BCA® Building Commissioning Association

Testing Critical Electrical Systems: An Integrated Commissioning Approach

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Biography

Muhammad Talha Alam

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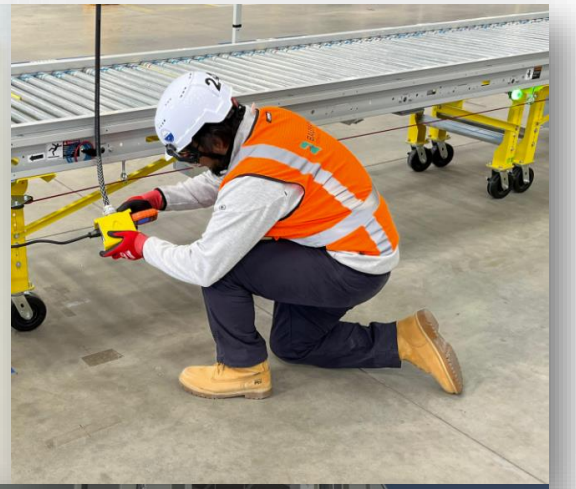
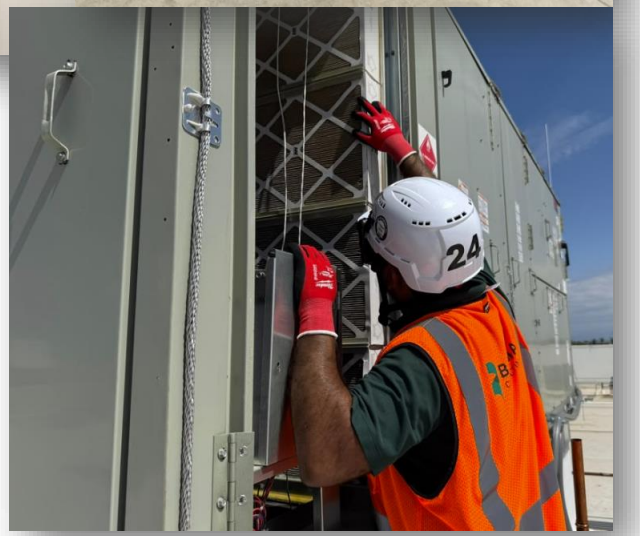




Muhammad Talha Alam is a Commissioning and Energy Engineer at Baumann Consulting specializing in HVAC and MEP commissioning.

His background encompasses commissioning planning, equipment verification, functional performance testing, and coordination of integrated testing activities across both mechanical and electrical disciplines — including fire alarm and fire protection systems.

Muhammad brings practical field experience with critical building systems and is focused on test-driven approaches that improve system reliability, documentation quality, and turnover readiness.

His project portfolio spans a diverse range of facility types, including large-scale distribution centers, residential and commercial developments, tenant fitout projects, and full-service hotel properties.

🔧 Fun Fact: Talha has had the opportunity to perform commissioning work in more than 22 states — and counting!

Course Description

This presentation focuses on how the Commissioning Provider (CxP) verifies critical electrical systems during integrated commissioning, specifically:

- Generator Load Bank Testing
- ATS (Automatic Transfer Switch) Switchover Testing
- UPS (Uninterruptible Power Supply) Load Bank Testing
- SDEN (Streamlined – Dynamic Extended Nesting) Operation

The purpose is to confirm that systems perform as intended, respond correctly during power disturbances, and support reliable building operation at turnover.

Attendees will learn how to plan, execute, and document generator and UPS load bank testing, ATS switchover testing, and SDEN modular infrastructure commissioning.

Learning Objectives

01 **Generator Load Bank Testing**

Explain the purpose of generator load bank testing and interpret how test results support system reliability and readiness.

02 **ATS Commissioning**

Explain the commissioning intent and functional test sequence for ATS switchover during normal power loss and restoration conditions.

03 **UPS Load Bank Testing**

Describe how UPS load bank testing is performed and why it is important for confirming system performance.

04 **SDEN Testing**

Identify key considerations for SDEN related testing

Integrated Commissioning Process Overview

- Verifies building systems work together as a coordinated whole — not simply as individual components in isolation.

The Commissioning Process

- Installation Verification (IV): Confirm equipment is installed per design and specifications
- Pre-Functional Testing (PFT): Static checks before energization — wiring, controls, interlocks
- Functional Performance Testing (FPT): Dynamic verification of sequence of operations under simulated conditions
- Integrated Systems Testing (IST): Cross-system coordination verification under realistic load scenarios
- Documentation & Turnover: Verified test records, O&M submittals, and owner training

Why It Matters for Critical Electrical Systems

- Failures in ATS, SDEN, UPS, or generator systems during an actual power event can have severe consequences
- Commissioning provides structured, documented evidence that systems are ready for occupancy and operation

Role & Importance of Electrical Commissioning

The CxP serves as the owner's technical representative, verifying that installed systems perform accordance with the Owner's Project Requirements (OPR), Basis of Design (BOD), and — most critically for the contractor — the Construction Documents, which prescribe exactly what is to be built and tested.

Core CxA Responsibilities

- Develop and coordinate functional test procedures for ATS, UPS, SDEN, and generator systems
- Witness and document all installation verifications and pre-functional checks
- Direct and observe functional performance tests; record pass/fail against acceptance criteria
- Coordinate multi-trade integrated testing with GC, electrical sub, controls, and owner
- Identify deficiencies, track resolution, and confirm re-testing as needed
- Compile the commissioning record: test reports, deficiency logs, O&M verification

A Collaborative Effort: Roles on the Testing Team

Successful electrical commissioning is a team effort. The contractor and testing agency perform the hands-on work — the “button pushing” — while the Commissioning Provider directs, witnesses, and documents from a safe location. Success comes from genuine collaboration, not any single party.

Who Does What During Testing

- Electrical contractor and testing agency perform the physical work: connecting load banks, operating breakers, and pushing the buttons
- Testing agency executes specialized procedures — primary injection, functional sequences, and load bank runs
- Commissioning Provider (CxP) directs the test sequence, witnesses results, and documents pass/fail — all from a safe location
- General contractor coordinates trades and schedules and ensures site readiness and safety
- Owner and engineer of record confirm results meet the OPR, BOD, and Construction Documents
- Pre-test coordination meetings and clear communication keep the entire team aligned and safe

Generator Load Bank Test – What Is It & Why Commissioning It?

Definition

A controlled procedure where an artificial electrical load ("the load bank") is applied to a generator to simulate real operating conditions.

What NETA Requires and Why It Matters:

Per NETA ATS, load bank testing is critical for four reasons:

- Wet Slacking Prevention:
- Voltage & Frequency Stability
- Thermal Validation
- Transfer Switch Coordination

Commissioning Intent

- Formal proof-of-performance milestone for the generator
- Confirm the generator meets the specified performance criteria
- Documented test record
- Satisfies the pre-requisite for the downstream of commissioning activities

What is a Load Bank?

Definition

Load Bank is a temporary electrical device that creates a controlled and artificial demand on a power source.

Purpose & Importance

- Test instrument for generator and UPS acceptance testing
- Simulate real electrical demand
- Controlled kW levels of testing without the need for an actual load
- Verify voltage, frequency and temperature stability
- Identify issues that may not appear during no-load start-up such as overheating, voltage instability, or poor engine performance

Generator Load Bank Test

Purpose

- Verify engine performance, thermal stability, and electrical output quality under sustained load — including wet stacking prevention and confirmation the generator meets nameplate capacity.

Test Methodology

- Step 1: Start generator; warm-up at no-load (typically 3-5 minutes)
- Step 2: Apply load incrementally
- Step 3: Record voltage, frequency, current, oil pressure, coolant temp, exhaust temp at every 15-minute intervals
- Step 4: Sustain 100% load for required duration; monitor for alarms, voltage deviation, frequency drift
- Step 5: Remove load; allow cool-down period before shutdown

Acceptance Criteria

- Voltage: +/-2% of rated | Frequency: +/-0.5 Hz | No sustained alarms

Parties Involved

- Electrical contractor
- Generator startup tech
- Testing agency (load bank)
- CxP witnesses & directs

Pre-Test Safety Checks

Key Checks Before Load-Bank Testing

- Verify the local E-Stop at the genset and any remote emergency stop station each shut the engine down immediately and lock out restart until manually reset
- Confirm engine protective shutdowns — low oil pressure, high coolant temp, overspeed, overcrank, low coolant level
- Verify fuel-system safeties: low-fuel alarm, day-tank / sub-base rupture-basin alarm, and leak detection
- Confirm ventilation and combustion-air interlocks — louvers and dampers prove open before and during the run
- Apply LOTO and confirm energy isolation before any hands-on work near the set
- Complete all safety checks before applying the load bank; confirm PPE, arc-flash boundary, and grounded, secured cam-lock connections
- Inspect the proper anchorage, alignment and grounding of the generator

Pre-Test Checks

Review Approved Submittal

Confirm generator nameplate kW/kVA rating.
Note rated voltage, frequency, and phase rotation.

Establish Safety Perimeter

Barricade generator yard and load bank area with rope barriers and traffic cones.
Post warning signs.
Brief test team — assign roles for instrument recording, observation, and safety watch.

Verify Fuel Level ≥ 75%

Check day tank and main fuel tank levels.
4-hour full-load test burns significant fuel — confirm adequate supply before starting.
Document actual fuel level on test form.

Check Engine Oil & Coolant

Engine oil must be within normal operating range on dipstick.
Coolant level must be full.
Inspect for any visible leaks, staining, or signs of previous issues around the engine compartment.

Verify Camlock Connections

Confirm all cam-lock cables are fully seated and locked.
Ground connects first, disconnects last — every time.
Verify Phase A (black), B (red), C (blue) phasing matches load bank panel labels.

Calibrate & Connect Instruments

Verify calibration certificates are current for all recording instruments.
Connect on all 3 phases. Confirm instrument is logging before generator start — capture the no-load baseline.

Load Bank Connection to Generator — Field Setup

30% Load (60 kW) for 1 hour

55% Load (109 kW) for 1 hour

100% Load (200 kW) for 2 hours

Test Results

TIME	% LOAD	AMPS (PHASE A)	AMPS (PHASE B)	AMPS (PHASE C)	VOLTS (A-B)	VOLTS (B-C)	VOLTS (C-A)	KW LOAD	OIL PRESSURE (PSI)	COOLANT TEMP (F)	AMBIENT TEMP (F)
Start	30	72	70	75	480	479	478	60	86	75	77
0:15	30	71	70	75	484	483	479	60	82	183	77
0:30	30	71	70	75	481	481	479	60	81	183	77
0:45	30	71	70	75	481	480	479	60	81	183	77
1:00	55	130	130	133	481	479	478	109	81	183	77
1:15	55	130	130	133	481	480	478	109	78	183	77
1:30	55	130	130	133	482	478	477	109	77	185	77
1:45	55	130	130	133	480	479	477	109	77	183	77
2:00	100	242	242	243	483	482	479	200	80	185	77
2:15	100	241	241	243	482	480	479	200	79	185	77
2:30	100	242	240	243	480	480	479	200	81	186	77
2:45	100	242	242	244	481	478	479	200	81	186	77
3:00	100	242	241	243	484	478	479	200	80	186	77
3:15	100	242	242	243	483	479	482	200	79	186	77
3:30	100	243	242	244	480	479	478	200	79	186	77
3:45	100	241	242	243	484	482	478	200	79	186	77
4:00	100	242	242	243	481	479	482	200	79	186	77

NETA ATS Section 7.22.1 Compliance

- ✅ Incremental load stepping - consistent with NETA intent
- ✅ 100% nameplate load reached and sustained - satisfied
- ✅ 2-hour minimum at full load - satisfied

NFPA 110 Section 7.13.4.3 Acceptance Testing

- ✅ 100% load (200 kW) sustained for 2 full hours - fully satisfied
- ✅ Load bank sized to 100% of nameplate kW rating - satisfied
- ✅ Total test duration of 4 hours - exceeds minimum

ATS – What Is It & Why Commissioning It?

Definition

Automatic Transfer Switch (ATS) is a device that automatically transfers a connected load from a primary source to an alternate source without manual intervention.

Critical Role

ATS units are the gating mechanism for life-safety, mission-critical, and legally required emergency loads in hospitals, data centers, high-rise buildings, and industrial facilities.

Commissioning Intent

Commissioning validates that the ATS will perform its transfer and re-transfer sequences reliably under real conditions, within required timing, and with all interlocks and safeties functioning correctly.

Safety Verification: Automatic Transfer Switch (ATS)

Verify the interlocks and source-sensing that prevent paralleling or transfer to a bad source before functional testing.

Key Interlock & Isolation Checks

- Verify mechanical and electrical interlocks prevent both sources closing at once (no inadvertent paralleling on an open-transition switch)
- Confirm source-sensing prevents transfer to a dead or out-of-tolerance source (voltage / frequency; in-phase monitor on closed-transition units)
- Verify the manual handle operates only when de-energized, with Lockout/Tagout (LOTO) applied
- Verify manual switchover works
- On bypass-isolation units, confirm the load can be bypassed and the ATS isolated for service without dropping load
- Identify all loads downstream of ATS before transfer test begins
- Confirm arc-flash labeling and available fault current reflect both the normal and emergency sources
- Establish LOTO points, PPE, and a safe witnessing position before initiating any transfer
- Time Delay Settings are be verified against the approved submittal before any transfer test begins

ATS Switchover Testing

Testing Procedure Overview

- Step 1: Confirm ATS in normal position
- Step 2: Simulate normal source loss
- Step 3: Verify generator start and run-up within specified time
- Step 4: Confirm ATS transfer to emergency position
- Step 5: Restore normal source
- Step 6: Confirm retransfer to normal and generator cool-down and shutdown sequence

Acceptance Criteria

- Generator start: ≤10 seconds (NFPA 110 Level 1)
- Transfer time: ≤60 seconds (total)
- Voltage at transfer: ≥90% rated
- No nuisance alarms during sequence

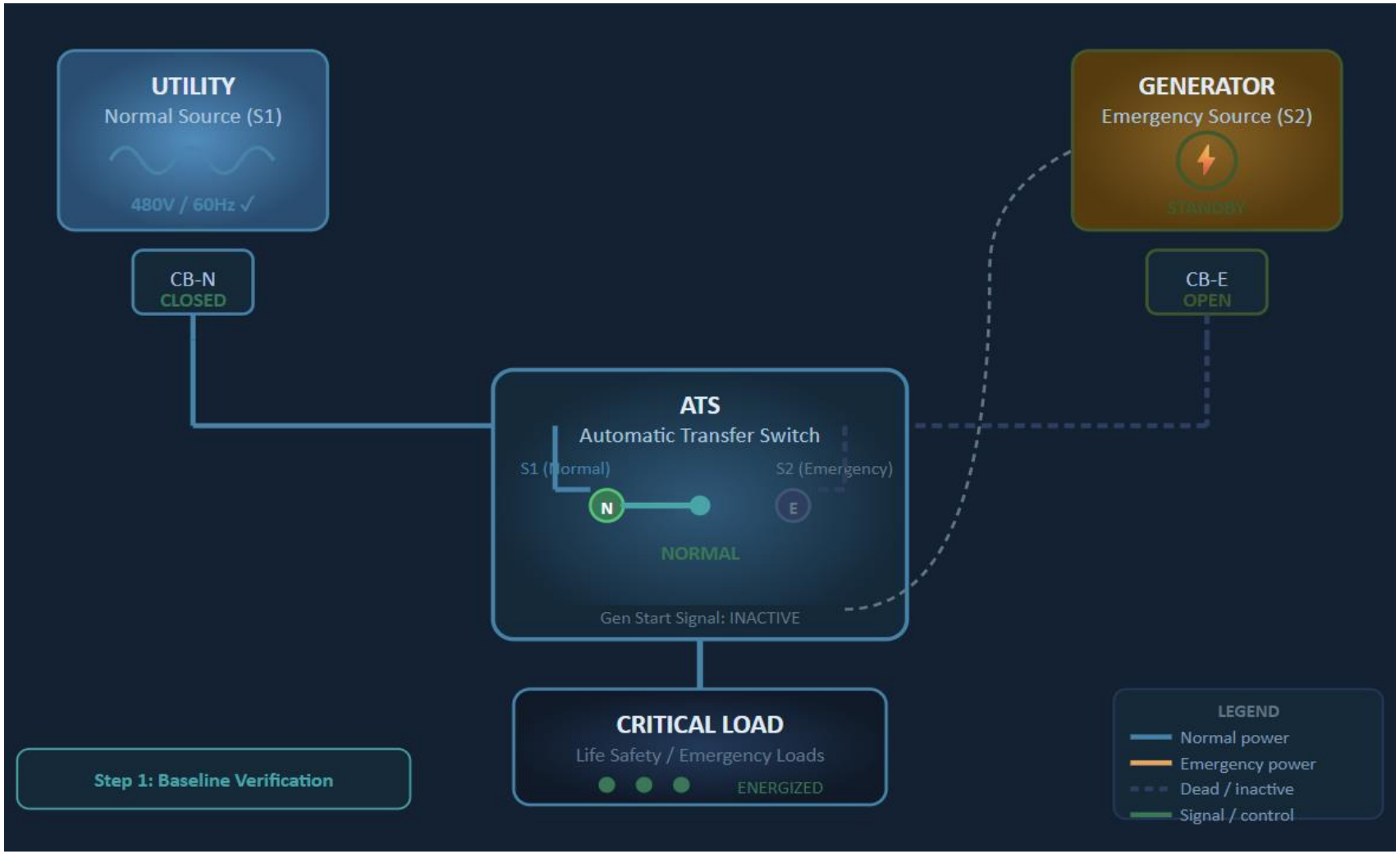
Time Delays

- TDNE: Time Delay Normal to Emergency (Wait before transferring to generator)
- TDEC: Time Delay Engine Cooldown (Keep generator running after retransfer)
- TDEN: Time Delay Emergency to Normal (Wait before transferring back to utility)
- TDES: Time Delay Engine Start (Wait before starting the generator)

Parties Involved

- Electrical contractor
- ATS startup tech
- NETA testing agency (load bank)
- CxP witnesses & directs

Step 1 – Confirm Normal Position



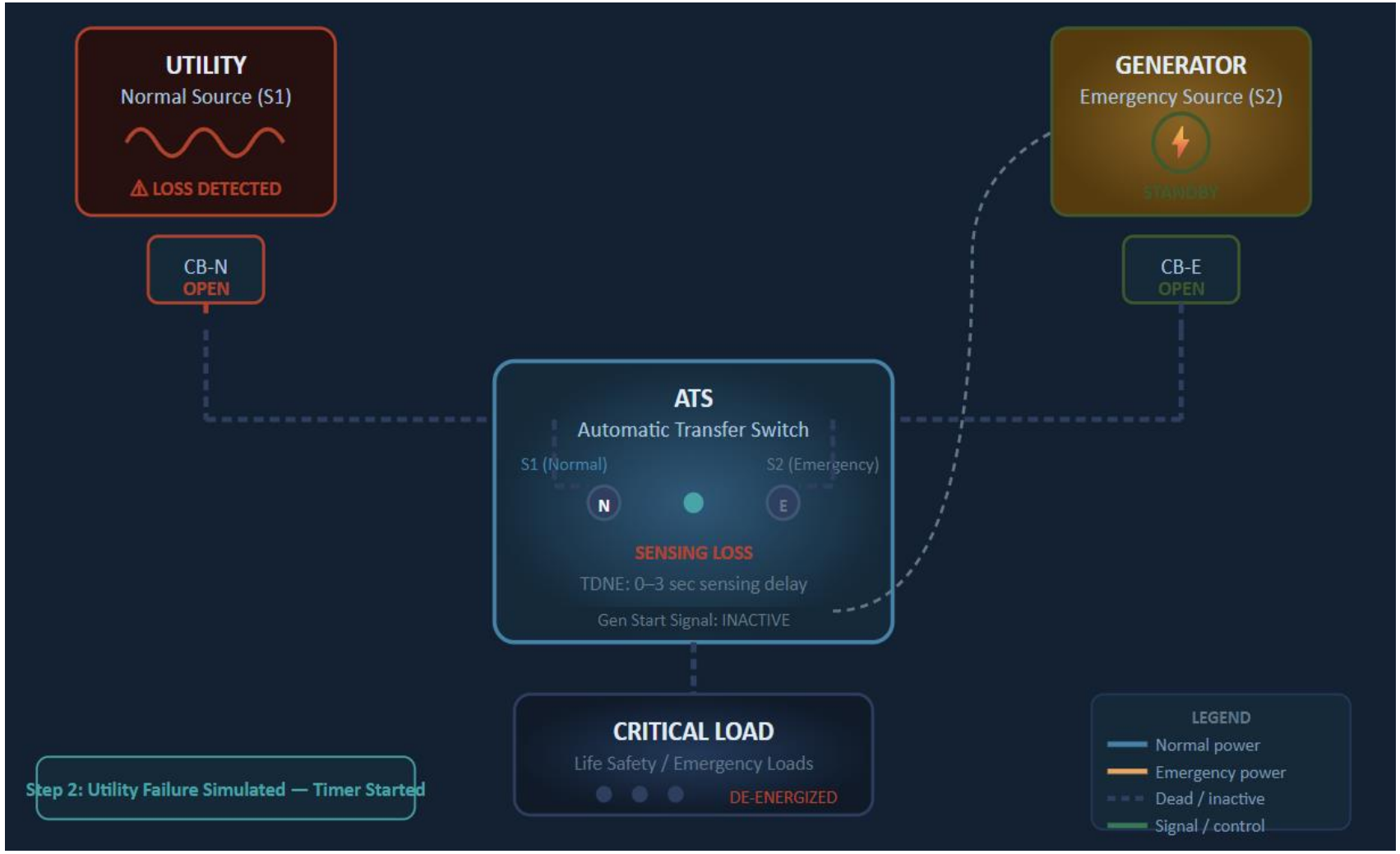
Normal Source: Live

Generator: Standby

ATS: Connected to Normal Source

Load: Connected to Normal Source

Step 2 – Simulate Utility Failure



Normal Source: Offline

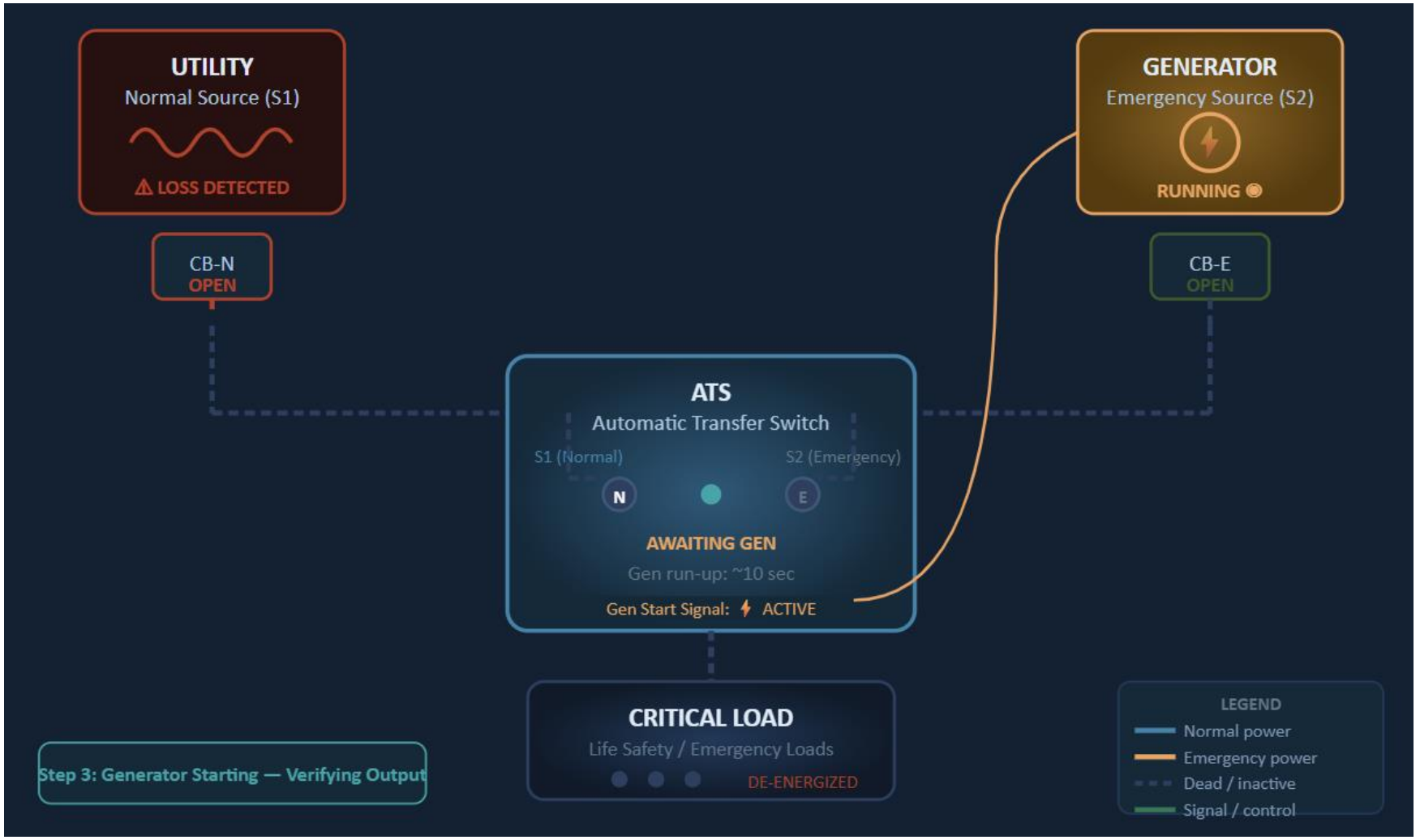
Generator: Standby

ATS: Sensing Loss of Normal Power

Load: De-Energized

TDNE (0 to 3 seconds)

Step 3 – Generator Start & Run-Up



Normal Source: Offline

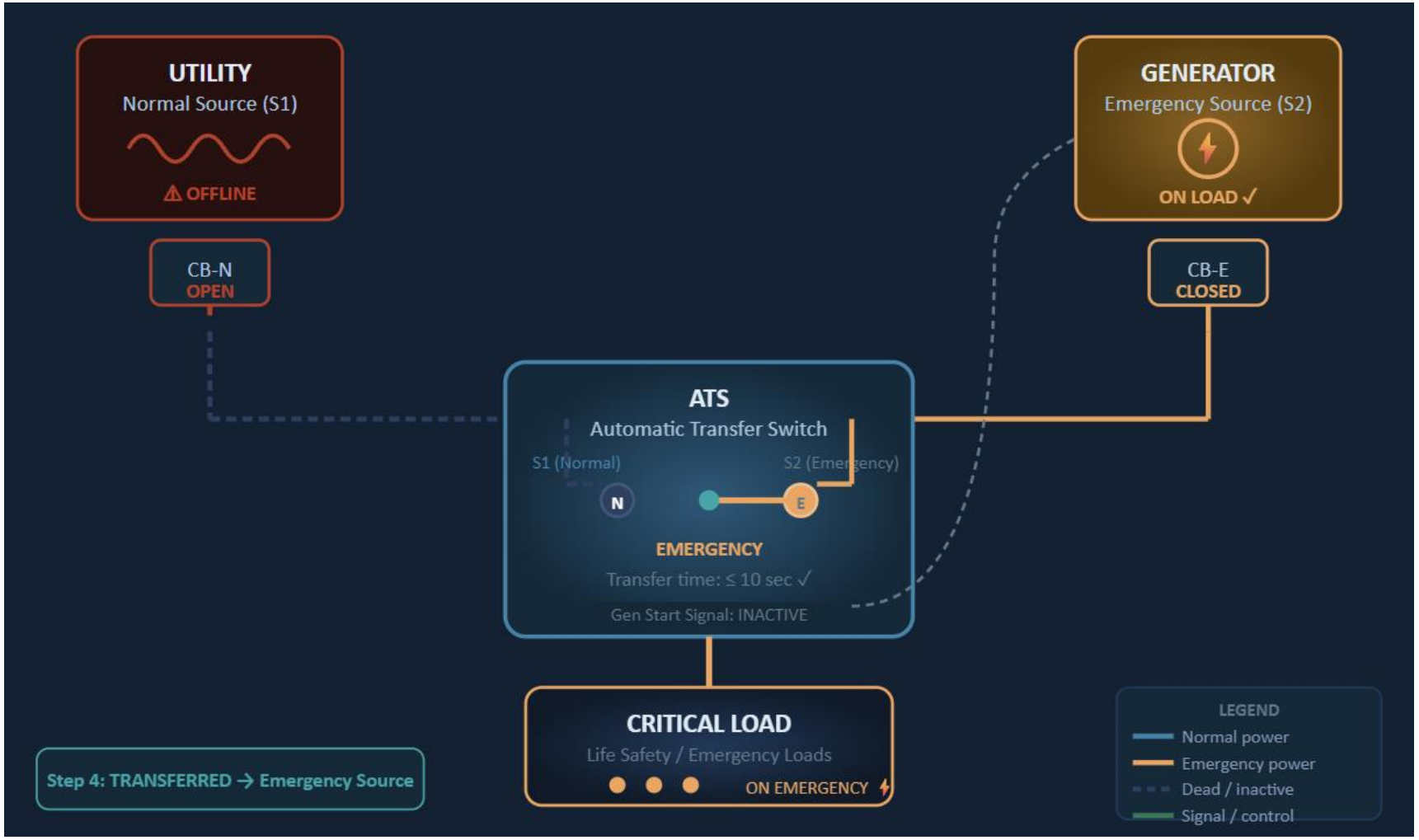
Generator: Running

ATS: Awaiting Generator

Load: De-Energized

Generator Start Time ~ 10 seconds

Step 4 – ATS Transfers to Emergency Source



Normal Source: Offline

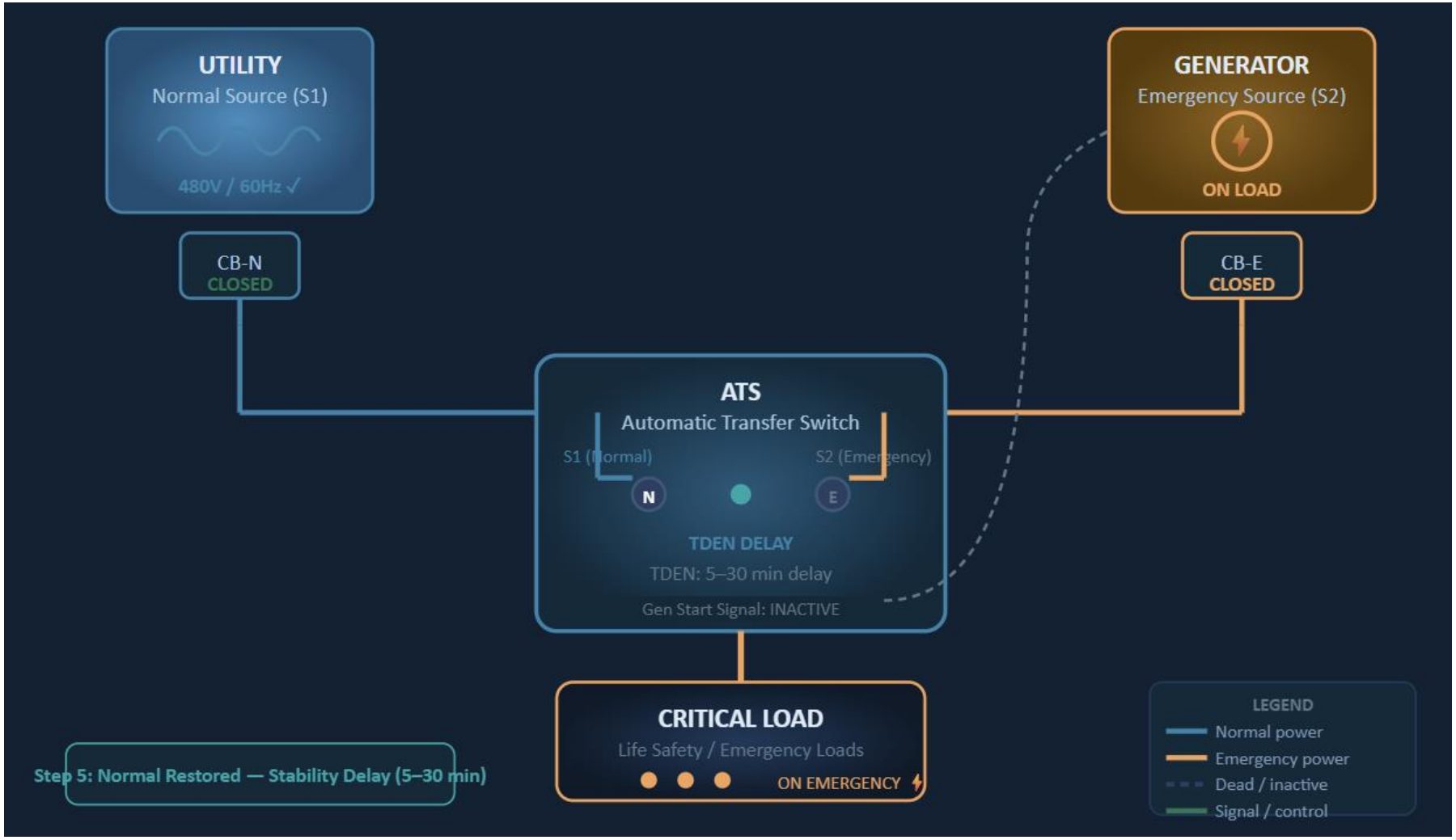
Generator: On Load

ATS: Connected to Emergency

Load: On Emergency

Transfer Time ≤ 10 sec

Step 5 – Restore Normal Source



Normal Source: Live

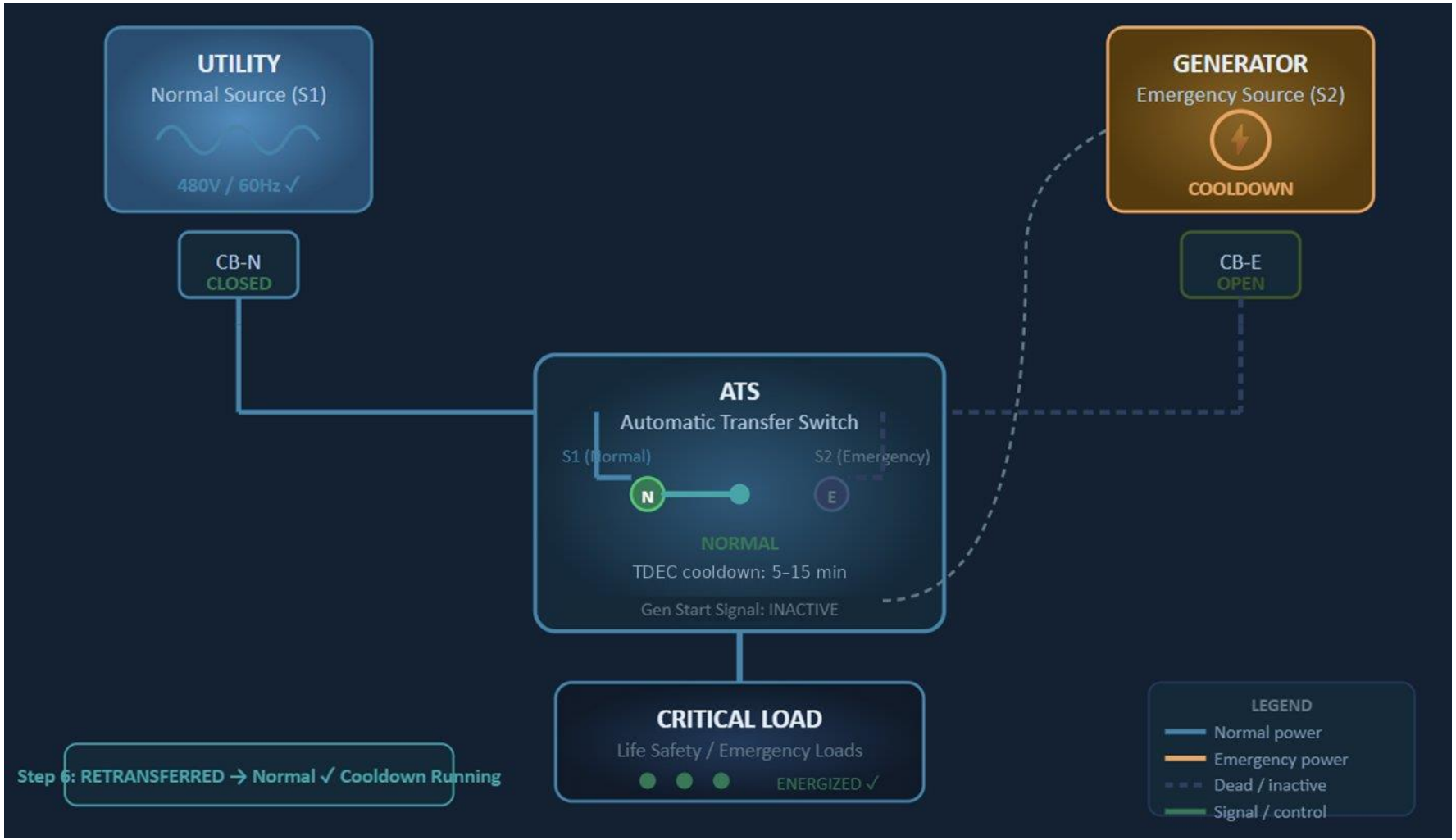
Generator: On Load

ATS: Connected to Emergency

Load: On Emergency

TDEN: 5 – 30 min

Step 6 – Retransfer & Generator Cooldown



Normal Source: Live

Generator: Cool Down

ATS: Normal

Load: On Normal

TDEC: 5 – 15 min

ATS Switchover Testing Pictures

Transfer from (Utility Power) to Source 2 (Generator) happened in under 8 seconds.

At re-transfer, the generator engine cool down started and had a cool down timer for 10 minutes.

Once the cool down ended, the generator de-energized and the voltage decreased from 481 to 0 Volts.

Common ATS Testing Challenges

01 Phase Monitor Sensitivity — HIGH

Phase monitors set too conservatively prevent ATS transfer when utility voltage is within acceptable range but below the monitor's threshold.
Requires coordination between electrical contractor and ATS manufacturer to recalibrate.

02 Generator Readiness Interlock — HIGH

ATS will not transfer if generator readiness signal is absent.
Common causes include low coolant/oil alarms, air damper proof switches not made, and battery charger faults that weren't cleared before test.

03 Test Switch vs. Live Source Test — HIGH

Testing using the ATS built-in test switch does NOT verify the full transfer sequence.
A live source interruption test is required by NFPA 110 and ASHRAE Guideline 0 for commissioning acceptance.

04 Downstream Load Sequencing — MED

Critical loads connected to ATS may include HVAC equipment with soft starters, medical equipment, or variable frequency drives that require specific sequencing upon restoration.
Unmanaged inrush can trip breakers.

05 Retransfer Timing Conflict — MED

Automatic retransfer to utility source after restoration must account for elevator recall, fire suppression sequences, and BMS return-to-normal protocols.
Default retransfer timers often need adjustment.

06 Documentation Gaps — LOW

ATS maintenance and test records from commissioning must be captured in a format compatible with the owner's CMMS.
Often overlooked until close-out — plan for this during test documentation development.

UPS – What Is It & Why Commissioning It?

Definition

Uninterruptible Power Supply (UPS) is a back-up power source that supplies temporary power to the connected equipment during a power outage or voltage fluctuations, helping keep the equipment running.

Critical Role

Provides instantaneous power protection during outages, voltage sags, or power quality events
Bridges the gap between normal power loss and generator pickup
Protects critical loads such as IT systems, life safety controls, BAS panels, and security systems
Prevents equipment damage, data loss, and operational disruption

Commissioning Intent

Confirm stable voltage and frequency
Validate battery runtime meets design requirements under discharge
Documented test record

UPS Burn-In Test

Purpose

- Validate that the UPS system accepts, sustains, and transfers rated load under controlled conditions — confirming battery performance, thermal behavior, and transfer characteristics before critical loads are energized.

Test Methodology

- Step 1: Connect resistive load bank to UPS output; apply load incrementally
- Step 2: At each step, record input/output voltage, current, power factor, and temperature
- Step 3: At 100% load, simulate utility failure; verify seamless transfer to battery (zero transfer time for on-line double-conversion UPS)
- Step 4: Record battery discharge voltage and runtime at full load; compare against manufacturer specification
- Step 5: Restore utility; verify controlled recharge and return to normal operation

Why This Test Is Critical

- Actual building loads are often unavailable or unsafe to energize during early commissioning
- Battery capacity degrades over time; factory ratings must be field-verified at installation
- Confirms bypass switch operation, alarm relay functions, and EPMS integration
- Provides baseline runtime data for future maintenance and operational planning

Parties Involved

- Electrical Contractor
- UPS Tech
- Testing Agency
- CxP witness and directs

Safety Verification: UPS

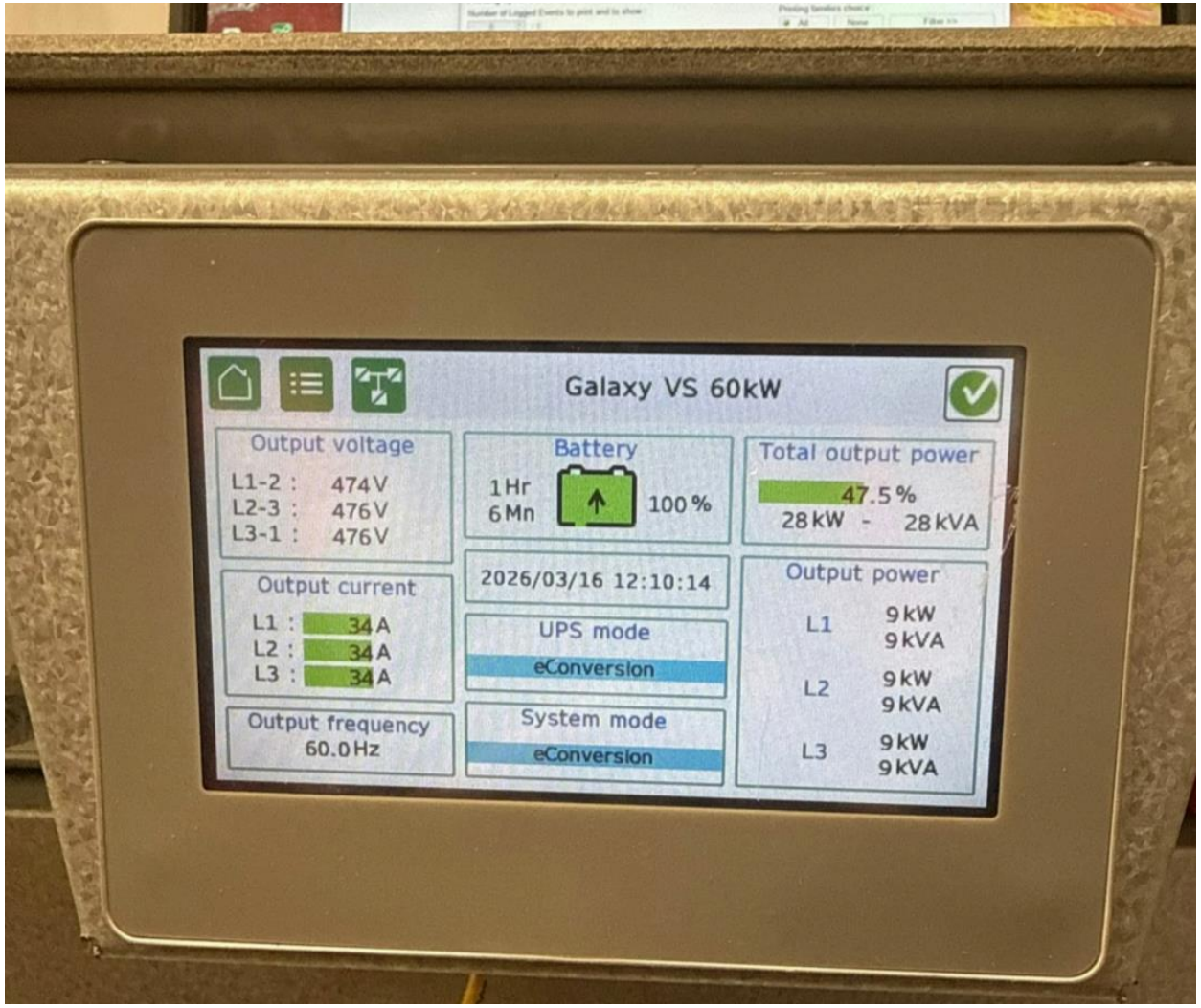
Key EPO, Bypass & Battery Checks

- Verify the Emergency Power Off (EPO) de-energizes the UPS output and require manual reset
- Confirm the EPO isolates input, output, and the battery / DC source — not just the inverter
- Verify maintenance bypass is make-before-break so load is never interrupted, and prevents back-feed
- Confirm battery safeties: DC disconnect operation, over-temperature / thermal-runaway, and DC ground-fault alarms
- Apply Lock-Out/Tag-Out
- Confirm PPE and arc-flash boundary, and set a safe witnessing position before testing

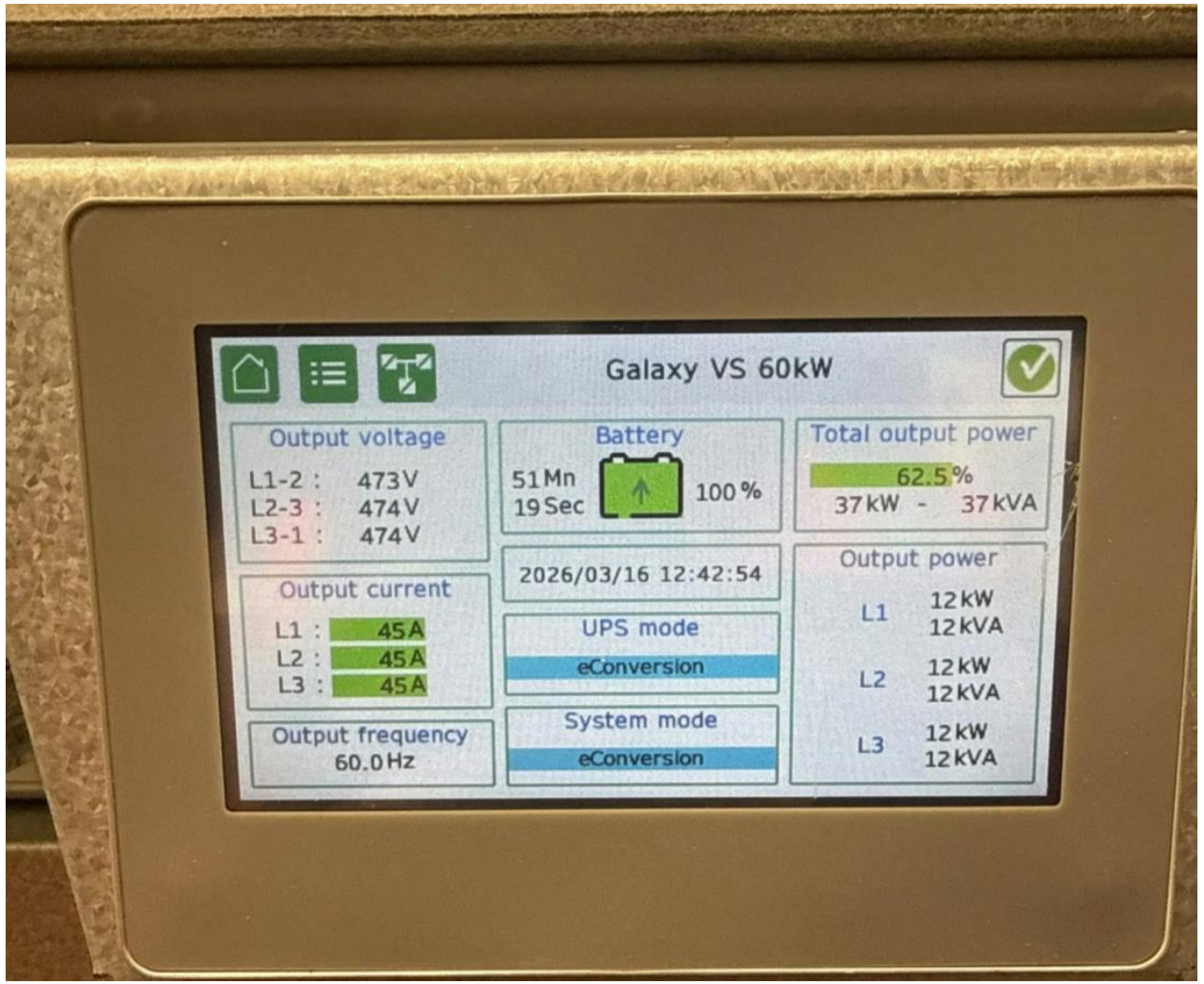
Load Bank & Wiring Connections Start-up

33% Load – 20 kW for 30 minutes

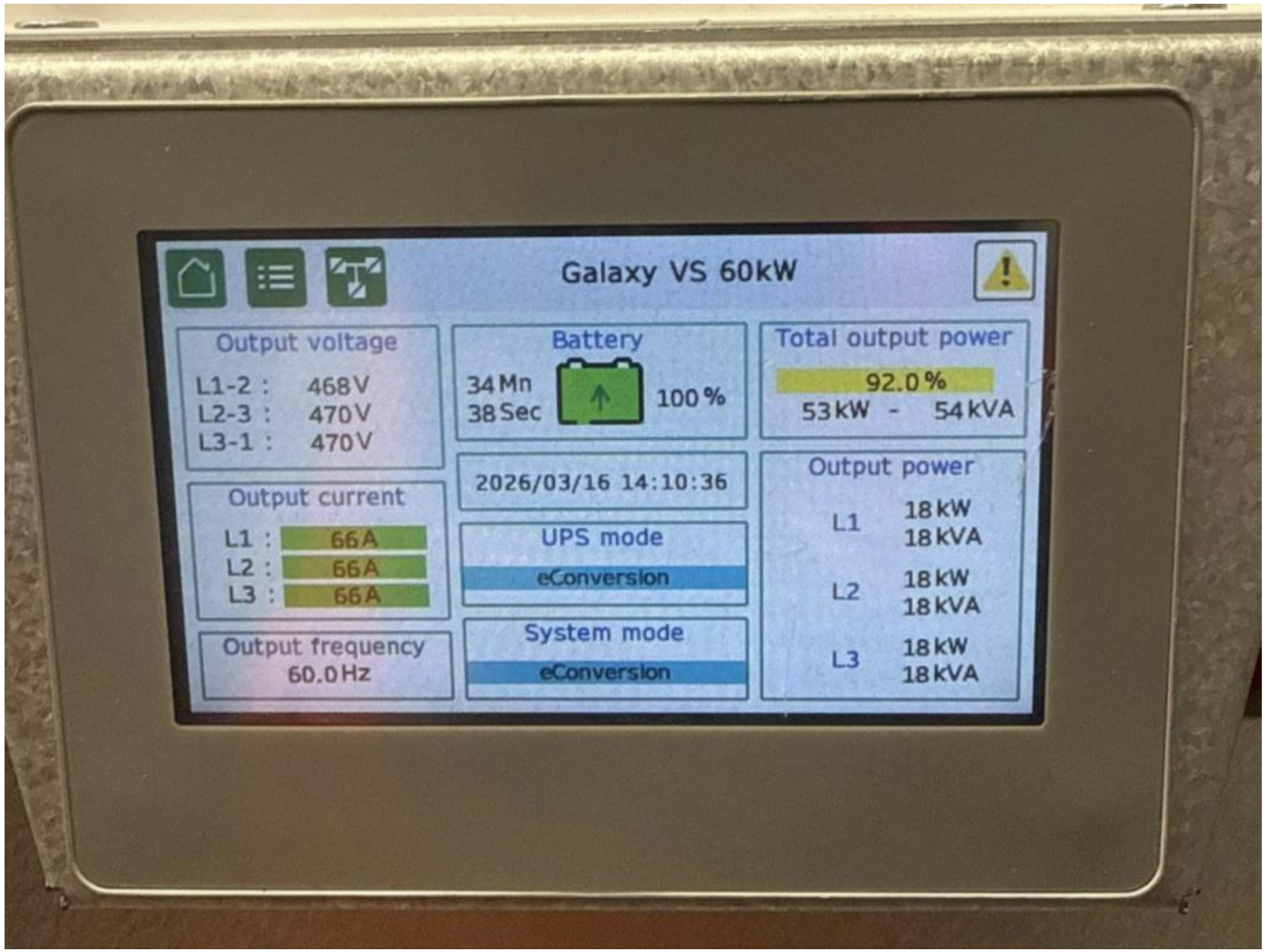
50% Load – 30 kW for 30 minutes



65% Load – 40 kW for 30 minutes



100% Load – 60 kW for 2 hour 30 minutes



Test Results

TIME (MINUTES)	% LOAD ON LOAD BANK	VOLTS (A-B)	VOLTS (B-C)	VOLTS (C-A)	CURRENT (A)	CURRENT (B)	CURRENT (C)	kW LOAD UPS OUTPUT	kVA LOAD UPS OUTPUT	FREQUENCY (HZ)
15	33%	484	485	484	24	23	23	19	20	60
30	33%	484	484	484	24	23	23	19	20	60
45	50%	483	484	483	35	34	34	29	29	60
60	50%	483	484	483	35	34	34	28	29	60
75	65%	482	482	482	46	45	45	38	38	60
90	65%	482	482	482	46	45	45	38	38	60
105	100%	481	482	480	68	67	67	56	56	60
120	100%	480	482	480	68	67	67	56	56	60
135	100%	479	480	479	68	67	67	55	56	60
150	100%	480	480	480	67	67	67	55	56	60
165	100%	479	480	479	67	67	67	55	56	60
180	100%	478	479	478	67	67	67	55	55	60
195	100%	479	479	478	67	67	67	55	55	60
210	100%	478	479	478	67	67	67	55	55	60
225	100%	479	477	477	67	67	67	55	55	60
240	100%	478	479	477	67	67	67	55	55	60

NETA ATS Section 7.22 – UPS Acceptance Testing

- ☑ Incremental load stepping to 100% rated capacity
- ☑ Sustained full load run
- ☑ Voltage stability under load
- ☑ Frequency stability under load
- ☑ Phase Current Balance
- ☑ Total Test Duration - 4 hours (exceeds minimum)

Transfer Test

What is a UPS Transfer Test?
A Transfer is when the UPS moves your equipment's power supply from one path to another.

Forward Transfer: UPS Inverter → Static Bypass

Reverse Transfer: Static Bypass → UPS Inverter

Maintenance Bypass Transfer: UPS Inverter → Static Bypass → Maintenance Bypass → Normal Operation

Why important?

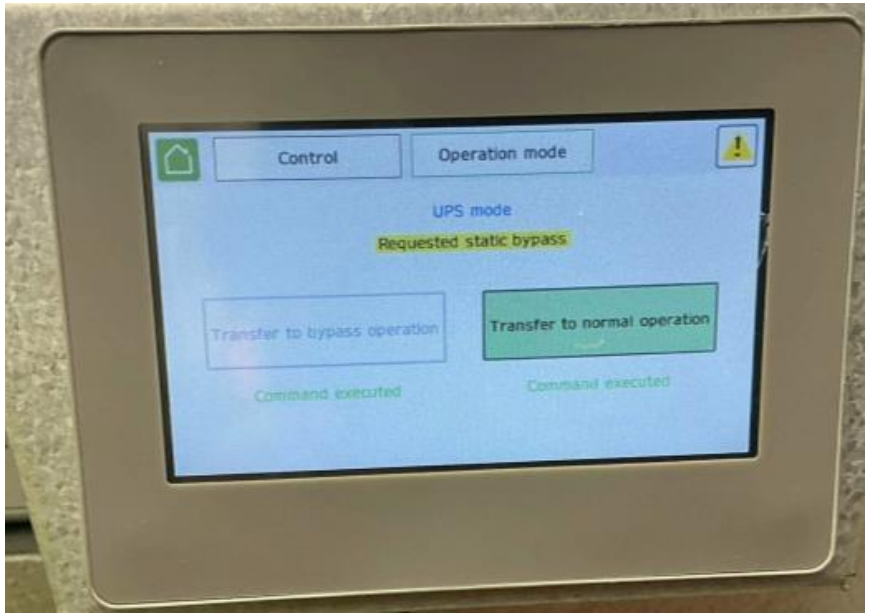
- Transfer causes voltage spike leading to servers getting damaged
- Transfer takes too long meaning equipment loses power momentarily
- Bypass path has a fault which can be fatal
- ✅ Did the switch happen fast enough?
- ✅ Did voltage stay stable? (checked with a Digital Voltmeter)
- ✅ Did the UPS display show the correct status?
- ✅ Did any unexpected alarms go off?

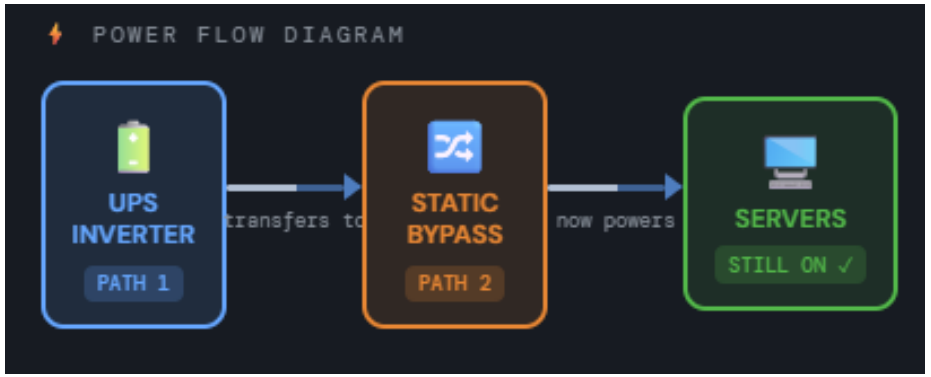
Forward Transfer – Transfer Test

What is a Forward Transfer Test?
Test load is transferred from the UPS Inverter to the Static Bypass

What actually happens?
- Equipment is running on UPS Inverter
- UPS synchronizes the Bypass path
- Transfer happens — in milliseconds
- Equipment is now running on Static Bypass

Why needed?
- UPS needs servicing or cool down
- UPS detect an overload and auto-transfers



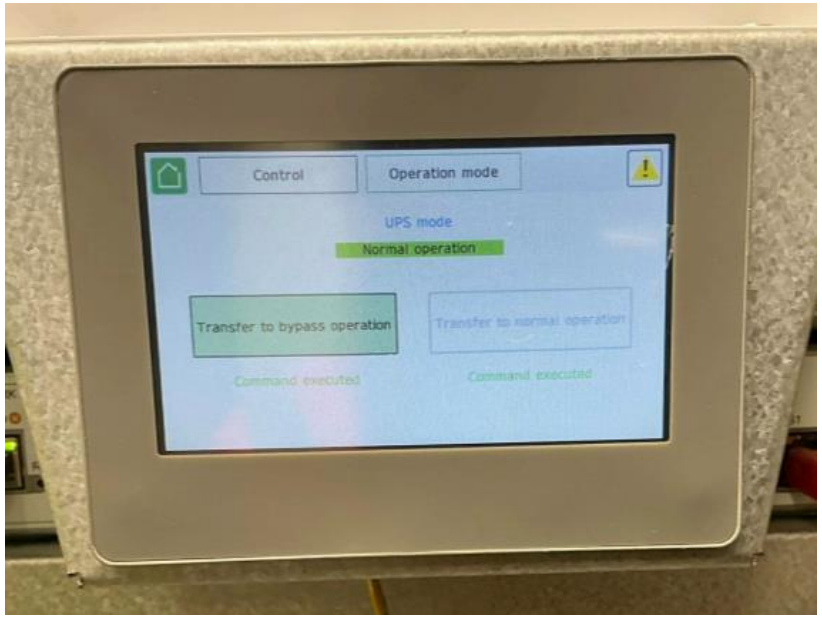


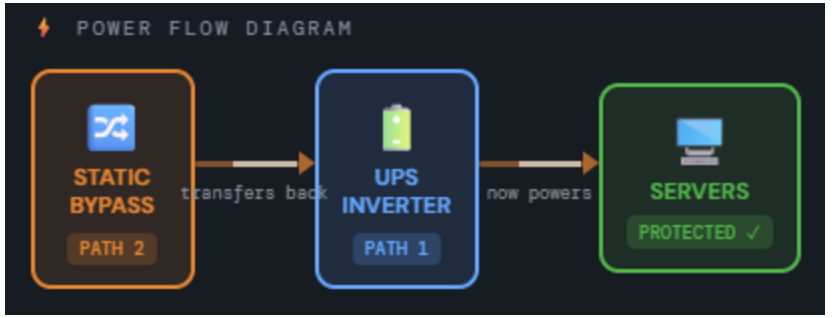
Reverse Transfer – Transfer Test

What is a Reverse Transfer Test?
Test load is transferred from Static Bypass back to UPS Inverter

What actually happens?
- Equipment is running on Static Bypass
- UPS Inverter is brought back online
- UPS synchronises again
- Transfer happens — back to protected path

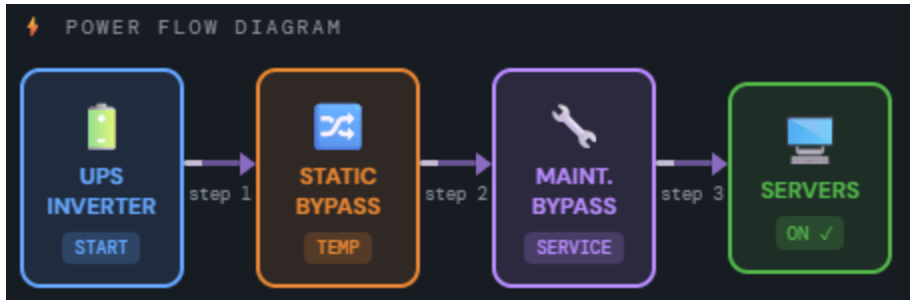
Why needed?
- Restores battery protection after maintenance
- Equipment on Bypass has no backup — this fixes that





Maintenance Bypass Transfer – Transfer Test

What is a Maintenance Bypass Transfer Test?
Full cycle: Inverter → Static Bypass → Maintenance Bypass → back to normal



What actually happens?
- Step 1 — Forward Transfer: Inverter → Static Bypass
- Step 2 — Engage Maintenance Bypass
- Step 3 — UPS is serviced or replaced
- Step 4 — Return to normal operation

Why needed?
- Only way to physically service the UPS while keeping equipment live
- Required when a UPS needs repair, replacement, or major inspection

Battery Operations Test

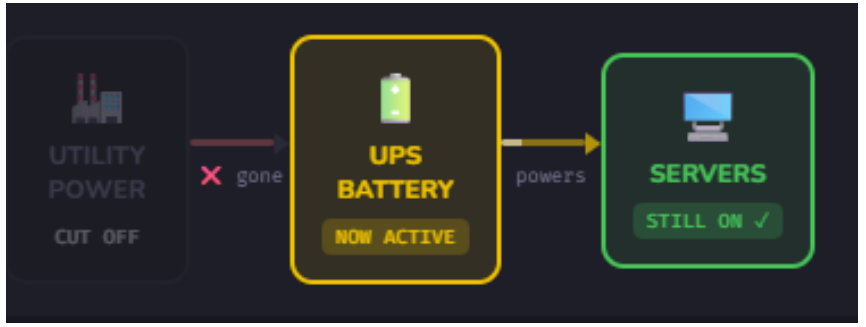
What is a Battery Operations Test?
The UPS can actually keep equipment running when the grid power is completely cut off, using only its internal batteries.

What actually happens

- Start: Equipment running normally
- Utility power is deliberately removed
- UPS switches to battery — instantly
- Battery test runs for X minutes
- Utility power is restored
- UPS returns to normal — batteries recharging

Why is it needed

- Batteries Can Fail Silently
- Real Outages can Happen



Common Issues

- Battery not at full SOC on test day — reschedule or partial test
- Maintenance bypass transfer tested before line-interactive test
- Inadequate ventilation for load bank heat rejection during test
- Static transfer switch (STS) nuisance transfer during test steps
- Runtime falls short — battery capacity or age issue

SDEN & MDF – What Are They?

MDF

Main Distribution Frame

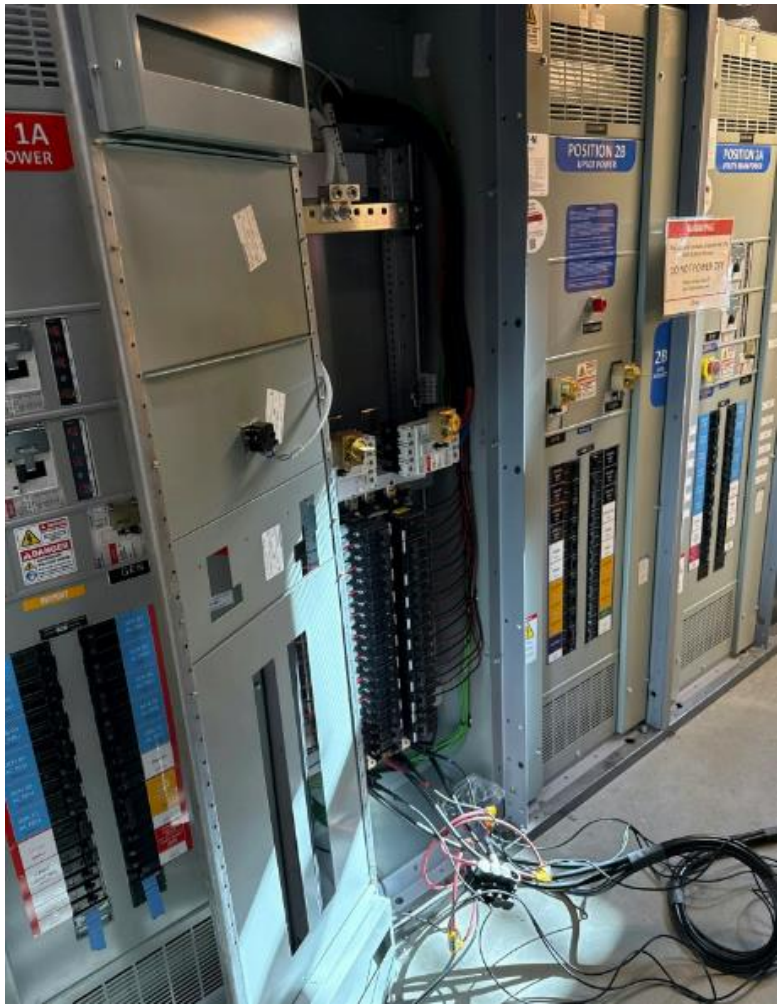
- Built-in place on-site
- Multiple specialized contractors
- Longer lead times
- Complex procurement
- High project dependencies
- Significant construction effort

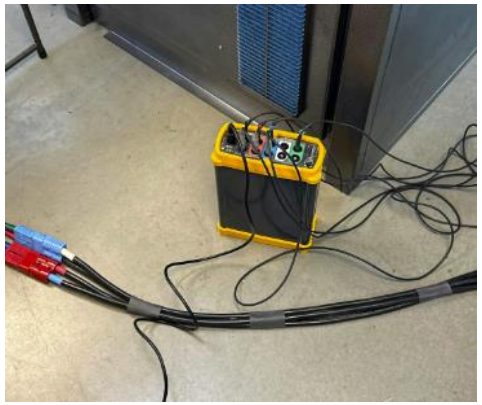
S D E N

S	D	E	N
Streamlined	**Dynamic**	**Extended**	**Nesting**
All-inclusive flat-pack: rack, cabling, cooling, security, low voltage & electrical	Flexible, scalable design adaptable to different fulfillment center program types	Supports up to 7 x 42U IT enclosures, extending capacity as the facility grows	Components nest as one integrated system, shipped directly to the construction site

- DEN is an individual modular unit – where (1) single DEN houses one 42 U racks
- Modular MDF (Main Distribution Frame) – fast and economical alternative to MDF rooms with a capacity of up to 7 IT enclosures
- Procured by as a single unit, simplifying procurement
- Streamlined, as all-inclusive infrastructure containing all the material and related infrastructure
- Reduced project dependencies

Pre-Test Field Setup





50% Load for 1 hour

100% Load for 3 hours

Test Results

TIME (minutes)	% LOAD	RUN TIME (hours)	VOLTS (A-N)	VOLTS (B-N)	VOLTS (C-N)	KW LOAD	KVA LOAD	FREQUENCY (HZ)
15	50	0.25	119.8	119.8	119.8	28.7	28.7	60
30	50	0.50	119.8	119.9	119.9	28.7	28.7	60
45	50	0.75	119.8	119.8	119.8	28.7	28.7	60
60	50	1.00	119.7	119.7	119.8	28.7	28.7	60
15	100	0.25	119.6	119.6	119.7	56.8	56.9	60
30	100	0.50	119.6	119.6	119.7	56.8	56.9	60
45	100	0.75	119.6	119.7	119.7	56.6	56.7	60
60	100	1.00	119.6	119.7	119.7	56.6	56.6	60
75	100	1.25	119.6	119.6	119.7	56.6	56.6	60
90	100	1.50	119.6	119.6	119.6	56.6	56.6	60
105	100	1.75	119.6	119.6	119.6	56.6	56.6	60
120	100	2.00	119.7	119.7	119.7	56.6	56.6	60
135	100	2.25	119.7	119.7	119.8	56.6	56.6	60
150	100	2.50	119.8	119.6	119.6	56.6	56.6	60
165	100	2.75	119.7	119.8	119.7	56.6	56.6	60
180	100	3.00	119.7	119.7	119.8	56.6	56.6	60

IR Camera Imaging

The Overall Commissioning Process

01

Pre-Design

Owner's Project Requirements (OPR)
Cx scope defined

02

Design

Basis of Design (BOD) review
Spec input

03

Construction

Submittals
Site Observations
Pre-Functional Checklists (PFC)

04

Acceptance

Functional Performance Tests (FPT)
Issues log

05

Post-Accept.

Seasonal Testing
Owner Training
Final Cx report

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