Validation and Verification Report

ACR815 Advanced Refrigeration – ARS2022001

February 8, 2023

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TABLE OF CONTENTS

1 INTRODUCTION

Therm Solutions, Inc. (Therm) contracted with Ruby Canyon Environmental, Inc. (RCE) to perform the validation and verification of the ACR815 Advanced Refrigeration – ARS2022001 Project (Project) for the reporting period starting and ending on August 27, 2022 and a crediting period of August 27, 2022 to August 26, 2032 under the American Carbon Registry (ACR) program. This report is documentation of validation and verification activities that RCE performed for the Project located in Hickory, NC. For the validation, RCE reviewed the project information as described in the Project Plan "ACR815 Project Plan" dated February 2023 (Version 6). For the verification, RCE ensured that the GHG assertion was materially correct, that the data provided to RCE was well documented, and that if Therm made any material errors, that these errors were corrected.

1.1 OBJECTIVES

The objectives of the validation are to evaluate:

- Conformance to the ACR standard and the approved ACR Methodology for the Quantification, Monitoring, Reporting, and Verification of Greenhouse Gas Emissions Reductions and Removals from Advanced Refrigeration Systems, Version 2.1, August 2021 (Methodology);
- GHG emissions reduction project planning information and documentation in accordance with the applicable ACR-approved methodology, including the project description, baseline, eligibility criteria, monitoring and reporting procedures, and quality assurance/quality control (QA/QC) procedures;
- Reported GHG baseline, ex ante estimated project emissions and emissions reductions/removal enhancements, leakage assessment, and impermanence risk assessment and mitigation (if applicable).

The objectives of the verification are to evaluate:

- The emissions reductions and to ensure that the assertion is materially correct;
- The data provided to RCE can be documented and if errors or omissions are detected, they be corrected.

RCE retains all data and documents for seven years after the end of the project reporting period or for the duration required by the GHG program, whichever is longer.

1.2 PROJECT BACKGROUND

The Project involves the installation of low GWP refrigerant (R-717) in large commercial refrigeration systems resulting in the reduction of greenhouse gases (HCFC-22) through the displacement of emissions from standard refrigerant equipment and standard leakage rates. Baseline emissions are calculated using the quantity of refrigerant in baseline system equipment multiplied by the annual amortized emission rate of refrigerant in the baseline system. The Project is located at a third-party property owned by Performance Food Group in Hickory, North Carolina.

1.3 Responsible Parties

Project Proponent
Therm Solutions Incorporated
170 S Poplar Road
Lake Forest, IL 60045
Olivia Bonnes
720-545-5628

End Use Customer
Performance Food Group
12500 West Creek Parkway
Richmond, VA 23238
Trey Willis
303-662-7240

1.4 Validation and Verification Team

Lead Validator and Verifier: Garrett Heidrick
Team Member: Jessica Stavole
Internal Reviewer: Nina Pinette

1.5 Validation and Verification Criteria

1.5.1 Validation and Verification Standards, Guidelines, and Tools

- ACR815 Advanced Refrigeration – ARS2022001 Project Plan, Version 6 (February 2023)
- ACR815 Advanced Refrigeration – ARS2022001 Monitoring Report
- ACR Standard, Version 7.0 (December 2020)
- ACR Validation and Verification Standard Version 1.1 (May 2018)
- Quantification, Monitoring, Reporting, and Verification of Greenhouse Gas Emissions Reductions and Removals from Advanced Refrigeration Systems, Version 2.1, (August 2021)
- ISO 14064-3:2006 "Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions"

1.5.2 Level of Assurance

The verification was conducted to a reasonable level of assurance.

1.5.3 Materiality

The verification was conducted to ACR's required materiality threshold of ±5% of the GHG project's emissions reductions or removal enhancements.

2 VALIDATION AND VERIFICATION PROCESS

As the first step in validation/verification activities, the Verification Team developed a Validation/Verification Plan to be followed throughout the validation and verification. The plan included the following activities:

- RCE completed a COI form on October 4, 2022 to identify any potential conflict of interest with the Project or Project Developer. The COI form was approved by ACR on October 6, 2022.
- RCE and Therm held a validation/verification kick-off meeting on October 18, 2022. During the kick-off meeting RCE reviewed the validation/verification objectives and process, reviewed the schedule, and submitted an initial document request.
- RCE performed a strategic review and risk assessment of the received data and support documents to understand the scope and areas of potential risk in the GHG emissions reductions.
- RCE developed a risk-based sampling plan based upon the strategic review and risk assessment. The validation/verification plan and sampling plan were used throughout the process and were revised as needed based upon additional risk assessments.
- RCE conducted a site visit to the Project in Hickory, North Carolina on November 10, 2022. During the site visit RCE observed the new ammonia system and confirmed that the old refrigeration system utilizing R-22 had been removed. RCE interviewed key personnel involved in the Project while onsite. RCE met with the following personnel during the site visit:
    - Olivia Bonnes – Director of Operations, Thermcool
    - John Tinsley – President, Thermcool
    - Trey Willis – Director of Environment, Performance Food Group
    - Ron Petit – Maintenance Manager, Performance Food Group
    - Jason Hedrick – Safety and Loss Prevention Manager, Performance Food Group
- RCE performed a risk-based desktop review of the submitted validation/verification documents. The desktop review included an assessment of the GHG calculation methods and inputs, source data completeness, GHG management and monitoring systems and eligibility documentation.
- RCE submitted requests for corrective actions, additional documentation, and clarifications as necessary to Therm throughout the validation/verification.
- RCE's internal reviewer conducted a review of the validation/verification sampling, report, and statement.
- RCE issued a final validation/verification report, verification statement, and List of Findings.
- RCE held an exit meeting with Therm.

3 VALIDATION AND VERIFICATION FINDINGS

3.1 PROJECT BOUNDARY AND ACTIVITIES

RCE reviewed the project boundary and activities and confirmed that both were appropriately identified and described in the Project Plan. The Project activity is the complete replacement of a large commercial high-GWP HCFC-based (HCFC-22) refrigeration system with an advanced refrigeration system with a low-GWP refrigerant (R-717) at an existing facility.

The Project's temporal boundary is the reporting period beginning and ending on August 27, 2022.

3.2 GHG Sources Sinks, and Reservoirs

Table 1 shows the GHG emission sources included in the project boundary based on the Methodology. RCE confirmed that the Project Plan appropriately identifies the offset project boundary and includes all relevant SSRs.

Table 1. GHG Emissions Sources

Source	GHG	Description
SSR 5	HCFCs and Low GWP refrigerant	Refrigerant leaks from the operation of the refrigeration system in the baseline and the project.
SSR 6	HCFCs and Low GWP refrigerant	Refrigerant emissions occurring from servicing refrigeration or A/C equipment or system to replace leaked refrigerant.
SSR 7	HCFCs	Emissions from the disposal of the equipment at end-of-life, including destruction of refrigerant.

3.3 Eligibility

3.3.1 ACR Eligibility

RCE confirmed the following ACR eligibility criteria listed in the ACR Standard, Version 7.0 by reviewing the project proponent's Project Plan, Monitoring Report, and calculations as well as other supporting documentation described throughout this report (a full list of documents reviewed is in Appendix A).

- Start Date: The project start date is August 27, 2022.
- Crediting Period: The crediting period is ten years as specified by the Methodology, August 27, 2022 – August 26, 2032.
- Minimum Project Term: Projects with no risk of reversal subsequent to crediting have no required minimum project term.
- Offset Title: RCE confirmed that the project proponent has undisputed title to all offsets. Therm retains all legal claims to the environmental attributes and GHG benefits of its processes and the avoidance of future leaks into the atmosphere. RCE reviewed a Refrigeration Carbon Development Agreement signed by both Therm and Performance Food Group in addition to an Attestation signed by Therm management confirming the transfer of title to Therm.
- Additional: RCE confirmed that the project is additional as described in Section 3.4.
- Permanent: There is no risk of reversal of GHG removal enhancements for this project type.
- Net of Leakage: According to ACR, and per the Methodology, leakage can be disregarded.
- Independently Validated and Verified: RCE is a third-party validation and verification body that the project proponent has contracted to validate the project.
- Community & Environmental Impacts: RCE reviewed project impacts as described in section 3.6 of this report.

3.3.2 Methodology Eligibility

RCE reviewed the Project against the ACR Methodology eligibility requirements and confirmed the following:

- The Project occurs in the United States. The Project is located at 543 12th St Dr NW, Hickory, North Carolina, 28601.
- The Project is within a sector and segment which has a low adoption rate for the relevant project activity: Large commercial refrigeration.
- HCFCs in the original equipment have been recovered and destroyed or sent to a refrigerant reclaimer in accordance with ACR guidance and the Methodology, except 700lbs of refrigerant, which was kept onsite by the project proponent to be reused in another facility owned by the same company.
- R-717 is an acceptable substitute according to the United States EPA SNAP program for use in commercial refrigeration end-uses and used in accordance with SNAP use conditions.

3.4 ADDITIONALITY

The Project meets the requirements for the demonstration of additionality specified by the ACR Standard by exceeding the approved practiced-based performance standard defined in the Methodology and demonstrating surplus to regulations.

3.4.1 Regulatory Additionality Test

No existing laws or regulations mandate the Project activity and as such, the project passes the regulatory additionality test. There are no Federal requirements in the United States that require installation of advanced refrigeration technology. Starting in 2019, several states have introduced legislations that prohibit use of specific refrigerants in specific end-uses. North Carolina is a member of the US Climate Alliance but has not committed to regulating HFC refrigerants.

3.4.2 Practiced-Based Performance Standard Test

Per the Methodology, a review of US EPA's GreenChill Partnership program data (see Appendix A) indicates low market adoption rates for advanced refrigeration technology across all product segments. Project activities within the sectors qualify for offset credit creation under this Methodology.

3.5 PERMANENCE

There is no risk of reversal. Once the refrigeration system is installed with the low-GWP refrigerant the associated GHG reductions are fixed.

3.6 ENVIRONMENTAL AND COMMUNITY IMPACTS

The Project Plan includes a comprehensive summary of the project activity's net positive environmental impacts including the reduction of GHG emissions resulting from transitioning to advanced refrigeration systems. There are no negative community or environmental impacts for this project. The Project Plan also identifies contributions as aligned with relevant sustainable development goals (SDGs) including Industry, Innovation, and Infrastructure; Sustainable Cities and Communities, Responsible Consumption and Production; and Climate Action.

The validation team confirmed that the project activity is not expected to promote significant negative environmental impacts.

3.7 Local Stakeholder Consultation

Not applicable for this Project. The Methodology does not require public consultation from stakeholders.

3.8 Baseline Scenario

The Project's baseline scenario is continued use of high-GWP refrigerant in the operation of large commercial refrigeration systems. By following the Methodology requirements for large commercial refrigeration systems, the Project establishes the annual emission rate of the replaced baseline system as the average of the previous two years (2020 and 2021) of baseline system operation prior to the installation of the advanced refrigeration system. Historical operating records were used to establish quantity of HCFC recharged to the baseline system. The Project results in the reduction of greenhouse gases (HCFCs) through use of low GWP refrigerant R-717 in large commercial refrigeration systems. RCE confirmed that the Project Plan appropriately identifies the baseline scenario.

3.9 Data Management System and Monitoring Plan

RCE reviewed Therm's processes for data collection and management and determined that they were sufficient to meet all ACR and Methodology requirements. The validation/verification team gained an understanding of QA/QC controls put in place through interviews with key personnel, the site visit to the Project and Performance Food Group's warehouse facility, and the review of all documentation provided by Therm. A full list of documents reviewed is included as Appendix A.

Therms's Project Plan includes a Monitoring Plan that identifies all monitored data and parameters. RCE confirmed that the monitoring parameters and approaches conform to the methods required by the Methodology. The plan includes all relevant data parameters and appropriately identifies units of measurements, data sources, methodologies, uncertainty, monitoring frequency and procedures, and QA/QC procedures. The following parameters were tracked:

- $Q_{BR,j,}$i: Quantity of refrigerant used in baseline system
- Ark,i: Quantity of alternative refrigerant used in Project system
- $ERA_{REF,j}$: Annual amortized emission rate of refrigerant j in baseline system (%).
- $ERA_{REF,k}$: Annual emission rate of alternative refrigerant used in Project system
- $GWP_{REF,k}$: GWP of alternative refrigerant used in Project system

After discussions with Therm and reviews of project documents, RCE determined that the Monitoring Plan accurately reflects how Project data is monitored and recorded. Therm implemented the monitoring plan as stated in the Project Plan during Project activities.

3.10 Project Data and GHG Emissions Reduction Assertion

RCE reviewed the Project Plan, Project data, and calculations to ensure that appropriate equations were used in calculating baseline emissions, project emissions, and emissions reductions.

3.10.1 Baseline Emissions

Baseline emissions include the emissions that would have occurred had the Project not installed an advanced refrigeration system. Baseline emissions are calculated using the quantity of refrigerant in baseline system equipment multiplied by the annual amortized emission rate of refrigerant in the baseline system and the GWP of the baseline HCFC. RCE verified that Therm appropriately calculated the annual emission rate of the replaced baseline system as the average of the previous two years (2020 and 2021) of baseline system operation prior to the installation of the advanced refrigeration system. Historical operating records were used to establish quantity of HCFC recharged to the baseline system.

3.10.2 Project Emissions

Project emissions from alternative refrigerants are calculated by multiplying the charge size of alternative refrigerant (R-717) used in the Project system by the appropriate refrigerant substitute annual emission rate and the GWP of the alternative refrigerant. Because the GWP of R-717 is 0, project emissions are 0.

3.10.3 Emissions Reductions

RCE verified that Therm calculated emissions reductions according to relevant Methodology equations and that the methods are included in the Project Plan.

RCE calculated emissions reductions for the reporting period according to the equations defined in the Methodology and the Project Plan and found the assertion to be free of material misstatement. RCE's calculated ERTs are shown in Table 2.

Table 2. RCE-calculated ERTs

Reporting Period	RCE ERTs ($MTCO_2e$)	Therm ERTs ($MTCO_2e$)
August 27, 2022 – August 27, 2022	19,002	19,002

4 VALIDATION AND VERIFICATION RESULTS

RCE developed one List of Findings for both the validation and verification notifying Therm of corrective action requests (CARs), additional documentation requests (ADRs), and clarification requests (CRs). Therm appropriately responded to all items in the List of Findings. The List of Findings is provided as Appendix B.

5 VALIDATION AND VERIFICATION CONCLUSION

RCE conducted a risk-based validation and verification of the Project that included a strategic review of the project data, documentation, and emission reduction calculations. The objective of the validation activities was to assess the project design, baseline scenario, and monitoring plan and to ensure compliance of the Project Plan to the assessment criteria defined in Section 1.5.1. The objective of the verification activities was to conduct an independent assessment of the project reporting period and ex-post GHG emission reductions resulting from the Project.

Based on the review and the historical evidence collected, RCE concludes to a reasonable level of assurance that the GHG assertion is free of material misstatement. The emission reductions resulting from the Project for the reporting period beginning and ending on August 27, 2022 can be considered in conformance with the:

- ACR Standard, Version 7.0 (December 2020)
- ACR Validation and Verification Standard Version 1.1 (May 2018)
- Methodology for the Quantification, Monitoring, Reporting, and Verification of Greenhouse Gas Emissions Reductions and Removals from Advanced Refrigeration Systems, Version 2.1 (August 2021)
- ISO 14064-3:2006 "Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions"

Table 3 provides a summary of the emissions reductions.

Table 3. Emissions Reductions

Vintage	Baseline Emissions ($MTCO_2e$)	Project Emissions ($MTCO_2e$)	Emissions Reductions ($MTCO_2e$)
2022	19,002	0	19,002

Lead Validator and Verifier

Garrett Heidrick

Internal Reviewer

Nina Pinette

6 APPENDIX A—DOCUMENTS REVIEWED

1. Republic Refrigeration Work Order 242858
2. Rapid Recovery invoice showing recovery of R-22
3. Two years of invoices of R-22 refrigerant recharges showing historical operating records used to establish the annual leak rate of the replaced baseline system.
4. Refrigeration Carbon Development Agreement signed by both Therm and Performance Food Group
5. Attestation signed by Therm management confirming the transfer of title to Therm

7 APPENDIX B—LIST OF FINDINGS

Includes Corrective Action Requests (CAR), Additional Documentation Requests (ADR), and Clarification Requests (CR)

Corrective Action Request, Additional Documentation Request, or Clarification Request ID#	Finding	Section of Quantification Standard v.7.0 (QS), Val/Ver Standard v.1.1 (VV), or Methodology (M)	Offset Material Misstatement (OMM) or Conformance (C)	OPO/APD response	RCE response	Additional OPO/APD response	Additional RCE response	Open or Closed
CAR 1	700 pounds of recovered R-22 (7 100lb cylinders) were viewed during the 11/10/22 site visit. Please provide confirmation from ACR that this is acceptable given that the methodology requires the destruction of HCFC.	Section 5.2 (M)	C		November 14, 2022: RCE sent an inquiry to Megesh at ACR on 11/14/22 to receive clarification on this item. November 15, 2022: ACR responded, "For CFCs and HCFCs, the project proponent should provide evidence of either destruction or reclamation for reuse. Since R-22 is rarely destroyed after recovery and in most cases sent for reclamation, please request evidence that the recovered R-22 was sent/sold to a reclamation facility." Thermcool should contact ACR about the cylinders remaining onsite and likely apply for a deviation.	12/15/2022: Megesh stated leakage is not needed and no deviation is needed.	12/15/2022: Closed.	closed
CAR 2	GWP used in ER calculation should be 1710. Please see page 28 of Methodology: "For installation of a Large Commercial Refrigeration system at an existing facility, project proponents shall use the GWP of the refrigerant used in the system that is replaced. Project proponents shall apply the 100-year value for refrigerant GWPs found in the IPCC Fifth Assessment Report for the historical refrigerant used". Currently, the emission factor from AR4 is being used.	Section 4.1 (M)	C	Updated.	11/14/2022: Updated. Closed			closed

ADR 1	Please provide documentation showing 5,818lbs (full charge amount) used in Leak Rate Calculation.	Section 3.1, Section 4.1 (M)	C	October 26, 2022: Please refer to Republic Refrigeration WO -Please note, this is the baseline charge, this got mistakenly put in also as the project new charge in our PP, I will amend. That # is 2205 & can be backed up if you refer to the document 7-1-22 Charge Invoice.	November 8, 2022: Please provided updated PP when available. November 14, 2022: Provided.			closed
ADR 2	Leak rate calculations utilize a different weight than shown on the following invoices: 7/8/2020, 7/29/2020, 8/14/2020, 3/17/2021, 5/26/2021, 6/18/2021. Please provide additional invoices or an explanation of the discrepancy.	Section 3.1, Section 4.1 (M)	C	October 26, 2022: Any invoice that had a letter after it, will have multiple invoices equaling the total the charge amount; I didn't include the other invoices, data invoice folder has been updated with these now.				closed
ADR 3	Please provide evidence confirming the start date (date of store initiation).	Acronyms and Definitions, Section 1.3 (M)	C	October 26, 2022: Please refer to the 7-1-22 Charge Invoice				closed
ADR 4	Please provide Refrigerant Carbon Development Agreement between Therm Solutions, Inc. and Performance Food Group.		C	October 26, 2022: Provided.	November 8, 2022: The Agreement states in Section 5.1 that the RCCs belong to Therm "so long as Therm does not breach or default on this Agreement". Is Therm able to provide an attestation stating that they did not breach or default on this Agreement as it pertains to this Project? November 14, 2022: Thermcool provided an attestation signed by management regarding the above provision.			closed

ADR 5	Please provide documentation showing proof of destruction for the displaced CFC: -Bills of lading for shipments of CFC from the facility to a destruction facility -Attestation from project proponent and signed by representatives from the project proponent and the destruction facility that the volume of displaced CFC or HCFC from the baseline system was destroyed including the dates of destruction.	Section 5.2 (M)	C	October 26 2022: It was our understanding that we had to provide proof of removal not destruction. Happy to discuss.	November 8, 2022: That is true if the refrigerant being replaced is an HFC. However, R-22 is an HCFC and thus, the requirements for replacing HCFC's from Section 5.2 of the Methodology must be met. Please see Section 5.2 of the Methodology for additional detail. RCE sent an inquiry to Megesh at ACR on 11/14/22 to receive clarification on this item. November 15, 2022: ACR responded, "For CFCs and HCFCs, the project proponent should provide evidence of either destruction or reclamation for reuse. Since R-22 is rarely destroyed after recovery and in most cases sent for reclamation, please request evidence that the recovered R-22 was sent/sold to a reclamation facility". The document titled "Republic Refrigeration WO 242585" notes that 5,118lbs were sold to A-Gas; please provide evidence of this sale (contract, invoice, etc.).		November 18, 2022: Provided.	closed
ADR 6	Leak rate calculation guidance states that "Each time you add refrigerant to a system normally containing 50 pounds or more of refrigerant (see Module C) you should promptly calculate the leak rate". Section 4.1 of the Methodology states: "For Large Commercial refrigeration projects where, existing equipment is being replaced, use regulatory compliance reporting or verifiable historical operating records to establish the annual leak rate of the replaced baseline system which shall be based on the average of the previous two years of baseline system operation prior to installation of advanced refrigeration system.". Installation occurred in August 2022, according to the WO provided, so the previous two years of baseline system operation would be July 2020 - July 2022.	Section 4.1 (M) and Compliance Guidance For Industrial Process Refrigeration Leak Repair Regulations Under Section 608 Of The Clean Air Act, Page D-1	C	November 14, 2022: Provided spreadsheet titled "Final Leakage Rate". Uploaded to Dropbox.	November 18, 2022: The spreadsheet in Dropbox was uploaded prior to the issuance of ADR6. Do you have an updated spreadsheet you can provide?	November 21, 2022: We were interpreting that section in the Methodology as being January 2020-December 2021. We are thinking this for a couple of reasons- for EPA reporting, there is no mid year reporting so this would likely be a more accurate measurement. Also it is unlikely that when a new system is imminent, that the customer would recharge the system.	November 23, 2022: ACR confirmed this approach is acceptable.	closed

CR 1	Please provide additional detail as to the timeline for the old equipment being removed and the new equipment coming online. While RCE was onsite, PFS staff stated that the first ammonia charge occurred on July 1, 2022. The project start date is listed as August 29, 2022. Please clarify and provide justification for this decision.	Acronyms and Definitions, Section 1.3 (M)	C		November 14, 2022: Thermcool provided an attestation regarding start date. RCE sent an inquiry to Megesh at ACR on 11/14/22 to receive clarification on this item. November 15, 2022: ACR confirmed that a start date of 8/27/22 is appropriate.			closed