Content Community Connection

United States
The Electricity Forum Inc.
742 Pre Emption Road
Geneva, NY 14456
Tel 289-387-1025

Canada
The Electricity Forum
1885 Clements Rd, Unit 218
Pickering, ON L1W3V4
Tel 905-686-1040
Fax 905-686-1078
Toll Free 855-824-6131

NFPA 110: Standard for Emergency and Standby Power Systems - Generator Training

View Course Details

COURSE DATES AND TIMES

November 30-1 December,2026

10:00 am - 4:30 pm ET

Why Take This NFPA 110 Training Course?

Modern infrastructure — hospitals, data centers, industrial facilities, and commercial buildings — often cannot tolerate power outages. Standby generators provide that redundancy, and for facilities with Level 1 or Level 2 life-safety loads, NFPA 110 and local building codes make it a legal requirement, not an option.

This course walks through how emergency standby power, prime power, and grid-connected or micro-grid systems are designed, installed, and maintained in accordance with NFPA 110, alongside supporting guidance from EGSA, IEEE, NFPA 70B, NECA, and NETA. You'll learn to read vendor drawings, size and specify generators, manage parallel sources and load-sharing, and build a compliant testing and maintenance program — not just the theory, but the practical requirements an inspector or facility compliance officer will actually check.

NFPA 110 Generator Requirements

NFPA 110 classifies emergency power supply systems by three criteria, and understanding them is the starting point for any compliant design:

- **Level** — Level 1 systems serve loads where failure could mean loss of life or serious injury (hospitals, life-safety systems); Level 2 covers less critical, legally required standby loads.

- **Class** — the minimum number of hours the system must run on its own power source before refueling or recharging.
- **Type** — how quickly the system must restore power after a utility failure (Type 10 systems, used in healthcare, must restore power within 10 seconds).

This course covers how these classifications drive real design decisions: fuel storage sizing, transfer switch selection, generator set specification, and how Level 1 and Level 2 systems differ in practice despite sharing much of the same equipment.

NFPA 110 Generator Testing Requirements

An EPSS is only compliant if it's tested the way NFPA 110 requires — and this is where many facilities fall short. The course covers the full inspection, testing, and maintenance (ITM) cycle:

- Monthly testing — exercising the entire EPSS under load, not just running the generator, performed by qualified personnel
- 36-month (triennial) testing — the comprehensive system test required for Level 1 installations
- Acceptance testing — required whenever a new EPSS is installed or significantly modified
- Troubleshooting using a logical, systematic approach to isolate and repair generator, transfer switch, and control problems
- Documentation practices that hold up under inspection or audit

Course Overview

Specific requirements and recommendations for the installation, operation, and maintenance of backup power generation equipment, with guidance on where to find authoritative information from EGSA, IEEE, NFPA, NECA, and NETA.

- How to read and understand vendor drawings and technical information for generators
- How generators operate, and the EPSS components that support them
- Supporting electrical equipment: transfer switches, switchgear, emergency power distribution
- Auxiliary generator equipment: fuel tanks, silencers, ventilation, control equipment, gas detection
- Working with parallel energy sources: synchronizing procedures and load sharing
- Generator energy management and heat recovery applications

Learning Outcomes

- Understand NFPA 110's Level, Class, and Type classifications and how they apply to your facility
- Understand how generators operate and the auxiliary equipment required to support them
- Understand how generators integrate within an entire electrical distribution system

- Learn the different types of generators — emergency standby, prime power, and continuous power — and which NFPA 110 requirements apply to each
- Learn how to size and specify generators
- Gain the background needed to operate, maintain, and test generator sets under NFPA 110's ITM requirements — critical for data centers, hospitals, banks, airports, water treatment facilities, manufacturing plants, schools, stadiums, and commercial buildings
- Learn about thermal applications of power generators, such as cogeneration and combined-cycle operation
- Build the knowledge foundation recommended before attempting EGSA Apprentice or Journeyman certification

WHO SHOULD ATTEND

This Emergency Generator Training course is ideal for professionals responsible for on-site emergency power systems or working in facilities where uninterrupted power is critical. Anyone with an interest in emergency or standby generators will benefit.

This course is well-suited for:

- Electrical engineers and consulting engineers
- Electrical maintenance technicians, supervisors, and managers
- Plant, facility, and building engineers
- Plant and facility managers and superintendents
- Electricians and mechanics
- Stationary engineers
- Emergency preparedness and compliance personnel
- Healthcare and data center facilities staff responsible for EPSS compliance
- Technicians preparing for EGSA Apprentice or Journeyman certification
- Anyone seeking a practical, standards-based introduction to emergency and standby power generation systems

STUDENTS RECEIVE

- NFPA 110 Training Course Certificate
- 1.2 Continuing Education Unit (CEU) Credits (12 Professional Development Hours)
- Preparatory knowledge aligned with EGSA Certification exam topics
- 100-Page Generator UPS Handbook (Value $20)
- A FREE Magazine Subscription (Value $25)
- $100 Coupon Toward Any Future Electricity Forum Event (Restrictions Apply)
- Course Materials in PDF Format

COURSE OUTLINE

NFPA 110: Standard for Emergency and Standby Power Systems - Generator Training

DAY ONE

1. Introduction To Generators

- Introduction to generators
- Purpose of electric generators
- Application of electric generators, i.e. power plants, microgrids, prime power, off-grid, standby and backup power
- Standby vs Prime Power vs Continuous-rated generators
- Generator Drivers (Gas Reciprocating Engine, Gas Turbine, Steam Generation, Hydro)
- Renewable generation

2. Generator Basic Electrical Fundamentals

- Electrical fundamentals
- How electricity is produced and controlled in generators and batteries
- Understanding single-phase and three-phase generator wiring configurations
- Understanding Generator Nameplate Data

3. Generator Types and Construction

- Stator
- Mechanical Components
- Wye Configuration
- Delta Configuration
- Types of Rotors
- Salient Pole
- Cylindrical Pole
- Types of Bearings and Lubrication Systems
- Sinusoidal Voltage Output
- Motor vs Generator Comparison
- Three-phase Generators
- Components
- Operation

4. Generator and Engine Controls

- Paralleling and Non-Paralleling Governor Control
- Purposes of Generator Excitation
- Power to the Rotating Electromagnetic Field
- Locking Rotor to Stator
- Means of Regulating Voltage
- Types of Generator Excitation
- DC Exciters
- Static Excitation
- Brushless Excitation

- Concept of Response Time vs Voltage Levels
- Voltage regulator function
- Voltage regulator components
- Voltage regulator operation
- Reactive Power Control for Parallel Operations
- Auxiliary regulator functions
- Voltage regulator troubleshooting
- On-site Generator Controls, including PLCs and SCADA Systems

5. Generator Auxiliary Power Requirements

- Pre/Post Lube Pumps
- Starter Motors
- Battery Chargers
- Cooling Fans

6. Generator Emissions

- Government requirements
- Specifying generators
- Emission Controls

7. Auxiliary Systems and NFPA 110 Testing Requirements

- Fuel Systems and Fuel Tanks
- Cooling and Exhaust Systems
- Vibration and Sound Attenuation
- Engine Starting Systems and Load Banks
- NFPA 110 Monthly Testing Requirements (exercising the EPSS under load)
- NFPA 110 36-Month Comprehensive (Triennial) Testing Requirements
- NFPA 110 Acceptance Testing for New or Modified EPSS
- Testing and Maintenance Documentation Requirements

8. Generator Protection

- Short circuit protection
- Ground fault protection
- Overload protection
- Thermal protection
- Overspeed protection
- Low field excitation or loss of field excitation protection
- Generator motoring protection
- Protection against unbalanced faults
- Overexcitation protection
- Reverse Power Protection
- Volts Per Herts Protection
- Synch-Check

- Over/Under Voltage Protection
- Over/Under Frequency Protection
- Differential Protection
- Rate Of Change of Frequency Protection

9. Generator Grounding

- Why do generators require grounding?
- Neutral Grounding Resistors
- Standby generator grounding vs parallel generator grounding
- Considerations for parallel generator grounding

10. NFPA 110 Classifications and Generator Applications

- NFPA 110 Level 1 and Level 2 Emergency Power Supply Systems (EPSS)
- NFPA 110 Class: Minimum Run-Time Requirements
- NFPA 110 Type: Power Restoration Time (including Type 10 for healthcare facilities)
- Legally Required Standby Systems
- Optional Standby Systems
- Applicable Codes and Standards (NFPA 110, NFPA 70, NFPA 99, EGSA, IEEE)

DAY TWO

11. Generator Loading And Control

- Effects of various types of loads on generator control: lighting, motors, UPS Systems
- Parallel operation
- Protection and transfer of power

12. The Gas, Natural Gas And Diesel Engines As Prime Movers

- Prime mover types and fuel considerations
- Mechanical systems operation: fuel, intake air, lube oil, cooling, governors
- Typical manufacturers, ratings and operation of diesel generator sets.
- Diesel vs Gas generators.

13. Transfer Switch Equipment

- Types and applications of transfer switch equipment
- The Automatic Transfer Switch (ATS)
- Loss of utility power scenarios
- Load shedding operations
- Bypass operation

- Protection considerations
- Transfer switch equipment maintenance: Safer
- Utility re-transfer scenarios
- Open vs closed transition switches

14 Emergency and Standby Generator Architecture

- Manual Transfer Switch
- Auto Transfer Switch
- Main-Tie-Main architecture
- Micro-grid
- Generator Paralleling Switchgear Application
- Parallel Operation of Generators

15. Generator Transients and Operation

- Starting a generator
- Transferring load
- Motor Starting
- Load pickup
- Load Rejection
- Harmonics and Generators
- Generator Sizing

16. Emergency Busses

- What is an emergency bus?
- What loads are typically placed on an emergency bus?
- Power transfer to an emergency bus
- Re-transferring to the utility

17. Troubleshooting And Maintenance Of Standby Generators

- NFPA 110-Aligned Maintenance Practices (cross-referenced with IEEE, NETA, EGSA)
- Developing a Logical Systematic Approach to Troubleshooting
- Common Generator Problems
- Electrical Testing of Generators
- Starting Battery Maintenance
- Troubleshooting Frequency Control Problems
- Troubleshooting Voltage Control Problems
- Troubleshooting Grounding Problems

18. Basic Generator Installation Requirements

- Marking requirements
- Overcurrent protection
- Selecting and sizing Cables and Conductors for generator output
- Protecting live parts
- Loads supplied – practical applications

19. Review Of Safety Issues With Emergency And Standby Power Generation

- The importance of code and standard requirements
- The three hazards to protect against
- Selection of Personal Protective Equipment (PPE) for work on Standby Power Systems
- Safe work practices to follow Safer

20. Generator Synchronization

- What is synchronization
- Why is synchronization required
- How to synchronize
- Scenarios where generator synchronization may be required
- Synchronization switchgear and equipment
- Droop vs Isochronous Operation

21. Generator Thermal Applications

- Reciprocating engines vs gas turbines
- Combined Heat and Power
- Co-Generation
- Heat Recovery and Steam Generation
- Combined Cycle Power Generation

22. On-Grid Generator Applications

- Synchronizing to the grid
- Parallel operation with a utility
- Exporting power
- Types of export power applications

COURSE SCHEDULE:

Both days:

Start: 10 a.m. Eastern Time
Finish: 4:30 p.m. Eastern Time

Contact us Today for a FREE quotation to deliver this course at your company’s location.

Request Quote