# Scope Of Works: Simulator Generator

1. **Project Overview**
   The purpose of this project is to provide a complete standby power generation system comprising an 800 kVA outdoor diesel (or alternative) generator set, complete with canopy, foundation/plinth, fuel system, exhaust system, automatic change-over switch gear (ATS/AMF panel), interconnection to the building's electrical distribution system, earthing, cabling, controls, testing and commissioning, and hand-over to the client in full working order.

2. **Standards and Regulations**
   The following standards are applicable to the project and the project is not limited to the mentioned standards.

   - OHSA Act 85 of 1993 – Electrical machinery regulations
   - SANS 10142-1 (Wiring of premises)
   - SANS 8528 (Reciprocating internal-combustion engine driven generating sets)
   - SANS 60034 (Rotating electrical machines)
   - IEC/BS standards as appropriate where SANS equivalents not available.
   - Compliance with Acts & Regulations: Occupational Health and Safety Act 85 of 1993, National Building Regulations and Building Standards Act 103 of 1977, local municipal by-laws, environmental regulations.
   - The installation shall be executed by qualified and registered contractors (Electrical Contractor registered with relevant body, competent persons on site).
   - Provide permits and local authority approvals where required (e.g., fuel tank bunding, noise emission, exhaust routing, municipal electrical connections).

3. **Extent Of Works**
   3.1 Supply

   The Contractor shall supply the following major equipment and components:

   - An 800 kVA, 400 V, 50 Hz, 3-phase standby generator set (diesel engine + alternator) sized for full 800 kVA output with an appropriate overload/fault margin.
   - Weatherproof, outdoor-rated sound-attenuated canopy or enclosure suitable for external installation, including appropriate ventilation, acoustic insulation, service access, lifting lugs.
   - Concrete plinth/foundation as per manufacturer recommendations (dimensions, anchor bolts, anti-vibration mounts).

- Fuel system: day tank / bunded tank (capacity for minimum X hours of full-load operation, per specification), fuel piping, filters, automation (low fuel level shutdown/alarm).
- Exhaust system: silencer/exhaust piping with bird-mesh guard, termination point, suitable for outdoor environment, including thermal insulation where required.
- Automatic change-over/AMF panel (automatic mains fail) with appropriate switchgear, breakers, busbars, control wiring, remote indicators/alarm, manual override facility.
- Interconnection cabling and conduit/trunking from generator output to change-over panel, from panel to existing building distribution board (or as specified), including power and control cables.
- Earthing/grounding system (earth rods, earth grid, bonding between generator frame, canopy, panel, building grounding).
- Auxiliary systems: battery charger, starter batteries, DC control system, instrumentation (engine gauges, alternator meters, alarms), automatic start/stop control logic.
- Civil works associated with installation: trenching for fuel lines and cables, preparation of site (grading, paving, bund walls, stormwater drainage where required).
- The bund wall must be able to take 110% of the fuel capacity.
- Commissioning aids: load bank or approved method of proving full-load capability; test instrumentation and certificates.
- Documentation: operating & maintenance manuals, as-built drawings, wiring diagrams, test certificates, guarantee/ warranty documents.

### 3.2 Delivery and transport

- The Contractor shall transport the generator set, canopy and related equipment to site (Johannesburg / South Africa) including any import clearance, freight, insurance, off-loading and storage on site (if staging is needed).
- The site and route shall be verified by the Contractor (clear access, crane/lifting, relevant site visits) and any required lifting gear/rigging shall be part of the Contractor’s scope.
- Protective packaging and storage on site until installation, including weather protection, security where needed.

### 3.3 Installation and assembly

- The Contractor shall carry out detailed site survey post contract award to verify dimensions, clearances, access, cable routes, fuel line routes, exhaust routing, ventilation.
- Installation of concrete plinth/foundation including formwork, reinforcement, curing, anchor bolt setting, level & dimension checks.

- Positioning of generator set on anti-vibration mountings, coupling to canopy (if separate), securing anchor bolts.
- Installation of fuel tank, bund wall (if required), fuel supply piping, filtration system, shut-off valves, low level sensors.
- Exhaust system installation: installation of exhaust piping from engine canopy to termination, supporting brackets, silencer, bird/rodent guard, insulation where required.
- Ventilation & airflow: ensure canopy/external installation has adequate intake/exhaust, comply with manufacturer's ventilation requirement and local ambient conditions.
- Electrical installation: power cabling from generator alternator to change-over panel, change-over panel to building distribution board, earthing/grounding conductors, cable trays/trunking, cable terminations, glands, lugs, labelling. Control wiring between engine, alternator, AMF panel, remote alarm/indicators.
- Installation of the AMF/change-over panel: mounting, wiring, integration with mains supply fault detection, generator start signal, change-over logic, manual override, busbars, protective devices.
- Integration of instrumentation, meters (voltage, current, power factor, frequency), alarms (low fuel, high water temperature, low oil pressure, overspeed, overcurrent, etc.).
- Testing of each subsystem during installation: insulation resistance testing, continuity checks, functional wiring tests.
- Site reinstatement: making good of building penetrations, waterproofing sleeves where cables pass through walls/roof, finishing and cleaning of installation area.

### 3.4 Testing and commissioning

- Factory Acceptance Test (FAT) of generator set and canopy (as required) prior to shipment; supply test report.
- On-site site acceptance test: run generator under load (either load bank or building load) for a defined period (e.g., 30 minutes full-load, plus load step test) to verify performance.
- Functional testing of change-over panel: simulate mains failure, generator start, change-over to generator supply, restore mains, change back, verify seamless operation.
- Safety & protective devices testing: over/under voltage, over/under frequency, overspeed, earth fault, differential protection (if applicable), alarms and shutdowns.
- Verification of earthing/grounding system: earth resistance tests, bonding continuity.

- Verification of fuel system: leakage, shut-off valve functionality, low fuel level alarm, bund wall integrity.
- Noise level measurement (if specified) to ensure compliance with ambient and site requirements (e.g., < 65 dB at 7 m) for outdoor installations.
- Provide certificate(s) of compliance (COC) in accordance with SANS 10142-1 (Wiring of premises), and other relevant SANS standards.
- Hand over of as-built drawings, wiring schematics, single-line diagram, maintenance schedules, operating manuals (min. 3 hard copies + electronic).
- Training of client's nominated operators/maintenance staff: at least 2 persons, covering operation, start/stop procedures, weekly/monthly checks, alarms, shutdowns, basic service tasks.
- Warranty/guarantee: Provide minimum 12 months (or e.g., 12 months or 1 200 hours whichever occurs first) warranty on equipment and installation workmanship.
- Generator shall reach full 800 kVA load, voltage/frequency within ±5% at full load, no abnormal vibration or noise.
- Change-over shall occur automatically within defined time (e.g., <60 seconds) upon mains fail and revert when mains resumes.
- All alarms and protective devices shall function correctly and shutdown under fault conditions.
- Noise emission outside canopy shall not exceed specified limit (e.g., 65 dB at 7 m).
- Earth resistance shall meet specified value (e.g., ≤5 Ω or as per site requirement).
- Fuel tank bund shall capture 110% of tank capacity and have no leaks.
- Wiring, terminations, labelling shall be complete and compliant with SANS 10142-1.
- Full documentation provided and training completed.

### 3.5 Documentation and training

- Update operational and maintenance manuals with new ATS integration
- Provide as-built drawings and control schematics
- Train site operators on the automatic switchover system, including emergency manual override procedures
- Provide Certificate of Compliance (CoC) in terms of SANS 10142-1
- As-built wiring diagrams and control schematics.
- Test reports and commissioning certificates.
- Manufacturer data sheets and warranties.
- Operating manual and training.
- Provide spare parts list and critical spares availability

- Site survey report and proposed installation layout drawing.
- Equipment datasheets for generator, alternator, canopy, ATS panel, fuel tank.
- Concrete plinth drawings and structural details, anchor bolt layout.
- Wiring diagrams, single-line diagram of builder's installation.
- Load bank test certificate / factory test certificate.
- As-built drawings and installation record drawings.
- Operation & Maintenance manuals and maintenance schedule.
- Commissioning certificate and certificate of compliance (COC).
- Training session records and attendance list.
- Warranty/guarantee certificate.
- Final hand-over report including test results, measurement data (noise level, earth resistance, temperature rise etc).

### 3.6 Responsibilities and interfaces

- Client shall provide: site access, building services/infrastructure information (existing supply, cable run routing, building plans, civil works interface), power downtime schedule, and timely decisions on equipment location, approvals.
- Contractor shall: carry out detailed survey, propose final layout, cable routing, canopy placement, fuel tank location, submit drawings for approval, coordinate with other trades (civil/structural, HVAC, building management).
- Contractor must coordinate with building management, local supply authority, fuel supplier (if same site), ensure minimal disruption to building operations (particularly when mains supply is cut over to generator).
- Contractor to manage site logistics, safety plan, temporary works, lifting, protection of existing services and reinstatement.
- Contractor to attend site meetings, progress reporting, quality control documentation, risk management plan.

## 4. Health, safety and environment

- Contractor to prepare and maintain a Health & Safety (H&S) Plan in accordance with OHS Act and site requirements.
- Contractor to ensure safe access, lifting operations, scaffolding (if required), noise/vibration mitigation, fuel spill prevention/containment, smoke/exhaust routing compliance.
- Environmental protection: bund walls for fuel, proper disposal of waste oils/filters, compliance with environmental regulations.
- Signage and barricading around generator installation during works, especially during commissioning.

5. **Warranty, Maintenance and spare parts**
    - Provide minimum 12-month warranty on equipment and workmanship.
    - Provide schedule of maintenance inspections (e.g., quarterly) and major service after 12 months (or as specified). (etenders.gov.za)
    - Provide list of critical spares and recommended stock levels.
    - Provide emergency fault-response plan and contact details for support service.
    - Provide guarantee certificate and maintenance certificate upon handover.

6. **Contract strategy**

    The client and the contractor shall use the NEC4 ECC contract for this work. This includes all contract administration templates.