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2019 NYS Healthcare Engineering Conference

Emergency Power and Microgrid Applications

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**Content**

- 99 and 110 changes – Microgrids, Fuel Cells, Education and Maintenance/Record Keeping
- Location of EPOs...Not on Cabinets?
- Fuel Polishing
- Inspection of transfer switches - TJC
- Wireless Annunciators
- NYS and NYC Statues/Laws
- Remote Annunciators
- Monthly Testing of ATS
- NEC 700.3(f)

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**Exercising the Life Safety and Critical Branch ATS**

Recently a question was raised about a mandatory annual exercise of each and all Life Safety and Critical Branch ATSs, to prove a minimum 10 second transfer time from a normal power failure until emergency power was available at the load side of each ATS.

According to NFPA 99, this type of exercise is not required unless, during any monthly/annual test of any one LS or CB ATS, there is a greater than 10-second transfer.

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### Exercising the Life Safety and Critical Branch ATS

NFPA 99, Health Care Facilities Code, 2012 edition, 6.4.4.1.1.2: *The 10-second criterion shall not apply during the monthly testing of an essential electrical system. If the 10-second criterion is not met during the monthly test, a process shall be provided to annually confirm the capability of the life safety and critical branches to comply with 6.4.3.1.*

Be aware that when using an ATS test switch, and while normal power is still available, there can be a delay if an in-phase monitor is active in the ATS you are using to start your monthly test. Personally, I would use another switch.

Lastly, there is software now available which will verify "start wire connections", passively.

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### USA Today – August 26, 2019

*Two years after Hurricane Irma slammed through South Florida, killing scores of people and knocking out power to three-quarters of the state, four nursing home workers are facing aggravated manslaughter and other charges in the deaths of 12 residents felled by the searing heat the storm left behind. Operators of the center failed to evacuate for three days despite a lack of air conditioning that caused temperatures in the building to soar.*

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### In the words of an attorney who has spent many years representing personal injury plaintiffs:

*"I would ask for their protocols and then I would depose everyone I could find looking for examples where the protocols were not followed. Then I'd hire an expert to pick apart their protocols for any deficiencies. I only need one point of failure if I'm the plaintiff's attorney; either bad protocols or failure to follow those protocols are enough.*

*Keep in mind that the equipment manufacturer can also be sued, so inevitably there will be cross-claims between the hospital and the equipment manufacturer. If the hospital's protocols result in a use or maintenance schedule that goes against the manufacturer's recommendations, then that's another point of potential liability."*

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### Unadopted but Published Standards

12 People

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### NFPA 99 and 110 Changes

- Microgrids Approved
  - Fuel Cells Approved
  - Record Keeping Increased
  - Education Emphasized
  - Fuel Polishing Reference
  - Transfer Switch Inspections
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- Al Capone Real Estate – UL and TJC Leases – Protection Rackets

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### Location of EPOs

- CMS has decided EPOs do not belong on the outside of generator cabinets. No reference stated. "CMS's long-standing interpretation is that a manual stop needs to be "remote" from the generator as prescribed by 2010 NFPA 110, 5.6.5.6. As such, to be "remote," a manual stop could not be located on the generator housing."
- NFPA 110, 5.6.5.6 *All installations shall have a remote manual stop station of a type to prevent inadvertent or unintentional operation located outside the room housing the prime mover, where so installed, or elsewhere on the premises where the prime mover is located outside the building.*

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### Location of EPOs – NFPA 110, 2019 edition

- NFPA 110, 5.6.5.6 All installations shall be provided with at least one remote emergency stop switch for each prime mover.
- NFPA 110, 5.6.5.6.1 The remote emergency stop switch shall be located outside the room housing the prime mover or exterior enclosure and shall be permitted to be mounted on the exterior of the enclosure.

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### Fuel Tests and Polishing

- Fuel polishing is required to maintain clean diesel fuel.
- The CMS requires proof of fuel maintenance plans in order to comply with 42 CFR 482(e)(3) as part of their SOC.
- It is not mandatory that a facility own their own fuel polishing equipment.

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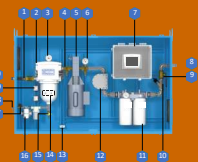
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### CLOSED LOOP FUEL DIALYSIS

FILTER. SEPERATE. CONDITION. REPEAT.



- |                                |                                   |
|--------------------------------|-----------------------------------|
| 1. Fine Filter                 | 12. Inline Conditioner            |
| 2. Inlet Ball Valve            | 13. Leak Detector                 |
| 3. Pre Filter/Water Separator  | 14. Water Level Probes            |
| 4. Vacuum Gauge                | 15. Water Drain Valve             |
| 5. Vacuum Switch               | 16. Auto Water Drain Motor        |
| 6. Pump                        | 17. Auto Water Drain (Optional)   |
| 7. Pressure Switch with Gauge  | 18. Waste Water Outlet (Optional) |
| 8. Smart Filtration Controller | 19. WATECT Water Sensor           |
| 9. Fuel Outlet (Discharge)     | 20. Fuel Inlet (From Tank)        |
| 10. Outlet Ball Valve          |                                   |
| 11. Flow Switch                |                                   |



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**REMOTE MONITORING**  
BUILDING MANAGEMENT SYSTEM (BMS) INTEGRATION

- Communicates via Modbus TCP/IP Protocol
- Shares: System Status & Alarms

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**Inspection of Automatic Transfer Switches**

- Lights and Switch Position only.
- Doors should not be opened unless PPE used – Nothing good can happen by opening an ATS door unprotected.
- Keep Additional Inspection Records – AHJs are asking for them.

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**Test Reports**

- They do not have to be manually recorded.
- Recording equipment does not have to be hard wired. (Only remote annunciation according to NFPA 110, 5.6.5.2 must be hard wired, and that requirement will soon be removed from standards.)
- The report need only record specific data according to manufacturer's manuals, or the optional template at NFPA 110, Figure A.8.4.1 (a).
- Wireless recording is allowed, takes less staff time, always accurate, and when automated...is an invaluable tool for round-the-clock monitoring.

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### Test Reports

- BMS not allowed. NFPA 99, 6.4.1.1.18.7 *A centralized computer system (e.g., building automation system) shall not be permitted to be substituted for the alarm annunciator in 6.4.1.1.18 but shall be permitted to be used to supplement the alarm annunciator.*

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### Wireless Benefits

- Alerts staff anytime generator has been asked to start, including no-load tests and power outages.
- Alerts the proper staff personnel, and the EPSS contractor, and not just with an audible and visual signal. (I can start, and monitor, over 1200 from phone.)
- Records and archives all generator run events, not just compliance testing.(\*)
- (\*) – automatic data collection during power outages may substitute for compliance testing if duration and load percentages meet the minimum standards. (NFPA 110, 8.4.1.1)

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### Monthly Test Report

Time	Engine Hours @Start	Engine Hours @Stop	Runtime Under Load	Oil Pressure	Oil Temp	Coolant Temp	kW	% Load	Phase A Amps	Phase B Amps	Phase C Amps
Name: Engine #1 Nameplate kW: 525 kW 30% kW: 157.5											
02:10 PM	117.4	117.4	1	75.40	132.50	122.20	127.40	20.38%	156.60	155.80	150.00
02:20 PM	117.4	117.5	10	62.10	212.20	181.40	366.40	58.62%	446.00	442.40	443.40
02:30 PM	117.6	117.7	10	60.30	219.40	183.20	369.80	59.01%	451.60	450.60	445.20
02:40 PM	117.7	117.9	10	58.60	218.90	183.20	359.60	57.66%	432.20	432.20	430.00
02:50 PM	117.9	118.0	10	59.20	218.10	181.40	345.30	55.25%	421.00	418.40	410.60
03:00 PM	118.1	118.2	1	0.00	201.30	186.80	0.00	0.00%	0.00	0.00	0.00
Name: Engine #2 Nameplate kW: 525 kW 30% kW: 157.5											
02:10 PM	101.3	101.3	1	71.40	134.50	129.60	128.60	20.58%	159.40	159.80	155.20
02:20 PM	101.3	101.5	10	64.40	208.50	181.40	367.60	58.82%	454.20	440.40	443.00
02:30 PM	101.5	101.7	10	63.80	215.20	181.40	366.10	58.59%	451.20	444.20	444.00
02:40 PM	101.7	101.8	10	62.10	216.40	181.40	359.30	57.01%	438.40	428.00	427.60
02:50 PM	101.8	102.0	10	62.70	215.90	181.40	342.90	54.86%	423.20	416.20	415.60
03:00 PM	102.0	102.1	2	0.00	199.50	183.20	0.00	0.00%	0.00	0.00	0.00
Name: Engine #3 Nameplate kW: 525 kW 30% kW: 157.5											
02:10 PM	112.4	112.4	1	77.20	134.50	129.20	127.70	20.43%	155.40	153.80	160.80
02:20 PM	112.4	112.6	10	62.70	209.90	181.40	367.60	58.82%	442.60	443.80	436.80
02:30 PM	112.6	112.7	10	59.80	217.40	183.20	367.90	58.86%	448.20	447.40	460.40
02:40 PM	112.8	112.9	10	59.80	217.80	183.20	354.20	56.57%	433.00	429.60	443.40
02:50 PM	112.9	113.1	10	60.30	217.60	181.40	345.30	55.25%	415.60	415.60	427.20
03:00 PM	113.1	113.2	1	0.00	202.30	186.80	0.00	0.00%	0.00	0.00	0.00

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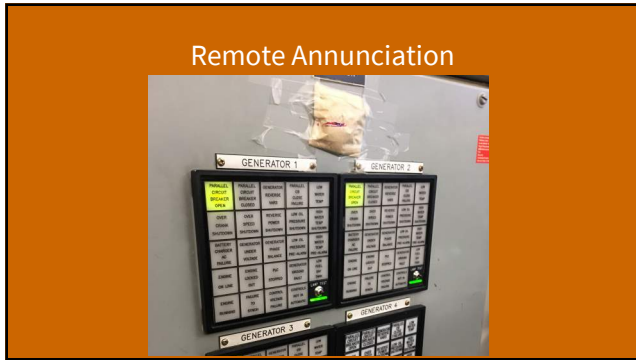
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**NYC and NY State Emissions Issues**

AO8429 (State) - On July 18, Gov. Andrew Cuomo signed the Climate Leadership and Community Protection Act, which calls for the state to derive 100% of electric power from renewable sources by 2040 and to eliminate or offset all greenhouse gas emissions by 2050.

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**NYC and NY State Emissions Issues**

LL 97 (NYC Only) - Impacts over 57,000 buildings across the city with the goal of reducing building-based emissions 40% by 2030 from a 2005 baseline. To comply, building owners must submit an emissions intensity report stamped by a registered design professional every year starting in 2025 or pay substantial fines.

Owners of nonprofit hospitals and healthcare facilities have the option to apply for a percent reduction requirement rather than a cap. If they apply by July 2021, they are required to reduce carbon emissions 15 percent below 2018 levels for 2024-2029, and 30 percent below 2018 levels for 2030-2034.

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### Microgrids - Latitude in Design and Retrofitting

- Economics
- 3<sup>rd</sup> Party Ownership
- Resiliency
- Redundancy
- Reliability
- Sustainability
- Formula determining if you are a prospect
- Who to select – MEP firm

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### Fuel Cells

Are allowed to be a part of the EPSS...if, paralleled with another acceptable source of power that can be on-line from a black start in 10 seconds.

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### Life Safety and Critical Branch Electrical Panels- Mixed Circuits?

- Life Safety Branch Panels- do you have circuits feeding equipment not allowed to be on the Life Safety Branch or Critical as described in NFPA 99 (2012) Chapter 6 Electrical Systems?
- Does the main Fire Alarm circuit (identified in RED per EC.02.05.01 EP 9 Note # 2 ) share the same circuit with other equipment?
- Are the Life Safety and Critical Branch electrical panel legends up to date?
- Any installed breaker in a electrical panel must identify what the circuit serves or be labeled as a "spare".

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### Life Safety Branch Allowed Circuits Per NFPA 99 (2012) Chapter 6 Electrical Systems

- 6.4.2.2.3.2 The life safety branch shall supply power for lighting, receptacles, and equipment as follows:
- (1) Illumination of means of egress in accordance with NFPA 101, Life Safety Code
  - (2) Exit signs and exit directional signs in accordance with NFPA 101, Life Safety Code
  - (3) Hospital communications systems, where used for issuing instruction during emergency conditions
  - (4) Generator set location as follows:
    - (a) Task illumination
    - (b) Battery charger for emergency battery-powered lighting units
    - (c) Select receptacles at the generator set location and essential electrical system transfer switch locations
  - (5) Elevator cab lighting, control, communications, and signal systems
  - (6) Electrically powered doors used for building egress
  - (7) Fire alarms and auxiliary functions of fire alarm combination systems complying with NFPA 72, National Fire Alarm and Signaling Code

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### Critical Branch Allowed Circuits Per NFPA 99 (2012) Chapter 6 Electrical Systems

- 6.4.2.2.4.2 The critical branch shall supply power for task illumination, fixed equipment, select receptacles, and select power circuits serving the following areas and functions related to patient care:
- (1) Critical care areas that utilize anesthetizing gases, task illumination, select receptacles, and fixed equipment
  - (2) Isolated power systems in special environments
  - (3) Task illumination and select receptacles in the following:
    - (a) Patient care rooms, including infant nurseries, selected acute nursing areas, psychiatric bed areas (omit receptacles), and ward treatment rooms
    - (b) Medication preparation areas
    - (c) Pharmacy dispensing areas
    - (d) Nurses' stations (unless adequately lighted by corridor luminaires)
    - (4) Additional specialized patient care task illumination and receptacles, where needed
    - (5) Nurse call systems
    - (6) Blood, bone, and tissue banks
    - (7) Telephone equipment rooms and closets

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### Critical Branch Allowed Circuits Per NFPA 99 (2012) Chapter 6 Electrical Systems Cont'd

- (8) Task illumination, select receptacles, and select power circuits for the following areas:
  - (a) General care beds with at least one duplex receptacle per patient bedroom, and task illumination as required by the governing body of the health care facility
  - (b) Angiographic labs
  - (c) Cardiac catheterization labs
  - (d) Coronary care units
  - (e) Hemodialysis rooms or areas
  - (f) Emergency room treatment areas (select)
  - (g) Human physiology labs
  - (h) Intensive care units
  - (i) Postoperative recovery rooms (select)
- (9) Additional task illumination, receptacles, and select power circuits needed for effective facility operation, including single-phase fractional horsepower motors, which are permitted to be connected to the critical branch

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## Separation of Systems?

### Separation of Systems

According to Section 700.10 (B) and Article 517 Part III of the *NEC*, emergency loads must be kept entirely independent of other wiring and equipment. Article 517, as it is currently enforced, was introduced in the 1971 edition of the *NEC*. Before that, the accepted practice was to commingle the emergency system with other branches of power. Today, in facilities where essential electrical systems are 150kVA or less, loads may be combined but they must be separated from the normal power source unless they meet the criteria of the *NEC* exceptions. Many older hospitals still have "E" power and have not completely separated their system to meet current code requirements.

The intent of this separation requirement is to assure emergency systems can maintain power in the event of a utility outage or fault by another branch of power. There are many interpretations of how this requirement should be implemented for both new construction and remodeling or upgrade projects. Thus, it is always prudent to discuss the installation and design intent with the authority having jurisdiction (AHJ) before proceeding with any system modification.

IEEE Paragraph

Evaluating Electrical Distribution Equipment to Determine Replacement Needs

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