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Spending and revenues review of the energy sector

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Notice

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Executive summary

The state's important role in the energy sector stems from regulatory, tax and spending policies. Public expenditure in the energy sector amounts to EUR 1.5 billion (1.4 % of GDP), mainly representing the cost of energy procurement, the operation of authorities and institutions dealing with energy, and tax expenditures. Revenue from the energy sector amounts to EUR 2.5 billion (2.3 % of GDP), more than half of which comes from mineral oil taxation. State holdings in energy companies operating in a market environment are not included in the scope of this review.

The review analyses expenditure of EUR 1 billion (0.9% of GDP) and revenue of EUR 1.4 billion (1.3% of GDP). In particular, expenditure items revised in previous spending reviews and one-off expenses related to the energy crisis are not analysed. On the revenue side, non-structural revenue (solidarity contribution) and revenue resulting from EU-wide legislation (proceeds from the sale of emission allowances) are not considered.

The identified potential for actionable policies sits at EUR 155.1 – 223.5 million per year (Table 1). In the area of expenses, this mainly concerns the optimisation of expenditure on energy procurement and coal mine closures, and the use of extra-budgetary resources to finance public policies in line with foreign practice. The high revenue growth potential stems from the relatively low revenues from energy taxes in Slovakia, as confirmed by the National Reform Programme of the Slovak Republic (MoF SR, 2024). For example, the elimination of inefficient tax exemptions and the indexation of tax rates for electricity, natural gas and coal could increase revenues.

Table 1: Overview of measures with annual potential for expenditure decreases or revenue increases

Sub-chapter	Measure	Annual potential (EUR mil.)
2.1	To procure energy centrally for governmental and local authorities	10.1 + 9.7
2.2	To reduce the subsidy for mine closures to 2020 levels adjusted for inflation	10.7
2.2	*Alternative: To replace part of the subsidy for mine closures with EU funding*	*2.2*
2.3	To finance the Office for Regulation of Network Industries from the point of use charge from consumers	7.2
2.4	To merge the four regulatory authorities into one	4.9
2.5	To transfer responsibility for financing radiation protection to the Nuclear Regulatory Authority	2.8
2.5	*Alternative: To delimit responsibility for radiation protection to the Nuclear Regulatory Authority*	*2.8*
	Total expenditure	*36.9 – 45.4*
3.1.1	To abolish exemptions from excise duty for households, combined heat and power generation (CHP), and renewable energy sources (RES)	64.5
3.1.1	*Alternative: to abolish exemptions for CHP and RES only*	*27.8*
3.1.2	To index excise duty on electricity, gas and coal	63.2
3.1.2	*Alternative: to index without removing the exemption for households*	*40.0*
3.2	To increase excise duty on diesel by 5 %	48.0
3.3	To abolish the tax exemption for mineral oils used for CHP	1.2
3.4	Valorise the tax on gas and liquid storage	1.3
	Total revenue	*118.3 – 178.2*
	Total	**155.1 – 223.5**

Source: VfMU

The review also recommends a number of measures with long-term impact. Firstly, the financial model of the National Nuclear Fund should be revised to ensure that there are sufficient resources for the future closure of nuclear power plants. Secondly, the review estimates the cost and construction time of nuclear power plants according to foreign practice. Third, it recommends procuring emergency stocks of crude oil and petroleum products partly abroad to reduce expenditure. Fourth, the recently reformed air pollution charges create inappropriate incentives that are not conducive to meeting Slovakia's objectives. We propose to address these shortcomings in the next levy reform.

1 Review assesses energy sector spendings and revenues of €2.4 billion p.a.

Total state expenditure and revenue in the energy sector amounts to EUR 4 billion (3.7% of GDP). Expenditure on energy amounts to EUR 1.5 billion, revenue to EUR 2.5 billion. Of this, the review assesses public expenditure of EUR 1 billion (0.9% of GDP), identifying potential savings of EUR 36.9-45.4 million, mainly on energy expenditure and a decrease in expenditure by energy institutions. The review also assesses revenue of EUR 1.4 billion (1.3 % of GDP), a significant part of which is made up of excise duties on mineral oils. The identified revenue raising potential amounts to EUR 118.-178.2 million.

Energy is the sector of the economy concerned with the production, distribution and use of energy. The sector encompasses all the energy needs of a country, e.g. in industry, transport, households, public administration and small businesses (Box 1). This review places less emphasis on the transport or agriculture sectors, which have been the subject of departmental reviews (VfMU and API, 2019, VfMU and IFP, 2016). This review also does not address energy efficiency thematically, as its support from the state budget is not systematic.

Box 1: Slovak energy mix

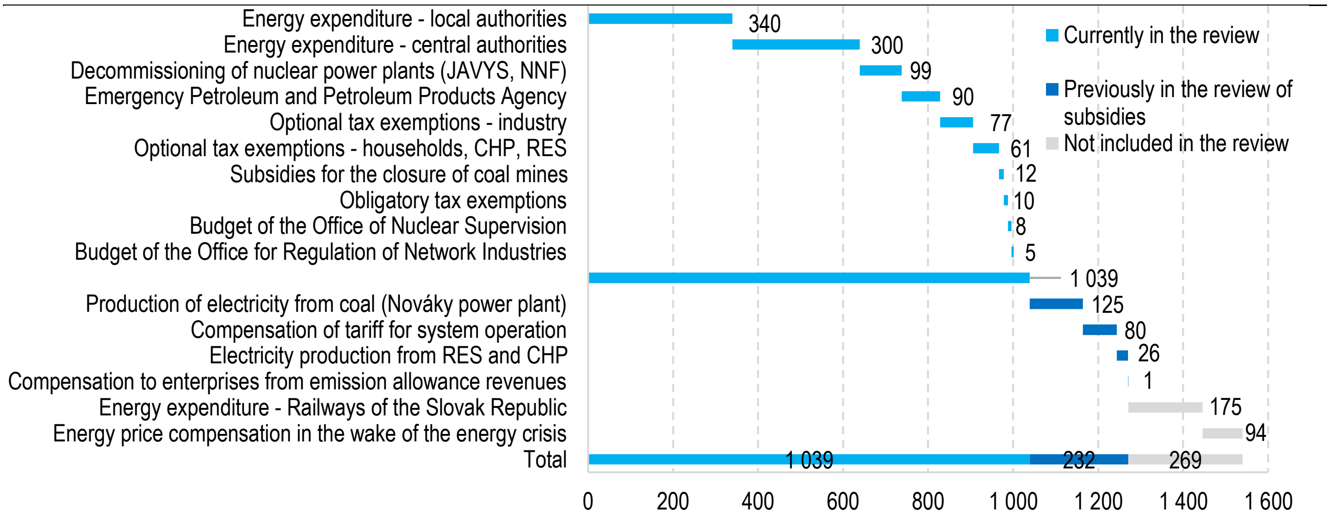
The energy mix describes the primary energy sources used by a country to meet its energy needs. Primary energy sources are obtained directly from nature and have not undergone a process of production or transformation. These include, for example, coal, uranium, natural gas or solar energy. They can also be converted into secondary energy sources such as electricity or heat.

It is important to distinguish between the energy mix and the electricity mix. Unlike the electricity mix, which describes the resources used to generate electricity, the energy mix also captures other energy carriers, including the whole process of their transformation up to their consumption in all sectors (transport, households, industry, etc.). A detailed graphical overview of the Slovak energy mix is available in Annex 1.

Public spending in the energy sector amounts to EUR 1.5 billion per year, or 1.4% of GDP (2022). Expenditure is paid directly from the state budget or does not pass through the state budget but is the result of regulations and public policies. Examples of such expenses are the tariff for operating the system in the final electricity prices, tax exemptions or mandatory payments for emergency stocks of oil and petroleum products.

The review assesses expenditure at EUR 1 billion (0.9% of GDP) and identifies a potential saving of EUR 45.4 million. The breakdown of revised and non-revised expenses is summarised below (Figure 1). In particular, non-revised expenditure is expenditure that has already been the subject of a review of subsidy expenditure (VfMU, 2023) or is subject to the business strategy of a public administration entity operating in the market (expenditure of the Slovak Railways).

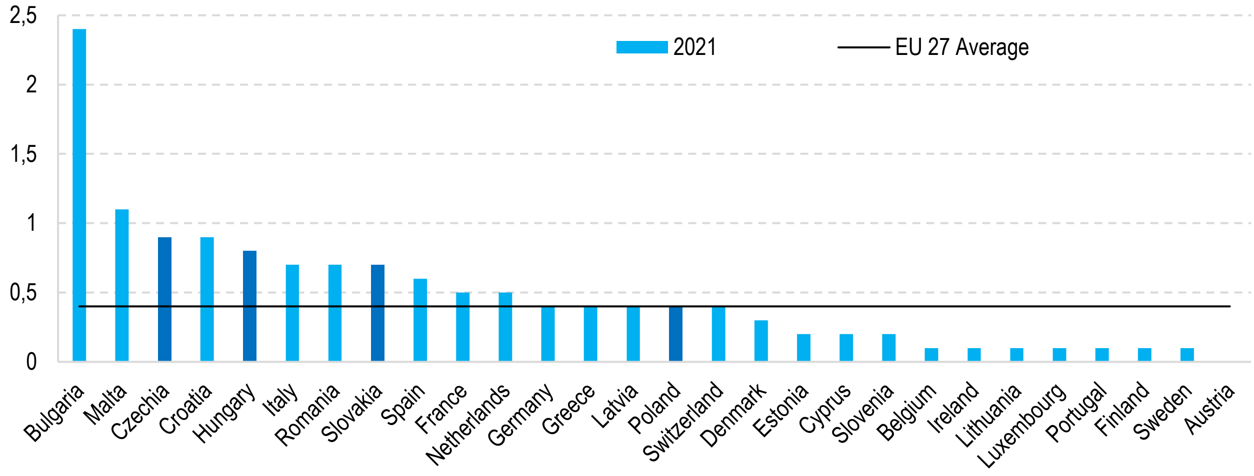
Figure 1: Public spending in the energy sector in EUR million, 2022



Sources: Budgetary Information System, ÚRSO, Envirofond

Eurostat uses a different methodology to classify energy expenditures, according to which Slovakia's expenditures are higher than the European average. It is also above the V4 average (Figure 2). According to Eurostat's classification, energy expenditure in 2021 will amount to EUR 731 million, which is lower than the amount of expenditure covered by the review (Chart 1). This is because Eurostat does not consider energy expenditure to be related to energy purchases or support in the form of tax exemptions. On the contrary, Eurostat also includes in their comparison expenditure that is not financed by the state budget, such as investments from the Recovery Plan. The comparison of expenditure according to Eurostat's classification (Figure 2) thus does not take full account of energy expenditure.

Figure 2: Eurostat energy expenditure (COFOG classification) as % of GDP (2021)

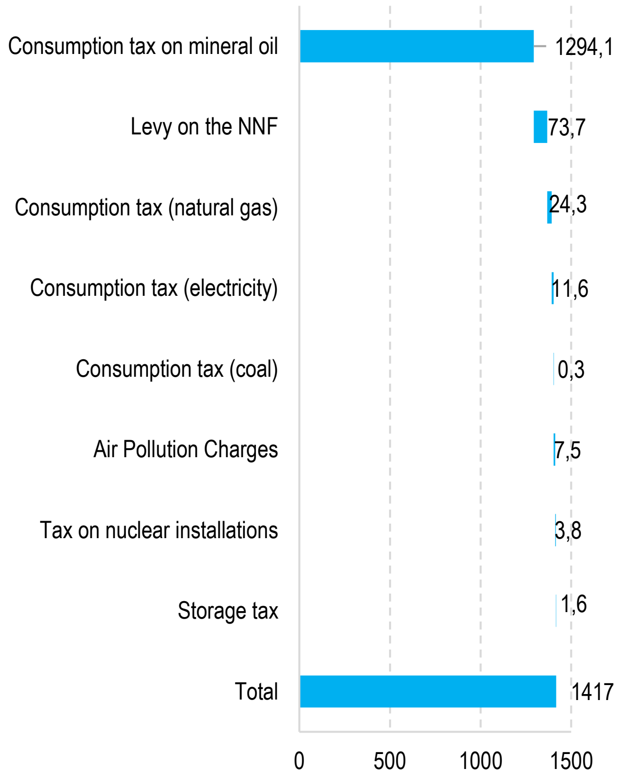


Note: Eurostat's methodology differs from that of the VfMU in the classification of energy expenditure, resulting in Figures 1 and 2 tracking different expenditures. *Sources: Eurostat, VfMU*

Slovakia's tax revenue from the energy sector was estimated at EUR 2.5 billion in 2022 (2.3% of GDP), of which the review considers EUR 1.4 billion (Figure 1). The review does not assess the solidarity contribution (EUR 521 million in 2022), revenues from auctioning of emission allowances (EUR 276 million) and revenues from the tariff for operating the system (EUR 266 million). This is due to their nature as non-structural, one-off revenues resulting from the energy crisis (solidarity contribution), embedded in European legislation (emission allowances) or assessed in previous revisions (tariff for operating the system in the VfMU, 2023: pp. 33-41).

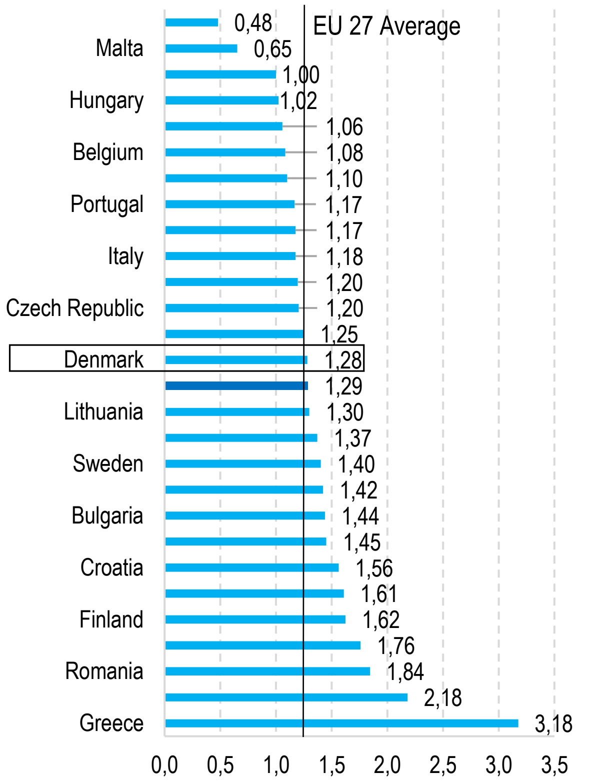
The review assesses revenue of EUR 1.4 billion (1.3% of GDP), with a potential revenue increase of EUR 178.2 million. The estimated tax revenue is below the EU average (Figure 3) by about 0.1% of GDP (EUR 0.1 billion per year). The only V4 country with higher taxation is Poland (1.8% of GDP). Increasing the share of environmental taxation has been recommended in strategic documents approved by the government (MoE, 2019: p. 42), in the government's programme statement (CCG, 2023: p. 29) and has also been recommended by international organisations (OECD, 2024: p. 66).

Figure 3: Assessed tax revenues from the energy sector in the SR by category, in EUR million (2022)



Sources: Eurostat, VfMU

Figure 4: Energy tax revenue in EU countries as % of GDP (2022)



Note.: One-off revenues from the energy crisis, emission allowances and national TSO equivalents have been removed from all tax revenues.

Sources: Eurostat, VfMU

The impact of the measures on electricity and gas prices for households would amount to 3.96 and 2.56 EUR/MWh including VAT, respectively. The biggest impact would be the removal of excise duty exemptions for households and the indexation of tariffs. Measures shifting the financing of ÚRSO, strategic gas reserves and CHP support from the state budget to consumers would have a smaller impact (Table 2). The impact on a household with average electricity and gas consumption would be EUR 3.06 per month.

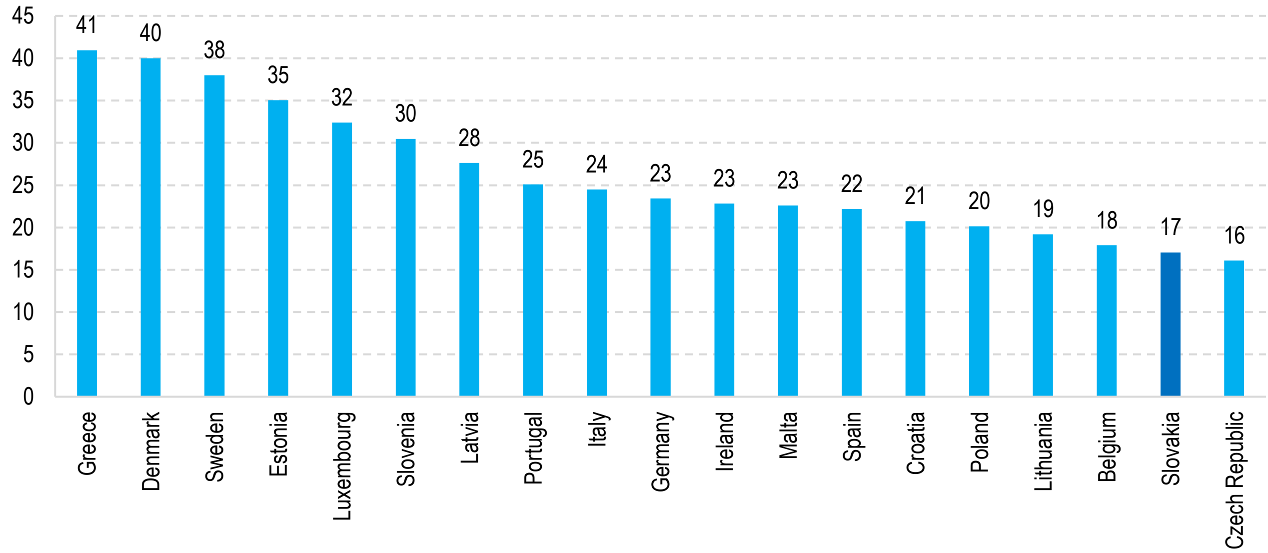
Table 2: Impact of the measures on electricity and gas prices for households, including VAT

Measure	Electricity	Gas
Abolish excise duty exemptions for households	1.57	1.62
Eliminate excise duty exemption for CHP (increase in TSO)	1.33	
Indexation of excise duty (2027)	1.06	1.09
Total (eur/MWh)	**3.96**	**2.65**
Finance ÚRSO from the charge per point of consumption from consumers (EUR/month)	0.23	

Source: VfMU

Slovakia's implicit taxation of fossil fuels is one of the lowest in the EU. The implicit taxation indicator measures the total amount of taxes imposed on fossil fuel consumption, converted into the total fossil fuel consumption in the country. Thus, it does not only compare the level of rates, but also considers, for example, the volume of tax exemptions, reduced rates or exemptions. However, the indicator is also influenced by the structure of energy consumption; for example, excise duty exemptions for industry have a stronger impact on the level of implicit taxation in countries where industry is responsible for a larger share of energy consumption. Implicit taxation on fossil fuels in Slovakia in 2022 was only EUR 17.1/MWh; among the countries compared, implicit taxation was lower only in the neighbouring Czech Republic (Figure 5). The reason for the low taxation is a combination of few taxes, low rates and many tax exemptions, which affect a significant part of energy consumption.

Figure 5: Implicit taxation of fossil fuels (EUR/MWh, 2022)



Source: Eurostat, VfMU

2 State spendings can be reduced by up to EUR 45.4 million a year

The review assesses state spending at over EUR 1 billion a year. The additional expenditure of around EUR 230 million assessed in the review of expenditure on subsidies (OJEU, 2023) is not part of this review. Nor does the review assess the Slovak Railways' expenditure on energy, the volume of which depends on the company's business strategy.

Local government bodies pay around EUR 414 million (2021) annually for energy. Potential savings of EUR 20 million per year arise from the possibility to centralise energy procurement into larger units. The available data show that the State can achieve significantly better unit prices through centralised procurement.

The subsidy for mine closure can be reduced, the potential for savings is EUR 11 million per year between 2025 and 2027. Hornonitrianske bane Prievidza, a.s., responsible for mine closure, have not demonstrated the need for the increase in subsidy that occurred in 2023. The potential for savings can be met by reducing the subsidy to the level of 2020, with smaller savings possible through financing of the expenditure from European sources.

The Office for the Regulation of Network Industries is financed from the state budget, which is not standard abroad. We propose to finance the Authority's expenditure of over EUR 6 million per year from a small monthly charge per point of consumption from energy consumers. The total potential, including VAT revenue, will amount to EUR 7.2 million per year; the measure will also increase the independence of the Office.

We recommend that consideration be given to merging the four regulatory authorities. These are the Office for Regulation of Network Industries, the Telecommunications Authority, the Transport Authority and the Gambling Regulatory Authority. The merger of regulators is also a trend abroad and Slovakia has positive experience with it. We estimate the potential savings at EUR 4.9 million per year.

Unlike abroad, the Slovak Nuclear Supervision Authority does not supervise radiation protection. Transferring this responsibility to the Office and financing it from the resources the Office collects from regulated entities would save the state budget approximately EUR 2.8 million per year.

The remaining expenditure areas have the potential to deliver significant savings in the long term. The other sub-chapters relate mainly to long-term investment projects in the energy sector, where the state needs to set quality policies today to avoid the creation of investment debt and future liabilities on the state budget.

The National Nuclear Fund does not build up a sufficient reserve for the decommissioning of nuclear power plants. This is due to over-optimistic expectations in the financial model, which lead to a lower accumulation of funds than would be necessary. The Fund's expenditures until 2137 will exceed EUR 7.5 billion in constant 2023 prices.

Emergency oil storage is expensive to procure compared to abroad. This is mainly due to the lack of competition in the storage market in Slovakia. The solution may be to open up competition and allow stocks to be stored outside Slovakia, which is also common practice abroad. The potential of this measure is likely to be realised only after 2030, when new tenders for storage will be launched.

The National Energy and Climate Plan foresees the need for a new nuclear power plant around 2045. This is mainly due to the modelled increase in electricity consumption. The cost and length of construction of nuclear power plants in the western world is routinely significantly increased compared to the original plans. From the projects that have been carried out, it is possible to estimate the cost of a 1200 MWe reactor at EUR13.7 billion in 2024 prices.

2.1 Central energy procurement has the potential to save tens of millions of euros a year

The energy expenditure of municipalities and central government bodies amounted to approximately EUR 414 million in 2021. An analysis of electricity and gas supply contracts shows that lower unit prices can be achieved when larger volumes are purchased. By centralising purchases and procuring in larger bundles, savings of EUR 20 million per year could thus be secured. Operationalising the management of public buildings, including energy procurement by 2026, is also part of the Slovak Recovery and Resilience Plan.

More than half of central government bodies purchase energy separately, and local governments also purchase energy separately. Thus, they procure energy in small volumes at higher prices, often according to suppliers' price lists instead of individual price agreements. Central energy procurement for several organisations in a common package is only carried out in some public administrations. Examples of good practice in central purchasing include the Prison and Justice Guard Corps, which procures energy for all prisons, and the Ministry of Justice, which procures energy for the courts in a similar way.

Buying larger volumes of energy generally means a lower unit price for the commodity. Contracts with high contract volumes are more attractive for suppliers as they can yield high profits in absolute terms. Larger contracts also spread fixed costs, such as administration, over a larger volume of purchases. Buying energy in large volumes thus improves the bargaining position of the contracting authority and allows it to negotiate lower unit prices. The relationship between the volume procured and unit prices is also confirmed by an analysis of public authority contracts for electricity and gas from the Central Register of Contracts. More than 120 contracts were analysed, including twelve central procurement contracts concluded during 2020 (i.e. before the energy crisis) for the supply of energy for 2021. However, in addition to the size of the procurement, well-configured procurement conditions are also important, as summarised in Annex 2.

The price of power electricity was 14% lower in 2021 for large volume procurement than for small volume procurement. While the median price of power electricity in small procurements of up to 100 MWh was 58.02 EUR/MWh, the median was 49.82 EUR/MWh for large procurements above 1 000 MWh (Annex 3). For procurements between 100 and 1 000 MWh, the median unit price was 53.89 EUR/MWh. Most of the contracts examined were for volumes below 1 000 MWh, highlighting the high potential for aggregating small purchases into larger volume packages.

For gas, the difference in commodity prices is more pronounced, with unit prices up to 23% lower for large procurements. While the median price for small procurements of up to 500 MWh of gas was 19.90 EUR/MWh, for the largest procurements above 10 000 MWh the median price was only 15.30 EUR/MWh. For procurements between 500 and 3700 MWh the median price was 17.28 EUR/MWh (Annex 3).

Up to EUR 16.4 million a year could be saved by centralising the purchase of electricity and gas. Central government authorities (CGAs) currently procure approximately 417 GWh of electricity and 700 GWh of gas independently, while local governments consume approximately 554 GWh of electricity and 1 112 GWh of gas annually (IEA, 2024). If these energy volumes were procured centrally and the procurement price reached the level achieved by large-scale procurement, savings of up to EUR 16.4 million could be achieved (Table 3). The potential has been calculated on the basis of the implemented procurements at the level of several tens of GWh per year; moving forward, there will also be an accumulation of demand for several authorities at the same time.

Central procurement of energy has been successful abroad; energy does not have to be procured in one large package. The recommendation to centralise procurement does not mean buying energy for all public administrations in one large procurement. As already demonstrated by the centralised procurement already underway at departmental level, savings can be achieved even when procuring in several larger packages. Splitting into multiple procurements also allows smaller suppliers to participate in the procurement process who would not be able to supply all public administrations (for example due to insufficient capital to make deposits or secure large volumes of contracts, further barriers to entry are described in Annex 2) but are able to cover one or more of the sub-central procurements. At the same time, selecting only one supplier would pose a high risk to the State in the event of the supplier's bankruptcy. At the same time, central procurement of energy also operates successfully abroad, typically through organisations that centrally procure other goods and services in addition to energy, ranging from IT and telecommunications to office equipment and vehicles. In Slovakia, under REPowerEU, the

Ministry of the Interior Affairs of the Slovak Republic is the promoter of centralisation of energy purchases, which in the past provided some form of voluntary central procurement through framework contracts. Centralised procurement abroad as well as Slovak plans under REPowerEU are described in more detail in Box 2.

Further savings can be achieved by improving existing central procurement. Not all large, centralised energy procurements achieved savings in 2021. If they were run in the same way as the more successful centralised procurements, a further EUR 3.3 million could be saved (Table 3). The actual level of savings will thus also depend on the design of central procurement. The shortcomings of the procurements are listed in Annex 2.

Table 3: Overview of savings potential from central energy procurement in EUR million (2021)

		CGAs	Local government	Total
Electricity	All central procurements	3.42	4.54	7.96
	Improvement of existing procurement processes	1.75	-	1.75
Gas	All central procurements	3.36	5.11	8.47
	Improvement of existing procurement processes	1.58	-	1.58
Total		**10.11**	**9.65**	**19.76**

Note: CGAs - central government authorities. *Source: VfMU*

The savings estimate is based on 2021 energy prices and could be even higher under today's market conditions. The analysis examines contracts and central procurement mainly from 2020 concluded for the supply of energy for 2021. 2020 was chosen as it was not affected by the energy crisis and volatility in the energy markets and thus allows a better examination of the relationship between the volume procured and the unit price. Since 2021, there has been a significant increase in the market prices of electricity and gas, which were about twice as high in early 2024. Higher prices also imply potentially higher savings.

Box 2: Central energy procurement - foreign practice and future in Slovakia

Central procurement of energy for the public sector has also been successful abroad. In Portugal, the eSPap agency was created in 2017 with the aim of negotiating better prices from suppliers thanks to larger volumes of goods and services procured (OECD, 2019a). In the energy sector, eSPap procures electricity, gas, but also fuel. The identified savings in the first year of eSPap's operation (9.7% - electricity; 21.1% - gas) were very similar to the results of the IHP savings estimate (14.1% - electricity; 23.1% - gas). The number of organisations involved in eSPap procurement on a mandatory and voluntary basis is gradually increasing. In 2023, eSPap projected savings of EUR 38.3 million, maintaining a similar percentage saving as in the first year of operation (eSPap, 2022).

Abroad, central procurement of energy is brokered by organisations responsible for the procurement of other goods and services. In addition to Portugal, there are state or state-appointed central procurement organisations in Austria, Finland, Estonia and New Zealand, for example. However, they procure a wide range of goods and services in addition to energy. For example, in addition to energy, the Austrian Bundesbeschaffung also procures IT, telecommunications, vehicles, foodstuffs, office supplies, furniture and laboratory and medical equipment.

Slovakia also plans to apply the good practice of centralised procurement in the framework of the Recovery Plan. The establishment of a central coordinator to oversee the management of public buildings, including energy procurement, is part of Component 19 of the REPowerEU Recovery and Resilience Plan. The REPowerEU component became part of the Recovery and Resilience Plan in response to Russia's aggression in Ukraine and the subsequent energy crisis and aims to increase energy efficiency, develop renewable energy sources and diversify energy supply. One of the planned measures under REPowerEU in Slovakia is to introduce central management of public buildings, which will include central energy procurement. A milestone in Q2 2025 is the development and approval of a strategy for the management of public administration buildings. A central coordinator is to be established by mid-2026. The MoIA SR is the lead agency.

Smaller central electricity procurement exercises already implemented have delivered savings in half of the cases, but their success depends on the terms of the procurement. For the 2021 delivery, six central electricity purchases have been identified with volumes above 10 000 MWh per year (Table 4). For electricity purchases, the procurement of PJGC, MoD SR and MoJ SR secured significant savings, and their unit prices were among the lowest of the whole procurement sample. On the other hand, the procurement of the MoIA SR achieved a unit price similar to small buyers, as instead of procuring a specific large volume of electricity, it was carried out through a framework agreement that re-opened the competition for each individual entity involved. At the same time, the procurement was not carried out by auction and the price offered was not set nominally; instead, suppliers bid on the amount of a coefficient by which the reference futures price for the months preceding the bidding was multiplied (Annex 2).

Table 4: Overview of central electricity procurements with delivery for 2021

Procuring authority	Annual volume	Period	Bidding	No. of procurers	Final price (EUR / MWh)
PJGC	19 213 MWh	1 year	Yes	5	48.1 € / MWh
MoD SR	45 492 MWh	3 years	Yes	6	49.8 € / MWh
MoJ SR	23 000 MWh	1 year	Yes	4	51.9 € / MWh
MoIA SR	148 000 MWh	1 year	No	6	~ 59 € / MWh
MoLSAaF SR	36 151 MWh	1 year	Yes	4	59.4 € / MWh
MoC SR	16 986 MWh	4 years	Yes	3	79.5 € / MWh

Source: PP Office, VfMU estimate

Half of the central gas purchases have been signed for 4 years. Six central gas procurements were identified for 2021 with volumes above 10 000 MWh (Table 5). Three of them, namely the procurements of the MoLSAaF SR, MoD SR, MoC SR, were concluded in previous years for a period of 4 years and thus at higher unit prices, which, however, guaranteed lower prices in times of energy crisis. In unit price terms, the largest savings were achieved by the procurement of PJGC and MoJ SR. The procurement of the MoIA SR was carried out jointly with the procurement of electricity under the same problematic conditions. The procurement of the MoC SR achieved the highest unit price among central purchases, which was due to the exclusion of the lowest bid of SPP a.s. in addition to the long contract period. The bid from SPP was only EUR 25.8/MWh, but according to the Public Procurement Act, in case of an extremely low bid, the bidder must provide an explanation for such a bid. The Commission set a deadline of 6 working days for the written explanation, during which time SPP failed to deliver the explanation and was thus excluded from the Tender procedure.

Table 5: Overview of central gas procurements with delivery for 2021

Procuring authority	Annual volume	Period	Bidding	No. of procurers	Final price (EUR / MWh)
PJGC	67 645 MWh	1 year	Yes	5	15.1 € / MWh
MoJ SR	16 000 MWh	1 year	Yes	5	15.7 € / MWh
MoIA SR	328 948 MWh	1 year	No	6	~ 16.4 € / MWh
MoLSAaF SR	51 343 MWh	4 years	Yes	2	22.5 € / MWh
MoD SR	136 866 MWh	4 years	Yes	3	26.7 € / MWh
MoC SR	28 928 MWh	4 years	Yes	3	35.5 € / MWh

Sources: PP Office, VfMU estimate

Public Procurement (PP) of energy is very different from the procurement of other goods and services. This is because energy is a commodity, and its price can be volatile and strongly dependent on the situation on global markets. Meanwhile, the procurement of electricity supplies is even more complicated than the procurement of gas. As electricity cannot be stored for long periods, it has to be purchased in specific volumes for specific periods of time (both at consumer and supplier level), which requires a more complex purchasing strategy taking into account the possibilities of long- and short-term contracts or spot market purchases. Weaknesses have been identified from some central procurement exercises that may lead to less favourable prices for procuring entities, such as ambiguous off-take volumes, pricing using coefficients, or demanding criteria for participation in the PP such as high deposits, strict references or short periods for explaining low bids. The shortcomings of the energy PPs and potential problems are described in more detail in Annex 2.

2.2 Government spending on mine closures can be reduced

The original state subsidy for the closure of the Upper Nitra mines was EUR 92.6 million for the years 2019 to 2027. In 2021, the mines declared that the closure could be implemented for EUR 53.1 million, which led to a decrease in the subsidy budget. Government Resolutions 705/2023 and 275/2024 resulted in an increase in the subsidy to the original level of EUR 92.6 million. Inflation can explain only a small fraction of the renewed increase. We propose to reduce the subsidy or to finance it with European resources.

The state subsidizes Hornonitrianske bane Prievidza, a. s. (HBP, a.s.) a significant part of the costs of mine closure, reclamation of the territory and severance pay to miners. The funds are transferred to a separate account within HBP, a.s. and were not used to finance normal production operations, but only for the costs associated with the closure of the mines. The state aid of EUR 92.6 million was approved by an EC decision of 28 November 2019[1].

HBP, a.s. is legally obliged to create a reserve for the closure and disposal of mining fields. The reserve amounts to a total of EUR 17 million over and above the subsidy. However, its volume is insufficient to cover all costs, not least because of the long history and scale of mining activity. Additional public funding is therefore needed. The closure of the mines is in line with the environmental commitments of the Slovak Republic. Inadequate closure may cause significant environmental and social damage in the future.

Declared closure costs fell from EUR 92.6 million to EUR 53.1 million in 2021, rising back to the original level in 2023. The 2019 Action Plan and State Aid Notification set the amount of state funding at EUR 92.6 million between 2019 and 2027. In 2021, the amount was reduced based on negotiations between the inter-ministerial commission and HBP, Inc. Based on internal calculations, the company reduced costs by over 40% from EUR 92.6 million to EUR 53.1 million over the entire closure period, which was shortened to 2019-2025. In the preparation of the 2024-2026 budget and based on Government Resolutions 705/2023 and 275/2024, the pre-2021 situation was reverted. The closure was extended to 2027, and expenditure increased back to around EUR 92.6 million (Table 6).

Table 6: Mine closure costs under various scenarios

	Action Plan (PwC, 2019)	Updated plan (PwC, 2020)	Retrieval	Government Resolution 275/2024	Updated plan, indexation	Potential savings
2019	3.4	0	1.3			
2020	8.8	3.4	3.7			
2021	14.6	7.3	7.5			
2022	17.1	11.8	12			
2023	12.2	14.7	14.9			
2024	17.6	11.9		17.6		
2025	8.6	4.1		14.8	5.7	9.1
2026	6.6	0		13	0.0	12.9
2027	3.7	0		10	0.0	10.0
Total	**92.6**	**53.2**	**39.4**	**55.4**	**5.7**	**32.0**

Sources: Action plans, RIS, Government Resolution, MoE SR, VfMU

Inflation does not justify a significant increase in spending; a decrease in spending can be considered. Some level of increase in subsidy over the 2021 Updated Plan is justified due to significant inflation between 2021-2023. However, inflation justifies only EUR 1.6 million of the EUR 32 million increase in spending between 2025 and 2027. The Updated Plan, Indexation column (Table 6) includes spending from the Updated Action Plan with inflation-adjusted spending.

The Just Transition Fund could reduce the need for funding from the state budget. The aim of the fund is to "enable regions and people to address the social, employment, economic and environmental consequences of the transition to achieve the Union's climate goals" (MIRRI SR, 2021, p. 3). The Upper Nitra region is also an eligible territory in Slovakia, with the financing of the repurposing and reuse of abandoned industrial sites and land restoration identified as a priority activity (MIRRI

[1] Notifikácia štátnej pomoci SA.55038 (2019/N) – Pomoc na pokrytie mimoriadnych nákladov spoločnosti Hornonitrianske bane Prievidza (HBP) v súvislosti s ukončením ťažby (EK, 2019a).

SR, 2022, p. 603). Particularly relevant within the Slovakia Programme is measure 8.2.2 - Revitalisation and reconversion of industrial areas with an allocation of over EUR 42 million from European sources.

The Fund could cover up to a quarter of the total expenditure. The Fund is not intended to cover all mine closure activities and could not be used to finance, for example, underground safety work and severance payments for miners. However, it could probably be used for surface remediation and reclamation, which account for half of the necessary expenditure. The Fund's co-financing rate for large enterprises in the Upper Nitra region is 40 %.

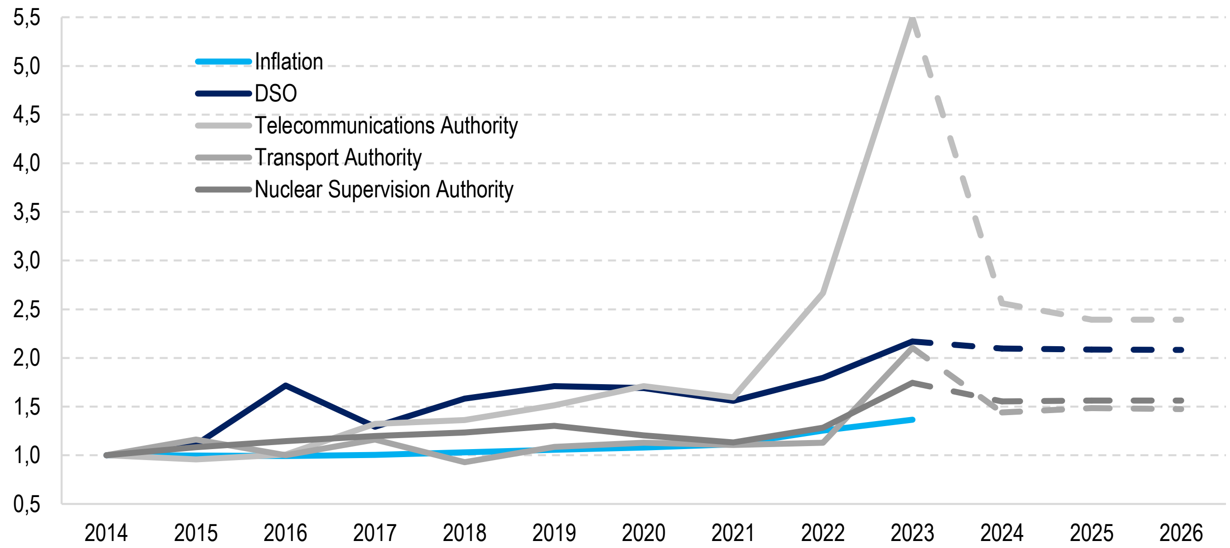
We recommend that the subsidy be reduced to the Plan level in 2020 and indexed, alternatively explore the possibility of funding it from off-budget sources. Without co-financing from the state, HBP, a.s. would not be able to close the mining facilities, which could lead to environmental burdens. State support for mine closure is therefore a justified subsidy. In the context of the necessary consolidation of public finances, the theme is cost reduction in line with the 2020 Action Plan Update (PwC, 2020) with indexation. This is because HBP, Inc. has also declared in 2021 that the mines can be closed for less resources. An alternative savings opportunity arises from the financing of some activities from European sources, in particular from the Just Transition Fund.

2.3 The Regulatory Office for Network Industries could by financed by consumers

The Regulatory Office for Network Industries (ÚRSO) has an annual budget of approximately EUR 6.2 million (2024-2026) and is financed from the state budget. The more standard model in Europe and the V4 is funding by market participants to strengthen the independence of the Authority. ÚRSO could be financed through royalties from regulated companies or fees paid by electricity consumers. As the administratively simplest model that will guarantee stable revenues, we propose the introduction of a fee for the operation of ÚRSO, which would be paid by electricity consumers on a per-point-of-subscription basis. The potential savings, including VAT revenue, amount to EUR 7.2 million per year.

In 2023, ÚRSO´s expenditure was EUR 5.6 million. It is responsible for regulation in the electricity, gas, thermal energy and water sectors. For example, it carries out price and quality regulation and grants permits to carry out activities. Since 2014, ÚRSO's expenditure has almost doubled, far outpacing inflation (Figure 6). However, the Office's competences have also expanded significantly, for example in cooperation with international institutions, adjudicating disputes and collecting data, but it has also added the operation of a consumer portal comparing energy prices from different suppliers. The last amendment of summer 2024 transferred the competences of the Slovak Trade Inspection in the field of network industries to ÚRSO; the Office also controls the application of energy prices resulting from crisis regulation or regulates prices for access to gas storage facilities.

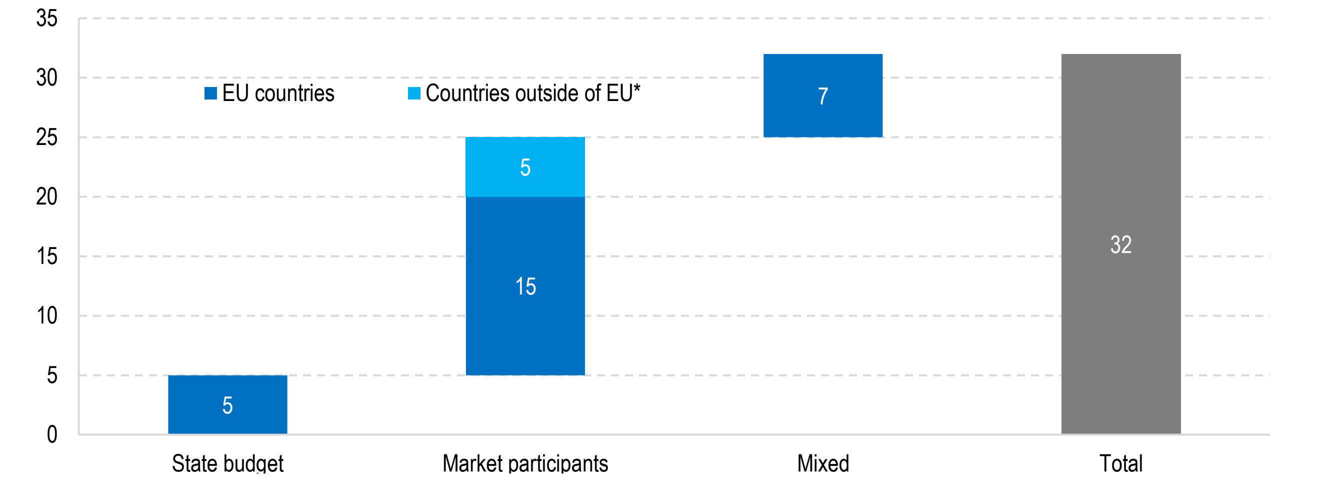
Figure 6: Expenditure index of ÚRSOand other regulatory authorities



Note.: Planned budgets used in 2024-2026 *Source: VfMU*

Today, ÚRSOis financed directly from the state budget, while most European countries finance their energy regulatory authorities from other sources. The Slovak model of financing from the budget is rather non-standard in Europe. Of the 32 members of the Council of European Energy Regulators (CEER) surveyed, only five countries, including Slovakia, finance their energy regulators in this way. The majority of countries receive funding from market participants, i.e. energy companies or directly from consumers (Figure 7). The most common method of financing abroad is the collection of royalties from companies operating in the regulated sectors. For example, the UK's OFGEM or Denmark's Forsyningstilsynet collect annual fees from regulated companies based on the amount of energy they have produced or transmitted. Some countries also fund regulators through special charges or taxes on energy paid by energy consumers. An example is Belgium, which finances its energy regulatory authority from energy excise duties.

Figure 7: Methods of financing energy regulatory authorities in Europe



** Bosnia, Georgia, Kosovo, North Macedonia and Serbia.* *Source:* CEER, 2021

Among the V4 countries, Slovakia is the only one that finances its energy regulatory authority from the state budget. In Hungary and Poland, the regulatory authorities are primarily financed by fees that the authorities collect from energy companies based on their total revenues. In both countries, the energy regulators also contribute to the state budget. The Hungarian Energy Act stipulates that 30 % of the revenues from MEKH (the Hungarian equivalent of ÚRSO) fees go to the state budget. Similarly, in Poland, the URE contributed 68% of its revenues to the state budget in 2022 and used the rest to cover its activities. In the Czech Republic, the regulatory authority is financed by fees paid by final energy consumers (Box 3).

Box 3: Czech and Polish models for financing the Energy Regulatory Authority

The Czech Energy Regulatory Office (ERO) has annual expenditures of CZK 299 million (EUR 11.9 million). Up to CZK 300 million (EUR 12 million) is raised from fees paid by electricity and gas consumers for the ERO's activities (ERO, 2024). In the case of electricity, the fee applies per point of consumption and for 2024 is CZK 4.14/month (EUR 0.17). For gas, the fee is charged per MWh of consumption at 2.83 CZK/MWh (EUR 0.11).

The Polish Energy Regulatory Office (URE) has an annual expenditure of PLN 64.8 million (EUR 13.9 million) but its revenues amount to PLN 202.9 million (EUR 43.6 million). The Office transfers the difference to the state budget. As much as 86.3 % of URE's revenue is made up of concessions - i.e. fees paid by companies that have been granted a licence to operate in a regulated area. The remaining revenue is made up of fines and interest. The URE collects concessions on the basis of the revenues of the regulated firms according to the specific form of regulated activity they carry out. The fee is set at a level ranging from 0.03% to 0.05% (Table 7).

Table 7: URE fees per type of regulated activity

Type of regulated activity	URE fee (% of sales)
Production of heat, electricity or natural gas	0.05 %
Transmission and distribution of heat, electricity or gaseous fuels	0.05 %
Trade in heat, electricity, gas fuels, foreign trade in natural gas	0.05 %
Storage of electricity or natural gas	0.05 %
Production, storage, trading, transmission and distribution of liquid fuels	0.03 %
Carbon dioxide transmission	0.03 %

Source: URE

A financing model independent of the state budget is also recommended by international organisations. Publicly funded regulatory authorities are more vulnerable to political pressure, as their resources can be reduced as part of the standard budgetary process. For this reason, the World Bank (2019) recommends for regulatory authorities to move away from this form of funding and opt for alternative pathways that better protect regulators from political pressure. The OECD (2017) also stresses the importance of regulators' financial autonomy in its handbook on governance and independence of regulators.

ÚRSO can be funded by royalties from regulated entities or directly from consumers. Three main funding models can be considered. The first could be funding through regular royalties from regulated companies. For example, the Polish URE is financed by royalties (Box 3). In Slovakia, regulatory authorities in telecommunications or nuclear energy are financed in a similar way. However, the royalty model does not seem to be ideal from the perspective of public resources in Slovakia, as the state owns a stake in most of the largest energy companies and such a model would thus be largely a resource spillover. The alternative is to finance directly through consumer charges as in the case of the Czech Republic (Box 3), which can be set up in two ways. Charges can be linked to consumption, which would place a significant burden on energy-intensive businesses, or to consumption points, which would imply slightly higher costs for households, which make up the majority of consumption points.

Consumption-linked charges would place a significant burden on energy-intensive businesses; a per-point-of-use model is more viable. Charging per MWh of energy consumed would significantly affect the largest energy consumers. For example, Duslo Šaľa, the largest gas consumer in Slovakia, would have to pay almost half a million euros in fees for the operation of ÚRSO, with its consumption of over 5.8 TWh of gas per year. In the case of the point-of-use charges, the ÚRSO would be financed mainly by households, but they would pay only a few tens of euro cents more in charges than in the case of the consumption charge (Table 8). Households are the majority of electricity and gas consumers, while businesses are a minority of consumers but have higher energy consumption. Up to 99.5 % of electricity consumption points in Slovakia are low-voltage consumption points, i.e. mainly households and more energy-efficient enterprises. Of the gas consumption points, households account for 94.8% (ÚRSO, 2023a), but only account for 45.5% of gas consumption.

Administratively, the simplest solution is to collect charges only for electricity consumption points. Unlike the licence fee model, this form of financing would not require an increase in the administrative capacity of ÚRSO. As with the TSO and TSS, the point-of-sale fees could be invoiced by OKTE to the individual settlement entities. There would also be no additional administrative burden for the business sector. Electricity, unlike gas and heat, is consumed by virtually every household and business. The electricity point-of-sale charge would thus apply to almost all consumers in the sectors regulated by the OKTE. At the same time, point-of-use charges guarantee stable revenues, as the share of points of use varies only minimally over time, while energy consumption fluctuates from year to year based on a number of factors such as weather or industrial activity.

We recommend financing ÚRSO through a charge per electricity point of use, each customer would pay EUR 2.30 for its operation (2024). Households currently pay an average of around EUR 470 per year for electricity, the fee for ÚRSO would be 0.4% of the average household's electricity bill. Alternatively, following the Czech mixed model, the charge per electricity point of use would be EUR 0.10 per month and the charge per MWh of gas EUR 0.09, but would be more difficult to administer (Table 8 and Table 9).

Table 8: Fee alternatives under a range of funding models (for the 2024 state budget)

Form of fee	Electricity charge	Gas charge
Subscription point fee (recommended)	~ 0.19 €/month	0 €/month
Subscription point fee	~ 0.12 €/month	~ 0.12 €/month
Fee per MWh consumption	~ 0.11 €/MWh	~ 0.11 €/MWh
Czech mixed model	~ 0.10 €/month	~ 0.09 €/MWh

Source: VfMU

Table 9: Table 8 charges for an average household (EUR/year)

Form of fee	Electricity charge	Gas charge
Subscription point fee	2.30 €/year	0 €/month
Subscription point fee	1.46 €/year	1.46 €/year
Fee per MWh consumption	~ 0.28 €/year	~ 1.20 €/year
Czech mixed model	1.15 €/year	~ 0.98 €/year

Note.: The average consumption of a Slovak household was taken into account in the calculation. *Source: VfMU*

The additional VAT revenue would amount to EUR 1.1 million. Applying the VAT rate to the fee for the operation of ÚRSO as for other fees linked to electricity consumption (e.g. TSO or levy to the NNF), the additional tax revenue to the budget would amount to approximately EUR 1.1 million per year. The total positive impact of the measure on the public administration budget would thus amount to EUR 7.2 million per year.

2.4 A merger of regulatory authorities would lead to financial economies of scale

Based on foreign experience, we recommend merging four regulatory authorities - the Regulatory Office for Network Industries, the Regulatory Office for Electronic Communications and Postal Services, the Transport Authority and the Office for Regulation of Gambling with a cumulative budget of EUR 36.5 million. The reason for this is savings from support activities and concentration of expertise. The merging of regulatory authorities has been successfully implemented in the past in Spain and the Netherlands. Slovakia also has good experience with mergers, with the merger of the Telecommunications and Postal Regulatory Authority saving 13% of costs. Assuming the same level of savings, we expect to reduce the costs of regulators by EUR 4.9 million per year.

A common practice abroad is to merge several regulators into a single entity. In addition to energy, regulatory authorities overseeing energy may regulate telecommunications, postal services, waste management, or some types of transport such as railways or air transport (Table 10). Regulatory authorities with a broad remit operate, for example, in the Netherlands, Estonia and Spain.

Table 10: Competences of energy regulators in EU countries

	Electricity	Gas	Heating	Telecommunication	Water	Sewage	Waste	Postal services	Railways	Airports	Number of fields of competence
Slovakia (ÚRSO)	X	X	X		X	X					5
Austria (E-Control)	X	X									2
Belgium (CREG)	X	X									2
Coratia (HERA)	X	X	X								3
Cyprus (CERA)	X	X									2
Estonia (ECA)	X	X	X		X	X		X	X	X	8
Finland (EV)	X	X									2
France (CRE)	X	X									2
Germany (BNetzA)	X	X		X				X	X		5
Greece (RAE)	X	X									2
Hungary (MEKH)	X	X	X		X	X	X				6
Ireland (CRU)	X	X			X	X					4
Latvia (PUC)	X	X	X	X	X	X	X	X			8
Lithuania (VERT)	X	X	X		X	X	X				6
Luxembourg (ILR)	X	X		X				X	X	X	6
Malta (REWS)	X	X			X						3
Netherlands (ACM)	X	X	X	X	X			X	X		7
Norway (NVE-RME)	X	X									2
Portugal (ERSE)	X	X									2
Romania (ANRE)	X	X	X								3
Slovenia (AGEN)	X	X	X								3
Spain (CNMC)	X	X		X				X	X	X	6

Source: CEER, 2021

In Slovakia, transport and telecommunications are regulated by separate authorities - the Transport Authority and the Regulatory Office for Electronic Communications and Postal Services. The Office for the Regulation of Gambling is also a separate regulatory authority. The offices could be merged with ÚRSO as is the case in some EU countries. At the same time, however, ÚRSO covers five different areas and is thus still above the average of EU countries, where the average is four areas (Table 10).

The merger of the regulatory authorities allows the authorities to share and thus reduce some operational costs. It is not cost-effective to provide services related to the operation and rental of buildings or administration separately. Regulatory offices, which have only a few dozen employees, are thus housed in separate buildings, have their own departments managing the administrative running of the office and procure goods and services for their needs separately. The merger of regulators makes it possible to reduce the number of staff responsible for administration (e.g. one common personnel office or communication department) or to merge the operation of IT systems. By moving to shared premises, it is possible to reduce the material costs associated with renting or maintaining separate premises. Larger combined offices also allow for better concentration and sharing of expertise between regulators in different areas, thanks to more direct contact between the different sections.

Regulatory authorities in Slovakia and abroad have undergone similar mergers in the past. The Slovak Regulatory Office for Electronic Communications and Postal Services was established in 2014 by merging the Telecommunications Office and the Postal Regulatory Office. The new office reduced spending on regulatory activities by 13% and the number of employees fell by 17%. We see similar practice abroad. In 2013, as many as seven separate Spanish regulators merged into one entity, and in the same year, regulatory authorities merged in the Netherlands. In the case of the Netherlands, the three original regulators, including the authority overseeing the network industries, were merged into a single Consumer and Market Authority. The merger in the joint authority reduced operating costs by about 6% despite a concomitant increase in competences in the new authority (ACM, 2014).

The merger of ÚRSO with the three other regulators could result in savings of up to EUR 4.9 million per year. The budget for 2025 of the Office of the Regulatory Authority, the Telecommunications Authority, the Transport Authority and the Gambling Regulatory Authority totals EUR 36.5 million. The merger of the offices would require an initial one-off investment linked to the costs of relocation, harmonisation of IT systems or rebranding. The operational costs of the merger of the regulatory authorities would result in savings of around EUR 2.2 million per year under the Dutch scenario, with savings of almost EUR 4.9 million at the level of the establishment of the Office for Electronic Communications and Postal Services (2014).

2.5 The Nuclear Regulatory Authority should also be responsible for radiation protection

The expenditures of the Nuclear Regulatory Authority (ÚJD) amount to more than EUR 9 million per year and are financed by contributions from regulated companies in the nuclear power industry. The Nuclear Regulatory Authority supervises nuclear safety, but unlike regulators abroad, it does not supervise radiation protection, which is the responsibility of the Public Health Authority (PHA). The competences in the field of radiation protection could be transferred to the ÚJD and financed by increased contributions from regulated entities. State budget expenditure would decrease by at least EUR 2.8 million per year if the measure were implemented. Another advantage of the transfer is a more efficient sharing of expertise, technology and information, which would lead to a better performance of radiation protection in Slovakia.

The ÚJD's expenditure was EUR 9.1 million in 2022. ÚJD finances its activities through contributions from regulated companies. In 2022, the ÚJD collected EUR 9.2 million in contributions from holders of licences for activities in the field of peaceful uses of nuclear energy. The Authority's expenditure was thus fully financed by contributions from regulated companies.

The Nuclear Regulatory Authority is the central body of the state administration that supervises nuclear safety, including the management of nuclear materials, radioactive waste and spent nuclear fuel. It participates in the development of relevant legislation, issues licences for the use of nuclear energy, assesses the safety of nuclear installations and carries out inspection activities. Table 11 compares the status and activities of the Nuclear Regulatory Authority and other equivalent authorities abroad.

Table 11: Status and operation of certain nuclear regulatory authorities

Country (authority)	Status	Nuclear security	Radiation protection		Transportation safety
			Nuclear facilities	Medicine	
Slovakia (ÚJD)	Government agency	X			X*
Czechia (SÚJB)	Government agency	X	X	X	X
Hungary (OAH)	Government agency	X	X		X
Finland (STUK)	Government agency	X	X	X	X
France (ASN)**	Independent agency	X	X	X	X
Great Britain (ONR)	Government agency	X	X		X
Germany (BMUV)	Ministry	X	X	X	X
Spain (CSN)	Independent agency	X	X	X	X
Sweden (SSM)	Government agency	X	X	X	X
Japan (NRA)	Government agency	X	X	X	

Note: Simplified scheme of competences of regulatory authorities, it does not take into account all nuclear safety and radiation protection authorities in each country. *Source: ASN*
**Together with MoT SR. ** Currently in the process of merging with the Institute of Radiation Protection and Nuclear Safety.*

Unlike similar authorities, the Nuclear Regulatory Authority does not supervise radiation protection. Nuclear supervision, which is the responsibility of the Nuclear Regulatory Authority, deals mainly with the technical and physical safety of nuclear installations, including the assessment of incidents at nuclear installations. Radiation protection mainly focuses on the protection of the health of workers and the population in the framework of radiation prevention and protection and monitors, for example, the level of radiation in the environment or monitors leakages. Radiation protection also includes the supervision of the use of radiation in medicine and the protection of patients and workers, and this aspect is also carried out as standard abroad by joint supervisory bodies (Table 11). Radiation protection in Slovakia falls mainly under Nuclear Regulatory Authority. In the field of transport of radioactive materials and sources of ionising radiation, radiation protection is carried out by the MoT SR.[2]

The transfer of radiation protection from the Nuclear Regulatory Authority would improve the performance of supervision in Slovakia. The division of competences between nuclear supervision and radiation protection is non-standard abroad (Table 11), and efforts to merge the authorities in Slovakia have been unsuccessful for more than twenty years. The current situation complicates the supervision of nuclear installations. While the Nuclear Regulatory Authority oversees

[2] Radiation protection authorities also include the Ministry of Health, the Ministry of the Interior, the Ministry of Defence and the Slovak Information Service (Act No. 87/2018 Coll., § 4(1)).

technical safety or nuclear waste management, radiation leakages from these facilities and the protection of health and the environment from radiation exposure are monitored by the PHA. This division of responsibilities between separate authorities complicates cooperation and information sharing. Merging nuclear supervision with radiation protection would also allow more efficient sharing of expertise, technical equipment and costs, which would support the performance of radiation protection outside nuclear installations. In this respect, a merger of radiation protection competences in the transport of radioactive materials, which is currently the responsibility of the Ministry of Transport, could also be considered. In the field of medical uses of radiation, the transfer of supervision from an office under the Ministry of Health to a separate regulatory authority would strengthen the independence of supervision and regulation.

The lack of effective cooperation between the ÚJD and the NHA was also criticized by the International Atomic Energy Agency's IRRS mission, which also recommended ensuring the independence of medical regulation. For example, the mission noted a lack of coordination between the authorities in carrying out inspections of nuclear installations and enforcing corrections, or duplication of responsibilities in granting licences or informing the public. Thus, one of the tasks of the action plan to implement the findings of the IRRS mission is to ensure effective coordination and cooperation between regulatory authorities (ÚJD, 2024).

The IRRS mission also recommends ensuring the funding of radiation protection and the independence of medical regulation. The Action Plan tasks the Ministry of Health with ensuring that the IRRS has sufficient resources to carry out its oversight activities. The IRRS report notes that the MoH SR does not have sufficient financial, human and material resources to adequately perform its duties (ÚJD, 2024). Thus, the fulfilment of this task will require additional financial resources, which, in the event of a merger with the NSA, could be secured from reimbursements from regulated entities. In addition, the mission highlighted the conflict of interest in a situation where radiation protection in hospitals is supervised by a subordinate office of the Ministry of Health, while the Ministry has jurisdiction over these hospitals. Ensuring the independence of radiation protection under the MoH is also one of the tasks of the Action Plan (ÚJD, 2024).

Funding radiation protection from contributions from regulated entities, which finance the Nuclear Regulatory Authority, would save at least EUR 2.8 million. Radiation protection at the PHA, including regional offices, is carried out by 60 employees (ÚJD, 2022: 76). The exact amount of radiation protection costs is not clear from the annual reports of the Public Health Authority, but assuming the same average wage costs as the PHA, the potential savings amount to approximately EUR 2.8 million in staff costs alone. The actual savings potential is likely to be higher, as the estimate does not consider costs for technical equipment and premises or possible economies of scale. In line with the polluter pays principle, radiation protection would be conditional on reimbursements from nuclear operators to finance radiation protection related to the performance of their activities. Following this principle would require other areas of radiation protection to be financed by reimbursements from relevant entities such as medical facilities or, where appropriate, to continue to be financed from the state budget.

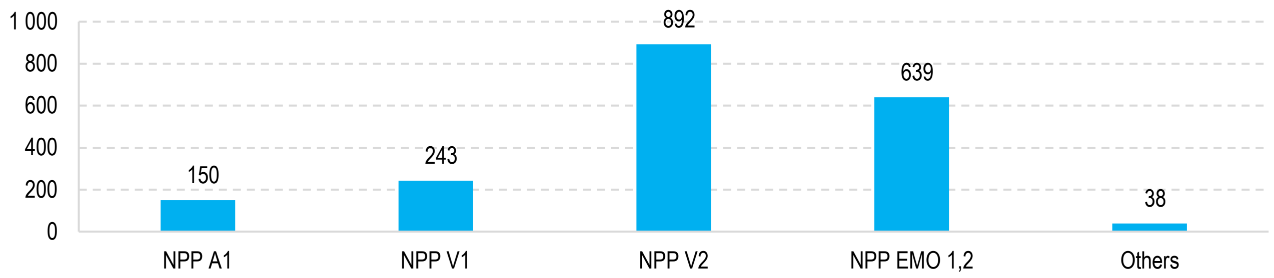
In order to minimise the bureaucratic burden, we propose to finance radiation protection only from contributions from nuclear installations. The revision offsets the increase in this expenditure for nuclear installations through other measures by recommending the abolition of the nuclear siting tax (approximately EUR 3.8 million per year), the proceeds of which are a revenue for the municipalities in the vicinity of nuclear power plants and are not linked to a specific use (Chapter 3.3). This tax can thus be replaced by an increase in the contribution to the operation of the ÚJD and these resources can be used to ensure radiation protection.

2.6 The National Nuclear Fund may lack the resources to decommission nuclear power plants

The National Nuclear Fund (NNF) collects funds to provide for the final phase of nuclear power - the decommissioning of power plants (EUR 2.9 billion by 2137) and the disposal of radioactive waste (EUR 4.6 billion by 2137). The main sources of funding are contributions from nuclear operators and the levy on the NNF, which is paid by all electricity consumers. The current financial model that determines the mandatory contributions and payments has certain risks which need to be addressed in the next update. In the event of a shortfall in the resources collected, the final phase of nuclear power would have to be financed from public resources, which could place a significant burden on the national budget in the future.

The main objective of the NNF is to provide financing for the final part of the use of nuclear facilities. The Fund has accumulated approximately EUR 2 billion until 2023. The sources of income are contributions from the nuclear power plant operator Slovenské elektrárne, a.s. (EUR 78 million per year), mandatory payments from JAVYS (EUR 3.7 million per year), a levy to the NNF paid by final consumers (approximately EUR 65 million per year) and interest on invested funds. Only approximately 1 % of the NNF's income and expenditure is part of the general government budget according to ESA 2010.

Figure 8: Amount of accumulated funds in individual NNF sub-accounts as of 31.12.2022 (EUR million)



Source: NNF, VfMU

The contributions of nuclear power plants (EUR 78 million per year[11]) are collected in accordance with the polluter pays principle. The payers are the operators of the V1 and V2 reactor nuclear installations in Jaslovské Bohunice and MO 1, 2 and 3 in Mochovce. The amount of contributions and payments for individual nuclear installations according to Government Regulation No 22/2019 Coll. is shown in Table 12. The financial model of the NNF foresees their annual increase by the inflation rate.

Table 12: Compulsory contributions and payments by nuclear operators after 2023 (EUR)

Nuclear reactors	NPP V2	46 307 425
	NPP MO 1, 2	32 182 115
	NPP MO 3, 4	29 411 437
Nuclear facilities besides reactors	TTC RAW	3 002 954
	ISSNF	363 592
	FToLRW	256 570
	IS RAW	10 793
	RRAWR	81 411

Sources: NNF, VfMU

The levy on the NNF (EUR 65 million per year) paid by final consumers is used to cover the historic debt. The debt is the result of the fact that the experimental nuclear power plant A1 (1972-1979) and partly the nuclear power plant V1 (1978-2008) did not accumulate sufficient funds for their decommissioning during their operation. In order to compensate for this debt, a levy was created in 2011 and included in the electricity price, which currently stands at EUR 3.27/MWh. The levy is paid by all electricity consumers, with partial discounts for the largest consumers (VfMU, 2023, p. 53). The Ministry of Economy of the Slovak Republic is the recipient of the funds and transfers them to the NNF, which in turn uses them to cover the costs associated with the decommissioning of the A1 and V1 nuclear power plants. Almost EUR 785 million were collected through this levy in 2011-2022.

Interest on deposits in the accounts of the National Nuclear Fund averaged EUR 28 million in 2007-2022. The existing financial model of the NNF assumes a return on deposits of 2.95% p.a. In accordance with Act No 308/2018 Coll. (Art. 10, para. 15), NNF's deposits are valued in the State Treasury at relatively low interest rates (on average 2.66 % p.a. for the period 2007-2022). The more aggressive strategies have better returns - the average of the largest Slovak index funds in the pension pillar II has been 4.38% p.a. over the period; the Norwegian Pension Fund 3.83% and the three key equity indices 5.49%. For a more detailed overview see Annex 4.

The objective of NNF expenditure is to finance the decommissioning of nuclear installations and related activities. Between 2007 and 2022, the NNF provided almost EUR 873 million to eligible applicants. Of this, more than 866 million (over 99%) was granted to the state-owned company JAVYS. Up to 70% of the NNF expenditure was for the decommissioning of NPP A1, amounting to more than EUR 625 million at current prices (more than EUR 806 million at 2023 price level). Almost EUR 174 million (almost 20% of NNF expenditure) was provided for the decommissioning of NPP V1. The remaining approximately 10% is made up of smaller items such as storage of spent nuclear fuel (approximately 4%, EUR 33 million), operation of radioactive waste repositories (3%, EUR 28 million), management of the NNF (1.3%, EUR 11 million) and others.

NNF expenditure will exceed EUR 7.5 billion in constant 2023 prices by 2137, or EUR 20 billion in nominal prices. This amount will cover all costs in the final part of all nuclear power plants. Almost 57% of this is the cost of building the deep repository, 38% the cost of decommissioning the nuclear installations themselves and 5% the cost of storing the spent nuclear fuel. Given the similar performance of all three and the similarity of other technical parameters, the projected decommissioning costs are comparable. Only the spent fuel storage costs and the contribution to the deep repository show significant differences. Another long-term liability of the NNF (more than EUR 200 million at constant prices) is the decommissioning of five non-reactor nuclear installations.

Table 13: Expected costs of decommissioning of nuclear power plants V2 and MO 1-4 (in EUR million)

		JE V2	JE MO 1, 2	JE MO 3, 4	Total
Contributions	current prices (2023)	1 644	1 192	1 430	4 266
	nominal prices	4 067	3 587	3 583	11 237
NPP decommissioning costs	current prices (2023)	960	955	966	2 881
	nominal prices	1 810	2 375	3 719	7 904
Spent fuel storage costs	current prices (2023)	208	96	61	365
	nominal prices	563	349	259	1 171
Total Costs	**current prices (2023)**	**2 813**	**2 243**	**2 456**	**7 512**
	nominal prices	**6 440**	**6 311**	**7 560**	**20 311**

Sources: NNF, VfMU

According to the latest updated NNF revenue forecast, the total NNF revenue will reach approximately EUR 20 billion in nominal prices by 2137. The NNF's liabilities extend over a period of 100 years, which requires a realistic financial model today to ensure that there is sufficient funding for the final phase of nuclear power. The NNF sets a fixed level of compulsory annual contributions and payments for nuclear operators to fully cover all expected expenditures of the Fund. The NNF model is updated periodically by law, which may lead to changes in the level of mandatory contributions and payments over time.

Table 14: Forecast of NNF revenues in the nuclear reactor sub-accounts until 2137 (in EUR million)

Sub-account	JE V2	JE MO 1, 2	JE MO 3, 4
Situation as of 31.12.2022 (EUR million)	892	639	0
Annual contribution after 2023 (EUR million)	46	32	29
Inflation rate (p.a.)	2.00 %	2.00 %	2.00 %
Appreciation rate (p.a.)	2.95 %	2.95 %	2.95 %
Total revenue (EUR million)	6 496	6 368	7 636
- - of which revenue from contributions after 2023 (EUR million)	1 274	1 812	3 354
- - of which interest income after 2023 (EUR million)	4 289	3 892	4 282

Sources: NNF, VfMU

The current model assumes an average annual appreciation of 2.95% p.a., which is too optimistic. The average appreciation rate of NNF funds in Treasury accounts from 2007-2022 was 2.66% per annum, reaching the required level of 2.95% or more only in 2008 and 2011-2015. As a result of rising interest rates, NNF was able to close out 2024 confirmations at approximately 3.5% per annum. Nevertheless, it is unlikely that, maintaining the current investment strategy, the average rate of appreciation of NNF's funds will reach 2.95 % p.a. As interest income constitutes a significant part of the funds destined for decommissioning, even minor changes in the percentage return can have a significant impact on the financial sustainability of NNF's operations. We recommend adjusting the projected rate of appreciation to the Treasury's actual possibilities or presenting concrete measures to achieve it.

The financial model foresees an annual increase of 2% in compulsory contributions and payments, which is not enshrined in legislation. The amount of mandatory contributions and payments for nuclear operators is approved by the Government of the Slovak Republic on the proposal of the NNF. However, the currently applicable Government Regulation of December 2022 only provides for a fixed amount of contributions for individual nuclear installations and does not foresee any indexation or inflationary increase. Thus, the implementation of the NNF forecast will require the annual approval of increases in mandatory contributions and payments. However, the adoption of these decisions depends on the political will, which creates a risk for the stability of the whole system. The risk of this assumption is confirmed in 2023, when there was no increase in contributions for 2024. We recommend introducing automatic increases in the compulsory contributions and payments at the rate of inflation.

The collection of the NNF levy between 2049 and 2080 in the amount of EUR 2.4 billion is not justified. With a planned levy of EUR 75 million per year, the necessary funds for the decommissioning of NPPs A1 and V1 should be accumulated by 2049 (NNF, 2024: p. 118). The continued levy collection cannot therefore be explained by the payment of historical debt and therefore represents an unjustified financial burden passed on to the final consumers of electricity. The polluter-pays principle, which excludes unjustified burdens on final consumers, remains key to the financing of the final part of the nuclear cycle. We recommend shortening the levy collection period so that the levy is only used to secure the final phase for A1 and V1.

The financial model does not assume that the resources collected from the NNF levy will be capitalized. Such a move would represent significant additional revenue. Thus, the valorisation of the levy represents a positive risk of the model.

The projected cost of administering the NNF will be lower than in the current model under compliance with the Act. The financial model for 2023-2137 expects revenues of EUR 24.3 billion and management expenditure of EUR 643 million (both in nominal prices). If the statutory rule of 1% of revenues transferred to the administration of the NNF were respected, expenditure would be at EUR 243 million (70% less). Hence, by law, the cost of administering the NNF will be significantly lower, which represents a positive risk for the financial model, which we recommend taking into account.

An additional risk is an increase in expenditure compared to forecasts. NNF's key long-term liabilities include the decommissioning of six nuclear reactors and the interim storage of radioactive waste (EUR 7.9 billion) and the construction of a deep repository (EUR 13.8 billion, both in nominal prices). Due to the high technical and safety complexity of the processes and the low number of finalised projects, unexpected additional cost increases cannot be ruled out. The decommissioning of NPP V1 saw a cost increase of 81% (Figure 9). It is recommended to apply the experience from the decommissioning of NPP V1 to reduce the risk of cost increases for the decommissioning of NPP V2, MO 1, 2 and MO 3, 4.

We recommend that more detailed studies be carried out on the financing of the construction of a deep repository, including the corresponding costs of its construction, operation and closure. The inclusion of nuclear power in the EU's green taxonomy has confirmed the need for a deep repository and has also led to a slight reduction in the time horizons for its construction. In this context, the IAEA Artemis expert mission in February 2023 concluded the necessity to carry out a significant amount of work in the construction of a deep repository (IAEA, 2023). Developments need to be incorporated into the NNF's economic plans (reallocate planned expenditures over time) so that it has sufficient funds to cover these objectives in real time. This is subject to the development of more detailed documentation for the construction, operation and closure of the deep repository from various perspectives.

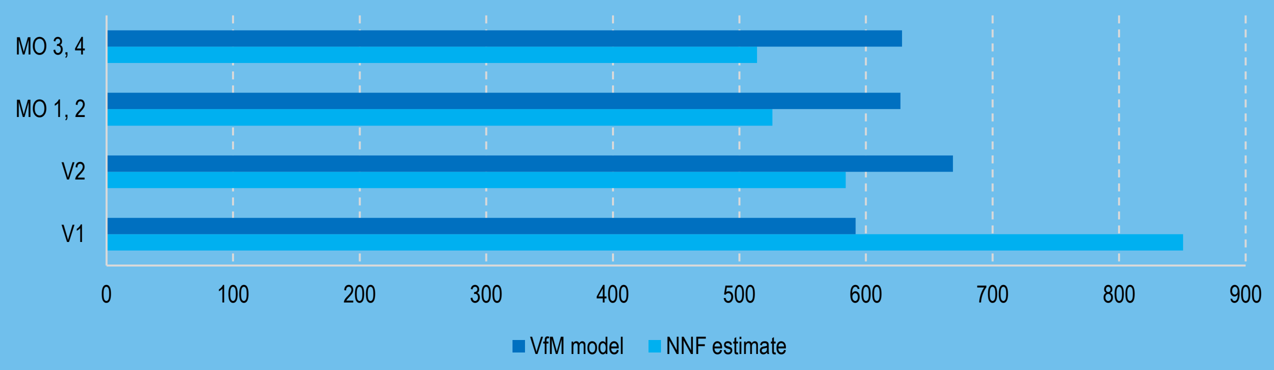
We recommend expanding the permissible areas of professional experience completed by NNF Board of Trustees members to include investment advisory, finance, and/or economics. The Board of Trustees is responsible for drawing up the draft medium- and long-term financial plan of the NNF and depositing the funds in the Treasury accounts. The economic background of the members of the Board of Trustees may also be appropriate in these activities.

Some of the above measures are a part of the update of the National Programme for the Management of SNF and RAW in the Slovak Republic (NNF, 2024), which is in the process of preparation and will be subject to approval by the Government of the Slovak Republic.

Box 4: NNF Cost Estimates - Nuclear Decommissioning and Deep Repository

NNF estimates the costs of decommissioning of NPP V2, MO 1, 2 and MO 3, 4 quite optimistically (Figure 9). A realistic estimate of decommissioning costs is very important; an unrealistically low estimate could lead to a debt for which the State could be liable in certain circumstances. Compared to the foreign benchmark, the projected decommissioning costs of Slovak nuclear power plants are about 16% lower. For NPP V2 the savings rate is 13%, for MO 1, 2 - 16% and for MO 3, 4 - 18%. Foreign experience suggests that such savings are possible. For example, the retirement of one pressurised-water reactor of the water-to-water type in the Bulgarian Kozloduy NPP with a capacity of 408 MWe and other similarities with the Slovak plants amounted to almost EUR 400 million in constant prices (EC, 2021), which is a saving of 28% compared to the model. **The methodology of the model is in Annex 4.**

Figure 9: Projected costs of decommissioning nuclear power plants per reactor (EUR million, in 2023 prices)



Source: VfMU

However, the experience with the decommissioning of V1 NPPs indicates a risk of a significant increase in the estimated costs during the decommissioning process itself. V1 decommissioning costs increased by 81% between 2006 and 2023. In 2006, the estimate of the total cost was quantified by JAVYS, a. s. at EUR 585 million, which, when converted to constant prices at 2023 level, corresponds to EUR 922 million. However, the actual total cost of decommissioning V1 is estimated at EUR 1.7 billion. Compared to the above model, the actual cost of decommissioning V1 NPP is 44 % higher.

The estimated cost of the deep repository is EUR 13.8 billion; it is impossible to verify this assumption. Only a few underground storage facilities have been completed in the world to date. Foreign estimates for the cost of their construction vary from 2 to 140 billion euros. Nuclear waste repositories are the types of projects where, on average, the largest cost overruns of the originally expected costs occur (Flyvbjerg and Gardner, 2023, p. 225). Any cost increase over the originally identified level would negatively affect either the state, which would have to pay the difference in costs, or the nuclear operators, who would probably not be able to cover the significant cost increase in the short term. For more information on the deep repository, see Annex 4.

2.7 According to foreign experience, the cost of a new nuclear power plant will exceed EUR 9.6 billion

New generation capacity will be needed because of the projected growth in electricity consumption. The Government, by Resolution 279/2024, has recommitted itself to the construction of a new nuclear power plant (NPP). Experience from abroad suggests that this project will be both time and cost intensive. Even against conservative forecasts, the construction of nuclear power plants is taking considerably longer, increasing the final cost. It is necessary to adapt expectations about the construction of the NPP to the current experience in the construction of nuclear power plants.

A preliminary version of the Integrated National Energy and Climate Plan (NECP) identified the need to build a new nuclear power source around 2045. The rationale for this construction is confirmed by the model implemented in the NECP and by subsequent sensitivity analyses of the VfMU (Box 5). Even if the lifetime of Unit V2 is extended beyond the 60-year horizon (i.e. beyond 2045), growth in electricity generation will be required due to the electrification of industry, heating and transport.

Box 5: Energy-climate modelling and a new nuclear power plant

The model used to analyse the need for a new nuclear build was the one used in the preparation of the NECP. It is a combination of the CPS energy model and the GEM-E3 macroeconomic model (MoE SR, 2024: pp. 251-252). Together, these models examine the complex relationships between energy and the economy, including greenhouse gas emissions, energy prices, power system stability, energy mix, and many other aspects. The model is cost-optimised, thus seeking an equilibrium in which energy needs can be provided at the lowest possible cost.

The WAM model resulting from the NECP expects a new nuclear source to come online in the period 2045-2049. This would be a capacity equivalent to the NPP project (1 200 MWe). The reason for the need for new sources is the significant growth in electricity consumption due to decarbonisation. To meet this demand, gross electricity generation would need to increase by around 130% between 2019 and 2050. The aim of the VfMU modelling was to develop a sensitivity analysis for the construction of a nuclear resource. This is an analysis of the input parameters that must change for the model to select an alternative to building a nuclear source.

The WAM model assumes a relatively low cost of nuclear construction but prefers a new reactor even with a more realistic cost estimate. WAM assumes the cost of constructing a new nuclear power source to be close to EUR 8.2 billion (capital cost of EUR 6.8 million/MWe of capacity) in 2024 prices, which is approximately at the upper end of the JESS estimate. However, even with a more realistic price estimate based on realised projects abroad of around EUR 13.7 billion (EUR 11.4 million/MWe of capacity), the model favours the construction of new nuclear at the expense of alternatives (increased growth of renewables).

The model considers the construction of a nuclear power plant to be disadvantageous only at a cost exceeding 14.5 billion euros, the cost-effectiveness is also influenced by electricity imports and cheaper support services. At a construction cost exceeding EUR 12.1 million/MWe of capacity (EUR 14.5 billion per plant), renewables are a more cost-effective investment. The construction of a NPP may not be the most cost-effective alternative even at a relatively conservative price of EUR 12 billion (EUR 10 million/MWe). The construction of a nuclear power plant is not an option if 2-3 TWh of electricity per year is imported and gas prices fall by around 3% after 2050 compared to initial assumptions. This is because the alternative to nuclear construction is unstable renewables combined with grid regulation with electricity from natural gas (electricity generation from natural gas is 0.5-1.5 TWh per year higher in 2050-2070 compared to the NPC scenario). The model does not determine whether the infrastructure in question will or should be built by the state or the private sector.

The inclusion of small modular reactors in modelling is problematic due to the lack of experience with commercial operation. Small modular reactors (SMRs) could also potentially replace large nuclear sources. However, the inclusion of SNRs in modelling is problematic as it is a new technology for which there are no realistic estimates of construction or operating costs based on past experience. The cost of building SNRs could be lower than for large nuclear reactors in the long term, but mass adoption of this technology and mass construction of SNRs is a prerequisite. In the time horizon of the NPP construction plan, it is unlikely that SNRs would be able to compete with the cost of building a large nuclear unit and therefore have not been considered in the modelling.

The model assumes a significant increase in the capacity of renewable sources even in the case of the construction of the NPP, without the core the demands on RES will be even higher. In the case of the NPP, there will be an expansion of 25.9 GWe of solar electricity generation capacity and 15.8 GWe of new wind turbines between 2025 and 2070. In the scenario without the construction of the NPP, up to 29.5 GWe of solar and 18.8 GWe of wind would have to be added.

Jaslovské Bohunice should be the place for the construction of the new source. The project has been discussed since 2008 and the Nuclear Energy Society of Slovakia (JESS) was established in 2009 to implement it. Through JAVYS, the Ministry of Economy is a 51 % shareholder and the Czech ČEZ, whose majority shareholder is the Ministry of Finance of the Czech Republic, is a 49 % shareholder. In 2016, the project underwent an environmental impact assessment (EIA) with a planned construction start date of 2021, but due to concerns about the project's profitability, the process was frozen in 2019. The permitting process was restarted in 2022, and in May 2024, the government approved the plan to build an NPP with a capacity of up to 1 200 MWe by a resolution. In 2024, the Ministry of Environment issued a positive final opinion to issue a permit for the siting of a nuclear facility with a maximum net electrical installed capacity of up to 1 700 MWe (EIA, 2024).

The most likely suppliers for the construction of the NPP are the USA, France or South Korea. The project envisages the construction of a Generation III+ reactor, with no specific contractor yet known. Table 15 gives an overview of possible suppliers, with the most likely being the US Westinghouse, France's EDF and Korea's KEPCO, which also won the tender for the Czech Dukovany plant in July 2024. Representatives of the Ministry of Economy and Science have said that the participation of a Russian supplier is not under consideration (ENERGOKLUB, 2024).

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Table 15: Overview of possible nuclear reactor suppliers

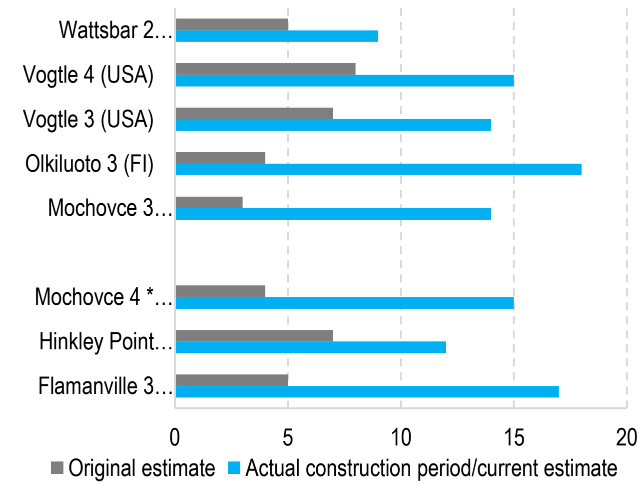
Reactor type	Manufacturer	Number of completed reactors (worldwide)	Number of reactors under construction (worldwide)	Power
AP1000	Westinghouse (USA)	6	0	1117-1170 MWe
EPR	EDF (France)	3	3	1600-1660 MWe
APR-1400	KEPCO (South Korea)	8	2	1340-1418 MWe
HPR1000	CGN a CNNC (China)	6	11	1017-1116 MWe

Note.: Only the AP1000 and HPR1000 reactors are suitable for the intention to build a reactor with a capacity of up to 1 200 MWe. However, EDF and KEPCO have designs for scaled-down versions of the EPR and APR-1400 reactors, the EPR1200 and APR1000, both with capacities up to 1 200 MWe, which are not yet under construction.

Source: World Nuclear Association, 2024

Construction of Generation III+ nuclear power plants in the West is consistently longer than previously estimated; the 2039 NPP start-up schedule is optimistic. NPP construction is planned to take 8 years, Generation III+ nuclear plants in the West are being built for 12-18 years (average 15 years). The Finnish Olkiluoto 3 reactor, for example, took 18 years to build, the French Flamanville 3 is not completed even after 16 years. Figure 10 shows the trend of prolonging the planned construction time in the reference group, the initial estimates are on average 2/3 of the time shorter than the actual construction time. The reasons for the time delays are analysed in Annex 5.

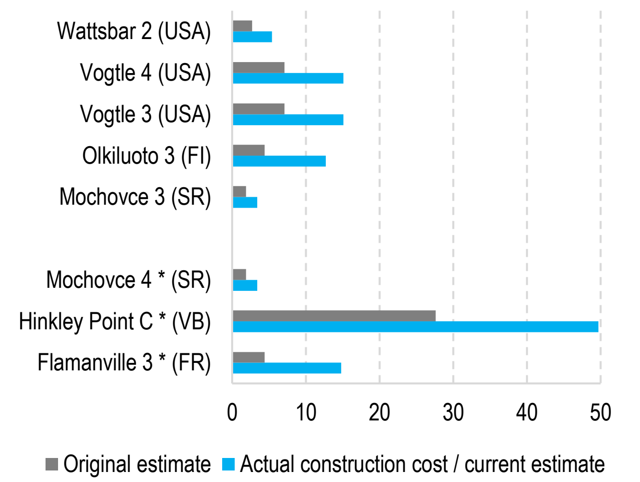
Figure 10: Planned and actual construction periods for nuclear power plants (years)



*Note: Completed construction marked with *. With Wattsbar 2 and Mochovce 3 just the completion of an already under construction project.*

Source: VfMU

Figure 11: Planned and actual prices of NPP construction, (billion euros, price level 2024)



*Note: Completed construction marked with *. With Wattsbar 2 and Mochovce 3 just the completion of an already under construction project.*

Source: VfMU

Estimates of construction costs are also too optimistic; nuclear power plant construction is routinely overpriced. According to estimates from 2015, the cost of construction should range between EUR 5.5 and EUR 8.3 billion in 2024 prices (JESS, 2015). This is an optimistic estimate; the cost of building one 1 050 MWe nuclear unit at Dukovany in the Czech Republic by KHNP (a subsidiary of KEPCO) should reach EUR 8.8 billion by 2024, according to the Czech government's estimates from July 2024. Converted to the planned capacity of the NPP (1 200 MWe), this would amount to around EUR 10 billion. All the reactors built in the last decade in Europe and North America cost much more than originally expected. For example, Finland's Olkiluoto 3 reactor was 183% overpriced, England's Hinkley Point C has already cost twice as much as originally planned and is still incomplete (Figures 10 and 11).

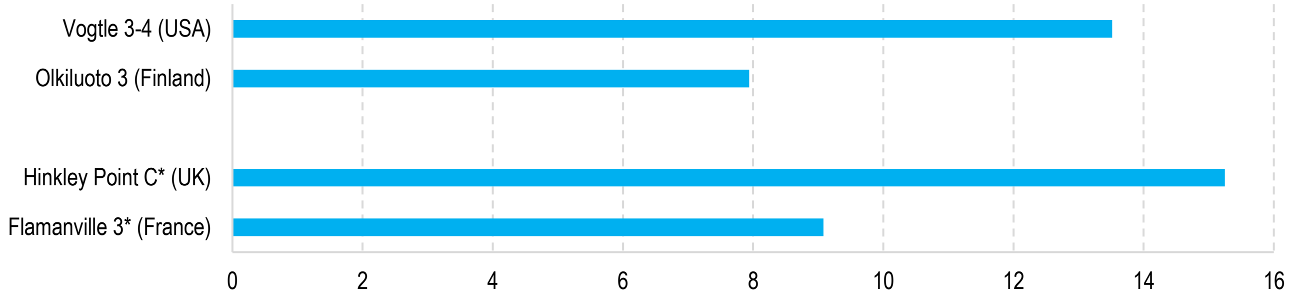
The reason for highly inaccurate cost estimates may be due to poor methodology. Typically, the cost of large projects is calculated by adding up the cost of the individual parts. Contractors estimate the type and quantity of materials needed, their cost and the cost of labour. The sums are then added together and 30-50% is added as a reserve (OECD and NEA, 2020, p. 35). In the construction of complex projects, such as nuclear power plants, it is impossible to consider all the risks, as many of them only arise during the construction itself. For these reasons, it is common for estimates to underestimate the cost of the plant.

A more accurate price estimation method is the so-called reference class forecasting (Flyvbjerg and Gardner, 2023). This method precedes optimistic estimation as it looks at the final prices and durations of projects in the reference class (reference class). These final data take into account any problems encountered during construction and the time and financial costs required to resolve them. Therefore, even unforeseen risks can be captured using this method.

For the construction of a new nuclear power source, the reference class is Generation III+ nuclear power plants built in the West. These plants have a unit cost of between EUR 7.9 and EUR 15.2 million per MWe (Figure 12). Taking into account the size of the planned source in Bohunice (1 200 MWe), its price can thus be estimated at EUR 9.6-18.4 billion (in 2024 prices), with an average of EUR 13.7 billion. Using the same reference group, the construction time can be estimated at 12-18 years (average 15 years). This estimate is probably more accurate than the estimates produced by the traditional method, but it must be taken into account that the size of the reference class is relatively small, which reduces the quality of the estimate. On the other hand, the estimate is partly optimistic as some of the plants in the reference class are not yet completed and thus their final sum may be higher than the latest estimate.[3]

[3] The model works with a restricted reference group. Increasing the reference group to the construction of Generation II plants since 1990 would reduce the price per MWe estimate, but the model would be less reflective of the current circumstances and challenges facing the European nuclear industry.

Figure 12: Price of nuclear power plants in the reference group in millions of euros per MWe (price level 2024)



*Notes: All new commercial Generation III+ reactors in Western Europe and the USA since 2012 are compared. Vogtle 3 and 4 reactors are listed together due to the nature of the project financial data. Reactors under construction are marked with *.*

Source: VfMU

The foreign projects also assume relatively optimistic construction duration and cost, which are well below the level of completed projects. Box 6 gives an overview of other upcoming nuclear projects in the Czech Republic, Poland and the United Kingdom.

Box 6: Overview of upcoming projects abroad

In the Czech Republic, South Korea's KHNP won the tender for the expansion of the Dukovany power plant (1 050 MWe). EDU II, a wholly owned subsidiary of ČEZ, announced the tender in 2020. Construction of the new AP1000 Generation III+ nuclear reactor is scheduled to start in 2029 with an expected start of operation in 2036 (EC, 2024a). The construction cost of Dukovany 5 is estimated at EUR 8.8 billion (Government of the Czech Republic, 2024). The state is also supporting the construction with an interest-free loan during the construction period. If the plant pays an interest rate at the level of Czech bonds at the time of construction (4.21% as of July 2024), the actual cost is estimated at EUR 10.8 billion. This translates to EUR 8.99 mil./MW, which falls within the reference class identified above.

Poland plans to start construction of the first nuclear power plant on its territory in 2026. The Lubiatowo-Kopalino plant is to consist of three Generation III+ reactors (3 750 MWe). The first reactor is expected to be operational in 2033. Polskie Elektrownie Jadrowe (PEJ), 100% state-owned, is the client for the construction. The construction contractor will be the US-Canadian Westinghouse. Construction costs are not yet known; the construction financing model is likely to be in line with the new European energy market design reform (PPP project complemented by a CfD contract for difference).

Construction of the Sizewell C nuclear power station in the UK is due to start as early as 2024. The project includes two Generation III+ EPR reactors (3 200 MWe) with a planned start of operation in 2033. French EDF and Chinese CGN are both the contractor and part-owner of the plant. The estimated construction cost is around EUR 20 billion (EDF, 2020). Sizewell C will be financed through the regular asset base model (RAB), which guarantees a return on investment by paying investors already during construction through increased electricity prices.

2.8 We secure emergency oil supplies more expensively than abroad

The Emergency Oil Stocks Agency (EOSA) was established in 2013 to ensure the procurement and maintenance of emergency stocks. EOSA relieved the State Material Reserve Administration from funding stocks but maintained the state's control over stocks in the event of an emergency. The fees paid by importers of crude oil and petroleum products to the EOSA for the provision of stocks are among the highest of the EU countries. The main reason for this is the repayment of the financial assistance to buy back stocks from the SMRA and the high cost of storage services provided by suppliers in a poorly competitive environment. Savings could be made through increased competition by storing part of the stocks abroad.

Formally, EOSA is an interest-based association of legal entities. At present, its members are Spoločnosť pro skladovanie, a.s. ; OMV Slovensko, s.r.o.; PROGRESS TRADING, a.s.; SLOVNAFT, a.s. and ORLEN Unipetrol Slovakia s.r.o. The storage company holds 70 % of the voting rights in EOSA and, thanks to its ownership structure, the State retains a decisive share. The remaining four members representing the private sector hold a total of 30% of the voting rights. EOSA became a public entity in 2014.

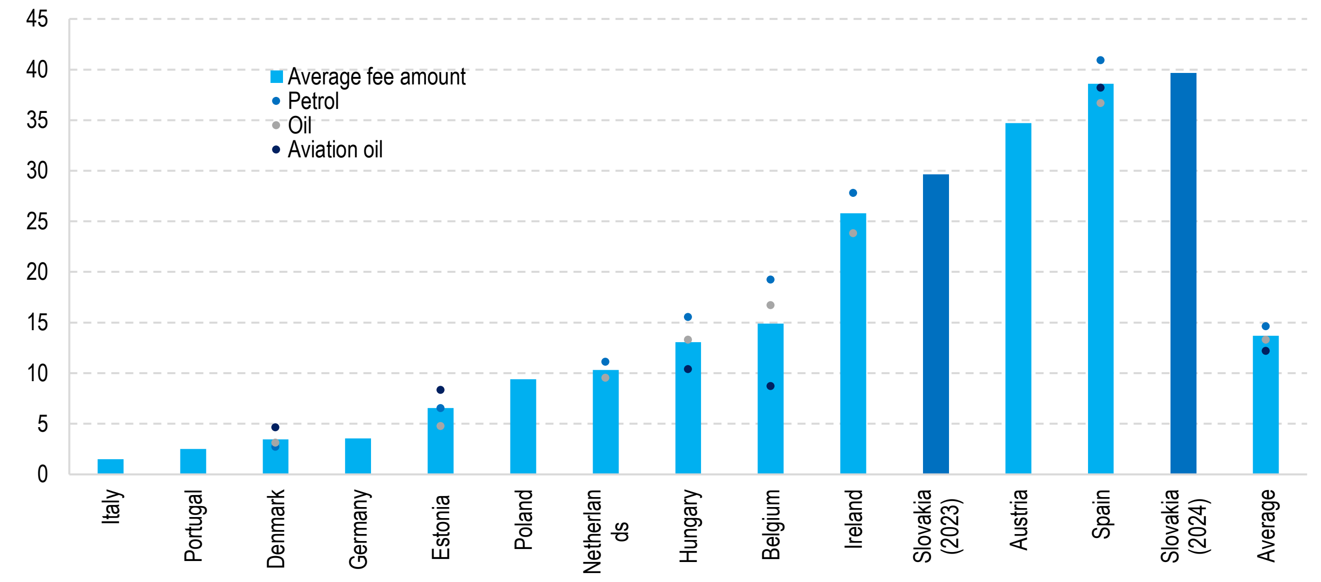
The minimum volume of stocks is set by the State Material Reserve Administration; in 2023, EOSA held more stocks. The minimum volume of emergency stocks required by the European Commission corresponds to 90 days of average net imports of crude oil and petroleum products in the previous year. The specific minimum volume of emergency stocks for the Slovak Republic is set annually by the State Material Reserves Administration. The real volume of stored crude oil and petroleum products in 2023 exceeded the established minima and corresponded to 101 days of net imports (Eurostat, 2023).

The most significant regular source of revenue for EOSA is the royalty paid by importers of crude oil and petroleum products. Entities that import at least 20 m3 of petroleum products into Slovakia in a 12-calendar month period are obliged to participate in the provision of emergency stocks and to pay EOSA for their provision. In 2014-2022, the reimbursements amounted to a total of EUR 725 million. The amount of remuneration per unit of imported crude oil or petroleum products is determined by the EOSA according to a set formula, which, however, is not respected in practice (SAO, 2020).

The amount of compulsory remuneration is approximately three times higher in Slovakia compared to the average of European countries with a similar stockholding system. While in Slovakia the level of remuneration from 2024 onwards amounts to EUR 39.65/t, the average level of remuneration in the surveyed countries amounts to only EUR 13.70/t. Countries also differ in the differentiation of the level of charges for different types of petroleum products: six of the EU countries surveyed have different rates for different products and six (including Slovakia) have the same rates for different products. The highest charges are for petrol (average EUR 14.62/t), followed by diesel (average EUR 13.30/t) and aviation kerosene (average EUR 12.19/t). Annex 6 provides a more detailed overview of the level of charges.

Higher allowances for all three fuel types are only introduced in Spain. A more detailed description of the level of the petrol contribution per country is given in Figure 13. The same sequence of countries with slightly different contribution levels is found for diesel levies.

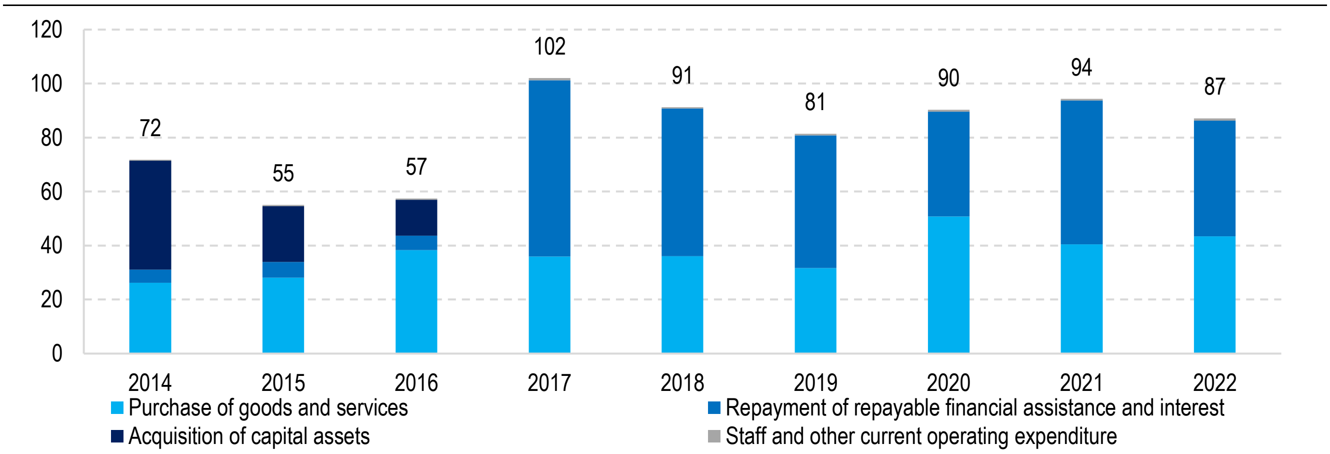
Figure 13: Amount of compulsory storage levies in selected EU countries in 2024 (€/t)



Note.: For countries with differentiated rates, the individual rates are illustrated by the points in the graph *Sourcej: VfMU*

The largest part of EOSA's expenditure consisted of the purchase of goods and services and the repayment of repayable financial assistance and related interest. Between 2014 and 2022, purchases of goods and services accounted for 45 % of total expenditure (EUR 331 million), mainly for the cost of providing storage capacity. In 2014, the Ministry of Finance provided a repayable financial assistance of EUR 520 million to EOSA to repay the loan for the purchase of emergency stocks from the State Material Reserve Administration. The repayment of this financial assistance accounted for 44% of EOSA's expenditure (EUR 320 million) and is due to be completed at the end of 2026. The acquisition of EOSA's capital assets accounted for approximately 10 % of EOSA's expenditure (EUR 74 million). EOSA's staff and other current operating costs accounted for less than 1 % of expenditure (EUR 5.5 million).

Figure 14: EOSA expenditure 2014-2022 (EUR million)



Source: VfMU

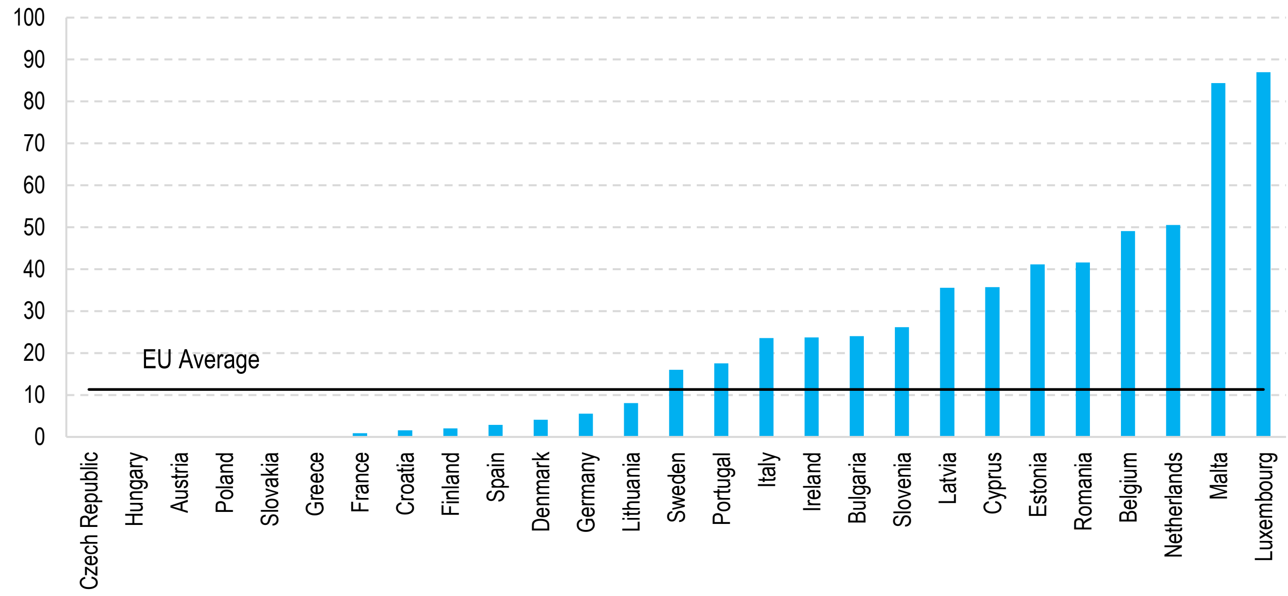
The repayment of the repayable financial assistance will reduce the amount of the repayment by approximately half. Between 2023 and 2024, repayment expenditure is expected to account for approximately 54% of total expenditure. After elimination of these expenditures at the end of 2026, the level of repayment could fall below EUR 20/t, around the level of Belgium, but still above the average of the countries surveyed (Figure 13).

The amount of storage costs increased significantly between 2014 and 2022. The rate of growth in expenditure has significantly exceeded the rate of increase in the volumes of emergency stocks of crude oil and petroleum products. While storage costs increased by 73% between 2014 and 2022, the volume of stocks in storage increased by only 15%. The annual storage cost for the period 2025-2029 amounted to EUR 53.34/tonne for crude oil and EUR 47.11/m3 for petroleum products (gasoline, diesel and aviation kerosene).

EOSA procures storage services from suppliers, there is no competition between them. EOSA itself does not have storage capacity and procures it from external suppliers. These include primarily the Storage Company, a.s. (a subsidiary of Transpetrol and the State Material Reserve Administration) and the Association for Stock Storage, a.s. (a subsidiary of Slovnaft). There is no competition among storage service suppliers, and they are the only ones with adequate storage capacities in Slovakia.

Holding stocks abroad is common in the EU but is not practiced in the V4 and Austria. Across the EU, 11.3% of emergency stocks of crude oil and petroleum products are held outside the country to which the stocks belong (Figure 15). Only the V4 countries and Austria hold the entire volume of stocks on their territory. Meanwhile, smaller countries normally hold a significant part of their stocks outside their borders. In the smaller EU countries of up to 10 million inhabitants, which store part of their stocks across borders, up to 19% of the total stock is stored in this way.

Figure 15: Percentage of emergency stocks of crude oil and petroleum products stored abroad (%, May 2023)



Source: Eurostat

Future tenders should allow some stocks to be stored abroad, which may lead to a lower tendered price. In the past, the tender conditions for storage explicitly required that storage facilities be located in Slovakia (EOSA, 2022a; EOSA 2022b). This was due to concerns about guaranteeing supply in the event of a crisis and border closures. However, the use of foreign storage capacity for at least part of the emergency stocks may increase competition and reduce storage costs. If not all stocks are stored abroad, the capacity of domestic warehouses can cover the period until the transfer of the remaining stocks from abroad is resolved. Thus, part of the storage capacity could be procured in the future with the possibility of involving foreign firms, while it is important to consider the technical aspects of imports in the event of an emergency. The measure has a long-term horizon, with current storage contracts expiring only in 2035. However, it is possible that EOSA will buy up stocks before 2035.

Increased competition between storage providers could reduce EOSA's costs by units of millions of euros. Currently, EOSA's average annual storage costs amount to EUR 59.10/tonne of oil equivalent. In neighbouring Hungary, unit costs amounted to EUR 42.50/tonne. If a unit price at the Hungarian level were achieved for a quarter of the stocks held (EU countries with stocks abroad hold on average 26.4% of stocks in this way), storage costs would thus fall by around EUR 3.1 million. At the same time, the estimate does not take into account the dynamic effects on the cost of storage capacity in Slovakia as a result of increased competition. The EOSA remuneration could thus decrease by around EUR 1.39/t, with a positive impact on the public administration budget if the level of the charge remains unchanged.

3 State revenues can be increased by EUR 183 million per year without significant impact on consumers

The review estimates the state's revenue from the energy sector at EUR 1.4 billion (1.3% of GDP). The largest state revenue from the energy sector is the revenue from excise duty on mineral oils, amounting to approximately EUR 1.3 billion per year. The contribution to the National Nuclear Fund, amounting to EUR 74 million per year, is another revenue, and is analysed under Chapter 2.7. Another approximately EUR 36 million are revenues from excise duties on electricity, natural gas and coal. The remainder is made up of taxes with low annual collection - e.g. air pollution charges and the tax on nuclear installations.

The review assesses revenues mainly from the perspective of taxing the negative impacts of fossil fuels. The burning of fossil fuels produces widespread environmental or health damage. However, the costs of these damages are not reflected in their prices, and fossil fuels still often represent a cheaper alternative to energy sources with significantly less harmful impacts. The lack of taxation of harmful fuels constitutes a hidden subsidy (IMF, 2024), as consumers do not have to bear all the costs associated with their combustion. These are 'subsidised' by the health system or climate change mitigation.

Excise revenues from electricity, natural gas and coal and fossil fuel taxation are significantly lower than abroad. This is due to low rates and the existence of various types of exemptions that favour the consumption of polluting fuels; due to these factors, the overall implicit taxation of fossil fuels is also low. We therefore recommend that the three exemptions (for households, CHP and RES) be abolished. Real excise tax revenues have fallen significantly since the last rate change, so we also recommend indexing the excise tax rate for inflation since 2010. The revenue growth potential from these two steps is EUR 127.7 million per year. Part of these revenues should be directed to compensate the most affected low-income households; compensatory measures should primarily aim at increasing energy efficiency, e.g. by supporting the renovation of houses or heating installations.

Setting excise taxes on mineral oils favours polluting diesel over petrol. The tax on diesel is lower than on petrol; its nominal rate has been reduced since 2004. In the context of price comparisons with neighbouring countries, we propose to increase diesel taxation by 5% (1.8 cents per litre) with an expected positive impact of EUR 48 million per year, which will not lead to an increase in fuel tourism. Furthermore, we propose to abolish the tax exemption for the use of mineral oils for combined production of electricity and heat, which encourages the consumption of polluting fuels. The potential of this measure is EUR 1.2 million per year.

The nuclear facility tax is a municipal revenue, it has no objective justification. The tax of almost EUR 4 million per year is paid by nuclear power plants to municipalities within a radius of 20 km from their location; their use is not anchored in legislation. The costs to municipalities of locating a nuclear power plant are negligible, and a similar tax is an exception abroad. We propose to abolish the tax in its current form and use the resources to finance radiation protection.

The gas and liquid storage levy has a minimal yield and is recommended to be indexed for inflation. The levy is paid by storers exploiting deep geological deposits; it applies only to two sites in the long term. The tax has not been indexed since 2002, indexation will bring an additional EUR 1.3 million per year in tax revenue.

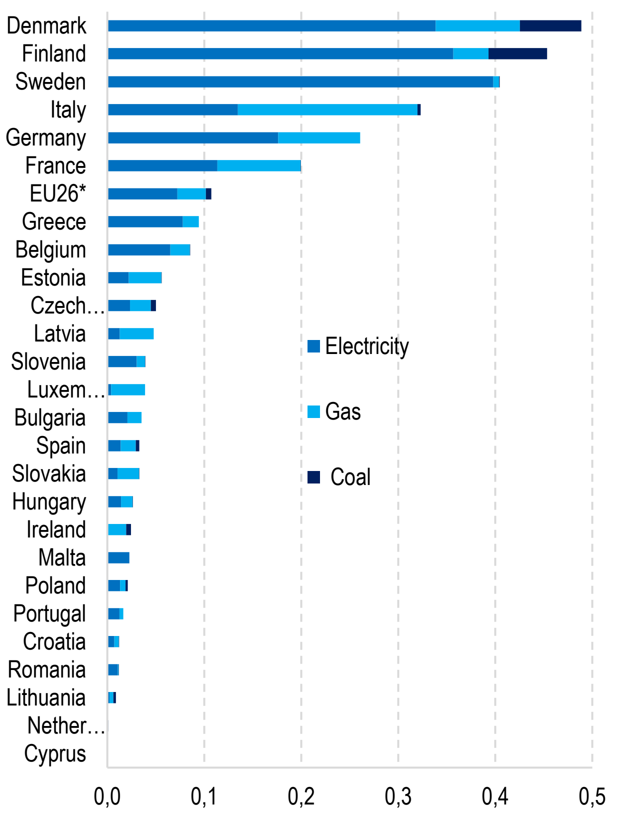
Air pollution charges have recently been reformed; the new system creates distortions. Charging rates reflect the true cost of pollution only minimally and do not reflect the level of pollution from individual pollutants and national reduction targets. In order to achieve the Slovak Republic's air quality objectives, we recommend that in the future the rates for the substances whose emissions are of greatest concern to Slovakia, in particular particulate matter, nitrogen oxides and ammonia, should be increased more rapidly.

3.1 Excise duty on electricity, natural gas and coal are below average

Excise duties on electricity, coal and gas are below the EU average in Slovakia. This is mainly due to the large number of tax exemptions and their low rates, which do not reflect environmental impacts. This puts cleaner electricity at a disadvantage compared to fossil fuels. Bringing the taxation of externalities from coal and gas closer to electricity would put a fairer burden on energy relative to their negative impacts and incentivise a switch to cleaner sources. We recommend eliminating tax exemptions for residential, combined heat and power, and renewable electricity. The potential of the measure is EUR 64.5 million per year. Furthermore, we propose to gradually index tax rates to inflation since the last increase in 2010. The measure would generate an additional EUR 63.2 million when exemptions are removed. The impact of these measures would be minimal even for the lowest income households, whose energy costs would increase by EUR 1.81 per month (equivalent to 0.37% of disposable income).

Revenue from excise duties on energy is below average compared to EU countries. In 2022, revenues from excise duties on electricity, natural gas and coal amounted to EUR 36.2 million and represent only 0.03% of Slovakia's GDP. In EU countries, revenues from these taxes are almost four times higher and represent on average 0.11% of GDP. This puts Slovakia among the countries with the lowest collection of excise duties on electricity and gas in the EU (Figure 16), despite the fact that per capita energy consumption in Slovakia is close to the EU average (Eurostat, 2024a). Revenues are below average mainly due to lower rates, but also due to the large volume of tax exemptions. Implicit taxation of fossil fuels is also low compared to abroad (Figure 17), but excise duties on coal and gas account for only a small part of the implicit taxation due to low rates and a large number of exemptions.

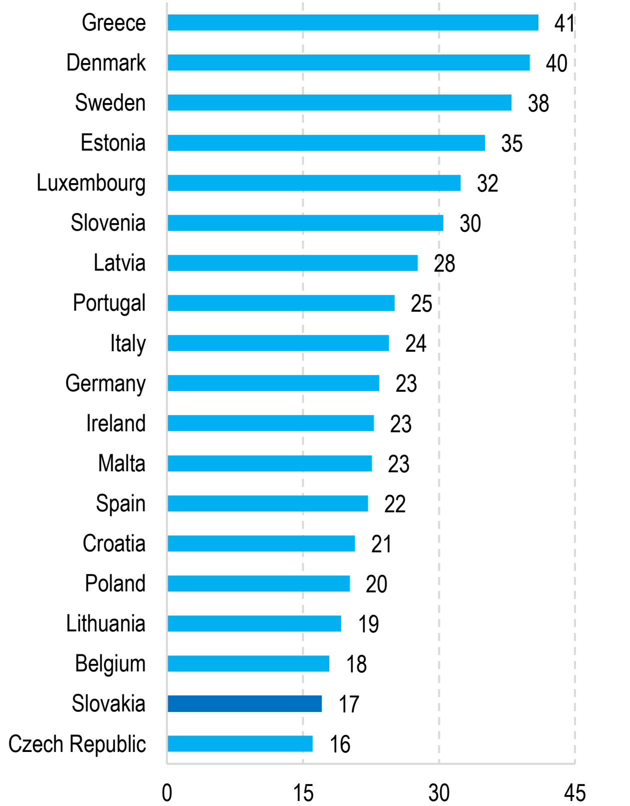
Figure 16: Energy excise duty revenue (% of GDP)



** The chart lacks data for excise duty collections on coal in Germany, Greece and Latvia, so the real figures are higher. Data for Austria are not available.*

Source: EC, 2023, VfMU

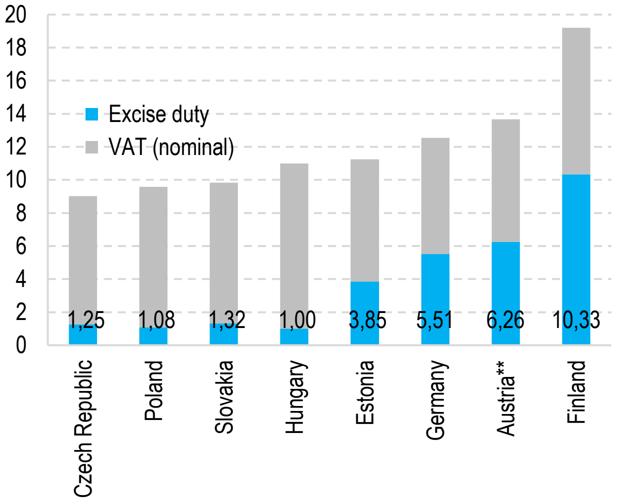
Figure 17: Implicit taxation of fossil fuels (EUR/MWh)



Source: Eurostat, VfMU

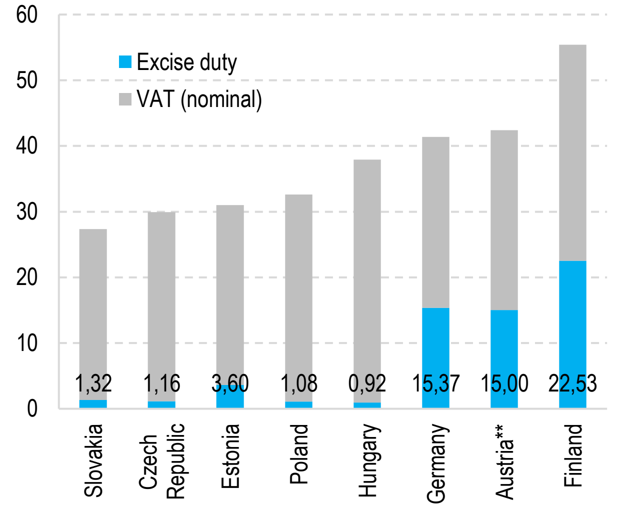
Excise duty rates are low and the overall tax burden on electricity is the lowest in the V4 thanks to lower VAT. The excise tax rate on electricity and gas in Slovakia is EUR 1.32/MWh, while coal is taxed at EUR 10.62/t. The overall tax burden on electricity in Slovakia is the lowest among the V4, despite a slightly higher excise duty rate. This is due to the lower VAT rate, which accounts for the largest part of energy taxation. The tax burden on gas is the second highest among the V4, due to the highest excise duty rate and the higher VAT rate (Figure 18 and Figure 19). Several countries tax electricity at a higher rate than gas and coal. The high taxation of electricity has been identified as problematic by the European Commission, which has long sought to reform the excise duty directive to take into account the environmental impacts of different sources (EC, 2019b).

Figure 18: Nominal gas taxation at a price of EUR 37.01/MWh (EUR/MWh)



Note: The figures correspond to the excise duty rates *Source: EC, VfMU*
*** Standard rate before the temporary reduction during the energy crisis.*

Figure 19: Nominal electricity taxation at a price of 136.95 EUR/MWh (EUR/MWh) [4]

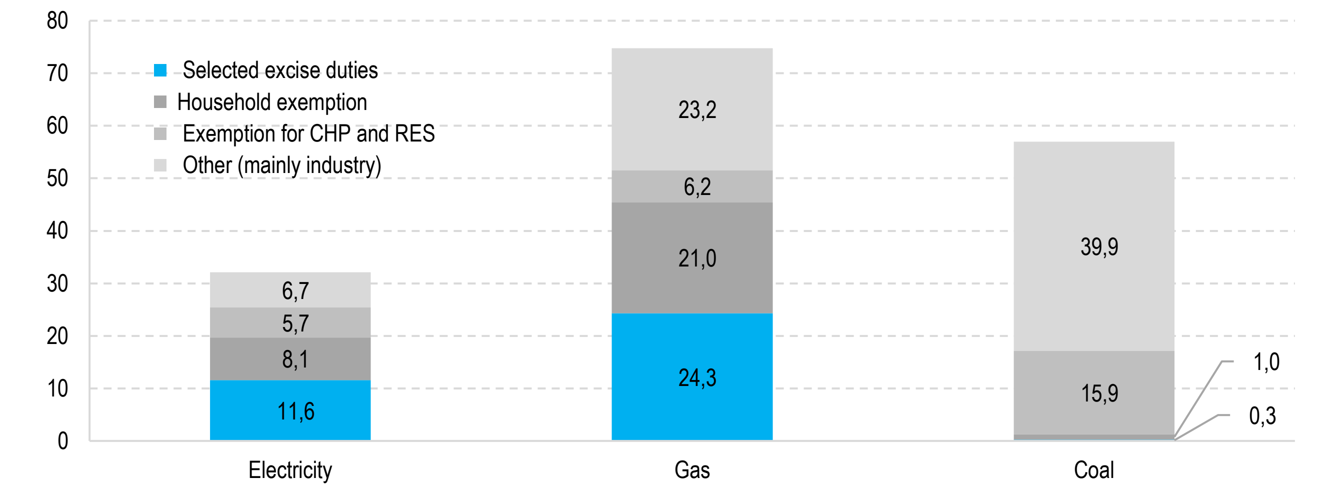


Note: The figures correspond to the excise duty rates *Source: EC, VfMU*

3.1.1 Tax expenditure on unjustified exemptions amounts to EUR 64 million per year

The reason for the low excise revenues is also the large number of exemptions, which cover up to 78% of potential revenues. In 2022, excise tax exemptions covered 64% of potential revenues from electricity, 67% from natural gas and up to 99% from coal (Figure 20). Exemptions mainly apply to industrial energy use, residential consumption and combined heat and power (CHP), a detailed overview of exemptions is provided in Annex 7.

Figure 20: Excise revenue and tax expenditure from exemptions for 2022 (EUR million)



Source: VfMU

The industry is exempted from excise duties to a similar extent as in neighbouring countries. Most of the optional exemptions target non-energy uses in industry (chemical reduction in electrolytic or metallurgical processes, mineralogical uses or coke production). The scope of the exemptions allowed is regulated by EU legislation. However, most of them are optional, which means that Member States have the competence to unilaterally repeal them. Based on European legislation,

[4] Average prices in the countries surveyed, including distribution charges, for the first half of 2021

only the exemption from excise duty on energy carriers used for electricity generation is mandatory (in Slovakia in 2022 approximately EUR 4.2 million). However, despite the possibility to abolish optional exemptions, industrial exemptions are applied practically universally across the V4, similarly also in Austria or Germany.

The tax expenditure on the household exemption amounts to EUR 37 million per year. Exemptions for households amount to EUR 30.1 million per year, with a further EUR 6.6 million lost to the state in VAT. Excise duty exemptions are justified by social objectives, but their impact on the household budget is minimal (next subchapter). Households are exempted from excise duties in only a small number of countries (in the V4, Slovakia and Hungary). In contrast, eight EU countries apply higher excise duty rates on household energy than on business (EC, 2024).

Even for energy inefficient households, the exemptions save only a few euros a month, with electricity exemptions helping wealthy households the most. The gas tax exemption does not have a significant impact on a household's budget, even if it lives in an old, uninsulated house. For a four-person household in an energy class D5 house with a floor area of 100 m^2 using gas for cooking, hot water and heating, this is about EUR 4.06 per month. In nominal terms, the richest households benefit the most from the exemption, as their electricity and gas consumption is approximately twice as high as that of the poorest households (next subchapter).

In addition, the exemption from excise duties for households favours the production of heat from fossil fuels. As the efficiency of electric heat pumps is many times higher than that of gas or coal boilers, they use much less energy to produce the same amount of heat. Conversely, fossil fuel heat generation is more energy intensive. The greater volume of gas or coal consumed means a greater amount of tax exemption than for electricity. While the production of 1 MWh of heat by a heat pump requires only about 0.33 MWh of electricity and the tax expenditure is only EUR 0.52, a gas boiler requires 1.11 MWh of gas, and the tax expenditure is EUR 1.80[5]. Heat pumps are currently used by only a few tens of thousands of households in Slovakia, exemptions from excise duties are one of the factors that reduce the motivation to heat with heat pumps. Given the recent rise in the price of alternative fuels (Myšáková, 2023), we do not expect the removal of exemptions to lead to a substitution effect and a switch to dirtier fuels.

The tax expenditure on exemptions for Combined Heat and Power (CHP) amounts to approximately EUR 22 million per year, support can be provided from the tariff for operating the system. The consumption of coal and gas in CHP plants is exempted from excise duty if electricity is cogenerated alongside heat production. The exemption for CHP promotes energy efficiency and is also applied in other EU countries. Support for CHP can be passed on directly to consumers, replacing tax expenditures of the state budget. In addition to the excise duty exemption, CHP is also supported by a surcharge on the tariff on system operation (TSO). The TSO surcharge constitutes the majority of the support to CHP (approximately EUR 109 million in 2020). The amount of the TSO surcharge depends on market prices for electricity. It is a more cost-effective form of support than the excise duty exemption, since at high market prices, which ensure a good return on investment, CHP electricity generation is subsidised less or not at all. At the same time, since CHP is also a service for electricity consumers, its support should be financed directly by consumers who pay the TSO. Thus, the excise tax exemption can be abolished and the support can be transferred to the TSO surcharge. The TSO rate, including VAT, would thus increase by approximately EUR 1.33/MWh[6].

Expenditure on support for electricity from renewable sources amounts to approximately EUR 6 million per year, but RES support can be provided by the market. Electricity consumers who have purchased guarantees of origin for electricity produced from renewable sources are exempt from excise duty. The revenues from the sale of the guarantees go to RES electricity producers, so the exemption is intended to indirectly support RES by motivating consumers to purchase the guarantees. The administration of the subsidy is quite challenging for the tax administration and taxpayers due to the need to report guarantees of origin. However, the market can already provide support for RES through guarantees of origin without state intervention. The prices of guarantees of origin were higher than the exemption level (EUR 1.32/MWh) from summer 2022 to February 2024. In the February 2024 OKTE auctions, the average price of guarantees was 2.89 EUR/MWh and 1.39 EUR/MWh. The higher prices indicate that the market values guarantees of origin not only because of the tax exemption (e.g.

[5] Heat pump with 300% efficiency and gas boiler with 90% efficiency. Heat pump efficiencies range from 200-400%, while the latest condensing gas boilers are typically quoted at around 98% efficiency.

[6] The recalculation takes into account the individual rate for electricity-intensive businesses as it worked after the introduction of the multi-band TSO.

due to the marketing of "green energy" to consumers or ESG criteria of companies). At the same time, the subsidy does not take into account market prices for electricity. Due to the high prices during the energy crisis, RES producers' revenues increased significantly without an equivalent increase in costs, and RES producers benefited from windfall profits, yet continued to receive support from the subsidised system of guarantees of origin.

Table 16: Volume of excise duty exemptions that we propose to abolish (EUR million in 2022)

	Electricity	Gas	Coal	Additional VAT revenue	Total
Households	8.1	21.0	1.0	6.6	36.7
CHP	0.1	6.2	15.9	-	22.2
RES	5.6	-	-	-	5.6
Total	**13.8**	**27.2**	**16.9**	**6.3**	**64.5**

Sourcej: VfMU

3.1.2 Indexation of excise duties would increase revenues by additional EUR 63 million per year in 2027

Real excise duty rates have fallen significantly since the last adjustment due to inflation, indexation of rates would increase budget revenues by an additional EUR 63.2 million per year. Excise rates have not been increased since 2010, so real rates have fallen by around 35% over time. Given the relatively stable nominal level of excise revenues due to inflation, real revenues of the state budget have also fallen at the same time. The rising price level of other goods and services therefore justifies indexing rates. Indexation of rates would ensure that real excise revenues would not fall due to inflation, while at the same time ensuring a similar impact on the behaviour of economic agents as at the time of the adoption of the legislation.

Excise rates can be increased gradually to catch up with inflation in 2027. In the event of a jump in rates by the level of inflation, excise rates would rise from EUR 1.32/MWh for electricity and gas to EUR 2.08/MWh in 2025 and from EUR 10.62/t to EUR 16.75/t for coal. As an alternative, we propose a gradual increase in rates so that rates catch up with inflation by 2027. The calculations assume an inflation rate until 2027, after which it is possible to adjust the year-on-year indexation by the real inflation rate (Table 17).

Table 17: Excise duty growth scenario

	Current rates	2025	2026	2027
Electricity and gas (eur/MWh)	1.32	1.62	1.91	2.21
Coal (eur/t)	10.62	13.01	15.41	17.80

Source: VfMU

Excise duties can be an important tool for achieving environmental objectives. The European Commission stresses the importance of excise duties as an environmental policy tool (EC, 2018). Well-designed excise taxes can incentivise energy efficiency improvements or motivate a switch to cleaner energy sources (Rosenow et al., 2022). Environmental objectives are also pursued by the abolition of exemptions along with the indexation of rates, especially from a heating perspective. Given the different efficiencies of heat pumps and fossil fuel boilers, indexed rates would mean increased taxation of fossil fuel heat compared to heat from electricity.

However, in addition to tariff indexation, a more comprehensive tariff reform that takes into account the harmful impacts of fossil fuels and promotes the use of electricity is also justified from the perspective of environmental objectives. The current tax and charging policy set-up heavily favours fossil fuels over cleaner electricity, and excise reform can be one tool to redress this disparity. Box 7 describes excise taxes from an environmental perspective. Annex 8 analyses the effects of tax and fee policies on energy prices.

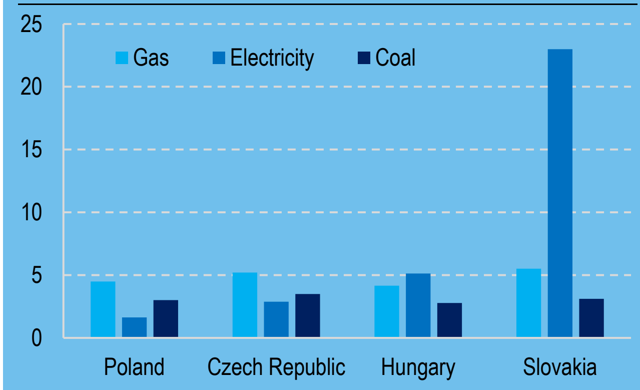
Box 7: The environmental aspect of excise duties

Slovak excise tax rates are currently not linked to the environmental impacts of individual fuel use. The IMF and OECD refer to energy excise taxes as implicit carbon taxes (IMF, OECD, 2021). In European countries, explicit CO_2 taxation is widespread, with carbon taxes existing in 12 EU countries, often linked to excise duties. For example, the excise tax in Finland has a carbon component that determines the fuel-specific portion of the rate, while in Ireland the carbon tax replaces excise taxes on natural gas, coal and peat biomass. Excise duty rates in Slovakia are not explicitly linked to emissions. The same rate for gas and electricity does not take into account their different emission intensity and the excise duty rate for coal does not distinguish between brown and hard coal.

At the same time, the under-taxation of harmful fossil fuels can be seen as a hidden subsidy, as taxation does not reflect the cost of the negative impacts caused by their combustion. Economic theory suggests that hidden subsidies reduce the welfare of society and that introducing and increasing taxes to remove them is justified (the Pigouvian tax). This theory is explained in more detail in Annex 9, which also describes negative externalities and how the external costs of pollution are quantified.

The effective carbon tax excise is significantly higher for electricity than for natural gas and coal, which favours fossil fuels. Slovakia taxes a tonne of CO_{2e} emissions from electricity more than four times as much as a tonne of emissions from gas and more than seven times as much as a tonne of emissions from coal. Thus, excise taxation of electricity emissions in Slovakia is the highest among the V4 countries (Figure 21), but still lower than in many Western European countries (Figure 22). A similar trend can be seen for other charges and taxes, with the use of electricity at a significant disadvantage compared to fossil fuels (Annex 8). The current tax and fee set-up burdens electricity significantly more than natural gas and coal, despite it being the cleanest energy source. Excise duties make up only a small part of all taxes and charges and, if set correctly, can play an important role in closing the tax and charge gap.

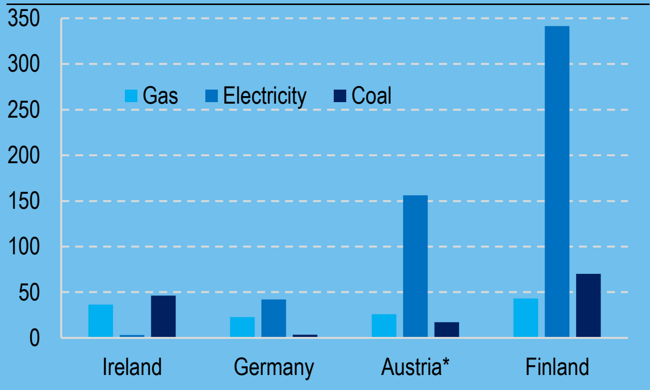
Figure 21: Excise duties per tonne of CO_{2e} in the V4 (EUR)



Note: Based on an estimate of the emission intensity of electricity in 2024 (without the Nováky and Vojany coal-fired power plants and with the third unit of Mochovce).

Source: EC, VfMU

Figure 22: Excise duties per tonne of CO_{2e} outside V4 (EUR)



** Standard rate before the temporary reduction during the energy crisis.*

Source: EC, VfMU

Excise duty that disadvantage electricity are not only a problem in Slovakia, which is why efforts are underway at European level to reform the Energy Taxation Directive. Directive 2003/96/EC sets minimum levels of taxation on energy carriers. The minimum rates for electricity, natural gas and coal have remained unchanged since 2003. For several years now, and also in the context of the Fit-for-55 package, there has been a so far unsuccessful effort to reform this Directive, which could have brought about higher minimum levels of taxation and automatic indexation of rates. An eventual agreement at EU level would thus probably lead to an increase in minimum rates above the current level of excise duties in Slovakia. As the future of the agreement is unclear and even if successful will most likely lead to an increase in rates above the current level, it is reasonable to consider a national solution within Slovakia.

Raising excise tax rates on fossil fuels is a possible solution; more comprehensive reform may include differential rates or special levies. In addition to raising fossil fuel rates or introducing a carbon component to the tax, excise rates can be differentiated by consumption or use. Differentiated rates can pursue a variety of objectives ranging from promoting electric heating or increasing energy efficiency. As part of a more comprehensive reform of tax and charging policy, the charge burden can be shifted from electricity to fossil fuels, while a new emissions trading scheme (EU ETS2) is being prepared at EU level, which will also affect the use of fossil fuels in buildings, including households and smaller businesses. Annex 10 summarises possible reforms of excise duties and charging policy, while Annex 11 deals with EU ETS2.

3.1.3 The impact on households of removing exemptions and indexing rates would be minimal

The abolition of exemptions and indexation of excise rates would increase state budget revenues by EUR 127.7 million per year until 2027. The revenue potential assumes a gradual increase in rates according to the scenario (Table 17). In addition to excise revenues, VAT revenues would also increase as it is applied to energy prices, including excise duties. The revenue growth by year is summarised in Table 18.

Table 18: Impact of measures on state budget revenue

	2025	2026	2027
Indexation of current earnings*	7.2	14.1	21.2
Abolition of exemptions and indexation	71.0	83.8	96.9
Additional VAT revenue	7.0	8.3	9.6
Total	**85.1**	**106.1**	**127.7**

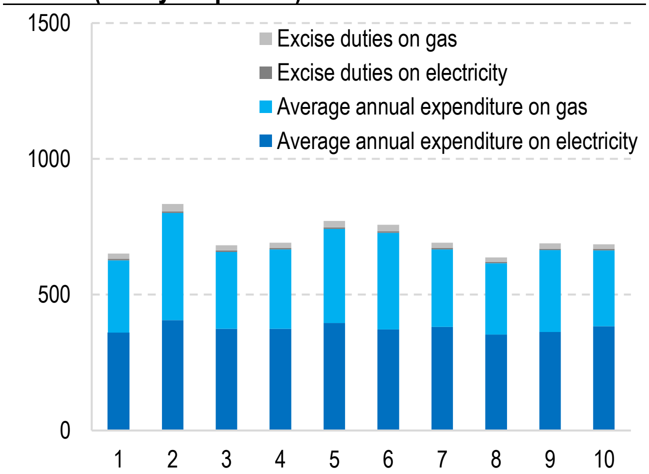
** The recalculation takes into account an increase in the public administration's excise duty costs (EUR 3.2 million in 2027).*

Source: VfMU

The revenue potential from the abolition of exemptions should be stable in the medium term, also in view of the change in the pattern of energy consumption. According to the energy modelling results for the Integrated National Energy and Climate Plan (NECP), household gas consumption will decrease by almost 2.2 TWh by 2030 compared to 2022. This decrease will be partly offset by the growth in electricity consumption, including for charging electric vehicles, but overall electricity and gas consumption is projected to decrease by around 1.4 TWh. However, electricity generation from RES is expected to increase significantly (by around 2.5 TWh). The potential of removing exemptions for RES electricity would depend on the amount of guarantees of origin purchased, but the overall impact of the change in energy consumption patterns by 2030 should not significantly affect the revenue potential of removing exemptions.

The impact on the household budget of abolishing household exemptions and indexing rates would be minimal. After the increase in tariffs to EUR 2.21/MWh (2027, after indexing tariffs for inflation), the increase in electricity and gas expenditure for households in the lowest two income deciles (disposable income up to EUR 609 per person per month) would be on average equivalent to 0.40% of disposable income (EUR 2.0 and EUR 2.82 per person per month, respectively).[7]

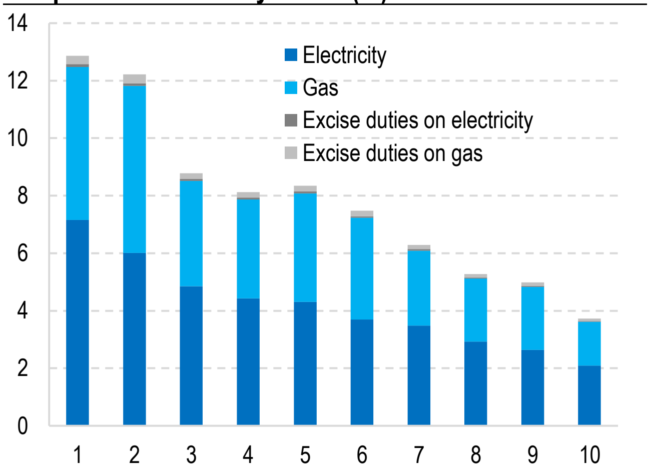
Figure 23: Electricity and gas expenditure by income decile (EUR/year/person)



Pozn.: Energy expenditure is based on 2022 data.

Source: Statistical Office of the SR, IFP

Figure 24: Share of electricity and gas expenditure in disposable income by decile (%)



Pozn.: Energy and revenue expenditure based on 2022 figures.

Source: Statistical Office of the SR, IFP

[7] Income and expenditure are equivalised according to the modified OECD scale. According to the scale, a coefficient of 1 is applied to the first adult in the household, a coefficient of 0.5 is applied to the other members over 14 and a coefficient of 0.3 is applied to children under 14. For a family of four with two young children, this would amount to EUR 4.21 and EUR 5.92 per month respectively.

The average household would pay EUR 1.29 per month if the excise tax exemptions were abolished, and EUR 2.15 per month after indexation of rates. The nominal impact of the measures on households is summarised in Table 19.

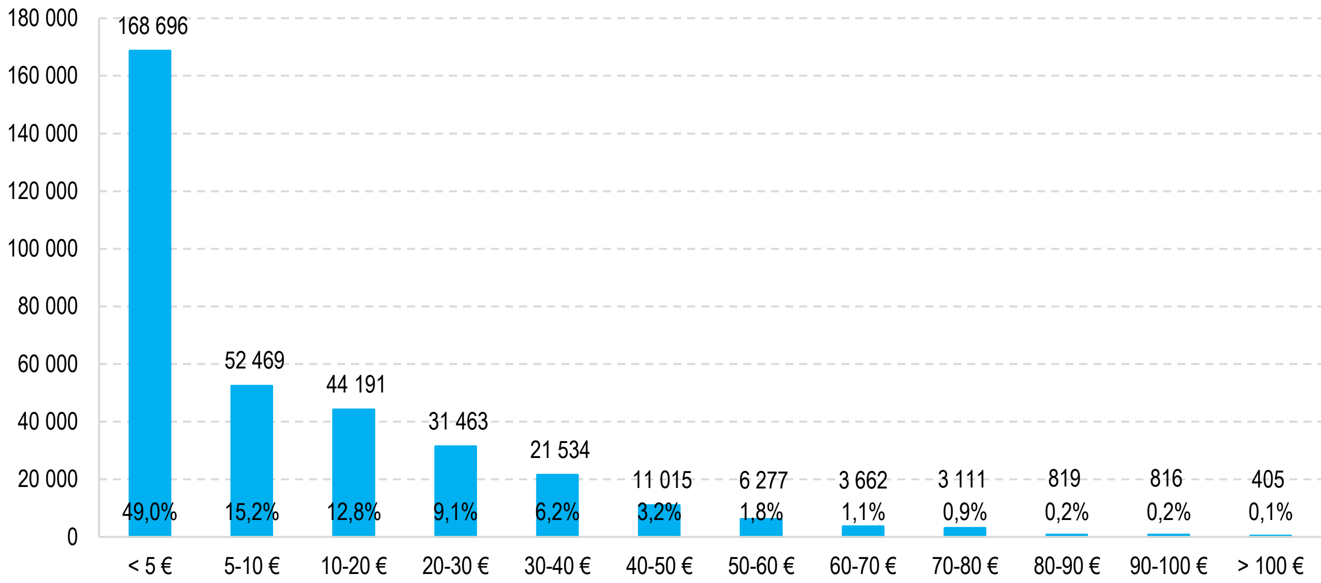
Table 19: Expected average household expenditure on excise duties as a result of the measures (EUR/month)

	Repeal of exemptions without indexation	Additional impact of rate indexation			Total impact in 2027
		2025	2026	2027	
10 % with the lowest income	1.20	0.27	0.54	0.81	2.00
Average household	1.29	0.29	0.57	0.87	2.15
10% with the highest income	1.28	0.29	0.57	0.86	2.15

Source: VfMU

The cost would rise by more than EUR 50 a year for only around 4% of the poorest households. Two thirds of the approximately 345 thousand households in the two lowest income deciles (disposable income up to EUR 609 per person per month) would see their electricity and gas costs increase by less than EUR 10 per year. Around 4.4% (15 thousand) of these households, whose bills would increase by more than EUR 50 per year, would be more significantly affected by the increase in excise duties (Figure 25).

Figure 25: Number of households in the bottom two income deciles by increase in annual energy expenditure



Source: Statistical Office of the Slovak Republic, IFP

Part of the proceeds from the measures can be used to mitigate impacts on the most vulnerable households. Support should primarily target low-income households with high energy consumption (households with the highest expenditure growth in Figure 25) and should focus on improving energy efficiency. These households are already at risk of fuel poverty (e.g. ÚRSO, 2023b) and are also targeted by measures such as the Renew House Challenge of the Recovery Plan, which provides financial grants for the renovation of energy inefficient houses for low-income households. By earmarking a third of the proceeds from this chapter for a similar scheme, it would be possible to support the renovation of more than 5 000 houses per year. Compensation measures are discussed in more detail in Box 8.

Box 8: Compensation measures for vulnerable households

The most vulnerable group is low-income households in energy inefficient buildings. In the case of rising energy prices, for example due to excise duties, but also due to the introduction of the EU ETS2 , low-income households with high consumption are the most vulnerable. High consumption in these households is often a consequence of low energy efficiency, especially households in uninsulated dwellings using older heating equipment with low efficiency.

Sustainable compensation measures should thus aim at increasing energy efficiency. Measures to compensate for the impact of increased energy prices may include direct compensation for energy costs, for example in the form of housing allowances, energy efficiency measures or energy efficiency education. In the context of energy poverty in Slovakia, possible measures are addressed, for example, in a publication of the Slovak Academy of Sciences (Dokupilová and Gerbery, 2023), which also stresses that measures that promote energy consumption reduction should be the preferred option. This could be, for example, allowances for renovation of dwellings, replacement of heating equipment, installation of RES (such as the existing Renew House or Green Household schemes), or loans for replacement of appliances. Conversely, direct financial support that does not target the renovation of buildings or the modernisation of heating and appliances does not support the improvement of energy poverty conditions in the long term, thus creating a permanent dependency on support and thus a burden on public finances.

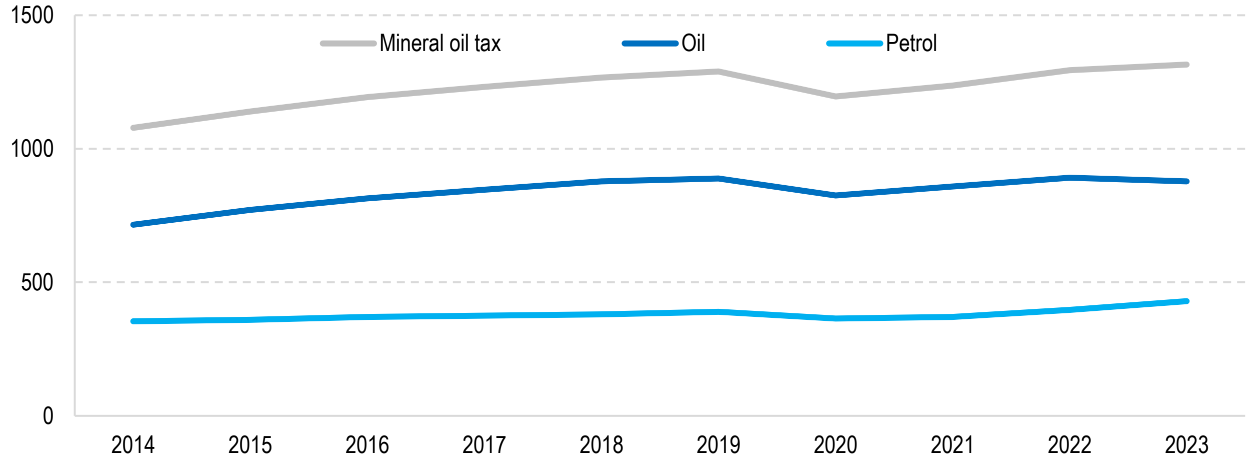
Measures to tackle energy poverty will be offered by the Social and Climate Plan linked to the implementation of the EU ETS2. The introduction of a system of emission allowances for heating and transport after 2027/2028 will lead to a significantly higher increase in gas prices than the excise measures in this chapter (see Annex 11 for details). In a minimalist scenario of low allowance prices, a MWh of gas will become more expensive by more than EUR 7, which is almost three times the price increase due to excise duties (EUR 2.72/MWh including VAT). In the context of the introduction of the EU ETS2, a Social and Climate Fund will thus be set up to cushion the impact of higher prices on vulnerable consumers. Countries have to draw up Social and Climate Plans for the use of the Fund, which will include measures to compensate or systematically support vulnerable consumers. The Slovak plan is currently being prepared by the National Implementation and Coordination Authority in cooperation with the relevant ministries. The final version should be ready by June 2025. The measures in the plan will thus also be applicable to price increases linked to excise duties.

3.2 Fairer taxation of diesel would increase revenue by EUR 48 million

Mineral oil excise duty applies to petrol, diesel, various types of oils and liquefied petroleum gas. In 2023, the revenue from this tax was EUR 1.3 billion. Most excise duty rates have not been indexed for a long time. Diesel is taxed at a significantly lower level than petrol despite its more negative externalities. We propose to increase the tax on diesel by 5%, with an additional annual revenue of EUR 48 million. Due to negative externalities and low environmental sustainability, we also propose to abolish the tax exemption for combined heat and power production from mineral oils.

Mineral oil tax revenue has grown by approximately 0.75% per year since 2018. This is significantly lower than the growth from 2005 to 2018, which was at around 2.2%. However, the figures for 2018 to 2023 are affected by the Covid-19 pandemic; without this negative shock, the growth in tax revenue would have been at around the same level in both periods. Until 2018, tax revenue growth was largely driven by rising diesel tax collections; from 2018 onwards, the opposite has occurred, with gasoline tax revenues growing faster and diesel revenues stagnating (Figure 26). In the medium term, mineral oil excise tax collections are projected to continue to grow. In the long term and as electro-mobility develops, collections will start to decline (Box 9).

Figure 26: Mineral oil tax revenue (EUR million)



Source: IFP

Box 9: Impacts of electromobility on tax revenues

Electromobility in Slovakia has so far had only a negligible impact on mineral oil excise duty revenue - of the approximately 2.5 million passenger vehicles, approximately 0.3% are purely electric. Despite the expected growth in the number of electric vehicles in the coming years, the decline in tax revenue should not be dramatic in the near future. However, from 2035 onwards, when the sale of fossil-fuelled vehicles in the European Union will cease, the impact on the mineral oil excise duty revenue will gradually start to be felt.

The estimated decrease in tax revenue due to the growth of alternative mobility is EUR 8.2-10.7 million per year (2023). The reduced level of the registration fee (annual impact of EUR 4.4 million) affected 5 900 EVs and 3 800 plug-in hybrids. The owner of an EV will save on average EUR 591 on the registration fee. The lower company tax on motor vehicles (annual impact of EUR 1.4 million) was used on 8 900 electric cars and 5 900 plug-in hybrids. The tax is on average EUR 120 per year lower compared to an internal combustion engine vehicle. Depending on the type of vehicle, drivers pay an average of EUR 250 to 500 per year in excise duty on mineral oil. Electric car owners will pay on average less than 1 euro per year in excise duty on electricity - the fiscal shortfall in excise duty is between EUR 2.5 and 5 million per year in 2023 (not including the impact of VAT).

Effective tax rates are gradually falling due to inflation. Nominal excise duty rates are, with the exception of the rate on heating and lubricating oils, at or below the 2004 level. As a result, their real rates are falling due to progressive inflation. For example, the excise duty rate on petrol was set at EUR 514/1 000 l in 2004 and has remained unchanged since then. If the rate were adjusted for inflation, it would be EUR 922/1 000 l in 2024. Similarly for diesel, the tax rate for which also fell in nominal terms in 2010.

Table 20: Mineral oil excise duty rates in 2024 and 2004

Mineral oil	Rate 2004	Rate 2024
Motor spirit of nomenclature code (unleaded petrol) [8]	514 eur/1 000 l	no change
Motor spirit of nomenclature code (aviation and leaded petrol)[9]	597.49 eur/1 000 l	no change
Nomenclature middle oil (kerosene: aviation kerosene and others)[10]	481.31 eur/1 000 l	no change
Gas oil (diesel fuel)	481.31 eur/1 000 l	368 eur/1 000 l
Heating oil	26.55 eur/1000 l	111.50 eur/1 000 kg
Liquid gaseous hydrocarbons	258.91 eur/1000 l	182 eur/1 000 kg
Lubricating oils and other oils (viscosity up to 10 mm2/s)	0 eur/1 000 kg	100 eur/1 000 kg
Lubricating oils and other oils (viscosity above 10 mm2/s)	0 eur/1 000 kg	no change

Source: IFP

The introduction of an indexation calendar for the gradual indexation of taxes would solve this problem, but an EU-wide solution is needed. Regular indexation is not yet common even in neighbouring countries and its introduction in Slovakia could amplify the negative impact of cross-border fuel tourism and other dynamic influences. Therefore, the introduction of an indexation calendar requires pan-European coordination and legislative anchoring in the Directive, which regulates the rules on the taxation of energy products in the EU.

Box 10: Research on fuel tourism from abroad and changes in fuel demand

Experience from small open economies shows that when prices rise as a result of excise duty increases, there is significant fuel tourism, especially in regions close to the border. For example, a 10% reduction in the price of gasoline in Switzerland led to a 6.7% to 7.7% increase in demand for gasoline in its border regions (within 5 km of the border) (Banfi, Filippini and Hunt, 2003). Research shows that the long-standing fuel price differentials between Italy and Switzerland resulted in more than a quarter of consumption in the Italian border regions being pumped in Switzerland. In response to the gradual convergence of fuel prices, this figure fell to around 5% over three years.

Research on Dutch drivers living close to the border with Germany came to a similar conclusion. The findings suggest that the average driver is willing to travel 1 km to fill up for every 0.5 eurocent difference in price per litre of fuel (Rietveld, Bruinsma and van Vuuren, 1999). Travelling for refuelling can be even more significant if it is also linked to another purpose, such as shopping.

The average estimated change in fuel demand due to a 1% price increase is around minus 0.34% in the short term to minus 0.84% in the long term (Brons et al., 2008). Demand sensitivity depends on a number of domestic and foreign socio-economic variables. The lower bound estimate of demand elasticity registered in this meta-study was minus 1.36 in the short run and minus 2.04 in the long run.

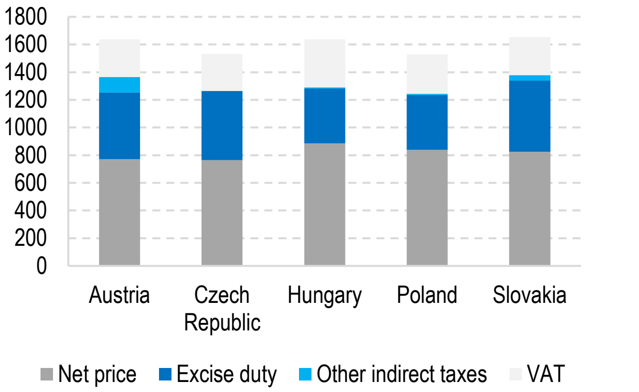
3.2.1 Excise duties on petrol and diesel

In addition to excise duty, the final price of petrol in Slovakia also includes value added tax and, indirectly, a fee for maintaining emergency oil stocks. Excise duty on petrol is relatively high in Slovakia, at EUR 514/1000 l (Figure 27). From 2023, the Czech Republic has also increased its rate to around the same level, and from 2024 Hungary and Poland have increased their tax rates to almost EUR 400/1000 l. On the other hand, Slovakia (and Austria) has the lowest VAT rate in the region at 20%. The final price of petrol in Slovakia is also subject to an indirect tax burden - a levy on the maintenance of emergency oil stocks. This indirect tax burden in Slovakia is the second highest in the region (after Austria). Its amount is

[8] Combined nomenclature 2710 12 41, 2710 12 45, 2710 12 49
[9] Combined nomenclature 2710 12 31, 2710 12 50
[10] Combined nomenclature 2710 19 21 a 2710 19 25

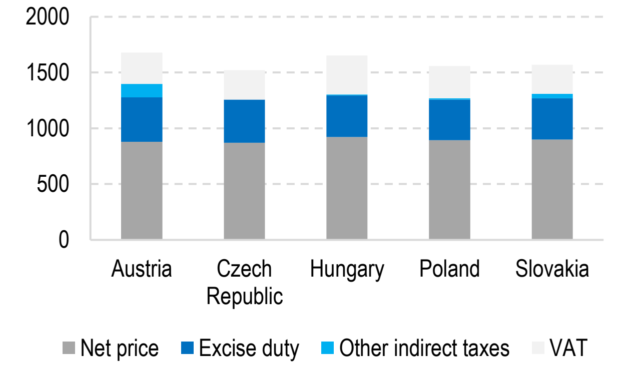
significantly lower compared to excise duty and value added tax; in February 2024, the levy for maintaining emergency oil stocks increased by about one third (to EUR 39.65/1000 l).

Figure 27: Components of the final price of petrol in V4 and Austria in 2024 (EUR/1000 l)



Source: IFP

Figure 28: Components of the final price of diesel in V4 and Austria in 2024 (EUR/1000 l)

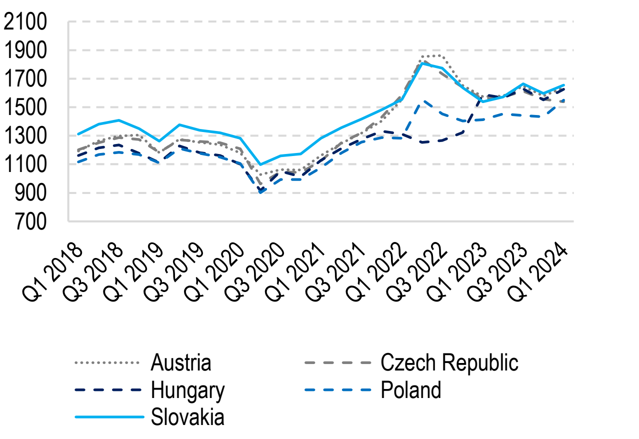


Source: IFP

The same items enter into the final price of diesel as for petrol. However, the rate of excise duty on diesel is significantly lower than on petrol in all countries. Poland, Hungary and Slovakia have the lowest excise duty (approximately EUR 368/1000 l). Hungary and Poland have increased their rates significantly as of 1 January 2024, bringing them to the level of Slovakia; for example, Hungary has increased its rate by almost 30%. The value added tax applicable to diesel is identical to petrol in all countries in the region. Similarly, other tax burdens are roughly the same as for petrol in all countries in the region.

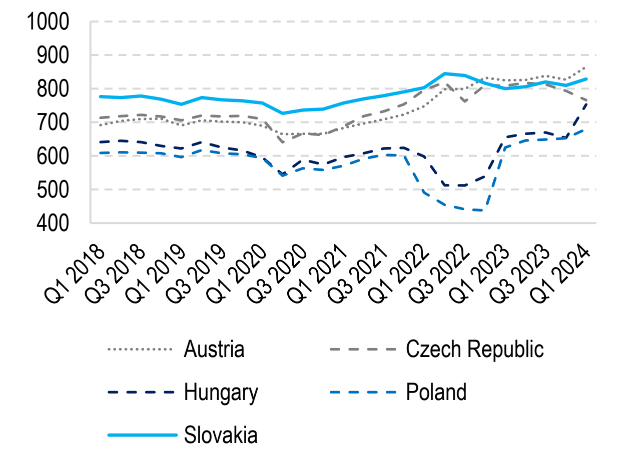
Final petrol prices in Slovakia have long been at the highest level among the V4 countries and Austria. The net price of petrol is at the median in the region, but the total tax burden expressed in EUR/1000 l is the second highest in the region after Austria (Figure 30).

Figure 29: Final petrol prices in V4 and Austria (eur/1000 l)



Source: IFP

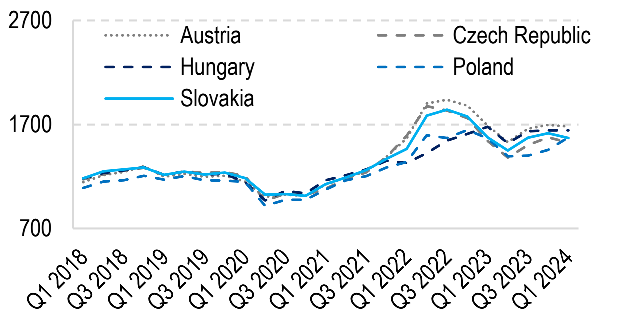
Figure 30: Total petrol tax in the V4 and Austria (EUR/1000 l)



Source: IFP

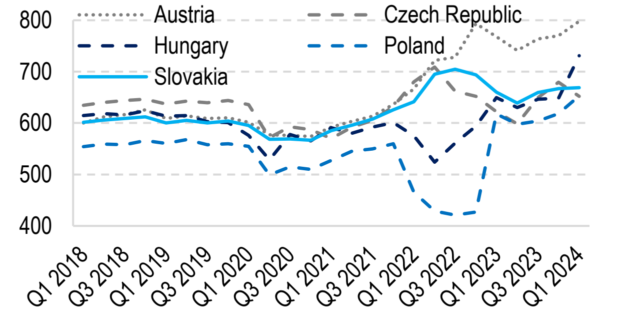
The price of diesel fuel in Slovakia is more competitive than the price of petrol compared to neighbouring countries. Final diesel prices (Figure 31) and the level of tax (Figure 32) are at the median of the V4 and Austria. The price competitiveness of diesel is primarily supported by the road transport sector, as up to more than 85% of the excise duty on diesel is paid by the road haulier sector.

Figure 31: Final diesel prices in V4 and Austria (EUR/1000 l)



Source: IFP

Figure 32: Total diesel tax in the V4 and Austria (EUR/1000 l)



Source: IFP

With a 5% increase in diesel excise duty, revenues could increase by up to EUR 47 million per year in 2025 in an ideal scenario (EUR 48 million after VAT impact). The final price of diesel in Slovakia is at the median in the region and the vast majority of diesel consumed is used for freight transport. Taking into account the current state of the road haulier sector (Box 11) and the competitiveness of Slovak diesel, we therefore estimate that with a relatively small increase in diesel excise duty of 5% (EUR 0.018/l), to EUR 386/1000 l, the dynamic and behavioural impacts would be negligible, and hence the level of pumping and fuel tourism would remain unchanged. Nor would the competitiveness of Slovak hauliers be jeopardised, as the excise duty also applies to foreign hauliers in Slovakia.

Box 11: Analysis of the road transport sector

An analysis of the sector, which accounts for more than 85% of diesel consumption, shows that even after accounting for inflation, sales grew by an average of 3% a year over a 10-year period. The sector has never made a loss over the past 10 years and in the past 3 years the profit as a percentage of sales has risen from 0.2% to 2.2%.

Fuel prices, especially diesel, have negligible impact on the competitiveness of Slovak carriers, as their amount is uniform in a particular country regardless of the origin of the carrier. On the domestic market, Slovak hauliers are at an advantage compared to foreign competitors, mainly due to lower minimum wages and lower domestic meal allowances. Approximately 73 % of the revenues of Slovak road freight hauliers come from the domestic market, while the share of the foreign market has been declining in the long term.

On the other hand, we do not recommend an increase in the gasoline tax because of the already long-standing highest gasoline prices in the region and the dynamic effects. Since the substitution of Slovak gasoline for foreign gasoline is relatively easy for a large part of the Slovak population and its final price in Slovakia is already the highest in the region, a 5% tax increase (as for diesel) would likely lead to significant dynamic effects. Based on experience from abroad, this tax increase would reduce demand (for petrol) by between 0.65% and 1.6%. Despite the dynamic effects, we estimate that after a 5% increase in the excise duty on petrol, tax revenues would increase by between EUR 13.2 million and EUR 17.1 million per year (EUR 15.5 million to EUR 20.5 million when including the impact on VAT).

We tax diesel less than petrol even though it generates more external costs, so a tax increase on diesel is justified. In the case of petrol, the tax is around 50% of the final price, while for diesel it is 43%. External costs include, for example, higher emissions of carbon, nitrogen oxides and particulate matter, but also more damage to roads. The disparity in the taxation of the fuels is best seen when calculating the effective carbon taxation, which is significantly lower for diesel than for petrol. The CO2 taxation of diesel is just above the EEA median estimate of the social cost of carbon (EUR 130/tonne) - at EUR 137/tonne. For petrol, the rate is well above this estimate - at EUR 221/tonne. Slovakia's effective carbon taxation in road transport is at the median level for petrol in the European Union, and the highest in the V4 and Austria. Slovakia's effective carbon taxation for diesel is below the EU average and at the median of neighbouring countries (OECD, 2019b). A more significant problem in Slovakia, and indeed in all EU countries, is carbon taxation outside road transport and outside the sectors covered by the EU ETS[11].

The significant difference in taxation creates inconsistent incentives to reduce emissions across fuel types and encourages undesirable substitution between diesel and petrol. In general, the proposed increase in the diesel excise duty rate should mitigate this inconsistency and support environmental objectives. However, in a small open economy like Slovakia, achieving such objectives without supranational coordination is more challenging, as a more significant increase in the rate could also lead to an increase in cross-border fuel tourism, potential revenue shortfalls from refuelling of transiting freight and other dynamic impacts on consumption. The analysis suggests that a relatively small increase in the diesel excise tax rate should achieve an increase in diesel excise tax collections with no impact on consumption.

Box 12: Distribution impacts

Compared to increases in food or energy prices, the impact of higher fuel prices is progressive and relatively small (Fulvimari et al., 2023). The Slovak average (6.9%) and median (5.8%) share of the household budget on transport is well below the EU average (8.3%) and median (6.6%), which means that Slovak households spend relatively less on transport than in other countries. In the case of households on the poverty line, the share of the budget spent on fuel is even significantly below the EU average.

The rise in fuel prices has led to an increase in transport poverty. The EC examined the impact of fuel price rises on household budgets from August 2021 to January 2023. The price of fuel rose by around 35% in Slovakia over this period, which is just below the EU average[12.] Among households at risk of poverty, the number of transport-poor households in Slovakia increased from 16% to 21% (the 6th lowest level in the EU). In the total population, the number of transport-poor households increased from 29% to 42% (the EU average increased to 47.2%).

An increase in the diesel excise duty rate would increase the average household's monthly expenditure by EUR 1.08 per month. Households that use diesel would be only minimally affected by an increase in the excise duty rate. The impact of the measure would be regressive, with the richest households seeing their expenditure rise the most, by an average of EUR 1.58 per month (Table 21).

Table 21: Impact of diesel tariff increase on diesel households (eur/month)

10 % with the lowest income	0.99
Average household	1.08
10 % with the highest income	1.58

Source: Family accounts, VfMU

Measures from the Social and Climate Fund will also address transport poverty. The introduction of the EU ETS2 will lead to an increase in fuel prices of EUR 0.7-0.17/l (Annex 11). Thus, the Social Climate Fund will also be used for measures related to transport poverty alleviation, for example by promoting public transport. The specific measures will be contained in the Social and Climate Plan, which should be drawn up by June 2025. Part of the proceeds from increased excise duties on diesel could thus be used to additionally finance these measures and mitigate the impact of increased diesel prices on vulnerable consumers.

3.2.2 Other mineral oils and exemptions

The excise duty on liquefied gaseous hydrocarbons (propane, butane, etc.) is the third largest part of the mineral oil tax after petrol and diesel, amounting to approximately EUR 7.3 million (2023), which is less than 0.6% of the total mineral oil tax. The basic rate of excise duty on liquefied hydrocarbons used as fuel in Slovakia is at the median of the V4 and Austria, at EUR 182/1000 kg. Austria has the highest rate, at EUR 243/1000 kg, and the Czech Republic and Poland the

[11] The median effective taxation outside road transport and outside the sectors covered by the EU ETS system is only EUR 10/tonne CO_2 in 22 OECD countries. This should improve with the advent of ETS 2, which we describe in Annex 11. In Slovakia, effective carbon taxation outside transport is at EUR 7/tonne CO_2, which is still the highest level of carbon taxation outside transport in the V4.

[12] The research only considers measures and support mechanisms that have a direct impact on price, the others are stripped out. Behavioural influences and behavioural changes are also not considered. Households are defined as 'transport poor' if the share of the household budget spent on fuel exceeds 6%.

lowest (depending on the exchange rate), at around EUR 155/1000 kg. Slovakia, the Czech Republic and Hungary do not tax liquefied gaseous hydrocarbons used for heating purposes and heat production, Austria taxes them at a reduced rate of 43 or 88 EUR/1000 kg depending on the nomenclature and Poland at around 15 EUR/1000 kg. In Slovakia, this exemption applies (for the year 2023) only to 124 tonnes of liquefied hydrocarbons and represents a negligible tax expenditure of approximately EUR 23 thousand per year.

The tax revenue from the excise duty on fuel oils was at the level of approximately 450 thousand euros in 2023. In Slovakia, the excise duty on fuel oils, without distinction as to the combined nomenclature, use or chemical characteristics of the oil in question, is at the level of EUR 111.5/1000 kg. In Austria, the basic rate of excise duty on fuel oils used for heating purposes is EUR 60/1000 kg, but the rate can rise to EUR 425/1000 l, depending on the specific characteristics of the oil and its use. Similarly, in Poland, the basic rate of excise duty on fuel oils is EUR 54/1000 l, but depending on the chemical characteristics of the oil and the nomenclature, the rates range from EUR 16/1000 kg to EUR 275/1000 l. Hungary has the highest excise duty rate at EUR 290.5/1000 kg and the Czech Republic the lowest at EUR 18.66/1000 kg.

The tax revenue from the excise duty on aviation kerosene was only at the level of about 440 thousand euros in 2023. The types of kerosene are distinguished according to their intended use: for jet engines (2710 19 21); and for other purposes (2710 19 25). Slovakia has the highest rate among the neighbouring countries, the same for both nomenclatures of kerosene - EUR 481.31/1000 l. Austria and the Czech Republic tax kerosene at rates just below EUR 400/1000 l and Poland applies two different rates based on the combined nomenclature - EUR 338 and EUR 426/1000 l. Hungary has a similar set-up, but the specific rate for kerosene also depends on world market oil prices. As in neighbouring countries, kerosene used in air transport is exempt from excise duty in Slovakia, with the exception of private flights.

Exempted uses of mineral oils include mainly fuels used in aviation (80%) and for shipping on the Danube (11%). The remaining exemptions apply to fuels used in tax storage and for industrial purposes (mineralogical processes, dual use and electricity generation and combined heat and power generation).

Table 22: Volume of excise duty exemptions on mineral oils (million euro)

Aim	Section of the Act n. 98/2004	2021	2022	2023
Aviation fuel	§ 10, par. 1, subpar. 1 b)	12.2	25.4	23.9
Boat operating substance on the Danube	§ 10, par. 1, subpar. 1 c)	3.2	3.2	3.3
Technological purposes, tax warehouses, depreciated substances	§ 10, par. 1, subpar. 2	2.0	1.5	1.6
Mineralogical and dual use, power generation, CHP	§ 10, par. 1, subpar. 1 d) – i)	0.1	0.8	1.2
Purpose other than as a propellant or fuel	§ 10, par. 1, subpar. 1 a)	0.7	0.6	0.1
Total		**18.2**	**31.5**	**30.0**

Note: The data are the result of aggregation of tax returns, which may be subject to some error. *Source: IFP*

The legislation enshrining mineral oil tax exemptions is similar to that abroad. Almost identical types of exemptions exist in Poland and Austria. A partial exception is Czechia, where there are no exemptions for industrial purposes. However, this may be due to the fact that Czech refineries do not produce electricity or do not have combined heat and power facilities.

Most mineral oil tax exemptions favour less environmentally friendly forms of transport and are based directly on EU legislation. Petrol and diesel are covered by mineral oil excise duties, but most aviation kerosene (and marine fuels) are not. Tax policy thus provides an incentive to use more air transport, which produces higher emissions (per passenger and per kilometre, or per tonne of goods and per kilometre). Tax policy needs to be reformed at European level. Increasing taxation on aviation kerosene would not be in line with Council Directive 2003/96/EC. In response to the Fit-for-55 package, the abolition of excise duty exemptions on mineral oils in aviation and shipping is under discussion, but no agreement has yet been reached. The abolition of the exemption for aviation kerosene would increase the volume of taxed fuel by 49.4 million litres (currently around 914 thousand litres are taxed) and would bring EUR 23.9 million per year to the budget.

We propose to repeal the exemption for the use of mineral oils for electricity generation and CHP. The production of heat from mineral oil is more harmful than its production from natural gas, the exemption for which we also propose to repeal. The problem with the combustion of mineral oils is mainly local pollution. The measure will increase tax revenue for the state by around EUR 1.2 million per year.

3.3 There is insufficient justification for the nuclear facilities levy

The nuclear facility tax is paid by nuclear power plants to municipalities within 20 kilometres of the plant. The revenue from the tax is EUR 4 million a year, which the municipalities can use for any purpose. There is not enough justification for the existence of the tax. A similar tax exists in the EU only in Slovenia, and the negative effects of the location of a nuclear installation on municipalities are minimal. We recommend abolishing the tax by amending Act No 582/2004 Coll.

Operators of nuclear power plants are obliged to pay a tax for the nuclear installation to the surrounding municipalities. The tax is based on the area of the cadastral territory of the municipality in the danger zone (within a radius of 20 km from the nuclear power plant), with the tax rate depending on the distance of the municipality from the centre of the danger zone. For municipalities whose territory is located within 1/3 of the radius of the danger zone, the rate is set at 0.0039 EUR/m^2, in the zone above 1/3 of the radius up to 2/3 of the radius it is 0.0013 EUR/m^2 and in the zone above 2/3 of the radius it is 0.0006 EUR/m^2. If the territory of the municipality extends into more than one zone, the higher tax rate is applied to its entire cadastral territory.

The total amount of tax collected for nuclear installations is almost EUR 4 million per year. Since 2013, it has remained at around EUR 3.8 million per year. The tax rate has remained unchanged since its introduction in 2004. If increased by the inflation rate (totalling 62%), the real amount collected in 2022 would exceed EUR 6 million.

The use of funds from the tax on nuclear installations by municipalities is not regulated by legislation. Practice shows that these revenues are used to cover investment and current expenditures that are not directly related to compensating for the negative impacts of the proximity of a nuclear power plant.

The location of a nuclear power plant in the vicinity of a municipality implies a minimum of additional obligations for the municipality. The only exception is the regular replacement of iodine tablets for the affected municipalities every five years. The iodine tablets are provided by the plant operator and distributed to the municipalities by the Ministry of the Interior Affairs of the Slovak Republic. The municipalities are responsible for organising the information campaign and distributing the tablets directly to the citizens.

Box 13: Arguments in favour of a tax on nuclear installations are not justified

The existence of the tax is justified by the implementation of anti-radiation measures or the decline in property values (Marčan and Slovák, 2007). Under normal circumstances, communities around nuclear power plants are not exposed to a substantially higher level of radiation than other communities. Serious nuclear accidents are extremely unlikely (Rose and Sweeting, 2016), but in their case, municipalities outside the 20-kilometre radius hazard area would be highly likely to be affected, regardless of the counter-radiation measures implemented by the municipalities.

Academic studies have not confirmed a negative impact of the presence of nuclear power plants on property values. The relationship between proximity to nuclear power plants and property prices was not found by Oredsson and Hellman (2022), Ewelönn (2011), or Clark et al. (1997). An exception is an earlier study by Folland and Hough (1991), however, which focused on agricultural land, which largely does not appreciate in value based on investments made in the community[13] . Another counter-argument is the fact that the construction of power plants started in the late 1950s or early 1980s. Thus, a significant proportion of the current owners acquired property in the vicinity of the power stations at the time of their existence.

A similar form of tax is an exception in the European Union, with only Slovenia taxing nuclear installations at the level of local authorities. In Slovenia, not only reactor (power plants) but also non-reactor facilities (e.g. fuel storage facilities) are taxed, and the amount of tax for different types of nuclear facilities varies (PISRS, 2014). Considering the commissioning of new or closure of non-reactor nuclear facilities, the amount of tax collected in 2013-2022 fluctuated between 5.79 and 12.27

[13] A disadvantage of this study is also the inconsistently reported statistical significance, which makes it impossible to determine at what level the relationship was statistically significant.

million euros. In other countries, e.g. the Czech Republic, power plants provide subsidies to surrounding municipalities (Hána and Černý, 2017) on a voluntary basis, and these subsidies are considerably lower per capita than in the case of the nuclear facility tax.

Support for nuclear power is also strong in regions that are not recipients of the nuclear facilities tax. According to a 2022 survey for Slovak Power Plants, up to 83.3% of respondents living in areas with nuclear power plants consider nuclear power safe, compared to 60.6% in the general population. Support for the development of nuclear power in Slovakia is also higher among residents living in the vicinity of nuclear power plants. Up to 56.7% support the construction of new power plants and another 32.5% support the continued operation of existing reactors. In the rest of the population, 34.1% support new nuclear and another 35.1% support continued operation (ACRC, 2022). Higher support for nuclear in communities near nuclear plants may also be influenced by the benefits of the tax levy for siting a nuclear facility. However, it is not possible to isolate the causal impact of tax revenues on surrounding communities from the available data; higher support for nuclear may also stem from a better understanding and experience with nuclear plants compared to the rest of the population. Given the generally high support for nuclear, it is not justified to attempt to increase it by levying a tax.

The tax can be repealed by an amendment to the law. There are no valid arguments for maintaining the tax; nuclear power plants are the only types of facilities required to pay a similar tax. The possible abolition of the tax requires an amendment of Act No 582/2004 Coll. (§ 67 - § 76).

3.4 We recommend that the tax on the storage of gases and liquids be indexed

The tax is paid for the storage of gases or liquids in geological deposits. The statutory rate is SKK 0.015 (EUR 0.00045) per m3 of stored gas or tonne of liquid. It is paid by companies storing gases and liquids and the recipient of the tax is the Environmental Fund. The rate has not been valorised since 2002; cumulative inflation has reached 80% since then. The annual revenue from the tax is insignificant compared to other taxes, averaging EUR 1 million per year. The level is volatile and depends on the use of reservoirs.

Table 23: Revenues from the tax on payments for the storage of gases or liquids (EUR million)

	2019R	2020R	2021R	2022ER	2023ER
Proceeds of the tax	1.7	0.6	0.3	1.6	1.6

Note: R – reality, ER – expected reality. *Source: MoF SR*

The tax is justified by Article 4 of the Constitution of the Slovak Republic, which stipulates that mineral wealth and caves belong to the state. Empty rock formations resulting from gas and oil extraction are thus still considered to be the property of the State, which consequently taxes their use for the storage of gases or liquids. A similar form of tax has not been identified in any other EU country.

The only taxpayers are the companies NAFTA and POZAGAS, which operate underground storage sites in western Slovakia. These are the sites near the village of Láb and the Gajary-baden storage facility (MMO, 2023, p. 63). In the entire existence of the tax (since 2002), there has been no other site subject to the tax. The tax is administered by the Main Mining Office.

The tax has not been indexed for a long time, we recommend to increase it by the inflation rate and to introduce automatic indexation. A rate increase of 80% of inflation (since 2002) would raise the tax to 0.008 EUR/m3 or EUR/t. The additional revenue would amount to EUR 1.3 million per year, assuming the expected reality for 2022 and 2023. For the following years, we recommend the introduction of automatic indexation to inflation according to the methodology of the SRS.

3.5 Air pollution charges do not take into account the cost of pollution

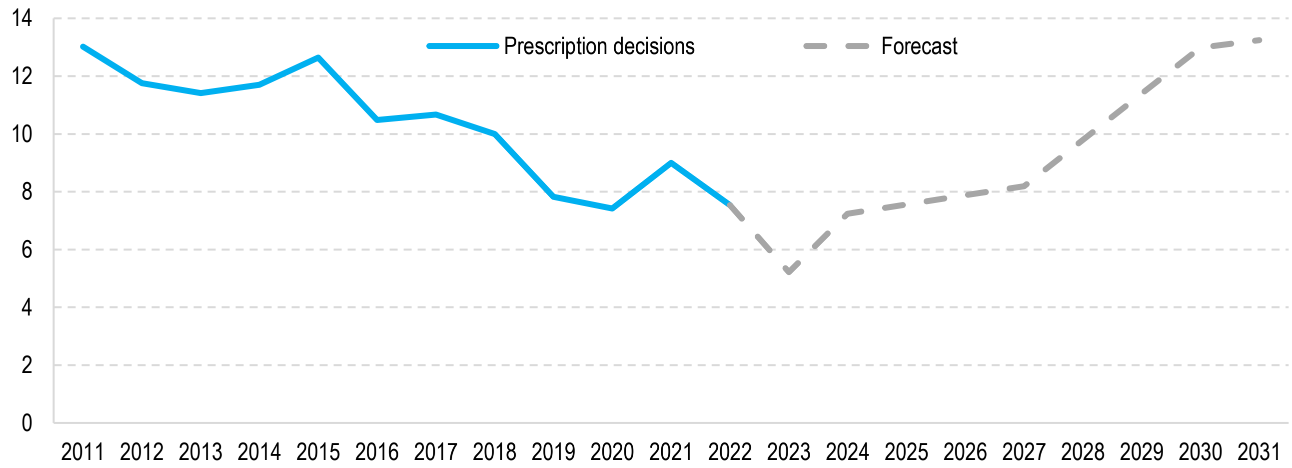
Air pollution charges are payable by industrial, energy and agricultural sources of pollution. Charging rates reflect the true cost of pollution only minimally. At the same time, the rates do not reflect the level of pollution of each pollutant and the national reduction targets. In order to achieve the Slovak Republic's air quality objectives, we recommend abolishing the carbon monoxide charge in the future and increasing the ammonia charge at the same rate as for other pollutants. Rates for the pollutants whose emissions are of greatest concern for Slovakia (particulate matter, nitrogen oxides and ammonia) should rise faster than they do today.

Pollution charges charge for emissions of pollutants harmful to health into the air. Charges apply to stationary sources, e.g. in industry or agriculture. Revenue from large and medium-sized sources is revenue for the Environment Fund. Municipalities can decide by ordinance to charge fees for small sources in their cadastre; the revenues from these sources are revenues for municipal budgets. The fees are intended to motivate polluters to reduce pollutant emissions. Since a significant part of the fees are due to energy use, the topic is included in this revision.

The sources of pollution affected by the charges are responsible for a significant part of the emissions, so the level of charges is a good tool to achieve environmental objectives. Chargeable sources of pollutant emissions (industry, energy and agriculture) accounted for 42% of GHG emissions, 57% of NOx emissions and over 90% of SOx and NH3 emissions in 2021 (SHMO, 2024b and Enviroportal, 2023). The largest emitters are large industrial installations that use fossil fuels, waste and biomass for their energy needs (Table 27 provides an overview of the largest emitters).Charging for these emissions is one of the tools for reducing pollution and achieving Slovakia's air quality objectives, as it motivates actors to reduce emissions by, for example, introducing the best available filtration technologies or substituting polluting fossil fuels with electricity. Other important sources of pollution are household heating, which will be incentivised to reduce emissions mainly by charging for emissions under ETS 2 after 2027/2028.

Fee income has been declining over the long term and will increase slightly in the future. The total volume of fees for emissions discharged in 2022 amounted to EUR 7.5 million, while back in 2012 the fee revenue was EUR 11.8 million (Figure 33). The volume of fees collected has been decreasing due to the reduction of pollutants emitted into the air; the decrease in emissions revenue for 2023 is due to the amendment of the law that exempted entities participating in the EU ETS from carbon monoxide fees. However, fee revenues will grow in the future due to the change in the law; the amendment set a gradual increase in fee rates.

Figure 33: Total air pollution charges (EUR million)



Note: The volume of emission charges discharged in a given year. Fees are paid annually to Envirofund for emissions emitted in the previous year.

Source: Envirofond, VfMU

Fee rates have been significantly increased by the 2023 law change, the number of substances subject to fees has been reduced. The base rates have been approximately doubled from the original rates, and the rates are being further increased over time by the use of offsetting coefficients (Table 23). The compensation coefficients are multiplied by the base rates established in the 2023 law and are intended to gradually double the rates by 2030. The number of chargeable substances was reduced from the original 120 to 6 major polluters, as most of the chargeable substances had a minimal share in the total amount of fees collected. At the same time, an exemption from the carbon monoxide charge for sources participating in the greenhouse gas emissions trading scheme was introduced.

Table 24: Air pollution charge rates (EUR/t)

	2022	2023 (basic fees)	2024	2030
Particulate matter (PM)	166	330	363	660
Sulphur oxides (SO_x)	66	130	143	260
Nitrous oxides (NO_x)	50	100	110	200
Carbon monoxide (CO)	33	60	66	120
Total organic carbon (TOC)	133	260	286	520
Ammonia (NH_3)	66	60	60	60

Note: Rates in 2024 are 1.1 times the base rates from Law 190/2023 (except for ammonia), and double in 2030. *Source: EEA, 2024a, VfMU*

Fee rates are comparable to abroad. Currently, the highest fees in the V4 are in the Czech Republic, which, like Slovakia, increased its fees significantly by changing the law in 2012. However, by 2030, Slovak rates should exceed those in the Czech Republic. At the same time, air pollution charges are not commonplace in the EU. They are absent in Austria, Germany or the Netherlands, for example. A comparison of pollutant rates is presented in Table 24.

Table 25: Foreign pollution levy rates (EUR/t, valid for the year in brackets)

	SR (2024)	CZ (2023)	HU (2023)	PL (2024)	FR (2023)	SR (2030)
Particulate matter ($PM_{2,5\text{-}10}$)	363	613	130	103	283	660
Sulphur oxides (SO_x)	143	204	312	153	148	260
Nitrous oxides (NO_x)	110	163	78	25	179	200
Carbon monoxide (CO)	66	-	-	31	-	120
Volatile organic compounds (VOC)	286	408	-	-	148	520
Ammonia (NH_3)	60	-	-	127	-	60

Source:VfMU

Despite the increase, pollution charges are significantly lower than the cost of health complications caused by pollution. In 2024, most fees amount to only a few tenths of a percent of the external costs of pollution (Table 25). Thus, the negative health impacts on people affected by pollution are only minimally charged for. The level of charges will not come significantly closer to the external costs even if charges increase by 2030. Even after rates double in 2030, for example, the level of the charge for particulate matter will be more than 200 times lower than the external costs of pollution (in the 2024 price level).

Table 26: External costs of industrial pollution (EUR/t, price level 2024)

	Fee rate 2024	External costs	% of external costs
Particulate matter ($PM_{2,5}$)	363	134 566	0.27
Particulate matter (PM_{10})	363	103 513	0.35
Sulphur oxide (SO_2)	143	53 787	0.27
Nitrous oxide (NO_x)	110	34 242	0.32
Ammonia (NH_3)	66	50 304	0.13
NMVOC	286	2 926	9.77

Note: External costs are determined by the VOLY method (Annex 9). NMVOC = Volatile Organic Compounds. *Source: EEA, 2024a; VfMU*

Charging for harmful emissions should pursue the achievement of air quality objectives. Slovakia has set targets for air pollutant emission levels (EUR-Lex, 2016), having already achieved the 2030 target for reducing emissions of sulphur dioxide (SO_2) and non-methane volatile organic compounds (NMVOCs) in 2021. In contrast, we are lagging behind in emissions of nitrogen oxide (NOx), ammonia (NH_3) and particulate matter of 2.5 micrometres ($PM_{2.5}$) and 10 micrometres (PM_{10}) [14] . Air pollution charge rates should also reflect these targets, so rates should be increased especially for substances where Slovakia does not meet emission reduction targets in order to incentivise reductions. Slovakia's emission reduction targets and their level are summarised in Table 26.

[14] Slovakia is close to reaching the target for $PM_{2.5}$ emissions with regard to their percentage reduction since 2005. However, specific sites that exceed the set limits on an annual basis remain a problem. The situation is similar for PM10 concentrations (SHMO, 2024a). The majority of $PM_{2.5}$ emissions are produced by households (approximately 80%). PM_{10} emissions are more heavily influenced by industry (households produce approximately 60% of these emissions).

Table 27: Reduction of pollutant emissions compared to 2005 (%)

	$PM_{2,5}$	NO_X	NH_3	SO_2	NMVOC
Reduction by 2021	48	45	23	84	34
2030 target	49	50	30	82	32

Source: SHMO, 2023

Today's charging system does not emphasise charging for problematic substances. For example, CO pollution in Slovakia is currently not a problem, with average maximum eight-hour CO concentrations in Slovakia not even reaching a quarter of the WHO limit (SHMO, 2024a) [15]. The CO charge can thus be abolished completely. Instead, the charge should target substances whose concentrations in the air are problematic and for which Slovakia is not achieving its emission reduction targets.

Charges for GHG, NO_x and NH_3 should be brought closer to external costs and incentivise emission reductions. Current fee rates do not create sufficient incentives to reduce emissions, with the largest polluters paying only tens to hundreds of thousands of euros in fees, some paying less than before the 2022 reform (Table 27). For example, the rate for ammonia (NH_3) has been reduced from 66 to 60 euros in 2023 and, unlike other pollutants, is not set to rise further. Charges for other pollutants with high concentrations in Slovakia (TZL, NO_x and NH_3) are only slowly increasing over time.

Table 28: Total amount of fees for the most burdened companies (thousands of euros)

	2022	2024	2030
U.S. Steel Košice, s.r.o.	3 184	987	1 793
SLOVNAFT, a.s.	574	862	1 564
Danucem Slovensko, a.s.	212	320	579
Ferroenergy, s.r.o	104	220	401
Slovalco, a.s.	335	217	395
Mondi SCP, a.s.	134	203	369
IKEA Industry Slovakia, s. r. o.	77	139	253
Duslo, a.s.	74	124	220
Považská cementáreň, a.s.	137	121	220
PCA Slovakia, s.r.o.	45	95	173
Kia Slovakia s. r. o.	41	87	158
CEMMAC a.s.	189	80	146
MH Teplárenský holding, a.s.	46	75	136
Knauf Insulation, s.r.o.	37	64	113
BUKÓZA ENERGO, a. s.	56	52	94
FORTISCHEM, a. s.	45	45	82
Leier Baustoffe SK s.r.o.	41	25	45
Calmit, spol. s r.o.	41	21	39
KOVOHUTY, a.s.	33	14	26
VOLKSWAGEN SLOVAKIA, a.s.	42	12	23
Total	**5 446**	**3 764**	**6 827**

Note: The twenty companies that paid the most in air pollution charges in 2022. Slovak power plants were excluded from the table as they have since stopped generating electricity from coal. The table shows the emissions charges in a given year, with the charges due one year later. *Source:VfMU*

We recommend a number of changes to the system in the next reform of the pollution charges. First, abolish the CO charge, as Slovakia does not exceed the limits in this area and most sources are exempt from the charge anyway, thanks to the exemption for entities participating in the EU ETS. Second, significantly increase the charging for ammonia (NH_3), whose charge has been reduced despite long-standing problems with meeting the limits. Thirdly, a faster increase in charges, especially for those for which Slovakia does not meet the limits (TZL, NOx). Due to the recent reform of the charging system, we recommend that these measures should only be applied in a further comprehensive reform.

[15] CO pollution is problematic at high concentrations, which are generally only achieved by large installations. These are now exempt from the CO charge if they belong to the ETS emissions trading scheme. For this reason, the amount of charges for U.S. Steel Košice has fallen considerably. The CO concentration limits are not exceeded in the area around Košice either.

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List of abbreviations

ACM	Office for Consumers and Markets (*Autoriteit Consument & Markt)*
API	Agricultural Policy Institute
bil.	billion
CEER	Council of European Energy Regulators
ČEZ	*České energetické závody*
CfD	Contract for Differece
CGA	central government authorities
CGN	China General Nuclear Power Group
CHP	combined production of electricity and heat
CHS	central heat supply
ČNB	*Česká národní banka*
CNNC	China National Nuclear Corporation
CO	Carbon oxide
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
COFOG	Classification of the functions of government
DS	deep storage
DWL	deadweight loss
EC	European Commission
ECB	European Central Bank
ED	Excise duty
EDF	*Électricité de France*
EDU	Dukovany Power plant (Elektráreň Dukovany)
EEA	European Environment Agency
EIA	Environmental Impact Assessment
EMCS	Excise Movement and Control System
EOSA	Emergency Oil Stocks Agency
EPH	Energy and Industrial Holding *(Energetický a průmyslový holding)*
ERÚ	Energy Regulatory Authority *(Energetický regulační úřad)*
ESA	European system of accounts
ESG	Environmental, social and governance
eSPap	Entidade de Serviços Partilhados da Administração Pública
ETS	Emissions Trading System
ETS 2	Emissions Trading System 2
EU	European Union
FToLRW	Final treatment of liquid radioactive wastes
GDP	gross domestic product
GO SR	Government Office of the Slovak Republic (Úrad vlády SR)
GWe	gigawatt electric
GWh	gigawatthour
HBP	Hornonitrianske bane Previdza
IAEA	International Atomic Energy Agency
IEA	Institute of Economic Analysis
IFP	Institute of Financial Policy
IMF	International Monetary Fund
IRRS	Integrated Regulatory Review Service
IS RAW	Integrated storage facility for radioactive waste
ISSNF	Intermediate storage of spent nuclear fuel
JAVYS	Nuclear and Decommissioning Corporation (Jadrová a vyraďovacia spoločnosť)

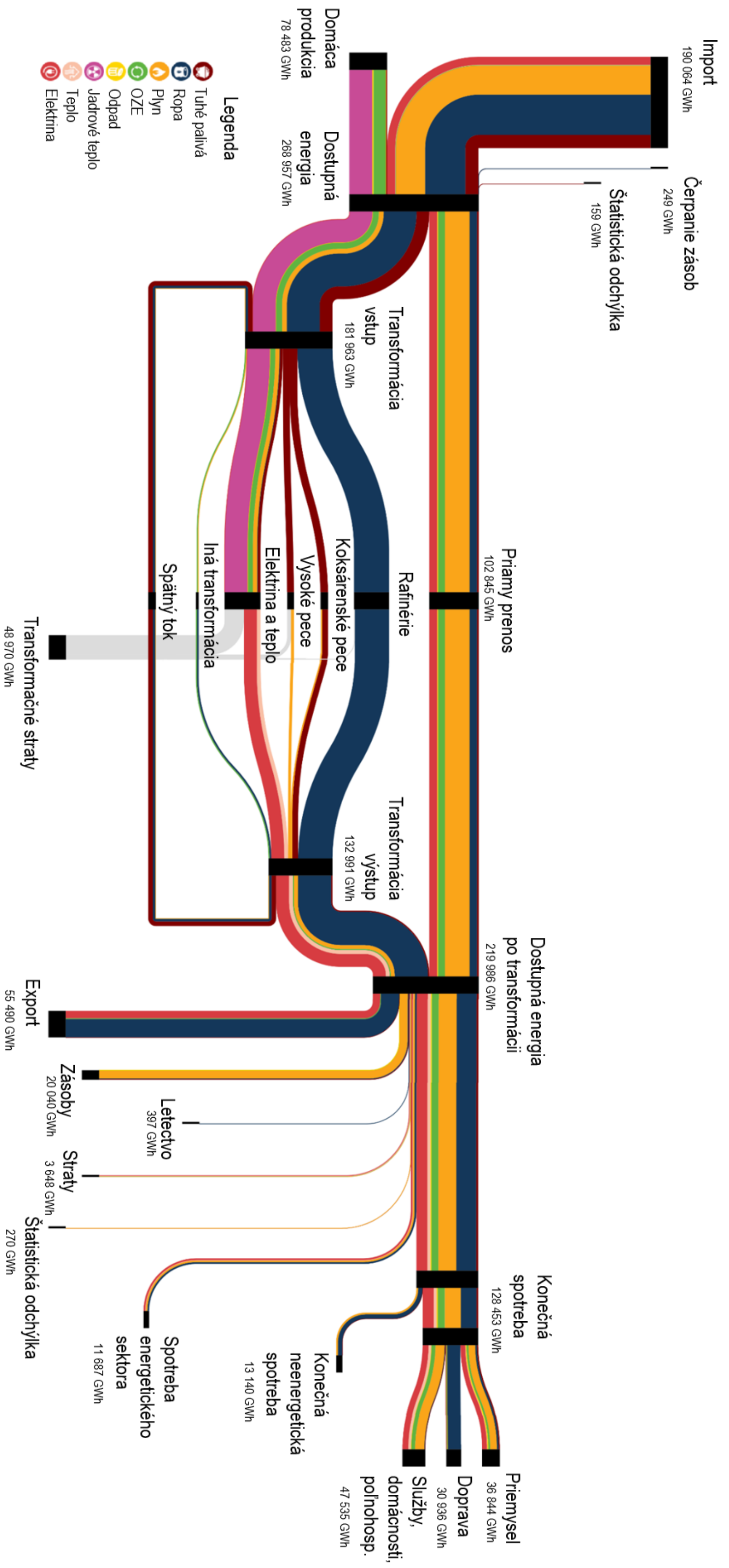
JESS	Nuclear Energy Company of Slovakia (Jadrová energetická spoločnosť Slovenska)
KEPCO	Korea Electric Power Corporation
kg	kilogram
KHNP	Korea Hydro & Nuclear Power
l	liter
m^2	meter square
m^3	cubic meter
MAAE	International Agency for Atomic Energy
MEKH	*Magyar Energetikai És Közmű-Szabályozási Hivatal*
mil.	million
MIRRI SR	Ministry of Investment, Regional Development and Informatisation of the Slovak Republic
MMO	Main Mining Office
MoC SR	Ministry of Culture of the Slovak Republic
MoD SR	Ministry of Defence of the Slovak Republic
MoE SR	Ministry of Economy of the Slovak Republic
MoEn SR	Ministry of the Environment of the Slovak Republic
MoF SR	Ministry of Finance of the Slovak Republic
MoIA SR	Ministry of the Interior Affairs of the Slovak Republic
MoJ SR	Ministry of Justice of the Slovak Republic
MoLSAF SR	Ministry of Labour, Social Affairs and Family of the Slovak Republic
MoT SR	Ministry of Transport of the Slovak Republic
MWe	megawatt electric
MWh	megawatthour
NECP	National energy and climate plan
NF	nuclear facility
NH_3	ammonia
NMVOC	Non-Methane Volatile Organic Compounds
NNF	National Nuclear Fund
NNS	New nuclear source
NO_x	Nitrous oxides
NPP	Nuclear power plant
NPP A1	Nuclear power plant A1 (Jaslovské Bohunice)
NPP MO	Nuclear power plant Mochovce
NPP V1	Nuclear power plant V1 (Jaslovské Bohunice)
NPP V2	Nuclear power plant V2 (Jaslovské Bohunice)
OECD	Organization for Economic Co-operation and Development
OFGEM	Office of Gas and Electricity Markets
ÚJD	Nuclear RegulatoryAuthority (Úrad jadrového dozoru)
p.a.	per annum
PEJ	*Polskie Elektrownie Jadrowe*
PHA SR	Public Health Authority of the Slovak Republic (Úrad verejného zdravotníctva SR)
PJGC	Prison and Justice Guard Corps (Zväz väzenskej a justičnej stráže)
PL	price level
PM	particulate matter
$PM_{(2,5\text{-}10)}$	particulate matter
PP	public procurement
PPP	Public private partnership
Q1-4	Quarter 1-4
RAB	Regulated asset base
RES	renewable energy sources
RIS	budget information system (Rozpočtový informačný systém)

ÚRSO	Office for Regulation of Network Industries (Úrad pre reguláciu sieťových odvetví)
RRAWR	Republic radioactive waste repository
SAO	Supreme Audit Office (Najvyšší kontrolný úrad)
SEPP	Slovak Electric Power Plants (Slovenské elektrárne)
SHMO	Slovak Hydrometeorological Office (Slovenský hydrometeorologický ústav)
SNF	spent nuclear fuel
SO SR	Statistical Office of the Slovak Republic (Štatistický úrad SR)
SO_2	Sulphur oxide
SO_x	Sulphur oxides
SPP	Slovak gas industry (Slovenský plynárenský priemysel)
SR	Slovak Republic
tCO_{2e}	tonne of carbon dioxide equivalent
TOC	Total Organic Carbon
TSO	tariff for system operation
TTC RAW	Technologies for the treatment and conditioning of radioactive waste
TWh	terawatthour
URE	*Urząd Regulacji Energetyki*
V4	Visegrad group (Slovakia, Czechia, Hungary, Poland)
VAT	Value added tax (on the basis of the draft consolidation measures of 18.9.2024)
VfMU	Value for Money Unit (Útvar hodnoty za peniaze)
VOC	volatile organic compounds
VOLY	value of a life year
VSL	value of a statistical life
WAM	[scenario] with additional measures
WHO	World Health Organization

Annexes

Annex 1: Sankey diagram of energy flow in Slovakia

Figure 34: Sankey diagram of energy flows in Slovakia in 2022



Sources: Eurostat, VfMU

Čerpanie zásob	Stock drawdown
Domáca produkcia	Domestic production
Doprava	Transport
Dostupná energia	Available energy
Dostupná energia po transformácií	Available energy after transforrmation
Elektrina	Electricity
Elektrina a teplo	Electricity and heat
Iná transformácia	Other transformation
Jadrové teplo	Nuclear heat
Koksárenské pece	Coke ovens
Konečná neenergetická spotreba	Final non-energy consumption
Konečná spotreba	Final consumption
Letectvo	Aviation
Odpad	Waste
OZE	RES
Plyn	Gas
Priamy prenos	Direct transmission
Priemysel	Industry
Rafinérie	Refineries
Ropa	Oil
Služby, doomácnosti, poľnohospodárstvo	Services, households, agriculture
Spätný tok	Reverse flow
Spotreba energetického sektora	Energy sector consumption
Štatistická odchýlka	Statistical deviation
Straty	Losses
Teplo	Heat
Transformácia vstup	Transformation input
Transformácia výstup	Transformation output
Transformačné straty	Transformation losses
Tuhé palivá	Solid fuels
Vysoké pece	Blast furnaces
Zásoby	Stocks

Annex 2: Energy procurement issues

Public Procurement (PP) of energy is very different from the procurement of other goods and services. This is because energy is a commodity and its price can be volatile and strongly dependent on the situation on global markets. Meanwhile, the procurement of electricity supplies is even more complicated than the procurement of gas. Electricity supply operates on the basis of long-term contracts and electricity cannot be stored, so it has to be purchased for a specific time and volume (both at consumer and supplier level). Weaknesses have been identified from some central procurement exercises which may lead to less favourable prices for procurers:

Ambiguous volume of offtake. A favourable price for the purchaser can be achieved by committing to a specific volume of electricity or gas, which allows the supplier to minimise risks and secure low prices in advance through hedging. However, some procurements only contain a maximum possible off-take, which may differ by an order of magnitude from actual consumption. As the off-taker does not commit or indicate a realistic figure, suppliers have less incentive to offer a reduced price as they are not sure of realistic off-take and thus cannot hedge prices.

Price determination by spot price coefficients instead of fixed prices. The criterion for some PPs was not a fixed price for electricity supply, but a coefficient. For example, in the collective PP of MoIA SR (2020), the coefficient was multiplied by the average of the market prices for the last three months before signing. The bidder with the lowest coefficient won the tender. The problem is that in long-term electricity markets, energy suppliers can only buy at a fixed price, not at a coefficient in relation to the spot price. The consequence is a higher risk for the suppliers, who then have to reflect this in the higher prices offered.

Single-round selection without electronic auction. By default, the winner of the Tender is determined by auction. However, some VOs do not include an auction and the winner is determined by the price offered in the sealed envelope. A similar form of competition does not incentivise competitors to drop the price, as might happen in an electronic auction. Auctions are particularly advantageous in cases of a higher number of bidders and low switching costs (Williams, undated: 3), which is a feature of energy procurement.

Precarious contracts with the possibility of cancellation without adequate reason. Suppliers apply different strategies when purchasing energy to secure contractual obligations. However, they generally buy at least part of the total quantity they plan to supply on long-term markets. Thus, suppliers incur part of the cost of contract performance up front and the possibility of withdrawing from the contract during its duration poses a risk to them, especially in the event of a price drop. Requiring the possibility to withdraw from the contract may discourage suppliers or force them to charge higher prices to cover the risk of withdrawal.

Absence of a penalty for non-compliance with the contractual off-take. Similar to early withdrawal, failure to take over the contracted amount of energy or to take more than the contracted amount creates unnecessary costs for suppliers. If there is no contractual penalty associated with these breaches, suppliers tend to increase prices to hedge against this risk.

Pricing including distribution charges. Energy suppliers have no influence on the level of distribution charge rates. Setting a fixed price that includes distribution charges can therefore be problematic, especially for contracts concluded several years in advance, as distribution charge rates may increase during this period. As the supplier would then have to absorb this increase, it will as a precautionary measure demand a higher contract price to protect it from this risk.

Uncertain start of the supplier relationship. Some PPs do not include a specific start date for the supplier relationship, which creates increased risk for suppliers and leads to higher prices.

Long contract periods. Buying energy for a longer period in advance generally implies a higher unit price, coupled with the cost of guaranteeing a fixed price over several years and the low liquidity of long-term contract exchanges (especially over a horizon of more than two years). However, negotiating energy several years ahead even at higher prices can be worthwhile in volatile market conditions. In 2021, the MoE SR, MoESIaF SR and MoC SR purchased gas at a higher price than other PPs with shorter contract periods, but in the following years during the energy crisis they paid significantly less than the market price for gas supply. Thus, when setting the duration of the contract, it is necessary to balance higher prices compared to current market conditions and guaranteed price stability of energy supply even in potential crisis situations.

Low number of applicants. Higher number of firms involved in the bidding process increases competition and pushes prices down (Table 4 and Table 5). It is therefore important that as many suppliers as possible participate in the tender. An option is also to bundle multiple central procurements into even larger common packages, thereby increasing their attractiveness to suppliers, which can potentially increase overall savings beyond the VfMU's estimate.

High deposits, demanding references and billing conditions. Some of the ancillary conditions of the procurement, which are not directly related to the commodity, may also reduce the number of bidders and thus worsen the conditions for the contracting authority. These are in particular high security deposits and requesting references with high delivery volumes or overly complex specifications (high number of off-take points per contracting authority). A similar barrier may be the billing conditions, e.g. split per point of purchase, which may create an additional administrative burden for the supplier.

Late payment of invoices, lack of advances or poor salary discipline in the past. Suppliers buy energy for customers on markets and have financial obligations to their suppliers. Without adequate advances and with late invoice payments (later than the 15th-20th of the month), they have to cover these liabilities from their own resources. This may discourage smaller suppliers from engaging in PPs, especially for high consumption.

Short period of time to explain the low price. The Public Procurement Act (Article 53(5)) imposes a minimum time limit for the explanation of an abnormally low tender of 2 days for electronic communication and 5 days for other forms of communication, but allows the Commission to set a longer time limit. Short explanatory periods of the legal minimum risk eliminating a favourable tender even from a reputable supplier.

Failure to take responsibility for reactive power. The electricity supplier must supply more electricity to the point of consumption than the actual consumption. In addition to the active energy, it also supplies reactive energy, which is responsible for maintaining the magnetic field necessary for the transmission of energy in alternating current. In the case of faulty technology (e.g. transformers), the consumption of reactive energy is higher and represents an additional cost for the supplier if the contracting authority requires it to take responsibility for this item.

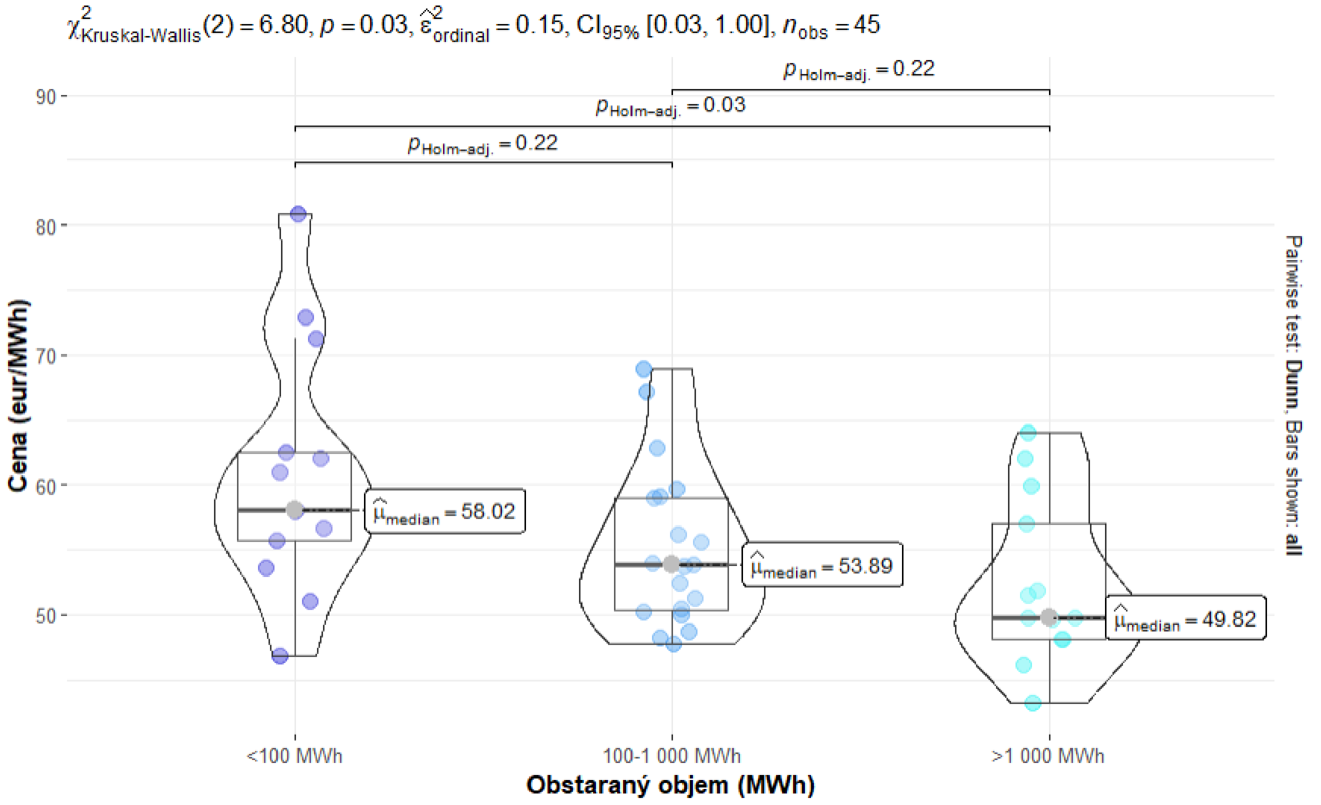
Annex 3: Unit price analysis in public procurement

The unit prices of energy in the procurements studied varied significantly even for similar volumes. Many factors influence the final price (Annex 2), so the price awarded is not only a function of the volume procured but also of the conditions of the procurement. There are therefore significant differences in unit prices even for similar volumes procured. Since the energy procurement data had a significant number of outlier measurements and their distribution was not normal, non-parametric methods were used for the analysis.

The Kruskall-Wallis test was used to analyse the relationship between procurement volume and price. This is a non-parametric alternative to the analysis of variance that detects whether the medians differ statistically significantly between groups of data. The Dunn test was used to compare the medians with each other. The data on procurement volumes and unit prices were divided into three groups according to procurement volume. For electricity, the procurements were divided into below 100 MWh, 100 to 1 000 MWh and above 1 000 MWh while for gas they were below 500 MWh, 500 to 3 700 MWh and above 3 700 MWh.

The differences in median prices between small and large procurements are statistically significant and the volume procured has a significant effect on the unit price. Figure 35 and Figure 36 summarise the results of the statistical tests for electricity and gas procurement. The differences in the medians between the small and large volume groups are statistically significant and grouping has a significant effect on these differences.

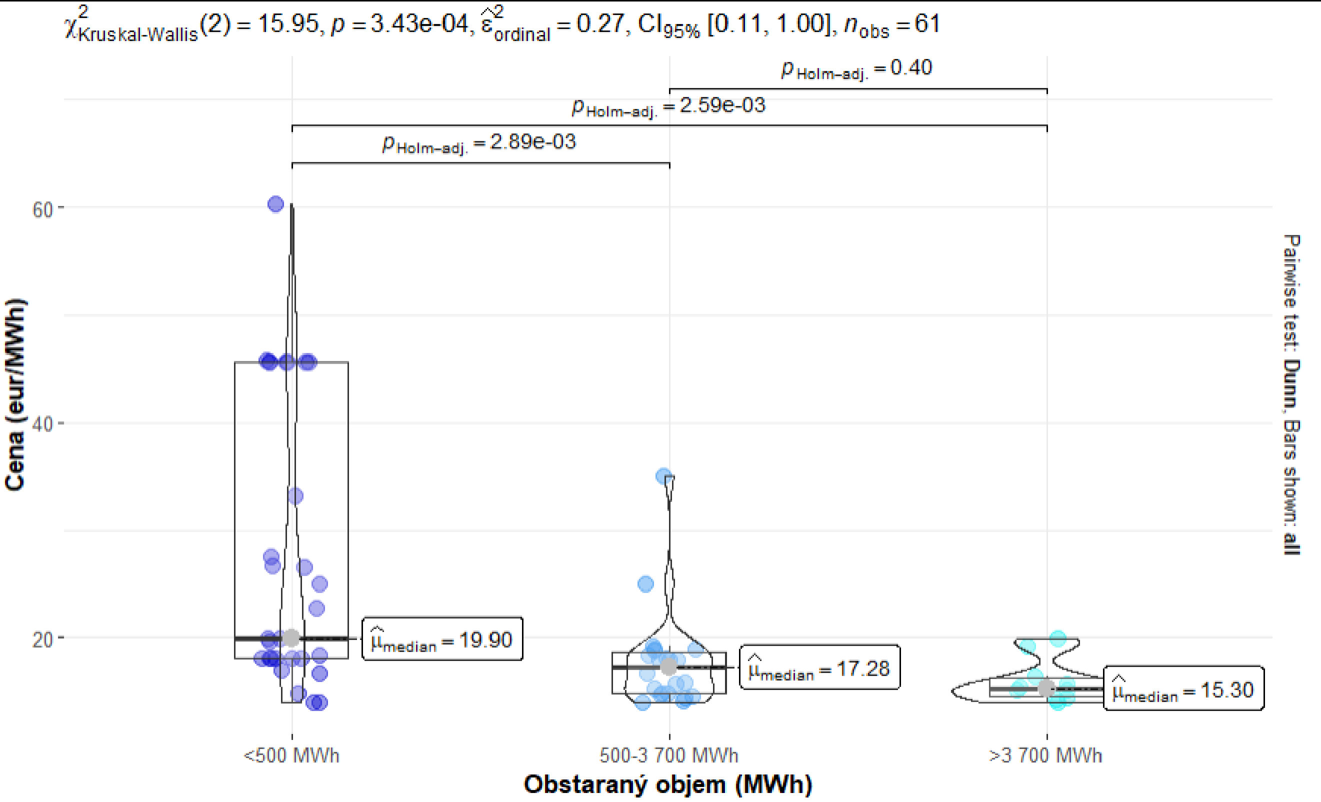
Figure 35: Power electricity prices by volume procured



Note.: The difference between the groups is statistically significant if $p_{Holm\text{-}adj.} < 0.5$.
A group effect on the variable of interest is considered large if $\varepsilon^2_{ordinal} > 0.14$.

Source: VfMU

Figure 36: Natural gas prices by procured volume



Note.: The difference between the groups is statistically significant if $p_{Holm\text{-}adj.} < 0.5$.
A group effect on the variable of interest is considered large if $\varepsilon^2_{ordinal} > 0.14$.

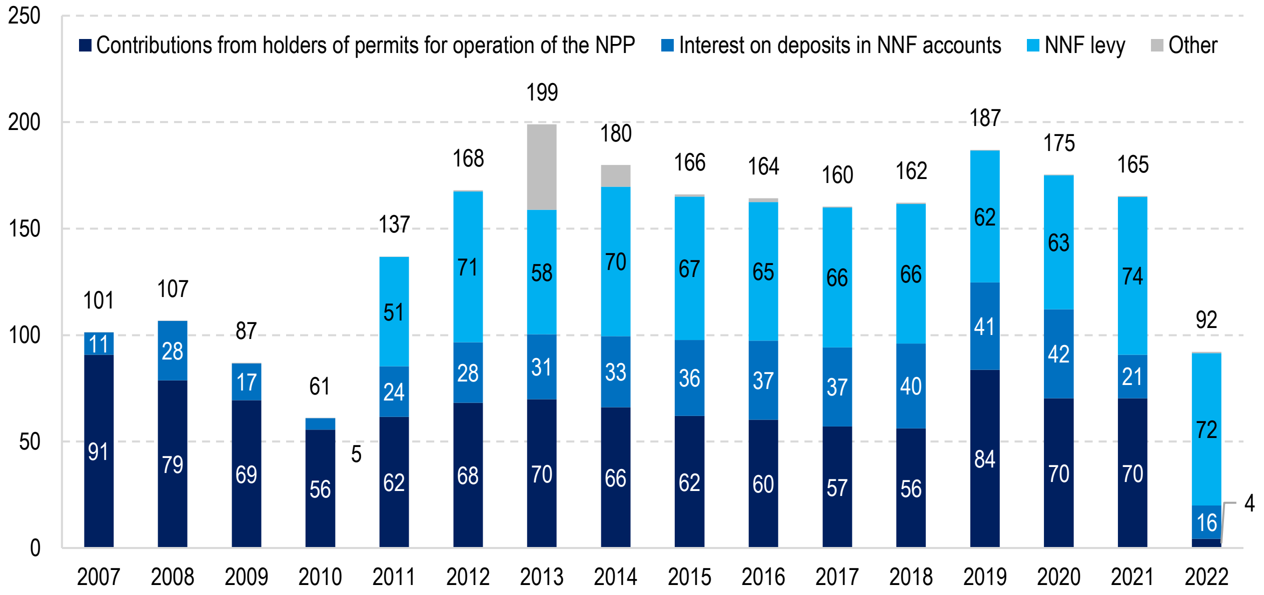
Source: VfMU

Obstaraný objem	Procured volume
Cena	Price

Annex 4: Overview of revenue and expenditure of the National Nuclear Fund

At the beginning of 2023, more than EUR 1.96 billion was accumulated in the NNF accounts. Total NNF revenue for the period 2007-2022 amounted to more than EUR 2.3 billion; total expenditure to approximately EUR 0.9 billion. The key to raising the Fund is the application of the polluter pays principle. Since this principle was only applied after 1995, some decommissioned nuclear sources have not been able to accumulate sufficient funds for their decommissioning. This, together with tightening safety and environmental standards, has made it necessary to diversify the NNF's income in the form of a levy on the NNF. The deposited resources from mandatory contributions, payments and levies are continuously remunerated in the Treasury in accordance with the current interest rate conditions.

Figure 37: NNF revenue by source 2007-2022 (EUR million)



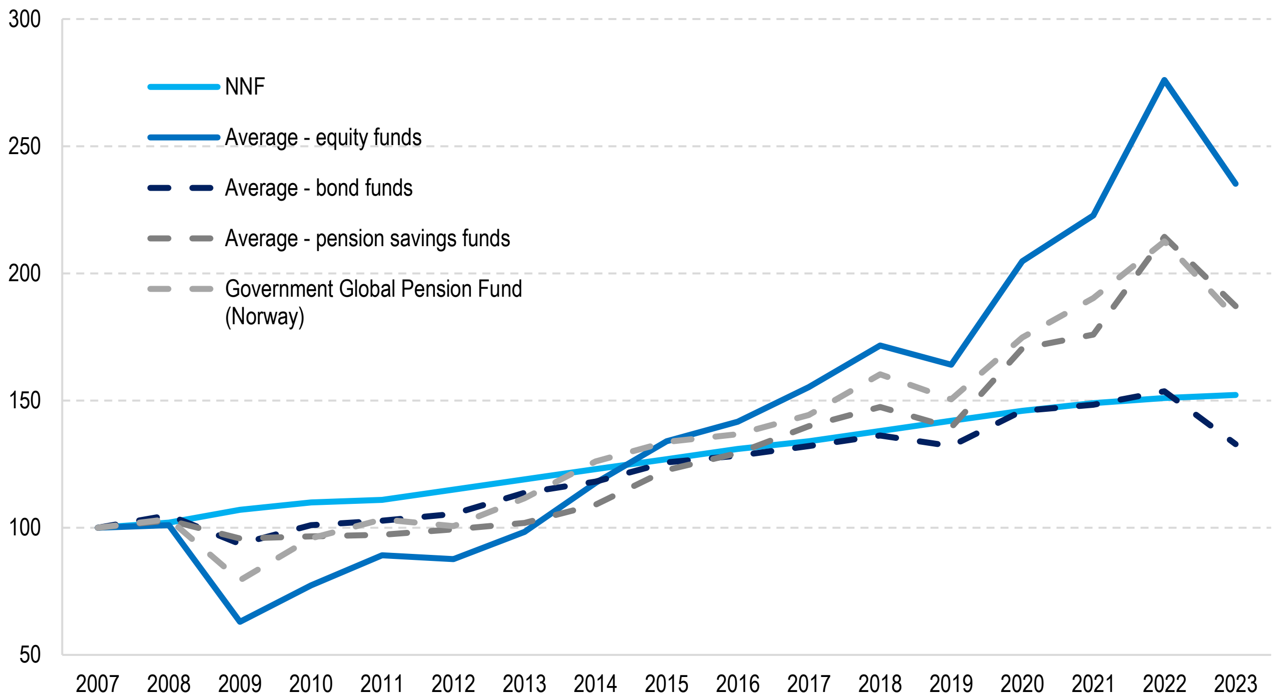
Source: NNF, VfMU

Revenue

Deposit income accounted for almost 20% of NNF's revenue (more than EUR 446 million) in 2007-2022 and is expected to increase in importance in the future and is projected to cover more than half of the decommissioning costs. All calculations assume an average interest rate of 2.95 % p.a. If the NNF does not achieve this rate of return, it will be necessary to increase the collection of funds from other sources (compulsory contributions and payments). The choice of a realistic investment strategy is therefore crucial to ensure that the NNF fulfils its functions.

Despite the long-term investment horizon, the rate of appreciation is low (2.66% on average over the period 2007-2022). A comparison of the appreciation rate on NNF accounts with benchmarks shows the low interest yield on the Treasury. To fairly compare the returns achieved, we selected four benchmarks of fund appreciation. The appreciation of NNF's funds in the Treasury over the 2007-2022 reporting period had an average annual rate of appreciation of 2.66%. The 2022 versus 2007 stock index averaged 5.49% p.a. when adjusted for tax, and the retirement savings averaged 4.38% p.a, The Norwegian Government Global Pension Fund averaged 3.83 % p.a. A lower rate of appreciation was recorded only for bond funds, averaging 1.79 % p.a. The evolution of the individual appreciation indices over time is shown in more detail in Chart 38.

Figure 38: Comparison of NNF return indices and selected appreciation benchmarks 2007-2022 (%)



Note: The return has been adjusted for the 19% capital gains tax on all types of appreciation for a fair comparison.

Source: NNF, MoF SR, ycharts.com, curvo.eu, thebalancemoney.com, druhypilier.datalizer.sk, nbim.no, VfMU

Alternative recovery options

NNF assumes an average annual return of 2.95% per annum, which is overly optimistic for the current investment strategy. An alternative would be to diversify and make the investment portfolio more risky by investing in equity and index funds. A prerequisite would be the transfer of part of the funds from the Treasury deposits.

The arguments in favour of maintaining the current investment model are summarised below.

- **Comparison with the investment practice of most analogous institutions abroad.** In most countries, investment in venture capital funds is limited by the proportion of the principal used in this way to the fund's total capital (in the UK - 17 %, in Sweden - 40 %).
- **Cheaper debt financing for the state.** The Slovak system links the appreciation of funds in the State Treasury and the financing of the national debt. The system is advantageous for the state as there is no need to issue additional bonds and increase gross indebtedness. Borrowing from the sovereign is cheaper than borrowing from the market. At the same time, investors receive a relatively high return compared to alternative bond investments (but not compared to a riskier portfolio).
- **Relatively simple and inexpensive administration.** NNF does not choose the investment strategy, the only important criteria is the time of deposit in the Treasury and the associated risk spread.
- **The existence of long-term fixations (the weighted average is 27 years) on existing term deposits in the Treasury, which make it impossible to invest the deposited money in any other way.** The fixation could theoretically be lifted, but the result would be a contractual penalty, so NNF would not recover the full principal.

The main and key risk of the current investment model is that NNF is unlikely to be able to generate the 2.95% p.a. interest rates it is planning for in the long term. This could subsequently lead to a reassessment of the level of mandatory contributions and mandatory payments and an increase in them, otherwise a new "historical" debt is created.

The main benefits of a possible change (diversification) of investment strategy include:

- **Higher probability of reaching the 2.95% per annum appreciation threshold.** The average annual returns for global equity funds, pension funds and the Norwegian Government Global Pension Fund were 5.49%, 4.38% and 3.83% respectively between 2007 and 2022.
- **Possible reduction of compulsory contributions.** SE, a.s. are a key contributor and could use the reduction in contributions e.g. to pay dividends. The State would also benefit as it has a 34 % stake in SE, a.s.
- **Increase in state revenue from capital property tax.** This would occur as a direct result of an increase in imputed revenues, resulting in an increase in the tax base.

Conversely, changing the investment strategy in order to increase the rate of appreciation would entail the following risks:

- **The inevitability of issuing Treasury bonds on worse terms in the event of a Treasury withdrawal.** To preserve liquidity, the State would be forced to issue bonds in the amount of NNF funds (EUR 1.96 billion at the end of 2022) at interest rates higher than the current rates of appreciation of NNF funds in the Treasury[16].
- **An increase in government debt as a direct result of the issuance of government bonds.** With the current high level of public debt, this may also imply a reduction in investor confidence.
- **Greater riskiness. Investments with a more aggressive strategy also entail a higher risk of losses, but this should not play a significant role given the cyclical development of financial markets.** For longer investment horizons, even in the case of short-term losses, the overall return is higher compared to the current model.
- **Administration of the new investment strategy.** A change in investment strategy would require a more active role for the NNF, ideally through in-house staff - finance and investment experts. This would require significant additional expenditure by NNF, which could however be covered by the increased income that NNF can generate in this way.
- **Political risks.** The appreciation of global equity funds or Pillar 2 retirement savings, even taking into account the crisis years of 2008 and 2022, exceeded the appreciation of the NNF funds in the Treasury. However, there is still a risk of undue policy influences (e.g. a temporarily adverse development in financial markets could lead to an inappropriate change of strategy).
- **Impairment of NNF funds fixed on long-term deposits with the Treasury.** Their early withdrawal with a view to more favourable reinvestment is possible only under financially unfavourable conditions (contractual penalty). If it is decided to change the investment strategy and at the same time withdraw funds from the Treasury without a contractual penalty (e.g. following a political decision), the result may be a moral hazard for other state-owned companies with funds in the Treasury.
- **Potential destabilisation of the Treasury system.** The current system of guaranteeing sovereign debt through deposits of state organisations reduces the cost of debt financing to the state. The possible exit of the NNF from this system could lead other state institutions (Envirofund, Social Insurance Fund, Land Fund) to leave it, even if their investment horizons are significantly shorter and thus not suitable for such a change. However, the final decision will be the responsibility of the members of the government.

A possible change in the NNF's investment strategy may thus have wider implications beyond the economic activity of the Fund itself and with a direct impact on the financing of the national debt. It is a policy decision whether the potential gains to NNF in the event of a change in investment strategy outweigh its potential negative impact on the public finance system (including the servicing of the national debt) as a whole. A necessary condition for the changes under consideration is that they should be implemented at a time of better position of the State on the financial markets and a lower level of indebtedness, which will guarantee better conditions for the issuance of bonds to cover the shortfall in NNF's resources from the Treasury.

Expenses

Up to 70% of the NNF expenditure was for the decommissioning of NPP A1, which amounts to more than EUR 625 million at current prices (EUR 806 million at 2023 price level). Almost EUR 174 million was provided for the

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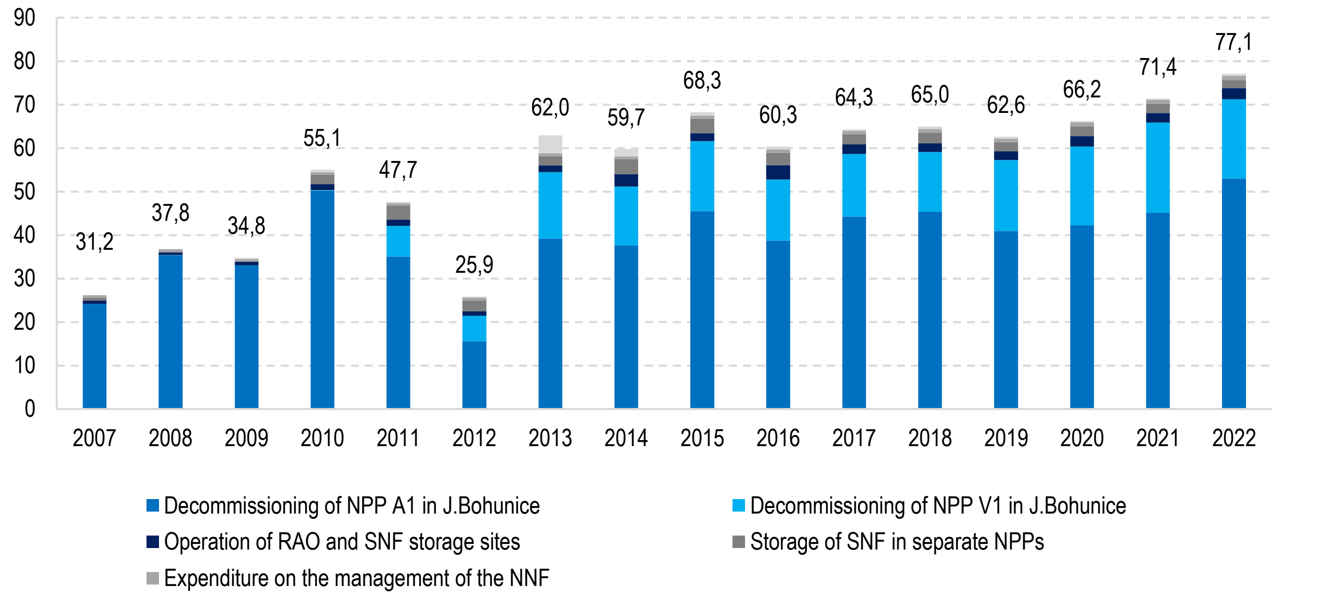
[16] As of 04.09.2023, the State Treasury guaranteed an appreciation of 3.45% for annual deposits. The average annual yield on government bonds with a 10-year maturity, issued on 20.09.2023, amounted to 3.87%.

decommissioning of NPP V1[17]. The amount of the different functionally distinct expenditures of the NNF in the period under review is shown in Figure 39.

Figure 39: Functional composition of NNF expenditure 2007-2022 (EUR million at current prices)



Source: NNF, VfMU

NNF long-term liabilities: decommissioning of nuclear installations

Expected expenditures for decommissioning of Slovak nuclear power plants[18] will exceed EUR 7.9 billion in nominal prices. To assess the justification of these costs, they were compared with the costs of decommissioning 15 pressurised water nuclear reactors[19] in three EU countries (Table 28). The data below show that the costs of decommissioning V1 are higher than abroad. In contrast, NNF expects the costs of decommissioning V2 and Mochovce reactors to be significantly lower compared to abroad.

Table 29: Cost of decommissioning selected pressurised water reactors in the EU (EUR million, constant 2023 prices)[20]

Power Plant	Number of reactors	Installed capacity (MWe)	Total price	Price per reactor	Price per reactor, by model	The difference per reactor
V1 (Slovakia)	2	880	1701	851	592	259 *(+44 %)*
V2 (Slovakia)	2	1010	960	584	669	-85 *(-13 %)*
MO 1, 2 (Slovakia)	2	940	955	526	627	-101 *(-16 %)*
MO 3, 4 (Slovakia)	2	942	966	514	629	-115 *(-18 %)*
Biblis A (Germany)	1	1167	1453	1453	1450	3 *(0 %)*
Biblis B (Germany)	1	1240	1569	1569	1536	33 *(+2 %)*
Greifswald 1-5 (Germany)	5	2040	4202	840	554	286 *(+52 %)*
Jose Cabrera 1 (Spain)	1	141	251	251	239	12 *(+5 %)*
Kozloduy 1-4 (Bulgaria)	4	1632	1596	399	554	-155 *(-28 %)*
Obrigheim (Germany)	1	340	459	459	474	-15 *(-3 %)*
Stade (Germany)	1	640	648	648	828	-180 *(-22 %)*
Unterweser (Germany)	1	1345	1673	1673	1660	13 *(+1 %)*

Source: VfMU

[17] In this case, however, the NNF is only a co-funder and bears only part of the total cost of decommissioning the V1 nuclear installation.
[18] Including the temporary storage of radioactive waste arising from their dismantling.
[19] The pressurised water reactors also include VVER reactors (water-water power reactor), which are installed in all nuclear power plants in the territory of the Slovak Republic.
[20] The identified linear dependence (reactor cost (million EUR) * reactor power + 72.72 (million EUR)) is statistically significant ($p < 0.0001$). The limitation of the model is the limited scope of input data and the fact that the decommissioning of the monitored nuclear facilities has not yet been completed.

Box 14: Model for calculating the decommissioning costs of a pressurised water reactor depending on the installed capacity

The above model for the calculation of the decommissioning costs of a pressurised water reactor as a function of installed capacity was developed using a linear regression method on the basis of data for 15 pressurised water nuclear reactors in the EU. The identified dependence (cost per reactor (EUR million) = 1.18 * reactor capacity (MW) + 72.72 (EUR million)) has a relatively high significance value ($R^2 = 0.94$) and is statistically significant ($p < 0.0001$). The calculation model is simplistic as it does not take into account, for example, the number of units in one nuclear power plant. This is because plant technologies that are common to several units are also subject to decommissioning. The reason for not including this factor is the low number of observations, which does not allow statistical analysis.

A key limitation of the model is the significantly limited range of input data, which results from the relatively low number of decommissioned nuclear power plants of the same type in the world. However, the selected examples are largely comparable in their technical parameters to reactor installations in Slovakia and can therefore be considered relevant. Another limitation of the model is the fact that the decommissioning of almost all of the nuclear installations under consideration is still in its initial phase or has not been completed. The resulting costs may therefore differ significantly from the forecast costs used in the model.

NNF's long-term liabilities: construction of the underground storage facility

The programme for the development of an underground repository in Slovakia is at the stage of assessing various alternatives, and no decision has yet been taken on the location or the need for the construction itself. A deep repository is a nuclear facility for the safe and permanent storage of spent nuclear fuel and radioactive waste. The construction of a deep repository is a direct part of the final part of the nuclear power industry, so these costs are borne by the operators of nuclear installations in the form of compulsory contributions paid to the NNF. At present, it appears to be the most appropriate and only technically feasible solution for the end of the fuel cycle. The actual commissioning of the repository is not planned until after 2065.

Currently, two options are still under consideration to address the issue of underground storage (the so-called dual path). The first one involves the construction of a repository on the territory of the Slovak Republic at an estimated cost of EUR 13.8 billion and is considered to be a priority, the second one envisages Slovak participation in the project for the construction of an international underground repository. The decision on the location of a deep repository in Slovakia or abroad should be taken by 2030 (NNF, 2015), with a possible disposal in Slovakia in one of 5 potentially suitable locations: Tríbeč, Veporské vrchy, Stolické vrchy, Rimavská basin and Cerová vrchovina.

Estimated expenditures[21] for the construction of a deep repository range from EUR 2 to EUR 140 billion (in 2023 prices). The significant dispersion of the estimated costs makes it impossible to use the benchmarking method when deciding on the construction of a deep repository in Slovakia. However, the analysis of examples from abroad points to the risk of cost overruns when implementing a similar project in Slovakia. The estimated construction costs at Yucca Mountain in the USA have seen a significant increase: in 2001, the forecasts were EUR 64.2 billion, and in 2021 they will be more than EUR 140 billion. Also according to foreign studies (Flyvbjerg and Gradner, 2023), investments in nuclear repositories are the riskiest in terms of excessive cost growth compared to the original estimates.

[21] Estimate calculated using data from 9 comparable projects at different stages of implementation in the USA, Finland, France, Russia, UK, Switzerland and Sweden.

Annex 5: Reasons for time delays in the construction of nuclear power plants

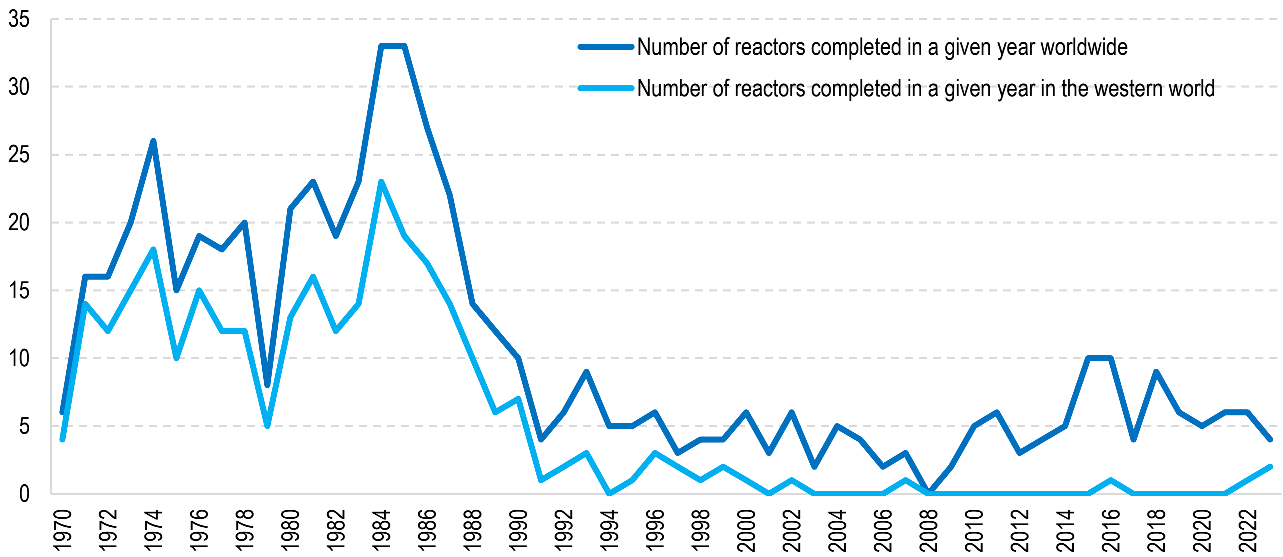
The key to staying on budget is staying on schedule. When construction is extended, not only do capital prices rise, but so do the chances of unplanned external problems. An example is the construction of Hinkley Point C in the UK. One of the reasons for the significant construction cost overruns was the COVID-19 pandemic and the subsequent war in Ukraine, which disrupted global supply networks. The likelihood of such events occurring in a single year is relatively low, but the chances of at least one external disaster occurring over a long construction period increase significantly, each with the ability to make construction significantly more expensive.

Nuclear power plants are often built without thorough plans. It is common practice to finalise the plans only after approval and construction has started. In the construction of Olkiluoto in Finland, the approval process was completed long before the plans for construction were finalised. Parts of the reactor were not designed and many others were not manufactured or even without a designated manufacturer. This meant that it was necessary to wait for these supplies immediately after construction started, which according to authorities delayed the start of construction by 2 to 3 years (Laaksonen, 2010).

Poor quality plans are often the result of political pressures. If there is political will to build a plant, contractors tend to start construction quickly to exploit the potential of a politically inclined government. This acceleration can lead to poor quality preparation. This was the case, for example, in the early construction of Hinkley Point C. As late as 2003, under the Blair government, the official government position was that it was not economically viable to build new nuclear reactors. However, this changed in 2006 when a massive pro-nuclear campaign began (Watt, 2017). The latter eventually led to an accelerated decision to build the plant. Due to concerns about the evolving political situation and the potential stalling of the project, construction started too quickly. The rushed construction resulted in problems with both incomplete plans and low estimates of the cost and time required for construction, which in turn made construction more expensive.

Problems in construction also arise from lack of experience at all levels of the project. In Europe and North America, nuclear power plants were discontinued after mass construction in the 1970s and 1980s. Three periods of nuclear power plant construction can be seen in Figure 40. Until 1991, there was frequent construction of nuclear power plants, two-thirds of which were built in the Western world. After 1991, new plant construction declined worldwide, but even more markedly in the West, where only about a quarter of all new plants were built. Since 2009, we have seen a renewed increase in the construction of new power stations, but this is concentrated mainly in Asia, with only around 5% of all new power stations built in the West since 2009. It is therefore currently difficult to find suppliers with experience of building nuclear reactors. An example of this was the inability of some subcontractors in the construction of Flamanville in France to perform the welds on the reactor according to strict technical specifications, as these subcontractors had no previous experience with these types of welds (Cour de Comptes, 2020b).

Figure 40: Number of reactors completed in a given year globally and in the western world



Note: By the Western world we mean the countries of Europe that were not part of the Warsaw Pact until 1991, as well as the USA and Canada. After 1991, we understand the Western world to include, in addition, the countries that are currently in the EU.

Source: World Nuclear Association

Various environmental and legal standards prevent uniform power plant designs. The tightening of environmental standards in recent decades explains the prolongation of plant construction, but only creates significant time lags in the case of exceptional events such as the Fukushima nuclear disaster. Thus, regular delays cannot tighten standards. A more significant problem is the different nature of these standards in different countries, with which subcontractors are not familiar, which makes construction longer and more expensive. In the case of Olkiluoto in Finland, for example, the French contractor was not familiar with the fact that the Finnish Radiation and Nuclear Safety Agency has to approve every design plan for a non-standard component before it is manufactured (Laaksonen, 2010), which has complicated the design process and led to slower construction.

Annex 6: Amount of the compulsory levy and oil storage costs in selected EU countries

Table 29 summarises data on the amount of the compulsory fee levied on oil and petroleum product dealers in the 13 EU Member States (including Slovakia) where these activities are under the responsibility of a state agency. Other countries have not been included in the comparison due to the application of a non-agency model for the management of emergency stocks of crude oil and petroleum products (most often under the direct responsibility of the private sector, or exclusively by the State) or the public unavailability of annual reports and other financial data.

Table 30: Amount of compulsory storage charges for petrol (crude oil), diesel and aviation kerosene

Country	Responsible authority	Výška povinného poplatku (eur/t)		
		Petrol	Oil	Kerosene
Slovakia	EOSA (2013)	39.65	39.65	39.65
Belgium	APETRA (2006)	19.24	16.71	8.70
Denmark	Danish Central Oil Stockholding Entity (1964)	2.69	3.10	4.62
Estonia	Estonian Stockpiling Agency (2021)	6.53	4.76	8.33
Netherlands	Netherlands Petroleum Stockpiling Agency (1987)	11.11	9.52	0
Ireland	National Oil Reserves Agency (1995)	27.78	23.81	0
Hungary	Hungarian Hydrocarbon Stockpiling Association (1993)	15.52	13.30	10.38
Germany	German National Petroleum Stockpiling Agency (1979)	3.56	3.56	3.56
Poland	Rządowa Agencja Rezerw Strategicznych (2020)	9.41	9.41	9.41
Portugal	ENSE (2018)	2.50	2.50	2.50
Austrial	ELG (1976)	34.72	34.72	34.72
Spain	CORES (1994)	40.91	36.68	38.18
Italy	Italian Central Stockholding Entity (2012)	1.51	1.51	1.51

Note: The table shows the most recent published data for each country at the end of 2023. The average conversion rate used to convert the amount of mandatory contributions and costs from other currencies is the ECB average conversion rate for the calendar year concerned.

Source: calculations by the VfMU according to the websites and published annual reports of the above agencies

Annex 7: Overview of exemptions from excise duties on electricity, coal and natural gas

The table summarises the amount of tax expenses according to the individual categories of exemptions from Act No. 609/2007 Coll. on excise duties on electricity, coal and natural gas.

Table 31: Overview of tax expenditure on excise duty exemptions (EUR million, ESA 2010)

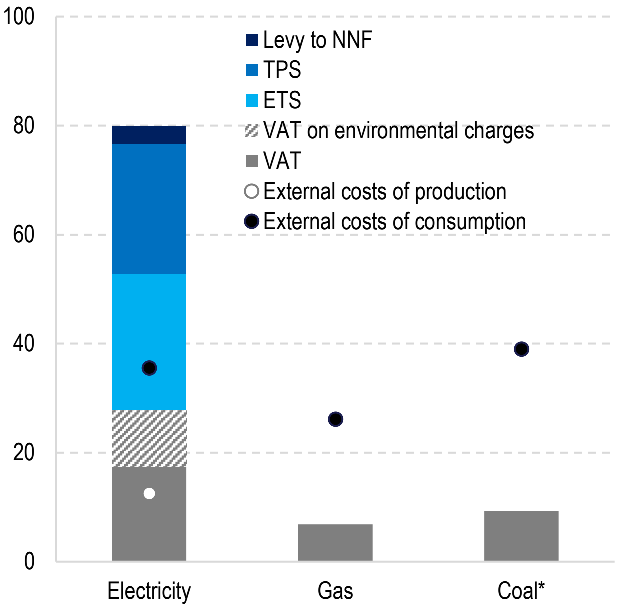
Exemption	2020	2021	2022
Electricity	19.8	22.6	20.5
to household electricity end-users	7.7	8.2	8.1
made from a renewable source	4.7	6.3	5.6
for chemical reduction, electrolytic processes, metallurgical processes	3.8	4.5	3.6
for the generation of electricity and for maintaining the capability of the electricity generating installation, including losses	2.2	2.1	2.0
on mineralogical processes	1.0	1.1	0.9
for the transport of persons or freight by train, metro, tram, trolleybus, electric bus or cable car	0.2	0.2	0.2
for combined production of electricity and heat	0.2	0.1	0.1
for the production of energy-intensive products	0.1	0.1	0.1
Gas	**57.2**	**62.6**	**50.4**
to household end-users of natural gas	19.4	22.4	21.0
for dual use	9.6	10.4	8.5
for operational and technological purposes in the gas undertaking, including losses	10.1	9.8	8.1
for combined production of electricity and heat	7.5	7.5	6.2
for a purpose other than as a propellant or as a fuel for the production of heat	2.6	2.9	2.6
for electricity generation	6.0	7.5	2.1
in mineralogical processes	2.0	2.1	1.9
Coal	**49.8**	**62.4**	**56.7**
for the manufacture of coke or semi-coke	16.2	22.4	20.4
for dual use	16.6	23.0	18.5
for combined production of electricity and heat	15.4	15.1	15.9
to household end-users of coal	0.9	0.9	1.0
in mineralogical processes	0.5	0.6	0.6
for a purpose other than as a propellant or as a fuel for the production of heat	0.4	0.4	0.3
for electricity generation	0.0	0.0	0.1
Total	**126.8**	**147.6**	**127.6**

Source: IFP

Annex 8: Tax and fee policy favours fossil fuels

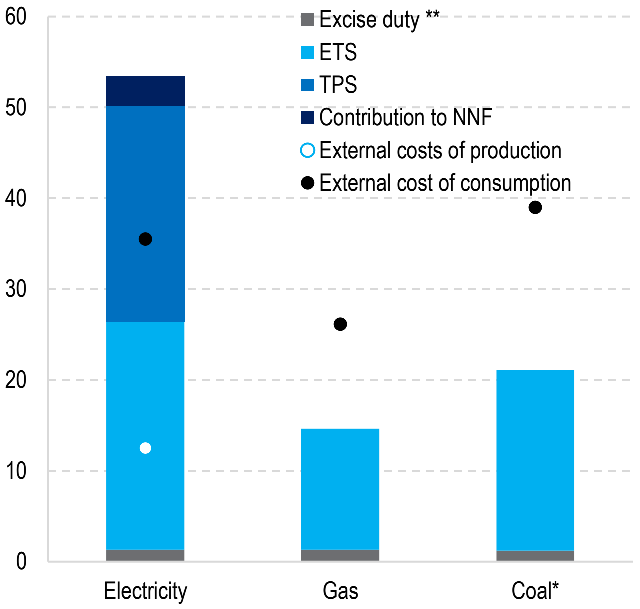
External energy costs are significantly higher for electricity, which encourages the use of fossil fuels. As shown in Figure 41 and Figure 42, the amount of taxes and charges that apply to electricity is significantly higher than for gas and coal. Electricity is subject to specific charges (TSO and NNF levy) that have no equivalent in the case of fossil fuels. VAT also plays an important role in energy taxation, the nominal amount of which is also significantly higher than for gas and coal due to the higher price of electricity. The difference in the nominal VAT rate is partly due to the fact that VAT is also applied to the charges entering into the electricity price, which exacerbates the unequal burden on electricity and fossil fuels. Compared to the level of external costs generated by the consumption of each energy, electricity is thus the only source where the tax and fee burden exceeds the level of external costs (more than twice). The high tax and fee burden disadvantages and discourages the use of electricity and encourages the burning of fossil fuels. Such tax and charging policy goes against Slovakia's decarbonisation objectives and slows down the transition to the use of low-emission electricity.

Figure 41: Household energy taxes and charges and external CO_{2e} costs (eur/MWh, 1st half 2021)



** Coal with a calorific value of 24.65 MJ/kg.* *Source: EC, VfMU*
Note: Electricity consumed in Slovakia due to imports produces more emissions than electricity produced in Slovakia.[22]

Figure 42: Taxes and charges on industrial energy and external CO_{2e} costs (eur/MWh, 1st half 2021)



** Coal with a heat of combustion of 31.76 MJ/kg.* *Source: EC, VfMU*
*** Except for exempt industrial uses.*

The external costs of fossil fuels are explicitly charged only in electricity and heat generation and in industry. The main policy determining the price of emissions in Slovakia is currently the European Emissions Trading System (EU ETS). The ETS charges for emissions from electricity and heat generation as well as industrial emissions. It does not cover the use of fossil fuels for heating and hot water in buildings; this sector is to be covered by ETS 2 from 2027. Emission allowance prices in 2023 averaged EUR 85.27/tCO_{2e} (S&P Global, 2024). Apart from the ETS, the only tax linked to fossil fuel emissions is the air pollution charge, which is discussed in Chapter 3.5. Air pollution charge rates reflect the external costs of pollution only minimally, charging for pollutant emissions does not even reach one per cent of the total external costs of pollution.

The largest amount of taxes and charges is on electricity. Around a third of these are emission allowances, which are reflected in the sale price. Fossil fuel power plants are already covered by the ETS. In Slovakia, fossil fuels generate the minimum amount of electricity, with fossil fuels mainly being used to produce imported electricity from abroad. However, as a consequence of marginal pricing, the price of emission allowances also affects the price of emission-free sources. Since the

[22] Figure 41 and Figure 42 are based on average emissions from electricity generation in Slovakia in 2021 of 115 kgCO_{2e}/MWh (EEA, 2024b). However, the emission intensity of electricity consumed in Slovakia is several tens of kgCO_{2e}/MWh higher (136 kgCO_{2e}/MWh on average over the last 5 years) as a result of grid interconnection and imports of dirtier electricity. For comparison, burning natural gas produces 240 kgCO_{2e}/MWh and burning coal about 358 kgCO_{2e}/MWh.

electricity market is cleared by the price of the most expensive resource sold, which is usually natural gas-fired power plants, nuclear and renewables are also sold at a price that reflects the cost of the ETS.[23]

Electricity is also subject to taxes and charges paid by consumers... Electricity consumers pay a tariff for the system operation (TSO), which can be considered as a green tax, as the proceeds from it are used to support the production of electricity from renewable sources and CHP. In France, for example, the TSO alternative operated as a separate tax and has been part of the electricity excise duty since 2022. At the same time, consumers pay a levy to the National Nuclear Fund (NNF) and firms not covered by industrial exemptions (mainly consumption for water heating and heating) also pay excise duties. Thus, the total tax and fee burden on electricity exceeds that on gas by almost twelve times for residential consumption and by almost four times for industrial consumption (Figure 41 and Figure 42). VAT is also an important factor; given that the price of electricity is significantly higher than that of gas or coal, the nominal amount of VAT per MWh of energy is also significantly higher for electricity.[24]

Tax and charging policies should reflect the external costs of energy. A shift to low-emission sources outside industry will be key to achieving climate targets. In 2021, households accounted for 27.1% of total energy consumption in Slovakia, with commercial and public services accounting for a further 12.9% (Eurostat, 2024b). Up to 86% of energy consumption in households is heating and water heating (IEA, 2023). It is therefore crucial that pricing policies incentivise the use of electricity as the cleanest source of energy.

[23] At the same time, nuclear power plants pay a tax for the location of the nuclear installation. The tax for the location of a nuclear installation amounts to approximately EUR 3.8 million per year (approximately EUR 0.17/MWh in terms of electricity consumption in Slovakia). However, as a consequence of marginal pricing, nuclear electricity is sold at a price that also takes into account the cost of the nuclear siting tax.

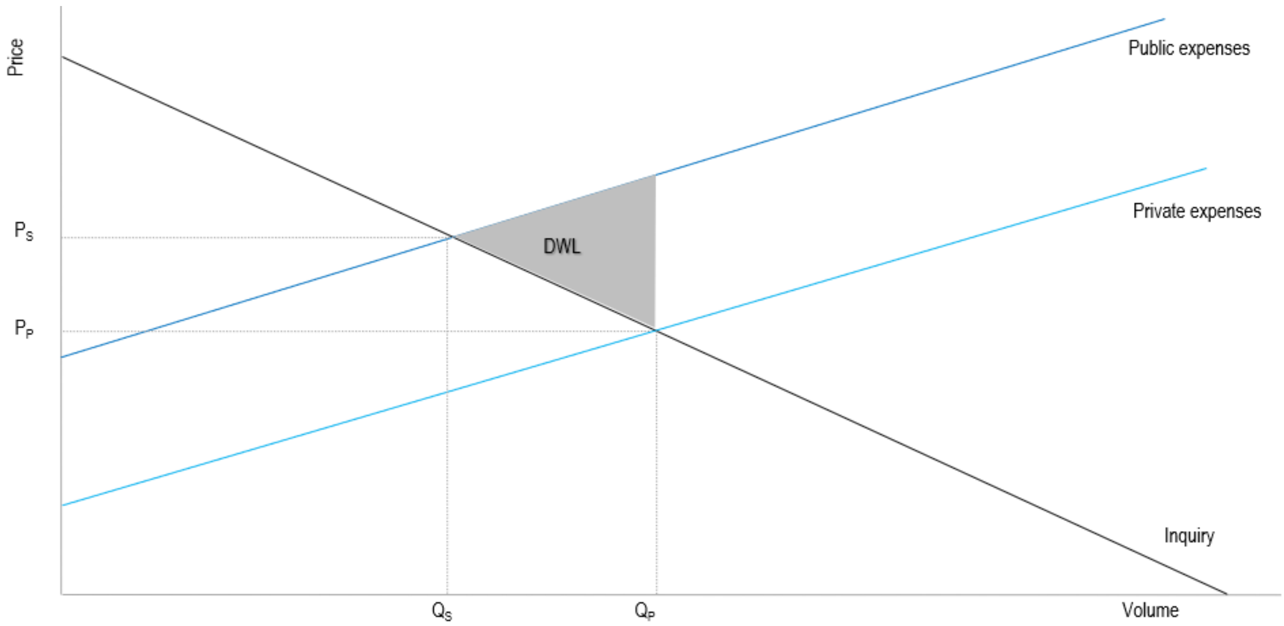
[24] VAT is considered a tax that does not distort the market (IMF, 1991) as it is applied as a percentage of the price to all products and thus does not change the relative price ratio. For energy, however, VAT can be considered as a distortionary tax. Since final electricity prices take into account the external costs of CO_{2e} due to their coverage in the ETS, VAT is applied to a part of the external costs for electricity, whereas for gas and coal the external costs are not charged and thus not subject to VAT. VAT is also applied to electricity-related charges such as the TSO and the levy on the NNF, thus distorting prices and thus consumers' decisions even more.

Annex 9: Negative externalities of fossil fuels

Negative externalities are negative impacts of economic activity that are borne by third parties. In the context of fossil fuels, these are the negative effects of their combustion and extraction, such as the effects of global warming or the health complications caused by air pollution. The costs of these impacts are borne by third parties (e.g. people living near a coal-fired power plant who suffer health complications) and not directly by the producers of fossil fuels or their consumers, and are therefore not reflected in market prices. One solution is therefore state intervention in the form of taxes that force consumers to pay a price that also takes into account the negative societal impacts (external costs).

Failure to take into account the social costs leads to excessive consumption of fossil fuels. Figure 43 illustrates the social costs of overconsumption due to negative externalities. The market equilibrium is at the level of Q_P consumption, where demand equals private costs. However, the social equilibrium is at a lower level of consumption Q_S as the social cost, which is the sum of private and external costs, is higher. Thus, market mechanisms lead to higher consumption than socially optimal, external costs are not taken into account and a deadweight loss (red triangle DWL) arises, which represents the social cost of market inefficiency. A possible solution, for example, is to introduce a tax to bring the price up to the level of the P_S. Demand at the P_S price is at the Q_S level, which is the socially optimal quantity at a price that also takes into account external costs.

Figure 43: Negative externalities and deadweight loss



Source: VfMU

Substances released into the air during combustion cause local pollution and health effects. The main air pollutants emitted include particulate matter ($PM_{10}/PM_{2.5}$), nitrogen and sulphur oxides (NO_X, SO_x) and volatile organic compounds (VOCs). Nitrogen oxides cause respiratory diseases such as asthma and increase the risk of respiratory tract infections. Volatile organic compounds, sulphur oxides and particulate matter have similar effects on human health. Particulate matter also causes cardiovascular disease and can lead to cardiac arrhythmias or heart attacks.

The external costs of emissions vary according to the source (industry/transport) and the location of the pollution (cities/rural). The external costs of pollutant emissions are summarised in Table 31. The amount of external costs is influenced by factors such as the dispersion of emissions (in industry affected by, for example, tall smokestacks) or the population density at the location of the pollution. Another important factor is human health pricing. The values in the table are based on the value of a life year (VOLY), which is defined as the monetary value that people assign to one extra year on top of their life expectancy.[25]

Table 32: External costs of pollutants (EUR/kg, PL 2024)

Polluting substance	Industry	Transport (urban / rural)
$PM_{2,5}$	124.6	151.6 / 85.2
PM_{10}	95.9	23.4
NO_X	31.7	35.8 / 21.2
SO_2	49.8	14.6
VOC	2.7	1.0
NH_3	46.6	35.2

Source: EEA, 2024a, EK, 2019c

The external costs of CO_{2e} pollution are calculated on the basis of avoided costs. The price of greenhouse gas emissions (CO_{2e})[26] can be determined by the cost of the damage caused by global warming or by the cost of reducing the volume of these emissions. Correctly estimating the effects of climate change and the total extent of the damage it will cause is challenging. Such an approach requires assigning a monetary value to damages that are difficult to quantify, such as reduced economic growth potential, loss of biodiversity or the impacts of climate migration. At the same time, climate science still cannot definitively predict the impacts of climate change on weather, the occurrence of fires or floods, or the consequences of major changes such as the melting of polar ice caps or changes in ocean currents. For this reason, the European Environment Agency prefers to price greenhouse gas emissions on the basis of the costs of avoiding them. Costs are determined by analysing the most cost-effective measures to achieve the environmental targets set, such as the EU's commitments to reduce emissions by 50% below 1990 levels by 2030 and the targets under the Paris Agreement.

Table 33: External costs of greenhouse gases (eur/tCO_{2e}, PL 2024)

	Lower estimate	Median estimate	Upper estimate
Short-term (do 2030)	78	130	246
Long-term (od 2040 do 2060)	203	350	649

Source: EEA, 2024a

[25] An alternative method is to use the value of a statistical life (VSL), which determines the value people place on avoiding immediate death. The VSL can thus be seen as a discounted value of VOLY for each year of life (in reality, there are differences between these values). In external costing, VOLY or VSL values are standardly determined from meta-analyses, as individual values vary considerably depending on the specific study and methods chosen.

[26] CO_{2e} is the greenhouse gas emissions expressed in equivalent amounts of carbon dioxide.

Annex 10: Options for reform of excise duties and energy taxation

Excise duty rates need not be uniform; a good practice from abroad may be to differentiate rates according to consumption. Denmark supports heating with electricity at a reduced rate for high consumption. For households with electric heating, the excise duty rate for consumption exceeding 4 MWh/year (i.e. for consumption exceeding the basic needs of common appliances) is reduced from around EUR 127.5/MWh to EUR 1.3/MWh. However, the unlimited reduction in rates for high consumption does not incentivise reducing consumption, for example by better heating settings or by heating only up to a certain temperature, and encourages increasing electricity consumption for other purposes such as cooling. In Italy, by contrast, gas tax rates rise with consumption. While the rate for gas in the lowest of the four consumption bands (up to 1.3 MWh/year) is EUR 4.28/MWh, consumption in the highest band (above 16.5 MWh/year) is EUR 18.11/MWh. At the same time, a reduced VAT rate of 10% (compared to the standard 22%) is applied to the lower two bands. Increasing gas excise duty rates provide incentives to reduce consumption and improve energy efficiency.

A number of countries differentiate rates for businesses and households, reduce rates for high-consumption businesses or use reduced rates for specific industries as an alternative to exemptions. While only a minimum number of countries differentiate rates for households according to consumption, different rates for households and businesses are relatively common in the EU. The Netherlands and Luxembourg do not differentiate between households and businesses, and the excise rate bands are set so that all households are in the lowest consumption band. Excise rates in the higher consumption bands are further reduced to relieve the burden on energy-intensive businesses. In Finland, instead of an exemption, a reduced rate is applied to electricity consumed in industry, mining, agriculture, data centres and central heating. In Germany, exemptions are replaced by a lower excise duty rate applied to certain fossil fuels, including natural gas, used for electricity generation, CHP or pipeline operation.

Part of the TSO costs could be shifted from electricity consumers to gas consumers. In order to mitigate the disadvantage of electricity charges[27], it would be appropriate to create a TSO equivalent for gas and to shift part of the total TSO costs to it. As the revenues from the TSO are primarily used to support RES and CHP and thus reduce emissions, these objectives should not only be financed by consumers of low-emission electricity but also by gas consumers (polluter pays principle - the TSO would thus function as an analogue of a climate tax, the revenues of which finance green measures). As with electricity, gas consumers would pay a tariff for each MWh consumed. The TSO for gas would be EUR 1.21/MWh[28] if half of the costs were shifted. At the same time, the expected level of the TSO for electricity would fall from EUR 5.5 to EUR 2.75/MWh. The measure is fiscally neutral, the amount of funds collected from the TSO would be constant.

The creation of a TSO for gas would support electric heating. A model household with a heat pump with an annual heat demand of 15 MWh (4 persons, 105 m^2 house, energy class A) would save EUR 20.76 per year on electricity bills. A similar model household with gas heating (energy class B) would pay EUR 18.71 more per year, counting on the savings for lower electricity bills. Nearly 938 thousand households heat with gas, and another nearly 543 thousand households take their heat from district heating, which is produced by burning gas (Statistical Office, 2021). The introduction of a gas TSO would affect a large number of households, the potential to change the heating system in these households would depend on the total investment costs of the installation (which are higher in energy inefficient buildings as they require complex renovation) or the available support schemes (which will be introduced, for example, by the Social and Climate Plan. Electric heating is used by 96 thousand households, about a third have a heat pump.

[27] The Slovak Republic's goal of achieving carbon neutrality by 2050 will require a transition from fossil fuels to clean energy sources. Consumers who currently use gas and coal will also have to switch to electricity or sustainable biomass. As electricity from RES and CHP will also have to be used by fossil fuel consumers in the future, they should contribute to the financing of the development of these sources.

[28] The recalculation is based on the preliminary estimates of the RONI for 2025 and gas and electricity consumption in 2022.

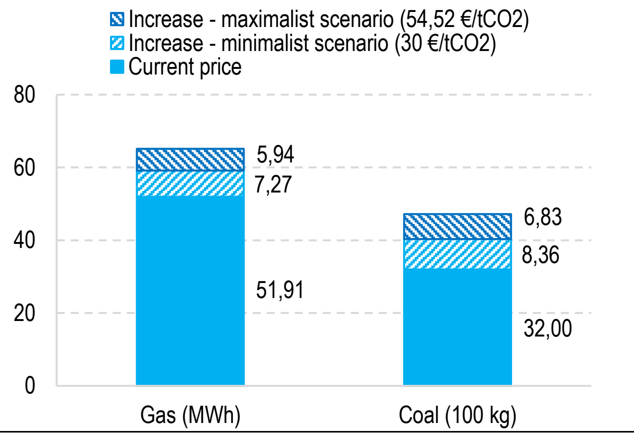
Annex 11: Emissions Trading Scheme ETS 2

In 2027, ETS 2 will come into force, introducing CO_2 charging in the buildings, transport and small industry sectors. The scheme will cover all fossil fuels (natural gas, petrol, diesel, coal, etc.) consumed by entities not yet covered by the ETS, in particular households and small and medium-sized enterprises. ETS 2 will operate separately from the existing ETS, but may be merged in the future.

The price of allowances in ETS 2 will depend on auctions. The EC will have a stabilisation reserve of 20 million allowances until the end of 2029. If ETS 2 allowance prices rise above EUR 45/tCO_2 for at least two months, this reserve can be auctioned to reduce prices. The EUR 45 threshold is set at 2020 prices, so in 2024 prices it is EUR 54.52

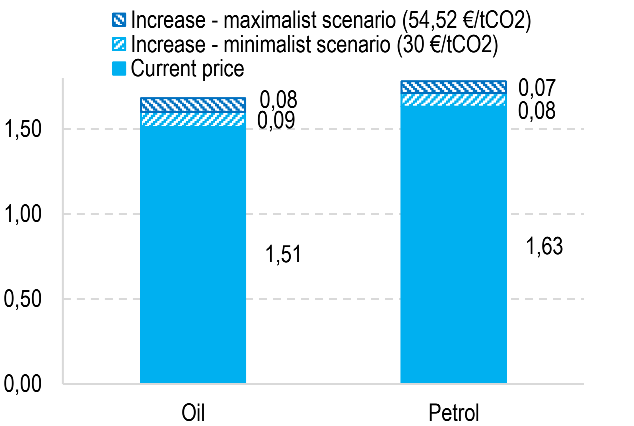
The introduction of ETS 2 could increase gas prices by up to a quarter and fuel prices by around 10%. If the maximum allowance prices were reached, gas prices would rise by over EUR 13/MWh including VAT, a 25.5% increase compared to current regulated household prices. A more conservative estimate of quota prices at EUR 30/tCO_2 would translate into a price increase of EUR 7.27/MWh. Petrol prices would rise by 8-15 eurocents per litre and diesel prices could rise by 9-17 eurocents per litre (at a quota price of EUR 30/t and EUR 54.52/t respectively).

Figure 44: Gas and coal price increases in the two allowance price scenarios (euros)



Source: VfMU

Figure 45: Diesel and petrol price increase in two scenarios of emission allowance prices (eur/l)



Source: VfMU

To mitigate the impact of ETS2 on vulnerable consumers, a Social and Climate Fund has been established. The fund will be financed from part of the proceeds from the sale of emission allowances. The allocation from the fund for Slovakia is expected to reach EUR 1.5 billion between 2026-2032. The Fund is intended to address energy and transport poverty and can be used, for example, for temporary direct financial transfers to vulnerable groups to cushion negative financial impacts, to increase energy efficiency and decarbonise buildings, to support public transport or low-emission and zero-emission vehicles, including the necessary infrastructure.

To benefit from the Fund, each country must prepare a Social and Climate Plan by June 2025, which is then approved by the EC. The structure is similar to the Recovery and Resilience Plan and includes buildings, transport and direct financial support. There is also a strong emphasis on targeting support to vulnerable actors. Member States must co-finance at least 25% of the estimated total cost of their plans from their own resources. In the case of Slovakia, this will be EUR 383 million.

Part of the proceeds from the quotas will go to the state budget. Revenue from the sale of allowances will be used as a priority to provide a predetermined amount of funds for the Social and Climate Fund, with the remaining proceeds redistributed to states based on their share of total emissions. The revenues of the Slovak state budget will thus depend on the quantity and price of allowances sold; the lower limit can be estimated at around EUR 1.3 billion in 2027-2032, but may exceed EUR 2 billion at high allowance prices. As with revenues from the ETS already in operation, ETS2 revenues will have to be used for specific purposes. These will be identical to the objectives of the Social and Climate Fund, and countries will also be able to use these funds to co-finance their social and climate plans or other environmental objectives identical to those of the use of ETS revenues.