

THE ROLE OF NUCLEAR AND RENEWABLE ENERGY IN ENSURING THE ENERGY SECURITY OF TÜRKIYE IN THE FACE OF NEW CHALLENGES OF GEO-ECONOMIC DEVELOPMENT

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Abstract

The article deals with the issues of Türkiye's energy development on the challenges of non-carbon energy sources, nuclear and renewable, which over the past 20 years have become new forms of energy for the country. It is most important to consider the aspects of their inclusion in the country's unified energy citadel, to project certain problems in the country's internal development. Despite the strategic approach of the Turkish government on the implementation of energy federalism in terms of renewable sources, where in fact each territorial and administrative unit determines the development vectors, there are certain trends towards unification and standardization in the nuclear energy industry. All this is projected onto the geo-economic field, strengthens the course of asserting energy independence in foreign policy, and also allows control (in particular, hydrological ones) over neighboring countries. The article also examines topical issues of a social and economic nature that have a direct impact on the political conjuncture of the ruling Justice and Development Party.

Keywords: energy security, Türkiye, geo-economics, nuclear energy, renewable resources, energy federalism, Greater Middle East.

Introduction

Starting in the late 1960s, the need for electricity on a global scale began to increase, as a result of which the development of nuclear energy in countries without the fundamental principles of civilian or military atoms became a priority.

In Türkiye, which has a rapid demographic growth, the practical importance of nuclear energy is increasing. The significance of this type of energy for the Türkiye, first of all, comes from the high level of electricity consumption, and the possibility of placing them in the eastern part of the country compensated for the integration of the

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regions into the country's overall power transmission chain. As for the other area, renewable, the development of new (alternative) energy sources, initiated by Western countries since the early 1990s, has transformed the classical approaches to obtaining resources. Gradually becoming a new type of energy, the restructuring of the economic sector began, where common features and prospects for alternative sources were derived at the level of public administration.

Given the fact that green energy has become a key determinant policy approach of the EU, since the early 2000s, significant approaches have been borrowed in Türkiye, where the presence of wide geographical landscapes and territories can potentially contribute to the development of the following sources of alternative energy: solar, wind, and also a hydroelectric power plant.

Based on the above aspects, there is a need for a comprehensive consideration of Türkiye's energy potential in geo-economic and strategic contexts. The development of nuclear energy in Türkiye is quite new, where there is the importance of political reflection in the system of energy trends and devices, its uniqueness and the possibility of applied use. In contrast to the previous area, Türkiye's renewable energy industry is the most developed, based on extensive regulation by the ruling Justice and Development Party over the past twenty years.

Nuclear energy as a basic direction for ensuring the energy security of Türkiye

Given this fact, the increase in electricity consumption in Türkiye, since 1990, has increased by 5% annually. For 2020, electricity consumption in Türkiye has reached 260 TWh in total, which, if generalized, can be classified as a country with a dynamically developing domestic demand. Accordingly, before the adoption of the nuclear strategy, Türkiye's main source of electricity was small hydroelectric power plants, which were initially developed for the western regions and later became part of the entire supply chain to the east of the country.

A significant progress in the formation of the political basis for Türkiye's energy security was the creation of a single state body in the field of nuclear energy in 1956, whose tasks included maintaining the government's approach to the new, at that time, energy policy. Despite the fact that the organization was disbanded in 2020 (the Turkish Council for Nuclear Energy and Mining Research was formed in its place), the foundations of the modern stage of nuclear energy were laid in 1993-2005.

Consideration of minerals, whose isotopic characteristics contributed to the development of nuclear energy in Türkiye, can also be considered a weighty fact. About 6% of the world's thorium reserves are located in Türkiye (roughly in the eastern regions), which is about 374,000 tons of pure products, whose potential is used in power plants of this kind (Ağbulut et al. 2021, 1447-1455). Another constituent element is uranium, the total volumes of which are 5,7 million tons, but it has not yet been fully explored how much can be mined, enriched and converted into useful value. Due to the lack of a technical base, as well as the construction of new power units, it is assumed that these two materials will be imported either from Russia or from Kazakhstan. This fact can be confirmed by the fact that in order to discover these

resources in Türkiye, the government will have to use private land, including for research and evaluation work (Temurçin and Aliğaoğlu 2003, 25-39; Karahan 2018, 340-343).

In the context of the increasing level of electricity consumption in Türkiye since the mid-1990s qualitative assessments of the prospects for a new energy security agenda were carried out, where general problems and prospects for an individual approach were formulated at the level of a theoretical approach (Eroğlu and Finger 2021; Şahin 2021). Theoretically, the authorities emphasized either the promotion of alternative energy (then only initiated by the EU, for which Türkiye actively sought membership until 2010), or the defragmentation of the 60-year-old nuclear program. Based on this, new subtexts have emerged: emissions from nuclear power plants, the high cost and low efficiency of new alternative technologies. In addition, in matters of general energy security, the Turkish authorities paid attention to the fact that only 30% of the resources are directly obtained in the country, the rest is imported. From the point of view of political reality, the authorities faced another dilemma: to ensure complete energy independence, since the level of danger in case of accidents at nuclear power plants is high (Akyuz 2017, 7-9). At the social level, there are serious trends in the development of anti-nuclear discourse. Objectively, the main arguments of the representatives of this movement have practical features: the proximity of nuclear power plants to urban and residential infrastructure, the lack of economic goals (due to the high cost of construction and maintenance of nuclear power plants), giving preference to renewable energy (Balkan Şahin and Bodur Ün 2022, 32-36).

The issue of inclining the official government of Türkiye towards nuclear energy in terms of political aspects has several important principles. Firstly, the construction of new nuclear power plants will be carried out through the use of foreign technologies, and the lack of personnel will be compensated by their further training abroad. Secondly, since the end of the 90s of the XX century, the official position of Türkiye has been aimed at the complete diversification of the energy sector, where the final goal is to reduce import dependence as much as possible, increase the share of domestic resources for full energy independence in terms of 2020-2030. In addition, the development of nuclear power will significantly reduce the use of coal, to a certain extent, and natural gas for combined heat and power plants (which are especially well developed in the west and south of the country). The development of nuclear energy is also able to meet the energy needs of the eastern part of Türkiye, where at the moment the system of small hydroelectric power plants is exceptionally developed.

Despite the dissolution of the previous body in the field of nuclear energy, the Government was officially presented with strategic plans for the development of this area in the interval of 9 years. The first strategy, from 2014, calculated until 2018, mainly updates the Vision 2023 agenda: to develop and diversify the area to achieve a supply volume of 5% to the total chain from nuclear power plant systems by the deadline. Certainly, such a volume is calculated in connection with the issues of other energy sources, but it should be noted that in case of successful launch of all nuclear power plants in the project, the above figure will increase either by 2 or 3 times. The cooperation of this organization and the International Atomic Energy Agency (IAEA) was aimed at the development and proper use of the peaceful atom strategy (TAEK

2013). The other strategy, which covers 2019-2023, is practically the same, moreover, the framework in the Vision 2023 projects is confirmed, namely, the transformation of Türkiye into a country with a priority nuclear direction, which also has a position on the world stage (TAEK 2019).

Based on official documents, the Turkish government, however, to this day has not developed a unified political strategy in the field of nuclear energy. This fact reveals common foreign policy disagreements, when nuclear energy was transformed into internal regional development. To resolve these disputes, after the financial crisis of 2001, at the official level, a decision was made to privatize this sector (indirectly, in Vision 2023, all energy implications were included in the course of liberalization), and state coverage will have more legislative implications than beneficial (Kaya and Göral 2016). Nevertheless, one cannot fail to emphasize the state interest, which demonstrates the significant inseparability of nuclear energy and the internal, party approach. By integrating new nuclear power plants into the network, the idea of an ever-widening gap between energy imports and expected consumption is being implemented, that is, the government's goal is to provide a stable 10,000 MW/h by 2030, capable of covering the needs of developing regions (for example, the eastern Mediterranean Sea and the central western part of the Black Sea).

In the field of uninterrupted power supply, the ruling Justice and Development Party is primarily focused on reducing Russian gas imports, which will further reduce the operation of thermal power plants, but will significantly promote the role of nuclear power plants and technologies to strengthen the internal cycle of independent electricity supply (Keçeci 2020). It is expected that by 2030-2035 Türkiye will be able to compensate the need for natural gas to a greater extent, however, objective difficulties arise at the stage of assessing profits, and in general, do not allow nuclear power plants to be correctly classified in the country's energy security system.

From a political point of view, at the internal level there is a certain approach in the field of nuclear energy, which, in fact, does not have a strategic isolation. From the point of view of foreign policy, the reduction of natural gas imports from Russia testifies to the dualistic approach of the Turkish government: while reducing this area, joint projects are being carried out with Russia in the nuclear energy industry. A relatively equidistant approach contributes to the principle where none of the representatives of the project has certain advantages, the role of foreign actors has been brought to the maximum permissible threshold (Gabrielyan 2022, 15-21).

Existing projects for the construction of nuclear power plants in Türkiye are actively developed with the participation of foreign consortiums, which are most often state-owned. The operation of such types of strategic facilities is often in the nature of political agreements at the highest level. The politicization of nuclear energy in Türkiye is almost always associated with the diversification of the domestic energy market, the heterogeneous functionality of tasks and technologies. This policy was developed in the early 2000s (when the current ruling Justice and Development Party came to power), when a liberal, non-state, institutional approach was first updated in Türkiye in the entire energy sector of the country. The second stage, which began in early 2015 and continues to this day, when the free market system was officially established, the neoliberal policies of the Justice and Development Party were

associated with technological heterogeneity, respectively, with a more flexible state approach that promotes vectorial foreign policy activity. Nuclear energy has become more of an instrument of foreign policy flexibility for other actors, where Russia, the countries of East Asia (Japan) and Western Europe (France and Germany) are making adjustments and proposals in the development of this energy sector.

The current and former partner in the construction of a nuclear power plant in Türkiye is Russia, where, together with the state organization Rosatom, an infrastructure of four Akkuyu reactors (VVER-1200) is being organized. The specified nuclear power plant is being built on the territory of the southeastern part of Türkiye, on the coast of the eastern segment of the Mediterranean Sea. The project to build a nuclear power plant in this part of the country has been developed since the mid-1980s, but the final proposal was formulated in 2007, with the final decision of the Turkish parliament to transfer the development and construction of the plant to another state (Varış 2020). The intergovernmental agreement signed in 2010 between Russia and Türkiye provided for the construction of a nuclear power plant, taking into account the use of Russian technologies and with a total capacity of 4800 MW/h¹. The end of construction and commissioning of the first power unit is expected to be completed by 2023 (in honor of the centenary of the formation of the modern Türkiye, one of the goals of Vision 2023), and the rest by 2026.

It is noteworthy that the agreement will be implemented according to the BOO (Build-Own-Operate) model, which includes, among other things, operation from the Russian side, where, as a result of the agreements, a corresponding organization was opened in Türkiye (*tur*: Akkuyu Nükleer Güç Santrali (NGS) Elektrik Üretim A.Ş.). It should also be noted the latest agreements, when the Turkish Electricity Trading and Contracting Company (TETAŞ) for 12,35 c/kWh will buy the final products and redistribute the electricity prices to the regions at the agreed state rate (the contract was concluded for 15 years) (Androulaki 2022).

Returning to the topic of Türkiye's practical energy dependence on Russia, it should be noted that, based on the fact that the Akkuyu nuclear power plant is currently the most promising option for the development of nuclear energy in Türkiye, a bilateral energy precedent is being created in the political interconnection of the geostrategy of both countries². Here, the possibilities of the Turkish government, aimed at reducing the share of electricity imports in general, are significantly limited, moreover, the issue of constant and affordable provision of the eastern regions is on the agenda of internal energy security³. The Akkuyu nuclear power plant, first of all, is aimed not so much at

¹“Agreement between the Government of the Russian Federation and the Government of the Republic of Turkey on Cooperation in the Construction and Operation of the Akkuyu Nuclear Power Plant in the Republic of Turkey.” Accessed June 13, 2023. <https://www.resmigazete.gov.tr/eskiler/2010/10/20101006-6-1.pdf>.

² Akkuyu Nuclear. 2010. “Akkuyu NPP construction project.” Accessed June 13, 2023. <http://www.akkunpp.com/akkuyu-npp-construction-project>.

³“Joint Declaration between the Republic of Turkey and the Russian Federation on Progress towards a New Stage in Relations and Further Deepening of Friendship and Multidimensional Partnership, Moscow, 13 February 2009. Republic of Türkiye Ministry of Foreign Affairs.” Accessed June 13, 2023. <https://www.mfa.gov.tr/joint-declaration-between-the-republic-of-turkey-and-the-russian-federation-on->

the operation of a facility of this kind, but rather at compensating for electricity consumption in the territory of the eastern Levantin. The most important safety issue is the factor of the very participation of the Russian state body Rosatom, where the most updated technology is not fully developed and operated. Nevertheless, despite such a critical approach (including the seismic stability of a nuclear power plant), the developers themselves position the Akkuyu nuclear power plant as the most relevant program that meets all standards and environmental requirements (Iban and Sahin 2022; Bıçakcı and Evren 2022; Aydın 2020).

Another project within the framework of Türkiye's nuclear energy is the construction of the Sinop station, located in the city of the same name, in the north of the country, on the Black Sea coast. The significance of this project was incomparably great in political terms in the historical period of 1995-2010, when the use of the Western (European) vector in Türkiye's energy policy was a priority. The participation of Western and Asian companies made a significant contribution to the integration of the European energy production system, which was strategically linked to the idea of a hub thesis in foreign policy (Kryukov 2016; Güney 2016; Uyar 2017, 110-114). However, a significant fact in the uncertainty of this project was, perhaps, the unwillingness of the official government of Türkiye to financially allow the state approach, and the recent trend of the depreciation of the lira, the uncertain situation of the economy does not allow us to imagine the expediency of a nuclear power plant as a whole. Another negative factor was the preparedness of countries in the implementation of the technical base, when certain key approaches were not revised (Akgün, Ada and Koçkar 2015). Perhaps a practical problem was the fact that the presentation of the Sinop nuclear power plant also had political problems, where it was impossible to situationally assess the role of the object in the Turkish energy stronghold system (Yavuz 2023). This thesis can be confirmed by the aforementioned fact, namely the absence of a strategic state approach in the field of nuclear energy (Ozmen 2020).

As in the case of the Akkuyu nuclear power plant, Sinop envisaged the BOO model, where all development, construction and operation were supposed to be transferred to foreign consortiums, that is, in 2013, the Japanese Mitsubishi Heavy Industries, as well as the French Areva. The memorandum signed at a high level provided for the construction of four power units, where in total each produced 1120 MW/h, when the completion and commissioning of the first power unit were calculated for 2031 (Demircan 2020). In general, the technical novelty of the Japanese project had some ambiguities after the incident at the Fukushima nuclear power plant in 2011, which called into question the significance and environmental future of this project.

Given the previous man-made disasters, there is a need to consider safety issues, as a result of which the Japanese consortium Mitsubishi Heavy Industries left the Sinop NPP project in 2019, and the further participation of the French side in the person of Areva was in doubt, based on the fact that the development was carried out jointly. Another factor was the final estimate of the Japanese consortium (44 billion US

dollars), which the Turkish side refused due to the lack of such material resources⁴. This factor was facilitated by the fall in the value of the lira, which politically determined the rejection of further mutual cooperation (Erat et al. 2021; Baltas et al. 2019).

The construction and operation of new nuclear power plants from the point of view of reducing the impact of electricity imports is of fundamental importance. From the position of political strategy, the infrastructural value of nuclear power plants is aimed at reducing long-term costs, in return receiving their own resources, respectively, and state control, regardless of the liberal course of the country's energy policy (Aydın 2018; Kryukov 2016, 87-92; Güney 2016, 69-71). Before the immediate launch of the NPP construction programs, it was expected to reduce the level of imports by 7.2 billion US dollars, and in the future (in the context of an increasing level of electricity consumption), the reduction in funds would increase significantly⁵. The official approach of the Turkish government in the long term can be explained by the goal of increasing the level of energy independence of the country. The future of the Sinop NPP has repeatedly been a priority in Türkiye's energy strategy, but hypothetically, the project is currently frozen, despite the possibility of the Russian side to unify it with Akkuyu, offering the same political and technological conditions⁶.

The last, third, planned nuclear power plant in Türkiye, Igneada, is the result of a joint development with China. The new Igneada NPP, unlike others, is located in the west of the country, near Istanbul, not far from the Bulgarian border, on the Black Sea coast. As in other nuclear power plants, it is similarly planned to build four new power units, whose total capacity (one) will be from 1250 to 1400 MW/h (Harunoğullari 2019). The plans to build a nuclear power plant in a fairly populated region proceeds from objective goals, where the level of increasing energy will increase in the interval up to 2040. The next factor is that this technology is not Chinese, but the result of a joint development with the American Westinghouse, the certification of which comes from the fact that power reactors are also approved in many Western countries (Gürel and Kozluca 2022).

Despite the fact that the details have not been discussed, the implementation of the standard option in the energy strategy of Türkiye, the BOO model, is supposed to be implemented. The presence of China's energy capital in Türkiye is not fundamentally new, but cooperation in such a strategic project is the result of many years of negotiations between the official authorities (Guo and Fidan 2018). As a result, in 2016, a memorandum of cooperation was signed between the state-owned energy companies of China and Türkiye with the approval of the strategic project turnover, the

⁴ Tsuji, Takashi. 2018. "Japan to scrap Turkey nuclear project." *Nikkei Inc, December 4, 2018*. Accessed June 13, 2023. <https://asia.nikkei.com/Economy/Japan-to-scrap-Turkey-nuclear-project>.

⁵ Karaaslan, Bulent. 2013. "Nuclear plants to help Turkey shave 7.2 bn \$ off energy imports." *Anadolu Ajansı, May 4, 2013*. Accessed June 13, 2023. <https://www.aa.com.tr/en/world/nuclear-plants-to-help-turkey-shave-72-bn-off-energy-imports/249638#>.

⁶ Spasić, Vladimir. 2021. "Turkey to construct two more nuclear power plants - Erdoğan." *Balkan green energy news, November 10, 2021*. Accessed June 13, 2023. <https://balkangreenenergynews.com/turkey-to-construct-two-more-nuclear-power-plants-erdogan/>; WNN. 2023. "Turkey 'aiming for 20 GW of nuclear by 2050s'." *July 10, 2023*. Accessed July 30, 2023. <https://world-nuclear-news.org/Articles/Turkey-aiming-for-20GW-of-nuclear-by-2050s>.

obligations of Beijing and Ankara in the field of nuclear safety (Pekar 2019; Eliküçük Yıldırım 2022; Atlı 2022). However, the uncertain outlook for the Igneada NPP is indicative of some aspects related to the positioning of the project itself. Given the complexities of US-China relations (in particular, energy relations), it is impossible to assess the use of certain developments in a third country. Unlike the Sinop and Akkuyu projects, at the current stage, the final estimate, the construction price and the surplus for the Chinese side have not been presented for Ignead. Meanwhile, no official political negotiations took place after 2017, and construction was supposed to start before 2023⁷ (Gündoğan and Turhan 2017; Degang, Xu and Tu 2022; Eliküçük Yıldırım 2022). Based on these facts, the prospect of the Igneada NPP is uncertain, given the objective political and financial components and the impossibility of the Turkish government to present the position of the project in the country's energy system.

Comparing current strategies and programs, the position of the nuclear component of Türkiye's energy security can be inferred from common distinctions and trends. Based on the analysis, the lack of a comprehensive strategic approach in the current area, the influence of the state interest is limited to the guiding role. The influence of the neoliberal course in the energy sector as a whole puts the nuclear section on a part with the renewable and oil and gas sectors, where the position of the state is considered exclusively in the macropolitical system, attracting external actors, as well as the possibility of implementing the general trends of Vision 2023, as well as establishing a special pricing policy, reducing the government's strategic interest to a minimum. In certain aspects, this trend in the field of energy can be characterized as a general political one, where new resources diversify this area (Kulaksız 2019; Pekar 2019; Guo and Fidan 2018).

The shortcomings in the field of nuclear power plant construction are associated with a holistic approach to the importance of this area for the state. If in the period before 2015 (in particular, the presidency of Abdullah Gul) the development of nuclear energy was considered a priority, then after 2016 (during the presidency of Recep Tayyip Erdogan and the premiership of Ahmet Davutoglu) there was a sharp political decline, namely: an increase in the importance of the oil and gas region as a central component of the energy citadel of Türkiye. The lack of progress in the construction and operation of the Sinop and Igneada nuclear power plants can also be explained by the state's fixation on the more accessible Russian organization Akkuyu, which, nevertheless, indicates that the lack of a complementary policy is compensated by strategic partnership.

Based on this, the influence of Russian technologies in the field of nuclear energy can also be considered in other political aspects. In foreign policy, it can be stated that the Turkish side, represented by the ruling Justice and Development Party, does not include nuclear energy in the context of the hub strategy, respectively, the nuclear power plant service (in the foreseeable future) will be aimed at conditional generation

⁷ Baldoni, Mattia. 2022. "New Reactors Will Help Meet 'Massive' Demand For Energy And Reduce Reliance On Fossil Fuels." *NucNe*, January 17, 2022. Accessed June 21, 2023. <https://www.nucnet.org/news/new-reactors-will-help-meet-massive-demand-for-energy-and-reduce-reliance-on-fossil-fuels-1-1-2022>.

of electricity on an intra-republican scale. Russia's monopolistic position in Türkiye's nuclear power industry significantly increases foreign policy efforts. However, the increase in energy alternatives reduces other areas, including nuclear. The construction of nuclear power plants in Türkiye by Russia in the foreseeable future is likely to become much more intensive, but the importance of the former in the energy citadel will not change significantly. An assessment of the future of nuclear energy in Türkiye may also be the fact that in the context of political transformations, the country's position in the Western system of energy security is not yet so clear. If in the case of oil and gas projects it is possible to argue about favorable political positions, then the still unfulfilled nuclear energy does not have any prospects in the context of geostrategy.

The status of hydrological resources through the geopolitical processes of the Greater Middle East

Occupying a key position in Türkiye's energy policy, hydropower is one of the developed and proven systems of an uninterrupted source of electricity. Several practically important reasons contributed to this factor, where, not having sufficient oil and gas reserves (most of them are imported), the Turkish government has been considering a hydroelectric power system since the 2000s as a priority industry. Considering this issue through a historical prism, it must be noted that the importance of hydroelectric power plants was consolidated in the future, while giving priority to small systems. According to the geographical position of Türkiye, as well as the limited funds, in the face of the insufficiency of other energy sources, it is relevant that the hydroelectric power station is the central and most important resource for the country. It was expected that by 2020 the total production of electricity from the hydroelectric power plant will be 35,000 MW/h, in parallel offsetting the level of coal use (Ozturk and Yuksel 2016).

Based on these factors, the development of alternative energy in Türkiye is also facilitated by the general state approach. The trend of neo-liberalism, which began in 2015, indicates a general privatization of this sector, where in the case of hydropower, the approach indicated the formation of a market economy of territorial significance. The increase in the level of investments of private interests contributed to diversification into the local economy, especially in the eastern regions, where the level of investment is significantly inferior to the same central or western regions. This condition was also helped by the fact that in the early 2000s, the ruling Justice and Development Party approved a law allowing, using a simplified procedure, to expropriate territories that are privately owned, but used for their intended purpose. It is noteworthy that these lists included regions mainly inhabited by Kurds, that, in addition to aspects of private law, political issues were also raised (Erensü 2017, 127-129; Adaman and Akbulut 2021). Considering the fact that the lack of energy developments in the territory of eastern Türkiye, which contributed to the development of a separate block in alternative energy, the construction of small hydroelectric power plants, where it is possible not to use huge financial resources, while solving issues of uninterrupted power supply. Small hydroelectric power plants are designed to

compensate for the missing electricity (up to 10 MW/h in Türkiye), reducing the level of state influence by an order of magnitude lower than in the case of oil and gas or nuclear energy. As confirmation of this thesis, by 2023 it is calculated that out of 1391 small hydroelectric power plants 1164 will be under the control of private investors (about 73.2%) (Erensü 2017, 124).

The course of neo-liberalism in Türkiye's energy policy is often reflected in the hydroelectric system for several probabilistic reasons. The limited resources and constant financial crises in Türkiye (both in 2001 and the current serious one in 2017) have actualized many issues of public administration, and the increasing level of electricity consumption in the medium term would require state guarantees in the regulation of pricing and logistics strategies. In order to compensate and protect against further social shocks, the government, based on the development of the region, established a constant purchase value, which was further distributed among the beneficiaries.

Another factor is political, when the purchase of electricity from border countries is not possible. The eastern regions of Türkiye in the energy context are significantly abstracted from international communications, the level of self-sufficiency forces regional administrations to take into account Ankara's requests and proposals. During the last 20 years, the development of small hydropower plants has brought a general characteristic of the entire energy policy of the country, increasing the role of the private and free market. Energy federalism in Türkiye shows that an active course of neo-liberalism can succeed if other issues, in particular agriculture, are ignored. It is possible that in the medium term the role of foreign investment from Asia may also increase.

Exploring the significance of classical (large) hydroelectric power plants, several assumptions are put forward in the framework of ensuring the energy security of Türkiye. Unlike small hydropower plants, large ones are heavily politicized due to their location, potential and environmental friendliness. Another important difference is that the majority of classical hydroelectric power plants are at the disposal of the state, and the role of non-profit organizations is limited. Based on the official neo-liberal course recommended since the period of Türkiye's EU membership strategy, it also embraced the republican layer, taking into account the establishment of state capitalism in much more important infrastructures. Such dualism testifies to the indicated state approach to diversification of each energy sector, but taking into account global practices. Of significant political interest is the strategic importance of the water and logistics potential of the two largest rivers in the Greater East, the Tigris and Euphrates. The transformation of water policy, first of all, has a strategic aspect to use the entire hydrological potential of Türkiye by 2023 (Islar 2012). The logistical potential is largely of secondary importance, where the ultimate goal is to have a stable hydrological resource to serve Türkiye's large energy sector. A certain autarchy in this issue indicates that in the future political disputes with Syria and Iraq regarding the water strategy will become an instrument of foreign policy influence in case of failure of some of Türkiye's initiatives in these countries.

The active construction of large hydroelectric power plants in Türkiye began at the end of the 20th century, namely, in 1992, one of the largest platforms in the world, the

Ataturk Dam, was commissioned, located in the southeast of the country, not far from the Syrian border (Kalkan 2014; Kartal and Kadrioglu 2019). Except for its energy and agricultural importance, the construction of the new dam signaled the beginning of a comprehensive approach to artificially restrict resources for other countries. Attention is drawn to the importance of this hydroelectric power plant, which has a capacity of 2,400 MW/h, allowing it to actively meet domestic electricity demand. The concentration of the Turkish government in the energy subtext indicates the priority of the sector, the need to monopolize the potential of the Euphrates to the detriment of the interests of other countries. Moreover, the current situation disrupts economic cooperation between Türkiye and Syria since 1986, where 58% of the water potential of the Euphrates was to be distributed among the Arab countries (Al-Ansari 2019). Despite the fact that both Syria and Iraq had to adjust their approaches to water policy, however, in the context of civil wars, the current situation is capable of provoking a humanitarian catastrophe, and not only in the matter of drinking water, but also in all agricultural security. In addition to the above, it must be emphasized that the Tigris and Euphrates are key sources of logistics for Syria and Iraq, and access to the Persian Gulf can solve many transport issues.

As a continuation of the topic of Türkiye's hydrological autarchy in the political dimension, it is necessary to consider another topical hydroelectric power station, Ilisu, built already at the source of the Tigris River. Put into operation in 2019, this hydroelectric power plant had both technical and environmental and political problems from the very beginning. As a result, attempts were made to governmental intervention in the project, and in 2008 the Turkish government allocated approximately 8,5 billion liras for the construction of the entire complex. The nominal capacity of the hydroelectric power plant was 1200 MW/h⁸, and the estimated potential is aimed at solving many issues (in particular, energy) of the southeastern part of Türkiye (Zwahlen 2022, 461-465; Şenel 2019). During the development of the project, the British investment company Balfour Beatty gradually came to the fore, and then Swiss, Austrian and German concerns. It is not known for certain whether this is the result of political pressure from European environmentalists or whether it is an unsatisfactory financial component with significant risks. As in the case of the Ataturk hydroelectric power plant, so with the Ilisu there is a threat of the PKK's combat impact, and with the outbreak of civil wars and the emergence of terrorist organizations in Syria and Iraq, the security of infrastructures is in the zone of real defeat by various means (Hourie 2019; Kibaroglu and Sayan 2021).

The essential importance of the hydroelectric power plant for Türkiye was marked by a period of energy isolation and ignoring the interests of neighboring countries. Having a colossal water reserve, the hydroelectric power plant system is the most developed among the entire list of alternative energy types, and from an economic point of view, it is more diversified: volatility is on a positive markup. However, the neoliberal approach does not allow us to assert that the region has a free market trend:

⁸ T.C. Cumhurbaşkanlığı. 2020. "Cumhurbaşkanı Erdoğan, Ilisu Barajı ve Hidroelektrik Santrali birinci ünitesinin açılışını gerçekleştirdi." 19.05.2020. Accessed June 21, 2023. <https://www.tccb.gov.tr/haberler/410/120264/cumhurbaskani-erdogan-ilisu-baraji-ve-hidroelektrik-santrali-birinci-unitesinin-acilisini-gerceklestirdi>; Batman Valiliği. "Ilisu Barajı ve HES." Accessed June 21, 2023. <http://www.batman.gov.tr/ilisu-baraji-ve-hes>.

small hydroelectric power plants are more designed for regional development than for national development. From the point of view of foreign policy impact, of course, reducing the domestic demand for electricity, there is no question of its import from other countries. As already mentioned, water policy has become a key element in influencing neighboring countries, which, being in a post-conflict period, are only now solving new problems, not excluding entry into an energy and logistical confrontation with Türkiye. This kind of political dualism indicates the emergence of a new and non-traditional hotbed of conflict, where alternative energy is at the center of political clashes.

Consideration of the deep details of the development of alternative energy in Türkiye contributes to the classification of some strategic approaches. In this case, the strategic feature is formed from the official plans of the ruling party, the work of the relevant bodies. In this context, the authorized Ministry of Energy and Natural Resources considers the development of the following sectors of renewable resources as determinant: solar, wind, geothermal, organic and hydrological⁹. Starting with the most massive sources of solar, wind and hydrological, it is important to note that in the total volume the potential of these energy resources can be incomparable competition with traditional sources. As of the end of 2022, hydroelectric power plants managed to generate about 31,558 MW/h of electricity (total percentage 31%), solar stations 8,479 MW/h (8,35%), and wind 10,976 M/Wh (10,81%)¹⁰. Comparing official statistics, the wind and hydrological components have had a significant increase since 2019, while the solar one since 2016, due to the beginning of the spread of this area throughout Türkiye¹¹.

The development of other types of alternative energy sources in Türkiye (organic use of biological waste, geothermal) have recently begun to be used more intensively than in the period 2011-2015. This is facilitated by the fact that Türkiye ranks first in geothermal sources in Europe, 4th in the world. In total, for 2022, 1686 MWh (1,66%) of energy were obtained by enriching mining sources, re-exploiting the Kyzylter power plant. It is noticeable that in 2008 the course of liberalism also affected this type of alternative energy, where some specialized organizations were partially privatized¹².

A significantly different situation is observed in the organic part of alternative energy. It is important to note that the processing of biomass into energy is a relatively new direction, with a number of legislative initiatives taken in Türkiye since 2011 (Law No.5346). Despite a much smaller role, agricultural enterprises currently provide 2,14% of the total number of alternative energy sources, the so-called 2,172 MW/h,

⁹ "TURKEY: Ministry of Energy and Natural Resources (MENR) Strategic Energy Plan 2015-2019." *Asia Pacific Energy Portal*. Accessed June 21, 2023. <https://policy.asiapacificenergy.org/node/2245/portal>.

¹⁰ Ministry of Energy and Natural Resources. 2022. "Türkiye national energy plan." Accessed June 21, 2023. https://enerji.gov.tr/Media/Dizin/EIGM/tr/Raporlar/TUEP/Türkiye_National_Energy_Plan.pdf.

¹¹ Official Website of the International Trade Administration. 2022. "Electric Power - Renewables, Smart Grid, Energy Storage, Civil Nuclear." Accessed June 21, 2023. <https://www.trade.gov/country-commercial-guides/turkey-electric-power-renewables-smart-grid-energy-storage-civil-nuclear>.

¹² T.C. Enerji ve Tabii Kaynaklar Bakanlığı. 2022. "Jeotermal." Accessed June 21, 2023. <https://enerji.gov.tr/bilgi-merkezi-enerji-jeotermal>.

significantly increasing the importance, especially in those regions where there are no wind, solar or geothermal stations¹³.

The development of new alternative energy industries in Türkiye is realizing a dynamic political and economic transformation of the entire industry. From a political point of view, although protectionism is observed at the legislative and executive levels, it is nevertheless aimed at diversifying the investment level and ensuring a self-sufficient energy course at the level of administrative units. From the point of view of economic transformation, the state presence remains, which is created by specialized budget funds, subsidy programs for small national (local, Turkish) energy companies. It is noteworthy that already in 2021, a total of 1 billion US dollars was allocated for the development of wind energy, which is an unprecedented measure of political regulation in the context of the domestic financial crisis. In addition, the issue of reducing environmentally harmful emissions into the atmosphere is being updated (the Mejlis of Türkiye ratified the Paris Agreements in October 2021), where by 2053 there is a global trend of abandoning carbon and oil sources¹⁴. As part of the state program to reduce CO2 emissions by 2030 to 21%, and in 2020 the figure approached 524 million tons¹⁵. Along with other natural sources of renewable energy, the system of using solar energy is also developing. Thus, in 2022 in Türkiye, the total installed capacity is 8479 MW, that is, the percentage of use has increased to 8,35 percent compared to 7,83% in 2021¹⁶.

The presence of an economic (currency) crisis in the country significantly regulated the new agenda of alternative energy. When creating block and autonomous units, there are no risks that are present in the western regions. Based on the level of general social development, when the eastern regions are significantly inferior to the western ones, there are no sharp financial gaps among the social status of the population. Perhaps this principle will migrate from energy experience to political experience in the future. This idea has certain prerogatives as a possible stage in the decentralization of the entire political administration of the country, where energy experience had a significant surplus.

The development of renewable energy in Türkiye at the strategic level did not have significant trends towards the transformation of value approaches. Since the 2010s, this subtext has been repeatedly updated until it is included in the official government program. In particular, the strategy of the Ministry of Energy and Natural Resources of Türkiye (2013-2023) highlights the critical importance of developing new facilities,

¹³ T.C. Enerji ve Tabii Kaynaklar Bakanlığı. 2022. "Biyokütle." Accessed June 21, 2023. <https://enerji.gov.tr/bilgi-merkezi-enerji-biyokutle>.

¹⁴ Republic of Türkiye Ministry of Foreign Affairs. 2022. "Türkiye's International Energy Strategy." Accessed June 21, 2023. <https://www.mfa.gov.tr/turkeys-energy-strategy.en.mfa>; Turkey - Renewable Energy Integration Project. Sustainable Development Bonds Results. Washington, D.C.: World Bank Group. Accessed June 21, 2023. <http://documents.worldbank.org/curated/en/535711506333805464/Turkey-Renewable-Energy-Integration-Project>.

¹⁵ Kucukgocmen, Ali. 2022. "Turkey raises greenhouse gas emission reduction target for 2030." *Reuters*, November 15, 2022. Accessed June 21, 2023. <https://www.reuters.com/business/cop/turkey-boosts-greenhouse-gas-emission-reduction-target-2030-2022-11-15/>.

¹⁶ T.C. Enerji ve Tabii Kaynaklar Bakanlığı. 2022. "Güneş." Accessed June 21, 2023. <https://enerji.gov.tr/bilgi-merkezi-enerji-gunes>.

developing local infrastructures by diversifying various renewable energy opportunities. Presumably, this strategy aims at a political perspective on renewable energy policy in general. In favor of this judgment is the fact that already in 2009, at the government level, a decision was made on direct interaction between the state and the private market, where the implementation of a new energy policy plan in the possibilities of renewable resources became an end in itself (Kulaç and Ciğeroğlu Öztepe 2020, 893). Significantly, the formation of a new political agenda for renewable energy was manifested in an active approach on the part of the EU since 2005, after a legislative initiative to develop a new plan (Kulaç and Ciğeroğlu Öztepe 2020, 891-892).

The direct directive affected not only the legal field of EU members, but also countries seeking integration and membership in the latter. If we consider the stage of the EU-Türkiye relations in the indicated time intervals, the energy agenda was a fundamental part, partly a priority. Despite the phasing out of the Turkish government in favor of integration with the EU, since 2016, the main state approaches in the field of renewable energy have been developed at the intra-republican level. It should be noted that at the moment there are no mechanisms developed to determine this context in foreign policy programs, namely: complete independence in a closed cycle or partial integration into EU renewable energy projects in Eastern Europe and the Balkans.

In the context of geo-economic interests in renewable energy, interstate projects are being carried out to build new hydroelectric power plants. Definitely, the development of hydropower infrastructures around the Kuro-Araks region is the most promising, where Georgia is a good example. Since 2010, interstate negotiations have been held between Türkiye and Georgia, and specifically to use the Black Sea area to build new energy capacities, aimed at the joint distribution of electricity. In total, the cost of construction of the new Namakhvani hydroelectric power plant (as well as the secondary Tvishi) was to be about 800 million US dollars, and the construction site was the Rioni River in the Imereti region. As part of the agreement, the construction was entrusted to the private Turkish company Enka, whose production capacity was 250 MW, and the maximum energy generated by each of the five turbines was 50 MW¹⁷. However, recent events with the withdrawal of the Turkish consortium from the project testify to practical intractable difficulties, including environmental ones. However, the main problem is the Georgian government's gradual abandonment of the course of energy liberalism, in particular with an increase in the state's share¹⁸.

With the exception of external programs in the field of renewable energy (at the moment, the prospects for a hydroelectric project in Georgia are rather pessimistic), it is geo-economically important for Türkiye to preserve the independence of domestic sources, including the use of maritime spaces. At the moment, it can be stated that the entire sector of alternative energy is aimed at reducing import dependence, respectively, maintaining the policy of diversifying the sector as a whole. Support for

¹⁷ Khvicha Vashakmadze. 2021. "Power Struggle in Georgia." *Transitions*, March 8, 2021. Accessed June 21, 2023. <https://tol.org/client/article/power-struggle-in-georgia.html>.

¹⁸ Palazzo, Claudia. 2021. "Namakhvani HPP: Georgian Hydropower Between Energy Security and Geopolitics." *The Jamestown Foundation*, June 16, 2021. Accessed June 21, 2023. <https://jamestown.org/namakhvani-hpp-georgian-hydropower-between-energy-security-and-geopolitics/>.

the private sector in the political sense is a necessary measure to maintain the stable work of domestic actors, and the issue of retaining domestic capital is relevant due to the unstable inflation rate. In the long term, inflation and uncontrolled rise in prices for basic needs will affect both the energy sector and the transport sector. If we take into account that it will be possible to accumulate renewable energy sources, then in fact the export procedure may not take place due to an undeveloped logistics line, where the construction of new branches will require quick investments. This subtext at this level has not yet been officially considered, and since the Turkish renewable energy sector itself has not been finally assessed, potential counterparties interested in stable supplies of clean sources have not been found. However, the development of strategies for oil and gas and carbon energy projects is taking place on a par with the renewable one, which implies a slight defragmentation, but the prioritization of the latter (it must be taken into account that the main action plan is aimed until 2023). In this regard, at the moment, for the solvency of the entire renewable energy sector, investments in the amount of 60 billion US dollars are needed, which even according to the most optimistic estimates is very difficult in an unstable economy, and more voluminous state guarantees for individuals will also be required (Kalehsar 2019, 12).

Updating the transport agenda, which should be viewed through the prism of building new eco-friendly infrastructures, will require about 47 billion US dollars of investment, of which 18.6 billion should be received immediately to combine the needs in the industrialization of the country. A significant part of these investments (about 24 billion US dollars) should be aimed at reducing carbon sources and phasing out the use of this product as a whole (Kalehsar 2019, 13).

The energy balance in Türkiye as a whole is a conglomeration of various resources, which has been developing intensively since 1990, with an increase in the positions of non-carbon sources. According to the statistics of the International Energy Agency in a thirty-year time interval, energy consumption has risen by 78,25%¹⁹. According to the world energy statistics report (data provided by the UK Energy Institute), carbon and oil and gas sources continue to dominate, dynamic consumption fragments the statistics thoroughly. Thus, oil consumption in terms of power is 583,71 TW/h (in 2017 this figure is 576), natural gas is 512,12 TW/h (515,68 in 2017), coal is 484,84 TW/h (458,91 in 2017). Of the renewable sources, hydropower has a fundamental position (total number of small + medium) 175,19 TW/h (154,94 in 2017), wind 91,62 TW/h (against 47,65 in 2017), solar 41,49 TW/h (7,69 in 2017)²⁰. There is no situation with nuclear energy due to the construction of the Akkuyu nuclear power plant for 2022.

The development of renewable energy in Türkiye is aimed at creating a new business environment where local companies are given priority (or Asian companies can become a potential donor). The accumulation and concentration of capital in this area of energy underlines the importance of the neoliberal course, which is relatively stable in the current conditions, which cannot be said about the long term. Given the

¹⁹ IEA. 2022. "Türkiye: Key energy statistics, 2020." Accessed June 21, 2023. <https://www.iea.org/countries/turkiye>.

²⁰ Our World In Data. 2023. "Energy consumption by source, Turkey." Accessed June 21, 2023. <https://ourworldindata.org/grapher/energy-consumption-by-source-and-country?stackMode=absolute&time=2017..latest&country=~TUR>.

gradual increase in electricity consumption in the country, it is necessary to point out the diversification strategy at the moment, which has been developed and is being used in the eastern regions of the country. It is not possible to assess the position of renewable sources in the west of the country, where the level of consumption is traditionally increased. In general, despite this problem, small and large hydropower plants may compensate for the demands of the eastern regions, but in the long term, the status of renewable energy in Türkiye will be fixed as politically important.

The EU has played a special role in the political understanding of renewable energy in Türkiye, setting the main legal and strategic vector used by the current ruling Justice and Development Party. It is noteworthy that the idea of green sources is not new, that is, it is considered as an integral part of the entire energy sector, but does not dominate oil and gas or carbon resources²¹.

Conclusion and discussion

Fundamental changes in government strategies have significantly transformed Türkiye's energy policy system over the past 20 years. Despite the primacy of oil and gas energy systems in Türkiye, there is a strengthening of the position of renewable sources.

The study emphasized repeatedly that the development of certain energy systems is directly reflected in geostrategic initiatives. In the case of renewable energy at the domestic level, there is a significant isolation of production, the approval of the agenda of regional energy sovereignty. The export of this strategy to foreign policy initiatives has not yet been successful, primarily due to the lack of proven geo-economic technologies. At this stage, a process of autarky is observed in alternative and hydrological energy, which, for reasons of the Turkish government, will reduce the energy deficit in the regions, given the high dynamics of the country's industrialization. However, at the same level, there are also elements of hard power policy in relation to the southern neighboring countries, where the limitation of hydrological resources carries a significant political context.

As a negative side of the energy context, it must be stated that the principle of uneven regional energy development is inherent in Türkiye at the present stage. The investment mechanism is most conciliatory towards the most developed regions, while the rest remain on the possibilities of internal financing (including through local private initiatives), less often, within the framework of state financing. At the current stage, the development of renewable resources corresponds to the logic of the EU amendments, to some extent serve as a practical guide. From a geo-economic point of view, the system of a hub thesis in the political discourses of Türkiye, namely integration into large regional energy transport projects, is not excluded. The positions of some Asian

²¹ Akçalı, Emel, Evrim Görmüş, and Soli Özel. 2022. "Towards A 'Green' Mediterranean? Environmental Geopolitics of Turkey, Egypt and Israel." *Institut Montaigne, February 17, 2022*. Accessed June 21, 2023. <https://www.institutmontaigne.org/en/expressions/towards-green-mediterranean-environmental-geopolitics-turkey-egypt-and-israel>.

countries may be the most promising, combining factors of internal development and geopolitical.

The position of nuclear power in Türkiye's electricity supply chain is clear on the scale of the southern regions, but not specified in the future development agenda. It is important to emphasize that the construction of the Akkuyu NPP in Türkiye has significant geopolitical implications, the country's nuclear energy system is being developed, with a traditional system of technology diversification. However, given the interest of Rosatom in the construction of the Sinop nuclear power plant, it is possible to transform to some extent into a unification subtext. Due to the practical novelty of nuclear energy in Türkiye, it is possible that in the near future the area will be monotonous and not diversified, unlike oil and gas or renewable energy sources.

Based on the above conceptual aspects, it is necessary to draw certain final theses on the nuclear and renewable components of Türkiye's energy balance:

- The perspective of the Akkuyu NPP in the energy security system of Türkiye is significantly uncertain. However, the construction of more than four power units with a capacity exceeding 4000 MWh is the most possible in the foreseeable future. The nuclear energy system in Türkiye is at the stage of development, where real prerogatives are taken into account, the creation of new energy supply systems.
- The position of the Akkuyu NPP in the political plane proceeds from the geo-economic features of Russia, increasing its own capital in foreign countries, and under the conditions of sanctions, this process is increasingly stimulated.
- Despite the development of the renewable energy system, it will not be able to surpass the importance of carbon sources. Stable high consumption of coal is a consequence of the developed energy technology in Türkiye. In contrast, the importance of small hydroelectric power plants is increasing.
- The construction of small hydroelectric power plants is of significant political importance to minimize the risks for states, as well as the creation of complex autonomous power supply systems. The expansion of the system of large hydroelectric power plants is developing with Türkiye's water policy of exclusivity, that is, causing direct damage to neighbors in favor of its own. This principle has a clear political connotation; it reduces the energy transport capabilities not only of the Arab countries, but also of the Kurdish autonomies in northern Syria and Iraq.
- The development of wind energy systems in Türkiye is very promising, while solar energy can be listed among the well-established ones. Global energy trends stimulate the development of such systems, but despite this, the Turkish example is biased due to the dynamic level of consumption of all energy resources.

Supplementary material

The supplementary material for this article can be found at <https://doi.org/10.46991/JOPS/2023.2.5.034>

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Conflict of interests

The author declares no ethical issues or conflicts of interest in this research.

Ethical standards

The author affirms this research did not involve human subjects.

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