

## ATTACHMENT 11A

### TECHNICAL SPECIFICATION OF CHEMICAL-PHYSICAL CHARACTERISTICS AND OF THE PRESENCE OF OTHER COMPONENTS IN NATURAL GAS

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### 11A.1 GROSS CALORIFIC VALUE (“GCV”) COMPONENTS

The Natural Gas components that are used to measure the GCV are listed below:

Component	Acceptable Value	Measurement Unit
Methane	(*)	
Ethane	(*)	
Propane	(*)	
Isobutane	(*)	
Normal butane	(*)	
Isopentane	(*)	
Normal pentane	(*)	
Hexanes and above	(*)	
Nitrogen	(*)	
Carbon dioxide	≤ 3	% mol

(\*) acceptable values for these components are intrinsically limited by the acceptable range of the Wobbe Index.

### 11A.2 QUALITY PARAMETERS

Parameters	Acceptable Value	Measurement Unit
Hydrogen sulphide	≤ 6.6	mg/Sm <sup>3</sup>
Sulphur mercaptans	≤ 15.5	mg/Sm <sup>3</sup>
Total sulphur	≤ 150	mg/Sm <sup>3</sup>

Gross Calorific Value	34.95÷45.28	MJ/Sm <sup>3</sup>
Wobbe Index	47.31÷52.33	MJ/Sm <sup>3</sup>
Relative density	0.5548÷0.8	
Oxygen	≤ <b>0.6</b>	% mol
Water Dew Point (a)	≤ -5	°C
Hydrocarbon Dew Point (b)	≤ 0	°C
Max. temperature	<50	°C

- a) At the pressure of 7.000 kPa  
b) In the 100 ÷7.000 kPa pressure range

### 11A.3 OTHER PROPERTIES

The gas, at operational conditions, should contain no traces of the following components:

- a) water and hydrocarbons in liquid state;  
b) solid particulate in such quantities that would damage the materials used for gas transportation;  
c) other gases that may affect the safety or integrity of the transmission system.

### 11A.4 REGULATORY FRAMEWORK

- CNR-UNI 10003 “International System of Units (SI)”;
- Ministerial Decree of 24th November 1984 “Fire-prevention safety rules for the transportation, storage and usage of natural gas with density lower than 0.8”;
- UNI EN 437 “Trial gas – Trial pressure – Categories of equipment”;
- ISO 13443 “Natural gas – Standard reference conditions”;
- Decree of 22nd December 2000 “Identification of the national pipeline network according to Article (9) of the Law Decree 23 May 2000, N.164”.

- Decree of 19th February 2007 "Approval of the technical regulations on the chemical and physical characteristics and on the presence of other components in the fuel gas to be carried."

### **11A.5 REFERENCE CONDITIONS**

The reference conditions adopted for volume units are the following standard conditions (see ISO 13443), or:

<i>Pressure</i>	<i>101.325 kPa</i>
<i>Temperature</i>	<i>288.15 K (= 15°C)</i>

To determine the Gross Calorific Value and the Wobbe Index, the following enthalpy reference is adopted:

*288.15 K (= 15°C) ; 101.325 kPa*