ANNEX 8: MEASURING THE KPI AND BONUSES/MALUSES

1. General

This annex describes how the measurement of each of the KPI relating to the technical requirements 1.2.1, 1.2.2 and 1.2.3 of annex 7 takes place, which data is necessary for this and which verification method is used.

2. Recording accuracy

KPI 1 relating to technical requirement 1.2.1: Recording accuracy - average *"The total number of kilometres recorded on routes to be further determined, made by vehicles with a working OBU shall not differ by more than 4% in urban areas and more than 2% in non-urban areas, including major roads in urban areas, from the actual number of kilometres travelled."*
KPI 2 relating to technical requirement 1.2.2: Recording accuracy - number of cases of over-recording *"The number of vehicles with a working OBU for which the number of recorded kilometres exceed the actual number of kilometres travelled by more than 1.5% in urban areas and 1% in non-urban areas, including major roads in urban areas, must be less than 0.1%."*
KPI 3 relating to technical requirement 1.2.3: Recording accuracy - number of cases of under-recording *"The number of vehicles with a working OBU for which the number of recorded kilometres fall short of the actual number of kilometres travelled by more than 4% in urban areas and 2% in non-urban areas, including major roads in urban areas, must be less than 2%."*

Viapass, in consultation with the toll chargers, will select several routes for which the service provider must compare the distance actually recorded by OBU-proxy combinations with the distance known in advance. The starting point of the verification method is the distance between two fixed enforcement stations, which is known in advance. For each verification period, Viapass will indicate on which routes these KPI must be determined, and will also specify for each route whether this is a route in an urban or non-urban area.

3. Required data

The service provider must organise the system in such a way that sufficient data are available in its *back office* to determine, for all vehicles subject to the charge that have completed a selected route, the distance recorded for that route by the relevant OBU-proxy combination. It is important that this distance, which is used to determine the KPI, is equal to the distance used to invoice the party subject to the charge. The times at which the enforcement stations are passed and the recorded number of kilometres between the two enforcement stations must also be sent by the OBUs to the back office of the service provider. This makes it possible to determine the

plausibility that a vehicle subject to the charge has covered the route in question without any detours.

The aforementioned data must be made available to Viapass or the toll charger if requested, so that the service provider's calculation can be verified.

4. Verification method

A route is designated below with the index i and has an actual length of S_i^A, where the "*A*" stands for actual. An observation of a vehicle is designated with the index j, and the distance recorded by the OBU of vehicle j for route i is designated with S_{ij}^M, where the "*M*" stands for measurement.

The following steps must be performed once for routes in urban areas and once for routes in non-urban areas:

1. Using the data from the OBU-proxy combination, the service provider searches for a observed vehicle j that has passed both stations of a particular route i, and for which it is plausible that the vehicle completed this route without detours or stops. This plausibility can be determined based on the average speed of the vehicle between the two stations, taking into account the traffic conditions. If a certain vehicle is observed multiple times, all observations shall be taken into account.
2. Based on the data provided by the OBU-proxy combination of vehicle j the service provider determines the distance recorded on route i: S_{ij}^M. This must be done by using the same data and the same algorithms which were used to invoice the party subject to the charge.
3. This must be repeated for *all* routes specified by Viapass and for *all* observations of vehicles that can be found by using the procedure in step 1 (N_i observations for route i), where

    a. the total distance recorded $S_{tot}^M = \sum_{ij} S_{ij}^M$ is calculated by summing over all routes and vehicles found. This total distance may not deviate from the actual total distance $S_{tot}^A = \sum_i N_i S_i^A$ (summing over all routes) by more than indicated by the KPI - the requirement is therefore that $\frac{|S_{tot}^A - S_{tot}^M|}{S_{tot}^A} \leq 4\%$ for urban areas and $\frac{|S_{tot}^A - S_{tot}^M|}{S_{tot}^A} \leq 2\%$ for non-urban areas (KPI 1);
    b. it is counted how many recorded distances, out of a total number of $N = \sum_i N_i$, **exceed** the actual distance by more than 1.5% for an urban route or more than 1% for a non-urban route (i.e. vehicles for which $\frac{S_{ij}^M - S_i^A}{S_i^A} > 1{,}5\%$ or 1%) - this number is called *M1*.
    This number must be less than indicated by the KPI – so the requirement is that $\frac{M1}{N} < 0{,}1\%$ (KPI 2);
    c. it is counted how many recorded distances **fall short of** the actual distance by more than 4% for an urban route or 2% for a non-urban route (i.e. vehicles for which $\frac{S_i^A - S_{ij}^M}{S_i^A} > 4\%$ or 2%) - this number is called *M2*.

This number must be less than indicated by the KPI – so the requirement is that $\frac{M2}{N} < 2\%$ (KPI 3);

Frequency

- During the daily operation of the kilometre charging system, the measured data are generated automatically, so measurements can be taken continuously on the routes chosen by Viapass. The results are reported with a frequency to be agreed upon with Viapass.

Numbers

- All routes selected by Viapass must be taken into account.
- All vehicles registered with the service provider, subject to the charge, equipped with an OBU and driving on a selected route must be taken into account.

5. Specific bonus/malus relating to the technical requirements 1.2.1, 1.2.2 et 1.2.3 of annex 7

a. Bonus/malus relating to technical requirement 1.2.1 (Annex 7)

<u>Bonus/Malus</u>:

A malus will be awarded in case the service provider records the travelled kilometers less accurately than the maximum inaccuracy laid down in the KPI. A bonus will be awarded in case the service records the travelled kilometers more accurately than the maximum inaccuracy laid down in the KPI.

Refer to the measuring method laid down hereunder:

- Define D_u to be the value measured for the deviation $\frac{|S_{tot}^A - S_{tot}^M|}{S_{tot}^A} * 100$ for urban areas in the quarterly period concerned.
- Define $D_{n\text{-}u}$ to be the value measured for the deviation $\frac{|S_{tot}^A - S_{tot}^M|}{S_{tot}^A} * 100$ for non-urban areas in the quarterly period concerned.
- DefineT_u to be the revenues of the service provider pursuant to the collection of kilometer charge in urban areas in the toll domains of all Belgian toll chargers in the quarterly period concerned.
- Define$T_{n\text{-}u}$ to be the revenues of the service provider pursuant to the collection of kilometer charge in non-urban areas in the toll domains of all Belgian toll chargers in the quarterly period concerned.
- Define the graduated scale S_u for urban areas as follows:

  $S_u = 1/30$ if $|D_u - 4| < 1$;
  $S_u = 2/30$ if $1 \leq |D_u - 4| < 2$;
  $S_u = 1/10$ if $2 \leq |D_u - 4| < 3$;
  etcetera
- Define de graduated scale $S_{n\text{-}u}$ for non-urban areas as follows:

  $S_{n\text{-}u} = 1/30$ if $|D_{n\text{-}u} - 2| < 1$;
  $S_{n\text{-}u} = 2/30$ if $1 \leq |D_{n\text{-}u} - 2| < 2$;
  $S_{n\text{-}u} = 1/10$ if $2 \leq |D_{n\text{-}u} - 2| < 3$;
  etcetera

where |x| is indicating the absolute value of x.
Both graduate scales are valid both in case of a malus and in case of a bonus.

The bonuses or maluses BM_u for urban areas and BM_{n-u} for non-urban areas are calculated as follows:

$$F_u = S_u * (D_u - 4)$$

$$F_{n-u} = S_{n-u} * (D_{n-u} - 2)$$

$$BM_u = 5 * \frac{T_u}{100} * F_u$$

$$BM_{n-u} = \frac{T_{n-u}}{100} * F_{n-u}$$

If BM_u is a positive number, a malus in the amount of BM_u will be awarded.
If BM_{n-u} is a positive number, a malus in the amount of BM_{n-u} will be awarded.
If BM_u is a negative number, a bonus in the amount of 1/10 * $|BM_u|$ will be awarded.
If BM_{n-u} is a negative number, a bonus in the amount of 1/10 * $|BM_{n-u}|$ will be awarded.

b. Malus relating to technical requirement 1.2.2 (Annex 7)

<u>Malus:</u>
A malus will be awarded in case the service provider records the travelled kilometers less accurately than the maximum inaccuracy laid down in the KPI. For this KPI a bonus will never be awarded.

Refer to the measuring method laid down hereunder:

- Define D_u to be the value measured for the deviation $\frac{M1}{N} * 100$ for urban areas in the quarterly period concerned.
- Define D_{n-u} to be the value measured for the deviation $\frac{M1}{N} * 100$ for non-urban areas in the quarterly period concerned.
- Define the graduated scale S_u for urban areas as follows:
  $S_u = 1/30$ if $|D_u - 0{,}1| < 0{,}02$;
  $S_u = 2/30$ if $0{,}02 \leq |D_u - 0{,}1| < 0{,}04$;
  $S_u = 1/10$ if $0{,}04 \leq |D_u - 0{,}1| < 0{,}06$;
  etcetera
- Define the graduated scale S_{n-u} for non-urban areas as follows:
  $S_{n-u} = 1/30$ if $|D_{n-u} - 0{,}1| < 0{,}02$;
  $S_{n-u} = 2/30$ if $0{,}02 \leq |D_{n-u} - 0{,}1| < 0{,}04$;
  $S_{n-u} = 1/10$ if $0{,}04 \leq |D_{n-u} - 0{,}1| < 0{,}06$;
  etcetera

where |x| is indicating the absolute value of x.

- Define T_u to be the revenues of the service provider pursuant to the collection of kilometer charge in urban areas in the toll domains of all Belgian toll chargers in the quarterly period concerned.
- Define T_{n-u} to be the revenues of the service provider pursuant to the collection of kilometer charge in non-urban areas in the toll domains of all Belgian toll chargers in the quarterly period concerned.

The maluses M_s for urban areas and M_{n-s} for non-urban areas are calculated as follows:

$$F_u = S_u * (D_u - 0{,}1)$$

$$F_{n-u} = S_{n-u} * (D_{n-u} - 0{,}1)$$

$$M_u = 200 * \frac{T_u}{100} * F_u$$

$$M_{n-u} = 40 * \frac{T_{n-u}}{100} * F_{n-u}$$

If M_u is a positive number, a malus in the amount of M_u will be awarded.
If M_{n-u} is a positive number, a malus in the amount of M_{n-u} will be awarded.
If M_{n-u} or M_u is a negative number, no malus will be awarded.

c. Malus relating to technical requirement 1.2.3 (Annex 7)

<u>Malus:</u>
A malus will be awarded in case the service provider records the travelled kilometers less accurately than the maximum inaccuracy laid down in the KPI. For this KPI a bonus will never be awarded.

Refer to the measuring method laid down hereunder:

- Define D_u to be the value measured for the deviation $\frac{M2}{N} * 100$ for urban areas in the quarterly period concerned.
- Define D_{n-u} to be the value measured for the deviation $\frac{M2}{N} * 100$ for non-urban areas in the quarterly period concerned.
- Define the graduated scale S_u for urban areas as follows:
  $S_u = 1/30$ if $|D_u - 2| < 1$;
  $S_u = 2/30$ if $1 \leq |D_u - 2| < 2$;
  $S_u = 1/10$ if $2 \leq |D_u - 2| < 3$;
  etcetera
- Define the graduated scale S_{n-u} for non-urban areas as follows:
  $S_{n-u} = 1/30$ if $|D_{n-u} - 2| < 1$;
  $S_{n-u} = 2/30$ if $1 \leq |D_{n-u} - 2| < 2$;
  $S_{n-u} = 1/10$ if $2 \leq |D_{n-u} - 2| < 3$
  etcetera
  whereby |x| is indicating the absolute value of x.

- Define T_u to be the revenues of the service provider pursuant to the collection of kilometer charge in urban areas in the toll domains of all Belgian toll chargers in the quarterly period concerned.
- Define T_{n-u} to be the revenues of the service provider pursuant to the collection of kilometer charge in non-urban areas in the toll domains of all Belgian toll chargers in the quarterly period concerned.

The maluses M_u for urban areas and M_{n-u} for non-urban areas are calculated as follows:

$$F_u = S_u * (D_u - 2)$$

$$F_{n-u} = S_{n-u} * (D_{n-u} - 2)$$

$$M_u = 5 * \frac{T_u}{100} * F_u$$

$$M_{n-u} = \frac{T_{n-u}}{100} * F_{n-u}$$

If M_u is a positive number, a malus in the amount of M_u will be awarded.
If M_{n-u} is a positive number, a malus in the amount of M_{n-u} will be awarded.
If M_{n-u} or M_u is a negative number, no malus will be awarded.

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