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WESR Low-Voltage Operating Rules

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Tabel of content

1. Purpose, Scope, Principles (LV)

1.1 Purpose

This Low-Voltage (LV) Addendum sets **enhanced safety requirements** for planning, operating, isolating, working, testing, and restoring LV electrical installations under WESR. It establishes **Dead working as the default** and defines the limited conditions under which **Live work** may be considered.

1.2 Hierarchy and applicability

1. This Addendum is **mandatory** for all LV activities and **supersedes baseline WESR where it is more stringent**.
2. Where WESR is more stringent than this Addendum, **WESR prevails**.
3. WESR roles, safety documents, work process, and competence model remain in force; this Addendum **adds LV-specific controls**.

1.3 Scope

Applies to all work and operations on LV parts of electrical installations, including turbines, BOP equipment, switchboards, control panels, auxiliaries (UPS/chargers), instrumentation, and temporary power. It covers:

- **Operational activities:** switching, measurement, inspection, functional checks.
- **Work activities:** Dead working, working in the vicinity of live parts, and *exceptional* live work.

Note: High-voltage activities are governed separately and are out of scope for this Addendum.

1.4 Roles and responsibilities (LV emphasis)

Core WESR functions apply:

- **PREI** — appoints the PCEI and sets governance.
- **PCEI** — controls the installation; plans and verifies switchings and primary safety measures; issues/controls Safety Documents until restoration is complete.
- **PCWA** — controls the work activity; performs the on-site risk review (RISK-W); sets supplementary measures; briefs the team; clears the Safety Document.

LV-specific LOTO functions (LV only):

- **LV Isolation Lead (LV-IL)** — person in charge of LOTO on the day; executes the isolation plan; applies primary locks/tags; completes the Isolation & Lockout Record; coordinates group lockout.

- **LV Isolation Verifier (LV-IV)** — independent verifier; performs the four-eyes check on isolation points, tags, and the **test-measure-test** results; must be **different** from the LV-IL.
- **LV Lock User (LV-LU)** — any worker applying a personal lock; signs on/off the group lock station and follows PCWA briefing.

Competence: LV-IL and LV-IV must be **Skilled** for LV isolation/verification; LV-LU must be **Instructed** (or higher) and briefed by the PCWA.

1.5 Safety documents (LV usage)

- **Permit-to-Work (PTW)** — default Safety Document for LV Dead working and vicinity work; issued by PCEI (or D-PCEI) to the PCWA.
- **Sanction for Test (SfT)** — used where test conditions require varying primary precautions; presence and exclusivity rules apply.
- **Access Agreement (AA)** — used for non-electrical tasks that involve electrical risk (e.g., work near exposed live parts under barriers).

Each LV Safety Document must include LV confirmations (see Section 2.3).

1.6 Work process (six steps)

All LV activities follow the standard six-step flow:

1. **Plan & manage risks** (RAMS; define work boundaries; nominate PCWA and LOTO roles).
2. **Prepare the installation** (Switching Schedule; four-eyes review; execute switchings; apply LOTO; issue Safety Document).
3. **Prepare the work** (PCWA conducts RISK-W; set supplementary measures; team briefing).
4. **Perform the work** (controls maintained; change management applied).
5. **Restore the workplace** (remove tools/screens/earthing as applicable; workers withdrawn; PCWA clears).
6. **Restore the installation** (PCEI returns to normal operation).

1.7 LV safety principles (enhanced)

A. Dead working (default) — the Five Safety Rules

1. Disconnect completely.
2. Secure against reconnection (locks/tags at every point of isolation).
3. Verify absence of operating voltage using **test-measure-test** (instrument self-test before and after).
4. Apply earthing/short-circuiting or bonding **where design warrants** (e.g., long cables, stored charge).

5. Protect against adjacent live parts (barriers/screens/safe distance and, where needed, dedicated supervision).

B. Minimum distances (LV)

- Live working zone: **no contact**.
- Vicinity zone: maintain **≥ 300 mm** or install barriers/screens; the PCWA sets and documents the chosen control.

C. Live work (exceptional only)
Live LV work is **not routine**. If justified (e.g., measurement that cannot be performed de-energised), it requires:

- documented justification and RAMS,
- explicit approval by the appointed authority,
- appropriate PPE/tools/instruments and work positioning,
- presence/controls defined by the Safety Document (often via SfT).

1.8 LV LOTO model and independence

- **Execution:** LV-IL executes the isolation plan and applies LOTO; **PCEI** retains control of the installation.
- **Independent verification:** LV-IV performs a **four-eyes** check of isolation points, lock/tag IDs, and the **test-measure-test** results **before** the PTW is issued to the PCWA.
- **Group lockout:** Each LV-LU applies a personal lock at the group lock station and signs on/off; the PCWA verifies attendance and briefings.
- **Conflict-of-interest:** LV-IV **must not** be the LV-IL and must be independent of the LV-IL for the task at hand.

1.9 Standard LV statuses

Use the following status model consistently in documents and communications:
Isolated → Proved Dead → (Earthed/Bonded, if applicable) → Work in Progress → Suspended (Made Safe) → Under Test (Controlled) → Ready for Energisation → Restored / Normal Operation.

1.10 Records and traceability (LV)

All LV Safety Documents, Switching Schedules, Isolation & Lockout Records, test logs, and briefings must be uniquely identified, signed, time-stamped, and retained per the governing retention policy. Calibration status of measurement instruments and torque/insulation tools shall be verifiable at the point of use.

2. Roles, Documents, and Controls (LV)

2.1 Roles (LV emphasis)

- **PREI** — appoints the PCEI; sets governance and authorisation matrix.
- **PCEI** — controls the installation; plans and verifies switchings and primary safety measures; issues/controls Safety Documents until restoration is complete.
- **PCWA** — controls the work activity; performs on-site risk review (RISK-W); sets supplementary measures; briefs the team; clears the Safety Document.
- **D-PCEI** — written delegation of defined control tasks from PCEI for a bounded area/time.
- **Switching Assistant** — assists PCEI/D-PCEI with switchings (HV role; **not used for LV LOTO**).
- **LV Isolation Lead (LV-IL)** — person in charge of LOTO execution for the job; applies primary locks/tags; completes the Isolation & Lockout Record; coordinates group lockout.
- **LV Isolation Verifier (LV-IV)** — independent verifier; conducts the four-eyes check on isolation points, tags, and **test-measure-test** results before PTW is issued; must be different from LV-IL.
- **LV Lock User (LV-LU)** — each worker applying a personal lock; signs on/off the group lock station.

Competence: LV-IL and LV-IV must be **Skilled** for LV isolation/verification. LV-LU must be **Instructed** (or higher) and briefed by the PCWA.

2.2 Safety documents (LV usage & rules)

- **Permit-to-Work (PTW)** — default for LV **Dead working** and **vicinity** work; issued by PCEI/D-PCEI to PCWA.
- **Sanction for Test (SfT)** — used when LV testing requires varying primary precautions; **presence and exclusivity** apply (no parallel Safety Document on the same equipment).
- **Access Agreement (AA)** — used for non-electrical tasks with electrical risk (e.g., near exposed live parts protected by barriers).

Common rules:

1. Unique ID, version, signatures, timestamps.
2. Clear equipment boundaries and single point of control (PCEI).
3. Hand-back sequence: PCWA clears → PCEI restores installation.

2.3 Enhanced LV confirmations (mandatory content)

A. Switching & isolation (PCEI / LV-IL)

1. **Visible break or reliable position indication** at every isolation point.

2. All **energising directions** identified and made inoperative (including aux/UPS/generator/backfeed).
3. **Control/signal circuits** isolated where they can energise or influence LV equipment.
4. **Four-eyes** approval of the Switching Schedule before execution.

B. Verification of absence of voltage (LV-IL; witnessed/verified by LV-IV as required)

1. **Test-measure-test** with suitable instrument; **self-test before and after**.
2. **Residual energy discharged** (capacitors/cables); **bonding/earthing** applied where the design warrants.
3. **Adjacent live parts** identified and controlled (barriers/screens/safe distance; supervision if needed).

C. Work boundaries & team control (PCWA)
Marked boundaries, safe access/egress, lighting, concurrent-work coordination, and recorded team briefing.

D. Interruptions & suspensions
On pause, leave installation **Made Safe** (primary precautions intact). Re-start requires documented re-confirmation and PCWA team re-brief.

2.4 Standard LV statuses (for documents & comms)

Isolated → Proved Dead → (Earthed/Bonded, if applicable) → Work in Progress → Suspended (Made Safe) → Under Test (Controlled) → Ready for Energisation → Restored / Normal Operation.

2.5 Field lists for LV document set (ready for form build)

PTW-LV-001 — Permit-to-Work (LV)

- Header: PTW ID; version; site; system/equipment; location; issuer (PCEI/D-PCEI); recipient (PCWA); validity window.
- Work description: task summary; selected working procedure (Dead / Vicinity / Live-exception via SfT reference); RAMS ID; Work Request ID.
- Roles on the job: PCEI; D-PCEI (if any); PCWA; **LV-IL**; **LV-IV**; list of **LV-LUs** (or link to sign-on sheet).
- Primary safety measures (from ILOR): isolation points; lock/tag IDs; visible break/position indication; control/signal circuits isolated; barriers/screens; earthing/bonding (if applicable); verification of absence of voltage completed/pending.
- RISK-W (PCWA): hazards at location; adjacent live parts control; distance or barrier selection; supplementary PPE/tools; team briefing acknowledgment.
- Instruments & tools: instrument ID/category; calibration dates; special tools (insulated, torque, test leads).

- Communication & four-eyes: Switching Schedule ID; four-eyes check reference; order/confirmation log reference (if used).
- Suspensions: “Made Safe” confirmation; re-start checklist requirement (Y/N).
- Clearance: workplace restored; tools/screens/earthing removed as applicable; workers withdrawn; PCWA signature/time.
- Final restoration: PCEI restoration signature/time; return to **Restored / Normal Operation**.

ILOR-LV-001 — Isolation & Lockout Record

- Header: ILOR ID; linked PTW ID; site; equipment; date/time.
- Isolation plan (per point): device ID; position (open/off/racked-out); visible break/position indication; feed directions; aux/UPS/generator/backfeed disabled.
- LOTO application: lock ID(s); **POI-TAG-LV** ID(s); applied by **LV-IL** (name/sign/time).
- Independent verification: **LV-IV** name/sign/time; **conflict check** box (LV-IV ≠ LV-IL).
- Stored/induced energy: capacitors discharged/shorted; cable discharge; bonding/earthing applied if required; notes on long cable runs.
- Verify Absence of Voltage: meter type/category; **self-test before/after**; test points; L1/L2/L3/PE & DC results; LV-IV verification tick.
- Adjacent live parts & barriers: identified; barrier/screen ID; supervision required (Y/N).
- Four-eyes review: second competent person sign/time (can be LV-IV if competent for the schedule).
- Changes during work: any reconfiguration; reason; authorised by (PCEI); time.

SS-LV-001 — Switching Schedule (LV)

- Header: SS ID; site; equipment; PCEI; executor(s); **LV-IL** identified for LOTO.
- Step list: device IDs; actions/positions; verification method; expected indications; interlocks; functional tests (if any).
- Four-eyes approval: reviewer name/sign/time; constraints/hold points.
- Completion: actuals vs plan; deviations; hand-off to PTW issuance.

POI-TAG-LV — Point-of-Isolation Tag

- Fields: tag ID; device/location; “Do Not Operate” statement; PCEI contact; **LV-IL** contact; date/time applied; PTW/ILOR references.

TEP-LV-001 — Test & Energisation Plan (supports SfT where needed)

- Header: TEP ID; equipment; PCEI/D-PCEI presence requirement; exclusivity note (no parallel Safety Document).

- Test scope: signals/measurements to be taken; test points; expected ranges; risk controls.
- Set-up controls: temporary protective devices; barriers; observers; stop criteria; communication protocol.
- Closure: post-test state; removal of temporary measures; transition back to PTW or to restoration.

AA-LV-001 — Access Agreement (LV)

- Header: AA ID; location/scope; issuer (PCEI/D-PCEI); recipient (in-charge person).
- Hazards/controls: adjacent live parts; barriers/screens; minimum distance; supervision level; prohibited actions.
- Duration & hand-back: start/finish; return conditions; sign-off.

RISK-W-LV-001 — On-Site Risk Review

- Fields: location hazards; proximity to live parts; environmental conditions; concurrent work; selected controls; team briefing log.

TMC-LV-001 — Tool & Meter Check Log

- Fields: instrument/tool ID; category/class; calibration due; visual check pass/fail; quarantined items.

EBL-LV-001 — Earthing/Bonding Log (if LV bonding is applied)

- Fields: bonding/earthing points; method/device; continuity check; removal time; authoriser.

CJL-LV-001 — Change Log

- Fields: change ID; description; reason; impacted sections/forms; approver; effective date.

3. Roles & RACI (LV)

Legend: R = Responsible, A = Accountable/Approver, C = Consulted, I = Informed

Task (LV)	PREI	PCEI	D-PCEI	PCWA	LV-IL	LV-IV	LV-LU	Notes
Nominate PCWA & approve plan (RAMS/work request)	A	C	I	R	I	I	I	Work planner submits; RAMS appended to Work Request.
Prepare Switching Schedule (LV)	I	R/A	R (if delegated)	C	C	C	I	Four-eyes approval required before issue.
Execute switchings / apply primary safety measures	I	A	R	C	R	C	I	PCEI remains in control over the affected installation part.
Issue Safety Document (PTW / SfT / AA)	I	R/A	R (if delegated)	C	C	C	I	Issued by PCEI/D-PCEI to PCWA.
Perform RISK-W at work location	I	C	I	R/A	C	C	I	PCWA sets safety distance & supplementary measures.
Apply LOTO & complete ILOR	I	A	C	C	R	C	C	LV-IL executes; LV-LUs sign on; PCWA oversees briefing.
Independent verification of isolation & absence of voltage	I	A	C	C	C	R	I	LV-IV must be independent from LV-IL.
Team briefing / boundary control	I	C	I	R/A	C	C	R (attendance)	PCWA ensures understanding & sign-on.
Perform work activity	I	C	I	R/A	C	C	R (own actions)	Abort if new risks emerge.
Suspension (“Made Safe”) & re-start checks	I	A	C	R	R	C	I	Re-brief before re-start.
Clearance of Safety Document (hand-back)	I	A (receives)	I	R (clears)	C	C	I	PCWA clears to PCEI; then PCEI restores.
Restore installation to normal	I	R/A	R (if delegated)	I	C	I	I	Return of control documented.

4. Operational & Working Procedures (LV)

4.1 Operational procedures (LV)

Operational activities (switchings, measurements, tests, inspections) may proceed **only when risk is low** and appropriate tools are used; otherwise use a working procedure.
Controls to embed in SS-LV-001 / PTW-LV-001: identify all energising directions (incl. UPS/gensets/backfeed); confirm visible break or reliable position indication at each isolation point; isolate control/signal circuits as needed; four-eyes approval before issue; order/confirmation logging when used.

4.2 Working procedures (LV)

4.2.1 Dead working (default)

Apply the Five Safety Rules in order:

1. Disconnect completely (all sources; visible break or reliable indication; withdrawable units in disconnected position; discharge capacitors/cables; isolate control/signal circuits).
2. Secure against reconnection (locks/tags at all devices; disable auxiliary power if required).
3. Verify absence of operating voltage — **test-measure-test** with a suitable instrument; **self-test before & after**; test phase-to-earth/neutral and phase-to-phase as applicable; document results on **ILOR-LV-001**.
4. Apply earthing/short-circuiting or bonding where design warrants (e.g., long cables, stored charge).
5. Protect against adjacent live parts (barriers/screens/safe distance, supervision).

Vicinity & distances: For LV, live zone = **no contact**; vicinity zone = **≥ 300 mm** unless barriers/screens are installed and supervised.

4.2.2 Working in the vicinity of live parts (LV)
Use when parts remain energised **outside** the work boundary. Requirements: PCWA sets safety distance (≥ 300 mm) or installs barriers/screens; marks boundaries; briefs team. No person or tool may encroach the live working zone; special care with long objects. Screens are applied/removed as controlled actions.

4.2.3 Live work (exceptional)
Live LV work **shall not ordinarily take place**. If necessary, it must be justified and approved by the appointed authority, with suitable precautions and PPE, and supported by documented RAMS. Where testing requires varying primary precautions, manage via **Sanction for Test**; **PCEI/D-PCEI must be present** and no other Safety Document may be in force on the same equipment.

4.3 LOTO (LV) — execution & independence

- **LV-IL executes LOTO** per SS-LV-001; applies locks/tags (**POI-TAG-LV**); completes **ILOR-LV-001**.
- **LV-IV performs four-eyes verification** (isolation points, lock/tag IDs, **test-measure-test** results) **before** PTW issue to PCWA; LV-IV must be a different person than LV-IL.
- **Group lockout:** each **LV-LU** applies a personal lock at the group station; PCWA verifies sign-on/off and briefings.
- On **suspension**, leave installation **Made Safe** with primary precautions intact; re-start requires re-confirmation and re-brief.

4.4 Testing & commissioning (LV)

- Use **TEP-LV-001** when entering **Under Test (Controlled)**. Define test points, expected ranges, temporary devices, observers, stop criteria, and communications.

- **Presence & exclusivity:** for **SfT**, PCEI/D-PCEI present at the location; no parallel Safety Document on the same items.
- Post-test: remove temporary measures; transition back to PTW or to restoration (as applicable).

4.5 Workplace controls & housekeeping

Clear, marked boundaries; adequate access/egress & lighting; separation from non-electrical hazards; up-to-date drawings/records available; tool/PPE suitability & condition verified.

5. Maintenance (LV)

5.1 Purpose & scope

Sets minimum controls for **preventive** and **corrective** maintenance on LV equipment, including inspections, adjustments, replacements, firmware updates, functional checks, and condition-based tasks.

5.2 Planning & preparation

- RAMS & work definition; drawings & data; outage & interfaces; people & roles (PCWA, LV-IL, LV-IV, LV-LUs); tools & spares (instrument category, calibration, insulated/torque tools, approved spares).

5.3 Execution controls

- Routine replacements treated as **work activity** unless an approved operational instruction permits live change with defined safeguards.
- Protection/relay/PLC updates: require **SfT** or PTW depending on variation of primary precautions; define roll-back.
- Capacitors, VFDs, UPS strings: discharge/verify; bond/earth where warranted; confirm no residual charge.
- Adjacent live parts: barriers/screens or ≥300 mm vicinity control and supervision.
- Concurrent work: single PCEI control area; coordinate permits; no conflicting Safety Documents on same equipment.

5.4 Temporary interruptions & suspension

Use **“Suspended (Made Safe)”** status for holds. Primary precautions remain intact; site is secured; re-start requires documented re-confirmation and team re-brief.

5.5 Post-maintenance testing & restore

Functional tests per **TEP-LV-001** if primary precautions vary; otherwise under PTW. Quality checks (torque, insulation/continuity, polarity/phase rotation, labels/ferrules, housekeeping). Hand-back: PCWA clears; PCEI restores to **Restored / Normal Operation**; update drawings/records.

5.6 Defects & asset records

Tag unsafe/defective items out of service; record defect and interim controls; update asset registers, spares usage, calibration logs, and change history.

6. Competence & Authorisation (LV)

6.1 Competence levels

- **Skilled Person (LV):** can plan/execute LV isolation, verification, testing; eligible for **LV-IL** or **LV-IV**.
- **Instructed Person (LV):** can work under PCWA with briefing; eligible as **LV-LU**.
- **Ordinary Person:** may only enter controlled areas when escorted and briefed.

6.2 Role-specific authorisations

- **PCEI / D-PCEI:** appointed in writing with named control areas; renewal period stated.
- **PCWA:** appointed per work activity; accountable for RISK-W and team control.
- **LV-IL / LV-IV:** listed on authorisation matrix for LV isolation/verification; independence rule enforced (LV-IV ≠ LV-IL).
- **LV-LU:** briefed and signed on; removes own lock only.

6.3 Training & assessment

Initial training covering WESR roles, this LV Addendum, Five Safety Rules, instrument categories, LOTO, barriers/distances, SfT, and change control. **Periodic refreshers** and **practical assessment** (isolation, test-measure-test, barrier use, suspend & resume). **Event-driven re-authorisation** after incidents, long absence, equipment upgrades, or procedure changes.

6.4 Supervision & ratios

PCWA sets supervision level based on task risk and team competence; higher oversight for live-adjacent or complex testing.

6.5 Refusal/stop-work

Any person may stop work on unsafe conditions; PCWA logs, PCEI decides disposition, and work only resumes after risk is controlled.

6.6 Visitors, apprentices & contractors

Visitors: escorted with local briefing; no exposure to live zones.
Apprentices/trainees: may assist as **LV-LU** under direct supervision.
Contractors: competence and authorisations verified; briefed to this Addendum; language and communications confirmed.

7. Procedural Checklists (LV)

A. Dead-Working Checklist (LV-IL executes; LV-IV verifies)

1. Boundaries identified; work description and equipment IDs confirmed.
2. All sources identified (incl. aux/UPS/generator/backfeed).
3. Isolation devices operated to OFF/disconnected/withdrawn; visible break or reliable position indication confirmed.
4. **Locks/tags** applied at each isolation point (**POI-TAG-LV** IDs recorded).
5. Control/signal circuits isolated where they could energise or influence equipment.
6. Stored/induced energy eliminated (capacitors discharged/shorted; long cables discharged; bonding/earthing if warranted).
7. **Test-measure-test** performed with suitable instrument; **self-test before & after**; results logged.
8. Adjacent live parts controlled (barriers/screens or ≥300 mm distance + supervision).
9. PCWA brief completed; team sign-on; PPE/tools/instruments verified.
10. **LV-IV** four-eyes verification done; PTW issued to PCWA.

B. Re-Energisation Checklist (PCWA clears → PCEI restores)

1. Work complete; no persons/tools/materials in the work zone; covers/screens/temporary devices removed as applicable.
2. All earths/bonds and test links removed (if used) and recorded.
3. Cabinet housekeeping restored; labels/ferrules updated; doors/covers secured.
4. PCWA clears Safety Document (time/signature).
5. PCEI reviews Switching Schedule and ILOR; removes LOTO per plan; restores in defined order.
6. Functional check pass; unexpected indications investigated; status set to **Restored / Normal Operation**.

7. Records updated; lessons captured if deviations occurred.

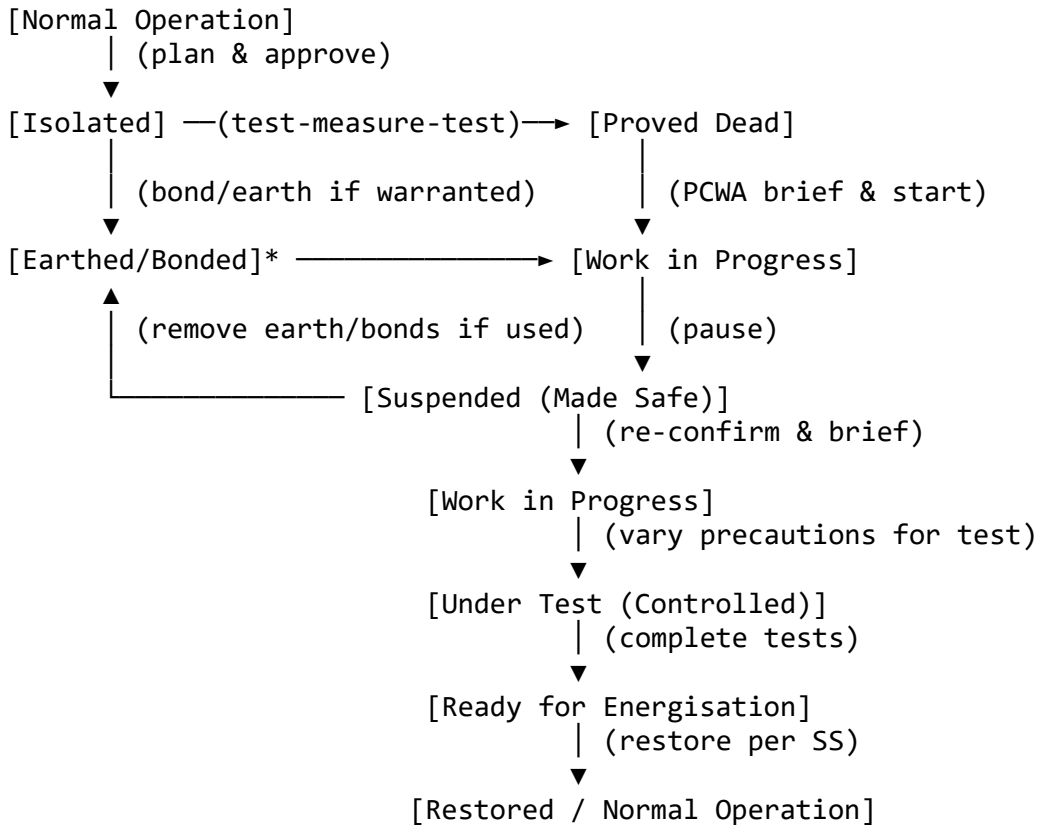
C. Suspension / Re-Start Checklist

1. Installation left **Made Safe** (all primary precautions intact).
2. Workface secured; warnings posted; responsibilities during pause defined.
3. On re-start: reconfirm isolation points, tags, instrument status; re-brief team; re-validate boundaries/adjacent live parts controls; resume.

D. PCWA Briefing Checklist
Scope, hazards, boundaries, adjacent live parts controls, PPE/tools/instruments, communication signals, emergency arrangements, stop-work expectations, and sign-on sheet complete.

E. SfT / LV Test Checklist (when entering Under Test)
Justification, exclusivity (no parallel Safety Document), **PCEI/D-PCEI presence**, test points & expected ranges, observers, temporary devices, stop criteria, communication protocol, and post-test return state.

8. LV Status Model & Transitions



Earthed/Bonded is conditional for LV where design warrants (e.g., long cables, stored charge).

Transition rules (high level):

- Normal → Isolated: Switching Schedule executed by PCEI/D-PCEI; LV-IL supports.
- Isolated → Proved Dead: **Test-measure-test** complete; LV-IV verification before PTW.
- Proved Dead → Work in Progress: PTW issued; PCWA brief done; LV-LUs signed on.
- WIP → Suspended: site left **Made Safe**; re-start requires re-confirmation and briefing.
- WIP → Under Test: via **SfT/TEP-LV-001**; presence/exclusivity enforced.
- Ready for Energisation → Restored: PCWA clears; PCEI restores per SS.

9. Change Control & Document Governance (LV)

9.1 Versioning & identifiers

Use semantic versioning (e.g., **v1.0.0**) and unique document IDs (PTW-LV-001, ILOR-LV-001, etc.). Every issue/revision shows **Effective Date**, **Supersedes**, and **Change ID**.

9.2 Proposing a change

Submit a **Change Proposal (CJL-LV-001)** including: problem statement, scope, affected sections/forms, drivers, risk assessment, training impact, and rollout plan.

9.3 Review & approval

Technical review: PCEI (installation controls), PCWA panel (workface practicality), and HSE/Compliance.
Approval: PREI (or named delegate). High-impact changes may require pilot and verification.

9.4 Communication & rollout

Publish updated documents; archive superseded versions; brief PREI/PCEI/PCWA/LV-IL/LV-IV populations; update training and assessments; set a **go-live date** with cut-over rules.

9.5 Records retention

Retain Safety Documents, ILORs, TEPs, incident/near-miss reports, calibration certificates, and Change Logs per Annex L.

Annexes

Annex A — Emergency & Incident Response (LV)

A1. Priorities: 1) Make safe; 2) Preserve life; 3) Preserve scene; 4) Notify.
A2. Shock/arc response: Isolate power if safe; otherwise pull casualty clear with non-conductive aid; call emergency number; AED if indicated; cool burns with clean water ≥20 min; cover with sterile dressing.
A3. Medical evaluation: Any electric shock (suspected or confirmed) → **mandatory medical evaluation** before return to work.
A4. Notifications: PCWA → PCEI immediately; PREI/HSE per site timelines.
A5. Scene control: Stop work; barricade; keep switching positions and instruments unchanged until released.
A6. Re-authorisation: Resume only after cause known, risks controlled, team re-briefed, and authorising roles confirm in writing.

Annex B — PPE & Task Matrix (LV)

Task type	Hands	Eye/Face	Clothing	Hearing	Footwear	Notes
Dead work (enclosed panels)	Insulating gloves for LV isolation tasks (when handling conductors/components)	Safety glasses	Non-melting workwear	As required	Safety footwear	Gloves may be removed for non-electrical sub-tasks after PCWA assessment.
Dead work (open cabinets)	Insulating gloves	Safety glasses/face shield if risk of ejected parts	Non-melting workwear	As required	Safety footwear	Screens/barriers in place; tools insulated as needed.
Vicinity work (≥300 mm, barriers in place)	Task-appropriate	Safety glasses	Workwear	As required	Safety footwear	Maintain distance; supervise if close tolerances.
Live testing under SfT (exceptional)	**Insulating gloves rated for task**	**Face shield**	**Arc-rated** where justified	As required	Safety footwear	Use TEP; observers; stop criteria; minimise exposure duration.

PPE governance: PCWA confirms PPE suitability at briefing; defective PPE removed from service.

Annex C — Test Instruments & Tooling

C1. Approval: Only instruments/tools on the approved list; calibration in date.
C2. Daily checks: Visual inspection; function check; **self-test before and after** for voltage presence tests.
C3. Categories: Select measurement category appropriate for the circuit; leads/accessories match instrument rating.
C4. Quarantine: Any failed check → quarantine, tag, and record in TMC-LV-001.

C5. Insulated tools: Use where credible contact risk exists; verify insulation integrity.
C6. Probes/adapters: Guarded tips in confined spaces; no interlock defeat.

Annex D — LOTO Hardware Governance

D1. Identification: Unique padlock IDs; POI-TAG-LV shows tag ID, device/location, contacts, date/time.
D2. Key control: Personal locks have unique keys; **lost key** → escalate to PCEI; removal by controlled method with documented verification that owner is clear.
D3. Group lock station: Fixed or mobile; sign-on/off sheet for LV-LUs; station ID on PTW and ILOR.
D4. Spare locks: Controlled issue logged to LV-IL; returned at close-out.
D5. Tag content: "Do Not Operate — Personnel Working"; PTW/ILOR references; PCEI and LV-IL contacts.

Annex E — Communication Protocol

E1. Order/confirmation: Giver states order → receiver **read-backs verbatim** → giver says "Confirmed."
E2. Channels: Prefer a single dedicated channel during critical steps; record start/end time on SS-LV-001.
E3. Written vs verbal: Device positions and hold-points are written on the Switching Schedule; no step proceeds without recorded confirmation.
E4. Language: Briefings in a language understood by all; PCWA verifies comprehension (repeat-back).
E5. Handover: Any handover of PCEI/D-PCEI/PCWA control is logged with time and signatures.

Annex F — Temporary Power & Stored Energy

F1. Sources to consider: UPS, battery strings, VFD DC links, capacitor banks, PV/DC feeders, portable generators, parallel transformers.
F2. Controls: Disable/isolated changeovers; remove portable sources; open DC links where designed; **discharge & bond** capacitors/cables where warranted; verify no backfeed and record in ILOR.
F3. Re-energisation: Confirm removal of temporary supplies; remove labels; update records.

Annex G — Concurrent Work / SIMOPS

G1. Single point of control: One PCEI for the affected installation part.
G2. Permit coordination: No conflicting Safety Documents on the same equipment; interfaces documented (mechanical, scaffolding, lifting).
G3. Physical segregation: Barriers/locks/labels for adjoining works; clear signage.
G4. SIMOPS meeting: For overlapping tasks, hold a short coordination meeting; record decisions and constraints.

Annex H — Interfaces & Boundaries

H1. Boundary definition: Drawn on PTW; shows what is inside/outside the work scope.
H2. HV/LV interface: LV Addendum applies up to the defined boundary; HV tasks governed separately.
H3. External parties: Where external interfaces exist, document contact persons, notification triggers, and hold-points.

Annex I — Labelling & Drawings

I1. Device labels: Unique equipment ID matching drawings; direction of feed where useful; danger and isolation labels legible.
I2. Wiring IDs: Ferrule scheme consistent across terminations; no duplicate IDs.
I3. Drawings control: Latest issue at point of work; red-line changes during job; update to as-built before close-out.
I4. Panel schedules: Updated after replacements/setting changes.

Annex J — Audit & Performance

J1. Internal audit checklist (sample):

- PTW complete and legible; LV-IL/LV-IV identified; independence enforced.
- ILOR shows all isolation points, lock/tag IDs, **test-measure-test** with self-test logs.
- RISK-W covers adjacent live parts; chosen control (barrier/≥300 mm) documented.
- Instruments/tools on approved list; calibration valid.
- Suspension/re-start records present; communication logs for switching.
- Restoration sequence followed; records updated.

J2. KPIs: % PTWs with LV-IV verification; % instruments within calibration; # deviations/waivers and closure timeliness; near-miss reporting rate; audit pass rate.

J3. Review cadence: Quarterly management review; action tracker maintained.

Annex K — Deviation/Waiver Control

K1. When allowed: Only where safety intent is preserved and risk is demonstrably controlled; **never** for convenience.
K2. Request content: Reason, scope, affected sections/forms, risk assessment, additional controls, sunset date, training impacts.
K3. Approval: PREI (or delegate) in writing; copy to PCEI and PCWA.
K4. Closure: Verify outcomes; record lessons; withdraw temporary instructions.

Annex L — Records Retention

Record	Minimum retention
PTW-LV-001, ILOR-LV-001, SS-LV-001, AA-LV-001	3 years (or next audit cycle, whichever is longer)
TEP-LV-001 (including SfT exclusivity notes)	3 years
RISK-W-LV-001, RAMS-LV-001	Project life + 2 years
TMC-LV-001, calibration certificates	Until superseded + 1 year
EBL-LV-001	3 years
Incident/near-miss reports, medical eval confirmations	5 years
CJL-LV-001 (Change Log)	Life of standard