Tawanai Energy

Reliable power for existing generator users.

Updated : 22 May 2024

Battery rates

Medium household : 1000 KWH per month
1000 KWH / 720 hours per month = 1388 watts continuous.
16 hours on batteries. 8 hours on sunlight.
22.208 KWH storage required.

0.7 (70 percent battery round trip) 31.72 KWH round trip.
0.5 for 12V lead acid = 31.72 / 0.5 = 63.45 KWH based on rated capacity.
63450 / 12V = 5287 Amp Hours.
https://prislo.com/pk/tubular-battery

https://w11stop.com/power-sources-batteries-and-regulators/batteries/tubular-batteries/phoenix-tx2500-tubular-battery?utm_source=prislo

TX 2500 example : Rs 71500 / 230 Ah = Rs 310 per Ah.

https://batteryustad.com/product/phoenix-battery-tx-3500/

TX 3500 : Rs 90,000 / 280 Ah = Rs 321 per Ah (22 May 2024 price)

Battery price = 5287 Ah x Rs 321 / Ah = Rs 1,697,127 for batteries.

Transport : Rs 20000

Total for batteries = Rs 1,717,127

Cycles at 50% DOD = 1500 rated cycles.

1500 cycles x 22.208 KWH (real world) = 33312 KWH stored and used.

Rs 1,717,127 / 33312 KWh = Rs 51.5 Rs per KWh stored and used via batteries.

After use you can get 1/3 of the cost of the batteries back in return.

1,717,127 / 3 = Rs 572,375 returned at the end of life.

Rs 1,717,127 - Rs 572,375 = Rs 1,144,751 for 33312 KWH stored and used.

Rs 1,144,751 / 33312 KWH = Rs 34.36 per KWH stored and used.

We might be able to do better with some of our special methods, but such experimental systems are available only to some customers. The rates are better, but results vary a bit so we cannot provide such accurate estimates.

Changing the battery type to any other is most likely (>99% chance) going to increase the price.

The price of trying to outsmart physics, chemistry and the industrial processes already in place. We have done over 20 years of research into battery technologies and those who contradict this wisdom usually know less. However if they are willing to explain the technology behind their point of view backed by real measurements in the lab or in the field or both, then we are open to listening.

If they have an opinion based on hearsay, then you can email us with the opinion and it most likely shall be ignored. For the nitpicking type note we said most likely not 100%.

Inverter rates

720 watt inverter Rs 25,000

https://w11stop.com/solar/max-power-mp-1000?sort=p.price&order=ASC

720 watt inverter Rs 13,200 (Rs 18.33 per watt)

https://w11stop.com/solar/max-power-mppv-1200-720w-hybrid-inverter?sort=p.price&order=ASC

1.5 KW inverter Rs 33,000

https://w11stop.com/solar/solar-max-sm-r4-m-1.5kw-off-grid-inverter?sort=p.price&order=ASC

3KW inverter Rs 34,600 (Rs 11.53 per watt)

https://w11stop.com/solar/max-power-3-kva-24v-hybrid-inverter?sort=p.price&order=ASC

3KW inverter Rs 37,950 (Rs 12.65 per watt)

https://w11stop.com/solar/max-power-vp-3000-pwm-solar-inverter?sort=p.price&order=ASC

3KW inverter Rs 52,000 (Rs 17.33 per watt) MPPT. **We like this one for a small house. Also tried and tested.**

Price difference from PWM = 52,000 – 37950 = Rs 14,050

1000 watts max difference in power. Rs 40 per watt ++ other costs about Rs 80 per watt for solar generator. So the difference in power generation cost is Rs 50,000 to Rs 80,000

So the price is worth it. Select MPPT for an extra 1000 watts.

https://w11stop.com/solar/maxpower-vm-ll-3000-24v-off-grid-inverter?sort=p.price&order=ASC

3KW inverter Rs 175,000

https://solarshop.pk/product/axpert-vm-iii-3kw/

Solar module rates.

Solar generator rate : Rs 90 / Watt without frame.

https://w11stop.com/solar/solar-panel-price-in-pakistan/jinko-solar-panel?sort=p.price&order=DESC

These are at Rs 100 per watt.

https://www.olx.com.pk/item/jinko-n-type-585-watts-panel-10-year-warranty-dilvery-all-karachi-iid-1086675692

Rs 23800 / 585 watts = Rs 40.68 per watt.

https://www.olx.com.pk/item/jinko-n-type-585-watt-available-iid-1087077141

Rs 22900 / 585 watts = Rs 39.14 per watt.

Wholesalers are offering Rs 37 per watt so this looks about right as the retail price.

We shall take an even Rs 40 per watt for the solar modules.

Transport for 20 to 30 modules is about Rs 10,000 so we can make the transport cost within the city to be Rs 1.5 per watt. But this is for at least 10,000 watts.

100 Ah 12V minimum battery recommended.

Exide Tubular 145 Ah 12V. Rs 48,850

Wires

Wire sizes chart : https://atrc.net.pk/dokuwiki/doku.php?id=products:energy:wires

7/.052											43	9460	2064	1032	516
9 AWG	0.1144 in	2.906 mm	6.63 mm2	0.79	2.6	64	19	2050 Hz	380 lbs	–					
6 mm2			6 mm2								31	6820	1488	744	372
7/.044											36	7920	1728	864	432
10 AWG	0.1019 in	2.588 mm	5.26 mm2	1	3.28	55	15	2600 Hz	314 lbs	35		7700	1680	840	420
11 AWG	0.0907 in	2.305 mm	4.17 mm2	1.26	4.13	47	12	3200 Hz	249 lbs	–					
4 mm2			4 mm2								24	5280	1152	576	288
7/.036											28	6160	1344	672	336

https://wageprice.com/fast-cable-price-list/

Fast Wiring Cable Price List 2024

Cable Size	450/7500 V CU/PVC/INS
1.0 MM^2	Rs. 5,222
1.5 MM^2 (1/1.38) Solid	Rs. 7,833
1.5 MM^2 (7/53) Standard	Rs. 8,317
2.5 MM^2 (1/1.78) Solid	Rs. 12,283
2.5 MM^2 (7/67) Standard	Rs. 13,347
4.0 MM^2 (7/85) Standard	Rs. 19,344
6.0 MM^2 (7/1.04) Standard	Rs. 28,532
10 MM^2 (7/1.35) Standard	Rs. 48,650
16 MM^2 (7/1.70) Standard	Rs. 75,055

https://sbestore.com/product/pakistan-cables-7-44-6mm%C2%B2-pure-copper-wire/

Pakistan Cables 7/44 6mm² Pure Copper Wire

★★★☆☆ (2 customer reviews)

Rs 26,540

Units Sold: 6

Color: Choose an option

- 1 + ADD TO CART

Compare Add to wishlist

Share:

Pakistan cable prices.

https://www.pakistancables.com/media/21355/retail-price-list-01072023.pdf

6mm wire 2 core (Close to 7/0.044) : Rs 28532 / 90 Meters = Rs 317 per meter for a single core.

2 Cores shall cost : 2 x Rs 317 / meter = Rs 634 per meter.

PVC Pipe for cables.

https://pakprices.pk/pvc-pipe-price-in-pakistan/

Pipe Size	Pipe Length	Weight	Price in Pkr
1-inch	10 feet	700 g	Rs. 350
1 ¼ inch	10 feet	1 kg	Rs. 550
2-inches	10 feet	1 kg	Rs. 600
2-inch (double)	10 feet	1.5 kg	Rs. 800
3-inch	13 feet	3 kg	Rs. 1700
4-inch	13 feet	4 kg	Rs. 1920
4-inch (double)	13 feet	4.5 kg	Rs. 2200
4-inch (Thick)	13 feet	4.8 kg	Rs. 2400
5-inch	13 feet	7 kg	Rs. 3800
6-inch	13 feet	10 kg	Rs. 4850

We use 1.5 inch pipe so we can assume Rs 600 / 10 feet = Rs 60 per feet = Rs 5 per inch

Rs 5 / inch x 40 inches per meter = Rs 200 per meter.

1.5 inch pipe allows movement of the MC4 connector if needed.

Frames :

https://w11stop.com/galvanized-iron-frame-86-inch-14-guage

Rs 6500 for each module. Module sizes are larger.

So 570 Watts for a module. The frame cost is Rs 6500 / 570 watts = Rs 11.4 per watt.

L2 16 Gauge Rs 4100

L2 14 Gauge Rs 6000

Frame sizes :

L1 = 50 Inches (4 Feet 2 inches)

L2 = 96 Inches 8 Feet

L3 = 144 Inches 12 Feet

L4 = 192 Inches 16 Feet

L5 = 240 Inches 20 Feet

Simple Frame rate : Rs 15 per watt.

Raised frame : Rs 25 per watt.

Steel price : Rs 250 per kg.

3.5 Meters of I beams per module. 17 KG per meter = 60 KG of Steel per module.

Rs 250 x 60 KG per module = Rs 15,000 per module for a raised frame.

Rs 15,000 / 585 watts per module. = Rs 25.6 per module for the frame steel.

Frame labor : Rs 10 per watt. Total Rs 35 per watt for a raised frame.

Rs 10 per watt extra for a frame with walk way.

Total for a raised frame with walk way : Rs 45 per watt.

https://www.kksteel.com.pk/?page_id=111

I-BEAM

ASTM A36/A6

More Grades According To Demand

Item Description	Thickness			Weight		
	Web (mm)	Flange (mm)	Radius (mm)	Kg / Mtr	Lbs / Ft	Kg / Ft
"18 x 7" Inches		T1=18.5				
	Tw=14	T2=21	R=20	115	77	35.00
450mm x 175mm		T3=24				
"16 x 6" Inches		T1=18				
	TW=13	T2=21	R=18	89	60	27.27
400mm x 150mm		T3=24				
"14 x 6" Inches		T1=13				
	Tw=12	T2=16	R=14	78	51	23.18
350mm x 150mm		T3=17				
"12 x 6" Inches		T1=9				
	Tw=10	T2=9.5	R=12	54	36	16.36
300mm x 150mm		T3=10				
"12 x 5" Inches		T1=10				
	Tw=9	T2=12	R=11	48	32	14.55
300mm x 125mm		T3=13				
"10 x 5" Inches		T1=10				
	Tw=9.5	T2=11	R=11	41	28	12.73
250mm x 125mm		T3=13				
"8 x 4" Inches		T1=8				
	Tw=8	T2=9	R=8.5	27	18	8.18
200mm x 100mm		T3=11				
"8 x 4" Inches		T1=8				
	Tw=8	T2=10	R=8.5	23	15	6.82
200mm x 100mm		T3=11				
"6 x 3" Inches		T1=7				
	Tw=6.5	T2=8	R=5.5	17	11	5.00
150mm x 75mm		T3=10				

Services.

Initial Survey charges : Rs 5000 + Transport charges (Rs 2000).

Deliverable : Status of wires and estimate of costs to prepare for installation within +/- 40% of actual.

Consultancy for designing the system

Initial Design charges : Rs 35,000

Prerequisites : Initial Survey.

Deliverable :

1. Analysis of usage patterns.

2. Recommended system design based on

a. Customer usage patterns

b. Customer requirements for energy now and expected in the future.

c. Reliability and efficiency requirements.

Estimates of costs for installation within +/- 20% of actual based on current prices.

Labor

Minimum 5 days contract.
Electrician with one assistant : Rs 8500 per day.
Electrician assistant : Rs 3500 per day.

Netmetering related services

KE netmetering with grounding : Rs 250,000

Lahore netmetering with grounding : Rs 210,000

https://electrosofttechnologies.pk/earthing-lightning-protection/

https://www.buysolar.pk/shop/earting-material/3ft-copper-lightning-arrester-complete-set-price-in-pakistan/

General ROI Calculation.

Rs 150 per watt for solar generator.

Rs 35 per KWH for batteries.

Each solar watt generates 1.825 KWh per year.

Over 20 years each solar watt shall generate 36.5 KWh.

Rs 150 / 36.5 = Rs 4.1 per Kwh for solar generator.

So solar energy used during 9:00 to 17:00 the cost is Rs 4.1 per KWh.

For solar energy used during 17:00 – 9:00 the cost is Rs 4.1 + 35 = 39.1 per KWh.

If you look at your bill and divide the total billed amount with the units (KWH) used, you shall know the average price per unit.

For shops and offices which use more during the day time, the ROI is within 1 year. Rough estimate based on an actual bill of Rs 83 per KWh for a shop (May 2024).

For residential where the usage is more at night, then the ROI is from 4 to 8 years depending on how much is used at night. Based on estimates of Rs 50 to 70 per KWH.

Contact

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Email tawanai@atrc.net.pk

Web : http://atrc.net.pk/tawanai

Reference information :

Details of sheet metal gauges.

http://www.custompartnet.com/sheet-metal-gauge

Gauge in mm (approx.)

Gauge	mm	Gauge	mm
38	0.100	18	1.024
36	0.130	16	1.291
34	0.160	14	1.628
32	0.200	12	2.052
30	0.255	10	2.588
28	0.321	8	3.263
26	0.405	6	4.115
24	0.511	4	5.189
22	0.644	2	6.543
20	0.812	1	7.348

Solar Gauge: The term “solar gauge” typically refers to the thickness or strength of materials used in solar installations. For example, when constructing solar panel frames, the gauge of the material matters.

1. **Frame**: Solar panel frames are essential for supporting and securing solar panels. They come in various materials and designs. Here are some details about solar panel frames:
    - **Aluminum Frames**: These are commonly used in solar panel manufacturing. They offer superior mold sophistication and reliable performance.
    - **Galvanized Iron Frames**: These are also used for solar panels. For instance, a galvanized iron frame measuring 86 inches and made from 14-gauge material is available.
2. **Mounting Structure**: When installing solar panels, a sturdy mounting structure is crucial. These structures are available in different gauges of material and can be customized to meet specific requirements.
3. **Solar Panel Thickness**: The average thickness of a solar panel frame is around 3 to 3.5 mm, although this can vary based on the material used and specific design requirements.

Remember, the success of a solar installation depends on choosing the right components, including frames and mounting structures. If you’re considering a solar project, make sure to consult with experts to ensure optimal performance and longevity.

Elevated steel structure.

Usually Rs 20 - 25 per watt for 10 KW.

Higher rate for less watts. Depends on design.

Considerations are safety and design for wind loads.

Return on investment

This system shall save about Rs 300 per day and has an ROI of about 5.4 years if there is no utility power failure.

If the load shedding is 5 hours per day and you used a diesel generator to cope, then this system shall save about Rs 500 per day and has shall have an ROI of about 3.3 years.

These estimates are based on our experience. Please understand that it is an estimate and based on our measurements of delivered systems so far.

Every system and case is different and the savings could be more or less depending on how it is used and how much load shedding occurs in your area.

We can upgrade the system to meet any unexpected developments which were not known during the design and implementation phase of the system.

We do offer systems in multiple phases so you get an optimized spending instead of having to spend all of your resources in one installation. You can choose to do it in one phase or multiple. We shall guide you in the benefits of different choices.

Initial visit for feasibility.

Karachi : Rs. 3000. Can be reduced or eliminated for existing customers and contacts.

For other cities, please get estimate for visit.

We send one of our representatives who shall get the following information for you.

Roof for checking placements of solar array

Routes possible for wires

Existing wiring quality and situation

Estimate wiring required for separations.

List which items are to be on the ups/inverter. Not all are recommended in the beginning.

Location of distribution boxes

Location possibilities for ups distribution box or boxes

Generator location and current wiring and changeovers

KE meter location and Wiring condition

All of your requirements and what you are expecting.

Your bills preferably for last 12 months. Just send pictures.

Timings of use of power during the day.

Please write all these notes and send pictures of the notes so a better analysis and suggestion can be provided.

Send to khawar@atrc.net.pk or also can be sent via whatsapp.

To WhatsApp at high quality send the picture as a document.

Full day visit for detailed measurements.

Karachi : Rs. 5000.

For other cities, please get estimate for visit.

We send one of our representatives who shall get do detailed measurements.

Labeling of existing wires.

Measurements of all required wires based on initial visit and finalized requirements.

Making of detailed drawings for wiring.

Design of required change overs, breakers, and fuses.

Wiring plan for distribution box or boxes.

Wiring plan for solar modules to inverter.

Wiring fix plan for existing wiring.