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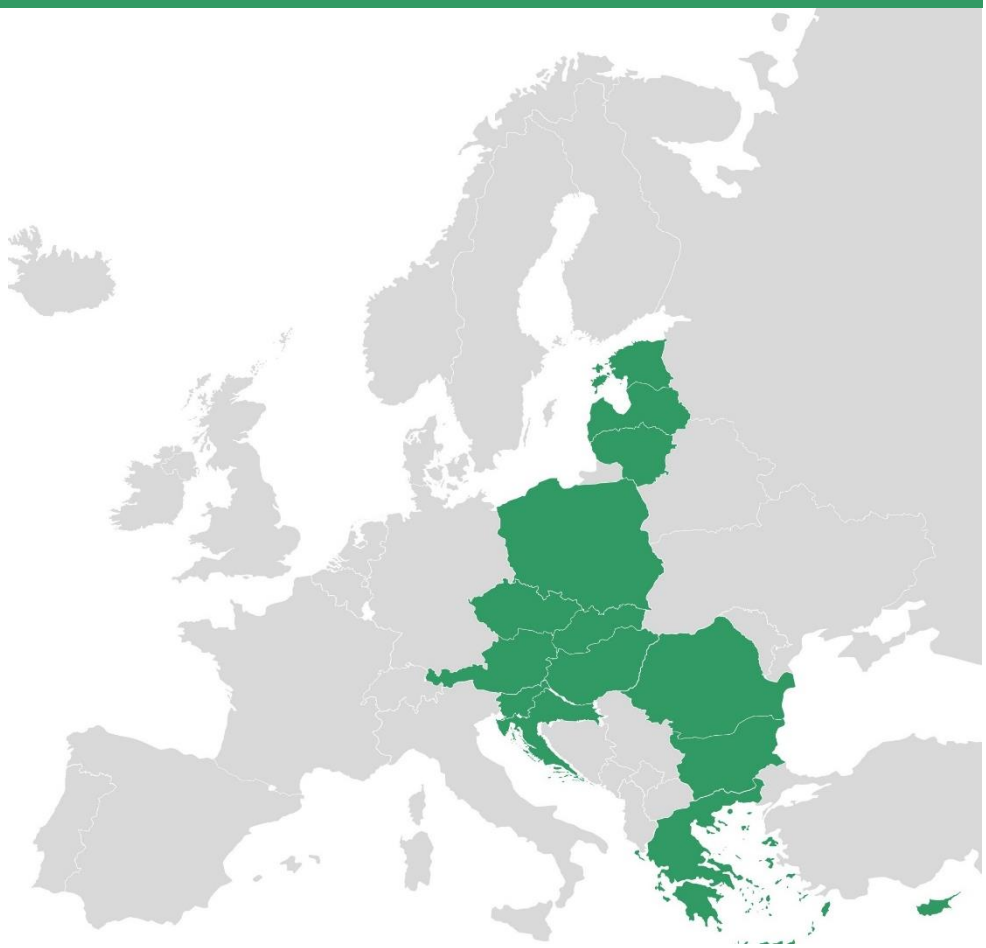
CENTRAL & SOUTH-EASTERN EUROPE

DECARBONISATION REPORT 2022

Special Focus: The role of gas in the Energy Transition



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Part I: Introduction

Every year many energy markets and decarbonisation studies are published in the European Union. However, the geographical scope of these studies is unbalanced. Whereas most of the papers cover one or more countries in Western Europe, there is a lack of information about the market development and decarbonisation efforts of EU member states in Central- and South-Eastern Europe (CEE / SEE region). The main aim of this report is to fill this information gap and to provide you with relevant up-to-date information about the status of the energy markets and the energy transition in the CEE / SEE region.

The report is comprehensively covering all the 14 member states in the CEE / SEE region (Austria, Bulgaria, Croatia, Czech Republic, Cyprus, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia). Thus, in one report, you are getting:

- a comparative analysis of the national energy markets in the region
- the key energy market figures of each of the 14 member states
- the current emissions and emissions target figures of the member states
- the main decarbonisation challenges and strategies of the member states

The report is divided into two chapters. In Part II, we present a high-level regional comparative analysis of the national energy markets in the CEE/SEE region. In Part III, we present the key energy market figures, the emissions figures, and the decarbonisation strategy for each EU member state in the region. This information is presented in separate country sheets in an easy-to-read format and in alphabetical order.

In addition to presenting the key figures, we have also prepared specific information about the role of gases (natural gas, hydrogen and biomethane) in the energy transition in the CEE/SEE region. In Part II, this information is presented in specific boxes covering topics such as the future expected decarbonisation role of hydrogen and biomethane and case studies on specific cross-border gas infrastructure projects with a decarbonisation focus. In the country sheets in Part III, we have added a section with information regarding the role of natural gas, hydrogen and biomethane. In some of the country sheets, examples of decarbonisation projects using the gas infrastructure have also been listed. The project information is based on publicly available data in national and EU Ten-Year Network Development plans.

We hope you will find the information helpful. Enjoy reading!

Gas Infrastructure Europe & Deloitte

November 2022

Data collection methodology

All the figures in the report come from publicly available sources as of end of August 2022. In the analysis, where the data for individual metrics changed significantly since publishing, we have chosen to add the most recent figures published and/or approved by the respective national government or regulatory authority in the analysis.

Data for the key statistics in *Country analysis* part and comparison graphs in the *Regional analysis* part were drawn from *Eurostat*'s database. At the time of writing, the most recent data in this database covers the year 2020. As a result, 2020 data has been used. The category of Solid fossil fuels reported in total consumption, heating, and power generation is a combination of the following fuels: anthracite, coking coal, other bituminous coal, sub/bituminous coal, lignite, brown coal briquettes and coal tar, manufactured gases (which are mostly coke oven and blast furnace gases – produced from solid fossil fuels), non-renewable waste, where lignite accounts for more than half of the volume. The Oil products category comprises of refinery gases, liquefied petroleum gases, gas oil and diesel oil (excluding biofuel portion), fuel oil, petroleum coke, and other oil products. Finally, the Renewables category includes hydro, geothermal, wind, solar photovoltaic, primary solid biofuels, pure biodiesel, other liquid biofuels, biogases, and renewable municipal waste. In transport, Gaseous fuels include natural gas and liquified petroleum gases. The category Other listed in the consumption of gas by sector includes the sectors: transportation, agriculture and forestry, fishing and other with transportation and agriculture and forestry accounting for most of that category.

Greenhouse gas emissions information and data were taken from the European Parliament's briefings, titled *Climate action: Latest state of play*, which was published from June until October 2021. In the hydrogen and biomethane part of the *Country analysis*, the information was collected from National Climate and Energy Plans, legislative documents of individual countries and other relevant policy documents related to hydrogen or biomethane, including national strategies. In part of the report which analyses the legislative environment, data was also collected from the database of the HyLaw project.

Part II: Regional Analysis

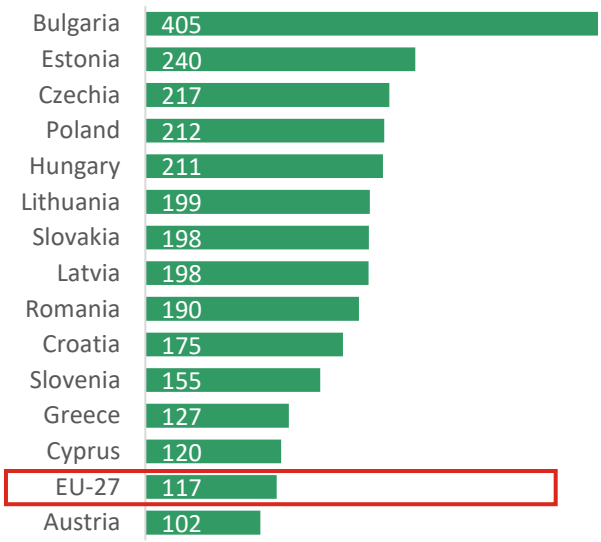
A. General overview

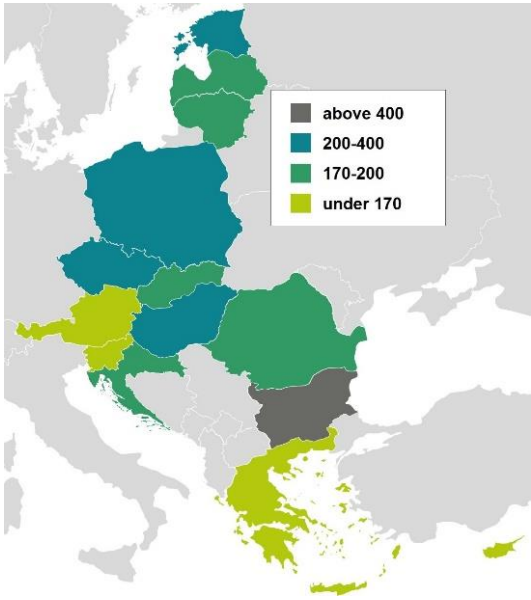
Energy plays a very important role in the economies of the CEE/SEE region

Energy plays a very important role for the economies of many of the EU member states in the CEE/SEE region compared to many less energy-intensive member states in Western Europe. The chart below illustrates that **all countries in the region, except for Austria, have an energy intensity higher than the EU-27 average**. Energy intensity is one of the indicators to measure the energy needs of an economy. A high number indicates that the economy utilises a lot of energy to create its products and services.

Many factors influence the level of energy intensity. It reflects the structure of the economy and its cycle, general standards of living and weather conditions in the reference area. Energy intensity is calculated as units of energy per unit of GDP. **Although the five EU member states with the highest energy intensity are all from the CEE/SEE region, each of these member states delivered significant reductions from 2005 up until the last reported year of 2019** (Bulgaria -40 %, Poland -44 %, Czechia -38 %, Estonia -42 % and Romania -54 %).

Figure 1: Energy intensity of the GDP



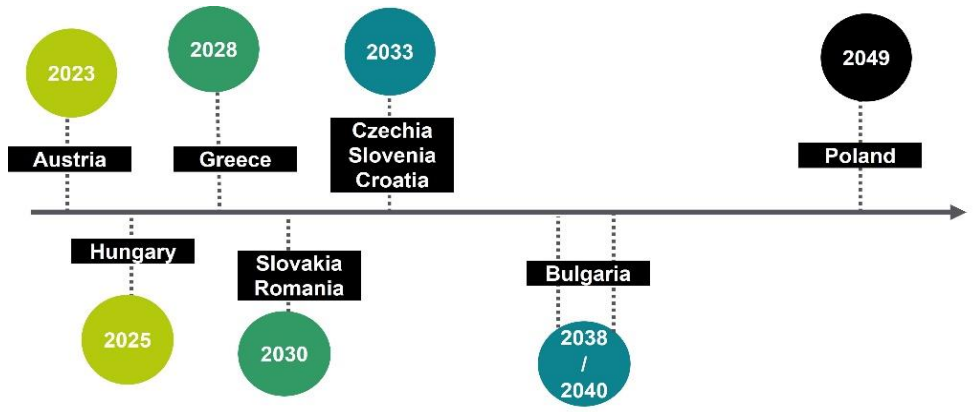


Source: Eurostat 2020

Significant role of coal and oil in the consumption mix

Many EU member states in the CEE/SEE region are burdened by a significant carbon footprint due to the **extensive use of coal and oil** in their total energy consumption. Poland (96%) and Czechia (4%) are the EU's last hard coal producers. Brown coal, which is consumed almost exclusively domestically, is present in the energy mix of most of the countries in the region except for Estonia, Latvia, Lithuania, and Cyprus. **All the countries currently using brown coal, except for Poland, declared its phase out in the short to mid-term horizon**. For the announced phase outs see the chart below.

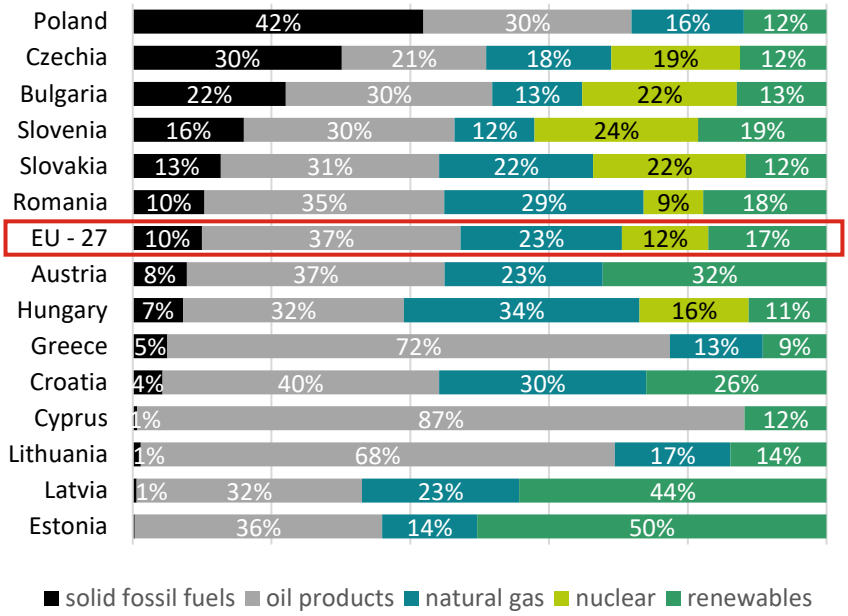
Figure 2: Coal phase-out timeline

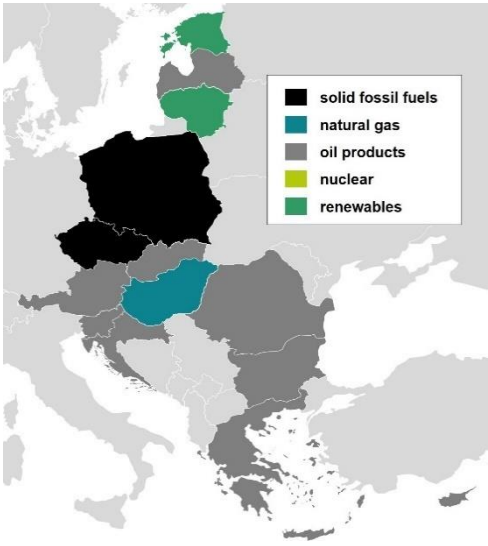


Since February 2022, the majority of the countries operating or presently retiring coal power plants has opted for their reopening in the light of possible Russian gas cut-off and increased gas prices.

Source: Individual country announcements

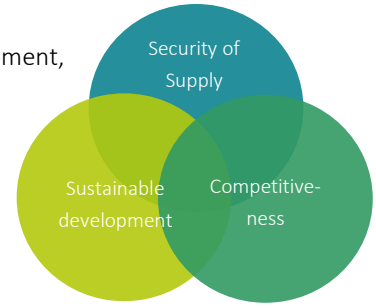
Figure 3: Total consumption mix by fuel (%)





Source: Eurostat 2020

SPECIAL FOCUS: The Energy Trilemma in the CEE/SEE region



EU's energy policy is centred on three key objectives: Sustainable development, Competitiveness and Security of Supply. The aim is to find the best balance between all three objectives as they are not always compatible. Finding such a balance is especially difficult in the CEE/SEE region.

Due to the war in Ukraine, EU is striving to increase Security of Supply by reducing its reliance on Russian gas and reduce gas demand in general. Many EU member states in the CEE/SEE region used to be heavily reliant on Russian natural gas as well as Russian oil and coal. Weakening this reliance is a large and costly challenge which will likely decrease the Competitiveness of the region in the short- to mid-term and possibly even prolong EU's energy crisis.

In addition, a reduction in natural gas demand does not correspond with the Sustainable Development plans of many EU member states in the CEE/SEE region, who plan to switch from the extensive use of coal to an increased utilization of natural gas in the power and heat production and in the industrial processes.

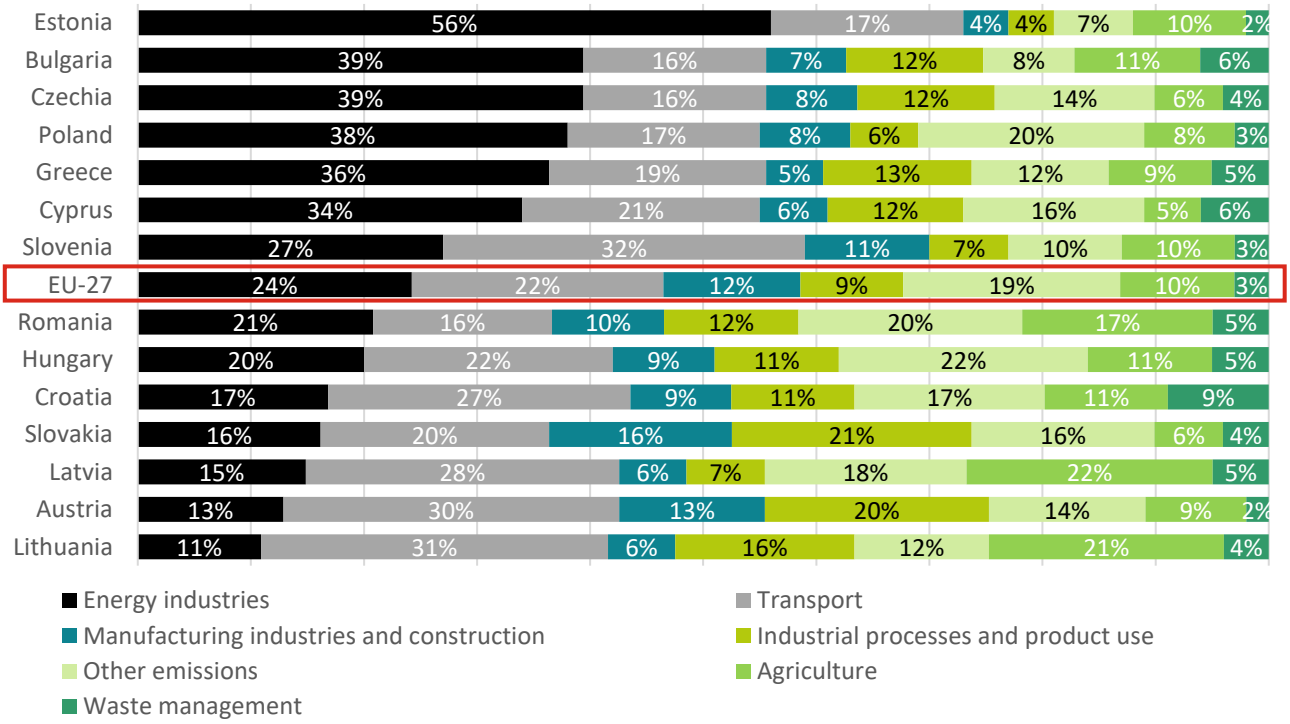
B. Sector analysis

Energy industries and transport generate the most emissions

When evaluating the progress of decarbonisation, it is crucial to assess each sector individually. The reason is their largely different decarbonisation potentials. Transport, agriculture and buildings (under the 'other emissions' category) are the three sectors with the slowest emissions reduction progress, as monitored by the EU.[1]

As in the rest of the EU, the 'energy industries' and 'transport' are the most emissions-heavy sectors also in the CEE/SEE region. Estonia, Czechia, Poland, Bulgaria, Greece, and Cyprus pollute more in the former, while Slovenia, Slovakia, Lithuania, Austria, Latvia, Croatia, and Hungary need to lean in heavily on the latter in their decarbonisation efforts. A nonnegligible share of the regional emissions, a 15% on average, comes from the 'other emissions' sector, which comprises mostly of buildings and tertiary sector. This report looks closer at the fuel mix in the public part of this sector, which is represented by 'services'. An average of 11% of the greenhouse gas emissions of the countries of the CEE/SEE region come from 'Agriculture'. However, Eurostat does not report on the fuel mix in this sector and, therefore, information is not included in this report.

Figure 4: Total GHG by sector (MtCO2e)



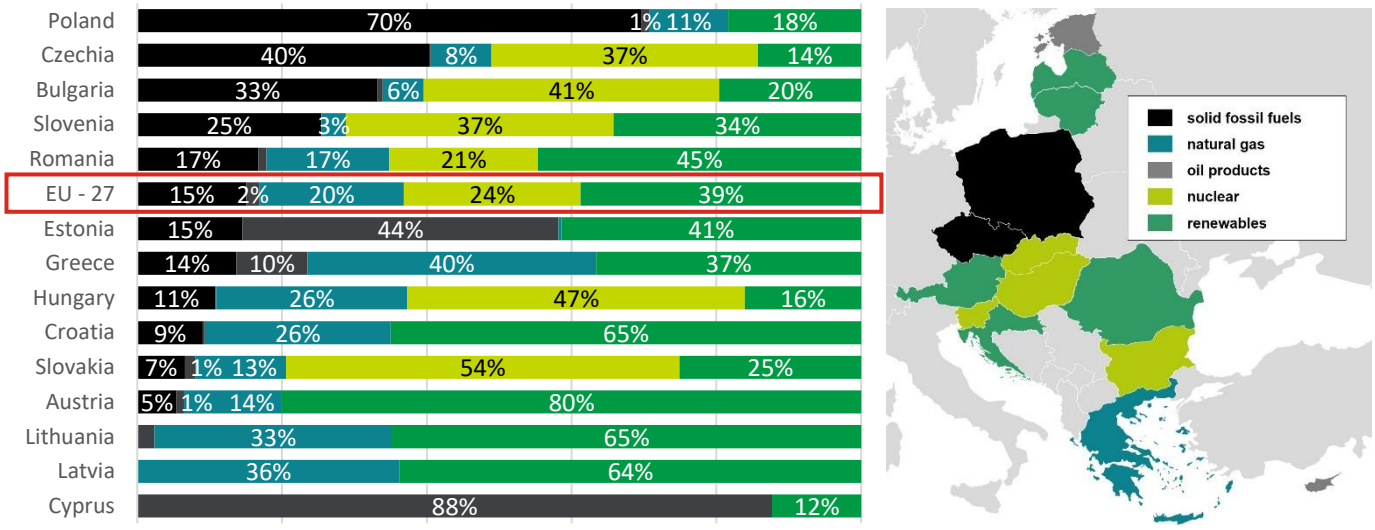
Source: European parliament briefing, Climate action - latest play, 2019

[1] Climate action in the European Union Latest state of play, European Parliament briefing, December 2021

Decarbonisation is most advanced in power generation

As with the European Union in general, the most noticeable progress in the regional decarbonisation can be found in the power generation sector. However, **to reach EU's climate neutrality target, the use of coal in the electricity sector must be phased out completely**. As you can see from the graph, the share of solid fossil fuels in power generation, from which 80 - 90% is coal, remained significantly above the EU average of 15% in Poland, Czechia, Bulgaria, Romania, and Slovenia in 2020.

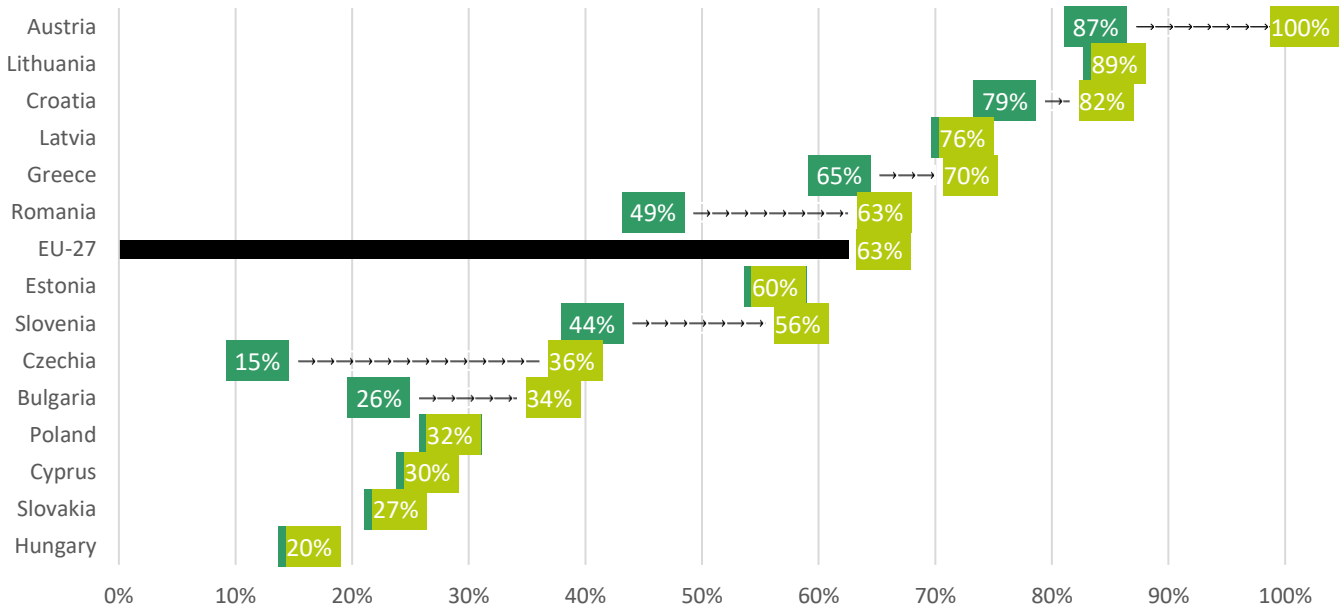
Figure 5: Power Generation by fuel (%)



Source: Eurostat, 2020

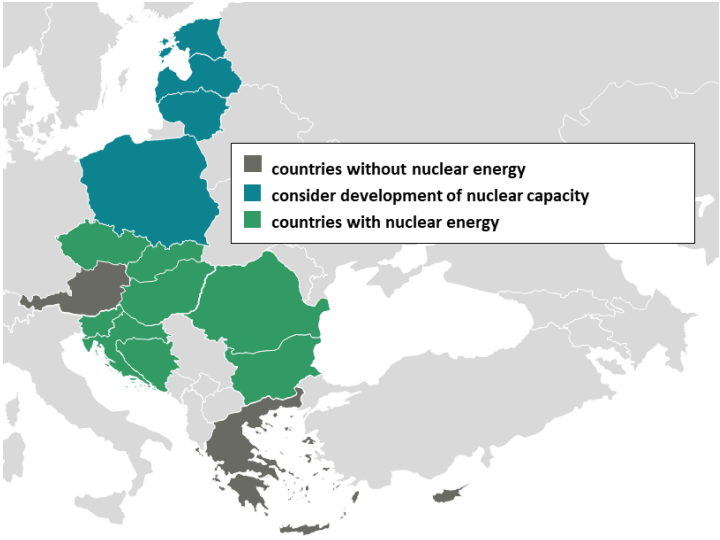
Targeted share of RES in power generation became more ambitious in selected countries in reaction to Russia's aggression in Ukraine. Austria, Croatia, Greece, Romania, Slovenia, Czechia, and Bulgaria all increased their 2030 targets from the goals previously declared in their NECPs in 2019. However, the targeted share of RES is still below the EU average in the case of some CEE/SEE countries, most visibly Hungary, Slovakia, Cyprus, Poland, Bulgaria, and Czechia.

Figure 6: Targeted share of RES in national power generation in 2030 (%)



Source: Ember, Shocked into action report, 1 June 2022

SPECIAL FOCUS: The role of nuclear power production is increasing in the CEE/SEE region



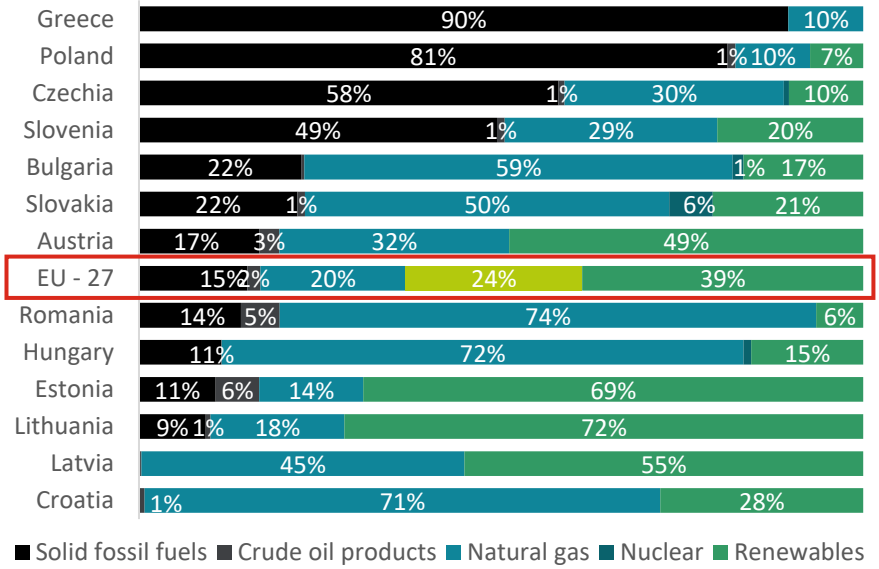
For some CEE/SEE countries, the way to both decarbonise their economy and strengthen energy security is through the employment of nuclear power. Countries highlighted in green on the map are already producing electricity based on nuclear energy. These countries plan or consider to increase or modernize their nuclear power plants portfolio. Poland, Lithuania, Latvia and Estonia marked in blue do not produce any nuclear energy but plan or consider development of nuclear capacity in the future.

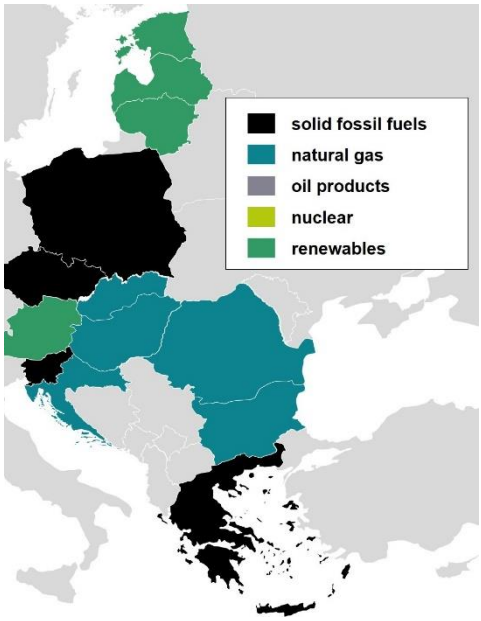
Contrarily Greece, Cyprus and Austria marked in grey do not produce any electricity from nuclear sources, and they also do not have any plans to develop nuclear energy. However, most of the EU members from the CEE/SEE region perceive nuclear energy to decrease their carbon footprint.

Decarbonisation of the heating and cooling sector is making some progress

The process of replacing fossil fuels with renewable energy sources and other zero-carbon solutions **in the heating and cooling sector has so far been slower** than in the power generation sector. While most EU countries produce heat from other fossil fuels (natural gas, oil/oil products) or renewable sources, a few CEE/SEE states rely heavily on coal. Greece, Poland, Czechia, Slovenia, Bulgaria and Slovakia produce more than 20% of their heat from coal. Greece produces almost all its heat from lignite, Poland 76% from hard coal, while Czechia produce almost 60% of its heat from coal (mostly using lignite).

Figure 7: Heating by fuel (%)



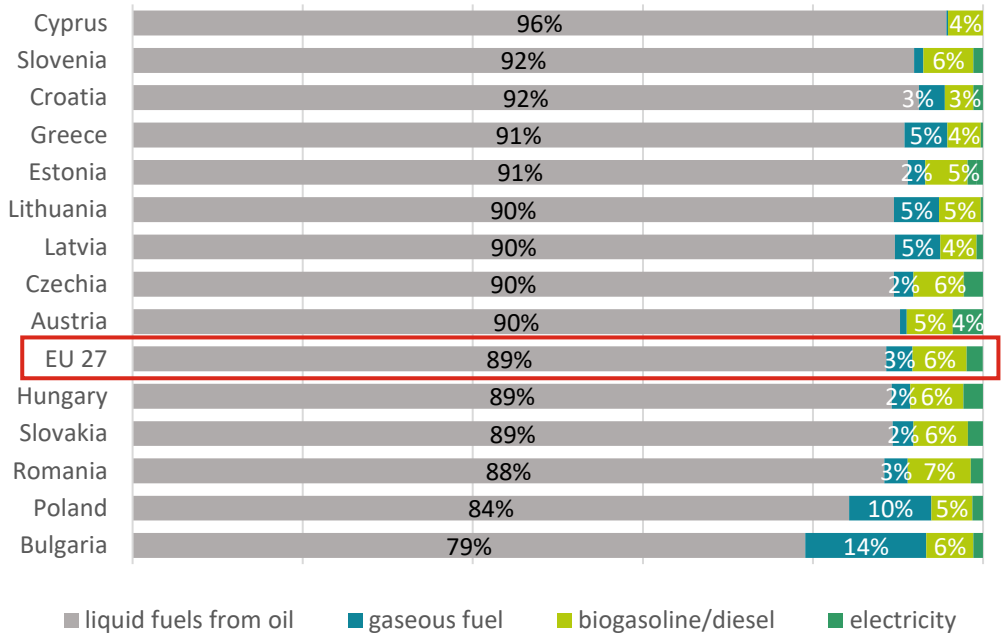


Source: Eurostat 2020, Eurostat does not report any heating consumption data for Cyprus

Decarbonisation in transportation has just started

For most countries in the CEE/SEE region, transport is the 1st or the 2nd largest contributor to GHG emissions. As of 2019, Bulgaria, Slovakia, Lithuania, Poland, Hungary, and Estonia were above the 2015 target of CO_2 emissions performance standard for new cars set at 130 gCO_2/km. It is important to note that the target was even lowered to 95 gCO_2/km from 2021.[2] The share of alternative fuels to the traditional liquid fuels from oil (mainly gaseous fuels and biogasoline/diesel) is so far not larger than 20% as shown in the graph below.

Figure 8: Transportation by fuel (%)



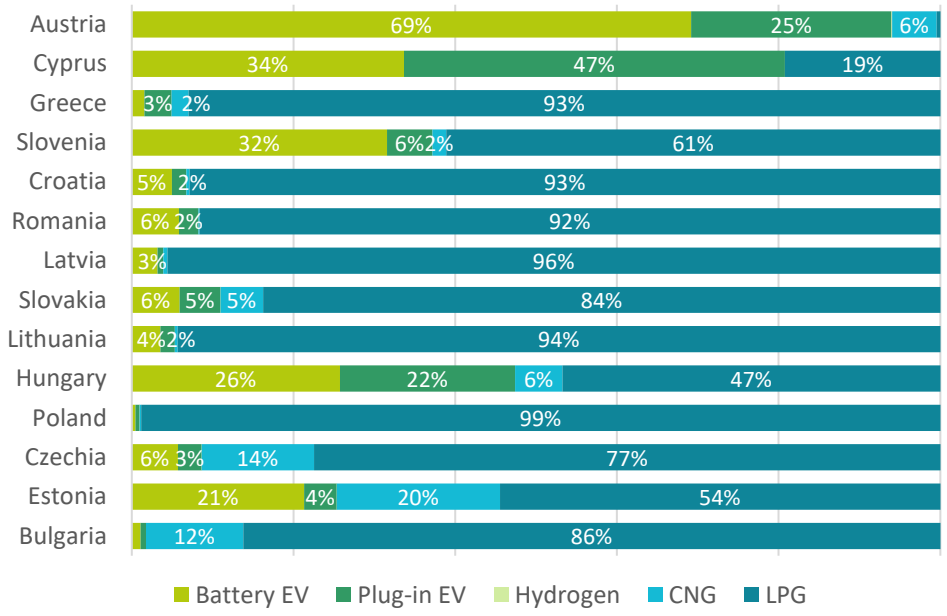
Source: Eurostat 2020

In the graphs below, you can see the employment of alternative fuels, in other words fuels or sources which serve, at least partly, as a substitute for fossil oil source in the transport sector. These sources require installation of alternative infrastructure that is not interchangeable. The below displayed sources are recognized as alternatives by the Directive 2014/94/EU.[3]

According to European Alternative Fuels Observatory[4], which collects and regularly updates data for all EU countries, liquified petroleum gas (LPG) dominates the alternative fuel mix for most of the countries in the region. The latest data updated in July 2022 reveal that **only Austria, Cyprus, Hungary, and Slovenia have a cumulative share of electric (battery electric vehicle (BEV)) and hybrid vehicles (plug-in hybrid electric vehicles (PHEV)) of 50% or more of the total alternative fuel vehicles.** Only Poland (111), Austria (55), Czechia (9), Slovakia (3), and Estonia (1) **have registered hydrogen passenger vehicles**.

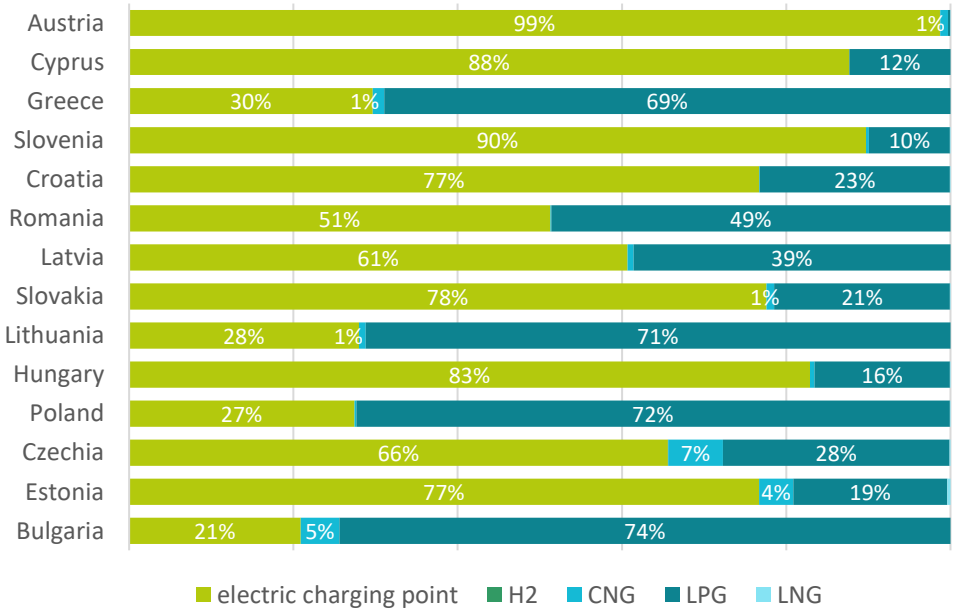
[2] Note: Other member states (outside of the CEE/SEE region) above the 2015 target were Luxembourg and Germany.
[3] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32014L0094
[4] https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road

Figure 9: Alternative fuel passenger vehicles, share by type (%)



Source: European Commission, European Alternative Fuels Observatory, July 2022. Note: The data shows only M1&N1 type

Figure 10: Alternative infrastructure points, share by type (%)

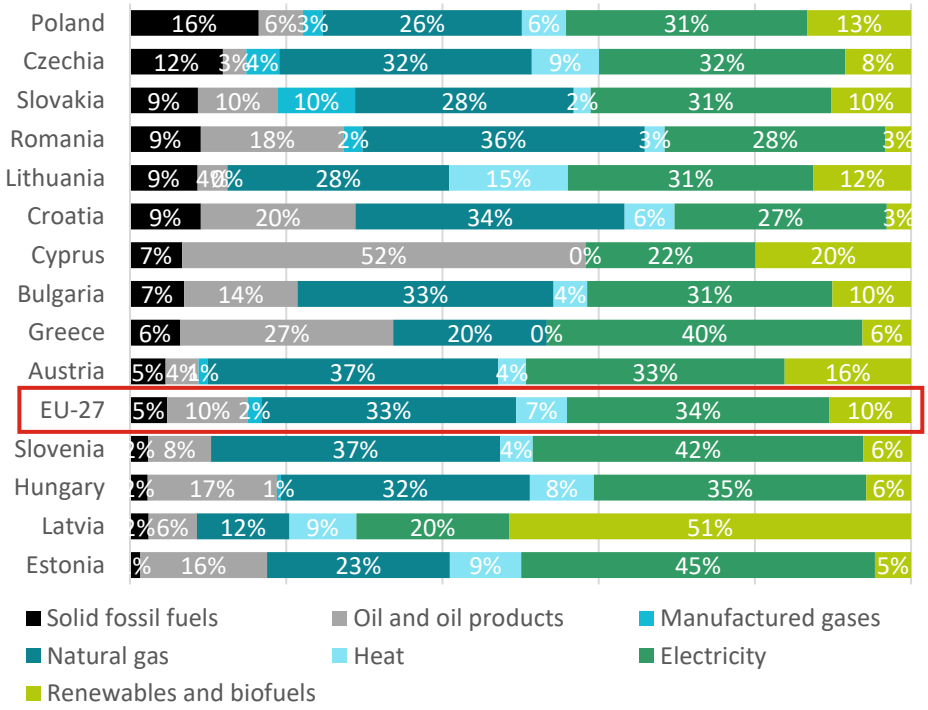


Source: European Commission, European Alternative Fuels Observatory, July 2022

Decarbonisation in industrial sectors is challenging [5]

In industry, decarbonisation proves to be very difficult as the process demands reimagining production processes and redesigning existing sites with costly rebuilds and retrofits. For companies adopting low-emission production this means a short- to mid-term cost increase, putting them at a disadvantage. According to Eurostat in 2020, the Czech Republic (28%), Slovenia (27%), Poland and Slovakia (24%), Hungary (23%), Romania (22%), Austria and Lithuania (21%) had a share of industry (except construction) larger than the EU-27 average of 20%, making their economies more vulnerable when implementing structural changes. Further, compared to the EU-27 average of 30%, the regional industry and manufacturing sector (except construction) employs almost half of the labour force in some CEE/SEE countries, with the most notable example being Czechia (54%), Slovakia (45%), Slovenia (43%) and Poland (43%) with shares above 40%. The impact of decarbonisation on employment must therefore also be considered by these member states. The chart below illustrates the dependency of regional industries on the emission-intensive fuels.

Figure 9: Final energy consumption in the industry by type of fuel



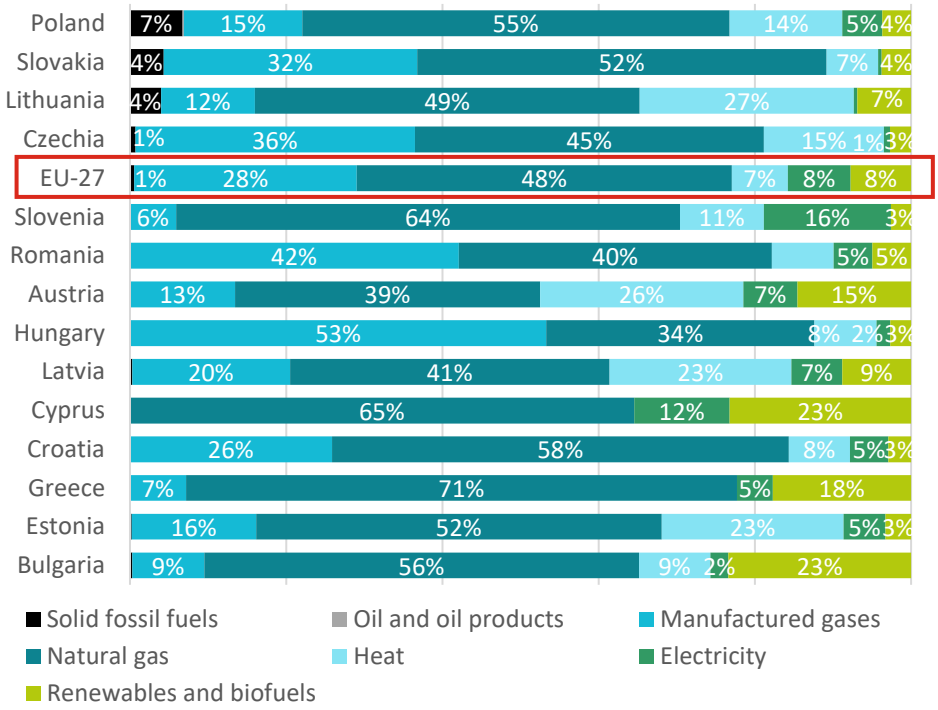
Source: Eurostat 2020

[5] Note Final energy consumption in industry covers the energy consumption of the NACE divisions: 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 41, 42 and 43. For NACE divisions 7, 8 and 9, only mining and quarrying of non-energy products is included. Quantities of energies transformed into another energy product are excluded from the industry sector and reported in the transformation sector (for example: electricity generation, coke ovens, blast furnaces, oil refineries)

Decarbonisation in services[6]

In the services sector, the region overall follows the EU-27 progress and approaches decarbonisation using the same tools of energy efficiency measures and targeting the same emission sources, mainly buildings. Outliers are Poland, Slovakia and Lithuania which still utilize solid fossil fuels in the final energy consumption of this sector as presented in the graph below.

Figure 10: Final energy consumption in services by type of fuel



Source: Eurostat 2020

[6] Final energy consumption in services covers the energy consumption of public and private entities in the NACE divisions 33, 36, 37, 38, 39, 45, 46, 47, 52, 53, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 84 (excluding Class 8422), 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96 and 99. Also includes fuel used by all non-transport activities of NACE Divisions 49, 50 and 51 (such as heating and lighting of buildings).

SPECIAL FOCUS: The role of low-carbon gases in hard-to-decarbonise sectors

Following the Russian invasion of Ukraine, the European Commission started to look for alternative gas sources to reduce EU's reliance on Russian natural gas. Simultaneously, it boosted its existing plans for the increased role of renewables, among which the low-carbon gases hydrogen and biomethane have a significant role to play.

Increase of renewable gases such as biomethane and synthetic methane is a natural choice as it can directly substitute Russian natural gas. **There is also no need for any major investment in the current gas infrastructure as it is already ready for the uptake and transportation of these gases.** As there is still a great potential to increase the production of biomethane in the European Union, such production could both add economic value and increase the security of supply in EU. Several EU-member states in the CEE/SEE region do include biomethane in their National Energy and Climate Plans (NECPs) as a part of their plans to decarbonise the energy mix – see country sheets.

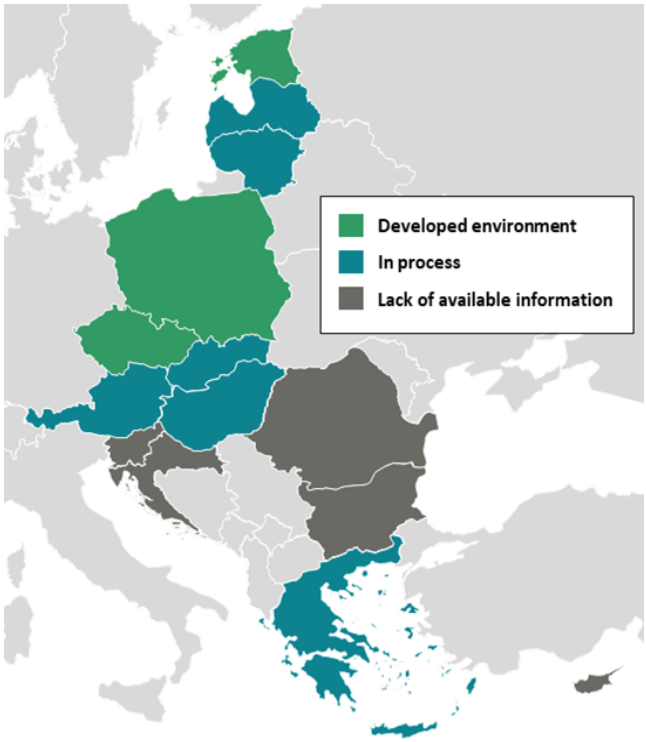
17 billion cubic meters

(bcm) of annual natural gas imports could be replaced by biomethane, according to the EU's plans.

We assess the current political and legislative environment based on existence of official documents and relevant actors in each country. The progress is presented in the maps below. Detailed information about the state of each country can be found in the Part III: Country analysis.

Biomethane: political environment

Biomethane: legislative environment



Source: Various national sources compiled by Deloitte

10 million tonnes by 2030 of each domestic renewable hydrogen production and imports by 2030, a target set by the European Commission

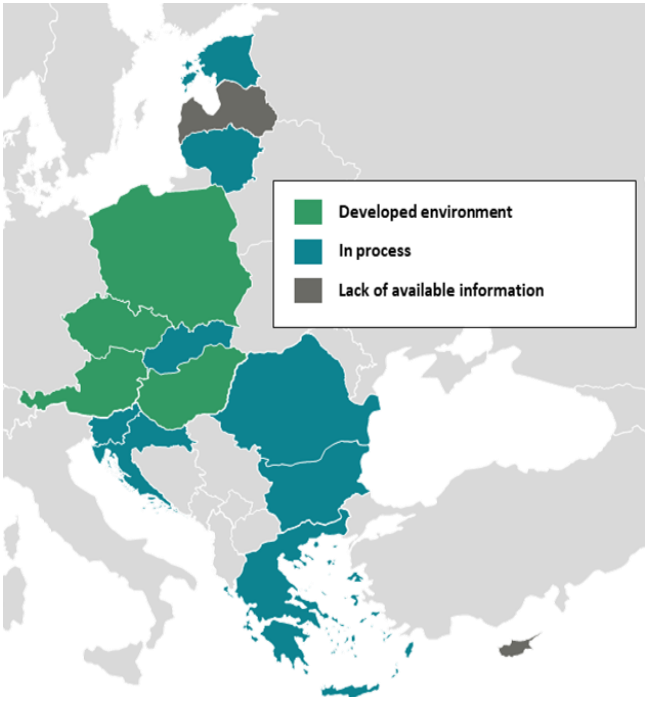
Like biomethane, **hydrogen could replace natural gas, coal and oil in hard-to-decarbonise industries and transport sectors**. The EU executive also identified Ukraine as one of the key sources of imported green hydrogen as it offers excellent conditions for large-scale production.

Ramping up the hydrogen economy is difficult. It means building up an entirely new value chain from production via transportation to the consumer on an industrial scale. As the value chain consists of different entities, some commercial and others fully regulated, that requires a consistent political and regulatory framework and incentives to invest in the necessary technologies and systems at the various steps of the value chain.

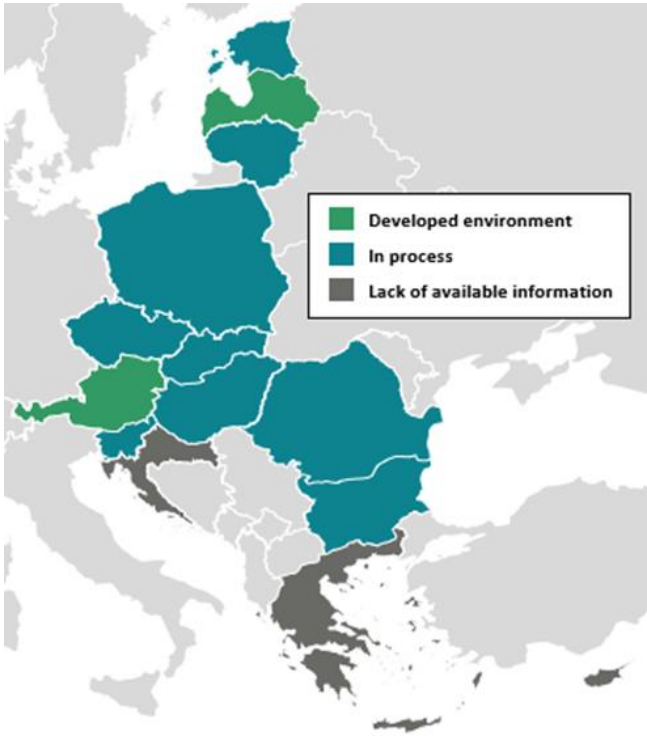
- Commercial producers of hydrogen require clear and pragmatic electricity procurement criteria for electrolysers, investment incentives for electrolysers used in hydrogen generation and a fast planning and approval processes for renewables and electrolysers.
- Regulated gas transmission operators need a common grid fee regulation for natural gas, biomethane and hydrogen to secure funding for repurposing natural gas pipelines and to avoid an excessive cost burden for pioneering hydrogen customers.
- Hydrogen storage operators need financial subsidies for new hydrogen storages and/or for repurposing natural gas storages to hydrogen storages.
- Hydrogen consumers need a clear framework for how hydrogen consumption can be credited against meeting their climate targets.

The challenge is to align the entire value chain, and to correctly set the framework. If a given step is incorrectly set, there is a risk that the entire hydrogen ramp-up will become more expensive or be substantially delayed. Here again, the maps below illustrate the progress in adopting hydrogen technologies in the region. We assess the current political and legislative environment based on the existence of official documents and relevant actors in each country. Detailed information about the state of each country can be found in the Part III: Country analysis.

Hydrogen: political environment



Hydrogen: legislative environment



Source: Various national sources compiled by Deloitte

SPECIAL FOCUS: Ukrainian Hydrogen Corridor

The European Hydrogen Backbone (EHB) initiative has identified five hydrogen import corridors to cover the new demand for renewable hydrogen. One of these corridors focuses on transportation of hydrogen produced in Ukraine. Below are two concrete gas infrastructure initiatives related to this Ukrainian hydrogen corridor.

PROJECT (1): H2EU + STORE PROJECT

H2EU+Store is an international industry partnership founded to accelerate the market ramp-up of green hydrogen in Central Europe.
Participating companies include RAG Austria, Eco-Optima, Bayerngas, bayernets, OGE, Gas Connect Austria, EUSTREAM, NAFTA, Gas TSO of Ukraine, Storage System Operator of Ukraine and MND.

H2EU+Store is structured as an integrated project by looking at the entire value chain (from production, transport and storage and including the consumer market) of the future hydrogen market. The goal is to import green hydrogen from prospective countries for large scale hydrogen production (such as Ukraine) to Austria and Germany. The Hydrogen storage facilities of RAG Austria (e.g. Underground Sun Storage 2030) will be used to secure and structure the (seasonal) demand of the Hydrogen consumers. Also, NAFTA is starting a project for storing of hydrogen (the project was awarded a status of IPCEI).

The project has 3 implementation phases: 2030 (2.5 TWh) / 2040 (40 TWh)/ 2050 (80 TWh). More information at www.h2euplusstore.com.

PROJECT (2): Central European Hydrogen Corridor

In 2021, four leading Central European gas infrastructure companies joined forces to develop a joint initiative called the Central European Hydrogen Corridor (CEHC). The aim of CEHC is on developing a hydrogen import "highway" from Ukraine via Slovakia and the Czech Republic to large hydrogen demand areas in Germany and the EU. The hydrogen corridor will also enable the transportation of hydrogen between hydrogen production facilities and hydrogen consumers in the Czech Republic and Slovakia.

Central
European
Hydrogen
Corridor

Participating companies include EUSTREAM (the Slovak gas TSO), GTSOU (Gas TSO of Ukraine), NET4GAS (the Czech gas TSO) and OGE (a leading German gas TSO).

The CEHC Initiative believes that such a corridor for the transportation of hydrogen from Ukraine to Germany can be created based on repurposed existing gas infrastructure, combined with targeted investments in new dedicated hydrogen pipelines and compressor stations. This enables dedicated hydrogen transport over long distances at affordable costs.

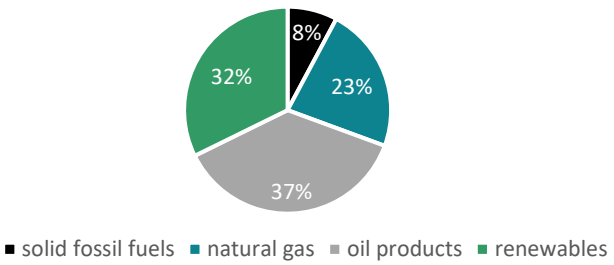
The current plan is to complete the project by 2030, with work starting already in 2024. However, turning this project into reality requires an appropriate framework and the necessary investment conditions to be in place. More information at www.cehc.eu.

Part III: Country Analysis

Austria

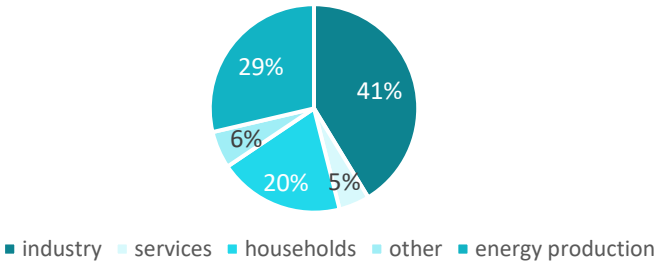
has one of the largest shares of renewable energy in the total energy consumption, taking advantage of the country's high renewable energy potential, especially in hydropower.

Total energy consumption by fuel



Source: Eurostat 2020

Consumption of natural gas by sector



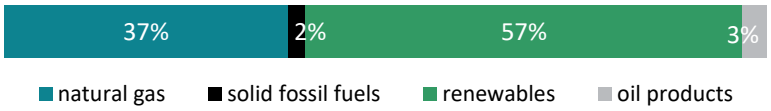
Source: Eurostat 2020

Renewables and crude oil products play the main role in Austrian energy consumption. In 2020 they constituted 32 % and 37 % of the energy consumption respectively. Austria has a geographically advantageous location which gives it **high energy potential primarily from hydro and in addition from wind, and PV**. Further, it passed legislation subsidizing renewable resources which supports its **aim to produce 100 % of its electricity from RES by 2030 (yearly balanced).** While natural gas which accounts for 23 % of the overall energy mix still plays a key supporting and balancing role for the whole energy system, Austria intends to move to renewable gases, biomethane and hydrogen, in the next decades.

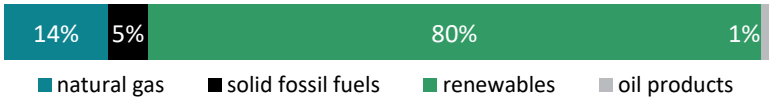
On average, around 10 TWh of Austria's gas were obtained through domestic extraction of natural gas over the last five years. Domestically produced amounts of bio-methane have so far been negligible (0.14 TWh). **The remainder of the natural gas used is imported (79 TWh)**, Austria has a storage capacity of 95 TWh, which means it could store more than its annual gas consumption.

80 %
of natural gas was imported in 2020 from the Russian Federation

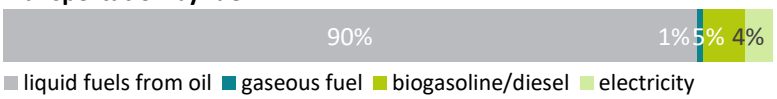
Heating sector by fuel



Power generation by fuel



Transportation by fuel



Source: Eurostat 2020

Austria's heating sector is quite decentralized with 76 % of dwellings having their own heating sources. Austria decided to ban gas boilers in new buildings as of 2023. Decarbonisation of the sector is further supported by a requirement to replace broken oil and coal heaters with green options.

Austrian power comes mostly from RES, where the intermittency of PV and wind is compensated by large hydropower plants.

Austria further aims to utilize its RES potential to decarbonise the transportation sector. The country has the most developed EV infrastructure out of all CEE/SEE countries (approx. 8 000 chargers in 2020).

83 $MtCO_2e$
Total GHG emissions

Austria generates 2.2 % of the EU's total greenhouse gas (GHG) emissions and its carbon intensity is lower than the EU average. The transport sector accounted for 30 % of Austria's total emissions in 2019 and its share is continuing to rise, whereas in 2019 the energy industries accounted for just 13 % of the total emissions. Austria's target for emissions reduction has been set for 2030 at around 36.4 Mt CO_2eq. The country is aiming to reach carbon neutrality by 2040.

SPECIAL FOCUS: The role of gases in the decarbonisation of Austria[7]

Natural gas

60-89 TWh
Planned consumption in 2030

The present imports of natural gas can neither be substituted immediately nor in the short term. The need to diversify away from Russian sources means that Austria will need to import 36 TWh of gas from other sources in 2030. Part of the volume needs to be replaced by imported renewable gas. According to the Renewable Gas in 2040[8] study from 2021, the demand for gaseous energy carriers (methane and hydrogen) should grow by 2040 and range between 89 TWh and 138 TWh (67-75 TWh of that for hydrogen). Austria plans to publish renewable gases act.

Biomethane

One of the twelve flagship projects mentioned in NECP aims to prepare a legal framework and a tax for biomethane. **NECP predicts that 13 petajoules of biogas and biomethane will be consumed in the country in 2030 annually,** four times the 2021 consumption. According to NECP natural gas will be replaced by biomethane from biogenic residues and waste and by synthetic methane from renewable power sources.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment
There is an active Association[9] focused on the sustainable development of biogas and biomethane production and consumption. Biomethane is also covered by NECP, however, there are no specific strategies for biomethane.

Legislative environment
There are no direct national incentives for biomethane at this moment. However, **NECP sets a target to implement tax incentives for biogas development.**

Hydrogen

Austria has high ambitions to develop an advanced hydrogen economy. **According to the NECP[10], hydrogen will be one of the key technologies for sector coupling and integration**. New regulations and tax incentives should boost the development of the hydrogen economy. These measures aim to develop the entire hydrogen supply chain. According to the Austrian hydrogen strategy, the **country set a target of having 1 GW of installed capacity of electrolyzers by 2030**. **This capacity will be able to produce up to 10 Mt of hydrogen annually**, with a total of 80 % of the volume to be climate neutral by 2040.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment
In Austria, there are several hydrogen associations and platforms[11] that promote hydrogen solutions and connect stakeholders from government, industry, and research. **Austria also has its hydrogen strategy[12]** with specific goals for individual sectors and **includes hydrogen in national plans for the deployment of alternative fuels infrastructure**.

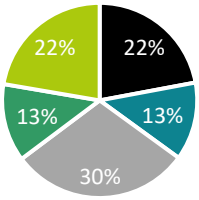
Legislative environment
Specific tax incentives for hydrogen are already implemented and **Austria is part of the HyLaw[13] project**, which aims to identify the status and legislative barriers to hydrogen development. The presented tax reforms focus on the support of the production of low-carbon hydrogen and other low-emission fuels and the demand for hydrogen in transport.

7 Planned gas consumption in 2030 source: https://www.energyagency.at/fileadmin/1_energyagency/presseaussendungen/allg._pa/2022/04_independence_from_russian_gas_analysis_aea_bmk_2022.pdf, page 4
8 https://www.energyagency.at/fileadmin/1_energyagency/presseaussendungen/allg._pa/2021/06_erneuerbares_gas_2040_final_barrierefrei_juni21.pdf
9 https://www.kompost-biogas.info/
10 https://energy.ec.europa.eu/system/files/2020-03/at_final_necp_main_en_0.pdf
11 WIVA P&G Energy Model Region: https://www.wiva.at/; H2Austria: https://www.h2austria.eu/; Hydrogen Austria: https://www.hydrogen-austria.at/; HyCentA (Hydrogen Center Austria): http://www.hycenta.at/
12 https://www.bmk.gv.at/themen/energie/energieversorgung/wasserstoff/strategie.html
13 https://www.hylaw.eu/

Bulgaria

has large coal reserves, with large shares of the oil and natural gas imported. To decarbonise and increase energy security Bulgaria needs to reduce dependency on all three.

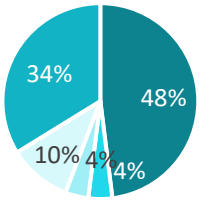
Total energy consumption by fuel



■ solid fossil fuels ■ natural gas ■ oil products ■ renewables ■ nuclear

Source: Eurostat 2020

Consumption of natural gas by sector



■ industry ■ services ■ households ■ other ■ energy production

Source: Eurostat 2020

Crude oil products together with solid fossil fuels and nuclear energy play the main role in the Bulgarian fuel mix. **The Bulgarian electricity market is currently in transition, but nuclear power is expected to remain dominant. The government is slowly decreasing its coal power capacity to gradually replace it with RES.** A considerable share of Bulgarian RES comes from hydropower. However, Bulgaria has very favourable conditions for PV plants due to its location in the southern part of Europe. Its access to the Black Sea also opens opportunities for 116GW of technically feasible plants offshore wind plants. Most of the gas is consumed by the Bulgarian industry, which comprises metallurgy and machinery production and other energy-heavy industries.

Bulgaria consumes about 3 bcm (30 TWh) of gas per year, about 99.4 % of which are imports. In December 2020, Bulgaria started receiving small quantities of gas from Azerbaijan. In July 2022, Bulgaria completed an interconnector with Greece with an initial capacity of 3 bcm and a potential to raise it to 5 bcm. Located by the Black Sea, Bulgaria can explore the LNG options. Onshore exploration opportunities exist in the Western and Northern parts of the country. Bulgaria has a storage capacity of only 5,8 TWh, which makes it more vulnerable in case of import disruption.

90 %

of natural gas used to be imported from Russian Federation

Heating sector by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear

Power generation by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear ■ oil products

Transportation by fuel

■ liquid fuels from oil ■ gaseous fuel ■ biogasoline/diesel ■ electricity

Source: Eurostat 2020

Bulgarian heating sector is highly dependent on natural gas. As there is large share of electricity produced from nuclear sources, there is **potential for better management of waste heat from the nuclear power** which could be used to partially substitute heat produced from natural gas.

Nuclear energy accounted for 41 % of the power generation in 2020. Bulgaria has large PV and onshore and offshore wind potential for additional capacities to be developed which could replace solid fossil fuels.

Bulgarian **transportation sector is highly dependent on liquid fuels from oil**. With only 195 EV chargers, its infrastructure for electric vehicles is very weak and decarbonisation of transportation will require considerable development of infrastructure.

57.2 $MtCO_2e$

Total GHG emissions

Bulgaria is the most GHG-intensive economy in the European Union. The energy sector remains the main source of these emissions due to the utilization of coal. Bulgaria's 2030 target for greenhouse gas emissions not covered by the EU Emissions Trading System (nonETS) is 0 % compared to 2005. Renewable share is set at 27 % of gross final consumption of energy by 2030.

SPECIAL FOCUS: The role of gases in the decarbonisation of Bulgaria[14]

Natural gas

44.4 TWh
Planned gas consumption in 2030

The utilization of natural gas in 2030 is predicted to remain at the current level of 3 bcm/year and the remaining volume should come from renewable gases. Bulgaria will import some 1 bcm of natural gas per year from the Shah Deniz II field in Azerbaijan for a period of 25 years under a contract with SOCAR and talks to increase the volume are underway. Remaining natural gas is expected to come from LNG through the IGB interconnector.

Biomethane

Bulgaria's NECP does not primarily mention the use and development of biomethane. According to the projections of the report, **biogas and off-gases could reach up to 680 GWh in 2030**. Projection of the development in renewable transport technology shows no use of biogas and consequently no biomethane. According to the National Energy strategy[15] **published in 2020, biogas has the technical potential to cover a 6 % share of RES** in the country.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment

The technical potential of biogas is mentioned in the National Energy Strategy of 2020. **Biomethane is not explicitly mentioned in this document or other relevant national strategies**. In Bulgaria, there is Biogas Association, which was established in 2017 with no significant activity yet.

Legislative environment

Specific tax incentives to encourage the use of biomethane are not currently implemented. However, one of the targets of the National Energy Strategy published in 2020 is the creation of an appropriate legislative framework that will enable biogas producers to subsequently produce biomethane and push it into the gas transportation network.

Hydrogen

According to the NECP[16], Bulgaria intends to enable the integration of hydrogen in its energy and transport. The country **expects an annual final hydrogen consumption of 32 GWh in the transport sector by 2030**, which will be facilitated by the planned deployment of hydrogen refuelling stations. The hydrogen should be produced by electrolysis using renewable electricity. **According to Bulgaria's NECP a pilot project for hydrogen production with a total installed capacity of 20 MW is planned.** There is currently a limited number of projects operating in the country and most Bulgarian hydrogen is fossil-fuel based. According to Bulgaria's Sustainable Energy Development Strategy[17], the **country intends to prepare key gas infrastructure for hydrogen transport by 2030**.

Hydrogen application areas mentioned in NECP

Energy	Heating*	Industry*	Transportation*

*Bulgaria sets policy goals for hydrogen in these sectors in other relevant strategic documents.

Political environment

In Bulgaria, **there is an active** hydrogen association [18]bringing together approximately 10 stakeholders. **Bulgaria does not have its hydrogen strategy**, but hydrogen is mentioned in other strategic documents and road maps focusing on innovation and sustainable development. **Bulgaria includes hydrogen in national plans for the deployment of alternative fuels infrastructure** (2014/94/EU).

Legislative environment

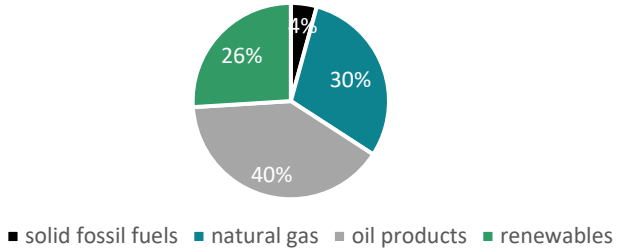
Specific tax incentives to encourage the use of renewable or low-carbon hydrogen or other legislation are not currently implemented. Nevertheless, **Bulgaria is part of the HyLaw[19] project**, which aims to identify the status and legislative barriers to hydrogen development.

[14] 2030 planned gas consumption source: ДЕ С ЕТ ГОДИШЕН ПЛАН ЗА РАЗВИТИЕ НА МРЕЖИТ Е НА „БУЛГАРТ РАНСГАЗ" ЕАД ЗА ПЕ РИОДА 2021– 2030г ., Bulgartransgaz, 2021, page 39
[15] http://www.seea.government.bg/documents/EnegyStrategyEN.PDF
[16] https://energy.ec.europa.eu/system/files/2020-06/bg_final_necp_main_en_0.pdf
[17]https://www.moew.government.bg/bg/strategiya-za-ustojchivo-energijno-razvitie-na-republika-bulgariya-do-2030-g-s-horizont-do-2050-g-i-proekt-na-integriran-nacionalen-plan-v-oblastta-na-energetikata-i-klimata-inpek-na-republika-bulgariya-do-2030-g/
[18] https://bgh2a.bg/
[19] https://www.hylaw.eu/

Croatia

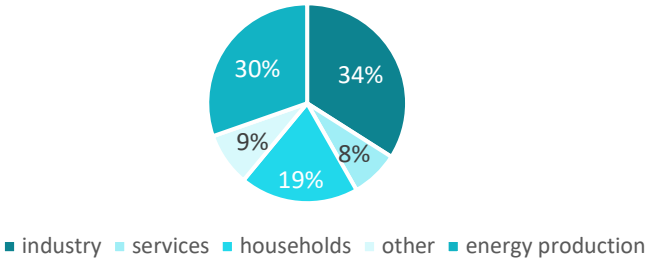
plays a role in the region's energy security as it operates an LNG terminal, the first one to serve Balkan directly.

Total energy consumption by fuel



Source: Eurostat 2020

Consumption of natural gas by sector



Source: Eurostat 2020

Croatia, unlike most of its Western Balkan neighbours, no longer has its own coal reserves. A full coal phase-out is expected to follow before 2030. **Croatia is somewhat dependent on electricity imports, depending on hydrological conditions as around 30 % of its electricity comes from hydropower on average** (increasing to 48.8 % in 2021). Croatia has a higher use of natural gas in services than other countries in the region. Its **industry is more dependent on gas compared to other countries in CEE/SEE.** The most prominent subsections in the Croatian industry contributing to gas consumption are manufacturing and chemical products.

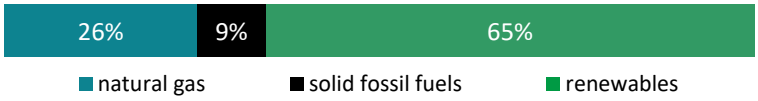
Croatia consumes around 3 bcm (30 TWh) of gas annually, of which some 65 % come from imports. Croatia has its own natural gas production with 0.78 bcm produced in 2021. New plans to increase the gas output will mean that domestic production could cover 40 % of the country's demand. In 2021 Croatia opened its first **LNG terminal with a current annual capacity of 2.9 bcm, through which around 57 % of the total natural gas supply was imported**. Croatia can only store 4.7 TWh or 15 % of its gas consumption.

22 %

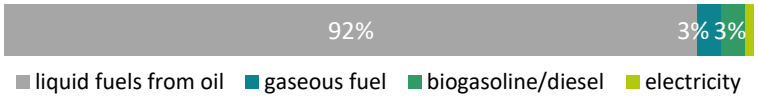
of natural gas used to be imported from Russian Federation

Heating sector by fuel

Power generation by fuel



Transportation by fuel



Source: Eurostat 2020

The Croatian heating sector is highly dependent on natural gas. However, **the volume used for heating is relatively low** due to the favourable climate.

While there is a high share of RES in power generation, **Croatia still relies on power from natural gas and solid fossil fuels.** Croatia also technically produces electricity from nuclear power as it owns 50 % of a nuclear power plant in Slovenia, from which electricity is imported.

Almost a quarter of Croatia's transportation is dependent on gas. However, the intent to decarbonise is slowly showing through continuous absorption of EU funding. For instance, in July 2022, the Croatian Ministry of the Sea, Transport and Infrastructure expanded on cooperation with EIB for the development and financing of transport.

19.3 $MtCO_2e$

Total GHG emissions

Croatia generates 0.7 % of the EU's total greenhouse gas (GHG) emissions and has reduced emissions at a slower pace than the EU average since 2005. The transport sector accounted for over a quarter of Croatia's total emissions in 2019, of which road passenger transport was 71.6 %, road freight 24.7 %, rail 0.8 %, maritime and river transport 2.4 % and domestic air traffic 0.5 %. The Croatian building stock is also responsible for a significant share of total emissions. Energy industry emissions fell by almost 40 % between 2005 and 2019.

SPECIAL FOCUS: The role of gases in the decarbonisation of Croatia[20]

Natural gas

25,2 TWh

Planned gas consumption in 2030

The planned consumption of natural gas remains unchanged.

Biomethane

Although NECP does not mention the use of biomethane in more detail, the **report mentions the intention of injecting biomethane into the gas network and the use of biogas for biomethane production in general**. National Energy strategy [21]from 2009 briefly mentions biomethane's role in the transport sector. The strategy also claims that the domestic production of biogas should be stimulated but mentions no other details or targets.

Biomethane and biogas application areas mentioned in NECP

✓ Developed environment ✓ In process ✗ Lack of available informations

Energy	Heating	Industry	Transportation*

*Croatia generally mentioned the use of biomethane in these sectors in other relevant strategic documents

✗ **Political environment**

In Croatia, there is no association focused on biomethane. **Biomethane as a separate component is also not covered any subsidy scheme and the government does not introduce any strategy or roadmap for developing biomethane or biogas.** The association OIE Hrvatska [22]focuses on RES in general.

✗ **Legislative environment**

Specific tax incentives to encourage the use of biomethane are not currently implemented.

Hydrogen

According to the NECP[23], by 2030 Croatia intends to cooperate on research and development in the field of hydrogen with other countries in the region. **More significant development of hydrogen in Croatia is expected after 2030.** At the same time, **NECP assumes that in 2040, 0.01 PJ or 2.8 GWh of hydrogen will be consumed mainly in inland transport**. To further develop the inland market, the transport sector plans filling stations and technical standards for hydrogen.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

✓ **Political environment**

In March 2021, **Croatia started the creation of its hydrogen strategy**, which is supposed to set more immediate goals for the production and consumption of hydrogen. **There is also an active** National Hydrogen Association[24], which is gradually developing cooperation between industry and research in the field. However, **Croatia does not include hydrogen in national plans for the deployment of alternative fuel infrastructure** (2014/94/EU).

✗ **Legislative environment**

Specific tax incentives to encourage the use of renewable or low-carbon hydrogen or other legislation are not currently implemented. Croatia also isn´t part of the HyLaw project, which aims to identify the status and legislative barriers to hydrogen development.

[20] Planned gas consumption in 2030 source: Strategija energetskog razvoja Republike Hrvatske do 2030. s pogledom na 2050. godinu, Ministarstvo zaštite okoliša i energetike, 2020, page 19

[21] https://mingor.gov.hr/UserDocsImages/UPRAVA%20ZA%20ENERGETIKU/Strategije,%20planovi%20i%20programi/Energy%20Staregy%20of%20the%20Republic%20of%20Croatia.pdf

[22] https://oie.hr/

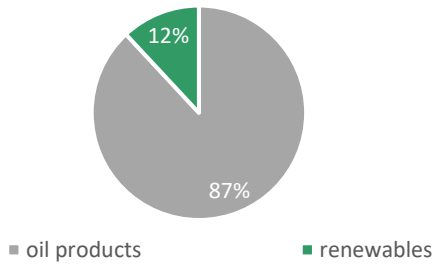
[23] https://energy.ec.europa.eu/system/files/2020-01/hr_final_necp_main_en_0.pdf

[24] http://croh2.fesb.unist.hr/

Cyprus

is an outlier country in the CEE/SEE region. Its energy consumption is rather unique due to its climate and economic activities. However, Cyprus can play a role in the natural gas market due to its newly discovered gas field estimated to hold 125 bcm.

Total energy consumption by fuel



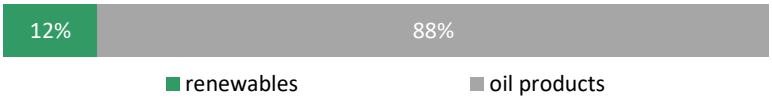
Source: Eurostat 2020

Almost 90 % of Cyprus's GDP comes from services and only very little from industry including cement plant and a small number of brick and tile factories. **Cyprus does not consume any natural gas** and all its energy needs are met from crude oil products and renewables. Oil covers around 90 % of the country's needs and therefore, further development of RES is needed to decarbonise. All oil products are imported with around half of them used to produce electricity and about a third going to the transport sector. A higher penetration of RES, primarily photovoltaics, would also reduce the island's electricity costs.

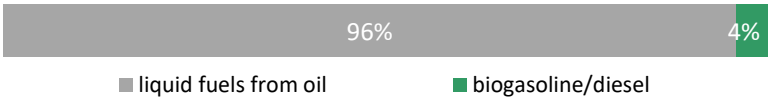
Although Cyprus does not consume any natural gas, it might become its producer. Final development plan for the Aphrodite offshore gas field will be presented by the end of 2022 with 2027 as a realistic date for production. The field might be then connected to existing infrastructure in the region or the Ikdu LNG terminal in Egypt. Gas exploration is also continuing in other Cypriot offshore blocks.

Residential energy consumption per capita increased by about 15 % between 2005 and 2019, due to growing demand for space cooling. The widespread adoption of solar water heating systems is currently the main technology option contributing to the relatively high RES share in the heating and cooling sector.

Power generation by fuel



Transportation by fuel



Source: Eurostat 2020

Oil-fired generation contributed to 90 % of the total generation mix in 2019 and the remainder was supplied by renewable energy sources (mainly wind and solar photovoltaics).

Mobility is largely dependent on motor vehicles for the transport of both passengers and goods. There are no railways, and public transport modes account for about 2 % of total passenger mobility. The share of electric vehicles is very low (some 370 registered BEVs and 520 PHEVs) and there are very few public charging stations (around 60).

9.4 $MtCO_2e$

Total GHG emissions

Total GHG emissions have been increasing slightly since 2013, reaching 8.9 MtCO2e in 2019. They reached a peak of 10 MtCO2e in 2008 and dropped by 21 % between 2008 and 2013 with the deep economic recession. Cyprus' NECP aims to reduce GHG emissions by 24 % by 2030 compared to 2005, including -24.9 % in ETS sectors and -20.9 % in non-ETS sectors (including industry, waste, and agriculture). In 2019, GHG emissions were 4 % below 2005 levels. The NECP sets a target of 23 % of renewables in gross final energy consumption by 2030, including at least 26 % in electricity, up to 39 % for heating and cooling, and up to 14 % for transport.

SPECIAL FOCUS: The role of gases in the decarbonisation of Cyprus[25]

Natural gas

10,3 TWh

Planned gas consumption in 2030

The planned consumption of natural gas remains unchanged.

Biomethane

NECP of Cyprus reports on the possible development of biogas technologies. **The current output of biogas technologies is 21 MW, by 2030 it is expected to increase to 50 MW and 64 MW by 2040**. NECP mentions biogas, the report does not provide more detailed references to biomethane.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment

In Cyprus, there are active associations involved in the development of biogas and biomethane, but their primary purpose is not the promotion and development of biogas and biomethane in the economy. The **Government also has not prepared a strategy for biomethane development**.

Legislative environment

Cyprus plans to introduce a policy framework and support scheme for the use of alternative fuels in transport to achieve sustainable mobility, but no other tax incentives or other legislation framework is implemented.

Hydrogen

Although Cyprus could produce hydrogen by electrolysis thanks to its PV potential, **Cyprus does not mention hydrogen development plans for 2030** in its NECP[26] or other relevant documents.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment

There is currently no strategy for hydrogen and no government plans to develop a roadmap in the nearest future.

Legislative environment

Specific tax incentives to encourage the use of renewable or low-carbon hydrogen or other legislation are not currently implemented. Cyprus also isn´t part of the HyLaw project, which aims to identify the status and legislative barriers to hydrogen development. According to the Commission, the creation of a hydrogen-specific legal framework is currently not envisioned in Cyprus.

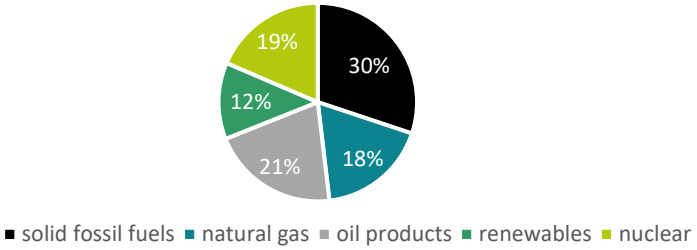
[25] Planned gas consumption in 2030 source: Εθνικό Σχέδιο της Κύπρου για την Ενέργεια και το Κλίμα, Theodoulos Mesimeris, ministerstvo životního prostředí / Nicoletta Kythraiotou, ministerstvo životního prostředí, 2020, page 217

[26] https://energy.ec.europa.eu/system/files/2020-01/cy_final_necp_main_en_0.pdf

Czech Republic

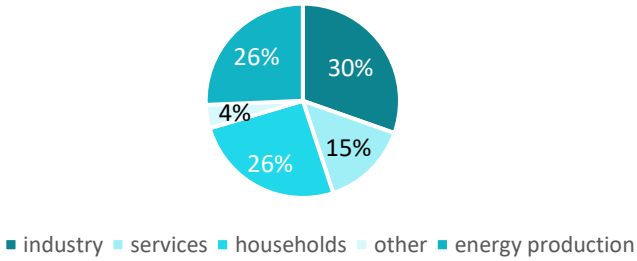
has large brown coal reserves, which play a significant role in both power generation and heating. Natural gas, which is a key source for the Czech industry, is almost entirely imported.

Total energy consumption by fuel



Source: Eurostat 2020

Consumption of natural gas by sector



Source: Eurostat 2020

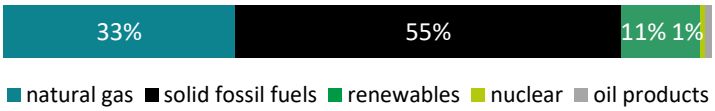
The Czech Republic's energy mix is largely based on solid fossil fuels and nuclear. Before the Russian invasion of Ukraine, the phase-out of coal seemed realistic before 2030 as the high emissions allowance costs were making coal power and heat production uneconomical. The national decarbonisation plans counted on natural gas as a replacement for solid fossil fuels, especially in heating, mainly due to its lower emissions. The country relies predominantly on old power plants and no new large-capacity sources were commissioned in the last decade. The Czech Republic's RES development is delayed. However, the boost should now come from the recent legislative change and available EU funding, especially in the transitioning regions.

The Czech Republic consumed 9.3 bcm (90 TWh) of natural gas in 2021 with almost equal shares going into industrial production, households, and the energy sector same as in 2020. Czechia imports 95 % of its gas consumption. The country's storage capacity is 43.7 TWh, covering only one-third of the natural gas consumption.

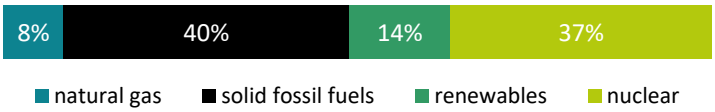
86 %

of natural gas used to be imported from Russian Federation

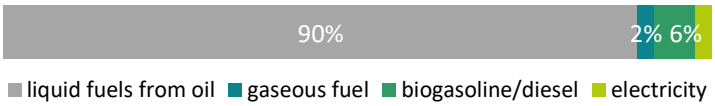
Heating sector by fuel



Power generation by fuel



Transportation by fuel



Source: Eurostat 2020

The heating sector is heavily dependent on coal (42 % in 2019) and natural gas (19 %). Large structural change is necessary to decarbonise the sector. A large part of the heat is supplied via a centralized network. Thus, Czechia aims to increase utilization of the nuclear waste heat in heating to decarbonise. In local heating, the replacement of solid fossil fuel boilers with natural gas boilers received substantial funding in the last couple of years.

Power generation also heavily utilizes coal (40 %). The second largest source is nuclear power (35 %) with an ongoing tender for new capacity. The share of RES was only 12 %.

The transport sector is highly dependent on fossil fuels as well. **Alternative fuels play a minor role in national transportation.** The Czech Republic has a noticeable charging infrastructure. Together with Poland and Hungary, it is the second largest in the CEE/SEE countries amounting to almost 3 000 points.

131 $MtCO_2e$

Total GHG emissions

Czechia generates 3.5 % of the EU's total greenhouse gas (GHG) emissions. Energy industries, manufacturing, and industrial processes account for 60 % of Czechia's total emissions. Energy industry emissions fell by almost 20 % in the 2005-2019 period. The biggest reduction of 45 % has been in the manufacturing industries and construction. The waste and transport sectors recorded the biggest increases in emissions over the period (24 % and 23 % respectively). Emissions linked to industrial processes and product use rose by 10 %.

SPECIAL FOCUS: The role gases in the decarbonisation of the Czech Republic[27]

Natural gas

117,7 TWh
Planned gas consumption in 2030

Czech Republic has not altered its 2030 target yet considering the Russian invasion of Ukraine and assumes that gas will still play an important role in its energy transition away from coal.

Biomethane

According to the NECP, Czechia plans to support the development of production and use of biomethane, especially in transport and heating. **It plans investment and operational support for biomethane.** The production of biomethane, its injection into the gas network, and other projects for the use of biomethane are already underway. **According to the NECP, biomethane production in the country should reach 500 mcm in 2030.**

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment

The country extensively describes plans for biomethane in its NECP and National Plan for Clean Mobility[28]. In the National Energy Strategy[29], biomethane is not directly mentioned, however, the document provides for the production and use of biological gases. **There is also an active biogas** association[30] **in the Czech Republic**, which brings together more than 100 members.

Legislative environment

Tax incentives for biomethane are included in financial support for other RES. The legislative framework further enables the **tax incentives for biomethane and other biological gases in transport and does not pose fundamental obstacles to injecting** biomethane into the gas system.

Hydrogen

The Czech Republic has ambitious goals to use hydrogen in transport, industry, and energy industries. It sets specific goals for the development of hydrogen in the NECP[31] and further develops them in the national hydrogen strategy. The strategy lays out detailed scenarios for the development of hydrogen in individual sectors and assumes **that in 2030 more than 95 thousand tons of low-carbon hydrogen will be consumed in the Czech Republic.** This volume equals the current production of fossil-based hydrogen in the country. **The transport sector and heavy industry should become the largest consumers of hydrogen**.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry*	Transportation

*Industry is not mentioned in NECP but already figures in Czechia's hydrogen strategy

Political environment

In Czechia, an active hydrogen association[32] **that** promotes hydrogen solutions and connects many stakeholders from government, industry, and research **already exists**. Czechia also **has its** hydrogen strategy[33] **with specific goals and includes hydrogen in national plans for the deployment of alternative fuel infrastructure** (2014/94/EU).

Legislative environment

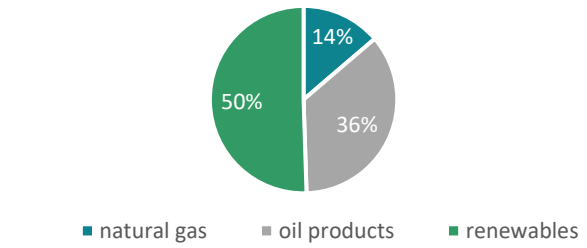
Specific tax incentives to encourage the use of renewable or low-carbon hydrogen or other legislation are not currently implemented. Czechia also isn´t part of the HyLaw project, which aims to identify the status and legislative barriers to hydrogen development. However, hydrogen is mentioned in legislation connected with alternative fuels in transport.

[27] Planned gas consumption for2030 source: Desetiletý plán rozvoje přepravní soustavy v České republice 2023 - 2032, NET4GAS, 2022
[28] https://www.mpo.cz/en/industry/manufacturing-industry/automotive-industry/national-action-plan-for-clean-mobility--179151/
[29] https://www.mpo.cz/dokument161030.html
[30] https://www.czba.cz/en.html
[31] https://energy.ec.europa.eu/system/files/2020-03/cs_final_necp_main_en_0.pdf
[32] https://www.hytep.cz/en/
[33] https://www.mpo.cz/assets/cz/prumysl/strategicke-projekty/2021/9/Hydrogen-Strategy_CZ_2021-09-09.pdf

Estonia

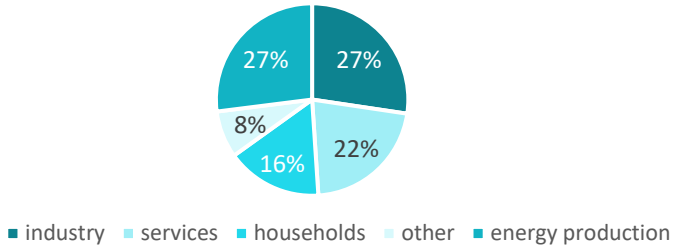
Estonia still relies on locally produced and highly polluting oil shale as its primary source of energy but is gradually moving to RES, mainly solid biomass.

Total energy consumption by fuel



Source: Eurostat 2020

Consumption of natural gas by sector



Source: Eurostat 2020

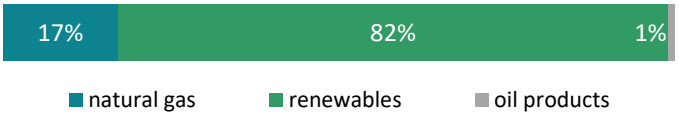
Estonia has a unique energy mix, where the energy supply is dominated by domestically produced oil shale, some 65 % of the final energy consumption of around 30 TWh. This gives the country a high degree of energy independence but also makes it one of the most carbon-intensive in the region. In early 2021, the new Estonian government announced plans to reach carbon neutrality by 2050. The share of RES in the gross final energy consumption reached 30 % in 2020. More than 90 % of renewable energy is from biomass. More than half of the Estonian territory is covered with forest and the role of forestry and wood industries in the Estonian economy is substantial, representing 11 % of GDP. Approximately 36 % of wood biomass removals in Estonia are primarily used for energy, mostly originating from low-quality wood, and felling residues. Gas consumption across the Baltic states is quite small, accounting for some 7 % in Estonia. District heating is the main natural gas consumer (34 % of consumption in 2019) in Estonia. Nearly a third of the gas is consumed by the residential-tertiary-agriculture sector (including 19 % for services and 15 % for households) and 26 % by industry.

Estonia's gas consumption has remained stable since 2015 at around 0.5 bcm (5 TWh). Estonia imports 100 % of its natural gas consumption. Estonia plans to temporarily replace Russian gas through the deployment of a floating LNG import terminal in Paldinski and to acquire some 1TWh of gas to be stored in Latvian storage.

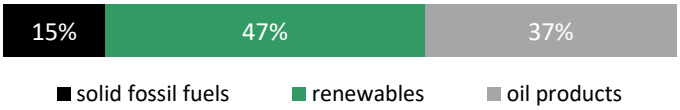
100 %

of natural gas used to be imported from Russian Federation

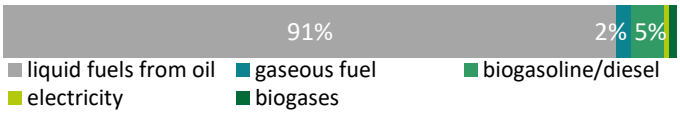
Heating sector by fuel



Power generation by fuel



Transport by fuel



Source: Eurostat 2020

District heating takes up around 60 % of heating in Estonia and its continuous growth is supported by the government. 50 % of heating is covered by biomass.

Electricity production from oil shale was radically reduced in 2019 (by 50 %). For now, the reduction is compensated with electricity imports from neighbouring countries. **The electricity generated from RES was 28.3 %, dominated by biomass.** The solar and wind capacity is small but projected to quadruple in the next decade.

The final energy consumption in transport is slightly increasing, with renewable energy/fuels showing an upward trend in the past years. **In 2019 renewable energy in transport was around 4 %**, mostly through biofuels.

15.2 $MtCO_2e$

Total GHG emissions

Estonia generated 0.4 % of the EU's total greenhouse gas (GHG) emissions. Between 2005 and 2019, energy industries remained the main source of GHG emissions in Estonia. The extraction and processing of oil shale, the main raw material used for electricity generation and production of liquid diesel fuel, is highly energy intensive and generates a significant amount of CO2. The government aims to phase out shale in electricity production by 2035 and in the entire economy by 2040.

SPECIAL FOCUS: The role of gases in the decarbonisation of Estonia[34]

Natural gas

4.85 TWh

Planned gas consumption in 2030

Estonia assumes similarly small natural gas consumption in 2030 and will focus its decarbonisation efforts on the phase out of oil shale. Decarbonisation of the hard-to-abate sectors will be achieved partially with the increased production of low emission gases.

Biomethane

One of Estonia's targets in the NECP is to increase the share of renewable transport fuels to 14 %. The target should be met primarily by increasing domestic biomethane production to 380 GWh per year by 2030 compared to 40 GWh in 2018.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment

There is an **active** biomethane association[35] **in Estonia**. According to their knowledge, no investment decisions concerning gasification and power-to-methane production have been made yet.

Legislative environment

To develop biogas and biomethane, The Ministry of Economic Affairs and Transportation of Estonia introduced a new regulation to support biomethane producers with feed-in premium to cover the price gap between biomethane and natural gas **until 2023**. It is expected that this support and regulation will be extended for a further period and the level of support increased.

Hydrogen

Estonia plans to **develop the entire hydrogen supply chain to use hydrogen in transport, heating, and electricity generation.** According to the NECP, Estonia is actively involved in EU and regional working groups dealing with the development of hydrogen. **The Estonian NECP mentions hydrogen as one of the main options for storing electricity**. The country is also actively involved in supporting IPCEI projects including hydrogen. In 2022, Estonia received a total of 23 applications to support hydrogen projects under IPCEI with a total value of 1.5 billion euros. The country aims to cooperate with other countries.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment

There is currently no official strategy for hydrogen, but government institutions are developing plans for hydrogen in various sectors. Estonia also **includes hydrogen in national plans for the deployment of alternative fuels infrastructure** (2014/94/EU). In 2016, the Estonian Association of Hydrogen Technologies[36] was established.

Legislative environment

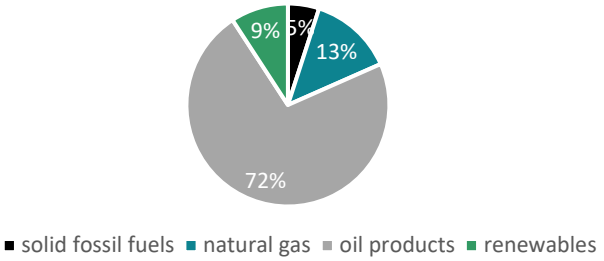
Specific tax incentives to encourage the use of renewable or low-carbon hydrogen in the transport sector are currently implemented, but Estonia is not part of the HyLaw project, which aims to identify the status and legislative barriers to hydrogen development.

[34] Planned gas consumption in 2030 source: EESTI GAASIÜLEKANDEVÕRGU ARENGUKAVA 2021-2030, Elering, 2021, page 13
[35] http://eestibiogaas.ee/
[36] http://h2est.ee/eng/

Greece

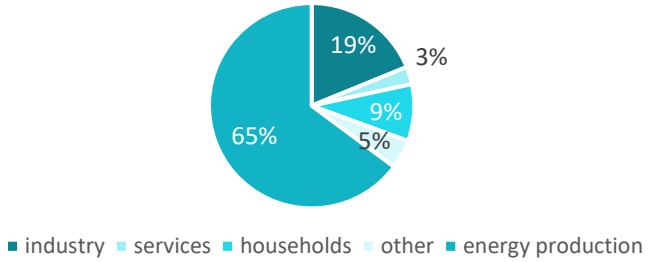
has an LNG terminal, making it strategically important in European energy security. It also has significant coal reserves which play a role in determining its energy mix.

Total energy consumption by fuel



Source: Eurostat 2020

Consumption of natural gas by sector



Source: Eurostat 2020

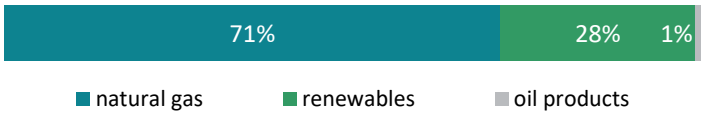
Despite the country's significant potential for large-scale RES development, solid fossil fuels still play a significant role in the Greek energy production mix as **Greece has large coal reserves.** Greece has announced the complete phase-out of lignite from energy production by 2028 and the aim to decrease dependency on Russian oil. However, there are some delays in the intermediate steps. Additional major energy sources are renewables and natural gas. 2021 was a record year for gas consumption in Greece. The largest share was consumed by electricity generation units (around 65 %), followed by household consumers, businesses connected to the distribution networks and industries (including non-energy use).

Greece consumed almost 6 bcm (60 TWh) of gas in 2021. About 40 % of that was covered by Russian gas. **Greece is fully dependent on natural gas imports and is one of the few countries in this region without a gas storage**. The largest amount of 45.5 % still comes through Sidirokastro entry point on the border with Bulgaria. About 17.5 % of the gas came through Nea Mesimvria, the new TAP connection. Almost a third of gas was imported via the Revithoussa LNG terminal. Greece started the construction of **additional LNG infrastructure** which should be completed by 2024.

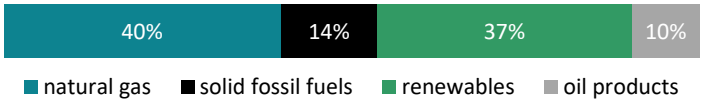
40 %

of natural gas used to be imported from Russian Federation

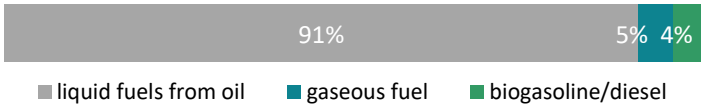
Heating sector by fuel



Power generation by fuel



Transportation by fuel



Source: Eurostat 2020

Greece has a very **low need for heating due to its climatic conditions**.

Natural gas is the greatest source of energy used for electricity production in Greece but is **closely followed by RES**. According to the Greek energy regulatory authority, there are some 5 500 licensed RES projects amounting to 95 GW competing for completion. About 20 % or 9.5GW of newly installed RES capacity seems to be the realistic outcome by 2030. The RES is to be accompanied by storage with 14.3GW currently licensed. Among them are 14 pump storage hydropower plants of 3.04GW.

Greece uses biofuels in transportation but has a limited deployment of electromobility. The main obstacle is Greece's EV infrastructure, which is one of the weakest in the considered region.

86 $MtCO_2e$

Total GHG emissions

Greece accounts for 2.4 % of total EU GHG emissions and has reduced its emissions at a higher pace than the EU average since 2005. With a 28 % share of the total, energy industries accounted for the largest share of Greece's GHG emissions. Energy industry emissions fell by almost 45 % in the 2005-2019 period in Greece, reducing their share of total emissions by 14 %. Further reductions are expected as the country proceeds with phasing out lignite-fired power plants. The sectors that showed the greatest percentage reduction in emissions between 2005 and 2019 – 54 % – was manufacturing industries and construction. Transport and agriculture were the sectors with the lowest reductions.

SPECIAL FOCUS: The role of gases in the decarbonisation of Greece[37]

Natural gas

75 TWh
Planned gas consumption in 2030

Natural gas will continue to play a significant role in Greece's demand in 2030, especially in district heating. The decarbonisation focus will remain on the more polluting lignite plants. Hydrogen production in Greece (mainly via electrolysis) is expected to reach 0.8 TWh in 2030 and 12.8 TWh in 2040. In addition, Greece is expected to be a net hydrogen exporter by 2045 (8,6 TWh or 2,4 bcm H2), while in 2050 the net exported volumes are anticipated to be even larger (20,2 TWh or 5,7 bcm H2).

Biomethane

In the NECP, Greece plans the gradual blending of **biomethane into the gas network and its use in heating, transport, and energy sectors**. To successfully fulfil this target, the **country plans to create a new regulatory framework that will enable the development of biomethane production and its use in gas transmission and transportation network**. The NECP does not provide any specific predictions for biomethane production. However, it provides **predictions for the use of biofuels in transport, the consumption of which should reach 4,3 GWh in 2030**.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment
The use of biomethane is outlined in the NECP, but the government is yet to present a more detailed biomethane strategy. There is a national association[38] uniting biogas producers, with an active role.

Legislative environment
According to NECP Greece intends to provide regulatory support for biomethane in the gas network, the goal is an increase of RES for heating-cooling. **Biogases support is part of the regulatory framework for the support of renewable sources. However, the set conditions limits its obtaining.**

Hydrogen

Greece declares in the NECP[39] that it is necessary to consider the production of hydrogen in connection with the construction of RES. Further, it mentions the potential of hydrogen blending into the gas system and sector coupling. According to government institutions, **Greece must participate in relevant programs that deal in more detail with the application of hydrogen in individual sectors**. The importance of hydrogen in the decarbonisation of the Greek economy was also confirmed by government representatives, which highlight Greece's place in the development of hydrogen projects within the framework of the IPCEI initiative.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment
Although government supports the development of the hydrogen economy, there is currently no strategy for hydrogen, but the government is in the process of developing a hydrogen roadmap. Greece also **does not include hydrogen in its national plans for the deployment of alternative fuel infrastructure** until today (2014/94/EU).

Legislative environment
Specific tax incentives to encourage the use of renewable or low-carbon hydrogen or other legislation are not currently implemented. Greece is also not part of the HyLaw project, which aims to identify the status and legislative barriers to hydrogen development.

[37] Planned gas consumption for 2030 source: ΣΧΕΔΙΟ ΠΡΟΛΗΠΤΙΚΗΣ ΔΡΑΣΗΣ, Regulatory Authority for Energy, 2022, page 58
[38] https://habio.gr/en/?lang=en
[39] https://energy.ec.europa.eu/system/files/2020-03/el_final_necp_main_en_0.pdf

Example of hydrogen project:

High Pressure pipeline to West Macedonia – New built H2 infrastructure

Timeline of the project
2020–2024

The project concerns the extension of the existing NGTS via a new pipeline branch up to the region of West Macedonia. According to the basic design study the Project consists of 157 km Natural Gas High Pressure pipeline.The project also includes Kardia Metering Station to supply the district heating installations for the cities of Kozani, Ptolemaida and Amyntaio, as well as line valves to supply other consumption in the region. The pipeline will be designed for transportation of blends with biomethane and hydrogen up to 100%, in line with DESFA's action plan to prepare the transmission system for the energy transition to renewables.

The country aims to ensure a fair development transition in the lignite regions of West Macedonia and Megalopolis, which is based on three pillars: defending employment, compensating for the socio-economic impact of the transition and ensuring the energy self-sufficiency of lignite regions and the country in general. The pipeline will connect to an area where agricultural production can support biogas plants to be developed, and renewable hydrogen is planned to cover energy needs after lignite phasing out, allowing surplus quantities of hydrogen to be transported to the main pipeline. Thus, the project can support the development of renewable and low carbon gases as a sustainable energy solution for the area.

It shall be also highlighted that this Investment meets the targets of the National Plan for Energy and Climate. More specifically, one of the main targets of the project is the substitution of oil consumed by the local area households and industries, but also replace lignite currently used for the provision of heat in the district heating networks of the cities in the region, which are connected to the current lignite plants. The pipeline will supply the Heat & Power Cogeneration Plant which will supply with hot water the integrated district heating network of the cities of Kozani, Ptolemaida and Amyntaio. Until now, the supply of hot water to the district heating network, is provided by the old lignite power plants, located in the area of Kozani.

In that respect DESFA has signed a Memorandum of Understanding and Strategic Cooperation with the Municipalities of Amyntaio, Kozani, Eordaia West Macedonia as well as with PPC, District Heating Company of Amyntaio, District Heating Company of Ptolemaida and the Water Supply Company of the region declaring their intention to cooperate, within the framework of their responsibilities, to promote and complete the necessary actions to ensure that the needs of the district heating in Western Macedonia are met and after the closure of the existing lignite units in the region.

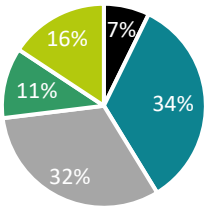
Project status: Under construction.

Project promoters: DESFA S.A.

Hungary

is highly dependent on Russian gas. Natural gas is the main heating fuel and assumes second place in the country's power generation.

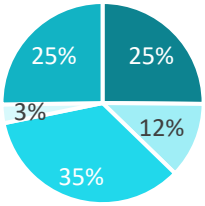
Total energy consumption by fuel



■ solid fossil fuels ■ natural gas ■ oil products ■ renewables ■ nuclear

Source: Eurostat 2020

Consumption of natural gas by sector



■ industry ■ services ■ households ■ other ■ energy production

Source: Eurostat 2020

Natural gas is the main source of energy in Hungary. Gas consumption has increased since 2014, by 4 %/year on average. Half of the gas is consumed by households and services (49 % in 2020), mainly for heating. The share of industry amounted to 22 % in 2020 (including non-energy uses), a share higher than that of the power sector (19 %). Gas is supplemented by nuclear energy and renewables, which were in the national decarbonisation strategy identified as the key drivers toward Hungary's net-zero emission target by 2050. In June 2020, Hungary adopted a new law making the target a binding obligation. The current share of RES in final consumption is 12.6 %. Hungary also produces around 7 Mt/year of lignite, from which around 86 % is used in the power sector by the only remaining coal power plant. The coal exit is planned for 2025.

Hungary consumes around 11 bcm (110 TWh) of gas annually. In 2020, 1.57 bcm of natural gas was extracted domestically. **The country imports around 90 % of its gas** and most of it comes from Russia. Hungary's gas storage capacity is 67.7 TWh.

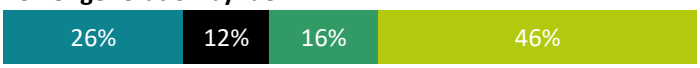
80 %

of natural gas is imported from Russian Federation

Heating sector by fuel

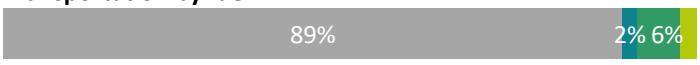
■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear

Power generation by fuel



■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear

Transportation by fuel



■ liquid fuels from oil ■ gaseous fuel ■ biogasoline/diesel ■ electricity

Source: Eurostat 2020

Hungary is amongst the most dependent on (Russian) gas for heating in CEE/SEE region. However, due to very large share of nuclear power, waste heat can be used to substitute considerable amount of natural gas in Hungarian heat production

The Renewable Energy Aid Scheme, replacing a feed-in tariff, helps both the construction of new RES power generation units and the market integration of RES. Hungary also plans to increase its nuclear capacities through the Paks II project, where two nuclear units of 1.2GW each are to be built in partnership with Russia.

Hungary ranks 3rd in the region in the share of battery EV and plug-in EV vehicles among its alternative fuels fleet (almost 50%). There is a plan and a mechanism in place to boost electromobility by 2030 with existing subsidies and tax incentives.

52 $MtCO_2e$

Total GHG emissions

Hungary accounts for 1.7 % of total EU GHG emissions. Each with a 22 % share of the total, the transport and 'other emissions' (buildings and tertiary) sectors accounted for the largest share of Hungary's GHG emissions in 2019. The energy industry sector is responsible for 19.6 % of the emissions. The opposite, an increasing trend between 2005 and 2019, was observed in agriculture, manufacturing, and construction.

SPECIAL FOCUS: The role of gases in the decarbonisation of Hungary[40]

Natural gas

87 TWh
Planned gas consumption in 2030

Natural gas remains to be the main source of energy still in 2030, however dependence on natural gas imports may drop to close to 70 % by that time, and Hungary's strategic goal is that the approximately 6.2 bcm would be covered from the most diversified sources possible. Besides the current main supplier, Russia, LNG, and alternative sources are being explored. The current and the planned infrastructure creates a suitable basis for regional market integration and domestic market development, which enhances a better utilization of natural gas and provides a stable ground for decarbonisation in the country.

Biomethane

According to the NECP, the **share of biogas in the total gas consumption is expected to be 1 % in Hungary in 2030**, **which is approximately 85 mcm/year.** NECP mentions the **possibility to blend biomethane into the gas network or use it as an alternative fuel.** Hungary's National Energy Strategy[41] lists the **annual potential of biogas at 25 PJ**, the document also mentions the intentions to develop biogas in general.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment
Hungary has an association[42] in the field of biogas and biomethane. The future role of **biomethane is not explicitly mentioned in the National Energy strategy or NECP**, these documents, however, bring up the potential of biogas, which has a direct impact on biomethane production.

Legislative environment
Hungary intends to encourage biogas/biomethane production through the **establishment of new subsidy schemes.** Refundable aids in the 2021-2027 period should support biogas plants processing agricultural waste.

Hydrogen

Hungary expects that the development of hydrogen and other alternative fuels will occur mainly in connection with the increase in domestic production of natural gas. According to the NECP, **Hungary plans to implement hydrogen in transport, industry, and heating and intends to further develop plans to transport hydrogen through the existing gas system**. The development of hydrogen will be supported by the new regulation that will cover the entire supply chain. **The country sets a target of consuming 593 GWh of hydrogen produced through electricity from RES in 2030**. Hungary further specifies the plans for the development of the hydrogen economy in its hydrogen strategy, according to which country has set itself **the goal of installing 240 MW of electrolysers by 2030 and developing consumption scenarios in individual sectors in detail**. According to the strategy, hydrogen solutions should be implemented by 2026, which will ensure the preparation of the infrastructure for further development.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment
In Hungary, an active hydrogen association [43]that promotes hydrogen solutions connects many stakeholders from government, industry, and research **already exists**. **Hungary also has its hydrogen strategy** [44]with specific goals and **includes hydrogen in national plans for the deployment of alternative fuels infrastructure** (2014/94/EU).

Legislative environment
Specific tax incentives to encourage the use of renewable or low-carbon hydrogen or other legislation are not currently implemented. Nevertheless, Hungary is part of the HyLaw[45] project, which aims to identify the status and legislative barriers to hydrogen development.

[40] Planned gas consumption for 2030 source: Nemzeti Energiastratégia 2030, kitekintéssel 2040 ig, Ministry of innovation and technology, 2020, page 19
[41] https://zoldbusz.hu/files/NE2030.pdf
[42] http://www.biogas.hu/?lang=en
[43] https://p2g.hu/
[44] https://www.iea.org/policies/13928-national-hydrogen-strategy-nhs
[45] https://www.hylaw.eu/

Example of hydrogen project:

Aquamarine - Integrated H2 project (production, transport, use)

Timeline of the project
01/02/2021- 01/02/2023

As part of the Aquamarine project Hungarian Gas Storage Ltd (HGS) will implement an electrolysis system with approximately 2,5 MW total performance and the corresponding hydrogen gas preparatory technology at the Kardoskut Underground Gas Storage site. The entire investment of the Aquamarine Project comes to approximately EUR 8 million, two thirds of which is tender support, the rest is provided by HGS. Creating the system in this form carries a substantial innovative content to energy storage concept and contributes to the balance of the electricity system. By operating the electrolysis equipment, it can be ensured that instead of turning off (stopping production) renewable energy sources by using the surplus electric energy hydrogen could be produced by the decomposition of water. The hydrogen produced in this way mixed with natural gas will be utilized within Hungarian Gas Storage's own gas-operated equipment and reducing its own CO2 emission in this way.

Furthermore, this natural gas mixed with hydrogen could be injected into the gas transmission system -strictly complying with gas quality and safety instructions – and will be part of the supply to end users. The spill over effect of the project will give ground to the widespread use of hydrogen utilization/-based technology. Therefore, Hexum Natural Gas Ltd. is also an integral part of the decarbonisation efforts of the Hungarian gas infrastructure, adjusting their technology to manage the hydrogen blended natural gas as fuel gas for gas engines at Szőreg-1 UGS. Through the implementation of the Aquamarine Project Hungarian Gas Storage Ltd is strongly committed to the smart sector integration and, also, to playing an active role in the decarbonisation processes.

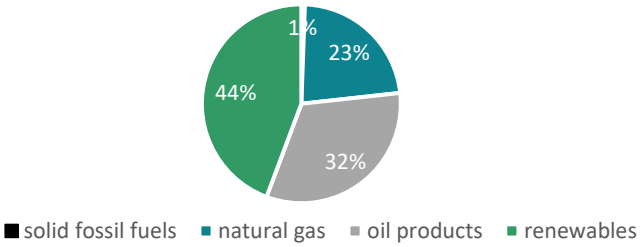
Project status: Under construction. The preparatory steps have already started. The procurement processes are ongoing for the electrolyser/compressor technologies and engineering services. Beside the asset related items contracting with universities is ongoing to start the project related Research & Development cooperation.

Project promoters: HGS

Latvia

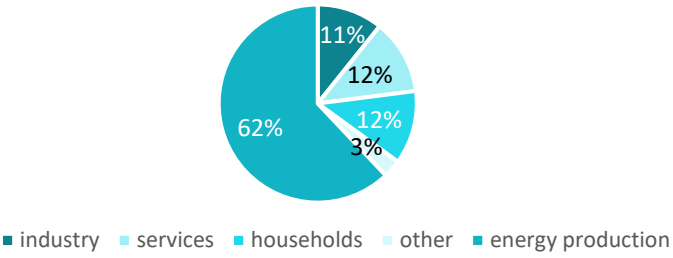
aims to create new LNG terminals which would significantly increase its energy security. It a has well-developed network of renewable energy sources.

Total energy consumption by fuel



Source: Eurostat 2020

Consumption of natural gas by sector



Source: Eurostat 2020

Latvia achieved a 41 % share of RES in the final energy consumption in 2019 and aims to reach 50 % by 2030. The most common renewable source is wood fuel, followed by biogas and solid biomass in the production of electricity and heating and cooling. The main driver of gas demand is the power sector responsible for the consumption of 51 % of natural gas. The Latvian Industry consumes very little gas.

In 2021, Latvia consumed some 1.2 bcm (12,5 TWh) of gas. All Latvian natural gas is imported with the majority coming from Russia. Latvian lawmakers have passed a legislative amendment banning imports of Russian gas into the country starting January 2023. Latvia, as are its neighbours, is also looking into LNG import options. Latvian storage has a capacity of 24 TWh, larger than the country's consumption.

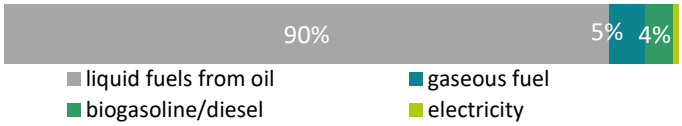
90 %

of natural gas used to be imported from Russian Federation

Heating sector by fuel

Power generation by fuel

Transportation by fuel



Source: Eurostat 2020

Compared to 2020, last year the amount of heat produced in **CHP plants** grew by 13 %, reaching 5.6 TWh or **66 % of the total amount of heat produced in Latvia** (8.6 TWh).

The **electricity produced by CHP plants has constituted more than half of the total electricity** produced in the country for the past ten years. Most of the fuel used in the CHPs was fossil, not renewable fuel. **Almost half of the electricity used in the country is provided by RES.** The main renewable resource is hydroelectric power. CHPs account for 23 % of electricity produced (15 % in biomass CHP plants and 8 % in biogas CHP plants).

The transport sector is the second-largest consumer of energy and the biggest polluter. Latvia's alternative fuel vehicles are by 96 % comprised of LPG vehicles. During the covid-19 pandemic, Latvia began experiencing a sudden spike in EV sales. However, the share of BEV is only 3 % of the alternatives.

12.9 MtCO2e

Total GHG emissions

Latvia accounts for 0.3 % of total EU GHG emissions. Its emissions increased by 11.2 % between 2005 and 2019, going against the EU-27 trend. The transport sector accounts for 27.8 %. Agriculture represents 22%, followed by 'Other emissions' with 18%. Energy industries account for 15%. Manufacturing industries and construction, industrial processes and waste management sector contribute with around 6% each.

SPECIAL FOCUS: The role of gases in the decarbonisation of Latvia[46]

Natural gas

11,8 TWh
Planned gas consumption in 2030

According to NECP, natural gas is potentially seen as alternative fuel (CNG, LNG) to gradually decarbonise transport sector. Further, desynchronization of the Baltic electricity network from the BRELL[47] circle, and synchronization with Continental Europe will have a significant impact on the natural gas market. After joining the new synchronization zone, Latvian electricity producers will have to provide their own generating capacities and natural gas will largely play the role of a guarantor of a stable electricity supply.

Biomethane

Latvia mentions the use of biomethane in the field of transport (alternative fuel), NECP also mentions regional cooperation in the transport sector between the Baltic States, but there are no more details about biomethane development in Latvia.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment
In Latvia, there is an active association[48] operating in the field of biomethane. The Latvian Biogas Association connects 44 members from the industry, government, and academic spheres. Latvia Ministry of Environment also published a document focusing on the development of biogas.

Legislative environment
According to a governmental statement, the increase in biomethane production and its use in transport should be supported by the obligation of fuel suppliers to sell energy obtained from RES. Neither NECP nor other strategic documents mention the planned biomethane support in more detail.

Hydrogen

According to the NECP[49], Latvia focuses on the application of hydrogen as an alternative fuel for transport. However, the **plan does not include specific goals for the application of hydrogen and presents a more long-term vision for hydrogen development.** Latvia also lacks comprehensive legislation dealing with hydrogen, although hydrogen is included as an alternative fuel in the implemented directive. **Currently, the main activities related to hydrogen in Latvia are taking place in the academic sphere**. Conexus, the gas TSO is pro-actively researching H_2, by cooperating with gas TSOs of Estonia, Finland and Lithuania and started preparation of research and development study of technical capabilities for injection and transportation of hydrogen in the gas grid. Conexus also started first phase of research on evaluating possibilities of injecting 100% hydrogen in Inčukalns UGS. While also participating on infrastructure vision development under European Hydrogen Backbone initiative.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment
There is currently **no strategy for hydrogen and no plans to develop a roadmap** in the nearest future. Latvia **does not include hydrogen in national plans for the deployment of alternative fuels infrastructure** (2014/94/EU).

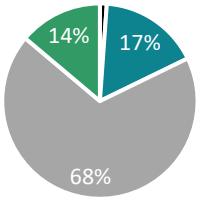
Legislative environment
Specific tax incentives to encourage the use of renewable or low-carbon hydrogen in the transport sector are currently being implemented. Latvia is also part of the HyLaw[50] project, which aims to identify the status and legislative barriers to hydrogen development.

[46] Planned gas consumption for 2030 source: Dabasgāzes pārvades sistēmas operatora, Conexus Baltic Grid, 2021, page 13
[47] Signed agreement among Belarus, Russia, Estonia, Latvia, and Lithuania on synchronization of mutual electricity networks of the states
[48] http://www.latvijasbiogaze.lv/
[49] https://energy.ec.europa.eu/system/files/2020-04/lv_final_necp_main_en_0.pdf
[50] https://www.hylaw.eu/

Lithuania

has by international comparison a fossil-fuel intensive energy mix, but a high share of bioenergy, like its Nordic and Baltic neighbours and Austria.

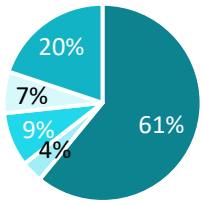
Total energy consumption by fuel



■ solid fossil fuels ■ natural gas ■ oil products ■ renewables

Source: Eurostat 2020

Consumption of natural gas by sector



■ industry ■ services ■ households ■ other ■ energy production

Source: Eurostat 2020

Since the end of domestic nuclear production in 2010, Lithuania strongly depends on imports. Lithuania's own energy production which accounts for a quarter of the consumption consists mostly of bioenergy and waste (90 %), a minimum of other renewables such as wind, solar, hydro, and geothermal, and negligible oil production. All other consumed oil, coal and natural gas must be imported. Dominant sources in the country's total energy consumption are oil and natural gas, which increases the country's need for decarbonisation. The sectors accounting for almost two-thirds of the final energy consumption are transport and industry (agriculture). Natural gas plays an important role in the industry, satisfying more than half of the sector's fuel consumption.

Lithuania's consumption in 2021 was 2.3 bcm (23 TWh). Lithuania imports all its gas. In April 2022, it stopped all imports of Russian gas, utilizing the 2.9mn t/y FSRU The Independence. Lithuania is one of the few countries in the region without underground gas storage.

0 %

of natural gas is imported from Russian Federation

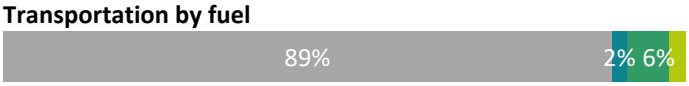
Heating sector by fuel

■ natural gas ■ renewables ■ oil products

Power generation by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ oil products

Transportation by fuel



■ liquid fuels from oil ■ gaseous fuel ■ biogasoline/diesel ■ electricity

Source: Eurostat 2020

Lithuania operates district heating with more than 50 % of households connected to it. Most of the fuel used is secondary biomass, a by-product of the lumber industry. State support for biomass is now cancelled and new subsidies should become available for solar and heat pumps.

In the next phase of the transition of the energy industries, the country will invest in CHP plants to replace simple biomass boilers. By 2030, Lithuania wants to reduce its electricity imports and cover 70 % of its electricity consumption with domestic RES. It plans to complete its synchronization with the continental European power system by 2025.

Lithuania has one of the OECD's lowest excise duties on petrol and diesel and a much lower tax rate on diesel than petrol. The EVs are receiving political and investment support to be a dominant replacement. Currently, there are some 3 300 BEVs and 1 600 PHEVs registered.

20.6 MtCO2e

Total GHG emissions

Lithuania generates 0.55 % of the EU's total GHG emissions. In 2019, transport accounted for the largest share (31 %) of total emissions in Lithuania, followed by agriculture. With Lithuania's low population density and dispersed towns making road transport the dominant mode of travel for passengers and freight, transport emissions are projected to rise steeply until at least 2024 without additional measures. As a highly agrarian country, agriculture was responsible for 21 % of total emissions, compared to the EU average of 10 %. Energy industries account for only 11 % of emissions (half the EU average).

SPECIAL FOCUS: The role of gases in the decarbonisation of Lithuania[51]

Natural gas

20 TWh
Planned gas consumption 2030

In Lithuania, the existing gas infrastructure will remain an important basis during the transition towards low carbon economy. In future, the infrastructure will be repurposed and newly build to cover flows of low carbon gas in 2030 and onwards. During the mid-term the injection of hydrogen and methane blends will be available in Lithuania. The analysis is undergoing on the level of share of hydrogen in blending mix. The domestic gas demand will remain at the level of approx. 20 TWh by 2030. The level of consumption will depend on shifting of local hydrogen production from grey to green and conversion of consumers to other, mostly, renewable sources of energy. Currently, industry consumes more than half of gas for grey hydrogen production. In its National Energy Independence Strategy, Lithuania has set ambitious goals to contribute to the decarbonisation goals set by the EU. The aim is to increase the share of renewable energy usage (including biomethane and other gases from renewables) in the domestic gross final energy consumption. For transport sector, biomethane and green hydrogen consumption should account at least 5.2% of the final consumption by 2030.

Biomethane

Lithuania mentions the use of biomethane in the field of transport as an alternative fuel. According to the NECP, the **consumption of biomethane in Lithuania transport should reach 950 GWh in 2030**.[52] To cover such a volume of demand, it will be necessary to build new production capacities. **Lithuanian government sets a goal of supporting new production capacities in the NECP**. One of the measures to increase biomethane production is to support the reorientation of biogas stations to biomethane production.

Biomethane application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment
There is an association for biogas in Lithuania (Lithuanian Biogas Association[53]), which has more than ten member companies. Based on the association's website, it does not appear to be very active, compared to other countries.

Legislative environment
According to the NECP, **Lithuania intends to develop investment support for biomethane production in the 2020 to 2030 period.** Investment support should also be available for biomethane stations, or the purchase of public, utility, or other commercial vehicles fuelled by compressed natural and/or biomethane gas.

Hydrogen

In its NECP, **Lithuania perceives hydrogen technologies as promising for the industry, transport, and energy. It is dedicated to supporting research in the field of hydrogen**. Specific goals are then mentioned in the Act on Alternative Fuels, according to which for transport sector, biomethane and green hydrogen consumption should account at least 5.2 % of the final consumption by 2030.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment
The Ministry of Energy is in the process of preparing the Strategy for hydrogen in Lithuania. It is planned to have it ready by the end of 2022.

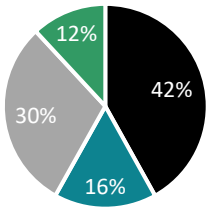
Legislative environment
Specific tax incentives for hydrogen are currently being implemented. Lithuania does not participate in the HyLaw project, which aims to identify the status and legislative barriers to hydrogen development.

[51] Planned gas consumption in 2030 source: https://www.ambergrid.lt/uploads/structure/docs/220_98ea7a3edc477637d38bc3279c1c069a.pdf
[52] https://am.lrv.lt/uploads/am/documents/files/KLIMATO%20KAITA/Integruotas%20planas/Final%20NECP.pdf, page 60
[53] http://www.lbda.lt/en/home

Poland

is still largely dependent on its coal production and utilization. In gas, it plays an increasingly more important regional role with its existing LNG terminal and planned new infrastructure.

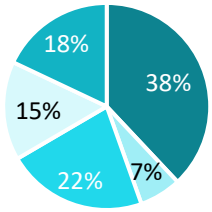
Total energy consumption by fuel



■ solid fossil fuels ■ natural gas ■ oil products ■ renewables

Source: Eurostat 2020

Consumption of natural gas by sector



■ industry ■ services ■ households ■ other ■ energy production

Source: Eurostat 2020

Poland has the EU's largest hard coal reserves and extensive lignite deposits. In 2020, coal accounted for 41 % of Poland's total energy supply, and for 59 % of energy-related CO2 emissions in 2019. In 2020, 69 % of Poland's electricity came from coal, growing to 72 % in 2021. The record use of coal can be attributed to growing gas prices. While the share of coal in Poland's energy system has been gradually declining, the replacement was found mostly in natural gas and RES. Wind and solar energy account for only 10.94 % of Poland's total energy supply in 2021 but play an increasingly larger role in power generation. Poland's RES power generation capacity totalled 13.9 GW in October 2022 with PV and wind accounting for 12 % and 28 % of this capacity, respectively. Biomass, hydro, and biogas, despite presenting huge potential, play a minor role. Poland also considers nuclear power, but the first six nuclear power blocks with 6-9 GW of total capacity would be ready by 2034 at the earliest.

Poland consumes around 19 bcm (around 200 TWh) of gas annually. Poland's own gas production has been around 4 bcm for the past few years. In 2021, natural gas imports totalled 17.4 bcm (87%) with more than half from Russia. Starting on 27th April 2022 Gazprom terminated gas flows to Poland and Polish-Russian contract become factually permanently suspended. LNG imports accounted for 22% (3.8 bcm after regasification) of all imported gas fuel. The existing LNG terminal in Świnoujście is now set to increase its capacity to 6.2 bcm of regasification capacity and it will extend its capacity up to 8,3 bcm from the beginning of 2024. Gas started flowing to Poland through the new project Baltic Pipe pipeline in October 2022 with a 10 bcm capacity from Norway via Denmark and the Baltic Sea. In addition, the Polish government is planning to build a 6.1 bcm Floating Storage Regasification Unit (FSRU) by the end of 2027.

55 %

of natural gas used to be imported from Russian Federation

Heating sector by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ oil products

Power generation by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ oil products

Transportation by fuel

■ liquid fuels from oil ■ gaseous fuel ■ biogasoline/diesel ■ electricity

Source: Eurostat 2020

As much as 76 % of heat is generated in individual heating installations (households 49 %, industry and construction 20%, trade, services, and others 7%). The remaining 24 % is produced in district heating systems (households 17%, I&C 5%, and T&S&O 2%)

Poland's RES generation is unique due to the share of prosumers, which amounted to 80% of installed capacity due to favourable RES laws with guaranteed tariffs for 15 years.

Poland's demand for EVs is outpacing the European average by a considerable margin. Poland has already some 16 300 BEVs and 18 100 PHEVs registered. To keep up, Poland will need to expand its infrastructure, currently at 2 800 charging points.

400+ MtCO2e

Total GHG emissions

Poland has to perform a significant change in generation sources as it is at the moment responsible for generating 10.5 % of the EU's total GHG emissions. The energy industries sector, heavily reliant on coal, is the country's largest GHG emitter, with 38 % of total emissions. The second place in emissions (20 %) belongs to the 'Other emissions' sector, which comprises primarily buildings and the tertiary industry. Transport accounts for 17 % of the emissions, marking an 84% increase since 2005. Manufacturing industries and construction, industrial processes and agriculture have similar shares of

SPECIAL FOCUS: The role of gases in the decarbonisation of Poland[54]

Natural gas

387,3 TWh
Planned gas consumption 2030

Poland still sees gas as a transition fuel and did not declare new consumption target in the light of the war in Ukraine. "We are moving away from coal, and this is a political and administrative decision. So, we must also realize at the political and administrative level that the coal we are getting rid of must be replaced with something. It must be replaced with what is available, not what is imaginary. In the perspective that we can consider when making decisions, it will be gas, it will be nuclear energy, it will be renewable sources." Poland's Government Plenipotentiary for Strategic Energy Infrastructure, Piotr Naimski, September 2021

Biomethane

The NECP expects **the production of agricultural biogas to exceed 7.8 bcm annually but mentions no specific use of biomethane**. According to the National Energy Policy[55], the biomethane and other biogas markets should reach a 14 % share of the total renewable energy consumption in transport by 2030.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation*

*Use of biomethane in transport also figures in Poland's national Energy policy.

Political environment

Several associations[56] are active in the field of biogas and biomethane in Poland. The Polish government supports the **biogas and biomethane sector** and perceives it as an important part of decarbonisation and energy security plans.

Legislative environment

Poland introduced a zero-excise tax for CNG, LNG, biomethane, biogas, and hydrogen. Another discussed support scheme is primarily concerned with biomethane from anaerobic digestion. **Low-Carbon Transport Fund represents another catalyst regarding biomethane development**. This fund will support the development of alternative fuel infrastructure, including biomethane, over 10 years.

Hydrogen

In the NE as CP[57], Poland emphasizes the potential of hydrogen in the energy, transport, and gas sectors and sees hydrogen as one of the possible alternatives that will help strengthen the country's energy security. **Specific goals for hydrogen development are set out in the Polish Hydrogen Strategy[58], which focuses on the entire supply chain of the hydrogen economy. According to this strategy, five hydrogen valleys should be established in Poland by 2030, and a total of 2 GW of capacity to produce low-carbon and green hydrogen should be installed**. In the initial stage, the distribution of hydrogen will have to be ensured by train transport, and afterward with the help of already existing gas infrastructures.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry*	Transportation

*Industry is not mentioned in NECP but already figures in Poland's hydrogen strategy.

Political environment

In Poland, an active hydrogen association[59], which promotes hydrogen solutions and connects many stakeholders from government, industry, and research **already exists**. Poland also **has its hydrogen strategy with specific goals but does not include specific goals for hydrogen in its national plans for the deployment of alternative fuels infrastructure** (2014/94/EU).

[54] Planned gas consumption in 2030 source: KRAJOWY DZIESIĘCIOLETNI PLAN ROZWOJU SYSTEMU PRZESYŁOWEGO na lata 2022-2031
[55] https://www.gov.pl/web/climate/energy-policy-of-poland-until-2040-epp2040
[56] https://biometan.org.pl/en/kontakt-en, http://www.pspbr.org/, http://www.upebi.pl/
[57] https://energy.ec.europa.eu/system/files/2020-01/pl_final_necp_summary_en_0.pdf
[58] https://www.gov.pl/web/klimat/polska-strategia-wodorowa-do-roku-2030
[59] http://www.hydrogen.edu.pl/index_en.php

Legislative environment

Poland has set up a CO_2 pricing mechanism, which supports the use of hydrogen in transport. Poland is also part of the HyLaw[60] project, which aims to identify the status and legislative barriers to hydrogen development. HyLaw already identified high regulatory and legislative barriers to hydrogen development in Poland.

Example of hydrogen project:

Damasławek Hydrogen Storage - enabling the storage of pure hydrogen

Timeline of the project
Pre-feasibility start 31/03/2021

The project involves the construction of an underground storage facility for pure H2 (2 caverns with the capacity of approx. 40 mcm each) and H2-ready caverns for CH4 that may be converted to H2 (up to 36 caverns with the capacity of approx. 40 mcm each). The project is planned to be in the Damasławek salt deposit (central Poland). Integral parts of the investment are the underground and aboveground infrastructure of the storage facility, the leaching plant, brine, water, and high-pressure pipelines for H2 and CH4. The project foresees the construction of a tankless underground hydrogen storage facility that will offer the possibility to store renewable energy, to increase energy efficiency and to foster environmental sustainability including through the reduction of greenhouse gas emissions by decarbonising the economy in a socially equitable manner.

The project will store hydrogen that will be distributed via the Polish Hydrogen Backbone Infrastructure, thus balancing supply and demand for hydrogen. It will be supplied with renewable hydrogen (e.g., onshore, and offshore wind, solar PV) and low-carbon hydrogen in line with application EU and national regulatory framework. The project will contribute to the integration of renewable and low carbon gases into the gas network, greenhouse gas emission reductions, as well as flexibility and seasonal storage options for renewable electricity generation. It will provide efficient and safe storage of hydrogen with aim to support use of hydrogen as an alternative fuel in transport, decarbonisation of industry and reduction of greenhouse gas emissions of the whole economy, especially in hard-to-abate sectors (e.g. heavy industry), as well as utilisation of hydrogen technologies in the energy sector to reduce the emissions and diversify the energy generation structure, to limit the use of fossil fuels and to reduce the state's dependence on fuel imports.

Project status: Planned. Pre-feasibility phase is underway since 2021 and shall end in 2022. Feasibility phase is scheduled for 2023-2024. Next steps to be determined after the feasibility studies.

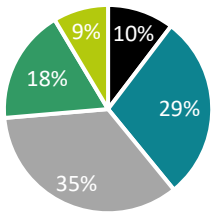
Project promoters: GAZ-SYSTEM S.A.

[60] https://www.hylaw.eu/

Romania

is the second largest producer of natural gas in the EU with the ability to grow. It could also become a major European LNG supplier and transport hub.

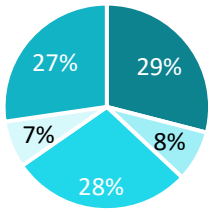
Total energy consumption by fuel



■ solid fossil fuels ■ natural gas ■ oil products ■ renewables ■ nuclear

Source: Eurostat 2020

Consumption of natural gas by sector



■ industry ■ services ■ households ■ other ■ energy production

Source: Eurostat 2020

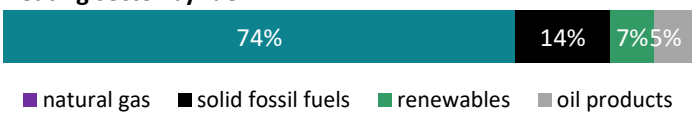
Romania relies to a great extent on fossil fuels. Romania is the second largest gas producer in the EU with sizeable reserves, including newly found ones in the Black Sea. This means that Romania has the lowest reliance on gas imports in the region. Natural gas accounts for almost 75% of Romania's heating and plays a supporting role in power generation. Romania still produces and uses coal, operating a 4.9 GW coal capacity. The country committed to a coal phase-out by 2032 but, in the light of the energy crisis, decided to keep the power plants in reserve instead of decommissioning them. Renewables, along with nuclear energy, but also gas as a primary energy source, is seen as essential to the transition process. Romania achieved a 24.3 % share of RES in 2019, aiming to reach its 2030 target with wind, hydro, solar, and fuels from biomass. Nuclear energy will continue to play an important role in Romania's energy mix. The two existing reactors supply around 20% of the country's power.

Romania produces 80 % of its natural gas consumption domestically. That makes it less dependent on imported gas. Over the last few years, the percentage of imports in Romania's gas consumption increased as quantities extracted from mature fields declined, while the development of offshore projects was delayed by legislation changes. The is expected to run around in the coming years. Romania's on Russian gas is less severe, but not insignificant. So far Romania has no LNG terminal.

29.5 %

of natural gas was imported from Russian Federation in 2021

Heating sector by fuel



■ natural gas ■ solid fossil fuels ■ renewables ■ oil products

Power generation by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear ■ oil products

Transportation by fuel

■ liquid fuels from oil ■ gaseous fuel ■ biogasoline/diesel ■ electricity

Source: Eurostat 2020

The existing district heating systems generate heat predominantly from coal and natural gas. The current share of RES in heating is around 15%, while the country's 2030 target is 33%. 2030 A new measure sets to support fuel switch to RES such as biogas, biomass, and geothermal, but the progress is so far slower than planned.

More than a third of Romania's electricity is generated from hydropower, followed by coal and wind power (around 16 % each), fossil fuels with 14.3 %, and nuclear and solar energy contribution of just over 7 % each. In the coming years, Romania still plans to replace the phased-out coal power plants with new gas capacity.

In May 2022, European Commission endorsed Romania's recovery and resilience plan with reforms promoting decarbonisation of road transport, green taxation, incentives for zero-emission vehicles, and a modal shift to railways and water transport.

113 MtCO2e

Total GHG emissions

Romania generates 3 % of the EU-27's total GHG emissions. Energy industries continue to account for the largest share of Romania's GHG emissions 21%), followed by 'other emissions' from buildings and tertiary sector (20%), agriculture (17%), Transport (16%), industrial processes (12%) and manufacturing and construction (10%).

SPECIAL FOCUS: The role of gases in the decarbonisation of Romania[61]

Natural gas

103.4 TWh
Planned gas consumption 2030

To provide the national energy security, Romania aims to maintain a diversified energy mix by 2030 (natural gas accounting for 12% of the installed capacity), considering the resilience on the domestic sources and the decarbonisation objective of the energy system, while ensuring its flexibility and adequacy.

Biomethane

Biogas in general is at a very early stage of development in Romania. The NECP does not mention the specific role of biomethane in transport, heating, or industry. In the NECP, the **country sets general targets for the promotion of biogas research, which will determine the potential for biomethane production. No data is available at the national level,** based on which future potential can be estimated.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment

In Romania, operates the Association for biomass and biogas[62] (ARBO), which represents the shareholders of the bio-industry and actively propose new incentives to promote and support biogas and biomethane potential. However, **biomethane is not part of the National energy strategy until 2030[63].**

Legislative environment

In Romania, **there is currently no tax or legislative support for upgrading biogas or for injecting biogas/biomethane into the natural gas grid**, also no tax incentive is provided for biomethane usage in transport and other relevant sectors.

Hydrogen

According to the NECP[64], Romania focuses on the implementation of pilot hydrogen projects in industry and the energy sector to achieve the country's decarbonisation goals. The country further considers the transportation of hydrogen through the existing gas infrastructure, with a full blending rollout after 2025. According to the National Recovery and Resilience Plan, **Romania plans to build 2 000 km of new gas infrastructure, which will be fully prepared for hydrogen blending**. **In 2026, the share of hydrogen should reach 20 % of transported gases via gas infrastructure**. Recently introduced amendment to the Energy Act includes incentives for the development of hydrogen production and transportation.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment

There is currently no strategy for hydrogen, but a hydrogen **strategy with more detailed targets and prediction scenarios should be published in 2023**. Active hydrogen association[65], which promotes hydrogen solutions and connects stakeholders from government, industry, and research **already exists in Romania.**

Legislative environment

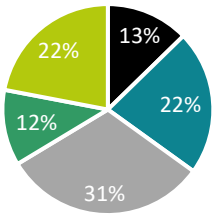
Romania has set up a CO_2 pricing mechanism and introduced carbon-related taxation, which could contribute to supporting the shift to low carbon transportation. The country is also part of the HyLaw[66] project, which aims to identify the status and legislative barriers to hydrogen development.

[61] Planed gas consumption in 2030 source: Strategia Energetică a României 2016-2030, cu perspectiva anului 2050, Ministerul Energiei, 2016, page 64
[62] https://www.arbio.ro/english/#all
[63] http://energie.gov.ro/wp-content/uploads/2016/11/Romanian-Energy-Strategy-2016-2030-executive-summary3.pdf
[64] https://energy.ec.europa.eu/system/files/2020-06/ro_final_necp_main_en_0.pdf
[65] http://www.h2romania.ro/en/index.html
[66] https://www.hylaw.eu/

Slovakia

has a balanced energy mix with notable shares of nuclear and natural gas energy.

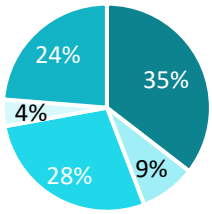
Total energy consumption by fuel



■ solid fossil fuels ■ natural gas ■ oil products ■ renewables ■ nuclear

Source: Eurostat 2020

Consumption of natural gas by sector



■ industry ■ services ■ households ■ other ■ energy production

Source: Eurostat 2020

Slovakia's total energy consumption depends on crude oil products due to transport, imported natural gas, domestic nuclear energy, and electricity imports. Unlike other countries, Slovakia confirmed coal phase-out for 2023 despite the energy crisis. Two additional nuclear reactors, Mochovce 3 and 4 will help to secure power supply after the coal retirement. Addition of the new blocks would double the nuclear capacity (currently 1 400 MW). However, the block's construction is delayed with original commissioning dates set for 2012 and 2013. Domestic energy consumption is driven by the demand for energy from the industrial and commercial sectors.

Slovakia consumes around 5.2 bcm (52 TWh) of gas annually. The country imports 95 % of its natural gas and most of it is from Russia. To become independent, Slovakia has reserved the capacity in several European LNG terminals and will import gas from Norway via a pipeline. Slovakia is also completing an interconnector with Poland. Slovakia can cover about 70% of its annual consumption from its underground gas storage, assuming full utilization of their capacity.

85 %

of natural gas used to be imported from Russian Federation

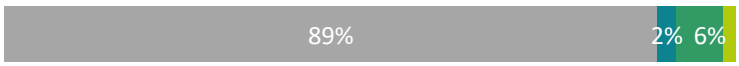
Heating sector by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear

Power generation by fuel

■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear ■ oil products

Transportation by fuel



■ liquid fuels from oil ■ gaseous fuel ■ biogasoline/diesel ■ electricity

Source: Eurostat 2020

Slovakia heavily utilizes natural gas and to lesser extent coal in heat production. When the new nuclear blocks come online, further utilization of waste heat from blocks 3 and 4 could boost the decarbonisation of the heating sector.

Most of the electricity comes from nuclear power (56%), followed by RES (23%) and fossil fuels (21%). Slovakia plans to build additional RES capacity, including 80 MW of solar on the soon-to-be-retired coal sites.

The priority direction of decarbonisation of the transport sector of the Slovak Republic is the use of engines with compressed natural gas (CNG, currently some 3 000 personal and light commercial vehicles), liquefied natural gas (LNG, currently no vehicles), as well as CNG or LNG supplemented by biomethane. However, the number of BEVs (some 3 400) and PHEVs (2 900) is also growing as is the charging infrastructure (over 1 300 charging points).

31.6 $MtCO_2e$

Total GHG emissions

Slovakia accounts for 1.1 % of the EU's total GHG emissions. The industry is responsible for the largest share of the emissions, with 21 % of total emissions coming from industrial processes and product use and 16 % from manufacturing industries and construction (the Kosice US Steel plant being the largest installation). Transport follows with 20 % of the emissions. Energy industries and 'other emissions' account for a 16 % share.

SPECIAL FOCUS: The role of gases in the decarbonisation of Slovakia[67]

Natural gas

52.6 TWh
Planned gas consumption 2030

The natural gas stays in mid-term an important energy source, mainly due to highly developed and implemented central heating systems for domestic sector and the hard-to decarbonise industry in Slovakia. The focus will be on coal phase-out at least cost and to improve air quality especially in regions affected by the energy poverty.

Biomethane

To achieve its goals in the field of renewable resources, Slovakia plans to increase the production of biogas and biomethane. The **NECP anticipates an increase in biogas and biomethane from the 2021 level of 21 GWh annual production to 1 440 GWh in 2030.** Slovakia intends to use biomethane in several sectors, the NECP mentions an alternative fuel, injected into the gas network, or used in the heating sector.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment
Biogas Association[68] brings together shareholders from the industry and governmental sphere to improve the legislative framework for biogas development.

Legislative environment
According to the NECP, **Slovakia intends to introduce several legislative measures to support biomethane** (promoting the transition from biogas to biomethane, support for the recovery of waste from plant and animal production, support for the recovery of waste from the biodegradable part of municipal). None has yet been implemented.

Hydrogen

In the NECP[69], Slovakia perceives hydrogen technologies as a promising option to decarbonise its economy. **According to the document, hydrogen should cover 1 % of the total energy consumption in transport in 2030**, and most of the hydrogen production should be ensured through electricity from nuclear power plants. **More specific targets were presented in the Slovak Hydrogen Strategy[70], according to which the major development of hydrogen till 2030 should take place in transport**.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment
Active association[71] to promote hydrogen solutions and connect many stakeholders from government, industry, and research already exists in Slovakia. Slovakia also **has its hydrogen strategy with specific goals but does not include hydrogen in its national plans for the deployment of alternative fuels infrastructure** (2014/94/EU).

Legislative environment
Specific tax incentives to encourage the use of renewable or low-carbon hydrogen or other legislation are not implemented and Slovakia is also not part of the HyLaw project, which aims to identify the status and legislative barriers to hydrogen development.

[67] Planned gas consumption in 2030 source: Plán rozvoja prepravnej siete spoločnosti eustream, a. s., na obdobie 2022 – 2031 EUSTREAM, page 10 (calculated from the table)
[68] https://www.sba-sk.sk/
[69] https://energy.ec.europa.eu/system/files/2020-03/sk_final_necp_main_en_0.pdf
[70] https://www.slov-lex.sk/legislativne-procesy/-/SK/LP/2021/155
[71] https://nvas.sk/en/

Example of hydrogen project:

H2I Transmission - Retrofitting/repurposing existing infrastructure

Timeline of the project
To be commisioned 2030

The project aims at repurposing of one of existing natural gas transmission lines, enabling transport of hydrogen. The goal is to create a corridor for H2 transmission from H2 production areas to consumers in Slovakia and other EU countries. The existing pipeline connects border point with Ukraine (Veľké Kapušany) with Slovakia-Austria border at Baumgarten and Slovakia-Czech Republic border at Lanžhot. The repurposed pipeline will have daily transport capacity of hydrogen 120 GWh/d, enabling the transit of hydrogen - the clean fuel of the future, substantially contributing to sustainability goals of the EU.

The project forms an integral part of 2 multilateral projects in the region. It is a part of the Central European Hydrogen Corridor (CEHC) project. The CEHC initiative explores the feasibility of creating a hydrogen highway in Central Europe for transporting hydrogen from major hydrogen supply areas in Ukraine via Slovakia and the Czech Republic to hydrogen demand areas in Germany. It is also part of H2Store project which investigates the repurposing of existing transit route between Ukraine and Germany via Slovak republic and Austria with a special focus of utilizing abundant gas storages in Austria and Slovakia for storage of hydrogen. Thus, the main potential of clean hydrogen – ability to be stored – can be utilized. Successful implementation of the project will have significant impact on security of supply as well as sustainability goals of the EU, helping to build and strengthen the EU hydrogen market.

To achieve its goals in the field of renewable resources, Slovakia plans to increase the production of biogas and biomethane. The **NECP anticipates an increase in biogas and biomethane from the 2021 level of 21 GWh annual production to 1 440 GWh in 2030.** Slovakia intends to use biomethane in several sectors, the NECP mentions an alternative fuel, injected into the gas network, or used in the heating sector.

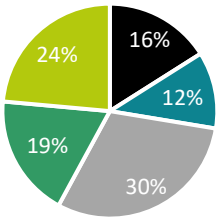
Project status: Planned. Ongoing preparation of the pre-feasibility study.

Project promoters: Eustream

Slovenia

has been traditionally an electricity exporter due to its nuclear and hydropower generation. In its decarbonisation, the country needs to focus on transportation and heating.

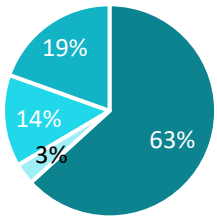
Total energy consumption by fuel



■ solid fossil fuels ■ natural gas ■ oil products ■ renewables ■ nuclear

Source: Eurostat 2020

Consumption of natural gas by sector



■ industry ■ services ■ households ■ energy production

Source: Eurostat 2020

In 2020 Slovenia covered its energy needs by 55 % with domestic resources. Crude oil products (33 %) together with nuclear power (23.2 %) play the main role in the Slovenian energy mix. The share of RES is approaching the 20 % mark, with majority being hydropower. Solid fossil fuels and natural gas follow with 15 % and 12 % respectively. Slovenia currently operates one coal-fired 600MW thermal power plant. It announced a phase-out by 2033. Large share of Slovenia's electricity, 39 %, was exported also because neighbouring country Croatia is co-owner of the nuclear power plant. Slovenia joined a group of another 10 EU members which issued a joint statement saying that the best way to achieve the EU's independence from Russian fossil fuels is to accelerate the green transition towards climate neutrality by 2050 at the latest.

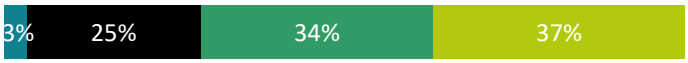
Slovenia uses approximately 0.8 bcm (9 TWh) of natural gas annually (based on 2020 data). Slovenia imports all its natural gas with the majority coming from Russia. The country currently has no LNG import terminals, but in recent months discussed LNG imports with major suppliers through the LNG terminals of its neighbours. Slovenia is one of the countries in the region without underground gas storage. Further, Slovenia's natural gas infrastructure company Plinovodi plans together with Hungary's FGSZ to construct a new gas interconnector to link Hungary and Slovenia, as well as some other upgrades and enlargements with neighbouring TSOs.

81 %
of natural gas used to be imported from Russian Federation

Heating sector by fuel

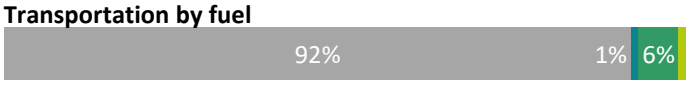
■ natural gas ■ solid fossil fuels ■ renewables ■ oil products

Power generation by fuel



■ natural gas ■ solid fossil fuels ■ renewables ■ nuclear

Transportation by fuel



■ liquid fuels from oil ■ gaseous fuel ■ biogasoline/diesel ■ electricity

Source: Eurostat 2020

Slovenia has a high use of biomass for individual heating, especially in small cities and rural areas. Most district heating is based on large-scale fossil-driven district heating networks. The development of small-scale RES driven district heating networks is a part of the Slovenian national energy plans and strategies.

Slovenia's new renewable capacity build-out still largely counts on hydropower (NECP sees a 42 % increase). Slovenia's new government further accelerated efforts to increase power generation from renewable sources, including solar and wind energy. The last source to boost RES share in Slovenia's power generation is wood biomass.

Due to emissions development in the transport sector, the current decarbonisation measures include integrated transport planning, mobility management, incentives to use modern technologies applied to managing mobility, and subsidies aimed at public transport.

15 $MtCO_2e$
Total GHG emissions

Slovenia accounts for 0.5 % of total EU GHG emissions. Transport accounted for the largest share of Slovenia's GHG emissions in 2019, with 32.3 % of the total. The sector marked a sharp increase due to increased daily migration and increased transit. The second largest emitter was the energy industry (27 %). Agriculture, the 'other emissions' sector, and manufacturing were all around 10 %, with industrial processes approaching the mark (7%).

SPECIAL FOCUS: The role of gases in the decarbonisation of Slovenia[72]

Natural gas

10.5 TWh
Planned gas consumption 2030

There is a new version of NECP in preparation. It is expected that development of renewable gases (biomethane, green hydrogen and synthetic methane) at the expense of fossil gas will be faster than envisaged in the current plans.

Biomethane

According to the NECP, Slovenia expects a total of 34 MW power generation capacity from all types of biogases by 2030. This could generate up to 170 GWh in 2030. The NECP mentions the total biogas potential to be approximately 480 GWh in 2030 and up to 700 GWh in 2040, including biogas produced from sewage treatment plants, waste treatment, landfill gas capture, and agricultural gas production.

Biomethane and biogas application areas mentioned in NECP

Developed environment | In process | Lack of available informations

Energy	Heating	Industry	Transportation

Political environment
There is **no active specialized biomethane association in Slovenia**. However, it is the Chamber of Commerce and Industry of Slovenia[73] (CCIS), which is the largest independent, voluntary, non-profit association of companies in Slovenia that covers the development of biogas and biomethane projects. Slovenia does not currently have a biogas or biomethane strategy.

Legislative environment
At this moment, **there is no legislative framework for biomethane** support in Slovenia.

Hydrogen

According to the NECP[74], the role of hydrogen should develop with the increasing share of RES in power generation. The **annual consumption of hydrogen in transport is predicted to reach 9.5 ktoe (111 GWh) in 2030.** Slovenia is also considering mixing green hydrogen into the existing gas infrastructure. According to the Long-Term Climate strategy and NECP, **Slovenia plans to achieve an approximately 10 % share of renewable hydrogen or synthetic gas in the transmission and distribution system by 2030.** By 2040, the country intends to replace 25 % of the gas it consumes with hydrogen or other synthetic gases.

Hydrogen application areas mentioned in NECP

Energy	Heating	Industry	Transportation

Political environment
There is currently no strategy for hydrogen, however the hydrogen is included in main strategic documents. There are initiatives to develop hydrogen strategy. Slovenia also includes **hydrogen in its national plans for the deployment of alternative fuel infrastructure** (2014/94/EU) to a limited extent.

Legislative environment
Slovenia has set up a CO_2 pricing mechanism and introduced carbon-related taxation, which could nudge the shift to low carbon transportation. However, Slovenia is not part of the HyLaw [75] project, which aims to identify the status and legislative barriers to hydrogen development.

[72] NECP, Sankey diagram, page 205 (scenario with ambitious additional actions). Represented are: natural gas + syngas + h2
[73] https://eng.gzs.si/
[74] https://energy.ec.europa.eu/system/files/2020-06/si_final_necp_main_en_0.pdf
[75] https://www.hylaw.eu/

Example of hydrogen project:

Project SLOP2G - Integrated Power-to-Gas project

Timeline of the project
2022-2028

The SLOP2G project is promoted by 4 Slovenian energy companies with the aim to integrate first green hydrogen and renewable gases production facilities in Slovenian natural gas system. Project of power and gas sector coupling is oriented towards implementing efficient way of storing renewable electricity surpluses in natural gas (NG) transmission system and decarbonising energy supply in Slovenia. Project will have impact not only on decarbonising power supply by allowing for greater RES penetration in the power system, but also in decarbonising NG supply in sectors where substituting NG with electricity is not possible or feasible.

The project will address optimal distribution and use of renewable electricity surpluses, their conversion to green gases and new model and optimization-based control system for optimization of all segments, from electricity production to final green gases injection. The project will encourage further production and use of green gases and decarbonisation of energy supply and industry by encouraging private investors to invest in renewable technologies as well as enable the NG TSO to prepare for the injection and operation of the transmission system with renewable gases and coordinated operation with the electricity system operation. Project sites are located near Slovenian NG transmission system backbone, where NG flows are the highest, thus allowing for further upscaling in the future.

Project status: Planned. Ongoing preparation of the pre-feasibility study.

Project promoters: Plinovodi d.o.o., ELES d.o.o., HSE d.o.o., HESS d.o.o.