Appendix A:

Guidance for Fuel Analytical Data Management

This appendix addresses the fuel analysis provisions of regulation section 95103(a), including fuel analytical data capture, fuel use measurement accuracy, and procedures for interim fuel analytical data collection in the event of fuel monitoring equipment breakdown. The accurate quantification of fuel consumption is central to an accurate accounting of facility greenhouse gas emissions, which is why the regulation establishes rigorous standards for instrumentation used to quantify fuel use.

Many of the GHG accounting methods found in the regulation also require the measurement of fuel properties such as fuel heat content and carbon content. In order to ensure the collection of consistent and accurate emissions data, the regulation in many instances stipulates specific ASTM methodologies for the determination of these parameters. This appendix also discusses analytical issues that influence the collection of accurate fuel compositional information.

What are the fuel analytical data capture requirements?

Fuel analytical data is the data collected about a fuel to calculate GHG combustion emissions, including mass, volume, flow rate, heat content, and carbon content. Fuel analytical data capture requirements are specified in section 95103(a)(8) of the regulation.

If more than 20 percent of the required data for a particular source is missing, emissions from that source are considered unverifiable. Consequently, if emissions from the affected source(s) constitute more than 5 percent of facility-wide emissions, the GHG report for that year cannot be positively verified. There may be recourse If data is missing due to an unforeseen breakdown in fuel analytical equipment, however; see the discussion later in this appendix.

If less that 20 percent of the required data is missing, the missing data is substituted according to the fuel analytical data capture requirements of 40 CFR Part 75 or Part 60, if the source is subject to either of those federal requirements. If not, the mean of the data captured must be used to substitute for the missing data.

What are the fuel use measurement accuracy requirements?

Section 95103(a)(9) requires operators to "employ procedures for fuel use data measurements (mass or volume flow) used to calculate GHG emissions that quantify fuel use with an accuracy within ±5%. All fuel use measurement devices shall be maintained and calibrated in a manner and at a frequency required to maintain this level of accuracy."

The purpose of this chapter is to provide guidance on the requirements of section 95103(a) of the mandatory GHG reporting regulation. As described more specifically in Chapter 1 of this document, this guidance does not add to, substitute for, or amend the regulatory requirements as written in these or other sections of the regulation [Subchapter 10, Article 2, sections 95100 to 95133, title 17, California Code of Regulations].

Note that this requirement applies **only** to fuel use data that is "used to calculate GHG emissions." For example, in a hypothetical case where three fuels are mixed prior to combustion and the composition (carbon content) of the mixture is determined, the operator must measure the flow volume or mass of the mixture with an accuracy of ±5%, as this value will be used to calculate combustion emissions. The operator must also determine the flow volume or mass of the three fuels, in order to meet the separate requirement to report fuel consumption for all fuels. Because these three flow values are not used to calculate GHG emissions, however, they are not subject to the ±5% accuracy requirement.

In addition the operator is required to measure *total fuel flow* over the specified time interval (e.g. daily, monthly). A flow meter that provides only instantaneous measure of fuel flow, without digital or analog recording, may not be sufficient to demonstrate that the ±5% fuel use measurement accuracy requirement has been met. It may be necessary to install a totalizing flow meter to provide a sufficiently accurate measurement of fuel use for the measurement period. In addition, the operator should ensure that all algorithms or methodologies used to convert digital or analog instantaneous flow rate readings to total flow (e.g., scf/min to scf/sampling period) are rigorous.

> *A reminder:* You are also required to report the facility's *annual* fuel consumption for each fuel combusted. Maintaining a database containing monthly fuel consumption data for each fuel will enable you to easily calculate and report your annual consumption for each fuel.

Totalizing meters may also have a limited recording range. When the meter reaches this volume it may automatically reset and start from zero. It is important that this issue be addressed to maintain accurate flow records. For instance, if a critical flow meter resets every day under normal operating conditions, it may be advisable to record sample volume several times per day to ensure total flow can be determined accurately.

Operators should consider several critical questions in determining whether fuel use measurements meet the regulation's accuracy requirements. The following criteria are especially important considerations when purchasing new equipment.

1. Is the flow measurement device that you are using designed and warranted by the manufacturer to provide this level of accuracy, for the fuels you are combusting, under the conditions (such as temperature and pressure) and in the flow range encountered in the particular application?

2. Is the instrumentation installed according to the original equipment manufacturer (OEM) specifications required to provide the necessary accuracy? For instance, orifice flow meters typically must be installed a minimum specified number of pipe diameters downstream of any directional changes in flow in order to ensure laminar flow and accurate flow measurements. Check OEM specifications carefully.

3. Has the instrumentation been maintained and operated according to OEM specifications? For instance, have critical components been replaced or inspected at prescribed intervals? Are the operating conditions to which the instrument is subjected (e.g. flow range, temperature, pressure, moisture content) within OEM specifications?

4. Is the instrument calibrated according to the procedures and schedule prescribed by the OEM?

Staff recognizes that in some instances strict adherence to calibration and maintenance time intervals prescribed by the OEM might result in an unacceptable interruption of critical facility operations. Where this is the case staff recommends that facility operators talk with OEM suppliers and work to ensure that the required level of flow measurement accuracy can be maintained. The best solution is to install instrumentation capable of maintaining the required level of accuracy while considering unavoidable operational constraints. Staff also recognizes that older flow measurement devices may not have been installed according to OEM specifications and may be operated outside the design range. Operators must still maintain and calibrate these devices to meet the ±5% accuracy requirement if the data they generate is used for GHG emission calculations.

In cases where OEM manuals are not available or there is uncertainty about installation, staff suggests that operators contact the OEM to obtain guidance on proper equipment maintenance and calibration, and consult industry standards such as API publications for acceptable practices. Operators may also talk directly with ARB staff about such concerns.

Solid Fuels. The regulation requires operators who do their own solid fuel measurements to "validate fuel consumption estimates with belt or conveyor calibrations conducted at least quarterly, and retain record of such calibrations." If your scale or measurement device provides mass in units other than kilograms, convert fuel mass to kilograms and express the mass of fuel combusted monthly in metric tonnes. See Table 2 in Appendix A of the regulation for conversion factors.

Liquid Fuels. Operators should measure the total volume of each liquid fuel combusted each month at representative locations. Where fuel flow meters provide data in units other than gallons, convert the reading to gallons using the correct conversion factor.

Gaseous Fuels. Operators should measure the total volume (in standard cubic feet - scf) of each gaseous fuel combusted each month at representative locations. Where fuel flow meters provide data in units other than standard cubic feet, convert the reading to standard cubic feet using the correct conversion factor. Gas flow meters should be temperature compensated, i.e., it should provide gas flow volume that is corrected to a specific temperature (20°C or 60°F). If you are unsure for which of these temperatures your gas meter expresses volume, check the meter or consult the meter manufacturer.

What documentation could a verifier seek to address the fuel measurement accuracy requirement?

ARB staff recommends that operators retain documentation to address several factors that may be examined to verify compliance with the accuracy requirement for fuel measurement.

Table A-1 Recommended Documentation for Fuel Use Accuracy

Factor	*Supporting Documentation*
Manufacturer certification of accuracy level--Confirm original equipment manufacturer (OEM) certification of ± 5% accuracy level for use of the measurement device under the actual conditions. Actual conditions may include specific fuel(s) and flow conditions, including absolute flow, flow range, temperature, pressure.	OEM equipment manual(s)
Installation--Confirm the device is installed according to OEM specifications, (laminar flow considerations, for example).	OEM equipment manual(s)
Operation and maintenance--Confirm operation and maintenance planning and practice has complied with OEM specifications.	Facility's plans and logs
Calibration--Confirm OEM calibration specifications are being met.	Facility's calibration records
Engineering calculations--Cases in which engineering calculations or mass balance methods have been used, because measurement devices are not present.	Calculations and supporting input data

What are the options in the event of an equipment breakdown that affects fuel analytical data collection?

The regulation includes a provision for an interim data collection procedure in a case where an unforeseen breakdown of fuel analytical equipment occurs. The procedure for interim fuel analytical data collection is specified in section 95103(a)(10).

To use this option the operator must provide to the ARB Executive Officer (EO), within 30 days of the breakdown, evidence to address each of the following evaluation criteria:

1. The breakdown will result in the loss of more than 20 percent of the source fuel data for the reporting year, thus rendering emissions from this source unverifiable;
2. The failed equipment cannot be promptly repaired or replaced without shutting down a process unit or portion of the facility significantly affecting facility operations, or that the monitoring equipment which must be replaced or repaired is not immediately available;
3. The interim monitoring procedure will remain in effect only as long as is reasonably necessary to affect repairs.

At the same time the operator must submit a written request to the EO that includes the following:

1. The proposed start date and end date of interim data collection;
2. A detailed description of what data are affected by the breakdown;
3. A discussion of the accuracy of data collected with the usual method and equipment;
4. A demonstration that no feasible alternative exists that would provide more accurate emissions data;
5. A demonstration that the interim procedure will remain in effect no longer than necessary, and the criteria above have been satisfied.

Data collected using an EO-approved plan will be considered adequate to meet the data capture rate requirements of the regulation, which is 80 percent minimum for verification.

The interim procedure may be modified by the EO to limit the duration or include additional conditions which must be met. The EO will also determine whether the accuracy of the data collected under the interim procedure is reasonably equivalent to data collected using properly functioning monitoring equipment. If the EO determines that the interim method is not reasonably equivalent, a reasonable accuracy will be assigned for the purposes of evaluating any possible material misstatement under section 95131(b)(11).

Are there other fuel composition and analytical considerations?

In some instances you may have several options for the methodology you use to calculate your emissions. If you have concerns or questions concerning the accuracy associated with using default values, it would be appropriate to investigate in more detail which approach is suitable to ensure an accurate accounting.

As an example, if you are using headspace gas (drawn from a storage tank where both gas and liquid phases are present) as a fuel or feedstock and are presently measuring only bulk liquid composition, you should examine the appropriateness of this approach. How closely does the liquid analysis approximate the composition of the actual fuel or feedstock, and is the measured HHV significantly different from the default value? In this case, analysis of both phases should answer the question. When presented with alternative approaches, choose a method that ensures the integrity of your emissions report.

If your fuel supplier provides you with an analysis of a solid fuel that you purchase, it may be acceptable to use this data. However, you should examine the representativeness of this data before using it to calculate your emissions. Is the carbon content data that you receive from your fuel supplier representative of the fuel you actually burn? Do you pre-treat the fuel once you receive it from your supplier? Does that pretreatment change the carbon content of the fuel? Does the fuel sit outside for extended periods of time and dry or absorb moisture? Such questions may arise during the verification process. If you have concerns about the representativeness of the data you receive from your fuel supplier, the best way to ensure that this carbon content value is representative is to collect a sample just prior

to combustion, analyze the sample and compare this data with that you receive from your fuel supplier.

When a solid fuel must be analyzed for its energy or carbon composition, weekly samples are combined for a monthly composite sample. Additional detail is provided in Chapter 13, under the sections addressing assessment of heat and carbon content.

Are there requirements affecting the installation and operation of on-line instrumentation?

On-line instrumentation must be installed at a location that ensures representative sampling of the gaseous fuel combusted. On-line instrumentation (e.g., a high heat value analyzer or on-line gas chromatograph) should be installed, maintained and calibrated according to OEM instructions. Just as with fuel flow determination, on-line instrumentation must be warranted by the manufacturer to provide the requisite accuracy under the operating conditions that it will encounter.