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CLIMA.A.3 - Monitoring, Reporting, Verification

Guidance Document

The Accreditation and Verification Regulation - Sampling

AVR Key guidance note No. II.4, Version of 15 November 2012

This document is part of a series of documents and templates provided by the Commission services for supporting the implementation of Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council.

The guidance represents the views of the Commission services at the time of publication. It is not legally binding.

This guidance document takes into account the discussions within meetings of the informal Technical Working Group on the Accreditation and Verification Regulation under the WGIII of the Climate Change Committee (CCC), as well as written comments received from stakeholders and experts from Member States.

This guidance document was unanimously endorsed by the representatives of the Member States at the meeting of the Climate Change Committee on 15 November 2012.

All guidance documents and templates can be downloaded from the documentation section of the Commission's website at the following address:
http://ec.europa.eu/clima/policies/ets/monitoring/index_en.htm.

Background

This key guidance note is part of a suite of guidance documents developed by the Commission services to explain the requirements of the EU ETS Regulation on Accreditation and Verification (AVR)¹. The suite of guidance documents consists of:

- an explanatory guidance on the articles of the AVR (EGD I), including a user manual providing an overview of the guidance documents and their interrelation with the relevant legislation;
- key guidance notes (KGN II) on specific verification and accreditation issues;
- a specific guidance (GD III) on the verification of aircraft operator's reports;
- templates for the verification report and information exchange requirements;
- exemplars consisting of filled-in templates, checklists or specific examples in the explanatory guidance or key guidance notes;
- frequently asked questions.

This key guidance note explains the sampling requirements and principles of the AVR. The note represents the views of the Commission services at the time of publication. It is not legally binding.

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| <ul style="list-style-type: none">▪ Wherever the note uses the term operator's report it means the operator's emission report and the aircraft operator's emission report or tonne-kilometre report.▪ Wherever the note uses the term operator this also means aircraft operators unless this is specifically mentioned otherwise in the note. |  |
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1. The meaning and relevance of sampling in the verification plan

After checking compliance with the monitoring plan (MP), the next important step in verification is checking the implementation of the operator's control activities and the procedures covered by the approved monitoring plan as well as checking the plausibility, completeness and correctness of the data reported. Based on the risk analysis, the verifier may use sampling when checking the control activities and procedures, and performing substantive data testing.

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As outlined in the key guidance note on risk analysis (KGN II.2), the basic approach is that the verifier assesses the inherent risks (IR) and control risks (CR), and based on this assessment determines the nature, timing and extent of the verification activities to be performed in order to reduce the risk that material misstatements are not detected. This detection risk² (DR) must be sufficiently low so as to arrive at a verification risk³ (VR) that enables the verifier to conclude with reasonable assurance that the operator's report is free from material misstatement(s). Sampling is one of the verification activities that is impacted by this risk assessment. Depending on the verifier's analysis of the level of inherent and control risks, the verifier determines whether sampling is justified, which samples⁴ it needs to take,

¹ Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council, OJ EU, L 181/1.

² Detection risk means the risk that the verifier does not detect a material misstatement.

³ Verification risk is the overall risk that the verifier issues an inappropriate verification opinion. It consists of three components, i.e. inherent risk, control risk and detection risk.

⁴ Any subset of the total population of data or control activities and procedures, that is selected for assessment.

what the sampling size and selection approach should be and which types of tests or other checks it should undertake on each sample.

The verifier's "confidence" in making a statement that the operator's report is free from material misstatements, and the risk that the verifier makes an inappropriate verification opinion statement⁵, are mirroring concepts.

The verifier must be confident that using its planned sampling approach it will detect misstatements or reduce the risk that it will not detect a misstatement leading to an inappropriate verification opinion statement. In other words: the detection risk (DR) must be sufficiently low to arrive at a level of verification risk (VR) that is consistent with the required "reasonable assurance". This approach and formula explained in KGN II.2 on risk analysis is equally relevant for determining the sampling size.

Verification Risk (VR) = Inherent risk (IR) * Control risk (CR) * Detection Risk (DR)⁶

The purpose of the operator's control system is to mitigate its inherent risks. However, the control systems are not without limitations and the risk always remains that a material misstatement is not prevented, identified and corrected on a timely basis by the control system: i.e. the control risk. These two risks in combination, i.e. the inherent risk and control risk, create the risk of material misstatements: the higher the inherent and control risks, the higher the risk of material misstatements.

Safeguarding the operator's report against material misstatements is the duty of operator's management and those responsible for monitoring and reporting. It is therefore the operator's responsibility to set up and implement a sufficiently robust control system to mitigate the inherent and control risks. The verifier cannot control the risk of the material misstatement by reducing the inherent and control risks. The only option available to the verifier is that it applies the necessary verification activities to detect misstatements and requires the operator to correct misstatements if these are identified. If these misstatements cannot be corrected by the time the verification report is issued, the verifier must consider whether this misstatement is material or not.

The greater the risk of a material misstatement as a result of high inherent and control risks, the more extensive the number of verification activities (testing, sampling) needs to be because only by applying more verification activities will the verifier detect those misstatements.

The detection risk that "results" from the relationship indicated above determines the verifier's judgment on the sampling size. So, if the inherent risk and/or the control risk are

⁵ See footnote 3.

⁶ The formula "VR = IR x CR x DR" is foremost to be understood as **conceptual**. To demonstrate the working of this conceptual model, one may connect numerical values to the formula elements, i.e. values to a high, a medium or a low risk assessment. So, setting VR at 5% and supposing that the IR of the operator is high, and that also the CR is relatively high, means that this is a high risk entity where the operator's control procedures are not adequate to manage the risks involved. In this case the verifier will aim at a very low DR by detailed and substantive data testing and a sufficiently high sample size. Through the above formula, the DR can be "estimated" by setting the VR at 5%, by translating the high IR in a numerical value of 100%, and the CR at 50%: the DR is then calculated at: $0.05 / [1 * 0.5] = 0.10$. In other words, in this example the formula results in a very low DR figure of 10%. If on the other hand the IR is high (say again 100%) but the operator has installed adequate controls to mitigate these risks, the CR can be assessed as low, say 10%. Following the same conceptual approach as above, in this example the resulting DR figure is then 50% ($0.05 / [1 * 0.10] = 0.50$). It means that the verifier can accept a higher risk and can therefore reduce the sample size.

low (low risk of material misstatement), the verifier is in a position to accept a higher detection risk, requiring fewer samples.

However, if the combination of inherent and control risks is high (high risk of material misstatement), the verifier should aim for a low detection risk in order to be sure that it will detect the misstatements as much as possible. One has to realise that the detection risk should be set at a lower level in case the materiality level is 2% i.e. the level for Category C installations, than in case the materiality level is 5%, i.e. the level for Category A and B installations. The relation between the detection risk and the materiality level is illustrated in the figure below.

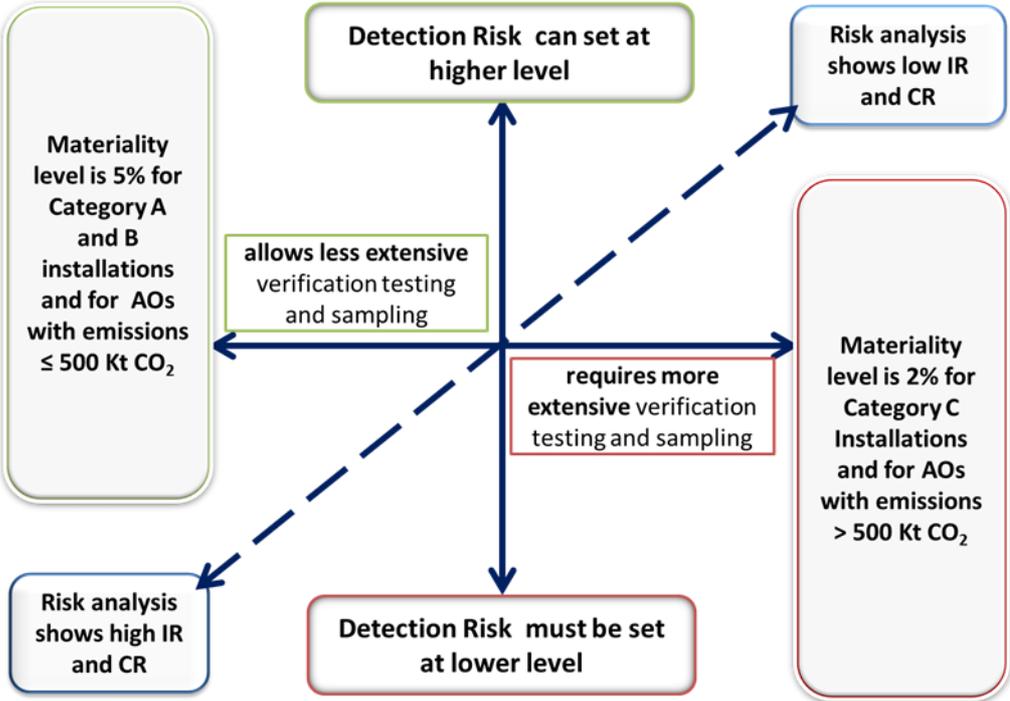


Figure 1: The relation between the detection risk at a lower or higher level in connection to a combined IR and CR (high or low) and the materiality level defined at 5% or 2%.

On the basis of its risk analysis, and considering the materiality level⁷ relevant for the operator, the verifier can start designing its sampling methodology, the frequency of items to be sampled and the sample size to be contained in the verification plan.

2. What is sampling and which sampling techniques are commonly used in verification?

Sampling is the application of an approach whereby a smaller number of items is checked and verified compared to all items within a population⁸ of data and/or control

⁷ Please note that the materiality level does not mean that non-material misstatement can be ignored. In fact all identified misstatements must be corrected. If these misstatements are not and/or cannot corrected by the time the verification report is issued, the verifier must consider the materiality of these misstatements. Even misstatements below the materiality threshold can be material [please see section 3.2.8 and 3.2.9 of the Explanatory Guidance (EGD I)].

⁸ The population is the entire set of data or control activities (all the items constituting for example a source stream) from which the verifier wishes to sample in order to reach a conclusion on the entire population. Therefore the population from which the sample is drawn has to be appropriate, and verified as complete for the specific verification objective.

activities/procedures that is subject to verification. This sampling shall be applied in such a way that all sampled items⁹ have <in principle> the same chance of being selected. This is important, because the verifier must be sufficiently confident that the results are representative enabling it to draw conclusions about the entire population from a sample¹⁰.

The risk analysis is therefore key to the verifier when deciding that sampling is justified. If the inherent risks are high and/or there are significant risks of misstatements and there are no other means of gathering sufficient and appropriate evidence except by testing the entire population of data or control activities, then sampling a limited number of control activities/procedures is unlikely to be justified: in that case the whole data set and/or all control activities need to be tested. Furthermore, where the data population is small e.g. 12 fuel invoices, it may be more efficient to check all records.

When sampling is justified on the basis of the risk analysis, the verifier should first consider the risk that its conclusion based on a sample may be different from its conclusion if the verifier were to subject the entire population to the same verification procedures as the sample: underestimating that risk can lead to erroneous conclusions. When testing control activities, the verifier may for instance conclude erroneously that the control activities are more effective than they actually are. In a similar way, when carrying out detailed data testing, the verifier may conclude erroneously that there are no material misstatements. These misstatements could then lead, individually or aggregated, to an inappropriate verification opinion statement. To mitigate these risks, the verifier must increase the sample size so that it can reach the required level of confidence.

In view of the above, the verifier must consider some key principles with respect to sampling:

- sampling must be justified on the basis of the risk analysis and must be detailed in the verification plan;
- the sampling approach and the sampling size must be fully documented in the verification plan, and must together with the outcome of the sampling be recorded in the internal verification documentation;
- the sampling must be specific to the operator;
- sampling the data universe of several installations or combining data of several sites is not allowed;
- sampling must be representative of the total population of the control activities, procedures or the data selected;
- where possible, the verifier must take account of the sampling regime used and results during prior year verifications. Sampling should be set up in such a way that over a number of verification cycles all data flows and source streams or emission sources are included within a detailed data testing approach. Furthermore, the level of sampling and testing is likely to vary between source streams that are major “material contributors” to the aggregated data, and other source streams that are marginal or de-minimis contributors.

⁹ Sample units can be invoices, control activities, procedures, or other primary source data.

¹⁰For large installations and aircraft operators the data flow, the data population itself and the control activities and procedures implemented to mitigate the risks in the data flow can be considerable, and it will then not (always) be possible, effective or efficient to verify each and every item.

3. Statistical and Non-Statistical Sampling

The verifier will have the option to choose between statistical and non-statistical sampling using its professional judgment. Professional judgment will also be used in the planning, performing, and evaluating of sampling, and the sample evidence obtained in relation to other verification evidence.

This choice between the statistical and non-statistical is often based on a number of considerations, such as the number of source streams and data points per source stream, the variation between those data points, and the degree the sample allows a conclusion over the entire population of data or control activities. The verifier uses its professional judgment to assess factors such as the characteristics of the data, the control activities or the procedures for control activities, and the risks in relation to these characteristics in order to determine the appropriate sample size.

Non-statistical Sampling

Any sampling procedure that does not permit the numerical measurement of the sampling risk is a non-statistical sampling procedure, even if the verifier rigorously selects a random sample.

For most verifications, the non-statistical approach will be appropriate, since for system audits¹¹, addressing questions such as “are the proper control activities installed, implemented and maintained”, are important and highly relevant. This also applies to the verifier's analysis of the nature and cause of errors as well as its conclusion on the mere absence or presence of errors. The verifier can in this case choose a fixed sample size of items to be tested for each key control activity provided that the size of the sample is increased if errors are identified. Nonetheless, professional judgment remains critical in determining the relevant factors to consider. However, if a non-statistical approach is being used, the results of the sampling do not allow extrapolation to the entire population.

Statistical Sampling

In the case of statistical sampling, the verifier will use probability sampling and selection methods, i.e. random, systematic or stratified sampling, to select the items to be reviewed during verification. Probability sampling provides an objective method of determining the sample size and selecting the items to be examined. A number of sampling techniques come into perspective that assist the verifier in its conclusion on the number of misstatements in the sample and the misstatements in the entire population of data. These techniques are explained in text books, but also in guidance issued by the Commission¹².

Sample selection

Apart from the distinction between statistical and non-statistical sampling, the verifier will also choose between the following sampling approaches:

1. Random selection of samples

¹¹Detailed tests of control activities, procedures and reporting, which are intended to provide evidence about the effectiveness of the design and operation of a control system in preventing or detecting material misstatements and about the operator's ability to record, process, summarize and report data.

¹²Guidance note on sampling methods for audit authorities (under Article 62 of Regulation (EC) no 1083/2006 and article 16 of Commission Regulation (EC) n° 1028/2006), Version of 15/09/2008 - COCOF 08/0021/02-EN

2. Systematic sample selection
3. Haphazard selection
4. Block (cluster) selection
5. Judgment selection
6. Risk based sampling combining elements of the selection methods under point 3 to 5.

Random selection of samples requires always a selection tool that will make sure that the selection of samples is indeed “at random”, i.e. independent from the judgement or preference from the “sample taker”. This is important to ensure that all items in the population to be sampled, have an equal chance to be taken. Often Excel functions are used for this non-select or random sampling.

Systematic sampling picks “randomly” a starting point and then applies a systematic rule to select further items (e.g. each 20th item after the first (at random selected) starting item).

Haphazard selection is a “false random” selection in the sense that an individual item is apparently “randomly” selected, but may in fact have an unmeasured bias in the selection (e.g. items easier to analyse, items easily accessed, items picked from a list displayed on a screen, etc.). This method is always and unavoidably biased, i.e. depending on the professional judgment and/or preferences of the verifier, or dictated by convenience or other factors.

For block or cluster selection, the verifier selects a cluster of control activities or data non-randomly. Judgment selection is based purely on the verifier’s discretion whatever the rationale (e.g. items with similar names or all operations related to a specific emission source or source stream etc.).

Risk-based sampling is a non-statistical selection of items based on various intentional (thus biased) elements, often taking from the other three (item 3 to 5) non-statistical selection methods listed above.

4. Content of the Verification plan

The verifier must include in the verification plan:

- a test plan setting out the scope and methods of testing the control activities and the procedures of these control activities;
- a data sampling plan setting out the scope and methods of data sampling related to the data points underlying the aggregated emissions in the operator’s report or the aggregated tonne-kilometre data in the aircraft operator’s tonne-kilometre report.

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AVR**

The verifier shall design its test plan and determine the sample size and sampling activities for testing the control activities, based on its assessment of:

- the inherent risks;
- the control environment;
- the relevant control activities;
- the requirement to deliver a verification opinion with reasonable assurance.

**Art.13(2)
AVR**

Similarly, the verifier shall design the data sampling plan and determine the sample size and the sampling activities related to the data points underlying the aggregated emissions, by considering:

- the inherent and control risks;

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- the results of the analytical procedures;
- the requirement to deliver an opinion with reasonable level of assurance;
- the materiality level;
- the materiality of the contribution of individual data element to the overall data set.

Moreover, the verifier shall update the risk analysis and the verification plan, and adapt the verification activities when it finds additional risks that need to be reduced (e.g. when tests fail) or when there are less actual risks than earlier expected.

5. Factors that impact the sampling size

The AVR specifies the factors that are relevant for determining the sample size and sampling activities. When selecting a sample for verification, the verifier shall consider the objectives of the verification and the characteristics of the control activities or data population(s) from which the sample will be drawn. The verifier shall determine a sample size that is sufficient to allow that:

- in the case of tests of details, all misstatements are detected; or
- in the case of tests of control activities, the total rate of deviation does not give rise to unacceptable risks of misstatements of the data.

The verifier should therefore select the sample in such a manner that it can be expected to be representative of the population(s) making up the whole data universe.

Testing of control activities and the procedures related to the control activities¹³

The preliminary risk analysis based upon the strategic analysis will provide the verifier with a first impression of the inherent risks and control risks and their likely magnitude (high, medium, low).

Factor	Explanation
Inherent risk	If the inherent risks are high, the sample size to test the control activities and associated procedures should be higher than when a low risk is identified ¹⁴ .
Control environment	Control risks are to a large extent determined by the operator's control environment, i.e. the way and the stringency with which inherent risks are addressed and mitigated within the installation or the aircraft operator. See page 5 of the key guidance note on risk analysis (KGN II.2).
Relevant control activities	When both the inherent risks and control risks are high, the verifier has to apply more detailed and robust verification activities and has to select a larger sample to lower the detection risk. Determination of the sample size for testing the control system as presented in the GHG permit (for installations) and the

¹³ **Dual testing:** In some circumstances the verifier may select a sample that will be used for dual purposes: e.g. testing the operating effectiveness of an identified control activity and testing whether the control activity has been implemented and applied.

¹⁴ **Tests of Automated IT Controls:** IT systems process registrations and other information consistently unless the systems or programmes (or related tables, parameters, or similar items that affect how the programmes process the data) are changed. Therefore, when testing the operations of automated control activities, the verifier may adopt the strategy of testing one or a few of each type of data registrations at a point in time, and test general control activities (e.g. control activities over implementation and changes to systems and programmes, access and security, and computer operations) to provide evidence that the automated control activities have been operating effectively over the monitoring period. When general IT control activities are tested and determined to be effective, a single test of an automated control activity for each type of control operation may be sufficient to place reliance on the automated control activity during the period of under verification.

Factor	Explanation																											
	<p>approved monitoring plan depends on the frequency of the internal control tests and the control activities, and the number of items that need to be controlled.</p> <p>The frequency of the control activity means how many times a control activity is being carried out.</p> <p>The number of items refers to the number of data points and data flows that are being controlled by the control activities, e.g. how many measurement instruments are being used, how many calibration reports there are, how many documents there are in the documentation management system etc..</p> <table border="1" data-bbox="432 591 1394 1093"> <thead> <tr> <th colspan="3" data-bbox="432 591 1394 629">Example</th> </tr> </thead> <tbody> <tr> <td colspan="3" data-bbox="432 629 1394 770">The table below provides an example of how the frequency of control activities and the number of items in relation to the inherent and control risks can affect the sample size (in combination with the verifiers professional judgment):</td> </tr> <tr> <th data-bbox="432 770 794 846">Frequency and (Population Size)</th> <th colspan="2" data-bbox="794 770 1394 846">Minimum Sample Size in the case of combined inherent and control risk are</th> </tr> <tr> <td></td> <th data-bbox="794 846 1114 884">high</th> <th data-bbox="1114 846 1394 884">low</th> </tr> <tr> <td data-bbox="432 884 794 922">Quarterly checks (4)</td> <td data-bbox="794 884 1114 922">2</td> <td data-bbox="1114 884 1394 922">2</td> </tr> <tr> <td data-bbox="432 922 794 960">Monthly checks (12)</td> <td data-bbox="794 922 1114 960">4</td> <td data-bbox="1114 922 1394 960">2</td> </tr> <tr> <td data-bbox="432 960 794 999">Twice-monthly (24)</td> <td data-bbox="794 960 1114 999">8</td> <td data-bbox="1114 960 1394 999">3</td> </tr> <tr> <td data-bbox="432 999 794 1037">Weekly (52)</td> <td data-bbox="794 999 1114 1037">10</td> <td data-bbox="1114 999 1394 1037">5</td> </tr> <tr> <td data-bbox="432 1037 794 1093">>52</td> <td colspan="2" data-bbox="794 1037 1394 1093">The rule of thumb is to test a sample size that is at least 10% of the population.</td> </tr> </tbody> </table>	Example			The table below provides an example of how the frequency of control activities and the number of items in relation to the inherent and control risks can affect the sample size (in combination with the verifiers professional judgment):			Frequency and (Population Size)	Minimum Sample Size in the case of combined inherent and control risk are			high	low	Quarterly checks (4)	2	2	Monthly checks (12)	4	2	Twice-monthly (24)	8	3	Weekly (52)	10	5	>52	The rule of thumb is to test a sample size that is at least 10% of the population.	
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The requirement to deliver a verification opinion with reasonable assurance	Where the verifier identifies a misstatement or non-conformity in the course of sampling, it shall request the operator to explain the root cause(s) of that misstatement or non-conformity. Based on the outcome of that assessment the verifier shall determine whether additional verification activities are needed, and whether the sampling size needs to be increased (usually the case).																											

Special consideration

In the case that the tests of control activities reveal that there are differences in the quality and functioning of the control activities compared to what was concluded in the risk analysis, the following options are available to the verifier:

- to create two (or more) groups with for example: a first group in which the verifier has low confidence and requiring a higher sample size, and a second group in which the verifier is very confident, therefore requiring a lower sample size.
- to attach the lowest confidence to the entire set of control activities and test all the control activities individually.

Creating different groups of control activities according to their quality and functioning (first bullet) is illustrated in the figure below:

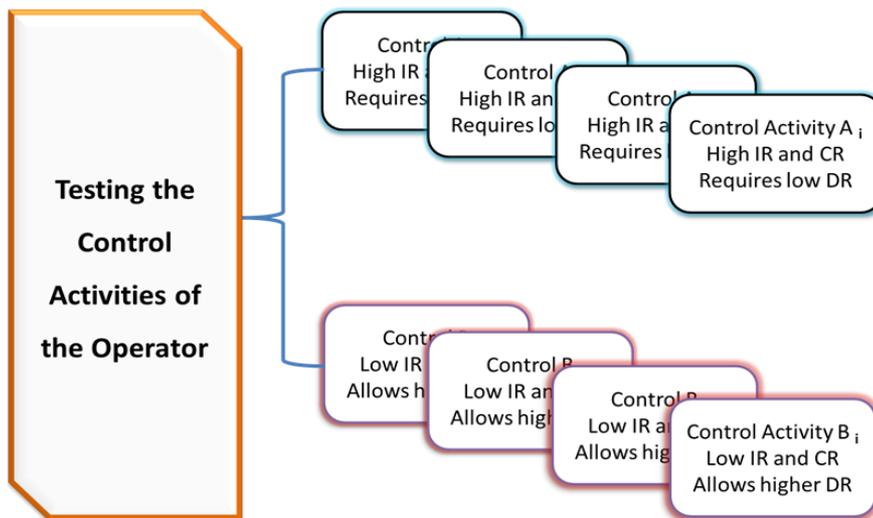


Figure 2: Control activities of the operator show differences in quality and functioning. Effective testing of these control activities may then necessitate a split between the lower and higher quality control activities

For data sampling the following factors must be considered:

Factor	Explanation
Inherent risk and control risks	If major weaknesses are identified during the testing of control activities, the verifier will conclude that the confidence obtained from that control activity is low and therefore that the risk of material misstatement is high. In that case the verifier will aim for a larger test sample to give it the necessary confidence that all possible misstatements will be detected. If no major weaknesses are found in the testing of the control activities, the confidence obtained from applying tests on the system and the control activities will be high meaning that the verifier is confident that it may trust the system and therefore aim for a smaller test sample. In both cases the verifier's professional judgement is applied to the percentage of the population that is sampled to give it the necessary confidence that all possible misstatements will be detected.
The results of analytical procedures	Fluctuations and trends in data, deviations from previous years, data gaps, outliers, as well as unexpected data without explanation from the operator will require special attention and affect the number of data points to be sampled.
The requirement to deliver a verification opinion with reasonable assurance	The sampling and the sampling results need to enable the verifier to provide an opinion with reasonable assurance suggesting a higher rather than lower percentage of the population being included in the sample.
The materiality level	The materiality level indicated in Article 23 of the AVR is either 2% (for Category C installations) or 5% (for Category A or B installations) of the total reported emissions in the reporting period ¹⁵ . The verification activities to be undertaken by the verifier, and the data points to be sampled, can be expected to be more extensive and detailed in the case of a 2% materiality level than they will for a 5% materiality level.

¹⁵The materiality level is 5% for aircraft operators with annual emissions equal to or less than 500 ktonnes of fossil CO₂. For aircraft operators with annual emissions of more than 500 ktonnes of fossil CO₂, the materiality level is 2%.

<p>The materiality of the contribution of an individual data element to the overall data set</p>	<p>As a first step the verifier will identify the data points which individually represent a significant quantity of the total reported emissions, e.g. major source streams versus minor source streams, or those data points that are significant because of their nature. These are treated separately and the size of each sample is taken in relation to the contribution and risk assessed for the data points. From the remaining population (e.g. de minimis source streams) sufficient checking will have to be done to confirm that the data inputs and outputs are reasonable and have a basis in evidence.</p> <p>The sample size depends then directly upon 3 parameters:</p> <ol style="list-style-type: none"> 1. the confidence level that the verifier aims at to achieve in relation to reasonable assurance 2. the variability of the population the verifier has identified 3. the acceptable error set by the verifier related to the maximum materiality level <p>For determination of the sample size the verifier can make use of generally accepted software. Please see section 7 of this guidance note.</p>
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6. Impact of a misstatement or non-conformity on the sampling size

When performing checks on a sample, it is possible that the verifier identifies misstatements or non-conformities. The verifier must then analyse these misstatements and non-conformities and their occurrence in the sample, and use the results to estimate the total likely misstatement in the entire population. When analysing misstatements or non-conformities, the verifier should consider their nature, cause and possible impacts on other areas of verification and on the verification opinion statement as a whole to assess their material impact on the total reported data.

If deviations result from testing the control activities, the verifier determines whether the tests provide an appropriate basis for relying on the control activities, or whether the identification of the increased risks require additional testing of control activities, and whether the risks of misstatements need more detailed data testing. The revised risk analysis should then lead to an increased sample size, adaptation of the sampling activities or further testing requiring the verification plan to be updated.

If deviations result from checking the sampled data, the verifier must assess the risk of misstatements and non-conformities in other parts of the population from which the sample was taken and subsequently increase the sample size, and determine whether further sampling activities and testing is required. The verifier must consider whether the sample selected provides a reasonable basis for conclusions about the tested population to the level of assurance required by EU ETS: reasonable assurance. These steps are shown in the figure below:

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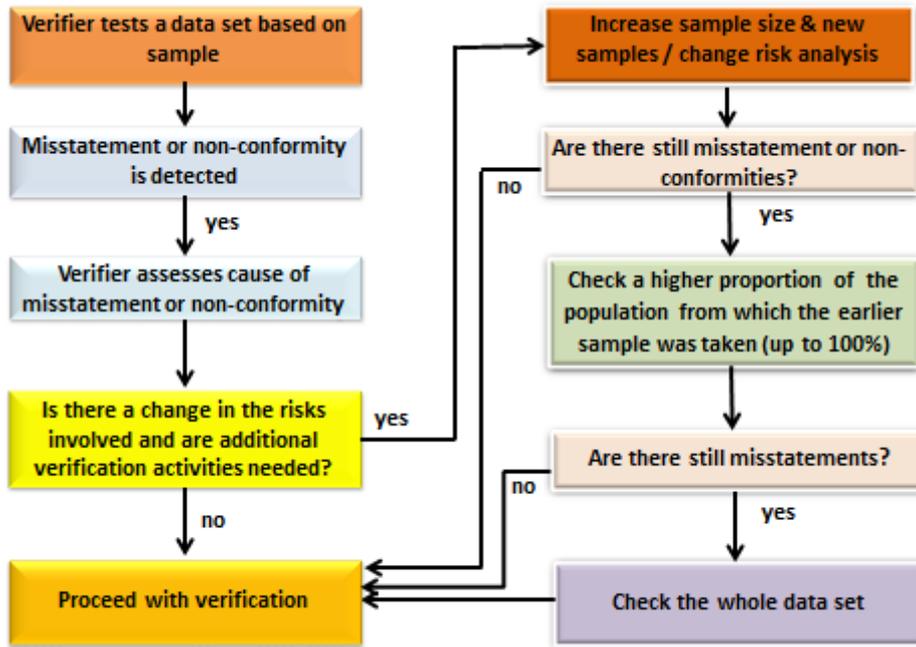


Figure 3: The steps that verifier must consider when it tests a sample of a data set

Please note that any identified misstatements or non-conformity must be corrected by the operator.



7. Tools for Sampling

For large and complex installations/aircraft operators the data populations may be large and sometimes very large (e.g. thousands of eligible flights, or 30 second fuel consumption data aggregated to hourly averages). So, sampling may be complex and therefore warrant the use of software tools to design the sampling regime.

The verifier may want to use software¹⁶ to facilitate the process of sample selection and sample evaluation; the financial accounting profession has generally accepted models that can be adapted for this verification purpose (or models can be specifically developed). The advantages offered by these tools are many. First of all, verifiers do not need to remember many complicated formulas used in statistical analysis. These statistical formulas are already embedded in the software, and by inputting the necessary parameters, the system provides reliable calculations. Secondly, these tools are fast, allowing the verifier to save time. Thirdly, selections operated by the software are not influenced by subjective factors that could influence the verifier in a manual selection. Furthermore, audit-dedicated software available on the market offers many audit-specific features that can also be used by verifiers providing specific information on each test performed.

¹⁶A broad range of software can help the verifier apply sampling methods, from standard office software, such as MS Excel, to specific data management/data mining software. Regarding sampling methods, audit-specialised software can perform data stratification, sample extraction and statistical analysis. Non-dedicated software can provide the same features.