Northeast GAS ASSOCIATION
NYSEARCH

# Technology Brief

# Study on Impact of Trace Constituents in RNG

**Description:** **A study comprised of a gap analysis followed by laboratory testing to evaluate effects of trace constituents in RNG on gas infrastructure and residential appliances**

**Status:** **The gap analysis is complete with select trace constituents identified for further evaluation of trigger limits and scientific evidence to support specified limits**

## BENEFITS

This project aims to reduce the uncertainties and variation in limits set by different utilities for the trace constituents found in Renewable Natural Gas (RNG) by providing scientific data to back up the trigger limit recommendations. Considering growing demand for RNG production and injection into distribution infrastructure in North America, the testing should help both producers and developers to help determine the optimum upgrading and measurement system for biomethane. For LDCs, it will aid decision making and help advance specifications to address safety and reliability issues.
The gap analysis will help identify deleterious constituents and/or group of constituents to gas infrastructure and appliances.

## BACKGROUND

To reduce carbon emissions and move towards a more sustainable energy supply, there is an increasing trend of using Renewable Natural Gas (RNG) in the United States and Canada. Depending on the source (See Figure 1), RNG can contain compounds that are not present in traditionally distributed natural gas such as ammonia, halocarbons, siloxanes, biologicals etc. One of the requests by our members during a NYSEARCH Decarbonization Workshop was to conduct additional research to determine the appropriate levels of some of the contaminants in RNG. NYSEARCH was directed to establish the science-based limits as needed for the RNG trace constituents. Our initial survey led to limited documented scientific evidence on the appropriate levels of trace constituents in pipeline quality gas.

Also, the trace constituents list considered for further evaluation includes contaminants that are present in natural gas and for which there are network limits, e.g., mercury, hydrogen sulfide and moisture. This is because some limits set for natural gas are based on empirical data. They are either missing scientific evidence or are based on measurements now deemed obsolete such as historical analytical capabilities.

DNV-GL has conducted two risk assessments for NYSEARCH members on Impact of Corrosive substances on distribution infrastructure and the effects of Siloxanes on residential gas appliances and gas engines.

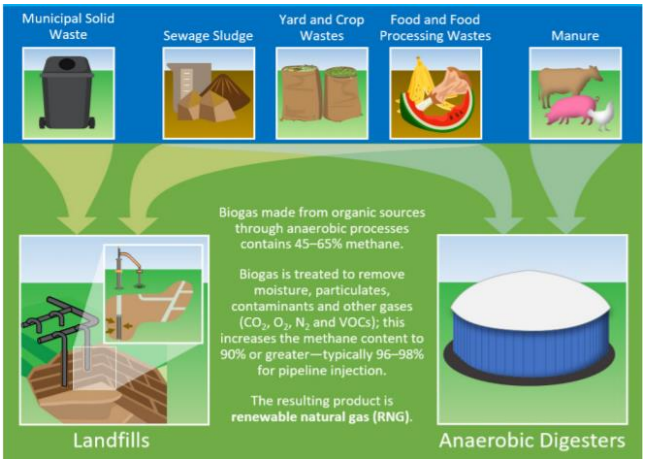


**Figure 1. Various RNG Sources and trace constituents**

DNV-GL is also currently process of testing for Trace Constituents for gas in the networks in Europe. DNV-GL's expertise in natural gas networks and RNG production led them to conclude that the

impact of any individual contaminant should not be considered in isolation due to fact that they will not be released in the network one at a time. Thus, a gap analysis is needed before limits can be set for individual constituents.

## TECHNICAL APPROACH

The objective of the project is to study the impact of trace constituents in Renewable Natural Gas and traditional pipeline gas on LDC infrastructure and customer appliances. This project will be carried out in two tasks as described below:

**Task 1: Gap Analysis**: DNV-GL surveyed the project sponsors for data of US networks and appliances. Using their expertise from over (10) years of biomethane risk assessments for UK gas networks, DNV-GL is assembling a list of possible RNG trace constituents that they are aware of or believe to be deleterious to network equipment and materials (metallic, polymeric, and elastomeric). The list includes a combination of trace constituents that can cause problems during certain network operations, e.g., pressure regulation, in-grid storage, in-grid compression, odorization, etc. A similar analysis is being conducted for consumer appliances as part of Task 1. The result is a list of trace constituents that are believed to be damaging and cause problems during or after combustion.


**Figure 2. Extraction of HDPE pipe sample prepared for trace constituent exposure testing**

DNV-GL is recommending which type of impact study i.e., network infrastructure, network operations, or consumer appliances are likely to be most critical in terms of trace constituent concentration.

**Figure 3. Water bath with extracted pipe samples submerged in testing agents**

**Task 2: Experimental Test Program:** The test program (see Figure 2 and 3) is anticipated to use an optimized design to examine the effect of the trace constituents on the properties of the polymer/elastomer. For this experimental design and for the selected materials, mechanical properties are measured before and after soaking in a test fluid that contains both a high and low concentration of the short-listed trace constituents. Results from this experimental approach will help evaluate relative effect of each trace constituent and give insights into any interaction parameters.

## PROGRAM STATUS

DNV-GL has completed the gap analysis and identified a list of trace constituents that need experimental testing to determine trigger limits. Materials testing is ongoing and appliance testing is planned. Complete results for the project are anticipated for first quarter of 2023.

### Highlights

- A set of deleterious trace constituents found in RNG are being tested to establish trigger limits to maintain the integrity of LDC infrastructure and evaluate residential appliance performance
- The data gained from this study will provide supporting scientific evidence needed to confidently establish limits for the industry as RNG opportunities grow

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