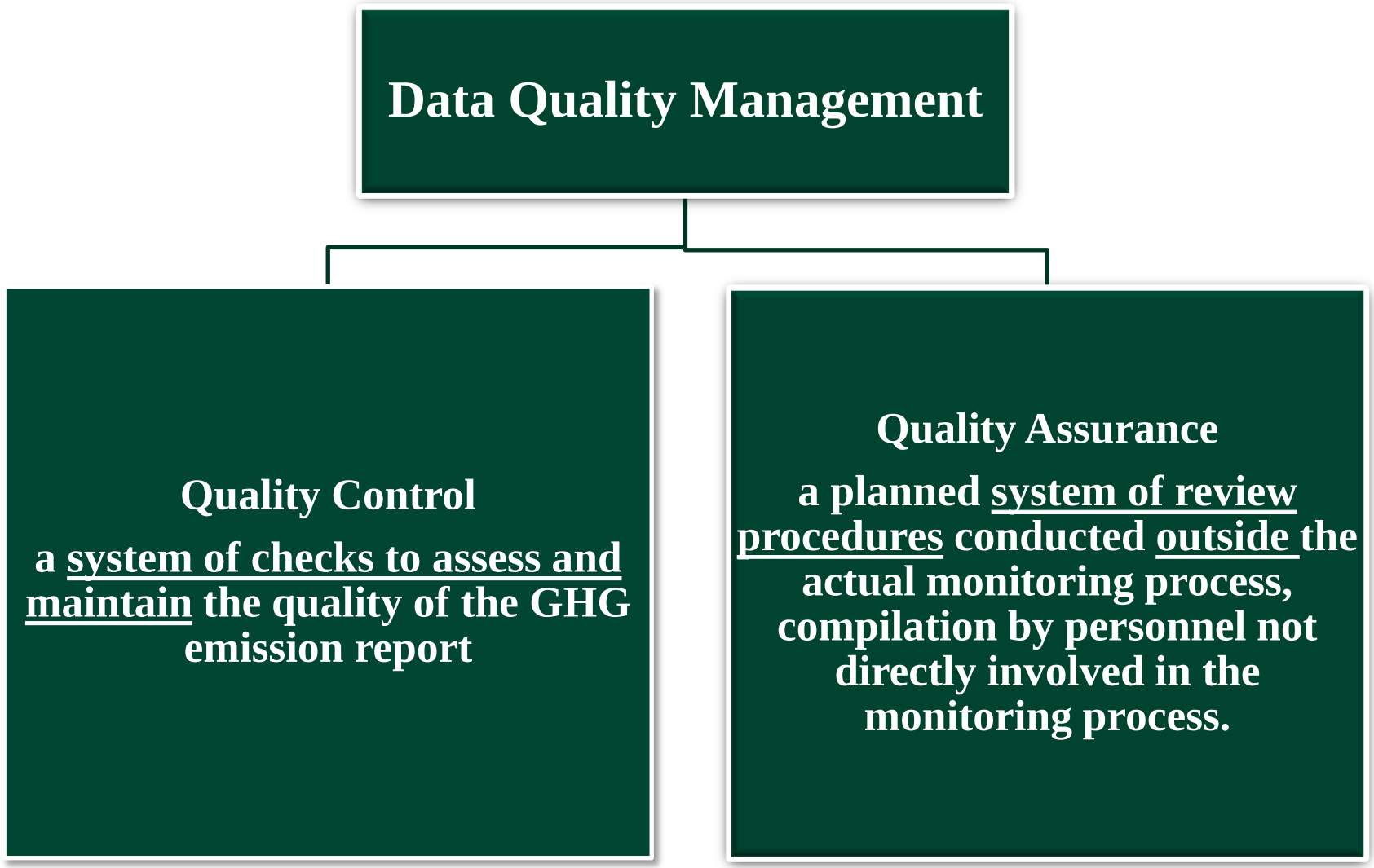
QUALITY ASSURANCE (QA) / QUALITY CONTROL (QC) AND VERIFICATION

SEPTEMBER 23-25, 2013

Overview

- **QA and QC are both measures to improve data quality**
- **QA and QC are often internalized to monitoring and reporting functions**
- **Several options for verification systems**
  - **Frequency (annually, every 2-3 years)**
  - **Verification activities (desk review, onsite audit…)**
  - **Program design (based on facility size, type of source….)**
- **Benefits from verification, but no 'bullet proof' guarantee**
  - **Trade off between cost and level of assurance**
  - **Different risks exist**
  - **Materiality defines the acceptable level**

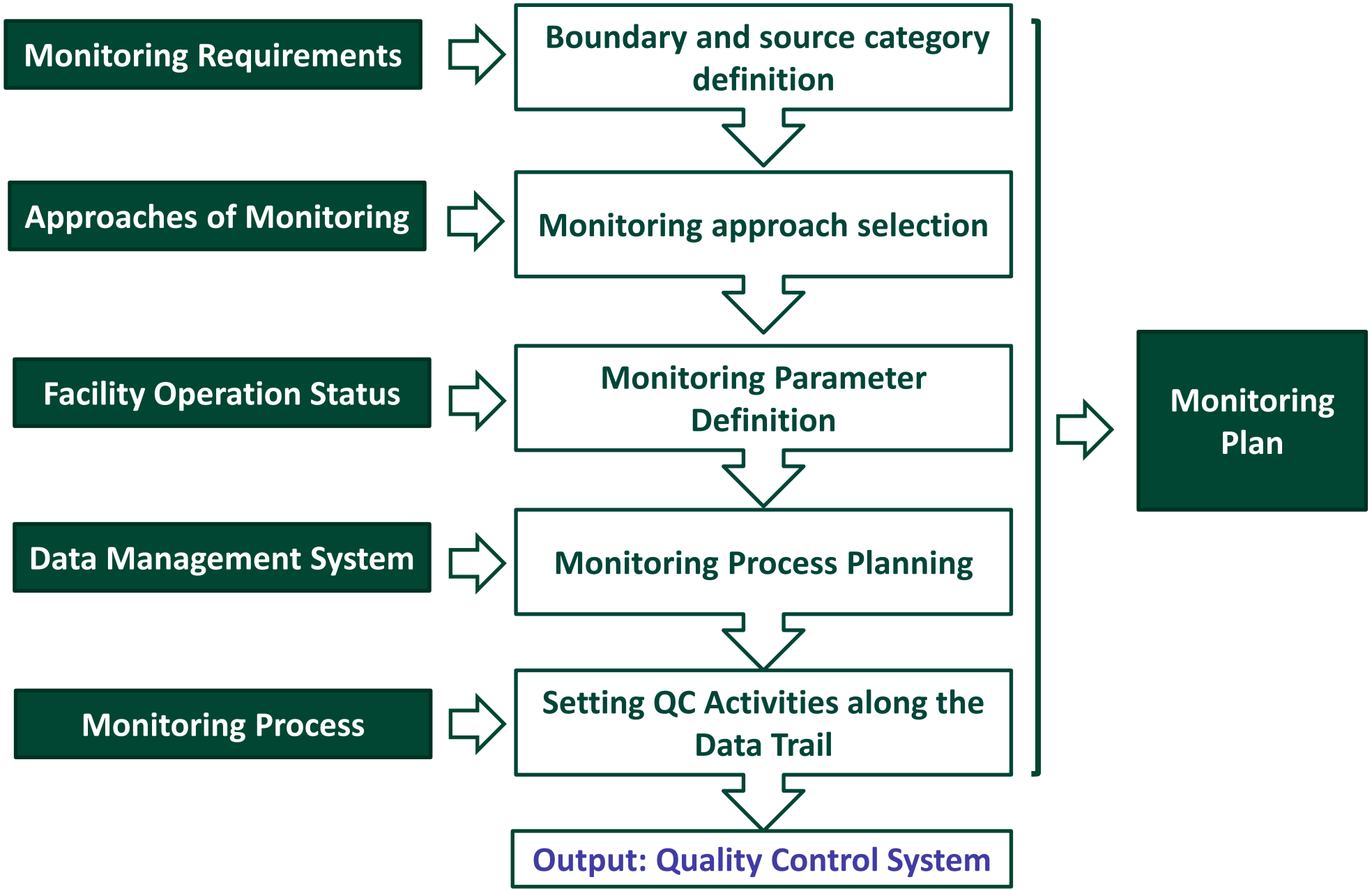
Definition


Data Quality Management
Quality Control
a system of checks to assess and maintain the quality of the GHG emission report
Quality Assurance
a planned system of review procedures conducted outside the actual monitoring process, compilation by personnel not directly involved in the monitoring process.

Purpose of QA/QC and Verification

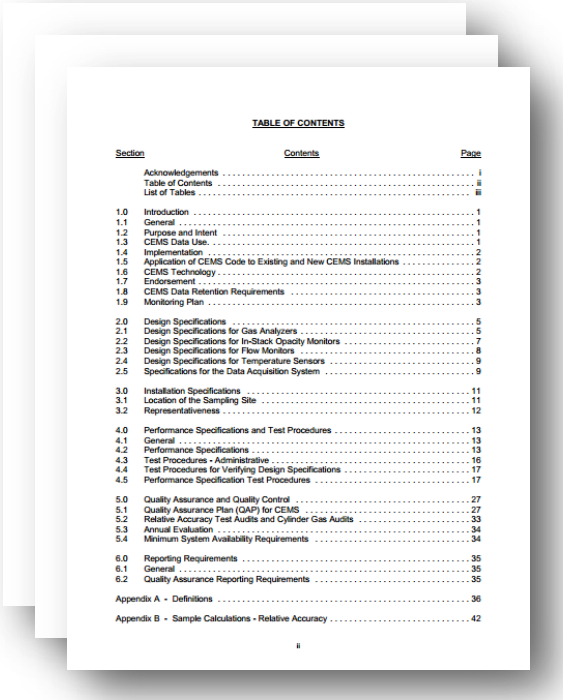
- **Investigate accuracy, completeness, transparency, consistency**
- **Risk management**
  - **Preparation and controls now avoids potential big problems later**
- **Management and credibility**
  - **Without checks, risk "garbage in as garbage out"**
  - **Assurance builds trust and confidence**
- **Continuous improvement**
  - **State of the art always evolving**

Quality Control System



QA/QC in Practice

- **IPCC QA/QC and Uncertainty Guidelines**
- **Program requirements integrated into monitoring, data management, record keeping**
- **Industry standards, national standards, equipment specifications (e.g., metering equipment calibration)**



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Examples of QC Activities along the Data Trail

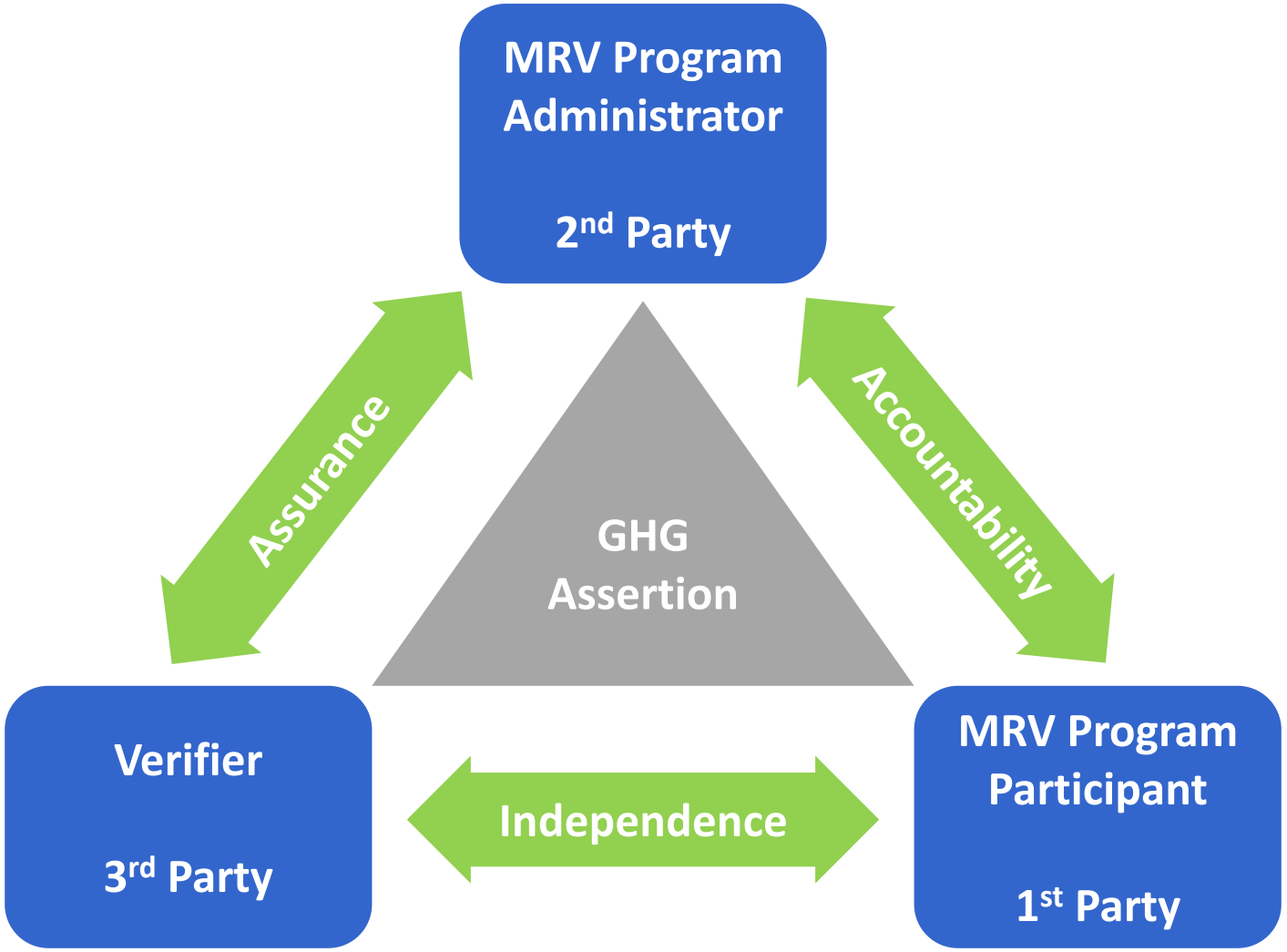
- **Input controls**
  - Metering equipment maintenance, calibration
  - Only personnel with training, job duty, data access
- **Data protection, version control, back ups, archiving, security**
- **Data checks**
  - Sequence testing, missing data tests, record counts, reasonableness checks, reference checks, transcription checks, units
- **Process controls**
  - Recalculation, profile analysis (related sources), trend/variance analysis (over time)

Quality Assurance System

Type of Quality Assurance

Type of Quality Assurance	Description	Independence Mechanism
Internal Assurance/ Internal auditing	Persons(s) from within the reporting company but independent of the GHG inventory determination process conducts internal assurance	Different lines of reporting
External Assurance/Verification	Person(s) from an organization independent of the product GHG inventory determination process conducts third party assurance	Different business from the reporting company

Verification Relationships



- **Verification Criteria (facility reporting requirements)**
- **Verification Standard**
- **Scope**
- **Objectives**
- **Level of Assurance**
- **Materiality**

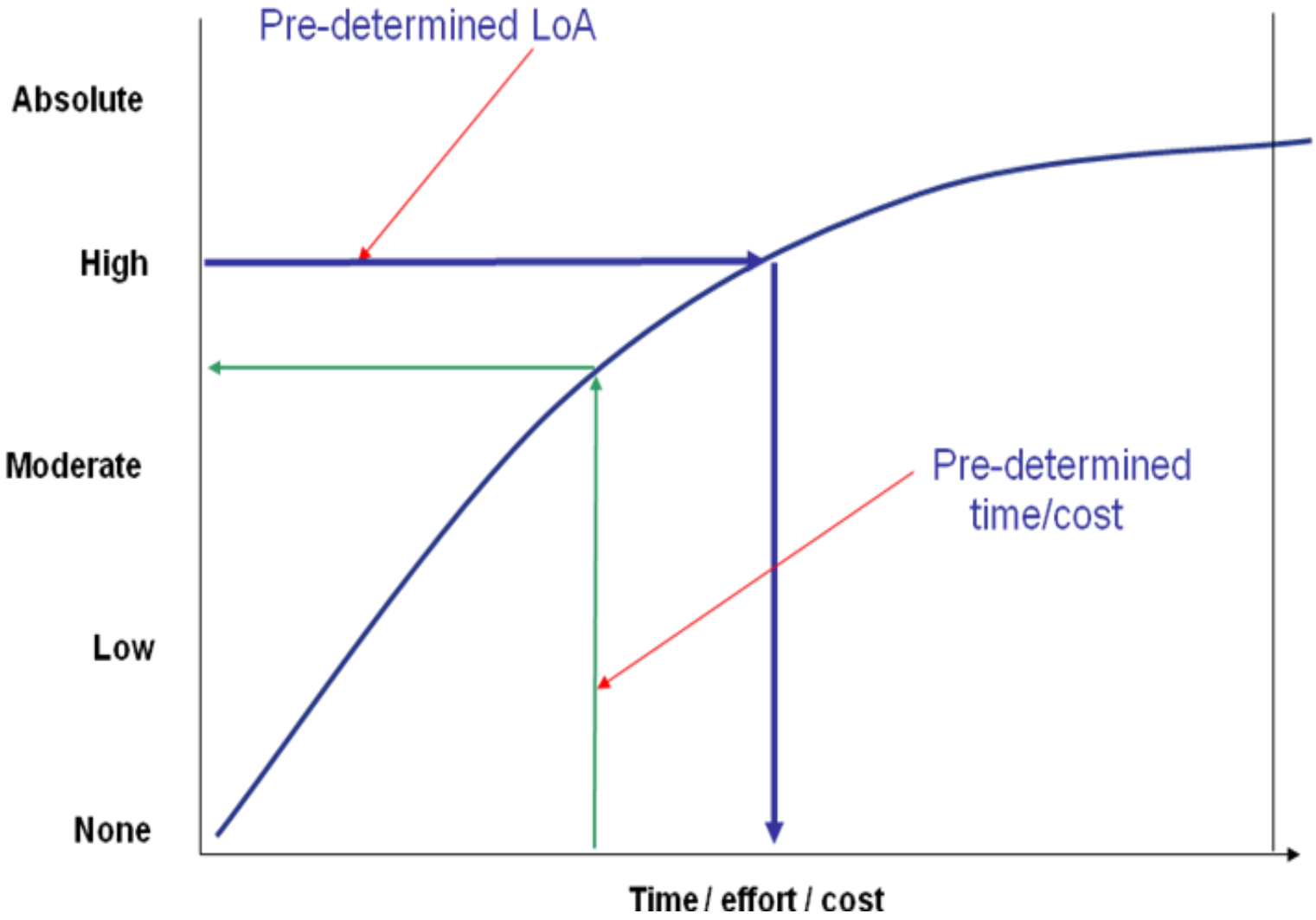
Level of assurance

'Reasonable assurance' means a high but not absolute level of assurance (Wording from international standard ISAE 3000 (www.ifac.org)

Reasonable level of assurance	Limited level of assurance
Intensive verification	Less intensive verification
Verification statement positively worded:	Verification statement with double-negative wording:
We have found that the emissions report is a fair representation of the emissions of the installation, and contains no material misstatements…	Nothing has come to our attention that causes us to believe that the data is not stated in all material respects in accordance with the relevant criteria…

- **LoA depends on the use of the verification statement and the intended user**
  - **Regulatory compliance (mandatory facility reporting)**
  - **Market transactions (emissions trading)**
  - **Public relations (claims about GHG management efforts)**
- **The degree of confidence the intended user (program administrator) requires in a verification statement**
- **Limiting Factors**
  - **Resources (time and budget)**
  - **Definitive standard**
  - **Risks**

LoA and Verification Budget



- **Inherent risk due to the complexity of the processes that are basis of GHG calculations and GHG assertions**
  - **Lower for a facility with a single combustion source vs. petroleum refinery**
- **Control risk due to failure of facility controls to prevent, detect, or correct an error or omission (QA/QC, metering)**
  - **Lower for an established company, with audited financial system**
- **Detection risk due failure of verification activities to identify or detect evidence of material misstatement**
  - **Higher if entity is spread over a large area, multiple owners, mentality of fear or resentment towards the verifier, lack of cooperation**

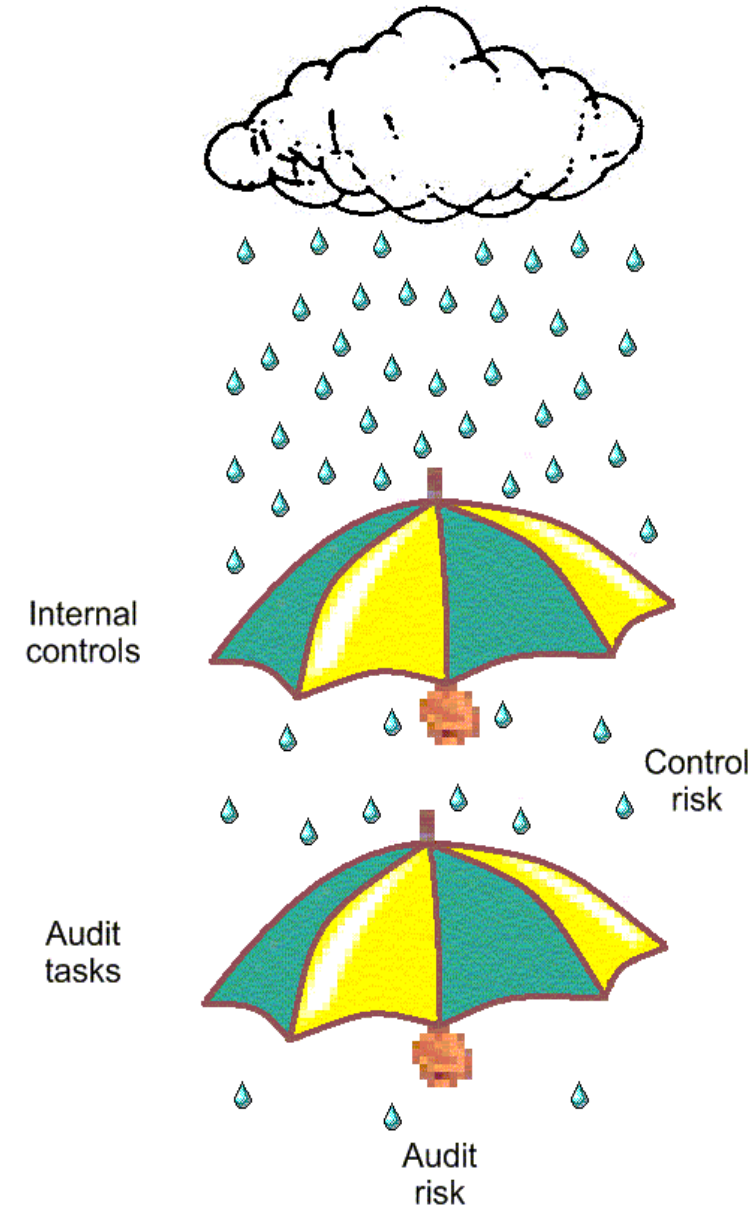
Verification – Risk based approaches

Inherent risk

Testing of controls

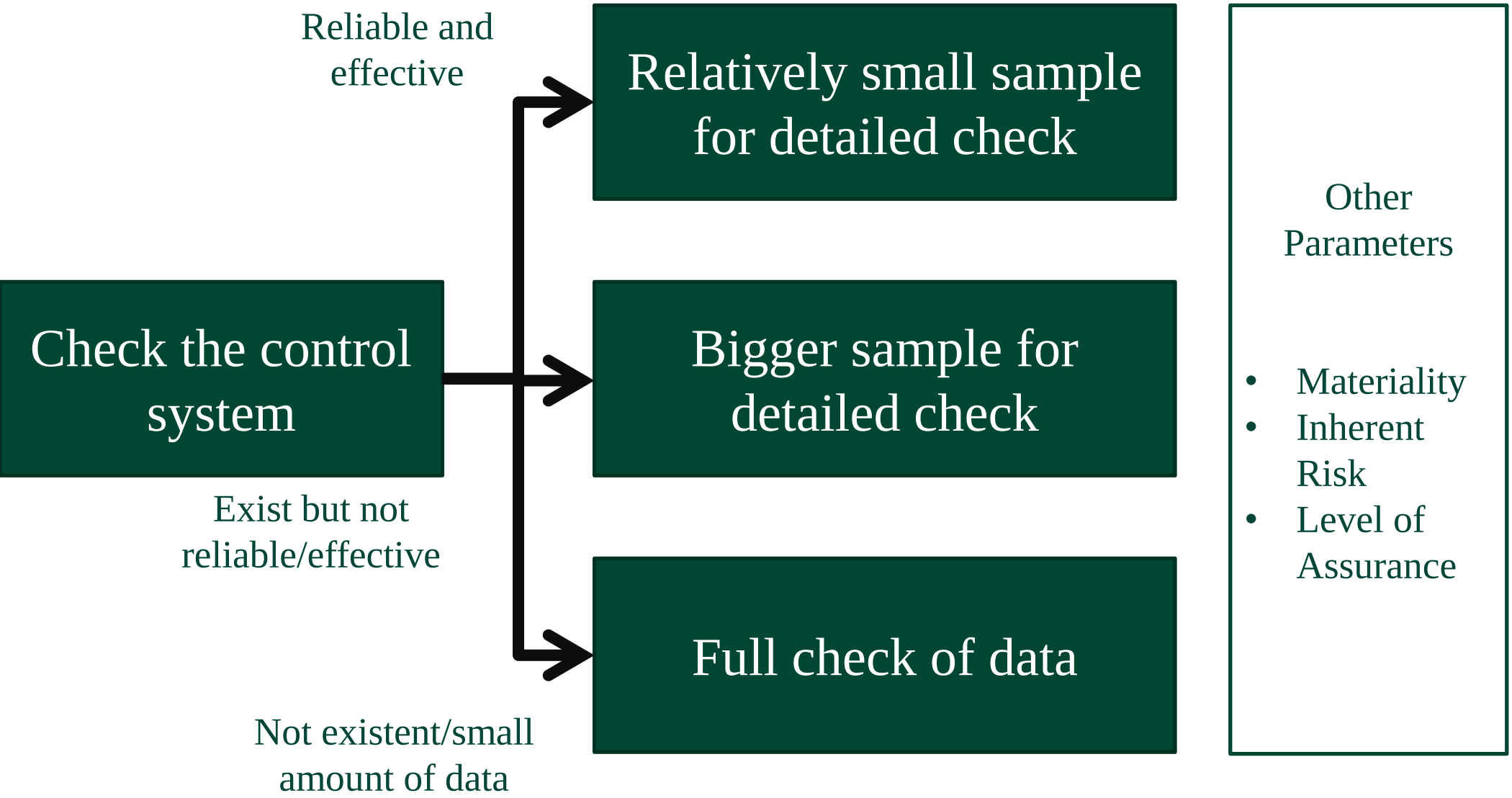
Sample based detailed checks

Verification risk



How a verifier deals with risks

Two-step approach



- **Criteria for determining if errors, omissions, misrepresentations, and non-conformities within or underlying a GHG assertion influence the decisions of the intended users**
- **Quantitative**
  - **uncertainty or error of 5% in the total emissions from the organization's inventory would affect decision**
- **Qualitative**
  - **uncertainties related to issues that are not easily expressed numerically, such as the potential of industry or market instability**

‘**Materiality Thresholds** ’: the quantitative threshold or cut-off point above which misstatements, individually or when aggregated with other misstatements, are considered material

- **Absolute/relative/mixture**
  - **e.g., 1000 metric tonnes of CO2e per year/**
  - **e.g., plus or minus 5% of annual total**
  - **e.g., 1000 metric tonnes of CO2e per year or 5% of total, whichever is less**
- **Varies by industry sector, GHG source**
- **Materiality thresholds guide verifiers in their determination of whether a discrepancy is material or not**

“Errors” and materiality

- ‘**misstatement**’ means an omission, misrepresentation or error in the reported data, not considering the permissible uncertainty
- ‘**material misstatement**’ means a misstatement that, in the opinion of the verifier, individually or when aggregated with other misstatements, exceeds the materiality thresholds or could affect the treatment of the operator’s report by the competent authority

Materiality Aggregation/Disaggregation

- **10% of an individual GHG source**
  - **A boiler is an example of an individual source of combustion emissions**
  - **A natural gas pipeline is an example of a source of fugitive emissions**
- **5% of GHG emissions from a facility or site**
- **Discrepancies that are immaterial individually may be material when aggregated**

- USA

- Kong Chiu
  - US EPA
  - Chiu.Kong@epa.gov

USA Snapshot

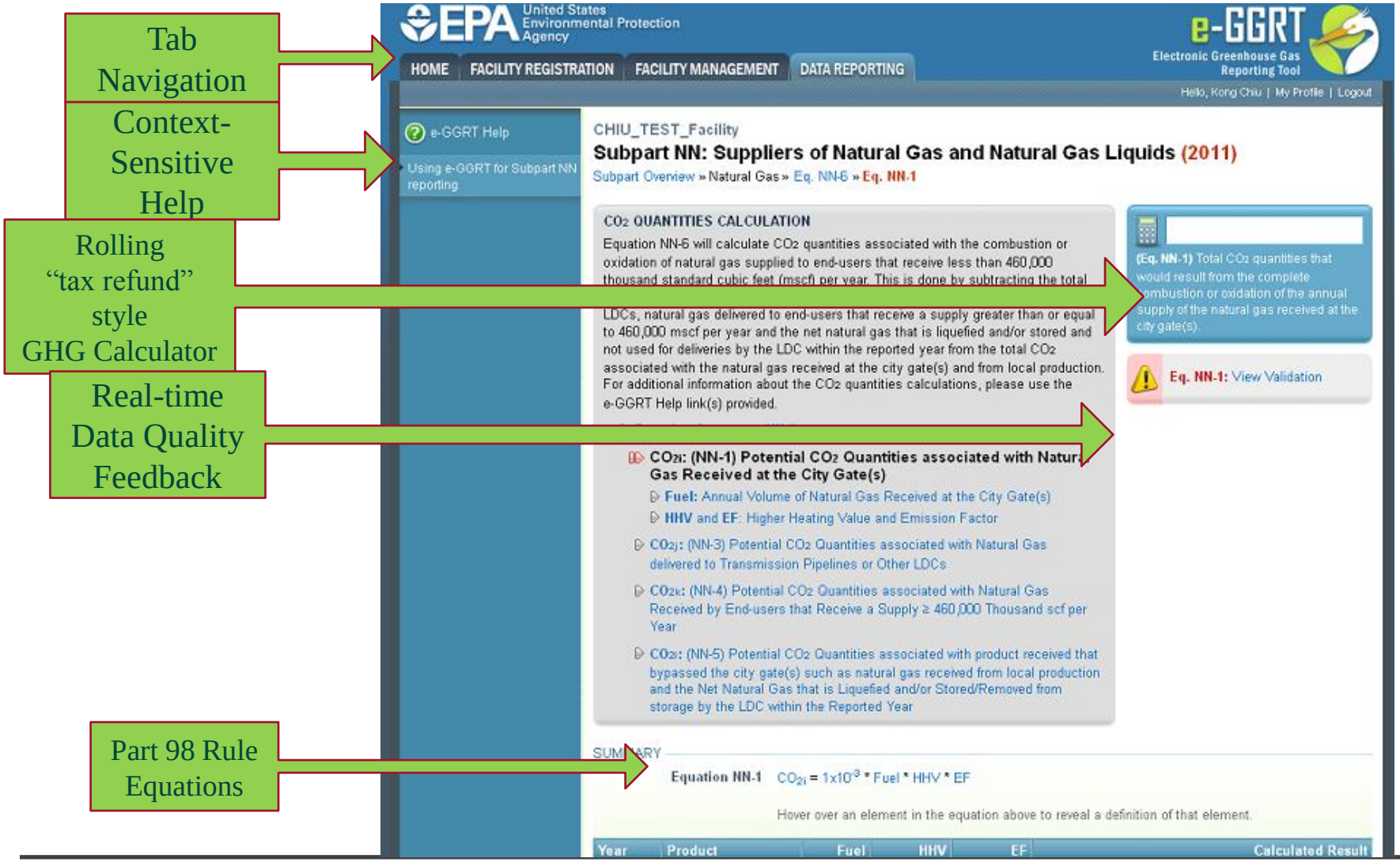
- US EPA GHG Reporting Program Verification
- Reporter Self-Certifies
- Electronic Verification
  - Pre-submittal warning for reporters entering data outside reasonable ranges or missing data
  - Post-submittal verification through logic checks, use of outside data sets, and statistical analyses across facilities
  - Improvements to ranges & algorithms over time with real data
- Staff review and direct follow-up
- Staff review electronic verification results
- Phone/email follow-up- built in secure communications via e-GGRT
- Resubmissions, as needed

US EPA Sample Checks

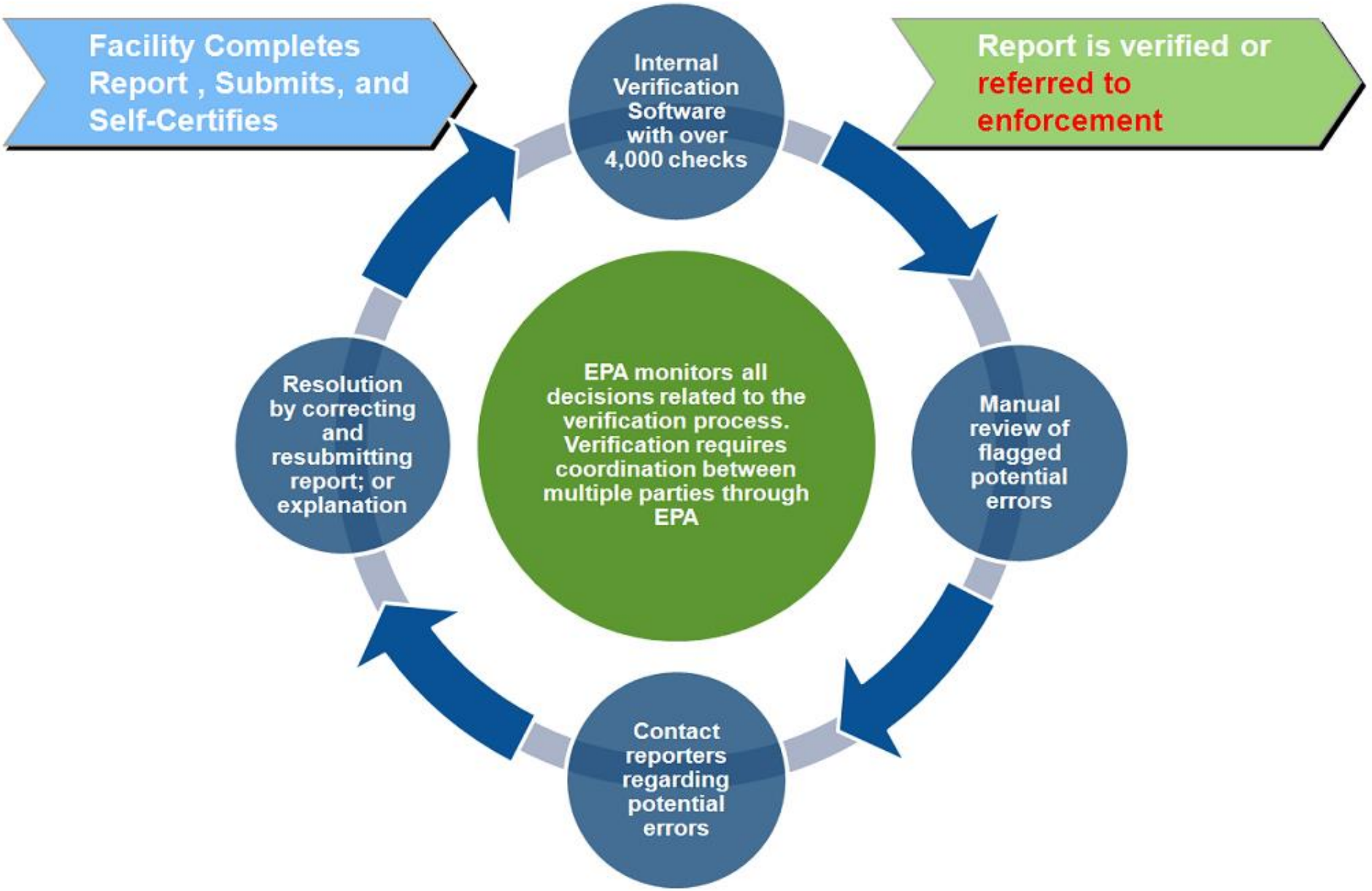
Type of Check检查类型	Example示例
Validation审定 (~50%)	The annual CH4 emissions for the subpart have not been reported 没有汇报年度CH4排放 Max. rated HI capacity was not reported for the subpart 没有汇报最大额定加热功率
Range区间 (~30%)	Group max. rated heat input (HI) cannot exceed 250 mmBtu/hr 组内最大额定输入热值不能超过250 mmBtu/小时(约251.4GJ/小时) Unit operating hours cannot exceed 8,784 装置运行小时不能超过8,784
Algorithm计算式 (~10%)	Fuel is not appropriate for a unit using a Tier 1 method with a maximum rated HI capacity greater than 250 mmBtu/hr 在最大额定HI功率超过250mmBtu/小时(约251.4GJ/小时)时，装置的燃料计算不能用层次1方法 The annual CO2 emissions is more than expected based on fuel type and max. rated HI capacity 基于燃料类型和最大额定HI功率，年CO2排放量高于预期值
Statistical统计 (~10%)	The ratio of annual CO2 emissions to max. rated HI has been identified as a potential outlier for large-capacity units that burn oil/gas. 对于使用油/气的大功率装置来说，年CO2排放量和最大额定HI的比值被认定是一个异类

Courtesy: US EPA

- Validation integrated into User-Friendly EPA Reporting Software



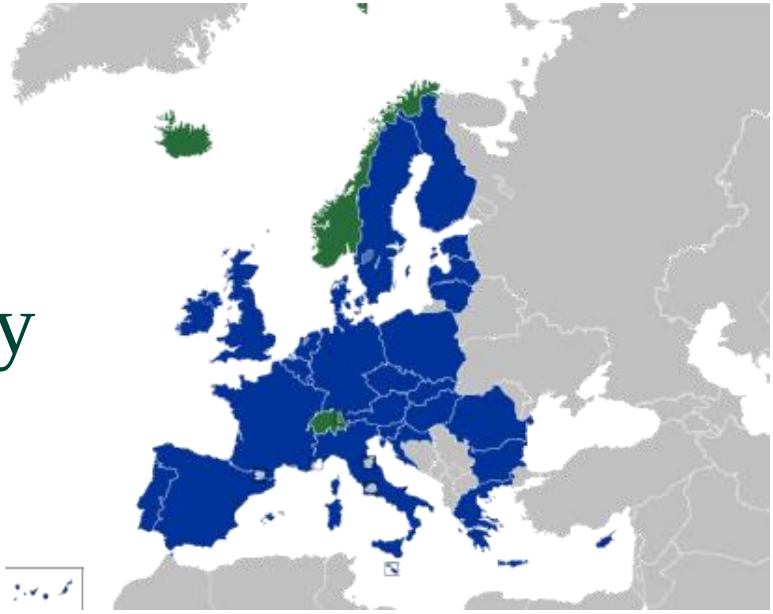
USA Snapshot



- European Union

- Dr Hubert Fallmann
  - Austrian Environment Agency
  - hubert.fallmann@umweltbundesamt.at

EU ETS – Verification and accreditation



- Aim is to create trust in the data by receiving an opinion of an independent and competent body (3rd party)
- EU ETS architecture requires this to be done by private entities:
  - Saves CA´s resources
  - Ensures independence and impartiality
- In order for the competent authority to control this process, the verifier needs an accreditation (proof of competence)

EU ETS – Accreditation of verifiers

- ‘Accreditation’ means an attestation by a national accreditation body that a verification body meets the requirements set by harmonised standards (or legislation) to carry out verification
- Requirements:
  - Proven competence
  - Independence and impartiality
- Not a one-off exercise, but involves annual surveillance and re-assessment every 4 to 5 years
- New element from 2013: Accreditation will be mutually accepted in all Member States “automatically”

EU ETS – Scope of verification

- The verifier shall assess whether he can conclude with **reasonable assurance**:

1. the data submitted in the emission reports are fairly stated (i.e. that the report is **free from material misstatements**);
2. the operator or aircraft operator has **complied** with the approved monitoring plan while carrying out monitoring throughout the reporting period and when preparing the emissions report.
3. The verifier shall furthermore report on recommendations of improvements found during verification

Process required by A&V Regulation:

- Pre-contract assessment
- Strategic analysis
- Risk analysis
- Set up verification plan (and sampling plan)
- Perform verification procedures ("process analysis") → Site visit!
- Require operator to correct all found misstatements and update methodology report, if necessary
- Compile internal documentation
- Prepare verification report & internally review it
- Issue verification report

Pre-contract stage

Verifier will check whether, and under which conditions he can take on this assignment:

- Assess monitoring plan / permit
- Check, if the team has all competences, or if external experts are needed
- Check, if team is available (a day only has 24h…)
- Estimate amount of time needed & make quotation
- Note: Lump sum contracts (all inclusive) are forbidden
  → if verifiers finds that more days are needed, the operator has to pay more
  → No “race to the bottom”!

Verifier attempts to understand the functioning of the installation and the operator's monitoring system, based on the monitoring plan, in particular:

- Complexity of the installation, the process applied, emission sources, fuels and materials to be monitored…
- The operator's data flow activities, responsibilities, IT systems
- The measurement instruments and laboratory analyses used, if applicable
- The operator's control system

Risk analysis

- Based on the strategic analysis, the verifier assigns a risk level to each important part of the monitoring system
- Areas of higher risks will get more attention during the process analysis
- Depending on the findings regarding the effectiveness of the operator's control system, the sample sizes for the detailed data checks have to be planned

Result: Verification plan and (if applicable) sampling plan

Verifier follows the verification plans (and adapts it if necessary)

- Check the control system – Efficient? Reliable? Applied?
- Has the Monitoring plan been adhered to?
- Check the instruments (calibration, maintenance…)
- Check the operator's files
- Check the data
- Check the calculations…
- Site visits! (can only be waived under special circumstances) → Without, a reasonable level of assurance is virtually impossible

EU ETS – Materiality

- Parameter for planning tests and coming to a conclusion on a verification opinion
- Not an excuse for ignoring errors if they are below the threshold
- **ALL found errors must be corrected!**
- The size and nature of the misstatements may cause the verifier to consider misstatements as material even if below the materiality level (also when aggregated)

Example of materiality level – EU ETS

- Could be left to the expert opinion of verifiers
- However, MS prefer a threshold in legislation:
  - Category A + B: 5% of the total reported emissions
  - Category C: 2% of the total reported emissions
- Note:
  - Category A: <50,000 t CO_2 / year
  - Category B: between 50,000 and 500,000 t CO_2 / year
  - Category C: > 500,000 t CO_2 / year

Verification documentation

- Verification needs documented evidence of the findings → you can't conclude on allegations
- Verifier has to compile all documents,
- Then prepare a draft verification report
- Carry out an internal, *independent* review (see next slide)
- Verifier concludes on the verification opinion

Independent review

- Requirement under ISO 14065
- EA 6/03:
  - section 5.5: there shall be a review; the reviewer should be someone who has not participated in the verification;
  - 6.3.3: reviewer shall not have been involved in the verification; shall have competence ... and authority to approve the verification report.
- Why is (independent) review important?
  - reduce the risk of errors and ensure compliance of the verifier
  - "the" quality assurance measure;
  - However, independent review per se is no 100% guarantee for perfect verification.
- Independent review is often seen as obstacle for small verification companies (single verifiers)

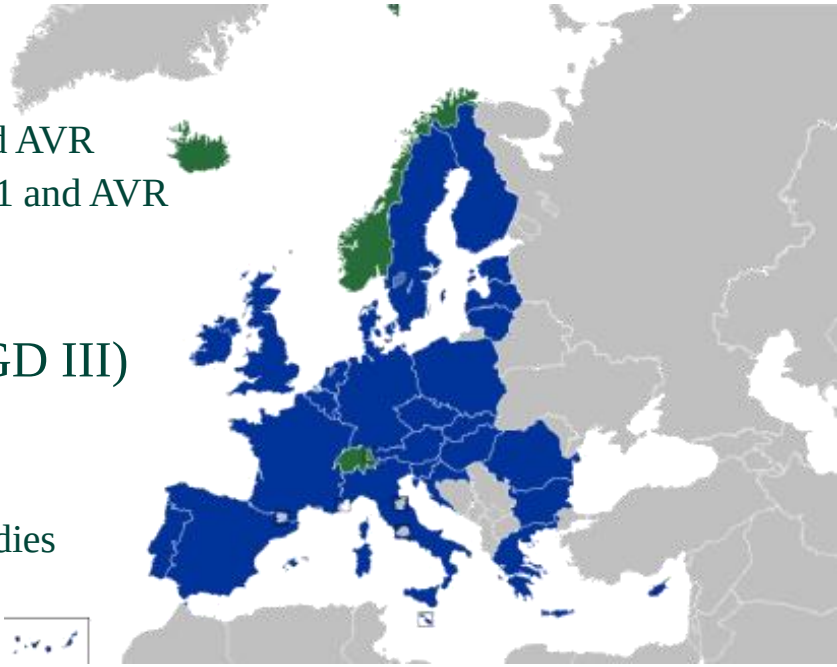
Possible findings

Situation	Reaction
Not enough information available, MP not up to date	Verification not possible, verifier has to quit
Everything is fine	Verifier can issue positive verification statement
Non-compliances found	Operator has to send updated MP to CA or change monitoring in order to be compliant
Misstatements found	Operator has to make corrections to data
Misstatements not fully removed	Verifier to assess if material
Non-material misstatements remain	Verifier issues positive verification statement with comments
Material misstatements remain	Negative verification statement

EU ETS – MRV Information sources

http://ec.europa.eu/clima/policies/ets/monitoring/

- Guidance documents on verification:
  - Explanatory Guidance Document No.1 - The Accreditation and Verification Regulation
  - Key guidance notes (GD II)
    - KGN II.1 on the scope of verification
    - KGN II.2 on risk analysis
    - KGN II.3 on process analysis
    - KGN II.4 on sampling
    - KGN II.5 on site visits concerning installations
    - KGN II.6 on the verification report
    - KGN II.7 on competence of verifiers
    - KGN II.8 on the relation between EN ISO 14065 and AVR
    - KGN II.9 on the relation between EN ISO/IEC 17011 and AVR
    - KGN II.10 on information exchange
    - KGN II.11 on certification
  - Verification Guidance for EU ETS Aviation (GD III)
  - Templates:
    - Verification report
    - Information exchange templates for accreditation bodies and competent authorities
  - FAQs etc. under development



Summary

- **QA/QC are essential activities and pre-requisite for practical verification**
- **Variety of options depending on program design**
  - **1st party, 2nd party, 3rd party**
- **Verifications provide several benefits, but recognize it does not guarantee there are no errors (just that no errors were found)**

- **Examples of QA and QC activities include:**

  a) Meter calibration
  b) Data collection checks
  c) Training
  d) Software security

- **Examples of verification risks include:**

  a) Detection
  b) Program
  c) Control
  d) Inherent
  e) Scientific/Model

- ***True or False.*** **The verifier determines what is a material misstatement.**

- **Examples of QA and QC activities include:**

  a) Meter calibration, b) Data collection checks, c) Training, d) Software security

- **Examples of verification risks include:**

  a) Detection, c) Control, d) Inherent

- **False. The verifier collects evidence and assesses it against the verification criteria. Materiality is determined by the program.**

Thank You

For more information on the Partnership for Market Readiness (PMR), please contact:

PMR Secretariat

pmrsecretariat@worldbank.org

www.thepmr.org