

A PRESENTATION FOR

HFMS NJ 2011 Seminar

**NFPA 110/111 –
Proposals for the 2013 Editions**



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Learning Objectives

- List major NFPA 110-2013 proposals
- List major NFPA 111-2013 proposals
- Describe NFPA 110 proposers' rationales for selected major proposals
- Describe NFPA 111 proposers' rationales for selected major proposals

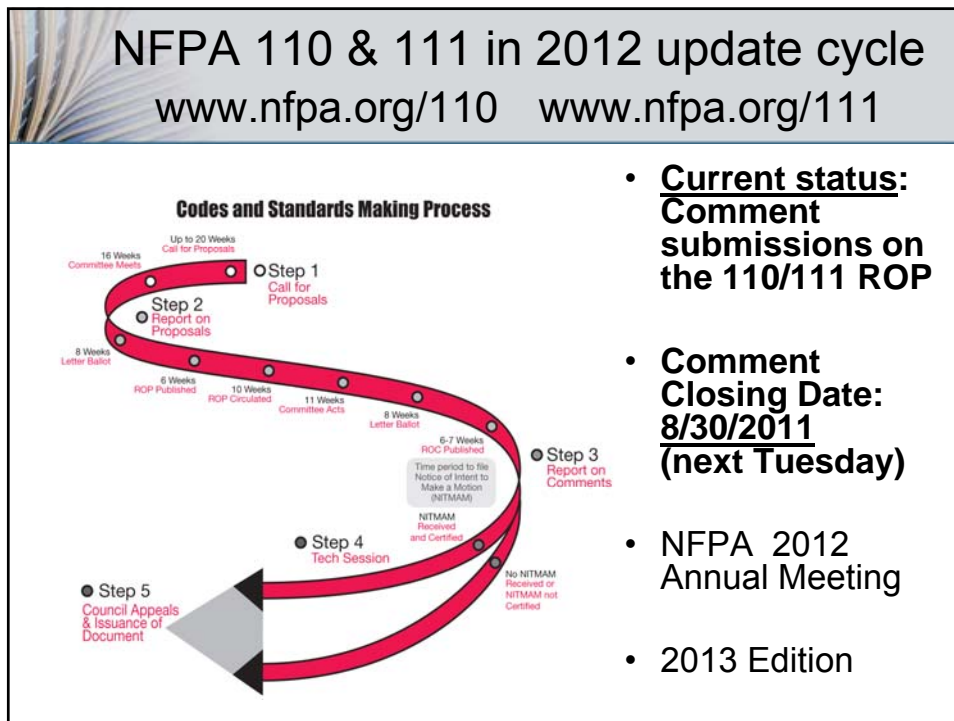
Note: We will discuss topics and rationales, we will not read the slides.

NFPA Disclaimer

- Although the speaker is Chairman of the NFPA Technical Committee on Emergency Power Supplies, which is responsible for NFPA 110 and 111, **the views and opinions expressed in this presentation are purely those of the speaker** and shall not be considered the official position of NFPA or any of its Technical Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation. Readers are encouraged to refer to the entire texts of all referenced documents.
- NFPA members can obtain staff interpretations of NFPA standards at www.nfpa.org.

NFPA 110 & 111 in 2012 update cycle

www.nfpa.org/110 www.nfpa.org/111

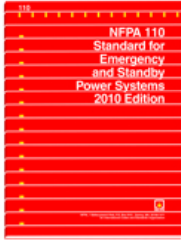


Major NFPA 110 proposals from the Public (P) and Tech. Committee (TC)

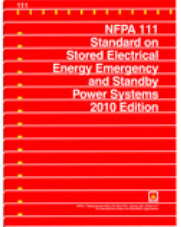
- Fuel (17P)
- NP feeder as EPS; reliability (7P)
- FP mist systems (4P)
- Testing (7P)
- EPS environment (3P+5TC)
- Controls/alarms (4P+1TC)
- Battery lights @EPSS (1P)
- Fluid analyses (1P)
- Ratings impact of EPS parasitic motor loads (1P)
- When consideration of portable is suggested (1P)
- 96 hr Class seismic (2TC)
- MV circuit breakers (1TC)
- Qualified persons (1TC)


Technical Committee actions on 110 & 111 public proposals


- ACCEPT
- REJECT
- APR – Accept in Principle
- APP – Accept in Principle in Part





- Wording shown is as the TC modified it and then balloted.





 <u>Accept</u> Log # 18	Fuel oil A.5.5.3
<p>Consideration should be given to sizing tanks in order to meet <u>minimum</u> fuel supplier delivery requirements, particularly for small tanks. Consideration should also be given to over sizing tanks. because many fuels have a shelf life and deteriorate with age. <u>More importantly, biodiesel blends up to B5 (ASTM D975) have much shorter shelf lives than conventional diesel fuel (ULSD) and can accelerate degradation processes endangering the entire diesel fuel supply. Where large tanks are required fuel is stored for extended periods of time (such as exceeding 12 months),</u> it is recommended that fuels be periodically pumped out and used in other services and replaced with fresh fuel. Prudent disaster management could require much larger on-site temporary or permanent fuel storage, <u>and several moderate sized tanks can be preferable to a single very large tank.</u></p> <p><u>Substantiation:</u> ... increase awareness of the reduced shelf life and accelerated deterioration issues involved with biodiesel blends up to B5 (ASTM D975).</p>	


 <u>Accept</u> Log # 20	Fuel oil, Reword A.7.9.1.2
<p>In order to optimize the long term storage of fuels for prime movers, the fuel should be kept cool and dry, and the tank as full as possible. Tanks that are subject to temperature variations can experience accelerated fuel degradation especially if the tanks are outside and above ground or close to an extreme heat source if stored inside a structure. The more constant and cooler the tank temperatures the less likely temperature related fuel degradation will occur. Tank ullage (air space) should be kept to a minimum. Excess airspace allows for warm humid air to enter the tank and condense moisture during the cool evening. Also, prolonged exposure to ambient air which is 20 percent oxygen can facilitate oxidative degradation of the fuel.</p>	


 <u>Accept</u> Log # 20	Fuel oil Reword A.7.9.1.2
<u>CONTINUED</u> Fuel Storage tanks should be kept as dry as possible and have with provisions for water drainage on a regular basis. The presence of water can lead to microbiological contamination and growth which in turn can lead to general or pitting corrosion of steel tanks and components possibly resulting in filter plugging, operational issues or a hydrocarbon release to the environmental. Regularly scheduled surveillance of the fuel allows the operator(s) to evaluate the condition of the fuel and make important decisions regarding the quality of the fuel dedicated to reliable operation of the prime mover. Fuel maintenance and testing should begin the day of installation and first fill in order to establish a benchmark guideline for future comparison. Where possible, always seek laboratory testing services from a qualified or certified petroleum laboratory.	

 <u>APP</u> Log #3	Fuel maintenance 7.9.1.2, 7.9.1.3, A.7.9.1.2
<p>7.9.1.2 Fuel system design shall provide for a supply of clean fuel to prime mover <u>by documentation of a fuel maintenance program that incorporates periodic centrifuge cleaning/ polishing with high pressure tank agitation and or mechanical tank cleaning with auxiliary filtration, in addition to sampling by qualified personnel for laboratory analysis of diesel fuel.</u></p> <p>7.9.1.3 Tanks shall be sized so that the fuel is consumed within the storage life, or provisions shall be made <u>to centrifuge clean/polish and laboratory test, or</u> replace stale fuel with clean fuel.</p> <p>A.7.9.1.2 Revision: Fuel maintenance-Filtration and <u>water separators</u> can remove contaminants and water returning fuel to conditions where it will provide reliability and efficiency for standby generators <u>to protect prime movers' injection equipment</u> when called upon in emergency conditions</p> <p>Substantiation: Detailed discussion referencing NFPA 2002.</p>	

	<u>APP</u> Log #12	Fuel oil piping material 7.9.3.1, A.7.9.3.1
<p><u>A.7.9.3.1 Fuel lines containing copper, copper-containing alloys, and zinc (including galvanized piping or containers) should be avoided. Copper can promote fuel degradation and can produce mercaptide gels. Zinc coatings can react with water or organic acids in the fuel to form gels that rapidly plug filters.</u></p> <p><i>DLS note: Submitter referenced ASTM D975, wanted mandatory language to replace existing 7.9.3.1 but TC put it in Annex instead.</i></p>		


	<u>APP</u> Log #7, #8, #9, #CP6	Fuel ASTM references
<p>5.1.1(1) Liquid petroleum products at atmospheric pressure <u>as specified in the appropriate ASTM standards and as recommended by the engine manufacturer.</u></p> <p>5.1.1(2) Liquefied petroleum gas (liquid or vapor withdrawal) <u>as specified in the appropriate ASTM standards and as recommended by the engine manufacturer.</u></p> <p><u>A.5.1.1(2) ASTM D1835 Standard Spec for LP Gases is a recognized standard covering LP gas.</u></p> <p><u>A.5.1.1(3) ASTM does not have a standard specification for natural or synthetic gas. Industry generally uses pipeline specifications for natural gas quality.</u></p>		


	APR Log # 14	Fuel quality testing
<p>Revise 8.3.8 to read: A fuel quality test shall be performed at least annually using tests approved by <u>appropriate ASTM standards</u>.</p> <p>Add a new annex Section A.8.3.8 to read: <u>A.8.3.8. Limited fuel quality testing performed annually using appropriate ASTM standard test methods is recommended as a means to determine that existing fuel inventories are suitable for continued long term storage. Special attention should be paid to sampling the bottom of the storage tank to verify that the stored fuel is as clean and dry as practicable, and that water, sediment or microbial growth on the tank bottom is minimized. ASTM D-975 contains test methods for existing diesel fuel.</u></p>		

	APR Log # 15	Fuel oil quality & storage
<p>A.5.1.1(1) See A.5.5.3 for shelf life precautions for fuel supplies. Diesel fuel should be 1D, 2D, or a blend and have a minimum cetane rating of 40. <u>The grade of diesel fuel selected for use in a prime mover should be based on recommendations from the diesel engine manufacturer and ASTM D975 Standard Specification for Diesel Fuel Oils. Where possible, the purchaser of fuel for the prime mover should specify a diesel fuel that does not contain biodiesel which can accelerate the degradation of the diesel fuel if stored for a period longer than six months. If diesel fuel is stored outside for long term storage, it may be necessary to use a winter or arctic grade of diesel fuel, or take extra precautions such as insulating and heat-tracing fuel tanks and lines to ensure that fuel will flow to the prime mover under the coldest possible conditions.</u></p>		

<u>REJECT</u>	Fuel oil test/recertification
Log # 11	
<p>7.9.1.3 Tanks shall be sized so that fuel is consumed within the <u>respective industry's recommended maximum</u> storage life, or provisions shall be made to replace stale fuel with clean fuel <u>test and recertify the existing fuel inventory as deemed necessary for continued storage or replace old fuel with new fuel.</u></p> <p><u>Substantiation:</u> The term "stale" is ambiguous and does not provide the end user sufficient guidance as to how to qualify fuel stored beyond the recommended shelf life of 12 months diesel fuel, 12 months, Liquefied (LP) Gas, and 6 months biodiesel blends.</p> <p><u>TC Statement:</u> The phrase "respective industry" is not clearly defined and could be misconstrued as to whether it is user of the fuel or the manufacturer of the fuel. The use of "old" to replace "stale" does not provide additional clarity and the term "stale" embodies more than just the age of the fuel. Requiring "recertification" as deemed necessary" does not provide the necessary details for enforcers to implement.</p>	

<u>REJECT</u>	LPG storage issues
Log #16	
<ul style="list-style-type: none">• <u>Proposed New A.5.1.1(2)</u> Where LPG is the emergency stand-by fuel, only Special Duty Propane as described in ASTM D1835 (or equivalent local fuel specifications) should be stored for an extended period of time. Commercial propane is less stable than Special Duty Propane and should not be stored for long periods of time.• <u>TC Statement:</u> The recommendation introduces indeterminate ("extended" & "long") periods of time.	

	<u>REJECT</u> Log #17	Fuel oil FIFO usage
<p><u>Proposed new A.5.5.1.1</u> Within the oil industry, it is considered good practice when storing fuel to use the oldest fuel first, clean the tank, and re-fill with new fuel. The presence of even a small amount of 'old' fuel can cause new fuel to degrade more rapidly. For operators of emergency stand-by power generators who do not have on-going uses for the standby fuel, a practice to consider, especially for diesel fuel, is to make arrangements with a local government or business fleet operator to use the 'old' fuel and replace it with new fuel in the long term storage.</p> <p><u>Substantiation:</u> To provide the end user with a mechanism to rotate fuel inventory in order to remove older fuel and replace with newer fuel inventory in an attempt to optimize long term storage of fuel.</p> <p><u>TC Statement:</u> The substantiation does not demonstrate that current tank refilling processes have resulted in problematic EPS operation. Outages occurring during a tank cleaning process would necessitate the use of a second or temporary tank to ensure operation of the EPSS. Testing of the fuel will indicate when it is necessary to completely evacuate the fuel from the tank.</p>		

	<u>REJECT</u> Log #26, #27, #28, #29	Water mist fire protection
<p>7.11.2.1 Where water based fire suppression systems are installed in EPS equipment rooms or separate buildings, and the manufacturers of the EPS certify that such water based fire suppression systems cannot damage the EPS system, hinder its operation or reduce its output, the water based fire suppression systems shall be designed and installed per NFPA 13, Standard For the Installation of Sprinkler Systems or NFPA 750, Standard on Water Mist Fire Protection Systems.</p> <p><u>Substantiation:</u> Because water based fire suppression systems are not excluded as an optional method of suppression in Section 7.11.2 paragraphs 1 & 2, and NFPA 13 and 750 are the primary standards outlining the requirements for water based fire suppression systems, they should be referenced to provide guidelines to the end user, AHJ and design firm. Water Mist has been approved and installed in a wide range of power system applications globally and for clarity NFPA 750 Standard on Water Mist Fire Protection Systems should be included in NFPA 110 as a Referenced Publication.</p> <p><u>TC Statement:</u> It is not plausible to expect an EPS manufacturer to certify that a water-based fire protection system will not damage the EPS, hinder its operation, or reduce its output. NFPA 110 does not prohibit the use of water-based fire protection systems for fire suppression within the EPS equipment room and determination of the applicable standard to use is the purview of the authority having jurisdiction.</p>		

REJECT Water mist fire protection
Log #26, #27, #28, #29

A.7.11.2 If a fire suppression system is used in EPS rooms or separate buildings housing EPS equipment, consideration should be given to preaction-type suppression systems per NFPA 13 Standard For The Installation of Sprinkler Systems or NFPA 750 Standard on Water Mist Fire Protection Systems.

Substantiation: Because NFPA 13 and 750 are standards outlining the requirements for pre-action systems, they should be referenced in this section to provide a standard for design and installation. Water Mist has been approved (FM – Combustion Turbines & Machinery Spaces) and installed in a wide range of power supply applications globally. NFPA 750 Standard on Water Mist Fire Protection Systems should also be included as a preaction system option.

TC Statement: There are preaction-type suppression systems other than wet. The recommendation implies that only wet-type systems are acceptable.


REJECT Battery lighting for EPSS
Log # 36


7.3.1 The Level 1 or Level 2 EPS **and EPSS** equipment location(s) shall be provided with battery-powered emergency lighting. This requirement shall not apply to units located outdoors in enclosures that do not include walk-in access.


Substantiation: Many enlightened designers, so to say, are already doing this but the practice should be mandatory. This relatively slight change in wording of this passage will place emphasis upon illumination for the actual system of disconnecting means, related protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a safe and reliable source of electric power.


For the convenience of the committee, the transactions of rejections by other NFPA technical committees is submitted with this proposal to supplement this substantiation and is attached herewith Finally, this link to a video clip showing how a switchgear room goes dark after a switchgear explosion should be evidence enough: <http://www.youtube.com/watch?v=P00WEZz9tu4> Note that the area of the explosion instantly goes dark. Without emergency lighting around the EPSS, how would rescue professionals be able to help? Note: Supporting material is available for review at NFPA Headquarters.


TC Statement: As cited in the submitter's substantiation, providing battery-powered emergency lighting units at locations other than as currently required is a design consideration. The substantiation does not support such a broad expansion of a mandatory requirement for this type of equipment. Response to outages is part of standard operating procedures established by facilities and this includes provision to illuminate areas that have been put into darkness.


 <p><u>REJECT</u> Campus feeder as EPS Log # 39 Under 5.1 Energy Sources</p>
<p>5.1.5.x A dedicated feeder in a multi-building, campus-style electrical power distribution network shall be permitted to be used as the EPS where the normal and emergency feeder independence and reliability is acceptable to the AHJ.</p> <p><u>Substantiation:</u> Many appa.org colleges and universities have large medium voltage distribution systems on the order of 10-100 MW – often backed up by district energy systems – that can be configured to present EPS availability that exceeds the availability of the best maintained building-level on-site generator. This resource can be used to meet life safety, business continuity and sustainability objectives the possibility of using two sufficiently independent sources is tracking in this document. Refer to related proposal on the application of quantitative methods for assessing power system reliability.</p> <p><u>TC Statement:</u> Vulnerability of outside utility sources to outages due to environmental factors (major natural disasters) is greater than the vulnerability of an on-site source of alternate power installed in accordance with this standard. Without on-site alternate power sources, critical operation of vital facilities could be compromised.</p>

 <p><u>REJECT</u> Expand NFPA 110 scope Log #43</p>
<p>Permit this document to grow beyond its present focus as an installation document for the on-site generation manufacturing, installation and maintenance industry by permitting proposals for use of utility sources for EPS in future revision cycles. <i>[by deleting (4) from 110 exclusions - DLS]</i></p> <p>1.1.3 This standard does not cover the following: (4)Utility service when such service is permitted as the EPSS</p> <p><u>Substantiation:</u> NFPA 110 needs to morph into a kind of “landing page” for all power system reliability issues at the building premises level and quite possibly one step up above the service point into the last mile of power distribution. State public utility regulatory authorities and the state building department and state emergency management agencies need a vast void filled by what this document could be. What other document in the NFPA universe would have growth potential to meet the demand for more granular power system reliability leading practice among these agencies? As a veteran of the scope discussions on NEC CMP-1 for the past 10 years I fully grasp how scope issues like this open onto a minefield of sensitivities among each of the interest groups.</p> <p>[CONTINUED]</p>

	<u>REJECT</u>	Expand NFPA 110 scope
	Log #43	
<p>[CONTINUATION OF SUBSTANTIATION]</p> <p>My hope at this stage of the revision process is to hope for informed discussion by the committee on this. It would not be expected that this could be done by this committee in a single cycle, in isolation from, say the NFPA Standards Council. But as surely as the present NFPA 110 once used to be NFPA 76A, this document needs to rise to a market for it that is already there. Either this committee or the NFPA Standards Council needs to approach this document and make it ready to receive smart grid and sustainability concepts, among others. Interactive sources and electric vehicles with bi-directional power flow capability that can be used for non-automatic, isolated sources of backup power is not too far ahead of us with great potential for changing the mix of EPS sources and the configuration of the last mile of municipal power infrastructure. Accordingly, the last mile of power infrastructure will inform leading practice in building premises power security.</p> <p><u>TC Statement:</u> The committee disagrees with the recommendation and substantiation. A utility may choose to use this document as a reference for their distributed power generation facility, but it is not the intent of this committee to expand the scope of this document to address other than on-site generation.</p>		

	<u>APR</u>	New proposed Annex "X"
	Log # 34	
<p>Add new Annex X: Availability and Reliability of Emergency and Standby Power Systems <i>[about 2 pages]</i></p> <p><u>Substantiation:</u> This material has been derived from Annex F of the 2011 National Electrical Code and has been modified for application to the more common emergency and standby power systems and to move closely align with the IEEE Standard 493 – Design of Reliable Industrial and Commercial Power Systems, the so-called "Gold Book" - . It is very general information that ought to be available to users of this document who deal with the far more common building emergency and standby power systems.</p> <p><u>TC Action:</u> Add a new last sentence to A.8.1 to read: "<u>For more detailed information on electrical equipment maintenance refer to NFPA 70B, Recommended Practice on Electrical Equipment Maintenance.</u>"</p> <p><u>TC Statement:</u> NFPA 70B-2010 contains the information provided in the recommendation and it is not necessary to repeat this information in NFPA 110.</p>		

	<u>APR</u> New proposed Annex "Y" Log # 35
<p>Add new Annex Y: Risk Assessment and Commissioning Based on the Criticality of the Facility or Regional Network of Facilities <i>[about 2 pages - DLS]</i></p> <p><u>Substantiation:</u> NFPA 110 needs to evolve to meet demand for more formal engineering modeling of power systems that backup normal power systems. This proposal, derived from material presented to the NFPA 70-2011 technical committees and related proposal for a new Annex X, is intended to provide the broad contours of a "landing page" for the design of all types of backup power systems. The classifying governmental agency having jurisdiction would benefit from a gradient level of criticality for the facilities that has specific operation guidelines. It provides the framework by which the jurisdiction can evaluate the criticality of all of their facilities relative to each other and thus provides a means to ensure the most critical systems are recognized as such and have the resources allocated to them so that they are available when needed to deliver emergency services and provide for disaster recovery. Without a gradient scale, fewer resources would be available to the most critical systems because all of the critical facilities would require the same amount of resources. The requirement for the various types of critical systems needs to align with the importance of the system to the protection of life and property. A set of specific operational requirements for the various levels of criticality is needed to provide design criteria and for consistent application. A gradient level of risk assessment with probabilistic modeling provides a quantitative method to ensure the most critical systems have been designed sufficiently robust so that they are available when needed to deliver emergency services and provide for disaster recovery.</p> <p><u>TC Statement:</u> <u>The committee action on Proposal 110-49 (Log #34) meets the intent of the recommendation.</u></p>	

	<u>REJECT</u> Reliability calcs & IEEE 493 Log #41
<p>Add informational note as shown below:</p> <p>1.4.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.</p> <p><u>Informational Note: Assignment of degree of reliability of the recognized emergency supply system, or equivalency of other methods, depends on the careful evaluation of the variables at each particular installation. For further information on quantitative methods for assessing power system reliability, see ANSI/IEEE 493-2007, Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems.</u></p> <p><u>Substantiation:</u> This is an adaptation of a new provision in Article 701 of the 2011 NEC. Members of that committee agreed that this resource offered a way to convey opinions about power security into the realm of science. Very often, the AHJ is put in the position of having to assess the equivalency of an Architect-Engineer's EPSS design. It would be reasonable for the AHJ to ask for reliability calculations, much as he or she might ask for short circuit or ampere demand calculations. Unfortunately, the training of many electrical engineers does not include formal, reliability analysis so reference to this document will provide a starting point for establishing equivalencies.</p> <p><u>TC Statement:</u> There are documents other than the recommended IEEE standard that address the reliability of power systems. The recommendation implies that this is the only relevant reference document.</p>	

REJECT AHJ okay for EPSS w/NP
Log #37

Unless otherwise permitted by the AHJ, based upon site specific factors such as architectural configuration, relative distance between equipment, occupancy, type or conditions of maintenance and supervision, Level 1 EPSS equipment shall not be installed in the same room with the normal service equipment, where the service equipment is rated over 150 volts to ground and equal to or greater than 1000 amperes.

Substantiation: While the committee's intention to assert isolation between normal power and emergency power switchgear has merit as good design practice, it must also be aware that many jurisdictions simply ignore this requirement because it drives up architectural costs when, for example, separate rooms must be built for, 750 kVA service switchgear and 150 kVA Level 1 switchgear. At 480V, 1000 amperes is less than 1000 kVA – meaning that this requirement affects a significant installed base in commercial and institutional buildings which usually meet the Level 1 criterion.


REJECT AHJ okay for EPSS w/NP
Log #37


CONTINUATION OF SUBSTANTIATION


Not only is the existing language costly (and, in the parlance of the current zeitgeist – “unsustainable” --there are many reasons to have the normal power switchgear and the EPSS at least within eyeshot of one another; not the least of which is the ability for electricians to verify the energization status of the normal power switchgear while performing maintenance or operating EPSS. In other words, some jurisdictions recognize that there are safety concerns about having the two separated.


The 1000 ampere threshold asserted here seems to be derived from flash boundaries that appear in other NFPA documents. While I have no data to prove it, it seems plausible that there is the risk in the likelihood of arc-fault damage to be weighed against the likelihood of human error in not being able to verify the operating conditions of both power sources simultaneously even when status appears on transfer switch controls .


TC Statement: This requirement is focused on protecting the EPSS equipment from exposures. Section 1.4.1 provides the AHJ with discretion to accept designs that provide equivalency.


	<u>REJECT</u> Log #38	Permit EPSS with NP
After		
7.2.2 Level 1 EPSS equipment shall not be installed in the same room with the normal service equipment, where the service equipment is rated over 150 volts to ground and equal to or greater than 1000 amperes.		
Add text to read as follows:		
<u>7.2.2.x (NEW) EPSS distribution equipment and transfer equipment shall be permitted in the same room as the normal service disconnect when the conductors for each system are not located within the same cabinet, enclosure or vertical switchboard section as the service disconnecting means or normal source feeder disconnecting means.</u>		
<u>Substantiation:</u> This proposal is derived from Mr. Manche's comment on the affirmative in the last revision cycle and strikes me as a well-reasoned statement. I could not track it any further in the development process so I am putting it out there for more discussion For context, the entire proposal is duplicated here for the convenience of the committee:		
<u>TC Statement:</u> Regardless of the equipment orientation, it is the intent of this requirement to separate the Level 1 EPSS equipment from the normal service equipment to achieve a higher degree of reliability and protection from fire hazards.		

	<u>REJECT</u> Log #1	Engine fluid lab analysis <i><u>(no wording provided)</u></i>
<u>Recommendation:</u> Similarly to diesel fuel, lubricating engine oil and coolants in power trains, such as diesel engines in emergency generators that are infrequently operated, are subject to contamination other than normal usage. It is recommended that a laboratory analysis schedule of all fluids be established with periodic sampling and testing to document and establish engine wear patterns for life cycle predictions and also as an aid in prediction of pending failures.		
<u>Substantiation:</u> <i>[See next slide]</i>		

	<u>REJECT</u> Log #1	Engine fluid lab analysis <u>(no wording provided)</u>
<p><u>Substantiation:</u> Scientific data should be used in today's progressive maintenance programs for critical emergency generators. Pending failures, wear patterns, and replacement of units can and should be determined by scientific laboratory analysis of fluids used in diesel generators. Oil and coolant laboratory analysis can predict pending failures and replacement cycles of emergency generators. Engine coolants are normally tested for freezing level rather than acidity. High acidity can cause corrosion, deteriorating cylinder liners and soft plugs in the blocks of diesel engines causing premature failure. Excessive wear and breakdown of emergency generator power trains can be caused by any failing component of diesel engines no matter the length of service. The vast majority of emergency generators' engines are run only to test. With lubricating oil sitting in the crankcase subject to condensation, overtime, small quantities of dust enter via the crank case breathers. Some generator oils are only changed annually and in worse cases on an hourly schedule creating excessive intervals between changes.</p>		

	<u>APP</u>	Fuel maintenance program Log #3
<p><u>Recommendation:</u></p> <p>7.9.1.2 Fuel system design shall provide for a supply of clean fuel to prime mover <u>by documentation of a fuel maintenance program that incorporates periodic centrifuge cleaning/polishing with high pressure tank agitation and or mechanical tank cleaning with auxiliary filtration, in addition to sampling by qualified personnel for laboratory analysis of diesel fuel.</u></p> <p>7.9.1.3 Tanks shall be sized so that the fuel is consumed within the storage life, or provisions shall be made to <u>centrifuge clean/polish and laboratory test,</u> or replace stale fuel with clean fuel.</p> <p>A.7.9.1.3 Fuel maintenance Filtration and <u>water separators</u> can remove contaminants and water returning fuel to conditions where it will provide reliability and efficiency for standby generators <u>to protect prime movers' injection equipment</u> when called upon in emergency conditions</p>		

	<p><u>APP</u> Log #3</p>	<p>Fuel maintenance program (continued)</p>
<p><u>Submitter's Substantiation: [Excerpts]</u></p> <p>The number one failure to start emergency generators is bad batteries; a plugged fuel filter from contaminated fuel is the number one failure of diesel engines while running. Inadequate maintenance documentation is the number one cause of litigation loss.</p> <p>Normal filtration is not a panacea. Filters and water separators are on generators to protect the injectors, rather than supply clean fuel. Specific guidelines to include new ideas, such as periodic fuel polishing of stored fuel, are needed for best fuel maintenance practices to ensure a clean fuel supply at all times for critical generators.</p> <p>Many large fuel tanks for generators hold fuel that has been stored for years. Some use several types of additives that slow build up of certain contaminants, but do not address many of the elements for long term storage including elimination of existing contaminants, rust, water, and tank deterioration.</p>		

	<p><u>APP</u> Log #3</p>	<p>Fuel maintenance program (continued)</p>
<p><u>CONTINUATION OF Submitter's Substantiation: [Excerpts]</u></p> <p>Fuel sampling alone is not a good indicator of clean fuel. It will not be accurate unless the tank walls are clean and free of fungus and slime build up. Fuel samples from the wrong locations without proper fuel agitation taken by untrained personnel will not show the true quality of fuel with a laboratory test.</p> <p>Periodic generator testing does not require enough time for the hot fuel to circulate to break up microbiological algae from tank walls. Fuel filters and water strainers are a safety item to protect fuel injectors, not a solution for bad or contaminated fuel.</p> <p>Topping off is part of fuel maintenance, but is consistently overlooked or ignored, due to the time and expense involved to add such a small quantity of fuel to refill the tanks. This causes condensation in fuel tanks, especially those stored in sunlight, i.e., adjacent to fire stations in high humidity areas such as coastal regions.</p> <p>For only a few hundred dollars a year, fuel polishing by centrifuging and testing accurate samples taken by qualified personnel would eliminate the problem. Centrifuge polishing takes fuel to the ultimate state of cleanliness by removing all heavier particles such as wax, metals, water, microorganisms, dirt, etc., ensuring unplugged filters and reliability. Lab analysis after fuel polishing signifies a specific maintenance program and, with documentation, is very cheap litigation insurance.</p>		

ACCEPT
Log #30

Testing clarification

Revise text to read as follows:

8.4.2* Diesel generator sets in service shall be exercised at least once monthly, for a minimum of 30 minutes, using one of the following methods:

- (1) Loading that maintains the minimum exhaust gas temperatures as recommended by the manufacturer
- (2) Under operating temperature conditions and at not less than 30 percent of the EPS **standby** nameplate kW rating

Substantiation: There are usually two kW nameplate ratings found on most engine driven generators: “standby” and “prime”. The present NFPA 110 standards do not distinguish between the two. There can be a 6% difference between the resulting kW figures when calculating 30% of name plate – e.g. a 100kW standby generator is normally considered a 80kW set for prime power, therefore $100\text{kW} \times 30\% = 30\text{kW}$; $80\text{kW} \times 30\% = 24\text{kW}$.


APR Monthly ATS 10 sec transfers
Log #25


Add new paragraph: 8.4.6.2 The criteria set forth in Section 4.3 and in Table 4.1(b) shall not be required during the monthly testing of the EPSS. If the criteria are not met during the monthly test, a process shall be provided to annually confirm the capability of the system to comply with 4.3.

Substantiation: There is no provision in NFPA 110 for the frequency of testing and proving the EPSS will respond to the criteria set forth in paragraph 4.3.

<u>REJECT</u> Log #4	Installation test order <u>(No wording provided)</u>
<p>I propose allowing the 2 hr full load test outlined in section 7.13.4.3 to be performed before the building load test specified in section 7.13.4.1.3(1) through (2). <i>[Second paragraph not included here, duplicative - DLS]</i></p> <p><u>Substantiation:</u> The order that these tests are specified creates some significant problems if the EPSS system is designed without a dedicated connection point for a load bank. Typically "EPSS" systems are designed for future expansion and therefore the actual building load is substantially less than the nameplate kW rating of the operator. To perform the testing in the order specified without a dedicated connection point or the load bank would require disconnecting the actual load from the generator and connecting a load bank after you have completed the building load test specified in section 7.13.4.1(1) through (12). In my opinion the test specified in section 7.13.1.1(1) through (12) seems to be a functional real world test that should simulate a real world power outage. It should be a representation of how your system will perform in real world outage and therefore should get the last test performed before the system is turned over to the end user. Disconnecting the actual building load and connecting a load bank up after completion of this test could create multiple opportunities for a mistake to occur when reconnecting the actual load back up to the generator. The test specified in 7.13.4.3 seems to be a performance test to ensure that the generator will produce the advertised kW under the actual site conditions where it is installed.</p>	

<u>ACCEPT</u> Log #24	Portable EPS when?
<p>Add text to read as follows:</p> <p>8.1.2 Consideration shall be given to temporarily providing a portable or alternate source whenever the emergency generator is out of service and the criteria set forth in 4.3 cannot be met.</p> <p><u>Substantiation:</u> Confusion now exists as to when a portable is required to be placed in service when a generator is down for servicing or repairs.</p> <p>DLS note:</p> <p>4.3 Type. The type defines the maximum time, in seconds, that the EPSS will permit the load terminals of the transfer switch to be without acceptable electrical power. Table 4.1(b) provides the types defined by this standard.</p>	

	<p><u>APR</u> EPS equipment loads Log #49</p>
<p>[NEW] A.5.6.7.5 Adding remote parasitic equipment loads into the overall load to be supplied by the EPS is a factor that should be included in the overall EPSS design.</p> <p><u>Substantiation</u> [for proposed mandatory language]: To allow these loads to be driven by the electrical output of the EPS included in the EPS output rating would deprive the customer of full electrical output.</p> <p><u>TC Statement</u>: The committee action meets the intent of the recommendation by providing information on how remote parasitic loads should be accommodated.</p> <p>DLS note: Existing 5.6.7.5 Power for fans and pumps on remote radiators and heat exchangers shall be supplied from a tap at the EPS output terminals or ahead of the first load circuit overcurrent protective device.</p>	

	<p><u>ACCEPT</u> Seismic 96 hour Class X Log #CP14, #CP15</p>
<p>[DELETE] 5.1.2 Seismic design category C, D, E, or F, as determined in accordance with ASCE 7, shall require a Level 1 EPSS Class X (minimum of 96 hours of fuel supply).</p> <p>Add new last sentence at end of Annex A.4.2:</p> <p><u>Where the seismic design category is C, D, E, or F, as determined in accordance with ASCE 7, the EPS supplying a Level 1 EPSS should be capable of a minimum 96 hours operation without refueling if it is determined that EPS operation is necessary for this period.</u></p> <p><u>TC Substantiations</u>: Determination of the need for continued operation and the minimum operational time without refueling is a design consideration that is subject to approval of the AHJ and should not be a mandate in this standard. The standard does not provide this type of requirement for other natural disaster events. The information in this requirement is better suited as advisory and should be in Annex A.</p> <p>The revised version of this former requirement reflects that 96 hours of operation is recommended where it is determined there is a need for continued operation of the EPSS in facilities such as hospitals or emergency management centers.</p>	

<u>ACCEPT</u> & Log #CP5	Remote controls, alarms annunciation
<p>Revise 5.6.6* Remote Controls, Alarms, and Annunciation: A remote, common audible alarm shall be provided as specified in 5.6.5.2(4).</p> <p>5.6.6.1 Alarms and annunciation shall be powered by the prime mover starting battery <u>unless operational constraints make this impracticable. Under that circumstance an alternate source from the EPS such as a storage battery, UPS, or branch circuit supplied by the EPSS shall be permitted.</u></p> <p>5.6.6.2 The following annunciation shall be provided at a minimum:</p> <ul style="list-style-type: none">(1) For Level 1 EPS, local annunciation and facility remote annunciation, or local annunciation and network remote annunciation(2) For Level 2 EPS, local annunciation <p>5.6.6.3 For the purposes of defining the types of annunciation in 5.6.6.2, the following shall apply:</p> <ul style="list-style-type: none">(1) Local annunciation is located on the equipment itself or within the same equipment room.(2) Facility remote annunciation is located on site but not within the room where the equipment is located.(3) Network remote annunciation is located off site. <p>A.5.6.6 The minimum "remote alarm annunciation" is to alert personnel at a constantly attended station somewhere on the site when the facility is in use as a Level 1 system. If the site is not continuously occupied, "network remote" should allow people at another site to know the operating status of the equipment.</p> <p>The preferred method of remote annunciation is to notify personnel both somewhere on the site and at other locations via a network such as LAN, WAN, or internet, including the ability to initiate auto-dial and send predefined text messages.</p> <p><u>Portion of TC Substantiation:</u> A long circuit run resulting in excessive dc voltage drop on the circuit is an example of the operational limitations that necessitate the use of the alternate sources of power.</p>	

<u>ACCEPT</u> Log #CP10	Listing MV transfer equip.
<p>Add a new last sentence to Section 6.1.6 to read: <u>Medium voltage transfer of central plant or mechanical equipment not including life safety, emergency, or critical branch loads shall be permitted to be transferred by electrically interlocked medium voltage circuit breakers.</u></p> <p><u>TC Substantiation:</u> The use of switches listed for emergency service to transfer loads that are not classed as emergency is not necessary.</p> <p><u>DLS Note:</u> Existing language under Section 6, Transfer Switch Equipment:</p> <p>6.1.6* Where available, each switch shall be listed for emergency service as a completely factory-assembled and factory tested apparatus.</p>	

ACCEPT Damage from hazards
Log #CP7

Revise Section 7.2.3 to read as follows:

7.2.3* The rooms, ~~shelters~~ **enclosures**, or separate buildings housing Level 1 or Level 2 EPSS equipment shall be designed and located to minimize the damage from flooding, including that caused by the following:

- (1) Flooding resulting from fire fighting
- (2) Sewer water backup
- (3) ~~Similar~~ **Other** disasters or occurrences

TC Substantiation: The revisions: 1) provide correlation with Section 7.2 and 2) expand the types of disasters to include natural disasters as well as those resulting from fire fighting or sewer water backup

ACCEPT Lighting level clarification
Log #CP8

Revise Section 7.3.3 to read as follows:

7.3.3* The ~~intensity of~~ **minimum average horizontal illumination provided by normal lighting sources** in the separate building or room housing the EPS equipment for Level 1 shall be 32.3 lux (3.0 ft-candles) **measured at the floor level**, unless otherwise specified by a requirement recognized by the authority having jurisdiction.

TC Substantiation: The revisions provide benchmarks and methods for determining the required illumination levels and clarify that the requirement applies to the normal lighting source.

<u>REJECT</u> Log #CP9	Combustion air source
<p>Revise text to read as follows:</p> <p>7.7.2.1 For EPS supplying Level 1 EPSS, combustion ventilation air shall be supplied directly from a source outside the building by an exterior wall opening or from a source outside the building by a 2-hour fire-rated air transfer system.</p> <p><u>TC Substantiation:</u> This section covers combustion ventilation air to the engine and the revised text clearly reflects the subject of the requirement.</p> <p><u>TC Statement:</u> The committee discussed this proposal extensively and did not reach consensus on moving it forward. <u>The committee encourages public comment on this proposal for input on whether this section and related ventilation and exhaust sections should be revised or reorganized for clarity.</u></p>	

<u>REJECT</u> Log #CP11	Ambient conditions
<p>Delete Section 7.7.6.</p> <p>7.7.6 The ambient air temperature in the EPS equipment room or outdoor housing containing Level 1 rotating equipment shall be not less than 4.5°C (40°F).</p> <p><u>TC Substantiation:</u> The requirements of Sections 5.3.1 and 7.7.7 address the necessity to provide heating of the prime mover so that it will start under cold temperature conditions. The requirement of Section 7.7.6 results in redundancy to the requirements of Sections 5.3.1 and 7.7.7.</p> <p><u>TC Statement:</u> The committee discussed this proposal extensively and did not reach consensus on moving it forward. The committee encourages public comment on this proposal for input on whether this section should be deleted.</p> <p>5.3.1 The EPS shall be heated as necessary to maintain the water jacket and battery temperature determined by the EPS manufacturer for cold start and load acceptance for the type of EPSS.</p> <p>7.7.7 Units housed outdoors shall be heated as specified in 5.3.1.</p>	

ACCEPT Maint./testing qualifications Log #CP13

8.4.8 The routine maintenance and operational testing program shall be overseen by a properly instructed individual. **EPSS components shall be maintained and tested by qualified person(s).**

Add the following definition to Chapter 3:

Qualified Person. One who has skills and knowledge related to the operation, maintenance, repair, and testing of the EPSS equipment and installations and has received safety training to recognize and avoid the hazards involved.

TC Substantiation: Reliable operation of the EPSS is highly dependent on the skill set of those performing maintenance and testing of the EPSS equipment. The revised text and new definition uses the NFPA 70 definition of qualified person as the basis for establishing a requirement and definition for those who perform the routine inspection, maintenance, and testing of EPSS equipment.

Minor public proposals Not reviewed in this presentation

- Log #45, #46, #47, #48 – controls & alarms proposals, all rejected
- Log #19, #6, #10, #31, #CP2 – references
- Log #32, #CP4 – reorganization for clarity
- Log #2, #21, #22, #23, #44, #CP12 – clarifications
- Log #13 – unclear proposal, rejected
- Log #33, #40 – minor wording
- Log #50 – prototype testing language

NFPA 111 proposals

- Public proposals
 - SEPSS not allowed in NP rooms (1)
 - Fire protection, mist systems (4)
 - Technology update: rectifier plants (2)
- Committee proposals – just minor
 - Updates to referenced standards

ACCEPT Log #1

No SEPSS in NP room


Add text to read as follows:


7.2.1.1 The location of SEPSS equipment serving Level 1 EPSS loads shall not be installed in the same room with the normal supply equipment, where the supply equipment is rated over 150 volts to ground and equal to or greater than 1000 amperes.

Substantiation: The intent of this paragraph is to bring NFPA 111 in line with the requirements of NFPA 110 with regards to the location of Level 1 EPSS equipment. NFPA 111 currently allows the installation of SEPSS equipment in the same room as normal supply (service) equipment. The term supply equipment was used to clarify that the supply can be a service, feeder or other source.

SEPSS located where supply equipment is rated over 150 volts to ground and equal to or greater than 1000 amperes must meet NFPA 110 paragraph 7.2.2. The intent of NFPA 110 7.2.2 is to locate the equipment where it provides maximum fire protection to the most critical, high energy systems. Life safety should be considered no matter the energy source, and this includes SEPSS equipment.

TC Statement: The committee notes that their action on Section 1.1.4.1(6) in the 2010 edition of NFPA 111 clearly excludes UPSs that are powered through an EPSS. This action only applies to SEPSSs covered within the scope of the NFPA 111.

	<u>REJECT</u> Water mist fire protection Log #2, #3, #4, #5
<p>Add text to read as follows:</p> <p>7.4.2 Where SEPSS equipment rooms or separate buildings are equipped with fire suppression, one of the following systems that is compatible with the battery or other electrochemical type shall be used:</p> <ul style="list-style-type: none">(1) Clean Agent gaseous systems(2) Pre-action Systems per NFPA 13, Standard For The Installation Of Sprinkler Systems or NFPA 750, Standard On Water Mist Fire Protection Systems(3) Other suppression systems approved by the AHJ <p><u>Substantiation:</u> With this reference to pre-action systems in line item #2, there should be a referral to an NFPA document/standard to draw design and installation guidance from. Because NFPA 13 and 750 are standards defining the requirements for fire suppression and pre-action systems, they should be referenced. Water Mist has been approved and installed in a wide range of fire suppression applications globally so NFPA 750 Standard on Water Mist Fire Protection Systems should be included.</p> <p><u>TC Statement:</u> There are preaction-type suppression systems other than wet. The recommendation implies that only wet-type systems are acceptable.</p>	

	ACCEPT Rectifier plants Log #6
<p>Revise text to read as follows:</p> <p>3.3.5.1 Stored Emergency Power Supply System (SEPSS) A system consisting of a UPS, a rectifier plant, or a motor generator, powered by a stored electrical energy source, together with a transfer switch designed to monitor preferred and alternate load power source and provide desired switching of the load, and all necessary control equipment to make the system functional.</p> <p><u>Substantiation:</u> Rectifier plants have been the standard for the telecommunications industry for about a century. Several efforts are, now under way to develop standard for distribution of dc power throughout commercial buildings and in information technology and communications equipment (ICTE) spaces. Such standards are expected to be in place by 2011-2012 and products will be commercially available by 2013. A rectifier plants can be a primary Emergency Power Supply System (EPSS) if provided with stored energy appropriate to the class; or it can be a bridging system.</p>	

APRRectifier plants
Log #7

Add new text to read as follows:

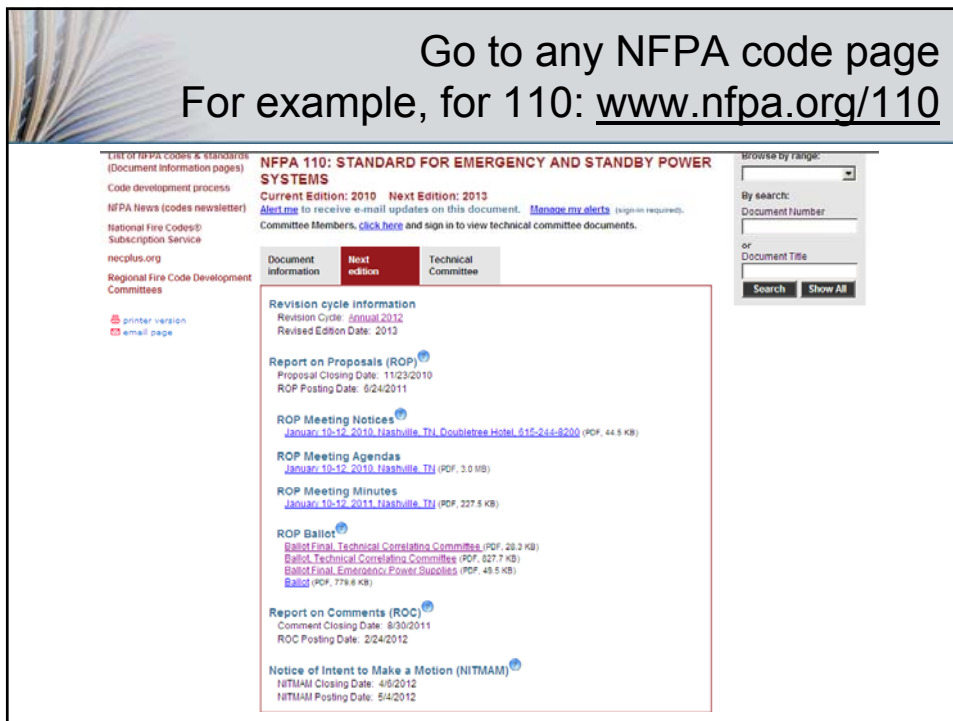
5.2.1.1 The following electrochemical bridging systems shall be permitted:

- (1) Solid state (static) UPS systems
- (2) Ultracapacitor systems
- (3) **Solid state (static) rectifier plants capable of providing continuous dc power to the load(s) without interruption or disturbance upon loss of the primary input source.**

Substantiation: Rectifier plants have been the standard for the telecommunications industry for about a century. Several efforts are now under way to develop standards for **distribution of dc power** throughout commercial buildings and in information technology and communications equipment (ICTE) spaces. Such standards are expected to be in place by 2011-2012 and dc products will be commercially available by 2013. A rectifier plant can be a primary Emergency Power Supply System (EPSS) if provided with stored energy appropriate to the class; or it can be a bridging system as proposed here.

Go to any NFPA code page

For example, for 110: www.nfpa.org/110



Thank you. Questions anyone?

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(References follow this slide.)



References

- NFPA 110-2010, Standard for Emergency and Standby Power Systems, Quincy, MA: NFPA, 2010.
- NFPA 111-2010, Standard for Stored Electrical Energy Emergency and Standby Power Systems, Quincy, MA: NFPA, 2010.
- NFPA Codes and Standards pages, www.nfpa.org
- NFPA Regulations Governing Committee Projects
- NFPA Regulations Governing the Development of NFPA Standards
- NFPA 110 page: www.nfpa.org/110
- NFPA 111 page: www.nfpa.org/111