



Energy Industry in Greece



General State of the Economy

Greece, officially the Hellenic Republic, is the southernmost country of the Balkan Peninsula. Greece borders Bulgaria and the Republic of North Macedonia to the north, Albania to the northwest and Turkey to the nor-

theast. The country is bounded by the Ionian Sea to the west, the Mediterranean Sea to the south, and the Aegean Sea to the east. With its large number of islands, Greece has the longest coastline in the Mediterranean Sea Basin stretching over 13,676 kilometers.

Greece / Hellenic Republic

Capital: Athens	Density: 79.1/km ²	Currency: Euro (€) (EUR)
Official languages: Greek	Life expectancy at birth: 81.09 years	GDP (PPP): \$416.969 billion (2023 est.)
National Day: 25 March	Area (land): 131,957 km ²	GDP - per capita (PPP): \$39,864 (2023 est.)
Population: 10,495,595 (2023 est.)	Coastline: 13,676 km	Internet country code: .gr

Source: [1,2,3,4,5]



Acropolis in Athens, Greece. Envato. UQPMXSNWDR

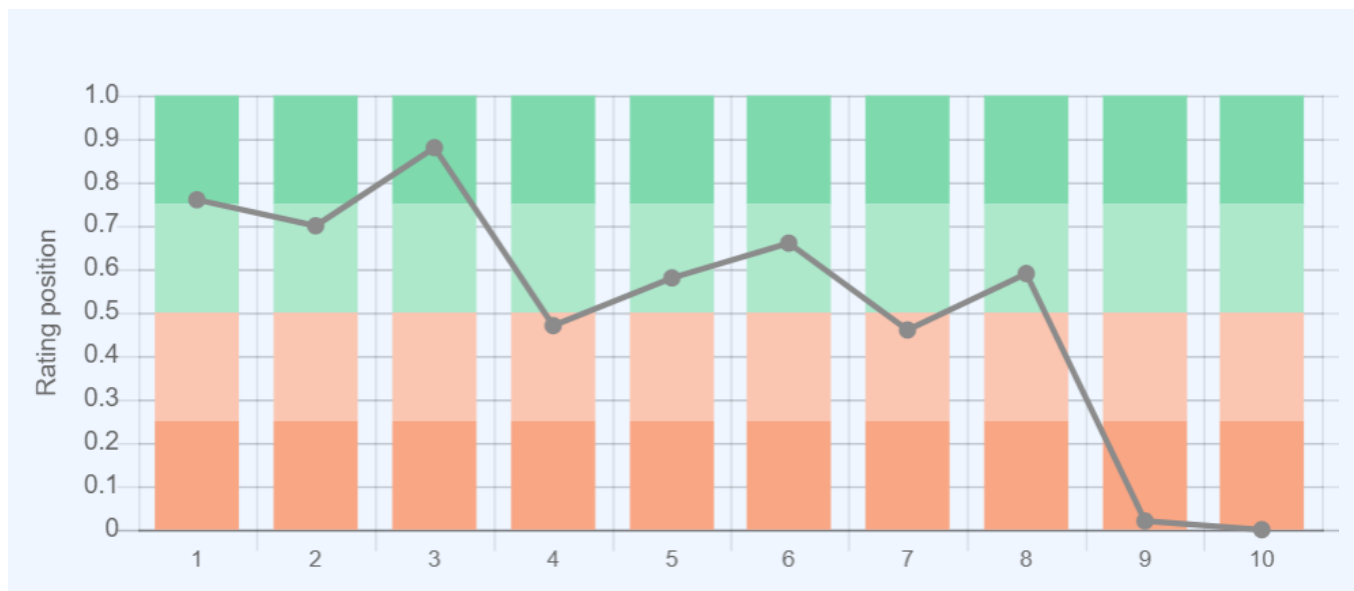
According to 2023 statistics, Greece, which in terms of size is 97th in the world, is home to around 10,5 million people. In terms of population density the country is 110th in the world out of 199 countries considered. The administrative map of the country is divided into 13 regions and 1 autonomous monastic state with Athens as its capital and the most-populous city. The political form of government is a parliamentary republic, and the official language is Greek [1,2,3].

The ranking positions of Greece relative to other countries have been determined for an extensive list of economic, energy, innovative and educational indices, as well as for metrics reflecting the state of the environment. The economic indices include, for example, GDP per capita, annual average GDP growth, high-technology exports, and others. The list of energy indices includes proven reserves of oil, gas and coal, production-consumption ratio combined, and energy use, etc. Each of the indices has a ranked list of included member countries. Since the number of countries in each rating is different for each index, the positioning of the country of

interest is displayed on a special chart, where the vertical axis is a uniform relative scale from 0 to 1, whereas the horizontal axis denominates the various indices and respective numbers relating to the descriptions given underneath.

Thus, in such a relative “0-1” diagram, the country’s position is marked with a dot in proportion to its location in the original rating list. If the country is among the leaders regarding the selected indicator, it will be marked close to 1 in the upper green zone on the relevant chart “0-1”, if the country is an outsider in the rating list, then it will be marked in the lower red zone of the chart “0-1”, etc. A single list of indices is used for all countries. If a country is not in the ranking list for any index, then the corresponding position on the charts is not displayed. Ranking position of Greece for list of economic indices: country is not in the ranking list for any index, then the corresponding position on the charts is not displayed.

Ranking position of Greece for list of economic indices:



Sources:

1. GDP (purchasing power parity), 2020 est. / The World Factbook/Library/Central Intelligence Agency *228
 2. GDP - per capita (PPP), 2020 / The World Factbook/Library/Central Intelligence Agency *229
 3. Inflation rate (consumer prices), 2019 est. / The World Factbook/Library/Central Intelligence Agency *228
 4. Charges for the use of intellectual property, receipts (BoP, current US\$), 2020 / International Monetary Fund, Balance of Payments Statistics Yearbook, and data files. / License: CC BY-4.0 *88
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 6. High-technology exports (current US\$) 2019-2020 / United Nations, Comtrade database through the WITS platform / License: CC BY-4.0 / Data *134
 7. 2021 Index of Economic Freedom / International Economics / The Heritage Foundation *178
 8. Reserves of foreign exchange and gold, 2017 est. / The World Factbook / Library / Central Intelligence Agency *195
 9. Annual average GDP growth in %, for the last 10 years (2011-2020) / World Bank national accounts data, and OECD National Accounts data files / License: CC BY-4.0 *206
 10. Public debt (% of GDP), 2017 est. / The World Factbook / Library / Central Intelligence Agency (from smallest to largest) *210
- * Total number of countries participating in ranking

Figure 1. Economic indices of Greece

As can be seen from the graph above, the economic situation in Greece is quite uneven. Of the indices presented, the country has the highest values for Inflation rate (0.88), GDP (0.76) and GDP per capita (0.70). The weakest parts

of Greece's economic indicators are Annual average GDP growth in % (0.02) and Public debt (0.00).

Energy resources

Greece has very small domestic reserves of fossil fuels in the form of natural gas and oil, amounting to 0.0005% and 0.0006% of the world total, respectively. The situation with coal is somewhat better, but reserves are sig-

nificantly lower than those of the world leaders. Greece has 0.27% of the world's coal, which is, for example, 38 times less than India and 8 times less than Kazakhstan. In terms of tons of oil equivalent, according to the 2024 data, conventional proved reserves by fuel type were: 99.9% – coal and 0.1% – natural gas (Fig.5).

Table 1. Fossil energy resources of Greece

Resource/explanations	Crude oil*	Natural gas*	Coal *	Shale Gas	Tight Oil	Coal mine methane
Value	0.01 (0.0006%)	0.035 (0.0005%)	3 170 (0.27%)	no date	no date	no date
Unit	billion barrels	Tcf	million short tons	-	-	-
Year	2021	2020	2021	-	-	-
Source	[6]	[6]	[6]	[-]	[-]	[-]

*the share of the country's reserves in world total is provided in brackets

Greece has favorable conditions for the development of renewable energy in general and wind power in particular. In a number of regions of the country, especially on the coast in the eastern part of country, wind speed reaches 8 m/s at a height of 50 m. The southern part of

Greece, including many islands, has the most advantageous climatic conditions for the development of solar energy, where the solar GHI reaches 4.9-5.2 kWh/m² per day.

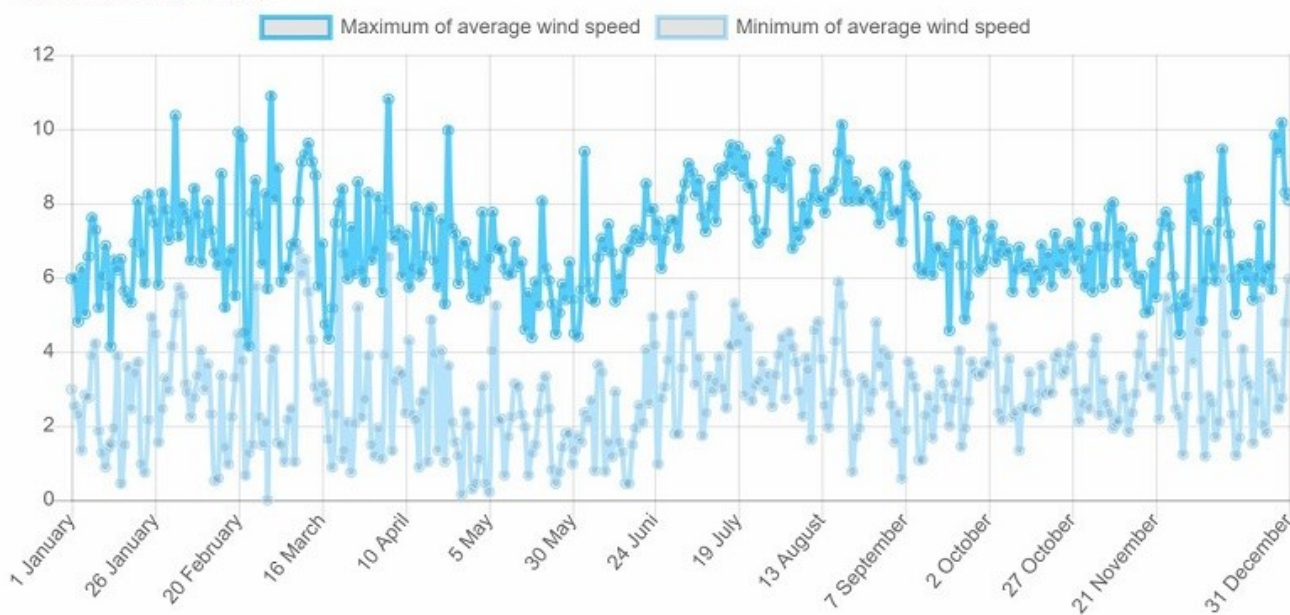
GREECE, PAROS

Latitude: 37.02 Longitude: 25.13

Average speed: 5.05 m/s, Operational share: 78%

Average daily sky coverage over 10 years of observations, %

Chart 1. Wind speed, m/s

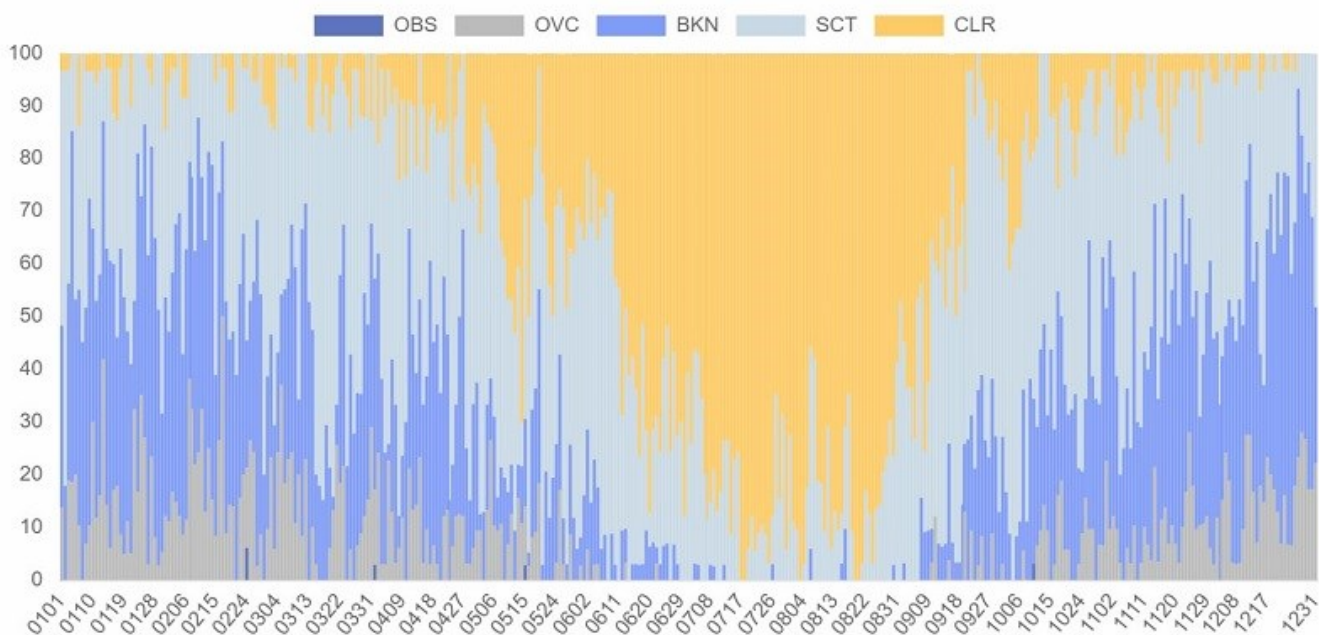


Source: based on NOAA U.S. Department of Commerce

GREECE, MILOS

Latitude: 36.73, Longitude: 24.43

Average daily sky coverage over 10 years of observations, %



CLR - clear, SCT - scattered from 1/8 TO 4/8, BKN - broken from 5/8 TO 7/8, OVC - overcast, OBS - obscured, POB - partial obscuration

Source: based on NOAA U.S. Department of Commerce

Hydropower has significant potential in the country and generated in 2021, with most hydroelectric power plants plays an important role in electricity generation in located in the northwestern mountainous area. Greece, providing about 27% of all renewable electricity

Table 2. Renewable energy resources of Greece

Resource/ explanations	Solar Potential (GHI)*	Wind Potential (50 M)*	Bio Potential (agricultural area)	Bio Potential (forest area)	Geothermal Potential	Municipal Solid Waste
Value	4.4-4.9	5.0-6.0	45.5	30.3	1500	524
Unit	kWh/m ² /day	m/s	% of land area	% of land area	MWe	kg per capita
Year	2020	2020	2020	2020	2014	2021
Source	[7]	[8]	[9]	[10]	[11]	[12]

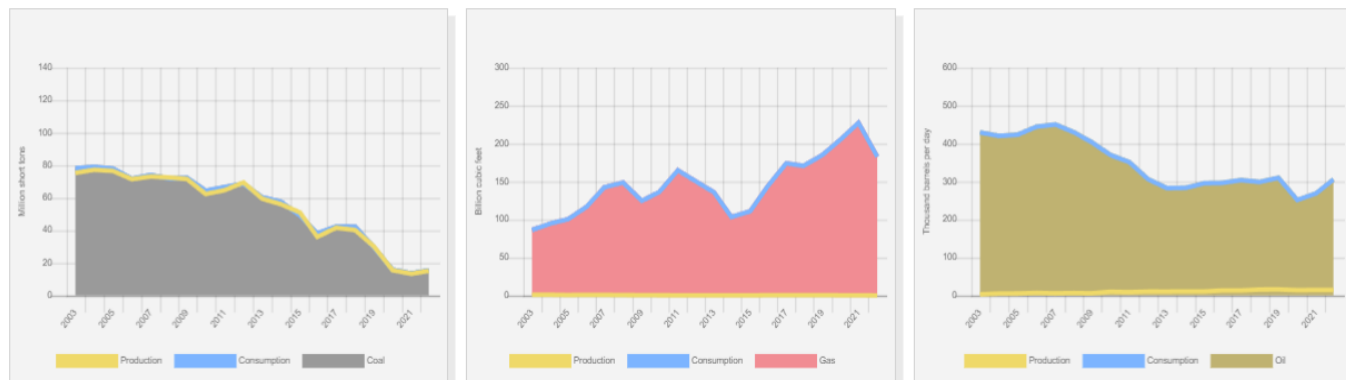
*for most of the territory of the country

About 75% of the country's territory is covered by agricultural and forest areas. Industrial waste from these areas form a worthy resource base for the development of a number of bioenergy technologies, particularly biogas and bioethanol production.

Energy balance

According to [6], in 2022 in Greece, the total production of primary energy was 0.154 quadrillion Btu, while consumption was at the level of 0.983 quadrillion Btu. Thus, the share of domestic production in primary energy consumption was 15.7%. This makes Greece a country highly

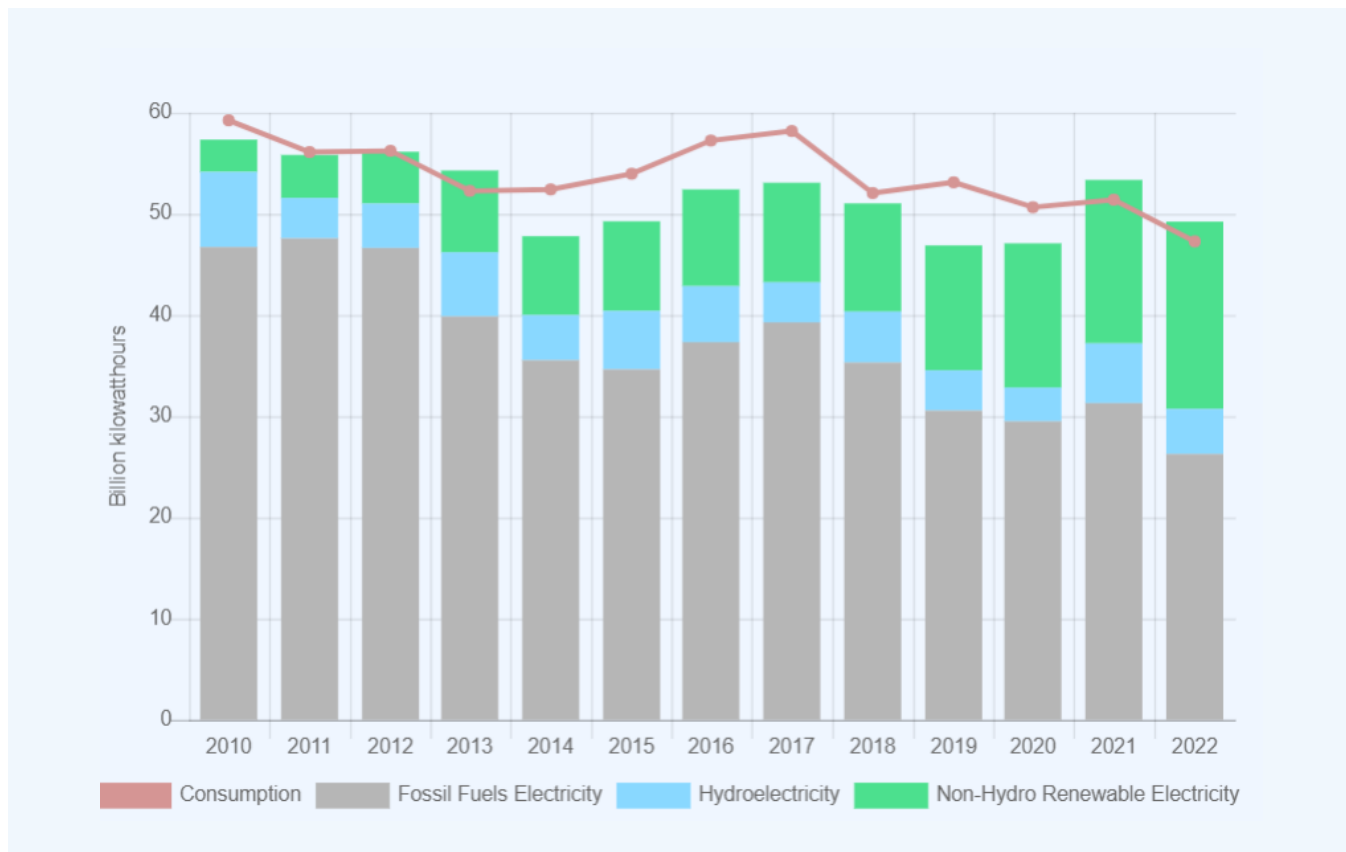
dependent on energy imports. According to the Statistical Review of World Energy 2022, primary energy consumption in Greece in 2021 amounted to 1.05 exajoules and was dominated by oil – 49.5%, followed by natural gas – 23.8%, renewables – 12.2%, coal – 6.7%, and hydroelectricity – 4.8% [13].



Source: U.S. Energy Information Administration (Mar 2024) / <https://www.eia.gov/>

Figure 2. Production and consumption of fossil fuels in Greece (left–coal, in the center– gas, right–oil)

As can be seen from the graph above, Greece produces only a negligible amount of fossil fuels domestically and is mostly dependent on imports. Compared to 2015, natural gas consumption more than doubled in 2022, while oil consumption decreased slightly over the same period.

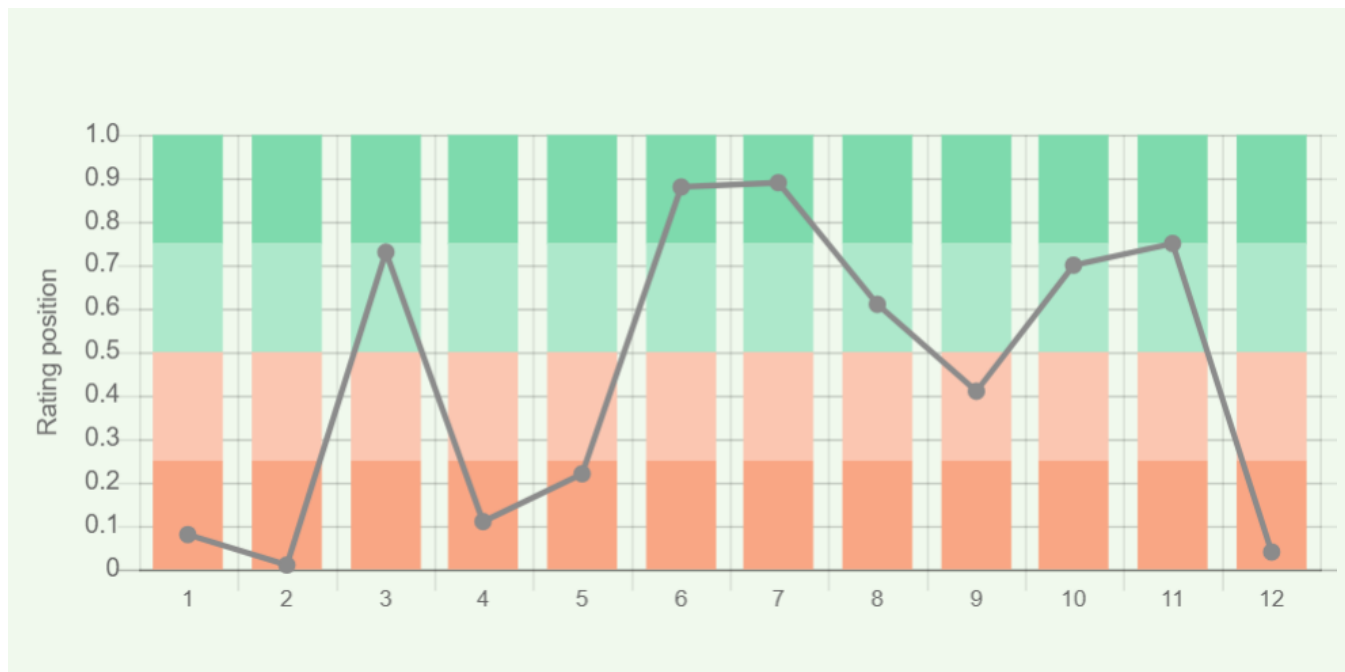


Source: U.S. Energy Information Administration (Mar 2024) / <https://www.eia.gov/>

Figure 3. Electricity production in Greece

The only fossil fuel that the country produces almost entirely domestically is coal, and there is a clear downward trend in consumption. In 2022, Greece's total electricity production was at the same level as in 2015. The country has been experiencing a shortage of self-generated electricity since 2014 and managed to reach self-sufficiency

in electricity in 2021. This is primarily due to an increase in energy production from renewable sources. For comparison, if in 2010 the share of renewable energy sources (except hydro) amounted to 5.6% of the total electricity generated, in 2021 this share reached approximately 37%.



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12. The Global Energy Architecture Performance Index Report (EAPI) 2017 / Rankings / Reports / World Economic Forum
13. Electric power consumption (kWh per capita), 2016 *217
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15. Combination of electricity production-consumption (kWh)/The World Factbook/Library/Central Intelligence Agency *216

Figure 4. Energy indices of Greece

The energy indices shown in the graph above reveal Greece as a country dealing with high energy demands. The generation to consumption ratio for natural gas (0.22) and crude oil (0.11) is relatively low because the country's energy needs are much higher than its domestic capacity.

Since almost all of the coal used in the country is domestically produced, the coal production and consumption ratio (0.88) is one of the highest indicators among all

presented. In addition, Greece has a good performance in renewable energy production (0.89), which has increased significantly in recent years.

Energy Infrastructure

A territorial map showing distribution of the largest infrastructure projects of the fossil fuel sector in Greece is displayed in Figure 5. As previously mentioned, coal reserves account for 99.9% and crude oil for 0,1% of all proven reserves of fossil fuels. The largest coal mine in Greece and the Balkans, Ptolemaida-Florina, is located

in the north of the country. Other important deposits are Drama and Elassona, also in the northern part of the country, and Megalopolis in the south. As part of the decarbonization process, Greece's long-term plan is a phase-out of coal, an implementation that was started but adjusted because of Russia's invasion of Ukraine. According to government statements, the country will have to increase coal production again in the coming



Figure 5. Basic infrastructure facilities of the fossil fuel sector in Greece

years to help reduce its dependence on gas. Crude oil and natural gas extraction in Greece is con-

centrated in the Prino-Kavala offshore basin, located in the northern part of the Aegean Sea. Crude oil is pro-

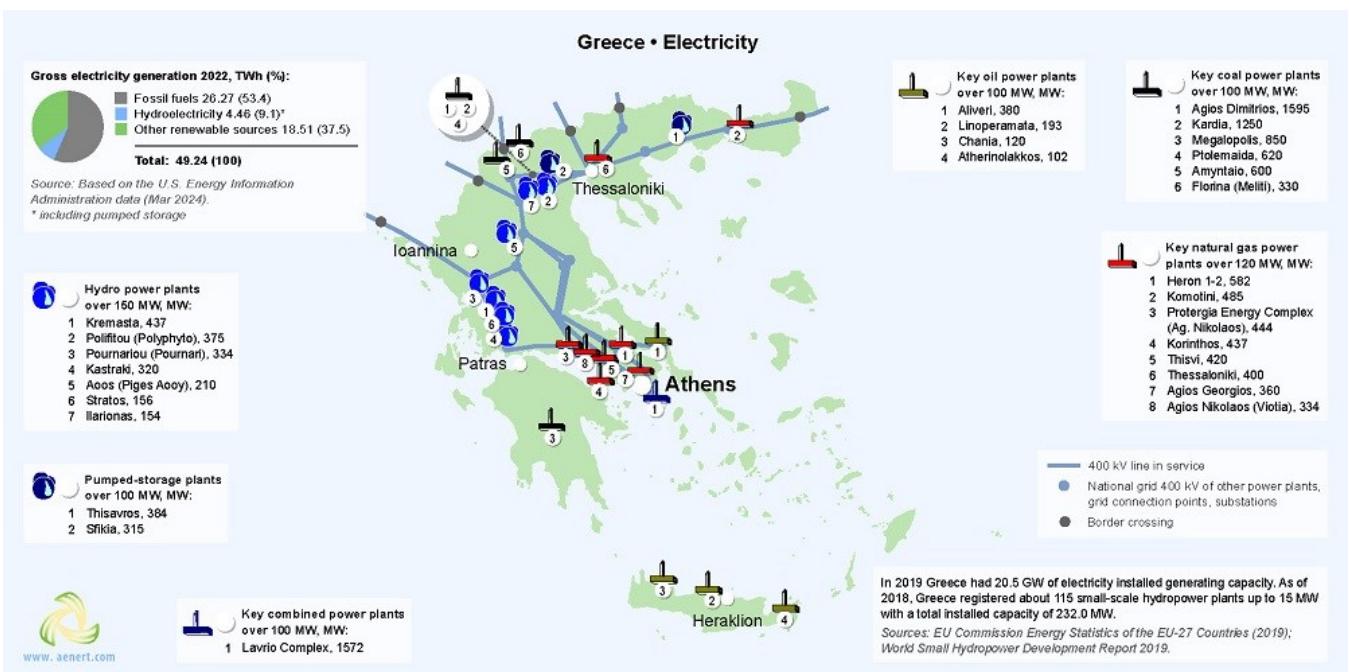


Figure 6. Electricity production in Greece

duced from three fields: Prinos, Prinos North and Epsilon. Greece's conventional oil infrastructure includes

several operating refineries, oil storage facilities and oil terminals.



Agios Dimitrios Power Plant in Greece. 1,585 MW, lignite. Envato. BRZ43CQEND

Greece has only marginal domestic gas production and meets its gas needs almost entirely through imports. Several gas pipeline systems operate in Greece to ensure domestic gas supplies and gas deliveries to Europe.

One of them, the Trans Adriatic Pipeline, which runs through Greece from the Turkish border to Southern Italy, is the main source of gas imports to Europe from Azerbaijan.

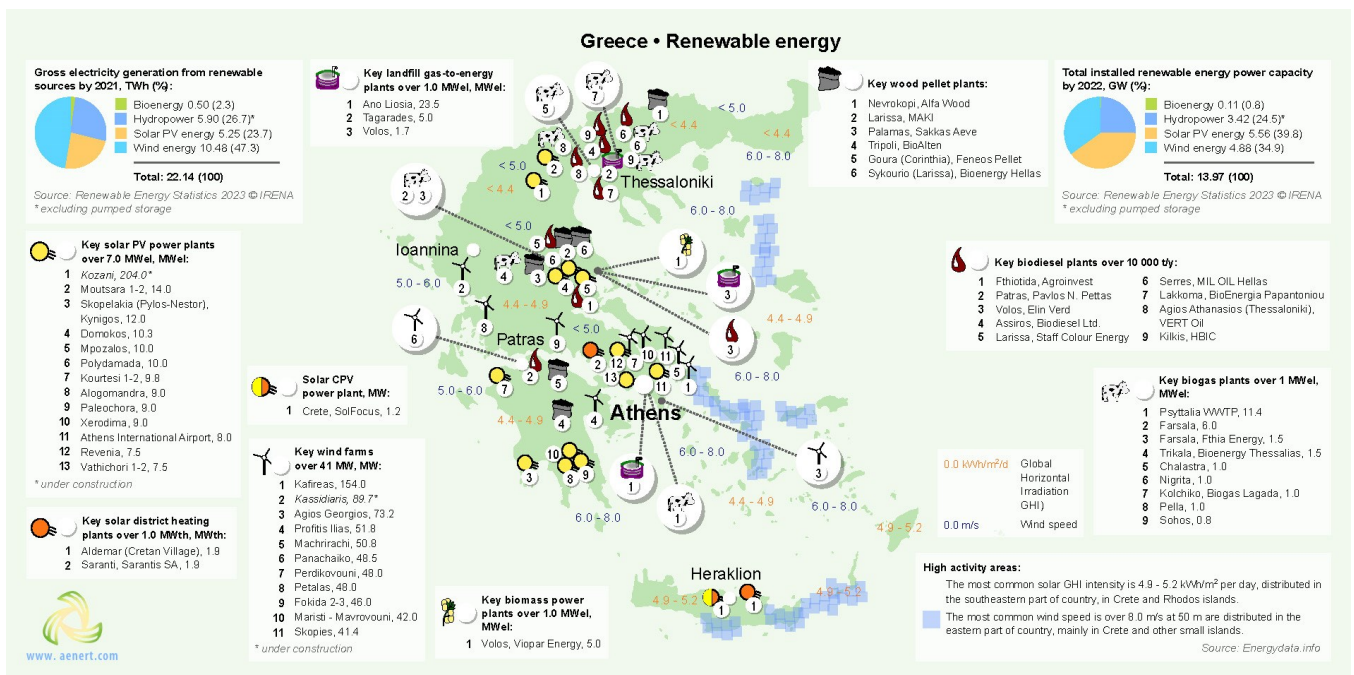


Figure 7. Renewable energy in Greece

According to the U.S. Energy Information Administration data, in 2022, 53.4% of electricity in Greece was generated by fossil fuels power plants, mainly driven by gas.

Although the largest power plant in the country is Agios Dimitrios with a capacity of 1595 MW is coal-fired and is located in Western Macedonia.

Hydropower also consistently contributes to the country's energy production at an average of approximately 10% depending on the year. Hydroelectric power plants are located in the northwestern part, in regions where most of the mountains are found. As of 2018, Greece registered about 115 small-scale hydropower plants up to 15 MW with a total installed capacity of 232.0 MW.

According to the data, provided by the U.S. Energy Information Administration, in 2022 about 38% of Greece's electricity production was renewables-based (excluding hydropower), dominated by wind power.

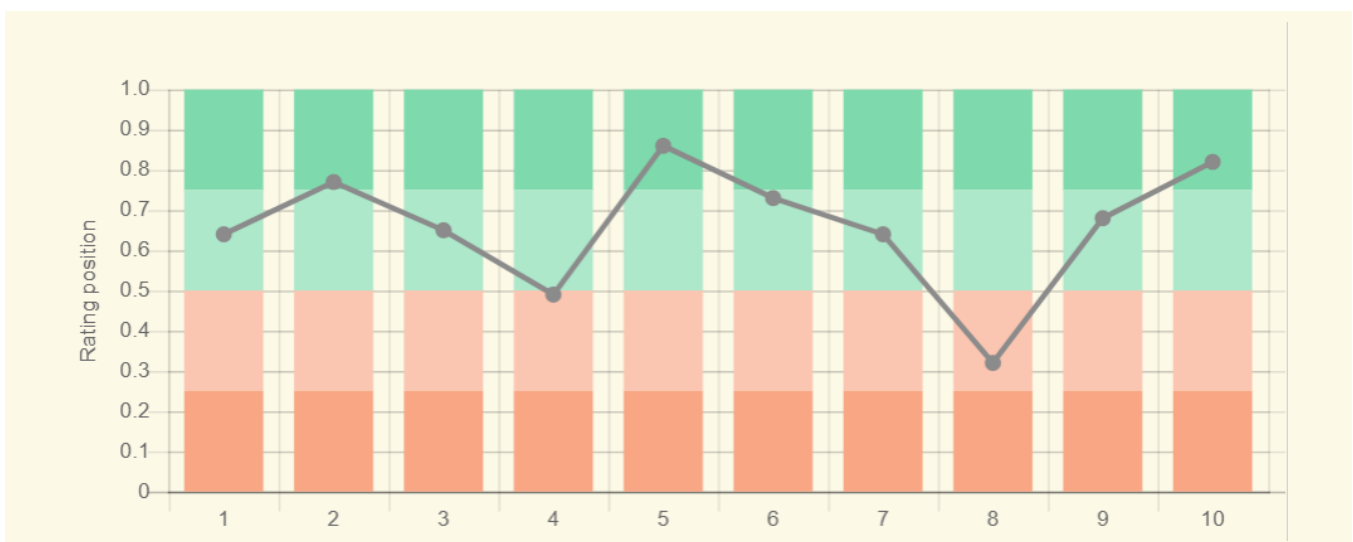
However, renewable energy has made a breakthrough in the last two years, and according to the latest data for Greece's interconnected electricity grid [14], in 2022 renewables, with the exception of large hydroelectric plants, surpassed all other electricity sources, leaving natural gas in second place. This leadership was maintained in the first eight months of 2023 (14224 GWh),

outperforming by 1.5 TWh fossil gas and lignite together (12753 GWh).

The largest wind cluster in Greece is the Kafireas wind project, located on the southern tip of the island of Evia. Its first part was commissioned in 2019 and has a total installed capacity of about 154.1 MW. Its sister project, the 330MW Kafireas II wind farm, is being developed by Greek renewable energy developer Terna Energy and is already partially operational [15].

The Greek government is working on measures to further accelerate the development of renewable energy in the country. According to the National Energy and Climate Plan, presented by the Ministry of Environment and Energy, the country plans to obtain 61% of its energy from renewable sources by 2030. In addition to the further development of solar and wind sources, the plan envisages the use of biomass for energy and fuel production and the development of appropriate energy infrastructure to transition from the current traditional uses of biomass to more energy-efficient and cost-effective ones. Special attention is to be paid to the use of biomethane by feeding it directly into the gas grid, as well as its application in the transportation sector [16].

Education and Innovation



Sources:

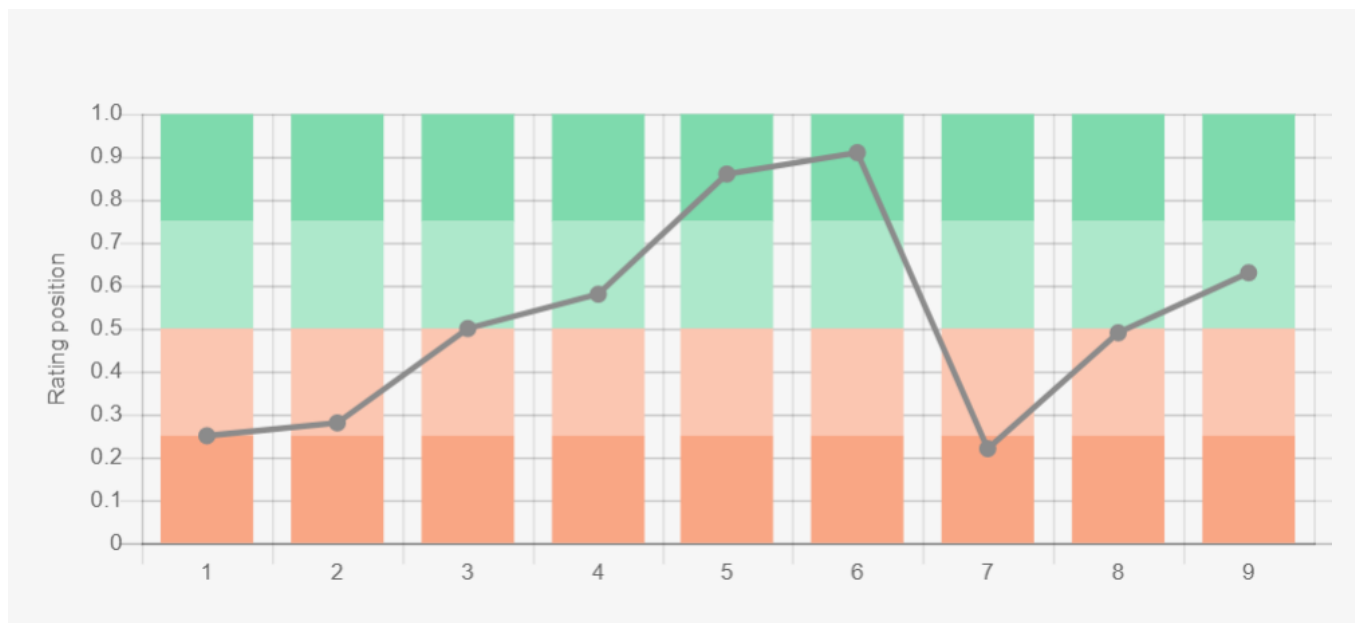
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8. Government expenditure on education, total (% of GDP), 2019 / United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics. License: CCBY-4.0 / Data as of September 2021*177
9. Research and development expenditure (% of GDP), 2018 / UNESCO Institute for Statistics. License: CCBY-4.0 / Data *119
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Figure 8. The indices of education and innovation in Greece

The majority of Greek indices describing the country's positioning in the various international rankings related to education and innovation are above average. Greece has the highest rankings in SCImago Country Rankings (0.86), Scientific and technical journal articles (0.82) and Patent Grants (0.77). The lowest indicator in the country is public spending on education (0.32). This is partly re-

sponsible for the fact that the country did not rise above the world average in the QS World University Rankings (0.49).

Ecology and Environment Protection



Sources:

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- * Total number of countries participating in ranking

Figure 9. Environmental Indices of Greece

Greece is among the countries with high carbon dioxide emissions, both overall (0.25) and per capita (0.28), which partly explains its low ranking in the National Footprint Accounts (0.22).

On the other hand, positive indicators include the country's high positions in terms of Annual freshwater withdrawals (0.91) and Environmental Performance Index (0.86). The forest area indicator in the country is at the world average level (0.50). The same applies to methane

emissions (0.49). In general, as can be seen from the above graph, the environmental situation in the country requires significant improvement.



Old windmills. Credit I.Ciorici

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The sources of charts and curves are specified under the images.

[For more information about the energy industry in Greece see here](#)
