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NEEA Style Guide for Public Research Reports

Prepared by:
NEEA Market Research and Evaluation
700 NE Multnomah Street, Suite 1300
Portland, Oregon 97232

Northwest Energy Efficiency Alliance
PHONE
503-688-5400
EMAIL
info@neea.org

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1   Introduction

The Northwest Energy Efficiency Alliance (NEEA) is an evidence-based, data-driven organization that requires high-quality technical report writing. This document provides guidance[1] to authors submitting all types of documents to NEEA, with special emphasis on market research and evaluation reports that are ultimately posted to NEEA's website. This guide can also serve as a general template, although each report will need some measure of customization.

NEEA's writing requirements generally align with the rules of *The Chicago Manual of Style*,[2] and authors should refer to this source for clarifications. The *Elements of Style* (Strunk and White 1999) provides an additional source of information about clear sentence structure, and commonly misused punctuation (e.g., semicolons and hyphenation) and form (e.g., passive voice).

1.1   Reports Covered by this Document

NEEA produces a variety of reports during the normal course of our work. This Style Guide is meant to provide expectations contractors should follow when preparing reports for NEEA review. This includes reports generated within the following business units: Market Research & Evaluation, Market Development & Transformation, Codes and Standards, Stock Assessments, and Product Management and Emerging Technology.

1.2   Understanding NEEA's Audience

NEEA's reports provide critical and timely information to its stakeholders, and as such NEEA is both a publisher of research as well as a consumer. This is a critical distinction because it means that authors are not writing to a NEEA project manager, but to a much broader audience. NEEA's default position is that all research and evaluation reports will be available to the public by posting on neea.org. Except in the rare case where a report contains substantial confidential information or a report is primarily an internal document, all reports are published on NEEA's website and are available to the general public. Potential publication exceptions include preliminary research that shows only part of a broader story, research that is co-funded by other entities with sensitivity concerns, or research that is conducted to motivate a targeted audience.

Consumers include regional utilities and energy agencies (especially, evaluation and planning professionals), federal agencies, trade allies and market actors, scholars, and the media. Given this broad visibility, NEEA requires authors to provide only the best quality reporting. Contractors who do not feel they can meet this level of expected quality are strongly encouraged to solicit writing services that meet this expectation.

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[1] On a project-by-project basis, authors should always defer to a NEEA project manager for final direction on report quality and content.

[2] Online version: https://www.chicagomanualofstyle.org/home.html. Most recent print edition: *The Chicago Manual of Style, 17th Edition.* University of Chicago Press, 2017.

2   General Formatting

File type—Submit all draft and final reports as Microsoft Word documents. With NEEA project manager agreement, exceptions—such as PowerPoint decks—will be accepted.

Font—Use Times New Roman, Calibri, or Cambria for all reports. All "normal" text should use 11pt font, though 10pt font is acceptable where appropriate for spatial formatting. Exceptions include chapter or section headings and footnotes, tables, figures, and captions. Font sizes for other styles:
- Header and footer—11pt
- Bulleted and numbered lists—11pt
- Table text—10pt
- Captions—10pt
- Figure/table notes —9pt
- Footnotes—9pt
- Heading levels 1 through 5—Vary; see examples

Margins—Set margins to one inch on all sides with an 8.5 x 11-inch format, portrait orientation. Exceptions for wide tables are allowed; in such cases, create a new section to accommodate landscape pages, then return to portrait orientation. Right-hand margins should be ragged, not justified.

Line spacing—Single-space all lines of text in a paragraph, with no extra spacing (i.e., no "points" before/after paragraphs). Lines of text between paragraphs should be double-spaced. Do not indent paragraphs.

Header—Align the report title with the left margin in the header. Align the NEEA logo with the right margin. Reports with titles longer than eight words should use a shortened proxy in page headers.

Footer—Insert page numbers, preceded by Northwest Energy Efficiency Alliance, in the lower right-hand corner of all pages of the report. Number pages preceding the main body of the report (e.g., acknowledgments and executive summary) using lower-case Roman numerals. Number pages in the main body of the report using Arabic numerals. Title page and tables of contents, figures, and tables have no page numbers.

Copyright notice— All copyrightable NEEA-materials distributed publicly should contain a copyright notice as of the date of first publication. More information pertaining to NEEA's Intellectual Property (IP) Policy can be found on NEEA's website: [IP Policy.pdf (neea.org)](IP Policy.pdf). A copyright notice requires: 1) a © or "copyright;" 2) the year the material was first published; and 3) "Northwest Energy Efficiency Alliance" (Example: © 2023 Northwest Energy Efficiency Alliance). This notice can be placed anywhere on the copyrighted material, but authors may find the left or right-hand corner of the footer a practical location.

Citations—Correctly cite all sources in-text using the author-date system. Do not cite in footnotes except in the following cases: 1) when all citations in the report are derived from fewer than five sources (in which case a reference section is unnecessary) and 2) when citing a publication in which additional information on the topic being referenced may be found. See Chapter 6 of this style guide for additional information.

Authors may find the use of Microsoft Word styles expedites consistent formatting for reports.

3 Grammar and Syntax

NEEA and its technical writers strive for the best quality writing. The language should be clear, concise, and should conform to generally established practices of grammar, sentence structure, and punctuation. Avoid the use of jargon or terms unfamiliar to lay audiences.

Default style guide—This guide covers most common elements of NEEA's style. When in doubt, or for style topics not covered herein: Please use *The Chicago Manual of Style* as suggested in the introduction.

Inclusive language—NEEA is committed to diversity, equity and inclusion in its business practices. Reports must strive to remove implicit bias and should use inclusive language by following these practices, at a minimum:
- Use "people of color" instead of "non-white."
- Use asset-based instead of deficit-based language to describe people and communities. For example, instead of "poor communities" use "neighborhoods with incomes below the poverty line/high poverty rates."
- Avoid generalizations. Be specific when describing groups of people. For example, instead of "vulnerable populations" refer to "people who are at increased risk for ___."
- Avoid use of the gendered pronouns "he/she." Use "they" instead.
- Capitalize the *B* in *Black* when referring to the race. Likewise, treat as proper nouns terms used to describe a racial or ethnic group, such as Asian, Hispanic, Indigenous, Native American, and Latina/o/e.

Point of view—Write in third person (e.g., "the project team," "[organization name]"). Do not submit a report written in first person (e.g., "we," "our").

Voice—Use active voice when possible. Passive voice may be acceptable when discussing process or research methods. Other instances for which passive voice may be used include
- when the performer is unknown, irrelevant, or obvious,
- when the performer is less important than the action, and
- when the recipient is the main topic.

Acceptable passive voice examples—The following sentences provide specific examples of acceptable use of passive voice:
- Data for the long-term field study *were organized* in a template for each test site.
- Up to 46% less nitrogen fertilizer *was applied* through the use of Variable Rate Irrigation.
- To test the water heater, inlet water temperature *was maintained* with a chiller.

Technical jargon—Minimize the use of technical jargon. This is especially important for NEEA's programs, which often develop their own language and nomenclature. Clearly define and describe technical terms when they must be included, using parentheses in-text or in a footnote. Do not assume that the reader will be familiar with the terms under discussion, and exercise judgment regarding which terms will likely require disambiguation for an educated lay audience.

Unfamiliar historical jargon—Avoid the use of jargon and slang as contemporary social reference. For example, *the Great Recession* was common vernacular between 2007 and 2009. However, it might not be recognized by readers of today. Readers would, however, comprehend "the real-estate collapse of 2008 which led to a major recession." A term like *the Great Depression*, on the other hand, is appropriate based on decades of historical reference.

Proper name usage—Ensure that the names of organizations, products, programs, etc., are properly spelled, capitalized, spaced, and punctuated. As examples:

- ENERGY STAR® is two words, all caps, with ® appended on first use in document.
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has one comma only (after Heating), one hyphen (after Air), with "and" spelled out (i.e., not "&") after Refrigerating.

For other proper names, refer to the organization's website.

Acronyms and abbreviations—Introduce all acronyms and abbreviations by first writing out the term in text followed by the acronym in parentheses. One could write, for example, "The Northwest Power and Conservation Council (NWPCC) proposed policy that affected the region." Acronyms and abbreviations should be introduced using the full term once in each major section of the report (i.e., executive summary, main body, appendix, etc.). All subsequent inclusions should use the acronym alone. Certain abbreviations, for example those referring to U.S. states or some units of measurement (e.g., kWh, lb., ml), are common and do not need introduction.

Citation signals—Reserve introductory and supporting signals (e.g., i.e., cf., etc.) for citations and other parenthetical notation. Do not use citation signals in text.

Number representation—In general, use words to identify whole numbers between zero and nine except for specific analytical results. Use numerals for numbers 10 and higher. Always spell out numbers that begin a sentence. When spelling out numbers, also spell out descriptors like "percent" and "dollars."

Analytical nomenclature—Report analytical results with numerals and appropriate nomenclature. As an example, one could report that of all survey respondents, 43% identified as homeowners. As another, the results of a *t* test could appear as t (332) = 1.14, $p < .05$.

Headings—Headings, particularly those beyond top-level Heading 1, should be straightforward and succinctly summarize the content in the text that follows. For example:

Insufficient

3 Findings

3.1 Contractor Perceptions

3.1.1 HVAC Installations

More Descriptive

3 Findings

3.1 Contractor Perceptions Are Generally Positive

3.1.1 HVAC Installations Are Increasingly Straightforward

**Punctuation—**Please observe the following punctuation styles (among others):
- One space after periods and colons
- Punctuation generally goes inside quotation marks
- Footnote superscript numbers go after punctuation
- Use en dashes to set off ranges (e.g., 21–50)
- Use em dashes to set off text in a sentence (e.g., Oregon and Washington—two of the states in the alliance—are among the states with the highest penetration.)

4 Tables and Figures

Table/figure layout—Center tables, figures, and illustrations horizontally on a page. They should appear between lines of text or paragraphs, "in line with text" (i.e., no text wrapping). Do not allow tables or figures to break pages.

Table form—Insert tables as editable text. Do not insert as pictures or images.

Additional table style—Tables may include notes, data source information, and key statistics in a *Notes* section below each table. Table captions (sentence case) should be sequentially numbered using the Insert Caption function and should appear above the applicable table. In-text references to specific tables should be inserted using the Cross-reference function, both to hyperlink them and to facilitate automatic number updating as needed.
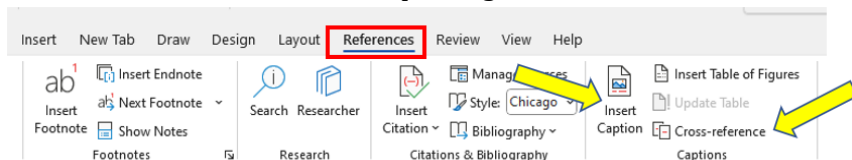
Table design—Tables should be formatted using banded rows and NEEA's color palette, with the exception of tables with cells that reflect heat map colors. See Tables 1 and 2 for examples.

Table 1. Comparison of NPR1 to participant mean total circulator sales

Type of Circulator	Participant Mean Sales (# Units)	How NPR1 Compares to Participants
Domestic Hot Water	3,407	Below participant range

| Hydronic Heat | 4,747 | Slightly above bottom of range, well below mean |
| Total, Both Types | 8,154 | Slightly above bottom of range, well below mean |

Notes: Adapted from Table 3 in *Extended Motor Products Regional Market Share Study,* report for NEEA by ADM Associates, Inc. and Johnson Consulting Group, November 15, 2022.

**Table 2. Heatmap of drivers mentioned by each market actor group**

Driver	Supply Chain	Designers	Installers	End Users
Incentives				
Codes and policies				
Sustainability goals				
Influence from project team				
Project goals				
End user demand				
Moving away from gas				

Notes: Darker red cells indicate a higher frequency of mentions for the associated barrier. Unshaded cells indicate no mentions of the barrier by the market actor group. Adapted from Table 3 in Central *Heat Pump Water Heaters for Multifamily Supply Side Assessment Study,* report for NEEA by New Buildings Institute, January 9, 2023.

Figures—Use a black border for all figures, charts, and illustrations. Include notes, data source information, full question text and number (for survey data), and key statistics in a *Notes* section below each figure. Figure captions (sentence case) should be sequentially numbered using the Insert Caption function and should appear below the applicable figure. In-text references to specific figures should be inserted using the Cross-reference function, both to hyperlink them and to facilitate automatic number updating as needed.

Charts—Identify and label all axes and units. Include the sample size (N) on the chart. Charts should use NEEA's color palette, found on page 15 in NEEA's Brand Guide: https://neea.org/img/documents/neea-brand-guide.pdf. See Figures 1 and 2 for examples. The data visualization checklist at https://stephanieevergreen.com/rate-your-visualization/ provides guidance, with exceptions as noted in this style guide, for chart style and formatting; a modified version of the checklist is attached to this Style Guide as Appendix A.
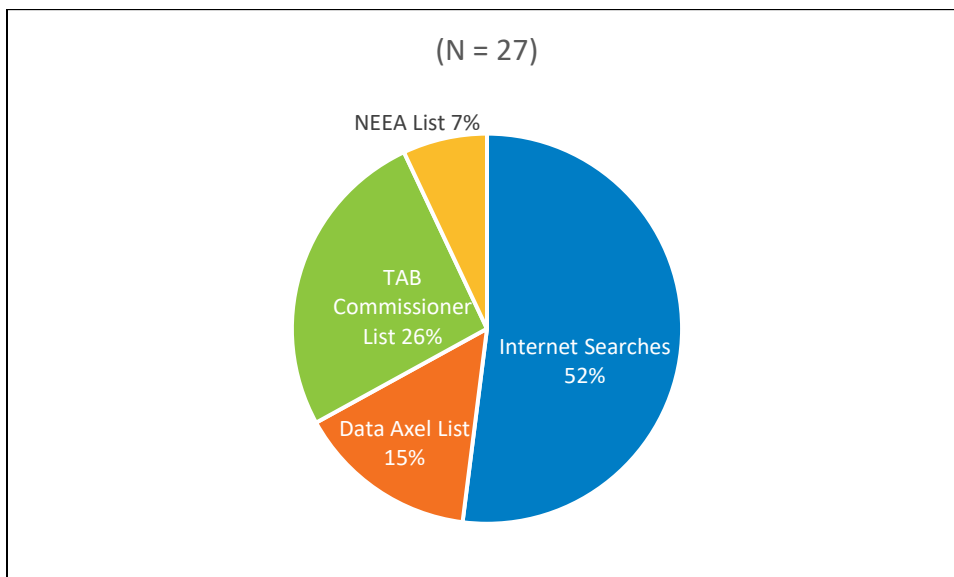
Figure 1. Source of respondent data
Notes: Adapted from Figure 2 in *Pump Energy Rating Label Awareness and Use Study,* report for NEEA by Johnson Consulting Group, August 15, 2022.
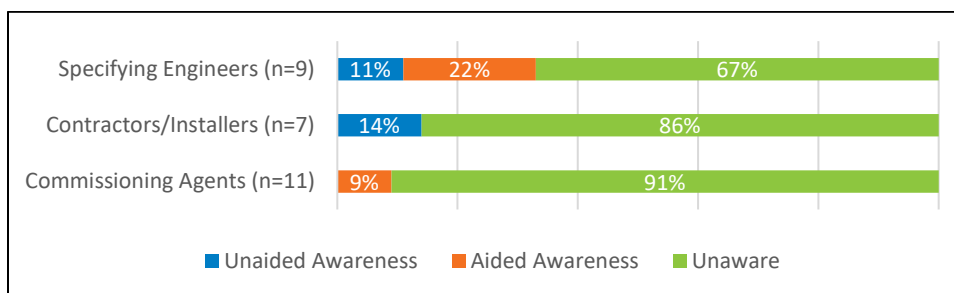
Figure 2. Comparison of awareness levels across market actors
Notes: Adapted from Figure 7 in *Pump Energy Rating Label Awareness and Use Study,* report for NEEA by Johnson Consulting Group, August 15, 2022.

Table and figure attribution—When tables and figures are extracted from NEEA reports (e.g., for use in presentations or secondary reports), NEEA requires such tables and figures to be copyrighted with the same year as the originating report.

5   Structure and Required Content

Report length—Limit all submissions to 40 pages, not including NEEA's title page, acknowledgments, tables of contents/tables/figures, an executive summary, references, and appendices.

Table of contents—Include a table of contents in all reports. The table of contents should be generated based on heading levels through References > Table of Contents on the ribbon. Reports with five or more tables or figures should also include a table of tables and/or a table of figures.

Executive summary—Include an executive summary in all reports, between the table of contents and the main body of the report. Although it will be integrated into the report, the executive summary should read as a stand-alone essay that provides sufficient information to aid the decision-making of managers and directors. It should provide a high-level description of the project that emphasizes the primary research objectives, key observations, interpretation of results, and main conclusions. Authors should work with NEEA project managers to determine the most critical and interesting topics to discuss in the executive summary. The executive summary should be sufficient in length to convey the most important details of the full report but should normally be limited to two to three pages.

Report levels—Structure the main body of reports by chapter (e.g., 1, 2, 3), then by section (e.g., 1.1, 1.2, 2.1) and subsection (e.g., 1.1.1, 1.2.1, 2.1.1). Use NEEA styles appropriate to each heading level—this will also facilitate easy generation of the table of contents. The executive summary and reference section are not numbered (but are listed in the table of contents); appendices are distinguished with capital letters rather than numbers.

General report progression—Although the numbers and labels of specific chapters and sections will be determined on a report-by-report basis, the general progression of all research reports includes: 1) introduction, 2) research methods, 3) findings, and 4) conclusions/recommendations.

- The introduction should meet the following conditions:
  - Demonstrate the author's comprehension of and perspectives on the subject under study
  - Be comprehensive
  - Explain the purpose of the research
  - Clearly indicate key research questions
  - Provide background information supported by literature and historical findings
  - Provide context for the research and provide information to help the reader navigate the study

- Research methods sections should describe the research approach and include detailed information about participants and sampling, materials (e.g., survey instruments), and procedures for carrying out the methods. They should refer the reader to appendices that contain the complete survey instruments and discussion guides used for the study.

- Findings sections should describe the results of research analyses and summarize key results.

- Conclusions (and recommendations, if applicable) should summarize the most important findings of the work, especially as they relate to understanding the questions or problems posed in the introduction. Premises and supporting arguments should be strong and should be supported by data and analyses. Important features of the conclusions include discussion of the implications of the research, disclosure of any limitations of the approach, and recommended directions for future investigation.

Reference section—Include a reference section after the conclusions chapter that covers all sources used in citations, including in-text citations and data sources for tables and figures. Do not report references in footnotes unless the document contains fewer than five of them, in which case

the reference section can be omitted. See Chapter 6 of this style guide for additional information.

Appendices—Appendices may include any content that will provide additional information about the study, and that is considered pertinent by the author and/or the NEEA project manager. When feasible, appendices should follow all rules of general formatting and syntax specified above; some appendices may be appended in their original style and formatting. Table, figure, and section numbers need not be updated in appendices to follow those in the body of the report. Appendices use capital letters (e.g., A, B, C), rather than section numerals, to distinguish them.

6   Citations and Reference Section

Following are NEEA's style requirements for citations and references. The information in this section is based on _The Chicago Manual of Style_, which should be consulted as the superseding authority when unclear.

6.1   In-Text Citations

Citing one vs. multiple authors—Format citations for works with a single author as (Author Year). If applicable, include page numbers; for example (NWPCC 2021, 32–38). Format citations for works with two to three authors as (Author1, Author2, and Author3 Year). Format citations for works with four or more authors as (Author1 et al. Year).

Multiple citations—Separate multiple in-text citations with a semicolon. Alphabetize multiple in-text citations by first author rather than listing from newest to oldest. Authors, for example, would cite two recent NEEA reports on high-performance windows as (Cadeo Group 2022; Stephen Selkowitz Consultants 2023).

Last name only in citations—Identify individual authors by last name only in citations (e.g., Smith 2022).

Citation frequency—Cite a source at least once in each paragraph where its content is discussed.

6.2   Reference Section

Reference section structure—For reports with five or more cited references: append a reference section to the end of the report, before the appendices. Title this section "References" with no section number. Submissions with a preponderance of data-based sources may consider using two reference sections, one for reports and other materials, and another specifically for data.

Reference order—Order references alphabetically by primary author last name or submitting organization name. Spell out first name as well as last name.

Reference spacing—Single-space text within references. Double-space text between references.

Reference alignment—Align the top line of each reference to the left margin of the page. Use a hanging indent to indent subsequent lines one-half inch.

6.3   Reference Styles and Examples

NEEA's requirements for references generally follow the format below, which is based on *The Chicago Manual of Style:*

Smith, Keisha, Frederick Jones, and Harper Brown. 20XX. *Title of Work*. Edition if any. Publisher's City, State: Publishing Firm, [page #s if applicable].

References often require additional detail. Below are some prominent examples of the types of sources used in NEEA's work.

6.3.1   Documents Accessed Electronically
Always include a web address for documents obtained online. As an example:

Northwest Power and Conservation Council (NWPCC). 2021. *The 2021 Northwest Power Plan*. Portland, OR: Northwest Power and Conservation Council. Retrieved from https://www.nwcouncil.org/fs/17680/2021powerplan_2022-3.pdf.

6.3.2   Numbered Technical Reports
Many technical reports, including those published by NEEA, have a report number. Include report numbers within citations.

Lieberman Research Group. 2022. *Study of Influences on Northwest Variable Speed Heat Pump Adoption* (Report No. E22-455). Portland, OR: Northwest Energy Efficiency Alliance. Retrieved from https://neea.org/img/documents/Study-of-Influences-on-Northwest-Variable-Speed-Heat-Pump-Adoption.pdf.

6.3.3   Articles in Journals, Magazines, and Other Periodicals
When referencing an authored work within a periodical, encapsulate the title of the work within quotation marks and italicize the name of the periodical. Include the volume number and page range of the article. Use the article's Digital Object Identifier (DOI) when available.

Yamaguchi, Kazuki, Tomohiko Ihara, and Yukihiro Kikegawa. 2021. "Observational evaluation of outdoor cooling potential of air-source heat pump water heaters." *Theoretical and Applied Climatology* 145: 1007–1025. Retrieved from https://doi.org/10.1007/s00704-021-03673-2.

6.3.4   Online Resources
Include a web address for websites, data, and other resources found online. For some frequently updated online resources, such as databases, a reader might not find the same material in an online resource as that cited in a report, even shortly after its publication; in such cases, precede the web address with "Accessed [date]" as shown below. Identify data resource types in brackets following the title.

ENERGY STAR. 2023. *ENERGY STAR Certified Clothes Dryers* [Database]. Accessed 1/18/2023 from https://www.energystar.gov/productfinder/product/certified-clothes-dryers/results.

U.S. Energy Information Administration. 2022. *2018 Commercial Buildings Energy Consumption Survey (CBECS)/Building Characteristics Summary Tables* [Website]. Washington, D.C.: U.S.

Energy Information Administration. Accessed 1/18/2023 from
http://www.eia.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.h
tml.

7 Requirements for Market Research and Evaluation Reports

7.1 Special Considerations for Market Progress Evaluation Reports

NEEA requires ongoing, unbiased, empirically based evaluation for each of its Market
Transformation programs and hires specialized consultants to conduct this evaluation work. NEEA
measures the progress of its programs based on *market progress indicators* (MPIs). MPIs are
metrics that NEEA defines as part of each program's *logic model*. NEEA uses MPIs to identify key
shifts in a target market (e.g., increased or decreased product sales, greater adoption of an energy
management approach) that are used to track the progress of a program.

Market progress evaluation reports (MPERs) provide critical information about the efficacy of a
NEEA program. At a minimum, they must provide
- a summary of the history of the program,
- a description of the program's major interventions in the market,
- a description of the target market(s) and target application(s) for the product or practice,
- a discussion of research and analytical methods used,
- the complete MPI table,
- a listing of the MPIs assessed as part of this evaluation, and
- the status of each MPI assessed. Ideally, results of MPI tracking are displayed in a table that
  compares progress over time as reflected in successive MPERs.

MPERs may include a review of the program's benefit-cost model (savings model), the key
assumptions of which NEEA uses to estimate and report the energy savings and cost-effectiveness
of the program. These reviews may also be conducted separately from the MPER.

While MPERs must follow the rules of formatting and content areas described in the sections above,
the scope, length, and emphasis of MPERs vary given the context of the program. However, most
MPERs will include the following chapters: 1) introduction, 2) research methods, 3) results or
findings, and 4) conclusions and recommendations. The following bullets describe the typical focus
of these standard chapters.

- **Executive summary—**The executive summary documents the specific research objectives
  for the MPER and summarizes key content from each of the subsequent sections, including
  the main conclusions.

- **Introduction—**The introduction of the MPER explains the program and establishes the
  overall context, including its key activities or interventions in the market and near-term and
  long-term goals. The introduction often provides a brief history of the program and
  summarizes NEEA's motivations and business case in establishing and continuing to
  support the program. The introduction provides a high-level summary of milestones and

planned evaluation activities for the program and includes a number of functional components (e.g., a graphic representation of the program's logic model). Importantly, the introduction should restate the specific research objectives of the MPER.

- **Research methods—**This chapter provides a detailed summary of the research activities upon which the MPER is based, framed around assessments of market change based on MPIs. Some MPERs include research activities designed to explore emerging trends and opportunities, newly identified barriers, or other topics not captured in the program's current logic model. These methods should also be described. In addition to the content described in Chapter 5 of this Style Guide, the research methods section of the MPER typically includes a tabular representation of evaluation activities.

- **Results or findings—**Results presented in an MPER provide valuable insight into the program's progress toward logic model outcomes and form the basis for any recommendations. MPER findings should be comprehensive but restricted in scope to those results that provide the greatest insight into the program's progress framed around its MPIs and any other research objectives included in the MPER scope. To moderate the length of the report, additional data or interesting results that may not relate directly to the explicit research objectives can be included in appendices. Specific sections of an MPER findings chapter might include:

  - A section detailing important characteristics of the market(s) the program seeks to transform. This section often refers to an established baseline market share against which the program's progress is compared.

  - A review of the program logic model to provide NEEA with an assessment of the program logic and to highlight any unsupported claims.

  - A description of key changes in the market and a claim as to the extent to which these market changes have been influenced by the program activities. Market changes (or outcomes) should be defined by the assessment of the program's MPIs, and claims should be qualified through a description of warrants. MPERs should include a table showing the status of each MPI over time as reflected in successive MPERs.

  - A section to track logic model outputs delivered as a result of program activities. These can be described in a table format with brief accompanying narrative.

  - [Optional] A review of benefit-cost model assumptions: The review section assesses the general suitability of the benefit-cost model assumptions for estimating the benefit-cost ratio and/or forecasted energy savings of the program based on quality, precision, and availability of data. Importantly, the function of this review is not to estimate actual energy savings—which is done in-house at NEEA—but to review and validate key assumptions in the model itself.

- **Conclusions/recommendations—**This chapter summarizes observations and analyses presented in previous chapters. Importantly, however, the function of this chapter is not merely to synthesize the results of the study, but to contextualize them in terms of the efficacy of the program (as defined by the program logic). Frame conclusions around the

implications to the program and use them to formulate a set of recommendations as the program moves forward. All conclusions must be based on empirical evidence as collected and assessed in the course of research conducted in the development of the MPER.

7.2 Special Considerations for Survey Research

NEEA's market research and evaluation often involves survey methodology. Thoroughly describe the survey population, sample frame, and sample and selection criteria in the research methods section. Clearly describe the form and content of the survey instrument in the research methods section and include a copy of the questionnaire or discussion guide as an appendix. When discussing discrete survey items, include question or item content in text, tables, and figures. Spelling out survey items for basic demographic content (e.g., age and gender) is not necessary. Clearly define and describe the variables being assessed in the research methods section.

Appendix A: Data Visualization Checklist

The following checklist is included with permission of the authors, Stephanie Evergreen & Ann K. Emery. While adherence to this checklist is not required for submitting reports to NEEA, NEEA highly recommends its use. An online version that facilitates individual review of charts—including views for black-and-white printing and color-blind individuals—is at https://stephanieevergreen.com/rate-your-visualization/.

Data Visualization Checklist

by Stephanie Evergreen & Ann K. Emery

This checklist is meant to be used as a guide for the development of high impact data visualizations. Rate each aspect of the data visualization by circling the most appropriate number, where 2 points means the guideline was fully met, 1 means it was partially met, and 0 means it was not met at all. n/a should not be used frequently, but reserved for when the guideline truly does not apply. For example, a pie chart has no axes lines or tick marks to rate. If the guideline has been broken intentionally to make a point, rate it n/a and deduct those points from the total possible. Refer to the Data Visualization Anatomy Chart on the last page for guidance on vocabulary and the Resources at the end for more details.

	Guideline	**Rating**
Text Graphs don't contain much text, so existing text must encapsulate your message and pack a punch.	**6-12 word descriptive title is left-justified in upper left corner** Short titles enable readers to comprehend takeaway messages even while quickly skimming the graph. Rather than a generic phrase, use a descriptive sentence that encapsulates the graph's finding or "so what?" Western cultures start reading in the upper left, so locate the title there.	2 1 0 n/a
	Subtitle and/or annotations provide additional information Subtitles and annotations (call-out text within the graph) can add explanatory and interpretive power to a graph. Use them to answer questions a viewer might have or to highlight specific data points.	2 1 0 n/a
	Text size is hierarchical and readable Titles are in a larger size than subtitles or annotations, which are larger than labels, which are larger than axis labels, which are larger than source information. The smallest text - axis labels - are at least 9 point font size on paper, at least 20 on screen.	2 1 0 n/a
	Text is horizontal Titles, subtitles, annotations, and data labels are horizontal (not vertical or diagonal). Line labels and axis labels can deviate from this rule and still receive full points. Consider switching graph orientation (e.g., from column to bar chart) to make text horizontal.	2 1 0 n/a
	Data are labeled directly Position data labels near the data rather than in a separate legend (e.g., on top of or next to bars and next to lines). Eliminate/embed legends when possible because eye movement back and forth between the legend and the data can interrupt the brain's attempts to interpret the graph.	2 1 0 n/a
	Labels are used sparingly Focus attention by removing the redundancy. For example, in line charts, label every other year on an axis. Do not add numeric labels *and* use a y-axis scale, since this is redundant.	2 1 0 n/a

EVERGREENDATA
INTENTIONAL REPORTING & DATA VISUALIZATION

Arrangement

Improper arrangement of graph elements can confuse readers at best and mislead viewer at worst. Thoughtful arrangement makes a data visualization easier for a viewer to interpret.

Proportions are accurate   2 1 0 n/a
A viewer should be able measure the length or area of the graph with a ruler and find that it matches the relationship in the underlying data. Y-axis scales should be appropriate. Bar charts start axes at 0. Other graphs can have a minimum and maximum scale that reflects what should be an accurate interpretation of the data (e.g., the stock market ticker should not start at 0 or we won't see a meaningful pattern).

Data are intentionally ordered   2 1 0 n/a
Data should be displayed in an order that makes logical sense to the viewer. Data may be ordered by frequency counts (e.g., from greatest to least for nominal categories), by groupings or bins (e.g., histograms), by time period (e.g., line charts), alphabetically, etc. Use an order that supports interpretation of the data.

Axis intervals are equidistant   2 1 0 n/a
The spaces between axis intervals should be the same unit, even if every axis interval isn't labeled. Irregular data collection periods can be noted with markers on a line graph, for example.

Graph is two-dimensional   2 1 0 n/a
Avoid three-dimensional displays, bevels, and other distortions.

Display is free from decoration   2 1 0 n/a
Graph is free from clipart or other illustrations used solely for decoration. Some graphics, like icons, can support interpretation.

Color

Keep culture-based color connotations in mind. For example, pink is associated with feminine qualities in the USA.

Use ColorBrewer to find palettes suitable for reprinting in black-and-white and for colorblindness.

Color scheme is intentional   2 1 0 n/a
Colors should represent brand or other intentional choice, not default color schemes. Use your organization's colors or your client's colors. Work with online tools to identify brand colors and others that are compatible.

Color is used to highlight key patterns   2 1 0 n/a
Action colors should guide the viewer to key parts of the display. Less important, supporting, or comparison data should be a muted color, like gray.

Color is legible when printed in black and white   2 1 0 n/a
When printed or photocopied in black and white, the viewer should still be able to see patterns in the data.

Color is legible for people with colorblindness   2 1 0 n/a
Avoid red-green and yellow-blue combinations when those colors touch one another. Avoid using red to mean bad and green to mean good in the same chart.

Text sufficiently contrasts background   2 1 0 n/a
Black/very dark text against a white/transparent background is easiest to read.

Lines

Excessive lines—gridlines, borders, tick marks, and axes—can add clutter or noise to a graph, so eliminate them whenever they aren't useful for interpreting the data.

Gridlines, if present, are muted   2   1   0   n/a
Color should be faint gray, not black. Full points if no gridlines are used. Gridlines, even muted, should not be used when the graph includes numeric labels on each data point.

Graph does not have border line   2   1   0   n/a
Graph should bleed into the surrounding page or slide rather than being contained by a border.

Axes do not have unnecessary tick marks or axis lines   2   1   0   n/a
Tick marks can be useful in line graphs (to demarcate each point in time along the y-axis) but are unnecessary in most other graph types. Remove axes lines whenever possible.

Graph has one horizontal and one vertical axis   2   1   0   n/a
Viewers can best interpret one x- and one y-axis. Don't add a second y-axis. Try a connected scatter plot or two graphs, side by side, instead. (A secondary axis used to hack new graph types is ok, so long as viewers aren't being asked to interpret a second y-axis.)

Overall

Graphs will catch a viewer's attention so only visualize the data that needs attention. Too many graphics of unimportant information dilute the power of visualization.

Graph highlights significant finding or conclusion   2   1   0   n/a
Graphs should have a "so what?" – either a practical or statistical significance (or both) to warrant their presence. For example, contextualized or comparison data help the viewer understand the significance of the data and give the graph more interpretive power.

The type of graph is appropriate for data   2   1   0   n/a
Data are displayed using a graph type appropriate for the relationship within the data. For example, change over time is displayed as a line graph, area chart, slope graph, or dot plot.

Graph has appropriate level of precision   2   1   0   n/a
Use a level of precision that meets your audiences' needs. Few numeric labels need decimal places, unless you are speaking with academic peers. Charts intended for public consumption rarely need p values listed.

Individual chart elements work together to reinforce the overarching takeaway message   2   1   0   n/a
Choices about graph type, text, arrangement, color, and lines should reinforce the same takeaway message.

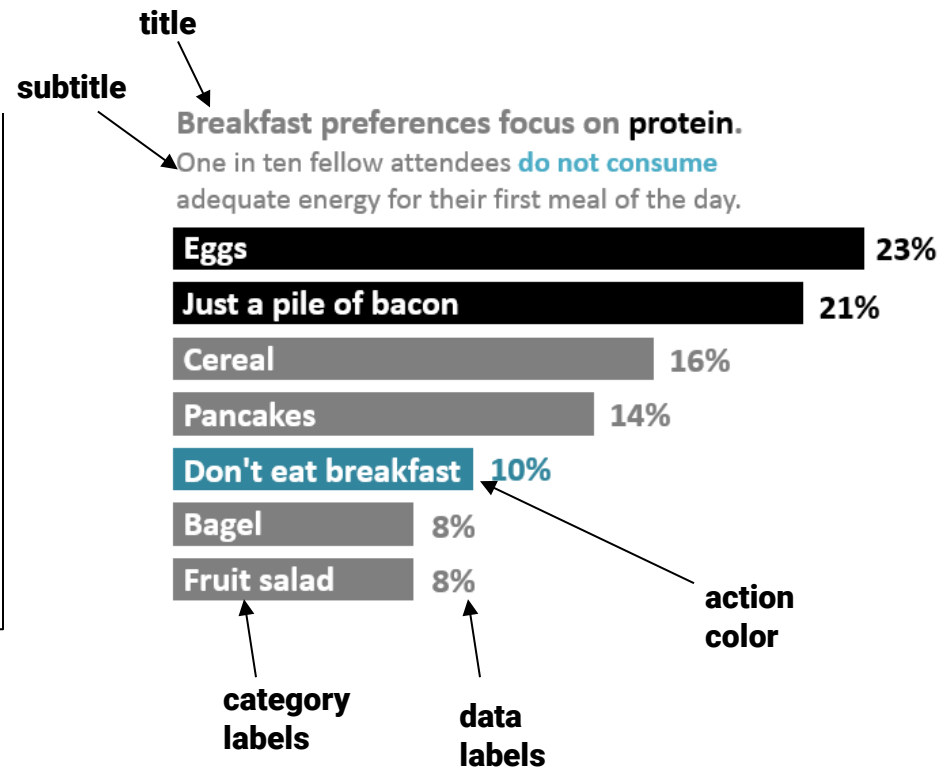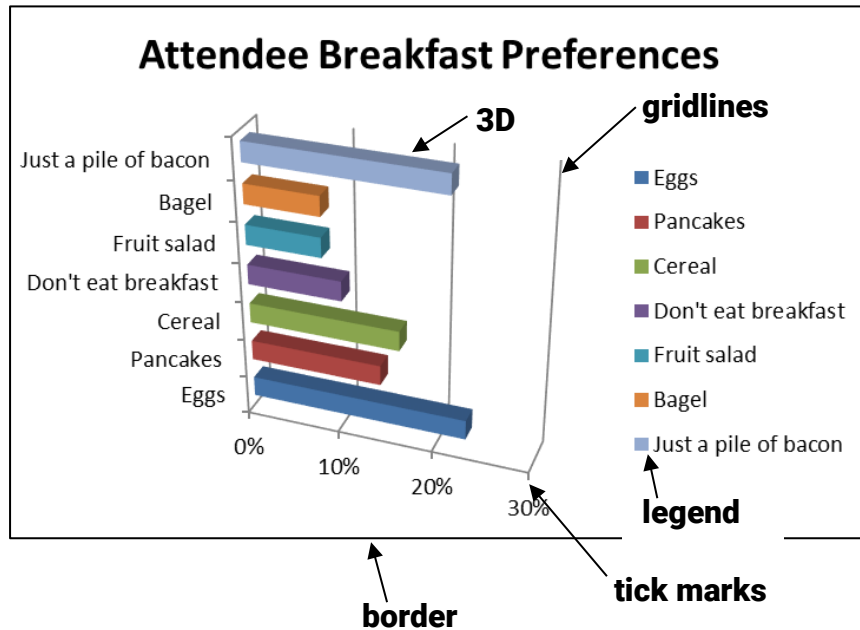
For more support, run your graph through the interactive Data Visualization Checklist site, where you'll get links to free resources to support you on any guidelines where you didn't score full points.

Score: _____ / _____ = _____ %

Well-formatted data visualizations score between 90-100% of available points. At this level, viewers are better able to read, interpret, and retain content.

Confused by the terminology? Review the anatomy charts below for illustration of what's what.
Try for less of what's on the left and more for what's on the right.

Attendee Breakfast Preferences

3D
gridlines
border
tick marks
legend

title
subtitle

Breakfast preferences focus on **protein.**
One in ten fellow attendees **do not consume**
adequate energy for their first meal of the day.

Eggs	23%
Just a pile of bacon	21%
Cereal	16%
Pancakes	14%
Don't eat breakfast	10%
Bagel	8%
Fruit salad	8%

action color
category labels
data labels

Resources

Stephanie's books, *Presenting Data Effectively* and *Effective Data Visualization*
Stephanie's blog: http://stephanieevergreen.com/blog
The interactive Data Visualization Checklist site, where you'll get links to free resources to support you on any
guidelines where you didn't score full points: https://stephanieevergreen.com/data-visualization-checklist/

Appendix B: Accurate Form of Proper Names Used in NEEA Reports

Abbreviation/Acronym List for NEEA reports
Updated 4/25/23

Abbreviation/ Acronym	Spelled-out term with correct caps, punctuation, etc.
ACEEE	American Council for an Energy-Efficient Economy
AHRI	Air Conditioning, Heating, and Refrigeration Institute
AIC	Association of Idaho Cities
all caps – HVAC co	AAON Inc.
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASRAC *(no F!)*	Appliance Standards and Rulemaking Federal Advisory Committee
AWHI	Advanced Water Heating Initiative
AWHS	Advanced Water Heating Specification
BBNW	BetterBuiltNW
BCD	Building Codes Division *(for Oregon)*
BEC	Building Envelope Campaign
~~BPA~~ *do not abbreviate in NEEA reports*	Bonneville Power Administration, The
BSPSI	Building Safety Professionals of Southwest Idaho
BTO	Building Technologies Office
CCE	Commercial Code Enhancement
CCMS	Compliance Certification Management System
CEC	California Energy Commission
CEAC	Cost-Effectiveness and Evaluation Advisory Committee
CEE	Consortium for Energy Efficiency
CIEB	Construction Industry Energy Board *(under Oregon's BCD)*
COP	coefficient of performance
CRI	color rendering index *(for fluorescent lamps)*
CSA	Canadian Standards Association *(often used as "CSA Group")*
CTA	Consumer Technology Association
CUAC/HP	Commercial Unitary Air Conditioners and Heat Pumps
DHW	domestic hot water
DOE	Department of Energy
DOPL	Division of Occupational and Professional Licenses *(for Idaho)*
DR	Demand Response
DRMS	Demand Response Management System
EEBA	Energy & Environmental Building Alliance
EISA	Energy Independence and Security Act of 2007
EPA	Environmental Protection Agency

EPRI	Electric Power Research Institute
ER	electric resistance
ERS	Energy & Resource Solutions
~~ETO~~ – *do not abbreviate in NEEA reports*	Energy Trust of Oregon
EV	electric vehicle
HBA	Home Builders Association of Metropolitan Portland
HERS program	Home Energy Rating System
HPWH	heat pump water heater
HRV	heat recovery ventilator
HSPF	Heating Seasonal Performance Factor
HVAC	heating, ventilation and air conditioning
IAQ	indoor air quality
ICC	International Code Council
IDABO	Idaho Association of Building Officials
IEC	International Electrotechnical Commission
IECC	International Energy Conservation Code
ISCC	Integrated Systems Coordinating Committee
ISO	International Organization for Standardization
LBNL	Lawrence Berkeley National Laboratory
LEP	Lighting Energy Partnership
LRC	Lighting Research Center
MN CEE	Minnesota Center for Energy and Environment
MT	Market Transformation
NCAT	National Center for Appropriate Technology
NEEM	Northwest Energy Efficient Manufactured Housing Program™
NEEP	Northeast Energy Efficiency Partnerships
NEMA	National Electrical Manufacturers Association
NGA	National Glass Association
NGBS	National Green Building Standard
NGLS	Next Generation Lighting Systems
NGTC	Natural Gas Technologies Centre
NOPR	Notice of Proposed Rulemaking
NPCC	Northwest Power and Conservation Council
NRCA *("Enrecka")*	National Roofing Contractors Association
NRDC	Natural Resources Defense Council
NRE	non-recurring engineering
NYSERDA	New York State Energy Research and Development Authority
OA	outside air
OHBA	Oregon Home Builders Association
ORRC	Oregon Residential Reach Code

ORSC	Oregon Residential Specialty Code
OZERCC	Oregon Zero Energy Ready Commercial Code
PAWS	Product Assessment Worksheet
PAWS	Partnership for Advanced Window Solutions
PCC	Products Coordinating Committee
PGE	Portland General Electric
PHIUS	Passive House Institute US
PNNL	Pacific Northwest National Laboratory
PTAC	Packaged Terminal Air Conditioner
RBSA	Residential Building Stock Assessment
RESNET	Residential Energy Services Network
RETAC	Regional Emerging Technology Advisory Committee
RFI	Request for Information
RMSB	Residential and Manufactured Structures Board
RPAC	Regional Portfolio Advisory Committee
RPS	Renewables Portfolio Standard
RTF	Regional Technical Forum
SBCC	State Building Code Council *(for Washington)*
SCOPEER	Strategic Steering Committee on Performance, Energy Efficiency and Renewables
SEER	Seasonal Energy Efficiency Ratio
SGD	smart grid device
SNOPR	Supplemental Notice of Proposed Rulemaking
T&D	transmission and distribution
TAG	Technical Advisory Group
TCOP	thermal coefficient of performance
TRM	Technical Reference Manual
TSC	Technical Standards Committee
TSPR	total system performance ratio
U.S. DOE	U.S. Department of Energy
UCD	Universal Communication Device
UEF	Uniform Energy Factor
VEIC	Vermont Energy Investment Corporation
VSHP	variable speed heat pump
WABO	Washington Association of Building Officials
WSEC	Washington State Energy Code
WSEC-C	Washington State Commercial Energy Code
ZER	Zero Energy Ready