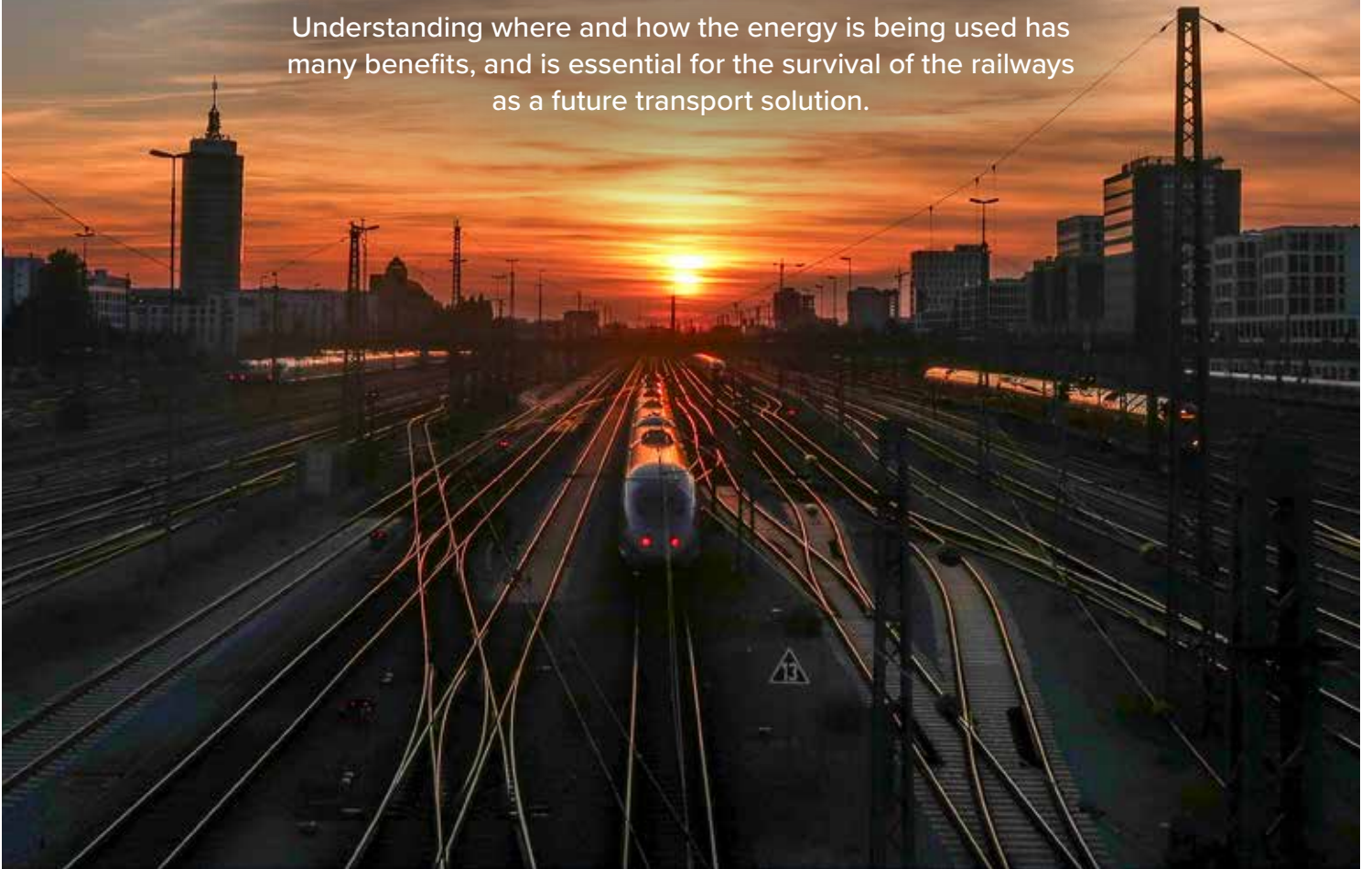


Eress

2019 MAGAZINE

The Rise of a New Era

Understanding where and how the energy is being used has many benefits, and is essential for the survival of the railways as a future transport solution.



STATISTICS

Understanding the Complex World of Railway Energy

A closer look at the findings of the 2019 railway energy survey conducted by the Sustainable Development Foundation. The overview provides a better understanding of the industry's perspectives concerning the technical harmonisation of the railway energy sector.



WELCOME

More Energy Collaboration is Needed

The development of the railway sector and collaboration in diverse fields, like the energy one, is key for the sectors' survival. But, how can we collaborate?

The good news is that many countries in Europe are already collaborating with each other in the energy area. In Eress, we promote this “energy on-track” collaboration and hope that more countries join us in the effort to standardize, work together and allow train companies to compete as the greener transport mode for the future.

Since the EU deadlines for exchange and settlement of energy are just around the corner (on July 2020), we decided to arrange Eress Forum 2019 in Brussels and invite the EU Commission, CER and EIM to give us the latest railway energy updates. A Sector Declaration is under discussion this year and it is key that both

Infrastructure Managers and Railway Undertakings are informed and agree on how to proceed on the traction energy field.

In this edition, Annika Utgaard interviewed 4 Eress partner representatives and asked why did Sweden, Finland, Belgium and The Netherlands decided to join Eress organization? What were their main challenges? Included in this magazine, you will also find the latest results and statistics coming from our yearly EU Railway Energy Survey. To make this possible, we thank the Sustainability Foundation.

We hope that you like this years' magazine. If you have any improvements to propose or have any challenge with energy metering, DCS, exchange of energy data or its settlement, do not doubt to contact us.

EU Dates for Metering & Billing

Mandatory in the EU from:



Energy Meters on Trains

Energy meters are mandatory on all new, renewed and upgraded rolling stock since November 2014 (Commission Regulation 1302/2014).



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 (Commission Regulation 1301/2014).



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).



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ERESS

The Future of Railway Energy

Interoperability means making it possible for trains to run smoothly across the different national railway systems. This is the most important challenge in creating an integrated European railway. Going forward, interoperability is required when it comes to enhancing train competitiveness as a passenger — and freight — mode of transport. Moreover, it is determinant for the survival of the railways as a future transport solution. Thus, we all are in the same boat. The adoption of energy monitoring and billing systems by operators and infrastructure managers, in particular, is linked to the technical harmonisation of the railway energy sector. A correct measurement of energy consumption represents the starting point for any energy efficiency programs that can be implemented in the future. Understanding where and how the energy is being used has many benefits, as seen here.

What Are the Benefits of Joining Eress?

EU Regulations require members to have an energy settlement system in place by 2020 and a data collection system on ground by 2022. Using Erex fulfills these requirements.

In order to invoice correctly, EU countries are required to meet two requirements. First, train operators must have energy meters installed onboard all trains. Second, infrastructure managers need to have a data collection service in place to collect data from these energy meters for invoicing. To do this, they must also have an energy settlement system up and running.

Energy meters have been mandatory since the previous EU commission regulation on new, renewed, and upgraded rolling stock. Officially speaking, nothing has to be done in terms of energy billing in 2019; however, by 2020, every member state is required to have an energy settlement system in place. With only one year to meet the 2020 deadline, countries do not have much time if they want to develop these systems themselves.

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The easiest way to get around this is to join Eress. However, for those who prefer to develop their own system, they will need to make a tender, follow it up, and put it in service. This is far more complicated than joining a running application that is fully functional and easy to customise.

Ultimately, the goal of these latest EU regulations is standardisation. Because each country shares its borders with others, the differing approaches to energy settlement is challenging. If more countries made use of the Erex system, it would lead to more precise energy settlement, and consequently, expedite the billing process. Using the same system would also allow countries to collaborate with ease going forward, and eliminate any issues concerning country-to-country data exchange.

Energy Saving

Measured train journeys have shown 30 percent energy saving when using Erex. This matches well with the EU's environmental target of a 27 percent increase in energy efficiency by 2030.

While the biggest cost for train operators is access to the network, the second biggest cost 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. Train operators may be reluctant to take on the cost of meter installation, but having energy metering means that infrastructure managers can invoice based on the cost of consumption, which is significantly more accurate than an estimate.

By focusing on saving energy through more efficient operation and the purchase of energy efficient rolling stock, train operators will quickly see a return on their investment. If train operators compare the installation cost of a meter—which runs between €10,000 to €20,000—to the cost per year of consumption of traction units, they gain anywhere from a five to ten percent return on investment for the installation of that meter, and that return only takes 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. Thus, cutting costs and saving energy—by paying upfront for less energy

Why join Eress?

- **EU Regulations** require members to have an energy settlement system in place by 2020 and a data collection system on ground by 2022. Using Erex fulfills these requirements.
- **Energy Saving:** Measured train journeys have shown 30 percent energy saving when using Erex. This matches well with the EU's environmental target of a 27 percent increase in energy efficiency by 2030.
- **Cooperation:** Erex is the only open-source system that works cross-border, independently from countries and train operators, and is easily adapted to any existing system.
- **Collaboration:** As an open partnership, Eress does not offer commercial services to the market. For this reason, it is not necessary for new partners to tender prior to joining.

consumption—should provide enough incentive for member states to get started.

If a train operator is fully equipped with onboard meters, then it will have the right to sign energy supply contracts directly with the market. Energy meters are also important for train operators in terms of energy efficiency, especially when it comes to eco-driving, analysing the consumption of energy, and the circulation of rolling stock material.

From an infrastructure manager'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.

For most countries, energy settlement and billing systems are very complex, but the biggest issue many are currently facing is not having the ability to measure exact energy consumption. By installing onboard energy meters as soon as possible, train operators will enable infrastructure managers to bill them according to the real consumption of

energy, rather than estimated consumption. Not only will this help infrastructure managers oversee 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. In the end, this is a win-win solution for all parties involved.

Cooperation

Eress is the only open-source system that works cross-border, independently from countries and train operators, and is easily adapted to any existing system.

Eress takes away the learning curve. When Swiss Railways (SBB) first wanted to introduce energy billing based on metering, they weren't sure of the most effective way to define the requirements of a billing system, what it should do, what it shouldn't do, all the possible use cases. They didn't have this kind of knowledge or experience, which is why they joined Eress. In doing so, they were able to quickly introduce an industry-proven and fully-operational system to their railway network. Together with Eress, SBB integrated the Erex system into different energy markets.

The same holds true for all member states. If any train operator or infrastructure manager 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 national specifications. Choosing this turn-key solution means saving thousands of hours of research and development, and not having to absorb the high costs associated with doing so.

Conclusion

It takes a lot of work to bring railway technology into the 21st century. However, standardising railways and updating their data collection and settlement systems paves the way for greater transparency and competitiveness on the open market. Furthermore, it means a significant improvement in the efficiency and profitability for train operators and infrastructure managers alike, across all member states.

It costs nothing to partner with Eress. If you are interested in coming onboard, please visit our website at eress.eu. ■

The Rise of a New Era

Since the dawn of the railway era, the industry has relied heavily upon guesswork and old formulas to calculate the energy consumed by trains. However, with the ever-increasing demand for cross-border rail transport and the complexity of both national and international standards, a more up-to-date means of measuring exact energy consumption has become a necessity. The solution? Erex: a software capable of running across European borders and transforming the settlement of traction energy in the 21st century.

In Norway, we began to ask ourselves why there wasn't a better system in place to determine the user of this energy and their exact consumption of it. Was it just disappearing into the abyss?

Terje Stømer

To learn more about how Eress and the Erex system came to be, and where they plan to go from here, we spoke with both Terje Stømer, Chairman of the Eress Board of Directors, and Dyre Martin Gulbrandsen, Director of Eress.

Eress: A Brief History

"To understand why we started Eress and created the Erex system, we must establish what invoicing the energy used by trains looked like 'back in the day'," Mr. Stømer explains. "First of all, the majority of trains in Europe use a gross-ton-per-kilometer estimate as the basis for their energy billing. This calculation is based on the size and speed of the train, which produces what we call a consumption factor. Train operators are billed for their energy consumption based on this factor. There were no alternative ways of determining how much energy was being used prior to the development of Erex."

"In Norway, we began to ask ourselves why there wasn't a better system in place to identify the user of this energy and their exact consumption of it. Was it just disappearing into the abyss? Were infrastructure managers simply splitting costs as they saw fit? How could train operators be incentivised to reduce their consumption of that energy? These were the questions we began to ask ourselves at the start of the new millennium."

"At that time, the regulation of the energy sector was still in its infancy in the Nordic countries. Later on, the railway sector was also deregulated. So, train operators were the business and the infrastructure manager was the monopolist. We wanted to marry the two and create a system that made the whole process smoother, more beneficial for both sides. To make this happen, we needed to equip train operators with onboard energy meters so that their energy usage could be measured and billed accordingly," says Mr. Stømer.

Eress: From the start

- Prior to Erex, train operators were billed based on their estimated energy consumption.
- Onboard energy meters allow precise energy usage to be measured and billed accordingly.
- Erex is a full-stack settlement solution and includes everything from the DCS (Data Collection System) and energy exchange to the settlement of that energy.
- Erex complies with the latest standards set by the European Commission, and directly integrates into each partner's country-specific solution.
- Eress is the largest energy settlement provider in Europe and provides the most cost-effective solution available on the market.

"We started to search the whole of Europe for systems that could make this happen, but no one had a solution to this problem. With trains constantly moving between price points and across the borders of neighbouring countries, finding a solution seemed almost impossible. We did find one system in Germany, but it was designed specifically for German trains. What we needed was an international system, which was not possible on any existing infrastructure at the time."

"Ultimately, we decided to take on the project ourselves. We hired subcontractors to build out the software and its corresponding solutions. It took about three years to complete. By 2007, everything was ready for rollout. At that point, we began installing meters onboard trains and we've

The real challenge that comes into play is when train operators cross borders into neighbouring countries. In these instances, we try to reduce the burden for them by having one standard solution for all.

Dyre Martin Gulbrandsen

been implementing more and more ever since.”

When asked how other countries came to partner with Eress, Mr. Stømer explains that “Sweden and Denmark contributed to the initial investment costs associated with the development of the Erex system, and joined as partners immediately thereafter. Following suit was Belgium, then Finland, Switzerland, and finally the Netherlands. Now we are seven partners in this collective, and we are all using the same system.”

“To make this work internationally, we had to have a system which is compliant with the latest EU regulations. So we worked closely with the different standardisation bodies to ensure that these meters were valid across Europe. Because of this, the Erex system complies with the standards set by the European Railways. This includes the latest regulation, which ensures that train operators with energy meters installed onboard their locomotives will be billed according to their exact energy consumption. Countries have one year left to meet the 2020 deadline for this new rule. After 2020, they have a given implementation period of two years prior to the final deadline in 2022.”

Mr. Stømer then adds, “What we have done with the Erex system is make it a non-business case. Yes, it is a business case for train operators but not for our organisation directly. Erex is a shared-cost system that is funded by each user. Together with the other partners, we hold an annual meeting to decide on the following year’s budget as well as to discuss further developments of the solution. A representative from



each partner country is present at these meetings. We offer full support to both current partners and those who wish to test our system. Eress truly is a non-profit organisation whose earnings go back to the end-user—the train operators—who pay for their exact energy consumption. The infrastructure manager of each partner country contributes each year to the further development of the Erex system.”

Eress Moving Forward

“Our goal is to be the largest energy settlement provider in Europe,” states Mr. Gulbrandsen. “Going forward, all European countries need to have a system like Erex in place by 2020. So, our biggest challenge at present is figuring out how to onboard new partners quickly and in a cost-effective way. With Erex, you



Terje Stømer
Chairman of the
Eress Board
of Directors

get a full-stack settlement solution. By 2020 we will have everything from the DCS (Data Collection System) and energy exchange to the settlement of that energy. All of this is directly integrated into each partner’s country-specific solution. Erex is the real deal, and it can handle the variations in national regulations, which is important to note.”

The key, of course, is to implement both national and international standards in a way that is cost-effective for both current and future partners. This is one of the guiding principles that Eress was founded on: utilising a single system that is as standardised as possible, while still adhering to both national and international rules. As Mr. Gulbrandsen points out, “The real challenge that comes into play is when train operators cross borders into neighbouring countries. Subsequently, they need to comply with the different systems, rules, and regulations. In these instances, we try to reduce the burden for them by having one standard solution for all.”

When asked about how Eress is helping its partners navigate the area between complying with international standards and continuing to operate within national



rules, Mr. Gulbrandsen states that, “Going forward, we need to agree on how we will do things in the railway sector, which is a huge discussion within the international railway community at the moment. As a result of this, we have started what we call a Sector Declaration. This Declaration points to the future direction of the railway industry and clarifies what is wanted—in terms of the purchase of energy—by both train operators and infrastructure managers alike. We hope to have it finished by the end of this year.”

He then adds, “What I like about this approach is that the industry is coming together to form a concrete statement that says, ‘We will make sure to have energy meters installed onboard trains and use them for accurate energy billing and settlement.’ This way, train operators have full transparency as well as the possibility to save on future energy costs.”

Concerning the future of the railway energy sector, Mr. Gulbrandsen is confident that both industries will become much more integrated within the next ten years than they were at the start of the millennium. “There is still a lot of work that

needs to be done from a digitalisation and standardisation standpoint, as there are currently too many specialised, country-specific solutions spread across Europe. But ten years from now? It’s highly likely that we will have a connected energy solution for the whole of Europe. Not necessarily one single solution but certainly improved systems that are capable of talking to one another across borders. Hopefully, we will also have energy consumption data easily accessible and more available so that the relevant parties can better understand their use of energy during operations.”

“Of course, all of this takes time and it needs to happen in both the railway and energy sectors,” he notes. “That said, Eress is in this for the long-run. We are carefully paving the way for this future, brick-by-brick. We know that we have a



Dyre Martin Gulbrandsen
Director of Eress

solution that works very well for our seven existing partners, but we are committed to developing further solutions going forward. The ever-changing landscape of technology creates on-going needs for both infrastructure managers and train operators, and we are keeping that in mind throughout this process. Beyond that, of course, we would like to continue expanding into other European countries as the most cost-effective solution available on the market.”

For those who are considering coming onboard with Eress, Mr. Gulbrandsen has a few sage words of advice. “We know from working with our current partners that it is necessary to run a settlement solution based on metered data. And doing so successfully requires infrastructure managers to work closely with train operators. Both parties need to be on the same page and on the same team.”

As a final note, he adds, “If you are an infrastructure manager, there is no need to do this alone. The best way is to join an existing collective, like Eress. If you choose to go at it alone, the risk of failing is much higher. And with the 2020 deadline fast approaching, the time to act is now.” ■

SWEDEN

Bringing Energy Invoicing into the 21st Century

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As one of the original creators of the Erex system, Sweden has observed, in-depth, the ever-changing dynamic between the railway and energy sectors over the past several years.

Lars Johansson, Manager of Electricity Trading at Trafikverket, remembers the days when he used simple measurements to estimate and invoice the amount of energy consumed by train operators.

“The original model we used to invoice train operators was simple and not very good,” Mr. Johansson explains. “At the time that model was developed, there were no other options available to us. So, what we did was base our calculations on key figures that allowed us to allocate the consumption of energy to the different train operators. The model was actually just an Excel sheet that we used for this purpose. Of course, it was not very accurate, so some operators paid too much and others paid too little. It was not an ideal solution.”

Eress was subsequently founded in 2007 by the three Scandinavian infrastructure managers—BaneNOR, Trafikverket, and Banedanmark—to accurately measure, control, and bill for the energy consumed by trains. They also worked to promote data sharing, which has grown as new members have come onboard.

When asked about the decision to join Norway and Denmark in founding Eress, Mr. Johansson pointed to the need to use more energy meters and pool ideas and resources, rather than compete with one another. “We decided to partner with Eress when we realized the need to use meters more. Because of that need, we required a system that could handle the data coming from those meters. Since we are a very small organisation, it would have been a lot of work for us to develop a system like this on our own. Therefore, we decided to join together with other countries to form the Eress organisation, which in turn, designed and built the Erex solution. Not only did this help us to provide fair invoicing to our train operators, but it also opened up the possibility for train operators to purchase energy directly from the market, which was very exciting.”

Mr. Johansson goes on to say, “For us, it wasn’t as much about developing the initial system. We were more concerned about running that system and maintaining it. Joining this collective created the advantage of not having to deal with updating all of these values day-in and day-out. The Eress organisation handles all of that for us, or rather, their technical team does. So, again, it was more about the maintenance side of things. We didn’t want to deal with any of that. Also, when you have to develop the system and ensure that it complies with the latest EU regulations, you need to have enough people in your organisation to manage all of this work. Trafikverket doesn’t have the manpower required for the job, but Eress does.”

When asked how he feels operations have been going, Mr. Johansson says, “It is a lot more work for us now than before, because we used to do energy settlement based on this simple little Excel sheet. But it wasn’t fair enough between the different train operators. So, even though we are required to do a little more work than before, we now have much better invoicing. That said, we feel that the benefits outweigh this slight inconvenience.”

To anyone considering joining Eress, Mr. Johansson has a few words of advice to share: “The Erex system is not a quick fix. It requires a lot of work upfront. That may not be the most convincing argument but it is important to know what you’re getting into before joining.”

He then adds, “What’s great about Eress is that this cooperation exists between many countries and is easily accessible. And with this new set of standards and EU



Lars Johansson
Manager of
Electricity Trading
at Trafikverket

Why did Sweden join Eress?

- Sweden decided to partner with Eress when the need for energy meters became more apparent. To handle the data coming from those meters, they needed a system like Erex.
- Erex helped provide fair and accurate invoicing to Sweden's train operators and also opened up the possibility for the purchase of energy directly from the market.
- Joining a collective like Eress created the advantage of not having to deal with the constant updating and maintenance of an energy settlement solution.
- The Eress cooperation exists between many countries and is easily accessible.
- With the upcoming EU regulations, energy exchange and settlement is better done through a collective than going at it alone.

regulations taking place, the energy exchange and settlement is better taken care of with a collective than if we were to go at it alone. If you have your own system, you have to do a lot more work to be compliant. And if you are a small country like Sweden, the cost and time associated with developing your own system simply doesn’t make sense. It’s not easy to create these updates all the time to satisfy the latest regulations and so forth. That said, Eress has very good connections and they are good about aligning themselves with the EU directives. So, all of the changes that need to be done to the system are always done in time and prior to any deadlines.”

To conclude, Mr. Johansson states, “We had control over our energy settlement before Erex, but back then, the various train operators were not paying the right amount because everything was estimate-based. Now, we have a much fairer way of invoicing. So, everyone pays the exact cost for what they consume. It is a very accurate way to do energy exchange and settlement.” ■

FINLAND

Standardising Energy Settlement

When it comes to energy exchange and settlement, the Erex system does a lot of the heavy lifting for its partners.

Juha-Matti Vilppo, Project Manager at Väylä, the Finnish Transport Infrastructure Agency, has been working directly with Eress to set up the Erex system to handle energy settlement across Finnish railways. Now that the solution has been up and running, we asked Mr. Vilppo about the experience thus far.

“In the beginning of 2017, we started to use the Erex system for energy settlement and billing in Finland,” Mr. Vilppo explains. “It has been going quite well since. The train operators are satisfied with this new procedure and we are in the process of installing more meters. Half of the traction units are now equipped with onboard meters and, as a result, we have been able to improve the accuracy of our estimates. Of course, it has been a lot of work on our end but the Erex system itself works very well. We receive reports every month on energy usage, and we make our transmission charges based on these reports. This has enabled train operators to buy their traction energy directly from the market, based on our balance settlement reports to both energy suppliers and the Nordic imbalance settlement unit.”

Mr. Vilppo then goes on to say, “The reason that we chose Erex is because it is very important to have a standardised energy settlement solution in Europe. And it is easier to standardise when member countries can develop something together and have good cooperation beyond their borders. This is why partnering with Eress made sense to us. Furthermore, I think that it is important to point out that, because the Erex solution was well-established within the Nordic countries already, it was

a very natural choice for Finland to join this collective. Of course, our primary reason for coming onboard was the economic benefit of developing this shared-cost solution with other Eress partners. Together, we focus on ensuring that the Erex system fulfills the EU requirements, is as transparent as possible, and is not too complicated to implement. I believe that we get a lot more out of developing these things together, rather than developing them on our own.”

When asked about the cost of establishing their own national system for energy exchange and settlement, Mr. Vilppo says, “I have not made this calculation before. However, cost aside, it was not possible for us to create an advanced solution as quickly as was done within this collective. I have worked on many data processing systems in the past and they required a lot of heavy work. Furthermore, when it is not possible to use commercial programs, the end user has to be prepared to pay to update their system frequently. As of 2019, there are still few, if any, fully-functional solutions outside of the Erex system. So, I think that partnering with Eress is the best way to work together and to get more out of the solution as well as any future developments.”

Concerning what kind of control Finland has over its energy invoicing and data, Mr.

Vilppo states that, “It is important to have good validation rules. And because we have many data sources, we are able to quickly recognize if there are any errors in the process. That said, I don’t have any concerns regarding this topic. The knowledge that the Eress organisation has, I believe, has been made very open to anyone who wishes to take a closer look. For us, we have come to realise that creating this kind of solution is not a one-time deal. It requires constant updating and development. So, I don’t know if there are any benefits in keeping this knowledge to ourselves or in privatising it.” He then adds, “It is very important to understand that you have to be ready to constantly modify the system if the rules of energy exchange or settlement change. Joining Eress, and implementing the Erex system, is the easiest way to do that.”

Finland now has a working solution for energy settlement and exchange, the validation of energy data, as well as for the purchase of energy on the market. Mr. Vilppo firmly believes that Erex is an excellent choice for both current and future partners. The Erex system is also compatible with energy market and railway directives, which makes it easier to discuss with other countries. The current focus is how to help train operators understand the different solutions available to them, as well as how their data is being collected. It is not just the data coming from the Erex system; there is also the data coming from outside systems too.

“Personally, I think it is very important that we have a common solution, like the Erex system, for energy exchange and settlement, in addition to implementing more energy meters. With the metered train-runs, it is possible to regularly adjust the accuracy of the estimated train-runs. It’s crucial to be able to get exact energy consumption readings and to validate them with the train-run data so that we can settle the bill accordingly. Energy-metered data is, by far, the most accurate approach,” Mr. Vilppo concludes.

On one final note, he adds, “Ultimately, if you have a common system, then you have a standardised way of producing this metered billing data. And it is easier to convince train operators to implement energy meters if they understand how doing so will result in significant cost reduction going forward. Furthermore, EU member states should work together on this in order to avoid having several different procedures for train operators to follow.” ■



Juha-Matti Vilppo
Project Manager,
Finnish Transport
Infrastructure
Agency

Why did Finland join Eress?

- Finland chose Erex because it is the only standardised energy settlement solution in Europe.
- One advantage of coming onboard was the economic benefit of developing this shared-cost solution with other Eress partners.
- Together, partner countries focus on ensuring that the Erex system fulfills the EU requirements, is transparent as possible, and is not too complicated to implement.
- As of 2019, there are few, if any, fully-functional solutions outside of the Erex system.



The Dutch Case for Energy Exchange

In many EU countries, the infrastructure manager is responsible for the purchase and settlement of energy that the train operators use. This, however, is not the case for the Netherlands.



Prior to 1998, the national carrier, Dutch railways, was also the infrastructure manager. There were no other train operators. After 1998, other operators entered the space, which meant that these responsibilities had to be split up. The question then became: who was going to take care of the purchase and settlement of energy? Ultimately, it was determined that the infrastructure manager did not have an incentive to go for the best price of energy purchase. Therefore, Dutch train operators made the decision to form a collective, Vivens, whereby they handle the purchase and settlement of energy themselves. As an energy procurement cooperative, Vivens brings a new set of forces into the Eress partnership.

To better understand how the Dutch navigate the landscape of energy exchange and settlement, we spoke with Ralph Luijt, Program Manager of Energy Projects at the Netherlands Railways (NS). According to Mr. Luijt, forming a collective for the purchase and settlement of energy was “the most effective way to proceed because we have a shared interest in creating the best conditions, both in terms of functionality and cost. That said, it was logical to do the same when it came to energy metering.”

When asked about the benefits of partnering with Eress, Mr. Luijt responded, “Up until now, this settlement has been based on a model calculation. However, we decided to make the transition to energy meters because they are more accurate and more transparent. Also, knowing that the European Directives were coming up, we looked into what possibilities existed on how to arrange this for the Netherlands. So, we went to our infrastructure manager and asked if we could make the change over to energy meters.”

“Of course, all the IT had to be brought in and we had to have a ground system in place to collect the energy data for

Why did the Netherlands join Eress?

- The Netherlands decided to make the transition to energy meters because of their accuracy and transparency.
- By combining the standardisation to the common model, the Netherlands ensured that the Erex solution fulfilled their national needs, while remaining within the standardisation efforts of Eress.
- The Netherlands chose the most cost-effective exchange and settlement solution on the market, and did not hesitate to step over any national sentiments.

validation and settlement,” explains Mr. Luijt. “With that in mind, we asked our infrastructure manager whether they were going to develop that protocol for the train operators. This all happened back in 2014. We were aware of the Eress corporation because we often work together with UIC and other parties. At the time, we considered two options. The first was developing our own system, with all the associated costs. This would, of course, require us to reinvent the wheel. The second option was to implement a proven system, surrounded by a partnership of countries on a non-profit basis. It turned out that joining Eress—and not having to redevelop an already existing solution—was the most cost-effective option for the Netherlands. So, that is how and why we decided to join forces.”

This year, the Netherlands will finish implementing the necessary functionality to use the Erex system for the settlement of energy, both for metered and non-metered trains. The goal is to make the transition within a single, consistent environment. “Back in 2015, when we first became a partner, we didn’t have the certified meters set up in the Netherlands. So, we had to do everything that was required to create an environment to use the meters according to all the standards, TSIs, and so on. If you look at other countries, you will see



Ralph Luijt
Program Manager
of Energy Projects
at the Netherlands
Railways

that this is an effort that takes a few years, which is why we are happy that we started when we did,” says Mr. Luijt.

“Right now, we are in the process of making it work for our situation. Because we have quite a detailed model-based settlement, we don’t want to lose any accuracy during the transition to the Erex system. The details require a lot of analysis and discussion when it comes to how we are going to adapt our existing settlement system within Erex, without becoming an island. That said, I believe that it will fulfill our national needs once it is up and running.”

“We used our entry to work together with the other partners to create a fundamental step towards a standardised Eress core. We are combining the standardisation to the common model—while also determining the amount of flexibility needed—to ensure that we end up with a solution that fulfills our national needs, on one hand, but that is also fit for the standardisation efforts of Eress, on the other hand. It seems that we will be successful in that,” states Mr. Luijt.

“From the beginning, the Netherlands has tried to be a very active partner to bring interests further, rather than sit back and watch everything unfold. We want to contribute and pave the way for new partnerships.”

When asked whether there were any arguments against joining Eress, Mr. Luijt says, “Not really. It was quite obvious for the end users—the train operators—that this was the most cost-effective solution. For instance, if the infrastructure manager were to do a €10 million development, the train operators would pay the bill. So, from the beginning, it was clear that, apart from spending much more money than was necessary, we would also have had to undergo the learning curve of ten years already covered by Eress.”

“For us, there were only arguments for joining Eress. We didn’t have any national sentiments either, meaning that we did not need a solution that was developed in the Netherlands. There are, of course, countries in Europe where it is not acceptable to use a solution developed by another country. Fortunately, we do not have that here. Dutch culture tends to take on the mindset of, ‘Okay, if you can get something just as good—but for less



Development would have been around €10 million—with an annual cost of €1,5 million—for a system with similar functionality.

Ralph Luijt

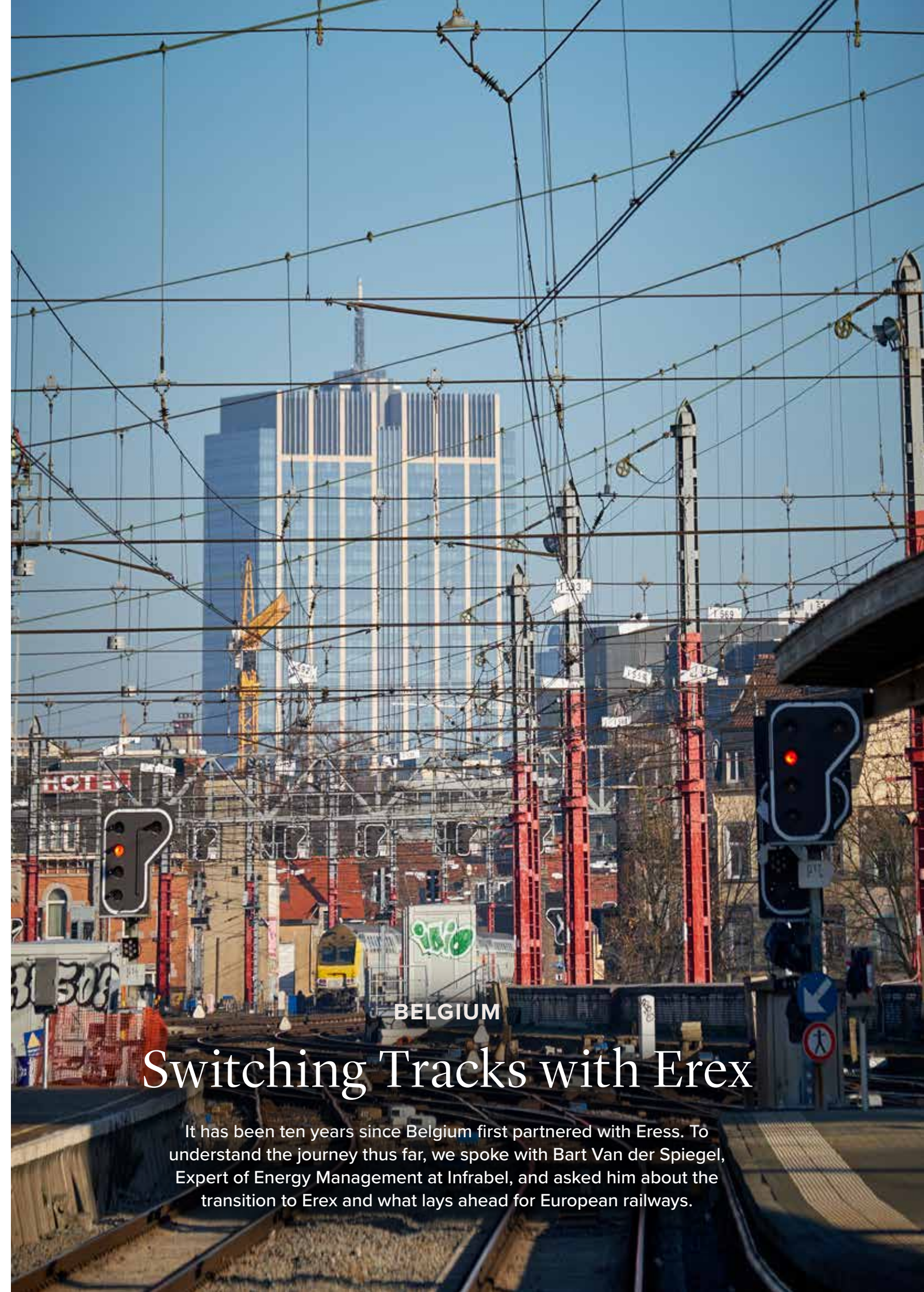
money—elsewhere, go elsewhere,’” he explains.

When assessing the cost of building a national system from the ground up, Mr. Luijt estimates that “development would have been around €10 million—with an annual cost of €1,5 million—for a system with similar functionality. This is not only for the national settlement of energy for Dutch train operators; it also includes a data collection service and the facilitation of cross-border settlement, in compliance with the European Directives.”

“The most important thing for us was that we didn’t lose accuracy for our non-metered trains during the transition to Erex. It was also important to ensure that the Erex system was a modular, configurable system that could easily be adapted to the needs

of current and future partners, without having to do a lot of redevelopment work. Because we collectively bear the expense of the meters and further developments, we want to keep costs low,” concludes Mr. Luijt. “Ultimately, looking at what Eress and Erex will bring us as we make the transition to meter-based billing, we are quite happy with what we have today. We are optimistic that the system will give us exactly what we need.”

As a final note, he adds, “To those countries who are evaluating their options on how to meet the upcoming European Directives, choose the solution that is the most cost-effective and don’t hesitate to step over any national sentiments, especially if they prevent you from choosing the best solution.” ■



BELGIUM

Switching Tracks with Erex

It has been ten years since Belgium first partnered with Eress. To understand the journey thus far, we spoke with Bart Van der Spiegel, Expert of Energy Management at Infrabel, and asked him about the transition to Erex and what lays ahead for European railways.

When it comes to the advantages of joining Eress, Mr. Van der Spiegel says there were three primary benefits. “The first was that, if we had done it ourselves, it would have taken a lot more time to define what we needed, purchase it or build it, then follow-up the construction of a complete system. By joining Eress, we were able to access an already existing solution. The second big advantage was knowledge sharing. There are only a few people who have a deep understanding of this topic at Infrabel. By joining forces with the other Eress partners, we were able to combine our resources and get a lot more knowledge on a very specific topic. The final advantage was that it is, of course, less expensive to join one common system than to reinvent the same wheel over and over again.”

He continues, “I have no idea how many millions of Euro developing our own system would have cost, but there were other things we had to consider outside of the expense. For example, we would have also needed sufficient know-how in order to design and build a system, as well as to maintain it. There is a constant need to adjust the system to changing regulation and market needs. A settlement solution for traction energy is too specific to develop for a small country like Belgium. So, I am very pleased to be able to use a joint system like Erex,” states Mr. Van der Spiegel.

“Prior to using the Erex system, we were not able to handle onboard meters,” he explains. “So, we did all of our invoicing based on the average energy consumption of a train per ton and kilometer. We also used this information for the invoicing of track access because it was part of the same system.”

“Upon implementing the Erex solution, we began with train-run based invoicing, permitting, in parallel, that meters could be used. We delivered some test meters to the major train operator, SNCB, in Belgium and with that, we could test the functionality of the Erex system. Currently, only 1.5 percent of energy is invoiced based on energy meters in this country, so a huge majority

Why did Belgium join Eress?

- By joining Eress, Belgium was able to access an already existing solution, without having to design and build a system themselves, nor maintain it.
- Becoming a partner allowed Belgium to combine resources with the Eress organisation and take advantage of knowledge sharing.
- It was less expensive for Belgium to join one common system than to reinvent the wheel.

is still estimated. We hope that this will change soon. SNCB is installing the two biggest series of rolling stock with meters. So, somewhere in 2019 or 2020, we should reach at least 40 percent of the energy to be measured by meters.”

When asked what Belgium is doing to promote the installation of energy meters, Mr. Van der Spiegel says that Infrabel is offering an advantage on energy consumption for train operators. “We overestimate the consumption of trains without meters by about two percent, which means train operators pay two percent more. In addition to the two percent increase in consumption, they will also have to pay two to three percent more on tariffs, as of 2020. So, for those trains that have meters, there is a return on investment because the operators only pay for what they consume. And we have seen from our major freight operator—which has meters installed on their track locomotives—that they have managed to reduce their consumption by 15 to 20

percent. This was simply done by preparing the train-run in advance and trying to avoid unplanned stops,” he explains.

Concerning what advice he has for countries who wish to partner with Eress, Mr. Van der Spiegel mentions that “one of the most common questions that comes up with new partners is, ‘Can we just join a partnership or do we have to tender first?’ So, I think there some misunderstanding here. For Belgium, we decided to check with our juridical department. They concluded that we did not need to consult the market and that we could just join Eress. This holds true for any country considering the partnership. Anyone can join and receive free access to the Erex system. They are welcome to consult the market first but they will not find anyone who can deliver this solution as cost-effectively as Eress. Furthermore, I think it’s important to note that Eress does not offer commercial services to the market because it is a public partnership. For this reason, and because Erex is tendering itself for each new development, it is not necessary for new partners to tender prior to joining.”

He then adds, “It is important that countries adjust their national way of working to the international framework. Both Eress and Erex fit completely within this framework. Yes, we have changed the legislation a bit in Belgium—to be compliant with the latest EU regulations—but Erex still works within those changes.”

To conclude, Mr. Van der Spiegel urges infrastructure managers to start now if they want to be in compliance by the 2020 deadline. “Don’t wait, contact us. Every country is required to have a settlement system in place by 2020, so the deadline is fast approaching. Either contact us for more information or sign up as a partner. Even then, it will be difficult to have a system up and running by July 2020. In fact, simply preparing a small system that will be able to send train-run data, as we did, takes at least half a year to create. Then you have to test everything, which can take another six months. So, one year is the absolute minimum to get up and running with a settlement system.” ■



Bart Van der Spiegel Expert of Energy Management at Infrabel

Don’t wait, contact us. Every country is required to have a settlement system in place by 2020, so the deadline is fast approaching.

Bart Van der Spiegel



China's next-generation signalling system targets automatic operation

The rapid expansion of China's high-speed rail network has gone hand-in-hand with the development of the Chinese Train Control System (CTCS). In 2018, Dr. Mo Zhisong, Director of the Signalling Division at China Railway Corporation, revealed that the development of a new train control system, based on CTCS but using AI technology, is now underway. As the train control system is one of the key technologies of a high-speed railway, the analysis of CTCS is expected to make a major contribution to the development of future train control systems around the world.

Japan's new test train pushes the boundaries of high-speed rolling stock

In December 2018, Japan Railway East launched Alfa-X (E956), a 400km/h Shinkansen test train, which will be used to evaluate new technical and aerodynamic advances for the next generation of Japanese high-speed trains. Through the use of IoT, Big Data, and AI, the focus is how to enhance the onboard information and control networks of the test train to make it more robust than that of the E5 series.

European funding drives next generation of Balkan railways

Renewed interest in the overhaul of obsolete infrastructure and rolling stock in the western Balkans was met with significant investment in countries across the region during 2018. This process is set to continue into 2019 and coming years. The trend was partially fuelled by the European Union, which, in many cases, has provided finance to refurbish existing lines and construct new infrastructure on strategic pan-European transport corridors. Investment in rail infrastructure—to improve the efficiency of transport and logistics—is considered a catalyst for economic growth and a means to boost exports. Increased passenger traffic is only a secondary motive, in a region where bus transport dominates.

Tel Aviv breaks new ground with first transit project

Tel Aviv is on course to open its inaugural light rail line in October 2021. The Red Line, which is the backbone of the system, is expected to serve 1.5 million passengers per day and 450 million per year. Trains will operate at 3- to 4-minute headways. The current focus is on finalising the preliminary design of the metro project, which the Israeli railways hope to have a completed statutory design within two years. Such ambitious plans for mass transit reflect a desire to develop infrastructure to serve Tel Aviv's expanding population.

Smartrail 4.0: A smarter way to boost capacity

Finding ways of boosting traffic on an intensively-used network sounds like a challenging task, but Switzerland's

Around the World

2018 was a year to remember for the railway industry, with innovation reaching a tipping point that is set to make 2019 a year full of further technological disruption and development.



new Smartrail 4.0 traffic management system aims to achieve exactly that. As one of the most densely-used railways in the world, Switzerland has launched Smartrail 4.0, a traffic management system, based on ETCS, for the entire rail network. This is expected to boost passenger and freight capacity by 15 to 30% using existing infrastructure, cut annual costs for Swiss Federal Railways (SBB) by millions of Euro, increase the availability of safety installations by 50%, increase safety—particularly during shunting and at work sites—and provide a high-capacity radio system for customers.

Global focus on rail investment could slash greenhouse gas emissions

Generating around 14% of greenhouse gas emissions, transport has a key role to play in the fight against climate change. A 2018 report from the International Energy Agency suggests “aggressive, strategic deployment of rail” could significantly cut emissions and energy demand. To explore how the benefits of rail might be optimised, the report puts forth something called a High Rail Scenario. Under the High Rail Scenario, policies to promote rail and encourage operational efficiency across all modes spurs huge growth in rail traffic, reducing air, car and two/three-wheeler traffic by 11.5 trillion passenger-km a year by 2050, while road freight movements would be reduced by 7.4 trillion tonne-km. An increased reliance on rail would promote broader accessibility, enhanced safety and reduced costs, according to the report.

New Zealand plans to change from highways to railways

Auckland, and New Zealand, have been reliant on cars for decades. But as Auckland's population increases at one of the fastest rates in the developed world, the city is pre-empting that growth with its largest ever investment in public transport. NZTA chief executive, Fergus Gammie, says light rail will become the centerpiece of the city's rapid transport network. The agency is focused on early engagement with the industry to identify new and innovative ways to procure, deliver, and finance the project.

Battery train promotes race to replace diesel

Rapid advances in battery technology and the drive to reduce emissions of harmful particles are helping to push the case for the development of battery-electric trains. Bombardier's prototype, Talent 3 battery-electric multiple unit (BEMU), is expected to enter service in Germany sometime this year. In addition to reducing the requirement for diesel operation, BEMUs might also offer some advantages over conventional EMUs, including the ability to operate independently in the event of a power outage in the overhead electrification, enabling discontinuous electrification on routes with limited structural clearances, and obviating the need for catenary and high-voltage cables in depots and yards. This means new through services can be introduced, and tenders can be structured in a more flexible way.

STATISTICS 2019

Railway Energy Temperatures in Europe

Rail transport offers a more sustainable alternative to most other transport modes — both in terms of energy use and carbon emissions per passenger-kilometre or tonne-kilometre — and is anticipated to continue doing so for decades to come. That said, the transportation sector is one that contributes the most to CO₂ emissions in Europe, accounting for approximately 28.3 percent of total emissions in 2015. Therefore, it is important to continue efforts to reduce the carbon footprint of the railway-energy sector.

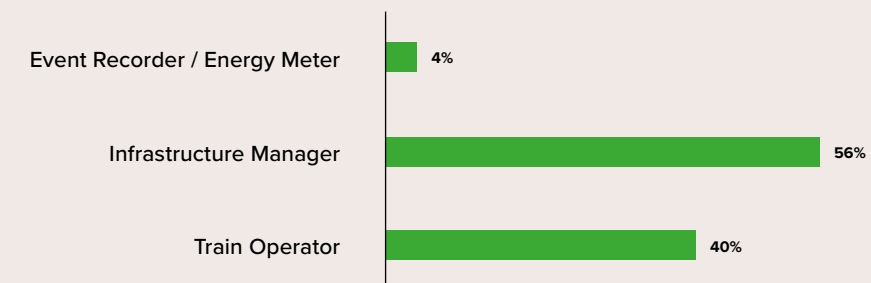
This is the third year that the Sustainable Development Foundation has gathered research, on behalf of Eress, on the status on railway energy in different countries across Europe. This Foundation aims to promote the green economy both in Europe and around the world. Concerning mobility, this means advocating for

the efficient use of resources and the continuous reduction of the impact — created by transport — on human well-being and the environment.

This year's survey collected key information from infrastructure managers, train operators, and event recorder operators. The purpose of this survey is to describe the state-of-the-art of the railway-energy sector, according to the people that work in it and face new challenges on a daily basis. The outcome provides an overview of railway energy monitoring systems within Europe's borders, taking into account the technological aspects as well as train operators' expectations on the future of the European energy market. More importantly, the results of this survey facilitate a better understanding of the complex world of railway energy.

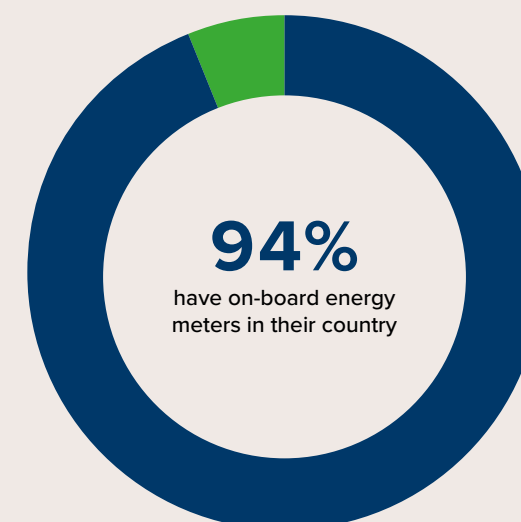
Thanks to the 25 energy managers, working in 19 different countries, who answered and completed this 2019 survey—conducted by the Sustainable Development Foundation—we have a qualified and highly representative statistical sample that describes the state-of-the-art of this sector. The results of this survey provide a better understanding of the complex world of European railway energy.

Where do you work?



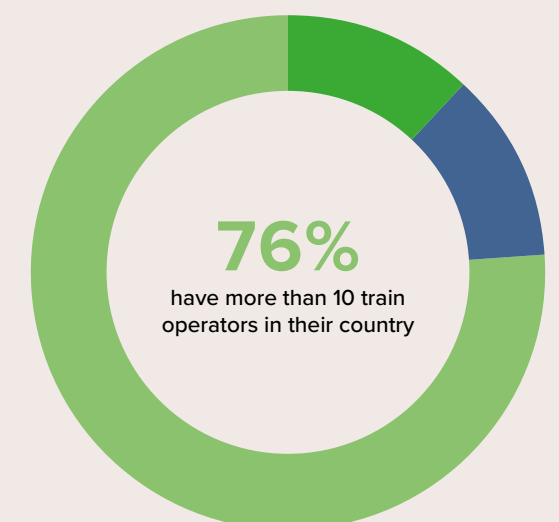
About on-board energy metering systems, do you have energy meters on trains in your country?

■ Yes (94,0%) ■ No (6,0%)

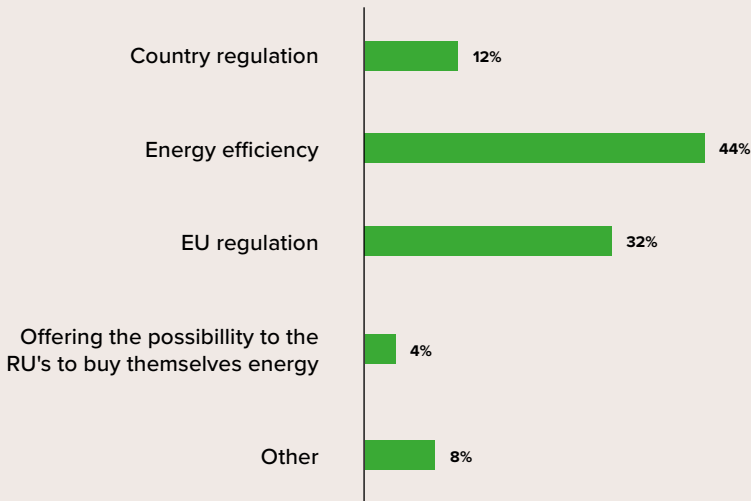


How many Train Operators do you have in your country today?

■ 1 (0,0%) ■ 2-5 (12%) ■ 5-10 (12,0%)
■ More than 10 (76%)



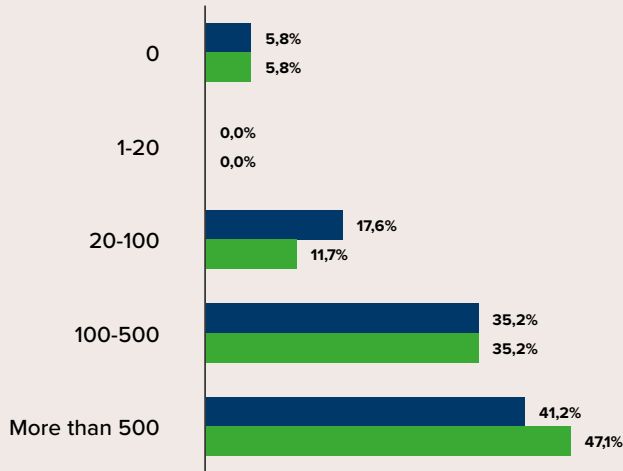
What is the main driver for the implementation of a rail energy billing system?



Because most trains are now operating on networks that require an energy settlement system to be in place, they should have energy meters installed onboard to exploit the benefits.

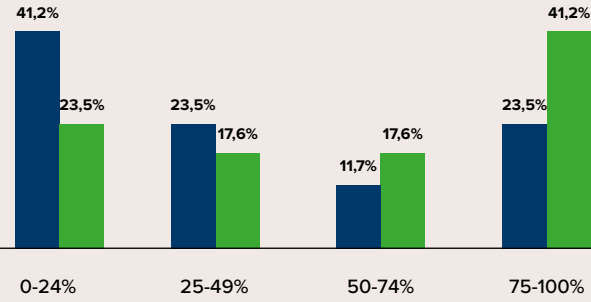
How many energy meters do you have on board your traction units in your country?

■ Today ■ By 2020

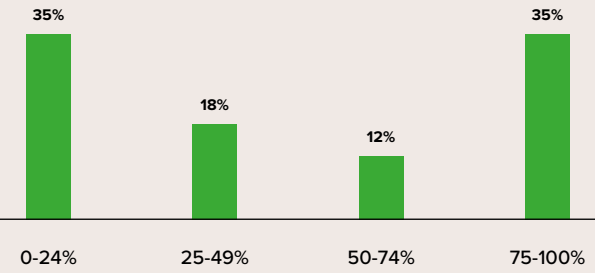


What is the percentage of traction units equipped with meters in your country?

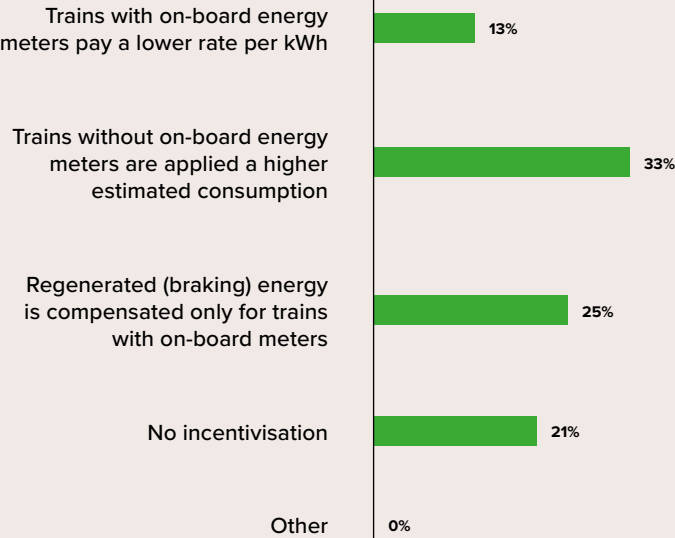
■ Today ■ By 2020



What is the percentage of meters that are TSI compliant? Please provide the estimated percentage of meters that have the technical specifications to ensure interoperability in your country.

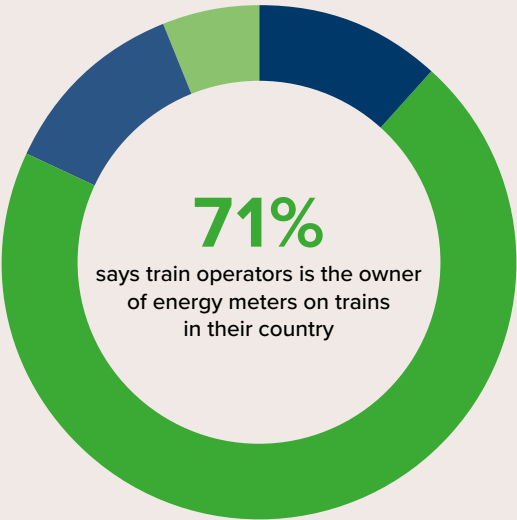


How is the installation of on-board energy meters incentivised in your country?



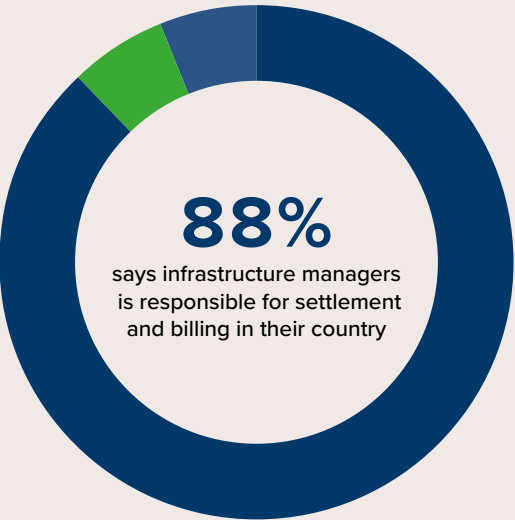
Who is the owner of energy meters on trains in your country?

■ Infrastructure Manager (12%) ■ Train Operator (71%) ■ Combination of Infrastructure Manager and Train Operator (12%) ■ Metering Service Supplier (6%)



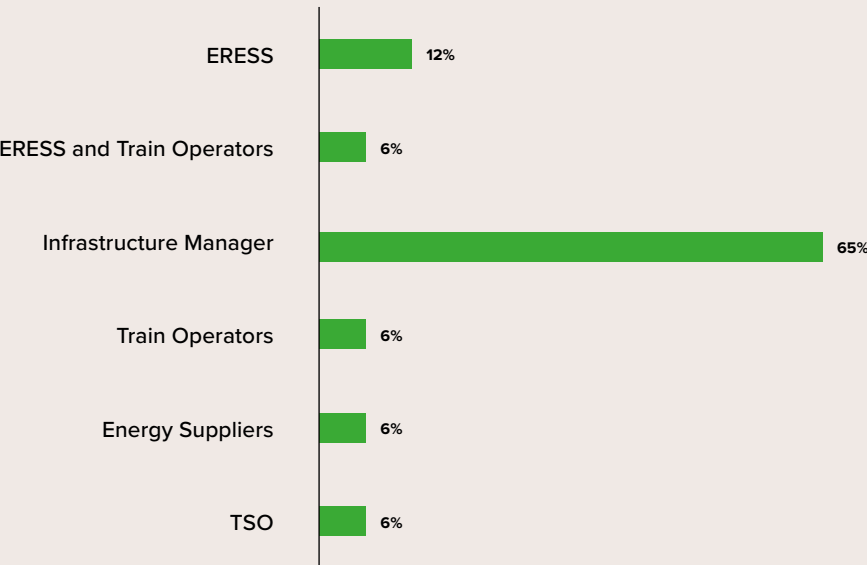
Who is responsible for the settlement and billing of traction energy in your country?

■ Infrastructure Manager (88%) ■ Energy Purchasing Collective for RU's (6,0%) ■ Energy Supplier (6,0%)



Respondents highlighted the following issues facing them at present: For infrastructure managers, the main challenge is to validate that the data coming from energy meters is correct. For train operators, the primary concern is the exchange of data internationally for billing purposes.

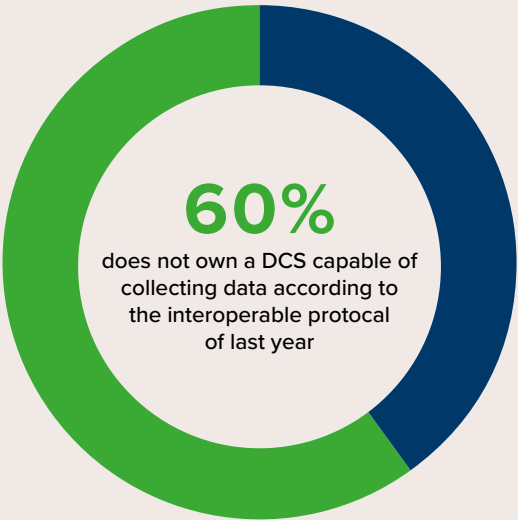
Who owns or will own the Data Collection System (DCS) in your country?



Does your organization own or will own a Data Collection System (DCS) capable of collecting data according to the interoperable protocol of last year?

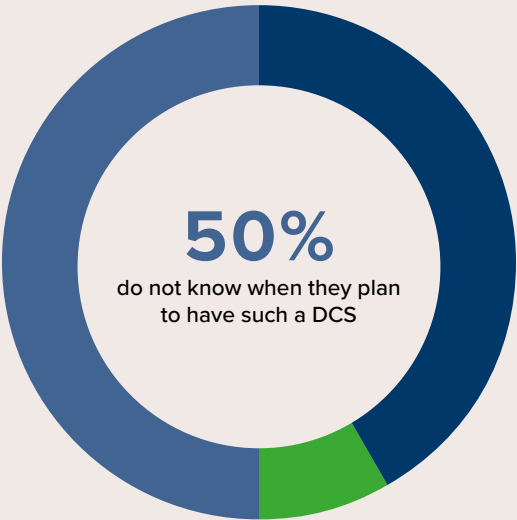
The interoperable protocol states that any on-ground energy data collecting system (DCS) shall receive, store, export and exchange data suitable for energy billing (CEBD) without corrupting it?

■ Yes (40%) ■ No (60%)



For those who answered no, when are you planning to have such a DCS?

■ Before 2022 (42%) ■ After 2022 (8%) ■ I don't know (50%)

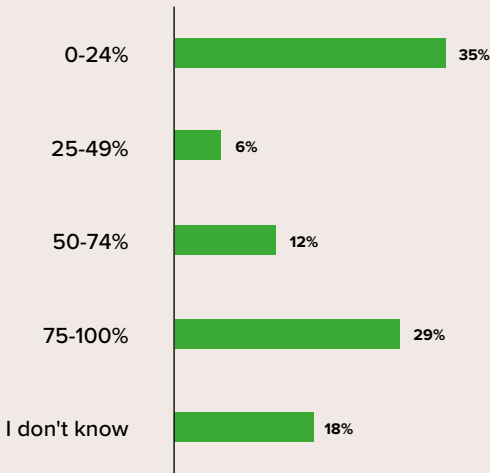


If there are installed meters in your country, do you have any challenge with:

Infrastructure Managers	Ranking	Train Operators
Validating that the data coming from energy meters is correct?	1	Exchanging data inside the country for billing purposes?
Exchanging data internationally for billing purposes?	2	Exchanging data internationally for billing purposes?
Allocating this data correctly?	3	Allocating this data correctly?
Exchanging data inside the country for billing purposes?	4	Validating that the data coming from energy meters is correct?

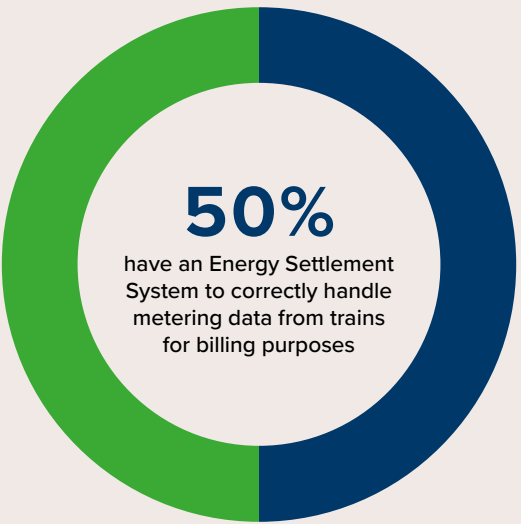
Having meters onboard trains provides the opportunity for analysis of energy economics. With the data collected from the meters, train operators can see where they use the most energy on their train-runs, where they regenerate the most energy while braking, and how they can optimise their overall energy consumption.

Which is the percentage of validated data, coming from energy meters, that is used for invoicing Train Operators in your country?



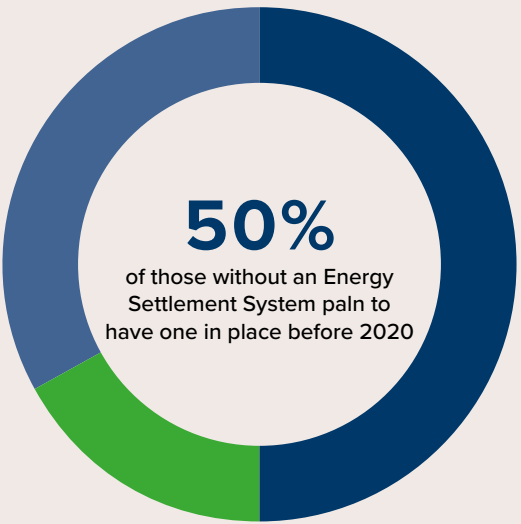
Do you have an Energy Settlement System to correctly handle metering data from trains for billing purposes?

■ Yes (50%) ■ No (50%)



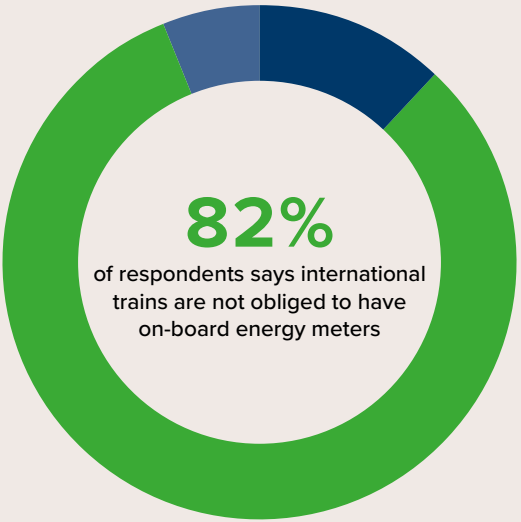
For those who answered no, when are you planning to have an Energy Settlement System in place?

■ Before 2022 (50%) ■ After 2022 (17%)
■ I don't know (33%)



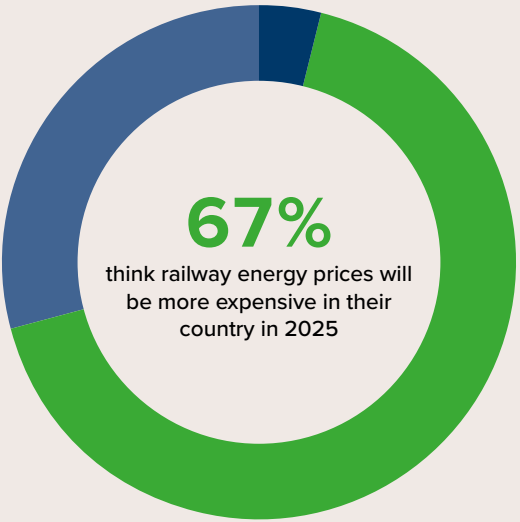
In your country are international trains obliged to have on-board energy meters?

■ Yes (12%) ■ No (82%)
■ I don't know (6%)

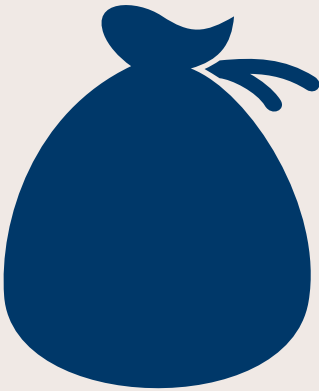
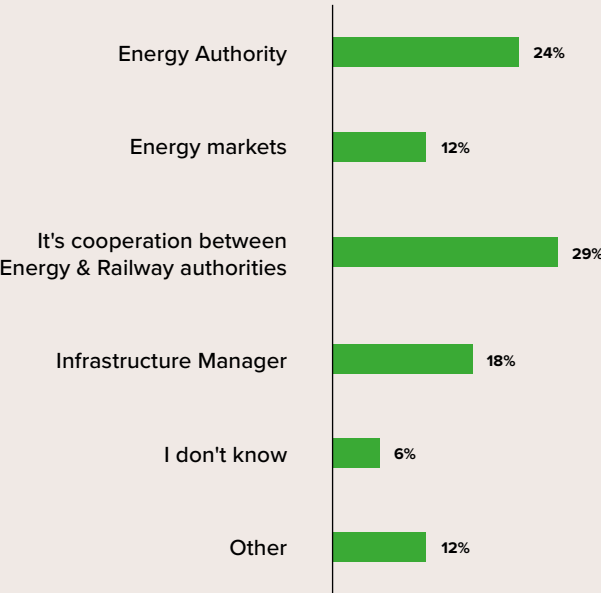


How do you think railway energy prices will be in your country in 2025?

■ Cheaper (4%) ■ More expensive (67%)
■ Same level (29%)



Who defines the railway energy prices in your country?



The vast majority of respondents answered that their organisation set targets to improve energy efficiency and reduce CO2 emissions. On the other side, half of the respondents declared that they already have an energy settlement system in their organisation. These two factors, together, give rise to a virtuous spiral: the growth of one promotes the growth of the other, and vice versa.

How do you think railway energy in your country will look in 2025?

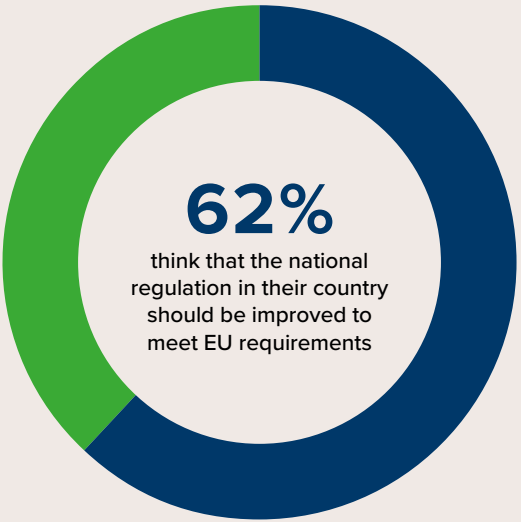
Infrastructure Managers	Ranking	Train Operators
An Energy Settlement System in place handling metering data from trains	1	National rules will still regulate the railway market
Traction energy bills based on real energy consumption	2	More Train Operators running in the country
Non-discriminatory railway energy distribution tariffs	3	A Data Collection System(s) in place
A Data Collection System(s) in place	4	An Energy Settlement System in place handling metering data from trains
Transparency of railway energy prices (open market for energy also in railway market)	5	Non-discriminatory railway energy distribution tariffs
More Train Operators running in the country	6	Traction energy bills based on real energy consumption
Free choice of energy suppliers for Train Operators or direct access to the energy market	7	Free choice of energy suppliers for Train Operators or direct access to the energy market
National rules will still regulate the railway market	8	Transparency of railway energy prices (open market for energy also in railway market)

What topics needs the most focus/are the biggest challenge in order to enable competition in the railway energy section?

By 2020	Ranking	By 2025
Data Collection System in place	1	Having installed energy meters on all trains
Energy Settlement System in place handling metering data from trains	2	Energy Settlement System in place handling metering data from trains
Having installed energy meters on all trains	3	National regulation
Transparency of railway energy prices	4	Data Collection System in place
National regulation	5	Transparency of railway energy prices

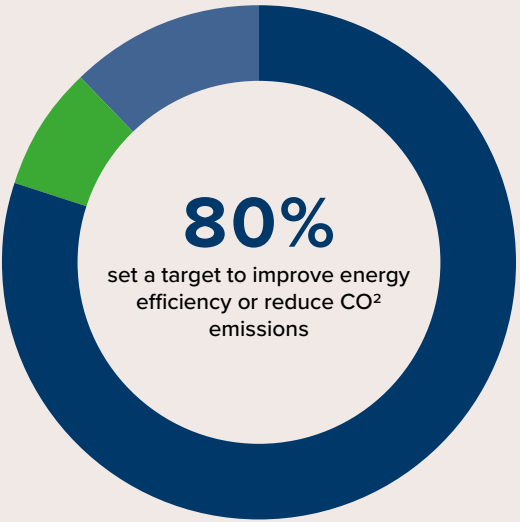
Do you think that the national regulation in your country should be improved to meet EU requirements?

■ Yes (62%) ■ No (38%)



Did your organization set any target to improve energy efficiency or to reduce CO² emissions?

■ Yes (80%) ■ No (8%) ■ I don't know (12%)





Partners

Switzerland
Finland
Belgium
Denmark
Sweden
Norway
The Netherlands

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