

FULL HANDBOOK

Global Renewable Energy Guide

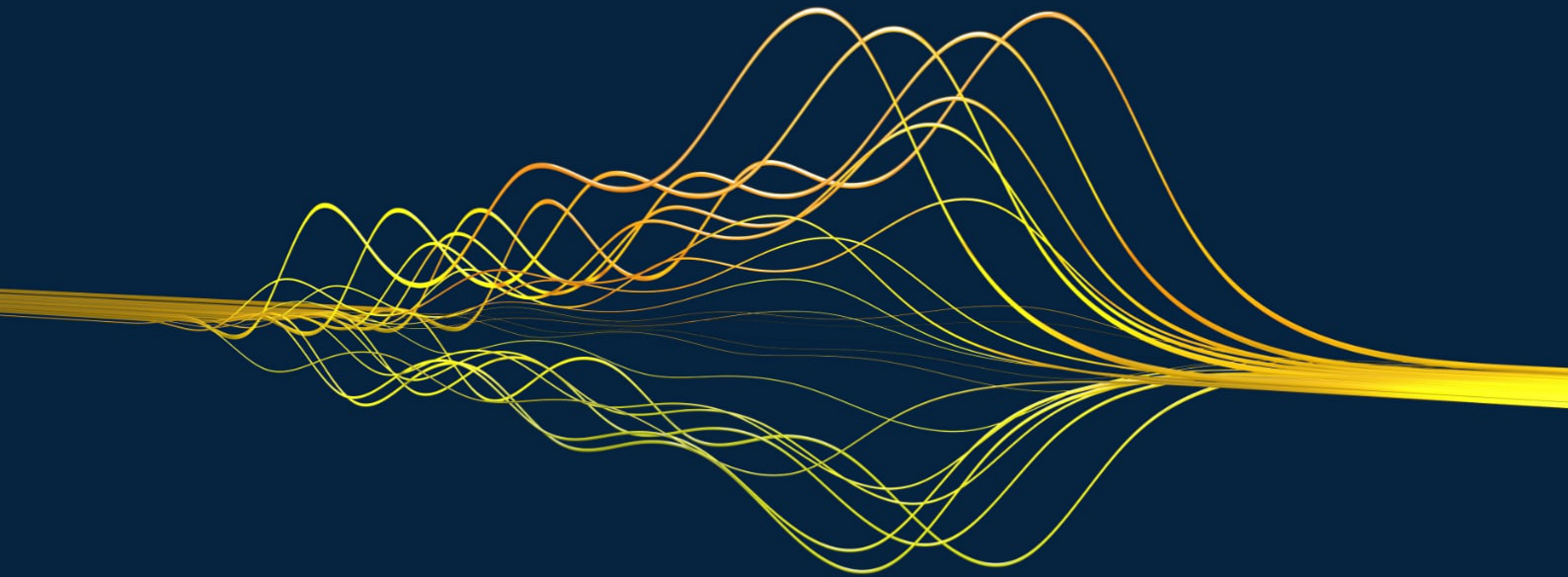
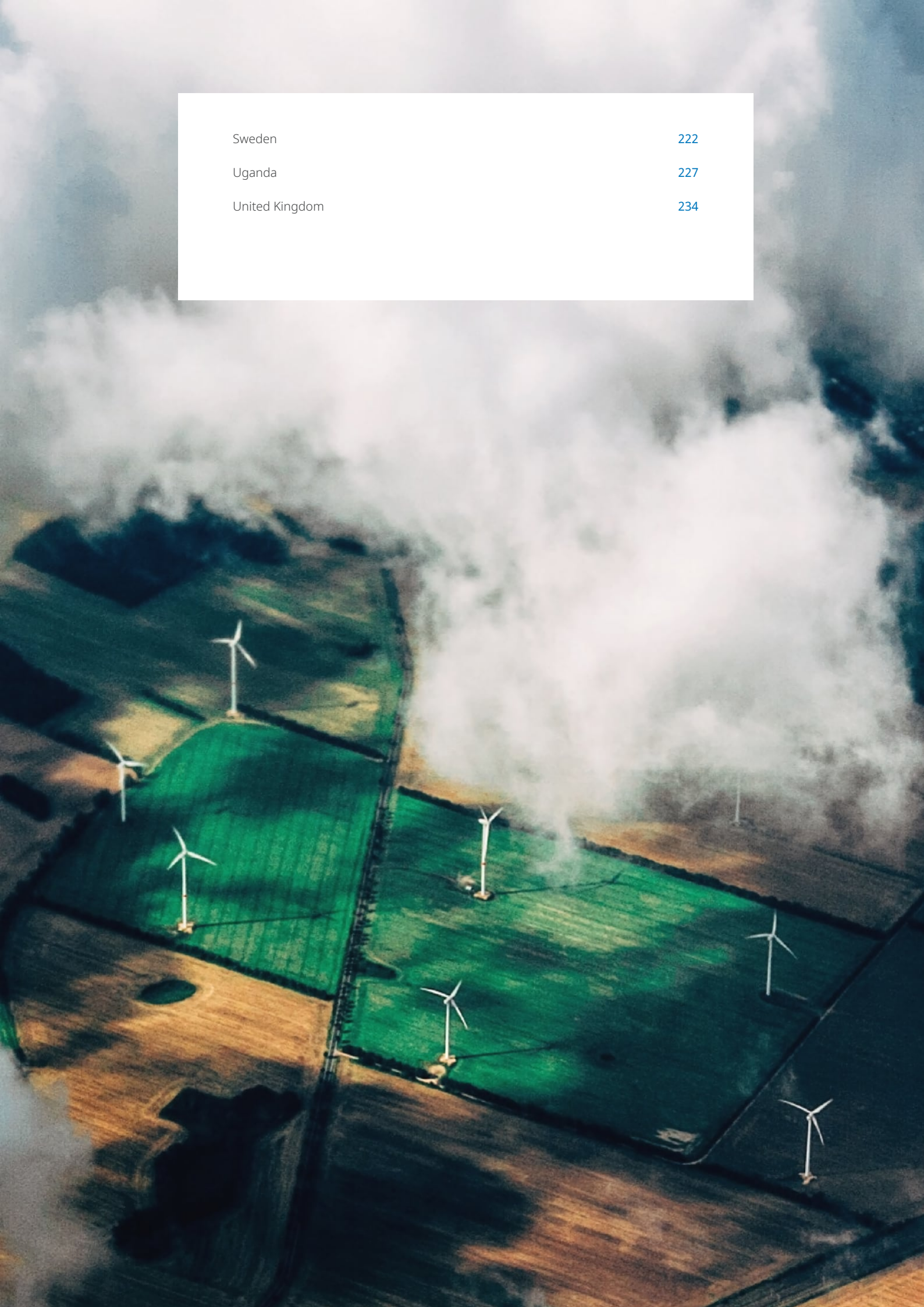


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About

In a world where the demands for energy are growing exponentially, those operating in the energy sector are looking to their lawyers to provide more than legal skill; they are also seeking in-depth sector know-how and innovative solutions to the challenges they face. DLA Piper's energy lawyers deliver to our clients the focused, innovative sector advice they need, wherever in the world they need it.

In a sector of relentless change, demand and complexity, private and public corporations wisely rely on experienced, global legal counsel for any matter involving energy.

We are entering an era of unprecedented demand for power generation and transmission, especially within emerging economies. This dynamic, together with the challenges we all face from climate change, is creating new opportunities for alternative energies and new technologies.

Our energy clients receive coordinated, across-the-board coverage for their needs, including construction and projects, corporate, competition, regulatory, contractual, trading, litigation/arbitration, dispute resolution and tax issues. We understand the technical, geographical, commercial and geopolitical factors that shape the industry and have first-hand access to contacts, sponsors and decision makers worldwide.

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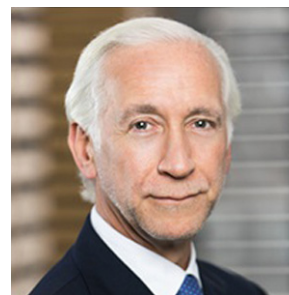
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Algeria

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Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Languages: Arabic, Tamazight, French
Population	44 million
Gross national income (GNI) per capita	GNI per capita: USD3,310 (2020)
Business environment	<ul style="list-style-type: none">• 2021 Index of Economic Freedom: 162 of 180• 2020 Corruption Perceptions Index: 104 of 180• 2019 UN Development Programme Human Development index: 91 of 189
Profile	<p>Algeria is a country in North Africa, part of the Maghreb region. It is bordered to the east by Tunisia and Libya, to the south by Niger and Mali, and to the west by Mauritania, the Western Sahara and Morocco. It is bordered to the north by the Mediterranean Sea.</p> <p>The economy has developed strongly in recent years, mainly due to the rise in oil and gas prices and high demand in the sector.</p> <p>Algeria remains dependent on this oil windfall, which accounts for up to 85% of its exports. With the significant fluctuation in commodity prices, the risk of weakening the country's public finances remains high.</p> <p>Algeria is betting on infrastructure development to get the country back on track after more than a decade of serious</p>

political unrest in the 1990s. Construction of highways, dams, power plants and seawater desalination projects are some examples of the infrastructure built over the last few years.

Electricity industry overview

Electricity industry overview

In 2017, 71,470 GWh of electricity was generated in Algeria.

This was comprised of:

- 10,074 GWh from thermal steam (14,09%);
- 31,009 GWh from thermal gas (43,39%);
- 29,508 GWh from combined cycle (41,29%);
- 71 GWh from hydraulic (0,01%);
- 286 GWh from diesel (0,4%);
- 21 GWh from wind (0,029%); and
- 500 GWh from photovoltaic solar (0,70%).

Electricity laws

In the early 2000s, institutional reforms brought about significant changes in the electricity and gas distribution sector in Algeria. They led to the promulgation of Law 02-01 of 5 February 2002 relating to electricity and gas distribution through pipelines, the main objectives of which were reorganize the national electricity and gas distribution market by recommending:

- A restructuring of the operator;
- The separation of electricity and gas activities;
- The opening up of electricity production and energy marketing activities to public and private investors in order to promote the emergence of benchmark competition;
- The modernization of the public service and the improvement of the performance of operators in the sector; and
- A consumer protection framework.

In order to ensure the effective implementation of these new reforms, Law 02-01 provided for the creation of a national regulatory authority whose main missions are:

- Monitoring and control of public services;
- Advising the public authorities on the organization and operation of the electricity and national gas markets;
- Determining the remuneration of operators;
- Determining the pricing of energy products (electricity and gas) for end consumers; and
- The supervision and control over the laws and regulations relating to it.

The establishment of the Electricity and Gas Regulatory Commission (CREG), whose Management Committee was set up on 24 January 2005, was intended to ensure the conformity of the implementation of the transformation process of the electricity and gas sector with the provisions of Law 02-01.

Generation and distribution

Generation

The national production fleet is made up of power plants owned by Société Algérienne de Production de l'Électricité (SPE), and Shariket Kahraba wa Taket Moutadjadida (SKTM), which are subsidiaries of Sonelgaz, as well as companies in partnership with Sonelgaz:

- Kahrama Arzew, which came into service in 2005;
- Shariket Kahraba Skikda "SKS" which came into service in 2006;
- Shariket Kahraba Berrouaghia "SKB" (Médéa) which came into service in 2007;
- Shariket Kahraba Hadjret Ennouss "SKH" which entered into service in 2009;
- SPP1 which entered into service in 2010;
- Shariket Kahraba Terga "SKT" commissioned in 2012; and
- Shariket Kahraba de Koudiet Edraouch "SKD" commissioned in 2013.

In 2017, generation was comprised of:

- SPE (67%);
- SKD (6%);
- SKT (6%);
- SKH (6%);
- SKTM (6%);
- SKS (4%);
- SKB (3%);
- Kahrama (2%);
- SPP1 (1%).

Distribution

The development program for electricity generation and transmission is accompanied by the reinforcement of the distribution network to ensure the reliability of the supply and distribution of electrical energy and guarantee a better quality of service.

At the end of 2017, the total length of the national electricity distribution network was 328,996 km.

Renewable energy overview

Renewables law

Despite the enactment of Law No. 04-09 of August 14, 2004, on the promotion of renewable energies in the framework of sustainable development, no concrete governmental decision to promote renewable energies has been taken since.

Renewable industry overview

In 2018, Algeria's energy mix was composed approximately of 1% liquid petroleum gas (LPG), 20% oil products and 79% gas.

Despite the establishment of a national programme dedicated to the development of renewable energy, the program's implementation schedule was never followed. Out of all the pilot projects totalling the 110 MW planned, only three projects were carried out, with a total capacity of 36.3 MW:

- The Hassi-Rmel hybrid plant (gas and solar thermal), with 25 MW of concentrated solar power (CSP) (commissioned in 2011);

- The 1.1 MW photovoltaic (PV) solar plant in Ghardaïa, including all four PV technologies, with and without solar tracking (commissioned in 2014); and
- The 10.2 MW wind power plant in Kabertène (Adrar), comprising 12 wind turbines with a rated power of 850 KW each (commissioned in 2014).

Between 2015 and 2018, power plants were installed mainly in cities located in southern Algeria (Adrar, Illizi, Tamanrasset, Djelfa, Laghouat) for a production capacity of 343 MW.

In 2019, the *Commissariat aux Energies Renouvelables et à l'Efficacité Énergétique* (CEFERE) was created by Executive Decree No. 19-280 of 20 October 2019 on the creation, organization and operation of the Commission for Renewable Energy and Energy Efficiency.

The CEFERE is responsible for contributing to national and sectoral development of renewable energy and energy efficiency.

Current issues in the renewables industry

The energy transition in Algeria can be achieved if certain issues are tackled:

- The identification of the components to be manufactured locally inducing heavy investment;
- Technology transfers in the field, particularly with regard to the local manufacture of strategic equipment;
- The creation of schools and specialized institutes for engineers and technicians specialized in conventional or renewable energies;
- The establishment of strategic partnerships;
- Transparency in project implementation; and
- Enhancing the credibility of institutions.

Government incentive schemes

Incentive measures

The Ministry of Energy has adopted a series of support measures aimed at the development of grid-connected renewable energies, through the establishment of a favorable legal framework and a National Fund for Energy Management, Renewable Energies and Cogeneration, CAS n°302-131 (FNMEERC) which is fed annually by 1% of oil royalties and the proceeds of certain taxes (such as 55% of the tax on flaring activities).

The legal framework, put in place in 2013, during the first phase of the launch of the national renewable energy development program was based on a Feed-in Tariff mechanism, which is less and less used in developed countries.

This system guarantees renewable energy producers benefit from tariffs that give them a reasonable return on their investment over a 20-year eligibility period.

The additional costs generated by these tariffs will be borne by the FNMEERC as diversification costs.

In this context, the executive decree n°15-319, amended and completed, setting the modalities of operation of the CAS 302-131 was published in December 2015.

Also, other incentive measures are planned. These include:

- Acquisition and provision of eligible land for the establishment of renewable energy plants;
- Support in the entire permit acquisition process;
- Identification of the renewable energy potential of the country's eligible administrative regions;
- Construction of pilot projects in each sector;

- Creation of bodies and entities for the approval and control of the quality and performance of components, equipment and processes relating to the production of electricity from renewable sources and/or cogeneration systems; and
- Support, through a recruitment and training plan for technicians, by professional training institutes and the association of universities and national research bodies in the research and training of engineers.

Major projects and companies

By 2019, renewable energy assets included 24 power plants with a total capacity of 354.3 MW.

This renewable energy park consists of 23 photovoltaic plants with a total capacity of 344.1 MW and one wind power plant with 10.2 MW.

Sonelgaz and its companies in partnership (see [Electric overview](#) above) are the major entities in charge of establishing new renewable energy projects.

Foreign investment ownership

The Law No. 16-09 of 03 August 2016 on investment promotion is the main legislative instrument governing foreign investment in Algeria.

The National Agency of Development of Investment (ANDI), created by article 6 of the ordinance n°01-03 of August 20th, 2001, modified and supplemented, is a public administrative establishment, endowed with the moral personality and the financial autonomy, in charge, in coordination with the administrations and the concerned organizations, of:

- the registration of investments;
- the promotion of investments in Algeria and abroad;
- the promotion of territorial opportunities;
- facilitating business practices, monitoring the formation of companies and the implementation of projects;
- assistance, help and support for investors;
- information and awareness-raising for the business community; and
- the qualification of projects, their evaluation and the establishment of the investment agreement to be submitted for approval to the national investment council.

A new law on investment promotion in Algeria is currently in the works.

UNFCCC – Paris Commitments and beyond

Algeria signed the Paris Agreement on 22 April 2016 and ratified the agreement on 20 October 2016.

Relevant resources and references

Ministry of Energy

- [Ministry of Energy - New and Renewable Energies and Energy Management](#)
- [Ministry of Energy - Electricity and Gas](#)

CREG

- [Mecanisme d'encouragement](#)
- [Programme national ENR](#)

SGG

- [JORADP](#)

World Bank

- [World Bank - Business Enabling Environment](#)
- [World Bank - GDP Per Capita](#)

The Heritage Foundation

- [The Heritage Foundation - Country Rankings](#)

PNUD (HDI)

- [La prochaine frontière : le développement humain et l'Anthropocène](#)

CPI Transparency

- [Corruption Percentage Index](#)

Other sources

- [Le système énergétique de l'Algérie](#)
- [L'Algérie 100% énergies renouvelables](#)

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Angola

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Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil law• Language: Portuguese
Population	32,87 million
Gross national income (GNI) per capita	GNI per capita: USD6,020
Business environment	<ul style="list-style-type: none">• 2018 Global Competitiveness Index: 134th position among the 140 countries evaluated in the competitiveness report)• 2020 Index of Economic Freedom: 54.2 points in a rise of 14 places, which places the country in the 140th position out of 180• 2020 Corruption Perceptions Index: 142/180, rose 25 positions and improved the score on this index• 2020 UN Development Programme Human Development Index: 148th out of 189 HDI countries
Profile	<p>Angola is a country on the west coast of Africa, with a territory that includes tropical Atlantic beaches, extending through southern Africa and bordering Namibia, Botswana, Zambia and the Democratic Republic of Congo. Most of its major cities, including the capital Luanda, are on the west coast of the South Atlantic.</p> <p>The Portuguese have been present since the 15th century in some parts of what is now the territory of Angola, interacting mainly with the native inhabitants on the coast. Angola was a Portuguese colony that only covered the country's current</p>

territory in the 19th century and the effective occupation, as determined by the Berlin conference in 1884, only in the 1920s.

The country has vast natural resources, such as large reserves of minerals and oil, and since 1990 its economy has shown growth rates that are among the highest in the world, in particular after the end of the civil war. Until the 1970s, Angola's economy was predominantly agricultural, with coffee as its main crop. The Angolan economy is currently driven by the oil sector, which represents around 50% of GDP, accounting for more than 70% of government revenue and corresponding to over 90% of the country's exports.

Angola is a unitary dominant party presidential-style government, headed by a President and accompanied by a Vice President.

Electricity industry overview

Electricity industry overview

- The energy matrix in Angola in the last five years has changed considerably. Installed capacity in Angola is above 4,889 GW, distributed by the following types of generation: i) hydro power, with a capacity of 3,005 GW / 61% of total power; ii) thermal, with an installed capacity of 1,866 GW / 31% of total power; iii) natural gas, with a capacity of 0.375 GW / 7% of total power; and iv) renewable energies, with a capacity of 0.063 GW / 1% of total power. The electricity sector is in an important phase of transition and exit from a long period marked by a generation deficit and an unreliable supply and constant blackouts. The entry into operation of the Cambambe heightening, the Soyo and Laúca power stations, with more than 3.5 GW, constitutes a reinforcement.
- Important reinforcements in terms of production, mainly in the Northern System, made it possible to reduce the deficit in production and the use of diesel for the production of electricity. It is expected that PRODEL (Empresa Pública de Produção de Electricidade – Angola's national energy generation entity) will reach 5.4 GW of installed power by 2022. The public effort in terms of production should be based on the operationalization of projects that are being concluded and on the maintenance, relocation and reconversion of fuels from existing thermal power stations. Transport will play a key role in consolidating and optimizing the electricity sector, with a view to taking energy from the Northern System to Luanda, the Center and the South of the country.
- Governance objectives in the sector go beyond the completion of ongoing projects. The priority in the Government's program is access: guaranteeing access to water and electricity produced from the Kwanza River and natural gas from Soyo to at least half of Angolan families and companies by 2022.

Electricity laws

- The restructuring of the sector began in 1996, with the publication of the General Law of Electricity 14-A/96, which combined with the 2011 Angola Energy Security Policy to pave the way for the publication of new regulations essential to the energy market and the amendment of the General Electricity Law, Law nº 27/15.
- The General Electricity Law, approved by Law no.14-A/96, of 31 May, as amended by Law no. 27/15, of December 14, established the general principles of the legal regime carrying out the activities of production, transport, distribution, marketing and use of electricity.
- Presidential Decree nº. 43/21, of February 17, which approved the new Regulation for Independent Electric Energy Production. The Regulation establishes the legal regime applicable to the independent generation of electricity and details the general rules on this matter provided for in the General Electricity Law - Law No. 14-A/96, of May 31, 1996 (as amended by the Law 27/15, of December 14, 2015).
- The Regulation establishes rules on (i) the independent production of electric energy aimed at satisfying its own needs, and (ii) the acquisition of the respective surplus for public supply.
- Scope of application: The Regulation applies to all natural and legal persons who carry out the activity of independent production of electricity.

Renewable energy overview

Renewables industry overview

In Angola, hydropower leads in installed capacity, followed by thermal energy, and biomass. Angola has a national strategy for new renewable energies, which was published in the Atlas and National Strategy for New Renewable Energies, which sets out the principles and objectives for the promotion and use of new renewable energy sources in Angola:

- Improve access to energy in rural areas, based on renewable energies;
- Develop the use of renewable energy linked to the grid; and
- Promote and accelerate public and private investment in renewable energy.

The global reduction in the consumption of fossil fuels in the medium and long term will result in a reduction in the price of crude oil in international markets, which could make research and production in Angola's oil fields, which are mostly in deep water, unfeasible, with high economic and environmental costs.

Hydro power

Hydro power has high reliability and allows local supply for irrigation. However, it can require population displacement, cause changes in ecosystems with a negative impact on biodiversity, and has high installation and deactivation costs.

Currently, Angola has installed around 2.4 GW of hydro power (Ministry of Energy and Water – Draft Preparation of the Master Plan for the Development of the Electric Sector in the Republic of Angola – Final Report). Angola's hydroelectric potential is estimated to be 18 GW (Atlas and National Strategy for New Renewable Energies).

Wind

In Angola, the wind resources in the southwest of the country and on the Atlantic escarpment present favorable conditions for the installation of more than 3.9 GW of wind power generation (Atlas and National Strategy for New Renewable Energies).

Solar

In Angola, solar radiation is high and constant throughout the country, having identified 17.3 GW of energy generation potential. (Atlas and National Strategy for New Renewable Energies). A Presidential Decree was recently authorized for an investment for the installation of solar panels in Bailundo, Benguela, Biópio, Cuito, Lucapa, Luena and Saurimo.

Geothermal

Angola does not show recent volcanism in geological terms, there are a few medium temperature geothermal manifestations in the provinces of Huambo (Alto Hama) and Kwanza Sul (Conda), which could have some geothermal potential.

Current issues in the renewables industry

- One of the current issues in Angola has been the lack of regulation in the renewable energy industry to attract investors.

Government incentive schemes

Trends and requirements

- There has been a progressive replacement of public investment in electricity generation with long-term private financing. Public financing is being reserved for investments that have a structuring nature.
- Agreement for CAE (official classification of economic sectors) with subsidized prices (feed-in-tariffs) during a period of reasonable time.
- Fixing the rate of return of investment capital.

- Tax reductions - tax on incomes, imports.
- Auctions for the purchase of energy for public and private entities, from renewable sources.

Major projects and companies

- The entry into operation of the Cambambe heightening, the Soyo and Laúca power stations, with more than 3.5 GW, constitutes a fundamental reinforcement that allows for a more stable energy supply.
- A project is underway to install solar hybrid plants in 7 municipalities which will be an important learning process for future projects in the pipeline.

Foreign investment ownership

The Private Investment Law and its investment regimes

In Angola, the Private Investment Law (PIL) establishes the general principles and sources of private investment, the benefits and facilities granted to private investors, the criteria for access to such benefits and facilities, as well as the rights, rights and guarantees of private investors.

Since 2018, there is no minimum value for private investments under the law, so it applies to private investments of any value, whether made by internal or external investors.

The PIL indicates that the investor may freely opt for either scheme when presenting a Private Investment Project (PIP). The special regime enjoys more favorable benefits and the prior declaration regime provides for other types of benefits. In both cases, companies must be previously incorporated and the presentation of the Private Investment Registration Certificate at the time of incorporation is dispensable, since this document will be issued at the time of the decision of the private investment request by AIPEX (the competent entity according to the PIL), and it is this document that certify the decision to approve the said request.

When registering a PIP, AIPEX is responsible for the verification of whether the object of the main activity of the PIP falls within the economic classification of the priority activity sectors.

The PIL provides that investors who are covered by the law will enjoy the benefits and facilities provided for therein, which are as follows:

- Benefits, which can be of (i) tax or (ii) financial nature:
 - Deductions from taxable income, accelerated depreciation and amortization, tax credit, exemption and reduction of tax rates, contributions and import duties, deferment in time of payment of taxes and other exceptional measures that benefit the investor;
 - Consists of access to credit, through the Executive's programs to support the economy, such as microcredit, interest subsidies, the public guarantee and risk capital for obtaining financing.
- Administrative convenience services ("*Facilidades*")

Amendment to the Private Investment Law

AIPEX is the competent entity according to the PIL, and respective regulation, for the purpose of granting the above mentioned benefits (both tax and financial) and administrative convenience services.

Law no. 10/21, of April 22, amended PIL, and made significant changes to the Private Investment regime, of which the following stand out:

- New obligation for investment projects regulated by special law to be registered with the competent institution, under terms to be regulated for the purposes of statistical control and attribution of the status of private investor;
- Within the scope of internal investments, the means of payment available to be used by foreign exchange residents must be available in the national territory (although with recourse to financing contracted abroad);

- Inward investment and foreign investment can be carried out using non-equity capital and foreign investment can also be carried out using raw materials (where permitted by law);
- Investors are now able to transfer abroad: i) dividends; ii) the proceeds from the liquidation of its ventures; iii) the indemnities due to it; and iv) royalties or other income associated with the transfer of technology, without the need for the Private Investment Project to be completely executed, maintaining only the obligation to pay the taxes due and the constitution of mandatory reserves;
- External investors and companies majority held by them are now eligible to resort to internal credit (under the terms of the legislation in force), before having fully implemented the respective Private Investment Project;
- Two impact factors were added for the attribution of benefits and facilities: i) Value of the investment; and ii) Number of jobs;
- The Contractual Regime is re-introduced, which is applicable to Private Investment Projects referring to any sector of activity in which a negotiation is carried out between the project promoter and the Angolan State, regarding the content and conditions applicable to the project.
- As a general rule, for the implementation of the Private Investment Project, investors are now exempt from obtaining provisional licenses and other authorizations from the Public Administration Bodies (OAP), the CRIP (Investment Registration Certificate) being sufficient for this purpose; and
- Without prejudice to cases in which it is considered essential to issue opinions, approvals, authorizations or the practice of other acts or formalities in the procedures applicable to investment projects, the OAP is obliged to comply with the deadlines established in the execution and implementation schedule Private Investment Project, under penalty of tacit approval.

UNFCCC – Paris Commitments and beyond

- Angola submitted its INDC (Intended Nationally Determined Contributions) to the UNFCCC in 2015, where it proposed to reduce 35% of GHG emissions by 2030, with 2005 as the reference scenario, focusing on the sectors renewable energy and reforestation.
- In 2017 Angola established the National Strategy for Climate Change (ENAC) 2018-2030 in order to achieve the goals defined in the agreement, that is, the document points out the mitigation measures, adaptation to climate change to be implemented in Angola. It also addresses the need for training and adequate technology, as well as a financing plan and the need to improve research, observation and analysis of climate scenarios. In 2020, Angola ratified the Paris Agreement.
- Currently, there are already some projects aimed at combatting droughts in southern Angola and strengthening the capacity of farmers to adapt to climate change, such as the FRESAN program and action (Strengthening Resilience and Food and Nutritional Security in Angola), as well as the strengthening of the National Institute of Meteorology and Geophysics (INAMET) in its capacity for forecasting and climate modeling.

Relevant resources and references

Relevant websites

- [World Bank Group](#)
- [MINFIN](#)
- [Countryeconomy.com](#)
- [Portal Oficial do Governo da República de Angola](#)
- [MINEA](#)
- [EcoAngola](#)

References

- [Government of Angola - Renewable Energy](#)
- [Climate change and the Paris Agreement](#)
- [The World Bank in Angola - Overview](#)

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Australia

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Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Common Law• Language: English
Population	25.42 million as at 28 June 2022 (based on Australian Bureau of Statistics data)
Gross national income (GNI) per capita	USD 55,115 as at 2020 (based on OECD data)
Business environment	<ul style="list-style-type: none">• 2022 IMD World Competitiveness Yearbook: 19 of 63 (up 3 rankings from 22 in 2021)• 2019 World Economic Forum's Global Competitiveness Report: 16 of 141 (down 2 rankings from 14 in 2018)• 2022 Index of Economic Freedom: 12 of 177 (down 9 rankings from 3 in 2021)• 2021 Corruption Perceptions Index: 18 of 180 (down 7 rankings from 11 in 2020)• 2020 UN Development Programme Human Development Index: 8 of 188 (down 2 rankings from 6 in 2019)
Profile	<p>Australia was inhabited by Indigenous persons for thousands of years before the British established a colony in New South Wales in 1788. Australia's six States formed a federation in 1901. The governance model was (and remains) largely a fusion of US federalism and a UK system of governance. Since World War Two, Australia has been an ally of the United States but now finds its economic security in Asia. Countries like China, Japan and India have fuelled Australia's resources boom, which saw it largely avoid the global financial crisis.</p>

Australia's GDP was USD1.54 trillion in 2021 according to the World Bank. The International Monetary Fund has forecasted that Australia's GDP will grow 2.2% in 2023. The Australian public sector debt ratio is forecasted to be 43% of the GDP by the end of 2022, which is well below the 89% average forecast for advanced economies.

Electricity industry overview

Summary of the electricity industry in Australia

- In Australia, the burning of fossil fuels has been the predominant driver behind the production of electricity given the abundance of onshore and offshore gas, oil and minerals found in-country, accounting for over 70% of electricity generated in the National Energy Market (NEM) in 2020 according to the State of the Energy Market 2021 Report released by the Australian Energy Regulator in 2020.
- However, with the acceleration of low emissions technologies being developed in Australia, coupled with the transition to net zero emissions by 2050, the use of fossil fuels has started to decline as Australia starts to shift to renewable energy to generate electricity instead (see renewable industry overview below).
- According to the State of the Energy Market 2021 Report:
 - over 3,700 MW of large-scale solar and wind generation capacity entered the NEM in 2020, largely contributed by projects in New South Wales and Victoria.
 - almost 2,500 MW of new capacity was installed across the NEM in 2020 as a result of rooftop solar photovoltaic (PV).
 - wind output has exceeded gas generation for an unprecedented first time.
- Despite the significant benefits the electricity market transition has to offer to consumers (if integrated efficiently into the power system), there is still some uncertainty surrounding the use of such technologies to provide a reliable electricity supply, particularly during periods when there is a lack of wind or sunshine.
- As renewable technology continues to expand and less reliance is placed on coal and gas powered generators to supply power output to the grid, transmission networks in South Australia, Tasmania and parts of Victoria and Queensland have experienced an imbalance of frequency shifts and voltage instability due to a shortage of system strength connected to the grid. The long-term risks associated with an unstable network means that renewable plants are unable to fully operate efficiently and creates another barrier for new plants to connect to the grid.
- The regulatory framework of the electricity sector across Australia is disaggregated between the east coast and the south-west coast.
- On the east coast of Australia there is retail competition through the National Energy Market. The NEM is connected by six major transmission interconnectors, which link the electricity networks of New South Wales, Queensland, South Australia, Tasmania and Victoria. The network consists of nearly one million kilometers of underground and overhead transmission and distribution lines /cables.
- However, because of their geographical isolation, the Northern Territory and Western Australia have their own electricity markets and are not connected to the NEM.
- Instead, Western Australia operates under the Wholesale Electricity Market and is governed by the Wholesale Electricity Market Rules due to its location in the South West Interconnected System.
- The Northern Territory on the other hand operates under the Interim Northern Territory Electricity Market and is governed by the System Control Technical Code, Electricity Retail Supply Code and the National Electricity Rules.
- There is a mix of State government ownership and private ownership of electricity infrastructure. Privatization of electricity assets owned by State governments has become politicized, receiving strong opposition from opponents of privatization including unions.

Electricity laws

- The National Electricity Law contained in the Schedule of the National Electricity (South Australia) Act 1996 (SA) and associated regulations, underpins the regulatory framework for the NEM, which is managed by the Australian Energy Market Operator. Following the enactment of the National Electricity Law in South Australia, each of the other participating states in the NEM subsequently adopted the National Electricity Law by introducing legislation as a law of their own jurisdiction.
- Together, the National Electricity Rules and the National Electricity Code govern access to transmission and distribution networks and set out the market rules including market operations, power system security, network connection, access and pricing for services in the National Energy Market.
- Part IIIA of the Competition and Consumer Act establishes the Australian Energy Regulator.
- The Australian Energy Market Commission Establishment Act establishes the Australian Energy Market Commission.
- The Offshore Electricity Infrastructure Act 2021 (Cth) (OEI Act) represents a significant development in Australia's commitment to achieving net zero emissions, as it introduces a dedicated regulatory regime for offshore infrastructure and technologies (e.g. offshore wind farms or solar farms) proposed to be carried out in Commonwealth offshore areas. The OEI Act has been modelled on the existing offshore petroleum framework under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) and will be similarly administered and regulated by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) and the National Offshore Petroleum Titles Administrator (NOPTA).
- The OEI Act is supported by the Offshore Electricity Infrastructure (Regulatory Levies) Act 2021 (Cth), which was introduced to impose a levy on offshore electricity infrastructure license holders, or those engaging in offshore infrastructure activities in Commonwealth waters.
- The introduction of the Competition and Consumer (Industry Code – Electricity Retail) Regulations 2019 (Cth) (Code) regulates the cap on standing offer prices and the process in which prices and discounts must be advertised, published or offered. The Code only applies to retailers that supply electricity to small consumers in the applicable distribution regions of New South Wales, South Australia and south-east Queensland and is regulated by the Australian Competition and Consumer Commission (ACCC).

Renewable energy overview

Summary of the renewables industry in Australia

- Despite the impacts of COVID-19 continuing to have an effect on the supply chain across the globe, coupled with increased shipping costs and key commodities, the renewable energy industry in Australia remained robust in 2021.
- According to the Department of Industry, Science, Energy and Resources, 24% of Australia's total electricity generation was from renewable energy in 2020 – representing an increase of 3% since 2019
- According to the Green Energy Council 32.5% of 24% of Australia's total electricity generation was from renewable energy in 2021
- A contributing factor to this significant increase was due to the additional 3 GW of new capacity generated by the small-scale solar sector and 2 GW of new capacity generated by the large-scale sector in 2020.
- Tasmania became the first Australian state to generate 100% of its electricity from renewable energy sources and recently passed legislation to lock in a renewable energy target of 200% by 2040.
- The potential commercialization of hydrogen began to emerge in 2020 as the Federal Government and State and Territory Governments pledged to invest in renewable hydrogen, including various pilot projects and new initiatives to determine the feasibility of developing hydrogen and ammonia produced from zero-emission electrolysis.

Solar energy

- Solar energy generation has increased dramatically in Australia over the last decade and is now the fastest growing renewable energy generated in Australia, with a significant majority of large-scale solar projects being developed in Queensland.
- In 2020, the rooftop solar industry experienced record high volumes of solar panels installed, contributing to 23.5% of the total clean energy generated in Australia in 2020 and 10% of Australia's electricity in 2020-21.
- In particular:
 - 3 GgW of new capacity was generated in 2020, an increase of 0.8 GW since 2019 for small scale systems.

- 117 MW of new capacity was generated in 2020 for medium scale systems.
- 893 MW of new capacity was generated in 2020 across 22 large scale systems, thereby bringing the sector's total capacity to 3.9 GW. Additionally, Australia's major retailers including Woolworths, Bunnings and Aldi transitioned into the renewable market in 2020 and have committed to use 100% renewable power, accounting for 1,146 MW of deals signed in 2020.
- Some of the recent solar energy projects commissioned during 2020 include:
 - the second stage of the Bungala Solar Farm in South Australia with a generation capacity of 220 MW (when combined with stages 1 and 2 of the project).
 - 105 MW Nevertire Solar Farm in New South Wales.
 - 100 MW Bomen Solar Farm in New South Wales.
 - 100 MW Merredin Solar Farm in Western Australia.
 - 100 MW Yarranlea Solar Farm in Queensland.
- And in 2022
 - 150 MW Suntop Solar Farm in NSW
 - 85 MW Hillston Sun Farm in NSW

Hydro power

- Hydro power electricity generation is the third leading renewable energy source in Australia and accounted for 23.3% of total clean energy generated and 6.4% of Australia's overall electricity in 2020.
- Australia's hydro power generation capacity is at an all-time high as it currently generates 14,638 GWh of power – an increase of 573 GWh since 2020.
- A number of major hydro projects are currently being developed in Australia, the most significant of these projects being:
 - the Snowy Mountains Hydro Electric Scheme in New South Wales which reached a number of significant development milestones in 2020.
 - Tasmania's Battery of the Nation project which continued to make progress in 2020.
 - Marinus Link, a critical component of the Battery of the Nation project, which reached final investment decision stage after the Federal Government invested a further USD94 million into the project.

Wind energy

- According to the Clean Energy Council, wind power is currently the cheapest source of large-scale renewable energy in Australia.
- In 2020, the wind sector accounted for approximately 35.9% of Australia's total renewable energy generation, demonstrating a 1.4% rise in total wind generation since 2019. Much of this increase was due to ten new wind farms being commissioned across Australia in 2020 which generated a total of 1097 MW in wind capacity.
- The largest project commissioned in 2020 was stage 1 of the Murra Warra Wind Farm in western Victoria which generated 226 MW of power, as well as the 184 MW Warradarge Wind Farm in Western Australia and the 144 MW Cattle Hill Wind Farm in Tasmania.
- The land use planning regime applying to wind energy varies greatly between State Governments. In recent years some State Governments have introduced new planning regulations which restrict where new wind farms may be built. A range of reasons have been cited for these amendments including concerns in some sectors of the community about the mental and physical effects of low frequency noise produced by wind turbines ("wind turbine syndrome"). For example, planning regulations in Victoria give residents who live within 2 km of a proposed wind turbine the power of veto over that project. These regulatory amendments have created an additional barrier to wind farm approvals in many areas.

Geothermal energy

- The geothermal sector in Australia is still in the infancy stages of development, contributing to approximately 0.001% of Australia's total clean energy generation.
- In 2018, Alinta Energy announced plans to commercialize geothermal heating and cooling after successfully installing geothermal heating and cooling throughout a major housing development in Blacktown, New South Wales.
- MGA Thermal Energy Storage Project – started 2022 – project cost \$2.84m - The MGA Thermal Energy Storage Project will design, manufacture and operate a 0.5 MWth / 5 MWhth demonstration-scale thermal energy storage (TES) system using MGA Thermal's proprietary Miscibility Gap Alloy (MGA) technology.

Biomass and biogas energy

- Australia produces about 20 million tons of organic waste per year from domestic and industrial sources.
- According to the Clean Energy Counsel's Clean Energy Australia Report 2022, bioenergy contributed approximately 1.4% of the total renewable energy generation in 2021. Some proponents suggest that in the future biogas could be more important than solar energy and as important as wind energy. These predictions have led the Australian Government to develop a roadmap to identify whether bioenergy is a viable option in generating clean energy and also inform of any investment and policy decisions in the bioenergy sector in Australia, which can be accessed [here](#).
- Some of the notable bioenergy projects announced in 2019, all of which are (partially) funded by The Australian Renewable Energy Agency (ARENA) include:
 - Logan City Biosolids Gasification, an AUD17.28 million project located in Loganholme, Queensland is Australia's first initiative to use the Loganholme Wastewater Treatment Plant to process sewage sludge and transform it into energy.
 - Hazer Process Commercial Demonstration Plant, an AUD22.57 million project located in Munster, Western Australia which seeks to convert biogas from sewage treatment into hydrogen and graphite.
 - The East Rockingham Waste to Energy project will process up to 330,000 tonnes of residual waste per annum and recover energy to produce 28.9 MW of power.
 - The Kwinana Waste to Energy project will develop a waste processing facility which will use moving grate technology to process approximately 400,000 tonnes of municipal solid waste, commercial and industrial waste and/or pre-sorted construction and demolition waste per annum to produce approximately 36 MW of baseload power for export to the grid.

Ocean energy

- With the assistance of ARENA providing funding support for 14 ocean projects, there has been some considerable progress in developing innovative technologies in both wave and tidal energy since 2012. Some of the most notable projects include:
 - Perth Wave Energy Project which was completed on 31 December 2017, became the world's first commercial-scale wave energy array that is connected to the Wholesale Energy Market and has the ability to produce desalinated water.
 - UniWave200 King Island Project – Wave Swell which involves the design, construction, deployment, installation and operation of a 200 KW wave energy converter (UniWave200) near Grassy Harbour on King Island, Tasmania. UniWave200 will be connected to the grid through a PPA with Hydro Tasmania with an estimated operational lifetime of twelve months.
 - Garden Island Microgrid Project which was completed on 31 December 2020, involved the construction and integration of 2 MW of PV solar capacity, a 2 MW/0.5 MWh battery storage system and a control system that can connect to the wave energy generation technology. This project is the world's first wave energy integrated microgrid which can produce both power and desalinated water.
- Despite ARENA providing funding assistance for the development of these technologies, there remains slow growth in commercializing these innovations due to challenges such as capital cost, project financing, environmental impacts and developing appropriate technology suitable for utilization in extreme ocean conditions that prohibit the full utilization of these technologies.

Carbon capture and storage (CCS)

- Whilst CCS technology is successfully carried out in countries around the globe such as Canada, United States and Norway, this technology is only starting to emerge in Australia's renewable market given its potential to reduce emissions from fossil fuel sectors and Australia's transition to net zero emission.
- Accordingly, CCS is identified as a low priority emissions technology under the Federal Government's Technology Investment Roadmap.
- Budget 2022-23 - \$50.3 million over 2 years from 2022-23 to accelerate the development of priority gas infrastructure projects consistent with the Future Gas Infrastructure Investment Framework and support investment in carbon capture and storage pipeline infrastructure.
- The USD54 billion Gorgon project operated by Chevron is the only operating CCS project in Australia (and also the world's largest), located in Western Australia. In July 2021, the Gorgon project failed to meet its target of capturing and burying 80% of the carbon dioxide produced from gas wells in Western Australia over five years. Notwithstanding this setback, five million tons of greenhouse gases have been injected underground since it commenced operations in August 2019.
- Other Australian CCS projects in the pipeline include:
 - The CarbonNet Project – This project funded by the Victorian and Federal Government comprises of a world class, commercially viable CCS hub in Gippsland, Victoria. Once completed, it will become a commercial scale carbon transport and storage system.
 - Moomba CCS Project – In November 2021, Santos and joint venture partner Beach Energy announced its final investment decision to proceed with the USD165 million (AUD220 million) Moomba carbon capture and storage project in South Australia. The Moomba CCS Project is projected to permanently store 1.7 million tons of carbon dioxide per year, with the first injection targeted for 2024.

Government plans

On 26 October 2021, the Australian Government released Australia's Long Term Emissions Reduction Plan (Plan), a copy of which can be accessed [here](#), in order to achieve a clean and resilient economy driven by renewables such as solar and wind instead of fossil fuels by 2050. Under the Plan, the Federal Government proposes to achieve net zero emissions by:

- providing capital costs through government funding in order to accelerate the development of technologies required to achieve net zero emissions. This includes:
 - ARENA committing over AUD1.4 billion over the next 10 years, with an additional AUD75 million allocated to low emissions technologies like EV charging.
 - Clean Energy Finance Corporation (CEFC) investing AUD10 billion to facilitate private sector investment in low emissions technology.
 - Investing AUD565 million with overseas partners for international low emissions technology.
 - Allocating AUD2.5 billion for projects through the Emissions Reduction Fund – Australia's carbon offset scheme – and AUD2 billion for further abatement through the Climate Solutions Fund.
 - Funding AUD1.2 billion for seven new clean hydrogen industrial hubs.
 - Investing AUD300 million in CCS hubs and technologies.
 - Spending AUD280 million to support industrial facilities to further reduce emissions using the new Safeguard Crediting Mechanism.
- building large scale infrastructure across all sectors.
- leveraging opportunities in new and traditional markets.
- partnering with other nations to accelerate innovation in low emissions technology.

Renewable energy laws

- Climate Change (Consequential Amendments) Bill 2022 was introduced to Parliament in late July 2022. If passed, will legislate Australia's commitment to cutting its emissions by a minimum of 43% by 2030 and reaching net zero by 2050, with potential to

provide greater regulatory certainty for businesses and investors across all sectors. Australia's targets will be integrated into the functions of key Federal entities and schemes, including the Clean Energy Regulator and National Greenhouse and Energy Reporting scheme, through amending legislation.

- The Renewable Energy (Electricity) Act 2000 (Cth) sets out Australia's target of having 20% renewable-sourced energy by 2020. The scheme established by the Act for achieving this target (the RET) aims to stimulate investment in renewables by requiring liable entities (usually electricity retailers) to purchase and surrender a certain number of Renewable Energy Certificates (RECs), in order to meet their obligation under the RET each year. RECs are created for each megawatt hour of renewable energy generated or displaced.
- Following a review of the RET, in 2011 the scheme was split into two parts – the Large-Scale Renewable Energy Target and the Small-Scale Renewable Energy Scheme. Under the new scheme RECs were replaced by large-scale generation certificates (LGCs) (generated by large-scale renewables projects) and small-scale technology certificates (STCs) (generated by small-scale renewables systems).
- LGCs are sold through the open LGC market, where prices fluctuate based on supply and demand and other market factors. As at 17 October 2019, LGC spot prices was AUD44. STCs may either be sold through the open market for an uncapped price, or through the STC clearing house at the fixed price of AUD40.
- In June 2015, the Australian Parliament passed the Renewable Energy (Electricity) Amendment Act 2015 (Cth). As part of the amendment Act, the 2020 Large-Scale Renewable Energy Target was reduced from 41,000 GWh to 33,000 GWh, with interim and post-2020 targets adjusted accordingly. The amendment Act also extended the partial exemption for emissions-intensive trade-exposed industries to a full exemption. The Small-Scale Energy Scheme has no target as such.
- Renewable energy regulation The Clean Energy Regulator (CER) is as an independent statutory authority established under the Clean Energy Regulator Act 2011 (Cth). The CER's functions include managing the:
 - National Greenhouse and Energy Reporting Scheme, under the National Greenhouse and Energy Reporting Act 2007 (Cth);
 - Emissions Reduction Fund, under the Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth);
 - Renewable Energy Target, under the Renewable Energy (Electricity) Act 2000 (Cth) and the Renewable Energy (Electricity) Regulations 2001; and
 - Australian National Registry of Emissions Units, under the Australian National Registry of Emissions Units Act 2011 (Cth).
- The Australian Renewable Energy Agency (ARENA) is an independent authority that aims to, among other things, improve the competitiveness of renewable energy technologies and increase the supply of renewable energy in Australia. It has supported numerous solar and wind projects, and is currently undertaking a Renewable Hydrogen Development Funding Round. In July 2022, changes to ARENA's financial assistance functions and funding strategy were announced, focusing their mandate on funding renewable energy technologies, clean hydrogen, low emissions metals and decarbonizing land transport.
- The Clean Energy Finance Corporation (CEFC) is an Australian Government-owned "green bank" established to provide a new source of finance for renewable energy technologies, and to facilitate increased flows of finance into the renewable energy sector.
- The Australian Energy Market Operator (AEMO) operates and manages the National Energy Market to ensure that energy can be generated, transmitted and distributed throughout the eastern and south-eastern states, and also manages the Australian gas markets and the buying and selling of energy in the financial markets to ensure that there's an affordable, secure and reliable source of energy for Australians.

Current issues in the renewables industry

In July 2022, Australia and USA joined forces forming the Net Zero Technology Acceleration Partnership aiming to accelerate development and deployment of zero emissions technology, and cooperate on critical minerals supply chains to reduce greenhouse gas emissions while supercharging economic growth.

During the most recent UN climate summit – the 26th Conference of the Parties (COP26) held in Glasgow in 2021, a number of countries across the world (including Australia) pledged to achieve net-zero emissions by 2050 and take steps to transition a net zero energy system over the coming decades. However, despite Australia's ambitions to transition to a clean energy future and readiness of a plan, Australia was confronted with a number of issues in the renewables industry such as:

- network constraints in renewable energy generators, particularly in Queensland;
- delays with AEMO approving network connections;
- rising prices for key equipment;
- supply chain issues for key components arriving from China, Italy, Spain and Germany;
- increased shipping costs;
- skill shortages for key technical professionals due to travel bans domestically and internationally preventing them from attending site; and
- as a result of the above, lack of investor confidence in renewable energy projects due to market uncertainty.

The Clean Energy Australia Report 2021 recognizes that significant investment, careful planning and a viable energy policy will be required to prepare Australia's grid for the transition to a clean energy future. However, the announcement of renewable energy zones by state governments should alleviate the pressure on the grid, as well as Federal Government funding for future renewable energy projects.

Government incentive schemes

- LGCs and STCs, as discussed above, are the main Federal Government incentives for renewable energy investment in Australia.
- Between 2012 to 2021, ARENA has supported 612 projects and provided AUD1.81 billion in grant funding.
- Pursuant to the Australian Renewable Energy Agency Act 2011 (Cth), ARENA is entitled to approximately AUD1.93 billion in government funding until 30 June 2022 to provide financial assistance for (among other things), the research, development, demonstration and commercialization of renewable energy and related technologies.
- In the Federal Budget 2020-21, ARENA was funded an additional AUD1.62 billion in grant funding until 2032 to provide financial assistance for companies seeking to develop new technologies that will cut emissions in agriculture, manufacturing, industry and transport.
- In ARENA's General Funding Strategy for 2021/22 – 2023/24, it has outlined its plans to support Australia's transition to net zero emissions by providing funding for projects and future technologies that will:
 - reduce carbon emissions in the agriculture, manufacturing, industry and transport industry;
 - commercialize clean hydrogen; and
 - provide cost effective energy storage.

Major projects and companies

- In December 2021, the Northern Territory government granted Aqua Aerem "major project" status in order to expedite its approval process and commence the development of the proposed 10 GW Desert Bloom Hydrogen project in Tennant Creek, Northern Territory. The estimated USD15 billion project to be carried out in various stages, seeks to produce renewable hydrogen using water drawn from the air in order to produce hydrogen through electrolysis. The initial production of hydrogen from initial stages is expected to be completed in 2023, with full production to commence by 2027.
- In October 2021, Fortescue Future Industries (FFI), a subsidiary of Fortescue Metals Group (FMG), announced its partnership with the Queensland government to build the Global Green Energy Manufacturing Centre (GEM Centre) at Aldoga in the Gladstone State Development Area (SDA). The GEM Centre expected to cost more than AUD1 billion to complete will be the world's largest green-energy infrastructure and equipment-manufacturing facility. FFI gained planning approval to construct the facility in November 2021 and is anticipated to have the first electrolyzers produced by 2023 in order to produce 2 GW of electrolyser capacity per annum, with a view of ultimately producing 15 million tons of green hydrogen a year by 2030.
- Vena Energy, one of the largest independent power producers of renewable energy, proposes to develop the Wandoan South Battery Energy Storage System (BESS) Project located near Wandoan, 400 km north-west of Brisbane in the Darling Downs region. The BESS has the capacity to produce 100 MW and storage 150 MWh of energy, which is equivalent to providing electricity to 57,000 average homes annually.

- In 2018, Energy Estate and MirusWind announced plans to develop the Walcha Energy Project in New South Wales which will combine wind and solar energy generation with pumped hydro storage and other storage options. The Walcha Energy Project will be the biggest single renewable energy project once completed and once connected to the NEM in 2022, will have a generating capacity of up to 4 GW of clean energy.
- Windlab, a global renewable energy development company, together with Eurus Energy, commenced construction of Kennedy Energy Park in late 2017 – the world's first utility-scale hybrid wind, solar and energy storage project located in Flinders Shire, Queensland. Once fully operational, the facility will feature 43 MW of wind, 15 MW of solar panels and 2 MW/4 MWh of battery storage. These initial power generation facilities are intended to act as a proof of concept with the ultimate plan to construct up to 1,300 MW of renewable power generation, which is equivalent to providing electricity to 800,000 homes.
- Lacour Energy, a renewable energy development company, announced plans to develop Clarke Creek Wind and Solar Farm located 150 km north west of Rockhampton and 150 km south of Mackay farm in central Queensland. Once constructed, the project would be the largest wind farm in the southern hemisphere with a power output of over 800 MW (using up to 195 wind turbines), up to 400 MW of solar power and a battery energy storage.
- Also in the pipeline is the Sun Cable project in the Northern Territory which will harness and store solar energy in Darwin and transport solar energy to Singapore via a high voltage direct current transmission system. Once the Sun Cable project becomes operational in 2026, it will be the world's first intercontinental power grid with a generating capacity of 10 GW.

Foreign investment ownership

- Foreign direct investment in Australia amounted to AUD1,026 billion at the end of 2020.
- The Federal Government reviews foreign investment proposals against the national interest on a case-by-case basis through the Foreign Investment Review Board (FIRB).
- The FIRB regime is governed by the following legislation:
 - The Foreign Acquisitions and Takeovers Act 1975 (Cth) (FATA);
 - The Foreign Acquisitions and Takeovers Regulation 2015 (Cth) (FATR);
 - The Foreign Acquisitions and Takeovers Fees Imposition Act 2015 (Cth); and
 - The Foreign Acquisitions and Takeovers Fees Imposition Regulations 2020 (Cth), andis further supported by Australia's Foreign Investment Policy dated 1 January 2021, which can be accessed [here](#).
- Australia's thresholds for investment requiring FIRB approval depend on whether the investor is from a country which has a free trade agreement with Australia, and also on whether the investor is a government or non-government entity. In general, although some exceptions apply, foreign persons should notify the Australian Government before acquiring an interest of 20% or more in an Australian business or corporation that is valued above AUD289 million.¹
- Land rich corporations and trusts will be considered Australian land corporations/trusts where the value of their interests in Australian land exceeds 50% of the value of total assets. An acquisition of any interest in an Australian land corporation/trust requires notification where the relevant monetary notification threshold is met. If public infrastructure, such as a system or facility that provides generation, transmission, distribution or supply of electricity services, or supply of gas to the public is located on land held by Australian land corporation/trust a lower AUD63 million monetary notification threshold applies. Similarly, if vacant commercial land interests comprise more than 10% of the Australian land corporation/trust the total assets, a AUD0 monetary notification threshold applies.
- In an effort to strengthen Australia's national security by scrutinizing investments in Australia, the FIRB regime underwent further significant reforms by introducing the Foreign Investment Reform (Protecting Australia's National Security) Act 2020 (Cth) and the Foreign Investment Reform (Protecting Australia's National Security) Regulations 2020 (Cth) (Amending Legislation).
- The Amending Legislation came into effect from 1 January 2021 and varied Australia's foreign investment regime by introducing (among other changes):
 - a "national security" test, in addition to the existing "contrary to the national interest" test;

- a new category of “notifiable national security actions” which must be notified to FIRB for review regardless of the value of the investment, the nature of the investor (i.e. private, government or whether from a free trade agreement country) or whether those actions are otherwise significant or notifiable actions under the existing regime; and
 - and new “call in” power and “last resort” power for the Treasurer to call certain investments for review if the Treasurer considers the investment may pose a national security concern regardless whether they are proposed or already taken.
- The scope of the types of businesses covered by the “national security” test was also significantly expanded on 2 December 2021 following significant amendments to the Security of Critical Infrastructure Act 2018 (Cth) (SOCI Act) which expended the SOCI Act’s coverage from four sectors (electricity, gas, water and ports) to eleven critical infrastructure sectors including the energy sector (which includes electricity, gas, liquid fuel and power businesses and assets).
 - Although each sector has certain prescribed criteria that limit the types of businesses and assets within the sector considered critical (e.g. thresholds relating to size, type of service, etc.), companies should seek advice before proceeding with any acquisition that may fall within any of these sectors, as the business or corporation may be considered a national security business for the purposes of FATA.
 - On 22 July 2022, the Treasurer announced changes to the FIRB application fee regime, which effectively resulted in the doubling of application fees applying to foreign investment notifications and applications made after 29 July 2022. If a notice of a notifiable action was given or an application was lodged before 29 July 2022, the fee payable was the fee specified in the pre-29 July 2022 fee schedule. As a result of the new rules, foreign investors may incur significantly higher costs to invest in Australia.

Note 1: The monetary thresholds range depending on the percentage acquired, the nature of the acquisition and may be subject to exceptions.

UNFCCC – Paris Commitments and beyond

Australia ratified the Paris Agreement on 9 November 2016 and committed to reducing emissions by 26-28% below 2005 levels by 2030, which builds on its 2020 target of reducing emissions by 5% below 2000 levels.

As noted above, Australia published a Long-Term Emissions Reduction Plan ahead of COP26. Following COP26 in November 2021, Australia signed the Glasgow Climate Pact, which collectively commits the world to a 45% reduction in emissions in this decade and requires Australia to increase its 2030 emissions targets.

In an updated NDC (Nationally Determined Contribution), Australia increased the ambition of its 2030 target, committing to reduce greenhouse gas emissions 43% below 2005 levels by 2030.

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Austria

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law (to be noted that Austria is a federal state, which entails that the legislative competence is divided between the federation (<i>Bund</i>) and the nine federal states (<i>Länder</i>))• Language: German (In addition, the minority languages Croatian, Slovenian and Hungarian are official languages in some border regions of Austria.)
Population	8,979,894 inhabitants (1.1.2022)
Gross national income (GNI) per capita	USD 55,590 (2020)
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 21 of 141 (up 1 rank)• 2021 Index of Economic Freedom: 25 of 178 (up 4 rankings)• 2020 Corruption Perceptions Index: 15 of 176 (down 3 rankings)• 2020 UN Development Programme Human Development Index: 18 of 189 (no change)
Profile	<p>The Republic of Austria (Austria) is a neutral country located on the Eastern Alps in Central Europe. It is composed of nine federal states, one of which is Vienna, Austria's capital.</p> <p>As a member of the European Union since 1995, the country adopted the Euro as its currency in 1999. The country's president is Alexander Van der Bellen, a Green Party member running as an independent. Chancellor Karl Nehammer's</p>

conservative People's Party formed a coalition government with the Green Party and is currently running Austria's government.

Austria has large services and industrial sectors and a small, highly developed agricultural sector. Challenges include assimilation of migrants and strains on labour markets and public finances caused by the aging of the population.

Electricity industry overview

Electricity industry overview

- In 2020, 72.866 GWh of electricity (gross) was generated in Austria. Austria does not rely heavily on fossil fuels (accounting to approx. 17.8%). 81% of electricity is generated from renewable sources. Electricity generation is comprised of:
 - 62% from hydropower (2020 figures);
 - 14% from natural gas (2020 figures);
 - 9.3% from wind (2020 figures);
 - 6.0% from biogenic fuels (2020 figures);
 - 3.0% from coal (2020 figures);
 - and
 - 3.0% from solar (2020 figures);
 - 1.0 from oil (2020 figures); and
 - 1.0 from other fuels

(data retrieved from E-Control and Austrian Energy Agency)

- Electricity demand is expected to grow at 1.4% per annum until 2030.

Electricity laws

- The main legal source for Austrian energy policy is the Federal Electricity Management and Organisation Act 2010 (Electricity Act 2010) which sets out the overall regulatory framework for the electricity industry. This aims to provide regulations for an equal, fair, consumer friendly and transparent energy market. Therefore, it regulates, among other things, the rights and duties of the market participants and especially their obligations to the consumers. The Electricity Act 2010 transposes relevant EU law, in particular Directive (EU) 2019/944 on common rules for the internal market for electricity.
- The Electricity Act is transposed and supplemented by the electricity acts of the federal states.
- To achieve its desired climate neutrality and its #mission2030 targets, Austria implemented in 2021 (and 2022 respectively) the so-called Renewable Expansion Act (EAG), which essentially transposes Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, and is considered a central element to foster and develop the renewable energy sector in Austria.
- The competent regulatory authority for electricity and gas is *Energie-Control Austria für die Regulierung der Elektrizitäts- und Erdgaswirtschaft* (E-Control).

Generation, distribution and transmission

- In 2001 the Austrian electricity market was fully liberalised, i.e. every consumer had the possibility to freely choose its electricity supplier ("full regulated third party access"). At the same time, Austria introduced the balance group model. The EU's Third Energy Package was transposed into Austrian law by way of adoption of the new Electricity Act 2010. The reform included tightened requirements regarding the unbundling of the transmission and the distribution system operators, most notably the so-called

ownership unbundling for TSOs with exceptions for existing TSOs, which had the possibility to unbundle either as Independent System Operator (ISO) or Independent Transmission Operator (ITO).

- Austrian Power Grid AG (APG) is the main TSO of the Austrian electricity transmission grid, responsible for the transmission system across eight of the nine Austrian states. APG is a 100% subsidiary of Verbund AG, however, APG is unbundled in accordance with the requirements for ITOs. APG is also acting as control area manager for the whole Austrian transmission system operator (including the transmission system in Vorarlberg).
- The transmission system in the western-most state, Vorarlberg, is operated by *Vorarlberger Übertragungsnetz GmbH*, which is ownership unbundled (however indirectly owned by the state of Vorarlberg).
- Additionally, to date there are 122 electricity distribution system operators (DSO) active in Austria. The main DSOs are the electricity companies owned by the federal states (*Länder*).
- The main generation companies in Austria are Verbund AG (51% state-owned), EVN AG (51% owned by the state of Lower Austria) and Wien Energie GmbH (indirectly owned by the City of Vienna).

Renewable energy overview

Renewables industry overview

- In 2020, Austria generated over 81% of its electricity needs from renewable energy. Austria is one of the leading countries in renewable energy generation within the EU, and particularly for hydropower.
- The Government has set a renewable energy target of 100% by 2030. These targets are underscored by implementing the Renewable Expansion Act to provide the legal means for the necessary energy structural changes.
- Austria is part of the EU Emissions Trading System, which was launched in 2005. The objective pursued for the emissions trade is to achieve a reduction of the CO₂ emissions.

Hydropower

- Hydropower contributes about 62% of Austria's total electricity use. Most of the country's hydropower capacity and potential is located in the mountains in the west, and the Danube (Austria's largest river), which hold many of the country's largest hydropower plants. Many of the country's most lucrative hydropower sites have already been developed.

Wind

- Wind-sourced electricity accounts for over 9% of Austria's total electricity production. Natural conditions especially in the east of Austria are highly favourable to developing wind onshore projects. In 2020 approximately 1,300 wind turbines have been installed in Austria. These range from single small turbines (110 kW) to large turbines with 2.5 MW (or exceeding) generating capacity.

Solar

- Solar generation currently only amounts to 3% of Austria's energy supply. However, in the course of its #mission2030 Austria envisages to upscale this to 11 TWh until 2030 (from currently 2,0 TWh), which means a fivefold increase.

Geothermal

- Austria has no relevant geothermal generation activity as it only amounts to 0.3 TWh.

Biomass and biogas

- The biomass industry is well-established in Austria, including biomass such as converting organic waste from landfills to energy, liquid biofuels developing alternative transport fuel and wood energy.
- Biogas accounts for 2.4 TWh of renewable energy.

- Future growth of RES is expected to come in particular from wind energy given the country's attractive wind speeds, and also by reshaping and further developing its PV activities (for example by initiatives such as the installation of photovoltaic systems on 1 million roofs).

Renewables laws

- Renewable Expansion Act (EAG);
- Green Electricity Act (ÖSG)

Current issues in the renewables industry

- Consistent with international trends, there has been an increased interest in the Power Purchase Agreement (PPA) market in Austria, especially as a means to promote renewable energy generation and procurement in the light of Austria's #mission2030 and 2040 target of climate neutrality.
- Major Austrian energy and electricity companies such as Verbund AG and OMV AG are currently working on the development and implementation of P2X schemes to provide Austria with green or even blue hydrogen.
- Austria remains opposed to nuclear energy and continues to lobby against the qualification of nuclear energy as being "green" on EU level.

Government incentive schemes

- Austria was relying on a feed-in tariff scheme for renewable energy generators until 2021.
- In July 2021 the Renewable Expansion Act was adopted which transposes Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources into Austrian law. The Renewable Expansion Act introduces a market premium as general incentive scheme instead of the previously granted fixed feed-in tariffs. The market premiums aim to compensate the difference between the production costs of electricity from renewable sources and the average market price for electricity. This effort is accompanied by planned tenders for all technologies (in the future).
- Under the Renewable Expansion Act consumers (mainly at a residential level), businesses and municipalities are encouraged to implement own solar or other onsite renewable generation technologies to assist Austria's RES efforts.

Major projects and companies

- OMV AG has launched the construction of Austria's biggest electrolyser at its refinery in Schwechat, which shall reach yearly production of up until 1.500 tons of green hydrogen. The renewable energy for the electrolyser is partly sourced from wind turbines located in Lower Austria on the basis of a long term PPA between W.E.B. and OMV.
- After many years of administrative proceedings, in 2020 APG was finally granted the permission to construct the new 380 kV power line in Salzburg, which is considered to be the "missing link" in Austria's 380 kV power line ring.
- Major energy and electricity companies contributing: Verbund AG, OMV AG, EVN AG, Wien Energie GmbH, Illwerke VKW.

Foreign investment ownership

- In Austria the legislation on screening of foreign direct investment is based on the (Foreign) Investment Control Act (InvKG) at national level (mainly since 2020).
- At EU level the legislation is based on Regulation (EU) 2019/452, the FDI-Screening-Regulation, which mandatorily applies also since 2020.

UNFCCC – Paris Commitments and beyond

- Austria (in the course of the EU) signed the Paris Agreement on 22 April 2016 and ratified the agreement on 5 October 2016.
- Austria is targeting climate neutrality by 2040.

Relevant resources and references

Websites

- [Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology](#)
- [E-Control Austria](#)
- [Austrian Energy Agency](#)

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Belgium

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil law• Language: French, Dutch and German
Population	11.5 million
Gross national income (GNI) per capita	USD 53,180
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 22 of 140• 2021 Index of Economic Freedom: 37 of 178• 2020 Corruption Perceptions Index: 15 of 179• 2020 UN Development Programme Human Development Index: 14 of 189
Profile	<p>Belgium is a federal parliamentary democracy with a constitutional monarchy. It has a civil law system which is based on the French Civil Code.</p> <p>Belgium's political system is a federal system comprising a federal government level, as well as three regions (Flanders, Wallonia and the Brussels-Capital Region, with mostly economical competences) and three communities (the Flemish Community, the Wallonia-Brussels Community (formerly the French-speaking community) and the German-speaking community, with cultural and language linked competences such as education). The governments on each of these levels have certain responsibilities.</p> <p>The Belgian economy is dominated by industry and the tertiary sector. Agriculture only accounts for a limited part of the GDP.</p>

Electricity industry overview

Electricity industry overview

In the past, Belgium was heavily dependent on coal for its electricity generation. As of 1990, however, the electricity generation units based on coal have been gradually replaced by electricity generation units based on gas. At present, 30% of the generated electricity is generated from gas.

For the last 40 years, Belgium relied on nuclear energy for most of its electricity generation. For many years, almost 50% of the electricity produced in Belgium was produced by nuclear plants. In the past, this percentage was lower due to (both foreseen and unforeseen) outages. In this regard, it is noted that Belgium's nuclear capacity will be phased-out by 2025. However, it cannot be ruled out that the current government will decide to keep certain nuclear facilities open beyond 2025.

Notwithstanding the fact that Belgium has the smallest exclusive economic zone in the North Sea, its current offshore wind generation capacity amounts to 2.3 GW. By 2030, the federal government wishes to increase this number to 5.4 – 5.8 GW.

Government plans

The Belgian government introduced a Capacity Remuneration Mechanism (CRM) in order to safeguard the security of supply, taking into account the envisaged nuclear phase-out. This mechanism seeks to solve the so-called 'missing money' problem. Particularly, the CRM ensures that electrical capacity holders are remunerated for the costs that are not compensated by their revenues. This way, it avoids capacity holders choosing not to keep their capacity in the market or not to invest in new capacity.

The first CRM auction (which is for the delivery period in 2025) took place in October 2021. The second CRM auction for this delivery period will take place in October 2024.

Electricity laws

The relevant electricity-related legislation is the following:

- **Federal**
 - Law of 29 April 1999 on the organisation of the electricity market.
 - Royal Decree of 2 April 2003 on the licensing of the supply of electricity by intermediaries and on the rules of conduct applicable to them.
- **Flemish region**
 - Decree of 8 May 2009 laying down general provisions regarding the energy policy.
 - Implementing decree of 19 November 2010 laying down general provisions regarding the energy policy
- **Brussels region**
 - Ordinance of 19 July 2001 on the organisation of the electricity market in the Brussels Capital Region.
 - Implementing decision of 18 July 2002 on the criteria and procedure for granting, renewing, transferring and withdrawing an electricity supply permit
- **Walloon region**
 - Decree of 12 April 2001 on the organisation of the regional electricity market.
 - Implementing decision of 21 March 2002 on the electricity supply licence.

Generation, distribution and transmission

- In Belgium, the major electricity producers are Engie Electrabel, EDF Luminus and EON.

- In the Flemish region, the distribution system operator is Fluvius. In the Walloon region, the distribution system operators are Ores, RESA, Rew, AIEG and AIESH. In the Brussels region, the distribution system operator is Sibelga.
- The transmission system operator for electricity is Elia.
- Every region has a regulatory authority for energy. On the federal level, the regulatory authority is the CREG. In the Flemish region, the regulatory authority is the VREG. In the Walloon region, the regulatory authority is the CWaPE. In the Brussels region, the regulatory authority is BRUGEL.

Renewable energy overview

In 2021, the electricity generation mix looked as follows:

- Nuclear: 52.4%
- Gas: 24.8%
- Off-shore wind: 7.3%
- On-shore wind: 4.3%
- Solar: 5.1%
- Biogas: 2.2%
- Others: 3.8%

As for the applicable incentive schemes for renewable energy, reference is made to the questions below.

Current issues in the renewables industry

On a general level, it is noted that developers of renewable energy projects are faced with limited availability of sites due to spatial planning restrictions, as well as potential opposition from local residents (NIMBY).

Government incentive schemes

General

In Belgium, the most important subsidy mechanism is a green certificate scheme. This includes a guaranteed minimum price mechanism, where electricity network operators are required to purchase the green certificates at a guaranteed minimum price, subject to generation type and location of the asset. It should be observed that there are four parallel schemes of RSE support in Belgium. This results from the division of competences when it comes to renewable energy.

As indicated, Belgium's political system is a federal system comprising a federal government level, as well as three regions and three communities. The competence to regulate renewable energy belongs to the regions (i.e. Flanders, Wallonia and Brussels Capital), rather than the federal government. In relation to renewable energy, the federal government is (only) competent to regulate the major infrastructures for energy storage, the transmission of electricity through grids with a voltage higher than 70 kV, the transmission network tariffs, the commodity tariffs for off-takers, and the production of energy in Belgium's territorial waters and its exclusive economic zone in the North Sea.

Federal

On the federal level, a green certificates scheme applies in order to support offshore wind energy installations. It should be noted that the Federal Parliament adopted a new Act establishing a tender procedure for new concessions for offshore wind farms, whose operators will then be eligible for support. To date, the key modalities for this tender have not yet been elaborated in Royal and Ministerial Decrees.

In addition, companies can reduce their taxable profits with an increased investment deduction for energy saving and energy recovery investments.

Flanders

A green certificates scheme applies in order to support renewable energy installations in the Flemish Region. Regularly the subsidy levels and periods are adjusted downwards for new projects, including recently for projects receiving permits from 2020 onwards.

The green certificates scheme does not apply to all renewable energy technologies. Certain types of renewable energy will (depending on their capacity) not be eligible for the green certificates scheme, but will receive subsidies depending on the type and capacity of the renewable energy installation. These subsidies are distributed by means of "calls for proposals". This is, for example, the case for photovoltaic installations with a capacity between 40 kW and 2 MW, and for wind turbines on land with a capacity between 10 kW and 300 kW.

Brussels Capital Region

A green certificates scheme applies in order to support renewable energy installations in the Brussels Capital Region. The Coalition Agreement for the new Brussels Region government states that by 2024 (the end of the current legislature), the green certificates scheme and the percentage of certificates allocated will be readjusted, taking into account the reduction of the cost of renewable energy systems. In addition, supplementary subsidies are offered to companies willing to invest in "green" projects, subject to the applicant meeting certain requirements.

Wallonia

A green certificates scheme applies in order to support renewable energy installations in the Walloon Region. In addition, a wide range of support including energy bonuses, investment aid for cogeneration plants or processing plants, and tax deductions for investments, is offered.

Major projects and companies

- The federal government agreement of 30 September 2020 envisages an increase in the development of offshore capacity, so that by 2028 4.4 GW should be installed.
- Belgium is also reinforcing its interconnection capacity with its neighbours:
 - The Nemo Link interconnector between Belgium and the United Kingdom consist of subsea and underground power cables connected to a converter station and a high-voltage substation in each country, allowing electricity to flow in either direction between the two countries. The Nemo Link interconnector went live at the end of January 2019.
 - The ALEGrO project consists in the construction of a high voltage direct current link with a bidirectional rated power of approximately 1000 MW capacity, as the first interconnection between Belgium and Germany. This first interconnector between Belgium and Germany was commissioned in November 2020.
 - The Brabo project has three main goals: (i) allow transborder electricity flows, (ii) enhance the Belgian electricity grid and (iii) allow a better distribution of electricity flows. This project consists of three subprojects. Brabo I has already been commissioned. Brabo II is ongoing and Brabo III is planned to be commissioned by the end of 2024.

Foreign investment ownership

- On the European level, Regulation (EU) 2019/452 of the European Parliament and of the Council of 19 March 2019 established a framework for the screening of FDI in the European Union.
- On the federal level, a legislative proposal to implement an FDI screening mechanism was submitted on 23 February 2021. This draft legislation is still pending. The draft legislation includes a notification obligation for foreign (meaning non-EU) entities who are considering investing in a sector of strategic importance (subject to certain conditions). Following the notification, the minister responsible for economic affairs can either allow the investment, impose conditions, or block the intended investment. Blocking the planned foreign direct investment or the imposition of additional conditions can only be decided if this is necessary to protect national security or public order.
- On the Flemish level, an FDI screening is already in place. This mechanism consists of an ex-post screening mechanism of legal acts (e.g. a share deal) by Flemish governmental institutions, which give control or decision-making power to foreign (to be understood as non-EU and non-EEZ) entities. In case a foreign entity would, following a certain legal act, acquire control or decision-making power

over a Flemish public body, and if the strategic interests of the Flemish Community or the Flemish Region are thereby threatened (in particular where the continuity of vital processes is endangered, where certain strategic or sensitive knowledge is threatened to fall into foreign hands or where the strategic independence of the Flemish Community or the Flemish Region is endangered) then the Flemish Government may annul, suspend, or declare inapplicable such legal act.

UNFCCC – Paris Commitments and beyond

The EU and its Member States, acting jointly, are committed to a binding target of a net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990.

As part of the dimension decarbonisation, Belgium will reduce its GHG emissions by 35% by 2030 compared with 2005 levels for non-ETS sectors. In light of these objectives, Belgium will generate 17.4% of its gross final energy consumption from renewable energy sources (RES) by 2030.

With regard to energy efficiency, Belgium has set its contribution to the EU target of 32.5% by 2030. Its estimated contribution is 15% in primary energy savings and 12% in final energy savings by 2030 compared with the PRIMES (Price-Induced Market Equilibrium System) 2007 baseline.

Relevant resources and references

References

- [Belgian's Electricity System - Elia Group](#)
- [Belgian's Energy - Fluxys](#)
- [National Energy and Climate Plans](#)
- [NECP 2021 - 2030, National Energy and Climate Plan](#)
- [Belgium's 2021 Electricity Mix](#)

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Brazil

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Brazil• Language: Portuguese
Population	214.9 million
Gross national income (GNI) per capita	USD 7,850
Business environment	<ul style="list-style-type: none">• 2022 Index of Economic Freedom: 133 of 177• 2021 Corruption Perceptions Index: 96 of 180• 2020 UN Development Programme Human Development Index: 84 of 189• 2022 World Competitiveness Index: 59 of 63
Profile	<p>Brazil is a country in South America, bordering the Atlantic Ocean. It has a continental territory and a diversity of geographies and climates that vary from north to south. In the 1980s, together with the promulgation of the current Federal Constitution, a liberalization of the economy took place – the basis for the current open and free-market economic configuration.</p> <p>Brazil is a republican and unitary state, with presidential elections every 4 years. The country is the largest economy in Latin America and one of the world's largest engines of economic growth (it is expected to become the fifth-largest economy on the planet by 2050).</p> <p>Brazil's economy is very diversified and one of the largest consumer markets in the world, with a highly productive agriculture sector, a broad and sophisticated industrial base, one of the most solid and prudently regulated financial</p>

sectors in the G20, and the largest stock market in Latin America.

It has abundant natural resources, including those that generate energy. Foreign investment plays a crucial role in helping the country work to achieve sustainable growth and development; for foreign investors, Brazil is among the most sought-after markets. According to UNCTAD's World Investment Report 2022, Brazil saw foreign direct investment inflows of USD50 billion, being ranked 6th in the countries with the highest FDI inflow in 2021.

Electricity industry overview

The general legal framework for the Brazilian energy sector is established in the Brazilian Federal Constitution. According to the Federal Constitution, the government shall, directly or by means of authorization, concession or permission, promote the rendering of public services.

Based on the above, since the late 1980s, the energy sector has experienced several restructurings, aiming to facilitate private investment and create sector security.

The federal government has passed the following laws, which represent the main legal framework for the power market in Brazil: (i) Law No. 8,987/95 (Public Concessions Law); (ii) Law No. 9,074/95 (Power Concessions Law); (iii) Law No. 9,427/96 (Creation of ANEEL); (iv) Law No. 10,848/04 (Power Trading), amongst others. The sector is also heavily regulated by ANEEL, the agency responsible for sectorial oversight, which issues rules and resolutions applicable to the power sector and its agents.

The development of energy projects in Brazil is subject to the granting of authorizations by the government. Depending on the nature and size of the project, the right to explore a resource or provide a power-related service (such as transmission and distribution) shall be awarded through public bidding procedures.

The power trading market is divided into the regulated market and the free market. The first has the goal of providing power to distribution companies at a certain price by means of a public bidding procedure. Captive consumers (natural persons and small businesses) are also included in this context, since they are only allowed to buy electricity from the local distribution company. In the free market, in contrast, power generators, traders and free consumers are allowed to buy and sell power at market conditions, being the contractual terms fully negotiable by the parties. In order to be a free consumer, such consumer must have a power demand of at least 1 MW, as of January 2022, being such amount reduced to 500kW as of January 2023. Nevertheless, the sector is currently discussing further opening of the free market, which could enable all high-tension consumers to access the free market by as early as 2024 and a complete opening, to all consumers, in the following years.

According to ANEEL, Brazil has over 17,000 operational power plants, with more than 183 GW in authorized capacity. When considering projects under development and construction, Brazil reaches the figure of over 270 GW in authorized capacity, generated by almost 20,000 power plants.¹

The country's generation capacity in 2021 was divided into the following sources²:

- Hydro – 55,3%
- Natural gas – 13,2%
- Wind – 11%
- Biomass – 7,9%
- Oil products – 2,8%
- Coal – 2,7%
- Solar – 2,6%

- Other – 2,3%
- Nuclear – 2,2%

1. See [ANEEL's Generation Information System \(SIGA\)](#)
2. See [Electric Energy Statistic Yearbook 2022](#)

Renewable energy overview

Brazil is a world leader in renewable energy, with over 75% of its generated power provided by renewable sources in 2021. The country's natural resources enabled the development of hydro power plants, which represented 55,3% of the country's energy generation last year, as well as biomass, wind and solar projects¹.

Brazil has a massive portfolio of hydro assets and the natural resources to enable the exploration of hydro power plants, but recent water crises and climate change have shown how dependent Brazil is on hydro. When reservoirs and rivers are not sufficient to generate enough power to meet market demands, this can create issues in energy supply. In this sense, diversification via the renewables matrix is currently viewed as a sector priority.

Just in 2020-2021, solar generation grew 56% and is expected to be one of the country's major sources in the future, attracting significant investment, both local and international.

One of the pillars of the current development of Brazil's solar capacity is distributed generation. First regulated by ANEEL in 2012 by means of Normative Resolution No. 482/2012 (REN 482/2012), the regulatory framework of distributed generation allows consumers (both natural persons and entities) to generate their own power and inject it in the local distribution grid, creating credits to offset their power consumption bills. As of July, 2022, Brazil had over 1,131,000 distributed generation units; more than 99% of these units are solar projects, located in 5,492 cities, with over 12 GW of installed capacity.² The recently sanctioned Law No. 14,300/22 establishes the regulatory framework of generated distribution going forward. Prior to such law, which has been extensively discussed by the sector's entities, the only regulatory framework was REN 482/2012, as amended. One of the main differences between these two rules is the change in net metering regulations applicable to generated distribution, with some incentives being reviewed for future projects with the establishment of a transition period.

Despite the changes on the horizon, recent studies by EPE (Empresa de Pesquisa Energética) have shown that distributed generation projects are expected to receive more than BRL120 billion in investments from 2022 to 2031, and the applicable installed capacity is projected to reach over 37 GW in the same period.

Wind generation already represents a relevant portion of the power matrix and is expected to increase even further going forward, including with the installation of offshore plants. For reference purposes, wind generation increased almost 27% between 2020 and 2021³. In mid-2022, wind projects have reached the important milestone of 22 GW in installed capacity, divided into 831 operational projects, with additional 414 projects under development with an authorized capacity of 15 GW.⁴ In addition, it is worth mentioning that the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) has received over 40 environmental licensing requests for offshore wind generation projects, with 133 GW in total.

Biomass is currently the fourth main source of power generation in Brazil. It reached over 600 operational biomass power plants in mid-2022, representing more than 16 GW in authorized capacity. Brazil's strong sugar cane industry, one of the main sources of biomass to the power sector, is also expected to see significant growth in the next years.

1. See [Electric Energy Statistic Yearbook 2022](#)
2. See [ANEEL's Distributed Generation Information System](#)
3. See [Electric Energy Statistic Yearbook 2022](#)
4. See [ANEEL's Generation Information System \(SIGA\)](#)

Current issues in the renewables industry

- One of the main issues currently being discussed in the context of Brazil's renewables industry is the diversification of power sources. As mentioned above, 55% of the country's power generation in 2021 was provided by hydro plants, which makes the country highly dependent on this source. Although Brazil has a great number of hydro assets, in the last few years the hydrological conditions have been constantly below average and, in some cases, reaching their lowest records ever registered, causing the risk of power outages.

In this sense, other sources such as solar (including by means of distributed generation), wind and biomass are expected to have a significant increase of their share in Brazil's energy matrix. One example of regulatory incentive for diversification is the newly enacted ANEEL's Normative Resolution No. 954/21, which provides for the regulation of hybrid power plants, combining more than one power source.

- Up until 2021, Law no. 9,427/1996 granted a discount of at least 50% in the distribution/transmission system usage tariffs (known as "TUSD" and "TUST") both for the power generator and for the energy consumers contracting renewable sources. Law no. 14,120/2021, however, provided for the end of such discounts, establishing a transition period and providing for the creation of a mechanism to assess the environmental benefits of each source. The Brazilian Ministry of Mines and Energy recently promoted a public hearing to discuss the guidelines for such mechanism –thus, further regulation is still under discussion.
- Regulation of offshore wind is still under discussion. Decree no. 10,946/2022 established guidelines for regulating offshore wind projects in Brazil – as such, it represents an important step towards the construction of a robust regulatory framework for offshore wind projects. However, according to the aforementioned Decree, the Ministry of Mines and Energy - MME must still publish supplementary rules until December 15, 2022.
- A main obstacle to the further development of renewable projects is the location of power plants, which are usually far from the main consumption centers, creating the need for major investments in transmission and distribution capacities. While most of the potential for hydro, wind and solar generation is located in Brazil's north and northeast regions, the largest population centers, such as São Paulo and Rio de Janeiro, are located in the southeast region.

Government incentive schemes

- In large-scale renewables projects, the most common funding sources are two government-controlled Brazilian development banks, BNDES (Banco Nacional de Desenvolvimento Econômico e Social), Brazil's main development bank, and BNB (Banco do Nordeste), both being extremely active in the sector.

BNDES, for example, is expected to finance more than BRL40 billion in renewables projects in the upcoming years.

- Certain local development banks, such as BDMG (Banco de Desenvolvimento de Minas Gerais), are also active in the development of renewables projects.

Major projects and companies

The wind farm Lagoa dos Ventos, the largest wind project in South America, with 716 MW of installed capacity, started operating on June 2021. This is the largest wind farm in Enel Green Power's portfolio in the world. An expansion of this plant is currently under construction, with the additional capacity of 396 MW.

French company Voltaia has started the operation of a solar plant in the state of Rio Grande do Norte with more than 320 MW in installed capacity. It is part of the Serra Branca complex, the largest solar and wind complex in the world, with 2.4 GW in installed capacity.

Chemical company Unigel started on July 26th, 2022, the construction of the first green hydrogen plant in Brazil, which is expected to enter commercial operation by the end of 2023, receiving an initial investment of USD120 million. Other major power companies, such as Enel and CTG, have also announced investments in the development of this power source in Brazil.

One of the most relevant current discussions in the Brazilian power sector concerns the privatization of Eletrobras, a company created in the 1960s that operates in the power generation and transmission sectors in Brazil and in SPVs for the development of power projects. The largest power company in Latin America, it is responsible for more than a third of the country's generation capacity and for approximately half of the transmission lines of the basic grid.

The privatization was achieved in June 2022, through a capitalization process, in which new shares of the company were offered to the private sector, for an approximate amount of BRL 29 billion. The federal government's equity in Eletrobras was reduced to approximately 35% of the voting shares. With the completion of the privatization process, Eletrobras is expected to renew its investment capacity (which has been insufficient in the last years), contributing to the further development of the power sector in Brazil. One of the examples of such renewed investment capacity is that Eletronorte – a Eletrobras subsidiary – was awarded with Lot 8 of the Transmission Auction No. 1/22. Prior to this auction, Eletrobras was not able to win any transmission auctions for almost a decade.

Major international companies, among them Engie, Enel, EDP, Statkraft, and Scatec, have renewable projects in Brazil.

Foreign investment ownership

Renewables companies that participate in the Brazilian power sector must be located in Brazil and incorporated under Brazilian laws. However, there are no restrictions regarding foreign participation in renewables companies, nor on any sort of foreign investments in renewables.

UNFCCC – Paris Commitments and beyond

- Brazil signed the Paris Agreement in 2015 and ratified the agreement on 12 September, 2016. On 8 December, 2020, Brazil submitted to the UNFCCC its new Nationally Determined Contribution (NDC), under the Paris Agreement.
- By the revisited NCD, Brazil has committed to reduce greenhouse gas emissions by 37% below 2005 levels by 2025, and by 43% below 2005 levels by 2030. Brazil's NDC also expresses the indicative objective of achieving climate neutrality (net-zero emissions) in 2060.
- All policies, measures and actions adopted by Brazil regarding climate change derive from several rules and norms, such as the following:
 - National System of Conservation Units (Law No. 9,985/2000)
 - National Policy on Climate Change (Law No. 12,187/2009), which is structured in four axes: (i) mitigation opportunities; (ii) impacts, vulnerabilities and adaptation; (iii) research and development; and (iv) education, training and communication
 - Fund on Climate Change (Law No. 12,114/2009) and its regulation (Federal Decree No. 9,578/2018)
 - Forest Code (Law No. 12,651/2012), which aims to protect native vegetation
 - National Plan for Adaptation to Climate Change (Ordinance No. 150/2016), aiming to "promote the management and reduction of climate risk in the country against the adverse effects associated with climate change, in order to take advantage of opportunities emerging countries, avoid losses and damages and build instruments that allow the adaptation of natural, human, productive and infrastructure systems"
 - National Policy for Biofuels (RenovaBio - Federal Decree No. 13,576/2017 and Federal Decree No. 9,888/2019 and Resolution CNPE 17/21) which establishes annual national goals for decarbonization for the fuel sector as well as encourages the increase in the production and participation of biofuels in the country's transport energy matrix. RenovaBio also instituted the decarbonization credit (CBIO)
 - National Policy of Payment for Environmental Services (Federal Law No. 14,119/2021) which aims to regulate the payment for environmental services to maintain, recover or improve ecosystem services
 - National Green Growth Program (Decree No. 10,846/2021) which aims to provide financing and subsidies to encourage sustainable economic projects and activities, prioritize the issuance of environmental licenses and generate so-called "green jobs"
 - Decree No. 10.275/2020 which established the Low Carbon Industry Technical Committee

- Decree No. 10.144/2019 which established the national Commission for the Reduction of Greenhouse Gas Emissions from Deforestation and Forest Degradation.
- Decree No. 10.606/2021 which instituted the Integrated Sectoral Plan Information System for the Consolidation of a Low-Carbon Economy in Agriculture
- Decree No. 11,075/2022 which establishes proceeding for the preparation of Sectorial Plans for Mitigation of Climate Changes and institutes the National System for the Reduction of Greenhouse Gas Emissions – Sinare.

Relevant resources and references

References

- [National Electric Energy Agency](#)
- [EPE Electricity News](#)
- [BNDES - Brazilian Development Bank](#)
- [Chamber of Deputies - News](#)
- [Eletrobras - Environment and Social Responsibility](#)
- [World Investment Report 2022](#)

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Canada

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Common Law; Civil Law (Quebec only)• Language: English and French; Indigenous languages
Population	38 million
Gross national income (GNI) per capita	GNI per capita: USD 51, 690 / CAD 57,200 (2021)
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 14 of 140• 2021 Index of Economic Freedom: 9 of 180• 2020 Corruption Perceptions Index: 11 of 180• 2020 UN Development Programme Human Development index: 16 of 189
Profile	<p>Canada is a country in North America. It contains ten provinces and three territories and is the world's second largest country by total area.</p> <p>In the 16th century, British and French expeditions led to colonization of a land that was continuously inhabited by Indigenous peoples. In 1763, France ceded nearly all of its colonies in North America to Great Britain and Spain. In 1867, the union of four British North American colonies formed Canada as a federal dominion of four provinces through confederation. An accretion of provinces and territories occurred next.</p> <p>The Canadian economy operates as an open and free market. Canada is a parliamentary democracy and a constitutional monarchy (sharing a monarch with the United Kingdom) with parliamentary elections held every four to five years. Canada is a federal state, with the federal parliament having</p>

responsibility for matters of national and international importance and the provinces having responsibility for local matters.

Electricity industry overview

Electricity industry overview

- In 2020, [634 million MWh](#) of electricity was generated in Canada. Sixty-seven percent of Canada's electricity is generated from renewable sources and 82% from non-GHG emitting sources.
- Canada is estimated to be the sixth-largest electricity producer in the world, representing 2% of the world's total production. It produced 641 TWh in 2018. Electricity generation is comprised of:
 - 60% from hydropower (2018 figures)
 - 11% from gas/oil/others (2018 figures)
 - 14.8% from nuclear (2018 figures)
 - 5.1% from wind (2018 figures)
 - 7.4% from coal (2018 figures)
 - 9.4% from natural gas (2018 figures)
 - 1.3% from petroleum (2018 figures)
 - 1.7% from biomass (2018 figures)

0.6% from solar (2018 figures) Electricity demand is [expected to increase](#) by 45% from 2019 to 2050.

Electricity laws

- Electricity production is generally regulated at the provincial level in Canada. Each province and territory has its own electricity market structure and regulatory framework.

Ontario

- *Electricity Restructuring Act* creates the electricity market framework in Ontario.
- Independent Electricity System Operator (IESO) administers, monitors and directs the Ontario electricity market.
- Transmission and distribution - A formerly provincially-owned corporation that is now privatized, Hydro One, owns most transmission assets in Ontario. Great Lakes Power, Canadian Niagara Power and Five Nations Energy are other transmitters.
- [Ontario's Bill 276](#) was introduced in April 2021 to assist the province's economic breakdown due to the COVID-19 pandemic. This bill would bypass the current requirement that the Ontario Energy Board must consider the promotion of renewable energy in approving an electricity transmission project.

Alberta

- *Hydro and Electric Energy Act* allows the Alberta Utilities Commission (AUC) to approve new electric generation facility construction.
- The wholesale market is deregulated. Electricity is bought and sold through a power pool operated by the Alberta Electric System Operator (AESO), which conducts an hourly energy-only auction.
- There are two major transmission utilities in the province, AltaLink in the south and ATCO in the north, each essentially having a monopoly in its territory.

Distribution is through a variety of local distribution utilities each having a monopoly in its service area.

Distribution and transmission utilities generally provide wires service only and not commodities.

Deregulated retailers provide electricity purchased from generators, wholesalers or from the AESO at auction to end users.

British Columbia

- Provincial policies have been created to encourage the development of renewable energy through legislation such as the British Columbia *Clean Energy Act*.
- The British Columbia Utilities Commission (BCUC) is the provincial regulatory agency.
- Transmission and distribution - Private corporations or Independent Power Producers' (IPP) roles in electricity generation has rapidly increased. BC Hydro, pursuant to the *Clean Energy Act*, buys electricity from IPPs through a tender bidding process.

Quebec

- Under the *Hydro-Quebec Act*, Hydro-Quebec (HQ) is a provincial Crown electric utility corporation that is the only reseller of electricity.
- Transmission and distribution - Contracts are awarded through a bidding process.
- The Canadian federal government (through the Canadian Energy Regulator) has extremely limited jurisdiction in respect of electricity imports and exports and infrastructure that crosses provincial and national borders.

Renewable energy overview

Renewables industry overview

- The *Canadian Energy Regulator Act* provides federal regulation of renewable energy projects in Canada's offshore waters. The *Nuclear Safety and Control Act* provides federal regulation of nuclear generation. All other generation is regulated provincially.
- In 2018, renewable energy sources [provided](#) about 16% of Canada's total energy supply (including electricity and energy used for heating and motor fuel).
- Wind and solar energy are the fastest growing sources of electricity in Canada.
- In 2018, Canada ranked seventh internationally for its share of renewable energy, producing 2,421 PJ.
- In December 2020, the federal government announced a new climate plan to address climate change through Canada's renewable energy sector, called A Healthy Environment and A Healthy Economy, with a goal of net-zero GHG emissions.
- The Smart Renewables and Electrification Pathways Program (SREPs) was launched by the federal government in June 2021, allocating CAD964 million to support smart renewable energy projects.
- Alberta has offered [price supports](#) for renewable projects (including projects with Indigenous content).
- Recently, Ontario has engaged in various procurement programmes to obtain electricity from wind power, solar and biofuel. Ontario had previously phased out coal-fired electricity and in 2019 only 6% of Ontario's power was produced with petroleum products.

Hydropower

- Hydropower is the primary source of renewable energy in Canada, providing 60% of Canada's electricity generation or 81,386 MW with a total share of 68% or 1383 PJ in 2018.
- In 2018 Canada was ranked the third largest producer of hydroelectricity internationally, producing 379 TWh, with a capacity of 81,386 MW.
- British Columbia, Quebec and Manitoba rely primarily on hydroelectricity.

Biomass

- Biomass constitutes the second largest share of renewable energy production in Canada, offering a share of 23%.
- Wood derived material is the most used biomass, amounting to a total of 432 PJ.

Wind

- In 2019 Canada ranked eighth internationally in the production of wind power, with a total capacity of 13,417 MW.

Solar

- In 2019 Canada ranked ninth internationally in the production of solar power, with a total capacity of 6.27 GW.
- In 2018 the solar photovoltaic industry capacity in Canada was 3,040 MW.

Liquid Biofuels

- In 2019 Canada ranked eighth internationally in the production of liquid biofuels, with a production of 1.61 billion Litres.

Geothermal

- Several Canadian provinces have [moved](#) to remove obstacles to commercial geothermal development and several pilot-scale projects have been announced, however, geothermal energy has not yet achieved commercial scale in Canada.

Nuclear

- Canada has six nuclear plants in operation (19 reactors, all of the CANDU heavy water design), representing approximately 14,000 MW of installed capacity.
- Nuclear energy represented 59% of energy generated in Ontario in 2019 and 34% of installed capacity
- A number of the Ontario nuclear reactors, which are approaching the end of their design lifespans, are currently being refurbished
- The provinces of Ontario, Saskatchewan, New Brunswick and Alberta have announced that they will cooperate in the development and implementation of a strategy to develop small modular reactor (SMR) technology. The first SMR (300 MW) is projected to be completed as early as 2028.
- Canada has the world's fourth largest uranium reserves, and is the world's second largest uranium exporter. Canada produces approximately 7000 tonnes of uranium per year, 85% of which is exported

Current issues in the renewables industry

- Canada has committed to reconciliation with Indigenous Peoples and has committed to fully implementing the United Nations Declaration on the Rights of Indigenous Peoples, including seeking the full, prior and informed consent of Indigenous Peoples prior to development on their territories. Any project proponent in Canada must, as part of the planning process, engage in meaningful consultation and accommodation with any Indigenous Peoples affected by the project.
- In the remote northern territories of Canada, the historical presence of off-grid systems and limited infrastructure makes it [difficult](#) to adopt clean energy.
- The federal government's climate plan initiative from December 2020 that is mentioned above includes grants for homeowners for energy retrofits.
- Alberta has faced issues with an overabundance of renewable generation in areas with significant wind resources, leading to transmission capacity constraints and temporary caps on new capacity
- Nuclear waste is an issue facing Ontario. The Nuclear Waste Management Organization (NWMO) is investigating safe steps to contain spent nuclear fuel through engineering studies at two locations in [Ontario](#).

Government incentive schemes

- The federal government's updated climate plan from December 2020, as mentioned above, aims to raise carbon price from CAD50 per tonne in 2022 to CAD170 per tonne in 2030.
- Clean Energy Canada and Navis Research [established](#) a research report stating clean energy jobs would increase twice as quickly under this new plan by representing 85,000 more job positions by 2030.

- Ontario is [expected](#) to grow its clean energy sector by 43%, representing 220,700 jobs in 2030.
- [Greener Homes](#) initiative by the federal government incentivizes homeowners to make their homes more energy efficient.
- [Green Infrastructure Phase II](#) is a federal initiative that aims to accelerate the development of next-generation clean energy infrastructure by investing in commercial-scale technology demonstrations, deployment, community capacity building, and targeted research and development.
- The [Clean Growth in Natural Resource Sectors Program](#) is a CAD155 million federal investment in clean technology research and development and demonstration projects in three Canadian energy sectors: energy, mining and forestry.
- The [Energy Innovation Program](#) is a federal program that aims to advance clean energy technologies to help Canada meet its climate change targets and support the transition to a low-carbon economy. Its key priority areas are renewable, smart grid and storage systems; reducing diesel use by industrial operators in northern and remote communities; methane and VOC emission reduction; reducing GHG emissions in the building sector; carbon capture, use and storage; and improving industrial efficiency.

Major projects and companies

- British Columbia is [constructing](#) a 1,100 MW hydroelectric facility called Site C. It received approval in 2014 and is anticipated to be operational in 2024.
- The [Muskrat Falls Project](#) in Newfoundland and Labrador is a construction of an 824 MW hydroelectric facility and commenced operations in 2020.
- The [La Romaine Complex Unit 4](#) project in Quebec is a 1,550 MW hydroelectric facility that aims to be fully operational in 2022.
- The [Canyon Creek Project](#) in Alberta is a 75 MW hydroelectric pumped storage facility that will be completed in 2022.
- [Saamis Solar](#) is a 300 MW solar photovoltaic project in Medicine Hat, Alberta. It is expected to operate in 2022.
- [Travers Solar Project](#) will be Canada's largest solar facility that will begin operating in Q4 2022. It will be located in Alberta and will produce 465 MW of solar energy.
- [Sharp Hills Wind Farm](#) near Sedalia, Alberta is expected to have a capacity of 300 MW. It is expected to commence operations in 2023.
- [Wild Rose Wind Farm](#) Alberta will have an installed capacity of 409 MW and its development is expected to start in 2022.
- In 2020, RBC signed a contract to procure green energy directly from BluEarth Renewables and Bullfrog Power. Also, Capital Power announced new wind and solar projects to reduce their overall emissions.
- [Amazon](#) invested in its first renewable energy investment in Canada through a solar project in Alberta. It is set to produce 80 MW of renewable energy to the grid and power over 18,000 Canadian homes yearly. This is the largest solar power purchase agreement in Canada and the project is anticipated to be completed by 2023.

Foreign investment ownership

- Foreign investment into Canada is regulated pursuant to the *Investment Canada Act* (ICA). The ICA mandates that foreign investments be subject to either a notification requirement or a formal review process. The question of whether a foreign investment is subject to notification or review depends on several factors, although generally it is based on a monetary threshold.
- Where the investor is a resident of a WTO member state, investments will be subject to review if the investor directly acquires ownership and control of a Canadian business that has an enterprise value of CAD1.140 billion or more. For non-WTO investors, the threshold is CAD5 million.
- Special rules may apply for investments by state owned enterprises (SOEs).
- Any investment by a non-Canadian investor that is below the relevant monetary threshold (described above) will be subject to a notification requirement.
- If an investment is subject to review, the investor will be required to satisfy the government that the transaction will be a "net benefit" to Canada. Some of the factors considered in assessing whether this is the case are as follows:

- how the investment will impact competition within Canadian industry
 - the level of participation of Canadians in the Canadian business
 - whether the investment is consistent with Canada's economic and cultural policies
 - the impact of the investment on research and development, as well as productivity
 - the impact of the investment on Canadian employment and resources and
 - the impact of investment on services and parts produced in Canada.
- The approval process can take up to 45 days. While most transactions are ultimately approved, the government may require undertakings as a condition of the approval (such as maintaining or increasing production and employment in Canada).

UNFCCC – Paris Commitments and beyond

- Canada has [committed](#) to reducing its GHG emissions by 30% below 2005 levels by 2030 as part of the Paris Agreement.
- In September 2020, the Liberal government during the Throne Speech stated its intention to exceed Canada's climate goal, as mentioned above.
- Canada was an [early supporter](#) of the Gender Action Plan, which aims to mainstream gender equality through the UNFCCC. Canada supported three regional workshops between 2017-2019 to help women leaders engage in international climate change negotiations.
- Canada is committed to further advancing the Local Communities and Indigenous People's Platform under the UNFCCC to meaningfully engage Indigenous Peoples in international climate action.
- Canada is engaged in the sustainable phase-out of unabated coal power through the Powering Past Coal Alliance (PPCA) by collaborating with the UK and 95 other members including governments, businesses, and civil society groups.
- Canada's domestic action includes the Pan-Canadian Framework on Clean Growth and Climate, which is developed with the provinces and territories and in consultation with Indigenous Peoples. The Framework aims to meet emissions reduction targets, build the economy, and increase resilience towards a changing climate. This Framework includes over fifty actions and is built on four pillars of pricing carbon pollution; complementary actions to reduce emissions; adaptation and climate resilience; and clean technology, innovation, and jobs. The Framework covers all sectors of the economy and allows Canada to stay on the course to meet its Paris Commitments GHG emissions reduction target.
- The federal government has invested more than CAD3 billion between 2016-2019 to support clean technology research, development and demonstration, commercialization, scale-up, and adoption.

Relevant resources and references

Relevant websites

- [Statistics Canada, 2020](#)
- [Government of Canada, Electricity facts](#)
- [Canada's National Observer](#)
- [Kleinman Centre for Energy Policy](#)
- [CBC News, Rooftop Solar Power](#)
- [Toronto Star, Nuclear Power](#)
- [Financial Post](#)
- [Government of Canada, Greener Homes Grant](#)
- [Government of Canada, Green Infrastructure Programs](#)
- [Government of Canada, Clean Growth Program](#)

- [Government of Canada, Energy Innovation Program](#)
- [Nalcor Energy, Muskrat Falls Project](#)
- [Hydro-Quebec, Romaine Complex](#)
- [Airswift, Renewable Energy in Canada on the Rise](#)
- [Yukon Energy](#)
- [DP Energy, Saamis Solar](#)
- [Greengate: Travers Solar](#)
- [Canadian Renewable Energy Association](#)
- [It World Canada, Amazon](#)
- [Government of Canada, United Nations Framework Convention on Climate Change](#)
- [Provinces Release Strategic Plan to Advance Small Modular Reactors](#)
- [About Uranium](#)

References

- [Canada Energy Regulator, Canada's Energy Future 2020](#)
- [Quantifying Canada's Clean Energy Economy, 2019](#)

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Chile

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil law• Language: Spanish
Population	19.12 million
Gross national income (GNI) per capita	GNI per capita: USD 27,410 (2022)
Business environment	<ul style="list-style-type: none">• 2022 Index of Economic Freedom: 20 of 177• 2021 Corruption Perceptions Index: 27 of 180• 2020 UN Development Programme Human Development Index: 43 of 189• 2022 World Competitiveness Index: 45 of 63
Profile	<p>Chile is a country located in South America, bordering the Pacific Ocean. Geographically, it has a continental, an insular and an Antarctic territory and, due to its great length, it has a diversity of climates that vary from north to south.</p> <p>In the 1980s, together with the promulgation of the current Constitution, a liberalization of the economy took place, which was the basis for the current open and free market economy configuration.</p> <p>Mining is the key pillar of the economy, with agriculture, fishing and manufacturing industries also playing a relevant role. Chile is a republican and unitary state, with presidential elections every 4 years.</p>

Electricity industry overview

Electricity industry overview (summary and productions rates)

- In terms of energy generation, as of June 2022, Chile had an installed capacity of 32.253 MW with 36.6% of the installed capacity corresponding to non-conventional renewable sources (such as solar, wind, geothermal, mini hydro, among others). Thus, according to the report for the month of June 2022, the updated monthly generation percentage is as follows:
 - 20.7% from hydropower;
 - 11.5% from solar;
 - 8.8% from wind;
 - 0.3% geothermal;
 - 0.3% from thermosolar;
 - 4.5% from diesel;
 - 28.6% from coal;
 - 22.8% from natural gas; and
 - 2.6% from other thermal.
- It is projected that by 2050, at least 90% of the installed capacity in Chile will be renewable energy sources.
- The main challenges are transmission capabilities and storage, implementation of the decarbonization process and the increase in the percentage of generation based on non-conventional renewable energies.

Projects, strategies and governments plans

- The National Energy Policy 2050, the Green Hydrogen Agenda, a project to promote unbundling of the distribution segment, storage and projects related to improve transmission capabilities, such the recently awarded Kimal - Lo Aguirre 1,500 km transmission line, are part of the strategy and government plans. In addition, the distributed generation means market has been rapidly developed and increased in regulation in the past years.

Electricity laws

- Since 1974, a process of decentralization and privatization of the electricity sector has been underway in Chile, and since the 1980s, policies have been applied that tend to grant significant participation to the private sector and make the electricity market more efficient.
- The general regulatory framework is comprised by the General Electric Services Law of 1981, currently contained in DFL 4/2018 (LGSE), which has undergone several modifications that have made it possible to improve the regulation of the different sectors of the electricity market (generation, transmission, distribution and free and regulated customers), with technical coordination carried out by the Independent Coordinator of the National Electric System (CISEN). It also contains provisions related to renewable energies.
- From the regulator's point of view, the laws that have provided the sector with a public law structure are mainly DL 2224/1978, which created the Ministry of Energy and the National Energy Commission, as well as Law No. 18,410, which created the Superintendence of Electricity and Fuels. Thus, while the Ministry of Energy is in charge of the public policy of the sector, the National Energy Commission (CNE) is the technical body of the authority in matters of tariffs and other related matters and the Superintendency (SEC) is in charge of the supervision and imposition of sanctions, if applicable. To this must be added the role played by the Panel of Experts (regulated in the LGSE) in the resolution of discrepancies between different actors in the electricity market and the CISEN in the coordination of the electricity system.
- In addition, there are other regulations which are of great importance for the development of the industry, such as the Regulation of the LGSE Decree 88/2019, which contains the Regulation of the Means of Small Scale Generation and Decree 37/2019 (enacted in 2021) that regulates transmission systems and its planning, among others.
- Technical regulations governing the installation, operation and maintenance of electrical facilities are mainly in the decrees of the Ministry of Energy, as well as the Ministry of Economy, which regulate the implementation of the Electricity Law and similar

regulations; but also the technical provisions issued by the CNE, such as the Technical Standard with Safety Requirements and Quality of Service dictated by the National Electric Coordinator, which ensures the coordination of the electrical system.

- Other relevant regulations include the law that regulates the payments for residential generators, the regulation that created a subsidy for transmission lines in order to facilitate access to non-conventional renewable energy (NCRE) projects.
- Finally, there are also laws on other matters that have a direct impact on electricity regulation, such as Law No. 19,300, on General Bases of the Environment, and DL 211/1973, which establishes Norms for the Defense of Free Competition.

Generation, distribution and transmission

- The Chilean electricity sector is a concentrated market in all segments (i.e. generation, transmission and distribution).
- In the generation sector, four private companies contribute up to 55.7% of the installed capacity of the total generation of the electrical system.
- Regarding the transmission sector: the transmission system is divided into a national transmission system, a transmission system for development poles, a zonal transmission system and a dedicated transmission system, each of which is a natural monopoly by law. The transmission sector is also concentrated mainly in Transelec S.A., Transmisora Eléctrica del Norte S.A. and Interchile S.A.
- Regarding distribution: due to its monopolist nature and also to the existence of large-scale economies, this activity is organized around concessionary companies of the distribution public service such as Compañía General de Electricidad S.A., Enel Distribución Chile S.A., Chilquinta Energía S.A., Sociedad Austral de Electricidad S.A. and Compañía Eléctrica del Litoral.

Renewable energy overview

Renewables industry overview

- For the year 2022, the annual production (updated information as of June 2022) of total energy of the National Electric System (SEN) amounts to 41,585 GWh, of which 13,250.3 GWh corresponds to non-conventional renewable energies (NCRE), which is equivalent to 31.86% of the total energy generated. This percentage is over the mandatory NCRE quota, which required a minimum of 20% by 2025.
- Due to its structure and geographic diversity (solar radiation in the north and over 6,435 km of coastline), Chile has a high potential for renewable energy development, which is in line with the public policies and regulations for their promotion that have been adopted in recent years. In this context, Bloomberg's Climatescope 2021 Emerging Markets Report positioned Chile as the best country in the region and second worldwide to invest in renewable energies.
- Considering the above, and the determination to phase out coal generation, a transition to a cleaner energy mix is projected, with the expectation that, by 2035, a 80% of Chile's power will come from renewable energies and that by 2050, 100% of the installed capacity will be sourced from renewables.
- In terms of decarbonization of the electricity mix, the Government of Chile committed in 2019 to a plan to decarbonize by 2050. In this context, it is estimated that by December 2025, 18 of the 28 coal-fired power plants in country will have closed.
- Renewable energy associations, such as the Chilean Association of Renewable Energies and Storage A.G. (Asociación Chilena de Energías Renovables y Almacenamiento A.G.), should also be mentioned. (ACERA), Asociación Chilena de Energía Solar A.G. (ACESOL), Asociación Chilena de Geotermia A.G., Asociación de Pequeñas y Medianas Empresas Hidroeléctricas A.G. (APEMEC), Asociación Chilena de Hidrógeno, among others.
- Historically, the generation of energy from hydro resources was the most predominant, together with coal-based generation (the latter, with greater intensity in the north of Chile). In the 2000s, the use of gas-fired thermal power plants increased and, subsequently, diesel and coal became more important. In the last decade, a diversification of the mix based on renewable energies has begun to take shape, which is the current and projected trend. Today, hydro, solar, wind and geothermal power generation stand out. Tidal and green hydrogen-based generation is also beginning to be promoted.

Hydro power

- By July 2022, 22.9% of energy generation was hydroelectric power. This corresponds especially to reservoirs, hydroelectric power plants and run-of-river power plants. This occurs especially in the south and central south of Chile, where there is greater availability of water and rainfall. Thus, the highest hydrological potential is found in the Biobío basin with 18%, Baker with 12% and Palena with 11%.
- Historically, electricity generation from hydro sources has had an important share. In 1897, the first Chilean hydroelectric power plant was built in Chilivilingo to illuminate the Lota mines. In 1908, the German Transatlantic Electricity Company (DUEG) installed the El Sauce power plant, the first hydroelectric plant with alternators in the country. In 1943, Empresa Nacional de Electricidad (Endesa) was created, which from that year on would be in charge of the construction of power plants. Since then, several power plants have proliferated, such as Pilmaiquén (1944), Abanico and Sauzal (1948), Los Molles (1952), Cipreses (1955), Pullinque (1962), Isla (1963), Rapel (1968), Antuco (1983), Colbún Machicura (1985), etc. Thus, hydroelectric power has been an important support for the system, with an average of about 65% in the sixties, reaching 80% in the eighties and going to a range of 30% to 40% in the last decade, depending on the year.
- It is important to note that during the 1990s there were droughts that impacted the southern part of the country, which generated water rationing policies that implied power cuts to customers.

Solar

- Chile has great potential for solar energy development, especially in the central and northern areas of the country. Thus, the northern area (the Atacama Desert, for example) is one of the most suitable places for the development of this type of energy in the world. Additionally, Chile has one of the largest reserves of lithium in the world, a material used in the production of solar panels.
- To date, the development of solar projects has been successful, with an installed capacity of at least 6,300 MW, and in June 2022, 20% of the total energy produced in the country was solar.
- As of April 2022, 4,670 MW (82 projects) are under construction, of which 53.9% are solar plants.

Wind

- Chile has good wind potential, considering its geographical distribution and extensive Pacific Ocean coastline. As of July 2022, the installed capacity corresponding to wind energy amounts to 3,810.7 MW, that represents 8.8% of the total energy produced.
- According to the July 2022 report provided by CISEN, of the 65 energy projects that are currently pending to come into operation, 11.3% are wind farms.
- There is diversity in the installed capacity of these projects, varying from projects that generate less than 3 MW to projects with a capacity close to 200 MW.

Geothermal

- Chile has a large geothermal potential estimated at 2,000 MW in the Norte Grande and 1,350 MW in the central zone. This industry has a total current installed capacity of 48 MW.

Biomass

- In Chile, biomass-based energy generation comes mainly from forestry, livestock and agricultural waste. Currently, the installed bioenergy generation capacity amounted to 502 MW (July, 2022).

Others (ocean energy and green hydrogen)

- **Ocean energy:** Due to its long coastline bordering the Pacific Ocean, tidal currents, as well as its strong waves, Chile is an attractive country for the development of tidal energy. Thus, it has been estimated that there is a potential for the generation of more than 160 GW based on this resource. In this context, research is currently being carried out, with the aim of studying the use of the movement of sea waves to produce energy. The Meric Technology Center has installed the first full-scale marine energy converter.
- **Green hydrogen:** Due to its solar and wind potential, the generation of green hydrogen is being developed as an alternative to other fuels and to support the electrical network. To this end, the Government has developed the National Green Hydrogen Strategy, which, together with parallel research, aims for Chile to become the main producer of green hydrogen in the world by the year 2030. There are already projects producing green hydrogen and an important pipeline of such projects in the development phase.

Renewable energy laws

In addition to the aforementioned laws and regulations, the following specific regulations on renewable energy are noteworthy:

- LGSE defines non-conventional renewable energy (NCRE) and in its article 150 bis regulates its attributes;
- Law No. 19,657, on geothermal energy concessions, which regulates its concession system and the relations between private parties and the State in this matter. Unlike other renewable energy sources, the legislature considers geothermal energy to be a public asset, and it may only be explored and exploited after a specific concession is granted;
- DS/ 29/2014 of the Ministry of Energy, which regulates the conditions and characteristics of tenders for the provision of annual blocks of energy with NCRE Generation Means;
- DS 119/2017 of the Ministry of Energy, which refers to the safety conditions of biogas plants;
- Decree 37/2019 of the Ministry of Energy that regulates transmission systems and transmission planning. It also regulates provisions applicable to the open access regime applicable to transmission systems, the transmission planning process and the bidding process for expansion works.
- Law of Net Billing (N°20,571 of 2012), which allows residential electrical customers to generate energy for their own consumption, to inject the surplus energy into the electrical grid, and to receive payments; and
- Decree 88 which regulates Smalls Means of Distributed Generation projects (PMGD for its initials in Spanish) for self-consumption or for commercializing their energy. The PMGD are means of generation whose surplus capacity is lower than or equal to 9 MW, and which are connected to the facilities of a distribution company or to the facilities of a company that owns electrical distribution lines that use domestic public goods, and benefit from a stabilized price regime.

Current issues in the renewables industry

The main issues and challenges are the following:

- Processing times to obtain environmental approvals: Projects that generate a relevant environmental impact (more than 3 MW), in accordance with Chilean Law need to be environmentally assessed by the competent authority.
- Relationship with local communities: Especially in the case of projects with an environmental impact that must be evaluated by the Environmental Impact Assessment System (SEIA), as referred above, it is possible that a project may be subject to a citizen participation process (PAC) depending on whether it entered via an Environmental Impact Statement (DIA) or go through a mandatory PAC if it entered via an Environmental Impact Study System ("EIA"). In the latter case, and depending on the location and impact of the project, it may even be necessary to implement an indigenous people consultation process.
- Restrictions in the transmission system: Nowadays the main difficulty in the development of renewable energy projects is that once they are operational, they face problems offloading power into the grid system, given the restrictions in the transmission system of the Northern Zone of the country.

Government incentive schemes

- **Quota system.** In Chile, a quota system requires power companies that have an installed capacity of more than 200 MW and that withdraw energy from the electrical grid for trading with distribution companies and final consumers to certify that a certain percentage of their energy withdrawal comes from renewable energy sources. This percentage has increased every year until reaching 20% in 2025. However, as mentioned before, this percentage was already achieved in 2021;
- **Toll exception.** One of the advantages provided to renewable energy projects is the exemption from paying tolls for using the main electrical transmission system. Renewable plants that generate less than 9 MW are completely exempt, and those that generate more than 9 MW but less than 20 MW are partially exempt;
- **Concessions for onerous use of fiscal property.** The Public Property Ministry published several general instructions regarding concessions for onerous use of fiscal property in order to incentivize the development of renewable energy projects on public land;
- **Corporation for the Promotion of Production (CORFO).** Development of renewable energy projects has been promoted through the allocation of CORFO subsidies for conducting investment feasibility studies and remaining stages of the projects. In addition,

CORFO has approved a long-term credit line for financing renewable energy projects with an installed capacity of up to 20 MW. CORFO has also called for financing of green hydrogen to attract investments of US\$1000 million;

- **Opting for the Stabilized Price for Small and Distributed Generation Facilities.** Opting for the Stabilized Price for Small Means of Generation and Distributed Generation, whereby generators of 9 MW or less are allowed to sell their energy at marginal cost, that is, spot price, or at a different fixed price, which will be calculated in hourly blocks;
- **Transfer of NCRE Attributes.** Article 150 bis of the LGSE provides that power utilities that withdraw energy with an installed capacity greater than 200 MW must prove that a percentage comes from energy generated by means of non-conventional renewable energies, a percentage that is gradual. Generators can meet the required percentage either through their own projects or by purchasing energy from renewable energy projects. LGSE regulates that those who exploit NCRE sources may benefit from the quota requirement, with the possibility of transferring the surplus to those who cannot comply with their own NCRE quota (which in the market has been referred to as NCRE attributes), even if they belong to different electricity systems.

Major projects and companies

- According to the Project Support Unit (UAP), of the Development Division of Projects of the Ministry of Energy, as of June 2022, there are 107 energy projects in the construction phase, including generation plants (91 plants), transmission works (15 projects) and green hydrogen (1 project). All of them represent an investment of USD 6,853 million.
- In 2021, the Cerro Dominador solar complex, located in Atacama Desert, inaugurated its Solar Power Concentration (CSP) plant, the first in Latin America. The plant generates during the day and night, as it concentrates the solar radiation reflected in a receiver located at the top of a 250 meter tower.
- Currently, there are 6 projects in Chile that have been awarded CORFO funds (first call for application) to develop green hydrogen projects:
 - “HyEx” in northern Chile, that will use solar energy to power 1.6 GW of electrolyzers, that will be used in mining; and
 - the “HIF” project, at the opposite end of Chile, in the Magallanes and Chilean Antarctic Region, that will use wind energy to generate green hydrogen-based e-fuels, using a 1.25 MW electrolyzer, and in the commercial phases it will be higher than 1 GW;
 - “Quintero Bay H2 Hub”, an electrolysis plant located in central Chile (GNL Quintero Terminal), which will generate H2 from water and removable electricity, will have a nominal power of 10 MW and considers an initial production of about 500 t/year;
 - “HyPro Aconcagua”, which is intended to replace a part of the current gray hydrogen production of the Aconcagua oil refinery and is expected to produce 3000 t/year of H2;
 - “Antofagasta Mining Energy Renewable (AMER)” located in the north of the country, which is expected to produce 60,000 tons per year of e-methanol, green hydrogen and CO₂ captured from a fixed source, with 80 MW of electrolyzed power;
 - “H2V CAP” in the Bio Bio Region, that seeks to implement a green hydrogen plant through the installation of electrolyzers for a power of up to 20 MW, for a production of 1,550 tons of green hydrogen per year and reduction of CO₂ emissions by approximately 161,000 tons.

Foreign investment ownership

- In general, Chilean law does not discriminate against foreign investors, who enjoy the same conditions as local investors. Indeed, there are no limitations on a foreign investor wholly or partially owning a Chilean company. Additionally, as a general rule, foreign companies and individuals can invest in all activities and sectors of the economy, with a few exceptional situations.
- Foreign investment in Chile is principally covered by two regulations:
 - Law No. 20,848 on foreign direct investments enacted on January 21, 2016, which sets out an elective legal framework for the protection of eligible foreign direct investment in Chile and abrogates the former regime established by Decree Law No. 600 of 1974; and
 - Chapter XIV (Chapter XIV) of the Compendium of Foreign Exchange Rules of the Central Bank of Chile (BCCH) which grants access to the Formal Foreign Exchange Market (Mercado Cambiario Formal) in relation to investments over USD10,000 or its equivalent in another foreign currency.

- From an international standpoint, foreign investments can also be governed by: Bilateral Investment Treaties (BITs) or Agreements of Reciprocal Promotion and Protection of Investments (APPIS) entered into by the State of Chile, and by the investment chapters of Free Trade Agreements (FTAs) to which Chile is a party. There are 31 Trade Agreements subscribed by Chile currently in force, which include Strategic Partnership Agreements, FTAs, Economic Complementation Agreements, and Partial Scope Agreements.

UNFCCC – Paris Commitments and beyond

- Chile has set ambitious goals to reduce greenhouse gas emissions, with a view to becoming a carbon neutral country by 2050. To this end, various measures are being taken, such as the promotion of electric vehicles and new energy efficiency regulations.
- Law No. 21,455/2022 was enacted in 2022 Framework Law on Climate Change aimed to address the challenges posed by climate change, move towards a development low in greenhouse gas emissions and comply with the international commitments assumed by the State of Chile on this matter. This Law will allow Chile to enforce through law its carbon neutrality by 2050. The Law is inspired by the Paris Commitments and is fully in force.
- Progress has been made in the country's climate change management, developing national instruments such as the National Climate Change Action Plan, the National Adaptation Plan and sectoral adaptation plans, in addition to the country's international commitment to reduce emissions in the nationally determined contributions.

Relevant resources and references

Relevant institutions

- [Ministry of Energy](#)
- [National Energy Commission](#)
- [Independent Coordinator of the National Electric System](#)

Specific web links

- [Electricity System](#)
- [Technical Information](#)

Reference material

- [Monthly Energy Report July 2022 of the Independent Coordinator of the National Electric System](#)
- [2021 Market Monitoring Report \(March 2021 date\) of the Independent Coordinator of the National Electric System](#)
- [National Energy Policy \(Updated version 2022\) of the Ministry of Energy](#)

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Cote D'Ivoire

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: French
Population	<p>22.7 million as the date of May 15, 2014.</p> <p>(In late November 2021, the government of Côte d'Ivoire initiated the fifth general census of the country. But the outcomes of this recent census have yet to be published)</p>
Gross national income (GNI) per capita	<p>GNI per capita: USD 5,300</p>
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 118 out of 140 (down 4 rankings)• 2022 Index of Economic Freedom: 76 out of 177• 2021 Corruption Perceptions Index: 105 out of 180 (no change)• 2020 UN Development Programme Human Development Index: 162 out of 189 (no change)
Profile	<p>Côte d'Ivoire is a country in West Africa bordered by the Gulf of Guinea. It is bordered to the north by Mali and Burkina Faso, to the east by Ghana, to the south by the Gulf of Guinea, to the southwest by Liberia, and to the northwest by Guinea. The country covers an area of 322,463 km² and has a population of 22,671,331 inhabitants (in 2015). The government conducted a census in late November 2021, the results of which have yet to be published. The political and administrative capital is Yamoussoukro, whereas the largest</p>

city and economic capital is Abidjan. The official language is French and the currency is the CFA franc (XOF). The country is a member of the Economic Community of West African States (ECOWAS) and West African Economic and Monetary Union (WAEMU).

Initially a French protectorate in 1843 and a French colony in 1893, the country gained independence on August 7, 1960, under the leadership of Felix Houphouët-Boigny, the first President of the Republic. Following independence in 1960, cocoa and cashew exports made Côte d'Ivoire West Africa's second-largest economy. Pro-business reforms and strong private investment in areas like agriculture, agribusiness, mining, light manufacturing, housing, and services have driven robust economic growth in recent years. Côte d'Ivoire joined the Asian Infrastructure Investment Bank in 2019.

Electricity industry overview

Electricity laws

- From July 1985 to March 2014, the electricity sector was legally regulated by the Law No. 85-583 of July 29, 1985, which granted the State a monopoly on the transmission, distribution, export and import of electricity, except for production.
- In 1990, the state granted a concession agreement to a private operator, *Compagnie d'Electricité Ivoirienne* (CIE) to carry out activities subject to the monopoly throughout the national territory and to operate the thermal and hydroelectric generation plants owned by the state, thus succeeding to the former national electricity company, *Energie Electrique de Côte d'Ivoire* (EECI).
- In December 1998, the state carried out an institutional reform to better control its responsibilities in the sector. The EECI was liquidated and three new state companies were created:
 - The National Authority for the Regulation of the Electricity Sector (ANARE)
 - *Société de Gestion du Patrimoine du secteur de l'Electricité* (SOGPE)
 - *Société d'Opération Ivoirienne d'Electricité* (SOPIE)
- In December 2011, the state undertook a new reform that led to the early dissolution of SOGPE and SOPIE, and the creation of a state-owned company under the name of *Société des Energies de Côte d'Ivoire* abbreviated as CI-ENERGIES, which took over all activities of the two dissolved structures.
- In 2014, law n° 2014-132 of March 24, 2014, on the Electricity Code (the New Electricity Law), which provides a comprehensive framework for the generation, transmission, distribution, sale, import and export of electricity, was enacted. Under this new law, the powers of the electricity regulatory authorities have been strengthened, including the development of alternative and renewable energies. Another innovation of the new law is the criminalisation of theft of electricity and other fraudulent acts that cause many technological and commercial losses in the sector.
- On October 12, 2016, decree n°2016-785 on the organization and operation of the National Regulatory Authority of the Electricity Sector of Côte d'Ivoire creates ANARE-CI following the dissolution of ANARE.
- On November 22, 2017, Decree 2017-773 amending the name of the company Energies Côte d'Ivoire and Articles 1, 2 and 13 of Decree No. 2011-472 of December 21, 2011, creating the state-owned company called Energies de Côte d'Ivoire, extends the purpose of CI-ENERGIES, in particular to the conversion of any source of energy, including new and renewable energies, into electrical energy and the transfer for consideration of the electrical energy thus produced.

Generation, distribution and transmission

- According to article 6 of the New Electricity Law: "The activities of generation, transmission, distribution, import, export and marketing of electrical energy do not constitute a state monopoly. The dispatching activities constitute a state monopoly that can be conceded to a single operator."

- Côte d'Ivoire has four primary energy sources: hydroelectricity, oil, natural gas and biomass.

The energy mix in Côte d'Ivoire is mainly thermal. There are four major thermal power plants. The main source is natural gas. But the national production of gas in Côte d'Ivoire does not meet the national demand of the thermal power plants. HVO (Heavy Fuel Oil) and DDO (Distillate Diesel Oil) are therefore the back-up fuels, and many projects to diversify the energy mix are underway.

Three private electricity companies (AGGREKO, AZITO Energie, CIPREL) manage and operate thermal power plants in the southwest region and in the suburbs of Abidjan as independent power producers (IPP). AZITO Energie and CIPREL have entered into a BOOT (Build-Own-Operate Transfer) concession agreement with the government, while AGGREKO has entered into a lease agreement. The BOOT contract provides for a transfer of possession to the state after 20 years.

- With respect to electricity transmission and distribution activities, although the state owns the assets, only CIE (*Compagnie Ivoirienne d'Électricité*), which holds a concession agreement granted by the state, has a commercial monopoly on the supply of electricity to individual customers and on import-export. CIE also operates a thermal power plant (CIE-VRIDI), six hydroelectric power plants (Ayame 1, Ayame 2, Faye, Kossoué, Buyo, Taabo) and independent isolated power plants. CIE began operations as a private company in 1990 with a 15-year concession contract and this contract was extended for another 15 years from 2005 to 2020.

Renewable energy overview

- Renewable energies in Côte d'Ivoire are part of a vision of sustainable development through the adoption of sustainable modes of production and consumption to include communities in low-carbon growth strategies.

Thus, the development of the renewable sector in Côte d'Ivoire for electrical energy consumption is based on three distinct sources:

- hydroelectricity
- biomass
- solar photovoltaic

The share of renewable energy in the energy mix proposed in the Electricity Generation and Transmission Master Plan (*Plan Directeur Production et Transport d'électricité* (PDPT)), adopted in 2014 and covering the period 2014-2030, is gradually increasing. Renewables increase from 20% (hydro only) in 2014 to 34% (23% medium and large hydro and 11% other RE sources) in 2020 to reach 42% (26% large and medium hydro and 16% other RE sources) by 2030.

Hydropower

The untapped hydroelectric potential is estimated at 7,000 MW, of which 1,847 MW is potentially economically exploitable.

The hydroelectric plants are state-owned and operated by CIE, except for the Soubré plant (275 MW), which was built with Chinese capital and for which a BOO concession contract was concluded between the government and CI-ENERGIES, which owns and operates the equipment (day-to-day management is provided by subcontractors), as CI-ENERGIES' activities were extended to power generation by decree in November 2017. It's expected that other activities will be transferred to CI-ENERGIES in the future.

Solar

Regarding solar photovoltaic energy in Côte d'Ivoire, several projects of between 25 MW and 50 MW are taking shape, particularly in the north of the country where sunshine conditions are good.

There's no guaranteed feed-in tariff for a fixed period of time to encourage the introduction of renewable energy, but there are incentives based on the investment code. These are targeted at specific regions and specific sizes of facilities, and within this framework, favorable regional tax measures can be expected for investments in the north of the country.

In terms of investment in renewable energy in Côte d'Ivoire, the PDER gives an estimate of the total amount of investment to be made in the 94 localities eligible for mini grids. Thus, the investment costs of hybrid solar production will require an investment of around F CFA17 billion for the 68 excluded localities, ie an average investment of F CFA250 million per locality.

Biomass

With regard to biomass energy (from agricultural residues and household waste), Côte d'Ivoire, with 1,200 million tons of biomass per year, is one of the African countries with the best opportunity. There are some plants that produce biomass energy for their own consumption of electricity. The Palmci-Biokala Project (nominal capacity: 2×23 MW) is in the implementation phase. It's a project of a biomass power plant based on the residues of palm seeds after oil extraction. The project aims to produce 46 MW of electricity, which will be the largest biomass power plant in Africa when it is completed in 2021, using the biofuel from the 400,000 tons of plant residues from palm oil mills.

Other biomass power plants, such as a bio-gas project from landfills, are also under development. Also, there are several biomass power plants. The power of these plants varies from 40 kVA to 800 kVA. They're located in various places: in the north, with Bafing, Bagoue and Bounkani, for example, and in the east, with Gountoug and Indenie Djuablin, but also in Gbokle in the south and Cavally in the west. In the North East in Zanzan, there is a PV-diesel mini hybrid network of 465 kW in total. The total capacity of these isolated plants is 5.6 MW, contributing 10.1 GWh in 2015.

Current issues in the renewables industry

- The recourse to photovoltaic solar energy is not encouraged by a feed-in tariff guaranteed for a determined period of time, notably for reasons such as the worldwide decrease observed in recent years on the cost of construction of large-scale photovoltaic production facilities, and the eventual buy-back at a relatively high price due to the expected effects on the decrease in consumption of natural gas, whose depletion is apprehended in Côte d'Ivoire.
- The limitation of photovoltaic electricity production to the daytime, the inability to cope with direct power supply at night peaks, power variations during changes in sunshine that require adjustment capacities to cope with them are constants issues.

Government incentive schemes

The financial incentives for investments in the renewable energy sector in Côte d'Ivoire exist, specifically the advantages granted within the Investment Code and the reduction of taxes on certain renewable energy equipment:

The value added tax at 9% on solar equipment

An important tax incentive is provided by the annex to the Finance Act No. 2011 – 480 of December 28, 2011, on the state budget for the 2012 management, under the value added tax (VAT).

As part of the promotion of solar energy, which remains one of the important aspects of the government's energy policy, the scope of the reduced VAT rate of 9% is applicable to solar energy production equipment, codified by Article 359 of the General Tax Code.

The incentive schemes of the Investment Code

Order No. 2012 – 487 of June 7, 2012, on the Investment Code in Côte d'Ivoire provides two main tax incentive schemes for investments in the country, including those in the field of Renewable Energy.

The investment declaration regime

The advantages granted under this regime vary from 5 to 15 years depending on the investment zone (A=5 years, B=8 years and C=15 years) and concern exclusively the exploitation phase.

These tax benefits include:

- Exemption from the tax on industrial and commercial profits or from the tax on non-commercial profits or from the tax on agricultural profits;
- The exemption from the contribution of patents and licenses;
- The reduction of 80% for zone B and 90% for zone C of the amount of the contribution payable by employers, excluding the apprenticeship tax and the additional tax for continuing professional training.

The investment approval system

The operators of the sector of the Renewable Energies are authorized under the terms of the code of the investment mentioned above to approve their programs of investment to benefit, no matter the zone of investments, from the advantages hereafter, in addition to those indicated previously for the regime of the declaration:

- The reduction of 50% of the amount of duties to be paid to the customs on equipment and materials as well as on the first batch of spare parts, for an amount of investment lower than the higher threshold, except for the community levies.
- A 40% reduction in the amount of customs duties on equipment and materials as well as on the first batch of spare parts, for an investment amount at least equal to the upper threshold, except for community levies.
- Total exemption from VAT.

In addition to these existing financial supports, an inter-ministerial decree is planned to determine and apply the tariff grid (price model) for the remuneration of the operators in charge of the management of the transmission facilities belonging to the state, based on the volume of energy transited, as well as a tariff for the remuneration of offgrid systems.

Major projects and companies

Production projects in progress

Hydroelectric power plants

- Singrobo (44 MW), Gribopopoli (112 MW)

Biomass plants

- Biovea (46 MW)

Thermal gas power plants

- Azito IV: (TAG 179 MW and TAV 74 MW), Ciprel 5: TAG (255 MW and TAV 135 MW)

Future generation projects

Hydroelectric power plants

- Boutoubéré (150 MW), Louga 1 (126 MW), Zégbéry (13 MW), Ferké (8 MW), Mankono (8 MW), Louga 2 (120 MW), Tiassalé (27 MW), Man (3 MW), Téhini (4 MW), Aboisso (6 MW)

Biomass plants

- Ten plants with a total capacity of 265 MW

Foreign investment ownership

The Order n°2018-646 of August 1, 2018, on the Investment Code (the Investment Code) is the main legislative instrument governing foreign investment in Côte d'Ivoire.

It provides several incentives aimed at facilitating foreign investment in the country. It guarantees fair and equitable treatment for foreign investors, unlimited access to foreign exchange, free transfer of assets subject to compliance with tax legislation, free access to raw materials, as well as a guarantee of repatriation of expatriate workers' remuneration.

Although foreign investors have no specific constraints to invest in conjunction with local entities, or to recruit local staff, the Investment Code defines specific incentives for foreign investors who willingly apply local content requirements.

The Investment Code provides tax credit for companies that apply local content requirements and invest a certain amount, depending on the geographical location where the investment is done. These advantages are provided for investments in the hospitality, agribusiness, health and agricultural sectors.

UNFCCC – Paris Commitments and beyond

- Côte d'Ivoire signed the Paris Agreement on April 22, 2016, and ratified the agreement on October 25, 2016. Côte d'Ivoire has committed to reducing 28% greenhouse gas emissions compared to a business-as-usual scenario. The target raised to 36% subject to international support.
- Since the adoption of the Paris Agreement on Climate, several documents and country strategies have integrated the climate issue. The country has greened the National Development Plan (2016-2020), developed during the preparation of the NDCs. In this NDP, axis 4 clearly deals with Adaptation and Mitigation by integrating REDD+.

Version 2 of the National Agricultural Investment Program (PNIA 2.0) has taken into account the issue of climate change.

In addition, the country is working to integrate climate change (based on the content of the NDC) into sectoral planning.

Relevant resources and references

Relevant websites

- [GNI per capita, current international PPP \(\\$\) - Cote d'Ivoire](#)
- [Biomass Key Dates](#)
- [Mise en œuvre de l'Accord de Paris](#)
- [Plan d'action National pour les Energies Renouvelables](#)
- [Achievements and Planned Projects](#)

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Czech Republic

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Continental Law• Language: Czech, Slovak¹
Population	10.7 million (2021)
Gross national income (GNI) per capita	GNI per capita: USD 24,070 (2021)
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 32 of 141• 2021 Index of Economic Freedom: 27 of 178• 2020 Corruption Perceptions Index: 49 of 180• 2020 UN Development Programme Human Development Index: 27 of 189
Profile	<p>The Czech Republic is located in the heart of Europe. It is also known as Czechia. It is bordered by Austria, Germany, Poland and the Slovak Republic.</p> <p>History</p> <p>In 1918, the independent Republic of Czechoslovakia was established. Between 1938 and 1945 the Czech Republic was occupied by Germany. After the end of World War II, in 1946 the Communist Party became the leading party in Czechoslovakia. Unfortunately, the state was not independent for the next 41 years.</p> <p>Human rights were restricted until November 1989, when the Velvet Revolution took place. The Slovak nation separated in 1993 and since then, two independent democratic states were created: the Czech Republic and the Slovak Republic.</p>

There are elections every four years to the Chamber of Deputies and every two years one-third of senators is elected. In 2004, the Czech Republic acceded to the EU. The Czech Republic is also a member of NATO (1999), the United Nations (1945 as Czechoslovakia), OECD (1995), WTO (1995), IMF (1990) and many other international organizations.

Note 1: The Slovak language is not an official language spoken in the Czech Republic. However, after the separation in 1993, Slovak stayed as commonly used language.

Electricity industry overview

Electricity industry overview

- In 2020, 81,427 GWh of electricity was generated in the Czech Republic. The Czech Republic still relies heavily on fossil fuels and nuclear power plants. Only 12% of its electricity is generated from renewable sources. Electricity generation in general comprises of:
 - 43,2% from coal and coal products (2020 figures)
 - 36,9% from nuclear power plants (2020 figures)
 - 12% from renewable sources (2020 figures)
 - 7% from gas (2020 figures)
 - 2% from other sources (2020 figures)

Electricity demand is expected to grow at 1% per annum until 2030.

Electricity laws

- The electricity laws in the Czech Republic are in accordance with EU directives:
 - The Energy Act (2000) (*Energetický zákon* – Act No. 458/2000 Coll.) is the fundamental act for energy sector. The act regulates business in energy sector, licenses and the conditions for granting them.
 - The Energy Management Act (2000) (*Zákon o hospodaření energií* – Act No. 406/2000 Coll.) regulates the efficiency of energy use and some obligations of the natural and legal person while managing the energy.
 - The Act on Supported Energy Sources (2012) (*Zákon o podporovaných zdrojích energie* – Act No. 165/2012 Coll.) supports electricity and heat from renewable energy sources.
- The Czech Ministry of Industry and Trade has stipulated that renewable energy sources will be important in the future and supports these energy sources: for example, solar energy.

Generation, distribution and transmission

- The company ČEZ produces about three-quarters of all electricity in the Czech Republic. Other smaller producers are, for example, Severní energetická and Sokolovská uhelná.
- The electrical transmission system carries electricity from producers to consumers. This system is operated by the state company ČEPS. ČEPS ensures the regulation of the system by its own means and by remote control (for example, by hydroelectric and pumped storage power plants).

The Czech Republic's energy and climate aims are to:

- Achieve a 22% share of renewable energy in gross final energy consumption by 2030.
- Achieve a primary energy consumption of 1,735 PJ, a final energy consumption of 990 PJ and a gross domestic product energy intensity of 0.157 MJ/cap in 2030.

- Increase the level of diversification of the energy mix.
- Energy Security – maintain import dependency at a level of no more than 65% by 2030 and no more than 70% by 2040.

Hydrogen Strategy of the Czech Republic 2021

The aim of the strategy is to accelerate the development and subsequent implementation of economically available hydrogen technologies. In its second stage, the strategy envisages connecting electrolyzers to large solar or wind power plants under construction.

Renewable energy overview

Renewables industry overview

The most important renewable sources in the Czech Republic are hydro, wind, solar and biomass.

The aim is to become climate neutral by 2050. It will not be easy to achieve this goal, because the Czech Republic still relies heavily on the use of fossil fuels, especially coal. The Czech industry is more energy intensive than industry in other more advanced countries.

Hydropower

Although the natural conditions in the Czech Republic are not ideal for building large hydroelectric power plants, hydropower is still one of the most important sources of renewable energy. Hydroelectric power plants serve as a complementary source of electricity generation. These power plants can quickly produce high power and can operatively balance a lack of energy in the Czech power grid.

Almost all big hydroelectric power plants are built on the Vltava River. They are fully automatic and are controlled from Štěchovice. The hydroelectric power plants that are not located on the Vltava river are, for example, Dalešice and Mohelno.

The share of hydropower from all renewable energy produced in the Czech Republic was 3.6% in 2020.

Wind

The use of wind as an energy source is quite traditional in the Czech Republic. The first windmill was documented in 1277 in the famous Strahov Monastery in Prague. Wind power plants are currently located in various places in the Czech Republic. This source of energy is one of the fastest developing ways of producing renewable energy. The capacity of wind power plants ranges from small turbines, which generate about 30 kW for private use, up to 3 MW. ČEZ, operates the biggest wind farm in Europe: about 240 turbines with a total installed capacity of 600 MW.

The share of wind energy produced in Czechia was 1.17% in 2020 from all types of renewable energy.

ČEZ operates wind power plants in Dlouhá Louka nad Osekem near Litvínov city, at Mravenečník in the Jeseníky Mountains and Nový Hrádek near Náchod city.

Solar

The average intensity of solar radiation is approximately 300 W/m² and the total energy 800-150 kWh per m² per year.

The share of solar energy of renewable energy produced in the Czech Republic was 3.84% in 2020.

The largest photovoltaic power plants in the Czech Republic are near Brno, Mimoň and Vranovská Ves.

Biomass

Biomass is a very important energy resource. The term “biomass” usually refers to a substance of biological origin: it can be from plants, animal biomass or organic waste. Biomass is then burnt in power plants. The use of biomass is considered to be appropriate because it minimizes environmental burdens.

The share of biomass of renewable energy produced in the Czech Republic was 25.54% in 2020.

Biomass can be burned in power plants in Hodonín and Poříčí (usually wood chips) and in Jindřichův Hradec (usually straw).

Geothermal energy

There are no geothermal power plants in the Czech Republic and due to unsuitable conditions, it's unlikely there will be any in the future.

Ocean energy

The Czech Republic is located in the heart of Europe, it is a continental state and so it does not produce any ocean energy.

Renewables laws

The most relevant Czech Act, which regulates renewable energy sources (RES) is the Act on Supported Energy Sources. It was enacted in 2012 and its main aim is to protect climate and environment. It includes:

- use of electricity and heat from renewable energy sources
- National Action Plan of the Czech Republic for Energy from Renewable Sources
- conditions for issuing, registering, and recognizing guarantees of origin for energy from renewable sources
- financing the electricity from renewable sources
- levy on solar electricity

Government plans

The Climate Change Adaptation Strategy for the Czech Republic

This strategy is a national adaptational strategy and it responds to the EU Adaptation Strategy. Its implementation document is the National Action Plan for Adaptation to Climate Change.

The Adaptation Strategy is aimed at all major manifestations of climate change in the Czech Republic. This Strategy makes up the fundamental principles of adaptation up to 2030 and even up to 2050.

The National Action Plan for Adaptation to Climate Change

This plan aims to address most serious issues of the Czech Republic, such as:

- long-term drought
- floods and flash floods
- heavy rainfall
- rising temperatures
- extreme wind
- forest fires

Current issues in the renewables industry

Solar boom

- In 2006, the Act No. 180/2005 Coll., on the Support of the Use of Renewable Sources came into force, by which the Energy Regulatory Office set the amount of the purchase price paid for 20 years after the construction of the power plant at 15 CZK/kWh. The aim was to guarantee the return on investment within 15 years. This law also included an amendment that introduced a limit of a maximum 5% year-on-year decrease in the feed-in tariff.

- Between 2009-2010, there was a “solar boom” in the Czech Republic. The main cause of this boom was the sharp drop in the price of photovoltaic technologies in 2008-2010 and the delayed response of the state, which did not adequately and quickly reduce the amount of support.
- The Czech government did not react to the critical situation of the solar boom until September 2010, when it passed an amendment to the law that significantly reduced support for other newly built solar power plants. The reduction of the solar feed-in tariff to about 6 CZK/kWh from January 1, 2011, was enforced. Thus, the limit of a maximum 5% year-on-year decrease in feed-in tariffs was removed.
- As a result of the unmanaged solar boom, the state then introduced a 26% solar tax on large photovoltaic power plants in 2011. This tax was in effect from 2011 to 2013. In 2013, a tax of 10% was introduced for power plants built in 2010, valid for their entire “lifetime.”
- However, the solar parks are currently the most efficient source of energy in Central Europe. The state set aside about CZK150 billion from the Modernisation Fund and investors’ plan for new projects: for example, land-based parks and unconventional solar farms on water, or over agricultural land or parking lots.
- The first solar farm over water is prepared by Sev.en Energy. The largest roof installation was built by Škoda Auto in Mladá Boleslav city in 2020. This installation is supposed to supply over 450 MWh of solar energy which is used by the carmaker for its own immediate consumption.

Resistance of the inhabitants of the villages against the construction of wind power plants

- The inhabitants of villages often oppose building new power plants near their houses. One of the latest resistances was in Malešín (2021), which stopped construction of a new wind power plant.
- The plant was a huge project, and the wind power plants were supposed to be the highest in the Czech Republic. Each one of them would have had an installed capacity of 4 to 5 MW. They would reach a height of up to 220 m.
- The construction company needed to get a positive opinion from the council, but it was not granted.

Government incentive schemes

The main sources of funding are from national programs and programs financed from revenues from the sale of emission allowances and the EU Multiannual Financial Framework.

As mentioned above, the Czech Republic acceded to the EU in 2004. Since then, a lot of programs have been financed by the EU, such as European Regional Development Fund, Cohesion Fund, the Equitable Transition Fund, InvestEU Programme, LIFE program, Horizon Europe.

Some of the national programs are:

- EFEKT 2017-2021 – This is a state support program, which is covered by Ministry of the Environment of the Czech Republic. It aims at energy savings.
- *Programme Nová zelená úsporám* – It covers the reduction of the energy performance of buildings. This support is focused on family and apartment buildings and state-owned buildings.
- Operational Programme for the Environment – It supports sustainable water management and transition to a circular economy. It is focused on adaptation to climate change, strengthening green infrastructure in cities and reducing pollution.

Major projects and companies

ČEZ produces about three-quarters of electricity in the Czech Republic. ČEZ supports renewable energy, as it increases the number of produced electricity from renewable sources every year. In 2017 about 2,219 GWh was produced from water, solar and wind power plants. And 572 GWh came from biomass in the same year. Three years later, in 2020, the amount of produced electricity from power plants increased up to 2,518 GWh and 625 GWh from biomass. In 2020 about 3,143 GWh of electricity was produced from renewable sources.

The other major Czech producer of electricity (covering mostly the Prague area) is PRE. PRE used to offer a special program called “PREekoproud” which was aimed at the electricity from renewable sources only. However, this program has recently been stopped.

If we consider share of electricity from renewable sources in electricity consumption, there is an improving trend. In 2010, electricity from renewable sources was only 5%, in 2020 it was 10% and it is supposed to be up to 38% in 2050.

Foreign investment ownership

The Foreign Investment Screening Act (2021) is the main legislative instrument governing foreign investment in the Czech Republic. The Act implements the EU legislation, and it establishes rules for examination of certain foreign investments. This is due to protection of internal security of the Czech Republic.

This Act is aimed at investors whose ultimate owner comes from a non-EU country. The Act applies to investments where more than 10% of the Czech target company is acquired. And the sector must be important for security, public or internal order of the Czech Republic. If the company is engaged in the production of military equipment, selected dual-use goods, or belongs to critical information infrastructure, the investor will need approval before closing.

UNFCCC – Paris Commitments and beyond

- The Czech Republic signed the Paris Agreement on April 22, 2016, and it entered into force on November 4, 2016. The Czech Republic has committed to reducing net greenhouse gas emissions by at least 40% (compared to 1990) to zero by 2030.
- The Czech Republic has no program to help with keeping its commitments. But the country does its best to meet its commitments.

Relevant resources and references

Websites

- [Ministry of Industry and Trade CR](#)
- [Ministry of the Environment of the Czech Republic](#)
- [CEZ GROUP](#)

Electricity industry overview

- [ČEPS, a.s.](#)
- [Vláda schválila strategii ČR podporující využití vodíku](#)
- [Vnitrostátní plán České republiky v oblasti energetiky a klimatu \(2020\)](#)

Legal regulations

- [ASPI | Wolters Kluwer ČR, a. s.](#)

The Climate Change Adaptation Strategy

- [Strategie přizpůsobení se změně klimatu v podmínkách ČR](#)

The National Action Plan for the Czech Republic

- [Národní akční plán adaptace na změnu klimatu](#)

Current issues in the renewables industry

- [Dobrodružství fotovoltaiky. Proč se ze solární naděje stala zatracovaná cesta české energetiky?](#)
- [Příčiny solárního boomu v České republice](#)
- [Česko čeká nový solární boom. I když mu politici nepřejí](#)

- [Odpor obyvatel Malšína na Českokrumlovsku zastavil stavbu větrných elektráren, měly být nejvyšší v Česku](#)

Financing in the renewable energy sector

- [Obecný programový dokument pro implementaci Modernizačního fondu v České republice](#)

Major projects and companies

- [Obnovitelné zdroje](#)
- [PREekoproud](#)

Foreign investments

- [Prověřování zahraničních investic](#)

UNFCCC

- [Pařížská dohoda](#)

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Denmark

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil law• Language: Danish (English is widely used for business purposes)
Population	5.83 million
Gross national income (GNI) per capita	GNI per capita: USD 62,720
Business environment	<ul style="list-style-type: none">• 2021 Global Competitiveness Index: 3 of 64 (down 1 ranking)• 2020 Index of Economic Freedom: 10 of 180 (no change)• 2020 Corruption Perceptions Index: 1 of 176 (no change)• 2020 UN Development Programme Human Development Index: 10 of 189 (up 5 rankings)
Profile	<p>The Kingdom of Denmark is situated as the interconnection between Continental Europe and Scandinavia and comprises one peninsula, Jutland, and a large number of islands of which Zealand, where the capital Copenhagen is situated, is the largest. The Kingdom of Denmark also comprises the Faroe Islands situated in the Atlantic Ocean and Greenland.</p> <p>Denmark is a constitutional monarchy with parliamentary elections minimum every four years. Currently, Denmark is governed by a social democratic government, but power generally shifts between conservative/liberal governments and social democratic governments. Generally, the transition of power from one government to another does not adversely</p>

affect the green energy industry as all major political parties in Denmark are very positive towards a quick transition to a green economy.

The Danish economy is a small open economy, and Denmark is generally deemed among the best countries in the world to do business in. The official currency in Denmark is Danish Kroner but the Danish Kroner is pegged to the euro and in general there is no currency exchange risk *vis-à-vis* the euro.

Electricity industry overview

Electricity industry overview

In 2019, 29 tWh of electricity was generated in Denmark, and Denmark imported 5.5 tWh of electricity. In 2030, it's expected that 97% of the electricity production in Denmark is generated from renewable sources. Electricity generation is comprised of:

- 0.78% from biogas (August 2021 figures)
- 0.53% from oil (August 2021 figures)
- 50.04% from wind (August 2021 figures)
- 10.61% from coal (August 2021 figures)
- 5.08% from biomass (August 2021 figures)
- 4.05% from waste heat (August 2021 figures)
- 6.23% from solar (August 2021 figures)

Electricity demand is expected to grow from 35 tWh in 2019 to 71 tWh in 2030.

Electricity laws

- The Danish Electricity Supply Act is the primary Danish legislation on electricity. The purpose of the legislation is to improve competition in the electricity market, enhance security of supply, ensure consumer protection, and increase electricity production.
- The Danish Renewable Energy Act governs renewable energy projects such as solar and onshore wind and has various mechanisms to compensate neighbors.
- The Danish Energy Agency is the regulator on all matters pertaining to energy production, transmission and distribution.
- The Energinet Act establishes Energinet as the sole Transmission System Operator (TSO) in Denmark. Energinet's purpose is to own, operate and develop the overall energy infrastructure in Denmark and manage related tasks, thus contributing to the development of a climate-neutral energy supply.

Generation, distribution, and transmission

- In Denmark, electricity is generated by Ørsted and a number of local and regional producers and by a relatively large number of new businesses focused on renewable energy only.
- The Danish grid was initially established as a downstream grid transmitting power from large power plants to consumers. With the development of onshore wind and solar power, the upstream capacity from wind farms and solar parks has in some areas of the country been constrained and development of additional capacity today needs to be factored in when developing new sites.
- Renewables projects obtain grid connection through the grid companies or alternatively for larger projects directly through the Danish TSO, Energinet.

Renewable energy overview

Renewables industry overview

- In 2020, more than half of the Danish electricity production was based on wind power. On windy days, more than 100% of the Danish power consumption is generated by wind power. Denmark is a world leader in the wind power industry thanks to key players such as Ørsted, Vestas, Siemens Wind Power and Copenhagen Infrastructure Partners. Together with these key players, a large number of developers in both wind and solar energy are making Denmark a key hub for renewable energy.
- The Danish government has set an ambitious goal to reduce Danish CO₂ emissions in 2030 by 70% measured against 1990 CO₂ emissions. Additionally, the official Danish target is that 100% of power production will be from renewable energy sources in 2030. It is the ambition that by 2050, Denmark will have abandoned fossil fuels completely.
- These ambitious goals are backed by tenders initiated by the Danish Energy Agency for three offshore wind parks before 2030, two energy islands and a number of near-shore wind farms. The tender for the first of the new offshore wind farms, the up to 1,000 MW Thor Offshore Wind Farm, was decided on December 1, 2021, and will be without public subsidies. The next tender for the up to 1,200 MW Hesselø Offshore Wind Farm will be decided in 2022. The two energy island projects, one in the North Sea and one near Bornholm, are intended to combine offshore wind and Power-to-X facilities.
- In recent years, development of solar parks has become a significant industry in Denmark, both in respect of parks situated in Denmark and parks situated abroad. Key players in the solar industry are Better Energy, European Energy, BeGreen, GreenGo and Obton.

Wind

- Wind-sourced electricity accounts for over 50% of Denmark's total electricity needs. Natural conditions and Denmark's coastline are highly conducive to developing wind projects, both onshore and offshore. Denmark has six operational offshore wind farms (Anholt, Horns Rev 1, 2 and 3, Nysted and Kriegers Flak), totaling 2,155MW, and a number of smaller nearshore windfarms. The onshore development of wind energy started in Denmark on the back of the 1973 oil crisis, and by 2020 production capacity onshore reached 4,562MW.
- While the general view in Denmark of wind-generated energy is very positive, neighbors to new projects often voice concerns. On onshore windfarms, limitations on noise pollution apply, and neighbor compensation schemes may be triggered depending on the distance to neighbors. In addition, onshore projects require zoning approval, which in the municipalities is subject to political decisions that may cause uncertainty in early-stage projects.

Solar

- Solar generation is becoming an increasingly significant part of the power supply in Denmark. While solar generation has natural seasonal variations, during summer more than 6% of Danish power consumption is now derived from solar power.
- The pipeline for new photovoltaic projects in Denmark is extensive. Several factors make solar projects very attractive for key stakeholders. For farmers, the income from leasing out farmland to solar power significantly exceeds the income from normal agricultural operations. Increasing prices on energy and decreasing prices on panels have made photovoltaic projects without subsidies attractive. Developers of solar parks have become professionalized and operate efficient businesses. There is a strong demand to invest in renewable energy which creates the option for developers to hold on to the solar parks, farm down or exit. Finally, solar parks may be financed up to 60% with the very attractive and efficient Danish long-term mortgage financing.

Biomass

- Biomass accounts for a relatively small part of the electricity production but plays an increasing role in heat production. Power plants have been modified to use biomass. Biomass is also increasingly used for production of biogas.

Geothermal

- Geothermal is currently not contributing to power production in Denmark but various projects for heating are being considered.

Power-to-X

- Focus in Denmark on future power-to-X projects is significant. The largest European plant for production of green ammonia is currently being planned near the Danish North Sea coast. The project features a production capacity for 600,000 tons of green

ammonia made from renewable energy. The plant will allow the use of otherwise idle capacity when the production of renewable energy exceeds demand.

- We see a huge interest from key energy players in power-to-X and expect the area to develop significantly in the coming years in Denmark.

Current issues in the renewables industry

- Regarding onshore renewable energy, opposition against new projects, both solar and wind, appears to be increasing, with the main focus being on visual pollution from solar parks and both visual and noise pollution from wind farms. It's our experience that a strong focus from developers on stakeholders' interests to a large extent can curb such issues.
- The process of obtaining zoning approval from municipalities for new projects can be lengthy.
- Development of grid capacity upstream from renewable projects in remote areas may delay the Commercial Operation Date (COD) for new projects.

Government incentive schemes

- Large-scale offshore wind farm projects are tendered through a public tender process where bidders contest based on the lowest subsidy for the projects. For the most recent tender, the 800 to 1,000 MW Thor Offshore Wind Farm bidders have tendered without any subsidies and the tender was consequently decided as a lottery.
- Generally, subsidies are being phased out. The primary scheme remaining is a technology neutral scheme that provides a subsidy based on a contract for differences, ensuring stable pricing.

Major projects and companies

- On December 1, 2021, the Thor Offshore Wind Farm project was awarded to RWE. The 800 to 1,000 MW project will have COD no later than 2027.
- The Hesselø Offshore Wind Farm tender has been ongoing but was put on hold in June 2021 as soft clay formations have been found in the upper 20-30 m below the seabed, and further analysis of the preliminary site is deemed necessary.
- Development of an artificial island in the North Sea and surrounding offshore wind farms approximately 80 km off the coast of Thorsminde. The island will comprise electrotechnical facilities for routing electricity from the wind turbines into the electricity grid, and potentially also a harbor and service facilities for the first 3 GW of offshore wind farms in the North Sea. Later, the island and wind farms are intended to be expanded to generate and distribute up to 10 GW of electricity.
- The energy island in the Baltic Sea will be Bornholm, where electrotechnical facilities on the island will serve as a hub for offshore wind farms off the coast, supplying 2 GW of energy.
- The largest European plant for production of green ammonia is currently being planned near the Danish North Sea coast. The project features a production capacity for 600,000 tons of green ammonia made from renewable energy. The plant will allow the use of otherwise idle capacity when the production of renewable energy exceeds demand.
- Key Danish players are Ørsted, Vestas, Siemens Wind Power, Copenhagen Infrastructure Partners, Better Energy, European Energy, BeGreen, GreenGo and Obton. Additionally, a number of international key players are active in Denmark both through project development and investments in Danish projects.

Foreign investment ownership

- New restrictions on direct foreign investments were enacted in 2021. In respect of renewable energy related assets, the consequence is that direct foreign investments into critical infrastructure and businesses related to industrial scale storage of energy, conversion of energy and transmission of energy will require prior approval from the Danish Business Authority.

UNFCCC – Paris Commitments and beyond

- Denmark signed the Paris Agreement on April 22, 2016, and ratified the agreement on October 5, 2016. Denmark has committed to reducing net greenhouse gas emissions by 70% by 2030 measured against 1990 figures and to zero by 2050.
- The Danish Climate Act introduces measures to ensure that the ambitious goals are ultimately reached. The Climate Act introduces an obligation for the government to act with an aim to reach the goals. Further, an independent Climate Council has been established to provide yearly guidance on whether the Danish government is on track to reach set goals. On this basis, the Danish government will provide, every year, a climate program and a report to the Danish Parliament. Based on that, the Danish Parliament will, on an annual basis, assess whether further initiatives are required. Further, on a yearly basis, the Danish Energy Agency will prepare a forward-looking report on the expected energy demand and supply.

Relevant resources and references

Relevant references

- [Danish Energy Agency](#)
- [Danish Ministry of Climate, Energy and Utilities](#)
- [Danish Energy Agency's site on tender processes](#)
- [Danish Business Authority's site on Direct Foreign Investments](#)
- [Danish Energy Supply Act](#) (Danish language only)
- [Danish Renewable Energy Act](#) (Danish language only)
- [Danish Climate Act](#) (Danish language only)

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France

Last modified 12 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: French
Population	67.8 million (as of January 1, 2022)
Gross national income (GNI) per capita	GNI Per capita: USD 46,700
Business environment	<ul style="list-style-type: none">• 2018 Global Competitiveness Index: 15 of 138 (plus 2 rankings)• 2020 Index of Economic Freedom: 64 of 180 (no change)• 2020 Corruption Perceptions Index: 23 of 176 (no change)• 2020 UN Development Programme Human Development Index: 26 of 189 (no change)
Profile	<p>France comprises a mainland area located in western continental Europe, plus the island of Corsica in the Mediterranean Sea and several overseas territories in North and South America, the Indian Ocean and the Pacific Ocean. Covering a total of 543,965 km², mainland France is the largest country in the European Union.</p> <p>France is a semi-presidential republic with a head of government - the prime minister - appointed by the president who is the directly elected head of state. The president is elected for a five-year term and can serve for two consecutive terms if re-elected. The legislative power is in the hands of the French Senate (348 senators) and the National Assembly (577 deputies).</p>

France plays an influential global role as a permanent member of the United Nations Security Council, NATO, the G-7, the G-20, the EU, as well as other multilateral organizations.

The French economy is diversified across all sectors. Many large companies were partially or fully privatized. However, the state maintains a strong presence in some sectors, particularly energy, public transport, and defence.

Key industrial sectors in France are mechanical industries (including metallurgy and the manufacture of metal products, machinery, and equipment), agri-food industries, automotive, chemical industry, aeronautics and pharmaceutical.

Tourism accounted for 7.4% of GDP in 2018. France is ranked as the most visited country in the world with 91 million foreign visitors in 2019.

Electricity industry overview

Electricity industry overview

- In 2021, 522.9 TWh of electricity was generated in France, a 2.7% drop compared to 2019.
- Electricity generation consisted of:
 - 69% from nuclear power
 - 12% from hydropower
 - 7% from wind power
 - 7 % from fossil fuels
 - 3% from solar power
 - 2% from bioenergy
- Nuclear generation and fossil fuel thermal generation were respectively 4% (18.8 TWh) and 8% (3.4 TWh) lower than in 2019. This sharp drop is in the context of the economic crisis due to the COVID-19 pandemic, which was characterized by a drop in consumption and a deterioration in the availability of nuclear power generation.
- A 0.6% growth per annum is expected in the electricity demand until 2030.

Electricity laws

- European directives 96/92/EC, 2003/54/EC and 2009/72/EC concerning common rules for the internal market in electricity were transposed into French law by:
 - law 2000-108 of February 10, 2000, on the public service of electricity
 - law 2003-8 of January 3, 2003, on gas and electricity markets and the public service of energy
 - law 2004-803 of August 9, 2004, on electricity and the public service of gas and electricity and gas companies
 - law 2006-1537 of December 7, 2006, governing the energy sector
 - ordinance 2011-504 of May 9, 2011.
- The other main legislation that applies:

- law 2010-1488 of December 7, 2010, on the new organization of the electricity market
- law 2015-992 of August 17, 2015, on energy transition for green growth
- law 2019-1147 of November 8, 2019, on energy and climate
- decree 2020-456 of April 21, 2020, on the multi-year program for energy
- law 2021-1104 of August 22, 2021, on climate and resilience
- Since 2011, the main measures relating to the energy sector are consolidated in the Energy Code.
- EDF is the largest electricity generator and retailer in France. A former fully state-owned company, it was transformed in 2004 into a joint stock company operating under private commercial law and which is listed on the Euronext Paris stock market. In July 2022, the French State announced its decision to nationalize EDF and intends to bring it back into full state ownership by the end of October 2022.
- The electricity regulations are implemented by the minister responsible for energy, the Directorate General for Energy and Climate (*Direction générale de l'énergie et du climat* or "DGEC") and other national authorities.
- The minister responsible for energy is currently the Minister for Energy Transition. The minister has certain prerogatives in terms of determining electricity tariffs, control, and penalties. More specifically, said minister has a right of access to the accounts of electricity undertakings and is also vested with powers of investigation and inspection. Competence in relation to raw materials and onshore mining activities is shared between the Minister for Energy Transition and the Minister for Industry.
- The DGEC is the ministerial department in charge of all energy matters. It determines and implements the energy policy, controls the performance of the public service missions in the energy field, and implements the state's policy on renewable and nuclear energy.
- The energy markets are regulated by the Energy Regulation Commission (*Commission de régulation de l'énergie* or CRE). The CRE is an independent administrative authority. The CRE has both an advisory role (with powers to make proposals and give opinions) and a decision-making role (with approval and regulatory powers).

Generation

- Three companies generate almost all non-imported electricity: EDF, Engie and Uniper.
- With total installed power of 86.4 GW in mainland France by December 31, 2021, EDF has the largest generation fleet in Europe. It owns and operates 80% of all generation capacity in France.

Distribution and transmission

- Two of EDF's subsidiaries, *Réseau de transport d'électricité* (RTE) and Enedis, are respectively in charge of transmission and distribution networks. Other historical distribution companies operate regionally.
- The French electricity transmission network is the largest transmission network in Europe, with more than 100,000 km of high- and extra-high-voltage circuits and 47 cross-border lines. The transmission network is operated by RTE under a concession agreement entered into with the state due to expire on December 31, 2051.
- Local authorities own electricity distribution networks and enter into concession agreements for their development and operation as well as electricity distribution. Enedis manages most of the electricity distribution activities in France. It operates a network of 1.4 million km and distributes 95% of the volume of electricity distributed in France.
- Energy production sites with a capacity of less than 12 MW are directly connected to the grid through the entities distributing power to end-users.
- When energy production sites have a capacity of more than 12 MW, they are connected to the grid through the entity responsible for power transmission (RTE).
- Network operators must guarantee access to the public transmission and distribution networks.
- Access to the networks is ensured through standard form agreements that are entered into between the transmission and distribution network operators and the users of these networks.
- Regulated tariffs for transmission and distribution networks and for supply are set by the CRE.

Supply

- Electricity supply has been fully open to competition since July 1, 2007, when the right to choose an electricity supplier (a right previously enjoyed only by the largest electricity consumers) was extended to all customers, including residential customers.
- EDF's main competitors on the electricity supply side are Total Direct Energie, Engie, Alpiq, Uniper and Enel.
- As of March 31, 2022, alternative suppliers held a 31% market share.

Government plans

- France has an ambitious objective: to become Europe's first major decarbonized economy by achieving carbon neutrality by 2050. Reducing the impact of France's economic activity on the environment, the *France Relance* recovery plan launched in 2020 committed EUR30 billion to speed up the ecological transition. According to this plan, France will notably support the thermal renovation of buildings, the decarbonization of industry, green hydrogen (with a EUR 9 billion investment from the State by 2030) and cleaner transport. In particular, to be at the cutting-edge of renewable hydrogen production and low-carbon technologies, France will support projects led by companies across the country to encourage the emergence of French hydrogen solutions. It will set up a mechanism to support hydrogen produced by water electrolysis and will create an Important Project of Common European Interest to support industrialization in France and develop projects.
- In addition, in October 2021, the authorities announced a new investment plan called "France 2030." The plan, worth EUR30 billion until 2027, would complement *France Relance* and especially target further investment in the energy sector (EUR8 billion). Pursuant to this plan, France aims at becoming a leader in green hydrogen and plans massive investments for industrial decarbonization through nuclear power (particularly development of small modular reactors) and renewable energy.

Renewable energy overview

Summary of the renewables industry in country

- In 2021, 22,5% of electricity generated in France was from renewable sources.
- In 2020, electricity generation from renewable sources is made up of:
 - 49.5 % from hydro power
 - 32.4 % from wind power
 - 10.8 % from solar power
 - 2.9 % from biomass
 - 2.2 % from biogas
 - 1.7 % from renewable waste
 - 0.4 % from geothermal electricity
 - 0.1 % from tidal power
- In 2021, the proportion of renewable energies as a percentage of France's gross final energy consumption was 19.3%. Renewable energies in France have enjoyed significant growth since 2005, mainly because of the development of biofuels, biomass, wind power and solar energy. While the proportion of renewable energies in France's gross final energy consumption was 24.2% in 2020, thus above France's 2020 target of 23% set out by the EU Directive 2009/28/EC on the promotion of the use of energy from renewable sources, this proportion decreased below this target in 2021 due to unfavorable weather conditions for hydropower and wind power, and this occurred despite an increase in the generation fleet.
- France aims to boost the share of renewable energy to at least 33% of total energy consumption and 40% of electricity production by 2030 and these targets are set out by law.
- The government set out specific near-term targets under the 10-year energy investment plans (*programmation pluriannuelle de l'énergie* or PPE) enacted in 2020. The following targets were set for the development of renewable electricity generation:

Installed capacity as of 31 December (in GW)	2023	2028	
		Low target	High target
Onshore wind	24.1	33.2	34.7
Solar	20.1	35.1	44.0
Hydro	25.7	26.4	26.7
Offshore wind	2.4	5.2	6.2
Biomethane	0.27	0.34	0.41

Solar

- In 2021, solar electricity accounted for 3% of France's electricity production.
- At the end of March 2022, the total installed capacity was 14.6 GW.
- The government expects that photovoltaic solar will be proportionately more developed in big solar power plants than it is today, because it is the most competitive channel and big projects (over 50 MW) will progressively be developed without subsidies, which will increase the average size of the systems. The government announced that it will ensure these projects respect biodiversity and agricultural land by prioritizing the use of industrial wasteland, neglected motorway space, military areas or even the big roof areas which will gradually become mandatory.

Wind

- In 2021, wind power accounted for 7 % of France's electricity production.
- At the end of March 2022, total installed capacity was 19.2 GW.
- The government expects that wind power will be developed partly through renovation of existing systems that have reached expiration, enabling an increase in the energy produced while keeping an identical or smaller number of masts.

Hydropower

- Hydropower is the second most important form of electricity generation in France after nuclear energy. It represents 12% of the electricity generated in France and is the first source of renewable electricity, accounting for 53% of the country's total gross renewable electricity production in 2021.
- France has one of the largest hydropower plants in Europe with about more than 25.7 GW deployed on its territory. The government intends to upgrade the existing facilities enabling additional generation of 200 MW by 2023 and increasing capacity by 900 - 1200 MW by 2028.

Geothermal

- Geothermal energy is a minor source of electricity generation in France, representing only 0.1% of renewable electricity production and 2.3% of renewable energies for thermal use in 2020.
- France essentially uses low and medium power geothermal energy for heating networks.
- The high-power geothermal energy for electricity generation is currently only used in two geothermal power plants. One of these plants is in Guadeloupe and uses the volcanic heat of an active stratovolcano named "*La Grande Soufrière*."

Bio energy/Biomass

- The main sources for bio energy generation in France are (i) solid biomass (wood energy and other solid components), (ii) renewable waste (household waste, paper waste, agricultural waste) and (iii) biogas (produced by the fermentation of biological materials).
- In 2020, the total bio energy installed capacity amounted to nearly 2.2 GW (950 MW for waste incineration, 680 MW for solid biomass and 540 MW for biogas).
- The solid biomass energy is mainly used for the basic consumption of heat, essentially in the residential sector, only a minor part being used for electricity generation (8%).

Government plans

Changes for calls for tenders award winning projects

On August 30, 2022 the CRE announced amendments to the specifications of 17 past and ongoing calls for tenders, which is one of the Government incentives schemes for the renewable energy sector (see [Government incentive schemes](#)). This measure is taken in the context of the energy crisis and aims at allowing a quicker commissioning for 6 GW of award-winning projects (which relate to wind – 3.4 GW, solar – 2.7 GW, hydropower and self-consumption projects). These amendments will enable renewable electricity producers to:

- sell the electricity generated on the market for a 18-month period before locking in the FIP contracts (see [Government incentive schemes](#)) in order to benefit from high market prices and amortize part of the increase in costs;
- request an extension of the deadlines for completion of the facilities;
- increase the projects' initial capacity mentioned in the call for tenders by up to 40%.

Since September 1, 2022, the producers have been able to request from the Minister responsible for energy the application of these amendments.

Speeding up the development of renewable energy projects

A draft law, which is currently under consultation and should be discussed before the Parliament in October 2022, aims to shorten the time required for commissioning renewable energy projects, by simplifying the applicable permitting requirements. Other provisions aim to facilitate the installation of solar panels on abandoned road and highway sites or in run-down areas, such as former landfills. The Government also intends to require existing outdoor parking lots of more than 2,500 square meters to install solar canopies on at least half of their surface.

Renewables laws

Several laws relating to renewables have been enacted in France. Their main provisions are consolidated in the Energy Code.

Current issues in the renewables industry

Retroactive cut-off of solar tariffs

- In 2020, the government decided to reconsider the FIT rates for power purchase agreements (PPAs) entered into prior to a revision of the support scheme which occurred in 2011, based on their alleged excessive profitability. Accordingly, the 2021 Finance Law provided for the reduction of the amount of the FITs of these PPAs aimed at limiting the projects to a reasonable return on capital. The reduction of the FIT is intended to be applied to all projects with an installed capacity of more than 250 KW, irrespective of the technology used (photovoltaic or thermodynamic). The reduction affects 436 facilities. The average reduction of the tariff is 47%, while 4% of the projects would suffer a 95% reduction. Broadly speaking, for ground-mounted solar projects located in mainland France, the FIT will be reduced from EUR 570 per MWh to EUR 30 per MWh. The minimum FIT will be in the range of EUR 18 to EUR 50 per MWh, and the average FIT will be around EUR 30 per MWh.
- The 2021 Finance Law provides, in addition, for a safeguard mechanism allowing producers to request the CRE to grant a FIT higher than that which has been notified to them. This mechanism is available to producers who can demonstrate that the revised FIT is likely to endanger their economic viability. Producers will need to show that all available steps have been taken to mitigate the financial impact, including seeking support from their direct and indirect shareholders. Producers were required to submit requests

for the safeguard mechanisms to be applied within three months of being notified of the new FIT. By 16 December 2021, 320 such requests had been submitted to the CRE. This means that 73% of the producers impacted by the measures took the position that the revised FIT are likely to endanger their economic viability. Once a request for the safeguard mechanism has been registered by the CRE, the application of the new FIT is suspended for a maximum period of 16 months. The CRE has 12 months to evaluate the request and make a proposal to the Ministers of Energy and Budget. If the producer's request is accepted, a ministerial order, adopted within one month after the CRE's proposal, will set out the new level of the FIT, its effective date and, as the case may be, the new duration of the PPA. If the request for the implementation of the safeguard mechanism is rejected, the revised FIT will apply retrospectively to the date set out in the ministerial order establishing the revised FIT. Given the timelines described above, the decisions rejecting or approving the implementation of the safeguard mechanism are expected to be issued between the end of 2022 and the first quarter of 2023.

Repayments under the FIP contracts

- In the context of the very significant rise in prices on the electricity market, renewable energy producers which entered into FIP contracts are liable for "negative premiums" to the State, i.e. the difference between the wholesale market price and the reference price set out in their contracts which is guaranteed by the State. Some of these contracts, however, set out mechanisms for capping these repayments which could create a windfall effect for these producers. The Amending Finance Law for 2022, enacted on August 16, 2022, provides for a removal of this cap, applicable retroactively to January 1, 2022. A ministerial order will set out, on a yearly basis, a "threshold price", which will serve as a reference for either a full removal or a partial removal of the cap.

Early termination by renewable energy producers of FIT or FIP contracts

- In a deliberation of July 13, 2022, the CRE indicated that renewable energy producers holding FIT or FIP contracts for some 1.3 GW, notably wind and hydropower projects, applied for the early termination of their FIT or FIP contracts in order to be able to benefit from the high market prices. The CRE recommended that the State engage quickly in order to set out a specific taxation mechanism for these producers, since they benefitted from the State's support in order to develop these projects.

Low power generation levels

- The nuclear output was of 154.1 TWh for the first half of 2022, which is 27.6 TWh less than in the same period in 2021. This is mainly due to a lower availability of the nuclear fleet following the detection of stress corrosion indications.
- Hydroelectric generation is also below the 2021 generation level, in a context of historically low water levels as a consequence of the drought in France.

Government incentive schemes

- The main support schemes that have been implemented for the promotion of renewable energies are the feed-in tariff (FIT) and feed-in premium (FIP).
 - The FIT scheme relies on the obligation imposed on EDF, and certain other local distribution operators (LDOs), to purchase electricity generated by independent power producers from renewable sources at a preferential tariff - the FIT. This price, set by the minister of economy, is higher than the market price.
 - Under the FIP scheme, producers selling electricity from renewable sources on the market at market prices receive compensation based on an agreement to be entered into with EDF or an LDO.
- Under these schemes, the extra charges imposed on EDF or on the LDOs are compensated through a contribution (payment) toward the electricity as a public service (*contribution au service public de l'électricité* or CSPE), which is collected in full and directly from end-users.
- These support schemes are made available as follows:
 - Small-size renewable plants may be granted the possibility to enter into either FIT or FIP contracts, depending on their size, through the so-called "open-counter" procedure (*guichet ouvert*).
 - Large-scale facilities may only benefit from the FIP scheme if they are awarded such incentive in the context of calls for tenders, launched from time to time by the state.

Major projects and companies

Offshore wind

Seven offshore wind farms projects are currently under development:

Project	Company / Shareholders	Capacity	Targeted commission
Saint-Nazaire (Pays de la Loire Region)	EDF Renouvelables, Enbridge, CPP Investments	480 MW	2022
Saint-Brieuc (Brittany Region)	Ailes Marines (a 100% subsidiary of Iberdrola)	496 MW	2023
Courseulles-sur-Mer (Normandy Region)	EDF Renouvelables, EIH (consortium composed of Enbridge and CPP Investments), wpd	448 MW	2024
Fécamp (Normandy Region)	EDF Renouvelables, wpd, Enbridge, CPP Investments	500 MW	2023
Iles d'Yeu & Noirmoutier (Pays de la Loire Region)	EMYN (Engie, EDP Renewables, Sumitomo Corporation, La Banque des territoires - Caisse des dépôts et consignations)	496 MW	2025
Dieppe – Le Tréport (Normandy Region)	EMDT (Engie, EDP Renewables, Sumitomo Corporation, La Banque des territoires - Caisse des dépôts et consignations)	496 MW	2025
Dunkerque (Hauts-de-France Region)	EMD (EDF Renouvelables, Enbridge, RWE Renawables)	600 MW	2027

The following calls for tenders are currently ongoing:

Project	Capacity	Timeline	Type
Zone to be defined offshore Normandy region	900 – 1050 MW	Call for tenders launched in January 2021 Award projected for February 2023	Fixed
South of Brittany region	230 - 270 MW	Call for tenders launched in April 2021 Award scheduled for September 2022	Floating
Mediterranean Sea	2 wind farms each of a capacity of 230 MW – 280 MW	Call for tenders launched in March 2022 Award projected for mid-2023	Floating

The Minister for Energy Transition announced on August 9, 2022 that a call for tender for a new offshore wind farm project with a capacity of up to 1.5 GW will be launched by the end of the year in the “Centre Manche” area.

Other ongoing calls for tenders

The table below sets out the calls for tenders for solar projects launched in 2021 which are scheduled within the next years.

Energy	Project type	Capacity	Date
Solar	Ground-mounted; specific eligibility requirements as set out in the call for tenders	925 MW	9 calls for tenders to be launched between 2021 and 2026
Solar	Projects exceeding 500 kW in size deployed on greenhouses or carports	300 MW for 4 of the calls for tenders 400 MW for 9 of the calls for tenders	13 calls for tenders to be launched between 2021 and 2026
Onshore wind	Projects which are not eligible to a FIT PPA pursuant to the “open-counter” procedure	925 MW for each call for tenders	9 calls for tenders to be launched between 2021 and 2026

Solar/wind	Individual and community self-consumption projects ranging from 500 kW to 10 MW in size installed within a single building, and community projects with capacity between 500 kW and 3 MW that are spread across several buildings, all projects to be located in mainland France	50 MW for each call for tenders	13 calls for tenders to be launched between 2020 and 2026
Solar, wind or hydropower	Specific eligibility requirements as set out in the call for tenders, all projects to be located in mainland France	500 MW for each call for tenders	5 calls for tenders to be launched between 2020 and 2026
Solar	Innovative ground-mounted projects or projects deployed on greenhouses or carports, without storage	140 MW for each call for tenders	4 calls for tenders to be launched between 2020 and 2025

Major companies

EDF Renouvelables, Engie, Voltalia, Neoen and Compagnie Nationale du Rhône are among the major renewable energy producers in France.

Foreign investment ownership

- Prior authorization from the Minister of Economy is required for foreign investments if they are made in respect of certain "sensitive industries".
- Foreign investments in relation to technologies involved in renewable energy generation are subject to prior authorization from the Minister of Economy since January 1, 2022.

UNFCCC – Paris Commitments and beyond

In the Paris Agreement, the European Union and France undertook to tackle the effects of climate change induced in particular by the increase in greenhouse gas emissions (GHG). To implement this commitment, the European Union and its Member States have decided to reduce their emissions by 30% by 2030 compared to 2005 levels, with a target of 37% for France. In addition, France has set itself, through a 2015 law, an even more ambitious target of reducing its emissions by 40% in 2030 compared to 1990 levels as well as an objective of reaching carbon neutrality by 2050.

To achieve the 40% reduction target, France adopted a reduction path extending over 4 periods (2015-2018, 2019-2023, 2024-2028 and 2029-2033), each of them with an emission ceiling (called "carbon budget"), progressively decreasing. Three five-year "carbon budgets" were set out within the National Low-Carbon Strategy (*Stratégie nationale bas carbone* or SNBC), which also sets emission reduction targets for each sector.

In 2021, the Council of State, France's supreme court for administrative matters, had to rule on a case regarding the fulfilment of France's commitments to reduce GHG. Grande-Synthe, a city in the North of France, referred a matter to the Council of State after it received a refusal from the government to take additional measures as to meet the objectives of the Paris Agreement. The Council of State upheld the application, noting that (i) the decrease in emissions in 2019 was small, (ii) the decrease in 2020 was not significant because economic activity had been reduced by the COVID-19 pandemic, and (iii) compliance with the trajectory, which provides for a 12%

decrease in emissions over the period 2024-2028, does not appear to be achievable if new measures are not adopted quickly. The Council of State therefore ordered the government, on July 1, 2021, to take by March 31, 2022, additional measures to reach the reduction target of GHG by 40% by 2030.

On May 2, 2022, the Government published a summary of the response submitted to the Council of State, containing details of all measures to achieve the reduction target which have been taken since the court's 2021 decision. The Council of State's final decision on this matter is pending.

Relevant resources and references

Websites

- [French Energy Code](#)
- [Ministry for Energy Transition](#)
- [Directorate General for Energy and Climate](#)
- [Energy Regulation Commission](#)
- [Key statistics on renewable energies](#)
- [National Low-Carbon Strategy](#)
- [Overview of renewable electricity in France \(December 31, 2021\)](#)
- [Electricity report \(February 24, 2022\)](#)
- [International Energy Agency – France 2021 Energy Policy Review](#)
- [Renewable energy calls for tenders](#)

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Ghana

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Common Law• Language: English <p>Of the over 50 indigenous languages spoken in Ghana, some of the most widely used languages include:</p> <ul style="list-style-type: none">• Akan• Ga/Dangme• Ewe• Dagbani• Nzema• Daagare/Waale• Kasem• Gonja
Population	31.07 million
Gross national income (GNI) per capita	GNI per capita: USD 2,230
Business environment	<ul style="list-style-type: none">• 2021 TI Corruption Perceptions Index: 43 points ranking 73 of 180 (down from 75 in 2020)• 2021 Global Innovation Index: 22.3 ranking 112 of 132• 2022 Index of economic freedom for Ghana: 60 of 100 (an increase of 0.8 from 59.2 in 2021)• 2020 UN Human Development Index: 0.611 of 185 (this is an increase of 31.4 percent from 0.465)

Profile

The Republic of Ghana is located in West Africa. It spans the Gulf of Guinea and the Atlantic Ocean to the south, sharing borders with Côte d'Ivoire in the west, Burkina Faso in the north, and Togo in the east. Formerly known as the Gold Coast, Ghana gained independence on 6th March 1957.

The country has a democratic system of government with the current President being His Excellency, Nana Akufo-Addo who won a re-election in December 2020 as the flagbearer of the New Patriotic Party (NPP). Ghana has a youthful population with the average life expectancy at birth of 61 years. Ghana has a rich diversity of ethnic groups. Major ethnic groups include Akans, Ewes, Ga-Dangme, Mole-Dagbanis among others.

Ghana has a mixed economic system. As at March 2022, the services sector remains the largest contributor to Ghana's GDP with 52 percent contribution with the industrial sector being the next largest followed by the agricultural sector. On the expenditure side is household consumption which forms the main component of the GDP and accounts for 81 percent of its total use. Ghana's main exports are gold, cocoa and crude oil. The Cedi is the official currency of Ghana. The economy advanced by 3.3% from a year earlier in the first quarter 2022 slowing down from a 7% expansion in the previous period.

Electricity industry overview

Electricity industry overview

Generation

Ghana's power supply is primarily sourced from hydro-electricity, thermal energy fueled by crude oil, natural gas and diesel as well as renewable sources such as solar. Ghana relies heavily on fossil fuels for power generation. The total installed capacity according to the 2021 published energy statistics produced by the energy commission stands at 5481 MW consisting of:

- Hydro power - 36.2%
- Thermal power - 63.6%
- Renewables - 0.3%

However, despite this large outlay of power, the dependable capacity is 4,975 MW.

According to Ghana's Energy Commission, final energy consumption increased by 4.3% in 2019. Peak electricity demand for 2019 was 2804 MW, well under Ghana's total installed capacity.

Ghana also exports power to Togo, Benin and Burkina Faso due to the country's large installed capacity. Ghana has been a net exporter of electricity for three consecutive years. The net export registered in 2020 was the highest, increasing by 33.8% (1743 MW) representing imports of 58 MW and exports of 1801 MW.

As at 2020, it is estimated that 85% of the total population of Ghana have access to electricity. This makes Ghana one of the African countries that are most likely to achieve 100% universal access by 2030.

Hydro

- Hydroelectricity is generated from three power plants: the Akosombo and Kpong Generation Stations, operated by the state-owned Volta River Authority (VRA); and the Bui Generation Station operated by the state-owned Bui Power Authority. Thermal Power is generated from a combination of private and public sector outputs by VRA and a variety of independent power producers (IPPs). Three state-owned and four privately-owned plants generate energy from the eastern enclave of the National Interconnected Transmission System (“national grid”) while two state-owned and three privately owned plants generate power from the western enclave of the national grid.
- According to 2021 published energy statistics, the installed hydro power generation capacity is 1,584 MW with a dependable capacity of 1,400 MW.

Thermal

Ghana’s installed capacity is dominated by thermal energy. Ghana’s thermal dependency is due to high demand, unpredictable water levels in domestic dams, discovery of indigenous oil and gas, and the introduction of the West African Gas Pipeline. According to the 2021 published energy statistics, Ghana’s thermal energy installed capacity stands at 3649 MW with a dependable capacity of 3480.6 MW.

Ghana currently has a number of power stations that generate electricity from thermal energy:

- Takoradi Thermal Power station (TAPCO)– 330 MW - Commissioned in 2000, runs on Gas/LCO
- TICO (T2)– 340 MW - Commissioned in 2001, runs on Gas/LCO
- Tema Thermal 1 Plant (TT1PP) – 110 MW - Commissioned in 2009, runs on Gas/LCO
- Tema Thermal 2 Plant (TT2PP) 87 MW - Commissioned in 2010, runs on Gas/LCO
- Kpone Thermal Power Station (KTPS) – 220 MW - Commissioned in 2016, runs on Gas/Diesel
- Kpone Thermal Power Station II – 340 MW - Commissioned in 2017, runs on Gas/Diesel/Crude Oil. This is the biggest independent power plant in Africa to date
- Ameri Power Plant – 250 MW - Commissioned in 2016, runs on Gas

There are also plants such as Sunon Asogli Power (Ghana) Ltd, Karpowership, Amandi, AKSA, Cenpower, Earlypower and Genser.

In 2019 Ghana procured 63% of gas from its own offshore fields and another 37% via the West African Gas Pipeline. Gas supply reliability is expected to improve again when the Tema LNG project is completed.

Solar

- Solar energy makes up largest fraction of the total power generated from renewable sources in Ghana. Steps are however being taken to diversify and increase power generation from solar and wind energy. The government has committed to increasing the proportion of non-hydro renewable energy in the national energy generation mix to 1363.63 MW and to accumulating carbon savings of about 1 million tons of CO₂ by 2030 through the implementation of a Renewable Energy Master Plan which will be dependent on private sector investment.

Electricity laws in Ghana

Transmission

- Transmission of power is the sole responsibility of the Ghana Grid Company which was established in 2006, in accordance with the Energy Commission Act, 1997 (Act 541) and the Volta River Development (Amendment) Act 2005 (Act 692) which provide for the establishment and exclusive operation of the National Interconnected Transmission System by an independent public utility and the separation of transmission functions of the Volta River Authority (VRA) from its other activities within the framework of the Power Sector Reforms.

- Government through the Ministry of Energy is embarking on major projects aimed at addressing transmission challenges through progressive replacement of over aged and obsolete equipment and reinforcement of others including the construction of 161 Kv and 330 Kv Transmission lines, construction of new substations across the country, expansion of some existing substations and installation of capacity banks.

Distribution

- Electricity distribution in Ghana is carried out by three main distribution utilities, two state-owned and one private sector operated.
- The Electricity Company of Ghana, the largest distribution company, is a limited liability company wholly owned by the government of Ghana. ECG is currently responsible for distribution and supply of electricity in six political/administrative regions in southern Ghana namely, Ashanti, Central, Eastern, Greater Accra, Volta and Western Region.
- Prior to reforms in Ghana's power sector in 1980s, ECG was responsible for the distribution of power in the whole of the country. In 1987, the Northern Electricity Department (NEDCo) of the VRA was charged with the distribution of electricity to Brong-Ahafo, Northern, Upper East and Upper West regions of Ghana and started with an initial load of about 10 MW with customer population of about 12,000. The network has grown extensively over the years mainly as a result of the various electrification programs of government. NEDCo has since 2012 been established as a subsidiary of VRA.
- Enclave power company Ltd (EPC) is the only privately-owned electricity distribution company operating in the Tema Free Zones Enclave in the Greater Accra Region. EPC has about 50 industrial customers. There is an effort to expand private participation in distribution and enhance supply reliability through the implementation of the compact II with the millennium challenge corporation (MCC) of the United States of America.

Access to electricity

- The National Electrification Scheme (NES) was instituted in 1989 with the policy objective of ensuring that all parts of the country are provided with reliable electricity supply by 2020. At the commencement of the NES in 1990, accessibility to electricity supply was estimated at about 20%. Ghana has since achieved an enviable record of having the highest electricity access rate in Sub-Saharan Africa. The national average access rate is currently at 83.24% and to attain universal access by 2020.

Renewable energy overview

General overview of the renewable energy sector

- Ghana's population is projected to rise to about 40 million by 2020. With the rise in energy demand surpassing supply, Ghana has committed to addressing these challenges by replacing conventional fuels with cleaner and more reliable sources of electricity.
- Ghana, like so many other African countries has adopted the United Nations Sustainable Development Goal (SDG) 7 which is targeted at ensuring universal access to affordable and modern energy.
- Ghana's installed capacity currently stands at 5228 MW; from hydro, thermal and renewable sources as well as from independent power producers (IPPs).
- The total installed renewable energy generation capacity in Ghana according to the 2021 published energy statistics is 98.87 MW.
- The government of Ghana has set up a goal to generate 10% of its electricity from renewable energy by the year 2030.

Hydro

- Until 1998, the supply of electricity in Ghana was mainly from hydropower sources with the Akosombo (1020 MW installed capacity) being constructed in 1966. Together with the Kpong Dam (160 MW), these two large hydropower stations were the source of most of the electricity generated in Ghana. The dams are managed by the Volta River Authority. The Bui Hydro-electric power station commissioned in 2013, has an electricity capacity of 400 MW.
- Currently, hydro power accounts for 36.2% of the electricity produced in Ghana with majority of the electricity supply coming from thermal energy. A constant problem affecting hydro power generation are unrelenting hydrological shocks due to drought and unreliable rainfall patterns. These climate issues have progressively made hydro-electric power facilities unreliable because of their inability to achieve full generation capacity.

- Various sites suitable for small (mini) and medium capacity hydropower plants have been identified in different locations in Ghana with the potential to generate over 900 MW when fully developed. The exploitable hydro sites in Ghana are 22 mini-hydro and 17 medium hydro sites with individual capacities of 15 kW to 100 MW and could be exploited to generate a total of about 800 MW of electricity.

Solar

Ghana has a few solar power stations which produce a low supply of electricity:

- Navrongo Solar Power Station - completed in 2013 - produces 2.5 MW of electricity - owned by an independent power producer (IPP)
- BXC Solar Power Station - completed in 2016 - produces 20 MW of electricity - owned by an independent power producer (IPP)
- Gomoa Onyaadze Solar Power station - completed in 2018 - produces 20 MW of electricity
- Meinergy Solar Plant – 20 MW installed capacity
- Bui Solar Plant – 10 MW installed capacity
- The government also commissioned the Lawra solar plant with an electricity capacity of 6.5M W in 2020.

The country is expecting to generate 155 MW (208,999 hp) from the Nzema Solar Power station which is still under construction. Described as the largest solar power installation in Ghana when complete, the Nzema Solar Power Station will bring electricity to the homes of more than 100,000 consumers. The project is under the control of UK-Based Blue Energy Ltd. Although the project was scheduled for completion in 2017, construction is still underway with the project now set to be completed before the end of 2023. This project is expected to increase the nation's electricity generating capacity by 6%.

Biomass

- Ghana has a strong potential for biofuel production, thanks to energy crops such as jatropha, oil palm fruit, soybean, coconut and sunflower. A recent study ranked Ghana as Africa's leading producer of biodiesel from jatropha. Generating energy from waste has also been identified as a potential source of electricity.
- The only notable project is the Safisana Biogas project which has an installed capacity of 0.10 MW.

Wind

- Average wind speeds in Ghana show possibilities for wind power project development especially along the eastern coastal areas and mountainous regions.
- The Volta River Authority is also working with two wind developers, Vestas and El Sewedy, to develop 150 MW of wind power at 4 identified sites in the southern part of the country based on wind resource potential; namely: Anloga, Anyanui, Lekpogunu and Akplabany.
- The Swiss company Nek has announced plans to generate 1000 MW of electricity from several wind farms in Ghana. The first phase is expected to generate 160 MW, and 75 MW for the second phase. The Swiss company already has major concessions in Ghana. In the locality of Amlakpo, more than 80 km from the Ghanaian capital Accra, Nek is looking to build a 200 MW wind farm on a plot of land of about 58 km².
- In the locality of Ayitepa in the south-east of Ghana, the company will develop a project for the construction of a 225 MW wind farm. Studies for the construction of this facility have been underway since 1998. Nek plans to sell the kWh of electricity generated by the Ayitepa wind farm to the state-owned Electricity Company of Ghana (ECG) at 8.9 cents.

Tidal/Wave

- Technologies to harvest energy from ocean/tidal waves are new to Ghana. So far, only one US company, TCs Energy, has expressed interest in it. However, the project was stalled for years due to financial constraints. The constraints have been resolved following the agreement signed in August, 2020 between TCs Energy, Seabased of Sweden and Power China Huadong Engineering Corporation Ltd to finance and revive the project. The project would start with 5 MW and scale up to 100 MW within 2 years.

Nuclear

- Although there have been qualms about the nuclear potential of the country, nuclear power can be considered a viable option in the national energy mix due to the increasing power demand and the country's quest towards achieving middle-income status. According to the Ghana Atomic Energy Commission, Ghana is making steady progress to go nuclear for its electricity generation.

Legal and regulatory framework of the renewable energy sector

The legal and regulatory framework governing the renewable energy sector in Ghana, within which the renewable energy goals of the country can be achieved is found in the Renewable Energy Act, 2011 (Act 832). This Act was enacted in pursuance of Ghana's commitment to boosting the renewable energy sector. Section 1 of Act 832 establishes that the predominant objective of the Act shall be to provide for the development, management and utilization of renewable energy sources for the production of heat and power in an efficient and environmentally sustainable manner.

The Renewable Energy Act makes provision, among others, for the following:

- Feed-in Tariffs (FITs)
- Establishment of a Renewable Energy Authority
- Renewable Energy Fund
- Research and Development
- Promotion of Clean Cookstoves
- Off-grid Electrification for Remote Communities
- Net Metering for Distributed Generation
- Renewable Energy Purchase Obligations

However, the Feed-in-tariff (FIT) scheme has been repealed by the Renewable Energy Amendment Act, 2020 (Act 1045). Act 832 was amended to enable consumers of electricity in Ghana to benefit from the reduced cost of electricity generation from renewable energy sources through competitive procurement instead of the feed-in tariff scheme.

The Renewable Energy Amendment Act 2020 also encourages small-scale self-generation and net-metering from renewables. Furthermore, it mandates fossil fuel-based wholesale electricity suppliers, fossil fuel producers and other companies that contribute to greenhouse gas emissions to complement the global effort of climate change mitigation by investing in non-utility scale renewable energy technologies, particularly for off-grid electrification

In 2012, the Energy Commission developed a licensing manual for service providers in the renewable energy sector to regulate the technical operations of service providers in the sector. The manual was prepared in accordance with Section 8 of the Renewable Energy Act, 2011 (Act 832). As of November 2019, 130 provisional licenses, 40 siting permits, 11 construction permits and 4 operational licenses had been granted

Aside the Renewable Energy Act which serves as the primary legislation on generation of energy from renewable sources, other tangential pieces of legislation such as the Environmental Protection Agency Act, 1994 (Act 490), the Bui Power Authority (Amendment) Act, 2020 (Act 1046), The Revenue Administration (Amendment) Act, 2020 (Act 1029).

Policy framework

Ghana has instituted a number of policies and measures aimed at promoting the development of renewable energy technologies, particularly, incentives that will attract renewable energy investors.

- **Strategic National Energy Plan (SNEP) 2006-2020:** Developed by the Energy Commission, the goal of this policy was to provide a sound energy market and to ensure the provision of sufficient energy services for Ghana. In contrast, the target of the Strategic National Energy Plan was to boost the renewable energy market. The renewable energy objective of this policy aimed at increasing the share of renewables up to 10% by 2020 while ensuring energy efficiency and conservation and achieving universal access to electricity by the year 2020.

- **National energy policy (NEP), 2010:** This policy was geared towards the development of an energy economy to ensure secure and reliable energy supply to all Ghanaians. Intended as a provisional update to SNEP, this policy reaffirmed the nation's commitment to renewable energy development. The energy sub-sector was introduced under the National Energy Policy 2010 to increase the proportion of renewable energy in the total national energy mix and to focus on the fiscal incentives, awareness creation and regulations to promote energy efficiency and conservation practices. The policy also set the target to achieve 10% of renewables by the year 2020, reduce the consumption of wood fuels from 66 to 30% by 2020 and encourage the use of clean cooking alternatives such as LPG, and efficient cookstoves.
- **Energy sector strategy and development, 2010:** This policy sets the goal and strategies to increase (i) the percentage of renewable in the total national energy mix and efficient use of stoves and (ii) establish legislation to encourage the development of renewable energy technologies.
- **The sustainable energy for all action plan (SE4ALL), 2012:** This action plan had as its target, universal access to electricity to island and riverside communities through on and off grid systems and providing universal access to clean cooking solutions. The UNDP has collaborated with some partner agencies to achieve universal access to energy by 2030.
- **Bioenergy Policy:** This policy was drafted to promote and develop bioenergy technology in sustainable supply and encourage its usage for energy security without compromising food security in the country. It is also meant to encourage the use of biomass waste for heat and electricity generation.
- **Renewable Energy Master Plan, 2019:** The REMP seeks to accomplish the targets enumerated in the previous policies - with some additions - by the year 2030.

Issues with the policy framework

- There is no long-term strategic plan and thus, most of the renewable energy projects are on pilot basis or on short-term basis. This had led to a constant shifting of timelines. The failure to set clear action plans as well as create viable renewable energy projects may signal to potential investors that the renewable energy is not a key priority for the government.
- The drive of the government towards complete electrification creates a split focus on the part of the government. This is another reason why electricity generation from (non-hydro) renewable sources stands at less than 1% in 2021.

Institutional framework

- Ministry of Energy: Formulates policies and some aspects of their implementation, and monitoring and evaluation
- Ministry of Environment, Science, Technology and Innovation Regulatory Agencies
- Public Utilities Regulatory Commission (PURC): Sets electricity tariffs and protect consumers through monitoring the quality of services provided by the utilities.
- Energy Commission (EC): Provides license and sets technical performance standards for operators in the renewable energy sector, planning for the sector, and provides policy advice to Minister of Energy
- National Petroleum Authority (NPA): Ensures that correct fraction and price of biofuel in biofuel blend are in line with the agreed petroleum pricing formula.
- Ghana Standards Authority: Develops and monitors standards for renewable energy technologies and biofuel.
- Forestry Commission: Supports development and execution of programs for sustainable wood fuel production and usage.
- Environmental protection Agency: Protects and improves the environment and helps with the implementation of environmental policies

Other agencies

- Volta River Authority
- Bui Power Authority
- Independent Power Producers (IPPs)
- Ghana Grid Company (GRIDCo)

- Electricity Company of Ghana (ECG)
- Northern Electricity Distribution Company (NEDCo)
- Enclave Power Company
- Bulk Oil Storage and Transportation Company (BOST)
- Oil Marketing Companies (OMCs)

Current issues in the renewables industry

- Nine years after the adoption of the Renewable Energy Act, the Renewable Energy Authority, whose absence was identified as a key hindrance to effective regulation of the renewable energy sector, has not been established.
- The Renewable Energy fund which was set up to provide financial support for activities to promote, develop and utilize renewable energy is not operational due to low cashflow into the fund. The delay in operation of the Renewable Energy Fund has negatively affected some provisions in the Renewable Energy Act, 2011 (Act 832), such as the off-grid electrification for remote communities, and research and development. For the Renewable Energy Fund to be operational, all the other sources of funding stipulated in the Renewable Energy Act should be exploited or the Energy Fund levy on petroleum products should be increased so that part can be set aside for the Renewable Energy Fund.
- There is insufficient experience in renewable energy development on all levels including the power sector entities, regulators, domestic investors, financiers and other stakeholders.
- Another barrier has been the lack of public awareness about the usefulness and socio-economic benefits that are derivable from renewable energy and its technologies.
- Investment in renewable energy in Ghana faces considerable challenges including the macroeconomic situation, perceived risk by the financial sector, financing terms and conditions, such as high commercial interest rates, limited tenor loans, high inflation and currency depreciation. Even though financial mechanisms such as equity finance, venture capital, debt financing and crowd financing among others are available to entrepreneurs, some of them are not fully developed in Ghana.

Government incentive schemes

The Renewable Energy Masterplan 2019 contains some incentives that the government seeks to provide in support of renewable energy sector such tax breaks, capital subsidies, loan guarantees, etc. They include:

- Substantial tax reductions for manufacturing and assembling;
- Materials, components, equipment and machinery (that cannot be obtained locally) for manufacturing or assembling, shall be exempted from import duty and VAT, up to the year 2025;
- Materials, components, equipment and machinery that Ghana has competitive advantage over, shall attract the relevant import duty and other applicable taxes to promote the local industry;
- Import of plant and plant parts for electricity generation from renewable energy resources, shall be exempted from import duty and VAT;
- Allocation of a quota for local industries in all government projects to facilitate expansion of the existing market; and
- Government shall provide a vehicle through existing facilities such as the Venture Capital Trust Fund to provide soft loans to local industries.

Other incentives in the form of tax holidays, locational incentives and investment guarantees are scattered throughout the legislations affecting the renewable energy industry, tax statutes as well as other sector specific laws which contain provisions on renewable energy.

Major projects and companies

- In line with the Government's intention to take a more active role in exploration and production activities with the goal of ensuring maximum recovery of Ghana's oil and gas resources, GNPC Explorco, a subsidiary of GNPC has been set to acquire assets and

become an operator. On August 2021, a joint parliamentary committee approved the potential acquisition by GNPC Explorco of a significant stake in the Deepwater Tano Cape Three Points and South Deep Water Tano Blocks.

- The Amandi Power Project (200MW Twin City Energy Project) has been completed, achieved commercial operation and dispatching power to the grid.
- The renegotiation and restructuring of the six (6) Power Purchase Agreements (PPAs) in the energy sector is progressing steadily. The refinancing and restructuring of the Cenpower project are expected to be completed by end of year.
- The First Phase of the 912kWp Jubilee Solar PV project has also been completed.
- The Bui Power Authority 50MW Solar Power Plant and the VRA 13MW Kaleo Solar Project have been successfully commissioned and operationalized.
- A total of 2,657 units of solar lanterns have been distributed to rural and peri-urban communities at subsidized price as part of efforts to promote clean lighting sources.
- A Swiss company, NEK in collaboration with an Accra-based Atlantic International Holding Company are developing a 50 MW wind project.
- The Volta River Authority is currently, seeking to develop a 150 MW wind capacity project in the southern part of Ghana by 2020.
- The World Bank has financed a USD220 million Ghana Energy and Development Access Project (GEDAP), which is among the first Bank-financed program to focus on inclusive access to renewable energy through off-grid solar services and products.
- The government in 2020 inaugurated a 5 MW floating solar photovoltaic system on the reservoir of the Bui Hydroelectric Dam in Ghana. The 5 MW pilot PV array is the first section of a floating PV project with a total capacity of 250 MW, which will be implemented in blocks of 50 MW.
- The government also launched the construction of two photovoltaic solar power plants in the Upper West region of Ghana. This project is entirely financed via a loan from the Kreditanstalt für Wiederaufbau (KfW), the two plants will have a capacity of 17 MWp. The project will be split in two; the first being the Kaleo Solar Power Plant (13 MWp) and the Lawra Power Plant (4 MWp).
- The Agence Française de Développement, in collaboration with the World Bank and Volta River Authority funded various studies to ascertain the feasibility of the Pwalugu and Juale hydropower sites with 40 MW and 90 MW capacities respectively.
- The Hydropower Sustainability Assessment Project (HSAP) covering six hydropower sites, (Lanka, Ntereso, Koulbi, Daboya, Kalpaw, and Jambito), on the Black and White Volta Rivers with total capacity of 362 MW was funded by Swiss Government through SECO.
- Under the GEDAP project, the Ministry of Power in partnership with the African Development Bank conducted pre-feasibility assessment on 10 additional small and medium hydropower sites which is capable of generating 248 MW.

Foreign investment ownership

In an effort to create an enabling environment for foreign investment, Ghana has promulgated some essential laws on investment. The main legislation is the Ghana Investment Promotion Centre Act, 2013 (Act 865) ("GIPC Act"). Some key elements of the Act are as follows:

- The 2013 GIPC Act establishes the Ghana Investment Promotion Centre as an agency to register, monitor and keep records of all business enterprises in Ghana.
- Under the GIPC Act, foreign investments are subject to the following minimum capital requirements: USD200,000 for joint ventures with a Ghanaian partner, who should have at least 10% of the equity; USD500,000 for enterprises wholly owned by a non-Ghanaian; and USD1 million for trading companies (firms that buy or sell imported goods or services) wholly owned by non-Ghanaian entities. The minimum capital requirement may be met in cash or capital goods relevant to the investment. Trading companies are also required to employ at least 20 skilled Ghanaian nationals.
- Ghana's investment code excludes foreign investors from participating in eight economic sectors which are reserved for Ghanaians.

- The GIPC Act grants certain investment incentives such as free transferability of dividends and profits; personal remittances, immigration quotas and exemptions from certain duties and Taxes under the Internal Revenue Act and under the Customs Harmonized Commodity and Tariff Code.
- Special tax incentives may also be granted to foreign investors upon acquisition of Parliamentary approval.
- The GIPC Act also contains provisions dealing with the protection of investments, expropriation and dispute settlement.

The Free Zones Act is another major piece of legislation which also contains provisions on investment.

Sector-specific laws further regulate investments in minerals and mining, oil and gas, industries within free zones, banking, non-bank financial institutions, insurance, fishing, securities, telecommunications, energy, and real estate. Some sector-specific laws, such as in the oil and gas sector and the power sector, include local content requirements that could discourage international investment. Foreign investors are required to satisfy the provisions of the GIPC Act as well as the provisions of sector-specific laws.

Investment in the power sector

In December 2017, Ghana introduced regulations requiring local content and local participation in the power sector. The Energy Commission (Local Content and Local Participation) (Electricity Supply Industry) Regulations, 2017 (L.I. 2354) specify minimum initial levels of local participation/ownership and ten year targets.

The regulations also specify minimum and target levels of local content in engineering and procurement, construction, post-construction, services, management, operations, and staff. All persons engaged in or planning to engage in the supply of electricity are required to register with the Electricity Supply Local Content and Local Participation Committee and satisfy the minimum local content and participation requirements within five years. Failure to comply with the requirements could result in a fine or imprisonment.

Outward investment

Ghana has no specific outward investment policy. It has entered into bilateral treaties, however, with a number of countries to promote and protect foreign investment on a reciprocal basis. A few Ghanaian companies have established operations in other West African countries.

Ghana has concluded the Bilateral Investment Protection and Protection Agreements (IPPAs) with 27 countries in total. Ghana has signed and ratified tax treaties commonly referred to as double taxation agreements with a number of countries as well.

UNFCCC – Paris Commitments and beyond

- Ghana became a signatory to the Paris Agreement on 22nd April 2016 and ratified the agreement on 21st September 2016. Ghana's participation in the Paris Climate Agreement came on the back of the production of a document titled Intended Nationally Determined Contribution (INDC) as part of its obligations under the UNFCCC. Consistent with article 4.9 of the Paris Agreement on successive updates every five years, Ghana has revised its 2016 NDCs prior to the Climate Conference (COP26) that took place in 2021 at Glasgow.
- The update to the NDCs reiterates Ghana's commitment to implementing 31 mitigation and adaptation actions across seven economic sectors in its nationally determined contributions to the UNFCCC drafted in 2015. The update also covered 19 policy areas and translated into 47 adaptation and mitigation programs of action.
- The 47 climate actions are expected to build the resilience of over 38 million people, generate absolute greenhouse gas emission reductions of 64 MtCO₂e, create over one million jobs and avoid 2,900 deaths due to improved air quality by 2030.
- The revised NDCs contains policies including new technologies that lower carbon lock-in and reduce the cost of transition, recognizes the need to bring sub-national private actors on board and provisions for details on investment needs and approaches to drive finance. It also took into consideration the effects of the COVID-19 pandemic on all sectors.

In its 4th Communication to the UNFCCC, Ghana noted some of the key strides that had been made in climate protection since signing the Paris Agreement in 2016:

- Adoption of a 2018-2019 Medium-Term Development Framework Plan that highlights climate change as a priority

- Adoption of the Renewable Energy Master Plan in 2016
- Promulgation of the Petroleum Exploration and Development Act, 2016 (Act 919), to restrict the flaring of gas in petroleum exploration and development
- Establishment of the SDG Delivery and Green Fund in 2019 with the target of raising USD100 million and USD 200 million respectively
- The Forestry Commission had signed an agreement to deliver six million tons of greenhouse gas emissions reduction under the Ghana Cocoa Forest REDD+ Program with the World Bank in 2019.
- Investment of USD200 million in the Greater Accra Resilient Integrated Development Project to improve flood risk and solid waste management in the Odaw River led by the Ministry of Water Resources and Sanitation with funding from the World Bank
- Investment of more than USD100 million in the Northern drylands to build the resilience of smallholder farmers and the fragile ecosystem they depend on for livelihood since 2016
- Investment of nearly USD670 million in seven sea defense projects across Ghana's coastline over the last decade
- In light of COVID-19, the government of Ghana launched the process to develop a National Adaptation Plan (NAP) in an effort to build nationwide resilience to climate change impacts. Supported by the UN Environment Program (UNEP), Ghana's Environmental Protection Agency (EPA) will be executing the NAP project, which is funded by the Green Climate Fund for USD2.97 million.

In 2020, the governments of Ghana and Switzerland signed an agreement on climate protection. This agreement signed to strengthen the mode of cooperation between the two countries under Article 6 of the Paris Agreement on climate actions will facilitate Ghana's National Clean Energy Access Programme (NCEP), which will enable the country to receive international financial support to implement projects to fulfill its climate commitments.

Relevant resources and references

Relevant websites

- [Ministry of Energy](#)
- [Volta River Authority](#)
- [Energy Commission](#)
- [Ministry of Finance](#)
- [Ghana Investment Promotion Centre](#)
- [Renewable Energy Masterplan](#)
- [Ghana's Intended Nationally Determined Contribution \(INDC\)](#)
- [Ghana's Economic Profile and Indicators](#)
- [Energy Statistics of Ghana](#)

Other references

- [Climate Actions of Ghana](#)
- [Ghana's Commercial Guide](#)
- [Renewable Energy Deployment in Ghana: The Hype, Hope and Reality](#)
- [Status of renewable energy resources for electricity supply in Ghana](#)

Key contacts



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Hong Kong

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Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Common Law• Language: English, Traditional Chinese (written), Cantonese (spoken), Mandarin (spoken)
Population	7.5 million
Gross national income (GNI) per capita	HK\$ 380,205 / USD 48,630
Business environment	<ul style="list-style-type: none">• 2021 World Competitiveness Ranking (Swiss-based International Institute for Management Development): 7 of 138 (down 2 rankings)• 2021 Economic Freedom Report (Fraser Institute): 1 of 180 (no change since 1996)• 2021 Corruption Perceptions Index (Transparency International): 12 of 180 (down 1 from 2021)• 2020 UN Development Programme Human Development Index: 4 of 189
Profile	<ul style="list-style-type: none">• Hong Kong is a former British colony and became a special administrative region of the People's Republic of China (PRC) on 1 July 1997, when Hong Kong was handed over to the PRC and the Basic Law came into effect.• The Basic Law is the constitutional document of the Hong Kong Administrative Region (HKSAR) and guarantees that the principles and policies governing the region, such as "one country, two systems" and "Hong Kong people administering Hong Kong", will remain unchanged for 50 years. The Basic Law ensures that Hong Kong remains within the common law system and the judiciary is

independent from the executive and legislative branches of the government.

- Hong Kong is located to the southeast of the PRC and lies in the vicinity of Peral River Delta and in conjunction with Shenzhen Special Economic District, forming a gateway between the PRC and other parts of the world.
- The Hong Kong government is led by the Chief Executive. The Chief Execution appoints people among senior officials of the executive authorised, members of the Legislative Council and public figures to the Executive Council, which assists the Chief Executive in policy-making. The Legislative Council is the law-making body of the HKSAR.
- Hong Kong has an economy characterised by free trade, low taxation and minimum governmental intervention.

Electricity industry overview

Electricity industry overview

- Electricity in Hong Kong is provided by two privately owned companies, CLP Power Hong Kong Limited (CLP) and The Hongkong Electric Company Limited (HKE).
- CLP supplies electricity to Kowloon and the New Territories. Electricity is generated by three power stations: Castle Peak (4108 MW), Black Point (3175 MW) and Penny's Bay (300 MW), with a total installed capacity of 7583 MW. CLP has also contracted to purchase about 70% (on a temporary basis until 2023) of the power generated from the two 984 MW pressurised water reactors in the Guangdong Daya Bay Nuclear Power station. It also has the right to use 50% of the 1200 MW capacity of Phase 1 of the Guangzhou Pumped Storage Power Station at Conghua.
- HKE supplies electricity to Hong Kong Island, Ap Lei Chau and Lamma Island. Electricity is generated by the Lamma Power Station, which has a total installed capacity of 3637 MW at the end of 2020.
- Between 2009 to 2020, electricity generation in Hong Kong has remained around the level of 35 to 40 TWh per year. The volume of electricity imported since 2008 has increased, while the volume of coal imported has decreased. This is due to the fact that Hong Kong is cutting down reliance on fossil fuels.

Electricity laws

- The regulation of the electricity market is exercised through the Scheme of Control Agreements entered into between the Government of Hong Kong and CLP and HKE, respectively. The Scheme of Control Agreements sets out, among other things, the rights and obligations of the power companies, the electricity-related financial affairs of the power companies as well as their reliability and environmental performance in providing electricity. The current Scheme of Control Agreements will expire on 31 December 2033.
- The Electricity Ordinance (Cap. 406) regulates the safe supply of electricity and the safety of household electrical products. Among other things, it covers the registration of generating facilities, contractors and workers for electrical installations, wiring installation standards and safe distribution and use of electricity.
- The Electrical Products (Safety) Regulation was enacted in 1997 and its main provisions, including specified safety requirements for household electrical products, came into effect in May 1998. The remaining provisions concerning certificates of safety compliance requirements commenced operation in December 2000.
- The Electricity Supply Lines (Protection) Regulation was enacted in April 2000 to deter damage to underground electricity cables and overhead electricity lines. It commenced operation on 1 April 2001.

Renewable energy overview

Renewable energy overview

- Based on commercially available technologies, it is estimated that Hong Kong has a renewable energy potential of about 3-4% of total electricity consumption arising from wind, solar and waste-to-energy that can be exploited between now and 2030. In 2018, the amount of electricity generated from renewable energy accounted for less than 1% of power consumption in Hong Kong.

Solar

- Currently, the largest solar energy generation system in Hong Kong has been installed at the Hong Kong Disneyland Resort, which has a capacity of 2,100 KW and is comprised over 5000 monocrystalline solar panels on the rooftops of 20 buildings.
- The current cumulative photovoltaic (PV) installation capacity in Hong Kong is less than 5 MW. There are over 200 relatively small projects in Hong Kong, where PV panels and solar water heaters have been installed mainly at schools and on the rooftops of public sector buildings and facilities as a result of the Hong Kong Government taking the lead to encourage the use of solar energy to generate electricity.

Wind

- Since 2000, the Hong Kong Observatory began to use wind power as an energy source in some remote automatic weather stations which have been relying on solar power. As sunshine in cloudy days may not be sufficient to keep the operation of those weather stations, wind turbine generators have been employed to provide an alternative energy source.
- The first commercial-scale wind power station was completed in February 2006 on Lamma Island, operated by HKE. The rotor diameter is 50 meters with a rated output power of 800 KW.
- Studies show that Hong Kong has two potential sites for developing wind power on a commercial scale, one at South West Lamma with the potential to develop a 100 MW capacity wind farm producing 175 GWh of electricity annually and another at South East Ninepin with potential to develop a 200 MW wind farm.

Solar & wind

- The first wind/solar hybrid system in Hong Kong was installed at the Shek Kwu Chau Drug Rehabilitation Centre. The first commercial-scale combined PV and wind turbine renewable energy power station at 200 kW capacity on Town Island was completed in 2011.

Waste-to-energy

Landfill

- There are three strategic landfills in Hong Kong, namely West New Territories Landfill, South East New Territories Landfill and North East New Territories, which have been utilizing landfill gas for energy production. The current uses include generating electricity for use in on-site infrastructures.
- The surplus landfill gas generated from North East New Territories Landfill is treated and delivered to Hong Kong & China Gas' (HKCG) production plant in Tai Po for use as alternative energy source.
- The surplus landfill gas generated from South East New Territories Landfill is treated (in the form of synthetic natural gas) and conveyed to HKCG's Offtake Station at Tseng Lan Shue, where the treated gas is blended with town gas for injection to the supply grid for HKCG's customers.
- Apart from the strategic landfills mentioned above, there are 13 closed landfills. The landfill gas generated from some of the larger closed landfills, namely Shuen Wan, Gin Drinkers Bay, Jordan Valley, Tseung Kwan O Stage I, II and III and Pillar Point Valley landfills, has been used as an energy source.
- For Shuen Wan Landfill, a special arrangement has been made with HKCG for piping the landfill gas to their plant for utilization. Landfill gas is also used as fuel in electricity generation to meet on-site uses in Jordan Valley and Tseung Kwan O Stage I landfills. For Gin Drinkers Bay, Tseung Kwan O Stage II/III and Pillar Point Valley, the landfill gas is used as a thermal energy source in the treatment of landfill leachate.

Biogas

- Hong Kong has been utilizing biogas from digesters in the sewage treatment works in Sha Tin, Tai Po, Fan Ling, Yuen Long for a number of purposes – in boilers for producing hot water for the digesters, in engine-driven blowers to provide compressed air for the sewage treatment process, and in engine-driven electric generators to provide electricity for the sewage treatment works.
- An example is the 330 KW engine-driven combined heat and power generator at Shek Wu Hui Sewage Treatment Works, which was commissioned in 2006 and subsequently connected to CLP's distribution network in 2008. The electricity generated is supplied to existing E&M facilities while the recovered thermal energy is used for pre-heating the recirculation water for maintaining the required temperature for the sludge digestion process in the sewage treatment works.

Current issues in the renewables industry

- Hong Kong has neither indigenous fuel sources nor the physical conditions favorable for large-scale development of renewable energy as it only has a land area of 1,106 square kilometers, much of which is hilly terrain.
- Although the technologies for renewable energy has advanced, there is concern about the cost of renewable energy being generally higher than that of conventional energy. For instance, studies show that it may take over HK\$10 billion to build the two potential wind farms mentioned above but the electricity generated could only provide for less than 1.5% of Hong Kong's total electricity consumption.
- It will depend on whether technology for renewable energy storage may allow large quantities of renewable energy to be stored in order for renewable energy to become a reliable source of energy production in Hong Kong.

Government incentive schemes

- In 2018 CLP introduced its Feed-in Tariff (FiT) Scheme in respect of electricity produced by solar or wind power systems with a generating capacity of up to 1 MW under the current Scheme of Control Agreements. Under the FiT Scheme, CLP will purchase the electricity produced by an approved renewable energy system once successfully connected to CLP's power grid. A smart meter will be installed to record the amount of electricity generated by the renewable energy system.
- A summary of the key terms of the CLP FiT Scheme is set out below.

Term	Summary Description
Parties	CLP and the account holder
Eligibility criteria, Application Process and Participation in the FiT Scheme.	<p>Among other criteria, that the account holder is a holder of a CLP electricity supply account, the renewable energy system has an aggregate generation capacity of up to 1 MW, ("Eligibility Criteria").</p> <p>A FiT application must be submitted, following which there is a technical assessment, systems test and meter installation. Grid connection and confirmation of the participation in the FiT Scheme is done by the issuance of a Completion Letter, setting out details of the renewable energy systems and the applicable FiT Rate.</p>
FiT Scheme Participation Agreement	Comprising the Application, Completion Letter and the general terms and conditions (the "FiT Agreement").
Term	From the Commencement Date (as set out in the Completion Letter) until 31 December 2033.
Sale and Purchase of Electricity	CLP agrees to purchase all electricity generated from the

	renewable energy system.
FIT Rate and payments	<p>As set out in the Completion Letter. The FIT Rate is fixed for the duration of the FIT Agreement (subject to an increase in the capacity of the system, which is scaled down based on an increased capacity of the system). Any reduction of general capacity will not affect the FIT Rate.</p> <p>FIT payments are reflected as credits in the electricity bill to offset charges. The account holder is still required to purchase electricity at the prevailing tariff rates for the gross demand and energy consumption at the relevant premises. This is measured by the FIT Meter.</p>
Risk Allocation	<p>CLP does not bear any liability in respect of third parties, any indirect or consequential loss or special loss, any loss of profit due to any act or omission.</p> <p>CLP has a liability cap of HK\$2 million in respect of any loss or damage caused by it.</p> <p>There is no force majeure coverage or "take-or-pay" arrangement. Only electricity actually provided and measured by the meter is purchased and recognized for payment.</p>
Termination, Suspension and Recovery	<p>The account holder may terminate the FIT Agreement by giving CLP 90 days' prior written notice.</p> <p>CLP may terminate the FIT Agreement, suspend the purchase of electricity and recover FIT payments if the account holder has breached a material term of the FIT Agreement, ceases to fulfil the Eligibility Criteria, after 12 months of disconnection of the system, bankruptcy / insolvency of the account holder.</p>
Others	<p>No assignment of the FIT Agreement is permitted.</p> <p>CLP may set off amounts owing by the applicant.</p> <p>CLP may unilaterally amend any provision of the FIT Agreement, provided that the amendment does not contravene applicable laws. CLP reserves the right to revise the terms and conditions of the FIT Agreement. However, CLP may not unilaterally amend the FIT Rate, as a result of its contractual obligations in the Scheme of Control Arrangement, which expires on 31 December 2033.</p>
Governing law and enforcement	Hong Kong law with submission to the exclusive jurisdiction of the courts of Hong Kong.

- As part of the Scheme of Control arrangements, from 1 January 2019, HKE agrees to purchase electricity generated from relevant renewable energy power system for the duration of the FiT Agreement at the applicable FiT rate stipulated in the FiT Agreement for generating capacity below 10 KW (for generating capacity above 10 KW, the FiT rate will need to be determined by a case by case basis with approval from the HKSAR Government). Under the FiT Scheme, HKE will purchase the electricity produced by an approved renewable energy system once successfully connected to HKE's power grid. A smart meter will be installed to record the amount of electricity generated by the renewable energy system.
- A summary of the key terms of the HKE FiT Scheme is set out below.

Term	Summary Description
Parties	HKE and the "applicant" or "customer"
Eligibility criteria, Application Process and Participation in the FiT Scheme.	<p>Among other criteria: that the applicant is a registered customer of HKE's electricity account, the system is not undertaking or owned by the HKSAR Government, the system is only a solar photovoltaic (PV) system and/or wind power system, and that the system is not connected to any non-renewable energy source or energy storage system.</p> <p>A FiT Scheme Application Form must be submitted together with certain ancillary documents, such as technical drawings, followed by an assessment of the application by HKE. After an initial assessment, HKE will issue a letter for its in-principle approval through a Consent Letter which will detail the application and give a Provision FiT Rate, following which the installation of the system can commence. Upon connection of the system to the grid, HKE will issue a Completion Letter with the FiT Agreement Start Date and the applicable FiT Rate.</p>
FiT Scheme Participation Agreement	Comprising the Completion Letter, terms and conditions of the FiT scheme, the Application and Consent Letter (the "FiT Agreement").
Term	From the FiT Agreement Start Date (as set out in the Completion Letter) until the project life of the system or until 31 December 2033, whichever is earlier.
Sale and Purchase of Electricity	HKE agrees to purchase, and the applicant agrees to sell, transfer and surrender, all the electricity generated from the system and the associated rights and benefits, including the rights to claim all greenhouse gases and other pollutant emissions reduction benefits for the duration of the FiT Agreement.
FiT Rate and payments	<p>At the applicable FiT rate stipulated in the FiT Agreement.</p> <p>FiT payments are made as a credit to the electricity account to offset the electricity charges, unless there is a credit balance, and the applicant can choose to retain and carry forward the</p>

	credit on future electricity bills or paid by cheque/bank transfer to an account that is under the applicant's name.
Risk Allocation	<p>HKE is not liable for any loss or damage to the system or its connection to the grid, any loss or damages to any third party, any indirect or consequential or economic loss.</p> <p>HKE has a liability cap of HK\$2 million in respect of any loss or damage caused by it.</p> <p>There is no force majeure coverage or "take-or-pay" arrangement. Only electricity actually provided and measured by the meter is purchased and recognized for payment.</p> <p>The applicant indemnities HKE for any loss, cost or damage as a result of the occurrence of any event which arise substantially from the same cause up to HK\$2 million (but excluding liability for claims arising from death or personal injury).</p>
Termination, Suspension and Recovery	<p>The applicant may terminate, without giving reasons, the FiT Agreement by giving HKE 60 days' prior written notice.</p> <p>HKE may terminate the FiT Agreement, electricity account, suspend the purchase of electricity if (amongst others): the applicant breaches a material term of the FiT Agreement, the system is disconnected from the grid by HKE, the applicants proceeds with a substantial alteration of the system for which a new application is necessary, the applicant becomes bankrupt or insolvent, the electricity account is terminated.</p>
Others	<p>No assignment of the FiT Agreement is permitted unless to a succeeding Customer.</p> <p>HKE may set off amounts owing by the applicant.</p>
Governing law and enforcement	Hong Kong law with submission to the exclusive jurisdiction of the courts of Hong Kong.

Major projects and companies

See [introduction of FiT Scheme in Hong Kong](#).

Foreign investment ownership

There are generally no restrictions on foreign investment in Hong Kong. It does not distinguish in law or practice between investments by foreign-controlled companies and those controlled by local interests. Foreign firms and individuals can incorporate their operations in Hong Kong, register branches of foreign operations, and set up representative offices. There is no restriction on the ownership of

such operations. Company directors are not required to be citizens of, or resident in, Hong Kong. Reporting requirements are straightforward and not onerous.

UNFCCC – Paris Commitments and beyond

- The Paris Agreement applies to Hong Kong.
- In January 2017, Hong Kong released the Climate Action Plan 2030+ which outlines its targets, including reducing its carbon intensity by 65% to 70% by 2030 using 2005 as a base.
- Hong Kong will review its climate change efforts every 5 years since 2019 and align them with the submission timelines under the Paris Agreement.
- The carbon reduction plan includes phasing down coal for electricity generation and replacing it with natural gas by 2030.

Relevant resources and references

Gross national income per capita

- [Census and Statistics Department](#)
- [World Bank - Hong Kong](#)

Business environment

- [IMD World Competitiveness Ranking](#)
- [Fraser Institute: Economic Freedom of the World 2021](#)
- [Transparency International: Corruption Perceptions Index](#)
- [UNDP Human Development Report 2020](#)

Electricity industry in Hong Kong

- [Hong Kong: Power and Gas Supplies \(PDF\)](#)
- [Electricity consumption in Hong Kong from 2009 to 2020, by use](#)

Electricity laws

- [The Government of HKSAR](#)

Renewable energy overview

- [Renewable Energy in Hong Kong](#)
- [List of Photovoltaic \(PV\) Projects](#)
- [Example Projects](#)
- [Landfill Gas Utilization](#)
- [From Sewage to Energy](#)

Current issues in the renewables industry

- [Hong Kong's Climate Action Plan 2023+ \(PDF\)](#)
- [Foreign investment ownership](#)
- [Paris Commitments \(PDF\)](#)

Key contacts



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Hungary

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Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: Hungarian
Population	9.75 million
Gross national income (GNI) per capita	USD 15,890
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 47 of 140 (48 in 2018)• 2021 Index of Economic Freedom: 55 of 178 (62 in 2020)• 2020 Corruption Perceptions Index: 69 of 179 (70 in 2019)• 2020 UN Development Programme Human Development Index: 40 of 189 (41 in 2019)
Profile	<p>Hungary is a landlocked country in Central Europe with an area of 93,030 square kilometres.</p> <p>Following World War II, Hungary became a satellite state of the Soviet Union, leading to the establishment of the Hungarian People's Republic. On 23 October 1989, Hungary became a democratic parliamentary republic. Hungary joined the European Union in 2004 and has been part of the Schengen Area since 2007.</p> <p>The leading industries are machinery (mainly automotive) and chemical industry. The Hungarian GDP growth was 7.1% in 2021. Tourism also plays a very important role in the country as Hungary welcomed 12.5 million international tourists in 2018. The pandemic had a negative influence on the tourism, but in 2021 the number of tourists and revenue from tourism rose again and are expected to surpass the numbers before the pandemic.</p>

Today Hungary is a representative democratic parliamentary republic with parliamentary elections held every 4 years. The main organ of state authority is the National Assembly (in Hungarian: *Országgyűlés*), which elects the head of government, the prime minister, who exercises the executive power.

Electricity industry overview

In 2020, Hungary generated 34.9 TWh of electricity and used 46.6 TWh, which means Hungary heavily relies on import. 17% of electricity is generated from renewable sources. The biggest electricity generator is the Paks Nuclear Power Plant, the only nuclear plant in the country, with 46% share in electricity generation. The volume of power generation was 3.21% higher and the consumption was 0.32 % higher in 2020 than in 2019.

The electricity generation comprises of the following primer sources (2020 figures):

- 46% – nuclear power
- 26% – gas
- 11% – coal
- 17% – renewable, of which:
 - 7% solar
 - 4% biomass
 - 2% wind
 - 1% hydropower
 - 1% waste
 - 1% biogas
 - 1% other

The Hungarian electricity sector was rather different in the 1990's than it is today. The power plants were privatized in 1995 and the generated electricity was bought by the state owned MVM – being the wholesale buyer – based on long term electricity purchase agreements. As Hungary was preparing to join the European Union, this system had to be changed.

In the 2000s, the liberalization of the Hungarian electricity market began based on Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity. The liberalization was performed with unbundling, which means that activities, which can be performed in competitive circumstances (generation and retail) shall be performed this way, while other activities (transmission and distribution) were still left at natural monopolies.

The TSO of the Hungarian electricity network is MAVIR Zrt. MAVIR is operating in accordance with the ITO (Independent Transmission Operator) model, thereby MAVIR is the owner and operator of the transmission network within MVM Group, a vertically integrated electricity corporation. The TSO has the following responsibilities:

- provide for the reliable, efficient and secure operation of the Hungarian electricity;
- controls and augments the assets of the transmission system, performs all renewal, maintenance and development required for a proper and reliable supply;
- ensures an undisturbed operation and further extension of the electricity market and of the balancing group system supporting the market, and ensures access for system users on equal terms;
- synchronizes the operation of the Hungarian electricity system with the neighbouring systems;

- coordinates professional international cooperation activities;
- prepares the network development strategy and puts forward proposals for the development of the generation pool.

In Hungary, there are 6 electricity Distribution System Operators, which work regionally in the country.

In 2020, there were 12 power plants in operation with the capacity of 50MW or above, furthermore between 0,5 MW and 50 MW capacity, there were additional 343 power plant units.

Electricity laws

- EU Regulations, Directives
- Act LXXXVI of 2007 on electric energy
- Government Decree No. 273/2007 (X. 19.) on the implementation of certain provisions of Act LXXXVI of 2007 on Electricity (Vhr.)
- Government Decree No. 299/2017 (X. 17.) on the mandatory take-over and premium subsidy for electricity produced from renewable energy sources
- Government Decree No. 389/2007. (XII. 23.) on the mandatory take-over and purchase price of electricity produced from renewable energy sources or from waste and electricity produced from cogeneration
- Decisions of the Hungarian Energy and Public Utility Regulatory Authority (HEA)
- Several other governmental, ministerial and HEA decrees
- Act LIV of 2013 on the implementation of utility cost reduction

Renewable energy overview

Renewables industry overview

In Hungary, the use of renewable energy sources is getting more and more widespread. The most up to date official data provided by MEKH is for the month of August 2021. Of the 2,905 GWh of electricity generated in this period, 43.6% was nuclear, 22% was provided from natural gas, 10.8% by coal and coal products, 22.4% by renewables and 1.1% by other sources. Of the electricity generated from renewable energy sources, 68.8% was provided by solar, 18.1% by biomass, 5% by wind, 3.4% by biogas, 2.8% by hydro and 2% by the renewable fraction of municipal waste. Compared to the same period last year, solar and wind increased, while the amount of energy from water, biomass, biogas and the renewable fraction of municipal waste decreased.

In January 2020, the Hungarian government adopted the new National Energy Strategy, which sets out Hungary's energy and climate policy priorities until 2030 (with an outlook to 2040). The new National Energy Strategy focuses on clean, smart and affordable energy services.

Hydropower

Due to the unfavourable geographical conditions, there are only a few hydroelectric power plants in Hungary. The two largest ones are located on the Tisza river, the Tiszalök power plant has an installed capacity of 12.5 MW and the Kisköre power plant has an installed capacity of 28 MW. There are also other hydroelectric power plants with smaller capacities in the country, mainly on the Rába river (e.g. Ikervár hydropower plant).

Wind

Most of the wind farms are located in North-west Hungary, where the natural conditions are most favourable for optimal power generation. The legal environment does not support the implementation of new wind farms, therefore the capacities are stuck on the same level in the last years. The Government supports the establishing of solar power plants instead of wind farms.

Solar

The use of solar energy is growing dynamically in Hungary, but it still lags behind Western Europe. Between 2015 and 2021, the capacity increased by an average of 64% annually. In 2021, solar power plants in the country had a total capacity of over 2850 MW. The largest solar power plants in the country are located in Kaposvár (100 MW), Kaba (43 MW) and Kapuvár (25 MW).

Geothermal

The geothermal situation in Hungary is extremely favourable, as it is geographically situated in an area where high temperature parts are relatively dense and close to the surface. Geothermal energy is mainly used for heating residential buildings, industrial plants and greenhouses. The country's first geothermal power plant to generate electricity was built in Tura. The 3 MW capacity power plant started operations in 2017.

Biomass

A big part of Hungary's renewable energy comes from biomass. The use of agricultural by-products and plants grown specifically for this purpose is widespread. Biomass is used in whole or in part to power a number of Hungarian fossil power plants (Dorog thermal power plant, Pécs thermal power plant). Firewood used for heating homes is also considered biomass. At the Kaposvár sugar factory, biogas produced as a by-product of production is purified and, in addition to meeting the factory's own energy needs, it also provides the city with a cheap source of energy.

Current issues in the renewables industry

Because of the requirements implemented by the Clean Energy Package and the appearance of prosumers and weather-dependent renewable energy sources on the market, significant investments and developments are necessary in order to prepare the distribution system for the upcoming challenges. The Hungarian energy sector is currently under transformation and beside the TSO, the DSOs will have an increasing role in the power system.

The electricity storage capacities are low, which is quite a significant deficiency, as the balancing of the electricity network by the TSO cannot depend on these capacities.

The so-called Robin Hood tax is also a big market entry issue. The scope of this tax includes – among others – DSOs, universal service providers, electricity trading licensees, electricity generators (except the KÁT and METÁR generators; described below). The Robin Hood tax is an income tax. The base of the tax is the domestic EBIT of the entities listed in the scope and the tax rate is 31%. The tax base may be decreased by certain items defined by law.

The Hungarian Government has recently introduced a so-called "extra profit tax" via Govt. Decree no. 197/2022. (VI. 4.) on extra profit taxes ("Extra Profit Tax Regulation"). This tax (as every other tax which is regulated in the Extra Profit Tax Regulation) is intended to maintain the balance of the state budget.

The tax is paid by renewable energy producers, who are entitled for KÁT or METÁR incentive schemes (detailed below), but they did not enter the relevant scheme or exited them before the expiry of their entitlement. A renewable energy producer that leaves (or does not enter) the KÁT or METÁR scheme must pay a kind of differential tax. The tax base for this can be calculated by deducting the hypothetical revenue that the producer would have generated by selling the electricity under the KÁT or METÁR scheme from the revenue generated on the market. The specific tax rate is 65%.

This kind of tax means that the power plant either applies for an incentive scheme and enters it for the whole time period or does not enter/leaves it but in this case the power plant shall pay this extra profit tax. Power plants which do not apply for an incentive scheme are not affected by this tax, but they are exposed to market volatility as they are not entitled to any subsidies.

The construction of wind farms in Hungary is nearly impossible at the moment as the law requires a 12 km wide protective distance from building zones (in Hungarian: *építési övezet*), which practically means that there is no place for wind farms to be implemented. This rule does not apply to residential wind turbines below 0,5 MW built-in capacity. According to the lawmaker the Hungarian wind conditions are not favourable enough to make wind farms profitable and wind farms do not fit into the landscape. An additional problem is that the blades of the wind turbines are hard to place after decommissioning.

The Act LIV of 2013 on the implementation of utility cost reduction regulates the residential prices of utility costs (gas, electricity, water and heat), which maximizes the household prices, therefore service providers can expect lower returns. As a result of that, limited number of service providers are on the residential market and in the near future there are no expected changes in this respect.

Currently, the most significant risk for a new power plant development project is the obtainment of grid connection capacities. The Hungarian TSO, MAVIR Zrt. and the DSOs publish the available grid connection capacities (in total for all kinds of power plants) every six months. In their last publication (May 2022), they stated zero MVA available grid connection capacity for power plants. Simultaneously, there is also zero MVA grid connection capacity available for weather-dependent power plants, which amount is also stated by the TSO every six months.

This means that currently no new power plants are able to connect to the public grid, except if the investors undertake to bear the costs of the necessary public network development or the implementation of non-weather-dependent supplementary capacity besides the power plant.

Government incentive schemes

The main government incentive scheme related to renewable energy is METÁR, which aims to encourage new investments in electricity generation from renewable energy sources and increase the share of electricity generated from renewable energy sources for sustainable development. In general, METÁR subsidies can be granted for renewable electricity production linked to a new investment, where the investment has not yet started at the time of the application.

A tender is announced if the competent minister requests the Hungarian Energy and Public Utility Regulatory Authority to announce it. In its request the minister defines the most important characteristics of the tender, such as the maximum amount of subsidized capacity, maximum amount of subsidies, the interval of the subsidies, etc. In conclusion, the number of auctions, as well as the target capacity depends on the discretionary power of the minister.

The tender shall be announced in a technology neutral form, but there are usually categories based on the nominal output of the power plants, independently from the technology. The subsidies are paid based on a subsidy contract, concluded with the Hungarian TSO.

In the tender, the offeror has to describe its production volume for which it applies for subsidies. If the bid wins, this amount of production will be subsidized. The METÁR scheme is a premium scheme which means that the company, who generates the electricity, sells the electricity on the market, and the TSO pays the difference between the market price and the subsidized price for the electricity generator.

Up to now the METÁR scheme was rather popular among investors, the capacities are always fully allocated. Usually there are one or two tenders every year.

Until 2017, there was another incentive scheme called KÁT, which means mandatory take-over system, where the Hungarian TSO purchased the generated electricity from the generator companies. This scheme is no longer available for new investments, but the companies, who applied and were awarded KÁT capacities, are entitled to sell the generated electricity to the TSO until their KÁT contract expires.

After the recent legislation changes, the generators who entered the KÁT system may not exit, they may only choose to enter the METÁR system instead (i.e. they are not allowed to sell their produced electricity on the wholesale market for market prices).

Similar changes were applied regarding the METÁR scheme. The power plants participating in the METÁR scheme shall conclude a contract with MAVIR Zrt. in accordance with its business rules and the commercial code. This contract – except for biomass or biogas power plants – may not be terminated by the power plant before the expiry of the subsidy period or before the total subsidized quantity of electricity has been accounted for.

These legislative changes mean that if a power plant, which has a KÁT or METÁR eligibility and already entered the respective system cannot exit these schemes, therefore they cannot sell their electricity on the wholesale market or via a PPA. The only option to sell the generated electricity on the wholesale market or via a PPA is not entering the KÁT or METÁR schemes, but in this case a special tax applies to the power plant as described in the paragraphs above.

The Hungarian Government subsidises residential rooftop solar panel installations. In the last tender, the intensity of subsidies was 100%, which means residentials were able to obtain solar panels for their homes at no cost. These kinds of measures help Hungarian households become sustainable and carbon neutral.

Major projects and companies

In the Hungarian Energy Strategy 2030, the Government defines the priorities that will drive and guide the national energy and climate strategy and future actions in the energy industry. These priorities are:

- climate-friendly and flexible power generation;
- improving the energy efficiency of the economy;
- green transport;
- energy-conscious and modern Hungarian homes.;
- energy innovation projects;
- energy and climate-smart society programme.

The Paks II project, which is practically the capacity expansion of the operating Paks nuclear power plant is the largest project in Hungary as of 2022. More than 40% of the electricity production comes from the existing Paks nuclear power plant, however its life expectancy will expire between 2032-37, therefore the new power plant is needed for the continuous supply of electricity. The new Paks II power plant, which consists of two units will have a nominal capacity of 2400 MW and is expected to start its operation in 2027-28. The Government expects Hungary to be independent in electricity supplies after the successful commission of the new NPP units.

MVM, the state-owned electricity company has a solar power capacity of approx. 200 MW, with further renewable power plants under construction. Their PV acquisitions and constructions are continuous, expanding their capacity from year to year.

MVM also owns the two largest hydroelectric power plants with a nominal capacity of 40.5 MW, the plants are located at Tiszaölök and Kisköre. This makes MVM the biggest electricity generator, considering the hydroelectric sector.

There are also many small companies, who operate smaller capacities of renewable energy. The renewable energy capacities are taking higher and higher parts of the energy generation every year.

The Hungarian Solar Panel Solar Collector Association (in Hungarian: *Magyar Napelem Napkollektor Szövetség*) is an institution for the popularisation of solar energy, with the effort of informing the public about technological developments, support schemes and services; lobbying for the promotion of renewable energy; participating in the design of grant and tender schemes, supporting legislation.

Foreign investment ownership

The Hungarian FDI regime has two legs:

- the 2018 FDI Regime introduced by Act LVII of 2018 and the related government decrees. The 2018 FDI Regime covers a national security-type screening in “classic” very strategic sectors (including defense, certain services under the respective Hungarian acts on electricity, natural gas, as well as the manufacturing of double-use products (in Hungarian: *kettsfelhasználású termék*), etc.). The Minister of Interior is in charge of the notification procedures;
- the regime introduced in 2020 in relation to the state of emergency (by Act LVIII of 2020 (“2020 FDI Act”) and related government decrees “2020 FDI Regime”). The 2020 FDI Regime covers a much wider array of sectors and activities, including retail trade, wholesale, manufacture of light metal packaging, aluminium production, manufacture of other chemical products n.e.c., manufacture of plastics in primary forms, manufacture of paints, varnishes and similar coatings, printing ink and mastics. The Minister of Innovation and Technology is in charge of the notification procedures.

UNFCCC – Paris Commitments and beyond

Hungary signed the Paris Agreement on 22 April 2016 and ratified the agreement on 5 October 2016. As other member states of the European Union, Hungary committed to carbon neutrality by 2050. The latest commitment is for the EU to reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990.

In June 2020, Hungary accepted a law to achieve total carbon neutrality by 2050, meaning that there will be no more emission of greenhouse gases than the environment absorbs. According to the legislation, the year 2030 is a milestone, which requires that by this time the country's total emissions should not exceed 40% of the emission in 1990.

Relevant resources and references

Relevant websites

- [Ministry of Innovation and Technology](#)
- [Hungarian Energy and Public Utility Regulatory Authority](#)
- [Hungarian Solar Panel Solar Collector Association](#)
- [Paks II](#)
- [Hungary's National Energy and Climate Plan](#)
- [Hungarian Climate Change Action Plan](#)
- [METÁR Scheme](#)

Resources

- [Data of the Hungarian Electricity System, 2020](#)
- [National Energy Strategy 2030](#)
- [Energy generation page of MVM Zrt.](#)

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Italy

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: Italian
Population	59.55 million
Gross national income (GNI) per capita	GNI per capita: USD 31,676.20 (EUR 27,952.19)
Business environment	<ul style="list-style-type: none">• 2020 Global Competitiveness Index: 44 of 63 (no change)• 2021 Index of Economic Freedom: 68 of 178 (1.1 point increase)• 2020 Corruption Perceptions Index: 53 of 180 (no change)• 2020 UN Development Programme Human Development Index: 29 of 189 (no change)
Profile	<p>Italy is a peninsular country located in central-southern Europe, with a population of approximately 59.55 million, making it the third-most populous state in the EU.</p> <p>Italy is a parliamentary republic. The Italian Parliament is split into two chambers and is elected every five years. It is empowered to appoint the President of the Republic and to grant or revoke confidence in the government.</p> <p>Italy has a major advanced capitalist mixed economy, ranking as the third-largest in the eurozone and the eighth largest in the world. The most developed economic sector in Italy is the advanced tertiary sector, especially for tourism, trade, personal and business services.</p>

Italy is also a country with a strong foreign trade orientation, characterized as one of the most competitive countries in world trade.

Italian industry is dominated by small and medium-sized enterprises (SMEs), primarily manufacturing.

Electricity industry overview

Electricity industry overview

- Electricity production in Italy is based on the use of non-renewable energy sources (fossil fuels such as natural gas, coal and oil, mostly imported from abroad) and increasingly on renewable sources (such as geothermal energy, hydroelectricity, wind energy, biomass and solar energy). The remaining electricity requirements are met by purchasing electricity from abroad, transporting it into the country via power lines and distributing it through the transmission and distribution networks.
- Electricity generation in Italy is comprised of (2021 figures):
 - 46% from gas
 - 20% from hydroelectric
 - 9% from wind
 - 9% from photovoltaic
 - 5% from coal
 - 3% from biomass
 - 2% from geothermal
 - 7% from other
- In 2021, electricity demand in Italy was 30.3 billion kWh, 38% of which was covered by renewables.
- In accordance with the data published by Terna S.p.a., in 2022 the electricity demand (214.970 GWh) is increasing compared to the same period in 2021 (+2%) and compared to 2020 (+8.9%). In August 2022, the electricity demand was met for 54.8% of the production from non-renewable energy sources, and for 34.5% from renewable energy sources (and the remainder from foreign).
- The main issues in the Italian electricity sector relate to high costs, mainly due to the extensive use of gas, which is one of the most expensive sources, and strong dependence on foreign countries.

Electricity laws

- Law No. 481/1995 established the Electricity Authority for the first time at the beginning of the liberalization of the electricity market. The Authority was defined as an independent body with powers to regulate and control the market. The government assigned the Authority functions of protecting the interests of consumers, promoting both competition in the energy market and the efficiency and diffusion of quality services. Subsequently, the government assigned wider tasks and objectives to the Authority, including gas and the water network within its sphere of control and, recently, also the waste cycle.
- Law No. 239/2004 introduced the reorganization of the energy sector and delegated to the government the reorganization of the provisions in force concerning energy.
- Legislative Decree 206/2005 (Consumer Code) also includes contracts concerning the supply of electricity and gas, stipulated online and off-premises. The competent authority responsible for monitoring compliance with the rules of the Consumer Code is the AGCM, the Italian Competition Authority.
- Legislative Decree no. 210/2021, in implementation of the EU Directive 2019/944 concerning common rules for the internal market in electricity, inter alia, provides for the regulation of modalities for the participation and energy sharing, the definition of active customers, the definition of the rights of final customers and active customers (e.g., billing and billing information, right to switch

supplier contracts with dynamic electricity pricing, smart systems and right to smart meter, aggregation contracts), the individuation of the conditions for citizens' energy communities.

Generation, distribution and transmission

- The Electricity Market or Power Exchange or IPEX (Italian Power Exchange) was established in Italy on April 1, 2004, following the approval by the government and the Electricity and Gas Authority of the measures implementing Legislative Decree no. 79/99 (the *Bersani Decree*), which implemented the structural reform of the electricity sector. Until that moment, in fact, the energy monopoly was in the hands of a single company: Enel. The Bersani Decree gave way to the free electricity market in which every operator in the sector can decide to produce electricity and resell it. Today, the Italian energy market can be configured as a real supply chain in which various players such as electricity suppliers or distribution companies operate.
- Before the Bersani Decree, the distribution and supply of electricity converged in the same entity. The liberalization of the market, on the other hand, has separated these two figures, allowing companies to deal with one or the other sector. Electricity distribution is entrusted to the electricity distributor, who transports electricity from the transmission network. The end customer has no relationship with these companies and cannot choose their local distributor as this is determined by tenders issued by local authorities.
- Until few years ago, the difference between distributor and supplier was not very clear because there were companies that dealt with both sectors. In 2015, a clear division of roles was imposed to avoid any confusion. Nowadays, while the distributor oversees transporting energy, the supplier's role is to sell retail electricity to the end customer, taking care of all the administrative and commercial aspects of the supply.
- In the Italian electricity market, the price of energy corresponds to the equilibrium price obtained by matching the quantities of electricity requested and those offered by the operators participating in the market. The Power Exchange is not a compulsory market: in fact, operators can also conclude sale and purchase contracts outside the exchange platform, through so-called bilateral contracts (OTC – Over The Counter).

Renewable energy overview

Renewables industry overview

- One of the most important innovations in the field of renewables in Italy is represented by the RED II decree, transposed in Italy by Legislative Decree No. 199 of November 8, 2021, entered into force on December 15, 2022, which implemented the EU Directive 2018/2001 on the use of Renewable Energy Sources. It aims to accelerate Italy's sustainable growth and energy transition path through provisions on the use of energy from renewable sources that are consistent with the decarbonization targets of 2030 (-55% climate-changing emissions compared to 1990) and 2050 (net-zero). The decree stipulates that renewable energies must account for at least 32% of gross final energy consumption, although the European Commission intends to raise the threshold to 38-40%.
- Italy has made some important commitments aimed at energy efficiency and at achieving certain quotas of energy production from renewable sources, as derived from Directive 2009/28/EC.
- In Italy, several documents set targets for renewables, like the PNRR (National Recovery and Resilience Plan), the PNIEC (National Integrated Energy and Climate Plan) and the Long-term National Strategy for Reducing Greenhouse Gas Emissions.
- In 2017 Italy generated more than 320 billion kWh, meeting more than 88% of national demand with a significant increase in energy produced from renewable sources.
- According to the GSE (*Gestore dei Servizi Energetici* – Energy Services Manager), in 2018 a further spread of renewable energy sources has been achieved in Italy, which are increasingly used both for space heating and cooling and in the transport sector. This is confirmed by the annual report on the spread and use of national green energy, where official data shows that the production of green energy in Italy has covered 17.8% of consumption, exceeding 2% of that of 2017.
- In 2019, according to calculations by Terna (the transmission system operator which manages the Italian transmission grid), the production of renewable energy in Italy amounted to 114.6 billion kWh, an increase of 1.3% compared to 2018.
- Against a national demand of 316.6 TWh (i.e. down from the previous year), renewable electricity sources in Italy in 2019 covered as much as 35.9% of national demand while still accounting for 40.4% of domestic electricity production as in 2018.

- With the exception of 2014, the figure recorded is still the highest ever and, among renewables, wind and photovoltaic grew by 14.3% and 9.3% respectively, together producing almost 44.4 TWh or 4.5 TWh more than in 2018.
- At the end of 2020, around 950,000 plants producing electricity from renewable sources were in operation in Italy with a total capacity of over 56 GW. Almost 936,000 of these plants are photovoltaic, about 5,700 wind power, while the remainder are powered by other sources (hydraulic, geothermal, bioenergy).
- At the end of 2021, electricity demand amounted to 319.9 TWh, an increase of 6.2% over the previous year. Gross domestic production amounted to 289.1 TWh, up 3.0% compared to 2020. In detail, 59.0% of national production was covered by non-renewable thermoelectric production (up 5.5% compared to 2020), 16.4% by hydroelectric production (-4.1% compared to 2020) and the remaining 24.6% by wind, geothermal, photovoltaic and bioenergy sources (wind +11.5%, photovoltaic +0.4%, geothermal -1.9% and bioenergy -2.9% compared to 2020).

Hydropower

- Hydroelectricity is the leading renewable source in Italy, producing 41% of the total renewable energy needed by the country. This technology is the leading renewable sector; in fact, there are almost 4,300 Italian plants that produce 46 TWh each year. This energy resource employs almost 15,300 people but requires constant maintenance and investment.
- Renewable hydroelectric energy is a resource that has already been largely exploited, but it assumes strategic importance in European projects to be implemented by 2030.
- Italy, where hydropower has assumed significant relevance, ranks fourth for hydroelectric power generated in Europe, just behind Norway, Sweden and France.
- Installed capacity has increased by 10% in recent years and the number of installations has risen by 78%.

Wind

- Wind energy production in Italy is significant, in Europe 10,758 MW of plants will be installed on shore in 2019, our country is in fifth place in Europe for wind production. Italian wind energy production accounts for 9% of national electricity production. Around 90% of wind power plants are concentrated in the south and on the islands, due to the greater availability of suitably windy sites in these regions.
- The wind power capacity installed in Italy in 2021, is almost 11 GW divided between 5,777 plants, which means that in two and a half years just under 1 GW has been installed and that today we have just 3 GW more than almost ten years ago.
- In 2030 Italian wind energy is expected to reach about 19,300 MW of installed capacity, of which about 900 MW from offshore wind. This capacity would guarantee annual electricity production of 40 TWh, or 10% of Italy's gross electricity consumption.

Solar

- In Italy there are 1,015,239 photovoltaic installations operating, with a capacity of just over 22 GW.
- At the end of 2021, 80,000 more solar plants were installed than the year before, with an increase in installed capacity of 940 MW. Out of an estimated total of about 115 TWh, solar accounted for 22% of the electricity produced from renewable sources, in second place after hydroelectric, numbers still too low if we look at the 2030 objectives and the growth levels of installed solar PV in the coming years (at least another 30 GW of PV to be installed in just under 10 years according to the PNIEC, but perhaps more would be needed for the targets we have given ourselves).

Geothermal

- Geothermal energy in Italy is quite widespread and its use is very old, dating back to the Roman Empire.
- Italy has a potential of extractable and exploitable geothermal energy that is estimated to be worth between 500 million and 10 billion tonnes of oil equivalent. That is between 5,800 and 116,000 TW.
- More or less, about 6 TW of energy is obtained each year in Italy, and an installed capacity of the order of 1.1 GW (1,100 MW). Of the latter, just over 900 MW corresponds to the power of the plants that convert heat into electricity – geothermal plants – while just

under 200 MW comes from direct use for urban heating, thermal, therapeutic uses and greenhouse cultivation. The fact that about one-seventh is used for thermal purposes and six-sevenths for electrical purposes is a well-established fact in national history, as reconstructed by the Italian Geothermal Union.

- Compared to national energy needs, however, geothermal energy is quantified at just under 2%, or about 5% of the sole renewable component.

Tidal energy

- Italy is moving towards the construction of tidal power plants, especially in ports.
- In Ganzirri, a hamlet of Messina, the Kobold turbine has been built, anchored to the seabed; it consists of three blades connected to the drive shaft by six arms. The turbine is connected to the national grid and has a power output of approximately 25 kW.
- The port of Civitavecchia has arranged for the installation of two devices: REWEC and WAVESAX, which produce electricity using compressed air from the movement of water.

Current issues in the renewables industry

- Italy wants to achieve the goal of decarbonization by closing all coal-fired power plants by 2025. At the same time, it must meet the country's electricity demand, including peaks. This means increasing use of clean energy sources.
- In Italy, there are plans to replace coal with other sources that are less polluting, but also capable of guaranteeing a programmable energy supply. From this perspective, natural gas today represents an effective alternative. Moreover, the switch from coal to gas allows greater agility in terms of utilization, improving the stability of networks.
- The share of plants operating competitively has decreased, as the market solution mechanism based on marginal price (all plants are remunerated at the price of the most expensive plant selected in the Day-Ahead Market) enables renewables to offer zero price and be remunerated at the price of the most expensive plant without participating in the market.

Renewables laws

- The Legislative Decree no. 387/2003, implementing EU Directive 2001/77/CE, provides for the so-called single authorization for the realization and the operation of renewable plants, including the related connection works. The single authorization is issued following the convening of a Local/Central Authorities meeting in order for all the competent authorities to examine contextually the various public interests involved in the relevant proceeding. The detailed standard discipline of the single authorization procedure at a national level is established by the National Guidelines adopted by means of the Ministerial Decree on 10 September 2010.
- The Renewable Energies Decree (Legislative Decree no. 28/2011) came into force on March 29, 2011. It incorporates Directive 2009/28/EC of the European Community and establishes the institutional framework, instruments and incentives for achieving the 2030 renewable energy targets.
- The *Conto Energia* (Energy Account) was introduced with the transposition of EU Directive 2001/77/EC, through Legislative Decree 387/2003, with the aim of improving the energy performance of buildings, premises and homes through the installation of photovoltaic systems: those who produce electricity by exploiting solar energy receive a sum of money from the electricity produced by their system. The incentive that the state provides is based on a 20-year period.
- The National Energy Efficiency Fund, established at the Ministry of Economic Development, is regulated by the Ministerial Decree of December 22, 2017. It economically supports energy efficiency interventions completed by companies and the Public Administration, on buildings, plants and production processes. It provides economic bonuses equal to 65% of the expenditure incurred for improving the efficiency and energy saving of buildings and to produce renewable energy, for Public Administrations and private entities.
- The National Integrated Energy and Climate Plan (PNIEC), presented by the Ministry of Economic Development to the European Commission in January 2019, gathers the guidelines to be followed and the objectives to be achieved in Italy in terms of energy and environmental protection, for the period 2021-2030.
- On November 30, 2021, Italy transposed Directive 2018/2001 (also called RED II – Renewable Energy Directive) on the promotion of the use of energy from renewable sources, which covers the use of renewable energy in the transport sector and the reduction of greenhouse gas emissions for biofuels, bioliquids and biomass fuels. Italy has set ambitious targets, such as achieving a 30% share

of energy from renewable sources in gross final consumption (compared to the European target of 32%); adhering to the European target of reducing greenhouse gas emissions by at least 55% on 1990 levels by 2030; increasing the energy from renewable sources in gross final consumption for heating and cooling equal to 1.3% as an annual average in the periods 2021-2025 and 2026-2030.

The so-called “Red II Decree” at issue, with the aim of establishing authorization simplifications for renewable plants, provides for the individuation of suitable areas *ope legis* and suitable areas to be identified by means of Regional Laws (in accordance with the criteria which will be identified by one or more ministerial decree(s)). In such areas, the following accelerated authorization procedures apply: (i) the mandatory non-binding opinion of the competent Landscape Authority: when the deadline for the expression of the landscape opinion expires, the proceeding Administration may issue the AU; (ii) the reduction by one third of the authorization procedures.

- The “Energy Decree”, adopted by means of the Decree Law 17/2022 (converted into Law 34/2022), also intervenes on the regulation of the cited “suitable areas” by raising the power thresholds for the application of the single authorization procedure up to 10 MW. Below this threshold: a) for plants – located in suitable areas – with power higher than 1 MW and up to 10 MW the simplified authorization procedure (“PAS”) applies; b) for plants – located in suitable areas – with power up to 1 MW, the sworn declaration of commencement of work (“DILA”) applies. Moreover, the Energy Decree provides for the possibility of installing, also by way of derogation from municipal planning instruments and existing coverage indices, photovoltaic plants in areas for industrial use within the maximum coverage limit of 60% of the same areas.

The scope of application of the PAS is also extended to: a) photovoltaic plants with power up to 20 MW and the relevant connection works to the high and medium voltage electricity grid where they are located in areas for industrial, productive or commercial use, in landfills or closed and restored landfill lots or in quarries or quarry lots that cannot be exploited further, for which the competent authority for the issuance of the authorization has certified the completion of the activities; b) photovoltaic plants with power up to 10 MW, where they are located in “suitable areas”; c) agro-voltaic plants that meet the conditions for eligibility for the incentives established by the amended Art. 65, para. 1-quarter of the Decree Law 1/2012 where they are located at no more than 3 km from areas for industrial, artisanal and commercial use. For such plants, only if their power is higher than 20 MW the national Environmental Impact Assessment and the regional Environmental Impact Assessment screening will apply. Instead, the aforementioned plants are exempted from such environmental procedures if their power is up to 20 MW and provided that the proponent attaches to the declaration for the PAS procedure a self-declaration showing that the plant is not located within areas specifically listed and identified as unsuitable pursuant to the Annex 3, letter f) of the MD September 10, 2010.

To be remarked the new regulation for the agrivoltaic plants, which are photovoltaic plants located in agricultural areas ensuring the integration between agricultural activity and power generation. For these plants it is introduced a derogation to the prohibition to have access to incentive regimes.

- The “Ter Support Decree”, adopted by means of the Decree Law 4/2022 (converted into Law 25/2022), provides for a two-way compensation mechanism on the price of energy, with reference to the electricity fed into the grid for the period from 1 February 2022 to 31 December 2022. The subjective scope of application of the measure refers to: a) photovoltaic plants with power higher than 20 kW benefiting from fixed premiums deriving from the “Conto Energia” mechanism, which are not dependent on market prices; b) solar, hydroelectric, geothermal and wind power plants with power higher than 20 kW that do not benefit from incentive mechanisms, which came into operation prior to 1 January 2010. For these purposes, the GSE shall calculate the difference between the following values:
 - a “reference price” equal to that indicated in the table introduced in Annex I-bis to Decree-Law No. 4/2022 with reference to each market area

CNOR	CSUD	NORD	SARD	SICI	SUD
58	57	58	61	75	56

 - a “reference price” equal to that indicated in the table introduced in Annex I-bis to Decree-Law No. 4/2022 with reference to each market area
 - for the plants referred to in subparagraph (a) above, as well as for the plants referred to in subparagraph (b) above from solar, wind, geothermal and run-of-river water sources, at the hourly zonal market price for electricity, or, for supply contracts entered into before 27 January 2022 that are not excluded from the scope of application of the rule, at the price indicated in the contracts;

- for the additional plants referred to in subparagraph (b), at the monthly arithmetic average of the hourly zonal electricity market prices, or, for supply contracts entered into before 27 January 2022 that are not excluded from the scope of application of the rule, at the price indicated in the contracts themselves.

In the event that the difference between the aforementioned values is positive, the GSE will pay the relevant amount to the producer; in the event that the difference is negative, the GSE will equalize or request the corresponding amount from the producer.

- The “Bis Ucraina Decree”, adopted by means of the Decree Law 21/2022 (converted into Law 51/2022), introduces measures aimed at increasing energy production from biogas plants: full utilization of the technical capacity of already operating biogas plants is now permitted, even if they are incentivized, up to a limit of 20% without authorization and subject to modification of the connection contract. Also the Ucraina Bis Decree intervenes on the regulation on the suitable areas set forth by the Red II Decree by means of the enlargement of the *ex lege* suitable areas (e.g., agricultural areas located at 500 metres from production/industrial areas; buffer areas at 300 metres from the motorway network). It is also established the extension of the type of variants/amendments to existing photovoltaic and wind plants subject to the sworn declaration of commencement of works (“DILA”).

Moreover, the Decree introduces the extraordinary contribution against high bills on the subjects operating in the energy sector as identified by the provision (subjects who carry out in the territory of the State, for the subsequent sale of the goods, the activity of electricity production; subjects who carry out the activity of methane gas production or natural gas extraction, etc.). The taxable base for the contribution shall be the increase in the balance of asset and liability transactions for the period from 1 October 2021 to 30 April 2022 compared to the balance for the period from 1 October 2020 to 30 April 2021. In the event of a negative balance for the period from 1 October 2020 to 31 March 2021, a reference value of zero shall be used for the calculation of the tax base for this period. The contribution shall be applied at the rate of 25 per cent in cases where the said increase exceeds 5,000,000 euro. The contribution is not due if the increase is less than 10%.

- The “Aids Decree”, adopted by means of the Decree Law 50/2022 (converted into Law 91/2022), extends the advantageous regulation applicable to the photovoltaic plants located in the suitable areas set forth by the Red II Decree to: a) the interconnection works related to the plants, where they are also located within a suitable area; b) biomethane plants located within a suitable area. In order to speed up the environmental and single authorization procedures, it is established that the deliberation adopted by the Council of Ministers replaces the Environmental Impact Assessment final provision; in the event that the deliberation states for the issuance of the positive Environmental Impact Assessment, the single authorization shall be considered to be issued after the expiry of 60 days and in the face of the silence of the proceeding authority.

For the first time, the time limit for the commencement of works authorized by means of the single authorization is regulated (three years from the issuance of the authorization title).

- The “Bis Aids Decree”, adopted by means of the Decree Law 115/2022 (converted into Law 142/2022), provides – inter alia - for measures aimed at reducing the effects of price increase in the electricity sector (measures for the protection of vulnerable customers in the natural gas sector; the zeroing of general system charges in the electricity sector for certain users; the suspension up to 30 April 2023 of the unilateral modification of contracts relating to the price definition by the electricity and gas supply and the *ex lege* ineffectiveness of any notice of termination exercised to that end.

Government incentive schemes

- The first support scheme for renewable energy sources (RES) was launched in Italy in 1992, including in the incentives all RES-E technologies, the FIT (Feed in Tariff) scheme, also known as CIP6. For the purposes of incentives, this legislation included the equating of renewable sources with assimilated sources, i.e., thermal sources using waste. The latter quickly exhausted the economic capacity of the capital account incentives of these laws delaying, according to some analysts, the production of real renewable energy.
- Formerly, incentives for renewable energy sources in Italy were mainly based on the Green Certificates (*Certificati Verdi*): marketable /tradable instruments corresponding to a certain amount of CO₂ emissions, which are provided free of charge by the GSE to the operator of a plant powered by renewable sources with the aim of emitting less CO₂ than a plant powered by fossil sources would.

- Legislative Decree no. 28 of March 3, 2011, implementing the European directive, and the Ministerial Decree of July 6, 2012, overcame the mechanism of Green Certificates for plants commissioned after December 31, 2012, and the transition to new incentive mechanisms. The new incentives guarantee the payment of a tariff by the GSE on net energy production in addition to the revenues from the valorization of the energy.
- The Ministerial Decree of July 4, 2019, in continuity with the Ministerial Decree of July 6, 2012, and the Ministerial Decree of June 23, 2016, aims to promote, through economic support, the spread of small, medium and large size plants producing electricity from renewable sources. The plants that can benefit from the incentives provided for by the Decree are newly built photovoltaic plants, onshore wind power plants, hydroelectric plants and finally plants using sewage gas. The Ministerial Decree identifies four different groups depending on the source, the type of plant and the category of intervention. For each group, separate quotas of incentive power are envisaged, to be allocated through seven subsequent competitive procedures of register or auction, based on specific priority criteria or of the reduction in the level of incentives offered by operators when participating in the individual procedure.
- The Legislative Decree 199/2021 - already mentioned - provides for a new incentive system to be implemented by means of one or more ministerial decree(s) to be adopted by the Minister of Ecological Transition, after consulting ARERA and the Unified Conference, within 180 days from the entry into force of the provision (the deadline is now expired). For large plants (power ≥ 1 MW), the incentive will be awarded through competitive tender procedures carried out with reference to power quotas. The implementing decree could, for the first time, introduce quotas differentiated by geographical areas for the declared purpose of promoting synergies with the development of the electricity system and the process, also innovative, of identifying the so-called "suitable areas". For small plants (power < 1 MW), the incentive will be recognized (i) directly against a request to be submitted on the date of entry into operation of the plant *"for plants with generation costs closest to market competitiveness"*, while (ii) *"for innovative plants and for plants with higher generation costs"* following the award of tenders in which power quotas are made available and selection criteria are established. To identify the categories of plants that fall into the first or second hypothesis we will have to wait for the implementing decrees.

Major projects and companies

- The National Recovery and Resilience Plan provides a package of investments and reforms divided into six missions. The Plan promotes an ambitious agenda of reforms, whose main four concern:
 - public administration
 - justice
 - simplification
 - competitiveness

Each component reflects reforms and investment priorities in a particular sector or area of intervention, or related activities and themes, aimed at addressing specific problems and forming a coherent package of complementary measures.

- Enel is Europe's largest utility, with a market capitalization of EUR103 billion, 67,000 employees and a presence in more than 30 countries. Its division dedicated to renewable generation – Enel Green Power – was founded in 2008; today Enel has a renewable capacity of about 44 GW, which it intends to increase to GW by 2030 through investments of EUR160 billion.

Foreign investment ownership

- The Foreign Investment Attraction Committee (CAIE) was established by Decree Law No. 133 of September 12, 2014, (*Sblocca Italia Decree* – Article 30), which can avail itself of the participation of representatives of the central and territorial administrations involved in the investment project from time to time.
- The CAIE:
 - formulates proposals, including regulatory proposals, on the operational methods that can strengthen and make more effective the activities for attracting foreign investments, with the aim of increasing national competitiveness;
 - acts as an observatory on current policies and international trends in foreign investment and the attractiveness of the Italian system, promoting the dissemination of studies and research in these fields;

- promotes links between central and territorial administrations and the diplomatic-consular network, through the member of the Ministry of Foreign Affairs and International Cooperation, to promote Italy as a country of destination for foreign investment in the international community.
- The control of foreign investment in Italy was governed by the Golden Power legislation. The Golden Power originally entered into force in 2012 and was limited to defense, national security, and infrastructure (e.g. transportation, energy, communications). It has recently been extended to additional strategic sectors (e.g. high technology, fintech, insurtech) following Law Decree 23/2020. The Golden Power is the special power of the Italian government to limit or stop foreign direct investments and corporate transactions involving Italian strategic assets. All transactions falling within the field of application of Golden Power must be reported in advance to the Italian Presidency of the Council of Ministers.
- To increase the flow of investment and new capital from abroad, recent measures have been taken to improve the environment for foreign companies and investors. The new National Transition 4.0 Plan is the main focus of the Italian Recovery Fund. This measure has two main objectives: to stimulate private investment and provide stability and certainty to businesses with measures that take effect from November 2020 to June 2023. In particular, the Plan envisages a greater focus on innovation, green investments and design activities.

UNFCCC – Paris Commitments and beyond

- Italy signed the Paris Agreement on April 22, 2016, and ratified the agreement with Law No. 204 of November 4, 2016. Italy has committed to reduce greenhouse gas emissions by at least 40% by 2030 (base year 1990), with the aim of decarbonization by 2050.
- Italy, in line with the provisions of the Energy and Climate Plan, is in the process of finalizing its long-term national strategy on the reduction of greenhouse gas emissions. The strategy identifies possible decarbonization paths, considering different technological options, including the most innovative ones, which have not yet been fully implemented, to reach the 2050 climate neutrality target. Once finalized, the strategy will be submitted to the European Commission, and to the UNFCCC, in accordance with the Paris Agreement.

Relevant resources and references

Relevant websites

- [Energy Services Manager](#)
- [Ministry of Ecological Transition](#)
- [Italian Federation for the Rational Use of Energy](#)
- [National Agency for New Technologies, Energy and Sustainable Economic Development](#)
- [Regulatory Authority for Energy, Networks and Environment](#)

References

- [Italian Electricity Industry perspectives](#)
- [Development of renewable energies in Italy](#)
- [Statistical report 2020 on solar and photovoltaics in Italy](#)

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Japan

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: Japanese
Population	Approx. 125 million as of January 2022
Gross national income (GNI) per capita	USD 43,803 as of 2019
Business environment	<ul style="list-style-type: none">• 2018 Global Competitiveness Index: 5 of 138• 2022 Index of Economic Freedom: 35 of 180• 2021 Corruption Perceptions Index: 18 of 176• 2020 UN Development Programme Human Development Index: 19 of 189
Profile	<p>Japan is the third-largest country in nominal GDP. Tokyo is the nation’s capital and largest city, and other major cities include Yokohama, Osaka, Nagoya, Sapporo, Fukuoka, Kobe and Kyoto.</p> <p>The Japanese political system is generally regarded as a constitutional monarchy, but the Japanese Emperor is characterized as a “symbol of Japan” under the Constitution of Japan and does not exercise any political power.</p> <p>The law-making power is solely vested in the Diet (<i>kokkai</i>) which consists of two houses, the House of Representatives (<i>shugin</i>) and the House of Councilors (<i>sangin</i>). The House of Representatives has 465 members whose term of office is four years, and its decisions may precede that of the House of Councilors for certain matters as specified under the Constitution of Japan. The House of Councilors has 245</p>

members whose term of office is six years, and half of the members are elected every three years. The Diet begins its 150-day ordinary session from January each year which may be extended and the Cabinet may convene extraordinary sessions whenever necessary.

The law execution power is vested in the Cabinet (*naikaku*), which consists of the Prime Minister (*naikakusori daijin*), who is the head of the Cabinet and the Ministers of State (*kokumu daijin*), who oversee each responsible ministry. The Prime Minister is designated from among the members of the Diet by a resolution of the Diet and appointed by the Emperor, and the Prime Minister appoints the Ministers of State. Legislation relating to the electricity industry is generally handled and executed by the Ministry of Economy, Trade and Industry (METI).

The judicial power is vested in the Supreme Court, and in such inferior courts as the High Courts, District Courts, Family Courts and Summary Courts. Japan adopts a three-tiered judicial system, and, in most cases, general civil lawsuits are handled by the District Courts as a court of first instance.

Electricity industry overview

Trends in the electricity industry

Since Japan experienced the Great East Japan Earthquake and the Fukushima Daiichi Nuclear Power Plant accident in March 2011, the Japanese government has been accelerating dramatic reforms of Japan's electricity system and nuclear power plant operation.

The Cabinet approved the Policy on Electricity System Reform in April 2013. Based on this Policy, the electricity system reform was implemented in three phases: (i) the establishment of the Organization for Cross-regional Coordination of Transmission Operators (OCCTO) as a new government-authorized organization responsible for the promotion of the transmission and distribution network development and managing nationwide power supply and demand adjustment; (ii) the full liberalization of entry into the retail electricity market; and (iii) the legal unbundling of the transmission and distribution sector, and the elimination of regulated retail rates. Only the elimination of regulated retail rates is yet to be implemented.

The Cabinet also approved the "Sixth Strategic Energy Plan" in October 2021. The basic philosophy under the Strategic Energy Plan is to realize "S+3E," which stands for safety plus energy security, economic efficiency, and environment. In the plan, the following goals are identified for the realization of S+3E: (i) regarding energy security, improvement in energy self-sufficiency to approximately 30%; (ii) regarding economic efficiency, reduction of costs in the face of an anticipated increase in surcharges arising from widening adoption of renewables; (iii) regarding the environment, the pursuit of, among other greenhouse gas reduction targets, reduction of energy-related CO₂ emissions by approximately 45%; and (iv) regarding safety, action to increase the safety of nuclear power.

Structure of the electricity industry

The Electricity Business Act (the EBA) is the main law governing the electricity industry. At present, the electricity business is basically classified into the following three categories under the EBA: (i) power generation, (ii) power transmission and distribution, and (iii) power retailing. The business in each category requires different types of licenses.

Power Generation Business

The power generation business requires an advance filing with METI. According to certain governmental sources, 986 entities had obtained power generation licenses as of June 30, 2021, with generating capacity of 70 GW as of March 2021.

Operating nuclear reactors for electric power generation is subject to a special regulation under the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (the Nuclear Reactors Law). The Nuclear Reactors Law requires a pre-operational

inspection and periodic inspections by the Nuclear Regulation Authority (NRA), and filing the operation plans with the NRA and obtaining approval before the commencement of operation.

Power Transmission and Distribution Business

Both the general transmission and distribution business and the transmission business require a license (*kyoka*), and a certain type of business called the “specified electricity transmission and distribution business” requires a filing with METI. Ten “general electricity utilities” operate the general transmission and distribution business and three other companies (J-POWER, North Hokkaido Wind Energy Transmission) operate the power transmission business. In addition, 36 companies such as Sumitomo Joint Electric Power Co., Ltd., operate the specified electricity transmission and distribution business as of 26 August 2021.

Power Retailing Business

The power retailing business was fully liberalized as of April 2016 through a series of amendments to the EBA. To engage in the power retailing business, prior registration with METI is required. According to certain governmental sources, as of August 25, 2021, 730 entities had obtained retail business licenses. In addition to affiliated companies of the general electricity utilities, electricity retailers include telecommunications carriers, trading companies, gas and petroleum companies, and steel manufacturers.

Market Status

In FY 2020, the electricity demand in Japan was 863.2 TWh and peak national demand came to 59.2 GW. The power consumption breakdown consists of 27% residential demand, 34% commercial demand and 37% industrial demand.

On the other hand, the electric power generated in Japan came to 845.4 TWh. The progressive shutdown of nuclear power plants following the Fukushima Daiichi Nuclear Power Plant accident increased dependence on thermal power plants and caused thermal's share of power generated to rise from 79.1% in FY 2010 to 82.6% in FY 2020. Total generating capacity in Japan came to 312.8 GW at the end of FY 2020. This consisted of 51.1% thermal power (14.7% coal, 26.9% LNG, and 9.5% oil), 10.6% nuclear power, 15.7% hydro, and 22.5% renewables (excluding hydro).

The Japan Electric Power Exchange (JEPX) is a Japanese wholesale electricity trading market and it provides both a spot-trading market and a forward trading market. The volume of trades on the JEPX spot market has been on the rise, reaching 312.8 TWh (equivalent to more than 30% of all electric power sold nationwide) in FY 2020. The average system price of supply for FY 2020 as a whole was 11.21 JPY /kWh.

Renewable energy overview

FIT/FIP regime

As one of the electricity system reforms after the Great East Japan Earthquake, Japan adopted the feed-in tariff (FIT) regime in July 2012. The Act on Special Measures Concerning Procurement of Renewable Energy Sourced Electricity by Electric Utilities (the FIT Act) is the main law concerning the FIT regime. Under the FIT Act, the utility companies are required to purchase the electricity generated from renewable energy sources at a certain purchase price and during a certain purchase period designated by METI annually. The main purpose of the FIT regime is to enable the renewable energy project operators to predict expected profits and accelerate capital investment into renewable energy sources.

However, several problems over the FIT regime emerged immediately after its adoption, especially in relation to solar projects. For example, many business operators who obtained the FIT license at the initial stage were entitled to a comparatively higher purchase price in comparison with the business operators who obtained it at a later stage. The situation was motivating business operators to delay commencement of project operation to wait for decreases in solar panel costs and achieve high profitability. To address these problems, the FIT regime was subject to several amendments.

The most recent trend of the FIT regime reform is an amendment to the FIT Act which came into effect as of April 1, 2022 (the Amended FIT Act). The Amended FIT Act newly introduced, among others, the feed-in premium mechanism (the FIP regime) and the automatic cancellation of FIT/FIP licenses of projects with delayed commencement of operation. Under the FIP regime, the business operators receive a “premium” (*kyokyu sokushin kofukin*) in addition to the revenue from power sales. The unit price of the premium is determined on the basis of two prices, the “basic price” (*kijun kakaku*) and the “referred price.” The basic price is determined by METI in advance as the price which enables the operators to earn appropriate profit. The referred price is also determined based on a calculation formula

designated by the relevant ordinance to the Amended FIT Act. The referred price is characterized as the average purchase price at the wholesale trading market plus the average price of an environmental value at the wholesale trading market with certain adjustments. The unit price of the premium is calculated by deducting the referred price from the basic price (i.e., premium = basic price – referred price). The basic concept of the FIP regime is to determine the amount of subsidies to operators in conjunction with the real time market status ensuring that they can earn appropriate profit even in case where the electricity market price declines. Although currently the FIT regime and the FIP regime are coexisting, only the FPI regime applies to certain projects (e.g. solar project with 1 MW or more output).

To deal with the problems caused by projects that do not commence power supply despite obtaining the license certificate and reserving grid capacity to deliver the electricity, the Amended FIT Act allows METI to cancel the license of such projects under certain conditions.

Trends in the electricity industry

The current energy mix status in Japan is 51.1% thermal power (14.7% coal, 26.9% LNG, and 9.5% oil), 10.6% nuclear power, 15.7% hydro, and 22.5% renewables (excluding hydro).

The Sixth Strategic Energy Plan sets as its top priority the transformation of renewable energy into the main electric power source. It calls for raising the current target for renewable energy's contribution to power generation in 2030 from 22-24% to 36-38%.

Renewable energy sources

Solar

Installed solar power generating capacity at the end of FY 2020 was 61.2 GW. Solar power makes up approximately 86.3% of total FIT-certified renewable power generating capacity.

Wind

Wind power generating capacity was 4.4 GW as of the end of FY 2020. The installation of wind power facilities has lagged behind that of solar power facilities, due to factors such as the longer time needed to assess environmental impacts and constraints on grid capacity. The majority of installed wind power generation facilities are onshore, and only around 20 MW of capacity is offshore. However, the FIT-certified capacity of offshore installations has trended upward, reaching 668 MW at the end of FY 2020.

Biomass and waste

Biomass and waste generating capacity at the end of FY 2020 came to 4.2 GW. In Japan, this form of power generation has centered on municipal waste incineration and the direct combustion of black liquor from papermaking and wood waste from lumber production. Biomass and waste power, low environmental load type thermal power is a renewable that, unlike variable renewable energy (solar and wind), can stably generate power with minimal fluctuation. This means that it can be used to reliably generate electricity in the wake of disasters, and is being increasingly introduced as a power source that can help to strengthen disaster resilience, even when compared with other renewables.

Current issues in the renewables industry

Grid capacity and the cost of installation are the main obstacles to the development of renewable energy in Japan.

To increase the use of renewable energy, grid capacity in relation to the inflow of fluctuating power generated from solar and wind sources must be expanded. Under the FIT regime, the utility companies are allowed to implement output control (ie temporary compulsory curtailment of output from power stations) without limit and without compensation to generators if the supply from solar power to the grid exceeds the total grid capacity. It's difficult for projects connected to grids covered by this rule to procure long-term project finance unless and until there's a clearer outlook of the probability of future output control. METI is discussing new rules for output curtailment to expand the use of renewable energy sourced electricity.

In terms of the grid system, the OCCTO is considering a long-term plan to strengthen the grid and implement better practices for grid operation. Also, a Japanese-type "connect and manage" mechanism is being introduced to use the existing grid system more efficiently. On the technology front, the development of larger and more cost-efficient batteries is essential to expand interconnection with renewable energy power generation facilities.

As for the cost of installing generation facilities using renewable energy, it's essential to control the rapid increase of the renewable energy surcharge payable by electricity users under the FIT regime. One of the major movements to address these issues was the amendment of the FIT Act, including the introduction of the FIP regime.

Government incentive schemes

The FIT/FIP regime as described above is the primary incentive scheme adopted to accelerate the use of renewable energy.

In addition, certain subsidies and preferable tax treatments are available for combined heat and power (co-generation).

Major projects and companies

The ten general electricity utilities, plus J-Power and the Japan Atomic Power Company, are the main players in the power generation market. Tokyo Electric Power Company and Chubu Electric Power jointly established JERA to integrate their fuel procurement and thermal generation business. Some registered retailers (including ex-PPS companies) have their own power generation plants and supply their own generated electricity to their customers.

In the offshore wind sector, bidding processes organized by the government to choose operators of the offshore wind projects are currently proceeding in several areas. Mitsubishi Corporation and its alliance won three bids recently (total output amount is 1.7 GW).

Foreign investment ownership

Under the Foreign Exchange and Foreign Trade Act (the FEFTA), the inward direct investments from foreign investors in Japanese energy sector generally requires the prior filing with the Bank of Japan and they will be reviewed by METI and the Ministry of Finance.

In 2020, the Japanese government designated general transmission and distribution operators, transmitters and power producers with output capacity of 50,000 kW or more as core businesses by amending the FEFTA. Stricter requirements and narrower exemptions apply to investments in core businesses.

UNFCCC – Paris Commitments and beyond

Since the adoption of the Paris Agreement at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) held in December 2015, the Japanese government has adopted several governmental policies.

The Japanese government set in 2015 the goal of reducing emissions in FY 2030 by 26% from FY 2013, and established in June 2019 a reduction target of 80% for FY 2050. Both goals were reported to the UN Secretariat.

The Prime Minister announced in October 2020 the goal of making Japan carbon neutral by 2050. In April 2021, the Prime Minister also declared that Japan would seek to reduce its greenhouse gas emissions by 46% in FY 2030 from its FY 2013 levels, and would thereafter further strive toward a 50% reduction.

Relevant resources and references

Websites

- [METI](#)
- [Agency for Natural Resources and Energy \(ANRE\)](#)
- [Electricity and Gas Market Surveillance Commission](#)
- [NRA](#)

- [OCCTO](#)
- [The Electric Power Industry in Japan 2022 published by JEPIC](#)

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Kenya

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Common Law• Language: The official languages are English and Swahili.
Population	47.6 million (2019 census figures)
Gross national income (GNI) per capita	GNI per capita: USD 1,760 (World Bank Data)
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 95 of 141 (down 2 rankings)• 2022 Index of Economic Freedom: 138 of 178 (maintained same rankings)• 2021 Corruption Perceptions Index: 128 of 180 (down 4 rankings)• 2020 UN Development Programme Human Development Index: 143 of 189 (up 4 rankings)• 2021 AfDB Electricity Regulatory Index (ERI) for Africa: 2 of 36 (up 3 rankings)
Profile	<p>The Republic of Kenya is a country located in East Africa, on the equator. Kenya borders Tanzania, Uganda, South Sudan, Ethiopia, Somalia, and the Indian Ocean. There are over 40 ethnic communities in Kenya. Kenya’s history stretches back to the Berlin Conference of 1885 after which the British established the East Africa Protectorate in 1895. Thereafter, Kenya was declared a British colony in 1920. On June 1, 1963, Kenya attained self-governance and on December 12, 1963, Kenya gained full independence. The following year, Kenya</p>

became a republic with Jomo Kenyatta as its first president. Since independence, Kenya has had a continuous shift in its political and economic governance.

Today, Kenya is a constitutional democracy with general elections held every five years for both national and county levels of government. Kenya is also a market-based economy with agriculture serving as the backbone of its economy.

Electricity industry overview

Electricity industry overview

- As at June 2021, Kenya's installed effective (grid and off-grid) capacity was 2802 MW¹ made up as follows:
 - 28.7% geothermal
 - 28.9% hydro
 - 24.9% thermal
 - 13.4% wind
 - 3.2% solar
 - 0.07% biomass
- The Least Cost Power Development Plan (LCPDP) 2021-2030 indicates that as at the end of the 2019/2020 period, electricity generated in Kenya comprised of:
 - 45.6% from geothermal
 - 36.2% from hydro
 - 9.6% from wind
 - 6.7% from fossil fuels
 - 0.8% from solar
- The above statistics reflect the reality that while thermal sources still form a large part of Kenya's installed capacity, there has been a continuous decline in electricity purchased from thermal generation. Energy purchased from thermals reduced from 1,298 GWh in the 2018/2019 financial year to 882 GWh in the 2019/2020 financial year. In contrast, energy purchases from wind and solar have increased.

Electricity laws

- The energy sector in Kenya has undergone major reforms over the years culminating in the unbundling of the power sector in 1997 and the enactment of an Energy Act in 2006. Before 1995, the electricity sector in Kenya was operated as an integrated monopoly under the supervision of the Kenya Power and Lighting Company (KPLC).
- In 2019, Kenya enacted the Energy Act, 2019, (Energy Act) a robust legal framework which consolidates the laws relating to energy; promotes renewable energy; promotes exploration, recovery and commercial utilization of geothermal energy; and regulates midstream and downstream petroleum and coal activities, among others. The Energy Act repealed the Energy Act, 2006, the Kenya Nuclear Electricity Board Order, 2013 and the Geothermal Resources Act, 1982 which previously governed the sector. Key regulations under the Energy Act are currently being developed.
- Kenya also has in place a Feed-in-Tariff Policy (FIT Policy), which is an instrument for promoting generation of electricity from renewable energy sources by guaranteeing a pre-determined tariff for power producers for a period of 20 years.

- The Public Private Partnerships Act, 2021 (PPP Act) also affects the electricity as it governs the participation of the private sector in the financing, construction, development, operation, and maintenance of government infrastructure and development projects.
- There are various institutions involved in Kenya's electricity sector including:
 - The Ministry of Energy, which heads the institutional framework and is responsible for developing and implementing policies that create an enabling environment for efficient operation and growth of Kenya's energy sector.
 - The Energy and Petroleum Regulatory Authority (EPRA), which is the regulator of the electricity and petroleum sectors in Kenya. Its functions include reviewing electricity tariffs, enforcing safety and environmental regulations in the power sector and safeguarding the interests of electricity consumers.
 - The Rural Electrification and Renewable Energy Corporation (REREC), which is mandated to promote and develop Kenya's renewable energy drive, in addition to implementing rural electrification projects.
 - The Nuclear Power and Energy Agency (NUPEA), which is tasked with implementation of the nuclear energy programme and promotion of the development of nuclear electricity generation in Kenya. Though NUPEA is currently in place, the Presidential Taskforce Report, which emanated from a Taskforce appointed by the President in March 2021 to review PPAs entered into by KPLC, has recommended its abolishment, as it is unlikely that the country will go into nuclear power production in the foreseeable future.
 - The Energy and Petroleum Tribunal, which is mandated to hear and determine disputes relating to the energy sector.

Generation, distribution and transmission

- In Kenya, the bulk of electricity is generated by the Kenya Electricity Generating Company (KenGen) which is a company mandated with generation of electricity through the development, management, and operation of power plants. It's 70% owned by the government, with 30% private shareholding through its listing at the Nairobi Securities Exchange. KenGen accounts for 62.97% of Kenya's effective generation capacity. Independent Power Producers (IPPs) account for 35.95% of the capacity while off-grid systems under the Rural Electrification Programme (REP) implemented account for about 1.07%.
- In June 2021, KenGen's share of the electricity generation increased to 65.8% while IPPs share slightly decreased to 33.57%. REREC's share also decreased to 0.63%.²
- Electricity transmission is carried out by the Kenya Electricity Transmission Company (KETRACO) which is a state corporation whose mandate is to plan, design, construct, operate and maintain high voltage (132 kilovolts and above) electricity transmission lines.
- Distribution is handled by KPLC, which is the system operator and the main off-taker in the Kenyan power market. KPLC buys bulk power from power generators on the basis of negotiated Power Purchase Agreements (PPAs) for onward supply to consumers.

References

[1] [EPRA: Energy & Petroleum Statistics Report 2021](#) page 10

[2] [EPRA: Energy & Petroleum Statistics Report 2021](#) pg 14

Renewable energy overview

Renewable industry overview

- Kenya is one of the countries leading the charge on renewable energy in the world. Currently, renewable energy accounts for 73% of Kenya's installed power generation capacity and 90% of the electricity in use.¹ At the COP26 Conference in Glasgow, President Kenyatta noted that Kenya is on course to achieve its targets of 100% use of clean energy by 2030 and 100% access to clean cooking by 2028. This reflects the government's commitment to promoting renewable energy.
- According to EPRA, total installed energy capacity as at June 2021 comprised 863.1 MW geothermal, 838.1 MW hydro, 435.5 MW wind, 2 MW biomass, 90.25 MW solar and 720.32 MW of thermal.²
- In 2016, the Climate Change Act, 2016 (Climate Change Act) was enacted to ensure that there is an enhanced response to climate change. The Climate Change Act requires the Cabinet Secretary responsible for climate change matters to formulate a National Climate Change Action Plan (NCCAP) which prescribes measures to enhance efficiency and use of renewable energy in industrial,

commercial, transport, domestic and other use. It also established the Climate Change Council to approve and oversee implementation of the NCCAP. The Climate Change Act also requires the Cabinet Secretary responsible for climate change to grant persons who encourage and put in place measures for the elimination of climate change including the use of renewable energy, incentives that may be necessary for the advancement of the elimination of and mitigation against climate change and its effects. These incentives are to be granted in accordance with the law, and upon consultation with the Cabinet Secretary responsible for finance.

- The Renewable Energy Resource Advisory Committee (RERAC) established under the Energy Act is tasked with the promotion of renewable energy. It advises the Cabinet Secretary responsible for energy on the management and development of renewable energy resources as well as licensing of renewable energy resource areas.
- REREC, which is also established under the Energy Act, develops, promotes and manages in collaboration with other agencies, the use of renewable energy and technologies, including but not limited to biomass, solar, wind, tidal waves, small hydropower and co-generation but excluding geothermal.
- In May 2021, the Cabinet Secretary – National Treasury and Planning announced that the government of Kenya is at an advanced stage of establishing an emissions trading scheme.
- Further to this, the Finance Act, 2022 introduced a tax incentive for corporate entities operating a carbon market exchange or emissions trading system. The new tax incentive is aimed at fostering investment in clean and sustainable business.
- Historically, geothermal energy and hydropower have contributed the largest proportion of Kenya's renewable energy growth. Given the abundance of geothermal resources in Kenya, the dominance of geothermal is expected to continue. However, over the last five years, there has been tremendous growth in other renewable energy technologies, particularly wind and solar. Various wind projects have already been connected to the grid such as the 310 MW Lake Turkana Wind Power Project, which is Africa's largest wind farm. It began injecting power into the national grid in September 2018. The 100 MW Kipeto wind farm was also commissioned in July 2021. Further, renewable energy generation got a boost with the commissioning of additional Selenkei Solar and Kianthumbi Hydro power plants, with installed capacities of 40MW and 0.5MW respectively.

Geothermal

- Geothermal energy is the largest contributor of energy to Kenya's national grid. With an installed capacity of 863.1 MW currently, the geothermal capacity is already approaching 1 GW.
- Kenya's geothermal resources are located in the Rift Valley and the LCPDP estimates that these resources boast an estimated potential of 10,000 MW.
- To tap into Kenya's vast geothermal resources, the Geothermal Development Company (GDC), which is a fully government-owned company was formed in 2008 to accelerate the development of geothermal resources in Kenya through the development of steam fields.
- Geothermal is now well developed in Kenya, with expertise in geothermal exploration, drilling, power plant implementation and operation being available in-country.
- Currently, geothermal generation is being carried out in Olkaria, Menengai and Eburu fields. New geothermal reservoirs are however being explored in Suswa, Longonot, Akiira and Baringo Silali.
- In 2019, the 178 MW Olkaria V geothermal power plant was commissioned. KenGen also recently commissioned Unit 6 of the Olkaria I geothermal power plant with an estimated capacity of 86MW. Additionally, there are plans to commission the Menengai III Geothermal project which will have a capacity of 35 MW by December 2022.
- The government, through KenGen, has four ongoing geothermal projects with a total estimated capacity of 314 MW.
- It's expected that geothermal will continue to play a key role in the Kenyan power system.

Hydropower

- Kenya has relied on hydropower for generations, to support its growing economy.

- Kenya's hydropower potential is estimated to be in the range of 3,000-6,000 MW. Currently, Kenya has a total installed large hydropower capacity of 838.1 MW, with KenGen controlling most of this capacity. Some of the large hydropower plants operated by KenGen include Masinga, Kamburu, Gitaru, Kindaruma, Kiambere, Tana, Turkwel, Sondu Miriu, and Sang'oro.
- Sites for small-scale hydro projects are also being developed, with some of these projects being implemented by the Kenya Tea Development Authority (KTDA).
- Hydroelectric potential has been identified in the Lake Victoria basin (329 MW), the Rift Valley basin (305 MW), the Athi River basin (60 MW) and the Tana River basin (790 MW) among others.

Wind

- By the end of June 2021, the total installed wind capacity in Kenya was 435.5 MW thanks to the 25 MW Ngong wind farm which comprises of 30 850 kW turbines and the 310 MW Lake Turkana wind farm which comprises of 365 turbines of 850 kW. In 2021, the 100 MW Kipeto wind farm was commissioned, increasing the share of wind power in Kenya's installed energy capacity.
- The LCPDP identifies the locations for the best wind sites in Kenya as Marsabit, Samburu, Laikipia, Meru, Nyeri, Nyandarua and Kajiado counties. In total, it's estimated that Kenya has an area of close to 90,000 km² with excellent wind speeds of 6m/s and above.
- There's significant potential for the development of wind energy in Kenya. The fact that the costs of developing wind energy have been on the decline in recent years only adds to the viability of wind energy as a key player in the development of Kenya's energy sector.

Solar

- Due to its location near the equator, Kenya is endowed with very high solar resources. Despite this, solar generation currently accounts for only 3.2 % of Kenya's installed capacity. This situation is quickly changing with various solar power projects currently in development. The most notable solar power plant in Kenya is the 50 MW Garissa Solar Power, which was developed by REREC. Other solar power projects in development include a 40 MW solar power project in Malindi, two 40 MW solar power plants in Uasin Gishu, a 40 MW solar power project in Lamu, and a 30 MW solar project in Makueni.
- Solar power is also seen as a driver for rural electrification. According to EPRA, an estimated 500,000 rural households in Kenya have solar home systems. This is largely attributed to private sector activity whereby companies such as M-Kopa, Sun King, Mobisol and Azuri offer consumers a battery package that is capable of running three or four lights, TV and a sound system.
- Many industrial consumers of power are also gradually shifting to solar power to generate their own electricity.

Biomass energy

- There are various biomass plants in Kenya that use sources such as agricultural waste, slaughterhouse waste, and municipal waste. As at June 2021, biomass accounted for 0.07% of the effective installed capacity.
- The LCPDP recognizes the potential of biomass in Kenya and indicates that its use for power generation into the national grid is being explored.
- Currently, KPLC does not purchase electricity generated from biomass.

Ocean energy

- Currently, Kenya does not have any ocean energy on its national grid. In February 2011, the Ministry of Energy had granted SDE Energy Ltd (SDE), an Israel-based energy company, the approval to construct a Tidal Power Plant project in the coastal line of eastern Kenya at a cost of USD80 million.³ There has, however, been little progress on the project.
- Ocean energy remains an untapped resource in Kenya. Given that the same is not mentioned in the LCPDP, this situation is not likely to change any time soon.

References

- [1] [Kenya to fully transition to clean energy by 2030](#)
- [2] [EPRA: Energy and Petroleum Statistics Report 2021](#) pg 10
- [3] [Energy & Resources Market Research Reports & Industry Analysis](#)

Current issues in the renewables industry

- In 2021, the Ministry of Energy issued The January 2021 Feed in Tariffs Policy (**2021 FIT Policy**) and The Renewable Energy Auctions Policy, January 2021 (**REAP Policy**). The 2021 FIT Policy is a revision of the 2012 FIT Policy with substantial changes introduced on the development of renewable energy projects in Kenya, in a bid to align with the Energy Act, 2019 and other recent developments in the Kenyan energy sector.
- Solar, wind and other renewable energy projects larger than 20 MW (except for geothermal power projects) will now be procured through power auctions under the REAP Policy. The objective of the REAP Policy is to enable the government to procure renewable energy on competitive terms. The REAP Policy marks a shift in the procurement of renewable energy capacity.
- Renewable energy power plants not exceeding 20 MW in biomass, biogas and mini hydro technologies will, on the other hand, be procured under the 2021 FIT Policy. Under the 2021 FIT Policy, all projects approved for implementation under it will not require any form of security or guarantee from government, including letters of support.
- In March 2021, the President of Kenya appointed a taskforce (**PPA Taskforce**) to review PPAs entered into by KPLC. The Taskforce made a raft of recommendations that may, if implemented, affect the renewable energy sector in Kenya. Some of the key recommendations include:
 - renegotiation of PPA tariffs within the existing contractual arrangements, to reflect price changes. This is likely to affect IPPs with renewable energy projects that were procured under the 2012 FIT Policy; and
 - captive power approvals should be granted for renewable energy technologies only. This will promote the reliance of renewable energy in Kenya.
- There's been an increase in the uptake of self-generation among corporate entities in Kenya. These include:
 - Ecobank, which announced in February 2021 that it was rolling out solar power solutions in its branches across the country to reduce operation costs and ensure reliable power supply.
 - Kenya Tea Development Agency, which has set up various hydropower plants throughout the country to reduce the energy costs associated with processing and manufacturing tea.
 - East Africa Breweries Limited, which announced plans to completely stop relying on power from KPLC by 2030.
 - Devki Group which announced that it is in the process of commencing its own power supply by 2023. The company will start with the construction of a 64 MW power plant in the Pokot region.
- While Kenya has an abundance of coal, plans to develop coal power plants have faced difficulty in attracting funding given the challenges coal poses in terms of climate change and the environment. This is in addition to the challenge of resistance from local communities and environmental activists. While the LCPDP contains plans for the development of coal power plants in the Mui basin, it's unclear whether these will take off. In fact, at the COP26 Climate Conference in Glasgow, President Kenyatta stated that Kenya is determined and on course to achieving full transition to clean energy by the year 2030.
- KenGen is conducting a feasibility study on reconfiguring of thermal power plants to use liquefied natural gas by 2030. This is part of Kenya's pursuit of a 100% climate-friendly grid.¹

Renewables laws

- The National Energy Policy, 2018 recognizes the potential of renewable energy in enhancing energy security, mitigating climate change, generating income, and creating employment in Kenya. The policy's objectives include encouraging generation of electricity from renewable resources.
- The Energy Act, 2019 is the main legislation governing the renewable energy sector in Kenya. It requires the Cabinet Secretary responsible for energy to promote the development and use of renewable energy technologies, such as biomass, biodiesel, bioethanol, charcoal, fuelwood, solar, wind, tidal waves, hydropower, biogas and municipal waste. It also has established the Renewable Energy Resource Advisory Committee which is an inter-ministerial committee tasked with advising the Cabinet Secretary for Energy on matters pertaining to renewable energy resources in Kenya.
- The FIT Policy, 2012, promoted the generation of electricity from renewable energy sources by enabling power producers to sell electricity generated at a pre-determined tariff for a given period. The government recently published the 2021 FIT Policy, which is a

revision of the 2012 FiT Policy but whose application has been limited to renewable energy power plants not exceeding 20 MW in biomass, biogas and mini hydro technologies. The 2021 FiT Policy shall only apply to renewable energy power plants developed after its publication.

- The REAP Policy 2021 governs the procurement of all renewable energy projects except for geothermal projects and renewable energy projects that fall under the proposed 2021 FiT Policy.

References

[1] [Kenya to convert oil plants to LNG in climate-friendly grid push](#)

Government incentive schemes

- Kenya has in place a feed-in tariff scheme for renewable energy generators. Under the scheme, power producers are able to sell electricity generated to KPLC at a pre-determined tariff for a given period. The feed-in tariff scheme was introduced in 2008 through the 2008 FiT Policy, which covered wind, small hydro and biomass sources, for plants with capacities not exceeding 50 MW, 10 MW, and 40 MW respectively. The FiT Policy was revised in 2010 and 2012 to include geothermal, biogas and solar resources. The 2012 FiT Policy has been in use until the introduction of the FiT Policy, 2021 which exclusively covers renewable energy power plants not exceeding 20 MW in biomass, biogas and mini hydro technologies.
- In the past, the government of Kenya has also traditionally issued letters of support for energy projects approved for implementation by IPPs. This has been instrumental in ensuring the bankability of energy projects in Kenya. The PPA Taskforce has however recommended that moving forward, government support measures should only be issued in exceptional circumstances and for strategic projects of national interest. This has been entrenched in law under the PPP Act, 2021.
- There are also various tax incentives that are applicable to players in the renewable energy sector. These include:
 - VAT exemption on specialized equipment for the development and generation of solar and wind energy, including deep cycle batteries which use or store solar power; and
 - VAT exemption on inputs or raw materials supplied to solar equipment manufacturers for manufacture of solar equipment or deep cycle-sealed batteries which exclusively use or store solar power.
- Players in Kenya's renewable energy sector also benefit from various tax incentives that apply to the energy sector at large. These include the exemption from tax on interest to be paid on loans from foreign sources for investing in the energy sector and exemption from tax on payments made to a non-resident for services rendered under a power purchase agreement.

Major projects and companies

- Frontier Energy is currently involved in the development of two 40 MW solar power plants in Uasin Gishu (Selenkei and Cedate Solar PV power projects). The projects reached financial close in 2019 with FMO and EIB as senior lenders.
- Kenya Solar Energy Limited is developing a 40 MW solar power project in Witu, Lamu county.
- Globeleq is developing a 40 MW solar power plant in Malindi County.
- KenGen remains a leader in the energy generation space in Kenya and has various projects currently under development. These include:
 - the development of the 83 MW Olkaria I unit 6 which was commissioned recently adding 86 MW to the grid;
 - the rehabilitation of the 45 MW Olkaria 1 (Units 1, 2 and 3) Geothermal Power Plant to upgrade it to 50.7 MW;
 - development of a 40 MW solar photovoltaic (PV) pilot plant in seven forks area in Embu county;
 - the redevelopment of Gogo Power Plant in Migori County to increase the current installed capacity from 2 MW to 10 MW;
 - raising of the Masinga Dam Spillway by an additional 1.5 meters to increase its storage and power generation capacity; and
 - conducting a feasibility study to determine the potential of wind power in Marsabit.
- Serengeti Energy (formerly known as ResponsAbility Renewable Energy Holding (rAREH)) is developing a 33 MW solar power project in Makindu, Makueni County.

- Alten Energías Renovables is developing a 40 MW solar power project in Kesses, Eldoret County.
- Aperture Green Power Company is developing a 50 MW Wind Power Project in Limuru, Kiambu County.
- Chania Green Generation is also developing a 50 MW Wind Power Project in Kajiado County.

Foreign investment ownership

- The Investments Promotion Act, 2004 is one of the legislative instruments governing foreign investment in Kenya. It established the Kenya Investment Authority, which promotes and facilitates investments in Kenya. The Authority assists foreign investors by issuing investment certificates, assisting in obtaining any necessary licenses and permits, and assisting in obtaining incentives or exemptions under various tax laws in Kenya. It provides that a foreign investor is entitled to an investment certificate from the Authority if:
 - the application is complete and satisfies the applicable requirements under the Act;
 - the amount to be invested by a foreign investor is at least USD 100,00 or the equivalent in any currency; and
 - the investment and the activity related to the investment are lawful and beneficial to Kenya.
- The Foreign Investments Promotion Act, Chapter 518 of the Laws of Kenya, gives protection to certain approved foreign investments in Kenya. It allows a foreign national who proposes to invest foreign assets in Kenya to apply to the Minister for a certificate that the enterprise in which the assets will be invested is an approved enterprise for purposes of the Act. It provides for protection from compulsory acquisition and permits the transfer of profits outside of Kenya.

UNFCCC – Paris Commitments and beyond

- Kenya signed the Paris Agreement on 22 April 2016 and ratified the agreement on 28 December 2016.¹ At the onset Kenya had committed to reducing greenhouse gas emissions by 30% by 2030. This target has now been revised upwards to 32% by 2030.²
- The Climate Change Act currently forms the backbone of Kenya's drive to address climate change. It was enacted in 2016 to provide a regulatory framework for an enhanced response to climate change. The Climate Change Act establishes the governance structures for climate change management in the country with the National Climate Change Council being responsible for oversight and coordination. It requires the Cabinet Secretary for Environment and Forestry to formulate a five-year National Climate Change Action Plan (NCCAP) prescribing among others measures and mechanisms for the achievement of low carbon climate development. It also establishes the Climate Change Directorate as the lead government agency responsible for coordinating climate change plans and actions and related measurement, monitoring and reporting.
- The NCCAP 2018-2022 sets out the various measures that the government aims to take to realize low carbon climate resilient development. These measures include:
 - increasing renewable energy for electricity generation;
 - enhancing energy and resource efficiency; and
 - promoting clean, efficient, and sustainable energy technologies to reduce over-reliance on fossil fuels.

References

[1] [United Nations: Kenya](#)

[2] [United Nations: NDC Registry](#)

Relevant resources and references

Relevant websites

- [Energy and Petroleum Regulatory Authority](#)
- [Geothermal Development Company](#)
- [Kenya Electricity Generation Company](#)
- [Kenya Electricity Transmission Company Limited](#)

- [Kenya National Bureau of Statistics](#)
- [Kenya Power and Lighting Company](#)
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- [Kenya's Updated Nationally Determined Contribution](#)
- [Least Cost Power Development Plan](#)
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Mauritius

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Mauritius draws legal principles from both French civil law and British common law.• Language: English, French and Mauritian Creole and ethnic languages such as Hindi, Telugu, Tamil, Malayalam, Marathi, Urdu, Tamil or Mandarin
Population	1.3 million
Gross national income (GNI) per capita	<p>GNI per capita: USD 10,230 in 2020, a 20.7% decline from 2019.</p> <p>USD 12,740 in 2019, up 3.5% from 2018. The GNI per capita of Mauritius was at USD 12,535 for the year 2019.</p>
Business environment	<ul style="list-style-type: none">• 2021 Global Innovation Index: 52 of 132 (1st in Africa)• World Happiness Report 2020: 49 out of 153 (1st in Sub-Saharan Africa).• 2020 Mo Ibrahim Index of African Governance: 1 out of 54• 2019 Global Competitiveness Index: 52 out of 141• 2021 The Wall Street Journal & The Heritage Foundation Index of Economic Freedom: 13 out of 178 (1st in Africa)• 2020 Corruption Perceptions Index: 52 out of 180
Profile	

Mauritius is an island situated in the Indian Ocean, just over 1,130 kilometres east of Madagascar, off the south-eastern coast of Africa. Its outlying territories include Rodrigues Island and other smaller islands. The island has a mixed developing economy based on manufactured exports, agriculture, tourism and financial services.

Mauritius forms part of the Commonwealth, having joined in 1968 following its independence from Britain on March 12 that year. Under the constitution, the legislative power is vested in a National Assembly, which is elected every five years and consists of 62 elected members and up to a further eight members drawn from the pool of candidates who were not elected but who may be appointed to broaden representation among minorities or under-represented parties.

Executive power is exercised by a Council of Ministers headed by a prime minister (appointed by the president), who then assembles a government from members of the National Assembly. The president and vice president are elected by the National Assembly for a term of five years.

Electricity industry overview

- In Mauritius, the primary energy requirements are met from a mix of imported sources (mainly petroleum products and coal) and local renewables. In 2020, 76.1% of the country's electricity was generated from non-renewable sources: coal (39.5%), fuel oil and diesel (36.6%). The remaining 23.9% was obtained from renewable sources: bagasse (sugarcane pulp used as biomass fuel) (13.3%), photovoltaic (PV) (5.1%), hydro (4%), wind (0.6%) and landfill gas (0.9%).
- In 2020, due to the COVID-19 pandemic, lockdown restrictions came into effect on the Island of Mauritius from March to May. This pandemic has impacted various sectors of the economy including the energy sector which saw approximately 11% reduction in electricity generation in 2019/ 2020. Electricity's peak demand dropped from 507 MW to 494 MW resulting in a reduction in the sale of electricity from 2,716 GWh to 2,409 GWh, with the commercial and industrial sectors most impacted. There were also decreases in imports and in the consumption of petroleum products such as gasoline, diesel oil and aviation fuel. In contrast, renewable energy sources such as photovoltaic, hydro, landfill gas and wind have been on the rise.
- The *Climate Change Act* was gazetted on 28 November 2020 and came into force on 22 April 2021. Under the Act, the Department of Climate Change is responsible for coordinating the implementation of relevant commitments to ensure compliance with the international climate change agreements. An Inter-Ministerial Council on Climate Change is provided to set national objectives, goals and targets with a view to make Mauritius a climate resilient and low emission country. A Climate Change Committee has also been established to enable multi-stakeholder participation for the preparation of the national climate change strategies and action mitigation and adaptation plans.
- The Act builds on an already strong climate change regulatory framework which includes:
 - Mauritius Renewable Energy Agency Act of 2015;
 - the National Disaster Risk Reduction and Management Act of 2016;
 - Land Drainage Authority Act of 2017;
 - Local Government (Amendment) Act, 2018; and
 - Mauritius Meteorological Act, 2019.

Renewable energy overview

- Some 23.9% of the energy sources in electricity generation in 2020 were obtained from renewable sources, comprising bagasse (sugarcane pulp used as biomass fuel) (13.3%), photovoltaic (PV) (5.1%), hydro (4%), wind (0.6%) and landfill gas (0.9%).
- In 2019/2020, electricity generated from renewable sources decreased by 2% (702 GWh to 688 GWh) along with electricity generated from bagasse, which included cane trash, decreased by 12.7% (440 GWh to 384 GWh).
- However:
 - landfill gas increased by 25% (20 GWh to 25 GWh);
 - hydro increased by 17.2% (99 GWh to 116 GWh);
 - wind increased by 20% (15 GWh to 18 GWh); and
 - photovoltaic energy source grew by more than 13%.
- These figures represent a gradual growth in the share of renewable energy – particularly solar and hydro – in the country's electricity generation over the last four years.
- In respect of institutional and regulatory changes, the government created the Mauritius Renewable Energy Agency (MARENA) under the *MARENA Act 2015*. MARENA is empowered, among other things, to oversee and promote the development of renewable energy in Mauritius, including research and innovation. In 2017, the CEB Act was amended to allow CEB (Green Energy) Co Ltd, whose function is to promote renewable energy, to participate in power projects without having recourse to public procurement.

Current issues in the renewables industry

- Given one of the government's key objectives is to change the energy mix and lift renewables from 14% to 60%, a primary challenge remains as to whether the existing national electricity grid has the capacity to take up the increased power generated from renewable sources. A number of risks will need to be addressed by the government to achieve this target including the modernization of the country's national electricity grid and the use of smart technologies.
- Because renewable energy is not entirely waste-free, the lack of a proper and efficient framework to safely dispose of used solar cells, batteries and PV panels could potentially hamper the country's goal towards achieving environmental sustainability also.
- The proper expansion of renewable energy capacity will also require further supporting policies to allow for fair and transparent development from tariff setting to technical adaptation of the grid.

Government incentive schemes

- In the 2021-2022 budget, renewable energy has been identified as a new pillar for Mauritius' economic growth. In light of the budget plan, the government has outlined its intention to take on board the following measures:
 - Setting up a National Biomass Framework, remunerating bagasse at MUR3.50 per kWh for all planters.
 - Investment by the CEB over the next three years of some MUR5.3 billion in increased battery capacity up to 40 MW, Gas Insulated Switchgear (GIS) substations and a 10 MW solar farm at Tamarind Falls, Henrietta.
 - Request for proposal by the CEB to construct a MUR2.4 billion 40 MW wind farm.
 - Carrying out a feasibility study on implementing offshore windfarms and mini hydro power plants and on the safe disposal of used solar panels and batteries.
 - Incentivising the use of electric vehicles by making purchases duty-free, reducing registration duty and road tax.
 - Removing the 5% excise duty on electric vans of up to 180 kW used to transport goods.
 - Allowing owners of electric vehicles to install a PV system not exceeding 10 kW to charge their vehicle and export any surplus to the grid.
 - Purchasing 25 electric buses for the National Transport Corporation to renew its fleet.

- The National Biomass Framework will encourage more landowners in Mauritius to engage in the production of renewable energy from biomass sources such as bagasse and consequently ensure a more equitable contribution from the sugarcane industry to support small farmers.
- Furthermore, the incentives and subsidies on electric vehicles will encourage a “greening” of the transport system in Mauritius which currently accounts for a significant proportion of energy consumption. The use of ethanol which is being produced only for export should also be encouraged.

Major projects and companies

- Mauritius has encouraged the financing and development of PV power plant projects through both international competitive bidding and joint ventures between the local private sector and international companies.
 - For example, the Medine Group in partnership with Akuo Group, set up a solar farm in Henrietta that has been operational since February 2019 with a production capacity of 17.5 MW. There have also been several initiatives led by the Central Electricity Board (CEB), the public utility company, such as the installation of PV rooftop systems on 10,000 low-income households.
 - Helios Beau Champ is a project of the Alteo Group and consists of 38,016 photovoltaic panels laid out over 14 hectares of land. It can generate up to 16 GWh of electricity per year, all of which is sold back to the Mauritian grid.
 - Terragen which is part of the Terra group also has an agenda to favour renewable energies as an alternative to coal. The measures to be implemented include:
 - Increase the yield of sugar cane straw to produce more electricity from it;
 - Set up a solar power plant, to reduce the consumption of coal;
 - Introduce eucalyptus-type biomass fuels – cultivation has already started with Terragri – or even, recycled wood.

Foreign investment ownership

- In regards to institutional and regulatory changes, the government created the Mauritius Renewable Energy Agency (MARENA) under the MARENA Act 2015. MARENA is empowered, among other things, to oversee and promote the development of renewable energy in Mauritius, including research and innovation.
- In 2017, the CEB Act was amended to allow CEB (Green Energy) Co Ltd, whose function is to promote renewable energy, to participate in power projects without having recourse to public procurement.
- It should be noted that non-citizens are still unable to hold more than 15% of shares in listed sugar companies without the prior written consent of the Financial Services Commission.
- Most renewable energy producers such as Alteo or Terra are listed sugar companies.

UNFCCC – Paris Commitments and beyond

- In light of the principle of common but differentiated responsibilities and respective capabilities, and in view of different national circumstances, and the principles of flexibility as inscribed in the Paris Agreement and decision 18/CMA.1, reporting and transparency will improve over time in Mauritius. Following the submission of the Mauritius Nationally Determined Contribution (NDC) on 1 October 2021, Mauritius will develop an Action Plan including details about policies and measures. Future improvements, corrections, recalculations and/or modifications may also follow.
- Mauritius will continue to engage with stakeholders (including businesses, civil society, youths, students, women, senior citizen and the research community) to co-create and co-deliver solutions, amplify awareness and encourage a whole-of-nation effort to address climate change.
- Mauritius believes that setting out the climate policy aspirations and strategies well in advance will help provide a clear sense of direction, minimise any negative disruptions to the economy and workforce and keep Mauritius competitive in a carbon-constrained world.
- Climate Change is reflected, inter alia, in the following national policies and strategy documents:

- Guideline for Climate Change Adaptation Strategy Coastal Setback (2016);
- Grid Code for Medium Scale Distributed Generation (MSDG) (2016);
- Net-Metering (Medium Scale Distributed Generation MSDG) (2016);
- Green Energy SSDG Scheme for Cooperatives (2017); and
- Vision 2030.
- Various sectoral roadmaps include:
 - Renewable Energy Road map 2019 -2030 (being revised);
 - Electric Vehicle Integration Road map 2020-2030.
- Masterplans include:
 - Draft Master Plan on Environment (2021- 2030) (under finalisation);
 - Marine Spatial Planning;
 - Wastewater Master Plan;
 - the Master Plan for Energy Efficiency/Demand Side Management and Action Plan for the period 2016 to 2030;
 - Renewable Energy Strategic Plan 2018-2023), all published by the respective government agencies;
 - Land Drainage Master plan (under finalisation).
- The Climate Change Act was gazetted on 28 November 2020 and came into force on 22 April 2021. Under the Act, the Department of Climate Change is responsible for the coordination and implementation of relevant commitments to ensure compliance with the international climate change agreements. An Inter-Ministerial Council on Climate Change sets national objectives, goals and targets with a view to making Mauritius a climate resilient and low emission country. A Climate Change Committee has also been set-up to enable multi-stakeholder participation for the preparation of the national climate change strategies and action plans for mitigation and adaptation.
- Further, besides the Climate Change Act, 2020, the existing regulatory framework to fight climate change has been strengthened with the following climate change; related legislations include:
 - Mauritius Renewable Energy Agency Act of 2015;
 - the National Disaster Risk Reduction and Management Act of 2016;
 - Land Drainage Authority Act of 2017;
 - Local Government (Amendment) Act, 2018; and
 - Mauritius Meteorological Act, 2019.
- In March 2021, Mauritius prepared the National Disaster Risk Reduction and Management Policy, Strategic Framework and Action Plan reports which are closely aligned with the Sendai Framework for Disaster Risk Reduction 2015-2030 and provide a pathway for achieving the internationally agreed priorities for action and targets in the Sendai Framework.
- Other initiatives and programmes to improve climate resilience are as follows:
 - The Adapt' Action Programme financed by AFD to the tune of EURO 2 million for the implementation of first Mauritius NDC.
 - Two National Adaptation Plans are being formulated to enhance resilience to climate change: (a) one on Infrastructure, bridges and culverts, Disaster Risk Reduction for flood prone areas and coastal zones, for a total of USD 2.5 million from the Green Climate Fund (GCF) and (b) another on health for a total of USD 425,000 from the GCF.
 - Technical assistance on Institutional Gaps and Needs Assessment to operationalize the Department of Climate Change (Euro 100,000).
 - Operational study of the coastal risks in Mauritius and Rodrigues (coastal erosion and coastal inundation) (Euro 1 million).

- Vulnerability Assessment and Analysis in the Agriculture sector (USD 105,000) under the SADC regional climate change programme.
- Development of long-term strategies (2050) for the following sectors: energy, transport, agriculture and tourism (Euro 1.1 million) under AFD Facilité 2050.

Relevant resources and references

Relevant websites

- [Statistics Mauritius](#)
- [Financial Services Commission website](#)
- [Central Electricity Board website](#)
- [United Nations Climate Change website](#)
- [Government Information Service](#)

References

- [Statistics Mauritius – Ministry of Finance, Economic Planning and Development Publication “Energy and Water Statistics – 2020”](#)
- [Mauritius Enters the High-Income Countries' Category](#)
- [International Indices](#)
- [Final updated NDC report for the Republic of Mauritius 01 October 2021](#)
- [Renewable energy: Medine and Akuo Energy jointly develop a solar farm project at Henrietta](#)

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Mozambique

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Roman-Dutch Civil Law• Language: Portuguese
Population	31.2 million people (in 2021)
Gross national income (GNI) per capita	GNI per capita: USD 460 (in 2020)
Business environment	<ul style="list-style-type: none">• 2019 Ease of Doing Business Report: 138 of 190• 2019 Global Competitiveness Index: 137 of 140• 2020 Index of Economic Freedom: 50.5 score, up from 48.6 score previous year (a change of 3.91%)• 2020 Corruption Perceptions Index: 149 of 179• 2020 UN Development Programme Human Development Index: 181 of 189
Profile	<ul style="list-style-type: none">• Mozambique is located on the east coast of southern Africa. It covers an area of 799,380 km², with a coastline approximately 2,515 km long. It shares borders with South Africa, eSwatini (former Swaziland), Zimbabwe, Zambia, Malawi, and Tanzania. Its administrative division is comprised of 11 provinces, namely: Maputo - Cidade, Maputo - Província, Gaza, Inhambane, Sofala, Manica, Tete, Zambézia, Nampula, Niassa and Cabo-Delgado.• In terms of politic system it is a Democratic Republic based on the principle of separation and interdependence of powers, with presidential elections every 5 years.

- Key economic sections include agriculture, extractives, manufacturing, transport, storage, communication and tourism. The top three export goods by value (in 2020) were coke, power and aluminium and the top three import sources (in 2020) were India, South Africa and United Kingdom.

Electricity industry overview

- The electricity industry in Mozambique is characterized by the prominent role played by the National Electricity Utility Company, *Electricidade de Moçambique* (EDM) which manages the national grid and actively participates in the entire value chain, from generation to distribution as well as being the sole electricity offtaker.
- EDM was created in 1977 (two years after the independence) and since then has been acting also as the sector's joint regulator with the National Electricity Council, *Conselho Nacional de Electricidade* (CNELEC). The Energy Regulatory Authority, *Autoridade Reguladora de Energia* (ARENE) replaced CNELEC in 2017.
- The right to develop electricity projects is granted through a Power Concession Agreement by (i) the Ministry of Mineral Resources and Energy for projects with capacity less than 100 MW and by (ii) the Council of Ministries (the Government) for projects with capacity from 100MW.
- The majority of the electricity in Mozambique is generated from hydropower thanks largely to Cahora Bassa, the largest hydroelectric power plant in the continent. It has a capacity of 2.075 MW and plays a pivotal role in the Southern Africa Power Pool as well as acting as a hub of electricity generation for the Southern Africa region.
- Energy scarcity continues to be a significant challenge with only 34% of the population having access to electricity. This is compounded by the lingering colonial transmission and connection infrastructure which does not meet current demands.
- In 2020, the installed electricity capacity was around 2.780 MW and, according to the 2018-2043 Integrated Master Plan for Electricity Infrastructures, that capacity will increase to 6.001 MW by 2030. In 2020 it was reported that almost 80% of Mozambique's electricity matrix was hydropower (2.189 MW), and other sources including:
 - 442 MW of natural gas, (16%);
 - 108 MW of Heavy Fuel Oil - HFO, (4%), and
 - 41 MW of solar photovoltaic, (1%).
- The legal framework of the electricity sector in Mozambique is still under improvement and consolidation. The main legal instruments regulating the sector are as follows:
 - Law n.º 21/97, of 1 October ("Electricity Law");
 - Law n.º 15/2011, of 10 August, ("Public, Private Partnership Law");
 - Decree n.º 8/2000, of 14 April ("Electricity Law Regulation");
 - Decree n.º 42/2005, of 29 November ("National electricity Grid;
 - Decree n.º 16/2012, of 4 June ("Public, Private Partnership Law Regulation").
- In an attempt to address the challenge of electricity scarcity, the Government of Mozambique has approved the National Strategy for Electrification 2018 to 2030, which was followed by the launch of the Mozambique Electricity for All Project, also known as ProEnergia, replacing the MOZA-LIGA Project (which had essentially the same purpose). ProEnergia's main goal is to ensure energy access for all citizens by 2030.
- To meet its targets, ProEnergia is looking to boost the country's renewable energies capabilities.

Key future projects are include:

- The Central Termica de Temane (CTT), a gas-fired power plant will have approximately 450MW capacity and will be complemented by the Temane-Maputo Transmission Project (TTP) which will involve the construction of 563km of 400kV single-circuit transmission lines along with three new substations. Construction works were scheduled to be started in late 2021;
- The construction of the long-awaited Mphanda Nkuwa Dam, which has a 1,500 MW capacity.

Renewable energy overview

- At present, no electricity in Mozambique is generated using fossil fuels.
- Renewable energy projects are subject to the general procedure and requirements as applicable to mega projects, in addition to the Tariff Regime for New and Renewable Energies, Mozambique.
- Given the predominance of hydropower solar and wind are expected to grow significantly in the future.
- In terms of potential capacity, The National Energy Fund - *Fundo Nacional de Energia* - FUNAE indicates that the outlook of renewable energy in Mozambique is as follows:
 - Hydric: With 18.572 MW
 - Wind: With 4.580 MW
 - Solar: With 2.702 MW
 - Geothermal: With 57 MW
 - Biomass: With 2.181 MW
 - Waves: With 11 MW
- Government initiatives related to renewables include:
 - Under ProEnergia, the Government of Mozambique launched the Promotion of Auctions for Renewable Energy (PROLER) in 2020, which aims to achieve greater capacity for generating renewable energy resources at a lower cost for the benefit of the end-consumer;
 - EDM has already launched two pioneering solar projects - the Mocuba Solar Power Plant with 40 MW capacity which commenced operations in 2019 and the Metoro Solar Power Plant with 30 MW capacity, which is expected to commence operations in January 2022.

Current issues in the renewables industry

- The electricity law dates from 1997 and needs to be improved to accommodate the evolution of the sector. Significant steps have been taken in that regard, including an advanced draft which was expected to be approved by the end of 2021. It is anticipated that EDM will be maintained as the sole electricity offtaker.
- Given Mozambique hosts one of the biggest investments of natural gas from the Rovuma Basin, it is expected a strengthening of the domestic supply from natural gas to generate more electricity will stimulate more investments on the Gas-to-Power projects.
- Mozambique intends to become an energy hub in southern Africa with the production of hydrogen. Cheap energy used to produce hydrogen would be a real motivator for the construction of Mphanda Nkuwa Dam on the Zambezi River, a project that exists since the colonial era.
- In September 2021 the Government approved the Regulation for Off-Grid Energy Access. This is a milestone as it provides greater clarity to all actors in the off-grid energy sector and ensures the necessary conditions for the private sector to develop its activities and protect its investments in a diverse set of technologies applicable to the off-grid context, such as solar home systems, mini-grids, and improved cooking solutions.

Government incentive schemes

- With PROLER calling for bids under a public tender system, the Government intends to provide greater transparency and competitiveness in the renewable energy sector, which will attract national and international investors.

- The draft of the Electricity Law proposes to liberalize mini-grids of 1 to 5 MW in Mozambique will see them struggle to compete with neighboring countries who are liberalizing their grids by up to 100 MW. This will need to be reviewed to remain competitive in this space.

Major projects and companies

The major projects are as follows:

- CTRG (Central Termica de Ressano Garcia), a gas-fired power plant with 175 MW capacity, operating since 2016;
- CTT (Central termica de Temane), a gas-fired power plant scheduled to commence construction in 2021, with 450MW combined with the construction of 563km of 400kV transmission lines along with three new substations
 - In Temane, Province of Inhambane and the transmission line over three provinces, namely Inhambane, Gaza and Maputo
 - The construction works were scheduled to start in late 2021
- Mphanda Nkuwa Hydroelectric Power Plant with 1.500 MW capacity
 - In Cahora Bassa District, Province of Tete
 - Funding is scheduled for 2024 with the project to commence shortly thereafter
- Metoro Solar Power Plant with 30 MW capacity
 - In Ancuabe District, province of Cabo Delgado
 - Operations are scheduled to commence in January 2022
- Namaacha Wind Power Plant with 120 MW capacity
 - In Namaacha District, Province of Maputo
 - Currently under feasibility studies
- Tsatse Hydroelectric Power Plant with 50 MW capacity
 - In Tsatse, Province of Tete
 - Currently under feasibility studies
- Boroma Hydroelectric Power Plant with 180 MW capacity
 - In Boroma, Province of Tete
 - Currently under feasibility studies
- Lupata Hydroelectric Power Plant with 600 MW capacity
 - In Lupata, Province of Manica
 - Currently under feasibility studies
- Some of the companies involved are as follows: Globeleq Africa Holdings Limited; EleQtra, Limited; Scatec Solar; KLP Norfund Investments; Neon Energy Group; Ncondezi Energy, among others.

Foreign investment ownership

- The main investment legislation in Mozambique comprises:
 - Law n. º 3/93, of 24 June, (the “Investment Law”);
 - Decree n. º 43/2009, of 21 August as amended by Decree n. º 21/202, of 13 April, (the “Regulations of the Investment Law”);
 - Law n. º 4/2009, of 12 January (the “Code of Fiscal Benefits”);

- Decree n. ° 56/2009, of 7 October (the “Regulations on the Fiscal Benefits Code”).
- Foreign investors with a project in Mozambique must register their project as well as the funds imported as FDI with the Bank of Mozambique (the Central Bank). This registration is carried out through their commercial bank. The funds from foreign direct investment must be registered at the commercial bank within 90 days from the entry of funds into Mozambique.
- There are four main investment incentives available in Mozambique:
 - Tax incentives;
 - Customs incentives;
 - Incentives related to the repatriation of capital invested and profits; and
 - Protection/guarantees provided by the Mozambican state for private property and investments.

UNFCCC – Paris Commitments and beyond

- Mozambique ratified the relevant international instruments relating to the environment and has actively taken steps towards environmental safeguard and mitigating the effects of pollution as demonstrated below:
 - Through Resolution n. ° 23/2017 of 29 December, Mozambique ratified the Paris Agreement on Climate Change;
 - In an attempt to meet the Paris Agreement goals, on 15 November 2018, the country validated and launched a Partnership Plan for Climate Action, aiming at supporting the country implementation of the Intended Nationally Determined Contribution (“INDC”) 2020 - 2025, which highlights an ambitious mitigation commitment to reduce about 76.6MtCO₂ per year from 2020 to 2030;
 - The INDC also determines the strengthening of the legal and institutional framework and the development and financing of 2.200 MW new and renewable energy projects;
 - The enactment of the Decree n. ° 23/2018 of 3 May, which approves the Regulation for Increase and Conservation of Carbon Reserve Programs and Projects toward Reducing Emissions from Deforestation and Degradation (“REDD+ Decree”). This Decree provides for the possibility of issuing, transferring and transacting and withdrawing emission reduction securities - Carbon Credits, by the Ministry of Economy and Finance;
 - Recently, in the historic COP 26, Mozambique committed to strengthen the use of less polluting energy sources in order to ensure the energy transition. The natural gas was pointed out as the main to be used by Mozambique bearing in mind the discovery of significant natural gas reserves in Rovuma Basin.

Relevant resources and references

Relevant websites

- [FUNAE – Fundo de Energia](#)
- [Situação da Eletricidade em Moçambique](#)
- [EDM - Eletricidade de Moçambique](#)

References

- [ESTRATÉGIA DA EDM 2018-2028](#)
- EDM Strategy 2018-2028
- Resolution n. ° 23/2017 of 29 December, which ratifies the Paris Agreement on Climate Change
- Resolution n. ° 49/2018 of 31 December, approves the National Strategy for Electrification 2018 – 2030 (“ENE”) on 16 October 2016, followed by the launching of the so called *Mozambique Electricity for All Project*, also known as ProEnergia on 12 November 2018
- Law n. ° 21/97, of 1 October, approving the Electricity Law
- Law n. ° 15/2011, of 10 August, approving the Public, Private Partnership Law

- Decree n. ° 8/2000, of 14 April, approving the Electricity Law Regulation
- Decree n. ° 42/2005, of 29 November, establishing rules pertaining to the national electric energy grid
- Decree n. ° 16/2012, of 4 June, approving the Public, Private Partnership Law Regulation
- Decree n. ° 58/2014 of 17 October, which approves the Regulation that Establishes the Tariff Regime for New and Renewable Energies ("REFIT")
- The Decree n. ° 23/2018 of 3 May, which approves the Regulation for Increase and Conservation of Carbon Reserve Programs and Projects toward Reducing Emissions from Deforestation and Degradation ("REDD+ Decree")
- Law n. ° 3/93, of 24 June, which approved the Investment Law
- Decree n. ° 43/2009, of 21 August as subsequently amended by Decree n. ° 21/202, of 13 April, which approve the Regulations of the Investment Law
- Law n. ° 4/2009, of 12 January, which approved the Code of Fiscal Benefits
- Decree n. ° 56/2009, of 7 October, which approved the Regulations on the Fiscal Benefits Code
- Law n. ° 11/2016, of 30 December, as subsequently amended by Law n. ° 18/2017, of 28 December

Netherlands

Last modified 27 October 2023



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil law• Language: Dutch
Population	17.6 million
Gross national income (GNI) per capita	GNI per capita: USD 66,750
Business environment	<ul style="list-style-type: none">• UN Human Development Index (2022 report): 10 of 191 countries• Corruption Perceptions Index (2022 report): 8 of 180 countries• Index of Economic Freedom (2023 report): 8 of 176 countries• Global Competitiveness Index (2023 report): 5 of 64 countries
Profile	<p>The Netherlands is a country located in Western Europe and is part of the Kingdom of the Netherlands. The Kingdom consists of 4 countries: the Netherlands, Aruba, Curaçao and Sint Maarten. The countries work independently on some issues, and they work together on others. Each country has its own government.</p> <p>The Netherlands is a parliamentary democracy. Dutch people can choose who represents them in parliament. The Netherlands is also a constitutional monarchy. The King's position is laid down in the Constitution.</p>

Electricity industry overview

Electricity industry overview

- In 2022 the total electricity consumption was 117 billion kWh. The total gross electricity production was almost the same as in 2021.
- In recent years, the contribution of fossil fuels in electricity production has decreased in favor of renewable energy. This trend continued in 2022. While 81 percent of total electricity production came from fossil fuels in 2016, it was 55 percent in 2022.
- Of the total electricity production 40 percent came from renewable sources, up from 33 percent one year previously. Solar power production increased by 54 percent, while wind power production was up by 17 percent. This was largely related to increased capacity and more favourable weather conditions. Electricity production from biomass and hydropower declined. Production from fossil sources fell by 11 percent.
- Sources of energy used for electricity, per 2022:
 - Gas 39,6%
 - Wind 17,5%
 - Solar 14,6%
 - Coal 12%
 - Bioenergy 7,9%
 - Other fossil 5%
 - Nuclear 3,4%

Electricity Act 1998

- The Dutch Electricity Act of 1998 (the *Elektriciteitswet* 1998) is a pivotal piece of legislation that governs the production, transport, distribution, and supply of electricity in the Netherlands. The act deals with market liberalization and competition, unbundling of activities, grid management and access, guaranteed supply and universal service, and regulation and oversight.
- The Electricity Act is to be replaced by the new Energy Act. According to the Dutch government, the act aims to better protect energy consumers, enable more flexible use of the electricity grid, and organize secure data exchange between grid operators, energy companies, and consumers. Further, it establishes the foundation for significant changes in the Dutch energy system, which will contribute to combating climate change and reducing dependence on the import of fossil fuels. Additionally, it provides consumers, social institutions, and businesses with more opportunities to actively participate in the energy market.

Generation, distribution and transmission

- In the Netherlands, the major electricity distributors are Liander, Enexis and Stedin.
- TenneT is the sole electricity TSO in the Netherlands. It is responsible for the management, operation, and development of the high-voltage electricity grid in the country. TenneT ensures the reliable and secure transmission of electricity across the Netherlands.

Regulators

- The Electricity Act 1998 establishes regulatory bodies responsible for overseeing and enforcing the provisions of the act. These include the Authority for Consumers & Markets (ACM) and the Netherlands Enterprise Agency (*Rijksdienst voor Ondernemend Nederland* or RVO). These agencies play a role in regulating and monitoring the electricity market.

Renewable energy overview

Summary of the renewables industry

- Over the last decade, renewable energy consumption increased in the Netherlands. In 2021, the share of consumed energy derived from renewable sources reached 13 percent, an increase of roughly 45 percent in comparison with the consumption share registered in 2019.

- In 2022, renewable energy accounted for 15 percent of gross national energy consumption. That brings the Netherlands halfway its goal to generate at least 27 percent of its total energy consumption from renewable sources by 2030.
- Dutch renewable energy consumption amounted to 277 PJ (petajoules) in 2022, 6 percent more than in the previous year. One petajoule is the equivalent of the total energy use of around 23 thousand homes in 2022. The total final energy consumption from all sources was 1,850 PJ, over 7 percent lower than the year before and the lowest since 1990. "Partly due to the decrease in total consumption, the share of renewable energy increased," CBS said.

Renewable energy percentages of gross final energy consumption

- Biomass: 5,96%
- Solar: 3,34%
- Wind: 4,20%

Solar

- Forty-six percent more solar power was used in 2022 than in 2021. Not only did the number of newly installed solar panels rise further. At the end of 2022, the total capacity of installed solar panels in the Netherlands was more than 19 GW, 28 percent more than twelve months previously. This is more than the total capacity of all power stations combined (17 GW).
- The growth of solar power in the Netherlands hit an all-time high in 2022 with around 4.2 GW of installed power. The National Plan Energysysteem (*Nationale Plan Energiesysteem*) (NPE) forecasts that by 2050, the Netherlands will achieve a solar panel output of 173 GW. The NPE is the holistic plan developed by the Dutch government setting out what the future energy system of the Netherlands should look like.

Wind

- Wind energy consumption increased by 13 percent to 78 PJ last year. This is nearly the same amount as the combined electricity consumption of all homes in the Netherlands in 2022. Consumption from offshore wind farms amounted to approximately 30 PJ, about the same as the year before. Consumption of wind energy on land grew by 25 percent to 47 PJ. The total capacity of wind turbines grew by 14 percent compared to 2021.
- At least 4.5 GW of offshore wind farms need to be operation by 2023. This commitment is enshrined in the Energy Agreement for Sustainable Growth. Offshore wind farms will then supply 3.3% of all the energy in the Netherlands. The Climate Agreement (2019) and the coalition agreement (2021) include a commitment to maintain the offshore wind energy policy. Consequently, some 21 GW of offshore wind farms will need to be in operation around 2030, which is enough to supply 16% of all the energy in the Netherlands and 75% of current electricity consumption. The Dutch government presented its plans in the 'Offshore Wind Energy Road Map'.
- When it comes to generating wind energy on land, the Dutch government has set the goal that all onshore wind energy contributes to the goal of generating at least 35 TWh of sustainable electricity on land by 2030.

Geothermal

- Geothermal energy output in the Netherlands in 2022 grew by 6% compared to 2021. A total of 6.8 PJ of geothermal energy was produced from 36 geothermal energy doublets at 26 locations in the Netherlands. This corresponds to savings of more than 193 million cubic meters of natural gas for the year and a reduction of 365,000 tonnes in CO₂ emissions.
- There are currently 28 operating geothermal projects in the Netherlands. With 70 other projects in the pipeline, the number of geothermal projects in the country can reach 100 in the coming years.
- These measures are instrumental in attaining the country's goal of 55% to 60% CO₂ emissions by 2030. The Dutch geothermal sector is still very young but it has gained interest from major market players. Geothermal has the potential of supplying about 25% of the country's heat demand and possibly more than 50% of the heating requirement of the horticulture industry.

Biomass

- The gross final consumption of biomass decreased by 15 percent in 2022 compared to the year before. A quarter less biomass was co-fired at power stations last year. Stricter sustainability criteria for biomass also took effect in mid-2021.

- The Netherlands Programme Sustainable Biomass (NPSB) by the Netherlands Enterprise Agency supported around 40 pioneering projects in biomass for several years. The general outlook of the programme is that demand for biomass resources is expected to increase for both local markets and export markets as well as for existing uses and for new markets in the biobased economy. Future possibilities for biomass importing countries to use biomass depend not only on available sustainable production potentials, but also on demand from other countries. The NPSB project portfolio consists of the Global Sustainable Biomass Fund and the Sustainable Biomass Import Fund. These programmes are funded by the Dutch Ministry of Economic Affairs and Climate Policy and the Dutch Ministry of Foreign Affairs.

Current issues in the renewables industry

Grid capacity and congestion

- The rapid growth of renewable energy sources, such as wind and solar, has led to a strain on the existing electricity grid. Integrating these intermittent energy sources efficiently into the grid is a significant concern. The grid, once constructed based on a predictable production and offtake model, is unable to cope with large peaks, especially in the rural areas.
- Investments in grid infrastructure upgrades, smart grid technologies, and energy storage solutions are being pursued to alleviate grid capacity issues.

Permitting

- Obtaining the necessary permits for the development of renewable energy projects, especially in densely populated areas or ecologically sensitive regions, can be a lengthy and complex process in the Netherlands. Streamlining and expediting the permitting process, while maintaining environmental safeguards, is a priority for the Dutch government. Clearer regulatory frameworks and policies should also facilitate renewable energy development.

Local participation

- Since 2019, renewable energy developers and investors are obligated to include local citizens and businesses as participants in their Dutch wind, solar, geothermal, hydrogen and energy storage projects.
- In the 2019 Climate Agreement, the Dutch government, sector representatives and civil society organisations set a target of 50% local ownership for large-scale renewable energy projects. This fits the broader trend of democratising energy, where citizens and companies will eventually generate their own energy and use their own infrastructure.
- The Netherlands has already privatised both power producers and grid operators. The high percentage of rooftop solar installations and the rise of innovative solutions like closed distribution systems and energy hubs further reinforce local participation. This landscape poses an important challenge for developers and investors of renewable energy projects in the Netherlands.
- In addition, the defined purpose of local participation is still unclear and the legal framework to support it is lacking. The level of organisation, technical understanding and financial capabilities of participating citizens and businesses can vary widely. Overall, this can put the interests of developers and investors at risk.

Hydrogen

- The government is aiming to invest in the transition to hydrogen-based energy for at least the five main industrial clusters and the transport sector. The government has decided to transform the grid supplying the five clusters with natural gas to a grid for hydrogen, thereby forcing the industries in these clusters to adapt and transform to hydrogen powered industries as well. This project is called HyWay27.
- Hydrogen is regarded as a solution to respond to the fluctuations in the availability of renewable energy, especially from the offshore wind farms. In the Rotterdam area, investments are announced to build several electrolyzers. The north of the Netherlands inhabits a strong alliance; on one hand it's the local and regional governments and on the other hand several industrial corporations, which create the 'Hydrogen Valley'. This is meant to build a green hydrogen ecosystem based on wind energy from on shore and offshore wind farms. The project aims not only to provide for demand in the Netherlands, but also for Belgium and Germany.

Government incentive schemes

Main schemes

The main support schemes that have been implemented are the SDE++ and the Energy Investment Allowance (EIA).

- The *Stimulerende Duurzame Energie* (SDE++) subsidy can be used for using CO₂ reducing technologies. With this subsidy, the difference between the costs of the use of the CO₂ reducing technology, and the profit will be covered. This subsidy can be used for various kind of technologies, including: renewable electricity, renewable heat, renewable gas, CO₂ reducing energy. This subsidy scheme, even as its predecessor the SDE+, is a great stimulus for renewable energy projects. Wind and solar have benefitted well from these schemes and are currently also supporting CCUS projects.
- The Energy Investment Allowance (EIA) provides for a tax reduction up to 11% to stimulate investments in energy-efficient technologies and sustainable energy. The tax reduction can be received for clearly defined investments (specific) and for tailor-made investments (generic) that result in substantial energy savings.

Other schemes

Further support schemes that are made available include the ISDE, SSEH and the energy cost saving loan.

- With the ISDE, homeowners can apply for subsidized solar water heater, hybrid heat pump and more “green” technology. Business owners can also apply for this subsidy.
- Several subsidy schemes are available for private homeowners to support investments in making houses and other buildings more sustainable through the SSEH and energy cost saving loan.

Major projects and companies

The Dutch government regularly provides updates about ongoing major projects on the www.rvo.nl website.

We have highlighted some major renewable energy projects below:

Green hydrogen

The Netherlands – and Europe as a whole – faces the task of more than halving carbon emissions by 2030 in order to become climate-neutral by 2050. The transition to clean energy occupies a key position in this pursuit, especially for the industry. Green hydrogen is a key pillar in the energy transition to a more sustainable energy system.

Project NorthH₂

- NorthH₂ was launched in 2020 in order to investigate the feasibility of large-scale production of green hydrogen in the Northern Netherlands in concert with all other stakeholders. The ultimate aim of the project is to use self-generated offshore wind energy to produce green hydrogen, as well as storing and delivering hydrogen to industry and heavy mobility clients in the Netherlands and beyond. This scope makes NorthH₂ one of the most ambitious hydrogen projects in Europe.

Project Uniper – Rotterdam

- Energy company Uniper and the Port of Rotterdam have signed a Memorandum of Understanding for the production of green hydrogen at the Uniper Maasvlakte site. The 100 MW electrolysis plant is planned to be connected to the planned hydrogen-based infrastructure HyTransport.RTM. The infrastructure is supposed to provide the Port of Rotterdam of CO₂ neutral hydrogen-based energy.

Offshore

The Dutch section of the North Sea has the potential to play a significant role in hitting the targets of the Climate Agreement and the transition to energy from renewable sources, not least with offshore wind energy.

Project IJmuiden Ver

- In the IJmuiden Ver Wind Farm Zone, 3 sites have been designated: Alpha (formerly I-II), Beta (formerly III-IV) and Gamma (formerly V-VI). The Dutch Government will start 2 tender procedures for the permits to develop projects in this wind farm zone: Sites Alpha and Beta in 2023 and Site Gamma in 2025.
- The IJmuiden Ver Wind Farm Zone (IJVWFZ) is located 33.4 nautical miles (62 km) off the west coast of the Netherlands in the Dutch North Sea. The total surface area of the sites within the IJmuiden Ver Wind Farm Zone (including the maintenance and safety zones) is approximately 650 km². Approximately 6 GW of new offshore wind capacity will be installed in IJVWFZ, with the power generated supplied to the Dutch electricity grid.

TenneT

- TenneT, the National Grid operator, is responsible for the building and operation of the offshore grid, connecting the offshore wind farms with the onshore grid.
- TenneT will install 3 platforms with 3 grid connections in the IJmuiden Ver Wind Farm Zone.
- TenneT's platforms all have a 2GW direct current (DC) connection to an onshore substation. With DC, the voltage on the grid remains constant. With alternating current, the voltage shifts between positive voltage and negative voltage 50 times per second. These are the first offshore wind farms in the Netherlands to be connected with a DC connection.

CO₂-storage

The Climate Agenda is aiming for a CO₂ reduction of 80-95% in 2050. This can be achieved by capturing CO₂ at the source and transporting it to storage locations located deep underground, also called Carbon Capture and Storage (CCS).

Project Porthos

- The parties behind Porthos are developing the project to transport CO₂ from industry in the Port of Rotterdam and store this in empty gas fields under the North Sea.
- The CO₂ that will be transported and stored by Porthos, will be captured by various companies. The companies will supply their CO₂ to a collective pipeline that runs through the Rotterdam port area. The CO₂ will then be pressurised in a compressor station. The CO₂ will be transported through an offshore pipeline to a platform in the North Sea, approximately 20 km off the coast. From this platform, the CO₂ will be pumped in an empty gas field. The empty gas fields are situated in a sealed reservoir of porous sandstone, more than 3 km beneath the North Sea.
- Porthos will store around 37 Mton CO₂, approximately 2.5 Mton CO₂ per year for 15 years.

Foreign investment ownership

European Union

Regulation EU 2019/452: EU Foreign Investment Screening Mechanism

- Although the screening of Foreign Investment ownership still remains with the individual member states, this regulation gives the member states more options to keep foreign investors out of vital sectors such as ICT, Energy and military. Relevant provisions of the Regulation include:
 - Definition of Foreign Investment
 - Guidelines about collaboration between member states
 - Definition of investors (outside EU)

National legislation

Electricity Act 1998

- Under this Act, any (direct or indirect) change of control over electricity generating installations with a capacity exceeding 250 MV must be notified to the Bureau Toetsing Investeren, an office of the Ministry of Economic Affairs. The Minister will review whether the change of control may compromise public safety, the integrity of energy generation or the security of supply. If the Minister

determines that such threat exists, the transaction may be prohibited, or conditions may be imposed which must be observed by the person or entity acquiring control.

- The review considers, among other things, the financial reliability of the acquirer, the transparency of its activities and the way in which it is managed. Also the acquirer's track record will be examined with regard to guaranteeing safety and their technical expertise for the reliable operation of the relevant activities.

Vifo Act

- The *Wet veiligheidstoets investeringen, fusies en overnames* (Vifo Act) entered into force on 1 June 2023. This law introduces a security test for investments, mergers and acquisitions that could pose a risk to national security.
- The security test applies to two types of companies with activities in the Netherlands: vital providers and companies that have sensitive technology. Vital providers are companies that carry out vital processes that are so important to Dutch society that failure or disruption can lead to major social disruption. Sensitive technology covers military and dual-use goods and technology, as well as certain highly advanced technologies.
- In relation to the energy sector, in particular certain heating networks, nuclear energy generators and companies active in natural gas exploration or gas storage are considered to be vital providers.
- Transactions that are in scope of the Vifo Act may only be completed after notification to, and approval by, the Bureau Toetsing Investeren, an office of the Ministry of Economic Affairs. In its review of the proposed transaction, the Minister assesses whether it may pose a risk to national security. If there appear to be such risk, conditions may be imposed on the acquiring party or, if no other solution can be found, the transaction can be prohibited.

UNFCCC – Paris Commitments and beyond

- The Netherlands is committed to several international agreements:
 - United Nations (UN) Climate Treaty of 1992.
 - Kyoto protocol from 1997
- The UN Climate Treaty of 1992 is the first climate treaty made. The Kyoto protocol from 1997 states that the emission reductions differ from country to country and can be traded among each other.

UNFCCC – Paris Commitments and beyond

- The 2023 UN Climate Change Conference will convene from 30 November to 12 December 2023 in Dubai, United Arab Emirates (UAE). The Incoming Presidency announced that COP 28 will focus on four paradigm shifts:
 - Fast-tracking the energy transition and slashing emissions before 2030;
 - Transforming climate finance, by delivering on old promises and setting the framework for a new deal on finance;
 - Putting nature, people, lives, and livelihoods at the heart of climate action; and
 - Mobilizing for the most inclusive COP ever.
- In the wake of the Glasgow climate summit in 2021 (COP26), the Netherlands raised its national ambitions and is now aiming for a 60% reduction in carbon emissions by 2030. The Dutch economy must be climate-neutral, fossil-free, nature-inclusive and fully circular by 2050 at the latest.
- The Netherlands stepped up its national ambitions after COP26 in Glasgow to bring them in line with the 1.5°C target set under the Paris Agreement.
- Water security will be among key green initiatives taken up by the UAE and the Netherlands ahead of the Cop 28 climate summit in Dubai later this year. Furthermore, the COP28 Presidency announced a partnership with the Netherlands and Tajikistan to serve as COP28 Water Champions. COP28 aims to give unprecedented attention to water risks and opportunities across the agenda, from agriculture to disaster prevention.
- The Dutch Prime Minister Mark Rutte has also pledged to work with the COP28 host, UAE, to mobilize action on a \$100 billion package to support lower-income communities around the world affected by climate change.

Climate agreement

- The Climate Act provides for a roadmap to decrease emissions in line with the path of the Paris Agreement: 49% by 2030 compared to 1990, and 95% in 2050. The Energy production must be carbon neutral in 2050. It is possible that these targets will soon be raised to match the increased target of the European Union, who want to reduce emissions by 55% by 2030. The pace of reduction is currently not high enough to meet the 2030 and 2050 targets.

Relevant resources and references

- [How much of the energy we consume is renewable? - The Netherlands in numbers | CBS](#)
- [Renewable energy share rose to 15 percent in 2022 \(cbs.nl\)](#)
- [Samenvatting \(cbs.nl\)](#)
- [Sustainable biomass | RVO.nl](#)
- [Offshore wind energy | RVO.nl](#)
- [Stimulation of sustainable energy production and climate transition \(SDE++\) | RVO.nl](#)
- [Energy Investment Allowance - EIA | RVO.nl](#)
- [Klimaat & Energie \(rvo.nl\)](#)
- [NorthH₂ | Hydrogen project of RWE](#)
- [Hydrogen to Maasvlakte | Uniper](#)
- [Ijmuiden Ver Wind Farm Zone | RVO.nl](#)
- [CO₂ reduction through storage under the North Sea - Porthos \(porthosco2.nl\)](#)

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New Zealand

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Common Law• Language: English, Māori and New Zealand Sign Language
Population	5.1 million
Gross national income (GNI) per capita	GNI per capita: USD 42,710
Business environment	<ul style="list-style-type: none">• 2018 Global Competitiveness Index: 18 of 138 (down 2 rankings)• 2020 Index of Economic Freedom: 3 of 180 (no change)• 2020 Corruption Perceptions Index: 1 of 176 (no change)• 2020 UN Development Programme Human Development Index: 14 of 189 (no change)
Profile	<p>New Zealand (Māori: <i>Aotearoa</i>) is an island nation located in the south-western Pacific Ocean. The country geographically comprises two main landmasses. The North Island (Māori: <i>Te Ika-a-Māui</i>), and the South Island (Māori: <i>Te Waipounamu</i>).</p> <p>New Zealand was colonised by the British in the 19th century. In 1840, the Māori Indigenous chiefs agreed to the Treaty of Waitangi, which ceded sovereignty to the British Crown whilst also retaining territorial rights for the Indigenous Māori population.</p> <p>In the 1980s, government policies transformed the economy into an open and free market, which contributed significantly to the high standard of living which New Zealanders enjoy</p>

today. The agriculture and tourism industries are the two key sectors in the economy today. New Zealand is a constitutional monarchy with parliamentary elections every three years.

Electricity industry overview

Electricity industry overview

- In 2019, 44,811GWh of electricity was generated in New Zealand. New Zealand does not rely heavily on fossil fuels. 82.4% of electricity is generated from renewable sources. Electricity generation is comprised of:
 - 55-60% from hydropower (2019 figures);
 - 14.9% from gas (2015 figures);
 - 17.4% from geothermal (2019 figures);
 - 5.1% from wind (2019 figures);
 - 4.1% from coal (2019 figures);
 - 0.8% from wood (2015 figures);
 - 0.5% from biogas (2015 figures);
 - 0.1% from waste heat (2015 figures); and
 - 0.3% from solar (2015 figures).
- Electricity demand is expected to grow at 1% per annum until 2030.

Electricity laws

- Like many sectors in the economy, the energy sector underwent major reforms during the 1980s and 1990s. The reforms deregulated the market and limited the reach of state monopolies. The Electricity Act 1992 sets out the overall regulatory framework for the electricity industry. *The Electricity Industry Participation Code 2010* governs the operation of the electricity market.
- *The Electricity Industry Act 2010* was a result of a ministerial review of the electricity sector. The Act has sought to improve competition within the electricity market, enhance security of supply and it also abolished the Electricity Commission, replacing it with the Electricity Authority.
- The Ministry of Business, Innovation, and Employment advises the Government on energy efficiency and renewable energy matters. The Minister of Energy and Resources is responsible for the New Zealand Energy Efficiency and Conservation Strategy. The National Energy Research Institute conducts energy research within New Zealand.
- Transpower New Zealand Limited, being the sole owner and operator of the New Zealand national bulk electricity transmission grid, is subject to individual price-quality regulation under Part 4 of the *Commerce Act 1986*.

Generation, distribution and transmission

- In New Zealand, electricity is generated by five major electricity generating companies. Genesis Energy, Mercury and Meridian Energy operate under a mixed ownership model in which the Government holds a majority stake. Contact and Manawa are private sector companies.
- In 2016, the generation share comprised:
 - Meridian Energy (35%);
 - Contact Energy (21%);
 - Mercury (16%);
 - Genesis Energy (13%);

- Manawa (6%); and
- the remainder made up from a number of smaller generating companies.
- Generation companies own and operate power stations across the country. Most of New Zealand's electricity is generated at remote locations and requires an efficient transmission system to transport it to the main centres. More than 200 generation plants are able to supply electricity to the national grid. Some of the smaller scale generation is 'embedded' and feeds directly into local distribution networks.
- Transpower New Zealand Limited is the sole owner and operator of the New Zealand national bulk electricity transmission grid.

Renewable energy overview

Renewables industry overview

- In 2019, New Zealand generated over 82% of its electricity needs from renewable energy. The country is a global leader in renewable energy generation, particularly for geothermal energy. The International Energy Agency (IEA) released a report in 2019, stating that New Zealand has the second highest share of renewables in primary energy of IEA member countries in 2018, behind Norway. This is the third highest share of renewable electricity generation in the OECD.
- The Government has set a renewable energy target of 100% by 2035. This is significantly higher than any other country in the region and reflects the advanced state of renewable energy in the country.
- In 2019, Parliament enacted the Climate Change Response (Zero Carbon) Amendment Act. In addition to setting a new target of net zero emissions by 2050 for most greenhouse gases, the Act also established an independent Climate Change Commission (CCC). The CCC will be expected to provide expert advice and monitoring to help successive governments meet their long-term sustainability goals. In 2019, the Interim Climate Change Committee (a precursor body to the CCC) released its Accelerated Electrification Report which sets out recommendations for how best to achieve a transition to 100% renewable electricity by 2035.
- The Energy Efficiency and Conservation Authority is the chief government body for the promotion of renewable energy. It reports to the Minister of Energy and Resources. The Ministry for the Environment also plays an active role in the renewable energy industry, particularly insofar as it affects New Zealand's climate change program.
- New Zealand has had an emission trading scheme since 2008, however, its success to date has been limited due to subsequent amendments lessening the impact of the scheme and the slow international pickup with such schemes. In 2020, the scheme received a refresh with the Climate Change Response (Emissions Trading Reform) Amendment Act, which introduces a cap for the first time to the cap-and-trade scheme.
- Historically, geothermal energy and hydropower have contributed the largest proportion of New Zealand's renewable energy growth. Future growth is expected to come from wind energy, given the country's attractive wind speeds, and further geothermal projects.

Hydropower

- Hydropower contributes about 55-60% of the country's total electricity use. Most of the country's hydropower capacity and potential is located in the South Island. New Zealand's two largest river systems, the Waikato in the North Island and the Clutha in the South Island, hold many of the country's largest hydropower stations. Many of the country's most lucrative hydropower sites have already been developed. Proposals for the development of further sites have been met with stiff environmental opposition. Due to New Zealand's reliance on hydropower, drier months have resulted in electricity shortages in the past.
- As part of its commitment to 100% renewable energy by 2035, the Government committed \$30 million in 2020 to investigating the business case for pumped hydro at Lake Onslow.
- New Zealand has a long history of hydropower facilities. The Waipori scheme (commissioned in 1903) and the Coleridge plant (commissioned in 1914), were the earliest hydropower stations in the country. By the 1950s, New Zealand had over 1GW of installed hydropower and in 1965 a high voltage transmission line from Benmore in the South Island to Haywards in the North Island was constructed. This line resulted in more hydropower stations in the South Island (such as the 540MW Benmore station, the 750MW Manapouri station and the 432MW Clyde dam) and hydropower generation reached 5GW by the 1990s. New Zealand's hydropower capacity has remained steady since then.

Wind

- Wind-sourced electricity accounts for over 5% of New Zealand's total electricity needs. Natural conditions throughout New Zealand are highly conducive to developing wind projects, both onshore in mountainous areas and along the coast, as well as offshore. New Zealand has 19 wind farms either operating or under construction. These range from a single small turbine at Southbridge (100kW) to the three stages of the Tararua wind farm, which has 134 turbines with a capacity of 161MW. West Wind, near Wellington, is the largest wind farm built in one stage in New Zealand. Its 62 2.3MW turbines have a combined generating capacity of 142.6MW.
- There is currently 2,500MW of wind generation consented in New Zealand and developers are exploring sites throughout New Zealand for new wind farm sites.
- Both national and local standards regulate the maximum noise levels that can be emitted from wind turbines.
- All of New Zealand's wind generation is currently onshore, however, a number of parties are currently exploring the possibility of developing offshore wind resource.

Solar

- Solar generation is currently a small proportion of New Zealand's energy supply, making up only 0.4% of its total renewable energy. However, there has been a significant increase in development in the solar sector in recent years. Solar generation produced 0.18 TWh of electricity in 2020 but this is projected to increase to 12.4 TWh by 2050.
- Price reductions in solar photovoltaic equipment have made it more popular with homeowners and businesses, despite the fact that for most it remains more costly than grid-supplied electricity. Residential solar power is likely to contribute to changes in New Zealand's energy market design, energy policy and pricing structures in the future. Figures collected at the end of 2018 show that are 21,037 residential connections with solar in New Zealand.

Geothermal

- All of New Zealand's geothermal generation is in the North Island, mostly around the Taupo Volcanic Zone. Geothermal-sourced electricity makes up more than 17% of the country's electricity needs.
- Geothermal capacity is approaching 1GW, which is largely due to two older, large-scale geothermal plants and several more recent, smaller-scale geothermal plants.
- In 2019, the Government invested \$10.7 million into a project researching new ways to extract geothermal energy at greater depths. Conservative estimates from GNS, the New Zealand Crown Research Institute tasked with the research, indicate that deep geothermal could unlock 10,000MW.
- Geothermal energy is used for direct heating in some parts of New Zealand. As a world-leader in geothermal generation and research, New Zealand has signed agreements with other countries who are seeking to boost their own geothermal capacity.
- The biomass industry is also well-established in New Zealand, in the biomass such as converting organic waste from landfills to energy, liquid biofuels developing alternative transport fuel and wood energy. Wood-processing facilities produce a lot of the country's biomass energy.

Ocean energy

- The Kaipara tidal power station was a proposed tidal power project to be located in the Kaipara Harbour with an ultimate size of 200MW at a cost of NZ\$600 million (approx. US\$420 million). However, in 2013, it was announced that the project had been put on hold.

Current issues in the renewables industry

- In January 2021, it was announced that the Tiwai Point aluminium smelter, owned by Rio Tinto, would remain open until the end of 2024. Rio Tinto had announced plans in 2020 to close the smelter. The closure of the smelter, which represents 13% percent of New Zealand's electricity demand, would have created a significant demand shock in the electricity market. However, under an arrangement with Meridian Energy and Contact Energy in January 2021, Tiwai's operations have been extended until 2024. Tiwai has announced that it is currently in negotiations with generators with regards to another potential extension.

- In 2016, it was announced that New Zealand is phasing out all coal-fired power generation, with Genesis Energy advising it will permanently shut its last two coal-burning generators by December 2018 amid ample supplies of cheaper renewable energy generation and subdued demand. The New Zealand Commerce Commission announced that Transpower plans to invest around NZ\$5 billion (approx. US\$3.5 billion) in critical infrastructure upgrades.
- At the time of writing, coal-fired electricity generation is still used in New Zealand. In 2020, as for other years, coal was relied upon to meet the electricity supply shortfall during a time of low renewables sourced generation (e.g. dry hydrological years).
- In the electricity retail sector, a report released by the Electricity Authority, shows that small and medium sized electricity companies are gaining increasing market share. The Electricity Authority statistics show smaller companies have quadrupled their market share since 2009.
- Consistent with international trends, there has been significant attention to the Power Purchase Agreement (PPA) market in New Zealand as a means to promote renewable energy generation and procurement, although the domestic market is more nascent than the US and European PPA markets. The Major Electricity Users' Group's Renewable Electricity Generation Project, launched in 2020, provides an example of how some of New Zealand's major electricity users are looking to employ PPAs in their energy strategies.

Renewables laws

- The Energy Efficiency and Conservation Act 2000 was the first legislative effort to promote renewable energy in New Zealand. The Act established the Energy Efficiency and Conservation Authority which produces regular reports on New Zealand's energy use and energy targets. The Act largely sets out the ambit of the Authority's reporting requirements.
- The National Policy Statement for Renewable Electricity Generation 2011 is the main government policy paper coordinating the renewable energy drive throughout New Zealand. The paper's main objective is to "*recognise the national significance of renewable electricity generation activities by providing for the development, operation, maintenance and upgrading of new and existing renewable electricity generation activities*".
- The Resource Management Act 1991, known as the RMA, is a key piece of legislation relevant to the development of renewable energy generation projects in New Zealand (and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) for offshore projects). The purpose of these Acts is to promote the sustainable management of natural and physical resources in New Zealand. The RMA requires that central and local government prepare environmental standards, policy statements and plans to aid in the management of the environment. Renewables projects will come into contact with the RMA where resource consents are required to undertake activities that are not permitted by the planning documents prepared in accordance with the RMA. For offshore projects, the EEZ Act directs the types of consents required.
- Following a review in 2020, the RMA is set to be repealed and replaced by three separate pieces of legislation covering land use and environmental regulation, long-term regional spatial strategies, and climate change respectively. Some of these new Acts are due for introduction to Parliament in October 2022, with the intention being the Act governing land use and environmental regulation being passed into law by the third quarter of 2023.

Government incentive schemes

- New Zealand does not have a feed-in tariff scheme for renewable energy generators. Although there are no central government incentives to assist consumers or businesses in New Zealand to implement solar or other onsite renewable generation technologies, there are some local authorities that have initiatives in place to encourage renewable energy generation at a residential level.
- The Government has established the Low Emission Vehicles Contestable Fund as part of a package of initiatives to help stimulate electric vehicle uptake and meet the target of 64,000 electric vehicles on New Zealand roads by 2021. The Fund offers up to \$6.5 million per year to projects that will help transition New Zealanders towards lower-emission, and electric vehicles.
- In 2019, the Government consulted on a Clean Car Standard (a fuel efficiency standard) and a Clean Car Discount (a "feebate" scheme) for new and used light vehicles. Legislation to implement the Clean Car Standard is expected to be introduced in 2021, with the standards applying 2022. At the time of writing, the Government is still considering EV subsidy options, including the feebate scheme. Future activity is expected in this space with the CCC's first draft report, published in 2021, recommending that the majority of vehicles imported into New Zealand be electric by 2035.
- As part of its commitment to decarbonise transport, the Government has also committed \$50 million in 2021 to assist councils to transition to a fully decarbonised public bus fleet by 2035.

- In 2020, the Government committed to making the public sector carbon neutral by 2025. As part of this pledge, mandated Crown agencies will be required to replace their car fleets with EV or hybrid-vehicles.
- Overall, the New Zealand Emissions Trading Scheme, as well as the electricity market reforms are perhaps the greatest government incentives for renewable energy in New Zealand.

Major projects and companies

- Hydropower generation has remained relatively steady since 1993. The only major hydropower project since then was the completion of the second Manapouri tailrace tunnel in 2002, increasing the station from 585MW to 750MW. Further expansion of hydropower generation is constrained because of community concerns over environmental impacts and loss of amenity values, as well as competing demands for water resources.
- Hydrogen energy has been an area of focus in recent years. In 2019, the Government released the H2 Taranaki Roadmap, which outlines how Taranaki can leveraged its existing skills and infrastructure to become a leader in the hydrogen energy space. In 2020, Taranaki-based company, Hiringa Energy, and King Country-based company, Waitomo Group, announced plans to develop New Zealand's first nationwide hydrogen refuelling station. The Government has committed \$19.9 million in principle from the Provincial Growth Fund to the project.
- Contact Energy has begun early work on developing a new 150MW geothermal power station on the Tauhara geothermal field in Taupō. Contact Energy is expected to invest \$600 million into the project.
- Future electricity generation investment is likely to be in a mix of generating plants, predominantly wind, solar and geothermal, with gas-fuelled plants for peaking and dry-year support. The 2010 streamlining of resource management legislation is intended to assist the development of new generation plant.
- In addition to the 19 wind farms that are either operating or under construction, there are about 10 projects that have been 'consented'. However, not all projects with 'consent' will be built. Many are currently on hold as developers wait for demand to increase enough to make the wind farm commercially viable.

Foreign investment ownership

The Overseas Investment Office (OIO) assesses applications from overseas investors to make sure they meet the criteria in the Overseas Investment Act 2005 (Act). Overseas people and organisations (more than 25% foreign-owned) wanting to invest in sensitive New Zealand assets must get consent before they do so. Consent decisions are made by Ministers, with advice from the OIO, or by the OIO itself, under delegation from Ministers.

An "overseas person" requires the approval under the Act to acquire significant business assets and sensitive land.

Significant business assets are assets in New Zealand that are valued at NZD 100 million or more. Generally, overseas persons need consent (among others):

- to acquire a more than 25% ownership or controlling interest in an entity if either the consideration paid or the value of the shares or the value of the entity's assets (including its subsidiaries) exceeds NZD 100 million;
- where they intend expending more than NZD 100 million to establish a business in New Zealand before commencing the operation of the business; and
- to acquire property used in carrying on business in New Zealand if the total value of consideration provided exceeds NZD 100 million.

Sensitive land includes land that is the fresh or seawater areas, the bed of a lake, land on islands (other than the North Island and South Island), residential land and non-urban land that exceeds five hectares. An interest in sensitive land requiring consent is a freehold estate, or a lease or any other 'interest' in land for a term of ten years or more (unless it is residential land), including rights of renewal that are not an exempted interest. Licences and easements over land are generally not interests in land requiring consent.

UNFCCC – Paris Commitments and beyond

- New Zealand signed the Paris Agreement on 22 April 2016 and ratified the agreement on 4 October 2016. New Zealand has committed to reducing net greenhouse gas emissions (excluding biogenic methane) to zero by 2050.
- The New Zealand Emissions Trading Scheme is the Government's principal policy response to climate change. It supports global efforts to reduce greenhouse gas emissions while maintaining economic productivity. The scheme puts a price on greenhouse gas emissions and provides an incentive for industry participants to reduce emissions and plant forests to absorb carbon dioxide. Certain sectors are required to acquire and surrender emission units to account for their direct greenhouse gas emissions or the emissions associated with their products.

Relevant resources and references

Relevant websites

- [Ministry of Business, Innovation & Employment](#)
- [Electricity Authority](#)
- [Climate Change Commission](#)
- [New Zealand Energy Strategy 2011 – 2021](#)
- [The New Zealand Energy Efficiency and Conservation Strategy 2017-2022](#)
- [National Policy Statement for Renewable Electricity Generation 2011](#)
- [National Policy Statement for Freshwater Management 2020](#)
- [New Zealand's Emissions Trading Scheme](#)

References

- [Ministry of Business, Innovation and Employment, New Zealand Energy Data Publication 2020](#)
- [The Treasury, Foreign Investment Policy](#)
- [New Zealand's Intended Nationally Determined Contribution Statement](#)

Nigeria

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: English Law• Language: English, Yoruba, Hausa Igbo and several others
Population	211 million
Gross national income (GNI) per capita	GNI per capita: USD 2,097.1
Business environment	<ul style="list-style-type: none">• 2018 Global Competitiveness Index: 125 of 137• 2022 Index of Economic Freedom: 124 of 180• 2021 Corruption Perceptions Index:154 of 180• 2020 UN Development Programme Human Development Index: 161 of 189
Profile	<p>Nigeria has a land mass of 923,768 km squared and is bordered by the Atlantic Ocean to the South, the Republic of Benin in the West, Republic of Niger in the North, Chad Republic in the Northeast and the Republic of Cameroon in the East. The country is a multinational state with 250 ethnic or nationality groups speaking 500 distinct languages, all identifying with a wide variety of cultures.</p> <p>The country is made up of thirty-six states and a Federal Capital Territory. The states are grouped into six geo-political zones namely: Northeast, Northwest, North Central, Southeast, South South, and Southwest.</p> <p>Nigeria was colonized by the British in the 19th century, taking its present territorial shape with the merging of the southern Nigerian protectorate and northern Nigeria</p>

protectorate in 1914. Agriculture, manufacturing and telecommunication are the principal sectors while more than 80% of government revenues come from oil and gas.

Nigeria is a federal republic with a presidential system of government. The president is elected every four years to a maximum of two four-year terms.

Electricity industry overview

Electricity industry overview

- Nigeria has circa 12,500 megawatts of installed generation capacity, which is largely dependent on natural gas. About 87.5% of the on-grid energy supply mix is derived from thermal plants (gas) with the remainder generated from hydropower sources.
- Prior to 2005, the entire power generation, transmission and distribution chain was monopolized by the state corporation – National Electric Power Authority (NEPA). This resulted in inadequate generation, poor maintenance of transmission systems, a lack of adequate funding for distribution infrastructure and illiquidity due to high Aggregate Technical and Commercial Losses (AT&C) amongst other issues.
- As a result, the government embarked on a comprehensive reform of the electricity sector which culminated in the enactment of the *Electric Power Sector Reform Act, 2005* (EPSRA). Key highlights of EPSRA included abolishing NEPA, the privatisation of the electricity sector and the setting up of sectoral regulators for the industry - NERC.
- The reforms articulated under EPSRA concerning privatisation, were expected to be incremental. In the first stage, NEPA was to be abolished and its assets temporarily transferred to a new company – Power Holding Company of Nigeria (PHCN).
- PHCN was also expected to be unbundled within a relatively short time frame, with its assets transferred to successor companies. Hence, the government unbundled PHCN into 18 companies comprising of 6 generation companies, 1 transmission company and 11 distribution companies. With the exception of the transmission company, each of the Gencos and DisCos have been privatized.
- To support the privatization effort and ease liquidity constraint, the government set-up the Nigeria Bulk Electricity Trading Plc (NBET). NBET was expected to buy power in bulk from the 6 Gencos (and other privately licensed players) for on-selling to DisCos. This would ease the impact of the AT&C suffered by DisCos and encourage uninterrupted production of power by the gencos.
- Other stages the privatisation reform include the Transition stage, the Medium-Term market stage and the Long-Term market stage. The Transition market stage is characterized mainly as competition for the market; the medium-term market is characterized by full wholesale competition for and in the market; and the long-term stage expects the market to be open to full wholesale and retail competition.
- On 22 April 2014, NERC published the Rules for the Interim Period between Completion of Privatisation and the Start of the Transitional Electricity Market of Nigeria Electricity Supply Industry (Interim Rules). Primarily, the interim rules were to kick-start the transitioning into the Temporary Electricity Market. It established a framework to govern trading arrangements when PPAs between PHCN successor Gencos and NBET and vesting contracts between NBET and PHCN's successor DisCos, will not be operative.
- Outstanding issues still remain regarding metering, illiquidity in the distribution infrastructure, inadequate funding, poor transmission network etc.

Electricity laws

- *The Electric Power Sector Reform Act 2005* (EPSRA) is the primary legislation that governs the Nigerian Electricity Supply Industry (NESI). As previously noted, EPSRA established the sectoral regulator for the industry - Nigerian Electricity Regulatory Commission (NERC). Key responsibilities of NERC includes licensing and regulating persons engaged in the generation, transmission, system operation, distribution and trading of electricity.
- *Environmental Impact Assessment Act 1992*: The Environmental Impact Assessment Act (the EIA Act) makes it mandatory for an EIA to be conducted for projects that are likely to have significant effects on the environment, including power projects. The EIA is a requirement for obtaining a generation licence from NERC.

- *Meter Asset Provider and National Mass Metering Regulations 2021*: The Meter Asset Provider and National Mass Metering Regulations (the “Regulations”) were issued by NERC on 19 August 2021. The Regulations which amended the Meter Asset Provider Regulations 2018 provided regulatory guidelines for the provision of meters to customers of the distribution companies and the achievement of the following goals: closing of the metering gap through accelerated roll out of meters; elimination of estimated billing practices in the NESI; attracting private investment to the provision of metering services; and enhancing revenue assurance at the retail end of the NESI.
- *The Regulations on National Content Development for the Power Sector 2014*: The objectives of the Regulations are to promote the deliberate utilization of Nigerian human and material resources, goods, works and services in the industry. Also, to build capabilities in Nigeria to support increased investment in the industry, and to leverage existing and future investment to stimulate the growth of Nigerian-located enterprise.
- *NERC Regulations for Independent Electricity Distribution Networks 2012 (IEDN Regulations)*: The IEDN Regulations provides standard rules for the issuance of licences to qualified operators and licensees to engage in electricity distribution, independent of distribution systems operated by the DisCos.
- *NERC Guidelines on Distribution Franchising in the Nigerian Electricity Supply Industry (the Franchising Guidelines)*: The Franchising Guidelines were issued by NERC on 2 July 2020, to provide regulatory framework for franchising arrangements by electricity distribution licensees (DisCos). The grant of distribution franchise by DisCos is expected to: stimulate investments that address the liquidity and infrastructure challenges in the distribution sector; provide a platform for third parties to invest in the distribution sector; and to further improve the quality and reliability of electricity supply to the end use customer.
- *NERC Mini-Grid Regulations 2017*: This was another ambitious project to stimulate investment in the power sector, particularly for underserved (i.e., areas getting inadequate supply of power from DisCos) and unserved (i.e., no supply) areas.

Under the regulations, a license for Mini-Grids with a generation capacity of up to 1 MW may be issued to qualified persons. Structurally, a mini-grid could be isolated or interconnected, the key consideration being whether the mini-grid is connected to a distribution network of a DisCo. Tariff for power generated under the regulations are calculated under the extant MYTO methodology.

Renewable energy overview

Renewables industry overview

- Nigeria has substantial renewable energy potential, in particular, hydropower generation contributes roughly 16 percent of the energy supplied to the national grid. Off-grid power generation often relies on renewables, particularly from solar and wind sources.
- EPSRA established the Rural Electrification Agency (REA) which is charged with: expanding the main grid; developing isolated mini-grid systems; and promoting renewable energy power generation. The REA is also mandated to set up and administer a Rural Electrification Fund (REF) which is to promote, support and provide rural electrification programmes to achieve more equitable regional access to electricity.
- In 2011, the Federal Government launched the Renewable Energy Master Plan which was aimed at increasing the share of renewable energy in the country’s energy mix by at least 13% by 2015, 23% by 2025, and 36% by 2030. It is expected that with current focus on renewable energy, the country will see significant growth to meet some of these targets.

Principal renewable energy regulations

- *National Renewable Energy and Energy Efficiency Policy (NREEEP)*: The Federal Executive Council in 2015, approved the NREEEP which is broadly geared at removing the barriers that put renewable energy and energy efficiency at economic, regulatory, or institutional disadvantages, and providing a conducive political environment that will attract investments in the renewable energy and energy efficiency arena.
- *Regulations on Feed-In-Tariff for Renewable Energy Sourced Electricity in Nigeria (REFIT)*: In 2015, the NERC issued REFIT, which primarily applies to energy generated and supplied through the national grid and orders that NBET and electricity distribution companies shall, as a matter of priority, purchase 50 per cent of the renewable energy electricity capacity limit established by the Regulations. The REFIT also provides a special tariff framework for renewables, in the form of feed-in-tariffs which were designed to be attractive to private investors.

Hydropower

- The substantial bulk of renewable energy generated in Nigeria comes from hydropower. Kainji Power Station, with an estimated capacity of 960MW, is the largest contributor of renewable energy in the country. Other major hydropower plants in operation includes Jebba (578.4 MW) and Shiroro Hydroelectric (600MW) Power Stations.
- At present, there are two major hydropower projects at different stages of construction. The first is the Mambilla Power Station located at the foot of the Mambilla Plateau, Taraba State. The project is being funded by the government and a syndicate of Chinese investors backstopped by Sinosure, with an anticipated power generation of 3,050MW upon completion.
- Second is the construction of the 700 Megawatts project in Zungeru, Niger State. Similarly, the project is being funded by the Federal Government and a syndicate of Chinese lenders. Initial commission date was in 2021, but has been postponed due to delays.

Solar

- Solar is the second most significant source of renewable energy in Nigeria. Nigeria straddles the Sahel and Savannah regions of Africa, with massive photovoltaic power potential.
- In 2016 the Federal Government, as part of its efforts to increase generation through renewable energy and to diversify away from thermal and hydro, signed 14 utility scale solar Power Purchase Agreements (PPAs) to supply circa 1,125MW of power to the national grid. Put and Call Options Agreements (PCOAs) were put in place to ensure the bankability of these projects.
- Despite the above, power generation from solar energy is largely underutilised. The contribution of solar power to the national grid is negligible. Currently, power generation from solar is limited in scale to, primarily, Mini-grid generators, independent power producers and homeowners.
- Several entities are currently engaging in solar projects in different parts of the country. For example, Lumor Global Ltd was reported to have received US\$35m funding from the US International Development Finance Corporation (DFC) to expand its off-grid solar installation project to 16,000 homes.
- Other opportunities still exist under different programs of the government to exploit solar energy (please see government policies below).

Wind

- Equally Nigeria has strong potential to generate electricity from wind sources. At present, there are wind generation plants in the Northwest States of Katsina with an installed capacity of 10 MW.
- However, power generation from wind sources forms a negligible component of the country's electricity mix, and there is underutilised capacity.

Biomass

- Similarly, biomass contribution to the energy mix remains small, however Nigeria has good prospects as biomass sources include plants materials and animal products.
- Biomass has the potential to supply more energy than solar or wind power, however, this source of renewable energy remains largely untapped in Nigeria.

Current issues in the renewables industry

- Despite the growing interest in renewable energy production, the national grid still requires investment to transmit energy produced from Gencos to DisCos. While we note that there is a current contract between Siemens and the Federal Government to rehabilitate and expand the national grid, there is still a delay in implementation.
- Apart from the transmission chain of the supply network, a large percentage of Nigerians are still not connected to the national grid (i.e., rural communities) and for those connected, power supply is a serious problem. Around 90% of the total energy demanded is not supplied, hence, the DisCos are unable supply electricity to those communities.

- Another issue is the huge metering gap that still exist in the Nigerian Electricity Supply Industry. Despite the introduction of several mass metering programmes, only about 4.66 million end-users, representing 36 per cent of the entire pool has been fully metered at the end of November 2021.
- Against this backdrop, NERC introduced the Independent Electricity Distribution Network 2012 which permits qualified operators and licensees to engage in electricity distribution, independent of distribution systems operated by the DisCos. It is envisaged that these private players will operate in unserved and underserved areas to increase delivery of power to consumers.
- A major concern has been the tariff methodology which has been a key factor in developing bankable power projects. The most recent MYTO became effective in 2022, which according to industry players, is not cost-reflective.
- Macroeconomic issues such as inflation, currency fluctuation, COVID-19 pandemic etc. has limited the delivery of projects in the sector as well.

Government incentive schemes

- The NERC made Regulations on Feed-In Tariffs for Renewable Energy sourced in Nigeria (REFIT) in 2015. The policy is designed to encourage small scale renewable projects which will either be connected to the grid, or directly to distribution companies. In addition, the government set a 10% target for renewable energy usage in the country by 2018 and for that to increase to 20% by 2030. It is expected that corporate appetite for renewable energy will increase in the near future based on the Federal Government's National Renewable Energy and Energy Efficiency Policy 2015 (NREEEP), National Renewable Energy Action Plan 2015 – 2030 (NREAP), Power Sector Recovery Program 2018 (PSRP) amongst other policy documents.
- In a bid to incentivise renewable energy investments in Nigeria, certain financial incentives have been introduced. For example, the Value Added Tax (Modification Order) 2020, has exempted certain renewable energy equipment from Value Added Tax. This includes: wind powered generators; solar powered generators; solar cells whether or not in modules or made up of panels; other photosensitive semiconductor devices; Solar DC generators of an output not exceeding 750 W; Solar DC generators of an output exceeding 750 W but not exceeding 75 kW; Solar DC generators of an output exceeding 75 kW but not exceeding 375 kW, and Solar DC generators of an output exceeding 375 kW. As such, the importation or domestic sale of this equipment would not attract VAT.
- The Federal Government of Nigeria (FGN) in response to the Covid-19 pandemic launched the *Solar Power Naija Project* in December 2020. This project focused on providing five million households with solar home systems for off-grid communities, under the Nigeria Economic Sustainability Plan (NESP). The implementation of the project will be facilitated by the Central Bank of Nigeria, which will make NGN140bn (approximately US\$340m) available in direct and in-direct loans to qualifying projects.

Major projects and companies

- In 2019, PowerGen commissioned the first mini grid under the Nigeria Electrification project in the Rokota community. The 64kW solar hybrid mini-grid and 60kWh of battery storage has a 10km distribution network and is capable of supplying electricity to local businesses and over 400 households.
- The Federal Government on 3 December 2019, through the Rural Electrification Agency (REA), commissioned a 234kW solar hybrid mini grid power plant in Shimankar community, Shendam local government area, Plateau State. The installed mini grid is expected to provide reliable electricity to 1,972 households, 273 commercial users, 5 productive users and 19 public users in the community and to further improve the socio-economic life of the community.
- The Federal Government through the REA also commissioned a 98.8kW solar hybrid mini grid power plant at Kare-Dadin Kowa, Kebbi State, under its Rural Electrification Fund (REF). This is part of the Federal Government's initiative to promote off-grid electrification and stimulate innovative approaches to rural electrification.
- In the same vein, the Federal Government through the REA, also commissioned a 100kW solar hybrid mini grid power plant in Akpabom Community, Onna Local Government Area, Akwa Ibom State. The project was constructed and operated by GVE (Nigeria's leading mini-grid developer) and jointly financed by the Rural Electrification Fund, impact investor All On, and the Akwa Ibom State government.

Foreign investment ownership

- The Companies and Allied Matters Act 2020 (“**CAMA 2020**”) is the principal law governing the formation and management of companies. Under CAMA 2020, a foreign company intending to carry on business in Nigeria (except for companies exempted by the minister) shall be incorporated as a separate entity in Nigeria.
- The Nigerian Investment Promotion Commission Act (NIPC Act) established the Nigerian Investment Promotion Commission (the “**Commission**”). The Commission’s objectives include encouraging, promoting and coordinating investments in Nigeria. Section 17 of the NIPC Act provides that a foreigner may invest and participate in the operation of any enterprise in Nigeria. In addition, every foreign investor is guaranteed unconditional transferability of funds through an authorized dealer. Furthermore, an enterprise with foreign participation seeking to commence business in Nigeria shall first be incorporated under CAMA 2020 and registered with the Commission.
- The Industrial Development (Income Tax Relief) Act (“**IDTRA**”) provides tax relief with respect to certain industries upon issuance of a pioneer certificate. Section 1 of the IDTRA empowers the President to designate a list of industries and products that may be considered pioneer industries. Conferment of pioneer status operates as a tax holiday for an initial period of three years which may be extended for an additional period of two years (i.e., 5 years in total).

UNFCCC – Paris Commitments and beyond

- Nigeria signed the Paris Agreement on 22 September 2016 and ratified the agreement on 16 May 2017. Nigeria is committed to reducing greenhouse gas emissions unconditionally by 20 percent, below business as usual by 2030, and conditionally by 45 per cent in line with Nationally Determined Conditions by 2015.
- The updated nationally determined contribution (NDC), dated 27 May 2021, represents the federal government’s policy response to climate change. Further to the NDC submitted in 2015, the federal government has introduced some key policies showing its commitment to implement the unconditional contribution. This includes, the elimination of kerosene lighting by 2030; a greater uptake of bus rapid transit; and a 50% reduction in the fraction of crop residues burnt by 2030.
- At the UN Climate Change Conference held in Glasgow (Cop26), the President of the Federal Republic of Nigeria pledged that Nigeria would achieve a net zero target by 2060. This implies that the government will encourage/pursue renewable projects going forward.

Relevant resources and references

References

- [Nigeria - Country Commercial Guide](#)
- [Commissioning of 234kWp Solar Hybrid Mini-Grid Shimankar Community, Shendam LGA, Plateau State](#)

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Norway

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil law• Language: Norwegian
Population	5.4 million
Gross national income (GNI) per capita	GNI per capita: USD 78,250
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: 17 of 138 (down 1 ranking)• 2021 Index of Economic Freedom: 28 of 178 (no change)• 2020 Corruption Perceptions Index: 7 of 176 (no change)• 2020 UN Development Programme Human Development Index: 1 of 189 (no change)
Profile	<p>Norway is a Nordic country in Northern Europe, the mainland territory of which comprises the western and northernmost portion of the Scandinavian Peninsula. The capital and largest city in Norway is Oslo. With the Barents Sea to the north, the Norwegian Sea and the North Sea to the west, and Skagerrak (Skager Strait) to the south, Norway has land borders only to the east — with Sweden, Finland, and Russia.</p> <p>Harald V of the House of Glücksburg is the current King of Norway. Jonas Gahr Støre has been prime minister since September 2021, replacing Erna Solberg. As a unitary sovereign state with a constitutional monarchy, Norway divides state power between the parliament, the cabinet and the supreme court, as determined by the 1814 constitution. The kingdom was established in 872 as a merger of many petty kingdoms and has existed continuously for 1,149 years.</p>

Norway maintains close ties with both the European Union and the United States. Norway is also a founding member of the United Nations, NATO, the European Free Trade Association, the Council of Europe, the Antarctic Treaty, and the Nordic Council; a member of the European Economic Area, the WTO, and the OECD; and a part of the Schengen Area.

The petroleum industry accounts for around a quarter of the country's gross domestic product (GDP). On a per-capita basis, Norway is the world's largest producer of oil and natural gas outside of the Middle East. Norway has the world's largest sovereign wealth fund, with a value of USD 1 trillion.

Electricity industry overview

In Norway there is in general a mix of renewable energy sources, mainly being:

- Hydropower
- Wind (onshore, offshore new industry)
- Solar
- District heating
- Bio energy
- Thermal

New laws in the past 1-2 years: Offshore renewable energy production is governed by the Offshore Energy Act and the Offshore Energy Regulation. This legislation regulates the application for licenses, development phase, construction phase etc. of the new offshore wind power industry in Norway, and is currently subject to amendments going forward, please see details under "offshore wind" below.

Renewable energy overview

Hydropower

Within Europe, Norway is considered to have the highest share of electricity produced from renewable sources in Europe (approx. 97%, of approx. 75% comes from hydropower). This is mainly due to the large sources of hydropower, and storage recourses. As a consequence, Norway also has very low emissions from this power sector. Annual production is normally approx. 140 TWh. Norway has more than 1,000 hydropower storage reservoirs and 1,660 hydro power plants.

Specific legal issues:

- Due to protection of its natural recourses, there are certain thresholds and limits included in the legislation:
 - According to the Norwegian Waterfall Rights Act, at least 2/3 of the capital/votes in a project company must be owned by Norwegian public undertakings/entities (state, municipalities, county municipalities etc). This only relates to large hydropower plants exceeding 4,000 natural horse powers or more (approx. 40 GWh annual production).
- Small scale hydropower plants; no such ownership requirements for foreign investors.
- Licenses issued in accordance with the Waterfall Rights Act require consent from (and notification to) NVE/MPE, if:
 - the transfer of the waterfall is subject to a license/concession;
 - the transfer results in a change of more than 90% of the shares/ownership interest;

- the transfer of the waterfall as such is subject to a license/concession.

Onshore wind

Wind power farms (onshore) have been a renewable energy source in Norway for a couple of decades, and several new wind farms have been developed in Norway the past years. However, in recent months the window for constructing new wind farms have been more closed due to political reasons. Approx. 16 TWh is the anticipated production from this renewable source within 2021 (when the el-certificate incentive expires).

The Norwegian Supreme Court ruled the “Fosen” decision, resulting in the licenses for wind power development on Fosen (wind farm) ruled invalid as the construction was considered a violation of Sami reindeer herders' right to enjoy their own culture.

Government/Parliament plans/projects – offshore wind in particular – a new renewable industry in Norway

Since the Government changed in autumn 2021, the Government has published two press releases (9 February and 11 May 2022) to emphasize that the Government works hard with realize the offshore wind development and construction within the first offshore wind areas, Utsira Nord and Sørilige Nordsjø II.

In Norway there are currently two main areas open for offshore wind projects:

- Utsira Nord (floating offshore wind), and
- Sørilige Nordsjø II (bottom fixed offshore wind projects).

Both areas were publicly opened for applications 12 June 2020. MPE (Nw. *Olje- og energidepartementet*) has stated that 2-3 participants /consortium JVs will be assigned with a license within each geographical area, and the Norwegian Water Resources and Energy Directorate (“NVE”) is currently exploring two new areas to be opened for offshore wind projects. A strategic environmental assessment (SEA) must be carried out prior to the opening of any zone areas.

On 9 February 2022, the new Norwegian Government announced in a press conference updates on the next steps of development in what will be the start of a new renewable energy industry in Norway, by stating they have initiated instruction actions towards the Norwegian Water Resources and Energy Directorate (“NVE”), including two overall main tasks; (i) to identify new areas for renewable energy production and impact assessment, and (ii) to assess alternative grid solutions and systems for offshore wind consequences for the Norwegian electricity system.

The key take-away points from the press release are:

- The two main areas already opened for establishing and developing offshore wind projects, Utsira Nord (“UN”) and Sørilige Nordsjø II (“SNII”), are maintained, but the main change for the area Sørilige Nordsjø II is that it will be divided into two phases. The earlier pronounced 3000 MW production limit is divided into (i) a first phase of 1500 MW production limit (“Phase I”, rendering electricity to approx. 450,000-500,000 households), and (ii) a second phase of an additional 1500 MW production limit (“Phase II”).
- For Phase I the Government has concluded, based on an overall political assessment of the recent high electricity prices and ensuring sufficient electricity production of renewable energy in Norway the upcoming decades, that no “hybrid” grid system will be considered. Both for UN and SNII, a production radial and grid connection to the Norwegian mainland will be the preferred grid option. Requested hybrid grid connection systems, involving commercial possibilities to exchange electricity to foreign countries via interconnectors, have not been weighed heavy enough compared to national interests of securing delivery of green renewable energy.
- The Prime Minister, Jonas Gahr Støre, emphasized that for Phase II it may be considered to assess hybrid grid connections, though based on NVE's further assessment.
- The awarding of areas for offshore wind will mainly be based on an auction model, the details and requirements of which are still pending the Government's final approval. Thus, the Government will continue to follow up on the regulatory changes proposed in June 2021 to finalize an auction model suitable for offshore wind development. The proposal included a pre-qualification phase to ensure that participants in the auction process hold the necessary technical and financial capacity. The Government has not determined yet on an auction model for UN, but as signaled earlier qualitative criteria will be the basis for the assessment.

- As expected, the Government is working on submitting a proposal to the Norwegian Parliament, to adopt necessary and more detailed amendments to the existing offshore energy regulatory framework (the Offshore Energy Act and Offshore Energy Regulation). The proposed amendments must be adopted prior to the commencement of an auction process to ensure an effective and fair process. The amendments are expected to provide necessary clarifications for industry players and stakeholders to have a clear view on planning both internal and external processes going forward more in detail.
- The Government has introduced a consultation note related to further division of UN and SNII project areas into smaller areas, being subject to public consultation with a deadline expiring 29 April 2022. For floating offshore wind projects at UN, the suggested alternatives involve two project areas of 500 MW, and two project areas of 250 MW, or two project areas of 600 MW and one project area of 300 MW. For the bottom-fixed projects at SNII, the Government considers three project areas, each of 1500 MW. The Government is currently only planning to open up two of the areas for auction.
- State aid/subsidies is still emphasized of being necessary for development of the complex floating offshore wind projects being constructed at UN due to the major costs to construct a production radial over far-reaching distances. Enova will, among others, be an important funding source for these projects, and the Government stated to be prepared for providing state subsidies in line with the political importance of a successful offshore wind delivery of Phase I.
- The Government has not provided a specific timeline for when the public auction process/announcement of licensing process for Phase I will commence (and whether this will include both UN and Phase I simultaneously), but in general the Government stated that this will happen within 2022. The exact timing will depend on the result of both the public consultation of the project areas and adoption of the required changes to the regulatory framework. Even if the exact timing for announcement of the areas has not been decided upon yet, it is important for participants in the licensing auction process to prepare for and take necessary pre-qualification steps, including seabed surveys, technical/construction and financial preparations, setting up the "readiness" of the entity/JV in accordance with regulatory terms etc. NVE has been instructed to assess new, potential and suitable areas for development and construction of offshore wind projects on the Norwegian continental shelf (likely to be in the North, Mid-West or South of Norway) The task includes developing an impact assessment program and is expected to be finished within 9 to 12 months.
- Further, NVE has been instructed to conduct an assessment on the impact that separate alternatives for power connections from offshore wind projects (including hybrid interconnectors to other countries) has on the Norwegian energy/electricity system. The assessment will be instrumental in the chosen solution for Phase II and is expected to be completed during the fall 2022.

References

- [Norwegian Government's / the Minister of Petroleum and Energy's press release no 18/22 dated 9 February 2022](#)
- [NVE's assessment of consequences for the electricity system – alternative grid solutions for offshore wind](#)
- [NVE's assessment of identifying new areas for renewable energy production and impact assessment](#)
- [Public consultation of division of the areas UN and SNII](#)

Solar

Solar power as a renewable energy source is a growing segment in Norway, but is currently developed on a "small scale" compared to other European countries. There may be many reasons for this, including that Norway, to date, has focused on other renewable energy sources (such as hydropower). In 2021, solar power installations in Norway generated an installed capacity of approx. 0.14 TWh, and it is assumed that the solar energy capacity in Norway will increase significantly the upcoming decades. However, the regulatory framework and legislation related to solar projects must be developed and made efficient for the various solar alternative business models, and this takes time.

Solar power plants for the production and sale of electricity are subject to licensing pursuant to the Energy Act, governed by the Planning and Building Act's regulations on impact assessments (solar power plants with a voltage of 1,000 V AC/1,500 V DC or less, do not need a license according to the Energy Act), and companies conducting business related to trade of solar power are subject to holding a trading license.

Hydrogen

The new Norwegian Government has stated in its basis/principles for the upcoming period in "Hurdalsplattformen" that it will prioritize the focus on establishing a coherent value chain for production, distribution and utilization of hydrogen, as part of the goal to reduce

emission of CO₂ gas (low-emission country per 2050). As per date the Government has explicitly set a goal for the next decade (as for offshore wind) to annually produce blue and green hydrogen within 2030, including to establish a state-owned hydrogen-company. There will be a need for a further detailed, regulatory framework when this new business segment is further developed, and also when experiencing the medium to large scale development.

The Government's strategy for hydrogen is [published online](#).

In general there are several business projects/development business ideas ongoing in Norway related to green ammonia (as part of the value chain from hydrogen), especially within shipping/transport and as "fertilizer".

Carbon capture

There has been a long-term ongoing work to realize a full-scale project for capture, transport and storage of CO₂ (CCS) in Norway. The Norwegian Parliament approved the Solberg government's full-scale CO₂ management project in Meld. St. 33 (2019–2020) Longship - capture, transport and storage of CO₂ in the state budget for 2021. A total of NOK 25.1 billion will be invested in the project. The government will cover approximately 2/3 and the industry will cover approximately 1/3 of the costs in the project's first phase. Please see [Carbon capture and storage - CCS](#).

Geothermal/bio

The geothermal energy resources are indicating a gradual growth of the geothermal fluids in Norway. The evaluation stage involving exploitation of the resource for power generation is already in place. The thermal energy offered by the geothermal source is constantly increasing and at the same time, the private partnership in this sector is encouraged by the Government. The use of the geothermal resource is considered to contribute to the growth of the Norway's economy. The "waste-to-energy" market and bio-fuel market are also increasing.

Batteries

Norway is becoming a leading country within the battery storage segment, including major players such as FREYR, Morrow Batteries and the Joint Battery Initiative (Equinor and Panasonic).

Several companies are currently planning to build battery cell giga-factories in Norway. Although the emerging industry is promising new 'green' economic growth for Norway, it is reliant on lithium and other raw materials that are extracted elsewhere.

Current issues in the renewables industry

Please see comments for the specific renewable sources, but note in particular the restriction for foreign investors to only be allowed to invest up to 1/3 in a large hydropower plant (small scale hydropower does not have this restriction), and offshore wind industry /framework being under continuous development, including development of grid system (hybrids etc) by Statnett over the upcoming decade to commercialize offshore wind as the new major industry and an energy transition from the O&G segment/suppliers.

Statnett is working continuously on preparing and building the grid network out to prepare for the new offshore industry, and this may also take within a decade to build in order to meet the energy transition requirements. Please see links to Statnett's website summary and a fact-based report release by Statnett in March 2022:

- [Offshore wind power in Norway](#)
- [Fagrapport om havvind i Sørlige Nordsjø II \(PDF\)](#)

Government incentive schemes

- El-certificates (window "closed" 31 December 2021 related to onshore wind concessions, and currently assessed to have low value in the market).
- GoOs – in general preferred as evidence that the energy source is "green" – value in market.

Major projects and companies

A few examples of ongoing major projects:

- Longship/Northern Lights (Government's carbon capture/storage)
- Empire Wind, Hywind Tampen (Equinor, offshore)

Some major Norwegian players/companies contributing in general to the renewable future in Norway:

- Equinor
- FERD
- Vårgrønn
- Hafslund E-CO
- Nysnø Climate Investments
- Aker Group (Carbon/Hydrogen/Offshore, Bio etc)

Foreign investment ownership

Norway has a relatively new Security Law (in force 2019) – [Lovdata](#).

The authorities may screen investments in Norwegian businesses from a “national security” perspective. If anything is considered as a not insignificant (potential/actual) threat to Norway, an infrastructure/renewable energy project or investment may be denied or blocked by the Norwegian State. We have seen few examples in practice of this, but a Russian acquisition was stopped one year ago on these grounds.

Should a foreign investor be subject to AIF-rules, please see legal requirements on [Act on the Management of Alternative Investment Funds \(PDF\)](#).

UNFCCC – Paris Commitments and beyond

- Norway and the EU have ratified the international Paris Agreement on climate change, and, like the EU, Norway has committed to a target of at least 40% reduction of greenhouse gas emissions by 2030 compared to 1990 levels.
- Norway allocates a significant amount of funding to REDD+ (Reducing emissions from deforestation and forest degradation in developing countries).
- According to CAT (“**C**limate **A**ction **T**racker”) Norway’s policies and actions have so far been rated as “Insufficient”, indicating that Norway’s climate policies and actions towards 2030 need substantial improvements to be consistent with the Paris Agreement’s 1.5° C temperature limit.

Relevant resources and references

Resources

- [Lovdata – the Offshore Energy Act](#)
- [Lovdata – the Energy Act](#)
- [Lovdata – the Waterfall Rights Act](#)
- [Lovdata – the Water Resources Act](#)

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Peru

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: Spanish, Quechua and other native languages
Population	33 million
Gross national income (GNI) per capita	GNI per capita: USD 6,250
Business environment	<ul style="list-style-type: none">• 2021 Index of Economic Freedom: 50 of 178• 2020 Corruption Perceptions Index: 94 of 180• 2020 UN Development Programme Human Development Index: 79 of 189• 2021 World Competitiveness Ranking: 58

Profile	<p>Peru is a country located in southern America, bordering the Pacific Ocean. Geographically, it has a continental territory and, due to its location, it has a diversity of geographic sites and climates that vary mostly from coast, highlands and rainforest. In the 1990s, together with the promulgation of the current Constitution, a liberalization of the economy took place, which was the basis for the current open and free market economic configuration. Mining is the key pillar of the economy, with agriculture, fishing and manufacturing industries also playing a relevant role. Peru is a Republican and Unitary State, with presidential elections every five years.</p>
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Electricity industry overview

Electricity industry overview

- In 2021, 53,990 GWh of electricity was generated Peru within the framework of National Electric Power Interconnected System (SEIN). Peru does not rely heavily on fossil fuels. The major percentage of electricity is generated from hydro and gas. Electricity generation is comprised of:
 - 56.8% from hydropower
 - 38.38% from thermoelectric
 - 3.34% from wind
 - 1.49% from solar

Electricity laws

- In 1955, the development of the regulation of the electric sector in Peru began with the Electric Industry Law (Decree Law No. 12378), published in the Official Gazette *El Peruano* on June 8, 1955, and regulated on January 5, 1956. This was the first regulatory framework in the history of the Peruvian electricity sector, and it established precise rules for the development of the electricity business with guidelines for the state and the "concessionaire of public services." This regulation stimulated the development of the sector in the country by enabling private companies to obtain information to expand investments and meet the increase in their demand.
- In May 1982, President Belaunde enacted Law No. 23406, General Electricity Law (LGE), which was based on the previous electricity laws. Due to the financial crisis of the sector, a new decentralized legal framework was proposed. The provision of the public electricity service remained in the hands of the state and regional companies were created as subsidiaries of *Electro Peru*. The distribution activity was transferred to the regional companies. *Electro Peru* acted as a holding company, being in charge of the Mantaro, Cañón del Pato, Carhuaquero and Cahua power plants.
- Beginning in March 1991, the government of Alberto Fujimori implemented an aggressive process of structural reforms aimed at reducing state intervention. The new approach was aimed at achieving sufficiency in electricity supply through an economy integrated to international trade and the structuring of competitive markets. In this new context, on November 19, 1992, Law No. 25844, Law of Electric Concessions, was decreed, which repealed the LGE, the previous regulatory framework for the sector.
- In July 2006, the Law No. 28832, Law to ensure the efficient development of electricity generation, was published. This law was created with the purpose of ensuring the sufficiency of efficient generation to reduce the exposure of the Peruvian electricity system to price volatility and the risks of prolonged rationing due to lack of energy. It also aimed to reduce administrative intervention for price determination and introduce a compensation mechanism between the SEIN and the Isolated Systems.
- In September 2015, the Peruvian government published the Law No. 28749, General Rural Electrification Law, with the objective of establishing the regulatory framework for the promotion and efficient and sustainable development of electrification in rural areas, isolated and border localities of the country.

Generation, distribution and transmission

- In Peru, electricity is generated by six major electricity generating companies: Electro Peru, Enel Generacion Perú, Engie, Fenix Power, Kallpa and Statkraft. These companies operate as private sector companies, although electricity market is strictly regulated by Government policies and companies do not possess free will to generate and distribute energy.
- In 2021, the generation share comprised:
 - Kallpa (17.1%)
 - Electro Peru (13.1%)
 - Engie (12.4%)
 - Enel Generación Perú (12.8%)
 - Fenix Power (6.3%)
 - Statkraft (4.5%)

- Others (33.8%)

The remainder was made up of a number of smaller generating companies.

- Generation companies own and operate power stations across the country. Most of Peru's electricity is generated at remote locations and requires an efficient transmission system to transport it to the main centers.
- According to the information available in the COES, to date there are 18 projects in the electricity generation subsector, for the period from 2022 to 2024. Although the existence of projects in the electricity sector is positive, the outlook does not seem to be very dynamic in the short term on the side of the generation supply.
- On average, 100 MW per year would be adding, compared to an average growth of the maximum demand of 200 MW. However, in the short term, this would not cause a problem in the close panorama due to the available supply, currently, in the country.
- Regarding the transmission projects (13 to date), they belong to the Proinversion's portfolio and it is expected that they will be tendered under the modality of a Public Private Partnership (PPP).

Renewable energy overview

Renewables Industry Overview

- In 2021, Peru generated over 9.77% of its electricity needs from renewable energy. Clearly, the country is not a global leader in renewable energy generation; nevertheless, in the last decade the energy generated by renewable sources has shown continued growth.
- To improve the quality of life of the population and protect the environment, the development of non-conventional renewable energies began in Peru in 2008 as a result of a new regulatory framework that provides for competitive and periodic auctions. As a result, four RER auction processes have been executed for the National Interconnected Electricity System (SEIN) and one for off-grid areas.
- According to their degree of technological development and level of penetration in energy systems, they are usually classified into Conventional Renewable Energies (CRE) and Non-Conventional Renewable Energies (NCRE). Within CRE, the most important is large-scale hydropower. In Peru, the current regulatory framework defines NCRE as wind, solar, geothermal, tidal, biomass and small hydropower sources. In this regulatory framework, NCRE are referred to as Renewable Energy Resources (RER).
- In 2010, the Peruvian government designed the National Energy Policy 2010-2040, and one of the objectives of which is to have a diversified energy matrix, with emphasis on renewable sources and efficiency to develop an energy sector with minimal environmental impact and low carbon emissions within a sustainable development framework.
- Following that line, in 2012 the Ministry of Environment (MINAM) launched the Planning for Climate Change (PlanCC). The technical coordination is undertaken by Libélula and the financial support comes from the Children's Investment Fund Foundation (CIFF), the Swiss Agency for Development and Cooperation (COSUDE) and the Climate and Development Knowledge Network (CDKN). The project developed sound evidence on possible climate change mitigation scenarios in Peru, strengthened capacities and laid the foundations for long-term low carbon economic growth.
- Also, in 2015 the Peruvian government launched the National Climate Change Strategy (ENCC), approved by Supreme Decree No. 011-2015-MINAM, which established that public policy objectives on climate change should be aimed for the population, economic agents and the state to conserve carbon stocks and reduce GHG emissions.
- The Ministry of Energy and Mines (MINEM) is in charge of defining the energy requirements, preparing and approving the bases and signing the contracts resulting from the auction, while the Supervisory Agency for Investment in Energy and Mining (Osinergmin) is in charge of conducting the auction, setting the maximum prices and supervising the resulting contracts. These two entities, alongside the MINAM, are the chief government bodies for the promotion of renewable energy.
- Peru's RER system operates under an auction scheme. The type of auction used in Peru is a first-price sealed bid and uses as a competition factor the lowest monomial price of generation, in addition to the amount of energy to be auctioned. Both the energy quotas established for each RER technology and the corresponding reserve prices represent the maximum values up to which the State is willing to purchase RER energy. In this sense, even when the price resulting from the RER auction is relatively close to the reserve price, the State obtains a profit.

- Peru also has an emission trading scheme since 2013, under the regulation of the Kyoto Protocol and now the Paris Agreement, operating by the Clean Development Mechanism which consists of the purchase and sale of gas emission certificates, known as carbon credits. Notwithstanding, the country has just begun to operate in this market in the recent years, thus the low impact of this mechanism so far.
- However, in 2021 the Peruvian government approved the "Peru Sustainable Bond Framework," a document that seeks to finance environmental and social projects to achieve the principles of a dignified and productive society with a sustainable management of natural resources. The Framework establishes that it's the obligation of the government, through the General Directorate of the Public Treasury, to act as the issuer of carbon bonds. This regulation reflects clear progress toward the reduction of GHG emissions.
- Also, in January 2022, the Government issued Supreme Decree No. 003-2022-MINAM, which declares the climate emergency to be of national interest. In this sense, it establishes that the Ministry of Energy and Mines, within the framework of its functions and competences, and in coordination with the Ministry of Environment, guarantees the use of non-conventional renewable energy resources in the electricity generation matrix with a projection of reaching 20% of its participation by 2030.
- Historically, more than 50% of Peru's electricity production has come from renewable sources. Until 2002, hydroelectric generation accounted for 85% of the country's total electricity generated. With the development of the Camisea gas, hydroelectric power plants have been decreasing and currently represent 13-15% of the energy matrix.
- In this sense, the Peruvian electricity system is characterized by being dispatch hydrothermal due to its main resources to supply the demand for electricity at its maximum requirement: water and gas Camisea native. However, in recent years, non-conventional renewable energies power plants such as solar and wind, that have priority in the dispatch of electricity, are charging important relevance.
- On average, the RER plants have come to provide the tenth of the dispatch on the days of greatest demand for energy. In this regard, on the day of maximum demand in 2021, the participation of the RER in dispatch was 9.2%. In the 2019 and 2020, the participation was 11.1% and 12.7%. In the future, such behavior is expected to continue.

Hydropower

- Peru has a long history of hydropower facilities. The production of electric power in Peru had its beginnings in the district of Yungas (Huaraz), where the mining company Tarma built the first hydroelectric power plant, which came into operation in 1884. In 1961, the *Corporación de Energía Eléctrica del Mantaro* (CORMAN) was created to build the Mantaro Hydroelectric Power Plant for the development of the region and the country, which was installed in 1973 and began operating in 1965. The total power installed in the country up to 1976 was 2,516 MW, of which 55.9% was hydroelectric.
- According to an interview conducted on April 4, 2021, the president of the National Society of Mining, Petroleum and Energy (SNMPE), Raul Jacob, stated that Peru has almost USD8.5 billion in energy investment projects, mainly in clean energy sources. Of this amount, 67% (approximately USD5.7 billion) is earmarked for hydroelectric power plants.

Wind

- At the end of 2021 Peru registered seven wind farms: Marcona, Wayra I and Tres Hermanas in Ica, Cupisnique in La Libertad, Duna and Huambos in Cajamarca and Talara in Piura, with a total installed capacity of 408 MW. It's worth noting that the largest wind farm in the country is Wayra I, with a total installed capacity of 132.3 MW (42 wind turbines with an individual power of 3.15 MW).
- Wayra I (the biggest) generates aprox. a total of 600 GWh per year, equivalent to the annual consumption of almost half a million Peruvian households, and will prevent the emission of almost 288,000 tons of CO₂ into the atmosphere per year.
- Between the end of 2020 and the first half of 2021, the Duna and Huambos wind farms entered into operation, each of these with an effective power of 18.4 MW. The two wind power plants are located in the north, specifically in the department of Cajamarca.
- In 2022, the construction phase began on Wayra Extension, which will be the expansion of the existing Wayra I wind power plant and will have a capacity of 108 MW. The approximate investment amount is USD148.41 million.
- Thus, there are three wind projects (Wayra Extension, Parque Eólico San Juan and Punta Lomitas) that have a definitive concession, add up to an installed capacity of 499 MW and represent a joint investment of approximately USD 600 million.
- It's estimated that Peru has a wind energy potential of 77,000 MW, of which more than 22,000 MW could be exploited.

Solar

- At the end of 2021 Peru registered eight solar power plants with photovoltaic technology in the regions of Arequipa (two), Moquegua (four), Lima (one) and Tacna (one). The largest solar power plant in the country is Enel Green Power Peru's Rubí, with an installed capacity of 144.5 MW. It also recorded an annual production of 424.2 GWh in 2018, which represented 57% of the country's total solar production. According to Enel, the plant is capable of generating 440 GWh per year, equivalent to the consumption of 350,000 Peruvian households, thus avoiding the annual emission of more than 209,000 tons of CO₂.
- The first hybrid solar hydroelectric plant called "Yarucaya" (1.62 megawatt) began its official operation on november, 2021 and is located in the district of Sayán, in the province of Huaura, 3 hours from Lima. The plant clean electrical energy into the SEIN.
- At the end of 2021, two definitive concessions were awarded in Peru (Clemesí solar power plant and the Iquitos solar power plant).
- The solar energy atlas of Peru shows that the region with the largest resources is located along the southern coast of Arequipa, Moquegua and Tacna. In these areas the annual average daily radiation is around 250 watts per square meter (W/m²).

Geothermal

- Peru is part of the Pacific Ring of Fire, which is characterized by frequent tectonic movements.
- Geothermal potential in the country has been studied since the 1970s with the identification of potential areas in the south, such as Moquegua and Tacna. In addition, more than 200 hot springs, fumaroles and some geysers have been identified.
- In 2012, the West Japan Engineering Consultants published the Master Plan for the development of geothermal energy in Peru which confirmed that the country has abundant geothermal resources with a total potential of 2,860 MW, mainly in the southern zone.
- In 2021, the Achumani (Arequipa) and Quello Apacheta (Moquegua) geothermal power plant projects were approved, both of which are in the initial development stage and will require an investment of more than USD1 billion to generate close to 500 MW.

Biomass/biogas

- Peru currently has five biomass power plants: Paramonga, Huaycoloro, La Gringa V and Doña Catalina located in Lima, and Maple Ethanol in Piura. In 2018, the biomass plants Maple Etanol and Paramonga had a higher share of the total installed capacity with 52.9% (37.5 MW) and 32.4% (23 MW), respectively. The Paramonga plant – which uses sugarcane bagasse as a source of energy for the production of electricity – was the first power plant with renewable resources of thermoelectric origin to start commercial operation in November 2010.
- Peru has the potential to install conventional biomass power plants with a capacity between 450 and 900 MW and biogas plants with a capacity of 5,151 MW. The main crops that can be used for ethanol production in Peru are sugarcane and sorghum.

Current issues in the renewables industry

- Historically, only the urban population had the comfort and utility of guaranteed electricity. The rural population for the most part did not have access to the grid or the voice and strength to demand it. However, there were isolated successful initiatives to electrify rural populations with decentralized systems (eg Pozuzo and Acopalca), but they represented nothing more than a drop in the bucket in view of the great need. According to the poverty map of the *Fondo Nacional de Cooperación para el Desarrollo* (FONCODES), 70% of the rural population in 2007 did not have access to electricity, with large variations between different departments.
- Apart from a partial liberalization of customs duties for renewable energies, there are no concrete incentives for individual or private investment. With the exception of projects and programs of international cooperation and some NGOs, there are still no measures to promote renewable energy at the individual level.
- In practice, there's a lack of easy access to favorable credits. Although there are funds for renewable energies through the Development Bank of Peru COFIDE (a second-tier bank), access to these credits through commercial banks for the majority of the population is in fact non-existent.
- The main critical points of the enabling conditions for the implementation of projects to combat climate change and GHG emissions are related to: i) the difficulty in intrasectoral, intersectoral and territorial articulation; ii) insufficient funds for the implementation of

adaptation measures at the public, private and international cooperation levels; iii) moderate political will at the national and international levels that should allow the prioritization of climate change as a conditioning factor that influences public health in the country.

- An important milestone in the electric power industry was the use of natural gas electricity generation, when in August 2004 the exploitation of Camisea gas began, which increased thermal generation. The use of this resource caused changes in the Peruvian energy matrix, diversifying primary sources and lowering costs.

Renewables laws

- Since 2008, the development of RERs began in Peru as a result of a new regulatory framework that contemplates the holding of competitive and periodic auctions to make the exploitation and participation of RER generation projects viable within the country's electricity sector matrix.
- The Legislative Decree for the promotion of investment for the generation of electricity with the use of renewable energies, Legislative Decree No. 1002, is the main government regulation for the renewable energy drive throughout Peru. This regulation declares of national interest and public necessity the development of new electricity generation through renewable resources and establishes incentives for the promotion of RER projects, such as:
 - Priority for daily cargo dispatch by the Economic Operation Committee of the National Interconnected System (COES).
 - If there is capacity in the electricity transmission and distribution systems of the SEIN, RER generators will have priority to connect.
 - Long-term stable tariffs (20 years) determined through auctions.
 - Purchase of all energy produced.
 - Establishing a market mechanism based on auctions for the award of RER projects and states that the frequency of these auctions must be no less than two years.
- In 2010, through Resolution No. 289-2010-OS/CD, the Procedure for calculating the energy not injected due to causes beyond the RER generator's control was published. This procedure establishes the criteria and process for determining the Energy Not Injected due to causes beyond the control of the Generator with RER (applicable exclusively to the successful bidders of the Auctions for electricity supply with RER).
- In 2011, through Supreme Decree No. 012-2011-EM, the Peruvian government published the Regulations for the Generation of Electricity with Renewable Energies, to establish regulatory provisions (Auction, Definitive Concession, Planning) for the production of electric energy based on the use of RER.
- In 2013 the Peruvian government published the Regulation for the Promotion of Electricity Investment in Off-Grid Areas, approved by Supreme Decree No. 020-2013-EM, which has the objective of establishing the necessary regulatory provisions for the adequate application of the Law in order to promote the use of Renewable Energy Resources to improve the quality of life of the population located in Off-Grid Areas.

Government incentive schemes

- The Ministry of Energy and Mines grants the following benefits to Electricity Renewable Sources or Renewable Energy Resources (RER) – biomass, wind, solar, geothermal, tidal and hydraulic energy when the installed capacity does not exceed the 20 MW:
 - Daily dispatch in the National Interconnected Electric System (SEIN) priority.
 - Energy production variable cost equal to zero.
 - Energy tenders for the short-term market.
 - Guaranteed income in energy tenders. It does not include the delivery of (i) energy committed to third parties and (ii) energy that can be purchased in the SEIN itself.
 - Formula: Income from Energy Sales + Additional Price Paid to Tender Winners ("Premium") = Guaranteed Income.

- Special accelerated depreciation regime for income tax purposes. The depreciation rate will be applicable to the machinery, equipment and civil works necessities for the plant installation and operation. The annual depreciation rate shall not exceed 20% as the annual global rate.
- If there's capacity in the SEIN's transmission and/or distribution systems, the RER generators will have priority to connect.
- The National Rural Electrification Plan (PNER) 2016-2025, in accordance with the Universal Energy Access Plan 2013-2022, aims to promote efficient, environmentally sustainable and equitable economic development in the energy sector, implementing projects to expand Universal Energy Access. These initiatives establish a policy for the sector to increase the rural electrification rate.
- On July 20, 2016, through Supreme Resolution No. 005-2016-MINAM, the Peruvian government created the Multisectoral Working Group of a temporary nature in charge of generating technical information to guide the implementation of the Nationally Determined Contributions (GTM-NDC), which is attached to the Ministry of Environment (MINAM). The GTM-NDC has following functions:
 - Elaborate general guidelines that should guide the governmental sectors directly related to the country's NDCs in the elaboration of the evaluation and/or quantification of direct and indirect costs, the identification of environmental and social co-benefits, as well as other economic effects derived from the initiatives that provide technical support to the NDCs.
 - Elaborate a tentative programming and/or roadmap and/or action plan to propitiate the enabling conditions that will allow the implementation of the NDC in the short and medium term.
 - To report every six months and at the end of its term, through a final report, the results of the work of the working group and the fulfillment of its purpose.
- From 2009 to date, the Peruvian government has held four RER auctions for the Interconnected Electricity System (SEIN) and one off-grid RER auction. Thus, progress was made with the diversification of electricity generation sources in the country. Eleven years after the first auction, almost 9% of the generating park is made up of non-conventional renewable energies. After four auctions, 249 projects have been presented, of which 64 have been awarded. Of these, 49 are already in commercial operation. In addition, technological progress and signals adopted by the regulator (such as not disclosing maximum prices) have helped to reduce the prices offered.
- In May 2018, the Ministry of Economy and Finance (MEF), in coordination with the Ministry of Environment (MINAM) charged higher taxes on fuels, taking into account their degree of harmfulness. In the case of vehicles, the selective consumption tax (ISC) applicable to new electric, gas and hybrid vehicles was abolished, while the applicable rates are 10% and 20% for new gasoline and diesel vehicles, respectively.
- In 2021 the Peruvian government approved and published the "Peru Sustainable Bond Framework," which seeks to finance environmental and social projects to achieve the principles of a dignified and productive society with a sustainable management of natural resources. The Framework establishes that it is the obligation of the government, through the General Directorate of the Public Treasury, to act as the issuer of carbon bonds.

Major projects and companies

- On October 26, 2012, the Central Solar "Repartición 20T" was inaugurated in the district of La Joya, province of Arequipa, the first photovoltaic plant in Peru with an investment of USD73 million and an approximate power of 20 MW.
- Enel Green Power Perú S.A. has been operating a big 126MW wind power station on the Wayra I in Ica. Contact Energy is expected to invest USD165 million into the project. In Addition, Enel Green Power Perú S.A. has been operating solar plant 144MW solar farm in Moquegua.
- Until July 2020, there are a total of 30 RER power plants under construction (between hydroelectric and wind), however, most of these are paralyzed due to controversies currently submitted to arbitration.
- In 2022, MINEM approved renewable energy projects for nine photovoltaic and four wind power plants, as well as other electrical works (transmission lines, substations and rural electrical systems) with an investment of approximately USD3.85 billion.

Foreign investment ownership

- The Legislative Decree No. 662 enacted in 1991 is the main legislative instrument governing foreign investment in Peru. It does not demand any regulatory requirements to make foreign investments in Peru. In this sense, foreign investments made in the country are automatically authorized.
- The Legislative Decree No. 757, Framework Law for Private Investment Growth, enacted in 1991 promotes the participation of foreign investment, so that there should be equal treatment in terms of exchange matters, prices, tariffs or non-tariff duties for national and international investors.

UNFCCC – Paris Commitments and beyond

- Peru ratified the Paris Agreement in 2016 through Supreme Decree No. 058-2016-RE, with the objective of recognizing and prioritizing climate change, seeking to reduce net GHG emissions in the atmosphere by 30% by 2030. Peru was the first Spanish-speaking country in Latin America to ratify the Agreement, which entered into force in 2020.
- Peru Emissions Trading Scheme is currently being enhanced by the government to become one of the principal policies responses to climate change. It supports global efforts to reduce greenhouse gas emissions while maintaining economic productivity, especially in rural areas. The scheme puts a price on greenhouse gas emissions and provides an incentive for industry participants to reduce emissions and plant forests to absorb carbon dioxide.

Relevant resources and references

Relevant websites

- [Ministry of Energy and Mining](#)
- [Electricity Authority](#)
- [Climate Change National Commission](#)
- [Committee of Economic Operation of the National Interconnected System](#)

References

- [La industria de la electricidad](#)
- [Análisis de la matriz energética peruana en los últimos años](#)
- [Planning for Climate Change \(PlanCC\) - Phase I](#)
- [Estrategia Nacional ante el Cambio Climático](#)
- [El Acuerdo de París](#)
- [Peru Sustainable Bond Framework](#)
- [Sistema Peruano de Información Jurídica](#)
- [Parque eólico Wayra I y proyecto Wayra Extensión](#)
- [Perú tiene potencial en la geotermia para suministrar energía eléctrica](#)
- [Perú cuenta con amplio potencial para desarrollo de energías renovables](#)
- [Análisis del Mercado de Electricidad](#)

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Poland

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil law• Language: Polish
Population	37.78 million (as of 2021 according to the data World Bank)
Gross national income (GNI) per capita	GNI per capita: USD 35,830 (as of 2021 according to the data from World Bank)
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: rank 37 out of 138• 2022 Index of Economic Freedom: rank 39 out of 180• 2021 Corruption Perceptions Index: rank 42 out of 180
Profile	<p>Poland is a central European country with over 1,000 years of history. After the second world war the country fell into the eastern, communist bloc, and thus its political and economic transformation into a democratic country with a free market happened after 1989. Since then, Poland's economy has skyrocketed, fueled by numerous foreign investments.</p> <p>Another milestone in recent Polish history was joining the EU in May 2004. This created new opportunities for growth and is one of the major factors (aside the transformation into a free and open market economy in 1989) contributing to the rapid development, which Poland has enjoyed in recent years. As of 2019, wholesale and retail trade, transport, accommodation, and food industry as well as industry are the key sectors of Polish economy. Nevertheless, quite recent transition into the free-market economy and necessity for continuing growth still limits the pace of modernization and transformation of several key sectors of Polish economy – like the energy market. Even though there's been a huge boom in renewable</p>

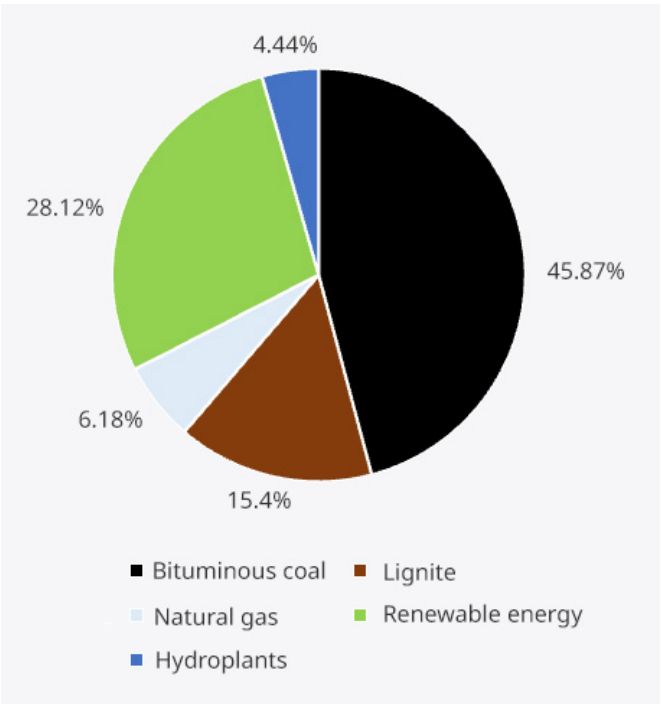
energy sector in recent years, Poland still has tough challenges to overcome, as the majority of electricity is still generated from coal or lignite.

Poland is a parliamentary republic with parliamentary elections held every four years. The government is led by the prime minister of Poland; however, the head of state is the President of the Republic of Poland.

Electricity industry overview

Electricity industry overview

Electricity market structure as of December 31, 2021 (installed power)



Source

- According to the information presented in the graph above, the majority of the total installed capacity in Poland comes from bituminous coal. However, what needs to be noted is the increase of the electricity generated from the renewable sources which makes up 28.12% of total installed capacity (increase by 7.43 percentage points (around 36%) since 2020).
- The total installed capacity in 2020 was 49,238 MW (5.2% increase from 2019). Additionally, annual electricity consumption reached 174.4 TWh (5.4% increase from 2020).
- The electricity consumption also varied between the sectors. As of the day of compiling this information, we do not possess the data for 2022; however, we do have the data regarding the consumption of electricity in 2021.

Key players on the electricity market

- Energa Capital Group
- Enea S.A.
- Tauron Polska Energia S.A.
- PGE Polska Grupa Energetyczna S.A.

- innogy Polska S.A. (since the end of 2021 – E.ON Polska S.A.).

Key plans and challenges

Key plans and challenges with regard to the electricity market in Poland include the transformation of the energy generation system. There's a plan to move away from coal and lignite and focus on renewables. This transition is expected to be helped by the commencement of the first nuclear power plant in Poland, which is currently being planned; however, no further actions have yet been undertaken to speed up construction.

Further issues regard the renewables industry and have been described below.

Legal framework

The following legal acts are the main legal acts regulating specific branches of the energy sector in Poland:

- Act of March 6, 2018, on the rules of participation of foreign entrepreneurs and other foreign persons in the economic trade on the territory of Poland
- Act of February 20, 2015, on Renewable Energy Sources
- Act of 27 April 2001 – the Environmental Protection Law
- Act of 3 October 2008 on Making Available Information on the Environment and its Protection, Public Participation in Environmental Protection and Environmental Impact Assessments
- Act of April 10, 1997 – Energy Law
- Act of April 23, 1964 – Civil Code
- Act of July 7, 1994 – Construction Law
- Act of March 27, 2003, on Zoning Planning and Development

Renewable energy overview

Overview of the renewable energy sector

In 2021, 28,12% of the power installed in the grid came from renewable energy sources (mainly from wind and solar installations). Nevertheless, the percentage share of the electricity generated from renewable energy sources in the whole national electricity production is only 16.9% (according to the data from Polish Energy Market Agency (PL: *Agencja Rynku Energii*)).

The target for renewables is set by the EU and its climate policy. According to the EU policy, by 2030, at least 40% of the energy mix must come from renewable energy sources. This level varies between countries therefore, Poland is obliged to have at least 31% of its energy mix generated from renewable energy sources.

Directive 2009/28/EC of the European Parliament and of the Council does not indicate any sanctions for failing to meet the 2020 target, and according to press information, the European Commission does not plan to publish any guidelines regarding the course of action in such a case.

In this context, the principles arising from the EU treaties, which concern failure to fulfil obligations arising from the EU law, become important. National renewable energy sources targets, due to their nature, are such an obligation. The European Commission may initiate a procedure against any country failing to meet its obligation. The potential consequences for countries falling behind in meeting the 2020 targets should be understood rather as a means to motivate them to catch up, but also to increase their ambition to meet the second EU RES target, the one set for 2030.

According to Article 6 of Directive 2009/28/EC, Member States may agree and make arrangements for statistical transfers of a certain amount of energy from one Member State to another. At the moment, however, there are no specific decisions of the Polish government in this respect.

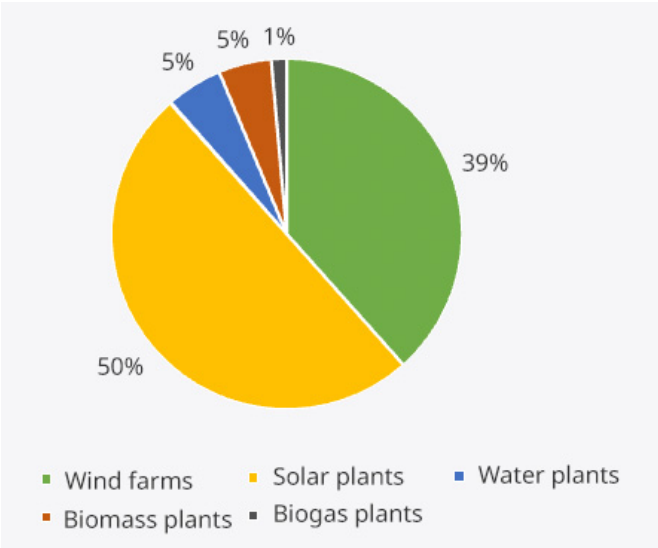
As of today, the government declares that the percentage share of the energy generated from renewable energy sources in the entire energy mix, for 2030, will be 23%. This is not in line with the EU goals, and thus it would require the government to increase the efforts with regard to the green transformation. This prognosis of course is not set in stone as according to the EU Poland has potential to reach 31% of the share of the energy generated from renewable energy sources in the Poland whole energy usage by 2030. This however would require numerous efforts from the current and future governments in order to achieve ambitious EU goals.

These efforts mainly result in providing legal framework as well as support systems aimed at rapid development of the renewables sector. Such actions may be considered as amending the Act on Renewable Energy Sources that extended the primary support system for renewables in Poland – the auction system. This auction system has been extended until 2027 (before this amendment the auction system was to be in place till 2021). On November 30, 2027, the European Commission agreed to the extension of the auction system until 2027 (consent was required as it was an extension of the public aid).

The majority of the renewable energy sources in Poland include wind and solar plants. According to Agencja Rynku Energii S.A. (Energy Market Agency) the structure of the installed power in renewables is as follows:

Wind farms	7 211,6 MW
Solar plants	9 401,1 MW
Water plants	977,5 MW
Biomass plants	914,1 MW
Biogas plants	265,7 MW

Installed capacity in renewables in Poland (September 2021)



Source

The Act Amending the Act on Maritime Safety and the Act on Maritime Areas of the Republic of Poland and Maritime Administration was adopted in 2022. The amendment is a continuation of legislation aimed at creating a legal framework for the construction of offshore wind farms in the Polish Exclusive Economic Zone of the Baltic Sea and sets of equipment for power evacuation within the meaning of the Act on Promoting Electricity Generation in Offshore Wind Farms. Nevertheless, Poland as of yet has no operating offshore wind farms; however, projects are currently being planned by both private and state-owned investors.

The amendments to the Act on maritime areas of the Republic of Poland and maritime administration will not impose new obligations on investors but will only sort out the issue of allowing offshore wind farms to be connected to the grid.

Solar energy

Solar energy is the largest part of the renewable energy mix as it constitutes 50% of all installed capacity of renewable energy installations (which is an increase of 22% compared to last year). Up to 2020, the electricity from PV installations was not generated in substantial amounts and could not compete with wind farms. This, however, has changed in recent years and energy companies have started to push for PV projects (also due to the introduction of the 10h rule in 2016). This allowed for the increase in development of solar farms, which have recently started to generate electricity to be sold to customers. A sudden increase in installed capacity of PV installations occurred in 2020-2022. As a result, the installed capacity in PV projects, amounting to 6,3 GW in 2020, has grown by 3,1 GW and is on the level of 9,4 GW (as of March 2022). These numbers have grown, as predicted.

Wind power energy

Another vital part of Polish energy mix is wind energy, and as it constitutes 39% of all installed capacity of renewable energy installations (a decrease of 13% compared to last year), it must be concluded that it's also an important fraction of the energy mix in Poland as a whole. In summary, wind power plants are a vital element of the green transformation that's necessary if the country is to increase its electricity production from renewable energy sources and move away from being mainly powered by coal or lignite power plants.

The most dynamic growth of wind powered renewable energy installations was between 2005 and 2016, when the growth was almost 70-fold. The best year for wind power was 2016 – in this year 1,225.38 MW of new installed capacity was added to the market. The end of 2016 also marked the end of the previous energy support scheme – green certificates, which were subsequently replaced by the auction system (the current and valid support system for energy from renewable sources in Poland).

The auction system, however, was not the factor that slowed down the investments in the renewable energy sector. Along with the introduction of the auction system in 2016, the government introduced a key factor – the 10h rule. The 10h rule was implemented by the Act of May 20, 2016, on investments in wind power plants. The 10h rule, prohibiting the location of power plants at a distance less than 10 times the height of the turbine, makes investments impossible in 99.7% of the area of the country. This rule in accordance with the data from the independent think-tanks resulted in only 0.3% of Poland's land area being available for wind energy investments and hindered the development of any major onshore wind farm projects in Poland.

This however is about to change as the Polish Parliament is working on adopting amendment to the abovementioned act. Under new proposed provisions, the location of wind farms would still be only allowed under the local zoning plan (PL: *miejscowy plan zagospodarowania przestrzennego*) that specifically allows for such location. It is the minimum distance of the turbine to the buildings that is going to be changed. In accordance with proposed regulations the distance from buildings may be changed by the municipality as part of the local zoning plan - the main restriction here being that the distance between a building and a turbine specified in the local zoning plan shall not be less than 500 meters.

Current issues in the renewables industry

Challenges overview

Like many markets, the Polish Energy market faces tough challenges it needs to overcome to comply with obligations arising from Poland's commitments to the EU Strategy and the Paris Agreement. Moreover, these challenges mainly arise from the pending issues on the Polish market.

The main source of these issues is the ongoing transformation of the whole energy sector in Poland. The majority of Polish electricity is still produced from coal or lignite in big power plants that were built in the late 20th century. Because of this, the transformation of the electricity market is necessary to satisfy the ever-growing needs of the economy and allow Poland to be self-sufficient in providing electricity to its branches.

The success in the energy transformation comes with the development of the renewable energy sector and the plans to commence construction of first nuclear power plant in Poland. As of this moment, the plans for the construction of the nuclear power plant are being made, however, with no real timeline regarding its construction. Additionally, the renewable energy sector is undergoing rapid

development; however, this progress needs to be quicker if Poland is to fulfil its obligations with regard to the reduction of CO₂ emissions.

The following paragraph explains particular challenges that are identified by experts on the Polish market and sectors that need to change.

Main sectors overview

- One of the major CO₂ producers is the energy sector in Poland, which is still heavily dependent on coal and lignite. This can be done simultaneously by increasing the amount of electricity from renewable energy sources, mainly solar and wind energy (both offshore and onshore). Similarly, the majority of the Polish heating market is still dependent on coal.
- Another sector that requires reduction in CO₂ emissions is the transportation sector, in which the emissions of CO₂ grew three times in the last 30 years. As experts state, the reduction may take place on multiple fronts such as favoring mass transportation and reduction of the means of transport using combustion engines and favoring electrical means of transport (promotion of alternative transportation such as electric cars, hydrogen or hybrid motors).
- Industry is another sector that produces substantial amounts of CO₂. Polish industry is relatively old so the government, according to experts, should promote innovative and modern industry that consumes less electricity. Another issue is with the Polish mining sector – as, according to Ember thinktank, it produces 70% of the coalmine methane in Europe (reduction in that part may come from reduction of the coal-powered electricity plants and their share in the Polish energy mix). Another sector that produces major amounts of greenhouse gases in Poland is agriculture, mainly the livestock industry. Promotion of plants and plant-based production and a reduction in meat consumption in Poland is necessary, as the average annual consumption of meat in Poland per person is 80 kg annually. This adds to the greenhouse gases produced by this industry.
- In summary – Poland faces tough challenges to meet EU and worldwide goals, as described by the internal policy of the EU and the Paris Agreement. The current actions of the government are extensive but still inadequate as experts deem that much larger actions and policies need to be adopted for Poland to effectively tackle climate change and meet worldwide and European obligations.

Government incentive schemes

- In Poland, the main support system is the auction system.
- The auction system was introduced into the Polish legal system on July 1, 2016, based on an amendment to the RES Act. The first auction was conducted in December 2016.
- The auction system allows electricity generators from RES to participate in auctions, the possible winning of which ensures generators' participation in this support system. It should also be noted that participation in the auction itself applies not only to renewable electricity generators (mainly solar or wind units) that are new or still under construction, but also to older units that started generating energy for the first time before July 1, 2016.
- RES auctions are organized once or twice a calendar year. Initially, the auction support system was to last until 2021, but it was extended until the end of 2027 on the basis of an amendment to the RES Act. The auction system itself is one of the main factors contributing to the dynamic development of the renewable energy sector in Poland in recent years. This dynamic development also concerns PV installations, the total installed capacity of which has increased at a very fast pace in recent years.
- In Poland, there are also FIT and FIP schemes. The FIT/FIP tariff scheme applies to biogas plants and small hydroelectric power plants with an installed electrical capacity of up to 1 MW, while the FIT scheme can cover installations with a capacity of up to 500 kW.
- According to Article 70a of the RES Act, the FIT system can be used by producers of electricity from renewable energy sources in a small installation or micro-installation, who sell or will sell unused electricity to an obliged seller.
- The FIP system may be used by generators of electricity from renewable energy sources in a renewable energy source installation with a total installed electrical capacity of no more than 1 MW, who sell or will sell unused electricity to a selected entity other than the obliged seller.
- The purchase price in the FIT/FIP schemes is 95% (installations up to 500 kW) or 90% of the reference price determined for a given calendar year by a decree issued by the Ministry of Climate and Environment.

- The price applicable in the year in which the generator submitted its declaration of participation in the FIT/FIP scheme to the ERO is applied throughout the entire support period. The energy purchase price is also subject to annual indexation with the average annual consumer price index from the previous year.

Major projects and companies

Key players

- Energa Capital Group
- Enea S.A.
- Tauron Polska Energia S.A.
- PGE Polska Grupa Energetyczna S.A.
- innogy Polska S.A. (since the end of 2021 – E.ON Polska S.A.).
- PKN Orlen
- Polenergia
- EDP Renewables Polska
- OX2
- Mashav Energia
- Respect Energy
- Tauron Ekoenergia
- PGE Energia Odnawialna

Solar energy

Large-scale solar investments are becoming more and more popular in Poland. Many of these projects are still in the development phase, such as Zwartowo PV farm located near the coastline and is to have an installed capacity of 204 MW (first phase of the investment) that will be extended to 390 MW in the second phase of investment. It's the largest PV project in this part of Europe (as large as 300 ha) and by 2050 will limit CO₂ emissions by 5 million tons. The project is developed by the Polish company Respect Energy S.A. in partnership with the German corporation Goldbeck Solar.

Some Projects have already been developed. In autumn 2021, the news broke that photovoltaic power plant located in Brudzew has commenced operations and started production of electricity. As of this moment, PV Brudzew is the largest photovoltaic power plant in Poland, with an installed capacity of 70 MW. PV Brudzew was constructed by ESOLEO and PAK Serwis for the commercial group ZE PAK.

Additionally, it needs to be highlighted that solar energy has undergone a rapid development in recent years. According to data from PSE, the installed capacity of PV installations in Poland has increased rapidly since September 2021 from 6.3 GW up to 9.4 in March 2022.

On-shore wind

The first place in the ranking of wind farms in Poland by capacity is taken by the Potęgowo Wind Farm. It has 81 turbines with capacities: 2.5 MW and 2.75 MW. It was fully commissioned in December 2020.

The second largest wind farm in Poland is located in Margonin in the Wielkopolskie Voivodship. It has been in operation since 2009. It has 60 windmills with a total capacity of 120 MW.

OX2 is implementing the construction of the Grajewo wind farm. The wind farm will consist of a total of 12 turbines (40 MW) with an estimated annual energy production of 130.6 GWh. The entire project should be finalized and commissioned by the end of 2022. Another important project on the map of Polish renewable sources is the Sulmierzyce wind farm. The farm will consist of a total of seven turbines (23.1 MW) and will have an estimated annual energy production of 67.6 GW.

Offshore wind and others

February 18, 2021, marked the entry of the legal act regulating offshore wind farms in Poland. As a first step, public aid is granted via a decision of the President of Energy Regulatory Office. Such decisions were issued for these projects:

- EW Baltica 2 (1498 MW)
- EW Baltica 3 (1045 MW)
- Baltic Trade and Invest (350 MW)
- OWF Baltic II (720 MW)
- OWF Baltic III (720 MW)
- Baltic Power (1197 MW)
- BC-Wind Polska (369 MW)

This means that Polenergia and Equinor, PGE Polska Grupa Energetyczna and Ørsted, RWE Renewables, PKN Orlen and Northland Power and Ocean Winds will receive support.

On 13 August, the Act of 7 July 2022 amending the Act on maritime safety and the Act on maritime areas of the Republic of Poland and maritime administration will come into force, which introduces three types of certificates confirming compliance with the requirements set out in the Act on promoting electricity generation in offshore wind farms:

1. **the certificate of design conformity**, confirming the compatibility of the construction project with technical standards
2. **the certificate of exploitation**, confirming the compatibility of the construction process with the construction design and the certificate of design conformity
3. **the certificate of operational safety**, confirming the completeness and correctness of the documentation in terms of proper maintenance and servicing of the offshore wind farm or its part or set of equipment.

In the following years support will be granted in an auction system similar to the one described above.

Foreign investment ownership

- Conducting business activity in generating electricity in Poland is a regulated activity. For installations that have installed capacity exceeding 1 MW, it requires an Electricity Generation License issued by the President of ERO. The licenses are granted for a period from 10 to 50 years.
- To obtain an Electricity Generation License, the applicant should meet a number of conditions, the fulfilment of which is examined in detail by the President of the ERO on the basis of the license application, the information contained in it and the documents attached. This information consists primarily of documents confirming the fulfilment of the conditions set out in the provisions of the Energy Law Act, as well as documents confirming that the applicant has adequate funds for the proper performance of its activity or can obtain them.
- To obtain the Electricity Generation License, the applicant must meet the conditions set out in Article 33 section 1 of the Energy Law Act, have its registered office on the territory of a Member State of the EU, the Swiss Confederation or a Member State of the European Free Trade Association (EFTA) – a party to the Agreement on the European Economic Area or Turkey.
- The examination of a complete application for the Electricity Generation License is a matter for the ERO and may take from 6 to 18 months. Completion of documents to the application by the applicant should take about 8 weeks.

- After obtaining an Electricity Generation License, the licensee should meet a number of obligations, the most important of which is the timely payment of the properly calculated license fee. Other obligations are mainly connected with reporting and providing information.
- Smaller installations do not require an Electricity generation License. For an installation with installed capacity over 50 kW but not exceeding 1 MW (small installation) the electricity producer is required to register in the register of small installation energy producers. Installations with installed capacity of under 50 kW do not require any registration or an Electricity Generation License.

UNFCCC – Paris Commitments and beyond

Poland signed the Paris Agreement on April 22, 2016. As a member of the EU, Poland continues to work toward a major reduction of CO₂ emissions and to halt climate change. The goal set out by the Paris Agreement as well as the goals set out by the EU require immediate action from the Polish authorities, as Poland – with its current pace – is expected to fall behind these thresholds. Polish experts and journalists highlight several issues with Poland's contribution to fighting climate change and priorities in which immediate action is recommended and required.

Current Polish efforts are guided not only by international commitments but also the Polish goal to transform its aging energy market structure by means of introduction of numerous renewable energy generation units as well as construction of the first nuclear power plant (it's important to add that although the official plans of the Polish government rely on construction of a nuclear power plant, the whole process has not moved much within the last decade and no construction works have begun). The aim and a goal of these efforts is to reduce the share of coal-generated electricity in the whole electricity mix in Poland. There are many reasons for that: Poland's coal power plants are old and are damaging the environment, prices of coal continue to rise, as Polish coal resources are decreasing, and its mining is becoming more and more unprofitable, and rapidly increasing prices of CO₂ emission certificates.

In summary, Poland is undertaking numerous efforts to comply to the green transformation and its international commitments, but a common conclusion on the Polish market is that the government is not doing enough to meet the required thresholds. Therefore, it's widely accepted that in the next few years Poland needs rapid development in renewable energy sector.

Relevant resources and references

Relevant websites

- [Energy Regulatory Office \(*Urząd Regulacji Energetyki*\)](#)
- [Polish Power Grids \(*Polskie Sieci Elektroenergetyczne*\)](#)
- [Energy Market Agency \(*Agencja Rynku Energii*\)](#)
- [Ministry of Climate and Environment \(*Ministerstwo Klimatu i Środowiska*\)](#)
- [Settlement Administrator S.A. \(*Zarządca Rozliczeń S.A.*\)](#)
- [Polish Power Exchange \(*Towarowa Giełda Energii*\)](#)

Key contacts



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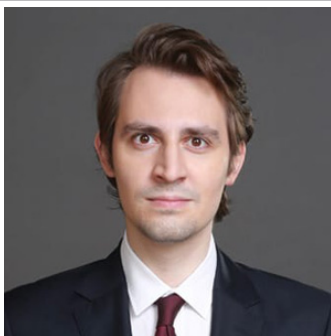
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Portugal

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: Portuguese
Population	10.3 million
Gross national income (GNI) per capita	PIB per capita: EUR 20,390
Business environment	<ul style="list-style-type: none">• 2021 Global Peace Index: 4• 2021 Index of Economic Freedom: 52 of 186• 2021 Global Innovation Index: 31• 2020 UN Development Program Human Development Index: 38• 2021 Corruption Perceptions Index: 32 of 176• 2019 Global Competitiveness Index: 34 of 138
Profile	<p>Portugal is located on the Iberian Peninsula, in Southwestern Europe, whose territory also includes the Atlantic archipelagos of the Azores and Madeira. Portugal is the oldest continuously existing nation-state on the Iberian Peninsula and one of the oldest in Europe. In the 15th and 16th centuries, Portugal established the first global maritime and commercial empire, becoming one of the world's major economic, political, and military powers. Portugal has left a profound influence across the globe, with a legacy of around 250 million Portuguese speakers. It is a member of the UN, the EU, the Schengen Area, and the Council of Europe (CoE),</p>

Portugal was also one of the founding members of NATO, the eurozone, the OECD, and the Community of Portuguese Language Countries.

Portugal has been a semi-presidential representative democratic republic since the ratification of the Constitution of 1976, with Lisbon, the nation's largest city, as its capital. Portugal's Socialist party (PS) won the January 2022 parliamentary election with an outright majority.

The national currency of Portugal is the euro (€) and the country was one of the original member states of the eurozone. The tertiary sector is presently the most important component of the Portuguese economy.

Electricity industry overview

Portugal is one of the EU countries with the highest energy dependence rate, totalling 74.2% in 2019. This is mainly due to the lack of fossil energy sources which continue to have a significant impact on the total consumption of primary energy.

Portugal has no production of crude oil, natural gas, or coal, and relies entirely on imports for these energy sources. Domestic energy production comes primarily from bioenergy (direct use and electricity generation) and generation from wind and hydro.

- Oil products were the largest energy source in 2019, accounting for 43% of TES (Total Energy Supply).
- Road transport accounted for most oil products demand (51%), followed by industry (16%) and oil-based building heating (5%).
- Natural gas is the second-largest energy source, accounting for 24% of TES, and is used mainly for electricity generation (60%) and industrial processes (24%).

Portugal was among the first countries in the world to set 2050 carbon neutrality goals. Portugal's energy and climate policies push for carbon neutrality primarily through broad electrification of energy demand and a rapid expansion of renewable electricity generation, along with increased energy efficiency. There is a strong focus on reducing energy import dependency and maintaining affordable access to energy.

Portugal's National Energy and Climate Plan (NECP) sets 2030 targets for a 17% reduction of non-ETS GHG emissions and a 45-55% reduction in total GHG emissions (both compared to 2005 levels), energy efficiency (primary energy demand less than 21.5 million tonnes of oil equivalent (Mtoe), compared to 22.1 Mtoe in 2019, and final energy demand less than 14.9 Mtoe, compared to 17.1 Mtoe in 2019), renewable energy (47% of gross final energy demand, 80% of electricity generation, 49% of heating and cooling demand, and 20% of transport demand), 15% cross-border electricity interconnection (compared to 10% in 2019), and 65% external energy dependency (compared to 74% in 2019).

Decree-Law no. 15/2022, dated 14 January, as last amended

This Decree-Law establishes the revised framework for the National Electric System ("SEN") in line with the needs and challenges posed by the strategic instruments that guide the energy policy of the European Union and Portugal.

The legal framework currently in force introduces amendments to the organization and operation of the SEN, notably:

- Centering in one single law all matters related to the organization and operation of the SEN;
- Removing the distinction between ordinary and special-size production, thus eliminating 2 separate licensing procedures for power production activity;
- Imposing the installation of smart meters and grids;
- Strengthening consumer information rights;

- Establishing the legal framework applicable to new realities, such as retrofitting, hybrids, and storage, as well as to projects for innovation and development through the creation of three Technological Free Zones ("ZLT").

Renewable energy overview

Portugal continues to be a global leader in renewable energy production. A well-structured incentive mechanism and the adoption of ambitious targets helped this sector grow over recent years.

Currently, domestic primary energy production in Portugal is mostly based on **Renewable Energy Sources** (RES), from natural resources (water, wind, biomass, sun, and earth's heat).

RES allows for the production of hydroelectric, wind, biomass, solar, oceanic and geothermal energy. The production of energy from renewable sources reduces the need to import fossil fuels, such as coal and natural gas thus reducing the country's energy dependency, as well as greenhouse gas emissions.

Portugal has achieved high shares of renewable energy production, covering 30.6% of the gross final energy demand in 2019. Thanks mainly to hydropower and wind generation, renewables covered 54% of electricity generation. There is also a high use of bioenergy to supply power for industrial and household purposes.

Portugal foresees a key role for hydrogen produced from renewable energy in hard-to-decarbonize sectors and for achieving carbon neutrality. The country's Recovery and Resiliency Plan ("*Plano de Recuperação e Resiliência*", "PRR") allows for funding to the energy sector, notably in respect of sustainable mobility, energy efficiency, renewables, decarbonization and bioeconomy. The plan allocates € 610 million for energy efficiency and renewable energy in buildings and €185 million to support 264 megawatts (MW) of renewable gas production (hydrogen and biomethane).

At the end of June 2021, the installed capacity in units of production of electric energy from renewable sources was 14,762 MW. The percentage target from renewable energy according to Directive 2009/28/EC reached 55.5%. The main sources of renewable energy included hydro, followed by wind, solar and biomass. From January to June 2021, 24 909 GWh of electricity were generated in mainland Portugal, of which 71,3 % were generated by renewable sources.

Renewables laws

Decree-Law no. 15/2022, dated 14 January, as last amended

As mentioned above, this Decree-Law establishes the revised framework for the National Electric System ("SEN"). Therefore, it also regulates every step of the production, storage, self-consumption, transport, distribution, aggregation, and sale of renewables.

Law no. 98/2021, dated 31 December

The Climate Basic Law establishes the main guidelines that will direct climate action frameworks in Portugal. It defines the main targets to be achieved, namely the achievement of carbon neutrality until 2050, as well as greenhouse gas emission reductions of 55% (until 2030), 65 to 75% (until 2040), and 90% (until 2050).

Decree-Law no. 141/2010, dated 31 December, as last amended

Defines the national target for the use of renewable energy until 2030.

Current issues in the renewables industry

National hydrogen strategy

Portugal sees a key role for hydrogen produced with renewable energy to support clean energy transitions in hard-to-decarbonize sectors and end uses and to achieve carbon neutrality by 2050. The National Hydrogen Strategy (EN-H2) indicates that by 2030, hydrogen should cover:

- 1.5-2% of Portugal's energy demand;

- 2-5% of industry energy demand;
- 3-5% of domestic maritime shipping energy demand;
- 1-5% of road transport energy demand;
- 10-15% of the volume of gas delivered by the natural gas network.

This would require the deployment of an estimated 2-2.5 gigawatts (GW) of electrolysis capacity powered by renewable electricity by 2030, along with enabling legislation, regulations, and standards. The EN-H2 also indicates that in the long term, renewable hydrogen could be used directly for electricity generation and energy storage.

Lithium prospection

The Portuguese Government has announced that public tenders for lithium prospection and research rights with respect to 6 areas will proceed in 2022, following the completion of viability assessments.

Government incentive schemes

There are several government funds and schemes directed at incentivizing investment on renewables.

Namely, the Innovation Support Fund (*"Fundo de Apoio à Inovação"*; **"FAI"**) was designed to support innovation, technological development and investment on renewable energy and energy efficiency.

The Energy Efficiency Fund (*"Fundo de Eficiência Energética"*, **"FEE"**) funds programs foreseen on the National Action Plan for Energy Efficiency (*"Plano Nacional de Ação para a Eficiência Energética"*, **"PNAEE"**).

Other funding programs and schemes can also be employed to incentivize investment on renewables and sustainable development, such as the Operational Program Sustainability and Efficiency on the Use of Resources (*"Programa Operacional Sustentabilidade e Eficiência no Uso de Recursos"*, **"PO SEUR"**), the Innovation, Technology and Circular Economy Fund (*"Fundo de Inovação, Tecnologia e Economia Circular"*, **"FITEC"**), or the Environmental Fund (*"Fundo Ambiental"*)

In 2020 the Ministry of Environment and Climate Action launched the Support Program for "More Sustainable Buildings" (*Programa de Apoio "Edifícios Mais Sustentáveis"*), under which persons can apply for State funding to improve the energetic efficiency of their houses, for instance by installing self-consumption electro productive centers or renewable sourced heating systems.

Besides national funding and schemes, EU funding is also available, namely through the European Strategic Energy Technology Plan (Set Plan), Horizon 2020, the European Regional Development Fund (ERDF), among others.

Major projects and companies

- The Portuguese Government has announced public tenders for **lithium prospection** and research rights with respect to 6 areas will proceed in 2022, following the completion of viability assessments.
- The first hydrogen cluster in Portugal starts 2023. The GreenH2Atlantic project is the result of a consortium of 13 entities and has a funding of €30 million.
- EDP Renováveis (EDPR) sold a wind portfolio of 221 megawatts (MW), located in Portugal, to Onex Renewables, in a deal valued at €534 million. EDP Renewables is a global leader in the renewable energy sector and the world's fourth-largest wind energy producer.
- Electrica dos Açores plans to invest €181 million in renewable energy by 2026.
- Investment of two billion in wind farm off Viana do Castelo: A German group wants to install 25 to 53 wind turbines offshore to produce energy in 2028.
- Public tender for the conversion of the Pego power station, in Abrantes.
- KEME Energy, a Portuguese company that implements renewable energy self-consumption projects, will invest 5.2 million in installing a green hydrogen production plant in Sines (Setúbal).

- Iberdrola has started the construction of four solar farms in Portugal totalling 86MW.

Foreign investment ownership

Renewable energy

Portugal continues to be an attractive market for the development of renewable energy. However, decision-making tends to be bureaucratic and collaborative relationships with local companies are considered to be the most appropriate strategy to enter the Portuguese market. Any major project will mostly require some type of joint venture. A sustained local presence, product exposure, or track record in the renewable energy industry will also prove to be a major asset while the market continues to develop.

While on general terms there are no significant restrictions on foreign investment in Portugal, energy, being considered a strategic asset, is protected by means of Decree-Law no. 138/2014, dated 15 September. This means that the Council of Ministers may oppose to operations from which results in the acquisition of control from people or groups of people from third countries outside of the European Union and the European Economic Area (EEA). A shareholder that wishes to enter the Portuguese market by incorporation of a Company must file a request for a Portuguese taxpayer number, as well as for the directors of the company to incorporate. In case the shareholders or directors are non-EU citizens, they must also designate a tax representative. The remaining incorporation procedure follows the same steps as a national company.

At European level, Regulation 2019/452 of the European Parliament and of the Council of 19 March 2019, established a framework for the screening of foreign direct investments into the Union, referring to the investment's potential effects on energy as one of the factors to determine if said foreign direct investment is likely to affect security or public order.

UNFCCC – Paris Commitments and beyond

- Decarbonization path to achieve emissions reduction of more than 85% in 2050 and compensation for other emissions through land and forest use.
- A 1.3 GW coal-fired power plant located in Sines was closed in January 2021, and a 0.6 GW Pego coal power plant ceased operations in November 2021. The Government indicates that natural gas electricity generation will be maintained until 2040.
- Both residential and service buildings will also make a significant contribution to decarbonization (reduction of over 96% compared to 2005), due to an almost total electrification of energy consumption, further supported by large energy efficiency gains through reinforcing the insulation of buildings, the use of solar heating and heat pumps.
- The use of hydrogen and advanced biofuels in the public transport system will also play an important role in replacing current fuels. The conversion of mobility in private vehicles into other forms of mobility (public, active, shared, autonomous) will significantly increase the volume of passengers or goods transported, without the need to increase fleets, particularly of private cars
- A central aspect of Portugal's energy and climate policy is the Green Taxation Law, passed in 2014 to better align energy sector taxation with decarbonization goals. As part of the Green Taxation Law, Portugal established a carbon tax in 2015 that covers fossil fuel demand in all non-ETS sectors.

Relevant resources and references

Relevant websites

- [APREN – Associação de Energias Renováveis](#)
- [APA – Agência Portuguesa para o Ambiente](#)
- [DGEG – Direção Geral de Energia e Geologia](#)
- [ENSE – National Entity for the Energy Sector](#)
- [ERSE – Regulating Entity for Energy Services](#)
- [EU National Energy and Climate Plans | Portugal](#)
- [Ministry of Environment and Climate Action](#)

References

- [EN-H2 National Hydrogen Strategy](#)
- [International Trade Administration: Portugal Country Commercial Guide](#)
- [IEA – International Energy Agency Portugal](#)
- [REA – State of the Environmental Portal | Portugal](#)
- [Portugal Energia](#)

Key contacts



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Romania

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Romania• Language: Romanian
Population	19.19 million (resident population in 2021, insse.ro)
Gross national income (GNI) per capita	USD 12,580 (2020, World Bank)
Business environment	<ul style="list-style-type: none">• 2019 Global Competitiveness Index: Rank 51, Score 64.4• 2022 Index of Economic Freedom: Rank 47, Score 67.1• 2021 Corruption Perceptions Index: Rank 66, Score 45• 2020 UN Development Programme Human Development Index: Rank 49, HDI Value 0.828
Profile	<p>Romania is a country at the crossroads of Central, Eastern and South-eastern Europe. It has a predominantly temperate-continental climate, and an area of 238,397 km2 (92,046 sq mi), with a population of around 19 million. Romania is the twelfth-largest country in Europe, and the sixth-most populous member state of the European Union.</p> <p>Romania was formed in 1859 through a union of the Danubian Principalities of Moldavia and Wallachia. In the aftermath of WWI, having fought together with the Allied Powers from 1916, Bukovina, Bessarabia, Transylvania and parts of Banat, Crisana, and Maramure became part of the Kingdom of Romania. At the end of WWII, a communist regime supported by the USSR took control of the country and ruled until 1989. After the 1989 Revolution, Romania began a transition towards democracy and a market economy, ultimately joining NATO in 2004 and EU in 2007.</p>

Romania's political framework is a semi-presidential representative democratic republic where the Prime Minister is the head of government while the President represents the country internationally, signs some decrees, approves laws promulgated by parliament and nominations as head of state. Romania has a multi-party system, with legislative power vested in the government and the two chambers of Parliament: the Chamber of Deputies and the Senate.

Electricity industry overview

Electricity industry overview

According to data published by Romania's electrical grid transport and system operator (C.N.T.E.E. Transelectrica S.A.), in 2021, compared to the previous year, net domestic consumption increased by 5% and net energy production by 6% (to 56.1 TWh). In the structure of the production mix, in 2021, there was a decrease in nuclear of 2% and in renewables of 3%. The contributions from thermo and hydro sources have increased by 9% and 13% respectively. The components of the net energy production mix are:

- Thermo: 35%
- Hydro: 31%
- Nuclear: 18%
- Renewables: 16%

Following the European Commission's recommendations, Romania's updated contribution to achieving the EU objectives by 2030 as highlighted below (set out by the Integrated National Plan in the field of Energy and Climate Change 2021-2030) is:

- ETS (i.e. Emissions Trading System) emissions (vs 2005): -43.9%
- Non-ETS emissions (vs 2005): -2%
- Renewables proportion from the total gross consumption: 30.7%
 - Renewables in the electricity system: 49.4%
 - Renewables in the transport system: 14.2%
 - Renewables in the heating and cooling system: 33%
- Energy Efficiency:
 - Primary Consumption: -45.1%
 - Final Consumption: -40.4%

Electricity laws

The main regulatory act in the energy sector is represented by Law 123/2012 of electric energy and natural gas ("**Energy Law**"), which establishes the general legal framework of Romania's energy system. This general framework is further detailed under the secondary legislation, which mainly consists of norms and regulations adopted by the National Authority for Energy Regulation (ANRE).

As a general consideration, Romania's energy sector is highly regulated and dynamic, with specific secondary legislation addressing in detail a variety of subjects, from the establishment of new production capacities, licensing of energy operators for various activities (e.g. production, trading, supply etc.), grid connection rules and procedures as well as energy markets' organization and operation.

Major changes have been implemented recently to the legislative framework in the energy sector, starting with the adoption of a substantial set of amendments to the Energy Law, through the enactment, at the end of 2021, of Government Emergency Ordinance no. 143/2021 for the amendment of Law no. 123/2012 of electricity and natural gas, as well as for the amendment of other regulatory acts ("

GEO 143/2021). The amendments were mainly focused on the alignment of the Energy Law with the provisions of Directive (EU) 2019 /944 of the European Parliament and of the Council on common rules for the internal market for electricity, which had a transposition deadline of 31 December 2020. Romania was formally notified by the European Commission in February 2021 for failing to communicate the transposition measures of the aforementioned Directive.

Arguably the most anticipated change brought on by GEO 143/2021 was the definitive lift on the ban over directly negotiated PPAs on the Romanian electricity market. Prior to this amendment, directly negotiated PPAs have been prohibited under the law since 2012, with a first step towards partially lifting the ban having been implemented in 2020, but that only applied to production capacities commissioned after 1 June 2020. Other relevant changes implemented under GEO 143/2021 focused on aspects such as increased transparency from grid operators over grid development plans and connection procedures, a more favorable legal framework for energy prosumers (ie, consumers operating small electricity production capacities), aimed to encourage the adoption of small scale photovoltaic solutions by individuals and companies, as well as a more extended legal framework for electricity storage and electric vehicles charging stations.

GEO 143/2021, although already in force, is currently undergoing a process of Parliamentary approval, having been approved with amendments by the Romanian Senate and currently under review by Romania's second Parliamentary body, the Chamber of Deputies.

In the context of the wider energy crisis, following a first set of state intervention measures on the energy market, which applied from 1 November 2021 until 31 March 2022, the Romanian Government decided to extend the emergency regulatory intervention through the adoption on 18 March 2022 of the Government Emergency Ordinance no. 27/2022 on the measures applicable to final consumers on the electricity and natural gas market between 1 April 2022 and 31 March 2023, as well as for amending and supplementing certain regulations in the energy sector (**GEO 27/2022**).

GEO 27/2022 extended the support provided to consumers until 31 March 2023, by implementing caps on the electricity and natural gas prices, for both household and non-household consumers. Another measure that was extended and further regulated was the additional taxation of incomes derived by electricity producers. Thus, until 31 March 2023, the additional income generated by electricity producers and resulting from the difference between the average monthly selling price of electricity and the price of RON 450 (approx. € 90)/ MWh will be taxed at 80%. The 80% tax does not apply to income derived by electricity producers from production capacities that are commissioned after the entry into force of GEO 27/2022. Under the previous set of measures (applicable between 1 November 2021 until 31 March 2022), fossil fuel-based electricity producers were also exempt from the application of this additional tax, but this exemption, deemed discriminatory by other categories of producers, was no longer maintained under GEO 27/2022.

Renewable energy overview

Renewables industry overview

Romania reached in 2020 the target of 24% of total energy consumption from renewable sources. For 2030, the new target set by the Romanian government is 30.7%, which together with the FIT for 55 measures, would be achievable by adding 10-11 GW in renewable capacity.

In terms of energy consumption, according to Eurostat data, in 2020, approximately 24.5% of energy consumption came from renewable energy sources, placing Romania in 11th place in the EU and above the average level of the Union.

In 2021, the production of electricity in Romania came in proportion of 16% from renewable energy sources (mainly wind and solar) and 31% from hydropower. The 2021 total installed capacity of renewable production facilities was of 4,545 MW, of which 66.3% represented wind farms and 30.7% photovoltaic parks (with the remaining 3% from biomass).

Romania had in place a support scheme for the promotion of renewable energy sources in the form of mandatory quotas combined with the issuance of green certificates that was open to projects commissioned until 31 December 2016. The scheme is valid generally for 15 years and the green certificates are traded on the centralized market.

Power Purchase Agreements (PPAs)

Corporate PPAs (physical delivery) were not used in Romania since 2012 when the Energy Law has been amended and provided that electricity is to be exclusively traded on a centralised competitive market operated by OPCOM, in a transparent, public, centralised and non-discriminatory manner, an amendment which essentially banned corporate PPAs (except for small capacities not exceeding 3MW).

The ban on PPAs was seen as one of the legislative measures that has determined decline of the first wave of investments into renewable energy projects in Romania, together with the subsequent discontinuation of the green certificates support scheme, which applies only for renewable projects commissioned before the end of 2016.

Following the entry into force (as of 1 January 2020) of the EU Regulation no. 943/2019 on the internal market for electricity, the Romanian regulator adopted certain regulations to provide a framework for long-term directly negotiated PPAs outside the centralized market by making reference to the “unregulated markets”. However, the Energy Law and the related obligation of the power producers to sell their entire produced electricity exclusively on OPCOM remained unchanged leading to certain unclarities and discussions on how to interpret and apply the contradictory provisions.

After that, the Energy Law has been further amended, first in 2020, expressly providing that new generation capacities commissioned after 1 June 2020 are allowed to conclude PPAs, at negotiated prices, outside the centralized market, and more recently under GEO 143 /2021, which, as previously detailed, has definitively lifted the ban over directly negotiated PPAs outside the centralized market.

There still remains some uncertainty with regards to the final scope of the amendments to be implemented to GEO 143/2021, under the Parliamentary approval process which is currently ongoing, and this has caused producers to be cautious in taking advantage of the new opportunities for PPAs in Romania until this point. However, there is a lot of interest in PPAs, both on the side of producers and on that of offtakers, and a more pronounced resurgence in the market is expected.

Current issues in the renewables industry

In recent years, besides the discussion around lack of PPAs, the main issue for Romania’s hopes of attracting investments into renewable projects has been the capacity of the national electrical grid to integrate the output of such projects. Developers looking towards larger, more ambitious projects often have to cover associated grid reinforcement costs in order to ensure that the energy to be produced by such projects could be adequately and safely integrated in the system. However, there are hopes that the influx of EU funds earmarked for energetic transition will allow the undertaking of larger strategic grid reinforcement and development projects, as recently underlined by the CEO of CNTEE Transelectrica S.A. (i.e. Romania’s electrical grid and system operator), who mentioned that the projects for which the grid operator will seek funding from the EU Modernization Fund may open up the grid capacity for integrating new projects of up to 2,300 MW within the next 5 years.

Also, it worth mentioning that Romania still has the highest balancing costs per MW in Europe.

Government incentive schemes

High ranking officials within the Ministry of Energy have declared that the ministry will carry out financing programs from European funds worth 13 billion euros until 2030. Out of the total financing available, part of the money is expected to come via “classic” European funds, and the other part through allocated funds within the National Recovery and Resilience Plan (PNRR).

More recently, the Ministry of Energy announced the opening of the application period for the PNRR-financed state aid scheme for renewable projects, with a budget of EUR 457.7 million, which seeks to facilitate and support the development of an additional 950 MW of installed capacity from renewable sources.

There is also an expected new incentive scheme for renewable capacities based on the contracts for difference (CfD) system, which the Ministry of Energy has been working on together with the EBRD; the scheme is expected further fuel the interest of investors in developing and financing renewable projects in Romania, by promising a more stable and predictable revenue model for such projects.

Major projects and companies

The last couple of years was marked by an ever-increasing interest for investments in renewable capacities in Romania, mainly focusing on solar and wind parks.

The most recent statistical data from the transport and system operator indicated that, at the level of May 2020, there was a total of approx. 4,900 MW in wind capacities for which grid connection agreements were concluded, of which approx. 3,015 MW were installed in capacities that were already commissioned at the time (with the rest representing capacities under development).

For solar capacities, the figures (also at the level of May 2020) were of 2,347 MW in capacities that had grid connection agreements, of which 1,376 MW in capacities which were commissioned.

More recently, we note that there is an additional ~ 900 MW of wind projects and 300 MW of solar projects that received grid connection approvals from the transport and system operator, with many other smaller projects that received such approvals from local distribution system operators.

Biggest players

Romania's energy market is currently dominated by the two major state-owned energy producers, namely Hidroelectrica (i.e. hydro power) and Nuclearelectrica (i.e. nuclear power), but production from other renewable sources, such as wind and solar is envisaged to match and possibly exceed nuclear and hydro production in the next decade, if Romania is to meet its strategic goals outlined in the Integrated National Plan in the field of Energy and Climate Change 2021-2030.

Foreign investment ownership

EU Regulation in relation to foreign investments

Regulation (EU) 2019/452 establishing a framework for the screening of foreign direct investments into the Union ("**FDI Regulation**"), applicable as of 11 October 2020, provides the legal framework for the screening by EU Member States of foreign direct investment in the EU from a security and public policy perspective. Furthermore, the regulation provides requirements for Member States wishing to maintain or adopt a screening mechanism at national level.

In Romania, a draft Government Emergency Ordinance ("**Draft GEO**") for the implementation of the FDI Regulation was repeatedly submitted for public consultation since 2020, most recently by the Romanian Competition Council, at the end of July 2021. The public consultation period ended on 15 August 2021 but the Draft GEO has yet to be formally adopted by the Government.

Under the Draft GEO, as it has been published by the Romanian Competition Council, investments by foreign individuals or entities (i.e. originating from a non-EU country) may be subject to prior FDI screening by a special FDI screening council to be subordinated to the Romanian Government, if such investments relate to specific strategic sectors, as previously detailed, and provided that the total value of the investment exceeds EUR 2 million. However, the value threshold is not an absolute rule, as there is an exemption under which even investments below this threshold may be submitted for screening, if they present significant risks for public order or national security. The provisions of the Draft GEO would impose prior screening of investments, as well as subsequent screening, in the event that the investment was completed before the Draft GEO would enter into force.

National Security Screening

Unrelated to the aforementioned FDI screening process which is expected to be implemented through the Draft GEO, Romania has had a specific procedure, still in force, which requires that investments in certain sectors which are construed as essential to national security must be screened and approved by the Supreme Council of Defence ("**CSAT**"), energy security being one of the sectors in question.

However, this procedure does not discriminate between investments from foreign investors or from domestic investors. Under this current legislation, given the generality of the legal requirement, a legal assessment is being done in each particular case by the involved parties to see whether a filing is needed or not. As a matter of general practice, CSAT approval is requested primarily in major transactions where either the target has a strategic size or position (i.e. critical infrastructure etc) or the buyer will consolidate its market share on a specific critical sector.

UNFCCC – Paris Commitments and beyond

The national energy and climate plans (NECPs) were introduced by EU Regulation 2018/1999 on the governance of the energy union and climate action and serve the purpose of outlining how the EU countries intend to address energy efficiency, renewables, greenhouse gas emissions, research and innovation as well as other related subjects.

In accordance with EU Regulation 2018/1999, Romania developed its Integrated National Plan in the field of Energy and Climate Change 2021-2030, devised in accordance with EU's five pillars of energy policy, taking into account the following elements:

- The holistic approach to energy, the economy, the environment and climate change should be closely linked to the economic reality of the Member States, so as not to affect the internal macroeconomic and social balance;
- Restructuring the market framework, in the context of transition-induced costs and the capacity of Member States to bear these costs, in terms of accessibility and competitiveness;
- Economic growth and income per household (by 2030);
- Reducing energy poverty.

Relevant resources and references

Relevant websites

- [Ministry of Energy](#)
- [ANRE \(i.e. Romania's Energy Regulator\)](#)
- [OPCOM \(Romania's energy markets operator\)](#)

References

- [The 2021-2030 Integrated National Energy and Climate Plan](#)

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Senegal

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Languages: Senegal has French as its official language; Other minority languages include Serer, Pulaar, Diola, Mandingo and Sarakole while Wolof is the national language.
Population	16.2 million
Gross national income (GNI) per capita	GNI per capita: USD 3,420
Business environment	<ul style="list-style-type: none">• 2020 Global Competitiveness Index: 49,69 points• 2021 Index of Economic Freedom: 58,00• 2021 Corruption Perceptions Index: 43 points• 2020 UN Development Program Human Development Index: 168

Profile

Senegal is located on the west coast of Africa, between 12 ° 88 and 16 ° 41 north latitude and 11 ° 21 and 17 ° 32 west longitude. Senegal has a strategic geographical position that gives it an opening to the world and an easy accessibility.

Senegal was colonised by France in the 20th century.

Senegal is one of the most successful economies in sub-Saharan Africa. For several years now, the economy has recorded sustained growth of more than 6%. Its long history of social and political stability and its ever-improving business environment make it a safe destination for investment. The implementation of a major reform agenda makes for better competitiveness of the economy and stimulating FDI flows in key sectors, including agriculture, industry, tourism, transport infrastructure and extractive industries.

The Senegalese Government is implementing the Emerging Senegal Plan (PSE), a reference document for economic and social development policies whose vision is *"Senegal, an emerging country in the horizon 2035, with a solidarity society in a state of law "*.

Electricity industry overview

Electricity industry overview

The 2012 Energy Sector Development Policy Letter aimed to diversify sources of energy generation. The Senegalese National Electricity Company signed several power purchase agreements with independent power producers in order to buy MW generated power from private companies to be injected in the public grid.

In addition, the Senegalese National Electricity Company occasionally buys surplus renewable energy power generated by self-producers.

Production rates

The energy mix refers to the power generation from coal, gas, hydro, solar and wind. Please see percentages below:

- Power generation from location: 5.2%
- Power generation from SENELEC: 31%
- Power generation from IPP (conventional): 27.4%
- Power generation from Mauritania (importation) :1.4%
- Power generation from Self-producer: 0.4%
- Power generation from Non-interconnected grid: 4.7%

Projects and strategies

In 2013, the Republic of Senegal adopted the energy strategic plan, which aimed to increase the dynamic energy mix in the country for five years (2013-2018).

Between 2013 and 2018, plants producing 143 MW of solar PV, 201 MW of heavy oil convertible into natural gas, 15 MW of hydroelectricity (from the Organization for the Development of the Senegal River infrastructures), and 125 MW of coal power were installed.

Government plans

In 2019, the government adopted an electricity roadmap for 2035 to increase access to electricity, increase the mix of energy sources, and reorganize the electricity subsectors (production, transport and commercialization) as well as the governance of the sector. This roadmap is in line with the Senegalese Development Plan for 2035 adopted in 2014.

The total capacity will be increased in the next few years as Senegal has discovered 17 trillion-cubit feet of natural gas at the *Grand Tortue Ahmeyim* (GTA) gas field near the maritime border with Mauritania. Production is expected to start around 2023. In this regard, a gas code was adopted in 2020 through Act No. 2020-06, following a National Strategy Plan called “Gas to Power” developed in 2018. The main objective of this strategic plan is to produce electricity from natural gas and to increase public access to electricity in Senegal.

Electricity laws

- Law No. 2021-31 relative to the electricity Code
- Law No. 2021-32 relative to creation and functioning of the Regulatory Body in charge of energy and oil & gas sectors

Renewable energy overview

Renewable energy overview

The Republic of Senegal launched the Energy Sector Development Policy Letter of October 31, 2012, pursuant to Act no. 2010-21 on the Renewable Energy Policy Law of December 20, 2010, and Decree no. 2011-2013 on the Implementation of the Renewable Energy Act. This decree sets the conditions for the purchase and remuneration of electricity generated from renewable energy sources by power plants and their connection to the grid.

Solar

Solar energy is still underutilized in Senegal, despite the great service it provides. However, the country has already embarked on an ambitious program of projects to diversify, increase and improve energy production capacity, with good results in a number of interesting applications. The Government of Senegal has adopted a policy to *"seek alternative solutions to its energy supply problems, promoting, in this context, the development of renewable energies through the diversification of production sources"*.

Hydropower

The Organization for the Development of the Senegal River (OMVS) implemented the Manantali hydroelectric dam project.

This project consisted of the construction (between 1997 and 2002) of a 200 MW hydroelectric power station at the foot of the dam (in service since 1988).

The over 1700 km long HV transmission network includes 12 HV/MV transformer stations in Mali, Mauritania and Senegal and a central dispatching station in Manantali which coordinates the operation of the Manantali Interconnected Network.

Wind

The Government of Senegal has implemented a policy aimed at *"seeking alternative solutions to its energy supply problems by promoting the development of renewable energy through the diversification of production sources"*.

The 158.7 MW Taiba N'Diaye wind farm positions Senegal as a pioneer in clean, reliable and competitively priced energy. The project combines the provision of electricity to 2 million Senegalese with a significant local socio-economic impact throughout the life of the project.

Geothermal

National Agency for Renewable Energies does not detail any activities regarding geothermal initiatives.

Biomass

Biomass is organic matter (including micro-algae) of animal, bacterial or fungal (mushrooms) origin, which can be used as a source of energy (bioenergy). This energy can be extracted by direct combustion (e.g. wood energy), or by combustion after a transformation process of the raw material, for example methanisation (biogas, or its purified version bio-methane) or other chemical transformations.

Senegal has adopted and is implementing the National Biogas Program.

Production rates

- Power generation from hydro: 5.2%
- Power generation from solar PV: 11.5%
- Power generation from wind: 3.8%

Projects

- Wind power generation plant in Taïba Ndiaye
- Photovoltaic power generation plant in Bokhol
- Manantali hydro power projects
- Solar Streetlight Maintenance Project - 1835 Installed Solar Streetlight
- Installation of four (4) mini power plants without storage for self-consumption in four (4) regional hospitals and the supply of electricity to public and community structures.
- Implementation of Multifunctional Solar Platforms Project (on-going)
- Project to install 50,000 solar-powered street lamps (on-going)

Government plans

The national plan to diversify energy sources is being implemented through 168MW of solar PV, 51MW of wind power and 75MW of hydroelectricity (22% of the country's total electricity production) being connected to the grid of by the end of 2019. In addition, there are off-grid systems installed by public and private institutions. The government's decision to place the renewable energy sub-sector at the heart of the Emerging Senegal Plan was also marked by the creation of the National Agency for Renewable Energy (ANER).

Some plans governing energy policy in Senegal include:

- Emerging Senegal Plan
- National Action Plan of Renewable Energy
- National Strategy for the Development of Renewable Energy

Renewable laws

- Law n° 2010-21 on the guideline law on renewable energies
- Law n° 2010-22 on the guidelines for the biofuel sector

Current issues in the renewables industry

In Senegal, according to the Ministry of Petroleum and Energy, the energy sector is being challenged by environmental, geopolitical, socio-economic and territorial issues. The environmental challenges include the reduction of greenhouse gas emissions, the fight against the risks of accidents linked to the exploitation of fossil fuels (oil spills, nuclear risks, etc.), the mitigation of pollution (air, water, soil and biosphere) and the preservation of ecosystems.

The socio-economic challenges include poverty reduction, increased energy security, job creation in the sector, the development of industrial sectors through the involvement of private promoters, and the establishment of modern, affordable and sustainable energy services capable of raising the country's economy to acceptable levels of development with the aim of improving the well-being of the population.

The geopolitical challenges include reducing dependence on fossil fuels, securing energy supplies, using renewable energy sources as much as possible in Senegal, and meeting national energy needs (electricity production, heating, transport, etc.).

As for the territorial challenges, they are mainly related to reducing the disparities between the rural and urban populations in terms of access to energy services.

Government incentive schemes

- In accordance with the provisions of General Tax Code, natural persons liable for income tax on the basis of their industrial and commercial profits, their agricultural profits or their profits from non-commercial professions, and who make investments in Senegal in equipment designed to use solar or wind energy, may benefit, on their request and under the legal requirements, a reduction on the amount of the said tax for which they are liable (Article 241).

The amount of the tax reduction to which these taxpayers are entitled is equal to 30% of the total amount actually paid for the eligible investments.

However, the discount granted for the taxation of a given year is limited to 25% of the tax amount of the financial year in which these amounts were paid.

If, as a result of this cap, there is still a residual amount deductible from taxation, this residual amount can be carried forward to subsequent years.

- Due to a regulation signed in 2020, there is also an exemption of VAT on materials or equipment used for power generation from renewable energies (solar, wind and biogas).

Major projects and companies

Major projects happening in Senegal:

- Taïba Ndiaye project (wind)
- Senergy 2 (Solar)
- Senergy Photovoltaic

Major companies contributing to Senegal's renewable future:

- PETN Company (Taïba Ndiaye project)
- SENERGY 2 Company (solar project)
- SENERGY PV Company (Photovoltaic)

Foreign investment ownership

New laws or changes to laws in relation to investment

In energy sector, the new laws are the following:

- Law No. 2021-31 relative to the electricity Code; and
- Law No. 2021-32 relative to creation and functioning of the Regulatory Body in charge of energy and oil & gas sectors.

Investment regimes

Senegal has adopted an investment code that provides specific incentives to stimulate investment in key sectors such as agriculture and agribusiness, fishing, livestock and related industries, manufacturing, tourism, and mining, among others. Investment incentives include, among others:

- Exemptions from customs duties (over 3 years)
- Suspension of VAT (over 3 years)
- Tax credits of 40% for eligible investment and deductible within 5 years
- Free export company status for agriculture, industry and telecommunications companies deriving at least 8% of their turnover from exports

Senegal has signed several Investment Protection and Promotion Agreements (IPPAs) with several partner countries around the world. In a context of globalisation, these agreements improve the legal security of investments. They provide for the free repatriation of investment capital and returns, guarantee expropriation and provide for Most Favoured Nation (MFN) treatment of investors. They also provide for compensation of losses in the event of war, armed conflict or riot. Senegal is fully committed to improving its business climate to promote investment and foster private sector-led economic growth.

UNFCCC – Paris Commitments and beyond

In Senegal, there is the National Committee on Climate Change (COMNACC), which brings together all the ministries involved, local authorities, private sector, civil society, and institutions., local authorities, private sector, civil society, research institutions, etc.

Relevant resources and references

Regulations

- Law No. 2021-31 relative to the electricity Code
- Law No. 2021-32 relative to creation and functioning of the Regulatory Body in charge of energy and oil & gas sectors
- General Tax Code
- Law n° 2010-21 on the guideline law on renewable energies
- Law n° 2010-22 on the guidelines for the biofuel sector

Websites

- [Aner: Agence Nationale pour les Energies Renouvelables](#)
- [Conseil Patronal des Énergies renouvelables du Sénégal](#)
- [Senegal in brief](#)
- [APIX: Promotion des Investissements et Grands Travaux](#)

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Sweden

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: Civil Law• Language: Swedish and five official minority languages: Sami, Finnish, Meänkieli (Tornedalen Finnish), Yiddish and Romani Chib
Population	10.4 million (2021)
Gross national income (GNI) per capita	GNI per capita: USD 56,630 (2020)
Business environment	<ul style="list-style-type: none">• 2018 Global Competitiveness Index: 9 of 140• 2020 Index of Economic Freedom: 22 of 180• 2020 Corruption Perceptions Index: 3 of 179• 2020 UN Development Programme Human Development Index: 7 of 189
Profile	<p>Sweden is situated in northern Europe and is part of Scandinavia. Sweden is a constitutional monarchy, with a parliamentary democracy. Political power lies with the parliament and government. As such the monarch only has ceremonial functions. In Sweden, general elections are held every four years.</p> <p>The government rules Sweden by implementing the decisions of the parliament and by formulating new laws or law amendments, on which the parliament decides. Sweden has a market-based mixed economy and is extensively tax-financed.</p>

Electricity industry overview

Electricity industry overview

- The Swedish electricity market was deregulated in 1996. Both trade and production of electricity have since been exposed to full market competition.
- In 2020, 160,9 TWh of electricity was generated in Sweden which is 2.9% lower than the year before. The dominant sources since the 1980s are hydro and nuclear power. 56.4% of electricity is generated from renewable sources (2019 figures).
- Electricity generation is comprised of:
 - 44,7% from hydropower (2020 figures);
 - 29,4% from nuclear (2020 figures);
 - 8,2% from conventional thermal power (2020 figures);
 - 17,1% from wind (2020 figures);
 - 0,6% from solar (2020 figures).

Electricity laws

- The Swedish electricity market is governed by both local regulation as well as applicable regulations adopted within the European Union (EU). The Swedish electricity act (1997:857) (Sw. *Ellagen*) sets out the overall regulatory framework for the Swedish electricity market.
- The Swedish Environmental code (1998:808) (Sw. *Miljöbalken*) sets out the regulatory framework for environmental assessments in relation to activities that may have an impact on the environment.
- The Electricity Certificate Act (2011:1200) (Sw. *lagen om elcertifikat*) regulates the system of electricity certificates which is used to boost the use of renewable energy.
- The Certification of Transmission Network Companies for Electricity Act (2011:710) (Sw. *Lag om certifiering av transmissionsnätsföretag för el*)
- The Special Management of Certain Electrical Installations Act (2004:875) (Sw. *Lag om särskild förvaltning av vissa elektriska anläggningar*)
- The Intervention Against Market Abuse in Trade in Wholesale Energy Products Act (2013:385) (Sw. *Lag om ingripande mot marknadsmissbruk vid handel med grossistenergiprodukter*)

Generation, distribution and transmission

- The six largest electricity producers' share of the total production constituted approximately 78 % of the total production or 118.9 TWh. The largest producers are Vattenfall (100% owned by the Swedish state), Fortum (listed and 50% owned by the Finnish state), E.ON (listed in Germany), Uniper (owned by Fortum), Statkraft (100% owned by the Norwegian state) and Skellefteå Kraft (100% Swedish municipality owned).
- The transmission network is owned by the state enterprise Svenska kraftnät (SvK). SvK regulates the power balance and the operational reliability in the Swedish electricity network. SvK also transmits electricity from major power plants to regional electrical grids via the national grid.

Renewable energy overview

Renewables industry overview

- The Swedish government stated in 2018 that 100% of the electricity production shall consist of renewable energy by 2040. The Swedish government has also set up the following climate goals:

- By 2045, Sweden is to have zero net emissions of greenhouse gases. This means that greenhouse gas emissions from activities in Sweden should be at least 85% lower than in 1990. The remaining 15% can be achieved through supplementary measures such as increased carbon sequestration in forest and land, carbon capture and storage technologies (CCS) and emission reduction efforts outside of Sweden. After 2045 Sweden should achieve negative emissions, meaning that the amount of greenhouse gas emitted is less than what can be reduced through the natural eco-cycle or through supplementary measures.
- By 2030, emissions from domestic transport will be reduced by at least 70% compared with 2010 (excluding domestic aviation which is included in the European Union Emissions Trading System).
- By 2030, emissions in Sweden in the sectors covered by the EU Effort Sharing Regulation should be at least 63% lower than in 1990, out of which 8% may be achieved through supplementary measures.
- By 2040, emissions in Sweden in the sectors covered by the EU Effort Sharing Regulation should be at least 75% lower than in 1990, out of which 2% may be achieved through supplementary measures.
- Sweden has also, as a member of the European Union, committed to fulfill the climate goals adopted by the EU. These goals are integrated in the above mentioned climate goals.
- Sweden has also joined the Beyond Oil and Gas Alliance (BOGA), that seeks to counteract the extraction of gas and oil.
- In Sweden, renewable energy sources consist of hydropower, biofuel, wind power, waste and solar power. Hydropower is by far the largest renewable energy source with a production of 71,9 TWh during 2020.
- The use of renewable energy in relation to final energy use has increased every year since 2011 and was just over 56% in 2019. The increase over the year is mainly due to production from wind power, but also a higher use of biofuels.
- The Ministry of the Environment is responsible for the environmental goals in Sweden. Every fourth year, the government is required to draw up a climate policy action plan to describe how the climate goals are to be achieved.
- Historically, hydropower has contributed the largest proportion of Sweden's renewable energy growth. Future growth is expected to come from wind (both onshore and offshore) and solar power.

Hydropower

- There are about 2,000 hydropower plants in Sweden. Hydropower produces between 50 and 75 TWh per year depending on how much it rains and snows. This corresponds to 30 to 45 % of the electricity use and in 2020, 44,7% of the electricity used derived from hydropower.
- Currently there is no expansion of new large-scale hydropower in Sweden, instead the focus is mainly on environmental adaptations and streamlining of existing facilities.

Wind

- The supply of wind power has grown significantly since 2010. However, only 20% of the generated electricity derives from wind power currently.
- Wind power in Sweden is predominately produced at onshore wind farms. Only 91 wind turbines out of a total of 4,363 wind turbines were installed offshore at the end of 2020.
- Wind power is the second largest source of renewable energy with a total installed capacity of 10 GW in 2020 divided among 4,286 wind turbines. Total actual production in 2020 was 27.526 TWh.
- Yearly electricity generated by wind turbines has grown substantially from 1 TWh in 2006 to 27.526 TWh in 2020.
- The government announced in October 2021 that it intend to expand the transmission network in order to facilitate the development of offshore wind power.

Solar

- Only a small part of the generated electricity on the Swedish market derives from solar power, but solar PV systems increased by 50% between 2019 and 2020 and the total number of systems in Sweden at the end of 2020 amounted to almost 65,819 with a total installed power of 1,090 MW.

- Up until 7 July 2020, a private person could apply for governmental support to build a solar PV system. Currently, a tax reduction can be obtained for the cost of the work and materials up to SEK 50,000.

Current issues in the renewables industry

Discussions regarding offshore wind power is ongoing. Some see the development of offshore wind power as complimentary to other renewable energy sources. However, the offshore wind farms have challenges, for example the Swedish Armed Forces often declines applications in relation to offshore wind farms as they deem that it has a negative impact on their ability to defend the country.

Government incentive schemes

Electricity certificates

- The main incentive for building renewable energy production capacity in Sweden has been provided in the form of the Electricity Certificate (ECs) system (the "**EC system**"). The market for ECs and the EC system started in Sweden in 2003 and in 2012 has been extended to Norway. Currently, the market and the system will operate until 2045 although Norway has decided to leave the system in 2035. The stated aim of the EC system is to increase the amount of yearly renewable energy production in Sweden and Norway with a combined 28,4 TWh until 2020 (the goal was reached in May 2019), and in relation to Sweden an additional 18 TWh until 2030. The EC system is, as opposed to a feed-in tariff system, a market-based system.
- The obligation to buy ECs is prescribed by law and will continue in Sweden until 2045. The quotas increase up to the year 2030, to boost demand.
- Renewable electricity producers (biofuel, water-, wind-, solar-, wave- and geothermal power producers) are allocated 1 EC for each 1,000 KW/1 MW produced during the first 15 operational years of the relevant plant. In order to be eligible for allocation, a producer has to apply for certification with the Swedish Energy Agency (Sw. *Energimyndigheten*). Measurement of production by the hour is required at the production plant.
- As the EC system is market based, the increased volumes of renewable energy have resulted in a decrease of the ECs price. The importance of EC system as an incentive for investors in renewable energy has thus dropped significantly.

Tax reductions

- Tax reductions may be granted for the production of renewable energy under certain conditions and each person or entity has to apply for such reductions as they are not granted automatically.

Major projects and companies

- A large number of offshore wind projects are currently in the permitting phase and are expected to benefit in particular the southern parts of Sweden, which has a higher electricity price than the northern parts of the country.
- Large scale onshore wind projects are expected to continue to be a major part of investments in renewable projects in Sweden.
- The northern part of Sweden is currently experiencing a boom in investments in battery storage (for instance various data centres and Northvolt producing batteries for electric cars) and the availability of renewable energy is a main prerequisite for all of these investments.
- The energy sector is looking intensively to invest in hydrogen production.
- Companies developing methods to produce climate neutral steel (green steel) with hydrogen have started to establish themselves in the Swedish market and large investments have been made for development. Vattenfall, which is a state owned company that produces electricity, is cooperating with two major steelmakers in Sweden to develop a method to use hydrogen to make green steel. In 2020, a pilot plant was established in Luleå and a new pilot plant is currently being built, where Vattenfall and its partners have an aim to produce one million tonnes of fossil-free steel per year by 2026.

Foreign investment ownership

- In general Sweden does not have any restrictions on foreign ownership and the majority of the investments in renewable energy in the last few years have been made by foreign investors.

- There are some restrictions that may apply to investments in the energy sector but the scope of the current Security Protection Act has been considered to be fairly limited. However, a proposal for foreign direct investments is currently being reviewed and if adopted investments implemented after February 2023 may be subject to approval from the Inspectorate for Strategic Products.

UNFCCC – Paris Commitments and beyond

- Sweden is part of the Paris Agreement entered into 2015 and which came into force in November 2016. Sweden has committed to reducing net greenhouse gas emissions to zero by 2050. Sweden has taken measures to reduce greenhouse gas emissions through nationally set climate goals. International implementation support to developing countries has been taken to contribute to the goal set up under the Paris Agreement.
- In 2017, Sweden adopted a climate policy framework. The framework is a key component in Sweden's efforts to honour the Paris Agreement to reduce greenhouse gas emissions.

Relevant resources and references

Relevant sources and references

- [The Swedish Environmental Protection Agency](#)
- [The electricity market trading handbook](#)
- [The Swedish Energy Agency](#)
- [Government offices of Sweden](#)
- [Human Development Index ranking](#)
- [Corruption Rank](#)
- Sweden's electricity and natural gas market, 2020 (Ei R2021:10)

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Uganda

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: The Constitution of the Republic of Uganda 1995 (as amended), Acts of Parliament, English common law and English doctrines of equity• Language: English
Population	43 million
Gross national income (GNI) per capita	Approximately USD 1,850
Business environment	<ul style="list-style-type: none">• 2020 Doing Business Report: 116 of 190• 2020 Global Competitiveness Index: 115 of 140• 2020 United Nations Development Programme Human Development Index: 159 of 189
Profile	<p>Uganda is a landlocked country in East Africa and is well-known for its natural beauty, savannah, wildlife and warmth of its people. Uganda is also one of the world's fastest-growing populations.</p> <p>Uganda was a British Protectorate territory for the period 1894 to 1962, before being granted independence on 9 October 1962. Due to these historic ties, Uganda's legal system is closely aligned to the English legal structure and system. The supreme law in Uganda is the Constitution of the Republic of Uganda 1995 (as amended), followed by Acts of Parliament and accompanying statutory instruments made under the respective Acts of Parliament. English common law and English doctrines of equity retain a privileged position in Uganda's legal system and are specifically recognized as sources of law that are subordinate to written law.</p>

Uganda's economy is fully liberalized and is made up of the agriculture (23%), industry (27.4%) and services (49.6%) sectors. Uganda's economic development blueprint, *Vision 2040*, sets out to transform Ugandan society into a modern and prosperous middle-income status country by 2040. The key growth sectors have been identified are services (tourism, science and technology), industry (oil and gas, mining and construction) and agriculture.

Uganda is a founding member of the East African Community, and has significant trading links with neighbours Kenya, Tanzania, Rwanda, Burundi, South Sudan and the Democratic Republic of Congo.

Electricity industry overview

Electricity industry overview

- The Uganda electricity industry is partially liberalized and takes an unbundled structure that is delineated across three discrete areas: generation, transmission and distribution. The industry reorganisation took place in 1999 and followed wide-ranging structural form that completed the vertical unbundling of the national utility in existence at the time [Uganda Electricity Board], introduced private sector participation in the electricity distribution and generation segments, established an independent sector regulator, and introduced cost-reflective tariffs.
- The sector regulator is the Electricity Regulatory Authority (“**ERA**”), established in 1999 following the enactment of the Electricity Act 1999.
- Uganda has an installed capacity of approximately 1,252 MW and a system peak demand of approximately 720–740 MW. Uganda has four main sources of energy: hydropower (82%), thermal (7.8%), co-generation (5.1%) and grid-connected solar (4.7%). Even with an increased focus on alternative renewable energy sources by the Government of Uganda (“**GOU**”), installed and generation capacity is dominated by hydropower.
- The three major power dams are Bujagali II (250 MW), Isimba (183 MW), Kiira (200 MW) and Nalubaale (180 MW). Currently, construction is ongoing on the 600 MW Karuma dam, which is expected to be commissioned by the end of December 2022. Additional hydropower projects with a total rating of approximately 1,954 MW are currently in various stages of study and development.
- Uganda's tariff model is a cost-reflective tariff, and the role of establishing a tariff structure and investigating tariff charges is vested in ERA.
- In terms of rural electrification, GOU established the Rural Electrification Fund in 2001 with the primary objective of promoting the equitable coverage of rural electrification in Uganda through the increased provision of access to electricity for economic, social and household use. The Rural Electrification Fund is administered by the Rural Electrification Agency (“**REA**”). GOU has so far implemented over 10,000 kilometres of medium-voltage power lines and approximately 9,000 kilometres of low-voltage distribution power lines. This has translated into the connection of over 700,000 customers onto the national grid.
- With respect to off-grid energy, ERA has licensed several private and REA-sponsored isolated grids to promote rural electrification. Off-grid installed generation capacity currently stands at approximately 8 MW.

Electricity laws

- **The Constitution of the Republic of Uganda 1995 (as amended)** – provides for the government of Uganda's responsibility to develop an energy policy.
- **Electricity Act 1999 and accompanying regulations / statutory instruments** – provides for the establishment of the sector regulator, the generation, transmission, distribution, sale and use of electricity, the licensing and control of activities in the electricity sector and the liberalization of the electricity sector.

Generation, distribution and transmission

Generation

On-grid electricity generation is a fully liberalized market, with several projects sponsored by both private and governmental entities. There are approximately 25 licensed generation companies in Uganda.

The licensing process for generation under the Electricity Act is an unsolicited, non-competitive framework, and ERA's role is to evaluate applications received from project developers against a defined set of eligibility criteria. Only in exceptional cases will ERA issue a generation license under the Electricity Act through a competitive tender process, in which the mainstream procurement rules will apply alongside the Electricity Act.

Importantly, generation licenses are not issued as of right. ERA considers the prevailing government policy at the time, the available spinning reserve for a particular source of power based on national peak demand, the general state of the national energy mix and other wide-ranging technical, financial and policy considerations before deciding an application.

Distribution

The distribution function is also fully liberalized, with nine entities licensed to exclusively distribute electricity in defined territories. One key player is the Uganda Electricity Distribution Company Limited (UEDCL), a governmental entity formed for the specific purpose of distributing electrical energy in licensed territories and which owns the 33 KV-and-below voltage electricity distribution grid in Uganda.

Umeme Limited is a well-known public limited company which took over the distribution system for the supply of electricity from UEDCL in certain territories under a concession (including all the associated operational assets) for the period 1 March 2005 to 28 February 2025.

Transmission

Electricity transmission is handled by the Uganda Electricity Transmission Company Limited ("UETCL") under Uganda's single buyer/off-taker electrical energy purchase model.

UETCL is a governmental entity formed for the specific purpose of bulk power supply/transmission and system operation, operation of high voltage transmission grid, and power import and export. The 33 KV-and-over electricity transmission grid in Uganda is operated by UETCL.

Renewable energy overview

Renewables industry overview

- Uganda's 2007 Renewable Energy Policy sets out to make modern renewable energy a substantial part of the national energy consumption. The overall policy goal is to increase the use of modern renewable energy to over 60% by 2020. Uganda developed a bespoke renewable energy policy and encouraged investment in renewable energy sources because of four unique challenges: an electricity supply deficit on the national grid, escalating oil prices on the international market, the need to make electricity accessible to the rural population through grid extension and isolated grids and to fulfil the government's commitment on greenhouse gas emissions reductions under the Kyoto Protocol and contribute to the global fight against climate change.
- According to *Vision 2040*, Uganda expects to increase its installed capacity to 41,738 MW by 2040. The required capacity is projected to be generated from renewable energy technologies such as geothermal (1500 MW), nuclear (24000 MW), solar (5000 MW), biomass (1700 MW) and peat/biomass (800 MW).
- To promote the development and use of renewable energy sources, the government of Uganda has developed the renewable energy feed-in-tariff (RE-FiT) as an instrument for promoting private sector generation of electricity from renewable energy sources. The Ugandan RE-FiT is designed to provide price certainty to renewable energy generators. Depending on the phase, the tariff covers several technologies and is attractive because it is based on the levelized cost of each technology, and not the incremental cost of generating or purchasing power.
- ERA also issued a regulatory notice in 2020 stating that the licensing of new generation capacity from wind and solar technology will be subject to a competitive tendering process. This competitive procurement initiative is designed to ensure reasonable and fair pricing of solar and wind power, as well as harness the various technical benefits of modular technologies (system loss reduction and voltage stability).

Hydropower

- Although hydropower contributes the bulk of energy production in Uganda, the risk of unreliability during periods of drought has caused the government to consider solar, wind, thermal and geothermal generation in its current plans for the energy sector. The fall of water levels in Lake Victoria is considered a particular risk concern.
- In addition to large hydros, the development of mini-hydro facilities is a special focus area. Under the GET FIT Uganda Program, 14 mini-hydro dams with a total rating of 118 MW were licensed. The main objective of the GET FIT Program was to assist East African nations in pursuing a climate resilient low-carbon development path resulting in growth, poverty reduction and climate change mitigation.

Wind

- Currently, Uganda has no grid-connected wind systems. An off-grid solar and wind hybrid system is currently operating and supplying power to rural communities in Kotido, Napak and Namayingo districts. These systems supply power to households, health centres and schools. The Ministry of Energy and Mineral Development is in the process of developing a wind resource map.

Solar

- Uganda currently has about 50 MW of solar grid-connected systems: ERA has also licensed several private and REA-sponsored isolated grids with a capacity of 0.5 MW–2 MW to promote rural electrification.
- Various private companies also provide ‘pay-as-you-go’ energy for off-grid customers by selling solar home systems on an affordable payment plan to domestic consumers who are not connected to grid-supplied electricity.

Geothermal

- The exploitation of geothermal energy is currently at exploration stage. Exploration has been carried out in the main geothermal areas of Kibiro, Panyimur and Buranga. Drilling of temperate gradient wells is expected to start in Kibiro and Panyimur in 2019. In order to attract private sector participation, the government is currently developing a geothermal policy and legislation.

Bagasse/Co-generation

- Co-generation using bagasse as a primary fuel is common practice in the domestic sugar industry. Uganda’s 2010 National Sugar Policy encourages sugar factories to produce close to 100 MW of “green” electricity from burning bagasse, mainly for own-use and with the surplus to be dispatched for sale to the national grid.
- A 20 MW bagasse plant operated by Kakira Sugar Limited plant was licensed under the GET FIT Program. Another 26 MW co-generation plant operated by SCOUL Uganda has also been licensed and awaits commissioning.

Renewables laws

- **The National Energy Policy for Uganda 2002** sets out GOU’s policy aspiration to meet the energy needs of Uganda’s population for social and economic development in an environmentally sustainable manner, with the National Energy Policy spelling out GOU’s commitment to the development and use of renewable energy resources for both small- and large-scale applications. In achieving this objective, GOU has deployed the strategy of disseminating renewable energy technologies to increase their positive impact on Uganda’s energy balance and the environment.
- GOU is in the process of updating the National Energy Policy for Uganda 2002, the current draft policy sets out the following objectives for renewable energy technologies:
 - diversify the energy mix of energy supply options, including power generation to mitigate reliance on any single source;
 - mainstream climate change mitigation, adaptation and resilience into all energy sector planning, activities, projects and programmes;
 - conduct renewable energy resource assessments;
 - facilitate market development of renewable energy technologies;

- promote the use of renewable energy technologies through appropriate pricing policies and tax incentives;
 - encourage local manufacturing of renewable energy technologies through establishing renewable energy credit facilities and establishing sales promotion funds for manufacturers;
 - develop a framework for integration and net metering of rooftop solar on the grid;
 - promote the development of appropriate local capacity for installation, maintenance and operation of basic renewable energy technologies; and
 - encourage financial institutions to provide credit facilities for renewable energy through fiscal and other incentives.
- **The Renewable Energy Policy for Uganda 2007** sets out GOU's policy objective to make modern renewable energy a substantial part of the national energy consumption and to increase the use of modern renewable energy. In relation to small power schemes limited to 20 MW installed capacity per plant, GOU has deployed the strategy of licensing the private sector to implement and operate these schemes.
 - **The Electricity Act**, which provides for the licensing and supervision of renewable energy projects.

Current issues in the renewables industry

Take-or-pay/deemed energy

- In 2019, GOU issued a policy directive which (i) capped the tariff for new projects at USD8 cents per kilowatt hour and (ii) placed a blanket prohibition on take-or-pay clauses in power purchase agreements entered by the sole off-taker, UETCL.
- This policy was passed to control the economic burden that was being placed on the treasury because of, among other factors, electricity over-supply and the effects of an underdeveloped transmission and distribution infrastructure. This policy directive may prove to be a significant commercial disincentive as it will affect what private investors consider to be a competitive internal rate of return. In addition, the lack of take-or-pay assurance in power purchase agreements will have a considerably adverse effect on the ability of sponsors to secure limited recourse financing for projects.

Proposed amendments to the Electricity Act

- GOU is in the advanced stages of amending the Electricity Act and an amendment Bill was introduced before Parliament in late 2021. The Bill seeks to:
 - vary the current single-buyer electricity purchase model by allowing generation companies to supply electricity to not only the primary off-taker itself, but directly to a licensed distributor for a particular territory or directly to a specified class of consumers. This will provide a framework for corporate power purchase agreements in the Ugandan market. If this proposal is approved by Parliament, the Ministry of Energy and ERA will then prepare detailed regulations to address this issue;
 - specifically empower ERA to prescribe standardized feed-in-tariffs for renewable technologies generating up to a maximum capacity of 50 MW;
 - specifically empower ERA to invite applications for licences (for generation, distribution and transmission) through a competitive process; and
 - provide for the payment of royalties by generation companies to the local authority in which the generation facility is situated.

Government incentive schemes

To attract foreign direct investment in the renewable energy sector, GOU has undertaken the following initiatives:

- ERA has developed standardized power purchase agreements, implementation agreements and model licenses in consultation with development partners, lenders and project developers. This has resulted into the reduction in advisory service costs and the time required to negotiate the power purchase agreement between the developers and the single off-taker.
- Development of the renewable energy feed-in-tariff as an instrument for promoting private sector generation of electricity from renewable energy sources.

- Providing a value added tax exemption in respect of the supply of any goods and services to the contractors and subcontractors of hydroelectric power, solar power, geothermal power or biogas and wind energy projects.

Major projects and companies

- **600 MW Karuma hydropower dam:** When commissioned over the course of 2022, the 600 MW Karuma hydropower dam will be Uganda's largest dam. The project is developed by GOU, with the Uganda Electricity Generation Company Limited as the implementing agency. The engineering, procurement and construction contractor is China's Sinohydro Corporation. The project is financed through a government concessional loan facility from China's Exim Bank.
- **250 MW Bujagali II hydropower dam:** Uganda's second largest generation facility, which was commissioned in July 2012. The project is owned by the Aga Khan Fund for Economic Development and Norway's SN Power AS (through special-purpose vehicles). The project was financed through a syndicated loan from a cluster of development financial institutions and commercial banks led by the International Finance Corporation and the African Development Bank.
- **183 MW Isimba hydropower dam:** The 183 MW Isimba hydropower dam was commissioned in March 2019. The project is developed by GOU, with the Uganda Electricity Generation Company Limited as the implementing agency. The engineering, procurement and construction contractor was China International Water and Electric Corporation. The project is financed through a government concessional loan facility from China's Exim Bank.
- **200 MW Kira and 180 MW Nalubaale hydropower dam:** The Kira-Nalubaale dam (previously named the Owen Falls dam) was constructed between 1947 and 1954 when Uganda was still a British Protectorate. It is currently owned by GOU, through the Uganda Electricity Generation Company Limited. Eskom Uganda Limited (a subsidiary of Eskom Holdings South Africa) holds a 20-year concession to operate, manage and maintain the dam.
- **Independent solar power projects:** ERA has licensed 60 MW of on-grid solar generation capacity. 40 MW has so far been commissioned.

Foreign investment ownership

Uganda's economy is fully liberalized and there is no restriction against foreign investors and investments, including in the electricity sector.

The Investment Code Act 2019 contains a requirement for all foreign investors to hold an investment license, but this requirement can be properly classified as an administrative compliance matter for all foreign investors and does not act as an entry barrier. Significantly, the investment license is subordinate to any license granted by a regulatory authority in a business sector in which the foreign investor plans to operate. A foreign investor includes a company incorporated under the laws of any country other than that of an East African Community Partner State, or a company incorporated under the laws of Uganda in which the majority of the shares are held by a person who is not a citizen of an East African Community Partner State.

The Investment Code Act provides that a qualifying foreign investor is entitled to a certificate of incentive which shall provide details of the incentives given. The Act does not set out the nature and scope of incentives to be provided, and it is expected that this important aspect will be addressed in subsidiary regulations to be passed in due course.

Uganda has no exchange control restrictions. The applicable regulatory requirement is that all payments in foreign currency, to or from Uganda, between residents and non-residents, or between non-residents, shall be made through a licensed commercial bank. The net effect of this liberalized exchange control position is that no governmental consent (such as, for example, that of the Central Bank or the Minister of Finance) is required to pay foreign currency in and out of a bank account held in a Ugandan commercial bank. Payments in this respect include fees/charges to offshore suppliers and contractors and dividends to non-resident shareholders.

There is a blanket prohibition under Ugandan law against foreign companies owning or holding land in perpetuity (freehold or "mailo" tenure) interest in land. Foreign companies can only hold a leasehold (periodic) interest granted by a Ugandan citizen for a maximum single period of 99 years.

UNFCCC – Paris Commitments and beyond

Uganda ratified the Paris Agreement 2016 (an agreement within the United Nations Framework Convention on Climate Change) on 21 September 2016. In line with this global commitment, Uganda's Nationally Determined Contribution Support Programme seeks to help the country reduce greenhouse gas emissions in forestry and wetlands, energy, transport, and agriculture sectors.

It is projected that this programme will catalyse investment towards realizing Uganda's commitment for a 22% reduction in greenhouse gas emissions by 2030. In 2018, Uganda became the first country in Africa to sign the United Nations Development Programme Partnership Plan for Nationally Determined Contributions.

Relevant resources and references

Relevant websites

- [Ministry of Energy and Mineral Development](#)
- [Ministry of Finance, Planning and Economic Development](#)
- [Electricity Regulatory Authority](#)
- [Uganda Electricity Transmission Company Limited](#)
- [Uganda Electricity Generation Company Limited](#)
- [Rural Electrification Fund](#)
- [Uganda Climate Change Department](#)

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United Kingdom

Last modified 10 October 2022



Overview

Topic	Details
Key facts	<ul style="list-style-type: none">• Jurisdiction: The UK is made up of four countries, in which there are three legal jurisdictions: England and Wales, Scotland and Northern Ireland.• Language: English is spoken by over 90% of the population in the UK.
Population	67,081,000 (2020 Mid-Year Population Estimate from the ONS)
Gross national income (GNI) per capita	34,135 (2021 ONS)
Business environment	<ul style="list-style-type: none">• Economic freedom: The UK's economic freedom score is 72.7, making its economy the 24th freest in the 2022 Index of Economic Freedom.• Human Development Index (HDI): In 2019, the UK had a HDI score of 0.932 which is considered very high as it was ranked 13th in the world in the HDI. The UK's HDI score is increasingly steadily as improvements are made to the life expectancy at birth, years of schooling and GNI per capita.• Corruption Perceptions Index: In 2021, the UK had a score of 78.00 in the Corruption Perceptions Index and ranked 11th safest out of 180 countries.
Profile	The UK is a state made up of England, Wales, Scotland and Northern Ireland. ¹

The UK government uses taxes to fund its activities including income tax and environmental taxes.²

The current UK Prime Minister (as of 6 September 2022) is Liz Truss.

The UK left the European Union on 31 January 2020 which has impacted its trade relations. At the time of writing, political disruption has led to the UK Currency, Pound Sterling, to fall below \$1.15.³ The UK is currently looking to build Free Trade Agreements (FTA) and strengthen trade ties globally, having already signed three new FTAs with Australia, New Zealand and Singapore since leaving the EU.⁴ As a result of this, the proportion of goods imported from non-EU countries has increased.⁵

The United States remains the UK's largest trading partner, largely because the UK exported £39.0 billion of services to the US in the first half of 2020.⁶ Service industries which includes retail, hospitality, professional services, and finance, accounted for 80% of the total UK economic output. The next significant industry was manufacturing which contributed 10% followed by the construction industry which contributed 6%.⁷

These industries also reflect the percentage of UK workers who work within each respective industry. For instance, the services industry provides jobs to 84% of the UK workforce.

The UK GDP for Q1 2022 was £569,182 million.⁸

The UK has natural oil and gas reserves in the North Sea.⁹

References

- [1] [United Kingdom country profile](#)
- [2] [UK Government Revenue & Expenditure Statistics](#)
- [3] [British Pound 2022 Data](#)
- [4] [Financial Times: UK-EU trade relationships tumble after Brexit](#)
- [5] [ONS: UK trading partners and trade relationships: 2020](#)
- [6] [ONS: UK trading partners and trade relationships: 2020](#)
- [7] [UK Parliament: Industries in the UK](#)
- [8] [ONS: Gross Domestic Product](#)
- [9] [PWC: The Future of the North Sea Oil & Gas](#)

Electricity industry overview

The Department for Business, Energy and Industrial Strategy (BEIS) is the governmental department responsible for policy setting in the electricity sector. BEIS aims to ensure the UK energy system is secure and affordable whilst promoting sustainable energy in order to tackle climate change.

The UK electricity market is a fully privatised and competitive electricity market organised around the following licensed activities: Generation, Transmission, Distribution, Supply (including smart metering) and Interconnection.

Trends and issues affecting the UK electricity sector includes Climate Change targets, the Energy White Paper (discussed further below), and the challenges arising from the Covid-19 pandemic.

Key regulators

Great Britain's electricity market (England, Wales and Scotland) is regulated by the Gas and Electricity Markets Authority (GEMA). GEMA consists of a panel appointed by the Secretary of State; however, GEMA is entirely independent from the government with no stakeholder involvement in GEMA's regulatory or operational capacities.

The day-to-day administration of GEMA is carried out by the Office of Gas and Electricity Markets (Ofgem). Ofgem follows the strategy and decisions set by GEMA and implements these policies in its regulation of companies which run gas and electricity networks. Notably, Ofgem is responsible for granting, modifying and enforcing licences, approving significant changes to the industry standard documents, price control regulation for the network businesses and tariff capping for energy supply companies.

In Northern Ireland, the renewables market is regulated by the Northern Ireland Authority for Utility Regulation (NIAUR). The NIAUR is a non-ministerial government department that protects the interests of the renewables, gas, water and sewerage consumers. Northern Ireland operates a wholesale electricity market independent to Great Britain, known as the single electricity market (SEM). The SEM in Northern Ireland was reformed in 2018 to comply with the European Third Energy Package to develop trading arrangements with the government of the Republic of Ireland, thereby forming the Integrated Single Electricity Market (I-SEM). The I-SEM model enables wholesale electricity to be traded on an all-island basis for regulatory purposes.

Key legislation

The main legislation regulating the electricity sector in the UK includes the following:

- Electricity Act 1989;
- Competition Act 1998;
- Utilities Act 2000;
- Enterprise Act 2002;
- Energy Acts of 2004, 2008, 2010, 2013 and 2016;
- Climate Change Act 2008;
- Electricity and Gas (Market Integrity and Transparency) (Enforcement etc.) Regulations 2013 (SI 2013/1389);
- The Electricity Capacity Regulations 2014 (including the Capacity Market Rules);
- Domestic Gas and Electricity (Tariff Cap) Act 2018.

Licences and industry codes

Companies engaged in the supply, generation, transmission or distribution of electricity must obtain a licence under the Electricity Act 1989, unless the relevant company is exempt either as an individual exemption or a class exemption under The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001.

Licensed market participants must additionally apply to the relevant organisations in respect of the industry codes that must be complied with or become a party to the licence.

These industry codes include:

- Elexon – for the Balancing and Settlement Code (BSC);
- NGESO for the Connection Use of System Code (CUSC);
- Electralink – for the Distribution Use of System Agreement (DCUSA);
- Gemserve – for the Master Registration Agreement; NGESO for the Grid Code;
- the Energy Networks Association for the Distribution Code; NGESO – for the System Operator – Transmission Operator Code (STC); and
- SECAS – for the Smart Energy Code (SEC).

Energy supply mix

The supply mix of electricity in Great Britain's market in Q3 2021 was published and consists of the following (TWh/quarter):

- Coal – 1.38
- Oil – 0.29
- Gas – 27.97
- Nuclear – 9.63
- Hydro – 0.65
- Wind and Solar – 14.37
- Bioenergy – 7.88
- Other fuels – 1.92
- Net imports (interconnectors) – 7.65

Renewable energy overview

The UK has a world-leading renewable energy industry. In June 2019, the UK became the first major economy to pass net zero emissions laws with the target to bring all greenhouse gas emissions to net zero by 2050. This was followed by the publication of the Energy White Paper in December 2020 which aimed to initiate the transition from fossil fuels to clean energy in power, buildings and industry; whilst creating jobs, growing the economy and ensuring energy bills are affordable.

On 19 October 2021, the government published its Net Zero Strategy "BEIS: Net Zero Strategy: Build Back Greener". It sets out the government's vision for a decarbonised economy in 2050 and the policies required to meet its carbon budgets under the Climate Change Act 2008 and its nationally determined contribution (NDC) pledge made during the Paris Agreement.

Renewables play an active role within the UK market, particularly with businesses in the low carbon and renewable energy economy, having generated an estimated £42.6 billion turnover in 2019.

The investment in renewable energy has been aided by the UK's potentially rich supply of renewable resources. They include its long and windy coastline and high tidal ranges; complemented by the existing onshore and offshore energy industry, and a strong technological research and development base. However, developing renewable energy is expensive and can be complicated due to planning consent issues.

As of Q3 2021, low carbon sources generated 51.5% of the UK's total electricity generation with renewables comprising 35.9% at 24.3 TWh. Whilst renewables have yet to surpass fossil fuels in terms of usage, Q3 2021 saw an increase in renewable capacity, highlighting the potential for further growth.

As we can see from the energy supply mix (set out above), wind energy is leading the renewables energy market in the UK, with energy generated from wind power having increased by 715% from 2009 to 2020. With greater energy storage capacity and larger wind farms, this figure is expected to grow even further in order for the UK to meet its 2050 net zero targets.

Up until recently, the UK had the world's largest offshore wind capacity having reached just under 10.4 gigawatts in 2020, compared to the global capacity of 34.4 gigawatts during the same period. The UK Government is looking to capitalise on such clean energy through opportunities for global trade.

In June 2021 the UK's export credit agency, UK Export Finance, signed a memorandum of understanding with Offshore Renewable Energy Catapult Ltd., an offshore wind research and innovation centre, to help UK suppliers export and trade energy on a global scale. Prior to this, the UK Government's Offshore Wind Sector Deal looked to increase UK offshore wind exports to £2.6 billion per year by 2030, five times the amount seen in 2020, as well as investing up to £250 million in building a stronger UK supply chain for renewable energy export.

The UK is, however, still a net-importer of energy. The UK Government is focused on local content through the construction and operation phases of renewable energy projects, particularly via 'Supply Chain Plan questionnaires'. These questionnaires will determine whether developers can bid into the CfD scheme; the UK Government's renewable energy investment incentivising programme (discussed further below). The CfD scheme ensures that developers are paid a flat rate for electricity produced and prevents high support costs for consumers when the cost of renewable energy is high. Developers who do not 'pass' the Supply Chain Plan questionnaire by requiring a particular level of local content in their supply chain will not qualify for the CfD scheme.

Current issues in the renewables industry

Each source of renewable energy faces its own set of unique issues. In the UK, solar energy has experienced a reduced rate of growth due to a significant cut in government subsidies. Solar power is intermittent in nature, so grid modernisation is critical to its growth in the UK.

The challenges around geothermal energy are primarily economic and regulatory, with issues such as gaining planning permission as well as acquiring licenses/ownership over geothermal resources – which remains unclear under the current law.

Issues around biomass energy production include environmental issues such as the combustion of certain biofuels, which may affect the UK's commitments to air quality; as well as the expectation of short-term growth as more biowaste is used to produce fuel, whilst also potential long-term supply reductions due to collective conscience efforts to reduce waste.

Prior to the COVID-19 pandemic, renewable energy consumption was expected to rise by around 3% in 2020. However, the pandemic led to a decrease in the production of renewables such as solar PV and wind energy, and a sharp decline in added capacity for renewable technologies. Capacity levels in Q3 2021 were less than a third of Q3 2020, which was during a peak period in the COVID-19 crisis, showing the detrimental impact of covid on the renewables industry.

Social distancing guidelines and lockdown measures inevitably caused supply chain disruption and delays to the construction phase, meaning that commissioning renewable energy projects proved increasingly challenging. There was also less demand for renewable energy, as restrictions on travel and border closures to limit the spread of the virus led to reduced demand in the transport industry, causing the consumption of biofuel and other renewable energy sources to decline.

With these disruptions and reduced demand for renewable energy, there had been less need to procure new renewable energy projects. Nevertheless, following COP26 in 2021 and the broader push to meet UK climate and net carbon zero targets, demand has begun to rise again.

Government incentive schemes

The **Feed-in Tariff (FiT)** scheme was introduced in April 2010 by the Energy Act 2008 (and orders made under it) to promote the uptake of renewable and low-carbon electricity generation. It is limited to small scale renewable installations up to 5MW and requires participating licensed electricity suppliers to make payments on electricity generated and exported by accredited installations. The FiT scheme closed to new applicants on 1 April 2019, with some exceptions. In June 2019, the government announced its decision to introduce a new **Smart Export Guarantee** in Great Britain from 1 January 2020 to support small scale renewable generation. While this

replaced the FIT scheme, it is worth highlighting that both schemes involve the making of payments from suppliers to generators. For larger scale regeneration, the FIT scheme has been replaced by the Contracts of Difference scheme.

The **Renewables Obligation (RO)** scheme imposes an obligation on electricity suppliers to source a certain amount of electricity from renewable sources. The RO rewards the output of renewable energy over a period of time and similarly imposes financial penalties on the failure to do this. Compliance with the RO involves the use of RO certificates (ROCs) which are issued to eligible generators, and traded independently of the underlying electricity, whereby obliged suppliers purchased a quantity of ROCs from the market to demonstrate compliance. The RO was (before the advent of the Contracts for Difference scheme under the Energy Act 2013 – see below) the main financial mechanism used by the government to incentivise the deployment of large-scale renewable electricity projects in the UK. The RO scheme, which came into effect in 2002 in Great Britain (GB) and 2005 in Northern Ireland (NI), is closed to all new generating capacity as of 31 March 2017, except for extended deadlines for certain projects to January 2019 in GB, and March 2019 in NI. Newly accredited projects receive support for 20 years or until the final closure of the RO scheme on 31 March 2037, whichever is the earlier.

The **Contracts for Difference (CfD)** scheme was introduced by Part 2 (*Electricity Market Reform*) of the Energy Act 2013, which is the central plank of the legislative framework created for delivering secure, affordable and low carbon energy. The scheme was designed to replace the Renewables Obligation and incentivise investment in large-scale low carbon electricity generation. CfDs operate as private law contracts between low carbon electricity generators and the Low Carbon Contracts Company (LCCC), which manage CfD contracts. The CfD provides price security, and thereby bankability for a renewable generator by setting a “strike price” for the electricity generated. The CfD then pays the difference between the wholesale market price (the “reference price”) and the strike price. For example, should the market reference price fall below the strike price, the LCCC would pay a ‘top-up’ to the generator for the drop in value. However, should the market reference price exceed the strike price, the generator would pay back the difference to the LCCC. In this way, the CfD scheme abates the risk of market volatility that would otherwise discourage generators from entering into the renewables industry and lenders from financing these projects.

Major projects and companies

Key players

The UK renewables sector is currently home to major global players as well as an emerging cleantech industry fuelled by smaller start-up companies who are looking to slow climate change with innovative renewable energy technology.

The companies holding the largest market share in renewable electricity generation in the UK include Orsted Power (UK) Ltd, Scottish Power UK plc, SSE plc and RWE AG.

Iberdrola has identified the UK market as a key target for its renewable generation capacity growth. In October 2021, they announced that it would invest £10 billion in the UK by 2025, with the aim of doubling its renewable generation capacity to be at the forefront of decarbonisation in the country.

Major projects

The UK has some of the most ideal conditions in Europe for the production of wind power due to its high average wind speeds. Accordingly, offshore and onshore wind farms are the largest source of renewable energy in the UK.

The world's largest offshore wind farm, Orsted's Hornsea Two project, sits 55 miles off the coast of Yorkshire and spans an area of approximately 462 square kilometres. The windfarm has 165 turbines and a total capacity of 1.3GW, enough power to supply 1.4 million homes. However, with even larger projects under construction nearby in the North Sea, its title as world's largest offshore wind farm is not expected to last long – as construction recently began on the 3.6GW Dogger Bank Wind Farm which is due to be completed in 2026.

The Drax Power Station harnesses energy from biomass and is located in the UK's formerly largest coal-fired power station. Four of the six boilers have been converted to transfer biomass into a renewable source of energy, with the remaining two coal units decommissioned in March 2021. Drax Power Station has a capacity of 2.6GW for biomass and the plant is in the process of piloting a carbon capture and storage scheme in its pursuit to becoming a negative-emissions power plant.

Regarding solar, in early 2022 Elgin Energy, a leading international independent solar and storage developer, sold a 519MW portfolio of solar PV projects and 70MW of co-located energy storage capacity to ScottishPower Renewables (UK) Limited, a wholly-owned subsidiary of global utility Iberdrola Group, one of the world's largest energy companies.

The portfolio sale marks the UK's largest solar PV transaction to date, consisting of 12 projects at the pre-construction stage located across England, Wales and Scotland, with a combined capacity of 519MW. The portfolio also includes a co-located 70MW battery solution that is at an advanced stage of development. It is anticipated that the projects will be operational between 2023-2025. The portfolio will be the largest to be delivered in the UK's post-subsidy market, demonstrating the key role that solar PV combined with storage will play in the UK's future generation mix, providing flexible and competitive renewable energy.

At 72MW, Shotwick Solar Farm is currently the largest solar park in the UK.

The Whitelee Green Hydrogen Project is a trailblazing hydrogen storage project alongside Whitelee Windfarm, near Glasgow, which in part will develop the UK's largest electrolyser to convert water into hydrogen gas. The project has received £9.4 million in funding from the UK Government and when finished, can store and provide enough zero-carbon fuel for 225 buses travelling to Glasgow from Edinburgh and back each day.

The Blue Eden Project (which features renewable energy projects, a data centre and eco-homes) is a privately-funded project being built off the coast of Swansea. The scheme is part of Swansea Council's ambition to become a net zero city by 2050. This £1.7 billion project is part of a £4.3 billion total investment that is to be injected into the region to revamp their energy strategy and move away from fossil fuels entirely.

Foreign investment ownership

Foreign investment and changes in regulation will continue to act as a positive force for good in respect of the overall investment of the renewables industry. If managed correctly, they will speed up economic recovery after the Covid-19 pandemic and help create thousands of new jobs across the country.

There are no specific restrictions on foreign investment into the UK renewable energy sector, although the energy sector is one of the 17 sectors that will be subject to mandatory notification under the New National Security and Investment Act 2021 granting the government powers to scrutinise transactions on national security grounds.

In October 2021, the UK Government announced it had secured £9.7bn in new foreign investments to be used in 18 renewable focused deals across the UK.

A snapshot of the deals includes £6bn to be invested by Spanish firm Iberdrola through Scottish Power in the East Anglia Hub offshore windfarms, creating 7,000 jobs; and £1bn to be invested by KRR owned Viridor in cutting edge decarbonisation technology across five of its UK sites, creating 1,180 jobs. The other new deals include a host of projects which all utilise differing renewable technology across the whole spectrum of the industry.

As part of the impetus to continue the drive for increased foreign investment in renewables, the UK Government has also launched its 'Investment Atlas'; an online tool designed to support potential foreign investors identify high-priority investments, each with a strong focus on sustainability within the UK.

UNFCCC – Paris Commitments and beyond

Paris Agreement

One of the UK's main targets under the Paris Agreement was its commitment to reducing economy-wide greenhouse gas emissions by at least 68% by 2030 compared to 1990 levels, and 100% by 2050 (net zero).

The Climate Change Committee (an independent, statutory body established under the Climate Change Act 2008) has recommended that the UK take steps to become more energy efficient by switching low-carbon fuels for heating and transport, and moving towards electricity generated from renewables to meet net carbon zero targets.

Since the Paris Agreement and following the UK's withdrawal from the EU, the UK has withdrawn from the EU Emissions Trading System (EU ETS) and has created a separate UK ETS, designed to price carbon emissions from UK participants.

COP26

The COP26 green energy transition campaign is focused on accelerating the decarbonisation of the power sector by phasing out coal and supporting the rapid scaling up of renewable energy by ensuring renewables are the most attractive option for new power generation in all countries.

The UK has committed £200 million of investment to the Accelerating Coal Transmission programme, which will be used to fund numerous schemes across several countries including India, South Africa and the Philippines to drive the global transition to greener energy. A reduction of 80% in coal energy is required for the UK to meet their ambitions to be net carbon zero by 2050, with coal accounting for a high proportion of the rising CO₂ emissions.

Transitioning into more renewable energy sources such as solar and wind power or battery storage technologies will not only be more cost-effective, it will also provide critical climate benefits, as the decarbonisation from using more natural energy sources will reduce emissions.

In order to meet long term net carbon zero targets, the UK is looking to cut greenhouse gas emissions urgently in the aftermath of COP26 to try and limit global heating to 1.5°C in 2022.

With regards to roads and transport systems, some of the largest global car manufacturers are working together to ensure that all new cars sold will produce zero emissions by 2040, which aligns closely with the UK's own ambitious petrol and diesel car phase out dates as more consumers are switching to electric cars which produce lower emissions. Market leaders such as Tevva for instance, are scaling up their production of electric and hydrogen trucks at their London-based production facility.

These are just a few examples of the investments which the UK government are making both locally and globally to reduce greenhouse gas emissions and reach 2030 and 2050 net carbon targets which were reinforced in the COP26 agreement.

Relevant resources and references

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