Annexes

Annex Energy measurement systems

1 Background

Version 2.0 dated 9 December 2022

This annex defines the requirements that must be observed for energy measurement systems and the procedure for registering vehicles for energy billing based on the measurements. The Rail Network Access Ordinance forms the basis for this.

NWS Annex "Data Provision" sets out how these measurements should then be transmitted for actual billing.

2 Requirements for energy measurement systems

In order to be approved for actual billing, energy systems on vehicles must meet one of the following requirements:

2.1 Energy measurement system in accordance with TSI

The Energy Measurement System (EMS) must meet the requirements of TSI LOC & PAS (EU Regulation 1302/2014 or later) Section 4.2.8.2.8, incl. Annex D (Version 2014 or later). The system's conformity must have been confirmed by a conformity assessment body.

2.2 Energy measurement systems on existing vehicles

For the purposes of these requirements, existing vehicles are railway vehicles that were first taken into operation before 1 January 2018. For existing vehicles not assessed according to TSI, the requirements set out below shall apply.

2.2.1 Energy measurement system in accordance with EN 50463

The energy measurement systems of existing vehicles must comply with the requirements 50463 (the 2012 or later version), with the exception detailed in Point 2.2.2 of this Annex. The

conformity of the systems must have been confirmed by a conformity assessment body. CMS User

2.2.2 Energy measurement system which deviates from EN 50463

Energy measurement systems of existing vehicles which do not meet all the requirements of Point 2.1 or 2.2.1 of this Annex may nevertheless be approved for the actual billing of traction current after consultation with the infrastructure manager (IM). The energy measuring systems must comply with the implementing provisions set out below. The conformity of the systems must have been confirmed by a conformity assessment body.

2.2.2.1 Transducers (VMF and CMF)

For measuring transducers that are not certified to EN 50463, compliance with the following conditions must be demonstrated:

a) The accuracy class of the transducers must be at least 1.0. The type and class of the transducers installed in this vehicle must be evident from the routine inspection report for the energy measurement system (in accordance with Section 3.1.5 of this Annex).

b) The limit values of the measurement deviations for the entire energy measurement function (VMF, CMF and ECF) of 1.5 (AC) or 2.0 (DC) must be adhered to in accordance with the definition in EN50463-2 Chapter 4.2.3.2.

2.2.2.2 Multiple assignment of the transducer outputs

Connecting other equipment to the fixed outputs of the transducers is permissible. However, the vehicle owner must ensure that this does not affect the energy measurement function.

2.2.2.3 Multiple rail traction power supply systems

The minimum requirement is that energy consumed in the 15kV / 16.7Hz rail traction power supply system must be measured. Measuring energy consumption in other rail traction power systems is optional as regards approval for actual billing in Switzerland.

2.2.2.4 Reactive energy

The measured values for reactive energy are not relevant for actual billing. Accordingly, the measurement of reactive energy is not subject to any requirements.

3 Registration of vehicles for actual billing

3.1 The registration process

3.1.1 Registration of a new vehicle and of a new type of equipment

The following documents must be submitted to the IM in order to register a vehicle:

- Registration form (Point 3.1.3)
- Conformity certification documents by type of vehicle (Point 3.1.4.)
- Conformity certification documents by locomotive (Point 3.1.5.)
- Calibration certificates for each system component (Point 3.1.6)

3.1.2 Registering an already approved vehicle and type of equipment

The following documents must be submitted to the IM in order to register a vehicle:

- Registration form (Point 3.1.3)
- Conformity certification documents by locomotive (Point 3.1.5.)
- Calibration certificates for each system component (Point 3.1.6)

3.1.3 The registration form

The registration form can be obtained on written request from SBB Infrastructure (onestopshop@sbb.ch). The applicant (train operating company, vehicle keeper, manufacturer, etc.) should submit the completed registration form to SBB Infrastructure together with the other documents listed at Point 3.1.1 and/or 3.1.2.

3.1.4 Conformity certification documents per vehicle type

The following conformity certification documents must be submitted to the IM in respect of each vehicle type (e.g. Re 420, RABe 521, etc.) and each equipment type (integration of a specific combination of voltage transformer, current transformer, measurement device and/or other components of the energy measurement system):

a) For energy measurement systems conforming to TSI LOC & PAS (EU Regulation 1302/2014 or later) in accordance with Point 2.1: an assessment report incl. a test certificate issued by a conformity assessment body

or

b) For existing vehicles with energy measurement systems conforming to EN50463 in accordance with Point 2.2.1: an assessment report from a conformity assessment body (incl. confirmation of conformity)

or

c) For existing vehicles with energy measurement systems deviating from the TSI or EN 5 defined in Point 2.2.2): an assessment report from a conformity assessment body; this report must also identify the deviations from the requirements and assess whether the deviations are in conformity.

3.1.5 Conformity certification documents for each locomotive

A routine test report in respect of every energy measurement system installed on the vehicle must be submitted to the infrastructure manager.

The report is to contain at least the following data on the energy measurement system:

- The date of installation
- The installation location
- The designation, class and scale of the voltage transformer (only if applicable)
- The designation, class and scale of the current transformer (only if applicable)
- The complete EVN, as well as all CPIDs for the energy measurement systems installed in the vehicle.
- The designation and serial number of the energy calculation function/energy measurement device/meter
- The reference to the assessment report and the EN 50463 conformity certificate or to the EC test certificate

3.1.6 The calibration certificate

A calibration certificate must be submitted for each "Energy Calculation Function" system component. This calibration certificate must, among other things, include the date on which the calibration ceases to be valid. If this expiry date is exceeded, the energy measurement system will no longer be in conformity.

3.1.7 The monitoring phase

The purpose of the monitoring phase is to verify that the energy measurement system is working correctly. During the monitoring phase, the consumption values per train type as published in the infrastructure performance catalogue will be used. In order that the monitoring phase can be completed within two months, the following requirements must be met at the same time:

- The vehicle must be operated in Switzerland.
- The vehicle must be in use for at least 10 operating days.
- In this time, the energy measurement system provides complete data.
- In this time, complete data is also provided via the railway operating systems (EVN).

After successful completion of the monitoring phase, the vehicle will be activated for actu CMS User and the vehicle keeper will receive corresponding confirmation.

If a vehicle is approved for the actual billing of traction current, energy will be billed exclusively on the basis of the readings taken on the vehicle, irrespective of which train operating company is using the vehicle.

3.2 Preserving conformity

Following any changes to the energy measurement system (e.g. the replacement of an energy measurement system) which might affect conformity as defined in Point 2, updated documents as listed in Points 3.1.1 and 3.1.2 must be submitted. If the infrastructure manager (IM) detects that the energy measurement system has been changed but has not been sent the relevant documentation, it reserves the right, due to this lack of conformity, to base its billing on the flat rates per train type as published in the IM's List of Services (retrospectively, from the time the change was made).

If an energy measurement system is exchanged for a system which is already approved for 'actual' billing in accordance with Point 3.1.2, there is no need for a monitoring phase as set out in Point 3.1.7. If, following such an exchange, the IM detects irregularities in energy measurement (e.g. incorrect measurement data), Point 3.1.7 will be immediately applied.

If a conformity assessment body certifies that a change to the energy measurement system will have no effect on conformity (e.g. a software update to the baseline), this Point will not apply.

4 Contact

For questions on energy measurement systems related to energy billing, please contact onestopshop@sbb.ch.

5 Amendments

Version	Date	Amendment	Comment
2.0	09.12.2022	3.2 New provision in the event of changes to the energy measurement system without the	-

Version	Date	Amendment	Comment
		infrastructure manager being notified	
1.2	02.08.2021	Annex now published as a web version as opposed to previous PDF version Editorial corrections The new Annex designation amended from the 2022 timetable	The provisions from version 1.1 from 19 November 2020 were kept unchanged.
1.1	19.11.2020	2.2.1 Amendment to the version of EN 50463 2.2.2 Clearer statement that it refers to the actual billing.	-
1.0	02.12.2019	Published 3.1.7 Monitoring phase 10 instead of 15 operating days	Compared to version 1.0 of Appendix 2020, this Appendix has been subjected to comprehensive editorial revision and is now timetable-independent, so that it applies equally to several published Network Statements. Based on experiences, the observation period is reduced to 10 days.