

SOLAROPIA

INNOVATIONS IN SOLAR PUMPING TECHNOLOGY

SOLAR GROUND WATER RO PLANTS



The 21 Century Plants Operate with Solar

S-RO-GW

WORLD'S FIRST RO PLANTS OPERATING WITH SOLAR POWER

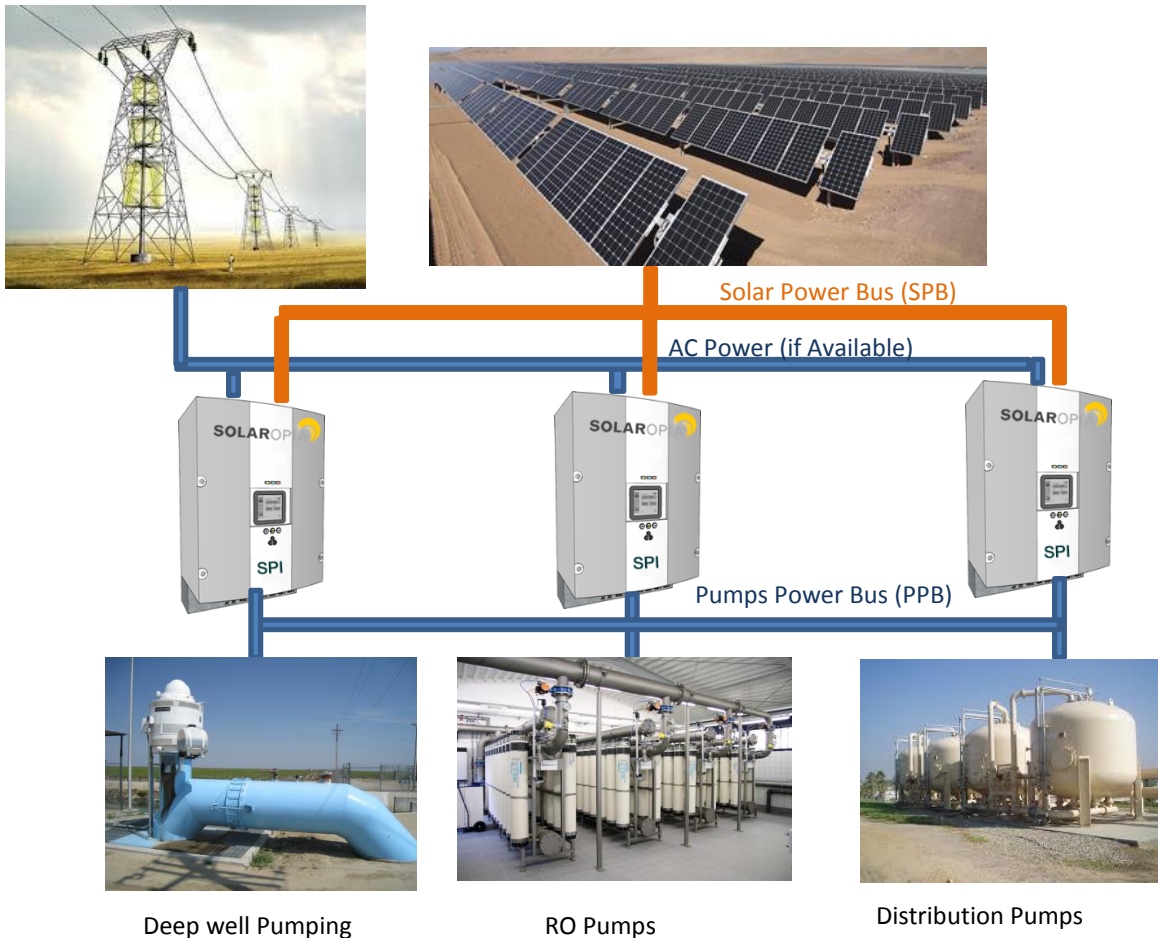
ABOUT S-RO GW

SOLAROPIA S-RO are solar systems dedicated to operate ground water RO plants directly from PV power. These systems use new solar pumping technologies (SPI Technology) with distinguished solar technologies:

- New Solar VFD technology to operate pumps at various plant loads and directly operate from Solar PVs
- Operate Plant pumps Off-Grid (in Rural Areas Plants)
- Operate 24 hours pumping in hybrid Solar-AC mode (in Urban Areas)
- Pump type independent (no need to change existing plant infrastructure to operate with solar)
- Extremely efficient (about 40% higher efficiency than conventional solar power systems)

S-RO GW PLANTS

S-RO GW provides complete solar system to operate brackish water RO plants for deep-wells up to 2000' (700 m) head, and RO production capacity up to 2 million GPD (about 5000m³/day). S-RO GW offers economic solution for new plants, and for existing plants – it does not require changes to existing RO plants infrastructure. S-RO operates all plant pumps from one control: Deep-well pump, RO pumps, and distribution pumps (or pumping to elevation tanks). Our S-RO GW can operate all RO plant size (small or large) offering clean economic power solution to use ground brackish water to supply towns, cities, industrial and irrigation plants with sweet water to support basic living in rural or urban areas.



Deep well Pumping

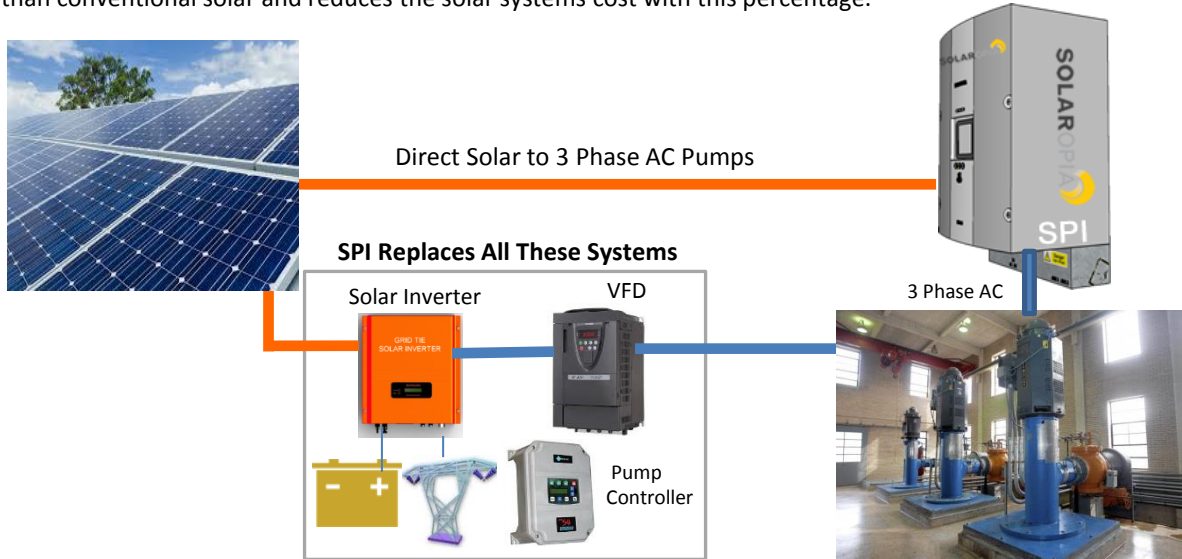
RO Pumps

Distribution Pumps

All SPI Solar VFD and pumps can be operated Remotely and Manually

EFFICIENT SOLAR PUMPING TECHNOLOGY

S-RO plants use new SPI solar pumping technology developed by SOLAROPIA for industrial pumping with solar power. Conventional solar inverters (Off and On Grid) are not suited to operate pumps – they would need four systems (Solar Inverter, Transformer, VFD, and Pump Controller) which translates into 20%-30% of solar power losses. SPI solar pumping technology operates pumps directly from PV plants - it eliminates all the losses and the extra systems cost (see the diagram below). SPI technology is by 40% average more efficient than conventional solar and reduces the solar systems cost with this percentage.



SOLAR HANDLES ALL DAY PLANT SUPPLY

S-RO systems have a great economic advantage – it can operate plants without grid power providing 100% plant production capacity during solar hours with dual pumping to direct distribution and to gravity tanks for night time supply.

THE S-RO PLANT ECONOMY

RO ground water plants are energy intensive -the lifting of 1AF (about 1000 m3) per day from a deep well at 1000' (300m) head would require about 180 KWh, its RO treatment requires about 150 KW, and its distribution 60 KWh, totally about 400KWh per day is required. This power represents about 90% of the plant total operating cost. S-RO will reduce this cost dramatically by 50% or more, making brackish RO plants affordable, economic water solution, and environmentally clean powered plants.

The cost and saving data for medium size plant 1 AFPD (1000 m3/day) is provided below for comparison between the operating cost of S-RO power (average ₱8 per KWh), diesel co-plant power (average ₱22 per KWh), and Utility grid power cost (average ₱18 per KWh). The operating cost is provided for 15 years (S- RO solar plants operate for 15 years minimum and 25 years average). S-RO saves about 66% of the diesel operating cost (saving about \$400,000), and 55% of grid power operating cost (saving about \$280,000).

| Plant Power Source | Operating Cost (\$USD) (15 years)* | Saving in Operating Cost (\$USD) (15 years) |
|-----------------------|---------------------------------------|--|
| Diesel Co-Plant Power | \$500,000 | \$0 |
| Utility Grid Power | \$400,000 | \$100,000 |
| S-RO Solar Plant | \$175,000 | \$325,000 |

* The cost is calculated based on production 1AF (1000m3) only at 400 KWh per 8 hours/day for 15 years

S-RO Ground Water Plants Models

S-RO GW models can be sized for various Ground RO plants. S-RO GW models are listed below for up to 1million GPD (3000 m3/day). The required Plant power is provided for standard 1000' deep- well – source TDS at 10000 ppm requiring 300 psi RO pump (for other pumping heads and required RO pressure please refer to our SPI pumping systems for their power sizing) . Larger than 1 million GPD also can be provided using this modular plant.

| RO Plant Capacity | | Required Solar Power (KW PV) | | | | S-RO Plant |
|-------------------|--------|---------------------------------|---------------------------------|--|----------------------------------|--------------|
| GPD | m3/day | Well Pumps* (H: 1000' -300m) | RO Pumps (P: 200 psi-15 bar) | Distribution Pumps (P: 100 psi-7 bar) | S-RO Plant Power (KWh/ KW PV) | S-RO REF |
| 25000 | 100 | 18 | 12 | 6 | 30 KW | S-RO-GW 30 |
| 50 000 | 200 | 36 | 18 | 12 | 75 KW | S-RO-GW 75 |
| 125 000 | 500 | 90 | 48 | 24 | 200 KW | S-RO-GW200 |
| 300 000 | 1000 | 200 | 90 | 48 | 400 KW | S-RO-GW 400 |
| 600000 | 2000 | 350 | 180 | 90 | 650 KW | S-RO-GW 650 |
| 1 000 000 | 3000 | 500 | 270 | 150 | 100 KW | S-RO-GW 1000 |

*Deep-well pumps provides twice water volume to RO plant with average 50% recovery rate

S- RO PLANT IMPLEMENTATION

SOLAROPIA Offers services to install a-operate and commission S-RO plants:

PAC1: Package for New RO plants (designated for RO Plant manufacturers-designers- contractors)

PAC2: Full service package for Existing RO plants (designated for Plant Operators- City water Utilities)

| PAC1 | PAC2 |
|--|---|
| Complete solar System for new designed plants SOOLAROPIA works with RO Plant designers to provide complete solution , install and commission the solar S-RO plant | Complete solar System for existing RO plants SOLAROPIA and its certified partner in the country of installation will provide complete solution , install and commission the solar S-RO plant |



S-RO Plant Referencing

| S-RO | GW | W | P |
|------------|----|-------------|--------------------|
| Plant Type | | Plant Power | Package Type: 1, 2 |

