MINUTES

NFPA NEC Code-Making Panel 2
NFPA 70 First Draft Meeting (Annual 2025)

January 15-19, 2024
8:00 AM – 5:00 PM (ET)

Charleston, SC

1. **Call to order.** David Humphrey, chair, called the meeting to order at 8:00 AM on 1/15/2024.
2. **Introductions.** Attendees introduced themselves and identified their affiliation and NFPA staff took attendance.
3. **Chair report.** David Humphrey welcomed attendees and provided an overview of the meeting.
4. **Staff liaison report.** Barry Chase provided an overview of the standards development process and the revision cycle schedule.
   a. No members declared that they had been retained to represent the interest of an entity that would be classified in an interest category different from their own with respect to a specific issue or issues that were being addressed by the committee.
5. **Previous meeting minutes.** The minutes from October 2021 Second Draft meeting were approved without revision.
6. **NFPA 70 First Draft.**
   a. **Review of Public Inputs.** The Technical Committee reviewed the Public Inputs and developed First Revisions and Committee Inputs as necessary. These will be available in the First Draft Report at www.nfpa.org/70.
   b. **Task group reports.** The following task groups provided their reports and recommendations.
      i. **CMP-2 Task Group 1**. Thomas Domitrovich, Chair. The task group provided a report and revisions were made. The task group was reconstituted to continue work. See attached.
      ii. **CMP-2 Task Group 2**. Nehad El-Sherif, Chair. The task group provided a report and revisions were made. The task group was reconstituted to continue work. See attached.
      iii. **CMP-2 Task Group 3.** Alan Manche, Chair. The task group provided a report and revisions were made. The task group was reconstituted to continue work. See attached.

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iv. **CMP-2 Task Group 4.** Robert Osborne, Chair. The task group provided a report and revisions were made. The task group was reconstituted to continue work. See attached.

c. **Presentation(s).** The committee heard presentations from the following individuals.

i. **210.8.** David Bixby, ACCA. 10 minutes. Verbal presentation only.

ii. **210.8** Greg Woyczynski, AHAM. 10 minutes. Presentation attached.

iii. **210.8** Randall Dollar, Siemens. 10 minutes. Presentation attached.

iv. **210.8(F)** William Koffel, Koffel & Associates. 10 minutes. Verbal presentation only.

v. **210.12** Keith Waters, Schneider Electric/ACBMA. 10 minutes. Presentation attached.

vi. **210.12** Dan Buuck, NAHB. 10 minutes. Verbal presentation only.

vii. **210.12** Merton Bunker/Steve Rood, AFCI Consortium & Legrand. 10 minutes. Presentation attached.

viii. **210.12(A)** Donald Talka, Mark Earley, John Kovacik, AFCI Consortium. 10 minutes. Presentation attached.

ix. **210.12** Randall Dollar, Siemens. 10 minutes. Presentation attached.

x. **210.70** Bob Spehalski, Lutron. 10 minutes. Verbal presentation only.

xi. **220.87** Brennan Less, LBNL. 10 minutes. Presentation attached.

xii. **220** John McCamish, ACBMA. 10 minutes. Presentation attached.

xiii. **Proposed Reorganization of NEC®.** Robert Osborne and Alan Manche. Approximately 45 minutes. Presentation attached.

7. **Other Business.** There was no other business taken up by the CMP.

8. **Future meetings.** The next committee meeting will be October 14-26/2024. A meeting notification will be posted at www.nfpa.org/70next when the meeting is scheduled.

9. **Adjournment.** The meeting was adjourned at 4:13 PM (ET) on 1/19/2024.

Attendees

Committee Members:

✓	**David Humphrey**	Chair	IAEI
✓	**John Ambrosino**	Principal	ACCA
✓	**Charles Boynton**	Principal	ACC
✓	**Daniel Buuck**	Principal	NAHB
✓	**Steve Campolo**	Principal	Leviton Manufacturing Company, Inc.
✓	**Mark Cook**	Principal	Faith Technologies Electrical Contracting
✓	**Tyler Doering**	Principal	GE Appliance

✓	**Thomas Domitrovich**	Principal	NEMA
✓	**Nehad El-Sherif**	Principal	IEEE-IAS/PES JTCC
✓	**Brian Johnson**	Principal	Tower Pinkster
✓	**David Johnson**	Principal	IEC, Inc.
✓	**Andrew Kaszany**	Principal	Electric Light & Power Group/EEI
✓	**Arthur Libby**	Principal	State of Michigan
✓	**Alan Manche**	Principal	Schneider Electric
✓	**Daniel Naughton**	Principal	IBEW
✓	**Fred Neubauer**	Principal	NECA
✓	**Frederick Reyes**	Principal	UL Solutions
✓	**Johnny Rhodes**	Principal	City of Waco, TX
✓	**Jeremy Tidd**	Principal	Mitsubishi Electric, US Inc.
	Oscar Velasquez	Principal	Bechtel Corporation
✓	**Greg Woyczynski**	Principal	AHAM
✓	**Shelly Born**	Alternate	Electric Light & Power Group/EEI
✓	**William Crist**	Alternate	IEC, Inc.
✓	**Andrew Kriegman**	Alternate	Leviton Manufacturing Company, Inc.
✓	**Brett Larson**	Alternate	Schneider Electric
	Steven Orlowski	Alternate	NAHB
✓	**Robert Osborne**	Alternate	UL Solutions
	Irozenell Pruitt	Alternate	ACC
	Brian Rock	Alternate	NEMA
✓	**Erik Sprague**	Alternate	Mitsubishi Electric US, Inc.
✓	**Michael Weaver**	Alternate	NECA
✓	**Larry Wildermuth**	Alternate	IAEI
	Matt Zabel	Alternate	Faith Technologies Electrical Contracting
✓	**Douglas Lee**	NonVoting	US Consumer Products Safey Commission
	Einstein Miller	NonVoting-Alternate	US Consumer Products Safey Commission
✓	**Barry Chase**	Staff	NFPA
✓	**Steve Kaitharath**	Staff	NFPA

Guests:

1. Don Talka DJT Advisory, LLC

2.	John Kovacik	AFCI Consortium
3.	Paul Dobrowsky	Innovative Technology Solutions
4.	Megan Hayes	NEMA
5.	William Koffel	Koffel Associates Inc.
6.	David Kendall	ABB Inc.
7.	Joseph Wages Jr.	IAEI
8.	Bryan Holland	NEMA
9.	Gerald O'Connor	Eaton
10.	John McCamish	Eaton
11.	Ryan Jackson	Steel Tube Institute
12.	David Hewitt	Siemens Industry, Inc.
13.	David Bixby	ACCA
14.	Steve Rood	Legrand
15.	Chad Duffy	NFPA Staff
16.	Tim McClintock	NFPA Staff
17.	Chris Strange	Generac
18.	Jonathan Potter	Legrand
19.	John Brower	Hubbell
20.	Frank Tse	Hubbell
21.	Chad Roberts	Flour
22.	Doug DeVries	Musco
23.	Nick Tippett	Musco
24.	Amy Cronin	Strategic Code Solutions
25.	Mark Earley	Alumni Code Consulting Group
26.	Merton Bunker	Merton Bunker & Assoc., LLC
27.	Scott Harding	FB Harding
28.	Dean Austin	NFPA Staff
29.	Kim Cervantes	NFPA Staff
30.	Erik Hohengasser	NFPA Staff
31.	Randy Dollar	Siemens
32.	Bob Spehalski	Lutron Electronic
33.	Mark Pollock	Littlefuse
34.	Brian Baughman	NEMA
35.	James Hathorn	IAEI/City of Irving, TX
36.	Larry Ayer	IEC, Inc
37.	Keith Waters	Schneider Electric
38.	Susan Newman Scearce	IAEI
39.	Brennan Less	LBNL
40.	Mario Valdes	Mike Holt Enterprises
41.	Brian House	Mike Holt Enterprises
42.	Vincent Della Croce	Siemens

Total number in attendance: 73

Commented [ML1]: Add asterisk next to name if it is a hybrid meeting. This line can be deleted if it is a fully remote meeting.

NEC® Code-Making Panel 2 First/Second Draft Chair Report

Signature: David G. Humphrey

Date of Meeting: Jan. 15, 2024- Jan.19 2024

1. List names of NEC® Code-Making Panel Members in Attendance: On file with NFPA staff.

2. List names of Guests in Attendance: On file with NFPA staff

3. List names of Guests who addressed the Panel, the subject of their presentation and the length of time they spoke:

1)	D. Bixby	210.8	10 min.	ACCA Oppose Expansion
2)	G. Woyczynski	210.8	10 min.	AHAM Oppose Expansion
3)	R. Dollar	210.8	10 min	Siemens Support Expansion
4)	B. Koffel Date to 2029	210.8(F)	10 min.	AHRI/Leading Build. Move Eff.
5)	K. Water	210.12	10 min.	ACBMA Supp. expansion
6)	D. Buuck	210.12	10 min.	NHBA Oppose Expansion
7)	M. Bunker/ S. Rood Oppose expansion.	210.12	10 min.	AFCI Cons/Le Grande
8)	J. Kovacik, M. Early, D Talka New method for 210.12A list.	210.12(A)	10 min.	AFCI Consortium/
9)	R. Dollar	210.12	10 min.	Siemens Supp. Expansion
10)	B. Spehalski low battery indicator.	210.70	10. Min	Lutron Battery wall switch
11)	B. Less	Art. 220	10 min,	LBN Labs Overview of 220 FRs
12)	J. McCamish	Art. 220	10 min.	Eaton overview of 220 FRs Oppose.

4. Number of Public Inputs/Comments acted upon. **PI 330**

5. Number of First/Second Revisions Created: **FRs 80**

6. List any Task Groups appointed to work subsequent to the First/Second Draft Meeting, along with the names of Task Group Chair/members.
   N/A

7. List any Public Input/Comment or First/Second Revision that may need to be referred to another Panel for information or correlation:

a) Refer to CMP 10. This FR correlates with changes to 215.10 (PI 1641) and 230.95 (PI 1645) which eliminate the need for a second level of GFPE to achieve selective coordination, greatly simplifying selective coordination. See section 210.13.

b) Refer to CMP 7. Branch circuit is clearly defined in Article 100 as the circuit conductors between the final overcurrent device protecting the circuit and the outlet(s). The fact that there is an outlet that served the cord supplying an RV does not make the circuit a feeder as the outlet to which the cord is attached is supplied by the final overcurrent device in the circuit.

c) Refer to CMP 12 public input 3145 as detailed as bullet item 8 (c) below.

d) PI 4238 Energy Management System (EMS) was renamed to Power Control System (PCS) to differentiate an EMS with overload control from an EMS without overload control.
The name of the EMS with overload control and the addition of part II in article 750 will be decided by CMP 13. During the second revision CMP 2 will change the name of the system to align with CMP 13 and act in reference to part II if necessary.

8. List any Public Input/Comment that requires NEC® Correlating Committee attention:

a) Many articles use the phrase "shall not be refurbished" regarding specific equipment. CMP 2 has in PI 2598 rephrased this to "shall not be installed" as it is the installation that may not be permitted by this code.

b) PI 4050 Branch circuit overcurrent protective device has been made plural as follows "branch circuit overcurrent devices" to comply with the style manual section 3.5.3. Further "Branch circuit overcurrent device as found in 210.4(C) has been rephrased to "branch circuit OCPD".

c) While CMP 2 finds there is merit to changing EVSE to Electric Vehicle Power Transfer System Equipment (EVPTSE) or (EVPTS) as the submitter of PI 3145 suggests, changing the heading is inconsistent with the rest of the code, including the content in art. 625. We recommend that this be done at a global level, either through the correlating committee or a PI in the next code cycle.

9. List any general requests for information or assistance from the NEC® Correlating Committee:

N/A

10. List any issues that should be brought to the attention of the NFPA Research Foundation:

CMP 2 sees merit in providing AFCI protection on DC circuitry. At this time there appear to be no such products on the market. The panel may gain direction as to the feasibility of such a requirement by understanding the current state of technological advancement of DC AFCI.

11. List any additional information that would be helpful to the NEC® Correlating Committee, NFPA Staff, or process in general:

2026 NEC® Public Input Task Group Report

CMP #	**2**
TG#	**1**
TG Chair	**Thomas Domitrovich**
TG Members	1. Daniel Buuck 2. Brett Larson 3. David Humphrey 4. Frederick Reyes 5. Andrew Kasznay 6. Greg Woyczynski 7. Andrew Kriegman 8. Douglas Lee 9. Nehad El-Sherif 10. Tyler Doering 11. Vince DellaCroce 12. Daniel Naughton 13. Randy Dollar

Article/Section	Public Input #	PI Report Page #	TG Recommendation & Statement
100 Basement	1711	**24**	**RESOLVE** The proposed definition includes a story of a building that is partly below grade which would classify an area of the structure beyond what would be classified as a basement by building codes and other industry reference codes and standards.
100 Basement	2186	**26**	**RESOLVE** The proposed definition includes an application of a building that is partly below grade which would classify an area of the structure beyond what would be classified as a basement by building codes and other industry reference codes and standards.
Bathing Area	3279	**25**	**RESOLVE** The term Bathing area is not used in the NEC, adding this defined term would violate the NEC Style manual section 2.1.2.2 which states that Definitions of terms used in the document shall only be located in Article 100. The term "Bathing Area" is not used in this document.

100 Bathroom	3281	**9**	**RESOLVE** The proposed change in the definition of bathroom could have unintended consequences. Using the proposed definition, a room in a dwelling with just a toilet or just a sink, or just a tub would now be considered a bathroom and require a 20-amp circuit.
Bathroom	735	**10**	**RESOLVE** The existing defined term "Bathroom" is used in many locations throughout the Code. Changing this term to "Restroom" does not add clarity. This definition does not imply that there is a bathtub/shower.
Branch Circuit, Individual	453	**12**	**RESOLVE** This public input did not follow the rules established as part of Section 4.3.4.1 of the Regulations Governing the Development of NFPA Standards. Substantiation has not been provided to delete the defined term Branch Circuit, Individual. The term outlet referenced in the substantiation for this public input is a defined term found in Article 100 and does exist in power distribution systems. The substantiation is incorrect in stating that there is no outlet. This term is used in the NEC and deleting it could cause confusion. The proposed informational note proposed is not correct and conflicts with the definition of an outlet.
100 Branch Circuit, Individual	1344	**11**	**RESOLVE** The proposed language does not add clarity. An individual branch circuit is a branch circuit that supplies only one utilization equipment and it is not necessary that only one outlet exist as long as the individual branch circuit is serving only one utilization equipment.

Column	1395	**27**	**RESOLVE** This term is not currently used within Article 210 in the context of a building structural or decorative element. Only terms used in the National Electrical Code should be placed in Article 100. The companion public input number 1397 seeking to add requirements for a column was not accepted.
Counter (Countertop)	175	**13**	**First Revision FR-TG1-01** The definition is modified to recognize beverage preparation and beverage serving in addition to food as the definition clearly references the risk of spillage of liquids. This change also separates preparation from serving as either and not both are important in the application of this defined term.
Dormitory Unit	2035	**15**	**RESOLVE** The suggested changes do not align with the international building code nor NFPA 5000. The text suggested to be removed is included in the building codes. Removing this text would have unintended consequences, one of which could include expanding this defined term to apply to hotels. The restrictions around number of persons and those pertaining to meals and cooking facilities are necessary to both align with building codes and limit the application of the term.
Dormitory Unit	798	**16**	**First Revision FR-TG1-02** The language is modified as extracted text from NFPA 101 Section 3.3.68 to add clarity and consistency within the NEC and between it and other NFPA documents.
Dwelling Unit	720	**19**	**RESOLVE** The proposed language does not add clarity and is not necessary. This is adefinition of a dwelling unit, adding language that suggests what is excluded can cause confusion if not all inclusive of every type of structure that is not a dwelling unit.

Commented [TD1]: NOTE TO MR. HUMPHREY AND MR. MANCHE: PLEASE PUT THIS IN ALAN MANCHE'S BASKET RIGHT AFTER PUBLIC INPUT NUMBER 1397 IS REVIEWED]

Dwelling, Multifamily (Multifamily Dwelling)	2476	**20**	**RESOLVE** The suggested changes are not accepted. The phrase "shall be considered a single family dwelling" is written as a requirement and definitions cannot include requirements. Reference NEC Style Manual Section 2.1.10 which includes the requirements for informational notes and specifically Section 2.1.10.2, "Language", which states "Informational notes shall not be written in mandatory language and shall not contain requirements, make interpretations, or make recommendations.". Language stating that a townhouse shall be considered a single-family dwelling was not accepted because single phase dwelling is not the correct terminology and adding this language could cause confusion as a townhouse could include a 2-family dwelling.
Grade Level	1864	**28**	**RESOLVE** The public input does not include proposed changes in legislative text as required by Section 4.3.4.1(C) of the Regulations Governing the Development of NFPA Standards.
GFCI, Special Purpose	4523	**21**	**RESOLVE** The proposed language includes a requirement inside of a definition which violates NEC Style Manual Section 2.1.2.5 which states ". . . Definitions shall not contain requirements or recommendations." Use of the term practical is not accepted as the term practicable is a more appropriate term to be used. The addition of the phrase "protection of personnel" is not added as the UL Outline of Investigation, UL 943C, does not include the same phrase.

Laundry Area	1834	**22**	**RESOLVE** The suggestion to remove "area" is not accepted as the use of the term is necessary. There are consequences related to accepting this suggested change that would reduce electrical safety. The fact is that an "Area" may not be a room. As an example, a closet may not constitute the dimensions to be considered a room but may still be an area where a washing machine and dryer and other laundry equipment could be located and would meet the definition of a "Landry Area".
Laundry Area	1835	**23**	**RESOLVE** The suggested language does not add clarity and would be difficult if not impossible to enforce. Determining intentions is not enforceable.
Residential Vehicle Bay	73	**31**	**RESOLVE** The suggested language is not accepted as adding precise dimensions would exclude many vehicle bays that do not fall within the dimensions proposed without substantiation on why those vehicle bays should not be subjected to the requirements for all vehicle bays. The suggested changes are not accepted. The phrase "shall be considered . . " is written as a requirement and definitions cannot include requirements. Reference NEC Style Manual Section 2.1.10 which includes the requirements for informational notes and specifically Section 2.1.10.2, "Language", which states "Informational notes shall not be written in mandatory language and shall not contain requirements, make interpretations, or make recommendations.".

Worksurfaces	PI Committee 3		**FR-TG1-03** The definition is modified to recognize beverage preparation and beverage serving in addition to food as the definition clearly references the risk of spillage of liquids. This change also separates preparation from serving as either and not both are important in the application of this defined term.

2026 NEC® Public Input Task Group Report

CMP #	**2**
TG#	**1**
TG Chair	**Thomas Domitrovich**
TG Members	1. Buuck, Daniel (DBuuck@nahb.org) 2. Larson, Brett (brett.larson@schneider-electric.com) 3. Humphrey, David (Hum@henrico.us) 4. Reyes, Frederick P. (frederick.p.reyes@ul.com) 5. Kasznay, Andrew (Andrew.Kasznay@uinet.com) 6. Woyczynski, Greg (gwoyczynski@aham.org) 7. Kriegman, Andrew (akriegman@leviton.com) 8. Lee, Douglas (dlee@cpsc.gov) 9. El-Sherif, Nehad (nehad.e.el-sherif@ieee.org) 10. Doering, Tyler (tyler.doering@geappliances.com) 11. Naughton, Daniel (daniel.naughton@bostonjatc.org) 12. Dollar, Randy (randy.dollar@siemens.com)

Article/Section	Public Input #	PI Report Page #	TG Recommendation & Statement
210.1	2626	58	**FR-TG1-01** This revision brings this text into alignment with Style Manual Section 4.1.4, regarding the use of Parts. 4.1.4 References to an Entire Article requires that references shall not be made to an entire article, except for Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number.

210.2	2598 1317	60	**FR-TG1-02** This revision aligns with the NEC Style Manual requirements of Section 2.2.1 titled "Parallel Numbering Required," and recognizes the fact that the National Electrical Code is an installation requirements document and cannot control what happens to products that are not installed. This change makes it clear that the requirement pertains to reconditioned equipment requiring that it not be installed. Public Input 1317 – The phrase "shall not be permitted" is not accepted as it is no different than shall not. The phrase "shall not be installed" is clear and concise. NOT FOR PANEL STATEMENT: NOTE: Correlating committee should drive consistency with this language "shall not be installed" instead of "shall not be permitted." The phrase "shall not be permitted" is found in the following sections of the NEC: Sections 404.16, 406.2, 408.2,410.2, 470.2, 495.2, 495.49,695.2,700.2,701.2,702.2, and 708.2.
210.3	979		**FR-TG1-02A** Section 90.3 makes it clear on the organization of the Code. The existing Table could lead to confusion should sections or Articles be left out. Removing Section 210.3 will ensure no conflict exists.

210.3	979	61	**FR-TG1-03** This revision brings this text into alignment with Style Manual Section 4.1.4, regarding the use of Parts. 4.1.4 References to an Entire Article requires that references shall not be made to an entire article, except for Article 100 or where referenced to provide the necessary context. References to specific parts within articles shall be permitted. References to all parts of an article shall not be permitted. The article number shall precede the part number. Part IV was added as the title of part IV is “motor branch circuit short circuit and ground fault protection.” And also must be included to be complete. Section 210.3 is moved to 210.14 to accommodate the change to moving 210.2 for reconditioned equipment to 210.3 in accordance with the NEC Style Manual section 2.2.1.
210.4(E)	2196	62	**Resolve** The suggested change would move a wiring method from Chapter 3 and is not accepted. The reference to informational Note No. 2 which states “See 300.13(B) for continuity of grounded conductors on multiwire circuits” is adequate and provides the User of the Code appropriate information to achieve what this submitter was seeking. Wiring methods must remain in Chapter 3 for clarity and usability.

210.5(C)	781 782 3060	67 68 64	**FR-TG1-04** New second level subdivision is added to give users of the Code clear requirements for the proper identification of branch circuits supplied from a single nominal voltage system. The reference to Section 310.6(C) provides the link to the requirements on how to properly identify these ungrounded conductors from one nominal voltage system. The remainder of 210.5(C) has been renumbered to accommodate the addition. In addition, the word “enclosed” was appropriately located where necessary to align with the new defined term “enclosed panelboard” and for technical accuracy.

210.4	4050		FR-TG1-05 Changes made to address the use of the term “Branch Circuit Overcurrent Protective Device”. This change addresses two areas in 210.4, including the following: 210.4(A) states “containing the branch-circuit overcurrent protective device or protective devices.” This is modified to read as “containing the branch-circuit overcurrent protective devices (OCPDs).” This change removes the “or protective devices” and makes the existing text protective device plural. This aligns with the NEC Style manual section 3.5.3 titled “Plural” which states the following: “Unless referring to a single item of equipment, references to electrical components and parts shall be plural rather than singular. This results in greater consistency and makes it clear that the requirement refers to all components or parts of a given type or class.” Additionally, this is the first use of the term branch-circuit overcurrent protective device and it is at this point for Article 210 that the use of the acronym “OCPD” is introduced and can be used throughout this Article. This is permitted by the NEC style manual as per Section 3.2.3 Titled “Acronyms and Uncommon Abbreviations” which states “All acronyms and any abbreviations that are not in common use and not in Article 100 shall be spelled out with the abbreviation following in parentheses for the first use of the term in the body of each article. Each subsequent use of the term in the article shall be permitted to be the acronym or abbreviation only. Acronyms for defined terms shall be unique and not used with any other term.” The second change is found in 210.4(C) which replaces “branch-circuit overcurrent device” with “branch-circuit OCPD” to align with the defined term branch-circuit overcurrent protective device and the previously established acronym OCPD.

210.6(A)	969	71	Resolve There is no substantiation provided for allowing higher voltages in these occupancies. The suggested change could lead to confusion as there would be enforcement difficulties.
210.6(A)	4348	70	Resolve The word nominal is consistent with its use in other parts of this article as well as throughout the NEC and in some cases added per public inputs made during this code cycle. Reference 3.5.1.1 Sentence Structure as this exact phrase is used to demonstrate proper sentence structure.
210.8	1503	73	Resolve The suggested change was not accepted as the current structure of this section is understood.

210.8	264	79	FR-TG1-06 PI 4269: The parent text of 210.8 was modified to accommodate AC and DC applications in accordance with the addition of first level subdivision (G). DC Circuit requirements are added to accommodate growth of DC circuits in structures. DC residential and commercial installations are emerging in the electrical infrastructure and are expected to be a growing alternative to the traditional AC only utility fed building. Examples include the US DOE Grid-interactive Efficient Buildings project (Note 1), the Purdue University RENEWW house (Note 2), and a DC Microgrid community in Vermont (Note 3). These installations may involve buildings that are distributed entirely with DC, or with an AC/DC hybrid distribution. The addition of (G) in 210.8 and adjustment of the parent text of 210.8 helps ensure safety from shock hazards for these types of applications. The following was accepted based on PI 264: The exception for receptacles on rooftops was moved to the parent text of 210.8 as this exception applies regardless of what type of occupancy. Type of occupancy doesn't dictate the accessible nature of the receptacle. The following items from PI 264 were not accepted: 210.8(F): Section 210.8(F) suggested changes were not accepted as clarity is not added and the existing language is sufficient. The existing language does not indicate that GFCI protection must be provided as a wiring device only. The language uses the word "protection" which indicates protection is provided either at the device or upstream of the device. 210.8(A) and 210.8(B): The removal of Kitchens from list item (6) in 210.8(A) and list item (2) in 210.8(B) is not accepted as it could create confusion. Identifying "kitchens" clearly in 210.8 adds clarity and increases usablity of the Code. A kitchen is well defined and not

			in all cases does 210.8(A)(7) cover a kitchen. Not all of the criteria in 210.8(A)(7) are included for kitchens. 210.8(A)(7) says “or cooking” and the definition of a kitchen says “and cooking”.
210.8(G)	3630	72	Resolve The suggested language could cause confusion with 210.8(B) which would include work areas. The term “work area” is too vague and hard to enforce as work areas could exist in many locations.
Work Area	4266	32	Resolve The language of public input 3630 was not accepted and as such this term is not used in the Code. A definition for the term Work Area which is not used in Article 210 is not necessary. The proposed definition would be difficult to enforce and could cause further confusion.
210.8(G)	3889	173	Resolve Section 300.4(B), which covers NM cables passing through metal framing, requires listed bushings or grommets covering all metal edges, that are securely fastened in the openings.

210.8(G)	4269	99	FR-TG1-07 The requirements of Section 210.8 provide lifesaving protection for personnel from electrical shock hazards. However, the requirements are currently applied to AC circuits only, even though the same electrical shock hazards exist in DC circuits. As there is continued expansion of DC throughout the infrastructure it is necessary to ensure that the same level of electrical shock protection is provided to personnel in the locations addressed by 210.8.
210.8	4315	198	Resolve The suggested language would no longer permit a Class A GFCI device to meet the requirements of 210.8. Compatiblity with appliances would be improved but not assured using the Class A-HF GFCI.
GFCI HF Definition	4308	29	Resolve The term is not used in the NEC and the companion public input, PI 4315, was not accepted. Terms that are used in the NEC are located in Article 100.
210.8	475	200	Resolve The suggested language is too restrictive and not substantiated. There are several methods available to achieve GFCI protection and the option chosen is up to the designer, installer, or owner.

210.8	161	197	Resolve The suggested language is not necessary as a branch circuit is defined in Article 100 as the circuit conductors between the final overcurrent device protecting the circuit and the outlet(s). The fact that there is an outlet that served the cord supplying an RV does not make the circuit a feeder as the outlet to which the cord is attached is supplied by the final overcurrent device in the circuit.

210.8(A)	1096 1334 182 1335 1949 1388 1764 3384	107 109 117 111 119 113 115 121	FR-TG1-09 Section 210.8(A) includes changes to numbering of list items due to accepted modifications to this section. Public inputs 1096, 1334: Existing list Item (2) is separated into two list items for clarity. In addition, the words “that have a floor located at or below grade level” are removed as the location of the floor does not remove the electrical shock hazard that GFCI is meant to address. Public inputs 182, 1335 and 1949: List item (12) is now separated into two list items for clarity to address the issue of the use of the word “and” between indoor damp locations and indoor wet locations. These are two separate areas that are not shown as two list items. This change adds clarity. Public Input 264: Exception No’s 2 and 3 are reworded for clarity. The removal of Kitchens from list item (6) in 210.8(A) and list item (2) in 210.8(B) is not accepted as it could create confusion. Identifying “kitchens” clearly in 210.8 adds clarity and increases usability of the Code. A kitchen is well defined and not in all cases does 210.8(A)(7) cover a kitchen. Not all of the criteria in 210.8(A)(7) are included for kitchens. 210.8(A)(7) says “or cooking” and the definition of a kitchen says “and cooking”. Public Inputs 1388, 1764, 3384: Exception No. 4 is modified to remove “bathroom” as exception should not only apply to bathroom exhaust fans. It would also be a valid exception in utility areas where that GFCI protection would otherwise be required.

210.8(A)(13) 210.8(A)(13)	1447 2185	106 134	RESOLVE Substantiation hasn't been provided to expand GFCI protection to other areas covered as part of 210.8(A) and 210.8(B). If these floor receptacles are located in any of the areas identified in both 210.8(A) and 210.8(B), they would indeed be required to be protected by GFCIs. A floor receptacle is not an area location. The substantiation isn't correct that current wiring methods do not require GFCI protection to floor outlet receptacles". If they are in any of the locations found in (A) and (B) they would ineed have to be GFCI protected.
210.8(A)(3)	383	123	RESOLVE CMP-2 reaffirms these outlets are required to be GFCI protected. These outlets could be used for applications other than plugging in an RV attachment plug.
210.8(A)(5)	4381	130	RESOLVE The suggested language would result in an unprotected receptacle located in the basement that can be used for other equipment. The root cause of the tripping identified was not presented and so it is not confirmed that a compatibility issue exists. The tripping could have been because a ground fault was detected. In addition, this could create a conflict with the requirements in 422.5 where GFCI protection is required for a sump pump.
210.8(A) Except New	862	132	RESOLVE Substantiation was not provided to remove GFCI protection for ceiling receptacles powering a garage door opener. Exposure to water is not the only way electric shock can occur. There has been evidence of electric shock on garage doors due to failures.

210.8(A) Except New	1346	195	RESOLVE The suggested language in proposed exception 5 is not accepted. The restriction of being on an individual branch circuit does not remove the hazard. Simply removing the receptacle does not remove the electrical hazard, the hazard is not the receptacle. Massachusetts data shows that a country wide issue with refrigerators is not substantiated. The suggested language could also lead to receptacles that provide power to the refrigerator left without GFCI protection yet serve other appliances. The receptacle does not have to be located in the space behind the refrigerator. The suggested language in proposed exception 6 is not accepted. This suggested language could result in general receptacles in the areas identified in 210.8 to be left without GFCI protection. Appliance standards do not require GFCI protection to be placed integral with the appliance and older appliances may still be plugged in to receptacles. Keep in mind that UL standard 60335-2-24 requires a means of disconnect.
210.8(A) Except New	4070	125	RESOLVE The proposed exception is not accepted. Placing an appliance on an individual branch circuit or placing the appliance within a dedicated space does not remove the electrical hazard. Language such as “not easily moved”, “in normal use” and more is vague and unenforceable.

210.8(A) Except new	4107	91	RESOLVE The two exceptions proposed are not accepted as the exception does not remove the hazard. Placing an appliance within a dedicated space and not being able to be easily moved or is fastened in place does not remove the electrical hazard. Language such as “not easily moved”, “in normal use” and more is vague and unenforceable.
210.8(B)	9	154	FR-TG1-10 List item (8) is separated into two list items to align with changes made in 210.8(A) and for clarity as these are two separate locations. Public Input 264 Exception No. 2 is deleted as this exception was moved to the parent text of 210.8 as part of a separate first revision. Exception No. 6 is reworded for clarity. Public Input 9 Exception No. 3 has been replaced with language from the 2020 Edition of the NEC which was deleted during the NEC 2023 Code cycle. No information could be found to explain reasoning for this removal. This change brings back the exception for industrials for outdoor receptacle outlets and removes the previous exception for receptacles and equipment within 6 ft. of sinks. The assured equipment grounding conductor program that was previously optional has been modified to be required for that equipment supplied by receptacle outlets that would would create a greater hazard if power is interrupted or is of a design that is not compatible with GFCI protection for an additional consideration should GFCI protection not be provided.

210.8(B)(16)	2237	146	RESOLVE The proposed language is vague and unenforceable. It is would be difficult to define what a welder work area is. And portable lighting equipment can be anywhere. Article 630 has the requirement in 630.8 requiring GFCI protection and is clear and enforceable. The intent is addressed.
210.8(B) Exception 6	2091	142	RESOLVE Substantiation was not provided to include the proposed language. This application of a receptacle within is like the receptacle in an exhaust fan which has an exception to GFCI.
210.8(B) Except NEW	3158	150	RESOLVE The suggested exception no. 7 is not accepted as hardwired control equipment would not be addressed in 210.8(B) as this section is for receptacles located in areas identified. If the appliance is cord and plug connected and located in these areas identified in 210.8(B), GFCI protection must be provided. Substantiation was not provided to reduce the current level of protection afforded by 210.8(B).

210.8(B) Except NEW	3789	85	RESOLVE The proposed Exception No. 7 and No. 8 are not accepted. Exception No. 7 for luminaires proposes a twistlock type cord and plug connection but this solution does not remove the electrical shock hazard. In addition, a luminaire that is not readily accessible doesn't mean the receptacle is not readily accessible. Exception No. 8 for electric motors would cover all areas of 210.8(B), the substantiation was givien for only one area. There are unintended consequences that reach beyond where the substantiation was noted. Please note that twistlock is a trade name.
210.8(B) Parent Text	1897	138	RESOLVE The proposed language does not add clarity and could have unintended consequences. GFCI protection would be required with the existing language for the application stated by the submitter.
210.8(C)	92	159	FR-TG1-11 Adding the word "nominal" for 120 volts nominal is accepted and consistent with the use of the term in other areas of Article 210.8.
210.8(C)	3237	158	RESOLVE Adding "at or below grade" was not accepted as the proximity to grade does not remove the electrical shock hazard that GFCI is meant to address.

210.8(D)	2549	164	RESOLVE Substantiation was not provided to support hard wired garbage disposals. Many cord and plug garbage disposals are GFCI protected by the existing language found in 210.8, this change would only impact hard wired garbage disposals.
210.8(D)	90	170	RESOLVE It is not necessary to provide an exception for appliances that would operate below the low-voltage contact limit. If these appliances are cord and plug connected, they would have to have conversion equipment hence the receptacle would still be at 120 Volts or other voltage where GFCI is required and should not be removed. Examples of Hard wired appliances that operate below the low-voltage contact limit would be helpful to understand the application better. Just because the appliance is low voltage, doesn't mean we should not provide protection for the outlet.
210.8(D)	29	166	RESOLVE The suggested language does not add clarity. The existing language ensures protection and is sufficient.
210.8(D)	82	168	RESOLVE Substantiation was provided as part of SR 7596 during the 2023 Code cycle when these items were added. The panel statement noted that the CPSC database demonstrated 104 electrocutions from 2011-2020, of which 81 percent were working on an appliance or other type of appliance or equipment.
210.8(D)	195	160	RESOLVE Removing the words "branch circuit or" does not add clarity. The existing language meets the intent of the submitter ensuring that a circuit breaker or wiring device type GFCI can be used.

210.8(D)	2227	163	RESOLVE The suggested language would be difficult to enforce with appliances like microwaves and similar which are often store bought and installed by the occupant. Permits are typically not required to install these appliances hence enforcement would be very difficult. If permits are pulled, it is highly likely that enforcement of the existing language would be necessary.

210.8(D)	4477 2092	167 161	FR-TG1-12 This first level subdivision is modified to align with the existing requirements found in 210.8(B) for three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less. Appliances in three-phase applications are in use that are beyond the 60 A value currently stated and GFCI devices are commercially available at this amperage rating. The following items from public input 2092 were not accepted: 1. The voltage was not changed from 150 volts or less to ground as the existing language is adequate and clear. 2. The branch-circuit rating was not moved from 60Amperes to 50 Amperes as substantiation was not provided to reduce the level of protection currently afforded by 210.8(D). 3. Adding dewatering pumps was not accepted as this is not a defined term and could cause confusion. 4. An exception for elevator pits is not accepted as the GFCI protection requirements can be found in Article 620 as part of 620.6. 5. Removing list items (8) through (12) was also not accepted as substantiation was not provided to reduce the current level of protection afforded by these requirements. Substantiation was provided as part of SR 7596 during the 2023 Code cycle when these items were added. The panel statement noted that the CPSC database demonstrated 104 electrocutions from 2011-2020, of which 81 percent were working on an appliance or other type of appliance or equipment.

210.8(F)	1501	174	RESOLVE Existing requirements were substantiated with unfortunate examples of death due to electrocution on outdoor equipment when 210.8(F) was added during the 2020 Code cycle. 210.8(F) compliments the existing requirements for outdoor receptacles which have been required to be GFCI protected for many years. The addition of 210.8(F) recognized the fact that the electrical shock hazard does not disappear when the equipment is hardwired instead of being cord-and-plug connected.
210.8(F)	3285	186	RESOLVE Substantiation has not been provided to warrant moving the ampere rating from 50A to 60A.

210.8(F)	3619 1582 4392 4471 157	179	FR-TG1-13 *The language found in the parent text of 210.8(F) was modified to identify that the outlets are outdoor outlets which aligns with the title of 210.8(F) and that the outlets are installed at and not in the locations listed. In addition, (Reference Public Input No. 264), the language "shall be provided with GFCI protection" was modified to add clarity stating that these outlets "shall be GFCI protected". The existing language could be read as requiring outlets installed in garages, accessory buildings and boathouses to have GFCI protection. This change will make it clear that only outdoor outlets require GFCI protection. Note that the rule in 210.8(A) will continue to require GFCI protection for receptacle outlets installed in these locations.* Exception No. 2: The date found in Exception No. 2 was extended to provide more time for standards and manufactured solutions to be developed. The suggested three new exceptions proposed by PI 4471 were not accepted as substantiation was not provided to reduce the current level of protection provided. GFCI protection provided in EV chargers provides protection between the charger and the vehicle but not upstream of the charger between the panelboard and the outlet.
210.8(F) Exception 2	4026	189	RESOLVE The suggested language does not provide a solution for the problems identified with for the application when the requirement entered the NEC.
210.8(F) Exception 2	4203	191	RESOLVE The proposed language does not provide a solution that has been proven to be compatible with the ground-fault currents that flow through the equipment grounding conductor which is causing tripping of GFCI protection.

2026 NEC® Public Input Task Group Report

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Article/Section	Public Input #	PI Report Page #	TG Recommendation & Statement
210.11(C)(1)	2389	202	**Resolve** The proposed language is redundant and not needed because 210.52(B)(2) states that small-appliance branch circuits in dwelling units shall have no other outlets.
210.11(C)(2)	985	203	**FR-TG-2-1** This revision is made to add clarity that the required 20-ampere branch circuit for the laundry area and 120-volt nominal equipment such as flat irons, washing machines, and for heat-pump clothes dryers or gas clothes dryer ignitions, and to clarify that this requirement applies to receptacle outlets in a laundry area as define in Article 100.
210.11(C) (3) & (4)	23	204	**FR-TG-2-2** This revision is made to add clarity regarding the voltage of bathroom branch circuits relative to "nominal voltage" cited in 110.4.

NEW 210.11(C)(5)	3406	206	**Resolve** Insufficient substantiation was provided that the overloaded circuits and tripping issues were directly attributable to bedroom circuits being overloaded.
NEW 210.11(C)(6)	437	209	**Resolve** No evidence was provided in the substantiation to show a problem that warrants the addition of the proposed language. 120 V rated water heaters are only one option. There are water heaters requiring 240 V and others requiring no power at all.
210.11(C)(4)	1867	210	**Resolve** No proposed changes were provided, which is in violation of Section 4.3.4.1(c) of the Regulations Governing the Development of NFPA Standards.
210.11(C)(4)	1868	211	**Resolve** No proposed changes were provided, which is in violation of Section 4.3.4.1(c) of the Regulations Governing the Development of NFPA Standards.
210.11(C)(4)	2550	212	**Resolve** The 210.52(G)(1) mandate for the receptacle outlets is a subset of the mandates and allowances for the 210.11(C)(4) branch circuit. 210.52(G)(1) addresses receptacle outlets serving solely each vehicle bay up to 5½ feet above the floor. By contrast, the 2023 210.11(C)(4) words ", including those" expanded the allowance for that 120-volt branch circuit to supply receptacle outlets located within or at the garage but serving purposes not specifically related to that vehicle bay (e.g., power tools, work benches, ancillary appliances and equipment) or above the 5½ -foot height (e.g., garage-door openers) to be not prohibited by the "no other outlets" words. Exception No 2, added to this section last cycle, permissively allows other outlets besides the one receptacle outlet mandated by 210.52(G)(1).
210.11(C)(4)	2575 483	213 215	**FR-TG-2-3** This revision is made to add clarity by replacing "outlets for other equipment" by "other outlets" as the restrictions on other equipment within the same

			garage are sufficiently addressed in 210.23(B). Outlets for luminaires are also covered in 210.23(B).
210.11(C)(4)	2858	214	**Resolve** Public Input 2858 results in correlation issues. Article 210 addresses the wiring of a branch circuit within or at the detached garage. Where branch circuits run between buildings (i.e., between the dwelling and a detached garage), however, those requirements fall within the scope of Article 225. From a dwelling to a detached garage, the Submitter's objective is already mandated by 225.30 and by existing 210.11(C)(4) Exception 1 for receptacle outlets of the load side of one outdoor branch circuit, multiwire or not, or of multiple branch circuits from one outdoor feeder. Further, the proposed language effectively the 20 A garage branch circuit to supplying only outdoor receptacles in the same garage.
Group 1 – 210.12 Parent Text			
210.12	1230 3492	216 375	**FR-TG-2-4** (Detail) To enhance Code usability and to provide clarity, the following revisions were made: 1. The reference to list items (1) through (6) of 210.12(A) in the parent text of 210.12, 210.12(B), (C), and (D) are deleted; 2. Editorial changes are made in 2nd level subdivision list items 210.12(A)(5) and (6) to change the language from permissible to mandatory to comply with the parallel construction requirement of Section 2.1.8.2 of the NEC Style Manual.
Group 2 – 210.12 (A)			
210.12 (A)	2794	242	**FR-TG-2-5** (Detail) A new option to provide AFCI protection using a listed outlet branch circuit-type AFCI in conjunction with a listed overcurrent protective device is added.
210.12 (A)	3786	221	**FR-TG-2-6** (Detail) A new option to provide AFCI protection using a listed outlet branch circuit-type AFCI in conjunction with a listed overcurrent protective device is added.
Group 3 – 210.12 (B)			

210.12(B)	4163-I 1438 1903	230 273 277	**Resolve** Interoperability continues to be a concern. Expansion of AFCI protection should not take place until interoperability is addressed.
NEW 210.12(E)	4276	235	**Resolve** Despite the merits of providing arc-fault protection for dc circuits, there are currently no listed products commercially available for this purpose.
210.12(B)	1229 1773 3379	271 275 339	**Resolve** Interoperability continues to be a concern. Expansion of AFCI protection should not take place until interoperability is addressed. The issue of garages has been looked at from group of welder manufactures.
210.12(B)	3155-I 3966 4450	279 353 357	**FR-TG-2-7** (Detail) Kitchens and laundry areas are deleted from the list because they are the primary locations for appliances that experience incompatibility issues causing nuisance tripping.
210.12(B)	889 3155-II	363 279	**FR-TG-2-8** (Detail) Similar areas are deleted because it is a vague and an unenforceable term per NEC® Style Manual 3.2.1 and Table 3.2.1. Arbitrary inspection interpretations have resulted in inconsistency as to what exactly constitutes a "similar area".
210.12(B)	3372 3407	337 344	**Resolve** Interoperability continues to be a concern. Expansion of AFCI protection should not take place until interoperability is addressed. The issue of garages has been looked at from group of welder manufactures.
210.12(B)	3380 3408	341 346	**FR-TG-2-9** (Details) A new requirement for arc-fault protection of dwelling unit bathroom branch circuits is added. This revision is to recognize that these branch circuits experience similar hazards to other dwelling unit branch circuits and thus should be afforded the same level of protection.

			Bathrooms have been added to the list as inoperability concerns with bathroom exhaust fans have been addressed.
210.12(B)	3635 4163-II	349 230	**Resolve** Exception No. 2 is not deleted to address incompatibility issues.
210.12(B)	534	361	**FR-TG-2-10** (Detail) The date in Exception No. 2 was deleted and the exemption of arc welding equipment from AFCI protection was extended to dwelling unit garages and accessory buildings.
210.12 (B), (C), & (D)	3926 3931	351 370	**Resolve** The charging language of 210.12(B), (C), and (D) is for locations required to be protected by one of the AFCI means of protections in 210.12(A). The proposed language addresses a wiring method and not a location.
210.12(B)	482	359	**Resolve** The term outlet encompasses the utilization equipment. Outlets serve utilization equipment
210.12 (B), (C), & (D)	16	365	**FR-TG-2-11** (Detail) This revision is made to add clarity regarding the voltage of AFCI-protected branch circuits relative to "nominal voltage" cited in 110.4.
210.12(C), (D), & (E)			
210.12(C)	800-I	368	**FR-TG-2-12** (Detail) Changing the title of 210.12(C) from "*Dormitory Units*" to "*Dormitories*" is to enhance Code usability and to better corelate with NPFA 101 and NFPA 5000.
210.12(C)	800-II	368	**FR-TG-2-13** (Detail) Bathrooms were deleted because of interoperability concerns.
210.12(C)	800-III	368	**FR-TG-2-14** (Detail) Similar rooms were deleted because it is a vague and an unenforceable term per NEC® Style Manual 3.2.1 and Table 3.2.1. Arbitrary inspection

			interpretations have resulted in inconsistency as to what exactly constitutes a "similar area"
NEW 210.12(G)	1445	372	**Resolve** The hazard being addressed by location of tamper-resistant receptacles differs from the hazard being addressed by AFCI protection and substantiation has not been provided to support the inclusion of the locations in 406.12.
210.12(E)	2341	373	**FR-TG-2-15** Adding 'or switch' gives installers the option to provide AFCI protection via a AFCI switch device if the circuit is extended, modified, or replaced.
210.12(E)	2594	374	**Resolve** The proposed language only affords AFCI protection to branch circuits and eliminates AFCI protection of outlets, devices, and appliance supply cords.
Global	3085	1	**No Action** The Informational Note in 210.12(A) is included to differentiate between different methods of AFCI protection. Thus, the Informational note is not in conflict with the NEC Style Manual.
End of 210.12			
210.13	1633	376	**FR-TG-2-16** This FR correlates with changes to 215.10 (PI 1641) and 230.95 (PI 1645) which eliminate the need for a second level of GFPE to achieve selective coordination, greatly simplifying selective coordination. The FR does not prohibit GFPE, but rather makes it optional when very specific arc-flash energy reduction methods are utilized. Equipment damage is reduced because arc-flash energy reduction, used for personnel protection, is much faster than GFPE that is used for equipment protection.
210.17	799	385	**FR-TG-2-17** "Dormitories" was included in the occupancies listed to improve usability of the NEC® and to correlate consistently with the defined term's cited extraction sources NFPA 101® Life Safety Code®,

			revised since being included originally in NEC®, 3.3.205 (2024) and A.3.3.205 (2024). regarding individual guest rooms and individual guest suites of dormitories versus the entire dormitory occupancy. This First Revision FR-TG-2-17 (PI-799), together with First Revision FR-TG-1-02 (PI-798) for the revised definition of "Dormitory" in place of "Dormitory Unit", will bring the treatment of this occupancy in the NEC® into correlation with its usage in NFPA 101®, NFPA 5000 Building Construction and Safety Code, and other codes.
210.18	966	387	**Resolve** The substantiation provided is not clear and did not provide any evidence to support that the use of labels will improve safety.
210.19(A)	1823	388	**Resolve** This section covers the general requirements for branch circuits and is appropriately located in article 210. Article 240 covers overcurrent protection and not the ampacity of branch circuit conductors. Moving this section to Article 240 could create confusion to Code users.
210.19(A)(1) & (2)	471	390	**Resolve** These are list items that do not require a title as per Section 2.1.8.2 of the NEC Style Manual
210.19(A)(1)	494	392	**Resolve** The 125% continuous use factor does not exist in the NEC solely due to the limitation of an overcurrent device installed in an enclosure. Heat rise tests performed on equipment address more than just the OCPDs located within. These tests are also addressing other components installed within the assembly. The increase in conductor size by application of 125% of continuous loads helps to provide conductor material to act as a heat sync for achieving a lower impact on temperature rise.
NEW 210.19(E)	1911	394	**Resolve** No proposed changes were provided, which is in violation of Section 4.3.4.1(c) of the Regulations Governing the Development of NFPA Standards.
210.19	281	395	**Resolve**

			Adding "Nominal" to the text is unnecessary as the text "for circuits exceeding 1000 volts ac or 1500 volts dc" have be deleted in FR-TG-2-18.
210.19	2423-1	5	**FR-TG-2-18** With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is redundant and unnecessary.
210.20	282	396	**Resolve** Adding "Nominal" to the text is unnecessary as the text "for circuits exceeding 1000 volts ac or 1500 volts dc" have be deleted in FR-TG-2-19
210.20	2423-2	5	**FR-TG-2-19** With the identification in the title and scope of the Article that the requirements apply to certain voltage ranges, the inclusion of this detail in this section is redundant and unnecessary.
210.21(B)	748	397	**Resolve** The substation provided does not corelate with the requirements of 210.18, 210.22, and 210.24.
210.21(B)(2)	3147	399	**Resolve** The existing requirements are requirements for both continuous and non-continuous loads.
210.21(B)(3)	2459	400	**Resolve** NEMA configurations of NEMA Standard WD 6 do not represent the sum-total of all configurations eligible for receptacles, attachment plugs, connectors and inlets (motor plugs). Other configuration standards exist, such as UL 1681, UL 1686, and UL 1691 to name a few. Furthermore, proprietary configurations that do not violate 406.8 and 406.4(F) are not precluded. Although not common, receptacles rated at 40 amperes have been listed and produced in the past, and remain eligible to be listed and produced in the future.
210.23(A)(1)	2497	401	**Resolve** No evidence was provided in the substantiation for allowing exhaust fans to be supplied from 10-

			ampere branch circuits other than those for bathroom or laundry room lighting. Exhaust fans are typically found in bathrooms and laundry rooms. Supplying them from 10-ampere lighting circuits in bathrooms and laundry rooms is preferred as it keeps the location of the exhaust fan and the circuits supplying it together. This section only addresses 10-ampere branch circuits. There is no restriction to supply exhaust fans from branch circuits with other ratings. No evidence was provided in the substantiation for eliminating gas fireplace units from being supplied by a 10-ampere branch circuit. This permission needs to be provided in 210.23 as this is the only section addressing 10-ampere branch circuits. The requirement contains an implied restriction that no other loads can be provided in the circuit supplying the gas fireplace unit. Therefore, an individual branch circuit is required.
210.23(A)	1643 1644	402	**FR-TG-2-20** To enhance Code usability and to add clarity, 210.23(A) was rewritten. The following revisions were made: 1. "Comply with the requirements of 210.23(A)(1) and (A)(2)" was deleted from 210.23(A)'s charging text; 2. The title of 210.23(A)(1) was deleted, while its list items (1) through (3) were retained and moved to 210.23(A); 3. List item (1) of 210.23(A)(2) was moved as a prohibition to 210.23(A)'s charging text and the remainder of 210.23(A)(2) was deleted in its entirety; 4. A new Exception was added to permit 10-ampere branch circuits to supply those unit receptacles that are integral to exhaust fans located in dwelling-unit bathrooms and laundry areas if those circuits also serve lighting outlets.
210.23(B)	1467	404	**Resolve**

			Insufficient substantiation was provided to exempt garage branch circuits from supplying only the receptacle outlets specified in 210.11(C)(4).
210.23(B)	2390	405	**Resolve** Informational notes are not allowed to have a requirement as per Section 2.1.10.2 of the NEC Style Manual.
210.23(C), (D), & (E)	968	406	**Resolve** The substantiation provided is not clear and did not provide any evidence to support that the use of labels will improve safety.
210.23(E)	4183	408	**Resolve** The added language is not needed as 210.23(E) covers multiple-outlet branch circuits, while 210.18 covers branch circuit rating.
210.24	970	409	**Resolve** No substantiation was provided to warrant the change.15A receptacles having feed-through terminals are listed for carrying 20 A.
210.25(B)	1912	413	**Resolve** The substation provided does not corelate with the requirements of 210.25(A) and 240.24(B).
Global PI-4050 Overcurrent Protection terms			
210.11(B)	4050	2	**FR-TG-2-21** CMP 2 has revised text under its purview to use consistent terminology for “Branch-Circuit Overcurrent Protective Devices”, which is a defined term. CMP 2 also chose to include a commonly used acronym for Overcurrent Protective Devices (“OCPD”) and then apply it in the body of the text. The first use of the term is in 210.4(A), then the acronym is used throughout the rest of Article 210. This practice is permitted by Section 3.2.3 of the NEC Style Manual.
210.12	4050	2	**FR-TG-2-22** CMP 2 has revised text under its purview to use consistent terminology for “Branch-Circuit Overcurrent Protective Devices”, which is a defined term. CMP 2 also chose to include a commonly used

			acronym for Overcurrent Protective Devices ("OCPD") and then apply it in the body of the text. The first use of the term is in 210.4(A), then the acronym is used throughout the rest of Article 210. This practice is permitted by Section 3.2.3 of the NEC Style Manual.
210.18	4050	2	**FR-TG-2-23** CMP 2 has revised text under its purview to use consistent terminology for "Branch-Circuit Overcurrent Protective Devices", which is a defined term. CMP 2 also chose to include a commonly used acronym for Overcurrent Protective Devices ("OCPD") and then apply it in the body of the text. The first use of the term is in 210.4(A), then the acronym is used throughout the rest of Article 210. This practice is permitted by Section 3.2.3 of the NEC Style Manual.
210.19(A)	4050	2	**FR-TG-2-24** CMP 2 has revised text under its purview to use consistent terminology for "Branch-Circuit Overcurrent Protective Devices", which is a defined term. CMP 2 also chose to include a commonly used acronym for Overcurrent Protective Devices ("OCPD") and then apply it in the body of the text. The first use of the term is in 210.4(A), then the acronym is used throughout the rest of Article 210. This practice is permitted by Section 3.2.3 of the NEC Style Manual.
210.20	4050	2	**FR-TG-2-25** CMP 2 has revised text under its purview to use consistent terminology for "Branch-Circuit Overcurrent Protective Devices", which is a defined term. CMP 2 also chose to include a commonly used acronym for Overcurrent Protective Devices ("OCPD") and then apply it in the body of the text. The first use of the term is in 210.4(A), then the acronym is used throughout the rest of Article 210. This practice is permitted by Section 3.2.3 of the NEC Style Manual.

2026 NEC® Public Input Task Group Report (12/15/2023)

CMP #	**2**
TG#	**3**
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Article/Section	Public Input #	PI Report Page #	TG Recommendation & Statement
210.52			Action / Language (FR or Resolve) (Code Language)
			Statement
210.52	1600		Resolve -
			Section 210.52 addresses receptacle outlets and therefore should not be retitled to expand the scope. The language in 210.60(A) is clear. The substantiation indicated receptacles should be provided to address furniture fixed in place however it would impact receptacle placement that could reduce the number of receptacles along the wall space.
210.52	867		Resolve

			The language proposed is already in 210.52(4) by addressing the receptacles located 5-1/2ft above the floor.
210.52	1849		TG3-FR1 Controlled by a switch or listed wall-mounted control device.
			The language has been revised to provide consistency with 210.70.
210.52(A)(1)	1915		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(A)(2)	376		Recpt below counter Resolve
			NEC 210.52(A)(2) establishes the required wall space for determining receptacle locations.
210.52(A)(2)	1405		Recpt bar counter Resolve
			NEC 210.52(A)(2) establishes the required wall space for determining receptacle locations. NEC 210.52(C)(2) establishes the restrictions for locating the receptacle for a work surface or countertop.
210.52(A)(3)	1917		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(A)(4)	288 See (C)(2)		CounterTop Resolve
			NEC 210.52(A)(4) establishes that receptacles for countertops and work surfaces are not to be considered as the receptacles located along the wall in accordance with 210.52(A). NEC 210.52(C)(2) establishes the restrictions for locating the receptacle for a work surface or countertop.
210.52(A)(4)	321 See (C)(2)		CounterTop Resolve
			The receptacles serving the countertop or work surface are located to serve that specific location based on the multi-appliance usage requiring the need for those receptacles. NEC 210.52(A) is determining the usable wall space where general use receptacle are place to support other general

			loads. NEC 210.52(C)(2) establishes the restrictions for locating the receptacle for a work surface or countertop.
210.52(A)(4)	3274		CounterTop Resolve
			NEC 210.52(A)(4) establishes that receptacles for countertops and work surfaces are not to be considered as the receptacles located along the wall in accordance with 210.52(A). NEC 210.52(C)(2) establishes the restrictions for locating the receptacle for a work surface or countertop.
NEW After 210.52(A)(4)	1397		Columns Resolve
			There is insufficient substantiation to require receptacles specific to columns. The language would create an enforcement challenge. NEC 210.52(A)(2)(1) would already address “any space 2ft or more in width (including space measured around corners).”
NEW After 210.52(A)(4)	289		Resolve
			A recessed receptacle will not address the damage to a cord being plugged into an outlet behind a door, swinging or barn door. A receptacle can be located beyond the sliding door as already addressed with pocket doors.
210.52(B)(1)	1914		Resolve
			The proposed language is confusing and does not add clarity. The existing language requirement is for the receptacle outlet and not the receptacle. The code does not require a duplex receptacle to be fed by both small appliance branch circuits.
210.52(B)(3)	1831		Resolve
			The current language provides the utility to serve the necessary loads in consideration of the two receptacles found in a duplex configuration from the two small appliance branch circuits. The two small appliance branch circuits will still supply the same load capacity through the two receptacles in the duplex configuration.
210.52(B)(3)	3644		Resolve
			The outdoor area that meets the definition of a kitchen needs to follow the rules for the wiring installations for a kitchen. There are a number of configurations for outdoor kitchens similar to indoor kitchens that need the same requirements to operate and provide appropriate safety parameters.
210.52(C)	2093		Resolve

			Receptacles located to serve the appliance in a location other than on the countertop is permitted. The branch circuit and receptacles serving the countertop are not permitted to serve other outlets except as permitted in 210.52(B).
210.52(C)	3383		Resolve
			No substantiation has been provided to require the receptacles to be deenergized when located below the work surface.
210.52(C)	322		Resolve
			Cabinets with countertops are not considered wall space as found in 210.52(A)(4). Any cabinets located outside of areas denoted in 210.52(C) could have the receptacle located above the cabinet not more than 5 ft 6 inches in height 210.52(4).
210.52(C)(1)	13		Resolve
			Insufficient substantiation has been provided to support the language revision. Confusion may be created in attempting to align a point along the wall with edge of the counter. The existing language is clear and enforceable.
210.52(C)(1) (c)2?	1316	Bucket	
210.52(C)(1)	1919		Resolved Similar to 1914 and 1915
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(C)(2)	318	Bucket	Adding a rept back to the island
210.52(C)(2)	1155	Bucket	Similar to 1316
210.52(C)(2)	1228	Bucket	FR? – Not addressing countertop
210.52(C)(2)	1546	Resolve	Resolve
			Summer Kitchen Countertop is not defined in the NEC and would create additional confusion.
210.52(C)(2)	1658	Bucket	
210.52(C)(2)	2574	Bucket	
210.52(C)(2)	3404 1316 318 1155 1228 2574 1658		TG3-FR2 TG – Looking for a path to get a receptacle on the island that addresses the CPSC data. Place a receptacle on the island 210.52(C)(3)

	3995 4313 4408 81 2338 3405 3335		Replace existing language in (2) with the following: At least one receptacle outlet shall be installed in accordance with 210.52(C)(3) (SEE BELOW) when an island has a minimum of 9 square feet of counter top surface. This area shall not include a range, counter mounted appliances or sinks. With a working surface long dimension of 24 inches and a short dimension of 18 inches At least one receptacle outlet shall be installed on each island or peninsular countertop and located in accordance with 210.52(C)(3).
			Committee Statement The language has been revised to require at least one receptacle on the island or peninsula. 2023 NEC attempted to address the CPSC reports on incidents caused by hanging cords off the top of kitchen islands and peninsulas. The code removed all requirements for receptacles serving the countertops of islands and peninsulas. The future provisions for installing a receptacle has been eliminated because it may unintentionally drive receptacles to be located on the side of cabinets for kitchen islands and peninsulas that enable the safety concern cited in the development of the 2023 NEC. Language has also been added to clarify the receptacle location restriction for wall space below a counter that may also reside toward the bottom of a cabinet or wall divider deemed as wall space. The reference is updated to reflect the lasted document title and date.
			210.52 Dwelling Unit Receptacle Outlets. (C) Countertops and Work Surfaces. (2) Island and Peninsular Countertops and Work Surfaces. ~~Receptacle outlets, if installed~~ At least one receptacle shall be provided to serve an island or peninsular countertop or work surface with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater and shall be installed in accordance with 210.52(C)(3). ~~If a receptacle outlet is not provided to serve an island or peninsular countertop or work surface, provisions shall be provided at the island or peninsula for future addition of a receptacle outlet to serve the island or peninsular countertop or work surface.~~ A peninsular countertop shall be measured from the connected perpendicular wall. (3) Receptacle Outlet Location.

			Receptacle outlets shall be located in one or more of the following: (1) On or above, but not more than 500 mm (20 in.) above, a countertop or work surface (2) In a countertop using receptacle outlet assemblies listed for use in countertops (3) In a work surface using receptacle outlet assemblies listed for use in work surfaces or listed for use in countertops (4) Receptacle outlets shall not be installed on the exterior of the cabinet or wall space between 450 mm (18 in.) above the floor to the bottom edge of the countertop or work surface. (4) Separate Spaces. Countertop or work surface spaces separated by rangetops, refrigerators, or sinks shall be considered as separate countertop spaces in applying the requirements of 210.52(C)(2). If a range, counter-mounted cooking unit, or sink is installed in an island or peninsular countertop or work surface and the depth of the countertop behind the range, counter-mounted cooking unit, or sink is less than 300 mm (12 in.), the range, counter-mounted cooking unit, or sink shall be considered to divide the countertop space or work surface into two separate spaces. Each separate countertop or work surface space shall comply with the applicable requirements in 210.52(C)(2). Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks, or rangetops as covered in 210.52(C)(1), Exception No. 1, or appliances occupying assigned spaces shall not be considered as these required outlets.
210.52(C)(2)	3995	Bucket	
210.52(C)(2)	4313	Bucket	
210.52(C)(2)	4408	Bucket	
210.52(C)(3)	81	Bucket	
210.52(C)(3)	1541	Resolve	Resolve
			The language is maintained to clarify the requirements for the installer to use appropriate receptacle assemblies.
210.52(C)(3)	1901		Resolve
			Where the NEC is addressing a safety issue, it must also be addressed for those requiring accessibility. It is the understanding of CMP-2 that a new version of the A117.1

			Standards will align and work within the requirements of the NEC.
210.52(C)(3)	1922 Same as 1924 1927 1928 1929 1930 1934 1945		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(C)(3)	2338	Bucket	
210.52(C)(3)	3335	Bucket TG3- FR2	
			The reference is updated to reflect the lasted document title and date.
NEW After 210.52(C)(3)	3405	Bucket	
210.52(D)	1924	1922	Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(D)	3646		TG3-FR3 Additional Charging Statement Receptacle outlets shall be installed in accordance with 210.52(D) 1 through 3. Also include structural revisions
			The section is revised to comply with NFPA Style Manual 3.5.1.2.
210.52(D)	669		Resolve
			NEC 406.9(C) exception 4 permits the installation of a receptacle near the toilet. Insufficient substantiation has been provided to support the proposed requirement.
210.52(E)(1)	1406		Resolve
			The additional language does not add clarity.
210.52(E)(1)	1927	1922	Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.

210.52(E)(2)	1928		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(E)(3)	1407		Resolve
			Substantiation has not been provided to convey the hazard of concern.
210.52(E)(3)	1929		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(G)(1)	1930		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.52(G)(1)	1932		Resolve
			The proposed language does not add clarity.
210.60	801	PI2035 PI798 - FR	TG3-FR4
			Align with FR (PI 798)… The terminology and usage for dormitories and for guest rooms and guest suites of dormitories in NFPA 70® be clarified at this time, consistent with NFPA 101 and to avoid enforcement confusion.
210.60	1602		Similar to PI 1600 Resolve
			Section 210.52 addresses receptacle outlets and therefore should not be retitled to expand the scope. The language in 210.60 is clear. The substantiation indicated receptacles should be provided to address furniture fixed in place and would impact receptacle placement that could reduce the number of receptacles along the wall space.
210.62	1934		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.63	3478		
210.63	1945		Resolve
			The proposed language is not necessary as it would have limited impact on dimensional measurements. The language does not add clarity to the requirement.
210.63(A)	277		Resolve

			No evidence has been provided that demonstrates a hazard would exist from a receptacle located inside the equipment where proper access is established.
210.63(A)	1498 3637		Resolve
			NEC Section 400.12 already prohibits a cord from being run through doors or windows to reach the outside.
210.63(A)	1832		Resolve
			A receptacle outlet is required however the current language does not require the receptacle to be located above the ceiling and below the floor or attic above.
210.63(A)	3637	Bucket	
210.63(B)	272 4009 10 498 772		TG3-FR5 Use language as proposed but keep “room or area” provided within the same room or area as Remove Exception and place after “dwellings,” In other than ~~one- and two-family~~ within a dwelling unit, a receptacle outlet shall be required for premises wiring systems that include a solidly-grounded system operating at less than 150 volts to ground. The receptacle outlet shall be located within the same room or area as indoor switchboards, switchgear, panelboards, motor control centers, and service equipment.
			The language has been simplified to align with revisions to the dedicated electrical space established in the 2023 NEC. The language to require the receptacle to not be located on the load side of the equipment disconnecting means is removed.
210.63(B)	2095		Resolve
			In multi-family dwellings there is no substantiation to remove GFCI protection from the receptacle servicing the equipment.
210.63(B)(2)	10	Bucket	
210.63(B)(2)	498	Bucket	

210.63(B)(2)	772	Bucket	
210.63(B)(2)	2094		Resolve
			The receptacles needs to be located to comply with 300.22 and avoid compliance issues with cords.
210.63(B)(2)	4009	Bucket	
210.65	765 1504		Resolve
			The proposed revision is making an assumption that the receptacle or outlet will feed a table which may not be accurate. The use of the room is unknown. The receptacles and outlet are located to serve the area for multiple configurations.
210.65	1504	Bucket	
210.65(A)	2096		Resolve
			The proposed language is making an assumption based on the occupancy permitted. The use of the space may require receptacles or outlets located in accordance with the provision of this section with limited occupants.
210.65(B)(2)	1578		Resolve
			The proposed revised language does not enhance the enforceability of the requirement. The phrase “no possible” is in conflict with the NEC style manual. A room smaller than 215 sqft is not required to have receptacles or outlets.
210.65(B)(2)	1579		Resolve
			There is not a retrofit requirement in this section of the NEC for existing buildings.
210.70	795 1086 1833 4444		TG3-FR6 TIA 1753 – TG would like to include PI 4286 in the discussion **210.70 Lighting Outlets Required.** Lighting outlets shall be installed where specified in 210.70(A), (B), and (C). The switch or listed wall-mounted control device shall not rely exclusively on ~~a~~ battery power unless ~~a~~ it incorporates a positive means of notification of impending battery depletion. ~~is provided for automatically energizing the lighting outlets upon battery failure.~~ Informational Note: Examples of positive means of battery depletion notification include an audible indicator, a visual indicator, a graphical indicator in an application program that controls the wall-mounted control device, or a combination of these, that provides advance notification of battery depletion and the need for battery replacement.

			The language aligns with TIA 1753 for the 2023 NEC. The informational note is added to provide examples for the users for the revised requirement.
210.70	1086	Bucket	
210.70	1833	Bucket	
210.70	4286		Take to Panel for discussion FR - Reverting back to 2020 language FR – Affirmation of TIA 1753 language Resolve – See 795 above
			FR – Committee Statement for TIA 1753 The code panel reaffirms its position in support of the language accepted in TIA 1753 and revised to align with TG3-FR6. FR - Committee Statement for reverting back to 2020 NEC The exhaustion of a battery in a control device does not pose any greater threat to safe egress than the failure of any other element of a lighting branch circuit such as a failed lamp, loss of utility power, or a tripped circuit breaker. The committee also recognizes that the automatic energization of the lighting could also create a safety issue. Additionally, the need for safe egress lighting falls within the scope of the NFPA 101.
210.70	4444	Bucket	
210.70(A)(1)	184 2187 Similar but not Bucketed 2188 2190		TG3-FR7 At least one lighting outlet controlled by a switch or listed wall-mounted control device shall be installed …
			The language is revised to align with the parent language to include “switch” for consistency and useability.
210.70(A)(1)	1135		Resolve
			The public input does not provide sufficient substantiation to warrant the revision. Enforcement would be challenging. Access from closets, balconies, internal spaces, and other such areas do not necessarily warrant the addition of a switch.
210.70(A)(1)	1506		Resolve
			The revised language does not add clarity and does not provide adequate substantiation.

210.70(A)(1)	1836		Resolve
			The language in this section refers to laundry areas and not laundry rooms.
210.70(A)(1)	1902		Resolve
			The lighting outlet is to be located to provide illumination for the area.
210.70(A)(1)	2187	Bucket	At least one lighting outlet controlled by a switch or listed wall-mounted control device shall be installed …
			The language is revised to align with the parent language to include "switch" for consistency and useability.
210.70(A)(2)	275 2188		TG3-FR8 3. For other than *an outdoor, grade-level bulkhead door with stairway access to a sub-grade-level basement* where lighting outlets are installed for an interior stairway with six or more risers between floor levels, there shall be a listed wall-mounted control device at each floor level and at each landing level that includes a stairway entry to control the lighting outlets.
			The language is revised by adding positive language to Item 3 in order to accomplish the same action in the suggest revision provided in the public input. The language is revised to align with the parent language to include "switch" for consistency and useability
210.70(A)(2)	2188	Bucket	At least one lighting outlet controlled by a switch or listed wall-mounted control device shall be installed …
			The language is revised to align with the parent language to include "switch" for consistency and useability.
210.70(B)	2190		TG3-FR9 At least one lighting outlet controlled by a switch or listed wall-mounted control device shall be installed …
			The language is revised to align with the parent language to include "switch" for consistency and useability.
210.70(C)	1538		TG3-FR10 **(C)** All Occupancies. For attics and underfloor spaces, utility rooms, and basements, at least one lighting outlet containing a switch or controlled by a wall switch or listed wall-mounted control device shall be installed where these spaces are used for

			storage or contain equipment requiring servicing shall comply with (1), (2), and (3). 1) A point of control shall be at each entry that permits access to the attic and underfloor space, utility room, or basement. 2) Where a lighting outlet is installed for equipment requiring service, the lighting outlet shall be installed at or near the equipment. 3) Control by automatic means shall not be permitted to control all illumination in attics, underfloor spaces or utilities rooms unless a manual means to bypass the control is provided.
			The structure of the section is revised to align with the NEC style manual. Item 3 is added to prohibit exclusive automatic control of lighting in these areas.

2026 NEC® Public Input Task Group Report

CMP #	2
TG#	4
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Article/Section	Public Input #	PI Report Page #	TG Recommendation & Statement
Article 100 Definition – Demonstrated Load	4251		Resolve Committee Statement: No revision processed for CMP 2 utilized the term "demonstrated load". A similar concept is addressed in 220.87; however, the historical demand is referred to as 'metered data'. This is a term that does not require a definition. It is noted that the public input is related to a public input submitted to CMP 15 (refer to PI 2903). As such, CMP 15 may consider taking action based on this public input.
120	4311	33	First Revision NOTE: As this is a relocation of the entire Article, there is no mark-up provided, and therefore, no "TG 4, FR X" designation. Committee Statement: Requirements in Article 220 applies to all installations; therefore, it is more appropriate to have it located in Chapter 1 of the NEC. This First Revision would relocate Article 220, as modified by other First Revisions by CMP 2.
220.5(D)	3334	552	Resolve Committee Statement: Section 90.4(B) gives the AHJ the responsibility for enforcement of the Code and making interpretations of

			the rules. As part of these responsibilities, the AHJ may request documentation, such as load calculations.
220.5(D)	4267	553	TG 4, FR 1 Committee Statement: Throughout Article 220 there are requirements for utilizing "volt-ampere" ratings for conducting load calculations. However, DC rated equipment and dc loads are routinely rated in watts (W) and kilowatts (kW). For dc circuits, these are equivalent to volt-amperes (VA) and kilovolt-amperes (kVA), respectively. This new sub-section for 220.5 recognizes the electrical power equivalency and clarifies the load calculation rules as applicable to DC rated equipment and loads.
220.5(A)	**2916** 3129	554 555	TG 4, FR 2 Committee Statement: Many industrial and commercial facilities, such as data centers, now use a 416Y/240 volt system. Adding this as a standard voltage to Article 220 assists users of the Code when performing load calculations for these systems.
220.5(B)	1039	556	Resolve Committee Statement: This move could have unintended consequences for other Articles in the Code. The relocation (or not) of these requirements to Article 110 (PI 1057) is the decision of CMP 1. CMP 2 can revisit removal of the requirement from Article 220 as a PC, should this be added to Article 110 by CMP 1.
220.5(B)	1514	559	TG 4, FR 3

			Committee Statement: Adding the word "Load" provides clarity to this paragraph as to when rounding up or down is permitted.
220.5(C)	1389 **1763**	560 561	TG 4, FR 4 Committee Statement: Including "detached garages" to the list of areas not included in floor area calculations clears up the confusion of whether or not to include detached garages.
220.5(C)	3066	562	Resolve Committee Statement: By removing the text as proposed, areas such as large open porches or other unfinished areas are unnecessarily added to the floor area for load calculations. This addition of these areas is not substantiated.
220.5(E) (NEW)	-	-	TG 4, CI 1 Committee Statement: For the 1999 NEC Code Cycle the TCC Task Group on the Usability of the NEC, submitted a proposal with the following substantiation: "The proposal serves to make Article 220 a true calculations article and relocate any other requirements (such as conductor or overcurrent device sizing) to the appropriate parts of Articles 210" (refer to NEC-ROP-1998, Proposal 2-5). Load calculations in Article 220 are not intended to require a 125 percent multiplier simply due to the fact that the load is considered continuous. However, there are Section in 220 that do require a 125 percent multiplier. To improve clarity, a new sub-section is added to Section 220.5 that addresses this issue. Also included is an Informational Note that explains that being a continuous load impacts the sizing of the conductor and

			overcurrent device, but not necessarily the computation of the load when performing a load calculation.
220.10	596	563	Resolve Committee Statement: This move could have unintended consequences for other Articles in the Code. Small appliance and laundry circuit load calculations should remain in 220.52 similar to Appliance, Electric clothes dryer, and electric cooking appliance load calculations.
220.11	1739	564	Resolve Committee Statement: The language was added in the 2023 NEC to specifically address how these loads are used in the calculation of branch circuit loads. The referenced sections are calculations for services and feeders. Refer to 2023, SR 8214.
220.11(A)	-	-	TG 4, CI 2 Committee Statement: The current wording is clarified to indicate that the 125 percent multiplier is a minimum value.
220.11(B)	-	-	TG 4, CI 3 Committee Statement: The sub-section heading includes more details than necessary. To align with other sub-section titles for this Section, the title modified to reflect "Lighting Loads".
220.14(D)	-	-	TG 4, CI 4 Committee Statement: The current wording is clarified to indicate that the maximum volt-ampere rating of the equipment and lamps is a minimum value.
220.14(E)	448	565	Resolve Committee Statement: Requirements for “Continuous and Non-Continuous Loads”

			were located in Article 220 in the 1996 and earlier editions of the NEC. For 1999, these requirements were relocated to Articles 210 and 215, as these requirements are associated with the sizing of the conductor and overcurrent device, and not the computation of the load. While some requirements in 220 may indicate a multiplier of 125%, it is not the intent to apply the 125% multiplier based on the load being considered "continuous".
220.14(F)	1505	566	Resolve Committee Statement: The requirement for a 1200 volt-ampere allocation for signs or outline lighting has been in place for decades and may be considered outdated based on the extensive use of LED technology. CMP 2 made extensive revisions to the table for general lighting loads in 2020 (refer to FR 8075-NFPA 70-2018) based on "technology enhancements" and data from ASHRAE 90.1 ("Energy Standard for Sites and Buildings Except Low-Rise Residential Buildings"). Consistent with the action taken in 2020, data should be provided to support a reduction in the 1200 volt-ampere value.
220.14(H)	2210	567	Resolve Committee Statement: The term "appliance" is a broad term covering many types of utilization equipment (not just for use in dwelling units) and the proposed term of "load" is not a defined term. To ensure clarity in the requirement, the term "appliance" should be maintained.
220.14(I)	593	568	Resolve Committee Statement: The change that is proposed in the Public Input is not

			substantiated. Other statements provided with the substantiation do not have corresponding recommended changes that would address the concerns of the submitter.
220.14(K)	290	569	TG 4, FR 5 Committee Statement: Outlets not covered by 220.14(A) through 220.14(J) may include loads that are known to be greater than 180 volt-amps per outlet. The current wording is clarified to indicate that the 180 volt-ampere per outlet is a minimum value.
220.14(K)	4255	570	Resolve Committee Statement: The use of 180 volt-amps for the load calculation of receptacle outlets for general-use has been in this requirement for many years and is adequate for limiting the number of outlets per circuit. The recommended text identifies grade school buildings as the focus but did not provide substantiation for the suggested 120 volt-amps use. The same argument could be considered for other occupancies. The fact that this is a grade school does not warrant a reduction. Building uses can change over time. The substantiation also used the recent pandemic as a reason. While uses of educational facilities may evolve as a result of the pandemic, many primary and secondary schools, which are the focus of the PI, have returned to full-time in person learning. See CMP 2 Committee Statement for 2023 PI 4014.
220.16	4209	572	Resolve Committee Statement: The intent of this PI is unclear. Clarification is needed to respond to the PI.

220.16(A)	**827** 915	573 574	TG 4, FR 6 Committee Statement: The requirement is revised for clarity. All of 220.14 should be referenced. With this reference to the entire Section, other requirements referred to in 220.14, such as 220.41 (refer to 220.14(I)) are included.
220.41	3236	575	TG 4, FR 7 Committee Statement: The minimum load for general lights and receptacles over-estimates the load when high-efficacy light sources (e.g., LED, CFL) are used. In new dwelling units, building code requirements for high-efficacy lighting are ubiquitous in the US. In addition, recent rulemaking by the US Department of Energy (DOE) prohibits the sale of any general service lamp (GSL) that does not meet a minimum efficacy standard of 45 lumens per watt (10 CFR 430.32(dd)). This rulemaking effectively prohibits the sale of all incandescent and halogen GSL in the US. Lawrence Berkely National Lab (LBNL) has recently reported on sub-metering in 896 occupied US dwellings showing median general lights and receptacle density of 2.3 watts/ft2, including dwellings with a variety of lighting types. Similarly, LBNL reported on lighting audit data from 2,053 existing dwellings in the Pacific Northwest. The installed lighting density was strongly dependent on the fraction of LED/CFL light sources, with an observed reduction in lighting density of 0.015 va/ft2 for each percent of LED or CFL light sources in the

			dwelling. 100% CFL or LED lighting reduced lighting density by 1.5 va/ft2. The new value of 2 va/ft2 assumes approx. 80% LED or CFL lighting in the dwelling (3 va/ft2 – 0.80*0.012). Note - The 0.015 va/ft2 from LBNL is reduced in this calculation to 0.012 va/ft2 using an 80% power factor (this is consistent with treatment of lighting loads in Table 220.42(A)). In order to avoid impacting the number of branch circuits serving general lights and receptacles in dwellings, 220.10 is revised to reference a new section 220.13. This new section located in Part II of the article, maintains branch circuit calculations at the current value of 3 va/ft2.
220.41	595	577	Resolve Committee Statement: This move could have unintended consequences for other Articles in the Code. Small appliance and laundry circuit load calculations should remain in 220.52 similar to Appliance, Electric clothes dryer, and electric cooking appliance load calculations.
220.47	1946	579	Resolve Committee Statement: A load that operates continuously impacts the size of conductors and size of the overcurrent devices, but not the computation of the load. Demand factors for receptacle loads are not intended to be impacted by whether or not a load is continuous.
220.50(B)	2629	580	TG 4, FR 8

			Committee Statement: The text is reformatted to comply with Section 4.1.4 of the NEC Style Manual.
220.51	4361	581	TG 4, FR 9 Committee Statement: Differentiating between types of space heating equipment is necessary, because they have been shown to have different impacts on maximum demand. The revised requirements separate space heating equipment into three categories: (1) Central electric resistance space heating (at 100%), (2) Fixed heat pump space heating (at 75%), and (3) Fixed room electric space heating (at 30%). The percentages for these technologies are based on analysis shared by Lawrence Berkely National Lab (LBNL) of sub-metering end-use data in 953 occupied US dwellings. LBNL observed the following median demand factors for existing space heating loads in dwellings: • Central Electric Resistance Heating (n=81), 95% • Fixed Heat Pump Space Heating (n=550), 72% • Fixed Room Electric Resistance Space Heating (n=198), 1% (mean of 31%) Note: The demand factors reported from LBNL above are conservative. They are based on the maximum demand observed for the load over 15-minute time-steps, not on the nameplate rating, which was always higher than observed (typically 20% higher).
220.52	1581	582	Resolve Committee Statement: While it could certainly be true that there could be loads

			similar to kitchen and laundry rooms used in a bathroom there is not enough information provided by the submitter to understand if there is a true need to add to the additional load to the service and feeder calculations.
220.53	4144	583	TG 4, FR 10 Committee Statement: The demand factor for appliance loads is reduced from 75% to 30%, with no minimum number of loads required, based on analysis shared by Lawrence Berkely National Lab (LBNL) of sub-metering end-use data in 953 occupied US dwellings. LBNL observed the following median demand factors for existing appliance loads: • Hot tub (n=65), 34% • Pumps (n=107), 27% • Refrigerator/Freezer (n=708), 20% • Laundry Receptacles (n=92), 14% • Dishwasher (n=637), 13% • Clothes Washer (n=517), 12% • Kitchen Receptacles (n=1,063), 8% • Garbage Disposal (n=314), 5% Most appliances had observed demand factors well below 30%. Household appliances operated by occupants were amongst the load types with the lowest demand factors in the LBNL research. Note: The demand factors reported from LBNL above are conservative. They are based on the maximum demand observed for the load over 15-minute time-steps, not on the nameplate rating, which was always higher than observed (typically 20% higher).

220.53	4220	584	Resolve Committee Statement: Regardless of whether EVSE's are considered an appliance, inclusion in the list ensures proper application of the requirement.
220.54	1948	585	Resolve Committee Statement: The longstanding rule for both dryers and ranges (RE: 220.55) has been the two or more units, as presently stated. Balancing between phases becomes an option as soon as you have more than one unit. With two units, you can choose to apply one per phase or two per phase, but if two are applied per phase, the adder is necessary, unless the two loads are balanced, which is encouraged by the existing rule.
220.58 (220.54) (220.55)	**1947** 3651 3652	611 586 595	TG 4, FR 11 Committee Statement: The requirement related to loads connected between two phases of a 3-phase, 4-wire feeder or service is covered in two places (220.54 for clothes dryers, and 220.55 for ranges). Other power intense single-phase loads should apply the same requirement. Relocating to a new Section, and making the requirement agnostic to the load, ensures equal treatment for all loads.
220.54	4151	587	TG 4, FR 12 Committee Statement: The demand factor for clothes dryers is revised. The value of 80% is based on analysis shared by Lawrence Berkely National Lab (LBNL) of sub-metering end-use data in 953 occupied US dwellings. LBNL observed the following median demand factors for electric resistance clothes dryers:

			• Clothes Dryer (resistance) (n=574), mean of 64% demand factor (median of 77%) Additionally, nameplate ratings (when available) for clothes dryers are permitted to be used in lieu of the 5000 watt default. This is in response to newer technologies, such as heat pump clothes dryers, which have much lower electrical requirements than traditional electric resistance units. A minimum load of 5000 watts overestimates when these lower-powered clothes dryers are installed. These lower powered clothes dryers commonly use standard 120-volt receptacles, and as a result, replacement with higher powered, resistance clothes dryers, is not trivial and requires new electrical work. This First Revision also effects 220.14(B), reference First Revision XXXX, which removes references to 220.54 from 220.14(B). Lastly, requirements related to single-phase loads supplied by a 3-phase, 4-wire feeder or service, are relocated to a new Section 220.58, reference First Revision XXXX.
220.14(B)	-	-	TG 4, CI 5 Committee Statement: References to electric dryers, and the reference to 220.54, are removed from this section so that changes implemented in 220.54 do not impact dryers on an individual branch circuit. With this change, 5 or more dryers would no longer be supplied by an individual

			branch circuit with a diversity factor applied. The existing provision to require treatment of the dryer at the nameplate rating, or 5000 watts, whichever is greater, is now stated in 220.14 for the branch circuit.
220.54	463	589	Resolve Committee Statement: The title of this Section is consistent with other Sections in Article 220 regarding the use of the term "Dwelling" (and not including the phrase "In Dwelling"). The first sentence in 220.54 explains that the requirement applies to "…clothes dryers in a dwelling unit(s)…".
220.55	1056	590	Resolve Committee Statement Note 3 provides a method in lieu of that in Column C (as stated in the Title of Table 220.55 – "Column C to be used in all cases except as other permitted in Note 3"). If opting to use the provision in Note 3, a calculation is based on the demand factors in Columns A or B, as appropriate (based on the kW rating of the appliances). Adding the statement, as proposed, would create confusion, as it would imply that Note 3 method isn't an option (i.e., permissive rule), but a mandatory rule.
220.55	4160	600	TG 4, FR 13 Committee Statement: The demand factors in columns A and B of Table 220.55 overestimate cooking appliance loads on services and feeders; therefore, these values are revised to a maximum of 50%. All values currently less than 50% are unmodified. Consistent with this treatment at 50%, the Maximum Demands in Column C of Table 220.55 are reduced by 2 kW for one through

			five cooking appliances. The value of 50% is based on analysis shared by Lawrence Berkeley National Lab (LBNL) of sub-metering end-use data in 953 occupied US dwellings. Cooking appliances had very low demand factors across the population of dwellings analyzed, and the selected 50% value is conservative based on their results. LBNL observed the following median demand factors for electric cooking appliances: • Stove/Oven/Range (n=644), 28% • Microwave (n=404), 8% • Kitchen plugs (n=1,063), 8% Note: The demand factors reported from LBNL above are conservative. They are based on the maximum demand observed for the load over 15-minute time-steps, not on the nameplate rating, which was always higher than observed (typically 20% higher). The changes for service and feeder loads are not intended to impact branch circuit loads for cooking appliances. Yet, sections 220.11(C) and 220.14(B) both reference 220.55 for branch circuit load calculations. In order to avoid unintended impacts, Note 4 of Table 220.55 is revised so that one range is treated at the larger of either 8 kW or 80% of its nameplate rating. For clarity, Note 6 is also revised to point the user back to Note 4 for ranges. Lastly, requirements related to single-phase loads supplied by a 3-phase, 4-wire feeder

			or service, are relocated to a new Section 220.58 (refer to FR XX).
220.55	432	605	Resolve Committee Statement Note 3 provides a method in lieu of that in Column C (as stated in the Title of Table 220.55 – "Column C to be used in all cases except as other permitted in Note 3"). The wording in Note 3 is consistent with the Title of the table and conveys the correct usage of Columns A and B.
220.56	1005	610	Resolve Committee Statement: Current language includes "water heaters", which would include all water heaters, regardless of type. Including a specific type of water heater is unnecessary, and may lead to an incorrect conclusions that some types of water heaters are not covered by the requirement.
220.57	1439	612	Resolve Committee Statement: Although the informational note is informative and adds clarity to nameplate ratings, the continuous load requirements apply to the sizing of the conductor and overcurrent device, and not to load calculations.
220.57	3145	613	Resolve Committee Statement: While we find that there is merit to changing EVSE to Electric Vehicle Power Transfer System Equipment (EVPTSE) or (EVPTS), changing the heading is inconsistent with the rest of the code, including the content in art. 625. We recommend that this be done at a global level, either through the correlating committee or a PI in the next code cycle.

			Changes to allow the calculation to be based on the nameplate rating of the equipment, or 7200 watts if the nameplate is not available do not account for updates to the system where a larger EVSE may be installed. Reference to 625.42(A) and (B) is not necessary as 220.70 already permits the use of EMS and the required nameplate rating would include the information of 625.42(B)
220.57	750	615	Action: Resolve Committee Statement: Basing load calculations on amperes rather than watts or VA is inconsistent with other requirements throughout Article 220.
220.6 (NEW) (220.60)	 1261 1826 2049 3024 309 3996 4235 **4298** 83	 616 617 618 619 620 621 622 623 624	TG 4, FR 14 Committee Statement: Section 220.60 has been rewritten and restructured to clarify the determination and treatment of noncoincident loads. Requirements regarding the "125 percent of either the motor load or air-conditioning load, whichever is larger" was originally added to clarify that the value included application of the motor-operated and combination loads as specified in 220.11(A) (Refer to FR 8062-NFPA 70-2018; note that 220.11(A) was 220.18(A) in the 2020 NEC). Present wording is confusing, so rather than restate the requirement, the statement is revised to note that the largest noncoincident load treat the motor-operated and combination loads as specified in 220.11(A), thus maintaining the original intent of the requirement.

			List items were added to specify what is considered as noncoincident loads, with feeders and services maintaining the traditional usage of "two or more loads that are unlikely to be in use simultaneously", and a more rigorous requirement applying to branch-circuits, since those loads do not benefit from diversity of multiple loads. Section 220.60 is also relocated to Article 220, Part I (General), to allow the provision to apply to load calculation throughout Article 220, including branch-circuits in addition to feeders and services.
220.61(A)	1827	626	Recommend: Resolve Committee Statement: The requirement specifies that the neutral load is the maximum unbalance of the load. For line-to-line loads, there is no unbalance, and therefore text is unnecessary.
220.61(B)	**3071** 1540	627 628	TG 4, FR 15 Committee Statement: The 70 percent demand factor is relocated to sub-sections (1) and (2) for improved clarity.
220.7 (NEW) (220.57) (220.70) (220.70) (220.70) (220.82(B)) (220.83(B)) (220.83(A)) (220.84(C))	 4238 **3025** 4302 4357 4237 4491 4488 4498	 614 629 631 632 648 686 681 695	TG 4, FR 16 Committee Statement: Section 220.70 was relocated to Article 220 Part I to reinforce that a Power Control System can be used for load calculations throughout Article 220. The new 220.7 restructures the requirements into 5 sub-sections for clarity. Energy Management System (EMS) was renamed to Power Control System(PCS) to differentiate an EMS with overload control from an EMS without overload control. 220.7A refers to part II of article 750 which is the subject of a PI for CMP 13 to identify

			requirements for EMS with overload control functionality. Should CMP 13 not create part II, this action will need to be revisited. Chair note: The name of the EMS with overload control and the addition of part II in article 750 will be decided by CMP 13. During second revision CMP 2 will change the name of the system to align with CMP 13 and take action in reference to part II if necessary. A requirement was added that the setpoint shall be determined by “Qualified Personnel”. Chair Note: The requirement for qualified personnel to determine the setpoint should be in Article 750 Part II. This will be decided by CMP 13. If this is added in 750 Part II, it will be removed from this section in the second revision stage. PCS are intended to manage loads so the overcurrent protective devices (OCPDs) do not have to interrupt the circuit in response to an overload condition. In order to ensure this behavior, the setpoint must be no greater than 80% of the OCPD protecting the relevant circuits. This is not because PCS loads are continuous, but because a margin is required for any controller to adequately avoid OCPD interruption in an overload condition of any duration.

			Clarification was added on how to handle load calculations for PCS's that only monitor controlled loads (220.7(C)(1)), versus PCS's that monitor both controlled and non-controlled loads (220.7(C)(2)): Monitoring Only Controlled Loads - For PCS that only monitor controlled loads, the PCS manages the loads based on the operational current of only the loads that are monitored. In this scenario, the current setpoint of the PCS is used in place of a traditional load calculation for those loads, as the current setpoint of the PCS is effectively replacing the load. Monitoring Both Controlled and Non-Controlled Loads - For PCS monitoring both controlled and non-controlled loads, the PCS manages the load based on the operational current of the entire system. In this scenario, while the PCS has visibility of the entire system, it can only control a sub-set of loads. The minimum operational current of that sub-set of controlled loads establishes the current value used in place of a traditional load calculation for those controlled loads. The value is the lowest setting of the PCS, which may be 0 amps or some other value(s), depending on whether the PCS de-energizes or modulates the load(s) to limit the current.

			A sub-section was added to ensure requirements in Parts II – VII of this article are applied. As part of a separate First Revision, examples of load calculations with PCS's were added to Annex D. An informational note was added to this section to inform the user which examples to refer to.
220.82(D) (NEW) (220.82) (220.82(B))	 2282 3204	 634 645	TG 4, FR 17 Committee Statement: EVSE are becoming more commonplace and represent a significant load. As such, a new sub-section (D) is added to refer back to 220.57, which is the Section in 220 that provides requirements for calculating the load attributed to EVSE.
220.82(A)	2407	638	TG 4, FR 18 Committee Statement: New sub-section (D) is added to the requirement to align with First Revision XXXX (TG 4, FR 16).
220.82(A)	457	642	Resolve Committee Statement: The recommended revisions do not add clarity.
220.82(B)	1886 3067 **3239** 643 838	643 644 646 650 651	TG 4, FR 19 Committee Statement: In response to this data provided by Lawrence National Labs (Refer to Committee Statement related to First Revision in Section 220.41), the requirement of 3 VA per ft2 is reduced to 2 VA per ft2. Additionally, the treatment of the first 10 kW of load at 100% is reduced to 8 kW at 100%, based on analysis performed by Lawrence Berkely National Lab (LBNL) on sub-metering data from 942 occupied US

			dwellings. LBNL assessed the connected loads in these homes (based on observed maximum power demand for each branch circuit) and compared this with the metered maximum power demand for the whole dwelling. The report demonstrates that the 8 kW value leads to accurate load calculations in 95% of dwellings, where the predicted load is greater than the metered load. The 10 kW assumption performs similarly, while negatively impacting homes with fewer loads by overestimating their loads. Lastly, inconsistencies have emerged between 220.5(C) and 220.82(B)(1). The description of the floor area should match between these two sub-sections, but due to changes in 220.5(C), that alignment has been lost. Rather than repeat the text from 220.5(C), a reference to that sub-section is provided.
220.82(C)	4169	652	TG 4, FR 20 Committee Statement: Based on analysis reported by Lawrence Berkely National Lab (LBNL) of sub-metering end-use data in 953 occupied US dwellings, the following median demand factors were observed for existing space heating and cooling loads in dwellings: • Central Electric Resistance Heating (n=81), 95% • Air Handler (n=691), 79% • Central Cooling (n=376), 75% • Central Heat Pump (n=550), 72% • Room Cooling (n=8), 16% (mean of 33%)

			• Room Heating (n=198), 1% (mean of 31%) Consistent with these findings, the demand factors associated with space heating and cooling loads is revised. While the code does not differentiate between electric resistance room heaters and central electric resistance space heating (i.e., electric furnace), the report observed very different behavior between these load types, as described below: Central electric resistance space heating was often a very large load (10-11 kW) with very high demand factor (95%), while room heaters were small with very low demand factors. Requirements underestimate the load for central electric resistance space heating, treating it at 65%; therefore, a category of Central Electric Resistance Space Heating is added to 220.82(c), and it is clarified that items 4 and 5 apply to room heaters. Heat pump equipment had substantially lower demand factors, and for that reason will be treated at 75%. Ductless heat pumps (not differentiated above) had particularly low demand factors (mean 29%). Central Cooling behaved similarly to heat pumps. Backup resistance electric heat paired with heat pumps will be treated similarly to central electric resistance space heating at 100%. Finally, room heaters showed very low demand factors across the board, and for this reason, differential treatment based on the number of room

			heaters is eliminated, and the associated demand factors are lowered.
220.83	**3319** 3028 308 916 850 851 1234	670 654 667 678 683 688 697	TG 4, FR 21 Committee Statement: 220.83 differentiates when adding or not adding new HVAC equipment. This is not justified based on analysis of 8,529 individually sub-metered end-uses in existing dwellings reported by Lawrence Berkely National Lab (LBNL). Most new HVAC equipment added to dwellings contributes much less than 100% of its nameplate rating to dwelling maximum demand. In contrast, other loads are currently allowed to be added using 220.83 at 40%, but their contributions are substantially underestimated (for example, EVSE, water heaters and clothes dryers). LBNL also reported analysis of metering data from 9,093 existing Vermont dwellings that installed cold climate heat pumps. They observed only a 5% demand factor across this population of dwellings, with new heat pumps rated at an average of 3.6 kW, increasing whole dwelling maximum demand by only 0.2 kW. Consistent with these findings, 220.83 is revised as follows: • Differential treatment when adding new HVAC is eliminated, condensing 220.83(A) and 220.83(B) into a single section 220.83, with a single Table 220.83 for load percentages. • General lights and general receptacles loads are reduced from 3 to 2 va/ft2,

			consistent with other revisions (see 220.41). • Treatment of existing loads remains the same (first 8 kVA at 100%, remainder at 40%). • All new loads being added to existing dwellings is treated at a more conservative 50% demand factor, which is consistent with median values observed in sub-metering data for water heating, clothes dryers and a variety of HVAC loads. • Two notable exceptions are treated with higher demand factors of 80%—EVSE and Central Electric Resistance Space Heating—because sub-metering showed they were large loads with the highest demand factors. The treatment of new loads being added at 50% was evaluated by LBNL using the same sub-metering data, and they found that the proposed treatment at 50% resulted in conservative load predictions for 99% of branch circuits. Underestimates were most commonly due to the presence of EVSE and Central Electric Resistance Space Heating, hence their treatment at 80%. Lastly, Reference to 220.42 is unnecessary and has been removed. Response Message for PI 1234: Note that the PI does not appear to accurately capture the intended changes; therefore, it is unclear if the First Revision addresses the concerns identified by the submitter.
220.83(A)	873	685	Resolve

			The Public Input is incomplete, as it does not indicate what changes should be made to the text. Refer to the Regulations Governing the Development of NFPA Standards, clause 4.3.4.1(c).
220.84(A)	3073	690	TG 4, FR 22 Committee Statement: As presented in PI Committee Statement: Including this requirement will align the Section with the new Section 220.58.
220.84(A)	438	691	Resolve Committee Statement: The idea of adding an exception for these types of loads, similar to what is done in 220.84(A)(2) Exception, has merit. However, the proposed text relies on the phrase “simulated, engineered in-dwelling heating or air-conditioning system”, which is not defined or explained elsewhere in the Code. Additionally clarity is needed regarding this part of the proposed text before this exception could be added.
220.84(C)	3242	693	TG 4, FR 23 Committee Statement: Refer to Committee Statement related to First Revision in Section 220.41.
220.87	3303	701	Resolve Committee Statement: Extensive revisions have been made to Section 220.87; however, these revisions do not limit the provision to “other than dwelling units”. There is no justification for limiting the rule to “other than dwelling units”.
220.87	3320 1990 2855 349	702 699 700 712	TG 4, FR 24 Committee Statement: The language in 220.87 is unclear on the following items: (a) time-step for metered data, (b) duration of metered data, (c) metering hardware types,

			(d) treatment of loads being added or removed, and (e) operating conditions or occupancy during metering. Most of the details in 220.87 are embedded in the exception, resulting in a lack of clarity. A summary of changes include: • New section 220.87(A) specifying the requirements for determining and using existing load from metering data (addressing the unclear items identified above). While the method targets metered data in 15-minute time intervals, in dwellings, it allows use of adjusted 60-minute time intervals. This allowance for 60-minute data is important because it allows the nation's smart meter infrastructure to be used to generate load calculations for dwellings. These values are based on a study by Lawrence Berkely National Lab (LBNL), where 15-minute and 60-minute maximum demand were compared in the same 11,940 existing US dwellings. The adjustments in 220.87(A)(3), Exception, were designed around a 99% performance target, where actual 15-minute maximum demand exceeds the prediction in only 1% of dwellings. Without the adjustments, use of 60-minute data will under-predict actual demand. • New section 220.87(B) specifies treatment of loads being added or

			removed from the installation, as determined by either the nameplate ratings, or by application of the load applications in Parts III-IV of Article 220. • While the unit of measurement is changed from kilowatts to kVA, a sentence is added, similar to the one in 220.54 and 220.55, that indicates kVA shall be considered equivalent to kW. This ensures the existing unit of kW is still permitted in the revised text.
220.87	590	713	Resolve Committee Statement: Requirements for "Continuous and Non-Continuous Loads" were located in Article 220 in the 1996 and earlier editions of the NEC. For 1999, these requirements were relocated to Articles 210 and 215, as these requirements are associated with the sizing of the conductor and overcurrent device, and not the computation of the load. While some requirements in 220 may indicate a multiplier of 125%, it is not the intent to apply the 125% multiplier based on the load being considered "continuous".

Deleted:

2026 NEC® Public Input Task Group Report

CMP #	2		
TG#	4		
TG Chair	Robert Osborne		
TG Members	Irozenell Pruitt, Brett Larson, William Crist, Nehad El-Sheriff, Tyler Doering, Andy Kriegman, Arthur Libby, Andrew Kasznay, Vince DellaCroce, Brennan Less, James Frey, David Humphrey		
Article/Section	**Public Input #**	**PI Report Page #**	**TG Recommendation & Statement**
Annex D	4050	2	TG 4, FR 1 Committee Statement: Annex D examples D1 through D6, as well as Articles 210 and 220, are under the purview of CMP 2. CMP 2 has revised text under its purview to use consistent terminology for “Branch-Circuit Overcurrent Protective Devices”, which is a defined term. CMP 2 also chose to include a commonly used acronym for Overcurrent Protective Devices (“OCPD”) and then apply it in the body of the text. In the case of Article 210, this occurs with the first use of the term in 210.4(A), then the acronym is used throughout the rest of Article 210; for Annex D, this occurs with the addition of the acronym in the beginning of the Annex. This practice is permitted by Section 3.2.3 of the NEC Style Manual. Additionally, the term “Overcurrent Protection” is used; however it is not defined in Article 100. For clarity, an explanation of that term is included in the beginning of Annex D. TG Recommendation: Suggest that the Chair Report include a referral to CMP 10 to consider a new definition for Overcurrent Protection and

			including the "OCPD" acronym in the Article 100 definition for "Branch-Circuit Overcurrent Protective Device."
Annex D, Example D1(b)	3074	809	TG 4, FR 2 Committee Statement: In accordance with Section 220.5(A), calculations use 120 or 240 volts.
Annex D, Example D2(a)	3075 63	810 819	TG 4, FR 3 Committee Statement: In accordance with Section 220.5(A), calculations use 120 or 240 volts. Under Air Condition kVA Calculation, the value should be 1.44 kVA not 1.38 kVA. In addition, several appliances do not indicate a voltage, but the example include a calculation for a neutral load. To ensure clear understanding of the example, a utilization voltage is added for appliances where appropriate.
Annex D, Example D2(b)	3077 65	812 814	TG 4, FR 4 Committee Statement: In accordance with Section 220.5(A), calculations use 120 or 240 volts. In addition, several appliances do not indicate a voltage, but the example either include a calculation for a neutral load (assuming a 120/240 volt appliance) or do not include a calculation for a neutral load (assuming a 240 volt appliance). To ensure clear understanding of the example, a utilization voltage is added for appliances where appropriate.
Annex D, Example D1(a)	64 62	817 818	TG 4, FR 5 Committee Statement: In the example, the voltage for the range is not mentioned, but considering the calculation indicates a neutral load for the range, indicating it is rated 120/240 volts is appropriate. A similar revision is included to reflect that the dryer is rated

			120/240 volts (as it also indicates a neutral load in the calculation).
Annex D, Example D4(a)	66	820	TG 4, FR 6 Committee Statement: In the example, the voltage for the range is not mentioned, but considering the calculation indicates a neutral load for the range, indicating it is rated 120/240 volts is appropriate.
Annex D, Example D4(b)	67	822	TG 4, FR 7 Committee Statement: In the example, the voltage for the range is not mentioned, but considering the calculation indicates a neutral load for the range, indicating it is rated 120/240 volts is appropriate.
Annex D, Examples D14(a) – D14(b)	-	-	TG 4, CI 1 Committee Statement: Four examples are added to Annex D to aid in the application of the requirements related to Power Control Systems (PCS) included in the NEW Section 220.7. As a new provision in the Code, with multiple options, these examples are intended to ensure clear understanding of the requirement.

Objectives

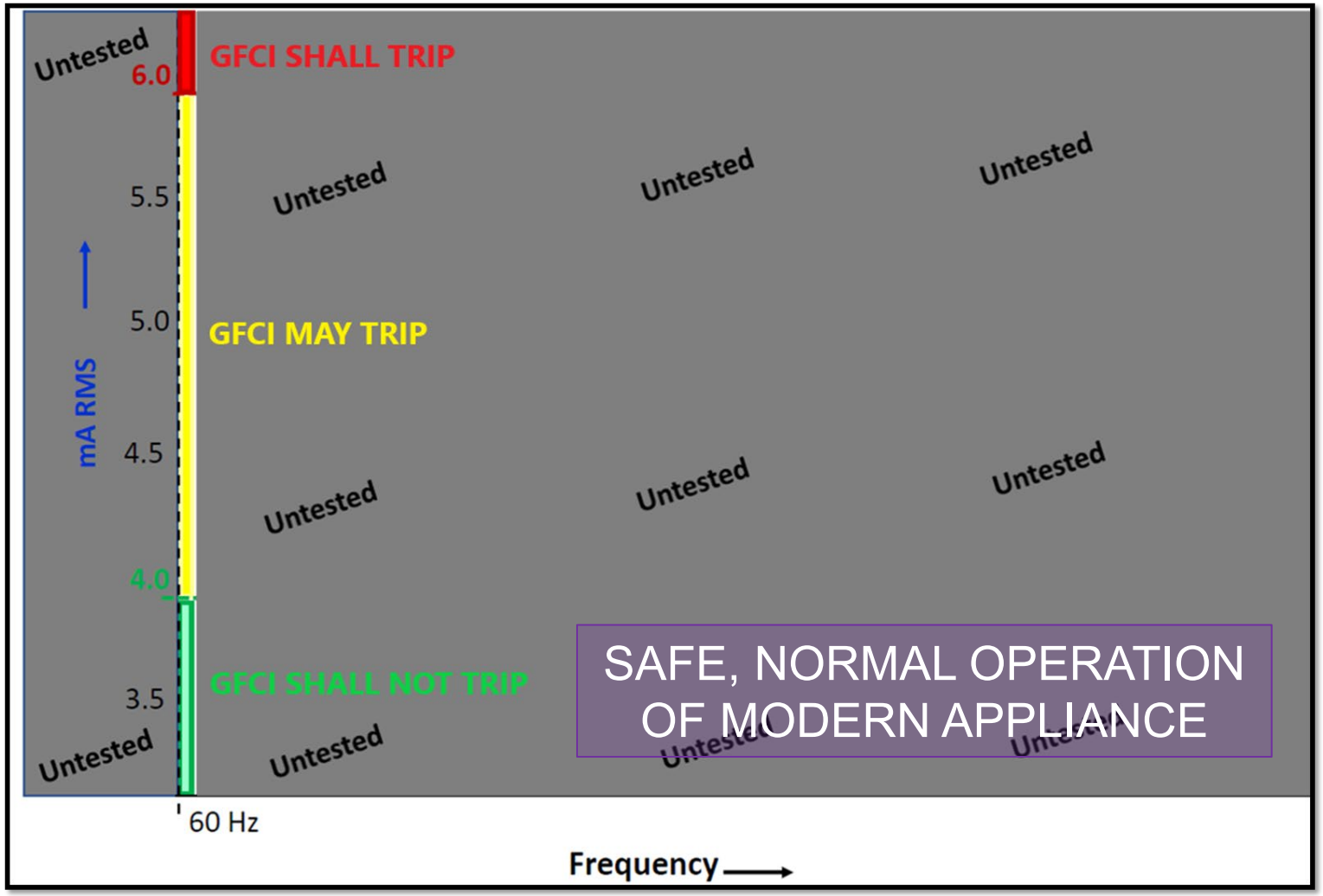
- Updates to UL GFCI standard
- Updates to UL appliance standards
- Solutions to nuisance tripping

GFCIs – Present state of UL 943

60Hz – mains frequency

REQUIREMENTS at 60HZ

Simple older construction appliances operate at 60Hz:
- Hair dryers
- Toasters
- Blenders



60Hz – mains frequency

NO REQUIREMENTS at higher frequencies

Modern, more complex, home appliances operate at 60Hz and higher frequencies:
- Refrigerators
- Cooking tops
- Air conditioners

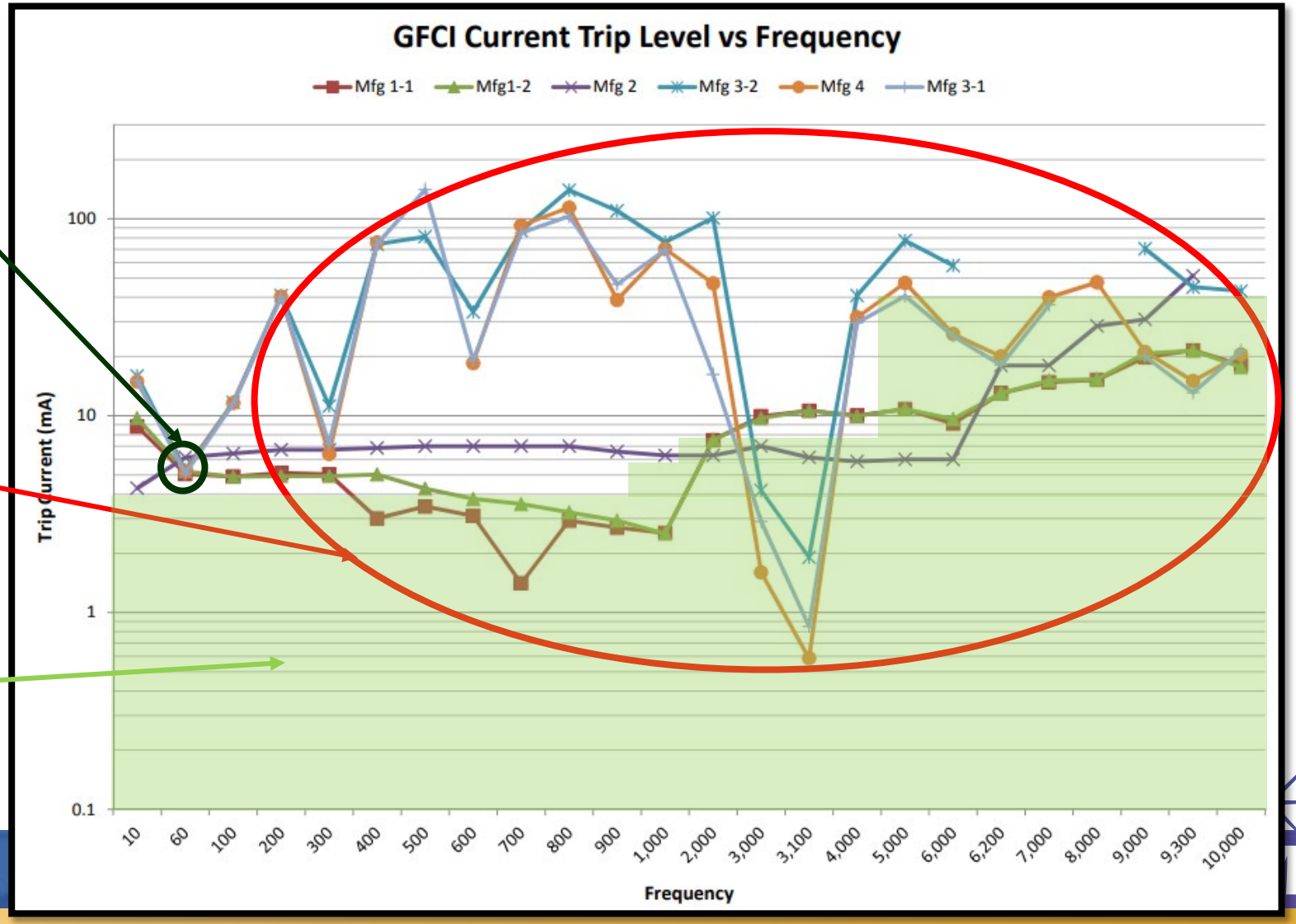
GFCI – Present state of UL 943

- Each GFCI manufacturer decides their own trip levels at high frequencies

- Standardized as per UL 943, appliance designers know what to expect in the field

- Non-standardized, up to individual GFCI manufacturers. Low trip thresholds cause nuisance tripping.

- No evidence of shock injuries from high frequency leakage



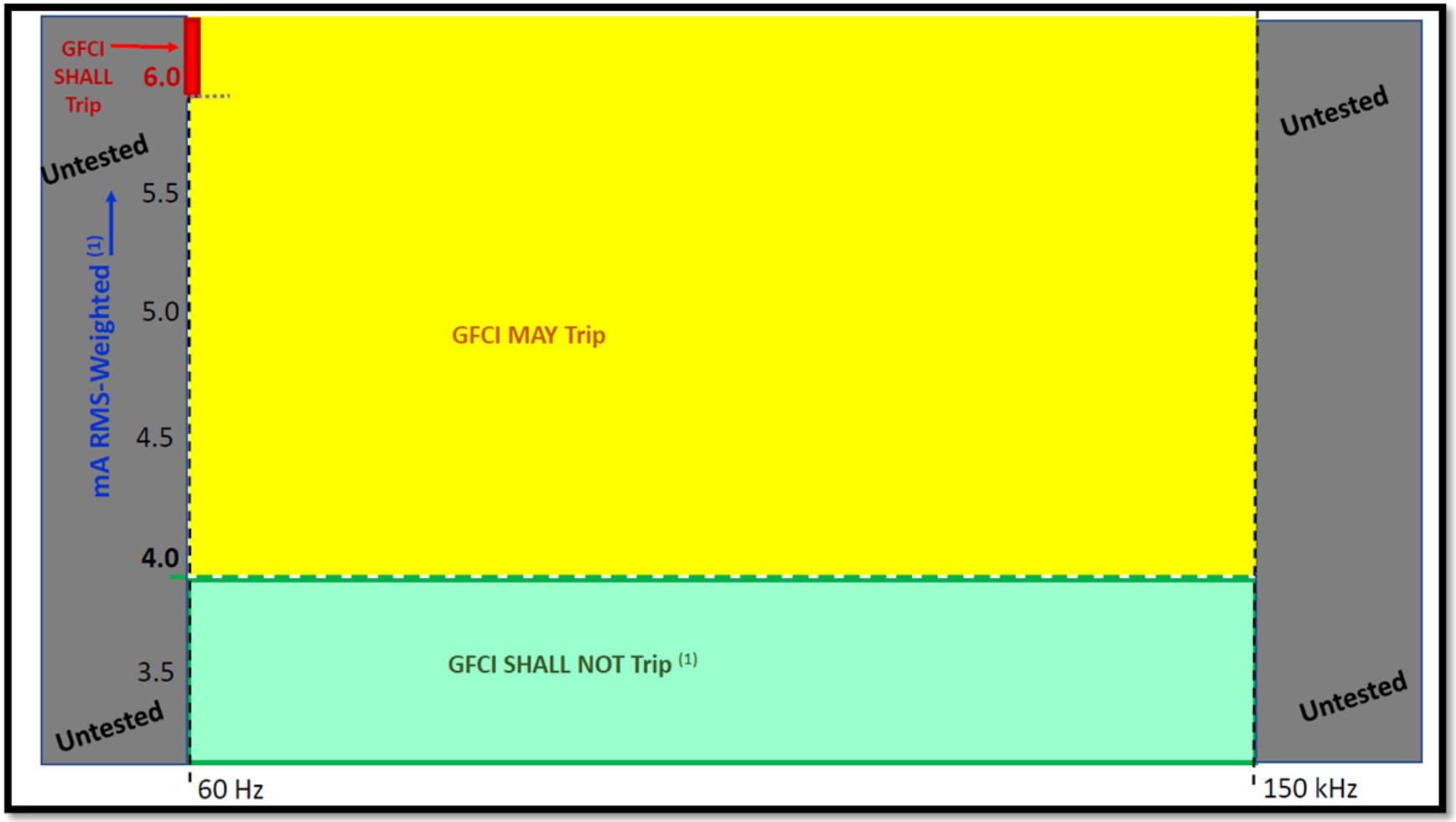
GFCI – UL study on nuisance tripping

- UL Solutions conducted compatibility testing on 3 appliances
  - Each appliance is a different type, from a different manufacturer
  - **All appliances were confirmed to be operating safely**
  - All appliances were operated normally after connection to 10 different GFCIs
  - **Nuisance tripping occurred on all 3 appliances**
  - The 3 appliances are representative of 70+ models that are “essentially identical” as defined by DOE

- crc.ul.com/app/library/33905

GFCI – Future state of UL 943

- UL 943 working group developed requirements for Class A-**HF**



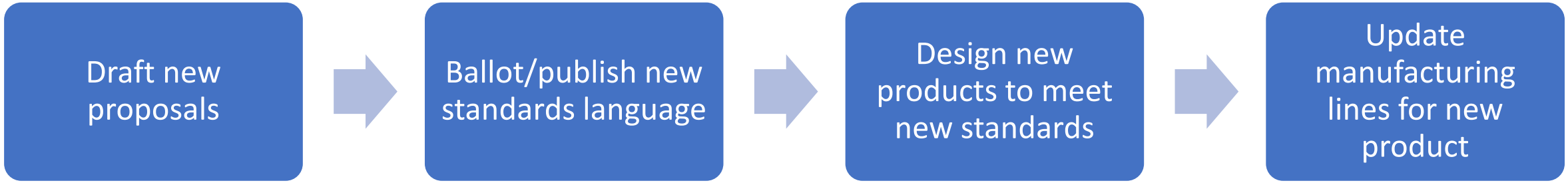
- Will start first step of UL standards process (preliminary review) in next couple months

Appliance – Present state of standards related to nuisance tripping

UL 858 – published electric range green zone requirements at 60Hz, goes into effect in 2025

UL 101 – test developed and published to measure high frequency leakage from appliances, help keep appliances in the green zone for 60Hz + high frequency

More work needs to be done in appliance standards:



CMP2 actions to prevent GFCI nuisance tripping

- Vote for Class A-HF even though it is not ideal solution (PIs 4308 and 4315)

> **Ground-Fault Circuit Interrupter, High Frequency (GFCI).**
>
> *A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when the frequency weighted differential current exceeds the values established for a Class A-HF device. (CMP-2)*
>
> *Informational Note: See UL 943, Standard for Ground-Fault Circuit Interrupters, for further information. Class A-HF ground-fault circuit interrupters do not trip when the frequency weighted differential current is less than 4 mA.*

  - If you would like to see **high frequency REQUIREMENTS** for Class A GFCIs, apply to 943 Technical Committee: safetyscience.my.site.com

- Neither optional Class A-HF or modernized Class A requirements are in place today for GFCIs
  - NEC needs to account for nuisance tripping and provide relief until one of these solutions is in place (PIs 4070 and 4107)

Thank you!

2026 NEC First Revision – CMP 2

PI’s 4070, 4107

SIEMENS

GFCI – PI 4070

Seeks to add an exception for refrigerators and HVAC given certain conditions

- Claims a “technological incompatibility” between appliances and GFCI
  - MA data shows a different story.
    - Data includes reports but does not require investigation
    - 1,868 total instances reported as of January 3, 2024, regardless of product type
    - HVAC: only 1 instance (heat pump)
    - Refrigerators: 22 instances
      - 3 appliance models, representing 13 of the 22 instances, were tested with no issues found.

GFCI – PI 4107

Seeks to add an exception for ranges, ovens, and microwaves given certain conditions

- Claims a “technological incompatibility” between appliances and GFCI
  - MA data was analyzed around the specific appliances identified in the PI.
    - Data includes reports but does not require investigation
    - 1,868 total instances reported as of January 3, 2024, regardless of product type
    - Microwave ovens: 5 instances
    - Ovens and Ranges: 1,780 instances (95.3% of total reported instances)
    - 1,441 instances from a single appliance manufacturer
      - 77.1% of all reported instances
      - 81.0% of oven/range reports

- Claims GFCIs trip on safe appliances
  - 60 Hz leakage current well in excess of 30mA was found in lab evaluations
  - 4 of the instances in the MA data were evaluated on site
    - All demonstrated >35mA leakage current at 60 Hz (enough to stop a person’s breathing)
    - Oven was run on a conventional circuit breaker for 20 minutes → <1mA leakage current after this burn-in
      - 1,297 instances from a single appliance manufacturer involve 2 specific heating/bake elements (90.0%)

GFCI - Conclusion

- Public safety is compromised by PI's 4070 and 4107

- The MA data does not confirm any "technological incompatibility".
  - 60Hz leakage current is a hazard, not a nuisance.

Please do not remove a layer of electrical safety.
Resolve PI's 4070 and 4107
Do not push out the expiration date of the Exceptions in place (PI 3619, 4203).

ACBMA

American Circuit Breaker Manufacturers Association

Headquartered in Washington DC, the ACBMA is an association of American manufacturers of circuit breakers to represent and promote the mutual interests of American circuit breaker manufacturers in areas of codes and standards, applications, safety, and education. Members of the Association include:

ABB

Eaton Corporation

Siemens Industry, Inc.

Square D/Schneider Electric

Accept PI's 3372, 3379, and 3380

(Submitted by Keith Waters on behalf of ACBMA)

- Support AFCI expansion to additional 15/20A 120V circuits
  - PI 3372 Attics
    - Mississippi attic fire example details
  - PI 3379 Garage Door Openers
  - PI 3380 Bathrooms
    - Fan testing information (K. Waters)
  - Circuits easily identified for enforceability
    - Branch circuit wiring travels through multiple areas of a dwelling.
  - Supports CMP-2's continual & gradual expansion since initial 1999 AFCI introduction

PI 3372- Addition to 210.12 (B) - Attics

- Key Substantiation Items
  - Interoperability Testing for Attic Fans
    - New testing covered 5 different fans from 5 different manufacturers
      - Conditions: in a humidity chamber of 120Vac, and +54C (+130F)
      - 3 different NEMA manufacturers of dual function circuit breakers were → none tripped
  - The detailed Fire Marshal's report on the 7 fatalities from a 2020 Attic fire in Clinton, MS was reviewed.
    - Report stated the fire started in the attic.
    - The only ignition source was the electrical wiring.
    - There was wiring missing from the ignition point.
      - This indicates damage to wiring from either overload or arcing fault.
      - An overload would have tripped the overcurrent protection device.
    - Fault was most likely an arcing fault.
  - 4600 Fires per year occur in the Attic
    - Average of 10 fatalities, 70 injuries, & $194M in home damages
  - Since 1/1/2020, the Commonwealth of Massachusetts has required AFCI protection on all 15A & 20A receptacles without any reports of tripping on circuits feeding the attic.
    - 21,349 Single Family + 26,578 Multi-Family = 47,927 residential permits 1/1/2020 thru 12/31/2022 per NAHB. The data will be higher after 2023 data is included.

PI 3380 - Addition to 210.12 (B) - Bathrooms

- Key Substantiation Items
  - Interoperability Testing for Bathroom Fans
    - Expanded interoperability testing of bathroom fans in a humidity chamber was conducted during May and June. The testing covered 11 different fans from 6 different manufacturers utilizing Conditions of 120Vac, +32C (+90F), and Relative Humidity 20% - 93%. The fans were a mix of types including those with lighting, humidity sensors, and ECM motors. Three different manufacturers of current dual function circuit breakers were used and none of the devices tripped. Similar tests were run on 5 Radon Fans without any tripping of the dual function circuit breakers.
  - 2300 Fires per year occur in the bathroom leading to an average of 10 fatalities, 50 injuries, & $48M in home damages.
  - Since 1/1/2020, the Commonwealth of Massachusetts has required AFCI protection on all 15A & 20A receptacles without any reports of tripping on circuits feeding the bathroom. *21,349 1-2 Family & 26,578 Multi-Family for a total of 47,927 residential permits 1/1/2020 thru 12/31/2022 per NAHB. . The data will be higher after 2023 data is included.*

PI 3379 - Addition to 210.12 (B) – Circuits feeding garage door opener

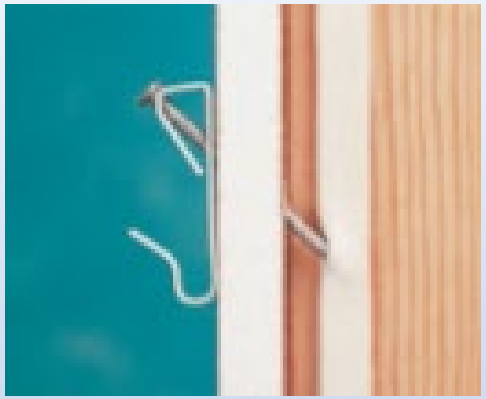
- Key Substantiation Items
  - Interoperability Testing for Garage Loads
    - The industry still has questions on specific loads, but none of the concerns are around the garage door opener.
    - This load uses typical motors seen utilized without issue in other parts of the AFCI protected branch circuits.
    - The addition of this protection would help in reducing garage fires and be another incremental step by CMP 2 to improve electrical safety.
  - 6600 garage fires
    - Average of 30 deaths, 400 injuries, and $457M in property loss
    - Electrical malfunction is a major contributor to the number with an annual average of 1590/yr. and 10 deaths per year.
    - Reduction of these fires is needed.
  - Since 1/1/2020, the Commonwealth of Massachusetts has required AFCI protection on all 15A & 20A receptacles without any reports of tripping on circuits feeding the garage.
    - 21,349 One and Two Family + 26,578 Multi-Family = 47,927 residential permits 1/1/2020 thru 12/31/2022 per NAHB. . The data will be higher after 2023 data is included.

Confirming: ACBMA recommends

- Support AFCI expansion to all 15/20A 120V circuits, or…continue gradual AFCI expansion to additional 15/20A 120V circuits

  - PI 3380 – bathrooms
  - PI 3372 – attics
  - PI 3379 – circuits supplying garage door openers

Questions?



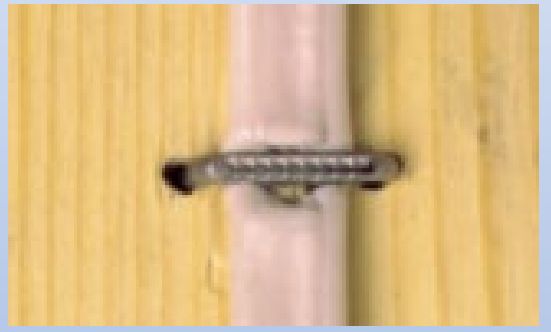
- Also…
  - Visit ACBMA website: www.acbma.org
  - Visit NEMA's AFCI website: www.afcisafety.org
  - Contact any of the ACBMA manufacturers:

ABB

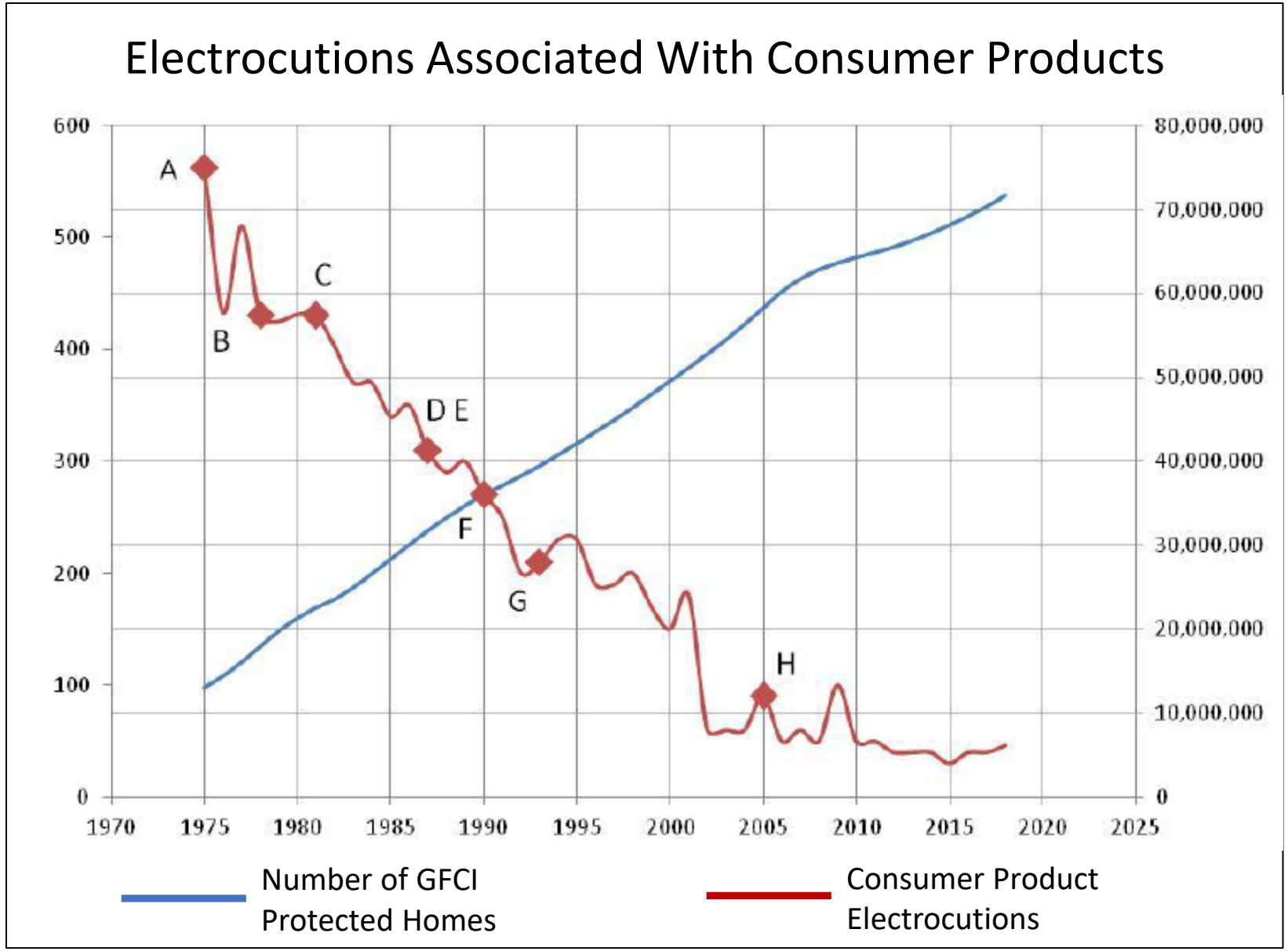
Eaton Corporation

Siemens Industry, Inc.

Square D/Schneider Electric



ACBMA® American Circuit Breaker Manufacturers Association



GFCIs: Required Locations

- **A** Bathrooms (1975)
- **B** Garages (1978)
- **C** Spas and Hot Tubs (1981)
- **D** Kitchens (1987)
- **E** Unfinished Basements (1987)
- **F** Crawlspaces (1990)
- **G** All Sinks (1993)
- **H** Laundry/Utility Rooms (2005)

Source: GFCI Protection in Homes Versus Electrocutions 1975 to 2018 (Source: A NEMA Ground Fault Personnel Protection Section Article entitled “GFCI Receptacles: Consumer Protection Personified” June 2020, Revision 2)

Home Fires Caused by Electrical Distribution and Lighting Equipment – *NFPA*

RESEARCH

HOME FIRES CAUSED BY ELECTRICAL DISTRIBUTION AND LIGHTING EQUIPMENT

Supporting Tables

February 2022
Richard Campbell

Table 1. Home Structure Fires Involving Electrical Distribution and Lighting Equipment by Year

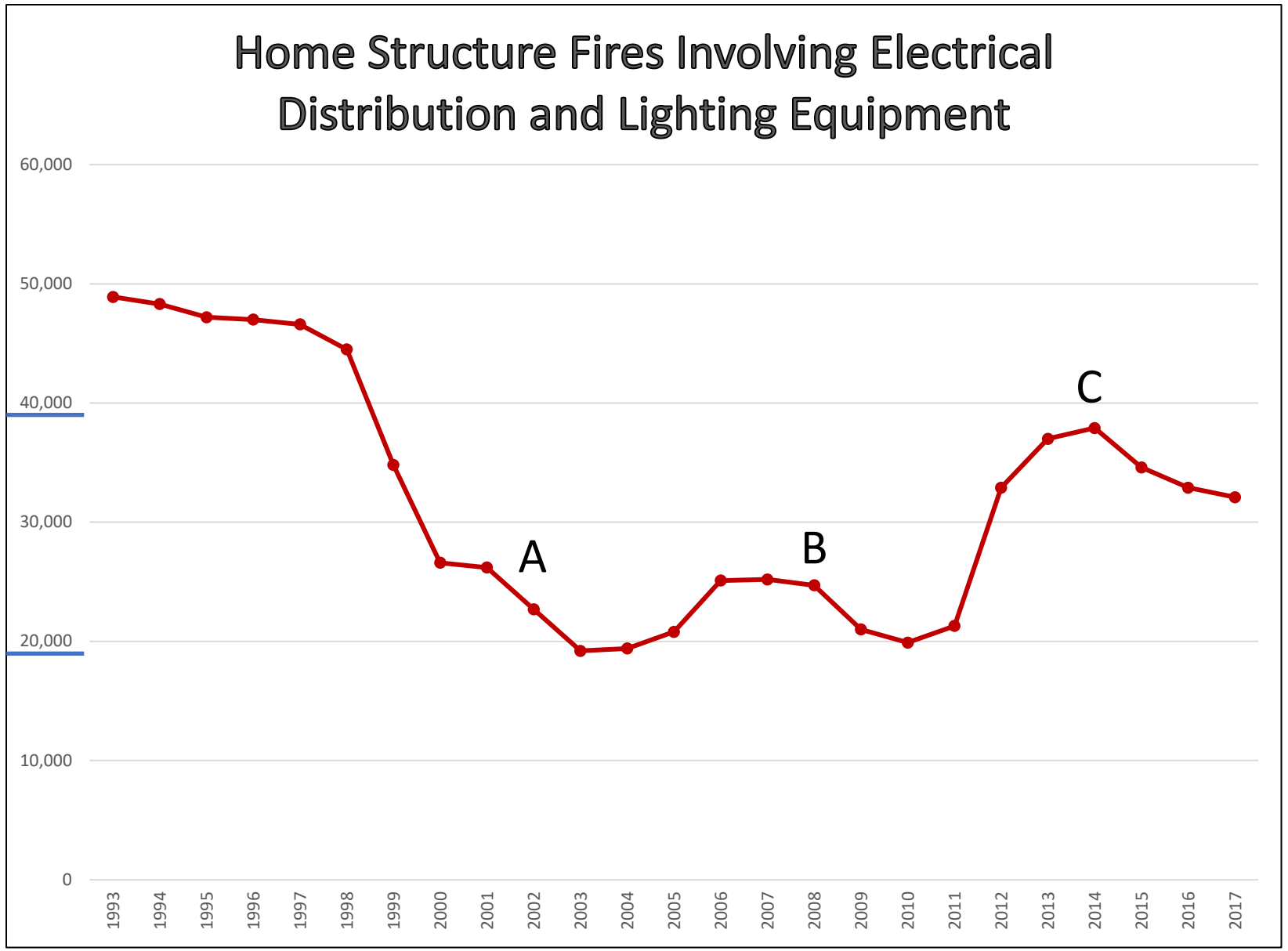
Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage	Direct Property Damage in 2019 Dollars
1980	68,400	523	1,650	$493	$1,532
1981	62,300	553	1,500	$459	$1,289
1982	60,900	408	1,820	$519	$1,374
1983	56,700	500	1,570	$548	$1,406
1984	54,800	445	1,520	$549	$1,349
1985	56,500	470	1,400	$720	$1,709
1986	54,300	717	1,420	$597	$1,394
1987	51,600	522	1,580	$512	$1,152
1988	53,400	439	1,720	$715	$1,547
1989	47,900	610	1,500	$642	$1,325
1990	47,400	438	1,540	$683	$1,338
1991	49,000	354	1,890	$958	$1,798
1992	46,400	403	1,770	$617	$1,125
1993	48,900	418	1,900	$818	$1,448
1994	48,300	464	1,640	$714	$1,233
1995	47,200	489	1,650	$775	$1,300
1996	47,000	470	1,560	$839	$1,369
1997	46,600	352	1,580	$865	$1,378
1998	44,500	363	1,370	$843	$1,324
1999	34,800	183	530	$806	$1,237
2000	26,600	122	1,130	$631	$938
2001	26,200	436	1,030	$717	$1,036
2002	22,700	166	700	$593	$843
2003	19,200	320	600	$698	$971
2004	19,400	292	840	$623	$844
2005	20,800	498	1,060	$858	$1,124
2006	25,100	366	840	$776	$984
2007	25,200	274	1,050	$663	$817
2008	24,700	515	880	$964	$1,146
2009	21,000	318	1,000	$935	$1,114
2010	19,900	242	980	$774	$909
2011	21,300	295	840	$822	$936
2012	32,900	292	1,250	$1,326	$1,478
2013	37,000	601	1,290	$1,418	$1,555

Table 1. Home Structure Fires Involving Electrical Distribution and Lighting Equipment by Year (Continued)

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage	Direct Property Damage in 2019 Dollars
2014	37,900	535	1,290	$1,433	$1,546
2015	34,600	461	1,020	$1,136	$1,226
2016	32,900	562	1,120	$1,020	$1,088
2017	32,100	343	850	$1,661	$1,733
2018	32,100	437	1,160	$1,336	$1,360
2019	29,800	333	1,160	$1,255	$1,255

Note: Figures in parentheses exclude confined fires, which are fires reported as confined to a fuel burner or boiler, chimney or flue, cooking vessel, trash, incinerator, or commercial compactor. These are national estimates of fires reported to US municipal fire departments and so exclude fires reported to only federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of a small number of unusually serious fires. Fires are rounded to the nearest hundred, civilian deaths to the nearest one, civilian injuries to the nearest ten, and direct property damage to the nearest million dollars. Figures for 1980–1998 are based on ignition factors 54–55 and reflect a proportional share of the home fires with ignition factor unknown, unreported, none, or blank. Figures for 1999 and later reflect a proportional share of the home fires with factor contributing to ignition as unknown, reported, none, or blank. Because of low participation in NFIRS Version 5.0 during 1999–2001, estimates for these years are highly uncertain and must be used with caution. Inflation adjustment to 2019 dollars was calculated using the Consumer Price Index.

Source: NFIRS 5.0 and NFPA's fire experience survey.



Source: Home Fires Caused by Electrical Distribution and Lighting Equipment: Supporting Tables, Feb. 2022, NFPA
Note: Because of low participation in NFIRS Version 5.0 during 1999-2001, data from these years is not considered reliable.

AFCIs: Required Locations

A Bedrooms (2002)

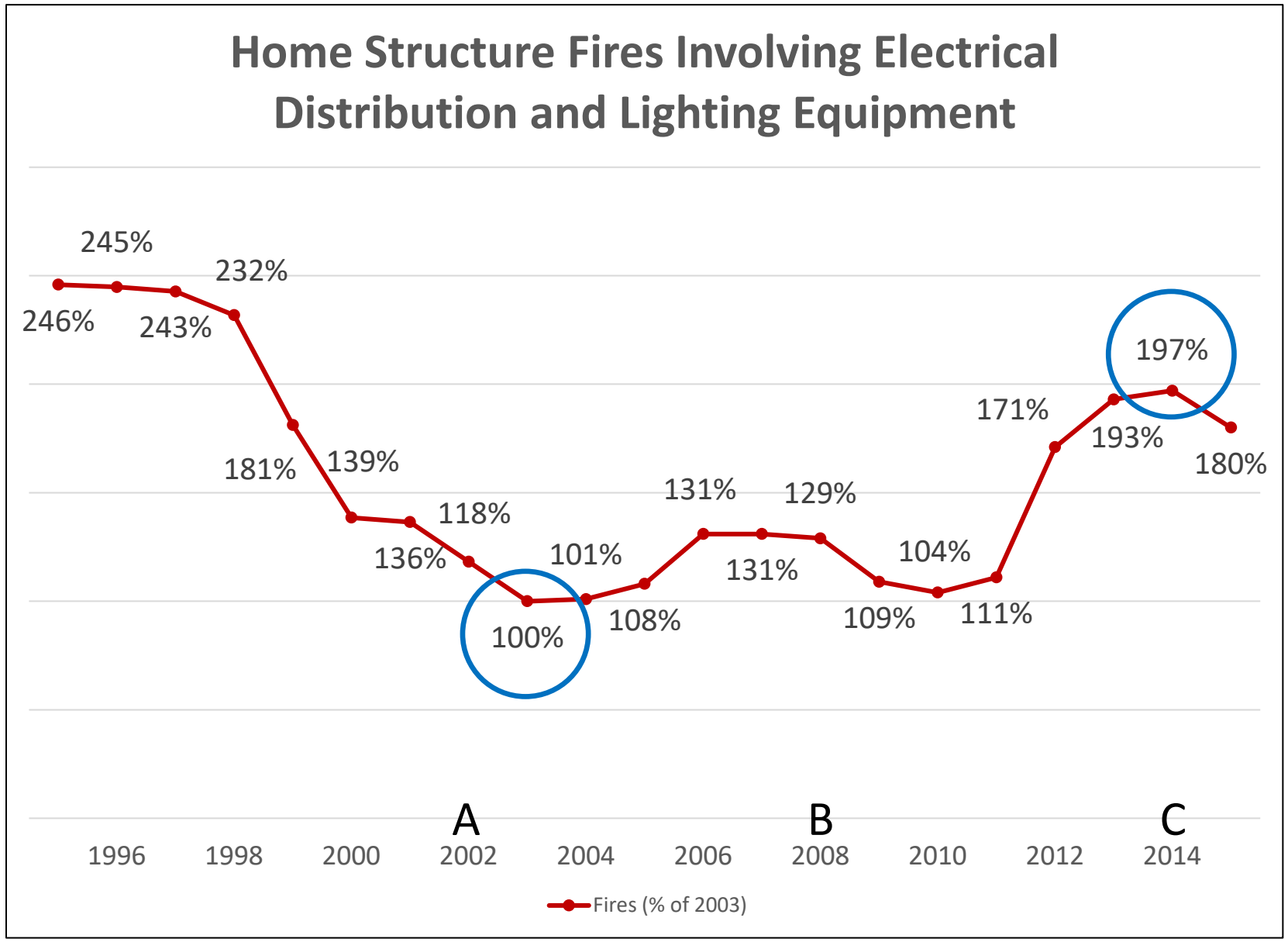
B Family rooms, dining rooms, living rooms, parlors, libraries, dens, sunrooms, recreation rooms, closets, hallways similar rooms or areas (2008)

C Kitchens, laundry areas (2014)

2003: Approx. 6 million AFCI devices installed*

2023: 10s of millions

* Presentation to CPSC on 9/23/2003



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Public Input No. 3155-NFPA 70-2023 [Section No. 210.12(B)]

Presented by:

Merton Bunker, PE - Merton Bunker & Associates

Steve Rood – Legrand Pass & Seymour

On behalf of: Arc Fault Circuit Interrupter Wiring Device Joint Research and Development Consortium

USFA Residential Building Electrical Malfunction Fire Trends (2012-2021)

Fires, deaths, injuries and dollar loss

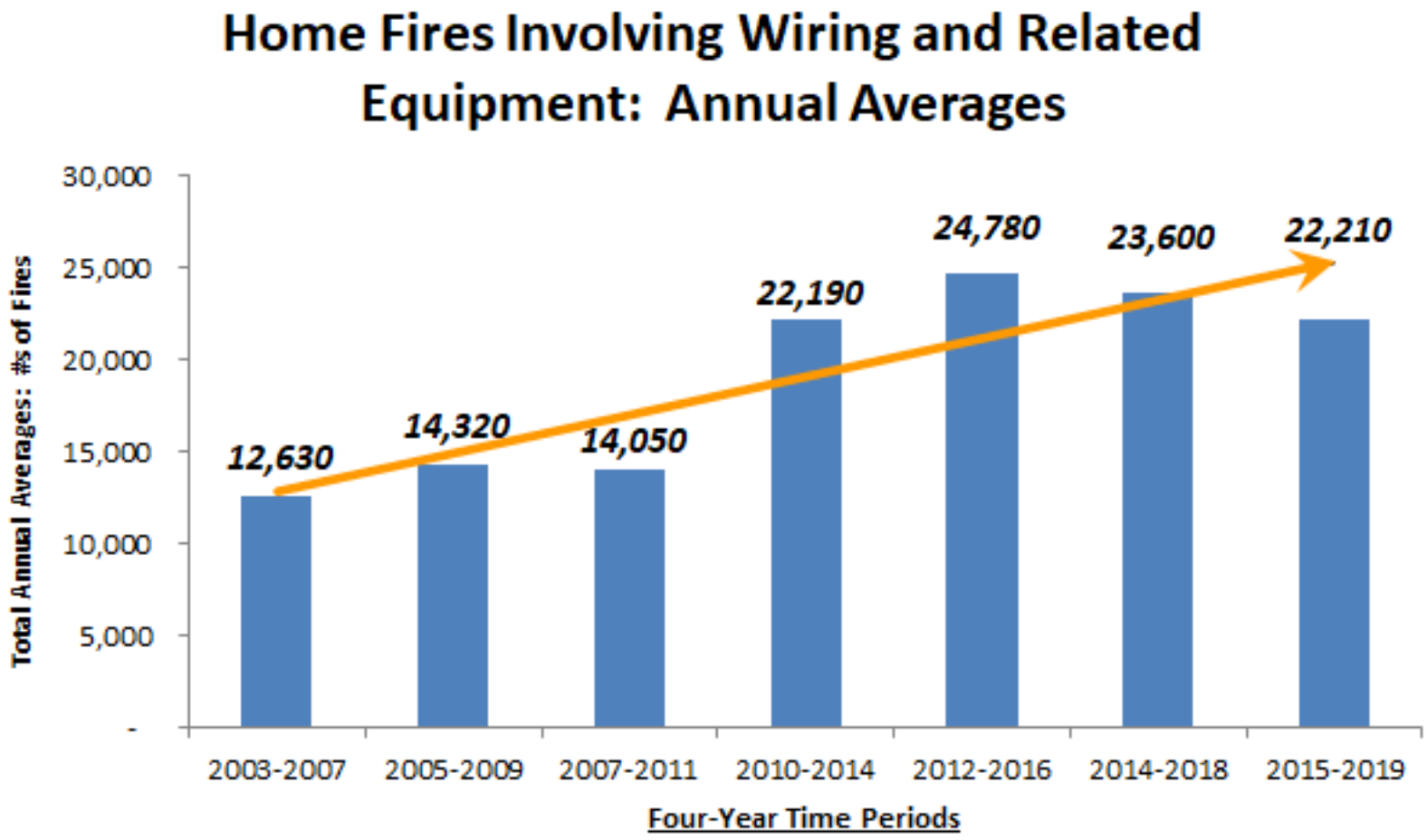
Fires | Deaths | Injuries | $ Loss

Residential building electrical malfunction fires

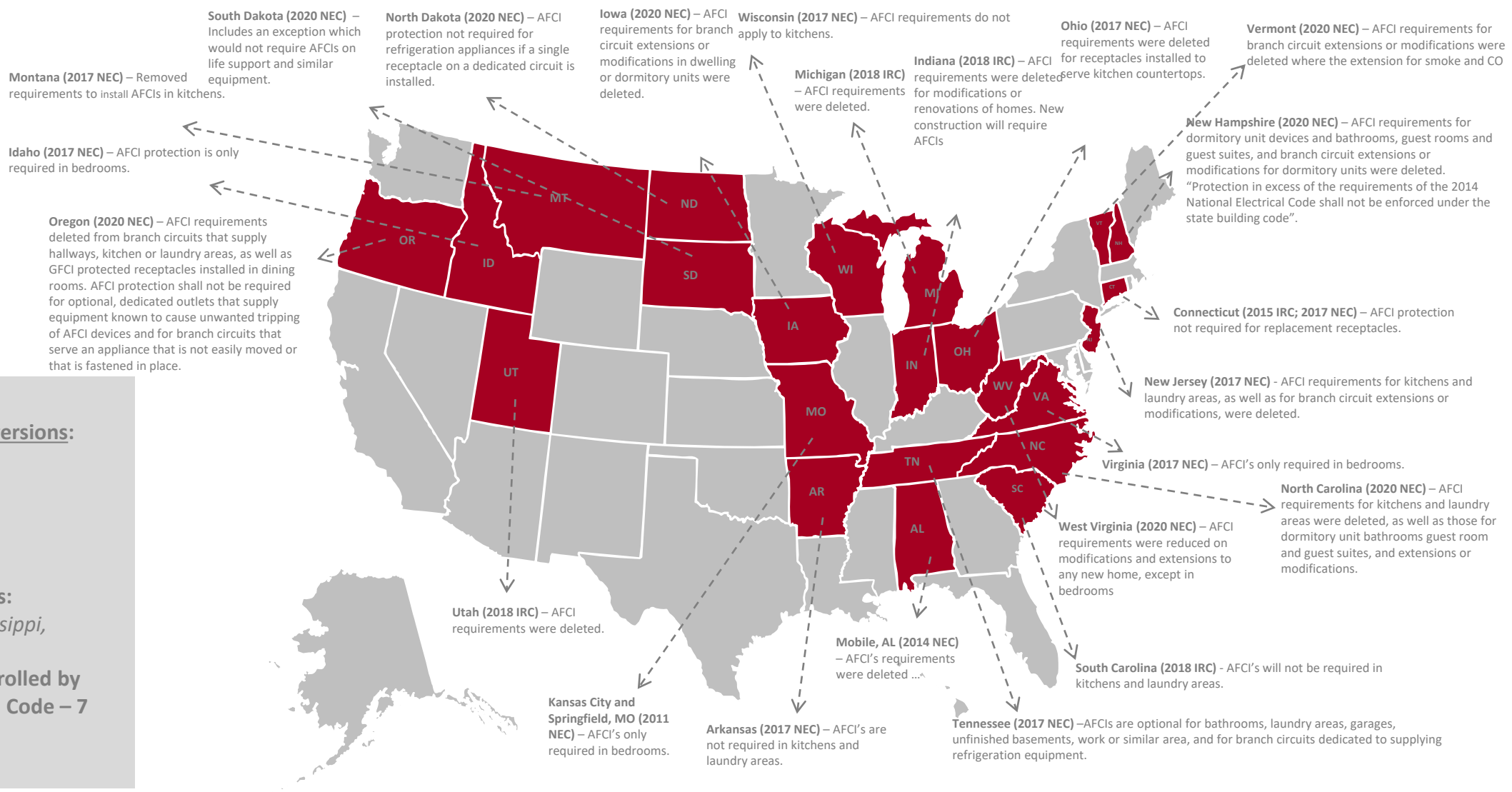
View data in a table | Download chart

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Fires	20,200	23,100	23,900	24,500	23,500	24,100	25,700	24,200	23,400	24,200

National Fire Protection Association Fire Data (2003-2019)



Overview of AFCI Requirements: 20 states and 3 major municipalities have made amendments to reduce the AFCI requirements. Below is a summary of the changes that have been made:



Overview of NEC adopted versions:

- **2023 NEC – 2 States**
- **2020 NEC – 17 States**
- **2017 NEC – 17 States**
- **2014 NEC – 1 States**
- **2008 NEC – 1 States**
- **Local Adoption – 5 States:** *Alabama, Arizona, Mississippi, Missouri and Nevada.*
- **AFCI Requirements Controlled by International Residential Code – 7 States**

AFCI Manufacturers Changing Trip/No-Trip Criteria

- Individual manufacturers' proprietary AFCI trip/no-trip criteria change frequently with limited or no notice.
- This is an impossible task for appliance manufacturers, requiring hundreds of companies (which are constantly designing new consumer products) to check-in with at least eight companies, just to obtain AFCI specs.
- Development of AFCI trip/no-trip criteria are not collaborative but rather proprietary; appliance manufacturers MIGHT only be consulted if proprietary problems in the field have arisen.
- Until all AFCI trip/no-trip criteria are defined in the consensus standard, UL 1699, AFCI expansion is premature whether in the 2026 or previous Codes.

AFCI and Nuisance Tripping Research Study

Dr. Steven W. Schmidt
Dr. Xi Lin
East Carolina University

August 15, 2023

2023 Research Study Overview

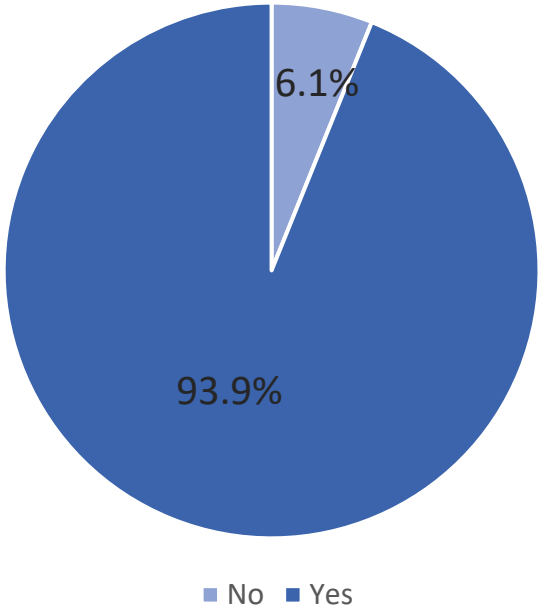
The purpose of this study was to investigate residential electricians' experience in the field with arc fault circuit interrupters (AFCIs) and nuisance tripping. This study was designed to build on the 2020 AFCI study.

This study was conducted to examine a variety of issues surrounding the use of AFCIs and nuisance tripping, including the following:

- Frequency of nuisance tripping, troubleshooting, and solutions
- Costs (time and money) associated with nuisance tripping
- Electricians' perceptions of AFCIs and nuisance tripping
- Customers' perceptions of nuisance tripping
- Customer safety and protection

Source: AFCI and Nuisance Tripping Research Study; Schmidt & Lin; East Carolina University August 2023

Have you ever experienced nuisance or unwanted tripping of AFCIs and/or Dual Function AFCI/GFCIs on residential projects?

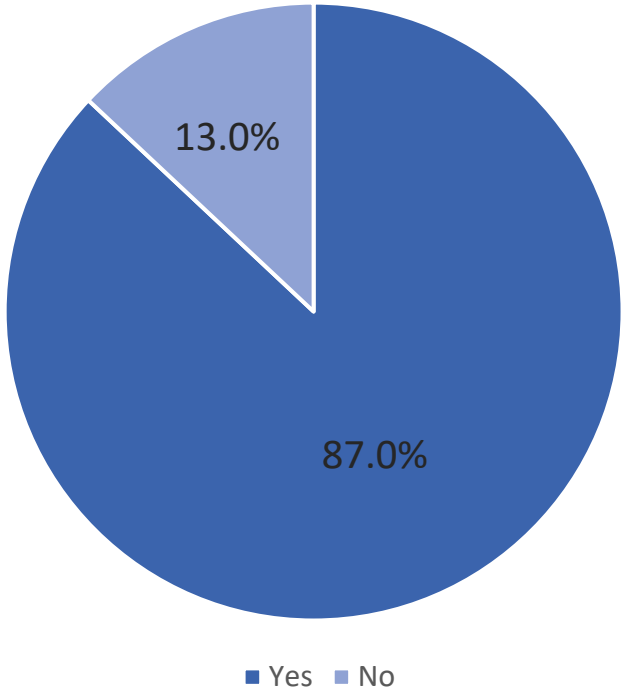


Most respondents have experienced nuisance tripping.

- **Yes: 93.9%**
- No: 6.1%

Source: AFCI and Nuisance Tripping Research Study; Schmidt & Lin; East Carolina University August 2023

Are you aware of anyone ever replacing an AFCI or Dual Function AFCI/GFCI Breaker with a standard circuit breaker to resolve the nuisance tripping issue?

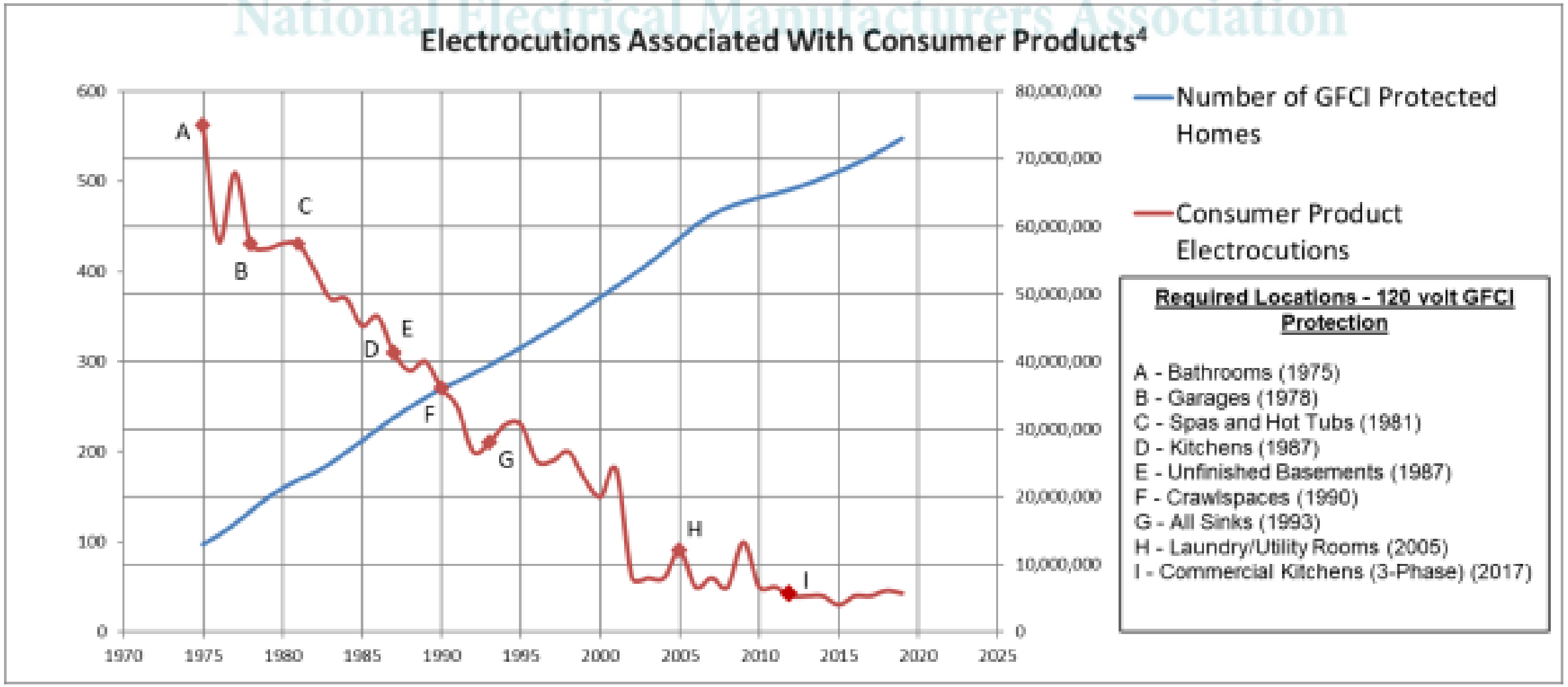


Most respondents knew someone who had replaced an AFCI breaker with a standard breaker. This percentage is consistent with that from the 2020 survey (83 percent).

- **Yes: 87%**
- No: 13%

Source: AFCI and Nuisance Tripping Research Study; Schmidt & Lin; East Carolina University August 2023

Electrocutions decline with expansion of GFCI protection



AFCI Nuisance Tripping Research Study Findings

- The major problems with nuisance tripping are as follows:
  - More technologically advanced appliances do not work well with the AFCIs being installed in the home.
  - Rewiring/rework projects on existing homes, whereby new AFCIs are added to existing wiring systems.

Source: AFCI and Nuisance Tripping Research Study; Schmidt & Lin; East Carolina University August 2023

AFCI Nuisance Tripping Research Study Findings

- **In the past year,** respondents worked on an average of 45 residential projects
  - 34% of these projects (15 of 45) experienced AT LEAST ONE issue with nuisance tripping
  - 87% of those projects (13 of 15) required at least one call-back
  - 18% of the projects (8 of 45) experienced TWO OR MORE issues with nuisance tripping
  - 88% of those projects (7 of 8) required two or more call-backs

- Note that the 8 projects that experienced TWO OR MORE issues with nuisance tripping are counted in the 15 projects that included at least one nuisance trip.

Source: AFCI and Nuisance Tripping Research Study; Schmidt & Lin; East Carolina University August 2023

AFCI Nuisance Tripping Research Study Findings

- Most respondents agreed that safety was the main benefit of AFCIs.
- Only 23% of respondents believed the benefits of AFCIs outweighed the problems associated with them.
- Overrun costs for replacing AFCIs are still a major concern for electricians.
- There is agreement that AFCI technology is improving, but not improving fast enough.

Source: AFCI and Nuisance Tripping Research Study; Schmidt & Lin; East Carolina University August 2023

AFCI expansion could inadvertently lead to a reduction in GFCI protection.

Please support PI 3155

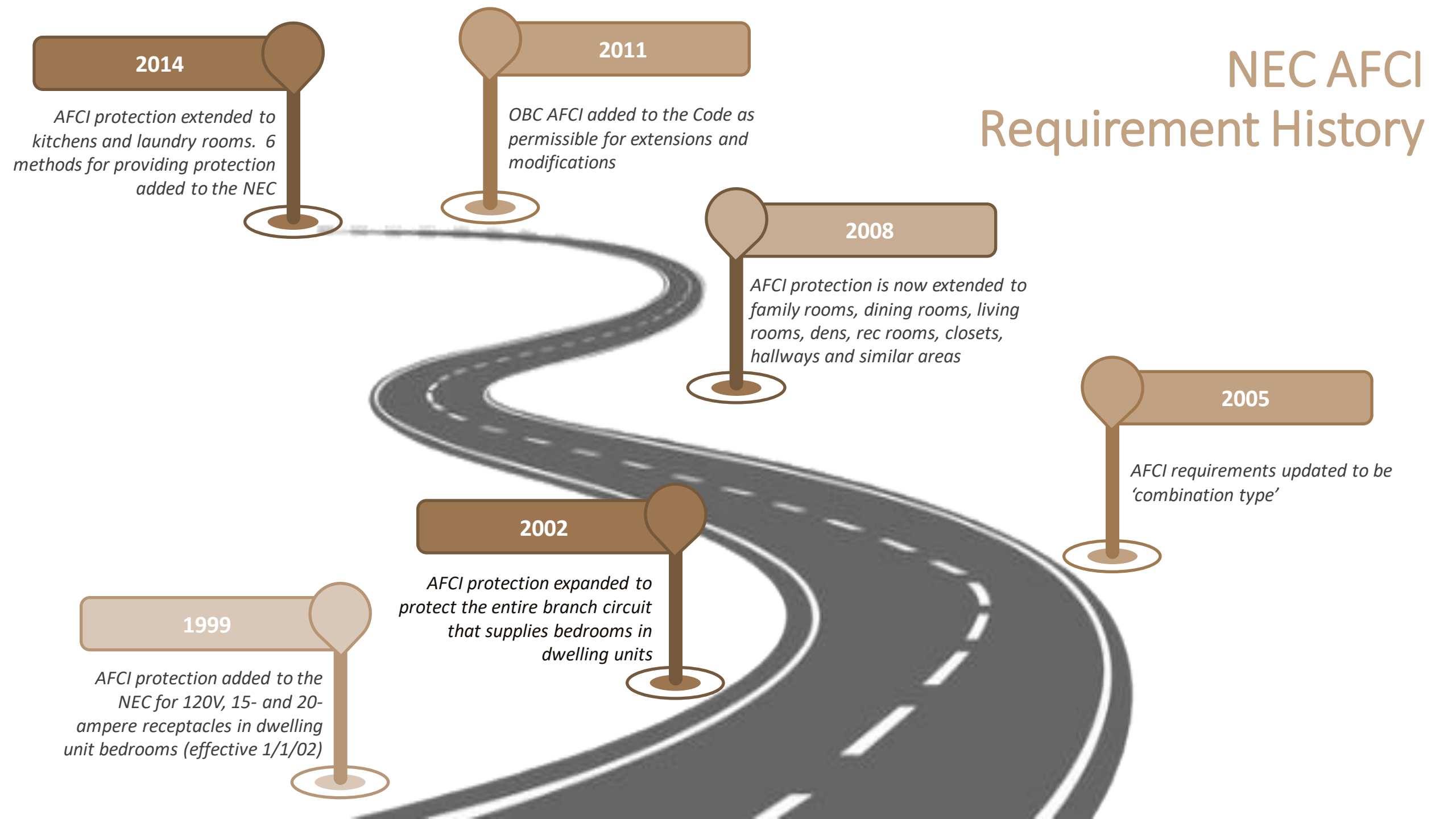
Addition of a ***New, Viable*** OBC AFCI Installation Method - PI #2794

John Kovacik - Retired Principal Engineer from UL after 49 years of service. Served on NEC Correlating Committee and CMPs 10, 12, 13, 15 and 20; NFPA Standards Council and UL Corporate Fellow

Mark Earley - Retired Chief Electrical Engineer from NFPA after 33 years of service; Editor-in-Chief of 11 editions of the NEC Handbook and former UL Electrical Council Member

Don Talka - Retired Senior Vice President and Chief Engineer from UL after 42 years of service. Served on CMPs 15 (Chair) and 20; NFPA Standards Council and UL Corporate Fellow

NEC AFCI Requirement History



2014

AFCI protection extended to kitchens and laundry rooms. 6 methods for providing protection added to the NEC

2011

OBC AFCI added to the Code as permissible for extensions and modifications

2008

AFCI protection is now extended to family rooms, dining rooms, living rooms, dens, rec rooms, closets, hallways and similar areas

2005

AFCI requirements updated to be 'combination type'

2002

AFCI protection expanded to protect the entire branch circuit that supplies bedrooms in dwelling units

1999

AFCI protection added to the NEC for 120V, 15- and 20-ampere receptacles in dwelling unit bedrooms (effective 1/1/02)

Six Existing Installation Methods for Providing AFCI Protection per NEC 210.12(A)

Use of a listed combination-type AFCI installed to provide protection of the entire branch circuit	Valid installation method	✓
Use of a branch/feeder-type AFCI OCPD	No longer available on the market	✗
Use of a supplemental AFCI OCPD in combination with a AFCI receptacle	Supplemental AFCI OCPDs never made it to the market	✗
An OBC AFCI receptacle, as the first outlet, in combination with a listed OCPD, if the combination is identified as 'system combination-type AFCI'	There is no standard developed, and no progress on development, for a 'system combination-type AFCI' since this method was first introduced	✗
An OBC AFCI receptacle, as the first outlet, in combination with a listed OCPD, if the home run is type MC, AC or metal raceway	Vast majority of new construction utilizes type NM cable	✗
An OBC AFCI receptacle, as the first outlet, in combination with a listed OCPD, if the home run is encased in concrete	Vast majority of new construction utilizes type NM cable not buried in concrete	✗

Dwelling Locations Requiring AFCI Protection

Public Input

- Public Input #2794 ***lays out an additional method*** to installers for providing AFCI protection to homeowners via the use of an OBC AFCI
- Eight conditions are required for the use of this new method, ***ensuring equivalent protection*** is delivered to homeowners
- This Public Input offers installers a ***real, and immediately available,*** alternative to the present installation methods

Eight conditions are required for use of this added OBC method:

- The home-run is unspliced and untapped from the OCPD to the OBC AFCI
- Home-run length is a maximum of 50’ (for 14AWG) and 70’ (for 12AWG) copper conductors
- First outlet is to be marked
- The utility transformer has a minimum rating of 25kVA
- The use of ferromagnetic conduit is prohibited
- Service length from the transformer to the service equipment is limited to 125’ (for 3/0 aluminum) or 75’ (for 1/0 aluminum)
- The branch circuit OCPD is only allowed to be a listed single-pole thermal magnetic breaker
- The use of high magnetic trip breakers is prohibited

Technical Concerns Addressed

OBC AFCI Research History

Research

While I was working at UL, I commissioned the research surrounding this issue so that the CMP could make ***educated*** decisions. The research shows the safety of this method

The research, when taken along with other studies, can provide a ***valuable tool*** to assist in the decision-making process

Due to time elapsed and changing CMP rosters, it is important to re-visit the key findings of the research which show this method ***ensures equivalent protection***

- Risk deals with the ***probability*** of an event happening vs. the consequences of the event happening
- The NEC is a risk-based code with ***multiple examples*** of installations where low-level risk was found to be acceptable (panelboards installed on unheated exterior walls is a good example)
- The current methods for providing AFCI protection provides some ***low-level of risk***; this proposal does ***not increase risk*** to the NEC
- UL research shows that there is an ***extremely low probability*** of an installed NM cable run to transition into a parallel arcing fault**
- UL research* shows the following equation defines the parameters for a circuit breaker to protect the homerun:

$$I_{mag} < \frac{0.8\, V_{rms}}{2\rho_L L + R_c + \left(\frac{V_{rms}}{I_{pssc}}\right)}$$

  - This equation is based on cable length, available current at the panelboard and the magnetic trip levels of the circuit breaker
- Section 210.12(E) considers an AFCI receptacle, installed at the first receptacle, as ***proving equivalent protection*** to a listed combination type AFCI breaker.
  - 210.12(E) applies to old construction, where it can be assumed, has lower available fault current than what's required in this PI. The panel decided the "risk" was acceptable. In new construction, with higher available fault current, the "risk" is even lower
- It is ***time*** to accept this PI

*UL Solutions, *Evaluation of Run Lenth and Available Current on Breaker Ability to Mitigate Parallel Arcing Faults, Part II: Effect of Run Length with 500A Available at the PanelBoard, 2012*
**https://code-authorities.ul.com/wp-content/uploads/sites/40/2015/02/Investigation_of_Damage_and_Degradation_of_NM_Cables.pdf

2026 NEC First Revision – CMP 2

PI’s 2794, 3786, 4163

SIEMENS

AFCI – PI 2794

Seeks to add another means of protection similar to 210.12(A)(4) but removes the listing requirement in 210.12(A)(4)(d)

- Additional requirements compared to 210.12(A)(4)
  - Minimum rating for the transformer (minimum 25kVA)
  - Service conductor cannot be installed in ferro-magnetic conduit.
  - Service conductor <=125 ft
  - OCPD “shall not be a circuit breaker identified as high magnetic trip”
    - Key point for home run protection

- Problems that would result in reduced safety
  - A listed OCPD may not be sufficient to provide protection to the home run circuit.
    - “Identified” is a defined term related to product evaluation.
    - No standards or industry guidelines to define “high magnetic trip”
    - 15 & 20A single pole circuit breakers with instantaneous trip points from 140A to 600A
      - commonly available but not marked in any way as “high magnetic”

AFCI – PI 3786

Seeks to add another means of protection that includes an ADA-compliant type requirement

- Copies 210.12(A)(4) but leaves out the listing requirement in (d)
  - *"The combination of the branch-circuit overcurrent device and outlet branch-circuit AFCI shall be identified as meeting the requirements for a system combination-type AFCI and listed as such."*
  - Cannot piecemeal ADA requirements in the NEC
    - US Department of Housing and Urban Development covers these requirements.
  - Access via stairs should not be a reason to eliminate a listing requirement for safety.

AFCI – PI 4163

Seeks to include AFCI protection for all 10, 15 & 20A branch circuits in dwelling units

- Support expansion of AFCI to improve electrical safety in dwelling units

AFCI - Conclusion

- Public safety is compromised by PI's 2794 and 3786
  - Listing requirements ensure that products meet appropriate standards and has been tested and found suitable for a specified purpose.
  - Removing the listing requirement decreases electrical safety.

Please do not remove a layer of electrical safety.
Resolve PI's 2794 and 3786

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U.S. DEPARTMENT OF ENERGY

Background for Proposed Changes to Dwelling Unit Load Calculations

By: Brennan Less (bdless@lbl.gov)

LBNL Residential Building Systems

2024-1-18

Download these slides here!!!

Who Are We and What Are Our Goals?

- Team
  - National lab researchers working on behalf of the US DOE
  - Other partners including practitioners, consultants and utility/government partners

- What did we do?
  - Reviewed Section 220 for barriers/challenges to existing dwelling electrification
  - Analyzed load data to understand dwelling power demand
  - Submitted 17 PIs to Section 220
  - Participated in Task Group 4

- Our Goals
  - Clear and safe electrical load calculations for dwelling units being electrified
  - Accurate, scalable electrical load calculations using nation’s smart meters

What Data Did We Use?

- **Whole dwelling 15- and 60-minute maximum demand data**
  - 11,750 existing US dwellings
  - 2.7 years per dwelling
  - 32,000 dwelling-years of data

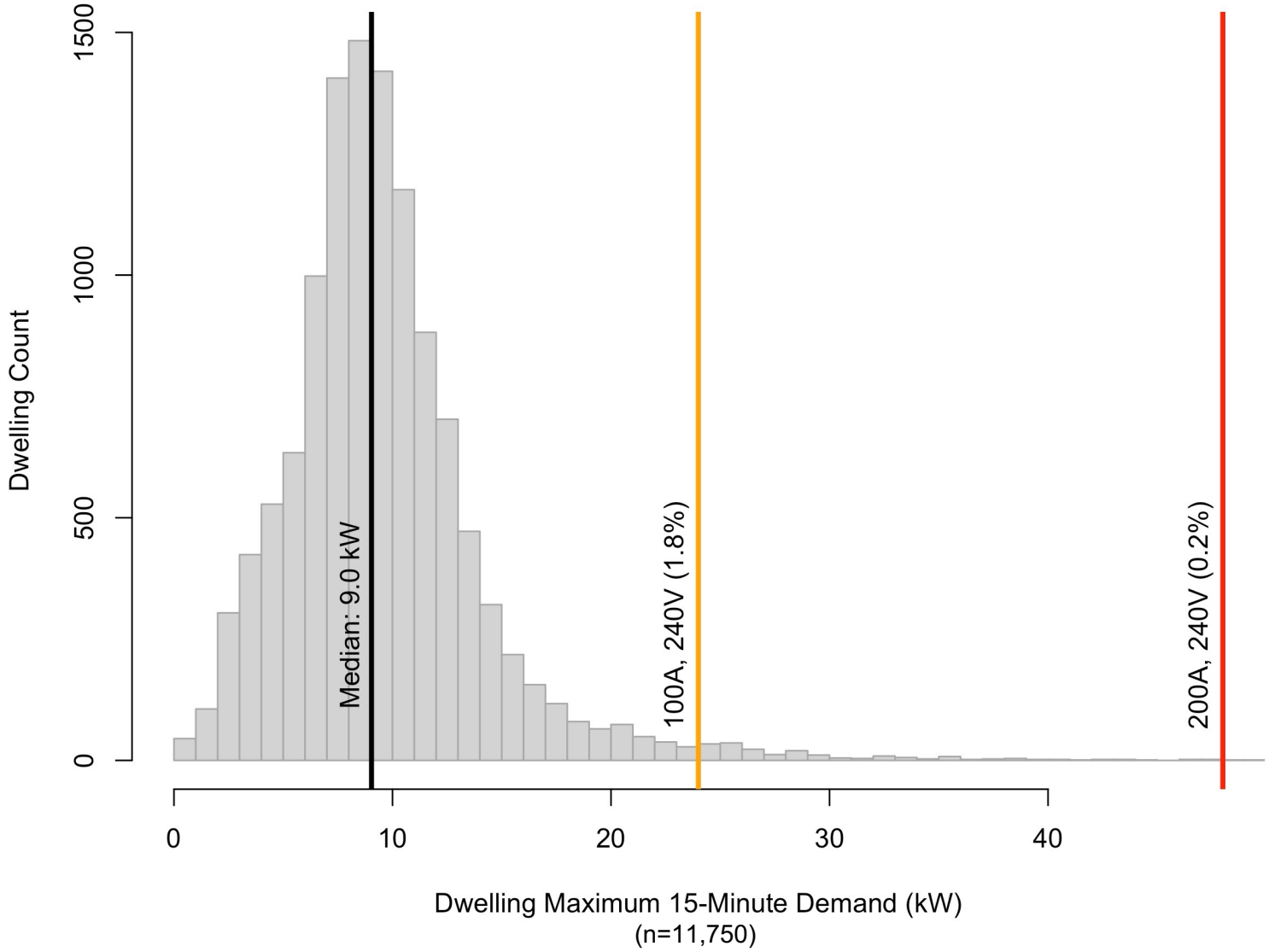
- **End-use sub-metering 15-minute data**
  - 957 existing US dwellings
  - 9,490 branch circuits
  - 3.5 years per dwelling
  - 3,376 dwelling-years of data

- **Lighting audit data**
  - 2,053 existing US dwellings

- States include: **TX**, CA, NY, CO, OR, WA, ID, MT, **VT**
- Housing types: **Single-family**, multi-family and manufactured

High-Level Learnings for Services and Feeders

- Most dwellings have LOTS of capacity for new loads
- New loads add at <100%
- Lots of load diversity (40-50%), increases with more connected loads
- Never do more than four loads operate at or near 100% together
- Appliance maximum power draw < nameplate ratings
- Existing Load vs. New Load demand factors are different



* 10 CFR 430.32(dd))

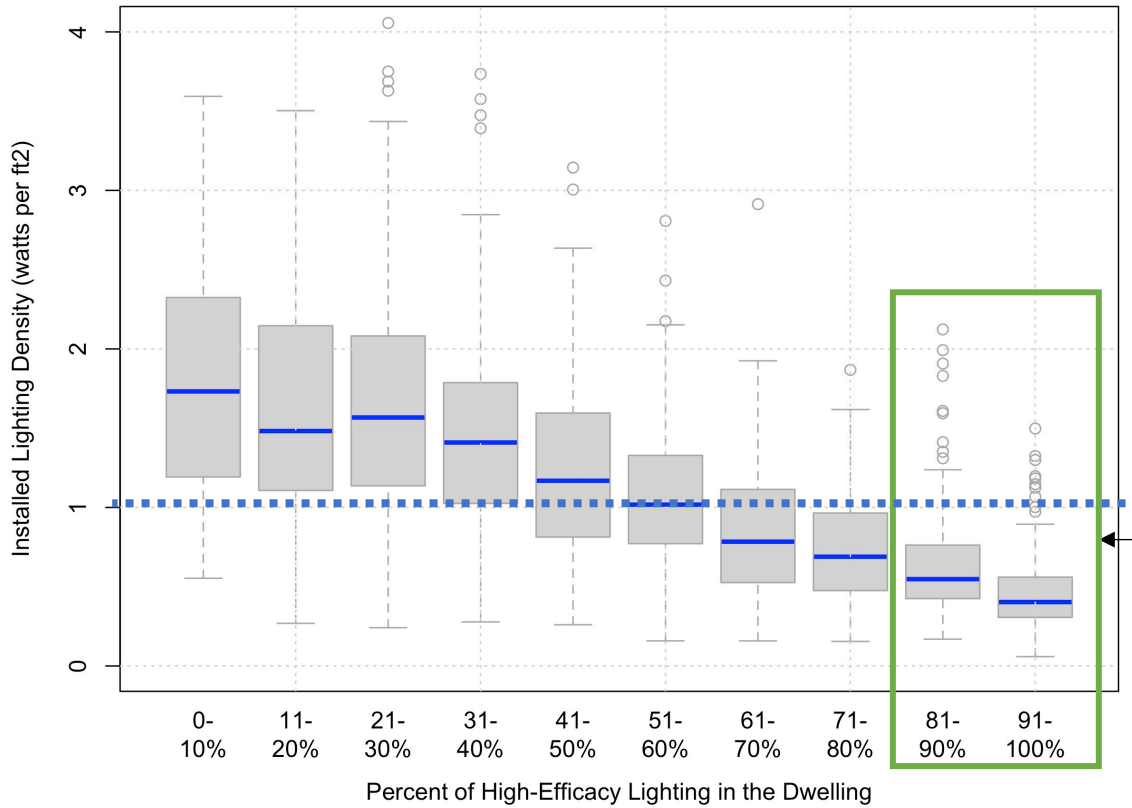
Lighting Density—220.41

- **Propose**: reducing 3 to 2 VA/ft^2 throughout 220

- Federal regulation* has banned sale of low-efficacy General Service Lamps
- Lighting density is reduced in dwellings with LEDs and CFL

Lighting audit data from 2,053 NEEA RBSA dwellings

Median =
52% high-efficacy
1.03 w/ft^2



As regulation takes effect, most dwellings will become like these.

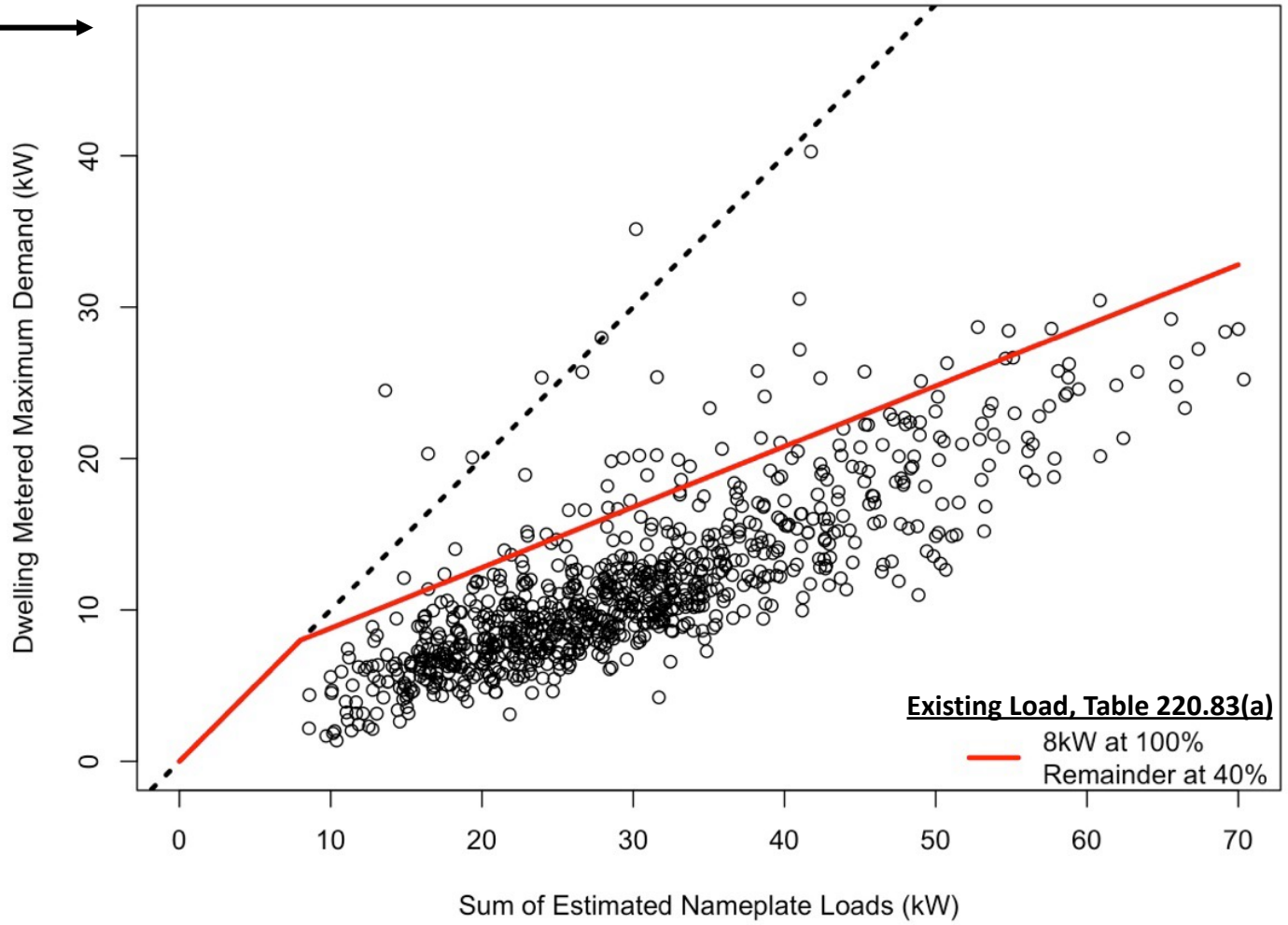
Existing Dwelling Unit—220.83

"Sum of connected loads"

- Keep existing load calculations unchanged
- Simplify and eliminate different treatment for new HVAC

Load (kVA)	***Percent of Load***
First 8 kVA of existing and new load	100
Remainder of existing load	40
New Electric Vehicle Supply Equipment (EVSE)	80
New central electric resistance space heating	80
All other new loads	50

Existing Loads in Dwelling Units



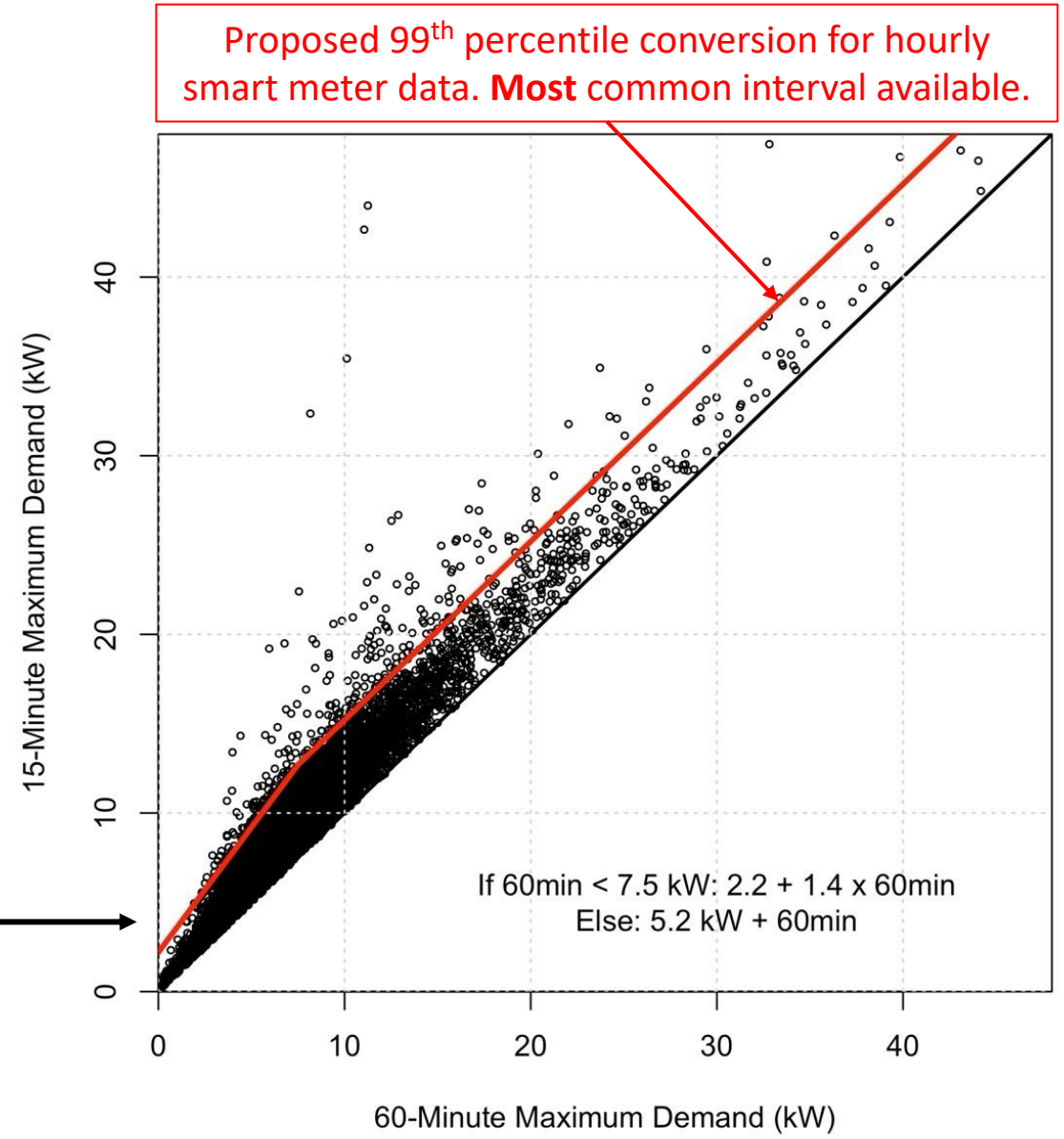
Adjusted for light/plugs, kitchen/laundry circuits, and divided by 80% nameplate ratings. Max of heating or cooling loads.

Determining Existing Loads—220.87

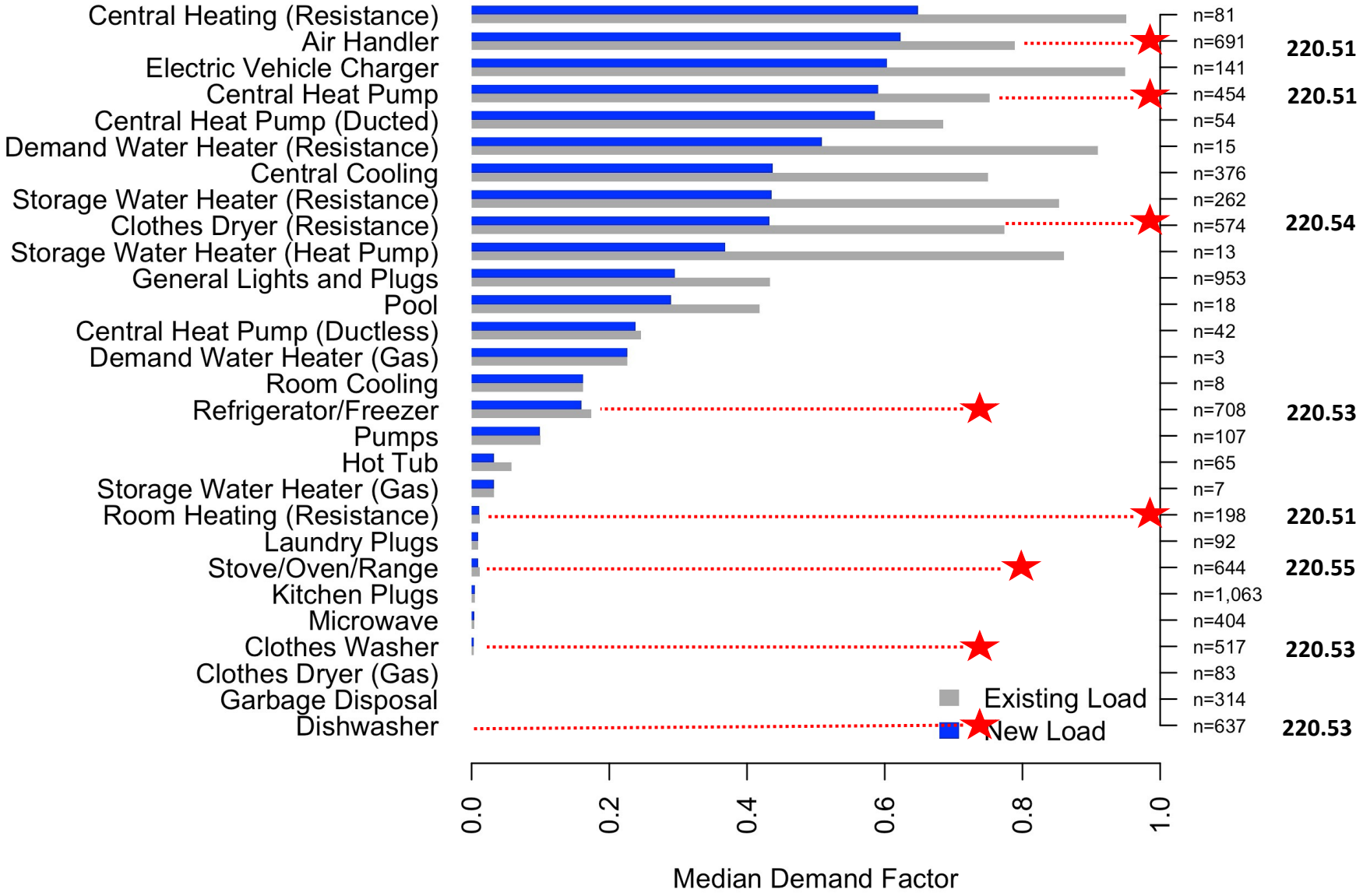
"Metered loads"

- Current language is **unclear**, leading to inconsistent use/interpretation:
  - Most details currently located in an Exception
    - Acceptable hardware for metering
    - Metering time-intervals and duration
    - Treatment of parallel power sources
  - Treatment of new loads being added

- **Propose**:
  - Eliminate reliance on the Exception
  - List acceptable metering hardware
  - 30-day minimum with requirements when <1-year
  - 15-minute metering interval with method for adjusting 60-minute data in dwellings
  - Account for loads being removed
  - Treat change in load using demand factor percentages from elsewhere in 220



Demand Factors vs. Metered Data—Section 220



★ Current Section 220 values

Assessment for Existing Dwelling Revisions

- For each branch circuit in the dataset, we tested it as a retrofit using the proposed 220.83 and 220.87 calculations treating new loads at 50%.
  - Compared - Dwelling load calculation vs. Metered dwelling demand

- For ~99% of branch circuits, the calculated load > the metered maximum demand of the dwelling.
  - The 1% are **NOT** the same as an overload

- Also re-worked current Annex D dwelling load examples
  - Typical 20% reduction in service/feeder load

Thank You!

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There are more details in additional slides.

Appendix Slides

One Billion Machines…

- Massive electrification of US housing
- Majority existing dwellings
- ~1/3 with 100A service
- Upsizing panels and service wires is expensive and time consuming
  - >$100 billion for all 100A service panels
- Context: Flexible utility rates, PV, storage, demand response, controls.

Type	Machines (Millions)
Fossil space heating	69
Fossil water heating	63
Clothes Drying	19
Cooking	95
Vehicles	275
Breaker boxes	100
Vehicle chargers	275
Rooftop solar	55
Home battery storage	29
Total Fossil	**980**
Elect. Resist. space heating	29
Elect. Resist. water heating	54
Total Fossil + Elect. Resist.	**1,063**

Table 6: Adding up all the machines.

Source: *https://www.rewiringamerica.org/policy/one-billion-machines*

Data Source Details

Data Source	Data Type	Time Interval	# of Dwellings	States Represented
Pecan Street Dataport	End-Use Sub-Metering	15-min	776	**TX**, CA, NY, CO
NEEA End-Use Load Research	End-Use Sub-Metering	15-min	181	OR, WA, ID, MT
VEIC Cold Climate Heat Pump Program	Whole Dwelling Maximum Demand	15-min and hourly	9,065	VT
Home Energy Analytics – Home Intel	Whole Dwelling Maximum Demand	15-min and hourly	1,728	CA
NEEA Residential Building Stock Assessment	Lighting Audit Data on Installed Fixtures		2,053	OR, WA, ID, MT

Calculation of demand factors

- **Existing Loads**
  a. For each dwelling, identify dwelling maximum demand and the time period
  b. For each load, identify maximum demand (i.e., estimated nameplate)
  c. For each load, identify demand during the dwelling maximum time period
  d. Demand factor is the ratio of c / b

- **New Loads Being Added**
  a. For each dwelling, identify dwelling maximum demand and the time period
  b. For each load, identify maximum demand (i.e., estimated nameplate)
  c. For each load, identify dwelling maximum demand that occurs when that load is subtracted from the dwelling demand at each time-step
  d. For each load, identify its contribution to dwelling maximum demand (a - c)
  e. Demand factor is the ratio of d / b

Methods

- Calculation of Demand Factors for each load and for whole dwellings
  - **Existing Loads**

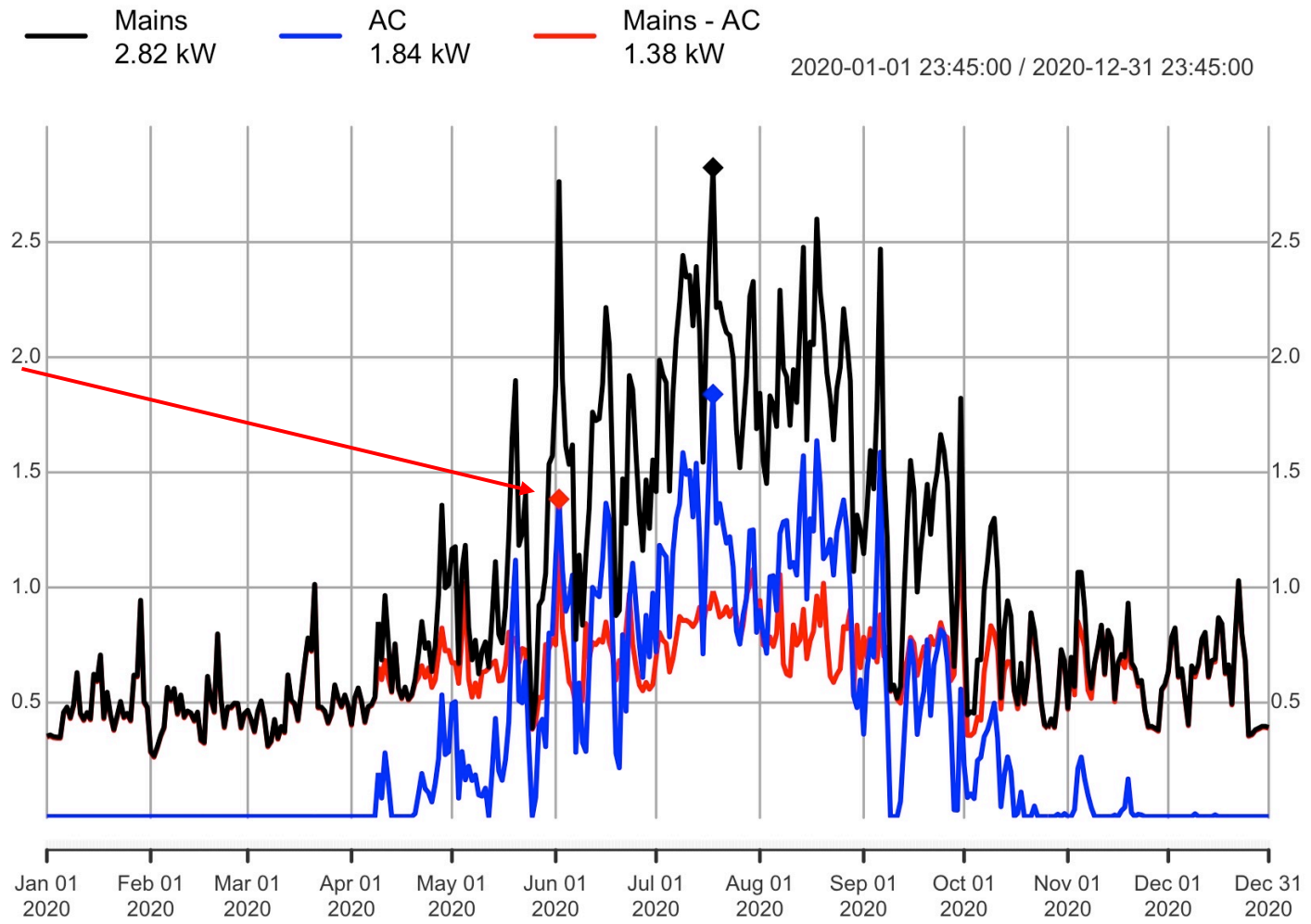
$$Demand\ Factor = \frac{EquipmentDemandDuringDwellingMaximum_{kW}}{EquipmentObservedMaximum_{kW}}$$

  - **New Loads Being Added**

$$Demand\ Factor = \frac{\left(DwellingMaximum_{withLoad,kW} - DwellingMaximum_{\text{withoutLoad},kW}\right)}{EquipmentObservedMaximum_{kW}}$$

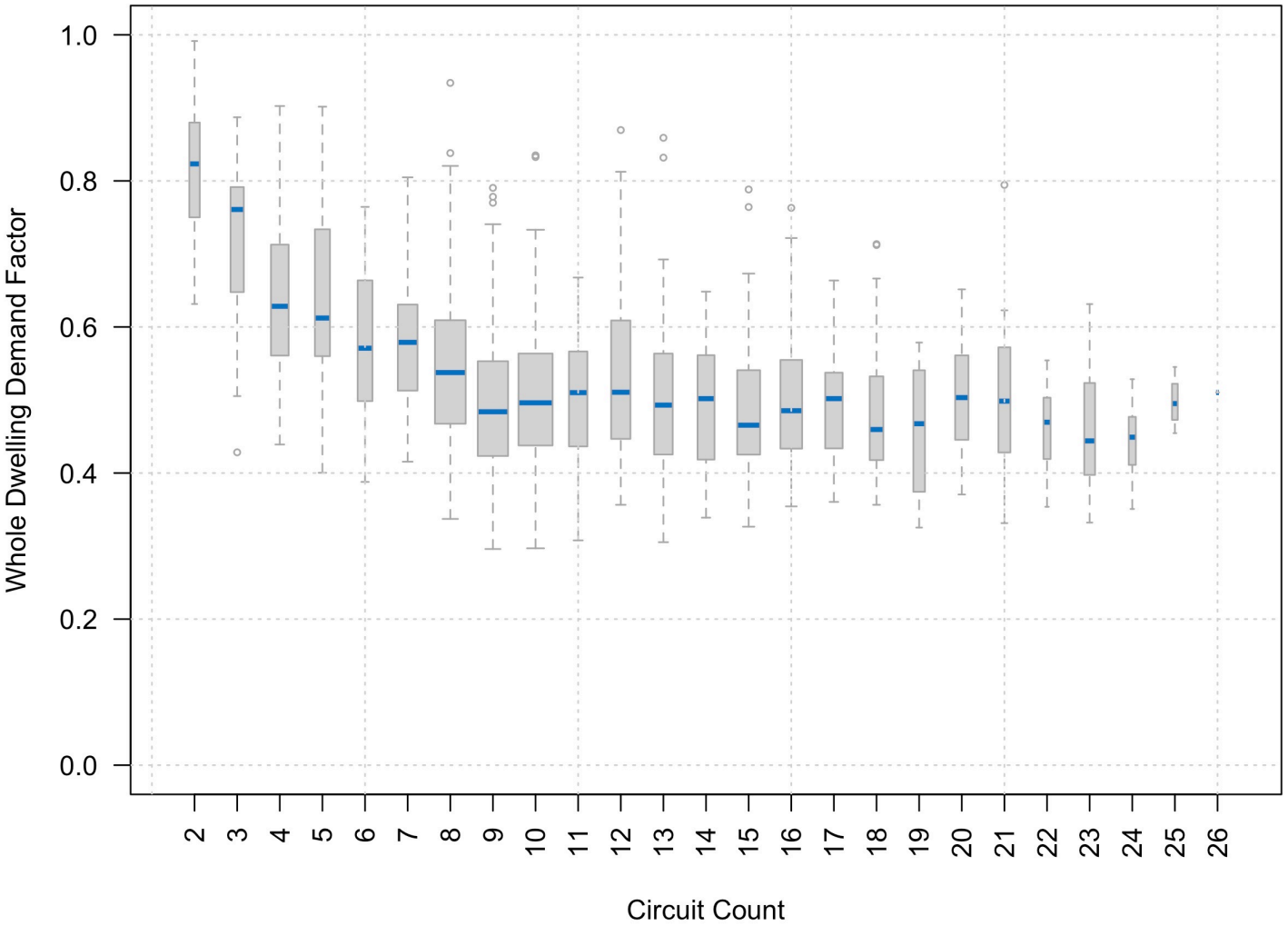
Calculating Demand Factors for Existing and New Loads Being Added

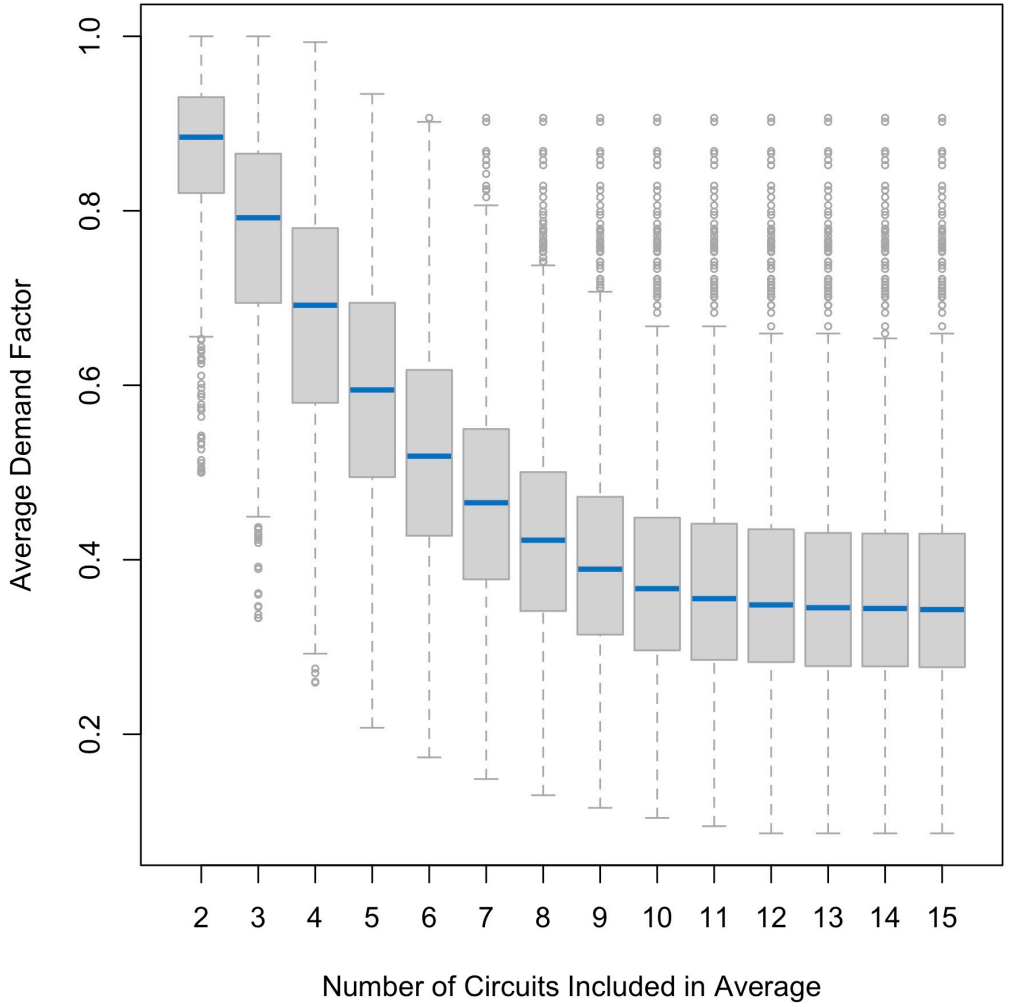
Dwelling peak that would have occurred without the AC installed ("pre-retrofit")



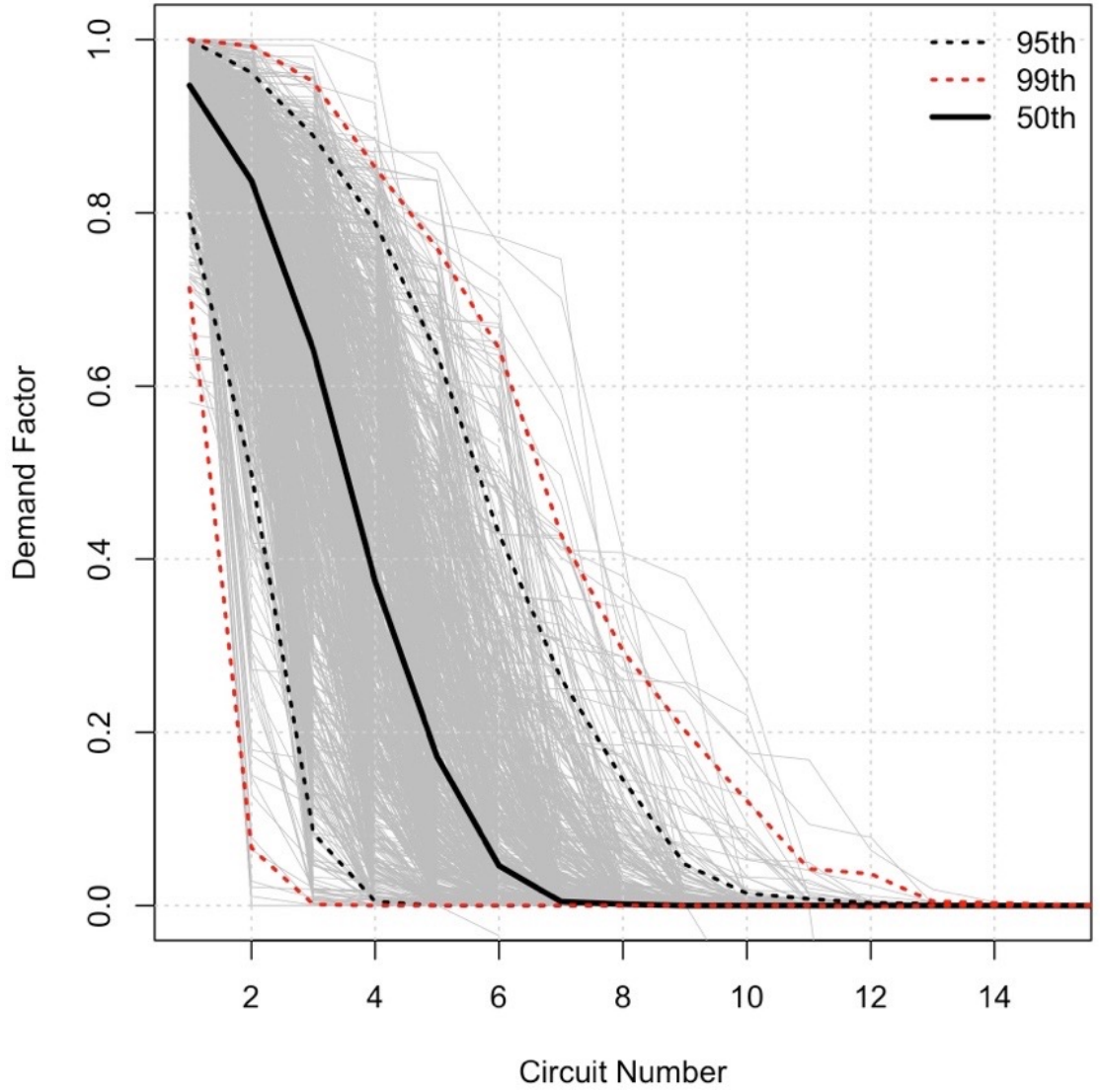
- Mains Peak
  - 2020-07-18 23:45
  - 2.82 kW
- AC max and peak
  - 2020-07-18 23:45
  - 1.84 kW
- Mains – AC peak
  - 2020-06-02 23:45
  - 1.38 kW
- AC Contribution to Peak
  - 2.82 – 1.38 = 1.44 kW
- Demand Factors
  - Existing Load: 1.84 / 1.84 = 100%
  - New Load: 1.44 / 1.84 = 78%

Load diversity is high in existing dwellings and increases with more connected loads

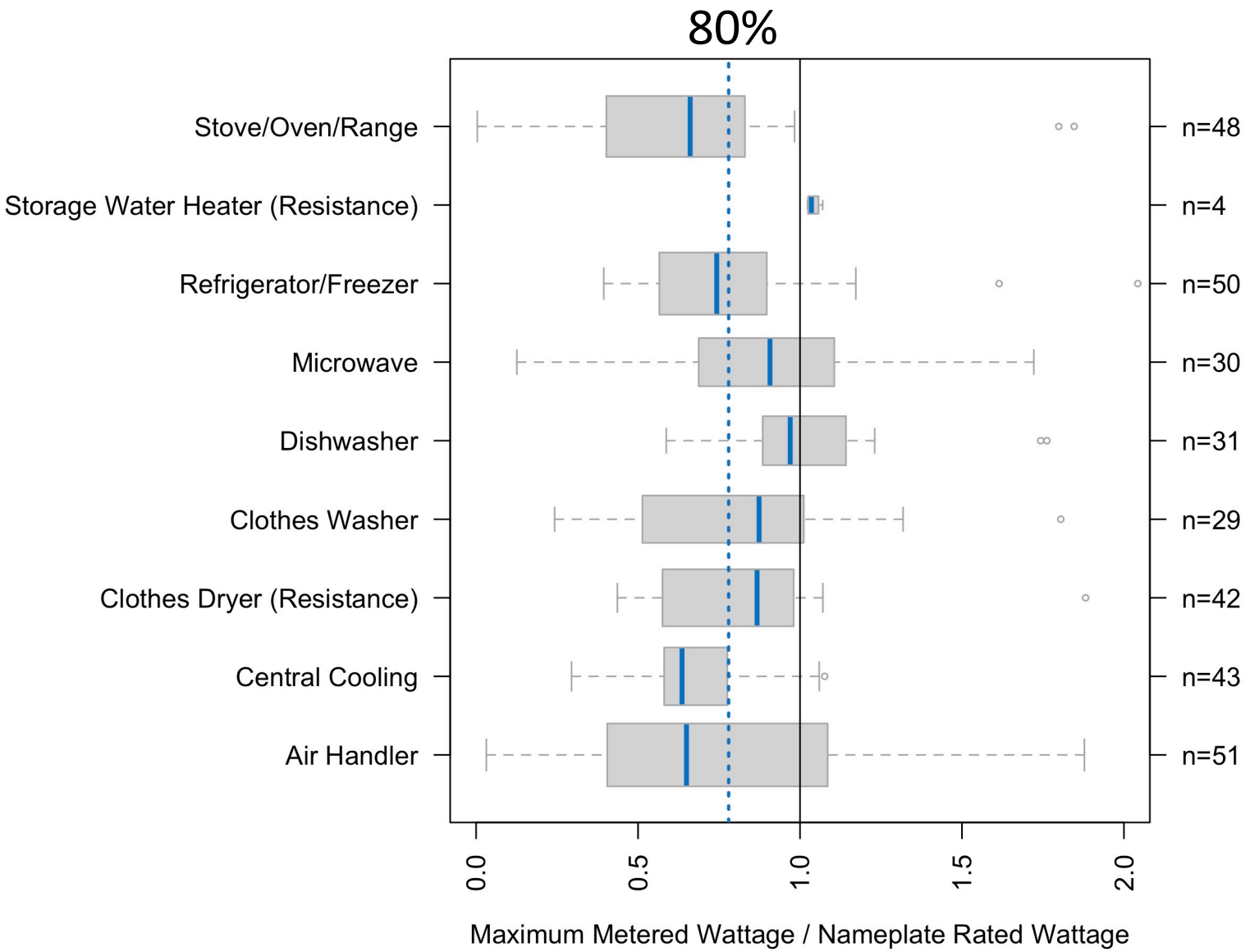




Never are more than four loads at or near 100% during dwelling maximum



Maximum Demand is < Nameplate Ratings



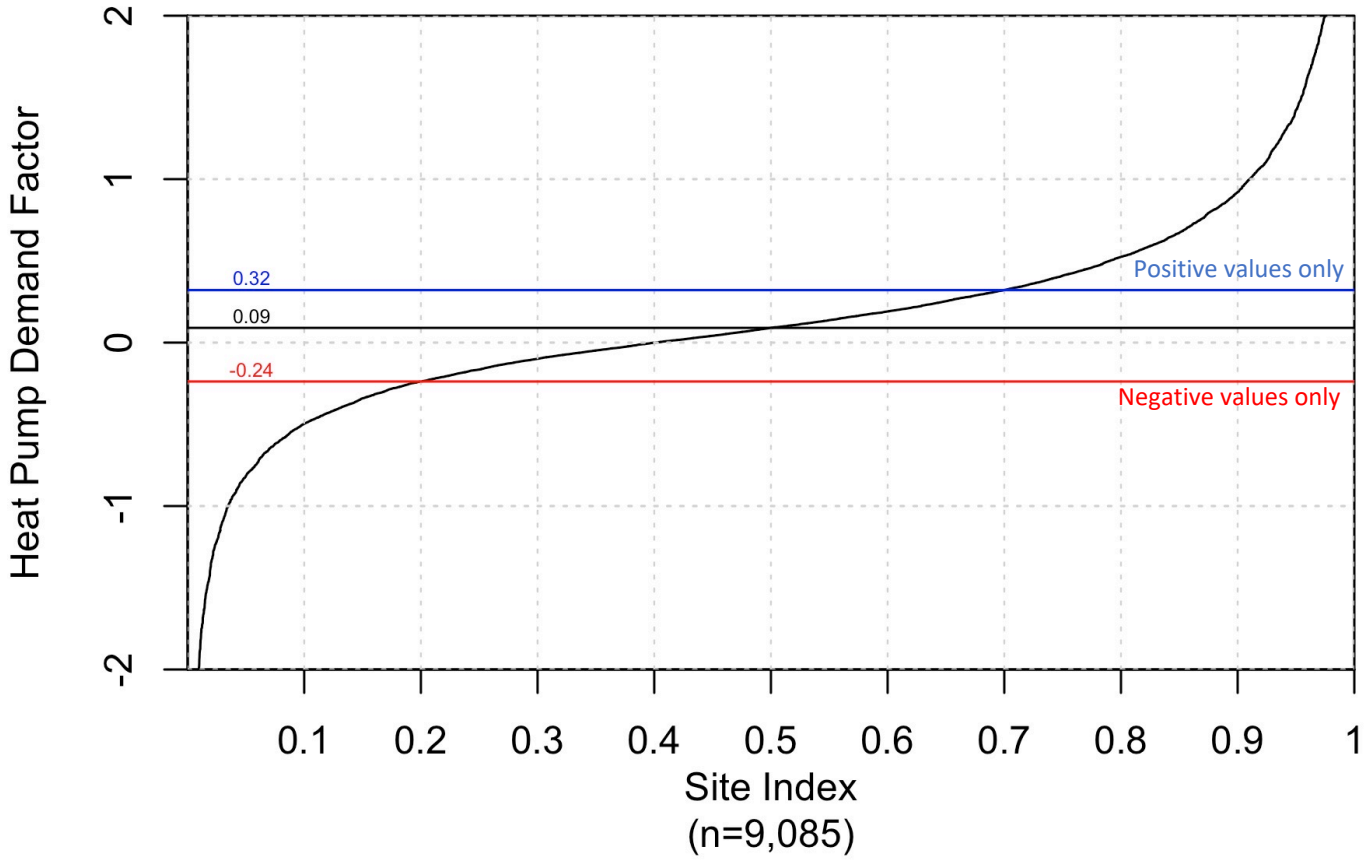
Regulation of General Service Lamps

- **10 CFR 430.32(dd)** (link). “Beginning July 25, 2022 the sale of any general service lamp that does not meet a minimum efficacy standard of 45 lumens per watt is prohibited.” [went into force in July 2023]

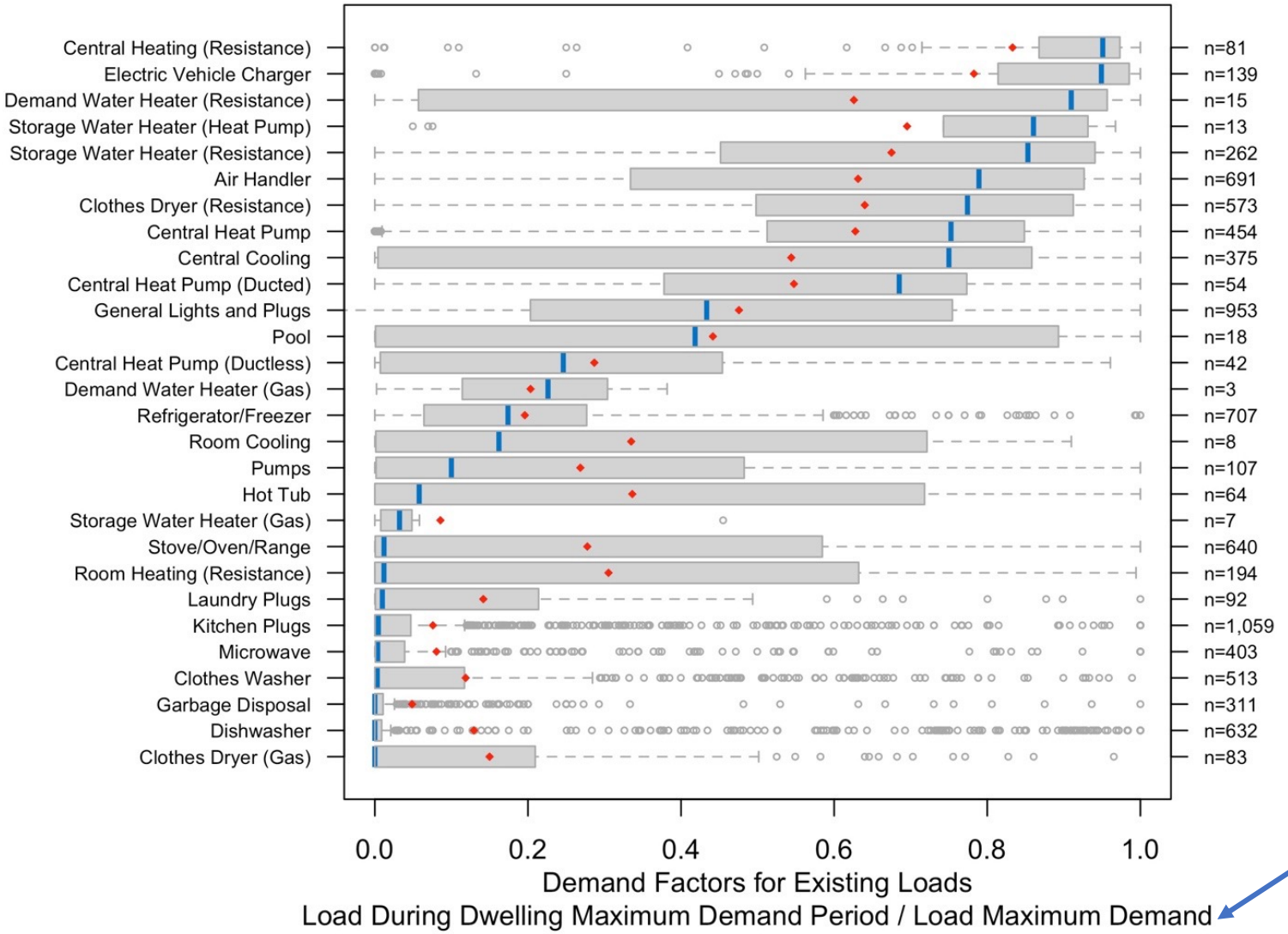
- **Definition:** *"General Service Lamps (GSLs) include general service incandescent lamps (GSILs), compact fluorescent lamps (CFLs), general service light-emitting diode (LED) lamps, organic light-emitting diode (OLED) lamps, and any other lamps that are used to satisfy lighting applications traditionally served by GSILs. GSLs are used in general lighting applications and account for the majority of installed lighting in the residential sector."*

HVAC Heat Pumps Do Not Add at 100%

- 9,085 cold climate heat pumps were installed in existing VT homes
  - Median 3.6 kW rated power
  - Median 0.4 kW increase in dwelling demand
- Very low demand factors (9%)
- Roughly ½ decreased maximum demand post-install

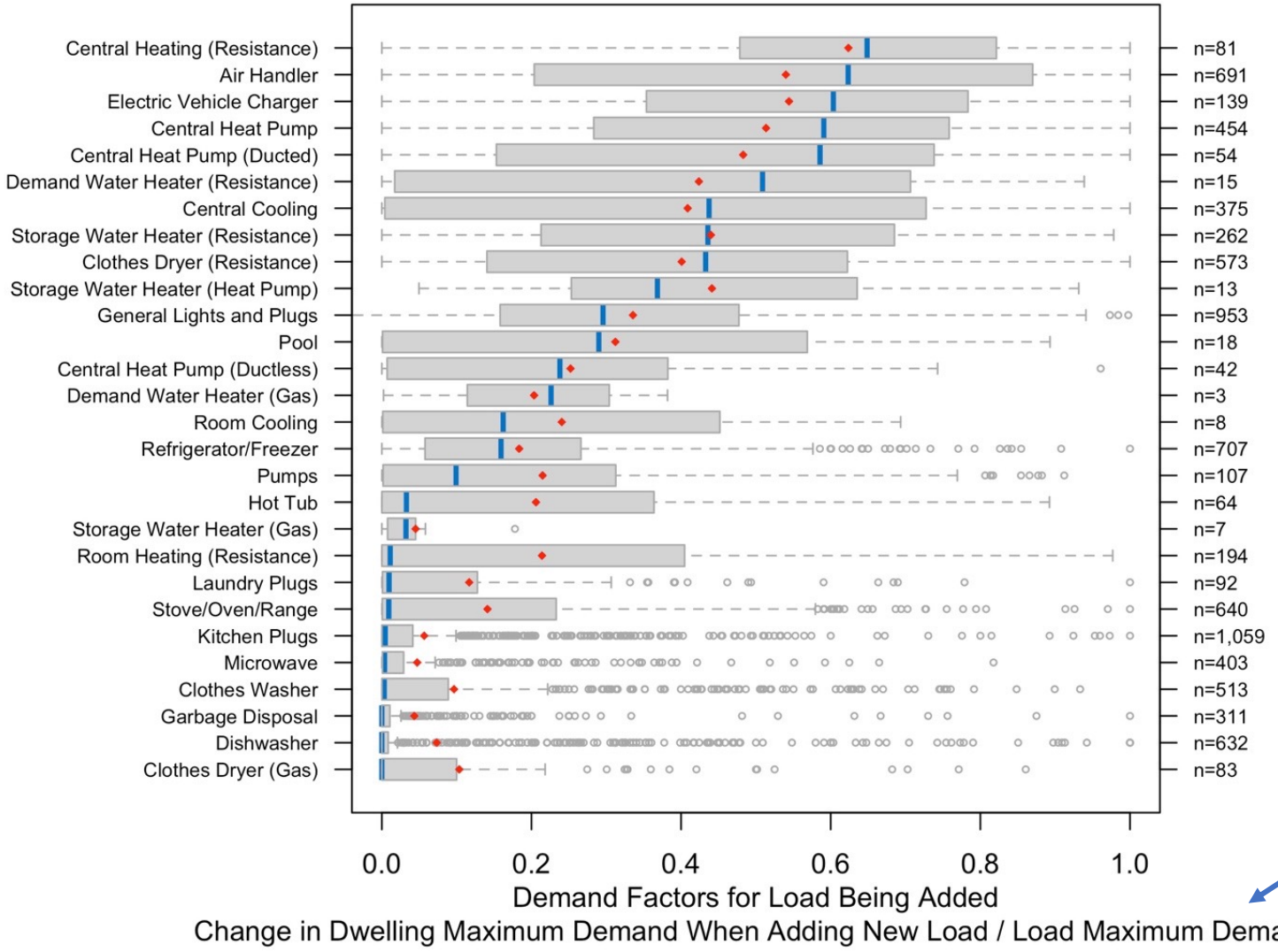


Demand Factors for Existing Loads



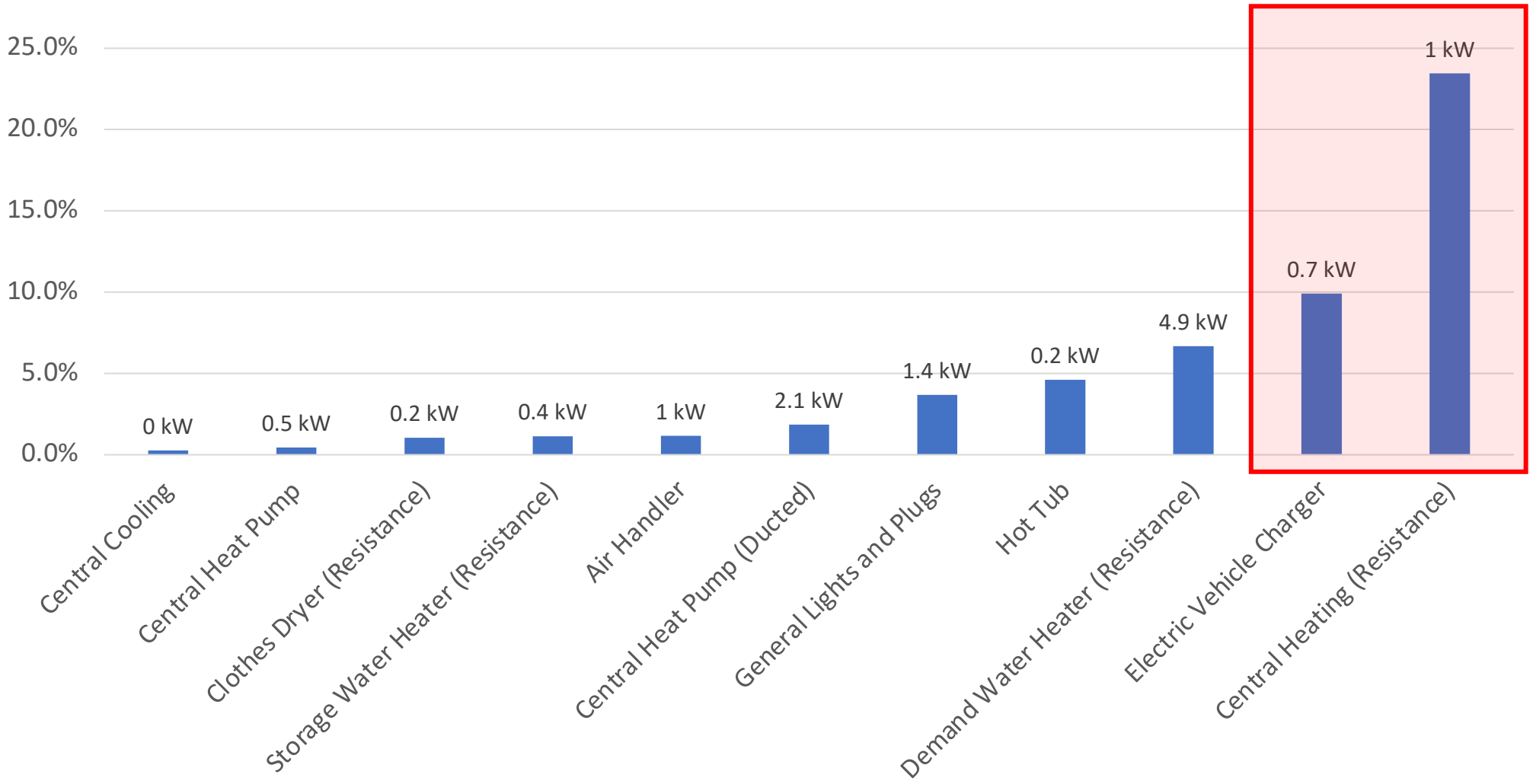
NOT adjusted as noted for light/plugs, kitchen/laundry circuits or div by 80%

Demand Factors for New Loads Being Added



NOT adjusted as noted for light/plugs, kitchen/laundry circuits or div by 80%

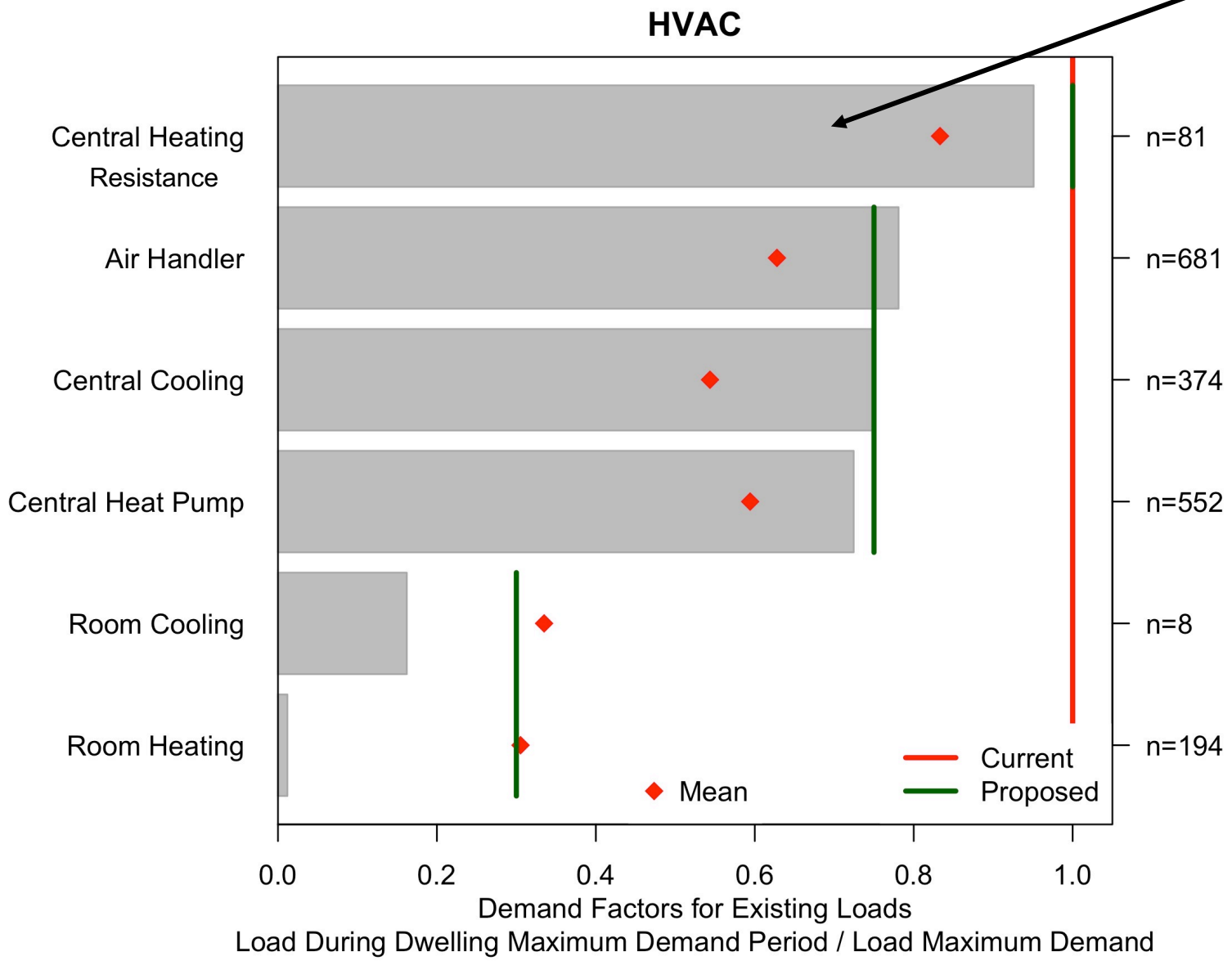
The 1% That Missed…



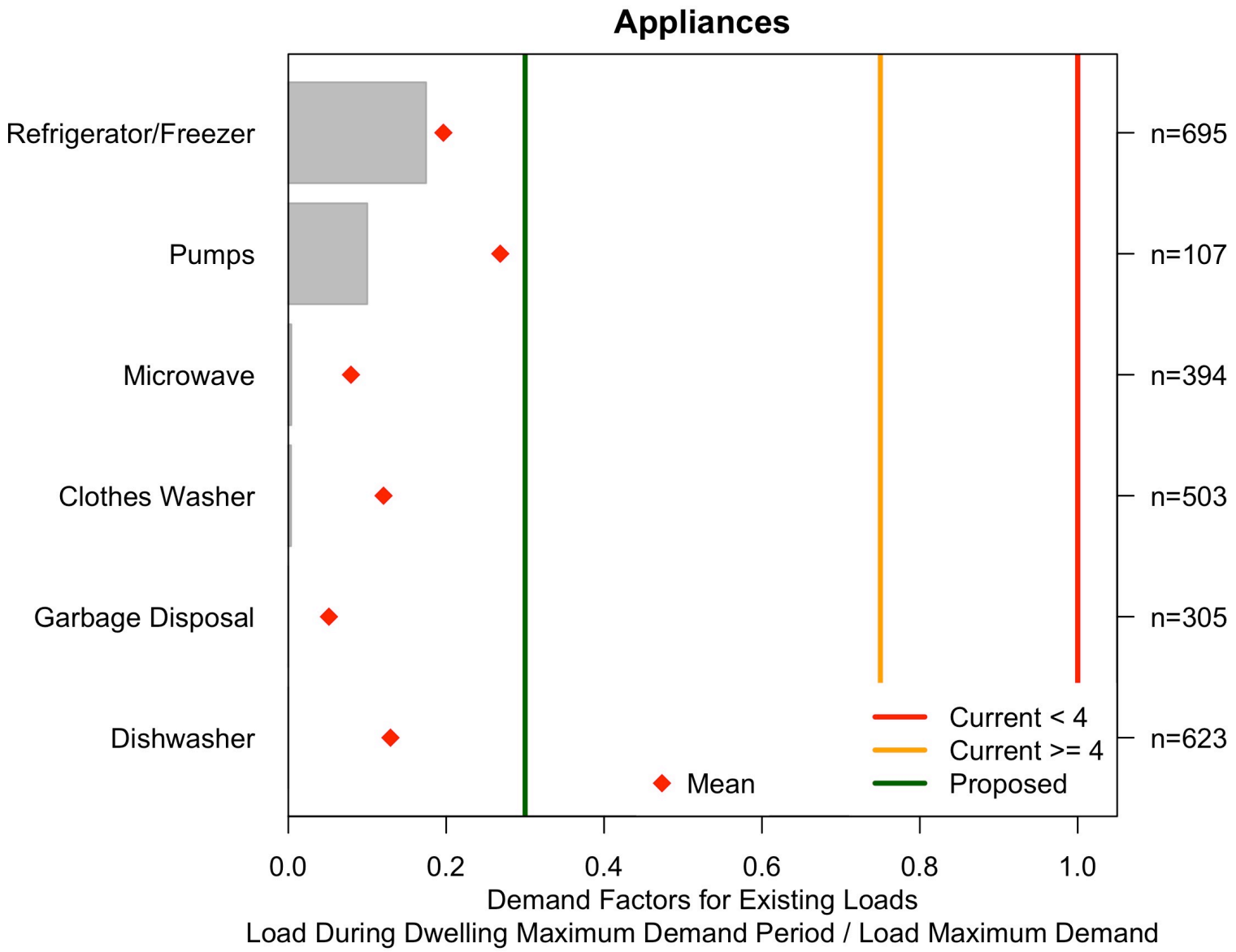
Special treatment in 220.83

HVAC Loads –220.51, 220.82

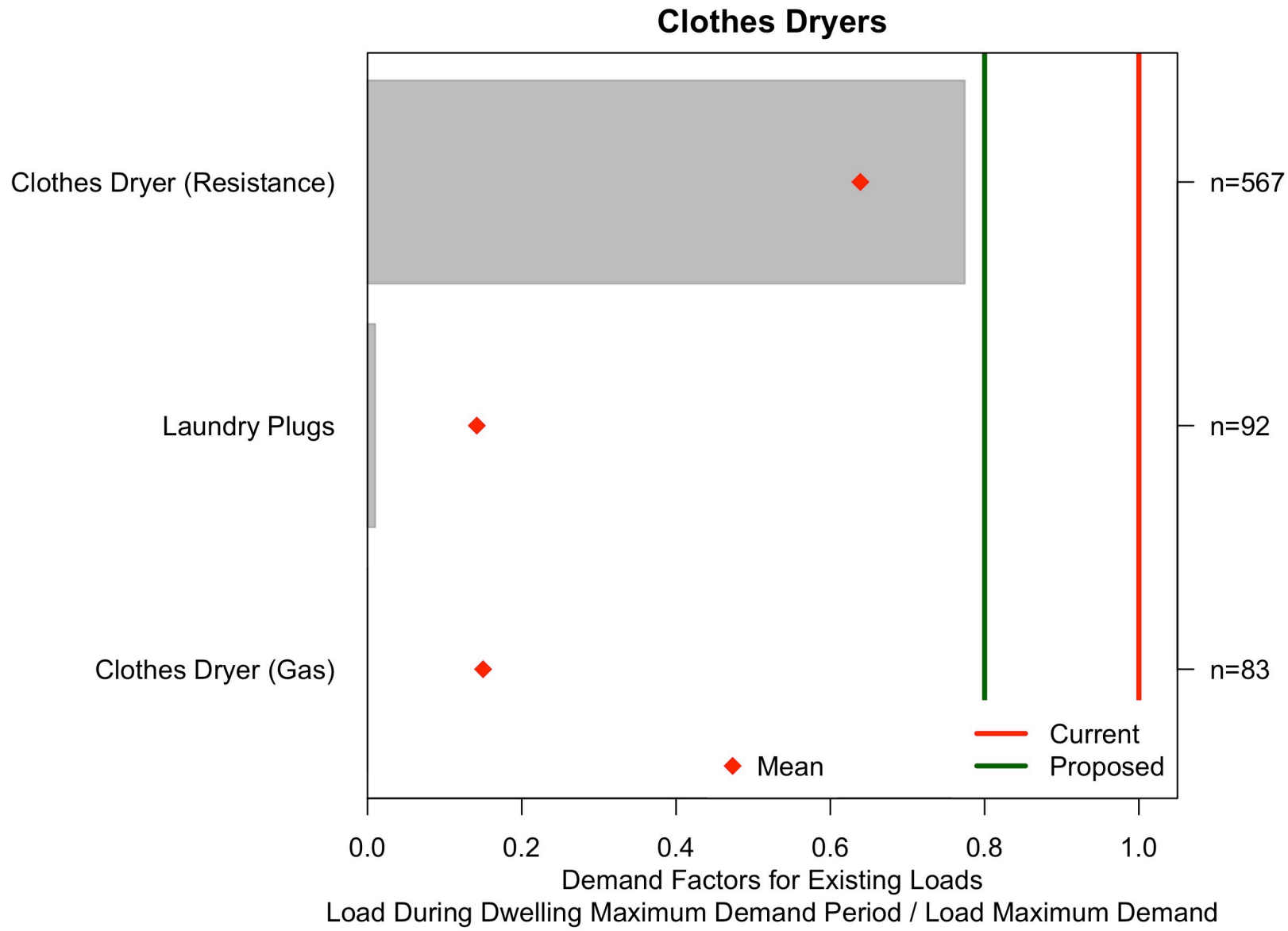
Grey bars = median



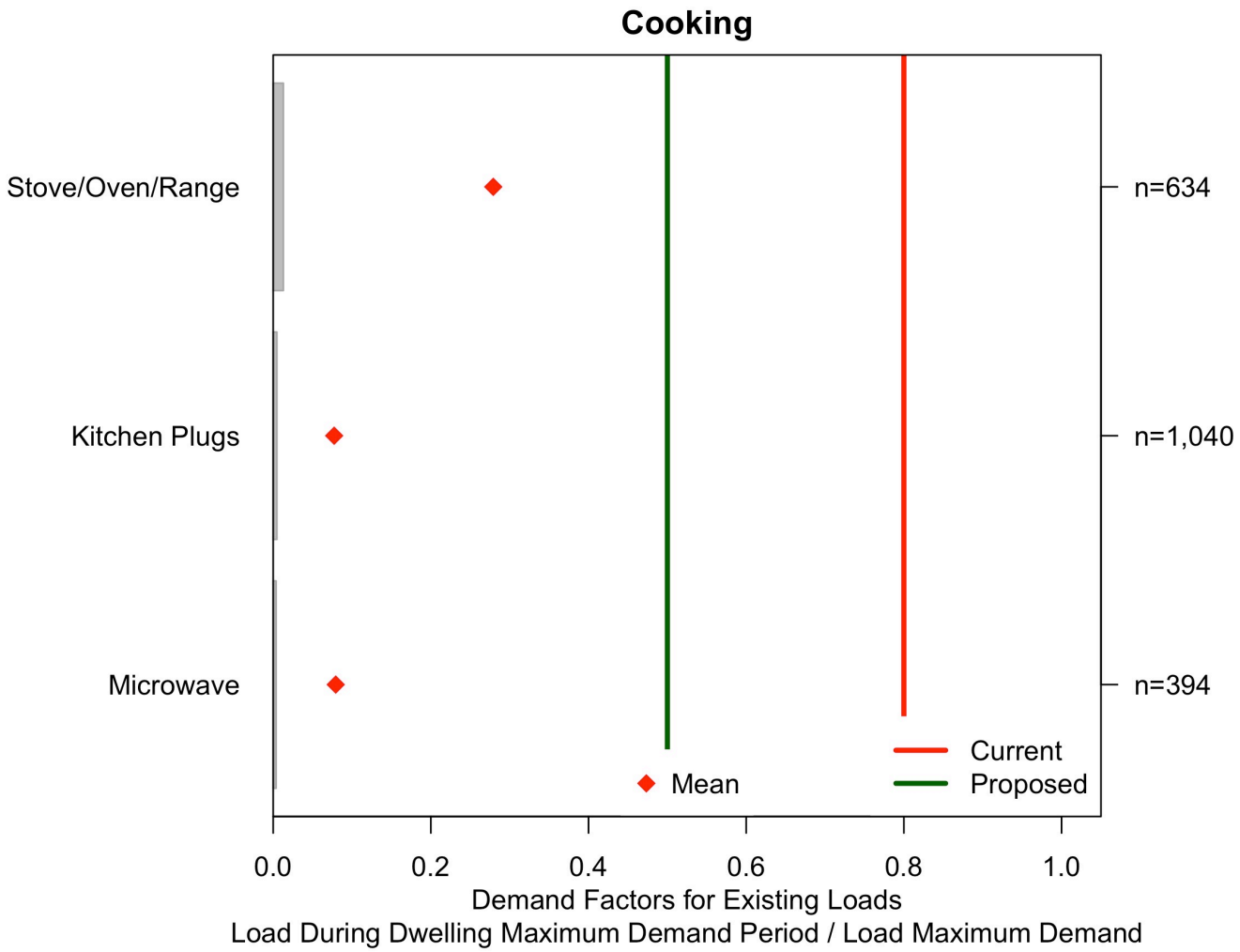
Appliance Loads – 220.53

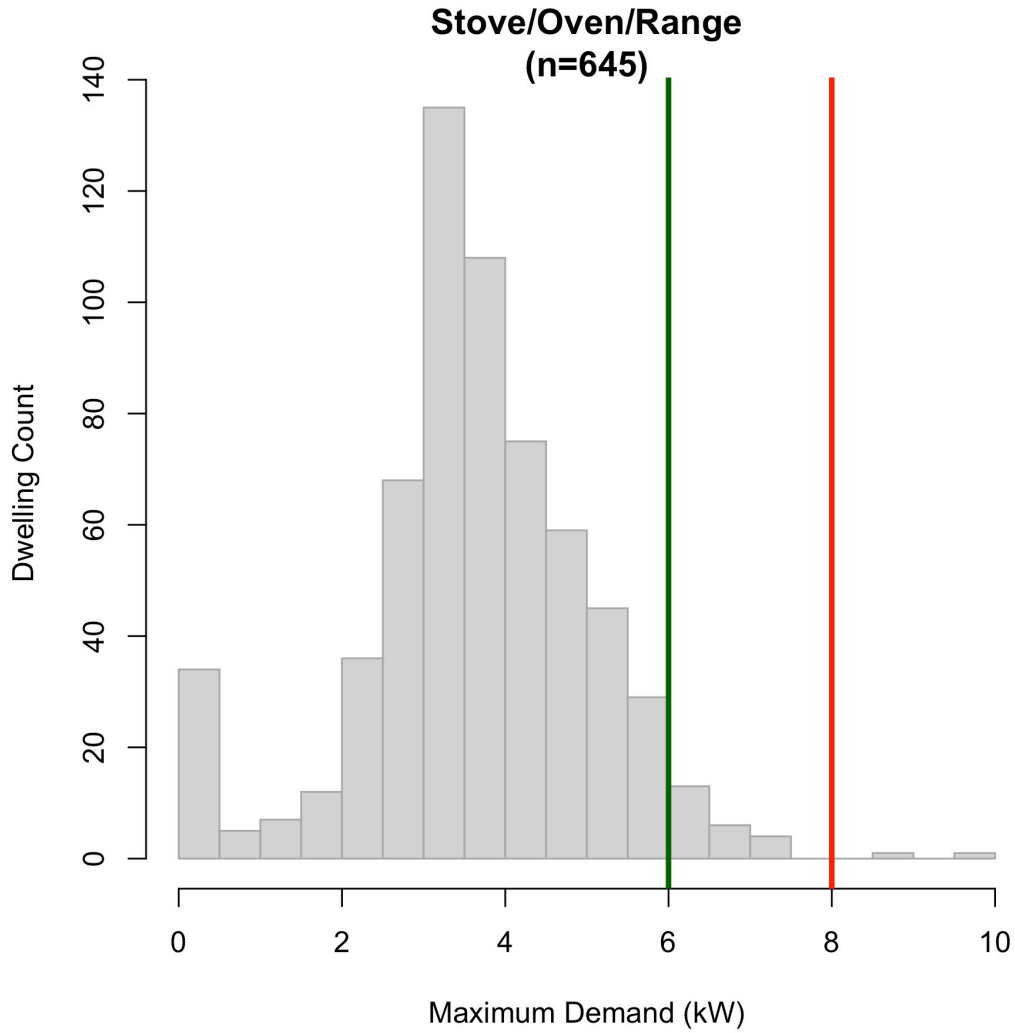


Clothes Dryer Loads – 220.54



Cooking Loads – 220.55





Should We Treat Each Load Using Worst-Case Assumptions?

- For branch circuit loads, **YES**, worst-case loading is appropriate

- For service and feeders, **NO**, using typical values works well
  - All loads are not coincident on service/feeders
  - Take advantage of load diversity (220 already does this)
  - The more loads we consider the less coincidence there is
  - Conservative assumptions throughout provide additional safety buffer
  - LBNL demand factors are biased high by ~20%, because they are based on maximum observed power, not on the larger nameplate ratings.

- We tested this for retrofits using 220.83 and 220.87 and found ~99% conservative predictions at the service level

ACBMA
American Circuit Breaker Manufacturers Association

Headquartered in Washington DC, the ACBMA is an association of American manufacturers of circuit breakers to represent and promote the mutual interests of American circuit breaker manufacturers in areas of codes and standards, applications, safety, and education. Members of the Association include:

ABB

Eaton Corporation

Siemens Industry, Inc.

Square D/Schneider Electric

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Comparison of Load Calculations

2023 NEC and 2026 NEC

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Compare…

- The current requirements of the 2023 NEC against the 2026 with the following public inputs for load calculations.
- The 2026 data is cumulative, with all of the public inputs applied

Public Inputs Considered

- **3236** 2 VA per square foot for lighting and general purpose receptacles
- **4361** heating: central 100%, heat pump 75%, room heating 30%
- **4144** 30% to appliances, remove the minimum number of 4
- **4151** 220.54, dryer table
- **4160** 220.55, range table

Single Family Loads

- 2 small appliance branch circuits
- 1 laundry circuit
- Dryer at 5000 VA
- Range Column C
- 4 appliances including water heater

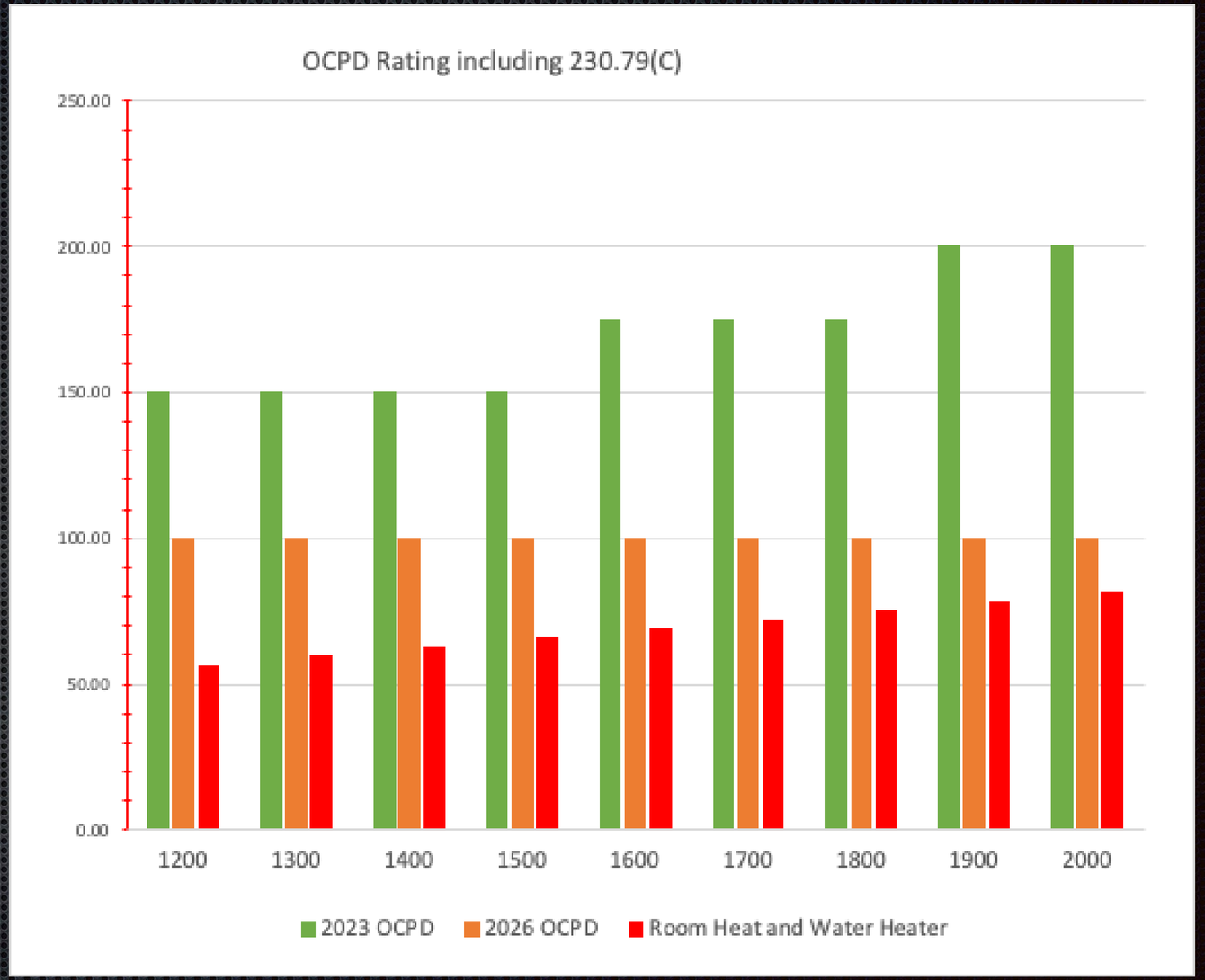
- Total appliance load 7,226 VA
- Resistance heat loads 7.5 watts per square foot
- Heat Pump heat loads, 16 SEER at 1.88 watts per square foot, and fractional tonnage

OCPD with Room Heat

As the square footage increases the effect is more clearly seen.

As of the 2023 NEC garages are included in square footage.

A two car garage is usually at least 400 square feet.



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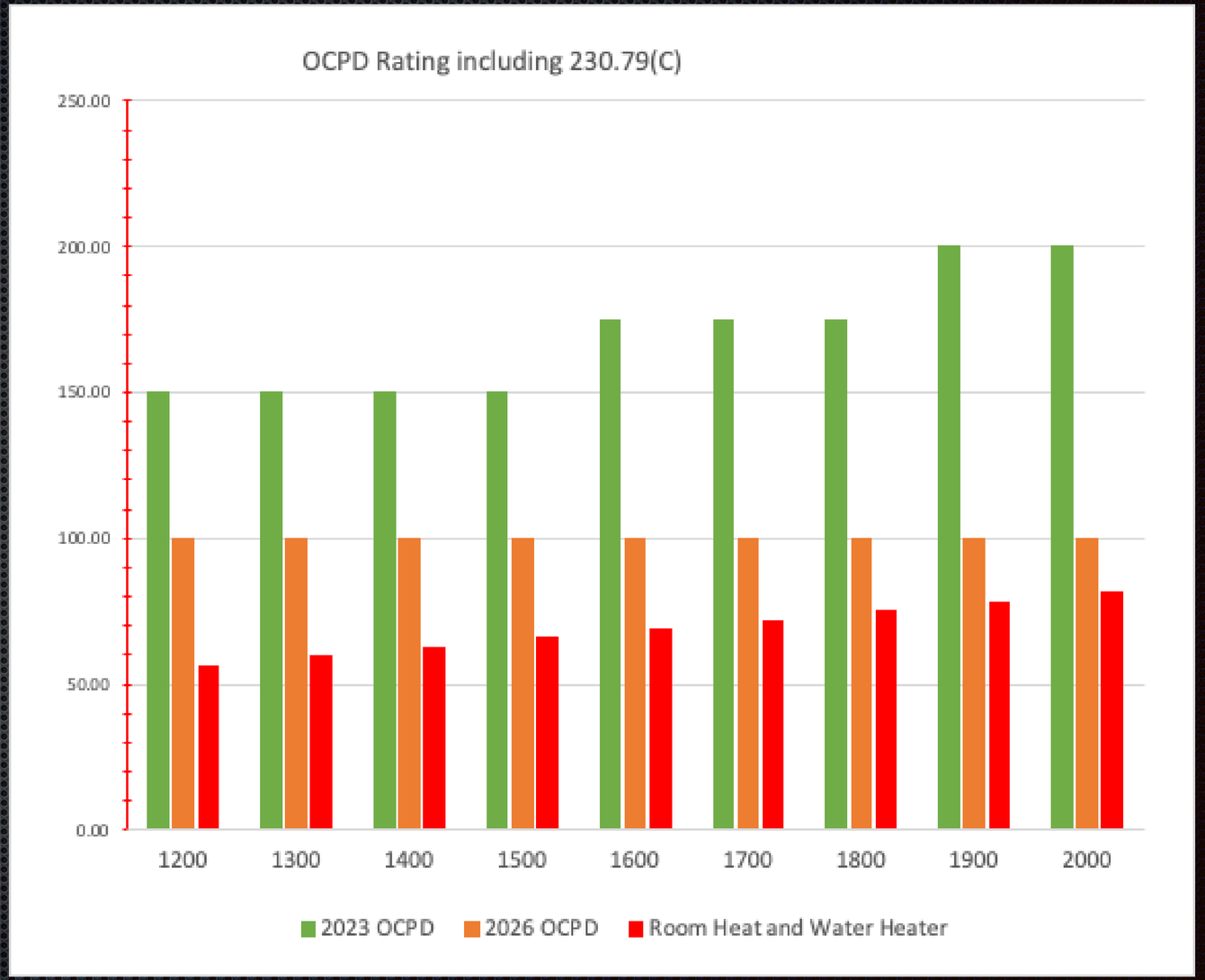
OCPD with Room Heat

A 2000 square foot home would have heat and water heat load equal to 81% of the OCPD rating.



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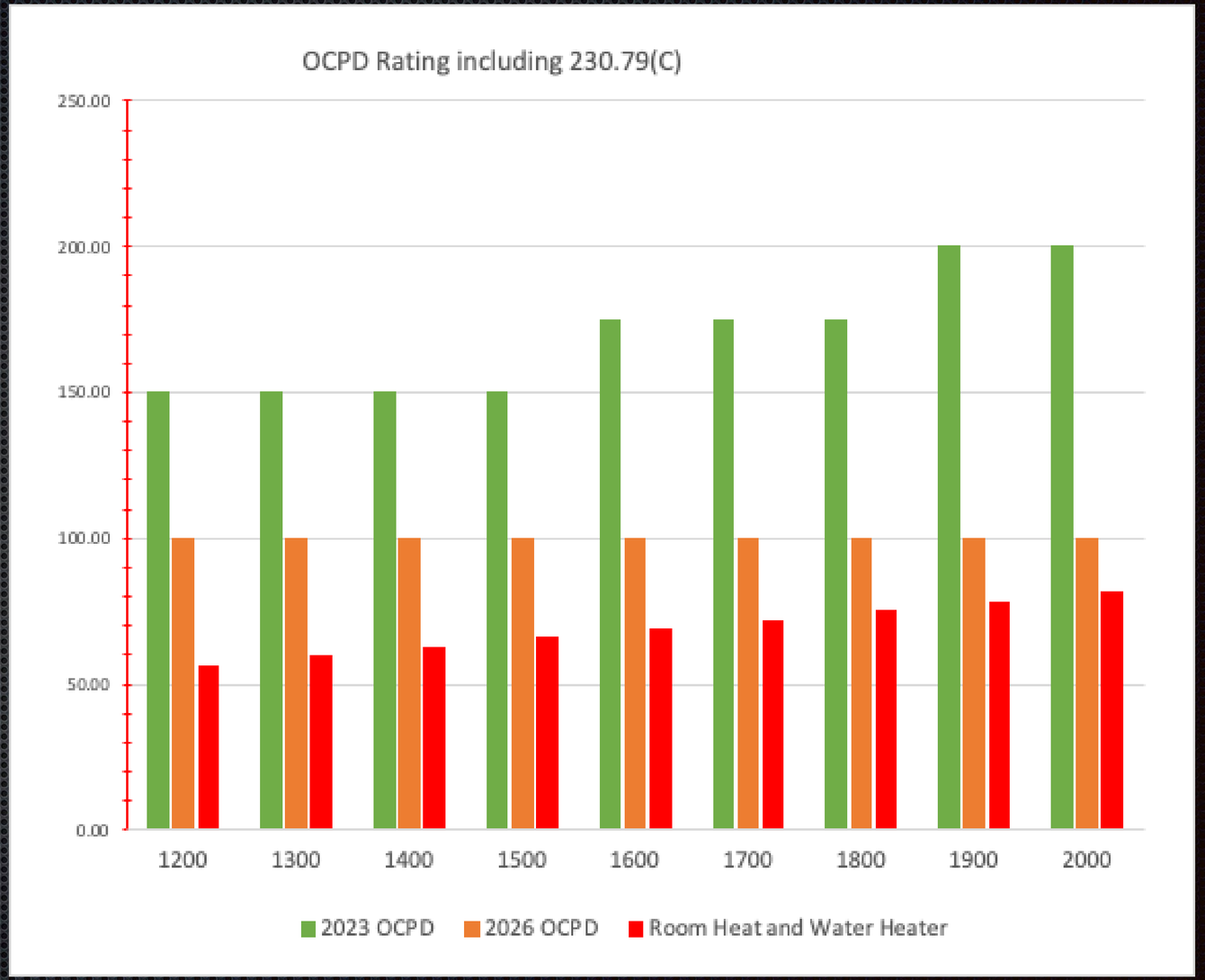
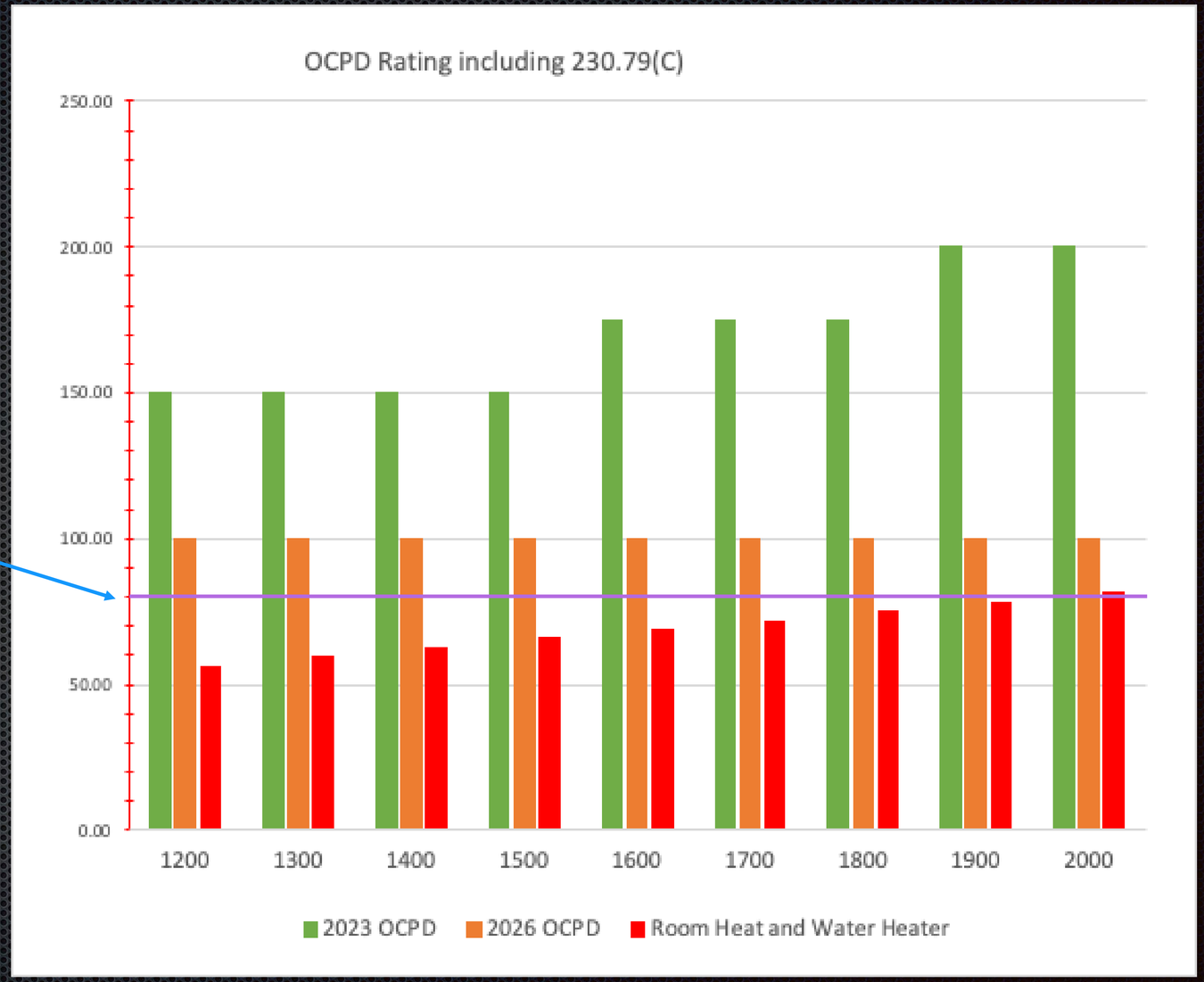
OCPD with Room Heat

Note that 310.12 would allow all of the 2026 homes to have a #4 copper as their service conductors



OCPD with Room Heat

The ampacity of a #4 copper is 85 amperes.



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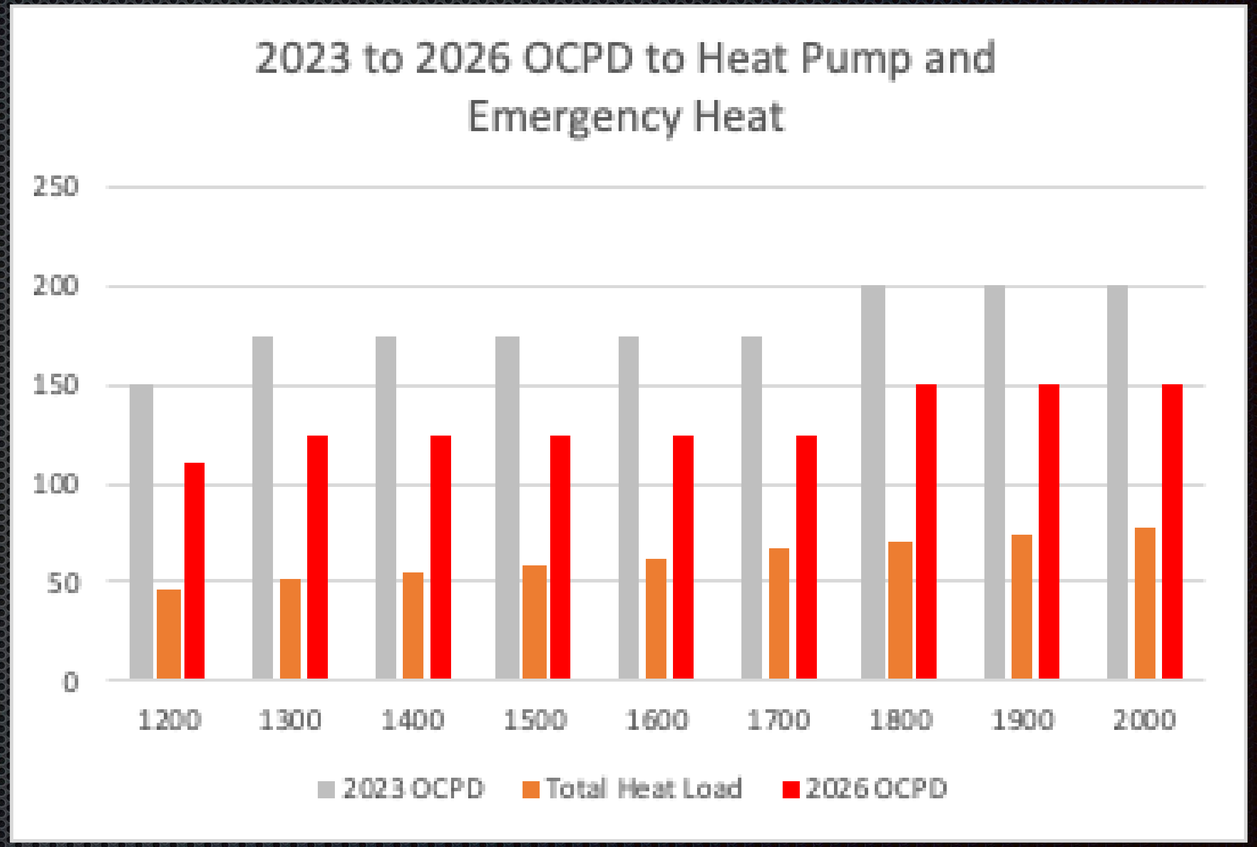
OCPD with Heat Pump

Heat pumps are extremely efficient.

Heat pumps also employ emergency heat



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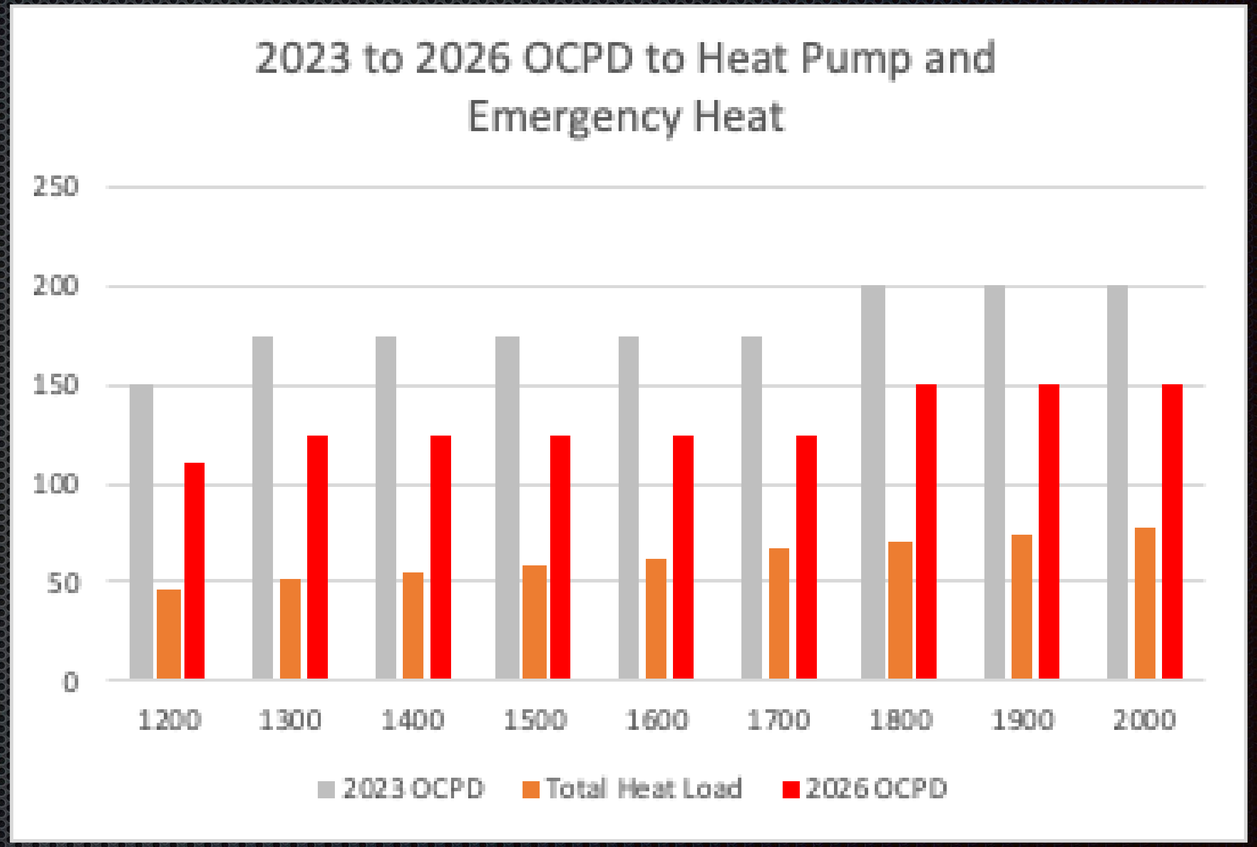
OCPD with Heat Pump

In the 2023 NEC all heat regardless of type is treated at 100%

PI 4361 calls for heat pumps to have a demand of 75%

Does this include emergency heat?



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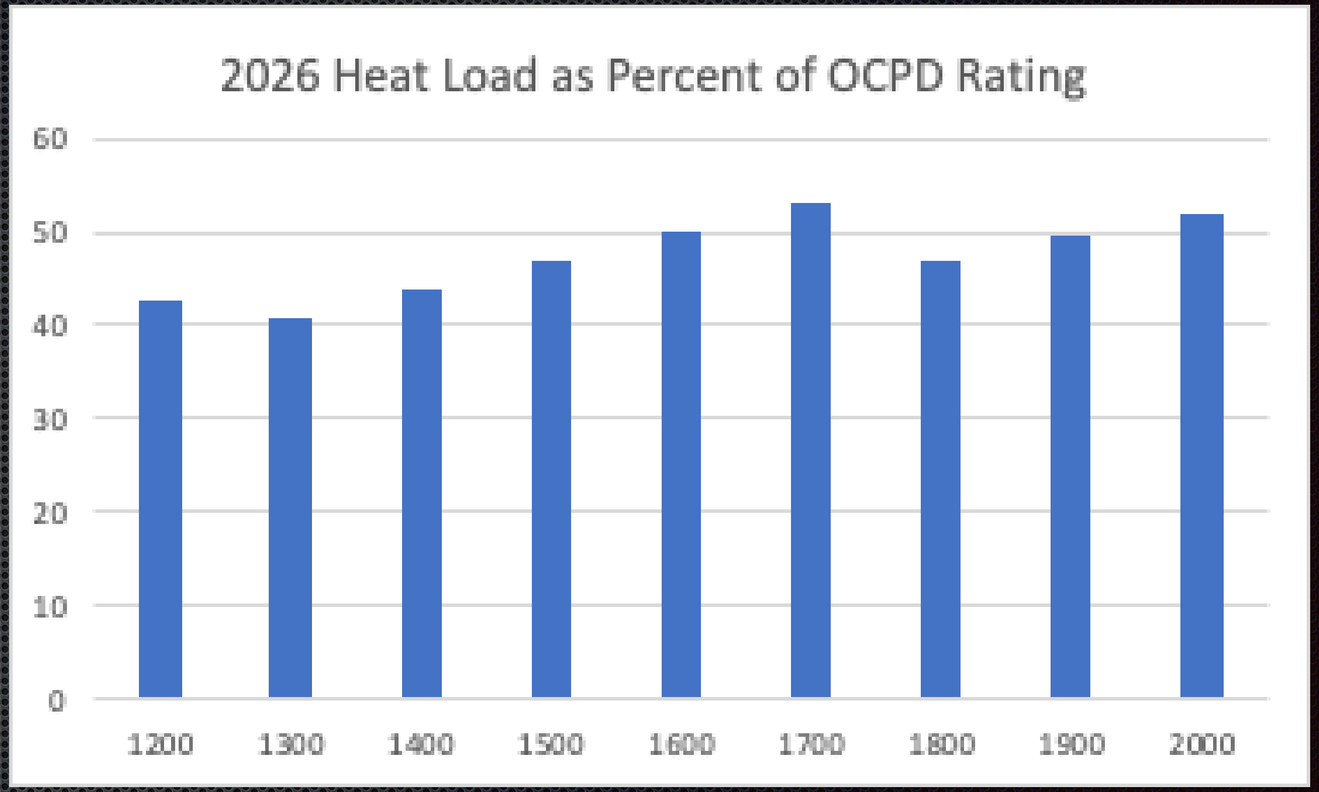
OCPD with Heat Pump

While the ratios are not as extreme, proposed language lacks clarity, where before all heating was at 100%.



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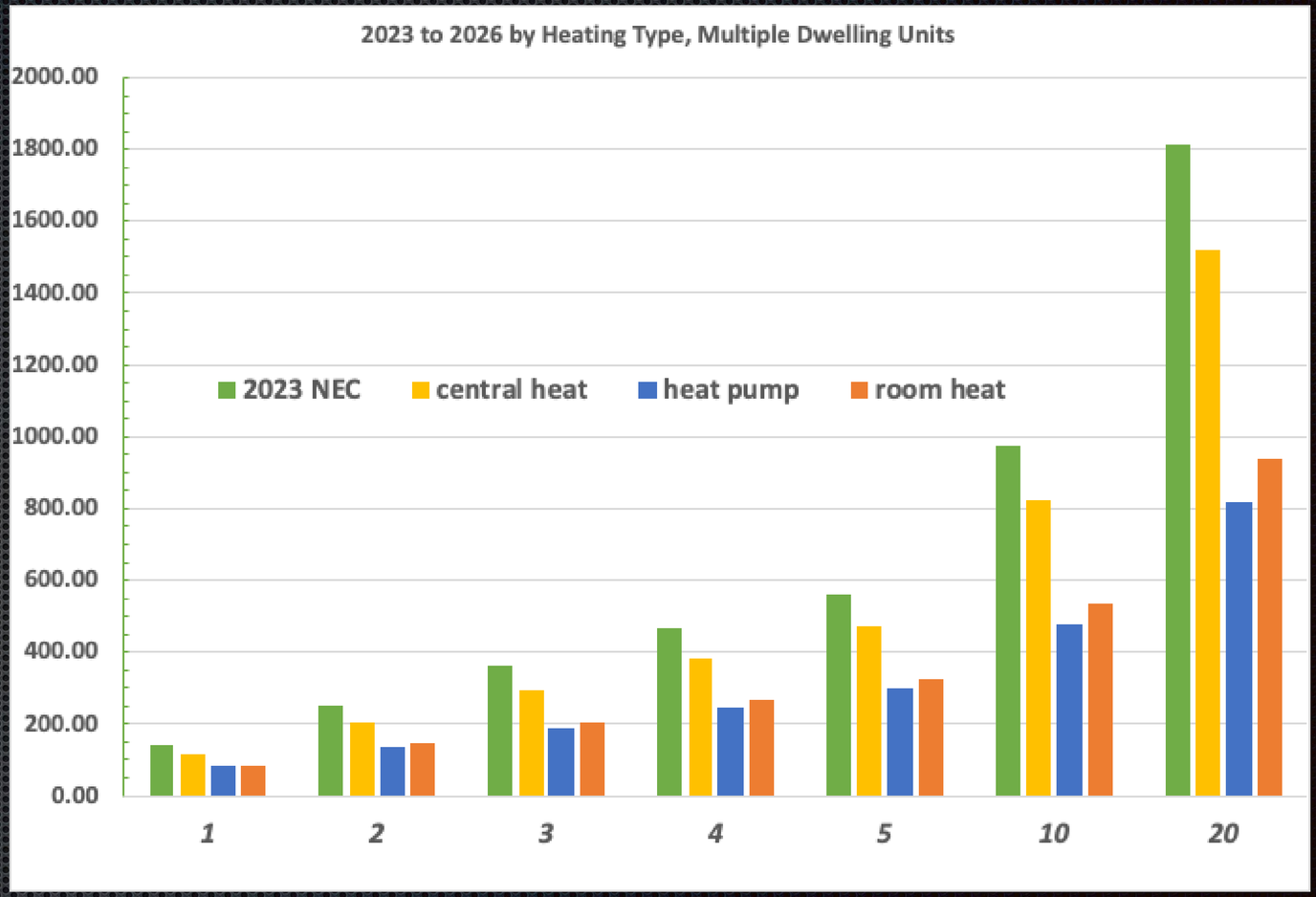
Multifamily Dwelling Unit Loads

- 2 small appliance branch circuits
- 1 laundry circuit
- Dryer at 5000 VA
- Range Column C
- 4 appliances including water heater
- 1100 square feet each
- Total appliance load 7,226 VA
- Heat 10kw (9 watts per square foot)
- Heat Pump heat loads, 16 SEER at 1.88 watts per square foot, and fractional tonnage

Compare by Heating Type

The demand factors for heating in Public Input 4361 result in extreme reductions of overcurrent protection.

The reduction from 2023 to 2026 central heat is due to lighting, dryer, appliance and range load reductions



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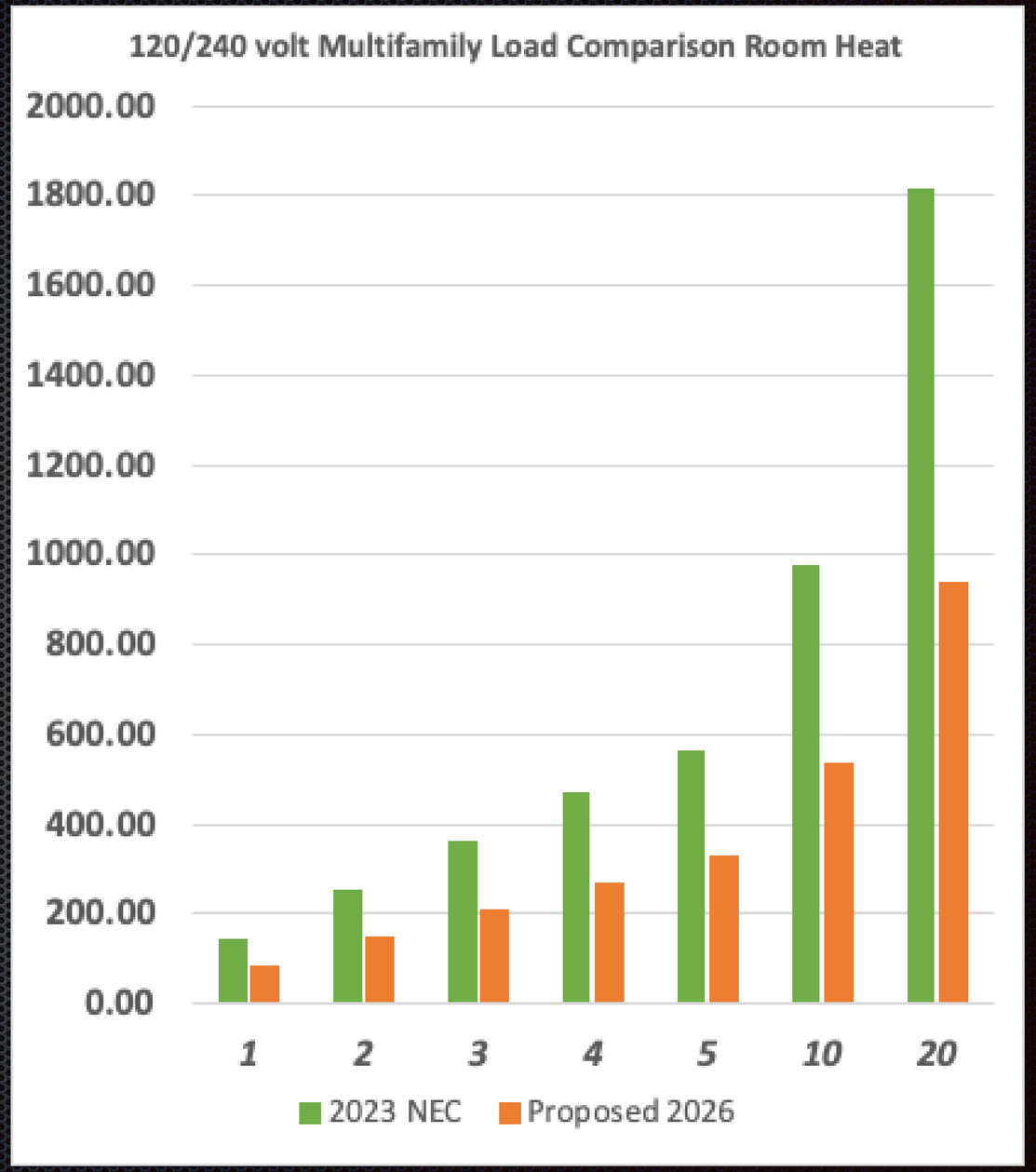
American Circuit Breaker Manufacturers Association

Compare by Heating Type

The demand factors for heating in Public Input 4361 result in extreme reductions of overcurrent protection.

This graph compares the 2023 to the proposed 2026 using room heating.



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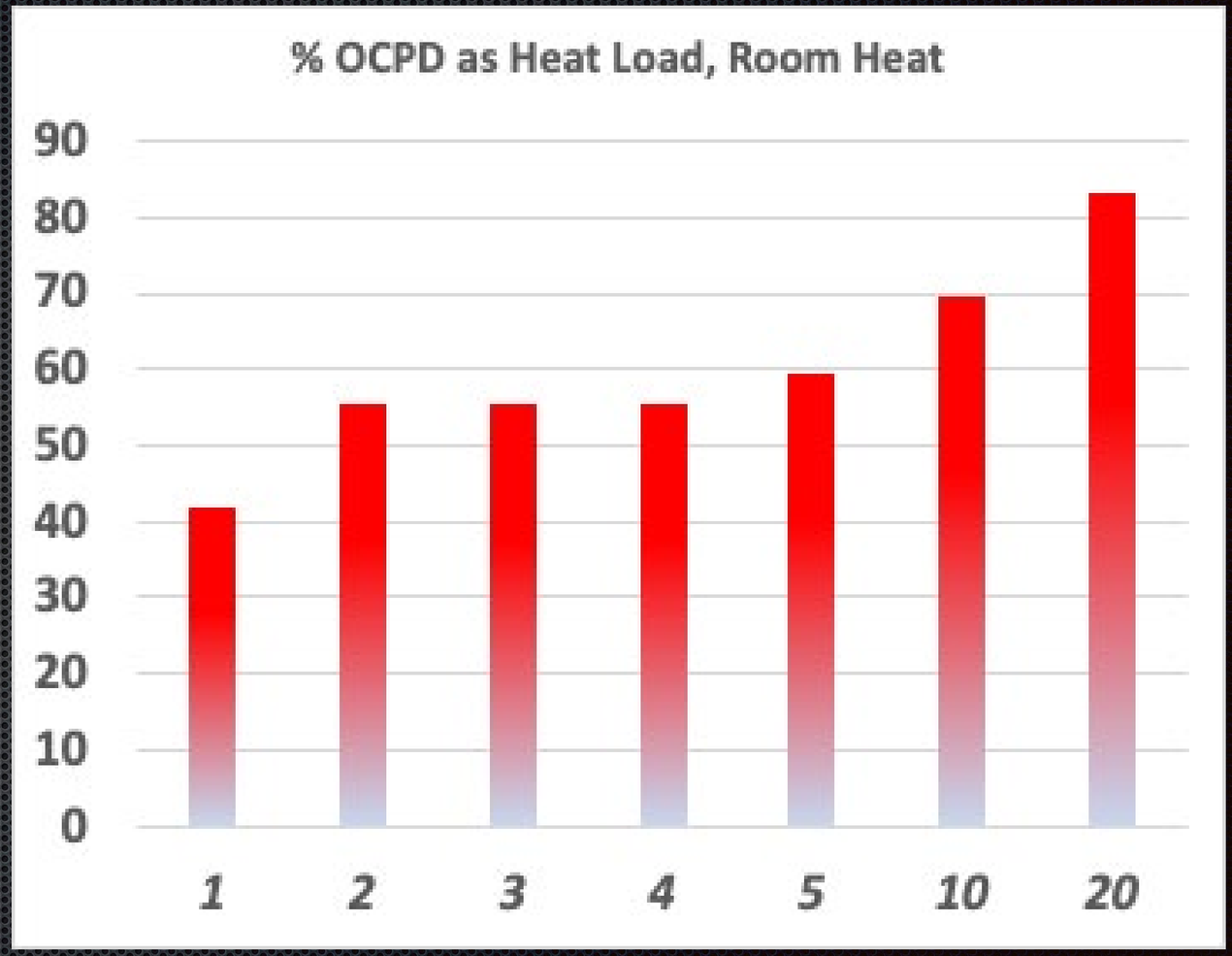
American Circuit Breaker Manufacturers Association

Total Load Vs OCPD Rating

This graph shows the percentage of heating load alone of the dwelling units compared to the rating of the MAIN SERVICE OCPD.

After a power failure, the 20 units will have 167 amperes to share before exceeding the rating of the main breaker.



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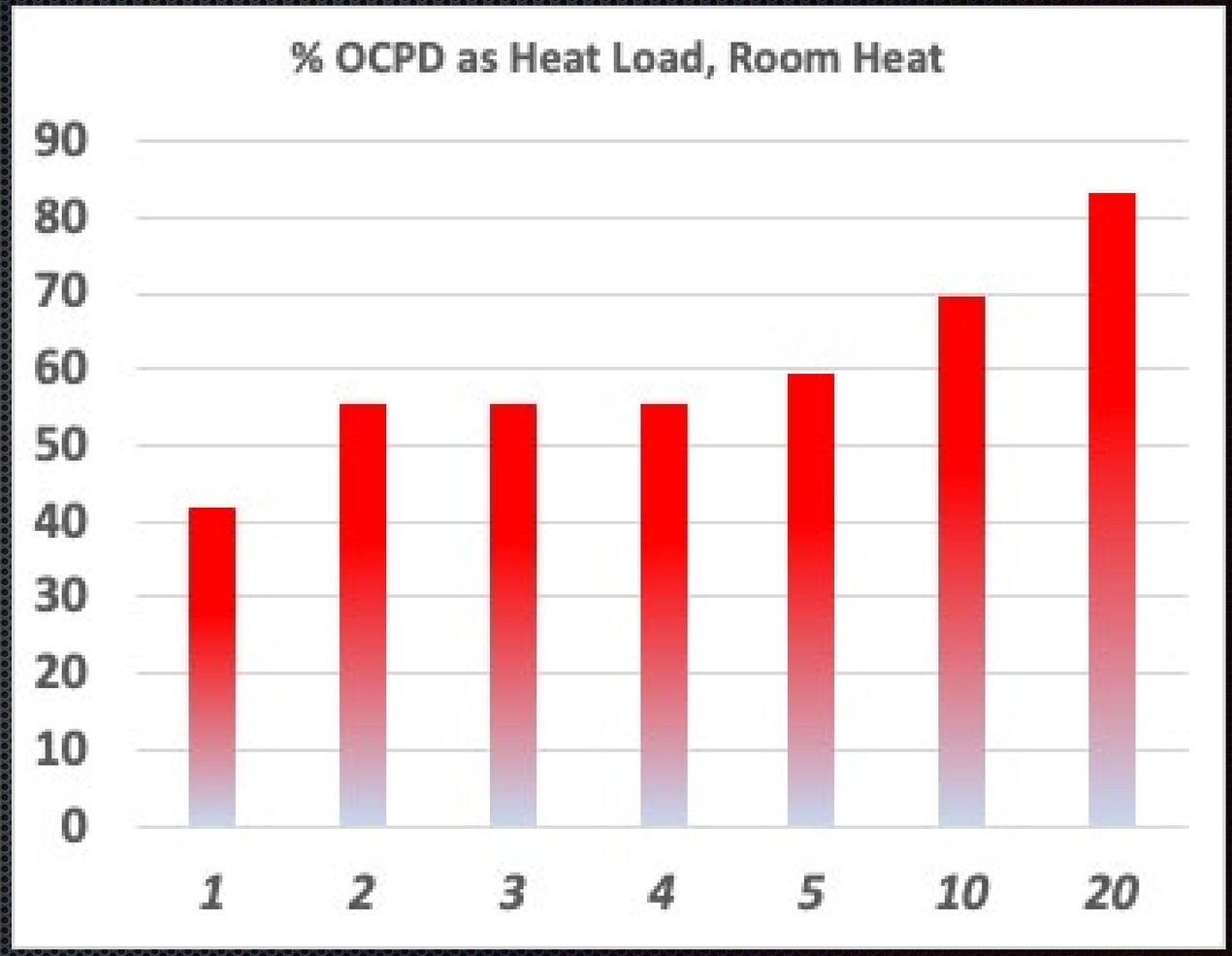
Optional is still optional

With these radical reductions in service sizes, the standard method is likely to become the method of choice and be compliant with these new requirements.



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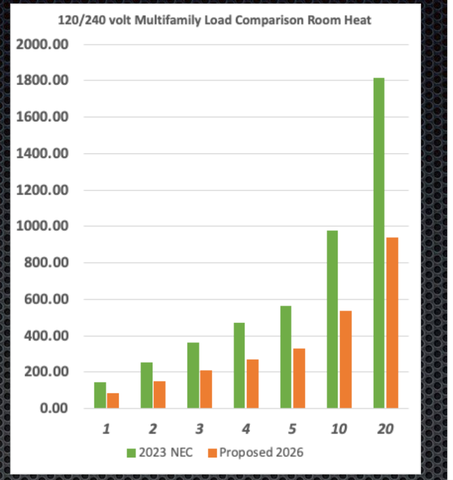
Resolve

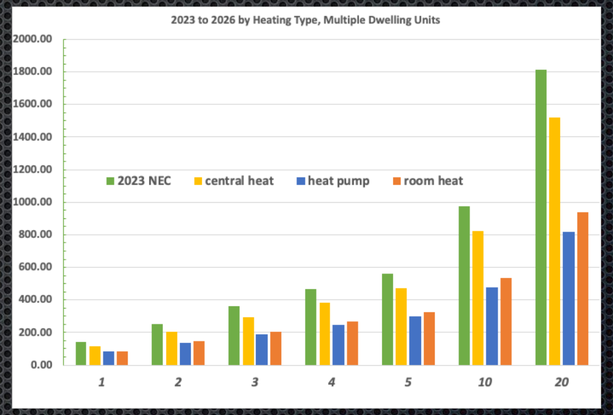
- **3236** 2 VA per square foot for lighting and general purpose receptacles
- **4361** heating: central 100%, heat pump 75%, room heating 30%
- **4144** 30% to appliances, remove the minimum number of 4
- **4151** 220.54, dryer table
- **4160** 220.55, range table

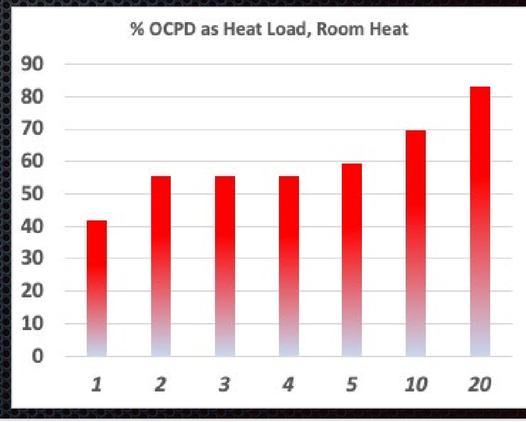
What is needed..

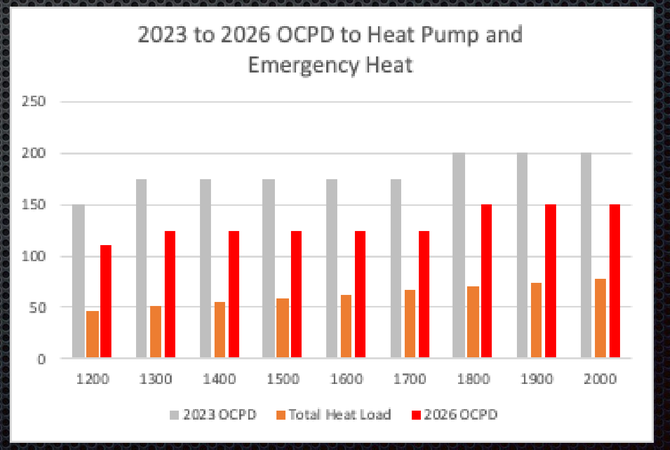
With increased electrification of dwellings, need to move forward on reliable foundations.

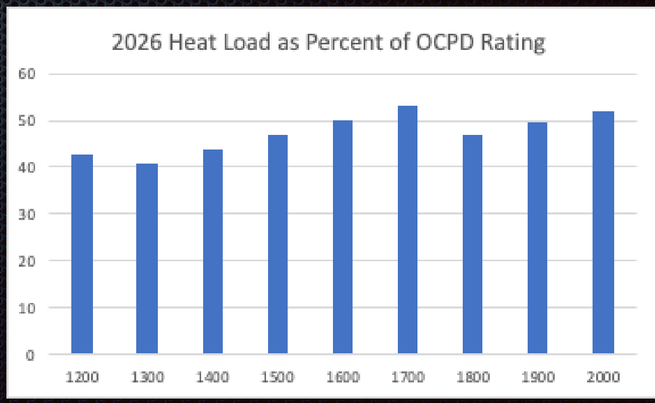
- Actual use cases for events such as power failure and restoration.











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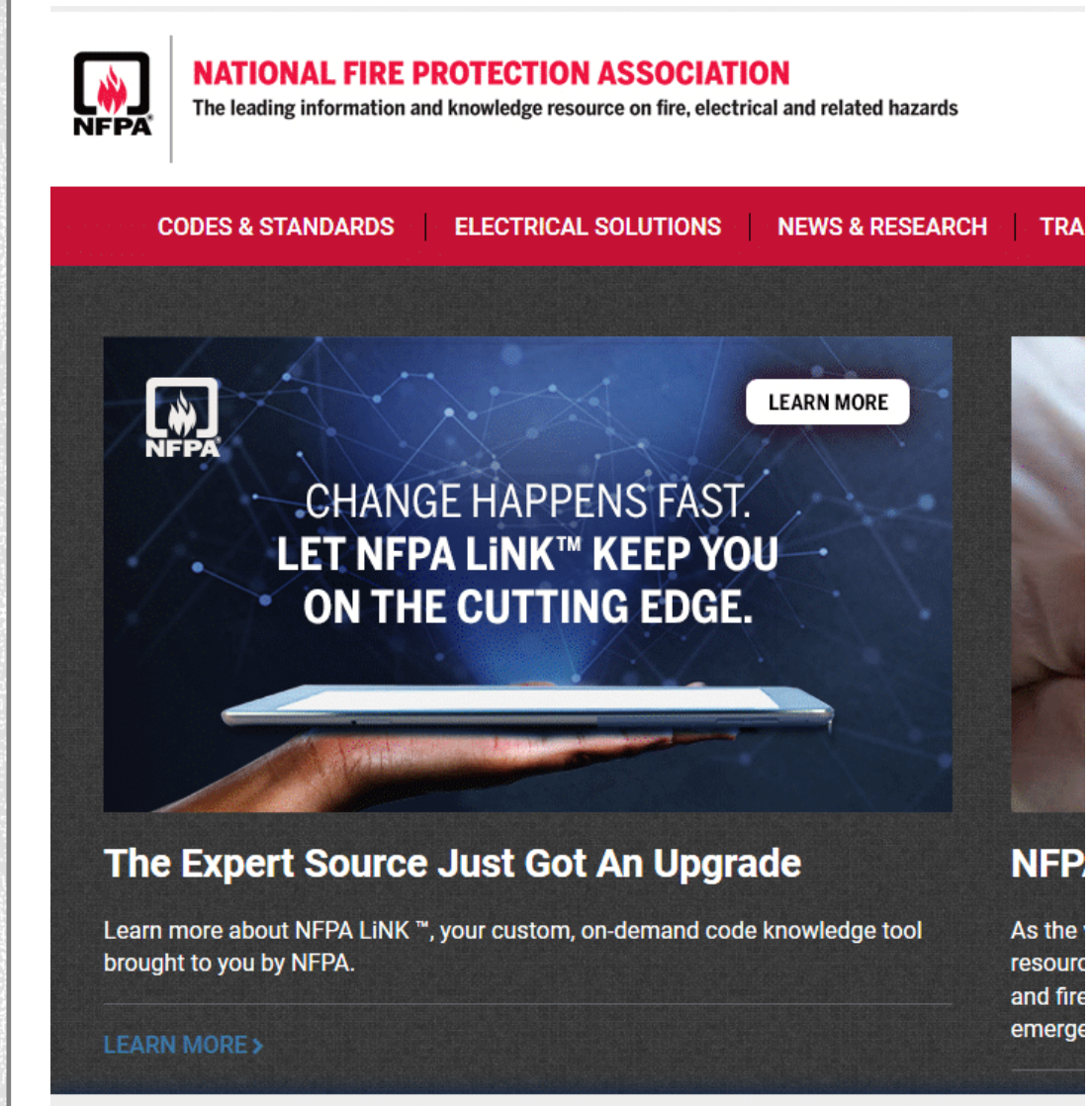
Founded to sell watches; evolved to sell everything	Founded to sell books; evolved to sell everything
1972	2017
sears	amazon
2 of every 3 Americans shopped in last 3 months	2 of every 3 Americans shopped in last 3 months
1987 Sales = 1% of GDP	2017 Sales = 1% of GDP

Merriam Associates

Source: Chicago Tribune



March 2020

Chapter 1

General

Chapter 2

Wiring & Protection

Chapter 3

Wiring Methods & Materials

Chapter 4

Equipment for General Use

Chapter 5

Special Occupancies

Chapter 6

Special Equipment

Chapter 7

Special Conditions

Chapter 8

Communications Systems

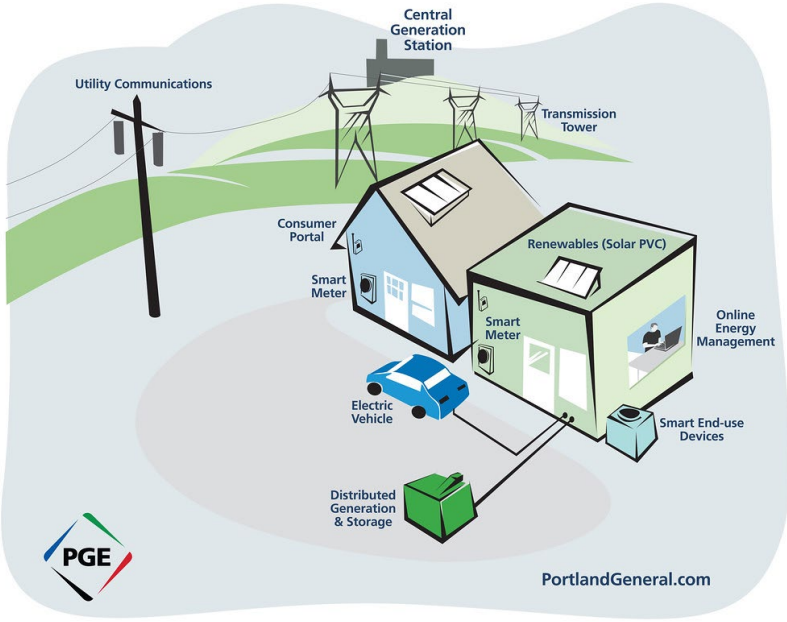
1937-2023 (35 editions):

Introduction (Identified as Article 90 starting in the 1959 edition)	Chapter 1 – General	Chapter 2 – Wiring Design and Protection	Chapter 4 has grown from 10 articles in the 1937 edition to 22 articles in the 2023 edition
Chapter 5 has grown from 5 articles in the 1937 edition to 27 articles in the 2023 edition	Chapter 6 has grown from 7 articles in the 1937 edition to 27 articles in the 2023 edition	Chapter 7 has grown from 4 articles in the 1937 edition to 15 articles in the 2023 edition	Chapter 8 has grown from 2 articles in the 1937 edition to 6 articles in the 2023 edition

What Else is Coming Down the Pike?

By: MTA Construction and Development

By: Portland General Electric



By:National Renewable Labs

Where do we want to go?

- Remain relevant with the quickly evolving electrical industry
- Improve usability
  - Place content where it makes sense
  - Logical/parallel structure
    - Systems below 1000V
    - Limited Energy
    - Medium Voltage
  - Eliminate “Special Equipment”/ “Special Conditions”
  - Leverage the past to make the future even better
- Create a structure that looks to the future

NATIONAL FIRE PROTECTION ASSOCIATION
The leading information and knowledge resource on fire, electrical and related hazards

National Electrical Code® Correlating Committee White Paper

Keeping the NEC® Relevant - Is Now the Time to Modernize?

The National Electrical Code® (NEC®) is the foundation of the electrical installation regulatory infrastructure for the United States, Mexico, and numerous other jurisdictions around the world. Growing demand for safe, reliable, resilient, and efficient use of electrical power to support society and the economy is aligning with technological advancement of power generation sources, electrical distribution, and new electrical power loads. It is critical the NEC be revised and implemented by the electrical community every three years to support the accelerating pace of change and technological advancement.

The structure of the NEC plays a critical role for personnel in learning, understanding, applying, and enforcing the requirements established within this regulatory code. While the current structure, first introduced in 1937, has provided tremendous success and stability and continues to be used by engineers, contractors, electricians and training programs, the ability to efficiently learn and quickly apply and inspect advancing technologies and uniquely configured electrical systems is a challenge for all electrical professionals. The existing NEC structure needs modernization to continue to support the advancing electrical infrastructure configurations and technological advancements. Therefore, it is imperative that the electrical industry actively pursue a revised NEC organizational structure to support ease of learning, understanding, and applying the NEC safety provisions in a rapidly advancing new energy landscape.

Keeping the NEC Relevant Now is the Time to Modernize

- Industry Trends
- Medium Voltage
- Limited Energy
- Multi-Directional Power Flow
- Digital Delivery of Content
- Future Vision
- Path Forward
- Feedback

Medium Voltage

A Starting Point for Considering a New Approach

- More difficult for AHJ's when inspecting
- Less likely to have listed equipment since traditionally geared toward utility.
- More likely to have requirements that are antiquated
- Depth of knowledge of Technical Committees can be a challenge.
- Wiring methods in Chapter 3 for >1000 volt systems are difficult to determine
- With renewable energy and microgrids lines of distinction between NESC and NEC are blurred.

Limited Energy

Past

- Confusing
- No more Ma Bell
- Independence Chapter 8 vs Dependence Chapter 1-7
- Cat 5/6 Cable Article 725 and 805
- POE is Article 725 and 840
- How do we maintain relevance?

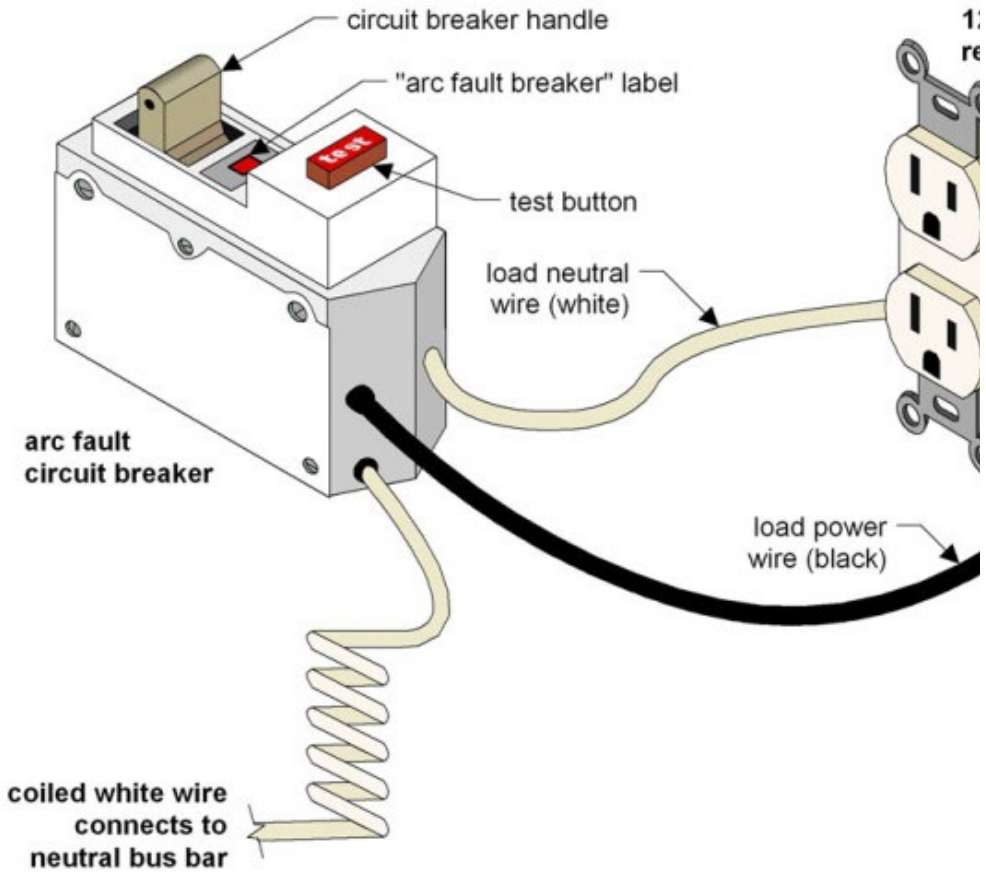
Future

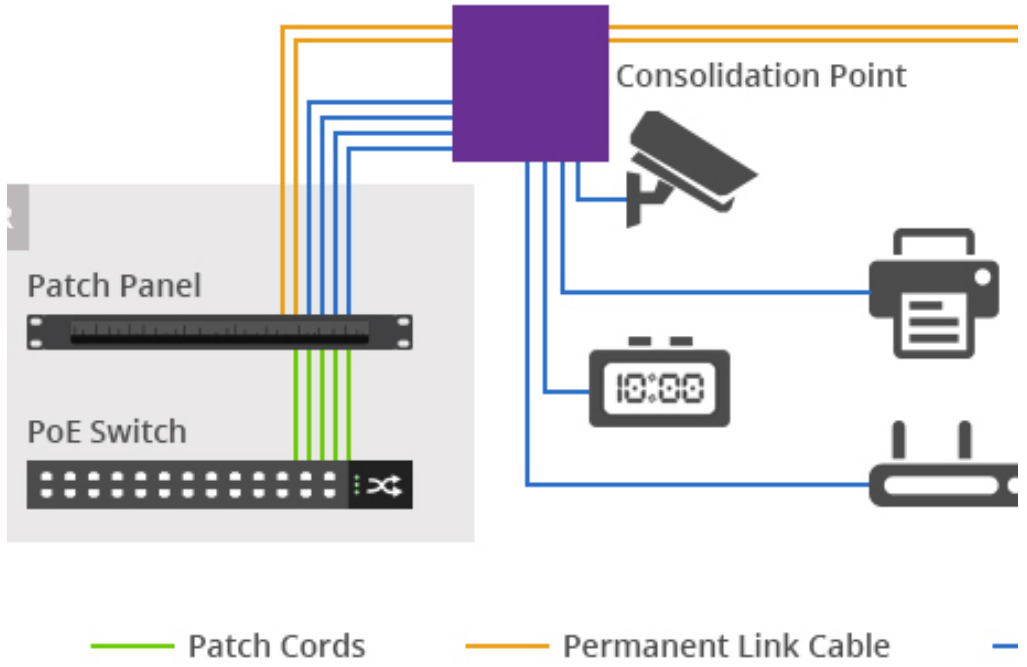
- Improve usability.
- Improve Terminology
- Create structure that is technology agnostic.
- Eliminate redundancy.
- Parallel Structure
- Everything communicates

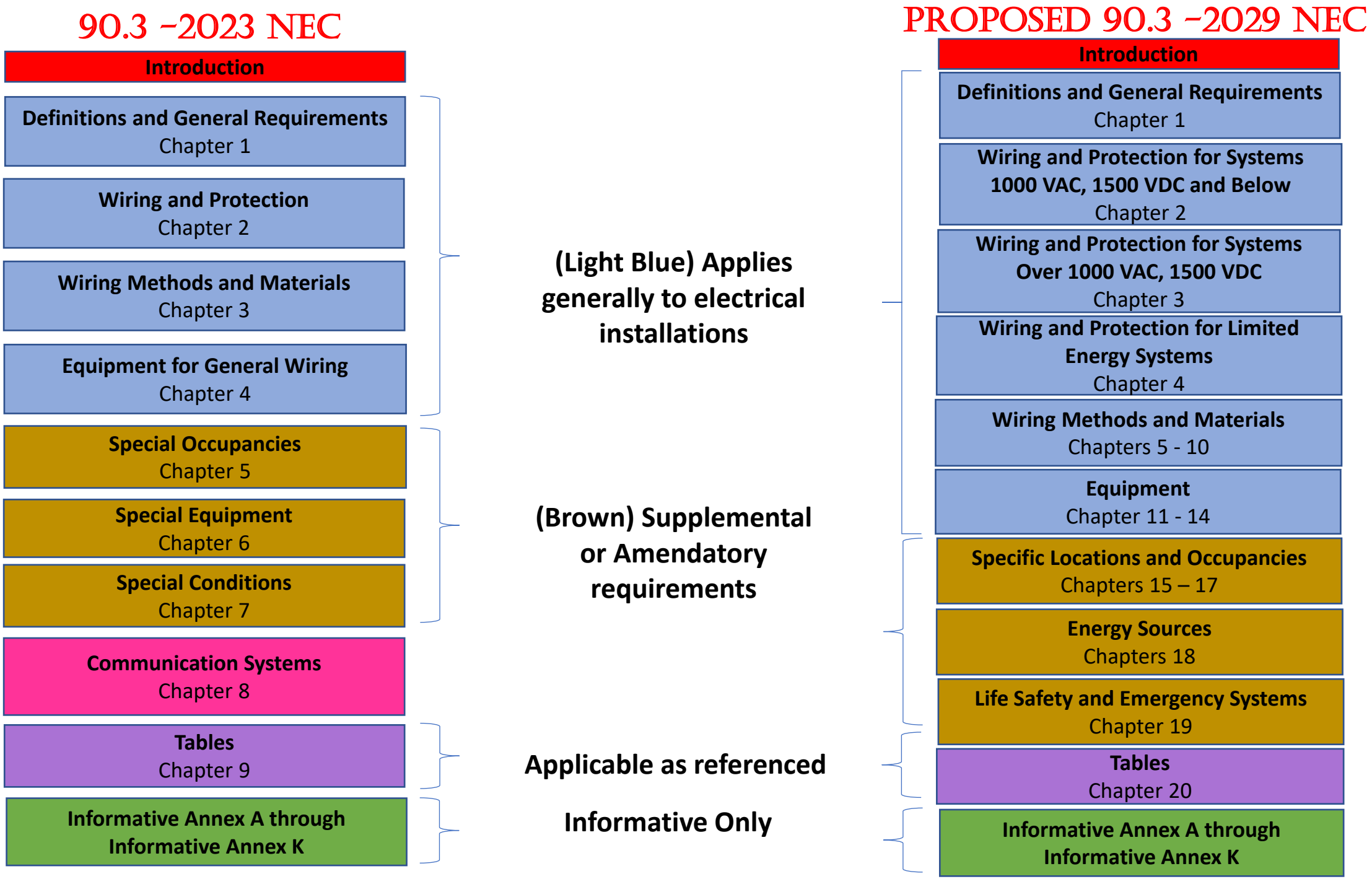
Short-Term Goals (2026)

MV /Limited Energy	• Move from Medium voltage structure to Medium Voltage Technical changes • Work on Limited Energy
Create parallel structure for Limited Energy	• Make it look like the front of the book. • (Protection scheme, wire and a load)
Begin Implementation	• Move certain articles for long-term road map implementation

Arc fault circuit interrupter






90.3 -2023 NEC
Introduction
Definitions and General Requirements
Chapter 1
Wiring and Protection
Chapter 2
Wiring Methods and Materials
Chapter 3
Equipment for General Wiring
Chapter 4
Special Occupancies
Chapter 5
Special Equipment
Chapter 6
Special Conditions
Chapter 7
Communication Systems
Chapter 8
Tables
Chapter 9
Informative Annex A through
Informative Annex K
(Light Blue) Applies generally to electrical installations
(Brown) Supplemental or Amendatory requirements
Applicable as referenced
Informative Only
PROPOSED 90.3 -2029 NEC
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Chapter 1
Wiring and Protection for Systems
1000 VAC, 1500 VDC and Below
Chapter 2
Wiring and Protection for Systems
Over 1000 VAC, 1500 VDC
Chapter 3
Wiring and Protection for Limited
Energy Systems
Chapter 4
Wiring Methods and Materials
Chapters 5 - 10
Equipment
Chapter 11 - 14
Specific Locations and Occupancies
Chapters 15 – 17
Energy Sources
Chapters 18
Life Safety and Emergency Systems
Chapter 19
Tables
Chapter 20
Informative Annex A through
Informative Annex K

Title		2023 Reference	2026 CMP	2029 CMP
90	Introduction	90	1	1
Chapter 1 Definitions and General Requirements				
100	Definitions	100	1	1
110	Requirements for Electrical Installations	110	1	1
120	Load Calculations	220	2	2
130	Energy Management Systems	750	13	13
140	Temporary Installations	590	3	3
Chapter 2 Wiring and Protection for Systems 1000 VAC, 1500 VDC and Below				
200	General Requirements	300	3	3
205	Conductors	310	6	6
206	Use and Identification of Grounded Conductors	200	5	5
210	Branch Circuits	210	2	2
215	Feeders	215	10	10
225	Outside Branch Circuits and Feeders	225	10	10
230	Services	230	10	10
240	Overcurrent Protection	240	10	10
242	Overvoltage Protection (Part I and II)	242	10	10
250	Grounding and Bonding	250	5	5

3

Chapter 3 Wiring and Protection for Systems Over 1000 VAC, 1500 VDC				
300	General Requirements	305	9	9
305	Conductors and Cables	315	9	9
306	Use and Identification of Grounded Conductors	205	5	9
310	Branch Circuits	235	9	9
315	Feeders	235	9	9
325	Outside Branch Circuits and Feeders	235	9	9
330	Services	235	9	9
342	Overvoltage Protection	242 (Part III)	10	9
350	Grounding and Bonding	250 (Part X)	5	5

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Chapter 4 Wiring and Protection for Limited Energy Systems				
400	Wiring Requirements and Materials		3	3
405	Conductors and Cables (Including Listing and Flammability)	722	3	3
406	Use and Identification of Conductors		3	3
430	Interior Cabling Systems Part I- Class 1 Power-Limited Circuits Part II- Class 2 and Class 3 Part III- Class 4	724, 725, 726	3	3
435	Exterior Cabling Systems (Outside Plant) Part I- Communication Circuits Part II- Antenna Systems Part III- CATV Part IV- Networked-Powered Broadband Communication Systems Part V- Premises-Powered Broadband Communication Systems		16	16
440	Overcurrent Protection Part I- Class 1 Power-Limited Circuits Part II- Class 2 and Class 3 Part III- Class 4	724, 725, 726	3	3
442	Overvoltage Protection		3	3
450	Grounding and Bonding		16	5

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Chapter 5 Enclosures and Wiring Support Structures				
500	Cabinets, Cutout Boxes, and Meter Socket Enclosures	312	8	8
502	Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Handhole Enclosures	314	8	8
504	Cable Trays	392	8	8
506	Auxiliary Gutters	366	8	8
508	Metal Wireways	376	8	8
510	Nonmetallic Wireways	378	8	8
512	Nonmetallic Extensions	382	6	8
Chapter 6 Wire and Cable				
600	Armored Cable: Type AC	320	6	6
602	Flat Cable Assemblies: Type FC	322	6	6
604	Flat Conductor Cable: Type FCC	324	6	6
606	Integrated Gas Spacer Cable: Type IGS	326	6	6
608	Metal-Clad Cable: Type MC	330	6	6
610	Mineral-Insulated, Metal-Sheathed Cable: Type MI	332	6	6
612	Nonmetallic-Sheathed Cable: Types NM and NMC	334	6	6
614	Optical Fiber Cables	770	16	16
616	Instrumentation Tray Cable: Type ITC	335	6	6
618	Power and Control Tray Cable: Type TC	336	6	6
620	Type P Cable	337	6	6
622	Service-Entrance Cable: Types SE and USE	338	6	6
624	Underground Feeder and Branch-Circuit Cable: Type UF	340	6	6
626	Flexible Cords and Flexible Cables	400	6	6
628	Fixture Wires	402	6	6

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Chapter 7 Circular Raceways (Conduit and Tubing)				
700	Intermediate Metal Conduit: Type IMC	342	8	8
702	Rigid Metal Conduit: Type RMC	344	8	8
704	Flexible Metal Conduit: Type FMC	348	8	8
706	Liquidtight Flexible Metal Conduit: Type LFMC	350	8	8
708	Rigid Polyvinyl Chloride Conduit: Type PVC	352	8	8
710	High Density Polyethylene Conduit: Type HDPE Conduit	353	8	8
712	Nonmetallic Underground Conduit with Conductors: Type NUCC	354	8	8
714	Reinforced Thermosetting Resin Conduit: Type RTRC	355	8	8
716	Liquidtight Flexible Nonmetallic Conduit: Type LFNC	356	8	8
718	Electrical Metallic Tubing: Type EMT	358	8	8
720	Flexible Metallic Tubing: Type FMT	360	8	8
722	Electrical Nonmetallic Tubing: Type ENT	362	8	8
724	Raceways for Limited Energy Systems (Communication Raceways)	800, 805, 810, 820, 830, 840	16	16
Chapter 8 Non-Circular Raceways				
800	Cellular Concrete Floor Raceways	372	8	8
802	Cellular Metal Floor Raceways	374	8	8
804	Strut-Type Channel Raceway	384	8	8
806	Surface Metal Raceways	386	8	8
808	Surface Nonmetallic Raceways	388	8	8
810	Underfloor Raceways	390	8	8

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900	Busways	368	8/9	8
902	Cablebus	370	8	8
904	Insulated Bus Pipe (IBP) and Tubular Covered Conductors (TCC) (New)	369	8	8
906	Flexible Bus System (New)	371	8	8
908	Multioutlet Assembly	380	8	8
910	Low-Voltage Suspended Ceiling Power Distribution Systems	393	18	18
912	Manufactured Wiring Systems	604	7	7
916	Office Furnishings	605	18	18
Chapter 10 Open Wiring				
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1002	Messenger-Supported Wiring	396	6	6
1004	Open Wiring on Insulators	398	6	6
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1102	Wiring Devices	406	18	18
1104	Switchboards, Switchgear and Panelboards	408	10	10
1106	Industrial Control Panels	409	11	11
1108	Transformers and Transformer Vaults	450	9	9
1110	Phase Converters	455	13	13
1112	Capacitors	460	9/11	11
1114	Resistors and Reactors	470	9/11	11

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Chapter 12 Utilization Equipment				
1200	Luminaires, Lampholders and Lamps	410	18	18
1202	Low-Voltage Lighting	411	18	18
1204	Electric Signs and Outline Lighting	600	18	18
1206	Motors, Motor Circuits, and Controller	430	11	11
1208	Cranes and Hoists	610	12	12
1210	Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts	620	12	12
1212	Electrically Driven or Controlled Irrigation Machines	675	7	7
1214	Appliances	422	17	17
1216	Fixed Electric Space Heating Equipment	424	17	17
1218	Fixed Resistance and Electrode Industrial Process Heating Equipment	425	17	17
1220	Fixed Outdoor Electric Deicing and Snow-Melting Equipment	426	17	17
1222	Fixed Electric Heating Equipment for Pipelines and Vessels	427	17	17
1224	Air-Conditioning and Refrigeration Equipment	440	11	11
1226	Induction and Dielectric Heating Equipment	665	12	12
1228	Electric Welders	630	12	12
1230	Pipe Organs	650	12	12
1232	Information Technology Equipment	645	12	12
1234	Sensitive Electronic Equipment	647	12	12
1236	X-Ray Equipment	660	12	12

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Chapter 13 Systems (Equipment)				
1300	Electric Vehicle Power Transfer System	625	12	12
1302	Electrified Truck Parking Spaces	626	12	12
1304	Audio Signal Processing, Amplification, and Reproduction Equipment	640	12	12
1306	Modular Data Centers	646	12	12
1308	Electrolytic Cells	668	12	12
1310	Electroplating	669	12	12
1312	Industrial Machinery	670	12	12
1314	Integrated Electrical Systems	685	12	12
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1400	General	495 (Part I & II)	9	9
1402	Switchgear and Industrial Control Assemblies	495 (Part III)	9	9
1404	Mobile and Portable Equipment	495 (Part IV)	9	9
1406	Boilers	495 (Part V)	9	9
1408	Motors, Motor Circuits, and Controllers	430 (Part XI)	11	9
1410	Capacitors	460 (Part III)	11	9
1412	Resistors and Reactors	470 (Part III)	11	9

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Chapter 15 Hazardous Locations				
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1501	Class I Locations	501	14	14
1502	Class II Locations	502	14	14
1503	Class III Locations	503	14	14
1504	Intrinsically Safe Systems	504	14	14
1505	Zone 0, 1, and 2 Locations	505	14	14
1506	Zone 20, 21, and 22 Locations for Combustible Dusts or Ignitible Fibers/Flyings	506	14	14
1511	Commercial Garages, Repair and Storage	511	14	14
1512	Cannabis Oil Equipment and Cannabis Oil Systems Using Flammable or Combustible Materials	512	14	14
1513	Aircraft Hangars	513	14	14
1514	Motor Fuel Dispensing Facilities	514	14	14
1515	Bulk Storage Plants	515	14	14
1516	Spray Application, Dipping, Coating, and Printing Processes Using Flammable or Combustible Materials	516	14	14

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1600	Health Care Facilities	517	15	15
1602	Assembly Occupancies	518	15	15
1604	Theaters, Audience Areas of Motion Picture and Television Studios, Performance Areas, and Similar Locations	520	15	15
1606	Control Systems for Permanent Amusement Attractions	522	15	15
1608	Carnivals, Circuses, Fairs, and Similar Events	525	15	15
1610	Motion Picture and Television Studios and Similar Locations	530	15	15
1612	Motion Picture Projection Rooms	540	15	15
1614	Manufactured Buildings and Relocatable Structures	545	7	7
1616	Agricultural Buildings	547	7	7
1618	Mobile Homes, Manufactured Homes, and Mobile Home Parks	550	7	7
1620	Recreational Vehicles and Recreational Vehicle Parks	551	7	7
1622	Park Trailers	552	7	7

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Chapter 17 Installations Associated with Bodies of Water				
1700	Swimming Pools, Fountains, and Similar Installations	680	17	17
1702	Natural and Artificially Made Bodies of Water	682	7	7
1704	Marinas, Boatyards, Floating Buildings, and Commercial and Noncommercial Docking Facilities	555	7	7
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1800	Interconnected Systems	705	13	13
1802	Generators	445	13	13
1804	Stationary Standby Batteries	480	13	13
1806	Solar Photovoltaic (PV) Systems	690	4	4
1808	Large-Scale Photovoltaic (PV) Electric Supply Stations	691	4	4
1810	Fuel Cell Systems	692	4	4
1812	Wind Electric Systems	694	4	4
1814	Energy Storage Systems	706	13	13
1816	Stand Alone Systems	710	4	4
1818	Optional Standby Systems	702	13	13
Chapter 19 Life Safety and Emergency Systems				
1900	Emergency Systems	700	13	13
1902	Legally Required Standby Systems	701	13	13
1904	Fire Pumps	695	13	13
1906	Fire Alarm Systems	760	3	3
1908	Circuit Integrity Cables and Electrical Protective Systems (Fire- Resistive Cable Systems)	728	3	3
1910	Critical Operations Power Systems (COPS)	708	13	13

Introduction

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Informative Annex A through Informative Annex K

2026 NEC STRUCTURE

2026 NEC		2023 NEC Reference
Chapter 1 Definitions and General Requirements		
100	Definitions	100
110	Requirements for Electrical Installations	110
120	Load Calculations	220
130	Energy Management Systems	750
140	Temporary Installations	590

Takeaways

- Feedback to Jeff Sargent
- Proposed structure is fluid and will continue to evolve as we receive input
- Intent to print proposed structure in Annex for 2026 NEC edition.
- Structure is not intended to impact technical, only the organization and correlation of the technical content
- Intent is to move articles once