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ENERGY COOPERATION BETWEEN SWITZERLAND AND THE EU COUNTRIES

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Abstract

The article is devoted to the study of the energy sector development in the Swiss Confederation. The key trends in the Swiss energy market are identified: a reduction in the total volume of energy consumption in the country, which energy carriers occupy the largest share in the consumption structure, trends in the legislative framework regulating the energy sector. In 2017, a new Energy Strategy until 2050 was adopted, the main message of which is to phase out the use of nuclear energy and switch to renewable energy sources. The most important types of energy used in Switzerland are oil, electricity from nuclear and hydroelectric power plants, and natural gas. The largest amount of energy is consumed by the transport sector. Also, the dynamics and the ratio of indicators of production, export, import of energy in Switzerland were analyzed. Due to the very small number of mineral deposits, about 75 % of the energy is supplied to the country by partner states. Fuel resources (oil and oil products) account for a significant share in

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imports, and electricity – in exports. The energy cooperation between Switzerland and the countries of the European Union is considered – the current stage, the dynamics of the supply of fuel energy resources, the prospects for the development of relations in the energy sector are identified. Over the past 10 years, the countries of the European Union have occupied about 100 % of the supply of fuel resources to Switzerland. Switzerland has been in talks with the EU on a bilateral agreement in the electricity sector since 2007. A key perspective in energy cooperation between the European Union and the Swiss Confederation is the transition from the use of non-renewable fuel energy resources and nuclear energy to renewable energy sources.

Introduction

The energy component of the country's resource supply is undoubtedly one of the main factors in the development of the country's economy as a whole. Energy, specifically energy sources, play the role of the foundation for launching various business processes: production, distribution, exchange and consumption of goods, services, works, etc. This applies both the use of energy resources for industrial purposes and for domestic purposes. It should be noted that the provision level of the state with energy resources directly relates to the issue of national security of the country. There is such a thing as raw material safety – this is the state of the raw material base, in which there are no serious problems with the implementation of the volumes and rates of increase in the reserves of the entire complex of minerals, established based on the needs of the national economy and the requirements of the country's economic independence, the extraction of which is necessary for the normal progressive development of the state economy [*Perchik*, 2003: 118]. The availability of energy resources is an integral part of the state's raw material security. Consequently, the state needs to develop an energy strategy, which will indicate measures to ensure raw material security within the framework of energy resources: their efficient use, what types of energy sources are used to service economic processes, what percentage of energy resources the country can import, etc.

Switzerland's economy and its level of resource endowments

The Swiss Confederation belongs to the group of highly developed small countries. Despite its small territory and limited amount of natural resources, Switzerland has remained for many years one of the most highly developed economies in Europe. In the dynamics of the main macroeconomic indicator – the *(*GDP*)* of Switzerland over the past 10 years, a fairly stable trend can be traced: in the period 2011–2015 there was an increase, then in 2015–2018 – a slight decrease in the indicator, and an increase to 656 billion euros in 2020[1] (fig. 1).

[1] The statistical office of the European Union // https://ec.europa.eu/eurostat, accessed 25.05.2021.

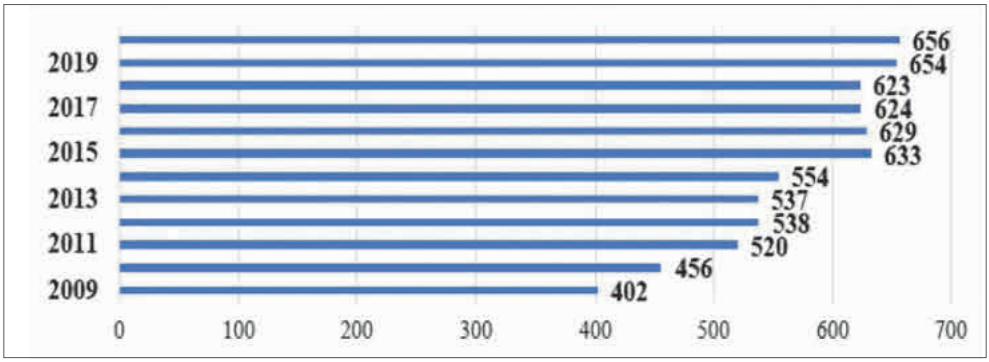


Fig. 1. The dynamics of the Switzerland GDP during 2009–2020, billion euros

Source: The statistical office of the European Union

The second place in the world in terms of GDP per capita for 2019 appears to be a confirmation of the highly developed economy of the country and a high level of national welfare.

In Switzerland, the greatest economic activity is observed in the service sector – this sector generates about 70 % of the gross domestic product. The industrial sector, which accounts for 25 % of GDP, is also an important pillar of the economy, with the extraction of natural resources accounting for only 0.7 % of GDP *(*fig. 2). Key industries are pharmaceuticals, finance, ICT, as well as mechanical engineering, electrical engineering and metallurgy. It should be noted that the Swiss

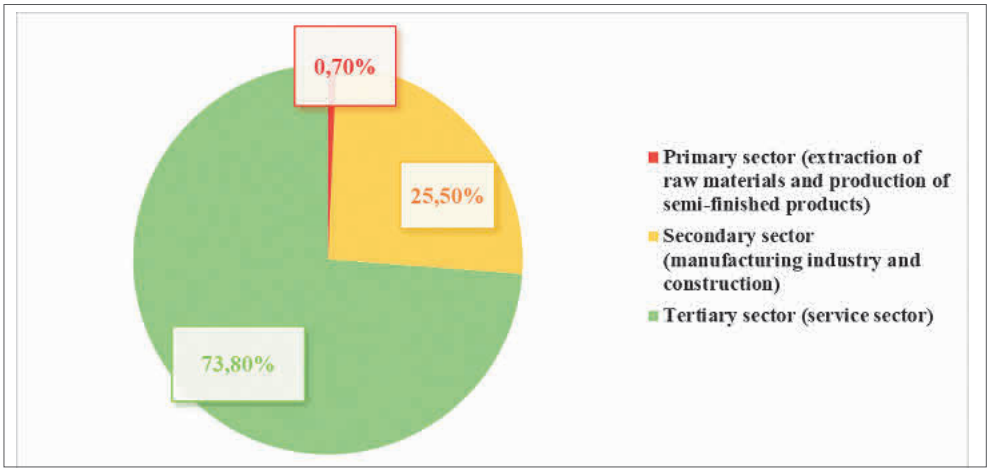


Fig. 2. The Distribution of the Switzerland GDP by economic sectors in 2019,%

Source: Handbook for investors – Switzerland Global Enterprise

economy has been export-oriented for many years, the ratio of export to GDP in Switzerland is one of the highest in the world. The European Union (EU) plays a key role here, accounting for 55 % of exports and 71.6 % of imports of Confederation. Small and medium-sized enterprises (SMEs) dominate the Swiss economy. More than 99 % of companies have fewer than 250 full-time employees. However, Switzerland is also home to multinational companies, which account for about one third of the country's value creation [2].

The provision of the state with natural resources is a bottleneck in the Swiss economy. The territory of the Swiss Confederation is not rich in minerals. There are small deposits of iron ore, graphite, coal, talc, asphalt. The only natural gas field (near Finsterwald in the canton of Lucerne) was closed in 1994, and no other potential deposits were explored. Coal mining in Switzerland was almost completely stopped by the beginning of the twentieth century. The advantage of the state in the field of natural resources is the abundance of water bodies and forest areas, which is also reflected in the use of these types of resources for energy purposes [*Schrepfer-Proskuryakov,* 2018].

The energy situation in Switzerland is characterized by the following trends. The fundamental regulatory document in Swiss legislation in this area is the Energy Strategy until 2050. The main coordinator for the implementation of the Energy Strategy is the Swiss Federal Office for Energy (SFOE), the national competence center for energy supply and consumption, part of the Federal Department for the Environment, Transport, Energy and Communications (DETEC). In 2007, the Federal Council developed an energy strategy that includes four main areas: energy efficiency, renewable energy sources, replacement / construction of new large power generation facilities (including nuclear power plants) and external energy policy. However, after the accident at Japan's Fukushima-1 nuclear power plant in 2011, the Federal Council presented an updated state energy strategy document, the main change of which was to ban the construction of new nuclear power plants or make any significant changes to existing nuclear power plants. Existing nuclear power plants can remain in operation as long as they remain safe. The Federal Nuclear Safety Inspectorate (ENSI) inspects the conditions for safe operation. [*Petrov., Reisser,* 2017] At the moment, there are four nuclear power plants in Switzerland – Beznau 1 and 2, Gösgen and Leibstadt. The nuclear power plant in Mühleberg was decommissioned in 2019. It is noted that the updated Energy Strategy 2050 was supported by 58.2 % of citizens of the Swiss Confederation in a referendum in 2017.[3] Only 4 out of 26 cantons and half-cantons – Schwyze, Obwalden, Glarus and Argau – expressed their opposition to the transition to re-

[2] Handbook for investors – Switzerland Global Enterprise // https://www.s-ge.com/ru/publication/spravochnik-investora/spravochnik-investora, accessed 25.05.2021

[3] Supporters of nuclear power plant abandonment won referendum in Switzerland // https://tass.ru/mezhdunarodnaya-panorama/4269144, accessed 25.05.2021

newable energy sources [*Yorio,* 2018]. In connection with the introduction of the new energy strategy, some federal laws have also undergone changes: The Federal Law on Energy, the Federal Law on Electricity and the Federal Law on Electricity.

Accordingly, the set of measures provided for in the Energy Strategy 2050 is aimed at improving energy efficiency and promoting the development of renewable energy sources, including hydroelectric power plants, wind turbines and solar installations, with economic stimulation of this process from the state. In addition, the Alpine Republic intends to reduce the use of imported hydrocarbon energy resources through savings and energy efficiency measures. Stimulation from the state is manifested in various support measures, namely:

- operators of enterprises producing electricity from solar, wind and geothermal energy, as well as from biomass can apply for preferential remuneration;
- operators of small and large photovoltaic systems can apply for a one-time fee, that is, a one-time contribution to the investment costs of a facility, this fee covers a maximum of 30 % of the investment costs of a comparable facility;
- investments in buildings aimed at improving energy efficiency are not subject to taxation;
- in the future, licensing procedures for generating electricity from renewable sources will be reduced and simplified, etc. [Swiss Federal Office of Energy].

Statistical figures and facts show the following situation in the Swiss energy market. Dynamics of the total volume of energy consumption in the country in the period 2005–2019 demonstrates a gradual trend towards a decrease in energy consumption today *(*fig. 3). This trend is a consequence of one of the goals of the

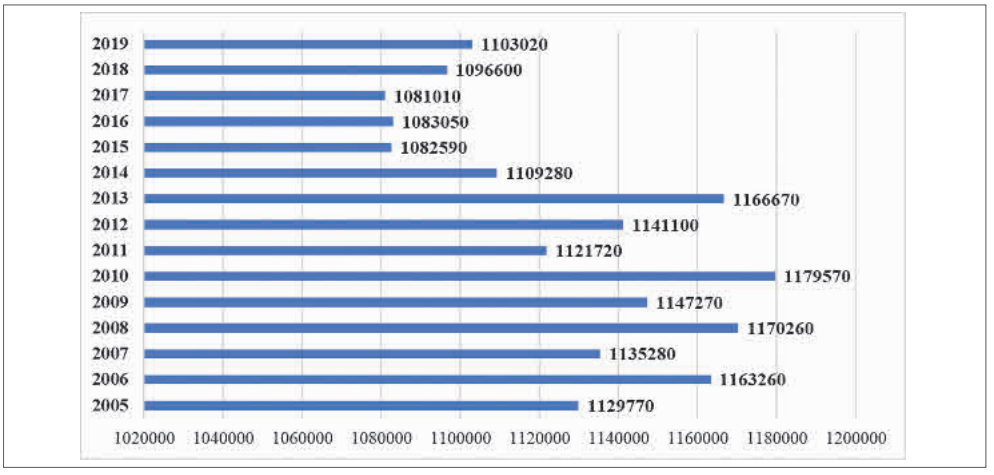
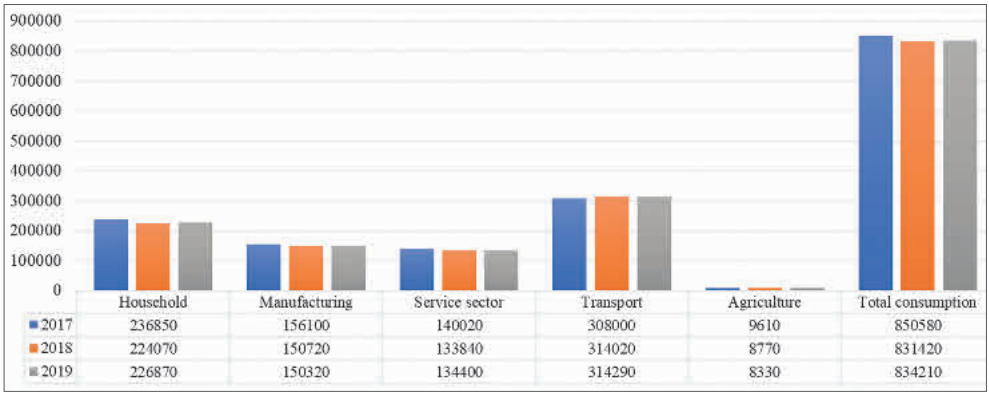


Fig. 3. The dynamics of the total energy consumption in the Swiss Confederation during 2005–2019, TJ

Source: Swiss Federal Office of Energy



	Household	Manufacturing	Service sector	Transport	Agriculture	Total consumption
2017	236850	156100	140020	308000	9610	850580
2018	224070	150720	133840	314020	8770	831420
2019	226870	150320	134400	314290	8330	834210

Fig. 4. The distribution of the energy consumption in the Swiss Confederation by economic sectors in 2017–2019, TJ

Source: Swiss Federal Office of Energy

Switzerland Energy Strategy – by 2035, the average energy consumption per capita should be reduced by 43 % [Swiss Federal Office of Energy].

According to statistics from the Swiss Federal Office of Energy, over the past three years, the largest share of energy consumption has been in the transport sector, followed by household energy consumption, third by the industrial sector, followed by the service sector and the least consumption is in agriculture (fig. 4).

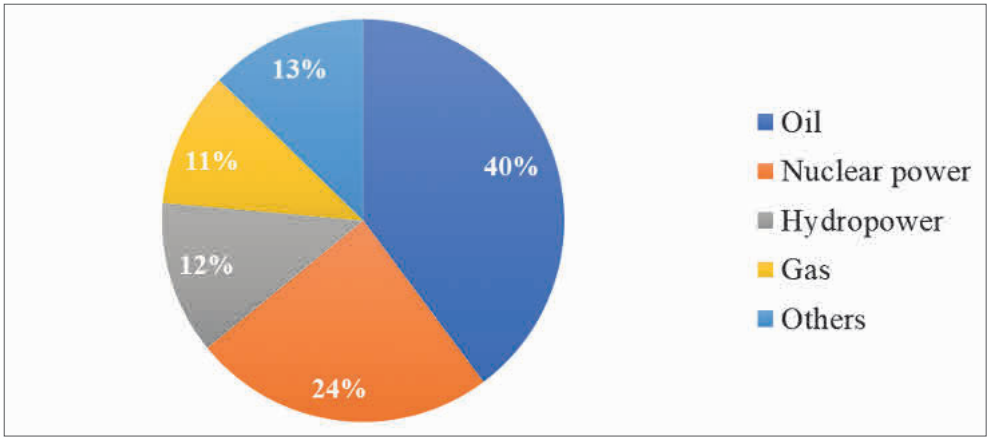


Fig. 5. The distribution of the energy consumption in the Swiss Confederation by type of energy carrier in 2019,%

Source: Swiss Federal Statistical Office

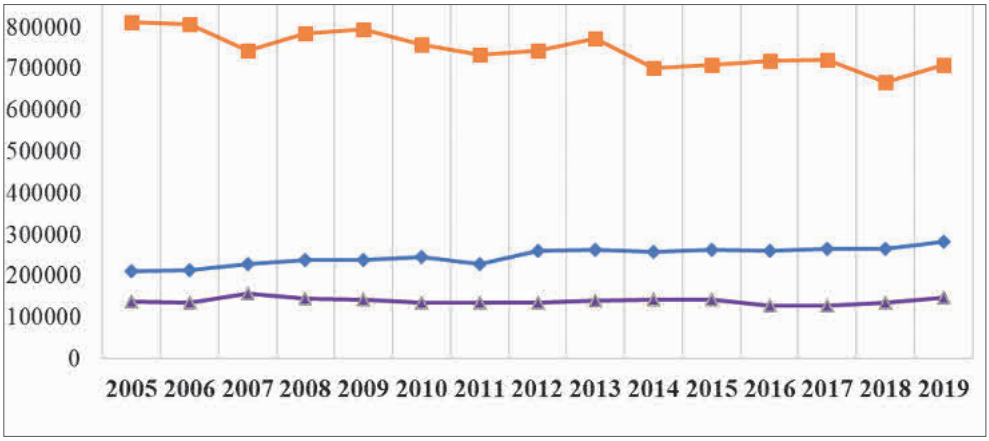


Fig. 6. The dynamics of the volumes of local production, import and export of energy in Switzerland during 2005–2019, TJ

Source: Swiss Federal Office of Energy

The most important types of energy used in Switzerland are oil, electricity from nuclear and hydroelectric power plants, and natural gas *(*fig. 5) [Swiss Federal Statistical Office].

The main types of renewable energy generated in Switzerland are hydropower, solar energy, heat from the environment (heat pumps), biomass (wood), wind energy and energy from waste incineration [*Krishtal*, 2021].

Switzerland has about 638 hydroelectric power plants. They provide 59.9 % of the total electricity generated in the country. The largest dam in Switzerland is the Grand Dixens dam in the Valais canton, which is 285 meters high. Grand Dixens is the third highest gravity dam in the world.

It should be noted, as it was mentioned earlier, the Swiss Confederation is not rich in natural resources, including energy resources, and despite the export orientation of the Swiss economy, about 75 % of energy consumption is filled by imports of non-renewable energy *(*fig. 6) [Swiss Federal Office of Energy]. The dynamics of the volumes of own production, import and export of energy in the Swiss Confederation in the period 2005–2019 demonstrates a significant prevalence of the volume of energy import over the volumes of its own generation and export. It should also be noted that there is a slight decrease in imported energy, which confirms the fact of the gradual achievement of the goal of the state's energy strategy.

Imported energy categories mainly include fuel and mineral resources: the largest share in the structure of Switzerland's energy import for 2020 is oil and

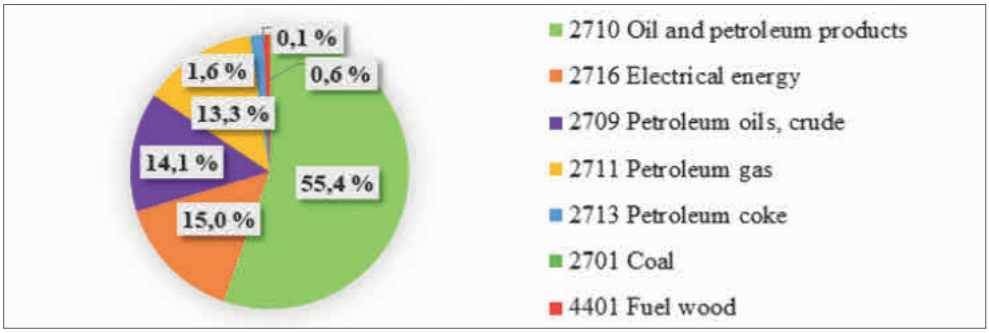


Fig. 7. The distribution of Swiss import by types of energy carriers in 2020,%

Source: The Statistical base on international trade Trademap

oil products obtained from bituminous rocks, except for raw (55.4%) (fig. 7,8). Switzerland's export structure is dominated by the share of electricity – 80.2%[4].

The statistics on the types of imported energy resources seem to be extremely obvious, due to the small number of mineral deposits in the territory of the Confederation.

In addition to the commodity structure, it is also advisable to analyze the geography of supplies of various types of energy resources to Switzerland *(*fig. 8)[5].

[4] The Statistical base on international trade Trademap // https://www.trademap.org/Index, accessed 25.05.2021.

[5] The Statistical base on international trade Trademap // https://www.trademap.org/Index, accessed 25.05.2021.

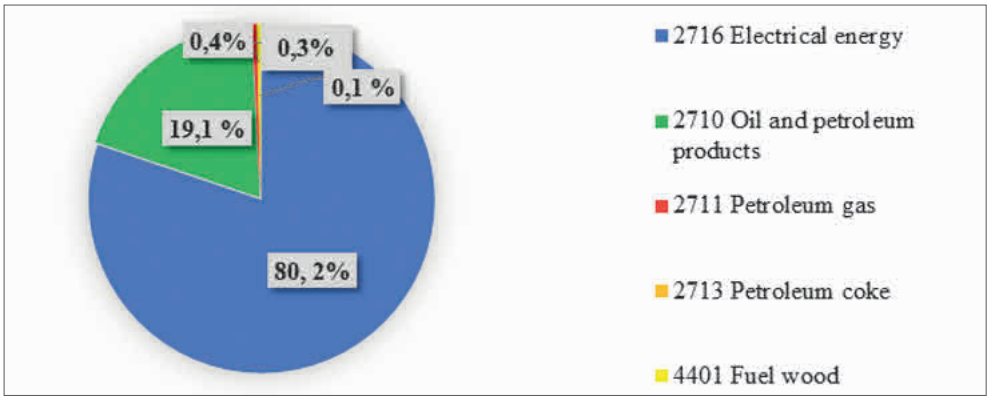


Fig. 8. The distribution of Swiss export by types of energy carriers in 2020,%

Source: The Statistical base on international trade Trademap

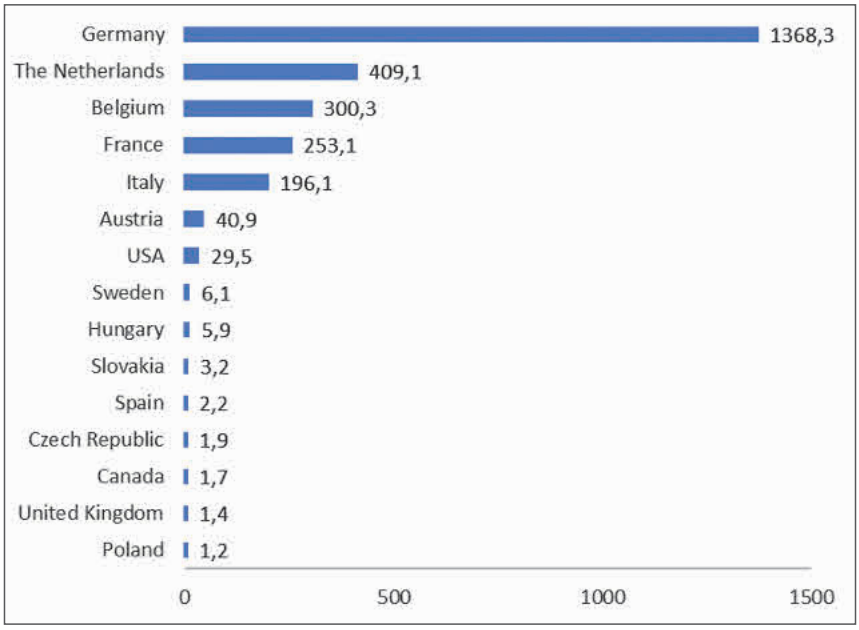


Fig. 9. Top-15 import partner countries of Switzerland in terms of oil and oil products in 2020, USD million

Source: The Statistical base on international trade Trademap

Figure 9 shows the top 15 countries that supply oil and petroleum products to Switzerland in 2020. Consequently, there is a clear orientation of the Swiss Confederation towards the countries of the European Union in the matter of energy cooperation: 12 out of 15 states. There is no publicly available full-fledged statistics on the distribution of Switzerland's electricity exports by recipient countries, however, it should be noted that, according to available data, the EU countries also occupy the leading positions, namely Italy, Germany, France, Austria.

Energy cooperation between the Swiss Confederation and the countries of the European Union

Switzerland's energy supply is highly dependent on imports of fossil fuels and combustible materials, as well as on imports of nuclear fuel – about 75 % of consumed energy in Switzerland is imported. This high dependence on imports, the need to guarantee security of supply and the stated sustainable development goals in Switzerland's energy policy mean that close cooperation with international energy organizations and foreign energy authorities is a key point for the state. In

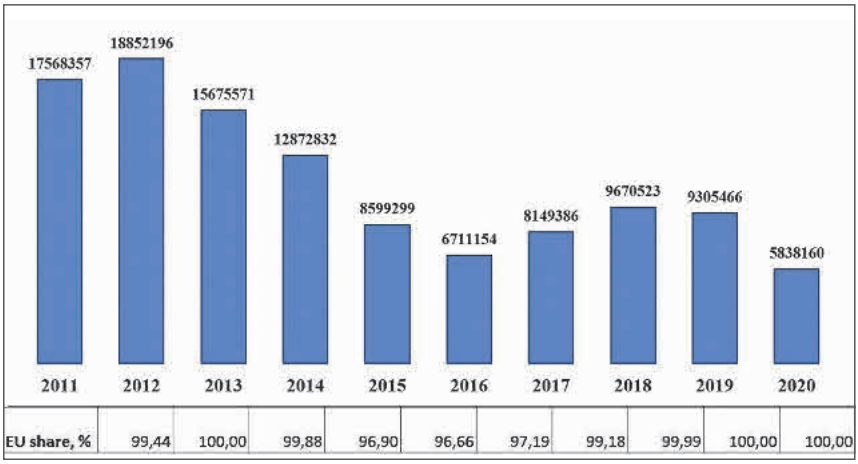


Fig. 10. The dynamics of the volume of import of mineral fuel, oil and products of their distillation (HS code 27) of Switzerland from the EU countries, USD thousand

Source: The Statistical Base on International Trade Trademap

accordance with the strategy of the Federal Council for 2008, different priorities arise in relation to cooperation with different institutions.

Switzerland maintains high-level contacts *(*Federal Council and heads of federal authorities*)* on a regular basis with neighboring countries. The broad area of cooperation extends from security of supply to the promotion of renewable energy sources, energy efficiency and energy research.

As the statistics in the field of energy cooperation show, the Swiss Confederation focuses on the countries of the European Union. This fact does not seem surprising, as the EU is Switzerland's strategic partner in many areas of foreign economic cooperation, including trade.

Switzerland has been in talks with the EU on a bilateral agreement in the electricity sector since 2007. In autumn of 2010, the Federal Council expanded its negotiating mandate to include the latest legal changes in the EU. It is supposed that the mandate is intended to lead to a long-term and comprehensive energy agreement with the EU. For both sides, the focus is on security of supply, which, due to the highly ramified energy sector, cannot be achieved by any single country alone. Consequently, the agreement between Switzerland and the EU should regulate cross-border electricity trade, harmonize safety standards, ensure free market access and guarantee Switzerland's membership in various committees [Swiss Federal Office of Energy].

The expanded mandate also facilitates to including of an EU Directive promoting the use of renewable energy to the negotiation. This means Switzerland will be

able to position itself in the renewable energy sector across Europe, which could open up new business opportunities in the Swiss electricity and clean technology sector. In addition, the aforementioned Directive will also lead to the mutual recognition of certificates of origin for electricity from renewable sources such as water, wind and sun.

The dynamics of import volumes of mineral fuel, oil and products of their distillation (CN FEA code 27) Switzerland from the EU countries during 2011–2020 is characterized by a declining trend. (fig. 10)[6] As the data is given in monetary units, it follows keep in mind that they do not fully demonstrate an objective picture, because they do not take into account inflationary phenomena, as well as the dynamics of prices for fuel resources, which depends on the ratio of supply and demand in the market. An example is the record decline in oil prices in spring of 2020, which contributed to a decrease in the volume of trade in oil of various grades in value terms, but might not imply a decrease in this indicator in physical units.

It should be noted the dynamics of the shares of the European Union countries in the total volume of Switzerland's imports of fuel resources – for 10 years, the EU countries accounted for almost 100 % of the total volume of imports, that is another confirmation of the fact that the EU is an important strategic partner for Switzerland, in particular in the energy sector.

A key prospect in energy cooperation between the European Union and the Swiss Confederation is the transition from the use of non-renewable fuel energy resources and nuclear energy to renewable energy sources. This trend may lead to a decrease in the volume of imports of mineral resources in Switzerland and, conversely, to an increase in the turnover of safe renewable energy resources, in particular solar, wind and biomass energy. This development of events is dictated not only by the new Energy Strategy of Switzerland until 2050, but also by the energy strategy in the European market as a whole.

Conclusion

Based on the research done, the following conclusions can be drawn. The energy situation in Switzerland is characterized by several trends. The main one is the suspension and phasing out of the use of nuclear energy, which was spelled out in the Energy Strategy until 2050. The dynamics of the total energy consumption in the country demonstrates the consistent achievement of the goals of the Energy Strategy – reducing the total volume of energy consumption by 43 % by 2025. The largest amount of energy is consumed by the transport sector. In the matter of supplying the economy with energy, Switzerland largely depends on the outside world – 75 % of energy resources are imported, the European Union acts as a key

[6] The Statistical Base on International Trade Trademap // https://www.trademap.org/Index, accessed 25.05.2021.

strategic partner in energy cooperation – almost all of the fuel resources are supplied to Switzerland from the EU countries.

A key perspective in energy cooperation between the European Union and the Swiss Confederation is the transition from the use of non-renewable fuel energy resources and nuclear energy to renewable energy sources.

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ЭНЕРГЕТИЧЕСКОЕ СОТРУДНИЧЕСТВО МЕЖДУ ШВЕЙЦАРИЕЙ И СТРАНАМИ ЕС

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Статья посвящена исследованию развития энергетического сектора в Швейцарской Конфедерации. Выявлены ключевые тенденции на швейцарском энергетическом рынке: сокращение общего объёма потребления энергии в стране, какие энергоносители занимают наибольшую долю в структуре потребления, тенденции в законодательной базе, регулирующей энергетический сектор. В 2017 году была принята новая Энергетическая стратегия до 2050 года, основной посыл которой заключается в постепенном отказе от использования ядерной энергии и переходу на возобновляемые источники энергии. Наиболее важными видами энергии, используемыми в Швейцарии, являются нефть, электричество от атомных и гидроэлектростанций и природный газ. Наибольшее количество энергии потребляет транспортный сектор. Также были проанализированы динамика и соотношение показателей собственной выработки, экспорта, импорта энергии Швейцарии. По причине очень маленького коли-

чества месторождений полезных ископаемых около 75 % энергии поставляются в страну государствами-партнёрами. В импорте значительную долю занимают топливные ресурсы (нефть и нефтепродукты), в экспорте – электроэнергия. Рассмотрено энергетическое сотрудничество Швейцарии и стран Европейского Союза – современный этап, динамика поставок топливных энергоресурсов, выявлены перспективы развития взаимоотношений в энергетической сфере. На протяжении 10 последних лет страны Европейского Союза занимают около 100 % в структуре поставок топливных ресурсов в Швейцарию. Швейцария ведёт переговоры с ЕС о двустороннем соглашении в электроэнергетическом секторе с 2007 года. Ключевой перспективой в энергетическом сотрудничестве Европейского Союза и Швейцарской Конфедерации является переход от использования не возобновляемых топливных энергетических ресурсов и ядерной энергетики к возобновляемым энергоносителям.

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