



Public Input No. 13-NFPA 110-2022 [Global Input]

There are a number of various terms used throughout the document for the source that supplies the facility during normal conditions. These terms should be replaced with "primary power source" since this aligns with the scope statement of the standard. The following sections contain one or more of the terms that should be replaced.

4.1

5.6.5.7

5.6.9.4

6.2.2.1

6.2.3

6.2.8

6.2.9.1

6.2.9.2

6.2.12

6.2.16.1

6.5.2

7.1.5

7.2.3 (A7.2.3)

7.13.4.3.1

7.13.4.3.2

7.13.4.3.4(11)

7.13.5.3.1

7.13.5.3.2

7.13.5.3.4(9)

8.4.3

8.4.5

8.4.9.3

A.8.3.4

A.8.4.2.1.1

A.8.4.6.1

Statement of Problem and Substantiation for Public Input

There are a number of various terms used throughout the document for the source that supplies the facility during normal conditions. These terms should be replaced with "primary power source" since this aligns with the scope statement of the standard. The following sections contain one or more of the terms that should be replaced.

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Submittal Date: Thu May 26 09:10:11 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: Although this public input has merit, the submitter has not met the requirements of Section 4.3.4.1 of the regulations governing the development of standards and has not provided the proposed text including the wording to be revised or deleted. The global input identifies "a number of various terms" as that to which needs to be addressed without providing details on which terms should be addressed. A task group will be assigned to review the various uses of the phrase "power sources" prior to the Second Draft Meeting.



Public Input No. 36-NFPA 110-2022 [Global Input]

Revise the title of the standard from "Standard for Emergency and Standby Power Systems" to "Standard for Emergency Power Systems."

Statement of Problem and Substantiation for Public Input

In reviewing the document, all of the requirements seem to pertain to Level 1 and Level 2 power systems, both of which are classified as Emergency Power Supply Systems (EPSS). There are no requirements for standby power systems or what are often called optional standby power systems. It would be more suitable to classify backup power systems as either Emergency (life-safety, mandated either Level 1 or Level 2, within the scope of 110) or Standby (optional, not within the scope).

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 37-NFPA 110-2022 [Section No. A.4.1]</u>	

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Committee: EPS-AAA

Committee Statement

Resolution: Section 1.1.2 clearly states that the standard covers installation, maintenance, operation, and testing requirements as they pertain to the performance of the emergency power supply system. The title does not need to change because some standby systems may serve emergency loads.



Public Input No. 22-NFPA 110-2022 [Section No. 1.1.3]

1.1.3

This standard does not cover the following:

- (1) Application of the EPSS
- (2) Emergency lighting unit equipment
- (3) Distribution wiring
- (4) Utility service when such service is permitted as the EPSS
- (5) Parameters for stored energy devices
- (6) The equipment of systems that are not classed as Level 1 or Level 2 systems in accordance with Chapter 4 of this standard
- (7) Optional standby systems used solely for continuity of business operations

Statement of Problem and Substantiation for Public Input

Optional standby systems that are used to back-up business operations and continuity of service and are not used for building safety systems are maintained based on the criticality of the business. These business operations will typically be backed up by UPS systems or bulk DC power plants during a commercial power outage with the standby generator providing service for a longer duration outage. The Origin and development section of the document states that a significant revision in the 2010 edition of NFPA 110 clarified that requirements to systems classed as optional standby is not mandatory but no further definition is provided. Section 1.1.3 (6) states EPSS other than Level 1 and Level 2 are not covered by NFPA-110, but we see continued confusion as to when certain EPSS may be considered Level 2. This is further compounded by having the title refer to both "Emergency" and "Standby" power.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 23-NFPA 110-2022 [Section No. 1.1.3]	

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Committee: EPS-AAA

Committee Statement

Resolution: [FR-1-NFPA 110-2022](#)

Statement: Optional standby systems are not required to meet the requirements of this document.



Public Input No. 23-NFPA 110-2022 [Section No. 1.1.3]

1.1.3

This standard does not cover the following:

- (1) Application of the EPSS
- (2) Emergency lighting unit equipment
- (3) Distribution wiring
- (4) Utility service when such service is permitted as the EPSS
- (5) Parameters for stored energy devices
- (6) ~~The equipment of~~ Optional standby systems that are not classed as Level 1 or Level 2 systems in accordance with Chapter 4 of this standard

Statement of Problem and Substantiation for Public Input

Optional standby systems that used to back-up business operations and continuity of service and are not used for building safety systems are maintained based on the criticality of the business. These business operations will typically be backed up by UPS systems or bulk DC power plants during a commercial power outage with the standby generator providing service for a longer duration outage. The scope and origin introductory section of NFPA-110 states that the 2010 edition of NFPA-110 clarified that the requirements are not mandatory for optional standby systems, but it is not clear throughout the body of the document. Additional guidance in Chapter 1 in this regard would be very helpful.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 22-NFPA 110-2022 [Section No. 1.1.3]</u>	combines input into 1 bullet

Submitter Information Verification

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Committee: EPS-AAA

Committee Statement

Resolution: FR-1-NFPA 110-2022

Statement: Optional standby systems are not required to meet the requirements of this document.



Public Input No. 31-NFPA 110-2022 [Section No. 3.2.4]

3.2.4* Listed.

Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.4+ Microgrid

A group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid.

Statement of Problem and Substantiation for Public Input

The vocabulary of this document should be expanded to include technical terms in common use and placed here to coordinate with the appearance of this term elsewhere in the document. It is derived from the publication linked below:

"Defining a Microgrid Using IEEE 2030.7" | Douglas R. Hanley | November 2019

<https://www.cooperative.com/programs-services/bts/documents/techsurveillance/surveillance-defining-microgrids-november-2019.pdf>

"How Microgrids Work" | US Department of Energy | June 17, 2014

<https://www.energy.gov/articles/how-microgrids-work>

Additional references may be found at:

<https://standardsmichigan.com/2025-nfpa-110-public-input/>

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Submission Date: Wed Jun 01 14:26:46 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: The term “microgrid” is not used in the standard.



Public Input No. 29-NFPA 110-2022 [New Section after 3.3.11.2]

Nickel Cadmium Battery (NiCd)

A secondary cell in which the active material of the positive electrode is nickel oxyhydroxide, the active material of the negative electrode is cadmium, and the electrolyte is dilute potassium hydroxide.

Statement of Problem and Substantiation for Public Input

Section 5.6.4.5 states the starter battery shall be lead-acid or nickel cadmium. Definitions are provided in section 3 for lead acid (VRLA and VLA) types but no definition is provided for NiCd. Add the NiCd definition for consistency.

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Committee: EPS-AAA

Committee Statement

Resolution: [FR-2-NFPA 110-2022](#)

Statement: A definition is added for the battery type used in standard.



Public Input No. 11-NFPA 110-2022 [New Section after 3.3.13]

Primary Power Source.

A source or source system that supplies all loads during normal conditions.

Statement of Problem and Substantiation for Public Input

The term "primary power source" should be defined to add clarity and usability to the standard. During normal conditions the primary power source may be a utility service or a system of sources such as a microgrid. The inclusion of a definition and use of the term within the document will align with the various system configurations used in modern power systems.

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Committee: EPS-AAA

Committee Statement

Resolution: Although this public input has merit, the submitter has not met the requirements of Section 4.3.4.1 of the regulations governing the development of standards and provided the proposed text including the wording to be revised or deleted. The global input identifies "a number of various terms" as that to which needs to be addressed without providing details on which terms should be addressed. A task group will be assigned to review the various uses of the phrase "power sources" prior to the Second Draft Meeting.



Public Input No. 28-NFPA 110-2022 [New Section after 3.3.13]

3.3.13 Optional standby systems

3.3.13 Optional standby systems are used solely for continuity or business operations and do not support life safety systems as described for Level 1 and level 2 EPSs.

Statement of Problem and Substantiation for Public Input

NFPA-110 Section 1.1.3 and Section 4.4 both acknowledges that the standard covers Level 1 and Level 2 EPSs. The Origin and history section of NFPA-110 state that previous version in 2010 clarifies that the standard does not apply to optional standby systems, however no explicit definition is provided for optional standby systems. Annex A4.4.1 and A4.4.2 provide examples of the types of loads attributed to Level 1 and Level 2 EPS covered by the document but there is no description of standby systems used for business continuity and business operations and those systems that are provided battery back-up in the event of loss of primary power. This leads to a miss-application of the standard when AHJs seek compliance for systems that should be considered optional standby.

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Submittal Date: Tue May 31 17:35:59 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: FR-3-NFPA 110-2022

Statement: The NEC definition has been added for the phrase used in this standard.



Public Input No. 12-NFPA 110-2022 [Section No. 3.3.14.2]

3.3.14.2 Bypass-Isolation Transfer Switch.

A ~~manually operated device~~ manual, nonautomatic, or automatic device used in conjunction with an automatic transfer switch to provide a means of directly connecting load conductors to a power source and of disconnecting the ~~automatic~~ transfer switch.

Statement of Problem and Substantiation for Public Input

The definition of Bypass Isolation Switch should be revised to align with the 2023 NEC term Bypass Isolation Transfer Switch. The NEC definition accurately describes the various types of these transfer switches that are available and being utilized within emergency power systems.

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Committee: EPS-AAA

Committee Statement

Resolution: FR-4-NFPA 110-2022 The proposed change from “bypass-isolation switch” to “bypass-isolation transfer switch” was not made because the phrase “bypass-isolation transfer switch” is not used in the document.

Statement: This definition was modified for accuracy in relation to UL 1008 and options currently available on the market.

The first modification recognizes that the bypass-isolation switch is not only a manually operated device. It can be manual, non-automatic or automatic.

The next change occurred in two locations and removes the reference to an automatic transfer switch and simply refers to “transfer switch”. This change aligns with the fact that Section 6.4 is generic in nature as well using the generic term of “transfer switch” and not “automatic transfer switch”.

Clarity was added through introducing the word “bypass” which first aligns with the word bypass in the term being defined (bypass – isolation) and second accurately describes what is occurring when the switch operates connecting the load conductors directly to the power source.

The last change is at the end of the definition providing an accurate description of what the bypass/isolation switch does. This switch acts to isolate or disconnect the transfer switch. This change also aligns with 6.4.4, “Operation”, where it notes that the transfer switch is isolated or disconnected.



Public Input No. 9-NFPA 110-2022 [New Section after 3.3.14.3]

3.X Energy Management System (EMS).

A system consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s), or other device(s) that monitors and/or controls an electrical load or a power production or storage source. [70: Article 100]

Statement of Problem and Substantiation for Public Input

The definition of EMS from NFPA 70 is added to provide correlation between NFPA 110 and the NEC. The definition will add clarity that an EMS is the system that provides load management or load shedding for the connected loads as required in the NEC and NFPA 110.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 7-NFPA 110-2022 [Section No. 5.6.5.2]	
Public Input No. 8-NFPA 110-2022 [Section No. 5.6.5.4]	
Public Input No. 10-NFPA 110-2022 [New Section after 5.7.5]	

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Committee: EPS-AAA

Committee Statement

Resolution: The phrase “energy management system” is not used in the standard.



Public Input No. 17-NFPA 110-2022 [Section No. 4.1]

4.1* General.

The EPSS shall provide a source of electrical power of required capacity, reliability, and quality to loads for a length of time as specified in Table 4.1(a) and within a specified time following loss or failure of the normal power supply as specified in Table 4.1(b).

Table 4.1(a) Classification of EPSSs

<u>Class</u>	<u>Minimum Time</u>
Class 0.083	0.083 hr (5 min)
Class 0.25	0.25 hr (15 min)
Class 2	2 hr
Class 6	6 hr
Class 48	48 hr
Class X	Other time, in hours, as required by the application, code, or user

Table 4.1(b) Types of EPSSs

<u>Designation</u>	<u>Power Restoration</u>
Type U	Basically uninterruptible (UPS systems)
Type 10	10 sec
Type 60	60 sec
Type 120	120 sec
Type M	Manual stationary or nonautomatic — no time limit
Type X	Other time, in seconds, as required by the application, code, or user

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Table_4.1_a_Windey_Final.docx		

Statement of Problem and Substantiation for Public Input

Add a “Type X” designation to table 4.1(b) to represent “other time...” so specifiers have something reasonable and competitive to use for projects in this space. For certain large gensets, particularly at MV, meeting the type 10 designation can be problematic. And many times, the next larger type designator (type 60), won’t have the granularity required for EPSS specifiers (as it is too far away from type 10).

Furthermore, for systems that have the critical loads backed up by UPS, it’s not mandatory that the genset is online in less than 10 seconds. For this case it’s the capacity of the UPS batteries that dictate how soon you really need to have the genset online.

Finally, by having a “Type X” designation in table 4.1(b), there will now be symmetry with the “Class X” class in table 4.1(a).

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Submittal Date: Tue May 31 11:16:46 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: [FR-6-NFPA 110-2022](#)

Statement: A "Type X" designation has been added to Table 4.1(b) to represent "other time..." to give specifiers greater flexibility and transparency of the performance of EPSS.

Table 4.1(b) Modify the table to add a row for “Type X” designation to represent “Other time, in seconds, as required by the application, code, or user”.

Substantiation: Add a “Type X” designation to table 4.1(b) to represent “other time...” so specifiers have something reasonable and competitive to use for projects in this space. For certain large gensets, particularly at MV, meeting the type 10 designation could be problematic. And many times, the next larger type designator (type 60), won’t have the granularity required for EPSS specifiers (as it is too far away from type 10).

Furthermore, for systems that have the critical loads backed up by UPS, it’s not mandatory that the genset is online in less than 10 seconds. For this case it’s the capacity of the UPS batteries that dictate how soon you really need to have the genset online.

Finally, by having a “Type X” designation in table 4.1(b), there will now be symmetry with the “Class X” class in table 4.1(a).



Public Input No. 33-NFPA 110-2022 [Chapter 5 [Title Only]]

Emergency Power Supply (EPS): Energy Sources, Converters, Microgrids and Accessories

Statement of Problem and Substantiation for Public Input

A continuation of suggestions to drive contemporary terminology and to (perhaps, encourage product and interoperability innovation) into this title. Installation requirements would follow National Electrical Code Article 712 Direct Current Microgrids.

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Submittal Date: Wed Jun 01 15:36:55 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: A microgrid is an electrical system that can utilize various power sources. A microgrid that includes approved power sources as required by NFPA 110 could be used an emergency power supply.



Public Input No. 32-NFPA 110-2022 [Section No. 5.1.1 [Excluding any Sub-Sections]]

The following energy sources shall be permitted to be used for the emergency power supply (EPS):

- (1) * Liquid petroleum products at atmospheric pressure as specified in the applicable ASTM standards and as recommended by the engine manufacturer
- (2) * Liquefied petroleum gas (liquid or vapor withdrawal) as specified in the applicable ASTM standards and as recommended by the engine manufacturer
- (3) * Natural or synthetic gas
- (4) * Hydrogen gas
- (5) Microgrid

Statement of Problem and Substantiation for Public Input

Adding "microgrid" to this list correlates with public input in Definition Chapter 3; intended to reflect contemporary technical vernacular. Performance requirements of the microgrid system (say an egress lighting storage battery for part or all of a building charged by a rooftop solar panel and appropriately sectioned with transfer switches) is covered in Section 5.1.1.1.

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Submission Date: Wed Jun 01 14:50:34 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: A microgrid is not an energy source. A microgrid utilizes energy conversion equipment.



Public Input No. 14-NFPA 110-2022 [Section No. 5.2.3]

5.2.3 Energy Converter Design and Testing.

The energy converter for Level 1 systems shall be specifically designed, assembled, and tested to ensure intended system operation under the following conditions:

- (1) Short circuits, including phase-to-ground neutral , phase-to-phase, and 3-phase bolted faults
- (2) Load surges due to motor starting
- (3) Elevator operations
- (4) Silicon-controlled rectifier (SCR) controllers
- (5) X-ray equipment
- (6) Overspeed, overtemperature, or overload
- (7) Adverse environmental conditions

Statement of Problem and Substantiation for Public Input

For condition #1, change from “phase to ground” to “phase to neutral”. This is necessary, since some gensets won’t have the neutral bonded to ground. In addition, the product standard for gensets (UL 2200) uses L-N mode for the “AC Short Circuit Test” requirement. Finally, manufacturer’s literature (including a Cummins White Paper) also supports the validity of using phase to neutral.

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Committee: EPS-AAA

Committee Statement

Resolution: [FR-5-NFPA 110-2022](#)

Statement: Some generate sets will not have the neutral bonded to ground. In addition, the product standard for generator sets (UL 2200) uses L-N mode for the AC short circuit test requirement.



Public Input No. 15-NFPA 110-2022 [Section No. 5.5.3]

5.5.3* Fuel Tank Capacity.

~~The~~ For classes of 24 hours or less (as specified in table 4.1(a)), ~~the~~ main fuel tank shall have a minimum capacity of at least 133 percent of ~~either~~ the low-fuel sensor quantity specified in 5.5.2- ~~or the quantity required to support the duration of run specified in Table 4.1(a) - .~~ For classes greater than 24 hours, the main fuel tank shall have a minimum capacity of at least 100 percent of the low-fuel sensor quantity specified in 5.5.2.

Statement of Problem and Substantiation for Public Input

For EPSSs with a large Class rating (per table 4.1(a), there is a risk of oversizing an already large fuel tank. Fuel preservation and stabilization are issues that will need to be addressed, resulting in additional costs to the owner of the equipment.

For instance, for a facility with a diesel fueled 1,500kW EPS, 33% additional capacity for a Class 24 EPSS represents 832 gallons of diesel fuel - out of a 3,352 gallon tank. Whereas for a Class 72 EPSS, the additional capacity will represent 2,495 gallons of diesel fuel - out of a 10,055 gallon tank.

The situation gets worse as the EPS size and EPSS Class get larger – which is common these days. As such, changing the fuel tank capacity requirement so it's conditional will help in reducing the risk of fuel spoilage and the financial burden to owners. For shorter run time classes, it makes sense to require a 33% extra capacity. For longer run times classes, however, it doesn't make sense.

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Committee: EPS-AAA

Committee Statement

Resolution: [FR-7-NFPA 110-2022](#)

Statement: For EPS's with a larger class rating (per Table 4.1(a)), the fuel tank capacity requirements are revised to be conditional. For shorter run time classes, it makes sense to have the extra 33% capacity. For longer run times classes, the volume of spoiled fuel will be significantly higher due to the requirement for oversizing an already large fuel tank. Fuel preservation and stabilization are issues that need to be addressed.



Public Input No. 2-NFPA 110-2022 [Section No. 5.6.4.2]

5.6.4.2* Otto or Diesel Cycle Prime Movers.

For otto or diesel cycle prime movers, the type and duration of the cranking cycle shall be as specified in Table 5.6.4.2.

Table 5.6.4.2 Starting Equipment Requirements

<u>Starting Equipment Requirements</u>	<u>Level 1</u>	<u>Level 2</u>	
(a) Battery unit	X	X	
(b) Battery certification	X	NA	
(c) Cycle cranking	O	O	
(d) Cranking limiter time-outs	-	-	
- Cycle crank (3 cycles)	75 sec	75 sec	
- Continuous crank	45 sec	45 sec	
<u>Electric cycle crank (3 cycles)</u>	<u>75 sec</u>	<u>75 sec</u>	
<u>Electric continuous crank</u>	<u>45 sec</u>	<u>45 sec</u>	
<u>Stored energy cycle crank (2 cycles)</u>	<u>45 sec</u>	<u>45 sec</u>	
<u>Stored energy continuous crank</u>	<u>30 sec</u>	<u>30 sec</u>	
(e) Float-type battery charger	X	X	
- dc ammeter		X	X -
dc voltmeter	X	X	
<u>Recharge</u>	<u>24 hr</u>	<u>36 hr</u>	
(f) <u>Electric recharge time</u>	<u>1 hr</u>	<u>2 hr</u>	
<u>Stored energy recharge time</u>			
<u>Low battery voltage alarm contacts</u>	<u>X</u>	<u>X</u>	
(g) <u>Low air pressure alarm contacts</u>	<u>X</u>	<u>X</u>	

X : Required. O: Optional. NA: Not applicable.

5.6.4.2.1

A complete cranking cycle shall consist of an automatic crank period of approximately 15 seconds followed by a rest period of approximately 15 seconds. Upon starting and running the prime mover, further cranking shall cease.

5.6.4.2.2

Two means of cranking termination shall be utilized so that one serves as backup to prevent inadvertent starter engagement.

5.6.4.2.3

Otto cycle prime movers of 15 kW and lower and all diesel prime movers shall be permitted to use continuous cranking methods.

Statement of Problem and Substantiation for Public Input

Table 5.6.4.2 is Starting Equipment Requirements for electric, but it is referenced by paragraph 5.6.4.2

which applies to both electric and stored energy systems. Consequently a conflict is created between paragraphs 5.6.4.1.2 and 5.6.4.2 (a.k.a. Table 5.6.4.2), because the former requires two cranking cycles for stored energy systems, while the latter requires three cranking cycles. Also, Table 5.6.4.2 recharge time appears based upon battery; arbitrarily picked 1 and 2 hours for pneumatic (our USACE guide spec UFGS-263215 says 1/4 hour). In addition, Table 5.6.4.2 does not require an alarm contact for low air pressure. In summary, Table 5.6.4.2 needs to be revised to also address stored energy systems.

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Committee Statement

Resolution: The public input did not provide sufficient technical justification for shorter crank cycles or crank time for a nonelectric starter.



Public Input No. 7-NFPA 110-2022 [Section No. 5.6.5.2]

5.6.5.2

Control panels provided in accordance with 5.6.5.1 shall contain the following:

- (1) Automatic remote start capability
- (2) “Run-off-automatic” switch function
- (3) Shutdowns as required by 5.6.5.4(3)
- (4) Alarms as required by 5.6.5.4(4)
- (5) Controls as required by 5.6.5.4(5)
- (6) ~~Load shed~~ EMS controls for Level 1 systems as required by 5.6.5.4(7)

Statement of Problem and Substantiation for Public Input

The term “load shed” is replaced by the term “EMS” since the EMS is the system that performs load shedding

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 9-NFPA 110-2022 [New Section after 3.3.14.3]	Energy Management System
Public Input No. 10-NFPA 110-2022 [New Section after 5.7.5]	Energy Management System
Public Input No. 8-NFPA 110-2022 [Section No. 5.6.5.4]	

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Committee: EPS-AAA

Committee Statement

Resolution: Load shed does not have to be performed by an EMS and some systems do not include an EMS.



Public Input No. 4-NFPA 110-2022 [New Section after 5.6.5.4]

TITLE OF NEW CONTENT

5.6.5.4 (3) (F) Other protective functions as required by the manufacturer of the engine or alternator are acceptable and shall be annunciated in a similar fashion.

Statement of Problem and Substantiation for Public Input

Some authorities take the position that a standard states required protection and does not allow for protection that is not specifically required by the standard. (In theory, more protection results in a greater possibility for unnecessary shutdown of a system.) This change allows the engine and alternator manufacturers, who know most about the needs for protection of their products, to specify necessary protection, whether or not is specifically required by this standard.

Submitter Information Verification

Submitter Full Name: Gary Olson

Organization: KWRx LLC

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 20 16:54:22 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: FR-8-NFPA 110-2022

Statement: Item (3)(d): High engine temperature may be independent of other factors.

New Item (3)(f) allows the prime mover manufacturer to specify necessary protection, whether or not it is specifically required by this standard.



Public Input No. 3-NFPA 110-2022 [Section No. 5.6.5.4]

5.6.5.4

An automatic control and safety panel shall be a part of the EPS containing the following equipment or possess the following characteristics, or both:

- (1) Cranking control equipment to provide the complete cranking cycle described in 5.6.4.2 and required by Table 5.6.4.2
- (2) Panel-mounted control switch(es) marked Run/Off/Automatic to perform the following functions:
 - (3) Run: Manually initiate, start, and run prime mover
 - (4) Off: Stop prime mover or reset safeties, or both
 - (5) Automatic: Allow prime mover to start or stop by operating a remote contact.
- (6) Controls to shut down and lock out the prime mover under any of the following conditions:
 - (7) Failing to start after specified cranking time
 - (8) Overspeed
 - (9) Low lubricating-oil pressure
 - (10) High engine temperature

unless

 - (a) as indicated by high engine coolant temperature

is due to high lubricating-

 - (a) , high lube oil temperature , or both.
 - (b) Operation of remote manual stop station
- (11) Individual alarm indication to annunciate any of the conditions listed in Table 5.6.5.4 and with the following characteristics:
 - (12) Battery powered
 - (13) Visually indicated
 - (14) Have additional contacts or circuits for a common audible alarm that signals locally and remotely when any of the itemized conditions occurs
 - (15) Have a lamp test switch(es) to test the operation of all alarm lamps
- (16) Controls to shut down the prime mover upon removal of the initiating signal or manual emergency shutdown
- (17) The ac instruments listed in 5.6.9.9
- (18) Controls to shed Level 2 loads and to initiate an overload alarm for EPS that serves both Level 1 and Level 2 loads, per Table 5.6.5.4

Table 5.6.5.4 Safety Indications and Shutdowns

<u>Indicator Function (at Battery Voltage)</u>	<u>Level 1</u>				<u>Level 2</u>		
	<u>CV</u>	<u>S</u>	<u>RA</u>		<u>CV</u>	<u>S</u>	<u>RA</u>
(a) Overcrank	X	X	X	-	X	X	O
(b) Low water temperature	X	N/A	X	-	X	N/A	O
(c) High engine temperature prealarm	X	N/A	X	-	O	N/A	N/A
(d) High engine temperature	X	X	X	-	X	X	O
(e) Low lube-oil pressure	X	X	X	-	X	X	O

<u>Indicator Function (at Battery Voltage)</u>	<u>Level 1</u>				<u>Level 2</u>		
	<u>CV</u>	<u>S</u>	<u>RA</u>	-	<u>CV</u>	<u>S</u>	<u>RA</u>
(f) Overspeed	X	X	X	-	X	X	O
(g) Low fuel main tank	X	N/A	X	-	O	N/A	O
(h) Low coolant level	X	O	X	-	X	O	X
(i) EPS supplying load	X	N/A	N/A	-	O	N/A	N/A
(j) Control switch not in automatic position	X	N/A	X	-	X	N/A	X
(k) High battery voltage	X	N/A	N/A	-	O	N/A	N/A
(l) Low cranking voltage	X	N/A	X	-	O	N/A	O
(m) Low voltage in battery	X	N/A	N/A	-	O	N/A	N/A
(n) Battery charger ac failure	X	N/A	N/A	-	O	N/A	N/A
(o) Lamp test	X	N/A	N/A	-	X	N/A	N/A
(p) Contacts for local and remote common alarm	X	N/A	X	-	X	N/A	X
(q) Audible alarm silencing switch	N/A	N/A	X	-	N/A	N/A	O
(r) Low starting air pressure	X	N/A	N/A	-	O	N/A	N/A
(s) Low starting hydraulic pressure	X	N/A	N/A	-	O	N/A	N/A
(t) Air shutdown damper when used	X	X	X	-	X	X	O
(u) Remote emergency stop	N/A	X	N/A	-	N/A	X	N/A
(v) Overload alarm/load shed contact	X	N/A	X	-	N/A	N/A	N/A

CV: Control-panel-mounted visual. S: Shutdown of EPS. RA: Remote audible. X: Required. O: Optional. N/A: Not applicable.

Notes:

(1) Item (p) shall be provided, but a separate remote audible signal shall not be required when the regular work site in 5.6.6 is staffed 24 hours a day.

(2) Item (b) is not required for combustion turbines.

(3) Item (r) or (s) shall apply only where used as a starting method.

(4) Item (i) EPS ac ammeter shall be permitted for this function.

(5) All required CV functions shall be visually annunciated by a remote, common visual indicator.

(6) All required functions indicated in the RA column shall be annunciated by a remote, common audible alarm as required in 5.6.5.2(4).

(7) Item (g) on gaseous systems shall require a low gas pressure alarm.

(8) Item (b) shall be set at 11°C (20°F) below the regulated temperature determined by the EPS manufacturer as required in 5.3.1.

Statement of Problem and Substantiation for Public Input

Current text says, "High engine temperature unless high temperature is due to high lube oil temperature". That implies that you can't indicate high engine coolant temperature if high lube oil temp is indicated. That literally means that you can't indicate high engine temperature unless you have high lube oil temperature. Many engines don't even monitor lube oil temp!

The change suggested adjusts the words to what I think is the intended text: you should be able to indicate high engine temperature using coolant temperature, oil temperature, or both. (Most engines use only provide high coolant temperature.)

Submitter Information Verification

Submitter Full Name: Gary Olson

Organization: kWRx LLC

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 20 16:39:37 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: [FR-8-NFPA 110-2022](#)

Statement: Item (3)(d): High engine temperature may be independent of other factors.

New Item (3)(f) allows the prime mover manufacturer to specify necessary protection, whether or not it is specifically required by this standard.



Public Input No. 8-NFPA 110-2022 [Section No. 5.6.5.4]

5.6.5.4

An automatic control and safety panel shall be a part of the EPS containing the following equipment or possess the following characteristics, or both:

- (1) Cranking control equipment to provide the complete cranking cycle described in 5.6.4.2 and required by Table 5.6.4.2
- (2) Panel-mounted control switch(es) marked Run/Off/Automatic to perform the following functions:
 - (3) Run: Manually initiate, start, and run prime mover
 - (4) Off: Stop prime mover or reset safeties, or both
 - (5) Automatic: Allow prime mover to start or stop by operating a remote contact.
- (6) Controls to shut down and lock out the prime mover under any of the following conditions:
 - (7) Failing to start after specified cranking time
 - (8) Overspeed
 - (9) Low lubricating-oil pressure
 - (10) High engine temperature unless high temperature is due to high lubricating-oil temperature
 - (11) Operation of remote manual stop station
- (12) Individual alarm indication to annunciate any of the conditions listed in Table 5.6.5.4 and with the following characteristics:
 - (13) Battery powered
 - (14) Visually indicated
 - (15) Have additional contacts or circuits for a common audible alarm that signals locally and remotely when any of the itemized conditions occurs
 - (16) Have a lamp test switch(es) to test the operation of all alarm lamps
- (17) Controls to shut down the prime mover upon removal of the initiating signal or manual emergency shutdown
- (18) The ac instruments listed in 5.6.9.9
- (19) ~~Controls~~ EMS controls to shed Level 2 loads and to initiate an overload alarm for EPS that serves both Level 1 and Level 2 loads, per Table 5.6.5.4

Table 5.6.5.4 Safety Indications and Shutdowns

<u>Indicator Function (at Battery Voltage)</u>	<u>Level 1</u>				<u>Level 2</u>		
	<u>CV</u>	<u>S</u>	<u>RA</u>		<u>CV</u>	<u>S</u>	<u>RA</u>
(a) Overcrank	X	X	X	-	X	X	O
(b) Low water temperature	X	N/A	X	-	X	N/A	O
(c) High engine temperature prealarm	X	N/A	X	-	O	N/A	N/A
(d) High engine temperature	X	X	X	-	X	X	O
(e) Low lube-oil pressure	X	X	X	-	X	X	O
(f) Overspeed	X	X	X	-	X	X	O
(g) Low fuel main tank	X	N/A	X	-	O	N/A	O
(h) Low coolant level	X	O	X	-	X	O	X

<u>Indicator Function (at Battery Voltage)</u>	<u>Level 1</u>				<u>Level 2</u>		
	<u>CV</u>	<u>S</u>	<u>RA</u>		<u>CV</u>	<u>S</u>	<u>RA</u>
(i) EPS supplying load	X	N/A	N/A	-	O	N/A	N/A
(j) Control switch not in automatic position	X	N/A	X	-	X	N/A	X
(k) High battery voltage	X	N/A	N/A	-	O	N/A	N/A
(l) Low cranking voltage	X	N/A	X	-	O	N/A	O
(m) Low voltage in battery	X	N/A	N/A	-	O	N/A	N/A
(n) Battery charger ac failure	X	N/A	N/A	-	O	N/A	N/A
(o) Lamp test	X	N/A	N/A	-	X	N/A	N/A
(p) Contacts for local and remote common alarm	X	N/A	X	-	X	N/A	X
(q) Audible alarm silencing switch	N/A	N/A	X	-	N/A	N/A	O
(r) Low starting air pressure	X	N/A	N/A	-	O	N/A	N/A
(s) Low starting hydraulic pressure	X	N/A	N/A	-	O	N/A	N/A
(t) Air shutdown damper when used	X	X	X	-	X	X	O
(u) Remote emergency stop	N/A	X	N/A	-	N/A	X	N/A
(v) <u>EMS Malfunction/ Overload alarm/load shed contact</u>	X	N/A	X	-	X	N/A	N/A

CV: Control-panel-mounted visual. S: Shutdown of EPS. RA: Remote audible. X: Required. O: Optional. N/A: Not applicable.

Notes:

(1) Item (p) shall be provided, but a separate remote audible signal shall not be required when the regular work site in 5.6.6 is staffed 24 hours a day.

(2) Item (b) is not required for combustion turbines.

(3) Item (r) or (s) shall apply only where used as a starting method.

(4) Item (i) EPS ac ammeter shall be permitted for this function.

(5) All required CV functions shall be visually annunciated by a remote, common visual indicator.

(6) All required functions indicated in the RA column shall be annunciated by a remote, common audible alarm as required in 5.6.5.2(4).

(7) Item (g) on gaseous systems shall require a low gas pressure alarm.

(8) Item (b) shall be set at 11°C (20°F) below the regulated temperature determined by the EPS manufacturer as required in 5.3.1.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
2025_NFPA_110_EMS_PI_s.docx	Clean Word Doc version of all of the EMS related Public inputs	

Statement of Problem and Substantiation for Public Input

EMS is added to the beginning of 5.6.5.4 (7) for correlation and clarity purposes. EMS malfunction is added to item (v) in Table 5.6.5.4. Since an EMS can be installed on a Level 2 systems, the system malfunction requirements shall also be applied to those systems.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
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[Public Input No. 7-NFPA 110-2022 \[Section No. 5.6.5.2\]](#)

[Public Input No. 9-NFPA 110-2022 \[New Section after 3.3.14.3\]](#)

[Public Input No. 10-NFPA 110-2022 \[New Section after 5.7.5\]](#)

Energy Management System

Energy Management System

Energy Management System

Submitter Information Verification

Submitter Full Name: Brian Baughman

Organization: Generac Power Systems Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 23 10:08:57 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: Load shed does not have to be performed by an EMS and some systems do not include an EMS.

2025 NFPA 110 Public Inputs.

New Definition

Energy Management System (EMS).

A system consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s), or other device(s) that monitors and/or controls an electrical load or a power production or storage source. [70:Article 100]

Substantiation: The definition of EMS from NFPA 70 is added to provide correlation between NFPA 110 and the NEC. The definition will add clarity that an EMS is the system that provides load management or load shedding for the connected loads as required in the NEC and NFPA 110.

New Section.

***5.8 Energy Management System (EMS).** If an EMS is utilized for load management or load shedding control, or to control the EPS, the EMS shall be installed in accordance with NFPA 70.

***A5.8.** An EMS can be utilized for the purposes of load shedding, load management, peak load shaving and also for controlling the electrical output of various power production or storage sources. See UL 916 Energy Management Systems for additional information.

5.8.1 EMS Setpoint Modification. If the setpoints of the EMS are modified for the testing required in 7.13, 8.3, or 8.4, the operation setpoints shall be reset to the original settings after the testing has been completed.

5.8.2 Load Management. If the EMS is utilized for the control of optional standby loads on the EPS, the EMS shall load manage or load shed the optional loads when the EPS is loaded to 80 percent of the EPS rated capacity.

5.8.2.1 An EMS shall not be permitted to control any load connected to a Level 1 system.

5.8.3 EMS Malfunction. The EMS shall use monitoring and controls to remove all managed loads off the EPS, upon malfunction of the EMS.

5.8.3.1 System malfunction shall be in accordance with Table 5.6.5.4 (v).

Substantiation: A new section is provided to cover the installation and use of an EMS in NFPA 110. New requirements are added for when the setpoints of an EMS are adjusted to override the system setpoints and increase the connected load on an EPS for annual testing purposes. A requirement for the EMS to manage connected optional standby loads is added to NFPA 110 as the NFPA 110 performance standard is the correct document to cover the EMS performance requirements. The EMS malfunction requirements correlate with the requirements in Article 750 in the NEC and require the EMS malfunction

to be visually and audibly annunciated on all EPS control panels. Informative Annex material is provided in A5.8 to explain the functions of an EMS.

5.6.5.2

Control panels provided in accordance with 5.6.5.1 shall contain the following:

- 1) Automatic remote start capability
- 2) "Run-off-automatic" switch function
- 3) Shutdowns as required by 5.6.5.4(3)
- 4) Alarms as required by 5.6.5.4(4)
- 5) Controls as required by 5.6.5.4(5)
- 6) ~~Load shed~~ **EMS** controls for Level 1 systems as required by 5.6.5.4(7)

Substantiation: The term "load shed" is replaced by the term "EMS" since the EMS is the system that performs load shedding.

5.6.5.4

7) **EMS** ~~controls~~ to shed Level 2 loads and to initiate an overload alarm for EPS that serves both Level 1 and Level 2 loads, per Table 5.6.5.4

Table 5.6.5.4

(v) EMS Malfunction /Overload alarm/load shed contact	X	N/A	X	X	N/A	X
--	---	-----	---	----------	-----	----------

(Add EMS malfunction to item (v) and change the requirements from N/A to required for control panel visual and remote audible for Level 2 systems)

Substantiation: EMS is added to the beginning of 5.6.5.4 (7) for correlation and clarity purposes. EMS malfunction is added to item (v) in Table 5.6.5.4. Since an EMS can be installed on a Level 2 systems, the system malfunction requirements shall also be applied to those systems.



Public Input No. 16-NFPA 110-2022 [New Section after 5.6.5.7]

After 5.6.5.7

For Level 1 systems, the integrity of the EPS start signal circuit from a remote device such as an ATS or paralleling control, shall be monitored for broken, disconnected, or shorted wires. Loss of integrity shall cause the EPS to start.

Statement of Problem and Substantiation for Public Input

We must harmonize the EPS control wiring requirement with the requirements in NFPA 70 (in articles 695 and 700). This new requirement is necessary to ensure that the EPS will start and run when needed. Previously, there was no mention of this circuit integrity and if an abnormal circuit condition existed, it could inhibit the starting of the EPS.

Submitter Information Verification

Submitter Full Name: Timothy Windey
Organization: Cummins Power Generation
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 11:11:42 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: FR-16-NFPA 110-2022

Statement: An EPS start circuit wiring integrity requirement is added to ensure that the EPS will start and run when needed. This new requirement also harmonizes with the generator control wiring requirements in NFPA 70 (in Articles 695 and 700).



Public Input No. 10-NFPA 110-2022 [New Section after 5.7.5]

*5.8 Energy Management System (EMS). If an EMS is utilized for load management or load shedding control, or to control the EPS, the EMS shall be installed in accordance with NFPA 70.

*A5.8. An EMS can be utilized for the purposes of load shedding, load management, peak load shaving and also for controlling the electrical output of various power production or storage sources. See UL 916 Energy Management Systems for additional information.

5.8.1 EMS Setpoint Modification. If the setpoints of the EMS are modified for the testing required in 7.13, 8.3, or 8.4, the operation setpoints shall be reset to the original settings after the testing has been completed.

5.8.2 Load Management. If the EMS is utilized for the control of optional standby loads on the EPS, the EMS shall load manage or load shed the optional loads when the EPS is loaded to 80 percent of the EPS rated capacity.

5.8.2.1 An EMS shall not be permitted to control any load connected to a Level 1 system.

5.8.3 EMS Malfunction . The EMS shall use monitoring and controls to remove all managed loads off the EPS, upon malfunction of the EMS.

5.8.3.1 System malfunction shall be in accordance with Table 5.6.5.4 (v).

Statement of Problem and Substantiation for Public Input

A new section is provided to cover the installation and use of an EMS in NFPA 110. New requirements are added for when the setpoints of an EMS are adjusted to override the system setpoints and increase the connected load on an EPS for annual testing purposes. A requirement for the EMS to manage connected optional standby loads is added to NFPA 110 as the NFPA 110 performance standard is the correct document to cover the EMS performance requirements. The EMS malfunction requirements correlate with the requirements in Article 750 in the NEC and require the EMS malfunction to be visually and audibly annunciated on all EPS control panels. Informative Annex material is provided in A5.8 to explain the functions of an EMS.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 9-NFPA 110-2022 [New Section after 3.3.14.3]	Energy Management System
Public Input No. 7-NFPA 110-2022 [Section No. 5.6.5.2]	
Public Input No. 8-NFPA 110-2022 [Section No. 5.6.5.4]	

Submitter Information Verification

Submitter Full Name: Brian Baughman

Organization: Generac Power Systems Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Wed May 25 11:23:43 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: The existing control system language already addresses necessary requirements.



Public Input No. 35-NFPA 110-2022 [New Section after 5.7.5]

5.8 Direct Current Microgrids

5.8.1 Direct current microgrids supplying emergency or standby power shall be installed according to Article 712 of the National Electrical Code.

Statement of Problem and Substantiation for Public Input

I recognize that a significant amount of correlation lies ahead in getting microgrid concepts tracking in NFPA 110 & 111. I am happy to work with any task force that might be assigned to get expand the presence of microgrid concepts in the NFPA catalog.

Submitter Information Verification

Submitter Full Name: Michael Anthony
Organization: Standards Michigan LLC
Affiliation: IEEE Education & Healthcare Facilities Committee
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 01 15:49:44 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: This topic is already addressed in a broader perspective. Article 712 has been removed from the NEC 2023 edition.



Public Input No. 5-NFPA 110-2022 [Section No. 6.3.1]

6.3.1

The transfer of loads to the EPS shall be sequenced as follows:

- (1) First-priority loads shall be switched to the emergency bus upon sensing the availability of emergency power on the bus.
- (2) Each time an additional engine generator set is connected to the bus, a remaining load shall be connected in order of priority until all emergency loads are connected to the bus.
- (3) The system shall be designed so that, upon failure of one or more engine generator sets or bus overload, the load is automatically reduced, starting with the load of least priority and proceeding in ascending priority, so that the last load affected is the highest-priority load.

Statement of Problem and Substantiation for Public Input

Load shedding may be necessary to protect the reliability of service to critical loads, even if no genset fails or is degraded in capability. So, the load shed function should be initiated to maintain service to the most critical loads whenever there is a bus overload.

Submitter Information Verification

Submitter Full Name: Gary Olson

Organization: KWRx LLC

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 20 17:04:45 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: Section 5.2.1.3 of this standard requires that abnormal conditions be addressed. Requirements in 5.2.5 address concerns over overload under normal conditions. Section 7.1.2 requires that these considerations be reviewed for any EPSS.



Public Input No. 6-NFPA 110-2022 [Section No. 7.13.4.3.4]

7.13.4.3.4

The tests conducted in accordance with 7.13.4.3.1 and 7.13.4.3.2 shall be performed in accordance with the following:

- (1) When the EPSS consists of paralleled EPSs, the quantity of EPSs intended to be operated simultaneously shall be tested simultaneously with building load for the test period identified in 7.13.4.3.4(10).
- (2) The test load shall be all loads that are served by the EPSS — there is no minimum loading requirement for this portion of the test.
- (3) The time delay on start shall be observed and recorded.
- (4) The cranking time until the prime mover starts and runs shall be observed and recorded.
- (5) The time taken to reach operating speed shall be observed and recorded.
- (6)* The engine start function shall be confirmed by verifying operation of the initiating circuit of all transfer switches supplying EPSS loads.
- (7) The time taken to achieve a steady-state condition with all switches transferred to the emergency position shall be observed and recorded.
- (8) The voltage, frequency, and amperes shall be recorded.
- (9) Where applicable, the prime mover oil pressure and water temperature shall be recorded.
- (10) The load test with building load, or other loads that simulate the intended load as specified in Section 5.4, shall comply with both of the following:
 - (a) Be continued for not less than 1.5 hours
 - (b) Have the run time recorded
 - (c) For applications utilizing paralleled generator sets, the testing shall verify the proportional load sharing capability of the system.
- (11) When normal power is restored to the building or facility, the time delay on retransfer to normal power for each switch with a minimum setting of 5 minutes shall be recorded.
- (12) The time delay on the prime mover cooldown period and shutdown shall be recorded.

Statement of Problem and Substantiation for Public Input

There is currently no requirement in the testing process verifies that the load sharing system of the equipment provided is properly operating. The added text simply notes that the load sharing capability of the system has been validated.

Submitter Information Verification

Submitter Full Name: Gary Olson

Organization: kWRx LLC

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 20 17:21:37 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: No safety concern is identified to justify this new requirement. Section 7.13.4.3.3 requires testing of these applications to the approved design, in accordance with the manufacturer's specifications identified in Section 7.1.3 (2).



Public Input No. 20-NFPA 110-2022 [Section No. 8.3.6 [Excluding any Sub-Sections]]

Storage- For Level 1 EPS storage batteries, including electrolyte levels or battery voltage, used in connection with starting and control systems shall be inspected weekly and maintained in full compliance with manufacturers' recommendations. For Level 2 EPS storage batteries, including electrolyte levels or battery voltage, used in connection with starting and control systems shall be inspected monthly and maintained in full compliance with manufacturers' recommendations.

Statement of Problem and Substantiation for Public Input

Standby generators used for continuity of service / business operations during commercial power outages typically are inspected in conjunction with monthly or bi-weekly test runs and maintenance routines. Critical business services will usually have battery back-up or UPS back-up in the event a generator fails to start. Telecommunications facilities with standby generators are FCC mandated to have 3 to 4 hours of battery backup in the event the standby generator does not start. With thousands of small facilities with standby generators and unmanned facilities it is not practical (and cost prohibitive) to send a crew for a weekly inspection. NFPA-111 requires monthly battery testing even for Level 1 systems as described in 8.4.1.

Submitter Information Verification

Submitter Full Name: Randy Schubert
Organization: Ericsson
Affiliation: ATIS
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 16:18:59 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: FR-17-NFPA 110-2022
Statement: The minimum maintenance schedule for storage batteries is differentiated as weekly inspection for Level 1 EPS and monthly for Level 2 EPS based on the reduced criticality of a Level 2 system.



Public Input No. 19-NFPA 110-2022 [Section No. 8.3.6.1]

8.3.6.1

Maintenance of lead-acid batteries shall include the monthly testing and recording of electrolyte specific gravity. Battery ~~conductance~~ ohmic testing shall be permitted in lieu of the testing of specific gravity when applicable or warranted.

Statement of Problem and Substantiation for Public Input

Changing the term battery conductance testing to ohmic testing is consistent with terminology for battery monitoring and testing and is used in NFPA-111.

Submitter Information Verification

Submitter Full Name: Randy Schubert

Organization: Ericsson

Affiliation: ATIS

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 31 12:06:35 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: FR-14-NFPA 110-2022

Statement: The changes provide clarity around the differences between maintenance-free and non-maintenance-free batteries. Additionally, it gives greater options and guidance to the testing procedures that are available.



Public Input No. 30-NFPA 110-2022 [Section No. 8.3.6.1]

8.3.6.1

Maintenance of lead-acid batteries shall include the monthly testing and recording of electrolyte specific gravity. Battery conductance testing ~~shall~~ or carbon pile load testing shall be permitted in lieu of the testing of specific gravity when applicable or warranted.

Statement of Problem and Substantiation for Public Input

Several studies outline the effectiveness of various tests for batteries. In short, carbon pile load testing is the most comprehensive test for batteries because it places the batteries under the amp/hour load required for the generator. Facility's teams should not be limited and forced to perform a conductance test when superior tests (that are proven to take less time/man-hours/cost) exist.

Submitter Information Verification

Submitter Full Name: Joshua Brackett

Organization: Banner Health

Street Address:

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State:

Zip:

Submittal Date: Wed Jun 01 01:04:01 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: [FR-14-NFPA 110-2022](#)

Statement: The changes provide clarity around the differences between maintenance-free and non-maintenance-free batteries. Additionally, it gives greater options and guidance to the testing procedures that are available.



Public Input No. 18-NFPA 110-2022 [Section No. 8.4.1 [Excluding any Sub-Sections]]

Level 1 EPSs, including all appurtenant components, shall be inspected weekly, and the EPSS shall be exercised under load at least monthly. Level 2 EPSs shall be visually inspected and exercised under load at least monthly.

Statement of Problem and Substantiation for Public Input

Standby generators used for continuity of service / business operations during commercial power outages typically are inspected in conjunction with monthly or bi-weekly test runs and maintenance routines. Critical business services will usually have battery back-up or UPS back-up in the event a generator fails to start. Telecommunications facilities with standby generators are FCC mandated to have 3 to 4 hours of battery backup in the event the standby generator does not start. With thousands of small facilities with standby generators and unmanned facilities it is not practical (and cost prohibitive) to send a crew for a weekly inspection. NFPA-111 requires monthly inspections for both Level 1 and Level 2 stored energy electrical emergency and standby power systems.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 21-NFPA 110-2022 [Section No. 8.4.1 [Excluding any Sub-Sections]]	

Submitter Information Verification

Submitter Full Name: Randy Schubert
Organization: Ericsson
Affiliation: ATIS
Street Address:
City:
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Submittal Date: Tue May 31 11:39:40 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: FR-15-NFPA 110-2022

Statement: The frequency of inspection has been changed based on the reduced criticality of a Level 2 system.



Public Input No. 21-NFPA 110-2022 [Section No. 8.4.1 [Excluding any Sub-Sections]]

Level 1 EPSs, including all appurtenant components, shall be inspected weekly, and the EPSS shall be exercised under load at least monthly. Level 2 EPSs in remote or normally unattended locations shall be visually inspected and the EPSS exercised under load at least monthly.

Statement of Problem and Substantiation for Public Input

Standby generators used for continuity of service / business operations during commercial power outages typically are inspected in conjunction with monthly or bi-weekly test runs and maintenance routines. Critical business services will usually have battery back-up or UPS back-up in the event a generator fails to start. Telecommunications facilities with standby generators are FCC mandated to have 3 to 4 hours of battery backup in the event the standby generator does not start. With thousands of small facilities with standby generators and unmanned facilities it is not practical (and cost prohibitive) to send a crew for a weekly inspection.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 18-NFPA 110-2022 [Section No. 8.4.1 [Excluding any Sub-Sections]]	

Submitter Information Verification

Submitter Full Name: Randy Schubert
Organization: Ericsson
Affiliation: ATIS
Street Address:
City:
State:
Zip:
Submission Date: Tue May 31 16:29:13 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: The proposed revision is too limited.



Public Input No. 38-NFPA 110-2022 [Section No. 8.4.2]

8.4.2

EPSs in service shall be exercised at least once monthly, for a minimum of 30 minutes, using one of the methods in 8.4.2.1.

8.4.2.1 Minimum Load Test Requirements.

8.4.2.1.1*

Diesel or spark-ignited generators shall be exercised at a minimum of once per month using one of the following methods:

- (1) Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer

Under

- (2) if aftertreatment systems exist.
- (3) Minimum loading requirements as prescribed by the engine manufacturer to achieve recommended operating temperature conditions and at not less than 30 percent
- (4) 10 percent of the EPS standby nameplate kW rating

8.4.2.1.1.1

A supplemental load bank shall be permitted to be used to meet ~~or exceed~~ the 30 percent minimum load requirement - in 8.4.2.1.

2-

~~For 1 for diesel or spark-ignited EPSs, loading shall be the available EPSS load. EPS's..~~

8.4.2.2

The date and time of day for required testing shall be decided by the owner, based on facility operations.

8.4.2.3

Equivalent loads used for testing shall be automatically replaced with the emergency loads in case of failure of the primary source.

8.4.2.4 *

Diesel or spark -

powered

ignited EPS installations that do not meet the requirements of 8.4.2.1.1 shall be exercised monthly with the available EPSS load and shall be exercised annually with supplemental loads at not less than 50 percent of the EPS nameplate kW rating for 30 continuous minutes and at not less than 75 percent of the EPS nameplate kW rating for 1 continuous hour for a total test duration of not less than 1.5 continuous hours.

8.4.2.5

The date and time of day for required testing shall be decided by the owner, based on facility operations.

8.4.2.5.1

Equivalent loads used for testing shall be automatically replaced with the emergency loads in case of failure of the primary source.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Load_test_8.4.2.1_Final.docx		

Statement of Problem and Substantiation for Public Input

Diesel or spark-ignited engine powered generators should follow the manufacturer's guidelines for monthly exercising. Modern high pressure common rail electronic fuel injection systems for diesel engines do not experience the "wet-stacking" issues of older generation engines and therefore do not need 30% loading for routine exercising. This change allows flexibility for different engines and their requirements as recommended by the manufacturer. Diesel and spark-ignited engine load test requirements can therefore be harmonized.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 39-NFPA 110-2022 [Section No. 8.4.9.5]	
Public Input No. 39-NFPA 110-2022 [Section No. 8.4.9.5]	

Submitter Information Verification

Submitter Full Name: Timothy Windey
Organization: Cummins Power Generation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 01 17:14:50 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: No substantiation has been provided for reducing testing limits from 30% to 10%.

8.4.2.1 Minimum Load Test Requirements.

8.4.2.1.1

Diesel or spark-ignited generators shall be exercised at a minimum of once per month using one of the following methods:

(2) Minimum loading requirements as prescribed by the Engine manufacturer to achieve recommended operating ~~under operating~~ temperature conditions and at not less than ~~3~~10% of the EPS standby nameplate KW rating.

(1) Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer if aftertreatment systems exist.

8.4.2.1.1.1

A supplemental load shall be permitted to be used to meet ~~or exceed the 30 percent requirement~~ the minimum load requirement in 8.4.2.1.1 for diesel or spark-ignited EPSs.

(Delete 8.4.2.1.2)

8.4.2.4

Diesel or spark-ignited EPS installations that do not meet the requirements of ~~8.4.2~~ 8.4.2.1.1 shall be exercised monthly with the available EPSS load and shall be exercised annually with supplemental loads at not less than 50 percent of the EPS nameplate KW rating for 30 continuous minutes and not less than 75 percent of the EPA nameplate KW rating for 1 continuous hour for a total test duration of not less than 1.5 continuous hours.

8.4.9.5

The minimum load for this test shall be as specified in 8.4.9.5.1

8.4.9.5.1

For ~~a~~ diesel or spark-ignited EPS installations, loading shall follow requirements in 8.4.2.1.1

(delete 8.4.9.5.2 and .3)

Substantiation:

Diesel or spark-ignited engine powered generators should follow the manufacturer's guidelines for monthly exercising. Modern high pressure common rail electronic fuel injection systems for diesel engines do not experience the "wet-stacking" issues of older generation engines and therefore do not need 30% loading for routine exercising. This change allows flexibility for different engines and their requirements as recommended by the manufacturer. Diesel and spark-ignited engine load test requirements can therefore be harmonized.

Related PC's:



Public Input No. 39-NFPA 110-2022 [Section No. 8.4.9.5]

8.4.9.5

The minimum load for this test shall be as specified in 8.4.9.5.1, 8.4.9.5.2, or 8.4.9.5.3.

8.4.9.5.1*

~~For a diesel or spark -powered- ignited EPS installations , loading shall be not less than 30 percent of the nameplate kW rating of the EPS. A supplemental load bank shall be permitted to be used to meet or exceed the 30 percent requirement. follow requirements in 8.4.~~

~~9.5.~~

~~2~~

~~—~~

~~For a diesel-powered EPS, loading shall be that which maintains the minimum exhaust gas temperatures as recommended by the manufacturer.~~

8.4.9.5.3 –

~~For spark-ignited EPSSs, loading shall be the available EPSS load.~~

~~.1.1.~~

8.4.9.5.4

For fuel cell-system EPSs, loading shall be the available EPSS load.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Load_test_8.4.2.1_Final.docx		

Statement of Problem and Substantiation for Public Input

Diesel or spark-ignited engine powered generators should follow the manufacturer's guidelines for monthly exercising. Modern high pressure common rail electronic fuel injection systems for diesel engines do not experience the "wet-stacking" issues of older generation engines and therefore do not need 30% loading for routine exercising. This change allows flexibility for different engines and their requirements as recommended by the manufacturer. Diesel and spark-ignited engine load test requirements can therefore be harmonized.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 38-NFPA 110-2022 [Section No. 8.4.2]	
Public Input No. 38-NFPA 110-2022 [Section No. 8.4.2]	

Submitter Information Verification

Submitter Full Name: Timothy Windey
Organization: Cummins Power Generation
Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 01 17:29:50 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: No substantiation has been provided for reducing testing limits from 30% to 10%.

8.4.2.1 Minimum Load Test Requirements.

8.4.2.1.1

Diesel or spark-ignited generators shall be exercised at a minimum of once per month using one of the following methods:

(2) Minimum loading requirements as prescribed by the Engine manufacturer to achieve recommended operating ~~under operating~~ temperature conditions and at not less than ~~3~~10% of the EPS standby nameplate KW rating.

(1) Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer if aftertreatment systems exist.

8.4.2.1.1.1

A supplemental load shall be permitted to be used to meet ~~or exceed the 30 percent requirement~~ the minimum load requirement in 8.4.2.1.1 for diesel or spark-ignited EPSs.

(Delete 8.4.2.1.2)

8.4.2.4

Diesel or spark-ignited EPS installations that do not meet the requirements of ~~8.4.2~~ 8.4.2.1.1 shall be exercised monthly with the available EPSS load and shall be exercised annually with supplemental loads at not less than 50 percent of the EPS nameplate KW rating for 30 continuous minutes and not less than 75 percent of the EPA nameplate KW rating for 1 continuous hour for a total test duration of not less than 1.5 continuous hours.

8.4.9.5

The minimum load for this test shall be as specified in 8.4.9.5.1

8.4.9.5.1

For ~~a~~ diesel or spark-ignited EPS installations, loading shall follow requirements in 8.4.2.1.1

(delete 8.4.9.5.2 and .3)

Substantiation:

Diesel or spark-ignited engine powered generators should follow the manufacturer's guidelines for monthly exercising. Modern high pressure common rail electronic fuel injection systems for diesel engines do not experience the "wet-stacking" issues of older generation engines and therefore do not need 30% loading for routine exercising. This change allows flexibility for different engines and their requirements as recommended by the manufacturer. Diesel and spark-ignited engine load test requirements can therefore be harmonized.

Related PC's:



Public Input No. 24-NFPA 110-2022 [New Section after A.1.1.4]

A1.1.3

EPSs that are not designated as Level 1 or Level 2 systems include optional standby systems. Optional standby systems are used solely for continuity of business operations and do not support life safety systems as described for Level 1 and Level 2 EPSs.

Statement of Problem and Substantiation for Public Input

Section 1.1.3 bullet 6 currently states that EPSs other than Level 1 and Level 2 systems are not required to meet NFPA-110 but makes no mention of optional standby systems that are specifically mentioned in the Origin and Development section of NFPA-110 history as examples of EPS not covered by NFPA-110. While the standard covers emergency and standby systems that have life safety loads, there is no direct reference to standby EPSs that are used solely for business continuity or operations that have no Level 1 and Level 2 loads.

Submitter Information Verification

Submitter Full Name: Randy Schubert
Organization: Ericsson
Affiliation: ATIS
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 16:57:10 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: FR-1-NFPA 110-2022

Statement: Optional standby systems are not required to meet the requirements of this document.



Public Input No. 37-NFPA 110-2022 [Section No. A.4.1]

A.4.1

This standard specifies requirements for the EPSS as a complete functioning system in terms of types, classes, and levels. It is not the intent of this standard to recommend the EPSS most suitable for any given application. The terms *emergency power supply systems* and *standby power supply systems* as as used in this standard include ~~, but are not limited to, such terms~~ as the following:

- ~~Alternate power systems~~
- ~~Standby power systems~~
~~Legally legally required standby systems~~

- ~~Alternate power sources~~
~~Since power systems. Since~~ this standard specifies the installation, performance, maintenance, and test requirements in terms of types, classes, and levels, ~~any of either of~~ these terms might be appropriate for describing the application or use, depending on the need and the preference of the parties involved.

Statement of Problem and Substantiation for Public Input

The standard does not contain requirements for standby or alternate power systems, except for legally required standby systems. The reference to those should be removed.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 36-NFPA 110-2022 [Global Input]</u>	Same issue

Submitter Information Verification

Submitter Full Name: Richard Kluge
Organization: Ericsson
Affiliation: ATIS
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 01 16:37:26 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: FR-12-NFPA 110-2022

Statement: The changes help clarify the distinction between the EPSS and standby systems as used in this document.



Public Input No. 26-NFPA 110-2022 [Section No. A.4.4.1]

A.4.4.1

Typically, Level 1 systems are intended to automatically supply illumination or power, or both, to critical areas and equipment in the event of failure of the primary supply or in the event of danger to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life. Other NFPA codes and standards such as NFPA 20, NFPA 99, NFPA 101, and NFPA 1221 provide specific requirements on where Level 1 systems are required.

Essential electrical systems can provide power for the following essential functions:

- (1) Life safety illumination
- (2) Fire detection, alarm, and notification systems
- (3) Elevators
- (4) Fire pumps
- (5) Emergency services communications systems
- (6) Industrial processes where current interruption would produce serious life safety or health hazards
- (7) Essential ventilating and smoke removal systems
- (8) Medical life sustaining systems

Statement of Problem and Substantiation for Public Input

The list includes the example of industrial processes that pose a risk if interrupted. Similarly critical medical care systems should also be added to the list. While the explanatory material calls out NFPA-99 for health care it also calls out NFPA-20 for fire pumps and those are included in the list.

Submitter Information Verification

Submitter Full Name: Randy Schubert

Organization: Ericsson

Affiliation: ATIS

Street Address:

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Submission Date: Tue May 31 17:10:30 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: FR-9-NFPA 110-2022

Statement: Medical life sustaining systems is added as yet another example of that which can be supplied by an essential electrical system.



Public Input No. 25-NFPA 110-2022 [Section No. A.4.4.2]

A.4.4.2

Typically, Level 2 systems are intended to supply power automatically to selected loads (other than those classed as emergency systems) in the event of failure of the primary source.

Level 2 systems typically are installed to serve loads, such as the following, that, when stopped due to any interruption of the primary electrical supply, could create hazards or hamper rescue or fire-fighting operations:

- (1) Heating and refrigeration systems
- (2) ~~Communications~~ Building or facility communications systems
- (3) Ventilation and smoke removal systems
- (4) Sewage disposal
- (5) Lighting, including unit equipment described in *NFPA 70 (NEC)*, 700.12(I)
- (6) Industrial processes

Statement of Problem and Substantiation for Public Input

The term communications systems is too broad. Emergency services communications is covered for Level 1 systems and communications systems for Level 2 refers to facility and building systems, not the public internet, cable TC, telecommunications, or wireless. These systems are backed-up via UPS or battery so that interruption of the primary electrical supply will not immediately cause a disruption. The amount of back-up time without generator operation is dependent on regulatory or business requirements. All other bullets in this section refer to facility systems.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 27-NFPA 110-2022 [Section No. A.4.4.2]	

Submitter Information Verification

Submitter Full Name: Randy Schubert
Organization: Ericsson
Affiliation: ATIS
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 31 17:03:54 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: [FR-10-NFPA 110-2022](#)

Statement: Sewage disposal is changed to a more broad and accurate term. Text was added to address that public telecommunications power is not Level 1 or level 2 to prevent misapplication of Item 2.



Public Input No. 27-NFPA 110-2022 [Section No. A.4.4.2]

A.4.4.2

Typically, Level 2 systems are intended to supply power automatically to selected loads (other than those classed as emergency systems) in the event of failure of the primary source.

Level 2 systems typically are installed to serve loads, such as the following, that, when stopped due to any interruption of the primary electrical supply, could create hazards or hamper rescue or fire-fighting operations:

- (1) Heating and refrigeration systems
- (2) ~~Communications~~ Building or facility communications systems
- (3) Ventilation and smoke removal systems
- (4) Sewage disposal
- (5) Lighting, including unit equipment described in *NFPA 70 (NEC)*, 700.12(I)
- (6) Industrial processes

Standby generators used solely for telecommunications services that utilize battery back-up in compliance with FCC guidelines are classified other than Level 1 or Level 2 EPSs and are outside the scope of this standard.

Statement of Problem and Substantiation for Public Input

For systems or loads utilizing battery backup in compliance with FCC requirements a loss of commercial power and failure of EPS will not result in service interruption for 3-4 hours or more. These systems are for continuity of business operations and are an example of optional standby systems. Some telecom sites do not utilize fixed or permanent generators and rely on back-up of 8 hours or more and portable generators.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 25-NFPA 110-2022 [Section No. A.4.4.2]</u>	

Submitter Information Verification

Submitter Full Name: Randy Schubert
Organization: Ericsson
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City:
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Zip:
Submittal Date: Tue May 31 17:26:16 EDT 2022
Committee: EPS-AAA

Committee Statement

Resolution: [FR-10-NFPA 110-2022](#)

Statement: Sewage disposal is changed to a more broad and accurate term. Text was added to address that public telecommunications power is not Level 1 or level 2 to prevent misapplication of Item 2.



Public Input No. 34-NFPA 110-2022 [Section No. A.5.1.1]

A.5.1.1

Examples of probability of interruption could include the following: earthquake, wind damage, flood damage, cyber-hacking or a demonstrated utility unreliability.

Statement of Problem and Substantiation for Public Input

For your consideration.

Submitter Information Verification

Submitter Full Name: Michael Anthony

Organization: Standards Michigan LLC

Affiliation: www.standardismichigan.com

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jun 01 15:44:59 EDT 2022

Committee: EPS-AAA

Committee Statement

Resolution: [FR-11-NFPA 110-2022](#)

Statement: The section is expanded to show more examples. The annex material is moved to the appropriate section.