Jernbaneverket

On track

GLIMPSES FROM THE NORWEGIAN NATIONAL RAIL ADMINISTRATION'S ACTIVITIES IN 2013

The railways are developing fast

Norwegian railways have rarely moved as fast as they are right now: Passengers are flocking on board, construction is at an all-time high and the trains are on schedule.

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"The really big lift comes with the InterCity development, which is in full swing".

EDITORIAL

A good year for the railway

The railway achieved a number of great results throughout 2013. The most impressive development was the growth in passenger traffic, which increased for the country as a whole by more than seven percent compared with the previous year.

The largest increase was seen in eastern Norway, where the effect of the new route model introduced in December 2012 really took effect. The goal for passenger train punctuality was also achieved and ended up at 90.6 percent.

The transport needs associated with the population growth in and around the large cities must be solved through investments in public transport. This is one of the main points in the national transport plan (NTP) for the period 2014-2023, which was considered by parliament in June 2013. In line with this goal, Jernbaneverket is committed to facilitating even more trains being put into operation, particularly in eastern Norway. The work on several new stabling and turning facilities continued in 2013 in preparation for more trains when the clock-face scheduling model is supplemented from December 2014.

The really big lift comes in the wake of the InterCity development, which is the highest priority project in the national transport plan. The development is in full swing and there has been excellent progress in the ongoing projects during 2013.

The greatest challenges for Jernbaneverket during the year have been associated with more extreme weather conditions with subsequent floods and landslides. The Dovre line has been the most exposed stretch and had to be closed for several weeks to make way for repair works following the damage. Such closures pose difficult challenges to the goods traffic that has lost out on market shares to road traffic. The work on making the infrastructure more resilient through increased investments in maintenance and renewal will therefore have the highest priority going forward.

Jernbaneverket gears up. To ensure that as much as possible of the funding available to Jernbaneverket is utilised for measures on the tracks, Jernbaneverket has been working on an extensive streamlining programme during 2013. After large parts of the organisation provided input for the improvement activities early in the year, work has been undertaken to develop simpler and smarter working processes and to establish a more streamlined organisation with simple reporting lines. The new organisation came into force on 1 April 2014. This will ensure that we are well equipped to handle demanding tasks for the railway in the future.

E Enger

Director General

Winning the fight against time

For the second year in a row the railway has reached the punctuality goal of 90 percent. This has required both science and passenger education.

The major investment in renewals, maintenance and contingency is the biggest reason for reaching the punctuality goal in 2013. Another contributing factor is the excellent collaboration between Jernbaneverket and the train companies NSB and Flytoget. Both independently and together we have attempted to identify every minor element that could contribute to more punctual trains - including some passenger education.

Punctual trains sound simple in theory. This is not the case in practice. During rush hour all it takes is a bit of rain at Skøyen. The stop at the station takes longer than the timetable allows for, as passengers need to fold their umbrellas before boarding the train! In areas where the trains line up, like through the Oslo tunnel, all of the trains have to drive at exactly the same speed during rush hour and have the exact same stop duration at stations to prevent traffic issues from arising. Of the 884 scheduled trains entering Oslo Central station every day, 706 of them have to pass through the tunnel.

Stopwatches at the ready. NSB asked for SINTEF's assistance with the improvements. With their stopwatches at the ready they came out to determine how long each train spent at each station. They also looked at where the trains stopped, where on the platforms passengers were standing, where the conductor stood and what people were doing.

One of the measures was to determine where the train would stop each time and where the doors would then be located. At those locations the platforms were marked using letters that could also be found on the information panels. In good time before the train arrived, it was clear that the quiet carriage would stop at A, passengers with buggies would have to board the train at C and so on.

In short, the project was a success. When SINTEF arrived with their stopwatches again, the stop at the station clocked in at significantly less time than before the measures were implemented.

The Oslo project. The renewal of the Oslo hub in recent years is the most important contribution to improved punctuality, as interruptions here can rapidly affect numerous trains.

> "When SINTEF arrived with their stopwatches again, the stop at the station clocked in at significantly less time than before the measures were implemented. "

When funding was made available for replacement of old telecommunication and signal cables, sleepers and rails, upgrades to the driving machinery for the switches, etc. and not least a thorough cleaning of the entire Oslo tunnel, the results could be observed very quickly.

The most important individual cause of the overall punctuality not being even better in 2013 was the flood affecting the Dovre line on 23 May. In the space of just a few hours there was the same amount of precipitation as would normally be the case in two months in North Gudbrandsdal. The 100-year old railway body was unprepared and the damage was so extensive that the stretch will not be fully restored before sometime in 2014.

The Director General of Jernbaneverket, Elisabeth Enger, and Head of Customer and Traffic Information, Victor Hansen, agree that the letter marking on the platform has resulted in great time savings. Both research and the contingency improvements have contributed to the success.

Increased contingency. When water collects along the track or a signal system stops working, the overhead line is pulled down or a wobbly switch fails to assume the intended position, there are Jernbaneverket employees available 24/7 and ready to be called out.

In total Jernbaneverket has 1,420 employees in a contingency rota across the country. They are usually on their toes during winter and carry out other work when things are all running smoothly.

For the uninitiated, the "lump patrol" is the most exotic part of this contingency. In winter, when the weather indicates that there will be trouble ahead, the "lump patrol" will be ready at the tunnel opening when the train arrives. The chances are high that snow and ice will have melted sufficiently inside the tunnel for large lumps to fall off at the first switch. If a lump of ice settles between the switch blade and the rail, the next train will not be given the green light. The lump patrol is tasked with removing the lumps of ice as soon as possible.

New methodology. Through a major research programme, specific methodology has also been developed to establish the real reason why certain trains are particularly at risk of becoming delayed.

The methodology is based on where trains are frequently delayed. By moving backwards through the production chain, the real cause can be identified. It could be a weakness in the timetable, damage to the track which takes time to repair or it could be difficult to move the locomotive/engine car from the workshop to the departure station.

When the cause can be described it can also be solved. The PIMS methodology is now being tested on all trains in the Oslo area during rush hour.

Those who want to avoid a train that is often delayed can check the departures at their station via "Se punktlighet for mitt tog" at www.jernbaneverket.no (left column).

Me. Another important reason why trains have become delayed is me. That is, the me that rushes in at the last minute and who is used to being lucky enough that the conductor holds up the train and waits for me to board. But kind conductors and me being late is a poor combination.

In this respect, Flytoget has been strict for quite some time. NSB will now follow, even if it is difficult for a conductor to wave the departure off when they can see passengers running towards the train.

This is one of the elements NSB has been working heavily on in recent years. It has become much better. And I will just have to get used to the fact that it sucks when the train leaves without me.

Developments in passenger train punctuality

	2009	2010	2011	2012	2013
All passenger trains (goal 90%)	86.6	85.5	88.6	91.2	90.6
Flytoget/Airport Express Train (goal 95%)	94.3	92.0	94.3	96.2	96.1

What the researchers did

- Experts from SINTEF went out with stopwatches to determine what measures could be implemented on the platforms.

What Jernbaneverket did

- When the funding arrived, Jernbaneverket was quick to implement essential renewals. The results could quickly be seen.
- The 24/7 contingency was increased and the crew can now come out much more quickly than before when problems occur.
- Through a major research programme, specific methodology has been developed to establish the real reason why certain trains are particularly at risk of becoming delayed. This ensures that measures can be implemented at the correct stage.

What passengers were encouraged to do

- Being on time … An important reason for trains previously being delayed was passengers who arrived late but were still admitted. The conductors are no longer quite as nice.
- When it rains, fold your umbrella up as early as possible.

Gudbrandsdalslågen burst its banks and washed out the ground under the rails in 200 places on the Dovre line at the end of May. The flood caused damages totalling more than one billion Norwegian kroner in Gudbrandsdalen alone.

FOTO: SCANPIX/HÅKON MOSVOLD LARSEN

Battle against man-made waterways

A large proportion of Jernbaneverket's maintenance budget for 2013 was spent on urgent troubleshooting and repairs due to flood and landslide damage. But the biggest problems are not always caused by nature itself.

- Precipitation records in 2013
- Damages resembling those caused by tsunamis
- Safety maintained

Culverts under the E6 and the Dovre line became clogged during the floods in 2011 and 2013. Clogged waterways, full of stone and gravel, were opened up using high-pressure flushing.

Renewals are necessary to make the infrastructure more resilient. In 2013. 78 percent of the renewal work was exposed to competition.

The cause of damage can often be identified in developments and measures situated far away from the railway track.

In spring 2013 the Dovre line had to be closed down for three weeks following extensive damage caused by floods and landslides. The extent of the damage was enormous and the railway was broken in 200 places.

Jernbaneverket allocated all its personnel and materials and "hoovered" the contracting market for people and equipment to repair the worst damage as soon as possible. Already before the flood had reached its peak the plans for the redevelopment had been established and work had begun. Nevertheless, the damage was so extensive that it took three weeks of 24/7 efforts before the trains could run between Lillehammer and Dombås again. The work continued throughout the autumn and will continue for the majority of 2014.

"It is now crucial that we renew and make our own installations more resilient. The cause of the damage can often be found outside the railway fence," says the Permanent Way Superintendent at Norway's most flood and landslide-hit railway line in the last three years, Tormod Urdahl. He notes that water that has gone astray is often man-made. The need for coordination and comprehensive thinking is great. Following the floods in the same area in 2011 Jernbaneverket cautioned forest owners, landowners and local authorities not to build forest truck roads with undersized waterways.

"The causation is conspicuous," says Urdahl and believes that the large precipitation volumes combined with inadequately secured waterways and drainage systems were the cause of yet another flood causing extensive damage in May. "The positive aspects were that both notification and contingency worked, ensuring that safety was maintained."

"Water will often behave predictably when nature handles things on its own. But where man has made interventions of different kinds we will often experience problems. We are unable to think comprehensively and ensure that the water is led downstream to the larger waterways such as Gudbrandsdalslågen and Mjøsa. Since the Dovre line is situated downstream, our installations take quite an undeserved beating," explains Tormod Urdahl, who believes that there is no doubt that the Norwegian Water Resources and Energy Directorate (NVE) has both the expertise and authority to get involved in exposed waterways to ensure comprehensive solutions and prevent this kind of damage.

> "Water will often behave predictably when nature handles things on its own. But where man has made interventions of different kinds we will often experience problems."

In connection with the work to make the Dovre line more resilient, extensive charting has been initiated for the ground surrounding the railway. In collaboration with the Norwegian Public Roads Authority (NPRA) and the Norwegian Water Resources and Energy Directorate (NVE) several projects have been implemented to better secure Gudbrandsdalen and the infrastructure there.

"We often find that the cause of damages is identified in developments and measures far away from the railway track, whether it is an alpine facility, cottage development, residential development, along municipal roads, forest truck roads, county roads or classified roads. Many of them have contributed to the damages that have occurred," Urdahl explains.

In Lillehammer it rained as much in 36 hours as it would usually do over the course of one and a half months and further north in the valley the precipitation volume corresponded to two ordinary months. "Our installations are not prepared for this much precipitation over such a short period of time. They were put out of action through damages resembling those caused by tsunamis. The waterways have not been dimensioned for such volumes," Tormod Urdahl concludes.

Extensive measures were also implemented on the Bergen line and the Nordland line to gain control of water and landslide risks in 2013. There are a number of ongoing projects on the Bergen line in connection with drainage and landslide prevention. On the Nordland line the ground conditions in and along the layout of the line were mapped and an extensive programme is under way to reinforce the large railway embankments on the line.

FACTS

Extra pot for maintenance

- For 2014 the allocations for operations and maintenance have been increased by 500 million Norwegian kroner to just above 6 billion Norwegian kroner. This increase will enable Jernbaneverket to continue the crucial work to make the infrastructure more resilient.

FACTS

Did you know that …

- In 2013 Jernbaneverket exposed 78 percent of the railway renewals and 90 percent of investments to competition.

The costs of maintenance in 2013:

- Corrective (urgent) maintenance and contingency: 425 million Norwegian kroner.
- Preventative (scheduled) maintenance and inspections: 973 million Norwegian kroner.

The cutting for the Storberget tunnel between Farriseidet and Porsgrunn at Ønna, furthest into the Langang fjord.

Those who move mountains

Millions of cubic metres of stone are being removed to make room for the many Jernbaneverket projects across Norway. Resulting in saved travel time and improved comfort. Check out what is happening near you.

Tunnel project on rails

Jernbaneverket has been blasting its way through the mountain at Holmestrand in Vestfold since 2010. To put it mildly, it is no small task.

In addition to Holm-Nykirke, Project Director Stine Ilebrekke Undrum is also responsible for the new double track between Larvik and Porsgrunn, which is being built across several valleys.

- Holm-Nykirke (14.2 km)
- 12.3 kilometres in the tunnel
- 550 metre station hall

In Holmestrand a total of 12.3 km of tunnel has been blasted out and 2.9 million cubic metres of blast rock has been transported away. This corresponds to 116,000 lorry loads! However, this part of the work is now complete. Now the focus is on finishing work and fitting out the interior of the station hall.

Project Director Stine Ilebrekke Undrum makes no attempt to hide the fact that 2013 has been an exciting and challenging year for the Holm-Nykirke project. It was the peak year for tunnel driving and at most the tunnel was driven from nine attack points distributed across five tunnel and ground contracts. A total of two million cubic metres of stone was blasted out in 2013 alone.

"When we are transporting this much stone away it is important to collaborate closely with the local community," says Undrum and adds that the project has prioritised having a dedicated neighbourhood contact handling all inquiries from neighbours and other affected parties.

"That has been a success factor for the project thus far," she notes.

2013 began with the Snekkstad contract furthest to the south discovering an area of loose masses instead of rock in parts of the tunnel profile.

Additional safety measures: An "umbrella" consisting of steel pipes was drilled into the rock and filled with concrete. This was the chosen solution when the weakness zone in the station hall had to be passed. The tunnel cross-section was split into two, the detonation length was reduced from 5 to 3 metres and the rock was secured using grated arches.

"This is a good example of a challenge that ended up with a solution that had never before been used in Norway," says Undrum.

"It was the contractor Marti/IAV which proposed to create a "pipe umbrella". We lost some time but we gained a lot of knowledge. And we ended up with significantly better rock than expected in the mountain hall that will house the new Holmestrand station."

"Now that the tunnel driving is coming to an end the project is preparing for the technical railway work."

However, the contract strategy did not turn out as intended here. We tried for a large technical railway contract, without signals, but the market was not ready for such a large contract. There was zero response and we had to return to separate trade contracts. These turned out to be a success and the contracts have been signed. The contract to fit out the station hall itself will be entered into during summer 2014.

"In other words there is plenty of exciting work left to do, even though the tunnel driving is complete," concludes a satisfied Project Director.

The new station hall in Holmestrand will be 550 metres long, 35 metres wide and 18 metres high.

FACTS

Holm–Nykirke

- The project employs 73 people from Jernbaneverket and approximately 450 other people from contractors and consultants.
- In May 2014 production had reached around 55 percent of the estimated final cost.
- **Production costs in 2013:** NOK 1,125,630,000
- **Budget for 2014:** NOK 1,310,000,000
- **Final cost forecast:** NOK 5,569,429,000
- Completion autumn 2016

- New double track Larvik–Porsgrunn (22.5 km)
- Completion summer 2018
- Frequent train departures in Hordaland county

Furthest into the Langang fjord, the Ønna bridge climbs into the air. The opening of the Storberget tunnel is at the left end of the bridge, whilst the Ønsåsen tunnel starts on the right.

Revolutionary double track

22.5 km double track under construction between Larvik and Porsgrunn. The project will save passengers more than 20 minutes when the new track is put into operation during summer 2018.

Construction of the new double track between Farriseidet and Porsgrunn began in September 2012. In 2013 production increased at an exceptional rate as one gigantic contract was signed after another. Project Director Stine Ilebrekke Undrum explains that they focused on adapting the size of the contracts to the demand in the market. The market responded well to the new strategy and four large contracts with prices ranging from 792 million Norwegian kroner to 1.34 billion Norwegian kroner were finally signed.

"The project is having extensive ripple effects on local industry in Vestfold and Telemark counties," says Undrum. Many local subcontractors are involved in the project and products and services are procured from the local area. Nearly 600 people are working on the project, which has a price tag of 6.5 billion Norwegian kroner.

> "We are continuously working to improve safety to prevent injury to people and damage to the environment and material assets."

To optimise the technical solutions and create a positive collaboration environment, the work was initiated with a four-week coordination period between Jernbaneverket, the contractor and the consultant, before work began in the ground. Undrum highlights the Skillingsmyr contract as a good example. Here the coordination period resulted in a more efficient driving method for the tunnel than had originally been proposed, which will in turn reduce the length of the construction period.

FACTS

New double track Larvik–Porsgrunn

- 70 out of 600 people employed by Jernbaneverket.
- In May 2014 production had reached around 34 percent of the estimated final cost of 6.5 billion Norwegian kroner.
- **Production costs in 2013:** NOK 1,122,686,000
- **Budget for 2014:** NOK 1,880,000,000

A major project also requires great attention to health, safety and the working environment. This is particularly challenging in the Farriseidet–Porsgrunn project. Seven tunnels and ten bridges testify that the railway is being built in very rugged terrain – the layout of the line runs through several valleys.

"We are continuously working to improve safety to prevent injury to people and damage to the environment and material assets," says Undrum and adds that everyone must return home from work just as intact as when they left, every day.

ILLUSTRATION: JERNBANEVERKET/NORDICONSULT

Ulriken tunnel viewed from Arna station.

Arna–Bergen

The Arna–Bergen stretch is one of Europe's busiest single track railway lines with 130 trains passing every day.

The stretch is a bottleneck for train traffic to and from the station and the goods terminal in Bergen.

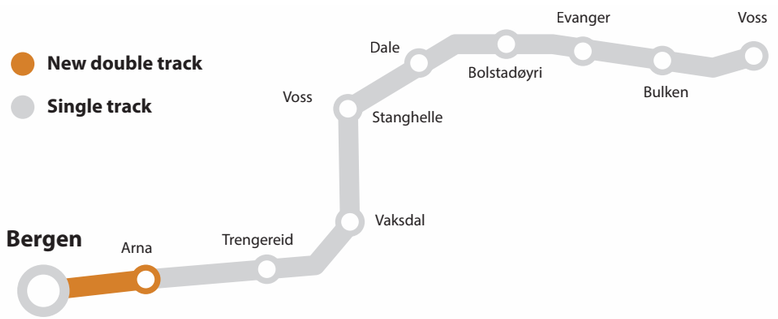
The development of a double track between Arna and Bergen consists of two parts: a new tunnel between Arna and Fløen and a double track from Fløen to Bergen with a new signal and safety system. The new safety system at Bergen station will also have the capacity to control Arna station. In addition, the current tunnel bore will be revamped when the new bore is ready and Arna station will be upgraded and altered.

The new tunnel is first and foremost a measure to increase capacity, allowing passengers more departures to choose from. Two tunnel bores also reduces the vulnerability associated with having only one tunnel bore.

For freight traffic there will be an average timetable gain of ten minutes as well as a punctuality gain. This is possible because of direct transport using a separate track for freight trains. For certain freight train departures this could result in a time saving of up to 30 minutes.

The tunnel contract for the new Ulriken tunnel was announced in October 2013 with two alternative driving methods, traditional blasting and the use of a tunnel bore machine (TBM).

JV Skanska Strabag and the use of TBM came out on top.



- New double track from Oslo S to Ski (22 km)
- The longest railway tunnel in the Nordic region so far (20 km)
- Completion 2021

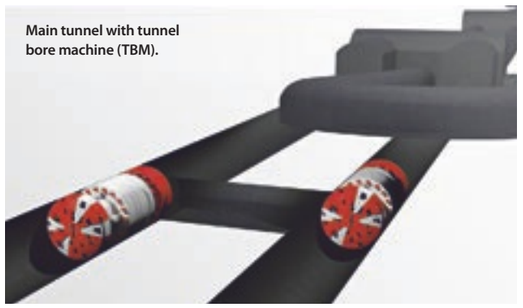
ILLUSTRATION: VIANOVA

The world looks to Follo

Several large international companies are positioning themselves to win major contracts in Norway. And the Follo line is where things really took off.

The Follo line will more closely link the two important public traffic hubs of Oslo S and Ski.

(Below) The Follo line will use four large tunnel bore machines to create two parallel tunnel bores. The machines will be nearly 200 metres long and the bore heads will have a diameter of approximately 10 metres. Photo: Herrenknecht AG



Main tunnel with tunnel bore machine (TBM).

When the first of the "pre-qualification rounds" for the Follo line development entered the market, it attracted attention far beyond the national borders. Many large international companies entered the playing field and they are now entering into collaborations with Norwegian contractors to win more major contracts.

In 2013, the Follo line took a big step closer to the final start of construction. The project has invested significant work in a new contract strategy in which contractors are given more responsibility and more freedom than before when it comes to deciding how to solve the tasks for Jernbaneverket. In total we are looking at four "EPC contracts", EPC being short for Engineering, Procurement and Construction.

Massive lift. Investment in such large contracts is pioneering work for Jernbaneverket. The contracts define the premises and goals and the contractor will carry out its work within this framework and deliver a complete installation by the date agreed.

"It has been demanding and work-intensive, but everyone has delivered and we are now really looking forward to getting started," says Erik Smith, Project Director of the Follo line project. The new railway will be ready at the end of 2021 if everything goes according to schedule.

The first pre-qualified suppliers for the two tunnel contracts, TBM (boring) and Drill & Blast (blasting) were ready in November last year. In March 2014 the pre-qualification process for the final two EPC contracts began: Accessing Oslo Central station (Oslo S) and Ski station.

Tempting the world. Many companies or joint ventures from many parts of the world signed up to the initial battle for the tunnel contracts. Jernbaneverket's strategy for the Follo project, in which there are far fewer and larger contracts would therefore appear to be a success.

"There has been great interest from major players with high levels of expertise. In our competitive strategy we have focused on the stimulation of expertise transfer and strengthening of Norwegian TBM technology in collaboration with large international companies with experience of such tasks. When we look at the constellation of pre-qualified companies it could appear that we have achieved just that," says Smith.

Project Director Erik Smith

Several of the Norwegian contracting companies have actually entered into collaborations with large international companies from countries such as Germany, Spain, France, Italy, Turkey and Austria. When the final two pre-qualifications are ready, the project management also expects these to contain a number of exciting opportunities.

"The new contracts for the Follo line are a pilot project for Jernbaneverket. It is important to us to contribute to strengthening the Norwegian contracting market by facilitating collaboration with and expertise transfer from external companies with broad experience of TBM technology and large-scale projects, etc.," says Smith.

Positioning itself. The Follo line is the innermost part of the InterCity investment south of Oslo. This is also a major point for the foreign companies.

"They consider the Follo line to be a strategic opportunity to establish themselves in Norway and want to use the project as an entry ticket for the rest of the InterCity development. Those who deliver great work here could participate in the competition for other projects in Norway," says Jan Vormeland, Head of Procurement in the Follo line project.

Educating companies. Norwegian legislation can be a challenge to international companies. In order to gain a mutual understanding and to avoid misunderstandings and conflicts along the way, the Follo line decided to invite pre-qualified companies to a full-day seminar on laws and regulations. Many representatives from the pre-qualified companies turned up to learn.

"Don't be too creative. The Follo project will be monitored by authorities, organisations and the media," stresses Torbjørn Amundsen, partner in the auditing and consultancy firm KPMG at the seminar.

The Follo line also places strict requirements on its contractors and will monitor them closely.

"There were a few "aha moments" associated with the requirements set out in Norwegian legislation. Jernbaneverket has great expectations of the contractors. We are looking forward to it all being put into practice when the main works commence," says Erik Smith.

FACTS

The Follo line:

- Built for speeds of up to 250 km/h
- Comprises a total of 65 km of new railway track
- Facilitates halved travel time between Oslo and Ski (from 22 to 11 minutes)
- Preparatory works initiated in 2013 and continuing in 2014
- Will be complete in 2021

- Unique collaboration between the NPRA and Jernbaneverket
- 5.2 million cubic metres of masses to remove

Records along Mjøsa

Norway's largest construction area involves 20 different nationalities, 1,500 employees and is being built at record speeds for a record sum.

The dimensions in the Joint Project, from the size of the construction machinery to the enormous construction area mean that I return home with a massive "WOW" having been out in the field along Mjøsa," says Project Director Erik Nilssen.

Nilssen is the head of Construction Projects East which includes, among other things, the Joint Project, Norway's current largest construction area. The Joint Project is a collaboration between NPRA and Jernbaneverket on the shared development of a new motorway and a new double track along Mjøsa, from Minnesund and two miles to the north. The largest pieces of construction machinery on the market are working side by side: no less than 5.2 million cubic metres of stone masses will be blasted away and moved.

"Never before has Jernbaneverket blasted away such large stone masses in the exposed zone and this close to the existing road and railway. Constructing in the middle of traffic is something Jernbaneverket will experience multiple times in future projects, and the Joint Project adds valuable experience as to how 12,000 cars and 95 trains can pass throughout the day through a narrow construction area in which blasting and excavation work is being carried out," Nilssen explains.

Steady collaboration. In December 2014, 19 out of 22 km of new motorway will open to traffic. The final part of the road will open in June 2015. In October 2015, 17 kilometres of double track will open.

"There are valuable lessons to be learned from a joint venture between two government bodies. To build something together, learn from each others' cultures, handle large contracts together and collaborate with foreign contractors is crucial. We have also handled a major international bankruptcy and did so in a good way," Nilssen explains. One of the three main contractors in the project, the Austrian contractor Alpine Bau, went bankrupt on 19 June 2013. The bankruptcy cost the project NOK 500 million but it has managed to stay within the framework of the budget and the only practical consequence is that only 19 and not 22 kilometres of motorway will be ready in December 2014.

The new E6 and new double track along lake Mjøsa are taking shape. In 2015 the new double track stretching from Minnesund and 17 kilometres north will open to traffic.

First up with a new standard. When it comes to water and frost protection in railway tunnels, the Joint Project is the first in Norway.

"We have dared to set an example as a project. In order for the railway tunnels to require minimal maintenance we are constructing using complete casting and waterproof membrane. This is a completely new type of water and frost protection that has not been used in Norway before, but I am confident that it will become a new standard in Norway," says Nilssen.

> "Never before has Jernbaneverket blasted away such large stone masses in the exposed zone and this close to the existing road and railway."

Visible where it's happening. In a project that is being built in record time and for a record sum with up to 20 different nationalities and 1,500 employees in full swing, awareness of safety is the number one priority.

"Even though we are constructing a lot in a short period of time, it must never be at the expense of safety. As a developer we are always visible on the construction site, we carry out systematic safety work and set out clear expectations of our contractors. In spite of this the Joint Project has been hit by two fatal accidents and this is something that affects us deeply and pushes us to be even more thorough in our efforts. It may very well feel massive and impressive to arrive out at the site. But it should never, ever be dangerous," says Nilssen.

Project Director Erik Nilssen

FACTS

Joint Project

- By the middle of May 2014 production in the Joint Project totalled approximately 6 billion Norwegian kroner.
- Final cost forecast: 10.1 billion Norwegian kroner

An additional lift in the north

Over the course of the year Jernbaneverket has conducted a great number of small and large development projects across the country. Stations are being upgraded, capacity increased and railway lines renewed.

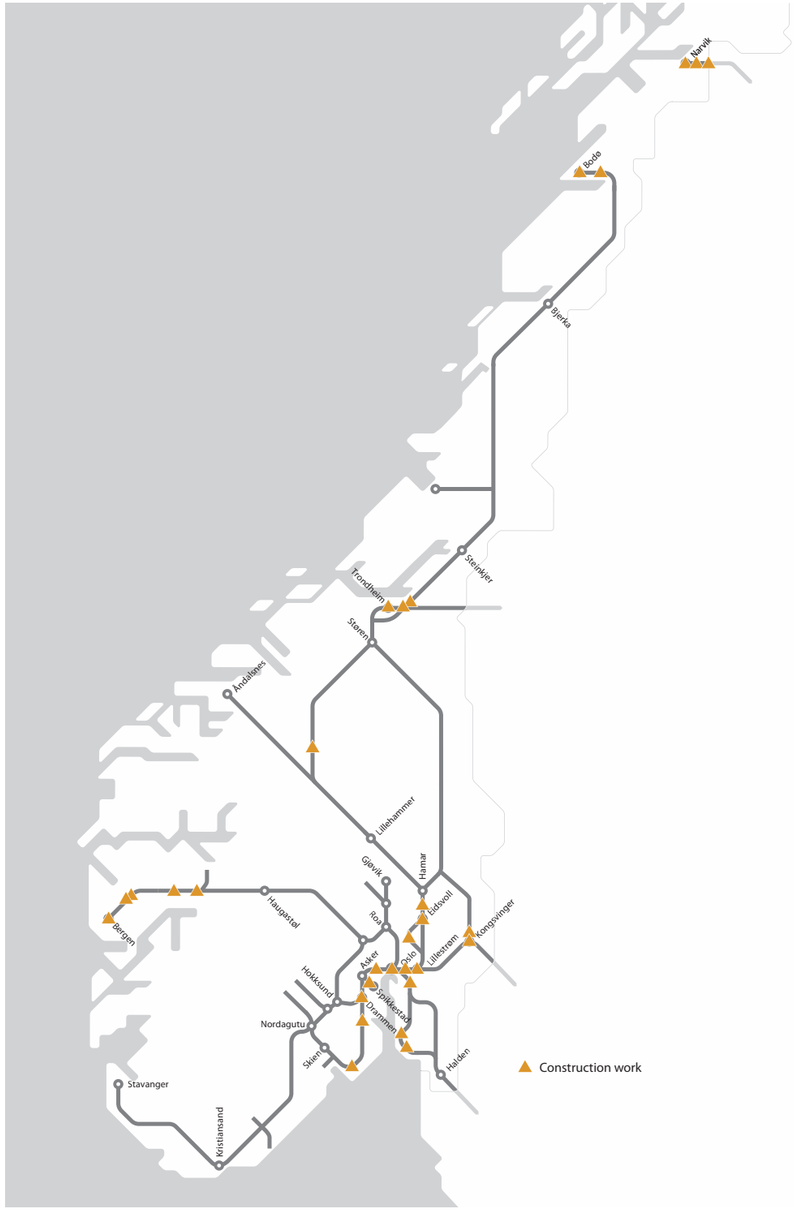
One of the places that experienced bustling activity in 2013 was the country's northernmost railway stretch. The Ofoten line has passenger traffic, ordinary freight trains and, most prominently, dense traffic from heavy and long ore trains. There is a great need to increase the capacity of the line and Jernbaneverket has several projects that will contribute to it being possible to run more, longer and heavier trains on the railway stretch.

At Bjørnfjell the works to extend the passing loop is in full swing and the fully extended track will be put into operation during autumn 2014 if everything goes to plan. Simultaneously, work is under way on the plans for the extension of the passing loop at Rombak and the upgrades to the power supply for the Ofoten line.

The Narvik harbour terminal has been altered and modernised. Additionally, the three-kilometre Fagernes line, the stretch between Narvik station and the terminal, has been equipped to handle an axle load of 30 tonnes. This facilitates the ore company Northland Resources being able to use Narvik as its shipping harbour.

Projects around the country

Jernbaneverket is blasting, building and improving the railway in many places around the country. Here you can find out where.



The InterCity revolution:
- 1 hour and 23 minutes from Lillehammer to Oslo
- 1 hour and 36 minutes from Oslo to Porsgrunn

InterCity: A planning job for the ages

The task is to plan 230 kilometres of double track and investments of 100 billion Norwegian kroner. It is no small responsibility that Project Director Anne Siri Haugen has taken on.

The head of Jernbaneverket's InterCity project emphasises that the national transport plan (NTP) has provided clear orders in respect of what needs to be built, how the train provisions will be improved in increments and when it all has to be ready.

"By establishing a separate organisation to handle the entire planning portfolio it is easier to succeed. The keywords are joint concepts and technical solutions, ensuring that as much as possible is done only once," says Haugen, who has been managing the project since autumn 2013.

The assignment In 2024 a consecutive double track will be completed to Tønsberg, Hamar and Seut near Fredrikstad and further on to Sarpsborg in 2026. According to the NTP, planning should aim for further developments to Lillehammer, Skien and Halden in 2030.

The InterCity project will plan the line sections not already in development or start-up. Investigation and planning of the new stretches is beginning now with an aim to build from 2018 onwards.

The Ringerike line has also been incorporated into the InterCity project after a study brought the planning of the line to the same level as the other stretches. However, the Ringerike line was added after NTP was adopted and the opening year has yet to be announced.

Predictability is crucial.
"Predictable framework conditions, particularly in respect of financing, is the most crucial prerequisite for success. The different planning phases and developments can then follow each other without breaks," says Haugen.

In the immediate future Anne Siri Haugen (centre) will manage the spending of 100 billion Norwegian kroner. Here at a public meeting in Moss together with Planning Manager Marianne Hermansen and the Mayor of Moss, Tage Pettersen.

"The double track through Moss is an example of the planning process having taken too long. As funding has not been allocated, the process has been ongoing for more than 20 years. This provides poor predictability for those affected by the development, those developing the areas surrounding the station and for passengers. Now that the stretch has been incorporated in the InterCity project we will work towards having the development plan adopted by the end of 2016. This will then become one of the stretches for which development will commence in 2018, as required by NTP.

> "Predictable framework conditions, particularly in respect of financing, is the most crucial prerequisite for success."

Haugen says that even though the InterCity investment is both desired and demanded, there will be disagreements and conflicts of interest in several areas.

"We need to identify conflicts at an early stage and determine how they will be handled, collaborate beyond what is set down by law and provide good information to all involved parties about when the various decisions will be made. Good communication is particularly important in the public planning process as set out in the Norwegian Planning and Building Act, where the layouts of the line corridors are selected using the municipal sector plan and the selected layout of the line is detailed using the development plan.

She notes that it is generally most efficient to keep the authority for planning within the municipality.

"Here there is experience and relevant knowledge and the municipalities will facilitate the development surrounding the stations. If there are major local conflicts of interest the central planning authority may be an option," says Haugen.

The way it currently looks, the Nykirke–Barkåker section of the Vestfold line is the only one that appears relevant for central government intervention. Here both the municipality and the county administration have asked the department for a central municipal sector plan.

Hub development. "Central localisation of stations is also one of the success criteria for the InterCity investment." Together with an area policy that encourages densification around hubs, centrally located stations also provide the highest number of passengers and the largest benefit to society. As set out in NTP, attractive hubs are also a key concept if the development of a modern railway network is to contribute to sustainable development.

"The InterCity development comprises a total of 21 stations with different characteristics. What they all have in common is that the project has to collaborate with other stakeholders to ensure that the stations become something more than just somewhere the train stops. We want to be predictable and clear and establish a joint approach," says Haugen.

Great minds are in demand. An important task for the project in 2014 is to secure the foundations for the further work by recruiting the right specialists. Many management positions were filled in the first half of the year whilst a number of other jobs will be advertised during the rest of the year.

"We need skilled, positive and knowledgeable people who know about planning, railways, structures, hub development, geology, geotechnology, land acquisition, communication, project management and a number of other disciplines. We are also reliant on good planning capacity with consultants, municipalities and county administrations," says Anne Siri Haugen.

"InterCity provides a massive lift and it is crucial that we ensure that society gets as much as possible in return for the major investments. To manage this we are completely dependent upon great work and collaboration at all levels!

InterCity will make eastern Norway smaller

More information about the project and the status of the different line sections can be found at www.jernbaneverket.no/intercity

FACTS

The InterCity project will facilitate:

- availability that meets the demand for transport in line with population growth.
- short travel times, frequent departures and excellent regularity.
- development of more densely populated areas along the routes and respite for the Oslo area.
- development of well-functioning hubs.
- the collaboration with other stakeholders in the cities contributing to as many people as possible benefiting from the investment.
- capacity to transport more freight using the railway.

- 1,500 train movements per day
- Country-wide traffic management system
- Automated customer information

Traffic control centre in Oslo: "The new country-wide traffic management system will provide all parties with much more information and improved predictability compared to today," says Director of Traffic, Bjørn Kristiansen (right). Sverre Kjenne, Head of Signal and Telecommunications in the Infrastructure Division is in full agreement.

How "the new railway" will be managed

The new traffic management system ERTMS will modernise and automate train operations in Norway. The system will be massively important to both traffic controllers and to you as a customer.

Jernbaneverket is working on a complete modernisation of the entire value chain when it comes to traffic management. A crucial aspect of this work is a new, country-wide system that will enable us to provide our customers, both train companies and train passengers, with information and predictability in a much better way than today, says Director of Traffic Bjørn Kristiansen.

Ensuring optimal and safe traffic flow. The remote control system connects the safety systems at the stations to the traffic control centre to ensure optimal and safe traffic flow. The system makes use of timetables produced in the underlying data systems.

In Norway the first data-based remote control system was put into operation as early as the mid-70s. The systems are still in use but have gained more functionality over time.

Over the years Jernbaneverket has acquired three systems for remote control of train traffic (EBISOC, VICOS and RailManager). However, it is very demanding to use different technical solutions to handle around 1,500 train movements per day.

> "With a joint traffic management system for the entire country we will be able to coordinate and strengthen the expertise of traffic controllers."

The implementation of the joint system ERTMS (European Rail Traffic Management System) will, among other things, provide better information about the train and its position. The system provides opportunities to analyse traffic conflicts, propose actions and automate schedules and is crucial in being able to handle train traffic in a satisfactory manner.

Current developments in data technology for traffic management systems are coming faster and faster. The objective is to assist traffic controllers to make good decisions in connection with unexpected events and traffic deviations.

Expertise – an essential factor. "With a joint traffic management system for the entire country we will be able to coordinate and strengthen the expertise of traffic controllers. Both the flexibility and the resilience of the railway will increase. If, for example, a traffic management centre is out of action, another will be able to take over and guide the trains to where they are going," says Kristiansen.

New customer information system. KARI is a fully automated, modern tool for customer information that can be connected to the new traffic management system when it is in place. KARI will replace the current tool in 2015.

"It is an exciting development. Our people are used to handling new technology so I am pretty confident that this will go just fine," says the Director of Traffic.

Support functions. The new traffic management system has many support functions with a number of new opportunities for modern traffic management. Our task is to implement the functionality with the highest value for train operations in Norway," says Sverre Kjenne, Head of Signal and Telecommunications in the Infrastructure Division.

However, one clear challenge has been identified for the deployment of ERTMS in Norway: How to maintain existing systems that do not have an interface with the modern technology that will be implemented.

"This is often a dilemma when modernising and changing technical platforms. We do not have a definite solution yet. But we will identify the best solutions together with Traffic Operations and Customer Services," says Kjenne.

The train driver receives detailed timetable information directly to the ERTMS display on board the train.

FACTS

The advantages of ERTMS

- Provides a better basis for customer information – for both train companies and passengers
- Modern and more efficient management of train traffic
- Flexibility in the system, particularly in the event of traffic deviations
- Increased resilience against system faults
- Coordinated expertise for traffic controllers
- More flexible use of resources

KARI – the customer's best friend

- A fully automatic system for customer information
- Replaces the current system in 2015
- Can be connected to the new traffic management system

- 60.5 million journeys in 2013
- Many stations have been upgraded
- 25 projects implemented in record time

More trains for the people

In December 2014, Norway's new clock-face scheduling model will be fully established. To reach the goal of more train departures for the general public, Jernbaneverket is implementing 25 projects, costing three billion Norwegian kroner, in record time.

Major changes have taken place at Lillestrøm. New tracks with all necessary infrastructure have been constructed to make room to stable more trains. Here, crucial parts of the overhead line system are being installed.

The most crucial changes to the timetable were introduced in December 2012. More train departures in important stretches resulted in strong passenger growth during 2013. A total of 60.5 million journeys were made, which corresponds to a growth of 7.3 percent. The largest proportion of the growth has been the result of timetable changes and improved availability in eastern Norway. From December 2014 train provisions will become even better.

The main goal of the new timetable model has been to be able to offer trains departing every 10 minutes from the hubs on the Lillestrøm–Asker stretch. This includes the stations at Lillestrøm, Oslo S, Nationaltheatret, Skøyen, Lysaker, Sandvika and Asker. The new services from five of these six stations were implemented in December 2012 whereas the sixth will be implemented in connection with the timetable change in December 2014.

Jernbaneverket has entered the final stage of the preparations for the new clock-face scheduling model.

"In parallel with the increased train services, Jernbaneverket also needs to find track space for NSB's 66 newly acquired Flirt trains and we are therefore constructing new stabling and turning facilities for the trains at the railway terminus. A number of stations have also been upgraded to include new and longer platforms," says Per Arne Fredriksen, who has had the responsibility of coordinating all the projects involved in the development of the new timetable.

> "The major traffic increase experienced by NSB in 2013 shows that the money has been well spent"

"The majority of the projects have been implemented on schedule. With the exception of the new station and turning track at Høvik, we will be on target with everything that remains in connection with the timetable change in December," Fredriksen says.

Creating new timetable models is a very extensive task and long periods of time pass between each major change. The previous timetable model was established for the opening of the Gardermoen line in 1998. Since then this model has been adjusted slightly every year. In the meantime the capacity of the railway network in the Oslo area has been developed to include new double tracks in the West corridor, for example.

"However, new double tracks were not enough. New timetables require new turning facilities and new trains require stabling tracks and longer platforms. When we are done with Høvik station we will have spent three billion Norwegian kroner in just a few years on 25 small and large projects to manage the changes. The major traffic increase experienced by NSB in 2013 shows that the money has been well spent," says Per Arne Fredriksen.

At Eidsvoll, extensive work is being undertaken to construct and customise ahead of the extended timetable and the new commuter train between Eidsvoll and Skien. Here, new cable ducts are being customised by Austrian workers.

- Universal design
- 220-metre side platforms
- Three tracks for turning and stabling

A complete redevelopment of Høvik station commenced in spring 2013.

Working flat-out

A successful timetable change in December 2014 is reliant on several projects in the area around Oslo. Construction activities at Høvik, Ski and Drammen are hectic in order to reach the goal.

"In order for the new clock-face scheduling model to be a success in eastern Norway we are also reliant upon Høvik, Ski and Drammen. We are impressed with our employees who are working feverishly to complete by December 2014," says a very proud Project Director in Construction Projects East, Erik Nilssen.

Between Lysaker and Sandvika the entire infrastructure is being renewed to include a new signal system, a new station at Høvik with a new turning and stabling track and an improved station at Stabekk with new lifts and a higher platform. Everything included, the budget is around one billion Norwegian kroner.

"All of the work will be ready in time for the timetable change with the exception of some delays in the delivery of the signal system. We are working towards opening for traffic between Lysaker and Sandvika as soon as as possible," says Erik Nilssen.

The work on the new stabling track in Ski is also running according to schedule. Whilst train replacement buses will run for three weeks during summer 2014, intensive work will be carried out, including for the new signal system which needs to be installed. The project has a budget of NOK 533 million.

The new stabling area in Drammen opened in 2012 whilst the signal work at Drammen station and Sundland is currently under way. The works are costing NOK 73 million and will be completed in December 2014.

In spring 2014 the actual substructure underneath the tracks at Høvik started to take shape. A number of retaining walls, ramps and staircases are also in place.

When Høvik station is ready it will be a modern and safe station adapted for all user groups, with new platforms, entrances, parking and three new tracks for turning and stabling of trains.

- Maintaining high safety levels
- Aiming to document the environmental advantages of the railway
- Improving energy efficiency, generating less noise and protecting animals

Clearing of woodland and other vegetation along the track upholds both environmental and safety considerations. The benefits include improved vision for the train driver, fewer animal collisions, better travel experiences and less risk of trees falling down onto the track in adverse weather conditions.

Safe and environmentally friendly

And the railway always will be.

Trains are among the safest and most environmentally friendly transport options available. This position is one that Jernbanverket intends to maintain and it therefore is continuing its work on continuous improvements within safety, contingency and the environment.

Safety. The safety of the Norwegian railway is high. There has been a steady decline in the number of fatalities and serious injuries since 1950, and since 2000 the level has been at a stable low. In line with the zero vision, Jernbaneverket works systematically to continuously improve safety in order to prevent harm to people, the environment or property.

Investing in the environment. Jernbaneverket's environmental and energy policy supports the safety policy and takes a more detailed look at the direction of environmental work. The goal is to strengthen and document the railway's environmental advantages and ensure that environmental considerations are integrated in all Jernbaneverket's activities. Environment is therefore one of Jernbaneverket's core areas with specific goals for the next four years.

The environment concept comprises many different environmental topics. Efforts are currently ongoing to specify the direction of the work within the different disciplines in the form of strategies.

The purpose is to ensure a unified approach for each discipline and consistent choices in our daily work. Energy efficiency improvements, noise and animal collisions were the first issues on the list. In the next round, strategies will be planned for climate and natural diversity, which are prioritised environmental topics together with noise, for example, in the national transport plan.

"In line with the zero vision, Jernbaneverket works systematically to continuously improve safety."

Noise screening is a highly prioritised environmental topic for Jernbaneverket.

From daily ice cutting to permanent protection

Preventing ice formation using heating cables and insulation provides increased safety and requires fewer inspections.

The stretch between Hallingskeid and Myrdal on the Bergen line requires major efforts every winter to keep ice away from the track.

In recent years major investments have been made in preventive measures to reduce the need for daily inspections, ice cutting, etc. The project falls under the auspices of the project department and in 2013 Jernbaneverket's production department at Myrdal was responsible for the execution. Three areas with severe ice issues were prioritised; Seltuft, Ostabygget and Grøndalen. At all three locations trenches were dug, drainage pipes with heating cables were laid and new ballast was installed. In the tunnel wall and ceiling, the rock was cleared and bolted before installing insulation panels. The technical solution was developed internally and is based on experience and local knowledge. This is part of the project "Climate measures for the Bergen line" with a budget of NOK 25 million in 2013. There is little doubt that this will provide results over time, both in respect of safety and operating costs.

A lion never steps on the track

A proper lion always checks where he is putting his paw down.
The primary school children at Sem school think this is a wise move by the lion.

Carin Pettersson has drawn and developed the concept "Lukas the Lion" as an education tool to talk with children about trains and safety. The Lukas the Lion costume is the latest addition to the toolbox and will be used at large events.

Train driver André Ebert from NSB and Communications Advisor Carin Pettersson from Jernbaneverket visited the primary school in Tønsberg at the end of October 2013. The aim is to create awareness of trains and safety.

The two of them met all 290 pupils at the primary school. And even though the trains on the Vestfold line no longer stop at Sem station between Tønsberg and Stokke, many of the pupils live near railway tracks.

"We are very glad that we have the opportunity to come out and talk with the children about trains and safety," says Pettersson.

"The youngest ones get to hear about Lukas the Lion who drives a train and is very committed to safety, whereas year stage four and up listen to a more traditional presentation."

Headmaster Rune Olsen explains that the school works with traffic safety a fair bit but not so much with railways. In this respect the visit is both useful and positive.

"A proper train driver in uniform inspires respect and is listened to by the pupils," explains Olsen.

Train driver Ebert thinks that school visits are a different and very enjoyable way to meet customers.

"A lot of time and money is invested to make the railway safe and an important aspect of this is to make children aware of safety. The knowledge is good, it is awareness we need to work on," says Ebert and adds:

"If we see someone on the track there is only one thing we can do: Sound the horn, brake and hope that they see us in time. Since trains are so heavy they cannot stop in the same way a car does. The train has a much longer stopping distance.

In collaboration with NSB, Jernbaneverket carried out five school visits in eastern Norway during 2013. The school visits are part of awareness-raising work to improve traffic safety. Other measures include information campaigns, children's films, brochures, posters and marking the International Level Crossing Awareness Day (ILCAD).

"We have great faith in awareness-raising work," says Pettersson. "People already know that they must look for the train but sometimes people forget and it can be nice to receive a friendly reminder. The train always has right of way and this means that you must look out for the train, at all times.

Sander Eidjord-Hansen loves his Lukas the Lion teddy. It is part of the educational programme and gifted to the pre-schools that implement the programme.

FACTS

- In 2013 approximately 190 minor and major measures were implemented in respect of level crossings in Norway.
- The railway network has a total of 3,627 level crossings.

In 2014 maintenance plans will be ready for all lines.

A landscape gardener for 4,000 kilometres of railway

Spring cleaning a garden pales in comparison to managing the vegetation along 4,000 kilometres of railway tracks.

It is necessary to clear vegetation in and alongside the track to ensure resilient and safe operation of train traffic and this also contributes to fewer animal collisions and better views for passengers. But there is no doubt that the scope makes the "gardener's job" a challenging one. Jernbaneverket has therefore created stretchal maintenance plans that will ensure that the work is more systematic and efficient. With map solutions for tablets and other platforms it is easy both to retrieve and update relevant information in the field for Jernbaneverket's own employees and for enlisted contractors.

The plans contain relevant data concerning the vegetation, including height, growth conditions, the need for hedge cutting and the most suitable methods for implementing measures. The plans also set out whether any special considerations must be made, i.e. whether there are any cultural monuments, wildlife passages or particularly vulnerable areas of nature along the stretch of the railway. At the end of 2013 maintenance plans for vegetation had been established along the Gjøvik line, the Bergen line and the Nordland line. Plans for the Sørland line are currently under development and the aim is to complete the maintenance plans for all lines during 2014.

Follo line documents its greenhouse gas emissions

In 2013 a new international standard for environmental accounting for the development of railway infrastructure was launched. Jernbaneverket was involved with the development work and is already applying the new standard when obtaining tenders in connection with the development of the new Follo line.

The use of different types of building materials is key in the standard and the Follo line therefore requests documentation of the ten most important building materials from contracts in the award criteria. Building materials have been estimated to constitute 90 percent of the project's greenhouse gas emissions and the environmental impact during the life cycle of the project can therefore be verified and documented.

The ten materials are steel, concrete, cement, mortar, XPS (extruded polystyrene), EPS (expanded polystyrene), lightweight clinker, natural stone, overhead lines and fibre cables. The consumption of fuels, oil and other petroleum-based products and chemicals must also be documented.

The results from the Follo line and everyone else following the accounting rules set out in the new standard will make it possible to hone the environmental requirements for later projects and strengthen the environmental advantages of the railway.

2013

January-February

1 The Director General of Jernbaneverket, Elisabeth Enger, is travelling across all of Norway's railways by train to get tips from employees about how the organisation can improve their jobs over the next four years. Some of the feedback is so clear that she has announced changes.

Winter contingency in Jernbaneverket has been substantially upgraded with new equipment and more staff in recent years. A further two snow clearing machines are now being delivered to the Oslo area.

Jernbaneverket is looking at the use of personal protective equipment in construction areas. Together with the industry organisations EBA (contractors' association for the construction and civil engineering industry) and MEF (the Norwegian Association of Heavy Equipment Contractors) a campaign has been created to ensure the use of protective clothing and equipment to protect against injury and prevent accidents.

14 January: The avalanche warning system at varsom.no is launched by Minister of Petroleum and Energy, Ola Borten Moe. The development and operation of the avalanche warning system is a joint effort by the NPRA, Jernbaneverket and the Norwegian Meteorological Institute.

March

4 March: In the evening the stretch between Trofors and Mosjøen on the Nordland line opened again after having been closed for nearly six days following heavy water volumes near the track and a risk of sideslips and landslides.

2 **21 March:** Jernbaneverket presents its new train for more efficient track maintenance on the new double tracks. The train set comprises three carriages, from the inside of which you can safely carry out all track maintenance without affecting traffic on the neighbouring track.

April-May

29 April to 24 May: Jernbaneverket makes a concerted effort to combat landslides and flooding on the Dovre line. Trenches are cleared of vegetation, soil and grass to ensure that the water goes where it is supposed to during the next bout of heavy rain. New routing was also installed for cables. The line is closed only for brief periods during working days when there is little traffic.

7 May: For the second time Jernbaneverket marks the International Level Crossing Awareness Day (ILCAD) with small and large events in several locations across the country. The aim is to increase awareness among the general public with regard to level crossings.

3 **25 May:** Bergen station opened on 26 May 1913 and the 100-year anniversary is celebrated at the station this Saturday.

June

3 June: Work is fully under way on the new railway between Larvik and Porsgrunn. Construction began at six different places at the same time.

4 **Night to Sunday 9 June** Jernbaneverket changes the customer information system for monitors and loudspeakers. Line maps and line numbers are implemented for trains in eastern Norway. Early on Monday morning Jernbaneverket employees are present at Oslo Central station to greet passengers.

July

Jernbaneverket experiences sun kink issues, particularly on the Dovre and Røros lines. The buckling of the rail tracks is linked to the flood that ravaged the railway in May.

Extensive construction work is initiated on the Ofoten line. At Bjørnfjell station heavy ground work is initiated for the extension of the existing passing loop. In the centre of Narvik the Fagernes line is upgraded to withstand an axle load of 30 tonnes. Work is carried out 24/7 for several weeks.

August

14 August: The Ministry of Transport and Communications appoints Jernbaneverket to manage the study of new tunnels through Oslo in collaboration with NPRA and Ruter. The study will be complete in early 2015.

5 **19 August:** The "Efficient station stops" project (ESO) was launched with new sector marking of the platforms at Nationaltheatret and Oslo S. Passengers are now informed of where "their" train carriage will stop before the train arrives.

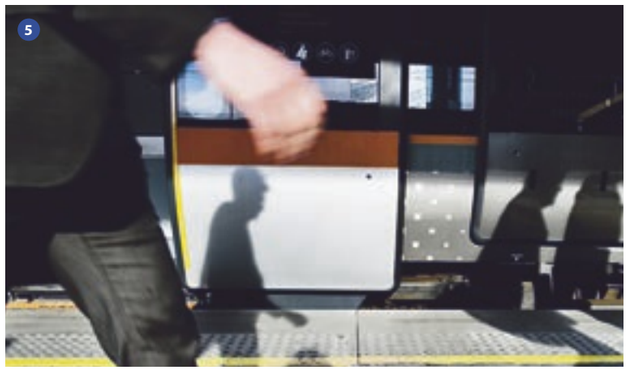
September-October

NSB announces record traffic growth after the first eight months of 2013. NSB Gjøvikbanen AS and Flytoget AS also announce growth in traffic on their train routes.

10 September: An extensive fault in the communication system between trains and traffic management (GSM-R) results in all train traffic coming to a standstill for two and a half hours. A duplicated component, intended to make the system more reliable, failed.

A three-month test period for two mobile static converters is initiated in late September/early October. The reliability of the power supply to trains in the Oslo area increases substantially as a result of this. Over time the converters will be part of a contingency programme.

21 October: The Dovre line between Eidsvoll and Dombås was closed for a week for extensive landslide remediation and intensive work on the new double track along lake Mjøsa.



6 **22 October:** New, country-wide alert service for landslides is launched. The service is a joint project between the Norwegian Water Resources and Energy Directorate, the Norwegian Meteorological Institute, NPRA and Jernbaneverket.

28 October: The first part of what will become the new double track along Mjøsa is put into operation.

November

15 November: Jernbaneverket is granted an additional 750 million Norwegian kroner for maintenance and planning from the new government following budget negotiations with the centre parties.

7 **21 November:** The new freight terminal in Narvik is opened.

December

8 **11 December:** The ERTM-S test stretch on the Østfold line, eastern line is officially opened. The new signal system makes the traditional, external signalling lights unnecessary and provides better traffic flow.

18 December: The new organisational model is adopted. The change to the organisational structure is one of several instruments to develop a simpler and more efficient railway.

160 years of Norwegian railway history

1854 The first railway line in Norway (Kristiania–Eidsvoll) opens.

1890–1910 1,419 kilometres of tracks are built in Norway.

1909 **The Bergen Line** is completed. The price was the equivalent of an entire national budget.

1938 **The Sørland line** to Kristiansand opens.

1940–1945 **German forces assume control of NSB** Restrictions on energy consumption give the railway a near-monopoly on transport. The railway network is expanded by 450 km using POWs.

1952 Funds are granted for the **electrification of the railway network** under the motto "Away with the steam" ("Vekk med dampen").

1969–1970 The 1952 electrification plan is completed.

1996 Norwegian State Railway is split into a train company (NSB BA) and an infrastructure manager (Jernbaneverket).

1999 **The Gardermoen Line.** The first high-speed railway in Norway is a success.

2000 The tragic **Åsta accident,** the third big railway accident in Norway in 50 years, leaves its mark on the railway at the turn of the Millennium.

2004 NSB and Jernbaneverket celebrate the **150-year anniversary of the railway together.**

2005 **The largest development project** within Norway, the double track between Sandvika and Asker, opens.

2007 In Jæren, the **Ganddal freight terminal** near Sandnes is completed in December. In total, about 100 development projects worth NOK 2.2 billion were completed.

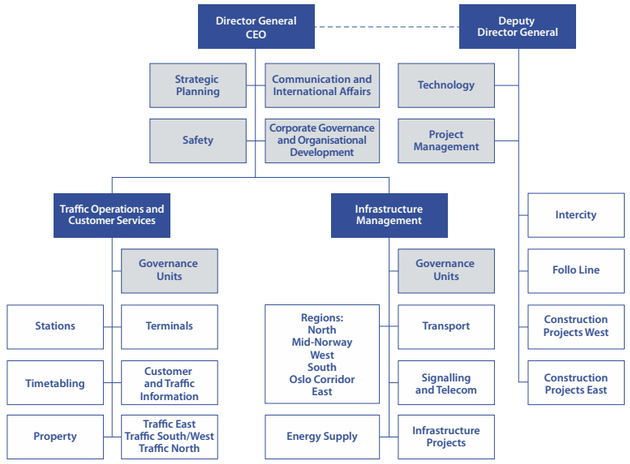
2008 The Oslo project for the renewal of the railway network through Oslo starts up during the spring. The introduction of a new **travel guarantee scheme** is approved.

2010 A decision is made to build a dual tunnel in what will become **the longest railway tunnel in Norway** on the Follo Line, the 22 km new double track that will be built between Oslo and Ski.

2011 After renewal work in 2011, **60 per cent of the railway network in central Oslo is completely new.**

2012 The punctuality of train traffic is better than for years, with **nine out of ten trains running on time.**

2013 The national transport plan for 2014-2023 is presented, according to which an investment of **168 billion Norwegian kroner will be spent on the railway in the next ten years.**



About Jernbaneverket

Jernbaneverket plans, constructs, operates and maintains the Norwegian railway network, and is responsible for traffic control. Among other things, traffic control entails distributing available track capacity to the different train companies, timetabling, train management and public information at the stations. Jernbaneverket is a subsidiary agency of the Ministry of Transport and Communications.

Jernbaneverket is managed by the Director General of the Norwegian National Rail Administration, Elisabeth Enger. In 2013 a new organisation was adopted. From 1 April 2014 Jernbaneverket consists of the following main divisions: Infrastructure Management, Traffic Operations and Customer Services, the staff of the Director General, as well as the major development projects that report directly to management via the Deputy Director General.

Jernbaneverket employees are spread across much of the country and have a broad range of professional competencies. In Jernbaneverket, you can find dispatchers, traffic controllers, railway fitters, land consolidation graduates, construction managers, architects, geotechnicans, supervisors, environmental advisers, engineers and track coordinators, to mention some of the many occupations represented. As of 31 December 2013 the number of employees in Jernbaneverket was 4,013.

Jernbaneverket's new organisation emphases the lines of responsibility

From 1 April 2014 the railway lines in Norway are split into six regions. The responsibility for operations, maintenance and minor investments within each region is clearly defined and positioned in Jernbaneverket's new line organisation.

FIGURES

Key figures for the Norwegian railways as of 31 December 2013

Extent of the railway network

EL	Name of line	Km	Km double track	Bridges	Tunnels	Level crossings	Stations
●	Nordland line	729	0	296	155	710	42
■	Sørland line	546	14	515	191	128	45
■	Dovre line	485	4	322	40	287	28
●	Røros line	384	0	228	6	471	27
■	Bergen line	371	0	203	144	177	33
■	Østfold line, western line	169	64	133	17	69	23
■	Vestfold line	140	23	98	17	103	12
■	Gjøvik line	124	2	75	7	95	22
■	Kongsvinger line	115	0	61	0	69	13
●	Rauma line	114	0	106	5	180	4
●	Solør line	94	0	31	1	195	0
■	Main line	68	20	65	5	17	21
■	Østfold line, eastern line (Ski-Sarpsborg)	85	0	44	2	60	11
●	Meråker line	70	0	47	1	47	4
■	Gardermoen line	64	60	24	4	0	3
■	Randsfjord line (Hokksund-Hønefoss)	54	0	22	1	71	2
■	Bratsberg line	47	0	44	20	48	2
■	Ofoten line	39	0	7	23	43	5
■	Drammen line	41	41	26	12	2	16
■	Arendal line	36	0	17	3	47	8
■	Roa-Hønefoss line	32	0	27	3	48	0
■	Flåm line	20	0	2	21	40	8
■	Asker line	17	17	8	7	1	0
■	Spikkestad line	14	0	10	0	8	6
■	Tinnos line (Hjuksebø-Notodden)	9	0	16	4	17	2
■	Brevik line	10	0	18	0	5	0
●	Stavne-Leangen line	6	0	10	2	0	1
■	Freight line Alnabru-Loenga	7	0	0	0	0	0
■	Alna line	5	0	6	0	1	0
■	Skøyen–Filipstad	2	1	0	0	1	0
	Total lines with regular traffic	**3,897**	**246**	**2,461**	**691**	**2,940**	**338**
	Total lines without regular traffic	**327**	**0**	**109**	**42**	**687**	**0**
	Total:	**4,224**	**246**	**2,570**	**733**	**3,627**	**338**

■ Electrified
● Not electrified

"Stations" in the table indicate locations with stops for passenger trains; in technical railway terms, the number of stations is far higher.

Environment

	2011	2012	2013
Electricity consumption in Jernbaneverket (GWh)[1]	104.4	105.1	111.3
Number of locations with polluted soil	43	29	20
Number of animals hit by a train	2,050	1,951	2,152
Clean tracks (percent)	87	88	90
Clean stations (percent)	88	92	93

[1] Total electricity consumption for the operation of infrastructure without corrections.

Financial highlights (NOK million)

Excerpt from cash accounts

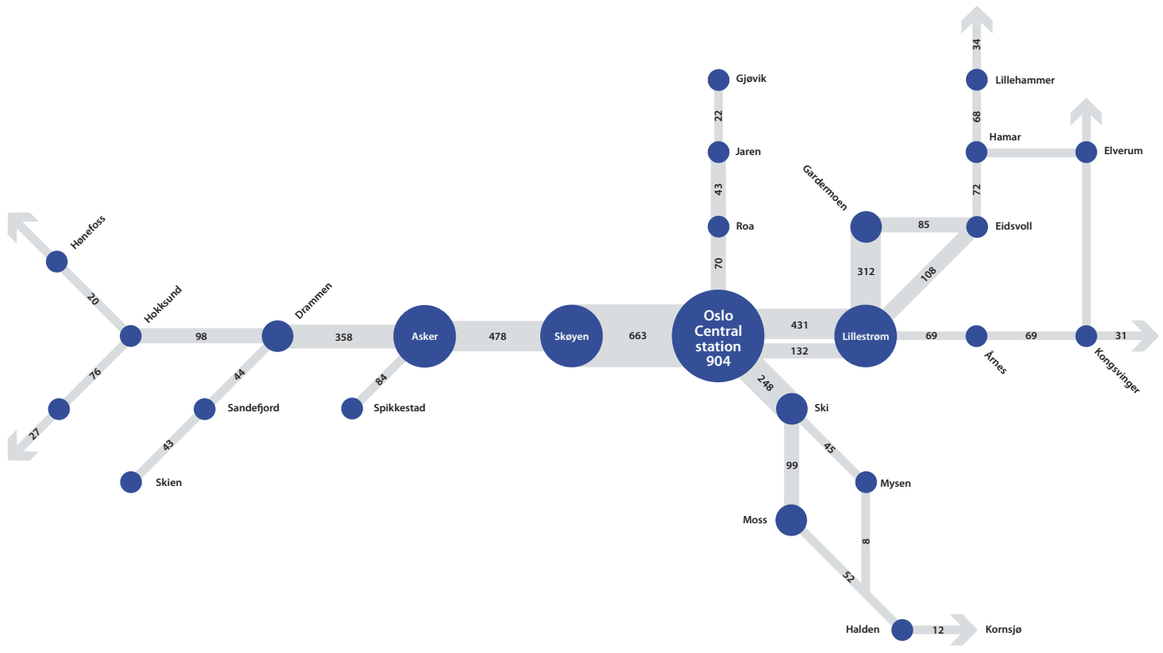
	2011	2012	2013
Operation and maintenance	5,587	5,538	5,429
Operation and maintenance Gardermoen line	89	99	109
Investments in the line	4,403	5,070	6,546
Grant-funded expenditure	**10,079**	**10,706**	**12,084**
Track access charges	101	120	138
Sale of electricity for train operations	297	192	233
Other revenue	331	424	492
Revenue to state accounts	**729**	**736**	**863**

Excerpt from accrued accounts

	2011	2012	2013
Total operating revenue	5,820	6,165	6,614
Total operating expenses	6,023	6,088	6,142
Total interest and other items	-1	-2	-6
Results for the year	**-204**	**75**	**466**
Grant coverage (as a percentage)	87.1	87.2	84.4
Payroll (as percentage of operating and investment expenses)	42.4	45.8	38.5
Full-time-equivalent employees	3,547	3,757	4,027

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.

Total number of trains per day in eastern Norway



Million tonne-kilometres[1]

	2008	2009	2010	2011	2012	2013
Domestic train transport	**2,599**	**2,464**	**2,157**	**2,089**	**2,775**	**2,346**
Of this:						
CargoNet AS	2,466	2,429	2,113	2,049	2,034	1,823
Others	133	35	44	40	741	523
Cross-border transport[2]	**956**	**813**	**1,065**	**1,367**	**931**	**916**
Of this:						
CargoNet AS	234	204	255	182	111	53
LKAB Malmtrafikk AS	558	494	683	696	737	733
Others	164	115	127	489	83	130
Total:	**3,555**	**3,277**	**3,222**	**3,456**	**3,706**	**3,262**

Source: Cargo Net AS, LKAB Malmtrafikk (Malmtrafikk AS), Tågåkeriet AB, Ofotbanen AS, Green Cargo, Peterson Rail AB, CargoLink AS, Railcare tåg AB, TX Logistikk AB, Grenland Rail, Hector Rail

Data from HectorRail AB is missing for 2009-2010, data from CargoLink is missing for 2009-2010, data from TX Logistics is missing for 2013

[1]Tonne-kilometre: term describing the transport of one tonne of freight for one kilometre.
[2]Tonne-kilometres calculated on stretches in Norway for cross-border transport.

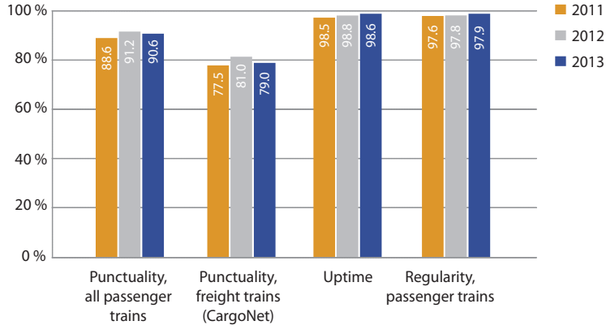
Million passenger kilometres[1]

	2008	2009	2010	2011	2012	2013
Domestic train transport	**3,047**	**3,012**	**3,023**	**3,030**	**3,090**	**3,247**
Of this:						
NSB AS	2,698	2,670	2,668	2,659	2,709	2,839
NSB Gjøvikbanen AS	57	59	59	61	63	64
Flytoget AS	282	273	286	298	306	330
Flåm Utvikling AS	10	10	10	12	12	14
Cross-border transport[2]	**63**	**68**	**71**	**72**	**44**	**44**
Of this:						
NSB AS	63	68	71	72	44	44
Total:	**3,110**	**3,080**	**3,094**	**3,102**	**3,134**	**3,291**

Source: NSB AS, NSB Gjøvikbanen AS, Flytoget AS, Ofotbanen Drift AS, SJ AB

[1]Passenger kilometres: the number of passengers multiplied by distance driven.
[2]Passenger-kilometres calculated on stretches in Norway for cross-border transport.

Punctuality, regularity and uptime



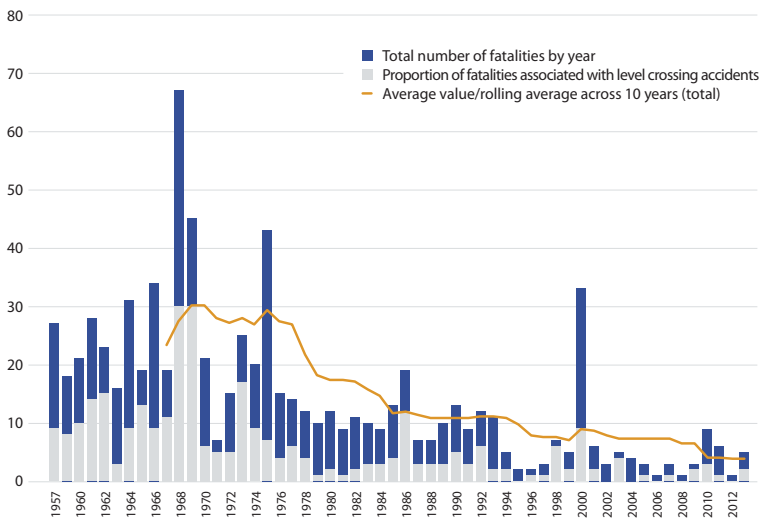
Accidents in 2013 and developments over time

- Accidents by type
- Accidents in accordance with UIC Safety Database definitions: Train directly involved, cost per incident > EUR 150,000, track closed > 6 hours, fatality or serious injury. Operational railway.

Type of accident	Number of incidents	Fatalities	Serious injuries
Collisions	**17**	**0**	**0**
- Train operations (train – train)	0	0	0
- Train operations (train – object)	16	0	0
- Shunting	1	0	0
Derailments	**5**	**0**	**0**
- Train operations	5	0	0
- Shunting	0	0	0
Level crossing accidents [1]	**4**	**2**	**2**
- Crossings with barriers, lights and claxons	3	2	1
- Crossings with gates	1	0	1
Other level crossing accidents	**0**	**0**	**0**
Rolling-stock fires	**1**	**0**	**0**
Other accidents [2]	**4**	**2**	**1**
Total:	**31**	**4**	**3**

[1] Collisions between road vehicles and railway rolling stock
[2] Other accidents resulting in death or serious injury

Long-term development, fatalities, Norwegian railway 1957-2013



Price level for maintenance and renewals per metre of main track

Track section	Operation, corrective and preventive maintenance (NOK per metre)	Renewals, incl. the Oslo project (NOK per metre)
Main line including the Oslo area	528	1,207
Drammen line	814	172
Gardermoen line	671	85
Kongsvinger line	104	104
Gjøvik line	182	9
Østfold line, western line	57	138
Vestfold line	329	127
Sørland line	353	253
Bergen line/Randsfjord line	465	251
Dovre line	318	147
Røros line	244	92
Nordland line	310	82
Ofoten line	1,130	1,363
Other lines	313	40
Unspecified and Infrastructure Management staff	155	54
2013 average	**501**	**237**

The figures apply to the Infrastructure Management Division, including Energy Supply (line energy), and are partially based on estimated distribution.
The figures are also based on the cash principle and are not directly comparable to previous years.

Some of the maintenance work in 2013

Action	Amount	Unit
Ballast cleaning	0	main line km
Preparations for ballast cleaning	0	main line km
Replacing sleepers	60,000	pcs
Replacing track	43	main line km
Replacing points	15	pcs
Contact line renewal	5	main line km
Track adjustment, continuous	630	line km

Contact us

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