Eress**17**

LEADING THE WAY IN TRANS-EUROPEAN RAILWAY STANDARDISATION

Erex - a one-stop solution to correctly validate data and accurately invoice energy on a train by train basis across Europe.

WELCOME

ONCE AGAIN, I am extremely delighted to welcome you, our readers, to our annual Eress magazine.

Whilst in our last issue we highlighted the expansion of Eress to seven partner-countries, this year we are upbeat about the consolidation of our partnership and the potential of future growth as the implementation of the TSI's are now only a year away.

In this issue we discuss the new modular partnership opportunities being rolled out at Eress, whereby even smaller Infrastructure Managers with limited budgets are able to sign up for the modules within the Erex system they currently need - with the ability to upgrade as they grow or see fit.

Of course, the Eress forum is the highlight of our annual partner-events and like last year, we celebrate the 'Eress Awards for Innovation in Railway Energy Efficiency', designed to harness the most creative ideas in energy efficiency from Master and PhD students from across Europe.

As we become the Pan-European standard in cross-border railway energy billing and invoice settlement, we encourage you to stay up to date with our monthly publications on www.eress.eu and to also contact us to share your experiences and your stories.

Once again thank you for your continued support and we hope you enjoy reading this year's magazine.

Sincerely,

Claudia van Diermen Jacobsen
Marketing and Partner Manager
Eress

EU DATES FOR METERING & BILLING

Mandatory in the EU from:

2014

ENERGY METERS ON TRAINS
Energy meters are mandatory on all new, renewed and upgraded rolling stock (Commission Regulation 1302/2014).

2018

COMMUNICATION TO GROUND
Communication to ground becomes mandatory based the Technical Specifications for Interoperability, (LOC&PAS TSI) for Locomotives & Passenger Rolling Stock.

2020

COLLECTION & DATA EXCHANGE
EU countries must be able to collect and exchange energy data.

Each member state in the EU will be able to collect and exchange energy data, including validation and allocation of energy consumption to the correct end user (Commission Regulation 1301/2014).

LEADING TRANS-EUROPEAN STANDARDISATION ACROSS THE RAILS

As the industry-wide deadline looms for the implementation of the Technical Specifications for Interoperability across European railways, *Dyre Martin Gulbrandsen,* Director of Eress, explains what the organisation is doing to facilitate precision in international energy metering and settlement to invoice trains across the continent.

Experience is certainly the name of the game at Eress. "Fortunately, after a decade on the market, Eress remains the only organisation in the European railway sector to have built an IT system like Erex, which from its inception, has served as an invoice settlement system across the rails and has been capable of managing international energy metering data across Europe. Furthermore, we remain the only organisation to have successfully expanded across seven European partner-countries, not to mention the fact that we are currently being tested in several other countries; including the UK and France. The combination of our system's trans-European development and our extensive experience, make us second to none", says Gulbrandsen.

Technologically, the Erex IT system, built on open source, is capable of providing train operators across Europe with a complete overview for an entire transcontinental journey. Mr Gulbrandsen explains, "Erex is the ideal solution for Europe, as it performs the actual calculation of bills with accuracy, for each and every train, for companies operating not just in one, but across multiple countries simultaneously".

Making it easier than ever to join Eress
So what else is new at Eress this year? "We used to be an 'all-in partnership', whereby partners had to sign up for the full system; however, we will be able to cater to the individual needs of infrastructure managers in Europe as we are opening up the Eress partnership to make it easier than ever to join, as the deadline for industry-wide implementation of the TSIs looms. We have essentially split the Erex product into two primary modules: Erex Exchange and Erex Settlement", explains Mr Gulbrandsen.

This means that from now on, new partners will be able to choose how they join Eress, based on their own needs. They can choose Erex Exchange only or Erex Exchange & Settlement, as before.

Erex Exchange
By choosing Erex Exchange only, new partners will ensure that all data coming from energy meters is validated, allocated and distributed correctly to their corresponding countries, which may include Eress partner-countries and / or other countries outside of Eress who have chosen to accept our data, which is based on the UIC leaflet 930.

Eress Partnership – Seven Countries and Counting

Erex is the ideal solution for Europe, as it performs the actual calculation of bills with accuracy, for each and every train, for companies operating not just in one, but across multiple countries.

Erex Exchange & Settlement

By choosing Erex Exchange & Settlement, new partners continue to benefit from three distinct, complex yet interconnected processes: 1) getting correctly validated and allocated data from all on-board meters; 2) acquiring sorted data according to each country's energy and railway specifications and 3) using the correctly sorted data to transparently bill all train operators running across their national networks.

Further standardisation of Erex IT system

"As standardisation remains a core component of the development of Erex IT system, we continue to standardise Erex based on the needs of our partners, like Finland, which is a good example of Eress' success in standardisation in Europe. Our trans-European experience over the past decade and the latest EU regulations have been key here", says Gulbrandsen.

By continuously standardising the Erex IT system, and by offering flexible partnership alternatives, Eress is confident to be in the right place, at the right time and ready to become the official Pan-European standard bearer for precise international energy metering, data settlement and invoicing of trains across the continent. "Our main objective at Eress is to help train operators become more competitive. We will have succeeded the day every single train operator gets transparent bills for the energy they use on-board, regardless of where in Europe their trains may operate", concludes Eress Director. ■

> As a trans-European partnership, Eress is able to create better standards across the entire European railway sector.

ELECTRIFIED RAILWAYS AND A MODERN BILLING SYSTEM

Electrification of the *Danish Railways* started in the early eighties and expansion of their electrification programme reinitiated in 2012. The modernisation programme's aim was to provide greater reliability, interoperability and efficiency; based on precision billing of electricity consumed across the network.

We sat with Hans-Erik Fogh, Key Account Manager at Rail Net Denmark, part of Danish Railway Authority, which operates under the auspices of the Danish Ministry of Transport. He explains, "We purchase energy from suppliers and sell to operators, manage the maintenance of the power supply infrastructure between 400 kW and the overhead contact line system and we also manage contracts with Transmission System Operators (TSOs) from the energy sector and maintenance companies".

"We are fully responsible for the purchase and sale of energy across Danish Railways; which means being able to measure energy consumption accurately, bill with precision and charge the right prices, which are all highly important factors to us. As an Eress partner, the Erex IT system ensures our billing for energy consumption is conducted with the highest degree of accuracy", says Fogh.

Erex receives data from on-board meters across Denmark's rail network and from its partners throughout Europe; including the GPS data per locomotive. Furthermore, the system provides the specific energy prices per country, validates, filters and combines all the details to ensure all data is correct before it becomes the basis used to bill operators for energy consumption.

As a result, train operators pay only for the energy they use at the right rates - giving them a huge financial incentive to reduce their energy consumption, as they are able to easily measure, analyse and consequently control usage based on real data.

Exchange of Information

Fogh says, "Exchange of information is one of the best aspects of being an Eress partner. When we face problems, we are able to contact Eress to see if any other partner had already experienced the same issue before. This aspect saves us both time and money as we are able to benefit from the solutions created by other partners instead of starting from scratch. A good example was the metered energy quality challenges we faced on BR185 trains. Through Eress, we were able to consult with other partners, exchange information and resolve the problem through fellow partner-countries that were more than happy to advise us".

Fogh concludes, "In addition to sharing information, as an Eress partner, we do not need to have our own dedicated systems - we share development costs across the partnership. Furthermore, Erex has built-in cross-border invoicing capabilities, which gives us the added advantage of being able to buy and sell energy accurately at a regional level. Moreover, as a trans-European partnership, Eress is able to create better standards across the entire European railway sector". ◾

THE FINNISH OPEN ENERGY MARKET

Finland is at the forefront of having developed a fully open energy market in Europe, whereby electrical power consumed on its railways is bought on the open market by Train Operators and all billing and invoice settlement are accurately and fully handled by Erex.

JUHA-MATTI VILPPO, Senior Officer, Electrical Engineering at Finnish Transport Agency (FTA) has been working directly with Eress since the agency joined the partnership to develop the necessary integrations that allow Erex to deliver precision energy bills across Finnish rail.

Through the Erex system, FTA is now able to accurately settle, control and manage the energy consumed by all trains across the entire country. The speed and efficiency which led to the opening of the Finnish rail energy market has been in part thanks to the already developed solutions that Eress provided, all based on up to date EU rail regulations on energy metering.

"The most important reason why we chose to join Eress was because the validation process for energy consumption data is very complicated. It was therefore far more cost effective to use a system like Erex that had already been developed, than to start from scratch on our own national metering system", explained Mr Vilppo.

Finnish rail is unique in that there are little to no cross-border trains runs between Finland and neighbouring countries, neither Scandinavia to its west or Russia to its east; which both have different track sizes. However, Finland is fully integrated into the Nordic energy market and trades energy freely across the region, which has led to greater competition, efficiency and transparency.

"The Erex system became a vital third party one-stop solution that is capable of managing both energy 'measurement principles' and 'invoicing principles' for electricity consumed on the rail with accuracy. In essence, the entire energy settlement system in Finland for rolling stock is based on on-board meters and the accurate measurement of energy consumption, which is facilitated by Erex. Most importantly, as an Eress partner, the implementation of the Finnish settlement system means complete standardisation with other European partners, which in the long runs saves time and money for all parties involved", says Vilppo.

Eress has fully developed a Third Party Access (TPA) solution for FTA which allows all Train Operators in Finland to choose and purchase their energy freely on the open market. "We have been very satisfied with the implementation of Erex and are also proud of our contribution to creating a very harmonised Erex system. Erex was smoothly implemented in Finland, much to our delight, and was easier than expected. We are happy to recommend joining Eress to all Infrastructure Managers in Europe facing the challenges of implementing EU regulations to open the railway and energy markets. We have also experienced that the knowledge base within the partnership is second to none and development costs are significantly lower than trying to go it alone", concludes Mr. Vilppo. ■

The speed and efficiency which led to the opening of the Finnish rail energy market has been in part thanks to the already developed solutions that Eress provided.

FROM ONE PRICING ZONE TO ACCURATE BILLING

As far back as 2000, *Trafikverket, the Swedish Transport Administration,* **began searching for ways to bill and invoice more fairly, transparently and accurately across Swedish railways. Additionally, they sought a system that would be capable of allowing train companies to select their own energy suppliers based on their individual needs.**

Lars Johansson is the Manager for Electricity Trading at Trafikverket, with whom we spoke about their journey as Eress partners. He explains, "We started out with Eress from the very beginning, as we were searching for ways to modernise our energy billing and invoice settlement system. Additionally, we wanted to prepare the railway market for future competition which would allow railway companies in Sweden to choose their own electricity suppliers at will. Currently, train companies in Sweden are not able to select their own energy suppliers as yet; however, when this happens, we will be more than able to handle it through the Erex system".

In November 2011, Sweden introduced the concept of 'pricing zones' on the railway electricity market, with four primary pricing zones that covered the entire country, wherein Trafikverket's biennial 'Network Statement' established the invoicing process and rules. Johansson says, "Before we started to use Erex, we invoiced train companies based on monthly averages. This meant that there was one price for the entire country. The

system was very simple to manage, but not very fair to customers, as some companies ended up paying a bit too much, whilst others paid a bit too little".

Times have changed since then and Trafikverket is now using the Erex system. The amazing thing about using Erex is that they receive real-time accurate data in 5 min intervals with GPS tags per train. This means they not only know exactly how much energy each train is consuming or generating, they also know their precise location at any given moment.

And when it comes to location, this is where Erex is a real game changer across our pricing zones, says Johansson. "The energy market in Sweden is hourly-based and since we get this data every 5 minutes, we are able to bill very accurately based on the pricing zones the trains traverse. When they cross into a new pricing zone, we are able to apply the right pricing available in that particular zone. This means that a train travelling across zones will always be billed with precision. There are approximately 8,760 values every year in each pricing zone, which would be

impossible to process without a robust system like Erex".

The Erex system collects all the 5 min values and staff at Eress monitor and check the values daily. Trafikverket provides the hourly rates for the given month and the Erex system does the calculation per train, per hour, per month, with precision.

"We cannot obligate train companies to use our meters, says Johansson, but the companies that do, benefit from massive cost savings and from paying for only what they consume. About 40% of the trains are currently metered in Sweden and the rest that are still unmetered receive their monthly estimated bills, the old fashion way".

In conclusion, Johansson mentioned that if they would have had to develop a system like Erex on their own, the investment would have been exorbitant. Fortunately, being an Eress partner allows them to benefit from shared development costs with all the other partners, whilst being able to keep their customers happy in Sweden by providing them with accurate billing and invoices. ■

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TAF will bring substantial business and benefits as a result of cross-industry standardised processes and messaging standards.

COUNTDOWN TSIs 2019

The countdown to the full implementation of the TSIs across European railways is well underway and Erex is at the forefront of facilitating standardisation. *Rodrigo Gutierrez,* **Project Officer for Telematics, at the European Union Agency for Railways (ERA) speaks about the implementation process and how his agency contributes to the standardisation.**

ERA performs the revision of existing TSIs, keeps them up to date, drafts new TSIs whenever necessary, and issues guides and training to ensure the entire industry is up to date on new developments.

Interoperability and standardisation are among the primary objectives at ERA and the Technical Specifications for Interoperability (TSIs) represent the rules by which interoperability will be achieved across European railways.

Technical Specifications for Interoperability (TSIs) define the technical and operational standards which must be met by the industry in order to satisfy the 'essential requirements' to ensure the 'interoperability' of the European railway system. TSIs also establish expected performance levels, such as safety, reliability, availability, health, environmental protection, technical compatibility and accessibility.

The development of TSIs, one of the basic tasks of the agency, is done in coordination with experts and stakeholders from across the railway industry; including European Representative Bodies of the Railway sector (RBs), the Intergovernmental Organisation for International Carriage by Rail (OTIF) and National Safety Authorities (NSAs), among others.

Mr Gutierrez goes on to provide some technical insight on TAF, which is part of the TSIs and stands for 'Telematic Application for Freight'. But what exactly is TAF? "Telematic Application for Freight will enable a new level of interoperability among European railways. TAF will bring substantial business and service benefits as a result of cross-industry standardised processes and messaging standards".

Other elements to consider are the interface protocols between on-board EMS (energy measuring systems) and track-side DCS (data collecting systems).

TAF works hand in glove with Eress in many ways, as the telematics applications for freight services provide information from systems useful for Erex, which provide (real-time monitoring of freight and trains), marshalling and allocation systems, reservation, payment and invoicing systems, management of connections with other modes of transport and production of electronic accompanying documents.

The benefits of trans-European rail standardisation are clear. Once achieved, it will facilitate the exchange of messages in a standardised format; improve interoperability across European railways; reduce technical barriers to competitively entering the rail markets of other member states and ultimately will make life easier for all rail users through the freer exchange of accurate information.

"Erex is definitely leading the pack when it comes to trans-European standardisation in energy metering and invoice settlement on trains. Having a system that is capable of addressing cross-border invoicing, based on real-time accurate data is a huge step forward for the railway industry", says Gutierrez. "It is not for us to select Erex as the system of choice for Europe, but it is certainly the system that could be one of the most successful in facilitating the type of trans-European standardisation we are aiming for, based on their existing experience".

AROUND THE WORLD

EUROPEAN RAILWAYS COMPARED (SINCE 2000)

	GERMANY	FRANCE	ITALY	UK
Change in public subsidy	**-20%**	**48%**	**-28%**	**-23%**
Increase in cost of rail travel	16	10	25	34
Increase in passanger km	**+10%**	**+23%**	**-5%**	**+45%**

HIGH SPEED TRAFFIC PASSANGERS/KM

All figures in billions

JR 2014	90.280
KORAIL 2014	14.433
THSRC 2012	8.643
DB AG 2014	24.316
SNCF 2015	49.976
RENFE 2015	14.129
FS SpA 2012	12.794
Eurostar Intl 2011	4.364
SJ 2015	3.365
RZD 2015	2.738
Other Europe	5.606
China Rail 2015	386.300

479.272
Total

UIC Statistics, The Worldwide Railway Organisation

2018

Nigeria starts construction on the Lagos-Ibadan line. The project is expected to be complete by 2018 and will serve to improve railway services in the region to support trade and increase mobility between agricultural and city centres in Nigeria and increase economic activity in these regions.


FRANCE

■ French National Railways (SNCF) is starting to use IBM Watson Internet of Things (IoT) on IBM Cloud to monitor train and infrastructure performance in real-time, equipped with 2000 sensors, which forward 70,000 data points per month. This enables SNCF engineers to remotely monitor trains for potential problems including door or air-conditioning failures, while they are in operation, avoiding the need for manual inspections in the depot, reducing costs and increasing efficiency.

EU PASSENGER RAIL MARKET

■ Signs of Growth in European Passenger Rail Market as seventeen of the EU Member States reported increases in passenger transport between 2014 and 2015. The largest increases were recorded in Slovakia (+22.8%), Greece (+19.7%) and the Netherlands (+15.6%). As per international transport, between 2014 and 2015, the largest increases were reported by Portugal (+44.9%) and Czech Republic (+20.9%).

KAZAKHSTAN AND IRAN

KTZ Express and Iran Shipping Lines are to form a joint venture to provide logistics services between Kazakhstan, Iran and the CIS countries. A joint terminal at the Iranian port of Bandar Abbas would provide access to India and Africa, and terminal facilities are planned for Incheh Borun on the Iran/Turkmenistan border and at Kazakhstan's Caspian Sea port of Aktau.
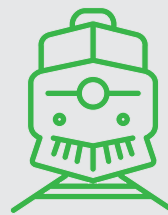
FIRST IN EUROPE

■ Bane NOR has successfully established a remote communication solution to energy meters on board trains in accordance to EN-50463-4. The process has involved intricate knowledge of the requirements set by this norm. The good work and cooperation between Bane NOR and the telecommunication supplier has been indispensable for optimal interfacing between the systems.

CHINA

■ About 2.5 billion passengers travelled by train in 2014, up 10 percent for the third year running. Bulk cargo transportation increased by 18.7 percent in 2015 from the previous year and container cargo transportation rose 20.2 percent year on year.

FROM JERNBANEVERKET TO BANE NOR

Winds of change are rolling over Norwegian railways. In 2015, the Norwegian Parliament (Stortinget) approved railway reform in the country, which saw the phasing out of Jernbaneverket in January 2017. The former Norwegian National Rail Administration was replaced by the creation of two separate entities: *'The Directorate for Railways',* a new state-owned company and *'Bane NOR'*, the new National Infrastructure Manager.

The objective is to create greater efficiency at all levels as the market opens up to competition. The new Directorate for Railways is responsible for budget management and for assigning projects to Bane NOR – whilst Bane NOR is exclusively dedicated to the execution of the assigned projects, based on well-defined goals and budgets.

The Directorate for Railways is based in Oslo and is fully financed by the state, under the leadership of Elisabeth Enger. Primary responsibilities include the overall management and coordination of all railway related activities throughout the sector, as well as the management of the Norwegian Railway Academy, responsible for training locomotive drivers and personnel in the traffic management.

The work of the Directorate includes dealing with transport needs of the future, enforcing competition rules in passenger rail services, and defining framework conditions for the companies that own rolling stock.

This gives Bane NOR the ability to dedicate its resources and expertise to the planning and construction of all future railway developments in the country. Bane NOR manages, maintains and refurbishes the railway infrastructure, including traffic management.
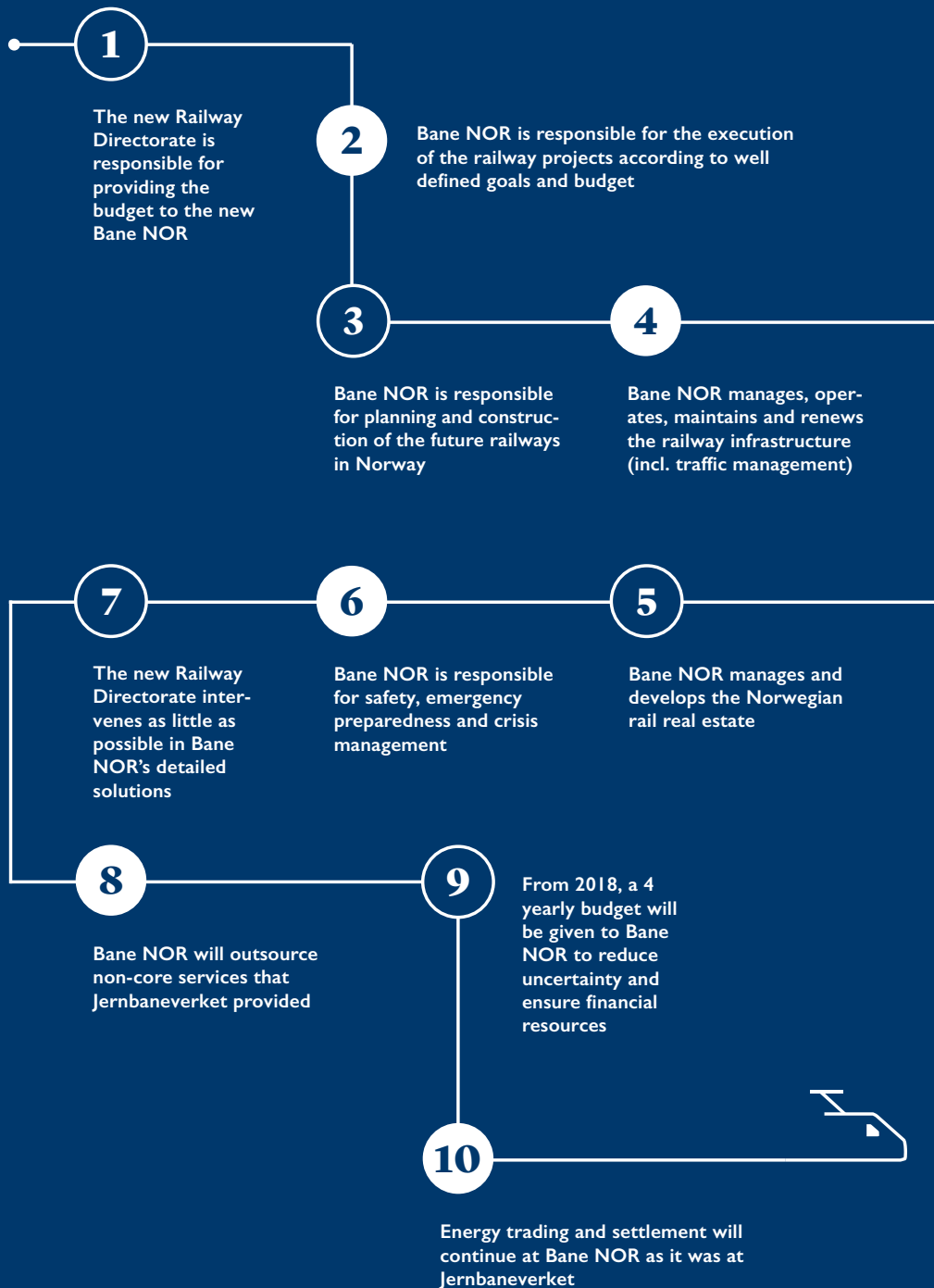
Importantly, in addition to the management and development of the Norwegian rail infrastructure, Bane NOR has also been tasked with safety, emergency preparedness and crisis management.

The state-owned organisation, Bane NOR, has taken over most of Jernbaneverkets' tasks and responsibilities, including its 3,900 employees. The value of all assets transferred is an estimated 143 billion Norwegian krone.

Additionally, Bane NOR has taken over ROM Eiendom's assets from NSB (the main train operator in Norway) for an estimated value of 3.5 billion Norwegian krone; including 980 buildings, of which 315 are stations and 350 listed buildings.

The Norwegian Railway Authority has given Bane NOR its safety approval to become an infrastructure manager (from 1 January 2017 until 2021). Its new CEO, Gorm Frimannslund, has been responsible for all Jernbaneverket's infrastructure in Norway since 2014 and Jernbaneverket's energy department will be part of Bane NOR's organisation, led by Terje Stømer, its new director. ■

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The new Railway Directorate is responsible for providing the budget to the new Bane NOR

2

Bane NOR is responsible for the execution of the railway projects according to well defined goals and budget

3

Bane NOR is responsible for planning and construction of the future railways in Norway

4

Bane NOR manages, operates, maintains and renews the railway infrastructure (incl. traffic management)

7

The new Railway Directorate intervenes as little as possible in Bane NOR's detailed solutions

6

Bane NOR is responsible for safety, emergency preparedness and crisis management

5

Bane NOR manages and develops the Norwegian rail real estate

8

Bane NOR will outsource non-core services that Jernbaneverket provided

9

From 2018, a 4 yearly budget will be given to Bane NOR to reduce uncertainty and ensure financial resources

10

Energy trading and settlement will continue at Bane NOR as it was at Jernbaneverket

START ACTING

The re-election of *Terje Stømer,* as Chair of Eress, has shown sustained confidence in the direction the organisation is going under his watchful eye. So what's under the bonnet for Eress in the upcoming years is what we seek to uncover, in light of the looming implementation of the TSIs.

Eress as an organisation and the development of Erex, its IT system, are now in their tenth year – and their vision has never been clearer. "We are now ready to become the European standard bearer for energy metering and settlement to invoice trains across the continent", says Mr Stømer, with confidence. This, perhaps because after ten years in the sector, no other organisation comes close to being able to handle and process the data with the level of precision on a transcontinental level as Erex.

What started out as an ambitious Scandinavian project has certainly become European in scope, with the current partnership comprising Norway, Sweden, Denmark, Finland, Belgium, the Netherlands and Switzerland. Furthermore, there are ongoing test partners in France and the UK. Additionally, data coming from Erex is now being fully accepted for billing purposes in Germany. This all means there is much reason for well-founded optimism at Eress.

As has been clearly documented, explains Stømer, "The development of the Erex system is going really well to the great satisfaction of our partners and users. We have been saving development costs for our partners, diligently developing new functionalities and incorporating the latest cutting edge technologies, which means the data coming out of Erex is more accurate than ever and easier to interpret and utilise than ever before. With the addition of each new partner, the system has morphed to cater to their needs, which has led to greater innovation, flexibility and capabilities.

Policy
So with all this optimism, what the next step is on the journey for Eress is where the conversation leads us; perhaps on a more sombre note, as the politics of policymaking kicks in. "There are so many committees debating what direction to take at a European level, whilst Train Operators are simply awaiting clear rules and systems to establish the way forward. They seem to be struggling to find a common ground and a common system to ensure all Train Operators benefit with fairness. We are at the point where national politics, policymakers and the big players in Europe have now become in some ways the greatest hurdle to cross. At Eress, we have been working diligently, sometimes far too silently, for the past 10 years on a system that has been fully developed and tested. My only thought now is how long will it take the sector to truly benefit from our system, our experience and our expertise, instead of attempting to reinvent the wheel in some cases", says Mr Stømer.

Expansion
As Eress expansion becomes imminent in light of the TSIs coming into force across European railways, the nature of the organisation itself may most likely change to facilitate the entrance of greater numbers of partners - both large and small – as Eress aim to provide the best options for the entire industry.

Mr Stømer explains, "We are debating our very structure to become especially attractive to smaller partners with smaller budgets, who would benefit greatly from our technology and experience. This may even lead potentially to the creation of a new corporate agreement for Eress".

A new corporate agreement at Eress may make Eress more accessible for new partners to join, potentially creating new levels of partnerships, with access rights to only the elements of the system they require. Additionally, the entire structure of governance may require change, as Eress envisages greater participation from the EU; all of which are at a draft level at this juncture.

What is certain, says Mr Størmer, is that "if Eress could transform itself, and there were some sort of consortium, perhaps at an EU level, funded at a supra-national level, which at the same time still allowed for continuous innovation without being bogged down in bureaucracy; this would eliminate all obstacles for smaller potential partners with lower budgets to join Eress – a development we would certainly welcome". ■

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After ten years in the industry, no other organisation comes close to being able to handle and process the data with the level of precision on a transcontinental level as Erex.

PARTNERS
SWITZERLAND
FINLAND
BELGIUM
DENMARK
SWEDEN
NORWAY
THE NETHERLANDS

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