



European Railway Energy Settlement System

ANNUAL REPORT 2009

You can only manage what you can control,
and control is worthless without measuring.

Unique on
the market.



PARTNERSHIP COUNTRIES

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“RESS for Infrastructure Managers – a tool for use in an independent and non-discriminatory way”



From left to right: Bart Van der Spiegel (member of the board and replacing Richard Marcelis), Lars Johansson (member of the board), Kåre Stig Nielsen (member of the board) and Terje Stømer (Chairman).

THE BOARD OF DIRECTORS

Message from the board

The Railway Energy Settlement System (RESS) has been fully operational for 3 years. RESS is the only proven and verified energy settlement system for railways that produces high quality results for its users. The use of RESS by infrastructure managers allows railway undertakings to benefit from the system by achieving substantial energy reductions and as a result, cost savings.

We have now extended our product portfolio by the addition of a new module called the European Railway Exchange Module (EREM). EREM ensures that energy measured data are validated and allocated to the concerned consumption areas in compliance with UIC Leaflet 930. This is particularly relevant to the exchange of data between infrastructure managers for cross-border railway traffic. Railway undertakings in Europe are currently testing EREM. It allows railway undertakings to operate on different grid areas in Europe and to pay exactly what they consume based on accurate and reliable validated energy measured data provided by EREM.

It is also with considerable enthusiasm and satisfaction that we welcome the newly approved Technical Specifications for Interoperability (TSI). Henceforth, TSI will require the use of measured energy data for billing purposes. This is in accordance with the ERESS goal of enhancing rail interoperability in Europe by providing solutions that meet our customers' needs.

ERESS will continue to be involved in European energy management standardisation programmes. We believe that future demands for harmonisation of European railways and the increased focus on the environment will result in ERESS becoming the common European settlement solution.

This year we also launched the first ERESS Customer Forum, which brought together participants from infrastructure managers, railway undertakings, authorities, manufacturers and notified bodies within the railway industry. The event was intended to provide a platform for exchanging and sharing best practices in relation to "On-Board Measuring and Managing of Traction Energy" with leading experts. Almost 100 participants from different countries in Europe contributed to the success of the forum, and we hope to make this an annual event.

ERESS partnership is pleased to announce that Mr. Terje Stømer has been appointed as the new Chairman of the ERESS Board of Directors.

It is accordingly with great pleasure that we are able to report that our initiatives and involvements are working as intended and providing an impetus for a positive change for the railway sector throughout Europe.

TERJE STØMER
Chairman of ERESS and representative of the Norwegian National Rail Administration

LARS JOHANSSON
Representative of the Swedish Transport Administration

KÅRE STIG NIELSEN
Representative of the Danish National Railway Agency

RICHARD MARCELIS
Representative of the Belgian Railway Infrastructure Manager

RESS reduces barriers
for cross-border
traffic to let railway
undertakings fully
enjoy the benefits of
competition.

Why ERESS?

Infrastructure Manager

- ▶ Ensures transparent and non-discriminatory treatment of all railway undertakings
- ▶ An open partnership based on non-profit-making cooperation
- ▶ A common solution for the railway market
- ▶ Facilitates the exchange of energy consumption data for cross-border traffic
- ▶ Data exchange between infrastructure managers in compliance with UIC leaflet 930
- ▶ Consistent energy loss distribution and settlement
- ▶ Developing consistent basic tariffs and invoicing rules
- ▶ Invoicing based on accurate data and on actual energy consumption
- ▶ Full support for changing energy price areas
- ▶ Energy consumption cost based on real-time market prices
- ▶ Advanced profiling of non-measured consumption
- ▶ Meeting deadlines for reporting energy consumption to the customer and market
- ▶ Reduced financial risks
- ▶ Ensures optimisation of overall system costs and performance
- ▶ Helps open the rail transport market up to competition
- ▶ Improves interoperability within European railways
- ▶ A cost-effective solution which provides high quality international services for all railway undertakings
- ▶ A flexible and proven system that is adaptable and easily manageable, offering tailor-made solutions

Railway Undertaking

- ▶ Invoicing based on accurate energy data and on actual energy consumption
- ▶ Supports all energy measuring equipments in accordance with European standards
- ▶ Raw data available shortly after transfer to the settlement system
- ▶ Transparent invoicing process
- ▶ Essential tool for energy management work
- ▶ Opportunity to perform data analysis for eco-driving and to conduct energy-saving projects
- ▶ Optimisation of energy consumption
- ▶ Reduces numbers of contact points for cross-border traffic
- ▶ Meeting deadlines for reporting energy consumption to the market
- ▶ An opportunity to access the energy market as an eligible consumer



ERESS Partnership Overview

Identity

European Railway Energy Settlement System (ERESS) is a partnership of four European infrastructure managers that are involved in the search for optimal common solutions for settling train energy consumption. The settlement system is currently jointly owned by the four partners, but the partnership is open to any European infrastructure managers. The Railway Energy Settlement System is suitable for both domestic and cross-border traffic. The partnership is based on a non-profit agreement where existing and future partners have the same rights.

Mission

ERESS partnership implements, develops and supplies an advanced energy settlement system for trains in order to improve railway competitiveness and interoperability. The ambition is to be the benchmark in the railway sector. ERESS provides an EFFICIENT, RELIABLE, ACCURATE and FLEXIBLE energy settlement system that enables all our partners to fulfil requirements for neutral and non-discriminatory operation, and allows railway undertakings to understand their use of energy and thereby save energy and costs.

European solution

ERESS is Europe's leading energy settlement solution for trains and the only system that meets requirements in terms of interoperability and accurate settlement and invoicing. The system is owned and operated by infrastructure Managers in Norway, Belgium, Denmark and Sweden. A number of other European railway undertakings are testing the system.

Long-term vision

The long-term objective of ERESS is to become a European standard. We believe that future calls for the harmonisation of European railways and the increased focus on the environment will result in ERESS becoming the common European solution.



“Encourages energy efficiency through competition by providing railways with an advanced settlement system”

Organisational Structure

The Board of Directors for ERESS consists of representatives from each of the four partners and joint owners. Each infrastructure manager appoints its representative and these elect the chairman. The ERESS Board of Directors is responsible for the strategic direction and the further development and operation of ERESS.

ERESS' management and operational organisation is located at Jernbaneverket Bane Energi, the energy department of Jernbaneverket. It acts on behalf of ERESS and uses its expertise and know-how in the administration and operation of the settlement system. Another principal task is carrying out continuous improvement and development of the railway energy settlement system in order to meet the future needs of partners and customers. The director of the ERESS management and operational unit is Dyre Martin Gulbrandsen.

The management and operational organisation is responsible for the data collection system, validation of the collected data and allocation of the validated data to the relevant consumption areas. It guarantees the accuracy and the completeness of the measured data that is transferred to the settlement system by the data collection system. As a general rule, the ERESS management and operational organisation performs quality control of the overall system.



From left to right: Lysne Bjørn, Elin Oldervik, Dyre Martin Gulbrandsen (Director of ERESS), Gunn-Helene Krogstad, Alf Olevik Ulvan, Saraha Dischington and Reidun Jørgensen.

Standardisation of Railway Energy Measurement, Management and Billing

Trains consume a lot of electricity but historically they have not been equipped with energy meters. Because Railway Undertakings and Infrastructure Managers were one and the same company, energy was measured at the external connection points to the public grids, e.g. at the substations.

Since 1994, Europe has been liberalising the railway market in the same way as the electricity market. The infrastructure is developed and maintained by an Infrastructure Manager. In most cases there is a monopoly consisting of an Infrastructure Manager with responsibility for the railway grid in one Member State.

Trains operated by a number of Railway Undertakings may be running on this grid, and all these undertakings need to request a train path, i.e. an opportunity to run a specific train on a specific track at a specific time. The cost of train paths needs to be transparent and non-discriminatory and so tariffs are published on a webpage in a Grid Access Declaration.

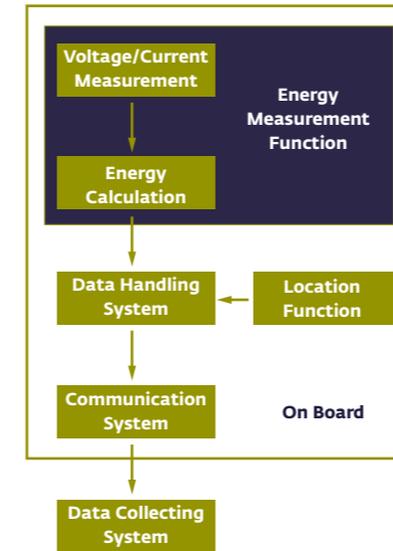
Without on-board Energy Measuring Systems, it is not possible to allocate the consumed energy correctly. How can the Infrastructure Manager know what actions the Railway Undertaking has taken to reduce its energy consumption? Actually in many countries the energy consumption of trains is still assigned to the Railway Undertakings using e.g. the gross tonne-km transported by that Railway Undertaking, and this is obviously not sufficiently accurate

Trains can move from one Member State to another, each with its own regulations, so not all nationally organised grid operators on the electricity market can be responsible for these on-board Energy-Measuring Systems.

A European set of regulations and standardisation documents is required in order to solve the problems described above and to enable the sector to continue to reduce its emissions and to maintain its position as a market leader as the most energy-efficient and environmentally friendly mode of transport.

“Our aim is the continuous improvement of RESS in order to integrate technological advances and to comply with european standards and laws”

FIG. 1. MAJOR COMPONENTS OF AN ON BOARD EMS.



Technical Specifications of Interoperability

The railway sector has a European regulator (ERA or European Railway Agency) that issues the Technical Specifications of Interoperability (TSI).

A TSI translates the general clauses of a Directive into practice. These are then the basic parameters. They become law by incorporation in the TSI and shall be applied in each Member State even without translation to national laws.

TSI Energy states that the requirements for the on-board Energy Measuring System are set out in the CR LOC&PAS TSI (TSI concerning Rolling Stock for Conventional Rail). The use of an on-board Energy Measuring System is not mandatory. If an on-board Energy Measuring System is required, it must be compatible with CR LOC&PAS TSI and data provided by this system shall be accepted for billing. CR LOC&PAS TSI describes the basic parameters for the equipment to be mounted on board.

These basic parameters are subject to homologation by a Notified Body prior to acceptance of certain series/types of traction units on the European railways. Once accepted by the Notified Body in one Member State, they shall be accepted all over Europe.

Energy Measuring Function (EMF)

The EMF shall measure energy supplied by all electric traction systems for which the traction unit is designed. In Europe five traction systems exist: 750 V DC, 3,000 V DC, 1,500 V DC, 15,000 V 16.7 Hz and 25,000 V 50 Hz.

The EMF is connected in such a way that all energy (traction and auxiliary) supplied to the train from the Overhead Contact Line is recorded. The regenerated energy (while braking) is also recorded. The reactive energy is also recorded for AC Energy Measuring Systems.

The EMF will have a total accuracy of 1.5 % (AC) / 2.0 % (DC) or better.

The required accuracies are not critical for AC systems using standard current and voltage transformers.

However these requirements have forced the builders of DC sensors to create new products. Normally Hall Effect sensors were used, though this technology is not suitable for also measuring small currents with sufficient accuracy. Most new products use a precise shunt and measure the voltage over that resistance, while other sensors use very innovative techniques.

Data Handling System

As trains cross borders sometimes even at 300 km/h, it is necessary to know the consumption in small Time Reference Periods. This period should be short enough to be able to split consumption at borders without making any substantial errors. Five minutes is considered to be precise enough.

Five minutes is also compatible with all possible periods used in the balancing markets in the different Member States. This enables the consumption of a Railway Undertaking running a set of trains at a certain time in a certain Member State to be calculated.

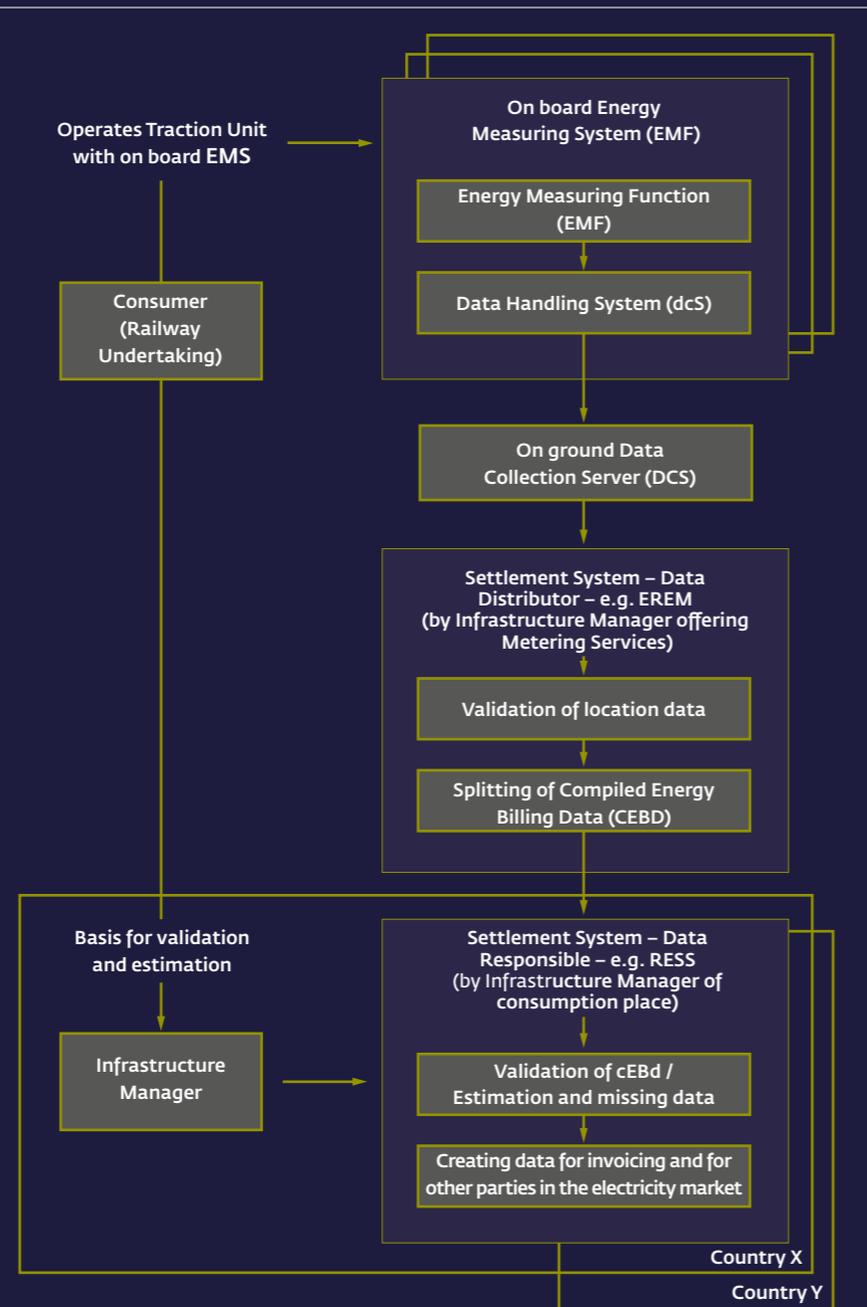


Fig. 2. Functional break down of major components of the complete system, including treatment on ground

Communication board to ground

The set of data is called CEBD (Compiled Energy Billing Data) and it is stored on board for 60 days. The on-board DHS shall transmit its set of CEBD to a Data Collecting System (DCS) on the ground at least once a day.

This transmission requires the use of wireless communication methods. Most systems use GPRS, which allows mobile Internet methods (FTP, HTTP) to transmit the CEBD using standard GSM-networks or GSM-R networks. Other methods involve the use of WiFi and important railway stations are equipped with this technology.

The DCS checks the completeness and integrity of the CEBD. It also converts the data format to a standardised format as described in UIC leaflet 930.

Other data may be stored on board and other data can also be transmitted to the ground. Extra sets of data, e.g. with a 1 minute measuring period, can also be stored. These data could prove more useful in investigating energy consumption.

Energy Settlement Systems

The Union International Chemin de fer (UIC) issued a leaflet, UIC 930, which defines the standard roles to be used on the ground. This leaflet also defines the protocols used to transfer data from Data Collecting Servers on the ground to Settlement Systems and between Settlement Systems.

The roles and protocols are based on the ebIX modelling methodology, which in turn is based on UN/CEFACT Modelling Methodology. The ebIX methodology is also used in the European energy sector. The protocol used is based on existing UTILTS messages adapted for introducing the location data.

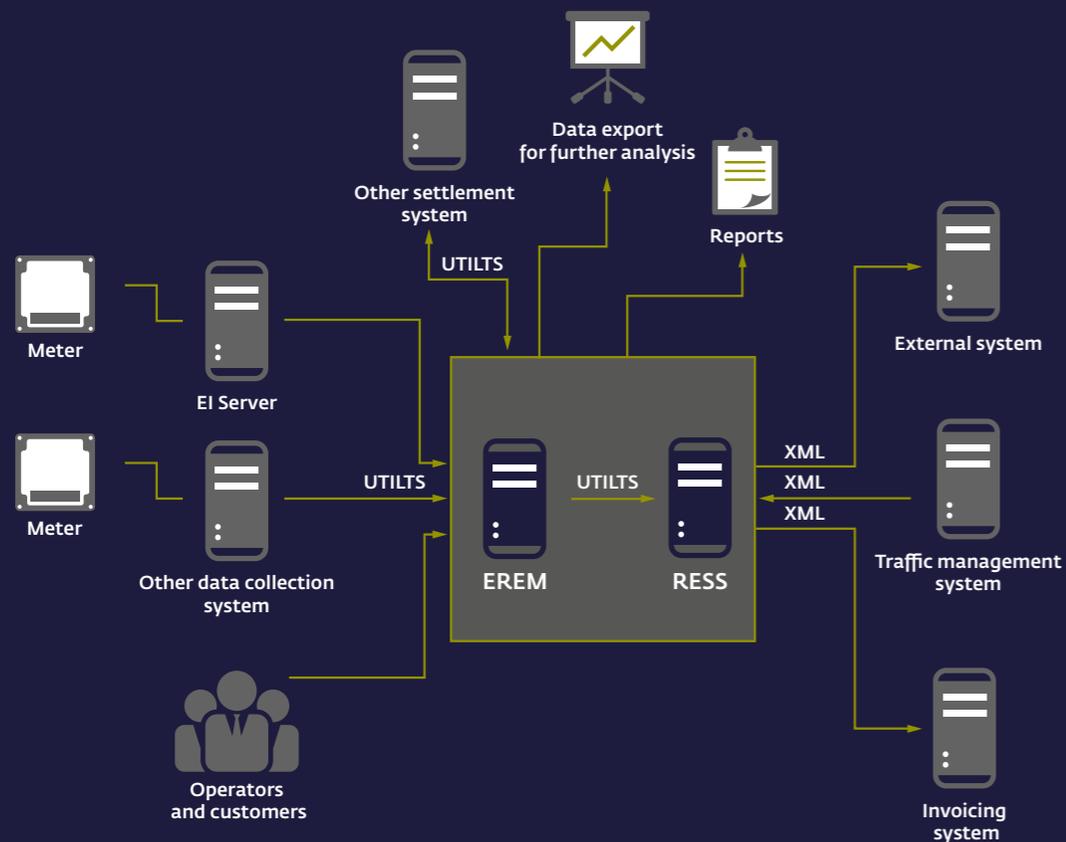
Data from a certain traction unit is always transferred to the same Settlement System. In this meter-reading Settlement System, the Data Distributor has to check where the consumption took place, and then split the data and transmit it to the Settlement System of the Infrastructure Manager on whose grid the consumption took place.

The Data Manager in the area where the consumption took place has to check the accuracy of the measured data. This can be done by performing a set of area-specific validation rules on the data. Consumption data can also be compared with data from Train Information Systems, knowing exactly where each train has been running on the grid.

Extra information that is required in order to be able to estimate the consumption for un-metered trains must also be received.

Finally these data can be run through the settlement system, distributing costs and creating invoices for the various customers in accordance with national settlement and billing rules.

Interaction of RESS and EREM with other systems



Railway Energy Settlement System (RESS) A la carte

RESS components

The system comprises five main components:

- ▶ Two-way advanced energy measuring unit (EMU) is in accordance with present European standards for use in traction units that measure energy consumption and regenerated energy from braking, time and position using GPS. The EMU also includes data storage capacity and GSM/GSM-R for the transfer of data by GPRS.
- ▶ An energy data collection system with functionality for two-way communication and smart metering. The collection system in use today also includes validation and correction functions for measured energy data.
- ▶ A module named European Railway Exchange Module (EREM) that provides accurate and reliable validation, splitting and distribution of measured energy data from traction units running between all European countries. It functions in compliance with the business processes and protocols for data transfer and data distribution between infrastructure managers as defined in UIC leaflet 930. EREM distributes data using various tools such as e-mail or ftp in order to meet the needs of all European infrastructure managers.
- ▶ A standardised interface for the exchange of energy based on the EDIEL standard UTILTS. The standard is anchored in ebIX. This has now also been approved as an international standard as a result of UIC Leaflet 930, Exchange of data for cross-border railway energy settlement.
- ▶ A settlement system that accommodates energy calculation, cost distribution and invoicing to train companies and other customers in the various user-countries. Customers have access to their measuring and cost data via the energy settlement system. Data exchange with other systems is also accommodated via the energy settlement system.

Interaction of RESS with other systems

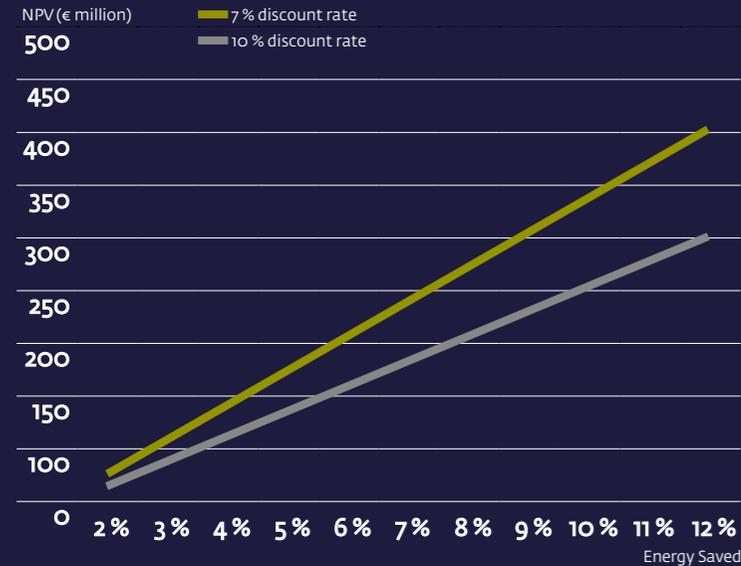
Energy data from measuring equipment on board are sent to collection systems and transferred to RESS in UTILTS format. RESS supports any type of data collection or traffic management system, irrespective of whether they have an integrated validation module. This flexibility is possible thanks to the use of standard interfaces and the implementation of an international validation, splitting and distribution module in accordance with UIC leaflet 930. Today RESS can operate with any energy measuring system able to exchange data in UTILTS format. In addition RESS is also able to read directly from other energy measuring devices.

As access to train consumption data is subject to commercial confidentiality, train operators can only consult the energy and billing data for their trains, whereas infrastructure managers can access the whole data set of railway undertakings operating on their grid. Both have access to the data through an Internet user interface.

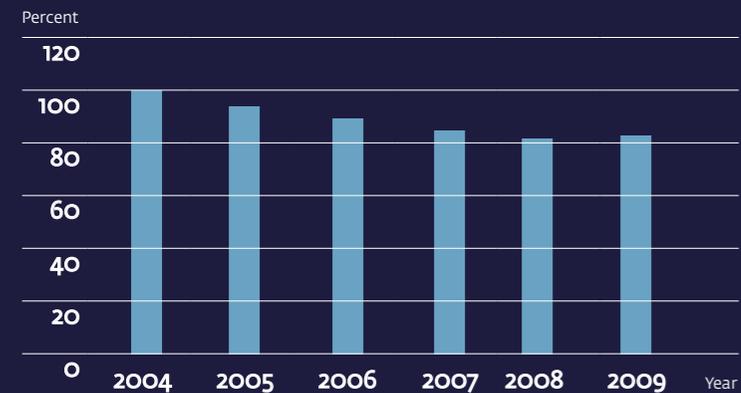
Railway undertakings are able to access all relevant data used as a basis for invoicing. This helps them to understand and control their invoices and their energy consumption. Providing access rights to such data improves the transparency of the invoicing process as well as openness between infrastructure managers and railway undertakings.

Additional service such as web service has been developed in order to provide better service to railway undertakings using measured data in their internal energy management processes. They can access the raw data shortly after it has been measured.

Net Present Value ERESS (EUR million)



Reduction in Wh per Gross ton Km, reference year 2004



“You can only manage what you can control, and control is worthless without measuring.”

“A cost-effective, custom-designed and advanced settlement system”

Financial Highlights

ERESS is a highly profitable project. Assuming 10% savings, based on an annual energy cost of EUR 250 million, the net present value of ERESS with a discount rate of 7% is EUR 355 million. Our customers, the railway undertakings, will realise this. The net present value calculation is based on realistic investments and operating costs for all four partners.

ERESS partnership entrance fee

The initial entrance fee is based on the new partners' share of the total costs that the existing partners have invested in ERESS minus the depreciation costs of the system. This is calculated on a non-profit basis and is set at EUR 400,000 for 2010. ERESS will keep pace with technological advances and will continue to develop value-added functionalities for its members and customers.

Substantial ongoing cost savings for our customers

The installation of energy measuring equipment, access to data, accurate settlement and billing all encourage railway undertakings to adopt energy efficiency programmes. This is done to reduce energy consumption and costs, and thereby increase the railway sector's competitive advantages. As a documented example, the Norwegian national railway (NSB AS) started a five-year energy-saving project in 2005 based on measured data. This project has allowed them to achieve substantial cost savings:

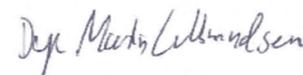
- ▶ 18% energy efficiency improvement between 2004 and 2009
- ▶ The objective of the passenger train energy project is for energy consumption in 2010 to be 15% lower than the level for 2009, given the same level of activity.

Accounting Figures

INCOME STATEMENT	NOTES	2009		2008		2007	
		in NOK thousand	in EUR thousand	in NOK thousand	in EUR thousand	in NOK thousand	in EUR thousand
Operating income							
Other operating income	2,3	9,133	1,046	5,360	596	2,414	303
Total operating income		9,133	1,046	5,360	596	2,414	303
Operating expenses							
Personnel expenses	2,4					0	0
Depreciation	2,5					0	0
Other operating expenses	2,6	9,121	1,045	5,359	596	2,414	303
Total operating expenses		9,121	1,045	5,359	596	2,414	303
Operating result		11	1	1		0	0
Financial items							
Financial income			0	0		0	0
Financial expenses		11	1	1		0	0
Net financial items		11	1	1		0	0
Annual result		0	0			0	0
APPLICATION OF PROFIT							
To equity capital		0	0	0	0	0	0
Total application of Profit		0	0	0	0	0	0



TERJE STØMER
Chairman of ERESS board



DYRE MARTIN GULBRANDSEN
Director of ERESS

Notes to the Financial Statements

Note 1: Project expenses entered as incurred. Project income is recognised when the expenses are allocated to the partners.

Note 2: This report uses an exchange rate of EUR 0.1146 / NOK.

Note 3: Project income consists of payments for three quarters and deposits for the fourth quarter from the partners and is calculated according to each partner's share of the operational and maintenance costs.

Note 4: Dedicated personnel in Jernbaneverket Bane Energi work with ERESS. During 2009, ERESS paid EUR 233 000 for personnel services.

Note 5: Depreciation of investments does not have an impact on the income statement. Investments and depreciation are borne by the partner organisations (Banedanmark, Banverket, Infrabel and Jernbaneverket)

Note 6: Analysis of other operating expenses in EUR thousand

	2009		2008		2007	
	in NOK thousand	in EUR thousand	in NOK thousand	in EUR thousand	in NOK thousand	in EUR thousand
Consultant services	7,037	806	3,504	390	1,020	128
Telephone and data communication	37	4	9	1	133	17
Personnel costs	2,036	233	1,702	189	1,247	156
Other costs	11	1	144	16	14	2
Total	9,121	1,045	5,359	596	2,414	303

Note 7: In 2008 the Belgian Railway Infrastructure Manager Infrabel NV became a partner in ERESS. According to the cooperation agreement they paid NOK 4,179 million. This represents one quarter of the investment costs at the stage of accession. The steering committee of ERESS decided to set the payment on a deposit account. The payment is not recognised in the income statement.



Auditor's Report for 2009

 ERNST & YOUNG

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To Bane Energi

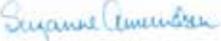
Statement on ERESS for 2009

We have audited the project accounts concerning ERESS for 2009. Total income constitutes NOK 9 133 000, and total costs NOK 9 133 000. Bane Energi's director and Chairman of ERESS are responsible for the project accounts. Our responsibility is to express an opinion on the project accounts based on our audit.

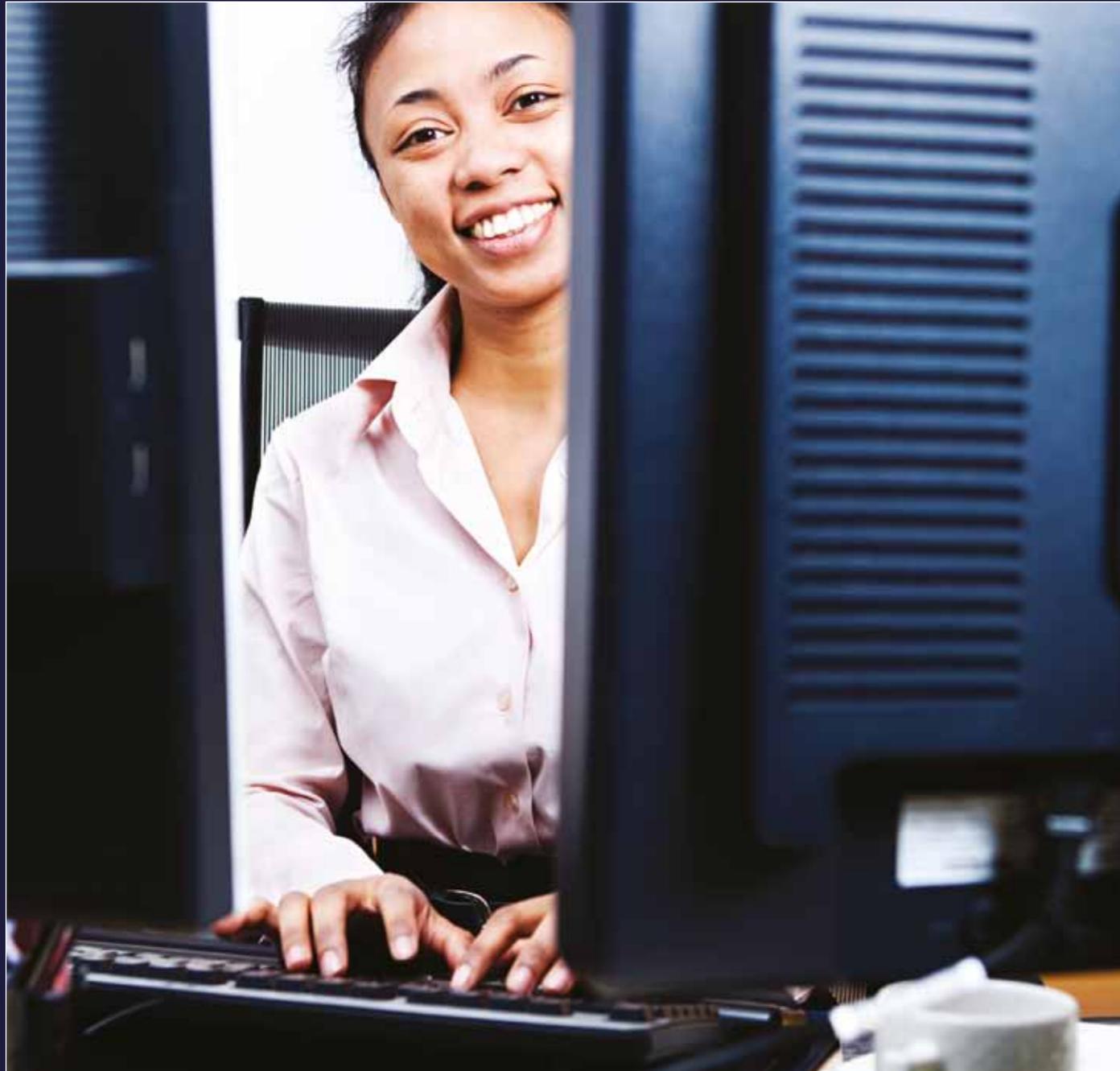
We conducted our audit in accordance with laws, regulations and auditing standards and practices generally accepted in Norway, including the auditing standards adopted by the Norwegian Institute of Public Accountants, and our statement is based on auditing standard RS 800 "The auditor's report on special purpose audit engagements". Those standards and practices require that we plan and perform the audit to obtain reasonable assurance about whether the accounts are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and the significant estimates made by management, as well as evaluating the overall presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the project accounts concerning ERESS present fairly, in all material respects, the project's results for the period in accordance with accounting standards, principles and practices generally accepted in Norway.

Oslo, 18 May 2010
ERNST & YOUNG AS


Suzanne Amundsen
State Authorized Public Accountant (Norway)

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"The calculation model is flexible and meets the requirements. It takes care of foreseeable variations and changes in settlement processes."

"[...] it is DNV's opinion that the RESS make it possible for railway infrastructure owners to adopt a practice more in compliance with the intentions of current energy laws with regard to free market for electric energy [...]."

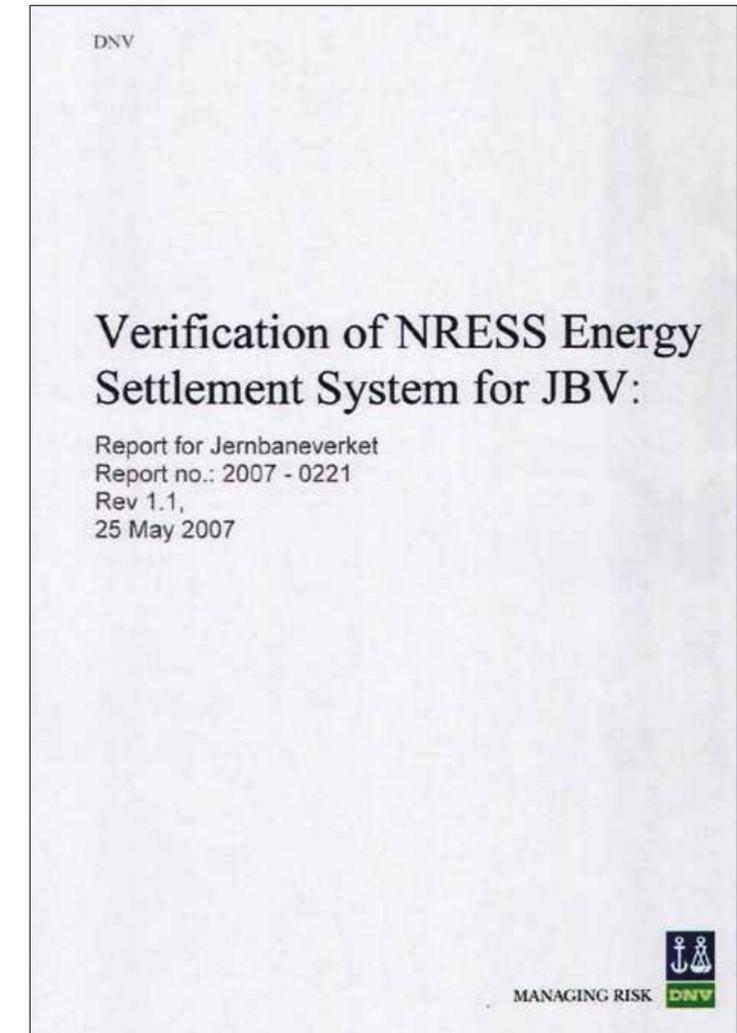
"The system is built on well known Java standard components and follows today's recommendations."

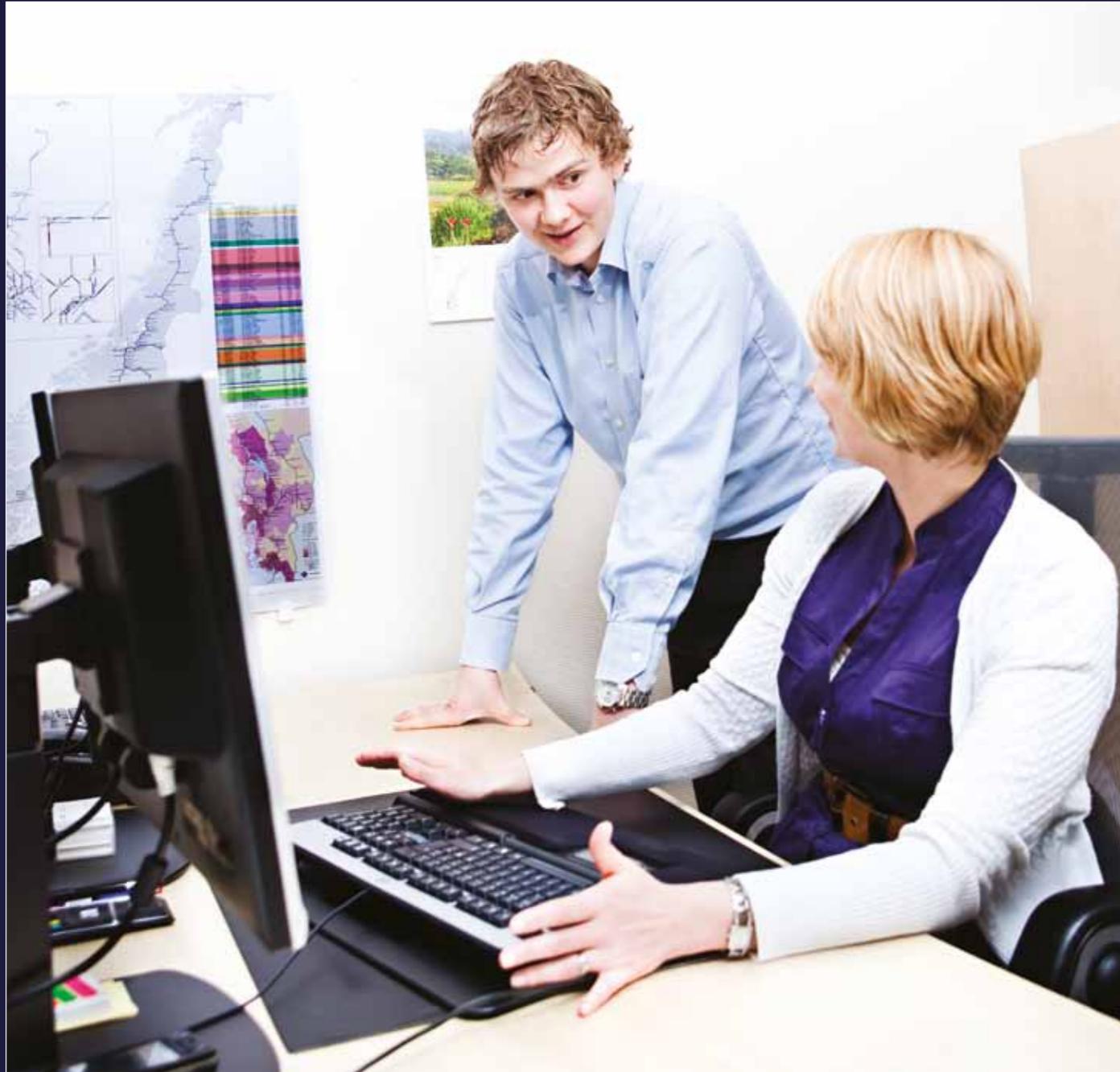
"DNV is of the opinion that RESS is an application well suited to its purpose."

"DNV has confirmed that the data representing energy consumption and generation for given consumption point is exchanged correctly between the Norwegian and Swedish instances of RESS."

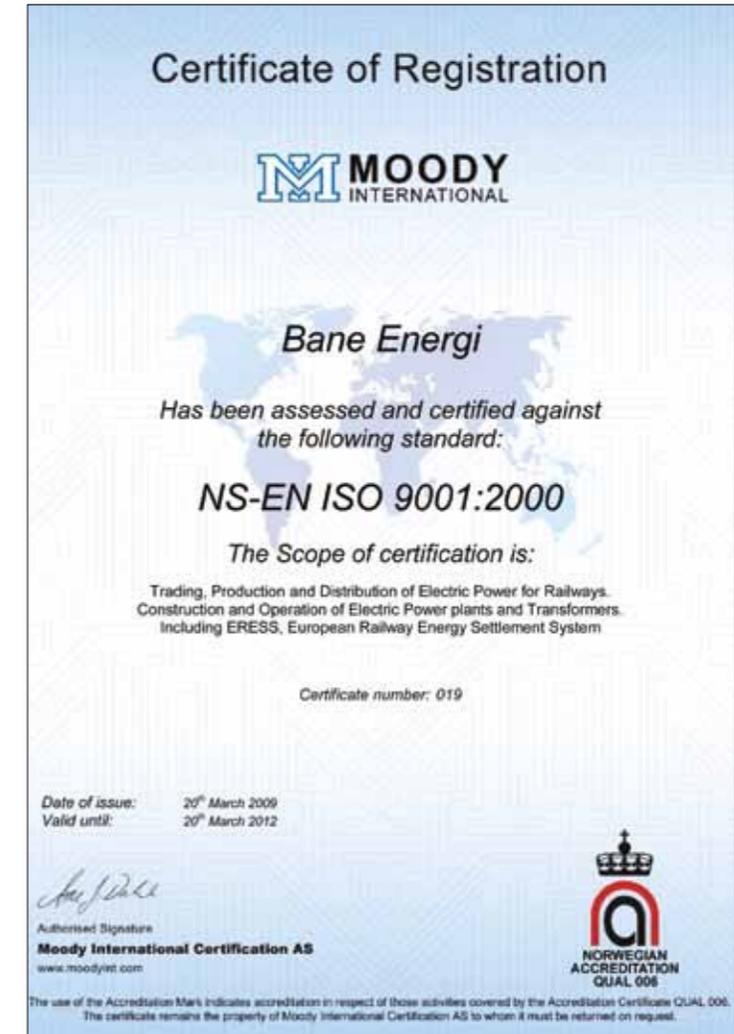
"The application's level of information security is seen by DNV as satisfactory."

Verification of RESS by a Third Party





ISO Certification





banedanmark



CONTACT INFO FOR QUESTIONS OR INFORMATION REGARDING ERESS, PLEASE GO TO WWW.ERESS.EU
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