Namami Gange & Rural Water Supply Department

Construction and O&M Of Solar Powered Water Supply Schemes Under the National Jal Jeevan Mission

Uttar Pradesh

21st Nov 2024

Yawii Khurd, Uttar Pradesh, India ME9+4VG, Pawii Khurd, Uttar Pradesh at 28.065879* org 77.670559* 0:02:24 01:03 PM GMT +05:30



The Jal Jeevan Mission (Har Ghar Jal) was announced by Hon'ble Prime Minister on August 15, 2019 to be implemented in partnership with States/Uts.

VISION

 The goal of the Jal Jeevan Mission is to provide piped water supply through Functional Household Tap Connection in adequate quantity (55 lpcd) of prescribed quality (BIS:10500) with adequate pressure on a regular and long-term basis to every rural household.

Status of FHTC – on 15th Aug 2019.





Har Ghar Jal Jal Jeevan Missio

Implementation Strategy

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- **1.** Conception & Planning
- 2. Feasibility Study /DPR Preparation
- 3. PMC/TPI & DPMU Selection
- **4.** Preparation of Tender Documents & Approval
- **5.** Tendering / Empanelment of Agencies
- 6. Award of Work
- 7. Land Acquisition
- 8. NOCs from Various departments

- 9. Physical, financial & Quality Monitoring
- **10.** Fund Management
- **11.** Timely Payment /E-MB
- **12.** Administrative/ Legal Challenges
- **13.** Completion of Civil, Mechanical & Electrical Works
- **14.** Commissioning of Villages
- **15.** Regular Water Supply/Trial Run
- **16.** Har Gar Jal Certification
- **17.** Operation & Maintenance



Project at a Glance in Uttar Pradesh







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Solar Based Project at a Glance





Pump house operated by solar panel in Kudha Gram Panchayat in Mohanlalganj, Lucknow.



Officials taking information about solar panel during inspection in Bhawa Khera Gram Panchayat of Lucknow

Schematic profile

Ground Water Vs Surface Water Schemes



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Estimated Annual Reduction in CO2 Emission/ Generation of Carbon Credit.



**CO2 baseline database for the Indian Power sector Version 19.0- Dec'2023. Author: CEA

5.1 Results for Fiscal Year 2022-23

Table 3 indicates the development of total emissions over the last five years covered by the database

Table 3: Total emissions of the power sector for the FY 2018-19 to 2022-23, in million tonnes CO2

2018-19	2019-20	2020-21	2021-22	2022-23
960.90	928.14	910.02	1002.02	1091.96

Table 4 shows the emission factors for FY 2022-23 both excluding and including cross-border power transfers.

Table 4: Weighted average emission factor, simple operating margin (OM), build margin (BM) and combined margin (CM) of the Indian Grid for FY 2022-23 (not adjusted and adjusted for cross-country electricity transfers), in I CO2/MWh

	Average	OM	BM	CM
Excluding cross-border power transfers	0.827	0.976	0.867	0.921
Including cross-border power transfers	0.823	0.971	0.867	0.919

* Indian Institute of Science - Renewable & Sustainable energy reviews. https://wgbis.ces.iisc.ac.in/energy/paper/hotspots_solar_potential/RSER_hotspots.pdf



Fig. 5. Annual average Global insolation map of India showing the isohels and solar hotspots.

Estimated reduction in CO2 emission/ Generation of Carbon cred

Estimated Annual Reduction in CO_2 Emission - Across Uttar Pradesh State			
Designed Capacity of Solar in 33157 Drinking Water Supply Schemes (A)	900	MWp	
Average area of a solar panel (B)	2.576	Sq.m	
Average capacity of a solar panel (C)	0.55	KW	
Average rate of solar intensity in UP* (D)	5.3	KWh/m2/day	
Power generation per solar panel (Efficiency X Rate of solar intensity X Area) (assuming 20% efficiency) (E = 0.2 X D X B)	2.73	KWh/day	
Power generation by designed 900 MWp solar panel (F = (E/C) X A X 1000)	44,68,189	KWh/day	
Annual power generations considering 320 sunny days / year (G = F X 320)	1,42,98,20,509	KWh/year	
Avg. last three years, CO_2 emission factor (Combined Margin) ** (H)	0.921	Kg CO₂/KWh	
Annual reduction in CO_2 emission (I = (G X H)/1000)	13,16,865	MT CO ₂	
Annual Equivalent Carbon Credits	13,16,865		

Operational (Electricity) Cost Savings Comparison: Solar Powered Vs Conventional Electricity.





Solar Power Based Drinking Water Supply Schemes

- The designed solar power generation capacity is 900 MWp.
- Designed life of the solar powered schemes are 30 Years.

All Value in Cr.					
Ca	Capex Operational C		Cost for 30 years		
Cost of Solar Installation	Cost of electricity connection (if the schemes designed on conventional electricity)	Solar power based schemes	Electricity Charges @ 8.60/unit for 30 Years (if (inc. GST) (if the schemes designed on conventional electricity)	Estimated Net Savings in operational cost over 30 years (incl. GST)	
7,812	2,487	Nil	42,720	37,395	

- Estimated annual reduction in CO2 emissions is about **13 Lac MT CO2**, equivalent to 13 Lac Carbon credits, may yield estimated revenue of 78 million USD which is equivalent to approx. INR. 624 Crores over 30 years.
- M/s Carbon Market Association of India (CMAI) has been engaged for technical assistant for assessment of the carbon credits.







Expenditure on Operation & Maintenance per Household

S.No	Types of Schemes	Total No. Of Schemes	No. of Villages	No. of Households	Estimated annual O&M cost Per Households (in Rs)
01	Solar based schemes	33,157	67,013	1,67,49,905	1220
02	Electricity based schemes	10,985	29,908	98,33,346	2531

The estimated annual O&M cost per household for solar-powered water schemes is ₹1,220, a significant reduction compared to
₹2,531 for electricity-based schemes—achieving a 52% decrease in costs.

- This shift to solar power also eliminates ongoing electricity expenses, leading to an estimated total savings of ₹37,395 crore over 30

years.



Advantages of Solar Powered Schemes



- <u>Off-Grid Solutions</u>: Solar-based water supply systems can operate in remote areas, providing access to drinking water where traditional power sources are impractical.
- Low O&M Costs: Solar-based water pumps and purification systems can lead to lower O&M costs by eliminating the need of high-cost fuel or electricity supply, contributing to long-term cost savings.
- **Environmental Friendly**: Solar energy systems have minimal to no environmental impact by reducing carbon footprints compared to conventional power systems.
- Reliable, Scalable & Consistent: Solar-based water supply systems can operate consistently in sunny conditions, providing a reliable and continuous water supply. These schemes are less vulnerable to power outages, ensuring continuous water demand. These schemes can be scaled up or down based on the water demand.
- **Community Empowerment**: Implementing solar water supply solutions empowers communities by providing them with control over their water resources, fostering sustainable development.
- Mitigation of Climate Change: By reducing reliance on fossil fuels, solar-powered water supply schemes contribute to mitigate the climate change, aligning with global efforts to address environmental challenges and reducing carbon footprints.
- Meet Sustainable Development Goals (SDGs): The SDGs goals 6,11,12,13,17 will be catered.
- Net Zero Emission by 2070 :Solar-based water supply schemes of about 900 MW will generate approximately 13 lacs carbon credits per year which will contribute to nations goal "Net Zero Emissions by 2070". Selling of Carbon Credits in international market will provide additional funds for O&M of the schemes.

Advancement in FHTC - Overview

2,66,54,834



2,23,67,420

(85.57%)

2,28,83,641

(85.85%)

5,16,221

(1.94%)

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National Level Comparison in FHTC Progress

(Work progress in achieved numbers of household with tap water supply)





FHTC's Progress in Uttar Pradesh

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FHTC's Achievement in Numbers





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Implemented Strategy for Sustainability of the Schemes

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- **Operation & Maintenance:** 10 Years of Operation & Maintenance period managed solely by the same execution firms, ensuring the long-term sustainability of the schemes.
- <u>Efficient O&M policy</u> has been implemented to make the schemes sustainable and achieve the service level benchmarks.
- Monitoring & Data Systems: Using IoT technology to monitor the performance of water schemes and identify areas that need maintenance or upgrades.
 - **Solar Power Integration**: By powering water supply systems with solar energy, O&M costs are reduced to a great extent, and the systems become more resilient and environmentally sustainable.
 - **Community Ownership**: Local Village Water & Sanitation Committees (VWSCs) have been empowered to support operation & maintenance of water supply schemes.
 - **Regulatory Oversight**: Ensuring that there is continuous governmental oversight to maintain service standards and quality of water supply.

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Community Empowerment



 Implementing solar water supply solutions empowers communities by providing them with control over their water resources, fostering sustainable development.

 Training programs for over 12.36 lakh local stakeholders, including plumbers, pump operators, and women for water quality testing, have created jobs and enhanced skills at the grassroots level



Pump house operated by solar panels in Udaipur Gram Panchayat of Lucknow. Women in the areas express their happiness as now 'no power' does not mean 'no water' for them



Information Education & Communication (IEC)

JJM not only focuses on building water infrastructure but also aims to empower local communities for responsible ownership in operate, maintain and managing water supply schemes.

The success of JJM also relies on effective implementation of Information, Education, and Communication (IEC) strategies, and the status of local community training under IEC in Uttar Pradesh is tabulated here.



Description	No of people trained
No. of trained plumbers	1,16,037
No. of trained electrician	1,16,667
No. of trained motor mechanic.	1,15,505
No. of trained fitter	1,16,078
No. of trained pump operator	1,16,007
No. of trained mason	1,75,880
Fotal Participants Trained	7,56,174

Woman Empowerment in Water Quality Monitoring & Surveillance



Under JJM in Uttar Pradesh, a routine activity has been initiated based on a standardized drinking water quality monitoring protocol. Local communities, with a particular focus on empowering women, are actively engaged in utilizing Field Test Kits (FTKs). This involves the identification and evaluation of factors related to drinking water that may pose health risks.



Cumulative Data	(0)	
Woman trained for FTK	5,53,699	
No. of test performed by FTK	1,09,56,581	
No. of test performed in schools by FTK	1,10,986 (95.07% out of 1,16,738)	
No of test performed in Anganwadi by FTK	1,46,051 (93.32 % out of 1,56,507)	पुन्ग्री, उत्तर प्रदेश, भारत 3965+Q7G, पुन्ग्री, पॉगरी, उत्तर प्रदेश 210129, भारत Lat 25.061255° Long 80.359353° 30/12/23 02:22 PM GMT +05:30

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SCADA & Automation

- SCADA & automation systems have been implemented in all the water supply schemes, enabling real-time monitoring dashboards to improve efficiency and sustainability.
- This system enables better control in water supply scheme operations, reducing downtime and resource wastage.
- This system designed in such a way to understand the water quality & quantity parameters. Which helps to monitor the service level benchmarks, ultimately improves the efficiency and sustainability of the system.



Grievance Redressal Mechanism



Grievance Reporting System

- •Toll free number 1800 1212164
- •Web portal https://jalsamadhan .in/
- Social media(facebooK,X,In stagram ,youtube)
- Grievance registers /complaints box water works compound/EE office etc.

Grievance resolution & monitoring system

- Grievances reaches to concerned agencies of the location
- Grievances will be attended within 24 hrs of complaints received
- If fails to resolve within 24 hrs, the grievance will be escalated to higher level (JE-> AE -> EE -> SWSM)
- If grievances not attended in stipulated time as per agreement penalty will be impose on the concerned agency.
- All the grievances will be monitored through real time Dashboard

Redressal system & Feedback mechanism

- Grievances will be resolved by concerned agencies.
- Complainant will receive the message after successful resolution of grievance.
- Complainant will close the complaint once resolved to their satisfaction (online portal) if fails concerned EE will close it.
- Complainant will receive the feedback call from SWSM.



Social & Health Impact



The impact assessment on social issues and health issues have been conducted in the state, revealed significant positive outcomes after the implementation of water supply schemes in rural areas:

Improved Health: 97% of women stated a reduction in waterborne diseases because of access to safe drinking water.
Time Savings: Availability of water at household premises saved time, enabling families to spend more quality time together and improving punctuality for working individuals.

3.Support for the Elderly: Easy access to water at home improved the quality of life for elderly individuals living alone, reducing the burden of fetching water from far location.

4.Empowered Women: Increased local employment, living standards and respect for women.

5.Reduced Urban Migration: Migration to urban areas decreased.

6.Inclusive Access: Water availability for all, regardless of economic/ social status, eliminated disparities.

7.Boost in Education: Students attendance has been increased due to consistent water supply to their household, schools and Anganwadi centers as the water borne dieses have been reduced significantly. The drop out rate of student especially girl child has been reduced drastically.

8.Local Employment: Enhanced local employment opportunities for both men and women.

Challenges



Land Acquisition.	Availability of material such as pipes, fittings, instruments etc
Electricity Coverage in Remote Areas	Various types of Geographical Terrain.
Availability of Skilled, unskilled manpower, Machineries, Tools & Plants.	Capacity Building , Community Engagement. & Public/Consumer behavior shift.
Availability of material such as pipes, fittings, instruments etc.	Lack of Robust O&M Policy
Measurement of Works & timely payment	Grey Water Management
	Land Acquisition. Electricity Coverage in Remote Areas Availability of Skilled, unskilled manpower, Machineries, Tools & Plants. Availability of material such as pipes, fittings, instruments etc. Measurement of Works & timely payment

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Contribution to Our Nation's Target

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Honourable Prime minister of India had set a target of building 100GW solar energy capacity. Out of which **01 GW** solar energy capacity has been achieved through solar based water supply schemes only in Uttar Pradesh.

Thank You ...



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