

To Tax or Not to Tax: Pakistan's Solar Energy Debate

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July 2024

Executive Summary

Solar power is an ideal solution for Pakistan's electricity crisis and is environmentally friendly. This paper highlights the economic development of solar panels, some related environmental factors in Pakistan, and the existing policies on solar panels in Pakistan. By highlighting the benefits of solar industry development in Pakistan and outlining the strategies to achieve the goal of Pakistan's energy independence using renewable energy sources, this paper aims to enhance the understanding of this subject. The paper highlights the need for policymakers to develop implementable strategies that offer immense returns at the national and business levels. Such incentives would assist in enhancing the efficiency of the installed solar panels in Pakistan with the overall economy and climate change mitigation efforts. The study also reveals the comparative advantage of solar energy in terms of cost, reduction in the emissions of greenhouse gases and the development of green job opportunities, making solar energy inevitable for Pakistan for its energy planning. Therefore, this paper outlines best practices based on global benchmarks and case studies on solar energy policies and enunciates the need to embrace new technologies and funding methodologies for the uptake of solar panels in Pakistan. To successfully implement solar energy in Pakistan, the government needs to collaborate with the private sector and the community through effective planning and integration.

Introduction

Electricity powers the economic system. Households need stable electricity since many tasks require it¹. Pakistan had frequent power outages for decades. The monopolistic supplier used cyclical load shedding over many hours daily in much of the country to avoid unplanned blackouts and meet power demand due to power production losses. Load shedding occurs when power demand exceeds the supply². Pakistan's major power resource for heating, cooking, and lighting is electricity, although load shedding's economic impacts are highlighted due to the country's difficult financial circumstances.

Solar panels are a welcome respite in Pakistan for its electricity problem. In terms of reliability and affordability, solar is the ultimate choice for people, especially when energy consumption and power supply interruptions are increasing. Residential and commercial structures fitted with solar panels can produce their own electricity, which helps free the power supply from being dependent on the national grid and solves the problem of too many cuts in power supply. This not only improves daily life but also translates to economic benefits as businesses experience less disruption and homeowners save on electricity bills³

Aside from solar leading to energy savings for consumers, it also provides a solution for Pakistan's energy future. Another difference is that unlike coal with gas solar energy generation fails to pollute the atmosphere with greenhouse gases and air pollutants. Pakistan must shift towards solar as a means of cutting its carbon emissions and help control climate change. Pakistan also has an excellent ratio of warm months throughout the year providing a good ground for solar energy as the country enjoys more days of sunshine than anywhere else in the world at 300 days per year. This can be pooled to be a long-term energy source for the country. The way forward in solar energy, as more and more people adopt solar, is to change the national energy mix so it isn't relying so heavily on fossil fuels and has better air to breathe and an environment for healthier living⁴.

¹ Gehringer C, Rode H, Schomaker M., (2018). The Effect of Electrical Load Shedding on Pediatric Hospital Admissions in South Africa. *Epidemiology*. 841-847.

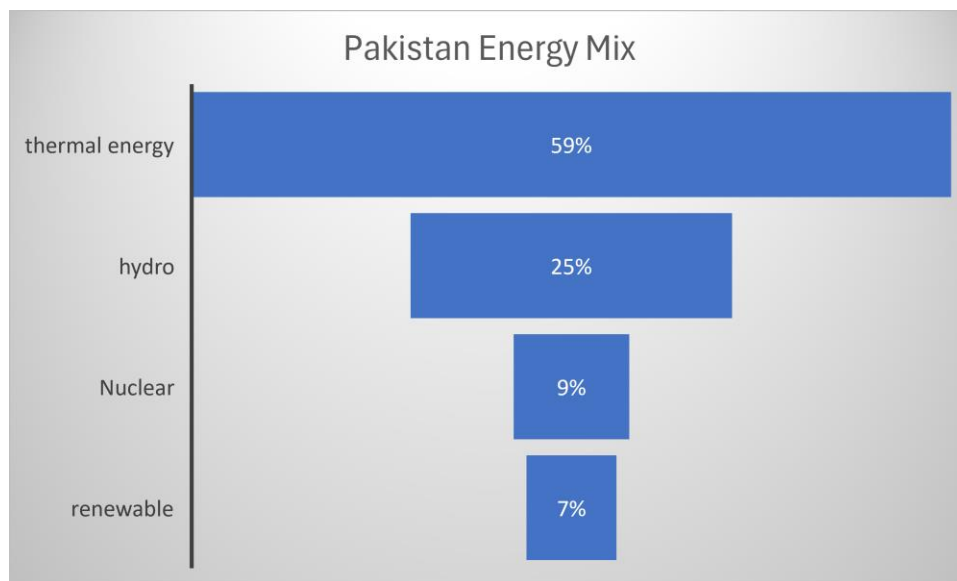
² Lodhi RN, Malik RK., (2013). Impact of electricity shortage on daily routines: a case study of Pakistan. *Energy & Environment*. (5):701-9.

³ Premier Energy. (2023, February 10). Top 10 Reasons to Go for Solar in Pakistan in 2023. <https://premierenergy.com.pk/why-choose-premier-energy-pvt-ltd/>

⁴ Think Faculty. (2022, September 22). Solar Energy in Pakistan - Practicality, Usage and Maintenance. <https://thinkfaculty.com/solar-energy-home/>

Pakistan Energy Mix

Pakistan's energy landscape is dominated by thermal power plants, which account for nearly 60% of the total installed capacity (43,775 MW). Hydropower comes in second at 25%, followed by nuclear (9%), and renewable sources (7%). This information likely depicts Pakistan's energy mix, highlighting the reliance on traditional sources like thermal and hydro compared to a smaller contribution from cleaner options like nuclear and renewables. Solar panels are important for Pakistan as it provides clean, cheap and affordable energy. It also alters the national energy mix which shows in below figure. Government has set a target to increase the renewable energy share to 20% by 2025 and 30% by 2030 as per Alternative and Renewable (ARE) Policy, 2020⁵



Source:

International Trade Administration, 2024⁶

Solar Energy Production Globally

China, the United States, Japan, Germany, India, Italy, Australia, the United Kingdom, South Korea, and France are the top 10 countries leading in solar energy production. The global shift towards renewable energy sources has significantly impacted the growth of solar energy production. Additionally, governments and international bodies have implemented trade tariff incentives and subsidies to stimulate investment in the solar energy market. China leads the world in solar energy production, followed by the United States, Japan, and Germany. There is no tariff implication for solar panels in countries like the UK, Australia, France, and Germany. These countries are giving incentives to promote solar panels as renewable energy resources. India, the USA, China, Japan, and Korea do have taxes on solar panels, but those

⁵ <https://power.gov.pk/SiteImage/Publication/YearBook2022-23.pdf>

⁶ <https://www.trade.gov/country-commercial-guides/pakistan-renewable-energy#:~:text=According%20to%20National%20Electric%20Power,%2C%20and%209%25%20from%20nuclear>

taxes are mostly on the import of solar panels. All these countries are also giving incentives to their society for the adaptation of solar energy as a renewable energy source. The leading countries in solar energy production are China, the United States, and Japan. China tops the list with an impressive 250 GW of solar energy production, followed by the United States with 90 GW and Japan with 70 GW. Germany ranks fourth with 50 GW, while India comes in fifth with 40 GW. Italy follows with 20 GW, and Australia produces 15 GW. The United Kingdom, South Korea, and France each produce 10 GW, rounding out the top ten countries in solar energy production⁷.

Country comparison

Country	Incentives and Benefits
Pakistan	<ul style="list-style-type: none"> • Net metering policy allowing consumers to sell excess electricity to the grid. • Exemption from customs duty for solar panel imports. • Sales tax exemption on solar equipment. • State Bank of Pakistan offers financing schemes at reduced interest rates.
India	<ul style="list-style-type: none"> • 30-70% subsidy on rooftop solar installation costs, depending on the region. • Production Linked Incentive (PLI) scheme for high-efficiency solar PV modules. • Accelerated depreciation benefit of 40% of the asset cost in the first year. • Net metering policies with incentives for excess electricity fed into the grid. • Interest subvention on loans for rooftop solar installations. • Renewable Energy Certificates (REC) and feed-in tariffs.
Bangladesh	<ul style="list-style-type: none"> • Infrastructure Development Company Limited (IDCOL) provides subsidies and low-interest loans for solar home systems. • Net metering policy for residential solar installations. • Government incentives for solar irrigation pumps.
China	<ul style="list-style-type: none"> • Feed-in tariffs for solar power producers. • Subsidies for distributed solar power generation. • Low-interest loans and financial incentives for solar project developers. • Large-scale investment in solar manufacturing and deployment through state-owned enterprises.
UK	<ul style="list-style-type: none"> • Smart Export Guarantee (SEG) paying small-scale solar producers for excess electricity exported to the grid. • Zero VAT on solar panels and installation services. • Renewable Heat Incentive (RHI) for solar thermal installations. • Green Home Grants for solar installations.
USA	<ul style="list-style-type: none"> • Federal Investment Tax Credit (ITC) providing 26% tax credit for solar installations. • Net metering policies in various states. • State-specific incentives and rebates (e.g., California Solar Initiative, New York's NY-Sun). • Property tax exemptions and sales tax exemptions for solar equipment. • Financing options such as solar leases and power purchase agreements (PPAs).

⁷ <https://www.geeksforgeeks.org/largest-solar-energy-producing-countries/>

Potential For Pakistan

In recent years, the Government of Pakistan has increased electricity tariffs up to a non-bearable level for almost every citizen due to which people are looking for an alternative solution to fulfil their needs and demands of electricity in the form of solar energy. Solar energy solutions, with their distinctive combination of economic and environmental benefits, have emerged as a transformative factor in Pakistan's energy market. The adoption of solar energy has increased, providing a promising corridor towards a more sustainable and prosperous future during the country's challenges of energy deficits, high electricity costs, and environmental issues⁸. The geographical positioning of Pakistan presents a favourable environment for solar technology adoption. Positioned between latitudes 23°35' to 37°05' N and longitudes 60°50' to 77°50' E, the country occupies a vast expanse that receives ample sunlight, contributing to approximately 95% of its energy production during daylight hours, which typically span 8 to 8.5 hours daily. Additionally, Pakistan experiences between 185 to 290 sunny days annually⁹. As outlined in a Mordor Intelligence report, Pakistan's cumulative solar capacity reached 1.242 GW by 2022, marking a 15.4 percent rise from the previous year¹⁰. Between January and September 2023, Pakistan acquired solar products valued at \$1.11 billion, which is estimated to be equivalent to around 4 gigawatts of modules. This aligns with the Private Power and Infrastructure Board (PPIB) issuing framework guidelines in September 2023 to accelerate power purchase agreements for solar projects and facilitate the integration of solar panels on public building roofs¹¹.

Present Issue in Pakistan

Net metering in Pakistan is a billing mechanism that credits solar energy system owners for the power they contribute to the grid. For instance, if a private client has a PV framework, it might create more power than the home uses amid sunlight hours. If the house is net-metered, the power meter will run in reverse to give a credit against what power is used around evening time or different periods where the home's power utilize surpasses the system's yield. Clients are only charged for their "net" energy utility. The advanced digital meter keeps running in both bearings to accommodate the power generated at the customer's home. Net metering permits clients to produce their power effectively and efficiently. Currently, the incentivized net

⁸ <https://medium.com/@synergycorporation/economic-and-environmental-impact-of-solar-solutions-in-pakistan-c2a0c6062e43>

⁹ <https://tribune.com.pk/story/2436369/nothing-like-the-sun-can-solar-solve-pakistans-energy-woes>

¹⁰ <https://www.mordorintelligence.com/industry-reports/pakistan-solar-energy-market>

¹¹ https://tribune.com.pk/story/2457697/chinese-solar-firm-eyes-growth-in-pakistan#google_vignette

metering policy sets rates at Rs. 18.64 /- PKR per unit for Residential buying, Rs. 22.2 /- PKR for Commercial buying, and Rs. 11.3 /- PKR for Industrial Buying¹².

The government is considering rationalising buyback rates of net metering electricity to Rs 11 per unit from current rates of Rs 21 per unit¹³. The current trend of installation of net metering across the country has unbalanced the government’s plan to collect capacity charges. The rich consumers are converting it to net metering. This means that the government is buying electricity from net metering at a high rate and giving consumers a lower rate. If only rich people can afford net metering, it might leave everyone else paying more for the grid. On top, the installation of solar panels has flexible payment from different private buyers, especially banks. Their payment plan varies from 2-7 years¹⁴.

Factors Influencing Solar Panel Prices in Pakistan¹⁵

Factors	How does it influence Solar panels?
Quality	There are different types of solar panels available in the market- Monocrystalline and polycrystalline. Thin-Film Sola. All 3 types have different manufacturing processes which affect the price levels.
Government Incentives and Policies	Government incentives and policies affect solar panel prices as it is a much more reliable and environmentally friendly alternative to electricity.
Economic Factor	The hard economic situation affected the prices of solar panels in Pakistan. The economic condition includes currency fluctuation and the impact of prices of imports of solar panels.
Local Market Dynamics	local market is influenced by the supply and demand of the market. Understanding that may affect the prices of solar panels.
Installation cost	Solar panel installation comes with the whole structure which results in the high installation cost. The hidden cost is important before installation.

Rooftop Mechanism

The rooftop solar installation mechanism in Pakistan is designed to facilitate the adoption of solar energy in the power sector.

¹² <https://zeus.com.pk/net-metering-in-pakistan/#:~:text=18.64%20%2F%2D%20PKR%20per%20unit,solar%20panels%20for%20net%20metering.>

¹³ <https://www.brecorder.com/news/40300217>

¹⁴ <https://www.meezanbank.com/solar-panel-financing/>

¹⁵ <https://tameereasy.com/blogs/factors-influencing-solar-panel-price-in-pakistan-what-you-need-to-know>

Step	Description
Policy Framework and Incentives¹⁶	The Government of Pakistan has implemented policies to encourage rooftop solar installations, including net metering regulations by NEPRA, which allow consumers to sell excess electricity back to the grid. Subsidies and tax incentives are also offered to reduce the initial cost, including tax exemptions on imported solar equipment and concessional financing options.
Site Assessment and Feasibility Study¹⁷	A thorough site assessment is conducted to evaluate feasibility, including checking roof condition, space availability, solar potential, and shading analysis. This ensures optimal placement and performance of solar panels.
System Design and Component Selection¹⁸	Customised solar system design based on energy consumption and available space. High-quality components such as solar panels, inverters, and mounting structures are selected to ensure durability and efficiency.
Permitting and Approvals¹⁹	Necessary permits and approvals from local authorities and utility companies are obtained to ensure compliance with building codes and net metering arrangements. This step is crucial for legal and operational authorisation.
Installation and Commissioning²⁰	Includes mounting structure installation, solar panel placement, electrical connections, and system testing. Ensures proper functioning and safety compliance.
Monitoring and Maintenance²¹	Regular monitoring and maintenance are essential to ensure optimal performance. This includes performance monitoring systems, routine inspections, cleaning, and prompt troubleshooting.
Financial Considerations and ROI²²	Solar installations lead to reduced energy bills, favourable return on investment due to savings and incentives, and positive environmental impact by reducing carbon emissions.

Pakistan Government’s Policies/ Strategies Regarding Solar Panels

Pakistan made its alternative renewable energy policy in 2019. The policy recognises solar panels as a popular form of on-grid and off-grid solutions and aims to create an enabling environment for their development and deployment. It also covers solar panels as part of the alternative and renewable energy technologies included in the policy, which aims to promote the development of a sustainable and affordable power market in Pakistan. The policy sets

¹⁶National Electric Power Regulatory Authority (NEPRA), 2021.

¹⁷ Pakistan Renewable Energy Society (PRES), 2022.

¹⁸ Pakistan Renewable Energy Society (PRES), 2022.

¹⁹ Government of Pakistan, Ministry of Energy, 2023.

²⁰ Alternative Energy Development Board (AEDB), 2023.

²¹ International Energy Agency (IEA), 2022.

²² Pakistan Council of Renewable Energy Technologies (PCRET), 2022; National Electric Power Regulatory Authority (NEPRA), 2021.

targets for on-grid renewable energy generation capacity and emphasises the use of competitive bidding, and indigenisation. It also focuses on simplifying regulatory and contract frameworks, involving the Private Power & Infrastructure Board (PPIB), and establishing an Institute of Renewable Energy Technologies for training and skill development. Overall, the policy aims to increase the deployment of solar panels and other renewable energy technologies to achieve a more sustainable and affordable energy mix in Pakistan²³.

The federal government has completed the formulation of a draft policy titled "Solar Panel Local Manufacturing and Allied Equipment" for 10 years. The policy aims to provide incentives to manufacturers, such as imposing tariffs on the import of finished goods, to increase local production²⁴.

Net metering is an electricity policy designed for consumers who own or plan to establish a Renewable Energy (RE) facility, enabling them to generate electricity using sources like wind and solar for their own consumption. Any excess electricity produced can be supplied to the national grid, offsetting units of electricity consumed during periods of low demand or when the RE facility's production is insufficient to meet the consumer's load. Consumers may then benefit from reduced utility bills or receive compensation for surplus energy exported to the grid, as per the terms outlined in the contract with the relevant Distribution Company (DISCO). NEPRA issued net-metering regulations in September 2015, allowing DISCOs in Pakistan to purchase excess electricity units generated by consumers and offset them against units consumed from the grid. Renewable Energy serves as a sustainable long-term power solution, with Solar PV Technology offering affordable electricity throughout its operational lifespan. Residential and commercial customers have the option to transition their electricity consumption to RE sources, thereby reducing their power bills²⁵.

Conclusion and Policy Recommendations

Solar panels are the best investments everybody can make in this present economic situation in Pakistan. It is economical and environmentally advantageous. Using solar panels will reduce the trade deficit of the country by importing less and generating more power using natural and renewable resources.²⁶ The solar industry plays a vital role in addressing the energy crisis and

²³ https://nepra.org.pk/Policies/ARE_Policy_2019_-_Gazette_Notified.pdf

²⁴ <https://www.brecorder.com/news/40299469>

²⁵ <https://energy.punjab.gov.pk/system/files/NetmeteringGuidelinesforConsumers.pdf>

²⁶ <https://www.linkedin.com/pulse/economics-residential-solar-solutions-pakistan-hatim-mustafa/>

combating the impact of climate change. The DISCOs are making an argument that the relief given to net metering rooftop solar systems results in an increase in the cost of electricity for normal consumers who do not own the rooftop system, but this is not a valid argument.

Policymakers must think of an alternative source to enhance the sustainable development of the solar energy systems of the country instead of putting tariffs on solar panels. Following is recommended:

- Power Purchase Agreements (PPAs) for the rooftop system should be only revised after 7-10 years so that the people who have invested in solar panels do not lose their investment.
- The government should engage with all stakeholders including private to formulate a future rooftop solar system policy with net metering arrangement.
- The government needs to focus on the local production of solar panels instead of importing from other countries. It will reduce the burden on the government and will reduce the cost of solar panels. Domestic productivity will also be enhanced, and local producers will get a chance to enter this market effectively.
- The Government should focus on the affordability and accessibility of solar panels to consumers especially in rural areas where people are wasting their production capacity due to the unavailability of electricity resources.
- The government should upgrade the grid infrastructure to accommodate the high level of renewable energy resources. This includes the modernisation of transmission and distribution networks, implementation of smart grid technologies, and improvement of grid stability and reliability to support the growth of solar energy generation.

Action Matrix

Action Area	Pathways to Solution	How to Implement Each Solution	Actor Responsible	Implementation Timelines
Revision of Power Purchase Agreements (PPAs)	Ensure investment protection for rooftop solar investors	Legislate a policy to revise PPAs only after 7-10 years	Government, Energy Regulators	3-6 months
Formulating Future Rooftop Solar Policy	Engage stakeholders for comprehensive policy development	Organise consultations with the private sector, industry experts, and relevant stakeholders	Government, Ministry of Energy	1 year
Focus on Local Production of Solar Panels	Reduce reliance on imports and boost local manufacturing	Provide incentives for local production, establish manufacturing units, and support R&D	Government, Ministry of Industry	2-3 years
Upgrading Grid Infrastructure	Accommodate high levels of renewable energy resources	Modernise transmission and distribution networks, implement smart grid technologies, and improve grid stability	Government, Ministry of Energy	5 years

About the Authors

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