

CHAPTER 9

GAS MEASUREMENT

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9.1 INTRODUCTION

For purposes of calculating the volume of natural gas injected and withdrawn, the Storage Company installs measurement systems designed to detect volumes and their energy equivalent expressed in multiples of joule (J) units; the Storage Company performs the measurement based on the provisions of Article 23, paragraph 1 of the Ministerial Decree of 26 August 2005 and in accordance with Article 7, paragraph 4 of Annex A to the Resolution AEEG 185/05.

This chapter briefly describes the principles and various procedures that can be used for measurement, with a brief comment describing the facilities and obligations in relation to management. The reference regulatory provisions and procedures for detecting and monitoring quality provisions are contained in Chapter 10.

9.2 GENERAL PRINCIPLES FOR GAS MEASUREMENT

Some general principles, necessary for the Storage Company to accurately conduct measurements, can be summarised as follows:

- a) The gas measurement is expressed in volume and/or energy;
- b) The unit of measure for volume is the cubic metre at the benchmark temperature and pressure conditions of 15° C and 1.01325 bars, respectively;
- c) The quantity of energy is obtained by multiplying gas volumes by the Higher Heating Value (HHV) of the gas. The gas composition and the related chemical-physical parameters are determined by the Storage Company based on the instructions in Chapter 10 “Gas Quality”;
- d) The Storage Code is in reference to the most recent Italian legislative, technical, and metrological rules. The timing for adopting new rules will be that which may be envisaged within said rules;
- e) The technique used to measure the flow rate and volumes of Gas in the Storage Company’s current measurements stations is the Venturi system through calibrated diaphragms;
- f) The measurement stations in the storage sites are designed, built, and managed by the Storage Company in compliance with the provisions of governing regulations on legal metrology;
- g) The Storage Company sends the relative documentation for the measurement system to the competent National Mining Office for Hydrocarbons and Georesources (UNMIG), which verifies that it was correctly carried out, requiring, if necessary, that the company performs certain obligations and informing the Ministry of Economic Development.

9.3 MEASUREMENT CALCULATION INSTRUMENTS

The measurement systems installed in the storage stations can be:

1. traditional;
2. automated.

The traditional measurement systems use a calibrated diaphragm inserted between specific flanges that hold the diaphragm for Venturi-system measurements; it is connected to a mechanical data recorder known as “triplex thermomanometer”, which registers the differential pressure values and pressure relative to operating temperature for the measured gas on graph paper.

In the automated measurement systems, the supervisory authority (UNMIG) responsible for approving and verifying the aforementioned instruments allows the addition of a flow computer to the traditional instruments, referred to in the previous paragraph, which, based on the parameters provided by the Venturi-system diaphragm, automatically and continuously processes both flow rates and volumes and the fiscal use of the data it processes.

In the measurement using the Venturi-system diaphragm, the primary parameters used in the formula for calculating flow rates/volumes are:

- a) diameter of the opening;
- b) internal diameter of the Venturi-system section to be measured;
- c) differential pressure of the opening between upstream and downstream;
- d) pressure and temperature in operation;
- e) density;
- f) coefficient that groups the conversion constants for the measurement units and the compressibility and outflow coefficients.

The measurement systems currently installed in the storage stations include differentiated measuring lines for Withdrawal and Injection and automated meters which provide daily volumes and monthly aggregates through the use of a flow computer.

During Injection, the Gas delivered by the Transport Company to the Storage Company is measured downstream from the gas intake used to measure consumption.

During Withdrawal, the Gas returned to the Transport Company by the Storage Company and issued into the NGPN is measured upstream from the gas intake used to measure consumption.

Moreover, the installed measurement systems enable the volumes of energy dispatched to be calculated by means of a gas chromatograph that continuously

sends the current HHV value to the fiscal calculators, which multiply it by the volume dispatched in Smc.

The volumes of gas consumed for purposes of physical movement of the gas in the system attributed to Shippers according to the procedure indicated in paragraph 8.2 of the chapter “Balancing and Replenishment of Storage Sites” can be classified into two categories: Gas consumed continuously (by thermal power plants, dehydration plants, and gas consumed for adjustments); gas consumed only for operations on the systems (e.g., purging the wells and washing the compressors). While the former are measured with a dedicated systems and normally represent 100% of the consumption allocated to the Shippers, the latter are calculated or estimated only as necessary.

9.4 MEASUREMENT DATA VALIDATION

Measurement data is validated by verifying the completeness, accuracy and veracity of the data processed by the measurement system and the absence of any anomalies that could compromise its validity.

The validation procedure, carried out at the end of each Gas-Day, includes two stages:

- a. Validation of measurement data at each operating site, where the measurement systems are installed, verifying the correct functioning of the installed measurement systems and the consistency of the data generated. If a malfunction is found in the measurement systems, the daily data used for commercial purposes will be those of the back-up system, as defined below in the paragraph 9.5 of this chapter.
After the control activities, the manager of each operating site certifies the daily data on volumes, HHV, and energy.
- b. Validation of measurement data at the operating site, where the consistency and completeness of the values at the level of the Storage System is verified, for which data is collected from all of the Storage Company’s measurement systems and entered into the IT system. Once this stage has been completed, the data is deemed usable by the Storage Company for carrying out the accounting activities for the injected/withdrawn gas on a daily basis within the times defined with the Major Transport Company.

9.5 CALCULATION OF AMOUNTS IN THE EVENT OF MEASUREMENT SYSTEM ANOMALIES

In the event of failure or malfunction of one or more of the instruments that comprise the primary measurement system, the amounts are calculated by the back-up system that operates in parallel as a guarantee. The equipment for this system, installed on each measurement line, is regularly checked to verify correct calibration and normal operation.

The timing defined with the Major Transport Company for sending the measurement data necessary for the daily balancing are maintained and observed even when the back-up system is used. In case of failure or malfunction of both systems (primary and back-up) a measurement figure is estimated in agreement with the transport companies.

9.6 MANAGEMENT AND MAINTENANCE OF MEASUREMENT SYSTEMS

The measurement system is installed in the Station and is owned by the Storage Company, which is responsible for its management. The verification of the efficiency and maintenance of the systems is entrusted to specialised companies and carried out every six months, in accordance with the provisions of the competent UNMIG.

9.7 PRODUCTION REGISTRY

The analogue or digital registry of daily measurements are available to the competent UNMIG, by the Storage Company, for a period of five years starting from the end of the end of each storage cycle.

9.8 AUDITS AND CONTROLS

Periodically, upon request and in the presence of officials from the competent UNMIG, audits are carried out to verify the correct accounting of the volumes handled in storage.

As indicated in sub-section 8.2.2 of the chapter “Balancing and Replenishment of Storage Sites”, the Storage Company communicates weekly to the Shippers the total quantities of gas, expressed in GJ, handled in the System during the previous week.

Upon written request to the Storage Company and according to procedures agreed with the Storage Company, the Shipper has the right to be present at the operations carried out at the sites that have an impact on the data measured.