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COMMISSION STAFF WORKING DOCUMENT

Assessment of the draft updated National Energy and Climate Plan of Slovakia

Accompanying the document

COMMISSION RECOMMENDATION

on the draft updated integrated national energy and climate plan of Slovakia covering the period 2021-2030 and on the consistency of Slovakia's measures with the Union's climate-neutrality objective and with ensuring progress on adaptation

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1 SUMMARY

1.1 Overview of key objectives, targets and contributions in the draft updated NECP


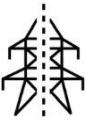
The European Green Deal, the fast-evolving geopolitical context and the energy crisis have led the EU and its Member States to accelerate the energy transition and set more ambitious energy and climate objectives, including objectives to diversify energy supplies. These developments are reflected in the legislative framework adopted under both the ‘Fit for 55’ package and the REPowerEU plan.

Slovakia’s draft updated national energy and climate plan (‘the draft updated NECP’ or ‘the plan’), submitted on 23 August 2023, partially takes into account this new geopolitical and legislative framework.

Table 1: Summary of key objectives, targets and contributions of Slovakia’s draft updated NECP

		2020	Progress based on latest available data	2030 national targets and contributions	Assessment of 2030 ambition level
	Binding target for greenhouse gas (GHG) emissions compared with 2005 under the Effort Sharing Regulation (ESR) (%)		2021: -12% 2022: -12.1% ¹	-22.7%	NECP: No ESR projections included. NECPR: -11.6%.
	Binding target for net greenhouse gas removals under the Regulation on Land Use, Land Use Change and Forestry (LULUCF)		Reported net removals of -7.66 Mt CO ₂ eq. in 2021 and reported approximated net removals of - 7.87 Mt CO ₂ eq. in 2022	-0.5 Mt CO ₂ eq. (additional removals target) - 6.8 Mt CO ₂ eq. (total net removals)	Insufficient ambition, SK will not reach the target
	National target/contribution for renewable energy: Share of energy from renewable sources in gross final consumption of energy (%)	17.3% (SHARES) 14% (target)	17.4%	23%	SK contribution of 23% is significantly below the 35% required according to the formula set out in Annex II of the Governance Regulation

¹ The ESR emissions for 2021 are based on final inventory data and for 2022 on approximated inventory data. However, the final ESR emissions for 2021 and 2022 will only be established in 2027 after a comprehensive review.

	National contribution for energy efficiency:				
	Primary energy consumption	16.4 Mtoe	16.4 ktoe	15 700 ktoe	SK primary energy consumption contribution is 15 700 ktoe. EED recast Annex I formula results: 13 621 ktoe
	Final energy consumption	10.4 Mtoe	11.59 Mtoe	10 270 ktoe	SK final energy consumption contribution is 10 270 ktoe. EED recast Annex I formula results: 8 461 ktoe
	Level of electricity interconnectivity (%)	41.4%	50.6%	15% ²	

Source: Eurostat; Slovakia's updated national energy and climate plan

1.2 Summary of the main observations³

The draft updated NECP refers to the revised energy and climate targets recently agreed under the **'Fit for 55'** package and the **REPowerEU plan**. However, it foresees to deliver on the targets only partially.

Regarding the reduction of greenhouse gas emissions under the **Effort Sharing Regulation (ESR)**, the plan does not provide evidence and emission projections to demonstrate that Slovakia is on track to meet its national greenhouse gas target of -22.7% in 2030 compared to 2005 levels. According to Slovakia's projections submitted in March 2023, there is a gap of over 11.1 percentage points, highlighting the need for more ambitious climate action.

Regarding the Regulation on **Land Use Land Use Change and Forestry (LULUCF)**⁴, the draft updated projections in the plan indicate that Slovakia will fall short of the 2030 ambition, highlighting the need for enhanced climate action. The draft does not clearly set out a pathway to increase the land sector's contribution to the EU's overall enhanced climate target. Despite identifying several relevant policies and measures, net removals are

² Calculated by the European Commission based on the ETNSO-E data (Winter Outlook 2022-2023). The 2030 level represents the general interconnectivity target of 15%. The level of ambition cannot be assessed, because the actual 2030 interconnectivity levels will depend on the implementation of the planned interconnectors and changes in the generation capacity.

³ In addition to the notified draft NECP, this assessment also considers informal bilateral exchanges, which are part of the iterative process established under the Governance Regulation.

⁴ Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (OJ L 156, 19.6.2018, p. 1).

projected to decrease significantly by 2030. The draft does not provide a clear implementation timeframe nor quantification of the impacts of specific policies and measures. It also lacks information on the status and progress in ensuring higher tier levels and geographically explicit datasets needed to ensure the robustness of net removal estimates.

On Carbon Capture Utilisation and Storage (CCUS), the plan does not identify annual CO₂ emissions that can be captured, nor geological CO₂ storage capacity. No details on CO₂ transport are provided. The plan mentions projects to convert suitable structures into other energy-related applications, including CO₂ storage sites. The plan would benefit from providing more information about these projects.

The draft updated plan reflects only **limited progress towards international commitments** under the Paris Agreement. While Slovakia is unclear on the commitment to phase out coal use for power generation, it does list some of the existing fossil fuel subsidies without giving details on their phase out or a precise timeline.

On adaptation to climate change, the draft updated NECP does not contain an adequate analysis of the relevant climate vulnerabilities and risks for the achievement of the national objectives, targets, and contributions, nor does it include sufficiently the policies and measures for the individual dimensions of the Energy Union. The link to the specific Energy Union objectives and policies, which adaptation policies and measures should support, is not specified and quantified in the plan despite the adaptation policies and measures in the energy sector contained in the Slovak national adaptation strategy and national adaptation plan, showing disconnect between the different planning tools. Adaptation policies and measures, to support Slovakia's achievement of national objectives, targets, and contributions under the Energy Union, are not properly described in terms of their scope, timing and expected impacts.

For renewable energy, the draft updated NECP puts forward a contribution to the overall EU target of 23% of renewables in the country's gross final energy consumption by 2030. This is significantly below the share of 35% resulting from the formula in Annex II of Regulation (EU) 2018/1999 on the Governance Regulation of the Energy Union and Climate Action ("Governance Regulation"). The draft updated NECP includes indicative trajectories for renewables in the electricity, transport and heating and cooling sectors. At the same time, Slovakia's plan provides additional policies and measures to support the achievement of the proposed objectives for its renewable energy contributions. However, the plan does not include the trajectories for renewable energy sources in industry and buildings. Overall, the plan takes into account, to some extent, Directive (EU) 2018/2001 on the promotion of energy from renewable sources, as amended by Directive (EU) 2023/2413 ("revised RED II"). However, the policies and measures for the most part lack robustness and sufficient details, particularly on the scope, timeframe, budget and expected impacts. For some of the policies included, such as decarbonisation of renewable heat production and renewable electricity generation, the draft updated NECP provides estimated investment costs.

On energy efficiency, the Slovakian draft updated NECP is a **good preliminary draft** that partly takes into account the new requirements of the Directive EU 2023/1791 on energy

efficiency and amending Regulation (EU) 2023/955 (recast) ('EED recast')⁵. However, the plan remains unclear as regards the different sections of the energy efficiency dimension and does not include: (i) detailed information on the values of the national contributions to the 2030 energy efficiency targets, (ii) the cumulative end-use energy savings requirement for 2021-2030, and (iii) information on the funding sources that are necessary to implement the planned measures.

On buildings, the draft updated NECP does not set out more ambitious targets than those included in the Slovakian 2020 long-term renovation strategy (LTRS), nor does it recall the main elements of the strategy. As the draft updated NECP does not specify the overall energy savings targeted by the buildings related measures, it remains unclear whether these measures are sufficient to reach the targets of Slovakia's 2020 LTRS.

On the energy security dimension, it is positively noted that Slovakia's main energy policy priorities include several objectives on energy security: (i) the enhancement of energy supply security, (ii) the diversification of energy sources and energy transport routes, (iii) the promotion of energy storage, and (iii) the improvement of the safety and reliability of nuclear power plants. In the **gas sector**, the draft updated NECP is comprehensive and notably evokes the expansion of underground energy storage capacities, the increase of domestic energy extraction, investments in gas transport infrastructure to make it more efficient and fit for hydrogen, and ambitious targets for low-carbon and renewable gases. It is important to note that despite recent efforts implemented by Slovakia to diversify away from Russia, Slovakia continues to depend on Russia for about 60% of its total gas demand in 2023. In the **electricity sector**, Slovakia has an ambitious nuclear programme. The continued and safe use of nuclear energy and its further development is therefore a key prerequisite laid down in the draft updated NECP. The draft updated NECP does not include a measurable target nor a dedicated strategy for the deployment of power storage.

On the internal energy market dimension, the draft updated NECP sets out an objective to bring the benefits of renewables and low carbon technologies to consumers. However, the process of adopting secondary and tertiary legislation to remove the remaining entrance barriers for flexibility services (e.g., demand response and storage) is ongoing.

The draft updated NECP includes measures to address **energy poverty**, such as measures to renovate buildings for vulnerable households. However, instruments targeting vulnerable households in energy poverty are still generally missing. While Slovakia has made some progress in defining energy poverty, a clear legal definition is not yet in place.

On the **research, innovation, competitiveness and skills** dimension, Slovakia's draft updated NECP is very well structured and includes targets, policies, and measures. The draft updated NECP outlines focus areas for national research and innovation (R&I) efforts and describes the main strategies and documents guiding them. However, it does not provide sufficient information on measures to scale-up manufacturing of clean energy technologies, components, and equipment, nor on how Slovakia will increase the resilience of its supply chain for clean energy technologies. While the plan mentions circularity, digitalisation of the energy system and skills development as priority areas, it does not elaborate on concrete targets and expected investments.

⁵ OJ L 231

Just transition is addressed in a limited manner in the draft updated NECP. There is only limited information on the employment, skills and social impacts of the energy and climate transitions, and on the distributional impacts on vulnerable groups. Furthermore, the plan does not include concrete employment and skills policies to tackle these issues more widely but focuses solely on some actions in the coal regions. As the draft updated NECP also provides contradictory information regarding Slovakia's commitment to phase out coal, the impact this could have on the planned measures is unclear. The plan also lacks more detailed analysis and measures on how to address the social aspects of the energy transition. In addition, it does not elaborate on how the various resources will be used to support a just transition. Finally, the draft updated NECP does not provide sufficient information for the preparation of the Social Climate Plan and how the consistency of the two plans would be ensured.

On its strategic alignment with other planning tools, the draft updated NECP is mostly consistent with the national RRP and the REPowerEU chapter. In some cases, measures included in the draft updated NECP lack the necessary granularity and detail to allow for a full comparison with those in the RRP. Slovakia's draft updated NECP is in line with the 2023 European Semester Country Specific Recommendations and reflects the challenges to be addressed by Slovakia.

The section on **investment needs and funding sources** has not been updated compared to the 2019 NECP. The plan includes an extensive quantitative analysis. Projections are included for both the with-existing-measures ('WEM') scenario and the with-additional-measures ('WAM') scenario, although the definition of the scenarios is not clear. The plan includes an impact assessment of the main policies. While the macro-economic impact assessment provides valuable information, it is based on outdated information, that does not consider of the anticipated tax increases or transfer reductions to finance the proposed new climate measures.

2 PREPARATION AND SUBMISSION OF THE DRAFT UPDATED NECP

2.1 Process and structure

The draft updated NECP was submitted on 23 August 2023. It is well developed, and follows the structure provided in Annex I of the Governance Regulation. It covers all five dimensions of the Energy Union. The draft updated NECP includes most of the objectives, targets, or contributions for the different dimensions, though with important exceptions as regards the Effort Sharing target. The plan includes policies and measures that are underpinned by an analytical basis. The plan states that a Strategic Environmental Assessment is required by Slovak legislation for the approval of strategic materials. But no further information is provided on which elements of the plan will go through this process.

Slovakia's draft updated NECP describes only partly the national context in which the update was drawn up. The draft updated NECP briefly explains how energy price volatility and the unjustified and unprovoked invasion of Ukraine affected the country. Issues such the accelerating frequency of extreme weather conditions are not analysed in detail.

Slovakia's draft updated NECP briefly explains how, in line with the whole-of-government approach, Slovakia collaborated with local and regional authorities, different ministries

and the Slovakian parliament to update the plan. The draft updated NECP is public and accessible through the Slov-Lex web portal operated by the Ministry of Justice. However, there is no clear explanation of the nature of possible synergies and trade-offs across different portfolios.

Slovakia worked with associations of cities and municipalities during the consultation phase of the draft updated plan. The draft updated NECP presents the role of local authorities and the urban context in terms of involvement in actions to support energy services, mobility, and energy efficiency. The role of local authorities is briefly mentioned in terms of mitigation and energy poverty, but there is no direct reference to them as far as adaptation is concerned.

2.2 Public consultation

It is not clear if the procedure outlined in Slovakia's draft updated NECP ensured early public participation in the decision-making process. The draft updated NECP only describes the general consultation procedure used by the government but gives no details on the specific consultation organised for the draft updated plan. The time frame for the public to prepare and participate effectively is not mentioned, nor is it clear what type and quality of information was provided to participants. Moreover, the plan does not describe what interest groups were identified and encouraged to take part in the consultation. It is also unclear to what extent the results of the public consultations have been taken into account in the draft updated NECP.

The plan is unclear on how Social Partners were consulted during the drafting process, which hinders the assessment on the fulfilment of a “whole-of-society” approach, as stated in the Council Recommendation on ensuring a fair transition towards climate neutrality.

2.3 Regional consultations for preparing the draft updated NECP

Joint meetings have taken place to discuss the preparation of the draft updated NECP with the Visegrad 4 countries (Slovakia, Czechia, Hungary, and Poland). However, the outcomes of these meetings have not been summarised in the plan, and the description of their scope is very generic.

3 ASSESSMENT OF THE AMBITION OF OBJECTIVES, TARGETS AND CONTRIBUTIONS AND ADEQUACY OF SUPPORTING POLICIES AND MEASURES

3.1 Decarbonisation dimension

3.1.1 Greenhouse gas emissions, removals and storage

The plan partially embeds the increased climate targets included in the ESR and LULUCF Regulation, as part of the ‘Fit for 55’ legislative package.

The draft updated NECP confirms Slovakia's commitment to achieve climate-neutrality by 2050, however, it does not show concrete pathways to 2030 and 2050. The draft updated NECP includes projections under the WEM and the WAM scenarios, neither of which appear to achieve net-zero emissions by 2050. These projections are identical to

those submitted in March 2023 under Art. 18 of the Governance Regulation. The plan shows net GHG emissions (including LULUCF and excluding international aviation) of 35 million tonnes of CO₂ equivalent (CO₂ eq.) by 2050 considering existing measures and of 20 million tonnes of CO₂ equivalent with additional measures. This is equivalent to projected reductions by 2050, compared to 1990, of 46% and 69%, respectively. The information provided in the draft updated NECP does not allow for a full assessment as to whether progress by Slovakia is consistent with the achievement of the EU climate-neutrality objective. However, based on all the available information, progress by Slovakia is likely to be consistent with the achievement of the EU climate-neutrality objective.

The **ESR** sets Slovakia's 2030 ESR emissions reduction target to -22.7% by 2030, compared to 2005 levels. It is not possible to fully assess the level of Slovakia's ambition based on the draft updated plan because it does not provide emissions projections from the effort sharing sectors.

According to the plan, Slovakia will increase emissions in the road transport sector by no more than 29% by 2030 compared to 2005. It will decrease emissions by 12% in buildings, 10% in agriculture, 24% in the waste sector and 40% in industrial sectors not covered by the EU emission trading system (ETS) (compared to 2005). However, the plan does not provide updated projections for the effort-sharing sectors under the WEM and the WAM scenarios. According to the plan, Slovakia will provide updated ESR projections for both the WEM and WAM scenarios in the final updated NECP. In 2021, Slovakia's ESR emissions were below the Annual Emission Allocation (AEA) by -3 Mt CO₂ eq.

Based on the outdated figures reported in the plan, Slovakia would reduce emissions by 22.2% by 2030 compared to 2005⁶. Thus, Slovakia expects emissions to fall slightly short of the mandatory target. However, the value for the 2005 base year does not correspond to the value as per the Commission Implementing Decision (EU) 2020/2126 of 16 December 2020. Based on the legal base year, Slovakia's 2030 ESR projection would reduce emissions by 12.9%. Moreover, the draft updated NECP mentions an even less ambitious ESR target of -20% in the list of measures for the WAM scenario, as part of Slovakia's low-carbon development strategy for 2030 with a 2050 perspective (NUS). As a result, it is difficult to confirm whether a correct pathway towards the target has been set.

Member States have **flexibilities under the ESR** to comply with their targets. No specific use of ESR flexibilities is mentioned by Slovakia. To assess whether Member States comply, the use of saved AEAs from previous years is taken into account.

Although ESR projections are missing from the draft updated NECP, based on the latest data that had to be reported by Member States by 15 March 2023 under the Governance Regulation, Slovakia is not on track to reach its ESR target by 2030. Based on Slovakia's WEM projections ESR emissions would reduce by 1.3% by 2030 compared to 2005, and based on WAM projections ESR emissions would reduce by 11.6% by 2030 compared to 2005.

⁶ From 25,917.50 t CO₂ eq. in 2005 to 20,157.24 t H₂ eq. in 2030.

Table 2: Slovakia's ESR target and projections in its draft updated NECP

ESR target and projections⁷					
	2030 target*	2021 performance (inventory data) *	2022 performance (approximated data) *	2030 WEM projection*	2030 WAM projection*
Slovakia	-22.7%	-12%	-12.1%	Updated projections to be provided in the final updated NECP.	
EU	-40%	-14.5%	-16.9%	-27%	-32%

*Compared to the 2005 emissions as set out in Annex I of Commission Implementing Decision (EU) 2020/2126.

The draft updated NECP does not fully reflect the increased ambition of the LULUCF Regulation and the 2030 national target requiring Slovakia to deliver additional -504 Kt CO₂ eq. net removals to reach a total value -6821 Kt CO₂ eq. in 2030. According to the projections submitted, Slovakia will only achieve -5064 Kt CO₂ eq. with additional measures by 2030, thus falling short of the 2030 value, highlighting the need for more ambitious climate action. It is also worth noting that there is an inconsistency between the projections submitted in section 4 and those in section 5, the latter ones seemingly being based on less ambitious and thus outdated targets.

The draft updated NECP does not set out a clear pathway towards increasing the contribution of Slovakia's land sector to the EU's overall enhanced climate target. Slovakia identifies several relevant EU-funded (through the CAP) as well as national policies and measures largely targeting the forestry sector. Nonetheless, the removals are projected to significantly decrease by 2030 even in a scenario including additional measures. This worsening trend is projected to continue up to 2040 with a slight recovery in removals in the last decade up to 2050.

Given that the two dominant land uses in Slovakia are managed and unmanaged woodland, the country has rightly focused on policies and measures in this area. Several additional policies, such as the National Forest Programme 2022-2030 or Slovakia's low-carbon strategy, are aimed at regenerating the country's ageing forests and slowing down the decay of its most vulnerable ones. Some of the actions mentioned, like afforestation through fast-growing trees, have a doubtful impact on carbon sinks in the medium to long term and on biodiversity. The plan also refers to some ecosystem restoration measures, but their impact –both for LULUCF sinks and biodiversity – is not assessed. Similarly, the draft does not analyse how the expected increase of woody biomass use for energy can affect carbon sinks and biodiversity. The draft updated NECP does not provide the implementation timeframe for these policies and, most importantly, the quantification, for each policy and measure, of its impacts.

Slovakia's draft updated NECP does not provide information on the current status of – and progress to be made in – ensuring improvements to, higher-tier levels/geographically

⁷ The comparison between the ESR target and emission projections does not take into account the flexibilities available for Member States under the ESR to comply with their 2030 targets. The ESR emissions will be comprehensively reviewed in 2027 (for the years 2021-2025) and 2032 (for the years 2026-2030).

explicit datasets for monitoring, reporting and verification, in line with Regulation (EU) 2018/1999.

Overall, Slovakia does not clearly present how its policies and measures for the LULUCF sector will contribute to the long-term transition to climate neutrality by 2050.

The plan contains objectives, targets, and policies and measures related to **transport decarbonisation**. The draft updated NECP is not aligned with the expected uptake of zero emission vehicles and the provisions of the Alternative Fuels Infrastructure Regulation. In 2022, 2221 recharging points were deployed and 9743 electric vehicles were registered. The draft updated NECP briefly addresses measures for further electrification of rail (50% increase by 2030). Slovakia does not develop specific measures to support the production and deployment of sustainable aviation fuels (SAF) to contribute to the ReFuelEU Aviation Regulation.

In terms of **carbon capture and storage**, the draft updated NECP does not identify annual emissions that could be captured from ETS and non-ETS sources, nor does it estimate the geological CO₂ storage capacity. Similarly, no plans related to CO₂ transport capacity development are described plan. The plan mentions projects to convert suitable structures into other energy-related applications, including CO₂ storage sites, however it does not provide details on their implementation.

Slovakia's draft updated NECP partly covers mitigating **non-CO₂ emissions** in different sectors. The plan includes measures on the development of biogas and biomethane (e.g., the introduction of guarantees of origin for biomethane; support for the transition from biogas to biomethane; blending biomethane with CNG and LNG 65) and linking its production to the use of agricultural waste (e.g., support for the recovery of waste from crop and animal production) and organic waste (e.g., promoting the recovery of waste from the biodegradable part of municipal, industrial kitchen and restaurant waste).

Slovakia's draft updated NECP does not, however, clearly address **methane emissions** from enteric fermentation in agriculture, except for mentioning feed additives as part of the WAM scenario. Nor does the plan set out specific measures to deal with methane emissions in energy, including fugitive emissions and fuel combustion, as well as from wastewater. It also fails to clearly tackle N₂O from agricultural soils, which is the second largest source of non-CO₂ emissions. Finally, the plan does not include any measures to deal with fluorinated-gas emissions.

Slovakia proposes a national target of a 10% reduction in **agricultural emissions** by 2030 compared with the reference year 2005. However, its draft updated NECP does not prioritise action to reduce emissions from the agricultural sector. This is reflected in the detailed projections for aggregated agricultural emissions, where Slovakia shows a steady increase up to 2030 and only a marginal decrease if additional measures are applied.

These shortcomings are problematic, because non-CO₂ emissions accounted for 26% of all greenhouse gas emissions within the Effort Sharing sectors in 2021.

The analytical basis of the draft updated NECP includes an assessment by sector of the impact of policies and measures on the achievement of the GHG mitigation targets contained in the draft updated NECP. However, the plan does not contain updated WEM and WAM scenarios and some of the policies and measures listed in the plan seem to refer to outdated targets (e.g., the ESR and RES targets). It is therefore not possible to assess whether the policy framework described in the plan will allow Slovakia to reach the targets

set at EU level, national legislation and other international commitments. The policies and measures are grouped by broad sectors and policy areas, but their scope, timing and likely impact are not described in sufficient detail.

The draft updated plan reflects limited progress towards international commitments under the Paris Agreement. The draft updated NECP is unclear on the commitment to phase down coal power for power generation. It incorporates different elements suggesting a significant effort to phase down coal, including the phase out of coal mining by 2023 in Bani Nováky, and decommissioning of Vojany and Nováky coal power plants. Also, it states that Slovakia expects a significant decrease in lignite mining after 2023, when support for electricity production from indigenous coal will cease. However, the exact timing of this process is unclear given that the plan reports seemingly contradicting information.⁸ Moreover, the analytical basis and the impact assessment do not seem to integrate these commitments. For instance, the WEM scenario envisages a phase out of mining in 2030 but reports positive CO₂ emissions from coal mining and mining activities until 2040. The phase out of fossil fuel subsidies for coal or biomass from unsustainable sources is mentioned in the plan as part of the Slovak Environment Policy Strategy 2030 (Envirostratégia 2030, Government Resolution No 87/2019). The draft updated plan lists a number of existing fossil fuel subsidies (e.g., various exemptions of excise duty, reduced rates etc) but does not discuss their phase out nor reports a precise timeline.

On 11 March 2020, Slovakia submitted to the Commission its national long-term strategy. The strategy includes the goal of achieving climate neutrality by 2050. Slovakia is currently drafting a climate law which would legally enshrine this goal. In March 2023, Slovakia reported on the progress on its initial NECP, where the climate-neutrality objective was confirmed. This climate-neutrality goal is reiterated in the draft updated NECP.

3.1.2 Adaptation

Slovakia's draft updated NECP does not identify the **relevant climate vulnerabilities and risks** that may threaten the achievement of national objectives, targets and contributions in the five dimensions of the Energy Union. Nor has it put in place policies and measures to address adaptation. Nevertheless, the current national adaptation strategy does support partially the achievement of these objectives, targets and contributions. The adaptation strategy links scenarios and potential impacts of climate change with proposals for appropriate adaptation measures in the broadest possible range of areas and sectors such as energy, forestry and water management, those are relevant for the decarbonisation dimension.

Slovakia identified adaptation goals in its 2019 NECP, where they referred to the national adaptation strategy. The goals were mostly qualitative. Compared with the 2019 NECP and the 2023 NECP report the formulation of adaptation goals has not changed.

⁸ The plan reports two different dates for decommissioning the Vojany plant, 2025 and 2027. But also mentions a commitment by the management of six state-owned heating plants to cease coal combustion from 2023.

The plan includes insufficient information on water and on the resilience of energy systems to structural or seasonal water scarcity although Slovakia relies on nuclear power in its energy mix: the drought and heat can affect the energy production.

Nature-based solutions are described in the draft updated NECP, although actual or expected impacts are not always provided. Slovakia mentions afforestation of non-agricultural land; establishment of fast-growing tree stands on agricultural land; grassing of agricultural land, and sustainable forest management (with existing measures scenario) in relation to Slovakia's rural development programme 2014-2020 (extended to 2022). Slovakia adds afforestation of agricultural land; investments to increase the water retention function of the forest; integrated projects for good practice of close-to-nature forest management; projects for recovery measures in forests (with additional measures scenario) in relation to Rural Development Programme of the Slovak Republic 2023-2027. However, the draft updated NECP does not describe the actual or expected impacts for these measures.

Slovakia's draft updated NECP also includes adaptation measures to be implemented as part of its 2022-2030 National Forestry Programme, to slow down the decay of Slovakia's most vulnerable forests (with additional measures scenario). The National Forestry Programme also aims to maintain vital forests by limiting the negative impacts of climate change through forest adaptation measures (promoting the use of alternative management models to adjust woodland composition, using appropriate provenances). This should also contribute to Slovakia's low-carbon strategy and in particular to the restoration of carbon sinks.

3.1.3 Renewable energy

The renewable-energy contribution proposed by Slovakia in the draft updated NECP is for renewables to achieve a share of 23% of Slovakia's national gross final consumption of energy in 2030. This proposal is based on the WAM scenario. This contribution is significantly below the level of 35% resulting from the formula in Annex II of the Governance Regulation. The scenarios set out in the draft updated NECP are detailed and provide yearly overall renewable-energy contribution trajectories and absolute values in terms of energy up to 2030, but do not include information beyond this period until 2040. The indicative trajectory to reach the 23% contribution in 2030 is provided, including specific reference points for 2022 (a renewables share of 18.2%), 2025 (a renewables share of 19.5%) and 2027 (a renewables share of 20.9%)⁹. The reference point for 2022 reaches the trajectory (16%) calculated in line with the EU 2030 renewable-energy target of 32%. The reference points for 2025 and 2027 (23% and 28% respectively) are below the trajectory calculated in line with the increased EU 2030 renewable-energy target of 42.5%¹⁰.

⁹ Reference points of 18% by 2022, 43% by 2025 and 65% by 2027 pursuant to Article 4(a)(2) of Regulation 2018/1999 pursuant to Article 4(a)(2) of Regulation 2018/1999.

¹⁰ Given that the provisionally agreed RED was not yet in force by the deadline of the submission of the draft NECPs, the value for 2022 has been compared to the trajectory values calculated on the basis of the 2030 EU renewable energy target of 32%. The reference points for 2025 and 2027 are compared to the trajectory calculated on the basis of the increased EU target of 42.5% in line with the revised RED.

The renewable electricity generation is projected to reach 29.5% of all electricity generated in 2030, with hydropower remaining the main source of renewable electricity (1755 MW of installed capacity), followed by solar power (1400 MW of installed capacity compared to 850 MW expected by end of 2023). Bioenergy is expected to account for 400 MW of installed capacity, covering both solid biomass and biogases. Onshore wind power capacity and electricity share are projected to increase significantly from 3.1 MW expected by end of 2023 to 750 MW in 2030. The draft updated NECP does not provide information on Slovakia's **innovative target for renewable-energy deployment**.

The use of renewable energy in the heating and cooling sector is projected to reach a share of 28.3% by 2030. However, the draft updated NECP gives a preliminary indication that Slovakia intends to increase renewable energy in heating and cooling by 1.4 and 1.3 percentage points as an annual average calculated for the periods of 2021 to 2025 and 2026 to 2030 respectively. The role of waste heat and waste cold in the accounting of renewable electricity in the trajectory as well as their impacts on target setting and achievement, remain unclear. Bioenergy will remain dominant providing 1100 ktoe to heating and cooling in 2030, although it is projected to increase by only 3% compared to 2023 because the supply of usable biomass is likely to decline.

Heat pumps will see their gross final consumption of electricity more than double by 2030 compared with 2023, reaching 175 ktoe. However, the electricity needed to run these heat pumps and the projected capacity increase in electricity to run them heat pumps are not included in the draft updated NECP. For **district heating and cooling**, the use of renewable energy is projected to reach 28.3% over the 2021-2030 period. The draft updated NECP does not include targets for the use of renewable energy in **buildings and industry** as required under the revised RED II. No information on the role of waste heat and renewable electricity to account for the calculation was given, nor was any information given on its impacts on target setting and achievement.

In the transport sector, the share of renewable energy is projected to reach 14.7% in 2030 in energy terms. However, Slovakia has not provided the equivalence of the target in GHG emissions reduction by 2030. For Slovakia to reach the transport sub-targets, the main measures proposed in the plan are the promotion of biodiesel consumption to reach 170 ktoe by 2030, followed by bioethanol to reach 80 ktoe in 2030, and biomethane to reach 18 ktoe in 2030. An **advanced biofuel** target was included in the plan, with a share of 1.0% in 2025 and 3.5% in 2030. A target for **renewable fuels of non-biological origin** has not been set and Slovakia's draft updated NECP lacks details on how it intends to limit the share of conventional biofuels. Slovakia's draft updated NECP sets a target of 56,000 electric cars by 2030 in the WAM scenario. The plan contains a number of measures to promote e-mobility, most of which are already existing measures. The action plan for the development of electromobility (of 2023) is the key instrument, aimed at putting in place legislative measures to facilitate permit granting for the installation of recharging points and incentives to support the purchase of electric vehicles. Slovakia has already put in place some incentives to promote the uptake of electric vehicles including, for example, subsidies for new electric vehicles, a reduced car registration fee or exemption from motor vehicle tax. The draft updated NECP indicates that the development of e-mobility will mainly be supported using RRP funds. Biomethane use in transport is to be increased from 0 to 18 ktoe by 2030. No specific information is provided on the implementation of sustainable urban mobility plans based on the proposed TEN-T Regulation and Low-

emission zones / urban vehicle access regulations (UVAR). However, the development of cycling and public transport is defined with specific measures and budgetary allocations.

Slovakia's draft updated NECP does not provide information on the capacity of electrolyzers in 2030, nor does it set out measures for the use of renewable fuels of non-biological origin in demand sectors including transport and industry. For the latter, no target has been set and no information on **international partnerships** to facilitate imports of renewable hydrogen provided.

Slovakia has set out additional **policies and measures** in its draft updated NECP in order to achieve the proposed objectives and contributions for renewable energy. However, the policies and measures for the most part lack sufficient details, particularly as regards their scope, timeframe, and expected impacts. For some policies, such as the decarbonisation of renewable heat production and renewable electricity generation, the draft updated NECP provides estimated investment needs. In the **electricity sector**, Slovakia's draft updated NECP does not mention the promotion of long-term power purchase agreements. It focuses instead on auctions, planned to support an additional 500 MW of renewable energy until 2030. On Guarantees of Origin, Slovakia proposes one legislative measure on biomethane, but does not specify additional measures to improve consumer information on other gases or in electricity. On **joint projects**, Slovakia does not refer to an established framework for cooperation, intending rather to achieve the objectives of the draft updated NECP with domestic measures. The plan states that if the national contribution is overachieved, Slovakia might conclude a statistical transfer.

The draft updated NECP lacks information on measures to accelerate deployment of solar energy in line with the EU's Solar Energy Strategy by simplifying and accelerating permitting procedures for solar energy. The plan considers **individual and collective self-consumption of solar energy and the promotion of renewable-energy communities** as a means of achieving these objectives, however with no significant detail on the actions that will deliver the increase of solar capacities in Slovakia. They will be promoted through the prolongation of the existing green households programme, which supports the purchase of equipment in order to match the pay-back period of the investment and has so far been successful. The plan does not, however, include quantitative targets for self-consumption or the promotion of energy communities.

Slovakia has not indicated in the draft updated NECP whether it has put in place a strategy on **energy system integration**. However, it acknowledges the importance of sectoral integration by laying down a regulatory framework to encourage the aggregation of demand side resources and demand response. The draft updated NECP indicates that Slovakia intends to amend its Energy Act to promote the uptake of storage by facilitating the integration of variable renewables into the grid and promoting the use of local storage systems including EVs. This would increase the overall flexibility of the grid. The development of smart metering systems and smart grids will also be supported through measures such as incentives for electricity system operators to actively monitor the development of metering systems, cost-effectively increase their market penetration, ensure interoperability, and create the conditions for the development of local smart grids.

Slovakia indicates in its draft updated NECP that the construction of new **district heating and cooling systems** using renewable-energy sources (in particular geothermal energy, biomass, biogas, biomethane, solar energy and aerothermal, geothermal and hydrothermal energy used in heat pumps), possibly combined with high-efficiency cogeneration plants,

will make it possible to increase the overall share of renewables in the heating and cooling sector. However, the plan also notes that it will be difficult to integrate cooling technologies and heat pumps into the existing and new district heating infrastructure. Slovakia has already put in place incentives to promote the uptake of **heat pumps** by households and does not announce any new measures to this effect. The draft updated NECP also gives priority to measures promoting renewable-energy use in district heating and cooling systems. They include incentive mechanisms for district heating and cooling system operators to increase the share of renewables in the fuel mix (e.g., by applying a more favourable calculation of a reasonable profit to them), imposing a mandatory amount of renewables or waste heat in centralised heating systems, and the mandatory connection of new buildings to efficient district heating systems using renewables. Measures for the deployment of renewables in **industry** have not been included. Measures to promote the renewable-based electrification of industrial processes to replace fossil fuels for industrial heating with renewable hydrogen and renewable electrification are also not included in Slovakia's draft updated NECP.

The total contribution of **bioenergy** (biogas and biomethane) in the 2023-2030 period is expected to increase considerably in all sectors, including electricity, heating, and transport. The draft updated NECP provides a description of the expected available supply of woody biomass for energy production. The current utilisation rate of available forest fuel biomass resources is estimated at 51% of the usable potential. The supply of secondary woody biomass will depend on the development of domestic processing capacities, the cascading rate of wood, the competitiveness of wood compared with other raw materials and fuel, and energy market developments. Against the reported balances of annual GHG emissions and removals on forest land between 2010 and 2017 by LULUCF categories, Slovakia expects that even a possible increase in the supply of forest fuel biomass should not have a significant negative impact on emission balances and removals by 2030. The analytical base of this assessment was not included (or Slovakia should confirm that it has been made). The plan has not assessed the impact that bioenergy trajectories may have on LULUCF sinks, biodiversity and air quality. The draft updated NECP does not include the assessment of the domestic supply of forest biomass for energy purposes in 2021-2030 in accordance with the strengthened sustainability criteria of the revised REDII, and of the compatibility of the projected use of forest biomass for energy production with Slovakia's obligations under the revised LULUCF Regulation, particularly for 2026-2030. A blending target of **biomethane** with CNG and LNG will be introduced by amending Act No 309/2009 on the promotion of renewable energy sources and high-efficiency cogeneration, aiming to increase the share of biomethane from 2% to 14% in 2030. The draft updated NECP outlines measures that target biomethane as a priority in transport and high-efficiency cogeneration, based on waste from plant and animal production, the biodegradable fraction of municipal waste, biodegradable kitchen and restaurant waste, and waste from wastewater treatment plants.

The draft updated NECP does not include a **mapping of the areas** necessary for its contribution to reaching the EU's renewable-energy target by including the designation of renewables acceleration areas and dedicated infrastructure areas. For the streamlining of administrative procedures and time limits for granting permits, the plan refers to the Slovak Innovation and Energy Agency as a contact point for project promoters. The Agency will set up one or more sites in its four branches to guide applicants throughout the administrative process of applying for a permit and issuing a permit for the construction,

modernisation and operation of renewable-energy installations and the equipment necessary to connect them to the grid. Further measures for streamlining administrative procedures are rather generic, with references to optimising the boundary settings for the environmental impact assessments of renewable-energy projects. Slovakia's draft updated NECP does not elaborate on the additional human resources needed for permitting procedures.

3.2 Energy efficiency (including buildings) dimension

Energy savings are presented as a key pillar of the draft updated NECP, with Slovakia evidently¹¹ targeting a reduction in final energy consumption of 27 ktoe/year until 2030 compared with the 2017-2019 average¹². This corresponds to a corrected national contribution of 15.7 Mtoe for primary energy consumption (compared with 13.6 Mtoe according to the results of the formula in Annex I to the EED recast) and 10.27 Mtoe for final energy consumption (compared with 8.46 Mtoe according to the results of the formula in Annex I to the EED recast). Slovakia's reported 2030 contributions for primary and final energy consumption deviate from the theoretical results stemming from the formula in the EED recast Annex I by 15.3% and 21.4% respectively. The targets for 2030 are set at a lower level than Slovakia's 2020 energy efficiency targets (-4.26% and -1.25% for primary and final energy consumption respectively).¹³

The target on reducing total final energy consumption of all public bodies is not described in the draft updated NECP. No information is included on the exclusion or inclusion of public transport or the armed forces. The renovation target on central government buildings as per Article 5 EED (Article 6 EED recast) on **exemplary role of public bodies' buildings** is not described in detail in the draft updated NECP, but it is part of the 2020 long-term renovation strategy (LTRS). Nevertheless, the draft updated NECP states that Slovakia chose the alternative approach to fulfil the annual target in Article 5 EED (i.e., 52.17 GWh/year).

The plan provides satisfactory information on the measures that will be implemented to deliver the **energy savings obligation** required post-2020 under Article 7 EED (Article 8 EED recast). The total 2021-2030 cumulative energy savings required is 6,137 ktoe according to the Eurostat 'FC_E methodology', and 6,899 ktoe according to Eurostat 'FEC 2020-2030 methodology'. The target has been recalculated based on the increased ambition of the EED recast. Slovakia chose to implement only alternative policy measures to fulfil its energy savings obligation. The largest contribution towards reaching the Article 8 EED recast target is expected to come from industry with 57% of total expected cumulative savings and from buildings with 28% of total expected cumulative savings.

¹¹ Slovakia's draft updated NECP is unclear on the 2030 energy efficiency targets, reporting two sets of targets: the 'realistic' target (based on a 'realistic' scenario) and the 'ambitious' target (based on an 'ambitious' scenario). National contributions are set at the absolute level of primary (realistic scenario: 16.15 Mtoe, ambitious scenario: 15.7 Mtoe) and of final energy consumption (realistic scenario: 10.4 Mtoe, ambitious scenario: 10.27 Mtoe). However, it is not said which targets should be regarded as the official targets. For the purposes of this assessment, it has been tentatively inferred from other sections of the draft updated NECP that the 'ambitious' targets should be regarded as the official targets.

¹² The 2017-2019 average has been calculated based on the EED recast FEC definition, and the savings per year have been calculated for the period 2021-2030.

¹³ The comparison has been made with the 2020 targets as 16.4 Mtoe PEC, 10.4 Mtoe FEC.

The concise list of planned measures for Slovakia to fulfil its energy savings obligation includes the quantification of the annual savings from each measure. However, further details on the measures to achieve the energy savings obligation would help to understand how these measures contribute to the achievement of the national contributions towards reaching the 2030 overall energy efficiency targets.

Slovakia's draft updated NECP presents the planned measures for it to reach the 2030 energy efficiency targets. Most of the policies and measures under the energy-efficiency dimension are sufficiently described and include an appropriate estimation of energy savings. However, in terms of reaching the higher 2030 energy-efficiency targets under **Article 4 EED recast**, it is not clear which measures are counted as part of the WEM scenario and which ones as part of the WAM scenario as only groups of measures, policies and strategies are distinguished, not individual energy-efficiency measures.

Slovakia's draft updated NECP also includes measures reflecting the **'energy efficiency first' principle**. Among them there is a competition to motivate companies to save energy as cost-effectively as possible. Moreover, all policies and measures under the energy security dimension and the internal energy market dimension of the plan are reportedly abiding by the energy efficiency first principle.

The draft updated NECP does not reflect or update the targets of Slovakia's **2020 long-term renovation strategy (LTRS)**, nor recall its key elements. The draft updated NECP contains some new data on the building stock and outlines measures, especially the type of funds and programmes that cover renovation measures for different categories of buildings such as the RRP's 'Renovate your house' target that is complemented by measures in the REPowerEU chapter targeting households at risk of energy poverty. The Slovak National State Housing Development Fund covers multi-apartment buildings, the upcoming Social Climate Fund will be used to renovate the buildings of vulnerable households, and the renovations of public buildings will primarily be financed using EU structural funds and the REPowerEU chapter of the Slovak RRP. Slovakia's draft updated plan does not specify the overall energy savings targeted by these measures, so it is not clear whether they are sufficient for Slovakia to reach the 2020 LTRS targets.

3.3 Energy security dimension

Fossil fuels remain a major part of Slovakia's energy mix, still accounting for 64% of gross available energy in 2021¹⁴. However, this share is expected to decrease to 54% by 2030 and 48% by 2040 according to the data provided with the draft updated NECP. More specifically, Slovakia continues to rely on Russian fossil fuels, and efforts to address this dependency are slow, creating a vulnerability. **Slovakia's dependency on energy imports from non-EU countries** has been roughly stable for the past 10 years, albeit with a slight downward trend, falling from 53% in 2013 to 48% in 2021¹⁵. It is positively noted that the draft updated plan states that Slovakia's main energy priorities are: the security of supply; the diversification of energy sources and transport routes; the promotion of energy storage; and improving the safety and reliability of nuclear power plants.

¹⁴ https://ec.europa.eu/eurostat/databrowser/product/view/nrg_ind_ffgae.

¹⁵ Eurostat data.

Natural gas was Slovakia's largest energy source in 2021 accounting for 26% of the energy mix (against 24% for the EU-27). However, gas accounts for 16% of the electricity mix, which is slightly lower than the EU-27 average of 20%¹⁶. In 2021, Slovakia was dependent on Russian exports for 69% of its gas needs, and in some years, Russia even supplied 100% of the country's gas needs¹⁷. Since the beginning of the war in Ukraine, the Slovak authorities have reduced their consumption of Russian gas considerably. According to the draft updated plan, the state gas company (SPP) is now able to cover around 70% of its customers' consumption from non-Russian sources.

The draft updated NECP features several objectives and measures to further strengthen Slovakia's **security of gas supply**. One of these measures is to increase the fixed transport capacity at the Veľké Zlievce interconnection point (which will enable further diversification of the gas supply), while another measure is to implement the Solidarity Ring project (which will further diversify the gas supply by connecting Slovak key gas infrastructures with those of Hungary, Romania, Bulgaria, Türkiye and gas resources in the Caspian region). Furthermore, the draft updated plan aims to transform Slovakia's gas transmission system, particularly by improving its energy efficiency and enabling the transport of 'blue' hydrogen (either through blending or by repurposing lines).

Slovakia also has some **domestic gas production**, which currently accounts for 2% of the country's annual consumption. The draft updated plan refers to Slovakia's high potential in terms of gas resources and suggests that, pending exploration and mining activities, domestic production of gas could one day reach 10% of domestic energy demands. There are no further details on the exact expected volumes of gas that could eventually be extracted, nor on the expected time horizon. The draft updated NECP also refers to Slovakia's plans to increase its gas-storage capacities, with the planned upgrade of the Veľké Kapušany underground gas-storage facility capacity by 340 bcm (or 4 TWh, which would add to the current 39 TWh capacity). The country's current gas-storage capacity is 3.5 bcm according to the draft updated plan, to which can also be added the 0.65 bcm of the Dolní Bojanovice facility located in Czechia but operated by SPP and used for Slovakia's needs.

Lastly, on renewable gases, the draft updated NECP expects biogas/biomethane to contribute to 1,440 GWh of electricity generation in 2030 (against 95 GWh in 2023) and 100 ktoe of heating and cooling production (against 65 ktoe in 2030). Overall, the draft updated NECP convincingly outlines targets and measures to strengthen Slovakia's security of gas supply.

Slovakia reduced its gas consumption by 14% between August 2022 and August 2023 compared with its average gas consumption of the past 5 years, which falls slightly short of the -15% indicative target and the EU-27's average reduction (-18%)¹⁸. The draft updated plan does not refer to the measures adopted in the framework Council Regulation (EU) 2022/1369 of 5 August 2022 on coordinated demand-reduction measures for gas, nor does it set out any details on how these measures are integrated into the country's medium-

¹⁶ https://energy.ec.europa.eu/data-and-analysis/eu-energy-statistical-pocketbook-and-country-datasheets_en

¹⁷ https://economy-finance.ec.europa.eu/system/files/2023-05/SK_SWD_2023_625_en.pdf.

¹⁸ DG ENER Chief Economist Team based on ESTAT NRG_CB_GASM (sub-series IC_CAL_MG subtracted by TOS) in TJ (as of 29 September 2023, 11:00).

term planning towards 2030. More generally, the draft updated plan does not refer to demand reduction as a way of improving the country's security of gas supply.

Nuclear power is the most important source of **electricity generation** in Slovakia, producing 52% of electricity in 2021. Two nuclear power units at Mochovce NPP are at different completion stages - Unit 3 is undergoing final commissioning tests while Unit 4 is under construction. Once those two new units are fully integrated into the national electricity grid Slovakia will have six nuclear reactors with a total installed capacity of 2,944 MW. The new nuclear units will replace the capacity shortfall caused by the closure of a lignite-fired power plant which will cease operations at the end of 2023. They will also enable Slovakia to produce sufficient electricity for its domestic needs. According to current plans, nuclear energy will remain the largest energy source in the electricity sector in 2050, although it will be complemented by the development of renewable-energy sources. To ensure a continued dominant role for nuclear, Slovakia plans for the long-term operation of existing nuclear reactors as well as the of a new nuclear resource at the Jaslovské Bohunice site ('the NJZ project') construction in 2035, which will have a capacity of 1,200 MWe.

To reduce its dependence on natural gas in the heating sector, Slovakia is planning to make greater use of heat from the Bohunice nuclear power plant and is also considering the use of heat from the Mochovce nuclear power plant and after 2030 possibly heat from SMRs. Slovakia imports 100% of its nuclear fuel and since the beginning of the unjustified and unprovoked Russian invasion of Ukraine, diversification efforts have increased to secure alternatives to the Russian Federation for the supply of nuclear fuel. Slovakia worked closely with Czech and Hungarian energy companies, as well as the Finnish company Fortum, to secure alternative nuclear fuel supplies. So far, a manufacturer in the US and one in France have been identified as potential sources of nuclear fuel. In the perspective of the construction of a new nuclear power unit and the foreseen enlargement of Slovakia's nuclear generation capacity, the draft updated NECP does not report details on further measures to be taken to diversify and address long-term supply of nuclear materials, fuel, as well as spare parts, and services.

Slovakia has 2,542 MWe of installed hydropower, of which 916 MWe are in pumped storage plants. The draft updated NECP hardly assesses the resilience of these installations confronted with climate-related events, like droughts or water scarcity. Electricity from coal has been decreasing for a long time. PV power plants experienced the biggest development between 2011 and 2013, when 530 MWe of installed capacity was commissioned. The draft updated plan does not mention a dedicated strategy or roadmap with measurable targets for the deployment of power storage. The draft updated NECP only sets out plans to achieve a stable level of pumped hydro storage capacity of 916 MW sometime around 2030. According to a study on storage commissioned by the European Commission¹⁹, the main barrier to storage in Slovakia is regulatory, as energy storage

¹⁹ This figure is derived from the database which accompanied the ENTEC study on storage funded by the European Commission and published in November 2022, by taking into account only the 'operational' facilities: https://op.europa.eu/en/publication-detail/-/publication/dfcaa78b-c217-11ed-8912-01aa75ed71a1/language-en?WT_mc_id=Searchresult&WT_ria_c=37085&WT_ria_f=3608&WT_ria_ev=search&WT_URL=https%3A//energy.ec.europa.eu/.

(except pumped hydro) is burdened by capacity and injection fees that over-charge for its usage.

According to the draft updated NECP, the coming decarbonisation of steel production and the future development of some strategic territories will put greater strains on the electric grid in one part of Slovakia. Therefore, the plan highlights the importance of strengthening the country's electricity transmission and distribution capacities with an appropriate structure of electricity generation and storage facilities to ensure both security of supply and the reliable operation of the country's electricity grid.

Oil and oil products represent about 22.7% of the primary energy mix. Slovakia is fully dependent on oil deliveries from the Russian Federation via the Druzhba pipeline. The Russian aggression in Ukraine did not affect oil flows which are covered by oil contracts until 31 December 2029. The Adria pipeline (connecting Croatia, Hungary, and Slovakia) represents an alternative to the Druzhba pipeline. The draft updated NECP notes that although there is limited capacity on the Adria pipeline, it should still be sufficient to meet Slovak demand. According to the draft updated NECP, Slovakia and Ukraine are also exploring the option of using the Druzhba pipeline for non-Russian oil deliveries.

There is one major oil refinery in Slovakia which works in close coordination with another refinery in Hungary. Slovakia holds on average about 100 days of net imports in emergency oil stocks, well above EU requirements for emergency oil stocks. According to the draft updated NECP, Slovakia does not expect a significant decrease in its oil consumption by 2030. The draft updated NECP does not contain detailed information about plans to accelerate the deployment of alternative solutions to Russian oil deliveries in cooperation with Hungary and Croatia. The plan also fails to assess the adequacy of the country's oil infrastructure (oil stocks, refinery capacity, ports, and pipelines) with the expected future oil demand.

Cybersecurity is mentioned in the draft updated plan along with the concept of smart management of the country's electricity system. Cybersecurity is also mentioned in relation to Slovakia's nuclear industry. However, there is no reference in the plan to specific cybersecurity measures or legislation. The draft updated plan fails to address critical infrastructure protection; the resilience of supply chains for critical raw materials; or the impacts of climate change on energy infrastructure (which could be particularly relevant for hydropower or nuclear outputs).

The draft updated plan does not describe measures that Slovakia will take in the event of **a security of supply crisis for natural gas** and does not refer to either its emergency plan or the preventive action plan in this area (which were submitted to the European Commission in October, and which are currently being assessed). Slovakia has also not submitted its updated national risk assessment nor its common risk assessment for the north-eastern risk group, both of which were due by 1 October 2022.

3.4 Internal energy market dimension

The draft updated NECP confirms that Slovakia's 2030 **interconnectivity target** has already been reached and the interconnectivity level is not expected to fall below 15% even in the case of a high increase in connections of new renewable-energy sources. This is particularly relevant considering the country's ambition for renewables to account for 23% of national gross final consumption of energy by 2030 and the importance of available

capacity in neighbouring Member States to ensure electricity demand is met, in particular during periods of scarcity in its electricity system requiring imports.

As regards **infrastructure developments**, the implementation of two projects of common interest (PCI) on cross-border smart grid will play an important role in the grid modernisation: ACON between Slovakia and the Czech Republic and the Danube InGrid between Slovakia and Hungary. For natural gas, following the completion of the interconnector between Slovakia and Poland, no major projects are set out in the REPowerEU Plan or in Slovakia's lists for PCI.

The draft updated NECP also provides information on infrastructure investments that Slovakia will need to make to enable the penetration of **hydrogen** to its energy market. Key hydrogen projects in which Slovakia is involved include the Central European Hydrogen Corridor connecting Ukraine to European demand areas; a new Slovakia-Hungary interconnection; and plans to repurpose hydrogen transport infrastructure in Slovakia. The blending projects aiming at increasing hydrogen content in the natural gas transmission network will have limited impact in terms of GHG emissions reductions and are not in line with the EU Hydrogen Strategy²⁰.

In light of the need to facilitate the penetration of renewable energy into the energy system, the plan does not include additional policies and measures to enhance flexibility and enable a non-discriminatory participation of new flexibility services. The draft updated NECP also fails to elaborate on the quantification of flexibility needs and fails to set clear targets and objectives for demand response, storage, and flexibility.

The draft updated plan states that all the requirements of the EU's Clean Energy Package were transposed into Slovak law by July 2022, including provisions on aggregation and flexibility. The plan indicates that several of these new activities such as aggregation of demand response, electricity sharing from renewable energy communities and active consumers, are all relying on centrally adjusted data flows. However, the absence of energy data centres constitutes a barrier for the uptake of these services and will therefore be created under Slovakia's RRP.

Furthermore, Slovakia's draft updated NECP explains that following the selective roll-out of smart meters for consumers with an annual electricity consumption of over 4 MWh, the Ministry of the Economy, in cooperation with the Office for the Regulation of Network Industries (ÚRSO), is currently preparing an analysis to determine the criteria and timetable for further roll-out.

In response to high energy prices, Slovakia adopted **extraordinary measures** to reduce the impact of the increase in electricity prices on selected groups of customers in 2023. The affected customers were mostly vulnerable electricity and gas customers, small household customers, and some non-household customers, and the aid was given pursuant to Council Regulation (EU) 2022/1854. The draft updated NECP states that the legislation on price regulation in the electricity market and the exceptional government measures are in line with the Electricity Directive as well as with Council Regulation (EU) 2022/1854.

²⁰ EU strategy on hydrogen (COM/2020/301):
<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0301>

On energy poverty, the draft updated NECP mentions several national programmes and strategies. Slovakia is currently in the process of defining energy poverty. The country's Office for the Regulation of Network Industries (ÚRSO) prepared a concept to protect customers in energy poverty in 2022 and set up a cross-ministerial working group in 2023 to work on energy poverty definition and relevant measures. Several recommendations on possible affordability instruments and structural instruments to address energy poverty are described in the draft updated NECP. These instruments include price regulation, reduced VAT on energy or renovations, support to energy efficiency measures and renewable energy sources, involving local and regional authorities, creating one-stop-shops to address the problem of energy poverty, payment schedules and energy advice for vulnerable consumers, bans on disconnection during wintertime etc. However, these possible instruments are yet to be assessed by the cross-ministerial working group. Electricity and gas prices for vulnerable customers are currently regulated and the draft updated NECP does not clearly describe the impacts of the gradual deregulation that Slovakia has planned for the energy market. In addition, the draft updated NECP provides insufficient details on the timeline for setting a target to reduce energy poverty in Slovakia and the implementation of possible measures to reduce energy poverty.

It could also explore in greater detail synergies with measures to develop demand response, accelerate building renovations and energy savings, promote energy communities, and engage stakeholders at various levels in a targeted manner so that vulnerable consumers and households in energy poverty can profit of them. In particular, the draft updated NECP acknowledges that there is a need to improve programmes to support housing renovations for vulnerable groups and to ensure that vulnerable consumers and households in energy poverty also have access to these programmes. Some steps in the direction of structural measures for people in energy poverty have been taken through Slovakia's RRP and the REPowerEU chapter.

3.5 Research, innovation, competitiveness and skills dimension

3.5.1 Research and innovation

Slovakia's draft updated NECP reports on the national focus areas for R&I in specific clean energy technologies. There are seven focus areas, including the development of new energy transmission systems, storage solutions, hydrogen, and technologies to increase energy efficiency and reduce energy intensity as well as new generation of nuclear reactors. Overall, Slovakia intends to put greater emphasis on supporting applied research. The focus areas are set by Slovakia's R&I strategy for smart specialisation for 2021-2027 and the national research, development, and innovation strategy 2030. However, the draft updated NECP does not provide concrete quantified targets in each focus area, nor clear timelines and associated funding to achieve the objectives.

Regarding funding of R&I activities, Slovakia specifies that the indicative budget for energy R&I amounts to EUR 87,525 million between 2024-2028. The plan does not specify the share of the funding in its overall R&I budget related to clean energy technologies, nor the contribution of private funding. While the plan details the overall R&I spending over recent years (2019-2023) it does not set annual spending targets for the medium-to-long term towards 2030 and 2050. Slovakia reports that private R&I funding is generally low. Therefore, the country plans to update its Entrepreneurial Discovery Process in 2024. The revision will take into account changing regional and global trends

and societal, economic and environmental developments. Slovakia's draft updated NECP does not set a concrete ambition for R&I in clean energy technologies for 2030 and 2050, but it does mention that the work on pathways for 2050 R&I objectives is ongoing.

Slovakia is active within various European and international cooperation frameworks related to R&I. The draft updated NECP highlights in particular Euratom, Horizon Europe, European Joint Undertaking Fusion4Energy, ITER project and the IEA's Solar Heating and Cooling Program. Within the SET Plan activities, Slovakia mentions its involvement in the Allegro project in the field of nuclear energy with Hungary, Czechia, and France. However, the draft updated NECP does not elaborate on the potential for future cooperation, nor on the concrete objectives that the country would like to achieve through its international R&I involvement. While hydrogen was identified as one of the new Slovak focus areas, the plan did not provide information related to the potential new SET Plan hydrogen activities and other pan-European fora.

The research in nuclear energy is focussed on nuclear safety and spent fuel management and disposal. Research and development activities on the continued release of materials from nuclear decommissioning are also conducted. Slovak organisations are expected to become more involved in developing new nuclear reactors, including in those with the potential to produce hydrogen.

3.5.2 Competitiveness

Slovakia's ambition in the area of competitiveness is to 'promote value-added investment, with a focus on business research and innovation.' Slovakia acknowledges that the low share of public investment, which should be made in addition to the European Structural and Investment Funds is limiting, and that Slovak clean energy technology manufacturing is undercapitalised. Slovakia has therefore put in place a compensation scheme to reduce the costs for electricity-intensive businesses. The plan does not set out additional measures or investments intended to support manufacturing and scaling-up of commercially available clean energy technologies, equipment and components and ensure the resilience of its supply chains to reach the climate and energy targets.

In its 2019 NECP, Slovakia already recognised the potential of the circular economy to reduce GHG emissions. Key sectors were mentioned in the 2019 NECP, but concrete measures were not defined. The draft updated NECP clearly establishes a strong role for circular economy to reduce GHG emissions and support energy efficiency and security. According to the plan, the circular economy is of particular importance during the earlier stages of the product lifetime (i.e., from design), for consumption patterns and in the higher part of the waste hierarchy (notably reuse). The plan also identifies key sectors that have a high climate impact and a high circular economy potential. However, the NECP does not propose concrete actions for the circular economy, beyond waste management. In addition, the plan does not integrate the circular economy in its climate models.

The plan provides information related to the Digitalisation of Energy System EU Action Plan. The Slovakian RRP and the REPowerEU chapter include a dedicated investment in the modernisation and digitalisation of the transmission system and regional distribution networks (EUR 133 million allocated). Such investment will be channelled into a digital data platform on the energy performance of the building stock, and into the digitalisation of the country's economy through Component 9 "More efficient governance and strengthening R&D&I funding". Slovakia already advanced with the so-called ACON

project in collaboration with Czechia, which will contribute to the digitalisation of the Slovak distribution system and offer new technological solutions to network users. Slovakia is also planning to focus on the digitalisation and automation of transport as the basis for the development of intelligent transport systems, as well as on digital security and cybersecurity of nuclear power plants. Finally, Slovakia plans to benefit from the Digital Europe Programme. The draft updated NECP does not, however, set quantitative targets on the digitalisation of its energy system.

3.5.3 Skills

The Slovak draft updated NECP identified two strategic focus areas for skills development, namely nuclear engineering and hydrogen related activities. Nuclear engineering was specifically mentioned as being an overall priority area for Slovakia, particularly in relation to the planned construction of small nuclear reactors. To increase the number of experts in this strategic field, the state is planning to cooperate with Slovak universities and the private sector. On hydrogen related activities, Slovakia plans to promote knowledge transfer through vocational education at secondary and tertiary level, as well as in dual (schools and workplaces) and lifelong learning systems.

Slovakia's draft updated NECP does not elaborate on the source of financing related to the identified skills to develop nor on concrete targets for skills. The plan did not connect its efforts to, e.g., relevant European Year of Skills initiatives, the large-scale partnerships under the Pact for Skills or the new innovation agenda.

4 JUST TRANSITION

The draft updated NECP addresses just transition aspects in a very limited manner. It includes limited analysis of the social, employment and skills impacts of the energy and climate transition on different actors, industries, and regions, and of the distributional impacts on vulnerable groups. Furthermore, the plan provides inadequate analytical basis for the preparation of the Social Climate Plan (SCP), as assessed in Chapter 7.

Measures addressing access to employment and to affordable and inclusive education, training and life-long learning are not set out in detail. The plan only mentions that state aid schemes are planned to address the adverse impacts of the transition and that an action plan has been put in place to help transform the coal region of Upper Nitra. However, although the NECP refers to Slovakia's commitment to phase out coal mining and combustion in the energy sector by 2023, by closing the Bani Nováky mines and reducing coal use by decommissioning the Vojany and Nováky coal power plants in 2025 and 2023 respectively, the dates differ across the document.²¹ In addition, the analytical basis and the impact assessment do not seem to integrate these commitments. The consequences of this inconsistency on measures supporting the transition away from coal financed from the just transition fund (JTF) are unclear.

The draft updated plan does not elaborate on social aspects in a comprehensive way and focuses mostly on actions and measures addressing energy poverty. As assessed in Chapter

²¹ The draft updated NECP provides two different dates for decommissioning the Vojany plant (2025 and 2027), so it is not clear when the phase out of electricity generation from coal will take place.

3, this is still work in progress and targeted measures to address vulnerable customers and households in energy poverty are currently mostly of an ad hoc nature.

Finally, the draft updated plan does not elaborate in detail on how the various resources will be used to support a just transition.

5 REGIONAL COOPERATION

The draft updated NECP highlights regional cooperation in the Central and South-Eastern Europe Energy Connectivity group (CESEC group) on energy security, infrastructure developments and market integration for natural gas. However, Slovakia is no longer a member of the group. Hence the draft updated NECP does not refer to the joint initiatives and projects discussed within this group, which are related to emerging collaboration on hydrogen infrastructure development and on deployment of renewables in the region and related grid enhancement.

The plan refers to initiatives related to the diversification and security of supply, such as the Solidarity Ring project and two Projects of Common Interest with Czechia and Hungary. However, the draft updated NECP does not contain measures or initiatives set under some of the available cooperation mechanisms in the area of renewables and infrastructure, such as those deriving from regional fora, like the political High-Level Groups²². Moreover, Slovakia did not sign any solidarity agreement for security of gas supply with its neighbours, despite being required to sign four (with Austria, Czechia, Hungary, and Poland). The draft updated NECP does not envisage any improvement of the situation.

6 INTERNAL COHERENCE AND POLICY INTERACTIONS WITHIN THE DRAFT UPDATED NECP

The draft updated NECP reflects key synergies within and between the five dimensions of the Energy Union. Slovakia's priority in the energy sector is to ensure consistency between sub-policies, cost-effectiveness, the promotion of the principles of sovereignty in the energy mix, the preservation of competitiveness and energy security. In this context, Slovakia considers the replacement of high-emission energy sources with low-emissions sources, as well as developing renewable-energy sources and rolling out energy-efficiency measure, as a means of achieving the emission targets.

However, the draft updated NECP does not provide a sufficiently detailed analysis of consistency of policies and measures in each dimension and a quantitative analysis of interactions of certain objectives.

²² Four high level groups have been set up by the European Commission to provide strategic steering and policy guidance on regulatory and infrastructure development and to monitor progress of projects of common interest in priority regions. They include: The North Seas Energy Cooperation (NSEC); Interconnections for South-West Europe; Baltic Energy Market Interconnection Plan (BEMIP); Central and South Eastern Europe energy connectivity (CESEC).

7 STRATEGIC ALIGNMENT WITH OTHER PLANNING INSTRUMENTS

Slovakia formally submitted a modified RRP and REPowerEU chapter on 26 April 2023. The modified RRP and REPowerEU chapter was approved by Council on 14 July 2023. The draft updated NECP refers to the main reforms and investments of the modified RRP. In some cases, the consistency between the draft updated NECP and RRP is only vague. The draft updated NECP includes or refers to 41 out of the 74 climate-relevant measures in the RRP (of the 74 climate-relevant measures, 38 have 40% climate-tagging, and 39 have 100% climate-tagging) covering 27 RRP investments.

Slovakia refers to REPowerEU chapter as one of the financial tools contributing to the achievement of the targets set out in the draft updated NECP. Notably, the draft updated NECP accounts for Reform 2, tackling the integration of renewables into the electricity grid. In terms of investments, the draft updated NECP refers to Investment 1 of the REPowerEU chapter, focusing on refurbishment of transmission grids, and investments in an electricity data centre. Additionally, the draft updated NECP tackles investments 2, 3 and 4, which aim to renovate single-family homes, energy poor households, increase renovation of public buildings, as well as provide quick energy efficiency fixes such as installation of smart metering. The draft updated NECP also discusses top-up investments 5 and 6 for deployment of zero-emission public transport and infrastructure, notably by increasing tram and multiple electric units, as well as 10km of electric trolleybus lines.

Overall, 14 measures among those that are 100%-climate tagged are poorly or not reflected in the draft updated NECP. The most significant missing measures concern the adaptation of the electricity legal framework (SK-C[C1]-R[R1]) and the renovation of historical and listed public buildings (SK-C[C2]-I[I2]). In addition, some of the measures reflected in the draft updated NECP lack the necessary granularity and detail to allow for a full comparison with those in the RRP. This is for example the case for measures referring to a stronger support to renewable energy installations.

The draft updated NECP's alignment with the **national air pollution control programmes** is unclear. The plan refers to clean air strategies and policies, without linking them to the NECP update. For some policies and measures, the plan mentions clean air co-benefits. However, air quality aspects are insufficiently addressed. In particular, information on the impacts of planned policies and measures on projected emissions of the main air pollutants regulated under Directive 2016/2284 is missing (according to the plan, modelling work is ongoing in cooperation with the World Bank).

The draft updated NECP is partially consistent with the **Territorial Just Transition Plan (TJTP)**. The plan is not completely and thoroughly updated and contains some outdated or misleading information.²³ The plan also shows limited ambition in supporting construction of new renewable installations, especially solar ones. Slovakia argues that the grid is not sufficiently flexible and has insufficient balancing capacity to connect more

²³ For instance, the date of decommissioning the Vojany power plant is not consistently reported throughout the text; the information related to the Novaky power plant does not seem correct, as it still provides heating for surrounding municipalities, etc.

unstable renewables like solar. Slovakia plans to compensate with production from nuclear which is also climate neutral, but cannot be considered as renewable.

The draft updated NECP provides inadequate analytical basis for the preparation of the **Social Climate Plan (SCP)** that will address the impacts of the new emissions trading system for fuel combustion in buildings, road transport and additional sectors (ETS2) on vulnerable households, transport users and micro enterprises. The draft updated NECP does not explain how the policy framework it identifies will contribute to the preparation of the SCP. Measures are not planned for the identification of transport poverty, nor are reduction targets mentioned. The plan also outlines a policy framework for buildings and road transport, which is relevant for the future SCP. Unfortunately, no information is included on the governance of the social climate fund. The projected evolution of energy savings in the buildings sector, including from renovation of multi-apartment and single-family houses is analysed in three scenarios taking into account the contributions of the social climate fund and the recovery and resilience facility. However, the plan does not provide the related impact analysis on the vulnerable groups supported by the fund. Thus, the current draft does not explain how the SCP will build on the NECP update and how consistency between the two plans will be ensured.

The draft updated plan is partially consistent with the specific objectives in the **ESF+ programme**. The inconsistencies refer to possible double funding for educational programmes planned under LIFE IP, targeting students and pupils as well as knowledge transfer from the market environment to VET schools. At the same time, educational programmes, training, and leisure activities for increasing environmental literacy for all pupils are planned under Priority ESO 4.5 (ESF+) in Programme Slovakia 2021-27 (PSK). The draft updated plan does not explain how the ESF+ contributes to achieve the objectives, targets and contributions.

In the draft updated NECP, Slovakia does not provide the quantification of the climate impacts of measures currently included in the **CAP Strategic Plan (CSP)**, thus the plan does not explain whether the CSP is in line with the new LULUCF and ESR targets and whether additional measures are necessary.

Compared to the current **national adaptation strategy**, the plan is less detailed and less ambitious on the respective actions.

In the draft updated NECP, **Slovakia addresses the 2022 and 2023 country-specific recommendations** to enhance diversification and reduce dependency on fossil fuels. The plan includes actions such as shortening and simplifying permitting procedures to accelerate the deployment of renewables. It also shows effort on energy efficiency, including for manufacturing processes and decarbonisation of industry.

8 FINANCING THE ENERGY AND CLIMATE TRANSITIONS

8.1 Investment needs

The draft updated NECP does not update the analysis of investment needs and funding sources as compared to the 2019 NECP. The plan includes only partial information on the expected investment necessary to implement the planned policies and measures. Although it includes very detailed information on the expected investment needs in certain sectors (industry and transport) and for a selection of planned policies and measures, these are

generally based on the 2019 NECP. Furthermore, the plan lacks an overview of the total investment needs, and a comprehensive breakdown into the high-level energy segments.

8.2 Funding sources

The draft updated NECP describes the main sources of financing used to implement the planned key policies and measures on an aggregated level, including the use of both national and EU funding programmes. However, the plan does not provide a systematic attribution of funding sources and resources to specific policies and measures or to specific investment needs (as these are not fully provided). There is no overview table gathering all the budgetary information of the different policies and measures.

The contribution of the recovery and resilience facility is not fully reflected in the draft NECP as some RRP measures are missing. Furthermore, the plan does not provide a quantitative indication of the contribution of the recovery and resilience facility to the expected public financing needs to implement the policies and measures of the draft updated NECP.

9 ROBUSTNESS OF THE ANALYTICAL BASIS OF THE DRAFT UPDATED NECP

The draft updated NECP is based on an extensive quantitative analysis, and most of the required elements are addressed. However, the assessment of the current situation, in terms of macroeconomic, energy and climate indicators, is based on rather outdated information (2020 as last vintage). The plan describes both a WEM and a WAM scenario. However, the methodologies and the analysis for both projections and the impact assessment of policies are not explained in a clear way. For instance, the WAM projections for industrial processes and LULUCF reported in the analytical basis section do not seem to match the ones reported in the impact assessment section.

The projections cover the most relevant sectors of the economy, including industry, the energy system and transport, for the period until 2040 or 2050, depending on the variables. However, the scenarios cover only partially the 5 dimensions of the Energy Union. More specifically, for the decarbonisation dimension, the section describing the analytical basis does not provide updated details on the ESR, making it impossible to assess whether and how Slovakia will respect the mandatory targets, or if it will reach climate neutrality by 2050. One of the annexes to the plan includes projections up to 2040 for different variables. However, the projections are outdated.

The description of the WAM scenario is not clear. In the impact assessment section, the plan refers to the EU CO₂ scenario and to outdated targets that do not take into account the Fit for 55 package. The new ETS for buildings, road transport and additional sectors (ETS 2) has been considered in the plan but not in projection scenarios.

The plan includes a detailed description of the modelling tools, with the Compact PRIMES model used for energy system modelling and the GEM-E3 for macro-economic valuations. The plan uses a mix of data sources, including Eurostat and national (statistical or ministerial) sources. Slovakia does not use the latest set of Commission's recommended parameters for reporting on GHG projections, but rather relies on an updated set of 2017 values. Slovakia did not use the voluntary template for both scenarios. Moreover, the

sources for key input parameters (Annex I Part 2) of the Governance Regulation do not seem available.

The draft updated NECP also includes a macro-economic assessment. It presents a useful breakdowns of GDP growth and impact on consumption, real wages, employment and budget balance up to 2050. However, the assessment does not seem to include any significant changes linked to the 2023 National Energy and Climate Plan revision, as its outcomes and analytical parts are the same as in the original plan from 2019. Some key transmission channels and assumptions explaining the effects of different components of the national account (e.g., net exports) are not presented. The methodology used in the macro-economic assessment is described rather synthetically. The plan also assesses the impact on public budget, assuming that increases in public spending will be funded by new tax measures or the reduction of transfers, leading to a broadly neutral overall impact on the budget balance. However, the characteristics and scale of the expected tax increases or transfer reduction are not presented. Lastly, the plan does not include an in-depth analytical assessment of policy interactions.