



EU railway sector declaration on traction energy metering and settlement

November 2020



EU railway sector declaration on traction energy metering and settlement

This Sector Declaration expresses how the railway sector wants to be compliant with European Regulation. It includes timings on fulfilling requirements from Commission Implementing Regulation (EU) 2018/868¹. It also includes timings on installation of EMS. It defines the minimal requirements to make energy metering and energy settlement operational and compliant with Railway Market Directive and Energy Market Directive.

Aim of the Sector Declaration is to enable correct traction energy metering and settlement with less obstacles, especially for cross border traffic.

This Sector Declaration includes some background, commitments of Railway Undertakings and commitments of Infrastructure Managers. Recommendation can be found in the 'Guidelines regarding on-board energy metering, exchange of data and traction energy settlement', published together with this Sector Declaration.

Background

The on-board Energy Measurement Systems (EMS) and their communication to a Data Collecting System (DCS) on ground are part of the framework of the Railway Interoperability Directive 2016/797.

The most recent regulation is published in the Commission Implementing Regulation (EU) 2018/868, amending the Commission Regulations (EU) 1301/2014 and 1302/2014, hereafter referred to as ENE TSI:2018 and LOC&PAS TSI:2018. These regulations require:

- EMS to be installed on all new, renewed and upgraded rolling stock, that has to send data to ground using the interface protocols and transferred data format defined in EN 50463:2017;
- all member states to have a DCS able to receive this data by 1st January 2022;
- all member states to have a Settlement System including the energy exchange function by 4th July 2020.

Also other legal documents are relevant in relation to traction energy metering, settlement and billing²:

- The Railway Market Directive 2012/34: All services offered by IM are open (each RU can request the service; service is described in e.g. a Network Statement) and non-discriminatory (each service is offered in the same way to all RU).
- European Treaty and 2009/72 Energy Market Directive: Each end consumer can choose its energy suppliers and all suppliers are able to deliver to their consumers.³
- Commission Regulation 2017/2195: Guideline on electricity balancing.

¹ Applicable to European Economic Area (EEA). This includes all EU-members but also Norway. Switzerland has also accepted this regulation, but is no EEA-member.

² Applicable to EEA. This regulation are not fully applicable in Switzerland.

³ The way this regulation is implemented may hamper the application of this principle.



Commitments of Railway Undertakings

1. RU will install EMS on all traction units where this is technically and economically feasible. This should result in 60% of traction units equipped with an EMS in 2025 and 90% in 2030.
2. All EMS on new traction units shall be fully compliant with LOC&PAS TSI:2018.⁴ Non-compliances on retrofitted EMS shall be stated in the Conformity Assessment documentation.^{5 6}
3. All new EMS shall send data to DCS at least every 4 hours and before intentional powering down.⁷ This also applies to renewed EMS.⁸
4. RU shall be able to deliver to the IM train compositions (including EVNs of all traction units) by 2023. This shall be done preferably at departure of train-run and latest 48 hours later.

Commitments of Infrastructure Managers⁹

1. IM shall provide DCS in accordance with ENE TSI:2018 latest in January 2022.
2. IM shall process data fast in DCS and exchange-function of Settlement and forward data without further delay in accordance with clause 5.4 of IRS 90930:2020.
3. International data exchanges will be in accordance with IRS 90930:2020.¹⁰
4. IM enables a pragmatic approach to increase the possibilities of the RUs in the electricity purchasing strategy. As a first step the possibilities and obstacles will be identified by 2022. Implementation of the agreed choices is recommended by 2025.^{11 12}
5. All relevant information is publically available:
 - a. Requirements to be able to use traction energy,
 - b. Methods applied for validation, estimation and allocation,
 - c. Tariffs for grid fee and if applicable energy,
 - d. Method and conditions to be able to choose energy supplier,
 - e. Method on how energy losses are defined, allocated and invoiced,
 - f. Incentives for installation of EMS¹³.

⁴ If the project has started before June 2018, compliance regarding EMS-requirement to older version of LOC&PAS TSI is sufficient until January 2022.

⁵ Older traction units might already have current and voltage sensors that were not designed and tested in accordance to EN 50463. So it can't be verified if the EMS is fully compliant to the accuracy requirements of TSI and EN. Flexibility is needed in accepting such devices.

⁶ IM can request to receive documentation regarding the Conformity Assessment.

⁷ EN 50463-3:2017 clause 4.9.3: 'Transmission to ground of CEED should be done more frequently than once a day.' and 'The DHS should include an automatic execution of this procedure at DHS intentional power down.'

⁸ Sending data to ground is a task of DHS. Electronic components have a shorter lifetime or can have intermediate upgrades.

⁹ Without prejudice to Article 7c paragraph 3 of Directive 2016/2370.

¹⁰ Clause 4.1.2.2 of IRS 90930:2020 includes the migration path from UTILTS to XML.

¹¹ The parties that make an agreement will depend on the situation in each country. Extra support is included in the guidelines. This commitment is only applicable in EEA-countries.

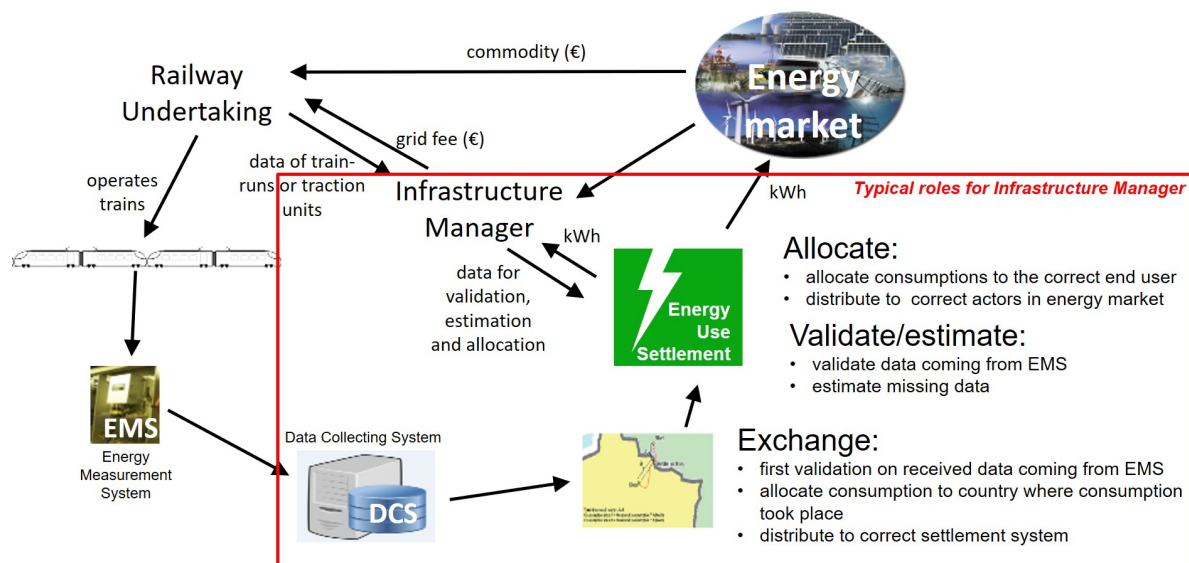
¹² ERFA requests IMs to always offer traction electricity as an additional service to the RUs.

¹³ These incentives can also be differences in the previous bullets depending on installation of EMS.

Informative annex

Guidelines regarding on-board energy metering, exchange of data and traction energy settlement

1. Process flow



Railway Undertakings operate trains. Trains can use electrical traction. In order to be able to be invoiced based on the real energy consumption, energy meters on-board of the trains are needed. As trains move from country to country, the EMS includes location data (e.g. coming from a GPS).

An EMS is installed on a vehicle. A Notified Body checks the Conformity Assessment¹⁴ and delivers the report to the Vehicle Keeper. This report also states the needed measures to be included in the maintenance plan of the vehicle to keep the EMS accurate over its lifetime.

All new EMS will use the protocol defined in EN 50463-4:2017 to send the energy metering data to ground. Older EMS might still use legacy protocols.

All on ground services are typically offered as a service by the party that is the relevant system operator (e.g. distribution system operator) of the electrical part of the rail system for a specific country.

Each member state shall offer the service to collect the data according to the new protocol. This is done with a DCS. EMS installed on trains running through different countries send all their data to one DCS.

Each member state shall offer settlement. CIR (EU) 2018/868 describes that settlement shall be able to exchange energy metering data with other settlement systems, validate this and allocate the consumption data to the correct parties.

¹⁴ For details of the assessment procedure see RFU-RST-301 of NB-Rail <http://nb-rail.eu/co/nbrail/RFU/RFU-RST-301%20EMS%20assessment.pdf>.



The first part of settlement is used to first validation on received data coming from EMS (e.g. interpolating missing locations), allocate consumption to country where consumption took place and distribute to correct settlement system. After this exchange-function, settlement will only have to deal with consumptions inside the settlement area where the consumption took place.

The settlement system also needs to validate the energy metering data, estimate missing data or replacement values for data of poor quality and allocate the consumption data to the correct parties. This part of settlement is also called Energy Use Settlement as it defines and allocates the energy consumptions. In order to do this, the Energy Use Settlement should receive data of sufficient quality on the input side. This should be specified in a document accessible to all concerned parties.

The EMS uses the EVN (European Vehicle Number) as a part of its ID. The Railway Undertaking should declare the real composition of train-runs via the TAP/TAF-messages. These messages shall include the EVN's of all traction units. With this data the Infrastructure Manager has useful data to estimate the consumption (based on mass, distance, gradients of the trajectory, speed, etc.) and can also make the link between energy metering data of some EMS with a train-run and thus with a Railway Undertaking. Other methods for validation and allocation are possible.

Energy Use Settlement allocates consumptions to a consumer (the Railway Undertaking that was operating a train having the EMS). Energy Use Settlement might need to allocate the consumptions also to grid areas inside the electricity market inside the country.

Energy Use Settlement shall be able to export the consumptions to the relevant actors in the national Energy Market after settlement (e.g. Balancing Responsible Parties, Energy Suppliers and Transmission System Operators), taking into account the requirements and requested protocols for that local market. Energy consumption (also called commodity) will be invoiced by the actors in the energy market (or by the Infrastructure Manager when the consumer mandated him to do this).

The Infrastructure Manager might also use these consumptions as basis for the calculation of a grid fee.

2. Installation of EMS

The Vehicle Keeper coordinates the installation with EMS supplier and installs EMS on the traction units.

New EMS shall be compliant with LOC&PAS TSI:2018. EN 50463:2017 is a harmonised standard. Compliance with EN 50463:2017 is sufficient in order to be compliant to the EMS-related requirement of LOC&PAS TSI:2018. It is only mandatory to be compliant to the clauses referred to by TSI. But nevertheless, it is still recommended to be fully compliant with EN 50463:2017.

If the project was in an advanced stage of development before June 2018, compliance regarding EMS-requirement to older version of LOC&PAS TSI is sufficient until January 2022.

Vehicle authorisation remains to be a big challenge for existing, retrofitted vehicles but also for ongoing projects.

- Often these vehicles already have components that could be reused but where it is not possible to prove compliance to EN 50463 or where full compliance can't be reached on e.g. lower currents or deviating temperatures. It should be permitted to re-use these components. Possible non-conformities should be specified in the Conformity Assessment report.



- EMS, compliant to LOC&PAS TSI:2018, are only very recently available. In the meantime EMS compliant to LOC&PAS TSI:2014 have still been installed on retrofitted but also on new vehicles. It should be permitted to keep on installing such EMS in projects in an advanced stage of development before June 2020 compliant to LOC&PAS TSI:2014 latest until January 2026. It might be useful to keep the EN 50463:2012 on the list of harmonised standards. Of course, it is preferred to install EMS, compliant to LOC&PAS TSI:2018, whenever this is already possible and economically more suitable.

The sector organisations will ask European Commission to facilitate the reuse of existing components and to permit to install EMS compliant to LOC&PAS TSI:2014 until January 2026.

3. Data coming from EMS

Data coming from new EMS is compliant with the EN 50463-4:2017 protocol. IRS 90930:2020 defines how this data can be further transferred on ground.

IRS 90930:2020 also contains the roles, the functions, the types of data and the processes.

The following migration requirements apply:

- All DCS, Exchange and Energy Use Settlement intended to exchange data with systems in other countries shall be able to use the XML-based data and data transfer defined in IRS 90930 within two years after the date of publication of the IRS.
- Systems already able to use UTILTS-based data transfer, shall be able to use UTILTS during the migration period. New systems should use XML-based data transfer. After the migration period no party can require that any other party shall accept UTILTS-based data transfer.
- Clause 4.3.4 of IRS 90930:2020 contains guidance on how to transfer data coming from UTILTS-based data transfer towards data to be used in XML-based data transfer.

An EMS compliant with EN 50463-4:2017 can send much more data to ground than only the mandatory 5 minutes consumptions with locations, a.o.:

- ReadingBlock can be used to send data with a higher granularity and can contain a lot of extra data like currents, voltages and temperatures.
- EventSet is a logbook that also registers when EMS is powered down and when EMS is powered up again and can be used to evaluate the vehicle operational state.

4. Settlement

Multiple types of data can be used for validation, estimation and allocation inside Energy Use Settlement.

Many settlement responsables use train-run data for this purpose. Crucial element in this train-run data is the train composition including the EVN's of the traction units part of the train. The TAP/TAF messages are adjusted and permit now to introduce also for consists the EVN's. The EVN is the key used to make the link between the train and the EMS on-board of the traction units inside this train.

IRS 90930:2020 contains extra information on train run data (clause 4.7), what EVN to be used for EMUs (clause 4.2) and how to introduce this information in masterdata (clause 4.8).

Informative Appendix I of IRS 90930:2020 includes some guidelines regarding possible solutions that can be used for validation, estimation and allocation of consumptions. This appendix also describes



different solutions on how energy losses between the connection with the public grid and the pantograph can be handled.

Clause 3.4.6 of IRS 90930:2020 gives more guidance on the allocation of grid costs.

5. Access to energy market¹⁵

The freedoms which the Treaty guarantees the citizens of the Union are achievable only in a fully open market, which enables all consumers freely to choose their suppliers and all suppliers freely to deliver to their customers.

Directive 2003/54/EC gives each end user the right to choose energy supplier.

A decision of court of justice of 22nd May 2008 confirmed this position. The court decided that Third Party Access is the rule and that exceptions should strictly be interpreted (“Citiworks” case C-439/06).

Directive 2009/72 confirms that since 1 July 2007, all customers are regarded to be eligible customers (art. 33). An ‘eligible customer’ is free to purchase electricity from the supplier of his choice (art. 2.12).

But this is in many countries still theory. A lot of juridical and practical obstacles block this.

Aim of free choice of supplier is to ensure that an end user pays the correct price for a product or service delivered to them. It is not possible or economical feasible to have the same high level requirements for RUs as typically used in energy market. A pragmatic approach is needed.

Price paid by the RUs shall be transparent and non-discriminatory. Each country shall find the most cost-effective solution taking into account the needs for large RUs but also for small RUs.

Possible solutions are:

- IM purchases all electricity and delivers the electricity as additional service to the RUs. If IM only charges real cost, the scale advantage results in lower prices.
- Railway sector purchases together all electricity and agrees on how to split the costs between all end users. It might even be possible to define unit costs for parts of the volume of an RU (price clicking inside the joint contract).
- Electricity for railways is purchased on spot market. RUs have access to the spot market and define price for the electricity delivered to them.
- RUs can choose their supplier and (if applicable) balancing responsible party in the electricity market (all products are possible).

Each Settlement responsible (so in most cases IM) shall take its responsibility and investigates the situation in its country. If needed, he contacts all relevant actors (regulators, government, TSO) in order to adapt the juridical, technical and organisational framework.

¹⁵ This clause is only applicable in EEA-countries.