ANALYSIS OF CLIMATE-ENERGY POLICIES & IMPLEMENTATION IN HUNGARY

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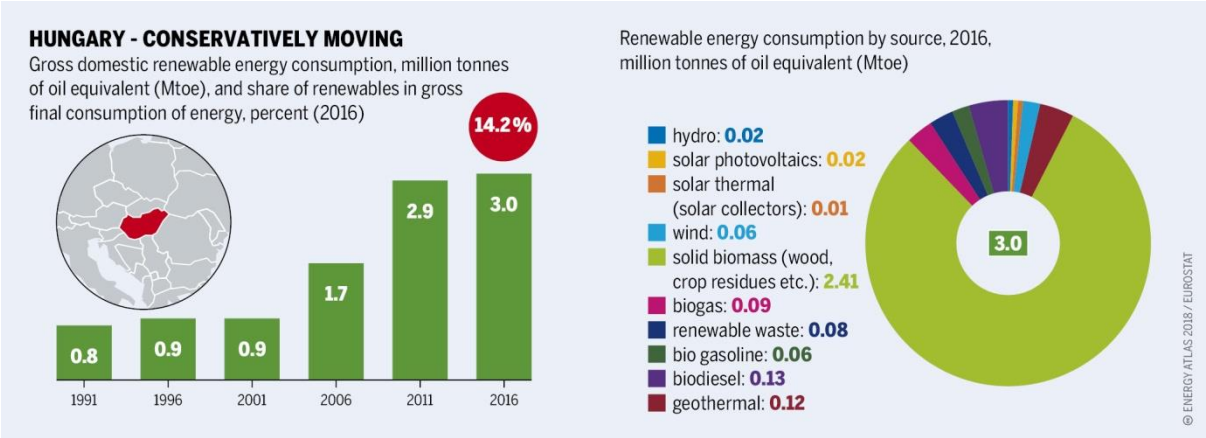
1. Introduction

Hungary is poor in fossil energy sources: Oil and natural gas production provides only 10% and 20-25% of the domestic demand, respectively[1]; the only significant source is low quality lignite. There are also notable, but (non-utilized) non-conventional natural gas sources. The mining of coal has ceased, lignite mining produces around 9 million tonnes/year (⅔ of the domestic coal consumption), but the government is considering a total coal exit by 2030.[2] The country has uranium mines which are currently not financially viable.

Among renewables, biomass is the largest renewable energy source (mainly as solid biomass, accounting for 80% of primary renewable consumption). Hungary has one of the best geothermal resources in the EU, providing hot water - mainly used in spas, usually without heat recovery. There is also some geothermal energy use for heat in the residential sector and in agriculture. Conditions for solar energy are also favourable in Hungary, with its expansion currently expanding rapidly.
The overall wind energy potential is not significant, although certain regions have a reasonable amount of wind potential. The rate of hydropower utilisation has remained at a low but stable level in the last decades. Beyond some small-scale hydro development, the potential use of large rivers for hydropower generation remains politically very controversial.



Hungary's total primary energy supply (TPES)[3] is coming 90% from fossil and nuclear sources and only 12.5% from renewables. This results in a strong energy import-dependence -- 60% on average, 90% in oil, and 100% in uranium. What is more, 95% of energy is imported from Russia. Within Hungary' total primary energy use of about 1000-1100 PJ/year, oil products and natural gas represent a share of 30-30% and nuclear a share of 18%. The most important final energy users are residential (32%), transportation (22%) and industrial (21%) sectors.[3]

In terms of heat production (54 PJ), 66% of district heating is produced by natural gas, 10-10% by coal and biomass, 5% by geothermal, 9% by other sources. 17% of households are

[1] Magyar Földtani és Bányászati Hivatal (2017): Ásványvagyon-nyilvántartás https://mbfsz.gov.hu/asvanyvagyon_nyilvantartas
[2] http://www.climatechangenews.com/2018/11/20/hungary-wants-end-coal-power-2030/
[3] Hungarian Energy and Public Utility Regulatory Authority (2018): Hungarian Energy Balance 2016

supplied by district heating. In case of residential heating, natural gas (51%), renewables -- meaning mainly firewood (37%) and district heating (8%) are the most important energy sources. In case of domestic hot water, natural gas (39%), electricity (39%) and district heating are the main sources. Cooling is entirely provided by electricity.

In 2016 the electricity production of the country was close to 32 TWh, half of which was provided by nuclear, 20% from natural gas and 18% by coal (mainly lignite)[4]. In the end of 2016, the total installed capacity of Hungarian power plants were 8576 MW, consisting primarily of large (50+ MW) power plants are dominating (large plants provide 82% of capacity and 85% of production). Electricity production is quite centralized as around ¾ of the total electricity production is provided by only two power plants, the Paks nuclear power plant and the lignite-based Mátra power plant.
In recent years the share of electricity import increased to around 30% (12.7 TWh net import) of the total electricity consumption of 44.4 TWh[5].

From electricity generation, renewables account for 7.2%[6]. Similarly to the total primary energy consumption, biomass is the primary source of renewable electricity generation. Despite investments in wind and solar, biomass still generated 46% of renewable electricity in 2016, although trending downwards from 84% in 2005. Producing power from biomass raises significant sustainability concerns as sometimes wood needs to be imported and/or co-fired with coal. Biogas, produced mainly from (landfill, sewage sludge and agricultural manure) waste treatment systems is producing 10% of renewable power.

The share of wind power was 21% of renewable in 2016. Wind power development started dynamically in the 2000's, resulting in 330 MW capacity by 2011. Despite strong investor interest, no tenders for wind capacity have been launched since that time. In principle, wind power could benefit from support through the 2016 renewable energy support framework of the Hungarian government (aka. METÁR, see under Section 4.4). However, a governmental decision in 2016[7] essentially banned new wind investment by requiring that no wind turbine can be within 12 kms of residential areas. Thus no new wind turbines have been installed in Hungary since 2016 and the regulatory environment is not expected to change.

First appearing in the 2000's, photovoltaics exceeded 200 MW in 2016 (6.3% of RES production) and 480 MW by mid-2018[8]. More than half of this capacity is comprised of small-scale household units[9]. The rate of solar generating capacity per capita is still well below EU average, but this is rapidly changing with rooftop solar installations doubling every year, and a parallel boom in large-scale solar plants due to a restructuring of the solar subsidy system (Although Hungary only hosts 0,3% of the total EU solar capacity, in 2017 it was home to 1,6% of all new installations)[10](see more on the subsidy system below under METÁR,

[4] IEA 2017
[5] MAVIR (Hungarian TSO)(2017): Data of the Hungarian Electricity System 2016.
[6] KSH (Hungarian Statistical Office)(2018): Hungarian Energy Statistics 2016.
[7] 277/2016. (IX. 15.) Korm. rendelet a szélerőművekre vonatkozó szabályok módosításáról
[8] Péter Grabner (2018): A megújuló energiákkal kapcsolatos kihívások a Hivatal nézőpontjából (presentation at VIII. Szolár Konferencia, 2018. november 8.)
[9] Hungarian Energy and Public Utility Regulatory Authority (2018): Small-scale household generator statistics of 2017
[10] https://www.eurobserv-er.org/photovoltaic-barometer-2018/

Section 4.4). In the re-starting METÁR, new tenders for projects above 1 MW will be available from the beginning of 2019. As a result of these tenders, the government expects around 2000 MW solar capacity by 2020[11] - equal to the capacity of the Paks nuclear power plant.
In addition, hydropower is producing 8.1% of renewable electricity, with an almost steady capacity of 50 MW; and renewable waste 7.6%.

With 32% of final energy use taking place in the residential sector[12], building energy efficiency is a central sector of climate policy in Hungary. Despite its significance, only limited progress has been made in this area over the last decade. A significant portion of Hungary's building stock is technically obsolete, lacking in adequate insulation or efficient heating systems. This is particularly true of single-family homes which make up ⅔ of the building stock. Thus, there are significant potentials (up to 150 PJ[13]) for energy savings in this sector. Household energy costs are higher than the EU average as a share of total household spending[14], and are thus both an important political issue and an incentive to invest in energy efficiency. The lack of adequate government subsidy schemes (see Section 4.) and the low credit rating of the population however results in continued underinvestment in household energy efficiency. This also explains why, - as indicated below under Section 3.1.2. - , Hungary is not on track to meet its energy efficiency targets for 2020. In 2012, the government ordered a series of rate cuts on heating and power prices[15], resulting in about 25% lower energy prices for all households irrespective of income levels - this has probably further curtailed the appetite for investments in energy savings.

The Hungarian National Energy Strategy until 2030 was adopted by the Parliament in 2011. The strategy initially envisaged a total primary energy consumption of 1150 PJ, which was later revised down to 1028 PJ in 2015 (that year the energy consumption was only 999 PJ). The strategy expected an average growth of 1.5% in electricity consumption, retrofit programs of buildings, wide electrification of transportation sector, modal shift to public and railway transport and a massive expansion of the current Paks nuclear power plant before 2030. To realize the above targets, the strategy proposed have an electricity mix of 54% nuclear, 30% natural gas, 16% renewables and 5% coal in electricity mix by 2030. According to the outlook, by 2050 the main capacities will be 10 400 MW natural gas-based plants, 4200 MW renewables, 2000 MW nuclear and 400 MW lignite.
This conservative outlook has largely been overtaken by various developments: The Paks expansion will be larger, with 2400 MW expected capacity but it not expected to become operational before 2032. The cost of solar has dropped so much that now the government is now expecting 2000 MW of solar capacity already in 2020. At the same time, total energy consumption has not grown as expected, standing at 1000 PJ in 2016.
The first substantial review of the energy strategy is currently taking place (started in 2018), therefore even substantial changes might happen in the details of the plan - except for the nuclear power plant and solar development.

[11] http://www.szon.hu/itm-a-kormany-tobb-naperomu-letesiteset-varja-az-uj-tamogatasi-rendszertol/4051118
[12] https://www.iea.org/statistics
[13] Negajoule 2020 study: https://energiaklub.hu/files/project/2011_03_03_nfm.pdf
[14] Eurostat: Final consumption expenditure of households by consumption purpose
[15] https://energiaklub.hu/files/study/osszefoglalo.pdf

2. Climate policy: plans and implementation

Climate change is not a central issue for Hungarian citizens. According to the 2018 Eurobarometer only 9% of Hungarians think that climate change is among the main issues facing the EU. This is under the EU average of 11% (the most frequently given answers are either immigration or terrorism in all EU member states). When asked what the most important issues facing Hungary at the moment were, environment, climate and energy issues were mentioned with an even lower frequency: only 5% of Hungarians think that it is a central concern (the EU28 average is 10%).
Regarding the common energy policy for the EU, 76% of Hungarians are supporting it, which is higher than the EU28 average (73%). When it comes to ordering priorities for the Energy Union, most important for Hungarians is "guaranteeing reasonable energy prices for consumers". It is interesting to see that 43% of Hungarians think that renewable energy development should be amongst the top priorities of the Energy Union, but only 25% think that fighting global warming should be a top priority as well[16].

This moderate interest in climate is reflected in the government's weakly supportive approach to climate change. The government is supporting climate policy initiatives but significant economic or political costs can trump climate policy objectives or targets. An example of this is a statement by the Minister of Foreign Affairs and Trade in September 2018, according to which Hungary will reject proposals towards strengthening the EU's 2030 climate targets as this would have a negative effect on the German car industry, thus on the Hungarian economy[17].
That said, there are positive developments as well: the new Secretary of State for Energy and Climate in the Ministry of Innovation and Technology is an internationally recognized and respected energy expert; and the Deputy Secretary of State for Climate Policy is also an important actor, both working with a strong team of public officials. On the international level, Hungary was the first one to complete the national ratification process of the Paris Agreement among EU member states on 24 May 2016. Hungary's President is also very active both in international climate diplomacy and domestic awareness raising.

The Hungarian climate administration regularly produces climate strategies. The most recent strategy was first developed and adopted for the 2008-2025 period. In 2013, a revision was launched, but the adoption of the Second National Climate Strategy (for the period of 2017-2030, with an outlook to 2050) endured repeated delays until it was finally endorsed by a resolution of the Parliament in 30 October 2018[18]. It should be noted that the Strategy was adopted by the Parliament through a non-binding resolution and therefore is not expected to have a strong, significant effect.

The strategy contains a decarbonisation roadmap for mitigation, a strategy on adaptation and the presentation of horizontal tools. The emission pathways were calculated using the UK government's 2050 Calculator[19]. A clear weakness of the strategy is that the data used for it is all from the period before 2015. E.g. post-2014 data shows that the good trends in

[16] Standard Eurobarometer survey of spring 2018 (EB89)
[17] https://hvg.hu/gazdasag/20180921_szijjarto_szerint_a_klimaceloknal_fontosabb_az_autoipar_versenykepessege
[18] 23/2018. (X. 31.) OGY határozat: A 2018–2030 közötti időszakra vonatkozó, 2050-ig tartó időszakra kitekintést nyújtó második Nemzeti Éghajlatváltozási Stratégiáról
[19] http://www.parlament.hu/irom41/00385/00385.pdf

emission reduction stopped: according to 2017 Eurostat results, the country's CO_2 emissions rose at an average rate of 5.6 % since 2015, which is higher that the 2-4% GDP growth of that period. This means that Hungary became more carbon intensive.[20]
Within six months following the adoption of the strategy, a Climate Action Plan has to be developed with concrete actions, measures, costs, resources and deadlines. This also will be a legally non-binding document.
Concerning international climate financing actions, in 2016-2017 Hungary set aside 1 billion HUF to support the Green Climate Fund, and 1 billion HUF for bi- and multilateral cooperation in the field of developments and investments connected to climate[21].

3. Government plans (regarding climate and energy policy) for 2020, 2030 and 2050

3.1. Plans for 2020

3.1.1. Effort sharing

As a contribution to reaching the EU GHG reduction target in the non-ETS sector, Hungary is required by the Effort Sharing Decision[22] to limit the growth of emissions in the non-ETS sector by 2020 to not more than 10% of 2005 emissions. This target will be significantly overachieved: in 2017, non-ETS emissions stood at 5% *below* 2005 emissions[23].

3.1.2. Energy efficiency

As regards the overall energy efficiency target of the EU for 2020, Member States have set their own indicative national energy efficiency targets. The sum of individual country targets shall cumulatively achieve the overall EU-wide objective.
Hungary's target based on primary energy consumption (PEC) is 24,1 Mtoe, and 14,4 Mtoe, based on final energy consumption (FEC)[24]. According to country-specific data collected by the European Commission (Member States have to report every year on the progress made to reach their national energy efficiency target), Hungary is still on track to meet its target based on PEC (although the PEC is growing), but should make further efforts if it wants to reach its target based on FEC. Actual final consumption is higher than the level recommended if a linear trajectory is drawn between 2005 energy consumption levels and 2020 targets[25].
Hungary has adopted a National Building Energy Efficiency Strategy in 2015[26], which set out to achieve a rate of building energy savings of 49 PJ/yr by 2020 and 111 PJ/year by 2030. The amount of building renovations taking place does not appear to deliver these rates, however.

3.1.3. Renewable energy

[20] Országgyűlési Napló, Budapest, 2018. október 2. kedd
http://www.parlament.hu/documents/10181/1569934/ny181002.pdf/97177f4d-323c-e72f-4a52-b87f13955bd2
[21] http://hand.org.hu/media/files/1460992485.pdf
[22] Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020
[23] https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2018
[24] https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive
[25] European Environment Agency: Trends and projections in Hungary 2017
[26] http://www.kormany.hu/download/d/85/40000/Nemzeti%20E%CC%81pu%CC%88letenergetikai%20Strate%CC%81gia%20150225.pdf

Hungary has to reach a 13% renewable share in its final energy consumption under the Europe 2020 strategy. This target was increased to 14,65% in its National Renewable Energy Action Plan. According to Eurostat data, the share of renewable energy is falling since 2013, when the country reached and surpassed its 2020 target with a share of 16,2%. The country is still above its EU target (14,2% in 2016). This compliance was reached in part with the help of a statistical adjustment, whereby the amount of wood stolen in Hungary was added to total firewood use. The obligation of recalculating renewable shares stems from EU Regulation 431/2014, and Hungary was not the only country which had to make new calculations, but Hungary is one of the countries where it resulted in the biggest change in data.. For example, in 2011, with the former calculation, firewood use reached 30,3 PJ, with the new calculation it reached 76,2 PJ. In 2015 the renewable share in final energy consumption reached 14,5%, the old calculation showed 10,3% for this very same year. Thus, the considerable growth in RES share is more due to new methodology than to real developments on the ground[27].

3.2. Plans for 2030

3.2.1. Effort Sharing

Under the Effort Sharing Regulation[28], Hungary is required to reduce its non-ETS emissions by 2030 to 7% below 2005 levels. At the moment, Hungary is projected to significantly overachieve this legally binding target.[29]

3.2.2. Renewable energy and energy efficiency

Renewable energy and energy efficiency targets are now being developed as part of the National Energy and Climate Plan (NECP), the first draft of which has to be submitted to the European Commission at the end of 2018. As no draft of the NECP is available to the public yet, we don't know how countries will share the burden and whether the 32% renewable target and the 32,5% energy efficiency target decided by the European Parliament in November 2018[30] will be met. As under the Governance Regulation[31] governments have to ensure the possibility of stakeholder participation in the preparation of the NECPs, it is expected that more information about the NECP will be available in early 2019.

The National Climate Strategy presents a minimum and a maximum GHG scenario for 2030 and 2050. It declares that the minimum GHG scenario for 2030 -- in which emission neutrality can be reached by that date due to old and new nuclear blocks running in parallel for a certain period -- can only be a hypothetical pathway, as natural gas and oil are totally missing from the energy mix, which, according to the strategy, is impossible to carry out with the actual technological development.
In the maximum GHG scenario there is no nuclear and CCS capacity which can only lead to the stagnation of emission levels, according to the Strategy.

[27] http://nrgreport.com/cikk/2017/03/31/oriasit-ugrott-hazankban-a-megujulo-energia-reszaranya-papiron

[28] Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013 (Text with EEA relevance)

[29] https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2018

[30] http://europa.eu/rapid/press-release_IP-18-6383_en.htm

[31] http://data.consilium.europa.eu/doc/document/ST-10307-2018-ADD-2/en/pdf

It concludes that the decarbonisation of the Hungarian system can be reached only with the use of different technologies at the same time.

3.3. Plans for 2050

The government is not developing a full 2050 Long-term Strategy, although the second, recently adopted National Climate Strategy does contain elements referring to 2050. The Decarbonization Roadmap contained in the Strategy builds on the under-review National Energy Strategy's nuclear-carbon-renewables scenario. The projections and plans for 2050 are quite vague: the Strategy states that a „cost-effective and sustainable decarbonisation in Hungary must reach between 52% and 85% by 2050 (compared to 1990)."

4. Subsidies and other financial schemes in climate and energy policy

4.1. Operational Programmes

In the 2014-2020 Multiannual Financial Framework of the EU, 760 billion HUF (2,4 billion EUR) can be used from EU funds to boost energy efficiency and the use of renewables via Hungary's different operational programmes. This is a significant amount of investment, amounting to about EUR 250 per capita.

In the framework of operational programmes, 100% grants are offered for the refurbishment of public buildings. No grants are offered to household energy efficiency investments, only interest-free loans. Furthermore, there is no coordination between these loans and the energy efficiency grants provided from auction revenues (see Section 4.2).

The interest-free loans aimed at enhancing the energy efficiency and the utilization of renewable energy in residential buildings are offered by the Hungarian Development Bank, and represent an amount of 110 billion HUF (344 million EUR)[32]. This program has received only limited interest from the public.

To our knowledge, no studies were conducted to date with the purpose of analysing the efficiency of these programmes.

4.2. Auction revenues

Hungary auctions around 14,5 Million EUAs in the EU ETS, which at 2018 prices will bring in about 200-250 million EUR in 2018 (the exact amount depends on the results of the auctions.). This is a sizeable sum, almost 50-60% of all the money spent annually on climate change under the EU's Structural and Investment Funds.

National legislation says[33] that from 2013 onwards, 50% of quota revenues under the EU ETS must be spent on the development of green economy. 25% of this income has to be used by the Ministry for Innovation and Technology via the Green Economy Financing Scheme (GEFS - Zöldgazdaság Finanszírozási Rendszer, ZFR), and 25% by the Ministry of Finance via the Greening the Economy Scheme (GES - Gazdasági Zöldítési Rendszer, GZR).

Between 2012 and 2015, the government had a legal obligation[34] to report to the Parliament on the use of auction revenues. To our knowledge, no such reports were submitted to the

[32]https://ec.europa.eu/info/sites/info/files/2018-european-semester-national-reform-programme-hungary-annex-en.pdf

[33] 26. §, 2012. évi CCXVII. törvény

[34] 26. § (6) , 2012. évi CCXVII. törvény (version valid before 7.VII. 2015)(http://njt.hu/cgi_bin/njt_doc.cgi?docid=157827.286838)

Parliament to date before the reporting obligation was abolished in 2015. In the absence of statutory reports, limited information is available on the use of auctioning revenues. In 2015 a parliamentary written response to an MP gave details on quota use[35]. In addition, Hungary's National Reform Programme provides some information on the auction revenues[36].

4.2.1. Warm homes programme (Otthon Melege Program)

The aim of this programme is to increase energy efficiency and the use of renewable energies in households, through grants. The support scheme is financed by income realised in the EU ETS. Between 2014 and 2017, around EUR 100 million were spent on grants in the framework of the Warm Homes Programme. The main measures subsidised were the purchase of energy efficient electric devices like fridges, washing machines, etc., and investments in buildings, like installation of PV-panels, heating system renovation or the change of windows for better insulation and energy efficiency.

Although the programme has its benefits, experience shows that there is a significant demand for this type of grant, as the available funds run out in a few hours. This it is safe to say that the amount is inadequate and should be increased significantly (the per capita amount of subsidy under the Warm Homes Programme is about 11 EUR per household per year).

Another shortcoming of the programme is that it is not linked to the subsidised loans provided by MFB, and thus only those people can take advantage of the programme who can finance the other half of the investment on their own.

4.2.2. Jedlik Ányos Terv (Jedlik Ányos Plan)

The aim of this plan is to boost electromobility. The funding is also coming from the ETS quota revenues. In 2016, EUR 3,8 million were spent on the construction of charging stations for electric cars, and EUR 4,6 million on purchasing electric cars. In 2018, grants of a total EUR 9 Million can be given to applicants to help the purchase of electric cars. The maximum amount of subsidy is EUR 4600 per vehicle.[37]

4.3. Indirect support

The Hungarian tax system supports fossil fuel use through a range of perverse incentives. For example, road hauliers can ask for excise duty refund to decrease their expenses, which obviously has a boosting effect on fossil fuel use, and a negative effect on emission reductions. The level of mining fees have been reduced in recent year, thus increasing the profitability of oil and gas extraction.

Hungary supplies fossil energy use in other indirect ways as well. In general, these subsidies are not transparent - there are no data about 70% of the fiscal support instruments. The total fossil fuel subsidy was estimated to be more than EUR 350 million per year (in average between 2014-16)[38]. From this, regarding fiscal supports, EUR 28 million went to coal industry, EUR 15 million to the transport sector and EUR 83 million to agriculture State-owned enterprise investments accounted to 43 billion HUF. As regards, capacity

[35] http://www.parlament.hu/irom40/06953/06953-0001.pdf

[36] https://ec.europa.eu/info/sites/info/files/2018-european-semester-national-reform-programme-hungary-annex-en.pdf

[37] A detailed account of the Jedlik plan is available here: https://ec.europa.eu/energy/sites/ener/files/documents/hu_neeap_2017_hu.pdf

[38] http://wwf.hu/media/file/1506769701_Monitoring_Europe.pdf

mechanisms, often is considered as subsidies for fossil fuels, in Hungary peak demand response is supported, but its amount is could not be estimated -- the only information is that the electricity utility's (MVM) income from capacity mechanism was 63 million EUR, from which fossils could bring EUR 19 million EUR[39].

The environmental product fee is a very ambiguous but interesting element of the Hungarian tax system, as it shows how ill-considered tax measures can be. This fee was originally developed to incentivize the rationalization of production and waste management of products especially harmful for the environment. There were possibilities to be absolved of the obligation to pay the product fee for those who made significant efforts towards environmental objectives. The state income connected to the tax was supposed to be used for environmental purposes. Unfortunately, the conditions to get exemptions became extremely difficult to fulfill, consequently the environmental product fee became a more or less fix tax income instead of a sustainability incentive. The plan of spending the whole income on environmental measures was not followed either. In addition, the government decided to enlarge the list of the products on which this tax has to be applied. Eventually, even solar panels got on the list of products that must pay an environmental product fee.

In 2013, as a political measure, Hungary started to cut significantly household energy prices (and raise energy prices for industrial users): the price of natural gas, electricity and heating for households dropped to levels under their actual cost, which discourages investments in buildings' efficiency and renewable energy.[40]

There are also good incentives in the system: for example in the Hungarian corporate tax legislation there is a positive option since 2017, which can be connected to climate change issues. If a company makes an investment of at least 100 million HUF net present value, that is an independent environmental investment, the company can get a maximum of 80% allowance from the corporate tax it should pay.

4.4. METÁR

In 2016, Hungary has reorganised its renewable subsidy system[41]. The new system called METÁR offers varying types of support to solar producers of various sizes. Producers with a capacity below 500 kW have a mandatory feed-in tariff of HUF 31,77/kWh (about EUR 0,1). Producers between 500 kW and 1 MW receive a so-called administrative premium over the market price, determined by the government on a case-by-case basis. Above 1 MW, subsidies are to be distributed on an auction basis.
The introduction of the new subsidy system resulted in a veritable boom of solar investment in Hungary. As installations below 500 kW could apply for a simplified funding system until January 2017, there was a rush of applications submitted to the government, with a total proposed capacity of over 2000 MW. This is more than the double of all existing solar capacity in Hungary. There is also a significant uptick in large-scale solar investment, where both large utilities and notable oligarchs with strong ties to the prime minister are involved. A

[39] http://wwf.hu/media/file/1506769701_Monitoring_Europe.pdf
[40] https://read.oecd-ilibrary.org/environment/hungary-2018_9789264298613-en#page34
[41] 165/2016. (VI. 23.) Korm. rendelet a megújuló energiaforrásból termelt villamos energia kötelező átvételi és prémium típusú támogatásáról

new solar capacity auction is planned for the first quarter of 2019. There has been no corresponding impact on wind energy investment because (as mentioned earlier) new wind investment is currently legally impossible at the moment.

5. Conclusions and recommendations for HU policymakers and stakeholders

Due to its energy mix of a lot of nuclear, a lot of gas and a high rate of electricity imports, and its scarcity of energy intensive industries, Hungary has the sixth lowest GHG emissions per capita in the EU[42]. A marked and steady decline in population (5% expected drop between 2018 and 2030[43]) means that total emissions remain steady even if consumption and per capita emissions are growing.

Prior to 2030 the EU is not expected to put any significant pressure on Hungary to adopt policies that reduce GHG emissions. However the development of the National Climate and Energy Plan and the related stakeholder consultations in 2019 will provide an excellent opportunity for proposing a further push towards lower emissions and greater sustainability.

5.1. *Alternative energy scenarios*

Hungary has the potential for more ambitious climate action. Several alternative **energy scenarios** for Hungary were developed by academic researchers and NGOs that envisaged pathways for meeting climate targets.

- The “Erre van előre” (The way forward) energy research group of ELTE University pointed out that with significant energy consumption reduction to 27% between 2005 and 2050, a sustainable energy system could be reached in Hungary based on 100% renewable energy sources[44].
- Energiaklub and Wuppertal Institut modelled four different energy scenarios for Hungary by 2050[45]. In the Green scenario, 82% renewable-based electricity production and 51% RES share in total primary energy supply (compared to 24% and 15%, respectively, in the reference scenario) is possible by 2050, including a 40% reduction in energy consumption. This scenario is also the cheapest one according to the estimations. Based on these studies, nuclear and coal phase-out with intensive renewable and energy efficiency development is the favourable way to reach a secure, affordable and healthy energy system in the future in Hungary. However, it is important to highlight that this solution requires proper planning, a new way of system management approach and flexible solutions to enable RES integration and system balancing like grid development, demand side response and management, regulated CHP plants, smart systems, storages etc. - however, only existing, mature technologies and solutions.

5.2. *Focus areas*

[42] https://www.eea.europa.eu/themes/climate/trends-and-projections-in-europe/trends-and-projections-in-europe-2017/country-profiles-greenhouse-gases-and-energy/hungary-ghg-and-energy-country-profile.pdf/view
[43] https://www.populationpyramid.net/hungary/2018/
[44] Munkácsy (ed.) 2014. http://ktf.elte.hu/wp-content/uploads/2014/09/ERRE-VAN-ELORE-2.0.pdf
[45] Lechtenböhmer et al. 2016. http://fenntarthatoenergia.hu/executive-summary

Hungary's most important **focus areas** for climate action is the greatest in the following areas:

- Residential emissions: These account for over 30% of total energy use in Hungary with a corresponding share of emissions. With many old and badly insulated buildings, the residential sector has significant low-cost potential for reducing emissions. In addition to reducing GHG emissions, these investments also generate jobs, free up income now spent on fuel, and reduce dependency on imported gas. At the moment, the government is spending very little on supporting housing renovation.
- Renewable energy sources emissions: Hungary is at the bottom of the EU league table both in solar energy per capita and in wind energy per capita. Hungary has favourable natural conditions for solar and after years of inaction, the government is now finally supporting the build-up of solar capacity at a rapid pace and the planned 2000 MW capacity is in line with the most ambitious expectations.
- There are no attempts however by the government to allow the exploitation of wind power potential - on the contrary, the development of wind is actively prevented by government policy.

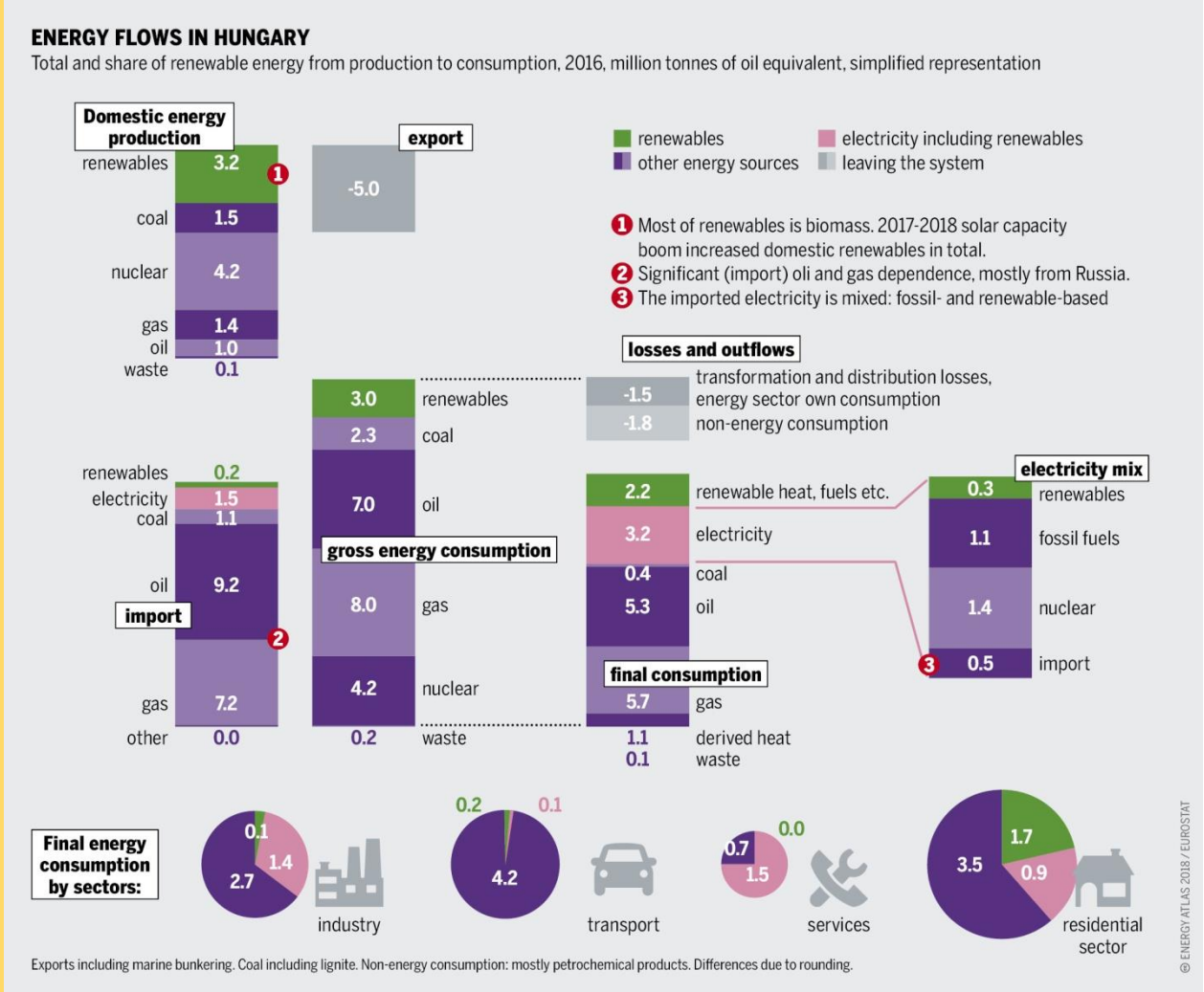
5.3. *Measures*

In light of the foregoing, the following measures are proposed for consideration:

1. A firm date to coal exit should be set for 2030, including highly polluting and unhealthy residential lignite burning.
2. Wind power development should be permitted more broadly in order to allow the exploitation of this renewable potential, where it is economically feasible and not detrimental to the environment. At least 750 MW of wind capacity should be developed.
3. Energy rate cuts that are applicable to all users (rezsicsökkentés) should be reformed and made to apply to people living in energy poverty only. For the rest of the public, these policies only serve to dampen the incentive for private investment in renewable energy and energy efficiency.
4. Other subsidies for fossil fuel use (e.g. some capacity maintenance mechanisms) should also be eliminated.
5. More attention should be paid to the challenge of integrating the significant new (mostly photovoltaic) renewable capacities into the energy system, focusing on electricity production. This requires a range of measures: improvement of energy storage capabilities, dual metering system, demand side response solutions, grid modernisation, etc.
6. Promotion of small-scale renewable energy generation, prosumers and renewable communities. This requires the establishment of a tailored subsidy system.
7. The high share of biomass in the renewable mix should be reduced. A lot of this biomass is firewood that is probably not sourced sustainably, and will likely not be classified as biomass after 2020, potentially causing compliance issues.
8. Energy poverty is becoming a very significant problem that is inadequately addressed at the moment. The government should develop tailored support programs for people living in energy poverty - both to ensure their continued access to heat and light and to enable them to invest in more efficient use of energy.
9. The subsidy framework for energy efficiency must be updated and reorganised. Grants and preferential loans should be provided within a single framework on a

predictable stable long-term basis. The 1,5% Energy Company Obligation should be reinstated, and an on-bill financing system should be developed alongside a voucher-based support scheme.

10. A proper 2050 long-term climate strategy should be developed, one that considers the implications of systemic change and gives directions for the Hungarian economy in the new low-carbon world. The milestones of this strategy should then be made binding and compliance regularly reviewed.



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