

**Version 17**

**Effective date: 29<sup>th</sup> January 2019**

**Traction Electricity Rules**

**Explanatory Note**

These Traction Electricity Rules set out:

- (A) for the purposes of calculating the Traction Electricity Charge:
  - (i) provisions relating to the calculation of Traction Electricity Charges based on actual metered consumption including:
    - (a) the process for collecting electricity consumption data and other related data from metering equipment installed on trains and supplying it to Network Rail; and
    - (b) the rules which apply where metered data is missing or not supplied to Network Rail within the prescribed time;
  - (ii) provisions relating to the calculation of Traction Electricity Charges for unmetered vehicles using a consumption rate extrapolated from metered data (Partial Fleet Metering);
  - (iii) provisions for applying Regenerative Braking Discounts to modelled consumption rates for those train operators using regenerative braking;
- (B) a rules change process for amending these Traction Electricity Rules (Note: where ORR carries out an access charges review which relates to track access contracts incorporating these Traction Electricity Rules, any amendments to those track access contracts to give effect to the conclusions of such access charges review may also include amendments to these rules made pursuant to Schedule 4A to the Railways Act 1993, rather than pursuant to the rules change process set out herein);
- (C) the volume and cost reconciliation provisions that apply to train operators using electric traction; and
- (D) other provisions relating to the procurement and billing of traction electricity.

This Explanatory Note does not form part of the Traction Electricity Rules.



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## 1. Definitions and Interpretation

1.1 Unless otherwise defined in these Traction Electricity Rules or the context requires otherwise, words and expressions used in these Traction Electricity Rules shall have the meanings, constructions and interpretation ascribed to them in the relevant track access contract.

1.2 In these Traction Electricity Rules, unless the context otherwise requires:

“**Act**” means the Railways Act 1993;

“**AC System**” means the alternating current system of electricity traction supply on the Network;

“**Appendix Amendment Notice**” means a notice given by ORR to Network Rail under either paragraph 13.6 or paragraph 13.7 which specifies amendments to Appendix 2 and/or Appendix 4 of these Traction Electricity Rules for any of the purposes set out in paragraphs 13.2(A) to 13.2(D) (inclusive);

“**Charge Correction Amount**” has the meaning ascribed to it in paragraph 18.3A of these Traction Electricity Rules;

“**Charter Train Operator**” means a train operator whose track access agreement is based on the model agreement entitled "Track Access Contract (Charter Passenger Services)" published by ORR (as either the train operator's agreement or the model agreement are amended from time to time with the approval of ORR);

“**Consist Tonnage**” means, in respect of a Journey, the weight (in tonnes) of the Specified Equipment for that Journey divided by the number of operating locomotives forming part of such Specified Equipment;

“**Consultees**” means all Metered Train Operators, all freight or regular scheduled passenger operators of trains using electric traction, and freight or regular scheduled passenger operators of trains that do not use electric traction who give notice to Network Rail that they are seeking either new track access contracts or amendments to existing track access contracts which will involve them using trains using electric traction;

“**Consumption Data**” means data in respect of the amount of electricity consumed (in kWh);

“**Cost Reconciliation**” means, for each train operator  $\omega$ , the process for the calculation and payment of the supplementary amount  $S2_{tw}$  set out in paragraph 18 of these Traction Electricity Rules;

“**Data Record**” means a record of either: (a) Consumption Data; (b) Regenerative Braking Data; or (c) GPS Data, as the case may be, in respect of each 5-minute period during a Journey or Non-Journey;

“**DC System**” means the direct current system of electricity traction supply on the Network;

**"Delivery Costs"** means those components of the traction electricity costs in respect of which the rate charged to Network Rail varies by Geographic Area g. These include costs associated with electricity supply industry transmission and distribution;

**"Derived Rate"** shall mean:

- (a) for PFM Year 1, the rate calculated in accordance with paragraph 14.13; and
- (b) for PFM Year 2 and subsequent PFM Years, the rate calculated in accordance with paragraph 14.14 or (in the case of a PFM Data Threshold Failure), determined in accordance with paragraph 14.17;

**"Electricity Data"** means Consumption Data and (where relevant) Regenerative Braking Data;

**"Electricity Type (AC/DC)"** means either the alternating current (AC), or the direct current system (DC) of electricity supplied through the electrification system;

**"EMU Length"** means the number of individual vehicles in the electric multiple unit;

**"Energy Costs"** means all traction electricity costs that are not Delivery Costs;

**"Geographic Area g"** means the relevant geographic section of the Network as set out in Appendix 5;

**"GPS Data"** means data in respect of geographical location;

**"Gross Tonne Mile" or "gtm"** means:

- (i) for passenger operators, in relation to a train, a mile travelled on the Network, multiplied by each tonne of the aggregate weight of the train in question; and
- (ii) for freight operators, in respect of each locomotive, loaded wagon, empty wagon or coaching stock, the Locomotive Miles, Loaded Wagon Miles, Empty Wagon Miles or Coaching Stock Miles multiplied by the relevant Locomotive Weight, Loaded Wagon Weight, Empty Wagon Weight or Coaching Stock Weight respectively;

**"Infill Value"** means the relevant value in respect of Consumption Data or Regenerative Braking Data, as the case may be, set out in the Journey Look-Up Tables or the value in respect of Consumption Data set out in the Non-Journey Look-Up Table, as the case may be;

**"Initial Opt-in Notice"** has the meaning ascribed to it in paragraph 14.1;

**"Initial PFM Rate"** means, in respect of a particular Metered Train Operator, the first PFM Rate to take effect in respect of any of its PFM Fleets;

**“Journey”** means a movement of Specified Equipment which has a designated headcode;

**“Journey Look-Up Tables”** means the tables containing Data Records in respect of Consumption Data and Regenerative Braking Data calculated or otherwise determined in accordance with paragraph 3, the templates for which are set out in Tables 1.1 and 1.2 respectively (in the case of passenger journeys) or Tables 1.3 and 1.4 respectively (in the case of freight and locomotive-hauled passenger journeys) in appendix 1;

**“kgtm”** means 1000 Gross Tonne Miles;

**“Look-Up Tables”** means the Journey Look-Up Tables and the Non-Journey Look-Up Table;

**“Metered Charges”** means the amounts  $E_{tme}$ ,  $E_{tmuAC}$  and  $E_{tmuDC}$  which are calculated using metered consumption data in accordance with Schedule 7 of the relevant track access contract;

**“Metered Data”** means Electricity Data and GPS Data in respect of a train which has been collected from the train’s On-Train Meter;

**“Metered Train m”** means, as the context requires, either:

- (a) a train of a particular type; or
- (b) a specific train having a train ID,

in either case as specified in Appendix 7D or Appendix 3 to Schedule 7 of the relevant track access contract, or Appendix 2 or Appendix 4 to these Traction Electricity Rules;

**“Metered Train Operator”** means a train operator whose Traction Electricity Charge is calculated (either wholly or partly) based on metered consumption data, and/or a train operator who has notified Network Rail that it intends to amend its track access contract to calculate its Traction Electricity Charge based (either wholly or partly) on metered consumption data from the start of the next financial year;

**“Metering Audit”** means the exercise by Network Rail, the Metered Train Operator or any other train operator of any of the rights set out in paragraph 16.2(A), 16.10 or 16.19 respectively, as the case may be;

**“Modelled Train Operator”** means a train operator, other than a Charter Train Operator, that is charged by Network Rail for traction electricity based on modelled consumption rates, and which is not a Metered Train Operator;

**“Net Infilled Electricity Data Value”** means, in respect of a particular Period, the total value (in kWh) of Data Records for Consumption Data which have been substituted with Infill Values, less the total value (in kWh) of Data Records for Regenerative Braking Data which have been substituted with Infill Values;

**“Network Rail Distribution System Loss Factor”** means the relevant factor that represents the electrical losses between the On-Train Meter and Network Rail’s

meter through which it purchases traction electricity for the AC System or the DC System in Geographic Area g, as set out in Appendix 3 of these Traction Electricity Rules;

**“Network Rail Metering Data Interface Specification”** means a document which shall be updated by Network Rail from time to time, in which Network Rail shall specify, in accordance with any applicable standards, the manner and format in which Metered Data shall be provided to it;

**“Non-Journey”** means a period during which the Specified Equipment is parked or laid up for maintenance or other purposes and is consuming electricity, in relation to which there is no designated headcode;

**“Non-Journey Look-Up Table”** means a table containing Consumption Data calculated or otherwise determined in accordance with paragraph 3, a template for which is set out in Table 2.1 in appendix 1;

**“Office of Rail and Road”** has the meaning ascribed to it in Section 15 of the Railways and Transport Safety Act 2003, and "ORR" shall be construed accordingly;

**“On-Train Meter”** means a meter or other device or technology which measures a train’s actual consumption of electricity, geographic location and, where relevant, electricity generated by braking and **"On-Train Metering"** shall be construed accordingly;

**“On-Train Metering Commencement Date”** means the date from which Metered Data is first used to calculate all or part of the Train Operator’s Traction Electricity Charge;

**"Opt-in Notice"** has the meaning ascribed to it in paragraph 14.1;

**“OTM Incentive Charge”** means the additional amount payable by the Metered Train Operator to Network Rail as a consequence of paragraph 7.1 of these Traction Electricity Rules;

**“OTM Incentive Year”** means the period of 13 consecutive Periods including and immediately preceding the relevant Trigger Period;

**"Partial Fleet Metering"** means the method of calculating the element of the Traction Electricity Charge relating to Unmetered Vehicles in a PFM Fleet using PFM Rates;

**"Percentage Loading Factor"** means the relevant factor that represents the relationship between electricity consumption and the number of electric multiple units in a train, applied to modelled consumption rates as applicable, as set out in the table in Appendix 6 of these Traction Electricity Rules;

**“Period”** means:

- (a) in the case of passenger operators, each consecutive period of 28 days commencing at 0000 hours on 1 April in each year, provided that the length of the first and last such Period in any year may be varied by up to seven days on reasonable prior



notice from Network Rail to the train operator; and

- (b) in the case of freight operators, each period of 28 days which coincides with a Network Rail accounting period save that:
  - (i) the first period and the last period may be of less than 28 days if:
    - (A) the date of signature of the relevant track access contract does not coincide with the first day of one of Network Rail's accounting periods; or
    - (B) the Expiry Date does not coincide with the last day of one of Network Rail's accounting periods; and
  - (ii) the duration of the first and last such period in any Financial Year may be varied so as to coincide with the duration of Network Rail's accounting periods by notice from Network Rail to the train operator;

**"PFM Data Threshold"** has the meaning ascribed to it in paragraph 14.4(A);

**"PFM Data Threshold Failure"** has the meaning ascribed to it in paragraph 14.16;

**"PFM Effective Date"** shall have the meaning ascribed to it in paragraph 14.8(A);

**"PFM Financial Spreadsheet"** means the financial spreadsheet model for calculating the PFM Rate, as published on Network Rail's website from time to time;

**"PFM Fleet"** means a fleet of electric multiple units of the same vehicle type operating on the same Train Service Code, comprised partially of Metered Trains;

**"PFM Qualification Threshold"** has the meaning ascribed to it in paragraph 14.4(B);

**"PFM Rate"** means a modelled traction electricity consumption rate (in kWh per electrified Train Mile) for Unmetered Vehicles within a PFM Fleet applicable for 13 Periods, calculated in accordance with paragraphs 14.12 to 14.18 of these Traction Electricity Rules;

**"PFM Rates List"** means the document entitled the "PFM Rates List" published by Network Rail on its website and specifying PFM Rates, as updated from time to time in accordance with these Traction Electricity Rules;

**"PFM Year"** means, in respect of the PFM Rate for a particular PFM Fleet, each period of 13 (thirteen) consecutive Periods from the PFM Effective Date;

**"PFM Year 1"** means the first PFM Year following the PFM Effective Date, **"PFM Year 2"** means the second PFM Year following the PFM Effective Date and so on;

**"PFM Year 0"** means the period of 13 (thirteen) consecutive Periods up to and including the date on which the PFM Qualification Threshold was met;

**"Power Factor Correction"** means the relevant power factor correction as set out in Appendix 2 of these Traction Electricity Rules;

**"Previous PFM Year"** means:

- (a) for the purpose of calculating the first PFM Rate to apply in respect of a particular PFM Fleet following the issue of an Opt-in Notice, PFM Year 0; and
- (b) for the purpose of calculating the PFM Rate to apply in respect of any other PFM Year, the immediately previous PFM Year;

**"Prospective Metered Train Operator"** means any train operator that has an application pending with ORR for approval of amendments to its track access contract by which its traction electricity charge would be based on metered consumption data;

**"Regenerative Braking Audit"** means the exercise by Network Rail, or a train operator of any of its rights set out in paragraph 16 in relation to the review of any Regenerative Braking System operated by any train operator;

**"Regenerative Braking Data"** means data in respect of the amount of electricity (in kWh) generated by braking;

**"Regenerative Braking Discount"** means the discount, applied by Network Rail in accordance with paragraph 15.1(B) in calculating the train operator's Traction Electricity Charges, which is provided in return for the train operator operating a Regenerative Braking System in respect of any vehicle for which the Traction Electricity Charges are payable based on modelled consumption rates;

**"Regenerative Braking System"** means a system used to generate electricity by braking;

**"Relevant Complaint"** means a complaint by a Consultee about the consultation process, or a complaint by a Metered Train Operator or a Modelled Train Operator about any part of the change procedure set out in paragraphs 17.1 to 17.16;

**"Relevant Vehicle Categories"** means the classes or sub-classes, as appropriate, of vehicle within a particular service code or service group, and using either the AC System or the DC System, as applicable;

**"Relevant Year"** means a year commencing at 0000 hours on 1 April and ending at 2359 hours on the following 31 March; **"Relevant Year t"** means the Relevant Year for the purposes of which any calculation falls to be made; **"Relevant Year t-1"** means the Relevant Year preceding Relevant Year t; and similar expressions shall be construed accordingly;

**"Scheduled Call"** in relation to the definition of Regenerative Braking Discount above, means a scheduled stop at a station for the purpose of allowing

passengers to join or leave the service or train (including the stops where the service or journey starts and ends);

**"Specified Equipment"** has the meaning ascribed to it in Clause 1.1 of the relevant track access contract;

**"Tariff band"** means the tariff zone and time band in which the train in question is operated;

**"Tolerance Factor"** means the relevant tolerance factor as set out in Appendix 4 of these Traction Electricity Rules;

**"Total Net Electricity Data Value"** means, in respect of a particular Period, the total value (in kWh) of Data Records for Consumption Data (derived from both Metered Data and Infill Values) less the total value (in kWh) of Data Records for Regenerative Braking Data (derived from both Metered Data and Infill Values);

**"Traction Electricity Charge"** has the meaning ascribed to it in Schedule 7 of the relevant track access contract;

**"Traction Electricity Modelled Consumption Rates List"** has the meaning ascribed to it in Schedule 7 to the relevant track access contract;

**"Train category"** means train category i as identified in the relevant section of the Traction Electricity Modelled Consumption Rates List or PFM Rates List, being either:

- (a) where there is no PFM Rate for a particular passenger vehicle type operating on a particular Train Service Code:
  - (i) where there is a modelled consumption rate for a particular passenger vehicle type operating on a particular Train Service Code, the relevant category set out in the table entitled "Passenger Traction Electricity Modelled Consumption Rates for CP5"; or
  - (ii) in respect of any other passenger vehicle type not referred to in paragraph (a)(i), the relevant category set out in the table entitled "Generic Traction Electricity Modelled Consumption Rates for CP5", or
- (b) where there is a PFM Rate for a particular passenger vehicle type operating on a particular Train Service Code, the relevant category set out in the PFM Rates List; or
- (c) in respect of all electrified freight services, the relevant category set out in the table entitled "Freight Traction Electricity Modelled Consumption Rates for CP5";

**"Train Mile"** means in relation to a train, or a portion of a train, a mile travelled by that train, or that portion of a train, on the Network;

**"Train Operator Energy Costs"** the amount of  $E_t$  (calculated in accordance with Schedule 7 of the relevant train operator's track access contract) plus  $S1_{tw}$

(calculated in accordance with paragraph 18.2 of these Traction Electricity Rules) payable in respect of Energy Costs;

**“Train Operator Delivery Costs”** the amount of  $E_t$  (calculated in accordance with Schedule 7 of the relevant train operator’s track access contract) plus  $S1_{t\omega}$  (calculated in accordance with paragraph 18.2 of these Traction Electricity Rules) payable in respect of Delivery Costs;

**“Train Service Code”** in the case of passenger operators has the meaning ascribed to it in paragraph 1.1 of Schedule 5 of the relevant track access contract, and in the case of freight operators means the eight character code used to identify Services (“Services” is defined in Clause 1.1 of the relevant track access contract);

**“Trigger Period”** has the meaning given to it in paragraph 7.1 of these Traction Electricity Rules;

**“Unmetered Vehicles”** means vehicles in a PFM Fleet which are not Metered Trains;

**“Vehicle Mile”** (in the case of passenger operators) in relation to a railway vehicle means a mile travelled by that vehicle on the Network;

**“Volume Reconciliation”** means, for each train operator  $\omega$ , the process for the calculation and payment of the supplementary amount  $S1_{t\omega}$  set out in paragraph 18 of these Traction Electricity Rules;

**“Working Day”** has the meaning ascribed to it in Clause 1.1 of the relevant track access contract.

1.3 In these Traction Electricity Rules, unless the context otherwise requires:

**(A) These Traction Electricity Rules**

References to these Traction Electricity Rules mean these Traction Electricity Rules as modified from time to time.

**(B) Appendices and paragraphs**

References to appendices and paragraphs are to appendices and paragraphs of these Traction Electricity Rules.

**(C) Definitions in the Act**

Terms and expressions defined in the Act shall, unless the contrary intention appears, have the same meaning in these Traction Electricity Rules.

**(D) Statutory provisions**

References to statutory provisions shall be construed as references to those provisions as amended or re-enacted or as their application is modified by other statutory provisions from time to time and shall include

references to any statutory provisions of which they are re-enactments (whether with or without modification).

**(E) Interpretation Act**

Words and expressions defined in the Interpretation Act 1978 shall have the same meaning in these Traction Electricity Rules and the rules of interpretation contained in that Act shall apply to the interpretation of these Traction Electricity Rules.

**(F) Include**

The words “include” and “including” are to be construed without limitation.

**(G) Other documents etc.**

Any agreement, instrument, licence, standard, timetable, code or other document referred to in these Traction Electricity Rules or entered into, approved, authorised, accepted or issued by a person pursuant to these Traction Electricity Rules shall be construed, at the particular time, as a reference to that agreement, instrument, licence, standard, timetable, code or other document, as it may then have been amended, varied, supplemented or novated.

**(H) Conflict**

In the event of any conflict of interpretation between these Traction Electricity Rules and an Access Agreement (not including these Traction Electricity Rules) the following order of precedence shall apply:

- (1) these Traction Electricity Rules; and
- (2) the Access Agreement.

**(I) Time limits**

Where in these Traction Electricity Rules any obligation of a party is required to be performed within a specified time limit that obligation shall continue after that time limit if the party fails to comply with that obligation within the time limit.

**(J) Headings**

The headings and references to headings shall be disregarded in construing these Traction Electricity Rules.

**(K) Ruling language**

All notices served under these Traction Electricity Rules shall be in the English language.

## **2. On-Train Metering - General**

- 2.1 The Metered Train Operator shall ensure that its On-Train Meters comply with all relevant industry standards (to the extent that such standards are applicable to the Metered Train Operator).
- 2.2 The Metered Train Operator shall collect Metered Data from all of its On-Train Meters and shall provide such data to Network Rail in accordance with the Network Rail Metering Data Interface Specification (or as otherwise agreed between that Metered Train Operator and Network Rail), within 7 (seven) days of the day on which such data was generated.
- 2.3 In the event that any Data Records are missing from the Metered Data collected by the Metered Train Operator, Network Rail shall provide data calculated in accordance with paragraphs 4, 5 or 6 (as the case may be) in place of such missing Data Records.
- 2.4 In the event that the Metered Train Operator fails to provide any Metered Data to Network Rail within the 7 (seven) day period referred to in paragraph 2.2, the provisions of paragraphs 4.2 and 5.2 as applicable shall apply for the purposes of calculating that part of the Traction Electricity Charge relating to such data (except any part of such charge calculated using PFM Rates, in respect of which the provisions set out in paragraph 14 apply).
- 2.5 The Metered Train Operator shall use reasonable endeavours to notify Network Rail as soon as reasonably practicable of any changes to information relating to its vehicles (including but not limited to vehicle IDs) which Network Rail requires for the purposes of calculating that part of the Traction Electricity Charge based on Metered Data (or Infill Values).
- 2.6 Not used.
- 2.7 Each Metered Train Operator acknowledges that, for the purposes of calculating the Traction Electricity Charge, it shall only be charged based on Metered Data in respect of those metered trains specified in Appendix 7D of Part 2 of Schedule 7 (in the case of passenger operators) or Appendix 3 of Schedule 7 (in the case of freight operators) of its track access contract, in accordance with the provisions of that contract once Network Rail confirms that data-flow and billing system tests have been completed successfully.

## **3. Look-Up Tables**

### *Journeys*

- 3.1 Network Rail shall create and maintain Journey Look-Up Tables for each Metered Train Operator.
- 3.2 Subject to paragraphs 3.3 and 3.9:
  - (A) in the case of non locomotive-hauled passenger journeys, in relation to each Journey for a particular Train Service Code, Specified Equipment, Geographic Area, Electricity Type (AC/DC), EMU Length and number of units, the Journey Look-Up Tables shall include the mean value of:

- (1) Consumption Data per 5-minute period; and
  - (2) where relevant, Regenerative Braking Data per 5-minute period,  
which shall be calculated using Metered Data for the previous Period; or
- (B) in the case of freight and locomotive-hauled passenger journeys, in relation to each Journey for a particular Train Service Group, Specified Equipment, Geographic Area, Electricity Type (AC/DC) and number of units, the Journey Look-Up Tables shall include the mean value of:
- (1) Consumption Data per 5-minute period per tonne; and
  - (2) where relevant, Regenerative Braking Data per 5-minute period per tonne,  
which shall be calculated using Metered Data for the previous Period.

3.3 If, in Network Rail's reasonable opinion, there is insufficient Metered Data for a particular Period to update the Journey Look-Up Table in accordance with paragraph 3.2, then Network Rail and the Metered Train Operator shall seek to agree the values to be included in the Journey Look-Up Table. If the parties are unable to agree within 7 (seven) days after the start of the relevant Period then Network Rail shall determine (acting reasonably) the values to be included in the Journey Look-Up Table for that Period.

#### *Non-Journeys*

- 3.4 Network Rail shall create and maintain a Non-Journey Look-Up Table for each Metered Train Operator.
- 3.5 Subject to paragraphs 3.6 and 3.9, in relation to Non-Journeys in each Geographic Area for particular Specified Equipment and Electricity Type (AC/DC), the Non-Journey Look-Up Table shall include the mean value of Consumption Data per 5-minute period of each relevant Non-Journey, which shall be calculated using Metered Data for the previous Period.
- 3.6 If, in Network Rail's reasonable opinion, there is insufficient Metered Data for a particular Period to update the Non-Journey Look-Up Table in accordance with paragraph 3.5, then Network Rail and the Metered Train Operator shall seek to agree the values to be included in the Non-Journey Look-Up Table. If the parties are unable to agree within 7 (seven) days after the start of the relevant Period then Network Rail shall determine (acting reasonably) the values to be included in the Non-Journey Look-Up Table for that Period.

#### *General*

- 3.7 Network Rail shall update the Look-Up Tables as soon as reasonably practicable after the start of each Period. The form of the Look-Up Tables shall be as set out in appendix 1, unless otherwise agreed between the parties.
- 3.8 ORR approval shall not be required for the creation or updating of the Look-Up Tables.

- 3.9 Unless sufficient relevant Metered Data is available in Network Rail's reasonable opinion, the Journey Look-Up Tables and the Non-Journey Look-Up Tables for the first Period and any subsequent consecutive Period following the On-Train Metering Commencement Date for a particular train category i shall be created using the modelled consumption rates shown in the Traction Electricity Modelled Consumption Rates List and, where relevant, the appropriate Regenerative Braking Discount.
- 3.10 In addition to any other rights of the Metered Train Operator, whether contained in its track access contract or otherwise, copies of the Metered Train Operator's current Look-Up Tables shall be made available by Network Rail to such Metered Train Operator upon request by the Metered Train Operator at all reasonable times.

#### **4. Missing Data Records (Electricity Data) for Journeys**

- 4.1 If, in respect of a Journey, any Data Record in relation to either Consumption Data or Regenerative Braking Data is missing from the Metered Data, the missing Data Record shall be substituted with the relevant Infill Value contained in the Journey Look-Up Tables and (in the case of freight and locomotive-hauled passenger journeys only) multiplied by the Consist Tonnage.
- 4.2 If, in respect of a Journey, Metered Data in respect of Electricity Data is not provided by the Metered Train Operator to Network Rail within 7 days (pursuant to paragraph 2.2 above), the missing Data Records for Consumption Data and Regenerative Braking Data shall be substituted with the relevant Infill Values contained in the Journey Look-Up Tables and (in the case of freight and locomotive-hauled passenger journeys only) multiplied by the Consist Tonnage.

#### **5. Missing Data Records (Electricity Data) for Non-Journeys**

- 5.1 If, in respect of a Non-Journey, any Data Record in relation to either Consumption Data or Regenerative Braking Data is missing from the Metered Data, the missing Data Record shall be substituted with the relevant Infill Value contained in the Non-Journey Look-Up Table.
- 5.2 If, in respect of a Non-Journey, Metered Data in respect of Consumption Data and Regenerative Braking Data is not provided by the Metered Train Operator to Network Rail within 7 days (pursuant to paragraph 2.2 above), the missing Data Records shall be substituted with the relevant Infill Values contained in the Non-Journey Look-Up Table.

#### **6. Missing GPS Data**

- 6.1 If, in respect of a Journey, any Data Record is missing from the GPS Data, the missing Data Record shall be interpolated as appropriate using the actual recorded GPS Data.

#### **7. Consequences of use of Infill Values above threshold**

- 7.1 If, in any Period following the On-Train Metering Commencement Date, the Net Infilled Electricity Data Value expressed as a percentage of the Total Net Electricity Data Value is greater than the percentage shown in Table 7.1:



Threshold Percentage table, the OTM Incentive Charge for such Period (the “**Trigger Period**”) shall be as follows:

(1) in the first Trigger Period in any OTM Incentive Year, the OTM Incentive Charge shall be 5% of the Metered Charges for Infilled Values; and

(2) in the second or any further Trigger Period in any OTM Incentive Year, the OTM Incentive Charge shall be 10% of the Metered Charges for Infilled Values.

**Table 7.1: Threshold percentage table**

Period Since On-Train Metering Commencement Date				
Periods 1-3	Periods 4-6	Periods 7-9	Periods 10-13	All later Periods
30%	25%	20%	15%	10%

7.2 Network Rail shall pay to each Metered Train Operator which consumes traction electricity a portion of the total amount of all OTM Incentive Charges received by Network Rail from Metered Train Operators pursuant to paragraph 7.1 in each Relevant Year for such train operator for that Relevant Year, calculated in accordance with the following formula:

$$PTO_t = \frac{A_t \times TIC_t}{B_t}$$

where:

$PTO_t$  means the proportional amount of OTM Incentive Charges payable to the train operator for Relevant Year t;

$A_t$  means the amount of the train operator’s metered Traction Electricity Charge (where relevant, following the Cost Reconciliation) in Relevant Year t;

$B_t$  means the total amount of metered Traction Electricity Charges (where relevant, following the Cost Reconciliation) for all train operators in Relevant Year t;

$TIC_t$  means the total OTM Incentive Charges received by Network Rail from all Metered Train Operators pursuant to paragraph 7.1 in Relevant Year t.

**8. Data to be published by Network Rail**

8.1 Within 14 (fourteen) days following the end of each Period, Network Rail shall publish the following data in respect of each Metered Train Operator:

- (A) the Total Net Electricity Data Value for such Period; and
- (B) the Net Infilled Electricity Data Value for such Period expressed as a percentage of the Total Net Electricity Data Value for such Period.

**9. Power Factor Correction**

- 9.1 Appendix 2 to these Traction Electricity Rules sets out the Power Factor Correction (PF) for each train type of Metered Train m for the purposes of calculating the Traction Electricity Charge.

**10. Network Rail Distribution System Loss Factor**

- 10.1 Appendix 3 to these Traction Electricity Rules sets out the Network Rail Distribution System Loss Factor for each Traction electricity Geographic Area (g) the AC System ( $\lambda_{ACg}$ ) and the DC System ( $\lambda_{DCg}$ ) for the purposes of calculating the Traction Electricity Charge.

**11. Tolerance Factors**

- 11.1 Appendix 4 to these Traction Electricity Rules sets out the Tolerance Factors for each train type of Metered Train m for the purposes of calculating the Traction Electricity Charge.

**12. Changes to Power Factor Correction or Tolerance Factors**

- 12.1 If at any time after the On-Train Metering Commencement Date there is a material change to any relevant Specified Equipment or On-Train Meters used by the Metered Train Operator which would or might result in:

- (A) the Power Factor Correction of that Specified Equipment decreasing or otherwise ceasing to correct to unity; and/or
- (B) a reduction in the accuracy of the On-Train Meters (unless the accuracy remains within the bounds required by the relevant industry standards),

the Metered Train Operator shall as soon as reasonably practicable notify Network Rail and discuss whether any amendments need to be made to the corresponding values in Appendix 2 and/or Appendix 4 to ensure that the Traction Electricity Charge is calculated accurately.

**13. Changes to Appendix 2 (Power Factor Correction) and Appendix 4 (Tolerance Factors)**

- 13.1 No amendment to Appendices 2 or 4 of these Traction Electricity Rules shall have effect unless ORR has given its consent to the amendment under either paragraph 17 or this paragraph 13.

- 13.2 Network Rail, a Metered Train Operator or a Prospective Metered Train Operator may propose to ORR that the tables in Appendices 2 and/or 4 be amended to:

- (A) include new entries to facilitate the billing of traction electricity using On-Train Meters;
- (B) improve the accuracy of the Traction Electricity Charge payable by the Metered Train Operator;
- (C) remove redundant entries or increase clarity; and/or

- (D) make any other modifications which it believes would be necessary or desirable as a consequence of any changes under paragraphs 13.2(A) to 13.2(C) (inclusive) above.

13.3 Any proposition of a kind referred to in paragraph 13.2 shall detail:

- (A) the reasons for the proposal and, where appropriate, include supporting technical data to justify any value to be inserted into the table; and
- (B) the extent to which Network Rail and any Metered Train Operators whose Traction Electricity Charges would be affected by the proposed amendment support the proposal.

#### *Co-operation and information*

13.4 ORR may request further information from the party that is proposing a change under paragraph 13.2 and/or any party that would be affected by the change.

13.5 Any party of whom a request for further information is made in accordance with 13.4 shall provide the requested information promptly and to the standard required by ORR, and if it fails to do so, ORR shall be entitled to proceed with its consideration of the matter in question and to reach a decision in relation to it without the information in question and the party in default shall have no grounds for complaint in that respect.

#### *ORR consent to a proposed change to Appendices 2 and 4*

13.6 If ORR is satisfied with a proposal submitted to it under paragraph 13.2 to amend Appendices 2 and/or 4, it may issue an Appendix Amendment Notice to Network Rail consenting to those amendments.

13.7 If ORR gives notice that it is not satisfied with the proposal submitted to it under paragraph 13.2, it may:

- (A) reject the proposal; or
- (B) following consultation with those parties it considers would be directly affected by the change, determine the changes to Appendix 2 and/or Appendix 4 and give an Appendix Amendment Notice to Network Rail specifying those changes.

13.8 Appendices 2 and/or 4 (as the case may be) shall have effect with the changes specified by ORR in an Appendix Amendment Notice from the date specified in that notice for this purpose.

## **14. Partial Fleet Metering**

### *Opting-in to Partial Fleet Metering*

14.1 A Metered Train Operator who operates a PFM Fleet may opt-in to Partial Fleet Metering in respect of such PFM Fleet at any time during a Relevant Year by giving written notice to Network Rail in accordance with paragraphs 14.1 to 14.3 ("**Opt-in Notice**"). The first such notice issued by a Metered Train Operator shall be the "**Initial Opt-in Notice**" for that Metered Train Operator.

14.2 The Opt-in Notice shall contain:

- (A) a list of the PFM Fleet(s) in respect of which the Metered Train Operator reasonably considers that the PFM Qualification Threshold will be met, specifying in each case the relevant vehicle type and Train Service Code; and
- (B) the date on which the Metered Train Operator reasonably considers that the PFM Qualification Threshold will be met for each PFM Fleet specified.

14.3 The Opt-in Notice shall be provided to Network Rail no less than 90 (ninety) days prior to the date on which the Metered Train Operator reasonably considers that the PFM Qualification Threshold will be met for each relevant PFM Fleet specified in the Opt-in Notice, unless agreed otherwise with Network Rail.

*PFM Data Threshold and PFM Qualification Threshold*

14.4 In respect of a particular PFM Fleet:

- (A) the **PFM Data Threshold** shall be met in respect of a particular Period where the Metered Train Operator has provided to Network Rail metered Electricity Data for that PFM Fleet in respect of Journeys on no less than 20% of the total electrified Train Miles for that Period; and
- (B) the **PFM Qualification Threshold** shall be met where the PFM Data Threshold has been met for 13 (thirteen) consecutive Periods.

For the purpose of this paragraph 14.4, "metered Electricity Data" means Electricity Data from the Metered Trains in the relevant PFM Fleet which has been provided to Network Rail in accordance with these Traction Electricity Rules.

14.5 Metered Train Operators that opt-in to Partial Fleet Metering shall use reasonable endeavours to ensure that, in respect of the PFM Fleet(s) specified in the Opt-in Notice, those trains that are selected to be metered are representative of the PFM Fleet as a whole (including in respect of the usage of Regenerative Braking Systems).

*Calculation and agreement or determination of PFM Rates*

14.6 Following the receipt of an Opt-in Notice and once the PFM Qualification Threshold has been met in respect of the PFM Fleet(s) specified in the Opt-in Notice, Network Rail shall calculate the proposed PFM Rate for PFM Year 1 for each PFM Fleet specified in the Opt-in Notice in accordance with paragraphs 14.12 to 14.18.

14.7 Following the calculation by Network Rail of the proposed PFM Rate in respect of a particular PFM Fleet and PFM Year, Network Rail shall promptly notify the Metered Train Operator in writing of the proposed PFM Rate for the Metered Train Operator to agree or dispute as follows:

- (A) If the Metered Train Operator disputes Network Rail's calculation of the proposed PFM Rate, then, within 28 (twenty eight) days of that notification, the Metered Train Operator shall refer the matter to ORR for determination, failing which it shall be deemed to agree to Network Rail's calculation.

- (B) If the Metered Train Operator agrees (or is deemed to agree) with Network Rail's calculation of the proposed PFM Rate, Network Rail shall promptly request ORR's consent to the proposed PFM Rate (and shall provide a copy of its request to the Metered Train Operator). ORR may then give its consent, withhold its consent or determine the PFM Rate as it considers appropriate.

In either case (whether the referral to ORR is for consent or determination), the parties shall, within such timescales as ORR may reasonably specify, furnish ORR with such information and evidence as ORR shall reasonably require. Such information and evidence may include details of PFM Fleets operated by the Metered Train Operator which meet the Qualification Threshold but in respect of which the Metered Train Operator has not issued an Opt-in Notice. If a party fails to furnish such information and evidence within the specified timescale, ORR shall be entitled to withhold its consent, or, as the case may be, determine the matter without that information and evidence and the party in default shall have no grounds for complaint in that respect.

*PFM Effective Date (respecting the year-end reconciliation provisions)*

14.8 Once ORR has consented to or determined the PFM Rate in respect of a particular PFM Fleet and PFM Year, and provided that the Metered Train Operator's track access contract includes provision for PFM Rates to apply, such PFM Rate shall apply for 13 (thirteen) consecutive Periods from the date specified by ORR in its consent or determination, and Network Rail shall update the PFM Rates List accordingly within 28 (twenty-eight) days of such consent or determination. Provided always that it shall not be a date falling prior to the start of the Relevant Year in which ORR consented to or determined such PFM Rate, and unless ORR specifies otherwise, the date shall be:

- (A) in the case of the Initial PFM Rate for a particular Metered Train Operator, the first day of the Period immediately following the Period in which the PFM Qualification Threshold was met following the issue of the Initial Opt-in Notice, unless such day would fall in January, February or March, in which case the date shall be the following 1 April (the date determined in accordance with this paragraph being the "**PFM Effective Date**"); and
- (B) in the case of annual revisions to an existing PFM Rate and any new PFM Rates for a particular Metered Train Operator, the relevant anniversary of the PFM Effective Date applicable to such Metered Train Operator.

14.9 Each PFM Rate shall be revised annually in accordance with paragraph 14.10.

14.10 Following the end of each PFM Year, Network Rail shall promptly calculate the proposed revised PFM Rate for the relevant PFM Fleet in accordance with paragraphs 14.12 to 14.18. Following such calculation, the revised PFM Rate shall be agreed or determined in accordance with paragraphs 14.7 to 14.8.

*No reversion to modelled rate*

14.11 Following the PFM Effective Date in respect of a particular PFM Fleet, PFM Rates shall apply in respect of such PFM Fleet unless and until all Unmetered Vehicles in such PFM Fleet become Metered Trains (at which point the PFM Fleet shall cease to be a PFM Fleet).

*PFM Rate calculation methodology - general*

14.12 Each PFM Rate shall be calculated using the PFM Financial Spreadsheet, in accordance with the methodology set out in paragraphs 14.13 to 14.18. In the event of any conflict or inconsistency between the PFM Financial Spreadsheet and these Traction Electricity Rules, these Traction Electricity Rules shall take precedence.

*Creation of a kWh 'per Train Mile' Derived Rate*

*PFM Year 1*

14.13 A derived electricity consumption rate shall be calculated for PFM Year 1 by summing the relevant consumption data from PFM Year 0 and then converting it into the relevant format for modelled usage (kWh per Train Mile) using the formula set out below:

$$\text{Derived Rate}_{i1} = \frac{K_{i0}}{M_{i0}} \cdot \frac{1}{(MU_{1i0} + MU_{2i0} + \dots + MU_{ni0})}$$

where, in respect of a particular PFM Fleet:

Derived Rate<sub>i1</sub> means the derived electricity consumption rate in kWh / Train Mile, for train category i and for one electric multiple unit in PFM Year 1;

K<sub>i0</sub> means the sum of the relevant consumption data for train category i in PFM Year 0 calculated using the formula below:

$$K_{i0} = \sum [P_{i0} \cdot (1 + \lambda_{gi0}) - RGB_{i0}] \cdot N_{v0}$$

Where

Σ means the summation across PFM Year 0 as appropriate;

P<sub>i0</sub> (the relevant metered data in kWh) means, for train category i and in PFM Year 0, the sum of Data Records (in kWh) for Journey Consumption Data that is Metered Data including Infill Values;

λ<sub>gi0</sub> means the Network Rail Distribution System Loss Factor for train category i and in Geographic Area g as set out in Appendix 3 of these Traction Electricity Rules as applicable in PFM Year 0;

RGB<sub>i0</sub> (the relevant regenerative braking data in kWh) means for train category i and in PFM Year 0, the sum of Data Records (in kWh) for Regenerative Braking Data that is Metered Data including Infill Values;

N<sub>v0</sub> means the Non-Journey adjustment factor for PFM Year 0 and train category i calculated using the formula below:

$$N_{v0} = \frac{\sum T_{v0}}{\sum V_{v0}}$$

Where

$\Sigma$  means the summation across PFM Year 0;

$T_{v0}$  means the relevant metered data, calculated using the formula below;

$$T_{v0} = \Sigma [(P_{vJ0} \cdot (1 + \lambda_{gv0}) - RGB_{vJ0}) + (P_{vN0} \cdot (1 + \lambda_{gv0}) - RGB_{vN0})]$$

Where

$\Sigma$  means the summation across PFM Year 0 and relevant Train Service Codes as appropriate;

$P_{vJ0}$  means the sum of Data Records (in kWh) for Journey Consumption Data that is Metered Data, including Infill Values, for vehicle class V;

$\lambda_{gv0}$  means the Network Rail Distribution System Loss Factor for vehicle class V and in Geographic Area g as set out in Appendix 3 of these Traction Electricity Rules as applicable in PFM Year 0;

$RGB_{vJ0}$  means for vehicle class V, the sum of Data Records (in kWh) for Regenerative Braking Data that is Journey Consumption Data and is Metered Data including Infill Values;

$P_{vN0}$  means the sum of Data Records (in kWh) for Non-Journey Consumption Data that is Metered Data including Infill Values, for vehicle class V;

$RGB_{vN0}$  means for vehicle class V, the sum of Data Records (in kWh) for Regenerative Braking Data that is Non-Journey Consumption Data and is Metered Data including Infill Values;

$V_{v0}$  means the relevant metered data, calculated using the formula below;

$$V_{v0} = \Sigma [(P_{vJ0} \cdot (1 + \lambda_{gv0}) - RGB_{vJ0})]$$

Where

$\Sigma$  means the summation across PFM Year 0 and relevant Train Service Codes as appropriate;

$P_{vJ0}$  means the sum of Data Records (in kWh) for Journey Consumption Data that is Metered Data, including Infill Values, for vehicle class V;

$\lambda_{gv0}$  means the Network Rail Distribution System Loss Factor for vehicle class V and in Geographic Area g as set out in Appendix 3 of these Traction Electricity Rules as applicable in PFM Year 0; and

$RGB_{vJ0}$  means for vehicle class V, the sum of Data Records (in kWh) for Regenerative Braking Data that is Journey Consumption Data and is Metered Data including Infill Values;

$M_{i0}$  means the total electrified Train Miles by Metered Trains for train category i in PFM Year 0; and

$MU_{x_{i0}}$  means the Percentage Loading Factor for  $MU_{x_i}$  multiplied by the total metered Train Miles by  $MU_{x_i}$  and divided by the total metered Train Miles of the PFM Fleet for train category i in PFM Year 0 (where x is a positive number which denotes the number of electric multiple units), as set out in the formula below:

$$MU_{x_{i0}} = PLF_{x_{i0}} \cdot \frac{M_{x_{i0}}}{M_{i0}}$$

Where

$PLF_{x_{i0}}$  means the relevant Percentage Loading Factor in PFM Year 0 as set out in Appendix 6 of these Traction Electricity Rules;

$M_{x_{i0}}$  means the total electrified Train Miles by Metered Trains consisting of x number of electric multiple units for train category i in PFM Year 0; and

$M_{i0}$  means the total electrified Train Miles by Metered Trains for train category i in PFM Year 0.

#### *PFM Year 2 and subsequent PFM Years*

14.14 A derived electricity consumption rate shall be calculated for PFM Year 2 and each subsequent PFM Year (relevant PFM Year y) by summing the relevant consumption data from PFM Year y-1 and then converting it into the relevant format for modelled usage (kWh per Train Mile) using the formula set out below:



$$\text{Derived Rate}_{iy} = \frac{K_{iy-1}}{M_{iy-1}} \cdot \frac{1}{(MU_{1iy-1} + MU_{2iy-1} + \dots + MU_{n_{iy-1}})}$$

where, in respect of a particular PFM Fleet:

Derived Rate<sub>iy</sub> means the derived electricity consumption rate in kWh / Train Mile, for train category i and for one electric multiple unit in PFM Year y;

$K_{iy-1}$  means the sum of the relevant consumption data for train category i in PFM Year y-1 calculated using the formula below:

$$K_{iy-1} = \sum [P_{iy-1} \cdot (1 + \lambda_{g_{iy-1}}) - RGB_{iy-1}] \cdot N_{vy-1}$$

Where

$\sum$  means the summation across PFM Year y-1 as appropriate;

$P_{iy-1}$  (the relevant metered data in kWh) means, for train category i and in PFM Year y-1, the sum of Data Records (in kWh) for Journey Consumption Data that is Metered Data including Infill Values;

$\lambda_{g_{iy-1}}$  means the Network Rail Distribution System Loss Factor for train category i and in Geographic Area g as set out in Appendix 3 of these Traction Electricity Rules as applicable in PFM Year y-1;

$RGB_{iy-1}$  (the relevant regenerative braking data in kWh) means for train category i and in PFM Year y-1, the sum of Data Records (in kWh) for Regenerative Braking Data that is Metered Data including Infill Values;

$N_{vy-1}$  means the Non-Journey adjustment factor for PFM Year y-1 and train category i calculated using the formula below:

$$N_{vy-1} = \frac{\sum T_{vy-1}}{\sum V_{vy-1}}$$

Where

$\sum$  means the summation across PFM Year y-1;

$T_{vy-1}$  means the relevant metered data, calculated using the formula below;

$$T_{vy-1} = \sum [(P_{vJy-1} \cdot (1 + \lambda_{gv_{y-1}}) - RGB_{vJy-1}) + (P_{vNy-1} \cdot (1 + \lambda_{gv_{y-1}}) - RGB_{vNy-1})]$$

Where

$\Sigma$  means the summation across PFM Year y-1 and relevant Train Service Codes as appropriate;

$P_{vJy-1}$  means the sum of Data Records (in kWh) for Journey Consumption Data that is Metered Data, including Infill Values, for vehicle class V;

$\lambda_{gvy-1}$  means the Network Rail Distribution System Loss Factor for vehicle class V and in Geographic Area g as set out in Appendix 3 of these Traction Electricity Rules as applicable in PFM Year y-1;

$RGB_{vJy-1}$  means for vehicle class V, the sum of Data Records (in kWh) for Regenerative Braking Data that is Journey Consumption Data and is Metered Data including Infill Values;

$P_{vNy-1}$  means the sum of Data Records (in kWh) for Non-Journey Consumption Data that is Metered Data including Infill Values, for vehicle class V;

$RGB_{vNy-1}$  means for vehicle class V, the sum of Data Records (in kWh) for Regenerative Braking Data that is Non-Journey Consumption Data and is Metered Data including Infill Values;

$V_{vy-1}$  means the relevant metered data, calculated using the formula below;

$$V_{vy-1} = \Sigma [(P_{vJy-1} \cdot (1 + \lambda_{gvy-1}) - RGB_{vJy-1})]$$

Where

$\Sigma$  means the summation across PFM Year y-1 and relevant Train Service Codes as appropriate;

$P_{vJy-1}$  means the sum of Data Records (in kWh) for Journey Consumption Data that is Metered Data, including Infill Values, for vehicle class V;

$\lambda_{gvy-1}$  means the Network Rail Distribution System Loss Factor for vehicle class V and in Geographic Area g as set out in Appendix 3 of these Traction Electricity Rules as applicable in PFM Year y-1; and

$RGB_{vJy-1}$  means for vehicle class V, the sum of Data Records (in kWh) for Regenerative Braking

Data that is Journey Consumption Data and is Metered Data including Infill Values;

$M_{iy-1}$  means the total electrified Train Miles by Metered Trains for train category  $i$  in PFM Year  $y-1$ ; and

$MU_{x_{iy-1}}$  means the Percentage Loading Factor for  $MU_{x_i}$  multiplied by the total metered Train Miles by  $MU_{x_i}$  and divided by the total metered Train Miles of the PFM Fleet for train category  $i$  in PFM Year  $y-1$  (where  $x$  is a positive number which denotes the number of electric multiple units), as set out in the formula below:

$$MU_{x_{iy-1}} = PLF_{x_{iy-1}} \cdot \frac{M_{x_{iy-1}}}{M_{iy-1}}$$

Where

$PLF_{x_{iy-1}}$  means the relevant Percentage Loading Factor in PFM Year  $y-1$  as set out in Appendix 6 of these Traction Electricity Rules;

$M_{x_{iy-1}}$  means the total electrified Train Miles by Metered Trains consisting of  $x$  number of electric multiple units for train category  $i$  in PFM Year  $y-1$ ; and

$M_{iy-1}$  means the total electrified Train Miles by Metered Trains for train category  $i$  in PFM Year  $y-1$ .

*Failure to meet PFM Data Threshold – use of PFM Substitute Data*

14.15 Subject to paragraphs 14.16 and 14.17, for the purpose of calculating the Derived Rate for PFM Year  $y$ , if the PFM Data Threshold was not met in any Period in PFM Year  $y-1$ , the data for such Period shall be substituted with the full set of data from the same Period in the Previous PFM Year (PFM Year  $y-2$ ) to calculate the value of  $K_{iy-1}$ . If the PFM Data Threshold was not met in the Previous PFM Year, data from PFM Year  $y-3$  shall be used (and so on).

*Sustained failure to meet PFM Data Threshold*

14.16 Where the PFM Data Threshold is not met for a particular PFM Fleet:

- (A) for 3 (three) consecutive Periods in a PFM Year; or
- (B) for 4 (four) non-consecutive Periods in a PFM Year,

this shall be a "**PFM Data Threshold Failure**" in respect of such PFM Fleet.

14.17 If there was a PFM Data Threshold Failure for a particular PFM Fleet in PFM Year  $y-1$  then the Derived Rate due to be calculated for such PFM Fleet for PFM Year  $y$  shall be equal to the higher of:

- (A) the most recently established PFM Rate for such PFM Fleet; and
- (B) the modelled consumption rate applicable for vehicles of the same type and same Train Service Code as those in such PFM Fleet, as shown in the Traction Electricity Modelled Consumption Rates List. Where the Metered Train Operator operates a Regenerative Braking System, such modelled consumption rate shall be reduced by the Regenerative Braking Discount determined in accordance with paragraph 15.1(B).

*Application of weighting structure to produce PFM Rate*

14.18 A weighting structure shall be applied to the Derived Rates to create the PFM Rate for the relevant PFM Year, as follows.

where, in respect of a particular PFM Fleet:

**PFM Rate<sub>y</sub>** means the PFM Rate for PFM Year y.

**N<sub>y</sub>** means the Derived Rate for PFM Year y.

*PFM Year 1 (y = 1)*

$$\text{PFM Rate}_1 = N_1$$

*PFM Year 2 (y = 2)*

$$\text{PFM Rate}_2 = \frac{2N_2}{3} + \frac{N_1}{3}$$

*PFM Year 3 (y = 3)*

$$\text{PFM Rate}_3 = \frac{N_3}{2} + \frac{N_2}{3} + \frac{N_1}{6}$$

*PFM Year 4 and subsequent PFM Years*

$$\text{PFM Rate}_y = \frac{N_y}{2} + \frac{N_{y-1}}{3} + \frac{N_{y-2}}{6}$$

*Additional PFM Fleets*

14.19 A Metered Train Operator who has issued an Initial Opt-in Notice may issue further Opt-in Notices in respect of additional PFM Fleets at any time in any Relevant Year.

14.20 Notwithstanding the date on which a Metered Train Operator issues any further Opt-in Notice in respect of additional PFM Fleets, the PFM Rates in respect of such additional PFM Fleets shall be calculated at the same time as all other PFM Rates are calculated or revised for that Metered Train Operator in accordance with paragraph 14.10 and the PFM Rates for such additional PFM Fleets shall take effect in accordance with paragraph 14.8(B).

*PFM information*

14.21 Network Rail shall maintain and publish on its website details of Metered Train Operators who have opted-in to Partial Fleet Metering, including in respect of each such Metered Train Operator:

- (A) PFM Rates for the current PFM Year and all previous PFM Years;
- (B) details of the ESTAs in which PFM Rates are applied;
- (C) details of whether the PFM Data Threshold has been met in each Period for each PFM Rate; and
- (D) details of the anniversary of the PFM Effective Date.

14.22 Network Rail shall maintain on its website the PFM Financial Spreadsheet along with an example of how it works, using notional data.

*Updates to PFM Rates and the PFM Rates List*

14.23 PFM Rates shall be calculated and updated, and the PFM Rates List updated by Network Rail, in accordance with these Traction Electricity Rules.

14.24 Following ORR's consent or determination of any PFM Rate in accordance with these Traction Electricity Rules, Network Rail shall within 28 (twenty-eight) days of such consent or determination issue any adjusting invoice or credit note to the Train Operator.

14.25 Network Rail shall be entitled to delete redundant entries in the PFM Rates List and make amendments to reflect Train Operator name changes.

**15. Application of Regenerative Braking Discounts to modelled consumption rates**

15.1

- (A) A train operator who operates a Regenerative Braking System for any of its Relevant Vehicle Categories is entitled to receive a Regenerative Braking Discount in respect of each such Relevant Vehicle Category, subject to the provisions of this paragraph 15.
- (B) Network Rail, acting reasonably, will decide the level of Regenerative Braking Discount to apply to each of the train operator's service codes in a manner that, overall, best reflects the distances between the Scheduled Calls of the Journeys within that service code. The levels of Regenerative Braking Discount are applied by reducing the relevant modelled consumption rate by the percentage discount specified below:

<b>Type of infrastructure / service frequency</b>	<b>Discount (%)</b>
AC, long distance (more than 10 miles between stations)	16%
AC, regional and outer suburban (less than or equal to 10 miles between stations)	18%
AC, local and commuter (less than or equal to 2.1 miles)	20%

between stations)	
DC	15%

*Opting-in process*

15.2 A train operator who, as at 31 March 2014, was already receiving a Regenerative Braking Discount in respect of a Relevant Vehicle Category shall continue to receive such discount unless otherwise provided for by this paragraph 15. In respect of other Relevant Vehicle Categories, a train operator who wishes to receive a Regenerative Braking Discount shall follow the opting-in process in accordance with 15.2(A) to 15.2(C) below.

- (A) The train operator shall notify Network Rail in writing to request that a Regenerative Braking Discount be applied. The notification given by the train operator shall set out:
  - (i) the Relevant Vehicle Categories in respect of which the train operator wishes to receive the Regenerative Braking Discount; and
  - (ii) any other information that the train operator considers Network Rail would require in reviewing its request.
- (B) The train operator shall provide promptly any other information which Network Rail, acting reasonably, considers that it requires in connection with the train operator's request under paragraph 15.2(A).
- (C) Within 28 days of receipt of the notification given by the train operator in accordance with paragraph 15.2(A) above, Network Rail shall determine, acting reasonably, whether a Regenerative Braking Discount should be applied to the notified Relevant Vehicle Categories and the level of that discount. Network Rail shall notify the train operator in writing of its decision and, if it determines that a Regenerative Braking Discount should be applied, of the date when the Regenerative Braking Discount shall start to be applied, which shall be the beginning of the next Period unless the train operator and Network Rail agree otherwise.

*Train operator's obligation to maintain its Regenerative Braking Systems*

15.3 The train operator shall use reasonable endeavours to ensure that the Regenerative Braking System for each vehicle in respect of which it receives a Regenerative Braking Discount continues to function effectively, such that the application of a Regenerative Braking Discount continues to be appropriate.

*Regenerative Braking Discount change process*

15.4 The train operator shall notify Network Rail promptly in writing if, in respect of one or more of its Relevant Vehicle Categories, it considers that either:

- (A) a Regenerative Braking Discount should no longer be applied; or
  - (B) the level of Regenerative Braking Discount currently applied should be changed.
- 15.5 Network Rail shall either cease applying a Regenerative Braking Discount or change the level of Regenerative Braking Discount, as appropriate, in respect of any of the train operator's Relevant Vehicle Categories in the following circumstances only:
- (A) to give effect to the train operator's notification in accordance with paragraph 15.4 above;
  - (B) where any of the train operator's Relevant Vehicle Categories cease to be billed on the basis of modelled consumption rates, in which case the discount shall cease to apply in respect of such Relevant Vehicle Categories; or
  - (C) where, following a Regenerative Braking Audit conducted in accordance with paragraph 16 below, Network Rail (acting reasonably) identifies that, in respect of one or more of the train operator's Relevant Vehicle Categories, either a Regenerative Braking Discount should no longer be applied or the level of Regenerative Braking Discount currently applied should be changed.
- 15.6 In the case of a notification served by the train operator under:
- (A) paragraph 15.4(A) above, Network Rail shall cease to apply the Regenerative Braking Discount from the start of the next Period following the date of the notice, or such other time as Network Rail may determine, having first consulted the train operator; or
  - (B) paragraph 15.4(B) above, promptly following the notice, Network Rail shall confirm the appropriate level of Regenerative Braking Discount that should be applied and shall apply this level with effect from the date that, acting reasonably, it determines is appropriate, having first consulted the train operator.

*List of train operators receiving a Regenerative Braking Discount*

- 15.7 Network Rail shall maintain, and make available on its website, a list of the Relevant Vehicle Categories which receive a Regenerative Braking Discount for each train operator. Network Rail shall update this list within 28 days of any change taking effect.

**16. Metering and Regenerative Braking Audits**

*Network Rail Metering Audit and Regenerative Braking Audit*

- 16.1 The Metered Train Operator shall, for a period of not less than two years, keep all data supplied by or on behalf of that Metered Train Operator to Network Rail in connection with On-Train Metering and all data used in or relating to the collection or creation of such data, and all material information relating to the supply, collection or creation of such data.

16.2 In addition to any other rights of Network Rail, including without limitation any rights set out in these Traction Electricity Rules or in any other provisions of the track access contract and subject to paragraph 16.8, Network Rail may, at Network Rail's cost and expense upon giving not less than 5 (five) Working Days prior notice to the train operator, but no more than once in any Relevant Year:

- (A) audit and inspect and take copies of such books, documents, data and other information (whether stored electronically or otherwise);
- (B) question such employees of the train operator and any of its agents, contractors, sub-contractors and consultants; and
- (C) inspect and/or test any On-Train Meters,

as Network Rail may reasonably require to verify either: (i) the accuracy of the data supplied to it by the Metered Train Operator pursuant to these Traction Electricity Rules; or (ii) whether in respect of one or more of the train operator's Relevant Vehicle Categories, either a Regenerative Braking Discount should not have applied or that a different level of Regenerative Braking Discount from the one currently applied should have applied. Where the train operator is party to more than one track access contract, Network Rail shall, if it wishes to exercise its rights to carry out a Metering Audit or a Regenerative Braking Audit, as the case may be, in respect of more than one of those contracts, exercise such rights simultaneously and not separately during any Relevant Year.

16.3 The train operator shall, at Network Rail's cost and expense (subject to paragraph 16.8), procure that its agents, contractors, sub-contractors and consultants shall provide such access to Network Rail as is reasonably necessary for the purposes of the Metering Audit or the Regenerative Braking Audit, as the case may be.

16.4 If,

- (A) following a Metering Audit carried out by Network Rail, any data is found by Network Rail to be materially inaccurate; or
- (B) following a Regenerative Braking Audit carried out by Network Rail, Network Rail finds, in respect of one or more of the train operator's Relevant Vehicle Categories, either a Regenerative Braking Discount should not have applied or that a different level of Regenerative Braking Discount from the one currently applied should have applied,

Network Rail shall notify the train operator in writing and shall provide evidence (in a reasonable level of detail) of such inaccuracy or in support of its findings, and details of any consequential financial adjustment which is required to be made to any amount paid or payable by any train operator.

16.5 The train operator shall be entitled, within 14 days following receipt of notice from Network Rail pursuant to paragraph 16.4, to notify Network Rail in writing that it objects to the findings of Network Rail's Metering Audit or Regenerative Braking Audit, as the case may be. Any such notice shall specify in reasonable detail the reasons for such objection (and, in the case of a Metered Train Operator objecting to the findings of a Metering Audit, what that Metered Train Operator believes to be the accurate data) ("**notice of objection**"). In the absence of any notice of objection being served within such time the findings of Network Rail's



Metering Audit or Regenerative Braking Audit, as the case may be, shall be deemed to be accepted by the train operator and shall be final and binding on the parties.

16.6 The parties shall seek to agree the details specified in any notice of objection and any consequential financial adjustment required. If the parties are unable to agree within 28 days following receipt of a notice of objection, the matter shall be determined at the request of either party in accordance with the ADRR, and where the dispute is allocated in accordance with the ADRR to arbitration under Chapter F of the ADRR:

- (A) the parties shall use their respective endeavours to ensure a joint paper setting out their respective positions on the matter in dispute is agreed for delivery to the arbitrator no later than 14 days following the expiration of a period of 28 days following receipt of a notice of objection;
- (B) the parties shall each request that the arbitrator's decision in writing (following any discussions or meetings between or with the parties that the arbitrator considers necessary) is delivered to the parties within 56 days of his appointment and that the arbitrator establish such rules and procedures for the conduct of the arbitration as he sees fit having regard to such timescale; and
- (C) each of the parties shall accept and abide by the rules and procedures established by the arbitrator under paragraph 16.6(B).

16.7 Any consequential financial adjustment which is required to be made to any amounts paid or payable by any train operator pursuant to paragraph 16.4 or 16.5 shall be made through the Volume Reconciliation carried out in respect of the Relevant Year in which such amounts were paid or payable.

16.8 Where:

- (A) as a result of a Metering Audit carried out by Network Rail, any data supplied by the Metered Train Operator to Network Rail pursuant to these Traction Electricity Rules is shown to be inaccurate in any material respect; or
- (B) as a result of a Regenerative Braking Audit carried out by Network Rail, it is found that a train operator is not entitled to any or all of the Regenerative Braking Discount it has claimed,

that train operator shall bear the reasonable costs of the Metering Audit or the Regenerative Braking Audit, as the case may be.

#### *Metered Train Operator Metering Audit*

16.9 Network Rail shall, for a period of not less than seven (7) years, keep all data used in or relating to the calculation of the Metered Charges including all Metered Data provided to it in accordance with these Traction Electricity Rules.

16.10 In addition to any other rights of the Metered Train Operator, including without limitation any rights set out in these Traction Electricity Rules or in any other provisions of its track access contract and subject to paragraph 16.16, the

Metered Train Operator may, at that Metered Train Operator's cost and expense, upon giving not less than 5 (five) Working Days prior notice to Network Rail, but no more than once in any Relevant Year:

- (A) audit and inspect and take copies of such books, documents, data and other information (whether stored electronically or otherwise);
- (B) question such employees of Network Rail and any of its agents, contractors, sub-contractors and consultants; and
- (C) inspect and/or test any model or other application used by Network Rail in the calculation of the Metered Charges,

as the Metered Train Operator may reasonably require to verify the accuracy of the Metered Charges. Where the Metered Train Operator is party to more than one track access contract, the Metered Train Operator shall, if it wishes to exercise its rights to carry out a Metering Audit in respect of more than one of those contracts, exercise such rights simultaneously and not separately during any Relevant Year.

16.11 Network Rail shall, at the Metered Train Operator's cost and expense (subject to paragraph 16.16), procure that its agents, contractors, sub-contractors and consultants shall provide such access to the Metered Train Operator as is reasonable for the purposes of the Metering Audit.

16.12 If following a Metering Audit carried out by the Metered Train Operator any Metered Charges are found by the Metered Train Operator to be materially inaccurate, the Metered Train Operator shall notify Network Rail in writing and shall provide evidence (in a reasonable level of detail) of such inaccuracy and details of any consequential financial adjustment which is required to be made to any amounts paid or payable by the Metered Train Operator or any other train operator.

16.13 Network Rail shall be entitled within 14 days following receipt by Network Rail of notice from the Metered Train Operator pursuant to paragraph 16.12, to notify the Metered Train Operator in writing that it objects to the findings of the Metered Train Operator's Metering Audit. Any such notice shall specify in reasonable detail the reasons for such objection and what Network Rail believes to be the relevant charges for the purposes of such Metering Audit ("**notice of objection**"). In the absence of any notice of objection being served within such time the findings of the Metered Train Operator's Metering Audit shall be deemed to be accepted by Network Rail and shall be final and binding on the parties.

16.14 The parties shall seek to agree the details specified in any notice of objection and any consequential financial adjustment required. If the parties are unable to agree such charges within 28 days following receipt of a notice of objection, the matter shall be determined at the request of either party in accordance with the ADRR, and where the dispute is allocated in accordance with the ADRR to arbitration under Chapter F of the ADRR:

- (A) the parties shall use their respective endeavours to ensure a joint paper setting out their respective positions on the matter in dispute is agreed for delivery to the arbitrator no later than 14 days following the expiration of a period of 28 days following receipt of a notice of objection;

- (B) the parties shall each request that the arbitrator's decision in writing (following any discussions or meetings between or with the parties that the arbitrator considers necessary) is delivered to the parties within 56 days of his appointment and that the arbitrator establish such rules and procedures for the conduct of the arbitration as he sees fit having regard to such timescale; and
- (C) each of the parties shall accept and abide by the rules and procedures established by the arbitrator under paragraph 16.14(B).

16.15 Any consequential financial adjustment which is required to be made to any amounts paid or payable by the Metered Train Operator or any other train operator pursuant to paragraph 16.12 or 16.14 shall be made through the Volume Reconciliation carried out within 90 days after the end of the Relevant Year in which such amounts were paid or payable.

16.16 Where any Metered Charges are shown as a result of a Metering Audit carried out by the Metered Train Operator to be inaccurate in any material respect, Network Rail shall bear the reasonable costs of the Metering Audit and the Metered Train Operator shall issue an invoice to Network Rail in the amount of those costs.

*Additional Metering Audits or Regenerative Braking Audits by Network Rail or the Metered Train Operator*

16.17 Neither Network Rail nor the Metered Train Operator shall be entitled to carry out more than one Metering Audit of one another in any Relevant Year, without the prior written consent of ORR. If either party wishes to carry out more than one Metering Audit of one another in any Relevant Year, such party shall notify ORR in writing, providing reasons why it considers that an additional Metering Audit is required.

16.18 Network Rail shall not be entitled to carry out more than one Regenerative Braking Audit of the train operator in any Relevant Year, without the prior written consent of ORR. If Network Rail wishes to carry out more than one such audit in any Relevant Year, it shall notify ORR in writing, providing reasons why it considers that an additional Regenerative Braking Audit is required.

16.19 If ORR consents to either party carrying out more than one Metering Audit, or to Network Rail carrying out more than one Regenerative Braking Audit, as the case may be, in any Relevant Year, any such additional audit shall be carried out by either Network Rail in accordance with the procedure set out in paragraphs 16.2 to 16.8 (inclusive) or by the Metered Train Operator in accordance with the procedure set out in paragraphs 16.9 to 16.16 (inclusive) (as the case may be), with such provisions being deemed to apply with such changes as are necessary in order to give effect to this paragraph 16.19.

*Metering Audit and Regenerative Braking Audit requests by third party train operators*

16.20 Any train operator may submit a request to ORR for a Metering Audit or Regenerative Braking Audit to be carried out in respect of any other train operator as appropriate. Such request shall be in writing and shall specify the reasons why the train operator considers that a Metering Audit or a Regenerative Braking Audit, as the case may be, is necessary.

16.21 If ORR consents to such request, such Metering Audit or Regenerative Braking Audit, as the case may be, shall be carried out by Network Rail on behalf of such train operator in accordance with the procedure set out in paragraphs 16.2 to 16.7 (inclusive), with such provisions being deemed to apply with such changes as are necessary in order to give effect to this paragraph 16.21.

16.22 Where:

- (A) as a result of a Metering Audit carried out pursuant to paragraph 16.21, any data supplied by the Metered Train Operator to Network Rail pursuant to these Traction Electricity Rules is shown to be inaccurate in any material respect; or
- (B) as a result of a Regenerative Braking Audit carried out pursuant to paragraph 16.21, it is found that the train operator was not entitled to any or all the Regenerative Braking Discount it has claimed,

the train operator who was the subject of the audit shall bear the reasonable costs of the Metering Audit or Regenerative Braking Audit, as the case may be, and in all other cases such costs shall be borne by the train operator who requested the audit.

*Time for completion of a Metering Audit*

Any Metering Audit or Regenerative Braking Audit (including the resolution of any dispute arising out of such audit in accordance with paragraph 16.6 or 16.14, as the case may be) shall be concluded no later than 28 days after the end of the Relevant Year in which the Metering Audit was commenced. If any dispute arising out of such Metering Audit or Regenerative Braking Audit is not resolved within such time the findings of such Metering Audit or Regenerative Braking Audit, as the case may be, shall be final and binding on the parties

**17. Changes to these Traction Electricity Rules**

*Entitlement to make Proposed Rules Change*

17.1 A proposal to change these Traction Electricity Rules (a "**Proposed Rules Change**") may be made by:

- (A) a Metered Train Operator or a Modelled Train Operator, save in respect of a proposal to change Appendix 3 (Network Rail Distribution System Loss Factors) or Appendix 5 (the Geographic Areas);
- (B) Network Rail; or
- (C) ORR,

(in each case a "**Proposing Party**").

17.2 Any such proposal shall:

- (A) be sent to Network Rail (except where Network Rail is the Proposing Party);

- (B) be in writing;
- (C) specify the wording of the Proposed Rules Change and the date or series of dates on which it is proposed that it come into effect, if other than the period of 14 days after any approval notified by ORR pursuant to paragraph 17.16 below; and
- (D) be supported by an explanation in reasonable detail of the reasons for the Proposed Rules Change.

*Notice of Proposed Rules Change*

17.3 Network Rail shall, when making a Proposed Rules Change, or, within 7 days following receipt of a Proposed Rules Change, or, if later, within 7 days following receipt of any clarification that Network Rail may reasonably request from the Proposing Party:

- (A) give notice of that Proposed Rules Change to the Consultees and ORR, as applicable, unless any such person has notified Network Rail that it does not wish to receive notice of a Proposed Rules Change; and
- (B) invite the submission to Network Rail of written representations in respect of that proposal within such period as is reasonable in all the circumstances (the “**Consultation Period**”), being a period of not less than 28 days from the date of notification under paragraph (A) above. Network Rail may make a written representation if it considers it appropriate to do so.

17.4 A Proposing Party shall promptly comply with all reasonable written requests of Network Rail for further clarification of the Proposed Rules Change.

17.5 Network Rail shall, within 7 days of the end of the Consultation Period, publish all written representations received in accordance with paragraph 17.3(B) above on its website, and shall send copies of the same to the Proposing Party.

17.6 The Proposing Party shall consider all written representations received from Network Rail in accordance with paragraph 17.5 above. If and to the extent the Proposing Party considers it appropriate, it shall modify its Proposed Rules Change to take account of such representations in accordance with paragraph 17.7 below. If the Proposing Party considers that no modification is required, the Proposed Rules Change shall be put to a vote in accordance with paragraph 17.9 below, save where the Proposed Rules Change is made by Network Rail in respect of Appendix 3 (Network Rail Distribution System Loss Factors) or Appendix 5 (the Geographic Areas) in which case Network Rail shall as soon as reasonably practicable submit the proposal to ORR in accordance with paragraph 17.13 below (without it being put to a vote in accordance with paragraph 17.9).

17.7 If the Proposing Party makes any modifications to its original Proposed Rules Change, together with Network Rail it shall take appropriate action as follows:

- (A) if either of the Proposing Party or Network Rail consider that the modification is material, the Proposing Party shall provide Network Rail with the modified Proposed Rules Change in writing, and the provisions of paragraphs 17.1 to 17.6 inclusive shall apply as if set out again in full, save

that the Consultation Period in respect of the modified Proposed Rules Change (the “**Re-Consultation Period**”) shall be 21 days (or longer if the Proposing Party so elects); or

- (B) if both the Proposing Party and Network Rail consider that the modification is immaterial, the modified proposal shall be put to a vote in accordance with paragraph 17.9 below, save where the Proposed Rules Change is made by Network Rail in respect of Appendix 3 (Network Rail Distribution System Loss Factors) or Appendix 5 (the Geographic Areas) in which case Network Rail shall as soon as reasonably practicable submit the proposal to ORR in accordance with paragraph 17.13 below (without it being put to a vote in accordance with paragraph 17.9).

17.8 If the Proposing Party considers it appropriate to make further modifications to the Proposed Rules Change after the Re-Consultation Period, paragraph 17.7 shall apply again, and this process shall continue until no further material modifications are made, at which point the modified Proposed Rules Change shall be put to a vote in accordance with paragraph 17.9 below, save where the Proposed Rules Change is made by Network Rail in respect of Appendix 3 (Network Rail Distribution System Loss Factors) or Appendix 5 (the Geographic Areas) in which case Network Rail shall as soon as reasonably practicable submit the proposal to ORR in accordance with paragraph 17.13 below (without it being put to a vote in accordance with paragraph 17.9).

#### *Voting on a Proposed Rules Change*

- 17.9 Save where a Proposed Rules Change is made by Network Rail in respect of Appendix 3 (Network Rail Distribution System Loss Factors) or Appendix 5 (the Geographic Areas), Network Rail shall promptly arrange for a vote to take place on whether a Proposed Rules Change is accepted or not, as follows:
- (A) the vote shall be open to Metered Train Operators, Modelled Train Operators and Network Rail, who shall each cast one vote either for or against each Proposed Rules Change, as they consider appropriate;
  - (B) Network Rail shall specify a period for casting a vote, which shall be open for voting for not less than 7 days; and
  - (C) the vote shall be conducted by e-mail.
- 17.10 A Proposed Rules Change shall have been endorsed only if a majority of the votes cast are in favour of the relevant Proposed Rules Change, provided that the failure of a party timeously to vote or a party intimating its abstention shall be treated as abstentions and not be included in the counting of votes to ascertain whether the Proposed Rules Change has been endorsed or rejected.
- 17.11 If the vote taken in accordance with paragraph 17.9 above endorses the Proposed Rules Change, Network Rail shall as soon as reasonably practicable submit the proposal to ORR in accordance with paragraph 17.13 below.
- 17.12 If the vote taken in accordance with paragraph 17.9 above rejects the Proposed Rules Change, Network Rail shall as soon as reasonably practicable notify the Proposing Party of that decision.

*ORR consent*

- 17.13 When submitting a proposal to ORR, Network Rail shall include a written memorandum:
- (A) containing details of the results of the consultation process (including copies of all representations made pursuant to paragraph 17.3(B) above, and any responses the Proposing Party may have made to the same);
  - (B) stating the results of any vote conducted pursuant to paragraph 17.9 above (including identifying how each relevant party voted); and
  - (C) stating the date or series of dates upon which it is considered that the proposal is to take effect, the first date being no earlier than 14 days after the date on which ORR consents to the proposal.
- 17.14 The Consultees and Network Rail shall use their respective reasonable endeavours to provide any further information required in relation to the consideration of a Proposed Rules Change by ORR.
- 17.15 No Proposed Rules Change shall have effect unless ORR gives notice to Network Rail in writing that it consents to the proposal. As part of its consent process, ORR may have regard to whether modifications made to the Proposed Rules Change and classed as immaterial in accordance with paragraph 17.7(B) above should in fact have been classed as material (and therefore should have been subject to a re-consultation).
- 17.16 If ORR consents to the proposed change Network Rail shall ensure that all Consultees shall be notified within 7 days of ORR's consent of the change and its effective date. Unless ORR otherwise determines, the effective date shall be 14 days from the date of the notification given by Network Rail pursuant to this paragraph 17.16.

*Procedural Irregularities*

- 17.17 If before the effective date or dates of any change (as notified under paragraph 17.16 above) a Relevant Complaint is made to ORR concerning a failure to comply with any part of the procedure relating to the relevant Proposed Rules Change, paragraph 17.18 shall apply.
- 17.18 In considering any Relevant Complaint, it shall be open to ORR to determine either that:
- (A) the change should become effective on the date notified under paragraph 17.16 above or any alternative date ORR considers appropriate in the circumstances; or
  - (B) the change should not become effective on the date notified under paragraph 17.16 above and to the extent ORR considers appropriate the rules change process in paragraphs 17.1 to 17.12 above shall be re-run.
- 17.19 A change in respect of which a complaint has been made under paragraph 17.17 above shall not become effective unless ORR makes a determination under paragraph 17.18(A) above.

17.20 If a complaint is made to ORR concerning a failure to comply with any part of the procedure relating to a Proposed Rules Change after the effective date or dates of any change, such change will remain in full force and effect as though no complaint had been made.

*Modification of the Traction Electricity Rules by ORR*

17.21 A modification made by ORR in accordance with paragraphs 17.22 to 17.27 below, does not need to be proposed in accordance with paragraphs 17.1 to 17.4 above.

17.22 The Traction Electricity Rules shall have effect with the modifications specified in any notice given by ORR for the purposes of these paragraphs 17.22 to 17.27, provided that:

- (A) ORR shall be satisfied as to the need for the modification as provided in paragraph 17.23 below;
- (B) the procedural requirements of paragraph 17.25 below shall have been satisfied; and
- (C) the modification shall not have effect until the date provided for in paragraph 17.26 below.

17.23 Subject to paragraph 17.24 below, a notice given by ORR under paragraph 17.22 above shall have effect if it is satisfied on reasonable grounds that either or both of the following conditions has been satisfied:

- (A) the modification in question is or is likely to be reasonably required in order to promote or achieve the objectives specified in section 4 of the Act; and/or
- (B) the interests of any relevant person would be unfairly prejudiced if the modification in question were not made, and the need to avoid or remedy such unfair prejudice outweighs or is likely to outweigh any prejudice which will or is likely to be sustained by any other relevant person or persons if the modification is made, having due regard to the need to enable relevant persons to plan the future of their businesses with a reasonable degree of assurance.

17.24 ORR may give a notice under paragraph 17.22 above without the conditions in paragraph 17.23 being satisfied where the modification which is the subject of ORR's notice relates to an amendment to paragraphs 17.1 to 17.20 above and is necessary, in the opinion of ORR, to remedy an inefficiency in the change process contained within those paragraphs.

17.25 The procedural requirements which require to have been followed for the purposes of paragraph 17.22 above are:



- (A) in its consideration of the matters referred to in paragraph 17.23 above, ORR shall have consulted Network Rail and the Consultees together with any other persons which ORR considers ought properly to be consulted, in relation to the modification which it proposes to make;
- (B) in the consultation referred to in paragraph 17.25(A) ORR have made available to each person so consulted such drafts of the proposed modification as it shall consider are necessary so as properly to inform such persons of the detail of the proposed modification;
- (C) ORR shall have given each person so consulted the opportunity to make representations in relation to the proposed modification and shall have taken into account all such representations received within the time specified by ORR for such consultation (other than those which are frivolous or trivial) in making its decision on the modification to be made;
- (D) ORR shall have notified each person consulted pursuant to paragraph 17.25(A) as to its conclusions in relation to the modification in question (including by providing to each such person a copy of the text of the proposed modification) and its reasons for those conclusions; and
- (E) in effecting the notifications required by paragraph 17.25(D), ORR may have regard to any representation (including any submission of written material) which (and to the extent that) the person making the representation shall, by notice in writing to ORR or by endorsement on the representation of words indicating the confidential nature of such representation, have specified as confidential information.

17.26 A notice under paragraph 17.22 above shall have effect upon such date, or the happening of such event, as shall be specified in the notice, provided that it shall in no circumstances have effect earlier than 90 days after the date upon which it shall have been given, with the exception of a notice to which paragraph 17.24 above applies, in which case the notice shall have effect 28 days after the date upon which it shall have been given.

17.27 A notice under paragraph 17.22 above shall not have effect in relation to any proposed modification of paragraphs 17.22 to 17.26 (inclusive) or this paragraph 17.27.

*Network Rail's role as secretariat*

17.28 Network Rail shall establish, maintain and update, as necessary, a website containing:

- (A) the current version of the Traction Electricity Rules (which for the avoidance of doubt includes the appendices);
- (B) all previous versions of the Traction Electricity Rules (which for the avoidance of doubt includes the appendices) (together with a statement of the dates between which each respective version was in force);
- (C) any current Proposed Rules Changes together with any representations received in response to the same;
- (D) a fully searchable archive containing details of consultations held, representations received and votes held (including identifying how each party voted) in relation to all previous Proposed Rules Changes; and
- (E) the data referred to in paragraph 8 above.

17.29 Network Rail shall maintain an up-to-date list of Modelled Train Operators and Metered Train Operators, and make it available, on request, to train operators at all reasonable times

17.30 Network Rail shall, as soon as reasonably practicable following issue of a notice under paragraph 17.22 above or following consent to a Proposed Rules Change by the Office of Rail Regulation, supply to all Metered Train Operators and all Modelled Train Operators a revised version of the Traction Electricity Rules (which for the avoidance of doubt includes the appendices) incorporating the change.

## **18. Volume and Cost Reconciliation for all train operators**

*Transitional risk sharing mechanism rebate for the Relevant Year ending on 31 March 2014.*

18A.1 For the purposes of the transitional risk sharing mechanism calculation to be carried out for the Relevant Year ending on 31 March 2014, the provisions in paragraphs 18.2 to 18.7 (Transitional Risk Sharing Mechanism) of the document called "EC4T Metering Rules" (and such definitions and other provisions as are relevant to paragraphs 18.2 to 18.7) in force as at that date shall continue to apply to the extent (and only to the extent) necessary to enable the calculation and payment of the TRSM Rebate.

18A.2 For subsequent Relevant Years, paragraph 18.1 to 18.3 below of these Traction Electricity Rules shall apply.

*Timing and scope of Volume and Cost Reconciliation*

18.1 Within 90 days after the end of Relevant Year t, Network Rail shall calculate, for each train operator  $\omega$ :

- (A) supplementary amount  $S1_{t\omega}$ ;
- (B) the Charge Correction Amount; and
- (C) (following and taking into account the calculation of  $S1_{t\omega}$ ) supplementary amount  $S2_{t\omega}$ ,

which shall be payable by or to the train operator in accordance with this paragraph 18. The calculations of  $S1_{t\omega}$ , the Charge Correction Amount and  $S2_{t\omega}$  shall be made for all train operators using electric traction, other than Charter Train Operators.

*Volume Reconciliation*

18.2 For each train operator  $\omega$ ,  $S1_{t\omega}$  is derived from the following formula:

$$S1_{t\omega} = \sum S1_{tg\omega}, \text{ summed over } g$$

where, for each Geographic Area g,  $S1_{tg\omega}$  is derived from the following formula:

$$S1_{tg\omega} = E_{tmog\omega} \bullet (A_{gt} - L_{tmog} - L_{tmeg} - L_{tmug} - L_{tmng}) / (L_{tmog} + L_{tmng} + (\lambda_g / (1 + \lambda_g))) \bullet A_{gt}$$

where:

$E_{tmog\omega}$  means the amount  $E_{tmog}$  calculated for each train operator  $\omega$  in accordance with paragraph 4.1.2 of Part 2 (in the case of passenger operators) and paragraph 2.4.1.2 (in the case of freight operators) of Schedule 7 of the relevant train operator's track access contract;

$A_{gt}$  means the total actual electricity consumption (in kWh), if any, in Geographic Area g in Relevant Year t billed to Network Rail by its electricity suppliers in that Geographic Area for traction electricity consumed in accordance with the terms for the purchase of traction electricity entered into by Network Rail;

$L_{tmog}$  means the total modelled traction electricity consumption charged to all train operators in Geographic Area g and in Relevant Year t which is derived from the following formula:

$$L_{tmog} = \sum C_i \bullet UE_{igt}$$

where:

$\Sigma$  means the summation across all train categories i and tariff bands j for Relevant Year t for all train operators, as appropriate;

$C_i$  means the modelled consumption rate or PFM Rate, as appropriate:

- (a) in kWh per electrified Train Mile in relation to passenger electric multiple units (using the rate for the relevant number of units); and
- (b) in kWh per electrified kgm in relation to locomotive-hauled units and all freight traffic,

for train category i shown in the Traction Electricity Modelled Consumption Rates List taking into account any Regenerative Braking Discount applied in accordance with these Traction Electricity Rules or, if a PFM Rate applies in accordance with these Traction Electricity Rules, the PFM Rates List;

UE<sub>igit</sub> means the actual volume of usage (in electrified Vehicle Miles in relation to passenger electric multiple units or electrified kgm in relation to locomotive-hauled units and all freight traffic), if any, of trains operated in Relevant Year t by or on behalf of all train operators in train category i, in Geographic Area g, where relevant, in tariff band j and in Relevant Year t in respect of which charges for traction electricity consumption are payable based on modelled consumption rates pursuant to paragraph 4.1 or 4.1.2 (in the case of passenger operators) or paragraph 2.4.1 or 2.4.1.2 (in the case of freight operators) of Schedule 7 of each relevant train operator's track access contract;

L<sub>tmeg</sub> means the total metered traction electricity consumption charged to all train operators in Geographic Area g and Relevant Year t which is derived from the following formula:

$$L_{tmeg} = \sum [((CME_{mijt} \bullet PF_m) - (RGB_{mijt} \bullet PF_m)) \bullet (1 + \delta_m)]$$

where:

$\Sigma$  means the summation across all relevant Metered Trains m for Relevant Year t for all train operators, as appropriate;

CME<sub>mijt</sub> means the consumption of electricity (in kWh) by Metered Train m, as measured by the On-Train Meters or as otherwise determined in accordance with these Traction Electricity Rules, in Geographic Area g, in tariff band j and in Relevant Year t;

PF<sub>m</sub> means the Power Factor Correction for Metered Train m;

RGB<sub>mijt</sub> means the electricity (in kWh) generated by braking by Metered Train m, as measured by the On-Train Meters or as otherwise determined in accordance with these Traction Electricity Rules, in Geographic Area g, in tariff band j and in Relevant Year t; and

$\delta_m$  means the Tolerance Factor for Metered Train m;

L<sub>tmug</sub> means the total amounts in respect of the Network Rail Distribution System Loss Factor, adjusted, where appropriate, for Power Factor

Correction and Tolerance Factor, charged to all train operators in Geographic Area g and Relevant Year t which is derived from the following formula:

$$L_{tmug} = L_{tmugAC} + L_{tmugDC}$$

where:

$L_{tmugAC}$  is derived from the following formula:

$$L_{tmugAC} = \sum [(CME_{mjtAC} \bullet PF_m \bullet EF_{gjt}) \bullet (1 + \delta_m)] \bullet \lambda_{ACg}$$

where:

$\Sigma$  means the summation across all relevant Metered Trains m for Relevant Year t for all train operators, as appropriate;

$CME_{mjtAC}$  means the consumption of electricity (in kWh) from the AC System by Metered Trains m, as measured by the On-Train Meters or as otherwise determined in accordance with these Traction Electricity Rules, in Geographic Area g, in tariff band j and in Relevant Year t;

$PF_m$  means the Power Factor Correction for Metered Train m;

$EF_{gjt}$  means an amount for traction current (in pence per kWh) consumed by railway vehicles operated by or on behalf of the train operator in Geographic Area g, in tariff band j and in Relevant Year t as agreed or determined pursuant to paragraph 19 of these Traction Electricity Rules;

$\delta_m$  means the Tolerance Factor for Metered Train m; and

$\lambda_{ACg}$  means the Network Rail Distribution System Loss Factor for the AC System in Geographic Area g;

$L_{tmugDC}$  is derived from the following formula:

$$L_{tmugDC} = \sum [(CME_{mjtDC} \bullet EF_{gjt}) \bullet (1 + \delta_m)] \bullet \lambda_{DCg}$$

where:

$\Sigma$  means the summation across all relevant Metered Trains m for Relevant Year t for all train operators, as appropriate;

- $CME_{mijtDC}$  means the consumption of electricity (in kWh) from the DC System by Metered Trains  $m$ , as measured by the On-Train Meters or as otherwise determined in accordance with these Traction Electricity Rules, in Geographic Area  $g$ , in tariff band  $j$  and in Relevant Year  $t$ ;
- $EF_{ijt}$  means an amount for traction current (in pence per kWh) consumed by railway vehicles operated by or on behalf of the train operator in Geographic Area  $g$ , in tariff band  $j$  and in Relevant Year  $t$  as agreed or determined pursuant to paragraph 19 of these Traction Electricity Rules;
- $\delta_m$  means the Tolerance Factor for Metered Train  $m$ ; and
- $\lambda_{DCg}$  means the Network Rail Distribution System Loss Factor for the DC System in Geographic Area  $g$ ;
- $L_{tmng}$  means the total traction electricity consumption in Geographic Area  $g$  and in Relevant Year  $t$  by: (a) Network Rail, and (b) all entities whose consumption is not modelled or metered in a track access contract subject to regulation by ORR in accordance with the Act; and
- $\lambda_g$  means, in any Geographic Area  $g$  which only uses the DC System, the Network Rail Distribution System Loss Factor for the DC System in Geographic Area  $g$  ( $\lambda_{DCg}$ ), and, in any other Geographic Area  $g$ , means the Network Rail Distribution System Loss Factor for the AC System in Geographic Area  $g$  ( $\lambda_{ACg}$ ).

### *Cost Reconciliation*

18.3A Prior to the calculation of  $S2_{t\omega}$ , Network Rail shall make any corrections for the charge for traction current (in pence per kWh) which, acting reasonably, it considers necessary (the “**Charge Correction Amount**”).

18.3 For each train operator  $\omega$ ,  $S2_{t\omega}$  is derived from the following formula:

$$S2_{t\omega} = S2E_{t\omega} \bullet S2D_{t\omega}$$

where:

$S2E_{t\omega}$  is derived from the following formula:

$$S2E_{t\omega} = EN_{t\omega} \bullet EC_t$$

where:

$EN_{t\omega}$  means Train Operator Energy Costs payable by train operator  $\omega$  in Relevant Year  $t$ ; and

$EC_t$  is a reconciliation factor, derived from the following formula:

$$EC_t = \frac{(CSE_t - CWE_t)}{CWE_t}$$

where:

CSE<sub>t</sub> means the total Energy Costs of traction electricity consumption payable by Network Rail to its electricity suppliers in Relevant Year t;

CWE<sub>t</sub> shall be derived from the following formula:

$$CWE_t = TEC_t + EN_{tmn} + ENRLOSS_t$$

where:

TEC<sub>t</sub> means the summation of the Energy Costs of traction electricity consumption across all train operators in Relevant Year t;

EN<sub>tmn</sub> means the summation across all Geographic Areas g, of the Energy Costs of the traction electricity consumption in Relevant Year t by (a) Network Rail, and (b) all entities whose consumption is not modelled or metered in a track access contract subject to regulation by ORR, which Energy Costs Network Rail shall assess as accurately as possible after allocation of each S1<sub>tω</sub>; and

ENRLOSS<sub>t</sub> means the Energy Costs of the traction electricity consumption allocated to Network Rail over and above its own consumption in the calculation of S1<sub>tω</sub>, in paragraph 18.2 of these Traction Electricity Rules, which Network Rail shall assess as accurately as possible, across all Geographic Areas g in Relevant Year t.

For each train operator ω, S2D<sub>tω</sub> is derived from the following formula:

$$S2D_{t\omega} = \sum S2D_{tg\omega}$$

where  $\sum$  means the summation across all Geographic Areas g; and

where, for each Geographic Area g, S2D<sub>tgω</sub> is derived from the following formula:

$$S2D_{tg\omega} = D_{tg\omega} \bullet DC_{tg}$$

where:

D<sub>tgω</sub> means Train Operator Delivery Costs payable by train operator ω in Geographic Area g in Relevant Year t;

DC<sub>tg</sub> is a reconciliation factor, derived from the following formula:

$$DC_{tg} = \frac{(CSD_{tg} - CWD_{tg})}{CWD_{tg}}$$

where:

CSD<sub>tg</sub> means the total amount payable by Network Rail to its electricity suppliers in respect of Delivery Costs in Geographic Area g in Relevant Year t;

CWD<sub>tg</sub> shall be derived from the following formula:

$$CWD_{tg} = TED_{tg} + DEN_{tmng} + DNRLOSS_{tg}$$

where:

TED<sub>tg</sub> means the summation of all Train Operator Delivery Costs across all train operators in Geographic Area g and Relevant Year t;

DEN<sub>tmng</sub> means the summation across all Geographic Areas g, of the Delivery Costs of the traction electricity consumption in Relevant Year t by: (a) Network Rail, and (b) all entities whose consumption is not modelled or metered in a track access contract subject to regulation by ORR, which Delivery Costs Network Rail shall assess as accurately as possible after allocation of each S1<sub>tω</sub>; and

DNRLOSS<sub>tg</sub> means the amount payable by Network Rail to its electricity suppliers in respect of the Delivery Costs of traction electricity consumption allocated to Network Rail over and above its own consumption in the calculation of S1<sub>tgω</sub>, in paragraph 18.2 of these Traction Electricity Rules, in Geographic Area g in Relevant Year t.

#### *Payment of reconciliation sums*

18.4 Network Rail shall, within 90 days after the end of Relevant Year t, provide to each train operator ω:

- (a) a statement of the amounts S1<sub>tω</sub> and S2<sub>tω</sub> and the Charge Correction Amount (in each case whether of a positive or negative amount);
- (b) such background workings as may reasonably be required for a proper understanding of the calculation; and
- (c) a certificate of the auditors of Network Rail confirming the accuracy of the calculation.



18.5 Within 30 days after the date upon which Network Rail shall have provided to the train operator the information referred to in paragraph 18.4, the amounts  $S1_{tw}$  and  $S2_{tw}$  and the Charge Correction Amount shall be invoiced for payment as provided under the relevant track access contract. If the aggregate of the amounts  $S1_{tw}$  and  $S2_{tw}$  and the Charge Correction Amount is positive, the invoice shall be issued by Network Rail and payable by the train operator. If the aggregate of the amounts  $S1_{tw}$  and  $S2_{tw}$  and the Charge Correction Amount is negative, Network Rail shall issue a credit note to the train operator.

**19. Strategy for the procurement of traction electricity**

19.1 At least three months prior to the start of each Relevant Year commencing on or after 1 April 2015, Network Rail shall consult with the train operator regarding a strategy for the procurement of traction electricity for the train operator in respect of that Relevant Year, and:

- (a) if Network Rail and the train operator agree on a strategy for the procurement of traction electricity, Network Rail will procure traction electricity for the train operator in accordance with that agreed strategy; or
- (b) if Network Rail and the train operator do not agree on a strategy for the procurement of traction electricity and the train operator has, during its consultation with Network Rail under this paragraph 19, notified Network Rail of the train operator's preferred strategy for the procurement of traction electricity and it is possible for Network Rail, acting reasonably, to implement that strategy, Network Rail will procure traction electricity for the train operator in accordance with the traction electricity procurement strategy so notified to Network Rail by the train operator; or
- (c) if Network Rail and the train operator do not agree on a strategy for the procurement of traction electricity and either (A) the train operator has not notified Network Rail of the train operator's preferred strategy for the procurement of traction electricity during its consultation with Network Rail in accordance with this paragraph 19, or (B) it is not possible for Network Rail, acting reasonably, to implement the train operator's preferred strategy for the procurement of traction electricity as notified to Network Rail during its consultation in accordance with this paragraph 19, Network Rail will:
  - (i) acting reasonably, determine the procurement strategy for traction electricity for the train operator, having regard to whatever information, if any, the train operator has supplied to Network Rail during its consultation under this paragraph 19; and
  - (ii) procure traction electricity for the train operator in accordance with that traction electricity procurement strategy.

**20. Actual cost of traction electricity**

20.1 Network Rail shall provide to the train operator within 30 days of the end of each Period in each Relevant Year, the actual cost of traction electricity consumed by railway vehicles operated by or on behalf of the train operator in the relevant Period against the budgeted amounts. Network Rail shall also provide to the train operator a provisional six month Volume Reconciliation by Geographic Area g

before 30 October of each Relevant Year and a provisional nine month Volume Reconciliation by Geographic Area g before 30 January of each Relevant Year.

**21. Dispute Resolution**

- 21.1 Save as expressly provided otherwise in these Traction Electricity Rules, the dispute resolution processes set out in clause 13 of the relevant track access contract into which these Traction Electricity Rules are incorporated shall apply in respect of any dispute arising out of or in relation to these Traction Electricity Rules.

**APPENDIX 1: TEMPLATE LOOK-UP TABLES**

**1. Journey Look-Up Tables**

***Table 1.1: Journey Look-Up Table for non locomotive-hauled passenger journeys – Consumption Data***

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Consumption rate (kWh/5 minute interval)				
Train Operator	Train Service Code	Specified Equipment	Geographic Area	Electricity Type (AC/DC)	EMU Length	1 Unit	2x Unit	3x Unit	4x Unit	Other

***Table 1.2: Journey Look-Up Table for non locomotive-hauled passenger journeys – Regenerative Braking Data***

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
						Consumption rate (kWh/5 minute interval)				
Train Operator	Train Service Code	Specified Equipment	Geographic Area	Electricity Type (AC/DC)	EMU Length	1 Unit	2x Unit	3x Unit	4x Unit	Other

**Table 1.3: Journey Look-Up Table for freight and locomotive-hauled passenger journeys – Consumption Data**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
					<b>Consumption rate (kWh/5 minute interval/tonne)</b>				
<b>Train Operator</b>	<b>Train Service Code</b>	<b>locomotive class</b>	<b>Geographic Area</b>	<b>Electricity Type (AC/DC)</b>	<b>1 Unit</b>	<b>2x Unit</b>	<b>3x Unit</b>	<b>4x Unit</b>	<b>Other</b>

**Table 1.4: Journey Look-Up Table for freight and locomotive-hauled passenger journeys – Regenerative Braking Data**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
					<b>Consumption rate (kWh/5 minute interval/tonne)</b>				
<b>Train Operator</b>	<b>Train Service Code</b>	<b>locomotive class</b>	<b>Geographic Area</b>	<b>Electricity Type (AC/DC)</b>	<b>1 Unit</b>	<b>2x Unit</b>	<b>3x Unit</b>	<b>4x Unit</b>	<b>Other</b>

2. **Non-Journey Look-Up Table**

*Table 2.1: Non-Journey Look-Up Table*

1.	2.	3.	4.	5.
<b>Train Operator</b>	<b>Specified Equipment</b>	<b>Geographic Area</b>	<b>Electricity Type (AC/DC)</b>	<b>Consumption rate (kWh/5 minute interval)</b>

## APPENDIX 2: POWER FACTOR CORRECTION

The table below sets out the Power Factor Correction (PF) for train type of Metered Train m.

Train Type	Power Factor	Power Factor Correction (PF <sub>m</sub> )
Class 313	N/A	N/A
Class 318	TBC	1
Class 319	0.9	1
Class 320	TBC	1
Class 321	0.85	1
Class 323	1	1
Class 350	1	1
Class 365	0.9	1
Class 375	N/A	N/A
Class 376	N/A	N/A
Class 380	1	1
Class 390	1	1
Class 442	N/A	N/A
Class 455	N/A	N/A
Class 444	N/A	N/A
Class 450	N/A	N/A
Class 458	N/A	N/A
Class 465	N/A	N/A
Class 466	N/A	N/A
Class 357	1	1
Class 377 (DC)	N/A	N/A
Class 377 (AC)	1	1
Class 334	1	N/A
Class 456	N/A	N/A
Class 387	0.93 (static loads) to 0.99 (full loads)	1
Class 700 (DC)	N/A	N/A
Class 700 (AC)	0.99	1
Class 707	N/A	N/A
Class 318	1	N/A
Class 320/0	1	N/A
Class 320/4	1	N/A
Class 345	1.0 motoring 0.91 stationary	1.0
Class 717 AC	0.99	1
Class 717 DC	N/A	N/A

### APPENDIX 3: NETWORK RAIL DISTRIBUTION SYSTEM LOSS FACTORS

The table below sets out the Network Rail Distribution System Loss Factor for each traction electricity Geographic Area (g) for the AC System ( $\lambda_{AC}$ ) and the DC System ( $\lambda_{DC}$ ) for the purposes of calculating the Traction Electricity Charge.

<b>ESTA</b>	<b>Traction electricity Geographic Area (g)</b>	<b>Network Rail Distribution System Loss Factor for the AC System (<math>\lambda_{AC}</math>)</b>	<b>Network Rail Distribution System Loss Factor for the DC System (<math>\lambda_{DC}</math>)</b>
M	Merseyside	N/A	0.1156
N	Midland Main Line	0.0423	N/A
O	London Tilbury & Southend	0.0321	N/A
P	Great Eastern	0.0321	0.1701
Q	West Anglia	0.0386	N/A
R	East Coast Main Line South	0.0309	0.1701
A	East Coast Main Line Central	0.0423	N/A
B	East Coast Main Line North	0.0423	N/A
C	East Coast Main Line Leeds	0.0423	N/A
S	Scotland Glasgow	0.0423	N/A
D	Scotland East	0.0489	N/A
E	Scotland North & West	0.0423	N/A
F	Scotland WCML	0.0489	N/A
T	West Coast Main Line South	0.0341	0.1701
G	West Coast Main Line Central	0.0386	N/A
H	West Coast Main Line West Midlands	0.0386	N/A

<b>ESTA</b>	<b>Traction electricity Geographic Area (g)</b>	<b>Network Rail Distribution System Loss Factor for the AC System (<math>\lambda_{AC}</math>)</b>	<b>Network Rail Distribution System Loss Factor for the DC System (<math>\lambda_{DC}</math>)</b>
J	West Coast Main Line North	0.0423	N/A
U	Southern	N/A	0.1701
V	Great Western	0.0386	N/A
L	Western	0.0386	N/A



#### APPENDIX 4: TOLERANCE FACTORS

The table below sets out the Tolerance Factor for train type of Metered Train m.

<b>Train Type</b>	<b>On-Train Energy Measurement Function Tolerance</b>	<b>Tolerance Factor (<math>\delta_m</math>)</b>
Class 313	0.87	0.00
Class 318	TBC	0.00
Class 319	N/A	0.03
Class 320	TBC	0.00
Class 321	0.87	0.00
Class 323	0.87	0.00
Class 350	1.2247	0.00
Class 365	0.87	0.00
Class 375	0.87	0.00
Class 376	0.87	0.00
Class 377	0.87	0.00
Class 380	1.2247	0.00
Class 390	1.4	0.00
Class 442	0.87	0.00
Class 455	0.87	0.00
Class 444	0.87	0.00
Class 450	0.87	0.00
Class 458	0.87	0.00
Class 465	0.87	0.00
Class 466	0.87	0.00
Class 357	1.374	0.00
Class 334	0.6	0.0
Class 456	0.87	0.00
Class 387	0.87	0.00
Class 700 (DC)	0.87	0.00
Class 700 (AC)	1.23	0.00
Class 707	1.58	0.00
Class 318	0.7	0.00
Class 320/0	0.7	0.00
Class 320/4	0.7	0.00
Class 345	0.866	0
Class 717 AC	1.22	0.00
Class 717 DC	1.66	0.00

## APPENDIX 5: THE GEOGRAPHIC AREAS

The table below describes the Geographic Area g for the purposes of Traction Electricity Charge calculations.

ESTA	Traction electricity Geographic Area / Tariff Zone	Description
M	Merseyside	Comprises the Merseyside third rail electrified system between Liverpool, Southport, Ormskirk, Kirkby, Hunts Cross, Ellesmere Port, Chester, New Brighton and West Kirby.
N	Midland Main Line	Comprises the overhead line electrified routes from London St Pancras and City Thameslink to Bedford. There is a link to the East Coast at St Pancras and a planned link to the Gospel Oak to Barking line at Carlton Road Junction.
O	London Tilbury & Southend	Comprises the overhead line electrified London Tilbury and Southend routes from Fenchurch Street to Shoeburyness via Laindon, Rainham and Chafford Hundred; the route between Gas Factory Junction and Bow Junction and the routes from Barking to Forest Gate Junction & South Tottenham.
P	Great Eastern	Comprises the electrified Great Eastern Main Line routes from Liverpool Street to Bow Junction, Upminster, Southend Victoria, Southminster, Braintree, Clacton, Walton-on-Naze, Harwich Town and Norwich; the West Anglia route from Liverpool Street to Hackney Downs station; the Lea Valley Line between Stratford and Coppermill Junction, the ac and dc section of the North London Line route between Stratford and Camden Road and the various interfaces with HS1 & East Coast north of Kings Cross/St Pancras.. There is a boundary with TfL on the curve between Dalston Junction and the North London Line.
Q	West Anglia	Comprises the electrified West Anglia routes from Hackney Downs station to Chingford, Enfield Town, Hertford East, Stansted Airport, Cambridge and Kings Lynn; the electrified route between Cambridge Junction (on the East Coast Main Line near Hitchin) and Cambridge and up to the neutral sections at South Tottenham and Coppermill Junction.

<b>ESTA</b>	<b>Traction electricity Geographic Area / Tariff Zone</b>	<b>Description</b>
R	East Coast Main Line South	Comprises the electrified East Coast Main Line from Kings Cross to the neutral section at Holme (between Huntingdon and Peterborough), the electrified route between Moorgate and Finsbury Park; the electrified route between Canonbury West Junction and Finsbury Park; the Kings Cross Incline between Camden Road East Junction and Freight Terminal Junction, the link to St Pancras Thameslink and the Haringgay link.
A	East Coast Main Line Central	Comprises the electrified East Coast Main Line between the neutral sections at Holme (between Huntingdon and Peterborough), South Kirkby and Hambleton Junction (between Doncaster and York).
B	East Coast Main Line North	Comprises the electrified East Coast Main Line between the neutral sections at Hambleton Junction (between Doncaster and York) and Chathill (between Alnmouth and Belford).
C	East Coast Main Line Leeds	Comprises the electrified East Coast Main Line between the neutral section at South Kirkby and Leeds, Bradford and Skipton.
S	Scotland Glasgow	Comprises the electrified routes in Scotland between the neutral sections at Uddingston, Langloan, Holytown, Motherwell, Midcalder, Auchengray (between Edinburgh and Carstairs), Carstairs, Lochwinnoch, Bishopston and Rutherglen.
D	Scotland East	Comprises the electrified routes in Scotland between the neutral sections at Chathill (between Alnmouth and Belford), Auchengray (between Edinburgh and Carstairs), Midcalder and Haymarket.
E	Scotland North & West	Comprises the electrified routes in Scotland on the North Clyde bounded by the neutral sections at Rutherglen, Uddingston, Langloan, Holytown, Motherwell and Haymarket; the routes from Bishopton neutral section to Gourock & Wemyss Bay and the routes from Lochwinnoch neutral section to Ayr & Largs
F	Scotland WCML	Comprises the electrified routes in Scotland between the neutral sections at Penrith and Carstairs.
T	West Coast Main Line South	Comprises the West Coast Main Line routes from Euston to the neutral sections at Berkswell and Nuneaton; the third rail electrified lines from Euston to Watford Junction; the West London Line to midway between North Pole junction and the Westway Road Bridge; the North London Line between South Acton and

ESTA	Traction electricity Geographic Area / Tariff Zone	Description
		Camden Road; the route between the Primrose Hill tunnels and Camden Road and the route between Gospel Oak and South Tottenham.
G	West Coast Main Line Central	Comprises the West Coast Main Line routes between Nuneaton and Stafford (Whitmore) / Macclesfield (Prestbury) bounded by the neutral sections at Nuneaton, Queensville (Stafford), Whitmore, Kidsgrove and Prestbury. Also from Rugeley to the neutral sections on the Walsall to Bescot and Darlaston curves.
H	West Coast Main Line West Midlands	Comprises the West Coast Main Line routes around Birmingham between the neutral sections at Berkswell & Queensville (Stafford).
J	West Coast Main Line North	<p>Comprises the West Coast Main Line routes between the neutral sections at Whitmore, Kidsgrove, Prestbury and Penrith including the Liverpool and Manchester areas.</p> <p>It will also include all new electrification in the Manchester to Blackpool area and towards Leeds.</p>
U	Southern	<p>Comprises all third rail electrified routes south from Farringdon, Cannon Street, Charing Cross, London Bridge, Waterloo and Victoria, to the Network Rail/Eurotunnel boundary; the Network Rail/HS1 boundaries at Ebbsfleet &amp; Fawkham Jn; the West London Line to the south of North Pole junction and west to Reading, Basingstoke and Weymouth; and the North London Line between Richmond and Acton Central.</p> <p>There are boundaries with TfL at East Putney, Gunnersbury-Turnham Green and New Cross Gate.</p> <p>There are boundaries with non-electrified routes at: Dorchester South Jn, Worgret Jn, Hamworthy, Totton Jn (West), Redbridge Jn, 600m south of Northam Jn, Easleigh East Jn, Worting Jn, Basingstoke GW Jn, Reading Spur Jn.</p> <p>The following routes are not electrified within the above area: Wokingham Jn to Aldershot Jn South; Shalford Jn to Reigate (Level Crossing); Hurst Green Jn to Uckfield; Ore (582935, 111118, ATH 81m 225yds) to Ashford 'd' Jn; Old Kew Jn &amp; New Kew Jn to South Acton Jn; Angerstein Jn to Angerstein Wharf; Hoo Jn to Grain;</p>

<b>ESTA</b>	<b>Traction electricity Geographic Area / Tariff Zone</b>	<b>Description</b>
I	Western West	Comprises the Western routes between Maidenhead, Newbury, Bristol and Bristol Parkway bounded by the neutral sections at Maidenhead and Filton.
V	Western East	Comprises the electrified routes from Paddington to Maidenhead. There will also be neutral sections at Westbourne Park (Crossrail), Old Oak Common (Crossrail Depot).
W	High Speed 1	St Pancras International to Eurotunnel Boundary.
Y	Crossrail	Comprises the electrified routes between the neutral sections at Westbourne Park (Westbourne) and Pudding Mill Lane (Great Eastern) and also within the Old Oak Common Crossrail Depot.
K	South Wales	Comprises the electrified routes from Swansea to the neutral sections at Stoke Gifford / Filton (Western).
L	Western	Comprises the electrified route from Maidenhead to Swindon.
2	Crossrail	Comprises the electrified routes between the neutral sections at Westbourne Park (Western) and Pudding Mill Lane (Great Eastern) and also within the Old Oak Common Crossrail Depot.
3	South Wales	Comprises the electrified routes from Cardiff to the neutral sections at Stoke Gifford / Filton (Western).

**APPENDIX 6: PERCENTAGE LOADING FACTORS**

<b>Number of Electric Multiple Unit(s)</b>	<b>Percentage Loading Factor (%)</b>
1	100
2	192
3	285
4	380
5	475
6	570
7	665
8	760
9	855
10	950