



CRITERIA FOR CERTIFICATION
ENVIRONMENTAL INNOVATION, GS-20 Edition 2.0
Sub-Category: Residential Gas Furnaces

| APPLICANT INFORMATION: | |
|------------------------|--|
| Company: | Lennox Industries |
| Product Name: | Variable Speed, Ultra Low Emissions Gas Furnace (SL297NV) and Constant Torque, Ultra Low Emissions Gas Furnace EL195NE) |
| Website: | www.lennox.com |

Introduction. Green Seal’s Environmental Innovation Standard (GS-20) provides a framework for the certification of environmental innovations. This certification demonstrates that an independent third party has verified the innovative aspect(s) of a product results in a significant reduction of human health and environmental impacts compared to products of the same functional class, achieving innovations not previously demonstrated within a product category. Certification neither constitutes the development of a product category standard or benchmark, nor does it require competitors within a product category to use the same innovation strategies in their approach to claiming innovation.

Certification of Environmental Innovation. If the applicant can demonstrate the product conforms to all criteria within this document, Green Seal will provide a Certification of Environmental Innovation.

Disclaimer. This Certification is not intended to identify all possible negative impacts and cannot rule out any unknown negative consequences from the use of this product.

Public Comment. A public comment period on the Draft Criteria was held from November 7 – December 6, 2019.

OVERVIEW

1.0 Eligibility

The Variable Speed, Ultra Low Emissions Gas Furnace (SL297NV) and Constant Torque, Ultra Low Emissions Gas Furnace (EL195NE) by the company Lennox are eligible to be certified under the Environmental Innovation Standard (GS-20, Edition 2.0), because the product:

1. Is a commercially available end use manufactured product
2. Exists within a market that has comparable options that achieve the same function, and
3. Has lifecycle phases for which there exists published health and environmental impact information from credible sources.

Product Function

When used as intended, this provides the following function(s):

1. Provides forced-air heat in single-family residential homes and small commercial buildings.

The product is intended for use in the following applications:

- Single family residential homes
- Small commercial buildings

Comparable Alternatives

Comparable alternatives are prevalent on the market, and are defined as heating units with a heat input rate of less than 225,000 Btu per hour whose function is the combustion of fossil fuel (natural gas, propane, or oil) for space heating with forced hot air.¹

Legal Compliance

Manufacturer shall not be in violation of any applicable environmental regulations or laws nor any applicable regulations under the authority of the U.S. Federal Trade Commission, U.S. Food and Drug Administration, or the U.S. Environmental Protection Agency (or equivalent if based outside the United States).

2.0 Product Lifecycle Impact Review

This section documents the anticipated human health and environmental lifecycle impacts associated with residential furnaces, noting the most significant (i.e., greatest in negative effect) impact.

Summary of Lifecycle Impact Review – Gas Furnaces

| Lifecycle Phase | Impacts Identified |
|-------------------------------|---|
| Resource Extraction | No significant impacts identified |
| Manufacturing | No significant impacts identified |
| Use | Emissions of carbon dioxide from energy use (and associated contribution to climate change) Emissions of nitrous oxides (and association contribution to smog, air pollution, and negative human health impacts) |
| Waste Management and Disposal | No significant impacts identified |

Resources and Manufacture Phases

¹ https://www.energystar.gov/products/heating_cooling/furnaces/key_product_criteria

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No significant impacts identified. The manufacture of a furnace typically requires the extraction of raw materials used to create steel, aluminum, brass, copper, and fiberglass. Furnaces are permanently installed appliances that generally have lifespans of 15 – 30 years. The long life of the product makes the resource and manufacture phases less significant than other lifecycle phases.

Applicant shall provide an attestation letter declaring that the Ultra Low Emissions Gas Furnaces:

- Are designed to have a weight consistent with other products of this type on the market of its type.
- Use materials (e.g., steel, aluminum, brass, copper, etc.) consistent with other products of this type on the market, from reputable suppliers of these materials.
- Do not produce any unique human health exposures or environmental releases to air, water, or land that differ from other products of this type on the market.

Use Phase

Gas furnaces function by burning natural gas that is provided from a municipal source. Given a 15-30 year life span, the use phase a furnace is by far the most significant lifecycle phase. Natural gas is a fossil fuel, and its combustion causes greenhouse gas emissions – the main cause of climate change. The catastrophic risks of climate change are well documented in the scientific community.

In addition, according to the Union of Concerned Scientists, “cleaner burning than other fossil fuels, the combustion of natural gas produces negligible amounts of sulfur, mercury, and particulates. Burning natural gas does produce nitrogen oxides (NO_x), which are precursors to smog...”

Waste Management and Disposal Phases

No significant impacts identified

CERTIFICATION REQUIREMENTS

3.0 Environmental Innovation Review

This section details the applicant’s proposed innovation claims, including

- Innovation Summary: describes how the applicant claims the their product differs from comparable products on the market,
- An Impact Reduction Statement: describes how the applicant claims the their product’s innovation results in reductions of significant lifecycle impacts identified in the Product Lifecycle Impact Review (Section 2.0 herein),
- Market Analysis: describes the parameters for the applicant to demonstrate their claim that the product is the first and only product of its type of achieve this innovation during the Certification Phase, and
- Drawbacks Analysis: a summary of any potential drawbacks that Green Seal has identified and mitigations necessary.

The applicant has opted to demonstrate innovation through *Option 1: Improved Design* - Demonstrate a minimum of 30% reduction of one or 20% in each of two or more significant environmental or human health impacts, as identified in Section 2.0.

3.1 Innovation Summary – How does this product differ from others on the market?

The applicant states that the line of Ultra Low Emissions Furnaces emits 65% less nitrogen oxides than other products on the market, having a nitrogen oxide emission level of no more than 14 nanograms per joule, while maintaining market leadership levels of energy efficiency. Leadership energy efficiency is defined as meeting the Qualification Requirements for ENERGY STAR v4.0², including:

- AFUE: $\geq 90.0\%$ for U.S. South, $\geq 95.0\%$ for U.S. North/Canada,
- Furnace Fan Efficiency: $\leq 2.0\%$, and
- Air Leakage: $\leq 2.0\%$.

During the Certification Phase, Green Seal will verify these claims through a technical review.

3.2 Impact Reduction Summary – How does the innovation result in impact reduction?

Nitrogen oxide emissions are one of six criteria air pollutants³ regulated by the EPA and are known to pose both human health risks and cause secondary forms of harmful air pollution.

According to the American Lung Association, nitrogen oxides pose direct harm to the lungs, including “increased inflammation of the airways, worsened cough and wheezing, reduced lung function, and increased asthma attacks.” The ALA also warns that nitrogen oxide emissions are a probable cause of asthma in children.⁴

Nitrogen oxides are precursors for a variety of harmful air pollutants, including ground level ozone, fine airborne particles (PM_{2.5}), and acid precipitation. These pollutants damage lung tissue, cause chest pain, coughing, shortness of breath and throat irritation; cause and worsen chronic respiratory diseases such as asthma; compromise the ability of the body to fight respiratory infections; and may cause cardiovascular effects, premature mortality, and cancer.^{5,6}

² https://www.energystar.gov/ia/partners/product_specs/program_reqs/Furnaces_Version_4.0_Program_Requirements.pdf

³ <https://www.epa.gov/criteria-air-pollutants>

⁴ <http://www.lung.org/our-initiatives/healthy-air/outdoor/air-pollution/nitrogen-dioxide.html>

⁵ <https://www.epa.gov/ozone-pollution/health-effects-ozone-pollution>

⁶ EPA: Integrated Science Assessment for Oxides of Nitrogen – Health Criteria (Final Report, 2016), <https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310879>

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Control of NO_x emissions is a key strategy for reducing these pollutants.

3.3 *Drawbacks Analysis – Has burden shifting occurred?*

As a result of a drawbacks analysis, Green Seal has not noted any burden shifting resulting from this product innovation. No mitigation necessary.

3.4 *Market Analysis – How unique is this innovation?*

During the Certification Phase, applicant shall provide evidence that demonstrates the product shall be the first and only gas-fired, fan-type furnace commercially available on the US market to have a nitrogen oxide emission level of no more than 14 nanograms per joule while maintaining market leadership levels of energy efficiency. Leadership energy efficiency is defined as meeting the Qualification Requirements for ENERGY STAR v4.0, including:

- AFUE: $\geq 90.0\%$ for U.S. South, $\geq 95.0\%$ for U.S. North/Canada,
- Furnace Fan Efficiency: $\leq 2.0\%$, and
- Air Leakage: $\leq 2.0\%$.

The public comment period did not produce any evidence or commentary that countered these claims.

4.0 **Evaluation of Functional Performance and Fitness for Purpose**

This section details the requirements to demonstrate that the applicant product functionally performs at least as well as or better than at least one nationally recognized or market leading product of its type, to be approved by Green Seal, including test methods and test reports to submit during the Certification Phase.

Test Methods

Applicant shall meet the requirements in this section to demonstrate the product functionally performs at least as well as or better than at least one nationally recognized or market leading product of its type, to be approved by Green Seal. The applicant shall use objective, scientifically validated testing methods conducted under controlled and reproducible laboratory conditions to demonstrate functional performance along the following parameters:

Air Leakage (Q_{leak}):

The percent of the rated airflow of the fan that is required to maintain the applied pressures, accounting for air that leaves or enters through cracks, joints and penetrations in the furnace cabinet rather than through supply and return ducts installed in accordance with manufacturer's instructions.

Annual Fuel Utilization Efficiency (AFUE):

For the exact definition of AFUE, refer to the federal test method 10 CFR Part 430, Appendix N to Subpart B. In general, the percentage of the heat in the incoming fuel which is converted to space heat instead of being lost.

Furnace Fan Efficiency (" e ")²:

The ratio of the furnace fan electrical consumption to the total energy consumption of the furnace during the heating mode.

For the purposes of meeting the requirements outlined in Section 4.0, data for this product that has been reviewed and certified by ENERGY STAR will suffice.

5.0 Environmental and Human Health Requirements

This section describes the Environmental and Human Health requirements with which the applicant product must demonstrate compliance. Green Seal uses the following factors to determine requirements for this section:

- **Product Form:** the applicant product is an assembly of parts.
- **Potential for Direct Human Exposure:** through regular handling and use of the product, the potential for inhalation, ingestion, or absorption is not present.
- **Potential for Environmental Releases:** as described in herein, when the product is used as intended, the product does not create environmental releases to air, water, or land, except as addressed through the product innovation (i.e., energy efficiency to limit carbon dioxide emissions; strategies to limit nitrous oxide emissions).

Disclosure

Applicant shall disclose all product parts through a Bill of Materials, including the part name, type (e.g., raw material, assembly, sub-assembly, component), part function, and material type (e.g., steel, aluminum, resin, nylon, etc.).

The exposure review of the disclosed Bill of Materials demonstrates that the requirements outlined in GS-20, Edition 2.0, Sections 5.2-5.20 do not apply.

Product-Specific Requirements

Products shall demonstrate a nitrogen oxide emission level of no more than 14 nanograms per joule while maintaining market leadership levels of energy efficiency.

Leadership energy efficiency is defined as meeting the Qualification Requirements for ENERGY STAR v4.0, including:

- AFUE: $\geq 90.0\%$ for U.S. South, $\geq 95.0\%$ for U.S. North/Canada,
- Furnace Fan Efficiency: $\leq 2.0\%$, and
- Air Leakage: $\leq 2.0\%$.

6.0 Packaging Requirements

Applicant shall meet the following packaging requirements as applicable.

Primary and Secondary Packaging.

Primary and secondary packaging shall meet the following requirements, based on the packaging material type:

Packaging made from paper or paperboard shall be *recyclable* and made from 100% recovered material.

Packaging made from containerboard (corrugated cardboard) shall be *recyclable* and made from at least 30% recovered material.

Packaging made from plastic shall be *recyclable*, or source-reduced by 20%, or shall contain 25% recovered material content (pre- or *post-consumer material*).

Heavy Metal Restrictions

The heavy metals lead, mercury, cadmium, and hexavalent chromium shall not be *intentionally introduced*. Further, the sum of the concentration levels of these metals shall not exceed 100 ppm; an exception is allowed for *refillable packages* or packages that would not exceed this

maximum level but for the addition of *post-consumer material*.

Other Restrictions

Phthalates, bisphenol A, and chlorinated packaging material are prohibited from being intentionally introduced to plastic packaging; an exception is allowed for packages that would not have added phthalates, bisphenol A, or chlorinated packaging material but for the addition of post-consumer material.

7.0 Certification Requirements

Applicant shall meet all certification requirements described herein.

Certification Term

The initial Certification Term shall be 4 years. After the Certification Term, the applicant has the option to undergo Recertification.

Site Visit

The applicant shall undergo a site audit of product manufacturing facilities that includes verifying product characteristics and quality manufacturing processes.

Certification Mark

The Green Seal® Certification Mark may appear on the product, packaging, secondary documents, and promotional materials, only in conjunction with the certified product. Use of the Mark must be in accordance with Rules Governing the Use of the Green Seal Certification Mark.

The Green Seal Certification Mark shall not be used in conjunction with any modifying terms, phrases, or graphic images that might mislead consumers as to the extent or nature of the certification.

Green Seal must review all uses of the Certification Mark prior to printing or publishing.

Use With Other Claims

The Green Seal Certification Mark shall not appear in conjunction with any human health or environmental claims unless verified and approved in writing by Green Seal.

Statement of Basis for Certification

Wherever the Green Seal Certification Mark appears, it shall be accompanied by a description of the basis for certification. The description shall be in a location, style, and typeface that are easily readable. If online space is limited, a link to the basis of certification may be used. Green Seal shall develop a statement of basis for certification for each product.