VARIANCE APPLICATION TO THE CALIFORNIA AIR RESOURCES BOARD

Respectfully Submitted by Stulz Air Technology Systems, Inc. (Stulz)

May 22, 2025

REDACTED VERSION

317-688-0151Prohibitions 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.

A. Name of Applicant: Stulz Air Technology Systems Inc.

Ownership Status: Privately held company

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B. Description of Business

1. Company Overview

Stulz Air Technology Systems (Stulz) is a privately held company headquartered in Hamburg, Germany, specializing in data center cooling equipment. Founded by Albert Stulz in 1947, the company initially manufactured electrical appliances for the German post-war market and transitioned to producing air conditioning equipment in the 1960s. In 1972, Stulz introduced its first computer room air conditioners (CRACs).

Today, Stulz operates 11 manufacturing plants globally, including facilities in Germany, Italy, the United Kingdom, Brazil, Spain, India, China, and the United States. In the U.S., Stulz operates manufacturing plants in Frederick, Maryland, and Dayton, Tennessee. A new manufacturing facility is scheduled to open in Denton, Texas, in 2025, further expanding its production capacity. Stulz employs over 3,500 personnel worldwide, including 750 in the United States.

In California, Stulz sells CRAC systems through independent manufacturers' sales representatives. [redacted]

2. Equipment Overview

Stulz is an original equipment manufacturer (OEM) of computer room air conditioners (CRACs). According to the U.S. Department of Energy (DOE), CRACs are a type of commercial air-conditioning and heating equipment designed for data processing rooms, computer rooms, and other information technology cooling applications. These units operate using a direct expansion system that includes, at a minimum, a compressor, condenser, evaporator coil, and metering device. They use volatile refrigerants with low boiling points to transfer heat. CRACs are federally defined under Title 10, CFR § 431.92.

Stulz currently offers CRAC systems utilizing R-407C (global warming potential, or GWP = 1,774) and R-410A (GWP = 2,088) refrigerants. The company is actively transitioning to R-454B (GWP = 466).

Stulz ATS manufactures five distinct product families of CRACs:

CyberAir DX – Floor-mounted, available in up flow, down flow, and horizontal flow configurations.

CyberOne EC – Floor-mounted, up flow, down flow, and horizontal flow configurations.

Mini-Space EC – Floor-mounted, up flow, down flow, and horizontal flow configurations.

CyberRow DX – Floor-mounted, horizontal flow configuration.

CeilAir – Ceiling-mounted, horizontal flow configuration.

The products are as follows:

CyberAir DX

Model Nomenclature								
CFX-XXX-XXX-X-XX								
Model	**Air Pattern**	**Capacity (kW)**	**Cooling Method**	**Number of Circuits**	**Heat Rejection**	**Secondary Cooling Options**	**Fan Location**	**Additional Special Options**
CyberAir Floor Mounted Solution	D = Downflow U = Upflow R = Rear Return	021 028 035 042 053 070 088 105	D = DX	2 = Dual Circuit	A = Air G = Glycol W= Water	0 = None F = Water-Side Economizer W= Alternate Water Source	I = In Unit	0 = Standard T = Tandem Compressors S = Special
CF	D	105	D	2	W	0	I	0

Example:105 kW Capacity, Dual Circuit, Water Cooled, Direct Expansion, Downflow, Floor Mounted System; with Internal EC Fans, and No Additional Options: CFD-105-D2W-0-I0

Product Family	**CyberAir DX**
Basic Models	CF( )-21-D-2-( )-( )-1-( ) CF( )-28-D-2-( )-( )-1-( ) CF( )-35-D-2-( )-( )-1-( ) CF( )-42-D-2-( )-( )-1-( ) CF( )-53-D-2-( )-( )-1-( ) CF( )-70-D-2-( )-( )-1-( ) CF( )-88-D-2-( )-( )-1-( ) CF( )-105-D-2-( )-( )-1-( )

CyberOne EC

COS-XXX-X-XX-X-EC					
System	**Capacity in 1,000s BTU/Hr**	**Cooling**	**Source**	**Air Flow Pattern**	**Fan Cooling**
COS = CyberOne	024 042 060 096 120	AR = Remote (Split) Air Cooled W = Water Cooled G = Glycol Cooled	AWS = Alternate Water Source FC = Free Cooling	D = Down Flow U = Up Flow	EC = Direct Driven, single inlet, two- fold backward curved radial fan with electronically commutated (EC) motor
COS	042	G	FC	U	EC

Example: CyberOne, 42,000 BTU/Hr, Glycol Cooled, Free Cooling, Up Flow Air, Electronically Commutated Motor - COS-042-G-FC-U-EC.

Product Family	**CyberOne EC DX**
Basic Models	COS-024-( )-( )-( )-EC COS-042-( )-( )-( )-EC COS-060-( )-( )-( )-EC COS-096-( )-( )-( )-EC COS-120-( )-( )-( )-EC

Mini-Space EC

Nomenclature					
CCX-XXX-X-EC					
CC	Air Pattern	Capacity (kW)	Refrigerant Circuits	Cooling Method	Blower Type
Mini-Space Compact System	D=Downflow U=Upflow R=Rear Return F=Front Discharge	04 06 08 11 12	0 1	A=Air W=Water G=Glycol C=Chilled Water	EC

Call Product Support at 888 529 1266 for additional information.

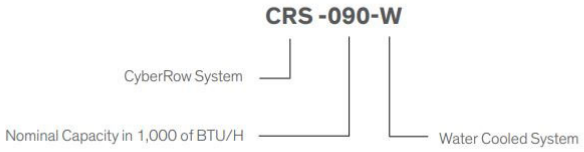
Example: 12 kW capacity, downflow air pattern, 1 circuit, water-cooled DX, EC fans:

CCD-121-W-EC

Product Family	**Mini-Space EC**
Basic Models	CC( )-04-1-( )-EC CC( )-06-1-( )-EC CC( )-08-1-( )-EC CC( )-11-1-( )-EC CC( )-12-1-( )-EC

CyberRow DX

CRS-XXX-X		
System	Nominal Capacity (MBH)	Cooling Method
CyberRow Row Based Cooling	1000's of BTU/H (MBH)	AR = Remote (Split Air Cooled) G = Glycol cooled W = Water Cooled



Product Family	**CyberRow DX**
Basic Models	CRS-042-( ) CRS-084-( ) CRS-085-( ) CRS-090-( )

CeilAir

Nomenclature				
OHS-XXX-XX-XX				
System	Nominal Capacity in 1,000's of BTU/Hr	Configuration		Options
OHS = CeilAiR Overhead System	012, 018, 024, 032, 040, 048, 060, 072, 084, 120	D( ) = Dual Circuit H( ) = Horizontal Discharge ("H-Series")	AHU = Air Handling Unit AR = Air-Cooled Remote (Split) AS = Air-Cooled Self-Contained C = Chilled Water System G = Glycol-Cooled W = Water Cooled	AWS = Alternate Water Source FC = Free Cooling LP = Low Profile Configuration SF = Same-Face Air Pattern SP = Special Configuration *
OHS	040	H	G	FC

* Call 888 529 1266 for additional information.

Example: OHS-040-HG-FC

Overhead System, 40,000 BTU/Hr Capacity, Horizontal Discharge, Glycol Cooled with optional Free Cooling: OHS-040-G-FC

Product Family	**CeilAir**
Basic Models	OHS-012-( )-( )-( ) OHS-018-( )-( )-( ) OHS-024-( )-( )-( ) OHS-032-( )-( )-( ) OHS-040-( )-( )-( ) OHS-048-( )-( )-( ) OHS-060-( )-( )-( ) OHS-072-( )-( )-( ) OHS-084-( )-( )-( ) OHS-120-( )-( )-( )

C. Relationship to the Product

Stulz is the manufacturer of the products in need of a variance.

D. Specific Sections of the Regulation from which a Variance Is Requested

Section 95374(c) – Table 3: End-Use and Prohibited Substances (Air-conditioning Equipment; Other air-conditioning (new) equipment) and related Section 95375 Prohibitions, Exceptions, Registration, Recordkeeping, Reporting, Labeling, and Disclaimer Requirements

E. Reasons for Seeking Variance

Stulz seeks a variance due to the impossibility of achieving compliance by the January 1, 2025 deadline. Despite exercising best efforts—including rigorous technical evaluations and significant resource investment—Stulz faced unavoidable delays stemming from regulatory uncertainty, certification bottlenecks, and component shortages. The requested variance will enable Stulz to complete the transition to low-GWP refrigerants while maintaining compliance with federal energy efficiency standards and delivering compliant CRAC systems to the market.

1. Regulatory Challenges and Industry Engagement

Stulz began evaluating substitute refrigerants in 2021, focusing on refrigerants with a GWP below 750, which aligned with federal energy efficiency requirements under Title 10, CFR § 431.97, and California Title 20 Appliance Efficiency Regulations. Stulz selected two potential substitute refrigerants, R-454B (GWP 466) and R-32 (GWP 675), based on their efficiency performance, availability, and compatibility with existing equipment designs.

By early 2022, Stulz began designing CRAC systems utilizing R-454B, which Stulz considered the most viable option due to its balanced characteristics. However, progress was disrupted in December 2022 when the U.S. Environmental Protection Agency (EPA) proposed stricter GWP limits of 150 to 300 for certain equipment categories under the American Innovation and Manufacturing (AIM) Act.[1]

This proposed rule undermined ongoing design work, as no refrigerants below 300 GWP can meet DOE's stringent efficiency standards for CRAC systems. Consequently, Stulz halted its transition efforts and joined industry peers in advocating for an achievable GWP limit. In early 2023, Stulz and other industry stakeholders engaged with EPA, providing technical evidence on the infeasibility of the 150 or 300 GWP limit. These efforts culminated in the EPA's October 2023 final rule, which established a 700 GWP limit for CRAC systems.[2] This rule realigned federal requirements with the refrigerants identified in Stulz's initial evaluations, allowing the company to resume transition efforts.

Although California had already finalized its prohibition on refrigerants with a GWP of 750 or greater for "Other air-conditioning (new) equipment" effective January 1, 2025, uncertainty at the federal level and other unresolved regulatory and standards-based barriers, made it commercially and technically infeasible for Stulz to proceed with redesign based solely on

[1] "Phasedown of Hydrofluorocarbons: Restrictions on the Use of Certain Hydrofluorocarbons Under Subsection (i) the American Innovation and Manufacturing Act of 2020," 87 Fed. Reg. 76738 (Dec. 15, 2022) (TT Proposed Rule).

[2] "Phasedown of Hydrofluorocarbons: Restrictions on the Use of Certain Hydrofluorocarbons Under the American Innovation and Manufacturing Act of 2020," 88 Fed. Reg. 73090 (Oct. 24, 2023) (TT Final Rule).

California's standard. At the time of EPA's proposed rule in December 2022, Stulz faced three separate barriers to using R-454B:

- **Federal energy efficiency standards:** No refrigerant below 300 GWP could meet DOE's NSenCOP requirements.
- **Safety certification:** UL 1995, then in effect, did not permit use of A2L refrigerants such as R-454B.
- **Building codes:** Installation of A2L refrigerants in direct-expansion systems was not permitted in most jurisdictions.

Therefore, even though R-454B aligned with California's 750 GWP limit, it could not be used without updated safety standards and would have failed to satisfy federal efficiency requirements.

In addition to these constraints, the regulatory environment at the federal level remained unresolved. EPA's proposed rule introduced the possibility of a more stringent national GWP cap, which—if finalized—would apply to all states, including California. As a result, Stulz could not prudently allocate engineering resources toward a redesign based solely on California's standard while the scope and stringency of the federal rule were still pending.

Continuing redesign work under the California threshold in 2023 would have required Stulz to assume substantial commercial and legal risk. Any product developed under California's 750 GWP standard could ultimately have been rendered non-compliant under a more restrictive federal rule, resulting in sunk costs and a product that could not lawfully be sold in the broader U.S. market.

Only after EPA finalized its Technology Transitions rule in October 2023—setting a 700 GWP threshold aligned with both R-454B and the DOE's Net Sensible Coefficient of Performance (NSenCOP) standard—could Stulz proceed with the certainty required to justify the investment of time, engineering labor, and capital necessary to complete compliant product redevelopment.

By that time, key enabling conditions had also materialized: UL 60335-2-40 had replaced UL 1995 as the applicable safety standard, allowing certification of A2L-based systems, and California had amended Title 24 to permit the installation of equipment using A2L refrigerants. Together, these developments provided the coordinated regulatory framework—across energy efficiency, safety, and building codes—needed to support a lawful and market-ready transition to R-454B-based systems.

2. Redesign Efforts and Transition Delays

Stulz immediately began redesigning its CRAC product families following EPA's publication of the TT Final Rule in October 2023. The transition to R-454B required a full redesign of all CRAC models, including adjustments to mechanical systems, refrigerant circuits, and energy efficiency performance to comply with DOE's NSenCOP standards.

The redesign process required substantial investment in engineering resources, including hiring additional staff, reallocating senior engineers, and conducting extensive prototyping across air-cooled, water-cooled, and glycol-cooled configurations to ensure compliance and reliability.

Despite prioritizing the transition to low-GWP refrigerants, the timeline between the EPA's final rule in October 2023 and California's January 1, 2025, compliance deadline could not be met within the available time. In particular, Stulz faces the following challenges:

- **Component Shortages:** Critical components such as compressors, evaporator coils, condensers, expansion valves, cabinet sizes, and fan systems remained in short supply. Manufacturers of these components were unable to scale production until after the EPA's rulemaking concluded, further delaying Stulz's ability to complete product redesigns and ensure consistent availability of parts.

- **Certification Delays:** Certification requirements were updated in late 2023 with the replacement of UL 1995 by UL 60335-2-40, which allowed the use of A2L refrigerants, such as R-454B, in direct expansion systems. However, the transition to the new standard created backlogs at independent certification laboratories, which remain fully booked into 2025, significantly delaying Stulz's ability to secure necessary certifications for redesigned products.

To address these challenges, Stulz leveraged its global design expertise, including experience gained from earlier transitions to low-GWP refrigerants in the European Union (EU). Stulz had adopted R-454C (GWP 146) for certain products sold in Europe. However, R-454C could not be used in the U.S. due to differences in energy efficiency metrics. The EU uses the Energy Efficiency Ratio (EER), which accounts for both sensible and latent cooling. In contrast, the U.S. DOE's NSenCOP metric credits only sensible cooling. As a result, systems using R-454C did not meet U.S. minimum efficiency requirements, making the refrigerant unsuitable for domestic use despite its lower GWP.

3. Prototype Development and Redesign Process

By October 2024, Stulz successfully developed and tested its first R-454B prototype, demonstrating compliance with minimum efficiency requirements. Testing was conducted at Stulz's ETL-certified satellite laboratory, which has been used for DOE and California Energy Commission efficiency testing for over a decade.

To streamline the redesign process, Stulz consolidated its CyberAir DX and CyberOne EC product lines into a single family, designated CyberAir 3 Pro. This consolidation reduced redesign efforts to four distinct product families: CyberAir 3 Pro, CeilAir, Mini-Space EC, and CyberRow DX.

Despite these efforts, the short timeline between the EPA's final rule and California's January 1, 2025, compliance deadline was insufficient to complete the redesign and certification of all product families.

4. Current Compliance Efforts

Stulz has committed substantial resources to meeting the EPA and California GWP limits. Current efforts include:

- Completion of the redesign and testing of the CyberAir 3 Pro product family (including efficiency and safety validation), with detailed timelines documented in the attached Gantt charts.
- Redesign of the CeilAir, Mini-Space EC, and CyberRow DX product families using R-454B refrigerant.
- Expansion of the engineering team and reallocation of senior engineering resources to accelerate the redesign process.
- Collaboration with component manufacturers to address ongoing supply chain challenges for R-454B-compatible components.

5. Transition Timeline

As described more fully in the Gantt Chart in the response to Question L, Stulz anticipates completing its transition to low-GWP refrigerants by the end of 2026, aligning its product families with federal and state GWP limits. This includes the redesign of four product families—CyberAir 3 Pro, CeilAir, Mini-Space EC, and CyberRow DX—with individual timelines tracked and documented in the Gantt chart.

F. Type of Variance Requested

Stulz seeks a variance for reasons of impossibility – *i.e.*, Stulz exercised best efforts but still was unable to comply with the regulatory requirements for reasons beyond its control despite exercising foresight to prevent the noncompliance.

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

Stulz acknowledges the negative impacts to human health and environment of the emissions of HFCs and other greenhouse gases. However Stulz believes any such impacts can be minimized, if not avoided, by offsetting its emissions through the purchase of carbon offsets potentially resulting in a net zero impact on human health and the environment.

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

As described more fully in response to Question E, Stulz has demonstrated best efforts to anticipate and address the impossibility of compliance by immediately resuming redesign efforts following the issuance of the TT Final Rule in October 2023. In particular, Stulz increased engineering staff, reallocated senior engineers, and began redesigning affected product families for use with R-454B. The company consolidated its CyberAir DX and CyberOne EC lines into a single product family to reduce redesign scope, initiated prototype development and performance testing at its ETL-certified laboratory, and coordinated with UL 60335-2-40 safety certification labs and component suppliers to schedule testing and secure parts compatible with A2L refrigerants. Despite these efforts, the limited time between the issuance of the TT Final Rule and California's January 1, 2025, deadline—combined with certification lead times and supply constraints—made compliance within the required timeframe impossible.

H. [Omitted; Not seeking Force Majeure event variance]

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.

- Attachment A: STULZ Sustainability Report 2023
- Attachment B: Affidavit of David Meadows, Director of Technology, Stulz Air Technology Systems, Inc., regarding lack of component availability.
- Attachment C: Supplier Email (Trade Secret Protected)
- Attachment D - CeilAir Product Family (Trade Secret Protected)

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

As described more fully in the response to Question E, Stulz has made focused efforts to transition to a substitute refrigerant following the issuance of the TT Final Rule in October 2023. Stulz identified R-454B as the appropriate replacement to meet the federal sub-700 GWP limit and DOE efficiency standards, and immediately resumed redesign activities. The company consolidated its CyberAir DX and CyberOne EC product families into a single line—CyberAir 3 Pro—to streamline development and reduce engineering workload.

Stulz allocated resources to support this effort by increasing engineering staff, reassigning senior engineers, and dedicating personnel to the design, build, and testing of prototypes across multiple configurations. In parallel, Stulz scheduled safety certification under UL 60335-2-40 and coordinated with suppliers to secure R-454B-compatible components. Prototype testing was conducted at the company's ETL-certified laboratory to confirm performance under applicable energy efficiency standards. These efforts reflect Stulz's continued work to complete the transition, despite certification delays and ongoing equipment supply constraints.

K. Length of Variance Requested

Stulz respectfully requests a variance until January 1, 2027.

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:

For additional information, please see response to Question E.

The first part of the plan to achieve compliance consists of an effort to first consolidate two of the existing product families' into one (CyberAir DX and COS EC products become the CyberAir 3 Pro product line), and then fully design the CyberAir 3 Pro product family offering using R-454B refrigerant.

The timeline for this consolidation and redesign effort is shown on the Gantt chart below:

- The CeilAir family of computer room air conditioners will also be redesigned using R-454B. The timeline for the redesign effort is shown in the Gant chart below.

- The Mini-Space EC family of computer room air conditioners will also be redesigned using R-454B. The timeline for the redesign effort is shown in the Gant chart below.

- The CyberRow DX family of computer room air conditioners will also be redesigned using R-454B. The timeline for the redesign effort is shown in the Gant chart below.

[redacted]

[redacted]

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:

This response contains confidential information protected as a trade secret under the California Public Records Act and may not be disclosed to the public pursuant to section 7924.510 of the California Government Code.

The inability to sell Stulz ATS computer room air conditioners in California due to immediate compliance requirements would significantly harm the company and its operations. This would

result in a direct loss of revenue from the California market, negatively impacting Stulz ATS's profitability and the livelihoods of employees involved in the production of this equipment.

Additionally, independent sales representatives in California who rely on these sales would experience commensurate decreases in revenue, further amplifying the economic impact. Beyond direct losses, this disruption could undermine Stulz ATS's reputation as a reliable supplier of comprehensive cooling solutions, potentially affecting customer confidence and demand across other product lines. These combined impacts pose a risk of extraordinary economic hardship for the company and its business partners.

[redacted]

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).

This response contains confidential information protected as a trade secret under the California Public Records Act and may not be disclosed to the public pursuant to section 7924.510 of the California Government Code.

1. ***Description and Justification of Methodology and Calculations***

Stulz has calculated emissions resulting from HFC based equipment that may be shipped to California based on the average lifetime of the equipment, the amount of refrigerant in the systems, the refrigerant in the line sets for split air conditioners, and the end of life emissions are based on the following formulas:

a. Formulas

(Annual leak rate)=(Quantity of systems)x(Average Maximum Refrigerant Charge)x(Annual leak rate %)x(GWP rating)x(System Life)

(End of Life emissions)=(Quantity of systems)x(Average Maximum Refrigerant Charge)X(End of life leak rate)x(GWP)

(Total lifetime emissions)=(Annual leak rate)+(End of life emissions).

Note: Due to the wide variety of systems within each individual product family the maximum average refrigerant quantity per unit was used in calculations. This number was determined by using the maximum charge of any unit sold into California. For water and glycol units this is the maximum charge per the units nameplate. For air cooled split units it is the maximum charge for the evaporator, the maximum charge for the condenser plus the charge of the maximum allowable liquid and hot gas lines per our engineering manuals (150 total feet).

The number of units sold into California in 2023 multiplied by the average maximum refrigerant charge is equal to the total refrigerant shipped into California in 2023 by product family.

b. Quantity of Systems

Total quantity of units was based on actual sales in 2023 which was similar, but greater than the previous two years that we have good records for. These numbers include all units shipped into California not only those sold by representatives within the state of California.

c. System Refrigerant Charge

Refrigerant Charge includes all refrigerant in self-contained systems (water and glycol cooled). For air cooled split system the refrigerant quality includes the evaporator charge, the line set charge, and the remote condenser charge. Refrigerant quantity in line sets was based on the maximum allowable line length. This value was then added to the condenser charge for that split systems.

The total quantity of units sold by product family and the refrigerant quantity associated with those units that are anticipated to be sold during the variance period are listed below:

d. Leak Rate

The annual and end of life leak rates were sourced from CARB's published inventory leak rates. Since several product families are comprised of units both above and below 65,000 BTU/hr the appropriate leak rates were applied to each member of that family in accordance with the chart below.

System Type	Baseline Refrigerant	Baseline GWP (100-year, AR4)	Lifetime (Years)	Average Charge Size (lbs.)	Average Annual Leak Rate (%)	Average End-of-Life Leak Rate (%)
Non-residential AC (≥ 65k to <135,000k BTU/hr)	R-410A	2,088	20	25	10.0%	56.0%
Non-residential AC (≥ 135,000k BTU/hr)	R-410A	2,088	20	60	7.0%	20.0%

2. Total Emissions Per Variance Period

The total emissions of the current systems over the variance period is **5,515.63 tons of CO^2e.**

Stulz will purchase carbon credits to offset the emissions between systems using R-410A and R-454B over the variance period.

(Carbon Offset) = ([high GWP] emissions) – ([low GWP] emissions)

(XXX tons of CO_2e) = (XXX tons of CO_2e) – (XXX tons of CO_2e)

The offsets to be purchased are **4,251.3 tons of CO^2e.**

3. *Refrigerant Emission Calculations*

Product family	CyberRow DX	CeilAir	CyberAir DX	CyberOne EC DX	MiniSpace DX
Average max system refrigerant charge (LBS)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Leak rate, annual	7%	7%-10%*	7%	7%	7%
Leak rate, end of life	20%	20%-56%**	20%	20%	20%
System life span	10	10	10	10	10
Emitance over life time (LBS GHG) (Total system refrigerant charge for product family x Annual leak rate x Life span x GWP)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Emitance at end of life (LBS GHG) (Total system refrigerant charge for product family x EOL leak rate x GWP)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
(Total lifetime emitance (LBS GHG)) Total emitance over lifetime + Total EOL leak rate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total lifetime emitance (kg) (LBS GHG x 0.4535924 kg)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Current refrigerant (R-410A and R407C)					
Refrigerant type	R-410A	R-407C	R-410A	R-407C	R-410A
GWP	2088	1774	2088	1774	2088
CO2e /system (mtons CO2e/system) (Total lifetime emitance mtons / number of units)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
mtons CO2e/ varience period (CO2 equivalent/system x total systems over varience period x 2 years	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total CO2e / varience period, mtons of CO2e			5515.63		
mtons CO2 equivalent per year (mtons CO2 equivalent/year)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total CO2et per year (mtons of CO2e)			2757.82		
New refrigerant (R-434B)					
New refrigerant	R-454B	R-454B	R-454B	R-454B	R-454B
GWP	466	466	466	466	466
CO2e /system (mtons CO2e/system) (Total lifetime emitance mtons / number of units)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
mtons CO2e/ varience period (CO2 equivalent/system x total systems over varience period x 2 years	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total CO2e/ varience period, (mtons of CO2e)			1264.33		
mtons CO2e per year (mtons CO2 equivalent/year)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total CO2e per year (mtons of CO2e)			632.17		

* 10% was used for units ≤65,000 BTU/hr, where greater then 65,000 BTU/hr 7% was used
** 56% was used for units ≤65,000 BTU/hr, where greater then 65,000 BTU/hr 20% was used

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

Stulz acknowledges the negative impacts to human health and environment of the emissions of HFCs and other greenhouse gases. However Stulz believes any such impacts can be minimized, if not avoided, by offsetting its emissions through the purchase of carbon offsets, as discussed more fully below in Question P.

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.

Stulz will purchase a quantity of carbon offsets equal to **4,251.3 CO^2e tons** for the variance period from a reputable offset provider upon granting of the variance within 90 days of being granted a variance.

Stulz will procure carbon offsets from A-Gas US, Inc., as described below. Stulz selected this option because of the connection to refrigerant emissions and A-Gas' reputation and credibility in providing carbon offsets. Additionally, a prior variance approved by CARB, for SMC Corporation, purchased carbon offsets from A-Gas for the mitigation plan. The information provided below has been reviewed and approved by A-Gas.

In the event Stulz is not able to procure carbon offsets from A-Gas US, Inc., Stulz will procure offsets of a comparable nature and quality from an alternative source.

1. Background Information

A-Gas US Inc's Voluntary Emission Reduction Project, A-Gas V16, involves the recovery and reclamation of AHRI 700 certified HFC refrigerants to service/re-charge existing and newly manufactured refrigeration and air conditioning equipment in the US. The benefit of using reclaimed HFCs is that it avoids production of newly produced high GWP HFCs and subsequent GHG emissions when these newly produced refrigerants leak to atmosphere.

The HFCs recovered and reclaimed in the carbon credit project include R-134a, R-404a, R-407a, R407c, and R-410a. These HFCs were reclaimed to industry specification standards at the A-Gas EPA certified reclamation facilities located in Rhome, Texas. All applicable laws and regulations were followed throughout this project.

2. Project Purpose and Objective

The purpose of this project is to avoid the production of virgin HFC refrigerants and subsequent GHG emissions by implementing the recovery, reclamation, and the reuse of used HFC refrigerants thereby resulting in emission reductions due to lower overall aggregate HFC emissions compared to the baseline condition.

3. Project Registry

The A-Gas V16 carbon credit project is registered with ACR. ACR is a world-leading carbon credit registry and is recognized globally for pioneering work in the field of carbon markets. ACR is an Offset Project Registry for the California Cap and Trade Program through its Compliance Offset Program. Additionally, ACR has been approved by the United Nations International Civil Aviation Organization to provide carbon credits under the aviation sector's Carbon Offsetting and Reduction Scheme for International Aviation. Finally, ACR has also been approved under the Integrity Council for the Voluntary Carbon Market (ICVCM) program to provide carbon credits with the "Core Carbon Principles" (CCP) designation. This CCP designation is a mark of quality in the verified carbon market and may only be provided by programs that achieve a rigorous set of quality standards developed by the ICVCM.

4. Project Vintage

A-Gas V16 is a recent project with carbon credits issued by ACR in 2023.

5. Project Methodology

The A-Gas V16 project applied ACR's Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from Certified Reclaimed HFC Refrigerants, Propellants, and Fire Suppressants.

6. Project Verification

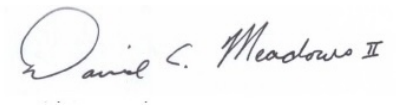
As with all ACR projects, the project was audited by an independent, accredited 3rd party (TUV SUD) to meet all requirements of the ACR program and ACR methodology as well as international best practice GHG accounting principles for carbon credit projects. A copy of the verification report for the project is available upon request to A-Gas.

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

Stulz has explored all feasible options to curtail noncompliance but has been unable to identify substitute refrigerants that would meet the regulatory requirements without obtaining a variance. Stulz equipment relies on refrigerants to function, and the transition to R-454B, which is necessary for compliance, requires significant redesign, testing, and certification processes that are still underway. Until this transition is completed, Stulz cannot manufacture compliant equipment for the State of California. Without the ability to produce and sell its equipment, Stulz and its customers—many of whom operate critical infrastructure such as data centers that support California's tech industry—would face severe disruptions, including interruptions in

service continuity, economic hardship, and potential impacts to the broader data center ecosystem.

R. By signing below, you (the Applicant) 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.)



May 22, 2025

Dave Meadows
Director of Technology
Stulz-ATS

Date

Application submitted via email to: HFCREDUCTION@ARB.CA.GOV