Project Profile For Off-Grid Water Purifier Installation Unit In Uttarakhand

1. Introduction

Access to safe drinking water continues to be a pressing challenge in the remote hill regions of Uttarakhand, where conventional piped supply systems are either unreliable or entirely absent due to terrain, limited infrastructure, and dispersed habitations. In such contexts, decentralized water purification technologies that operate independently of the electric grid—commonly known as off-grid water purifiers—present a vital solution. These systems are especially beneficial for villages prone to seasonal waterborne diseases and those relying on untreated spring, river, or handpump water sources.

Off-grid water purification units typically use gravity-based filtration, solar-powered ultraviolet (UV) or ultrafiltration (UF) systems, and bio-sand or membrane-based technologies that require minimal maintenance and no electricity. Their modular nature makes them ideal for hilly terrains, small schools, anganwadis, community kitchens, and gram sabha buildings. The initiative of setting up an Off-grid Water Purifier Installation Unit aims not only to provide access to clean drinking water but also to enable local entrepreneurs, SHGs, and youth to participate in water entrepreneurship through installation, servicing, and awareness-building.

The project supports the goals of Jal Jeevan Mission, Swachh Bharat Abhiyan, and UN Sustainable Development Goal 6 (Clean Water and Sanitation). By localizing fabrication, installation, and training services, this unit can create jobs in both technical and community-facing roles while reducing dependence on distant suppliers and improving health outcomes in rural Uttarakhand.

2. Industry Overview

The water purification industry in India has undergone rapid expansion in recent years due to rising concerns about water quality, increasing urbanization, and government-led sanitation initiatives. The sector is estimated to be worth over ₹12,000 crore and includes a wide range of technologies from domestic RO purifiers to industrial treatment plants. However, a growing sub-segment within this space focuses on **low-energy, decentralized purification solutions**—especially for rural and off-grid environments. This includes bio-sand filters, solar UV/UF systems, ceramic filters, and gravity-based multi-layer filters.

In Uttarakhand, the challenge of water purity is compounded by the frequent contamination of springs and streams by animal waste, pesticides, and seasonal runoff. Studies by NGOs and government agencies highlight bacterial contamination and heavy metals in many unprotected water sources. As a result, there is growing interest in locally deployable purification systems that can cater to households, clusters, or institutions like schools. Off-grid purification models, unlike RO systems, do not waste water and retain minerals, making them better suited for low-TDS hill water.

The state's focus on integrating entrepreneurship with development goals provides fertile ground for setting up micro-enterprises that specialize in installing and maintaining these off-grid units. Policy support from Jal Jeevan Mission, convergence with NRLM for SHG training, and interest from CSR partners in health and WASH (Water, Sanitation & Hygiene) domains further strengthen the case for this emerging rural business opportunity.

3. Products and Applications

The Off-grid Water Purifier Installation Unit will offer products and services focused on decentralized water purification solutions for small rural communities. The primary product offerings include:

- Gravity-based multi-stage water filters with activated carbon, ceramic, and silver-impregnated elements for households or small public spaces.
- Solar-powered UV/UF purification units capable of treating 20–100 liters per hour for use in schools, health centers, or community halls.
- Bio-sand filters for low-cost, chemical-free purification at household or cluster level.
- Rainwater harvesting filter kits combined with purification modules.
- AMC (Annual Maintenance Contracts), water testing, and filter replacement services.

The application of these products spans rural households, anganwadis, forest villages, and small hamlets located in grid-inaccessible zones. Mobile water kiosks and temple/community kitchens can also benefit from solar-UV installations. The units will cater to disaster-prone or migration-hit regions, where water insecurity is a common concern. Purifiers can be customized based on local water quality reports, usage capacity, and available sunlight or rainfall.

4. Desired Qualification

The ideal promoter for this enterprise need not be a formally trained engineer but should have strong grassroots understanding of rural Uttarakhand's terrain, infrastructure gaps, and drinking water challenges. Suitable candidates include ITI diploma holders, vocationally trained youth, ex-army personnel, and rural SHG members willing to undergo hands-on technical training. A minimum understanding of electrical systems, solar panel handling, plumbing, or mechanical fittings is beneficial.

Participation in government programs such as the Jal Jeevan Mission's Village Water & Sanitation Committees (VWSCs) or WASH-focused NGO trainings will enhance the promoter's credibility in the community. Basic digital literacy is essential for tasks like warranty registration, QR code tracking of installations, or using mobile apps for water quality monitoring. Familiarity with institutions like PHED, BDO offices, and school management committees will help in identifying installation sites and building trust.

The promoter should also possess communication skills for health awareness campaigns, community sensitization sessions, and after-sales servicing. Women SHGs can be trained as frontline demonstrators or sales agents, enabling gender-inclusive WASH entrepreneurship.

5. Business Outlook and Trends

The outlook for off-grid water purification solutions in India is highly promising, especially in states like Uttarakhand where terrain and climate pose unique challenges for centralized water supply systems. There is increasing recognition of the importance of decentralized solutions that can be installed quickly and maintained locally. The government's push for rural piped water access under the Jal Jeevan Mission is likely to create parallel demand for interim and supplementary purification methods, particularly in areas where tap water quality is inconsistent or coverage is yet to reach.

Recent trends also point towards growing consumer awareness of contaminants like fluoride, arsenic, and microbial impurities in water. This has resulted in demand for systems that not only purify but also preserve mineral content and require no electricity—key selling points of off-grid water purifiers. NGOs, CSR initiatives, and Panchayat-level interventions are also playing a role in promoting low-cost community solutions.

There is an emerging business trend around "WASH-preneurship" where local youth and SHGs are trained to install and maintain water purifiers. This reduces maintenance bottlenecks and builds trust. Furthermore, policy convergence under SBM, NRLM, and disaster preparedness programs make this an ideal time to invest in local water purification enterprises, especially when bundled with services like water quality testing, AMC, and school health outreach.

6. Market Potential and Market Issues

The primary market for off-grid water purifiers lies in the thousands of hill villages, forest settlements, and revenue hamlets of Uttarakhand that still rely on unprotected springs, rivers, or handpumps for drinking water. Additionally, institutions like schools, ashrams, temples, and community centers located in off-grid or partially connected areas form another significant customer base. Tourist camps, forest chowkis, and pilgrimage routes also present market potential for solar-based systems.

However, several challenges persist in this niche. First, rural customers are often unfamiliar with modern purification technologies and may not prioritize water treatment unless health messaging is strong. Second, affordability can be a barrier. Systems must be priced sensitively and ideally co-financed through Panchayats, CSR, or subsidies. Third, terrain and access difficulties can increase logistics costs, making delivery and servicing challenging in remote zones.

Marketing also requires building trust and local demonstration. Mass advertising is ineffective in these settings. Word-of-mouth, endorsements from school teachers or ASHA workers, and visual proof of water clarity are more persuasive. Certification of systems and availability of spares are crucial to build credibility. Hence, the unit should have a clear plan for community education, servicing, and value-based pricing.

7. Raw Material and Infrastructure

The raw materials required for assembling off-grid water purifiers are mainly sourced from manufacturers and include filter cartridges, ceramic candles, activated carbon blocks, plastic housing, solar UV modules, solar panels, and pre-fabricated components like sediment filters, O-rings, piping, and taps. In some cases, steel or HDPE tanks and mounting frames may also be required for large installations.

Infrastructure requirements include a small assembly and storage shed (500–800 sq ft), testing area, water source for trial runs, and basic tools like pipe cutters, TDS meters, and multi-meters. The unit should also maintain a stock of replacement filters, tubing, and solar connectors. A battery backup may be needed for operating testing equipment or assembling solar-UV units. The structure must include a clean space with good ventilation and access to loading/unloading.

The unit should ideally be located near a market town or block headquarters to enable access to courier services and government offices for permits and tenders. Tie-ups with water testing labs and NGOs can further strengthen operational capacity.

Table 1: Raw Material and Infrastructure Requirements

Component	Specification/Quantity	Remarks
Gravity Filter Housing	100–200 units/month	Food-grade plastic or steel
Filter Cartridges	150–300 units/month	Activated carbon, sediment, ceramic candles
Solar UV/UF Modules	10–20 units/month	With panels and backup batteries
Pipes, Fittings, Taps	As per design	For assembly and customization
Storage Tanks	20–50 litres/unit	HDPE or SS, depending on system
Assembly Space	600–800 sq ft	With clean water access, racks, lighting
Tools and Meters	Basic installation tools	Multimeter, TDS meter, cutter, drilling kit
Transportation Vehicle (optional)	1 small van or bike	For field servicing and delivery

8. Operational Flow

The operations of an off-grid purifier unit involve assembly, site assessment, installation, testing, servicing, and awareness-building. The promoter first sources the purifier components in kits or loose parts. These are then assembled based on the order specification. Site visits are conducted to check water source, sunlight availability (for solar units), and user capacity. Post installation, the team educates the users on maintenance and schedules periodic checks.

Flow Chart of Operational Process:

1. Component Procurement
└──▶ Inventory Check & Quality Testing
2. Assembly of Water Purifier Unit
└──▶ Site Assessment & Customization
3. Installation at Target Location
└──▶ Water Quality Testing (optional)
└──▶ User Orientation & Demo
4. After-Sales Servicing & AMC
└──▶ Feedback Collection & Repairs

9. Target Beneficiaries

The installation unit is designed to empower a variety of rural stakeholders. Key beneficiaries include:

- Rural and tribal households relying on untreated sources
- Government schools, AWCs, PHCs, and hostels in remote locations
- SHGs engaged in WASH entrepreneurship and product marketing
- Young technicians and plumbers trained as installation/service partners
- Panchayats and Forest Committees improving water access through local installations

These groups benefit not only from clean drinking water but also from reduced disease incidence, improved school attendance (especially for girls), and employment opportunities in service delivery, monitoring, and awareness campaigns.

10. Suitable Locations in Uttarakhand

The ideal locations include remote and mid-altitude blocks that lack piped water or face water quality issues. These include:

- Pithoragarh, Dharchula, and Munsyari blocks (high-altitude, spring-fed)
- Bageshwar, Kapkot, and Garur (cluster villages with seasonal water stress)
- Rudraprayag (Triyuginarayan, Ukhimath) with pilgrimage-linked footfall
- Tehri (Jakhnidhar, Ghansali) and Chamoli (Joshimath belt)
- Chakrata and Tyuni blocks in Dehradun district

Presence of schools, PHCs, and SHGs can act as anchor clients in these locations.

11. Manpower Requirement

An Off-grid Water Purifier Installation Unit is a semi-technical enterprise that can function effectively with a small but trained team. Core roles include technicians for system assembly and installation, field support workers for site assessment and maintenance, and admin/sales staff for managing orders, invoicing, and client relations. In the initial phase, the team can be lean and scaled as orders grow. Seasonal field staff or part-time SHG support can be hired during bulk installations.

Key roles required include:

- Technician (2 persons): Skilled in purifier assembly, solar wiring, basic plumbing, and troubleshooting.
- Field Installer (1–2 persons): Trained in village-level site assessment, installation, and filter replacement.
- Admin and Sales Coordinator (1 person): Manages client records, outreach, AMC database, and documentation.
- Community Awareness Mobilizer (1 person, part-time): Engages in school/SHG awareness sessions, demo camps.

Table 2: Manpower Requirement and Annual Cost

Position	No. of Staff	Monthly Salary (₹)	Duration	Annual Cost (₹)	Responsibilities
Technician	2	15,000	12 months	3,60,000	Assembly, installation, wiring, troubleshooting

Position	No. of Staff	Monthly Salary (₹)	Duration	Annual Cost (₹)	Responsibilities
Field Installer	1	12,000	12 months	1,44,000	On-site assessment, mounting, filter changes
Admin & Sales Coordinator	1	10,000	12 months	1,20,000	Orders, billing, AMC, recordkeeping
Community Mobilizer (P/T)	1	6,000	12 months	72,000	Awareness events, SHG sensitization
Seasonal Field Helpers	2	8,000	4 months	64,000	Bulk order installations, loading/unloading
Total Annual Cost	–	–	–	₹6,60,000	Based on small-scale operations

12. Implementation Schedule

The unit can become fully functional within 8–10 months of project sanction. Initial focus should be on vendor tie-ups, training, and local awareness building. Planning installations during summer or pre-monsoon seasons ensures community readiness and maximum utility.

Table 3: Month-wise Implementation Plan

Timeline (Months)	Activities
Months 1–2	DPR finalization, location selection, vendor outreach, subsidy application
Months 3–4	Space setup, tool procurement, recruitment, technician training
Month 5	Pilot batch assembly, product testing, demo installations in schools
Month 6	Full-scale marketing, SHG outreach, AMC enrollment
Months 7–8	Community installations, bulk orders, after-sales services
Months 9–10	Expansion to other blocks, partnerships with Panchayats, fairs, NGOs

13. Estimated Project Cost

The project cost varies with the level of in-house assembly vs sourcing. For a basic unit assembling 200–300 systems annually with solar and gravity models, the estimated investment is ₹10–₹12 lakhs including first-year working capital.

Table 4: Project Cost Estimate

Component	Estimated Cost (₹)	Remarks
Equipment & Tools	₹2,00,000 – ₹2,50,000	Drills, meters, solar testers, cutters
Initial Inventory	₹2,50,000 – ₹3,00,000	Filters, housing, tanks, pipes
Infrastructure & Rent	₹1,00,000 – ₹1,50,000	Assembly shed, furniture, storage
Marketing & Branding	₹50,000 – ₹80,000	Banners, flyers, demo kits
Working Capital (1st year)	₹3,00,000 – ₹4,00,000	Staff salaries, transport, installation material
Total Cost	₹10,00,000 – ₹12,00,000	Based on scale and procurement source

14. Means of Finance

The project can be financed through a mix of personal contribution, bank loan, and government subsidy under DUY, PMEGP, or Jal Jeevan Mission-linked CSR schemes.

Sources of Finance:

- Promoter's Equity: ₹2–3 lakhs (20–25%)
- Bank Loan / Mudra Loan: ₹5–6 lakhs (collateral-free under ₹10 lakhs)
- DUY/PMEGP Subsidy: ₹3–4 lakhs (up to 35% capital subsidy)
- CSR Partnerships / Panchayat Convergence: For demo models or filters in schools

Support from DRDA, DPMUs, or JJM field staff can help in linking with CSR or NGO funders working on water and sanitation.

15. Revenue Streams

Revenue is generated through sale, installation, servicing, and community awareness services. Value-added income can be earned from AMCs, filter replacement, and water testing contracts with Panchayats or NGOs.

Table 5: Revenue Sources

Revenue Stream	Unit Price (₹)	Annual Units	Annual Revenue (₹)	Remarks
Gravity Water Purifiers	₹1,500	1,000 units	₹15,00,000	Household and SHG customers
Solar-UV Units	₹15,000	50 units	₹7,50,000	Schools, temples, PHCs
AMC Contracts	₹300/year	500 units	₹1,50,000	Maintenance, spare parts
Filter Replacement & Accessories	₹100	1,000 units	₹1,00,000	Recurring every 6–12 months
Awareness + Training Camps	₹3,000/event	25 events	₹75,000	NGO, school, CSR-funded
Estimated Total	–	–	₹25,00,000 – ₹30,00,000	Year 2 onwards, scalable with outreach

16. Profitability Streams

The profitability of the unit depends on its ability to source components economically, build local partnerships for recurring orders, and maintain high installation and service standards. In the first year, when awareness and networks are being built, the unit may operate at modest margins. However, by the second year, revenues from filter replacement, AMC, and CSR bulk orders can significantly improve profitability.

Key drivers of profitability include local labor use, avoiding logistics delays, working with Panchayats for bulk orders, and efficient route planning for installations and services. Eco-labeling and WASH certifications can allow for premium pricing in institutional sales.

Table 6: Profitability Estimate

Year	Revenue (₹)	Expenses (₹)	Net Profit (₹)	Profit Margin (%)
Year 1	₹10–15 lakhs	₹9–13 lakhs	₹1–2 lakhs	8–12%
Year 2	₹20–25 lakhs	₹15–18 lakhs	₹5–7 lakhs	20–28%
Year 3	₹30–35 lakhs	₹20–25 lakhs	₹8–10 lakhs	25–30%

17. Break-Even Analysis

The break-even point depends on fixed costs, inventory turnover, and per-unit margin. Assuming average sales of 1,000 gravity units and 50 solar units annually with servicing income, the enterprise can break even within 16–18 months.

Table 7: Break-Even Estimate

Parameter	Value	Remarks
Fixed Annual Cost	₹6.5 – ₹7 lakhs	Salaries, rent, tools, admin
Avg. Revenue Per Unit	₹1,500 (gravity), ₹15,000 (solar)	Weighted avg. of sales mix
Break-Even Revenue	₹15–18 lakhs	Achievable in 14–18 months
Estimated Time to B.E.	16–18 months	Faster with subsidy support or bulk orders

18. Marketing Strategies

For a product category that relies heavily on community trust, localized and demonstration-based marketing is most effective. The focus should be on visual clarity of water, health messaging, and testimonials from local leaders or teachers.

Local Marketing:

- Conduct village demos during Gram Sabha meetings and SHG gatherings.
- Partner with PHCs and schools for demo models and water health days.
- Use wall paintings, radio jingles, and nukkad nataks to raise awareness.

Institutional and Online Marketing:

- Build partnerships with government schools, NGOs, and CSR initiatives.
- Maintain a WhatsApp-based catalog with videos and before-after water tests.
- Participate in block-level health fairs, Jal Jeevan Mission awareness events.

Emphasize local employment, WASH certification, and mineral-retention as USPs in brochures and packaging.

19. Machinery and Vendors in Uttarakhand

The following tools and machinery are required for assembly, servicing, and minor repairs of purifier units:

Table 8: Machinery and Equipment

Equipment / Tool	Specification / Use	Estimated Cost (₹)
Drill Machine	For mounting filters	₹6,000 – ₹10,000
Multimeter & TDS Meter	For solar wiring and water testing	₹3,000 – ₹5,000
Pipe Cutter and Wrenches	For fittings and plumbing	₹2,000 – ₹3,500
Solar Module Tester	For checking panel output	₹7,000 – ₹10,000
Filter Assembly Toolkit	Sealant, washers, O-rings	₹5,000 – ₹6,000
Labeling and Stamp Kit	For AMC tracking	₹1,500 – ₹3,000
Water Storage Tank	50–100 litres for testing	₹4,000 – ₹6,000
Total Setup Cost	–	₹30,000 – ₹45,000

Suggested Vendors (Uttarakhand and North India):

- **Solex Solar Systems**, Dehradun – Solar-UV kits
- **Rural Sanitation Hub**, Almora – Gravity filter components
- **Uttarakhand Renewable Energy Development Agency (UREDA)** – Panel suppliers
- **JalSathi Systems**, Haridwar – Filter components and training support
- **Gram Nirman Tools**, Haldwani – Plumbing kits and TDS meters

20. Environmental Benefits

This unit offers significant ecological benefits, particularly by reducing the need for plastic water bottles and fuel-based water boiling. It enhances access to safe water without the environmental cost of RO waste water or electricity dependence.

Environmental benefits include:

- Zero electricity usage in gravity models, minimal in solar-based units.
- No chemical additives or reject water (as in RO systems).

- Promotes use of harvested rainwater and protected springs.
- Reduces fuelwood usage by eliminating boiling practices.
- Decreases plastic bottle waste in tourism and school sectors.

21. Future Opportunities

The enterprise has considerable scope for expansion across product lines and service offerings. Future opportunities include:

- Manufacturing branded water filter kits with localized design
- Becoming service franchise for government schools under Jal Jeevan Mission
- Bundling with water kiosks for tourist destinations
- Developing a women-led SHG franchise model for purifier installation and AMC
- Scaling into nearby Himalayan states like Himachal Pradesh and Nepal border regions
- Creating water-health educational kits for schools