MONITORING AND DATA MANAGEMENT

SEPTEMBER 23-25, 2013

Overview

- **Monitoring at the source (emissions, inputs/outputs) and data management throughout the data life cycle ("data trail") enable quantification and verification**
- **Monitoring plans are customized to facilities**
  - **Sources and equipment, metering equipment, data management…**
- **Robust data management systems**
  - **Data capture, validation, storage, processing, output, security…**
- **Familiarity with facility operations and systems informs development of appropriate/practical requirements**

- **Facility monitoring systems track most parameters for process control – Industrial Internet**

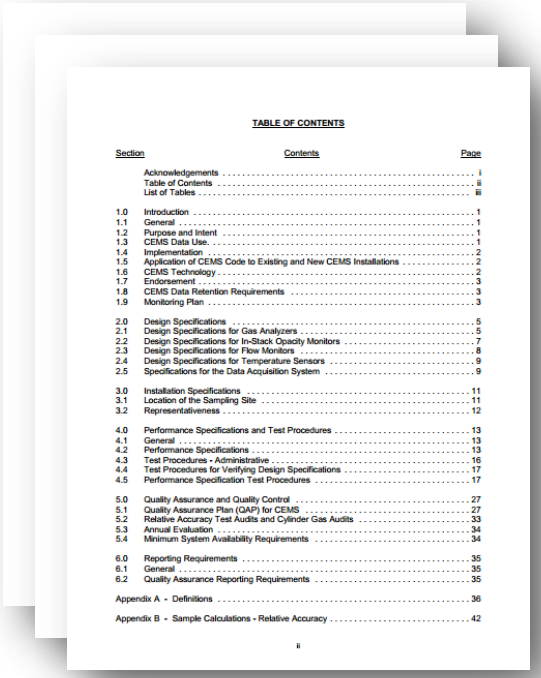
- **Program requirements prescribe specific information and data needs to be outlined in a monitoring plan**
- **Information to be submitted with GHG report, additional for audit purposes**

- **Monitoring requirements defined in the GHG reporting rules**
- **Generally there are 2 approaches of monitoring**
  - **Directly monitor GHG, e.g., continuous emission monitoring system (CEMS)**
  - **Monitor process/operational parameters, e.g., energy consumption, material inputs/outputs, operating conditions**
- **Monitoring parameters are specific to the source category and the facility operations**



Monitoring Plans

- **Personnel roles and responsibilities**
- **Description of monitoring procedures/methods for each source**
- **Meter installation, operation, maintenance, cleaning, calibration**
- **Data acquisition and management system**
- **Record keeping**
- **Links with manuals, SOPs, standards…**
- **Training, certifications**



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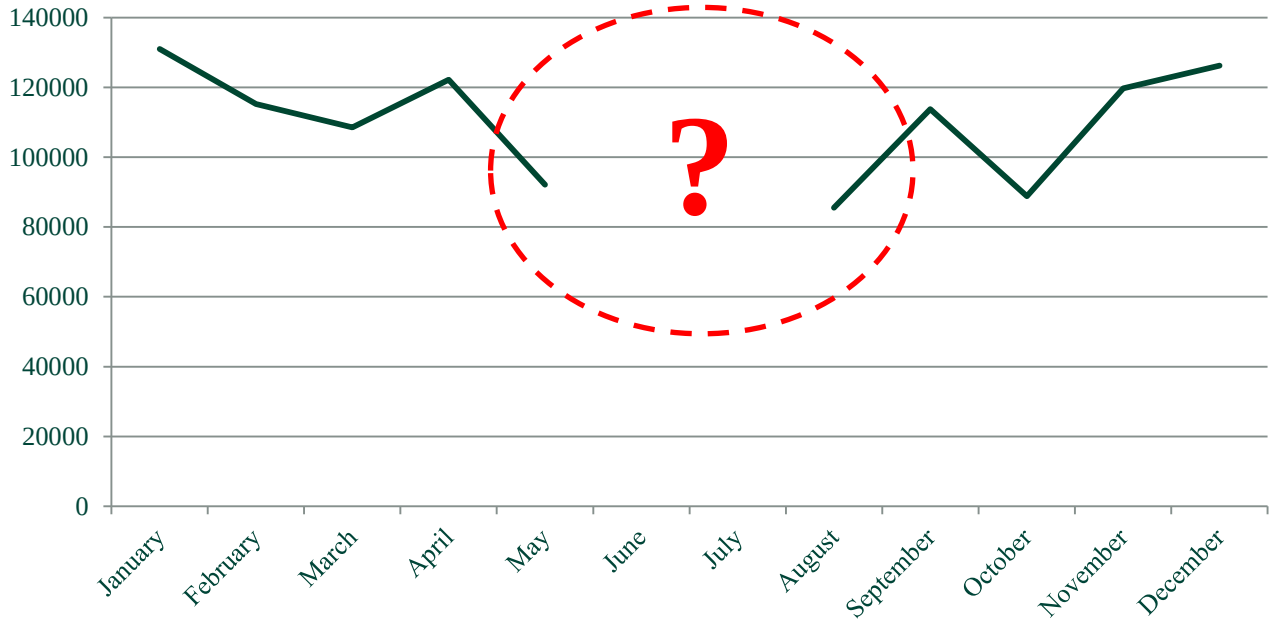
Monitoring Methods

- **Option of monitoring methods according to quantification tiers**
- **What is monitored, how it is monitored, how often, and record keeping …**
- **Validation of parameter properties (e.g., energy content or carbon) according to varying frequency**
- **Annual, semi-annual, every shipment received, …**

Monitoring Equipment Calibration

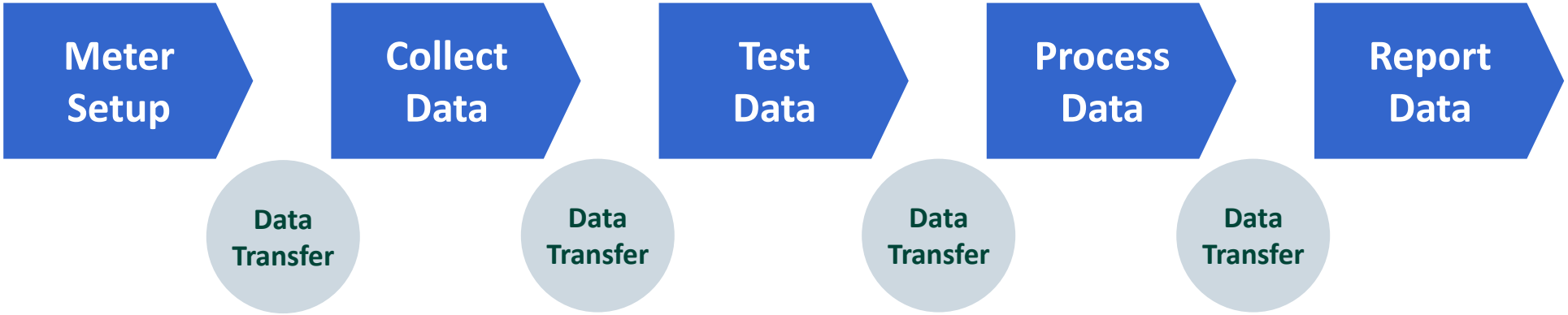
- **Flow meters, weighing scales, gas analyzers…**
- **Calibration current and continues to be valid for the data collection period**
- **In accordance with manufacturer's specifications, standards (industry, national), reporting requirements**
- **Qualified personnel, external service/certification**
- **Acceptable error range (e.g., less than # %)**
- **Record keeping**

- **During a specified time period data is:**
  - **not collected, e.g. meter or data logger not working**
  - **invalid, e.g. collected while the measurement device not calibrated or otherwise non-compliant with QA requirements**



- **Depending on the program, options to respond to missing data include:**
  - Re-analyze original data
  - Analyze data back ups
  - Generate new data if during the sample period and then analyze it
  - Make up substitution values and document process (e.g. historical, similar equipment/facility, worse case scenario…)
- **Consequences**
  - Punitative measures
  - Intentionally false – legal liability

Data/IMS vis-à-vis Data Trail

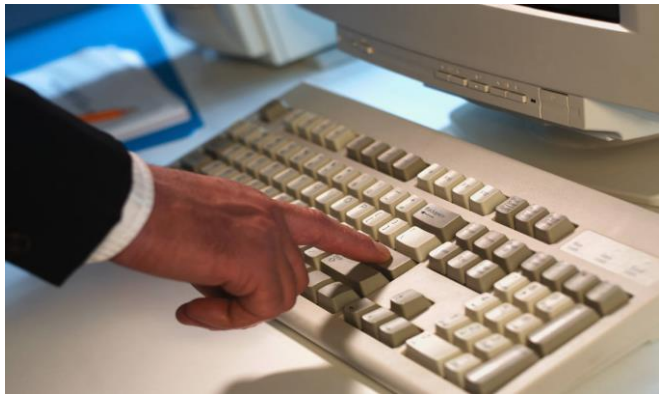


Storage | Data Integrity | Data Back Ups

Security | Controlled Access | Confidentiality

Staff Training | Resources | Infrastructure

Data Management System



- **Custom-built or off-the-shelf (SaaS)**
- **Integrates with existing IT infrastructure**
  - **Monitoring and operational hardware and software, SCADA**
  - **Organizational software (documents, finance…)**
  - **Control room, servers…**
- **Security (authorization, firewalls), back-ups, auditability**
- **GHG data model, calculations, reporting**

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MRV Program Focus

- Experience with program
  - Shenzhen ETS pilot MRV
  - Beijing ETS pilot MRV
  - Shanghai ETS pilot MRV
  - National MR guidelines

Experience with pilots and national MR guidelines development

- Sound foundation
  - long standing energy consumption statistics
  - 1,000-enterprise energy saving program during 11th FYP, 10,000-enterprise energy saving program during 12th FYP
- Issues
  - Enterprise level rather then facility or installation level
  - Lack of critical parameters: net heat value, carbon content, oxidization rate
  - Data quality varies by sector
  - Lack of data relevant to industrial process emissions
  - Institutional barriers

Challenges-1

- Develop MRV standard in short time period
- 7 pilots with different MRV systems
- Pilots have different social and economic situation, energy structures, require different arrangements
- Coverage: industrial sectors, tertiary industry
- Methodology: direct monitoring/calculation
- The treatment of direct and indirect emissions
- Different perception on monitoring plans
- Lack of knowledge and personnel on reporting and verification

Challenges-2：
Activity data and emission factors

- Boundary of emission sources to be monitored
- Type of fuel monitored：solid fuel classification
- Net heat value, carbon content, oxidation rate to be monitored, standards and methodology
- Frequency of monitoring: month, quarter, year
- Monitoring equipment

Monitoring plan: power sector

- Boundaries
- Monitor 1: fossil fuel physical consumption

Fuel type	Data collection methodology	Standards/protocols
	□ quantity received, stock accounting □ belt scale, meters etc. □ others （）	
	□ quantity received, stock accounting □ belt scale, meters etc. □ others （）	

Monitor 2: Net heat value of fossil fuels

Fuel type	Heat value		Sampling frequency		Methodology	
	Source	Notes	Frequency	Notes	Source	protocol
	□ direct monitoring □ default				□self monitor □ contracting	

Monitor 3: Carbon content of fossil fuels

Fuel type	Carbon content		Sampling frequency		Methodology	
	Source	Notes	Frequency	Notes	Source	protocol
	□ direct monitoring □ default				□self monitor □ contracting	

Monitor 4: Coal properties

Coal type	Monitor	frequency	Sampling method	Chemical analysis method and protocol
Coal for boilers	Heat value			
	Industrial analysis			
	Sulphur			
	H			
	C			
Coal purchased	Heat value			
	Industrial analysis			
	Sulphur			
	H			
	C			

Monitor 5: Oxidation rate of coal-fired boilers

Unit no.	Source		Slag and ash sampling /boiler thermal efficiency		Methodology	
	Source	Notes	Frequency /time	Notes	Source	protocol
	□ direct monitoring □ default				□self monitor □ contracting	

Lessons learned - 1

- Tier approach, encourage direct emission monitoring
- Strict requirements along with size of emission sources and sectors
- Provide method or default value for critical parameters
- monitoring plan is essential

Lessons learned - 2

- Information tools, software are must
- Collect historical energy consumption data to validate baseline emissions, verified
- Verification: invoices, confidential information
- Training is important : enterprises, firms, plants, organizations, personnel
- Continuous improvement process

- USA

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US GHG Reporting Program Data Management

- Monitoring/Recordkeeping support GHG methodologies
- Methodologies developed from extensive review of existing GHG programs
- Tiering approach used in many sub parts (lower order to higher order)
- Example: Stationary Combustion employs 4 Tier Approach
- In addition to calculation methodologies, the GHG Rule Requires
  - Adherence to and reference of Standards (ASTM, ISO etc…)
  - Calibration requirements
  - Missing data procedures
  - Extensive recordkeeping requirements

- Monitoring/Recordkeeping General Requirements:
  - Direct Measurement (certain units) and
  - Facility-Specific GHG calculation methods
  - Missing Data provisions
  - Source-category specific Requirements for
    - Monitoring
    - Quality assurance
    - Missing Data
    - Record Keeping

- Monitoring/Recordkeeping Special Provision:
  - Best Available Monitoring Methods (BAMM)
  - Certain circumstances, certain years
    - Parameter cannot reasonably be measured
    - Beginning of program (2010)
    - Beyond 2010 for certain sources (i.e. Hydrogen, Petrochemicals, Petroleum)
    - New for 2011 source categories
  - Methods and Equations still apply (but use best information available to obtain data inputs)
  - Monitoring Plan still required, covering BAMM time period
  - Once BAMM period expires, must follow all applicable monitoring and QA/QC requirements.

- Sample Monitoring Checklist

Iron and Steel Production Monitoring Checklist

EPA United States Environmental Protection Agency

Final Rule: Mandatory Reporting of Greenhouse Gases

What Must Be Monitored Under the Carbon Mass Balance Method?

Measure these parameters on an annual basis (unless otherwise noted)…

For Each Taconite Indurating Furnace

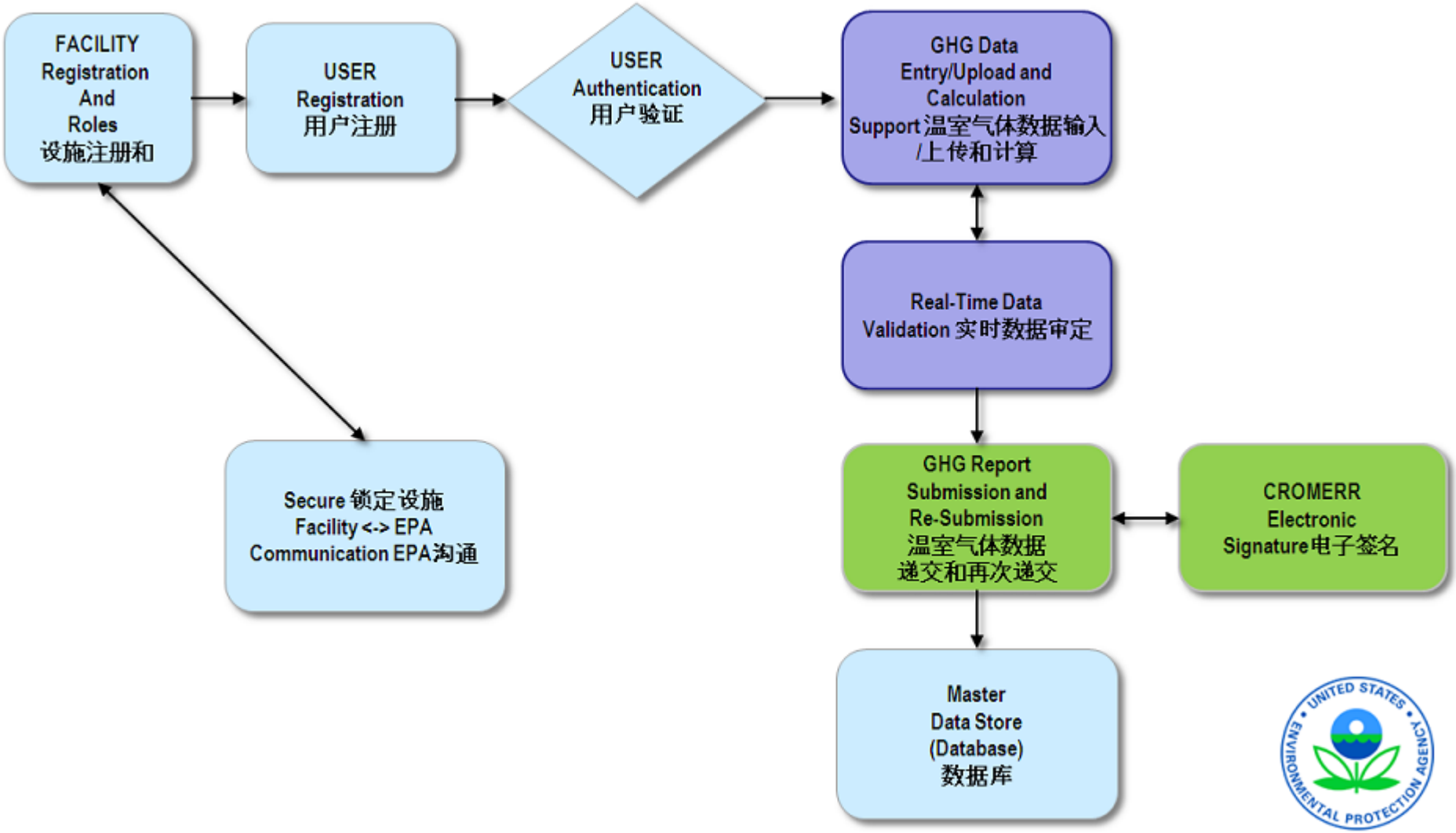
- ☐ Mass of solid fuel combusted each month (metric tons)
- ☐ Average carbon content of solid fuel (percent by weight)
- ☐ Volume of gaseous fuel combusted each month (standard cubic feet [scf])
- ☐ Average carbon content of gaseous fuel (kilogram [kg] C per kg of fuel)
- ☐ Average molecular weight of gaseous fuel (kg/kg-mole)
- ☐ Volume of liquid fuel combusted each month (gallons)
- ☐ Average carbon content of liquid fuel (kg C per gallon of fuel)
- ☐ Mass of greenball (taconite) pellets fed to furnace each month (metric tons)
- ☐ Average carbon content of greenball (taconite) pellets (percent by weight)
- ☐ Mass of fired pellets produced by furnace each month (metric tons)
- ☐ Average carbon content of the fired pellets (percent by weight)
- ☐ Mass of air pollution control residue collected each month (metric tons)
- ☐ Average carbon content of air pollution control residue (percent by weight)
- ☐ Annual production quantity of taconite pellets (metric tons)
- ☐ Annual operating hours

http://www.epa.gov/ghgreporting/documents/pdf/checklists/ironandsteelproduction.pdf

- Recordkeeping Requirements:
  - 3 year retention
  - Format suitable for inspection/review
  - Include
    - List of units, operations, processes, activities
    - Data used to calculate GHG emissions
    - GHG emissions calculations and methods used
    - Documentation for site-specific emissions factors
    - Results of any required HHV, carbon content analyses
    - Facility operating data or process information
    - Missing data computations (+duration, cause, actions)
    - Written GHG Monitoring Plan

- Monitoring Plans:
  - Format suitable for inspection/review
  - Include:
    - Positions of responsibility (job titles)
    - Explanation of processes and methods used to collect data for GHG calculations
    - Description of procedures and methods used for QA/QC, maintenance and repair of equipment, including CEMS, flow meters, instrumentation
    - Reference external documents, as appropriate (i.e. company procedures, QA/QC programs)
  - Revise and update, as appropriate (i.e. changes in processes, procedures)

Electronic Data Collection



US GHG Reporting Program Data Management

- Confidential Business Information (CBI)
- EPA protects any data determined to be CBI in accordance with regulations (40CFR Part 2, Subpart B)
- EPA publishes determinations of which data elements are CBI in the Federal Register
- Emissions data collected under Clean Air Act sections 114 and 208 cannot be considered CBI
- EPA deferred some deadlines for reporting data elements that are inputs to emissions equations to better assess implications of their collection and public release

Summary

- **Program administrators should have an understanding of the realities of facility operations**
- **Leverage existing guidance, standards… (industry familiarity)**
- **Guidance should be detailed and consolidated, as well as enable customization at the facility-level**
- **Group exercise includes data trail, activities, key concepts, challenges/solutions**

- **Place the word “accuracy” or “precision” in the following blanks.**
  - **[ ] is the consistent repeatability of a measurement.**
  - **[ ] is the correctness/closeness of data measurement to the true value.**

- **What happens when there is missing data?**

a) **New data can be used if [fill in the blank]**

b) **Substitute data can be used if [fill in the blank]**

c) **Existing data can be used if [fill in the blank]**

- **PRECISION is the consistent repeatability of a measurement.**
- **ACCURACY is the correctness/closeness of data measurement to the true value.**

a) **New data can be used if DURING THE SAMPLING PERIOD.**

b) **Substitute data can be used if FOLLOWS AN APPROVED PROCEDURE AND IS DOCUMENTED (HISTORICAL RECORDS, SIMILAR EQUIPMENT)**

c) **Existing data can be used if YOU CAN FIND IT (BACK UPS?)**

Thank You

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

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