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SOLAR ENERGY IN GEORGIA: PROBLEMS, CHALLENGES AND NECESSARY STEPS TO UNDERTAKE



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Abstract

Georgia has great potential for the development of solar energy. However, only a handful of solar projects are being implemented in the country. Moreover, Georgia does not have a strategic plan for the development of the energy sector nor does it have a specific policy or action plan in place for the development of solar energy. The article addresses the problems and challenges in the field of energy that hinder the development of Georgia's solar power. The paper also discusses the measures that should be undertaken to help develop solar energy in the country: developing an action plan, creating energy reserves in the network and/or building solar power plants equipped with batteries, conducting systematic surveys and information campaigns on solar power plants.

Introduction

The energy sector receives special attention within the context of climate change. According to the third National Communication of Georgia to the UNFCCC¹, energy in Georgia ranks first among the sectors that affect the climate. Increasing the use of solar, wind, and water energy can play a significant role in reducing greenhouse gas emissions. These energy sources are also considered to be the cleanest sources of energy. However, compared to other renewable energy sources, priority is given to solar power, which has the least impact on the environment.²

According to the International Renewable Energy Agency (IRENA), solar photovoltaic systems will cover the electricity needs of a quarter of the world's population by 2050. The sun will become the second-largest energy generation source after wind.³ These sources of energy have great potential in developing countries, where the energy sector continues to develop and have greater access to sunlight. Mastering solar energy and its rational use will further strengthen these countries.⁴ In settlements where electricity access is limited to part of the population, solar systems help improve the quality of their lives.⁵

The acquisition of New Renewables is one of the top priorities for the European Union, which aims to generate 20% of the energy consumed within its borders from renewable energy sources by 2020.⁶ Based on the EU Association Agreement, in 2014 Georgia committed to harmonizing its legislation with the EU third energy package. However, there are several salient questions surrounding the status of new renewable energy in Georgia – specifically in terms of solar energy. For example: what problems and challenges does the sector face; what is the potential of solar systems in the country and how promising is this potential; and what measures must be taken to develop solar energy in the country?

¹ United Nations Development Program, Third National Communication of Georgia to the UN Framework Convention on Climate Change, 2015,

https://www.ge.undp.org/content/georgia/ka/home/library/environment_energy/third-national-communication-of-georgia-to-the-un-framework-conv0.html

² Sampaio, P. G. V., & González, M. O. A., 2017, Photovoltaic solar energy: Conceptual framework. *Renewable and Sustainable Energy Reviews*, 74, 590-601.

³ International Renewable Energy Agency, 2019, Future of solar photovoltaic - Deployment, investment, technology, grid integration, and socio-economic aspects, <https://www.irena.org/publications/2019/Nov/Future-of-Solar-Photovoltaic>.

⁴ Devabhaktuni, V., Alam, M., Depuru, S. S. S. R., Green II, R. C., Nims, D., & Near, C., 2013, Solar energy: Trends and enabling technologies. *Renewable and Sustainable Energy Reviews*, 19, 555-564.

⁵ [1] Laufer, D., & Schäfer, M, 2011, The implementation of Solar Home Systems as a poverty reduction strategy— A case study in Sri Lanka. *Energy for Sustainable Development*, 15(3), 330-336.

[2] Modi, V., McDade, S., Lallement, D., & Saghir, J., 2005, Energy Services for the Millennium Development Goals. *Energy Services for the Millennium Development Goals*.

⁶ European Commission, Renewable energy directive, <https://ec.europa.eu/energy/en/topics/renewable-energy/renewable-energy-directive>

The arguments presented in the article are based on the findings of a sociological study of the capabilities and needs of solar power plants in Georgia. The study also included a desk review (analysis of publications on renewable energy sources) and 30 in-depth interviews with experts, representatives of energy sector agencies, solar systems companies, and owners of the network-connected and network-independent solar micro power plants.

Problems and challenges in the energy sector of renewable sources

The development of solar energy in Georgia has great potential.⁷ Georgia has an average European level of solar radiation, which is less than in Spain and Italy, but more than in Germany and the Netherlands. According to experts and representatives of solar companies, there is no significant difference between the various regions of Georgia in this regard. However, in Kakheti, this figure is slightly higher than in other regions, though it is almost three times less in winter than in summer. However, the use of solar energy in Georgia is almost non-existent, in particular, the use of solar energy to generate electricity and heat. This is due to various problems within the energy sector and at the public policy level.

Lack of diversification within the energy sector and its barriers

According to a document that lays out energy policy in Georgia, “Georgia’s energy policy aims to improve the country’s energy security, which ensures the observance of national interests by providing sufficient, high-quality, continuous and affordable energy.”⁸ The policy document identifies the sector’s main focuses: diversification of energy supply sources; gradual rapprochement of Georgian legislation with the EU legislation; the development of Georgia’s renewable energy resources; and others. However, despite the priorities identified by the Energy Policy in 2015, which focuses on key issues for the development of the sector, the country does not have an action plan in place for the strategic development of the energy sector and renewable energy.

The main guidelines for the government in this field are outlined in “Renewable Energy 2008”, a state program which identifies the rules for ensuring the construction of new renewable energy sources in Georgia.⁹ The program establishes a special rule for memoranda to be signed with the Government of Georgia regarding the construction of hydroelectric power plants.¹⁰ Accordingly, this document takes advantage of the construction of hydropower plants. It creates unequal conditions for the use of wind and solar energy compared to hydro. Due to these political barriers,

⁷ Ministry of Energy of Georgia, 2013, http://energy.gov.ge/energy.php?id_pages=60&lang=geo

⁸ Legislative Herald of Georgia, 2015, on the main directions of the energy policy in Georgia, <https://matsne.gov.ge/ka/document/view/2894951?publication=0>

⁹ Legislative Herald of Georgia, 2013, State Program “Renewable Energy 2008” – Approval of the Rules for Ensuring the Construction of New Renewable Energy Sources in Georgia <https://matsne.gov.ge/document/view/6700?publication=0>

¹⁰ Green Alternative, 2012, Memoranda of Understanding and Agreements for the Implementation of Energy Projects, pg. 22,

http://www.greenalt.org/webmill/data/file/publications/memorandumebi_da_xelshekrulebebi_analizi.pdf?fbclid=IwAR0dOQkIt0phpMCJj_7Vd9WMhillzgGrShggdJYmg0I9EZug-mecSbBFqIQ

solar power has failed to take its place in the country's energy sector. The country still does not have a massive solar power plant.

Energy shortages remain a problem in the Georgian energy sector. One of the reasons for this is the lack of diversification in the sector. That is why the country is forced to buy about two billion kilowatts of energy, especially during the winter. New sources of energy generation have not emerged in Georgia, and the sector's primary efforts continue to focus on developing hydro resources. The rivers of Georgia are characterized by seasonality. In winter, the production of energy by hydropower plants is significantly reduced. Consequently, the acquisition of hydro resources alone will not solve the country's energy deficit. It is necessary to install other sources of energy generation.

Lack of sufficient research in the field

The EU Energy Union's assessment of Georgia's energy sector states that "since there is no unified legislative act on renewable energy in the country, it does not have a systematic approach to regulating it (energy sector). Most of the research on the potential of renewable energy sources is outdated, and additional research is needed to identify the exact data."¹¹

Studies in terms of solar and wind energies are particularly scarce. Limits on the allowable capacity of wind and solar power plants in the country have been determined based on a single study, the report of which is not publicly available. Only its findings are briefly provided in the ten-year plan to develop Georgia's transmission network for 2019-2029.¹² The study, conducted with the support of KfW, was conducted to identify the strength of unstable power sources in Georgia that can be connected to the central grid so that the system does not fluctuate. The study found that Georgia's electricity system will be able to withstand the connection of only 350 megawatts of wind and 130 megawatts of solar energy by 2020-2021. A representative of the ministry economy and sustainable development said the quotas were calculated based on how the current system can withstand imbalance due to the engagement of solar and wind power plants.

The challenge of maintaining network stability

Georgia's energy system is characterized by specificity caused by the fact that it was part of the Soviet Union's energy system, and the network never faced instability. After the collapse of the Soviet Union, the Georgian energy system was separated from the rest of the network. Experts say it has been quite challenging to maintain stability ever since.

Energy experts say that the connection of unstable generation sources, especially solar power stations, is a major challenge for the Georgian energy system. Moreover, experts believe that the

¹¹ Energy Community, National Renewable Energy Action Plan, and progress towards 2020, Quality of the support schemes, <https://www.energy-community.org/implementation/Georgia/RE.html>

¹² Georgian State Electrosystem, 2019, ten-year plan to develop the Georgian transmission network for 2019-2029 http://www.gse.com.ge/sw/static/file/TYNDP_GE-2019-2029_GEO.pdf

inclusion of solar power plants may cause network instability and lead to more significant problems. One of the experts said, “when there is a substantial unstable element in the power system, the system will fluctuate, resonate, and shake the whole system.” The output must be equal to the loss and consumption, “if any of these overtakes another, then the system breaks down and an imbalance occurs,” said the expert.

Limitation of the net metering system

The introduction of a net metering system¹³ was the only significant step in encouraging the use of solar energy by the state. Net metering is managed by the Georgian National Energy and Water Supply Regulatory Commission (GNERC). It obliges electricity distribution companies (e.g. Telasi and Energo Pro Georgia) to connect to their generation system those power plants that operate on renewable energy sources, and those which are owned by micro-power or retail customers. According to experts however, the implementation of this regulation was followed by stiff resistance from the companies themselves, because “in fact, they included many small competitors in their network. On the one hand, taking care of so many small energy providers is a headache for them. On the other hand, they are afraid it will become a precedent, and many other small providers will emerge.” Under the terms of the agreement, both companies will allow unstable generation sources to use up to 2% of their network’s total capacity. When a small power plant connected to the network reaches the limit, Telasi and Energo Pro Georgia have the right to disconnect them.

Today, Telasi and Energo Pro Georgia own transmission lines, power generation facilities, and distribution rights. This situation also determines the shortcomings of the net metering system, which is to connect all generation facilities owned by these companies to the network without limits. For energy companies, it is more profitable to sell their own energy. It would be better for the network to be owned by the state, which provides free and unlimited access to the network from all sources of generation. Competition must be applied to energy producers, not to a distributor.

Compliance with the requirements of the EU Energy Community directives

The country continues to work on meeting the Energy community membership directives' requirements, which are being implemented with delays. However, experts believe that the commitments will play an essential role in increasing the use of solar and wind energy. Laws have been approved for compliance with the directive: on energy efficiency¹⁴ and energy efficiency of

¹³ In 2016, Georgia launched a net accounting system that allows owners of solar (as well as wind and water) micro power plants to turn on their stations in a unified network. It can be used by individuals who have up to 100 kilowatts of renewable energy for personal use. The power of the station involved in the system should not exceed the capacity of its consumption. Georgian National Energy and Water Supply Regulatory Commission, 2016, Net Accounting in Georgia, <http://gnerc.org/ge/media/presrelizebi-akhali-ambebi/08112016-relizi/19646>

¹⁴ Legislative Herald of Georgia, 2020, Law on Energy Efficiency, <https://matsne.gov.ge/document/view/4873938?publication=0>

buildings,¹⁵ on energy labeling¹⁶ and on the encouragement of energy production and use from renewable sources.¹⁷ Work is underway on a support scheme and a model of the energy market. Georgia intended to pass a new law on renewable energy sources and approve the appropriate action plan by December 31, 2018. However, it has not yet been approved. Sustainable energy and a climate action plan should be developed and approved by the end of 2020.

As part of the directive, the Ministry of Economy and Sustainable Development of Georgia plans to connect up to 130 megawatts of solar power plants to the network by 2020-2021. The study found that the demand for solar power plants is high, at least among solar companies operating in the country. According to the Ministry's representative, for the given moment, *“the Ministry has received a request to let the building of several solar power plants of up to 800 megawatts, but we will not be able to give consent for construction of those whose power generation exceeds more than 130 megawatts. We asked those in charge of the power system, and it seems the network will not withstand the connection of plants generating more energy. All requests concerning solar stations are under research now.”* However, the initiative to build solar power plants with a capacity of up to 130 megawatts still cannot be found in any national action plans.

A brief overview of the solar energy sector in Georgia

Solar systems companies and micropower stations

Only a few active companies on the Georgian market sell solar panels and provide services related to solar power plants. Mostly these are companies engaged in the retail of solar collectors/heaters, but their numbers are also small. Solar panels are imported and installed by about ten companies. Only four or five small companies among them are actively engaged in this activity. According to company representatives, there is a trend to reduce prices on solar systems, which makes them more affordable for the population.

According to company representatives, the number of solar panel users has significantly increased since 2018, and in 2019 the demand is five times more than in 2018. “Tomorrow or the day after tomorrow, everyone will install these devices. This is inevitable,” said a representative of a solar systems company. According to the data requested from GNERC, as of May 2020, about 180 microgeneration stations are connected to the net accounting system, with the total installed capacity exceeding 2,500 kilowatts. Respondents said the introduction of a net metering system was a critical step, prompting many customers to set up their solar power plants.

There are also autonomous solar power stations operating independently of the network. They are mainly set in highland and border villages where there is no central network developed, as

¹⁵ Legislative Herald of Georgia, 2020, Law on Energy Efficiency of Buildings, <https://matsne.gov.ge/document/view/4873932?publication=0>

¹⁶ Legislative Herald of Georgia, 2019, on Energy Labeling, <https://matsne.gov.ge/ka/document/view/4745123?publication=0>

¹⁷ Legislative Herald of Georgia, 2019, on Encouragement of Using and Energy Production from Renewable Sources, <https://matsne.gov.ge/document/view/4737753?publication=0>

well as in monasteries, protected areas, and others. These stations are especially popular in Tusheti, as this mountainous region lacks the benefits of a centralized electricity supply. Families have to take care of themselves by finding ways to get electricity from available sources. A project is underway to electrify highland villages. The project seeks to install solar-powered, network-independent stations for 207 families in 90 villages of Georgia. However, experts say that the project does not provide enough information on the maintenance of solar systems, which could significantly damage the project.

Solar power systems play an essential role in strengthening rural communities. According to the respondents, they do not have an alternative in terms of generating electricity and water heating. In fact, the existence of solar systems encourages and contributes to the development of tourism in Tusheti. Respondents recall that before installing solar power systems, they had to obtain electricity via a diesel generator, which was expensive and noisy, so they could not use it at night, and it polluted the environment.

Low awareness of solar systems

The low awareness of solar systems hampers the development of solar energy among the general population, experts and decision-makers. Representatives of solar systems companies also state that a considerable part of the population does not have information about solar systems, and companies have to spend many resources just to provide this information. The state is not providing the necessary information about solar systems, and the topic is not being adequately covered by the media. Companies are also not actively promoting solar systems. Additionally, the population's awareness about the existence of the net metering system and its opportunities is low. Many respondents state that they accidentally heard about this regulation due to its thin coverage.

It is also important to note that donors are not always informed about the local context and the use of solar systems. For example, one of the companies in Omalo in Tusheti will install refrigerators to store meat. Under this project, the purchase was incorrectly planned, and a high energy consumption refrigerator was purchased, which would not meet the energy parameters of the small solar system.

Measures needed to develop solar energy

Necessary political-institutional changes

It is necessary to develop a national action plan on renewable energy sources to support renewable energy development in the country. On the one hand, the absence of an action plan hinders the start of significant shifts in the sector, and on the other hand, it encourages the energy sector to be run by old, opaque rules - individual memoranda and guaranteed purchase agreements.

Practicing individual memoranda and guaranteed procurement conditions hinders the development of the energy sector and violates the functions and responsibilities of the government and the regulator. According to the European Energy Community, “practicing a guaranteed purchase agreement limits the ability of the energy market to develop and distort it.”¹⁸ In this case, the prices are determined in advance and not based on demand-supply. It turns out that in the current situation, the GNERC is not involved in this process at all, and the Georgian government does not consult with it during the agreement process. This practice also dissatisfies investors because it puts them in an unequal position. Instead of having unified energy guidelines, the terms of the contract are defined in the negotiation process, which increases the risk of corrupt deals. The state must take appropriate measures to separate the government's functions and the GNERC.

The need for a tariff policy

The price of energy generated by solar power plants has not yet been calculated. Some experts have discussed the importance of state tenders for the construction of solar power plants. They believe that the introduction of this practice will play an essential role in reducing power plant tariffs in the country. The tender should be announced on the principle that the state can issue a construction permit to the solar power plant. The winner of the tender will be the one who sells electricity at a cheaper tariff, taking into account the specified conditions (for example, guarantees the stability of the power supply).

The Construction of battery-powered solar power plants and/or the integration of energy-saving batteries into the network

Solar power should not depend on the construction of hydroelectric power plants. It is necessary to find other measures to increase the stability of the network. According to some experts, the construction of battery-powered solar power plants and/or the integration of independent energy-saving batteries into the system would be a reasonable decision. The strong side of a battery-powered solar station is that it provides power to the grid when the daytime solar radiation is very low or even equal to 0.

As for energy-saving batteries, they need to be integrated into the system, because in the case that something goes wrong in the network, the backup engine starts at that moment and protects the network from instability. According to the Georgian State Electro Systems (GSE) representative, it is a major contributing factor to integrating solar and wind power into the network. Its integration can have a very significant positive impact on the dynamic sustainability of the system.

¹⁸ Source 11.

State support for the production of solar electricity/technology

The state has the exclusive right to develop a strategy for the development of the energy sector and to plan ways to promote the large-scale development of solar and wind energy. First of all, it requires the political will and strategic support for solar power plants by the state. Representatives of state agencies and experts emphasize the forms of support available in other countries: green tariff, Feed-in Tariff, Feed-in Premium, and others. As mentioned above, the support schemes are currently being studied and discussed to identify which of them will be more useful for Georgia.

Meanwhile, other experts and representatives of some retail solar systems companies believe that the state will not need to subsidize the solar electricity tariff, in case a fair tariff is set for all energy agencies in the market. They note that European countries need to introduce support schemes to reduce tariffs because these technologies were expensive when they started using solar systems, while their prices have dropped significantly in recent years. Experts and representatives of the companies believe that the state's role should be expressed in support of solar systems companies and technology imports, and even in encouragement for on-site production.

Cooperation among stakeholders and information campaigns for the development of solar energy

There are various actors involved in the acquisition of solar energy and the extensive use of solar systems, and all of them have their functions. The core node of this network is the Ministry of Economy and Sustainable Development. Its primary mission is to regulate the sector. However, instead of developing solar energy and turning it into a strategic priority, the ministry is applying its strength in its delay. It is not taking sufficient measures for its development. Other actors in the sector must be more engaged in the development of solar energy. The involvement of new parties in these processes is needed. For example, the banking sector needs to start linking solar technologies to its lending system, through which communities and individuals will be able to make installments for this technology. It is noteworthy that none of the agencies in the country work to support solar power. However, the representatives of the state agencies have noted the importance of solar energy. It is necessary to conduct research in the field of solar energy in the country and increase competencies to accumulate sufficient knowledge and experience to develop this field.

The most critical aspect of the solar energy network, of course, is the population that needs to receive and install these systems. In addition to disseminating information to the general public, cooperation should be of paramount importance to all parties for various reasons. For example, if a massive solar power plant is to be built, the project could lead to more conflicts than benefits without active communication with the communities, and it can ultimately harm all parties involved.

It is necessary to kick start regular campaigns to raise awareness about solar technology and the net accounting system. This includes but is not limited to organizing long-term trainings or launching small awareness-raising events. It is essential to engage local self-government and the

media in these processes. The state can also set an example for the community and gradually ensure the provision of solar and thermal energy to public buildings (ministries, town halls, schools and kindergartens), the obligation of which will be imposed after the enactment of the law.

Conclusion

The potential and need to use solar energy in Georgia is high. But the country's energy sector faces many obstacles, including imports of large amounts of electricity, a lack of diversification within the sector, as well as a slowly developing energy market. These factors hinder the achievement of the goal set by the country, which is ensuring energy security. The development of solar energy can play an essential role in strengthening the country's energy security. However, political barriers, weak legislation, lack of sufficient competence and low awareness about solar energy, and solar systems, significantly reduce the development of the solar energy sector.

The use of solar energy in Georgia can bring about significant benefits at the macro level and at the micro-level for individual consumers. The state needs to take environmental measures to respond to climate change and its international obligations in this regard. The use of solar energy will play an important role and save resources. In addition, the use of solar systems has social and economic benefits. They help empower the rural highland communities by improving the living conditions, save resources, generate income sources, and help develop sustainable tourism. It is necessary to conduct information campaigns and support the active cooperation of all parties in the sector to develop solar energy in the country.