



European Rail  
Infrastructure Managers



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## EIM POSITION PAPER ON ENERGY METERS ON ELECTRIC TRAINS



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# EIM Position Paper on Energy Meters on Electric trains

## Summary

Data from energy meters on trains will be of benefit to European railways, as it can be used for energy reduction management and to enable accurate billing.

Train mounted energy meters are not required for interoperability.

If an electric unit is must be fitted with an energy measuring system, it should comply with the requirements of a European Standard. The Location Function shall be implemented.

The TSI should mandate the use of data coming from standard meters for billing where fitted.

The communications on ground should conform to the European Standard defined by the UIC-leaflet 930.

## Introduction:

In this paper EIM explains;

- The benefits of 'on train' energy measurement
- The benefits of standardising 'on train' meters
- The data collection, exchange and billing

## The benefits of “on Train” measurement

Electrical energy for trains is traditionally measured at bulk supply points and not on individual traction units. By using this method the total estimated consumption for the railway operation is recorded but it is not possible to accurately apportion the energy consumed by an individual railway undertaking. It is even more difficult to determine the amount of energy used by a particular train on a particular traction unit or journey. It is normal to estimate energy consumption per user based on a set of theoretical train characteristics with an assumed standard driving technique.

Energy measurement on an individual train will enable accurate apportionment to each particular traction unit or journey. This is an essential task to each infrastructure manager. Without energy measurement benefits of energy savings can't be appointed to the correct railway undertaking.

Data from the energy meters are necessary input for railway undertakings in their energy management work. Train driving technique can have a significant affect on the energy consumed for trains operating over the same route with the same stopping patterns. By using accurate energy data, railway undertakings can optimise driving technique, climate control and parking mode. It is documented that this delivers improvement in energy

efficiency of at least 10%. Knowing how much energy is used and being billed accurately provides an incentive to railway undertakings to reduce energy consumption.

Energy meters are also a necessity if railway undertakings are to enter the energy market as eligible consumer and the TPA principle are to be implemented regarding electric energy to trains.

### **The benefits of standard “on Trains” meters**

Standardisation enables trains to be fitted with a single metering system, thus avoiding the use of with multiple meters to suit the needs of the user. This will require a common specification for accuracy, time, date and positioning data. As on board energy measuring systems need to communicate with an external system, it will be necessary to specify the method of collection (e.g. radio), data protocol and download intervals.

The measured data shall consist of 5 minutes time series with consumed and regenerated energy together with a recording of the position. The recording of time and position is necessary for energy saving purposes and also to make it possible to use this data for commercial procurement and payment.

The EN 50463 will define the general requirements, the measuring of the energy consumption, the compiling this data with date, time and location, the communication to ground and the conformity assessment. CR RST TSI refers to this standard. Trains equipped with an energy meter intended for energy billing shall fulfil the essential requirements described in the TSI for Conventional Rail Rolling Stock.

This Location Function is essential for determining on which grid the consumption took place. In some Member States tariffs differ from area to area. Energy Measuring Systems fulfilling the essential requirements of the TSI and not having the optional Location Function are not sufficiently interoperable. The TSI should describe the Location Function as an essential part of the on board Energy Measuring System as is noticed on the UIC-leaflet 930.

### **Data collection, exchange and billing**

It is not yet a requirement for a data collection and billing system to be used, created or to form part of the railway infrastructure. However, recognising the benefit of energy measurement, and how it is likely to be used, it is obvious that systems will be created to capture and analyse the large volume of data involved.

The infrastructure manager shall be able to attribute the consumption to the correct railway undertaking. In an interoperable railway market, the only solution is likely to be the use of a settlement system able to use data coming from on board energy measuring systems.

The actual revision of Energy TSI only requires the use of all data coming from a standard energy meter in conformance with the Conventional Rail Rolling Stock TSI, if energy metering on board is required (e.g. on the grid of that infrastructure manager). It is strongly advisable to make this requirement stricter. Any infrastructure manager should be able to use the data coming from such standard energy meters.

The transfer of data from data collection systems to settlement systems and in between settlement systems is already standardized by UIC-leaflet 930. This enables the effective

and accurate distribution of energy data for the benefit of railway undertakings and infrastructure managers.

A settlement system should be designed to support the varying requirements of the electricity suppliers and the commercial contracts in place across the member states of Europe without impacting the operation of the railway. A settlement system should also be designed to provide acceptably accurate apportionment of electricity to railway undertakings and infrastructure managers without invoking complicated legislative requirements.

The only requirement is that a system shall be able to receive data from a standard train mounted energy meter or the standardized exchange format of the UIC-leaflet 930. However it is recognised that both the railway and electricity supply industry will benefit if the settlement system is standardised.

## **Conclusion**

Train mounted traction energy measurement will be beneficial to European railways because data can be used for energy reduction management and to enable accurate billing or apportionment.

All energy meters producing data suitable for energy billing shall comply with the same requirements stated in the Rolling Stock TSI's referring to a European standard.

The use of a Location Function inside an energy meter suitable for energy billing should become mandatory.

All data shall be transferred on ground using the protocols defined in UIC-leaflet 930.

It will be beneficial to the railway and electricity supply industry if the settlement system is certified to a European Standard.

Where fitted the Energy TSI should make the usage of data coming from interoperable on board Energy Measuring Systems mandatory.