Energy Policy Review

Lithuania 2025

INTERNATIONAL ENERGY AGENCY

The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 32 Member countries, 13 Association countries and beyond.

IEA Member countries:

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Japan
Korea
Latvia
Lithuania
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Republic of Türkiye
United Kingdom
United States

The European Commission also participates in the work of the IEA

IEA Association countries:

Argentina
Brazil
China
Egypt
India
Indonesia
Kenya
Morocco
Senegal
Singapore
South Africa
Thailand
Ukraine

Source: IEA.
International Energy Agency
Website: www.iea.org

Table of contents

Executive summary

Energy independence is the key principle guiding Lithuania's energy strategy. Lithuania moved with pace and determination to end its reliance on energy imports from the Russian Federation (hereafter, "Russia"). Thanks to strategic infrastructure investments, Lithuania is an important regional energy hub, and with the recently completed electricity grid synchronisation with the Continental European Synchronous Area (CESA), the Baltic states have successfully disconnected from the Russian-controlled system. While these are important achievements, Lithuania's final energy consumption remains highly reliant on imported fossil fuels, notably in transport, and a significant share of electricity demand is met by imports. This report seeks to provide Lithuania with timely advice on how it can progress towards its energy goals, including in two focus areas: expanding the electricity system and decarbonising transport.

Lithuania outlines a long-term vision for an electrified energy system and new industrial development. The National Energy Independence Strategy (NEIS) is formulated around four strategic goals: 1) ensuring energy security, 2) achieving climate neutrality, 3) transitioning to an electricity economy with a high value-added energy industry, and 4) ensuring that energy is available to consumers in a fair and affordable way. Meeting these goals would require a broad electrification across the economy, and Lithuania aims to become a net exporter of electricity by 2030 and of energy by 2050. The strategy also includes fostering industrial development related to renewables-based hydrogen. This requires a lot of electricity, and in the NEIS main scenario, electricity demand will increase sixfold by 2050, half of which will be used for hydrogen production. However, hydrogen market development has been slower than expected, both in Lithuania and in other European markets. While the NEIS is a crucial guide for the energy policy, it should be implemented in well-defined steps, prioritising actions with clear benefits and low risks.

Electricity generation has nearly doubled in the last two years, driven by supportive policy for renewables, but the outlook is uncertain. Lithuania has introduced measures to improve permitting and subsidise investments in renewable electricity generation, which helped drive rapid growth. While this development is positive, the pace is not yet sufficient to meet its 2030 renewable electricity capacity targets of 4.5 gigawatts (GW) onshore wind, 1.4 GW offshore wind and 4.1 GW solar photovoltaic (PV) power plants. Onshore wind is being built without subsidies, but market conditions need to be monitored, and policy action taken if they become less favourable. Offshore wind progress is more uncertain, and Lithuania was not the only country to see an offshore wind auction cancelled in 2024 resulting from a lack of bidders – a sign that investors need greater policy and financial certainty. Beyond renewables, Lithuania is considering the possible role for small modular nuclear reactors (SMRs) in the longer term, which requires necessary preparations.

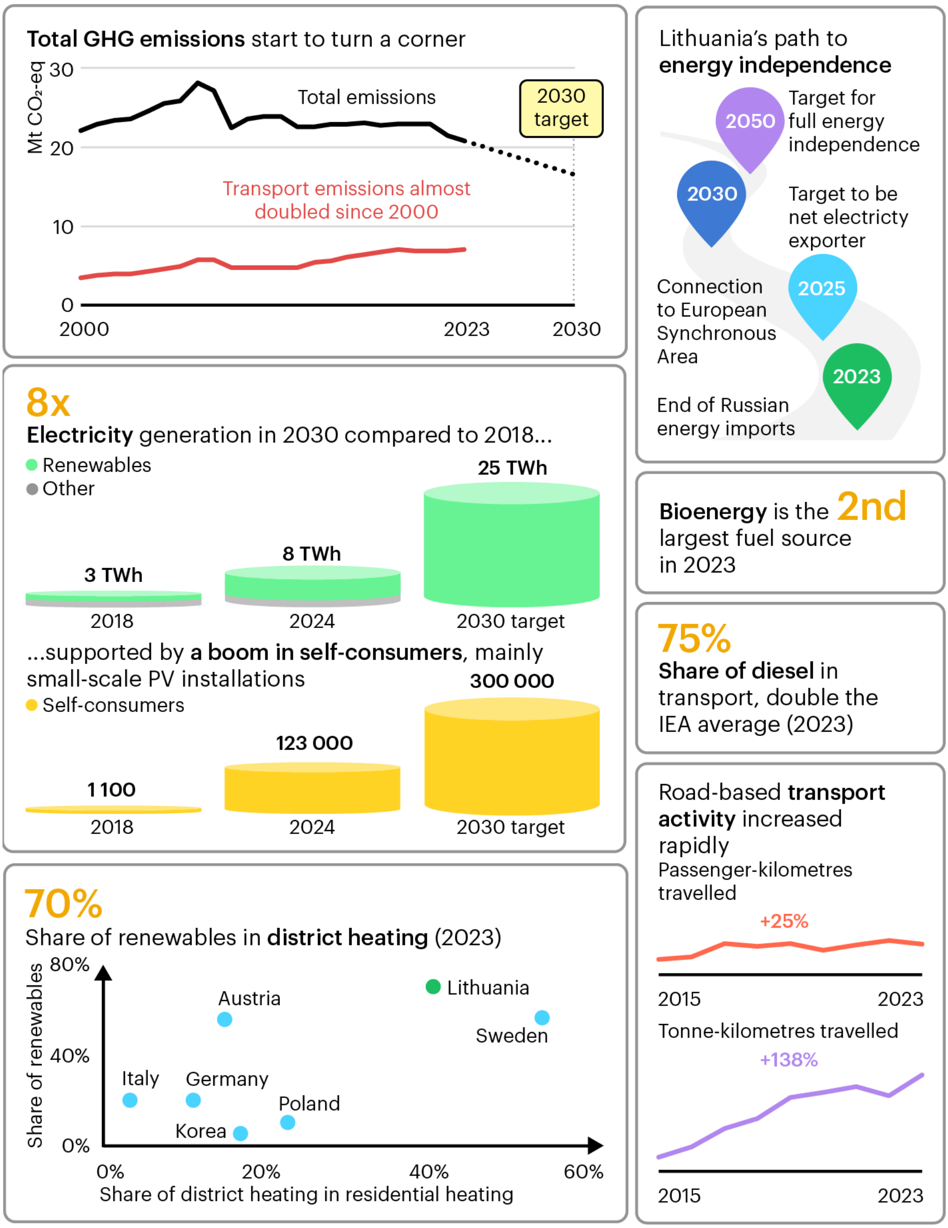
A rapid expansion of the electricity system will require a forward-looking approach that incentivises flexibility and proactive infrastructure buildout. Significant expansion and upgrading of transmission and distribution networks is crucial to accommodate the planned growth in renewable electricity generation and electricity demand. Lithuania has taken important steps to improve permitting processes, including designating transmission infrastructure as being of special national importance. However, the construction time for new grids remains long compared to new electricity generation or consumption. Lithuania should allow anticipatory investments in new grid capacity while shaping policy to use existing capacity more efficiently. Clearer price signals that incentivise flexibility and grid services are needed, including by expanding balancing markets and allowing dynamic grid tariffs. Another area for action is the net-metering system, which has succeeded in driving growth in solar PV investments but also reduced the incentive for providing flexibility and grid services. To enable future growth of distributed generation and self-consumption, without causing grid congestion problems, Lithuania should reform the net-metering system and replace it with a more grid-friendly approach.

Further investments are needed to improve efficiency in buildings and district heating systems. Lithuania's Long-Term Renovation Strategy – targeting a 60% reduction in primary energy consumption in buildings by 2050 and eliminating fossil fuel use – successfully channelled European Union (EU) funding and private capital into energy efficiency renovation programmes. The renovation rate is not in line with

Lithuania's targets, however, and many people continue to live in old, inefficient buildings. To boost energy performance in buildings, Lithuania should adopt a neighbourhood approach to renovation, simplify decision making for multi-apartment buildings and look for cost-efficiencies from economies of scale. This needs to align with plans for district heating, which has already seen a rapid switch from natural gas to domestic bioenergy, resulting in lower fossil fuel imports, energy prices and emissions. To further improve efficiency and diversify the fuel mix, Lithuania plans to introduce more residual waste heat and power-to-heat solutions. For this to happen, policies must help district heating companies make the necessary investments in the network and substations, enabling modernisation and efficient operation of the system.

Transport is the largest source of emissions in Lithuania and requires focused policy interventions to drive electrification and efficiency improvements. The transport sector accounts for around 40% of total final energy consumption (TFEC), 75% of oil demand and one-third of total greenhouse gas emissions (GHG). Road transport dominates the sector, and the Lithuanian car fleet is one of the oldest and least efficient in the European Union. Electrification is the main option for replacing fossil fuels in road transport and aligns well with the expansion of renewable electricity generation. However, electric vehicle (EV) uptake in Lithuania is currently low, due to relatively high purchase prices. Electrifying transport while maintaining affordability requires a combination of targeted incentives, infrastructure investments and regulatory support. In addition to electrification, shifting transport activity to public transportation and railways can improve the overall efficiency of the transport system. Taxation should play a greater role in incentivising electrification and modal shifts, as fuel taxation in Lithuania is comparatively low and Lithuania is one of few countries in the European Union without annual ownership taxation for cars.

Lithuania should continue to prioritise regional co-operation – exchanging best practices, harmonising policy and strengthening energy supply chains. Lithuania is an active participant in Baltic and Nordic energy markets and works closely with other countries in the region on energy infrastructure projects. Further co-ordination could increase electricity market liquidity and hydrogen offtake, inform building renovation strategies, facilitate potential nuclear development, and address the skills gap for the energy transition. More broadly, Lithuania's energy security would benefit from diversifying sources and routes, strengthening interconnections, ensuring the collective resilience of energy infrastructure, maintaining essential reserves, and generally working closely with neighbours and partners. Implemented effectively, Lithuania's strategies and plans can guide it towards a more secure, sustainable and prosperous energy future.


Total GHG emissions start to turn a corner
Mt CO₂-eq
30
20
10
0
2000
2023
2030
Total emissions
2030 target
Transport emissions almost doubled since 2000
8x
Electricity generation in 2030 compared to 2018...
Renewables
Other
3 TWh
8 TWh
25 TWh
2018
2024
2030 target
...supported by a boom in self-consumers, mainly small-scale PV installations
Self-consumers
1 100
123 000
300 000
2018
2024
2030 target
70%
Share of renewables in district heating (2023)
Share of renewables
80%
40%
0%
Austria
Lithuania
Sweden
Italy
Germany
Poland
Korea
0%
20%
40%
60%
Share of district heating in residential heating
Lithuania's path to energy independence
2050
Target for full energy independence
2030
Target to be net electricty exporter
2025
Connection to European Synchronous Area
2023
End of Russian energy imports
Bioenergy is the 2nd largest fuel source in 2023
75%
Share of diesel in transport, double the IEA average (2023)
Road-based transport activity increased rapidly
Passenger-kilometres travelled
+25%
2015
2023
Tonne-kilometres travelled
+138%
2015
2023

Policy recommendations for Lithuania

1
Implement the National Energy Independence Strategy in incremental steps, prioritising actions with clear benefits at low risks.

2
Boost energy performance in buildings, particularly multi-apartment buildings, by removing barriers to deep renovations.

3
Enhance the efficiency and diversification of district heating supply by enabling necessary infrastructure investments.

4
Ensure a predictable long-term planning framework to attract cost-efficient investments in new electricity generation.

5
Provide incentives for proactive grid expansion and effective use of existing grid capacity.

6
Increase flexibility in the electricity system by unlocking the potential for demand-side response from new consumption.

7
Reform the net-metering system to incentivise self-consumption that provides flexibility and grid services.

8
Strengthen the role for environmental taxation to drive efficiency gains and emissions reductions in the transport sector.

9
Push modal shift to improve transport system efficiency in both rural and urban areas.

10
Accelerate electromobility through targeted action on lead segments in the road transport sector.

Energy policy landscape

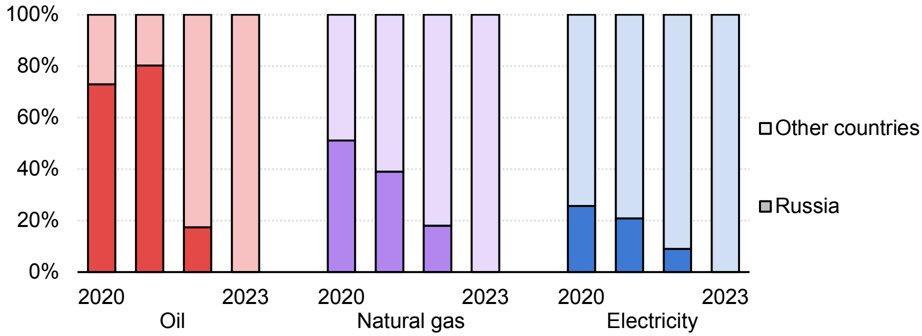
Energy independence is central to Lithuania's energy policy, and the country has taken important steps to reduce its dependency on energy imports, including ceasing all imports from Russia since March 2022. However, imported fossil fuels still account for over half of end-use energy consumption. To address the dependence on fossil fuels imports, Lithuania has set ambitious targets for renewable electricity expansion to enable electrification and reduce energy imports. Lithuania also sees great opportunities for production of hydrogen and its derivatives to use in new domestic industries and for export. The country is facing a rapid and significant transition of its energy system to enhance security and reduce GHG emissions. For this to be successful, energy policy must balance all aspects of a people-centred transition, including affordability and industrial competitiveness.

Energy security and climate

Since regaining national independence in 1990, Lithuania has pursued a strategy of energy security, gradually reducing its reliance on energy imports from Russia. With the completion of the Butinge oil terminal in 1999, Lithuania was able to diversify its crude oil imports. Natural gas dependency in heating declined through a shift to bioenergy in district heating production, and with the commissioning of the Klaipėda liquefied natural gas (LNG) terminal in 2014, Lithuania diversified its gas imports. Since the Ignalina nuclear reactors were shut down in 2004 and 2009, Lithuania has relied heavily on electricity imports, but recent expansions in wind and solar power have increased the share of domestic production in total electricity supply. Lithuania has also diversified its electricity imports through new interconnections.

After Russia's full-scale invasion of Ukraine and the subsequent energy crisis in 2022, Lithuania was one of the first European countries to completely end imports of electricity, gas and oil from Russia, without major disruptions. Furthermore, in February 2025, the electricity systems of the Baltic states were synchronised with and disconnected from the system controlled by Russia, thus further enhancing national security.

Share of Russian energy in net imports, 2020-2023



Sources: IEA (2025), Oil Information; IEA (2025), Gas Information; IEA (2025), Electricity Information.

National Energy Independence Strategy

Energy independence is seen as essential for national security in Lithuania – a perspective that is clearly present in the National Energy Independence Strategy. The NEIS has been updated twice since it was first approved in 2012 to reflect new challenges and goals for the energy transition. The third NEIS, adopted by Lithuania's parliament (the Seimas) in June 2024, presents an ambitious vision for the future energy system, formulated in four strategic goals to: 1) ensure energy security, 2) achieve climate neutrality, 3) transition to an electricity economy to develop a high value-added energy industry, and 4) ensure energy resources are available to consumers in a fair and affordable way.

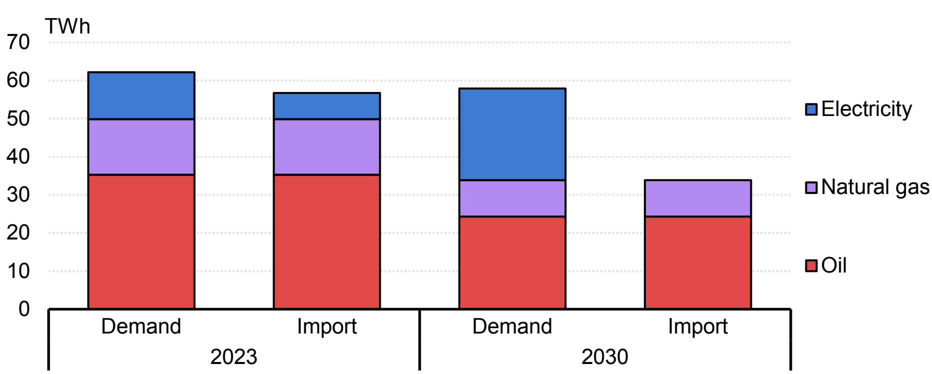
The NEIS is based on a scenario analysis for the development of the energy system. Lithuania assessed three scenarios, all projecting strong growth in electricity generation and demand, but with different assumptions on the development of new domestic industries. Based on the analysis, the government developed a Roadmap

Scenario that aims to ensure an optimal balance between energy independence, GHG emissions reductions, hydrogen and derivatives exports, and the overall cost of the energy system.

In the Roadmap Scenario, electricity consumption is projected to grow sixfold. Onshore and offshore wind power and solar PV will dominate electricity production. Access to surplus renewable electricity will enable the development of hydrogen and its derivatives, such as green synthetic fuels, methanol and ammonia. To address variability in renewable energy generation, the energy system will need more balancing capacity, reserve systems and flexible demand. New nuclear energy from the deployment of advanced SMRs also contributes to growth in electricity generation in the Roadmap Scenario.

With electrification, imported fossil fuels will be replaced by domestically produced electricity, reducing Lithuania's reliance on energy imports. Lithuania aims to turn the large electricity import dependency to net exports by 2030, or already by 2028 according to statements from the government in early 2025. By 2050, Lithuania aims to not only be fully energy independent, but also to be an exporter of electricity as well as of hydrogen and its derivatives. Based on the status of domestic energy supply and imports in 2024, this is a huge undertaking.

Demand and net import of oil, natural gas and electricity in Lithuania, 2023 and projection for 2030



Sources: IEA analysis based on IEA (2025), World Energy Balances; Republic of Lithuania, Ministry of Energy (2024), National Energy Independence Strategy (accessed January 2025).

Lithuania will implement the objectives and targets set out in the NEIS through the National Energy and Climate Plan (NECP), which was updated in 2024. To monitor progress, the NEIS contains a list of 29 indicators for 2030, 2040 and 2050, with clearly stated reporting responsibilities. Funding for the implementation of the NEIS will come from state and municipal budgets, EU funds, and other international sources, as well as private funding. The strategy will be updated in 2030, and thereafter every five years.

Climate targets and policy

Large combustion facilities in the power and industry sectors are part of the EU Emissions Trading Scheme (ETS), whereas non-ETS emissions from transport, buildings, agriculture and waste are subject to binding national GHG targets under the Effort Sharing Regulation (ESR).

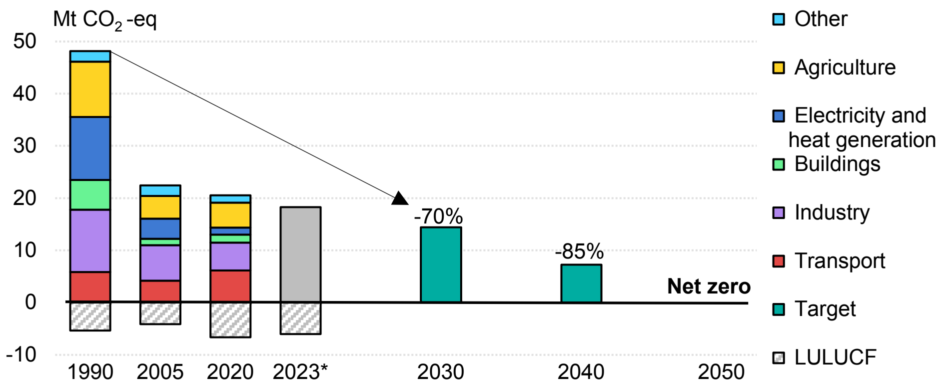
Emissions have dropped significantly from 1990, but further reductions are needed to meet the targets

In 2021, Lithuania set national GHG emissions reduction targets for 2030, 2040 and 2050 as part of its National Climate Change Management Agenda (2021-2030). Compared to the GHG emissions in 1990, Lithuania targets a 70% reduction by 2030 and an 85% reduction by 2040 to reach net zero emissions by 2050. The 2050 target includes the use of carbon capture, utilisation and storage (CCUS) technologies to offset GHG emissions in sectors where technological options for zero GHG emissions may not be available.

In 2023, total GHG emissions were 18.3 million tonnes carbon dioxide equivalent (Mt CO_2-eq). This was 62% lower than emissions in 1990, with a notable 42% drop in 1992 following the collapse of the Soviet Union. This early decline positions Lithuania more favourably to achieve its 2030 target. Since 2010, emissions have been more stable, though with a visible decline in the last few years. The transport sector has become the largest emitter, contributing 34% of total emissions in 2023.

In addition to emissions, the land use, land-use change and forestry (LULUCF) sector is an important carbon sink in Lithuania. In 2022, the LULUCF sector contributed with 6.4 Mt CO_2-eq. of negative emissions. In the LULUCF Regulation (EU) 2018/841, the European Union sets a goal for its member states to increase potential removals in the LULUCF sector, thus creating incentives for the sustainable use of agricultural and forest land and to restore damaged ecosystems.

Greenhouse gas emissions by sector (1990-2023) and targets in Lithuania



IEA. CC BY 4.0.

Note: Breakdown of 2023 emissions data by sector is not yet available for all sectors.
Sources: IEA analysis based on UNFCCC (2024), Lithuania National Inventory Document (accessed January 2025); European Commission (2024), Lithuania Climate Action Progress Report 2024 (accessed May 2025).

A tightening EU energy and climate policy framework sets new targets for member states

Lithuania has been a member of the European Union since 2004 and subject to EU climate policy and regulation. In July 2021, the European Commission presented the Fit-for-55 package to reach the target of 55% GHG emissions reductions by 2030 (compared to 1990), with corresponding updates to several directives. As a response to Russia's invasion of Ukraine and the energy crisis in 2022, the European Commission presented the REPowerEU plan to phase out fossil fuel imports from Russia, which further increased ambitions. Updates included changes to the EU Renewable Energy Directive (RED) and the Energy Efficiency Directive (EED). The new RED (RED3) includes a more ambitious 2030 target for renewable energy in final energy consumption for the European Union at 42.5% (aiming for 45%). To contribute to this EU target, Lithuania has set a national target of 55% renewable energy in final energy consumption. RED3 also sets sectoral targets, including

29% renewable energy in transport by 2030 and 42% renewable hydrogen in the industry sector. RED3 entered into force in November 2023 and needs to be implemented into national laws within 18 months. Another upcoming change is the creation of a new ETS, the ETS2, that covers CO_2 emissions in sectors not covered by the existing EU ETS, including buildings, road transport and small industries. The ETS2 will be operational by 2027 and provide incentives for investments in building renovations and low emissions mobility.

Funding and affordability

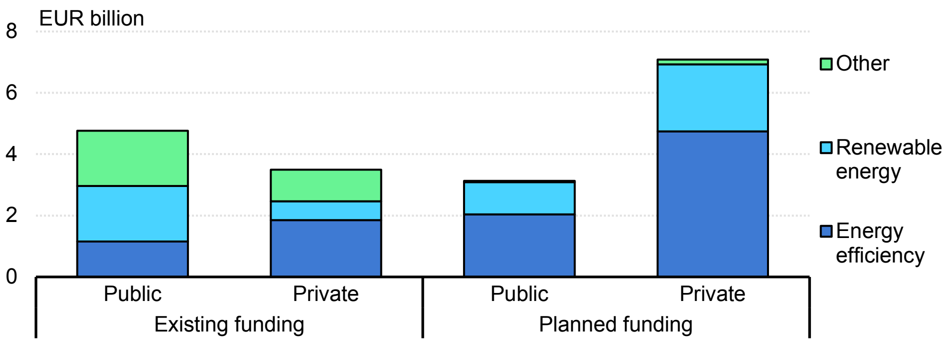
EU grants have contributed to a significant portion of Lithuania's recent energy-related investments

The NECP foresees a need for EUR 18.5 billion of funding to implement Lithuania's energy and climate objectives and targets in the period 2021-30, EUR 7.9 billion of which will come from national public funds and EU funds. Energy efficiency investments, particularly buildings renovations, accounts for the largest share of necessary investments, followed by investments in renewable energy.

So far, EUR 4.8 billion in public money has been allocated for existing measures, of which over half came from the EU Structural Funds and EU Municipal Development Fund. A significant amount from the public funding will continue to come from the European Union, including the ETS2 fund – which will become operational in 2027 – and the Social Climate Fund. In addition, private investors have provided EUR 3.5 billion of the existing funds for existing measures. Of the additional funds needed, a larger share is set to come from private investors, which will require sufficient incentives for market players, including households, small-scale industries and large companies.

There is potential for Lithuania to strengthen tax policy to both raise more money for the transition and incentivise emissions reductions. According to the OECD, around half of Lithuania's GHG emissions are subject to carbon pricing. The European Commission estimates that Lithuania's environmental taxes are lower than the EU average in terms of gross domestic product. Lithuania has particularly low vehicle and fuel taxation. As of 2027, however, the new ETS2 system will include emissions from transport as well as buildings and small industries.

Energy-related public and private investments in Lithuania, 2021-2030



Note: "Other" includes the categories internal market, energy security, and research and innovation.
Source: IEA analysis based on National Energy and Climate Action Plan for 2021-2030 (accessed January 2025).

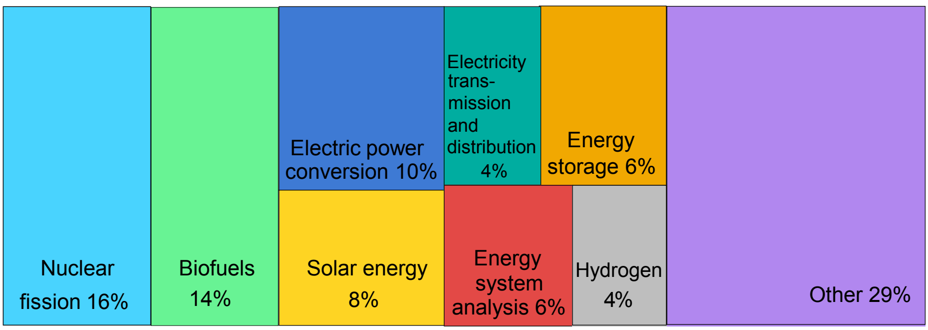
Research and innovation has a significant place in Lithuania's energy strategy, but needs a clear focus

Public funding for energy research and innovation in Lithuania totalled EUR 17.5 million in 2023, up from EUR 13.7 million in 2022. Over the five-year period 2019-23, Lithuania spent around EUR 70 million on a variety of technologies. Energy-related expenditure accounted for 13% of the total government research, development and demonstration budget in 2022.

The NEIS highlights the importance of energy research and innovation in contributing to the energy transition and to economic growth. Priority areas include renewable energy, smart and distributed energy generation, new district heating and cooling systems, SMRs, CCUS, power-to-gas and gas-to-power, power system operations, electricity market development, and energy security and cybersecurity. This is a long list, indicating a need for further prioritisation.

One of the NEIS' targets is to establish at least one energy technology development centre by 2030 to promote research and development and provide a platform for collaboration between academia and business. Lithuania also has several innovation clusters and programmes, including the Biofuels Development Cluster to advance Lithuania's biomass industry, the Smart Green City cluster to promote eco-innovation and a circular economy, and the Photovoltaics Technology Cluster to strengthen Lithuania's status as the main solar technology exporter in the region.

Cumulative public investment in energy-related research, development and demonstration in Lithuania, 2019-2023



Source: IEA (2025), Energy Technology RD&D Budgets.

Closing the skills gap is a big challenge for the transition

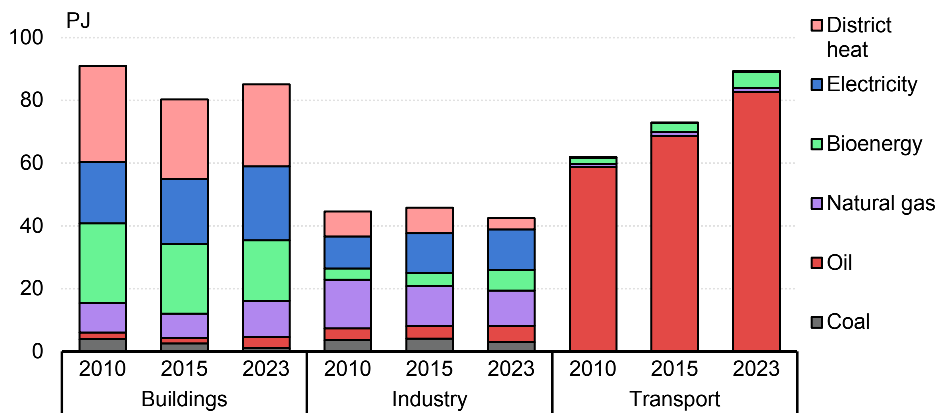
Lithuania's vision for a growing industrial sector, supported by access to large-scale clean electricity, presents significant economic opportunities. The government estimates that transformations in the energy sector could generate between 44 000 and 140 000 new jobs across the energy value chain by 2050, potentially contributing EUR 2-6 billion to the economy.

At the same time, the transformation of the energy sector increases the demand for skilled workers and specialised competencies. According to the NEIS, approximately 1 300 new jobs are expected to be created in offshore wind alone by 2030. While this is good news, it also poses a challenge, and state-controlled energy companies alone project a shortage of at least 2 500 employees. Addressing this workforce gap will be essential to prevent bottlenecks in the energy transition and, like in many other countries, deserves further attention in national strategies.

End-use sectors

Transport and buildings (including services) are the largest consuming end-use sectors in Lithuania, each accounting for around 40% of TFEC respectively, with industry consuming the remaining 20%. In 2023, TFEC was 218 petajoules (PJ), up 10% from 2010. The growth came from the transport sector, where energy demand has increased by 44% since 2010, while energy consumption in the buildings and industry sectors has been stable. However, if including the energy transformation in refineries and fuels used for non-energy purposes, particularly in fertiliser production, industrial energy demand increases significantly.

Total final energy consumption by sector and fuel in Lithuania, 2010-2023



IEA. CC BY 4.0.

Notes: "Industry" includes manufacturing and other sectors (agriculture, construction, mining and quarrying). It does not include refinery and non-energy use (fuels that are used as raw materials and are not consumed as fuel or transformed into another fuel).

Source: IEA (2025), World Energy Balances.

As outlined in its NECP, Lithuania aims to cap its final energy consumption at 184 PJ by 2030, representing a 16% reduction compared to 2023 levels. Energy consumption is set to decrease further to 166 PJ by 2040 and 151 PJ by 2050. Achieving these reductions will require greater energy savings than the EU average, as determined in the EU EED, necessitating policies that drive energy savings across all sectors. However, these targets exclude energy demand from green hydrogen production and new industrial developments, which are expected to become significant electricity consumers. Distinguishing between efficiency improvements in existing energy consumption and demand from new users is a good way to ensure that energy efficiency targets remain relevant in a changing system.

Transport

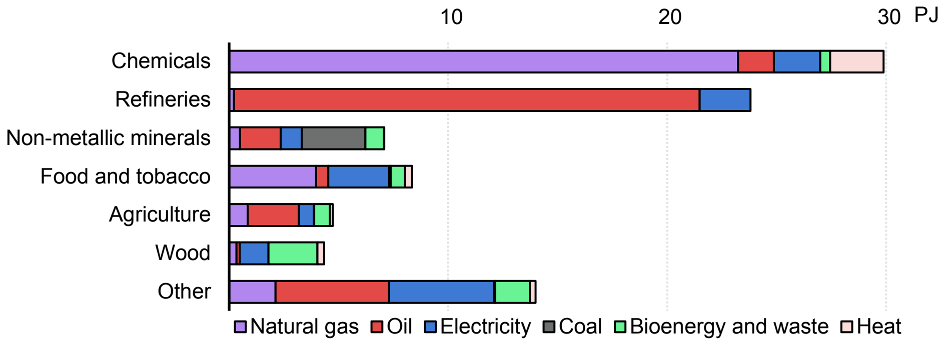
The transport sector is central for energy use and emissions in Lithuania. It accounts for around 40% of TFEC, over half of energy-related emissions and around one-third of total GHG emissions. Energy demand in the transport sector grew rapidly between 2013 and 2018, rising by 40% over five years. The trend has been more stable since 2019. Oil-based fuels remain the primary energy source, accounting for 93% of the energy consumption in the sector in 2023. Most of this was diesel and gasoline used in road vehicles, while the share of biofuels in the transport sector was around 7%. Road transport accounted for 92% of the energy consumed in the Lithuania's transport sector in 2022. The remaining 8% were smaller shares in railway, shipping and aviation. Lithuania has a significant road freight sector, which accounts for over 40% of all road transport energy demand, benefiting from low diesel prices. Decarbonising the sector goes hand in hand with improving energy independence by reducing fossil fuel imports and requires a broad set of solutions, including accelerating electrification and efficiency improvements across transport modes. This is analysed further in the focus area section of the report.

Industry

The industry sector, including refineries and non-energy use, consumed 94 PJ in 2023. Industrial energy demand has been stable, fluctuating between 115 PJ and 130 PJ over the last decade. However, consumption dropped by 25% from 2021 to 2023 due to high energy prices. Fossil fuels represented 73% of demand for energy and non-energy use in industry in 2023, followed by electricity (16%) and bioenergy (7%). The industry sector contributed 13% of energy-related GHG emissions in 2022, with the fertiliser, chemicals and cement industries being the main emitters.

The largest industrial subsector is chemicals, which accounted for one-third of energy and non-energy use in industry in 2023. This includes fertiliser production, with the company AB Achema, which consumes nearly half of Lithuania's natural gas. The second-largest subsector is refining, which accounted for 25% of energy demand in industry. Lithuania hosts the AB “ORLEN Lietuva” Refinery, the only refinery in the Baltic region, and exports oil products to neighbouring countries.

Energy and non-energy use in industry by subsector in Lithuania, 2023



Note: This chart includes refineries and non-energy use (fuels that are used as raw materials and are not consumed as fuel or transformed into another fuel).

Sources: IEA (2025), Energy End-uses and Efficiency Indicators; IEA (2025), World Energy Balances.

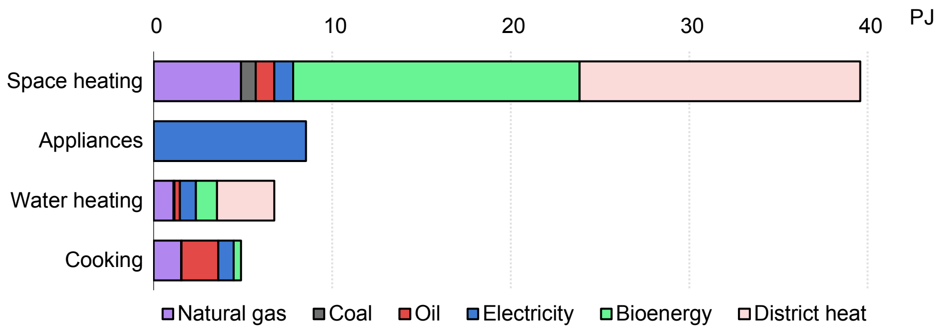
Major policies related to energy efficiency improvements and decarbonisation of the industry sector lie under the EED, which Lithuania implemented through the Law on Energy Efficiency. The law requires large enterprises meeting pre-determined size criteria to carry out energy audits every four years. The Lithuanian Energy Agency (LEA) oversees the energy auditing process by managing the list of certified energy auditors, ensuring the compliance of the process with the standards requirements and improving the quality of the audits. Based on audits from 2021 to 2023, LEA estimated the energy savings potential to around 4-9% for the companies required to do the energy audits, which equalled around 2-5% of the annual energy consumption in industry.

Buildings

The buildings sector represented around 39% of TFEC in 2023 and 11% of direct energy-related CO_2 emissions in 2022, excluding indirect emissions from electricity and heat generation. In 2023, energy consumption in the sector was 89 PJ, of which approximately 70% was in residential buildings and 30% in commercial and public buildings.

Although electricity has grown as an energy source in buildings, natural gas – and to some extent, oil – has also expanded, at the expense of lower carbon district heating and bioenergy. While energy demand in buildings has remained stable since 2010, direct emissions have slightly increased. Reducing emissions in the sector will require a combination of further energy efficiency improvements and a switch to cleaner energy sources, especially for heating. Nearly 80% of the energy consumed in residential buildings is used for space and water heating.

Energy consumption in residential buildings in Lithuania, 2023



Note: Data for lighting and space cooling is not available.
Source: IEA (2025), Energy End-uses and Efficiency Indicators.

Bioenergy is a big source for heating in buildings, but electrification is growing

In 2023, direct use of bioenergy accounted for 29% of total energy consumption in residential buildings, the fourth-highest share among IEA Members countries (after Lithuania's Baltic neighbours and Mexico). Residential consumption of biomass is more common in rural areas without access to district heating or a gas grid. Access to cheap domestic bioenergy helps reduce fossil GHG emissions from buildings and improves security of supply. However, it also causes local pollution when burnt in inefficient wood stoves. Lithuania aims to shift households to more efficient heating alternatives, including by supporting heat pump installations, and restricting or banning the use of solid fuels for individual heating in urban areas from 2040. Policy intervention in this area should focus on replacing outdated and legacy boilers with newer, more efficient models.

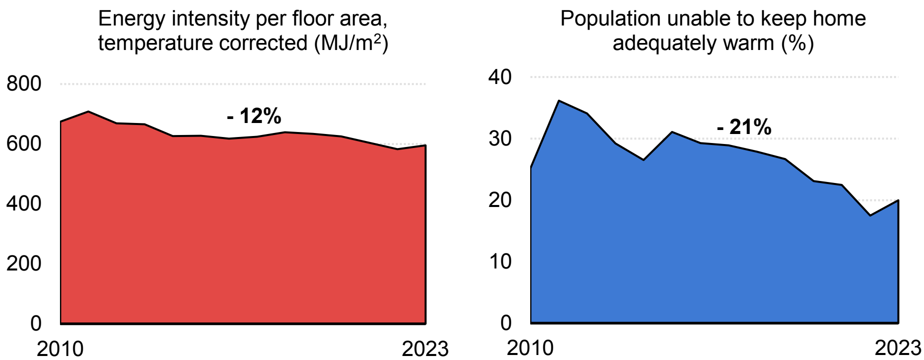
Electricity accounted for 19% of energy use in residential buildings in 2023, which was well below the IEA average of 38%. However, heat pump sales increased from around 25 000 in 2022 to 29 000 in 2023, reaching a total stock of around 150 000. Subsidies of up to EUR 14 500 have supported the growth in heat pump sales, and the share of heat pumps in new heating system sales grew from 49% in 2022 to 62% in 2023. As heat pumps work better in energy-efficient buildings, combining efficiency renovations with heat pump installations creates synergies that support the decarbonisation of space heating in buildings.

Building energy performance is improving, but the building stock is old and needs further renovations

Lithuania uses energy performance certificates (EPCs) to assess and rate buildings' energy efficiency on a scale from A++ (highest efficiency) to G (lowest efficiency). EPCs are mandatory for selling, renting and constructing new buildings and undergoing major renovations, and are valid for ten years. Lithuania maintains a comprehensive registry of EPCs for buildings and part of buildings. As of January 2025, over 300 000 EPCs had been registered. However, the building stock in Lithuania is old; over 70% of Lithuanian buildings were built before 1990, before energy performance standards were created. This indicates large potential for scaling up energy efficiency renovations.

Thanks to efficiency improvements, energy intensity per floor area in the residential building stock has been reduced by 12% since 2010. This benefits homeowners who pay lower energy bills, and during the same period, the share of people living under energy poverty has decreased. Nevertheless, energy poverty remains a significant issue in Lithuania, with a substantial portion of the population unable to afford adequate heating. According to Eurostat, 20% of Lithuanians reported being unable to keep their homes sufficiently warm in 2023, the fourth-highest rate in the European Union. Lithuania promotes energy efficiency measures and home renovations as a solution to energy poverty, by targeting energy-poor households. Support for self-consumption (prosumers) and energy communities is also seen as a measure to tackle energy poverty. Lithuania also aims to make funds available from the European Social Climate Fund, which will be implemented between 2026 and 2032, to mitigate the adverse social impacts of the ETS2 on vulnerable consumers.

Energy intensity and affordability in residential buildings in Lithuania, 2010-2023



Sources: IEA analysis based on IEA (2025), Energy End-uses and Efficiency Indicators; Eurostat (2025), Population unable to keep adequately warm by poverty status (accessed March 2025).

Over the past two decades, Lithuanian authorities implemented public-private partnerships to support the renovation of multi-apartment buildings using public funds from the government and the EU Regional Development Fund. Managed by the European Investment Bank, the Fund for Multi-Apartment Building Modernisation (JESSICA I and II) facilitated over EUR 1.2 billion in renovations, with a significant portion of funding coming from private investment. The programme benefited over 83 000 households, leading to a 63% reduction in building energy consumption on average. The model uses public grants to provide financial incentives, such as subsidised interest rates, technical assistance and capital rebates. The grants also provide security to encourage commercial banks to lend money to apartment owner associations for making energy efficiency investments. Notably, during the JESSICA II phase (2014-20), each euro of public funds invested contributed to five euros of renovation activity. This is a great success, which Lithuania should continue to build upon when looking at the next phase of renovations.

Building renovation policies in Lithuania are driven by both domestic initiatives and EU directives to improve energy efficiency and reduce carbon emissions in the sector. The Long-Term Renovation Strategy, approved in 2021, aims to reduce primary energy consumption in buildings by 60% by 2050 and eliminate fossil fuel use in this sector. Lithuania's NECP integrates these objectives with milestones in the European Union's revised Energy Performance of Buildings Directive, including mandatory improvements in energy performance and decarbonisation pathways. A draft for the new National Building Renovation Plan needs to be submitted to the European Commission by 31 December 2025 for revision into a final plan by 31 December 2026. Targeting multi-apartment buildings will have the greatest impact.

Home ownership rates in Lithuania are very high, around 90% in 2021, which provides more incentive to carry out renovations, as the split landlord-tenant incentives problem is less significant. However, most multi-apartment buildings are owned jointly by the apartment owners, and investment decisions require agreement from a majority of owners, which can create a barrier to energy efficiency improvements if all apartment owners cannot afford the investment cost or otherwise lack the incentive to reduce energy consumption. However, the state subsidises renovation costs for residents eligible for compensations of heating expenses.

District heating

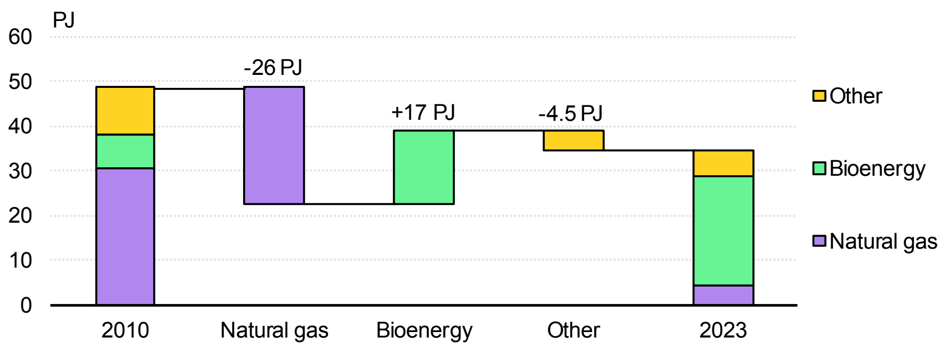
Lithuania, along with other Nordic and Baltic states, has one of the highest shares of district heating in total building heat supply. In 2023, district heating provided 31% of space and water heating in residential and services buildings in Lithuania. District heating serves over 700 000 customers, mainly in apartment buildings, and provides heat to over half the total population. While the number of district heating customers has increased in the last decade, the amount of heat produced has remained stable, thanks to efficiency improvements in buildings and in the distribution system.

District heating supply has largely decarbonised thanks to a switch from natural gas to domestic bioenergy

District heating production has experienced an impressive transition in recent decades, with bioenergy replacing natural gas in most systems. This switch was driven by high natural gas prices compared to bioenergy, which is a large domestic energy resource, and support from EU Structural Funds to replace and upgrade existing district heating technology (boilers and networks). The share of bioenergy in district heating production increased from around 7% in 2005 to over 70% in 2023. Lithuania aims to have 90% renewable energy in district heating by 2030.

With the transition from natural gas to bioenergy, Lithuania simultaneously managed to reduce emissions, prices and import dependency. Unlike in small inefficient household wood stoves, burning bioenergy in large, centralised boilers can be done with high efficiency, and with efficient flue gas cleaning to avoid local pollution. If used in a co-generation plant, the bioenergy-based district heating also provides renewable electricity. However, over two-thirds of the bioenergy is used in heat-only boilers, which leaves a large untapped potential for increased electricity generation to support the stability of the electricity system.

District heating fuel sources in Lithuania, 2010-2023



Source: IEA (2025), Energy End-uses and Efficiency Indicators.

The district heating regulation drives competition on the market, but not necessarily investments

Whereas district heating systems in most countries operate as monopolies, the market set-up in Lithuania is more competitive based on heat auctions that allow independent heat producers to participate in the market. The heat auctions are organised monthly by Baltpool, a digital international biomass exchange platform established in 2012 under the state-owned EPSO-G group. District heating prices are regulated by the National Energy Regulation Council (VERT) through a cost-plus based regulatory model where district heating suppliers receive compensation for fixed and operational costs only when they produce heat and have won the auction. For small district heating suppliers that have less than 10 gigawatt hours (GWh) of annual heat supply, prices are set by municipalities.

The challenge for Lithuania's district heating supply in the future is to improve efficiency and diversify the fuel mix by introducing more residual waste heat resources and power-to-heat solutions. This requires modernising the infrastructure, which is largely old and inefficient. According to Lithuania's District Heating Association, around 46% of the 2 700 kilometres (km) of district heating pipelines have been replaced with modern pre-insulated ones, supported by state and EU funding. The government provides support when upgrading to a low-temperature district heating system, limited to 20% of the investment cost. District heating development also needs to go hand in hand with building efficiency renovations, as it is not feasible to provide low-temperature district heating to inefficient buildings. The development of district heating thus needs to be co-ordinated with renovation strategies.

The regulatory framework and the heat auctions encourage competition that reduces costs for consumers. However, it doesn't provide incentives for long-term investments to modernise district heating systems. Furthermore, since a change in the heating law from 2011, the ownership of heating substations moved from the district heating company to the building owners. Effective operations of district heating systems require modern equipment that can be controlled centrally. Under the current set-up, substations are often operated by a building manager who lacks expertise in the district heating system, and the building owners lack the incentive to make necessary investments that allow for efficiency improvements of the whole network.

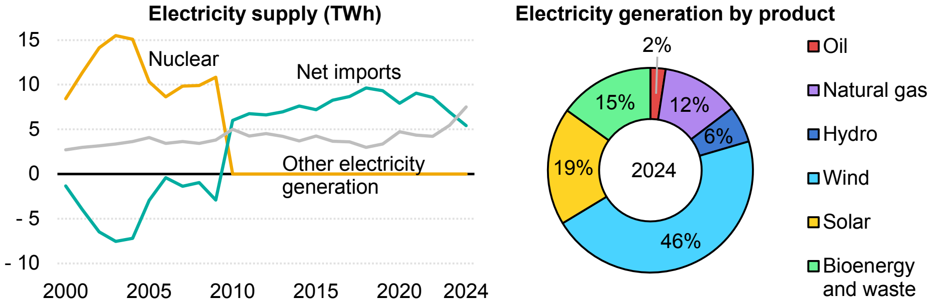
Electricity

The electricity sector is central to the energy transition in Lithuania, and the expansion of the electricity system is a focus area for this review. Both demand and supply are set to increase significantly, with large implications for the grids and market design.

Electricity supply and demand

Lithuania's electricity supply has undergone several major transitions. Since the closure of the Ignalina nuclear reactors in 2005 and 2009, Lithuania has been highly dependent on electricity imports. However, rapid growth in electricity generation from wind and solar in recent years has resulted in greater self-sufficiency, and net imports fell below half of total electricity supply in 2024. In addition to renewables, Lithuania has several combined cycle natural gas heat and power plants, the biggest of which is the 455 megawatt (MW) plant in the Elektrėnai Complex, which is also an important source of flexibility.

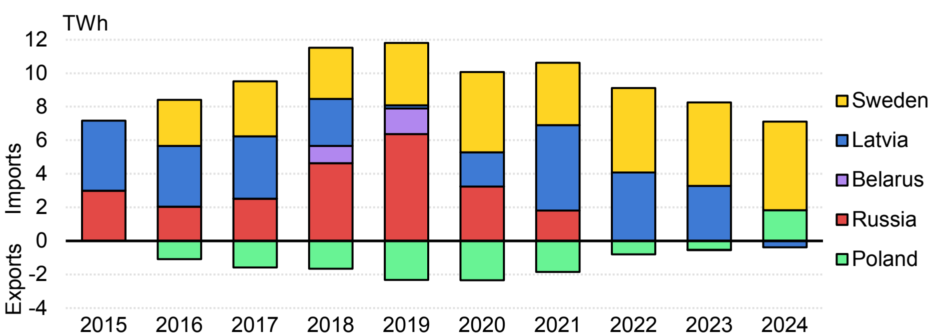
Electricity supply (2000-2024) and share of fuels in domestic electricity generation (2024) in Lithuania



Source: IEA (2025), Electricity Information.

With new interconnections with Poland and Sweden in 2016, Lithuania diversified its electricity imports and reduced reliance on other countries. Electricity trade with Belarus ceased on 3 November 2020 due to safety concerns regarding the Ostrovets District nuclear power plant as set out in Lithuanian law (XIII-451 and XIII-306).

Lithuania's electricity net trade by country, 2015-2024

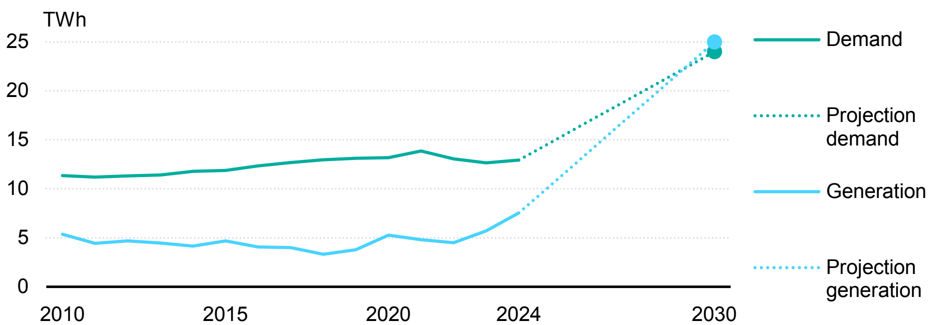


Source: IEA analysis based on Litgrid (2025), National electricity demand and generation (accessed May 2025).

Furthermore, thanks to the new interconnections and increased domestic electricity generation, Lithuania successfully ceased all electricity imports from Russia in 2022, and in February 2025, the Baltic states synchronised with the continental European grids, thus taking another step towards a more independent energy system (see "Policy Spotlight" below).

The electricity system is now facing its next big transition. Driven by the expansion of wind and solar, electricity generation increased from 4.5 TWh in 2022 to 7.5 TWh in 2024. The NEIS sets a target for Lithuania to be a net exporter of electricity by 2030, and the new government wants to reach this target by 2028. Meanwhile, electricity demand is expected to grow to 24 TWh in 2030, thus almost thus doubling in eight years. In the NEIS Roadmap Scenario for 2050, electricity demand and generation increase to 74 TWh, reshaping the entire system.

Electricity generation and demand in Lithuania (2010-2024) and forecast (2030)



Sources: IEA (2025), Electricity Information; Republic of Lithuania, Ministry of Energy (2024), National Energy Independence Strategy (accessed January 2025).

Policy spotlight: Disconnection from the Russian grid and connection to Continental European Synchronous Area

On 7-9 February 2025, Lithuania, along with its Baltic neighbours Estonia and Latvia, permanently disconnected from the IPS/UPS interconnected system and joined CESA. This transition represents an important step towards significantly enhancing regional energy security and reducing reliance on the Russian-controlled grid under the BRELL agreement (between Belarus, Russia, Estonia, Latvia and Lithuania). The project had been in development since joining the European Union in 2004, and the urgency of the mission intensified after Russia's full-scale invasion of Ukraine in 2022, which highlighted the risks of dependence on Russian energy infrastructure. The disconnection was completed at midnight 7 February, 10 months ahead of the original schedule, and followed by a 24-hour isolated operation period to assess the ability to control frequency autonomously. Electricity demand was successfully met through domestic power plants and interconnectors with Finland, Poland and Sweden, ensuring no disruption to consumers.

On 9 February 2025, the Baltic states successfully synchronised with CESA. This synchronisation was a high-priority project for both the Baltic countries and the European Union, receiving over EUR 1.23 billion in funding from the Connecting Europe Facility, covering 75% of the investment costs, along with additional support through the Recovery and Resilience Facility. Since the project's conception in 2007, it has involved extensive infrastructure upgrades, regulatory alignment and collaboration between the Baltic states, Poland and European energy system operators. In Lithuania, key infrastructure upgrades included 420 km of new transmission lines and the reconstruction of 230 km of existing lines, the modernisation of 13 substations, and the development of 4 large-scale battery storage systems with a total capacity of 200 MW.

By joining CESA, the world's largest synchronous grid, Lithuania and its neighbours gained full control over their electricity networks, further enhancing regional energy stability. The synchronisation with CESA will enhance capacity to balance variable wind and solar generation through access to a larger and more flexible energy market.

Electricity grids and markets

Litgrid is the transmission system operator (TSO) of the Lithuanian electricity system. The Law on Electricity, last amended in 2012, specifies the TSO as the responsible party for a stable and reliable operation of the electricity system. It includes performing national balancing operations and the provision of system services. Litgrid also regularly assesses the adequacy of Lithuania's electricity system. On the distribution level, there are three active system operators in Lithuania, with Energijos Skirstymo Operatorius AB (ESO) in a dominant position serving 1.6 million customers throughout the country, which is the vast majority.

Interconnectors increase security of supply

Lithuania is well-interconnected with neighbouring electricity systems through several interconnectors to Latvia (total capacity of 1 670 MW import and 1 550 MW export), Poland via the LitPolLink (500 MW in both directions) and Sweden via the NordBalt DC link (700 MW in both directions). This provided Lithuania an interconnectivity level of over 50% in 2022, calculated as the cumulative capacity of the interconnectors in relation to the total installed capacity. Lithuania targets an interconnectivity level of at least 23% with the European Continental System by 2030, while tripling its current installed capacity from solar and wind alone, which requires continued buildout of new interconnector capacity. The high level of interconnectivity guarantees Lithuania's electricity supply and provides access to transnational balancing services.

Electricity wholesale and retail markets are liberalising

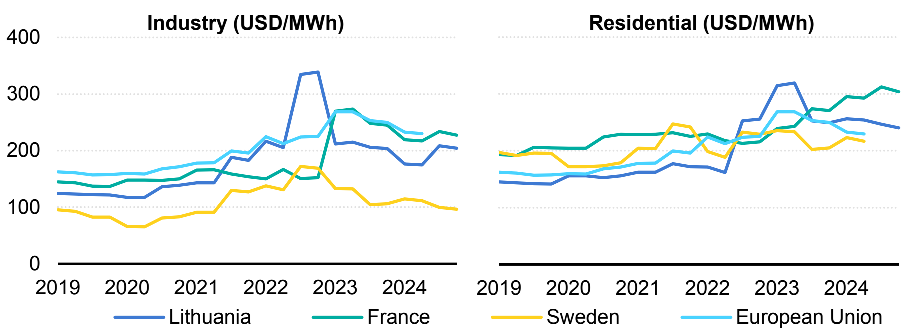
Since 2012, Nord Pool Spot AS, the operator of the Nordic and Baltic electricity exchanges, operates wholesale electricity trading in Lithuania. Wholesale trading can take place either on the electricity exchange or through bilateral transactions, using power purchasing agreements (PPAs). Lithuania has a total of 1.9 million electricity consumers, 90% of which are households.

All consumers can choose an electricity supplier, following the opening of the electricity supply market in three stages. The third stage, for consumers with an electricity consumption less than 1 000 kilowatt hours (kWh), will run until the end of 2025. A total of 26 independent electricity suppliers were active in 2023 in Lithuania. The three largest suppliers (Ignitis, Enefit and Elektrum Lietuva) have a total market share of 85%, indicating a high market concentration. Electricity supply to consumers who have not chosen an independent electricity supplier is guaranteed by the distribution system operator with a tariff approved by VERT, the energy sector regulator.

Electricity prices are below the EU average but above Lithuania's Nordic neighbours

Lithuania sees low electricity prices as an enabler of green hydrogen production at a competitive price. Retail prices for households in Lithuania are below the EU average while similar to neighbouring Baltic countries and higher than most of the Nordic countries. Prices for both households and industry spiked during the energy crisis and returned to lower levels in 2023 but are higher than before the energy crisis. Following the Baltic states' desynchronisation from IPS/UPS in February 2025, electricity prices have surged due to the reduction of 500 MW capacity available from Poland (now kept in reserve) and damage to the Estlink 2 interconnector in December 2024, which cut off access to significantly cheaper Finnish electricity, raising concerns about energy affordability and infrastructure security in the region. The Easlink 2 is expected to return to commercial use in July 2025.

Quarterly electricity retail prices in Lithuania and other selected countries, 2019-2024



Note: Data for EU industry, EU residential and Sweden residential prices are only available up to Q2 2024. All other data are available up to 2024 Q4.
Source: IEA (2025), Energy Prices.

The Law on Energy of Lithuania regulates price spikes of more than 40% by providing a partial compensation of the cost of electricity for household consumers from the state budget. In addition to the wholesale price and value-added tax, Lithuania includes a Public Service Obligation levy in the electricity retail price to raise the necessary funds, mainly to support renewable electricity generation. The Public Service Obligation budget was reduced significantly from EUR 95 million in 2020 to EUR 7 million in 2025.

The Baltic balancing market is growing

The Baltic balancing markets are going through changes. In preparation for synchronisation with the CESA, the Baltic electricity TSOs joined the European balancing energy platform MARI in October 2024. This can open new opportunities for electricity generators and large consumers in the Baltic states to provide balancing services. Furthermore, in March 2025, Litgrid became the 13th electricity TSO to join the pan-European Platform for the International Coordination of Automatic Frequency Restoration Reserves and Stable System Operation (PICASSO). The platform intends to enhance economic and technical efficiency integrating the European balancing markets.

The Baltic balancing model, which the Baltic TSOs operate jointly since 2018, is now changing from a reserve model to a balancing capacity market. In accordance with European regulations, imbalance settlement periods are shortened to 15 minutes from the existing 60 minutes in the Baltics. This means that balancing capacity services in the Baltic market will be purchased daily by auction, in 15-minute periods for the day ahead. The Baltic TSOs expect orders of up to 1 512 MW in balancing capacity. The amount of balancing services is expected to grow by 60% to more than 2 400 MW in 2032, driven by the growing generation from variable renewable electricity.

Fuels

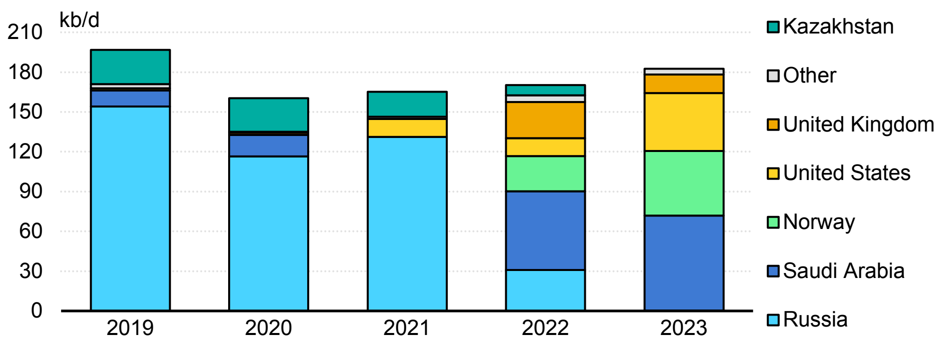
Lithuania’s energy strategy is based on a transition away from its current oil and gas import dependency towards domestically generated renewable electricity. Fossil fuels currently make up nearly 60% of total energy supply, which highlights the necessity for Lithuania’s energy sector to undergo a structural transformation in the coming years. Ensuring a secure supply of fuels and maintaining important energy infrastructure will remain important during the transition.

Oil

Oil remains a key component of Lithuania's energy mix, accounting for 41% of total energy supply (in 2023) and 38% of TFEC (in 2022). The transport sector consumed 75% of oil products in 2023 and has driven overall growth in oil demand in the last decade. The remainder is mostly used in industry and international bunkers.

With insignificant domestic crude oil production, Lithuania depends on imports. As imports from Russia have been phased out, most crude oil now comes from Saudi Arabia, Norway and the United States.

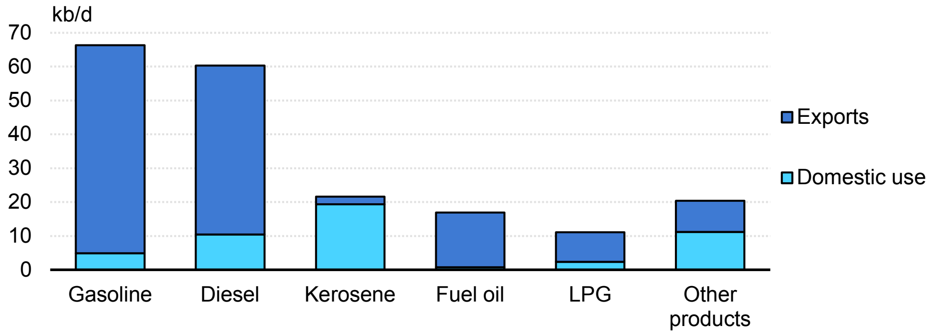
Crude oil imports in Lithuania, 2019-2023



Source: IEA (2025), Oil Information.

Thanks to the AB "ORLEN Lietuva" refinery – the only refinery in the Baltic region – Lithuania is a net exporter of refined oil products, producing well beyond domestic needs. It refined a total of 197 thousand barrels per day of oil products in 2023, with diesel and gasoline accounting for two-thirds of output. Products are primarily exported to neighbouring countries (Estonia, Latvia, Poland and Ukraine).

Oil refinery output and use in Lithuania, 2023

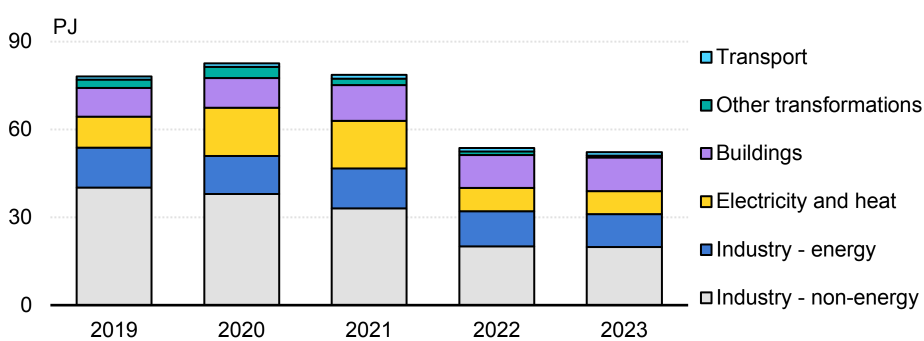


Note: LPG = liquefied petroleum gas.
Source: IEA (2025), Oil Information.

Natural gas

In 2023, Lithuania consumed 52 PJ natural gas, equal to 18% of total energy supply. The industry sector accounted for 60%, of which a large share was for non-energy purposes in fertiliser production. Affected by high gas prices in 2022, AB Achema, the Baltic's largest fertiliser company, decreased its output by 31%. This, combined with a drop in gas used in heat and power, explains the recent decline in gas consumption.

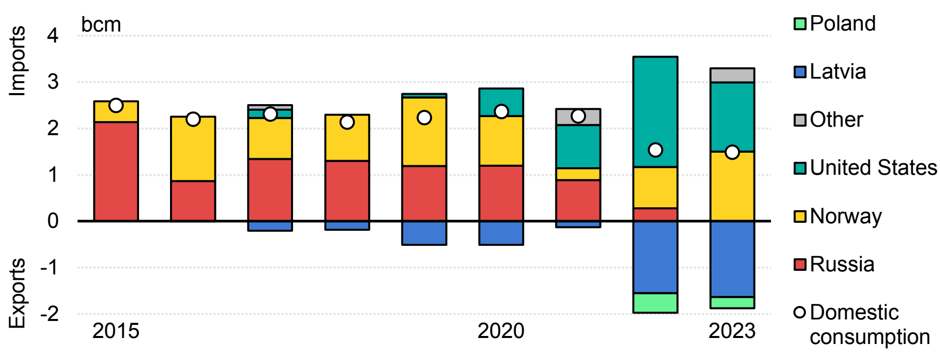
Natural gas demand by sector in Lithuania, 2019-2023



Source: IEA (2025), Natural Gas Information.

Lithuania has no domestic gas production and was dependent on Russian imports. The completion of the Klaipėda LNG terminal in 2014 allowed Lithuania to diversify its supply while cutting gas prices by 50% between 2012 and 2016. With an import/export capacity of 3.7 billion cubic metres per year (bcm/year; 7.1 million tonnes), the Klaipėda terminal can fully meet Lithuania's gas demand, which was 1.5 bcm in 2023. Lithuania is a regional gas hub. In 2023, imports amounted to 3.3 bcm, of which 90% were from Norway and the United States, while exports to Latvia and Poland reached almost 2 bcm.

Lithuania's natural gas net trade by country, 2015-2023



Source: IEA (2025), Natural Gas Information.

The gas network consists of over 2 000 km transmission pipelines and around 20 000 km distribution pipelines. Lithuania has two bi-directional operational gas interconnectors. One is the Lithuania-Latvia Interconnector, which gives Lithuania access to the Latvian and Estonian gas markets, including the critical Inckulans underground storage facility, while also giving these countries access to the Klaipėda LNG terminal. The other is the Gas Interconnection Poland-Lithuania, commissioned in 2022, which integrates the Baltic region into European gas networks. Amber Grid is the TSO responsible for the operation, maintenance and development of Lithuania's gas infrastructure.

Coal

Coal accounted for 1.7% of Lithuania's total energy supply in 2023, equivalent to 4.8 PJ. This represented a significant drop from 6.6 PJ in 2022. The decline was a result of lower demand from industry as well as some equipment modernisation and efficiency improvements. Around 70% of Lithuania's coal demand is used by the non-metallic industry, which consumed 3 PJ in 2023. The remainder is primarily used for heating in buildings (1 PJ) and lesser amounts in agriculture and forestry. Lithuania relies on imports to meet demand and until 2022 almost all coal imports came from Russia. Since 2023, most of the coal comes instead from Kazakhstan and Kyrgyzstan.

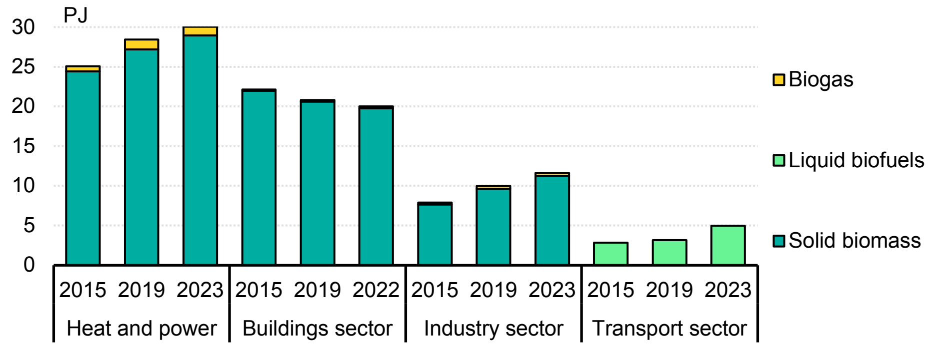
Bioenergy

Bioenergy accounted for 23% of total energy supply in Lithuania in 2023, second only to oil. It is also the dominant source of domestic energy production, with a share of 76%. The main source of bioenergy is solid biomass, used in district heating, households and industrial processes. Demand for bioenergy in the heating sector has increased in recent decades but is expected to decrease after 2040 due to improved energy efficiency and electrification. However, according to the NEIS, it will remain a strategic energy source, providing around 50% of district heating and 30% of decentralised heating by 2050. In addition, liquid biofuels are used in the transport sector, while biogas is mostly upgraded to biomethane and used in heat and power generation.

Most bioenergy used in the heating sector comes from domestically harvested wood, mainly branches and other residues from timber production. Fuel wood production reached 53.7 PJ in 2023, with exports amounting to 5.7 PJ and imports 5.6 PJ. The 2023 Renewable Energy Resources Law promotes the sustainable consumption of domestic forest resources by following a tiered approach, so that only biomass that can no longer be used for wood products can be used for bioenergy production.

Biogas consumption reached 2 PJ in 2022, compared to natural gas at around 25 PJ. Biogas consumption is expected to grow to 3.5 PJ by 2030, including for increased use in the transport sector. Since 2009, biogas production has grown more than eightfold, driven by the objective to reduce reliance on Russian natural gas. Despite that, there is potential to further increase production. As an example, today only 2% of the country's animal manure is utilised for biogas production. Other potential sources for biogas production are food waste and wastewater sludge.

Bioenergy demand by sector and product in Lithuania, 2015-2023



Source: IEA (2025), World Energy Balances.

Hydrogen and synthetic fuels

Lithuania has production capacity for 264 kilotonnes (kt) hydrogen per year, using fossil fuels. Around 200 kt of this is used for ammonia production in the fertiliser industry and around 54 kt in the production of refined petroleum products.

Hydrogen market development is not in line with targets

In its Hydrogen Roadmap, Lithuania has a target of installing 1.3 GW of electrolyser capacity by 2030. This would enable 129 kt of low-emission hydrogen production per year, assuming operation 57% of the time and using 6.5 TWh of electricity. Two-thirds of the green hydrogen (82 kt) is intended for the fertiliser industry, which would enable that industry to meet the 42% target for renewable hydrogen as required by the EU RED3, assuming that the production fulfils the criteria specified in the delegated act. Of the remaining green hydrogen in 2030, around 8 kt is set to go to heavy-duty road transport and 1 kt to shipping, 5 kt to oil refineries, and 33 kt to export markets.

While the hydrogen targets are ambitious, there is little evidence of progress to meet them. In September 2024, the fertiliser company AB Achema, the main hydrogen consumer in the country, postponed the implementation of a 213 MW electrolyser project due to technological and economic challenges and risks. This despite being granted a EUR 122 million state aid, which was approved by the European

Commission but now declined by Achema. So far, the electrolyser project pipeline consists of a few small projects, including a 20 MW electrolyser connected to the refinery; a 3 MW electrolyser planned in Vilnius district heating facility; and a 2 MW electrolyser at the Port of Klaipėda to feed a hydrogen refuelling station for ships, cars, trucks and buses, set to open in 2026.

By 2050, the Hydrogen Roadmap targets 8.5 GW of installed electrolyser capacity that could produce 732 kt of renewable hydrogen per year. The planned electricity demand for this production will be 36 TWh, close to half of the total electricity demand of 74 TWh envisioned in the NEIS Roadmap Scenario for 2050. As this new hydrogen-based industry only will develop if the right market conditions are there, and the market development so far is slower than expected, the strategy contains major uncertainties for the future energy system that must be addressed.

Hydrogen infrastructure development needs investments

Lithuania's strategy is to develop hydrogen production close to demand centres and limit the need for transport infrastructure. Initially, the plan is to develop infrastructure development around two hydrogen valleys in the central and northwestern parts of Lithuania where the biggest fertiliser and refinery installations are. Over time, pipeline infrastructure will be needed to enable larger hydrogen trade. Lithuania has a well-developed natural gas network that can be adapted to transport hydrogen in the medium- and long-term perspective when natural gas consumption decreases.

The envisioned development of the hydrogen market will require significant investment in new infrastructure. According to the Hydrogen Roadmap, EUR 196 million has been allocated to support the development of green hydrogen production facilities and the creation of a hydrogen filling infrastructure. In November 2024, Lithuania, together with Austria and Spain, announced new financial support for renewable hydrogen development via the European Innovation Fund. Lithuania is dedicating EUR 36 million from the Modernisation Fund budget to the scheme as part of the second European Hydrogen Bank auction, which will award grants in late 2025.

Hydrogen infrastructure development also requires international collaboration. The Nordic-Baltic Hydrogen Corridor (NBHC) is a cross-border infrastructure project which enables hydrogen to be transported through pipelines between Finland, Estonia, Latvia, Lithuania, Poland and Germany. The gas TSOs of the NBHC countries, including Amber Grid, completed a pre-feasibility study in 2024 and in April 2024, the European Commission granted the project status as Project of Common Interest.

Synthetic fuels from hydrogen and biogenic CO_2 are seen as a major business opportunity for Lithuania

Developing carbon capture and utilisation (CCU) is an integral part of the strategy of how to exploit the potential for low-emission hydrogen production in Lithuania. With good access to biogenic CO_2 from the district heating sector and the projected large growth in renewable electricity generation that can be used by electrolysers, Lithuania has good conditions for producing green synthetic fuels at competitive costs. Based on the market development for synthetic fuels, Lithuania aims to have a first plant capturing biogenic CO_2 operating by 2030, producing 2 TWh of hydrogen derivatives, which would require 0.4 million tonnes of biogenic CO_2. EU requirements, such as the target of a 1.2% share of synthetic aviation fuels from renewable hydrogen and captured carbon in all airports from 2030, function as a driver for both a domestic market and export opportunities.

Lithuania still needs to get a first project for carbon capture up and running. The NEIS states the need for a mechanism to support the capture and transportation of biogenic CO_2 and using it in the production of synthetic fuels. One inspiration for this can be found in Sweden, where the Swedish Energy Agency developed a reversed auctioning system for biogenic CO_2, with a total budget of SEK 36 billion (Swedish kronor; around EUR 3 billion). In January 2025, Stockholm Exergi was the first company to receive funds (around EUR 1.8 billion during a 15-year period) to support its project to capture, transport and store CO_2 from its bioenergy co-generation production.

Recommendations

1. Implement the National Energy Independence Strategy in incremental steps, prioritising actions with clear benefits at low risks.

Lithuania's updated strategy presents an ambitious vision for the long-term development of the energy system until 2050. It includes fulfilling climate targets at an accelerated pace, reducing energy imports and developing a new export industry based on hydrogen produced from abundant access to renewable electricity. Despite the many detailed targets in the strategy, major uncertainties remain, particularly related to the development of the international hydrogen and derivatives markets. In the main scenario, electricity demand in 2050 is projected to increase sixfold, nearly half of which would be used for hydrogen production. This requires extensive co-ordination between demand, supply and an infrastructure buildout. However, hydrogen market development is slower than expected and the 2030 targets seem difficult to achieve. To reduce the risk of making costly and inefficient investments, Lithuania should identify and prioritise actions that clearly reduce emissions and replace energy imports. Actions should be supported by comprehensive impact assessments for costs and affordability implications for Lithuanian consumers and regional markets. In doing so, the government should engage closely with relevant stakeholders in the country and the region to build on existing knowledge and expertise and enhance social awareness. At the same time, Lithuania should monitor market development and adjust policy when required. Industrial development should be supported through pilot projects and regulatory sandboxes to assess innovative technologies. This will showcase projects for the market, which is crucial to derisk investments and to build up towards complex integrated systems. Lithuania should also assess the need and availability of a skilled workforce to manage the transition.

2. Boost energy performance in buildings, particularly multi-apartment buildings, by removing barriers to deep renovations.

Lithuania has successfully channelled private capital and EU funding into energy efficiency renovation programmes. However, the renovation rate is not in line with Lithuania's targets and many people still live in energy poverty and in inefficient buildings with poor comfort levels and high energy costs. When updating the Long-term Renovation Strategy, Lithuania should adopt a neighbourhood approach for renovation and pursue cost-efficiency gains from using economies of scale. The work should be done in close collaboration with municipalities and industry and integrate plans for refurbishing and developing district heating and cooling. Furthermore, the current requirements for decision making in multi-apartment buildings presents a barrier to energy efficiency renovations. To address this, Lithuania should change the rules to simplify decision making while redirecting support to those who cannot afford the necessary investments in renovation from its current support scheme on bills to protect vulnerable consumers. Lithuania should also expand regional co-operation with countries with similar experiences and building stocks to exchange best practices, harmonise approaches and develop regional supply chains.

3. Enhance efficiency and diversification of district heating supply by enabling necessary infrastructure investments.

District heating accounts for around half of household heating supply in Lithuania and the infrastructure is an important asset for the energy system. Through a rapid and commendable switch from imported natural gas to domestic bioenergy, Lithuania reduced emissions, imports and cost, not only for heating companies but for end-users as well. In the government's analysis, district heating will maintain or strengthen its position on the heating market, and the supply is planned to increasingly come from waste heat streams in combination with power-to-heat solutions to improve the overall efficiency of the energy system. Existing financial support schemes for investments in efficient fourth-generation district heating technology should be maintained and, if needed, strengthened to support this development. Furthermore, the legislation that gives building owners responsibility for the heating substations that connect to the district heating network should be revised. District heating companies need to have ownership of the substations to be able to make necessary adjustments and modernisations of the equipment that enables efficient operation of the system.

Focus areas

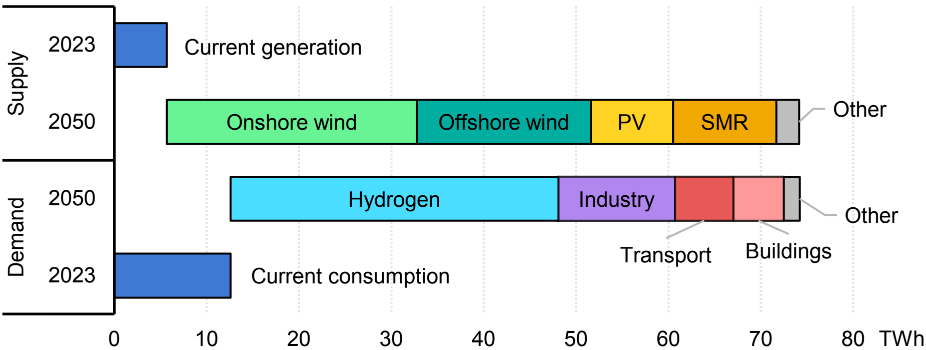
This review focuses on two particularly important areas for Lithuania's energy policy. The first is how to manage the electricity system expansion needed to meet the strategic goals of the NEIS. The second is how to decarbonise the transport sector, which is the largest source of GHG emissions in Lithuania.

Electricity system expansion

The NEIS is centred around the expected large expansion of the electricity system. Lithuania aims to turn large electricity import dependency today into net exports by the end of 2030, or even 2028 according to a government statement from early 2025. In the Roadmap Scenario for 2050, electricity consumption increases sixfold compared to 2023, to 74 TWh. Nearly half is set to be used for hydrogen production, but electrification of transport, heating and other industry applications will also require more electricity. New renewables will provide the main share of electricity generation, with a potential contribution also from nuclear.

Managing such significant growth in electricity generation and consumption is a huge undertaking. The investment conditions in new renewable electricity generation and grid infrastructure needs to be in place through the policy and regulatory framework, as do market incentives for flexibility and efficient use of the existing infrastructure. It will also require increased planning to ensure all interdependent parts of the electricity system follow each other, including new consumption and generation, and grids and storage infrastructure.

Projected changes in Lithuania's electricity supply and demand until 2050

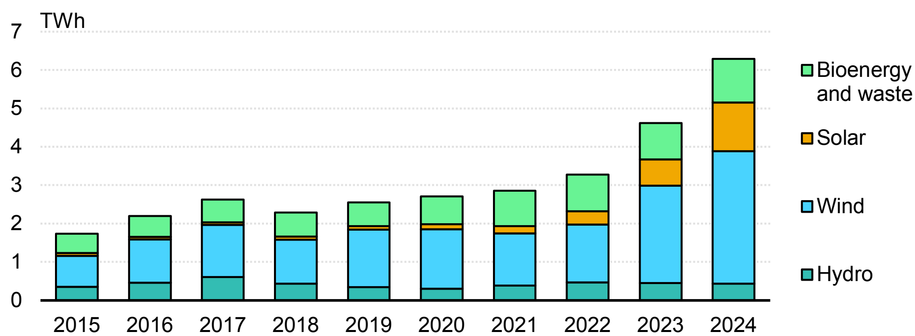


Source: IEA analysis based on Republic of Lithuania, Ministry of Energy (2024), National Energy Independence Strategy (accessed January 2025); IEA (2025), Electricity Information.

Renewable electricity deployment

After a period of slow growth, renewable electricity generation nearly doubled in two years from 3 TWh in 2022 to 6 TWh in 2024, helped by improved permitting.

Renewable electricity generation in Lithuania, 2015-2024



Source: IEA (2025), Electricity Information.

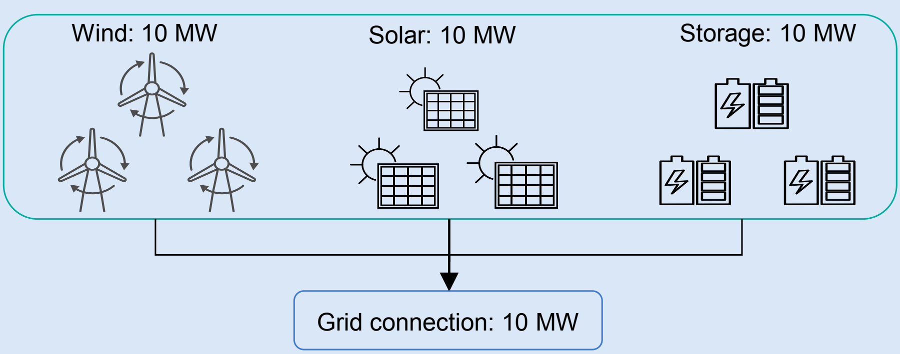
While the growth in renewable electricity generation is expected to continue, the NEIS Roadmap Scenario target of 25 TWh of electricity generation in 2030 would require accelerated renewables deployment, especially wind power. The long-term vision for renewable electricity growth is even more ambitious. According to the 2050 target from the NEIS, onshore wind power will produce 28 TWh, offshore wind 19 TWh and solar PV another 10 TWh. With small additions from hydro power and bioenergy, renewables are set to provide close to 60 TWh of clean electricity by 2050 – roughly a tenfold increase from the current level.

Policy spotlight: Simplifying permitting and grid connections for new renewable energy sources

In July 2022, Lithuania approved the Breakthrough Package for renewables. This included several legal changes to ease the conditions for permitting of wind and solar power projects by simplifying administration and promoting a more favourable public attitude towards the development of renewables. The Breakthrough Package includes measures to further promote self-consumption and energy communities as well as technology-specific measures directed at wind, solar PV, biogas and batteries. To reduce permitting times, Lithuania removed permits for renewable energy power plants of up to 100 kilowatts (kW), began recognising renewable energy to be of high public interest and shortened deadlines to environmental impact assessments.

As part of the package, Lithuania introduced a new legal concept of "hybrid power plants", which allows building and connecting several solar, wind and storage facilities at one connection point. If the grid has certain available capacity to connect new electricity generation, the model allows for that same capacity of solar, wind and battery storage each to connect as one hybrid power plant. The concept is based on an analysis of how solar PV and wind power generation complement each other, rather than overlap, and an assumption that battery storage would further help integration. This is an innovative policy feature that enables more efficient use of existing grid infrastructure and could be an example for other countries.

Illustration of Lithuania's hybrid power plant connection concept



Support for renewable electricity investment has changed several times

Lithuania's initial support scheme for renewables was introduced in 2011 and was based on feed-in tariffs valid for 12 years. Above 30 kW, feed-in tariffs were provided through technology-specific auctions. Below 30 kW, installations could obtain support without participating in an auction, but this threshold was lowered to 10 kW in 2013 after a significant drop in investment costs for solar power. The scheme enabled Lithuania to achieve its 2020 targets for renewables in 2015, after which additional support was suspended and investments slowed down.

In 2018, Lithuania revised its Law on Renewable Energy and introduced technology-neutral tenders with an auction-based market premium model for installations exceeding 10 kW. Technology-neutral tenders in combination with a fixed feed-in premium started in September 2019. In January 2020, an onshore wind farm won the first allocated quota of 0.3 TWh with a zero-subsidy bid. The auction-based market premium model was intended to support 0.7 TWh of new renewable power generation per year over the period 2020-22. However, less than three bids were received for the next tender in 2020 and the auction was declared void. The regulator VERT took this outcome as an indicator that the current cost of renewable power plants and the electricity price on the market enable investments under market conditions, and no subsequent auctions were held.

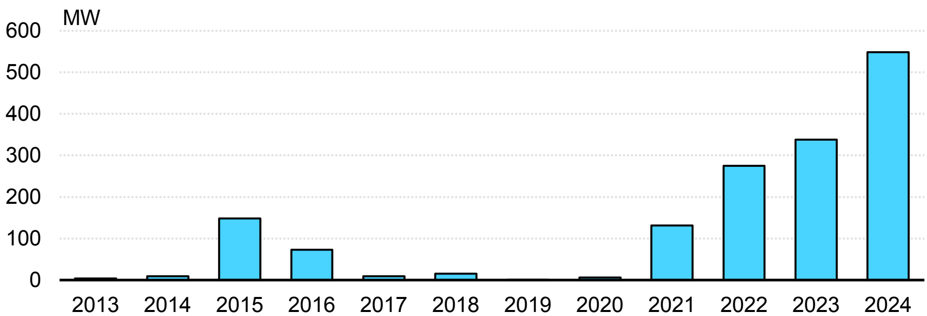
Indeed, installed renewable energy capacity has increased, and the goal of 5 TWh of renewable electricity by 2030 was achieved already in 2024. If Lithuania is to keep up the rapid deployment of renewable electricity in line with the vision for 2030 and beyond, the political framework and market conditions must provide sufficient incentives and long-term stability to investors.

Onshore wind will remain the biggest electricity source

Onshore wind provides all of Lithuania's existing installed wind capacity and has contributed to most of the electricity generation additions in recent years. Wind power installations have varied significantly over time due to shifting support schemes. Onshore wind was one of the main beneficiaries of the technology-specific auctions with feed-in tariff support allocated to more than 220 MW of wind capacity, most of which was connected in 2015 and 2016. New additions were scarce in the period

2017-20, before the market took off again, supported by the new auctioning system introduced in 2019 and improved market conditions that led to recent market-based investments.

Yearly additions of onshore wind capacity in Lithuania, 2013-2024



IEA. CC BY 4.0.

Sources: IEA analysis based on IEA (2025), Electricity Information; Litgrid (2025), Generation capacity (accessed May 2025).

A challenge for wind power is how to maintain profitability for new projects at increasingly higher shares in the electricity generation. The main solution is to increase flexibility in the electricity system by increasing storage, demand-side flexibility, and interconnection and market integration with neighbouring countries. PPAs can offer another way of making profitable investments in renewable energy. Lithuania can explore further regional collaboration to increase market liquidity and improve access to PPA markets.

Offshore wind has large potential but faces uncertainties

Lithuania has no operating offshore wind parks today but plans to build 1.4 GW of installed capacity around 2030 and envisions continued strong long-term growth. In 2023, Lithuania launched a first tender for the development of an offshore wind park of 700 MW. Two bidders participated and the winner was a consortium of the Ignitis Group and OceanWinds, with a development fee of 20 EUR million paid to the state for the right to use the maritime area in the Baltic Sea for electricity production for 41 years. This was lower than development fees in some tenders held in other countries at the same time, such as Germany and the Netherlands. However, the site will operate under market conditions without any contracts for difference or other support provided by the state. The developer is responsible for financing and constructing the offshore grid infrastructure needed to connect to the onshore grid. The project is expected to become operational by 2030; however, the final investment decisions have not been taken and recent developments show that the project could be delayed as large-scale electrolysis projects across Europe face delays.

In early 2024, Lithuania launched a second tender for another 700 MW offshore wind farm, this time providing more support to meet worsening global market conditions. In addition to providing territory for development, the government would provide a two-sided contract for difference, with a minimum price of 64 EUR/MWh (megawatt hour) and a maximum price of 107 EUR/MWh for a period of 15 years. However, as the law required at least two bidders to participate and only one registered, the auction was cancelled. In November 2024, the second auction round was relaunched, increasing the price to 75-126 EUR/MWh. In January 2025, the Lithuanian government temporarily suspended the auction to review the conditions of the tender but plans to relaunch it during 2025.

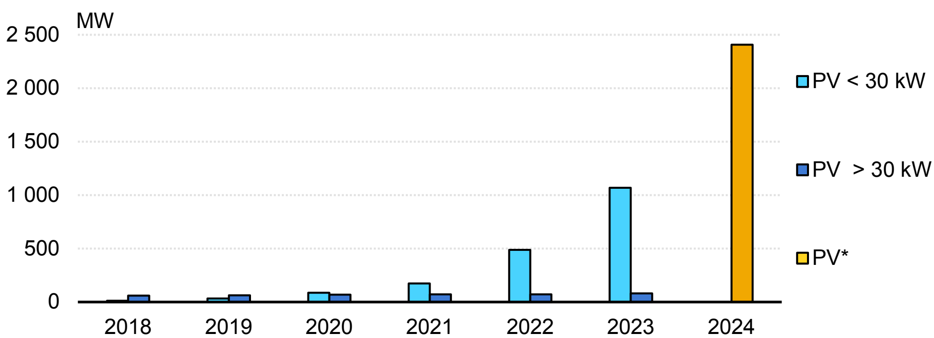
In a second stage of the offshore wind development, Lithuania plans to organise new tenders in 2026 to reach at least 2.8 GW of installed capacity by 2040. However, the recent potential delay of the first project and the suspension of the second tender increases uncertainty on the future for offshore wind in Lithuania. For offshore wind to deliver according to targets from Lithuania's strategies, the government needs to bring more clarity around its plans and develop a stable policy framework that increases certainty and provides sufficient incentives for investments in both the wind project itself and the supply chain. One example is the Offshore Wind Energy Roadmap in the Netherlands, which provides clear timelines for offshore wind development to reach a target of 21 GW of installed capacity by 2032 (originally aimed for 2030).

Solar PV is growing rapidly, strongly supported by the net-metering scheme and investment subsidies

Through a self-consumer net-metering system specified in the Law on Energy from Renewable Sources, solar PV installations of households (up to 10 kW) and non-profit legal entities (up to 50 kW) can feed excess electricity into the grid and use it to cover electricity consumption at another time during a two-year period from April to March, thus using the grid as a virtual energy storage. In addition to net metering, small-scale solar PV installations of up to 10 kW can receive state support covering up to 30% of the investment cost up to EUR 3 230.

Furthermore, in December 2023, Lithuania adopted amendments to the Renewable Energy Law, which introduced the net-billing scheme to a non-household self-consumer. Under the net-billing scheme, the self-consumer accumulates an amount of money in a virtual account during the two-year period, calculated by multiplying the amount of electricity fed into the grid by an agreed-upon fixed or variable price and reducing the electricity consumed multiplied by the price set in the electricity supply contract. This model takes into account the fact that market prices fluctuated and provides incentives for PV owners to use or store the electricity when prices are low. The net-metering scheme is still being applied to non-profit legal entities and households.

Total solar capacity by capacity in Lithuania, 2018-2024



IEA. CC BY 4.0.

Notes: Capacity breakdown for 2024 is not yet available. Up to 2023, the electrical capacity is the installed capacity of solar photovoltaic panels that generate electricity in direct current.
Sources: IEA analysis based on official submission from Lithuania to the IEA Secretariat via the Renewable and Waste Annual Questionnaire; Litgrid (2025), Generation capacity (accessed May 2025).

Thanks to the strong support from the self-consumer schemes (see Policy Spotlight below) and investment subsidies, solar PV deployment is increasing rapidly in Lithuania. Annual installed solar PV capacity grew from around 100 MW in 2021 to around 600 MW in 2023 and by the end of 2024, installed solar PV capacity was above 2 GW, which is the NEIS target value for 2030. After 2030, the NEIS indicates further rapid growth to 7 GW by 2040, followed by more modest growth to 9 GW by 2050. Most of the solar additions are distributed PV supported by the net-metering scheme. As of August 2024, 87% of all solar power plants were connected to the distribution grid. Utility-scale installations are not supported in the same way and have so far had less success in Lithuania, though some projects have been connected to the grid or are under development. For the long-term development, utility-scale solar parks are expected to play a bigger role.

Other renewables contribute to stability and flexibility

Electricity is generated from bioenergy in co-generation plants in the district heating sector. With the transition from natural gas to bioenergy in district heating, electricity from solid biomass increased to over 400 GWh per year. In addition, waste incineration provides over 200 GWh and biogas used in gas power plants produces over 100 GWh of electricity a year. For electricity generation connected with district heating, the potential for growth is limited by the heat demand. However, there is scope for increasing this by using co-generation instead of heat-only boilers to provide district heating.

Lithuania is not a mountainous country, and hydropower has limited potential beyond the existing 100 MW plant in Kaunas. However, in addition, Lithuania has a large pumped-hydro storage plant in Kruonis, which is currently the most important source of flexibility in the electricity system. The Kruonis plant has an installed capacity of 900 MW, which equals an impressive 43% of the peak hourly demand in Lithuania in 2023 at 2.1 GW. A fifth unit to expand the pumped hydropower plant will expand the capacity by another 110 MW by 2026. The hydropower and pumped storage plants are also able to operate independently in so-called island mode, allowing for a step-by-step re-start of the transmission network in case of major disruptions.

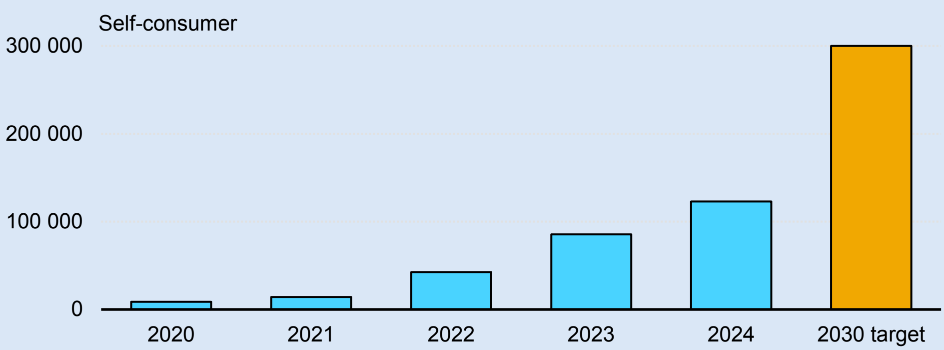
Policy spotlight: State support drives self-consumption

Making energy available and affordable to all consumers is one of the NEIS' four strategic energy goals. Encouraging active users, as individual self-consumption (or prosumers), is seen as a measure to increase acceptance for renewable energy projects, attract private investments and reduce energy poverty.

The net-metering system and investment subsidies for solar PV installations provide strong incentives for becoming a self-consumer in Lithuania. Consumers can also get subsidised loans at a maximum 3% interest rate for investments in solar or wind power. Furthermore, Lithuania has introduced an attractive system for households and companies to purchase or rent part of a solar park. This system enables consumers without access to their own rooftops to participate on the energy market. Investing in solar parks and applying for funding is made easy through digital platforms, such as Eparkai, run by the state-owned energy company Ignitis.

Thanks to the support provided and the system for remote participation, the number of self-consumers in Lithuania is growing rapidly. At the start of 2025, there were around 125 000 registered in the country, compared to less than 10 000 in 2020. Around two-thirds generate electricity at the point of consumption, typically rooftop solar PV installations, and one-third at remote power plants. Lithuania aims to have at least 300 000 self-consumers by 2030.

Development of self-consumers in Lithuania (2020-2024) and 2030 target



Sources: IEA analysis based on National Energy Regulatory Council (2024), Annual report on the electricity and natural gas markets of the Republic of Lithuania to the European Commission (accessed February 2025); Republic of Lithuania (2025), Gaminančių vartotojų skaičius per 2024 m. išaugo 40 procentų [The number of manufacturing consumers increased by 40 percent in 2024] (accessed February 2025).

Nuclear

Lithuania sees a potential future role for advanced SMRs

Lithuania has no operating nuclear power plants, after closing its two Soviet-era Ignalina reactors in 2004 and 2009 under EU accession requirements. A plan for a new 1 350 MW (electrical capacity) reactor in Visaginas was shelved after a 2012 referendum in which 63% of voters opposed the project. Current nuclear-related activities in Lithuania are focused on the safe decommissioning of the Ignalina plant, expected to be completed in 2038. However, public perception of nuclear seems to have shifted. A 2025 Eurobarometer publication indicates that 57% of respondents in Lithuania consider nuclear will have a positive impact on their lives in the upcoming 20 years.

In this context, Lithuania sees potential for advanced Generation IV SMRs. The NEIS Roadmap Scenario envisions 500 MW_e of nuclear capacity online by 2038 and up to 1.5 GW_e by 2050, providing 11 TWh of annual output. Such an addition of dispatchable nuclear capacity is seen as complementing variable renewable energy (VRE) sources by strengthening grid stability, energy security and overall system cost efficiency. Advanced SMRs are considered promising due to enhanced safety and fuel efficiency and reduced amounts of radioactive waste. New designs can also provide more flexibility by varying output quickly or by including heat storage.

By reducing their size, SMR technologies can be more adapted to smaller power grids and provide lower upfront costs, shorter development times and less construction risk. Less construction risk is possible thanks to their modular approach and the subsequent capacity to move significant parts of the manufacturing and construction process into controlled factory environments. Thanks to these possible benefits, Lithuania is not alone in looking at the potential of SMRs. Over 30 countries have been developing SMRs or are considering deploying them, and there are plans of varying maturity for up to 25 GW of SMR capacity.

However, uncertainties remain around the market developments for SMRs. Actual costs are still unclear as first-of-a-kind projects are not yet complete in most markets. Currently, there are more than 60 SMR concepts under active development at diverse stages of maturity. The cost for building new SMRs will be critical to the pace of deployment, while cost reductions will depend on the scale of deployment that increases experience and enables high-volume serial production. For a small country like Lithuania, following rather than leading the market development seems a prudent and sensible approach.

Preparations are needed to ensure an informed decision on SMR deployment and an efficient process

Lithuania will assess business models and feasibility for advanced SMR deployment by 2038. This work is set to conclude within the coming years, enabling a strategic decision by 2028. At the same time, early engagement in regional and international efforts related to Lithuania's potential nuclear plans should continue. In November 2024, Lithuania signed an intergovernmental agreement with the US Department of Energy focused on Generation IV SMRs. The agreement provides that the United States will share experience from the development of such SMRs, including business models and feasibility assessments.

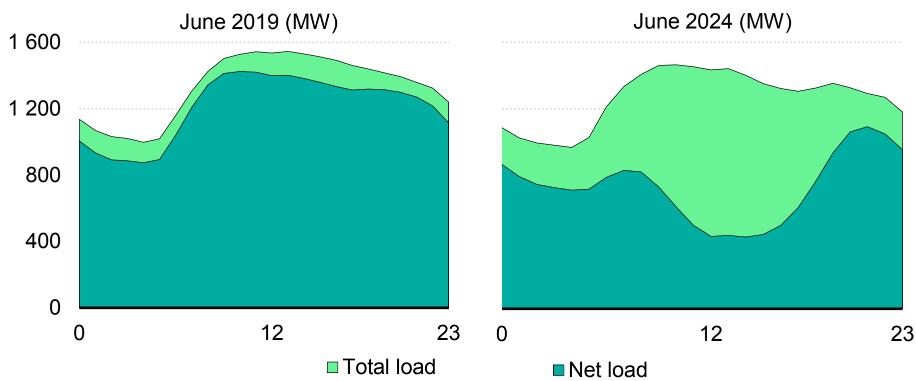
If Lithuania proceeds with new nuclear, it will benefit from being a former nuclear energy country with key infrastructure in place. Lithuania has an existing institutional and regulatory framework to license and operate nuclear plants, including a regulatory authority for nuclear safety (the Nuclear Power Safety Inspectorate, VATESI) and has a defined radioactive waste management strategy. The Ignalina site also provides an available nuclear licensed site with strong grid infrastructure capacity. Furthermore, Lithuania has accumulated knowledge and experience in the field, but these are decreasing. A future buildout will require early investment in maintaining and expanding skills across industry and public institutions.

Lithuania should build upon the existing knowledge and ensure that the necessary conditions are in place to take an informed decision backed by society regarding the role of nuclear energy in the future, and to facilitate a timely deployment of advanced SMRs should a positive decision be taken at the end of this decade. Establishing a dedicated and independent co-ordinating body for new nuclear would help deliver these conditions. Recent approaches in several European countries can serve as inspiration, ranging from interministerial co-ordination structures like Estonia's cross-ministerial Nuclear Energy Working Group or dedicated advisory bodies such as the Swedish National Nuclear Coordinator, to state-owned private implementation bodies such as Great British Nuclear in the United Kingdom. Each of these offers lessons on how to centralise expertise, ensure stakeholder co-ordination, and anchor decision making in robust technical and societal assessments.

System integration of renewable energy

The implications VRE have on the electricity system can be divided into six phases. Phases 1-3 are considered low phases with limited impact on the system while Phases 4-6 are considered high phases where VRE has large implications for system operations. Lithuania has already made impressive progress in integrating and expanding VRE and the rapid growth in wind and solar power generation could take Lithuania from Phase 3 to Phase 4-5 by 2030. Solar and wind power generation made a clear impact on the total load on the Lithuanian grid, illustrated by the increasingly "duck-shaped" curve, prominent in the higher phases of VRE integration. Additional measures are needed to support VRE use, such as large deployment of demand response, energy storage and grids, and more extensive solutions to ensure stability at low levels of conventional supply.

Average daily load and net load in Lithuania, June 2019 and June 2024



IEA. CC BY 4.0.

Note: "Net load" is defined as total load minus electricity provided from wind and solar power generation.
Source: IEA analysis based on ENTSOE (2024), Transparency platform (accessed February 2025), collected through the IEA Real-time Electricity Tracker.

New electricity consumers and market players provide opportunities for demand-side flexibility and storage

With the rapid expansion of wind and solar power, Lithuania will need more sources of flexibility. Currently, most of the system flexibility comes from the Kruonis pumped-hydro plant, but other flexibility sources will become more important. In 2023, Lithuania installed 200 MW of battery capacity to ensure the provision of the electricity system balancing services after the disconnection with the IPS/UPS system. Until 2030, Lithuania plans a total of 1.5 GW of battery parks. This number increases to 4 GW in 2050 in the NEIS Roadmap Scenario.

To realise the potential for flexibility from new distributed consumption such as EV charging and heat pumps in buildings, aggregators need to be able to participate in the electricity markets and gain access to transparent consumer data. This will benefit from the smart meter rollout, which started in 2022 and will complete its first phase by 2026, ensuring remote data collection for all consumers with an annual electricity consumption above 1 000 kWh. Lithuania should ensure a speedy deployment of smart meters according to the set timeline and allow access to data also for statistical purposes. To this end, statistical departments and agencies need to be sufficiently resourced. Lithuania is also establishing the legal framework for an open-access database on energy market production, supply and consumption. Such an energy hub will enable improved access to data from the smart meters once they are in place.

Hydrogen production in electrolysers will contribute to a considerable share of the long-term growth in electricity consumption until 2050 but can also be a source of flexibility. Lithuania aims to use surplus electricity from renewables in electrolysers to stabilise the grid and take advantage of low and negative market prices for hydrogen production. To use the flexibility potential of hydrogen production, the electrolysers must be able to respond to market price signals. Access to hydrogen storage can further increase the flexibility.

The market and regulatory framework need to provide price signals that incentivise flexibility

A successful deployment of batteries and other flexible assets depends on well-designed regulation and markets. The regulatory frameworks need to acknowledge the role of flexibility in the transition and avoid barriers to participation in markets. Batteries and other flexibility assets should be able to collect revenues from multiple services in parallel, so-called value stacking. With the right market signals, batteries can have multiple benefits for the system. The new balancing markets offer revenue opportunities for market participants that can provide the services, such as power plants, battery systems and demand aggregators. Different actors need to gain access to the auctions to get sufficient liquidity on the market. Household battery storage systems can also have an important role to play in balancing the increasing electricity generation from distributed solar PV and reducing pressures on the grid. Combining investment support for solar PV with requirements for battery storage is one method to ensure more efficient operations of the PV installations and the government is introducing generous subsidies for consumers to invest in batteries.

The net-metering system has been successful at driving growth in solar PV and self-consumption in Lithuania. However, as it does not create enough incentives for system-friendly behaviour of solar PV installations, it can create problems for the local electricity grid. An example is the Netherlands, where the existing net-metering system is seen as a main contributor to the grid congestion problems the country is facing, and is set to be removed. Lithuania's grid has so far been strong enough to accommodate most new PV installations, but the main distribution system operator ESO is increasingly restricting connections in areas where the capacity is limited. In those areas, PV systems can connect but not supply electricity to the grid, which functions as a barrier to continued self-consumption growth. The net-billing scheme used for commercial players and for consumers owning a wind farm takes into account the monetary value of the electricity consumed and fed into the grid, as opposed to net-metering, where the PV owner can use the grid as a virtual storage without considering market prices.

Grid operators should have incentives to support flexibility on the grid to use the existing infrastructure in an efficient way. This includes designing network tariffs for batteries and other flexibility assets that leverage benefits that they can have in providing balancing for the national electricity system as well as supporting the local grid. Variable network tariffs, either dynamic or time-of-use tariffs, can be used for this purpose, but this is not yet available in Lithuania. The European Agency for the Cooperation of Energy Regulators (ACER) also urges regulators to introduce benefit-based incentives for system operators. This can be complemented by educational campaigns to promote consumer awareness and understanding of dynamic pricing models. However, it is important to avoid a situation where network costs are moved from households that have the means to shift their demand and reduce their reliance on the power grid to those that remain entirely dependent on grid service.

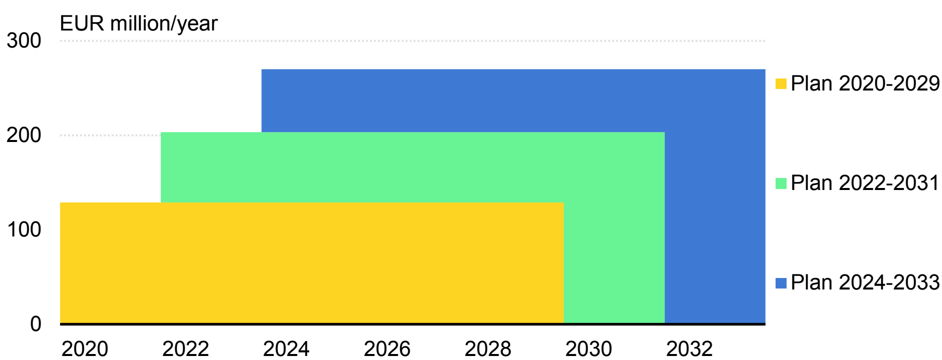
Electricity grid expansion and use

Transmission and distribution grids must expand

Lithuania faces an imbalance between the high potential for renewable electricity generation in the western part of the country and consumption clusters in the east. The connections of various parts of the electricity system needs to be strengthened to ensure a reliable operation and fast deployment of renewable electricity. There is also a need to further integrate Lithuania's electricity system with the Latvian system.

Litgrid prepares ten-year grid development plans for the transmission network. In its 2024 Transmission Network Development Plan for the period 2024-33, Litgrid expects electricity demand to more than double in a decade. The peak demand would increase from 2.1 GW to 3.9 GW. To accommodate this growth, Litgrid estimates the total investment needed in the development and reconstruction of the transmission network to be around EUR 2.7 billion between 2024 and 2033, a doubling compared to the development plan just three years earlier (for 2021-30). As a result, the total length of the transmission lines will increase by 12%. Similarly on the distribution level, ESO plans to invest EUR 3.3 billion between 2024 and 2033, which is an increase of 74% to the projected investment needs for 2021-30.

Evolution of investment plans in Lithuania's transmission networks, 2020-2033



Note: Investments are annual averages for each transmission network development plan.
Source: IEA analysis based on Litgrid (2025), Electricity Transmission Grid Ten-Year Development Plan (accessed in February 2025).

Energy system planning and regulation need to support grid expansion in line with the transition

The need for upgrading and expanding the transmission and distribution networks depends on the future growth in renewable electricity generation and demand. Investments are affected by uncertainty on both sides, as well as varying lead times for different components in the system. Electricity grid expansion, in particular transmission lines, take a long time and calls for efficient planning. Litgrid's recent Transmission Network Development Plan states the need to move towards long-term planning of the energy system, with at least a ten-year perspective, which also aligns with EU regulation. A longer term perspective to address the full life cycle of assets can be considered. Furthermore, EU Directive 2019/944 introduced a requirement for electricity distribution system operators to prepare and publish distribution network development plans. It is important that network development plans on the distribution level and transmission level are consistent. Having one dominant distribution system operator in the country could benefit Lithuania in terms of this co-ordination.

A proactive approach to grid expansion is needed to avoid the transmission and distribution networks from becoming bottlenecks to the energy transition. With increasing electricity demand, Lithuania recognises that the electricity grid needs to be built more proactively based on scenarios for future consumption, rather than the current gradual and reactive approach. While the regulator states in an ACER report that Lithuania has grid projects related to network development planning in the next ten years, focused on future demand rather than current demand, network operators in Lithuania have claimed that the current regulation lacks support for anticipatory investments, such as building new lines with larger dimensions to accommodate future demand growth. This indicates a need to look further into the regulation and how it supports grid expansion in line with the targets for the energy transition.

Another tool for improving energy system planning is a capacity map that shows available connection capacity on the electricity system in a transparent manner. Litgrid provides a map of possible connection points for wind parks on the 110 kV lines and ESO presents more detailed information on available capacity at substation level. To further improve the usefulness of such maps, inspiration can be drawn from other countries, such as the e-Gridmap in Estonia, which shows connection capacities (on a substation level) that can be used without increasing transmission line capacities and also calculates the estimated costs of additional investments for accommodating the desired connection capacity.

More interconnection capacity will be needed to ensure electricity security and system adequacy

Lithuania will continue to strengthen its electricity security and connectivity with the 700 MW Harmony Link interconnector with Poland, scheduled for completion in 2030. Originally planned as a marine cable, it will now be developed over land due to cost increases and security concerns for sea cables. In a 2022 study on the adequacy of the electricity system for the period 2026-30, Litgrid concluded that the new Harmony Link interconnector with Poland will have a major impact on the system adequacy. Until the Harmony Link is commissioned, Lithuania needs to ensure that all the existing reliably available and controllable power plant capacity is operating to ensure adequacy of the system. Beyond 2030, Lithuania sees a need to develop a capacity mechanism to maintain existing and develop new electricity generation capacities.

Total interconnector capacity is set to increase from around 2 150 MW today to 3 150 MW by 2030 and 5 400 MW by 2040. Furthermore, to meet the long-term electricity demand and balancing needs of the system, the government expects another doubling of interconnector capacity in ten years to reach 10 650 MW by 2050. Compared to current levels, this means an additional 4 700 MW of interconnectors between Lithuania and Central Europe (of which Harmony Link will provide 700 MW) and an additional 3 800 MW of interconnectors with the Baltic states.

Recommendations

4. Ensure a predictable long-term planning framework to attract cost-efficient investments in new electricity generation.

The National Energy Independence Strategy envisions massive growth in electricity generation, mainly renewables. Wind and solar power are increasing rapidly, facilitated by efficient permitting processes. However, uncertainties remain, particularly for the offshore wind market. To keep up the pace of renewables expansion, it is important to closely monitor progress and create stable policy and regulatory frameworks that provide sufficient predictable market conditions and revenue certainty for investors across technologies. This should include measures that strengthen domestic and regional offtake so that new generation is met by demand. Regional co-operation should be further explored to increase market liquidity, including for PPAs. Lithuania is also considering the deployment of advanced SMRs by the late 2030s, with a decision expected in 2028. If pursued, this would build on Lithuania's nuclear experience, regulatory framework and safety authority. In the current exploratory phase, it is essential to ensure an informed decision while also preparing the conditions for a successful rollout if the decision is positive. To enable this, Lithuania should establish an independent nuclear co-ordination body, mandated to oversee stakeholder engagement, public outreach and international co-operation; define technology selection criteria and, together with the nuclear safety authority, identify necessary regulatory and licensing framework adaptations needed to efficiently regulate and license advanced SMRs.

5. Provide incentives for proactive grid expansion and effective use of existing grid capacity.

With increasing electrification and rapid growth in power generation, network capacity must increase to enable new connections. While Lithuania has taken important steps to improve permitting processes, including by giving the transmission infrastructure the status of special national importance, the total construction time for new grids remains long compared to investments in new generation or consumption. Therefore, a forward-looking approach for grid expansion, including on the distribution level, is needed to avoid grids from becoming a bottleneck for the transition. The government should ensure that the regulator has the mandate to look at the whole energy transition beyond cost minimisation of individual projects to create a regulatory framework that allows anticipatory investments into new grids based on projections for future demand for connection capacity. The price regulation for network operators should also encourage a more effective use of existing grids, including by reducing underused capacity and incentivising investments in flexibility and grid enhancement technologies at these locations.

6. Increase flexibility in the electricity system by unlocking the potential for demand-side response from new consumption.

Electrification of end-use sectors will provide opportunities for more demand-side flexibility, both from aggregation of small users and from large industrial consumption. The potential for small-scale demand-side flexibility is supported by the smart meter rollout and the energy hub that make end-use data available for aggregators;

Lithuania should ensure a speedy deployment of this technology. To stimulate electrification in industries, Lithuania could support companies in identifying opportunities for electrifying more of their processes and providing flexibility to profit from using electricity when supply is high. In addition, clearer price signals that incentivise flexibility and grid services are needed. The recent development of new balancing markets is positive, and participation on the markets should be accelerated by reducing the 1 MW threshold for market entry. Furthermore, the regulatory framework for network operators should allow network companies to introduce dynamic grid tariffs to incentivise flexibility from existing and new consumers.

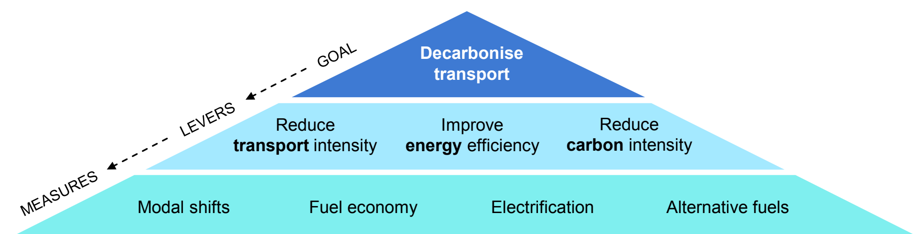
7. Reform the net-metering system to incentivise self-consumption that provides flexibility and grid services.

Through dedicated policy support, the number of self-consumers participating in the electricity market has rapidly increased. The growth in self-consumption is important for increasing renewable electricity generation and public participation in the energy market. Most self-consumption is distributed solar PV installations that benefit from the net-metering system. While this drives growth in solar PV capacity, it also creates inefficiencies and costs for the electricity system. To avoid overloading local grids, the distribution system operator is increasingly restricting the connection of new solar PV systems in areas where the capacity cannot accommodate additional production, deterring wider adoption of self-consumption. To enable continuous growth of self-consumption without causing grid congestion problems and additional costs, the government should gradually phase out the current net-metering model or reform it into a system that provides incentives for solar PV owners to support grid stability and system balancing. The new system could be linked to the support for domestic storage systems designed to increase the share of self-consumption in distributed solar PV systems. A version of the net-billing model, which is already used for commercial self-consumption, could also be applied for households.

Transport sector decarbonisation

Decarbonising the transport sector can be done in three main ways: 1) reducing the overall demand for vehicle transport (transport intensity); 2) improving transport efficiency; and 3) reducing carbon intensity from the energy used in transport. Transport intensity can be reduced by providing walking and biking infrastructure, mainly in urban areas. Improving energy efficiency (which also reduces emissions) can be achieved through modal shifts towards more public transportation, railway and shared mobility, and through increased vehicle efficiency. Reduced carbon intensity comes from replacing fossil fuels with electricity in EVs (which also significantly improves energy efficiency) or with biofuels and other low-emission fuels. Overall, a broad set of solutions will be needed, directed at both passenger and freight transport.

Illustration of methods for decarbonising transport



IEA. CC BY 4.0.

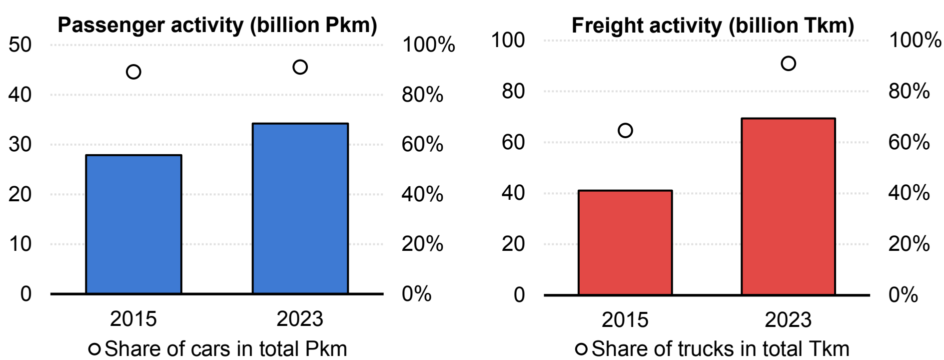
Efficiency of the transport system

Transport activity is increasing in Lithuania, both for passenger and freight. Road transport dominates the sector, and the use of cars and trucks is increasing. Shifting more transport activity to public transportation and railways can improve the overall energy intensity of the transport system. Economic incentives through taxation can be a driver of mode switching and efficiency improvements.

Road transportation is the dominant transport mode

Transport activity has been rising rapidly since 2015. In 2023, passenger travel exceeded 31 billion passenger-kilometres, over 90% of which were made by car – one of the highest shares in the European Union. As a result, other passenger modes such as rail and buses account for only a small fraction of the total, presenting a clear opportunity for a shift to less polluting modes of transport. In the freight sector, the increase in activity and energy use has been even more pronounced: freight transport reached 69 billion tonne-kilometres in 2023, up nearly 70% since 2015. This growth has been dominated by trucks, whose share of total freight activity rose from around 65% to 90%, largely at the expense of less energy-intensive rail transport. To address these trends, Lithuania has set targets to promote a shift toward more sustainable transport modes. In the short term, it aims for 12% of passenger activity to take place on public transport, with a specific focus on urban areas, where 60% of trips are targeted to be made by public transport, walking or cycling by 2030. For freight, Lithuania has set a longer term goal: by 2050, at least 50% of long-distance freight activity is to be carried out by non-polluting rail or inland waterways.

Share of transport activity by mode in Lithuania, 2015 and 2023



Note: Pkm = passenger-kilometres; Tkm = tonne-kilometres.
Source: IEA (2025), Energy End-uses and Efficiency Indicators.

Lithuania's car ownership rate reached 589 passenger cars per 1 000 inhabitants in 2023, surpassing the EU average of 570. The total car stock has increased by 53% since 2014, while the bus fleet has remained relatively the same. Given that cars are more energy-intensive per passenger-kilometre compared to public transport options, the growth in car travel has contributed to the increase in energy demand in the sector. At the same time, more energy-intensive large passenger cars, like SUVs and pick-up trucks, are gaining popularity, more than doubling their share in car sales from 8% in 2010 to 17% in 2023. Furthermore, due to the large share of imported used vehicles in car sales, the average vehicle age in Lithuania is relatively high, at 14.7 years for a Lithuanian car compared to the EU average of 12.5 years (in 2022). Replacing older models with newer and more efficient vehicles will help to reduce energy consumption and emissions in the sector. Electrification can also have a significant impact in reducing energy intensity in transport, with electric cars being over four times more energy efficient compared to conventional cars.

The stock of goods vehicles, which include heavy- and light-duty trucks, lorries, and road tractors, has grown by around 50% in the last decade, and as of 2022, there were 153 000 such vehicles on the road. Lithuania has one of the highest number of heavy freight vehicles per capita in the European Union, around double the EU average. Diesel covers most of the increasing activity in Lithuania's freight sector, strengthening its position as the dominating transport fuel. The growth in transport activity, both in passenger and freight transport, together with the increasing numbers of cars and trucks in the country, explains the increasing energy demand in the sector.

Modal shifts can increase transport system efficiency

While car ownership has increased, trips by bus and train have decreased, and the share of public transport in passenger-kilometres travelled fell from 12% to 7% between 2014 and 2022. Reversing this trend and encouraging less energy- and carbon-intensive forms of transport will be necessary to reduce energy consumption and emissions in the sector.

Concurrently, the government must also continue to encourage electrification and increased use of biofuels in the public transport fleet. Lithuania is implementing financial support measures to encourage the transition to electric public transport. In 2024, the Ministry of Transport and Communications allocated EUR 55 million to support the purchase of 275 electric buses across various municipalities, along with funding for the necessary charging infrastructure. From 2026, all newly purchased public transport vehicles in Lithuania will be required to run on alternative fuels, which can include electricity, biomethane and hydrogen-based fuels. At present, around 10% of registered buses operate on alternative fuels.

Trains are an energy-efficient mode of transport for both passengers and freight. As such, increased use of rail transport for both passengers and freight should be supported. While the long-term trend for rail bound freight is slightly increasing, with around 2% growth from 2014 until 2021, passenger rail activity declined by 12% over the same period.

Furthermore, the railways in Lithuania are one of the least electrified in Europe, with only 8% of the rail network electrified. Trains that run on diesel are less efficient and have higher CO_2 emissions. With new developments, including the construction of the Rail Baltica railway line that will integrate the Baltic states further with the European rail network, 39% of the Lithuania railway lines is set to be electrified by 2030. Further electrification of the railway system is needed for Lithuania to use the full potential of rail to decarbonise transport. However, this takes time, and biodiesel can be a good complement to reduce fossil fuel consumption during the transition. The share of biodiesel has increased from insignificant levels in 2000 to around 6% in 2023.

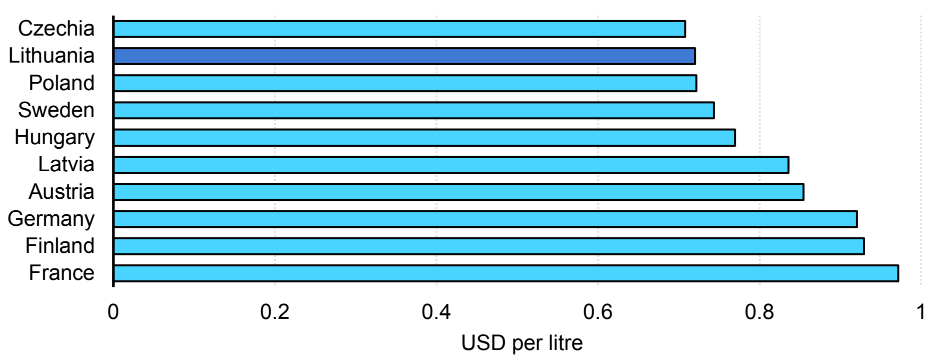
Walking and cycling remain underutilised modes of transport in urban areas in Lithuania. Many cities, including Vilnius, Kaunas and Klaipėda, have made efforts to expand biking infrastructure, but challenges such as limited dedicated bike lanes, safety concerns and car-centric urban planning persist. Investments in protected cycling paths, wider pavements, pedestrian-only zones and improved road safety measures could encourage more people to choose active mobility. In a 2022 strategy, Lithuania is planning to build 600 km of new bicycle paths by 2035, increasing the length of bicycle paths in residential areas by 40%. To further incentivise a modal shift and emissions reductions in urban areas, Lithuania could expand its implementation of low-emission zones, which started in Kaunas in 2024 and have been adopted more widely in other European countries.

For longer trips, multi-modal transport solutions can offer a sustainable alternative to private cars. Improving the integration of cycling with public transport, such as expanding bike-and-ride facilities at train and bus stations, could make it easier for commuters to combine different transport modes. Additionally, enhancing digital ticketing systems and real-time public transport information can facilitate seamless transitions between trains, buses and shared mobility services, some of which have become popular in the bigger cities. Implementing these strategies could enhance accessibility in Lithuania’s urban transport system while supporting a transition toward lower emission mobility and reducing dependence on private vehicles.

Vehicle and fuel taxation should be further explored as a way to incentivise emissions reductions

Lithuania's transport taxes are among the lowest in the European Union. Motor vehicles are taxed based on their CO_2 emissions only at the time of registration, and Lithuania is among the few countries without an annual pollution tax. Furthermore, Lithuania has lower excise duties on petrol, diesel and other motor fuels than most other EU countries, which is also a reason for the large and growing road freight sector in Lithuania. The excise tax policy was recently revised and in 2025 the Law on Excise Duties was amended to include a CO_2 component on fossil fuels. For unleaded gasoline and diesel, the excise duty per 1 000 litres is EUR 466 plus EUR 47-54 in CO_2 component. However, the regular taxation was reduced in 2023.

Taxes on automobile diesel in selected countries, 2024



Source: IEA (2025), Energy Prices.

In many places, taxation of vehicles and fuels and road tolls are important policy instruments to steer consumers towards cleaner transport solutions. As Lithuania continues to develop its vehicle and fuel taxation policy, it could look to other countries for examples of how taxation is used to influence consumer behaviour and encourage cleaner transport solutions. The car taxation in the United Kingdom has a high initial registration cost differentiated based on CO_2 emissions intensity, which also includes an additional fee for the most expensive cars. Norway's vehicle registration tax is based on the vehicle's tax group, weight, CO_2 emissions, nitrogen oxide (NOx) emissions and cylinder capacity.

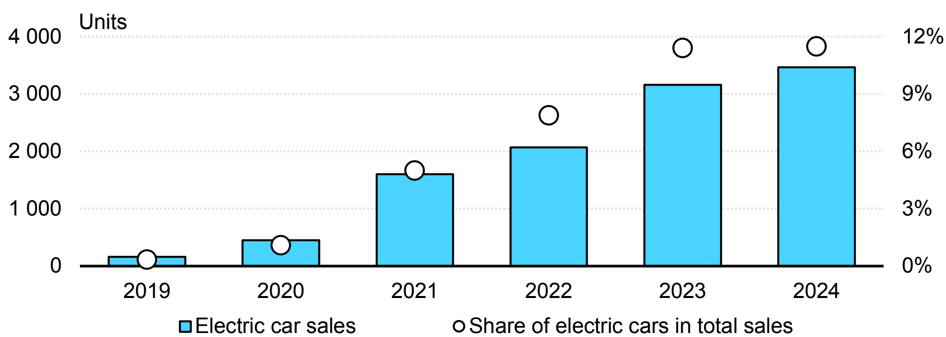
Electrification of road transport

Electrification is the main option for decarbonisation, especially for light-duty vehicles, but parts of the growing fleet of heavy-duty vehicles can also be electrified, as can public transportation. EV uptake in Lithuania is relatively slow due to high purchase prices compared to conventional internal combustion engine cars. Subsidies provided in recent years will help to accelerate EV adoption, but further efforts will be needed to meet electrification targets. However, in terms of charging infrastructure, Lithuania has made rapid progress in recent years. There is also an opportunity for smart charging and vehicle-to-grid (V2G) services to provide more flexibility to the electricity system.

The electric vehicle market growth has recently stalled

In 2024, EVs accounted for 11.5% of total car sales in Lithuania, very similar as in 2023 (11.4%). Lithuania set targets for the share of EVs in the total vehicle fleet, with the aim of reaching 15.8% by 2030 (equating to 262 000 vehicles). To reach this, EVs must account for at least 50% of annual sales for light-duty passenger vehicles by 2030, significantly higher than the current share. Long-term targets for the share of EVs in the total vehicle stock increase to 60% by 2040 and 80% in 2050.

Electric car sales and share in total car sales in Lithuania, 2019-2024



Sources: IEA analysis based on IEA (2024), Global EV Data Explorer; European Automobile Manufacturers' Association (2025), New car registrations: +0.8% in 2024; battery-electric 13.6% market share, (accessed February 2025).

According to a 2023 Consumer Monitor Report from the EU Alternative Fuels Observatory, attitudes toward battery electric vehicles (BEV) in Lithuania are evolving, but significant barriers remain. The report highlights that 43% of non-BEV drivers are interested in BEVs. The main perceived advantage of BEVs among Lithuanian drivers is their environmental benefit, particularly CO_2 emissions, making them a better choice for the climate. However, the high purchase cost remains the most significant barrier to adoption, with most Lithuanian drivers willing to pay a median price of EUR 10 000 for a BEV – considerably lower than the price of most available models.

Electrifying transport in Lithuania while maintaining affordability requires a combination of targeted incentives, infrastructure investments and regulatory support. Introducing low-interest financing programmes and enhancing trade-in schemes for high-emission vehicles can help lower the upfront costs for businesses and individuals. Additionally, reducing operational expenses through lower electricity costs for charging, tax exemptions and road toll reductions for EVs can encourage adoption. Lithuania could gradually increase fossil fuel taxes while using the revenue to fund electrification initiatives.

Lithuania has introduced subsidies and other support mechanisms to promote electrification

In 2022, Lithuania decided on an Action Plan for the Use of Electric Vehicles and the government has introduced several measures to support EV adoption. Individuals and companies purchasing a BEV can get a subsidy with up to EUR 5 000 and an additional EUR 1 000 is available for scrapping an old diesel or gasoline car. Furthermore, individuals may also receive a subsidy of EUR 2 000 for purchasing a plug-in hybrid vehicle and EUR 2 500 for purchasing of a second hand EV. The second hand markets are critical to get mass-market adoption for EVs over time. Another alternative is to introduce a social leasing scheme for electric cars targeted at the most vulnerable households, like the one used in France. Other benefits include free parking in Vilnius and select cities, access to bus lanes, and special registration numbers.

Lithuania also has various policies and initiatives to promote the electrification of heavy vehicles. In 2024, the government announced an upcoming financial support programme with an anticipated fund of EUR 10 million to EUR 13 million to encourage the purchase of large electric trucks and tractors, complementing a previous support for electric freight vehicles and buses. In 2022, Lithuania also signed the memorandum of understanding on Zero-Emission Medium- and Heavy-Duty Vehicles, which aims to achieve 100% zero-emission new truck and bus sales by 2040 with an interim goal of 30% by 2030.

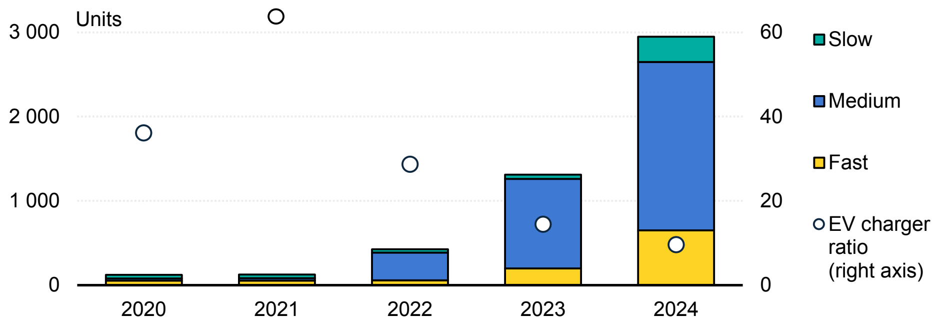
Lithuania has established a Sustainable Mobility Fund to promote its policies in the transport sector. This fund aims to provide financing until 2030 for the acquisition of alternative fuel vehicles, the development of charging and refuelling infrastructure, and the implementation of other sustainable mobility measures within municipalities.

Public charging infrastructure is growing faster than EV deployment

By 2030, Lithuania aims to have around 54 000 private and 6 000 public charging bays operational. According to the 2023 Consumer Monitor Report, Lithuanians ranked charging issues as the second most significant challenge of owning a BEV. However, substantial progress was made in public charging infrastructure in 2024, with the number of charging points more than doubling during the year, driven by dedicated support and planning. Public charging stations receive funding of up to EUR 10 000. Lithuania also supports EV infrastructure development through public tenders for installations of charging points and replacement of older public transport.

As a result, the ratio of EVs to public chargers fell from 63 EVs per charger in 2021 to only 7 EVs per charger in 2024. Though this is a successful development, the low ratio between EVs and public chargers might reflect the slow uptake in EVs as well as the expansion of charging infrastructure. The 2030 targets for EVs (262 000) and public chargers (6 000) would imply a ratio of 44 EVs per public charger, which would be a very high ratio. Continued expansion of public charging infrastructure will be important in shaping positive attitudes toward EV adoption. As electrification of freight transport is expected to be more challenging due to technical limitations and high costs, consideration should also be given to locating high-power charging ports close to major transport and logistics hubs.

Total number of public EV charging points by speed and ratio of EVs to charging points, 2020-2024



Source: IEA analysis based on European Commission (2025), European Alternative Fuels Observatory (accessed February 2025).

The development of publicly accessible charging infrastructure along national roads is planned in accordance with national targets. Charging parks with high-power charging ports (over 150 kW) are set to be established along key road sections. Around 20% of public chargers are now fast or ultra-fast chargers. Additionally, the expansion of charging infrastructure in municipalities is a significant focus. All Lithuanian municipalities have developed plans for public charging stations to be installed by 2030 in areas with high residential density, commercial centres, recreational spaces, healthcare facilities and educational institutions. In addition, charging infrastructure is subsidised up to EUR 1 500 for individuals and EUR 3 000 for shared systems in multi-party buildings.

Electric vehicle charging need to be integrated into the energy system

EVs can contribute to the flexibility of the electricity system, and for this to happen, the development of smart and bi-directional charging infrastructure must be encouraged. Smart charging enables load balancing, allowing EVs to charge when electricity demand is low, or VRE supply is high. This helps prevent overloading the grid and reduces electricity costs for consumers by taking advantage of off-peak electricity prices. Lithuania must also comply with the EU Alternative Fuels

Infrastructure Regulation, which mandated that all public charging points built after April 2024 be capable of smart charging.

Beyond load balancing, V2G integration offers further opportunities to enhance grid flexibility. Through V2G technology, EVs can feed electricity back into the grid during peak hours, effectively serving as distributed energy storage. This system supports greater integration of VRE sources, mitigates supply fluctuations and increases energy resilience. The adoption of smart meters and automated load management systems will be important in optimising these processes.

To enable large-scale EV adoption and smart charging, several infrastructure and regulatory requirements must be addressed. Grid modernisation will be necessary, including upgrades to transformers, substations and demand-side management solutions to manage increased electricity consumption. Additionally, standardisation and interoperability of charging technologies will be important for seamless access to charging points. Regulatory measures such as dynamic electricity pricing and incentives for installing smart chargers could encourage consumers and businesses to invest in intelligent charging solutions. According to the 2023 Consumer Monitor Report, there is a growing awareness of V2G technology, with 21% of drivers familiar with it and 48% interested in buying a V2G-capable vehicle. Lithuania should leverage this trend and enable EVs to be a resource in the electricity system.

Biofuels and synthetic low-emission fuels

While electrification will be the main decarbonisation option for light-duty vehicles and parts of heavy road transport, biofuels have the potential to decarbonise various parts of the transport sector, including heavy road transport. In addition, synthetic fuels produced from renewable electricity (so-called RFNBOs – renewable fuels of non-biological origin) can contribute to decarbonising certain parts of the sector, notably in aviation and shipping. In 2022, biofuels accounted for 6% of energy used in transport, mainly first-generation biodiesel and bioethanol.

While domestic production could potentially meet the demand, a lot of the biofuels produced and used are traded. In 2023, Lithuania produced 6.2 PJ of liquid biofuels domestically, exported 6.8 PJ and imported 5.3 PJ. Biodiesel produced from rapeseed made up 92% of domestic biofuel production; the remainder was bioethanol produced from grain, both considered first-generation biofuels. The European Union mandates that advanced biofuels or non-biological (synthetic) fuels from renewable sources must account for at least 3.5% of total final transport consumption by 2030. Based on the government's projections of total transport consumption reaching 76.5 PJ by 2030, this equates to 2.7 PJ of advanced biofuels or synthetic fuels.

Domestic biofuels could play a bigger role in transport

The government aims to boost advanced biofuels production, but domestic producers struggle to compete with cheaper palm oil-based alternatives. Fuel manufacturers have increasingly opted for lower cost foreign substitutes, driving biofuel imports up more than eightfold since 2010. Since 2023, the government provides investment support to increase the production of advanced biofuels to 0.5 PJ in 2026.

The government could drive a domestic market for biofuels through higher mandatory renewable fuel obligations. Biodiesel (HVO) has the benefit of having the same quality as fossil diesel and can be used for blending up to 100%. The high shares of diesel in Lithuania's transport provides an opportunity for domestic biodiesel to play a larger role in decarbonising transport. With a domestic market as a driver, this can also provide opportunities for industrial development and exports. However, affordability issues need to be addressed to ensure broad acceptance for using high shares of biofuels.

Hydrogen and synthetic fuels can be a complement, mainly for shipping and aviation

Lithuania's Hydrogen Roadmap projects that the transport sector will use 0.257 TWh of green hydrogen in 2030. Public transport is targeted for some of this, with targets to have at least two cities using green hydrogen in public transport by 2026 and five cities by 2030, with at least 30 buses in total. However, due to losses in the electrolyser process and in the fuel cell, the efficiency of using hydrogen as a transport fuel is significantly lower than direct electrification in a battery vehicle. Lithuania should closely follow the development of battery and vehicle technology and maintain flexibility in its commitments to technology-specific targets.

In the NEIS, Lithuania sees synthetic fuels, produced from hydrogen from renewable electricity in combination with biogenic CO_2 molecules, as an opportunity to develop a new export industry. However, large uncertainties remain on both the supply and demand sides. Synthetic fuel will have a role as sustainable aviation and shipping fuel and Lithuania can, as with biofuels, use the domestic market as a first driver of demand. State funding for innovation and pilot projects should also be aligned with the NEIS, which could include support for synthetic fuel production.

Recommendations

8. Strengthen the role for environmental taxation to drive efficiency gains and emissions reductions in the transport sector.

Lithuania is one of few countries in the European Union without annual ownership taxation for cars, and has comparatively low taxation for fuels, particularly diesel. The car stock continues to grow while sales indicate constantly increasing vehicle sizes. Also, Lithuania has one of the oldest, and inefficient, car fleets in the European Union. With transport accounting for vast majority of oil demand and half the energy-related greenhouse gas emissions in the country, and road transport completely dominating transport activity, there is a strong case for taxation to play a more important role in driving electrification and modal shifts. The recent development of adding a CO_2 component in fuel taxation is a good step in the right direction, and the European Union's ETS2 system will further increase fuel prices. Therefore, the main opportunity lies in introducing a CO_2-based annual vehicle taxation. To increase the efficiency of newly registered cars, Lithuania should also consider increasing the current CO_2-based car registration tax, lowering the maximum of non-taxable emissions factor, and including a weight-based component. Due to Lithuania's relatively high social and mobility poverty, it should consider making the tax progressive, protecting the most financially vulnerable car owners. Both ownership and registration taxation can be implemented as part of a bonus-malus scheme to provide additional support for EV investments. Taxation could also incentivise a shift to public transport and provide revenues to fund affordable and attractive public transport and infrastructure or be used to further support people suffering from mobility poverty.

9. Push modal shift to improve transport system efficiency in both rural and urban areas.

Ongoing electrification of rail lines and subsidised urban bus passes are commendable efforts. However, additional policy measures are needed to change the trend of increasingly higher dependency on private cars and road freight, especially in the context of Lithuania's energy security targets, mobility poverty, ageing population and the need of vehicle taxation changes. Introducing additional multi-modal intercity tickets and new bus lines with more frequent service would improve public transport opportunities in rural areas. Expanding the paid road network for trucks should be pursued to incentivise a shift to rail, capitalising on its network capacity availability and further supporting the growing length of electrified tracks. Furthermore, the government should strengthen its collaboration with municipalities and public transportation companies to enhance incentives for modal shifts in urban areas, including initiatives to raise social awareness of public transport benefits. The use of congestion fees and low- or zero-emission zones should be expanded across Lithuanian cities, while rising parking fees with temporary exceptions for EVs should be explored. Newly gained funds can be dedicated to subsidising public transport passes and infrastructure. These policies should be implemented alongside strategic financial support to enhance public transportation, prioritising the expansion of bus routes, the passenger rail network and service improvements. Expansion of walking and cycling infrastructure in cities should be continued, while also introducing park-and-ride hubs in the largest city outskirts.

10. Accelerate electromobility through targeted action on lead segments in the road transport sector.

Electrification will be the main technology to reduce emissions and dependency on oil imports for the large road transport sector. Electromobility also aligns well with the expansion of renewable electricity generation and creates new electricity demand. Due to limited access to private charging, as a large share of the population lives in multi-apartment buildings, the successful public charging infrastructure policy should be maintained. However, the main challenge for electrification is the high purchase price of EVs. A large share of car sales in Lithuania is second hand vehicles, and EVs are not yet available at scale on the used car market. However, other segments can be promoted and lead the way for electromobility in Lithuania, like publicly owned vehicles and corporate cars. Setting binding electrification targets while further promoting electrification of the corporate car fleets, like the currently used purchase grants and value-added tax deduction, could help kick-start a second hand EV market in the country and drive transport decarbonisation in a more affordable way. Public procurement targets for zero-emission vehicles by 2026 and 2030 are steps in the right direction. Government fleets could also leverage leasing and shared mobility to reach their targets. For private vehicles, Lithuania should consider re-introducing the successful trade-in scheme, promoting electric, active or shared mobility as a substitute for old polluting cars. The government could also introduce a social leasing scheme for electric cars targeted at the most vulnerable households.

Annexes

Acknowledgements

The IEA review team visited Vilnius on 3-7 March 2025 and met with government officials and public and private sector stakeholders across the energy sector. This report is based on information from these meetings, the review team's assessment of Lithuania's energy policy and detailed research by the IEA. The members of the review team were team leader Maarten Noeninckx (Belgium); Lisa Bjergbakke (Denmark), Karlis Goldstein (Estonia), Yann Mercier (European Commission), Alexiei Ozeretzkovsky (Nuclear Energy Agency), Aija Timofejeva (Latvia), Esmeralde van Vliet (the Netherlands), and Oskaras Alšauskas and Oskar Kvarnström from the IEA Secretariat.

Oskar Kvarnström managed the review and is the main author of the report with large contributions from Oskaras Alšauskas. Fabian Burkard, Anders Caratozzolo, Christina Hounisen and Samuel Talbot designed and prepared the energy data sections, figures and tables of the report and contributed to the analysis and drafting. The report benefited from reviews and insights from IEA staff, including Vasilios Anatolitis, Piotr Bojek, Roland Gladushenko, Kieran McNamara, Jeremy Moorhouse, Isaac Portugal, Divya Reddy, Alessio Scanziani and Jacques Warichet. Roberta Quadrelli, Zakia Adam, Thomas Elghozi and Riccardo Inverni provided support on statistics and data. Isabelle Nonain-Semelin, Astrid Dumond and Clara Vallois managed the editing and production processes and Poeli Bojorquez the design process. Jennifer Allain edited the report. Nicolette Groot supported the organisation of the energy review team's visit.

The IEA would like to thank all involved from the Lithuanian Ministry of Energy and the Lithuanian Energy Agency who helped during the review, including from the

Ministry of Energy; Dainius Bražiūnas, Enrikas Etneris, Donata Matulevičienė, Aurimas Salapėta, Saulius Šimanauskas, Mindaugas Stonkus, and Karolis Švaikauskas, and from the Lithuanian Energy Agency; Agnė Bagočiūtė, Vytenis Barkauskas, Rasa Jaciničienė, Živilė Naužemienė, and Tadas Norvydas. Special thanks to Jurgita Jakeviciuté for her tireless efforts co-ordinating the review visit. The team also expresses its gratitude to Minister Zygimantas Vaiciunas for his overview comments to kick off the review and to Vice Minister Airidas Dauksas who graciously received the team's presentation and recommendations at the end of the review week.

The IEA also thanks the numerous other individuals from the Lithuanian ministries and from the following organisations who provided valuable insights for the report, including: AB Vilnius Heating Networks, Ambergrid, Baltpool, Circular Economy (public organisation), ESO (distribution system operator), Hydrogen Energy Association, Ignitis (energy utility), Kaunas University of Technology, Lithuanian District Heating Association, Lithuanian Energy Agency, Lithuanian Solar Energy Association, Lithuanian Wind Power Association, Litgrid (transmission system operator), National Lithuanian Energy Association, and VERT (regulator).

Abbreviations and acronyms

ACER	Agency for the Cooperation of Energy Regulators
BEV	battery electric vehicle
BRELL	Belarus, Russia, Estonia, Latvia and Lithuania
CCU	carbon capture and utilisation
CCUS	carbon capture, utilisation and storage
CESA	Continental European Synchronous Area
EED	Energy Efficiency Directive
EPC	energy performance certificate
ESR	Effort Sharing Regulation
ETS	Emissions Trading Scheme
EU	European Union
EV	electric vehicle
GHG	greenhouse gas
IEA	International Energy Agency
LEA	Lithuanian Energy Agency
LNG	liquefied natural gas
LPG	liquefied petroleum goas

LULUCF	land use, land-use change and forestry
NBHC	Nordic-Baltic Hydrogen Corridor
NECP	National Energy and Climate Plan
NEIS	National Energy Independence Strategy
PICASSO	Platform for the International Coordination of Automatic Frequency Restoration Reserves and Stable System Operation
PPA	power purchasing agreement
PV	photovoltaic
RED	Renewable Energy Directive
SMR	small modular reactor
TFEC	total final energy consumption
TSO	transmission system operator
USD	United States dollar
V2G	vehicle to grid
VERT	National Energy Regulation Council
VRE	variable renewable energy

Units of measurement

bcm	billion cubic metres
GW	gigawatt
GWh	gigawatt hour
km	kilometre
kt	kilotonne
kW	kiowatt
kWh	kilowatt hour
Mt CO_2-eq	million tonnes carbon dioxide equivalent
MW	megawatt
MW_e	megawatt electrical
PJ	petajoule
TWh	terawatt hour

See the IEA glossary for a further explanation of many of the terms used in this report.

International Energy Agency (IEA)

IEA Publications
International Energy Agency
Website: www.iea.org
Contact information: www.iea.org/contact

Typeset in France by IEA - July 2025
Cover design: IEA

Lithuania 2025

Energy Policy Review

Government action plays a pivotal role in ensuring secure and sustainable energy transitions. Energy policy is critical not just for the energy sector but also for meeting environmental, economic and social goals. Governments need to respond to their country's specific needs, adapt to regional contexts and help address global challenges. In this context, the International Energy Agency (IEA) conducts Energy Policy Reviews to support governments in developing more impactful energy and climate policies.

This *Energy Policy Review* was prepared in partnership between the Government of Lithuania and the IEA. It draws on the IEA's extensive knowledge and the inputs of expert peers from IEA Member countries to assess Lithuania's most pressing energy sector challenges and provide recommendations on how to address them, backed by international best practices. The report also highlights areas where Lithuania's leadership can serve as an example in promoting secure and clean energy transitions. It also promotes the exchange of best practices among countries to foster learning, build consensus and strengthen political will for a sustainable and affordable energy future.