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FEDERAL AVIATION ADMINISTRATION

ORDER
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Air Traffic Organization Policy

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SUBJ: Electrical Power Policy

The basic mission of the Federal Aviation Administration (FAA) is to provide the safest, most efficient aerospace system in the world. Power Services Group, AJW-22, is responsible for providing electrical power of a quality, reliability, maintainability, and availability that fully supports the operational requirements of the National Airspace System (NAS). Well-designed systems are a necessity, not a luxury.

Public utility companies provide the primary source of electrical power for NAS facilities. During utility power failures and outages, FAA backup power systems provide some combination of conditioned, continuous, and standby electrical power to NAS facilities. This policy discusses the actions needed to ensure the quality and quantity of power to achieve the FAA Strategic Goals of enhanced safety, security, and system efficiency for the NAS.

A handwritten signature in cursive script that reads "Teri L. Bristol".

Teri L. Bristol
Chief Operating Officer
Air Traffic Organization

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Chapter 1. General Information

1-1. Purpose of This Order. This order establishes policies, provides implementation guidelines, defines electrical power service categories, and assigns responsibilities for power systems supporting the National Airspace System (NAS).

NAS facilities must have reliable and economical electrical power sources to provide safe, secure, and efficient air traffic control. The primary and backup systems must provide power reliability and availability commensurate with functional and operational requirements.

1-2. Audience. This order is for all FAA employees who are involved in power systems design, installation, and operation. This includes Service Areas, Engineering Services, Environmental Support Unit Personnel, engineers and managers who review and/or approve designs including those from non-FAA engineering entities.

1-3. Where I Can Find This Order. You can find an electronic copy of this order on the Directives Management System (DMS) website https://employees.faa.gov/tools_resources/orders_notices/, or go to the MyFAA Employee website, select 'Tools and Resources', then select 'Orders and Notices'.

This order may also be found on the Power Services Group / Orders, Standards and Specifications webpage -

https://employees.faa.gov/org/linebusiness/ato/operations/technical_operations/atc_facilities/power_services/sys_eng_team/stand_specs/

1-4. Cancellation. This order cancels Order 6030.20F, dated November 4, 2004, including Change 1 dated April 13, 2012.

1-5. Explanation of Policy Change. This revision incorporates various editorial changes, clarifications, and incorporates Change 1 of the previous revision.

Electrical power service categories or electrical power buses have been redefined in this revision. Power buses are now defined and described by their chief characteristics. Previous revisions of this order have defined and described these power buses in terms of the NAS service they support.

Chapter 2. Roles and Responsibilities

2-1. Technical Operations Services (AJW-0).

- a. Establishes subordinate policies, directives, standards, specifications, and maintenance orders ensuring uniform policy application.
- b. Designs, procures, installs, operates, and maintains NAS facility power systems.
- c. Reviews and approves proposed Air Traffic Control systems being introduced into the NAS via the NAS Change Proposal (NCP) process to assure compatibility with current equipment and the existing power systems.
- d. Provides, through Service Areas, all necessary field and technical support for recommending modifications and power sources, or combinations, based on knowledge of local conditions and facility performance requirements, quality of power sources available, and changing facility conditions.

2-2. Air Traffic Services (AJT).

- a. Identifies and coordinates air traffic operational requirements with all services or offices affected by this order.
- b. Identifies requirements for power system requirements for all facilities in their lines of business.

2-3. Airports (ARP). Issues guidelines to ensure implementation of their policy for facilities funded under the Airport Improvement Program

2-4. Safety and Technical Training (AJI). Determines the need for and type of training on related equipment.

2-5. Flight Program Operations (AJF). Coordinates flight operation requirements with other services and offices affected by this order.

2-6. FAA Logistics Center (AML). Provides support for managing the nationwide tracking, distribution, relocation, transportation, engineering, and repair services for NAS power system equipment, components, and supplies.

2-7. Real Estate and Utilities group (AFN/ALO). Contracts utility services for all NAS facilities with the local provider, and coordinate cost sharing agreements with collocated governmental agencies.

Chapter 3. Electrical Power Policy

3-1. General Guidance. When designing, installing, maintaining, inspecting, reviewing, interfacing, or otherwise working with an electrical power system in the FAA and/or NAS, the following are to be considered.

a. Environmental. The following documents provide the minimum guidance for environmental requirements.

- (1) Executive Order 13693, Planning for Federal Sustainability in the Next Decade
- (2) 40 CFR, Environmental Protection Agency (EPA)
- (3) National Environmental Policy Act (NEPA)
- (4) Applicable state and local environmental laws and regulations
- (5) Department of Transportation environmental directives
- (6) FAA environmental directives

b. Energy Efficiency. The following documents provide the minimum guidance for energy requirements. Renewable energy sources must be considered and used when cost-effective and when such sources present an acceptably low amount of risk to the NAS.

- (1) Executive Order 13693 Planning for Federal Sustainability in the Next Decade
- (2) Energy Independence and Security Act of 2007
- (3) Energy Policy Act of 2005
- (4) National Energy Conservation Policy Act of 1978 (Fully Amended)
- (5) FAA Order 1053.1, Energy and Water Management Program for FAA Buildings and Facilities

c. Security. The following documents provide the minimum guidance for security requirements.

- (1) FAA Order 1600.6, Facility Security Policy, in the design and operation of NAS Power Systems
- (2) FAA Order 1600.1, Personnel Security Program
- (3) FAA Order 1370.82, Information Systems Security Program
- (4) FAA STD 026, Software Development for the National Airway Facilities, for software that provides a control function for FAA Power Systems
- (5) FAA Order 1600.72, Contractor and Industrial Security Program

d. Safety. Design, install, operate, and maintain electrical power systems to provide a safe and hazard-free work environment. Train facility personnel in safety practices and guidelines. Design power systems to comply with FAA Orders and Standards, Occupational Safety and Health Administration regulations, and document versions referenced in Appendix B.

e. Cost-Effective. Cost-effectiveness can be achieved by specifying accurate reliability and availability requirements, and selecting designs and equipment with respect to both the initial and life cycle costs. Under-specifying requirements will result in poor equipment performance.

Over-specifying requirements will result in excessive life-cycle costs with no appreciable benefit to the NAS.

3-2. Compliance with Codes and Standards. FAA, Air Traffic Organization, Technical Operations Services is responsible for managing policy, requirements, engineering, integration and implementation support, maintenance support, and related activities of the NAS infrastructure, which includes FAA facilities that provide indirect support to the NAS, such as the William J. Hughes Technical Center and Mike Monroney Aeronautical Center.

Power systems design, installation, and operation shall meet or exceed the requirements of the documents listed in Appendix B. Other FAA Power Services Group documents may also be applicable. The editions of the codes and standards listed in Appendix B are those adopted by the FAA for use within the FAA.

3-3. Continuous Power Airports (CPA). In response to a massive northeast United States power failure, FAA instituted a program to install standby engine generators to maintain NAS services at 50 airports in the contiguous United States. The 50 airports were selected based on their activity and location. The engine generators installed would be capable of powering a control tower, airport surveillance radar, approach-light system, instrument landing system, and runway lights on the primary runway.

The duration of CPA runway operations depends on the distance between CPAs, airport activity, cost/benefit/risk analysis, and local response capability. A minimum duration of four (4) hours is recommended. An engine generator is the typical solution, but not the required solution for the various CPA systems.

Appendix A maintains the NAS approved list of designated CPA airports and runways. Changes to a CPA runway designation must be coordinated among the District Office (DO), Air Traffic Manager (Operations), and the Airport Authority (Airport Manager), and must be approved using the NCP process. A NCP will ensure a current, reliable master list for all approved designated Continuous Power Airports and runways. The DO is responsible for the proper notifications, listing the new runway, change date, and the complete required coordination.

3-4. Classification of FAA Standby Power Systems. Standby power systems provide electrical power to various loads. Systems essential for life safety are logically considered more important than systems that preserve comforts of life. Accordingly, FAA and NAS systems can be considered Emergency, Legally Required, and Optional. These terms derive from the National Fire Protection Association (NFPA), NFPA® 70 National Electrical Code® (NEC). Each of these classifications can have differing maintenance requirements.

This order introduces two terms. Fire/Life Safety Standby Power Systems (FLS-SPS), and NAS Standby Power Systems (NAS-SPS).

General guidance in determining whether a standby power system is FLS-SPS, NAS-SPS Legally Required, or NAS-SPS Optional is provided below. Classifying a NAS-SPS as Optional allows a reduction in maintenance activity which may be beneficial to the FAA resources. Establishing a NAS-SPS as Optional will be done by a NCP coordinated with the Systems Support Center manager, Air Traffic and affected stakeholders.

a. Emergency Systems. FAA standby power systems that provide required standby power to Fire/Life Safety systems, such as building emergency illumination, ventilation, and emergency

needs, are FLS-SPS and are considered Emergency Standby Systems as described by the NEC Article 700, Emergency Systems.

b. Legally Required Standby Systems. FAA standby power systems that provide power to NAS systems and equipment to maintain NAS Safety- and Efficiency Critical operations are NAS-SPS, and are considered Legally Required Standby Systems as described by the NEC, Article 701. Fixtures providing emergency standby illumination may be connected to the NAS-SPS without impacting the standby power system classification provided such fixtures meet the requirements of Unit Equipment as described by the NEC.

FAA standby power systems, used by NAS systems and equipment to meet International Civil Aviation Organization (ICAO) Instrument Flight Rules Category II and Category III operation rules, are NAS-SPS and are considered to be Legally-Required Standby Systems as described by the NEC Article 701 Legally Required Standby Systems.

FAA standby power systems that support Continuous Power Airport operations are NAS-SPS and are considered to be Legally-Required Standby Systems as described by the NEC Article 701. Specific system operational details relating to transfer time and operating time, i.e. Class and Type as stated in NFPA[®] 110 Standard for Emergency and Standby Power Systems, are addressed in Order 6950.2, Electrical Power Policy Implementation at National Airspace System Facilities.

Standby Power Systems supporting staffed facilities are generally Legally Required.

c. Optional Standby Systems. FAA standby power systems that provide power exclusively to NAS systems and equipment to maintain NAS Essential and Routine operations are NAS-SPS, and are considered Optional Systems as described by the NEC, Article 702. Fixtures providing emergency standby illumination may be connected to the NAS-SPS without impacting the standby power system classification provided such fixtures meet the requirements of Unit Equipment as described by the NEC.

Standby Power Systems supporting unstaffed facilities may be considered Optional.

3-5. Site Support Agreements. Prior to connection of any equipment not owned and/or maintained by the FAA, local Service Area management will document via a Memorandum of Agreement (MOA) between the FAA and any outside governmental agency. The MOA will document terms to include no less than: 1) site access and availability, 2) utility cost sharing, and 3) service provisions, e.g., additional E/G capacity. The MOA will be signed by the District Manager.

No equipment owned, operated, and/or maintained by an outside governmental agency may be connected to an FAA power bus without a signed MOA. Equipment, owned, operated, and/or maintained by an outside governmental agency, that does not meet the power quality requirements of Order 6950.2 will not be permitted to be connected to an FAA power bus that supports FAA equipment.

Chapter 4. Categories of Electrical Power Service

4-1. Overview. Historically, the FAA defined the electrical power buses with Uninterruptible Power Supply (UPS) units as Critical and Conditioned. The Critical bus was used for equipment providing critical air traffic control services. All other equipment was connected to the Conditioned bus. Effectively, the characteristics of these two buses were the same, creating confusion in practice.

Furthermore, electrical power buses were typically associated with the Air Traffic service they provided, e.g., Critical bus for Critical services. However, technology advances increased the need for continuous, conditioned power (as provided by the Critical bus) for equipment providing Essential and Advisory services. As such, more and more Essential and Advisory equipment needed access to the Critical bus, which led to confusion.

Therefore, this order is adopting FAA common vernacular designations for Critical, Essential and Non-Essential buses, and adopting chief values that are verifiable and repeatable. These bus definitions are independent of the Air Traffic service definitions. Equipment identified by program offices as requiring (i.e., continuous and conditioned) power may be connected to the Critical bus once it has demonstrated that the equipment complies with the requirements of Order 6950.2 concerning connection of equipment to NAS power systems. This interconnection will not be related to the equipment's AT service designation. As such, all equipment identified by program offices as requiring Critical (i.e., continuous and conditioned) power may be connected to the Critical bus once it has been demonstrated that the equipment introduces no negative power quality effects to the bus and meets/exceeds applicable orders and standards listed in Appendix B.

The purpose of the power service or bus is to provide power with the quality, reliability, and availability needed to allow the connected NAS Systems to meet their own functional and operational requirements. Accordingly, it is important for the NAS Program Offices to know what power quality their systems and equipment need, and to know what facility power quality is available.

4-2. Power Bus Descriptions. Power buses at FAA facilities are defined in terms of their chief characteristics and performance. Not every bus listed will be found at every FAA facility.

The bus names identified for FAA facilities are:

- a. Fire/Life Safety
- b. Critical
- c. DC (direct current)
- d. Essential
- e. Non-Essential

The Fire/Life Safety Bus, where it exists, provides unconditioned alternating-current prime and standby power to approved Fire/Life Safety systems, sub-systems, and equipment.

The Critical Bus provides conditioned, uninterruptible alternating-current prime and standby power to:

- a. Approved NAS systems, sub-systems, and equipment

- b. Approved non-NAS FAA sensitive electronic processing equipment
- c. Approved non-FAA systems, sub-systems, and equipment with Site Support Agreements/Memorandum of Agreement (MOA) between the FAA and outside governmental agency.

The DC Bus provides conditioned, uninterruptible direct-current prime and standby power to:

- a. Approved NAS systems, sub-systems, and equipment
- b. Approved non-NAS FAA sensitive electronic processing equipment
- c. Approved non-FAA systems, sub-systems, and equipment with Site Support Agreements/MOA between the FAA and outside governmental agency.

The Essential Bus provides unconditioned alternating-current prime and standby power to:

- a. Approved FAA systems, sub-systems, and equipment
- b. Approved non-FAA systems, sub-systems, and equipment with Site Support Agreements/MOA between the FAA and outside governmental agency.

The Non-Essential Bus provides unconditioned alternating-current prime and standby power to:

- a. FAA systems, sub-systems, and equipment
- b. Non-FAA systems, sub-systems, and equipment with Site Support Agreements/MOA between the FAA and outside governmental agency.

Table 1, below, describes the general performance characteristics of each power bus.

Table 1. Power Bus Chief Characteristics

Characteristic	Fire / Life Safety	Critical	DC	Essential	Non-Essential
Power Conditioning Capability	No	Yes	Yes	No	No
Standby Power Source	Engine-Generator	Battery; Engine-Generator	Battery	Engine-Generator	None
Typical Minimum Availability †	0.9998	0.999998	0.999998	0.9998	0.998
Typical Mean Time Between Failure (MTBF) † (hours)	5,000	50,000	50,000	5,000	500

† Data derived from the following NAS documents: System Requirements Specifications, NAS SR-1000; Requirements Document, NAS-RD-2013; and Reliability, Maintainability, and Availability (RMA) Handbook, FAA RMA-HDBK-006C V1.1

4-3. Power Systems Topologies. NAS service, system, and equipment requirements dictate the needed power. There are many possible power system topologies available that can provide a particular power bus, and some topologies may be able to supply multiple power buses. For example, a common topology located at En Route facilities is the Air Route Traffic Control Center Critical and Essential Power System (ACEPS). ACEPS provides Critical, Essential, and Non-Essential power. Critical Power Distribution System Type systems also provide Critical, Essential, and Non-Essential power. A particular NAS system that has a requirement for Critical Power may properly be connected to either of these topologies, or any other topology that provides the required power. It is not the purpose of this order to direct which available solution is the most cost-effective, or the one to be used. The topology selected depends on issues related to Reliability, Maintainability, Availability, Life-cycle Cost, and other factors as appropriate.

Specific power system topologies are assigned by the Power Services Group, and are addressed in Order 6950.2.

Chapter 5. Administrative Information

5-1. Distribution. This order will be distributed electronically.

5-2. Background. Public utility companies provide the primary sources of electrical power to NAS facilities. During utility power outages, FAA backup power systems provide continuous electrical power to NAS facilities. This policy discusses the actions needed to ensure the quality and quantity of power to achieve the FAA Strategic Goals of enhanced safety, security, and system efficiency of the NAS.

5-3. Authority to Change This Order. The Air Traffic Control Facilities/Engineering Services directorate issues changes to this order that do not set policy, delegate authority, or assign responsibility.

5-4. Definitions.

Commercial Power: Power furnished by an electric power utility company...It is usually, but not necessarily, the primary power source. When economically feasible, it can serve as an alternative or standby source. [Institute of Electrical and Electronic Engineers, IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications, IEEE Std 446-1995]

Power Conditioning System: Equipment and/or system designed to buffer the sensitive load from various disturbances from the primary power source. Equipment includes surge suppressors, filters, isolation transformers, low-voltage line reactors, voltage regulators, motor generators, UPS.

Prime Power: (1) That source of supply of electric energy utilized by the user which is normally available continuously day and night, usually supplied by an electrical utility company but sometimes by the user-owned generation. [IEEE Standard Dictionary of Electrical and Electronics Terms, IEEE Std 100-1977]; (2) That source of supply of electrical energy that is normally available and used continuously day and night, usually supplied by an electric utility company, but sometimes supplied by base-loaded user-owned generation. [IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications, IEEE Std 446-1995]

Standby Power: An independent reserve source of electric energy that, upon failure or outage of the normal (prime) source, provides electric power of acceptable quality so that the user's facilities may continue in satisfactory operation. [IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications, IEEE Std 446-1995]

Uninterruptible Power Supply (UPS): A system designed to provide power automatically, without delay or transients, during any period when the prime power source is incapable of performing acceptably. [IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications, IEEE Std 446-1995]

Appendix A. Continuous Power Airports and Current Runway Codes

This appendix maintains the NAS approved list of designated CPA airports and runways. Changes to a CPA runway designation must be coordinated among the District Office (DO), Air Traffic Manager (Operations), and the Airport Authority (Airport Manager), and must be approved using the NCP process. A NCP will ensure a current, reliable master list for all approved designated Continuous Power Airports and runways. The DO is responsible for the proper notifications, listing the new runway, change date, and the complete required coordination.

Airport (Code)	Runway	Airport (Code)	Runway
Albuquerque (ABQ)	8	Miami (MIA)	9L
Andrews AFB (ADW)	1L	Milwaukee (MKE)	1
Anchorage (ANC)	06R	Minneapolis (MSP)	30L
Atlanta (ATL)	9R	Nashville (BNA)	2L
Baltimore (BWI)	10	Newark (EWR)	4R
Bismarck (BIS)	31	New Orleans (MSY)	10
Boise (BOI)	10R	New York (JFK)	4R
Boston (BOS)	4R	New York (LGA)	22
Chicago (ORD)	10L	Oklahoma City (OKC)	35R
Charlotte (CLT)	36C	Omaha (OMA)	14R
Cincinnati (CVG)	36	Ontario, CA (ONT)	26L
Cleveland (CLE)	6R	Philadelphia (PHL)	9R
Dallas / Fort Worth (DFW)	17C	Phoenix (PHX)	7L
Denver (DEN)	35L	Pittsburgh (PIT)	10L
Des Moines (DSM)	31	Reno (RNO)	16R
Detroit (DTW)	3R	Salt Lake City (SLC)	34L
El Paso (ELP)	22	San Antonio (SAT)	12R
Fairbanks (FAI)	1L	San Diego (SAN)	9
Great Falls (GTF)	3	San Francisco (SFO)	28R
Honolulu (HNL)	8L	San Juan (SJU)	8
Houston (IAH)	26	St. Louis (STL)	30R
Indianapolis (IND)	5L	Seattle (SEA)	16C
Jacksonville (JAX)	7	Tampa (TPA)	36L
Juneau (JNU)	8	Tulsa (TUL)	35R
Kansas City (MCI)	19R	Washington (DCA)	1
Los Angeles (LAX)	24R	Washington (IAD)	1R
Memphis (MEM)	36L	Wichita (ICT)	1L

Appendix B. Codes and Standards

Power systems design, installation, and operation shall meet or exceed the requirements of the documents listed below. Other FAA Power Services Group documents may also be applicable.

The NFPA documents primarily address safety. The FAA documents may add additional requirements addressing performance. These additional requirements may disallow permitted NFPA practices.

The editions of the codes and standards listed in this section are those adopted by the FAA for use within the FAA. Local jurisdictions such as airport authorities may require more recent versions.

FAA documents are available within the FAA.

	Document Title	Version	Available From
FAA Order 6950.27	Power System Analyses: Load Flow Calculations, Short Circuit Analysis, Protective Device Coordination Studies, And Arc Flash Risk Assessment	Current Version	FAA
FAA Order 3900.19	Occupational Safety and Health Program	Current Version	FAA
FAA Order JO 3900.64	Air Traffic Organization Electrical Safety Program	Current Version	FAA
FAA Order JO 3900.67	Air Traffic Organization Hazardous Energy Control (Lockout/Tagout) Program	Current Version	FAA
FAA-STD-019	Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment	Current Version	FAA
HF-STD-001	FAA Human Factors Design Standard, Chapter 12, Personnel Safety	Current Version	FAA
29 CFR 1910			OSHA website
ANSI Z535 NEMA Z535	Safety Alerting Standards		IHS - at cost
NFPA® 70	National Electrical Code®	2017 Edition	IHS
NFPA 70E®	Standard for Electrical Safety in the Workplace	2015 Edition	IHS
NFPA® 780	Standard for the Installation of Lightning Protection Systems	2014 Edition	IHS
NFPA® 110	Standard for Emergency and Standby Power Systems	2013 Edition	IHS
NFPA® 111	Standard on Stored Electrical Energy Emergency and Standby Power Systems	2013 Edition	IHS