Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration, Stationary Air-conditioning, and Other End-Uses.

Application for a Variance from the requirements of California Code of Regulations, Title 17, sections 95374 and 95375.

Note: the requirements for a variance application are listed in California Code of Regulations, Title 17, section 95378, Use of this application template is optional.

A. Name of applicant: LG Electronics Inc.

Ownership status (e.g., parent, subsidiary): Parent

Address: 84, Wanam-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do, Republic of Korea, 51554

Telephone number: 82-55-269-4002

E-mail address: eunkyung.lee@lge.com

B. Please describe your business activity or product description.

LG Electronics was founded in 1958 as GoldStar in South Korea. After merging with Lucky Chemicals in 1995, LG Electronics was formed and remains headquartered in Seoul, South Korea. The United States subsidiary, LG Electronics USA, is headquartered in Englewood Cliffs, NJ with branches throughout the country.

LG Electronics provides business to consumer (B2C) products, such as home appliances, TVs and mobile communications, and business to business (B2B) products, such as commercial air conditioners and car parts. LG Electronics consists of five business divisions: H&A (Home Appliance & Air Solution), HE (Home Entertainment), MC (Mobile Communications), VC (Vehicle Components) and B2B.

LG Electronics Air Solution division currently contains one dehumidifier, the sleek, stylish LG PuriCare™ 50** Pint Dehumidifier with Drain Pump for effortless everyday use. The ENERGY STAR® certified LG PuriCare dehumidifier (model UD501KOJ5) offers smart capabilities and user-friendly features that make it more ergonomic and efficient for residential use. Its built-in pump continuously drains water directly into a sink, out a window or down a drain. Additionally, its drain tank option sends an alert when full and features auto-shut off for added peace of mind. Designed

with safety in mind, the Safety Standby Mode prevents overheating, and internal components are made of thermally resistant materials.

C. Please describe your relationship to the product.

LG Electronics manufactures and sells home appliances including dehumidifiers, the product currently needing a variance. The two similar models UD501KOJ5 and UD501KOG5 are both manufactured in Tianjin, China and then imported into the United States for sale. The spec sheets are attached to this application.

LG Electronics dehumidifiers are available for purchase throughout the United States either online at the LG store, (https://www.lg.com/us/dehumidifiers), or at participating LG Authorized Dealers such as Costco, Home Depot, Lowe's, Best Buy. LG Electronics sold approximately 7,000 units throughout the Unites States in 2022 and anticipates a similar amount in the following years.

D. List the specific section(s) of the regulation from which a variance is being requested.

Section 95374: List of Prohibited Substances. Tables 3: End-Use and Prohibited Substances, Air-Conditioning Equipment- residential dehumidifiers with a GWP of 750 or greater and the related Section 95373 Prohibitions, Exceptions, Registration, Recordkeeping, Reporting, Labeling, and Disclaimer Requirements.

E. Provide an explanation and description of the reasons for seeking a variance.

LG Electronics is requesting to use the existing refrigerant R410A in dehumidifiers temporarily until the allowance of the R32 refrigerant for dehumidifiers in the EPA SNAP rules and the development of an LG Electronics dehumidifier with R32 refrigerant. Currently, LG Electronics has no alternative to R410A in dehumidifiers and needs the variance request to continue to provide the customers in California with a safe and effective way to dehumidify their homes. Federal regulation did not allow the use of R32 refrigerant in dehumidifiers until the recent EPA SNAP 25 rule that was only released on April 28th, 2023.

LG Electronics is developing a dehumidifier for use with R32 as other LG Air Solution appliances already take advantage of the low GWP R32 refrigerant, but due to the timing of the federal regulations it was unknown when it would be allowed to be deployed. LG Electronics has created a mitigation plan to offset the environmental effects of using R410A for a longer time period and it is described in section P of this request.

F. Identify what type of variance is being requested:

☒ Impossibility (the Applicant exercised best efforts but still was unable to comply with the regulatory requirements of the regulation for reasons beyond his or her control despite exercising foresight to prevent the noncompliance.)

☐ Force Majeure Event (a sudden and unforeseeable event involving a clear danger, demanding action to prevent or mitigate the loss of, or damage to, life, health, property, or essential public services, arising from causes beyond the control of the Applicant, which delays or prevents the performance of any obligation under the regulation, despite the Applicant's best efforts to fulfill the obligation. This includes events where the local government, State of California, or federal government issues a declaration of emergency, such as war, wildfires, floods, hurricanes, tornadoes, earthquakes, volcanic eruptions, and pandemics. This does not include negligent acts or the Applicant's financial inability to perform that is unrelated to an event as defined in this section.)

☐ Both Impossibility and Force Majeure Event

G. If seeking an Impossibility variance please provide clear and convincing evidence demonstrating how all of the following Impossibility variance criteria have been met:

1. A lower risk substitute is not currently or potentially available.

Currently, LG Electronics does not have any refrigerants available for dehumidifiers with a GWP less than 750 to replace the R410A refrigerant in 2023. A dehumidifier using the R32 refrigerant is being developed, which has a GWP less than 750, but due to federal regulations, R32 was not acceptable by the EPA SNAP rules for a dehumidifier until very recently. While the refrigerant R513A is allowable by both the EPA and California regulations and has a GWP of 573, the differences between R410A and R513A will not make for a simple or efficient transition. The efficiency of R513A is better suited for a large capacity application in commercial or large scale products. R32 is much more appropriate for a small residential dehumidifier due to the increase hear per unit volume than can be utilized in the evaporation process. R32 has a higher calory per cubic meter and is more efficient than R513A as seen in the following table:

	R32			R513A			
TEMP. (º C)	density kg/m3	enthalpy kJ/kg	kcal/m3	density kg/m3	enthalpy kJ/kg	kcal/m3	R513A/R32 (%)
10	30.2320	516.66	3733.10	23.586	383.6	2162.37	58%
20	40.8560	516.90	5047.31	32.095	389.4	2986.97	59%
30	54.7760	515.72	6751.53	43.038	394.8	4060.95	60%

*1 kJ= 0.239Kcal

Furthermore, LG Electronics already uses the R32 refrigerant in air conditioners for window and split type currently and can reduce development time to meet the safety and energy requirements for the main components such as the compressor, motor and electric ignition components in dehumidifiers.

LG Electronics is committed to advancing technology and creating products with low GHG emissions, which is why in 2016 LG Electronics was the first manufacturer to implement R32 refrigerant in air conditioners and had the first air conditioner with R32 on the market.

2. An exemption will not increase the overall risk to human health or the environment.

According to the ASHRAE 43 and International Standard ISO 817 refrigerants are classified into two toxicity classes and both R32 and R410A are included in the lower toxicity Class A. Temporarily using the R410A refrigerant in dehumidifiers under the variance request will increase the risk to the environment due to increased GWP, but LG Electronics has created a mitigation plan to offset the environmental effects of using R410A for a longer time period and it is described in section P of this application.

3. The Applicant has used best efforts to anticipate and address the impossibility and any potential noncompliance.

LG Electronics has been aware of the dehumidifier GWP limits since CARB finalized the rule in December 2021, but due to the refrigerant R32 not being accepted by EPA SNAP rules, the development of a dehumidifier with a GWP under 750 has taken time. LG Electronics has an internal development schedule that requires all safety and energy efficiency requirements to be met that are either as stringent or more so than state and federal regulations. Other refrigerants have been evaluated, but due to R32 being used in other LG Air Solution equipment and the high efficiency, the transition from R410A to R32 was the natural progression.

H. If seeking a Force Majeure Event variance please provide clear and convincing evidence demonstrating how all of the following Force Majeure variance criteria has been met:

1. Non-compliance is due to a Force Majeure event.

Click or tap here to enter text.

2. The Applicant has used best efforts to anticipate and address any force majeure event and any potential noncompliance, including minimizing any adverse effects of the greenhouse gas emissions related to noncompliance.

Click or tap here to enter text.

I. Please attach supporting documentation for attributing noncompliance to Impossibility or a Force Majeure Event. Supporting documentation must be written in English. Please list the supporting documentation that is attached to this application.

Only recently on April 28th, 2023 did the new EPA SNAP Rule state that the refrigerant R32 is acceptable for a dehumidifier. Prior to the date, federal regulations restricted R32 for use in residential dehumidifiers.

LG Electronics uses R32 in other Air Solution products and has experience with developing appliances and components using this efficient refrigerant. Development of a new dehumidifier using the R32 refrigerant began in June of 2022 based on when the EPA SNAP 25 proposal was announced, but it takes time to finalize due to the internal development process which takes around 2 years depending on the product.

J. Provide a description of all efforts made to timely fulfill the requirements of the section(s) from which a variance is being requested.

LG Electronics reviewed alternative refrigerants for dehumidifiers with a GWP below 750, and found R32 and R290, but those were not acceptable refrigerants according to the EPA SNAP rules. SNAP 25 was only recently released on April 28th, 2023 allowing the R32 refrigerant in dehumidifiers.

LG Electronics has started developing a dehumidifier using the R32 refrigerant, which has a GWP less than 750, but due to federal regulations, R32 was not acceptable by the EPA SNAP rules for a dehumidifier, and it is unable to be sold to the USA market. While the refrigerant R513A is allowable by both the EPA and California regulations and has a GWP of 573, the differences between R410A and R513A will not make for a simple transition. Furthermore, LG Electronics already uses the R32 refrigerant in air conditioners for window and split type currently and can reduce development time to meet the safety and energy requirements for the main components such as the compressor, motor and electric ignition components in dehumidifiers

K. Please provide the length of the variance requested as well as the earliest date when compliance will be achieved.

Expected development schedule for R32 dehumidifier: June 2024

L. **Provide a compliance plan which describes in detail how, if a variance is granted, compliance will be achieved as expeditiously as possible including all of the following:**

(i) The method by which compliance will be achieved

New development for dehumidifier using the R32 refrigerant

(ii) Milestone dates

June 2024 (Expectation)

(iii) Milestone achievements

Development of a new compressor for R32 – July 2022 – May 2023 (10 months)

Design a new product and conduct a performance test – June 2023 – October 2023 (4 months)

Evaluate product liability and get a certification for safety – November 2023 – June 2024 (8 months)

LG Electronics was not able to develop an alternative to the R410A refrigerant dehumidifier until it was known that R32 would be allowed by EPA SNAP 25. Once it was found that R32 is available from EPA SNAP 25 proposal, development of a new dehumidifier with R32 began in June 2022. Changing the refrigerant from R410A to R32 is not a simple process as a new product is needed, including updated compressors, components, and etc. LG Electronics' internal development schedule takes time in order to make sure the products are safe for consumers and satisfy all regulations.

M. **Provide a description of the damage or harm that will result to the Applicant from immediate compliance with the regulatory requirements, including if compliance would result in an extraordinary economic hardship, such as closure of the entire facility or loss of a large portion or the revenue:**

Without the variance request acceptance, LG Electronics will incur at least $6.5 million in lost sales, and additional occurred cost loss due to the inoperability of the facility and stocks of inventory of parts and raw materials. LG sells its dehumidifier and other products to retailers and distributors throughout the country, but the large scale national retailers (Home Depot, Lowe's, Costco, Best Buy, etc.) will only accept products for all 50 US states. If the dehumidifier is not able to be sold in California it will be rejected for the entire country. California consumers along with the

rest of the country would be unable to purchase a high quality, energy efficient and most importantly safe dehumidifier for use in the homes and small businesses.

N. If applying for an Impossibility variance please provide quantification of current Greenhouse Gas (GHG) emissions resulting from normal business-as-usual operations as it directly relates to the continued use of any substance in end-uses listed in Table 1, section 95374 (a); Table 2, section 95374 (b); Table 3, section 95374 (c); or Table 4, section 95374 (d). This includes quantification of the direct GHG emissions resulting from refrigerant leaks or HFC emissions and indirect GHG emissions resulting from energy use (where applicable), with all calculations, based on the average lifetime of the equipment or product that will continue to use prohibited substances. Applicant must include all calculations used to calculate GHG emissions estimates, including emission factors (i.e., charge size as defined in section 95373, leak rate as defined in *40 C.F.R. Part 82.152*, and refrigerant used over the average lifetime of the equipment, system, or product). Please see the bottom of this application template for an example calculation.

- Annual Sales amount: 4,000 EA
- Average annual leak rate emissions: 1%
- Average loss rate of EOL: 98.5%
- Average life time in years: 5

1. Average annual leak rate emissions R410A

   4,000 dehumidifier x 1 lbs. x annual leak rate for dehum (1%) x 2,087.5 GWP x 5 years =

   417,500 lbs. CO_{2e}

2. End-of-Life emissions R410A

   4000 dehumidifiers x 1 lbs. x average loss rate of EOL for dehum (98.5%) x 2,087.5 GWP =

   8,224,750 lbs. CO_{2e}

3. Total Emissions R410A

   8,224,750 lbs. CO_{2e} + 417,500 lbs. CO_{2e} = 8,642,250 lbs. CO_{2e}

4. Convert to metric tons R410A

   1 metric ton = 2,204.62 lbs.

   8,642,250 lbs. CO_{2e}/2,204.62 lbs. = 3,920.06 $MTCO_{2e}$

5. Average annual leak rate emissions R32

4,000 dehumidifier x 1 lbs. x annual leak rate for dehum (1%) x 675 GWP x 5 years = 135,000 lbs. CO_{2e}

6. End-of-Life emissions R32

   4,000 dehumidifiers x 1 lbs. x average loss rate of EOL for dehum (98.5%) x 675 GWP =

   2,659,500 lbs. CO_{2e}

7. Total Emissions R32

   135,000 lbs. CO_{2e} + 2,659,500 lbs. CO_{2e} = 2,794,500 lbs. CO_{2e}

8. Convert to metric tons R32

   1 metric ton = 2,204.62 lbs.

   2,794,500 lbs. CO_{2e}/2,204.62 lbs. = 1,267.57 $MTCO_{2e}$

9. Comparisons

   R32 = 1,267.57 $MTCO_{2e}$

   R410A = 3,920.06 $MTCO_{2e}$

The 4,000 dehumidifier units relates to the yearly USA expected sales not only California. Actual sales in California will be much lower, but due to the dehumidifier being a country wide product, LG has no way of tracking which states retailers and distributors sell the final product in. Rather than attempting an impossible task of tracking each unit for California specifically, LG Electronics will offset and mitigate all excess environmental emissions countrywide as further described in section P.

O. Provide a description of any negative impacts to human health or the environment that may result from the granting of a variance.

In conclusion, GHG emissions have increased when the R410A refrigerant is used for the dehumidifier, the total emission value increases by 3.1 times compared to when R32 is used;

however, LG Electronics has developed a mitigation plan to negate the environmental impacts, described in the next section.

Both R410A and R32 are in the lower toxicity class A of refrigerants so there will not be any negative impacts on human health.

P. Provide a mitigation plan that demonstrates how you will reduce excess GHG emissions to a level equal to or below what would have been emitted had you been in compliance and how you will mitigate any negative impacts to human health or the environment. You must include all calculations used to calculate GHG emission estimates including emission factors (i.e., charge size as defined in section 95373, leak rate as defined in *40 C.F.R. Part 82.152*, and refrigerant used over the average lifetime of the equipment, system, or product). This may include an analysis of prohibited substances, efforts to reduce leaks or venting of prohibited substances, and options to recycle or destroy high-Global Warming Potential refrigerants.

LG Electronics plans to implement the use of R32 refrigerant in split air conditioners in both multi and single heat pump units before the CARB regulation enforcement date of January 1, 2025. Starting in April 2024, LG Electronics will use and sell products containing the lower GWP R32 refrigerant instead of the higher GWP R410A refrigerant in split air conditioners, lowering the excess GHG emissions in the United States by 6,058 MTCO2e. This will offset the 2,653 MTCO2e excess GHG emissions from the R410A dehumidifier and decrease the excess emission by an additional 3,405 MTCO2e.

Calculations:

- April to June 2024 sales amount: 1,500 EA (Multi Heat pump – 1,000 EA, Single Heat pump – 500 EA)
- Average annual leak rate emissions: 5%
- Average loss rate of EOL: 80%
- Average life time in years: 15
- Refrigerant: Multi Heat pump – 3.9 lbs., Single Heat pump – 4.4 lbs.

1. Average annual leak rate emissions R410A

   Multi: 1,000 x 3.9 lbs. x annual leak rate for AC (5%) x 2,087.5 GWP x 15 years =

6,105,938 lbs. CO_{2e}

Single: 500 x 4.4 lbs. x annual leak rate for AC (5%) x 2,087.5 GWP x 15 years =

3,444,375 lbs. CO_{2e}

2. End-of-Life emissions R410A

Multi: 1000 x 3.9 lbs. x average loss rate of EOL for AC. (80%) x 2,087.5 GWP =

6,513,000 lbs. CO_{2e}

Single: 500 x 4.4 lbs. x average loss rate of EOL for AC (80%) x 2,087.5 GWP =

3,674,000 lbs. CO_{2e}

3. Total Emissions R410A

6,105,938 lbs. CO_{2e} +3,444,375 lbs. CO_{2e} + 6,513,000 lbs. CO_{2e} + 3,674,000 lbs. CO_{2e} + = 19,737,313 lbs. CO_{2e}

4. Convert to metric tons R410A

1 metric ton = 2,204.62 lbs.

19,737,313 lbs. CO_{2e}/2,204.62 lbs. = 8,953$MTCO_{2e}$

5. Average annual leak rate emissions R32

Multi: 1,000 x 3.9 lbs. x annual leak rate for AC (5%) x 675 GWP x 15 years =

1,974,375 lbs. CO_{2e}

Single: 500 x 4.4 lbs. x annual leak rate for AC (5%) x 675 GWP x 15 years =

1,113,750 bs. CO_{2e}

6. End-of-Life emissions R32

   Multi: 1000 x 3.9 lbs. x average loss rate of EOL for AC (80%) x 675 GWP =

   2,106,000 lbs. CO2e

   Single: 500 x 4.4 lbs. x average loss rate of EOL for AC (80%) x 675 GWP =

   1,188,000 lbs. CO2e

7. Total Emissions R32

   1,974,375 lbs. CO_{2e} + 2,106,000 lbs. CO_{2e} + 1,113,750 lbs. CO_{2e} +1,188,000 lbs. CO_{2e} = 6,382,125 lbs. CO_{2e}

8. Convert to metric tons R32

   1 metric ton = 2,204.62 lbs.

   6,382,125 lbs. CO_{2e}/2,204.62 lbs. = 2,895 $MTCO_{2e}$

9. Comparisons

   R32 = 2,895 $MTCO_{2e}$

   R410A = 8,953$MTCO_{2e}$

   It is important to note that the dehumidifier mitigation plan will not affect LG Electronics' commitment to meeting the California R4 Program requirements. LG Electronics will satisfy the R4 Program with a combination of reclaimed refrigerant and the lower GWP R32 refrigerant. The dehumidifier mitigation plan will not use the same excess carbon emissions saved from the R4 Program.

   LG Electronics is prepared to keep track of the R4 Program versus the mitigation plan by serial numbers and manufacturing date of the appliances that will be used to satisfy each requirement.

Currently California building codes do not allow the installation of R32 split air conditioners in both multi and single heat pump units, but not later than July 1, 2023, the California Commission shall consider adopting updated standards. Other states in the United States have already adopted safety standards that include R32 and allow the use of R32 refrigerants in split air conditioners in both multi and single heat pump units.

Q. Provide a detailed explanation of efforts that may be implemented to curtail noncompliance in lieu of obtaining a variance

LG Electronics reviewed alternative refrigerants for dehumidifiers with a GWP below 750, and found R32 and R290, but those were not acceptable refrigerants according to the EPA SNAP rules. SNAP 25 was only recently released on April 28th, 2023 allowing the R32 refrigerant and a new dehumidifier using R32 is being developed. Another option to curtail noncompliance in lieu of obtaining a variance is to simply stop selling dehumidifiers in California until the R32 dehumidifier is developed, but because US sales are controlled by the product model name and the US market has the same product model names for all US states, LG Electronics is unable to control only California sales. This option will limit the choices of available dehumidifiers for the public and create a surplus of low-quality units that aren't as safe and reliable as the LG dehumidifier.

Without the variance request acceptance, LG Electronics will incur at least $6.5 million in lost sales, and additional occurred cost loss due to the inoperability of the facility and stocks of inventory of parts and raw materials because our buyers cannot accept a product which does not comply with a single state's regulation. LG will be forced to stop selling dehumidifiers nationwide. California consumers along with the rest of the country would be unable to purchase a high quality, energy efficient and most importantly safe dehumidifier for use in the homes and small businesses.

R. By signing below, you (LG Electronics Inc.) certify under penalty of perjury that you are a Responsible Official with full authority to submit the application and implement any provision of an Executive Order, and that all information provided is true and accurate to the best of your knowledge, after conducting due diligence. (Applications without this certification will be automatically denied.)

6/1/2023

Signature Date

S. Submit your application and documentation relating to the variance to CARB at the following email address:

HFCREDUCTION@ARB.CA.GOV

T. Any Applicant submitting information to the Executive Officer You may claim information as "confidential" by clearly identifying it as "confidential." Any claim of confidentiality must be based on your belief that the information marked as confidential is either trade secret or otherwise exempt from public disclosure under the California Public Records Act (*Government Code, section 6250 et seq*.). All such requests for confidentiality shall be handled in accordance with the procedures specified in *California Code of Regulations, title 17, sections 91000 to 91022*.