MRV in EU ETS: History and Development

Robert Gemmill

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Presentation Outline

1. Regulatory experience of power stations before EU ETS
2. The early days of EU ETS and reasons for a different approach to conventional 'command and control' involving emission limit values
3. Indication of improvements made
4. Current EU ETS Monitoring, Reporting, Verification and Accreditation (MRVA) requirements
5. Conclusions
6. Question and Answer Session

Before EU ETS

EU Legislation affecting LCP

- Large Combustion Plant (LCP) regulated in accordance with:
  - Council Directive 84/360/EEC of 28 June 1984 on combatting air pollution from industrial plants
  - The Large Combustion Plant Directive (LCPD):
    - Council Directive 88/609/EEC of 24 November 1988. Recast (superseded) by:
    - Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001
  - Integrated Pollution Prevention and Control (IPPC)
    - Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (IPPC). Recast (superseded) by:
    - Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on Industrial Emissions (IED)

Council Directive 84/360/EEC

- Aimed at reducing/preventing air pollution from industrial plants (especially categories listed in Annex I, including

  'Thermal power stations (excluding nuclear power stations) and other combustion installations with a nominal heat output of more than 50MW' (Large Combustion Plant, LCP)

- "Plant" defined as *'any establishment or other stationary plant used for industrial or public utility purposes which is likely to cause air pollution'*
- EU Member States required to **authorise** plants in advance of operation, based on:
  - All appropriate preventative measures being taken against pollution, including application of Best Available Technology Not Entailing Excessive Costs
  - Operation of the plant avoiding significant air pollution, in particular from the emission of substances listed in Annex II (for example: SO_2, NO_x, CO)
  - Applicable emission limit values (elvs) not being exceeded
  - Account of applicable air quality requirements
  - Approved compliance monitoring requirements
- Introduction into Member State law was required by 30 June 1987
- Eventually repealed in accordance with the IPPC Directive

Large Combustion Plant Directive

Requirement on EU Member States to legislatively limit certain flue gas emissions from combustion plant of thermal capacity of 50 MW or greater

- Aimed at fossil fuel power stations and other large thermal plants such as petroleum refineries and steelworks (but only combustion plant designed for the production of energy)
- Different requirements for "new" compared to "existing" plant, depending on operating licences granted on or after 1 July 1987, or before
- Member States required to draw up programmes for the progressive reduction of total annual emissions **from Existing Plants** by 1 July 1990
  - National Emission Reduction Plans for sulphur dioxide (SO_2), oxides of nitrogen (NO_x) and dust (particulate matter)
  - Existing plant required to comply with emission ceilings, percentage reductions and dates laid down for SO_2 and NO_x in Annexes I and II of the Directive respectively
- **New Plant** required to comply with emission limit values for SO_2, NO_x and dust as specified in Annexes III to VII of the Directive

LCPD Monitoring Requirement

1. Article 13

Member States shall take appropriate measures to ensure that the operator informs the competent authorities within reasonable time limits about the results of the continuous measurements, the checking of the measuring equipment, the individual measurements and all other measurements carried out in order to assess compliance with this Directive

LCPD Monitoring Requirement

2. Procedures for measuring and evaluating emissions from combustion plants (from 27 November 2002):

- Continuous measurements of concentrations of SO_2, NO_x, and dust from waste gases from each combustion plant with a rated thermal input of 100 MW or more; although derogations allowed in the case of:
  - combustion plants with a life span of less than 10 000 operational hours;
  - SO_2, and dust from natural gas burning boilers or from gas turbines firing natural gas;
  - SO_2 and dust from gas turbines or boilers firing oil with known sulphur content in cases where there is no desulphurisation equipment;
  - SO_2 from biomass firing boilers where the operator could prove that the SO_2 emissions could under no circumstances be higher than the prescribed emission limit values.
- Where continuous measurements not required, discontinuous measurements at least every six months, or alternative determination procedures approved by the competent authorities
- Application of relevant CEN standards as soon as available; and where they are not available, ISO standards, national or international standards which would ensure the provision of data of an equivalent scientific quality

LCPD Monitoring Requirement

3. Main requirements for CEMS (Continuous Emission Monitoring Systems):

- Continuous measuring systems subject to control by means of parallel measurements by reference methods at least annually

- 95% confidence intervals regarding single measured values being within the following percentages based on the emission limit values:
  - Sulphur dioxide 20 %
  - Nitrogen oxides 20 %
  - Dust 30 %

LCPD Monitoring Requirement

4. Determination of total annual emissions of combustion plants (until and including 2003):

New Plant:

Competent authorities required to obtain determinations of the total annual emissions of SO_2 and NO_x:

- By continuous monitoring, each operator's summation of daily emissions of each pollutant; or
- In the absence of continuous monitoring, estimates of the total annual emissions determined by the operator using procedures approved by the competent authority

Existing Plant:

From 1990, a complete emission inventory covering SO_2 and NO_x:

- On a plant-by-plant basis for plants above 300 MWth
- On an overall basis for other combustion plants

IPPC/IED

Industrial emissions regulated according to integrated pollution prevention and control (IPPC), Directive 96/61/EC (recast as Directive 2010/75/EU):

Aimed at:

- Integrated prevention and control of pollution – taking into account releases to all media (air, water and land)
- Large industrial activities, including large combustion plant >50MWth
- Preventing, or where that is not practicable, reducing emissions
- A high level of protection for the environment 'as a whole'
- Emphasis on prevention and process control (permits required to operate)
- A permit to operate system with conditions, including emission limit values, based on Best Available Techniques (BAT)
  - Provision of BREF Notes (BAT reference documents) to guide common interpretations
  - Some EU-wide emission limit values established by the IED
- Additional obligation for efficient use of energy
- Cover of all potential pollutants (but Greenhouse Gases not explicitly included in the list of indicative substances)
- Monitoring where required by the competent authority to check compliance
- Mandatory environmental inspections

➢ PROCESS CONTROL FIRST AND FOREMOST! MONITORING IN SOME CASES!

IED: Specific LCP References

IED Recitals Nos. 29 and 30:

(29) *"Large combustion plants contribute greatly to emissions of polluting substances into the air resulting in a significant impact on human health and the environment. In order to reduce that impact and to work towards meeting the requirements of Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants and the objectives set out in the Thematic Strategy on Air Pollution, it is necessary to set more stringent emission limit values at Union level for certain categories of combustion plants and pollutants"*

(30) *"The Commission should review the need to establish Union-wide emission limit values and to amend the emission limit values set out in Annex V for certain large combustion plants, taking into account the review and update of the relevant BAT reference documents. In this context, the Commission should consider the specificity of the energy systems of refineries"*

(Implemented via Article 30 and Annex V)

Experience so far!

Before the start of EU ETS, power station operators were already experienced in:

- Environmental legislation and regulation by a competent authority (regulator)
- The need for permits to operate (approved by the competent authority)
- The concept of Best Available Techniques Not Entailing Excessive Cost (BATNEEC)
- Operator 'self-monitoring' (as well as any 'check-monitoring' arranged by the competent authority)
- Operation and maintenance of CEMS (continuous emissions monitoring systems)
- QC/QA (Quality Control and Quality Assurance)
- Reporting

Far better prepared than most other EU ETS operators would be!

Additional Slide

Ensuring compatibility between IPPC/IED and EU ETS

IED Recital No.9

"In order to avoid duplication of regulation, the permit for an installation covered by Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community should not include an emission limit value for direct emissions of the greenhouse gases specified in Annex I to that Directive except where it is necessary to ensure that no significant local pollution is caused or where an installation is excluded from that scheme"

(Implemented by Article 9 of the IED)

Initial EU ETS

Reasons for EU ETS

Indications from the original EU ETS Directive (2003/87/EC):

"The Sixth Community Environment Action Programme established by Decision No 1600/2002/EC of the European Parliament and of the Council identifies climate change as a priority for action and provides for the establishment of a Community-wide emissions trading scheme by 2005. That Programme recognises that the Community is committed to achieving an 8 % reduction in emissions of greenhouse gases by 2008 to 2012 compared to 1990 levels, and that, in the longer term, global emissions of greenhouse gases will need to be reduced by approximately 70% compared to 1990 levels" (Recital No. 2)

"Once it enters into force, the Kyoto Protocol, which was approved by Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder, will commit the Community and its Member States to reducing their aggregate anthropogenic emissions of greenhouse gases listed in Annex A to the Protocol by 8 % compared to 1990 levels in the period 2008 to 2012" (Recital No. 4)

"The Community and its Member States have agreed to fulfil their commitments to reduce anthropogenic greenhouse gas emissions under the Kyoto Protocol jointly, in accordance with Decision 2002/358/EC. This Directive aims to contribute to fulfilling the commitments of the European Community and its Member States more effectively, through an efficient European market in greenhouse gas emission allowances, with the least possible diminution of economic development and employment" (Recital No. 5)

European Directive 2003/87/EC

Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC

Article 1 (Subject Matter):

"This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community (hereinafter referred to as the 'Community scheme') in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner"

- NOTE: MOVING AWAY FROM AN EMISSIONS CONTROL SYSTEM BASED ON EMISSION LIMIT VALUES TO A SYSTEM BASED ON FINANCIAL INCENTIVE
  - A financial value associated with every tonne of CO_2 emission reported
  - Important that 1 tonne CO_2 emitted = 1 tonne CO_2 reported to maintain the integrity of the ETS
  - TRUSTWORTHY MONITORING, REPORTING AND VERIFICATION (MRV) PARAMOUNT FOR AN ETS!

Definition of Scope and Boundaries

- **Covered Activities** (Article 2) – Defined in Annex I of the Directive:
  - For example: Combustion of fuels (>20MW$_{th}$); Cement (production capacity >500t/d rotary kilns; >50t/d other furnaces); Aluminium; Iron and Steel; Pulp and Paper, Chemicals, etcetera

- **Covered Greenhouse Gases** (Article 2) – Defined in Annex II of the Directive and listed where relevant against each activity in Annex I:
  - For example: CO_2 for energy activities; CO_2 and PFCs for electrolytic aluminium production

- **Key Definition: Installation** (Article 3(e) of the Directive):

  'installation' means a stationary technical unit where one or more activities listed in Annex I are carried out and any other directly associated activities which have a technical connection with the activities carried out on that site and which could have an effect on emissions and pollution

- **Key Definition: Operator** (Article 3(f) of the Directive):

  'operator' means any person who operates or controls an installation or, where this is provided for in national legislation, to whom decisive economic power over the technical functioning of the installation has been delegated

Permits, Allocation of Allowances

- Permit Requirement (Articles 4-7) – Confirmed requirement for operators to obtain and hold permits to operate:
  - *"Member States shall ensure that, from 1 January 2005, no installation undertakes any activity listed in Annex I resulting in emissions specified in relation to that activity unless its operator holds a permit issued by a competent authority in accordance with Articles 5 and 6"*
- Allowances and Allocation (Articles 9-13) – Criteria for National Allocation Plans defined in Annex III of the Directive

- Key Definition: Allowance (Article 3(a) of the Directive):

  'allowance' means an allowance to emit one tonne of carbon dioxide equivalent during a specified period, which shall be valid only for the purposes of meeting the requirements of this Directive and shall be transferable in accordance with the provisions of this Directive

- Key Definition: Emissions (Article 3(b) of the Directive):

  'emissions' means the release of greenhouse gases into the atmosphere from sources in an installation

Monitoring and Reporting (M&R)

- Guidelines for monitoring and reporting of emissions (Article 14):
  - *"The Commission shall adopt guidelines for monitoring and reporting of emissions resulting from the activities listed in Annex I of greenhouse gases specified in relation to those activities [… …], by 30 September 2003"*
  - *"The guidelines shall be based on the principles for monitoring and reporting set out in Annex IV"*
  - *"Member States shall ensure that emissions are monitored in accordance with the guidelines"*
  - *"Member States shall ensure that each operator of an installation reports the emissions from that installation during each calendar year to the competent authority after the end of that year in accordance with the guidelines.*

Annex IV: Principles for M&R

- Monitoring of carbon dioxide emissions: *'Emissions shall be monitored either by calculation or on the basis of measurement'*
- Calculation:
  - *Calculations of emissions shall be performed using the formula: Activity data × Emission factor × Oxidation factor*
  - *Activity data (fuel used, production rate etc.) shall be monitored on the basis of supply data or measurement*
  - *Accepted emission factors shall be used. Activity-specific emission factors are acceptable for all fuels. Default factors are acceptable for all fuels except non-commercial ones (waste fuels such as tyres and industrial process gases). Seam-specific defaults for coal, and EU-specific or producer country-specific defaults for natural gas shall be further elaborated. IPCC default values are acceptable for refinery products.*
  - *The emission factor for biomass shall be zero.*
  - *If the emission factor does not take account of the fact that some of the carbon is not oxidised, then an additional oxidation factor shall be used.*
  - *A separate calculation shall be made for each activity, installation and for each fuel*

Annex IV: Principles for M&R continued

- Measurement :
  - *Measurement of emissions shall use standardised or accepted methods, and shall be corroborated by a supporting calculation of emissions*
- Monitoring of emissions of other greenhouse gases:
  - *Standardised or accepted methods shall be used, developed by the Commission in collaboration with all relevant stakeholders*
- Reporting of Emissions:
  - *Data identifying the installation (name, address, Annex I activities carried out, contact details for a contact person, name of the owner of the installation and of any parent company)*
  - *For each Annex I activity carried out on the site for which emissions are calculated: Activity data; Emission factors; Oxidation factors; Total emissions; and Uncertainty*
  - *For each Annex I activity carried out on the site for which emissions are measured: Total emissions; Information on the reliability of measurement methods; and Uncertainty*
  - *For emissions from combustion, the report shall also include the oxidation factor, unless oxidation has already been taken into account in the development of an activity-specific emission factor*

Verification (Article 15)

- *Member States shall ensure that the reports submitted by operators pursuant to Article 14 are verified in accordance with the criteria set out in Annex V, and that the competent authority is informed thereof*
- *Member States shall ensure that an operator whose report has not been verified as satisfactory in accordance with the criteria set out in Annex V by 31 March each year for emissions during the preceding year cannot make further transfers of allowances until a report from that operator has been verified as satisfactory*

- *Criteria for Verification (Annex V):*
  - *General Principles: Verification of emissions from each activity; consideration of the operator's report and monitoring during the previous year (addressing the reliability, credibility and accuracy of monitoring systems and the reported data and information relating to emissions); a high degree of certainty in the reliability and credibility of the data provided by the operator; verifier access to all relevant sites and information*
  - Methodology: Strategic analysis, process analysis, risk analysis, reporting, and minimum competency requirements for the verifier (including independence from the operator and carrying out verification in a sound and professional manner)

Other Key Articles

- **Penalties** (Article 16) – *'Member States shall lay down the rules on penalties applicable to infringements of the national provisions adopted pursuant to this Directive'*
  - *Must be effective, proportionate and dissuasive*
  - *Must ensure that any operator failing to surrender sufficient allowances by 30 April of each year to cover their emissions during the preceding year shall be held liable for the payment of an excess emissions penalty (€100 for each tonne of carbon dioxide equivalent not covered)*
- **Competent Authorities** (Article 18) – *'Member States shall make the appropriate administrative arrangements, including the designation of the appropriate competent authority or authorities, for the implementation of the rules of this Directive. Where more than one competent authority is designated, the work of these authorities undertaken pursuant to this Directive must be coordinated'*
- **Registries** (Article 19) – Requirement on Member States to establish and maintain a registry to ensure the accurate accounting of the issue, holding, transfer and cancellation of allowances.
- **Implementation** (Article 31) – *'Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 31 December 2003 at the latest'*

Challenges: EU ETS Phase I

- Completely new regime for most operators and competent authorities (and EU Member States)
  - Many new competent authority/operator relationships required
- Directive requirements are not directly binding, requiring transposition into individual Member State laws, regulations and administrative provisions
  - Interpretation of requirements and the accuracy of transposition not always consistent
- Very short time period between publication of the Directive and the start of the first year of monitoring:
  - Publication of the Directive: 25 October 2003
  - Article 31 deadline for MS transposition 31 December 2003
  - Publication of Monitoring and Reporting Guidelines (MRG) 26 February 2004
  - Operators required to commence monitoring 1 January 2005
- Not all permits to operate were in place before the start of the first monitoring period
- First Monitoring and Reporting Guidelines (MRG) limited in detail and open to different interpretations in different Member States
- Particular issues found regarding different interpretations of relevant accounting/monitoring boundaries and in relation to combustion, and in the implementation of effective 'monitoring plans'

Accounting Boundaries

- In Phase I of the EU ETS (2005-2007) there were difficulties and differences found in the interpretation of accounting boundaries, and their description in monitoring plans, resulting in follow-on effects concerning accurate monitoring, reporting and verification (MRV)
- These challenges were addressed in the second and third phase of EU ETS (2008-2012 and 2013-2020 respectively)
- There are now clear rules on accounting boundaries in legislation (clear definitions & concrete cross-cutting and sector specific rules). Activity-specific guidelines were added to the MRG revised for Phase II, including Annex II for combustion emissions
- A broad definition of a combustion installation has been adopted
- There are clear requirements on what has to be included in a monitoring plan and the required approval of the competent authority (of the monitoring plan and thus the accounting boundaries)
- Further tools and guidance have been developed to facilitate understanding and correct implementation of accounting boundaries
- The rules for competent authorities and verifiers to assess and implement accounting boundaries are now clear

Monitoring Plans

- The concept of a monitoring plan was introduced in EU ETS from the start, but not explicitly
- The original MRG required competent authorities to approve a detailed description of the monitoring methodology prepared by the operator before the start of the reporting period, and advised a summary of the main elements required in the description, but these requirements were 'high-level' and the roles of stakeholders not clear in all aspects
- Some EU countries included detailed requirements in their domestic legislation on what a monitoring plan should contain, but others only high-level rules or no clear rules at all – resulting in a negative impact on consistency, quality and reliability
- Not all EU countries required competent authority approval of monitoring plans – resulting in enforcement difficulties and less legal certainty for installations
- EU countries did not always prescribe a template for completing monitoring plans leading to differences between installations and additional burdens in the work of the competent authorities and verifiers
- These challenges were partially addressed by revision of the MRG for Phase II (2008-2012) and strengthened still further when the European Commission adopted a Monitoring and Reporting Regulation to replace the MRG for Phase III (2013-2020) and onwards.
- Further tools and guidance have been developed to assist correct understanding and implementation of monitoring plans

Current EU ETS Legislation

Consolidated text: Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02003L0087-20230301

Consolidated text: Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018R2066-20220101

Consolidated text: Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018R2067-20210101

N.B. Commission Regulations are directly applicable on stakeholders without transposition into national legislation

Additional Tools and Guidance

To promote further administrative efficiency and harmonised approach across all countries, the European Commission now provides a suite of additional guidance, templates (for monitoring plans, annual emission reports, verification reports, improvement reports), exemplars and other tools. These are also seen to support correct understanding of the requirements of the regulations and more cost-effective application:

These items can be found included under the "Documentation" sub-heading on the European Commission's 'Monitoring, Reporting and Verification of EU ETS Emissions' web-page:

https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification-eu-ets-emissions_en

Current EU ETS MRV requirements

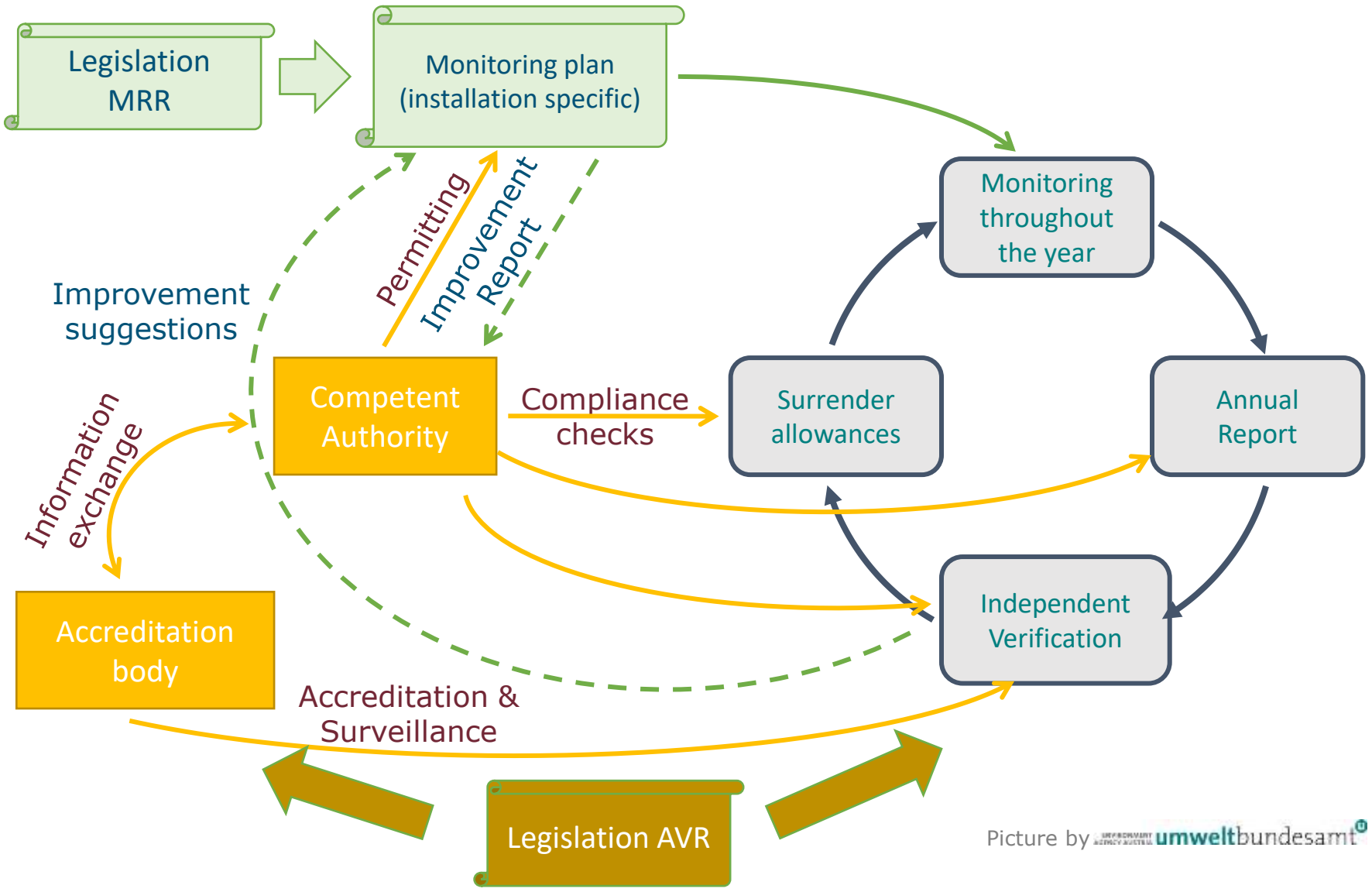
Current MRVA Regulations

- Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC – The MRR

- Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC – The AVR

➢ The requirements and responsibilities stated in the MRR and AVR are directly binding on EU ETS countries and the various specific parties named therein (legally binding EU-wide)

The EU ETS “Compliance Cycle”



MRR General Principles

- **Completeness:** Monitoring of all relevant emission sources and source streams
- **Consistency and Comparability:** Use of the same monitoring methodologies and data sets over time (changes and derogations only allowed subject to approval of the competent authority)
- **Transparency:** Acquisition, compilation, analysis, recording and documentation of monitoring data in a transparent manner, sufficient to enable reproduction of the determined and reported emissions (if necessary) by a competent authority and/or a verifier
- **Accuracy:** Reduction of sources of inaccuracy as much as possible; ensuring that determined emissions are neither systematically nor knowingly inaccurate
- **Integrity:** Use of appropriate monitoring methodology and reporting of emissions data free from misstatement, to enable 'reasonable assurance' (a high level of assurance as opposed to 'limited assurance') of the integrity of the reported data
- **Continuous Improvement:** The taking into account of ways to improve the accuracy of future monitoring and reporting (subject to the approval of a competent authority)
- **Coordination:** When more than one body (e.g. more than one competent authority) is involved

- These principles are the basis of many ETSs and international standards
- EU ETS Operators have to carry out their M&R obligations in accordance with these principles [MRR Article 4]

General Principle for Accuracy

[MRR Article 7]

- Operators shall ensure that emission determination is neither systematically nor knowingly inaccurate
- They shall identify and reduce any source of inaccuracies as far as possible
- They shall exercise due diligence to ensure that the calculation and measurement of emissions exhibit the highest achievable accuracy

- *'accuracy' means the closeness of the agreement between the result of a measurement and the true value of the particular quantity or a reference value determined empirically using internationally accepted and traceable calibration materials and standard methods, taking into account both random and systematic factors*

➢ *THIS ESTABLISHES THAT DETERMINATION OF EMISSIONS SHALL BE BY HIGHEST ACHIEVABLE ACCURACY*

General Principle on Integrity

[MRR Article 8: Integrity of the methodology and of the emissions report]

- Operators shall enable reasonable assurance of the integrity of emission data to be reported
- Reported emission data shall be free from material misstatement and avoid bias
- Improvements in monitoring methodology shall be balanced against additional costs
- Monitoring and reporting of emissions shall aim for the *highest achievable accuracy*, unless this is technically not feasible or incurs unreasonable costs

'reasonable assurance' means a high but not absolute level of assurance, expressed positively in the verification opinion, as to whether the report that is subject to verification is free from material misstatement

'material misstatement' means a misstatement that, in the opinion of the verifier, individually or when aggregated with other misstatements, exceeds the materiality level or could affect the treatment of the operator's report by the competent authority

'misstatement' means an omission, misrepresentation or error in the operator's reported data (excluding permissible uncertainty)

➢ *THIS CAVEATS THE NEED FOR HIGHEST ACHIEVABLE ACCURACY IN TERMS OF WHAT IS TECHNICALLY FEASIBLE AND NOT ENTAILING UNREASONABLE COSTS*

Requirement for Monitoring Plans

- Each Operator must monitor their greenhouse gas emissions according to a monitoring plan that is approved by the competent authority [MRR Article 11]

- MRR Annex I specifies the minimum content required of a Monitoring Plan, including:
  - A description of the installation, activities covered, source streams and emission sources to be monitored, measuring instruments and other issues relevant to the monitoring methodology
  - Descriptions of written procedures covering assignment of responsibilities for monitoring and reporting, and for data flow activities and data control activities
  - Details of the calculation-based and/or measurement-based monitoring methodology (measurement systems, calculation formulae, calculation factors, laboratories)

➢ Monitoring Plan templates have been developed to present requirements in a structured way and to promote greater understanding, completeness, consistency, transparency, and efficiency

How the Monitoring Plan Supports Implementation of EU ETS MRV

- A Monitoring Plan (MP) outlines the monitoring and reporting rules that apply to each installation, providing:
  - Clear instruction on how monitoring is to be carried out by the operator
  - A management instrument for timely and correct implementation of the monitoring methodology
  - A consistent format to assist competent authority approval
  - Assistance to verifiers, allowing check of the emission report against requirements approved by the competent authority, and in the identification and reporting of non-compliances with the approved requirements and the legislation
  - Ability to understand how the facility functions, which source streams and what emission sources are relevant, and what monitoring and QA/QC is applied
  - Uniform requirements, promoting equal treatment of operators and a reduction in interpretation problems
  - Facilitation of on-going compliance checks by the competent authority
  - Legal certainty for operators and other stakeholders.

- Monitoring Plans ensure an approved methodology is in place for each ETS compliance cycle, confirming requirements for installations and aiding the effectiveness and efficiency of subsequent regulation and verification
- They are also an important mechanism in the pursuit of the MRV Principles (completeness, consistency, comparability, transparency, accuracy, integrity and continuous improvement).

Monitoring Methodology (Calculation)

1. **Standard Approach for Calculating Fuel Emissions:**

$$Em = AD \times EF \ (\times OF)$$

Em = Emissions [t $CO_{2(e)}$]

AD = Activity data (amount of fuel x net calorific value); obtained from measurement (weighing, flow meters, etc.) or invoices

EF = Emission factor [t CO2(e)/TJ]; obtained using a default value or from actual measurements (based on a sampling plan and accredited laboratories)

OF = Oxidation factor; standard value or obtained from analysis

2. **Standard Approach for Calculating Process Emissions**: As above, but AD based on tonnage or cubic metres (not calorific value) and use of a Conversion Factor instead of an Oxidation Factor

3. **Calculation by Mass Balance Approach** (useful when it is difficult to relate emissions directly to individual input materials, e.g. integrated steelworks, or where products retain significant amounts of carbon such as bulk chemicals):

$$E_{MB} = \sum_i (f \cdot ADi \cdot CCi)$$

i = Index for fuel or material

f = Molar mass conversion factor for carbon to carbon dioxide, 3.664 t CO_2/t C [MRR Article 25(1)]

AD_i = Activity data, the mass of the fuel or material in tonnes (incoming materials or fuels are taken into account as positive; outgoing as negative)

CC_i = The carbon content of the component under consideration

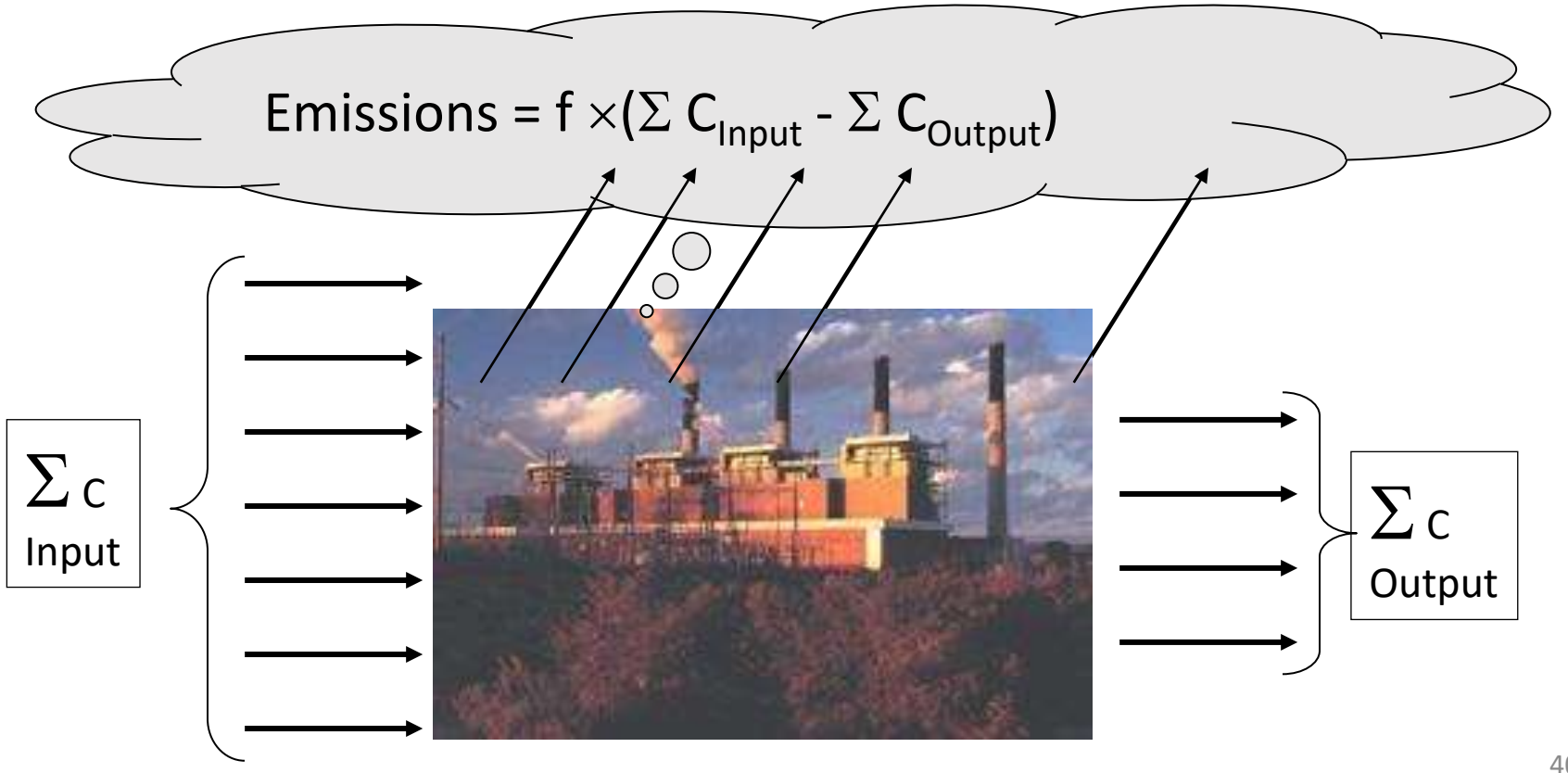
Mass Balance Calculation

- Each Operator must monitor their greenhouse gas emissions according to a monitoring plan that is approved by the competent authority [MRR Article 11]

- MRR Annex I specifies the minimum content required of a Monitoring Plan, including:
  - A description of the installation, activities covered, source streams and emission sources to be monitored, measuring instruments and other issues relevant to the monitoring methodology
  - Descriptions of written procedures covering assignment of responsibilities for monitoring and reporting, and for data flow activities and data control activities
  - Details of the calculation-based and/or measurement-based monitoring methodology (measurement systems, calculation formulae, calculation factors, laboratories)

➢ Monitoring Plan templates have been developed to present requirements in a structured way and to promote greater understanding, completeness, consistency, transparency, and efficiency

MRR Monitoring by Mass Balance Calculation



Monitoring Methodology (CEMS)

- The MRR allows operators to choose either a calculation-based methodology or a measurement-based methodology to determine the emissions from an installation [Article 21]
- The measurement-based approach determines annual emissions from an emission source by summing hourly values of GHG concentration (measured by CEMS) multiplied by the hourly values of the flue gas flow
- Flue gas flow can be determined either by continuous flow measurement or by calculation of a suitable mass balance of all significant input parameters
- Measurements must be in accordance with standards:
  - EN 14181 (Quality assurance of automated measurement systems)
  - EN 15259 (Requirements for measurement sections and sites and for the measurement objective, plan and report)
  - Other relevant ENs, in particular EN ISO 16911-2 (Manual and automatic determination of velocity and flow rate in ducts)
- Laboratories carrying out measurements, calibrations, and relevant equipment assessments for CEMS need to be EN ISO/IEC 17025 accredited
- Where emission sources cannot be measured as one emission source, they have to be measured separately
- Where relevant, emissions stemming from biomass need to be determined separately and subtracted
- With the exception of N_2O, emissions determined by CEMS must be corroborated against calculation [Article 46]

Proportionality (I)

- Prior to EU ETS: Most operators already had some monitoring in place for process control or other (environmental) legal reasons.
- But many operators claimed:
  - "My installation is different to others"
  - "I cannot install a measuring instrument just because of the EU ETS, it is too expensive", or
  - "Is this auxiliary fuel worth monitoring? It only contributes to 0.1% of my emissions"
  - Etc.
- The solution: **Not to require the impossible, but the reasonable!**
  - Clear rules, e.g. regarding completeness (yes, also 0.1% needs to be monitored)
  - A flexible system of approaches to select from (calculation, measurement, fall-back)
  - Use tiers to define how "good" a monitoring approach is, and require improvement (reaching higher tiers) over time
  - Ensure acceptance by operators by applying proportionate measures (see next slide)

Proportionality (II)

- MRR includes various provisions to allow competent authorities to apply pragmatism and proportionality where appropriate, including in relation to:
  - Technical Feasibility [Article 17] and Unreasonable Costs [Article 18]
  - A categorisation of installations, source streams and emission sources in terms of their scale of emissions [Article 19] and a corresponding tiered approach to requirements [Article 26], providing opportunity for more proportionate monitoring requirements in the case of lower emissions
  - Discretion to apply approved default values in place of factors determined by analysis, in accordance with the requirements of the tiered approach [Article 31]
  - Special provisions for installations with low emissions [Article 47]

- Controlled proportionality allows smaller emitters and less significant source streams and emission sources to be handled in a fairer and/or less onerous way
- It also provides a controlled mechanism suitable for allowing temporary derogations from the fully required monitoring methodology until necessary improvements can be implemented

Categorisation of Installations

- **Category A**: Installations with average annual emissions equal to or less than 50 000 tonnes of $CO_{2(eq)}$
- **Category B**: Installations with average annual emissions more than 50 000 tonnes of $CO_{2(eq)}$ and equal to or less than 500 000 tonnes of $CO_{2(eq)}$
- **Category C**: Installations with average annual emissions more than 500 000 tonnes of $CO_{2(eq)}$

[MRR Article 19(2)]

- **Small installations:** Installations with average annual emissions of less than 25 000 tonnes of $CO_{2(eq)}$

[MRR Article 47(2)]

Categorisation of Source Streams

- *De minimis* source streams: Where source streams selected by the operator jointly account for less than 1 000 tonnes of fossil CO_2 per year or less than 2% up to a maximum of 20 000 tonnes of fossil CO_2 per year, whichever is greater in terms of absolute value
- Minor source streams: Where source streams selected by the operator jointly account for less than 5 000 tonnes of fossil CO_2 per year or less than 10% up to a maximum of 100 000 tonnes of fossil CO_2 per year, whichever is greater in terms of absolute value
- Major source streams: Where source streams do not fall within the categories of *de minimis* or minor source streams

[MRR Article 19(3)]

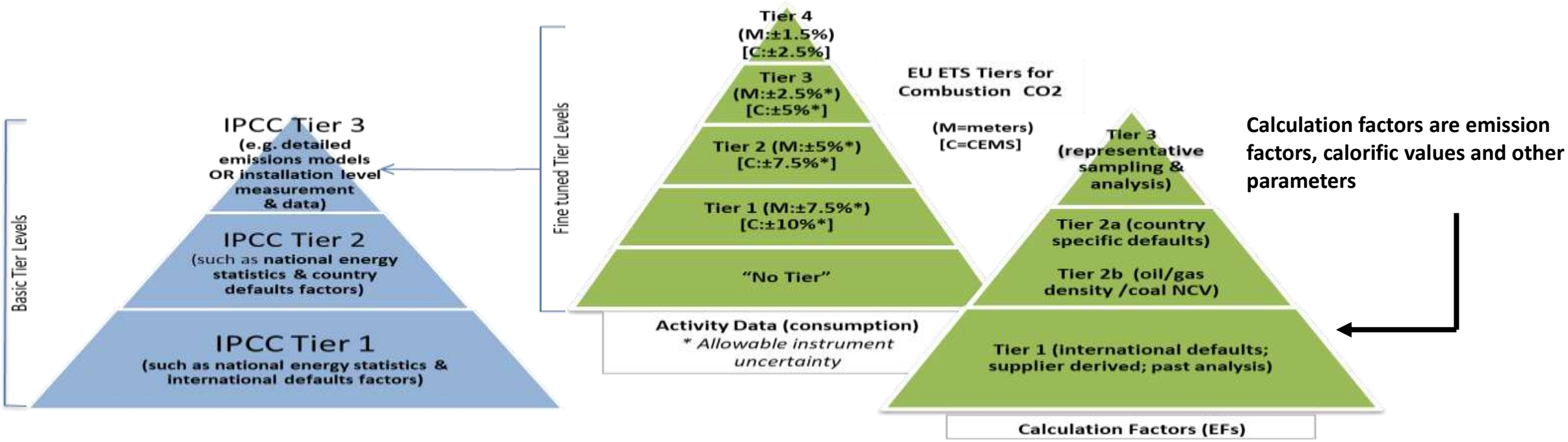
Categorisation of Emission Sources

- **Minor emission sources**: Where the emission source emits less than 5 000 tonnes of fossil $CO_{2(e)}$ per year or less than 10% of the installation's total fossil emissions, up to a maximum of 100 000 tonnes of fossil $CO_{2(e)}$ per year, whichever is greater in terms of absolute value
- **Major emission sources**: Where the emission source does not classify as a minor emission source

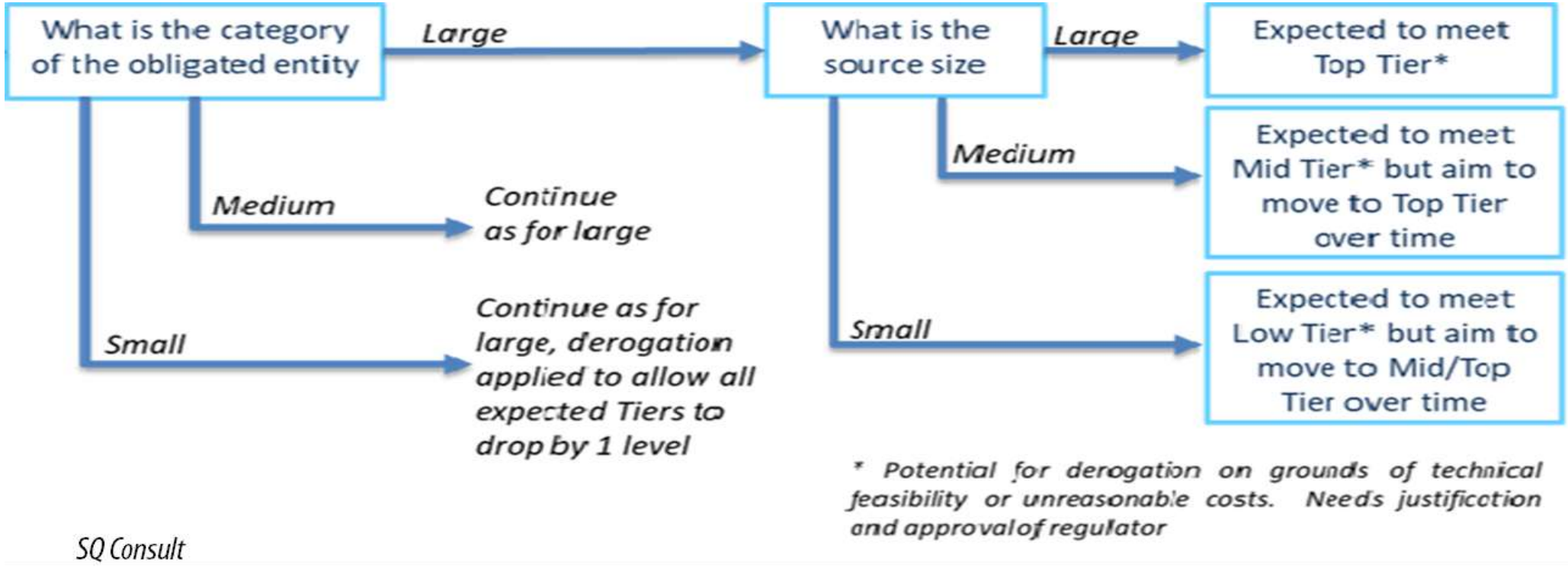
[MRR Article 19(4)]

WHAT IS A TIER STRUCTURE?

- A tiered approach can maintain accuracy in a more proportionate and cost-efficient manner.
  - The idea of a tiered approach comes from the IPCC guidelines but it is fine-tuned in some ETS, including the EU ETS.
  - Tiers are accuracy levels: the higher the tier the more stringent requirements are.
  - The tier structure allows for improvement over time: encouraging installations to move up tiers



HOW THE TIER APPROACH WORKS FOR DIFFERENT CATEGORIES OF INSTALLATIONS AND SOURCES?



Calculation: tiers applicable to activity data & calculation factors for source streams

CEMS: tiers applicable to emission sources (where CEMS is installed)

MRR Tier Requirements

- Annex II of the MRR defines tiers for calculation-based methodology related to different activities. Annex VIII for CEMS
- For Calculation Factors, the MRR defines when actual measurement and default values must be applied → application is dependent on the required tier
- Tiers for Calculation Factors (In Summary):
  - Tier 1: IPCC factors or, in their absence, values based on historical analyses where the operator can demonstrate to the satisfaction of the competent authority that those values are representative for future batches of the same fuel or material
  - Tier 2: Country specific factors used in the country's national UNFCCC inventory; or literature values agreed with the competent authority; or values specified and guaranteed by the supplier of a fuel or material where the operator can demonstrate to the satisfaction of the competent authority that the carbon content exhibits a 95 % confidence interval of not more than 1 %
  - Tier 3: Actual measurement
- The MRR specifies when there can be a deviation from the required tier (deviation is subject to approval from the Competent Authority)

Additional Monitoring Requirements [Article 20]

- The operator must include all relevant GHG emissions from all emission sources and sources streams belonging to activities carried out within the installation
- Inclusion of regular operations and abnormal events including start-up, shut-down and emergency situations
- Excluding emissions from mobile machinery for transportation purposes
- Account of sector-specific requirements laid down in MRR Annex IV ("Activity-specific monitoring methodologies related to installations")
    - MRR Annex IV Part 1: "Specific Monitoring Rules for Emissions from Combustion Processes"

MRR Annex IV Part 1

The most notable points drawn from **MRR Annex IV Part 1: "Specific Monitoring Rules for Emissions from Combustion Processes"** are:

- Operators must monitor and report CO_2 emissions from all types of combustion processes taking place under all activities (listed in Annex I of the EU ETS Directive), including from fuels used as process inputs and related to scrubbing processes
  - Regardless of export of heat or electricity to other installations
- Emissions from internal combustion engines used for transport are excluded
- Emissions associated with the production of heat or electricity that is imported from other installations is also excluded
- Specific monitoring requirements for the sector are listed, including for flue gas scrubbing and flares

Data Management and Control

[MRR Article 12(2) and Chapter V Articles 58-67]

- The operator must establish, document, implement and maintain:
  - Written procedures for data flow activities (operational activities from primary source data to emissions reporting)
  - An effective control system to ensure that the annual emissions report resulting from data flow activities does not contain misstatements and is in conformity with the monitoring plan and the MRR
- The control system consists of identifying risks and establishing control activities to mitigate those risks, including written procedures concerning:
  - QA of measurement equipment and IT used for data flow
  - Segregation of duties in the data flow and control activities and management of necessary competencies
  - Internal reviews and validation of data
  - Corrections and corrective actions
  - Control of outsourced processes
  - The keeping of records and documentation

➢ Effective data flow and control activities reduces the risks of misstatements in EU ETS reported emissions, allowing for more efficient verification

Reporting Requirements

[Article 68]

- The operator must submit a verified annual emissions report to the competent authority by 31 March of each year (at latest)
- MRR Annex X specifies the minimum content for annual emissions reporting, including:
  - General details related to the installation, including reference to the latest version of the monitoring plan
  - Information relating to all emission sources and source streams, and the total emissions
  - Details of any data gaps and their closure using approved surrogate data
  - 'Memo' items concerning biomass, transferred CO_2 or N_2O
- An EU ETS annual emission report template has also been developed to help obtain the required information in a structured and standard way, as well as an associated user manual to help ensure correct completion

➢ Provision of a template promotes submission of more properly completed annual emissions reports in a consistent format that allows for more efficient regulation and verification

AVR: General Obligations of the Verifier

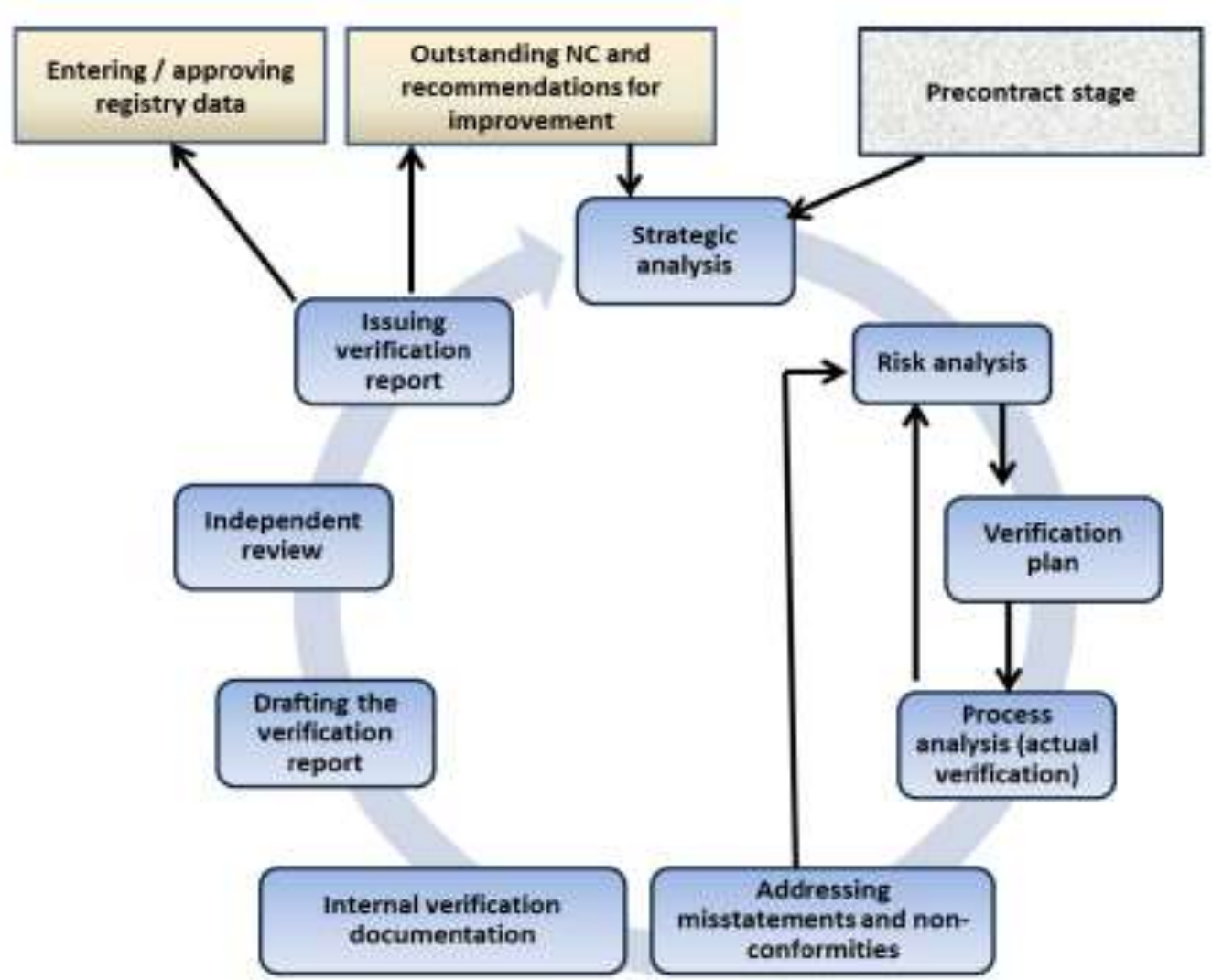
[AVR Article 7]

- Verification aimed at reporting with reasonable assurance that the operator's report is free from material misstatement.

  'material misstatement' means a misstatement that, in the opinion of the verifier, individually or when aggregated with other misstatements, exceeds the materiality level or could affect the treatment of the operator's … report by the competent authority

- Verification planned and performed with an attitude of professional scepticism
- Verification carried out in the public interest, independent of the operator and the competent authority
- Assessment included whether:
  - The operator's report is complete and in accordance with MRR Annex X
  - The operator has acted in compliance with their GHG permit and the approved monitoring plan (as far as verification of the operator's report is concerned)
  - Information can be provided in support of the operator's data flow activities, control system and associated procedures
- Reporting of non-compliance with the MRR (in the Verification Report)
- Ensuring competent authority approval of the operator's monitoring plan is complete and up to date

The Verification Process



Requirements for Verifiers

- A verifier must:
  - Be accredited for the appropriate scope of activity concerning the operator. [AVR Annex I: Scope of Accreditation for Verifiers]
  - Establish, document, implement and maintain a competence process to ensure entrusted staff are competent for the tasks allocated to them
  - Regularly monitor the continued performance of all personnel
  - Establish, document, implement and maintain procedures for activities in the verification process and further procedures and processes advised in AVR Annex II, e.g. safeguarding confidentiality, a process for appeals
  - Maintain a management system covering at least: Policies and responsibilities; management review; internal audits; corrective action; actions to address risk and opportunities to take preventative action; and, control of documented information
  - Be independent from the operator and impartial
- Verification teams must at least consist of an EU ETS Lead Auditor, and appropriate EU ETS Auditors and Technical Experts as concluded necessary by the strategic analysis for the particular verification
- An Independent Reviewer must be assigned, independently from the verification team, with appropriate authority to review the draft verification report and internal verification documentation
- EU ETS Auditors, Lead Auditors, Technical Experts and Independent Reviewers must meet the respective competences advised in the AVR. [Articles 38-40]

AVR: Requirements for Accreditation Bodies [AVR Chapters IV and V]

- EU ETS verifiers must be accredited by a National Accreditation Body (NAB) appointed in accordance with Article 4(1) of Regulation (EC) No. 765/2008
- The NAB must guarantee full independence from the verifiers that it assesses and be impartial in its accreditation activities
- The NAB cannot offer or provide any activities provided by a verifier or offer advice/consultancy to a verifier
- The NAB must appoint an Assessment Team for each particular assessment, consisting of a lead assessor and where necessary support assessors and technical experts for a particular scope of EU ETS accreditation
- The Assessment Team must include at least one person knowledgeable of the MRR relevant to the scope of accreditation, and one person with knowledge of relevant national legislation and guidance
- Lead assessors, assessors and technical experts must meet the respective competences advised in the AVR [Articles 59-60]
- In addition to periodic re-assessments and extraordinary assessments, the NAB must carry out an annual surveillance check on each verifier to which it has issued an Accreditation Certificate
- The NAB may suspend, withdraw or reduce an accreditation of a verifier if the verifier does not meet the requirements of the AVR
- NABs must subject themselves to regular peer evaluation
- Member States must recognise the equivalence of services delivered by duly appointed and successfully peer reviewed NABs
  - Mutual recognition of verifiers

Concluding Remarks

Concluding Remarks

- Accurate monitoring and reporting is fundamental to protecting the integrity of the EU ETS
- The MRR specifies detailed requirements and responsibilities that are legally binding on EU ETS countries, operators and competent authorities
  - More consistent implementation across the EU
- The AVR specifies detailed requirements and responsibilities for verification and accreditation of verifiers, which further adds to the trustworthiness of reported emissions
- EU ETS MRVA involves quality safeguards from the bottom to the very top (even NABs are subject to peer review)
- Initial extra investment in thorough MRVA is repaid by the subsequent gains in effectiveness and efficiency

Questions are welcome

Contact and Information

For further information, please contact:

Robert Gemmill (Coordinating Expert EU MRV)
rjgemmill@hotmail.com

Or visit:

The European Commission's EU ETS MRV Website via:
Monitoring, reporting and verification of EU ETS emissions (europa.eu)

Presentation to China Electricity Council
Carbon Emissions International Symposium
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thank you

Robert Gemmill

rjgemmill@hotmail.com