



RENEWABLE ENERGY IN THE SOUTH CAUCASUS

Special Editors: Mary Keogh and Agha Bayramov (both University of Groningen)

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Renewable Energy in the South Caucasus

Introduction by the Special Editors Mary Keogh and Agha Bayramov (both University of Groningen)

The ratification of the Paris Agreement (2016) commits the states of the South Caucasus to reducing carbon emissions as part of the global effort to mitigate the worst effects of climate change. Replacing high-emitting hydrocarbons with renewable energy will be essential to realising that goal. For Armenia, Azerbaijan, and Georgia, fulfilling the Paris agenda requires a recalibration of energy policy and dramatic changes in the energy mix.

This special issue provides an overview of the latest developments and policies on renewable energy in the South Caucasus. While all three states have significant potential for renewable energy development, multiple political, financial, technical, and social barriers obstruct the rapid and effective implementation of renewable energy policy in the region. In addition, the transition towards renewable energy is progressing at different speeds in each of the three states. They occupy different positions in the energy supply chain and, consequently, have different energy agendas and policies: Azerbaijan, as a hydrocarbon producer and exporter, faces very different constraints and opportunities in implementing a renewable energy strategy in comparison to Georgia, a consumer and transit state, and Armenia, a consumer state. This special issue examines these different opportunities and developments in the context of the evolving regional energy situation.

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Azerbaijan's Renewable Energy Policy: Opportunities, Drivers and Challenges

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Abstract

This article looks at Azerbaijan's renewable energy developments. Existing research and media coverage of international energy politics in the South Caucasus is overwhelmingly dominated by a focus on oil and gas pipelines, especially in Azerbaijan, due to its central place in traditional hydrocarbon fuels markets. This article aims to expand the scope of the literature on energy to bring more attention to Azerbaijan's renewable energy sector, investigating the potential of and challenges to renewable energy development in the country. The key questions are: why would a small oil and natural gas-rich country seek to develop renewable energy? Who is promoting renewable energy in Azerbaijan and with what effects? And finally, how do low oil prices and Covid-19 affect the progress of renewable energy in Azerbaijan?

Introduction

Existing research and media coverage of international energy politics in Azerbaijan is overwhelmingly dominated by a focus on oil and gas extraction due to its crucial place in traditional hydrocarbon markets. While the strategic aspects of oil and natural gas are well-researched, there still exists a great deal of uncertainty about how renewable energy will reshape Azerbaijan's energy security. This article

aims to expand the scope of the literature on energy geopolitics in the South Caucasus to bring more attention to Azerbaijan's renewable energy sector, which is still nascent.

Around the world, the use of renewable energy is growing rapidly because of climate change concerns, diversification strategies and strong economic investment. Although oil continues to hold the largest share of the energy mix (33.1%), the share of both natural gas and renewables

rose to record highs of 24.2% and 5.0% in 2019, respectively (BP, 2020). Renewables has now overtaken nuclear, which makes up only 4.3% of the energy mix. Recently, countries with significant oil and natural gas resources such as Nigeria and Qatar also have focused on developing their renewable energy potentials. The tendency is not only caused by concern for the environment, but also by economic demands. This trend is observed in almost all oil-rich countries, including Azerbaijan. For example, the Azerbaijani government has initiated various structural changes in order to facilitate investment in the renewable energy market. These initiatives include several draft pieces of energy efficiency legislation such as “Use of renewable energy sources in power generation” and “Efficient use of energy resources and energy efficiency” (IEA, 2020).

Traditional oil producers such as Saudi Arabia, Iran and Russia, which have historically enjoyed geopolitical influence because they supply fossil fuels, are likely to see a decline in their global reach and impact unless they can reinvent their economies for a new energy era. Azerbaijan may face challenges in adapting to a world increasingly powered by renewables. Azerbaijan’s economy is smaller and less diversified than those of some of the Middle Eastern oil producers. Therefore, oil and gas rents are a vital component of the state budget, accounting for around 90% of fiscal revenues; Azerbaijan simply does not have competitive industries beyond fossil fuels. Declining export revenues will adversely affect Azerbaijan’s economic growth prospects and the national budget.

The principal purpose of this research is to explore sustainable energy development in Azerbaijan through a transition to renewable energy. It intends to ascertain: why a small oil-rich country would seek to develop renewable energy; whether recent challenges on the world oil market in terms of consistently low oil prices can motivate Azerbaijan to increase the use of its renewable energy resources; and who is promoting renewable energy in Azerbaijan, and with what effects.

Renewable Energy Developments

Azerbaijan has been using oil as a principal driver of its economy since 1991. In this regard, the 2015 crash in oil prices negatively affected its economic and political stability; this was the first time in two decades that Azerbaijan’s economy showed significant stagnation, causing two currency devaluations. Such a situation made Azerbaijan reassess its priorities and seek a diverse economic and energy strategy for its sustainable development. In this regard, renewable energy resources appear to be the one of the most efficient and effective solutions (see below).

Azerbaijan has a low share of renewable energy in its Total Final Energy Consumption (TFEC), varying between 3.1% in 2010 and 1.6% in 2019 (The State Statistical Committee, 2019). One explanation for this var-

iance is the seasonal and year-on-year changes in hydropower production that have ranged from 2.4 % in 2010 to only 0.8 % in 2019 (The State Statistical Committee, 2019). Currently, 91.9% of electricity in Azerbaijan is produced from traditional sources of energy (mostly from natural gas), while 8.1% of electricity is produced from renewable sources (Savchenko, 2020a). In other words, renewable energy sources do not occupy the central position either in production or in consumption.

However, according to a 2019 report by the International Renewable Energy Agency (IRENA), Azerbaijan has outstanding renewable energy resources. More specifically, the potential of Azerbaijan’s renewable energy generating capacity is 26,000 megawatts (MW). To benefit from this potential, the government has established a goal of increasing the share of renewable energy sources in electricity production to 30% by 2030 (Babayeva, 2020). On 29 May 2019, President Ilham Aliyev signed the order “On Accelerating Reforms in Azerbaijan’s Energy Sector”, which established the foundation for expanding the usage of renewable energy sources, introduced a new legal framework, and moved to create a friendlier investment climate (IRENA, 2019).

Among renewables, hydropower has traditionally maintained a promising position in Azerbaijan’s energy production. It had the highest installed capacity of any renewable energy source (1134MW) in 2019, providing about 6–10% of total electricity generation demand (IRENA, 2019). The resources are located next to the rivers, such as the Kura and its tributaries, the Araz, streams terminating at the Caspian Sea, and irrigation canals. Additionally, Azerbaijan has a well-developed small hydropower generation sector, comprised namely of the Sheki, Mughan, Zeykhur, Gusar, Nyugedi, Chinarly, Balakan, Guba and Zurnabad power plants. To attract investors, the Azerbaijani government is considering the privatisation of these small power plants, which are of lesser importance for nationwide power supply. According to the Ministry of Energy, the six small hydroelectric power stations previously operated by the power generating company Azerenerji are most likely to be sold to private investors (AHK Azerbaijan, 2019).

After hydropower, wind energy has the second-highest installed capacity in the renewables sector (66MW). However, this is only a small fraction of total potential wind capacity, which is estimated at 3000MW (IRENA, 2019, 17). The Azerbaijani government plans to add 420MW in renewable energy capacity in 2020, including 350MW of wind. To develop this potential, Azerbaijan has completed several small-scale projects. For example, it inaugurated the Yeni Yashma Wind Park, with a capacity of 50MW, in October 2018. According to IRENA (2019, 18), Yeni Yashma is the largest operating wind park in the South Caucasus. In addition, on

9 January 2020, the Ministry of Energy signed agreements with two foreign companies, Saudi Arabia's ACWA Power and the United Arab Emirates' Masdar, on the implementation of pilot projects in the field of renewable energy.

ACWA Power will build 40 wind turbines with a total capacity of 240MW in Absheron and Khizi regions (Lmahamad, 2020). Despite its positive impacts, Azerbaijan should also consider wind energy's negative environmental, spatial and social effects. Numerous studies (Bilalova 2020; Dugstad et al. 2020) indicate that wind farms might be a problem for migratory birds if their locations are not carefully planned. Furthermore, several scholars highlight that due to issues of noise and landscape deterioration, wind energy has faced problems with social acceptance, namely "not in my backyard" (NIMBY) protests (Dugstad et al., 2020).

The potential for renewable energy production in Azerbaijan through solar power is promising. As of 2017, photovoltaic installations with a capacity of 34.6MW were installed across the country, including at businesses and on the roofs of various public buildings (IRENA, 2019). Currently, there are several solar power plants in Azerbaijan operating in the cities of Gobustan and Samukh, the Baku districts of Pirallahi, Sahil and Surakhan, and in Nakhchivan. Similar to other renewable energy sources, Azerbaijan's solar power potential is estimated at 2040MW (IRENA, 2019, 19), which is also not fully developed. The Azerbaijani government's 2020 renewable energy target (420MW) also includes 50MW of new solar power. The Ministry of Energy also signed an agreement with the UAE's Masdar in the field of solar energy, the company taking on construction of a 200MW solar power facility in Garadahg and Absheron regions.

Another project that has contributed to Azerbaijan's renewable energy development is the Baku-Waste-to-Energy Plant, which became operational in 2012. The plant is located in Baku's Balakhani settlement and features two incineration lines, each with a capacity of 250,000 tonnes and a power generation capacity of 231.5 gigawatts-hours (GWh) per year.

Environmental and Economic Benefits

One might ask: why would a small resource-rich country want to develop a renewable energy sector? First, Azerbaijan's prime incentive for developing wind and solar power is to ensure sufficient domestic production whilst maintaining gas export levels. In recent years, Azerbaijan's domestic energy consumption has increased. Due to the resulting high internal gas consumption, Azerbaijan has struggled to meet its obligations on a variety of contracts to export gas westward. To meet those shortfalls, it has had to import natural gas from Russia (O'Byrne,

2020). In this regard, renewables offer a way to keep that from happening, and when fewer fossil fuels are used domestically, more oil and natural gas can be exported.

Secondly, the fall in oil prices since 2014 has exposed Azerbaijan's significant economic vulnerability. In order to address its financial problems, in early 2016 Azerbaijan sought emergency loans from the International Monetary Fund and the World Bank. The country's leadership highlighted the importance of diversifying the economy and decreasing its dependence on the oil and gas sectors in its "Strategic Road Map on National Economic Perspectives" (approved by Presidential Decree on 6 December 2016). In this context, the increased share of renewable energy in the energy mix can offer multiple benefits, including job creation (direct and indirect), economic diversification and associated increases in GDP (Vidadili et al., 2017).

Furthermore, renewables offer the most prominent low-carbon solution to meeting Azerbaijan's climate targets. Azerbaijan has signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC) and adopted the Kyoto Protocol as a non-annex country on the international greenhouse gas emission standard. Since the electric power industry is one of the most significant emitters of carbon, the success of renewable power plants is key, as well as increasing the efficiency of existing fossil fuel facilities.

Finally, replacing fossil fuels-based electricity generation with renewables could force Azerbaijan to modernise its national electrical grids. According to AHK Azerbaijan (2019), the investment of US\$6.1 billion in the electric power industry from 2006–2017 was not sufficient to ensure a stable and, above all, efficient electricity supply for the country. Azerbaijan has also invested in modernising its old power plants, but the system is still designed to switch back to heavy oil in emergencies (IEA, 2020). In this regard, renewable energy can help Azerbaijan to modernise its electrical infrastructure, apply energy-efficient technologies and set up market-oriented management systems.

Who is Promoting Renewable Energy?

The realization of renewable energy projects requires the involvement of private actors and intergovernmental institutions, as they offer a number of the required resources to realise and evaluate the projects. These resources include financial investment, global networking, technical knowledge and advanced technology.

Considering BP's critical economic and technical role in oil and natural gas projects, Azerbaijan is also interested in BP's participation in auctions on providing the right to generate electricity in its territory through renewable energy sources. Azerbaijan has signed a memorandum of understanding on cooperation with nine

international energy companies including BP (UK), Masdar (UAE), Avelar Solar (Russia), Tekfen (Turkey), Total Eren (France), Equinor (Norway), ACWA Power (Saudi Arabia), Mitsui & Co. (Japan), and Quadran International (France) (Savchenko, 2020b).

However, the State Oil Company of Azerbaijan Republic (SOCAR) has showed little interest in renewable energy and has not formulated a clear renewable energy vision. For example, BP wants 50 gigawatts (GW) of renewables in its portfolio by 2030, up from just 2.5GW today. Contrastingly, it is not clear whether SOCAR is planning to transition from an oil and gas company to a broader-based energy company in the future. One might argue that moving away from its traditional base is risky for SOCAR because of the uncertainty in the speed of transition. Nevertheless, a wait-and-watch strategy by postponing investment decisions can create a window of opportunity for competitors. By analyzing international oil companies' renewable energy investment strategies, Pickl (2019) argues that there is a strong linkage between the oil companies' proven reserves and their renewable energy strategies. Oil majors with less proven oil reserves to tap into seem to be moving into the renewable space faster, with the aim of developing more diverse and less volatile portfolios sooner. Those companies with large pools of oil reserves, remarkably including US majors owning oil assets with especially low breakeven points, are rather selecting the strategy to embrace the renewable industry at a slower pace (Pickl, 2019).

In addition, several international organisations are active in Azerbaijan's renewable energy sector, namely the Asian Development Bank (ADB), the International Energy Charter, the European Bank for Reconstruction and Development (EBRD), the European Union (EU) and the United States Agency for International Development (USAID) (Aydin, 2019). The EBRD helps Azerbaijan with developing renewable energy auctions to facilitate private investment in future renewable energy projects. Furthermore, the ADB has allocated financial and technical support for the development of floating solar panels on Boyuk Shor Lake in Baku. The project involves the creation of a 300-kilowatt solar panel network on the lake (Cekuta, Schulz and Cohen, 2020). The World Bank and the Ministry of Energy have signed an agreement to increase the efficiency of small hydropower plants. Azerbaijan has also been cooperating with IRENA since 2009, and has been a full member of the organisation since 2014. In 2019, IRENA completed the Renewables Readiness Assessment (RRA) report for Azerbaijan.

However, development partners have so far contributed to the renewable energy sector mostly through technical assistance, with limited direct investment in renewable energy projects. Unlike oil and gas projects,

the state budget is the main financing source for the development of renewable energy in Azerbaijan. The main reasons for this are the current investment climate, the state monopoly of the power sector, and the fact that renewable energy legislation is not yet investor-friendly.

As mentioned above, renewable energy has many benefits for Azerbaijan, such as more diversified energy mix, less harmful greenhouse gas emissions, and job creation. However, it can be seen that the key actors promoting renewable energy in Azerbaijan are mainly Western-based. While implementing their renewable energy suggestions, Azerbaijan should ask: do these measures actually promote energy security or replicate existing technical, social and legal problems? When are they useful and when are they counterproductive in terms of Azerbaijan's energy security? The existing measures are mainly designed to address energy importing countries' needs, and therefore they should not simply be copy-pasted by Azerbaijan.

Conclusion and Challenges

Considering the fact that the concept of renewable energy is relatively young in Azerbaijan, there are several challenges to its development in the country, such as low oil prices, limited private foreign investments, legal barriers, institutional barriers, lack of political will (including on the part of state-owned energy companies SOCAR and Azerenerji), and inadequate public awareness.

The first issue is low oil prices. The decline in oil prices hinders the development of renewable energy. Since Azerbaijan's economy is based on fossil fuels, low oil prices result in tighter finances, economic slowdown and limited public budgets restricting the country's ability to invest in its renewable energy sector. As expected, annual oil production in Azerbaijan has also begun to decline as its reserves are running out. The Covid-19 crisis has further exacerbated global oil demand and financial uncertainties. In light of this, the Azerbaijani government has prioritised financial resources for the response to the spread of Covid-19.

Secondly, Azerbaijan does not have a dedicated, comprehensive law governing the various aspects of renewable energy development. This creates challenges for private investors when navigating legal and regulatory requirements, resulting in delays in the development of new projects and increased perception of risk among investors. In an aim to fill this gap, the draft law on "The Use of Renewable Energy Sources in the Production of Electricity" has been submitted to the relevant government agencies for approval. Furthermore, Azerbaijan has a significant fossil fuels subsidy system. This implies that the subsidies go to the oil and gas sector, while in actuality they benefit the population through

artificially low fuel prices. Because of this, household prices for energy are very low in the country. However, the renewable energy sector does not receive an equal amount of government support. This unbalanced subsidy system makes the renewable energy sector unattractive for potential investors. Several intergovernmental organisations' reports (e.g., IRENA, 2019) highlight energy subsidy reform, but this reform should be well-designed because it can have a significant adverse impact on the welfare of middle and lower-income consumers.

Thirdly, while measures have been recently implemented to align its banking sector regulations with international norms, renewable energy projects continue to face challenges in terms of access to capital in Azerbai-

jan due to lack of liquidity in the local banking system and high interest rates, which can be as high as 30% per annum in local currency. In this regard, private domestic investors' willingness to invest in renewable energy has yet to strengthen.

Finally, customers' preference to receive energy from renewable sources, rather than oil and natural gas, was and still is almost non-existent in Azerbaijan. The Azerbaijani public remains poorly informed in terms of the potential presented by a transition away from fossil fuels. Therefore, awareness-raising among the public also needs to be enhanced in order to expand the deployment of renewables in Azerbaijan.

About the Author

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Renewable Energy Development and Energy Security in Armenia

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Abstract

Overly dependent on Russian gas imports and an aging nuclear power plant, lacking domestic hydrocarbon resources and excluded from regional oil and gas projects, the development of indigenous renewable resources will play a key role in bolstering Armenia's energy security in general and limiting reliance on Russia in particular. The country has significant renewable energy potential and has committed to increasing the share of renewables in the energy mix to 26% by 2025. The implementation of renewable energy projects has been slow, however, with prohibitive installation costs and a continued emphasis on nuclear power stymying government investment in resource development. Yerevan has consequently sought to cooperate with both private investors and external political actors to realise its renewables agenda. This paper will explore the contribution of renewable energy to Armenian energy security, focusing in particular on the opportunities made available by and consequences of cooperation with external actors on renewable energy initiatives.

Introduction

Landlocked, without hydrocarbon reserves, and isolated from regional energy projects due to its hostile relations with Azerbaijan, Armenia's energy situation has been precarious since its independence in 1991. The country has remained highly dependent on Russian imports to fulfil domestic energy requirements. Both this dependency and the mismanagement of the energy sector have contributed to several energy crises since independence. The first, which lasted until 1994, highlighted issues with virtually all areas of Armenia energy security including affordability, availability, and security of supply. The second, in 2015, was more limited but nonetheless highlighted issues with the affordability of electricity supply in particular, as well as local corruption in the energy sector and popular dissatisfaction with overdependence on Russia (Kazarian, 2018).

In seeking to redress the dependence on hydrocarbon imports, as well as to address concerns around climate change and sustainability, Yerevan has increasingly sought to develop indigenous renewable resources. Renewable resource development is also essential for

Armenia to limit its carbon output and pursue a more environmentally-friendly energy strategy, meaning that diversifying resources will also facilitate the realisation of the state's climate change goals. This paper presents an overview of those renewable policies in the context of efforts to diversify energy sources and reduce dependence on external hydrocarbon suppliers. The next section will briefly outline the contemporary energy situation in Armenia, highlighting in particular the security implications of import dependency. The paper will then briefly explore renewable energy policy in general before focusing more specifically on solar power. In particular, the paper will highlight the necessity of attracting external foreign direct investment (FDI) to develop the renewables sector and the implications of that FDI for energy security.

Armenian Energy Security

Armenia is heavily dependent on fossil fuels. In 2018, crude oil and natural gas accounted for 10% and 64% of total primary energy supply (TPES) respectively. Nuclear power from Armenia's sole nuclear power plant

accounted for a further 16% of energy supply, while just under 10% of TPES was sourced from renewable resources—6% from hydropower, 3% from biomass, and under 1% from other sources (IEA, 2020a). That all fossil fuels are imported creates a significant reliance on external suppliers which is exacerbated by a specific dependence on Russia and, to a lesser extent, Iran, as key energy providers. Recent data on the precise details of energy imports are difficult to find; a report from the International Energy Agency (IEA) in 2015 reported that Iran accounted for 35% of Armenia's oil and 15% of gas imports, while Russia provided 27% of oil and 85% of gas supplies (IEA, 2015).¹ However, even those energy projects that appear to provide diversification in the Armenian energy sector tend to involve Russian influence: a Gazprom subsidiary owns and operates the Armenian section of the Iranian–Armenian natural gas pipeline, for example, and Armenia is also dependent on Russia for the supply and disposal of nuclear fuel.

This energy dependence creates several security challenges. Security and continuity of supply concerns—already challenged by the tenuous security environment in the South Caucasus—are exacerbated by Russia's often hostile relations with Georgia, a key transit state in the Russian–Armenian energy trade. Dependence on external resources also restricts the capacity of Armenia to set prices, leaving the state highly vulnerable to external energy and global economic market fluctuations as well as price manipulation by suppliers. The 2015 energy protests demonstrated how sudden price rises in the energy sector can have a knock-on impact on domestic stability. Secondly, overdependence of a consumer state on a particular producer state can endow the producer with leverage over the consumer or contribute to an asymmetry in bilateral relations. The greater the dependence—or the more limited the diversification by the consumer of its resources—the greater the leverage held by the producer and the more asymmetrical bilateral relations become. Armenia's dependence on Russian energy imports creates a significant asymmetry in bilateral relations that is further exacerbated by Armenia's lack of regional allies and its political and economic dependence² on Russia. Reducing dependence on Russian resources could somewhat redress this imbalance in bilateral relations.

Diversification of resources and suppliers is essential to mitigating the risks posed by dependence on Russia sources. While organisations such as the IEA (2015, 2020) and Armenia's Energy Agency (2020b) have stressed the importance of expanding energy relations with regional neighbours, closed borders with Turkey and Azerbaijan

have meant that Armenia has been excluded from major regional hydrocarbon projects like the Southern Gas Corridor. Electricity grid integration with Iran and Georgia has represented a more successful manifestation of the regional integration strategy—new high voltage lines to both countries are currently under construction (IAEA, 2020)—but has little impact on the diversification of primary energy sources. And so Yerevan looks to renewable energy to mitigate its energy insecurity.

Renewable Energy Development

The Renewable Resources and Energy Efficiency Fund (R2E2), the main organisation responsible for overseeing the promotion and development of renewable resources in Armenia, highlights the importance of renewable energy for promoting “energy security and energy freedom of Armenia” along with its benefits in terms of reducing the negative impacts of fossil fuels on human health and the environment (R2E2, 2020). While the development of indigenous industries was named as one of the four main pillars of Armenia's energy agenda in its 2005 Energy Strategy Paper, renewable energy is not a novel concept: hydropower development predates World War I and, in 2017, 31% of Armenia electricity came from domestic renewable resources (Armenian Energy Agency, 2020a). The majority of this output comes from two Soviet-era hydropower projects and around 190 small hydropower plants (SHPPs) (Ministry of Energy, 2020). Armenia has significant potential for further renewables development in the hydropower and solar power sectors in particular, but is more limited in terms of wind power. The country has good-to-excellent wind potential in about 4% of its territory, while another 4% has moderate potential (Elliot et al., 2003: 41). However, much of this territory is located in difficult to reach and high mountainous areas and the potential benefits of wind farm development are undermined by the additional costs associated with construction and maintenance of remote infrastructure.

Despite its potential, renewable energy development in the past two decades has been slow and has failed to match increased consumption. While hydropower production has increased, for example, its share of TPES declined from 7.6% in 2002 to 6% in 2019. In that same period, natural gas imports increased by 120% and oil by 33% (IEA, 2020a). Various scholars and energy agencies point out that limited investigations into renewable potential, complicated regulatory procedures, and the lack of a comprehensive energy development plan have been significant inhibitors to the development of an indigenous renewable energy sector (IEA, 2020b;

1 Data from the IEA (2020a) show that while consumption of all sources has increased since the 2015 report was issued, the energy balance remains relatively similar.

2 Data from the World Bank shows that in 2018, 26% of Armenian imports were Russian and 27% of exports destined for Russia, and that the balance of trade was firmly in Russia's favour (World Bank, 2020).

Apergis and Payne, 2010; Kazarian, 2018). That the development of renewable energy infrastructure and technology requires relatively high upfront financial investment has proved particularly problematic. With memories of the 1990s energy crisis lingering, the government has been hesitant to invest in renewable energy technology for fears of the long-term implications for end-user prices (EIA, 2017: 46). State-based development of renewable energy projects has consequently been limited, with the renewables agenda focusing on introducing regulatory and financial measures to create an attractive investment environment, such as a long-term (20–25 year) scheme that guarantees the purchase of all electricity generated by renewable energy sources.

These measures have been somewhat successful in attracting investment for small scale projects—in 2019, for example, 28 new SHPPs were either under construction or had been granted construction licences (Ministry of Energy, 2020)—but development of large-scale projects has been slower. Domestic economic limitations mean that attracting FDI is central to establishing and maintaining large-scale renewable energy infrastructure. Armenia's two major hydrocarbon projects highlight the importance of attracting foreign investors to sustain renewable endeavours. The Soviet-era Vorothon and Sevan-Hrazdan cascades account for 25% of total electricity generation and are the main source of supply diversification in a market in which 65% of electricity is generated by Russian-supplied nuclear fuel and gas. Neither system is owned by the state, and ownership of the Sevan-Hrazdan cascade has been significantly influenced by Russia and Russian-based companies. As part-payment for nuclear fuel debt accrued during the economic crisis of the 1990s, the cascades were sold to the Russian-owned company Inter RAO in 2003 before passing to a subsidiary of Russia's RusHydro. Since 2019, they have been under the ownership of the Tashir Group, a Russian company whose owner, Russia–Armenian billionaire Samvel Karapetyan, was named by the US Treasury Department on a list of 210 prominent Russians with close ties to Vladimir Putin in 2018 (McKenzie et al., 2018). The Vorothon Cascade has attracted investment from more diverse multilateral and multinational interests. Owned jointly by a US energy company, Contour Global, and the International Finance Corporation (IFC), a member of the World Bank Group, since 2015, it has received funding for modernisation and operation works from the EU (2003), Germany (2012), and the IFC (2017) over the past two decades.

Both cascades represent the capacity of Armenia to attract funding for and FDI in its renewable energy sector, and the Vorothon Cascade in particular exemplifies the potential for international investment from private companies and multilateral organisations to contribute to the diversification and renewable agendas. The Sevan-Hraz-

dan cascades, while reflecting foreign interest in Armenia's renewable energy sector, demonstrates the potential for companies with close ties to Russia to play a role in the renewable sector. In other words, it represents an expansion of Russian influence to a new strand of the Armenian energy sector and somewhat limits the diversification agenda. In addition, it is notable that despite the relatively well-established nature of the hydropower sector, investment has been restricted to improving existing infrastructure and SHPPs. In contrast, many of the more major new developments in renewable energy can be found in the solar sector.

Sectoral Analysis: Solar Power

While hydropower has traditionally been at the forefront of Armenia's renewable energy agenda, solar power has gained increasing prominence in recent years. Armenia has significant solar potential: the country's average annual solar energy flow per square meter of horizontal surface—the metric by which solar power potential is measured—is about 70% greater than the European average (IAEA, 2020). While solar development has been relatively limited to date, the past five years have seen a concentrated push for the development of an Armenian solar industry. In 2015, the government launched a six-year, US\$58 million solar programme to facilitate the construction of small- and large-scale solar projects. Commitment to the development of the solar sector was reaffirmed by the new regime following the 2018 revolution, with Chairman of the Energy Agency of Armenia Hayk Harutiunian suggesting that solar energy should constitute at least 20% of Armenian electricity output by 2030 (Danielyan, 2018). The push for solar expansion has been moderately successful in terms of small-scale developments, with various funding schemes initiated under the 2015 programme contributing to the installation of 2083 solar water heating systems and 71 photovoltaic systems in 126 communities (Armenian Energy Agency, 2020c).

Industrial-scale development has been more limited. As in the hydropower sector, large-scale projects are dependent on attracting FDI and funding from multilateral organisations. Consequently, while the 2015 programme is directed by the R2E2, in conjunction with the Armenian Ministry of Energy and Natural Resources, it is also supported by international financial institution including the EU, the World Bank, and the Asian Development Bank (Nazaryan, 2017). The Armenian government has also been relatively proactive in introducing measures to attract private FDI for the scheme, including the removal of customs tariffs for solar installation components. The most concrete outcome of this push for international cooperation in the solar sector to date is the proposed Masrik solar plant, a 100-hectare plant approved in 2019. The plant will be fully funded by loans from the European Bank for Reconstruction

and Development (EBRD), the IFC and the EU's Neighbourhood Investment Platform (NIP), and the Finnish government (EBRD, 2020), and will be constructed by Spanish-owned Fotowatio Renewable Ventures (FRV).

The project has notable implications for Armenian energy security. Firstly, Masrik is the first industrial-scale development of Armenian solar resources. It provides advocates of the solar policy with a major victory, and highlights the viability of energy projects that could, in the long term, reduce reliance on hydrocarbon imports. This in turn contributes to the sustainability of Armenia's energy system. In addition, FRV has agreed to sell power to the local grid at a price of 20.11 AMD per kilowatt-hour (kWh), which is lower than the average 23.8 AMD/kWh price at which hydro- and gas power plants normally sell electricity (Bellini, 2018). The project therefore features a distinct affordability angle that may also allay domestic fears about the possibility of renewable energy development driving up costs. Finally, it represents successful resource and source diversification independent of Russian funding.

It would be remiss, however, to overstate the contribution of Masrik to Armenia's overall renewables strategy—and, indeed, its energy security more broadly. The year 2021 marks the original end point of the 2015 solar programme, and yet Masrik remains the only significant project to come close to realisation. Both Yerevan and the EBRD continue to seek tenders for additional development sites (Bellini, 2019, 2020) and, towards the end of 2019, a formal deal was signed with Masdar, a clean energy company based in the United Arab Emirates, to develop multiple solar projects (Tsagas, 2019). However, 2020 saw little progress on neither that nor any other new projects. Indeed, the realisation of the Masrik plant itself has stalled: despite the agreement stipulating the plant must be in operation by the end of 2020, construction work had not yet started on the plant as of July 2020 (Willuhn, 2020), and there are no current updates on the project as of January 2021.

Conclusion

There is consensus in both the academic literature and in reports from multilateral organisations that the development of indigenous renewable resources should be a primary strategy for the mitigation of Armenian energy insecurity (Odabashyan and Khachatan, 2008; Apergis and Payne, 2010; Kazarian, 2018; IMF, 2003; IEA, 2020b; R2E2, 2020). Domestic production would contribute to reliability and affordability of supply, reducing the

insecurity associated with price fluctuations and geopolitical instability. In reducing dependency on imported fossil fuels and carbon output, renewables would contribute to the sustainability of energy supply and simultaneously reduce dependence on external actors. Reducing dependence on Russian imports in particular can contribute to redressing the significant asymmetry in bilateral relations between those two countries.

However, renewable energy development has been limited to date and hefty ambitions have failed to translate into tangible projects. Armenia has been somewhat successful in attracting international interest in the development of the renewables sector, but that has primarily been limited to the purchase of existing hydropower projects. The government's ambition to make renewables accountable for 26% of TPES by 2025 (Energy Partnership, 2015) looks increasingly unrealistic, even if the Masrik plant does become operational in the coming years. Existing issues have likely been exacerbated by the ongoing global Covid-19 pandemic. The pandemic has provided an entirely unprecedented scenario in the energy sector in general, and has likely contributed to the slow pace of new developments in Armenia's renewable energy sector this year. There is also likely to be a knock-on effect in coming years: global and domestic economic decline has created investment uncertainty that may deter FDI in the Armenian renewable sector.

Finally, further research into the increasing influence of the Tashir group in the Armenian energy sector is warranted. With total ownership over the Electricity Network of Armenia (ENA) since 2015, the purchase of the Sevan-Hrazdan cascades represents a significant move from the secondary to the primary energy sector in domestic energy politics and amplifies Armenian dependence on a company with close ties to the Kremlin. While contributing to the diversification of suppliers in theory, the replication of dominance by state-owned Russian companies in the hydrocarbon and nuclear sectors by private Russian companies in the renewables would undermine the overall diversification agenda and ensure the maintenance of close ties between Armenia and Russia at multiple levels of the energy system. Ownership of and funding for the Voroton cascades and the Masrik solar plant provide an alternative—and more diversified—model for simultaneously developing the renewable energy sector and reducing dependence on Russia.

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Georgia: Focus on Hydropower Generating Protest

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Abstract

Georgia has significant hydropower potential and there are plans to construct a number of new hydropower plants (HPPs). However, concerns have been raised about the impact of these new HPPs on local communities, as well as damage to pristine mountain environments and the biodiversity of the Caucasus. Additionally, Georgia is situated in a seismically unstable region, meaning it is prone to frequent tremors and earthquakes. There have been a number of protests about proposed projects, notably clashes between police and protesters in April 2019 over the construction of an HPP in the Pankisi Gorge. Thus, the example and experience of Georgia raises questions about the push towards renewables, in particular the need to ensure project sustainability. This article will assess the contribution that hydropower makes to Georgia's energy mix, future projects and what lessons can be drawn from the Georgian experience about the demands of balancing the country's electricity needs against environmental and social costs.

Introduction

Sources of renewable energy, such as hydropower, are viewed as a potential solution to the challenges of climate change and sustainable development, a way to offset a country's demand for electricity against its commitments to meeting the climate targets set by the Paris Agreement. However, the experience of Georgia suggests that states need to be cognisant of the difficult trade-off between the development of renewable energy sources, which may not always be as clean and sustainable as anticipated, environmental conservation and the impact on local communities.

Hydropower constitutes over 80% of Georgia's generating capacity and from 75% to 90% of power generation. The country has over 70 hydropower plants (HPPs) in operation, providing over 2,700 megawatts of generating capacity. Of these, two HPPs provide nearly half of the country's electricity supply: Enguri and Vardnili, two Soviet-era plants located in the north-west of the country. Georgia has significant hydropower potential and the government is keen to develop the country's hydropower potential further in order to bolster energy security. According to the country's National Renewable Energy Action Plan, approved in 2019, the potential capacity of Georgia's hydropower is estimated to be 15,000 megawatts (MW), of which less than 25% is currently utilised (Ministry of Economy and Sustainable Development, 2019).

Domestic renewable resources such as hydropower are viewed as a natural alternative to dependence on imported fossil fuels such as crude oil and natural gas for power generation, and the government hopes to achieve energy self-sufficiency through the utilisation of indigenous renewables. Until late 2008, Georgia was heavily dependent upon imported Russian gas and consequently

was at the mercy of the Kremlin, which has wielded the "energy weapon" several times in its spats with the Georgian government over the years. Gas supplies were frequently cut off during the winter months as political tensions spilled over (most notably following an explosion on a pipeline in North Ossetia in January 2006), forcing Tbilisi to seek increased supplies from neighbouring Azerbaijan. Since 2009, most of Georgia's natural gas needs have been met by imports from Azerbaijan, with only a very small amount coming from Russia.

Georgia's hydropower potential is thus viewed as a way to strengthen the country's energy security whilst also meeting its environmental commitments. The 2015 Energy Policy sets out a number of core objectives, including the diversification of supply sources and optimal utilisation of local resources, alongside the development of renewable resources: the document notes that Georgia is 'remarkably rich' in hydropower resources. A further key objective is the establishment of Georgia as a regional platform for the generation and trade of clean energy: 'Georgia's wealth in existing hydro-resources, corresponding infrastructure and favourable investment climate enable the country to establish itself as a regional platform for the generation and trading of clean energy' (Ministry of Energy, 2015). The utilisation of the country's existing clean energy potential, including hydropower, is a vital step towards achievement of this goal and there are plans to construct a number of new HPPs, including the Namakhvani HPP cascade project in western Georgia and the Nenskra HPP project in the Svaneti region.

However, one of the key issues with the use of hydropower for electricity generation is its seasonality, which leads to a gap between generation and consumption over the winter months, when high demand for electricity

coincides with depleted storage in reservoirs, reducing hydropower generating capacity. During the summer months, Georgia exports power to its neighbours, including Turkey and Russia, but has to import from Azerbaijan and Russia during the winter. In 2019, imports of electricity were needed even during the summer months to meet growing demand, and the supply-demand gap continues to grow. Furthermore, the exploitation of renewable resources has a cost, both in terms of social and environmental effects, and these projects have met considerable opposition from local communities and environmental organisations. The very features that make Georgia an ideal location for the construction of new HPPs also undermine the rationale for doing so: pristine mountain areas with fast-flowing rivers. Whilst hydropower harnesses the power of nature to generate electricity and is emission-free, it relies upon the natural environment and the construction of industrial generating facilities such as large dams which block river flow, have serious environmental and social impacts, and displace local communities and wildlife.

Environmental Challenges

Concerns have been raised about the impact of the construction of Georgia's proposed new HPPs on local communities, as well as damage to pristine mountain environments and the biodiversity of the Caucasus, which is one of the most biologically rich areas on earth. Described by the World Wildlife Fund as a 'biodiversity hotspot', it is also one of the world's most endangered areas.¹ Georgia's National Security Concept, adopted in 2011, identifies the threat posed by environmental challenges and states that 'ensuring the environmental security of Georgia and the region' is a key national interest.² Squeezed between the Greater Caucasus Mountains to the north and Lesser Caucasus Mountains to the south, Georgia is situated in a seismically unstable region, meaning it is prone to frequent tremors and earthquakes. It is also vulnerable to natural environmental disasters such as drought and flooding, all of which pose significant risks to the development of HPPs. The most powerful earthquakes in the contemporary era have taken place along the Greater Caucasus: the Racha earthquake of 1991, measuring 7 (Richter scale) in magnitude, and the earthquake of 2009 in Oni region, measuring over 6, both occurred in the mountainous northwest of the country where HPPs are either planned or under construction.

Climate change is expected to increase the frequency and magnitude of natural disasters such as flooding and droughts. Climate change has the potential to exacer-

bate existing social, economic and environmental difficulties. At a regional and local level, infrastructure will be threatened, health and social services will come under great pressure, homes and property will be damaged and possibly destroyed, and there may be tensions between environmental refugees and local inhabitants. A regional study on the impact of climate change estimates that Georgia suffered economic losses of at least US\$2.7 billion due to climate-related natural disasters and land erosion over the last 30 years (Westphal et al., 2011). While hydropower is one way for the state to meet its climate change commitments, the development of new HPPs comes at a cost: for example, the construction of dams often entails deforestation of rural areas, which can lead to landslides.

Social Protests

There have been protests against proposed hydropower projects across Georgia since the 1980s. The construction of the 702MW Khudoni HPP on the Svaneti region's Inguri River triggered nationwide protests and a hunger strike, leading to construction being suspended in 1989. Subsequent governments have sought to reinvigorate the project, but its future remains unclear. As part of its election manifesto in 2012, the "Georgian Dream" coalition pledged to ban the construction of large HPPs (Dundua & Karaia 2019), a promise that was abandoned once it took power and hydropower became linked to Georgia's economic development.

The proposed construction of new HPPs remains a controversial issue in the country and there have been ongoing protests, notably clashes between police and protestors in April 2019 over the construction of an HPP in the Pankisi Gorge. A number of non-governmental organisations (NGOs) are actively engaged in opposing new projects and drawing public attention to the wider environmental and societal costs, including Green Alternative and the Green Advocacy Platform (which brings together Green Alternative, the Georgian Young Lawyers' Association and the Human Rights Education and Monitoring Centre).

In November 2020, police forcibly dispersed a rally blocking the main Kutaisi–Tsageri road, as protestors attempted to prevent construction equipment reaching the site of the proposed Namakhvani HPP cascade project, which is being developed by Turkish construction company Enka and Norway's Clean Energy Group. There have been long-running protests against the planned HPP in western Georgia's Tskaltubo and Tsageri districts, which residents of the Rioni Gorge say will have devastat-

1 For further details see http://wwf.panda.org/what_we_do/where_we_work/project/projects/index.cfm?uProjectID=GE0026 [accessed 20 November 2015].

2 *National Security Concept of Georgia*, adopted by parliament on 23 December 2011, <https://mod.gov.ge/uploads/2018/pdf/NSC-ENG.pdf> [accessed 10 January 2021], p. 6.

ing environmental and social impacts. The Namakhvani HPP cascade is one of the country's largest hydropower projects, estimated for completion in 2024, and would include two dams with a planned combined capacity of 433MW, over 12% of Georgia's electricity consumption.

Georgia's Public Defender³, Nino Lomjaria, added her voice to criticism of the government's plans in a public statement. Acknowledging the critical importance of developing the country's energy potential and natural resources, she noted it was 'unfortunate that the State has not yet planned a long-term energy policy for the rational use and sustainable development of energy resources, which should be created and implemented in practice as a result of extensive public discussions and on the basis of the principle of transparency' (Public Defender of Georgia, 2020). Reminding the authorities that Article 29 of the Constitution enshrines in law the right of all citizens to participate in the adoption of decisions related to the environment, she stated that decisions made by state agencies with regard to the project had failed to answer the "legitimate questions" of society, pointing to a lack of trust in the outcomes of environmental impact assessments, a lack of public involvement, disregard for the socio-economic interests of local populations and doubts about the utility of the project.

Further controversy arose in the spring of 2020 when the government gave the go-ahead for the construction of the 206MW Oni HPP Cascade in Racha region (the location of one of the country's largest recorded earthquakes in 1991). Ministerial approval for the project was granted during the early days of the COVID-19 crisis, when restrictions prevented any public protest against the decision. In response to public anger and opposition from a number of environmental NGOs, the Minister of Environmental Protection and Agriculture, Levan Davitashvili, warned that disinformation about the project was being spread and accused NGOs of making "irresponsible" and "misleading" statements with the intention of "deliberately deceiving the population" (Ministry of Environmental Protection and Agriculture of Georgia, 2020). Such strong public accusations from a serving minister indicate a high level of frustration within government at continuing to come up against strong popular opposition to their plans for economic development at the expense of long-term sustainability.

Another major project, the construction of the Nenskra HPP (which was due to be completed in 2021), has been the subject of a compliance review following a formal complaint initiated by several Georgian civil society organisations and affected communities in 2018. The project, being developed by the Georgian government and Korean

company K-Water—with funding from the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB)—envisages the construction of a 130-metre dam with an installed capacity of 280MW on the Nenskra river in Georgia's mountainous Svaneti region. The review, released in September 2020 after a two-year investigation, found significant failures in the project's compliance with the standards required by both the EBRD and EIB in relation to a number of issues, including indigenous peoples, the assessment and management of environmental and social impacts, and cultural heritage (European Bank for Reconstruction and Development July 2020). The findings raised questions about the viability of the project and highlighted enduring concerns about the environmental and social impacts of Georgia's aspirations to harness its hydropower resources.

Conclusions

Georgia has significant hydropower potential and there are plans to construct a number of new hydropower plants. However, the very features that make Georgia an ideal location for the construction of new HPPs, also undermine the rationale for doing so: pristine mountain areas with fast-flowing rivers. Whilst hydropower harnesses the power of nature and is emission-free, it relies upon the natural environment and the construction of industrial generating facilities such as large dams, which block and divert river flow, have serious environmental and social impacts, and displace local communities and wildlife. The International Energy Agency has recommended that the Georgian government ensures adequate measures be taken to guarantee that new HPPs comply with the highest technical, safety, environmental and social quality standards as a possible way of reducing local opposition in the future.

A focus on renewable energy entails trade-offs that have long-term implications in terms of social and economic consequences, particularly for the livelihoods of local communities living near such projects. There is a tension between the current and future needs of local communities, the demands of economic development, investor interest and international commitments, which gives rise to a complicated balancing act for national governments. The Georgian government is facing a further challenge in its ongoing democratic consolidation, balancing the requirement for sustainable economic growth against the needs of local populations, whilst simultaneously protecting the country's unique environment, its biodiversity and its independence.

Please see overleaf for information about the author and a bibliography.

3 The Public Defender is an independent office responsible for overseeing the observance of human rights and freedoms in Georgia. It advises the government on human rights issues and analyses the state's laws, policies and practices, in compliance with international standards.

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