


Session 1.4: Tuesday, October 13, 2020, **Panel Discussion: Mission Critical Facilities**

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Threat and Hazard Analysis: **Dr. Arun Veeramany**, Data Scientist, Pacific Northwest National Laboratory (PNNL)

Mission-Related Power Requirements: **Mr. Todd Traver**, Vice President, IT Optimization and Strategy, Uptime Institute

Building-Level Power System Configurations: **Mr. Adam Ledwell**, Director of Systems Engineering, Schneider Electric

Questions and Answers

Mission-Critical Functions, Facilities and Their Energy Needs

Mission-Critical Functions Vs Mission-Critical Facilities

- Mission-critical/essential function is defined as a function that is vital to the continuation of operations of the organization or agency [AR 500–3]
- The concept of “critical function” serves as an intermediary between the community/campus/military installation mission or purpose, and the function of individual buildings or their infrastructure systems.
- Concentrating on providing resilience to the critical functions instead of to critical assets builds flexibility into the resilience investment plan and ultimately reduces cost in most applications. For instance, many functions can be provided by more than one building – human shelter is a prime example. Many buildings provide or can be adapted to provide multiple functions.
- Alternatively, a function may be supported by a small part of a single building and thus resilience for critical energy loads would not require full facility backup.
- Finally, different threats or scenarios can dictate which buildings are used to provide a function over others – for instance when a subset of buildings are flooded or damaged.

Examples of mission-critical functions and life, health and safety operations

Core mission	Life, Health, and Safety Operations
Air traffic control tower and runaways	Fire and police stations
Surveillance and Reconnaissance	Hospitals
Special Operations	Ambulatory Care Centers
Strategic Command Communication	Dining facilities
Network Enterprise Centers	Shelters
Critical Manufacturing and Maintenance	Sewer lift stations
Logistics	Water pumps
Chem-bio laboratories	Drinking water treatment plants
Critical Research facilities	Central energy plants
Strategic Training	Chilled water plants
Transportation and shipping	Transportation
Critical Data Center Operations	Firefighting water / pumps
Security and Force Protection Operations	Emergency communications centers
Petroleum, Oil, Lubricants Facility Operations	Wastewater treatment plants
Telecommunications facilities	
Banking and finance	

Examples of critical areas – Critical care areas within a hospital

Operating rooms	Intensive care and isolation care nursery
Labor and delivery rooms	Cardiac cauterization
Cystoscope rooms	Angiographic exposure room
Oral Surgery, Maxillofacial surgery, Periodontics, and Endodontics	Hemodialysis (patient station)
Recovery (surgery, and labor recovery beds)	Surgery suite preparation and hold
Coronary care units (patient bedrooms)	Hyperbaric chamber
Intensive care unit (patient bedrooms)	Hypobaric chamber
Emergency care units (treatment/trauma/urgent care rooms and cubicles)	Radiation Therapy (including simulator room)
Labor rooms (including stress test and preparation)	Nuclear medicine (camera room)

Determination of mission-critical functions and facilities

- The determination of whether a particular facility is critical hinges on whether the facility is essential to the mission or the function of the site [FEMP]. For different categories of communities/campuses/ military installations, this list will be different.
- Different methods are available to determine a priority of assets, e.g., DoD Mission-Based Critical Asset Identification Process [DoD Instruction 3020.45]
- Methodology described is provided as an example. This methodology allows to determine the importance of each asset and prioritize the assets based on consequence of loss and is based on the process that has been developed by U.S. Army North that guides planners through a prioritization of assets with focus on mission execution (USARNORTH 2019).
- The assets to be considered usually include those listed in existing Mission Essential Vulnerable Area (MEVA) lists, High Risk Targets (HRTs), and assets that are critical to tenants / organizations on the installation at all levels. The criticality methodology uses a modified version of the metrics from [DoD O-2000.12-H], where “importance” is the sum of all of the following metrics: **Effect**, **Recoverability**, **Substitutability, Mission Functionality**, and **Repairability**

Mission-critical facility metrics

Numerical Rating	0 – 4	5 - 8	9-12	13-16	17-20
Effect Metrics					
Description	Destruction or disruption of this asset would have little or no psychological, economic, sociological, and military impacts	Destruction or disruption of this asset would have local psychological, economic, sociological, and military impacts	Destruction or disruption of this asset would have regional psychological, economic, sociological, and military impacts	Destruction or disruption of this asset would have national psychological, economic, sociological, and military Impacts	Destruction or disruption of this asset would have worldwide psychological, economic, sociological, and military Impacts
Recoverability Metrics					
Description	Immediate restoration (less than 24 hours)	Short-term restoration (more than 24 hours, less than 72 hours)	Mid-term restoration (more than 72 hours, less than 7 days)	Long-term (more than 7 days, less than 30 days)	More than 30 days or no restoration possible
Substitutability Metrics					
Description	Can accomplish mission with substitutes available for personnel, facilities or materiel	Not difficult to accomplish mission with substitutes available for personnel, facilities or material	Difficult to accomplish mission with substitutes available for personnel, facilities or material	Very difficult to accomplish mission with substitutes available for personnel, facilities or material	No substitutes available for personnel, facilities or material
Mission Functionality Metrics					
Description	Destruction or disruption of this asset would have little or no impact on the ability of the unit /installation to accomplish its mission	The unit/installation could continue to carry out its mission if this asset were destroyed or disrupted albeit with some degradation in effectiveness	Half of the mission capability remains if the asset were successfully destroyed or disrupted	Ability to carry out a primary mission of the unit/installation would be significantly impaired if this asset were successfully destroyed or disrupted	Unit/installation cannot continue to carry out its mission until the function of the asset is restored
Repairability Metrics					
Description	Immediate repair / low cost (less than 24 hours)	Short-term repair / moderate cost (more than 24 hours)	Mid-term repair / significant cost (more than 72 hours, less than 7 days)	Long-term / high cost (more than 7 days, less than 30 days)	More than 30 days or repair possible

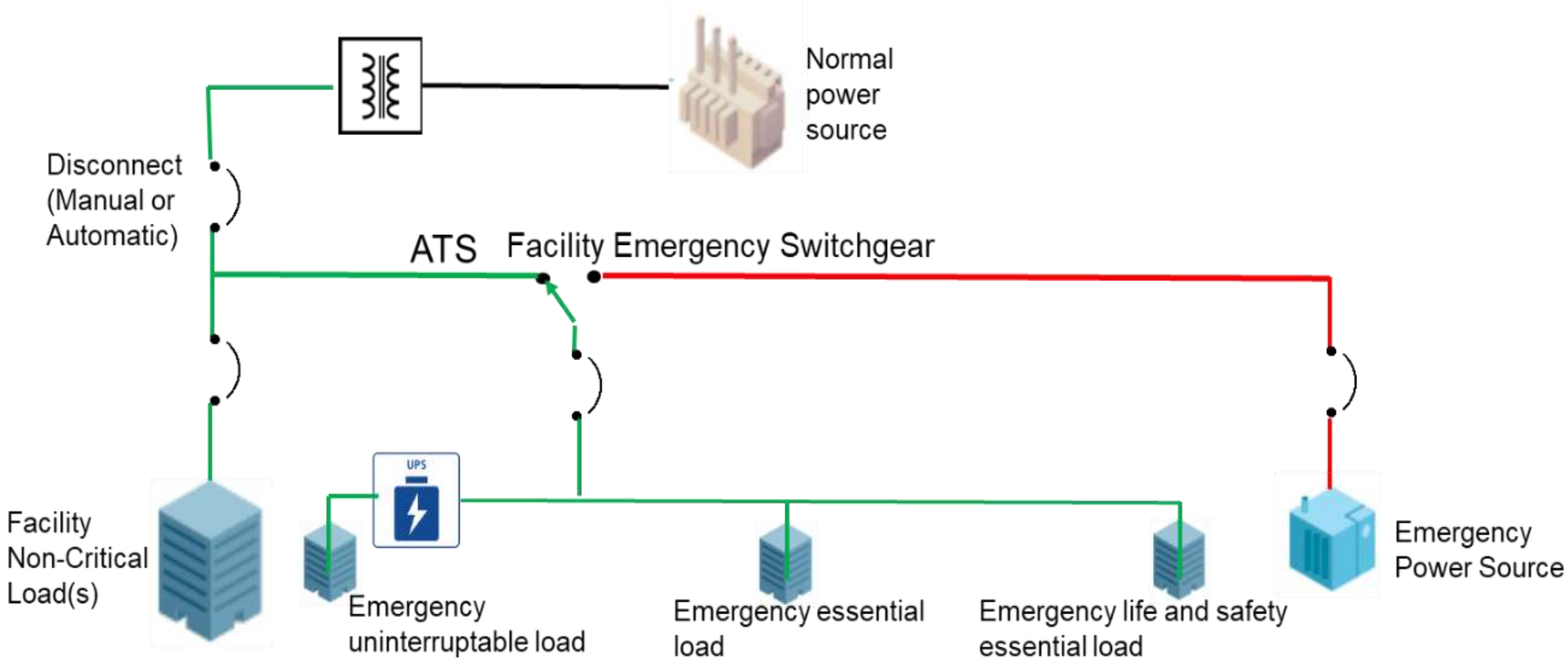
Criticality total score

Linguistic Value	Low	Moderate	Significant	High
Numerical Rating	0 – 25	26 - 50	51 - 75	76 - 100

Criticality in this context refers to the impact that incapacity or destruction of a mission would have on physical or economic security, public health or safety.

This criticality level can be assigned based on national priorities, or within the scope of a local project. In many cases, specific details related to the level of criticality of a mission may be classified.

Uninterruptible, Essential, and Nonessential Electrical Loads



Examples of Mission Critical Operations

Da Vinci Robotic Surgery. One of main reasons of malfunction is when power supply voltage is out of range.

Walk in Cooler. To prevent food spoilage, the refrigerator temperature shall be at 40 °F or below and the freezer is at 0 °F or below. The refrigerator will keep ***food safe for up to 4 hours.*** A full freezer will hold the temperature for approximately 48 hours (24 hours if it is half full).

Computers. Sudden loss of power and power surges can cause damage to computers.

Gym converted into a temporary shelter. Energy is required for a limited lighting. The space needs to be heated or cooled with a humidity control in some climates.

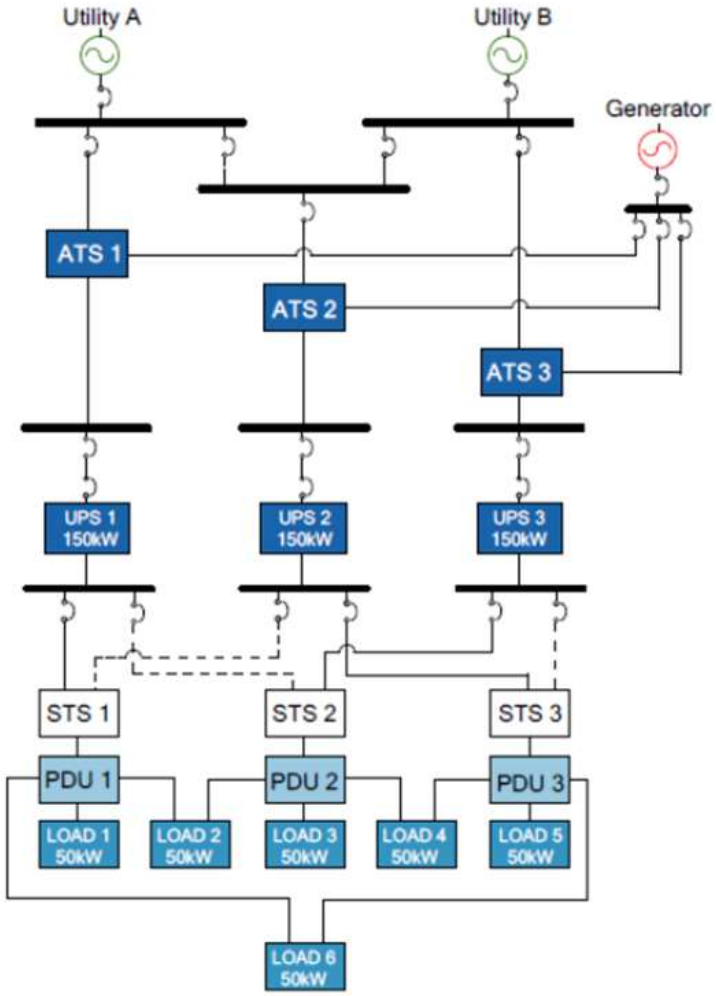
Water supply system

Performance Class Transient Limits (UFC 3-540-01)

Parameter	Performance Class			
	G1	G2	G3	G4
Frequency Deviation (Percent) for 100 Percent Load Decrease	<+18	<+12	<+10	TBD
Frequency Recovery Time (Seconds) for 100 Percent Load Change	<10	<5	<3	TBD
Voltage Deviation (Percent) for 100 Percent Load Increase	<-25	<-20	<-15	TBD
Voltage Deviation (Percent) for 100 Percent Load Decrease	<+35	<+25	<+20	TBD
Voltage Recovery Time (Seconds) for 100 Percent Load Change	<10	<6	<4	TBD
Frequency Droop (Percent)	<-8	<-5	<-3	TBD
Steady-State Frequency Band (Percent)	<2.5	<1.5	<0.5	TBD
Steady-State Voltage Regulation (Percent)	<5	<2.5	<1	TBD
Note: The Table C5 column for performance class G4 states “TBD,” which means that a site-specific analysis is required to determine the voltage and frequency limits.				

Performance Class Transient Limits and Nano-grids

Performance Class Transient Limits in Unified Facilities Criteria (UFC) 3-540-01 [NAVFAC 2019]) can be handled by the building-level energy systems. Building-level electric systems (Nano grids) generally include redundant or backup components and infrastructure for power supply, uninterruptible power supply, automatic transfer switches, data communications connections, environmental controls (e.g., air-conditioning, fire suppression).



Requirements to Emergency and Standby Power Systems

- If the normal/primary power source fails, emergency and standby power systems provide an alternative source of electrical power to essential loads in buildings and facilities.
- Standard NFPA 110 contains requirements to capacity, reliability and quality of power provided to loads by emergency power supply systems (EPSS) for a length of time and within specified time following loss or failure of the normal power supply.

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

Designation	Power Restoration
Type U	Basically uninterruptible (UPS systems)
Type 10	10 sec
Type 60	60 sec
Type 120	120 sec
Type M	Manual stationary or nonautomatic – no time limit

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