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CAN/BNQ 3672-100/2023

Biomethane — Quality Specifications for Injection into Natural Gas Distribution and Transmission Systems

SCC CCN

STANDARD

CAN/BNQ 3672-100/2023

Biomethane — Quality Specifications for Injection into Natural Gas Distribution and Transmission Systems

Biométhane — Spécifications de qualité pour injection dans les réseaux de distribution et de transport de gaz naturel

Bureau de normalisation du Québec

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This first edition of the National Standard of Canada CAN/BNQ 3672-100 supersedes the standard BNQ 3672-100, which is now withdrawn.

The decision resulting from the systematic review that will enable to determine whether the current document shall be modified, revised, reaffirmed or withdrawn will be implemented no later than at the end of November 2028.

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FOREWORD

This document was developed in compliance with the Standards Council of Canada (SCC)'s Requirements and Guidance for standards development organizations and approved as a National Standard of Canada by the SCC. Its publication was approved by a Standards Development Committee, whose members were:

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BIOMETHANE — QUALITY SPECIFICATIONS FOR INJECTION INTO NATURAL GAS DISTRIBUTION AND TRANSMISSION SYSTEMS

INTRODUCTION

Biomethane is obtained by cleaning and conditioning biogas to make it interchangeable with natural gas. Its injection into natural gas distribution and transmission systems enables it to be transported to many points of use.

Biomethane production

The biogas industry is quickly growing in a global way. According to statistics from the European Biogas Association, in 2019, Europe had nearly 19 000 biogas installations representing electrical power equivalent of around 193 TWh.[1] More recently, the European Commission has presented the *REPowerEU* Plan, a program to rapidly reduce dependence on fossil fuels and fast forward green transition that includes a dedicated action plan to boost biomethane production to 35 billion cubic metres by 2030.[2]

At present, the United States has more than 2 200 biogas installations covering all 50 states. This represents an electrical power equivalent of approximately 2.4 GWh.[3] According to the United States Environmental Protection Agency (U.S. EPA), as of September 2021 there were 548 operational landfill gas (LFG) projects in the United States. Moreover, in 2022, the number of digester systems in operation accepting animal manure was 322, and another 85 were under construction or undergoing modifications to upgrade biogas to biomethane.[4]

In Canada, biogas production increased by almost 50% between 2011 and 2020. By 2022, more than 270 biogas projects were in operation across Canada, including 45 digesters for agricultural operations, 9 digesters for industrial operations, 126 wastewater treatment facilities, and 99 landfill gas capture systems. The production from all major sources was equivalent to 2 420 million cubic metres per year of renewable natural gas, preventing more than 8 Mt of

1 European Biogas Association, *Annual Report 2020*.

2 European Commission, *REPowerEU*.

3 American Biogas Council, *Biogas Industry Market Snapshot*.

4 U.S. EPA, *AgSTAR Data and Trends*.

greenhouse gas (GHG) emissions from reaching the atmosphere every year.[1] This represents up to 810 MW of electricity and 1.3% of Canada's electricity demand.

Across Canada, governments are taking bold initiatives to increase renewable energy generation in order to act against climate change and meet global energy goals. Specific policies, regulations, and programs are being put in place to drive growth in the sector. In Quebec, regulations have established that the proportion of biomethane distributed in the gas network must rise to 5% as of 2025, and this proportion could be increased to 10% in 2030. In British Columbia, the target is to reach 15% by 2030. Ontario has also implemented supportive policies and Alberta is taking action to chart a similar course.

Studies have shown that biogas and biomethane could reduce GHG emissions by 14 Mt in 2030 and 62 Mt in 2050[2]. Still, most of Canada's biogas potential remains untapped. Previous analysis established that we are harnessing just 14% of Canada's feasible biogas and biomethane potential.[3] The situation is the same around the globe. The International Energy Agency estimates that the world's sustainable biomethane production could increase to 42.2 TJ by 2040. That is 30% of current consumption of natural gas in the world.[4] This opens the door to significant development.

Sustainable Benefits

Biomethane plays a key role in meeting the ever-increasing energy demand in Canada. It is also an environment-friendly source of energy and a smart waste management option. Substituting fossil fuels with biomethane from organic waste leads to major reductions in GHG emissions for the entire life cycle of biomethane compared to GHG emissions of the fossil fuels it replaces.

In terms of sustainability, the use of biomethane can contribute to, among other things:

a) decarbonization through the capture and productive use of the methane contained in biogas that would otherwise be thermally destroyed or released to the environment;

b) environmental protection by reducing the contamination and pollution of water, soil and air with the elimination of fossil fuel as well as the reduction of risks of potential harmful accidents. Landfills and digesters produce biogas that generates few of the environmental impacts normally associated with fracking, since they utilize material that already exists and would otherwise go to waste;

1 Canadian Biogas Association, *Biogas 101*.

2 Bioenergy International, *Canadian Biogas Experiences Decade of Rapid Growth*.

3 Canadian Biogas Association, *Hitting Canada's Climate Targets with Biogas & RNG*.

4 International Energy Agency, *Outlook for Biogas and Biomethane: Prospects for Organic Growth*.

c) sustainable development by encouraging locally owned biomethane production sites and allowing citizens direct involvement in environmental protection, as well as reinforcing local economies, jobs, and expertise;

d) promoting a circular economy by converting low-value organic waste to a high-value substance, thereby reducing the dependence on fossil fuels in the long run.[1]

Origin, composition, and use of biomethane

Biomethane is derived from the cleaning of biogas; biogas being produced from the anaerobic (without oxygen) decomposition of organic material.

In its raw state, biogas contains 40% to 70% methane (CH_4), inert gases (carbon dioxide [CO_2], oxygen [O_2], nitrogen [N_2], and others), sulphur compounds, and water vapor. The heating value of raw biogas is lower than natural gas.

The essential goal of cleaning and conditioning biogas is to increase its methane content and to reduce the amount of hydrogen sulphide (H_2S) [desulphurization], CO_2 (decarbonization), water (H_2O) [dehydration], O_2, N_2, and certain trace constituents. The resulting product of biogas cleaning is called *biomethane*, and its composition is similar to that of natural gas. The resulting biomethane may then be injected into natural gas distribution or transmission systems.

Although biogas can be produced from any organic material, sources are usually categorized as:

a) agricultural residues, which includes crop residues, manure and liquid manure;

b) industrial-grade food waste;

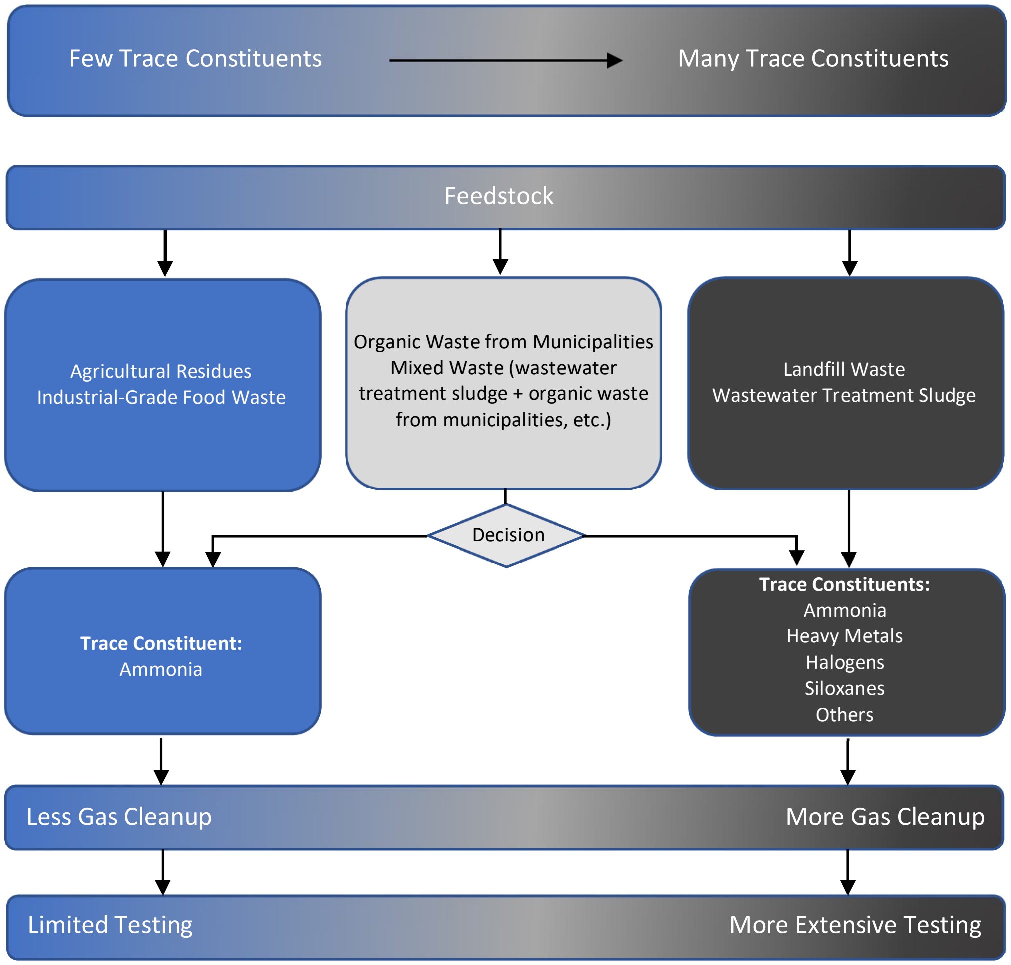
c) organic waste from municipalities;

d) landfill waste;

e) wastewater treatment sludge.

Depending on the feedstock, the level of contamination may vary significantly. The biogas sources from industrial-grade food waste and most agricultural residues, including manure, are free of heavy metals, halocarbons, and siloxanes. Mixed waste anaerobic digesters, however, can contain a wide variety of materials, and wastes may be commingled. Finally, landfill waste and wastewater treatment plant sludge are composed of a vast assortment of constituents of concern that require greater conditioning.

1 Environmental and Energy Study Institute, *Fact Sheet — Biogas: Converting Waste to Energy*.



Alternative technologies to produce biomethane from biogas

Most biomethane cleaning processes involve technologies that separate CO_2 from biogas. Emerging alternative technologies that are commercially available convert CO_2 into biomethane using hydrogen and either a biological or physical catalyst without the typical approach of separating the CO_2 from the biogas. Subsequent cleaning steps include the removal of water, hydrogen, and trace constituents. Since biomethane produced with these alternative technologies may contain residual hydrogen, many gas utilities, research institutes, industry associations, and government agencies are still studying its impact as a component in natural gas. As this issue remains unresolved, this edition of the standard does not prescribe any limits on hydrogen, which is left to the discretion of the gas distributor or transporter. However, it is recognized that, some day, renewable hydrogen may be within the scope of biomethane injection.

Guidelines

For the biomethane to be injected into natural gas distribution and transmission systems, and accepted into the Canadian market, it must be of a similar composition to that of natural gas, i.e., interchangeable. Biomethane must meet the Higher Heating Value (HHV) and Wobbe index requirements through the cleaning of biogas to among other things, increase its calorific value by the removal of inerts. Other trace constituents, such as sulphur compounds, also need to be limited and controlled to make the product safe for human health and the environment, pipeline integrity, and end-use applications.

1 PURPOSE AND SCOPE

This standard specifies the characteristics of biomethane at the injection point in the natural gas distribution or transmission system to ensure its compatibility with the characteristics of the natural gas present in the system into which it is injected.

It applies to biomethane produced from biogas derived from anaerobic decomposition, no matter the source of the organic material.

NOTE — Biomethane is sometimes called *renewable natural gas (RNG)* in North America, which is a more generic term. However, in this standard, the terms *biogas* and *biomethane* correspond to the definitions given in Chapter 3.

This standard does not cover biomethane produced and consumed on-site by the producer or biomethane produced and delivered by a dedicated gas line.

This standard does not cover synthetic gas (syngas).

This standard was developed to serve as a reference document for conformity assessment activities of specific products.

NOTE — Conformity assessment is defined as the systematic examination of the extent to which a product fulfils specified requirements.

2 NORMATIVE REFERENCES

2.1 GENERAL

The references below (including any amendment or errata) are normative references, and are therefore considered mandatory. They are essential to the understanding and use of this standard, and are cited in appropriate places in the text.

It should be noted that a dated (normative and informative) reference refers to that specific edition of the reference, while a non-dated reference refers to the latest edition of the reference in question.

NOTE — This standard also cites informative references, which are listed in an annex.
A bibliography of references on topics covered in this standard is also annexed.

2.2 DOCUMENTS FROM STANDARDS BODIES

AGA (American Gas Association) [https://www.aga.org]

AGA Report No. 4A — *Natural Gas Contract Measurement and Quality Clauses*.