



# GAS QUALITY STANDARD FOR SYSTEM INJECTION POINTS ON THE DECLARED TRANSMISSION SYSTEM

FOR THE PURPOSES OF THE NATIONAL GAS RULES

PUBLISHED: MAY 2014







Version number	Release date (DDMMYYYY)	Comments
Refer to "Gas Quality Standard – System Injection Points" 1.0 for earlier history.		
2.0		Updated to reflect changes in AS4564-2011

This document is based on the requirements of the Gas Safety (Gas Quality) Regulations 2007.

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# IMPORTANT NOTICE

## Purpose

This document has been prepared by the Australian Energy Market Operator Limited (AEMO) for the purposes of the National Gas Rules (Rules).

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This document does not cover all gas quality parameters, and expert advice should be sought in relation to supply contracts.

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# CONTENTS

<b>IMPORTANT NOTICE</b>	<b>2</b>
<b>1 INTRODUCTION</b>	<b>4</b>
<b>2 LEGAL AND REGULATORY FRAMEWORK</b>	<b>4</b>
<b>3 RELATED DOCUMENTS</b>	<b>4</b>
<b>4 SUBSTANTIVE PROVISIONS</b>	<b>5</b>
<b>5 EXPLANATORY SCHEDULE</b>	<b>6</b>
5.1 Water content	6
5.2 Objectionable Constituents:	6
5.3 Gas Odourisation	7
5.4 Mercaptan Sulphur	7
5.5 Temperature – Minimum	7
<b>ABBREVIATIONS</b>	<b>8</b>
<b>GLOSSARY</b>	<b>9</b>
<b>TABLES</b>	
Table 3-1 —AEMO’s Gas Quality Standard	5



# 1 INTRODUCTION

This document is :

- the gas quality standard approved by AEMO and which is applicable to all system injection points on the DTS.
- referred to in the definition of “gas quality specifications” in Part 19 of the NGR.

This document may be amended from time to time.

If there is any inconsistency between this document and the NGR, the NGR will prevail to the extent of that inconsistency.

This document also provides clarifications to the requirements of the Regulations. Where there is conflict between this document and the Regulations, the Regulations take precedence to the extent of and to resolve that conflict.

# 2 LEGAL AND REGULATORY FRAMEWORK

This document incorporates:

- The requirements of the Regulations (the “Prescribed Specifications”) and,
- AEMO’s gas quality standard as per the NGR.

# 3 RELATED DOCUMENTS

- AS 4564-2011 - "Specification for general purpose natural gas".
- The Regulations.
- NGR.
- AEMO’s Gas Quality Guidelines.



## 4 SUBSTANTIVE PROVISIONS

To be read in conjunction with the Regulations and the attached explanatory schedule.

**Table 4-1 —AEMO’s Gas Quality Standard**

Parameter/Characteristic	Gas Quality Standard Limit
<b>Required by Gas Safety (Gas Quality) Regulations 2007</b>	
Wobbe Index Max	52.0 MJ/m <sup>3</sup>
Wobbe Index Min	46.0 MJ/m <sup>3</sup>
Higher Heating Value Max	42.3 MJ/m <sup>3</sup>
Oxygen Max	0.2 mol%
Hydrogen Sulphide Max	5.7 mg/m <sup>3</sup>
Total Sulphur Max (including odorant)	50 mg/m <sup>3</sup>
Water Dewpoint at Maximum Transmission Pressure Max	0 °C
Water content of gas Max (Based on 15,000 kPa)	73 mg/m <sup>3</sup>
Hydrocarbon Dewpoint Max	2.0 °C at 3500 kPa gauge
Total Inerts Max (including Oxygen)	7.0 mol%
Objectionable Constituents Max	Nil
Gas Odourisation	Odourisation at rates between 7 and 14 mg/m <sup>3</sup> of a 70/30 blend of THT/TBM
<b>Required by AEMO</b>	
Mercaptan Sulphur Max	5.0 mg/m <sup>3</sup>
Temperature Max	50 °C
Temperature Min	2 °C

Where a parameter is expressed as per cubic meter (/m<sup>3</sup>) this refers to a cubic meter at standard conditions of 101.325 kPa absolute and 15°C.

Unless otherwise specified, pressures are gauge pressures



## 5 EXPLANATORY SCHEDULE

### 5.1 Water content

For the purposes of gas injected at a system injection point, the relevant transmission pressure for determining water dewpoint is deemed to be 15,000 kPa. For typical natural gas compositions, a 0°C dewpoint at 15,000 kPa corresponds to a water content of 73 mg/m<sup>3</sup>, and AEMO uses this as the basis for this document.

### 5.2 Objectionable constituents

Regulation 6 the Regulations provides that the prescribed standard of quality for natural gas conveyed through a transmission pipeline is set out in AS 4564 as follows:

*“The gas shall not contain –*

- a) materials, dust, and other solid or liquid matter, waxes, gums, gum forming constituents, and unsaturated or aromatic hydrocarbons to an extent which might cause damage to, or interference with the proper operation of, pipes, meters, regulators, control systems, equipment or appliances;*
- b) unsaturated or aromatic hydrocarbons to an extent which causes unacceptable sooting;*
- c) other substances that cause damage to, or problems in operation of, pipelines or appliances or that cause the products of combustion to be toxic, or hazardous to health, other than substances that are usually found in natural gas combustion products.”*

Some examples of what level of objectionable constituent considers is at the “extent which might cause damage or be a hazard to health” are listed below:

#### **Compressor oil: 20 ml/TJ**

The limit specified is based on the Queensland Petroleum and Gas (Production and Safety) Regulation 2004. The limit is an acknowledgment that, whilst undesirable, it is almost inevitable that some lubricating oil will escape from filters and coalescers downstream from reciprocating compressors. The limit is intended to restrict oil accumulation to manageable quantities and provide guidance for the design of oil separation equipment at compressor facilities.

#### **Elemental Sulphur: 1.0 µg/m<sup>3</sup>**

Elemental sulphur vapour concentration should be below 1.0 µg/m<sup>3</sup> (approx 1x10<sup>-4</sup> ppmv) to ensure that there will be no deposition of elemental sulphur above 2°C. The elemental sulphur formation and deposition process is extremely complicated and depends on a number of contributing factors. The limit is based on elemental sulphur equilibrium data published as part of elemental sulphur deposition studies by Dr. D. Pack (Curtin University).

#### **Mercury: 1.0 µg/m<sup>3</sup>**

Mercury is hazardous to human health if ingested, absorbed through the skin or via the lungs. Mercury can also cause “liquid metal embrittlement” and subsequent failure of aluminium alloys under pressure.

The NOHSC (National Occupational Health & Safety Commission) time weighted average (8hr day for 5 days a week) occupational health exposure is 25 µg/m<sup>3</sup> in air.

Mercury removal equipment for natural gas is quoted as being able to get down to 0.1 µg/m<sup>3</sup> from inlet concentrations of 25 - 50 µg/m<sup>3</sup>. The atmospheric concentration (depending on location) is generally around 0.02 µg/m<sup>3</sup> (but higher in some industrial centres).

The figure of 1 µg/m<sup>3</sup> in natural gas will not add significantly to the background level in a house or factory, is technically feasible and well below the occupational health exposure level after dilution during combustion.



### Radioactivity: 600 Bq/m<sup>3</sup>

Radioactivity has not been significant in Victorian gases. The limits indicated are in line with Western Australian practice and provide guidance for the development of future gas sources and interstate gas transfers.

Any radioactivity in natural gas is due primarily to radon. The limit of 600 Bq/m<sup>3</sup> is such that the products of combustion will create radioactivity levels below the exposure monitoring limit set by the Australian Radiation Protection and Nuclear Safety Agency of 200 Bq/m<sup>3</sup> and will not add significantly to the background level in a house or factory. The average concentration of radon in Australian homes is about 12 Bq/m<sup>3</sup>.

## 5.3 Gas odourisation

The Regulations require that;

*“gas must -*

- a) have an odour which is distinctive and unpleasant; and*
- b) have an odour level that is discernible at one-fifth of the lower explosive limit of the gas.”*

The preferred gas odourisation is by way of a blend of 70% THT and 30% TBM injected into the gas stream at a rate of 7 mg/m<sup>3</sup> of gas. This gas odourisation regime has traditionally been considered adequate to meet the requirements of the Regulations.

The preference is based on what has been used in the past, the odour of which is familiar to the community. Other odorant blends and injection rates are acceptable if they meet the requirements of the Regulations.

Odorant injection rates in the range of 7 to 14 mg/m<sup>3</sup> of gas are acceptable; rates of up to 23 mg/m<sup>3</sup> (usually limited-term associated with “conditioning” new pipelines) are acceptable provided the injection is such that they do not create “nuisance” leak reporting.

## 5.4 Mercaptan sulphur

This mercaptan sulphur level relates to the smell of gas before odorant is added. It is based upon the level which is likely to impact upon odourisation levels.

Mercaptan sulphur is continuously measured only if initial measurements indicate that significant levels of mercaptan sulphur are present in the gas-producing geological formations.

## 5.5 Temperature – minimum

The minimum temperature limit is based upon the maximum hydrocarbon dewpoint limit temperature.



## ABBREVIATIONS

Abbreviation	Term
AEMO	Australian Energy Market Operator
Bq	Becquerel
DTS	Declared Transmission System
NGR	the National Gas Rules
THT	Tetrahydrothiophene
TBM	Tertiary Butyl Mercaptan



## GLOSSARY

In this document, a word or phrase in this style has the same meaning as given to that term in the NGR

In this document, capitalised words or phrases or acronyms have the meaning set out opposite those words, phrases, or acronyms in the table below.

Unless the context otherwise requires, this document will be interpreted in accordance with Schedule 2 of the National Gas Law.

Term	Definition
AS 4564	Australian Standard "Specification for general purpose natural gas", as published from time to time.
Becquerel	Number of nucleus decays per second in a given quantity of radioactive substance.
The Regulations	Means the Gas Safety (Gas Quality) Regulations 2007 (as amended).
Tetrahydrothiophene	A cyclic sulphide used in gas odourisation.
Tertiary Butyl Mercaptan	A mercaptan used in gas odourisation.