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Republic of Moldova Energy Profile

International Energy Agency



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Republic of Moldova Country overview

The Republic of Moldova (Moldova), home to 3.6 million people with Chisinau as its capital, is situated in Eastern Europe neighbouring the north-eastern Balkans. The country covers 33 844 square kilometres (km²) and is bordered by Ukraine on the north, east and south, while the Prut River on the west defines the boundary with Romania (<u>http://moldova.md/</u>). The breakaway region of Transnistria, a strip of land between the Dniester River and the eastern Moldovan border with Ukraine, is recognised by three non-United Nations (UN) states only and is considered by the UN to be part of Moldova as of early 2020.

Moldova's economy has grown moderately over the 2007-19 period. Real gross domestic product (GDP), measured in US dollars (USD) on the basis of purchasing power parity (PPP) at 2011 prices, increased by 100% from 2002 to 2018 according to the World Bank. This growth is attributed to increased exports to EU markets and higher prices for agricultural products, although a ban on Moldovan wine imports to the Russian Federation (Russia) in 2006 and a heavy drought in 2007 severely affected the economy. Since lifting of the ban, growth has returned to the agriculture sector, which is the backbone of the economy. Moldova is, however, highly reliant on international donors and remittances from its many citizens working overseas.

Moldova's improved economic performance reduced national poverty from 30% in 2006 to 9.6% in 2015, and extreme poverty from nearly 5% to 0.2% over the same period (<u>https://mei.gov.md/ro/content/analiza-indicatorilor-saraciei</u>).

Because the country lacks energy resources, it is almost wholly dependent on fossil fuel and electricity imports: only 20%¹ of its energy demand was met by domestic sources in 2018. Natural gas, which serves most of its energy needs, was entirely imported from Russia via Ukraine up to the end of 2014. In August 2014 the lasi-Ungheni gas interconnector between Romania and Moldova was commissioned, and became operational in 2015. Once at full capacity in 2020, the pipeline is expected to supply almost all the gas Moldova consumes, but not that of the Transnistria region.

The government also plans to diversify the energy mix with more renewable energy. As expansion requires significant investment in the medium and long term, progress will depend on the country's ability to attract funds. The development of uncontrollable renewables, such as wind and solar, will be limited by the balancing capabilities of the Moldovan power system.

Moldova has been a member of the Energy Community since 2010 and signed an Association Agreement with the European Union on 27 June 2014. It therefore had until December 2017 to make its legislation conform to the EU *acquis communautaire*, which is the core EU energy legislation related to electricity, oil, gas, the environment, competition, renewables, efficiency and statistics. Moldova also plans to fully synchronise its electricity network with the European Network of Transmission System Operators for Electricity (ENTSO-E) to connect to the European electricity market.

Regional energy co-operation with Caspian and Black Sea countries and the European Union follows the framework of the Baku Initiative, which aims to facilitate the progressive integration of the region's energy markets into the EU market, as well as the transportation of substantial quantities of Caspian oil and gas towards Europe. Moldova also participates in the Eastern Partnership, a joint initiative involving the European Union, its member states and the post-Soviet states of Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine; it provides a venue for discussions on trade, economic strategy and travel agreements, as well as an energy security platform. In addition, the European Neighbourhood Policy promotes bilateral co-operation between the European Union and Moldova in line with the Partnership and Co-operation Agreement, which includes energy co-operation.

¹ This figure represents the IEA Secretariat estimates for the districts from the left side of the river Dniester and municipality of Bender

Key energy data²

• Moldova consumes around 4 million tonnes of oil equivalent (Mtoe) of energy per year (4.1 Mtoe in 2018), comparable to energy consumption in Luxembourg.

Supply

- Moldova's energy self-sufficiency is very low, among the lowest in the world.
- Around 20% of its energy demand is covered by domestic production, consisting almost fully of solid biomass; total domestic energy production was 0.82 Mtoe in 2018, of which 0.79 Mtoe solid biofuels.

Imports/exports

- Moldova needs to import most energy commodities to meet the domestic demand.
- All natural gas consumption (2.1 Mtoe, or 2.9 billion cubic metres (bcm) in 2014) is met through imports, mainly from Russia. A gas interconnector to Romania is under construction to reduce dependence on Russian gas.
- Imports cover 99% of Moldova's oil consumption (1.0 Mtoe in 2018, of which almost 80% diesel and motor gasoline)
- All coal consumed must be imported as well (0.09 Mtoe in 2018).

Demand

- Natural gas accounts for more than half of Moldova's total primary energy supply (53% in 2018), oil roughly a quarter (23% in 2018) and solid biomass one-fifth (19% in 2018).
- Most natural gas is used for electricity and heat generation,³ whereas oil is the most important energy source for final consumers.
- Residential sector is the largest energy consuming sector (around 1.4 Mtoe in 2018), solid biofuels covering over 50% of the sectoral consumption.
- Transport sector is the second-largest energy consumer (around 0.7 Mtoe) and the main driver in oil consumption growth.

² Official figures on natural gas imports, natural gas inputs to power plants, electricity production and consumption are modified by the IEA Secretariat to include estimates for supply and demand for the districts from the left side of the river Dniester and municipality of Bender.

³ Natural gas is used at MGRES power plant, which is situated in Transnistria. The Moldovan government procures electricity directly from the plant.

Renewables

- Renewables represent 20% of Moldova's energy mix, consisting almost fully of solid biofuels (19% in 2018).
- 6% of electricity generation comes from renewable sources (hydro, wind, solar PV).

Energy sector governance

Executive

The **Ministry of Economy and Infrastructure** is in charge of developing and implementing strategies and policies related to energy, such as Moldova's Energy Strategy 2030 (<u>http://www.mei.gov.md</u>).

The **Ministry of Agriculture, Regional Development and Environment** is responsible for developing environmental and natural resource management policies and strategies, as well as for implementing international environment treaties (<u>http://www.madrm.gov.md</u>).

The **Energy Efficiency Agency (EEA)** is the implementing agency under the national energy efficiency and renewable energy programmes. It promotes investment in energy saving and renewable energy projects, in accordance with existing government programmes (<u>http://www.aee.md</u>).

Legislative

The **Parliament** is unicameral with 101 members, elected by direct universal suffrage. The Chairman (Speaker) of the Parliament, the Standing Bureau, and the standing and special committees are the central institutional elements in the legislative process (http://www.parlament.md/).

Legislation can be initiated either as draft legislation or as a legislative proposal. In both cases, it is first considered by the parliamentary standing committee to which the draft or proposal has been allocated by the Chairman. At this stage, civil society organisations may make submissions, and other standing committees, legal staff of the Parliament and the government (when it is not a government initiative) may all submit advisory notes.

The approval of legislative text results in adoption of the legislation by Parliament. Ordinary laws may be enacted by the Parliament after a first reading (although this commonly happens after a second reading), whereas organic laws may only be enacted after a minimum of two readings. Laws are then signed by the Chairman of the Parliament and sent to the President for promulgation. After promulgation, the legislation must be published in the Monitorul Oficial (the Official Gazette); only after publication does the legislation take legal effect.

Judiciary

Judicial authority in Moldova is exercised through the courts system, regulated by the Constitution and specific laws (<u>http://justice.gov.md</u>).

Moldova possesses a three-tier judicial system that is independent of the executive and legislative branches. This court system comprises the Supreme Court of Justice, the Court of Appeals and courts of first instance (trial courts). Even the activity of the Constitutional Court is judicially based, independent of any other public authority, and obeys only the Constitution. Moldova has adopted a comprehensive strategy and implementation plan for reforming its judicial system.

The International Commercial Arbitration Court of the Chamber of Commerce and Industry of the Republic of Moldova was established in 1994 for commercial arbitration administration, with scope to settle disputes concerning foreign trade.

Regulatory framework

The **National Agency for Energy Regulation (ANRE)** is the single authority tasked with regulating Moldova's energy sector, and is therefore equipped with country-wide regulatory competences in the gas, electricity, heat and oil sectors. By law, ANRE is an institution legally distinct and functionally independent from any other public entity. Its main responsibilities are licensing, tariff setting and regulation (<u>http://www.anre.md/</u>).

Key policies

Moldova's energy policy focuses on improving integration in regional markets, strengthening energy security, improving compliance with EU directives, increasing electricity generation capacity and promoting energy efficiency and renewable energy. The significant changes the country's energy sector is undergoing, including institutional, market-related and physical development, are part of integration into the European energy market, as Moldova is required to harmonise its energy policy and

legislation under the Energy Community Treaty. Other binding international treaties include the Energy Charter and those of the World Trade Organization.

The main energy security-related projects are the lasi-Ungheni-Chisinau gas interconnection pipeline with Romania, and Moldova's integration into the EU electricity market through interconnections with the Romanian electricity network. Connection of the new lasi-Ungheni pipeline to Chisinau is likely to be achieved in 2020, and in 2013 a contract was signed with the European Union for funding of EUR 7.1 million to support the synchronous connection of the Ukrainian and Moldovan power networks with the ENTSO-E Continental Europe network by analysing potential technical, organisational and legal obstacles.

In February 2013, Moldova introduced its updated National Energy Strategy (NES) 2030, setting energy sector objectives for 2020 with an outlook to 2030. The updated NES targets are closely aligned with Energy Community Treaty requirements, even exceeding them in some cases: for instance, the Treaty's binding target for renewables in total final consumption (TFC) is 17%, whereas the NES sets a 20% goal. The main NES targets for 2020 are:

- 20% renewable energy sources in TFC
- 10% biofuels in transport
- 10% renewables in electricity generation
- 10% energy intensity reduction
- reduce electricity transmission and distribution network losses to 11%; reduce natural gas losses by 39%; and reduce heat losses by 5 percentage points from 2009 level
- 25% reduction in greenhouse gas (GHG) emissions from the 1990 level
- 20% reduction in energy consumption in buildings from the 2009 level
- 10% rehabilitation of public building stock.

Complementing the NES are the National Energy Efficiency Action Plans (NEEAPs) 2013-15, 2016-18, 2019-21 and the National Renewable Energy Action Plan (NREAP) 2013-20. The NEEAPs and the NREAP were designed consistent with Moldova's commitments under the Energy Community Treaty.

Energy statistics

The National Bureau of Statistics (NBS) is the institution responsible for collecting and processing energy statistics in Moldova, and three statisticians are dedicated part-time to this task. The main source of data is the energy survey (form <u>1-BE</u>), and

complementary data are drawn from various administrative sources, for example from ANRE on wind energy and solar photovoltaic (PV) electricity generation.

The main energy statistics publication is the <u>Energy Balance of the Republic of Moldova</u>, available in Portable Document Format (PDF) in Romanian, English and Russian on the website of the NBS. It provides the full picture of Moldova's energy situation in physical and energy units, and underlying energy data are easily accessible in Excel format in the <u>energy statistics section</u> of the website. The NBS also publishes data on electricity and gas prices, as well as monthly electricity and oil data.

Moldova shares energy data through five annual International Energy Agency (IEA)/Eurostat/UN Economic Commission for Europe (UNECE) joint questionnaires. In addition, since 2016 it has participated in the Joint Organisations Data Initiative (JODI) and has also been sending monthly oil and gas data to the International Energy Forum via the UN Statistics Division (UNSD).

The main users of energy data published by the NBS are the Ministry of Economy and Infrastructure, including for the Energy Strategy 2030, the Ministry of Agriculture, Regional Development and Environment (for energy modelling and long-term energy demand forecasts), the Energy Efficiency Agency (for monitoring the share of renewables in the energy mix and progress in energy efficiency), and ANRE.

A survey on end-use consumption in households was carried out in 2016 to acquire more comprehensive knowledge of residential biomass consumption. Future projects include revising the biomass time series based on survey results, and developing charts and explanatory materials to help consumers understand the energy data.

Chapter 1. Energy security

Resource endowment

Although it possesses limited lignite, phosphorite and gypsum deposits, Moldova is considered relatively resource-poor due to its lack of important coal, gas or oil reserves.

The potential of renewable energy sources (RES), especially wind and solar, is not being fully exploited. Because of the country's intensive agricultural activity, solid biomass is regarded as one of the most important sources of renewable energy, with the potential to be extensively exploited for energy production.

Moldova's two largest rivers are the Dniester and the Prut, both of which rise in the Carpathian Mountains in Ukraine.

Energy security and diversification

Energy security in Moldova in 2019 was at acceptable levels despite the country's exposure to gas supply shock risks. As Russia supplies all of Moldova's gas via Ukraine, two major supply shocks occurred in 2006 and 2009 due to disputes between the two countries. In January 2009, 50 000 people were left without gas for several weeks, the situation January 2006 did not last but in as long (http://europa.eu/rapid/press-release IP-09-38 en.htm).

To reduce the risk of gas supply shocks, the government has decided to diversify its gas import sources. The newly built lasi-Ungheni interconnector gas pipeline with Romania is expected to supply all of the country's gas demand when operational in 2020, but not that of the Transnistrian region. As of early 2020, the pipeline serves only the small town of Ungheni; after extension, however, it will also service Chisinau. Gas imports from Russia are still expected to continue, but at smaller volumes.

Moldova has no gas storage facilities, but the government is considering two possible sites for geological storage in the Zagarancea-Mânzesti-Unghenii de Jos villages area and in the Cantemir district. No concrete decisions have been taken on these developments.

The only way to diversify power supply to Moldova is through developing the power transmission network. The asynchronous/synchronous interconnection projects of Moldova with the EU internal power market through new power lines and strengthened internal networks are essential, both for supply security and for the country's social welfare. One of the first projects will be the southern asynchronous interconnection (Chisinau-Vulcanesti-Isaccea), to be constructed by the end of 2023.

The main results of implementing energy efficiency measures and using renewable energy sources that are closest in cost to conventional energy are also expected towards 2020.

Energy infrastructure and investment

Electricity

The electricity network is made up of 400-kilovolt (kV), 330-kV, 110-kV, 35-kV, 6–10-kV and 0.4-kV lines. The power transmission system operator (TSO) SE Moldelectrica manages the internal electricity transmission network that comprises 4 700 kilometres (km) of transmission lines of 400 kV, 330 kV and 110 kV on the west side of the Dniester River, and dispatches another 1 746 km of Dnestrenergo transmission lines in the Transnistrian region (<u>http://moldelectrica.md/ro/n etwork/annual_report</u>).

In all, the electricity distribution network is made up of 56 850 km of distribution lines supplying 1.3 million consumers; medium-voltage distribution lines are mainly radial type. High-voltage Interconnections with neighbouring countries include: 1 line of 400 kV with Romania (energised but not connected); 7 lines of 330 kV with Ukraine; 11 lines of 110 kV with Ukraine; and 3 lines of 110 kV with Romania (not connected).

Moldova's power system operates in parallel with Ukraine's (the Integrated Power System [IPS]/Unified Power System of Russia [UPS] grid), but it cannot currently operate in parallel with Romania's network, which is part of ENTSO-E. Only small quantities of electricity can be exchanged between the two systems through an island-mode operation.

For Moldova to connect synchronously to ENTSO-E, the cross-border network with Romania will need to be extended by one 400-kV interconnection (Suceava-Balti). In addition, generators, lines and substations will need to be rehabilitated and modernised because the power plants and network are old and inefficient and do not meet ENTSO-E technical requirements. Some rehabilitation of the network is ongoing, supported mainly by international financial institutions: the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB) and the EC Neighbourhood Investment Facility (NIF).

Moldova's electricity generation capacity on the west side of the Dniester River (i.e. excluding the Transnistria region) is approximately 350 megawatts (MW), 300 MW of which is produced by Termoelectrica SA (combined heat and power-1 [CHP-1] and CHP-2 plants). New planned capacity includes a 250-MW combined cycle gas turbine (CCGT) plant in Chisinau and 150 MW of renewables-based generation, but as the government is unable to finance these projects, substantial private investment will be required for their development.

The district heating sector was restructured and the two operators merged in 2015, and the government successfully negotiated a USD 40-million loan with the World Bank under the District Heating Efficiency Improvement Project for the rehabilitation of networks under a new district heating company in Chisinau (Termoelectrica). It also gained financing of EUR 10 million from the EBRD and the Eastern Europe Energy Efficiency and Environmental Partnership (E5P) fund for rehabilitation of CHP Nord (at Balti).

Natural gas

In 2019, natural gas transmission and distribution systems served almost 726 000 households and more than14 000 businesses through a total 24 600 km of pipelines, offering gas access to 60% of Moldova's communities.

MoldovaGaz manages and partially owns the pipelines in Moldova west of the Dniester River, and its subsidiaries operate more than 98% of the distribution network.

Moldova is an important transit country for Russian natural gas, being on the route from Ukraine to Romania, Bulgaria and Turkey, with branches to Greece and the Republic of North Macedonia. The total length of Moldova's three transit pipelines is 247 km (Moldovatransgaz) with a total capacity of 34.6 billion cubic metres per year (bcm/y).

Another pipeline interconnection with Ukraine traverses Moldova in the north to connect two parts of the Ukrainian network. This pipeline, with a capacity of 9.1 bcm/y, is important to Moldova's security of supply, as it connects to the storage facilities of Bogorodchany in Ukraine.

In practice, the capacity utilisation rate of all cross-border pipelines is only about 45% to 55%, meaning approximately 19 bcm/y of natural gas is transited through the southern route (in 2019 it deceased to 10 bcm/y) and 1 bcm/y through the northern one.

In August 2014, the Iasi-Ungheni gas pipeline from Romania was completed. It is 43 km long with a potential capacity of 1.5 bcm/y at a flat rate of 175 000 cubic metres per hour (m³/h). The pipeline runs 10 km on Moldovan territory and can currently be used only at very low capacity due to several technical constraints restricting the amount of natural gas that can be injected into the Moldovan natural gas transmission system from this interconnection; the availability of gas in Iasi is also limited. The government is making progress towards having the 120-km extension of the pipeline to Chisinau completed by the end of 2020.

Emergency response

The Ministry of Economy and Infrastructure is responsible for energy supply emergency response. It monitors the supply-demand balance and plans for future demand increases; in cases of energy supply interruption, wholesale customers or large independent customers are expected to adjust their consumption to available supply.

Two laws, the Law on Natural Gas and the Law on Electricity, adopted by Parliament in May 2016, provide the principles and basic rules regulating the duties and behaviour of natural gas and electricity market participants in emergency situations. They also cover co-ordination of activities in the natural gas and electricity sectors, as well as actions to be taken in case of natural gas and electricity supply disruptions.

Furthermore, these two laws require that the government adopt an emergency plan with accompanying action plan securing reliable and efficient gas and electricity supplies.

The Law on Commodity Reserves stipulates that the Material Reserves Agency keep 30 days' worth of CHP consumption in oil stocks, based on the previous year's consumption. CHP plants are also obligated to establish an emergency fuel (oil) reserve, though they can borrow fuel from the Material Reserves Agency. Technical specifications of thermal power stations require that they have fuel reserves for two weeks' operation at full capacity.

In 2012, Moldova committed to Directive 2009/119/EC on maintaining minimum stocks of crude oil and/or petroleum products, legally binding the country to establish

emergency oil stocks by 1 January 2023. To implement Directive 2009/119/EC on time, Moldova plans to transpose the Directive into its national legislation by December 2020.

Chapter 2. Market design

National market structure

Market information presented in this section does not cover the Transnistria region, as Moldovan state institutions do not monitor its energy sector. Only two electricity market participants from the Transnistria region requested and obtained licences from ANRE: Cuciurgani-Moldavskaya GRES (MGRES) power plant requested a licence for electricity production, and a supply licence was issued to Joint Stock Company (JSC) Energocapital.

Overall market restructuring is ongoing in Moldova, in accordance with provisions of the Third Energy Package and EU directives.

Electricity

The country's electricity sector relies on limited production sources: domestic supply comes from two combined heat and power (CHP) plants in Chisinau operated by (http://www.termoelectrica.md/), Termoelectrica one CHP plant in Balti (http://cet-nord.md/), an additional eight small CHP plants and the Costesti hydropower plant, all together covering up to 20% of consumption west of the Dniester River. The Cuciurgani-Moldavskaya GRES gas-fired power plant (installed capacity of 2 520 MW), owned by the Russian company Inter-RAO and located in Transnistria, covers the remainder of consumption (http://moldgres.com/). In addition, Ukrainian companies have regained access to the Moldovan market after the lifting of electricity export restrictions imposed by Ukraine in November 2014 due to the unavailability of coal-fired power plants in Eastern Ukraine.





The TSO and two DSOs have been legally unbundled from generation and supply activities. The Electricity Law provides an ownership unbundling model for the TSO and the conditions for certification as per Moldova's commitment to the Energy Community Treaty (ECT).

Moldelectrica is the state-owned TSO and central dispatcher for the whole country, including the Transnistria region (<u>http://moldelectrica.md</u>). RED Nord (state-owned; <u>http://rednord.md</u>) and Premier Energy Distribution (privately owned; <u>https://premierenergy.md</u>) are the DSOs. Premier Energy Distribution covers two-thirds of the country, and in 2020 privatisation will also be proposed for RED Nord.

The wholesale electricity market is based on bilateral contracts. Under the new Law on Electricity, former electricity suppliers at regulated tariffs (Premier Energy and Furnizare Nord) are designated to act as universal suppliers for end-consumers and as suppliers of last resort for a period of ten years, 2016-25 (<u>http://fee-nord.md</u>). Only one customer, a cement factory, has switched suppliers and is now supplied at unregulated prices by state-owned Energocom. Despite the Electricity Law granting switching eligibility to all customers, the competitiveness of retail suppliers is hampered because they only have limited access to wholesale supplies of electricity. As a result, there are very few retail suppliers for consumers to choose from.

Oil

Moldova relies completely on imports of petroleum products (99.9%) to meet domestic oil demand. It consumed 860 kilotonnes (kt) of petroleum products in 2019.

At the end of 2016, Frontera Resources (a US company) and Moldovan authorities signed a 50-year concession agreement for the exploration and development of hydrocarbon resources in southern Moldova. The contract grants Frontera Resources the exclusive right to explore and develop oilfields within an area of 12 000 km², focused around the Dobrudga Basin. The aim of this concession is to increase and diversify Moldova's energy sources and reduce the country's dependence energy imports.

Moldova's total storage capacity for petroleum products is over 150 000 m³, including state and industry storage but excluding the army's. In addition, the Giurgiulesti terminal has eight tanks for petroleum product storage with capacity of 63 600 m³ at its disposal.

Gas

Moldova's gas market is entirely monopolised: the majority of functions – imports, supply management, cross-border and national transmission, distribution and retail – are performed by MoldovaGaz and its subsidiaries (<u>http://www.moldovagaz.md/</u>). MoldovaGaz is owned by Gazprom (50%), the Moldovan government (36.6%) and the Transnistrian administration (13.4%).

MoldovaTransgaz, a MoldovaGaz subsidiary, was the only gas TSO (except Tiraspoltransgaz from the Transnistria until January 2015 when region) VestMoldTransGaz also received transmission licence а (http://www.moldovatransgaz.md/). The Law on Natural Gas introduced three possible unbundling models for gas TSOs and transposed a derogation granted by the Ministerial Council of the ECT allowing unbundling until 1 January 2020.



Figure 2 Moldova's gas sector before unbundling

Source: European Union High Level Advisers' Mission 2019-2021.

Moldova has achieved progress in restructuring Moldovagaz. Transmission and distribution system operators have all been legally unbundled, and all distribution companies of Moldovagaz have also been unbundled since January 2016 (since 2013 for the DSO Chisinau-gaz), with only the supply function still provided by Moldovagaz. The 12 main gas DSOs in Moldova are subsidiaries of MoldovaGaz, with other smaller DSOs covering less than 2% of gas distribution. The Law on Natural Gas transposed unbundling provisions for distribution operators, including exemptions for those serving less than 100 000 customers.

Moldovagaz acts as an importer, wholesaler and retail supplier. Household customers and small enterprises are entitled to regulated gas supplies by the supplier under public service obligations (PSOs).

The Actual Unbundling Plan, which provides for the ITO model, was sent to the Moldovan Energy Regulatory Authority (ANRE) in December 2019. Regarding MoldovaGaz's supply activities, a new subsidiary will be created, in order to avoid any conflicts of interest between MoldovaGaz and its daughter ITO. Implementation should happen by 1 September, 2020.

VestMoldTransGaz. which operates Moldova's section of the new lasi-Ungheni-Chisinau gas interconnector pipeline, was created in June 2014 and received TSO licence January а in 2015. State-owned Energocom purchases and imports gas from the EU market (from Romania) and uses VestMoldTransGaz's transmission service.

VestMoldTransgazis is fully unbundled in terms of ownership from any other energy activity in Moldova.



Source: European Union High Level Advisers' Mission 2019-2021.

There are no gas storage facilities in Moldova and no access to liquefied natural gas (LNG). Domestic gas production meets less than 0.01% of demand, and until the end of 2016 Valiexchimp had been the only company to explore and exploit gas and oil in southern Moldova.

Coal/peat

N/A

Nuclear

N/A

Large hydro

N/A

Energy efficiency

The Energy Efficiency Agency (EEA), an administrative body subordinate to the Ministry of Economy and Infrastructure, is responsible for policy implementation in energy efficiency and renewable energy (<u>http://aee.md</u>). Besides policy implementation, the EEA manages the National Communication Strategy in energy efficiency and renewable energy sources, aimed at promoting rational energy consumption and the use of green energy.

Until July 2018, financing of energy efficiency measures and renewable energy projects was undertaken by the Energy Efficiency Fund (EEF), which was an independent body governed by its Administrative Board (<u>http://fee.md/index.php?l=ro</u>). Since its creation in 2012, the EEF has been financing projects mainly in the public sector, highlighting the exemplary role of public buildings in energy efficiency. The calls for proposals under development by the EEF relied on market-driven financial instruments, moving away from high grant-component financing (up to 75%) towards energy performance contracts and preferential loans.

According to the recently adopted (July 2018) new Energy Efficiency Law, the institutional framework for the implementation of energy efficiency policies was reviewed with a view to strengthening the capacity of the competent authority. In particular, the Energy Efficiency Agency was reorganized through a merger (acquisition) with the Energy Efficiency Fund (the absorbed organization).

Other central public authority dealing with renewables and energy efficiency are the Ministry of Agriculture, Regional Development and Environment (MoARDEnv). The MoARDEnv promotes energy efficiency and renewable energy, and finances related sectoral activities through the National Ecological Fund, recognising the considerable impact of these projects on reducing greenhouse gas (GHG) emissions.

Renewable energy

The renewable energy market – overseeing electricity and biofuels, and the heating and cooling sub-sector – is regulated by ANRE, an independent authority established in 1997 to introduce market mechanisms in the energy field while protecting consumer and investor interests. It issues licences, regulates fuel and power prices, and establishes energy pricing principles and methodologies for calculating tariffs, including for renewables' support mechanisms through secondary legislation. In the renewable electricity market, the key stakeholders are the grid operators: the TSO Moldelectrica, and two DSOs – RED Nord (state-owned enterprise) and Premier Energy Distribution (private company) - and the Central Electricity Supplier – SA Energocom (state-owned enterprise), appointed by the government.

The main companies involved in gas supply, in the case that biogas producers eventually feed purified energy resources into the national network, are Moldovagaz and its affiliates.

The centralised district heating and cooling sector, which exists in the cities of Chisinau and Balti, is managed by JSC Termoelectrica and JSC CET Nord.

Local public authorities are also influential in the energy efficiency and renewable energy sector: they develop their own plans and programmes in both energy efficiency and renewable energy, and raise funds to implement projects in priority sectors. These public authorities are also responsible for issuing permits and certificates, such as urban planning permits for deep refurbishment of buildings (when an urban planning permit is required), and can make decisions on land destination for renewable projects when necessary.

Regulatory framework

To promote development of the energy sector, Moldova's legal framework was designed to correspond with the European framework and the relevant *acquis* of the Energy Community. Primary legislation includes the Law on Energy (2017), the Law on Natural Gas (2016), the Law on Electricity (2016), the Law on Petroleum Products (2001), the Law on Heat and Cogeneration Promotion (2014), the Law on Promotion of Energy from Renewable Sources (2016) and the Energy Efficiency Law (2018).

With adoption of the Laws on Natural Gas and Electricity (May 2016) and the Law on Energy (September 2017), Moldova fully transposed its Third Energy Package requirements). The new laws:

- Define the respective competences of government authorities, and the objectives, duties, powers and rights of ANRE.
- Define the tasks, rights and responsibilities of producers, TSOs, DSOs and suppliers.
- Define the concept of public service obligations and the basic rules for imposing them, which may relate to security of supply, regularity, quality and price of supplies, and environmental protection, including energy efficiency, energy from renewable sources and climate protection.

- Provide directives for unbundling, designation, certification and independence of TSOs and DSOs.
- Address network development and the authority to make investment decisions.
- Define the concepts of vulnerable customers and customer protection, which may be applied to energy poverty.
- Define market organisation, market liberalisation and third-party access to transmission and distribution systems.

The new Law on Energy transposed provisions for independence of the energy regulator and its enhanced powers.

The Law on Heat and Cogeneration Promotion was approved by the Parliament in May 2014 in accordance with international standards and EU directives; it is expected to define the responsibilities of dwelling-owners' associations, consumers and suppliers.

Renewables and energy efficiency developments in Moldova are governed by the new Law on Energy Efficiency (2018), aligned with EU directives on energy efficiency, the Law on Energy Labelling (2014), the Law on Energy Performance in Buildings (2014) and the Law on Eco-design (2014). A new Law on Promotion of Energy from Renewable Sources was adopted in February 2016, but its entry into force was delayed until 25 March 2018 to allow the competent authorities to adopt the necessary secondary legislation.

Apart from primary legislation, a number of secondary normative acts have been approved by ANRE, particularly on issues such as licensing, market rules, investments, tariffs, consumer protection, access and connection to electricity networks, contracting, supplying and billing of energy, and guarantees of origin.

The Regulatory Programme, prepared and approved by ANRE, lists normative acts and actions, with strict deadlines for approval and implementation, to be implemented by ANRE to make the energy market functional and competitive. More than 30 secondary acts were amended and adopted by 2019 for implementation of the electricity *acquis* alone. This includes certifying the TSO and updating the rules for the electricity market, such as those pertaining to balancing and imbalance settlement.

Tariffs

ANRE regulates and approves electricity, gas and heat tariffs in Moldova. Tariff regulation is mainly well-defined and based on global <u>good practices</u>:

- Effective total revenue yields, providing a fair return with a socially desirable level of service and safety. (In Moldova, total revenue has been determined effectively, with a rate of return based on the weighted average cost of capital [WACC], and a desirable level of service has been determined.)
- Stable and predictable revenue for utility companies. (Methodologies are determined for five to seven years in Moldova.)
- Stable and predictable consumer rates. (In Moldova, changes in operating costs may lead to sudden changes in consumer tariffs, but capital costs are included gradually.)
- Discouraging wasteful use of services. (Energy is billed based on consumption in Moldova, and in principle the total cost of production is covered.)
- Fairness of rates in the apportionment of total costs of service among different consumers. (Distribution tariffs in Moldova aim to account for differences in cost of service at different voltage/pressure levels.)
- Avoidance of discrimination in rates. (There is no cross-subsidisation in Moldova: consumers with similar connections pay the same tariff.)

Tariffs and methodologies are transparent and are published on ANRE's website, and ANRE also organises public hearings before tariff approvals to ensure transparency of the approval process.

Regional markets and interconnections

Electricity

Moldova's electricity system operates synchronously with Ukraine's, and the neighbouring systems are interconnected by 11 lines of 110 kV and 7 lines of 330 kV.

Although Moldova is interconnected with Romania, the two systems do not operate in parallel but can function together in island mode (four islands can be created). Romania's power system is part of ENTSO-E, and Moldova is currently working towards full synchronisation. The feasibility study for Moldova and Ukraine to interconnect with ENTSO-E outlines the next steps and measures to be taken.

The major challenge is to establish, in a short time, the proper and stable infrastructure connections with the European Union. In the interim, asynchronous interconnection is considered a transitory step towards final synchronisation. Priority projects are:

- Back-to-back (BtB) station Vulcanesti and 400-kV overhead line (OHL) Vulcanesti-Chisinau
- BtB station and 400-kV OHL Balti-Suceava

• BtB station and 400-kV OHL Romania-Ungheni-Straseni (optional).

Natural gas

Moldova is connected to the Ukrainian gas transportation system that transits all gas imports to Moldova from Russia on a bilateral contract. Moldova also transits gas to the border with Romania, to be sold on European markets in Turkey and the Balkans. The total length of Moldova's three transit pipelines is 247 km with a total capacity of 34.6 bcm/y. Another pipeline interconnection with Ukraine in northern Moldova connects two parts of the Ukrainian network; this pipeline, with a capacity of 9.1 bcm/y, is important to Moldova's supply security, as it connects to the storage facilities of Bogorodchany in Ukraine. In practice, the capacity utilisation rate of all cross-border pipelines is only about 45% to 55%, i.e. approximately 19 bcm/y of natural gas is transited through the southern route (in 2019 it deceased to 10 bcm/y) and 1 bcm/y through the northern one.

The lasi-Ungheni interconnector gas pipeline to Romania became operational in 2015 but can be used only at very low capacity due to technical constraints limiting the amount of natural gas that can be injected into Moldova's transmission system, and to the low availability of gas in the Romanian gas network supplying lasi. The government plans to extend the pipeline to Chisinau by 2020, maximising its 1.5-bcm/y capacity to meet all of Moldova's gas consumption, but not that of the Transnistrian region.

Chapter 3: Sustainable development

Renewable energy

Moldova's renewables sector is less developed than those in regional markets and neighbouring countries. Moldova committed to a binding target of 17% of energy from renewable sources in gross final energy consumption by 2020, set by the EnC-MC decision in 2012, and a voluntary target of 20% set in the National Energy Strategy 2030. Moldova has already reached its overall share of energy from renewable sources 2020 target, taking into consideration the finding of the 1st Survey on Energy Consumption in Households, conducted in 2016. More than one-quarter of the energy consumed in the Republic of Moldova is "green" energy, this being practically totally oriented towards heating (biomass).

Renewable energy sources (RES) sectoral contribution	2018 (%)	Target (%)
RES in heating and cooling	44.96	27
RES in electricity	2.59	10
RES in transport	0.27	10
Overall RES share (%)	27.46	17

Table 1 Moldova's renewable energy share in 2018 vs renewable energy target

The unattractiveness of renewable energy is the result of the supporting mechanism introduced by the previous Law on Renewable Energy (Law No. 160 of 2007) and the previous Methodology for the Determination, Approval and Application of Tariffs for Electricity Generated from Renewable Sources and Biofuels (ANRE Decision No. 321 of 2009).

Even though primary legislation stated that policy principles were, among other things, adjustments of the national legal framework to European and international standards, promotion of renewable energy through support schemes, guarantees of renewable energy commercialisation through non-discriminatory connection to the grids, etc., the secondary legislation diminished the attractiveness of the sector. The main culprit was the provision allowing the regulator to set the tariff for green electricity according to the

situation and level of feed-in tariffs (FiTs) approved in the region, in spite of other favourable basic principles promoted by the same act, such as case-to-case and cost+ approaches, the WACC factor, annual adjustment of the tariff, etc.

The situation changes with the new Law on Promotion of the Use of Energy from Renewable Sources (Law No. 10 of February 2016) and new Methodology for the determination of fixed tariffs and electricity prices produced by eligible producers from renewable energy sources (ANRE Decision No. 375 of 28.09.2018), that entered into force in March 2018 (http://lex.justice.md/index.php?action=vi ew&view=doc&lang=1&id=363886). The Law establishes many supporting mechanisms for different beneficiaries and projects:

Table 2 Supporting mechanisms established in Moldova for various producer types

fixed prices	 for producers who hold or will hold power plants with generation greater than the cumulative capacity limit set by government for producers identified as eligible in the framework of a tendering procedure according to Article 35 of Law No. 10/2016 and the Regulation on Tendering Procedures for renewable energy producers
fixed tariffs	 for producers who hold or will hold power plants with cumulative power capacity not exceeding the limit set by the government, but not less than 10 kilowatts (kW) for producers confirmed as eligible according to Article 36 of Law No. 10/2016 and the Regulation on Confirmation of the Status of Eligible Producers
net metering	 for small renewable energy investors oriented towards covering their own electricity consumption for those meeting eligibility criteria established under Article 39 of Law No. 10/2016
unregulated market	 for any kind of legal relationship between a project developer and electricity supplier other than those mentioned above, to be ruled in accordance with the principles and conditions negotiated directly by the two parties (installation of protection facilities should be obligatory).

Supporting mechanisms introduced by the government are market-driven and comply with the state aid legislation. They promote tenders and competition for large investors, and allow classical FiTs for small projects run by local investors and communities.

Capacity limits, maximum allowances and capacity categories for electricity from renewable sources by 2020, approved by the Government (Decision No 689, 11.07.2018) are shown in the table below.

Table 3 Capacity limits, maximum allowances and capacity categories for electricity from
renewable sources by 2020, approved by the Government (Decision No 689,
11.07.2018)

Capacity categories	Maximum shares of capacities for the RES technologies, MW			Small/ Large
RES Technologies	TOTAL	Capacity based on fixed tariff (approved by ANRE)	Capacity based on fixed price (established by tender)	project capacity limits, MW
Wind installations	100	20	80	4
Solar PV installations	40	15	25	1
Biogaz installation (cogen)	20	12	8	1
Cogen installations (solid biomass)	5	5	0	1
Small hydropower installations	3	3	0	1
TOTAL	168	55	113	-

According to the EEA, at the end of 2019 about 56 MW of intermittent capacity was installed, with 16 MW produced by one hydro installation located on the Prut River at the Romanian border.

Consistent with the third Republic of Moldova Progress Report under Renewable Energy Directive 2009/28/EC, national authorities assessed a 2 262-kt carbon dioxide-equivalent (CO_2 -eq) reduction in GHG emissions in 2017 from increased use of renewable energy.

Small hydro

Only one hydro installation is operational in Moldova, the Stinca-Costesti hydropower plant (HPP) on the Prut River, with an installed capacity of 16 MW. There is another HPP on the Dniester River dispatched by the Moldovan TSO Moldoelectrica, but its generation of 48 MW does not feed into the local market and therefore is not reflected in national energy statistics. In recent years, several local and international investors have expressed willingness to invest in small HPPs on inland rivers, but the total new capacity to be built does not exceed 1 MW, so the country's hydro potential is still considered low.

Solar

As of the end of 2019, several small (2 kW to 500 kW) solar projects have been built or are under construction in Moldova, with a cumulative capacity of 4.0 MW. Most generating units are of the type actively promoted by the government, and are mounted on the roofs of industrial, private and public buildings. Supported by the INOGATE programme, an interactive Solar Map was also created to be made publicly available for the investor community.

Given Moldova's geographical position and falling technology costs, solar thermal installations are becoming much more economically feasible, especially for public institutions with high water heating needs such as kindergartens and hospitals. What is more, projects of this type are supported by the donor community, which promotes the harnessing of solar thermal potential.

In order to assess the country's overall rooftop solar PV potential, a group of countries including Moldova is being analysed within the HiQSTEP initiative launched under the Eastern Partnership.

Wind

As of the end of 2019, several industrial wind installations with a total capacity of 35.6 MW have been built in Moldova, but the most considerable investments in this area are still to come. Although the TSO and DSOs have issued technical conditions for intermittent technologies of more than 1 gigawatt (GW) to connect to the public grid, not more than 100 MW of wind installations will be allowed until 2020 because of technical and balancing constraints, and most of them will go through the tendering procedure.

In 2016, the EEA and the Technical University of Moldova finalised their study on Moldova's wind energy potential in line with international standards (<u>https://moldova.awstruepower.com/</u>). Also, a recent International Renewable Energy Agency (IRENA) report announces a potential 11.8 GW of wind power for Moldova, but the actual electrical infrastructure cannot accommodate anywhere near this level of (http://www.irena.org/DocumentDownloads/Publications/IRENA Costintermittency competitive power potential SEE 2017.pdf).

Geothermal

Because geothermal technologies (heat pumps) are still unaffordable for the average citizen, only a small number of projects have been implemented around the country. The few installations built in the public sector were financed by donors or international projects. Meanwhile businesses and individuals can switch from fossil fuels to low-potential ground heating with the help of financing from international financial institutions (IFIs) and Moldova's Development Partners.

In addition, a rise in natural gas and electricity tariffs is raising the economic feasibility of geothermal and aerothermal options. To promote these technologies, success stories of the past five years are being publicised through a national contest, sponsored by Moldova Eco-Energetică, to reward the most notable projects, ideas and technologies contributing to sustainable development (<u>http://mee.md</u>).

Biomass

Because Moldova is agriculturally oriented and has received support from the international community in this domain, biomass is one of the most developed renewables sectors. In the form of agricultural residues and direct and indirect wood fuel, biomass is used almost completely for heating purposes. According to Moldova's NBS, 752 ktoe of biomass were used in 2017 (mostly by residential sector), which represents app. 10% of biomass potential. This allowed the Government to report 28% of renewable energy in gross final energy consumption target. In this context, the overall renewable target (17% -legally binding RE-related targets for Moldova that were set by the EnC-MC decision in 2012 and 20% -voluntary target set in the National Energy Strategy 2030) has already been achieved, taking into consideration the finding of the 1st Survey on Energy Consumption in Households, conducted in 2016. According to the EEA, more than 100 MW of biomass heating capacity was built in the public and residential sector in 2011-17 with EU support, and more than 300 boiler units were installed countrywide. At the same time, more than 3 000 small boilers (20 kW to 25 kW each) were installed in the residential sector, demonstrating rising public interest in this technology, stimulated in part by higher tariffs for fossil fuel-based energy. This increased market demand for solid biofuels amounts to EUR 7 million to EUR 10 million, met by 100 local producers.

Waste

N/A

Other

N/A

Energy efficiency

Of its commitments under the Energy Community Treaty, Moldova has already transposed the most important pieces of the European legal framework on energy efficiency: Directive 2012/27/EU on Energy Efficiency, Directive 2006/32/EC on Energy Services, the directives on Energy Labelling and Eco-design, and Directive 2010/31/EU on Energy Performance of Buildings. While the labelling and eco-design frameworks are almost fully in place (the government approved secondary legislation in 2016), the greatest challenge now is to implement the Law on Energy Efficiency and the Law on Energy Performance of Buildings.

A pressing challenge for the Ministry of Economy and Infrastructure, as the central public body responsible for the energy sector, is the implementation of the Law on Energy Efficiency. Besides strengthening national energy efficiency legislation, the Ministry of Economy and Infrastructure aims to consolidate the institutional entities responsible for energy efficiency policy implementation, as stipulated in the government's Action Programme for 2019-2021.

A detailed roadmap to address the complexity of buildings' energy performance is to be implemented with the support of Moldova's Development Partners. Major barriers to implementing the law are the country's insufficient local capacities in this field, its lack of international expertise and, as a former Soviet Union country, its reliance on old construction standards and regulations.

Even though the economy's energy intensity is three times the EU average, there have been considerable achievements, such as a 29% reduction in the energy intensity indicator for 2016-2018, from 0.45 tonnes of oil-equivalent per thousand euros (toe/EUR 1 000) to 0.32 toe/EUR 1 000. This decline was spurred by financial support for the public and residential sector by several institutions: the EBRD's Moldovan Sustainable Energy Financing Facility (MoSEFF; <u>http://www.moseff.org</u>) and Moldovan Residential Energy Efficiency Financing Facility (MoREFF; <u>http://moreeff.info/en/</u>), the EEF, the Energy and Biomass Project (<u>http://biomasa.aee.md</u>) and initiatives supported by E5P (<u>http://moldova.e5p.eu</u>), among others.

Moldova's energy efficiency target under the National Energy Efficiency Action Plan for 2019-21 is an 114-ktoe reduction in final energy consumption or 203 ktoe in primary

energy by 2021. Necessary financing will be provided by Moldova's Development Partners, IFIs, local funds and budget allocations. As one of the country's sustainable development financiers, the government relies on market-driven instruments such as energy performance contracts, concessional and preferential loans and private investments. Project proposals and financing initiatives in energy efficiency and renewables, drafted by the Donors Community and Development Partners in conjunction with national authorities, amount to almost EUR 400 million, to be applied by 2020-22.

Regarding climate change mitigation and Moldova's contribution to global GHG emissions reductions, rough estimates hold that 413 ktCO₂-eq will be avoided by 2020 as a result of energy efficiency project implementation.

Fuel switching

N/A

Environmental protection

Under the Law on Environmental Impact Assessment (2014), approximated to Environmental Impact Assessment (EIA) Directive 2011/92/EU, an EIA is mandatory for projects considered to have significant effects on the environment and listed in Annex 1 of the law. For projects listed in Annex 2, the national authority must decide whether an EIA is needed, based on criteria in Annex 3.

Also, the Law on Strategic Environmental Assessment, approximated to the Strategic Environmental Assessment (SEA) Directive, was adopted by the Parliament. The law requires SEAs for national and local plans and programmes on land use, transportation, energy, waste, agriculture, etc.

Climate change

Moldova's updated Nationally Determined Contribution (INDC) commits it to a net GHG emissions reduction of 70% (with land use, land-use change and forestry [LULUCF]) by 2030, compared with base year 1990, instead of 64-67% as committed in NDC1. This GHG emissions reduction commitment could increase conditionally up to 88% (compared to 78% committed in NDC1), subject to a future comprehensive agreement that would also address other important issues for Moldova as well as provision of low-cost financing, technology transfer and

multilateral technical co-operation. Access to all of these measures would be appropriate to global climate change challenges.

Moldova has also approved a Low Emissions Development Strategy, which aims to reduce GHG emissions in the energy, transport, agriculture, buildings, forestry, industry and waste sectors (<u>http://gov.md/ro/content/sedinta-guvernului-din-14-decembrie-2016-ora-1700 nr.7</u>).

In 2005 Moldova ratified the Kyoto Protocol and a Designated National Authority (DNA) for the Clean Development Mechanism (CDM) was established, and as of mid-2014 eight CDM projects had been registered (<u>https://cdm.unfccc.int/Projects/projsearch.html</u>). The DNA is the Climate Change Office in the Ministry of Agriculture, Regional Development and Environment. It is responsible for promoting CDM projects, and its priorities are to reduce GHG emissions and adapt to changing climate conditions. Moldova has ratified the Paris Agreement.

Technology research, development and deployment

The Institute of Power Engineering is unique in performing research in various fields. It has conducted research in Moldova's energy sector for more than 50 years (<u>http://www.ie.asm.md</u>). Annual funding allocated by the state for research in the energy sector is around EUR 170 000, but research institutes can also obtain funding through competitive projects for young researchers, projects within state programmes, technology transfer projects, etc., which are also funded by the state. This financing does not exceed 10% to 15% of direct funding, and money earned through research projects in partnership with the private sector usually does not exceed 5% to 10%.

The research institutions provide both fundamental and applied research, with 35% of funding allocated for fundamental research and 65% for applied research. Modern computer-assisted tools are used to perform fundamental research, and obsolete equipment is employed for applied research.

A fundamental problem is the lack of funding for equipment and specialised software, for experiential research and technologies accepted in modern countries, and for remuneration. Another problem is weak industrial growth that limits the implementation of research innovations in the national economy.

Since 2007 Moldova's research institutes have developed relationships with major European institutions that allow active participation in various European research programmes and attract additional funding, such as Horizon 2020 projects, Science and Technology Centre (STCU) projects and cross-border projects. Experts from Moldova's research institutes are actively involved as experts in national energy efficiency projects such as MoSEFF and MoREF, and in climate change and environmental protection measures implemented by various international institutions.

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