Energy in Hungary

Published by the Hungarian Energy and Public Utility Regulatory Authority (MEKH) on the occasion of the 20th ERRA Annual Conference on 9-10 October 2023 in Budapest

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Contents

I. Introduction

Given its strategic location in the heart of Europe, Hungary serves as a major interconnection point between East and West, North and South. This advantageous position presents ample opportunities for cooperation across various industries, including the energy sector. The Hungarian Energy and Public Utility Regulatory Authority (MEKH), a founding member of ERRA, serves as the national regulatory authority for the electricity, natural gas and district heating sectors as well as for water utilities and waste management.

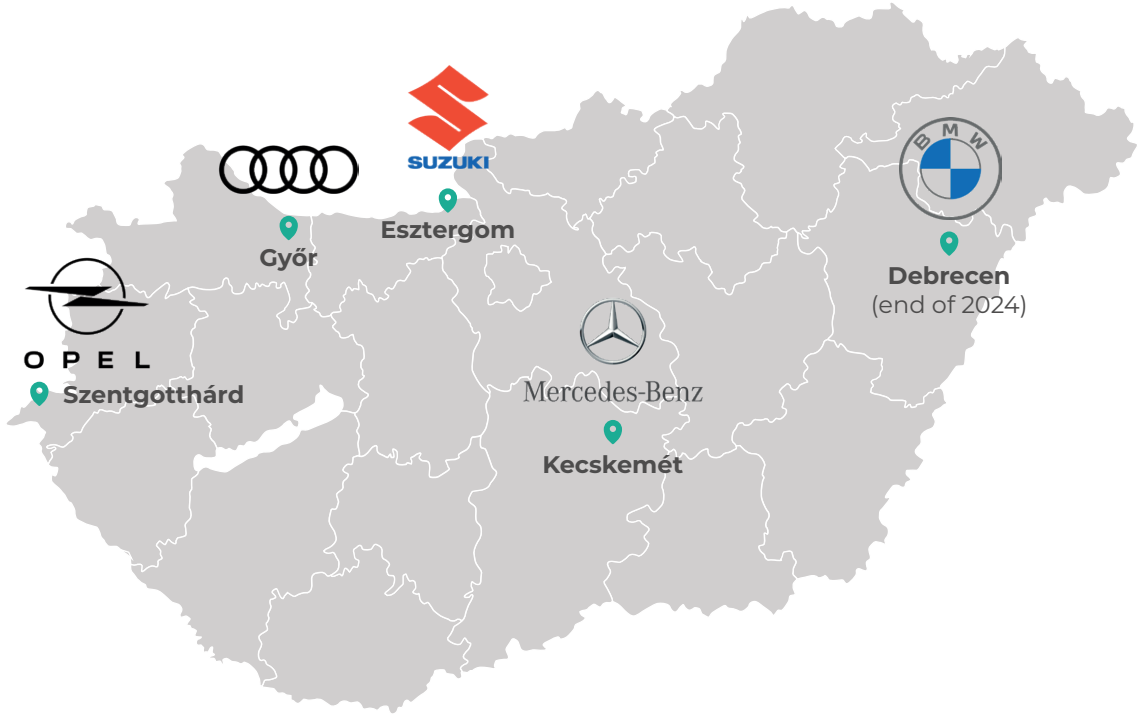
This publication aims to showcase the key features of the Hungarian energy sector on the occasion of the 20th ERRA Annual Conference on 9-10 October 2023 in Budapest, hosted by MEKH. ERRA Annual Conferences traditionally serve as excellent opportunities to bring together regulators and stakeholders with diverse backgrounds to facilitate mutual learning. This year's Conference is dedicated to the latest regulatory challenges that arise from the ever more pressing need for energy transition and sustainability, along with the European energy crisis. Through this concise summary, MEKH aims to facilitate understanding Hungary's perspective from a regulatory point of view.

Unless mentioned otherwise, the source of the data in the tables is MEKH.

II. Key Aspects of the Hungarian Economy

Hungary is a landlocked country, spanning 93,030 square kilometers. It shares borders with Slovakia to the north, Ukraine to the northeast, Romania to the east and southeast, Serbia to the south, Croatia and Slovenia to the southwest, and Austria to the west. Like most of its neighbors, Hungary is a member of the European Union, having joined the bloc in 2004. Budapest is the country's capital and largest city, while other significant urban areas include Debrecen, Szeged, Miskolc, Pécs, and Győr. The country has a population of approximately 9.7 million and a GDP per capita of USD 41.907. The currency is the Hungarian forint (HUF).

Hungary's economy is open and export-oriented laying great emphasis on foreign trade and investment. Over half of the world's largest multinational firms, and many of their SME suppliers have established a steady presence in Hungary, due to the highly skilled workforce, good location, attractive tax system and well-established physical and business infrastructure. Most of Hungary's exports (87%) are sent to other EU countries and they primarily include cars, vehicle parts, electronics, pharmaceuticals. The automotive industry is the backbone of the Hungarian economy, with four car manufacturers (Audi, Mercedes, Opel and Suzuki) operating in the country and with BMW's plant opening is scheduled for Autumn 2024. Hungary is an established center in Europe of lithium-ion (EV) battery production as a number of leading manufacturers are present (e.g. SK, Samsung, CATL). The Hungarian government offers considerable incentives to attract even more investment in this field in the future.

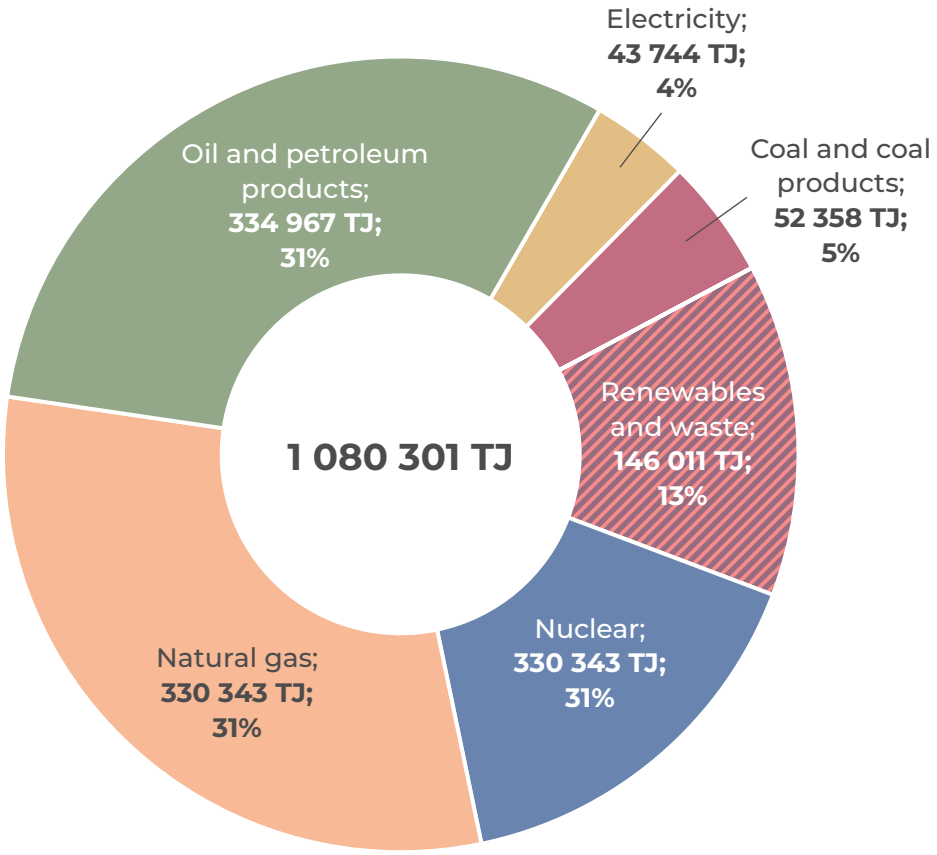


III. Hungary's Energy Sector at a Glance

The primary energy supply in Hungary was 1.080.301 TJ in 2022, which marks a 6% reduction compared to 2021. About half of this consumption is covered by domestic production, with the remaining half imported. Hungary's import dependency is comparatively high (natural gas: 86.4%, oil: 88.4%, coal: 39.5%). Nevertheless, there have been continuous efforts and steady improvements both in case of natural gas and electricity supply in the past years as a result of resource diversification efforts as well as market integration.

Electricity consumption is expected to rise until 2050, and by then, Hungary aims to achieve complete climate neutrality. According to the National Energy and Climate Plan (NECP), Hungary aims to make 90% of its electricity production carbon free already by 2030. In this context, it is noteworthy that nuclear power plays and is expected to play an important role in Hungary's energy mix. Hungary is dedicated to use nuclear power further on to attain climate neutrality objectives. To this end, it plans to extend the operation time of 2000 MW Paks I power plant (currently permitted until 2036-37) and to replace, renew and slightly increase its installed capacity through the Paks II project. The Paks II project foresees the installation of 2 new blocks, each with a 1200 MW capacity. Currently, nuclear energy is the primary source of baseload electricity consumption. However, PV capacities have skyrocketed in recent years (they surpassed 5000 MW at the end of Q2 2023) and are expected to reach even 13 GW by 2030. Household heating is to a large extent based on natural gas, while solid biomass (firewood) is the dominant renewable energy source. To decrease import dependency, especially for sectors serving household consumers, the heating sources should be diversified through e. g. heat pumps or geothermal district heating.

Total Primary Energy Supply, 2022 (TJ)



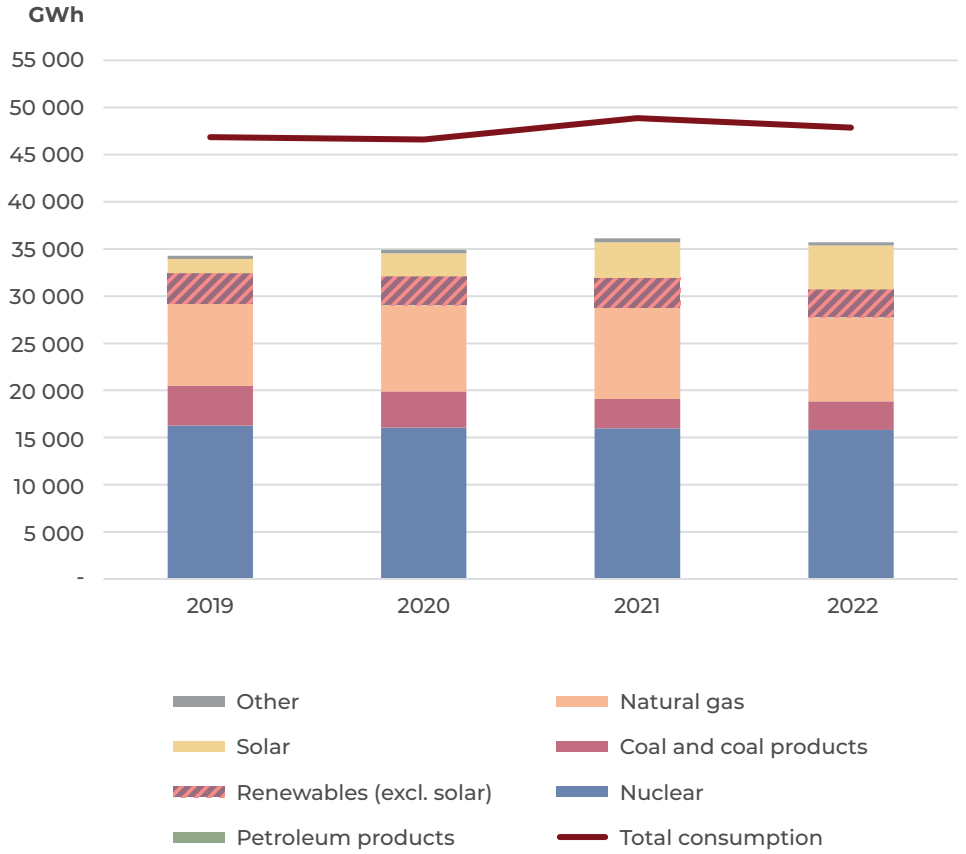
III. Hungary's Energy Sector at a Glance

As the country is a Member State of the EU, Hungary's energy related policies are significantly shaped by the EU's energy acquis and climate objectives, including concerning green-house gas emission reduction, improving energy efficiency and increasing the use of renewable energy sources. Furthermore, network development processes (led by the TSOs and DSOs and approved by MEKH) for the power and natural gas networks of Hungary are intertwined with the procedures for devising the European Ten-Year Network Development Plans as well as for selecting and realizing the European projects of common interest (PCIs).

In recent years, the biggest challenge faced by the government, the regulator and the market players alike was the European energy crisis in 2021-2022 with previously unseen price spikes necessitating immediate attention and intervention in multiple policy areas.

In the last decades, there have been significant changes in Hungary's electricity sector. Initially, this was due to privatization and then as a consequence of Hungary's accession to the EU, implementing EU legislation and policies. As a result of the implementation of the third energy package, certain segments of the natural monopoly industries had to be unbundled, Hungary's electricity grid got more interconnected to neighboring systems, and the day-ahead and intraday power markets were coupled with their European counterparts. Despite the privatization process, state ownership remained significant in traditional generation technologies. However, out of the total generation capacity of 12,4 GW the proportion of installed PV generation capacity, typically in private ownership, is constantly increasing, and by 31 December 2022, it reached 4 GW. Next to solar energy, nuclear energy (2026 MW), coal (1166 MW) and natural gas fired (4058 MW) power plants have the highest installed capacity, which is also reflected in the production mix as shown here.

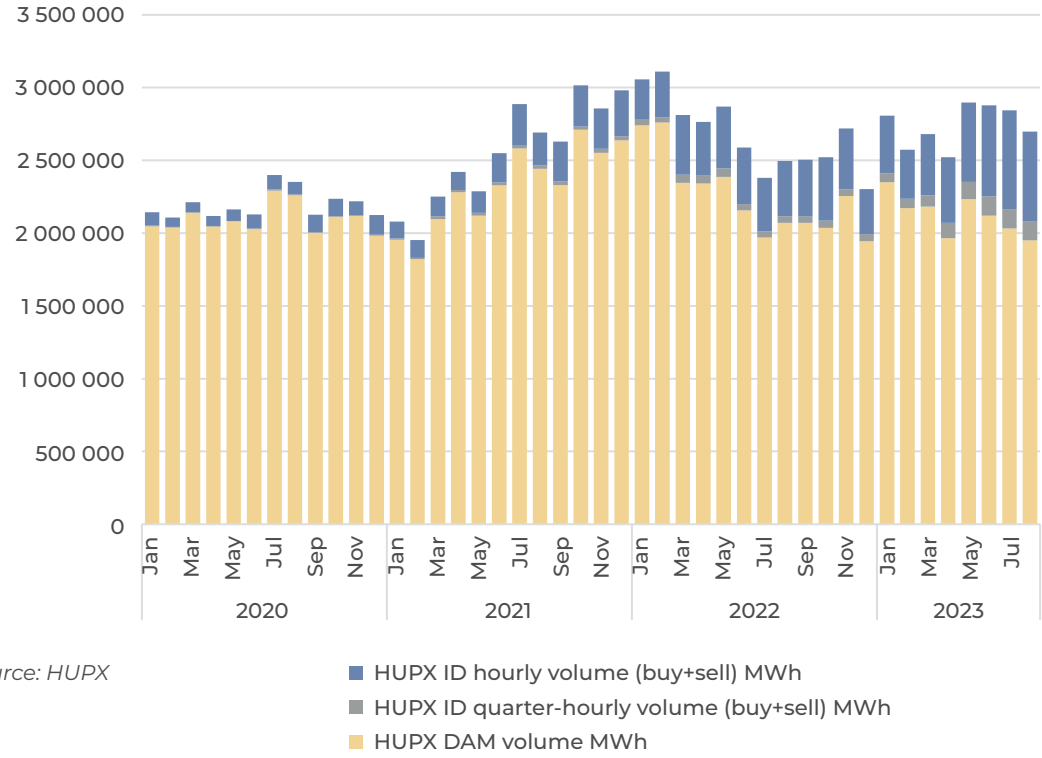
Gross electricity production by source and total consumption, 2019–2022p (GWh)



IV. Electricity

A large part of electricity trade is performed by HUPX, the Hungarian spot power exchange, a nominated energy market operator (NEMO) under EU legislation. HUPX has a leading position in Central and Eastern Europe with constantly increasing traded volumes, recently reaching 3000 GWh, and beyond the trading platform it provides reference prices for the region as well. HUPX actively took part in European power market integration through flagship projects such as the Single Day-ahead Coupling and the Single Intraday Coupling, which brought about a price convergence between the different Member States and increased market liquidity, especially on the intraday market. As a member of Europe's Core Capacity Calculation region, flow-based implicit allocation is implemented on Hungary's EU borders for the day-ahead timeframe. The next step in the market integration process is the integration of the balancing markets and the accession by TSO MAVIR to the EU balancing blatforms.

This degree of integration would not be feasible without the interconnected grid. Hungary has made constant efforts to enhance its interconnections, resulting in the Hungarian power system having direct connections with all of the neighboring countries. This has led to an interconnection capacity of 50% compared to the gross installed generation capacity, significantly higher than the 15 percent target envisaged by the EU. Hungary aims to further increase this figure to 60% by 2030 and is eager to strengthen its cooperation with its Energy Community member neighboring countries, namely the Republic of Serbia and Ukraine.



Source: HUPX

As the chart above indicates, Hungary heavily relies on imported electricity coming from its neighbors. Fortunately, this dependency is gradually decreasing due to the growth in renewable generation capacities.

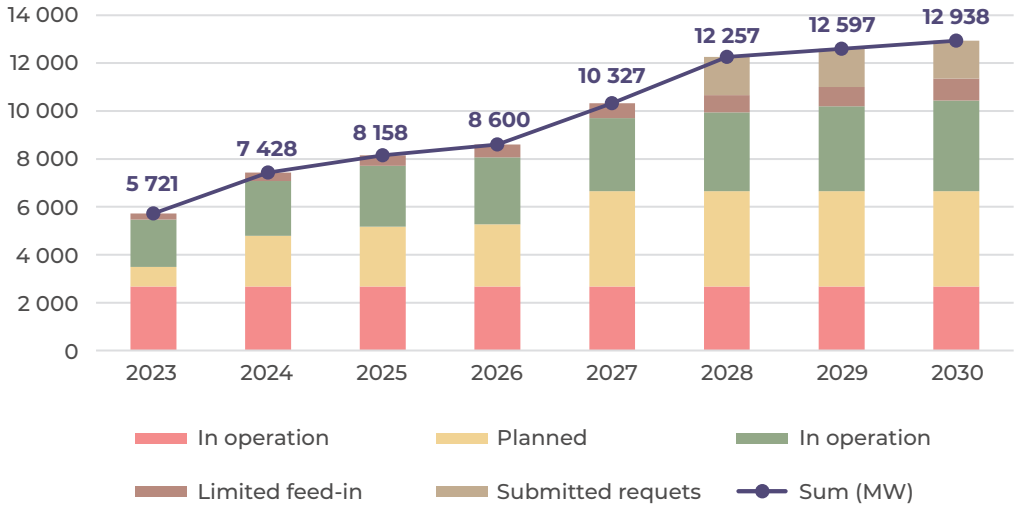
However, the rise in intermittent renewable generation increases the need for flexibility, particularly for aFRR (that is, secondary reserves). Furthermore, the need for flexibility is expected to continue to rise significantly, since PV installed capacity is forecast to reach 13 GW by 2030, potentially multiplying current levels of flexibility needs. This, together with the fact that in the region, Hungarian aFRR capacity prices are comparatively high, poses one of the biggest challenges in the energy transition and decarbonization for Hungary.

Key market participants:

MAVIR, the TSO; 6 DSOs: MVM Démász, MVM Émász, E.ON Dédász, E.ON Émász, E.ON Elmű, OPUS Titász; HUPX, the Hungarian power exchange; MVM, the most significant electricity generator whose electricity trader branch company, MVM Next is the Universal Service Provider in electricity. In 2022, there were approximately 100 power trading companies active in Hungary.

	2018	2019	2020	2021	2022p
Gross production	32 067 TJ	34 291 TJ	34 930 TJ	36 120 TJ	35 699 TJ
Total consumption	46 415 TJ	46 875 TJ	46 607 TJ	48 874 TJ	47 850 TJ
Net import rate in total consumption	30,9%	26,8%	25,1%	26,1%	25,4%

Forecast installed capacity of solar PV (MW)



Source: MAVIR

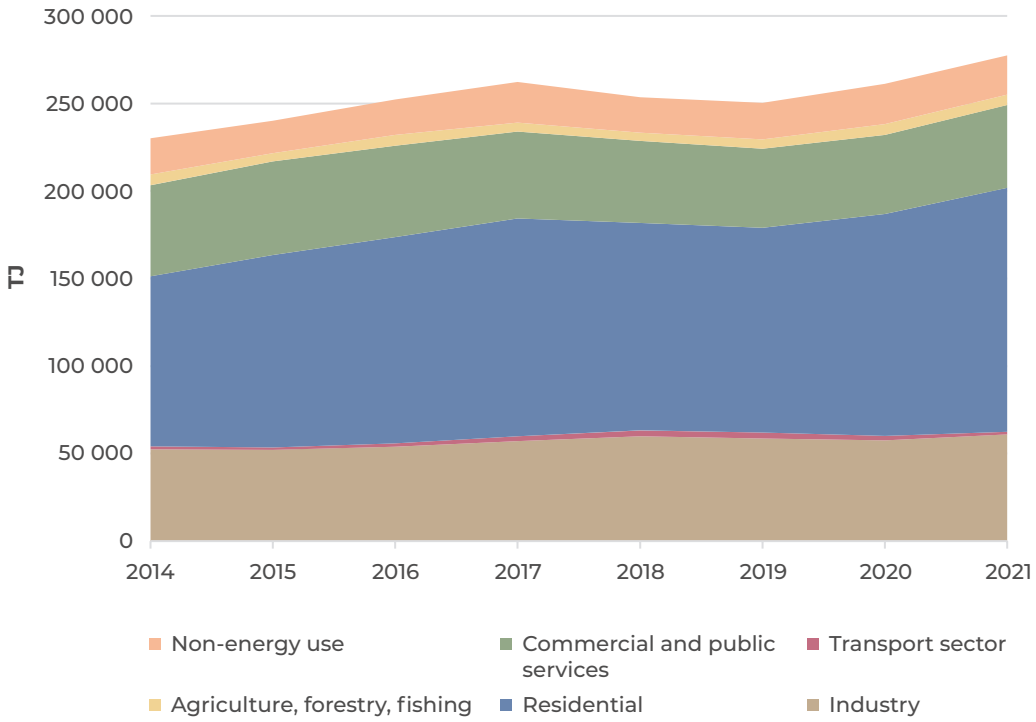
V. Gas

The natural gas sector underwent major changes in recent decades following the implementation of the EU energy acquis: gas trade was liberalized, the share of state-owned undertakings decreased, and the level of market integration as well as system interconnection grew. Natural gas plays an essential role in the Hungarian energy supply and makes up one-third of the primary energy supply due to its extensive use in household heating which constitutes almost 50% of the final consumption of natural gas as depicted below. This characteristic is rather unique among European countries.

In the context of the recent energy crisis, this dependence on natural gas and exposure to natural gas was intensified and spurred the Hungarian government to change the regulated price framework for households, however keeping the prices at a tolerable level was successful, while ensuring that there were no interruptions in energy supply during the heating season of 2022/2023. Partly as a result of the price increase, but also due to the lower heating demand during the mild winter, the use of natural gas fell by 15 percent in 2022. A major question for next winter and Hungary's decarbonization efforts is how much of the demand reduction remains structural. As Hungary has very low domestic production, up to 10 percent of its natural gas consumption, it is highly dependent on imports, mainly from Russia. Demand reduction would contribute to energy security but this is only desirable as a result of increased energy efficiency rather than demand destruction, resulting in industry disruption. Thus, in Hungary, the most pressing challenge of the sector is resource diversification.

	2020	2021	2022p
Domestic supply	1 098 515 TJ	1 149 721 TJ	1 080 301 TJ
of which natural gas	366 947 TJ	389 174 TJ	330 343 TJ
Share of natural gas in domestic supply	33,4%	33,8%	30,6%

Natural gas final consumption by sector, 2014–2021 (TJ)



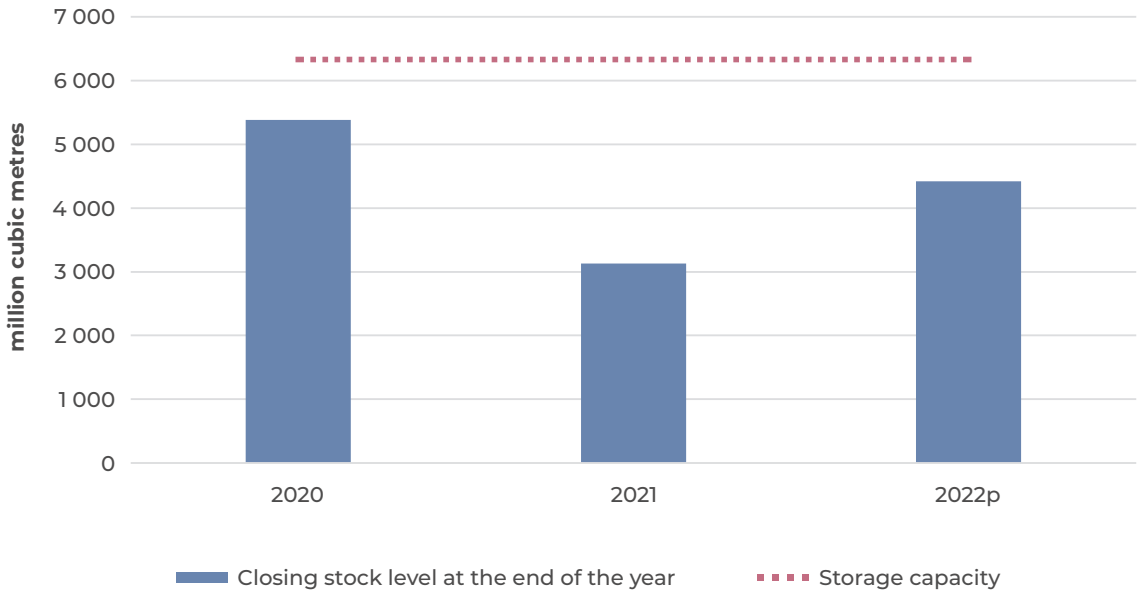
Being a landlocked country, Hungary can only receive natural gas by pipeline. The physically closest LNG facility is in neighboring Croatia: Hungarian companies have reserved the vast majority of capacities at the Krk LNG regasification terminal. Furthermore, Hungary has successfully embarked on natural gas infrastructure developments in cooperation with the neighboring countries. As a result, there are interconnection points towards all neighbors with the exception of Slovenia, and there is political will for the development of an interconnection with the latter as well. All interconnectors are bidirectional save the one with Austria. The Hungarian NRA and TSO are also in talks with the goal to explore how to use the existing pipelines for hydrogen transport in the future.

The country's security of supply is bolstered by its high natural gas storage capacity compared to domestic consumption. Hexum and Hungarian Gas Storage (MFGT) operate five commercial and one strategic underground gas storage facility. The commercial facilities have almost 5 billion m^3 total gas storage capacity while the strategic facility has around 1 billion m^3 total gas storage capacity. Compared to Hungary's yearly consumption the capacities are quite high. The outstanding quality of the storages is highlighted by the substantial total daily withdrawal capacity (70 million m^3 per day) which is above the average daily winter consumption rate.

Key market participants:

FGSZ, the TSO, 11 DSOs; CEEGEX, the Hungarian gas exchange; MVM as natural gas trader and, MVM Next as the Universal Service Provider; HEXUM and MFGT, the storage companies. In 2023, there are approximately 150 gas trading companies active in Hungary.

Natural gas closing stock level and storage capacity, 2020–2022 (million cubic metres)

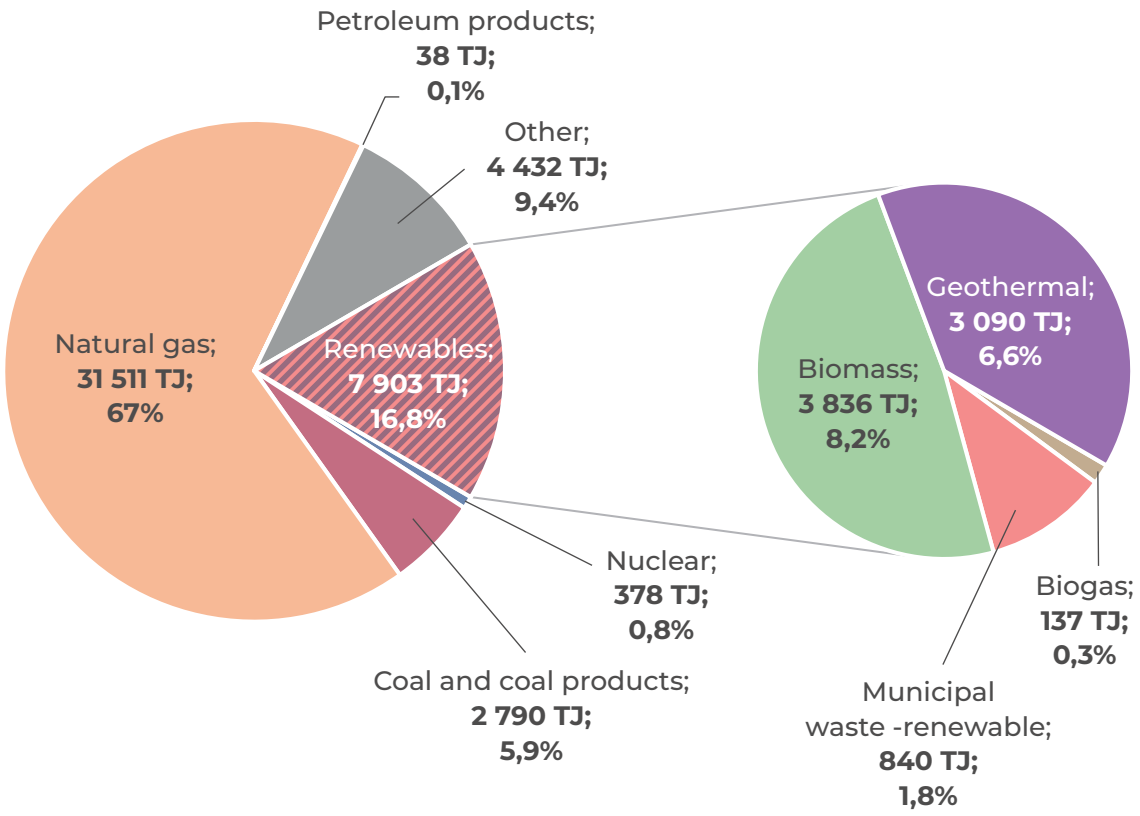


In Hungary, the number of households with district heating surpasses 650.000 in 94 municipalities. The fuel used by district heating producers is mostly natural gas. In most places, there is only one district heating supplier that is mostly owned by the local municipality it serves. Most suppliers serve only one municipality and there is sporadic interconnection of systems, most of them are of local character.

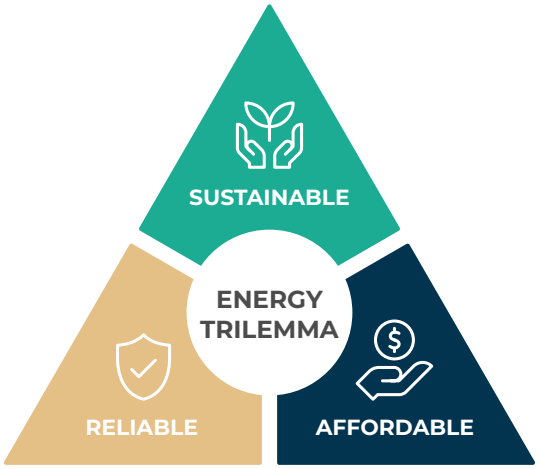
However, there is significant geothermal potential in Hungary, which could contribute to (at least partly) replacing existing natural gas-based heat generation with renewable technologies. For industrial and district heating, the main objective is to exploit the geothermal potential of Hungary where it is economically viable (i.e., where a suitable heat transfer fluid is available). The aim is to double the amount of geothermal energy currently used by 2030. In the district heating sector, the use of excess heat from industry or other sources, as well as use of ambient heat, is essential, alongside the dissemination of geothermal technology.

A recent notable development in the sector was the inauguration of the EU's largest geothermal heating system earlier this year in Szeged. The system finally provides affordable energy to over 28.000 households and over 400 public buildings. The project, co-funded by the EU, not only provides clean and affordable energy, but also helps Hungary decrease its gas dependency.

Heat production by fuel source, 2022 (preliminary) (TJ)



VII. Sustainability

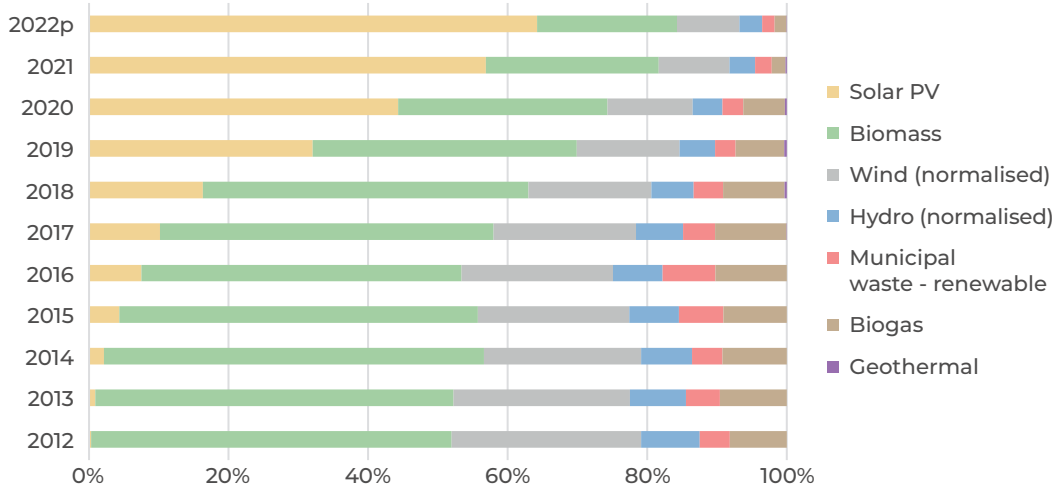


Along with affordability and security of supply, the third priority in the energy trilemma of our age is sustainability. Hungary's sustainability targets for 2030, as set out in the current draft of the National Energy and Climate Plan are as follows: reduction of GHG emission by 50% compared to the base year 1990, a final energy consumption of no more than 750 PJ, and to increase the share of renewables in the gross final energy consumption to at least 29%. Hungary is focusing on increasing its renewable production mainly through the deployment of solar PV. The installed capacity of solar PV surpassed 5.000 MW and is planned to increase up to around 12.000 MW until 2030 (based on the NECP targets). Installed wind capacity is expected to increase from the current 330 MW to 1000 MW. Renewable generation was previously subsidized with a feed-in tariff system (KÁT), but the FiT support scheme has been phased out for new entrants and replaced by the so called METÁR scheme. METÁR is an operational subsidy scheme offering a two-way contract for difference green premium for new or substantially refurbished RES power plants winning on the so called METÁR tenders, and also providing a brown premium for existing biomass/biogas power plants to ensure profitable operation.

As a result, the share of electricity from renewable sources in gross final consumption reached 15.2% by 2022. The rising interest in renewables also kindled the market for guarantees of origin (GO), and HUPX, the Hungarian power exchange acted upon this opportunity when it launched its advanced multiple seller model trading in the Fall of 2022.

The integration of variable and distributed renewable generation poses serious challenges to the grid, which needs to be prepared and developed accordingly, together with flexibility sources such as storage and new demand side balancing solutions. Accordingly, the Hungarian Government intends to build energy storage facilities in Hungary with a total capacity of around 500-600 MW by 2026, which could increase to 1 GW by 2030. In addition, the use of conventional, natural gas-based technologies (1.500 MW CCGT planned capacity) might also be essential to ensure a continuous and predictable supply of energy. There is also a dedicated government development project to upgrade the electricity distribution networks so that even more distributed energy resources can be integrated.

Gross electricity production from renewable sources, 2012–2022 (preliminary) (%)



VII. Sustainability

The potential for relying on other renewable sources such as biogas and biomethane is still to be better explored. The operational model of existing biogas plants is to generate heat and power in order to cover own consumption in first place or to feed the produced electricity to the grid. Expecting higher CO2 and fossil gas prices in the future, consideration is given to the elaboration of a strategy that facilitates the injection of biomethane in the natural gas grid. The technical biomethane potential for 2030 could be around 5 TWh or about 0,5 bcm, while theoretical potential for 2040 might reach around 13-17 TWh, that is, about 1,3-1,7 bcm.

As part of the decarbonization efforts, the Aquamarine project of the Hungarian Gas Storage Ltd (MFGT) should be mentioned. An electrolysis system with approximately 2.5 MW total performance and the corresponding hydrogen gas preparation technology is in place at the Kardoskút underground gas storage site. The hydrogen produced by using excess electricity will be mixed with natural gas. MFGT will use the gas blend in its own gas-operated equipment and at the same time test the potential for future H2-injection into the natural gas system. The trial operation of the equipment started in spring 2023.

The so-called Energy Efficiency Obligation Scheme (EEOS or ‘EKR’ in Hungarian) operated by MEKH contributes significantly to reach the national energy saving targets. It achieves this goal through incentivizing suppliers, commercial companies and universal service providers engaged in the retail trade of gas, electricity and transport fuels to implement energy efficiency measures that will lead to final energy savings. Regarding energy efficiency gains, the renovation of the residential building stock promises the biggest saving potential.

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2023