

*Aqua's (1005 hp @ 3.3kV) Submerged Centrifugal Pumpsets
based Floating Pumping Station*

to lift 444 MLD / 18,494m³/hr @ 140m

Water for the Initial-fill of the Lower Reservoir at

World's Largest Pinnapuram IREP

(Integrated Renewable Energy Project) with

1,680 MW Reversible Pump Turbines to store upto 10,800 MWh/day



**PINNAPURAM
1680MW PSP
Andhra Pradesh**



greenko 

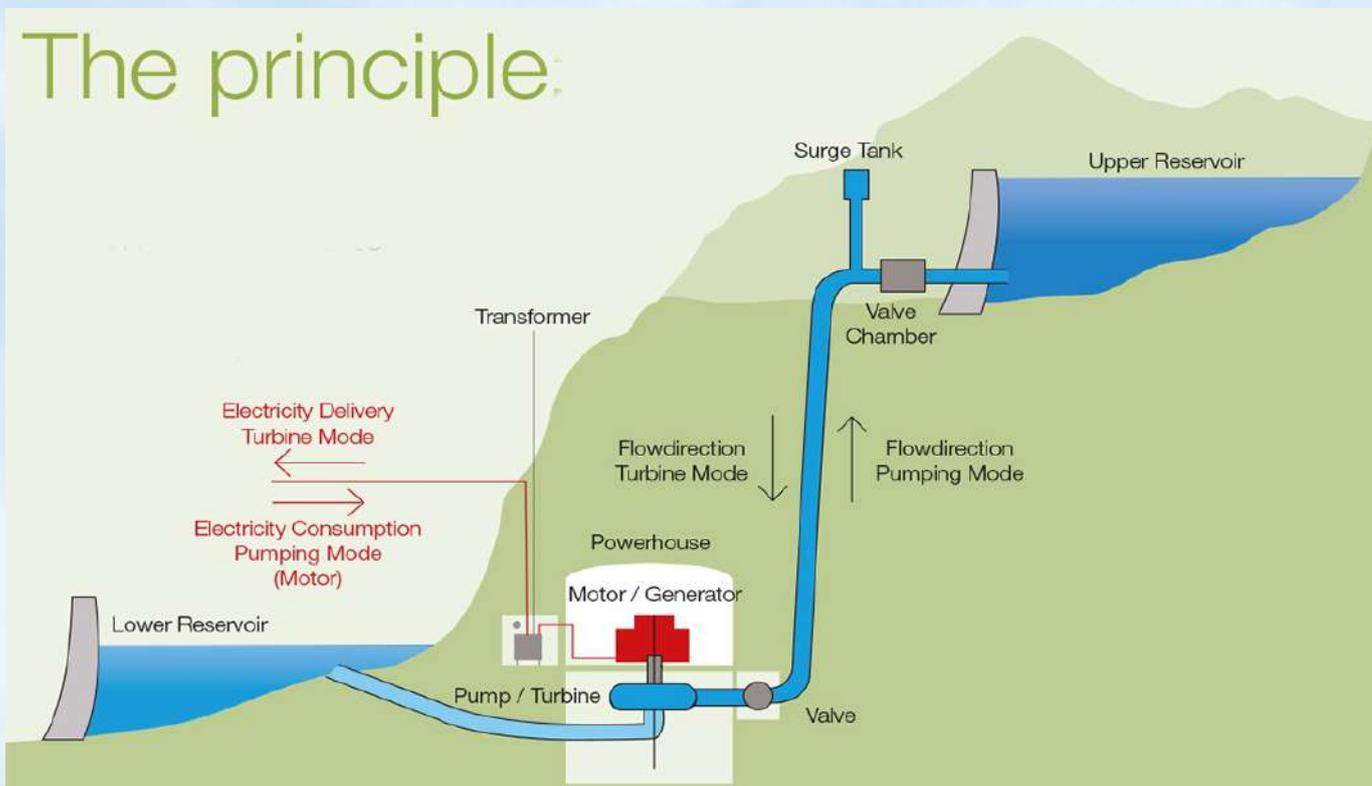
Renewable Energy Storage

Pumped Hydro Energy Storage (PSP), uses two huge water reservoirs to store electricity.

Excess (*renewable energy*) Electricity is used to Pump water from Lower reservoir to the Upper reservoir - thereby converting Electrical Energy into Geodetic (*Static*) Head of Water.

Then, whenever the Electricity is needed; Water from the Upper reservoir is released to flow back down to the Lower reservoir through the same Pump / Turbine that transforms it electricity - i.e. re-converting Geodetic (*Static*) Head of Water into Electrical Energy.

The idea is to store cheap green power during off-peak hours by raising water to a height and then releasing it into a lower reservoir to generate electricity when demand increases.



The Project:



Hyderabad-based **Greenko** Group is among the largest renewable energy

(RE) companies with an installed capacity of **7.5GW** across the Solar, Wind & Hydro generation assets spread in 15 states.

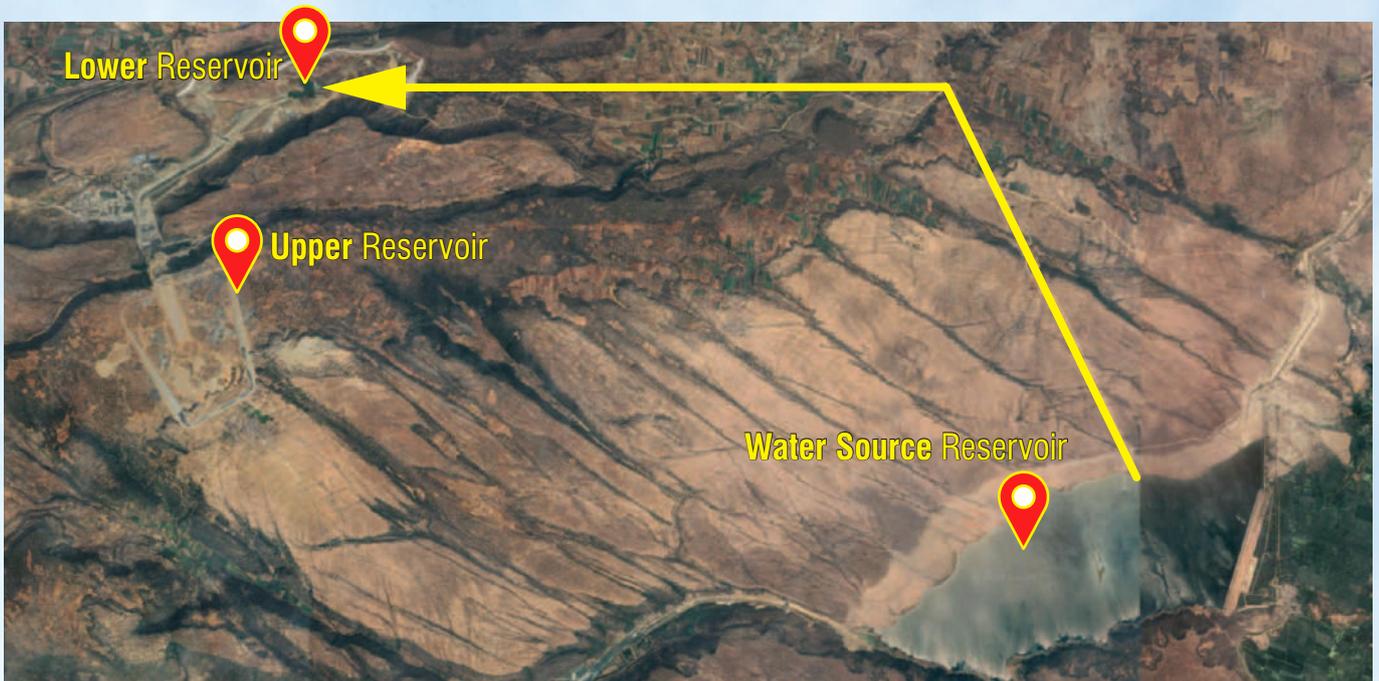
Pinnapuram is the **World's Largest & 1st Gigawatt** scale **Integrated Renewable Energy Project (IREP)** with Solar, Wind & Pumped Storage components that can supply **Schedulable Power On Demand (SPoD)**. It is 1st of its kind stream, closed-loop GW scale Long Duration energy storage with up to **10,800MWh of Daily storage..!**



The Situation :

Two large artificial lakes were made for feeding the RPT's which required a Initial charge of **1.4TMC** of water.

Being Artificial Reservoirs, Water for Initial Fill was to be Pumped from nearly **14km** (from Gorakallu reservoir) & at a Static Lift of **96m**



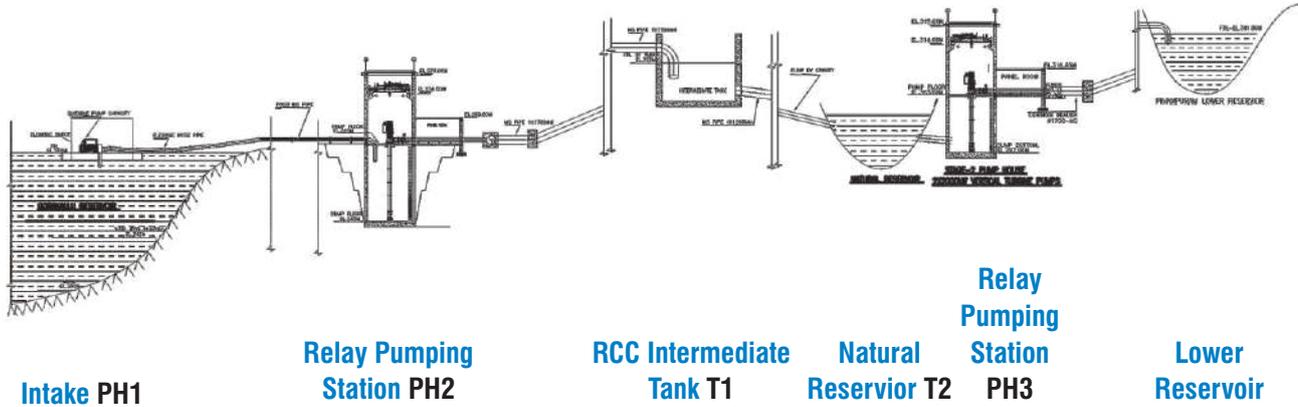
The Challenge :



Gorakallu reservoir has **Shallow, Rocky** terrain & has **Huge Seasonal Water Level Variation...** 

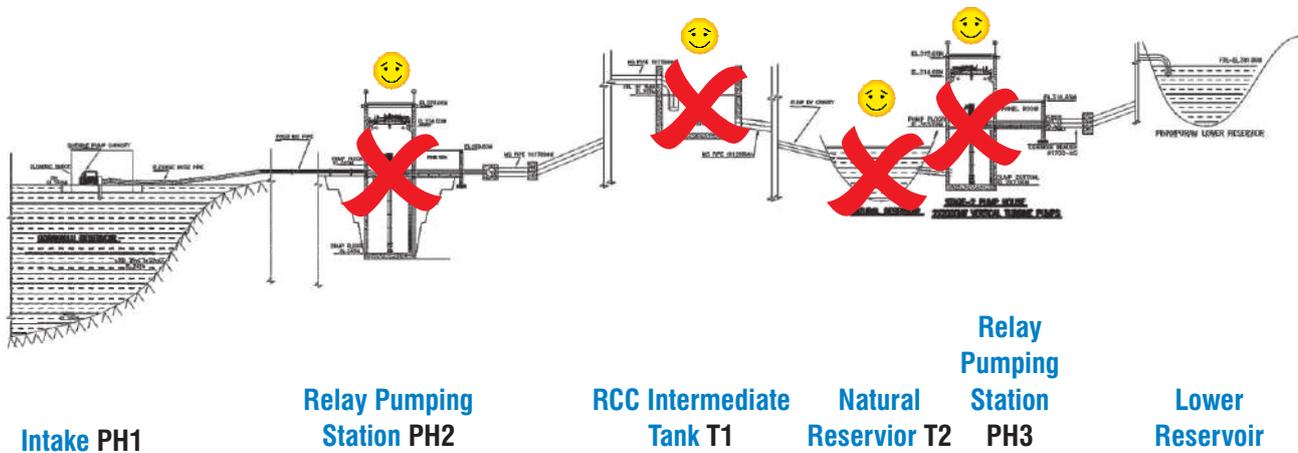
Water Pumping Layout

CLIENT's Original Scheme

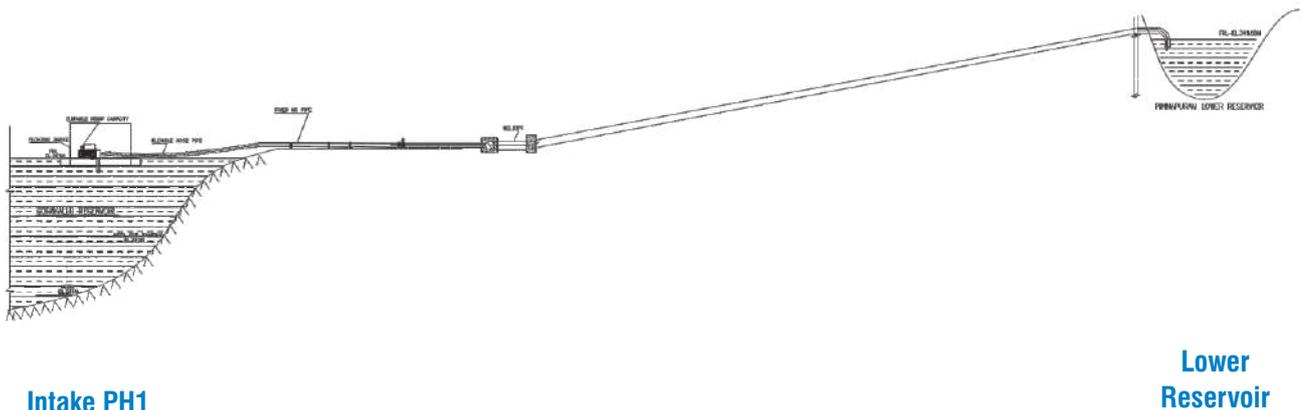


Optimized with the help of AQUA

Saving of 4 Elements



AQUA's Proposed, Selected & Executed

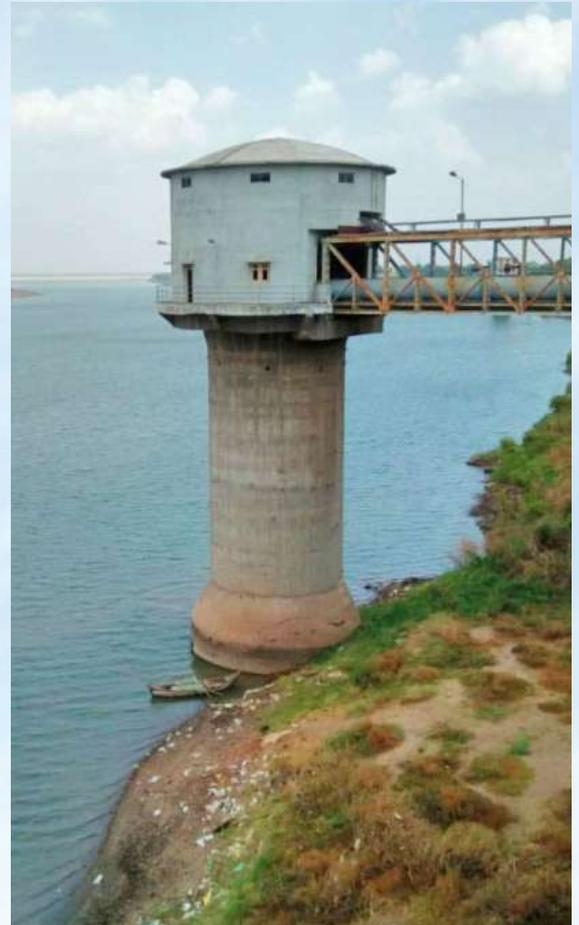


⚠ Construction of Intake Well is a Complex & Tedious job:

Constraints:

Design & Approval Synchronisation issues for Statutory permissions issues from **Multiple Authorities :**

- Land Acquisition Collectorate,
- Water Body Owner WRD,
- Beneficiary Local Body / PHE,
- often Forest Dept.,
- a plethora of DPR & Proof Consultants.
- Resistance of Local Farmers,



Quandry...?



VT Pump based RCC Lifting Station



SubCF Pump based Pontoon Lifting Station

$$\text{Benefit-Cost Ratio} = \frac{\sum_{t=0}^n \frac{CF_t [\text{Benefits}]}{(1+i)^t}}{\sum_{t=0}^n \frac{CF_t [\text{Costs}]}{(1+i)^t}}$$

However, before embarking on selecting any option of Lifting Stations, it's Benefit-Cost Ratio needs to be favorable. Due to the Competitive CAPEX (especially the Cost of Civil Structures) & Low OPEX (Maintenance) required by **SubCF pumps**, it's Benefit - Cost ratio was more **favourable**.

CLIENT'S REQUIREMENT				
Initial Water Drawl: 1.4 TMC (First Year)				
Recurring Water Drawl: 15% i.e. 0.214 TMC per Annum Make Up Water (MUW), 2nd Year Onwards				
	FEATURE / ASPECT	CLIENTS's Original Scheme (Initial Enquiry)	AQUA's Optimized Scheme (As Executed)	CLIENTS's Benefit
A	Water Intake from Gorukallu Reservoir			
	1. Intake vide Floating Pontoon Submerged Centrifugal Pumpsets	✓	✓	-
	2. Relay Pumping Station	✗	✗	Cost & Hassles saved 😊
	3. RCC Intermediate Tank	✗	✗	Cost & Hassles saved 😊
	4. Natural Reservoir	✗	-	Cost & Hassles saved 😊
	5. Relay Pumping Station	✗	✗	Cost & Hassles saved 😊
	Water Disposal to Pinnapuram Lower Reservoir	-	-	-
B	No. of Pumping Stations & RCC Structures to be made	Three Pumping Stations (Intake PH1, PH2 and PH3)	One (Intake PH1)	Cost & Hassles saved 😊
		Two Civil Structures (RCC Intermediate Tank T1 & Reservoir T2)		Savings in CAPEX on Civil Structures is ~ ₹ 7.5 Crores Savings 😊
C	Total Static Lift	96m	96m	-
D	Total Pumping Head (Static + Dynamic)	206m	140m	33% Reduction in Pumping Head 😊
E	Total Pumping Machinery	PH1 → 1500 kW PH2 → 3 no's x 2700 kW each = 8100 kW PH3 → 2 no's x 2000 kW each = 4000 kW Total: 13,600 kW	10500 kW PH1 → 14 no's x 750 kW Total: 10,500 kW	Savings in CAPEX on Pumping Machinery is ~ ₹ 7.75 Crores Savings 😊
				Savings in OPEX Power Consumption of 1st Year is ~ ₹ 4.69 Crores Savings 😊 (Only three months Pumping)

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F Make Up Water Requirement (2nd Year onwards) is approx. 15% i.e. 0.214 TMC	50% ...!	7.14% or 14.28% 😊	Lower Frictional Head Losses in Pipeline - No Loss of Energy. No Need of Frequent Start-Stops or Overflowing of subsequent Reservoirs. No risk of Pump running at Part Loads eliminating Cavitation, Vibration etc.	
G 2nd Year onwards, when only MUW (approx. 15%) is to be Pumped	Scope to Derate the Sub-station Connection Load to save Minimum Demand Charges	0.4 MVA @ Intake PH1	Higher Recurring Annuity Minimum Demand Charges of ~ ₹ 1.75 Crores Savings per Year ; Throughout, the Project Life Time of 30 Years ~ ₹ 54 Crores Savings 😊	
	Minimum Demand Load (from DISCOM)	3.2 MVA @ PH2		
	Total Minimum Demand Load (from DISCOM)	2.45 MVA @ PH3		
H Project Gestation Period	Eighteen (18) months	1.8 MVA	No Risk of Pump Cavitation, Vibration & Air Suction into Piping 😊	
I Possibility of Lifting Water even when Water Shore has Drifted Away / Lowered Down due to El Nino	Not Possible !	6.0 MVA	Quick & Assured Results without the need of Extensive Permissions from Water Resources Department. Assured Results without wastage of a year or two	
			No Risk - as Tank T1 and Tank T2 are Eliminated in AQUA's Optimised Scheme 😊	

Aqua's Solution:



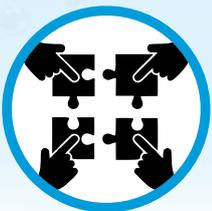
Aqua's Scope of Work

Design, Engineering, Manufacturing, Supply, Installation, Testing & Commissioning of Entire Floating Pumping Station consisting of:

- 1) **SubCF pumpsets 14W+1S, 1005hp @ 3.3kV**
(1321m³/hr x 140m)
- 2) **Pontoons** along with **Walkways**
- 3) **SS Flexible & MS fixed Pipelines**
- 4) **Valves**
- 5) **3.3 KV VCB Panels**
- 6) **1005hp 3.3kV FCMA Soft Starters** with **3.3kV Capacitors**
- 7) **HT & LT Cables**
- 8) **Auxiliary Transformer 3.3 KV/0.415KV**
- 9) **DCDB cum Battery Charger Panel**
- 10) **Earthing etc.**



Synchronization of
Hydraulic Engg + Pump + Pontoon + Walkway + Electricals + Piping
system design under a SINGLE ROOF for
Turnkey Responsibility
& Harmonious System Performance



Unforeseen Problem



EL NINO NEARLY DRIED UP GORAKALLU RESERVOIR

Water Shore when the Project was Conceived in the Year 2022



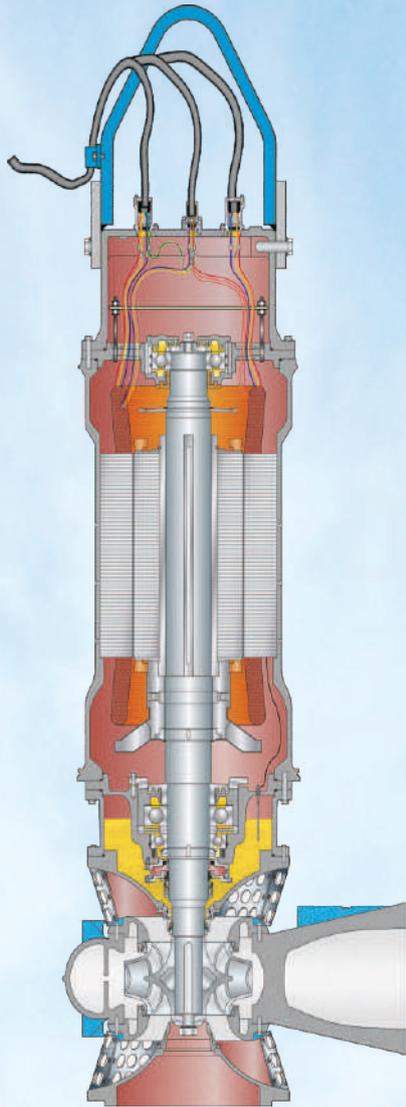
Receded Water Shore when the Project was Commissioned – A Huge Shift / Depletion



Despite “El Nino” causing unprecedentedly Low Water Level & Drifting of Water Shore away from Planned Off-take point; Thanks to AQUA's System, which could easily Lift Water under such Challenging and Unforeseen Conditions.



Thanks to **Submerged Pumpset design**, there is No need either of **Priming** nor of **Operators** on Pontoons.



ARSDS
Double Suction SCF Pumpset

Aqua's SubCF pumps:

1) Don't require any Costly, Huge Civil structures.



Huge Civil Cost & Time Savings



Avoids the need for Time Consuming RCC Intake well



Avoids issues of Land Acquisition (for Pumping Station)



Ultra Low ManPower Requirement

Requires No Special Pre – Post / Ancillary-Auxillary Operations; like :

- Suction Priming during Pump StartUp,
- Valve Opening- Closing during pump Starting- Stopping
- Operating & Maintaining the Forced Water Lubrication systems operation.



No need for Frequent Periodic....



Shafts &/or Coupling



Gland Packing



Oil &/or Grease

“ We have used Aqua's SubCF pumps at multiple sites & based on the very satisfactory results over the years, we preferred to go with Aqua yet again for Pinnapuram PSP's Raw Water Intake system.

M/s Aqua gave Proactive & Competent Pre Order Technical Support, thanks to which we could outrightly Eliminate a Fixed RCC Intake Well (thereby saving not only Crores of Rupees in Capital Cost, but also cutting down 18-24months (of Construction) Time).

However, during water drawl; due to El Nino there was an unprecedented dip in source Water Level (& far away from originally conceived tapping point); but thanks to the Flexibility of Aqua's Submerged pump based Pontoon Pumping Station; we could still draw water satisfactorily - this would not have been possible with a Fixed RCC Intake Well with Conventional pumps.

Further more advantage we have with Aqua's solution is that, after the Initial One Time Fill of 1.4TMC; we need only 10 to 15% (of Initial Water Quantum) as Make Up Water every year - hence we can shift balance pumping machinery to our other PSP sites; thereby offering Multiple Returns on our Single One Time investment.”

Adishesu Gopalam;

Director Greenko Group; Ex Director APGenCo



Greenko AP01 IREP Private Limited
 CIN: U40200GJ2012PTC139764
 K. Venkateswarlu,
 Vice-President, E&M
 Pinnapuram PSP
 Ph: 8247453927
 Email: venkateswarlu.kandru@greenkogroup.com

LF No: AP01-IREP-E&M-081, Date: 28-11-2024

To
 M/s Aqua Machineries Pvt Ltd
 Survey No. 442/2, 504/1 8504/2
 Near Haridarshan Estate,
 Near Express Highway,
 RAMOL, AHMEDABAD-382445

Contract Ref No: 1) HPL/Pumping Infra/AMPI/Contracts/2021-22/001 and amendments- 001A, 001B
 2) HPL/Pumping Infra/AMPI/Contracts/2021-22/002 and amendments- 002A, 002B

Subj: Erection, Testing and Commissioning of Submersible centrifugal Pumps along with associated equipment at part of water pumping system

Dear Sir,

It is to certify that Erection, Testing and Commissioning of Submersible centrifugal Pumps (15 Nos) along with associated equipment as part of water pumping system is Completed. All pumps are in running condition since 05/10/2024. The Performance of these pumps is satisfactory.

With Regards,

 K. Venkateswarlu,
 Vice-President, E&M
 Pinnapuram PSP

Regd. Office: Second Floor, Block 'B' Plot No. 13, St. No. 84 Post Office: Durgam Cheruvu, Hyderabad-500083, India. Phone: 080-42801300, Fax: 080-42811161, Email: info@aquapumps.com

WORK COMPLETION & RETENTION RELEASE

WORK COMPLETION

1. Name of the Project:	PSP Pinnapuram
2. Location and address:	Zero Point - Gopeshwally
3. Name of Vendor:	Aqua Machineries Pvt Ltd
4. Work Order No. & Date:	HPL/Pumping Infra/AMPI/Contracts/1/2021-22/002B
5. Contract Duration:	
6. Brief Description of Work:	Erection, testing & commissioning of Submersible centrifugal pumps along with associated equipment as part of water pumping system
7. Details of variations/Amendments if any	

Variation	Ref. Variation order (No. & date)
	HPL/Pumping Infra/AMPI/Contracts/1/2021-22/002B No. 6/12/23

Completion of All activities/Scope defined as per the Drawing/BOQ/Schedule

Work Completion Date: In All Respects: 05/10/2024

Contractor Acceptance regards Work/Order Completion Date:

Name & Signature of the Stores In charge:

Date of Reconciliation statement:

Name and Signature of the taking over person:

O & M - Site:
 O & M - Head (If Applicable):

Name and signature of Quality (QA/QC) Person:

Name and Signature of the Project Manager/in charge:

K. Venkateswarlu
 Vice-President/E&M

Pinnapuram PSP
 DGM & E.M.

RETENTION

DLP/Warranty Period of Work Order:	
Name & Signature of Retention Release Recommendation:	
Name and Signature of Retention Release Clearance:	



Rugged Pumps
Robust Solutions
Reliable People

Aqua helped the Client Save :

- A. **4 Civil Structures (including 2 Pumping Stations).**
- B. Gestation Time upto **15months.**
- C. Nearly **₹ 15.25Cr +** in CAPEX.
- D. Nearly **₹ 4.69Cr +** in OPEX Energy in First year itself.
- E. Nearly **₹ 54Cr +** in OPEX Minimum Demand Charges.
- F. Nearly **1 Year of Production Loss (despite El Nino severely depleting Source Water).**

Aqua Machineries Private Limited

www.aquapumps.com

Registered Office & Manufacturing Plant:

Survey No. 504/1-2, 442/2, Near Haridarshan Estate, Near Express Highway, Ramol, Ahmedabad-382 445. Gujarat, India.

marketing@aquapumps.com