Mapping Renewable Energy Sources potential, challenges, and opportunities in Albania

RENEWSTART

September 2024

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Introduction

The Albanian power system is dominated by hydropower, representing 95% of the country's installed capacity with a total of 2,493 MW. The installed hydropower capacity comprises mainly large hydropower installations (i.e., above 10 MW in size) amounting to 2,168 MW, while small hydropower installations amount to 325 MW[1]. The country has a 98 MW fossil-fuel thermal power plant representing 4% of the total installed capacity that has not been put into use since its construction in 2011 due to a failure in its cooling system. The remaining 1% (23 MW) of installed capacity comprised small-scale (i.e., each less than 2 MW) solar photovoltaic (PV) plants. Albania's domestic electricity production has fluctuated in recent years due to the electricity sector's over-reliance on hydropower and annual precipitation.

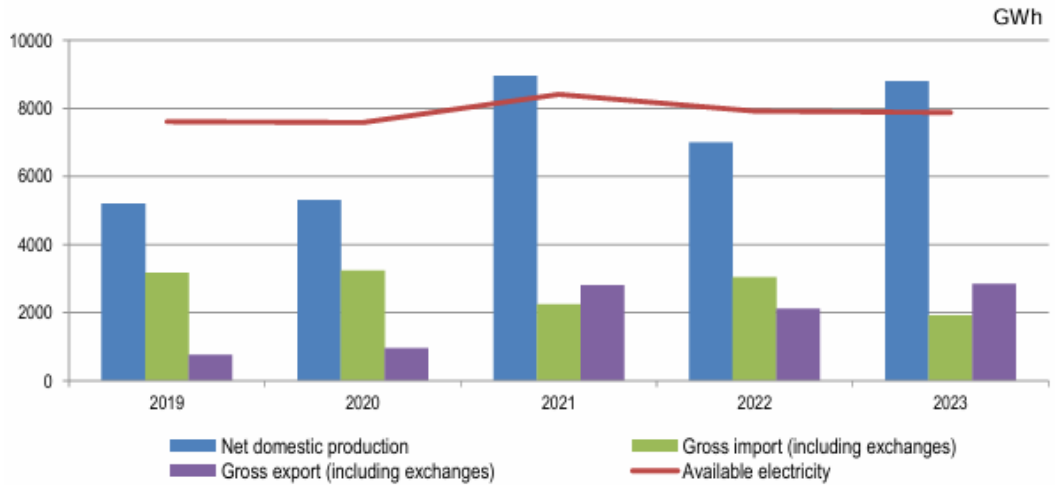
Net domestic production of electric power for 2023[2] reached the value of 8,796 GWh (See graph 1 and 2), realised by public hydro plants at 58.2% of net domestic production, by independent power producers to the extent of 40.8% and other producers (Photovoltaics) that generated 1% of net domestic electricity production. Gross import of electric power (including exchanges) reached the value 1,922 GWh from 3,044 GWh in the previous year, while gross exports (including exchanges) reached the value 2,842GWh. Electricity exchange (difference between gross exports and gross imports of electricity), in 2023, has reached a positive value of 920 GWh, while in 2022 was a negative value of 921 GWh (Graph 1 and 2). Electrical losses have reached value 1,655 GWh in 2023. Losses in transmission increased by 10.1 % and the weight that occupies in the total electrical losses is 13.3 %. The consumption of electricity by households reaching the value 3,117 GWh in 2023, while the consumption of electricity by non-households reaching the value 3,104 GWh.

Albania is a net energy importer. Net energy imports are directly correlated to annual rainfall, given that the electricity sector is almost entirely reliant on hydropower production. A further contributor to net energy imports is the country's rising demand for petroleum products, largely fueling the transport sector. Although Albania is the largest producer and exporter of oil in the South East Europe region, most oil extracted in Albania is exported as unrefined crude oil. As such, the country imports all of its refined petroleum products to meet its transport energy demand, which inevitably widens the country's trade gap.

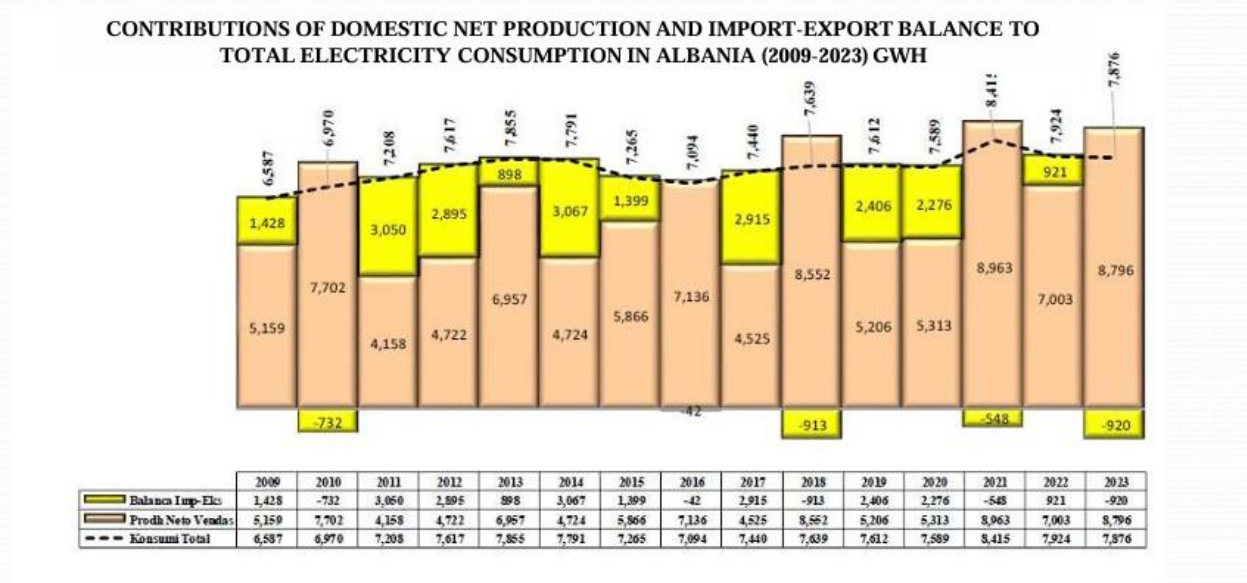
In 2022, Albania exported $287M in Electricity. The main destinations were Greece ($263M), Montenegro ($14.6M), Serbia ($5.77M), and North Macedonia ($3.78M). And imported $218M in Electricity, mainly from Greece ($213M), North Macedonia ($4.41M), Montenegro ($838k), and Serbia ($57.8k)3.

Graph 1 Net domestic production, gross import and export for Albania
Source: INSTAT

[1] Annual Implementation Report 2022: Energy reforms advance despite war - Energy Community Homepage (energy-community.org)
[2] Balance of electric power, 2023 | Instat
[3] Electricity in Albania | The Observatory of Economic Complexity (oec.world)



Graph 2 Contribution of Domestic net production and import-export balance to total electricity consumption



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Balanca Imp-Eks	1,428	-732	3,050	2,895	898	3,067	1,399	-42	2,915	-913	2,406	2,276	-548	921	-920
Prodh Neto Vendas	5,159	7,702	4,158	4,722	6,957	4,724	5,866	7,136	4,525	8,552	5,206	5,313	8,963	7,003	8,796
Konsumi Total	6,587	6,970	7,208	7,617	7,855	7,791	7,265	7,094	7,440	7,639	7,612	7,589	8,415	7,924	7,876

The production profile in Albania does not always align with the consumption profile during the same periods. Being also heavily reliant on hydropower also means that renewable generation is sensitive to rainfall, of which has seen considerable annual variations and a steady decline in recent years. This is likely to further decline with the effects of climate change. In addition to hydropower resources, Albania also has abundant solar and wind resources, which are currently almost entirely untapped. In order to improve energy security and climate resilience and to meet growing energy demand, it is imperative that Albania accelerates the transition to those abundant, available and local, renewable energy sources.

In terms of Energy trilemma (Figure 1), Albania performs weak on 'energy security' (52.4 points), medium on 'social aspects and equity' (65 points) and good on 'environmental sustainability' (82.7 point). The Albanian Government is continuing efforts for a better balance between the diversification of energy production sources, the security of energy supply and the protection of nature and sustainable system in order to increase domestic production, reduce the level of technical and non-technical losses of electricity in the distribution network as well as reducing the amount of imported energy to meet the demand for electricity in the country.

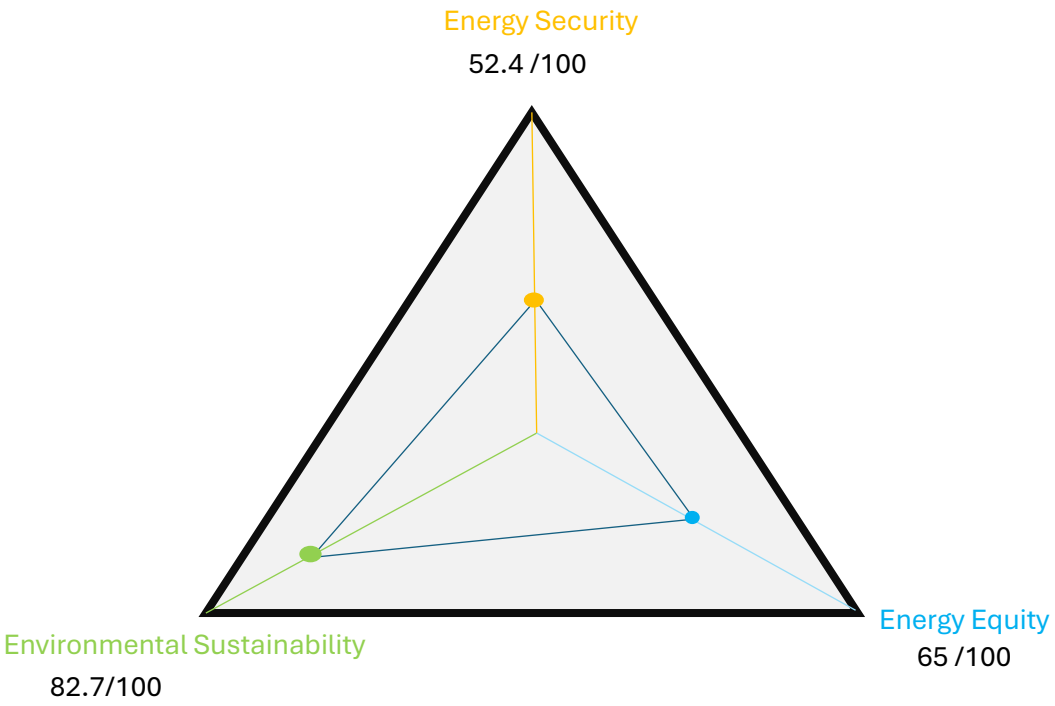


Figure 1 Energy trilema Score for Albania

Moving on to alternative renewable sources, Albania has a high solar radiation in most of its territory. On average, there are about 286 days, with up to 2,700 hours of sunshine per year (in Myzeqes it goes to 1,753 kWh/m^2/a).

According to preliminary site studies, there is currently an untapped technical potential, with a low capital cost, for the deployment of solar projects of up to 2,378 MW. The latest data show that in the project in the solar energy sector there are 1.3 GW.

The National Plan for Energy and Climate (PKEK) 2020 - 2030, approved by decision of the Council of Ministers no. 872, dated 29.12.2021 and revised in 2022 based on the recommendations of the EnC it is intended to reduce final energy consumption by 9.4% compared to 8.4% in the previous version, the share of renewable energy in final energy consumption has increased to 59.4% compared to 54.4%, while GHG emissions remain in 18.7%.

In total, during the year 2022, the production capacity of electricity from the entities that have been licensed is 289.4 MW, of which 62.3 MW from hydroelectric power production sources and 227.1 MW from photovoltaic sources.

- *how renewable energy sources can be a factor in economic development?*

Albania has significant renewable energy resource potential from hydro, wind, and solar energy. The Government of Albania recently adopted new electricity market laws and is undergoing a process of opening that market to competition. An attractive feed-in tariff is already in place for small hydropower, but the Government is still in the process of determining the incentive mechanism for encouraging more near-term investment in renewable energy technologies. Several very large and high-profile wind-farm deals are under development and should provide political pressure to speed the government decision process. The potential areas for follow-on activities to support the expanded use of RES in Albania include support mechanisms and administrative issues. The support mechanism that probably will be chosen by Albanian authorities (green certificates) needs to be developed such that certificates generated in the Albania national market can be sold and traded with the other European countries, especially given the new Italian wind-farm deal. Currently only hydropower makes a significant contribution to the current energy consumption in Albania. However, the country has significant potential for renewable resources in the form of wind, solar and biomass.

- *How EU directives affect the development of RES?*

The Albanian legal framework governing the energy sector, including the promotion and use of renewable energy sources (RES), has undergone significant developments in the last decades. This is due to the commitments of the Republic of Albania in the context of the European Union (EU) integration process (this involves the process of approximation of the Albanian legislation with the EU acquis), as well as the Energy Community Treaty (EnC Treaty) to which Albania is a party.

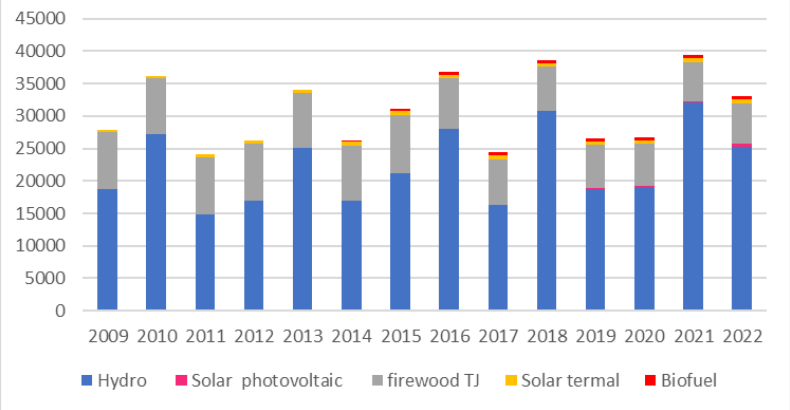
The Renewable Energy Sources Law (RES) aligned with the Renewable Energy Directive (EU) 2018/2001, was adopted in March 2023. The new Law brings a series of innovations to the electricity sector, including that a renewable energy community has the right to produce, consume and sell renewable energy, and offer aggregation, including power purchase agreements. It abolishes the feed in tariffs support schemes, so that all support measures will be granted via competitive procedures. The Law on bioenergy is still pending adoption.

The result is an evolving legal framework where the respective laws and secondary legislation have been and still are subject to continuous amendments.

- *What is the % of RES in the national energy mix?*

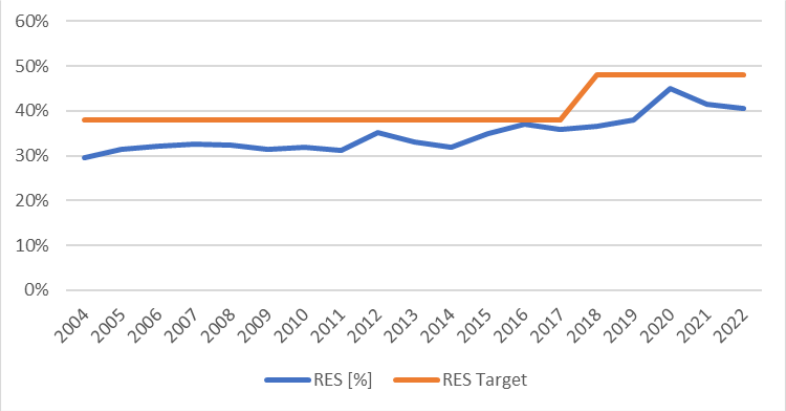
The renewable energy share in Albania is predominantly hydropower of which accounts for 95% of all generating capacity, with the remaining divided between solar (1%) and crude oil (4%). In the graph 3 is shown RES production through the years, while in graph 4 the RES production compared to the country RES targets.

Graph 3 The progress of the production from RES (TJ)



In terms of targets Albania Government has been doing well in achieving targets put in the National Plan of Energy and Climate (PKEK).

Graph 4 RES Contribution in years



- *What capacities are installed in RES (in total, in PV, wind, water separately)?*

The total installed capacity is 2,227 MW, out of which 1 ,350 MW public HPP's in Drini River Cascade; 756 MW are privateHPP's; 98 MW VloraThermopower Plant(VloraTPP) and 23 MW are PV's

- *What are the directions for further development?*

The National Energy Strategy 2018 – 2030 states that the energy sector has the potential of being a sustainable source of growth for the country over the short to medium and long-term. Albania has the potential for increasing the amount of electricity produced domestically and therefore decreasing necessary energy imports. Almost 100% of electricity produced in Albania is generated from HPP, but only 50% of Albania's hydropower potential is being utilized and electricity production is highly dependent on the volatility of the water flow in the Drini river cascade. Albania is the only

country in the Western Balkans to have completed new large hydropower plants in the last decade and as of the end of 2022 it had at least 25 operational hydropower plants of more than 10 MW.

Energy Policy of Albania include the promotion for the use of renewable energy sources beyond hydropower due to the significant potential our country has for photovoltaic and wind energy production, and its favorable geographical position, climate conditions and high intensity of the solar radiation for the use of solar energy. The aim of government is to increase the diversification of energy sources and the security of energy supply in Albania and to promote the use of energy from renewable sources.

In pipeline are:

- 1200 MW pumped hydro plant project, which it aims to build in the course of the Devoll River.
- 1 GW of solar capacity
- Construction of wind power generating plants and ancillary works in Tragjas, Orikum Administrative Unit, Vlora district, with generating capacities of 3MW respectively.

- *What are the estimates related to possible installed capacities?*

In the context of geopolitics, emphasize how important it is to secure our own energy sources and thus energy security.

Albanian energy goals consist in some priorities: security of supply through better exploitation and utilization of energy sources, energy diversification, increasing the competitiveness and the environmental protection. Due to this fact, Albanian National Strategy of Energy takes into consideration the development of energy sector on the path of most effective scenario. It includes the harmonization of legal framework of the energy sector with European directives, consumer protection, energy efficiency promotion and increasing the utilization of renewable sources.

Thanks to the favorable geographic position in the Mediterranean Sea Basin, Albania has significant potential of renewable resources to be utilized as energy sources as, water, wind, sun, biomass and geothermal. In the table 1 are given actual capacities and potential one in economic terms as well as in technical one.

Tabela 1 Actual and potential capacities on RES in Albania

Technology	Capacity in 2023	Economic potential (MW) in 2030	Technical Potential (MW) in 2030
HPP	1 ,350	2150	4813
PV	756	1074	2378
Wind	0	616	7483
Bioenergy	1	86	1832

Types and importance of renewable energy sources

In this part, please put information about:

- *the biggest PV, wind and water installations (place, capacity, generation, project status)*
- *state of art – what this segment looks like, how it was formed, what influenced its development*
- *geothermal power industry – if there is potential then mark that it is*

Solar power industry

Until now, there have been given 40 licences for the production of energy from PV panel with installed capacity of 466 MW. Most of the existing solar power plants in Albania are small-scale installations, with a capacity of less than 5 MW, and only 4 of them are 50-140 MW. The big operating PV power plant is:

Voltalia has won a 30-year concession for the **Karavasta photovoltaic power plant** in 2020. The 140-megawatt project was awarded to Voltalia by decision of the Albanian Council of Ministers on January 21, 2020, following the competitive bidding process launched by the Ministry of Infrastructure and Energy with the support of the European Bank for Reconstruction and Development - EBRD. According to the terms of the tender, Karavasta will sell 50% of the electricity through a 15-year sales contract to the Albanian public operator, while the remaining production will be sold through long-term contracts to private operators. The plant is expected to be commissioned in the second half of 2023. It will avoid the emission of more than 96,500 tons of CO2 per year, the equivalent of 9.5% of the emissions from the industrial sector in Albania. Voltalia has been producing energy for the Albanian consumer since December 2023. It has been put into operation since the end of January 2024. On a sunny day, it can produce even one Gigawatt hour of electricity.

Wind power industry

Albania currently has no installed wind power plants. However, according to the MIE, since the introduction of the wind FiT support scheme, 70 applications for the construction of wind plants up to 3 MW have been received. Of these, three have been authorised for construction with a total capacity of 9 MW which qualify for FiT support (MIE, 2019). At the end of 2020, a 150 MW wind tender was launched, restricted to projects with a minimum capacity of 30 MW and a maximum capacity of 75 MW. Each successful bidder will sign a 15-year PPA for the sale of 100% of electricity generated through the CfD support mechanism (MIE, 2020).

Annual average wind speeds in Albania range between 3.3 metres per second (m/s) and 9.6 m/s. The most suitable areas for wind power production, with capacity factors typically varying from 22% to 25%, have annual average values ranging between 5.8 m/s and 7 m/s.

Recently Albania has a reported 7GW of wind and solar potential, but is making slow progress to unlock it. Investors have faced hurdles with bureaucracy and an inadequate grid.

And yet projects are coming. Biopower Green Energy and Marseglia Group revealed plans for a 234MW project last April; and, in late July 2023, the government awarded support to Guris, Total Eren and Verbund for three projects totaling 222.5MW in the country's first utility-scale onshore wind tender.

Albania is preparing a wind power auction for 100 MW in total. The government is also working on an unnamed offshore wind power project. It is preparing a wind power auction for next year with a quota of 100 MW, which could rise to 150 MW.

Finally, the country is looking at how it can develop offshore wind in the Adriatic.

Water power industry

The current power system in our country is almost based on hydropower. Albania has a considerable hydro power potential, where only 35% of it is utilized. The hydrographic territory of Albania has a surface of 44,000 km^2 or 57% more than the national area of our country. The total reserves are estimated at 4,500 MW and the annual output potential can reach 18 TWh.

The hydropower sector began to develop after 1952, when Selita hydro-power plant started operation, with an installed capacity of 5,000 KW. In 1958, Ulza hydropower plant started functioning with installed capacity of 25, 000 KW. Following the construction of other three hydropower plants of Shkopet, Bistrica I and Bistrica II. In 1971, 1978 and 1985, three of the biggest hydropower plants of the country: Vau i Dejës Hydropower Plant (with an installed capacity of 250 MW), Fierza Hydropower Plant (with an installed capacity of 500 MW) and Koman Hydropower Plant (with an installed capacity of 600 MW) were constructed, respectively. They are state-owned by power utility, the Albanian Power Corpo.

Albania also has 189 privately-owned power generation facilities totalling 800 MW. Of the privately-owned hydropower plants, the larger ones are the Ulez and Shkopet plants owned by Turkish steelmaker Kurum International, Peshquesh and Fangu owned by Turkey's Ayen As Energji, Banje owned by a subsidiary of Norway's Statkraft called Devoll Hydropow er, Ashta owned by Austria's Verbund and Gjorica owned by a company called Diteko.

Successive governments in Albania have awarded at least 194 concessions for no fewer than 540 hydropower plants since 2002. The real number remains unknown, as there is no updated list of hydropower concessions publicly available. Not all of these have been built, but the 2018 Energy Reg ulator's annual report shows no fewer than 111 new plants under 10 MW having gone online since 2009, in addition to 32 pre-existing ones. No fewer than 29 more small hy dropower plants went online in 2019, so the boom is still very much ongoing.

Geothermal power industry

Albania is in the very early stages of geothermal assessment. However, similar to other South East European countries, low-enthalpy geothermal energy resources are available in Albania. Maximum temperatures of up to 80°C (degrees Celsius) can be found in the south of the country bordering Greece and in the northeast. The majority of Albania's geothermal resources are located in the Kruja

Geothermal Area, which extends from the Adriatic Sea in the north of Albania and runs in a southeastern direction through the country towards the Konitza area in Greece. Within this zone in carbonate reservoirs lies an estimated geothermal energy potential of 5.9x108-5.1x109 gigajoules. Due to the low-enthalpy resource, geothermal potential for power production is not likely and would mostly be exploited in heating applications.

Legal conditions

The Renewable Energy Directive (2018/2001/EU) entered into force in December 2018, as part of the Clean energy for all Europeans package, aimed at maintaining the EU's status as a global leader in renewables and, more broadly, helping it to meet its emissions reduction commitments under the Paris Agreement.

It established a new binding renewable energy target for the EU for 2030 of at least 32%, with a clause for a possible upwards revision by 2023. This target is a continuation of the 20% target for 2020. In order to help EU countries deliver on this target, the directive introduced new measures for various sectors of the economy, particularly on heating and cooling and transport, where progress has been slower (for example, an increased 14% target for the share of renewable fuels in transport by 2030). It also includes new provisions to allow citizens to play an active role in the development of renewables by enabling renewable energy communities and self-consumption of renewable energy and established better criteria to ensure bioenergy's sustainability.

On 14 July 2021 the European Commission adopted the 'fit for 55' package, which adapts existing climate and energy legislation to meet the new EU objective of a minimum 55 % reduction in greenhouse gas (GHG) emissions by 2030. The 'fit for 55' package is part of the European Green Deal, which aims to put the EU firmly on the path towards climate neutrality by 2050.

A key element in the 'fit for 55' package is the revision of the Renewable Energy Directive (RED II), to help the EU deliver the new 55 % GHG target. Under RED II, the EU was obliged to ensure at least 32 % of its energy consumption comes from renewable energy sources (RES) by 2030. The 'fit for 55' revision increased this target to 40 %. Under the REPowerEU plan of May 2022 it was then raised to 45 %. Additional targets were also proposed for several sectors, such as transport, buildings, industry, and heating and cooling.

Given the need to speed up the EU's clean energy transition, the Renewable Energy Directive EU/2018/2001 was revised in 2023. The amending Directive EU/2023/2413 entered into force on 20 November 2023. There will be an 18-month period to transpose most of the directive's provisions into national law, with a shorter deadline of July 2024 for some provisions related to permitting for renewables. The directive sets an overall renewable energy target of at least 42.5% binding at EU level by 2030 - but aiming for 45%.

To support renewables uptake in transport and heating and cooling, the revised directive converts into EU law some of the concepts outlined in the energy system integration and hydrogen strategies, published in 2020. These concepts aim at creating an energy-efficient, circular and renewable energy system that facilitates renewables-based electrification and promotes the use of renewable fuels, including hydrogen, in sectors like transport or industry where electrification is not yet a feasible

option. For these hard-to-electrify sectors, the directive sets new binding targets for renewable fuels of non-biological origin.

As an important bottleneck to the deployment of renewables on the ground, permitting procedures will also be easier and faster both for renewable energy projects, including through shorter approval periods and the creation of 'Renewables acceleration areas', and for the necessary infrastructure projects.

- *How and whether EU directives have influenced changes in national law? How national laws support the development of RES?*

The Albanian legal framework governing the energy sector, including the promotion and use of renewable energy sources (RES), has undergone significant developments in the last decades. This is due to the commitments of the Republic of Albania in the context of the European Union (EU) integration process (this involves the process of approximation of the Albanian legislation with the EU acquis), as well as the *Energy Community Treaty* (EnC Treaty) to which Albania is a party. The result is an evolving legal framework where the respective laws and secondary legislation have been and still are subject to continuous amendments.

The power system in the Republic of Albania consists of electricity production, transmission, distribution, trading and supply to customers. These activities are exercised by entities licensed pursuant to *Law no. 43/2015 "On the power sector"*, as amended (Power Sector Law). The regulatory authority is the Energy Regulatory Entity (ERE).

Until very recently, the key regulatory basis for the promotion of RES production in Albania was found in *Law no. 7/2017 "On promoting the use of energy from renewable sources"*. This Law approximated partially the *EU Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources* and amending and subsequently repealing *Directives 2001/77/EC and 2003/30/EC*. This Law was abrogated by *Law no. 24/2023 "On promoting the use of energy from renewable sources"*. It approximates partially the *EU Directive 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources*. It cannot be considered fully applicable since its key provisions require further regulation by means of secondary legislation to be enacted by the Government of Albania, MIE, and ERE. For this transitory period, which is expected to last up to 12 months, the Renewable Energy Law calls for the temporary application of the existing secondary legislation that was issued based on the Old Renewable Energy Law. Against this background, the following is based on the currently applicable rules as per the secondary legislation still in force, whilst also referring to the new rules under the Renewable Energy Law to the extent they are fully applicable as such or otherwise provide hints for the future regulation of the renewable energy sector in Albania.

There are also rules in place regarding energy efficiency and energy performance of buildings, which promote the use of renewable and energy-efficient technologies in heating and cooling in order to achieve energy performance targets.

The Renewable Energy Law sets out the following key principles and objectives based on which the Government shall promote the RES production and sale in Albania: **a)** promote the increase of RES

use to ensure sustainable development in Albania and to comply with its commitments under the EnC Treaty; **b)** reduce the import of fossil fuels, greenhouse gas emissions and protect the environment in compliance with the international commitments of Albania in line with the relevant international treaties or agreements; **c)** promote the development of the renewable electricity market and its regional integration; **d)** increase the diversification of the energy resources and the security of energy supply in Albania; and **e)** promote the development of rural and isolated areas by improving their supply with energy.

The Law provides for the legislative framework for promoting the use of RES, the binding national objectives for the contribution of RES energy in gross final energy consumption by 54.4% in 2030, the rules for supporting RES-produced energy, accessing and operating grids by RES producers, issuing, transferring and canceling guarantees of origin for the renewable energy produced, etc.

Also, the Law mentioned Renewable Energy Communities (RECs) for the first-time. In Article 21 regulates RECs in terms of rights, structure, membership, tariffs and control measures and entitles them in compliance with provisions of the REDII.

A renewable energy community has the right to:

a) produce, consume, store, distribute, sell renewable energy, and offer aggregation, including power purchase agreements;

b) have access to all relevant energy markets, directly or through aggregation, in a non-discriminatory manner;

c) be supported as a priority producer in accordance with this law. The Council of Ministers may decide to provide additional support to renewable energy communities, treating them as demonstration projects.

Renewable Energy Law promotes RES production by self-producers up to a capacity of 500 kilowatts. Self-producers are defined more broadly to comprise any final consumer that produces renewable electricity for its own consumption and that can store or sell self-produced renewable electrical energy, provided these activities do not constitute their main commercial or professional activity. Such self-producers are entitled to generate, consume, store, and sell excess production of renewable electricity, including bilateral supply and trading agreements according to the principles of equality and proportionality.

- *Regulatory sandboxes*

The most significant institutions in setting policy and regulation in the power sector in Albania are the Ministry of Infrastructure and Energy (“MIE”) and the Energy Regulatory Authority (“ERE”). In addition to MIE and ERE there are a number of ministries that have a smaller role in the sector, and also a number of government agencies with responsibilities with respect to the power sector that are delegated to them by the ministries. These are: Ministry of Finance (“MF”), Ministry for Health and Social Welfare, Ministry of Tourism and Environment ("MTE"). Minsitry of Economy, Culture and Innovation (MECI) and government agencies and companies involved in energy supply.

Determinants of development

The growth potential of the energy market in Albania, including further cooperation with neighboring countries.

Challenges and future perspectives of energy resources currently used in Albania and the transformation of its energy system infrastructure.

Energy efficiency and cogeneration and their growing importance in buildings and industry, in the context of demand management policies.

The rapid growth of Renewable Energy Sources (mainly PV and wind) and the need for energy storage

Albania's considerable hydrocarbon exploration and production potential within current production and planned investments and significant contribution to the country's finances as a result of crude oil exports.

The importance of **the activity of the Albanian Energy Exchange (ALPEX),** as well as the connection of the Albanian electricity market (mainly based on the production of hydropower plants) with Kosovo (based mainly on the production of thermal power plants), and the increasingly important role of energy resources renewables (especially photovoltaics) in the country's energy system

The renewable energy sector in Albania has witnessed significant growth and development in recent years, positioning the country as a promising player in the transition towards clean and sustainable energy sources. But in terms of investment costs there are no official data or trend over the years.

The wider adoption of renewable energy in Albania, especially at the household level, requires government-backed and well-structured awareness campaigns so that the citizens become more actively involved and participate in the energy transition. It is also important to communicate with public so that they understand the direct benefits of renewable energy technologies, both for the country as a whole and for individual citizens. High upfront investment costs of renewable energy technology, as well as lack of understanding of the payback periods of such investments discourage citizens to participate and to help uptake the renewable energy sector in Albania. Furthermore, the public is not always aware of existing support mechanisms and various incentives that are supposed to help them use renewable energy technologies. Such supporting schemes should always be clearly communicated, and this is also a great opportunity to present country’s commitment to and support for more environmentally friendly energy use.

- *How European politics stimulate the development of RES?*

Renewable energy is at the core of the European Green Deal priorities. The European Green Deal emphasizes the principle that the energy transition should be just and fair for all individuals, communities and regions. It also calls for the development of a “green deal diplomacy”, aimed at persuading countries around the world to pursue the energy transition. This narrative as advanced the interest of the Albanian Government to invest on electricity production and become a net exporter of the electricity until 2030. And no doubt RES and investment on solar and wind capacities

are the main priority. *The 2030 RES Development Strategy of Albania aims to: (i) reduce energy imports and increase domestic RES electricity generation to meet 2030 demand by diversifying the RES sources, not only with hydro, but also with solar photovoltaic and wind power generation, and (ii) increase the use of RES technologies, based on least-cost planning and environmental protection principles through development of mechanisms to encourage FDI in Albania's energy sector.*

The Inter-Ministerial Energy and Climate Committee (IECC) has been established to ensure that developed targets, policies and measures will be feasible and realistic in terms of implementation and expected impact at national level. In this way we would like to make progress towards EU integration.

- *Geopolitics vs. development of RES*

Energy security is becoming a critical concern in Albania because of high energy imports and electricity sector fully dependent on hydrological condition which are strongly affected by the ongoing climate change. Besides imports being the only solution to the uninterrupted power supply, dependency on imports also increases the financial burden for the state-owned power generation company. The position paper on Energy and Climate Planning Albania 2030 [2] stresses out that in 2019, drought triggered electricity imports cost by EUR 209 million and put the power utility KESH and Albanian DSO OSHEE into severe financial difficulty. The only solution to all the mentioned problems is that the energy system needs to be more diversified and more efficient. The improvement of the energy sector is the vital priority of any government and stressed out as the fundamental issue of Economic Reform Programmes (ERP) that all EU candidate countries and potential candidates prepare every year. Some efforts are already taken so the power line interconnecting Albania and Kosovo has become operational and the share of non-technical losses in electricity consumption was maintained at only 6% during the three first quarters of the 2020.

Barriers to the development of RES

Legal support and policies: Need for clear and sustainable policies and legislation to encourage investments in renewable energy sector. A well defined legal and regulatory framework is crucial to create a favorable environment for small and medium-sized enterprises and to promote renewable energy production. Currently, although licenses have been granted for investments in all three forms of renewable energy, lack of concrete investments is observed due to bureaucratic hurdles (e.g., construction permits) and inadequate monitoring systems. It is necessary to adapt laws in accordance with the acquis. Another aspect related to legal frameworks is the implementation and management of contracts. Contracts should be fair, adhere to international standards, and ensure the rights and obligations of all involved parties

Network infrastructure: The development of network infrastructure creates another challenge for the renewable energy sector in Albania. It is important to establish necessary networks for the efficient and sustainable transportation and distribution of renewable energy. Approximately 10-15% of production does not enter the grid due to interruptions in the distribution network and limitations in the transmission network during periods of high production when it rains.

Lack of coordination among relevant actors: There are various actors involved in this sector, operating without coordination, such as the Polytechnic University conducting research and development with support from the Ministry of Education, the Academy of Sciences conducting independent research and studies, a licensing agency, the Ministry of Infrastructure and Energy making decisions, and transmission and distribution operators. If there were coordination and joint decision-making, projects would be more comprehensive, easily financed by second-tier banks, and attract more investors. A comprehensive map of Albania highlighting areas with renewable energy potential is missing.

Lack of specialized skills: There is a shortage of specialized engineers in renewable energy for development, design, construction, and maintenance of renewable energy infrastructure. There is a need for upskilling and reskilling of existing engineers and specialists. Additionally, improving collaboration between the private sector and the education sector to identify and prepare new talents and increasing budgets beyond solely relying on state funding is considered crucial.

Need for updating processes to incorporate the latest technology: Need for updating standards in the renewable energy sector. It is important for competent authorities and the industry to stay abreast of the latest developments in renewable energy. This includes tracking new technologies, innovations, and advanced methods of renewable energy production, distribution, and utilization. Through the latest technological knowledge, new opportunities can be identified, and the performance of existing systems can be optimized.

Integration with the existing energy system: According to government there is potential to develop a sustainable hybrid system. Albanian lakes have the capacity to reserve water. Rather than just increasing capacity, investing in storage systems is also crucial.

Land usage and grid integration For large-scale photovoltaic (PV) projects to be implemented suc cessfully, it is essential that land use and grid integration issues be resolved. For optimizing energy output and reducing environmental consequences, effective land use and smooth PV system integration into the current grid are important. In addition, system reliability, predictability, Energy Management, and grid congestion must be considered. Nowadays grid regulations and operators require that the integrated large-scale PV system operate like conventional power plants as much as possible. As a result, the integrated large-scale PV system should be able to regulate the active power to support the grid's frequency, control the reactive power to maintain the grid's voltage and have the capacity to ride out faults during a variety of disturbances.

- *Environmental aspects*

Renewable energy especially other than hydro is a solution for decreasing the strategic dependence on energy imports and mitigating the impact of climate change resulting in unreliable hydropower production. However, there are conflicts of interest with environmental protection goals, which must be handled properly. And it gets a bit stronger, when talking about EIA and SEA. According to the report of Energy Community Treaty

Albania did not improve its legislation on Environmental Impact Assessment (EIA). The effective implementation of the Strategic Environmental Assessment (SEA) Directive continues to pose

challenges. No new mechanisms were introduced to enhance the consultation process, including its transboundary dimension. Albania designated the Vjosa River and its free-flowing trib utaries, Bënça, Shushica, and Drino, as a national park. At the same time, the still existing concession agreements for the hydropower projects Kalivaç and Poçem pose challenges for the park's future. The management and protection of the Ramsar wetland, which is of international importance and the Vjosa-Narta Protected Area, is still missing, with ongoing infrastructure projects within the site.

Investment funding - support instruments

The RES legal framework detailed by means of several governmental acts and regulatory acts (ERE Board of Commis-sioners' decisions) provide two key categories of schemes under which RES projects may be developed in Albania: **(a)** the auctions or Government-supported schemes, whereby the Government offers certain incentives to the private devel-oper selected through a competitive process, and **(b)** the commercial off-take or merchant scheme, whereby the right to develop the RES project is not subjected to a competitive pro-cedure and no incentives are granted as in the first scheme.

Foreign and local companies are treated equally as regards acquisitions of interests in companies operating in the renewable energy sector.

PV system adoption in Albania is significantly boosted by financial incentives. Feed-in tariffs, net metering, contracts for difference, investment incentives, and customized financing alternatives are a few of the incentives the government offers.

Feed-in tariffs provide fixed, long-term electricity purchase prices for renewable energy producers. This mechanism guarantees a stable and attractive return on investment for renewable energy projects, encouraging the development of solar PV installations. The government facilitates the signing of power purchase agreements between renewable energy producers and electricity distribution companies. PPAs ensure a predetermined price for the electricity generated from renewable sources, providing revenue certainty for project developers. This mechanism supports the bankability of solar PV projects and encourages private investment.

Premium tariff/CfD Larger renewable energy power plants whose installation capacities are above those set for FiT eligibility are eligible for a premium tariff or CfD. The tariff is determined through competitive bidding/auction. The auction terms and conditions are approved by the Council of Ministers, who may choose to limit certain technologies in the tender due to criteria such as network connection costs or resource diversification. According to the 2017 renewable energy law, the CfD is foreseen to have a duration of 15 years. Producers will be able to sell the electricity in the market and receive the variable difference between the auction price and the electricity market price (currently based on the Hungarian power exchange price) as a support measure.

Customs and excise tax exemptions Machinery and equipment used for the construction of energy power plants (non-renewable and renewable energy technologies) are exempted from custom duties. The fuels used by electricity producers are also eligible for excise tax exemption. However, a tax exemption does not apply for solar thermal systems or for renewable energy measuring

equipment such as wind masts. Furthermore, a 20% value-added tax (VAT) is applied on all equipment, machinery and fuels, except in cases of imported solar PV machinery and equipment valued above ALL 50 million (Albanian lek; USD 487 000) and for project capacities above 500 kW (Deloitte, 2018).

Net metering regulations enable electricity consumers with solar PV systems to offset their energy consumption with the electricity they generate. Excess electricity fed back into the grid is credited against future electricity consumption. Net metering encourages the adoption of rooftop solar PV systems by residential, commercial, and industrial consumers, as it offers financial savings and promotes self-consumption of renewable energy.

The Albanian Energy Regulatory Entity (ERE) has established a green certificate system. Renewable energy producers, including solar PV projects, are eligible to receive green certificates for each megawatt-hour of electricity generated from renewable sources. These certificates can be sold in the market to obligated electricity suppliers, providing an additional revenue stream for renewable energy projects. The government provides tax incentives to support renewable energy investments, including solar PV. These incentives may include tax exemptions, reduced tax rates, or tax credits for equipment purchases, installation, and operation of renewable energy systems.

By lowering the price of PV installations, ensuring an ongoing revenue stream, and luring private capital into renewable energy, these policies will aid Albania's transition to greener energy sources.

Support for solar power development has been provided by the 2018, 2020, 2021 and 2024 auctions. So far, the solar auctions have produced two PV projects with a total of 240 MW. Albania reports 7 GW of wind and solar potential and is looking into developing offshore wind in the Adriatic Sea.

RES development scenarios

- *Geographical potential vs. environmental aspects*

The availability of renewable energy resources in Albania for some renewable energy technologies is less studied than for others. Given the country's hydropower history, hydropower potential has been the most analysed resource; however, only the main rivers have been studied to a greater degree. With the increasing climatic changes that have caused erratic hydropower generation in recent years, many of the studies that have been carried out are now outdated, and future projections of hydropower generation potential remain understudied. For solar and wind resources in Albania, economic potential analysis and zoning are lacking. This hinders policy development in setting achievable targets, the appropriate sizing of solar and wind auctions, and least-cost power system planning.

Albania's energy sector is guided by its National Energy Sector Strategy 2030, along with the National Renewable Energy Action Plan 2018-2020 and the Gas Master Plan. As much as these documents set out a framework with overall goals along with quantitative scenarios and targets for the energy

mix, a holistic least-cost plan must be developed to aggregate sub-sectoral plans and assess the accompanying infrastructure needed to reach overall goals.

As Albania moves towards a more diversified renewable energy mix in its power system, the distribution network will increasingly be the backbone and determining factor of the scale at which renewables are injected into the power system. The current state of the distribution network is not conducive for increased variable renewable energy generation injection. The grid suffers from overloading in high-demand centers, such as in Tirana, posing serious obstacles to the injection of distributed generation such as, for example, solar PV net-metering systems. As the power sector works towards a more diversified generation mix, further injection of renewables will place an even greater strain on the grid unless immediate efforts are mobilized to fortify the distribution grid.

According to preliminary estimates, about EUR 40-80 million (USD 48-96 million) in investments is required to refurbish the distribution network to better handle variable renewable energy injection in the immediate term.

Confirmation of natural gas reserves with almost pure natural hydrogen in large quantities (emitting at least 200 tones of H2 a year) and near the surface in Albania (chromium-ore mine), positions the country on the international EU stage. Further exploration may uncover additional reservoirs, substantially augmenting existing supplies. Gas pipeline infrastructure could be used for hydrogen production.

Social acceptance

The deployment of renewable energy contributes to numerous socio-economic benefits for communities and countries, including employment, income generation, decreased air pollution, welfare improvements and local industrial development leading to increased GDP. According to IRENA's analysis, a typical 50 MW solar PV project requires some 230 000 person days along the value chain, as shown in Figure 12 (IRENA, 2017b). Although some parts of the value chain are sourced from outside of the country or require a renewables specific trained and certified workforce, much of the workload – especially in transport and construction – can be filled locally by the workforce of existing industries, which can immediately contribute to local employment and income generation. With skilled local labour, specifically in operation and maintenance as well as installation, over 70% of the workforce can be sourced locally, further enhancing local economies. Similarly, a 50 MW onshore wind farm requires 43% of its workforce for operation and maintenance, which can largely be locally sourced. While manufacturing of solar PV and wind energy technology is concentrated in a limited number of countries, solar thermal technology manufacturing has gained momentum in Albania, with several companies manufacturing system components locally. Furthermore, such systems can have direct economic benefits on individual users as they offset their electricity consumption and reduce monthly electricity bills.

- *Is the NIBY (ang. not in back yard) syndrome noticeable?*

People are opened to development of RES and they support initiatives or projects in the sector. The only problem seems to be the procedure followed especially when Government is giving permission

for construction of PV and wind turbine plants in the protected areas without undertaking an EIA / SEA assessment.

As mentioned above citizens are opened to RES and EE. Government of Albania needs of course to provide more information on the economic and environment benefits of such development. Above all they should provide financial mechanisms, sustainable business models and conduct a transparent SEA process for such developments.

Energy community is a new concept for the first-time mentioned in the Albanian Law for "Promoting the Use of Energy from Renewable Sources". Article 21 of the respective Law No. 24/2023 regulates RECs in terms of rights, structure, membership, tariffs and control measures and entitles them in compliance with provisions of the REDII. The updated Law (No. 24/2023) requires the creation of an enabling framework to promote the development of RECs. With other words the energy communities are not yet established. Milieukontakt Albania is working to raise awareness and provide information to interested stakeholders in starting a CEC or REC. In June 2023, the NGO Milieukontakt initiated a community energy pilot project in Piskova village in Përmet municipality as part of the EUCENA project. The goal was to demonstrate that RECs could thrive in the Albanian context, contributing to the country's efforts to diversify and decentralize its energy sources and fight energy poverty.

Milieukontakt, facilitated mentoring sessions and workshops to develop a concrete plan for a small grid-connected solar power plant. Since Law No. 24/2023 was not enacted yet, Milieukontakt developed a memorandum of understanding outlining the roles and responsibilities of key stakeholders, the municipality of Përmet, and the farmers benefiting from the project. A committee representing each group was set up to manage the project. More information about experiences with RECs have been published by RESCOOP.

Recommendations

The list of activities should be undertaken to accelerate the development of RES?

1. Consistent policy and regulatory framework

- Promoting support measures for integration of alternative energy sources and energy efficiency.
- Boosting investments in renewable energy, including through liberalization of the energy market.
- Streamlining procedures for issuing permits and licenses for the companies operating in the sector and improving the legal and regulatory framework, including through developing under-regulations and guidelines to facilitate the implementation of energy-related laws.
- Improve the capacities of the National Agency for Natural Resources (AKBN) and other institutions on collecting and processing the statistical data, also for developing a master plan for zoning areas with renewable energy potential.

2. Creation of a smart energy infrastructure:

- Supporting solar and wind energy source projects to diversify the renewable energy portfolio, harnessing Albania's ample sunlight and wind resources for clean power generation.
- Investing in the development of smart grids and storage systems, to support smart grids and energy storage infrastructure that can efficiently handle the various nature of renewable energy resources and enable cross-regional energy sharing.
- Enhancing energy infrastructure, including the construction of technology centers (TECs) and charging stations to support electric transportation.

3. Enhancement of skills capacity and research:

- Strengthening the partnership between academia, businesses, and the government to bridge the skills gap.
- Enhancing education and training programs to improve knowledge and skills in renewable energy, including through updating and revising VET curricula to align with industry needs.
- Providing financial support for lifelong learning initiatives in the energy sector.
- Supporting research and development efforts for energy-efficient technologies.
- Introducing licenses for the specialists operating in the energy sector to guarantee the specific know how.

4. Sustainable energy use practices:

- Promoting awareness about environmental value of using renewable energy sources in schools.
- Encouraging energy efficiency and energy-saving practices, through communication campaigns aimed at citizens and businesses.
- Implementing energy efficiency measures and energy-saving practices in public administration.
- Encouraging the utilization of waste-to-energy technologies, innovative technologies and biomass resources for clean energy production, reducing landfill waste.
- Implementing responsible forest management practices, including reforestation and sustainable timber harvesting, to balance economic gains with environmental conservation.

By diversifying their energy mix and integrating more of their variable renewable resources, Albania can create a more stable and resilient energy system, while stimulating positive social and economic outcomes and meeting its climate obligations.

Proactive planning, based on the country's resource potential, can play a crucial role in the development of a robust energy sector. Well-assessed resource potential and timely planning for variable renewable power generation and grid infrastructure can minimise technical disturbances to the grid and increase the quality of energy supply while ensuring economic viability for the power producer, the system operators and the final consumers.

Albania is still in early stage of discovering hydrogen reserves and further research and studies are needed before developing concrete strategies. Extraction methods should consider ecological consequences. At this stage it is not possible to give an answer if and when the hydrogen will be a pillar in energy landscape of Albania.