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Guidance Document

The Accreditation and Verification Regulation - Process Analysis

AVR Key guidance note No. II.3, Version of 17 October 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 17 October 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 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 (KGN II.3) explains the required activities a verifier must undertake during the process analysis. This note represents the views of the Commission services at the time of publication. It is not legally binding.

1. Process analysis

During the process analysis the verifier carries out several checks and tests to gather sufficient evidence to be able to come to an appropriate verification opinion statement. First of all the verifier checks whether the monitoring plan (MP) approved by the Competent Authority (CA) has been implemented and whether it is up to date.[2] This involves for example an assessment of the design and existence of the data flow, checking the installation's boundaries, checking the existence of the procedures listed in the MP, checking on site whether changes to the MP have occurred, checking whether and what documented information exists, checking the effectiveness of the control activities etc.). In addition the verifier carries out detailed data testing consisting of analytical procedures, data verification and assessing the application of the monitoring methodology.

The checking of the implementation of the MP and the substantive (detailed) data testing are interconnected and should not be seen as separate activities. For example the AVR requires the verifier to check the completeness of the source streams and the emission sources of the installation: this is a major element in the data testing and part of checking the implementation of the MP (e.g. checking the correct delineation of installation boundaries).

During these investigations, the verifier will assess whether the assumptions made and the assessments done during the strategic analysis and the risk analysis can be confirmed, or whether the verification plan needs adaptation. If decisions or assumptions in the strategic analysis and the risk analysis cannot be confirmed or if misstatements and non-conformities are identified, the risk analysis and the verification plan must be reassessed and adapted, and this will impact the depth and detail of further verification activities.

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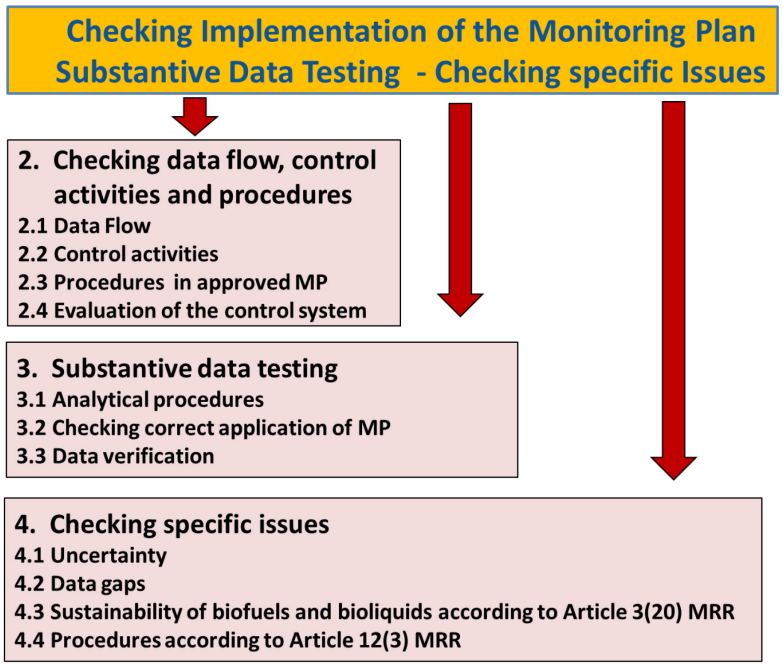
[1] Commission Regulation (EU) No 600/2012 of 21 June 2012 on the verification of greenhouse gas emission reports and tonne-kilometre reports and the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council, OJ EU, L 181/1.

[2] This could involve checking the implementation of multiple versions of the MP if the MP was updated several times during the reporting period. The verifier must check whether the monitoring plan is up to date and whether it has changed in the reporting period.

If a large amount of data or control activities are involved, the verifier can, based on its risk analysis, decide to use sampling (please see the key guidance note on sampling (KGN II.3)).

Although the concepts explained in this note equally apply to aircraft operators, examples presented herein apply specifically to installations. For aviation specific guidance and examples please see the separate EU ETS aviation verification guidance document (GD III), in particular section 3.2.6 and chapter 4.	

This KGN II.3 is built up as follows:



2. Checking data flow, control activities and procedures

A key aspect in the process analysis is checking the data flow, the control activities and the procedures listed in the approved MP.

2.1 Data flow

Art. 57 MRR

An operator has to establish, implement, maintain and document written procedures for the data flow activities. Data flow activities are all operational activities necessary to produce an operator's report from the primary data. Examples of data flow activities are measuring, analysing data, recording the information, sending samples to the laboratory for analysis, calculating parameters, automatically generating data from operator's systems and aggregating data for the emission report. In short, it concerns all steps that are needed to generate or compile an operator's report. Primary source data can come from many different sources and can arise at different points of time involving different departments in the operator's organisation and management structure. Data can be created centrally within the installation (e.g. measuring activity data with the operator's own measurement instruments) or in a decentralised way (e.g. data from fuel suppliers, analyses done by an external accredited lab). Primary source data are for example fuel data, data readings from measurement instruments, or data concerning source streams.

A verifier's check of the data flow

The verifier has to assess whether the data flow as described in the approved MP meets the actual practice by testing the data flow activities, checking the data trail and following the sequence and interaction of the data flow activities. The verifier traces the data back to the primary sources, checks the existence, consistency and validity of these primary source data and follows each processing step in the data flow. **Art. 14(a) AVR**

In addition, the verifier will check which persons are responsible for specific data flow activities. An important aspect which the verifier shall take into account when assessing the inherent risks related to the data flow activities, is whether these persons are accustomed and competent to deal with these specific data flow activities.

The general data flow is often dependent on existing IT and/or data management systems. The verifier cannot rely solely on existing IT and/or data management systems or procedures without testing the EU ETS specific data flow and EU ETS specific alterations to the existing systems.

To assess the data flow, the verifier must understand which data from the data flows actually end up in the final emissions data calculations, how the aggregation is being carried out and what the specific primary data sources are. For more guidance on how to understand the data flow, please see section 5.5 of the MRR guidance document No. 1 (GD1) and the MRR guidance document No. 6 on Data flow activities and control system (GD6).

2.2 Control activities

An operator must avoid misstatements in the reported data and mitigate the risks related to the data flow activities. To ensure that the operator's report resulting from the data flow activities does not contain misstatements and is in line with the approved MP and the MRR, the operator must establish, implement, maintain and document a sufficiently robust and accurate control system. Such a system consists of two components: the operator's risk assessment and the operator's control activities. **Art. 58 MRR**

An operator's risk assessment is an assessment of its inherent risks[3] and control risks[4]. The outcome of this assessment determines which and how the necessary control activities need to be set up to mitigate the inherent risks related to the data flow activities. These control activities include at least the following activities: **Art. 58(2) MRR**

- the quality assurance of the measurement equipment;
- the quality assurance of the IT system used for data flow activities[5];
- the internal reviews and validation of reported data;
- the control of outsourced processes;
- the corrections and corrective actions;

[3] Inherent risks means the susceptibility of a parameter in the operator's or aircraft operator's report to misstatements that could be material, individually or when aggregated with other misstatements, before taking into consideration the effect of any related control activities (Art. 3(15) AVR). These are risks related to the data flow activities without taking into account the effect of control activities.

[4] Control risks means the susceptibility of a parameter in the operator's or aircraft operator's report to misstatements that could be material, individually or when aggregated with other misstatements, and that will not be prevented or detected and corrected on a timely basis by the control system (Art. 3(16) AVR). These are risks that the control system is not functioning properly.

[5] IT systems also include DCS, plant information systems, laboratory information systems and meter flow computers etc.

- the records and documentation (as well as document retention);
- the segregation of duties.

A verifier's check of the control system

The verifier must assess the operator's risk assessment and inform the operator if it has failed to identify the relevant inherent risks and control risks properly. Please see the key guidance note on the verifier's risk analysis (KGN II.2). **Art. 12(3) AVR**

The verifier must also carry out its own assessment and test the control activities, based on the verifier's analysis of the inherent and control risks involved. Assessing the control activities not only concerns assessing the establishment of the operator's control activities, e.g. persons assigned to be responsible for data flow activities and carrying out systematic cross-checks (vertical and horizontal checks, access controls, release checks etc.). It also involves an assessment of the operator's documentation, implementation and maintenance of these control activities including appropriate succession or planning of replacement to accommodate situations when personnel change jobs or take leave. The key question is to what extent the control activities are sufficient to mitigate the risk of misstatements and non-conformities. Relevant questions for the verifier are for example: **Art. 14(b) AVR**

- Are the control activities set up such that they can function properly and effectively?
- What is the frequency of the control activities?
- Are the control activities carried out manually or electronically?
- Are the control activities implemented correctly so that they can function in practice? Is there a 4-eye principle (double check by another person)?
- Who is responsible for a specific control activity and does this person have sufficient knowledge and experience to carry out that control activity properly?

There are different types of control testing that could be carried out during the verification. These include the following:

- Inquiry of relevant information, e.g. through interviews. Note that inquiry alone will not provide sufficient evidence to support a conclusion about the effectiveness of a control. Accordingly, while inquiry can be useful, it is best used in combination with other control testing techniques;
- Observation, which consists of looking at a process or procedure being performed by the operator: for example, the verifier's observation of monitoring devices being calibrated by the operator's personnel, or of the performance of control activities. Observation provides evidence about the performance of a process or procedure, but is limited to the point in time at which the observation takes place and also by the fact that the act of being observed may affect how the process or procedure is performed;
- Inspection to determine whether, when and how manual controls are being performed. It involves:
  - Examining records or documents, whether internal or external, in paper form, electronic form, or other media, for example, calibration records of a monitoring device. Inspection of records and documents provides evidence of varying degrees of reliability, depending on their nature and source and, in the case of internal records and documents, on the effectiveness of the controls over their production. Examples are written explanations, laboratories' analysis results, manuals detailing information on collection procedures and internal control activities, reports prepared by management, indications of follow-up documentation; or

- Physical examination of, for example, a calibrating device, measurement equipment.

- Re-performance testing, which is generally used when a combination of inquiry, observation and inspection of evidence does not provide sufficient or appropriate evidence that a control is operating effectively. In the case of re-performance, the verifier carries out the control activity itself to assess its effectiveness (e.g. cross-checking the data itself).

Some existing control activities may have already been tested or verified by others, e.g. billing systems subject to internal audits and subsequently used to retrieve or cross-check with EU ETS data. This does not relieve the verifier from testing the control activities and especially the EU ETS adaptations. It is especially relevant for the verifier to assess what the scope and subject matter of the test performed by others was, e.g. what parts were checked and which were not, what alterations were made for EU ETS, who conducted the audits, is relevant documentation available, what audit procedures were carried out by that third party, are recommendations made in the audit also relevant for EU ETS, and if so, have these recommendations been implemented etc..

With respect to the testing of the different control activities, the following should be considered by the verifier:

Control activity	How the verifier checks the control activity	
Quality assurance of the measurement equipment	An operator must ensure that all relevant measuring equipment is calibrated, adjusted and checked at regular intervals and checked against measurement standards traceable to international measurement standards. The required frequency and nature of checks and adjustments may be specified in the operator's MP or in the internal written procedures. In such cases, the verifier shall: ▪ confirm that the appropriate checks and adjustments have been carried out; and ▪ review the documentation to ensure that the checks have been performed in accordance with the required standards and procedures. If the checks have not been carried out by the operator in accordance with the approved MP or procedure, this is to be noted as a non-conformity; and ▪ check whether corrective action has been taken by the operator if the measurement equipment was found not functioning properly. Where the frequency and nature of the checks is not specified in the MP, the verifier should review the documentation and records, and consider whether: ▪ the operator has demonstrated that the relevant metering equipment has been calibrated, adjusted and checked at regular intervals including prior to use; and ▪ the metering equipment has been checked against appropriate calibration standards traceable to international measurement standards (if available); and ▪ the operator has promptly taken necessary corrective action when the equipment was found not to conform to requirements. If appropriate international standards are not available, the operator shall follow draft standards, industry's best practice guidelines or on-site procedures and other scientifically proven methodologies, and provide evidence that the techniques used are appropriate. These will then be	**Art. 59(1) MRR**

Control activity	How the verifier checks the control activity	
	checked by the verifier. Examples of records that the verifier could request from the operator to assess whether the quality assurance of the measurement equipment is effective, include (inspection of) records on: ▪ age of the meter ▪ visual inspections ▪ maintenance carried out according to manufacturer's recommendations ▪ cleaning, calibration and adjustment of meters ▪ orifice plate/instrument sizing/isometrics ▪ laboratory calibration, and regular on-site loop calibrations of: - differential pressure transmitters - pressure transmitters - temperature transmitters - density transducers (densitometers) ▪ flow (mass) calculation checks ▪ in use constant values ▪ flow totalisation tests In addition to calibration and maintenance of meters, verifiers are reminded to consider and check the following: ▪ meter installation, e.g. adequate straight pipework upstream and downstream of a meter (depending on meter type); ▪ meters should be in the appropriate plane (vertical/horizontal pipework); ▪ flow volumes being measured, e.g. volumes and type still within the original design capacity of the meter; steady state flow etc.; ▪ the possible limitations of weighbridge calibrations; ▪ whether corrective action has been taken if during the reporting period equipment was found not to comply with the requirements or was not functioning properly; ▪ whether the correct factors have been used by operators to perform checks and adjustments. For example, verifiers must check that consistent standard temperature and pressure factors have been used and that these are consistent within any calculation for adjustments. If the operator cannot calibrate components of the measurement systems, the MRR requires the operator to propose alternative control activities in the MP. The verifier must check in that case whether the control activities are functioning and whether they are effective to mitigate the risks of misstatements. Where quality assurance of continuous measurement systems are used by the operator, the verifier checks: ▪ whether calibration is carried out at the frequency and in accordance with the requirements mentioned in the standard Quality assurance of automated measuring systems (EN 14181), and that parallel measurements are carried out at least once a year by competent staff; ▪ the annual average hourly concentration used as a substitute for emission limit values, if applicable; ▪ whether corrective action has been taken if the operator has found non-compliance with the quality assurance requirements and whether this has been reported to the CA.	**Art. 59(1) MRR** **Art. 59(2) MRR**

Control activity	How the verifier checks the control activity	
Quality assurance of the IT system used for data flow activities	IT systems can be used to collect and process data for the operator's report. However, an IT system is more than just hardware and software. It also concerns the IT environment/organisation, the IT based processes, IT applications and infrastructure: ▪ risks related to IT processes include for example lack of transparency in the data flows (black boxes), malfunctioning of the interface(s), risk that control measures only see to part of the processes and not the whole process, computer system failures resulting in a failure to collect data from automated monitoring equipment during the time of system failure; ▪ risks in IT applications relating to malfunctioning of those applications include for example lack of back-up procedures for data, lack of input controls, process controls and output controls (in particular where updates or new software are rolled out), potential software coding or scripting errors that could lead to misstatements; ▪ risks related to the IT infrastructure include the vulnerability to interference and breaches of information security which may lead to increased risk in the collation, transfer, processing, analysis, aggregation, storage and reporting of data; ▪ other risks are related to human errors in the computer information system e.g. overwriting a spreadsheet containing last month's data with this month's data before backing up the data. There can also be a combination of the above risks. Verifiers need to understand the extent of the risks and the control of these risks in relation to IT systems. In addition verifiers will also consider: ▪ the proper use of calculation formulae and access controls, the possibility of recovering data, continuity planning and security with respect to IT; ▪ whether the IT systems and processes are managed under an effective IT Management System such as ISO 20000. The verifier checks the control activities that are implemented in the IT system and electronic interfaces to ensure: ▪ timeliness, availability and reliability of data; ▪ correctness and accuracy of data, e.g. avoid double counting etc.; ▪ completeness of data; ▪ continuity of the data to avoid that data are being lost and to ensure traceability of data; ▪ integrity of data: i.e. data is not modified unauthorised. These control activities could include a manual check on whether the IT system is functioning and whether the aforementioned points are met. It will include control activities and maintenance tools built into the IT system such as access controls, backups, recovery, continuity planning, change management and security. The type of testing carried out by the verifier depends on whether these control measures are manual or electronic.	**Art. 60 MRR**
Internal reviews and validation of reported data	The operator must design and implement internal reviews on defined data sets throughout the data flow. This includes horizontal and vertical checks as well as plausibility checks. Basically two types of control activities performed by the operator exist: controls that monitor the data flow to avoid failures, and detection controls that aim to detect errors. Examples of monitoring controls are the four eyes	**Art. 62 MRR**

Control activity	How the verifier checks the control activity	
	principle, i.e. double check by another person, and access controls. Examples of detection control are plausibility checks or routine checks for identifying errors. Both types of controls can be carried out manually or electronically. The verifier will check that these internal review control activities and associated corrective actions are undertaken to rectify the errors in the data. This can include testing of the cross-checks and plausibility checks: for instance, the verifier can observe the operator carrying out these review checks or the verifier can perform cross-checks itself or test the access controls. The verifier will also assess to what extent these internal review checks and corrective actions are documented and which person is responsible for these checks. This documentation should contain proof that these internal review checks were performed, and that clear criteria for rejecting data have been documented. Examples of such proof are visible sign-offs after review, approvals by email or visible reconciliations performed.	
Control of outsourced processes	Parts of the data flow can be outsourced to external service providers such as external laboratories, measurement activities, etc.. In the case of outsourced processes, the operator will remain responsible for the correctness of the data entering in the operator's report and for the control of the quality of these processes. The verifier has to check to what extent a certain data flow activity or control activity has been outsourced. Moreover it has to test the control activities that the operator has implemented to ensure the quality of the outsourced processes: e.g. assessing the procedures for procurement, internal audit (including frequency of audits), carrying out plausibility checks on the data, checking contracts with external parties, instrument engineers, checking how an operator ensures that the party to which the activity is outsourced, carries out the activities according to the MRR and other requirements.	**Art. 64 MRR**
Corrections and corrective actions	If any part of the data flow activities or control activities is found not to function effectively or outside boundaries that are set in the procedures for data flow activities or control activities, the operator must make appropriate corrections and correct rejected data. The verifier checks for example whether: ▪ corrective action has been indeed taken in those situations and whether the emissions are not underestimated; ▪ effective control activities have been implemented to prevent data flow activities and control activities from not functioning effectively or from being outside the boundaries that are set in the relevant procedures; ▪ the criteria in the procedures for data flow activities and control activities are addressed and met by the operator, and whether the details of these procedures are effective to avoid malfunctions; ▪ the operator has notified the CA of any equipment failures or drops to lower tiers during the reporting period, and that efforts were made to correct the failures as promptly as possible.	**Art. 63 MRR**

Control activity	How the verifier checks the control activity	
Records and documentation (as well as document retention)	The verifier checks: ▪ whether and how information on the monitoring methodology, primary data, data flow activities, control activities and procedures is documented. This includes information on repairs, malfunctioning and incidents at the installation that can effect the reported data; ▪ whether the document management system to retain the information is effective.	**Art. 66 MRR**
Segregation of duties	The verifier checks whether the persons responsible for the data flow activities and control activities are competent and do not perform conflicting duties (e.g. whether the responsibilities for recording, processing and reporting are carried out by different persons). The verifier checks how the operator manages the competencies for the persons responsible for the data flows and control activities, and the verifier takes that into account when assessing the inherent and control risks.	**Art. 61 MRR**

2.3 Procedures mentioned in the approved MP

The MRR requires several elements to be put into written procedures. The objective of these procedures is to ensure that the control activities are effective and to mitigate the risks that ineffective control activities lead to misstatements and non-conformities. A summary of these procedures must be listed in the approved MP. This includes procedures for: **Art. 12 MRR**

- Management of responsibilities and competency of personnel;
- Data flow activities and control activities;
- Quality assurance of measurement equipment;
- Regular review of the MP for its appropriateness;
- Sampling plan if applicable and revision of that sampling plan;
- Methods of analyses if applicable;
- Demonstrating evidence for equivalence to EN ISO/IEC 17025 accreditation of laboratories, if relevant;
- Uncertainty analysis when the fall-back methodology is used;
- How to deal with missing data;
- Use of measurement based methodologies, including corroborating calculations and subtracting biomass emissions;
- Only if a Member State requires this, a procedure for ensuring that the operator meets the requirement laid down in Article 24(1) of Commission Decision 2011/278/EU[6]: i.e. reporting by 31 December of the reporting period, any planned or actual changes to the capacity, activity level and operation of an installation to the CA.

The verifier must check that these procedures: **Art. 14(c) AVR**

- are present, properly documented and retained;
- contain the information listed in the summary of the procedures in the approved MP;
- have been correctly implemented and are up to date;
- are applied throughout the year;
- are effective to mitigate the inherent and control risks.

[6] Commission Decision of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council, OJ EU, 17 May 2011, L 130/1.

If the verifier considers that the procedures are inadequate, improvements should be clearly described and noted in the verification report. If improper procedures lead to misstatements or if the verifier comes across a procedure that is not in line with the MRR, this should be reported in the verification report (please see the Key guidance note on the scope of verification (KGN II.1)).

2.4 Evaluation of the control system

The operator must monitor the effectiveness of the control system by, for example, carrying out internal audits using an internal auditor that is not involved in the data gathering, monitoring and reporting process, and by taking into account findings of the verifier. The verifier is responsible for assessing the quality of these internal audits and evaluation processes, and whether these processes are properly documented and whether findings of the verifier related to these procedures in a prior verification have been followed up.

Art. 58(4) MRR

3. Substantive data testing

Substantive data testing consists of analytical procedures, data verification and assessing the correct application of the monitoring methodology to detect misstatements. The extent to which this data testing is carried out depends on the outcome of the verifier's risk analysis and the verifier's assessment of the data flow, the control activities and the procedures listed in the approved MP. If the verifier does not have confidence in the robustness and appropriateness of the control activities and procedures, more extensive data testing is needed.

3.1 Analytical procedures

If during the assessment of the inherent risks and the control risks, and the testing of the control activities the verifier has doubts about the robustness and aptness of the control activities, the verifier must apply analytical procedures, i.e. analysing fluctuations and trends in data, assessing relationships with other data[7] and using other relevant information to check deviations from predicted values. In most cases analytical procedures will be applied anyway.

Art. 15 AVR

Key activities are assessing the plausibility of fluctuations and trends over time or between comparable items: e.g. comparing GHG emissions of the reporting period with previous year's emissions; comparing GHG emissions from various units with production figures for those units; comparing emission data and underlying data such as fuel consumption; analysing trends in emissions and production data during a defined period to identify anomalies for further investigation; comparing operational conditions with fuel consumption; identifying immediate outliers; identifying unexpected data and data gaps.

Art. 15(2) AVR

Unusual high or low figures or unexpected relationships in the data that are identified may assist the verifier in identifying potential risk areas and tailor further verification activities such as more strengthened data verification. In general analytical procedures are therefore used in several stages of the verification process:

- preliminary analytical procedures on aggregated data before the process analysis. This is part of the strategic analysis and assessment of inherent risks (please see key guidance note on risk analysis (KGN II.2));

Art. 15(3) AVR

[7] This involves for example comparing emissions with production data or comparing emission data from this year with data from previous years.

- substantive analytical procedures on aggregated data and the data points underlying these aggregated data to enable the verifier to identify potential structural errors and immediate outliers;
- final analytical procedures on the aggregated data to ensure that all errors identified during the verification process have been resolved correctly.

Analytical procedures are in particular effective when disaggregated data are readily available or when the verifier has reason to consider that the data to be used are reliable such as when it is extracted from well-controlled sources, e.g.:

- from the financial reporting system; or
- from other systems where common input controls are applied (e.g. if the quantity of purchased fuel as recorded on the fuel invoice(s) is entered into the operator's account payable system in the same way as other data from the invoice).

Where the verifier identifies outliers, fluctuations, trends, data gaps or data that are inconsistent with other relevant information or that differ significantly from expected amounts or ratios, the verifier shall obtain explanations from the operator supported by additional relevant evidence. Based on the explanations and supporting evidence provided, the verifier shall assess the impact on the verification plan and the verification activities to be performed. This could result in additional data verification.

Art. 15(4) AVR

3.2 Checking the correct application of the monitoring methodology

The verifier must check the correct application of the monitoring methodology laid down in the approved MP. The verifier will check for example whether:

Art. 17 AVR

- the operator has applied the monitoring methodology in line with the approved MP;
- the spread sheets and other tools or software used to calculate emissions have been correctly used and/or function properly;
- correct totals and subtotals have been used in the formulae to calculate the emissions and parameters;
- the correct tiers were applied according to the approved MP and whether all relevant tier requirements have been met, in particular the uncertainty thresholds for the parameters;
- the correct units were used for the parameters (e.g. activity data and calculation factors, and the proper parameters such as the flue gas flow and concentration in the case a measurement based methodology is applied);
- the type of metering upon which data gathering relies, the type and location of the measurement equipment and the measurement equipment has been included in the approved MP, whether this is in line with the requirements in the approved MP and whether regular calibration has been performed (please see under quality assurance of measurement equipment in section 2.2).

The table below provides some examples of what a verifier should check for some specific elements of the monitoring methodology.

Element in monitoring methodology	**Examples of what a verifier should check**
Activity data (calculation based methodology)	The verifier must for example: ▪ check invoices and delivery notes, and stocks if the activity data is based on liquid or solid fuels material that is stored on site;

Element in monitoring methodology	Examples of what a verifier should check
	▪ check meter readings if the activity data are based on measurement; ▪ check whether activity data and related data are properly documented; ▪ carry out cross-checks with other data such as total fuel consumption. The MRR allows for the consumption of fuels and materials to be determined by either the operator or the supplier. Supplier determinations will often be presented in the form of invoiced data issued to the operator for the goods received. However, an invoiced quantity may not always exactly tally with the start (1st January) or end (31st December) of the reporting period. For example, it may concern gas where an invoice runs from mid December to mid January. In these circumstances operators are expected to show reasonable clearness in deciding how much of the invoice relates to which reporting period. The verifier should ensure that the two parts, i.e. the part that is allocated to the current reporting period, and the part allocated to the next period, add up to the total(s) in the invoice concerned. The operator should either take a gas meter reading on 31st of December or otherwise proportion it using an appropriate pro rata mechanism. If a reading of a meter cannot be done by the operator exactly on 31st of December, then the verifier must consider the potential impacts of the meter reading being taken at another time and its effect on data accuracy. If the entire plant has closed down for the Christmas break and during that time no fuel is used, then an earlier meter reading should be acceptable and should not affect the data. This also applies to the start of the next reporting year commencing 1st January where the invoice has a different starting date. However, other circumstances will require more careful consideration of the robustness of any reconciliation involved.
Calculation factors (net calorific value, carbon content, emission factor, oxidation factor/ conversion factor, biomass fraction	The verifier must for example check: ▪ whether correct default values have been applied if the calculation factors are based on default values (e.g. IPCC data, national inventory data); ▪ results of sampling and analysis, and whether results are applied to appropriate batches, if the operator is required to determine the calculation factor by analysis of samples; ▪ whether analysis and sampling have been carried out according to the applicable standards; ▪ whether proper documentation is retained from laboratory tests to calculate emissions data, e.g. results from tests for establishing net calorific values and emission factors for fuels, activity specific oxidation factors, process emission factors and composition data, calibration procedures (reporting dates, certificates and data), and the biomass fraction; ▪ corrections to standard conditions 0°C and 101,325 PA.
Accredited Laboratories	The verifier must for example check whether: ▪ the laboratory is accredited according to EN ISO/IEC 17025; ▪ analytical tests as outlined in the contract with the accredited laboratory have been carried out according to the approved MP; ▪ the scope of accreditation of the accredited laboratory covers the

Element in monitoring methodology	Examples of what a verifier should check	
	required test methods and analyses.	
Non- accredited laboratories	The verifier must for example check whether: ▪ the non-accredited lab is certified in line with EN ISO/IEC 9001 or another equivalent certified quality management system that covers the relevant activities of the laboratory; ▪ the laboratory has provided evidence that the lab is capable of managing its personnel, procedures, documents and tasks in a reliable manner and that it is competent to generate technically valid results. Please see section 5 of the MRR guidance No. 5 on Sampling and Analyses (GD 5); ▪ laboratory procedures have been carried out as documented in the approved MP and related procedures.	
Sampling	The verifier must for example check: ▪ whether sampling is carried out according to the sampling plan approved by the CA; ▪ whether the sampling plan has changed and these changes were approved by the CA; ▪ whether the sampling plan is still appropriate and can deliver the most representative samples for the current circumstances; ▪ whether the procedure underlying the sampling plan is documented, implemented, maintained and effective.	**Art. 17(2) AVR**
Measurement based methodology	The verifier must for example check: ▪ completeness of hourly data and of substitution data for incomplete hours; ▪ calculations and underlying measurements if the flow rate is calculated; ▪ calibration and maintenance documentation for flow and concentration measurements; ▪ calculations used to corroborate the measured values; ▪ calculation of annual emissions; ▪ if laboratory procedures have been carried out as documented in the monitoring plan and related procedures.	
Transferred CO_2	The verifier must for example check whether: ▪ there are differences between the measured values at the transferring and the receiving installation and whether these can be explained by the uncertainty of the measurement systems; ▪ the correct arithmetic average of measured values has been used in the emission reports of the transferring and receiving installation. If the measured values at the transferring and the receiving installation cannot be explained by the uncertainty of the measurement systems, the verifier must check whether: ▪ adjustments were made to align the difference between the measured values; ▪ these adjustments are conservative and do not lead to an overestimation of emissions; ▪ the CA has approved the adjustments.	**Art. 17(3) AVR**
CCS	For installations for the capture of CO_2 and for transport networks for CO_2, and for CO_2 storage sites the verifier must check: ▪ the measurement systems at the CO_2 transfer points;	

Element in monitoring methodology	Examples of what a verifier should check
	▪ if measurements are carried out by the operators of the two (or more) connected installations, the applicability of those data, and compare this to the installation's own data if applicable. For CO_2 storage sites, the verifier must check: ▪ all information regarding leakage detection, and if relevant leakage has occurred, the quantification of that leakage; ▪ calculation of the annual emissions.

3.3 Data verification

Taking the approved MP, the verifier shall check the correctness of the installation boundaries and the completeness of the source streams and emission sources. The verifier checks:

Art. 16 (2) (a)(b) AVR

- whether the installation boundaries, emission sources and source streams as described in the approved MP, reflect the actual situation in the installation;
- the correct categorisation of the installation;
- the correct categorisation of emission source streams into de-minimis, minor and major source streams;
- whether data gaps and double counting have occurred because emission sources or source streams are lacking or have been incorrectly defined in the MP or the emission accounts.

The AVR requires the verifier to check the reported data as well as the underlying data. The key activity is to check the accuracy and reliability of the data and to see whether the aggregated reported data are consistent with primary source data. This can for example be done by:

Art. 16 AVR

- tracing the data back to the primary source: e.g. tracing emissions from reported CO_2 data back to activity data and then to primary sources, e.g. fuel invoice(s) or measurement data, tracing emission factors to appropriate sources such as national inventory values, lab analysis results;
- checking whether the data flow activities can be added up to a complete audit trail from primary data sources to the final figures in the report under verification;
- cross-checking data with internal data sources, e.g. cross-checking emission data with production data;
- cross-checking data with external data sources, e.g. cross-checking emission data with fuel data from the gas supplier(s);
- performing reconciliations, e.g. comparing data sets with each other;
- checking readings from measurement equipments;
- checking the accuracy of calculations and the suitability of calculation methods used (e.g. checking whether the input data in the calculation formulae result in the correct emission data, backtracking and recalculating the data to match with the reported emission data);
- checking how emissions established through the data gap approach[8] relate to actual reported emission data;

[8] Approach an operator has been using to fill a data gap that it has identified.

- cross-checking fuel consumption data with total fuel consumption from other sources;
- checking the extraction of the emissions report data from internal systems or checking the collection/manipulation of data for the actual drafting of the operator's report;
- checking the transfer of data from the internal systems to the CA's defined reporting format (e.g. emissions report template or IT system).

4. Specific issues related to checking the correct application of the monitoring methodology

During the actual verification, the verifier must check specific issues related to the application of the monitoring methodology. These concern for example the uncertainty of measurement equipment, the methods applied for missing data, the checking of the sustainability of the biofuels and bioliquids used, and the checking of specific procedures and data concerning the capacity, activity level and operation of the installation.

This section specifically applies to installation. For aviation specific guidance and examples please see the separate EU ETS aviation verification guidance document (GD III).	

4.1 Uncertainty

Managing the uncertainty of the monitoring of emissions plays a critical role in the calculation based methodologies, the measurement based methodologies and the fall-back approaches. For both the calculation based methodologies and the measurement based methodology, the verifier must therefore check the validity of the information used to calculate the uncertainty levels as approved in the MP. The type of information used depends on the methodology, on the type of measurement instrument and on the approach the operator applies to calculate the uncertainty levels and to demonstrate that the required tier and corresponding uncertainty threshold is met.

Art. 19(1) AVR

When determining activity data in the calculation based methodology, the different tiers associated with the activity data of a source stream are directly related to a maximum uncertainty allowed for the determination of the quantity of fuel or material over the reporting period.[9] Meeting the relevant tier must be demonstrated by submitting an uncertainty assessment to the CA. However, this requirement is not applicable to installations with low emissions. The approach used to assess whether the required uncertainty is being met, depends on whether the measurement instrument is under the operator's own control or under the control of other parties. For measurement instruments under the operator's, control different routes can be applied:

Art. 12(1) MRR

1. using the maximum permissible error in service allowed by the national legal metrological control, if the measurement instrument is subject to that control;
2. using a maximum permissible error specified for that measurement instrument in service, or using an uncertainty assessment obtained by calibration multiplied by a conservative factor, if the measurement instrument is not subject to national legal metrological control and the instrument is installed in an environment and under conditions that is appropriate for its use specifications;
3. undertaking a specific and extensive uncertainty assessment.

[9] MRR Guidance Document No. 4, on Uncertainty Assessment (GD4).

For point 1, the verifier checks whether the measurement instrument is covered by legal metrological control, e.g. checking the certificate of the official verification of the instrument and checking specifications from the national legal metrological control institute. The verifier must be sufficiently confident that the instrument is regularly calibrated.

For point 2, the verifier would for example check the manufacturer's specifications, the specifications from the legal metrological control, and the procedures implemented by the operator to ensure that the activity data are measured against the relevant standards.

For point 3, the information to calculate the uncertainty level by means of this complex uncertainty assessment is more substantive than the information needed for measurement instruments for which a more simplified uncertainty assessment can be applied. This means that the verifier will have to check all information used for this specific uncertainty assessment.

If the measurement instruments are outside the control of the operator, the verifier must check the validity of the information. The operator needs to make relevant evidence and documents available to the verifier. This means that the operator must obtain information on for example the calibration results and the manufacturer's specifications of the instruments used by the trade partner.

Although small installations are not required to submit an uncertainty assessment to the CA, the verifier will still check the validity of the information that is used by the operator to see whether it complies with the required uncertainty threshold.

Art. 47(3) (4) MRR

For determining calculation factors in the calculation based methodology, uncertainty plays a role in situations where the operator chooses not to use the minimum frequencies for the analysis listed in Annex VII of the MRR and the operator determines the frequency of analysis by using the approach of the IMPEL/ETSG Excel tool. This tool enables the operator to demonstrate that any variation in the analytical values for a fuel or material does not exceed 1/3 of the uncertainty value which the operator must meet for the monitoring of the activity data for that specific fuel or material. The determination of this variation has to be based on historical data, including analytical values for the monitoring of the respective fuels or materials in the reporting period immediately preceding the current reporting period. The verifier checks the historical data and other information that is used in the IMPEL/ETSG Excel tool described in section 4.2 of the MRR Guidance No. 5 on Sampling and Analysis (GD 5).

Art. 35(2) MRR

The operator may apply a fall-back methodology if the operator cannot apply at least tier 1 because of technical infeasibility or unreasonable costs:

- for one or more major source streams or for minor source streams under a calculation based methodology; or
- for one emission source related to the same source stream under a measurement based methodology.

Art 22 MRR

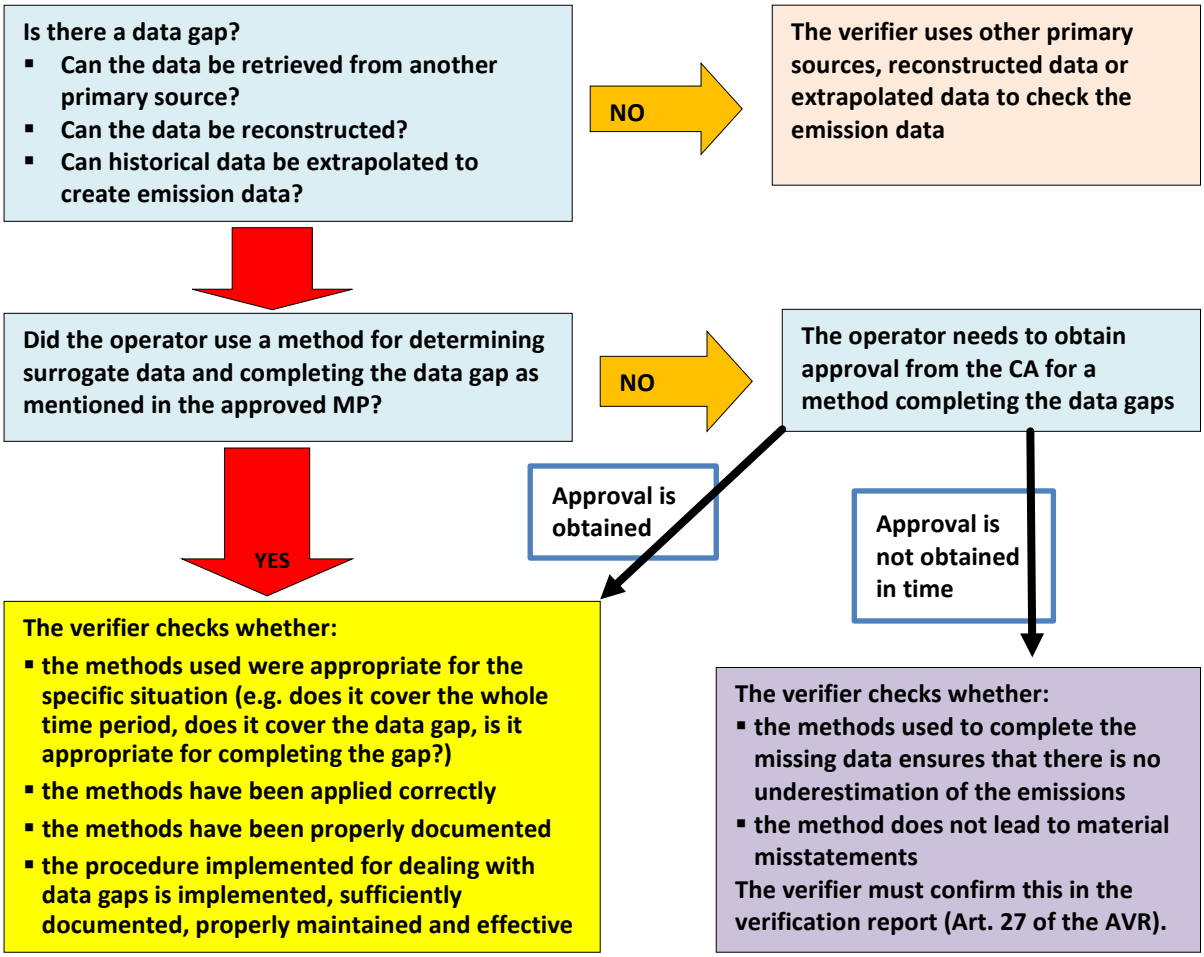
A fall-back methodology is not based on tiers whereby the operator is required to demonstrate compliance with an overall uncertainty threshold for the annual GHG emissions. However, the MRR contains specific requirements that an operator must adhere to when applying the fall-back methodology.

The verifier must therefore check:

- whether the operator has carried out an assessment and quantification of the uncertainty during the reporting period to make sure that the required overall uncertainty is being met; **Art. 19(2) AVR**
- the validity of the information used to assess and quantify the uncertainty; this can concern all types of information;
- whether the overall approach used for the assessment and quantification of the uncertainty is in line with the ISO guide to the expression of uncertainty in measurement JCGM 100:2008 or another equivalent internationally accepted standard;
- whether evidence is provided that the conditions for applying the fall-back methodology are applicable (e.g. the operator cannot apply at least tier 1).

4.2 Data gaps

Data gaps can be identified by the verifier when carrying out analytical tests and detailed data verification, or by the operator himself during the reporting period. The figure below shows what the verifier is required to check in the case of data gaps: **Art. 18 AVR**



A data gap occurring several times over a longer period of time may show that the control activities are not functioning correctly. The verifier will therefore assess the frequency of data gaps occurring and the control activities implemented to avoid these data gaps. The verifier assesses whether the control activities are effective. (e.g. whether IT systems, **Art. 18(2) AVR**

automatically transferring data, are secure and functioning properly, whether the operator has built in manual controls to ensure that no data gaps occur).

4.3 Checking the sustainability of biofuels and bioliquids

Art. 3(20) (21) (22) MRR

The MRR contains new requirements concerning biomass. The definition of biomass is aligned with the RES Directive.[10] This means that biofuels and bioliquids can only be zero rated under EU ETS if these meet the sustainability criteria mentioned in Article 17 of the RES Directive. If the criteria are not satisfied for these fuels and liquids, the biomass may not be zero-rated and must therefore be treated like a fossil source stream.[11]

The verifier must check:

- the completeness of the biofuels and bioliquids used (e.g. the Commission applies a broad definition of biofuels and bioliquids);
- whether the source streams in the installation are fossil source streams, mixed source streams, biofuels and bioliquids meeting sustainability criteria, or biomass where no sustainability criteria apply, or a mixture of fossil and biomass etc.;[12]
- the delineation of the biomass source streams. If the operator uses biofuels or bioliquids that are delivered in batches, the verifier should check whether these batches of source streams are considered or should be considered as different source streams;
- whether the operator has demonstrated compliance with the sustainability criteria.

The operator can demonstrate compliance with sustainability criteria in several ways:

- by using biofuels and bioliquids that have been registered in a national certification system, or;
- by using biofuels and bioliquids registered in a voluntary certification scheme that is recognised by the Commission;
- in accordance with the terms of a bilateral or multilateral agreement concluded by the Union and which the Commission has recognised for this purpose.[13]

Certificates granted in these systems can provide proof that the sustainability criteria have been met.

When checking the operator's demonstration of compliance with the sustainability criteria, the verifier should consider:

- whether the certificate is issued by a voluntary scheme that the Commission has recognised or is issued by a national system;[14]
- whether the certificate is still valid;
- whether the sustainability criteria of the biofuels and bioliquids are covered by the system or scheme concerned;
- whether the geographical scope of the source streams is in line with the scope identified in the systems.

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[10] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, OJ EU 5 June 2009, L 140/16.

[11] For more guidance please see the MRR Guidance document No. 3 on Biomass (GD3).

[12] Please see section 3.3.

[13] At the time of drafting this key guidance note, no such agreement have been concluded yet (see MRR Guidance No. 3 on biomass (GD3).

[14] The verifier is therefore not required to conduct a chain of custody audits to confirm whether the biofuels and bioliquids meet the sustainability criteria.

4.4 Checking procedures implemented according to Article 12(3) of the MRR

Annex I of the MRR contains minimum requirements for the MP. However, Member States may require operators of installations to include further elements in the MP to ensure that operators submit by 31st December of each year all relevant information about any planned or effective changes to the capacity, activity levels or operation of an installation to the CA.[15]

Art. 12(3) MRR

The further elements that can be included in the MP, concern for example a summary of a procedure ensuring that:

- the operator regularly checks if information regarding any planned or effective changes to the capacity, activity levels and operation of an installation is relevant (e.g. whether it has an impact on the installation's allocation);
- the information is submitted to the CA by 31 December of each year.

The procedure itself need not to be attached to the MP but must be made available to the CA. Also data on capacity or information on sub-installations can for example be submitted in the MP or procedure.

Art. 10(1) (e) AVR

If a MS requires that the operator includes further elements in the MP, the verifier must check the implementation of these elements. With respect to the procedure mentioned above, the verifier for example checks whether the procedure:

- is present and properly documented and retained;
- contains the information listed in the summary of the procedures in the approved MP;
- has been correctly implemented and is up to date;
- is applied throughout the year (e.g. whether the operators regularly checks changes to the capacity, activity levels and operation of an installation according to the frequencies mentioned in the procedure);
- is effective to ensure that operators regularly check if information regarding any planned or effective changes to the capacity, activity levels and operation of an installation is relevant and whether that information is submitted to the CA in time (e.g. checking the frequency with which the operator must check the information, how the operator must check and gather the information required to report to the CA etc.).

If the MP includes other data such as data on the capacity or sub-installation, the verifier must check whether the actual situation reflects the data mentioned in the approved MP.

The verifier must check whether changes to the MP occurred during the reporting period. During that process of checking changes, the verifier is likely to spot changes in the capacity, activity levels and operation of the installation. Furthermore analytical procedures and data verification tests may reveal changes in the capacity, activity level or operation of an installation. If these changes may have an impact on the installation's allocation of emission allowances[16] and have not been reported to the CA by the 31st of December, the verifier must include a description of those changes and related remarks in the verification report. Please see key guidance note on verification report (KGD II.6) for guidance on what to submit in the verification report.

Art. 27(3) (o) AVR

[15] For further guidance on allocation related issues please see the guidance material published on the Commission's website: http://ec.europa.eu/clima/policies/ets/allowances_en#tab-0-1

[16] Changes that might have an impact on the installation's emission allowances are for example significant capacity increases or reductions, changes in the configuration of the installation thereby impacting the sub-installation.

Please note that the requirement of a verifier to report any changes to the capacity, activity level and operation of the installation that might have an impact on the installation's allocation of emission allowance and have not been reported by the 31st of December is applicable regardless of whether MS has required the operator to include further elements in the MP according to Article 12(3) of the MRR