

Solar Powered Drinking Water Purification & ATW System through CSR

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Abstract- Every year India is losing 73 million working days due to water borne diseases, more than 37.7 million people affected and 1 lakhs people die of water-borne diseases. India especially in rural area needs safe & hygienic drinking water. Most of the area in rural area is without electric supply or regular power cut. So, it is essential to set up Solar Powered water treatment plant (RO) with ATW system in rural/semi urban area. This system is designed to run the Water Treatment Plant by Solar with 3-4 Hr. Battery Back-up time. The purpose of this article to set up Solar Power SMART RO Plant in rural & semi urban area association with CSR ,Gram Panchayat & Companies, to provide safe & hygienic drinking water at a reasonable price.

Key Words: RO: Reverse Osmosis, CSR: Corporate Social Responsibility, IEC: Information Education Communication, TFC/TFM: Thin Film Composite Film Membrane, ATW: Any Time Water

1. INTRODUCTION

Due to Poor quality of water and presence of chemical/ bacteriological contamination, many water borne diseases are spread, which causes untold misery, and in several cases even death, thereby adversely affecting the socio-economic progress of the country. From an estimate by Water Aid, it has come out that these diseases negatively affect health and education in children, and further what is worse, 180 million man days approx. lost in the working population to India every year.

2. NEED FOR INDIA

The rural population of India comprises more than 833 million people residing in about 1.69 million rural regions. Providing clean safe drinking water in adequate quantity and within minimum distance to such a large population is an enormous challenge.

The health burden of poor water quality is enormous.

As United Nations Report:

- ❖ Over 1 lakhs people die of water-borne diseases annually.
- ❖ 37.7 million People affected annually due to unavailability of Safe Drinking Water.
- ❖ ~ 25% of Indian villages have no protected drinking water source.

- ❖ 73 million working days lost yearly due to waterborne diseases.
- ❖ \$600 million economic burden yearly on India.

Water-related diseases put an economic burden on both the household and the nation's economy. At household levels, the economic loss includes cost of medical treatment and wage loss during sickness. Loss of working days affects national productivity. Government spends a considerable amount undertaking water supply projects including water purification and providing safe drinking water to all in rural India in adequate quantity and within minimum distance, including piped supply to within the household.

These are challenging and enormous tasks. Given the diversity of the country, solutions have to be diverse, and given the quantum of biological and chemical contamination in water in rural India, an all-out effort is required by all concerned to solve this gigantic problem which will improve the overall health and thereby the productivity of the Nation. It is in this context that interventions by Central Public Sector Units (CPSUs) and Corporate Houses under Corporate Social Responsibility (CSR) become relevant.

3. WHY CSR FOR DRINKING WATER

The provision of clean drinking water has been given priority in the Constitution of India. In Article 47 conferring the duty to the State for providing clean drinking water and improving public health standards, the government has undertaken various programmes since independence to provide safe drinking water to the rural masses. Till the 11th plan, an estimated total of Rs.72, 165.42 Cr have been spent on providing safe drinking water to the rural population in India. The expenditure has been substantial, but it remains a fact that despite such expenditure, lack of adequate quantity safe and secure drinking water within minimum distance (including piped house supply) to rural population in India continues to be a major challenge. Although India has met the MDG targets on water coverage, however quality, quantity, distance and sustainability still remain key issues. Through CSR initiatives, we intend to cover not only quality (chemical/ bacteriological contamination), but also the other three issues, as well as all related linked activities.

4. CSR- INDIAN COMPANIES ACT 2013

India's new Companies Act 2013 has introduced several new provisions which change the face of Indian corporate business. One of such new provisions is Corporate Social Responsibility (CSR). The concept of CSR rests on the ideology of give and take. Companies take resources in the form of raw materials, human resources etc. from the society. By performing the task of CSR activities, the companies are giving something back to the society.

Ministry of Corporate Affairs has recently notified Section 135 and Schedule VII of the Companies Act as well as the provisions of the Companies (Corporate Social Responsibility Policy) Rules, 2014 (CRS Rules) which has come into effect from 1 April 2014.

4.1 Applicability

Section 135 of the Companies Act provides the threshold limit for applicability of the CSR to a Company i.e.

- (a) Net-worth of the company to be Rs 500 Cr. or more;
- (b) Turnover of the company to be Rs 1000 Cr. or more;
- (c) Net profit of the company to be Rs 5 cr. or more.

Further as per the CSR Rules, the provisions of CSR are not only applicable to Indian companies, but also applicable to branch and project offices of a foreign company in India.

4.2 CSR Committee and Policy

Every qualifying company requires spending of at least 2% of its average net profit for the immediately preceding 3 financial years on CSR activities. Further, the qualifying company will be required to constitute a committee (CSR Committee) of the Board of Directors (Board) consisting of 3 or more Directors. The CSR Committee shall formulate and recommend to the Board, a policy which shall indicate the activities to be undertaken (CSR Policy); recommend the amount of expenditure to be incurred on the activities referred and monitor the CSR Policy of the company. The Board shall take into account the recommendations made by the CSR Committee and approve the CSR Policy of the company.

4.3 Definition of the term CSR

The term CSR has been defined under the CSR Rules which includes but is not limited to:

- ❖ Projects or programs relating to activities specified in the Schedule; or
- ❖ Projects or programs relating to activities undertaken by the Board in pursuance of recommendations of the CSR Committee as per the declared CSR policy subject to the condition that such policy covers subjects enumerated in the Schedule.

This definition of CSR assumes significance as it allows companies to engage in projects or programs relating to activities enlisted under the Schedule. Flexibility is also permitted to the companies by allowing them to choose

their preferred CSR engagements that are in conformity with the CSR policy.

4.4 Activities under CSR

The activities that can be done by the company to achieve its CSR obligations include eradicating extreme hunger and poverty, promotion of education, promoting gender equality and empowering women, reducing child mortality and improving maternal health, combating human immunodeficiency virus, acquired, immune deficiency syndrome, malaria and other diseases, ensuring environmental sustainability, employment enhancing vocational skills, social business projects, contribution to the Prime Minister's National Relief Fund or any other fund set up by the Central Government or the State Governments for socio-economic development and relief and funds for the welfare of the Scheduled Castes, the Scheduled Tribes, other backward classes, minorities and women and such other matters as may be prescribed.

4.5 Local Area

Under the Companies Act, preference should be given to local areas and the areas where the company operates. Company may also choose to associate with 2 or more companies for fulfilling the CSR activities provided that they are able to report individually. The CSR Committee shall also prepare the CSR Policy in which it includes the projects and programmes which is to be undertaken, prepare a list of projects and programmes, which a company plans to undertake during the implementation year and also focus on integrating business models with social and environmental priorities and process in order to create share value.

The company can also make the annual report of CSR activities in which they mention the average net profit for the 3 financial years and also prescribed CSR expenditure but if the company is unable to spend the minimum required expenditure the company has to give the reasons in the Board Report for noncompliance so that there are no penal provisions are attracted by it.

5. OBJECTIVES REGRARDS TO WATER

The main objective of taking up CSR activities in the rural drinking water sector are as under:

- ❖ Provision of safe and potable drinking water in adequate quantity and within minimum distance to all at all time and to bring about an improvement in the general quality of life in the rural area.
- ❖ Initiate conservation, recharge and sustainability measures with regard to drinking water in the rural area.
- ❖ Special attention may be given to habitations of weaker sections and SC/STs.

6. METHODOLOGY

CPSEs and Corporate Houses may partner with State Govt., Local Authorities and Panchayats/Village Level Water and Sanitation Committee and leading National level NGOs, Trusts, Social Non-Profit organizations and Section 25 companies having sufficiently long experience in constructing and maintaining Water and Sanitation projects depending upon what projects are proposed to be taken up under CSR.

7. TYPE OF ACTIVITIES

The targeted area for implementation of CSR projects by the CPSEs and Corporate Houses are under:

- ❖ Water Supply projects including conservation, recharge and sustainability projects.
- ❖ Provision of household pipe connections.
- ❖ Setting up centralized/ decentralized water treatment plants for Drinking Water and their Operation and Maintenance (O & M) for at least five years in the rural areas /semi-urban areas of the country.
- ❖ IEC, awareness advocacy and handholding on water quality, water quality testing, conservation, recharge, sustainability, safe storage and advocacy on taking up house connection etc.
- ❖ Setting up testing labs for testing of presence of heavy metals, pesticides, fertilizers etc. in raw water source and in treated water.
- ❖ Any other related activity.

8. ROLE OF MINISTRY OF DRINKING WATER AND SANITATION

The Ministry of Drinking Water and Sanitation (Gov. of India) will provide support to CPSEs/Corporate houses and play a facilitating role. State Governments will be requested by Ministry of Drinking Water & Sanitation to provide support to the CPSEs /Corporate houses for identification of projects and providing any land or building (if required) without cost to the project for construction of the CSR projects as identified above. It would be convenient to maintain a list of

(a) CPSEs/Private Corporate House is willing to promote CSR activities, (b) List of NGOs/Trusts/Section 25 Companies/Charities /not for profit Social Organizations/Others having long experience of construction/implementation and maintenance of projects in identified fields and (c) A list of villages/Gram Panchayats where CSR works can be undertaken.

State Government may provide Gram Sabha/ other lands / Wastelands/Common Lands/ Government Lands/ community lands or other buildings that may be required for setting up water activities as above through CSR. Only the minimum lands or buildings actually necessary may be considered.

9. MONITORING MECHANISM

Project monitoring and reporting are essential components of project management. A Central Monitoring and Coordination Committee (CMCC) would be formed at the Central level and a nominee from the state where the CSR projects is being implemented may also be invited. The CMCC would also play a facilitator role for the CPSEs/Private Corporate House for the CSR projects concerned.

Regular monitoring by meeting & report would enable the CMCC to identify actual or potential problems as early as possible and solve them in order to facilitate timely project implementation.

10. OPERATION AND MAINTENANCE

The CPSEs/Corporate Houses should enter into a separate agreement with the implementing NGO/Social organization (which is to construct the water project) for operation and maintenance of the Water Treatment Plant or other project (preferably for five years). O&M costs during this period would be part of project costs to be supported by the CPSE/ Private Corporate House. After this period, the project may be handed over by the implementing NGO/Social organization with the approval of CPSE/Private Corporate House to the Gram Panchayat for maintenance or to any other agency decided by the State Government/ Gram Panchayat who are capable to operate, or else maintenance by the CPSEs /Corporate House through the NGO/Social organization may be continued for further time. For purpose of funding O&M for the first 5 years, the CPSE/Private Corporate House may make assessment and create an amortization fund in a bank or otherwise, with regular releases every month/6 months to the O&M agency.

11. DRINKING WATER PURIFICATION SYSTEM

Reverse osmosis step are commonly used for water purification for drinking and cooking purpose worldwide. Such System typically includes as follows:

- ❖ Sediment filters to trap particles, including rust and calcium carbonate.
- ❖ Second sediment filters with smaller pores an activated carbon filter to trap organic chemicals and chlorine, which will attack and degrade TFC
- ❖ Reverse osmosis membranes a reverse osmosis (RO) filter, which is a thin film composite membrane (TFM or TFC).
- ❖ Second carbon filter to capture those chemicals not removed by RO membrane.
- ❖ Ultra-violets lamp for disinfecting any microbes that may escape filtering by the reverse osmosis membrane.

RO Plant controls the dissolved solids or salts such as calcium, magnesium, silica, sulphates, carbonates etc. in raw water.

12. BUSINESS & CUSTOMER SEGMENTS

Utility Services-Community	Utility Services-Commercial
Villages Gram Panchayats Social Entrepreneurs Corporates CSR NGO's	Schools Colleges & Institutes Hospitals Commercial Buildings Office Establishments PSU/ Corporates Dealer Network Gated Communities Townships Smart Cities

13. COMMERCIAL MODELS: END TO END SOLUTIONS

Corporates	OEM Suppliers	Project Based Teams
Direct connect Long term Partnerships Key Accounts Management	Company as system Integrator Tie up with OEM-Supplier Installation & Commissioning, O&M through Suppliers Spares Parts Management through OEM	Tender based orders execution through a team. Partner as required Design capabilities Solution based approach

14. DIFFERENT TYPE OF DRINKING WATER PURIFICATION SYSTEM

Source of Waters	Ground Water	Surface Water	Sea Water
Types of Plants	RO	UF	Desalination
	<ul style="list-style-type: none"> Solar Grid DG Set 	<ul style="list-style-type: none"> Solar Grid Gravity 	<ul style="list-style-type: none"> Grid

15. WATER PURIFICATION (RO) PLANT



16. KEY FEATURES OF RO PLANTS



- Preventive Maintenance
- RO Technician Training

17. SAFE DRINKING WATER STATION



18. DRINKING WATER DISTRIBUTION SYSTEM



19. SOLAR POWERED RO/UF PLANT



- Can run 500 to 1000 LPH RO Plant
- Can run 750 to 1250 LPH UF Plants
- Automatic operation
- With 3-4 Hours Battery Backup
- Places where there is no availability of power
- Reduces the energy consumption on plant which enables operation without grid connection

20. AUTOMATED RO PLANT WITH ATW (ANY TIME WATER) SYSTEM



- This is designed for 500-1000 LPH RO unit (Fully automated System) with ATM provision and the entire system is structured in a Pre-Fabricated Shelter
- The System is designed for rural communities
- Easy monitoring of the entire system and also prevent wastage of water.
- Aids in accurate consumption of drinking water

21. ADDITIONAL FEATURES OF ATW SYSTEM



- ATM System: Water distribution through Swipe card to easy monitor of the water consumption
 - GPRS System: It will useful for NGO's/ Entrepreneur to see the plan performance and functions
- Drinking water ATM Machine operation:
- Every family has to take the access card to take the 20 Liters of water / day & 30 times in a month.
 - After that he has to recharge like mobile recharge and operate / take the water.

22. VARIOUS BUSINESS MODELS

- NGO's Model
- Community Model
- Entrepreneur's Model
- Government Model
- Corporate Model

a) NGO's Model

Village Panchayat	NGO's	Company
<ul style="list-style-type: none"> • Shelter • Water Source • Electricity • Committee Formation with the 5 Members 	<ul style="list-style-type: none"> • Awareness Creation. • Arrangement of RO Plant from Company • Operation and Maintenance of the RO plant • Distribution of Safe Drinking Water to the Community through SHG • Sale of Drinking Water Rs.4/- per 20 Liters Can 	<ul style="list-style-type: none"> • Project Viability Report. • Supply of the RO plant. • Installation & Commissioning • Training to the Operators. • Frequently Water Check Ups

b) Community Model

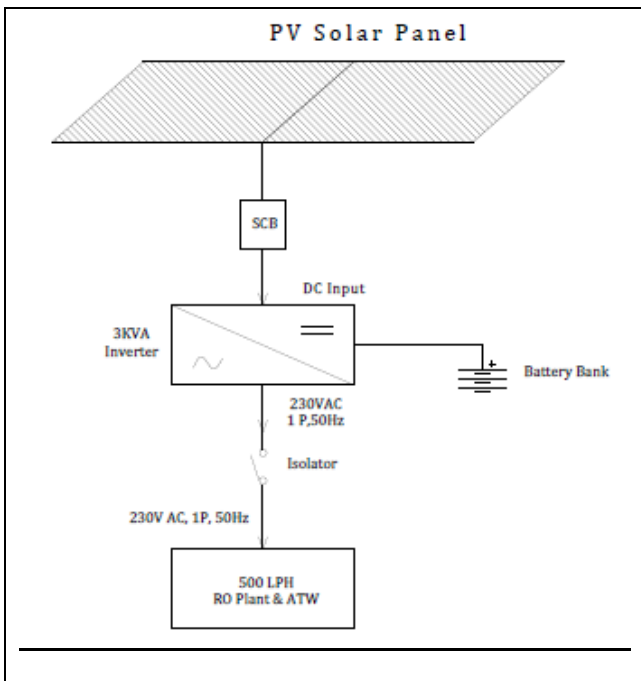
Village Panchayat	Self Help Group / Water Committees	Company
<ul style="list-style-type: none"> • Shelter • Water Source • Electricity 	<ul style="list-style-type: none"> • Operation and Maintenance of the RO plant • Distribution of Safe Drinking Water to the Community 	<ul style="list-style-type: none"> • Arranging finance from the Bankers for the Community • Awareness Creation • Supply of the RO plant • Installation & Commissioning. • Training to the Operators • Frequently Water Check ups

c.) Entrepreneur's Model

Lions Club /other clubs	Entrepreneur	Company
<ul style="list-style-type: none"> • Shelter • Water Source 	<ul style="list-style-type: none"> • Operation and Maintenance of the RO plant 	<ul style="list-style-type: none"> • Project Viability Report • Arranging the

<ul style="list-style-type: none"> • Electricity 	<ul style="list-style-type: none"> • Distribution of Safe Drinking Water to the Community • Sale of Drinking Water Rs.4/- per 20 Liters Can • Frequently Water Check Ups 	<ul style="list-style-type: none"> Finance from the Bankers for the Community • Awareness Creation • Supply of the RO plant • Installation & Commissioning • Training to the Operators
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23. SINGLE LINE DIAGRAM OF RO & ATW SYSTEM



24. SCOPE OF SUPPLY OF 500 LPH RO & ATW PLANT

(A) Company's Scope

500 LPH RO Water purification system & Solar Power Inverter system with battery Back-up.

- ❖ It is a skid mounted 500 LPH capacities RO Unit with manual operation and ATW system with 3 Hr. Battery back-up and 300 swipe cards.
- ❖ Suitable capacity Solar System with 4 Hr. back up and inverter to suit 500 LPH RO Unit.
- ❖ Supply of Raw & Product Water storage tank of capacity 2000(HDPE-food grade) & 2000(SS304) Litres for 500 LPH RO Unit.
- ❖ Pipes and fittings from raw water storage tank to product water storage tank and reject water pipe line up to 5 metres.

- ❖ Supply, Installation & Commissioning of the above systems at client site (village Gram Panchayat).
- ❖ One Month Consumables.
- ❖ Loading (Packing & Forwarding) of the supply equipment to site.
- ❖ Training to the Operator.

(B) Consumer (Village Panchayat) Scope

- ❖ Provide covered and secure Room of size 12'(L)x12'(W)x12'(H) for 500 LPH RO unit.
- ❖ Provide Raw Water either from a storage tank placed on 3'- 4' height pedestal outside the Room in which the RO plant is to be installed or an overhead tank close to Room fed by bore well.
- ❖ Provide connection from bore well to Raw Water Tank with 1" pipe for 500 LPH RO unit.
- ❖ Unloading of equipment at site.

(C) Cost: All the prices are exclusive of taxes

- ❖ Supply of 500 LPH capacity RO Unit: **INR 3.0 Lacks**
- ❖ Supply of Solar Power System :**INR 3.2 Lacks**
- ❖ Installation & Commissioning of the 500 LPH capacity RO Unit: **INR 0.10 Lacks**
- ❖ Installation Commissioning of the Solar Power System : **INR 0.10 Lacks**
- ❖ Transportation Charges for 500 LPH RO Unit : **INR 0.08 Lacks**
- ❖ Transportation Charges for Solar Power System :**INR 0.08 Lacks**

(D) Bill of Quantity of the above systems

Solar Powered Drinking Water System(RO)			
Capacity: 500 liter/Hr. for 6 Hrs., Daily operation= 3000 Liter / day for 1000 member of village			
Sl N	Description	Unit	Qty
A	RO Plant:		
1	Supply Of RO Water Purification Unit(500 LPH), TDS<2000 ppm)	1	No
2	Storage Tanks of capacity 2000(HDPE-Food grade)& 2000 Liters (MOC:SS304)	1	No
3	ATW System with 3 Hrs. Battery Back-up and 300 swipe cards	1	No
4	Installation and commissioning charges	1	No
B	Solar Power System:		
1	Solar Systems with 4 Hrs. Battery Back Up and Inverter to suit 500 LPH RO Unit	1	No
2	Installation and commissioning charges	1	No

25. CONCLUSION

India has yearly \$600 million economic burden. To overcome this burden we have to create / save the man days. Health is wealth. Hygienic food, Safe & purified drinking water are key role for good health. It is necessary to provide this requirement to our Citizen to keep them healthy. If our citizen will be healthy will work more & will create more man days. More working days mean higher productivity, more income, more GDP. More GDP will lead to economic growth of India, which will reduce our economic burden. It is duty of Government Bodies, NGOs & Private & Public Companies, Gram Panchayats to join hand together to develop our Country.

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