GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS

CODE AMENDMENT FORM

ITEM NO: _____ (DCA USE ONLY) PAGE 1 OF 6

CODE: 2023 National Electric Code SECTION: Article 702.4(A)(2)

PROPONENT: Michael Hart (Tesla) DATE: 4/12/2023

EMAIL: michart@tesla.com

ADDRESS: 12832 Frontrunner Blvd, Draper, UT 84020

TELEPHONE NUMBER: 415-235-6544 FAX NUMBER: N/A

CHECK ONE: X Revise section to read as follows: _____ Add new section to read as follows:

_____ Delete section and substitute the following: _____ Delete without substitution:

~~LINE THROUGH MATERIAL TO BE DELETED:~~ UNDERLINE MATERIAL TO BE ADDED

☐ Approve ☐ Approve as amended (DCA STAFF ONLY) ☐ Disapprove ☐ Withdrawn

DESCRIPTION:

Below is our suggested language for an amendment to Article 702.4(A)(2) of the 2023 National Electrical Code. Either option would address the concerns laid out in the "REASON/INTENT" section. Suggested language is in red text.

Option 1

2) Automatic Load Connection.

If the connection of load is automatic, an optional standby system shall comply with 702.4(A)(2)(a) or (A)(2)(b) in accordance with Parts I through IV of Article 220 or by another approved method.

(a) Full Load. The standby source shall be capable of supplying the full load that is automatically connected.

(b) Energy Management System (EMS). Where a system is employed in accordance with 750.30 that will automatically manage the connected load, the standby source shall have a capacity sufficient to supply the maximum load that will be connected by the EMS.

Exception: Battery energy storage systems used primarily for grid-interactive applications and employing EMS control in accordance with 750.30 shall be permitted to provide automatic load connection with a standby capacity sized in accordance with 710.15.

Option 2

2) Automatic Load Connection.

If the connection of load is automatic, an optional standby system shall comply with 702.4(A)(2)(a), 702.4(A)(2)(b), or 702.4(A)(2)(c) in accordance with Parts I through IV of Article 220 or by another approved method.

(a) Full Load. The standby source shall be capable of supplying the full load that is automatically connected.

(b) Energy Management System (EMS). Where a system is employed in accordance with 750.30 that will automatically manage the connected load, the standby source shall have a capacity sufficient to supply the maximum load that will be connected by the EMS.

(c) Battery energy storage systems meeting all of the following conditions shall be permitted to provide automatic load connection with a standby capacity sized in accordance with 710.15.

(1) The ESS is listed and installed in accordance with Article 706

(2) The primary application of the ESS is for grid-interactive functions

(3) The ESS employs EMS control in accordance with 750.30 to prevent connection in an overload condition

REASON/INTENT:

The intent of this proposal is to address concerns about the proposed language in Article 702.4 of the 2023 National Electric Code (NEC). You will find an outline of its impact to renewable energy deployment, the impact to residents in Georgia, and a proposal for amended language that would clarify the intent of this article and eliminate these impacts.

Issue with Language in Article 710 and 702.4(A)(2)

Article 710: Stand-alone Systems

There is new language in Article 710 that excludes grid-connected energy storage systems from being considered "stand-alone" systems. Traditionally energy storage systems, such as the Tesla Powerwall, have qualified as both grid-interactive and stand-alone systems due to their island functionality when operating off-grid. Stand-alone systems can supply a load panel that includes any number of house electrical loads if the stand-alone system has enough output capacity to back-up the largest single load in the panel.

Stand-alone System Sizing Summary

- *Sum of stand-alone system output capacity >= Largest single load connected to the system*

Example

- *Stand-alone system output capacity = 50A*
- *Allowable loads in back-up circuit: All loads individually 50A or less*

Due to the NEC 2023 exclusion of grid-connected energy storage systems from being classified as stand-alone systems, back-up circuit sizing is now forced into the requirements of Article 702 for optional standby systems.

Article 702.4(A)(2): Optional Standby Systems – System Capacity for Automatic Load Connection

This section covers optional standby systems. In this section, there are only two means of compliance for sizing the back-up circuit when automatically connected.

a) The standby source must be capable of supplying the full load that is automatically connected

Example:

- Optional standby system capacity = 50A
- Allowable loads in back-up circuit: A total calculated (combined) load of 50A or less

Or,

b) The standby source must be able to automatically manage the connected load as an Energy Management System and be capable of supplying the maximum load that will be connected to that system

These two options for back-up circuit sizing do not cover all potential pathways that meet the intent of this Article. The "Enhanced Content" on NFPA Link clearly states that the intent of this Article is to ensure the transferred load does not overload the source.

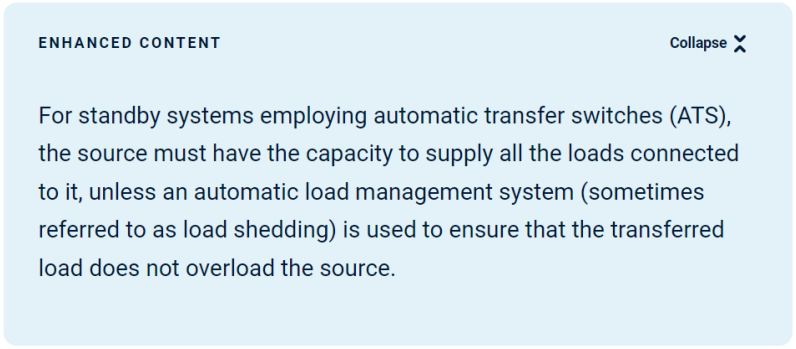

Figure 1: Enhanced Content from Article 702.4(A)(2) of the NEC 2023 on NFPA Link

While the Enhanced Content is not enforceable, it is a clear indication of the Article's intent and demonstrates that there is incomplete language within the written code. **This section does not consider that current technological safety features can be used to ensure that optional standby systems are not overloaded by transferred load.**

The Tesla Powerwall is an example of an energy storage system that has built-in safety features to prevent overloading. While this meets the intent of the code, the lack of explicit language in this section could force Powerwall systems to have back-up circuits sized in a manner that limits the homeowner's ability to select which loads to use during an outage, increases the cost of installation, and limits the growth of renewable energy deployment. These impacts are significant and amendments to Article 702.4 should be implemented to account for systems that can safely prevent overloading. **The amended language should allow systems with overload protection safety features to size back-up circuits to the requirements in 710.15 for stand-alone systems.**

Tesla Powerwall Safety and Functionality

Tesla's Powerwall systems are engineered to safely manage load demand while providing the optimal home backup profile for our customers. The Powerwall achieves this through the following functionality.

- Real-time monitoring of the house electrical loads connected to the system
- In the event of automatic transfer, the system ensures it can back-up the connected load to prevent overloading
- If the load exceeds the Powerwall capacity, it prevents overloading by requiring manual transfer

Each system has a site-specific design to ensure that the Powerwall's output capacity is sufficient for any single load in the backup circuit. This, in combination with the features listed above, enables the customer to safely manage which loads they want to use during a grid outage. Flexible load management is important to customers as they experience unique grid outage events that often differ in length, severity, and circumstance.

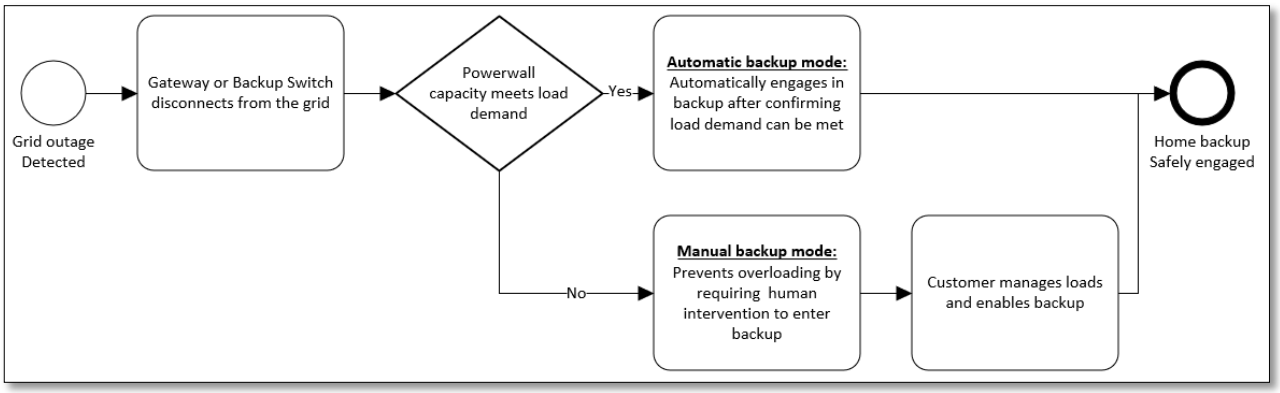

Figure 2: Example flow of Automatic and Manual Backup modes that ensure the system does not get overloaded upon transfer

Historically, Powerwall installations have used Article 710.15 for determining which loads can be included in the electrical back-up circuit. Over 90% of recorded outage events for these installations were backed up using automatic back-up mode. Meaning that the system ensured there is sufficient capacity, and rating, for real-time load demand when initiating automatic backup. In the instances where real-time load demand exceeds the available power, the Powerwall prevents overloading from occurring by entering a manual backup mode.

Impact to Renewable Energy Deployments in Georgia

This gap in the written NEC 2023 code introduces significant risks to renewable energy deployment in Georgia while having no safety benefit or impact. If left unresolved, jurisdictions will be left to interpret compliance of this code which is incomplete, and unclear, on its intent. This will result in increased labor and materials costs, reduced back-up functionality, and reduced customer satisfaction.

There are over 600 Powerwall systems installed annually in Georgia and more than 80% of those get the entirety of their home backed up. If broadly enforced, without consideration of the product's safety features, we estimate that less than 10% of customers would qualify for whole home back-up. The resulting increased cost for electrical work would exceed $1 million/year at a rate of approximately $1,700/install for Georgia. The bulk of this cost would likely be passed down to customers. The impact of this will only increase as renewable energy deployments increase in the state.

Impact to Customers

Outside of the additional cost burden to the residents of Georgia, this also has the potential for limiting back-up flexibility for our customers.

Tesla has developed its whole home backup offerings based on customer demand and value expectations. Powerwall system capacity is designed, and sold, to cover all typical loads both on-grid and off-grid. This is fundamental to the value proposition of energy storage systems. Reducing the number of house electrical loads that can be backed up has had the effect of limiting customer choice.

Residential customers have demonstrated a preference for the flexibility to select loads they connect to their energy storage system. They do not want to pay the expense associated with a much larger system or for a separate backup panel that limits that choice (i.e., paying more for less flexibility). The language change proposed in this document achieves a balance that meets the intent of overload prevention, while preserving the freedom to choose which electrical loads they want to use during a grid outage.

Summary

Either of the proposed amendments would allow a pathway for system sizing in accordance with 710.15 for grid-interactive systems with stand-alone capability and would have the following benefits.

- Reduces cost per installation by reducing electrical work and equipment
- Allows more customers to have whole-home back-up for flexible load management during grid outages
- Ensures the transferred load does not overload the source
    - Transferred load: Electrical home loads in the back-up circuit
    - Source: Optional standby system (i.e., Powerwall)

Without an amendment to Article 702.4(A), the 2023 National Electrical Code will lack clear direction for grid-interactive energy storage systems that have safety features built-in to prevent overloading the source upon transfer during an outage. This will result in jurisdictions enforcing overly restrictive requirements that are not based on safety, increase the cost to the customer, and provide fewer options for back-up which reduces the value proposition to the customer.

If you have any questions about this proposal, or the potential impacts of this issue, please contact Michael Hart at michart@tesla.com.

FINANCIAL IMPACT OF PROPOSED AMENDMENT:

- Decreases cost of energy storage system installations by approximately $1,700 per install.
    - Based on labor and material costs of electrical load relocation for electrical backup panels
- At the current rate of Tesla deployments, this would be approximately $1 million/year
    - This impacts all contractors installing energy storage systems
    - Impact will be greater for the entire industry
- Energy storage system installations are expected to grow exponentially over the coming years

GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS

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The Department of Community Affairs
Codes and Industrialized Buildings Section
60 Executive Park South, NE
Atlanta, Georgia 30329-2231

GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS

CODE AMENDMENT FORM

ITEM NO: _____ (DCA USE ONLY) PAGE _____ OF _____

CODE: 2023 National Electric Code SECTION: 210.12 (B)

PROPONENT: Tim Williams – HBAG DATE: April 21,2023

EMAIL: twilliams@americashomeplace.com

ADDRESS: HBAG, 877 W Marietta St NW, Suite T-105, Atlanta, GA 30318

TELEPHONE NUMBER: (678) 450-3583 FAX NUMBER: ( ) -

CHECK ONE: ☒ Revise section to read as follows: ☐ Add new section to read as follows:

☐ Delete section and substitute the following: ☐ Delete without substitution:

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☐ Approve ☐ Approve as amended (DCA STAFF ONLY) ☐ Disapprove ☐ Withdrawn

DESCRIPTION:

210.12(B) Dwelling Units.
All 120-volt, single-phase, 10-, 15-, and 20-ampere branch circuits supplying outlets or devices installed in the following locations shall be protected by any of the means described in 210.12(A)(1) through (A)(6):

(1) Kitchens
(2) Family rooms
[The remaining list items are unchanged.]

Exception No. 1: AFCI protection shall not be required for an individual branch circuit supplying a fire alarm system installed in accordance with 760.41(B) or 760.121(B). The branch circuit shall be installed in a metal raceway, metal auxiliary gutter, steel-armored cable, or Type MC or Type AC cable meeting the applicable requirements of 250.118, with metal boxes, conduit bodies, and enclosures.

Exception No. 2: AFCI protection shall not be required for the individual branch circuit supplying an outlet for arc welding equipment in a dwelling unit until January 1, 2025.

Exception No. 3: AFCI protection shall not be required for the individual branch circuit supplying an outlet for a refrigerator in a dwelling unit or a garage serving a dwelling unit.

REASON/INTENT: Requiring AFCI protection in this location has created additional warranty and even liability issues for builders and consumers. It is not only the cost of installation but also the cost and frustration of numerous call-backs. Food and medications requiring refrigeration have been lost in several cases. Despite help from the National Electrical Manufacturers, this problem continues to persist. Electrical fires caused by arcing in newer homes, especially in this area, are not common occurrences. Problems far outweigh any benefits

There is an incompatibility problem between AFCI devices and home appliances, and the added areas include many home appliances. Despite this, no formal evaluation was conducted on issues of compatibility between household appliances and AFCI devices, some of which are overly sensitive. There are no industry-wide rules for the specific protection that an AFCI must provide, making it impossible for home appliance manufacturers to consistently design products that will not nuisance trip an AFCI. Nuisance tripping is especially concerning when it puts consumers at risk and without access to appliances essential for health and safety. The Association of Home Appliance Manufacturers have created the white paper "Nuisance Tripping of Arc-Fault Circuit Interrupters (AFCIs) for Appliances" which explains the issue in greater detail.

FINANCIAL IMPACT OF PROPOSED AMENDMENT:

Providing an exception will reduce costs and liability for Georgia builders, electricians and consumers. The amendment will remove unnecessary regulatory costs without impacting safety. Help prevent lawsuits. Georgia is in an affordability crisis. Reducing unneeded costs is critically important is Georgia's goal to provide more affordable but safe homes.

Nuisance Tripping of Arc-Fault Circuit Interrupters (AFCIs) for Appliances

August 29, 2022

ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

Leadership ➤ Knowledge ➤ Innovation

1111 19th Street NW ➤ Suite 402 ➤ Washington, DC 20036
t 202.872.5955 f 202.872.9354 www.aham.org

ABOUT THE ASSOCIATION OF HOME APPLIANCE MANUFACTURERS

AHAM represents more than 150 member companies that manufacture 90% of the major, portable and floor care appliances shipped for sale in the United States. Home appliances are the heart of the home, and AHAM members provide safe, innovative, sustainable and efficient products that enhance consumers' lives. The home appliance industry is a significant segment of the economy, measured by the contributions of home appliance manufacturers, wholesalers, and retailers to the U.S. economy. In all, the industry drives nearly $200 billion in economic output throughout the U.S. and manufactures products with a factory shipment value of more than $50 billion.

AHAM is also a standards development organization, accredited by the American National Standards Institute (ANSI). The Association authors numerous appliance performance testing standards used by manufacturers, consumer organizations and governmental bodies to rate and compare appliances. AHAM's consumer safety program has educated millions of consumers on ways to safely use appliances such as portable heaters, clothes dryers, and cooking products. The Association's Verifide® program provides independent testing by verifying the volume, energy, and in some cases, performance of common household appliances to ensure they will perform according to manufacturers' stated claims.

Introduction

The NFPA 70® standard, National Electric Code® (NEC®) includes language requiring arc-fault circuit interrupters (AFCIs) for household branch circuits in new constructions and significant remodels. Section 210.12(B) affects household appliances:

> All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by [an AFCI]

However, in creating these NEC requirements, no formal evaluation has been conducted on issues of compatibility between household appliances in these locations and AFCI devices, some of which are overly sensitive.

AFCI software logic, designs and construction requirements have not kept up with the changing home environment and new technologies, which are constantly introduced to the home. An update to AFCI requirements is needed.

Protection from existing AFCIs

AFCIs are meant to provide arc-fault protection and prevent fires. However, there are no industry-wide rules for the specific protection that an AFCI must provide. To engineers designing home appliances, this lack of transparency creates uncertainty in the field. Clear and transparent, industry-wide rules on AFCI operation are needed. Currently, when an appliance manufacturer or others inquire about nuisance tripping, parties are asked to sign non-disclosure agreements (NDAs) directly with each AFCI manufacturer. As home appliances continue to adapt to new regulations and consumer needs, the existing NDA process is not sustainable for any of the parties involved.

Recently, a home appliance manufacturer followed the existing process and contacted the AFCI manufacturer to resolve an existing nuisance tripping issue. A month passed before the home appliance manufacturer received a meaningful response, which confirmed the AFCI was indeed nuisance tripping. During this one-month period, the consumer was without a functioning appliance. Nuisance tripping is especially concerning when it puts consumers at risk and without access to appliances essential for health and safety, like room air conditioners, dehumidifiers, refrigerators, freezers or room air cleaners.

The updated AFCI consensus standards must answer two essential:

- At what levels must an AFCI trip?
- At what levels must an AFCI not trip?

Without this knowledge, it is impossible for home appliance manufacturers to consistently design product that will not nuisance trip an AFCI.

Cooperation with AFCI manufacturers

AHAM and member companies support efforts that make the home less susceptible to electrical fire. However, the home appliance industry has been working with AFCI manufacturers since 2014 and AHAM members are still experiencing an unacceptable level of nuisance tripping associated with these devices. AFCI expansion should be paused until this interoperability issue is addressed. The home appliance industry remains ready to work with AFCI manufacturers on standardized solutions.

When consumers encounter nuisance tripping, they may seek a resolution from appliance manufacturers. Unfortunately, appliance manufacturers are left to address these issues with each different AFCI manufacturer since there are no industry-wide trip thresholds.

Nuisance tripping of AFCIs on circuits with microwave ovens

A considerable number of nuisance trip events have resulted from AFCIs connected to microwave ovens.

AFCI installation requirements effectively create additional new appliance requirements that go beyond the listing requirements in section 422.6 of the NEC. The current version of UL 923: Microwave cooking appliances, does not require AFCI compatibility, as there are no such published requirements to certify to. Microwave ovens are designed and manufactured by AHAM members in compliance with applicable standards and laws, by following UL 923 requirements and FCC requirements for conducted emissions.

Microwave ovens are designed using a half-wave voltage multiplier circuit and magnetron in the power pack to implement basic functions that generate microwaves (see Figure 1).

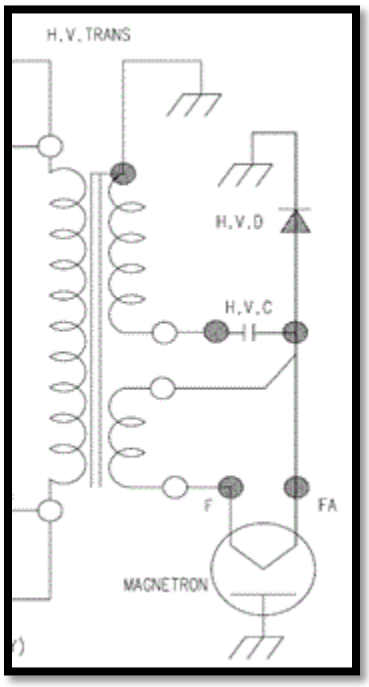

Figure 1, Typical Microwave Oven Circuit

A microwave oven's normal operation thus creates non-sinusoidal, noisy, waveforms that may be mistaken for arc signature by present AFCI's trip algorithms (see Figure 2).

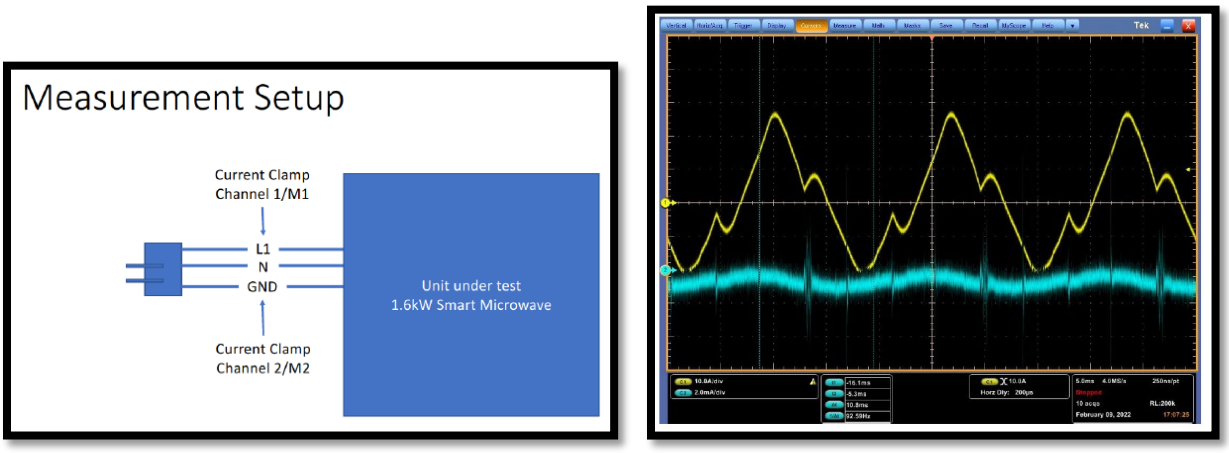

Figure 2, Typical Microwave Oven Waveforms

Until the AFCI designs and UL 1699/CSA C 22.2 #270 are updated to avoid nuisance tripping during normal microwave operation, microwave ovens should be excluded from the requirement of AFCI protection.

Remedies

NFPA Code Making Panel 2 (CMP2) has rejected multiple requests to add an appliances exception for AFCI installation, allowing time for appliances to improve compatibility with AFCIs, as required by the National Electrical Code.

A proactive, public effort is needed to eliminate nuisance tripping before it happens. In order to eliminate nuisance tripping, the bounds of AFCI operations must be defined. Solutions are available today. For example, in March 2020, UL proposed that an energy-based threshold of 350 joules be used for AFCI tripping criteria. Until a clear and transparent industry-wide AFCI standard is developed that includes agreed-upon tripping parameters, any in-home AFCI expansion should be delayed.

Twenty-two states and three major municipalities have recognized incompatibility issues and created exceptions within the state electrical codes. AHAM encourages all stakeholders to discuss solutions, including AFCI installation exceptions for appliances, with state officials.

Conclusion

Manufacturers are facing an urgent need to respond to increasing AFCI incompatibility complaints. Until the UL/CSA device standards are modernized to reflect updated parameters, appliance designers, installers, AHJs, and consumers will be forced to choose between a code compliant installation and an operational installation.

GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS

#@CODE AMENDMENT FORM

ITEM NO: _____ (DCA USE ONLY) PAGE _____ OF _____

CODE: 2023 National Electric Code SECTION: 210.8 (A) 6

PROPONENT: Derrick Daniel DATE: April 24, 2023

EMAIL: Srcg724@gmail.com

ADDRESS: 11821 Legend Dr, Greensboro, GA

TELEPHONE NUMBER: 468-288-0677 FAX NUMBER: _____

CHECK ONE: X ☐ Revise section to read as follows: ☐ Add new section to read as follows:

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☐ Approve ☐ Approve as amended (DCA STAFF ONLY) ☐ Disapprove ☐ Withdrawn

DESCRIPTION:

210.8.(A) Dwelling Units (Ground Fault Circuit Interrupter Protection)

6. Kitchens - Kitchen area is defined as the immediate area designed for permanent food and beverage preparation and for the purpose of GFCI requirements,only extends to an area six feet from any water distributing or utilizing appliance and or fixture.

REASON/INTENT:

Definition needed to identify space with open floor plans. Plans for residential construction are required in many jurisdictions.

FINANCIAL IMPACT OF PROPOSED AMENDMENT:

Provides guidance. Helps prevent conflicting interpretations between jurisdicitons. Constitency

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GEORGIA DEPARTMENT OF COMMUNITY AFFAIRS

CODE AMENDMENT FORM

ITEM NO: _____ (DCA USE ONLY) PAGE _____ OF _____

CODE: 2023 National Electric Code SECTION: 210.52(C) (3) (1)

PROPONENT: Derrick Daniel DATE: April 24. 2023

EMAIL: Srcg724@gmail.com

ADDRESS: 11821 Legend Dr, Greensboro, GA

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DESCRIPTION:
210.52 (C) (3) (1)

(1) On or above but not more than 500mm (20 inches) above a countertop or workspace.
Receptacles may be installed under the countertop surface on the side of an island if receptacle center is located at 812mm (32" inches) or higher.

REASON/INTENT:

Access to outlets needed for ADA compliance
Dangers of homeowner's installation of side outlets post construction due to new required access
Dangers of countertop debris in cjountertop outlets
Dangers of countertop submersion of outlets
Cost of rated GFCI around 300.00
Cost of normal GFCI pop-up getting wet and replacement plus the dangerous procedure
GFCI technology can be ruined if submerged or wetted.
Cost of electrician visit for each submersion.
Dangers of ease of access for preteens
Large amount of the incidents were fryer type appliances which have already been addressed by CPSC
STUDY is over a 30-year period – Derrick Daniel has details – will discuss

FINANCIAL IMPACT OF PROPOSED AMENDMENT:

Additional cost for new GFCI outlets that consumers do not want in their countertops. Safety issues if new requirements are adopted.

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Comments from Derrick Daniel on Study

<u>Study is over a period of 30 years, resulting in 10 deaths.</u>
Notable data:
31 Children A YEAR die from accidental poisoning
2 Children A YEAR die from trampolines
575 Children A YEAR to toppling furniture
34 Walker deaths since 1973 Responsible for around 2000 emergency room visits PER YEAR
140 Choking deaths A YEAR
100 Children A YEAR die from bicycle accidents 254,000 injuries

Out of the first 100 data points provided about half of them used a height advantage of some type, walker, step stool or adult.
Several Injuries were extraneous injuries and contained no data to support that an cord pull in accordance with the code attempt even occurred.
There was only one incident where an island was mentioned. However, there was also one incident that indicated the past logic of additional cords not intended for countertop use may cause a danger. In this incident a cord pulled a burning candle off the countertop. This incident could occur even with the new code changes and was the reason for past delays in implementation.

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