Eress18

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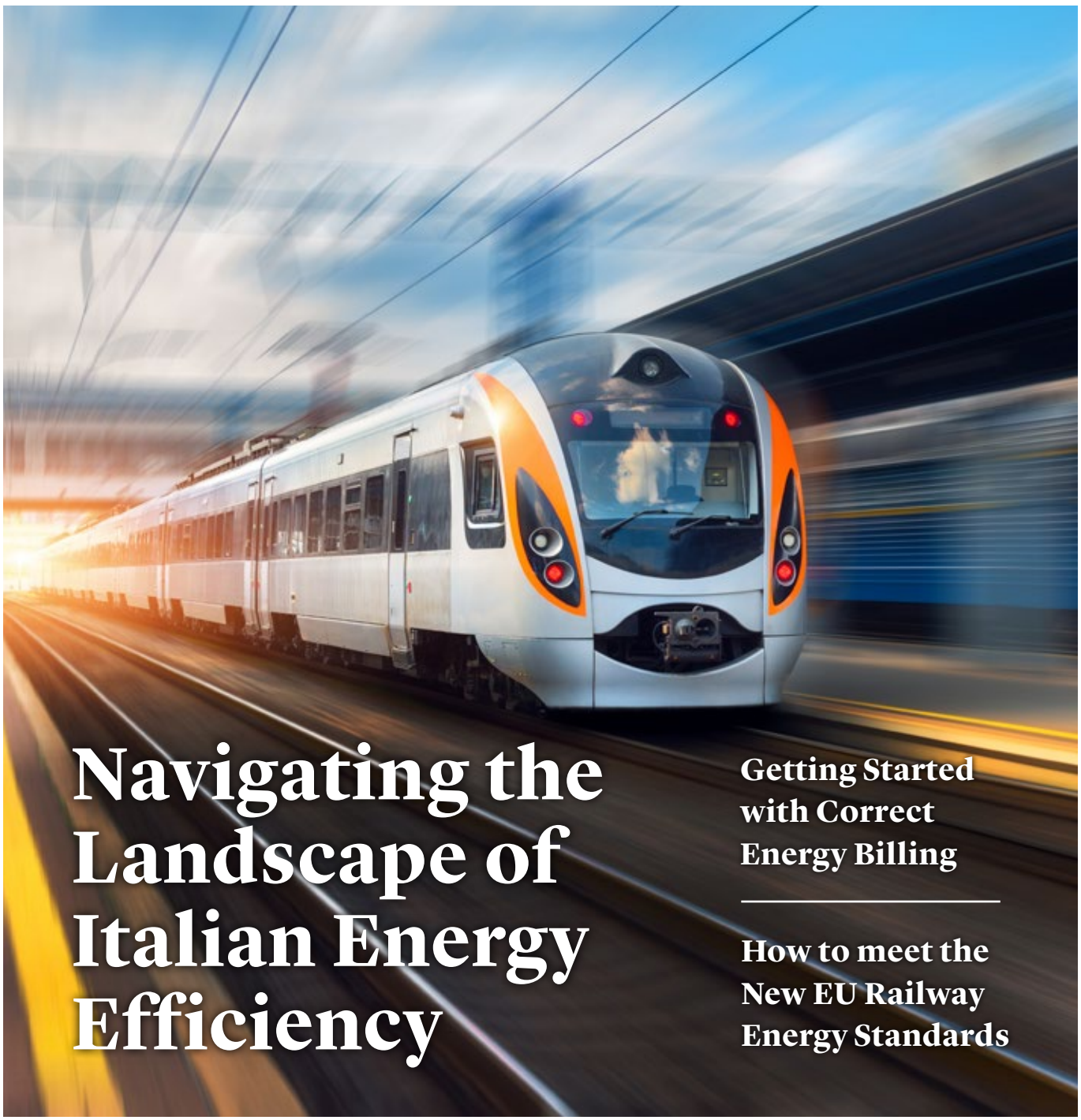

Navigating the Landscape of Italian Energy Efficiency

Getting Started with Correct Energy Billing

How to meet the New EU Railway Energy Standards

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 since November 2014 (Commission Regulation 1302/2014).

2020

EXCHANGE AND SETTLEMENT SYSTEM FOR ENERGY DATA
EU countries must have a settlement system.

By July 2020 each member state in EU will be able to exchange and settle energy data, Including validation and allocation of energy consumption to correct end user (Commmission Regulation 1301/2014).

2022

DATA COLLECTION SYSTEM (DCS)
EU countries must have a DCS by 2022

Each member state in EU will be able to collect and exchange energy data. from January 2022. (Commission Implementing Act amendment of TSI ENE and TSI LOC&PAS)

Welcome

Today we see that there is a strong will to find solutions to the changes we need to become a sustainable railway energy sector. There is no discussion that trains are seen as a preferred transport mode and that energy saving is quite relevant for both monetary and environmental reasons. In this edition we highlight Italy, because of its adaptation to EU regulation and how its market and IT development are helping the country to move in the right direction. As for the rest of the magazine, we have focused on standardization and collaboration between countries, which go hand-in-hand and are crucial for making European railways competitive.

Thanks to Annika Utgaard, who has helped us with the interviews and writing this year for the magazine.

HOW MUCH IS A TONNE OF CO2?

To put this data in context, one tonne of CO2 is equivalent in energy terms to:

Leaving a 60W light bulb on constantly for nearly:
4,5 years

Powering an average home for:
10 weeks

Boiling water for:
93,023
cups of tea

Driving:
4,625
km in a medium sized petrol car.

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Working Together for Standardising the Railway Energy Market

When it comes to energy settlement, Eress has made it their mission to ensure that train operators pay only for the energy they use. While this may seem like common sense, it is not yet a requirement for most countries across Europe. **Dyre Martin Gulbrandsen**, Director of Eress, discusses the importance of standardisation of the railway energy market and the benefits that come with it.

"The whole of 2017 has been an amazing year, from an operational standpoint. We have had 100 percent uptime of the Erex system, which means that it has been able to deliver service to our partners 24/7. Furthermore, we are now able to communicate directly with the energy market in Finland and are working on a new solution in Belgium. Both countries have allowed us to establish a standardised solution when settling energy based on train runs. However, the challenge for Eress moving forward is standardisation of the train run data in Europe."

The way the railway energy industry is regulated in other countries varies significantly. So, both Eress and its partners have had to adapt the Erex system to work within these regulations. "One of the challenges that we are dealing with, currently, is balancing the standardisation of the Erex solution with the needs of our partners, since they are the ones who are facing different regulations. We have done a lot of work on standardising the railway industry, but the key issue now lies at the intersection between the railway and energy sectors, especially when it comes to purchasing energy. For us, it is all about working on a common solution that will become the standard in terms of how train operators interact with the energy market across Europe. Without standardisation, we have to customise each solution for every partner country, which is not very efficient," states Mr. Gulbrandsen.

To help both its partners and all other infrastructure managers in Europe achieve a balance between standardisation and national regulations, Eress holds its annual forum. On June 13, in Rome, key players in metering settlement and energy billing will gather to discuss these challenges. "The Eress forum provides us with a good platform to exchange ideas and to work on standardisation. It also increases awareness of this issue and allows attendees to take this information back to their home countries and start working towards a solution. We have also started holding some informal workshops that are interlinked with standardisation, inviting both partners of Eress as well as members of EU Directorates, such as the European Railway Agency (ERA) and the EU Commission (DG Move).

We see a need, and we want to get people not just talking about the issue of standardisation but also working toward a common solution. Our goal is to work together with all infrastructure managers. Together we will make international train traffic as seamless as possible and provide a good and reliable service to train operators across Europe."

"We have always said that metering settlement and the billing of traction energy should be applied all over Europe. As of 2020, this will become mandatory for all member countries. The European Union has seen that proper energy settlement is necessary for train operators to be billed based on energy use rather than estimation. Therefore, the new EU regulation is that all member countries have a settlement system in place to accommodate this. The good news is that this new regulation is not only more energy- and cost-efficient for train operators, it also helps them become more competitive," argues Mr. Gulbrandsen.

On a final note, he added, "Until now, our partners have primarily been small- to mid-sized European countries. However, we now have larger countries showing interest in the Erex solution, as it has a proven track record and provides the most cost-efficient option for meeting the new EU standard. We are quite confident that the Erex system, and the structure we have in place, are ready to handle larger countries. Whether it's Italy, Germany, France, or Spain, Erex is the ideal solution for the energy invoicing of train operators across both national and international networks." ■

Dyre Martin Gulbrandsen, Director of Eress

Navigating the Landscape of Italian Energy Efficiency

The biggest challenge that most countries across Europe now face lies at the intersection between the railway and energy sectors, especially when it comes to buying energy. To get a closer look at how countries are navigating this new territory, we sat down with **Massimo Centra**, who is responsible for the settlement of energy at RFI, Italy's Infrastructure Manager.

Massimo Centra, responsible for the settlement of energy at RFI.

"The current landscape in Italy is that RFI buys traction energy directly on the Italian Power Market at the spot price defined by the intersection between supply and demand. The definition of the planned consumption for rail traction is based on a monthly forecast using a statistical model which takes into account the scheduled trains-per-kilometers. Optimizing this functional relationship, the statistical engine calculates a single coefficient which is then used to set the forecasts for each zone of the Italian electrical market. Taking apart the technical details of this process, our statistical platform calculates day-by-day, hour-by-hour, for each month, the exact amount of energy we must buy for all of the train operators. In addition, we can adjust the scheduled delivery of energy according to variations in the planned rail circulation, allowing us to fine-tune the forecast process. Of course, since actual consumption differs from planned consumption, due to variations in the rail circulation, we have to consider the relative imbalance and make the necessary adjustments. Once all of that is settled, the total cost of energy for rail circulation is billed to train operators, according to their actual energy consumption.

However, since Italian train operators are not equipped with onboard energy meters, the total cost of energy is divided amongst train operators using the trains-per-kilometers data. Outside of this, we do not use any other parameters for measuring energy consumption. This means that we do not consider the distributed effects of the energy in terms of the differences between rolling stock materials. We treat the overall consumption the same way for all of Italy's train operators. We are well aware that the trains-per-kilometers variable does not accurately represent the real consumption of a single train and that the more effective approach would be to install onboard energy meters," explains Mr. Centra.

Due to the recent change in regulation, we will have to alter the current energy approach slightly by dividing high-speed rail grids from the rest of the grids.

"Due to the recent change in regulation, we will have to alter the current energy approach slightly by dividing high-speed rail grids from the rest of the grids. This means that we will also have to manage a double price structure: one for high-speed trains and one for the rest of the trains circulating on what we call the historical line. From the energy market point-of-view, this will not change the purchasing process as a whole, even though it implies the division of the forecasting process in order to take into account the separation between these two categories. As far as the electrical market in concerned, we will continue to buy energy on the Italian Power Market. Therefore, our revised approach is that RFI schedules the purchase of energy, based on the estimated forecast of consumption for the month, and pays the energy market. Then RFI must distribute this cost to the train operators, and does so according to the new regulation structure."

It appears that the situation in Italy is divided into two different domains: the energy market and the railway market. This current situation is affected by the fact that Italian trains do not currently have onboard energy

RFI is doing quite a bit of planning when it comes to improving the energy efficiency of Italian railways

meters, thus making the current landscape complicated for a few reasons. As Mr. Centra explains, "The absence of onboard energy meters makes the distribution of the total cost neither punctual nor precise because energy costs are currently calculated on a single variable. Another complexity relates to the fact that the energy market can adjust the cost of energy up to five years later, meaning that every time there is an error measure, the energy market has the right to adjust this error up to five years later.

Two or three years from now, the landscape will probably be completely different because we will have energy meters onboard trains.

This creates a constant readjustment of cost for RFI, which also affects our financial budget. We must also consider the fact that it is very difficult to forecast the price of energy consumption. The overall process is based on a dichotomy between the energy market and the railway market, with RFI acting as the distributor dedicated to the railways. With the open competition of the energy market, many players on the market look at the railway system with increasing interest."

"Two or three years from now, the landscape will probably be completely different because we will have energy meters onboard trains. At least, that is what we hope will happen. At that point, we will have to change our settlement system so that train operators pay for what they consume. Then, we will have to settle the energy consumption based on real-time data coming from the train operators. It is also important to remember that not all trains will immediately have onboard meters, so we will have to manage a mixed system. It is my personal opinion that RFI will continue to buy the energy for the railway system because that is the most efficient approach. However, with the new price structure, if a train operator is fully equipped with onboard meters, then it will have the right to sign energy supply contracts with an energy operator directly. Onboard energy meters are also important for train operators in terms of energy efficiency, especially when it comes to eco-driving, analyzing the consumption of energy, and the circulation of the rolling stock material. From RFI's perspective, installing onboard energy meters is very important because the more precise the data, the more precise forecasting and settlement will be, with a gain in terms of market fairness," says Mr. Centra.

"Our current system is very complex, but the biggest issue we are facing right now is that we are unable to measure exact energy consumption. Our hope is that train operators will decide to install onboard energy meters as soon as possible so that we will be able to bill them according to the real consumption of energy, rather than on an estimated consumption. Ultimately, not only will this help us to manage the distribution of energy in the most efficient way possible, but it will also help train operators be more responsible for their own consumption and take action to improve energy efficiency. This is a win-win project because the more efficient train operators become, the more effectively railway infrastructure managers can do their job. The most important thing to remember, however, is that every updating of the railway infrastructure—every development, every technological update to the system—is always in service to the passengers. The passengers have the direct relationship with the train operators. It is up to the train operators to take into account the needs of the passengers and, therefore, they must do their best to adjust to these needs," concludes Mr. Centra.

At present, RFI is doing quite a bit of industrial planning when it comes to improving the energy efficiency of Italian railways. Mr. Centra was kind enough to provide us with a detailed overview of these projects:

The infrastructure manager in Italy is currently working on 6 mayor energy related projects

"The first of these projects relates to energy assessment and application, specifically in terms of energy delivery. Because of historical reasons related to the contribution of the rail sector to Italian electrical infrastructure, we don't currently have energy meters in electrical substations. So, the purpose of this project is to install electrical metering directly in substations across Italy. We believe this is crucial, in terms of energy efficiency, because it helps with energy settlement from the energy market. It also benefits RFI directly by lowering losses. As a result, the installation of energy meters in substations implies completely new technologies from transformers and so on."

"The second project relates to onboard energy meters. This is an issue that involves train operators directly because they have trains in circulation. Because RFI is interested in managing the energy system correctly for these trains, this project plans to define the technical requirements for all the main rolling stock material, according to the European standard. After defining these requirements, we will have the tender to extend these meters to the overall fleet of Italian trains. If train operators pay for what they consume, it allows for better managing of the settlement system. It also provides train operators with incentives for reducing the energy consumption of their trains. For example, implementing eco-driving."

"Another project that we are working on is the use of LED technology for the lamps used in signaling. We are installing new signals based on this LED technology, which will result in reduced consumption as well as reduced cost."

"Relating to this project, from a technological point-of-view, is the use of LED technology in stations. We are doing this by switching out all the lamps in these stations with ones that reduce energy consumption by 50 percent. These new lamps are strictly used for railway application to guarantee the quality of the lighting for passengers waiting on the platforms. Of course, this is an important application in terms of cost reduction and improving energy efficiency."

"The fifth project we have in the works is still in the research and development stage, but it involves the recovery of braking energy from trains. We are studying ways in which we can recover the braking energy from trains running on the line. Our ultimate goal is that whenever a train brakes, we can use that energy for other trains and other purposes. However, we still have to figure out the technical requirements for converting this energy."

"The last of these projects involves the use of renewable energy. We are planning to install a certain number of megawatt hours of renewable energy from both solar panels and wind turbines in train stations, where it is possible. Our goal in doing this is not to sell this energy, but to use it for the purpose of the Italian railway."

Mr. Centra finally added, "We believe that these projects are very good for both the Italian railway industry as well as the European industry because they promote the best overall systems for suppliers of the technology." ■

Crossing Swiss Borders into Italy

Swiss Railways (SBB) is on track to creating greater data precision and efficiency when it comes to invoicing the metered energy consumption of all trains operating across Switzerland. Now, SBB is beginning to look beyond their own borders at how a standardised energy settlement would significantly benefit neighboring countries.

Adrian Peter, Head of Energy Management Systems at Swiss Railways (SBB)

"SBB has a partnership with Italian railways, so we have direct trains from Switzerland to Milan and Switzerland to Venice. Everything runs very smoothly from the train operators side. On the infrastructure side, there is a lot of focus on shortening the travelling time to Italy. This involves building new speed tracks and tunnels. The new Gotthard Base Tunnel, in particular, has helped a lot in this respect. When it comes to energy metering, however, things are more complex, as Italy has not yet introduced energy billing based on meters. Currently, they invoice energy based on a consumption factor."

As a quick review, a consumption factor is essentially the average energy consumption of a train per ton and kilometer, which is usually a value between 20 to 30 watt hours, depending on train velocity and train type (passenger, cargo, etc). For energy billing, this factor is then multiplied by the weight of the train, the distance that the train drives, and the energy price. This system is easy to handle, but substantially lacks accuracy and does not reflect the actual energy consumption of a specific train. Therefore, this could lead to a waste of energy, depending on actual driving style. As a result, energy saving measures onboard these trains are not reflected in the train operator's monthly bill. Italy hopes to switch to a more accurate and fair energy billing system, but first needs to install energy meters onboard trains and put a system in place to handle the data from these energy meters.

When asked about the advantages of Italy partnering with Eress, Mr. Peter had this to say, "The main benefit is that Eress takes away the learning curve. When SBB first wanted to introduce energy billing based on metering, it was impossible for us to have all the knowledge of how to define the requirements of a billing system, what it should do, what it shouldn't do, all the possible use cases. We simply didn't have this kind of knowledge or experience. By joining Eress, we benefited a lot from their experience and were able to quickly introduce an industry-proven and operational system to our railway network. They have more than ten years of experience on energy billing with this system and they know how to integrate Erex into different energy markets. So, if Italy wanted to integrate with the energy market within their own country, the solution would already be present within the Erex system. It only needs to be customised and adapted to Italy's specifications. By choosing this solution, Italy would save a lot of time and avoid a rather expensive development of their own billing system."

SBB is currently using Erex for train run-based energy settlement. As Mr. Peter explained, "In Switzerland, trains and their energy consumption are billed based on a train run and not on the locomotive itself." "This means that infrastructure costs and the energy consumed by a train going from Zurich to Bern, for example, is allocated to that specific train.

This is where the Erex system comes into play. We have it integrated in such a way that all of the data coming in from our energy meters onboard the trains is sent to the Erex system. From there, that energy consumption data is combined with the train run data from our Rail Control System and is then sent back to SBB's own billing system.

Thanks to Erex, we were able to keep our current train billing system and expand it with new functionality for energy billing.

This process is done on a daily basis for all 9,000 to 12,000 train runs. Thanks to Erex, we were able to keep our current train billing system and expand it with new functionality for energy billing."

"It is a very streamlined, high-performing, and reliable system. Any fears that we initially had about energy and train run billing are gone, and we are very happy with Erex overall," added Mr. Peter.

"Right now, we are working towards standardisation, but this has proved challenging because every country has a different approach. There are many concerns surrounding this issue, but I think that standardisation is key to future collaboration among diverse countries. We have a lot of traffic in Switzerland and are interconnected to Germany, France, Austria, and Italy as well. So, we would like to see more of these countries using the Erex system, as this will help a lot in settling energy correctly and speeding up the billing process. If we all used the same system, then we could eliminate any issues with country-to-country data exchange," concluded SBBS' Head of Energy Management Systems. ■

Swiss trains are billed on a train run basis

Getting Started with Correct Energy Billing

With only four years left for member states to meet the EU requirements for data collection, and only two years left for energy settlement, we sat down with **Bart Van der Spiegel, Expert of Energy Management at Infrabel**, the Infrastructure Manager in Belgium, and asked about what train operators and infrastructure managers need to know to get started.

"In order to invoice correctly, train operators must have energy meters installed onboard all trains. Infrastructure managers need to have a data collection system in place—to collect data from these energy meters for invoicing—as well as a fully operational energy settlement system."

One of the biggest costs for train operators is energy. This makes the need for energy metering, data collection, and the ability to invoice correctly—based on metered data—a key issue for all parties involved. Of course, there are costs associated with this task as well. As Mr. Van der Spiegel explained, "The train operators have the cost of the meter installation. Having energy metering enables the infrastructure managers to invoice based on the real measured consumption. Therefore, by focusing on saving energy through operating more efficiently, train operators will quickly see a return on investment. Driving more efficiently is possible by avoiding unplanned stops, coasting sufficiently in advance, regenerating energy while braking, and by purchasing more energy efficient rolling stock. If train operators compare the cost of a meter to the cost per year of energy consumption of traction units, they can see a return on investment for the installation of that meter over the course of one to two years, at most. Without energy metering, train operators have no way of knowing how much energy they have saved, and therefore are not able to get a reduction on their energy bills."

For train operators, their next step is to focus on saving energy by running more efficiently.

Energy meters have been mandatory since the previous EU commission regulation on new, renewed, and upgraded rolling stock. In Norway and Germany, most trains have meters. A handful of other countries are beginning to install energy meters as well, but there are many countries with only a small percentage of meters. Thus, there is still a lot of work to be done. A lot of countries have less than five percent metered, but all countries should be aiming for 100 percent.

Once the energy meters are installed, the infrastructure managers should collect the data from the meters using a data collection system, and then use that data for billing purposes. By January 1st, 2022, every member state is required to have a data collection system on ground. This deadline, which was previously set for 2020, has been postponed to 2022, as the new protocol has only been available since November 2017 in most member states. Already in 2020, however, every member state should have an energy settlement system in place. Each settlement system should be able to allocate consumptions to the correct country and exchange the data coming from the meters to the correct settlement systems. This settlement system should also be able to validate the data coming from the meters, estimate missing data, and allocate the consumption data to the train operator. This should be done by taking into account the relevant legislation concerning the energy market. It is possible that data will also need to be exported to other players in the energy market, such as an energy supplier, a party responsible for balancing, and an entity that watches for imbalances in the electricity network.

Bart Van der Spiegel received, in November 2017, an award from the Belgian Standardisation Institute in the category of Non-Profit-Making Organisations, Academia or Public Authorities for the 12 years of work related to the field of energy metering and billing.

While 2020 may seem far away, the two years leading up to it do not give countries much time if they want to develop these settlement systems themselves. They will need to make a tender, follow it up, put it in service, and make sure that it works as it should. It is far more complicated than joining an already-working, international solution that is currently being used by seven countries. However, if any country intends to use Erex from 2020 on, a quick decision is necessary. Adjusting Erex for a new user and preparing all necessary data exchanges can take some time. It might be that the infrastructure manager needs to export train-run data to Erex in order to be able to make a correct settlement. Creating a new export and testing this will quickly take a year or even more. Therefore, Mr. Van der Spiegel urges infrastructure managers to start now if they want to be in compliance by the 2020 deadline.

"For train operators, their next step is to focus on saving energy by running more efficiently. A good starting point would be to educate drivers on eco-driving, followed by introducing tools such as driving advisory systems. For those who wish to go one step further, there is automatic train operation, similar to a driverless car or a plane on autopilot. While each of these steps requires some investment by the train operators and infrastructure managers, costs are quickly regained by reductions in energy consumption. They also result in less wear on brakes and wheels. Avoiding unplanned stops also improves punctuality and improves capacity on critical parts of the network," concluded Mr. Van der Spiegel. ■

Tips for success

■ "When it comes to correct energy billing, there are also some things that train operators and infrastructure managers should be aware of," added Mr. Van der Spiegel. "Trains can run at various voltages. Energy meters should be suitable for all intended traction systems. For example, we sometimes see that trains equipped for the German 15 kV are not equipped for other voltages in countries around Germany, even though it has been a requirement, since 2011, that trains must be equipped with the proper voltage sensors for all traction systems onboard. Another issue that we frequently see is meters going out of service while changing from one traction system to another. To avoid this, suppliers should test their meters thoroughly before installing them onboard trains. Suppliers should also only put meters on the market that are in one- or five-minute data values. Currently, we are still seeing meters with fifteen-minute data values, and that should not be the case. Overall, there is still a lot of work to be done, but if everyone concerned reads the requirements of Technical Specifications for Interoperability (TSI) and complies with those requirements, there would be a lot less problems."

Erex Communicates with the Energy Market in Finland

For decades, Finnish railways have relied upon a single train operator: the VR Group. However, with the opening of the energy market in Finland, that is now subject to change. Prior to implementing the Erex system, all of the energy coming into the railway electric network grid was either from the VR trains or the switch heating for the Finnish Transportation Agency (FTA). Therefore, invoicing the railway traction energy to train operators was very simple and straightforward. However, with the railway market opening up, there are now several freight operators in Finland; and it is expected that there will be several more passenger operators in the near future. For that reason, Finland realized the urgent need for a system that would allow them to divide the energy consumption between the different train operators. Fortunately, that is one of the core missions of the Erex system; and as an Eress partner, Finland was ready to take full advantage of this energy invoicing solution.

"In the previous arrangement, we always had to do a lot of calculation to divide the energy consumption between the FTA switch warming and the VR train runs. Of course, it's only going to get more complicated with more operators. Now, we have an easier and more efficient way to identify our own energy usage. With the Erex system, we are able to divide that energy consumption using metered consumption points, which gives us a very precise understanding of what our own consumption is, without having to spend time doing many calculations with no precise results. On top of that, since we now have energy metering at the consumption point level, we can also identify the energy usage of individual trains and train units, which allows us to work on improving our energy efficiency. Before, we didn't have that initiative because we couldn't measure the consumption at a unit level," says Janne Pusa, Energy Manager at the VR Group.

When discussing energy invoicing and management, Erex does a lot of the heavy lifting for its partners. This simplifies things for Finland because they now have, for the first time in Finnish history, two companies providing energy to the railway grid.
"We have one supplier for FTA that handles the switch warming and infrastructure-related energy consumption points, and then we have our own energy provider for the VR Group that provides traction energy to our trains, exclusively. From our point of view, this is a significant improvement because we have the opportunity to have different companies compete for the tender to provide electricity to VR trains. Therefore, we are actually saving a lot of money by choosing our own energy provider, and that makes a big difference for us," Mr. Pusa explains.

Juha-Matti Vilppo, Project Manager at the Finnish Transport Agency, has been working directly with Eress to set up the Erex system to handle energy settlement across Finnish railways. When asked how he felt operations are going now that the Erex system is fully underway, he concluded, "Although we have been a member of Eress since 2013, we have not been very hurried to implement the Erex system until recently because we only had one train operator. However, with the opening of the Finnish railway market, we now have a more urgent need for this energy settlement solution. In our case, this means that several retailers can provide energy to the railway grid, so that all train operators can buy their electricity directly from the energy market. It is very important that the train operators install energy meters as soon as possible so that they can get more accurate values. Using energy estimates according to train runs is not very exact because every driver uses different amounts of energy." Impressively enough, the VR Group alone has managed to implement enough energy meters to supply two-thirds of their rolling stock in less than 1 year. As Mr. Pusa says, "We are still very new to all of this, so we haven't been able to fully utilize the Erex system yet. Even though we are in a ramp up phase at present, we have the system in place and we have our energy consumption data in the system, which is great. That's something we've never had before, and it is very good for development. For instance, we can now look at the actual energy consumption and start thinking about energy improvement projects for rolling stock and driving style. We are looking forward to benefiting from the Erex reporting and invoicing functions in the very near future."

Eress is very good about making sure that the metered data in their system is correct and that new meters are installed quickly.

"We have been very pleased with how the installation of meters has been carried out by the VR Group. The progress has been very impressive, especially with regard to the speed of the meters, the roll out, and the usability of the metered data inside our system for billing. Looking forward, we plan to work together with FTA to focus on using as much metered data as possible for the energy billing of the VR Group," says Elin Pettersen, Project Manager at Eress.

"Finland is the first county in the Eress partnership to introduce the possibility for train operators to buy their own energy. As such, it is the first country inside Eress that needed a solution for reporting exact energy consumption. We are looking forward to seeing these reports, which provide an overview of the imbalance settlement and invoicing, from Finnish Erex in the upcoming months and using the experience gained from this project to assist other Eress partners," Ms. Pettersen adds. ■

Janne Pusa, Energy Manager at the VR Group.

Elin Pettersen, Project Manager at Eress.

Juha-Matti Vilppo, Project Manager at the Finnish Transport Agency

Around the world

17 — 18

2017 was a year to remember for the railway industry, with innovation reaching a tipping point that is set to make 2018 a year full of further technological disruption and development.

Germany equipped for the future with an integrated control system

In order to keep up with the era of digitalisation and make use of future, global opportunities, German infrastructure manager, DB Netz AG, has opted to replace its current system with the innovative Rail Control System (RCS) by the Swiss Federal Railways (SBB). The nationwide roll-out of the first stage of development is on track for 2020.

Goodbye diesel

The UK Government has announced that diesel-only trains will be phased out by 2040. Currently, 29% of the UK's fleet is diesel and the move has been received positively by campaigners. According to the Institution of Mechanical Engineers (IMECHE), a mere 42% of the UK's network is currently electrified, putting it behind the Netherlands (76%), Italy (71%) and Spain (61%). Network Rail needs to develop an appropriate specification for railway electrification, which will enable it to build an affordable business case for a rolling program of completion over the next 20 years.

Baltic States sign agreement for implementation of Rail Baltica Project.

The Prime Ministers of Latvia, Lithuania and Estonia have signed an intergovernmental agreement, which promotes the implementation of the European standard gauge public railway: Rail Baltica Project. The project is aimed at full integration of the Baltic States and their capitals into the EU rail and transport networks. The development of rail infrastructure within the Rail Baltica public railway is an object of strategic and economic importance for the region and its population. Furthermore, the benefits will extend to Nordic countries via an underwater rail tunnel, as well as the European Union, which aims to develop trans-European transport networks, including the North Sea – Baltic Corridor.

Fuel cells and hydrogen for the rail sector

While electrifying the transport system is a major priority to reduce greenhouse gas emissions in Europe, efforts are still needed to reach the environmental and zero-emission objectives set up for rail operations. Therefore, Fuel Cells and Hydrogen Joint Undertaking (FCH 2 JU) is teaming-up with Shift2Rail to launch a joint call for tender for assessing the potential of fuel cell and hydrogen (H2) technologies for the rail sector.

FCH JU is a unique public private partnership supporting research, technological development, and demonstration activities in fuel cell and H2 energy technologies in Europe. Its aim is to accelerate the market introduction of these technologies, realising their potential as an instrument in achieving a carbon-lean energy system.

Shift2Rail is the first European rail initiative to seek focused research and innovation and market-driven solutions by accelerating the integration of new and advanced technologies into innovative rail product solutions.

World's first Rail-less train unveiled in China

The ART (Autonomous Rail Rapid Transit) was developed by CRRC Zhuzhou Institute Co Ltd, which produces key parts for high-speed railways. The autonomous **30-meter train** is part of an intelligent rail express system, and runs on rubber tires rather than rails. It has a speed of **70 kilometers per hour** and can carry up to **300 passengers**, offering new options for easing modern transport pressures. The train is powered by electricity and works by reading the dimensions of the road using its onboard sensors. It can also plan its own route, which is like having a virtual rail for the train. According to the government of Zhuzhou city in Hunan province, a 6.5-kilometer ART line will be built through downtown Zhuzhou. Operations are set to begin during 2018.

Construction of Kuala Lumpur-Singapore high speed line begins

The Kuala Lumpur-Singapore High Speed Rail (HSR) is a strategic project between the governments of Malaysia and Singapore, and aims to facilitate seamless travel between the two capital cities, enhance business linkages, and bring the people of both countries closer together. **The HSR link is expected to cut the travel time between the two cities down to just 90 minutes**. Although this high-speed line is not due to open until 2026, it will allow trains to run at a top speed of **300 kilometers per hour**, with additional stations planned at Kuala Lumpur, Putrajaya, Seremban, Ayer Keroh, Muar, Batu Pahat, Iskandar Puteri and Singapore.

Russian railways main gas turbine locomotive enters service

Russian Railways has delivered a GT1h-002 main gas turbine locomotive for operation on the Sverdlovsk railways route. The locomotive has been designed to drive trains with increased weight and length. The introduction of this locomotive into the rail network forms part of the Energy Strategy for JSC Russian Railways and is an alternative to expensive diesel fuel. The move will also help to reduce harmful emissions by rail freight transportation.

How to Meet the New EU Railway Energy Standards

With European railways becoming more standardised, open and competitive, it can be difficult to keep track of all the changes in regulation. Fortunately, Eress is here to help member states navigate this new territory and make the process of adjusting easier for both train operators and infrastructure managers. Here is everything you need to know to get up-to-date on this exciting transition.

Energy meters meet standard

The best place to start when it comes to the new EU railway energy standards is with conformity assessment. As a recap, conformity assessment is an evaluation that determines, either directly or indirectly, whether a process, product, or service meets relevant technical standards and fulfills the necessary requirements. This evaluation can also include the close inspection of a product, as well as its design and manufacture.

When it comes to conformity assessment, most train operators are primarily concerned with simplifying the process in order to reduce internal costs. Eress recommends choosing an independent Notified Body from the preferred country of choice, as a certification of an energy measurement system in one country is valid in other countries as well. That being said, it is important to keep in mind that installing an energy measurement system does have an impact on the train's core safety certificate. This certificate also verifies some national requirements and, as a result, is country-dependent. The impact of energy measurement systems on safety certificates is not significant, which means that train operators can request that the National Safety Authority to simplify and standardise the impact of energy measurement systems on safety certificates. Any existing national verification by the National Safety Authority is also acceptable.

Another concern that often comes up is what to do when the Technical Specifications for Interoperability and the EN 50463 norm that describes specific requirements for onboard metering systems have different requirements than national rules. In these situations, it is important to remember that requirements of TSIs become national rules after adoption. If there are any conflicting national regulations, train operators will need to contact their local government in order to make the necessary changes. The best case scenario would be a decision that clarifies which national regulations are no longer applicable or that conformity to the TSI in question is an acceptable alternative to national rules.

For sensors and meters

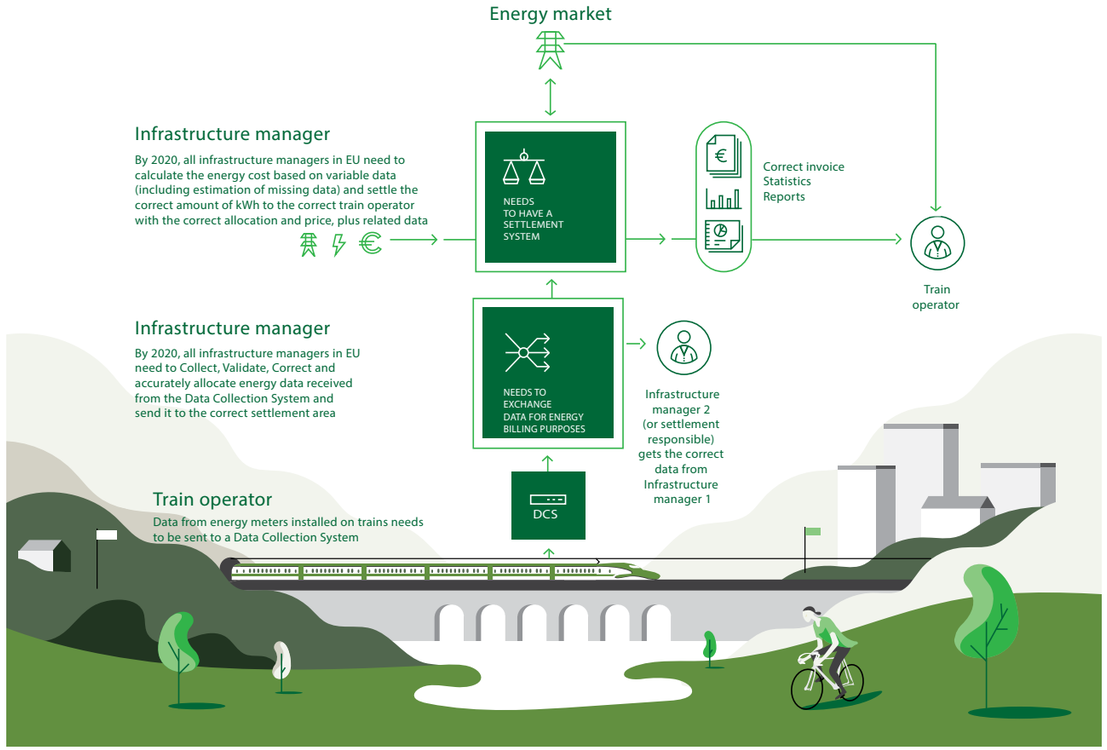
Removing or replacing sensors onboard trains can be a costly process, which is why many train operators have requested further standardisation of aging and accuracy tests over a sensor's lifetime, as well as more standardisation of recalibration procedures. Not having a fixed period of recalibration for both sensors and meters has also been requested, as inductive transformers typically do not need to be recalibrated. A shunt, on the other hand, is susceptible to aging, and its output of current measurement function can change over time. In such cases, a recalibration is essential after some years. The meter itself may not require any verification, but should be replaced every eight to twelve years, as some of its components may begin to fail after that period.

Both recalibration and reverification requirements are based on the experience of the energy measurement system supplier, and, as such, any information or requirements regarding these matters should be approved by the Notified Body during the initial conformity assessment. These requirements should then be written into the maintenance plan of the rolling stock.

Communication between meters and DCS Framework

While the legal framework of regulation and standardisation is adept and sufficiently detailed, only recently did the new regulation clarify the issue of communication between energy measurement systems and data collection systems.

Other concerns relating to the standardisation framework relate to one minute resolution requested to be used in data collection systems and energy settlement systems. With regard to one minute resolution, it is important to note that the Technical Specifications for Interoperability and the EU norm specify five minutes as the time reference period for all compiled energy billing data.



Therefore, conformity assessment will always be based on five minute data intervals. The good news here is that the Erex system is able to collect one minute values and combine them into five minute values and five minute values into one minute values for their partners.

Currently, there is no conformity assessment required for data collection systems. In fact, the testing requirements defined by the EN 50463 are quite limited. However, the obligation for implementing a data collection system is placed on member states by the Technical Specifications of Interoperability of the Energy subsystem. Consequently, it is possible that individual member states might add additional requirements. Settlement systems, on the other hand, need to be better specified and more standardised. Validation rules also need to be described more clearly. Efforts have been made by the UIC working group in an effort to make improvements in this area, however, there is still more work to be done. The results of this UIC working group will be presented on a Stakeholder Workshop on November 6th, 2018 in Paris.

For now, the most important thing to remember is the upcoming EU deadlines for both data collection systems and settlement systems. By 2020, infrastructure managers in Europe will be required to have a settlement system in place. By 2022, a data collection system able to collect the data according to the new data communication requirements will also need to be up and running.

It is a lot of work to bring railway technology into the 21st century. However, standardising and updating data collection and settlement systems paves the way for greater transparency and competitiveness on the open market, while also improving the efficiency and profitability for train operators and infrastructure managers across all Europe. ■

Standardising Train Run Data for Billing Accuracy

Eress was founded in an effort to expand on the concept of being able to accurately measure, control and bill the energy consumed by trains, as well as to promote data sharing. With the EU's ambitious 2020 climate and energy targets looming, Erex is becoming a European standard and turning cross-border standardisation from a pipe dream into a reality.

The need for Erex is readily apparent. In many countries, train operators are invoiced based on an estimate for the amount of energy consumed, using simple measurements that involve the weight of the train and how far it travels in a single run. Invoices are often exorbitant, and train operators have no way of knowing whether they are accurate or even close to real consumption.

Erex is overcoming this problem by acting as an energy settlement system solution. It receives precise energy data from already existing energy measurement systems that are active not just in partner countries but across Europe as well. The system also receives data from GPS positions, train management systems, and the specific energy prices for any given country. From this information, Erex is able to validate, filter, and combine all of the data to ensure that everything is correct before any infrastructure manager is able to invoice a train operator that is traveling through a specific territory.

One clear need in Europe is the standardisation of data. Infrastructure managers need to use standardised formats and data content in order to share data and correctly bill train operators across Europe. Eress recently organised a "standardisation of train run data" workshop in Vienna, on February 19th of this year, to discuss best practices in Europe and agree on how to standardise them. Representatives from Deutsche Bahn Energie, TAF/TAP TSI, SNCF Reseau and SNCF Mobility, Bane NOR, Infrabel, Lineas, ÖBB, DG Move, and RailNetEurope were all in attendance.

Both Eress partners and railway organisations across Europe have been instrumental in developing the solution's basic functionalities and increasing performance over the years, with data sharing paramount to future developments. That being said, during the workshop, several important matters were discussed.

One of these topics concerned key data related to train runs: the EVN (European Vehicle Number). An EVN identifies the accurate train unit running in the infrastructure managers' railways.

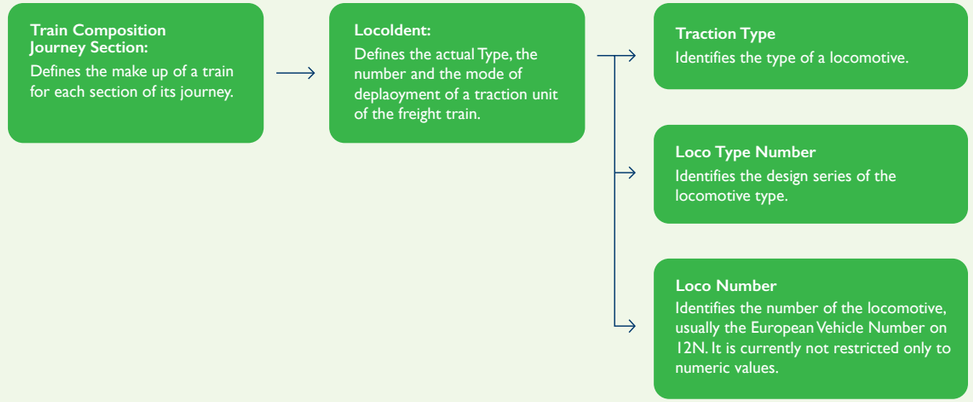
EVNs are essential, as they allow infrastructure managers to identify the actual train unit and charge the train operator accordingly. The workshop helped to clarify what most of the participants didn't know, which is that the EVN is already included in the TAF/TAP TSI (European regulation). This information was not previously known because train operators do not have to include the EVN when reporting where and when their trains have run through the infrastructure managers' network. The EVN is not yet mandatory; and because of this, it is currently considered a voluntary field that train operators can choose whether or not to use them.

Fortunately, the EVN possibility already exists in the current EU regulation (TAF/TAP TSI) and is ready for implementation at any time. The challenge remains in convincing all of the train operators to fill out this EVN field when reporting to the national infrastructure manager. Therefore, on a national level, through national regulation (network statement), each infrastructure manager has the right to demand this EVN from train operators.

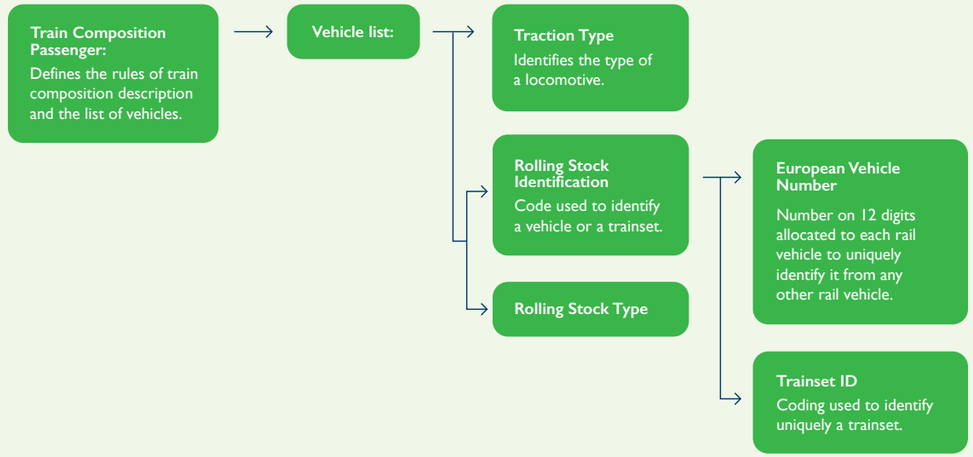
Ultimately, the vision for Eress and its partners is to pool ideas and resources into the organisation rather than compete with one another, with all shared data potentially leading to refinements and enhancements to the benefit of all involved. With more operators involved and thousands of train journeys being measured every day, those concerned with railway energy consumption can gain a complete picture of how much energy is being consumed and what should be done in order to reduce these levels for the good of the entire continent. It is Eress's goal to one day be able to facilitate increased data sharing among all EU member states, as it is a fundamental step in ensuring progress, improved performance, and stronger partnerships across Pan-European corridors.

If you are interested in learning more about the EVN in TAF/TAP TSI, please contact **info@eress.eu**. ■

(Freight) Train Composition Message



Passenger Train Composition Process Message



A change request was introduced.
A vehicle can be identified:

- by its EVN (especially for locomotive)
- and/or by the Rolling Stock Type and the Trainset ID (especially for the trainsets)

One for all and all for one

As the famous musketeers, Eress Steering Group is working for all its partner members and new potential ones with this attitude.

Finland
Juha-Matti Vilppo

Switzerland
Adrian Peter

Belguim
Bart Van der Spiegel

Norway
Terje Stømer

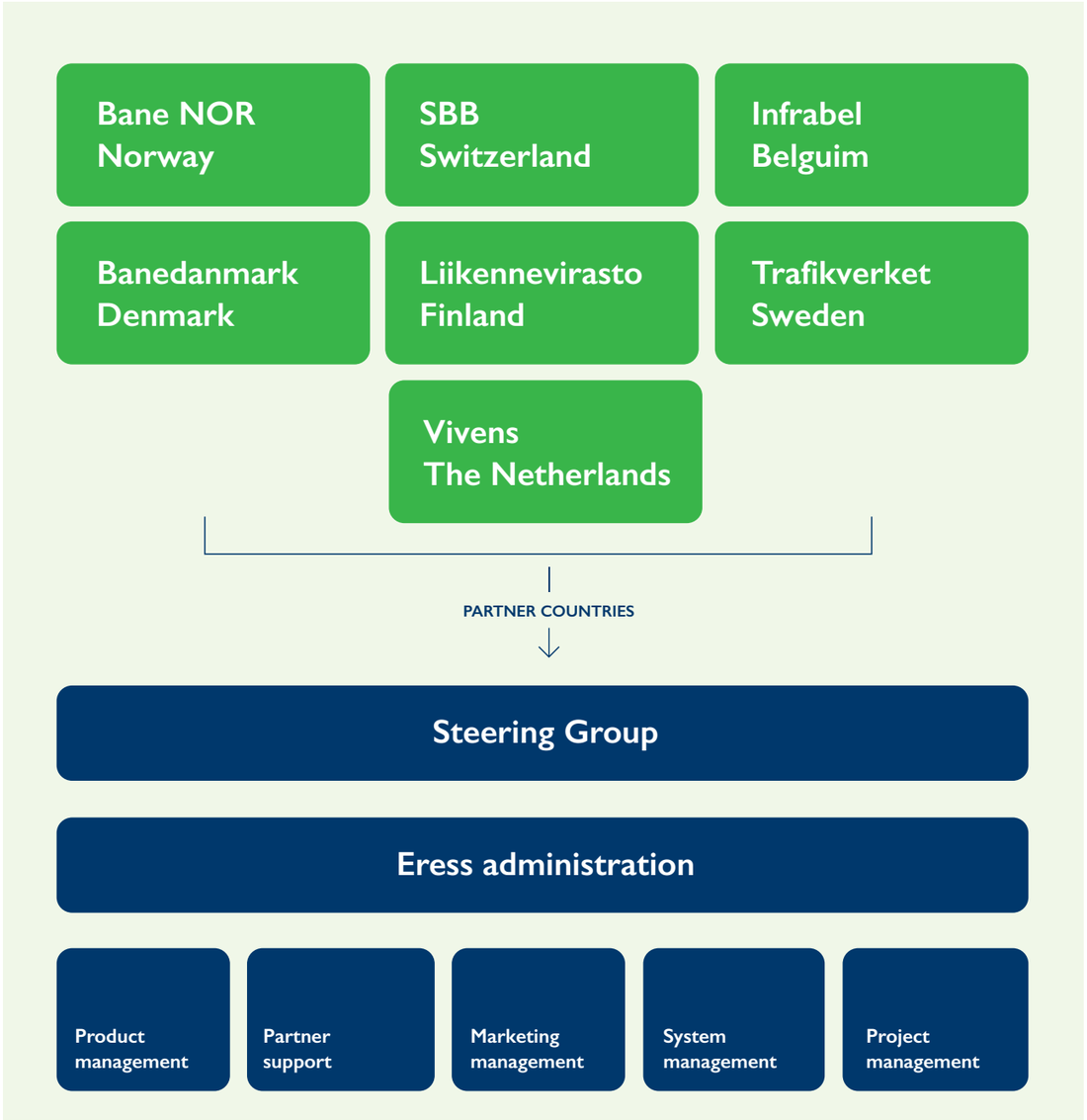
Denmark
Hans-Erik Fogh

Sweden
Lars Johansson

The Netherlands
Ralph Luijt

Eress Director
Dyre Martin Gulbrandsen

Organisation chart



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