impact. If the sector's currently limited ability to invest is overcome, it will be possible to make better and more sustained use of technological market opportunities.

The German rail sector, especially wagon keepers and railway undertakings, continue to be committed to achieving the 2020 noise mitigation target and have undertaken to reduce the noise produced by their complete fleet of freight wagons (by retrofitting existing wagons and procuring new ones) by the 2020/2021 timetable change.

To this end, all the necessary efforts will be made to progress and speed up the retrofitting of existing freight wagons with low-noise composite brake blocks and the procurement of new TSI-compliant freight wagons and to achieve the objective set out in the Coalition Agreement for the 18th Parliamentary Term that no noisy freight wagons should be operating on the German rail network as of 2020.


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B | The Rail Freight Masterplan – Objective and vision of a high-capacity and future-proof rail freight sector

There is still unexploited potential for productivity and development inherent in the rail freight sector and this can make a major contribution towards tackling the transport and climate change challenges. Industry and government are determined to unlock this potential. For this reason, they have agreed on the Rail Freight Masterplan. This is a comprehensive package of measures whose objective is to permanently boost the rail freight sector and offer shippers higher-quality rail freight services at more competitive prices. The focus is on:

- → ensuring high-capacity infrastructure;
- → making extensive use of the potential for innovation; and
- → improving the transport policy framework.

It will require a concerted effort for a fundamental modernization of the rail freight sector and the enhancement of its intermodal competitiveness to achieve the vision of a high-capacity and future-proof rail freight sector. Rail's market share of all freight traffic in Germany is to be significantly increased over the period to 2030.

The aim of the Rail Freight Masterplan is thus a lasting and demonstrable improvement in the competitiveness and logistics capabilities of the rail freight sector. Entrepreneurial and political action are required in order to permanently boost the earning power and innovative capacity of the rail freight sector.

Implementation of large sections of the measures recommended in the Masterplan can significantly improve the competitiveness of the rail freight sector. This applies first and foremost to the reliability, quality and prices of the railways as a means of freight transport. If we succeed in this, the industry is also convinced that shippers will, in the future, once again increasingly turn to the railways for the carriage of goods and, in addition, make greater use of the potential inherent in single wagonload traffic.

Measures for rail freight are to be guided by the following vision:

Vision for the future of rail freight

- Germany is to be a lead market and a world market leader in sustainable mobility solutions. In the rail freight sphere, this will have been implemented with a dual-track strategy that supports both a further reduction in emissions and the deployment of alternative drivetrains in the road haulage sphere and, of equal importance, the modernization and enhancement of the competitiveness of the rail freight sector.

- Rail freight is to be a mainstay of the German and European freight transport system. Its environmental friendliness will help achieve Germany's and Europe's carbon reduction targets, it will be the safest means of freight transport and will relieve the pressure on the roads.

- Through the continuous evolution and the deployment of noise prevention and reduction technologies on rolling stock and infrastructure, rail freight is to become significantly quieter and enjoy a high level of acceptance in the population.

- With the high energy efficiency of its electric traction, the growing volume of rail freight will have made a major contribution to the success of Germany's new direction in energy policy. The last few non-electrified sections of railway line, especially those in the "last mile", will be bridged using an efficient, environmentally sound electrically powered drivetrain technology.

- The rail freight sector is to meet the requirements of the freight transport markets in terms of journey times, reliability, logistics, order handling, prices and entrepreneurial flexibility. It is to have direct nationwide access to points of origin and final destinations of traffic via private sidings within the context of an efficient, competitive and fine-grained single wagonload network and via multimodal transport chains.

- Rail freight operators are to generate a sufficient rate of return, which will allow them to make continuous investment and recoup their outlay. The efficiency gains this makes possible will ensure a high level of competitiveness of rail freight compared with other modes of transport.

- High-capacity infrastructure in Germany and Europe – for long and, where necessary, very long trains with high-capacity rail hubs and state-of-the-art command, control and signalling equipment – is to form the basis for an economically efficient and reliable rail freight sector.

- The Single European Railway Area (SERA), with completely open and interoperable networks and with harmonized operational rules, will be a reality. The cross-border rail freight corridors will form the backbone of all long-distance rail freight services in the EU.

- The nationwide introduction of benchmark innovations, such as automated driving on the "last mile" and in the long-distance sector, automated coupling/shunting, intelligent operational control systems, automatic loading/unloading and the digitalization of the order handling and control processes, will have resulted in significant cost reductions and quality improvements. Because of its system properties – it is guided and can be controlled as an overall system – rail freight will have assumed a leading role in the digitalization and automation of freight transport.

- → Shippers, railway undertakings, wagon keepers, service providers and the rail industry will constantly develop new products and enhance the efficiency of the entire system. The rail industry will supply the rail freight sector with energy-efficient, quiet, high-mileage, logistics-capable and life cycle cost optimized freight wagons and motive power. The intelligent freight wagon will be part of the "Internet of Things (IoT)". By means of continuous real-time information on its location and status, it will enable better asset management and make a major contribution to the logistics capabilities of the rail freight sector.

- → Within the scope of an adequately funded and continuous research programme, approaches to the technological evolution of rail freight will be researched, trialled and developed until they reach commercial maturity.

- → For the market launch of innovative technologies, economic market launch incentives will be created where necessary.

- → The rail freight sector will be heavily involved in the implementation of logistics chains that are electrically powered from end to end to supply economic centres and metropolitan regions, using both combined transport (CT) and conventional single wagonload traffic.

- → Within the scope of their "green logistics strategies", shippers (trade and industry) will have significantly increased the shares of rail-based logistics. Contributory factors will have included, for instance, the timing of logistics processes to cater for the needs of rail freight, the provision/creation of railway loading facilities and the attenuation of volatility by means of interfaces between the dispatch/loading systems ("open data").

- → The rail freight sector will have become an established player on the training landscape. Forwarding and logistics training courses will be imparting knowledge about rail-based logistics and the use of the railways in freight transport. The rail freight sector will have a modern and attractive image and occupational profiles with a promising future.

Against this background, the following measures will initially be necessary to achieve these objectives:


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C | The Rail Freight Masterplan – Action areas and milestones

1 | Provide high-capacity infrastructure for the rail freight sector

If the rail freight sector is to be boosted, as is politically desired, high-capacity railway infrastructure is absolutely essential. To this end, the rail network has to be upgraded speedily on the corridors that are important for freight traffic, focusing on the bottlenecks. In this context, it is important that due regard be paid to rail freight in the nationwide integrated regular interval timetable. Enhancing capacity at the major rail hubs is just as imperative as adapting the infrastructure and the command, control and signalling equipment to enable end-to-end journeys by long freight trains. In addition, it is necessary to permanently safeguard the capacity of the existing network on the main trunk routes and in the regional sphere. To this end, an adequate funding line has to be ensured for investment in construction and upgrading schemes for the railway infrastructure relevant to freight. In addition, DB Netz AG has to speedily obtain construction go-ahead for many of the projects.

Construction and upgrading on the rail network

The construction of new and the upgrading of existing lines relevant to freight (for instance the Rhine Valley Line, the new Rhine / Main – Rhine / Neckar high-speed line, the Eastern Corridor, the Ruhr – Sieg line) will create capacity for more efficient rail freight services. In addition, the facilities used for freight traffic are to be upgraded to accommodate additional services.

Today, the six major rail hubs (Hamburg, Cologne, Frankfurt, Ludwigshafen / Mannheim / Heidelberg / Karlsruhe, Munich, Hanover) are already at virtually full capacity. Upgrading these hubs will remove bottlenecks, thereby reducing service disruption and making it possible to ensure that additional movements can be handled as planned. To be able to include further upgrading schemes for the six major hubs, including the lines carrying feeder services, in the first priority category of the requirement plan for the upgrading of the federal railway infrastructure, their macroeconomic appraisal has to be speedily concluded. DB Netz AG must subsequently expedite the planning processes for the next schemes and ensure rapid delivery.

Allowing longer trains to operate can improve the productivity of rail freight operators and thus their intermodal competitiveness. This requires first and foremost the construction of new or the lengthening of existing passing loops and the relocation of signals on the Core TEN Network and on the rail freight corridors. In the European rail freight sector, the 740 metre freight train has established itself as the UIC standard. The first step will thus involve creating the infrastructure conditions that will enable 740 metre trains to operate end-to-end journeys on the German and European rail networks. These schemes to create the 740 metre network in Germany will also be appraised as part of the FTIP process. It is also necessary to expedite and conclude the appraisal of the schemes and the planning that will be necessary once they have been included in the first priority category. The operation of even longer freight trains is currently being studied within the scope of research activities (including the Shift2Rail study), which are due to be concluded by the end of 2018.

No	Milestone	Parties involved	Time horizon
1.1	Complete the appraisal of the potential first priority category schemes as soon as possible, in particular the 740 metre network, Eastern Corridor and major hubs	Federal Ministry of Transport and Digital Infrastructure	Generally as quickly as possible, 2017 for the 740 metre network
1.2	Complete the planning of main freight lines – also making use of the findings of the Innovation Forum for Speeding up the Planning Process – as quickly as possible	Railway infrastructure companies, Federal Railway Authority, federal states, other parties to the proceedings	Permanent task
1.3	Ensure funding of construction and upgrading schemes relevant to freight, especially those in the first priority category	Federal Government, EU	Permanent task
1.4	Speedily deliver schemes for which construction go-ahead has been given	Railway infrastructure companies	Permanent task
1.5	Develop solutions regarding the feasibility of trains longer than 1,000 metres	Railway infrastructure companies, railway undertakings, EU, Federal Government	Midway through the next parliamentary term

Maintain the existing network to ensure that it is efficient and meets current and future requirements

The structural maintenance and quality assurance of the existing network must continue to enjoy top priority. The Second Service Level and

Funding Agreement (SLFA II) will expire at the end of 2019. A follow-on agreement is necessary for the structural maintenance of the federal railway infrastructure network. To this end, the SLFA apparatus is to be provided with the funds it requires and evolved such that its inherent scope for efficiency can be comprehensively leveraged by the railway infrastructure companies in the structural maintenance, operation and marketing of the infrastructure, for instance through digitalization (especially of the command, control and signalling equipment).

Consideration should be given as to whether incentives and penalties regarding customer-friendly building, which will be developed by the "Round Table on Construction Site Management" by the end of 2017, should be included.

No	Milestone	Parties involved	Time horizon
1.6	Agree on a successor regime to SLFA II that meets current and future requirements	Federal Government, DB AG	Next parliamentary term
1.7	Review the fleshing-out of SLFA III with regard to construction site management	Round Table on Construction Site Management	Current and start of next parliamentary term

Long-Distance Rail Freight Network Funding Act

Under the Long-Distance Rail Freight Network Funding Act, it has been possible since 2013 to provide federal subsidies amounting to 50 percent to investment in replacement infrastructure by non-federally owned railways. There is now extensive experience of the practical implementation of the statutory rules. In addition, the Act is being evaluated in terms of target achievement and potential for optimization. The funding envelope should be adapted to meet present and future requirements.

No	Milestone	Parties involved	Time horizon
1.8	Evolve the funding envelope to meet present and future requirements (25 million euros "plus")	Federal Government	Permanent task
1.9	Possibly evolve the Long-Distance Rail Freight Network Funding Act on the basis of the evaluation	Federal Ministry of Transport and Digital Infrastructure	Next parliamentary term

2 | Progress the digitalization of rail freight

Digitalization offers great opportunities for significantly enhancing the productivity and quality of rail freight. This is a major prerequisite for making the system more attractive to customers. This relates to the provision of network capacity tailored to the market through the deployment of digital instruments in network management and the provision of infrastructure. The deployment of digital technology on rolling stock and in processes will make it possible to further enhance the reliability and safety of operations and to accelerate procedures and make them more transparent. A major prerequisite for transmitting the required quantities of data is an upgrade of the digital infrastructure. In addition, due regard must also be paid to the issue of data security in order to rule out undesired external interference in digitalized rail freight as far as possible.

Enhancement of digital capacity on the network

Train paths are currently optimized manually and locally and planned individually as demand requires. Digital aids can achieve three effects:

- → The existing capacity of the network can be better utilized and controlled.
- → Average rail freight journey times on the core network are reduced.
- → Rail freight operators can book paths online (“click & ride”). Offers of paths are made within a maximum of three minutes.

In this way, the competitiveness of the rail freight sector can be significantly improved. The measures are already included in the Federal Ministry of Transport and Digital Infrastructure's programme of investments for the future

No	Milestone	Parties involved	Time horizon
2.1	Commission IT system	DB Netz AG	End of 2018
2.2	Roll out all IT functionalities	DB Netz AG	Up to 2021
2.3	Improve the availability of real-time condition data and evolve the quality of forecasts	Railway infrastructure companies, rail industry	Ongoing process

Proactive infrastructure maintenance

To minimize disruption, it is necessary to increase the availability of assets on the rail network. Given the size of the infrastructure network and the large number of installed assets, remote monitoring of the technical systems is necessary to identify malfunctions at an early stage and then quickly rectify them. A technical platform is to be used to enable real-time inspection of assets, for instance points, level crossings, etc. This platform is also to serve as a knowledge database in order to derive recommendations regarding maintenance (troubleshooting, need for spare parts and tools, etc.).

No	Milestone	Parties involved	Time horizon
2.4	Conduct trials at operationally important sets of points (provision of sensors) as pilots and integrate remote monitoring into the maintenance processes	Railway infrastructure companies	Start of 2017
2.5	Install more sensors to monitor the infrastructure	Railway infrastructure companies	Start of 2018

ETCS on-board units (OBUs) for freight locomotives

As trackside infrastructure is progressively equipped with ETCS, it will be necessary to fit locomotives, especially those operating on international rail freight services, with ETCS in addition to the present-day safety systems. New locomotives will have to be fitted with ETCS as standard. Existing rolling stock will have to be retrofitted with ETCS if it runs on lines operated exclusively by ETCS. This will increasingly be the case in cross-border services, and is already in place in some cases (for instance Switzerland, Denmark). This is being taken into account in the infrastructure; border-crossing points will be equipped over the period to 2023 and further sections are planned. The introduction of ETCS offers the following advantages:

1. An enhancement of capacity through a reduction in the headway between trains without requiring additional infrastructure.
2. Lower maintenance expenditure through a reduction of infrastructure to be maintained (signals).
3. Enhancement of the productivity of railway infrastructure companies.

The costs of equipping locomotives with ETCS currently vary (for instance authorization for more than one country) between 300,000 and 700,000 euros per vehicle. This depends on, among other things, the size of the fleet to be retrofitted. The advantages of retrofitting rolling stock will not be felt by the railway undertakings until the distant future, i.e. after the main European corridors have been equipped with a common system, whereas the costs of fitting the rolling stock with additional equipment will place a direct and substantial burden on the competitive position of the rail freight sector. The provision of financial assistance to the railway undertakings' investment in retrofitting is thus appropriate. To prevent distortions of competition and to comply with EU state aid law, this should be granted at EU level.

No	Milestone	Parties involved	Time horizon
2.6	Call on the EU to launch a special investment programme to improve capacity utilization on the network and to promote the installation of ETCS OBUs	Federal Ministry of Transport and Digital Infrastructure, sector	Current parliamentary term
2.7	Launch a European special investment programme, initially for rail freight locomotives operating predominantly on TEN corridors, from 2017 to 2026	EU	Current parliamentary term

Digitalization of the condition data of motive power and freight wagons

Digitalization will enable condition data of motive power and freight wagons to be collected while they are in operation and to be evaluated in real time. This will make it possible to locate the exact position of the rolling stock and identify emerging technical flaws at an early stage, thereby proactively improving the reliability and safety of railway operations. At the same time, laborious manual processes/steps will be replaced by digital solutions, resulting in significant cost savings. In the marketing sphere, there will be new possibilities for providing additional and proactive customer information to enhance the quality of service. In the operational sphere, there will be new possibilities for automation, for the optimization of scheduling and for maintenance based on condition and deployment. The last-mentioned will require adaptations of the set of regulations and amendments to the legal bases (section 32 of the Construction and Operation of Railways Regulations). Finally, digitalization of rolling stock will increase its mileage, thereby

contributing to the economic efficiency of the innovations. In some areas, the development and implementation of digital technology for rail transport will require public sector funding.

No	Milestone	Parties involved	Time horizon
2.8	Equip rolling stock with adequate power supply and standardized data interfaces and sensors as soon as possible	Railway undertakings, wagon keepers, railway industry	Permanent task
2.9	Create funding options that are as specific as possible within the scope of a Federal Government programme entitled "The Future of Rail Freight"	Federal Government	Start of the next parliamentary term
2.10	Adapt the regulations governing maintenance	Trade associations, railway undertakings, wagon keepers	By midway through the next parliamentary term
2.11	Amend section 32 of the Construction and Operation of Railways Regulations	Federal Ministry of Transport and Digital Infrastructure	Current parliamentary term
2.12	Digitalize the process chain in the maintenance of rolling stock (short-term funding of digitalization projects focusing on workshop management and digital process chains between railway undertakings and maintenance contractors)	Railway undertakings, rail industry, wagon keepers	Start of the next parliamentary term

Digitalization of business processes

At the interfaces between the parties involved in rail freight, the processes can be made more transparent, more reliable and safer by using digital technology.

- → The digital exchange of data ahead of the transport operation and of real-time data between railway undertakings and rail freight customers is designed to ensure reciprocal transparency and unlock potential for optimization in the planning and execution of rail-based logistics.
- → If timetable and other regulation documents are transmitted digitally and in real time to an electronic terminal, train drivers and other operating staff can respond to operational deviations at an early stage.
- → The interfaces between infrastructure managers and railway undertakings, from the preparation of a train journey to the invoicing of track access, can be made considerably simpler by the digitalized provision of information. The positive approaches to this developed within the scope of the "Railway Simplicity" project should be evolved and, if appropriate, funded.

- In the rail freight sector, the short-term and flexible allocation of railway infrastructure capacity is becoming increasingly important. It is becoming less and less possible to reflect the lifetimes and/or needs for adaptation of contracts of carriage in annual timetables. The deployment of digital technology can support the flexible and demand-driven allocation of paths.
- The digital provision of train and customer data for operating staff (for instance electronic conductor's report for the train driver, digitalized acquisition and forwarding of data during wagon inspection) can systematically combine and speed up the downstream planning, scheduling and maintenance processes. In the operational sphere, real-time monitoring will create new possibilities for optimized scheduling and maintenance.
- Deployment and development of an all-digital process chain in the maintenance of rolling stock for significant efficiency and availability enhancement in rail operations.

No	Milestone	Parties involved	Time horizon
2.13	Progress digitalization of the internal processes of the railway undertakings/railway infrastructure companies and of the processes between the railway infrastructure companies and their customers plus between railway undertakings and infrastructure managers/terminal operators	Railway undertakings, railway infrastructure companies, shippers	Permanent task
2.14	Evolve the “Railway Simplicity” projects	DB Netz AG	Permanent task
2.15	Create funding options that are as specific as possible within the scope of a Federal Government programme entitled “The Future of Rail Freight”	Federal Government	Start of the next parliamentary term

3 | Increase the level of automation in railway operations

The (partial) automation of operational processes is a major lever for improving the economic efficiency and competitiveness of the rail freight sector. Automation of rail freight will transfer basic functions of the production process, especially execution and monitoring tasks, from humans to technical systems. These technical systems will make the workflow processes safer, less prone to disruption and more reliable and will result in cost reductions. Shunting operations and "last mile" collections and deliveries are one of the most significant cost factors in the rail freight transport chain. Automation here will result in significant productivity gains for the entire transport chain.

Automation of railway operations

In the short term, technical systems in mainline operations, such as driver assistance systems, will support the train driver in adopting an energy-efficient driving style, thereby reducing CO_2 emissions and energy consumption. In addition, (partial) automation will allow trains to run at more frequent intervals, thereby increasing traffic density, with positive effects on the productivity of the rail freight sector.

Automatic operations in the long-distance sector should be trialled with actual applications (demonstrators) and evolved. For the automation of railway operations, it will be necessary (as in ongoing programmes in the road sector) to analyse the need for action and the resultant adaptations in the action areas of legislation, infrastructure, connectivity and cyber security/data protection and to adapt national and international sets of regulations and legal bases accordingly.

The operation of long trains may require the use of an additional locomotive, for instance in the middle. To safeguard the productivity advantage of long trains, the locomotive in the middle would have to be remotely controlled by the locomotive at the front. This technology of distributed traction and braking should also be regarded as a basic technology for further automation of railway operations (platooning on rail).

The (partial) automation of shunting operations and "last mile" collections and deliveries will result in significant productivity gains for the entire transport chain. Automated track switching will make it

possible to unlock efficiency potential at local rail freight facilities. In addition, the (partial) automation of shunting operations has to be evolved by trialling (partially) automated shunters. Retrofitting rolling stock for remote control can cut costs in shunting operations.

With regard to marshalling yards, the main approaches to be pursued are as follows:

- → Automation of the formation of trains as a step along the road to real-time control of the entire facility
- → Development and deployment of automation options (for instance decoupling robots) to support and ease the pressure on operating staff and to enhance health and safety at work, especially in manual steps (braking [drag shoe], decoupling, connecting brake pipes)
- → Fully automatic shunter
- → Automatic checking of the order of the wagons
- → (Semi-)automatic coupling and decoupling
- → Automated wagon inspections using video analytics
- → Automated brake tests
- → Real-time monitoring of all shunting processes and the infrastructure
- → Software for optimum real-time control
- → Funding of research projects on future working at digitalized and automated facilities

One aim is for today's standardized screw coupling to be superseded by automatic coupling. This can act as a key technology for many further digitalization and efficiency measures. It will support and ease the pressure on operating staff and enhance health and safety at work, especially in the manual steps of decoupling/coupling and connecting brake pipes. Power supply and sensor lines would support digitalization functions on freight wagons and automate operational processes such as brake tests. Introduction of automatic coupling will require consolidation of the ongoing national and international initiatives, a broad-based investment initiative (transport, environment, energy, national, EU) and a national and international investment and migration strategy tailored to the needs of the market.

Finally, potential for automation is also inherent in interface processes in multimodal transport chains. Unmanned cranes can be used in classic combined transport. This will make it possible to automate cargo handling as a step along the road to real-time control of the entire

terminal. This will require containers with digital technology (positioning, condition information, allocation to rolling stock). Automation of the loading and unloading processes is a major building block for the economic efficiency of multimodal transport chains in single wagonload traffic.

No	Milestone	Parties involved	Time horizon
3.1	Introduce and evolve automation technologies	Railway undertakings, railway infrastructure companies, rail industry	Permanent task
3.2	Create funding options that are as specific as possible within the scope of a Federal Government programme entitled “The Future of Rail Freight”	Federal Government	Start of the next parliamentary term
3.3	Evolve automation technologies in the long-distance sector with a coordinated procedure, especially along the main European rail freight corridors (funding of EU collaborative projects in the field of interoperable rail freight)	Railway undertakings, railway infrastructure companies, rail industry, Federal Government	To start in 2018 with demonstrators and an immediately coordinated basic approach in Europe
3.4	Progress distributed power technology for the driverless operation of pusher locomotives (better use of tonnage ratings as a basic technology for trains up to 1,500 metres long)	Railway undertakings, rail industry, Federal Government	Starting in 2018
3.5	Trial and evolve automation technologies in the short-distance sector (shunting operations, train formation yards) by means of demonstrators	Railway undertakings, railway infrastructure companies, rail industry, Federal Government, universities, research institutes	Starting in summer 2017
3.6	Modernize basic infrastructure for train formation operations, such as retarders, conveyor equipment, control technology, communications technology, nationwide as a basis for the digitalization and automation of train formation yards	Railway infrastructure companies, Federal Government	To start at the end of 2018
3.7	Develop and implement a standardized technical solution for an automatic coupling suitable specifically for rail freight (functionality, weight, costs) plus a commercially viable European migration strategy for market segments, national and European services	Railway undertakings, railway infrastructure companies, rail industry, Federal Government, wagon keepers, EU	Next parliamentary term
3.8	Create operational conditions for automated operations by railway infrastructure companies	Railway infrastructure companies	Permanent task
3.9	Adapt sets of operating regulations for automated operations	Railway undertakings, railway infrastructure companies, Federal Railway Authority, trade associations	Next parliamentary term
3.10	Adapt legal bases for automated operations	Federal Government, EU	Next parliamentary term

4 | Expedite technological innovations for rolling stock taking into account the economic efficiency and environmental performance of the rolling stock

Vehicles and freight wagons are important resources of the rail freight sector. Their provision and operation account for around one third of the costs of the rail freight sector (excluding energy costs). In standard operations, the deployment of innovative technologies will reduce rolling stock costs per unit of production, thereby lowering production costs as a whole. In addition, such innovations will further improve the environmental footprint of the rail freight sector.

Innovative rolling stock technology

With the existing hybrid motive power, it is already possible today to ensure the end-to-end operation of a traction unit, including the "last mile". This technology makes it possible to both reduce the operating costs of the motive power and minimize its environmental impact. Procurement of the rolling stock requires comparatively high investment, which can be encouraged by investment support or other financial incentives. In the segment of shunters, specifically, which are characterized by high proportions of idle time, there are likely to be savings in fuel consumption totalling 20 to 40 percent, combined with a significant reduction in noise and exhaust emissions.

So far, hybrid locomotives have been scheduled for deployment in shunting operations or on electrified long-distance lines with short non-electrified sections. There is also a need for their deployment on long-distance lines with longer non-electrified sections and corresponding requirements to be met by the power of the drivetrain. This will require the development and certification of fully-fledged and future-proof hybrid locomotives (with an electric drive component) for end-to-end journeys on long-distance lines (electrified network and longer non-electrified regional lines). This technology will make it possible to both reduce the operating costs of the motive power and minimize its environmental impact. The high level of investment should be encouraged by financial incentives.

Building on ongoing projects (especially "Innovative Freight Wagon" and "5L Demonstrator"), innovative components for rail freight wagons are to be developed to improve the competiveness, logistics capabilities and environmental sustainability of the rail freight sector and further reduce

noise. The modernization of existing or construction of new freight wagons can achieve significant cost savings in the operation of freight wagons by means of design changes or the evolution of components (including the use of more lightweight materials).

In addition, the freight wagon chassis and superstructure can be designed such that they can be separated, in order to tie up less “wagon capital” during loading and unloading times at customers and to enable the expensive chassis to have significantly shorter turnaround times (higher mileage and smaller wagon fleet) than the body. Specific superstructures will enhance the quality of the service provided to customers. Innovative components can further reduce noise emissions and wear. In logistics strategies that manage without gravity shunting, the stress on and design requirements to be met by freight wagons will be reduced.

This will reduce the costs of manufacture and, by enabling higher payloads, increase the economic efficiency of operations.

Since the procurement of new freight wagons with innovative components whose certification emission limits are significantly lower than those of the TSI Noise involves higher costs, temporary financial incentives are to be created to lower operators' reluctance to acquire such wagons.

No	Milestone	Parties involved	Time horizon
4.1	Deploy more hybrid locomotives (with an electric drive component) on the "last mile" (without overhead line)	Railway undertakings	Permanent task
4.2	Incentivize the deployment of driver assistance systems in the rail freight sector	Railway undertakings, railway infrastructure companies	To start immediately, underpin with financial assistance from 2017 to 2020
4.3	Develop fully-fledged and future-proof hybrid locomotives (with an electric drive component) for end-to-end journeys on long-distance lines (electrified network and longer non-electrified regional lines)	Rail industry	Short to medium term
4.4	Develop components for rail freight wagons such that they are ready for mass production and deploy them, in particular: – disc brakes – high-mileage bogies and wheelsets – multimodal modular superstructures – more lightweight automatic coupling – aerodynamics – digitalization (see measure 2)	Wagon keepers, railway undertakings, rail industry, Federal Ministry of Transport and Digital Infrastructure	Ongoing (e.g. "Innovative Freight Wagon" project)
4.5	Examine and streamline sets of regulations governing rolling stock with regard to the hampering of innovations by national and/or European provisions (TSI, network statements, NNTR, etc.)	Railway undertakings, railway infrastructure companies, wagon keepers, rail industry, Federal Ministry of Transport and Digital Infrastructure, EU	Short to medium term
4.6	Wherever possible, create funding options for the development, procurement and deployment of low-noise and low-emission locomotives and hybrid locomotives and innovative freight wagons within the context of a federal programme entitled "The Future of Rail Freight"	Federal Government	Start of the next parliamentary term
4.7	Create process reliability by means of lean certification processes at the European institutions (similar to national rules governing rolling stock certification)	Sector, Federal Ministry of Transport and Digital Infrastructure, EU	Permanent task

5 | Boost multimodality and safeguard and expand access to the railways

In a freight transport system that can meet the challenges of the future, railways are to play a key role. Alongside end-to-end rail freight movements, multimodal transport chains with their trunk haul on the railways are to take centre stage. Industrial and logistics sites that generate a high volume of freight should have a private siding. Where this is not the case, the initial and terminal hauls to and from both combined and conventional single wagonload traffic must work more reliably and economically.

Safeguard the rail freight sector's access to the freight volumes of the future

The volume of freight corresponding to the classic block train will become less important in the years ahead, in both absolute and relative terms (effect of freight structure and logistics). On the other hand, there will be an above-average increase in the volume of “smaller-sized” goods (less consolidation of movements, greater spatial differentiation of points of origin and final destinations). Because it is a guided method of transport, rail freight does not have area-wide direct access to the points of origin and final destinations of these goods. However, it will not be possible to increase rail freight's share of the modal split unless it can serve the growing submarkets on competitive terms. To this end, rail freight requires access to this freight volume of the future, either by means of rail links to loading facilities (automated wherever possible) directly at the points of origin and final destinations of the logistics chains or by means of initial and terminal hauls to intermodal terminals as part of multimodal transport chains.

Single wagonload services first require that a site be made spatially accessible by rail and that a private siding be in place. The existing programme for the funding of private sidings should be continued and proactively evolved. In this context, it is also to be considered whether, as in other states and as in the case of road links for locations generating a high volume of freight, there could be a mandatory requirement for rail links in planning/environmental law.

Multimodal transport comprises the movement of freight by at least two different modes of transport. Major cost drivers in intermodal transport are the initial and terminal hauls. The costs and risks (time, reliability) of changing transport modes several times also play a major role. Road transport on the initial and terminal hauls is not regarded as competition but as an important link to enable customers whose site is not near a railway line to have access to the rail system, thereby moving more freight to the environmentally friendly, efficient and safe railways for the trunk haul. Nevertheless, when certifying innovations in the initial and terminal haul sphere, care must be taken to ensure that they also result in greater demand for CT services.

The existing funding of combined transport terminals (requirement plan, Combined Transport Funding Guidelines) is to be continued, developed and allocated the appropriations it requires in the federal budget. This is also designed to enhance the handling capacity at existing CT terminals (for instance in Regensburg, Ulm and Kornwestheim). In addition, financial assistance should also be provided in the future to multimodal interchanges (including automation technologies and logistics

infrastructure) close to centres of economic activity as access points to the single wagonload services of the rail system. Consideration is also to be given to measures that enhance acceptance of intermodal transport interfaces among the resident population.

Currently, initial/terminal hauls to and from combined transport by container/trailer block trains enjoy privileges, especially in the form of higher maximum permissible weights. Consideration should be given to extending this privilege to include road-based initial and terminal hauls to and from conventional single wagonload services as part of multimodal transport chains.

Consideration should also be given as to whether exemption regulations allowing a vehicle height of 4.20 metres for HGVs operating initial and terminal hauls to CT could increase the amount of CT.

In addition, consideration should be given as to whether granting further privileges to vehicles operating initial and terminal hauls in intermodal transport where the trunk haul is by rail can strengthen the multimodal transport chain as a whole and whether intermodal transport involving conventional single wagonload services (rail ports, forwarding terminals and the like) should be put on an equal footing here. These privileges are to be granted exclusively to electrically powered vehicles or vehicles with low greenhouse gas emissions deployed exclusively on initial/terminal hauls to and from the railways in intermodal transport. The privileges could also include exemption from HGV tolls for the use of tolled roads. In certain cases, the creation of separate lanes and parking areas would also be conceivable.

Initial and terminal hauls and the handling of cargo are costly and place a significant burden on the economic efficiency of intermodal transport. Automated self-driving systems can improve the economic efficiency of the entire transport chain and unlock additional potential for intermodal transport. Likewise, as mentioned earlier, the automation of cargo handling operations can reduce the costs of the entire transport chain.

The economic efficiency and commercial viability of combined transport are closely connected with the technological compatibility and the interoperability of the different modes of transport at international level. Standardization of swap bodies at international level is a basic prerequisite of an intermodal and thus intelligently connected transport system. Only if the dimensions and weights of swap bodies are kept constant over a long period time will the logistics sector enjoy the planning certainty it

requires for investment. The European institutions must continue to preserve this prerequisite without hampering innovations. A stable regulatory framework is the guarantor of cost-efficient and competitive intermodal transport chains incorporating the roads, railways and waterways. The best example of this is the container with its standardized dimensions that have remained almost unchanged for 50 years. The container today is not just the symbol of globalization. It has been and still is the prerequisite of the establishment of connected, global production structures and growing world trade.

No	Milestone	Parties involved	Time horizon
5.1	Consider making it mandatory for rail links to be taken into account in planning/environmental law when approving and constructing industrial and logistics locations that generate a high volume of freight	Federal Government/federal states	Next parliamentary term
5.2	Continue and evolve the ongoing funding of combined transport terminals (requirement plan, Combined Transport Funding Guidelines) and private sidings and allocate the appropriations it requires in the federal budget	Federal Government	Permanent task
5.3	Fund multimodal facilities as access points to the single wagonload services of the rail system (forwarding facilities with private sidings, handling facilities at marshalling yards) including logistics infrastructure	Federal Ministry of Transport and Digital Infrastructure	Permanent task
5.4	Consider harmonizing and adapting the regulatory framework governing initial/terminal hauls to and from combined transport services and conventional single wagonload services as part of multimodal transport chains, including a 4.20 metre HGV height in CT initial and terminal haulage	Federal Government	Next parliamentary term
5.5	Consider granting regulatory privileges to electrically powered and low-emission/emission-free road vehicles operating initial and terminal hauls in intermodal transport	Federal Government	Next parliamentary term
5.6	Automate road-based initial and terminal haulage	Shippers, logistics operators	Medium term
5.7	Harmonize rules governing multimodal transport chains at European level	Federal Government, EU	Permanent task
5.8	Keep dimensions and weights of swap bodies constant over periods of time that are as long as possible	Federal Ministry of Transport and Digital Infrastructure, EU	Permanent task

6 | Expand electric haulage on and with the railways

Further electrification of the rail network and electrically powered solutions for initial and terminal hauls to and from the railways are the key to the end-to-end electric haulage of freight services. Alongside a special programme to fund electrification schemes, standardized and cost-effective technological solutions are to be developed.

End-to-end electrically hauled freight transport chain

Electric haulage on the railways is to be further expanded. A special programme for the further electrification of lines on the rail network will enhance the competitiveness of the rail freight sector and accelerate the transformation of Germany's energy system. With regard to freight transport, in particular, this is a necessary prerequisite for achieving the goals of the Climate Action Plan and the decarbonization of transport that is to be implemented by 2050. Today, high costs and planning problems hamper the speedy electrification of railway lines in many cases. Consideration should be given as to whether, and if so to what extent, the effort and expenditure required for electrification can be reduced in the spheres of engineering and planning law.

If electrification works do not satisfy the value-for-money requirements for public investment, hybrid vehicles can ensure end-to-end electrically hauled rail freight.

The end-to-end electrically hauled freight transport chain is to be ensured by the development, certification and introduction of electrically powered solutions for road-based vehicles operating initial and terminal hauls to and from the rail trunk haul (for instance electric goods vehicles in local and regional transport, electric vehicles specific to a shipper, possibly also driverless electric vehicles). This can ensure electrically powered transport operations right into the logistics hubs.

No	Milestone	Parties involved	Time horizon
6.1	Launch a special programme for further electrification of the rail network	Federal Government, railway infrastructure companies	Draft and, if possible, implementation in the next parliamentary term
6.2	Develop standardized and cost-effective solutions for the electrification of lines and service facilities with simple requirements (for instance lines used for regional services, interchange points, service facilities)	Railway infrastructure companies, Federal Railway Authority, trade associations	Immediately
6.3	Develop and fund electrically powered solutions for initial and terminal hauls to and from the railways	Shippers, automotive industry, Federal Government	Permanent task

7 | Significantly reduce track access charges and charges for access to service facilities

Charges for the use of railway infrastructure must be brought down to a competitive level. A significant reduction in infrastructure use charges will be directly reflected in the production costs of all rail freight operators. It will immediately improve their competitiveness on the freight transport markets and result in a rising market share for rail freight. In addition, the operators' capacity for innovation will be boosted because financial scope for investment will be created.

A significant reduction in infrastructure charges

In recent years, trends in infrastructure charges, especially compared with other modes of transport, have had an adverse impact on the competitiveness of rail freight operators. Here, the railway infrastructure companies themselves are also called upon to take action. They need to improve the efficiency of infrastructure provision and management.

To additionally secure and improve the competitiveness of rail services, infrastructure charges are to be significantly reduced. Here, the scope provided by EU law is to be exploited. This will not be possible unless additional public funds are provided for railway infrastructure for this purpose for a limited period of time. Subsequently, the lowering of infrastructure charges using public purse funding is to be progressively reduced. The scope for efficiency in infrastructure management and, in particular, the implementation of ETCS and digital signal box technology can be used to keep infrastructure charges permanently at a level that is competitive for rail freight operators without jeopardizing the profitability of the infrastructure companies.

No	Milestone	Parties involved	Time horizon
7.1	Temporarily provide additional public funding for the purpose of a very significant reduction in infrastructure use charges.	Federal Government	Start of the next parliamentary term
7.2	Improve the efficiency of infrastructure provision and management	Railway infrastructure companies	Permanent task

8 | Limit the burden imposed by levies and taxes

To boost electric haulage on the railways, consideration is to be given to reducing the triple burden imposed by electricity tax, the Renewable Energy Sources Act and emissions trading. General continuous monitoring without reasonable suspicion is not to be charged to the railway undertakings as part of the re-enactment of the Regulations governing the fees charged by the Federal Railway Administration.

The rail mode, which uses the highest proportion of renewable energy by far, is the only mode of transport to be directly and increasingly enlisted to fund the new direction in energy policy, and its competitiveness is being weakened as a result. In contrast, the competing road and waterway modes are not covered by the Renewable Energy Sources Act.

As is the case with the Renewable Energy Sources Act, emissions trading as a climate policy instrument affects mainly electrically powered rail transport. Neither road transport nor shipping is subject to emissions trading. Since 2013, power stations have had to pay the full costs of the CO_2 allowances they require, the result being that electrically powered rail transport is completely affected by the costs of emissions trading. The costs incurred as a result make traction current even more expensive. Almost 90 percent of the freight moved by rail on the German network is affected by this.

At the same time, the energy tax burden on the rail freight sector in Germany continues to be high compared with other European states. At 11.40 euros per megawatt hour, traction current in Germany is taxed at a significantly higher rate than in other European countries. In many countries, rail freight operators pay no tax whatsoever on their traction current consumption. Significantly lower tax rates are applied in almost all other European countries.

The multiple burdens imposed by the mix of energy and climate policy instruments on traction current for energy-efficient and climate-friendly rail transport, which is the only mode of transport that already uses renewable energy on a large scale today, should be removed.

The one-sided discrimination of rail freight in emissions trading, which is based on European law, should be rectified in the forthcoming reform of the emissions trading scheme. As long as the other modes of transport are not included in the instrument on a comparable scale, rail freight should be exempted from the burdens wherever possible. At the very least, the

scope for national action in the taxation of energy should be exploited to offset the additional burdens on the railways for reasons of environmental protection and climate change mitigation. Revenue from emissions trading should be used to offset the burdens imposed by emissions trading and to boost climate-friendly rail transport.

The taxation of the energy used by rail freight in Germany should be at least approximated to the rates of taxation in neighbouring European countries – chiefly in the case of traction current but also for diesel fuel used for traction. Total exemption of rail freight from electricity tax and from the taxation of diesel fuel used for traction can remove the high multiple burdens imposed on rail freight operators and boost their competitive position.

When the Regulations governing the fees charged by the Federal Railway Administration are re-enacted, multiple burdens on operators in connection with official acts performed by the Federal Railway Administration should be avoided wherever possible.

No	Milestone	Parties involved	Time horizon
8.1	Offset costs of emissions trading as of 2018	Federal Government	Start of new parliamentary term
8.2	Reduce the energy tax burden on the railways, lower electricity tax for the railways as of 2018	Federal Government	Start of new parliamentary term
8.3	Lower the levies paid by the railways by means of alternative funding of the renewable energy surcharge as of 2018 and/or reduce the renewable energy surcharge for rail transport to the pre-2014 level if possible	Federal Government	Start of new parliamentary term
8.4	Limit multiple burdens on railway undertakings wherever possible when re-enacting the Regulations governing the fees charged by the Federal Railway Administration	Federal Ministry of Transport and Digital Infrastructure	Current parliamentary term

9 | Ensure comparable standards in labour and social legislation and safety requirements in all modes of transport

Enforcement of labour and social legislation and safety requirements that is equally effective across all modes is an important prerequisite for the creation of fair intermodal conditions of competition.

Harmonize wage and social standards

On the European scale, there are great differences in wage and social conditions. Combined with the liberalization of the markets, this has resulted in undesirable effects, especially in the freight transport sector. As far as the labour and social conditions are concerned, there is a need to prevent malpractice. In this context, national measures are definitely justified, but rules at EU level are also required and should be preferred.

No	Milestone	Parties involved	Time horizon
9.1	Harmonize enforcement of pay, labour and social legislation throughout the freight transport sector	Competent Federal Government and federal state authorities	Agreement on measures in the current parliamentary term, implementation to start in 2018
9.2	Enact laws to clamp down on the activities of brass plate companies and other malpractice designed to undermine labour, social and safety legislation, especially the Minimum Wage Act at EU level	EU	Current parliamentary term

10 | Step up initial training and continuing professional development

A future-proof rail freight sector needs a qualitative and quantitative initial and continuing training drive. This requires the consolidation and strengthening of the industry's activities with the public sector.

Meet the growing demand for manpower

Today, there are already great manpower requirements for the rail freight sector. Locomotive drivers, schedulers, skilled operating and maintenance staff and other skilled workers are required so as to be able to manage rising volumes of freight traffic. In the case of college and university graduates, the railways are looking especially for engineers from various disciplines, holders of business management degrees and IT specialists. The industry must communicate its attractiveness as an employer and actively seek to recruit junior staff and lateral entrants at all skills levels if it is to be able to meet the growing demand for manpower.

This must also involve attractive initial training and continuing professional development schemes and prospects for progression. This is first and foremost the task of the operators and their associations. The state can assist the operators' activities to recruit skilled personnel.

In addition, it is also necessary to constantly adapt occupational profiles to changing requirements resulting from technological developments or changed performance profiles. This can only be ensured in a continuous dialogue between the industry and public sector institutions.

Another problem is that the training regulations for forwarding clerks do not make professional training for the rail mode mandatory. At vocational colleges, courses on rail transport are only optional. But if shippers and forwarders are to take more account of the rail mode, they require elementary knowledge of rail transport. The railways cannot be integrated into logistical processes unless the staff who put together the logistics chains have specific professional skills and know how rail freight movements are to be handled and organized. For this reason, an elementary syllabus covering the rail mode should be included and made mandatory in the training regulations and skeleton curriculum.

No	Milestone	Parties involved	Time horizon
10.1	Organize and conduct a campaign/drive to recruit skilled labour (continuing professional development and retraining schemes for lateral entrants)	Operators, trade associations	Permanent task
10.2	Assist operators' activities to ensure a new generation of workers and recruit skilled personnel (currently the campaign launched by employers in the Association of German Transport Companies (VDV) or the Pro-Rail Alliance's industry-wide online job board SchienenJobs.de)	Federal Government	Short term
10.3	Train Employment Agency staff in the field of rail freight	Operators, trade associations Employment Agency	Permanent task
10.4	Evolve and harmonize the initial and continuing professional development requirements of the future and a system of career educational pathways in the rail freight sector	Operators, trade associations. Federal Government. federal states	Permanent task
10.5	Include and make mandatory a syllabus covering the rail mode in the training regulations and skeleton curriculum for forwarding clerks	Operators, trade associations, German Chambers of Industry and Commerce, Federal Government, federal states (Standing Conference of Ministers of Education and Cultural Affairs)	Short term
10.6	Place support measures on an equal footing with other modes of transport	Federal Government	Permanent task


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D | Freight Transport Masterplan – Immediate action

From the aforementioned package of measures, the following are to be implemented as soon as possible:

1. Additional public funds to reduce track access charges

The Federal Government will provide additional public funds for the railway infrastructure. This is designed to significantly reduce the track access charges for the rail freight sector.

2. 740 metre network

Upgrading main freight lines for 740 metre long freight trains will make it possible to significantly enhance capacity and is thus an important measure for the competitiveness of the rail freight sector. As soon as proof has been furnished that potential first priority projects contained in the current requirement plan meet the criteria for inclusion in the first priority category, they will – in line with the Bundestag's decision – be included in the first priority category of the current requirement plan. DB Netz AG will subsequently start to implement them without delay.

3. Entrepreneurial contributions by the sector to the modernization of rail freight

Despite a very difficult environment, rail freight operators, infrastructure managers, wagon keepers and the rail industry will continue and extensively expand their innovation and modernization projects. This is proved by the following examples:

For the development and provision of innovative solutions for the railways of the future, the rail industry in Germany invests around 8 percent of its annual turnover in research and development.

By converting its entire wagon fleet to noise-reducing braking systems (retrofitting and procurement of new wagons), the sector is making a major financial contribution to the modernization of rail freight. The costs of this will amount to over one billion euros in the period from 2013 to 2020. Despite the provision of targeted financial assistance by the

Federal Government to the retrofitting scheme, around 85 % of these costs will be funded by the operators.

In the innovation field of digitalization, the German wagon keepers will equip around 100,000 freight wagons with telematics and sensor technology within three years, investing around 50 million euros for this purpose. In addition, DB Cargo AG, for instance, has to date already integrated digital intelligence into 50 percent of its locomotive fleet (over 1,000 locomotives of different classes) in order to proactively prevent rolling stock failure and reduce maintenance costs. Rail freight operators have already retrofitted around 250 locomotives with ETCS for operation on cross-border services. This involved investment of 125 million euros.

A new generation of hybrid locomotives will be able to operate on a wider range of lines by using different drivetrain technologies. Thus, for instance, the Havelländische Eisenbahn has ordered new types of hybrid main-line locomotives with a financial commitment at the higher end of the double-digit millions range, thereby demonstrating that the industry is willing to innovate. For some years now, several companies have been operating electric main-line locomotives with an additional, less powerful drive unit for the "last mile". Finally, hybrid locomotives have increasingly been procured for short-distance services in recent years in order to reduce the climate change impact of all shunting operations.

The "Innovative Freight Wagon" and "5L Demonstrator" projects focus on the evolution of the freight wagon from several perspectives. By way of example, optimized automatic centre buffer coupling is to be developed and trialled for deployment across the network. In the "Innovative Freight Wagon" project, which is funded by the Federal Government, the wagon keepers involved will make contributions of their own totalling around 5 million euros.

Rail freight that is electrically hauled from end to end offers solutions for future-proof logistics. With a set of regulations governing the electrification of railway lines with adapted and less expensive standards for a line speed of up to 120 km/h, the conditions will be created for the nationwide expansion of electric haulage on the railways that is cost-effective to a considerable extent.

Despite stringent requirements to be met by the construction of new and the upgrading of existing infrastructure, it is also essential that the existing infrastructure be used in a more intelligent, faster and simpler manner. Within the scope of its "Railway Simplicity" project, DB Netz AG

is continuously developing web-based tools that can be used to simplify the processes between railway undertakings and infrastructure managers. So far, DB Netz AG has invested around 3 million euros for this purpose. Around 2 million euros per annum is scheduled for the future.
In the recent past, sensor technology has already shown that it can improve traffic flows as an early warning system for the availability of infrastructure. Over the period to 2018, more than 18,000 points on the rail network will be equipped with around 20,000 sensors for remote monitoring. This represents an appreciable step towards the stability of the system.

Innovations and modernization place high demands on the skills and commitment of staff. For this reason, the sector is already investing in staff recruitment, initial training and continuing professional development. The “SchienenJobs.de” online job board and the employers' initiative launched by the German transport operators bring together career opportunities and company-related training initiatives.

The industry sees the Rail Freight Masterplan as interaction between lawmakers and the industry. The combination of existing contributions by operators, the detailed programme of innovation and the Federal Government’s contribution in the form of the necessary regulatory framework is the basis for enhancing the competitiveness of the rail freight sector. The industry will make a concerted effort to ensure that the railways, as a means of transport, are reliable and provide high-quality services at reasonable prices. The partners will create a common institutional framework for the management and monitoring of the measures.

4. Establishment of the first test bed for the digitalization and automation of the marshalling of freight trains

The first automated and digitalized train formation yard will be developed and tested at Munich North marshalling yard, with funding also being provided to research and development. Innovative approaches are to be adopted to improve the following stages of the process: planning, scheduling, shunting, coupling, checking and dispatching, as well as connectivity and information. Examples of optimization include fully automatic marshalling and hump shunting or automatic coupling.

The implementation of a pilot can start progressively in 2017. The automation of train formation is to be trialled and evolved by means of demonstrators.

5. Preparation of a blueprint for the Federal Government programme entitled “The Future of Rail Freight”

The Federal Government programme entitled “The Future of Rail Freight” is designed to permanently establish research structures in the rail sector as well. The basis for this will be the overview of railway research, which will be prepared by the Federal Ministry of Transport and Digital Infrastructure before the end of 2017. It is to be possible to provide the required funding for innovation projects in the individual development phases (research, development, trialling and introduction). The Federal Government programme is to be used to fund digitalization and automation technologies and innovative rolling stock technologies. Financial assistance will be provided to both technological developments and their trialling (demonstrators, test beds). In special cases (particularly high micro-economic risks), consideration will be given as to the extent to which the market launch can also be supported by suitable instruments. Under the auspices of the Federal Government programme entitled “The Future of Rail Freight”, a nuanced funding landscape is to be developed, with priorities that will be adapted if necessary. These include, but are not limited to, rail freight automation and digitalization clusters.

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