

## INVITATION TO SUBMIT A PROPOSAL ON AN ASHRAE PROJECT Guide for the Decarbonization of Grocery Stores

Attached is a Request-for-Proposal (RFP) for a project dealing with a subject in which you or your institution have either been recommended or have expressed interest. Should you decide not to submit a proposal, please circulate this information to any colleague who might have an interest in this subject.

**Title: Guide for the Decarbonization of Grocery Stores**

**Budget Range:** Approximately \$80,000 to \$100,000 (the awarded total may be more or less, as determined by the value of the proposal and competing proposals.)

**Scheduled Project Start Date:** November 1, 2025

All proposals (hardcopy or electronic format) must be received at ASHRAE Headquarters.

**Electronic copies must be sent to** [decarb@ashrae.org](mailto:decarb@ashrae.org).

If you have questions concerning the Project, please contact:

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**Contractors intending to submit a proposal should so notify, by mail, fax or e-mail, the Manager of Building Decarbonization by September 15, 2025 in order that any late or additional information on the RFP may be furnished to them prior to the bid due date.**

Proposals may now be submitted electronically. Electronic submissions require a PDF file containing the complete proposal preceded by signed copies of the two forms listed below in the order listed below. **ONLY electronic proposals are to be sent to** [decarb@ashrae.org](mailto:decarb@ashrae.org).

**All other correspondence must be sent to** [decarb@ashrae.org](mailto:decarb@ashrae.org). Hardcopy submissions require one (1) signed original in the same order. **In all cases, the proposal must be in the hands of the ASHRAE Manager of Building Decarbonization by 5 p.m. EST October 6, 2025.**

The following forms must accompany the proposal:

- (1) ASHRAE Application for Grant of Funds (signed)
- (2) Additional Information for Contractors (signed)

**ASHRAE reserves the right to reject any or all bids or to not proceed with the project if circumstances dictate.**

**WORK STATEMENT**  
**Decarbonization Guide for Grocery Stores**

**BACKGROUND AND VISION**

Grocery stores, often referred to as supermarkets, are unique buildings that are often open 24 hours a day, with high foot traffic, frequent exterior door opening, and are located in all climatic conditions. Grocery stores have high energy use needs for refrigeration, air conditioning, heating, dehumidification, water heating and cooling, sanitization, high lighting loads, and see the most traffic when compared to other similar size building structures. In addition, refrigerated trucks and trailers are needed for transporting food and pharmaceuticals to and from grocery stores that may also include a restaurant, pharmacy, bank, florist, salon, and even health clinics. The complexity surrounding grocery stores and their design makes it a significant challenge to be able to achieve decarbonization and net-zero carbon emissions in their built structures. Many grocery retailers have energy and sustainability goals, and many larger chains have Scope 1, 2, and 3 emission reduction goals; decarbonization is also seen as an opportunity to reduce and eliminate waste and improve resource use efficiency.

The vision for this guide is to provide holistic strategies and Whole Life Carbon (WLC) considerations (embodied and operational carbon emissions) applicable to grocery stores. The guide should build upon the existing ASHRAE and industry guides by providing specific design and operational parameters for building decarbonization projects (in the vein of a 50% Advanced Energy Design Guide (AEDG) but based on Zero rather than 50%) that allow the audience to maximize carbon reductions in all stages of the building life cycle and operation.

There are several significant gaps in broad knowledge, and an ASHRAE publication would be a good fit to provide that knowledge. Those gaps include, but are not limited to:

1. Several streamlined guides exist that are targeted at mainstream building professionals and provide guidance for designing and operating high-energy performance buildings; however, there is a lack of a companion guide for maximizing grocery store decarbonization with clarity and specificity.
2. Guidance for addressing specific systems or even emerging technologies is aimed at researchers and early adopters, not a mainstream audience. A guide that describes specific whole-building recommendations for an array of the most common systems is needed.
3. A guide is needed that could directly inform (and be referenced by) global standards and initiatives, including general sustainability and climate standards (such as those administered by ASHRAE, ISO, Green Building Councils, and others) as well as those that are more focused on a comprehensive, holistic approach to whole building life cycle accounting.
4. Very little of the guidance mentioned is focused directly on the goal of decarbonization. This guide would have decarbonization as the primary goal, which aligns it with the ASHRAE Strategic Plan for 2025-2028. Specifically, strategic goal #1 to position ASHRAE as the global leader in advanced solutions to improve indoor environmental quality (IEQ) and address climate change.

**OBJECTIVE**

To develop a guide for retail grocery store archetypes that explores the concepts, implementation strategies, and case studies supporting the reduction of whole-building carbon (including scope 1, 2, and 3 emissions, with an emphasis on 1 and 2) for both new and existing grocery store structures through the life of the building.

**SCOPE**

**Targeted Audience:**

Owners, operators, design professionals, maintenance engineers, sustainability and project managers, consultants, and other industry stakeholders. The guide should be applicable to the international community and include elements relevant to those outside the United States.

**Content:**

ASHRAE has developed guides to cover multiple aspects of decarbonizing the built environment, and the content of this guide should integrate with and refer to those other guides as appropriate. The *Proposed Outline* section of this RFP provides some guidance on which sections may overlap with the other guides, listed below:

- 50% AEDG for Grocery Stores
- Building Decarbonization Whole Life Design Guide
- Building Decarbonization Retrofits for Commercial and Multifamily Buildings
- Building Performance Standards Technical Resource Guide
- Decarbonizing Hospital Buildings
- Grid-Interactive Buildings for Decarbonization Guide
- Guide to Strategic Decarbonization Planning
- Heat Pump Application and Operation Guide
- Whole Life Carbon Guide for Building Systems

This guide intends to cover Whole Life Carbon (WLC) – Operational, Embodied, and End of Life – with design and operational strategies to reduce and eliminate direct and indirect emissions in new and existing retail grocery store buildings. Other considerations to include are (not a complete list):

- Load reduction/shifting strategies
- Thermal mass and phase change materials as peak reduction/peak shifting strategies
- Self-Generation Concepts, such as power/energy/electrical considerations (on-site renewables, electrical storage [BESS or otherwise], EV charging, load sharing and virtualized load panel devices), and co-gen considerations (existing equipment lifecycle replacement, clean fuel as hybrid/bridging technology, non-combustion forms of co-gen)
- Electrification transition considerations, including hybrid solutions (including hot water)
- Heat reclamation and thermal energy storage
- Cold-climate strategies (cold, very-cold, and subarctic)
- Ventilation strategies & Humidity Control
- Refrigerant leaks and emissions
- Control system strategies for decarbonization
- Portfolio evaluations and energy audits
- Life cycle cost considerations
- Equipment replacement cycle considerations
- Refrigerant considerations
- High-level discussion of refrigerant and WLC considerations for background
- Regulation constraints for existing site/building
- Occupant comfort considerations (affordability/equity, disrupting tenants, environmental justice)

The subject of decarbonization is broad, and there are many topics under that umbrella that this guide does not intend to cover in detail, but may need a brief overview, including (not a complete list):

- Considerations related to the circular economy, including recycled products and end of life recycling to achieve net zero Whole Life Carbon
- Policy and program design to set up metrics and targets for existing building energy efficiency retrofit and decarbonization (covered by Building Performance Standard Technical Guide)
- Grid-optimization (covered by Grid-Interactive Buildings Guide)
- Why we want to decarbonize buildings and why electrification (other than brief introduction)
- Food service equipment electrification (covered by existing guides, including AEDGs, see references), including cooking appliances, hoods, commercial refrigeration, etc.
- Emergency systems (emergency generators, smoke control, etc.)
- A detailed dive into embodied carbon and accounting methodologies. This guide should reference the Building Decarbonization Whole Life Design Guide, which covers new and existing buildings where appropriate.

Building decarbonization strategies and policies must consider healthy, safe, and comfortable environments; environmental and social impacts; sustainability; resilience; and economics. Decarbonization policies must consider

and mitigate impacts on disadvantaged communities and less-developed nations. The guide should touch on these topics throughout.

**Proposed Outline (to be used for guidance only):**

It is suggested that the proposed content of the guide include, but not necessarily be limited to, the elements laid out in this section. This could form a rough draft of the table of contents, but the guide is not strictly fixed to this structure.

1. Introduction
  - Overview
  - Purpose and Scope
  - Recommended Resources
2. Whole Life Carbon (WLC) – Operational, Embodied, and End of Life
  - Overview of Operational, Embodied, and End of Life Carbon
  - Benefits and Why Carbon Reduction is Important for Grocery Stores
  - New Versus Existing – Why it Matters
3. Remodels and Retrofits/Commissioning (Process and Equipment) Operational Carbon – What are GHG Protocol Scopes 1, 2, and 3 Emissions?
  - Operational Carbon Scope 1, 2, & 3 Emission Sources and Relative Magnitudes
  - Operational Carbon Accounting Method
  - Why Reduce and Eliminate Scope 1, 2, and 3 Emissions?
4. Design to Reduce and Eliminate Direct (Scope 1) Emissions in grocery stores
  - Overview
  - Food Waste
  - Natural Gas Heating – Air
  - Natural Gas Heating – Water
  - Natural Gas – Cooking
  - Refrigerant Leaks and Emissions - HVAC & R
  - Strategies to Mitigate Emissions
  - Impact of Different Climate Zones
  - Case Studies
5. Design to Reduce and Eliminate Indirect (Scope 2) Emissions in grocery stores
  - Overview – include major building systems
  - HVAC - Air Temperature and Humidity
  - Lighting
  - Refrigeration
  - Electric - Hot water & Cooking
  - Other Building Electric Load Sources
  - Strategies to Mitigate Emissions
  - Impact of Climate Zone
  - Case Studies
6. Design to Reduce and Eliminate All Other (Scope 3) Emissions in grocery stores
  - Overview
  - Upstream Emissions
  - Downstream Emissions
  - Strategies to Mitigate Emissions
  - Strategies
  - Impact of Climate Zone
  - Case Studies
7. Life Cycle Analysis (LCA) and Climate Performance
  - Embodied Carbon and Strategies to Reduce and Eliminate
  - End of Life Carbon and Strategies to Reduce and Eliminate
  - Include methodologies for measure level cost-effectiveness and LCA ROI
8. Whole System Performance Monitoring and Asset Management

- Building Automation System (BAS)
  - Expected vs. Actual Performance
  - Continuous Improvement
9. Making Selections to Meet Competing Needs and Goals
    - Prioritization
    - Making the Business Case
  10. Suggestions for More Help
    - Rating Agencies and Organizations  
(EX: DI, S&P Global ESG Scores, Moody's ESG Solutions, CDP, Ecovadis, etc.)
  11. Conclusion
    - Also to be included: Executive Summary, Glossary, List of Acronyms, References/Bibliography, Appendices.

## **DELIVERABLES**

### **Interim Deliverables:**

Progress and Financial Reports shall be made to ASHRAE (the Society) through its Director of Technology (or designee) at monthly intervals.

During this effort, the contractor shall provide the documents described below for review by the Project Monitoring Subcommittee (PMS). The PMS shall approve each deliverable listed below in a timely manner (as specified in the contract documents) prior to initiation of the succeeding deliverable. These documents shall be delivered to the PMS according to the final schedule specified in the contract.

1. An outline of the manual containing sufficient detail to allow the PMS to determine whether the scope of the manual will be adequate.
2. A preliminary working draft of the complete manual covering all sections of the guide (50% Draft, 75% Draft, and 90% Draft).
3. The final working draft of the complete manual (90% complete), incorporating changes recommended by the PMS on the preliminary working draft.

Electronic files of the working drafts shall be delivered to the Chair of the PMS and the Manager of Building Decarbonization (or designee) for each interim deliverable. Document delivery will be coordinated through the Manager of Building Decarbonization (or designee). The files shall clearly show the changes proposed. File formats shall be both Microsoft Word and Adobe Acrobat

### **Final Deliverables:**

#### Microsoft Word File

1. Appropriate front matter, including an accurate table of contents with page numbers.
2. Text and appendices in an electronic format specified by ASHRAE Publications in the User Manual template documents. (Copy attached.)
3. Illustrations, tables, and all other artwork provided separately and/or in electronic format specified by ASHRAE Publications and as noted below.
4. All other materials necessary for a complete publication.
5. Reprint permission by owner of copyright for any material, illustrations, graphics, or photographs used from outside sources.

#### Format Specifications for MS Word File

1. All of the text (including front matter, table of contents, any back matter such as an index, etc.) in Word. The Word file(s) must be free of conditional text, line numbers, track changes, and cross-references. The document must be in dual units (IP and SI).
2. Tables must be noted in the text (where they go) and numbered consecutively as they appear in the text. All tables must be Word or Excel tables; they CANNOT be unalterable images of tables. All table titles should be

descriptive but concise, and each column should be labeled with a heading and include units of measurement and other necessary qualifying information; dual units must be provided for all measurements. In creating tables, the authors should use only 1 point (0.014 in. [0.355mm]) or thicker lines.

3. Figures must be noted in the text (where they go) and numbered consecutively as they appear in the text, but the actual figures themselves must be provided to ASHRAE as individual TIF or EPS files in Grayscale mode saved at high resolution (600 dpi or greater) and at least 4 in. size or greater. All figure files should be clearly labeled. In creating figures, the authors should use only 1 point (0.014 in. [0.35 mm]) or thicker lines—smaller lines will not reproduce well. The figures will be reproduced in black and white, so they should employ patterns or shapes to distinguish sections instead of coloring and shading. Each figure should have a brief legend or descriptive labels, as appropriate. Any text included in a figure (except the figure caption) should be embedded as part of the image file and not contained in a separate text box that is not part of the image file; captions should NOT be part of the image file. All figures should be provided in dual units, like the text. Providing two graphics for each figure – one in IP units and one in SI units – is acceptable; such figures must be supplied as one TIF or EPS file with both graphics included in the one image file.
4. Works cited in the text must have reference list entries in a references section at the end of the document. ASHRAE uses the author-date citation method. Footnotes should be avoided in the document. Parentheticals are the preferred method for non-reference supplemental information.
5. The authors of the text need to obtain permission to reprint any images that they want to use from another source; ASHRAE will not obtain permissions for them.
6. The text and figures must comply with ASHRAE’s commercialism policy (<https://www.ashrae.org/about/governance/ashrae-commercialism-policy-and-guidelines>).
7. Final submission of the completed book must include the manuscript in Word, separate TIF or EPS files for all illustrations and photos and contact information for the authors in case of questions during any final editing or lay-out of the book.

### **CONTRACTOR REQUIREMENTS**

The contractor must have demonstrated familiarity with building operations, ideally with grocery stores and refrigeration systems, electrical and thermal storage, DHW, climate zone specific building controls strategies and with “smart grid” technologies, resources, and programs. Details of this familiarity should be specifically described in the proposal.

The contractor must have demonstrated expertise in the development of design guides, manuals, or documents of like kind.

### **LEVEL OF EFFORT**

The guide is expected to be no more than 100 to 150 pages in length. It is estimated that the selected contractor can complete this project within seven (7) months of the award of the contract. A total cost of approximately \$80,000 to \$100,000 is anticipated for the project (may be more or less as determined by the value of proposal and competing proposals.)

### **SUGGESTED APPROACH**

1. Prepare expanded/annotated outline for review by the PMS.
2. Review the outline draft with the PMS.
3. Address all review comments and reach an agreement on the organization and content of the document.
4. Compile a list of relevant literature, organizations, regulations, and other resources that should be referenced in the guide. Review this with the Monitoring Committee.
5. Review guidance on approximate sizing for electrical and thermal storage and DHW. Consider supplementing the guidance with high-level calculations or shoebox simulations.
6. Review literature to determine which control strategies are relevant in each climate.

7. Prepare a draft of the manual for review by the PMS.
8. Review the draft with the PMS. Address all review comments and reach an agreement on the substance of each change.
9. Develop formatting and graphics to produce the guide for publication by ASHRAE.
10. Develop the index and table of contents, composing each page, and providing consistent headers and footers.
11. Submit the document for final review and approval by ASHRAE to verify that changes have been accurately implemented.
12. Submit the project files, including source documents, for publication of the document by ASHRAE

## **ADDITIONAL INFORMATION FOR CONTRACTOR**

### **General Information/Proposal Requirements**

1. The proposal should specify a timeline with identified intervals for critical milestones, including reviews and deliverables. Bidders should consider the time and costs necessary to provide for at least two (2) interim review cycles by the PMS for each of the working drafts (preliminary and final). Review cycles should include time for the PMS to review the document and provide feedback to the contractor.
2. While ASHRAE regularly updates its guidance documents, this is the first version of the guide, so the contractor will not have a previous version to work from. The proposal should provide an indication of the expected page count, content, and organization to effectively meet the stated objectives.
3. Bidders should propose topics and an appropriate level of detail for the guide. Indicate resources, guidance, and standards that can be used to support topic discussions and a strategy for providing guidance to building managers for evaluating less defined or rapidly evolving options.
4. Bidders should specify what actions time, and costs are necessary to include guidance in the guide to determine which control strategies are relevant in each climate zone.
5. Monthly conference calls with the Monitoring Committee will be scheduled to monitor progress and direction.
6. The proposal should describe the bidder's relevant experience. This could include a) developing guidance documents, especially for building operations. management or design professionals; b) training building professionals; c) work having to do with designing or evaluating advanced grid functions, customer-focused programs, facility-sited distributed energy resources; etc.
7. The proposal should include a list of previously published works (articles, manuals, papers, etc.) relevant to this project.
8. The following materials are attached to this RFP:
  - a. Required Bid Forms:
    - i. Additional information for Contractors
    - ii. ASHRAE Application for Grant of Funds
9. All communications will be coordinated through the Manager of Standards (or designee), but the proposal should specify how the contractor plans to communicate with the PMS during the project. Communications may include virtual or in-person meetings (at the ASHRAE conferences).
10. Bidders who assisted in any work statement preparation or had knowledge of the contents of the work statement prior to the issuance of the RFP should identify themselves as such in the proposal. This is required to allow the PMS to satisfy themselves that these preparers did not gain an unfair advantage.
11. The following materials are available upon request:
  - a. Electronic copy of ASHRAE Author's Manual

### **Proposal Evaluation Criteria:**

1. Contractor's understanding of the Work Statement and approach to complete the project, as demonstrated in the proposal. **(25%)**

2. Past performance writing user-oriented guidance and/or evaluating options for facility operations. **(20%)**
3. Contractor's experience with different building operations and systems; building retrofits and building efficiency/electrification projects for a diverse range of building types and climates; familiarity with regulatory and market implications of deep decarbonization grocery store design projects. **(35%)**
4. Qualifications and experience of personnel for project, especially as it relates to Grocery Stores, refrigeration systems, and whole life carbon analysis. **(20%)**

In addition to these technical criteria, price will be a factor. Selection will be based on the best value for ASHRAE.

#### **COPYRIGHT**

This is a "Work for Hire." ASHRAE will be listed as the author of the User's Manual. ASHRAE will publish and hold the exclusive copyright to the Manual, including any associated software and source code. Only ASHRAE may license use of the Manual to third parties.

Reprint permission by owner of copyright must accompany any material, illustrations, graphics, or photographs used from outside sources.

All materials developed for this work will be treated as confidential material that cannot be disclosed to third parties without the written permission of ASHRAE.

#### **REFERENCES/RESOURCES**

In addition to the guides or standards mentioned within this document, the following resources may be useful:

- The Building Decarbonization Practice Guide: A Zero Carbon Future for the Built Environment, William Worthen Foundation, <https://worthenfoundation.org/get-the-guide-bdpg>
- California State University Building Decarbonization Framework, <https://www.calstate.edu/csu-system/doing-business-with-the-csu/capital-planning-design-construction/operations-center/Pages/energy-sustainability.aspx>
- DOE Advanced Energy Retrofit Guides <https://www.energy.gov/eere/buildings/advanced-energy-retrofit-guides>
- DOE Energy Efficiency in Separate Tenant Spaces <https://www.energy.gov/eere/buildings/downloads/energy-efficiency-separate-tenant-spaces-feasibility-study>
- DOE Better Buildings Solution Center - Efficiency (<https://betterbuildingssolutioncenter.energy.gov/carbon-hub/energy-efficiency>) and emerging technologies (<https://betterbuildingssolutioncenter.energy.gov/carbon-hub/emerging-technologies>)
- New Buildings Institute - Tools and Guides <https://newbuildings.org/hubs/zero-energy/#tools-guides> including School Decarbonization Roadmap <https://newbuildings.org/resource/decarbonization-roadmap-guide-for-school-building-decision-makers/>
- New Buildings Institute - Existing Building Decarbonization Code <https://newbuildings.org/resource/existing-buildings-decarbonization-code/>
- Lighting retrofits: [Upgrading Troffer Luminaires to LED](#), [LED Retrofit Kits](#), [TLEDs](#), and [Lighting Controls: An Application Guide](#), [LED Site \(Parking Lot\) Lighting Specification](#), [High-Efficiency Parking Structure Lighting Specification](#), [Wireless Occupancy Sensors for Lighting Controls](#), [Strategies for Success with Connected Lighting Systems](#)
- RetrofitNY Cost-Compression Study <https://www.nyserda.ny.gov/All-Programs/RetrofitNY/Resources-and-Reports>
- ANSI/ASHRAE/IES Standard 202-2018 Commissioning Process for Buildings and Systems
- ANSI/ASHRAE Standard 211-2018 Standard for Commercial Building Energy Audits
- ANSI/ASHRAE/IES Standard 100-2015 Energy Efficiency in Existing Buildings
- ANSI/ASHRAE/IES Standard 90.1-2019 Energy Standard for Buildings Except Low-Rise Residential Buildings
- ANSI/IIAR CO2-2021 Safety Standard for CO2 Refrigeration Systems
- ASHRAE Guideline 0-2019 The Commissioning Process
- ASHRAE Guideline 0.2-2015 Commissioning Process for Existing Systems and Assemblies



- ASHRAE Guideline 1.2-2019 Technical Requirements for the Commissioning Process for Existing HVAC&R Systems and Assemblies
- ASHRAE Guideline 13 Specifying Building Automation Systems
- ASHRAE Guideline 14 for M&V sections
- ASHRAE Guideline 36 Best in Class HVAC Control Sequences
- ASHRAE AEDG for Grocery Stores
- ASHRAE Humidity Control Design Guide
- ASHRAE Whole Life Carbon Guide
- ASHRAE Fundamentals Handbook Chapters 1, 9, 15, 29 (Refrigeration) and others
- ASHRAE Refrigeration Commissioning Guide (2013)
- ASHRAE Standard 15 Safety Standard for Refrigeration Systems
- ASHRAE Standard 15.2 (2022) - Safety Standards for A2L refrigerants in low-rise applications
- ASHRAE Standard 189.1 (2020) - Standard for the Design of High-Performance Green Buildings
- ASHRAE Standard 189.3 (2017) - Construction, and Operation of High-Performance Health Care Facilities
- ASHRAE Handbook 2023 HVAC Applications Chapter 3 Commercial and Public Buildings
- ASHRAE Handbook 2023 HVAC Applications Chapter 5 Places of Assembly
- ASHRAE Handbook 2024 HVAC Systems and Equipment Chapter 9 Applied Heat Pump and Heat Recovery Systems
- ASHRAE Position Document on Building Decarbonization
- ISO 27.200 - Refrigerating systems and heat pumps
- Better Buildings Low Carbon Technology Strategies: Supermarkets
- ASHRAE 2020 Smart Grid Application Guide Integrating Facilities with the Electric Grid
- US Building Stock Characterization Study, NREL. <https://resstock.nrel.gov/page/typology>
- California Title 24 Part 6 Building Energy Efficiency Standard 120.6 Commercial Refrigeration
- CEC 2021 Report Market Zero: Taking an Existing Grocery Store to Scalable Near-Zero Net Energy (Fact Sheet)
- NREL TP-5500-63796: Energy-Efficient Supermarket Heating, Ventilation, and Air Conditioning in Humid Climates
- NREL PIX Library <https://images.nrel.gov/>
- Two Approaches to Scaling Commercial Building Decarbonization Retrofits: Breadth and Depth
- Optimizing operational carbon: Reclaiming heat from refrigeration systems for space heating

#### **APPLICABLE RESEARCH**

- ASHRAE RP-1455: Advanced Control Sequences for HVAC Systems – Air Distribution and Terminal Systems
- ASHRAE RP-1711: Advanced Sequences of Operation for HVAC Systems – Phase II Central Plants and Hydronic Systems
- RP-1747: Implementation of RP-1547 CO<sub>2</sub>-Based Demand Controlled Ventilation For Multiple Zone HVAC Systems In Direct Digital Control Systems
- California Energy Commission, The Big-Box Efficiency Project: Empowering Energy Efficiency in Existing BigBox Retail/Grocery Stores, <https://www.energy.ca.gov/sites/default/files/2023-06/CEC-500-2023-023.pdf>