

The Role of Solar Energy in Albania's Economic Transformation

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ABSTRACT

This article examines the emerging role of solar energy in Albania and its economic impact. While Albania has historically relied on hydro-power for electricity production, the country is shifting towards a more diversified renewable energy portfolio, particularly in solar power. The paper assesses how solar energy can contribute to the country's energy security, reduce dependency on energy imports, and support economic growth through job creation and foreign direct investment (FDI). Key challenges include regulatory frameworks, financing barriers, and infrastructure modernization. Additionally, this paper provides policy recommendations to incentivize investment in solar projects and integrate solar energy into Albania's regional energy strategy. The findings indicate that expanding solar energy has the potential to significantly enhance Albania's economic resilience and sustainability.

1. Introduction

Albania's energy sector has long been dominated by hydropower, with over 95% of its electricity historically generated from hydroelectric plants. However, climate change-induced fluctuations in water availability and increasing energy demand have prompted the need for a diversified renewable energy portfolio. In recent years, solar energy has emerged as a viable alternative,

offering the potential to enhance energy security, reduce import dependency, and support economic transformation. This article explores the role of solar energy in Albania's economy, the challenges it faces, and the policy measures required for its successful integration.

1.1 Albania's Energy Landscape and the Shift Toward Solar Power

Albania's reliance on hydropower has led to periods of energy instability, particularly during drought seasons when water levels drop, reducing electricity generation capacity. The country has historically imported electricity to bridge supply gaps, making energy security a pressing concern. Given Albania's high solar irradiation levels—averaging around 1,500-1,700 kWh/m² annually—the potential for solar energy development is significant. Government initiatives, including feed-in tariffs and public-private partnerships, have be-

gun paving the way for large-scale solar investments. In 2021, Albania awarded its first large-scale solar photovoltaic (PV) projects, including the Karavasta and Spitalla solar parks, signaling a strategic shift towards solar energy. However, the total installed solar capacity remains low compared to regional counterparts such as Greece and Italy, demonstrating the need for accelerated investment and policy support.

2. Economic Benefits of Solar Energy Development

2.1 Energy Security and Reduction in Import Dependence

Increasing solar energy capacity can mitigate Albania's reliance on electricity imports, particularly during dry seasons. By integrating solar energy into the national grid, Albania can stabilize its electricity supply, ensuring consistent energy availability for households and industries. Additionally, distributed solar energy systems—such as rooftop installations—can enhance local energy resilience and reduce transmission losses. The expansion of solar energy also reduces Albania's vulnerability to external energy price fluctuations. Currently, the country imports electricity when hydropower production is insufficient, often at high costs influenced by international market dynamics. By developing solar infrastructure, Albania can lower its reliance on these imports and achieve greater energy independence. Moreover, solar energy supports decentralized energy production, which strengthens energy security by reducing the risk of grid failures. By incorporating solar power at multiple points in the grid, Albania can create

a more resilient energy system that withstands external shocks and enhances national energy autonomy. In addition to electricity generation, solar power can contribute to energy diversification in other sectors, such as agriculture and industry. The use of solar energy for water pumping and irrigation can enhance agricultural productivity, reducing reliance on fossil fuels. In industrial applications, solar energy can provide cost-effective heating solutions, improving overall economic efficiency and sustainability. By leveraging its abundant solar resources, Albania can position itself as a regional leader in renewable energy production, with the potential to export surplus electricity to neighboring countries. This would not only strengthen the national economy but also improve energy trade balances, further solidifying Albania's role in the regional energy market.

2.2 Job Creation and Workforce Development

The solar energy sector has the potential to create thousands of jobs across the value chain, including manufacturing, installation, maintenance, research, and

engineering. The demand for skilled labor in solar panel production, system installation, and grid integration is expected to rise, providing employment opportunities

for both low- and high-skilled workers. A shift towards solar can stimulate new employment opportunities in both urban and rural areas, addressing Albania's labor market challenges and reducing unemployment rates. Furthermore, the development of vocational training programs focused on renewable energy technologies can further support workforce readiness and economic mobility. Universities and technical institutes in Albania can introduce specialized curricula in solar energy systems, energy management, and sustainable engineering, ensuring that the local workforce is equipped with the necessary skills to support the industry. Collaborations with international

organizations and private-sector firms can enhance training opportunities and create pathways for employment in the growing renewable energy sector. The rise of solar energy can also lead to the expansion of auxiliary industries, such as battery storage production, inverter technology, and energy efficiency consulting. These industries will further contribute to economic growth and the establishment of a skilled workforce in Albania's green energy sector. Moreover, government-backed initiatives to promote local manufacturing of solar panels and related equipment can generate additional employment and stimulate economic activity in supporting industries.

2.3 Foreign Direct Investment (FDI) and Economic Growth

Albania's strategic location and untapped solar potential make it an attractive destination for foreign investors in the renewable energy sector. Large-scale solar projects can attract FDI, contributing to economic growth and infrastructure modernization. The integration of renewable energy into Albania's national energy strategy also aligns with European Union (EU) accession requirements, strengthening economic and political ties with EU member states. Foreign direct investment in Albania's solar industry can bring advanced technologies, expertise, and best practices from leading renewable energy markets. International firms specializing in solar power generation, energy storage solutions, and

smart grid systems can establish partnerships with local businesses, fostering knowledge transfer and improving technical capabilities within the country. Additionally, Albania's commitment to the EU's renewable energy targets can further encourage investment. The expansion of solar energy can enhance the country's appeal as an energy hub in the Western Balkans, offering opportunities for cross-border energy trade and regional integration. By leveraging international financial instruments such as green bonds, climate funds, and development bank loans, Albania can secure the necessary capital to expand its solar infrastructure and drive long-term economic growth.

3. Key Challenges and Barriers to Solar Energy Expansion

Despite the promising potential of solar energy in Albania, several challenges must be addressed to facili-

tate its widespread adoption and integration into the national energy mix.

3.1 Regulatory and Policy Framework

One of the primary obstacles to solar energy expansion in Albania is the lack of a well-defined regulatory and policy framework. While recent reforms have aimed to encourage renewable energy investments, inconsistencies in permitting processes, land use regulations, and tariff structures remain barriers. A streamlined and transparent regulatory framework is essential for attracting investors and ensuring the long-term viability of solar energy projects. Additionally, the current legal framework does not provide adequate long-term guarantees for investors, causing uncertainty in financial planning. The regulatory environment often lacks clarity regarding grid connection procedures and cost-sharing mechanisms

for solar energy projects. This regulatory ambiguity discourages investment, as project developers face difficulties navigating the approval process, securing power purchase agreements, and ensuring access to the grid. Moreover, Albania's incentive schemes, such as feed-in tariffs and auctions, have not been fully optimized to support small and medium-scale solar energy projects. There is also an absence of clear guidelines on net metering policies, which would allow residential and commercial consumers to feed excess solar energy back into the grid, making renewable energy adoption more attractive.

To overcome these challenges, the government should establish a comprehensive and investor-friendly regu-

latory environment. This includes clearer guidelines on licensing, tariff adjustments based on market conditions, and efficient dispute resolution mechanisms for renewable energy investments. Aligning Albania's re-

gulatory policies with the European Union's renewable energy directives can further boost investor confidence and enhance regional cooperation in energy markets.

3.2 Financial Barriers and Investment Constraints

The high initial investment costs associated with solar energy infrastructure pose a significant barrier, particularly for small and medium enterprises (SMEs) and residential consumers. Photovoltaic (PV) panels, inverters, battery storage systems, and installation costs require substantial upfront capital, making solar adoption less feasible for lower-income households and businesses with limited financial resources. Limited access to affordable financing options further restricts the ability of stakeholders to invest in solar energy solutions. Banks and financial institutions in Albania often lack specialized loan products tailored for renewable energy investments, leading to high interest rates and restrictive loan conditions. Without adequate financial support, many potential investors are deterred from pursuing solar projects, stalling the sector's growth. Government incentives, such as grants, tax exemptions, and low-interest loans, remain insufficient to bridge this financing gap. In comparison to other European countries where green financing mechanisms are more developed, Albania lacks a comprehensive subsidy program to encourage residential and commercial solar energy adoption. Furthermore, the absence of power purchase agreements (PPAs) with favorable conditions for solar investors reduces the attractiveness of large-scale projects. Another challenge is the underdeveloped carbon cre-

dit and emissions trading system in Albania, which limits additional revenue streams that could help finance solar investments. By integrating into European and global carbon markets, Albania could enable solar project developers to sell carbon credits, generating supplementary income to offset installation costs. Expanding financial incentives such as government-backed loan programs, feed-in tariffs, and risk-mitigation schemes is crucial for overcoming these barriers. The introduction of green bonds and climate-focused investment funds could provide long-term capital to finance large-scale solar infrastructure projects. Additionally, partnerships between financial institutions, international organizations, and the private sector could lead to the establishment of innovative financing models, making solar energy more accessible to a broader range of consumers. The high initial investment costs associated with solar energy infrastructure pose a significant barrier, particularly for small and medium enterprises (SMEs) and residential consumers. Limited access to affordable financing options, coupled with high interest rates, further restricts the ability of stakeholders to invest in solar energy solutions. Expanding financial incentives such as grants, subsidies, and green financing mechanisms is crucial for overcoming these barriers.

3.3 Infrastructure and Grid Integration Challenges

Albania's existing electricity grid requires significant upgrades to accommodate increased solar energy production. The country's aging infrastructure was primarily designed for centralized hydropower generation, making the integration of decentralized solar energy systems complex. Upgrading transmission and distribution networks is essential to prevent energy losses and ensure efficient electricity delivery from solar plants to consumers. The intermittent nature of solar power necessitates robust energy storage solutions and modernized grid infrastructure to ensure stability and reliability. The current grid lacks sufficient energy storage capacity, making it difficult to balance supply and demand, particularly during peak usage periods or when solar generation

fluctuates due to weather conditions. The integration of battery storage technologies, pumped hydro storage, and demand-response mechanisms would help stabilize the grid and enhance overall system reliability. Additionally, the lack of adequate transmission and distribution networks in certain regions limits the expansion of solar energy projects. Rural and underdeveloped areas often experience weak grid connectivity, making it challenging to integrate new solar installations into the national power system. Investments in smart grids, digital monitoring systems, and grid automation could optimize power distribution and enable more efficient use of renewable energy sources. Another critical challenge is the limited number of grid connection points available for indepen-

dent solar power producers. Bureaucratic delays in obtaining grid access permits further hinder solar project development. A more transparent and streamlined grid connection process, along with regulatory support for small-scale and community solar projects, could facilitate faster integration of solar energy into the national electricity network. Moreover, Albania's regional energy interconnections with neighboring countries remain underutilized. Strengthening cross-border electricity trade through infrastructure improvements and policy align-

ment with European energy markets would allow Albania to export excess solar energy during peak production periods, generating additional economic benefits. Albania's existing electricity grid requires significant upgrades to accommodate increased solar energy production. The intermittent nature of solar power necessitates robust energy storage solutions and modernized grid infrastructure to ensure stability and reliability. Additionally, the lack of adequate transmission and distribution networks in certain regions limits the expansion of solar energy projects.

3.4 Public Awareness and Technical Expertise

A lack of public awareness and technical expertise in solar energy technologies presents another challenge. Many businesses and households remain unfamiliar with the economic and environmental benefits of solar power. Misconceptions about the affordability, efficiency, and reliability of solar energy further contribute to its slow adoption. Public skepticism often stems from a lack of access to accurate information, making educational outreach and awareness campaigns essential. Moreover, there is a shortage of trained professionals in solar energy system installation, maintenance, and grid integration. The absence of specialized training programs limits the availability of skilled workers capable of supporting large-scale solar deployment. Establishing dedicated certification programs and vocational training centers focused on renewable energy technologies can help bridge this gap. Universities and technical institutes should integrate solar energy courses into engineering, environmental science, and business curricula to equip students with the necessary expertise. Collaboration between the government, private sector, and non-governmental organizations (NGOs) can further enhance knowledge dissemination. Public-private partnerships (PPPs) can fund awareness campaigns, offer hands-on training opportunities, and create mentorship programs for aspiring solar energy

professionals. Additionally, launching community-based initiatives, such as solar cooperatives and demonstration projects, can provide tangible evidence of the benefits of solar energy and encourage grassroots adoption. Government-led initiatives should also include incentives for businesses and households to adopt solar technologies, such as tax breaks, subsidies for solar panel installations, and streamlined bureaucratic procedures for permits. Awareness campaigns should utilize digital platforms, social media, and public workshops to reach a broader audience and highlight successful case studies of solar energy implementation in Albania. By addressing these educational and technical barriers, Albania can create a skilled workforce and an informed consumer base, ensuring the long-term sustainability and expansion of the solar energy sector. A lack of public awareness and technical expertise in solar energy technologies presents another challenge. Many businesses and households remain unfamiliar with the economic and environmental benefits of solar power. Moreover, there is a shortage of trained professionals in solar energy system installation, maintenance, and grid integration. Educational programs and workforce training initiatives are needed to build local capacity and support the sector's growth.

4. Policy Recommendations for Solar Energy Advancement

To fully harness the potential of solar energy and ensure its effective integration into Albania's energy sector, a comprehensive set of policy measures is required. These policies should address regulatory gaps, finan-

cial constraints, infrastructure limitations, and public awareness to create a sustainable and investor-friendly environment for solar energy development.

4.1 Strengthening the Regulatory Framework

A clear and predictable regulatory framework is essen-

tial to attract domestic and foreign investments in solar

energy. The government should simplify and streamline permitting procedures, ensuring that investors can efficiently navigate the approval process. Additionally, establishing transparent power purchase agreements (PPAs) with fair tariff structures will provide long-term revenue stability for solar energy producers. Aligning Albania's regulations with European Union (EU) renewable energy directives can enhance investor confi-

dence and facilitate regional energy market integration. The government should also introduce clear net metering policies to allow households and businesses to sell excess electricity back to the grid, making solar investments more attractive. Strengthening enforcement mechanisms for renewable energy targets and compliance with environmental regulations will further ensure the sector's long-term sustainability.

4.2 Expanding Financial Incentives

Financial support mechanisms play a crucial role in accelerating solar energy adoption. The introduction of targeted subsidies, grants, and tax incentives for solar panel installations can help offset high initial investment costs, making solar energy more accessible to small and medium enterprises (SMEs) and residential consumers. The government should collaborate with financial institutions to develop low-interest loan programs specifically tailored for solar energy investments.

Establishing green bonds, risk mitigation funds, and renewable energy investment funds can also help attract private-sector participation in Albania's solar energy market. Furthermore, integrating Albania into global carbon trading markets can generate additional revenue streams for solar project developers, making investments more financially viable.

4.3 Investing in Grid Modernization and Energy Storage

Modernizing Albania's electricity grid is essential to accommodate the growing share of solar energy and improve grid reliability. Upgrades should focus on expanding transmission and distribution networks, particularly in rural areas, to enable a more balanced distribution of solar-generated electricity. Investing in smart grid technologies, such as digital

monitoring and automation systems, will enhance the efficiency of solar energy integration. Additionally, expanding energy storage solutions—such as battery storage systems and pumped hydro storage—can help address the intermittent nature of solar power, ensuring a stable electricity supply even during low sunlight hours.

4.4 Promoting Public Awareness and Workforce Development

Raising awareness about the benefits of solar energy is crucial for increasing adoption rates among businesses and households. Government-led campaigns should use digital platforms, public workshops, and educational initiatives to highlight the environmental and economic advantages of solar energy. Expanding workforce training programs in collabora-

tion with universities, vocational institutions, and industry stakeholders will help develop a skilled labor force capable of supporting the solar energy sector. Certification programs for solar energy system installers, maintenance technicians, and grid integration experts should be established to ensure high technical standards and industry credibility.

4.5 Encouraging Public-Private Partnerships

Public-private partnerships (PPPs) can accelerate the deployment of solar energy projects by leveraging private sector expertise and financial resources. The government should facilitate collaboration between private investors, international development organizations, and research institutions to develop large-scale solar farms, rooftop solar installations, and communi-

ty-based solar projects. Incentivizing corporate adoption of solar energy through preferential electricity pricing schemes and tax benefits will encourage businesses to integrate solar solutions into their operations. Additionally, launching pilot projects in government-owned facilities and public institutions can serve as a model for wider adop-

tion and demonstrate the feasibility of solar energy integration at scale.

5. Conclusion

Solar energy presents a transformative opportunity for Albania's economy, offering a pathway to greater energy security, economic diversification, and environmental sustainability. As Albania transitions from a hydropower-dominated energy sector, integrating solar energy into its renewable portfolio can reduce dependency on imports, stabilize electricity supply, and create economic benefits such as job creation and foreign direct investment.

However, several key challenges must be addressed to ensure the successful expansion of solar energy. Regulatory and policy inconsistencies create uncertainty for investors, while high initial investment costs and limited financial mechanisms deter widespread adoption. Infrastructure limitations, including outdated grid systems and insufficient energy storage solutions, further complicate large-scale solar integration. Additionally, a lack of public awareness and technical expertise hinders both consumer adoption and workforce development. To overcome these obstacles, Albania must implement a comprehensive policy framework that fosters a conducive environment for solar energy growth. Strengthening regulations, streamlining permitting processes, and introducing net metering policies will create clarity for investors and consumers alike. Expan-

ding financial incentives through tax benefits, green bonds, and targeted subsidies will make solar energy more accessible. Modernizing grid infrastructure and investing in energy storage technologies will enhance the stability and reliability of solar power generation. Public awareness campaigns and workforce development initiatives are equally critical. Educating businesses and households on the economic and environmental benefits of solar energy can increase adoption rates, while vocational training programs can equip workers with the necessary skills to support a thriving solar energy sector. Furthermore, fostering public-private partnerships will leverage both governmental support and private sector innovation, driving large-scale solar projects and advancing Albania's renewable energy ambitions. By addressing these challenges through well-designed policies and investments, Albania can position itself as a leader in solar energy in the Western Balkans. A successful transition to solar energy will not only reduce the country's carbon footprint but also promote economic growth, energy independence, and long-term sustainability.

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DISCLOSURE

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