

# Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting



## General Verification Course 1.1 - Verification Context, Principles, and Program Overview

California Environmental Protection Agency



## ARB Staff Contacts or [ghgverify@arb.ca.gov](mailto:ghgverify@arb.ca.gov)

Sector	
Stationary Combustion, including Electricity Generation and Cogeneration Facilities, and <b>Process Emissions Specialty:</b> <ul style="list-style-type: none"><li>Cement, Glass, Lime, Nitric acid, Pulp/Paper, Iron/Steel, and Lead</li></ul>	Chris Halm 916-323-4865 <a href="mailto:chalm@arb.ca.gov">chalm@arb.ca.gov</a>
Biomass Derived Fuels, and <b>Transactions Specialty:</b> <ul style="list-style-type: none"><li>Electricity Retail Providers and Marketers</li><li>Suppliers of Transportation Fuels</li><li>Suppliers of Natural Gas, NGLs, LPG, CNG, LNG, and CO<sub>2</sub></li></ul>	Ryan Schauland 916-324-1847 <a href="mailto:rschaula@arb.ca.gov">rschaula@arb.ca.gov</a>
<b>Oil and Gas Systems Specialty:</b> <ul style="list-style-type: none"><li>Petroleum Refineries</li><li>Hydrogen Plants</li><li>Oil and Gas Production</li></ul>	John Swanson 916-323-3076 <a href="mailto:jswanson@arb.ca.gov">jswanson@arb.ca.gov</a>
Manager, Verification Section	Renée Lawver 916-322-7062 <a href="mailto:rlawver@arb.ca.gov">rlawver@arb.ca.gov</a>

GHG Reporting Section staff : <http://www.arb.ca.gov/cc/reporting/ghg-rep/ghg-contacts.htm>

## Welcome and Introductions

### ARB Management Team:

- Renée Lawver, Manager, Verification Section
- Brienne Aguila, Manager, Reporting Section
- Jim Aguila, Chief, Program Planning and Management Branch
- Rajinder Sahota, Chief, Climate Change Program Evaluation Branch

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## The Climate Registry Team

- The Climate Registry
  - Amy Holm, Program Director
  - Michelle Zilinskas, Program Assistant, Verification Services
- Direct Path Strategies (DPS), Inc.
  - Bill Master
  - Ann Hewitt
  - Don King
  - John Kline

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## Classroom Basics

- Be on time
- Remain active participants
- Be courteous to others
- Turn cell phone sound off
- Asking questions:
  - Raise your hand
  - Stick to the topics being presented
  - We will also pause throughout the course for Q&A, to check in with ARB staff for clarifications and for short breaks between classes

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## MRR Verifier Accreditation: Course Content and Exams

### Course 1: General Verification for Mandatory GHG Reporting

- 1.1 Verification Context, Principles, and Program Overview
- 1.2 Stationary Fuel Combustion and Sorbent Sources
- 1.3 Accuracy & Product Data
- 1.4 Electricity Generating Units & Cogeneration

### Course 2: Transactions Specialty

### Course 3: Oil and Gas Systems Specialty

### Course 4: Process Emissions Specialty

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## Disclaimer

This accreditation training is intended to provide administrative detail and recommended practices for compliance with the verification provisions of the California Air Resources Board's (ARB) Regulation for the Mandatory Reporting of Greenhouse Gas (GHG) Emissions (Regulation) (Title 17, California Code of Regulations, § 95100-95158).

Unlike the Regulation itself, this training and associated materials do not have the force of law. The training and associated materials are not intended to and cannot establish new mandatory requirements beyond those that are already in the regulation, and they do not supplant, replace or amend any of the legal requirements of the regulation. Conversely, any omission or truncation of regulatory requirements does not relieve verification bodies, lead verifiers, verifiers of emissions data reports, or reporting entities of their legal obligation to fully comply with all requirements of the regulation.

*Note: ARB verification accreditation exams are not limited to this verification accreditation training or associated materials. The exams may test on anything contained in the regulation, this accreditation training, and associated materials.*

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## Number of Reports Expected to be Verified<sup>1</sup>

Source Type	Facilities	Source Type	Facilities
EGUs/Cogen	180	CO <sub>2</sub> suppliers	<3
SFCs	95	Cement manufacturing	9
Fuel suppliers <sup>2</sup>	38	Glass production	10
Electric power entities	70	Hydrogen production	7+
Pet. & gas extraction	50	Iron & steel production	<3
Petroleum refineries	23	Lime manufacturing	<3
Pulp & paper	7	Nitric acid production	<3
		Lead Production	<3

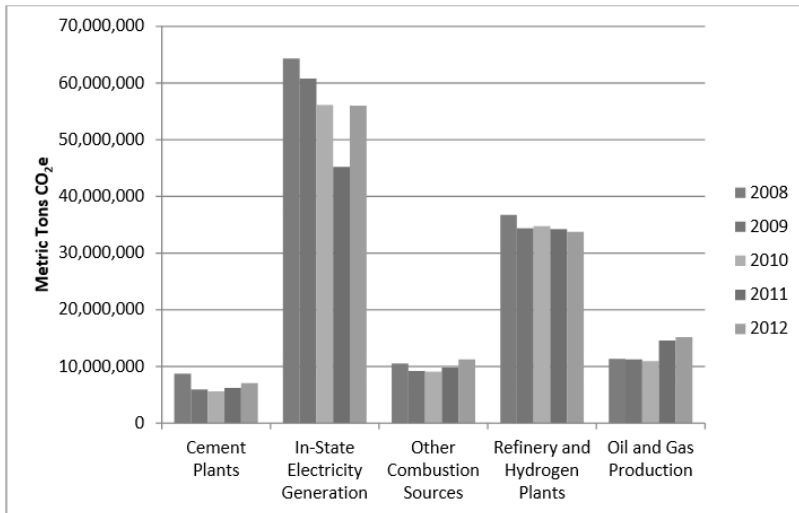
<sup>1</sup> Based on public release of 2013 data

<sup>2</sup> Transportation fuels and NG/LNG/LPG suppliers

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## GHG Emissions Comparison

**Facility Sector Emissions Comparison: 2008 to 2012**  
(non-biomass + biomass + process emissions)



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## Mandatory Reporting Regulation (MRR) Requirements Covered in Course 1

### Subarticle 1:

- §95101 - Applicability
- §95102 - Definitions
- §95103 - General Requirements
- §95104 - Emissions Data Report
- §95105 - Recordkeeping
- §95106 - Confidentiality
- §95107 - Enforcement
- §95109 - Standardized Methods

### Subarticle 2:

- § 95115 - Stationary Fuel Combustion (SFC) and Sorbent Sources
- §95112 - Electricity Generation Units (EGUs) and Cogeneration

### Subarticle 3:

- §95129 - Substitution of Missing Data for SFC and CEMS

### Subarticle 4:

- §95130 - 95133 - Verification

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## Specialist Accreditation Training

Course/Specialty	Sub-specialty
<b>Course 2</b> <b>Transactions</b>	<ul style="list-style-type: none"> <li>• Electric Power Entities</li> <li>• Suppliers of Transportation Fuels</li> <li>• Suppliers of Natural Gas, Natural Gas Liquids, and Liquefied Petroleum Gas</li> <li>• Suppliers of Carbon Dioxide</li> </ul>
<b>Course 3</b> <b>Oil and Gas Systems</b>	<ul style="list-style-type: none"> <li>• Petroleum Refineries</li> <li>• Petroleum and Natural Gas Systems</li> <li>• Hydrogen Production</li> </ul>
<b>Course 4</b> <b>Process Emissions</b>	<ul style="list-style-type: none"> <li>• Cement Production</li> <li>• Glass Production</li> <li>• Lime Manufacturing</li> <li>• Nitric Acid Production</li> <li>• Pulp and Paper Manufacturing</li> <li>• Iron and Steel Production</li> <li>• Lead production</li> </ul>

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## Verifier Exams - Scope

- All Exams will be based on
  - Training coursework
  - ARB's Mandatory GHG Reporting Regulation (MRR)
  - Relevant portions of EPA's 40 CFR Part 98 (Part 98)
- Participants must know the relevant portions of MRR and Part 98

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## Verifier Exams - Format

- 90 minute written exam
  - 10 multiple choice (20%)
  - 10 short answer (50%)
  - 2 long answer (30%)
- General exam includes all elements covered in training
- Sector specialty tests may also include general verification elements
- Complete all questions
- Partial credit given

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## Verifier Exams - Tools

- For the general verifier exam, bring
  - Hard copies of the current Mandatory Reporting Regulation and 40 CFR Part 98 Subparts A, C, and D posted on ARB web
  - Training slides
  - Calculator
- Notes in the margins of slides and regulations are acceptable as well as tabs and highlights
- May NOT bring hand-written or typed notes that are not on slides or in regulations (e.g., do not bring a sheet of notes, equations, etc.)
- See exam policy: Handout 1.1.1

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## Verifier Exams - Scoring

- Exams scored within two weeks
- Results
  - Greater than 70% (unweighted) = pass
  - $\leq 70\%$  = fail; may retake once
- May discuss topics in failed exam with ARB staff
- Exam retakes will be in Sacramento in April 2015

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## Questions and ARB Comments



## Course 1.1 Verification Context, Principles, and Program Overview

- Overview of AB 32 Climate Change Programs
  - Scoping Plan
  - Regulation for the California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms (C&T)
  - Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR)
  - Cost of Implementation Fee Regulation
- Verification Principles and Process Overview
- General Reporting and Verification Requirements
- Verification Process
- ARB Oversight

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## Course 1.1 Handouts

- 1.1.1 - Exam Policy - already discussed
- 1.1.2 - Excerpts from Cap-and-Trade Regulation
- 1.1.3 - Verification Process Diagram
- 1.1.4 - Issues Log Examples

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## California Global Warming Solutions Act of 2006 (Assembly Bill 32, Nuñez, Statutes of 2006, Chapter 488)

- “Early action” reductions
- Required ARB to write a “Scoping Plan” to reduce statewide emissions to 1990 levels by 2020
  - Governor’s Executive Order to achieve 80% reduction of 1990 levels by 2050
- Adopted
  - GHG emission reduction measures
  - Requirements for GHG reporting and verification
  - Cost of Implementation Fee Regulation

## AB 32 Scoping Plan

- Outlines strategy for reaching 2020 target
- Strategy combines
  - Technology-forcing standards
  - Market mechanisms
  - Incentives
  - Voluntary programs
- Creates conditions to spur growth in California’s clean technology businesses and jobs
- First Update to the AB 32 Scoping Plan - May 2014

## California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms

- Works together with command-and-control measures (e.g., traditional regulation) to reduce GHG emissions
- The “Cap” of the Cap-and-Trade Regulation
  - Limits total GHG emissions from all regulated sources
  - Declines over time to reduce emissions
- Participants may trade GHG emissions allowances
  - Creates flexibility
  - Reduces the cost of compliance

Information only - 21

## C&T Covered Sectors (C&T § 95811)

- Stationary sources  $\geq 25,000$  MT CO<sub>2</sub>e in a calendar year
  - Large industrial sources (e.g., cement, refineries, oil and natural gas producers)
  - Electricity generation and imports
  - $< 25,000$  MT CO<sub>2</sub>e prior to meeting criteria for cessation of reporting
- Upstream coverage of small combustion emissions sources (e.g., fuel wholesaler, or first entity to offer fuel on the market)
  - Transportation fuels
  - Residential and commercial use of natural gas
- Opt-in covered entities

Information only - 22

## C&T Compliance Obligation and Allocation of Allowances

- Covered entities in C&T must have compliance instruments equal to their *covered* emissions
- Compliance instruments are
  - Allowances
  - Offsets
- Verified data determines compliance obligation and direct allocation of allowances from ARB to certain industrial entities
  - Verified covered emissions → compliance instruments
  - Verified NAICS code and, as applicable, verified covered product data → free allowances

Compliance obligation = total covered emissions for calendar year
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Information only - 23

## Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (MRR)

- Satisfies AB 32 requirements to estimate, report, and track GHG emissions
- Provides accurate, verified, and reporting entity-specific GHG emissions and covered product data
- Original regulation adopted by the Board in Dec. 2007
- Updated in 2010 to support the Cap-and-Trade Program and harmonize with U.S. EPA Greenhouse Gas Reporting Rule
- Updated again in 2012, 2013, and 2014
- Improves California’s GHG emissions inventory

Information only - 24

## U.S. EPA Federal Regulation - 40 CFR Part 98

- Mandatory reporting of GHGs on a facility basis
  - Rule published in October 2009
  - 2010 first emissions reporting year
- Applies to
  - Direct greenhouse gas emitters
  - Fossil fuel suppliers,
  - Industrial gas suppliers,
- Summary emissions data available to the public  
<http://www.epa.gov/ghgreporting/ghgdata/reportingdatasets.html>

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## MRR Compared to 40 CFR Part 98 (1 of 2)

- Harmonized calculation and reporting requirements
  - MRR incorporates many provisions of Part 98 by reference
  - Must use the specific version of 40 CFR 98 posted on ARB's website
- Key MRR additions to Part 98 requirements:
  - Lower reporting threshold:<sup>1</sup>  
10,000 MT CO<sub>2</sub>e vs. 25,000 MT CO<sub>2</sub>e
  - Applicability threshold evaluation includes
    - Biogenic emissions
    - Geothermal emissions
    - Fuel cell emissions

<sup>1</sup> Note verification threshold is  $\geq 25,000$  MT CO<sub>2</sub>e, with some exceptions.

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## MRR Compared to 40 CFR Part 98 (2 of 2)

- Key MRR additions to Part 98 requirements:
  - More rigorous missing data provisions
  - “Higher tier” monitoring requirements for fuels with variable carbon
  - Requirements for reporting covered product data
  - Third-party verification of emissions and product data:
    - Sources  $\geq 25,000$  MT CO<sub>2</sub>e
    - Cap-and-Trade covered entities
  - Adaptations to support California's Climate Change Programs

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## 2013 and 2014 MRR Amendments (1 of 3)

- Underline strikeout versions help identify areas of nonconformance risk
- Applicability
  - Added new sector - lead production ( § 95124)
  - Added fuel cell emissions to applicability threshold ( § 95101(b)(6))
  - Clarified cessation criteria for reporting and verification ( § 95101(h)-(i))

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## 2013 and 2014 MRR Amendments (2 of 3)

- Specified reporting requirements for legacy contract transition assistance applicants, including energy flow diagrams ( § 95112(i))
- Covered Product Data
  - Added and clarified food processing product data ( § 95115(n))
  - Added requirement to exclude inaccurate covered product data and optional exclusion of covered product data, except for cement sector ( § 95103(l))
  - Clarified provisions to change monitoring and calculation methodologies ( § 95103(m))

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## 2013 and 2014 MRR Amendments (3 of 3)

- Added verification of NAICS code for codes/activities listed in Tables 8-1 and 9-1 of the Cap-and-Trade Regulation: inaccurate NAICS code reporting now results in adverse verification statement
- Clarified verification of correctable errors ( § 95131(b)(9))
- Updated verification data checks, conformance review, and material misstatement assessment ( § 95131(b)(8)and(12))
- Added Cost of Implementation Fee data fields

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## Questions and ARB Comments

- Overview of AB 32 Climate Change Programs
- Verification Principles and Process Overview
  - Reporting and verification standards
  - Key terms and concepts
  - Overview of verification process
  - Skills and responsibilities
  - Assurance and verification statement
- General Reporting and Verification Requirements
- Verification Process
- ARB Oversight

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## MRR Definition of Verification § 95102(a)

*A **systematic**, **independent** and **documented** process for evaluation of a reporting entity's emissions data report against ARB's reporting procedures and methods for calculation and reporting of GHG emissions and product data.*

- Systematic: organized, rigorous and thorough
- Independent: based on fact, unbiased, objective
- Documented: process, records, findings
- Judged against a set standard and to a given level of assurance
- Findings based on examination of objective evidence

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## Verification Standards and GHG Emissions

- Standard stipulates level of accuracy and level of assurance to be achieved
- Specifies an approach to be followed
- Other GHG programs use other reporting standards  
Examples include
  - CARB Compliance Offset Protocols
  - The Climate Registry (TCR) General Reporting Protocol
  - American Petroleum Institute (API) Compendium of GHG Emissions Estimation Methodologies for the Oil and Natural Gas Industry



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## MRR as a Reporting Standard

- Specific emissions monitoring and reporting requirements
  - Reporting threshold of 10,000 MT CO<sub>2</sub>e per calendar year
  - Verification threshold of 25,000 MT CO<sub>2</sub>e per calendar year with some exceptions
    - All C&T covered entities subject to verification
    - C&T opt in covered entities also require verification (see C&T § 95814)
    - Continued reporting and verification during cessation period
- Defines material misstatement (+/-5% error)

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## MRR as a Verification Standard

- Establishes accreditation program for individual verifiers and verification bodies
- Requires “reasonable assurance,” which means “a high degree of confidence that submitted data and statements are valid”
- Requires separate verification statements for emissions data and for product data



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## Scope of Verification

- GHG Emissions
  - Carbon dioxide, methane and nitrous oxide
  - Data, data collection, calculations, and data report
  - Material misstatement and conformance with regulation
  - Review covered and non-covered emissions
  - Covered emissions data are reviewed for accuracy and conformance with the regulation
  - Non-covered emissions are reviewed for conformance with the regulation only, not reviewed for material error
- Covered Product Data - Course 1.3

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## “Covered Emissions”

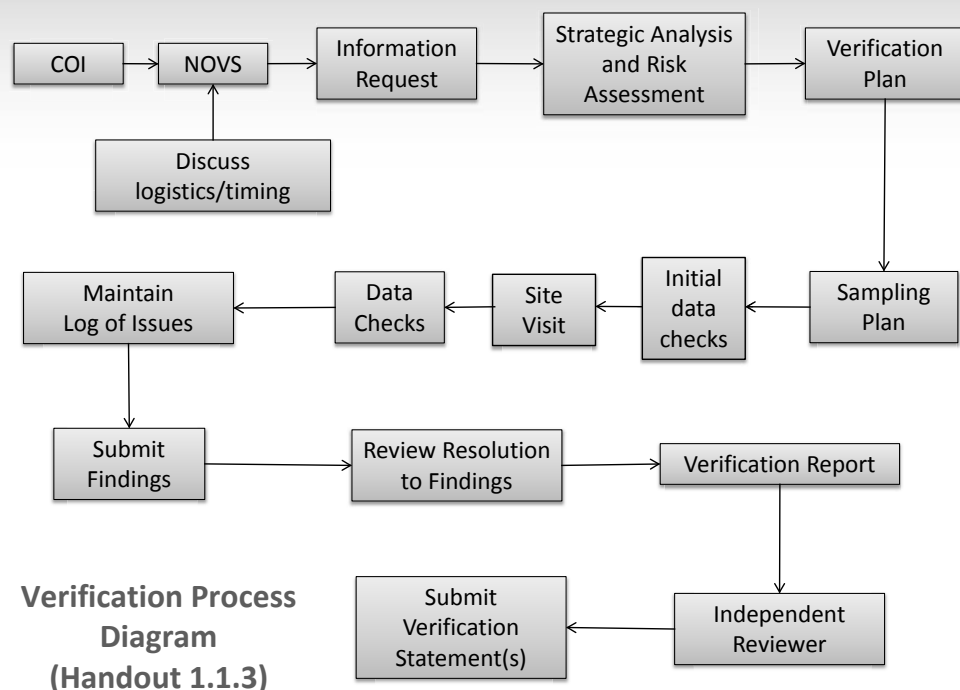
- Defined in MRR § 95102(a): “Covered emissions” mean all emissions included in a compliance obligation under C&T § 95852 - § 95852.2
  - Listed in Handout 1.1.2 Cap and Trade Regulation Excerpts
- Determine a reporter’s Cap-and-Trade compliance obligation:
  - Covered entities (C&T § 95811)
  - Covered gases (C&T § 95810)
  - Emissions with and w/o compliance obligation (C&T § 95852-95852.2)
- Verified for material misstatement and for conformance (measured and calculated following MRR procedures)

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## “Non-covered Emissions”

- Emissions w/o a compliance obligation (C&T § 95852.2)
- Partial List of “non-covered emissions”
  - Exempt biogenic emissions
  - Geothermal emissions
  - Most fugitive and vented emissions from oil and gas production
- Verified for conformance with MRR
- No material misstatement assessment

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## Overview of Verification Process (1 of 2)

- Pre-Verification Activities
  - Determine scope of verification services
  - Secure contract with reporting entity
  - Submit conflict of interest (COI) self-assessment and Notification of Verification Services (NOVS) for ARB approval
    - Wait for ARB approval before beginning *verification services* ( § 95102(a))
- Planning Verification Services
  - Review GHG monitoring plan and emissions data report, confirm verification scope, send data request
  - Conduct preliminary data review, strategic risk analysis, write verification plan and sampling plan, potential independent review
  - Identify any immediate issues in preliminary issues log

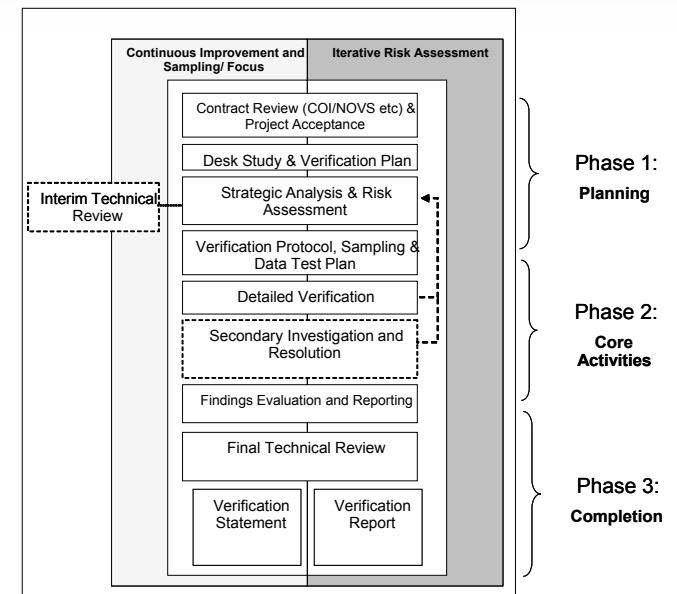
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## Overview of Verification Process (2 of 2)

- Conducting Verification:
  - Complete site visit to evaluate data management systems, emissions sources, and product data (if applicable)
  - Check data to identify errors and provide issues log to reporter (this may be an iterative process)
- Completing Verification:
  - Complete verification report summarizing resolution of issues
  - Conduct independent review—Independent Reviewer assesses procedures, judgment, and conclusions of verification team
  - Submit emissions data verification statement to ARB
  - Submit separate product data verification statement, but only if applicable

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## Verification Overview—Iterative Process



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## Skills and Responsibilities of an Effective ARB-Accredited Verifier (1 of 2)

- Understand and adhere to MRR and associated regulations and laws
- Understand reasonable assurance and how it applies to emissions data report verification
- Prepare, plan, stay organized, and keep good records
- Communicate effectively with reporting entities
  - Listen, ask questions
  - **Do NOT give advice**
  - Contact ARB for guidance, as needed

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## Skills and Responsibilities of an Effective ARB-Accredited Verifier (2 of 2)

- Maintain independence and objectivity
- Perform with integrity and honesty
- Review emissions data reports on behalf of ARB
- Focus on safety and efficiency

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## The Importance of Impartiality

- Conflict between self-interest and ability to maintain independence and objectivity
- Conflict of interest can be real or perceived
- Perceived COI can undermine public support and confidence in the quality of the reported data
- Conflict of interest can damage the reputation of impartiality of a verification body or verifier
- Conflict of interest is assumed to impair the quality of verification

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## Types of Conflict of Interest MRR § 95133

High COI 95133(b)	Medium COI 95133(d)	Low COI 95133(c)
<ul style="list-style-type: none"><li>• Sharing of staff between reporting entity and Verification Body (VB)</li><li>• Providing services within 5 years<ul style="list-style-type: none"><li>— air emissions or GHG reduction project consulting;</li><li>— brokering GHG credits;</li><li>— IT systems services</li></ul></li><li>• Providing non-monetary incentive to secure a verification contract</li></ul>	<ul style="list-style-type: none"><li>• When high or low COI does not exist</li><li>• Personal or familial relations between VB and reporting entity management</li><li>• COI mitigation plan is required</li></ul>	<ul style="list-style-type: none"><li>• No High-COI conditions exist AND</li><li>• Any non-verification services provided within the last 5 years are less than 20% of verification contract value</li><li>• Verification services are provided within 6 calendar years, or following 3 year break</li><li>• Verification that follows ARB COI requirements</li></ul>

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## Conflict of Interest (COI) / Notice of Verification Services (NOVS) Forms § 95133

- ARB recommends combined submittal of COI/NOVS forms after the VB holds the verification contract
  - ARB response required within 30 working days
  - May not begin work w/o ARB written approval
  - Resubmit form if change in lead verifier or independent reviewer
- If NOVS submitted after ARB approval of COI, services can begin 10 working days from NOVS submittal
- May submit COI during response to proposal, but do not submit NOVS until you hold the contract



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## COI Requirements and Air Districts § 95133(h)

- Any regular air district activities contained on list of high COI types of activities constitute medium COI if verification team is isolated from other district staff
- Must certify to prevent and/or mitigate any COI
- Hiring of subcontractors requires full COI evaluation of all VB (district) staff



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## Data Confidentiality § 95106

- Verifier can review all relevant data
  - Verifiers and Verification Bodies are responsible for maintaining confidentiality
- Emissions data, after release by ARB, is public information
  - Process rates and fuel characteristics can be marked confidential by reporting entities
- Similarly, data released by U.S. EPA is public information

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## Questions and ARB Comments

- Overview of AB 32 Climate Change Programs
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California Environmental Protection Agency  
 **Air Resources Board**

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## Assurance

- Intended to increase user confidence in information/data
- Three types of assurance: absolute, reasonable and limited
  - Reasonable assurance for MRR
- Financial audits have high level of rigor
  - Covered emissions and covered product data have financial implications and must have same level of rigor

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## Levels of Assurance

- Absolute assurance
  - 100% certainty that data/reports are correct because all data are checked
  - Considered onerous
- Limited assurance
  - Limited review of data and controls
  - Assurance is given in the negative: “nothing has come to our attention that causes us to believe that the emissions data report is not materially correct”



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## Reasonable Assurance

- Reasonable assurance is used in MRR § 95102(a)
  - High degree of confidence that submitted data and statement are valid
- If reasonable assurance of no material misstatement is not demonstrated by the reporting entity, results in adverse verification statement
  - Data Sampling
  - Conformance Checks

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## Establish Reasonable Assurance of No Material Misstatement § 95131(b)(12)

Any discrepancy, omission or misreporting (or combination) that leads the verifier to believe that the total reported covered emissions or covered product data have errors > +/-5%

$$\text{Percent error} = \sum \frac{[\text{Discrepancies} + \text{Omissions} + \text{Misreporting}] \times 100\%}{\text{Total reported Covered emissions}}$$

$$\text{Percent error} = \sum \frac{[\text{Discrepancies} + \text{Omissions} + \text{Misreporting}] \times 100\%}{\text{Total Covered product data}}$$

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## Examples of Discrepancies, Omissions, and Misreporting of Emissions

<u>Discrepancies</u> Differences between what was reported and what verifier calculates	<u>Omissions</u> Missing data that should have been reported	<u>Misreporting</u> Data that should or should not have been reported
<ul style="list-style-type: none"> <li>• Error in calculations</li> <li>• Use of incorrect data</li> </ul>	<ul style="list-style-type: none"> <li>• Source not reported</li> <li>• Period of time missing</li> </ul>	<ul style="list-style-type: none"> <li>• Duplicated emissions</li> <li>• Excluded source reported</li> </ul>

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## Establish Reasonable Assurance of Report Conformance with MRR Requirements

- “Nonconformance” means the failure to use the methods or emission factors specified to calculate emissions, or the failure to meet any other requirements of the regulation ( § 95102(a))
- Verifier must have reasonable assurance that methods specified in MRR to calculate emissions and covered product data are followed
- Scope of the conformance review of other reported information must also be considered in risk assessment and discussed in sampling plan

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## Examples of Nonconformance

- Incorrect emission factor used
- Fuel bill did not include 10 days in December
- Stationary combustion emissions reported under wrong subpart (hydrogen production)
- Small boiler observed on-site was not included (incomplete reporting)
- The sum of fuel meters double-counted a fuel stream
- Incorrect substitution of missing data
- Fuel flow measurement that represents half of total facility emissions has 10% error
- Incorrect product reported and/or product specification does not meet MRR definition

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## Emissions Data Report Non-conformances vs. Other Regulatory Non-conformances

- Your verification statement applies to (a) statements made by reporting entity in the emissions data report, and (b) conformance with GHG Monitoring Plan requirements
- Your verification statement does not include
  - Identified non-conformances with the regulation that are NOT included in the entity's GHG report (e.g., records related to GHG emissions not kept for 10 years)
  - Weaknesses
- Weaknesses should be considered in risk assessment and sampling plan and documented in the issues log, e.g.,
  - GHG Monitoring Plan includes staff training section, but not all relevant training is included
  - New staff unfamiliar with monitoring procedures

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## Issues Log Example (Handout 1.1.4)

#	Date	Description of Issue/Source	Regulation Citation	Potential Impact upon GHG Data	Action Required by Reporting Entity	Resolution
1	4/23/2014	GHG Monitoring Plan incomplete.	MRR §95105(c)	Meter location, description, and calibration records not made available. Non-conformance if not provided.	Please email these documents to me before the site visit on May 15, 2014. Failure to demonstrate accuracy may result in possible material misstatement and an adverse verification statement.	<b>Resolved on 5/10 via email.</b> Revised Plan emailed on 5/10 and was found to be complete.
2	5/15/2014	Emissions from propane heaters in Bldg. 54-A not reported.	40 CFR §98.32, and MRR §95115	Non-conformance; correctable error.	Provide invoices from 2012 and 2013 that includes the delivery date and amount of fuel delivered. Report propane emissions in Cal e-GGRT. This error must be fixed, or an adverse emissions data verification statement would be triggered.	<b>Resolved on 5/20 via email.</b> Invoices clearly showed fuel usage for 2013, and were clearly billed starting on the first day of each month. Propane emissions reported as de minimis. Calculation method is reasonable (Tier 1); emissions confirmed to be <3% of total and <20,000 MT CO <sub>2</sub> e.
3	5/15/2014	The reporting entity calculated emissions from RUZ10 boiler burning non-pipeline quality natural gas using the default high heating value of 1,028 Btu/scf for pipeline quality natural gas.	MRR §95115(c) and 40 CFR §98.33(b)	Non-conformance; correctable error.	Provide the regulation citation that allows for the use of a Tier 1 calculation for non-pipeline quality natural gas. Please determine if §95115(c)(4) applies to your facility and revise your emissions data report by 5/30/2014. Please contact ARB staff if you have questions about which Tier to use to report your emissions data.	<b>Resolved on 5/25 via email.</b> Reporting entity revised their emissions calculation to use Tier 3. Calibrations, MW calcs, flow measurements and corrections are all provided in GT40-GHGdata.xlsx spreadsheet. Calculation is in conformance (EDR certified in Cal e-GGRT 5/24).

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## Types of Verification Statements

- **Positive**
- **Adverse**
  - Due to material misstatement
  - Due to correctable error
  - Both
- **Qualified Positive**
  - No material misstatement
  - Other nonconformances
- **Separate Verification Statements:**
  - (1) emissions and (2) product data
    - Separate verification statements are rendered, but both emissions and product data are included in emissions data report (in Cal e-GGRT)
- A qualified positive or adverse verification statement requires full verification the following year

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## Effect of Nonconformance on Verification Statement (“VS”)

- If not corrected, reporting non-conformances lead to either a qualified positive VS or an adverse VS
- If non-conformance is a “correctable error” and not corrected, verifier must submit an adverse VS ( § 95131(b)(9))
- Note:
  - All nonconformances should be included in the issues log and sent to reporting entity to be addressed
  - Include all non-conformances observed based on original certified emissions data report, even when the reporting entity identifies the error

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## Correctable Errors (1 of 2)

- § 95131(b)(9) states “the verification team must document the source of any difference identified, including whether the difference results in a correctable error”
- Correctable errors means “errors identified by the verification team that affect covered emissions data, non-covered emissions data, or covered product data in the submitted emissions data report that result from a non-conformance with this article.” ( § 95102(a))
  - i.e., most errors that affect emissions or covered product data are considered correctable and lead to an adverse VS, if not addressed
- **If not fixed, results in adverse verification statement**
- **Contact ARB staff if there is a question whether an error is correctable**

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## Correctable Errors (2 of 2)

- Not all differences in data checks are errors and not all errors are correctable errors
  - Reasonable differences from rounding or truncation are acceptable (not considered an error)
  - If verifier sampling plan called for cross-check of data, differences might not represent correctable errors
  - If error does not affect covered emissions, non-covered emissions or covered product data (e.g., net electricity generation), it is not a “correctable error”, but may still be a non-conformance that results in a qualified positive VS
- Verifier should investigate differences and justify in data checks and sampling plan whether observed difference was a correctable error

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## Examples of “Correctable Errors”

- Natural gas bills used to report emissions spanned December 15, 2013 to December 14, 2014 and were not prorated for calendar year, resulting in a 0.2% difference
- Operator did not report emissions from propane space heating, resulting in a 0.07% difference
  - Source has to be included
- Operator used data from an incorrect year from a database
- Operator improperly included pass-through natural gas
- Operator changed calculation method without ARB approval
- Missing data provisions used incorrectly
- NAICS code listed in Table 8-1 of Cap-and-Trade Regulation does not represent facility activities

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## Examples of Other Nonconformances that Result in Qualified Positive VS if not Addressed

The following non-conformances are not considered part of the “correctable error” definition but still must be addressed to avoid a qualified positive VS

- Operator reported net electricity generation as kWh instead of MWh
- The GHG Monitoring Plan did not include required elements outlined in § 95105(c)
- Required calibration was not performed on a given meter used to calculate emissions

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## Examples of Issues that DO NOT Affect VS

- Rounding differences - Verifier’s data check includes a difference from the emissions data report, which is due to reasonable differences in rounding
- Late Reports - Emissions data report submitted after the reporting deadline or verifier submits the verification statement after the verification deadline because the verification was part of an enforcement settlement
- Recordkeeping requirements
  - Previous emissions data reports not kept § 95105(a)
  - GHG Monitoring Plan includes all required elements outlined in § 95105(c) but does not explain all methods and procedures completely

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## If not corrected, what Verification Statement is issued, absent other issues?

Issues	Positive	Qualified Positive	Adverse
Incorrect emission factor used, leading to 0.4% error that is not fixed			X
GHG Monitoring Plan missing a required element		X	
Spreadsheet error, leading to 10% error in covered emissions that is not fixed			X
Rounding error leads to difference of 3 metric tons, 0.001%	X		
Incorrect missing data substitution procedures used			X
Net electricity generation does not include month of January		X	
NAICS code incorrectly reported			X

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## Material Misstatement Assessment

- To calculate percent error (to determine materiality of errors), the following formula convention should be used:

$$\% \text{ Error} = 100 \times (\text{Reported Value} - \text{Verifier Value}) / \text{Reported Value}$$

- This formula results in a positive error if emissions were over-reported (reported inventory is too high)
- This formula results in a negative error if emissions were under-reported (reported inventory is too low)

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## Extrapolation of Errors in Sampled Data During Initial Review

- When an error is identified in a data sample, the verifier must first determine if it is a correctable error
  - If yes, the verifier notes the error in the issues log and discontinues quantitative analysis of the sampled area
  - If it is not correctable, the verifier continues quantitative analysis
- If the error identified in the sampled data is thought to be representative of the full data record, then the error should be extrapolated to all emissions reported for the full data record
- If the verifier is unsure if the error is representative of the full data record, then the sample must be expanded to determine the extent of the full data record that contains the identified error

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## Nonconformances - Reporting in Cal e-GGRT § 95104(e)

- Reporting entities are not responsible for reporting data required under this article that cannot be reported in the reporting tool
- If the reporting entity states that they cannot report some required information in Cal e-GGRT, **always contact ARB for confirmation**
  - In these cases, ARB will provide written confirmation and issue can be resolved by citing § 95104(f) in the issues log

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## Questions and ARB Comments

- Overview of AB 32 Climate Change Programs
- Verification Principles and Process Overview
- General Reporting and Verification Requirements
  - Thresholds, cessation, deadlines
  - GHG Monitoring Plan
  - Standardized methods
  - Changes in emissions calculation method
  - Recordkeeping requirements
  - Accreditation requirements for verification bodies and use of subcontractors
- Verification Process
- ARB Oversight

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## Reporting Thresholds § 95101

- Reporters with no threshold that have not met cessation criteria
  - Includes refineries, cement plants, nitric acid production, and others
  - Electricity importers
- Operators with emissions  $\geq 10,000$  MT CO<sub>2</sub>e from stationary fuel combustion and process emissions
  - Includes biomass-derived fuels, geothermal sources, and fuel cells
  - Excludes vented and fugitive emissions
- Operators and suppliers with emissions  $\geq 25,000$  MT CO<sub>2</sub>e
  - Includes vented and fugitive emissions
  - Includes portable non-self-propelled equipment from oil and gas
- Abbreviated (simplified) reporting allowed for operators with 10,000 - 25,000 MT CO<sub>2</sub>e
  - Not subject to verification
  - Not allowed for operators with a compliance obligation or who have not met verification cessation requirements

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## MRR and C&T Applicability Terms

- Entities and sources reporting under MRR but not subject to C&T referred to as “non-covered”
- “Non-covered” included in the reporting and verification applicability assessment
  - Geothermal electricity generation emissions
  - Exempt biomass-derived fuel combustion emissions
  - Fuel cell emissions
- MRR § 95103(l) Must estimate *excluded* covered product data (Course 1.3)
- MRR § 95101(f) excludes sources from reporting such as
  - Emergency generators designated in air quality permits
  - Fire suppression systems and equipment
  - Agricultural irrigation pumps

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## Reporting and Verification Cessation § 95101(h)-(i) and C&T § 95812(e) - (f)

Covered entities are subject to both C&T and MRR

MRR requirements apply once no longer subject to C&T

- If emissions drop below 10,000 MT CO<sub>2</sub>e, report for 3 years
- If emissions drop below 25,000 MT CO<sub>2</sub>e, verify for that year
- Report and verify for year of shut down
- Report again for first full year after shut down, but do not verify

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## Deadlines for Submitting Reports and Verification Statements § 95103(e)

Source Type or Conditions	Reporting Deadline	Verification Deadline
All source types, excluding electric power entities and abbreviated reporters	April 10	September 1
Electric power entities	June 1	September 1
Abbreviated reporters	June 1	N/A
Corrected abbreviated reporters to correct cumulative errors that (§95103(a)(8)): <ul style="list-style-type: none"> <li>• Exceed 5% of total CO<sub>2</sub>e reported, <u>OR</u></li> <li>• Result in total emissions ≥ 25,000 MT CO<sub>2</sub>e</li> </ul>	Within 90 days of discovery of error	<ul style="list-style-type: none"> <li>• N/A</li> <li>• Case-by-case</li> </ul>

*If a reporter subject to a compliance obligation under the Cap-and-Trade Program fails to submit their emissions data report OR obtain a positive or qualified positive emissions data verification statement by the deadlines, then an emissions level will be assigned by the Executive Officer ( § 95103(h); § 95131(i)(5)(A)-(C)).*

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## GHG Monitoring Plan Requirements for Facility Operators § 95105(c)<sup>1</sup>

- Identification of fuel use and covered product data measurement devices and locations
- Training practices of personnel
- Identification of any low-flow cutoffs
- Dates of measurement device calibration and scheduled re-calibration
- Equations used to calculate mass or volume flows
- Records of most recent orifice plate inspections
- Copies of methods used for fuel-based emissions analyses and standardized methods chosen
- Missing data procedures
- Original equipment manufacturer (OEM) documentation related to instrument accuracy, maintenance, calibration
- Fuel monitoring plan (optional weekly fuel meter check to reduce risk of missing data)

<sup>1</sup>Different requirements for suppliers (40 CFR § 98.3(g)(5)) and electricity importers or exporters ( § 95105(d))

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## Standardized Methods Incorporated by Reference § 95109 & 40 CFR 98.7

- Methods must be documented in a GHG Monitoring Plan (§ 95105(c))
  - Verifier reviews a copy of Monitoring Plan prior to site visit
  - Verifier documents areas where
    - Monitoring Plan deviates from MRR requirements
    - Actual operations deviate from Monitoring Plan and MRR
- Fuel characteristics for gaseous fuels may be determined by gas chromatograph (40 CFR 98.34)
- Alternative methods allowed but must be pre-approved by ARB Executive Officer § 95103(m)

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## Changes in Emissions and Covered Product Data Calculation Method § 95103(m)

- Methods chosen for monitoring or emissions calculations for emissions data cannot be changed, except
  - To improve methods (e.g., move to higher tier), or
  - To avoid missing data or comply with missing data provisions (e.g., replace monitoring system and move to higher tier)
  - Temporary methods allowed to avoid missing data
  - Other changes **require** specific ARB pre-approval
- Changes to covered product data calculation method require ARB pre-approval
- If change allowed/approved
  - Must demonstrate the difference between old and new method
  - Can only be implemented after the completion of a data year
- Verification issues
  - Monitoring plan must describe change and reason
  - New method must comply with missing data procedures (emissions only)

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## Recordkeeping Requirements

- Does not impact verification statement
- For reporters (§ 95105), duration is
  - 10 years if entity has compliance obligation
  - 5 years if reporter has no compliance obligation under the Cap-and-Trade Regulation
- For verifiers (§ 95131(b)(7)), duration is
  - 10 years
  - Applies to Sampling Plan, and all material reviewed, or generated as part of rendering a verification statement
    - Retain summary description of data and ways to identify specific records reviewed (e.g., invoice type and date) if data are confidential and not taken off-site

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## Verification Body Accreditation and Renewal Requirements § 95132(b)-(d)

- VB submits application to ARB
- VB discloses staffing plan, professional liability insurance, COI prevention policies
- Unique requirements for air districts
- For VB re-accreditation, ARB conducts “performance review”
- Professional liability insurance may not be general or umbrella
- Simple process to voluntarily withdraw from ARB’s verification program



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## Subcontracting Verification Services § 95132(e)

- Subcontractors must be ARB-accredited
- Subcontractors can serve the functions of
  - Verifiers or Lead Verifiers
  - Transactions, Oil and Gas Systems, or Process Emissions Specialists
- Subcontractors cannot
  - Be used to meet minimum of 5 staff and 2 leads required
  - Serve as independent reviewers
  - Further subcontract any services to another verifier

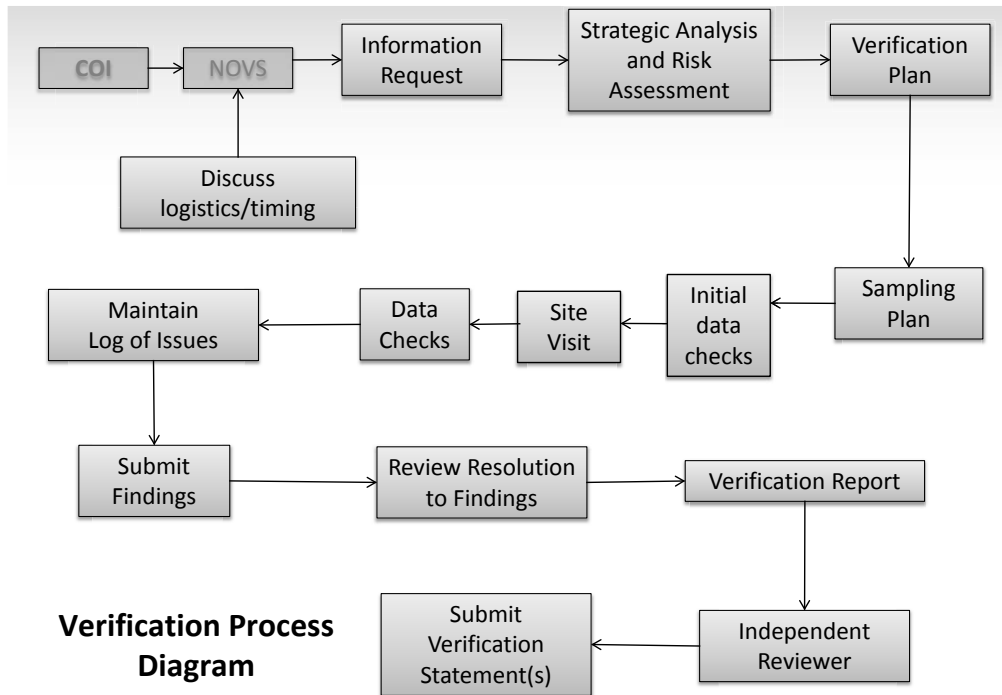
81

## Questions and ARB Comments

- Overview of AB 32 Climate Change Programs
- Verification Principles and Process Overview
- General Reporting and Verification Requirements
- Verification Process
  - Pre-verification activities
  - Planning verification services
  - Conducting verification
  - Completing verification
- ARB Oversight

California Environmental Protection Agency  
Air Resources Board

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## The Verification Team § 95131(a)(1)-(2)

<b>Verification Body (VB)</b>	A firm accredited by ARB according to MRR.
<b>Verification Team:</b>	All persons working for a VB, including subcontractors, who conduct verification activities for a reporting entity.
• <b>Lead Verifier</b>	A person accredited by ARB according to MRR to perform verification services, who may act as a lead verifier or an independent reviewer.
• <b>Verifier</b>	A person accredited by ARB according to MRR to perform verification services.
• <b>Sector Specialist</b>	A person accredited by ARB according to MRR to perform verification services, who is either a verifier or lead verifier, and is accredited in: <ul style="list-style-type: none"> <li>• Transactions</li> <li>• Oil and Gas Systems</li> <li>• Process Emissions</li> </ul>
• <b>Independent Reviewer</b>	An employee of the VB who: <ul style="list-style-type: none"> <li>• Is a lead verifier</li> <li>• Has not been involved in the verification activities for a reporting entity</li> <li>• Conducts an independent review of verification services performed for the reporting entity.</li> </ul>
• <b>Subcontractor</b>	A person who is not an employee of the VB, who is hired by the VB, is accredited as either a lead verifier, verifier, or sector specialist, and conducts verification work as part of a verification team.

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# Conflict of Interest (COI) Form

California Air Resources Board  
SECTION A - CONFLICT OF INTEREST / SECTION B - NOTICE OF VERIFICATION SERVICES  
FOR GREENHOUSE GAS EMISSIONS DATA REPORTS

See instructions at the end of Section B.

SECTION A. CONFLICT OF INTEREST				
PART I. VERIFICATION BODY INFORMATION				
VERIFICATION BODY NAME:		EMISSIONS DATA YEAR: 2013 <input type="checkbox"/>		
PART II. REPORTING ENTITY INFORMATION				
1. Reporting Entity Name(s):	ARB ID #:	Contact Name:	Phone number:	Email:
(one per line - must be same operator)				
2. Describe the Operational Control for each Reporting Entity listed above (see instructions).				
3. Is a Sector Accreditation Required for this Verification? <input type="checkbox"/> No <input type="checkbox"/> Yes. Check the appropriate box below. <input type="checkbox"/> Process emissions specialist <input type="checkbox"/> Oil and gas systems specialist <input type="checkbox"/> Transactions specialist				
Part III. CONFLICT OF INTEREST SELF-EVALUATION				
Based on my assessment, I believe my verification body's risk for a conflict of interest is <input type="checkbox"/> HIGH <input type="checkbox"/> MEDIUM <input type="checkbox"/> LOW				
Part IV. ATTACHMENTS:				
1. Organization Chart and Business Description Please attach an organization chart of your verification body and any entities related to your verification body. Only submit once per year, unless changes occur.				
2. Conflict of Interest Mitigation Plan (if applicable)				

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# NOVS Form

PART IV. VERIFICATION SERVICE DATES AND LOCATIONS: Required for all submittals	
VERIFICATION SERVICES START DATE ("upon approval" is acceptable):	
Reporting entity name(s) and site visit date(s) (one per line, if submitting multiple):	
Part V VERIFICATION BODY SIGNATURE (Required for all submittals of Section B):	
In signing this form, I certify under penalty of perjury of the laws of California that the information contained in this form, PTSD/GHG_03 Section B is true, accurate and complete. I further certify that I am duly authorized to represent and legally bind the verification body on all matters related to this form.	
SIGNATURE:	PRINTED NAME:
TITLE:	DATE:

Multiple facilities for the same operator can be included on the same form (with COI form)

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## COI/NOVS Form Tips from ARB Staff

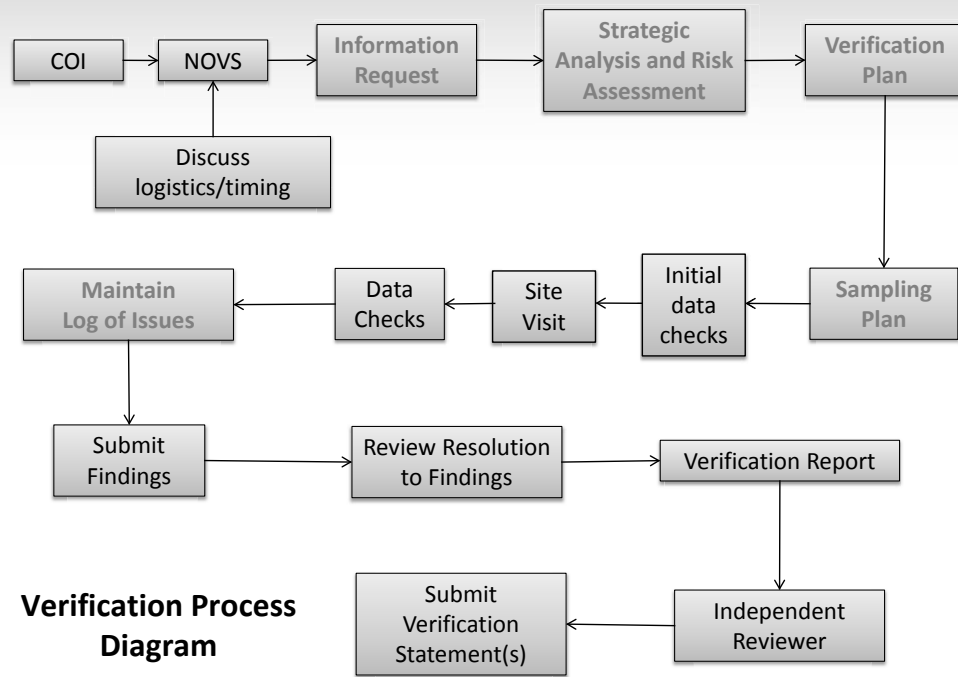
- Submit COMPLETED COI form
  - Proofread all submissions
    - Lead verifier signs the form under penalty of perjury
    - Errors can result in non-conformances even if ARB approves COI assessment
  - Ensure Subcontractors list all potential conflicts, every year
  - Sign the COI/NOVS form
- Send ALL COI/NOVS communications to [ghgverify@arb.ca.gov](mailto:ghgverify@arb.ca.gov), even if you have the personal email of a verification staff person

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## Verification Process

- Pre-verification activities
- Planning verification services
  - Verification Plan
  - Planning Meeting
  - Sampling Plan
  - Preliminary Issues Log
- Conducting verification
- Completing verification

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## Verification Plan § 95131(b)(1)

- Scope of verification activities
- Schedule of activities (date of site visits, completion of services)
- Verifier requests information on which to base the verification plan:
  - Sources, boundaries (**GHG Monitoring Plan**)
  - Expertise of personnel responsible for emissions and covered product data reporting
  - Methodologies for emissions and covered product data
  - Any data necessary to develop the verification plan
  - Information on emissions data management system
  - Previous verification reports
- Revisions, as necessary throughout the verification
- **Reporting entity must make all information and documentation available to the verifier as requested (per §95131(b)(5))**

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## Planning Meeting § 95131(b)(2)

- Discuss Verification Plan (via phone)
  - Review scope of verification
  - Discuss site visit logistics and planned interviews and participants
  - Develop a detailed agenda/schedule for the site visit – send to client a week in advance
- Ask questions about data already provided
- Describe types of information that are still needed
  - For example, elements of GHG Monitoring Plan, including
    - Equipment and processes (PFD, P&ID)<sup>1</sup>
    - Location and types of fuel and process meters
    - Any other emission sources
    - Data reporting responsibilities of staff

<sup>1</sup> PFD, P&ID = Process flow diagram, Piping and Instrumentation Diagram

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## Purpose of a Sampling Plan

- Overall, sampling plan sets context and outlines verifier's path to reasonable assurance
  - of no material misstatement *AND*
  - of conformance with MRR (includes information that is additional to emissions and covered product data)
- Assess uncertainty associated with all emissions and all covered product data sources
  - Include all applicable upstream data handling and management
- Explain what data sources are targeted for review
  - How does that mitigate risk?
- Revise to incorporate outcome of review
  - Is more review necessary or did everything meet standards?

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## Contents of Sampling Plan § 95131(b)(7)

→ **Must describe how risks uncovered after data review and after site visit were addressed (explain and justify your actions)**

- Rankings
  - Rank emissions based on amount of contribution to total CO<sub>2</sub>e
  - Rank emission sources with largest calculation uncertainty
  - Rank covered products with largest calculation uncertainty
- Narrative of approach to uncertainty assessment for
  - Monitoring/measurement equipment
  - Data sampling, frequency
  - Data processing, tracking
  - Emissions calculations
  - Covered product data
  - Data reporting
  - Management policies and practices

*The Sampling Plan is not just a plan that you create and then set aside before you conduct a site visit! You must document what you found, explain how you dealt with risks, and then finalize your Sampling Plan.*

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## Preparing a Sampling Plan (1 of 2)

- Review emissions data report (Cal e-GGRT) and any data collected prior to site visit, especially
  - GHG Monitoring Plan
  - Data management systems
  - Inputs for development of emissions report
  - Records related to operation and maintenance of equipment/systems to develop data (e.g., instrument calibration, etc.)
- Brief discussion during opening meeting
- Use verification team knowledge of sector and, if applicable, prior experience with reporting entity

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## Preparing a Sampling Plan (2 of 2)

- Include listings of (as applicable)
  - Emissions sources
  - All covered product data, other production data
  - Data sources and transactions to be targeted for records review, and why they are targeted (risk analysis)
- Update the Sampling Plan to show
  - Results of the risk assessment and how the identified risks were addressed
  - Completed tasks and issues that emerge related to misstatements and nonconformance
- Retain Sampling Plan for at least 10 years

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## Sampling Plan and Risks

- Materiality guides approach and focus
- Sampling plan should address three types of uncertainty risk
  - Inherent (type of industry, complexity of emission sources)
  - Control (types of internal control)
  - Detection (failure to identify material misstatement)
- Sampling plan should also address risk of misreporting
  - Emissions from largest sources
  - *Any and all* covered product data

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## Sampling Plan - Qualitative Risk

- GHG Monitoring Plan does not include information on CEMS testing, calibration, short tons to metric tons, etc.
- Boilers are not properly identified in Monitoring Plan and may not be separately metered or accounted for
- Reporter does not have clear documentation on purchase of fuel from utilities – missing invoices
- There have been significant changes in personnel since the last reporting period
- Others?

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## Sampling Plan Considerations

WEAK	STRONG
Generic	Specific and industry-specific
Quantitative only	Includes consideration of qualitative risk
Little or no need for revision	Dynamic - Reporter-specific issues are taken into account, often leading to revised sampling plan
Little consideration for sources	Documents “drill down” to sources and document data checks required

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## Log of Issues § 95131(b)(11)

- Note any issues uncovered that may affect determinations of material misstatement and nonconformance
- Indicate whether failure to resolve the issue may lead to adverse verification statement
- State specific regulatory provision (citation) in question
  - Could include sub-sub paragraphs
- Describe if and how the reporter corrected the problem
- Justify to your independent reviewer that major issues and required corrections have been addressed by the reporter
- Assist next year’s verification team in understanding issues
- Provide documentation of verifier and reporter actions in case of ARB audit

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## Issues Log: Group Participation Exercise 1.1.1 - Handout 1.1.4 (1 of 2)

Reporting Entity: ACME Combustion (ARB ID# 100999)						
Subparts Reported: C						
Year of Emissions Data: 2014						
Lead Verifier: Mary Smith						
#	Date	Description of Issue/Source	Regulation Citation	Potential Impact upon GHG Data	Action Required by Reporting Entity	Resolution
1	4/23/2014	GHG Monitoring Plan (1)	MRR §95105 (2)	Meter and calibration issues may affect report. (3)	Correct error. (4)	Resolved. (5)
2	5/15/2014	Propane heaters (6)	MRR §95115 (7)	Non-conformance (8)	Report emissions from propane as De Minimis. (9)	Reporter used verifier calculations (10)
3	5/15/2014	The reporting entity calculated emissions from RUC210 boiler burning non-pipeline quality natural gas using the default high heating value of 1,028 Btu/scf for pipeline quality natural gas.	MRR §95115(c) and 40 CFR §98.33(b)	Non-conformance; correctable error.	Provide the regulation citation that allows for the use of a Tier 1 calculation for non-pipeline quality natural gas. Please determine if §95115(c)(4) applies to your facility and revise your emissions data report by 5/30/2014. Please contact ARB staff if you have questions about which Tier to use to report your emissions data.	Resolved on 5/25 via email. Reporting entity revised their emissions calculation to use Tier 3. Calibrations, MW calcs, flow measurements and corrections are all provided in GT40-GHGdata.xlsx spreadsheet. Calculation is in conformance (EDR certified in Cal e-GGRT 5/24).

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# Issues Log: Group Participation Exercise

## 1.1.1 - Handout 1.1.4 (2 of 2)

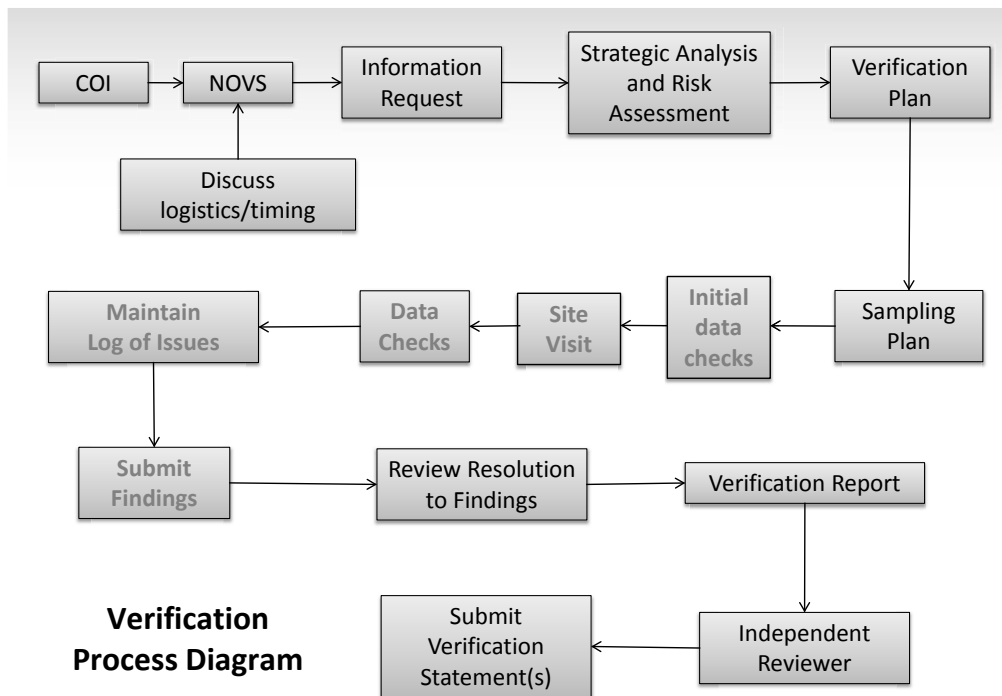
ABC Verification Company, Inc.						
Two Issues Logs for Verification of ACME Combustion (2014)						
Example #1						
Reporting Entity: ACME Combustion (ARB ID# 100999)						
Subparts Reported: C						
Year of Emissions Data: 2014						
Lead Verifier: Mary Smith						
#	Date	Description of Issue/Source	Regulation Citation	Potential Impact upon GHG Data	Action Required by Reporting Entity	Resolution
1	4/23/2015	GHG Monitoring Plan incomplete.	MRR §95105(c)	Meter location, description, and calibration records not made available. Non-conformance if not provided.	Please email these documents to me before the site visit on May 15, 2014. Failure to demonstrate accuracy may result in possible material misstatement and an adverse verification statement.	<b>Resolved on 5/10 via email.</b> Revised Plan emailed on 5/10 and was found to be complete.
2	5/15/2015	Emissions from propane heaters in Bldg. 54-A not reported.	40 CFR §98.32, and MRR §95115	Non-conformance; correctable error.	Provide invoices from 2012 and 2013 that includes the delivery date and amount of fuel delivered. Report propane emissions in Cal e-GGRT. This error must be fixed, or an adverse emissions data verification statement would be triggered.	<b>Resolved on 5/20 via email.</b> Invoices clearly showed fuel usage for 2013, and were clearly billed starting on the first day of each month. Propane emissions reported as de minimis. Calculation method is reasonable (Tier 1); emissions confirmed to be <3% of total and <20,000 MT CO <sub>2</sub> e.
3	5/15/2015	The reporting entity calculated emissions from RUZ10 boiler burning non-pipeline quality natural gas using the default high heating value of 1,028 Btu/scf for pipeline quality natural gas.	MRR §95115(c) and 40 CFR §98.33(b)	Non-conformance; correctable error.	Provide the regulation citation that allows for the use of a Tier 1 calculation for non-pipeline quality natural gas. Please determine if §95115(c)(4) applies to your facility and revise your emissions data report by 5/30/2014. Please contact ARB staff if you have questions about which Tier to use to report your emissions data.	<b>Resolved on 5/25 via email.</b> Reporting entity revised their emissions calculation to use Tier 3. Calibrations, MW calcs, flow measurements and corrections are all provided in GT40-GHGdata.xlsx spreadsheet. Calculation is in conformance (EDR certified in Cal e-GGRT 5/24).

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## Verification Process

- Pre-verification activities
- Planning verification services
- Conducting verification
  - Site visits
  - Detailed review of data
  - Assessing material misstatement and conformance
- Completing verification

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## Full Verification - Site Visit Required § 95130(a)(1)

- 1<sup>st</sup> year of operation ≥ 25,000 MT CO<sub>2</sub>e
- 1<sup>st</sup> year of each compliance period under cap-and-trade
  - 2013 emissions data reported in 2014
  - 2015 emissions data reported in 2016
  - 2018 emissions data reported in 2019
- Change in Verification Body
- If operational control changes (revised requirement)
- “Adverse” or “qualified positive” emissions/product data verification previous year
- If verification body concludes that full verification is warranted
- Conditions for “less intensive” verification ( § 95102(a))
  - 2<sup>nd</sup> and 3<sup>rd</sup> years of each compliance period AND
  - None of the conditions listed above

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## Less Intensive Verification for 2014 Data § 95130(a)(1)

Site visit not required after a full verification if:

- Verifier chooses not to conduct a site visit
- Received positive verification statement
- Same verification body (VB)
- No change in operational control
- Not first year of compliance period

2009 Data	2010 Data	2011 Data	2012 Data	2013 Data	2014 Data	2015 Data	2016 Data	2017 Data
Full	Less Intensive	Full	Less Intensive	Full	Less Intensive	Full	Less Intensive	Less Intensive

1st                      2nd

6-year limit for same VB

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## Site Visits - § 95131(b)(3)-(5)

- Conduct at least one site visit each year for full verification
- Who attends?
  - At least 1 accredited verifier
  - Sector specialist, if applicable
    - These can be the same person
  - **Facility personnel** responsible for data collection/management
  - ARB staff if verification is being audited

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## Conducting a Site Visit - Planning

- Written agenda
  - Activities and participants
- Prepare a checklist and interview questions specific to the reporter and the emissions data report
- Plan your day allowing some flexibility
- Use your sampling plan as a guide
- Ensure you will have access to areas/equipment/meters as needed
- Ensure availability of key facility personnel
- Know what safety equipment you need to take, incl. water
- Know where you're going - get there on time

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## Conducting a Site Visit - Opening Meeting

- Safety briefing
- Confirm availability of personnel
- Discuss site visit plan with reporter
- Request site plan and/or system diagrams
- Identify outstanding data requests
- Take notes and add to your issues log

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## Conducting a Site Visit - Physical Inspection and Interviews (1 of 2)

- Confirm all emissions sources and covered product data reported
- Observe major and high-risk sources
  - Take pictures
- Follow the audit trail
  - Ask how the reporter arrived at numbers in report and supporting summary spreadsheets
  - What are primary sources of data?

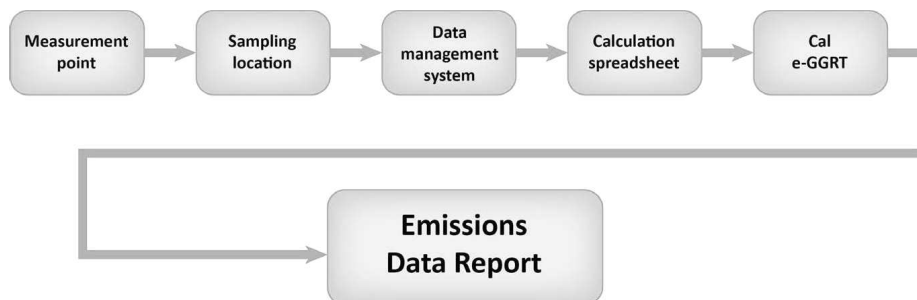
109

## Conducting a Site Visit - Physical Inspection and Interviews (2 of 2)

- Follow the audit trail (graphic on next slide)
  - Ask contact to reproduce a source report used to complete ARB report
  - Observe on-line data acquisition systems and other fuel and emissions reporting software **in action**
  - Review QA/QC records
- Ask questions!

110

## Tracing Reported Emissions to their Origin



111

## Conducting a Site Visit - Closing Meeting

- Discuss GHG Monitoring Plan
  - Identify areas where MRR, the Monitoring Plan, and actual practice appear to deviate
  - Identify areas where more detail may reduce verification uncertainty (weaknesses)
- Discuss outcomes of site visit
  - Any outstanding or additional data requests
  - Any issues you uncovered during the visit
- Review next steps in the verification process
  - Log of issues
  - Focus on correctable errors!
- Follow up in writing

112

## Verifying an Emissions Data Report § 95131(b)(8) (1 of 2)

- Ensure all applicable sources were reported
- Confirm appropriate measurement and calculation methods were used
- Check calculations and ensure equation inputs are substantiated

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## Verifying an Emissions Data Report § 95131(b)(8) (2 of 2)

- Tools to use
  - GHG Monitoring Plan
  - Sampling Plan
  - Emissions Data Report
  - System diagrams
  - Site visit observations
  - MRR and 40 CFR 98
  - Training materials
- Track reported emissions/covered product data to its origin

114

## Evaluate Data Management System(s) § 95131(b)(1)(A)(4)

- Initial review for developing Verification Plan
  - Strategic analysis and risk assessment
- Detailed review
  - Understand the reporting entity's systems that track, quantify and report GHG emissions and product data
- Document findings in Issues Log and Sampling Plan
  - Resolution of any problems found must be documented in Verification Report
- May help to point to nonconformances with regulation
  - Incorrect methods
  - Oversight of sources (e.g., biomass)
  - Missing data

115

## Recalculate Emissions § 95131(b)(8)(G)

- Evidence to request
  - Documentation of selection of methods
  - Inputs to Cal e-GGRT
  - Spreadsheets with documentation on calculations
  - Records of fuel usage, receipts
- How to evaluate evidence
  - **Re-calculate emissions for selected sources (data checks)**
  - Check for proper unit conversions
  - Compare to emissions data report
- Document in issues log any differences in methods

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## Compare Results

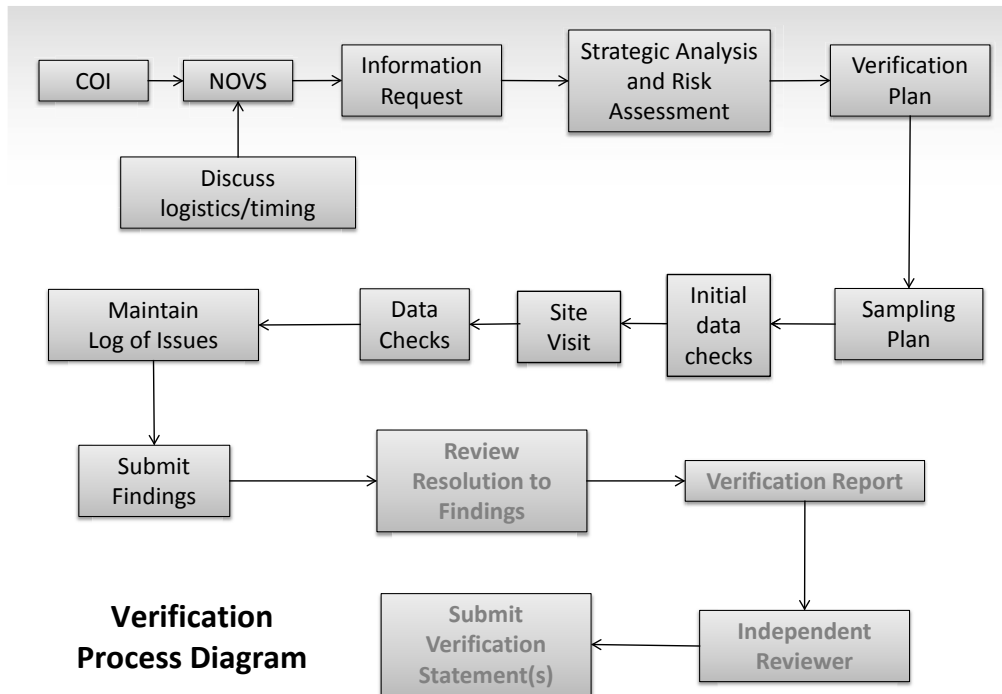
- Compare verifier's calculated results to reported results
  - Investigate all discrepancies ( § 95131(b)(8)(F))
- Narrative of the comparison between verifier's and reporter's results for verification report
  - Which transactions were checked
  - Quantity of data evaluated
  - Percentage of total emissions and total product data covered by the data checks

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## Verification Process

- Pre-verification activities
- Planning verification services
- Conducting verification
- Completing verification
  - Verification Report
  - Independent review
  - Verification statements

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## Verification Report § 95131(c)(3) (1 of 3)

- Report objective - Provide a comprehensive description of the process followed during verification and of the findings
- The verification report is submitted to the reporter after independent review and before (or with) the verification statement
- The verification report is submitted to ARB upon request

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## Verification Report (2 of 3)

The report must contain, at minimum, detailed descriptions of the following:

1. Emissions sources and covered product data
2. Data management system(s)
3. Verification Plan (updated, as necessary, to reflect new information gained during verification services)
4. Data checks and comparisons
5. Issues log
6. Any qualifying comments, including comments about revisions made through the verification process
7. Material misstatement assessment calculation of percent error for covered emissions and covered product data, using MRR formulae
8. Optional – data packet with all materials used in verification

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## Verification Report (3 of 3)

- What kinds of data would you include in the complete data packet?
- What are the pros and cons of including a complete data packet in your verification report?

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## Role of the Independent Reviewer (1 of 2)

- Provides final objective review of strategy of verification team
- Protects VB risk/liability
- Identifies errors in planning and data sampling
- Evaluates judgment of verification team based on entire evidence package
- May require multiple reviews until every issue has been fully resolved
- Review sampling plan during interim review to provide feedback on general approach

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## Role of the Independent Reviewer (2 of 2)

- Data needed for Independent Reviewer
  - Verification report, sampling plan, verification plan, **issues log**, site visit notes, reporter data: complete verification packet
- Independent Reviewer activities
  - Review risk assessment and sampling plan (first step)
  - Review issues log and request additional information if unclear
  - Recalculate a sample
  - Review verification report and confirm materiality calculations
  - Confirm that verification report and Cal e-GGRT numbers match
  - **Create a review log**

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## Emissions Data Report Verification Statements § 95131(c)(1)

- Prepare separate verification statements for emissions and product data
- Submit to Independent Reviewer
- Submit to reporting entity and ARB by deadline

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## Emissions Data Verification Statement

California Air Resources Board

VERIFICATION STATEMENT - EMISSIONS DATA REPORT (excluding product data)

<b>PART I. EMISSIONS DATA REPORT INFORMATION</b>	
1. REPORTING YEAR: 2014 data reported in 2015	
<b>PART II. VERIFICATION BODY INFORMATION</b>	
1. VERIFICATION BODY NAME: 	
<b>PART III. REPORTING ENTITY INFORMATION</b>	
1. NAME OF REPORTING ENTITY: 	2. ARB ID NUMBER: 
<b>PART IV. VERIFICATION STATEMENT INFORMATION</b>	
1. This verification statement attests that the submitted data are (check one) <input type="checkbox"/> reasonably assured of being free of material misstatement <input type="checkbox"/> <b>NOT</b> reasonably assured of being free of material misstatement	
2. This verification statement attests that the submitted data are (check one) <input type="checkbox"/> reasonably assured of being in conformance with the regulation <input type="checkbox"/> <b>NOT</b> reasonably assured of being in conformance with the regulation <input type="checkbox"/> <b>NOT</b> reasonably assured of being in conformance with the regulation, including <b>NOT</b> in conformance with §95131(b)(9): failure to correct data errors discovered during data checks	
3. As a result of the selections above, the final verification statement is (check one) <input type="checkbox"/> positive: reasonably assured of no material misstatement and in conformance with the regulation <input type="checkbox"/> qualified positive: reasonably assured of no material misstatement, but not reasonably assured in conformance with the regulation <input type="checkbox"/> adverse: not in conformance with §95131(b)(9) and/or not reasonably assured of no material misstatement	

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## Adverse Emissions Data Verification Statement § 95131(c)(4) (1 of 2)

- As soon as this appears probable, consult with ARB
  - Especially if reporter is unresponsive and error is correctable
- If unable to resolve
  - VB required to formally notify reporter and ARB in writing (via email) of potential adverse verification statement
  - Data reporter must be given at least 10 working days to correct misstatements or nonconformances
    - VB determines the timing to allow for timely verification statement
- If reporter makes corrections, verification is complete and verification statement is either positive or qualified positive

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## Adverse Emissions Data Verification Statement (2 of 2)

- If reporter does not make corrections
  - Reporter can petition ARB to make final decision before the verification statement is submitted by the VB
- If reporter receives an adverse emissions verification statement for a reporting year, ARB will assign an emissions level

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## Reminder - Adverse Verification Statement and Required Modifications (1 of 2)

§ 95102(a) “Adverse emissions data verification statement” means a verification statement rendered by a verification body attesting that the verification body cannot say with reasonable assurance that the submitted emissions data report is free of material misstatement and is in conformance with section 95131(b)(9) for the emissions data.

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## Reminder - Adverse Verification Statement and Required Modifications (2 of 2)

§ 95131(b)(9) Emissions Data Report Modifications. As a result of data checks by the verification team and prior to completion of a verification statement(s), the reporting entity must make any possible improvements or corrections to the submitted emissions data report, and submit a revised emissions data report to ARB.

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## Questions and ARB Comments

- Overview of AB 32 Climate Change Programs
- Verification Principles and Process Overview
- General Reporting and Verification Requirements
- Verification Process
- ARB Oversight
  - Verification statement petition and set-aside processes
  - Audits
  - Maintaining accreditation

## ARB Oversight

- Verifiers are crucial to ensuring data quality
- Petition and set-aside processes provide additional mechanisms for ARB data quality assurance
- ARB maintains quality standards that all verification bodies must meet
- VB audits and verification audits by ARB
  - Verification body audits include a review of management systems to inform oversight and other audit activity

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## Petitioning an Adverse Verification Statement § 95131(c)(4))

Reporting entity that disagrees with VB has the option of petitioning ARB BEFORE the verification statement is submitted by the VB

- Based on disagreement with the requirements of the regulation
- Important for VB to give reporting entity 10 working days to petition ARB
  - Failure to provide required time to reporting entity is the most serious non-conformance by a VB

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## Verification Statement Set Aside § 95131(e)

- A verification statement may be set aside if
  - An error that impacts data quality was identified by ARB, the reporting entity, or the VB
  - The accreditation of the verification body is revoked because of a serious lapse in judgment for that, or a different verification
  - High level of COI is discovered or emerges after Verification Statement is submitted
- Requires the report to be re-verified by a new VB

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## ARB Oversight - Verification Audits

- More than 10% of all verifications are audited by ARB staff
  - All VBs are audited at least once per year
  - Some include a site visit observation by ARB
  - All include review of your verification report, sampling plan, and data checks, and material misstatement evaluation
- Audits are chosen based on reporting sector (subpart), geographic coverage statewide, and to ensure consistent quality across verifications

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## Maintaining Your Accreditation

- Complete verifications by deadline
- Document your verifications and be subject to ARB audits
  - Verifier nonconformances must be addressed by a corrective action by VB (most do not impact quality of emissions data report but represent risk)
- Attend ongoing webinar trainings
- Be in close contact with ARB staff to ensure you follow ARB Guidance
- Poor performance (lack of quality control) is grounds for accreditation revocation of **your entire VB**

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## Questions and ARB Comments

### Course 1: General Verification

#### ***Complete:***

1.1 Verification Principles, Requirements, and Procedures

#### ***Next:***

1.2 Stationary Fuel Combustion and Sorbent Sources

1.3 Accuracy & Product Data

1.4 Electricity Generating Units & Cogeneration

# Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting



## General Verification Course 1.2 - Stationary Fuel Combustion and Sorbent Sources

California Environmental Protection Agency



## Course 1.2 Handout

- Handout 1.2.1 Minimal Allowable Methods (Tiers)

# Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting

## Course 1: General Verification

- 1.1 Verification Context, Principles, and Program Overview
- 1.2 Stationary Fuel Combustion and Sorbent Sources
- 1.3 Accuracy & Product Data
- 1.4 Electricity Generating Units & Cogeneration

California Environmental Protection Agency



## Course 1.2 Stationary Fuel Combustion (SFC) and Sorbent Sources (MRR § 95115)

1. Overview
  - SFC Applicability: who reports
  - GHG reporting requirements: what is reported & aggregation of SFC units
  - Comparing § 95115 to EPA's 40 CFR 98, Subpart C
  - Verifying correct methods to calculate GHG emissions
2. Verifying combustion emissions
3. Verifying sorbent emissions
4. Verifying biomethane and biomass CO<sub>2</sub> emissions

## Entities Subject to § 95115 - Reporting (1 of 2)

Subject to reporting requirements when any of these criteria are met:

1. Stationary combustion + process emissions  
≥ 10,000 MTCO<sub>2</sub>e ( § 95101(b)(2))
2. Only stationary combustion emissions sources  
≥ 10,000 MTCO<sub>2</sub>e AND  
aggregate maximum rated heat input capacity of the  
SFC units is ≥ 12 MMBtu/hr ( § 95101(b)(3))

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## Entities Subject to § 95115 - Reporting (2 of 2)

Subject to reporting requirements when any of these criteria are met:

3. Oil and gas production facilities have  
additional trigger: when all emissions, including  
portable drill rigs, ≥ 25,000 MT CO<sub>2</sub>e ( § 95101(e))
4. Cap-and-Trade Program “opt-in” covered  
entities
5. “All-in” categories of reporting entities  
( § 95101(a)(1)(A))

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## Entities Subject to § 95115 - Types of Reporting Entities

- Non-industrial, only SFC sources
  - Universities, hospitals, military bases, large government buildings (boilers, electricity generation units, cogeneration)
- Industrial facilities may have SFC and process emissions, for example
  - Glass production<sup>1</sup>
  - Cement plants<sup>1</sup>
  - Electricity generating units with wet flue gas desulfurization system

<sup>1</sup> Process emissions specialty is taught in Course 4

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## US EPA (Part 98) and California ARB (MRR)

- Both the federal government and the State of California require GHG reporting
- MRR is structured to incorporate US EPA rule (40 CFR Part 98, Subpart C) by reference
- Important differences between MRR and Part 98 will be discussed

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## GHG Reporting Requirements for SFC and Sorbent Sources § 95115

MRR generally references calculations from 40 CFR Part 98, Subpart C

- CO<sub>2</sub> from fossil fuel combustion
- CO<sub>2</sub> from biomass-derived fuel combustion
  - Exempt and non-exempt biomass
- CH<sub>4</sub> and N<sub>2</sub>O from fossil and biomass fuel combustion
- CO<sub>2</sub> sorbent emissions

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## Aggregation of SFC Units Compliance with § 95115(h) (1 of 2)

Verify

- All units aggregated under 40 CFR 98.36(c)(1)
  - Are each 250 MMBtu/hr or less
  - Use the same tier for any common fuels combusted
- Units associated with different U.S. EPA subparts are not aggregated together, except when they have a monitored common stack using a CEMS (40 CFR 98.36(c)(2))
- Appropriate tier used when units share a common liquid or gaseous fuel pipe and some units are >250 MMBtu/hr (40 CFR 98.36(c)(3))

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## Aggregation of SFC Units Compliance with § 95115(h) (2 of 2)

- Aggregated units using a common fuel pipe (40 CFR 98.36(c)(3)):
  - Verify the reporter accounted for any fuel diverted from those units
- Reporter attributing GHG emissions from a shared fuel supply to only “large” units (40 CFR 98.36(c)(4))
  - Verify reporter complies with 98.36(c)(4)(i) - (iii)

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## Introduction to 40 CFR Part 98, Subpart C (1 of 2)

- Four Tiers (methods) for calculating CO<sub>2</sub> based on
  - Unit Size
  - Fuel Type
  - Other Factors
- CH<sub>4</sub> and N<sub>2</sub>O are calculated depending on CO<sub>2</sub> Tier using
  - Measured therms or MMBtu and default EF or
  - Measured fuel mass or volume and either
    - Default EF and default HHV or
    - Default EF and measured HHV
- MRR specifies a particular version of Subpart C<sup>1</sup> ( § 95100(c))
- Verifiers should confirm they are using the version posted on ARB’s website and not an older or newer version.

<sup>1</sup>[http://www.arb.ca.gov/cc/reporting/ghg-rep/regulation/subpart\\_c\\_rule\\_part98.pdf](http://www.arb.ca.gov/cc/reporting/ghg-rep/regulation/subpart_c_rule_part98.pdf)

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## Introduction to 40 CFR Part 98, Subpart C (2 of 2)

- **Tier 1:** default EF and default HHV or measured therms  
(40 CFR 98.33(a)(1))  $CO_2 = 1 \times 10^{-3} * Fuel * HHV * EF$  (Eq. C-1)
- **Tier 2:** default EF and annual weighted average HHV  
(40 CFR 98.33(a)(2))  $CO_2 = 1 \times 10^{-3} * Fuel * HHV * EF$  (Eq. C-2a)
- **Tier 3:** average carbon contents and molecular weights  
(40 CFR 98.33(a)(3))  $CO_2 = \frac{44}{12} * Fuel * CC * \frac{MW}{MVC} * 0.001$  (Eq. C-5)
- **Tier 4:** CEMS (40 CFR 98.33(a)(4))
  - CO<sub>2</sub> CEMS  $CO_2 = 5.18 \times 10^{-7} * C_{CO_2} * Q$  (Eq. C-6)

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## Comparing § 95115 to Subpart C (1 of 2)

- Reporting threshold  
10,000 MT CO<sub>2</sub>e (MRR) vs. 25,000 MT CO<sub>2</sub>e (EPA)
- MRR uses same methods as Subpart C but:
  - Higher minimum tiers than Subpart C for some fuel and equipment size combinations
  - ARB requires reporting of GHG emissions from **ALL** fuels
    - Subpart C only requires units >250 MMBtu/hr and fuels ≥ 10% of annual heat input to report GHGs from fuels not listed in its Table C-1
  - For fuel providing <10% of heat input to a unit ≤250 MMBtu/hr, MRR reporter may use any method allowed by 40 CFR 98.33(b)

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## Comparing § 95115 to Subpart C (2 of 2)

### Under § 95115

- Report GHG from pilot lights if operated ≥300 hours/year
- May use a site-specific source test for CH<sub>4</sub> and N<sub>2</sub>O, whereas Subpart C only allows default CH<sub>4</sub> and N<sub>2</sub>O emission factors
- May use monthly fuel analysis instead of quarterly flue gas analysis in determining biomass fraction for partially biogenic fuels other than MSW (for example, tires)

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## Verifying Correct Methods (1 of 2)

- Verify reporter is using correct method according to § 95115 for each fuel type and SFC unit size
  - See Handout #1.2.1 for a table of minimal allowable methods based on unit size and fuel type and a decision tree diagram
- Reporting entities may always use a higher tier than the minimum required by the regulation
- Method should be consistent with previous year unless reporters follow and document change of methodology requirements ( § 95103(m))
  - Review GHG Monitoring Plan and previous EDR's to confirm acceptable methods

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## Verifying Correct Methods (2 of 2)

- If reporter is using § 95115(c)(3) provision, which allows use of any of the tiers for the emissions calculation if
  - fuels <10% heat input to unit, and
  - unit is ≤ 250 MMBtu/hr
- ...Then verify all are true
  - Does reporter have records and calculations supporting the 10% heat input determination?
  - Is method selected for calculating GHG emissions allowed for that fuel and unit size by 40 CFR 98.33(b)?

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## Questions and ARB Comments

1. Overview
2. **Verifying combustion emissions**
  - **CO<sub>2</sub> Emissions**
    - **Tiers 1-3**
    - Tier 4
    - O<sub>2</sub> Monitors
    - Part 75
  - N<sub>2</sub>O and CH<sub>4</sub> Emissions
3. Verifying sorbent emissions
4. Verifying biomethane and biomass CO<sub>2</sub> emissions

California Environmental Protection Agency



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## Types of Evidence for Verifying CO<sub>2</sub>

- GHG Monitoring Plan
- Fuel consumption data
- Measured data and measurement methodologies
  - High heat value (HHV)
  - Carbon content
  - Molecular weight
- Evidence of accuracy of meters and monitors
  - Calibration records
  - Linearity checks and other quality assurance procedures
- Missing data procedures and records used

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## Verifying Fuel Consumption

- Evidence to request
  - Fuel consumption records by fuel type
  - Methodology and supporting data used to reconstruct or replace missing data
- How to examine evidence
  - Examine fuel consumption records for completeness and accuracy
  - Confirm missing data procedures were followed:
    - Demonstrate reasonable efforts to capture 100% fuel consumption data; follow procedures in §95129(d)

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## Verifying Tier 1 Reports

- $CO_2 = 1 \times 10^{-3} * Fuel * HHV * EF$  (Eq. C-1)
- Confirm
  - Fuel consumption records
  - Correct default HHV values were used
  - Correct  $CO_2$  emission factors were used
  - Your calculation matches the reporter's calculations
  - Missing data procedures were followed (Course 1.3)
    - Demonstrate reasonable efforts to capture 100% fuel consumption and HHV
    - Follow applicable procedures in § 95129(c) and (d)

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## Verifying Tier 2 Reports (1 of 2)

- $CO_2 = 1 \times 10^{-3} * Fuel * HHV * EF$  (Eq. C-2a)
- Confirm
  - Fuel consumption records
  - Correct measured HHV values were used
  - Correct  $CO_2$  emission factors were used
  - Correct input into Cal e-GGRT
  - Your calculation matches the reporter's calculations

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## Verifying Tier 2 Reports (2 of 2)

Evidence to request when municipal solid waste facility uses steam production to calculate  $CO_2$

(Eq. C-2c):  $CO_2 = 1 \times 10^{-3} \text{ Steam} * B * EF$

- Total mass of steam generated during the reporting year (lb steam)
  - Confirm device accuracy and appropriateness of calculation
- Ratio of the boiler's maximum rated heat input capacity to its design rated steam output capacity (MMBtu/lb steam)
  - Should be a constant: Confirm appropriate source documentation
- Use of correct fuel-specific default  $CO_2$  emission factor, from Table C-1 (kg  $CO_2$ /MMBtu)

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## Verifying Tier 3 Reports

- More complicated methodology; higher risk of error
- Three different formulae, depending upon type of fuel: solid, liquid, gaseous
- $CO_2$  emissions calculated from fuel consumption, carbon content (CC) and, for gaseous fuels, molecular weight (MW)
- Daily sampling of CC and MW required

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## Verifying Tier 3 Reports: Evidence to Request (1 of 2)

Confirmation of measurement accuracy for 40 CFR 98.3(i) and § 95103(k) where applicable

- Solid fuels - may use “company records” but must still be +/-5% accurate
- Liquid and gaseous fuels
  - Calibrated fuel meter
  - Fuel billing (revenue) meter
  - For liquid fuels, tank drop measure using consensus-based standard (e.g., ASTM, API, ASME)

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## Verifying Tier 3 Reports: Evidence to Request (2 of 2)

- Carbon content (CC) for each fuel
  - Measured at the frequency specified in § 95115(f), and by methods specified in 40 CFR 98.34(b)(3)
- For gaseous fuels
  - Molecular weight (MW) measured at the frequency specified in § 95115(f), and by methods in 40 CFR 98.34(b)(3) and the temperature-dependent molar volume conversion (MVC) factor used
- For pre-mixed blended fuels
  - Data to calculate the blend’s annual average value of CC and MW, if appropriate, as in 40 CFR 98.34(b)(3)(v)

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## Evaluating Tier 3 Evidence (1 of 2)

- Does reporter have records of
  - Fuel consumption?
  - CC?
  - And for gaseous fuels, MW determination?
- Were CC and MW measured using correct methods at correct frequency?
- Where was the sampling location(s)?
- Gaseous fuels
  - Did reporter use correct MVC for standard conditions (temperature) at which fuel volume was measured?

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## Evaluating Tier 3 Evidence (2 of 2)

- Premixed blend fuels
  - Does reporter have records of data and calcs used for annual weighted average CC and MW (if appropriate)
- Do verifier-calculated emissions using fuel consumption, measured CC and (for gaseous fuels) MW and appropriate MVC match those reported?

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## Sample Calculations of CO<sub>2</sub> Emissions from a SFC Source

### Group Participation Exercise 1-2.1

- Scenario
  - Fuel: Natural gas (primary fuel for a boiler)
  - HHV:  $1.035 \times 10^{-3}$  MMBtu/scf (measured)
  - Consumption: 500,000,000 scf
- What are CO<sub>2</sub> emissions?
  - A. 27,437,850 MT CO<sub>2</sub>/yr
  - B. 27,438 MT CO<sub>2</sub>/yr
  - C. 27,252 MT CO<sub>2</sub>/yr

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## Sample Calculations of CO<sub>2</sub> Emissions from a SFC Source

### Group Participation Exercise 1-2.1 Solution

- Scenario
  - Fuel: Natural gas (primary fuel for a boiler)
  - HHV:  $1.035 \times 10^{-3}$  MMBtu/scf (measured)
  - Consumption: 500,000,000 scf

The correct answer is B:

CO<sub>2</sub> EF from Table C-1 is 53.02 kg CO<sub>2</sub>/MMBtu

Use eq. C-2a:  $\text{CO}_2 = 1 \times 10^{-3} \times \text{Fuel} \times \text{HHV} \times \text{EF}$ :

$1 \times 10^{-3} \text{ MT/kg} \times 5 \times 10^8 \text{ scf} \times 1.035 \times 10^{-3} \text{ MMBtu/scf} \times 53.02 \text{ kg CO}_2/\text{MMBtu} = 27,438 \text{ MT CO}_2$

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## Questions and ARB Comments

### 1. Overview

### 2. Verifying combustion emissions

- CO<sub>2</sub> Emissions
  - Tiers 1-3
  - Tier 4
  - O<sub>2</sub> Monitors
  - Part 75
- N<sub>2</sub>O and CH<sub>4</sub> Emissions

### 3. Verifying sorbent emissions

### 4. Verifying biomethane and biomass CO<sub>2</sub> emissions

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## Verifying Tier 4 (CEMS) Reports (1 of 3)

- Verifier must collect information on
  - Hourly CEMS concentration, flow and calculated CO<sub>2</sub> mass
  - Records of dates and results of CEMS certifications and quality assurance procedures
  - Methodology and supporting data used to reconstruct or replace missing data (more on missing data in course 1.3)
- Observation is key here
  - Visit CEMS “shack”, discuss outputs with CEMS technician
  - Visit control room to identify how data is recorded
  - Locate data transmitters and all meters on the site
  - Ask for a live demonstration and output from the Data Handling System

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## Verifying Tier 4 (CEMS) Reports (2 of 3)

- Evidence to request
  - CEMS Certifications
    - Records of dates
    - Results of:
      - Certifications
      - Quality assurance Procedures including
        - » Linearity checks
        - » Cylinder gas audits
        - » Relative accuracy test audit
  - Information should be included in the reporter's GHG Monitoring Plan

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## Verifying Tier 4 (CEMS) Reports (3 of 3)

- Evidence to request
  - Fuel consumption
    - Solid fuels may use “company” records
    - Liquid and gaseous fuels – calibrated fuel meter meeting 40 CFR 98.3(i), fuel billing meter or tank drop measure
    - Fuel consumption records do not need to meet measurement accuracy requirements unless used to report (non-de minimis) CH<sub>4</sub> and N<sub>2</sub>O ( § 95115(g))

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## Evaluating Tier 4 Evidence (1 of 2)

- Calculate CO<sub>2</sub> emissions using Tier 1 to cross-check
  - Calculated CO<sub>2</sub> emissions should be in general agreement with CO<sub>2</sub> emissions measured by CEMS, but some difference is expected
- Verifier must check actual daily CEMS data to “re-calculate” data as required by regulation
  - Sample the CEMS data produced through the DAHS
  - Ask the operator to query the data while you are on site

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## Evaluating Tier 4 Evidence (2 of 2)

- Determine whether the CEMS certifications and quality assurance procedures conform with the requirements in:
  - 40 CFR part 75
  - 40 CFR part 60
  - Or the relevant air district program under which the CEMS is operated
- Ensure CEMS missing data procedures have been followed

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## Questions and ARB Comments

1. Overview
2. **Verifying combustion emissions**
  - **CO<sub>2</sub> Emissions**
    - Tiers 1-3
    - Tier 4
    - **O<sub>2</sub> Monitors**
    - Part 75
  - **N<sub>2</sub>O and CH<sub>4</sub> Emissions**
3. Verifying sorbent emissions
4. Verifying biomethane and biomass CO<sub>2</sub> emissions

California Environmental Protection Agency

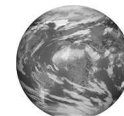
 **Air Resources Board**

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## Verifying CO<sub>2</sub> Emissions Calculated Using O<sub>2</sub> Monitors (1 of 2)

### Evidence to request

- Records of dates and results of CEMS certifications and quality assurance procedures
- Methodology and supporting data used to reconstruct or replace missing data

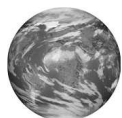


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## Verifying CO<sub>2</sub> Emissions - Calculated Using O<sub>2</sub> Monitors (2 of 2)

### How to evaluate evidence

- Check that O<sub>2</sub> monitoring requirements in 40 CFR 75.13 were followed
- Determine whether the CEMS certifications and quality assurance procedures conform with requirements in 40 CFR 75
- Confirm ARB missing data procedures were followed
- Procedures in Part 75 for O<sub>2</sub> concentration, stack gas flow rate, fuel flow rate, high heat value, and fuel carbon content



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## Verifying CO<sub>2</sub> Emissions - 40 CFR Part 75

- Developed as part of U.S. EPA's Acid Rain Program
  - Data available on public website
- Regulates EGUs (Electricity Generating Units)
- Requires continuous monitoring and reporting of, among other gases, CO<sub>2</sub> mass emissions and reporting of heat input
- First cap-and-trade program – SO<sub>2</sub>
- Includes
  - Monitoring Provisions
  - Operation and Maintenance Requirements
  - Missing Data Substitution Procedures
  - Record Keeping and Reporting Requirements
- Useful tool: US EPA's *Plain English Guide to the Part 75*  
[http://www.epa.gov/airmarkets/emissions/docs/plain\\_english\\_guide\\_par75\\_final\\_rule.pdf](http://www.epa.gov/airmarkets/emissions/docs/plain_english_guide_par75_final_rule.pdf)

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## Verifying CO<sub>2</sub> Combustion Emissions Calculated Using Fuel-based Methodology in 40 CFR 75.13(b) (1 of 6)

- Where Part 75 estimates are not based on measured concentrations of CO<sub>2</sub>
- Allowed under 75.10(3)(ii): Appendix G
- Based on measured content of the fuel and amount of fuel combusted (and sorbent where applicable)
- Operator calculates daily, quarterly and annual CO<sub>2</sub> mass emissions

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## Verifying CO<sub>2</sub> Combustion Emissions Calculated Using Fuel-based Methodology in 40 CFR 75.13(b) (2 of 6)

Appendix G provides two basic methods for determining CO<sub>2</sub> emissions:

1. Daily CO<sub>2</sub> emissions are calculated from company records of fuel usage and the results of periodic fuel sampling and analysis (to determine the % carbon in the fuel); or
2. Hourly CO<sub>2</sub> emissions are calculated using heat input rate measurements made with certified Appendix D fuel flow meters together with fuel-specific, carbon-based “F-factors”.

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## Verifying CO<sub>2</sub> Combustion Emissions Calculated Using Fuel-based Methodology in 40 CFR 75.13(b) (3 of 6)



Text of 75.13(b): *Determination of CO<sub>2</sub> emissions using appendix G to this part.* If the owner or operator chooses to use the appendix G method, then the owner or operator shall follow the procedures in appendix G to this part for estimating daily CO<sub>2</sub> mass emissions based on the measured carbon content of the fuel and the amount of fuel combusted. For units with wet flue gas desulfurization systems or other add-on emissions controls generating CO<sub>2</sub>, the owner or operator shall use the procedures in appendix G to this part to estimate both combustion-related emissions based on the measured carbon content of the fuel and the amount of fuel combusted and sorbent-related emissions based on the amount of sorbent injected. The owner or operator shall calculate daily, quarterly, and annual CO<sub>2</sub> mass emissions (in tons) in accordance with the procedures in appendix G to this part.

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## Verifying CO<sub>2</sub> Combustion Emissions Calculated Using Fuel-based Methodology in 40 CFR 75.13(b) (4 of 6)

$$W_{\text{CO}_2} = \frac{(MW_{\text{C}} + MW_{\text{O}_2}) \times W_{\text{C}}}{2,000 MW_{\text{C}}} \quad (\text{Eq. G-1})$$

$W_{\text{CO}_2}$  = CO<sub>2</sub> emitted from combustion, tons/day

$MW_{\text{C}}$  = Molecular weight of carbon (12.0)

$MW_{\text{O}_2}$  = Molecular weight of oxygen (32.0)

$W_{\text{C}}$  = Carbon burned, lb/day, determined using fuel sampling and analysis and fuel feed rates.

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## Verifying CO<sub>2</sub> Combustion Emissions Calculated Using Fuel-based Methodology in 40 CFR 75.13(b) (5 of 6)

### Evidence to request

- Hourly fuel flow rates from company records
- Measured high heating value (HHV) from fuel sampling
- Determine the carbon content of each fuel sample
  - The carbon-based F factor ( $F_c$ ) (i.e., ratio of CO<sub>2</sub> generated to the calorific value of the fuel combusted)
- Methodology and supporting data used to reconstruct or replace missing data

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## Verifying CO<sub>2</sub> Combustion Emissions Calculated Using Fuel-based Methodology in 40 CFR 75.13(b) (6 of 6)

### Confirm

- Appropriate fuel flow used
- Records and methodologies for HHV/gross calorific value (GCV) determinations
- Heat input appropriately calculated per Appendix F to Part 75, Section 5.5 (conversion procedures)
- Correct  $F_c$  factors were used for specific fuel
- Correct calculation
- Missing data procedures were followed
  - 40 CFR 75 for CO<sub>2</sub> concentration, stack gas flow rate, fuel flow rate, high heating value, and fuel content (in particular Appendix G to Part 75, Section 5)

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## Verifying Emissions Data for CH<sub>4</sub> and N<sub>2</sub>O Emissions (1 of 2)

- Emissions calculated using procedures in 40 CFR 98.33(c)
- Review equations in Part 40 CFR 98.33(c)
- How to evaluate evidence: Did reporter
  - Use same values for fuel consumption as for calculating CO<sub>2</sub> emissions under Tiers 1 or 3?
  - Use same values for fuel consumption and HHV, or for steam production, under Tier 2?
  - Have values for total annual heat input for units using Tier 4? What is the source of those values?

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## Verifying Emissions Data for CH<sub>4</sub> and N<sub>2</sub>O Emissions (2 of 2)

### How to evaluate evidence

- Were the EFs from Table C-2 used for the correct fuel, unless facility used source-specific EFs?
- For blended fuels, were emissions calculated for each individual fuel separately using procedures in 40 CFR 98.33(c)?
- Do verifier calculated emissions match reported emissions?

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## Questions and ARB Comments

1. Overview
2. Verifying combustion emissions
  - CO<sub>2</sub> Emissions
    - Tiers 1-3
    - Tier 4
    - O<sub>2</sub> Monitors
    - Part 75
  - N<sub>2</sub>O and CH<sub>4</sub> Emissions
3. Verifying sorbent emissions
4. Verifying biomethane and biomass CO<sub>2</sub> emissions

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## CO<sub>2</sub> Emissions from Sorbent: Equation and Inputs

$$CO_2 = 0.91 * S * R * \left( \frac{MW_{CO_2}}{MW_S} \right) \quad (\text{Eq. C-11})$$

- CO<sub>2</sub> = CO<sub>2</sub> emitted from sorbent for the reporting year (metric tons)
- S = Limestone or other sorbent used in the reporting year, from company records (short tons)
- R = The number of moles of CO<sub>2</sub> released upon capture of one mole of the acid gas species being removed (R = 1.00 when the sorbent is CaCO<sub>3</sub> and the targeted acid gas species is SO<sub>2</sub>)
- MW<sub>CO<sub>2</sub></sub> = Molecular weight of carbon dioxide (44)
- MW<sub>S</sub> = Molecular weight of sorbent (100 if calcium carbonate)
- 0.91 = Conversion factor from short tons to metric tons

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## Verifying CO<sub>2</sub> Emissions from Sorbent

- Evidence to request - Inputs and outputs used in Eq. C-11 in 40 CFR 98.33(d)
- How to evaluate evidence - Does the reporter have:
  - Company records supporting the reported type and annual amount of sorbent used?
  - Data or information supporting the values used in Eq. C-11?
    - R, moles of CO<sub>2</sub> released per mole of acid gas being removed
    - MWS, molecular weight of the sorbent

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## Selecting the Correct Tier Group Participation Exercise 1.2.2

- A pipeline natural gas-fired boiler that is 300 MMBtu/hr maximum rated heat input, the consumption is measured in therms and obtained from billing records, and the unit has no CEMS.
- What is the minimum allowable reporting Tier?
  - A. Tier 1
  - B. Tier 2
  - C. Tier 3
  - D. Tier 4

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## Selecting the Correct Tier

### Group Participation Exercise 1.2.2 Solution

- A pipeline natural gas-fired boiler that is 300 MMBtu/hr maximum rated heat input, the consumption is measured in therms and obtained from billing records, and the unit has no CEMS.
- What is the minimum allowable reporting Tier?
  - A. Tier 1
  - B. Tier 2
  - C. Tier 3
  - D. Tier 4

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## Selecting the Correct Tier

### Group Participation Exercise 1.2.3

- A single-cycle peaking turbine (EGU) that burns kerosene-type jet fuel 365 MMBtu/hr. The unit has no CEMS. What is the minimum tier?
  - A. Tier 1
  - B. Tier 2
  - C. Tier 3
  - D. Tier 4

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## Selecting the Correct Tier

### Group Participation Exercise 1.2.3 Solution

- A single-cycle peaking turbine (EGU) that burns kerosene-type jet fuel 365 MMBtu/hr. The unit has no CEMS. What is the minimum tier?
  - A. Tier 1
  - B. Tier 2
  - C. Tier 3
  - D. Tier 4

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## Evaluating Additional Conformance Requirements § 95131(b)(8)(F)

- Reporting entities that combust natural gas
  - Review natural gas bills
  - Confirm total amount reported in subpart A
  - Confirm natural gas provider (should be IOU/POU, not third-party, contracted provider)
- Supplied natural gas values must be reported **even if the facility reports GHG emissions using data from internal meters**

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## Questions and ARB Comments

1. Overview
2. Verifying combustion emissions
3. Verifying sorbent emissions
- 4. Verifying biomethane and biomass CO<sub>2</sub> emissions**

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## Biomass-Derived Fuels and Biomethane

- Biomass fuels are fuels that are derived from biomass products and byproducts, wastes, and residues from plants, animals, and microorganisms.
- “Biomethane” means biogas that has been processed and meets pipeline quality natural gas standards.

**(Not all biogas is biomethane.)**

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## Verifying Biomass-Derived Fuel Emissions § 95103(j); § 95131(i); C&T § 95852.2(a)

- Why is it important?
- Who has to report?
- What are the reporting requirements for fuels?
- How to verify fuels data?
- How to verify biomass-derived fuel combustion emissions?

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## Importance of Biomass-derived Fuel Reporting

- Emissions from exempt biomass have no compliance obligation pursuant to Cap-and-Trade Regulation
  - Reporting and verification is still mandatory under MRR
- Financial incentive to report emissions as exempt
- MRR requires thorough demonstration that combusted fuel is biomass-derived fuel
- Responsibility for reporter to demonstrate conformance
- Verifier must take needed time to determine conformance, may include upstream entities

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## Biomass-derived Fuel Combustion Emissions: Reporters

- Reporting entities emitting  $\geq 10,000$  MT CO<sub>2</sub>e (including CO<sub>2</sub> emissions from biomass-derived fuel), AND having aggregate maximum heat input capacity of **12 MMBtu/hr** or greater, must report biomass derived-fuel combustion emissions (§ 95101(b)(4))
- Biomass-derived fuel emissions count toward the 25,000 MTCO<sub>2</sub>e verification threshold (§ 95103(f))
- Emissions must be reported by fuel type unless using steam or CEMS-based methods (§95103(j))

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## Sources that Combust Biomass-derived Fuel

- SFC sources – same as for any other fuel
  - Mainly concentrated in electricity generation to meet the Renewable Portfolio Standard requirements: solid biomass, biogas, and biomethane
- Transportation fuel
  - As an oxygenate and to reduce the carbon intensity of the fuel: ethanol and bio/renewable diesel (Course 2)
- Anaerobic digesters
  - At wastewater treatment plants and landfill gas collection systems are also a source of biogas, often combusted on-site
- Some use in oil production, refining, and other sectors, but these are fairly unique

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## Reporting Requirements for Biomass-derived Fuel: Solid Biomass § 95103(j)(1)

- Identify if urban, agricultural, MSW, or forest-derived
  - Urban – pallets, construction waste, tree trimmings, mill residue, range land residues
  - Agricultural waste – as a result of agricultural activities such as crops, livestock, nurseries
  - MSW – solid phase waste discarded by households, commercial/retail entities, institutions (e.g., hospitals, prisons)
  - Forest derived – next slide
- If urban and agricultural biomass collected with MSW, then all identified as MSW (§ 95102(a)(247))

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## Reporting Requirements for Biomass-derived Fuel: Forest-derived Wood and Wood Waste § 95103(j)(2)

- Forest clearing and cutting, where combusted material is not a waste product from other processes (like milling)
- Report by California Forest Practice Rule (CFPR) and National Environmental Protection Act (NEPA) identifier
- Report name, address, and contact information for supplier

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## Verifying Exempt Classification for Biomass: Solid and liquid fuels

- Contract review
  - Ensure proper classification and procurement timing
- Air district permit and inspection reports
  - For biomass-only plants, can give confidence that only biomass is burned
- Proper classification
  - Ensure material type has been classified consistent with definitions
  - Only need to meet forest-derived wood requirements if wood combusted is **not** a byproduct of other process, such as mill residue

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## Verifying Exempt Classification for Biomass: Forest-derived wood

Forest-derived wood and wood waste have additional requirements

- Review forest product reporting form. Confirm that facility received wood from said companies.
- Confirm sample of listed companies had applicable permits or exemptions and were in compliance with those permits
- Justify sample chosen in sampling plan

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## Reporting Requirements for Biomass-derived Fuel: Non-exempt Biomass-derived Fuel § 95103(j)(4)

- Biomass emissions are **non-exempt** if they:
  - Do not meet requirements of MRR § 95852.1.1 and § 95852.2 of Cap-and-Trade Regulation OR
  - Cannot be verified according to the requirements of § 95131(i)
- Non-exempt emissions are subject to the reporting requirements of § 95103(k) and § 95110-95158
  - Remember: reporters have a compliance obligation pursuant to Cap-and-Trade Regulation (§)

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## Biomass-derived Fuel Use Accuracy § 95103(k)

- Fuel use accuracy is not required if fuel is exempt and CH<sub>4</sub> and N<sub>2</sub>O are reported as *de minimis*
- Fuel use accuracy is required for biomass-derived fuels when
  - CO<sub>2</sub> emissions trigger compliance obligation because fuel is classified as **non-exempt** biomass-derived
  - CH<sub>4</sub> and N<sub>2</sub>O emissions are not classified as *de minimis*
- Emissions can be calculated using any tier

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## Verifying Biomass GHG Emissions (1 of 4)

For determinations using 40 CFR 98.33(e) when the biomass fraction is known and the fuel is not otherwise addressed by §95115(e)

- Follow evidence and evaluation procedures for the applicable tier for the biomass fuel for calculating CO<sub>2</sub> emissions as if it were any other fuel
  - Note that pure, exempt biomass combustion can use any tier
- If a biomass fuel is combusted with a fossil fuel in a unit monitored by a CEMS, follow the procedures in 40 CFR 98.33(e)(2) to calculate biogenic CO<sub>2</sub> emissions
- Does not apply to the combustion of MSW

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## Verifying Biomass GHG Emissions (2 of 4)

Evidence to request and evaluate when CEMS are used:

- Inputs and outputs to Eq. C-12 to C-14 in 40 CFR Part 98, Subpart C

$$V_{CO_2h} = \frac{(\%CO_2)_h}{100} \times Q_h \times t_h \quad (\text{Eq. C-12})$$

$$\% \text{ Biogenic} = \frac{V_{bio}}{V_{total}} \quad (\text{Eq. C-14})$$

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## Verifying Biomass GHG Emissions (3 of 4)

Evidence to request and evaluate when CEMS are used

- Fossil fuel consumption and HHV must conform to Tier 2 data verification and missing data requirements
- Hourly average CO<sub>2</sub> concentration and stack flow rate data from CEMS must conform to Tier 4 data verification and missing data requirements
- Fuel specific carbon based F-factors must comply with Appendix G to Part 75 (see 40 CFR 98.33(e)(1)(iii))

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## Verifying Biomass GHG emissions (4 of 4)

- For determinations using 40 CFR 98.33(e) as specified in §95115(e)(1) for MSW, or other mixed fuels when biomass fraction is unknown (including when reporter elects to report biomass-derived CO<sub>2</sub> emissions from tires)
  - Follow verification procedures for the applicable tier for the fuel as described for determining CO<sub>2</sub> emissions
- For verification of the biomass-derived fraction
  - Review the sampling and analysis results of the flue gas or the fuel according to ASTM methods per 40 CFR 98.34(d)
  - Do the sampling and analysis conform to the ASTM methods and the frequency specified in 40 CFR 98.34(d)?

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## Verifying Exempt Classification for Biogenic CO<sub>2</sub> Emissions

- Evidence to request
  - Annual and hourly heat input records
  - Purchase records, invoices, scheduling, etc.  
( § 95131(i)(1)(B)(2))
  - Biomass specific requirements( § 95131(i)(2))
- Evaluating evidence – Confirm
  - Heat input records
  - Purchase records, transportation records, chain of custody
  - Eligibility and other biomass-specific requirements are met
  - Use of correct emission factors
  - Correct calculation

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## Verifying Biomass GHG Determinations: Mixtures of Natural Gas and Biomethane (1 of 2)

- “Biomethane” is biogas that meets pipeline quality natural gas standards ( § 95102(a))
- When using Tier 2
  - Reporters calculate separate GHG emissions from biomethane and natural gas (per §95115(e)(3))
  - Biomethane emissions are calculated from contractual deliveries
  - Verifiers follow Tier 2 verification steps for inputs and outputs used in equation in §95115(e)(3)

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## Verifying Biomass GHG Determinations: Mixtures of Natural Gas and Biomethane (2 of 2)

Using Tier 4 or subject to 40 CFR 98, Subpart D

- Reporters calculate GHG emissions from biomethane and assume the remainder are natural gas GHG emissions  
(Per §95115(e)(4))
- Biomethane GHG emissions are calculated from contractual deliveries
- Verifiers follow Tier 4 or Subpart D verification steps for the total GHG emissions from the mixture
- Verifiers follow Tier 2 verification steps for the inputs and outputs used in the equation in §95115(e)(3) for the biomethane GHG emissions

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## Verifying Biomass GHG Determinations: Mixtures of Natural Gas and Biogas

- Mixtures require either
  - Separate metering of each fuel, or
  - Solving by difference from total and other fuel  
(3 variables, 2 of them are known)
- When using Tier 3, Tier 4, or subject to Subpart D
  - Reporters use Tier 3 carbon content method to determine GHG emissions from biogas; the remainder are natural gas GHG emissions (Per §95115(e)(5))
  - Verifiers follow applicable Tier 3 or Tier 4 verification steps for the total GHG emissions from the mixture
  - Verifiers follow Tier 3 verification steps for the biogas GHG emissions if mixture contains “covered” emissions

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## Reporting Requirements and Exemption for Biomethane § 95103(j)(3)

- High risk - must review, even if small amount
- Reporting entity must report
  - Total biomethane consumption and exemption status
  - Name and address of biomethane vendor(s) and MMBtu delivered by each vendor
  - Name, address and facility type where biomethane is produced ( § 95103(j)(3))
- Must have documentation to demonstrate eligibility
  - Contract for actual biomethane, consistent with § 95852.1.1
  - Invoices for purchase
  - Shipping reports
  - Allocation, balancing, and nomination reports
- Document your approach in a sampling plan

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## Sample Calculations of CO<sub>2</sub> Emissions Group Participation Exercise 1.2.4

- Scenario
  - Fuel: Municipal Solid Waste
  - Steam generation:  $3 \times 10^9$  lb per year
  - B-ratio: 0.0016 MMBtu maximum rated heat input/lb of steam output capacity
  - Results of ASTM analysis of emissions: 62% of emissions are biogenic
- What are the annual fossil fuel CO<sub>2</sub> emissions?
  - A. 435,360 MT CO<sub>2</sub>/yr
  - B. 269,923 MT CO<sub>2</sub>/yr
  - C. 165,437 MT CO<sub>2</sub>/yr

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## Sample Calculations of CO<sub>2</sub> Emissions Group Participation Exercise 1.2.4 Solution

The correct answer is C: **165,437 MT CO<sub>2</sub>/yr fossil based emissions**

Step 1: Calculate total CO<sub>2</sub> emissions using Eq. C-2c, and correct CO<sub>2</sub> EF from Table C-1 of 90.7 kg CO<sub>2</sub>/MMBtu :

$$\text{CO}_2 = 1 \times 10^{-3} \times B \times \text{Steam} \times \text{EF}$$

$$1 \times 10^{-3} \text{ MT/kg} \times 0.0016 \text{ MMBtu/lb} \times 3 \times 10^9 \text{ lb/yr} \times 90.7 \text{ kg CO}_2/\text{MMBtu} \\ = 435,360 \text{ MT CO}_2/\text{yr}$$

Step 2: Calculate biogenic CO<sub>2</sub> emissions:

$$435,360 \text{ MT CO}_2/\text{yr} \times 0.62 \text{ MT biogenic CO}_2/\text{MT total CO}_2 = 269,923 \text{ MT CO}_2/\text{yr}$$

Step 3: Subtract biogenic CO<sub>2</sub> from total CO<sub>2</sub> to determine fossil-based emissions:

$$435,360 \text{ MT CO}_2/\text{yr} - 269,923 \text{ MT CO}_2/\text{yr} = 165,437 \text{ MT CO}_2/\text{yr}$$

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## Questions and ARB Comments

### Course 1: General Verification

#### **Complete:**

1.1 Verification Principles, Requirements, and Procedures

1.2 Stationary Fuel Combustion and Sorbent Sources

#### **Next:**

1.3 Accuracy & Product Data

1.4 Electricity Generating Units & Cogeneration

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# Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting



## General Verification Course 1.3 - Accuracy & Product Data

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## Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting

### Course 1: General Verification

- 1.1 Verification Context, Principles, and Program Overview
- 1.2 Stationary Fuel Combustion and Sorbent Sources
- 1.3 Accuracy & Product Data
- 1.4 Electricity Generating Units & Cogeneration

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## Course 1.3 Handout

- Handout 1.3.1 Covered Product Data:  
Table 9-1 of the Cap-and-Trade Regulation

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## Course 1.3 Accuracy and Product Data

1. Excluded Sources
2. *De minimis* Emissions
  - Examples
  - Verification
3. Measurement Accuracy
4. Missing Data
5. Product Data

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## Excluded Emissions Sources - Not Reported to ARB § 95101(f)

- EGUs designated as backup or emergency generators in air permit
- Portable equipment not part of oil and gas production
- Fire suppression systems and equipment
- Primary and secondary schools with a NAICS code of 611110
- Fugitive methane emissions from municipal solid waste landfills described in 40 CFR Part 98, Subpart HH
- Fugitive methane and fugitive nitrous oxide emissions from livestock manure management systems described in Subpart JJ, regardless of the magnitude of emissions produced
- Agricultural irrigation pumps

Facilities solely powered by nuclear, hydro, wind, or solar are excluded, unless on-site combustion emissions  $\geq 10,000$  MT CO<sub>2</sub>e (see Course 1.4)

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## Small Emissions Sources - Reported as De Minimis Sources § 95103(i)

- Sources with emissions that collectively are both
  - $\leq 3\%$  of total facility or supplier emissions including biomass-derived fuel combustion **and**
  - $\leq 20,000$  MT CO<sub>2</sub>e
- Emissions may be estimated using reasonable alternative method
  - Not biased toward over or under estimation
  - Accuracy within 5% not required
- Not applicable to electric power entities
- Not applicable to covered product data

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## De Minimis Emissions – Potential Examples

- Infrequent fuel deliveries of propane where amount combusted during year can be estimated using hourly logged meter
- Sorbent used in emissions control systems for power plants
- Diesel fuel from a single tank that is used for both reportable stationary combustion equipment and non-reportable mobile equipment (a “reasonable estimate” of reportable emissions is acceptable)
- CH<sub>4</sub> and N<sub>2</sub>O emissions from a power plant using CO<sub>2</sub> CEMS

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## Verification - Emissions Treated as De Minimis § 95103(i)

- Request documentation of data sources and emissions calculations reported as de minimis
- Assess reasonableness of alternative methods as well as accuracy of calculations
- Ensure appropriate categorization of exempt vs. non-exempt emissions reported as de minimis
- Evaluate uncertainty of emissions estimate to ensure total de minimis emissions are
  - $\leq 3\%$  facility emissions **AND**  $\leq 20,000$  MT CO<sub>2</sub>e

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## Group Participation Exercise 1.3.1: De Minimis Sources

An operator reports emissions for the following sources. Which sources can be reported as de minimis?

Source	Emissions (MT CO <sub>2</sub> e)	% of Total
A	6,100	0.7%
B	9,900	1.2%
C	20,500	2.4%
D	352,000	42%
E	450,000	54%
Total	838,500	

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## Group Participation Exercise 1.3.1: De Minimis Sources - Solution

Source	Emissions (MT CO <sub>2</sub> e)	% of Total
A	6,100	0.7%
B	9,900	1.2%
C	20,500	2.4%
D	352,000	42%
E	450,000	54%
Total	838,500	

Sources A and B may be reported as de minimis sources using either:

- Alternative reasonable method,
- OR
- Tier method with accuracy requirement relaxed as long as method and result are reasonable

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## Group Participation Exercise 1.3.2: De Minimis Sources

A refinery operator reports the following GHG emissions sources. Which sources may be considered de minimis?

Emission Point	Type of Fuel	Source ID(s)	Emissions (MT CO <sub>2</sub> e)	% of Total Emissions	Cumulative % of Total Emissions
P15	FCC Coke	RS7	1,116,740	31.54	100.00
P4	Refinery Fuel Gas - Utilities	RS12, RS15	696,314	19.67	68.46
P2	RFG – Fuels A	RS20, RS23/24	464,058	13.11	48.79
P8	RFG – Cracking	RS1	282,443	7.98	35.68
P1	Natural Gas	RS16	214,508	6.06	27.70
P12	Natural Gas	RS26	174,366	4.93	21.64
P12	Refinery Fuel Oil	RS3	155,762	4.40	16.72
P14	RFG – Fuels B	RS17/18/19	123,994	3.50	12.32
P3	RFG – Cracking	RS2	100,440	2.84	8.81
P9	Acid Gas	RS33	96,172	2.72	5.98
P8	RFG – Utilities	RS11, RS14	55,143	1.56	3.26
P1	Biomass-Derived	RS6	25,125	0.71	1.70
P10	Natural Gas	RS36/37/38	14,654	0.41	0.99
P4	CCR Offgas	RS4	12,321	0.35	0.58
P7	CCR Offgas	RS5	4,231	0.12	0.23
P12	Sour Gas	RS35/39	3,655	0.10	0.11
P6	Gas Oil	RS40	292	0.01	0.01
P7	Refinery Fuel Oil	RS12	0	0.00	0.00
				100.00	

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## Group Participation Exercise 1.3.2: De Minimis Sources - Solution

Emission Point	Type of Fuel	Source ID(s)	Emissions (MT CO <sub>2</sub> e)	% of Total Emissions	Cumulative % of Total Emissions
P15	FCC Coke	RS7	1,116,740	31.54	100.00
P4	Refinery Fuel Gas - Utilities	RS12, RS15	696,314	19.67	68.46
P2	RFG – Fuels A	RS20, RS23/24	464,058	13.11	48.79
P8	RFG – Cracking	RS1	282,443	7.98	35.68
P1	Natural Gas	RS16	214,508	6.06	27.70
P12	Natural Gas	RS26	174,366	4.93	21.64
P12	Refinery Fuel Oil	RS3	155,762	4.40	16.72
P14	RFG – Fuels B	RS17/18/19	123,994	3.50	12.32
P3	RFG – Cracking	RS2	100,440	2.84	8.81
P9	Acid Gas	RS33	96,172	2.72	5.98
P8	RFG – Utilities	RS11, RS14	55,143	1.56	3.26
P1	Biomass-Derived	RS6	25,125	0.71	1.70
P10	Natural Gas	RS36/37/38	14,654	0.41	0.99
P4	CCR Offgas	RS4	12,321	0.35	0.58
P7	CCR Offgas	RS5	4,231	0.12	0.23
P12	Sour Gas	RS35/39	3,655	0.10	0.11
P6	Gas Oil	RS40	292	0.01	0.01
P7	Refinery Fuel Oil	RS12	0	0.00	0.00
				100.00	

Threshold for de minimis is BOTH <3% of total emissions and <20,000 MT CO<sub>2</sub>e

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## Questions and ARB Comments

1. Excluded Sources
2. *De minimis* Emissions
3. **Measurement Accuracy**
  - Accuracy requirements
  - Calibration
  - Verification
4. Missing Data
5. Product Data

California Environmental Protection Agency



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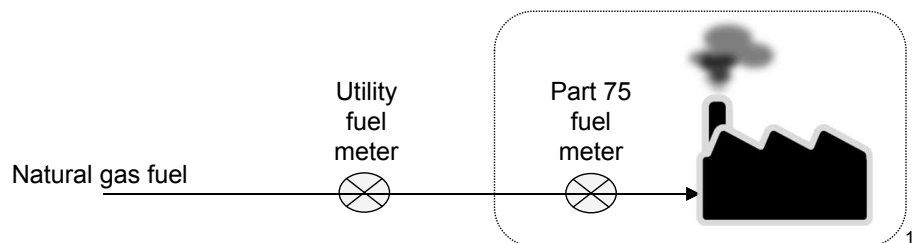
## Measurement Accuracy Requirements

- (1) 40 CFR Part 75 accuracy requirements
  - CFR Part 98 and § 95103(k) reference Part 75
- (2) 40 CFR 98.3(i) applies to facilities subject to Part 98
- (3) § 95103(k) applies to *covered* emissions and *covered* product data from *covered* entities (subject to Cap-and-Trade Regulation)
  - Requires covered data measurements to be +/-5% accurate
  - MRR calibration requirements more stringent than Part 98

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## Facilities Subject to 40 CFR Part 75

- Primarily applies to electric generating units (EGUs)
- Must meet Part 75 Appendix D accuracy requirements
- Exempt from MRR-specific calibration requirements in § 95103(k)
  - Except that facilities using Part 75 Appendix G § 2.3 (fuel flow based “CEMS”) must still meet measurement accuracy of +/-5% ( § 95103(k)(10))



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## Facilities Subject to 40 CFR Part 98.3(i)

- Requires calibration by 2010
- Calibration may be postponed if device cannot be calibrated until next scheduled maintenance outage (98.3(i)(6))
- Calibration procedures not specified - an “industry standard” may be used (98.3(i)(1)(i))
- For orifice meters, transmitter calibration requires
  - If 3 transmitters, +/-2% for each, or overall accuracy of +/-6%
  - If 2 transmitters, +/-2% for each, or overall accuracy of +/-4%
- Requirement to inspect orifice plate during calibration (98.34(b)(1)(iv))

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## Measurement Accuracy § 95103(k)

- MRR requirements follow 98.3(i) for fuels and feedstocks, with certain differences:
  - More specific calibration requirements
  - May postpone calibration if approved by ARB in writing
  - Measurement device accuracy (+/- 5%) applies for devices used to calculate **covered** emissions and **covered** product data
- § 95103(k) applies to monitoring of fuel and feedstock consumption; process stream flow; steam flow; density, specific gravity, MW measurements; mass and liquid flow measurements; chromatographs, spectrometers, calorimeters and scales
- Specific provisions for inventory, stock and tank-drop measurements are specified in § 95103(k)(11)

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## Data Not Subject to Measurement Accuracy Requirements under § 95103(k)

- Exempt biogenic CO<sub>2</sub> emissions, geothermal emissions, and some vented and fugitive emissions from oil and gas production (emissions not covered under C&T)
- Emissions measured using financial transaction meters (verifier confirms no ownership connection between fuel supplier and purchaser § 95103(k)(7))
- Emissions reported and verified as de minimis
- Individual emissions sources reported under Part 75
- Electricity generation or thermal output estimates
- Fuel usage, when not used to calculate emissions (CEMS)

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## Meters Not Subject to § 95103(k) Calibration Requirements

- When financial transaction meters are used ( § 95103(k)(7))
  - Verifier assumes data is measured accurately
- Non-financial transaction meters used by Public Utility Gas Corporations, meeting accuracy requirements of the CPUC
  - Verifier assumes data is measured accurately
- When “best available information/methods/data” are allowed ( § 95103(h))
  - Must still demonstrate measurement accuracy of data (+/-5%)
- Upstream ethanol and additive meters for gasoline blendstocks, applicable to § 95121 transportation fuel suppliers ( § 95103(k)(7))

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## ARB Calibration Requirements § 95103(k)

- Calibration procedures must be documented in the GHG Monitoring Plan
- All inspection and calibration information must be made available to verifiers
- Perform calibrations according to either
  - Original equipment manufacturer’s (OEM) documentation, or
  - 40 CFR 98.2(i)(2)-(3) if OEM is unavailable, except a minimum of 3 calibration points must be used
- If OEM is not available, or if another method is deemed to be more accurate, then can use alternate method
  - ALL alternative methods used must be approved in writing by ARB ( § 95109(b))
- Includes other requirements such as photo of orifice plate
- Postponement requests for cases of operational disruption

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## Recalibration Frequency and Accuracy Requirements § 95103(k)(4)

- See reporting guidance (Meter Calibration and Accuracy: Emissions Data Metering for Greenhouse Gas Reporting)
- Shortest frequency is required
  - According to applicable subpart of Part 98
  - As recommended by manufacturer
  - Once every 3 year compliance period (CA-only requirement)
    - No less than 30 months
    - No more than 48 months
  - When meter is replaced
  - Within 48 months of pre-2012 calibration if OEM does not specify calibration frequency

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## Failed Calibrations<sup>1</sup>

- If meter fails calibration, verifier must identify a nonconformance and confirm total period of invalid data
  - Data collected since the date of the last accurate calibration is considered invalid data
  - § 95103(k)(6)(B) provides for annual field accuracy tests in years between successive calibrations, to limit length of invalid data periods
- If invalid data for a measurement device represents >5% of covered emissions or covered product data, the operator must demonstrate using other evidence that the measured data is still +/-5% accurate ( § 95103(k)(10))

<sup>1</sup> See missing emissions data and excluded covered product data provisions later in Course 1.3 If an ARB-approved postponement request is in effect, see published guidance.

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## Verification of Measurement Accuracy (1 of 2)

- Include assessment of risk for meter accuracy in sampling plan
  - Higher risk for covered emissions, covered product data, and larger, more uncertain sources
  - Low risk for non-covered emissions and small sources

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## Verification of Measurement Accuracy (2 of 2)

- Confirm all measurements claimed as exempt meet specified exemption requirements
  - Public utility gas meters must meet CPUC requirements
  - Financial transaction meter criteria ( § 95103(k)(7))
  - Exempt biomass measurement (C&T § 95852.2(a))
  - CH<sub>4</sub> and N<sub>2</sub>O from biomass-derived fuel combustion are **not exempt** from accuracy requirements unless *de minimis*

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## Meter System Verification Issues

- Are the meter specifications appropriate for the application (e.g. fluid type, flow range, temperature range)?
- Was the meter installed per manufacturer specifications (e.g. required straight pipe lengths upstream and downstream)?
- Is the meter being maintained and operated per manufacturer specifications?
- Was the meter calibrated for the full period of data reporting, per U.S. EPA and MRR calibration requirements?
- Do the meter calibrations demonstrate required meter accuracy?

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## Addressing Meter System Issues in the Verification Risk Assessment (1 of 2)

- Verification risk assessments must address risk of inaccurate data from meter system issues
- Every verification team should include personnel knowledgeable about meter systems
- GHG monitoring plan should describe the meter system (specifications, calibrations, operation, maintenance)

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## Addressing Meter System Issues in the Verification Risk Assessment (2 of 2)

Complete documentation on high risk meters should be obtained and reviewed during the verification

- OEM specifications on fluid type, range, and temp. vs. in-service use
- Summary of OEM installation requirements vs. as-built confirmation
- OEM operation and maintenance procedures vs. in-service procedures
- OEM calibration procedures vs. in-service procedures
- Accuracy requirements for each meter and failed calibration procedures

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## Meter System Factors Contributing to Higher Verification Risk

- Meters operated by the reporting facility (particularly when no independent supplier data is available to compare to metered results)
- Meters that provide data used in the calculation of more than 5% of covered emissions
- Meters that provide data used in the calculation of *any* covered product data
- Complex metering systems that require multiple sensors
- Meter systems with sparsely available OEM and facility documentation
- Meter systems with infrequent calibrations (over one year) and no intervening field accuracy assessments

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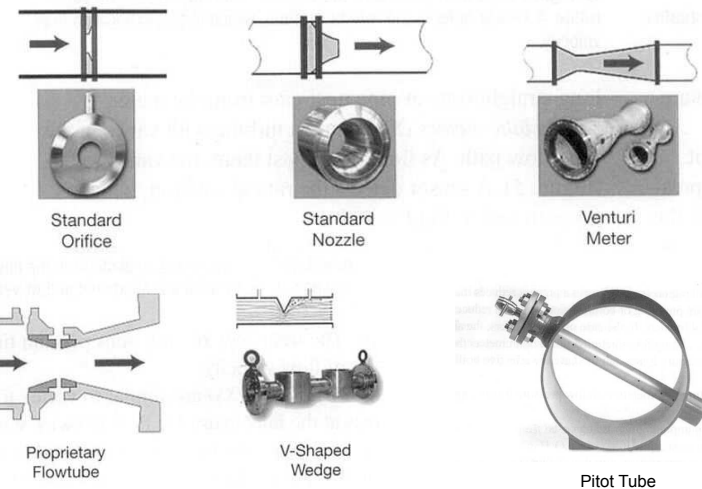
## Meter System Factors Contributing to Lower Verification Risk

- Meters producing data for minor and “*de minimis*” emission sources
- Meters exempt from § 95103(k) measurement accuracy requirements
  - Meters solely used to collect data on non-covered emissions and non-covered production
  - Financial transaction meters where supplier (meter operator) is independent of facility operator (see § 95103(k)(7))

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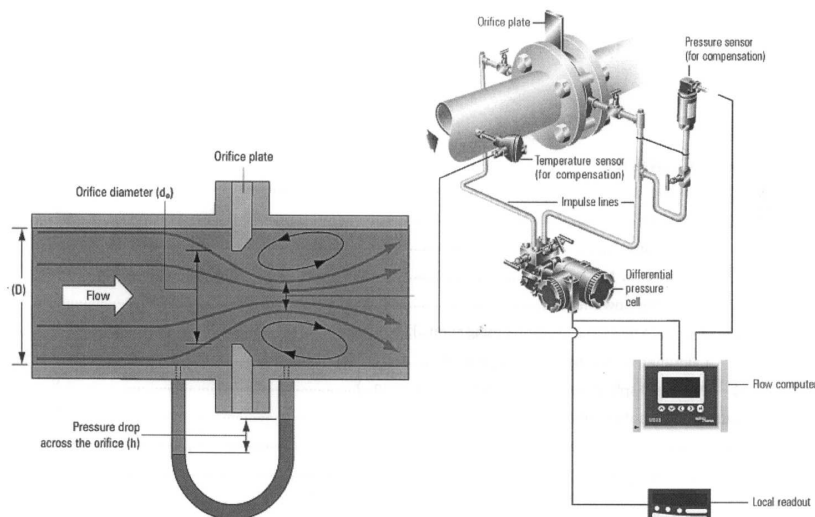
## Wide Range of Flow Meter Types Used

Differential Pressure Meters (including orifice, nozzle, venture, wedge and Pitot tube meters)



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## Orifice Plate Meters are the Most Common



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## Orifice Plate Meters (1 of 2)

- Common application for gas and steam flow meters
- OEM specified installation – minimum straight pipe lengths required upstream and downstream for linear flow
- Orifice meters have three sensors that must be separately calibrated (static pressure, differential pressure and temperature)
- Orifice plates must be installed correctly and must be inspected to check for deposits or etching of orifice - see § 95103(k)(6)
- The 5% meter accuracy requirement applies to the entire meter (i.e. sum the errors from each of the three sensors)

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## Orifice Plate Meters (2 of 2)

- During verification, graph flow to look for sudden changes or creep
- If plate replaced or serviced, look for sharp change in flow on service date
- During site visit, check that plate installed correctly (engraving faces upstream)
- Measure pipe diameter, upstream and downstream straight run
- Take photos of installation for future reference

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## Orifice Plate Example Calibration Record

Orifice Plate - Meter Tube Information			
Tube I.D.	1.939	Plate I.D.	1.732
Orifice Taps	Pipe <input type="checkbox"/> Flange <input type="checkbox"/>		
Orifice Fitting:	Serial No. _____		
Sr. <input type="checkbox"/> Jr. <input type="checkbox"/> Simplex <input type="checkbox"/> Flg. <input type="checkbox"/>			
<b>Plate Inspection</b>			
Plate Clean	Yes <input type="checkbox"/> No <input type="checkbox"/>		
Plate Damaged	Yes <input type="checkbox"/> No <input type="checkbox"/>		
Plate Change <input type="checkbox"/> Tube Change <input type="checkbox"/>			
Removed _____	Installed _____		

Thermometer			
Found		Left	
Range	Test Ther	Rec	Test Ther
High		200	
Flow		60.73	
Low		0.005	
<b>Static Pressure</b>			
Found		Left	
D W	Rec	D W	Rec
PSIG	24.85	PSIG	0
+A P	249.85	+A P	250
PSIA	274.70	PSIA	500
Date	4-11-12	Time	200 a.m.
Tester	Joe Bratt		

Differential					
Found	Left		Test Method PK <input type="checkbox"/> W.C. <input type="checkbox"/>		
Temp. Comp. Yes <input type="checkbox"/> No <input type="checkbox"/>	W.C. Temp. _____ °F				
W.P. Zero As Found					
Friction Test: O K <input type="checkbox"/> Reset <input type="checkbox"/>					
Found		Left			
Up	Down	Up	Down	Up	Down
PK/WC	Rec	PK/WC	Rec	PK/WC	Rec
		0.05			0
		74.99			75
		149.98			150

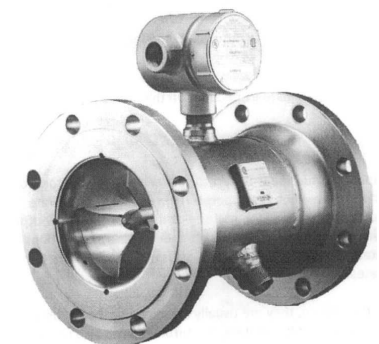
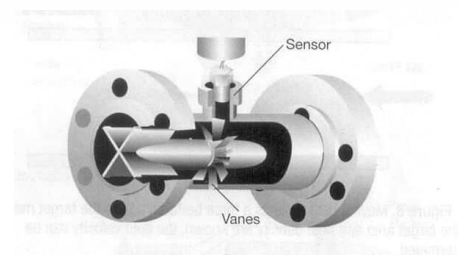
34

## Orifice Plate Example Calibration Record

Meter Type <b>ORIFICE</b>	Manuf <b>ALLEN BRADLEY</b>	Type <b>EFM</b>	<b>Differential Tests</b>			
S.N. 1 <b>DP-07292135</b>	S.N. 2 <b>SP-09070828</b>	Model No. <b>N/A</b>	DP Test Inst. <b>CRYSTAL 33</b>	Serial Number <b>2262-738439</b>		
DP Range <b>200</b>	SP Range <b>3000</b>	Static Set <b>PSIG</b>	DP Avg Initial <b>51.300</b>	DP Avg Final <b>46.300</b>	WP Zero <b>-.100</b>	AP Zero <b>-.100</b>
Taps <b>FLANGE</b>	SP Conn. <b>US</b>	D.P. Cutoff	Leak Found <b>No</b>	Pen Lag <b>N/A</b>	Arc <b>N/A</b>	Friction / Drag <b>N/A</b>
<b>Static Tests</b>			As Found Test	As Found Meter	As Left Test	As Left Meter
SP Test Inst. <b>CRYSTAL 33</b>	Serial No. <b>2262-738439</b>	SP Avg Initial <b>406.000</b>	SP Avg Final <b>405.000</b>			
As Found Test <b>405.100</b>	As Found Meter <b>405.000</b>	As Left Test <b>405.000</b>	As Left Meter <b>405.000</b>			
0.000	0.000	0.000	0.000			
<b>Temperature Test</b>			<b>Meter Tube / Plate Data</b>			
Temp Type <b>EFM</b>	Serial No. <b>CH105F2T4</b>	Scale	Fitting Manuf. <b>OTHER</b>	Type <b>FLANGE</b>	Serial No. <b>N/A</b>	Tube ID <b>4.026</b>
Temp Range <b>0-249.8</b>	Temp Test Inst. <b>OTHER</b>	Serial No. <b>111541364</b>	Inspect Plate <b>Yes</b>	Plate Clean <b>Yes</b>	Mic Plate <b>Yes</b>	Plate Cond. <b>Good</b>
As Found Test <b>76.700</b>	As Found Meter <b>76.000</b>	As Left Test <b>76.000</b>	As Left Meter <b>76.000</b>	Plate Bore <b>1.000</b>	Plate Changed <b>No</b>	Beta Ratio <b>0.25</b>

35

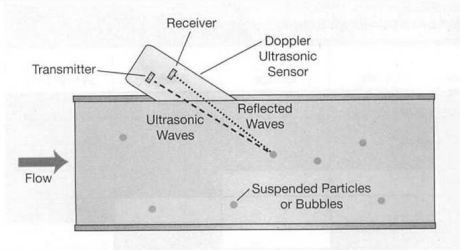
## More Common Flow Meters - Turbine Flow



- Requires temperature and pressure correction (normally internal)
- Best application is steady fluid flow
- Requires flow straightener vanes or long runs of straight pipe
- Internal parts should be inspected periodically for wear or corrosion

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## More Common Flow Meters - Ultrasonic



- Two types – Doppler and Time-of-Flight
- Common use in natural gas transmission
- Requires long straight pipe upstream and downstream
- These are low maintenance meters



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## Natural Gas Combined Cycle Electric Generating Unit Flow Meters

Most report CO<sub>2</sub> under 40 CFR 75 Appendix G 2.3

- This reporting is commonly referred to as CEMS CO<sub>2</sub> reporting, but does not make use of stack gas CO<sub>2</sub> and exhaust gas flow meters
- These facilities use CEMS software to calculate CO<sub>2</sub> emissions based on fuel gas flow from an orifice meter and heat content from a gas chromatograph
- Calibration standards per 40 CFR 75 App. D (sum of three sensor errors 4% or less, and orifice inspection within tolerance)
- Verify meters meet § 95103(k)(10) - exempt from § 95103(k)(1-9)
- Supplier fuel data normally available for comparison to reported fuel flow and heat content data

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## Group Participation Exercise 1.3.3: Measurements and Monitoring

An operator of an electric generation facility subject to Subpart D discovers that a natural gas fuel meter was out of calibration by 2%, and instead of adjusting the meter back into calibration, the operator replaces the meter

- What information should the verifier request?
- What actions should the verifier take?

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## Group Participation Exercise 1.3.3: Measurements and Monitoring - Solution (1 of 2)

**What information should the verifier request?**

- Calibration schedule to determine if frequency meets OEM requirement
- Dates and operating schedules for old meter removal and new meter installation - are there data gaps?
- Qualifications of person installing and calibrating new meter
- Initial calibration records for new meter
- OEM manual to determine if meter is fit for purpose - was it designed for that type of gas or liquid, moisture content, and pressure range?
- Explanation of which parts of the metering system are examined and evaluated for accuracy and which inputs are used to estimate flow
- Unless same meter type is used to replace the meter, ensure units of measurement in the measured output are the same

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### Group Participation Exercise 1.3.3: Measurements and Monitoring - Solution (2 of 2)

#### What actions should the verifier take?

- If both (old and new) meters are demonstrated to be +/- 5% accurate, then meters are deemed correct
- If new meter is not accurate, identify in issues log.
  - Determine whether reporter used a temporary method or an ARB-approved alternate method
  - Determine whether reporter used missing data provisions
  - Method(s) should be described in GHG Monitoring Plan

Review the (Meter Calibration and Accuracy: Emissions Data Metering for Greenhouse Gas Reporting) Guidance

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## Questions and ARB Comments

1. Excluded Sources
2. *De minimis* Emissions
3. Measurement Accuracy
4. **Missing Data**
  - **Types and Requirements**
  - **Missing Data Options**
  - **Evaluation and Verification**
5. Product Data

California Environmental Protection Agency  
 **Air Resources Board**

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### Types of Missing Data § 95129 (Applies to Emissions Data Only)

- Part 75 - use of Part 75 missing data provisions
- CEMS - use applicable Part 60/75 provision
- Fuel characteristic data § 95129(c)
  - High heat value of non-pipeline natural gas
  - Carbon content of mixture of petroleum coke and coal
- Fuel consumption § 95129(d)
  - Gallons of diesel fuel
  - Therms of natural gas
  - Wood waste or other biogenic sources

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### Missing Data § 95129

- Reporting entities must make every reasonable effort to collect valid data
- Most invalid or missing emissions data can be replaced using provisions in § 95129
- Missing data estimates are conservative and overestimate actual emissions
- However, correctly substituted data is treated as “accurate” by verifier when evaluating material misstatement

[http://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/missing\\_data.pdf](http://www.arb.ca.gov/cc/reporting/ghg-rep/guidance/missing_data.pdf)

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## Requirements for Missing Data § 95129

- Missing data substitution only applies to data used to calculate emissions—it does not apply to covered product data
- **§ 40 CFR Part 75:** All missing data for fuel-based CO<sub>2</sub> calculation for units using Part 75 methods
- **§ 95129:** Fuel consumption, fuel characteristic data, steam production data for all emissions; CH<sub>4</sub> and N<sub>2</sub>O calculation for Part 75 and units using CEMS

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## Types of Missing Data Required to be Substituted Under § 95129

- If a facility has missing fuel consumption or fuel characteristic data, or steam data, missing data substitution **is required** by § 95129
  - Verifier must note date and source of any missing data substitutions discovered during verification in the verification report ( § 95131(b)(13)(D))
- The following two examples do not trigger missing data because they do not impact data quality
  - Not following re-calibration frequency but subsequent calibration was found to be in compliance with measurement accuracy
  - A faulty temperature probe for a process that never changes temperature

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## Options for Missing Fuel Consumption Data under § 95129(d)(1),(2), and (3)

- Option 1: Estimate using load ranges
- Option 2: Estimate data capture rate for fuel consumption data
- Option 3: Use maximum potential fuel consumption rate if data capture rate is not available

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## Options for Missing Fuel Consumption Data under § 95129(d)(1): Option 1: Load Ranges

- Eligible sources (electricity generation)
- Create and maintain fuel-specific databases
- Establish 10 operating load ranges or use approved alternate load ranges (units producing electrical or thermal output, only)
- Estimate using previous 720 hours of data, use higher load ranges, and max potential flow rate, if necessary
- Lookback period of 3 years

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## Options for Missing Fuel Consumption Data under § 95129(d): Option 2: Data Capture

- Estimate data capture rate for fuel consumption data as required in § 95129(d)(2)  
Data capture rate:  $(\# \text{ obtained} / \# \text{ required}) \times 100$
- Use the following methods depending on capture rate

Data Capture Rate	Data Substitution Method
≥ 95%	Available process data
90-95%	90 <sup>th</sup> percentile value recorded in current and previous 2 years, use prorate procedure if required
80-90%	95 <sup>th</sup> percentile value recorded in current and previous 2 years, use prorate procedure if required
<80%	Maximum potential rate

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## Options for Missing Fuel Consumption Data under § 95129(d): Option 3: Use Max. Value

- Applies if unit is unable to use options 1 or 2, because no quality-assured data is available in missing data lookback period
- Use maximum fuel consumption for the unit for each hour of missing data

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## Evaluating Missing Data for Tier 4 Units (1 of 2)

- For missing fuel consumption data, follow same missing data procedures as for other tiers
  - If fuel consumption data were not used for emission calculation, operator may use best available estimate to fill missing data
- Do the missing CEMS data substitution procedures conform with applicable procedures in 40 CFR Part 60 and 75?

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## Evaluating Missing Data for Tier 4 Units (2 of 2)

- If there was a serious CEMS breakdown, did the reporter
  - Request and receive approval to use interim data collection procedures during the breakdown period?
  - Change calculation methods and follow Tier 2 or Tier 3 requirements during the breakdown?

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## Requirements for Missing Fuel Characteristic Data § 95129(c): HHV, CC, MW, etc.

- Reanalyze sample or analyze backup sample to obtain valid data
- Otherwise, estimate data capture rate  
(# obtained/# required x 100%)

Data Capture Rate	Data Substitution Method
≥ 90%	"Before and after" averaging
80-90%	Highest value recorded in current and previous 2 years
< 80%	Greatest of highest recorded of all records, or default in Table 1

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## Evaluating Missing Data for CH<sub>4</sub> and N<sub>2</sub>O Emissions and Source Test Data

- Follow the missing data procedures for evaluating evidence as specified in § 95129(d) - three options
- Part 75 and CEMS units also must follow § 95129(d) for CH<sub>4</sub> and N<sub>2</sub>O (unless *de minimis*) even though they do not use § 95129 for CO<sub>2</sub>
- If facility is using source testing to derive EF
  - Based on source test report, verify that source testing followed the ARB-approved test plan
  - Verify that calculations followed applicable procedures using source-specific EFs

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## Other Missing Data Substitution Requirements

- May use ARB-approved interim data collection procedure for fuel analytical data in case of equipment breakdown and loss of data >10% (§ 95129(h))
- Substitute missing steam production data based on data capture (§ 95129(e))
  - Use process data, 90<sup>th</sup> percentile value, highest value
  - If steam data are missing, contact ARB staff
- Note that a temporary method can be used to avoid missing data substitution – reporter notifies ARB and uses for <365 days (§ 95103(m)(4))

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## Missing Data Nonconformance

- If missing data affects greater than 20% of an emissions source, **OR** 5% of total emissions, a finding of nonconformance is issued and described in verification statement (§ 95131(b)(13)(C))
  - Includes fuel flow, fuel characteristics (HHV, CC, MW)
- If missing data procedure is used correctly, the substitute emissions data is defined as acceptable and does not impact evaluation of material misstatement (error = 0)

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## Verifying Missing Data Substitution § 95131(b)(13)

- If  $\leq 20\%$  of missing data are substituted and verifier confirms that correct procedure was used, a finding of conformance with required emissions calculation methods is issued
- If missing data procedures are followed correctly, data are defined as accurate and correct, even if the result of using the substituted data overestimates emissions
  - This is “built into” the regulation to incentivize reporters to minimize missing data

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## Group Participation Exercise 1.3.4: Missing Fuel Flow Data

Boiler burns natural gas to generate steam:

- At least 23% of the fuel flow data is missing
- HHV of gas is between 1,075 and 1,100 Btu/scf for 355 of 365 days
- Load range data is available per § 95129(d)(1)

What information should the verification team request?

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## Group Participation Exercise 1.3.4: Missing Fuel Flow Data - Solution

What information should the verification team request?

- Fuel flow data and operator’s method of missing data substitution (GHG Monitoring Plan)
- Data from another source, utility meter, or other fuel supplier
- Cause of missing data and steps taken to prevent future data risks
- **A nonconformance exists because >20% of the data used to estimate flow data is missing (see §95131(b)(13)(C)), regardless of the quality of the substituted data**

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## Group Participation Exercise 1.3.5: Missing Data

A boiler burns a mixture of natural gas and landfill gas (verified exempt) with the following data capture rates. How should missing data be substituted to calculate emissions?

	Natural Gas	Landfill Gas
Annual HHV (avg.)	955 Btu/scf	510 Btu/scf
% data capture of HHV	88%	100%
% data capture of CC	76%	0%
% flow data capture	88%	88%
Max HHV	1,045 Btu/scf	540 Btu/scf
95th percentile value of fuel flow (3yrs)	12,000 scfm	1,800 scfm
Fuel analytical data	86% CH <sub>4</sub> , 7% CO <sub>2</sub>	varies

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## Group Participation Exercise 1.3.5: Missing Data - Solution

- Natural Gas
  - Not pipeline quality (970 to 1,100 Btu/scf, and at least 90% CH<sub>4</sub>, <5% CO<sub>2</sub>)
  - Must use Tier 3 (measured CC)
  - Less than 80% data capture for carbon content, so use greatest of highest value or default from Table 1 (75%)
  - Fuel flow substituted using load ranges, if available, otherwise use 95% percentile value (>80% data capture)
- Landfill (biogas) emissions
  - Verified exempt (not covered), so may use either Tier 1 or Tier 2
  - Missing data substituted using § 98.35 (average of before and after, and best available allowed)

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## Questions and ARB Comments

1. Excluded Sources
2. *De minimis* Emissions
3. Measurement Accuracy
4. Missing Data
5. **Product Data**
  - **Covered Product Data**
  - **Verifying Covered Product Data**
  - **Product Data Verification Statement**

California Environmental Protection Agency



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## Covered Product Data ( § 95103(l)) (1 of 2)

- Required to support Cap-and-Trade Program direct allocation of allowances through product- based benchmarks
  - For each covered product, the operator must report a matching NAICS code and perform the activity listed with the product in Table 9-1
- Independent from emissions data verification
- Verifier must confirm that missing data were not used in place of actual product data
  - Missing data provisions DO NOT apply
- Covered products listed in § 95110, 95113-95120, 95124, and 95156 (especially 95115(n))

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## Covered Product Data ( § 95103(l)) (2 of 2)

- For many covered products, data must be quantified on a production basis. Some covered products are quantified on a sales basis, and some are intermediate products.<sup>1</sup>
  - Check reporting requirements to each covered product to determine which method is required.
  - Covered product data ONLY includes materials produced on-site.
  - Use of sales data with an inventory adjustment is considered equivalent to production data for products that are sold

<sup>1</sup>Covered Product Data General Reporting and Verification Guidance

64

## Verifying Covered Product Data § 95131(b)(8)(E) (1 of 2)

- Plant engineer and operations may be separate from accounting and sales departments—be sure to check data with both sources, if applicable
- Verification is evidence-based – review raw data *and* compiled data from daily production records, accounting, and sales department to determine accuracy of reported data.

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## Verifying Covered Product Data § 95131(b)(8)(E) (2 of 2)

- Types of information to request and check
  - Product inventory and stock records
  - Product sales records and contracts
  - Onsite and offsite product delivery records
  - Purchase and delivery records for inputs to products
  - Product measurement records
  - Other information that provides financial or direct measurement information about total products reported
- Request explanation of why sales data accurately represents the quantity of produced covered product, if applicable

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## Verifying Covered Product Data and Conflicts of Interest (95133(b)(2)(H)-(I))

- Verifiers must NOT perform a risk-based analysis of covered production data based on the contribution of that data to free allowance allocation
  - Doing so constitutes a high conflict of interest under 95133(b)(2)(H) and (I)
    - (H) Appraisal services of carbon or greenhouse gas liabilities or assets
    - (I) Brokering in, advising on, or assisting in any way in carbon or greenhouse gas-related markets
- Verifiers must instead check ALL covered product data for conformance and material misstatement

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## Verifying Covered Product Data § 95131(b)(7) Sampling Plan

- The verifier's risk analysis and sampling plan must include all covered product data.
- The verifier must conduct an in-depth review for covered products identified as the highest risk, including detailed data checks and review of data management systems.
- For all other covered products the verifier should at a minimum review the data management systems for data collection, and review data as needed, to reach reasonable assurance that each covered product meets the accuracy requirements of section 95103(k).

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## Requirements Specific to Measurement of Covered Product Data: Inventory, Stock, or Tank Drops § 95103(k)(11)

- All methods used to measure inventory, stock, or tank drops must achieve +/- 5% accuracy
- Quantification of a calendar year inventory adjustment or use of a material balance method must achieve +/- 5% accuracy for the year
- Techniques used to quantify amounts stored at the beginning and end of a time period are not subject to calibration requirements
- Verifier must confirm whether a correctable error exists and once corrected, account for uncertainty in amounts stored at the beginning and end of a time period in material misstatement assessment

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## Verifying Covered Product Data Measurements (1 of 3)

- Verifiers should not assume what is reported is complete
- Evidence to request
  - Scope of all owned and operated assets
    - Establish that all covered product data are properly evaluated
    - Ensure that all relevant business relationships are understood
  - GHG Monitoring Plan
  - Documentation of procedures and results for each product measurement device
  - Calculation of volumes/masses of inventory, stock, or tank drop measurements ( § 95103(k)(11))

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## Verifying Covered Product Data Measurements (2 of 3)

### How to evaluate evidence

- Same calibration requirements as emissions data
- Determine frequency of recalibrations meet rule requirements
- Determine calibrations demonstrate meters within +/-5% accuracy
- If accuracy spec not met and data not excluded, THEN verifier to document as “nonconformance” ( § 95103(k)(10))
- Failure to correct a correctable error results in adverse verification statement

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## Verifying Covered Product Data Measurements (3 of 3)

- How to evaluate evidence
  - Inventory, stock, or tank drop measurements ( § 95103(k)(11))
    - Compare records and independent calculations to reported fuel consumed/product produced (beginning/end of year estimates)
    - Check that all measurement devices meet accuracy requirements
  - **No use of data substitutions**
- Note: Changes in Product Calculation Method § 95103(m)

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## How to Cross-check Data

- **Data that are only used for reporting to ARB should be scrutinized very carefully**
- After using the same method to re-calculate covered product data, ask for any other data that can be used as evidence to corroborate the reported data
  - Sales data with an inventory adjustment may be a good comparison
  - Ask for internal production reports that are used by accountants and corporate management. If everyone uses the data, it's more likely to be "correct."
- Document why the cross-check supports your findings

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## Excluded Product Data § 95103(I)

- Data reporters are required to exclude portions of covered product data that are not measured accurately (and may elect to exclude accurate data)
  - Not an "all-or-nothing" allocation
- Does not impact the verification statement
  - Excluded covered product has no impact on assessment of material misstatement and conformance with measurement accuracy requirements of remaining covered product data

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## Reporting Excluded Product Data § 95103(I)

- Missing or invalid covered product data is still reported separately using best available methods
  - Evaluated for conformance, but allocations are only provided for verified covered product data that are accurate
- **Does not apply to cement covered product data**

Adjusted Clinker and Mineral Additives Produced = Clinker Produced x (1 + (Limestone and Gypsum Consumed)/Clinker Consumed))

Calculation does not allow data to be excluded

75

## Product Data Verification Statement



VERIFICATION STATEMENT - PRODUCT DATA <small>(delete this page if no product data)</small>	
<b>PART I. EMISSIONS DATA REPORT INFORMATION</b>	
1. REPORTING YEAR: 2014 data reported in 2015	
<b>PART II. VERIFICATION BODY INFORMATION</b>	
1. VERIFICATION BODY NAME:	
<b>PART III. REPORTING ENTITY INFORMATION</b>	
1. NAME OF REPORTING ENTITY:	2. ARB ID NUMBER:
<b>PART IV. VERIFICATION STATEMENT INFORMATION</b>	
1. This verification statement attests that the submitted data are (check one) <input type="checkbox"/> reasonably assured of being free of material misstatement <input type="checkbox"/> NOT reasonably assured of being free of material misstatement	
2. This verification statement attests that the submitted data are (check one) <input type="checkbox"/> reasonably assured of being in conformance with the regulation <input type="checkbox"/> NOT reasonably assured of being in conformance with the regulation <input type="checkbox"/> NOT reasonably assured of being in conformance with the regulation, including NOT in conformance with §95131(b)(9): failure to correct data errors discovered during data checks	
3. As a result of the selections above, the final verification statement is (check one) <input type="checkbox"/> positive: reasonably assured of no material misstatement and in conformance with the regulation <input type="checkbox"/> qualified positive: reasonably assured of no material misstatement, but not reasonably assured in conformance with the regulation <input type="checkbox"/> adverse: not in conformance with §95131(b)(9) and/or not reasonably assured of no material misstatement	
4. Qualifying Statement (required for qualified positive or adverse statements):	

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## Group Participation Exercise 1.3.6: Covered Product Data Verification

A tomato processing facility reports the following product data. What verification statement(s) is likely?

	Reported by Operator	Verifier Calculated	Difference
Total Combustion Emissions (MT)	124,005	124,001	4 (0.003%)
Diced tomatoes (tons)	350,000	350,012	-12
Aseptic tomato paste (31%TSS) (tons)	154,505	154,499	6
Salted and dried zucchini slices (tons)	45,670		
Quantity of covered product data (tons)	504,505	504,511	6 (.001%)

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## Group Participation Exercise 1.3.6: Covered Product Data Verification - Solution

If zucchini is removed from emissions data report, verifier submits positive product data VS

	Reported by Operator	Verifier Calculated	Difference
Total Combustion Emissions (MT)	124,005	124,001	4 (0.003%)
Diced tomatoes (tons)	350,000	350,012	-12
Aseptic tomato paste (31%TSS) (tons)	154,505	154,499	6
<del>Salted and dried zucchini slices (tons)</del>	<del>45,670</del>		
Quantity of covered product data (tons)	504,505	504,511	-6 (.001%)

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## Other Product Data (Not “Covered”)

- Verified for conformance, not +/-5% accuracy or material misstatement
- Only products in C&T Table 9-1 are “covered” product data
- Examples of product data that are not covered include
  - Rare earth oxide equivalents
  - Corn entering wet milling process
  - Cement production

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## Questions and ARB Comments

### Course 1: General Verification

#### **Complete:**

- 1.1 Verification Principles, Requirements, and Procedures
- 1.2 Stationary Fuel Combustion and Sorbent Sources
- 1.3 Accuracy & Product Data

#### **Next:**

- 1.4 Electricity Generating Units & Cogeneration

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# Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting

## General Verification Course 1.4 - Electricity Generating Units and Cogeneration

California Environmental Protection Agency



## Verifier Accreditation Training for Mandatory Greenhouse Gas Reporting

### Course 1: General Verification

- 1.1 Verification Context, Principles, and Program Overview
- 1.2 Stationary Fuel Combustion and Sorbent Sources
- 1.3 Accuracy and Product Data
- 1.4 Electricity Generating Units and Cogeneration

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## Course 1.4 Handouts

- 1.4.1 Energy Disposition
- 1.4.2 Sample Cogeneration Emissions Data Report
- 1.4.3 Comprehensive Case Study

## Course 1.4 Electricity Generating Units and Cogeneration

1. Applicability
2. Comparison of MRR § 95112 and 40 CFR Part 98
3. Electricity Generating Units
4. Verifying Emissions Data
5. Group Participation Exercises

3

4

## MRR § 95112 - Applicability

Facilities subject to MRR with Electricity Generating Units (EGUs)

- Must follow § 95112 for EGUs if  $\geq 1$  MW
- When total nameplate generating capacity  $< 1$  MW, must report, but may elect to follow § 95115 and report EGUs as stationary fuel combustion
- Other (non-EGU) SFC sources report under § 95115



5

## Facility Types Reporting under § 95112

- EGUs that are subject to the requirements of the Acid Rain Program and 40 CFR Part 75
- Geothermal electricity generating facilities
- EGUs include cogeneration and bi-generation units, as well as facilities that generate only electricity and no steam
- Exclusion
  - Electricity generating facilities that are solely powered by nuclear, hydroelectric, wind, or solar power **with stationary fuel combustion emissions  $< 10,000$  MT CO<sub>2</sub>e**

6

## § 95112 and Subparts C and D

§ 95112 consistent with 40 CFR Part 98 except

- Refers to Subparts C and D as modified by § 95115
- Requires reporting of
  - CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions reported by fuel type for each EGU (or aggregated group of EGUs) subject to reporting
  - Information about the electricity generating facility and units (§95112(a) and (b))
  - CO<sub>2</sub> and CH<sub>4</sub> emissions from geothermal facilities (§95112(e))
  - CO<sub>2</sub> emissions from hydrogen fuel cells (§95112(f))
  - On-site renewable electricity generation (§95112(g))

7

## Energy Data Reported Under § 95112

- Disposition of generated electricity and thermal energy (§95112(a)(4-5))
- Block diagram of equipment, energy flows, and meter locations (§95112(a)(6))
- For cogeneration or bigeneration units, total thermal output generated by the unit that can be potentially utilized in other industrial operations that are not electricity generation ((§95112(b)(3))
- Detailed reporting of steam or heat acquired from external sources for power generation (§95112(b)(8))
- For bottoming cycle cogeneration units only, also report input steam to the steam turbine and the output of the heat recovery steam generator (§95112(b)(8))

8

## Methods to Calculate CO<sub>2</sub> Emissions

Facilities/Units Subject to Part 75 are given a choice to report either

- Under Part 75 (Subpart D)
  - Fuel-based methodology (40 CFR 75.13(b) and Appendix G, Section 2.3, Eq. G-4), or
  - CO<sub>2</sub> or O<sub>2</sub> monitors (40 CFR 75.13(a)-(c))

or

- Under Part 98 (Subpart C)
  - Applicable Part 98 (Tier) methods may be used (§ 95112(c))
    - subject to the limitations in § 95103(m) for changing methods after 2013

9

## Geothermal Facilities/Units: Methods to Calculate CO<sub>2</sub> and CH<sub>4</sub> Emissions

Source-specific emission factors derived from an ARB approved measurement plan (§ 95112(e))



0

## Questions and ARB Comments

1. Applicability
2. Comparison of MRR § 95112 and 40 CFR Part 98
3. Electricity Generating Units
  - Boundaries
  - Types
  - System Energy Accounting
4. Verifying Emissions Data
5. Group Participation Exercises

## Data Reported by Facility/EGU

- Unit ID number (CEC, EPA, etc.)
- Nameplate generating capacity by unit
- Type of facility
- Disposition of generated electricity
  - Provided to retail provider or marketer who distributes over the grid (name of provider/marketer)
  - Provided or sold directly to particular end-users (customers)
  - If applicable, amount of electricity used by industrial processes/operations on site

## Electricity Generating Facilities/Units Subject to Verification

- Approximately 270 facilities were verified that generated electricity
  - 113 stand-alone power plants
  - 84 industrial/institutional/commercial facilities
    - Oil and gas, universities, paper manufacturing, landfills, etc.
  - 69 independently operated cogeneration facilities
  - 4 bigeneration plants
- Fuel is mostly natural gas, with some biomass-derived fuel, refinery fuel gas, and several geothermal plants

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## Facility Boundary § 95112(a)(3)

- Stand-alone - Independently operated and sited facility
  - Only emissions within facility boundary are reported
- Industrial/institutional/commercial electricity generating facility
  - Emissions from adjacent or co-located thermal host included in the facility boundary if shared ownership or operational control
    - Emissions from non-adjacent thermal host not included

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## Types of Cogeneration Facilities/Units

- Approximately 140 electricity-only power plants (not cogeneration, but includes combined cycle)
- 125 topping cycle cogeneration facilities
  - Oil and gas, hospitals and universities, food processing, lumber mills, refineries
- 5 bottoming cycle cogeneration facilities
  - Hydrogen production
  - Calciners

15

## Thermal Energy Generation Data

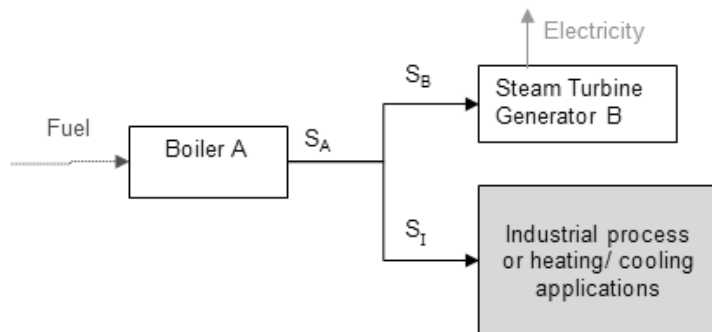
### Video of cogeneration

<http://www.youtube.com/watch?v=dRqqUCLjmqE>

16

## Bigeneration § 95112(a)(3) and (b)(1)(D)

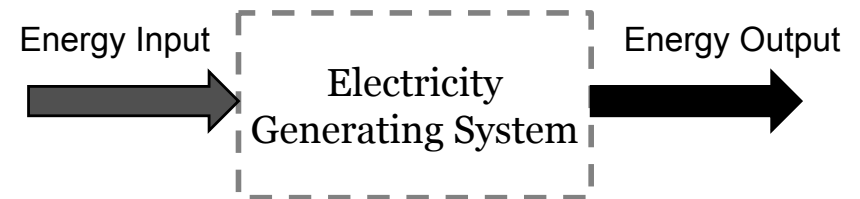
EGU that simultaneously produces electricity and steam from the same fuel source but does not utilize waste heat



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## System Energy Accounting (1 of 2)

“System boundary” is the foundation for determining what energy quantities are to be reported under § 95112(a) and (b)



The difference between energy input and energy output is waste energy (e.g., vented steam and mechanical friction)

18

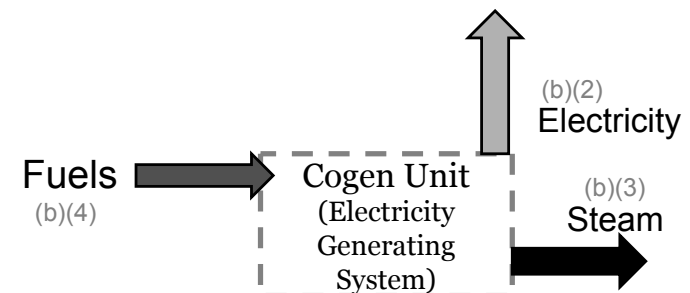
## System Energy Accounting (2 of 2)

- § 95112(a) - Indicates where the generated energy flows go after they leave the system
- § 95112(b) - Accounts for the energy inputs and outputs of the EGU or the electricity generating system
- To ensure the system energy balance is completely accounted for, a system energy diagram is critical

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## Simplified Block Diagram § 95112(a)(6)

- Equipment associated with the electricity generating system, and any equipment or industrial processes outside of the system that may inform energy flows
- Flows of energy (fuel input, electricity output, thermal output) shown with arrows and labels



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## System Approach

- Reporters aggregate the individual units in an electricity generating system (EGS) if the units are integrated
- Types of systems
  - Cogeneration system
  - Bigeneration system
  - Combined-cycle electricity generation system
  - System of boilers producing steam to power steam turbine generators
- Auxiliary or stand-by boilers
  - If the boiler does not contribute to electricity generation (boiler steam feeds a steam turbine generator), report it separately under subpart C

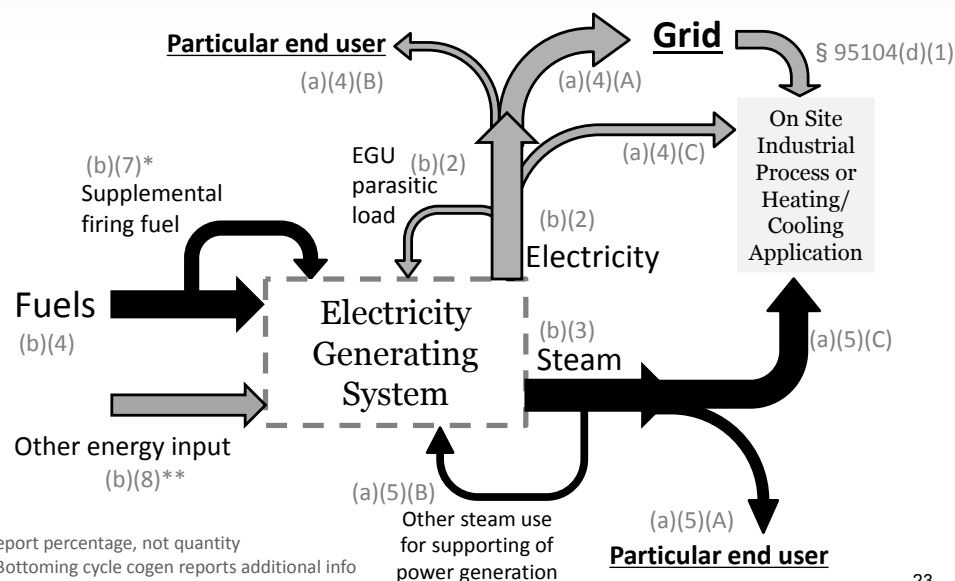
21

## Data Reported by Cogeneration or Bigeneration Unit

- Thermal energy provided or sold to another end-user
- If applicable, amount of thermal energy used by industrial processes/operations on site not used to generate additional electricity
- Thermal energy excludes steam that is used for power production (e.g., steam used to drive a steam turbine generator)

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## Cogeneration System Energy Accounting



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## Total Thermal Output (1 of 2)

- Total amount of usable thermal energy that can potentially be made available for use in industrial/commercial processes, heating/cooling applications, or delivered to other end users. It includes
  - *Steam sold* § 95112(a)(5)(A). Thermal energy provided or sold to a particular end-user
  - *Parasitic Steam Use* § 95112(a)(5)(B). Thermal energy used for supporting power generation that has been included in the § 95112(b)(3) quantity but is not accounted for in either § 95112(a)(5)(A) or (C)
  - *Steam for Industrial Use* § 95112(a)(5)(C). Thermal energy used in other on-site industrial processes or heating/cooling applications that are not electricity generation
  - Thermal energy that is vented, radiated, or otherwise wasted
- Does not include steam to make more electricity

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## Total Thermal Output (2 of 2)

$$\text{The Sum: } \begin{cases} \$ 95112(a)(5)(A) \\ \$ 95112(a)(5)(B) \\ \$ 95112(a)(5)(C) \end{cases} \leq \$ 95112(b)(3)$$

- The difference between the two sides of the comparison is the thermal energy that was generated by cogen/bigen units but was not utilized for any useful purpose (e.g., vented steam)
- Include only thermal energy generated by a cogen/bigen system in these quantities
- Engineering estimation is acceptable

25

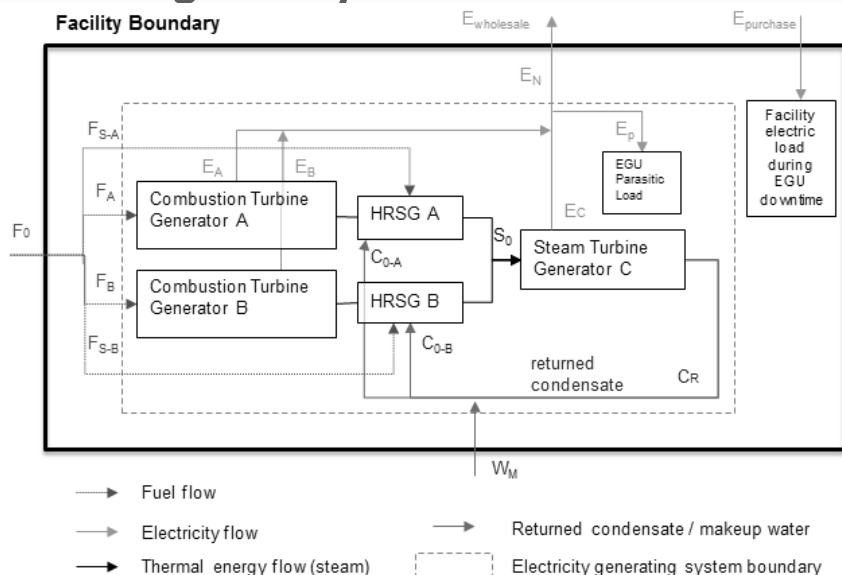
## Cooling Energy § 95112(a)(4)(C) and (a)(5)(C)

Cogeneration operator must now estimate and report electricity and thermal energy related to cooling energy (e.g., chilled water) if

- Provided to end user outside of facility boundary or
- Used for an on-site industrial process that is not part of electricity generation

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## Example of Combined Cycle Electricity Generating Facility



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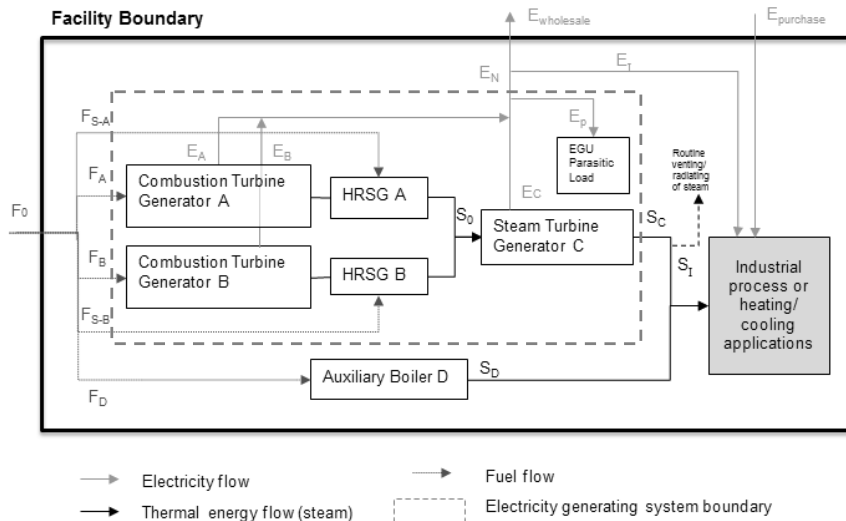
## Electricity Generation Data

Gross vs. net generation (*Example for previous slide*)

§95112	Item Description	Quantity
(a)(4)(A)	Generated electricity provided to wholesale (grid)	$E_{\text{wholesale}}$
(a)(4)(B)	Generated electricity provided or sold directly to particular end-user	0
(a)(4)(C)	Generated electricity used by on-site industrial processes or operations that are neither in support of or a part of the power generation system	$E_I$
(a)(5)(A)	Generated thermal energy provided or sold to particular end-user	0
(a)(5)(B)	Generated thermal energy for supporting power production	0
(a)(5)(C)	Generated thermal energy used by on-site industrial processes or operations (exclude any wasted energy)	$S_I$
(b)(2)	Gross generation	$E_A + E_B + E_C$
(b)(2)	Net generation	$E_N = (E_A + E_B + E_C) - E_P$

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## Example of Topping Cycle Cogen and Separate Aux Boiler



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## Verifying Electricity Generation and Disposition

- Evidence to request
  - Electricity generation and disposition measurement records
  - In the absence of an electricity meter, other records used to develop an engineering estimate
  - Facility meter layout and uses
  - CEC 1304 forms (use as a cross-check; not as primary data)
- How to examine evidence
  - Examine electricity generation and disposition records for completeness and accuracy
  - Review and confirm reasonableness of any engineering estimates
  - Confirm what is reported as net and gross generation is consistent with the applicable definitions

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## Verifying Thermal Energy Production and Disposition

- Evidence to request
  - Thermal energy production and disposition measurement records
  - In the absence of a steam meter, other records used to develop an engineering estimate
- How to examine evidence
  - Examine thermal energy production and disposition records for completeness and reasonable accuracy
  - Review and confirm reasonableness of any engineering estimates

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## Verifiers are Required to Review Energy Generation and Disposition if... § 95131(b)(8)(F)

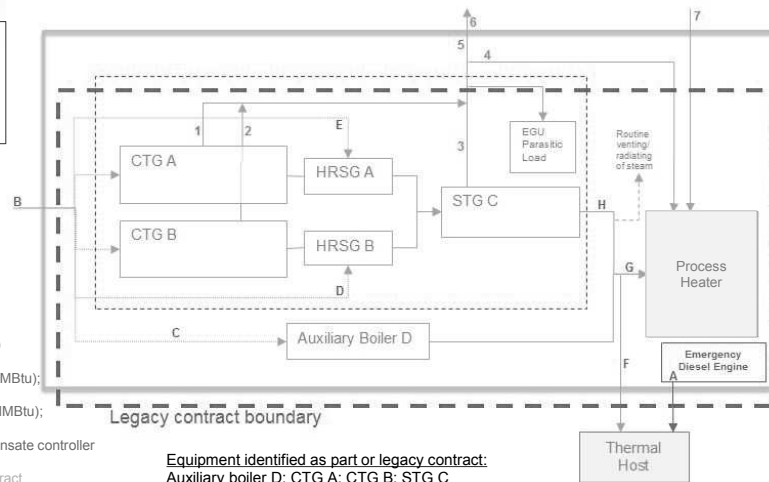
- The facility belongs to an industrial sector listed in Table 8-1 of the Cap-and-Trade Regulation;
- The operator is applying for legacy contract transition assistance<sup>1</sup> under the Cap-and-Trade Regulation; or
- The operator has applied for the limited exemption of emissions from the production of qualified thermal output pursuant to the Cap-and-Trade Regulation.<sup>2</sup>

<sup>1</sup> See new section 95112(i) for additional requirements for legacy contract data reporters; ARB will notify VB of legacy contract facility requirements upon COI submittal. A partial list of legacy contract generators is on page 13 of the Vintage 2015 Allowance Allocation report ([http://www.arb.ca.gov/cc/capandtrade/allowance\\_allocation.v2015\\_allocation.pdf](http://www.arb.ca.gov/cc/capandtrade/allowance_allocation.v2015_allocation.pdf).)

<sup>2</sup> A complete list of entities is on page 14 of the Vintage 2015 Allowance Allocation report. 32

## Legacy Contract Assistance Block Diagram

Not shown in this example but also required:  
fuel consumed by CTG A and B, and emissions associated with each piece of equipment shown.



Blue = Part of legacy contract  
A: Diesel engine fuel meter  
(0 gallons used / 0 kw provided)  
B: Utility revenue NG meter  
SCG4553 (4,595,000 Therms)  
C: NG fuel meter M104  
(624,300 Therms)  
D: Meter M110 (13,105 Therms)  
E: Meter M111 (12,440 Therms)  
F: Steam meter S33 (534,560 MMBtu);  
120 psi saturated steam  
G: Steam meter S32 (450,020 MMBtu);  
80 psi steam  
H: Steam conditioner and condensate controller

Orange = Not part of legacy contract  
1: Electricity meter E7 (90,988 MWh)  
2: Electricity meter E9 (101,543 MWh)  
3: Electricity meter E14 (22,043 MWh)  
4: Electricity meter E15 (25,915 MWh)  
5: Virtual meter E20 (188,659 MWh)  
6: Utility meter SCE 5150 (187,991 MWh)  
7: Utility meter SCE 5152 (9,911 MWh)

Equipment identified as part of legacy contract:  
Auxiliary boiler D; CTG A; CTG B; STG C  
Steam conditioner and condensate controller  
Legacy contract does not include electricity output

Emissions reported for cogeneration system: 498,643 MT CO<sub>2</sub>e  
Emissions reported for aux boiler: 63,250 MT CO<sub>2</sub>e

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## Questions and ARB Comments

1. Applicability
2. Comparison of MRR § 95112 and 40 CFR Part 98
3. Electricity Generating Units
4. Verifying Emissions Data
5. Group Participation Exercises

California Environmental Protection Agency

Air Resources Board

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## Group Participation Exercise 1.4.1: Determining § 95112 Applicability

- Given the following three facilities
  - A. EGU subject to the Acid Rain Program
  - B. Nuclear power plant with diesel-fired emergency generators that emitted 15,000 MT CO<sub>2</sub>e
  - C. Geothermal generating facility emitting 14,000 MT CO<sub>2</sub>e
- Which of the facilities are subject to reporting under § 95112?
  - A only
  - A and B
  - A and C
  - All of the above

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## Group Participation Exercise 1.4.1: Determining § 95112 Applicability - Solution

- Given the following three facilities
  - A. EGU subject to the Acid Rain Program
  - B. Nuclear power plant with diesel-fired emergency generators that emitted 15,000 MT CO<sub>2</sub>e
  - C. Geothermal generating facility emitting 14,000 MT CO<sub>2</sub>e
- Which of the facilities are subject to reporting under § 95112?
  - A only
  - A and B
  - A and C
  - All of the above

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## Group Participation Exercise 1.4.2: Determining Tier 4 Applicability

Which of these facilities must use the Tier 4 Methodology from 40 CFR 98.33 to calculate CO<sub>2</sub> combustion emissions?

- A. Facility not subject to Part 75
- B. Facility not subject to Part 75 and required by air district to operate CO<sub>2</sub> CEMS
- C. Facility subject to Part 75

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## Group Participation Exercise 1.4.2: Determining Tier 4 Applicability - Solution

Which of these facilities must use the Tier 4 Methodology from 40 CFR 98.33 to calculate CO<sub>2</sub> combustion emissions?

- A. Facility not subject to Part 75
- **B. Facility not subject to Part 75 and required by air district to operate CO<sub>2</sub> CEMS**
- C. Facility subject to Part 75

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## Group Participation Exercise 1.4.3: Cogeneration Facility Reporting

- A facility with a topping cycle cogeneration unit provides steam to an off-site thermal host. The facility also operates a separate simple cycle natural gas turbine that is subject to Part 75. The turbine represents 28% of the annual emissions.
- Under which subpart(s) should emissions be reported?
  - Subpart C
  - Subpart D
  - Subparts C and D
  - None of the above

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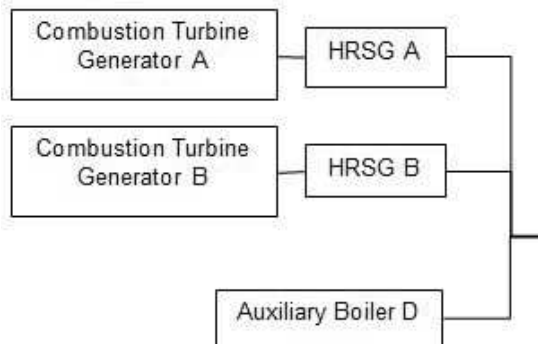
## Group Participation Exercise 1.4.3: Cogeneration Facility Reporting - Solution

- A facility with a topping cycle cogeneration unit provides steam to an off-site thermal host. The facility also operates a separate simple cycle natural gas turbine that is subject to Part 75. The turbine represents 28% of the annual emissions.
- Under which subpart(s) should emissions be reported?
  - Subpart C
  - Subpart D
  - **Subparts C and D**
  - None of the above

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## Group Participation Exercise 1.4.4: Energy Disposition

See Handouts 1.4.1: Energy Disposition and  
1.4.2: Sample Cogeneration Emissions Data Report



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## Comprehensive Case Study

- Handout 1.4.3, Comprehensive Case Study (Moo Cow) with recommendations and answers
  - Physical handout during class
- Prepare a sampling plan based on Cal e-GGRT report sample
- Facility producing butter and cheese

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## Questions and ARB Comments

### Course 1: General Verification

#### ***Complete:***

- 1.1 Verification Principles, Requirements, and Procedures
- 1.2 Stationary Fuel Combustion and Sorbent Sources
- 1.3 Accuracy and Product Data
- 1.4 Electricity Generating Units and Cogeneration

## General Errors made by EGUs Identified by Verifiers (1 of 2)

- Inadequate cogen block diagram
  - Missing return condensate
  - Lack of detail for fuel combustion devices
  - Electricity generation system boundary (red box) not included
- Incorrectly aggregated types of emission sources
- Over-estimated parasitic steam use
- Incorrectly identified EGU as cogen when only combined cycle power plant

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## Other General Errors Identified by Verifiers (2 of 2)

- Incomplete GHG Monitoring Plan
- Incorrect emission factors and calculation methods
- Excluded flares reported
- Small sources not reported
- Improper use of missing data
- Fuel bill was not pro-rated
- Monthly fuel sampling not conducted
- Sorbent improperly classified or misreported
- Incorrect biomass fuel classification  
(urban, ag, forest-derived)