REDHAKHOL FOREST DIVISION

Odisha Forest Department

Sambalpur District, Odisha

NOTICE INVITING TENDER

(NIT No.: F & E/RKL/ 015 (OFFLINE)/2026-27)

FOR DESIGN, SUPPLY, INSTALLATION, COMMISSIONING, CLOG RESISTANCE SYSTEM AND ANNUAL MAINTENANCE CONTRACT OF SOLAR-BASED DRIP IRRIGATION SYSTEM WITH IoT INTEGRATION

15 km Bio-Fencing Plantation | 3 Solar IoT Units | AMC Years 2–4 | Redhakhol Forest Division

Tender Reference No.	**F & E/RKL/ 015 (OFFLINE)/2026-27**
Name of Work	Design, Supply, Installation, Commissioning, Clog Resistance System & Annual Maintenance Contract (Years 2–4) for Solar-Based IoT Drip Irrigation System – 15 km Bio-Fencing Plantation, 3 Units
Estimated Contract Value	As per BOQ enclosed (Installation + Clog Resistance + AMC quoted separately per year)
Tender Document Fee	Rs. 1000/- (One Thousand) Only Non-refundable, DD in favour of DFO, Redhakhol)
EMD Amount	Rs. 5000/- (Five Thousand) as Demand Draft/Bank Guarantee in favour of DFO, Redhakhol Forest Division, payable at Rairakhol.
Opening Date	2nd June 2026
Last Date of Submission	18th June 2026 (5:00 PM)
Date of Opening	19th June 2026 (10:00 AM)
Issued By	Divisional Forest Officer, Redhakhol Forest Division, Rairakhol

PART – I: TENDER NOTICE

REDHAKHOL FOREST DIVISION, ODISHA FOREST DEPARTMENT
Office of the Divisional Forest Officer, Rairakhol, Sambalpur District – 768109
Email: dforedhakhol@odisha.gov.in |

NOTICE INVITING TENDER

NIT No.: F & E/RKL/ 015 (OFFLINE)/2026-27

The Divisional Forest Officer, Redhakhol Forest Division, invites sealed tenders from eligible, experienced firms specialising in solar-powered irrigation systems and IoT/SCADA solutions for the Design, Supply, Installation, Commissioning, and Maintenance Support of a Solar-Based Drip Irrigation System with IoT Integration for the 15 km Lemon/Lime Bio-Fencing Plantation.

The irrigation system shall serve a three-row zig-zag citrus plantation established along 15 km of forest-village boundary in the Naktideul Range of Redhakhol Forest Division, Sambalpur District, Odisha. Three irrigation units (one per 5 km) are required, each operating fully off-grid on solar power with IoT-based remote monitoring and automated control.

PART – II: SCOPE OF WORK

The Contractor shall be responsible for the complete design, supply, installation, commissioning, integration, training and maintenance support of the Solar-Based Drip Irrigation System with IoT Integration across three units covering 15 km of bio-fencing plantation. The scope is divided into four sub-components:

2.1 Component F1 – Solar Power Infrastructure

One unit per 5 km; 3 units total for the full 15 km plantation. Each unit shall comprise:

Sl.	Component	Specification
1	Solar PV Panels	Min. 5 kW peak capacity per unit; half cut design, monocrystalline; IP65-rated; galvanised MS mounting structure with tilt angle optimised for Odisha latitude (≈21°N)
2	Solar Charge Controller	MPPT-type, min. 40A, compatible with 24V/48V battery bank; overcharge, over-discharge, and short-circuit protection
3	Battery Bank	Minimum 48V, 300 Ah Li-FePO4 (Lithium Iron Phosphate), sized to provide 11.1 kWh of usable energy for running a 5 HP load for 3 hours and **continuous operation of IoT systems without solar input.**
4	Solar Pump	a) **Primary Borewell Pump:** 5 HP DC solar submersible pump; min. 30 m head; compatible with borewell depth of 250 ft / 76 m. b) **Surface Booster Pump:** 3 HP DC solar surface motor/pump; designed to draw water from ground-level tanks and pressurise the main line to min. 1.5 - 2.5 bar.
5	Solar Inverter / VFD	Solar Pump Controller / VFD (Dual-output capable or paired with automated changeover switch for sequential

		operation of borewell and booster pumps), remote ON/OFF and sequence scheduling via IoT RTU, supply and installation.
6	Civil Works	Foundation for MS mounting structure; electrical earthing; conduit runs for DC/AC wiring; weather-proof junction boxes, theft protection.

2.2 Component F2 – Drip Irrigation Distribution Network

Full drip irrigation network serving all three plantation rows across 15 km total length (5 km per unit):

Sl.	Component	Specification
1	Overhead Storage Tank	15,000 L HDPE Storage Tank(s) installed on a 1-meter high ground-level brick masonry/RCC plinth 2 Nos. per unit (6 total) at Central Location (Thermal Insulation, UV protection)
2	Main Line	HDPE pipe 63 mm dia., PN6; laid along plantation alignment; min. 5,000 RM per unit (15,000 RM total) **main line must be trenched to a minimum depth of 60 cm to 90 cm**.
3	Sub-Main Line	HDPE pipe 40 mm dia.; branching into each of the three plantation rows; 15,000 RM per unit (45,000 RM total), must be buried like above.
4	Drip Laterals	16 mm LLDPE drip lateral pipes with inline pressure-compensating drippers at 4 LPH, 2 m spacing; one lateral per row; installed along all three rows for full 15 km
5	Drip Emitters	Pressure-compensating inline drippers; 4 LPH; one per plant; clog-resistant; 22,500 emitters total. self-flushing anti-suck-back membrane" (Non-Drain / NDW feature)
6	Filter Unit	Sand + Screen filter at pump outlet; disc filter at sub-main inlet; min. 120 mesh to protect emitters; per unit (3 units total)
7	Fertigation Unit	Venturi-type fertigation injector per sub-main; with bypass valve; for future nutrient application; 9 Nos. total
8	Control Valves & Fittings	Ball valves at all junctions; air release valves (Double-Acting Kinetic Air Release & Vacuum Breaker Valves) at high points; flush valves at lateral ends; pressure gauges at main and sub-main inlets
9	Zonation	Each unit shall be classified in three Zones and watering those Zones actively at a time using IoT. The IoT controller should be programmed to irrigate sequentially (Zone 1, then Zone 2, then Zone 3)

2.3 Component F3 – IoT Integration and Automation System

Each of the 3 units shall be equipped with a complete IoT automation system enabling remote monitoring, automated scheduling, and real-time alerting:

Sl.	Component	Specification
1	IoT RTU / PLC Controller	Industrial-grade IoT Remote Terminal Unit (RTU) or PLC; IP65 weatherproof enclosure; capable of controlling solenoid valves, monitoring sensors, and transmitting data over 4G GSM/5G/Wifi network; local data logging (SD card) for offline backup
2	Automated Solenoid Valves	24V DC latching-type motorized/solenoid ball valves; min. 3 zones per unit (9 Nos. total); remotely operable via IoT controller; fail-safe closed configuration
3	Soil Moisture Sensors	Capacitive soil moisture sensors; min. 2 per km = 10 per unit (30 Nos. total); connected to IoT RTU; automated irrigation triggered when soil moisture falls below configurable threshold
4	Rain Gauge	Tipping bucket rain gauge; min. 0.2 mm resolution; 1 per unit (3 Nos. total); automatically suspends scheduled irrigation during or after user-defined rainfall threshold
5	Flow Meters	Ultrasonic or paddle-wheel flow meters at main line outlet and sub-main zone inlets; 4 per unit (12 Nos. total); connected to IoT RTU for water use monitoring and leakage detection
6	4G LTE/5G/Wi-Fi based Communication Module	Industrial 4G LTE modem with SIM slot per RTU; cloud data transmission at configurable intervals (min. 15-min telemetry); local SD card logging during network loss
7	Cloud SCADA / IoT Platform	Cloud-hosted web and mobile app (Android + iOS); real-time dashboard showing: soil moisture, pump status, zone valve status, flow rates, solar generation, battery state-of-charge, rainfall, irrigation schedules; minimum 3-year subscription included; data export to CSV/Excel
8	SMS / WhatsApp Alerts	Automated SMS and WhatsApp notifications to registered users (DFO, Range Officer, VSS) for: pump failure, low battery, sensor disconnection, zone valve fault, leakage detection alarm
9	Automated Irrigation Scheduling	Programmable scheduler with daily/weekly/seasonal settings; supports time-based AND soil moisture threshold-triggered modes simultaneously; manual override from mobile app or on-site control panel
10	Role-Based User Access	Admin (DFO/Range Officer) – full system control; Operator (VSS members) – monitoring + manual override; dashboard; minimum 10 user accounts
11	Solar Energy Monitoring	Daily solar energy generation log; battery state-of-charge history; pump run-hours; integrated with IoT dashboard; fault alerts for under-generation and low battery
12	Sequential Pump Control Logic	The IoT RTU/PLC must be programmed and electrically wired for **Sequential Dual-Motor Operation**. The system shall mechanically and programmatically ensure that the primary borewell pump and the surface irrigation booster pump CANNOT operate simultaneously. The RTU shall manage a two-phase daily cycle: Phase 1 (filling ground-level tanks via

		borewell pump) and Phase 2 (pressurized zonal irrigation via surface booster pump). The logic must include dry-run protection for the booster pump and overflow protection for the tanks via integrated tank level sensors.

2.4 Component F4 – Installation, Commissioning, Training and Support

The Contractor shall be fully responsible for the following post-supply activities:

- Complete installation and civil works for all 3 units (pump installation in borewells – **borewells to be provided by the Division**; coordination required)
- Full system commissioning including calibration of all soil moisture sensors, flow meters, and IoT data streams
- Integration testing: Verification of automated irrigation cycles, sensor-triggered operation, remote override via mobile app, and App Alerts/SMS/WhatsApp alert delivery to all registered users
- Site Acceptance Test (SAT): Formal testing in presence of DFO/Range Officer covering all functionalities; punch-list closure before final handover
- 2-day hands-on User Training at site for Forest Division staff and VSS members covering system operation, mobile app usage, routine maintenance, and basic fault diagnosis
- Operation and Maintenance Manual in Odia and English for each of the 3 units
- 12-month on-call technical support post-commissioning; remote diagnostics via IoT platform; site visit for critical faults within 48 hours

2.5 Component F5 – Clog Resistance System

Given the remote forest-village boundary location and the nature of the water source (borewell groundwater with potential iron, sediment, and biological load), a dedicated, multi-stage Clog Resistance System shall be designed, supplied, and installed as an integral sub-system of the drip irrigation network. This system shall protect the entire pipeline, emitter, and IoT sensor network from clogging and sedimentation throughout the project life. The Clog Resistance System is a mandatory component and its performance shall be verified at SAT and during each AMC inspection cycle.

F5.1 – Multi-Stage Filtration at Source (Per Unit)

Sl.	Component	Specification
1	Gravel / Media Filter	Pressure sand/gravel media filter at pump discharge; removes coarse particulate matter (sand, silt, iron oxide particles) from borewell water; minimum flow rate matching pump capacity; GI/FRP housing; top-mount automatic or manual backwash provision
2	Screen Filter (Primary)	Stainless steel woven screen filter; min. 200 mesh (75 micron); installed in-line after gravel filter; removable cartridge for cleaning; self-flushing or manual flush valve
3	Disc Filter (Secondary)	Multi-disc filter stack; min. 130 micron filtration; installed at sub-main inlet per zone; colour-coded disc stacks for easy identification of filtration grade; automatic self-cleaning disc filter preferred; manual cleaning provision mandatory
4	Activated Carbon / Chemical Dosing Unit	Inline dosing unit for controlled injection of chlorine solution or citric acid at main line; for periodic biological clog prevention (algae, biofilm); dose rate adjustable; compatible with fertigation injector; 1 per unit
5	Pressure Differential Indicators	Pressure differential gauges across each filter stage to indicate clogging status; triggers visual alarm on IoT dashboard when differential pressure exceeds set threshold, notifying the operator to clean filters

F5.2 – Emitter-Level Clog Resistance

Sl.	Component	Specification
1	Anti-Clog Pressure-Compensating Drippers	Inline drippers with large turbulent-flow labyrinth pathway (min. cross-section 0.8 mm × 0.8 mm); self-flushing anti-suck-back membrane that prevents soil ingestion when system is off; 4 LPH discharge; clog-resistant designation per manufacturer test data to be submitted
2	Lateral Flush Valves	Automatic flushing end-caps on each drip lateral; automatically purge sediment from lateral ends at the start of each irrigation cycle; 1 per lateral (minimum 45,000 Nos. for 3 rows × 15 km)
3	Anti-Drain / Check Valves on Laterals	Installed at entry to each lateral from sub-main to prevent drainage and back-suction; prevents soil particles and root intrusion into the lateral when system is off

F5.3 – Pipeline Protection and Anti-Clog Measures

Sl.	Component	Specification
1	Flushing Manifold at Sub-Main Ends	Lockable flush valve at the terminal end of each sub-main section; used for periodic high-velocity flushing to expel accumulated sediment from the pipeline; scheduled flushing protocol defined in O&M Manual
2	Air Release / Vacuum Breaker Valves	Combination air release and vacuum breaker valves at all high points of main and sub-main lines; prevent air lock and vacuum-induced siphoning of soil into laterals during shutdown
3	UV-Resistant Pipe Materials	All surface-laid LLDPE lateral pipes to be UV-stabilised (carbon black compound); UV degradation causes microcracking that increases algae and sediment ingress; UV stabilization extends service life and reduces biological clogging
4	IoT-Integrated Clog Detection	Flow deviation algorithm in IoT RTU: compares real-time zone flow meter readings against baseline flow curves; if flow drops below 85% of baseline, auto-alert sent to DFO via App Alerts/SMS/WhatsApp indicating possible clog in that zone; logged in cloud dashboard with timestamp and zone ID

F5.4 – Periodic Chemical Flushing Protocol

- The Contractor shall prepare and submit a Clog Prevention and Chemical Flushing Protocol as part of the O&M Manual, specifying: frequency of media filter backwash (minimum monthly during dry season), disc filter cleaning cycle (minimum fortnightly), lateral end-flush schedule (minimum at start of each irrigation season), and acid/chlorine flush cycle for biological clog prevention (minimum quarterly)
- The first chemical flushing shall be demonstrated live during the SAT and signed off by the DFO
- All chemical dosing shall use **food-grade citric acid or calcium hypochlorite at concentrations safe for plants and soil; maximum permissible doses to be specified in the O&M Manual**

2.6 Component F6 – Annual Maintenance Contract (AMC): Years 2, 3 and 4

Following the expiry of the 12-month Defect Liability and on-call support period (Year 1), the Contractor shall provide a comprehensive Annual Maintenance Contract (AMC) for Years 2, 3, and 4 of the plantation project. The AMC ensures sustained performance of the entire Solar IoT Drip Irrigation and Clog Resistance System throughout the critical plant establishment and fruiting period. AMC rates for Years 2, 3, and 4 shall be quoted separately in the BOQ and shall be binding for the full AMC period.

F6.1 – Scope of AMC (Applicable to Each of Years 2, 3, and 4)

Sl.	Activity	Scope and Frequency
1	Scheduled Preventive Maintenance Visits	Minimum 2 comprehensive site visits per year (one per every 6 month) for all 3 units; each visit shall cover: inspection of all solar panels, battery bank, pump, inverter/VFD, pipework, filters, emitters, IoT hardware, and sensors; tightening of joints, connections, and clamps; lubrication of mechanical parts; verification of system performance against baseline data on IoT dashboard
2	Filter Cleaning and Backwash	Cleaning of sand/gravel media filter (backwash), screen filter cartridge replacement or cleaning, and disc filter stack disassembly and cleaning during every scheduled visit; additional visits triggered by IoT pressure differential alarms within 48 hours of alert
3	Clog Detection and Emitter Clearing	Full zone-by-zone flow test using IoT flow meter data to identify underperforming zones; physical inspection of flagged laterals; individual emitter inspection with flow rate verification (flow catch test); replacement of clogged or damaged emitters; lateral flushing at terminal ends; documentation of clogged emitter count per zone per km
4	Chemical Flushing and Acid Wash	Quarterly acid/chlorine flush of laterals and emitters (citric acid or calcium hypochlorite at prescribed concentrations); annual full-system acid wash of main line, sub-mains, and all laterals; record of dosage, duration, and post-flush flow test to be submitted after each chemical maintenance cycle
5	Damage Rectification and Pipe Repairs	Repair or replacement of damaged sections of main line, sub-main, and laterals due to animal interference (wildlife, rodents), UV degradation, mechanical damage, or soil movement; sealing of leakages; replacement of fittings, connectors, and end-caps; all repair materials and fittings to be supplied by the Contractor within AMC scope (up to 2% of total pipe length per year); damage beyond 2% to be reported to DFO separately and treated as additional work
6	Solar System Maintenance	Annual inspection and cleaning of PV panels (removal of dust, bird droppings, algae growth); check and top-up of battery electrolyte (for SLA batteries); verification of charge controller settings and protection cutoffs; inspection of all electrical connections, earthing, and cable insulation; replacement of blown fuses or damaged terminal connections within AMC scope
7	Pump and Motor Maintenance	Annual pull-out and inspection of submersible pump (visual check, impeller condition, motor winding insulation test); replacement of pump wear parts (seals, bearings, impeller if worn) within AMC scope; pump re-installation and performance test; motor run current and head pressure verification against commissioning baseline
8	IoT System and Sensor Maintenance	Annual calibration of all soil moisture sensors (30 Nos.) against reference standard; replacement of any sensor found out of calibration (within AMC scope); firmware updates to IoT RTU

		and mobile app; verification of 4G LTE connectivity and cloud data sync; renewal of annual cloud subscription included; battery replacement in wireless sensors (if applicable); testing of all solenoid valves for correct operation
9	Overhead Tank and Civil Infrastructure	Annual inspection of overhead storage tanks for algal growth, sediment accumulation, and structural integrity; tank cleaning and disinfection (annual); inspection of MS/RCC support structures for corrosion, cracks, or settlement; minor rectifications within AMC scope; reporting of major structural defects to DFO
10	Emergency Breakdown Response	24/7 remote monitoring via IoT dashboard; response to breakdown alerts within 4 hours (remote diagnostics); on-site rectification within 72 hours for non-critical faults; within 24 hours for critical faults (pump failure, full zone shutdown, controller failure); IoT-logged fault and resolution records to be submitted in quarterly AMC reports

F6.2 – AMC Excluded Items (Covered under Separate Work Orders)

- Replacement of major equipment due to theft, deliberate vandalism, or elephant/wildlife damage beyond normal operational wear (quoted separately as additional work)
- Damage to pipeline exceeding 2% of total pipe length in any single year (to be reported and treated as additional work with DFO approval)
- Extension of pipeline coverage beyond original 15 km scope
- Borewell deepening or pump upgrade due to water table decline

PART – III: BILL OF QUANTITIES (BOQ)

Rates shall be inclusive of all design, supply, civil works, installation, commissioning, testing, training, O&M manuals, and 3-year cloud platform subscription. 12-month on-call support to be included. GST shall be quoted separately.

BOQ – F1: Solar Power Infrastructure

Sl.	Description	Unit	Qty.	GST Rate (%)	Amount (Rs.) inclusive of GST
F1.1	Solar PV System (Minimum 5 kW peak capacity; monocrystalline panels + MPPT charge controller + MS mounting structure at optimum tilt angle), supply and installation.	Units	3		
F1.2	**Minimum 48V, 300 Ah Li-FePO4 (Lithium Iron Phosphate), sized to provide 11.1 kWh,** supply and installation	Units	3		
F1.3	Primary Solar Pump (5 HP DC submersible or AC with solar inverter/VFD, min. 30 m head), supply and installation in borewell.	Units	3		
F1.4	Solar Inverter/VFD (min. 3 kVA, soft-start, DC + battery compatible, remote ON/OFF via IoT), supply and installation	Units	3		
F1.5	Civil works for PV structure foundation, electrical earthing, conduit wiring, weatherproof junction boxes per unit	Units	3		
F1.6	Surface Booster Pump (3 HP DC or AC motor, to pressurise drip network from ground-level tanks), supply, installation, and integration with sequential controller.	Units	3		

BOQ – F2: Drip Irrigation Distribution Network

Sl.	Description	Unit	Qty.	GST Rate (%)	Amount (Rs.)
F2.1	Storage Tank (15,000 L HDPE, installed on 1-meter ground-level plinth) – 2 Nos. per unit. (Thermal Insulation, UV protection)	Units	3		

F2.2	HDPE Main Line pipe 63 mm dia. PN6 (supply, laying, jointing along plantation alignment)	RM	15,000		
F2.3	HDPE Sub-Main Line pipe 40 mm dia. (supply, laying, jointing for row distribution)	RM	45,000		
F2.4	16 mm LLDPE drip lateral with inline pressure-compensating drippers @ 4 LPH, 2 m spacing (supply and laying along all 3 plantation rows for full 15 km)	RM	45,000		
F2.5	Filter Unit per unit: Sand filter + Screen filter at pump outlet + Disc filter at sub-main inlets (min. 120 mesh), supply and installation	Units	3		
F2.6	Venturi Fertigation Injector with bypass valve per sub-main unit, supply and installation	Nos.	9		
F2.7	Ball valves, air release valves, flush valves, pressure gauges at all junctions and high points (supply and installation – Lumpsum per unit)	Units	3		

BOQ – F3: IoT Integration and Automation

Sl.	Description	Unit	Qty.	GST Rate (%)	Amount (Rs.)
F3.1	IoT RTU/PLC in IP65 weatherproof enclosure with 4G LTE modem and SD card logger, supply and installation per unit	Units	3		
F3.2	Automated Solenoid/Motorized Ball Valves (24V DC/AC latching, fail-safe closed) – min. 3 zones per unit, supply and installation	Nos.	9		
F3.3	Capacitive Soil Moisture Sensors (min. 2 per km = 10 per unit, 30 Nos. total) with installation and calibration	Nos.	30		
F3.4	Tipping Bucket Rain Gauge (min. 0.2 mm resolution, 1 per unit), supply, installation and IoT RTU connection	Units	3		
F3.5	Flow Meters (ultrasonic/paddle-wheel) at main and zone sub-main inlets – 4 per unit (12 total), supply and installation	Nos.	12		
F3.6	Cloud IoT SCADA Platform (web + Android/iOS app, role-based	LS	1		

	access min. 10 users, real-time dashboard, SMS/WhatsApp alerts, auto scheduling, solar + battery monitoring, CSV data export) – 3-year subscription, full setup and configuration				

BOQ – F4: Clog Resistance System

Rates shall include supply, installation, and commissioning of all clog resistance components as an integral sub-system. All items to be verified at SAT.

Sl.	Description	Unit	Qty.	GST Rate (%)	Amount (Rs.)
F4.1	Gravel/Media Sand Filter at pump discharge (GI or FRP housing with backwash provision, matched to pump flow rate), supply and installation	Units	3		
F4.2	Stainless Steel Screen Filter (min. 200 mesh / 75 micron, in-line, with self-flush or manual flush valve), supply and installation	Units	3		
F4.3	Disc Filter (multi-disc stack, min. 130 micron, one per zone sub-main inlet, self-cleaning preferred), supply and installation	Nos.	9		
F4.4	Pressure Differential Gauges across each filter stage with IoT alarm integration (one set per unit = 2 gauges per unit), supply and installation	Sets	3		
F4.5	Inline Chemical Dosing Unit (citric acid / chlorine; adjustable dose rate; compatible with fertigation injector), supply and installation	Units	3		
F4.6	Anti-Clog Pressure-Compensating Drippers (large turbulent-flow labyrinth, self-flushing anti-suck-back membrane, 4 LPH) – replacement of standard drippers specified in F2 with anti-clog grade; one per plant	Nos.	22,500		
F4.7	Automatic Flushing End-Caps on drip laterals (auto-purge at cycle start), supply and installation	Nos.	45,000		
F4.8	Anti-Drain / Check Valves at lateral entry from sub-main (prevents back-suction and soil ingress), supply and installation	Nos.	45,000		

F4.9	Flushing Manifold with lockable flush valve at terminal end of each sub-main section, supply and installation	Nos.	9		
F4.10	Air Release / Vacuum Breaker Valves at all high points of main and sub-main lines (minimum 2 per unit), supply and installation	Nos.	6		
F4.11	IoT Clog Detection Algorithm – programming and configuration of flow deviation monitoring on RTU dashboard (zone-wise flow baseline vs. real-time comparison, auto-alert trigger at <85% baseline flow)	LS	1		
F4.12	Clog Prevention & Chemical Flushing Protocol Document (site-specific; submitted as part of O&M Manual; first live demonstration at SAT)	LS	1		

BOQ – F5: Annual Maintenance Contract (AMC) – Years 2, 3 and 4

AMC rates shall be quoted separately for each year. Rates are binding for the full AMC period. The AMC covers all scheduled maintenance, clog removal, damage rectification, emergency response, sensor calibration, chemical flushing, solar maintenance, pump service, IoT subscription renewal, and annual reporting as described in Component F6 scope. Materials for routine maintenance (filter consumables, emitter replacements up to 2% of total, flushing chemicals, sensor calibration consumables) are included in the AMC rate.

Sl.	Year	Description	Unit	Qty.	GST Rate (%)	Amount (Rs.)
F5.1	**Yr 2**	AMC Year 2: 2 scheduled preventive maintenance visits + filter cleaning (gravel backwash, screen cleaning, disc filter service) + quarterly clog detection and emitter clearing + quarterly chemical flushing (acid/chlorine wash of laterals) + damage rectification (pipe repairs, fitting replacements up to 2% of pipe length) + solar panel cleaning + battery inspection + pump annual pull-out and service + IoT sensor calibration (30 sensors) + solenoid valve testing + cloud subscription renewal + overhead tank cleaning + emergency breakdown response (24/7 remote + 72 hr on-site) + Annual AMC Performance Report	LS/yr	1		

F5.2	**Yr 3**	AMC Year 3: Same full scope as Year 2 above	LS/yr	1		
F5.3	**Yr 4**	AMC Year 4: Same full scope as Years 2 and 3 – additionally includes: comprehensive 4-year system health audit; condition assessment report for all major components (pump, battery, RTU, filters, laterals); replacement recommendations for components nearing end of service life; cloud subscription renewal for final year	LS/yr	1		

Note: AMC rates are to be quoted as annual lump-sum per year. The Contractor shall quote each year independently. Year 4 includes the comprehensive 4-year end-of-project system health audit at no additional cost.

BOQ – Summary

Ref.	Component	Amount (Rs.)
F1	Solar Power Infrastructure – 3 Units (5 kW PV + Battery + Submersible Pump + Booster Pump + Inverter + Civil Works)	
F2	Drip Irrigation Distribution Network – 15 km (Tanks, Main, Sub-Mains, Laterals, Filters, Fittings)	
F3	IoT Integration & Automation – 3 Units (RTU, Valves, Sensors, Gauges, Flow Meters, Cloud Platform)	
F4	**Clog Resistance System – Multi-Stage Filtration, Anti-Clog Emitters, Auto Flush Caps, Check Valves, Pressure Gauges, Chemical Dosing, IoT Clog Detection**	
	TOTAL – Installation + Clog Resistance (F1 + F2 + F3 + F4)	**Rs. _____**
F5	AMC Year 2 (F5.1)	
F5	AMC Year 3 (F5.2)	
F5	AMC Year 4 (F5.3) – incl. 4-Year System Health Audit	
	TOTAL AMC	**Rs. _____**
	GRAND TOTAL – Full Contract Value (F1–F4 + F5 Years 2–4, incl. GST)	**Rs. _____**

PART – IV: ELIGIBILITY CRITERIA

Bidders must fulfil the following conditions. However, the Authority reserves the right to relax the components to promote competition and value to the public money.

4.1 Legal Status

- Registered Proprietorship / Partnership Firm / Private/Public Limited Company specialising in solar energy, or irrigation engineering, or IoT/automation systems.
- Certificate of Registration under relevant law is mandatory

4.2 Technical Qualification – Solar and Irrigation

- The bidder shall demonstrate prior completion of at least ONE solar-powered pumping / irrigation system in any government, institutional or agricultural project in India, in the last 5 years
- Experience in supply and installation of drip irrigation systems (HDPE pipework, laterals, emitters, filters) covering minimum 5 km or 10 acres; completion certificate/work order shall be attached.

4.3 Technical Qualification – IoT and Automation

- The bidder (or a declared sub-contractor) shall demonstrate prior supply and installation of at least ONE IoT-based remote monitoring or automation system (SCADA/RTU/PLC-based) with cloud platform and mobile app in a government/institutional project in India, in the last 5 years
- Relevant completion certificate/system screenshots/photographs, and cloud platform demo access shall be provided with the technical bid

4.4 Prior Experience

- Minimum ONE completed work of similar nature (solar irrigation + IoT monitoring OR solar pumping + SCADA) valued not less than Rs. 20 lakhs in a single contract, in any government/public sector project/Private project, in the last 5 financial years
- Completion certificate and work order copies shall be attached

4.5 Financial Capacity

- Average annual turnover of minimum Rs. 30 lakhs during last three financial years
- Audited Balance Sheets / CA Certificate for last 3 financial years
- Net financial loss in not more than two of the last three years

4.6 EMD and Document Fee

- EMD: Rs. 5,000/- as Demand Draft/Bank Guarantee in favour of DFO, Redhakhol Forest Division, payable at Rairakhol
- Tender Document Fee: Rs. 1000/- (Non-refundable) as DD in favour of DFO, Redhakhol

4.7 Other Requirements

- Valid GST Registration Certificate | PAN Card copy
- Self-attested undertaking of non-blacklisting by any Government department

PART – V: GENERAL TERMS AND CONDITIONS

5.1 Schedule of Submission

Activity	Date / Details
Issue of Tender Document	As notified on OFD website and Divisional Notice Board
Pre-Bid Site Visit	Mandatory for all bidders – IoT/solar vendors must visit all 3 proposed unit sites
Last Date for Queries	5 days before bid closing date
Last Date for Submission	As notified
Opening of Technical Bids	On date of submission (or next working day)
Opening of Financial Bids	After scrutiny of Technical Bids – notified separately

5.2 Submission Format

- Double sealed envelope: Envelope 1 – Technical Bid (EMD, document fee, eligibility documents, IoT/solar experience proof, system demo access); Envelope 2 – Financial Bid (BOQ with rates)
- Outer envelope superscribed: 'Tender for Solar IoT Drip Irrigation, NIT No. RFD/CSR/MCL/2026-27/002'
- Physical submission at Office of DFO, Redhakhol Forest Division, Rairakhol

5.3 Defect Liability, Warranty and AMC Support

- Equipment warranty: Minimum 1 year for all hardware (solar panels, pumps, RTU, sensors, valves, clog resistance components) from date of commissioning; manufacturer warranty certificates to be submitted at handover
- Solar PV panels: Minimum 10-year product warranty and 25-year performance warranty per manufacturer datasheet
- Clog Resistance System: All anti-clog drippers, flush caps, check valves, and filters carry minimum 1-year warranty from commissioning; performance verified at SAT and each AMC cycle
- IoT platform: 3-year cloud subscription included; service level agreement (SLA) for 99% platform uptime
- Year 1 on-call support: Remote diagnostics within 4 hours; on-site response for critical faults within 48 hours
- Defect Liability Period: 12 months from date of Final Handover Certificate

5.4 AMC Performance Standards

- System uptime target: The irrigation system (pump, pipeline, IoT) shall be operational for minimum 95% of scheduled irrigation days in each AMC year; downtime due to equipment failure exceeding 5% shall trigger penalty provisions
- Clog-free emitter standard: Minimum 95% of all drip emitters shall deliver within ±10% of rated flow (4 LPH) at each AMC quarterly inspection; clogged emitters beyond 5% threshold to be cleared or replaced at no additional cost
- Filter performance: Filters shall be cleaned and restored to design differential pressure within 48 hours of any IoT pressure differential alert
- Emergency response: Critical faults (pump failure, full zone shutdown, RTU failure) to be resolved within 24 hours of alert; non-critical faults within 72 hours; log of all incidents and resolutions to be maintained on IoT platform
- Quarterly AMC reports must be submitted within 15 days of quarter-end; delayed reports will result in proportional payment hold
- Separate agreement will be made with successful bidders.

5.5 Performance Security

- 5% of total contract value (F1 to F5) to be deposited within 10 days of Work Order
- A separate AMC Security Deposit of 5% of the total AMC value (F6.1 + F6.2 + F6.3) to be deposited before commencement of AMC Year 2; released within 60 days of successful completion of AMC Year 4

5.6 Right to Reject

- The DFO/competent authority reserves the right to reject any or all tenders without assigning

PART – VI: DECLARATION AND UNDERTAKING BY BIDDER

I/We, the undersigned, hereby declare and certify that:

- The information provided in this bid document is true, accurate, and complete to the best of my/our knowledge and belief
- I/We have read, understood and accept all terms, conditions and specifications in this Tender Document (NIT No. RFD/CSR/MCL/2026-27/002) including the Clog Resistance System specifications (Component F5) and AMC obligations (Component F6) for Years 2, 3, and 4
- I/We confirm that the solar PV, pumping, IoT/SCADA, drip irrigation, and clog resistance systems offered meet all technical specifications and that hardware supplied will carry valid manufacturer warranties
- I/We confirm that the anti-clog drippers, multi-stage filtration system, automatic flush caps, and IoT clog detection algorithm offered meet the specifications in Component F5 and that clog resistance performance will be verified at SAT
- I/We confirm that the cloud IoT platform offered will maintain minimum 99% uptime SLA and the 3-year subscription is included in our quoted price
- I/We commit to performing the Annual Maintenance Contract for Years 2, 3, and 4 as quoted in BOQ-F6 at the rates submitted, including the 4-year system health audit in Year 4
- I/We are not blacklisted or debarred from any Government department or public sector undertaking
- I/We accept that the DFO's decision on all technical matters (system performance, clog resistance, IoT functionality, AMC compliance) shall be final and binding
- I/We agree to the payment milestones, AMC payment schedule, warranty obligations, and penalty clauses as stipulated in Part V of this tender document

The quoted rates are inclusive of all design, supply, civil works, installation, clog resistance system, commissioning, training, O&M manuals (incl. Clog Prevention Protocol), 3-year cloud subscription, and 12-month on-call support. AMC rates for Years 2–4 are quoted separately in BOQ-F6. GST has been quoted separately on both.

Name of Firm/Agency: _____ Name of Authorised Signatory: _____ Designation: _____ Date: _____	Signature: Place: _____

Seal:	Address: _____ Phone/Mobile: _____ Email: _____

SCHEMATIC DIAGRAM — SOLAR-POWERED IoT DRIP IRRIGATION SYSTEM

Lemon / Lime Bio-Fencing Plantation · 15 km, Three-Row Zig-Zag · Naktideul Range

Annexure to NIT No. RFD/CSR/MCL/2026-27/002 · · 2026–27

This annexure presents the system schematic for the solar-powered, IoT-controlled drip irrigation network specified in NIT-002. Three identical off-grid units (one per 5 km) serve the full 15 km three-row citrus bio-fence.

Figure 1 — System Schematic (per 5 km unit)

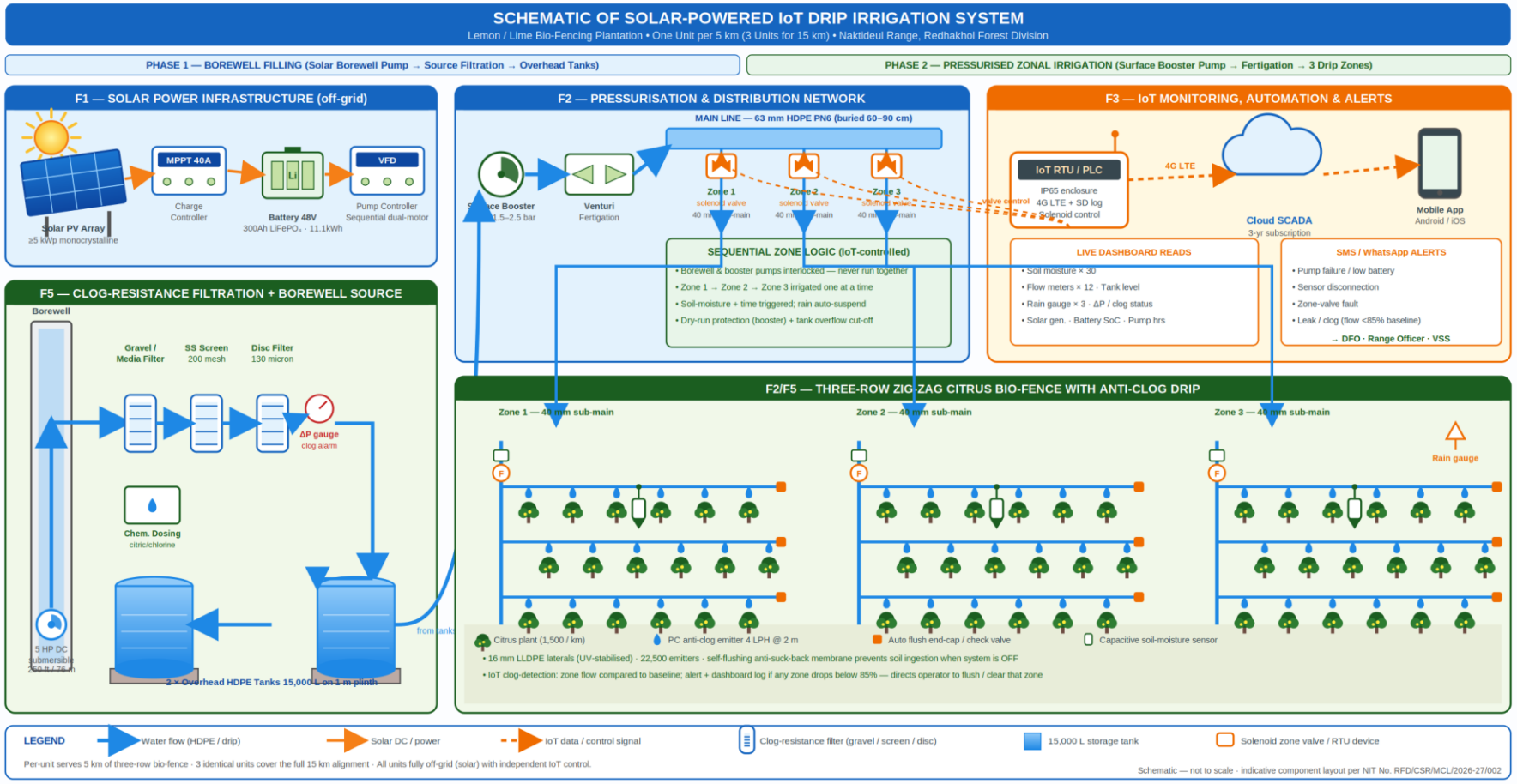

Figure 1: Pictorial schematic of one solar IoT drip irrigation unit — solar power (F1), source filtration & storage (F5/F2), pressurised zonal distribution (F2), IoT monitoring & alerts (F3). Power → amber, water → blue, IoT data/control → dashed amber.

Figure 2 — Schematic Component Schedule

Keys the schematic to the NIT-002 Scope of Work / BOQ components. Quantities are for the full 15 km plantation (3 units).

NIT Comp.	Sub-system	Key specification (per NIT-002 Scope of Work)	Qty (15 km / 3 units)
F1	**Solar Power**	5 kWp PV · MPPT 40A · 48V/300Ah $LiFePO_4$ (11.1 kWh) · VFD/sequential pump controller	3 (1 / 5 km)
F1	**Pumps**	5 HP DC borewell submersible (250 ft / 76 m) + 3 HP surface booster (1.5–2.5 bar)	3 + 3
F2	**Storage**	2 × 15,000 L HDPE overhead tanks on 1 m plinth per unit	6
F2	**Mains / Sub-mains**	63 mm HDPE PN6 main (buried 60–90 cm) · 40 mm HDPE sub-mains (3 rows)	15 km / 45 km
F2	**Drip laterals**	16 mm UV-stabilised LLDPE, PC drippers 4 LPH @ 2 m, one per plant	45 km / 22,500
F2	**Filtration / Fertigation**	Sand + screen + disc filter per unit · Venturi fertigation injector	3 / 9
F3	**IoT control**	IP65 RTU/PLC · 4G LTE · cloud SCADA + Android/iOS app (≥3 yr)	3 / 1
F3	**Field sensors**	Capacitive soil-moisture (2/km) · rain gauge · flow meters · tank-level	30 / 3 / 12
F3	**Zone valves**	24V latching solenoid valves, 3 zones per unit, sequential	9
F5	**Clog resistance**	Gravel/media + 200-mesh screen + 130-µm disc · ΔP gauges · chem. dosing	per unit
F5	**Emitter / lateral**	Anti-suck-back PC drippers · auto flush end-caps · anti-drain check valves	22,500 / 45,000
F5	**IoT clog detect**	Flow-deviation algorithm — alert if any zone < 85% of baseline flow	3 zones / unit
F6	**AMC (Yr 2–4)**	4 preventive visits/yr · filter & emitter service · chemical flush · 24/7 remote	3 years

Note: Schematic is indicative and not to scale. Borewell locations, exact alignment and unit positions to be fixed on ground in consultation with VSS, Gram Panchayat and the Divisional Forest Officer prior to installation. All units operate fully off-grid on solar power with independent IoT-based monitoring, automated scheduling and clog-resistance protection.

-Sd/-
Divisional Forest Officer
Redhakhol Forest Division