A TROUBLE-FREE SOLUTION TO ALL YOUR PROBLEMS.

# ROBOTIC SOLAR MOBILE PUMPING SYSTEM

ROYAL INSTRUMENT INDIA PRIVATE LIMITED

We never compromise when it comes to quality.

**THE FORCE WITH WHICH OUR PUMPS PUMP WATER WILL AMAZE YOU.**

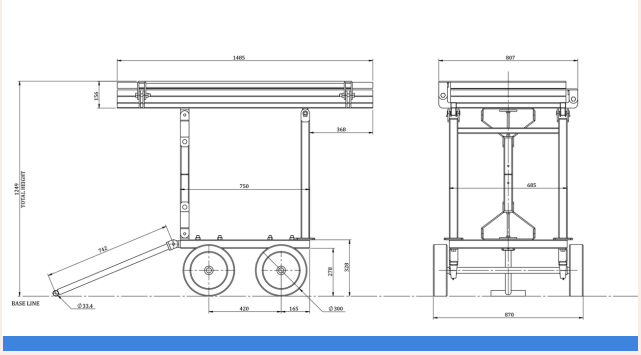
- Royal India

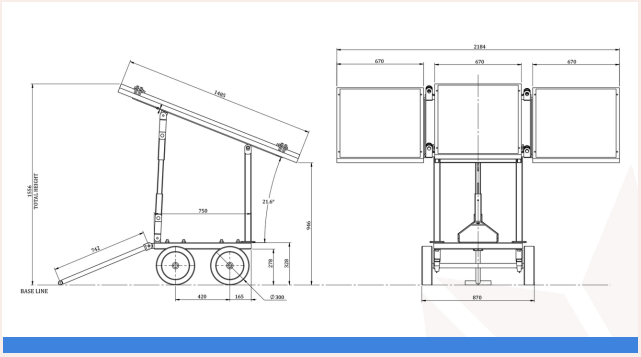
# PART A

# Overview

The Basic Reason for the high yield of productivity of the food grains is for the farmers to retain the whole agro division of the state into healthy and scientific techniques.

We at the Indian branch of the Renewable source of Energy Initiative have been involved in the assessment and promotion of efficient and clean energy services since the early 1995s.





**DURATION**

Project In Years: 5 Years

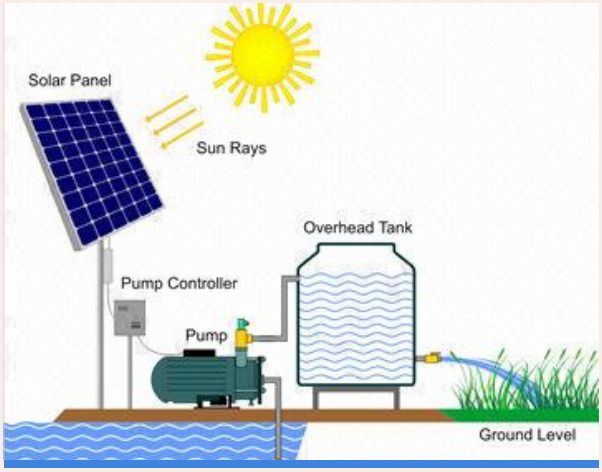
We have worked on irrigation efficiency, from estimations of the costs of conserved energy through improvements in efficiency, to a recent field project at which pump sets were replaced and micro-irrigation systems installed. We compile a list of experiences with improving irrigation efficiency.

Solar Water Pumping Solution for irrigation Purpose with renewal source of Energy. Institution: Department of Agriculture, irrigation Govemment of Jharkhand.

# Part B

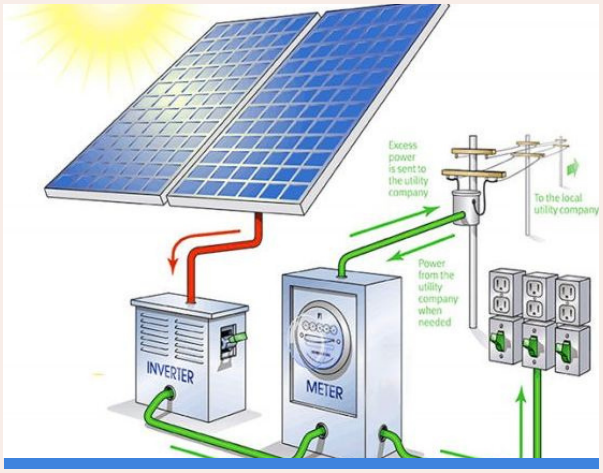
1.0
## Introduction

Farmers in India have become increasingly dependent upon groundwater for irrigation and about 60% of India's net sown area 1 is irrigated with groundwater (MoA-Gol, 2003). With the increase in population dependent on agriculture, the landman ratio has declined from over 0.4ha/person in 1900 to less than 0.1 ha/person in 2000 (Shah, 2009). Farmers felt the need to secure the means of irrigation that could permit intensification and diversification of land use, and the availability of small mechanical pumps and boring rigs provided the technological breakthrough. During the last 40 years, India has witnessed a decline in gravity-flow irrigation and consequently millions of small, private tube wells have come into use.




Most state utilities have been supplying electricity for irrigation pumping at very low (below-cost) rates for over two decades, Currently, electricity for irrigation is not properly supplied due to lack of production of electricity has increased and the practice of utilizing the non-renewable source of energy is causing the global warming at the second aspects of the mode of production. Farmers who can afford the cost of drilling a well can do so (on their own land), and solar-based electricity can be accessed anywhere, water can be pumped out at negligible energy costs. Hence, there is no incentive for efficient energy use.

The Work of Electricity consumption by farmers has worsened the financial health of the utilities, leading to high investments in the distribution system maintenance and improvements. consequently, power supply quality to rural areas has worsened considerably and the resulting unreliable supply (outages, fluctuation in voltage, etc.) has caused the frequent failure of motors. As a result, farmers have to spend regularly on repairs; they react by installing rugged locally manufactured/retrofitted pump sets that can better withstand poor supply.



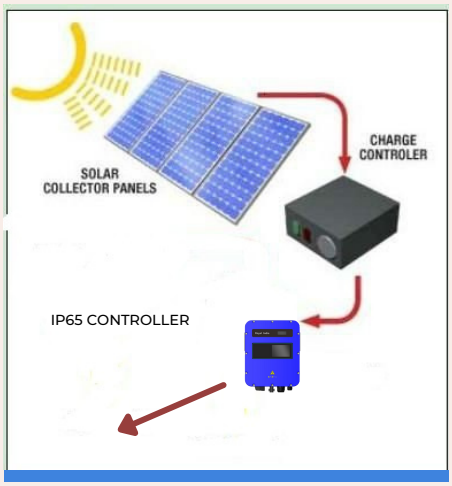

But, these are inefficient and of higher capacity, overloading the system further and to more unscheduled power shutdowns.

Utilities argue that failures of pump sets have been occurring due to the farmer's own problems, for example, us of non-standard pump sets, poorly maintained and repaired motors, and non-availability of LT capacitors (AP-CPDCL, 2009). As they get subsidized or free power farmers cannot complain about the quality. TO cope with the unreliable hours of supply, pumps are used whenever electricity is available (through automatic switches). While individual irrigation pump sets are not metered (and separation of agricultural feeders has taken place in only a few states) 4, the agricultural sector is estimated to use about 23% of utility-supplied electricity (MoP&USAID, 2009a) Further, enhanced use of groundwater has led to wells being bored increasingly deeper and farmers requiring higher-capacity pumps to lift water.

This extraction has not only increased the costs to the farmers and the utilities but progressively worsened water availability in various regions. Of the 5,723 administrative units (blocks/manuals, taluks, districts) in the country assessed by the central ground water board, in 550 blocks, groundwater resources were found semi-critical or grey (in the sense that 70% or more of the known resource was already developed).

2.0
## Rationale

The main aspect is to use the groundwater resource during the winter and as well summer seasons. During this season the scanty rainfall occurs due to which the farmers are not able to make intense farming at upland underground water resource helps the farmers for a great the yield of farm products even without rainfall through the scientific mode of farming.




3.0
## Objective

The main objective of our project is to design and fabricate a solar water pump so that our Indian farmers can utilize it at an affordable cost. From the above circuit diagram, a solar panel of 190 watts is connected to a controller and this is connected to a water pump. The main objective is to increase the yield of farm products and food grain even vegetables and many more to fulfil the need of our and other nation demand at a very low price since by utilizing the renewable source of energy the expense is cut-off to a great extent and even more, the source is pollution-free.

4.0
## Methodologies

The Most commonly employed system consists of an ac irrigation pump and inverter with a solar PV panel photovoltaic array. Submerged irrigation pump with surface mounted motor. This configuration was widely installed with turbine pumps. it gives easy access to the pump motor for brush changing and other maintenance. Solar Powered drip irrigation systems. when appropriately sized, solar pumps can support drip, sprinkler, pivot or flood irrigation methods.

4.1

## Agro-eco System Analysis

Irrigation in India has become increasingly dependent on wells, with the consequent impacts on groundwater availability and on energy use for its extraction. Efforts have been made over the past three decades from local pilot projects to state-wide programmes towards improving the efficiency with which groundwater is pumped, and for its re-charge and conservation. In this report, we have compiled the information available, from published reports and papers as well as news bulletins, on the field activities and studies carried out with respect to efficient water extraction and use for agriculture. Numerous programmers have been included ranging from cases where a few pump sets were focused on, to large programmes addressing thousands of pump sets. However, most of the cases involve the replacement/retrofitting of electrically powered irrigation pump sets. This compilation has two purposes.

Firstly, We are beginning a repository of such reports that are publicly accessible and can be expanded with more documents. As importantly, we intend to elicit lessons from past experiences that would benefit future programmes, thereby improving irrigation efficiency and contributing to the conservation of energy and water.

PERFORMANCE INDICATORS

## A. Technical Observations

Solar panels make up most (up to 80%) of the system cost. The Size of the PV system is directly dependent on the size of the pump, the amount of water that is required (m3/d) and the solar irradiance available.

A voltage of the solar pump motors can be AC (alternating current) or DC (direct current). How does a solar water pump work? When sunlight falls on the solar panels it produces direct current (DC) which then feeds the motor to pump out the water. However, in the case where the motor requires an alternating current (AC), the DC produced by solar panels is converted to AC using an inverter.

B

## Economic Indicators

A simple framework for the financial performance evaluation of a solar photovoltaic (SPV) water pump has been presented. The Unit cost of water delivered by such a pump has been estimated. The monetary benefits accrued to the end user have also been quantified on the basis of the amount of diesel or electricity saved.

The Net present value and internal rate of return of investment in an SPV water pump have also been estimated. The effect of fuel price escalation on the financial performance indices has been evaluated along with an estimation of the break-even prices of diesel and electricity. The effects of financial incentives such as capital subsidy accelerated depreciation related income tax benefits and provision of a low-interest loan on the break-even prices of diesel and electricity have also been studied. Results of some numerical calculations for a 1.8 kWp SPV pump are briefly presented and discussed.

C

## Farmers Reaction

The Cabinet Committee on Economic Affairs (CCEA), Government of India (GOI) launched the Kisan Urja Suraksha Evam Utthaan Mahaabhiyan (KUSUM) program and approved a central financial assistance (CFA) package of $6.8 billion in February 2019. The program aims to add a solar capacity of 25.75 GW by 2022 in the agriculture sector and is a subset of India's broader commitment
to renewable energy (RE) installed capacity of 175 GW by 2022.


While in the first phase, the KUSUM program aims for only 4GW of capacity by installing 1.75 million standalone solar-powered agricultural pumps and 1 million grid-connected solar-powered agricultural pumps, there is immense potential and need to 'solarize' the agriculture pumps in India.

By Converting the 29.3 million conventional pumps alone, India will be able to meet 38.1% of its 175 GW - ReTarget and 66.8% of 100 GW - Solar Target. The country can save $12.7 billion forex spent on imported coal and diesel, and farm power subsidies of $7.6 - 10 billion. This program gives an immense opportunity to reduce the 276.5 million tonnes of carbon dioxide emissions from a reduction in the use of fossil fuels in India's water-energy nexus.

To make complete sense of the water-energy nexus in India's agriculture sector, we need to look back on India's policy priorities since Independence. With the steady increase in population pressure on India's farmland, India needed to come up with fixes to feed everybody. Since total agricultural land was fixed, the only way out was to improve agricultural productivity.

But this required year-round access to irrigation. Tube well technology was new and inaccessible to subsistence farmers (85% of all farmers). Three Consecutive Years of crippling droughts pushed India to the verge of mass starvation and left the country at the mercy of food gifts from us and others.
This would mark the beginning of India's obsession with food security.

To further encourage adoption, electricity tariffs per kWh were reduced after specified use. State electricity boards (SEB) were struggling to keep up with associated transaction costs which some studies said were a third of the total cost to serve a tube well consumer (REC 1985) yet were forced to serve low revenue customers. This change from metered tariff to flat tariff for farm power supply set into motion a powerful chain reaction that has fundamentally reshaped Indian irrigation. This was the beginning of the perverse subsidies subsequently leading to long-lasting market distortions. Utilities were making losses and could not invest in infrastructure maintenance which led to poor electricity supply. This had an adverse impact on rural industries and unhappy farmers formed powerful interest groups to advocate further subsidies.

HORTICULTURE BASED MODULES

**Name of the crop: Food Grains (Rice, Wheat), Oil grains (Mustard, Chickpea, Flake seeds)**

- Name of Technology: Solar Mobile Pumping System
- Micro-Farming Situation: Small Farmers and other
- Problem: Path must be good and availability of transportation.
- Potential Solutions: Able for both underground water as well as other irrigation sources.
- Nature of Intervention
- Source of power: Solar Powered (Renewable Source of Energy)

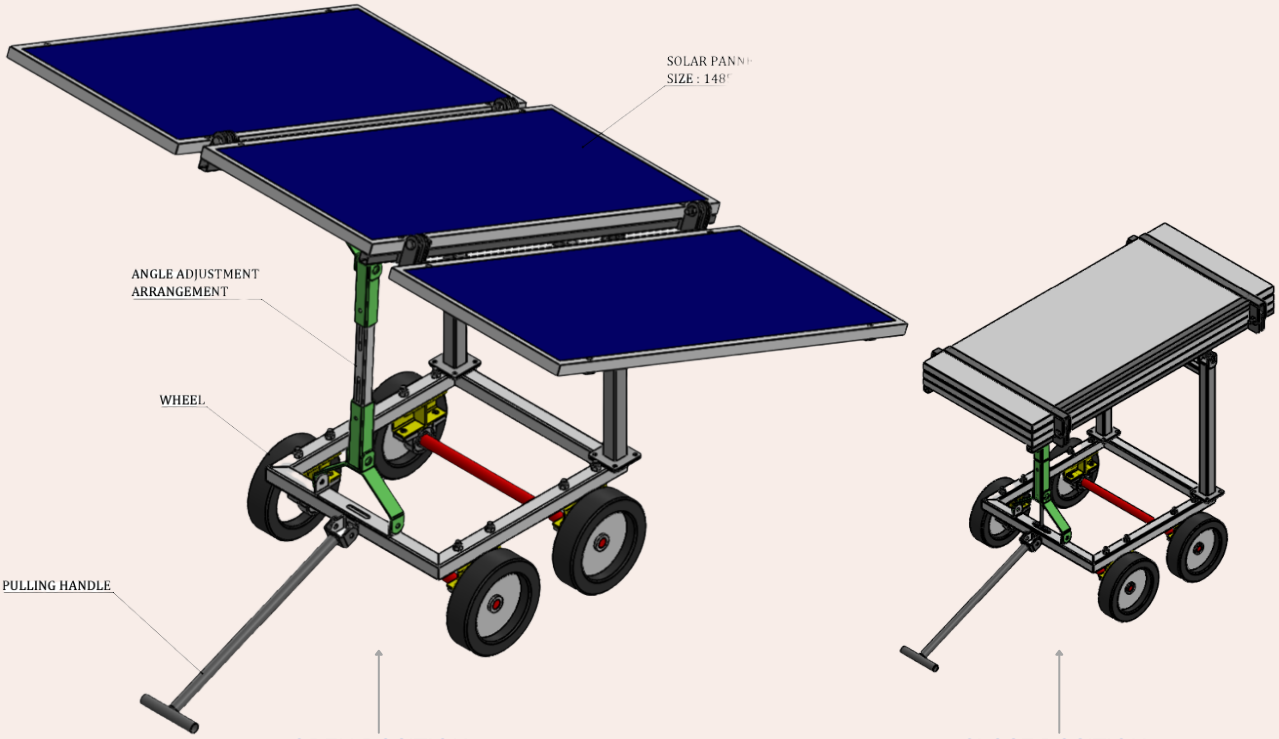
| SL | Particular 0.5 HP | QTY |
|---|---|---|
| 1 | 0.5 HP DC Monoblock micro pump set IEC certified from MNRE | 1 set |
| 2 | 2.2. kW IP65 MPPT Controller keypad: Parameter copy & paste. All Kind of protection function with RMS system. | 1 set |
| 3 | Solar PV module 200 WP Micro solar PV Module | 3 pcs |
| 4 | Mobile Robotic Structure with wheel mounted | 1 set |

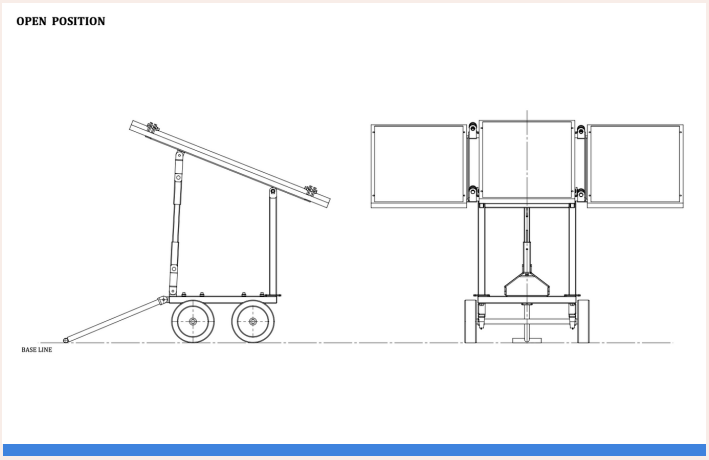
| SL | Particular 1 HP | QTY |
|---|---|---|
| 1 | 1 HP DC Monoblock micro pump set IEC certified from MNRE | 1 set |
| 2 | 2.2. kW IP65 MPPT Controller keypad: Parameter copy & paste. All Kind of protection function with RMS system. | 1 set |
| 3 | Solar PV module 200 WP Micro solar PV Module | 6 pcs |
| 4 | Mobile Robotic Structure with wheel mounted | 1 set |

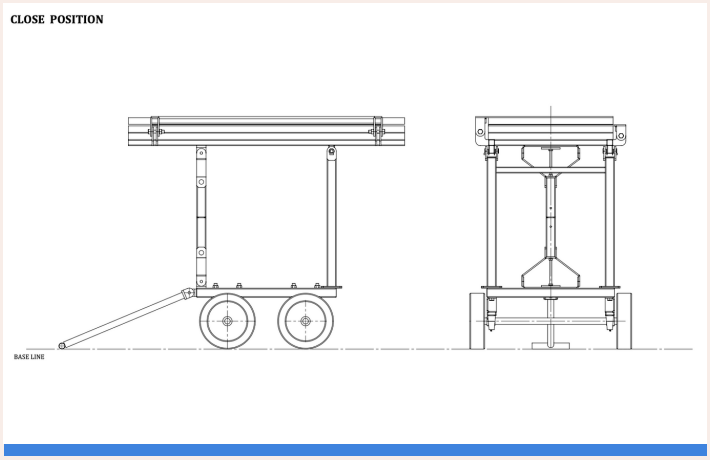
| SL | Particular 2 HP | QTY |
|---|---|---|
| 1 | 2 HP DC Monoblock micro pump set IEC certified from MNRE | 1 set |
| 2 | 2.2. kW IP65 MPPT Controller keypad: Parameter copy & paste. All Kind of protection function with RMS system. | 1 set |
| 3 | Solar PV module 200 WP Micro solar PV Module | 9 pcs |
| 4 | Mobile Robotic Structure with wheel mounted | 1 set |

PRODUCT IMAGE

## Details of the Pumping Solution for 0.5 HP Trolley System

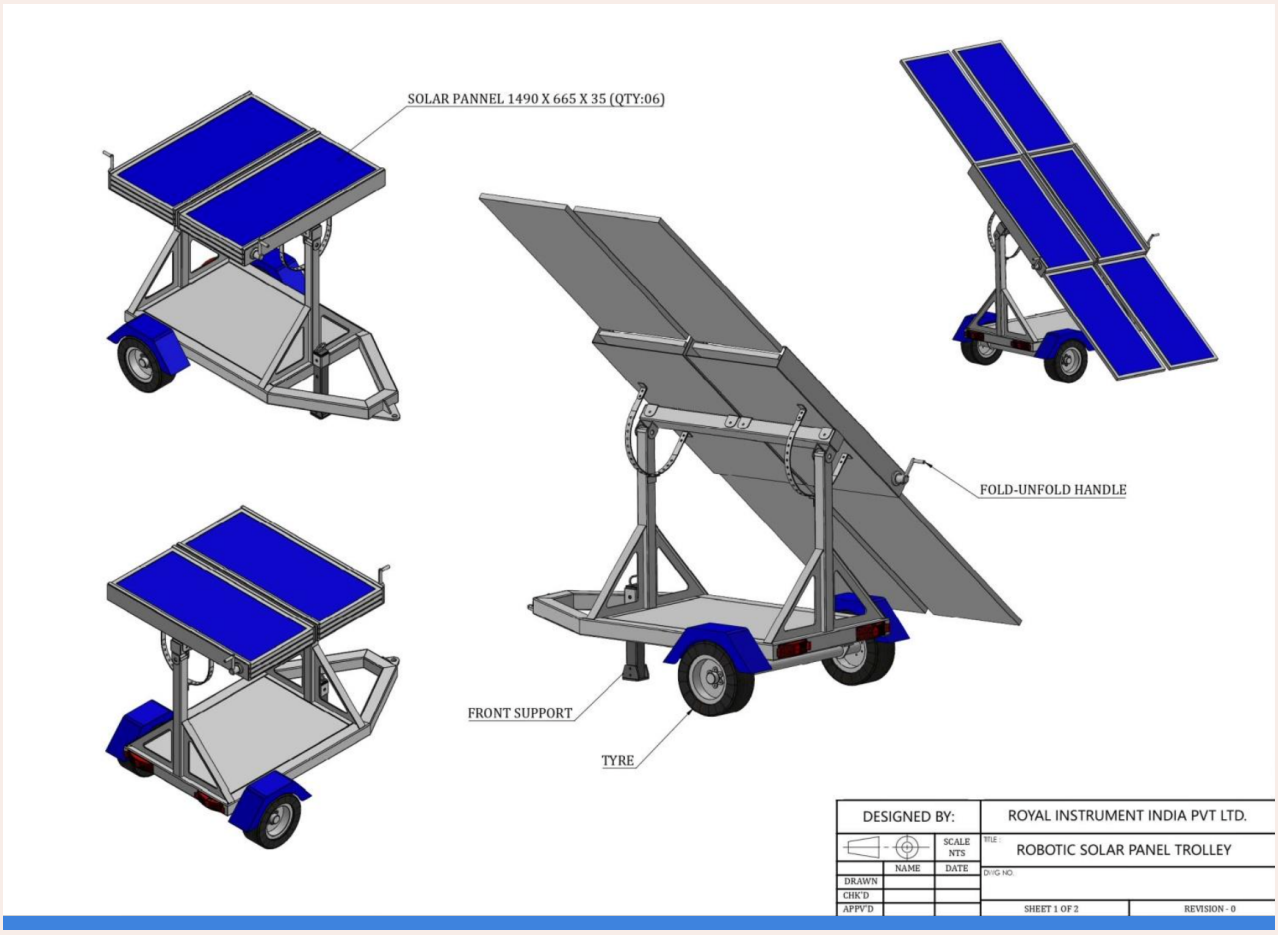


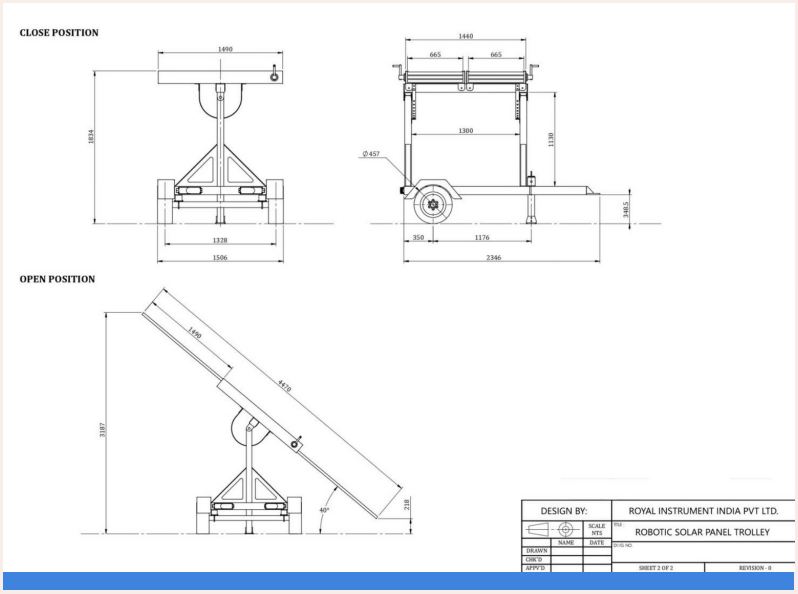



PRODUCT IMAGE

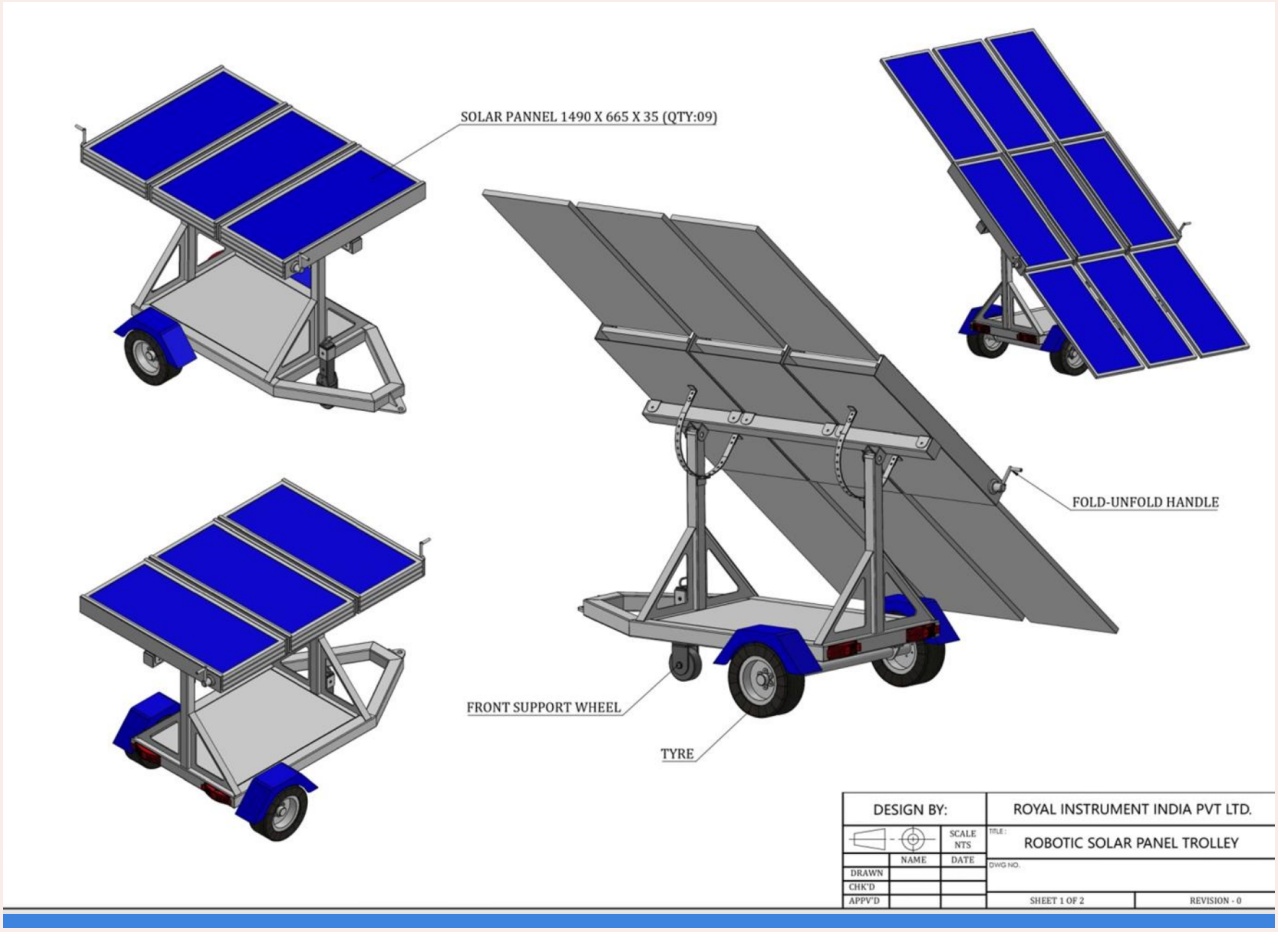
## Details of the Pumping Solution for 1 HP Trolley System

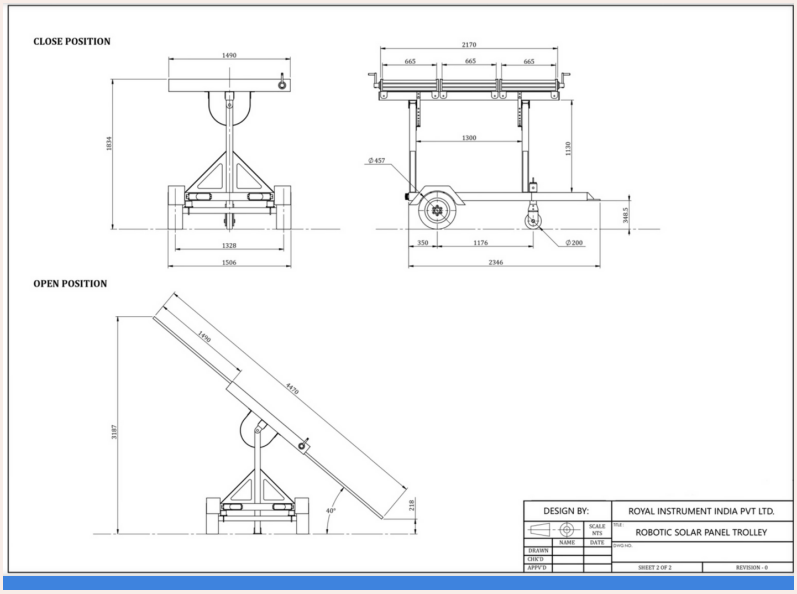


PRODUCT IMAGE

## Details of the Pumping Solution for 2 HP Trolley System



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YOUR TRUST IS ALL THAT MATTERS.