

On track

2010

A BRIEF LOOK AT THE ACTIVITIES OF JERNBANEVERKET IN 2010



Much to look forward to!

Budget allocations for Jernbaneverket, the Norwegian National Rail Administration, have been increased to develop the national railway network. Take a look at all there is to look forward to in the years ahead.



Jernbaneverket

Mighty mountains rich in iron ore

In Norway, 75 per cent of all railway freight is transported on the Ofoten Line. Read more about Norwegian iron ore rail transport on page 14.





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Jernbaneverket

The state railway network is an important part of society's infrastructure, contributing to the safe, efficient and environmentally-friendly transportation of freight and passengers.

Jernbaneverket is the Norwegian government's agency for railway services. Our task is to provide Norway's train companies with a safe and efficient transport system. We plan, construct and maintain the railway network, including railway stations and terminals.

We are also responsible for day-to-day traffic management and for providing traffic information to passengers at all railway stations in Norway.

Our employees have expertise in a range of specialist fields such as electrical engineering, construction, telecommunications, social planning, scheduling and traffic management.

Jernbaneverket reports to the Ministry of Transport and Communications. The Norwegian Parliament, the Storting, sets out long-term plans for developing the rail network in the National Transport Plan (NTP), as well as approving Jernbaneverket's annual budget.

Organisational structure

Jernbaneverket comprises the following main divisions:

The Director General and her staff, Traffic Operations and Customer Services, Infrastructure Management and Infrastructure Construction.

Objectives for the rail sector

The Ministry of Transport and Communications sets specific requirements for how Jernbaneverket should manage the resources it is allocated in order to best achieve our objectives within three key focus areas.

Our three focus areas are:

- Safety, punctuality and customer satisfaction
- Productivity and quality
- Competence and culture

Our achievements for the 2010 fiscal year within the focus areas are detailed in the Annual Report for 2010 available on www.jernbaneverket.no.

«The management and track workers alike are doing their utmost to meet the objective of a more reliable service.»

EDITORIAL

Better times ahead

Customer surveys conducted amongst rail passengers show a direct link between punctuality and customer satisfaction. At Jernbaneverket, we do our utmost to provide a more reliable rail service for our passengers.

Jernbaneverket is in delivery mode. However, despite our best efforts during 2010 we did not manage to provide our customers with the punctuality they deserve. The Ministry of Transport and Communications, the media and our customers are now paying close attention to developments in punctuality. The management and track workers alike are doing their utmost to meet the objective of a more reliable service. However, upgrading a neglected railway network requires considerable effort over time, so we must keep up our efforts. We are convinced that as the systematic modernisation work progresses, the infrastructure will become more robust and rail services will gradually improve.

Whatever it takes

This winter we managed to cut the number of delays by half, compared with the same period last year. This was possible by successfully increasing our winter response efforts by increasing staff and introducing new snow clearing equipment at our hubs, the areas near Oslo Central Station and Alnabru Freight Terminal.

Large-scale improvements and maintenance work have been implemented, and were stepped up in the four-week long period last summer when train services in the Oslo area were suspended. Much remains to be done, however, and more extensive improvements are scheduled for this summer.

Safety culture

Regretfully, incidents and challenges occurred in 2010 as well. We were deeply affected by the tragic accident on 24 March 2010, when carriages from Alnabru Freight Terminal broke loose and ended up crashing on Sjørsøya, causing loss of lives and major material damage. We were reminded of the significance of



working systematically and continuously to improve safety. Managing and improving our safety culture throughout Jernbaneverket has been our top priority this year. Safety has also played a key role in planning our operations for 2011.

We must all be vigilant and prepared to prevent potentially dangerous situations. We have, therefore, introduced mandatory safety seminars for all of our 3 300 employees. These will take place in the first half of 2011.

Gaining trust

In August, we opened a new customer service centre to improve passenger information. We will do our utmost to ensure that all customer groups regain their trust in the current railway system, including passengers, potential new users, train companies and freight transporters. When disruptions to our services are unavoidable it is vital that we are able to provide our customers with reliable information. We will make commuting easier by turning the commute into efficient work time. To do this, we need reliable mobile phone and internet access. As a step towards this, Jernbaneverket and the Norwegian State Railways (NSB) introduced free internet access as a pilot scheme on the

section between Skien and Lillehammer. Jernbaneverket will continue to develop the network in the years ahead.

Promising future

There is little doubt that rail is the transport mode of the future. Budget allocations for 2010 for operation and maintenance of the railway infrastructure were up 15.2 per cent compared with the year before to NOK 4.462 billion, whereas investment increased by 22.5 per cent to NOK 3.919 billion.

When presenting our input to the National Transport Plan (NTP) for 2014 – 2023 in cooperation with other transport agencies, we have been presented with an additional challenge; to specify the costs and, regardless of economic frameworks, present a realistic timeframe for implementing major strategic projects such as the further extension of the double track in Eastern Norway and introduction of the new signalling system ERTMS.

There is every reason to be optimistic on behalf of the railways!

E Enger
Director General

Preparing for the future

The political focus on railways has shifted from what it was just a few years ago. This means that Jernbaneverket can start laying tracks for the future.

Five years ago, the railway investment budget was around NOK 1 billion. Now it is approximately NOK 4 billion.

– In society at large, there is a much keener interest in and enthusiasm for railways as a means of transportation than just a few years ago. Furthermore, there is political will and desire to achieve something, says Director of Strategic Planning and Development, Anita Skauge of Jernbaneverket.

– Developments are moving too slowly for most people, and for us too. However, if the commitment to

«In society at large, there is a much keener interest in and enthusiasm for railways as a means of transportation than only a few years ago.»

railways continues and we see further investments, the railway could play an even more important part in the future, particularly in densely populated areas where there is a need for an efficient means of transport which is also environmentally-friendly, Skauge says.

Visible results. Even though the debate on high-speed trains is prominent in the media, there is no doubt that there is a pressing need for systematic upgrades and investments in the existing railway network. That work is already well underway. Skauge points out the ongoing work on the Vestfold Line, the Lysaker–Sandvika section, the Østfold Line, the Dovre Line and the construction of the Gevingåsen Tunnel north of Trondheim.

– These are all projects we were working on last year, and many of them will be completed in 2011, Skaugen says, pointing to other ongoing projects which will have positive ripple effects:

– By working systematically to improve the longest railway sections we will be able to transfer much of the heavy freight traffic onto the railway, thus relieving the road network. The additional effort to step up the work in the Oslo area is also positive in terms of increasing punctuality. Although the project is not complete, we can already see results, Skauge says.

The main artery. One aspect of the project comprises upgrades of the Etterstad–Lysaker section. This section is often considered the main artery of the Norwegian railway network. Modification work started in 2009



and involves replacing much of the infrastructure components, including rails, cables, switches and overhead contact lines. One of the major events last year was the installation of axle counters in the Oslo tunnel. The old track circuit technology was 85 years old and highly prone to technical problems. The new axle counters can be computer-monitored and Jernbaneverket estimates that 45 per cent of signal errors will be eliminated when the new axle counters enter use. This will significantly improve regularity.

The next big project is installing overhead conductor rails in the Oslo Tunnel during the 2011 summer closure, benefiting passengers in the autumn.

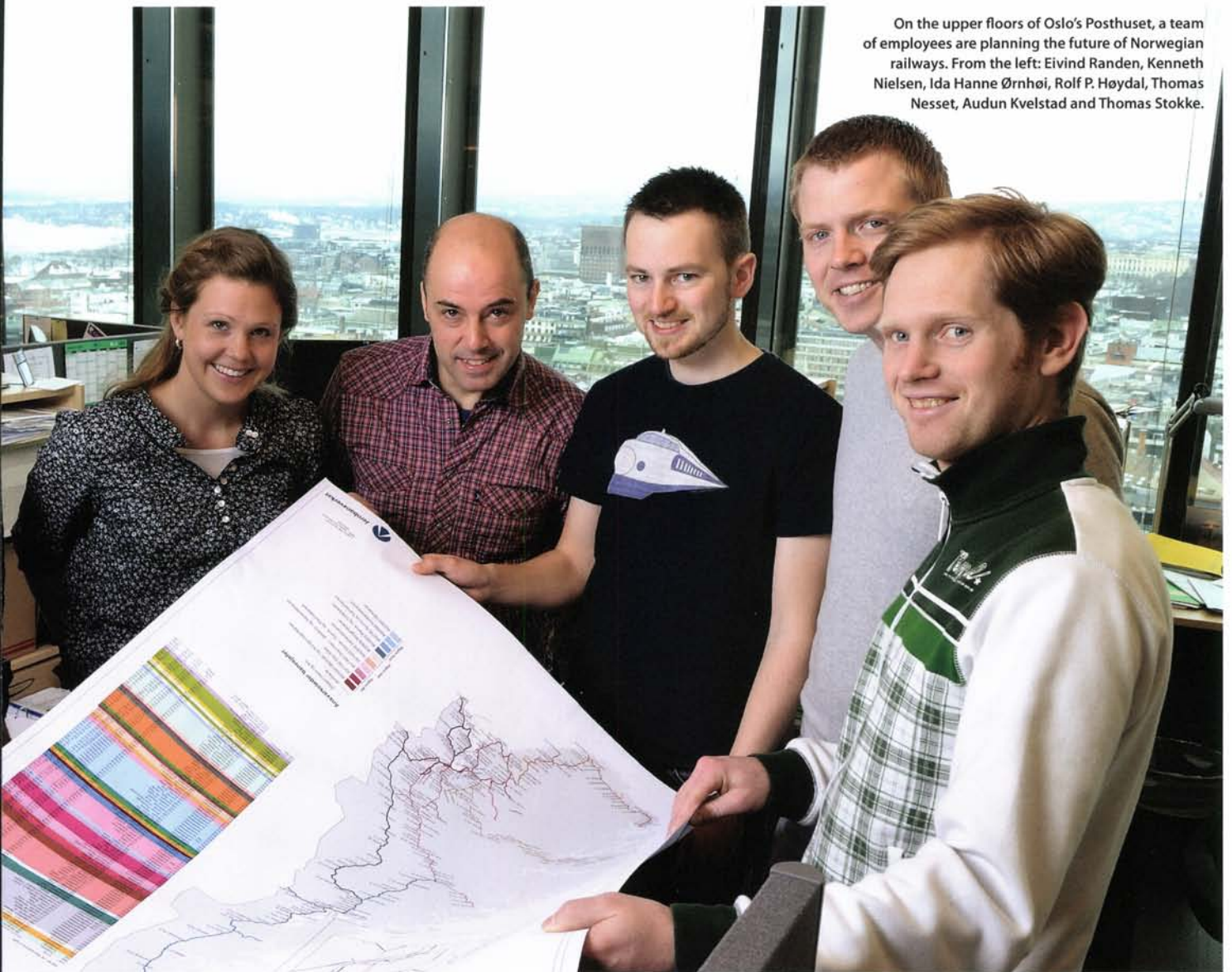
The cost of the Oslo project is estimated at NOK 1.5 billion and the project is scheduled for completion in 2012.



Anita Skauge,
Director of Strategic
Planning and Development

- ▶ Modernisation projects throughout the country
- ▶ The «Oslo effect» to be introduced from autumn 2010
- ▶ 85-year-old technology to be replaced

On the upper floors of Oslo's Posthuset, a team of employees are planning the future of Norwegian railways. From the left: Eivind Randen, Kenneth Nielsen, Ida Hanne Ørnhoi, Rolf P. Høydal, Thomas Nettet, Audun Kvelstad and Thomas Stokke.



SINTEF

Correct measures to reduce delays

SINTEF researchers have concluded that Jernbaneverket has introduced the correct measures to reduce the number of delays. This is the main conclusion from a recent report.

According to SINTEF, Scandinavia's largest independent research group, improved analyses and more measures to lower the railway's vulnerability to external factors could cut the so-called "delay hours" by 30 per cent.

– The SINTEF report confirms that we are on the right track, and that the measures that we have introduced will have the desired effect, says Thor Brækkan, SINTEF's main contact person during the report

work and ordinarily Permanent Way Superintendent on the Ofoten Line.

– The report confirms that we are making good progress towards achieving a reduction in delay hours of around 3 000 hours, Brækkan says.

SINTEF has conducted a thorough review of Jernbaneverket's plans and efforts to reduce the number of delay hours in 2013 to 6 000 hours, compared with an average of 10 300 hours in the past four years. According to the report, the number of delay hours may be reduced to 7 200 by 2013, taking into account the planned measures and the measures that have already been implemented.

The uncertainty of the estimates is plus/minus 1 000 hours.

The measures have already proved effective. The number of trains delayed in the InterCity region (see illustration on page 44) were, for instance, halved during the period 15 December–15 January 2011, compared with the same period last year.

The good commute

2010 saw the introduction of a number of new measures which improved the daily commute for many of our passengers. Frøydis Hovden is just one of our passengers who make the most of the peace and quiet on the train to catch up on some work.

At the time of our interview, Hovden had been commuting from Porsgrunn to her job at the Norwegian Association of the Blind and Partially Sighted in Oslo for four months. So far she is very pleased.

– My impression of the Vestfold Line is far better than its reputation might suggest. So far I have not experienced any significant delays and it's generally a good place to work. I have my most undisturbed working hours on the train, she says.

– We hope that many more of our passengers will share Hovden's experience as better economic framework conditions benefit passengers. In 2010, Jernbaneverket introduced a number of measures to improve train punctuality and customer information, says Traffic Director Bjørn Kristiansen.

Many points of information. – In 2010, Jernbaneverket established a new Traffic Operations and Customer Services Division with new areas of responsibility, including increased focus on traffic and customer information. The division opened a new customer service centre in September. The service centre handles everything from customer inquiries and comments to positive and negative feedback. The centre is conveniently located and uses many different forms of contact, says Traffic Director Bjørn Kristiansen.

– We have also increased our level of



Vestfold commuter Frøydis Hovden

expertise in terms of train information, ensuring that we provide relevant and correct information whenever possible. This is particularly important in the event of disruptions. In Oslo alone, 50 employees are working shifts to provide a 24-hour information service. Furthermore, we are in continuous dialogue with the Norwegian State Railway (NSB) and the Airport Express (Flytoget) to make sure that any disruptions are reported as early as possible. This enables us to help our customers find alternative means of transport such as bus or taxis, says Kristiansen.

Positive feedback. It is not only the information work which will be improved; the station areas will also get a make-over:

– A separate unit will be responsible for ensuring that the stations are clean

and tidy, easily accessible, cleared of snow and gritted, all to make sure our customers have a pleasant journey, Kristiansen says.

Last year, a number of new electronic information screens were installed in the Oslo area.

– This is a significant improvement. The objective of the screens is to provide customers with the latest information, not just over the loudspeakers. We have received positive feedback on this initiative, Kristiansen says.

According to Customer and Traffic Information Manager Yngve S. Andreassen another 58 stations were able to offer their passengers information on train services on new screens during 2010. Screens had previously been installed at 68 stations.

– The screens will provide customers with information about which trains are due, what platform the train will be departing from, any disruptions to services and alternative transport, Andreassen says.

Other initiatives which the customers will benefit from include mobile smartphone solutions displaying train services in real time, as well as a station timetable with real time information available at Jernbaneverket.no.

– In September, we launched our new customer service centre web pages and, starting in November, we launched access to an information screen via web browsers. This service is intended for organisations who wish to display train information on their own information screens, Andreassen says.



- ▶ Stepping up preparedness for harsh winters
- ▶ More information screens and tidier stations
- ▶ More railway staff

Rail Technician Einar Nilsen removes crushed stone and ice from the switches, maintaining punctuality and reliability – during winter as well.

Many measures, better winters

The number of delay hours in 2010 was higher than in previous years. This was mainly due to the harsh winter of 2009/2010. A number of measures were introduced to avoid a recurrence of last year's situation. Even though the winter of 2010/2011 was equally cold with heavy snowfall, we fared much better.

– We increased our winter preparedness. With more staff and better machinery and equipment we were better prepared for heavy snowfall and severe cold. Regular train services were resumed much quicker, says Beate Isetorp, Permanent Way Superintendent for the Greater Oslo Region.

– The 2010 renewal work in the Oslo Tunnel and at Skøyen and Oslo Central Station has paid off. The result of all measures combined is a more robust infrastructure with fewer faults. The effect of the various upgrades will become noticeable in the near future, Isetorp says.

Keeping an eye out for ice

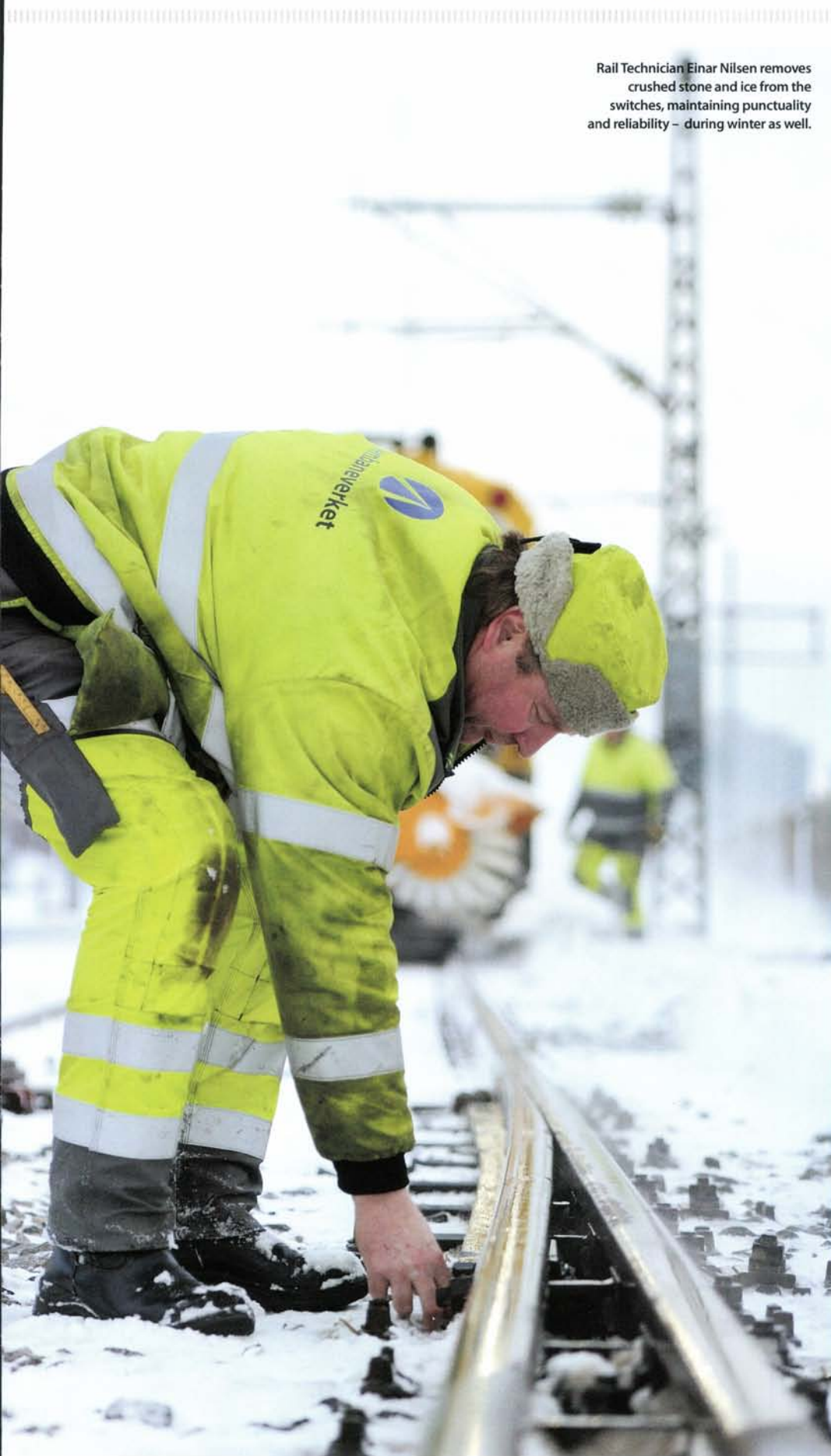
Jernbaneverket's ice guards are ready to respond to ice falling from the trains onto tracks and switches. Temperatures of 25 degrees below freezing and drifting snow do not deter them.

A small lump of ice can create a lot of trouble for Jernbaneverket, NSB and the passengers. If ice drops on to a central switch or a diamond crossover at, for instance, Oslo Central Station, it can easily cause major delays, unless the traffic controller is able to contact someone with the proper expertise who is also familiar with the rail section. This is when the ice guards play a key role.

– When a train covered by snow enters a warm tunnel, lumps of ice will form which may drop down onto the track. If the traffic controller spots any ice he will call us and we will respond immediately, says Rail Technician Einar Nilsen.

On weekdays in the Oslo area two ice guards are ready to turn out during the morning and afternoon rush hour. The ice guards are on duty no matter how cold it is.

– There is no lower temperature limit in this job. We just have to dress accordingly. Then we can work even if the temperature drops to 30 degrees below zero. We will do what it takes to make sure that trains are running, Nielsen says.



There for you

Jernbaneverket's customer service centre has experienced a massive response and receives good feedback on its services.

Jernbaneverket's customer service centre was established in September 2010 and is located in Drammen. Department head Kamal Kamboj was responsible for establishing the centre. She was joined by two executive officers who are responsible for providing the best customer service possible.

– Our main task is to receive and register customer inquiries and requests, process them and reply to the customers. We also make sure that improvement measures are implemented, says Kamal Kamboj.

Customers can contact us by e-mail and text message.

– We are also available on social media such as Facebook and Twitter, Kamboj says.

A wide range of services. The customer service centre is still finding its feet, and has only just started marketing its services. Nevertheless, the centre already receives more than 400 inquiries every month.

– Customers are often the first to spot if something is wrong, so it is important that we respond promptly. We are able to get in touch with the right people quickly, and launch improvements measures, Kamboj says.

– The customer service centre receives a wide range of inquiries and requests. However, most of them fall into the following main categories, Kamboj tells us:

1. Matters relating to train stations. This includes anything the customers experience from the moment they get off their bikes or park their cars at the

station, until they board the train. It can be anything from a clock being wrong to a malfunctioning screen, or there might not be enough parking spaces.

2. Insufficient or incorrect traffic information.

3. Feedback on Jernbaneverket's new mobile phone application.

– By the way, the new app is fantastic! It provides real time information about train services, and is reliable and easy to use. Most of the feedback we receive says that it is a good tool, Kamboj states.

«Customers are often the first to spot if something is wrong, so it is important that we respond promptly.»

Getting along with our neighbours

Keeping a good dialogue with our neighbours is an important factor for establishing credibility for Jernbaneverket as a professional developer.

For major developments and renewal projects there are dedicated information officers who function as neighbourhood contacts.

– Their responsibility is to function as points of contact for people living in the neighbourhoods and inform them about all aspects of the projects. It is good for the neighbours to have someone they can contact if needs be, says Communications Advisor Miguel Carazo of Jernbaneverket.

There are currently twelve employees working as neighbourhood contacts.

– The neighbourhood contacts are

also responsible for providing information about planned projects which may cause inconvenience for the neighbours, such as noise, dust and increased traffic. In such cases we send out information by post. During tunnel blasting work in populated areas we notify neighbours by text message if desired. They will then be notified ten minutes before the blasting work starts in a certain area, Carazo says.

In certain periods there may be a lot of noise, also in the night. In such instances, the neighbourhood contacts organise hotel accommodation for the neighbours.

– We also establish contact with schools in the area during the construction period, Carazo says.

Tracking the case processing. The customer service centre often receives positive feedback from customers who are pleased with the service they receive and the way we have handled their case.

– Many customers appreciate that we are present at so many platforms. We register every single request or inquiry. Where improvements are possible, the customers can observe the case processing via our web-based support system by giving us their e-mail address. They will then be able to check what we do and can track the whole process, Kamboj says.

FACTS

Service declaration

- Information: We will provide you with relevant information.
- Customer contact: We will be easily accessible.
- Railway stations: We will provide a clean, accessible and tidy station area.

1 New posters with Jernbaneverket's service declaration are posted at Oslo Central Station.

- ▶ Real time traffic information on smartphones
- ▶ Information on Facebook and Twitter
- ▶ Track your case until it is resolved

– Use the app! encourages Kamal Kamboj.



FACTS

Station upgrades

There are a total of 357 passenger railway stations on the Norwegian railway network, constructed over a period spanning 150 years. This means that many of them do not meet current requirements for accessibility and service. The need to ensure that all stations are accessible to all people regardless of mobility (universal design) will significantly improve the stations' passenger areas in the years to come.

Below are some of the minimum requirements which apply to modern stations:

- ▶ The principle of universal design applies in the station area and all the way to the platform. It also includes easy access to the station.
- ▶ All stations must have platforms with hazard signs and complete signage.
- ▶ Hourly schedules, railway maps, loudspeakers and other travel information must be available. Monitors and/or information screens showing current departure times and any delays are required.
- ▶ Information about Jernbaneverket's service declaration must be posted at all stations and railway stops.
- ▶ Benches, lighting and protection against the wind and bad weather (waiting rooms or shelters) must be available.
- ▶ Litter bins and tidy and clean passenger areas are required.

The most beautiful office in the country

The pilot project providing broadband and mobile service access has been a success. The service will now be introduced on more railway sections.

With green forests, blue lakes and yellow summer meadows zooming past your window, it is difficult to imagine a more beautiful office than the train. However, to be able to work efficiently in a railway carriage, the technical facilities must also be in place. Until now, however, the mobile phone and internet services along the railway have been of a highly variable quality.

Mobile phone operators said no.

Now many people are happy that things are about to change. First, last year's pilot project offering broadband and wireless internet access in the Oslo Tunnel was thoroughly tested, with satisfactory results, then the "broadband section" Lillehammer-Skien was launched.

– For many years the Ministry of Transport and Communications has tried to persuade broadband and mobile phone operators to extend coverage along the railway. However, the operators concluded that to do so would not be profitable. In 2009, Jernbaneverket was contacted by the Ministry with a request to assess the possibility of extending the coverage. In our assessment we operate with a cost estimate of NOK 450 million to develop mobile and internet services on the entire railway network, and with a schedule from 2010 to 2017, says Senior Engineer Martinus Grimsmo of Jernbaneverket.

– Last year, the Ministry of Transport and Communication responded by allocating NOK 20 million to start work on the first long test section between Lillehammer and Skien. This was launched as early as in the autumn of

2010. We have received new funding this year to extend coverage even further, Grimsmo says.

Free broadband services. The Norwegian State Railways (NSB), too, are happy with the broadband services, and would like to offer free wireless connection on all regional trains in the course of 2011.

– In our experience, the customers are not willing to pay for these services. We therefore decided to offer it for free as part of our customer service pledge, says Project Manager Arne Vidar Hesjedal of NSB.

– The Østfold Line will be ready in the summer and most trains on the Lillehammer-Skien section already provide the service. The service is also available on some trains on the Oslo-Bergen, Oslo-Trondheim and Oslo-Stavanger lines, Hesjedal says.

Happy commuter. Pål Nome from Tønsberg is an unofficial spokesman for commuters from Vestfold County. He has enjoyed wireless internet access on the train for a while.

– On the whole, it is a very good service. At first it was reserved for commuters with monthly or annual season tickets, and during the period when the wireless internet access was first made available to everyone, it was pretty useless. Now, however, it has become much more reliable, though tunnels still present a challenge, Nome says.

– If we didn't have access to wireless internet on the train, many of us would not have been able to commute. We spend between two and four hours on the train every day, Nome says.



- ▶ More passengers will get free broadband internet access on the train
- ▶ Jernbaneverket's target is internet access for "all" by 2017
- ▶ Commuters are satisfied

Commuters have been quick to make use of the new service.



Illustrative photo

More satisfied customers

Jernbaneverket has seen a significant improvement in customer satisfaction during disruptions to services.

The Norwegian State Railways, NSB, measures passenger satisfaction twice a year in twelve different areas. Jernbaneverket has a direct impact in three of these areas:

- The station area
- Information at the station area
- Information in traffic disruption situations

The objective is to achieve at least 67 points out of 100 on NSB's customer satisfaction index (CSI). The survey conducted in the spring of 2010 showed that customer satisfaction was at a historically low level of 60 points. This was

related to the operating difficulties we experienced during winter. However, the measures that we implemented to improve customer information were evidently very successful, because by autumn customer satisfaction had increased to 66 points. This is the best result we have achieved since the autumn of 2006 and applied to both local and regional services.

The measures included new monitors and loudspeakers at stations in the InterCity area (the Oslo–Lillehammer, Oslo–Halden and Oslo–Skien lines). We also increased the number of traffic information staff, renovated waiting rooms and established the new customer service centre.



Tore Amblie Bjorback, the Norwegian Association of Disabled (from the left), Dagfrid Hestnes, NSB and Egil Thorodd Andersen of the Delta Centre are active participants at Jernbaneverket's user participation meetings.

We listen to our customers

Jernbaneverket has launched a number of activities and projects which will improve customer accessibility at the stations.

The 357 stations currently used for passenger traffic were constructed over a long period of time and are of a varying standard. Many of our customers find it challenging to access the platform and board the train. In our work to make the stations more accessible, it is important to listen to customer input and experiences.

– To ensure that users with different disabilities are represented, we have established the Train Group, which is a special user participation group for rail transport.

Represented in the group are different disability organisations, train companies, the Delta Centre (a national resource centre for participation and accessibility) and the Ministry of Transport and Communications.

Jernbaneverket functions as coordinator and secretariat, says Head of Section Erik Hajum.

– Working with the user participation group for several years has been a very positive experience. The group members have extensive experience and all-round expertise, which is a valuable resource for Jernbaneverket's station planning and development, Hajum says.

Jernbaneverket will double freight transport capacity by 2020.



Freight – worth its weight in gold

Transferring traffic from road to railway is good for the environment. Moreover, it increases road safety and accessibility. One freight train replaces 24 heavy goods vehicles, and more and more players wish to transport their freight by railway.

- ▷ Increasing demand for rail freight transport
- ▷ One freight train equals 24 heavy goods vehicles on the roads
- ▷ Iron ore record in Narvik

Jernbaneverket's objective is to double the freight transport capacity on Norwegian railways by 2020. Our objective is contingent on extensive cooperation with the freight companies. One such company is CargoNet, a wholly-owned subsidiary of the Norwegian State Railways (NSB), operating a network of 21 freight terminals in Norway and Sweden.

Norway well ahead. – Despite our long and narrow country, we are relatively well advanced in terms of using the railway. Compared with many other European countries, we transport a high share of our part-load goods and fresh produce by train, and quality requirements are higher in Norway than in many other countries, says Head of Strategy and Information of CargoNet, Bjarne Wist.

In 2009, CargoNet's conveyances replaced 700 heavy goods vehicles from the roads every day all year round. This equals a reduction of 860 tonnes NOx emissions (nitrogen oxide). Energy consumption was reduced by an average of more than 82 per cent and carbon emissions were reduced by more than 94 per cent – compared with the corresponding quantities of road freight.

– We have noticed that our customers want to transport goods in the most environmentally-friendly manner. There is a fundamentally positive attitude to the railway. However, quality is the determining factor, Wist says.

Environmental focus. In 2010, a new company, CargoLink, entered the

freight terminals. Cargolink was established to develop the Autolink Group's focus on rail transport. Cargolink transports timber for Norske Skog and Borregaard, iron ore for Rana Gruber, cars for Autolink and consolidated goods for Schenker, Norway post, Bring and Tollpost, says Head of Intermodal Transport of Cargolink, Karl Ivar Nilsen. His experience is that there is an increased demand in the market for rail transport, spurred by a concern for the environment.

«Our target is to transfer half of BAMA's goods transport onto the railway by 2020.»

– A freight train normally holds 48 containers, whereas a heavy goods vehicle takes two. This means that one freight train equals 24 heavy goods vehicles. Our customers are concerned with the environment and wish to use rail transport if the quality is high enough. We have seen an increasing demand for just that, Nilsen says.

Fruit and vegetables on the train. BAMA is one company which transports much of their goods by rail. Approximately 25 per cent of the company's import volumes (approx. 40 000 tonnes) from Europe arrive by train. Once in Norway, 20 per cent of the onward transport is by rail.

– Rail transport saves time and the environment. Concurrently, there



Hanne Linnert, Information Manager of BAMA

are a number of logistical challenges. Transportation of fresh produce entails that BAMA has higher precision requirements than other companies. Moreover, the choice of transportation mode greatly impacts the quality of our produce, says Information Manager of BAMA, Hanne Linnert.

60 per cent reduction in carbon emissions. In 2009, BAMA adopted a strategy to increase the company's use of the railway as a mode of conveyance. – Our target is to transfer half of BAMA's goods transport onto rail by 2020. This will reduce carbon emissions by 60 per cent, and it is a faster means of transport. Moreover, the EU practises a very aggressive toll road policy, which means that the cost picture has changed in favour of railways, Linnert says. BAMA is on track to achieve its strategy:

– Since 2009, we have used Bring Frigoscandia to transport fruit and vegetables by rail from Rotterdam, which is a key hub in our import logistics. Produce from producers in the Netherlands, Belgium and Spain passes through Rotterdam, as do containers from overseas, Linnert tells us.

Increasing volumes of iron ore to Narvik

Measured in tonnes, transportation of iron ore to Narvik already makes up the majority of freight transportation on Norwegian railways. Due to an increase in mining activities in Northern Sweden, this figure is likely to double in the next five years.

The main player on the Ofoten Line is Swedish iron ore producer LKAB. From 17 million tonnes in 2010, the company's need for rail transport will double by 2020. 2013 will also see the introduction of a new player, Northland Resources, whose need for freight transportation is estimated to reach five million tonnes by 2015.

Together with Swedish transport administration and colleague Trafikverket, Jernbaneverket has started planning how the line capacity can be improved to handle the increase in traffic.

– We will have an even more challenging and hectic work day in the time ahead, says Thor Brækkan, Permanent Way Superintendent of the Ofoten Line, with a smile. Brækkan is very pleased with the development and is ready to meet the challenges that will arise.

– The increase in traffic will result in greater need for maintenance. Because of the weight of the trains, we currently have to replace

the tracks in the tightest curves every six to seven years. Now, we might have to replace them every fourth year. But we will look into improving the technical facilities and the maintenance system to reduce wear and tear. The track supplier is already testing rail steel of an even more durable quality.

More iron ore means that more trains will be passing each other, and we will therefore have more passing loops. Moreover, other mining companies are also considering using the Ofoten Line. This is in addition to the great increase in the general freight traffic into Oslo. In other words, Narvik's future is looking bright.

Freight traffic





Your home arrived by train

Did you know that 70 per cent of goods sold in Bergen have been transported by train? No? Neither did the Hordnes family.

«There is hardly one product group not represented on the freight trains»

1 Building materials

A number of large construction firms transport most of their goods by rail.

2 Books

Reading the latest best-seller? It probably came by train.

3 Furniture

IKEA is one of the companies transporting much of their goods by rail.

4 Drinks

Bergen has plenty of fresh water, but most other drinks come by train.

5 Electronics

The latest version arrives by train.

6 Entertainment

Board games are fun for the whole family. A lot of fun arrives by train.

7 Fruit

Straight lines and gentle curves over the Norwegian mountains are good for fruit and vegetables.

8 Clothes and sports equipment

Often, the latest trends also come to town on iron wheels.

That was a lot more than I thought and I was very surprised the first time I heard, says Anita Hordnes (42), who lives in Lyngbø, a suburb outside Bergen, together with her husband Tor (56) and her children Marte (14.5) and Matias (10.5).

– I don't think most people in Bergen are aware of how much we depend on the railway. On the other hand, I was pleased when I found out, both because of the environment and because I assume it means fewer trucks and better road safety, she says.

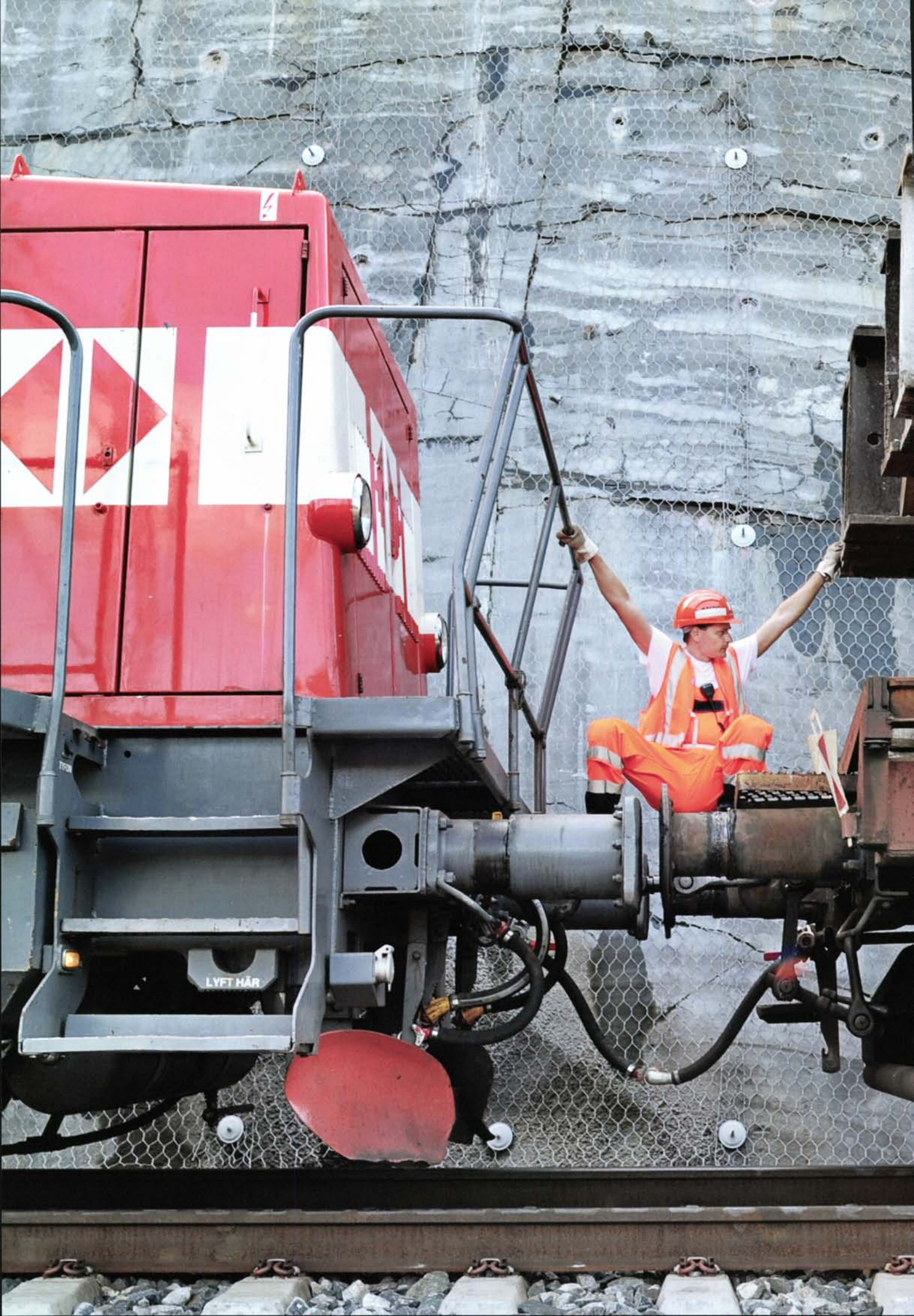
Other cities too. – Depending on where you draw the city line, it is fair to say that 70 per cent of all goods for sale in Bergen were transported by rail, confirms Information Manager Bjarne Wist of CargoNet AS, Norway's largest freight company.

– One could almost say that there is hardly one product group that is not represented on the freight trains, Wist says. Nor is Bergen the only city which depends a lot more on the train than most people are aware of.

– Stavanger, Trondheim and Bodø are examples of other cities where most of the goods are transported by rail, Wist says.

New awareness. After having gone through all household items transported by train in her home with our photographer, Anita Hordnes is ready to redefine one of life's great myths.

– One could almost think that the children came by train too, rather than the stork, Anita says with a smile.





Man and machine

On Norwegian railways, more construction, cleaning and maintenance work have been conducted recently than in the past ten years. On the following pages you can read more about what we have done for you and your railway section.



Xabgs 8076 983 1683-1
Svillevogn 100km/h
26300 kg (- 20,74m-)

Development projects

Best railway construction in the country

The expansion of the single track to a double track between Sandnes and Stavanger resulted in a significant increase in traffic.

At the annual industry trade fair Byggedagene, the double track section between Sandnes and Stavanger was named "Best Construction" in 2010. Before the construction work, capacity on the section was strained. The new double track reversed the situation, doubling the number of departures between the two cities from every 30 minutes to every 15 minutes. At the same time, three new stations were opened. The result of the development project is striking; after one year of operation, the average daily train traffic is up by 30 per cent.

High speed on the Follo Line

Jernbaneverket is planning to construct a new double track between Oslo Central Station and Ski (the Follo Line). Most of the double track will run through a continuous tunnel from Oslo to Vevelstad near Ski. The new track will be constructed to handle speeds of up to 250 km/h.

The current Østfold Line is a bottleneck for passenger and freight traffic into Oslo, and capacity on the line is stretched to the limit (strained section) at certain times of the day. Without the new double track no additional trains can be run on the section. A new 22-kilometre double track between Oslo and Ski will increase capacity, reduce travel times and improve punctuality on what is one of the busiest railway sections in Norway.

When construction of the new track is complete, the shortest travel time between Oslo and Ski is estimated to be 11 minutes.

Constructing a railway station inside the mountain

A new step towards a modern Vesfold Line is now being constructed between Holm and Nykirke.

The work on the area development plan was started in 2007 and construction was scheduled to begin in late 2010/early 2011. However, construction commenced as early as in the summer of 2010.

The current route from Holm to Nykirke is 15.1 kilometres long and has many curves and a poor standard. The line runs through avalanche-prone sections with a high risk of landslides.

The new double track between Holm and Nykirke will reduce travel times, increase capacity and, not least, improve punctuality of regional traffic. The new station for Holmestrand will be located inside the mountain. Constructing the station is technologically challenging; it will have four tracks and serve trains passing the station at speeds of up to 250 km/h.



- ▶ Winner of the «Best Construction» award
- ▶ Capacity doubled in Rogaland County
- ▶ Building high-tech station inside the mountain

– New, modern facilities will increase capacity, says Infrastructure Construction Director Harald Nikolaisen (right). Pictured here with Director General Elisabeth Enger and colleagues from the Infrastructure Construction Division.



Building the country by rail

Jernbaneverket is making plans for and upgrading Norwegian railways for the future.

Jernbaneverket's Infrastructure Construction Division is responsible for major railway developments, from the detailed engineering stage to complete railway facilities. In 2011, major planning and assessment work is being conducted to modernise the Norwegian railways. Concurrently, development projects are ongoing throughout the country.

A modern railway. The projects have one common objective: To create a modern railway for a modern society.

– The railway is an environmentally-friendly and area-effective means of transport. However, we need new tracks to be able to develop the railway in line with future needs. Much of the current railway infrastructure in Norway is old and worn, with a high proportion of single tracks. This means poor capacity and long travel times. New modern facilities will improve capacity and make sure passengers have a better journey. The increase in capacity will also benefit freight traffic, says Infrastructure Construction Director Harald Nikolaisen.

Reduced travel times. You and I will benefit from the measures in several ways. The new stations will have bicycle parking and be accessible to wheelchair users etc. But the journey itself remains our main priority. It will be more comfortable, with more departures and shorter travel times.

Harald Nikolaisen claims that the modern facilities will improve the daily commute and make the journey easier for everyone who wishes to travel by train.

– It will make living outside the city centre and travelling efficiently by public transport a viable alternative, Nikolaisen says.

He points out that transporting a great number of people by railway is both area-effective and energy-conserving.

– We provide significant cost reductions for society, in terms of financial as well as human costs, by reducing the number of serious traffic accidents, Nikolaisen emphasises.

Efficient transport network. The developments will first and foremost provide a modern and efficient transport network in the InterCity area in Eastern Norway (see illustration on page 44) and for local services around the major cities: Stavanger, Bergen and Trondheim. There is also a desire to transfer more goods from roads onto rail.

– Moreover, it is important to us to realise projects already on the drawing board. We want to be perceived as a professional developer who delivers long-term projects with stable operational reliability. By doing so we will fulfil our responsibility to society at large, the Norwegian state and the country's inhabitants, concludes Infrastructure Construction Director Harald Nikolaisen.

A time for everything

Jernbaneverket worked on several major development projects in 2010, and more is to come. Below is a list of the most important projects.

Started in 2010

1 Holm–Holmestrand–Nykirke

A new double track will reduce travel times, increase capacity and, not least, improve punctuality for regional services. Moreover, the double track will reduce the need for maintenance related to rock cuts and poor soil conditions.

2 Ski station

Redevelopments at Ski station will take place in several stages. The work is part of Norway's largest railway project, the Follo Line, consisting of 22 kilometres of double track from Oslo to Ski.

To be opened in 2011

3 Lysaker–Sandvika

The Lysaker–Sandvika section marks the final step in the removal of the bottleneck on the Drammen Line towards increasing capacity to improve train services in the entire Oslo area.

4 Barkåker–Tønsberg

A new double track will help reduce travel times between Tønsberg and Oslo. It will also increase capacity and thus improve regularity and punctuality to the benefit of all passengers on the Vestfold Line.

5 Gevingåsen tunnel

Gevingåsen Tunnel will improve capacity on the Trondheim–Stjørdal section, and close down an avalanche-prone and maintenance-heavy section.

Starting in 2012

6 Minnesund–Kleverud

The first section of a new double track

between Eidsvoll and Hamar. The project will increase capacity on one of the most heavily-trafficked single track sections in the country.

Being planned

7 The Follo Line

Scheduled for completion in 2018. A new double track between Oslo and Ski will increase capacity, reduce travel times and improve punctuality on one of the most densely trafficked lines in Norway. This project will provide Norwegian society with a four-track railway line into Oslo Central Station through Oslo and Akershus.

8 Farriseidet–Porsgrunn

The Norwegian Government will consider start-up of the project in connection with the 2012 fiscal budget. A new double track will reduce the travel time between Larvik and Grenland/Porsgrunn to 12 minutes, compared with the current travel time of 34 minutes, linking the Grenland and Vestfold regions closer together. Furthermore, the new double track will be constructed to improve punctuality and safety, increase capacity and provide environmentally-friendly transportation.

9 Bergen–Arna

The section between Bergen and Arna is the most heavily-trafficked single track section in Norway. A double track on the section will more than double the capacity, as well as facilitate increased speed and a more flexible service.

Sandbukta–Moss

Kleverud–Sørli

Second section Eidsvoll–Hamar

Eidsvoll–Minnesund

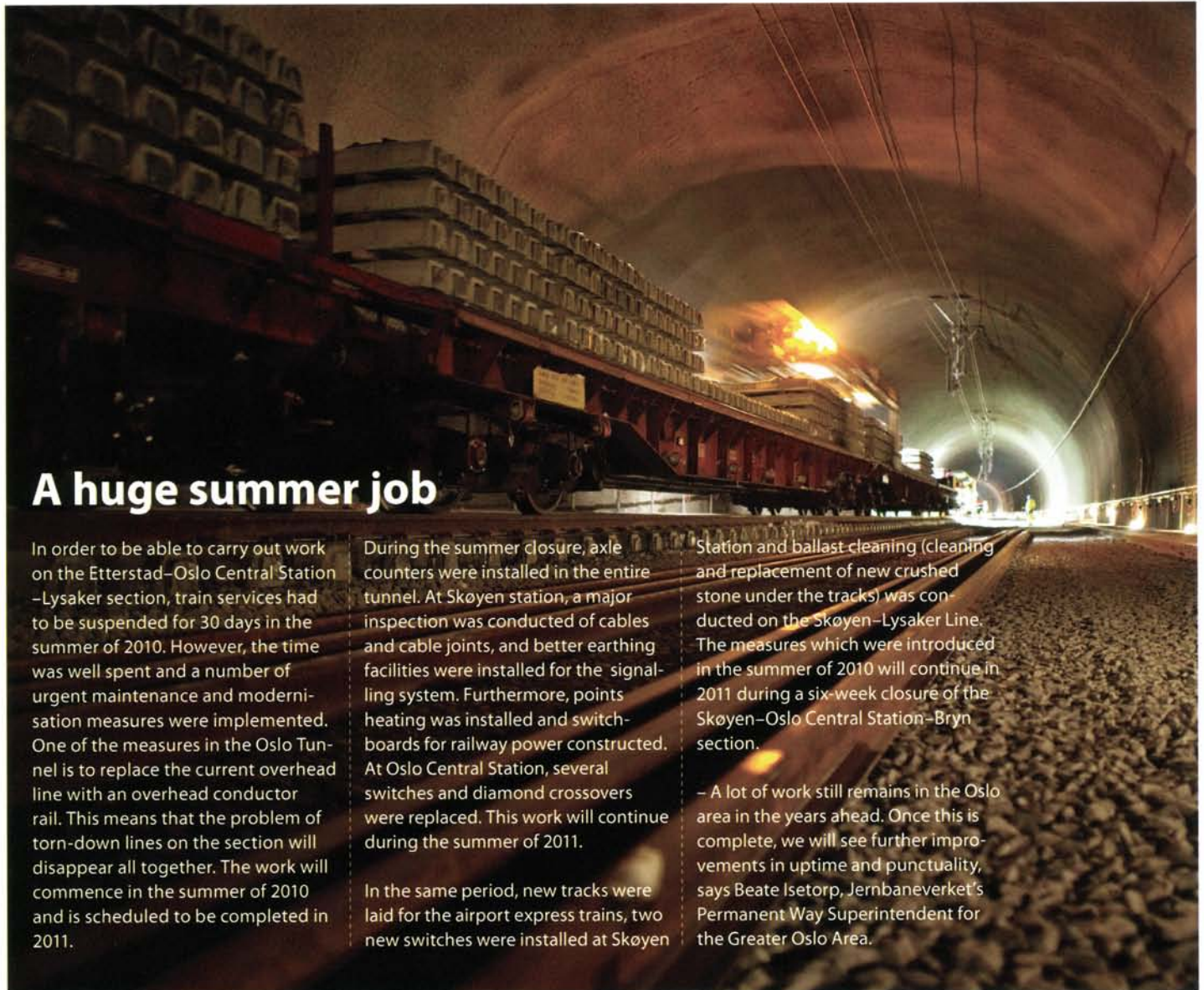
Third section Eidsvoll–Hamar





Other projects

- Passing loops
- Converters, electricity supply
- Freight terminals
- Marshalling yards
- Customer information systems
- Platform developments
- Station developments



A huge summer job

In order to be able to carry out work on the Etterstad–Oslo Central Station–Lysaker section, train services had to be suspended for 30 days in the summer of 2010. However, the time was well spent and a number of urgent maintenance and modernisation measures were implemented. One of the measures in the Oslo Tunnel is to replace the current overhead line with an overhead conductor rail. This means that the problem of torn-down lines on the section will disappear all together. The work will commence in the summer of 2010 and is scheduled to be completed in 2011.

During the summer closure, axle counters were installed in the entire tunnel. At Skøyen station, a major inspection was conducted of cables and cable joints, and better earthing facilities were installed for the signalling system. Furthermore, points heating was installed and switchboards for railway power constructed. At Oslo Central Station, several switches and diamond crossovers were replaced. This work will continue during the summer of 2011.

In the same period, new tracks were laid for the airport express trains, two new switches were installed at Skøyen

Station and ballast cleaning (cleaning and replacement of new crushed stone under the tracks) was conducted on the Skøyen–Lysaker Line. The measures which were introduced in the summer of 2010 will continue in 2011 during a six-week closure of the Skøyen–Oslo Central Station–Bryn section.

– A lot of work still remains in the Oslo area in the years ahead. Once this is complete, we will see further improvements in uptime and punctuality, says Beate Isetorp, Jernbaneverket's Permanent Way Superintendent for the Greater Oslo Area.

Roger inspects the rails

The rail line measurement and inspection vehicle Roger uses advanced technical equipment to measure the condition of the track and record any changes. Grooving and waving on the surface of the rail are measured by using two lasers and a camera which monitor the axle movements, whilst six lasers and camera measure the geometry of the track. The geometry of overhead lines is measured using a pantograph equipped with load cells and conventional electronics. In addition, images are taken every 20 metres.



Landslide protection

Climate change necessitates reinforcement of the track substructure in exposed areas. Jernbaneverket has conducted extensive mapping of areas prone to avalanches and landslides. In the first half of 2010, 18 new weather stations were planned and prepared along the railway network. On the Nordland Line alone, 57 new landslide measures were introduced in 2010.

Key figures for the Norwegian railway as of 31 December 2010

FIGURES

INFRASTRUCTURE¹

EL	Line	Kms track (Line in kilometres)	Of which	
			No. of km Double track	
●	The Nordland Line	734		
■	The Sørland Line	549	14	
■	The Dovre Line	492	4	
●	The Røros Line	382		
■	The Bergen Line	371		
■	The Østfold Line Western Line	171	64	
■	The Vestfold Line	138	17	
■	The Gjøvik Line	123	2	
■	The Kongsvinger Line	116		
●	The Rauma Line	115		
●	The Solør Line	88		
■	The Main Line	84	20	
●	The Meråker Line	70		
■	The Gardermoen Line	64	62	
■	The Østfold Line Eastern Line Ski-Sarpsborg	78		
■	The Randsfjord Line (Hokksund-Hønefoss)	54		
●	The Randsfjord Line North (Hønefoss-Hensmoen)	10		
■	The Bratsberg Line	47		
■	The Ofoten Line	43		
■	The Drammen Line	42	42	
■	The Arendal Line	36		
■	The Roa-Hønefoss Line	34		
●	The Numbdal Line (Kongsberg-Flesberg)	29		
■	The Flåm Line	20		
■	The Asker Line	15	15	
■	The Spikkestad Line	12		
■	The Tinnoset Line (Hjuksebø-Notodden)	10		
■	The Brevik Line	9		
●	The Stavne-Leangen Line	6		
■	The Alnabru-Loenga freight line	3		
■	The Alna Line	2		
■	Skøyen-Filipstad	2	1	
■	Dalane-Suldal	1		
	Total Lines open for traffic	3 950	241	
	Lines without regular traffic ²	217	0	
	Total	4 167	241	

- Electrified
- Not electrified

¹ For annual updates see www.jernbaneverket.no

² "Lines without regular traffic" includes the following lines: The Flekkefjord Line, the Valdres Line (Eina-Dokka), the Namsos Line, the Numedal Line Flesberg-Rollag, the Nelaug-Simonstad sidetrack, the Ålgård Line, the Randsfjord Line Hensmoen-Bergemoen, the Tinnoset Line Notodden-Tinnoset and other sidetracks.



ENVIRONMENT

	2008	2009	2010
Clean tracks (%)	79	82	85
Clean stations (%)	95	92	97
No. of locations with ground pollution	97	76	55
No. of animal hit by trains	1 877	1 778	2 292
Pesticides used (litres) ¹	13 364	15 376	13 609
Electric energy consumption by Jernbaneverket (GWh) ²	87	94	100

¹ The increase is caused by tree felling/clearing project.

² Figures for 2010 have been adjusted for degree days for precipitation and temperature. Precipitation has been included as an extra factor in 2010.

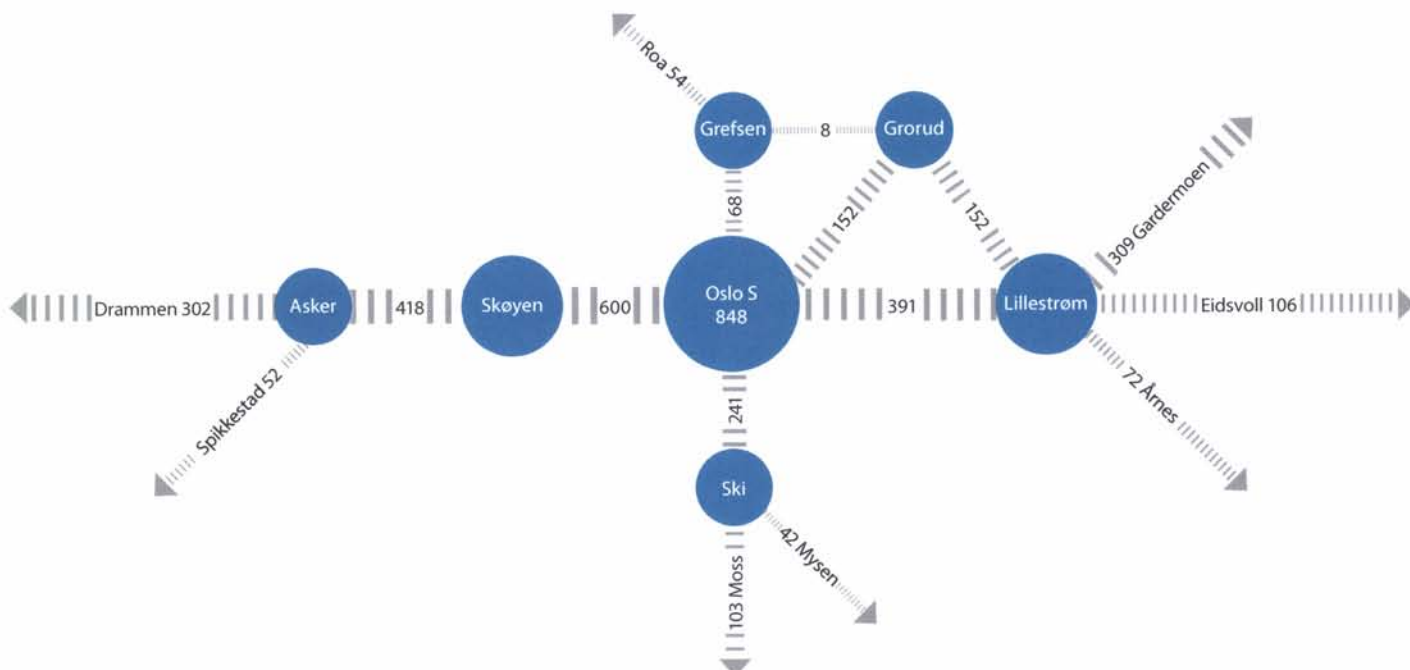
Financial highlights (NOK million)

	2010	2009	2008
Restructuring funds	0.0	0.0	0.4
Operations and maintenance	5 315.4	4 575.5	3 616.4
Operations and maintenance of the Gardermoen Line (Airport Line)	97.7	91.9	76.3
Investment in new infrastructure	3 864.9	3 134.0	2 364.9
Grant-funded expenditure	9 278.0	7 801.3	6 058.0
Track access charges	104.0	86.7	94.1
Sale of electricity for train operations	318.4	224.8	240.3
Other revenue	265.8	338.8	251.5
Revenue to state accounts	688.2	650.3	585.9
Total operating revenue	4 400.6	4 360.0	4 132.6
Total operating expenses	4 925.1	4 475.6	4 112.7
Total interest and other items	1.1	2.4	4.4
Result for the year	525.6	(118.0)	15.4
Grant coverage (as %)	80.8	84.9	83.5
Payroll as % of operating and investments expenses	21.9	22.5	24.8
Full-time equivalent employees in Jernbaneverket	3 275	3 066	2 941

The state accounts are based on cash accounting and follow the classifications in the national budget. The result for the year is in accordance with the accrual principle.

TRAFFIC

Total number of trains per day in the Oslo area



Tonne kilometres – in millions¹

	2005	2006	2007	2008	2009	2010
Local train traffic in Norway	2 215	2 380	2 453	2 550	2 430	2 115
Of this:						
CargoNet AS	2 203	2 356	2 430	2 480	2 390	2 114
Other	12	24	23	70	40	1
International combined traffic²	934	972	1 002	938	1 045	1 047
Of this:						
CargoNet AS	230	274	283	308	263	261
Malmtrafikk AS	622	621	633	558	494	683
Others	82	77	86	72	288	103
Total	3 149	3 352	3 455	3 488	3 475	3 162

Source: CargoNet AS, Malmtrafikk AS, Tågakeriet in Bergslagen, HectorRail (as of 2009), Ofotbanen Drift AS (up to and including 2008)

¹Tonne kilometre: Definition of transport of one tonne of cargo for one kilometre.

²Estimated traffic on Norwegian section for cross-border traffic.

Green Cargo AB, CargoLink AS, Peterson RailAB and Railcare Tåg AB did not report figures for 2010.

Passenger kilometers – in millions¹

	2005	2006	2007	2008	2009	2010
Local traffic in Norway	2 665	2 764	2 895	3 048	3 011	3 023
Of this:						
NSB AS (incl. Flåm Utvikling)	2 443	2 495	2 572	2 709	2 679	2 678
NSB Gjøvikbanen AS	0	25	55	57	59	59
Flytoget AS	222	244	268	282	273	286
International combined traffic²	35	37	59	63	67	72
Of this:						
NSB AS	29	29	32	33	31	49
Others	6	8	27	30	36	23
Total	2 700	2 801	2 954	3 111	3 078	3 095

Sources: NSB AS, Gjøvikbanen AS, Flytoget AS, SJ AB

¹Passenger kilometre: Number of passengers multiplied by distance driven.

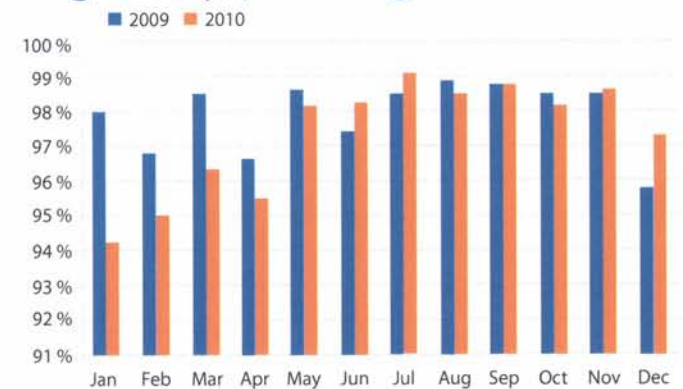
²Estimated traffic on Norwegian section for cross-border traffic.

Punctuality passenger trains



Average 2009: 86.6 %, 2010: 85.5 %

Regularity passenger trains



Average 2009: 97.9 %, 2010: 97.3 %

Summary of operating accidents 2010

Operating accidents according to definition by the UIC Safety Database with cost per incident > 150.000 EURO, fatality or serious injury or delay of train traffic > 6 hours. Operational railway.

Type of accident	Number	Fatalities	Serious injuries ¹
Collision	3	0	0
- Train operation (train–train)	0	0	0
- Train operation (train–object)	0	0	0
- Train operation (train–avalanche)	3	0	0
- Shunting	0	0	0
Derailments	4	0	3
- Train operation	4	0	3
- Shunting	0	0	0
Level crossing accidents²	3	3	1
- Secured with barrier, sound, light	2	2	0
- Secured with gate	1	1	1
Other level crossing accidents	0	0	0
Fire in rolling stock	1	0	0
Other accidents³	4	6	3
Other incidents⁴	6	0	0
Total in 2010	21	9	7

¹ Serious injury is defined as: person who is injured and who must be hospitalised for more than 24 hours.

² Applies to collisions between road vehicles and rolling stock.

³ Applies to accidents which resulted in fatalities or serious injuries.

⁴ Applies to other accidents which resulted in total delay of train traffic for more than six hours.

MAINTENANCE

Price level for maintenance and renovation per metre main track

Track section	Operation, corrective and preventive maintenance (NOK per metre)	Renovation, incl. Oslo project (NOK per metre)
The Main Line, incl. Oslo area	1 889	2 537
The Drammen Line	809	405
The Gardermoen Line	737	0
The Kongsvinger Line	392	993
The Gjøvik Line	634	187
The Østfold Line, Western Line	717	569
The Vestfold Line	296	251
The Sørland Line	368	371
The Bergen Line/Randsfjord Line	424	452
The Dovre Line	516	464
The Røros Line	217	159
The Nordland Line	250	168
The Ofoten Line	949	1 659
Other lines	150	61
Unspecified (including Infrastructure Management Division Staff)	25	27
Average in 2010	451	414

The figures apply to the Infrastructure Management Division and are partially based on estimated distribution.

Some of the maintenance work in 2010

Action	Amount	Unit
Ballast cleaning	80	Main line kms
Ballast cleaning preparations	105	Main line kms
Replacement of sleepers	52 000	Pieces
Replacement of tracks	25	Main line kms
Replacement of switches	14	Pieces
Overhead line renovation	45	Main line kms
Track adjustment, continuous	1 048	Track kms

- NOK 2 billion for upgrades in the Oslo area
- NOK 480 million for upgrades in the Greater Oslo Area in 2010
- Upgrades significantly improve punctuality

Maintenance coming to a place near you

Other major maintenance measures (replacement of components and facilities) aimed at boosting punctuality which were completed in 2010:

The Oslo area (Ski–Eidsvoll–Drammen)

In 2010, NOK 480 million was invested in projects in the Greater Oslo Area. The target is a robust and dependable railway line through Oslo providing a punctual and reliable train service. A total of NOK 2 billion will be spent on upgrading the railway in the Oslo area in the period leading up to 2014. Major projects implemented in 2010 included:

- Vegetation clearance Lysaker–Etterstad
- Substructure / superstructure Lysaker–Etterstad
- Overhead line Lysaker–Etterstad
- Information facility Lysaker–Etterstad
- Overhead line upgrades Spikkestad Line
- Electric power upgrades Spikkestad Line
- Superstructure renewal Spikkestad Line
- Information facility Drammen Station
- Track replacements
- Minor track renewals in the Oslo area
- Tunnel modifications upper Main Line

Østfold Line (Ski–Kornsjø)

- Accelerated forest clearing
- Station and platform improvements

Alnabru

- Points heating and return circuit upgrades at Alnabru freight terminal

Kongsvinger Line (Lillestrøm–Charlottenberg)

- Electric power upgrades at Kongsvinger Station

Gjøvik Line (Grefsen–Gjøvik)

- Accelerated forest clearing
- Replacing concrete sleepers with alkali reaction
- Replacing tracks

Vestfold and Bratsberg Line (Drammen–Skien–Nordagutu)

- Preparation for ballast cleaning
- Replacing sleepers
- Replacing tracks
- Replacing switches
- Replacing fences
- Neutralising tracks
- Renewing overhead line installations
- New track plan for Kongsberg Station
- Preparing public information at stations

The Sørland Line (Drammen–Stavanger)

- Preparation for ballast cleaning
- Replacing sleepers
- Replacing tracks
- Replacing insulated rail joints Egersund–Stavanger
- Drainage facilities
- Fences Egersund–Stavanger
- Rock and tunnel protection

The Bergen Line (Hokksund–Bergen)

- Preparation for ballast cleaning
- Replacing sleepers
- Replacing tracks
- Drainage facilities
- Replacing ballast
- Replacing pads and insulators
- Neutralising track
- Avalanche protection

The Dovre Line (Eidsvoll–Trondheim)

- Accelerated forest clearing
- Track renewal Dombås–Hjerkinn

Røros Line (Hamar–Støren)

- Replacing and rehabilitation of sleepers
- Signal system upgrades Hamar and associated stations

Nordland Line (Trondheim–Bodø)

- Accelerated forest clearing
- Preparation for ballast cleaning
- Replacing sleepers and rehabilitation
- Replacing tracks
- Replacing line – Medjå Tunnel
- Bridge rehabilitation
- Rock and landslide protection
- Substructure measures
- Avalanche and landslide protection Grong

Ofoten Line (Narvik–national border)

- Ballast cleaning
- Replacing sleepers
- Replacing tracks
- Renewal of avalanche protection – Kvitur

Significant improvement in punctuality

It is worth noting that punctuality figures for the autumn of 2010 show a significant improvement in punctuality for all sections where measures were implemented.

See attached Key Figures for more information about Jernbaneverket's maintenance work in 2010.



Demanding scenery

The Norwegian landscape is stunning, but also very challenging in terms of railway construction and operations. Fortunately, Jernbaneverket has many skilled experts who continually monitor and develop efficient avalanche and landslide prevention systems.

Strong iron rails cut past rocky hills, through tunnels and along lush fjords, running over mountain plateaux, defying snow, ice, water and cold. There is no doubt: Norway is a rugged and storm-scarred country.

For Jernbaneverket, this presents a wide number of challenges. Geologist Julie Engelién Bjørlien describes the main challenges and what Jernbaneverket does to address them.

Narrow cuts. New railway tracks are constructed at a safe distance from their surroundings. Nevertheless, much of the current railway still runs along the country's first, narrow railway route, where the trains pass close to the rock face. This is referred to as narrow cuts and represents a challenge as ice and rocks may fall down on to the track. These sections are inspected regularly and secured by dedicated rock removal teams.

– The rock removal teams have a special responsibility for cuts and tunnels. Protection work is conducted by either clearing the mountain of loose rocks and ice, or by bolting loose rocks and boulders. The teams do a very important job, Bjørlien says.

Avalanche and landslide risk. In several places the railway runs along sections prone to avalanches and landslides. As a preventive measure, Jernbaneverket has established warning systems on many of the sections. More warning systems will be introduced in 2011 on, among others, the Bergen Line and Ofoten Line.

To ensure a more robust and safe railway, NOK 70 million has been allocated for investment in avalanche protection in 2011.

Jernbaneverket's avalanche committee has mapped many of the avalanche-prone sections and is now working to implement physical protection and warning systems. In

2011, measures will be introduced on the Bergen Line, Nordland Line, Ofoten Line and Flåm Line, among others. This will be supplemented by dedicated clearance teams on most sections.

– Safe cuts and open drainage systems will save Jernbaneverket significant costs which could otherwise arise due to repairs and traffic disruptions, and could, in the worst case scenario, cause damage to material or personal injury, Bjørlien states.

Snow and ice. An efficient drainage system with ditches along the sides and culverts under the railway line will drain off most of the surface water. However, ice, gravel, stones, twigs and leaves may block the drainage. The culverts also tend to freeze in winter. Bjørlien points out that inspection and follow-up measures of vulnerable substructure objects such as water channels are important for robust railways in general, and particularly in extreme weather.

– It is essential that any blockages are removed. If not, the water will find a new course and wash away embankments and foundations from under the track, which in the worst case scenario, could leave the track hanging in the air. This has happened before, last time on the Nordland Line in 2010, Bjørlien says.

Provided that the drainage systems work, Jernbaneverket is able to handle most weather situations involving heavy precipitation.

Cold. In winter, rail breakages may occur. The rails contract and the steel structure becomes more brittle in the cold. Jernbaneverket's most efficient means of avoiding rail breakage is to ensure proper groundwork and regular maintenance. This includes ensuring the correct neutral rail temperature and making sure that the ballast gravel under the tracks is properly compacted.

Jernbaneverket also uses wheel damage detectors to discover damage and faults on railway wheels. Defective wheels will cause major additional strain on the tracks and may be another reason for rail breakages, particularly in the winter when the steel in the rails is more brittle.

Furthermore, intense cold and ice make overhead lines more susceptible to damage. Ice on the lines causes arcing between the overhead line and the current collector on the train due to poor contact. The arcing may cause damage to the top piece of the overhead line being torn down. If severe ice formation occurs, the ice will be knocked off the lines by Jernbaneverket's Operations Section.

FACTS

Gradual emergency preparedness

Jernbaneverket has introduced a gradual emergency preparedness system throughout the country. This will be effected in the event of extreme precipitation warnings, and uses three colour codes:

Green

Jernbaneverket collects weather data from the Norwegian Meteorological Institute and its own weather stations and conducts inspections of, for instance, culverts and the embankment terrain.

Yellow

The operative traffic controller assesses whether the speed should be reduced in cooperation with supervisors and the on-duty administration representative. Data from the weather stations are followed-up continually.

Red

Major risk of avalanches or landslides. The Permanent Way Superintendent continually assesses closure of the line. In winter, avalanche preparedness warnings are also provided by the Norwegian Geotechnical Institute (NGI).



- ▶ Combating ice and snow
- ▶ Bolting down rocks and draining away water
- ▶ Focus on physical protection and warning systems

Together with colleague Erling Nesbø, geologist Julie Engelen Bjørlien does what she knows best: solving challenges for the Norwegian railways. Here she studies the layers in a snowdrift north of Finse Station.



Students on the right track

Interest in railway studies has grown rapidly in the last year. Six months of railway engineering studies at Oslo University has left the students in no doubt: Railways are exciting!



Students find the course in railway engineering at Oslo University College "interesting and useful." Pictured, from left, are Christian Halland, Andreas Holager, Thor Gunnar Hansen and Espen H. Raa.

- ▶ Master of Railway Engineering to be offered soon
- ▶ New engineering programmes in Trondheim and Oslo
- ▶ Students believe in the railway



Interest in railway studies has soared, says Alf Helge Løhren, Jernbaneverket's external examiner for tracklayer apprentices and Adjunct Assistant Professor of railway studies at the Norwegian University of Science and Technology (NTNU) in Trondheim. Løhren is convinced that the increasing interest is a result of the political promises to focus on the railway in the years ahead.

Full focus on education. All of a sudden apprenticeships are hard to come by and there are ten times as many applicants for railway studies as before. This is reflected in the Norwegian Railway School's activities which have increased tenfold in five years. Last year, the school set a new record with 2 000 course participants/students.

«We have learned about the railway sector in general and have been provided with a good basis for deciding what direction to take next.»

Jernbaneverket has a wide focus on education. Future railway managers are trained on several levels:

Jernbaneverket has implemented trainee schemes offering engineering training in several subjects. Furthermore, we organise 13 courses through our own project management school. Jernbaneverket also cooperates with the Norwegian Public Roads Administration on establishing a transport school and a tunnel school. Moreover, new engineering courses are now available at NTNU in Trondheim and Oslo University College.

Attractive career opportunities. We meet up with four happy construction engineer students at Oslo University College. They do not deny that career opportunities were a decisive factor when choosing railway engineering as their optional subject in their third year.

– Railway studies seemed interesting and useful for future career opportuni-

ties, not least because it is a focus area where the Norwegian government allocates funding for construction and upgrades, says Thor-Gunnar Hansen.

Thor-Gunnar and his fellow students consider Jernbaneverket a potential future employer. Consultancy firms and industry construction firms are other good alternatives. But first they must finish their joint bachelor thesis.

– Our thesis looks at a new westward railway tunnel from Oslo Central Station, which would be linked to the new Bærum Tunnel opening in 2011. We believe that this tunnel could help solve the capacity problems in the existing tunnel, says Christian Halland.

Christian knows that there is not much chance of seeing the light at the end of this particular tunnel in the near future. During their studies, the students have been told that it takes an average of 50 years from when a transport project is first planned until it is completed. That has given the students a new perspective on working life.

– My dream job is to become project manager of a project that is actually completed, Christian says laughing.

Realistic approach. Upon completion of the course, the students feel they have been given a good foundation.

– We have learned about the railway sector in general and have been provided with a good basis for deciding what direction to take next, concludes Espen H. Raa.

Espen and his fellow students are working on a bachelor thesis together with the consulting engineering group Rambøll, a cooperation much appreciated by Christian.

– It's very valuable to be tutored by people who work on this type of project on a daily basis. A practical approach is an important supplement to the more theoretical part of the course. I'm now looking forward to gaining some work experience before starting on my master's degree, Espen says.

Anders Holager is the only one of the four not quite ready to embark on a career.

– I have always been interested in the railway, but I have decided to start on a master's degree straight away. Then who knows? Perhaps I get a job at Jernbaneverket when I am done?

Training in Jernbaneverket



Thomas Stokke (left), Tine Pedersen, Siv Seljesæter and Thomas Nettet in training for future management tasks in Jernbaneverket.

Training at all levels

Jernbaneverket's project management school

Jernbaneverket's project management school consists of 13 courses in project management available to employees. The courses combine e-learning with classroom teaching. A specially developed case from Jernbaneverket's daily project work is used for both e-learning and practical group assignments during taught courses. From 2011, Jernbaneverket's project management school will be available to the entire railway sector.

Extensive management training

Jernbaneverket also offers a special management training programme. A total of 280 managers will complete the management training programme. About half of them completed their training in 2010, and the remaining 160 will complete their training in 2011. The intention is to

strengthen managers' confidence and willingness to change and adjust their own behaviour. Jernbaneverket's values and desired cooperation, result, accuracy and safety culture are key terms in this respect.

The Infrastructure Construction Division offers a trainee programme for graduate engineers/master's degree graduates who are motivated and suitable for management tasks. The programme runs over two years and includes three practical training periods, various courses, training sessions and a mentor who monitors the project manager candidate's professional development. Up to six candidates are recruited each year.

Increasing student interest in railway engineering

Jernbaneverket was represented at various career fairs at universities and university colleges in 2010. We have seen a sharp increase in student interest.

At Oslo University College, 19 students chose the newly established course in railway engineering as their optional subject, many of whom are writing their bachelor thesis in cooperation with the railway sector. Also in Trondheim, there was a marked increase in the number of students choosing railway engineering; 39 students attended the lectures at NTNU. In 2011, work will start on the establishment of a practical master's degree in railway engineering at NTNU.

50 apprentices recruited

For the second year running, Jernbaneverket recruited more than 50 apprentices in 2010. Many of them have been offered traineeships and find that the railway of the future represents an exciting and challenging career choice. The training office for the railway sector has been granted more resources as a result of the growing number of apprentices in the railway sector.

- ◉ Brand new simulator system
- ◉ Popular apprenticeships
- ◉ Extensive management training

Training in 3D

Outside the engine driver simulator, the landscape rushes by in 3D. From the driver's seat, Principal of the Norwegian Railway School, Eva Ervik, confirms that the school is well equipped for the increasing number of applicants.

FACTS ||||| The Norwegian Railway School

◉ The Norwegian Railway School offers vocational training for engine drivers, several basic training courses, vocational courses for apprentices and further education and training for the entire railway sector. The Norwegian Railway School is located in Jernkroken in Grorud, Oslo. The school is a centre of excellence for the entire Norwegian railway sector.

◉ The Norwegian Railway School works closely with the railway sector and offers courses which match the needs of the railway sector. The school's ambition is to become a hub for skills development within railway subjects in Norway.

1 – The simulator provides very realistic training, says Principal of the Norwegian Railway School, Eva Ervik.

Isn't it great? Principal Eva Ervik's eyes light up in harmony with the warning lights on the control panel. Up until now, the Norwegian Railway School has rented simulator training facilities from the Norwegian State Railways (NSB). But in 2011, the school will open its very own simulator centre for traffic controllers and engine drivers. The solution offers state-of-the-art technology. The two simulators are actually able to communicate with each other directly. This has not been possible before.

– The simulator will give the students very realistic training. In addition, we can enter undesirable incidents into the simulator which will give the students training in handling difficult situations. They will also get plenty of train driving experience, Ervik says.

The simulator centre is a result of collaboration between the Airport Express and the Norwegian Railway School. Consequently, the cockpit simulator is just like entering the interior of an airport express train.

– Students will still have driving practice and take their exams out in the field. However, the simulator training provides a unique opportunity for safe and varied training, Ervik points out.

3 000 students. Eva Ervik took over as principal of the Norwegian Railway School at the end of October 2010. After only a few months at the helm, she has already staked out a course: the Norwegian Railway School will continue its development as a centre of excellence

and an updated school in line with the needs of the railway sector.

– The number of applicants for railway subjects has increased enormously and we have extended our courses correspondingly. The reason for this is increased developments, extensive maintenance and, not least, highly required safety measures. In addition, we have frequent recertifications. In 2010, we had almost 3 000 students studying exclusively railway subjects, Ervik says proudly.

The school provides training for Jernbaneverket and other players who work on or for the railway. Ervik says she would like to steer the school towards further partnerships in the sector.

– I believe interaction with the people we are here for is vital for the services we provide. We must be competent and attractive, and able to adapt to different needs. I focus on quality and, not least, on establishing good partnerships, internally and externally, she says.

Providing quality. After 15 years as principal at three different schools, Eva Ervik has experienced the value of quality assurance. Now she wishes to apply her experience to the Norwegian Railway School.

– I wish to further develop the quality of vocational training, ensuring that regulations and the curriculum comply with NOKUT guidelines (the Norwegian Agency for Quality Assurance in Education). We are already well on our way. At the railway school, we are in the process of updating the regulations in accordance with new



requirements. Furthermore, we are preparing a quality assurance system which will enable others to check that we supply quality, Ervik says.

The next challenge is to further improve the structure, system and quality assurance of the school's management systems, in cooperation with Jernbaneverket. Implementation is contingent on close collaboration with many players. Consequently, the process will take some time. However, Eva Ervik expects to have a sound framework in place for the further work by autumn.

– The development of educational material, such as e-learning, is a necessary and continuous process at all schools and centres of expertise. This is also the case at this school, Ervik points out.

The principal has a measurable ambition for 2011:

– My ambition is that we will be able to provide the railway industry with most of the courses and expertise they need. And that we enjoy good and close enough collaborations with the industry to have access to the best instructors, which is absolutely essential. We will deliver – and we will deliver quality, promises Principal Eva Ervik.

– The children are very active and ask many questions, says Mona Tviberg Hille (left).

No one beats the train!

The train is larger and heavier than most. No one understands this better than children – at least after they have given it some thought.

- ◉ Securing as many level crossings as possible
- ◉ Teaching children railway safety
- ◉ School visits yield results



When Jernbaneverket teaches school children rail safety, it has a clear effect. The effect can even be measured – by the reduction in the number of potentially dangerous incidents along the railways.

«**Undesirable incidents.**» The majority of undesirable incidents registered by Jernbaneverket are related to the public walking on tracks or level crossings. Safety advisor Mona Tviberg Hille from the Sørland Line pays regular visits to schools in the region to teach children about the dangers.

– We use a database of undesirable incidents called Synergi to plan our school visits. We check whether any of the incidents in Synergi relate to schools in the area. I then contact the principal and the school prepares a programme so that we can visit all the classes in the school. We usually spend one lesson with each class, Tviberg Hille says.

Whenever possible, she is accompanied by a uniformed police officer, an engine driver from the Norwegian State Railways (NSB) who has engaged the emergency brake, as well as a track inspector.

– Our aim is to influence the children’s attitude, making them understand how dangerous it is to walk on, or along, tracks and level crossings. We do a short presentation where we show photographs of local stations or level crossings and inform the children about the dangers. We also keep an open dialogue with them. The children are very active and have many questions and comments. They seem to understand the gravity of the situation, Tviberg Hille says.

Had to use the emergency brake.

– Whenever we make a school visit, we try to get some media coverage so that we can inform as many people as possible.

– When we visited Mosby School in Kristiansand this autumn, the local TV-station had a major feature, where they also interviewed the children, says Tviberg Hille. No doubt many people watched the programme.

«**Our aim is to influence the children’s attitude, making them understand how dangerous it is to walk on, or along, tracks and level crossings.**»

– On one of our subsequent school visits we were asked to sign autographs afterwards, Tviberg Hille says.

The visit to Mosby School was prompted by an incident on a level crossing where four children ran across the track just as a train was passing. The driver had to engage the emergency brake.

– The engine driver had a word with the children straight after the incident. They lived nearby, and their mother came running out. She had seen the train braking, but could not see the children, and was of course terrified. It was a very scary incident. The children’s mother contacted us and asked us to inform the children. The school also got involved and we organised a school visit, says Tviberg Hille.

– Such incidents show that we need to continue our work to remove as

many level crossings as possible in residential areas. Children are attracted to flashing lights and railway barriers closing and opening.

Makes an impression. Mona Tviberg Hille finds that children who have been involved in incidents are very embarrassed about it afterwards.

– Children view trains in the same way they view cars. They do not understand that a train cannot swerve off or stop. That’s why it’s so important to teach them how heavy and long a train is, especially freight trains, and how difficult it is for the engine driver to brake, Tviberg Hille says.

– It makes an impression on the children when an engine driver who has had to use the emergency brake tells them how unpleasant it is to see people walking on the track. The Egersund–Stavanger section is the worst in the country in this respect, and it’s not just children who walk on the track, Tviberg Hille adds.

– The school visits require a lot of resources. However, the reduction in the number of incidents after a school visit means that we will continue with our work, Mona Tviberg Hille concludes.

FACTS

Level crossings

- ◉ Jernbaneverket works continuously to secure and remove level crossings.
- ◉ 2010 saw the introduction of approximately 230 level crossing measures.

Why trains are so safe

Compared with other means of transport, rail travel is one of the safest ways of travelling. This is due to a number of factors.

Trains travel fast, require high-quality rails and have a very long braking distance. This may sound dangerous, but according to Statistics Norway train travel in Norway is one of the safest means of transport.

This is because of a number of safety barriers incorporated into railway operations. Here are some of the main safety features:

Automatic Train Control. ATC is a system which intervenes in dangerous situations. The control systems ensure that the train brakes automatically if speeds are too high, the engine driver brakes too late or is about to pass a stop signal.

Reduced speed. Sometimes construction work is conducted along the railway or there is damage to tracks. Jernbaneverket has a system which ensures that tracks are monitored at all times. This means that if minor faults occur on a section of the track, the train will be told to reduce speed on the relevant section. In rare cases, faults will cause a full stop. The tracks

will then be repaired as soon as possible.

Order of departures. The majority of Norwegian railway sections are single tracks. This means that the order of train departures onto the different tracks is very important. To run on schedule, and above all for safety reasons, the trains must be able to pass each other in an optimum manner at stations or on sections designed for this purpose. The order of train departures is based on meticulous calculations and a signalling system which is monitored by control centres at all times and across the country.

«Jernbaneverket works systematically to continually improve safety.»

Bespoke train radio communications system available everywhere. Jernbaneverket has developed its own bespoke mobile network, referred to as GSM-R, which is a modern

train radio communications system. The network is based on GSM technology, but has additional functions such as emergency calling, group calling and broadcasting functions. The system's availability requirement is 99.975 per cent and is available on all Norwegian railway lines, including in tunnels. The network is monitored around the clock from an operations centre in Trondheim.

Other measures. Jernbaneverket works systematically to continually improve safety to avoid personal injuries and damage to the environment or material assets. Moreover, the railway network is being upgraded to allow for climate change and special maintenance routines are designed with a focus on safety. In 2010, Det Norske Veritas evaluated Jernbaneverket's safety work, and an action plan has been prepared on the basis of the conclusions in the report.

All to make sure that Norway's safest means of transport is even safer!

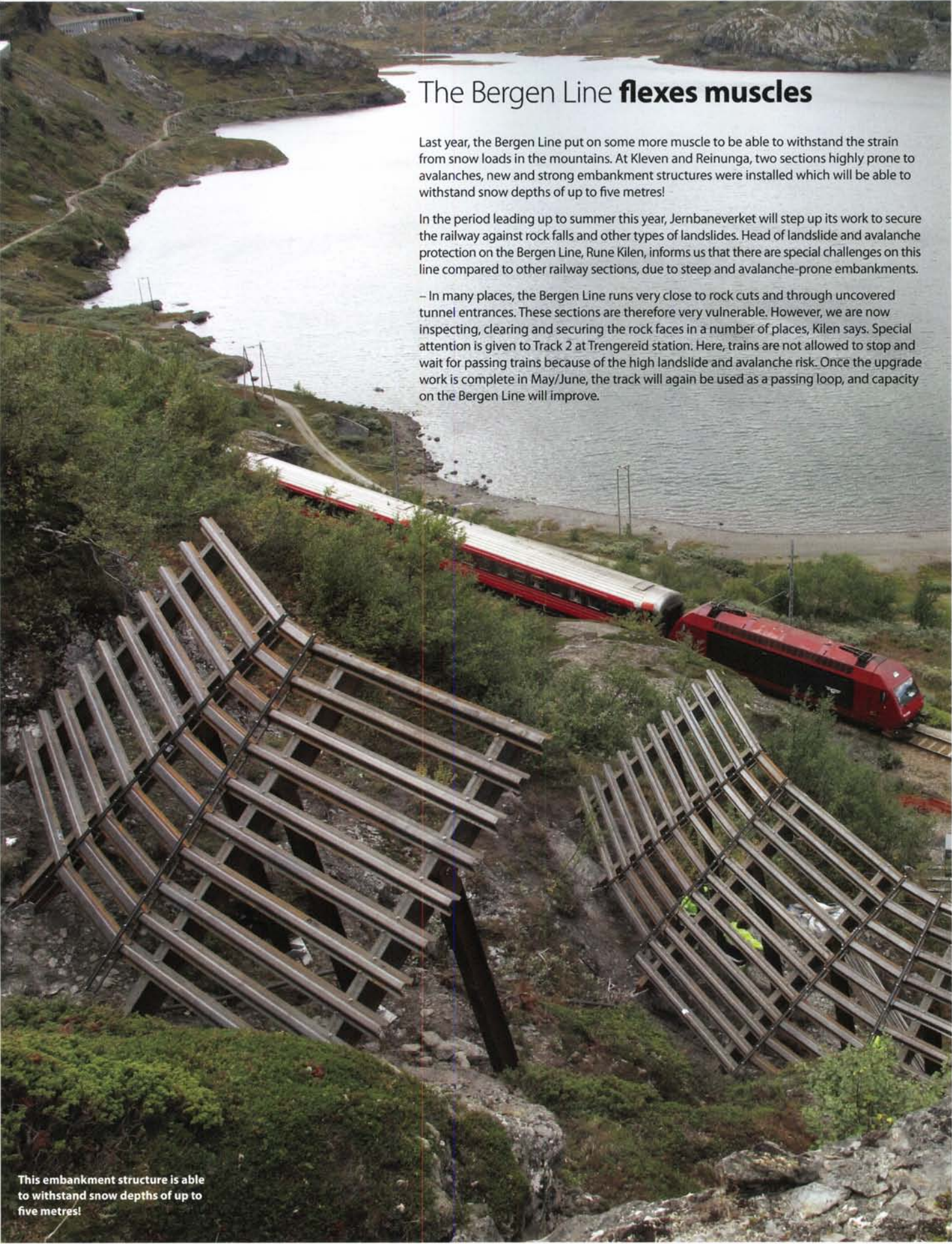
- ▶ Trains have automatic brakes
- ▶ Bespoke radio communications system
- ▶ Monitoring the tracks and the train traffic

The Bergen Line **flexes muscles**

Last year, the Bergen Line put on some more muscle to be able to withstand the strain from snow loads in the mountains. At Kleven and Reinunga, two sections highly prone to avalanches, new and strong embankment structures were installed which will be able to withstand snow depths of up to five metres!

In the period leading up to summer this year, Jernbaneverket will step up its work to secure the railway against rock falls and other types of landslides. Head of landslide and avalanche protection on the Bergen Line, Rune Kilen, informs us that there are special challenges on this line compared to other railway sections, due to steep and avalanche-prone embankments.

– In many places, the Bergen Line runs very close to rock cuts and through uncovered tunnel entrances. These sections are therefore very vulnerable. However, we are now inspecting, clearing and securing the rock faces in a number of places, Kilen says. Special attention is given to Track 2 at Trengereid station. Here, trains are not allowed to stop and wait for passing trains because of the high landslide and avalanche risk. Once the upgrade work is complete in May/June, the track will again be used as a passing loop, and capacity on the Bergen Line will improve.



This embankment structure is able to withstand snow depths of up to five metres!

Visions and values

One of the most environmentally-friendly means of transportation in the world is undergoing constant changes. Read more about what we are doing for the environment today, and what you can expect in the coming 10, 20 and 30 years.







Ensuring survival of the species

The Norwegian railway does not just provide clean energy and emission-free transport. Measures implemented along the railway will also prevent the loss of biodiversity in Norway.

FACTS

- ▶ **The Norwegian Red List** is a list of plants and species that are endangered in some way, faced with major population reduction or are naturally rare.
- ▶ **The Norwegian Black List** is a list of alien species which have a negative impact on the existing ecosystem in Norway.

According to the Norwegian Directorate for Nature Management, biodiversity is being reduced 100 times quicker than 50 years ago. The reason is human activity. As much as 85 per cent of the loss is caused by landscape interventions. The rest is mainly linked to pollution and climate change. Biodiversity is important for human existence. There is an international commitment to halt the loss of biodiversity.

The railway is an area-efficient means of transport. For instance, as many people can be transported on a double track railway as on two or even three-lane motorways. It goes without saying that habitats can be saved if railways become the preferred means of transport. However, even for railway

constructions, it is a challenge to reduce the impact on biodiversity.

Mapping biodiversity

As one of the largest property owners in Norway, Jernbaneverket has mapped biodiversity on its own land since the year 2000. This is done so that adverse environmental impact caused by the railway can be limited as much as possible. The mapping has become more extensive and systematic in the last two years as a result of the adoption of a new nature biodiversity act and requirements from the Ministry of Transport and Communications.

– The railway cuts through the landscape, and by doing so, it also cuts through a cross-section of Norwegian nature. So far, we have

registered several thousand valuable natural areas along the railway. Last year, we assessed these areas and concluded that railway operations and maintenance will have a negative impact on about 500 of the areas, says Environment Advisor Astrid Busengdal. The effort to quantify conflicts has not yet been concluded and will continue in 2011.

Flowers along the railway line

Sometimes, the design of railway facilities provides the eco-balance necessary to maintain or even create new valuable habitats for endangered plants and species. One example of such a plant is the mountain clover, which is one of the rarest plants in Norway. It grows only on Hovedøya Island in the Oslofjord and at the

- Mapping biodiversity
- Protecting endangered species
- Combating alien species



The railway is an environmentally-friendly means of transport. However, Jernbaneverket's activities have an impact on the external environment. When developing, operating and maintaining the railway, Jernbaneverket takes into account factors such as the natural environment, the cultivated landscape, biodiversity, noise, energy consumption and the visual environment.

Meeting the national target

By 2020, the number of people exposed to noise levels above 38 dB must be reduced by 30 per cent compared with the level in 2005.

The Norwegian Pollution Regulations set requirements for the maximum permitted noise level from roads and railways. The maximum permitted average noise level for indoor areas over a 24-hour period is 42 dB. In addition, the Norwegian Government and Parliament (the Storting) have adopted a national objective to reduce noise disturbance by ten per cent by 2020, compared with 1999 levels, and the number of people exposed to average noise levels above 38 dB over a 24-hour period by 30 per cent by 2020, compared with 2005 levels. A noise level of 38 dB compares to having a road with medium traffic load right outside your window. A mapping conducted by Jernbaneverket in 2010 shows that façade measures and/or noise abatement measures will be required for about 250 residences along the railway to meet the national objective of indoor noise level. The costs are roughly estimated at NOK 50 million.

Eidanger railway station at the terminus of the Vestfold Line. Dragonhead is another endangered plant for which Norway has a Nordic responsibility to protect. Dragonhead is found at four railway locations in Eastern Norway.

Bees, bumble bees and wasps also

«In 2011, we will look at how we can limit vegetation on embankments and at the same time retain biodiversity.»

thrive in open, sunny and sandy areas, which can be found in areas along the railway. The ortolan bunting bird was formerly known for nesting

along many railway sections.

– We believe the ortolan bunting bird likes the scorched areas along the railway. There are currently only about 100 pairs left in Norway and they live within a small area in southern Hedmark close to the Solør Line. Since 2003, Jernbaneverket has scorched vegetation along the Solør Line embankments to help provide a suitable habitat for the ortolan bunting, says Astrid Busengdal.

Many species that become extinct are linked to the old cultivated landscape in Norway. The species disappear as agriculture and the landscape change. Perhaps railway embankments can help create new habitats for these species?

– In 2011, we will look at how we can limit vegetation on embankments and at the same time retain

biodiversity. We will identify suitable methods for how to do this and the cost of these, says Astrid Busengdal.

Limiting alien species

The railway is a dispersion corridor and habitat for endangered species (Norwegian Red List), but also for alien species (Norwegian Black List). Jernbaneverket has prioritised combating cow parsnip, the "Tromsø palm" (Persian Hogweed), Japanese knotweed and Himalayan balsam.

– The dispersal of these species has been mapped previously and in 2010 we will continue to limit the number of plants. However, to succeed in combating the Black List species, we need help from private and public property owners, concludes Astrid Busengdal.

The environment and corporate social responsibility

The correct choice of rails is important for the environment.



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Shining from the inside

Jernbaneverket encourages suppliers to compete even more – for the sake of the environment.

- ◉ Recycling more and more, and introducing an environmental budget
- ◉ CO₂ emissions reduced
- ◉ The most environmentally-friendly rails in Europe

FACTS

Owns, develops and manages infrastructure

◉ Jernbaneverket manages much of society's infrastructure. Jernbaneverket's property includes railway tracks, platforms, waiting rooms, stations built after 1996, electrical railway facilities, signalling systems and facilities as well as traffic control facilities and telecommunication facilities. As well as being responsible for operations and maintenance, Jernbaneverket also constructs new infrastructure.

Common European requirements for a sustainable life-cycle for railway technical equipment will promote more environmentally-friendly acquisitions. The International Union of Railways (UIC) has prepared guidelines for environmentally-friendly train procurement and is now in the process of establishing environmental guidelines for the acquisition of railway technical equipment.

The work conducted so far has resulted in a list of products which the project group believes should be subject to environmental requirements. The list is called InfraGuidER (Infrastructure Guidelines for Environmental Railway Performance).

Sound environmental criteria.

For Jernbaneverket, the timing of the introduction of the InfraGuidER guidelines is impeccable.

– The list was a good tool for establishing sound environmental criteria when we were going to implement an NOU (official Norwegian report) for the environment and corporate social responsibility last year. At approximately the same time, we were about to establish framework agreements for rails and switches, both of which were covered in the InfraGuidER guidelines. It helped us apply the guidelines says Procurement Director, Per Melby.

Melby admits that in the past Jernbaneverket has focused too much on establishing environmental requirements which limit the negative environmental impact of finished products.

– The InfraGuidER list taught us to also focus on the production process. The final product is only as environmentally-friendly as its production process, Melby states.

Stiff competition. The InfraGuidER list puts forward many proposals for what you should ask yourself during the selection process. However, this is not a comprehensive list. When Jernbaneverket was going to enter



Per Melby, Procurement Director

into new framework agreements for rails and switches, we focused on three key elements: energy consumption, waste and the use of recycled steel.

We hired the consultancy firm ECo2Win to help us ensure that we received the proper documentation from our suppliers.

– They helped us ask the right questions, so we can conduct a good and reliable assessment of the information we have requested. It means we can compare apples with apples, says Per Melby with a smile.

At the start of the process, Melby set a requirement; when choosing suppliers the procurement group should let environmental considerations count 20 per cent.

«We have now purchased the most environmentally-friendly rails that can be found in all of Europe.»

It was very ambitious. It meant that, ultimately, the environment could be a determining factor on par with other criteria such as price. But we did it. The suppliers competed on the lowest carbon emissions, the most environmentally-friendly energy mix for the production phase, the lowest waste quantities and the highest

percentage of recycled steel in their production process. And now we have purchased the most environmentally-friendly rails that can be found in all of Europe. They have been put in place all over Norway as the old rails are gradually being replaced, says Per Melby proudly.

Complete focus on the environment.

The InfraGuidER project has now been completed. In 2011, guidelines will be established on how to set environmental requirements for purchasing of railway material.

– This guideline will help us create a uniform environmental profile. Furthermore, it will help us establish environmental requirements for the entire value chain. Consequently, we will contribute to reducing carbon emission, minimising the use of toxic substances and increasing the use of renewable resources from cradle to grave. We will then have a complete sustainable process chain – from purchasing of office equipment and cleaning to major development projects, says Per Melby.

CO₂-reductions on the Follo Line

Environmentally-friendly tracks and switches yield CO₂ reduction for the Follo Line.

On the Follo Line, all elements relating to construction must be recorded in an environmental budget. In the budget, new environmental rails and switches will yield substantial CO₂ profit. The measuring method, which has been developed by Jernbaneverket, comprises the entire life of all input factors.

– This pilot project ensures that we are one step ahead, so that we can make the most environmentally-friendly decisions in the further planning process. In the long term, we aim to use environmental budgets for all major projects, says Environmental Advisor Håvard Kjerkol of Jernbaneverket.

Norwegians are keen on high speed

A new study shows that Norwegians are very positive towards high-speed rail services between the major cities in southern Norway.

In February 2010, Jernbaneverket was tasked by the Ministry of Transportation to study the future of high-speed railway services in Norway. The second phase of the study was to establish fundamental prerequisites for high-speed trains, and the phase was completed in March 2011. In the coming year, the project group will study the sections and estimate the cost of constructing such train sections in Norway.

Five sections. – We are a small project group in Jernbaneverket who work on this, so we have hired some external consultants, in addition to the executive committee and the expert group, says Project Head Tom Stillesby.

Together with Project Coordinator Britt Narmo, Commercial and Contract Manager Per Ustad and Communications Advisor Lisbet Kierulf Botnen, they form the Jernbaneverket project group.

During a press conference in 2011, attended by journalists and members of the Storting's standing committee on Transport, Stillesby presented the results of phase two of the study.

– During the past five months we have worked with establishing the prerequisites for studies of the sections Oslo–Kristiansand–Stavanger, Oslo–Bergen, Oslo–Trondheim, Oslo–Gothenburg and Oslo–Stockholm, Stillesby says.

Largest market share. According to a survey carried out by consultancy firm Atkins, given the same price as air travel, seven out of ten would

prefer to travel by high-speed trains on all sections. The only exception is Gothenburg which is currently dominated by car use. Time-saving, comfort and the possibility of working while travelling are the main reasons why people would prefer travelling by high-speed trains.

– The premises of the survey were that ticket prices would be the same, travel time would be equal to, or shorter than air travel, the total travel time

«We have massive amounts of data and will prepare alternatives for both 2024 and 2040.»

would not exceed three hours and there would be hourly train services in each direction, Stillesby says.

The results of the survey show that with a travel time under three hours, the train would have the largest market share.

If a high-speed train ticket were to cost the same as airfare today, the market in 2024 would probably be 6 000 passengers each day between Oslo and Bergen, 8 000 between Oslo and Trondheim, 9 000 between Oslo and Kristiansand/Stavanger, 12 000 between Oslo and Bergen/Stavanger (via Haukeli) and 2 000 between Oslo and Stavanger.

Winter no problem. Weather and climate pose no problem for

construction of high-speed railway sections, as long as they are built and operated with the weather conditions in mind. In countries such as Germany, with both high-speed train services and winters, speeds are lowered in winter.

– We need to make accommodations for weather conditions, for instance by making sure that the maintenance organisation is staffed around the clock should something happen, Stillesby says.

Calculations also show that high-speed trains are just as safe as regular trains, even if speeds can reach up to 350 km/h. The reason is that these trains are constructed in an even safer way.

Although passengers are positive, there is not a large market for using high-speed trains for freight as the market is price-conscious and unwilling to pay more, although travel time is reduced.

Crunching the numbers. The project group is now entering the third and final phase of the study. It will be completed in February 2012.

– We have massive amounts of data and will prepare alternatives for both 2024 and 2040. In the autumn we will present the costs of the development. Then the question is how much of these costs should be included in the ticket prices, Stillesby says.

The expert group has determined that no country has been able to develop high-speed train services just through ticket prices, without government support.



- ▶ 7 out of 10 prefer high-speed trains to air travel
- ▶ Predicts 12 000 passengers daily between Oslo and Bergen/Stavanger
- ▶ Looking at costs and ticket prices



Project Head Tom Stillesby will present cost estimates for developing high-speed train sections.

Vast possibilities

What would happen if the Østfold and Vestfold Lines were completed with modern double tracks? The number of passengers would triple.

FACTS

Jernbaneverket's vision for 2040:

- ▶ Rail is the preferred mode of transport of passenger and freight companies alike.
- ▶ Rail has increased its market share all through the period leading up to 2040.
- ▶ Trains run on time and travel times have been significantly reduced.
- ▶ Long-distance trains compete with air travel, and in the major cities we have contributed to public transport absorbing all traffic growth.
- ▶ The freight trains' market share has grown at the expense of road transport.
- ▶ We have contributed to a safer and more environmentally friendly way of travelling in Norway.

This is one of the results of a feasibility study carried out by Jernbaneverket, assisted by several consultancy firms.

The estimates in the study show that by constructing double tracks on both lines, the number of passenger would triple. This is because the increased capacity will significantly reduce travel times and increase the number of departures.

– The study shows that construction of double tracks would improve rail services, bringing cities in the Oslo-area closer together in terms of travel time, says Project Manager in Jernbaneverket, Anne Siri Haugen.

Such developments will make Eastern Norway a more dynamic residential and working market, with Oslo as the hub in an urban sprawl of two million people.

Two main alternatives. The study looked at two main alternatives: One with a travel speed of 200 km/h, with a lower speed between station cities, and the second with a general travel speed of 250 km/h or more. Impacted municipalities and county administrations have been consulted during the

study, and have contributed recommendations and input to the work.

Cost estimates show that completion of a double track on the Østfold Line down to Halden would cost between NOK 16 and 20 billion, depending on the alternative and routes selected.

There are only minor cost differences between the speed standards on the Østfold Line. The differences on the Vestfold Line are larger. Here the cost of development will probably reach NOK 23 billion for a 200 km/h standard and approx. NOK 35 billion for a 250 km/h standard.

Travel time estimates. Travel time estimates show a reduction of 25 to 50 per cent in travel times. Travel times between Oslo and Halden could be reduced to one hour, 45 minutes quicker than today, while Drammen–Tønsberg could be done in 23 minutes compared with the current 54.

The study analyses the need for resources on the basis of a 15-year timeframe from adoption to completion, but the construction period will vary depending on the funds allocated for the development.

The recommendations will be

coordinated with the high-speed study and submitted as input to the Ministry of Transportation's work on the upcoming National Transport Plan to be published in 2013.

The InterCity area



Travel far in the same carriage

In the future it will probably be easier to travel from Narvik to Naples in the same carriage.

With the current itinerary, travelling from Narvik to Naples would take 55 hours. Of this, five hours is just waiting; waiting at stations and waiting at borders for new locomotives.

Traditionally, railways have been a

national concern, and all countries have developed their own signalling and electric power supply systems, as well as their own national rules of operations.

This is now changing. ERTMS, the new European signalling system, has been adopted on some European railway sections. Standardised solutions across

borders, improved service and increasingly harmonised regulations will in the long-term yield a more competitive European railway network including sections such as Narvik–Naples.

- ◉ Oslo–Halden in just one hour?
- ◉ Drammen–Tønsberg in 23 minutes?
- ◉ Oslo–Naples direct?



Illustration photo

Improved infrastructure in the north

Growth in the northern areas requires improved infrastructure. Industries such as oil and gas, mining, tourism, fisheries and aquaculture, manufacturing and maritime industries all depend on good transport alternatives to expand, provide more jobs and increase the number of inhabitants in the region.

The Norwegian Public Roads Administration, the Norwegian Coastal Administration, Avinor and Jernbaneverket have been tasked by Minister of Transport and Communications Magnhild Meltveit Kleppa to study the need for new infrastructure in the north ahead of the upcoming National Transport Plan (NTP). Increased focus on railways, more deep-water berths, good highways, main airports and improved oil spill preparedness will be studied.

New signalling system makes Europe easier

The new European signalling system ERTMS does away with red and green light signals along the track. Instead, the locomotive operator will see the signals on the speed indicator.

ERTMS means that all European countries will have a joint signalling system unlike today. This will make it easier to cross borders. The work of replacing the signalling system in Norway is fully under way. The first section to receive ERTMS will be the Eastern Line on the Østfold Line. It is about 80 kilometres long and the job will be completed in 2014.

Based on the experiences made on this section, Jernbaneverket will facilitate further implementation of the system on the remaining Norwegian railway network. Trains also need new technical equipment, and a training programme in the use of the

system must be implemented.

The new facilities are based on EU's shared European technology platform for signalling and speed monitoring of trains (ECTS/ERMST). The European specifications have been adopted into Norwegian law under the EEA agreement.

Highlights of the year

10

January

1 The cold period at the start of the year causes problems for railway operations. It is difficult to predict where on the railway sections the problems will occur due to the combination of snow, age and wear on the infrastructure. Both Jernbaneverket and the train companies increase their preparedness to attempt to alleviate the situation.

February

Jernbaneverket enters into a cooperation agreement with the NSB to ensure better traffic information to passengers during disruptions. The agreement includes standardisation of announcements and the NSB is consulted regarding where information channels should be placed and what should be prioritised. Jernbaneverket also increases staffing at Oslo Central Station and in Drammen.

March

2 On 24 March, 16 carriages come out of control at the Alnabu Freight Terminal. This results in the tragic accident on Sjørøya, causing three fatalities. The routines at the terminal are changed immediately. Jernbaneverket assumes responsibility for the accident and accepts a corporate fine of NOK 15 million. To prevent similar accidents in the future, several new derailing points are installed at Alnabu.

April

On 28 April, Jernbaneverket appoints civil engineer Tom R. Stillesby as the project manager for the study of possible high-speed railway lines in Norway.

The maintenance and renewal season starts. The budget for the Oslo area is NOK 470 million.

May

3 On 7 May, a ceremony is held marking the official construction start on the Follo Line. This will be the new railway section

between Oslo and Ski, which will be completed in 2018, and halve the travel time to 11 minutes. Minister of Transport and Communications Magnhild Meltveit Kleppa breaks the ground at Ski station.

May is characterised by a number of landslides and rock slides as well as slope failures on several railway sections due to large amounts of precipitation, melting snow and spring thaw. The Nordland Line is one of the sections that have to close, and extensive repairs are carried out during the Pentecost holidays. A construction road is made and 7 000 cubic metres of rocks are filled in before the track and sleepers are put in place.

June

On the Bergen Line this summer, rail track renewals totalling NOK 160 million are carried out in addition to the regular maintenance work. The additional efforts are to prevent sun kinks and limit the need for reduced speed. Much of this work is carried out at night.

July

From 10 July to 9 August, Jernbaneverket closes rail services between Oslo Central Station and Drammen to prioritise the replacement of old facilities causing delay. Work is carried out both high and low during this 30-day period. From 23 July, parts of Oslo Central Station also close for extensive work.

August

On 9 August, the resumption of rail services between Oslo and Holmestrand/Gulskogen is marked. Extensive track changes along Lake Engervannet in Sandvika have been carried out, the signalling system in Drammen has been upgraded and all cable junctions in the signalling system at Skøyen have been checked.

September

4 On 29 September, Jernbaneverket





4



5

launches its new customer service centre during a ceremony at Oslo Central Station. At the same time, the public is informed it can receive information about all trains on mobile devices. – This is a great leap forward for improving traffic information, Minister of Transport and Communications Magnhild Meltveit Kleppa says.

October

The state budget is presented. The Norwegian Government proposes an allocation totalling NOK 9.2 billion for Jernbaneverket in 2011. The framework for maintenance and renewal is proposed increased by NOK 2.2 billion. This is an increase of 19.3 per cent compared with 2010.

November

A press conference regarding internet access on trains is held on 9 November. The first section to receive such access is Skien–Oslo–Lillehammer. Jernbaneverket is working together with both the train companies and mobile and broadband service providers to ensure reliable coverage along all Norwegian railway lines.

5 On 15 November, the winter preparedness starts. Many measures are implemented in the Oslo area. New snow clearing equipment is acquired and clearing personnel hired, switches and drainage are improved and the traffic controllers have dedicated snow coordinators.

December

By the end of the year, 119 of a total of 357 stations have received new electronic information screens or displays showing departures and any delays. The stations are also equipped with improved loudspeaker systems.

On 22 December, tenders for the last phase of the high-speed railways study are opened. The consultancy firm that is awarded the contract will start its work in February/March. The firm will supply specific proposals for routes for four sections; northwards, southwards, eastwards and westwards. The final report regarding the high-speed railway service study will be presented by 1 February 2012.

157 years of Norwegian railway history

- 1854 ▶ Norway's first railway line (Kristiania–Eidsvoll) opens.
- 1890–1910 ▶ Railway lines totalling 1 419 km are built in Norway.

The Bergen Line

is completed at a cost equivalent to the entire national budget.

1909 ▶

The Sørland Line

to Kristiansand opens.

1938 ▶

1940–1945 ▶ **The German occupation forces take control of NSB, Norwegian State Railways.** Restrictions on fuel consumption give the railway a near monopoly on transport. The railway network is extended by 450 km using prisoners of war as forced labour.

1940–1945 ▶

1952 ▶ Funds are allocated for **electrification of the railway network** under the motto "Away with steam".

1952 ▶

1969–1970 ▶ The 1952 electrification plan is completed.

1969–1970 ▶

1996 ▶ Norwegian State Railway (NSB) is split into NSB BA (train operating company) and Jernbaneverket (infrastructure manager)

1996 ▶

The Gardermoen line

Norway's first high-speed line, from Oslo to Gardermoen airport, enters service with great success.

1999 ▶

2000 ▶ The tragedy at **Åsta**, Norway's third largest rail accident in 50 years, leaves its mark on the railways at the start of the new millennium.

2000 ▶

2004 ▶ NSB AS and Jernbaneverket jointly celebrate **150 years** of Norwegian railways.

2004 ▶

2005 ▶ **Norway's largest onshore construction project**, the new double track line between Sandvika and Asker, opens for traffic.

2005 ▶

2006 ▶ The railway enjoys **growth in both freight and passenger traffic**, and increases its market share.

2006 ▶

2007 ▶ **The Ganddal freight terminal** at Sandnes in Jæren is completed in December. In all, around 100 different construction projects valued at NOK 2.2 billion are under way.

2007 ▶

2008 ▶ **Project Oslo** to renew the railway network through Oslo starts in the spring. Introduction of a new **travel guarantee scheme** is approved.

2008 ▶

2009 ▶ A National Transport Plan is presented. According to the plan, **NOK 92 billion** will be invested in the railways over the next 10 years.

2009 ▶

2010 ▶ A decision was made to have two tunnel tubes in what will become **Norway's longest railway tunnel** on the Follo Line, the 22-kilometre long double track which will be constructed between Oslo and Ski.

2010 ▶

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