EasyGo quality system

Annex 3.7 to
Joint Venture Agreement
Toll Service Provider Agreement

Document: 307
Version: 2.0
Date: 12 May 2016

Table of contents

Document Revision History

Version	Date	Author	Main changes
1.0	05.05.2014	Arild Skadsheim	Approved on the 4/4 ESC meeting with comments
1.1	02.05.2015	Arild Skadsheim	Revision of KPIs including harmonisation with REETS New chapter "Quality management" Revision of structure and numerous minor changes
2.0	12.05.2016	Arild Skadsheim	Approved by ESC

1 EasyGo vision and objectives

The EasyGo steering committee (ESC) has adopted the following vision for the EasyGo service:

"Tolling as easy as it goes"

From this vision the following main objectives have been identified:

	Type of objective	Objective
A	The user perspective	*The EasyGo service shall be of high quality and attractive to the service users*
B	The efficiency perspective:	*The operation of the EasyGo service shall be as efficient as possible to avoid loss of income and minimize operational cost*
C	The authority and policy perspective:	*The EasyGo service shall adapt to national and European legislation and standardisation* & *The EasyGo partners shall continue to be pioneers in the field of tolling and influence the development of the European tolling service.*

Each of these objectives have been analysed to identify which factors and conditions influence our ability to achieve these objectives. The following results are considered the most important:

A	***The EasyGo service shall be of high quality and attractive to the users***

	The following factors are important to reach this objective:
	• Good customer service
	• Minimize errors
	• Adequate data protection
	• A secure service trusted by the user
	• Automatically get the best price
	• No need for additional / local contracts
	• The service is easy to understand / use
	• Clear rules for the users
	  ○ Correct registration of vehicle data
	  ○ Correct mounting of OBE
	  ○ Act according to rules stated by TSP and TCs

B	***The operation of the EasyGo service shall be as efficient as possible to avoid loss of income and minimize operational cost***

	The following factors are important to reach this objective:
	• Secure income
	• Minimize losses
	  ○ Correct registration of data / contract
	  ○ Correct detection of OBE
	  ○ Back-up solutions
	  ○ Effective collection from unequipped users
	  ○ Quality of data interfaces
	  ○ Quality of invoices
	• Optimize costs
	  ○ Equipment
	  ○ Maintenance
	  ○ Operation
	  ○ Fees (Issuer fee, VLPR etc.)
	• Ability to improve
	  ○ Monitoring
	  ○ Benchmarking
	  ○ Best practice

C	***The EasyGo service shall adapt to national and European legislation and standardisation*** ***&*** ***The EasyGo partners shall continue to be pioneers in the field of tolling and influence the development of the European tolling service***
	The following factors are important to reach this objective: • Knowledge of national and EU legislation • Participation (with papers) at conferences • Participation in European projects and standardisation groups • Dialogue with countries / regions that may be new EasyGo TCs • Producing and making available information about EasyGo • Understand business case of electronic tolling • Readiness to include new TSPs • Harmonize opinions inside EasyGo towards third parties

This document mainly handles objectives A “The user perspective” and B “The efficiency perspective”.

Regarding “The user perspective” mainly factors related to customer service are included. Beyond this, this document does not define any KPIs for objectives A and C.

The remaining factors of “the user perspective” are handled by WG3 while ESC handles factors related to objective C: “The authority and policy perspective”.

2 EasyGo quality system

2.1 Introduction

The EasyGo service has been established to make it easier for users to travel between countries and make the collection of tolls as effective as possible for the Toll Chargers (TCs).

This document describes the quality system for the EasyGo service. It describes responsibility for quality, Key Performance Indicators (KPIs), reporting and procedures.

The document is primarily intended for TCs and TSPs (Toll Service Providers). and states the requirements put on each of them to ensure a good or at least an acceptable quality of the EasyGo operation.

2.2 Key performance indicators

Key Performance Indicators (KPIs) have been defined for TCs, TSPs and for the EasyGo HUB. KPIs are monitored by each TC, TSP and EasyGo Management (EM) and compared against two levels as shown below:

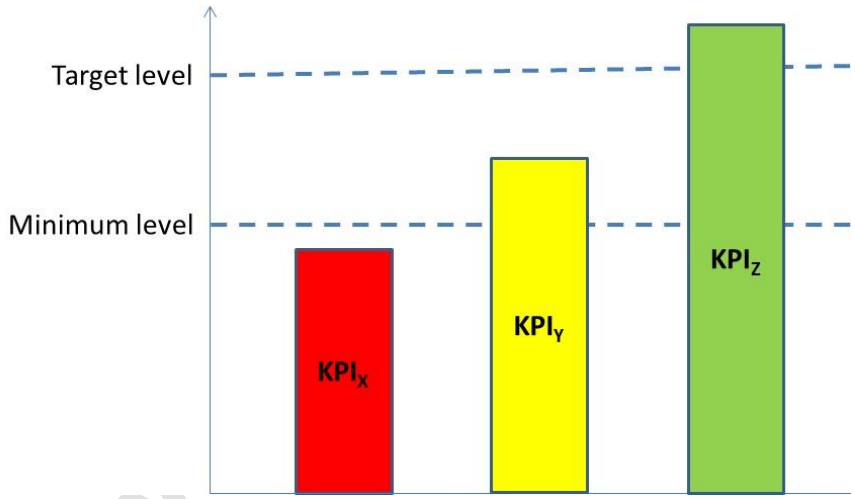


Fig 1 Key Performance Indicator levels

- The "*Minimum level*" constitutes the agreed minimum service level within EasyGo

  Note that the agreed level in some cases can be a maximum level ("the error rate should not be higher than…") and in other cases a minimum level ("the detection rate shall not be lower than…"). For practical reasons, however, both are in this document generally referred to as the min/max level.

- The "*Target level*" expresses a service level beyond the min/max level which the EasyGo actors will try to achieve. Measures to increase the service level may be agreed between EM and individual (or group of) actors.

The table on the next page shows the 14 KPIs currently defined for the EasyGo service. Each KPI is described in detail in Appendix 1 (chapter 4). These KPIs represent important parameters in the daily operation of the EasyGo service and they will all be monitored. Follow-up will, however, focus on those KPIs that at any given time are outside the min/max levels.

No	KPIs - A description of each KPI can be found in appendix 1	Actor being monitored	Min / max level	Target level	Av[1]	To be reported by	Auto/ man	To be reported to
1	DSRC OBE (On Board Equipment) Error Ratio	TSP	See chapter 4.1	0.8 %[2]	-	TC + HUB	Auto/man	EM, TSP
2	DSRC RSE (Road Side Equipment) Error Ratio	TC	See chapter 4.2	0.8 %	-	TC / TSP + HUB	Auto/man	EM, TC
3	The time it takes for a TC to submit EasyGo transactions (C1) to a TSP	TC	30 days	Next day	1	HUB	Auto	EM, TC
4	Video based transactions (C8) • The number / share of video based transactions (C8) by any TC • The time it takes for a TC to submit C8 transactions to the TSP	TC	90 days	15 days	18-33	HUB	Auto	EM, TC
5	Incorrect video transactions (C7) • The number / share of transactions where a missed reading of a valid OBE is not corrected based on HGV list (/white list) when it should have been • The time it takes from passage until a video transaction invoiced directly from the TC or via an EDC, has been corrected and sent to the TSP as a C7 transaction	TC (NO, SE, DK)	180	60	103	HUB	Auto	EM, TC
6	The number / share of transactions where the TC does not follow up on a decision to replace an invoice directly from a TC or via an EDC, with an EasyGo transaction (C7)	TC (NO, SE)				TSP	Man	TC, EM
7	The time it takes from a passage until a (presumed) non-equipped user has received an invoice directly from a TC or via an EDC	TC	< 1 % exceeds 180 days	120 days		TC	Man	EM
8	The percentage of records which have to be rejected by the TSP during the processing of TIF files	TC	1 %	0 %	< 0.1 %	TSP/HUB	Auto	EM, TC
9	Verify that file transmissions between the EasyGo HUB and TCs/TSPs takes place in due time	EM, TC, TSP	< 1 % exceeds 48 hours	0 %	< 0.1 %	HUB	Auto	EM, TC/TSP
10	Monitor if files sent between the EasyGo HUB and TCs/TSPs are correct or not (validation lists, transaction files etc.)	TC, TSP	????	0 %	1 %	EM/HUB	Auto	EM, TC/TSP
11	The percentage of records which have to be rejected by the EasyGo HUB during the processing of local NAT and HGV-files (validation files)	TSP	5 %	0 %	3 %	HUB	Auto	EM, TSP
12	Quality of the personalisation of OBEs and the data entered into the HGV-list done by the TSP	TSP	2 %	0 %		TC	Man	TSP, EM
13	The percentage of enforcement support requests which have been answered by the TSP within an agreed time limit	TSP	< 1 % exceeds 72 hours	0 %		TC	Man	EM, TSP
14	The time it takes from a Service User (SU) makes a complaint till he receives an answer	TC / TSP	9 days	6 days		TSP	Man	EM

Table 1 Key Performance Indicators

[1] Average across all EasyGo TCs and / or TSPs during the last 12 months - filled in with data from the EasyGo HUB
[2] The max level for KPI_1 is defined by each TC while the target level is for EasyGo as a whole

2.3 EasyGo transactions and quality

An important part of the quality of the EasyGo service is related to the processes taking place from the moment a vehicle passes a charging point until collection has taken place. As a basis for a common understanding figure 2 describes alternative processes depending on available information and status of contract etc.:

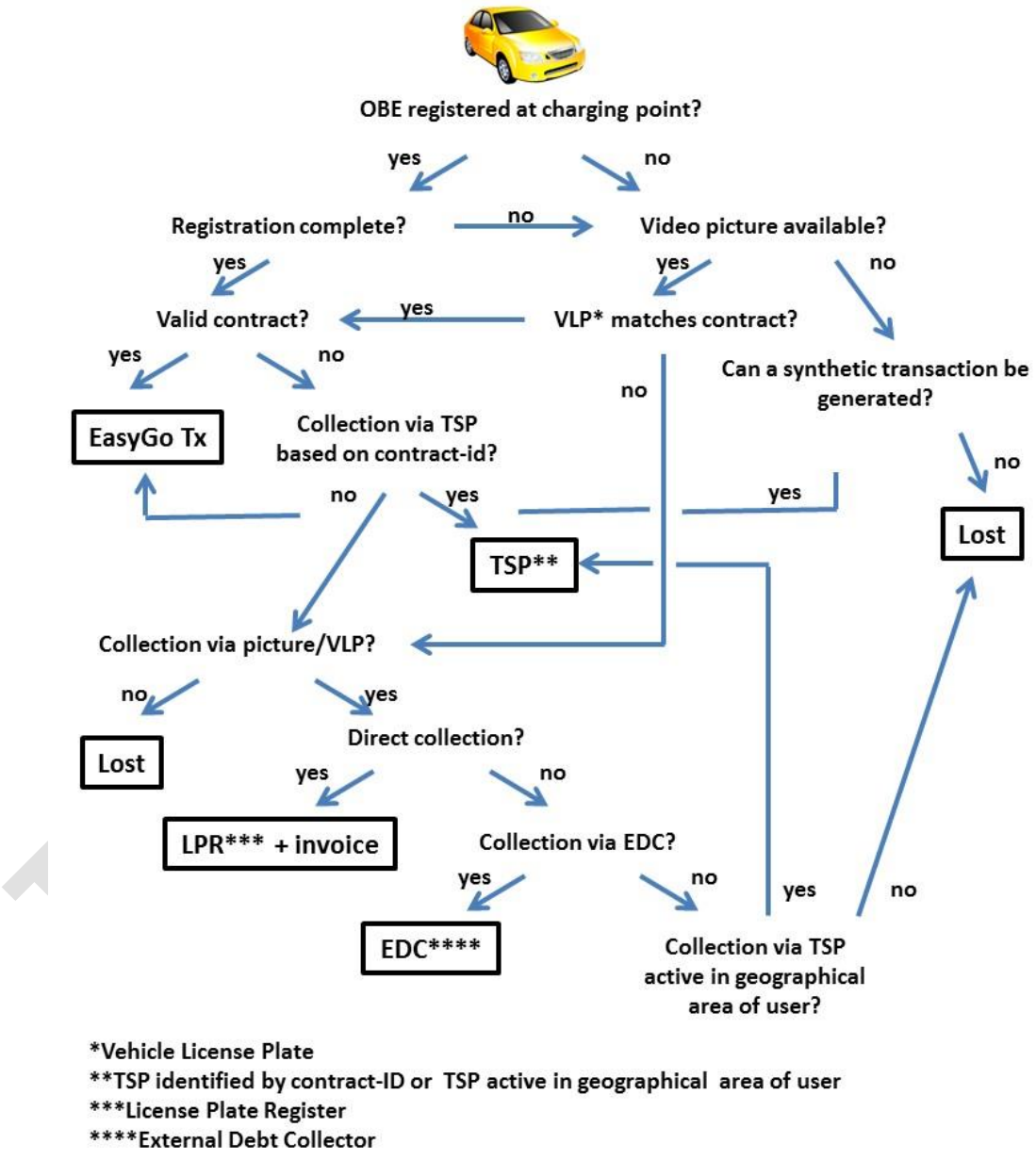


Fig 2 Processing of transaction data

Not all alternatives are shown in figure 2. The most important not shown are:

- In toll domains where OBEs are mandatory, the lack of a complete / correct transaction will automatically lead to an enforcement situation if detected by enforcement equipment (if a transaction cannot be deduced from an incomplete transaction or a reconstructed transaction can be generated or the user retroactively paid for the missing transaction)
- In barrier operated systems the lack of registration and lack of picture will not lead to a lost transaction as the vehicle will remain in the lane until the situation is solved (manual entry of OBE-ID, alternative payment etc.)
- In some toll domains it is possible for the user to make a retroactive payment at points of sale or via internet if an error occurs
- In Austria, if a transaction is incomplete, an attempt is made to reconstruct the transaction
- Reconstructed transactions can in some cases be generated without the need for pictures as shown in figure 3

A vehicle with an OBE (or registered contract) may generate one of the following types of transactions:

Transaction name	**EasyGo code**	**Description**	**Normal usage**
TX_{comp}	C1	A complete and correct registration of an OBE generates an EasyGo transaction	All TCs
TX_{incomp}	C6	The OBE is read but the reading is incomplete. • In some cases the SU can be identified by the data from the incomplete reading and an EasyGo transaction can be constructed • In some cases it is not possible to reconstruct an EasyGo transaction The differentiation of C6 into the two groups (above) can be done in position 349-352 in the TIF file.	AT
TX_{vid1}	C8	Video based transaction type 1. The VLP is read and matches a contract and an EasyGo transaction is generated	All TCs
TX_{vid2}	C7	Video based transaction type 2. The VLP is registered but a matching contract is not found (for several reasons). The SU is invoiced, directly by the TC or via external debt collector, and complains as he states he had a contract at the time of passage. The invoice is credited and converted into an EasyGo transaction.	Toll systems in NO, DK and SE
TX_{rec}	C4	A reconstructed EasyGo transaction is generated in the event of gaps between two correct tolling transactions (following a plausibility check of the driving time) (see figure 3) A reconstructed transactions is sometimes referred to as a synthetic transaction	AT
TX_{bar}	C2	A manual entry of OBE-ID in a barrier operated system	Barrier systems

Table 2 Types of transactions

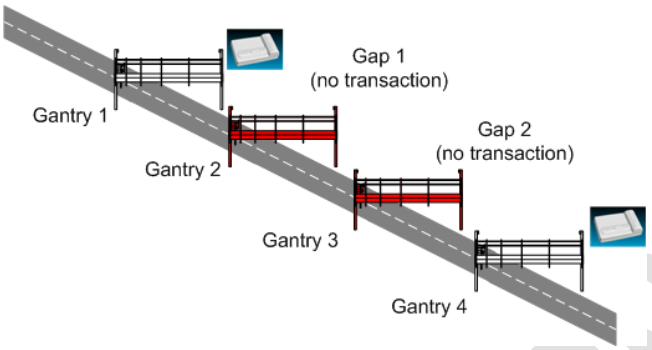


Fig 3 Generating reconstructed transactions

The total number of transactions is:

$$\mathbf{TX_{tot} = TX_{comp} + TX_{incomp} + TX_{vid1} + TX_{vid2} + TX_{rec} + TX_{bar}}$$

Additional transactions are being generated when vehicles with OBE/contract enter lanes or toll stations that are not equipped with DSRC antennas and a manual registration takes place. These transactions are not included in the TX_{tot} because they would influence the error ratio without cause (correct readings are not possible when there is no antenna)

There may also be additional passages where neither OBE has been read nor vehicle registered by video but as these cannot be registered they are considered as lost transactions and are therefore not included in the calculations.

Errors may occur ($\mathbf{TX \neq TX_{comp}}$) from one of the following causes:

- The OBE is not correctly mounted:

  The SU has not mounted the OBE, removed the OBE from the vehicle, mounted the OBE in an incorrect manner or shielded the OBE to prevent correct reading

- The OBE is not working correctly:

  The OBE has a technical error or the battery is discharged

- The RSE is not working correctly

  The antenna or other parts of the road side equipment have a technical error (e.g. configuration errors, equipment malfunction etc.), have been wrongly installed or been subject to external influence preventing correct functionality (antenna out of position, weather conditions etc.)

Errors made by the SU are impossible to detect or measure precisely as it will result in one of the types of transactions: $\mathbf{TX_{incomp}}$, $\mathbf{TX_{vid1}}$, $\mathbf{TX_{vid2}}$, $\mathbf{TX_{rec}}$ or $\mathbf{TX_{bar}}$. The SU should, when misreadings are detected, be informed that his OBE has not been correctly read and measures should be taken to ensure correct mounting or the replacement of the OBE. To

limit other types of errors the OBEs and the RSE shall be monitored regarding reading quality. Specific KPIs have been defined for this purpose.

2.4 Quality of OBEs and road side equipment

The reading quality when an OBE passes a RSE depends to a large extent on the quality of the OBEs (KPI_1) and the quality of the road side equipment (KPI_2). It is necessary to comment these two KPIs explicitly as they are strongly interrelated. It is not possible to define the quality of one or the other in one single measurement. The relative quality of the OBEs and the RSE can, however, be analysed by the following approach:

- The relative quality of OBEs is analysed by comparing different populations of OBEs being read at the same RSE (fig 4)
- The relative quality of the RSE is analysed by comparing the same population of OBEs read at multiple RSE (fig 5)

There are additional reasons than the quality of the OBEs and RSE that influence the overall reading quality such as correct mounting of OBEs in the vehicles, weather conditions etc. The significance of such influence is eliminated by comparing the reading performance to a reference group. This approach therefore gives a strong indication of the quality of a group of OBEs or individual RSEs, as long as comparisons are based on large volumes of transactions under equal conditions.

The principles how this is done are shown below.

KPI_1 – DSRC OBE Error Ratio

The relative quality of OBEs is analysed in the following manner:

1. The TC defines a reference group of OBEs, which is used as a basis for comparison. The selection of reference group should include a large volume to limit random variation.
2. The relative quality of other OBEs is found by comparing the quality of these OBEs to the quality of the reference group when they pass through the same (one or more) RSE(s)

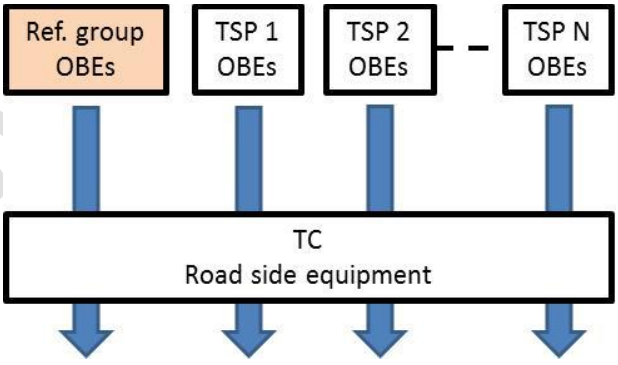


Fig 4 Comparing OBEs from different TSPs with reference group

The following should be noted:

- Monitoring and comparison can be done:
  - By the TC to verify quality of OBEs in a TSP agreement
  - By EM to monitor the overall quality of OBEs being used as a part of the EasyGo service
- The reference group of a TC will often consist of OBEs from one or several local TSPs and the EasyGo HUB only has data related to EasyGo transactions. It is therefore important that the TC reports the result of the reference group on a monthly basis to ensure that the performance of the reference group can be included in the calculation of the KPIs.
- TSPs may have different types/generations of OBEs which will give different results. The measurements made at the RSE are therefore valuable input to the TSP to enable him to replace groups of OBEs with low performance.

KPI_2 – DSRC RSE Error Ratio

The relative quality of RSEs can be determined by monitoring the same population(s) of OBEs across several RSEs as shown in the illustration below.

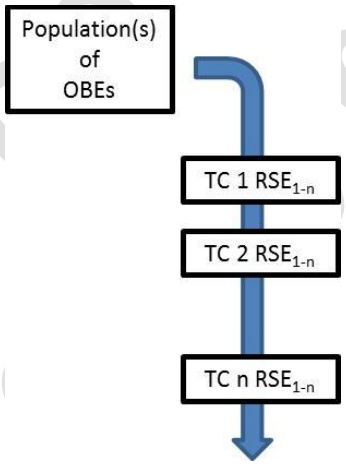


Fig 5 Comparing RSEs at different TCs by reading the same population(s) of OBEs

Summarised, the following should be noted (for KPI_1 and KPI_2):

- The reading results may be influenced by weather conditions, on-going construction work etc. and it is therefore important to compare these results with the reading quality of the reference group described for evaluation of OBE quality
- The TC shall report to EM how his reference group of OBEs are read at his RSEs
- The TSP can check how his group of OBEs are read at different TCs / RSEs. He can also check how his OBEs are read compared to the reference group of the TC but he cannot compare his OBEs to OBEs from other TSPs

- EasyGo can only monitor transactions being sent via the EasyGo HUB. It is therefore important that TCs and TSPs cooperate with EasyGo if there are doubts concerning a quality issue.
- It is the responsibility of the TC to continuously monitor the quality of his RSEs while it is the responsibility of the EasyGo management to analyse the quality of RSEs across TCs

The description of how these principles are used in KPI_1 and KPI_2 can be found in Appendix 1 which describes all KPIs in detail.

3 Quality management

3.1 Responsibility for quality

Each TC and TSP as well as EM shall appoint contact persons responsible for quality. The responsibilities of these persons are:

- To be the link between EM and the TC/TSP in all matters related to quality
- To make sure that all agreed quality reports are submitted in time and with the correct content
- To be the contact point if quality is not according to agreement or issues need to be clarified
- Monitor that quality reports are received from all relevant actors (as stated in KPI overview) and check if any of these quality reports indicate KPIs below minimum level and, if so, initiate action as described in chapter 3.4
- To follow up on quality issues and actions as required

In Norway NPRA is responsible for handling quality issues on behalf of the Norwegian TCs and TSPs

3.2 Reporting of quality data

The following principles apply for reporting of quality data:

- Data shall be reported by the individual TC and TSP according to the definition of the individual KPI described in appendix 1 “Key Performance Indicators”. Data available in the EasyGo HUB does not have to be reported by the TCs and TSPs.
- Reports shall be produced according to templates shown in Appendix 2 (chapter 5)
- Reports shall be submitted to recipients identified in the KPI overview (chapter 2.2), by e-mail as well as included in the operational report sent to the EasyGo Steering Committee

3.3 Analyses

It is the responsibility of each actor to:

- Collect and assess relevant reports
- Detect and follow up on missing and/or faulty reports including checking that data generated by the EasyGo HUB for the actor himself is correct
- Compare the reports from relevant TCs and TSPs and the EasyGo HUB with agreed KPI levels
- Follow up reports from actors where there are issues to be discussed (lack in reporting, not meeting KPIs, worrisome developments, positive developments etc.)

Specifically, it is the responsibility of EM to:

- Analyse developments across the service. This may include:

- The reading quality of OBEs (from individual TSPs) across a number of TCs/RSEs. If overall statistics shows that one TSP has a generally higher error ratio than others or reference group, this must be followed up (KPI_1)
- Compare reading of comparable populations of OBEs at the same RSE to evaluate the quality of the RSE (KPI_2)

- Produce feedback for individual TCs and TSPs and follow up actions from TCs and TSPs where minimum KPI levels are not met

3.4 Procedures when KPIs are outside min/max levels

1. It is the responsibility of each TC, TSP and EM to monitor their own systems and to analyse the reports produced by EM and:
    a. When an actor detects an error or KPI outside min/max level in his own system he shall without delay, and latest within 5 working days after an error has been detected, confirm to EM / Administrative support and to relevant TCs and / or TSPs influenced by the error, by e-mail that they have an error or KPI outside min/max levels
    b. When an actor detects an error or KPI outside min/max level in the system of another actor, he shall without delay, and latest within 5 working days after an error has been detected, point this out to EM / Administrative support and relevant TCs and / or TSPs influenced by the error by e-mail
    c. EM / Administrative support shall follow up on such cases, evaluate the "situation" and may advise on how to progress and who to involve
2. The TC, TSP or EM with an error or KPI outside min/max levels shall as soon as possible and latest 10 working days after the error was detected / notified, prepare a plan in writing how to correct the error and present the plan to EM / Administrative support and relevant TCs / TSPs. The plan shall include:
    a. Description of error and possible consequences of the error
    b. Description of proposed solution and contact person(s)
    c. Time schedule incl. latest date for correction
    d. Cooperation with other actors required to correct the error
3. In addition to the immediate notification specified in points 1 and 2 above, the parties shall present status of their "KPI-issues" at all EM meetings until errors are corrected
4. EM shall, in their meetings, monitor all reported errors / KPIs and make sure that procedures are followed and that plans are adequate
5. EM shall maintain an overview of all open "KPI-issues" and report status of "KPI-issues" in their operational report to the ESC

3.5 Consequences of KPIs outside min/max levels

This chapter shall describe two main issues:

- It is important that the actors in EasyGo have a joint understanding of the consequences of inadequate quality in equipment and procedures – for themselves, for the users, for other TCs and TSPs as well as the EasyGo service as a whole
- The bilateral agreements between TCs and TSPs need to be based upon agreed service levels and some form of penalisation may be considered if the agreed service levels are not met

These issues will be included in the document at a later stage.

3.6 Quality status and trends

It is the responsibility of the EM to consolidate and present the conclusions from the quality monitoring as it is described in chapters 3.2 – 3.4. EM shall include quality reporting in the operational report being presented to the ESC at regular intervals / in advance of the ESC meetings. The QA reporting should include the following:

- Statistics for the overall EasyGo service
- Value and trends of:
    - Traffic volume
    - Share of OBEs
    - Number and value of EasyGo transactions
- Accumulated developments of all KPIs (What is the overall trend of each EasyGo KPI?)
- Report where KPIs are not met and where developments of interest are taking place
- Status of actions already initiated
- Recommended new actions

It is important that all actors in EasyGo receive information about quality issues for them to be able to contribute to an improved service. The general parties will receive relevant information through their representatives in the ESC and EM. Limited parties and TSPs shall receive a resume of the minutes from the meetings in the ESC and the operational report.

3.7 Continuous quality improvement

In addition to the monitoring and follow-up of quality issues as described in chapters 3.1 – 3.6 there is a need to ensure long term quality. This shall be achieved by the following actions/responsibilities:

- EM shall continuously evaluate the KPIs of EasyGo if they are no longer required, needs to be changed or if new ones are required
- EM shall produce a quality plan every 12 months (the plan shall follow the calendar year) including the following:
    - Definition of quality goals for the coming 12 months including overall actions to be undertaken to achieve these goals

    - Reporting of what has been achieved during the last 12 months compared to the goals defined 12 months ago

  The plan shall be approved by ESC before implementation
- EM shall arrange regular quality workshops with participation from TCs and TSPs. The main goals of these workshops are:
    - Ensure that the participants have a common understanding of the quality system in EasyGo
    - Discuss concrete quality issues of common interest
    - Motivate benchmarking and best practice to allow the parties to learn from each other
- The EasyGo service offers a unique possibility for TCs and TSPs to learn from each other and improve the efficiency and customer relations of their service. EasyGo actors are therefore encouraged to explore possibilities for cooperation regarding quality issues beyond what is described in this document.

4 Appendix 1 – Key Performance Indicators

4.1 DSRC OBE Error Ratio

KPI_1	**DSRC OBE Error Ratio**	
The intention of the KPI	KPI_1 seeks to monitor the Error Ratio of OBEs from any TSP by comparing them to a defined reference group of OBEs	
Description of process	If an OBE is not (correctly) read at the RSE it may be an error caused by the OBE,the Service User or by the RSE. The DSRC Error Ratio related to OBEs is deduced by comparing how populations of OBEs from different TSPs are read at the same RSE/TC(s). See "Definition of KPI" below and chapter 2.4	
Actor(s) being monitored	TSP	
Definition of KPI	KPI_1 is calculated in the following way: 1. Each TC[3] defines its own reference group 2. The TC calculates the Error Ratio from this reference group (see also chapter 2.2) $$\textbf{DSRC OBE Error Ratio}_{REF} = \textbf{Ref}((TX_{incomp} + k_1 * TX_{vid1} + TX_{vid2} + TX_{rec} + TX_{bar}) / TX_{comp})$$ The factor "k_1" is used in Austria to compensate that not all toll gantries have video equipment. k_1 = Number of toll gantries / Number of toll gantries with video equipment k_1 is currently 4.5 in Austria. This factor will be adjusted annually if necessary. For other EasyGo TCs k_1 = 1.0 as all charging points are equipped with video equipment. 3. Each TC defines the maximum Error Ratio allowed for any EasyGo TSP as : $$\textbf{DSRC OBE Error Ratio}_{MAX} = k2 * \textbf{DSRC OBE Error Ratio}_{REF}$$ **where k_2 is defined by the TC** 4. Every TC shall inform TSPs and EM about the values of his formula and describe his reference group (TSP, volume, types of OBEs, production year etc.) 5. Every TC shall compare OBEs from individual TSPs to the reference group and report the following KPI: $$KPI_{1X} = \textbf{DSRC OBE Error Ratio}_x / \textbf{DSRC OBE Error Ratio}_{MAX}$$ ..where x represents the individual TSP.	
Data required / delivered by:	Description of reference group (TSP(s) and volume and types of OBEs per TSP)	TC
	Value of k_1 = Number of toll gantries / Number of toll gantries with video equipment	TC
	DSRC OBE Error Ratio reference group **DSRC OBE Error Ratio** $_{REF}$	TC
	Values in formula $\textbf{DSRC OBE Error Ratio}_{MAX} = k_2 * \textbf{DSRC OBE Error}$	TC

[3] or association of TCs

KPI_1	**DSRC OBE Error Ratio**	
	$Ratio_{REF}$	
	Error rate per TSP **Error $Ratio_x$** (where x represents the individual TSP)	TC
	Average detection ratio for <u>all</u> OBEs from all TSPs incl. local OBEs **Σ DSRC OBE Error $Ratio_x$** This error ratio is only calculated / reported for EasyGo basic.	TC
Calculation and reporting	The TC shall calculate **KPI_{1X} = DSRC OBE Error $Ratio_X$ / DSRC OBE Error $Ratio_{MAX}$** where x represents the individual TSP The TC shall inform TSPs and EM of the following: • Description of reference group (TSP(s) and volume and types of OBEs per TSP) • Value of **k_1** = Number of toll gantries / Number of toll gantries with video equipment • Value of k2 as decided by the TC • The values of each of the components of his formula **DSRC OBE Error $Ratio_{MAX}$ = k_2 * DSRC OBE Error $Ratio_{REF}$** • Average Error Ratio for all OBEs from all TSPs incl. local OBEs **Σ Error $Ratio_x$** Reporting of **KPI_{1X}** shall be done to EM and respective TSPs	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month The correct/final value of the KPI can only be established after all C7 and C8 transactions have been received	
Penalty calculation	TBD	
Penalty level	TBD	

The following should be noted:

- KPI_1 has the same validity in free flow systems as in barrier operated systems. If, however, a SU in a free flow lane has not mounted his OBE correctly, and is identified by the HGV-list, this will influence the KPI_1 of the relevant TSP in a negative manner
- To prevent variable quality of the road side equipment influencing the measurements, comparison of OBEs from any TSP with the reference group must always be based on the same monitoring period (k is fixed while OBE Error $Ratio_{REF}$ may vary)
- The max allowed OBE Error Ratio (OBE Error $Ratio_{MAX}$) must be the same for all TSPs including the TSP(s) included in the reference group
- Local OBEs may be OBEs issued by the TC himself when the company is a combined TC and TSP

- The components included in OBE Error Ratio$_{REF}$ vary among the TCs as follows:
  - NO (incl. Svinesund): $TX_{vid1} + TX_{vid2}$
  - DK (incl. ØSK): $TX_{vid1} + TX_{vid2} + TX_{bar}$
  - AT: $TX_{incomp} + TX_{vid1} + TX_{rec}$
  - SE: $TX_{vid1} + TX_{vid2}$

4.2 DSRC RSE Error Ratio

4.2.1 Free flow systems

KPI_{2A}	**DSRC RSE Error Ratio in free flow systems**	
The intention of the KPI	KPI_{2A} seeks to monitor the quality of the RSE in free flow systems by comparing the results when a defined population of OBEs passes through multiple RSEs	
Description of process	If an OBE is not (correctly) read at the RSE it may be an error caused by the OBE, the service user or by the RSE. The quality of the RSE is deduced by comparing how a defined population of OBEs are read at several/different RSEs/TCs. See "Definition of KPI" below and chapter 2.4 For transactions going through the EasyGo HUB, data is available in the TIF file. For local transactions it is required that the TC reports transaction data and KPI	
Actor(s) being monitored	TCs with free flow system	
Definition of KPI	The following KPI has been defined: **DSRC RSE Error Ratio$_{2AY}$** = (**TX_{incomp}** + **k_1***TX_{vid1}** + **TX_{vid2}** + **TX_{rec}**)) / (**TX_{comp}**) where Y represents the individual TC/RSE The types of transactions are defined in chapter 2.2	
Data required / delivered by:	Value of **k_1** = Number of toll gantries / Number of toll gantries with video equipment	TC
	Number of **TX_{comp}** per TSP and category/type of OBE	TC
	Number of **TX_{vid1}** per TSP and category/type of OBE	TC
	Number of **TX_{vid2}** per TSP and category/type of OBE	TC
	Number of **TX_{rec}** per TSP and category/type of OBE	TC
Calculation and reporting	TCs which do not have video equipment on every gantry report the factor **k_1** Each TC reports the number of **TX_{comp}**, **TX_{vid1}**, **TX_{vid2}** and **TX_{rec}** per TSP and category/type of OBE to EM EM must calculate reading quality at different TCs / RSE where the same TSP and category/type of OBE is used and report KPI_{2AY} to TCs	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month The correct/final value of the KPI can only be established after all C7 and C8 transactions have been received	
Penalty calculation	TBD	
Penalty level	TBD	

4.2.2 Systems with barriers

KPI_{2B}	**DSRC RSE Error Ratio in barrier systems**	
The intention of the KPI	KPI_{2B} seeks to monitor the quality of the RSE in barrier operated systems by comparing the results when the same population of OBEs passes through multiple RSE	
Description of process	If an OBE is not (correctly) read at the RSE it may be an error caused by the OBE, the service user or by the RSE. The quality of the RSE is deduced by comparing how the a defined population of OBEs are read at several/different RSEs/TCs. See "Definition of KPI" below and chapter 2.4 For transactions going through the EasyGo HUB data is available in the TIF file. For local transactions it is required that the TC reports transaction data and KPI	
Actor(s) being monitored	TC with barriers	
Definition of KPI	The following KPI has been defined: **DSRC RSE Error Ratio$_{2BZ}$** = (**TX_{vid1}**+**TX_{vid2}** + **TX_{bar}**) / (**TX_{comp}** + **TX_{vid1}** + **TX_{vid2}**[4] + **TX_{bar}**) where Z represents the individual TC/RSE The types of transactions are defined in chapter 2.2	
Data required / delivered by:	Number of **TX_{comp}** per TSP and category/type of OBE	TC
	TX_{vid1} per TSP and category/type of OBE	
	Number of **TX_{vid2}** per TSP and category/type of OBE	TC
	Number of **TX_{bar}** per TSP and category/type of OBE	TC
Calculation and reporting	Each TC reports the number of **TX_{comp}**, **TX_{vid1}**,**TX_{vid2}** and **TX_{bar}** per TSP and category/type of OBE to EM EM must calculate reading quality at different TCs / RSE where the same TSP and category/type of OBE has been used and report KPI_{2BZ} to TCz	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

[4] During high season the barriers at Storebælt remain open and the traffic flows freely through the lane. Errors may then result in the same procedures as when collecting via EDC.

4.3 EasyGo transactions from TC to TSP (C1)

KPI_3	**EasyGo transactions from TC to TSP**	
The intention of the KPI	KPI_3 seeks to monitor the time it takes for a TC to submit complete EasyGo transactions (C1) to a TSP	
Description of process	These transactions are of type TX_{comp} = EasyGo code C1 Regular EasyGo transactions TX_{comp} should normally be sent from the TC to the TSP without delay	
Actor(s) being monitored	TC	
Definition of KPI	The following KPI has been defined: **KPI_{3A} = Average days from passage until received by TSP** If min/max level KPI_{3A} is not met, details analysed with KPI_{3B} **KPI_{3B} = TX_{comp} sent later than X days after passage / Σ TX_{comp}**	
Data required / delivered by:	All **TX_{comp}** transactions sent from TC	EasyGo HUB
	Date of passage and date of transmission per **TX_{comp}**	EasyGo HUB
Calculation and reporting	Parameters monitored and calculated by EasyGo HUB KPI_3 shall be calculated per TC	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.4 Video based transactions (C8)

KPI_4	**Video based transactions converted into EasyGo transactions (C8)**	
The intention of the KPI	KPI_4 seeks to monitor o The number / share of video based transactions (C8) by any TC o The time it takes for a TC to submit C8 transactions to the TSP	
Description of process	When a passage is registered at the RSE and no corresponding OBE is read the passage is registered by video. The vehicle license plate is compared to the HGV-list to check if the vehicle is a registered user or not. If the license plate is registered with a contract the transaction is registered as an EasyGo transaction type TX_{vid1} = EasyGo code C8. The KPI monitors how many (share of total) such conversions are carried out and how long it takes from a vehicle passes the RSE until a TX_{vid1} transaction is sent to the TSP	
Actor(s) being monitored	TC	
Definition of KPI	KPI_4 is divided into two: **$KPI_{4A} = \Sigma\ TX_{vid1} / TX_{comp}$** If $KPI4_A$ is significant $KPI4_B$ should be monitored: **$KPI_{4B} = \Sigma\ TX_{vid1}$ sent later than X days after passage / $\Sigma\ TX_{vid1}$** where X is the agreed maximum number of days for C8 transactions. If min/max level for KPI_{4B} is not met, a detailed analysis must be carried out. Due to the delay in reception of C8 transactions data may not be complete until 90 days after passage.	
Data required / delivered by:	All **TX_{vid1}** transactions sent from TC	EasyGo HUB
	Date of passage and date of transmission per **TX_{vid1}**	EasyGo HUB
Calculation and reporting	Parameters monitored and calculated by EasyGo HUB KPI_4 is calculated per TC	
Period of monitoring	Per calendar month – C8 transactions received previous month.	
Reporting	Latest the 15th day of the following month The correct/final value of the KPI can only be established after all C8 transactions have been received If all data is not available on the 15th the reporting needs to be completed later The trend of the KPI will be monitored for the last 18 months.	
Penalty calculation	TBD	
Penalty level	TBD	

4.5 Incorrect video transactions (C7)

KPI_5	**Incorrect video transactions (C7)**	
The intention of the KPI	KPI_5 seeks to monitor: • The number of (share of) transactions where a missed reading of a valid OBEs is not corrected based on HGV list (/white list) when it should have been • The time it takes from passage until a video transaction invoiced directly from the TC or via an EDC, has been corrected and sent to the TSP as a C7 transaction	
Description of process	In Norway and Sweden, passages that are not invoiced directly to the SU from TSP or TC, can be sent to an EDC for collection. This is normal procedure for unequipped foreign vehicles. For several reasons, however, some vehicles that are (or should have been) equipped with an OBE are not read correctly. The reasons for this can be for example: • Malfunction or low performance of RSE • Malfunction or low performance of OBE • OBE not mounted or incorrectly mounted If a valid OBE has not been read, the vehicle is photographed and the license plate is compared to the HGV-list. KPI_5 monitors the number of transactions that are invoiced as video transactions directly from the TC or via an EDC in spite of the vehicle being (or should have been) registered on the HGV-list: TX_{vid2} = EasyGo code C7	
Actor(s) being monitored	TCs	
Definition of KPI	KPI_5 is divided into two parts: **$KPI_{5A} = \Sigma TX_{vid2} / TX_{comp}$** If KPI_{5A} is significant $KPI5_B$ should be monitored: **$KPI_{5B} = \Sigma TX_{vid2}$ sent later than Y days after passage / ΣTX_{vid2}** where Y is the agreed maximum number of days for C7 transactions. Due to the delay in reception of C7 transactions data may not be complete until 180 days after passage. If min/max level for KPI_{5B} is not met, a detailed analysis must be carried out. The analysis should include the splitting up of the C7 transactions into the following components: $TX_{vid2} = TX_{vid2}(a) + TX_{vid2}(b) + TX_{vid2}(c)$ where: • $TX_{vid2}(a)$ = Not listed on the HGV-list at time of passage • $TX_{vid2}(b)$ = The vehicle should have been registered on the HGV-list, but is not registered or there is a wrongful registration – TSP responsibility • $TX_{vid2}(c)$ = Wrongful use or no use of HGV-list – TC responsibility If the analysis shows that data from TC and/or TSP is required, the TC and TSP should be able to document the content of the HGV-lists valid at any given time. The EasyGo HUB may be able to assist as HGV-lists are stored in a period according to annex 2.1 chapter 2.4.2 "Storage of data".	
Data	Number of TX_{comp} per TC	EasyGo HUB

KPI_5	**Incorrect video transactions (C7)**	
required / delivered by:	Number of TX_{vid2} per TC	EasyGo HUB
	Date of passage and date of transmission per **TX_{vid2}**	EasyGo HUB
Calculation and reporting	Parameters monitored and calculated by EasyGo HUB KPI_5 is calculated per TC	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month The correct/final value of the KPI can only be established after all C7 transactions have been received up to 180 days after passage If all data is not available on the 15th the reporting needs to be completed later The trend of the KPI will be monitored for the last 18 months	
Penalty calculation	TBD	
Penalty level	TBD	

4.6 Missing follow up of wrongful invoicing

KPI_6	**Missing follow up of wrongful invoicing via EDC**	
The intention of the KPI	KPI_6 seeks to monitor the number of (share of) transactions where the TC does not follow up on a decision to replace a direct invoice or invoice via an EDC with an EasyGo transaction	
Description of process	When the TSP receives the complaint and confirms that the SU had a valid contract at the time of passage he shall inform the TC that the invoice via the EDC shall be replaced with a transaction **TX_{vid2}**. (= EasyGo code C7). In some cases, the TC does not follow up this procedure and the SU receives a new invoice or reminder. If the SU receives such a reminder, he will normally repeat his complaint to his TSP.	
Actor(s) being monitored	TC	
Definition of KPI	The following KPI has been defined: **KPI_6= Repeated complaints regarding TX_{vid2}**	
Data required / delivered by:	The number of complaints (per TC) where the TC already has been advised to correct an invoice to a TX_{vid2}	TSP
Calculation and reporting	The TSP reports the number of repeated complaints per TC (= **KPI_6**)	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.7 Invoice from TC

KPI_7	**Invoice or notification from TC or via EDC**	
The intention of the KPI	KPI_7 seeks to monitor the time it takes from a passage until a (presumed) non-equipped user has received an invoice from the TC directly or via an EDC	
Description of process	Unequipped users being invoiced by a TC either directly or via an EDC is normally not the responsibility of EasyGo. As there are cases, however, where a SU is wrongly invoiced when he should have been identified via OBE or video as having a valid contract, it is in the interest of EasyGo to solve such issues for the SU as quickly as possible. For this treason the time it takes from a passage until the SU receives an invoice from the TC directly or via an EDC is being monitored. The TC must also credit the invoice to the SU or instruct the EDC to do so. (see KPI_6)	
Actor(s) being monitored	TC (and EDC)	
Definition of KPI	The following KPI has been defined: **KPI_7 = Date of invoice – Date of passage**	
Data required / delivered by:	Number of invoices sent directly or via EDC	TC
	Date of passage	TC
	Date of invoice sent directly or via EDC	TC / EDC
Calculation and reporting	Each TC reports: • Total number of invoices sent directly or via EDC • Number of invoices (direct or via EDC) sent more than X days after passage **KPI_7** calculated by TC	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.8 Level of rejected transactions

KPI_8	**TIF file quality**	
The intention of the KPI	KPI_8 seeks to monitor the percentage of records which have to be rejected by the TSP during the processing of TIF files	
Description of process	Each EasyGo transaction shall be sent by the TC to the TSP via the EasyGo HUB. Each transaction is represented by a record in a TIF files Records that are not accepted by the TSP are sent back to the TC in the TIC file	
Actor(s) being monitored	TC	
Definition of KPI	The following KPI has been defined: **KPI_8 = Number of rejected TIF records/Total number of TIF records**	
Data required / delivered by:	Total number of records sent by TC	EasyGo HUB
	Number of records rejected by TSP	EasyGo HUB
Calculation and reporting	Parameters monitored and calculated by the EasyGo HUB	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.9 Files sent between EasyGo HUB and TC or TSP

KPI_9	**Files sent between EasyGo HUB and TC or TSP**	
The intention of the KPI	KPI_9 seeks to monitor that file transmissions between the EasyGo HUB and TCs/TSPs takes place in due time	
Description of process	Files are exchanged between TCs and TSPs via the EasyGo HUB according to a predetermined schedule	
Actor(s) being monitored	TC, TSP and EasyGo HUB	
Definition of KPI	The following KPI has been defined: **KPI_9 = Number of files sent from TC, TSP or EasyGo HUB more than X hours after schedule / Total number of files sent from** This KPI consists of the following components: **KPI_{9A} = Number of files sent from the EasyGo HUB to TC more than X hours after schedule / Total number of files sent from the EasyGo HUB to TC** **KPI_{9B} = Number of files sent from the EasyGo HUB to TSP more than X hours after schedule / Total number of files sent from the EasyGo HUB to TSP** **KPI_{9C} = Number of files sent from TC to the EasyGo HUB more than X hours after schedule / Total number of files sent from TC to the EasyGo HUB** **KPI_{9D} = Number of files sent from TSP to the EasyGo HUB more than X hours after schedule / Total number of files sent from TSP to the EasyGo HUB**	
Data required / delivered by:	Number of files sent more than X hours after schedule: • Per type of file • Per TC, TSP and EasyGo HUB	EasyGo HUB
	Total number of files sent • Per type of file • Per TC, TSP and EasyGo HUB	EasyGo HUB
Calculation and reporting	Parameters monitored and calculated by EasyGo HUB EM monitors data and reports KPI per file type, TC, TSP and EasyGo HUB	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.10 Incorrect or partly correct files sent by TC and TSP

KPI_{10}	**Incorrect or partly correct files sent by TC and TSP**	
The intention of the KPI	KPI_{10} seeks to monitor if files sent between the EasyGo HUB and TCs/TSPs are correct or not	
Description of process	The data exchanged between the actors in EasyGo is exchanged according to a predefined interface and data format	
Actor(s) being monitored	TC and TSP	
Definition of KPI	The following KPI has been defined: **KPI_{10} = Number of erroneous files / Total number of files sent between the EasyGo HUB, TC and TSP** This KPI consists of the following components: **KPI_{10a} = Number of not accepted files / Total number of files sent between the EasyGo HUB, TC and TSP** **KPI_{10b} = Number of accepted files where part of the transactions is incorrect / Total number of files sent between the EasyGo HUB, TC or TSP** **KPI_{10c} = Number of accepted lines / Total number of lines sent between the EasyGo HUB, TC or TSP**	
Data required / delivered by:	Number of not accepted files sent / received per type of file and receiver	EasyGo HUB
	Number of accepted files where part of transaction is incorrect per type of file and receiver	EasyGo HUB
	Number of accepted lines where part of transaction is incorrect per type of file and receiver	EasyGo HUB
	Total number of files sent / received per type of file and receiver	EasyGo HUB
Calculation and reporting	Parameters monitored and calculated by EasyGo HUB per file type, TC, TSP and EasyGo HUB	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.11 Actor – validation quality

KPI_{11}	**Actor – validation quality**	
The intention of the KPI	KPI_{11} seeks to monitor the percentage of records which have to be rejected by the EasyGo HUB during the processing of local NAT and HGV-files (validation files)	
Description of process	NAT-files (Not accepted Table / Black list) is sent by TSP to the EasyGo HUB and confirmed by the EasyGo HUB in NAC files HGV-files (Heavy Goods Vehicle file) is sent by TSP to the EasyGo HUB and confirmed by the EasyGo HUB in HGC files	
Actor(s) being monitored	TSP	
Definition of KPI	The following KPI has been defined: **KPI_{11A} = Number of declined NAT records / Total number of NAT records per TC** **KPI_{11B} = Number of declined HGV records / Total number HGV records per TC**	
Data required / delivered by:	Number of records in NAT and HGV files per TSP declined in a NAC or HGC file by the EasyGo HUB	EasyGo HUB
	Total number of records in NAT and HGV files per TC	EasyGo HUB
Calculation and reporting	Parameters monitored and calculated by EasyGo HUB per file type (NAT and HGV) and per TSP. Data shall be divided into EasyGo basic, EasyGo+ and EasyGo total	
Period of monitoring	On a monthly basis (Monday-Sunday)	
Reporting	Data available on the 1st of the next month	
Penalty calculation	TBD	
Penalty level	TBD	

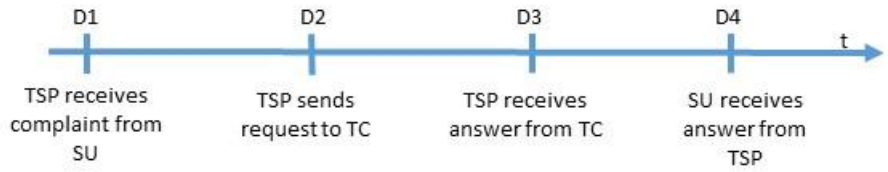
4.12 Quality of data in OBE and HGV-list

KPI_{12}	**Quality of data in OBE and HGV-list.**	
The intention of the KPI	KPI_{12} seeks to monitor the quality of the personalisation of OBEs and the data entered into the HGV-list done by the TSP The KPI shall also monitor the percentage of OBEs that are not blocked in NAT-file and removed from the HGV-list by the TSP within an agreed time limit after the blocking was requested by the TC.	
Description of process	To ensure that the correct toll fee is paid is is a prerequisite that the data on which the toll fee is calculated is correct. Such data include the following: • Correct personalisation of OBE • Entering the correct vehicle data into the HGV-list • Ensuring that the vehicle is equipped with the right OBE • OBEs that should be blocked have been blocked A TC may perform spot checks to verify any of or all of these.	
Actor(s) being monitored	TSP	
Definition of KPI	The following KPI has been defined: **KPI_{12A} = Personalization data error rate** **KPI_{12B} = HGV-list data error rate** **KPI_{12C} = Rate of OBEs that should have been blocked but are not blocked** **KPI_{12D} = Incorrect OBE rate**	
Data required / delivered by	Number of checked OBEs per TSP	TC
	Number of OBEs with erroneous content per TSP Number of HGV-list entries with erroneous content per TSP Number of OBEs that should have been blocked but are not blocked Number of vehicles with wrong OBE per TSP	TC
Calculation and reporting	TC reports error rate per TSP to EM	
Period of monitoring	Optional spot checks	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.13 Enforcement support response

KPI_{13}	**Enforcement support response**	
The intention of the KPI	KPI_{13} seeks to monitor the percentage of enforcement support requests which have been answered by the TSP within an agreed time limit	
Description of process	Often the TC requests assistance from the TSP as support in their enforcement efforts. When such requests are made the TSP should answer the TC within X days.	
Actor(s) being monitored	TSP	
Definition of KPI	The following KPI has been defined: **KPI_{13} = Number of enforcement support requests where date of answer - date of request > X days / Number of enforcement support requests**	
Data required / delivered by:	Number of enforcement support requests per TSP where date of answer - date of request > X days	TC
	Total number of enforcement support requests per TSP	TC
Calculation and reporting	The TC reports: • Number of enforcement support requests per TSP where date of answer - date of request > X days • Total number of enforcement support requests per TSP EM calculates the **KPI_{13X}** where X represents the individual TSP	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

4.14 Answering complaints from users

KPI_{14}	**The time it takes from a SU makes a complaint until he has received an answer**	
The intention of KPI_{14}	KPI_{14} seeks to monitor the time it takes from a SU files a complaint with a TSP until he has received an answer.	
Description of process	 D1 – D4 are dates	
Actor(s) being monitored	TSP and TC	
Definition of KPI	KPI_{14} is divided into two parts: KPI_{14} = KPI_{14A} + KPI_{14B} where: KPI_{14} is the average number of days from the SU files his complaint until he has received an answer (D1 → D4) KPI_{14A} is the average number of days used by the TSP ((D1 → D2) + (D3 → D4)) KPI_{14B} is the average number of days used by the TC (D2 → D3) A confirmation to the SU that his complaint has been received, does not apply as an answer.	
Data required / delivered by:	• TSP_{ID} = the TSP sending the data • Period of reporting = mm.yyyy • List of complaints including the following data for each complaint: ○ Identification of complaint = xxxxxx (continuous numbering) ○ Type of complaint = yy (to be defined) ○ Identification of TC = TC_{ID} (to be filled in if TC is involved in complaint handling) ○ D1 = Date of complaint from SU ○ D2 = Date of submission of request to TC (if TC is involved) ○ D3 = Date of receiving answer from TC (if TC is involved) ○ D4 = Date of answer from TSP to SU Report to be supplied as Excel-sheet. A template will be provided by EM.	TSP
Calculation and reporting	TSP reports all complaints where D1 is in the month covered by the reporting. EM calculates the KPIs as defined above EM will also be able to give statistics regarding the overall response times of the individual TC based on input from several TSPs.	
Period of monitoring	Per calendar month	
Reporting	Latest the 15th day of the following month	
Penalty calculation	TBD	
Penalty level	TBD	

5 Appendix 2 – Templates for reporting

5.1 Data to be reported by TCs

5.1.1 Transaction data

The following quality data shall be reported by each Toll domain once per month. (The EasyGo HUB will provide the remaining data and perform the calculations). The numbers in the table are examples:

TC-name	Actor-ID	Year	Month	Total traffic subject to tolling	EFC
Øresundsbron	**400001**	**2014**	**02**	**740532**	**68 %**

	Number of OBE transactions during a month in lanes with DSRC RSE							
TSP/ OBE	**TX_{comp} C1**	**TX_{incomp} C6**	**TX_{vid1} C8**	**TX_{vid2} C7**	**TX_{bar} C2**	**TX_{rec} C4**	**TX_{tot}**	**Detection rate %**
OBE total	**497459**			**31**	**3304**		**500794**	**99,3**
Ref.group	**259276**			**10**	**989**		**260275**	**99,6**

Definitions

Data field	Definitions
Total traffic	The number of vehicles subject to tolling passing through the toll stations independent of type of lane, method of payment and type of transaction (Example: In Austria only HGVs are subject to tolling. Therefore, it is the total number of trucks passing through the toll stations that shall be reported).
Total no of OBEs read	The total number of OBEs read independent if these OBEs are read correctly or not and independent if transactions are being sent via the EasyGo HUB or not
Ref group TX_{comp} - etc	The number of OBE transactions made by OBEs being a part of the reference group, distributed on the different transactions types
OBE total TX_{comp} - etc	The total number of transactions, distributed on the different of transactions types

5.1.2 Other data to be reported by TC

KPI	Description	Data required from TC	Format	Comment
7	the time it takes from a passage until a (presumed) non-equipped user has received an invoice from the TC or via an EDC	For each invoice via EDC: • Invoice ref • Date of passage • Date of invoice		
12	Quality of the personalisation of OBEs and the data entered into the HGV-list done by the TSP	Number of checked OBEs per TSP	XXXX	
		Number of OBEs with erroneous content per TSP	XXXX	
		Number of HGV-list entries with erroneous content per TSP		
		Number of OBEs that should have been blocked but are not blocked		
		Number of vehicles with wrong OBE per TSP		
13	The percentage of enforcement support requests which have been answered by the TSP within an agreed time limit	Number of enforcement support requests* per TSP where date of answer - date of request > X days	XXXX	
		Total number of enforcement support requests per TSP	XXXX	

5.2 Data to be reported by TSPs

For KPI_{14} the following template shall be used for reporting:

	A	B	C	D	E	F	G
1	**Template for reporting KPI_{14} - The time it takes from a SU makes a complaint until he has received an answer**						
2							
3	TSP-name:		abcdefghij				
4	TSP-ID:		xxxxxx				
5	Reporting period:		mm	yyyy			
6							
7	Complaints received during period:						
8	Numbering	Complaint received from SU	Type of complaint	TC	Request sent to TC	Answer received from TC	Answer sent to SU
9	N	dd1	yy	TC_{ID}	dd2	dd3	dd4
10	N+1	dd1	yy	TC_{ID}	dd2	dd3	dd4
11	N+2	dd1	yy	TC_{ID}	dd2	dd3	dd4
12							
13	Numbering should be consecutive - meaning each received complaint get +1.						
14	TC, dd2 and dd3 only to be filled in if relevant (not relevant if TSP can answer complaint without contacting TC)						
15	dd2, dd3, dd4 and TC_{ID} to be inserted up to the date of the reporting - latest the 15th of the following month.						

5.3 Parameters required to calculate KPI1

5.3.1 Definition of OBE reference groups

The OBE reference groups for each of the general parties are defined below. If the reference group consists of more than one batch of OBEs - more tables are filled in.

5.3.1.1 Sund & Bælt

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	978003000108
		PAN no	92086175xxxxxxxL
Storebælt / 200001	**BroBizz / 978003**	**OBE-ID**	9780030003xxxxxxxx
		Number of OBEs in reference group	Appx. 100.000
		Production year	

5.3.1.2 ASFINAG

The reference group for Austria consists of two batches - OBU 3021 and OBU FZ3458-GO.

OBU 3021:

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	C04001030000 C04001050000 C04001030002 C04001050002 C04001030003 C04001050003
		PAN no	308417**1234567890123**
ASFINAG / C04001	**ASFINAG / C04001**	**OBE-ID**	C0400100012345678
		Number of OBEs in reference group	

OBU FZ3458-GO:

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	C04001030000 C04001050000
		PAN no	308417**1234567890123**
ASFINAG / C04001	**ASFINAG / C04001**	**OBE-ID**	C04001001B12345678
		Number of OBEs in reference group	

5.3.1.3 Sweden

No reference group has been defined for Sweden as there are currently no OBEs being used

5.3.1.4 Norway

Norway has defined three batches of OBEs as their reference group:

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	
		PAN no	9578000713882010-9578000714082305
Fjellinjen / 100007	Fjellinjen / 30C007	OBE-ID	
		Number of OBEs in reference group	20.000 produced (17.374 in statusfile pr. 20 feb 2016)

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	
		PAN no	9578004010176019-9578004010348345
Bergen Bompengeselskap AS / 100040	Bergen Bompengeselskap AS / 30C028	OBE-ID	
		Number of OBEs in reference group	17.000 produced (14.124 in statusfile pr. 20 feb 2016)

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	
		PAN no	9578000810077019-9578000810364243
Trøndelag Bomveiselskap AS / 100008	Trøndelag Bomveiselskap AS / 30C008	OBE-ID	
		Number of OBEs in reference group	27.000 produced (22.410 in statusfile pr. 20 feb 2016)

5.3.1.5 Øresundsbron

The first table below is the newest OBE at Øresundsbron and will be the reference group when distributed in a bigger volume:

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	A40001000106
		PAN no	6377 5700 1
Øresundsbron / A40001	Øresundsbron / 40001	OBE-ID	N/A
		Number of OBEs in reference group	N/A

Until then the following reference group with the old OBE (6048) applies for Øresundsbron:

TC-name / ID	TSP-name / ID	Definition of reference group	
		Context mark	**A40001000102**
		PAN no	**6048 8200 1**
Øresundsbron / A40001	**Øresundsbron / 40001**	**OBE-ID**	**N/A**
		Number of OBEs in reference group	**N/A**

5.3.2 Video coverage

In the calculation of KPI_1 the following formula is included:

$$\textbf{OBE Error Ratio}_{REF} = \textbf{Ref}((TX_{incomp} + k_1 * TX_{vid1} + TX_{vid2} + TX_{rec} + TX_{bar}) / TX_{comp})$$

..where k_1 = Number of toll gantries / Number of toll gantries with video equipment.

The factor "k_1" is currently used in Austria to compensate that not all toll gantries have video equipment. In the other toll domains k_1 is 1.0 as all toll gantries are equipped with video equipment.

Toll domain	K_1
Sweden	1.0
Norway	1.0
Austria	4.5
Denmark	1.0
Øresundsbron	1.0

5.3.3 Allowed Error Ratio compared to reference group

Each TC shall define the maximum Error Ratio allowed for any EasyGo TSP as :

$$\textbf{OBE Error Ratio}_{MAX} = k_2 * \textbf{OBE Error Ratio}_{REF}$$

..where k_2 is defined by each TC. This means that the accepted error ratio of a population of OBEs from a TSP is a percentage(factor) of the error ratio of the reference group defined by the TC.

Every TC shall inform TSPs and EM about the values of his formula and describe his reference group (TSP, volume, types of OBEs, production year etc.)

The following values have been defined for K_2 in each toll domain:

Toll domain	K_2
Sweden	xx.x
Norway	xx.x
Austria	xx.x
Denmark	xx.x
Øresundsbron	xx.x