

# **Validation & Verification Report for Therm Solutions, Inc.**

## **American Carbon Registry**

**September 2022**

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## 1. Introduction

First Environment, Inc. (First Environment) provides this validation/verification report to Therm Solutions, Inc. (Therm) as a deliverable of the American Carbon Registry (ACR) project validation and verification process.

It covers the validation and verification of the following Project and reporting period:

Project Name	ACR Project ID	Reporting Period
Advanced Refrigeration - ARS2020001	ACR747	October 4, 2020 – October 9, 2020

The Project reports emission reductions for a single 10-year crediting period beginning on October 4, 2020.

First Environment conducted validation and verification activities from the date of the kickoff meeting through August 31, 2022.

## 2. Objectives

The purpose of the validation and verification was, through review of appropriate evidence, to establish that:

- the objectives of the ACR Validation and Verification Standard Chapters 1.B and 8.B are met;
- the Project conforms to the requirements of the criteria discussed in Section 3 of this report; and
- the data reported are accurate, complete, consistent, transparent, and free of material error or omission.

Validation activities also include an assessment of the likelihood that implementation of the project will result in the emission reductions as stated by Therm in the GHG Project Plan.

## 3. Validation/Verification Scope & Criteria

Specific scope metrics for the validation/verification are outlined in the table below:

<b>Geographic Boundaries</b>	Supermarkets located in: <ul style="list-style-type: none"><li>• Staten Island, NY</li><li>• Eastchester, NY</li></ul>
<b>Greenhouse Gases Verified</b>	Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO <sub>2</sub> -e) resulting from refrigerant replacement; Project emissions from use of eligible refrigerant R-744 (carbon dioxide))
<b>Reporting Period</b>	10/4/2020 – 10/9/2020
<b>Data Sources</b>	Refrigeration systems specifications and contractor installation records
<b>Level of Assurance</b>	Reasonable assurance
<b>Definition of Materiality</b>	Misstatements greater than five percent of the emission reductions assertion in the reporting period were considered material. Qualitative non-conformities with and discrepancies in the GHG Project Plan and Monitoring Report between the validation and verification criteria were also considered material.

The following outlines the guidance and protocols used to conduct the validation and verification:

<b>Standards of Validation/Verification</b>	<ul style="list-style-type: none"> <li>• ACR Standard, Version 7.0, December 2020 (ACR Standard)</li> <li>• Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from Advanced Refrigeration Systems, Version 2.1 (the Methodology), including Errata and Clarification issued August 13, 2021</li> </ul>
<b>Validation/Verification Process</b>	<ul style="list-style-type: none"> <li>• ACR Validation and Verification Standard, Version 1.1, May 2018</li> <li>• ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions, 2006</li> </ul>

The GHG Project Plan—the final version of which is dated August 2022 and marked as Revision 7—was also used to inform the verification process.

## 4. Project Description

Two supermarket locations owned and operated by Mannix Family Markets and DeCicco & Sons in Staten Island, New York and Eastchester, New York, respectively, utilize Large Commercial Refrigeration units, an eligible Refrigerant Sector and Segment under the Methodology. The Project consists of the transition from high global warming potential (GWP) refrigerants to a low-GWP refrigerant, R-744 (carbon dioxide) in these refrigeration systems. Both supermarkets are new store locations that opened in October 2020. The transition to a low-GWP refrigerant results in a net reduction in greenhouse gas (GHG) emissions over the lifetime of the refrigeration systems.

The Project is implemented as an Aggregated Project. The two locations identified in the preceding paragraph where ARS are installed comprise the Aggregate.

The GHG Project Plan provides additional details about the Project.

## 5. Overview of the Validation and Verification Process

To review the Project's GHG information, the following validation and verification process was used:

- conflict of interest review;
- selection of Audit Team;
- initial interaction and kickoff meeting with primary Therm contact;
- development of the validation/verification plans and sampling plan;
- site visit;
- review and evaluation of GHG information systems and data;
- follow-up interaction with Therm contacts for corrective action or supplemental data as needed; and
- final statement and report development.

The process was utilized to gain an understanding of the Project's emission sources and reductions, to evaluate and verify the collection and handling of data, the calculations that lead to the results, and the means for reporting the associated data and results.

### **5.1 Conflict of Interest Review**

Prior to beginning any third-party assessment, First Environment conducts an evaluation to identify any potential conflicts of interest associated with the engagement. No potential conflicts were found for the Project. A project-specific conflict of interest form was also filed with the ACR for the Project.

### **5.2 Audit Team**

First Environment's Audit Team consisted of the following individuals who were selected based on their validation and verification experience, as well as familiarity with industrial gas operations:

Lead Assessor – Michael Carim  
Validation/Verification Team – Logan Simpson, Edgar Espinal  
Internal Reviewer – James Wintergreen

### **5.3 Audit Kick-off**

The audit process was initiated with a kick-off meeting on June 24, 2022 with the primary Therm contact. The meeting focused on confirming the scope, schedule, and data required for validation and verification.

### **5.4 Development of the Validation & Verification Plans**

The Audit Team formally documented the validation/verification plan as well as determined the data sampling plan. The validation/verification plan was informed by the kick-off meeting where key elements of the validation and verification scopes were discussed including project team members, project level of assurance, materiality threshold, and standards of reporting and evaluation. It also provided an outline of the validation and verification processes and established project deliverables. Therm was afforded the opportunity to comment on the key elements of the plans for validation and verification. A separate data-sampling plan was designed to review all project elements in areas of potentially high risk of inaccuracy or non-conformance.

### **5.5 Site Visit**

Mr. Michael Carim performed a site visit on July 13, 2022 at the Mannix Family Market in Staten Island, New York. The site visit included interviews with key personnel and facility tours to assess GHG project boundaries, site operations, data collection processes, and information management systems. Key Therm and ShopRite personnel interviewed during the site visit and subsequent phone calls included:

- John Tinsley
- Adam Shorey
- Ryan Brower
- Tommy Mannix
- Mike Koch

First Environment's risk assessment determined that the site visit performed at the Staten Island, New York location was sufficient to meet sampling requirements for on-site inspection in the Aggregated Project.

## **5.6 Emissions Reduction Data and Calculation Assessment**

This assessment used information and insights gained during the previous steps to evaluate the collected data and the reported emissions reduction quantities and identify if either contained material or immaterial misstatements.

## **5.7 Corrective Actions and Supplemental Information**

The Audit Team made requests for corrective action during the validation and verification processes. Therm provided sufficient responses to all requests. These requests and Therm's responses are described in Appendix A of this report.

## **5.8 Validation & Verification Reporting**

Validation and verification reporting, represented by this report, documents the validation and verification processes and identifies their findings and results. Validation and verification reporting consists of this report for Therm, along with a signed verification statement. Both the report and statement are submitted to ACR as part of the validation/verification reporting process.

# **6. Validation Results**

## **6.1 Project Boundary**

The Project boundary is defined as emissions from Equipment Operation (SSR 5), Equipment Service/Recharges (SSR 6), and EOL/Equipment Disposal (SSR 7). Fugitive emissions of refrigerants occur in the baseline and project scenarios during the operation, servicing, and end-of-life of the refrigeration products. Emission reductions occur from the replacement of high-GWP refrigerants with a low-GWP refrigerant, R-744.

The Audit Team assessed the source, sink, and reservoir (SSR) determination included in the GHG Project Plan and found the justification accurate and in accordance with the Methodology.

Overall, Therm provided an accurate description of the Project boundary and a comprehensive justification for the project SSRs.

## **6.2 Baseline Scenario**

The baseline scenario is defined as the continued use of the baseline refrigerants in Large Commercial Refrigeration systems. Consistent with Table 6 in the Methodology, the baseline refrigerant is assumed to be a blend of R-407A (50%) and R-404A (50%).

## **6.3 Emission Reduction Quantification Methodologies and Calculations**

Emission reductions are quantified in accordance with the procedures described in the Methodology and the ACR Standard. The equations are correctly identified and the calculation of GHG emission reductions is presented in a transparent manner, incorporating all relevant GHG sources, sinks, and reservoirs.

Baseline emissions are quantified according to Equation 1 in the Methodology based on the quantity of refrigerant used in the baseline system and the annual amortized emission rate of the baseline refrigerants. The quantity of refrigerant used is based on the cooling capacity and default refrigerant charge size of the equipment type utilized in the project scenario.

Project emissions are quantified according to Equation 2 in the Methodology based on the quantity of alternative refrigerant used in the project system and an annual amortized emission rate set equal to that used in the baseline system. The quantity of alternative refrigerant used is based on the actual charge size of the equipment utilized in the project scenario.

Leakage emissions are not accounted for in the Project boundary and are not quantified under the Methodology.

Total net emission reductions are determined according to Equation 3 in the Methodology by subtracting project emissions from baseline emissions.

After reviewing the quantification procedure and supporting evidence, the Audit team concluded that the methodologies and the applicable tools have been applied correctly to calculate baseline emissions, project emissions, and net GHG emission reductions and removals.

#### 6.4 Data Monitoring and Management System

The monitoring plan described within the GHG Project Plan includes all relevant data and parameters required to obtain a reliable result of generated emission reductions and meets the requirements of the Methodology. The primary variables monitored in order to determine and account for emission reductions are presented in Table 1 below.

**TABLE 1: Monitoring Parameters**

Monitoring Parameter	Method of Estimation	Frequency of Measurement	Unit of Measurement	Frequency of Recording
Quantity of refrigerant used in the baseline system ( $Q_{BR,j,i}$ )	Manufacturer's specifications and Table 4 of Methodology	Once at installation	Kilograms	Once at installation
Quantity of alternative refrigerant used in the project system ( $AR_{k,i}$ )	Contractor installation records	Once at installation	Kilograms	Once at installation
Annual amortized emission rate of refrigerant in baseline system ( $ERA_{REF,j}$ )	Table 4 of Methodology	Once at validation	Percentage	Once
Annual emission rate of alternative refrigerant in project system ( $ERA_{REF,k}$ )	Set equal to emission rate of baseline system	Once at validation	Percentage	Once
GWP of the baseline refrigerant ( $GWP_{REF,j}$ )	Table 6 of Methodology	Once at validation	Dimensionless	Once
GWP of alternative refrigerant used in project system ( $GWP_{REF,k}$ )	Table 3 of Methodology	Once at validation	Dimensionless	Once

The GHG Project Plan includes a complete description of the frequency, responsibility, and procedures for recording, storing, monitoring, and measuring all project data. All requirements in Sections 5.1 and 5.2.1 of the Methodology are addressed by the monitoring plan contained within the GHG Project Plan.

The adequacy of the data management systems described in the monitoring plan was assessed during the site visit by reviewing installed equipment on-site and during the desktop review through tracing data back to its origin.

## 6.5 QA/QC Procedures

The GHG Project Plan includes QA/QC procedures for data that meet the requirements of the Methodology. Specifically, design specifications and service records can be cross-referenced with installed equipment at supermarkets to confirm reported activity data; however, due to the reliability of manufacturer's equipment specifications and vendor service records, minimal data uncertainty is foreseen.

## 6.6 Project-specific Conformance to ACR Eligibility Criteria, including Additionality

The Project meets the eligibility requirements set forth in the ACR Standard as described in Table 2 below.

**TABLE 2: ACR Eligibility Criteria**

Eligibility Requirement	Conformance Details	Validation Conclusion
Start Date	The start date for the project is October 4, 2020	Consistent with requirement.
Minimum Project Term	N/A – project type does not contain risk of emission reduction reversal	N/A
Crediting Periods	Ten years – October 4, 2020 through October 3, 2030	Consistent with requirement.
Real	Refrigerant transition is performed in accordance with an approved ACR methodology to produce verifiable evidence of emissions mitigation.	Consistent with requirement.
Emission or Removal Origin	The project proponent reduces non-energy direct emissions through the installation of the advanced refrigeration systems.	Consistent with requirement. Therm acquires ownership of emission reductions through agreements with store owners of the locations where the Project occurs.
Offset Title	Therm retains rights to GHG emission reductions associated with the refrigerant transition through terms and conditions with supermarkets.	Consistent with requirement. Therm has ownership of emission reductions through agreements with supermarkets where advanced refrigeration systems are installed.
Additional	Project satisfies additionality test in approved methodology and Regulatory Test in ACR Standard.	Project conforms to ACR additionality criteria. See Section 6.7 below for conformance details.
Regulatory Compliance	The supermarket facilities were in compliance with regulatory requirements relative to refrigeration product manufacturing during the reporting periods.	An attestation was provided to First Environment by Therm to confirm regulatory compliance throughout the reporting period for the Project.



Eligibility Requirement	Conformance Details	Validation Conclusion
Permanent	N/A – project type does not contain risk of emission reduction reversal.	N/A
Net of Leakage	N/A – the Methodology does not account for leakage.	N/A
Independently Validated and Verified	Therm contracted First Environment, Inc. to provide independent, trustworthy, and objective third-party validation and verification services to the Project.	First Environment is an ANAB-accredited and ACR-approved validation/verification body.  Audit activities were performed independently and in accordance with all ACR requirements.
Environmental & Community Assessments	No negative community or environmental impacts are identified. Net positive impact due to lower GHG emissions.	Consistent with requirement.  Project occurs in refrigeration systems at privately-owned supermarkets. No negative external environmental or community impacts are created from the refrigerant transition.

First Environment also concluded that the Project, as represented by the GHG Project Plan, addresses all relevant requirements for Aggregated Projects contained in section 6.F.1 of the ACR Standard.

The Project complies with the applicability requirements of the Methodology. The table below lists the relevant applicability requirements and identifies how the Project meets them.

**TABLE 3: Methodology Criteria**

Eligibility Requirement	Conformance Details	Validation Conclusion
Location	All supermarkets where project ARS is installed are located in North America	Consistent with requirement.
Refrigerant Sector and Segment	Large Commercial Refrigeration	Consistent with requirement.  Project equipment is used to store and display chilled and frozen goods for commercial sale in supermarkets and has a charge size greater than 50 lbs.
Start Date	See Table 2 above	
Alternative Refrigerant	R-744 (Carbon dioxide)	Consistent with requirement.

The Project does not participate in any other GHG emission trading or compliance programme nor has it been rejected by another GHG programme.

## **6.7 Additionality**

The Project satisfies the requirements for the demonstration of additionality specified by the ACR Standard by passing an approved practice-based performance standard and a regulatory surplus test.

The Project consists of the use of an eligible refrigerant in Large Commercial Refrigeration systems at supermarkets, which is an Eligible Refrigerant Sector and Segment listed in the Methodology; therefore, it satisfies the performance standard specified by the Methodology.

Additionally, Therm provided a management attestation confirming that the utilization of carbon dioxide as a refrigerant at the supermarkets was voluntary.

## **6.8 Approved Variance or Deviations**

None.

## **7. Verification Results**

During the verification process, First Environment reviewed the Project's Monitoring Report, GHG emission reduction assertion, and supporting documentation for the current reporting period to ensure consistency with the GHG Project Plan and the Methodology. Discrepancies between Project documentation and the verification criteria were considered material and identified for corrective action. Additionally, First Environment assessed the GHG emission reduction assertion and underlying monitored data to determine if either contained material or immaterial misstatements. The results of these reviews are discussed in greater detail below.

### **7.1 GHG Information Verified**

Emission reduction calculations were reviewed to ensure accuracy in the formulas used and the raw data used as inputs. Formulae were tested to ensure they were consistent with the calculation methodology described in the Methodology and GHG Project Plan. Total baseline emissions were quantified in accordance with Equation 1 from the Methodology.

The quantity of refrigerant used in the baseline system ( $Q_{BR,j,i}$ ) was determined from manufacturer's specifications and design records for the refrigeration system installed at each supermarket. The total cooling capacity of each system is multiplied by the default charge size specified in Table 4 of the Methodology to calculate total system charge in the baseline scenario.

The annual amortized emission rate of the baseline refrigerants ( $ERA_{REF,j}$ ) was correctly selected from the Methodology based on refrigerant segment type. The GWP of the baseline refrigerant blend ( $GWP_{REF,j}$ ) was determined from Table 6 of the Methodology.

Project emissions associated with equipment operation and disposal were quantified using Equation 2 from the Methodology. The quantity of alternative refrigerant used in the project system was determined from service records provided by the contractor who charged the system.

The annual amortized emission rate of the alternative refrigerants ( $ERA_{REF,k}$ ) was set equal to the emission rate of the baseline refrigerants and the GWP of alternative refrigerant ( $GWP_{REF,k}$ ) was correctly selected from the Methodology.

Total emission reductions were computed using Equation 3 from the Methodology. All emission sources within the project boundary are properly accounted for in calculations.

## 7.2 Verification Assessment Techniques and Processes Employed

Copies of the charge size data used in the calculations, including manufacturers specifications and contractor installation records, were compared with the data used in the final calculations and tested for transcription or mathematical errors. First Environment sampled all areas identified as being of high risk of inaccuracy, uncertainty, or misstatement and performed other data checks in order to assess whether the project sufficiently mitigated data uncertainty. The assessments performed on this data, as described above, confirmed the reliability of the evidence provided and verified the accuracy of the information flow. Additionally, First Environment performed recalculations of emission reductions for the entire reporting period to assess whether they were free of material misstatement. First Environment found the emission reduction calculations to be free of material misstatement.

The evidence provided was consistent with the requirements of the Methodology and the validated GHG Project Plan and meets generally accepted evidentiary standards for best practices in GHG accounting.

## 8. Audit Findings

Therm provided good documentation for the emissions estimates as well as the procedures surrounding the data collection process. To complete the validation and verification processes, First Environment issued corrective action requests. Through communications with the Audit Team, Therm was able to resolve all requests made by First Environment during the validation and verification processes.

The findings issued, as well as Therm's responses, are summarized in Appendix A of this report.

## 9. Validation & Verification Conclusion

First Environment was retained to provide validation and verification services to Therm for the Project's GHG emission reductions assertions based on the following fundamentals:

- *Level of assurance:* Reasonable assurance.
- *Validation/Verification objectives:* To assure project conformance with the validation/verification criteria and that the requirements of the ACR Validation and Verification Standard, Chapters 1.B and 8.B are met. Validation objectives also include an assessment of the likelihood that implementation of the Project will result in the emission reductions stated in the GHG Project Plan.
- *Validation/Verification criteria:* American Carbon Registry Standard, Version 7.0, December 2020; Methodology for the Quantification, Monitoring, Reporting and Verification of Greenhouse Gas Emissions Reductions and Removals from Advanced Refrigeration Systems, Version 2.1.
  - The verification process was also informed by the GHG Project Plan
- *Definition of materiality:* Misstatements of greater than five percent of the GHG reduction assertion and qualitative non-conformities with validation and/or verification criteria are considered material.

- *Scope, including:*
  - *Boundaries of the assertion:* The operation of the refrigeration equipment, emissions resulting from the recharging and servicing of that equipment, and end-of-life (EOL) / disposal emissions.
  - *The physical infrastructure, facilities, and activities within the assertion:* Large Commercial Refrigeration equipment.
  - *GHG sources, sinks, and reservoirs included within the assertion:* Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO<sub>2</sub>-e) resulting from refrigerant replacement; Project emissions from use of eligible refrigerant R-744 (carbon dioxide)).
  - *The time period for the assertion:* October 4, 2020 to October 9, 2020.

Based on the assessments performed and the historical evidence collected, First Environment concludes that the GHG Project Plan is in conformance with the specified validation criteria and the Project GHG emissions reductions, due to the transitions to a low-GWP refrigerant in the Large Commercial Refrigeration systems installed at Mannix Family Market in Staten Island, New York and DeCicco & Sons in Eastchester, New York for the above-referenced time period, can be considered with a reasonable level of assurance:

- consistent with the GHG Project Plan,
- in conformance with the ACR Standard and the Methodology, and
- without material discrepancy.

Verified results show<sup>1</sup>:

October 4 to October 9, 2020	Total
Baseline Emissions (tCO <sub>2</sub> e)	32,747
Project Emissions (tCO <sub>2</sub> e)	4
Emissions Reductions (tCO <sub>2</sub> e)	32,742

## 10. Lead Verifier Signature



Michael M. Carim  
Senior Associate

## 11. Independent Internal Reviewer Signature



James Wintergreen  
Senior Associate

<sup>1</sup> Totals may not sum due to rounding

## APPENDIX A – VALIDATION/VERIFICATION FINDINGS

ID	Corrective Action Request	Summary of Participant Response	VVB Conclusion
1	The following sections of the project plan do not address or contain inconsistencies with the requirements of the ACR template: <ul style="list-style-type: none"> <li>The parameter boxes in section D1 do not contain all relevant rows from the template</li> <li>Section H2 does not describe relevant project activities for each step of the project cycle</li> </ul>	The Project Plan was revised to address all requirements of the ACR template.	Response is acceptable.
2	The Monitoring Report was not prepared using the current version (4) of the ACR Monitoring Report template.	The Monitoring Report was revised to utilize version 4 of the ACR Template.	Response is acceptable.
3	The following sections of the monitoring report do not address or contain inconsistencies with the requirements of the ACR template: <ul style="list-style-type: none"> <li>Section V,2 does not describe any sampling methods employed</li> <li>Section V,2 does not discuss the retention requirements for data</li> </ul>	The Monitoring Plan was revised to address all requirements of the ACR template.	Response is acceptable.
4	Emission reduction totals are not rounded down to the nearest whole number.	Emission reduction calculations were revised to round total emission reductions down to the nearest whole number.	Response is acceptable.
5	The Project Plan does not describe general and project-specific risk factors for the Aggregated Project	Section A5 of the Project Plan was revised to include discussion of risk factors for the Aggregated Project.	Response is acceptable.

ID	Clarification Request	Summary of Participant Response	VVB Conclusion
No requests for clarification were issued during the validation/verification process.			