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COMMISSION STAFF WORKING DOCUMENT

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

Accompanying the document

COMMISSION RECOMMENDATION

on the draft updated integrated national energy and climate plan of Sweden covering the period 2021-2030 and on the consistency of Sweden'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 to set more ambitious energy and climate objectives, with a strong focus on the diversification of energy supplies. These developments are reflected in the legislative framework adopted under the Fit for 55 package and the REPowerEU plan.

Sweden’s draft updated national energy and climate plan (‘the draft updated NECP’ or ‘the plan’), submitted on 11 July 2023, partially takes into account this new geopolitical and legislative context.

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

		2020	Progress based on latest available data	2030 national target and contributions	Assessment of 2030 ambition level
	Binding target for greenhouse gas (GHG) emissions compared to 2005 under the Effort Sharing Regulation (ESR) (%)		2021: -32.6% 2022: -36.4% ¹	-50%	NECP: No ESR projections included. NECPR: -61.9%
	Binding target for net GHG removals under the Regulation on Land Use, Land Use Change and Forestry (LULUCF)		Reported net removals of -41.71 Mt CO ₂ eq. in 2021 and reported approximated net removals of -41.72 Mt CO ₂ eq. in 2022	- 3 955 kt CO ₂ eq. (additional removal target) - 47 321kt CO ₂ eq. (total net removals)	Insufficient ambition, not reaching the target.
	National target/contribution for renewable energy: Share of energy from renewable sources in gross final consumption of energy (%)	60.1% (SHARES) 49% (target)	62,2%	65%	SE contribution of 65% is significantly below the 76% required according to the formula set out in Annex II to the Governance Regulation
	National contribution to energy efficiency:				
	Primary energy consumption	43 400 ktoe	43 500 ktoe	40,410 ktoe (calculated from the target reported in terms of energy)	SE primary energy consumption contribution is 40 410 ktoe. EED recast Annex I

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.

				intensity reduction by 2030)	formula results: 35 424 ktoe
	Final energy consumption	30 300 ktoe	31 684 ktoe	29 830 ktoe (calculated from the target reported in terms of energy intensity reduction by 2030)	SE final energy consumption contribution is 29 830 ktoe. EED recast Annex I formula results: 25 100 ktoe
	Level of electricity interconnectivity (%)	24.2%	12.8%	15% ²	

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

1.2 Summary of the main observations³

Sweden's draft updated NECP refers to the revised energy and climate targets recently agreed under the 'Fit for 55' package and the REPowerEU Plan but does not elaborate on how these targets will be reached. As detailed information on existing policies and measures is missing, and planned additional measures are mostly not included, it is not possible to perform a comprehensive assessment of the plan's level of ambition and its overall coherence.

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 Sweden is on track to meet its national greenhouse gas target of -50% in 2030 compared to 2005 levels. However, according to Sweden's projections submitted in March 2023, Sweden is on track to overachieve its target with existing policies and measures by 11.9 percentage points.

On the regulation on **Land Use, Land Use Change and Forestry (LULUCF)**⁴, the draft updated projections in the plan indicate that Sweden 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. 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

² Calculated by the European Commission based on the ENTSO-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. The 2020 figure covers also interconnectors with the neighbouring countries outside the EU.

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).

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 any geological CO₂ storage capacity. No details on CO₂ transport are provided.

The draft updated NECP reflects **partial progress towards international commitments under the Paris Agreement**. While Sweden is already coal free in the power sector, the draft updated plan does not include any information on phasing out of the existing fossil fuel subsidies.

On adaptation to climate change, the draft updated NECP does not contain adequate analysis of the relevant climate vulnerabilities and risks for the achievement of the national objectives, targets, and contributions and the policies and measures in 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. Adaptation policies and measures, to support Sweden'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 instance, nature-based solutions and the preservation, protection and restoration of forests and other ecosystems, contributing to their resilience, are not sufficiently outlined in the plan.

For renewable energy, the draft updated NECP puts forward a contribution to the overall EU target of 65% of renewables in the country's gross final energy consumption by 2030 also notified in its 2019 NECP. This is significantly below the share of 76% resulting from the formula in Annex II of the Regulation (EU) 2018/1999 on the Governance Regulation of the Energy Union and Climate Action ("Governance Regulation"). The plan includes indicative trajectories for renewables in the electricity, transport and heating and cooling sectors. However, the draft updated plan does not clearly include the share of renewable energy sources in industry and buildings and sectoral targets such as for renewable fuels of non-biological origin (RFNBO). At the same time, Sweden's plan only includes existing policies and measures (based on "with-existing-measures" (WEM)) notably to address permitting for both wind and solar energy, regional cooperation and e-mobility, while indicating that the final updated plan will reflect Directive (EU) 2018/2001 on the use of energy from renewable sources as amended by Directive (EU) 2023/2413 ("revised REDII").

Energy efficiency is not a key pillar in the Swedish draft updated NECP. The plan expresses Sweden's energy efficiency ambition in terms of improved energy intensity by 50% compared to 2005 levels, which does not take into consideration the increased ambition in Directive (EU) 2023/1791 on energy efficiency and amending Regulation (EU) 2023/955⁵ ('EED recast'). The **energy efficiency first principle** is not mentioned in the plan. Furthermore, the draft updated NECP mainly includes existing measures. Only two additional measures are described as compared to the 2019 NECP. The ambition of these two measures cannot be compared due to missing information about their quantified impacts and financing. Overall, the contribution of Sweden does not seem to consider the

⁵ OJ L 231

need to increase efforts at the EU level to collectively reach the Union's 2030 energy efficiency targets.

On buildings, the draft updated NECP does not set out more ambitious targets than those included in the Swedish 2020 long-term renovation strategy (LTRS) but only recalls some of its elements. The plan predominantly includes measures already implemented. Existing barriers for the implementation of the LTRS are not mentioned in the draft updated NECP.

On the energy security dimension, the draft updated NECP is not sufficiently detailed about the envisaged targets, policies and measures to enhance the security of Sweden's energy system. Sweden has indicated that due to recent changes in government policies, several elements in the draft updated NECP will be updated in the final plan. Specifically in the **gas sector**, the plan does not provide sufficient information on Sweden's current security of supply situation or planned measures. For the **electricity sector**, the ambitious timeline foreseen by Sweden for the roll-out of low-carbon sources is positively noted. The plan does not, however, include a target for energy storage. As regards the **oil sector**, the plan does not assess the adequacy of Sweden's oil infrastructure in the long run (refinery, oil stocks), particularly in light of the expected decline in oil demand.

With regards to the **internal energy market dimension**, the draft updated plan emphasises the integrated nature of the EU electricity market and Sweden's role in the Nordic region. Sweden is highly interconnected, reporting an electricity interconnection level of 23% in 2021, exceeding the 15% interconnectivity target. However, the interconnection level is expected to decrease with the expansion of renewables. While the draft updated plan mentions the need to improve tradeable capacities on interconnectors, it does not provide clarity on the actions that will be taken to develop new interconnectors beyond 2027.

In addition, Sweden has rules on the non-discriminatory participation of flexibility and storage, though no dedicated targets are provided. The draft updated plan outlines challenges for future resource adequacy related to an expected increase in electricity demand and changing patterns of electricity flows in the Nordic region. The plan refers to the ongoing work by the Transmission System Operator ("TSO") to design a capacity mechanism to address these risks.

On energy poverty, the draft updated NECP lacks details both in terms of assessment, and in terms of objectives, policies, and measures, as Sweden indicates it has decided to tackle this issue through its general social and welfare policy. Some information is however provided on financial support schemes for electricity and natural gas bills in the context of the energy crisis.

The Swedish draft updated plan describes the state of play of the **research, innovation, competitiveness, and skills** dimension, but provides little quantitative information on targets, investments and trends for research and innovation (R&I) in clean energy technologies towards 2030 and 2050. The plan indicates that Sweden has a good regional cooperation in R&I. The draft updated NECP does not provide information about the investments needed for the manufacturing of commercially available clean energy technologies, equipment and components. There is also a lack of information on how Sweden will ensure the resilience of its supply chains to reach its climate and energy targets. The draft updated NECP does not include detailed information on funding for upskilling and reskilling of workers, digitalisation of the energy system, and the circular economy.

Just transition is addressed in a very limited manner in the draft updated NECP. The plan contains little information on the social, employment and skills impacts of the climate and energy transition, including distributional impacts. The plan is largely lacking employment and skills policies and measures to support a just transition, except for references to upskilling/reskilling measures in the Territorial Just Transition Plans. Social policies are carried out as part of the general welfare policy, on which limited information is provided. Except for the Just Transition Fund, the plan does not detail the resources dedicated for supporting a just transition. Finally, the plan does not provide sufficient information for the preparation of the Social Climate Plan and on how the consistency of the two plans would be ensured.

On its strategic alignment with other planning tools, the draft updated NECP does not refer to the role of Sweden's RRP and the new REPowerEU chapter. The plan does not explain on how the RRP's reforms and investments will contribute to the NECP and vice-versa. Furthermore, the Swedish draft updated NECP addresses that work is carried out by Sweden which is partly aligned with the latest **European Semester Country Specific Recommendations (CSRs)** and partly reflects the challenges to be addressed by the country. The draft plan is, however, not explicit in its descriptions of the work on the CSRs.

The draft updated plan provides only partial information on the **investment needs and funding sources** for the policies and measures included in the plan, not quantifying or distinguishing sources of funding, which makes it difficult to assess the potential funding gap. The **analytical base** of the draft updated plan includes only the with-existing-measures ("WEM") scenario. Moreover, some methodologies are not sufficiently detailed. There is no macro-economic assessment, which under the Governance Regulation is a mandatory requirement.

2 PREPARATION AND SUBMISSION OF THE DRAFT UPDATED NECP

2.1 Process and structure

The draft updated NECP was submitted on 11 July 2023. It follows the structure provided in Annex I of the Governance Regulation and is underpinned by an analytical basis. While the plan covers all five dimensions of the Energy Union, it is generally not well developed and does not always include objectives, targets, contributions, and measures across the different dimensions. The draft updated NECP announces an impact assessment for the forthcoming Climate Policy Action Plan, but it is unclear whether it refers to a Strategic Environmental Assessment (SEA) and if it will cover all the measures proposed in the draft updated NECP.

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

The draft updated NECP provides evidence that, in line with the whole-of-government approach, Sweden reached out and worked together with all relevant authorities to update the plan taking into account synergies and trade-offs across different portfolios. In addition, Sweden has established a multilevel climate and energy dialogue in the format of the "Fossil Free Sweden" initiative which gathers representatives from industry,

municipalities and regions, as well as civil society organisations. Fossil Free Sweden is tasked with presenting concrete measures to reduce emissions, for instance by developing and implementing so-called "fossil-free competitiveness roadmaps".

Sweden is involving cities and **local authorities**, along with other stakeholders, in the update of the NECP, including through seminars, workshop and consultations. Municipalities and regions have a significant role in the implementation of several measures and plans included in the draft updated NECP. They are involved in the provision of municipal energy and climate advice, research projects, conclusion of urban environment agreements, public procurement, exchange of information, renewable energy projects, energy efficiency, environmental assessment and monitoring, development of regional climate strategies and roadmaps, and climate and energy initiatives.

2.2 Public consultation

No specific public consultation was organised in the context of the NECP update, as required by the Governance Regulation. However, Sweden indicates that the policy objectives and instruments described in the plan have been subject to the regular national consultation procedure. The plan does not provide any indication on the interest groups consulted, including the involvement of social partners, nor on the time frame and format of these consultations. Furthermore, it does not explain how the opinions expressed in the context of the consultations were considered and addressed or why they were not taken on board.

A consultation on the final updated plan is planned in autumn 2023 on the basis of the notified draft.

2.3 Regional consultations for preparing the draft updated NECP

Sweden plans to share the draft updated NECP for comments with Denmark, Finland and Norway in view of its finalisation.

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 draft updated NECP recognises the increased climate targets included in the ESR and the LULUCF Regulation, as part of the 'Fit for 55' legislative package but embeds them only partially.

Sweden has committed to achieve climate neutrality by 2045. In the draft updated plan, WEM projections for total GHG emissions are done up to 2040 and there are no WAM projections. Projections submitted in March 2023 under Art. 18 of the Governance Regulation show net GHG emissions (i.e., including LULUCF and excluding international aviation) of -24 million tonnes of CO₂ equivalent (CO₂ eq.) by 2050 based on existing

measures.⁶ This is equivalent to a projected reduction in 2050 of 197% compared to 1990. Despite the commitment to achieve climate neutrality by 2045, the information provided in the draft updated plan does not allow for a full assessment as to whether progress by Sweden is consistent with the achievement of the EU climate-neutrality objective. However, based on all the available information, progress by Sweden is likely to be consistent with the achievement of the EU climate-neutrality objective.

It is not possible to fully assess the level of Sweden’s ambition based on the draft updated plan. The **ESR** sets Sweden’s 2030 emissions reduction target to -50% by 2030, compared to 2005 levels. In its draft updated NECP, Sweden sets itself an ambitious national target of reducing greenhouse gas emissions in the ESR sectors to at least -63% by 2030 compared to 1990 levels (instead of 2005 levels), but it does not provide projections of emissions under the ESR with existing and additional planned measures, latter to be decided once the new Climate Policy Action Plan has been presented. In 2021, Sweden’s ESR emissions were below the Annual Emission Allocation (AEA) by 2.18 Mt CO₂ eq. Based on the data that had to be reported by Member States by 15 March 2023 under the Governance Regulation, Sweden provided a 2030 ESR projection of -61.9% compared to 2005. Based on this, Sweden will overachieve its ESR target by 11.9 percentage points with existing measures scenario.

Member States have **flexibilities under the ESR** to comply with their targets. No specific use of ESR flexibilities is mentioned by Sweden.⁷ To assess whether Member States comply, the use of saved AEAs from previous years is taken into account.

Table 2: ESR targets and projections in Sweden’s draft updated NECP

ESR target and projections⁸					
	2030 target*	2021 performance (inventory data) *	2022 performance (approximated data) *	2030 WEM projection*	2030 WAM projection*
Sweden	-50%	-32.6%	-36.4%	-	-
EU	-40%	-14.5%	-16.9%	-27%	-32%

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

The draft updated NECP does not reflect the increased ambition of the new LULUCF Regulation and the 2030 national target requiring Sweden to deliver an additional -4 Mt CO₂ eq. of net removals to reach the total value of -47 Mt CO₂ eq. in 2030. According to the projections submitted in the draft updated NECP, Sweden will only achieve around an

⁶ In March 2023, Sweden did not submit GHG emission projections under the additional measure scenario.

⁷ Sweden has the possibility to ask by 31 December 2023 for the cancellation of a limited number of EU ETS allowances in the period 2025-2030 to increase its annual emissions allocations under the ESR for an equivalent amount. Based on the budget proposal for 2024, Sweden considers asking for this flexibility between EU ETS and ESR.

⁸ 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).

additional – 1.3 Mt CO₂ eq. by 2030 reaching a total value of -43 Mt CO₂ eq. in 2030, highlighting the need for more ambitious climate action. The draft updated plan does not clearly set out a pathway to increase the contribution of the land sector to the EU’s overall enhanced climate target and does not quantify the mitigation impacts of the planned additional measures in terms of removals or emissions from the LULUCF sector.

Although Sweden identifies national policies and measures largely targeting the forestry sector, the removals are projected to remain stable until 2025 and then increase. This trend is projected to continue up to 2030 leaving limited time to develop policies and implement measures to sufficiently increase removals within the sector.

Given that the two dominant land uses in Sweden are managed and unmanaged woodland Sweden has rightly placed a significant focus on policies and measures in this area. Several additional policies such as the Forest Policy and the Forest Act or the National Forest Program are described as key instruments that contribute to achieving the climate goals. However, the draft updated plan does not provide quantification of the impacts of the stated policies and measures.

The draft updated plan does not provide information on the status and progress to be made in ensuring the enhancements to higher tier levels/geographically explicit datasets for the monitoring, reporting and verification (MRV), in line with the provisions under Regulation (EU) 2018/1999.

Overall, Sweden 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 draft updated NECP contains objectives, targets, and policies and measures related to **transport decarbonisation**. By 2030, greenhouse gas emissions from domestic transport, excluding domestic flights included in the EU ETS, are planned to be at least 70% lower compared to 2010 with a predicted share of renewable energy (fuels+electricity) in transport of 78% by 2030. It includes policies and measures for improved access to zero- and low-emission mobility, transport and vehicles including taxes, emission requirements, reduction obligations, premiums, various eco-bonuses, support for charging infrastructure and hydrogen refuelling as well as Urban Environmental Agreements. The draft updated plan foresees support mechanism for the deployment of charging and hydrogen refuelling infrastructure to enable the uptake of zero-emission vehicles, with dedicated financial resources, however, it does not provide a quantified outcome compared to the requirements set by the **Alternative Fuels Infrastructure Regulation**. Although Sweden reports on its national **Sustainable Aviation Fuels (SAF)** legislation called ‘Reduction obligation’ (biofuels blending obligation) and research and demonstration projects linked to SAF, there are no specific roadmaps and measures for the production and deployment of neither these nor sustainable maritime fuels included in the draft updated NECP.

The draft updated plan refers to the ongoing cooperation on **carbon capture utilisation and storage (CCUS)**, amongst others, as part of the Nordic Energy Policy Cooperation Programme. It mentions that the Swedish Energy Agency was commissioned to be the national centre for carbon dioxide capture and storage (CCS) and that funds are offered to set up a system with reverse auctions for the capture and storage of carbon dioxide from renewable sources (bio-CCS). The draft updated NECP also mentions that work on a CCS/bio-CCS strategy was launched in 2023 and that CCS may be used in reaching Sweden’s 2045 emissions target only in lack of any other alternative. However, it does not identify any annual CO₂ emissions that can be captured nor foresees the deployment of any

dedicated CO₂ transport capacities. Also, it does not identify any geological CO₂ storage capacity.

The draft updated plan does not set objectives for **methane emissions** reduction. Moreover, Sweden does not propose a sector specific national target for reduction of non-CO₂ agricultural emissions by 2030, nor mentions methane emissions from enteric fermentation or N₂O from agricultural soils - both the largest sources of non-CO₂ emissions. The draft updated plan mentions measures targeting waste management (e.g., ban on landfilling organic matter and collection of methane) and the development of biogas and bio-methane (e.g., biogas aid to produce biogas upgraded to bio-methane) and links their production to the use of agricultural waste (e.g., manure support). However, it does not provide any specific quantified projections of non-CO₂ emissions. The draft updated plan pays very limited attention to emissions of F-gases, which are the third largest source of non-CO₂ emissions. These shortcomings are problematic, because non-CO₂ emissions accounted for 35% of all greenhouse gas emissions within the Effort Sharing sectors in 2021.

The draft updated NECP hardly refers to the role of **circular economy** for climate change mitigation, beyond waste-related measures, and does not quantify such impacts in models.

The draft updated plan reflects partial progress towards **international commitments** under the Paris Agreement. While Sweden has already phased out coal use in the power sector, the draft updated plan does not include any information on phasing out of existing fossil fuel subsidies.

On 19 December 2019, Sweden submitted to the Commission its national long-term strategy. The strategy includes the goal of achieving climate neutrality by 2045. The goal is enshrined into law. In the draft updated NECP, Sweden confirmed that it will achieve climate neutrality by 2045, in line with the mentioned national long-term strategy.

3.1.2 Adaptation

Sweden has not identified in its draft updated NECP relevant climate vulnerabilities and risks that may threaten the achievement of national objectives, targets and contributions, although it is mentioned that municipalities are required to carry out risk and vulnerability assessments as part of their work to deal with extraordinary events and crises. Also, the plan does not set out in sufficient detail the policies and measures put in place to support the achievement of national objectives, targets and contributions under the Energy Union. In particular, there is a lack of attention to the resilience of energy systems to structural or seasonal water scarcity. The absence of a comprehensive assessment is possibly since a new national strategy on adaptation to climate change and the Government's action plan on adaptation to climate change are awaiting adoption. Nature-based solutions for climate adaptation are not explicitly mentioned, even if some actions (e.g., rewetting drained wetlands) are briefly described in the LULUCF section. While Sweden identified its adaptation goals in its initial NECP of 2019, no new adaptation goals are mentioned in the draft updated NECP nor are they quantified. The link between goals and the specific Energy Union objectives and policies needs to be strengthened.

3.1.3 Renewable energy

The renewable-energy contribution proposed by Sweden in the draft updated NECP is for renewables to achieve a share of 65% of Sweden's national gross final consumption of energy in 2030, which remains the same as the contribution proposed in its 2019 NECP. This contribution is significantly below the share of 76% resulting from the formula in Annex II of the Governance Regulation. Sweden indicates that in its final updated plan it will provide an updated national contribution for renewable energy, including updated indicative trajectories, to reflect the increased EU renewable energy target of 42.5% for 2030.

Sweden has not yet taken a position on the specific types of energy to be used and the extent to which each technology is to contribute to the achievement of the trajectory for renewable energy. The latest long-term scenario, which will be updated in view of the final updated NECP, is described in detail and includes yearly trajectories for renewable share in the electricity, heating and cooling and transport sectors. The draft updated NECP indicates that the share of renewable energy in the final energy consumption is estimated to increase from 63% in 2021 to 75% in 2030 and then decrease slightly to 73% in 2040. This increase is due to the fact that the production and use of renewable energy is estimated to grow faster than the overall energy consumption by 2030, after which the energy consumption is projected to increase faster than renewable energy⁹.

The renewable electricity generation is projected to increase from 76% in 2021 to 88% in 2030 based on the WEM scenario. The total installed electricity generation capacity is projected to increase from 44 GW in 2021 to 67 GW in 2030. The installed capacity of wind and solar power is projected to increase by 13 GW and just under 5 GW respectively between 2021 and 2030. The total use of bioenergy is estimated to increase by over 11 TWh between 2021-2025, reaching 162 TWh by 2025 and 166 TWh by 2030. The use of solid biofuels in electricity production, transport and heating and cooling sectors is projected to decrease marginally between 2021 and 2030 by just over 2 TWh. The plan notes the work conducted by the Swedish Energy Agency on behalf of the Government to identify areas suitable for 90 TWh of offshore wind (around 30 GW) and the intention to adapt maritime spatial plans by December 2024, however without confirming these as offshore wind capacities as national targets. Furthermore, limited information is provided on environmental impacts and little reference is made to legislation to protect the marine environment. The draft updated NECP does not provide a specific target to promote the deployment of **innovative renewable energy technologies**. Though ocean renewables are mentioned in discussions on research and innovation under the Strategic Energy Technology Plan and European Technology and Innovation Platform Ocean energy, the plan does not specify ambitions for ocean energy.

The use of renewable energy in the heating and cooling sector is projected to reach a share of 73% by 2030 compared to 69% in 2021. As this is above 60%, Sweden may count such a share as fulfilling the new mandatory average annual increase of renewable heating and cooling under Article 23 of the revised REDII. This share does not include waste heat. Overall, the role of waste heat and cold and renewable electricity in the accounting of the trajectory and its impacts on the target setting and achievement remains

unclear. Bioenergy will remain dominant in heating and cooling, but it is estimated to decrease by just over 3 TWh between 2021 and 2025, before falling further by just over 0.5 TWh to 112 TWh in 2030.

The draft updated NECP does not provide an indication of the projected capacity and consumption of energy from **heat pumps** by 2030. Moreover, the plan does not provide an indication of the projected share of renewable energy in **district heating** by 2030. Therefore, it is not clear whether the country complies with, or may be exempted from the requirement to increase the annual average share of energy from renewable sources and from waste heat and cold in district heating and cooling by an indicative 2.2 percentage points for the period 2021 to 2030, in line with Article 24 of the revised REDII. An indicative average use of renewable energy in **industry** over the period 2021-2030 was not provided in the Swedish draft updated NECP, nor the renewable-energy use in **buildings** to be achieved by 2030.

In the transport sector, the share of renewable energy is projected to increase from 30% in 2021 to 78% in 2030 (including multipliers), due to the decrease of the overall energy consumption in the transport sector contributing to a higher share of renewable energy. The use of biofuels is estimated to increase by 14.5 TWh between 2021 and 2025, mainly due to an increased use of biodiesel in the form of HVO (around 15 TWh), which is currently mainly produced from waste and residues. For the transport sub-targets, the main measure foreseen is the introduction of obligations for the reduction of the emission intensity of fuels through the use of renewable fuels. In 2022, this obligation was set at 30% and 7.8% for diesel and petrol respectively. However, the government and the Swedish Democrats have reached a political agreement that the reduction obligation should be set at 6% during the current term of office (2024-2026). Other measures already put in place aim to increase energy efficiency of transport. Sweden has introduced a supply obligation for service stations with sales of more than 1,500 m³ petrol or diesel to offer at least one type of renewable fuel. In 2018, Sweden also put in place a support scheme for an eco-bonus system to shift freight transport from road to sea. The funding for this support scheme has been extended and broadened to also include rail transport by 2024.

The draft updated NECP does not include details about the share of **advanced biofuels** or **RFNBOs**, nor the limits for conventional biofuels. In addition, the plan does not provide a target for the uptake of electric cars by 2030. However, it provides an overview of existing support measures related to the uptake of electro-mobility both with regard to electric vehicles, recharging infrastructure, and hydrogen refuelling points, including for light and heavy-duty vehicles and non-publicly accessible recharging points for heavy-duty vehicles. Sweden has introduced support measures for heavy duty vehicles and buses. For example, there is an electric bus premium for public transport operators purchasing electric buses, plug-in hybrid buses, fuel cell buses, and trolleybuses with a transport capacity of more than fourteen passengers.

The draft updated NECP does not provide information on the expected capacity of electrolyzers for hydrogen production in 2030, nor does it set out measures to increase RFNBO use in demand sectors. In addition, Sweden has not yet set a target for RFNBO use in industry in line with the revised REDII. The draft updated NECP states that Sweden has adopted a Hydrogen Strategy, but does not provide further information regarding **international partnerships**, agreements, memorandum of understandings or bilateral exchanges to facilitate imports of renewable hydrogen.

The draft updated NECP includes existing **policies and measures** to support the achievement of the proposed objectives and contributions for renewable energy, however not reflecting the revised EU policy framework. Most of the policies and measures are existing and lack sufficient details on their timeframe, budget and expected impacts. On Guarantees of Origin Sweden does not specify any additional measures that aim to improve consumers' information or facilitate their transfer with energy purchase agreements. As regards **joint projects**, Sweden refers to regional cooperation in the context of the North Sea Energy Cooperation, which also focuses on promoting offshore wind energy. One of the expert groups has been dedicated to permit granting, maritime spatial planning and environmental considerations¹⁰.

In relation to the deployment of **solar energy**, Sweden refers to measures put in place since 2021, namely tax incentives to support the installation of photovoltaic systems, and the online initiative Solelportalen.se (in place since 2018). The online initiative collects information on photovoltaic installations, from the planning to decommissioning phase of a plant and streamlined administrative procedures for installation of solar energy equipment. The draft updated NECP does not provide any information or quantitative goals concerning **individual and collective energy self-consumption as well as renewable energy communities**. Moreover, Sweden does not indicate whether it has put in place a strategy on **energy system integration**, though it has introduced measures to encourage e-mobility, the use of innovative technologies, and electricity storage in batteries.

The draft updated NECP does not provide information on specific measures for **renewable district heating and cooling** nor for enabling integration between electricity and district heating and cooling networks. Sweden indicates that its district heating system is already well developed and competing with other forms of heating. The assessment of the need and profitability of new district heating and cooling infrastructure is carried out by the companies themselves.

Measures related to the **industry sector** are missing in the draft updated NECP. The plan does not contain information on the framework to enable sector integration between energy networks. Moreover, it does not refer to measures to promote renewable-based electrification of industrial processes, aiming to replace fossil fuels used for industrial heating.

According to the draft updated NECP, **bioenergy** represents the largest share of renewable energy in Sweden, accounting for 53% of renewable energy in 2021. Bioenergy is mainly used in industry and district heating, accounting for 81% of renewable energy in heating, followed by heat pumps (14%). Biomethane is mentioned very briefly, in a sub-measure of a state aid for the production of biogas upgraded to biomethane worth SEK 650 million. The production capacities and expected volume of biomethane by 2030 are however not reported. The draft updated NECP does not assess the impact that bioenergy trajectories may have on LULUCF sinks, biodiversity and air quality. The draft updated NECP does not include an assessment of domestic supply of **forest biomass** for energy purposes in 2021-2030 in accordance with the strengthened sustainability criteria of the revised REDII.

¹⁰ The Member countries are: Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway and Sweden with the participation of the European Commission. A Memorandum of Understanding on cooperation with the UK on offshore renewable energy was signed between the NSEC Energy Ministers and the EU Energy Commissioner in December 2022.

The plan also does not assess the compatibility of the projected use of forest biomass for energy production with Sweden's obligations under the revised LULUCF Regulation, particularly for 2026-2030. The plan does not assess whether a sustainable level of logging and land use might constrain the high reliance on wood, whether primary or secondary woody biomass, for energy production, which may further increase the need for emissions reductions elsewhere. No information on the impact of bioenergy use on biodiversity was included.

The draft updated NECP includes information on the **mapping of the dedicated areas** for the wind energy. The Swedish Energy Agency and the Swedish Environmental Protection Agency have jointly developed a strategy for sustainable development of onshore wind energy which was presented in 2021. It includes information on national development needs for wind energy at regional level and serves as a planning tool. In addition, Sweden adopted dedicated maritime spatial plans for the Gulf of Bothnia, the Baltic Sea, and the North Sea in February 2022, which are aimed at providing guidance on the use of the areas covered by the plan and used by authorities, municipalities and regions in the planning and examination of claims within those areas.

The draft updated NECP indicates Sweden will undertake measures to streamline administrative procedures for photovoltaic installations and solar collectors (some types of PVs and solar collectors are not subject to a building permit if they do not require changes in the structure of the building). The plan states that the Swedish Energy Agency has set up a contact point for permitting, exemption and notification procedures linked to renewable energy¹¹; however, it does not elaborate on the additional human resources dedicated to permitting.

3.2 Energy efficiency (including buildings) dimension

The Swedish draft updated NECP does not set **energy efficiency targets** for 2030 in terms of absolute primary energy consumption and absolute final energy consumption. Instead, the plan sets as its main target the improvement in energy intensity by 50% by 2030 as compared to 2005. As stated in the draft updated NECP, assuming an annual economic growth of 2%, the targets could be translated into 470 TWh for primary energy consumption (40.4 Mtoe) and 347 TWh for final energy consumption (29.8 Mtoe). However, the level of consumption in 2030 to meet the targets also depends on the GDP development, energy efficiency measures, structural changes in industry, the share of nuclear power and general economic developments.

Based on the data provided in the plan, Sweden would need to reduce final energy consumption by 0.14 Mtoe/year until 2030 compared to the 2017-2019 average¹². This corresponds to a corrected national contribution of 40.4 Mtoe for primary energy consumption (compared to 35.4 Mtoe according to the EED recast Annex I formula results) and 29.8 Mtoe for final energy consumption (compared to 25.1 Mtoe according to the EED recast Annex I formula results). Sweden's reported 2030 contributions for primary and final energy consumption deviate from the results of the formula in the Annex I of the EED

¹¹ <https://www.energimyndigheten.se/fornybart/tillstand>.

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.

recast by 14.1% and 18.8% respectively.¹³ The target for 2030 (50% energy intensity improvement in comparison to 2005) is set at a different level as compared to the Swedish 2020 energy efficiency target (20% energy intensity improvement in comparison to 2008).

The target on reducing **total final energy consumption of all public bodies** is not well described in the plan, which provides limited information regarding the envisioned measures. As regards the renovation of public buildings pursuant to Article 5 EED (Article 6 EED recast), Sweden opted for the alternative approach for implementing the public sector provisions. The results of the target achievement were not included in the draft updated NECP. The savings target is set at 28.6 GWh for the period 2021-2030.

As regards the **energy savings obligation** required post-2020 under Article 7 EED (Article 8 EED recast), Sweden uses an alternative approach which has been based on the application of energy and CO₂ taxes at levels above those laid down in the Energy Tax Directive. The expected contribution of energy and CO₂ taxes towards the target is quantified and aggregated by end-use sector and, according to the draft updated NECP it is expected to meet the total 2021-2030 cumulative savings requirement of 165 TWh. Savings are consistently expressed in final energy consumption. On the target itself, the draft updated NECP reports that the value is set in accordance with the requirements of **Article 7 EED** (i.e., 0.8% annual cumulative energy savings rate), thereby not taking into account the higher ambition of the EED recast.

The draft updated NECP presents in detail the planned **policies and measures** to achieve the 2030 energy efficiency goals but does not provide the expected savings and investment needs of each measure. The main measure on energy and CO₂ taxes addresses mainly the building (residential and services) and transport sectors. For this measure quantified impacts have been provided. The draft updated NECP does not include measures reflecting the **energy efficiency first principle**. The reported planned measures besides the tax incentives cover all sectors and concern mostly buildings, followed by transport. Energy audits are mentioned in one single measure, but without details on the number of audits carried out and the number of obliged companies as well. There are targets, policies and measures on the supply sector, such as a regulatory model for network operators, the Electricity Act and stakeholder cooperation in local energy efficiency nodes. Any quantification or detailed explanation of the impact of the policies and measures, besides the energy and CO₂ taxes, is missing, thereby making it impossible to assess if introduced measures are sufficient to meet the 2030 target.

The Swedish draft updated NECP does not foresee an update of the 2020 **long-term renovation strategy (LTRS)** but refers to some of its main milestones and key indicators. The key milestones of the 2020 LTRS are listed in the plan and include lower energy consumption of the building stock (kWh/m²) than at the previous milestone, higher share of buildings with energy classes A-C and lower share of buildings with energy classes E-G and the share of fossil fuels used in the building stock should be no more than 1% (2030) and no more than 0% (2040, 2050). Only two new measures were introduced since the 2019 NECP, which are the aid for energy efficiency in single-family houses, and stakeholder cooperation in local energy efficiency nodes.

¹³ According to Article 4(4) EED recast, a Member State shall ensure that its contribution in Mtoe is not more than 2.5% above what it would have been had it resulted from the EED recast Annex I formula.

In addition to the LTRS, the plan includes measures contributing to building renovations such as an energy efficiency instrument that is a debt, equity and guarantee instrument, as well as technical assistance for project development in several areas both in the private and public sector. However, the draft updated NECP does not provide any figures on the financing and estimated impacts of these measures. The existing barriers for the implementation of the LTRS measures are not listed nor mentioned in the plan.

3.3 Energy security dimension

The draft updated NECP reports that Sweden's energy mix is dominated by biomass, crude oil and petroleum products, nuclear fuel, and hydropower. The latter two are particularly important for electricity production, accounting for 44% and 30% of total electricity production respectively in 2021. Overall, fossil fuels accounted for 31% of gross available energy in 2021¹⁴, which is substantially lower than the EU average. While the draft updated NECP suggests that the share is set to decrease further, the plan does not provide a forecast to 2030. Sweden has decreased its overall energy **import dependency** from 33% in 2013 to 21% in 2021, while increasing the share of **third countries** in these energy imports from 31% in 2013 to 34% in 2021.¹⁵ The draft updated NECP does not provide any forecast of the evolution of the country's energy import dependency towards 2030.

Sweden has a high level of **security of gas supply** due to its diversified portfolio of providers and its extremely low consumption (2% of its energy mix and less than 1% of the electricity mix in 2021).¹⁶ In 2021, Sweden was dependent on Russia for only 2% of its gas imports.¹⁷ As a consequence of this low consumption, Swedish underground gas storage capacity is also low (0.1 TWh, less than 1% of the annual consumption in 2021), and the plan does not refer to any change in this regard. Between August 2022 and August 2023, Sweden managed to achieve a 35% reduction of its gas demand, well beyond the 15% voluntary objective and the EU27 average (-18%).¹⁸ The plan does not, however, demonstrate how the emergency measures adopted in response to the invasion of Ukraine, in particular with regard to gas demand reduction, are integrated into the medium-term planning towards 2030.

As regards the **electricity sector**, the energy policy target is being changed from 100% 'renewable' to 100% 'fossil-free' energy mix by 2040. To this end, Sweden aims to increase the amount of fossil-free electricity generation, including by strengthening the conditions for **deployment of nuclear power**. The projected electricity demand is at least 300 TWh in 2045. Existing nuclear power capacity and energy supply are assumed to remain in place until 2040. Sweden continues to invest in the life extension of its existing nuclear fleet, aiming to increase its lifetime from 35 years to 60 years. In 2023, the Swedish Energy Agency also received funds to invest in nuclear research. The draft updated NECP does not report details on measures taken to diversify and address long-term supply of nuclear materials, fuel, spare parts, and services.

¹⁴ Eurostat data.

¹⁵ Eurostat data.

¹⁶ EU energy statistical pocketbook and country datasheets (europa.eu).

¹⁷ Eurostat data.

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).

Sweden has a capacity mechanism in the form of a power reserve since 2003 to deal with peaks in **electricity supply** in winter. On 17 November 2022, the Government adopted a reliability standard for Sweden of one hour per year, corresponding to a target of reliability whereby the production and import of electricity will be able to cover the full expected consumption requirement of 99.9% of the time.

The transmission network is planned and operated according to the so-called N-1 criterion¹⁹, which means that a failure of a single component should not affect the supply of electricity. If such a failure occurs, the consequences shall be remedied within 15 minutes. In the case of electricity cuts, electricity network owners must ensure that electricity cuts do not exceed 24 hours unless due to reasons beyond their control.

In addition, the Swedish Energy Agency is working on crisis management measures to prevent electricity shortages and mitigate their consequences. The measures include a national information campaign to encourage electricity consumers to voluntarily reduce their use. On 15 December 2022, the Government gave a mandate to Svenska kraftnät and the Swedish Energy Agency to step up efforts to strengthen security of supply in the energy sector in the short and long term. The draft updated NECP also outlines the measures implemented during the 2022/23 energy crisis. Yet, it does not mention any dedicated strategy nor measurable target related to the deployment of **energy storage**. Current operational capacity is around 106 MW (mainly pumped hydro) and the main identified barrier to further deployment in Sweden is the insufficient economic incentives due to the lack of price volatility on the Nordic electricity market²⁰.

The draft updated NECP defines security of energy supply as one of the overarching objectives of Swedish energy policy. Since 5 January 2020, the Swedish Energy Agency has been the competent authority for electricity in Sweden in accordance with the EU Regulation on risk preparedness in the electricity sector. The draft updated NECP also refers to the country's Risk Preparedness Plan for the electricity sector.

In 2021, **oil** represented about 20% of Sweden's primary energy mix (similar to 2015). It is used mostly for transport and industry (61% and 32% of the final consumption respectively in 2021²¹). Sweden is entirely reliant on imported crude oil and has diversified from Russia already since 2020 (Norway, Russia and the United States represented 72%, 9% and 7% of crude oil imports in 2021, respectively). The country has 5 refineries, 6 oil ports and consistently meets the requirements of the EU directive on emergency oil stocks (2009/119/EC). Despite its dependence on crude oil and biofuel imports, Sweden is a net exporter of oil products. The draft updated NECP does not assess the adequacy of the oil infrastructure (refinery, oil stocks) with the expected oil demand decline and the further move toward lower-carbon alternatives.

¹⁹ The N-1 criterion is a long-established operational standard to measure the resilience of a grid and means that the network must be able to withstand the (temporary) loss of the biggest asset on the network.

²⁰ This figure for current capacity and the barrier are 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/.

²¹ Eurostat data.

It is positively noted that **cybersecurity** measures are included in the draft updated NECP, which notably foresees the transposition of the Directive (EU) 2022/2555 on measures for a high common level of cybersecurity across the Union (“NIS 2 Directive”) into Swedish law by October 2024 and mentions a National Strategy for Society Information and Cybersecurity. Neither the supply of critical raw materials necessary for the green transition nor the adaptation of the energy system to climate change are addressed in the draft updated NECP (as regard the implications for hydropower and nuclear outputs for instance).

The draft updated NECP briefly describes the measures in the event of a security of supply crisis for natural gas that are detailed in the Emergency Plan pursuant to Regulation (EU) 2017/1938 on gas security of supply. In this regard, it is positively noted that Sweden submitted its updated National Risk Assessment, Preventive Action Plan and Emergency Plan as well as the Common Risk Assessments for the Ukraine, Belarus, Baltic Sea, Norway and Denmark Regional Risk Groups. At the time of writing, these documents are all being assessed by the European Commission. However, the assessment for the North-Eastern Regional Risk Group has still not been submitted despite the deadline on 1 October 2022, and no Member State has yet volunteered to coordinate its work.

Overall, the draft updated NECP lacks details about envisaged policy targets and measures to enhance the country’s energy security. In view of the recent changes in government policies, Sweden has indicated that several assessments included in the draft updated NECP will need to be updated in the final version of the plan.

3.4 Internal energy market dimension

The draft updated NECP does not include an interconnection target for 2030. While the plan notes an electricity interconnection level of 23%, this level is for 2021 and the Commission expects it to have dropped to 12.8% in 2023. However, the draft updated NECP indicates that there are no planned interconnectors beyond 2027, while noting that the level of electricity interconnection will continue to decrease with the expansion of renewables. Moreover, while the draft updated NECP notes an ongoing analysis of the need for new interconnectors, it does not provide any information on the status and timeline of the analysis. The draft updated NECP does therefore not provide clarity on the actions that will be taken to develop new interconnectors beyond what is planned until 2027. Efforts to continue the timely development of interconnectors, such as the third AC link with Finland and the Hansa PowerBridge, and designing new interconnectors, for example via new offshore hybrid interconnectors, will be important for maintaining interconnectivity levels. In addition, the plan does not explicitly refer to the existing Projects of Common Interest, even if some such projects are referred to.

In terms of **energy infrastructure development**, the draft updated NECP acknowledges the need to increase interconnection and further strengthen the internal grid network in Sweden, as well as improve the tradeable capacities on these links. The plan does not, however, contain more detailed information on this topic, despite the importance of maximising cross-border trade for the internal market.

With regards to the increased renewable energy target, and the need to enable consumers to rapidly reap the benefits of renewables, the draft updated NECP provides key policies and measures to incentivise demand response, though without providing a clear overview of the flexibility needs. Moreover, the draft updated NECP does not indicate specific

measures to accelerate the deployment of electricity storage, nor to engage system operators in facilitating the penetration of flexibility services beyond what was done for the implementation of Regulation 2022/1854 to address high energy prices. Although the draft updated NECP outlines the importance of non-discriminatory participation in the market, it does not set clear objectives for demand response, storage, and flexibility.

Regarding the implementation of emergency Regulation 2022/1854 on an emergency measure to address high energy prices, Sweden introduced several measures including energy saving obligations for public authorities, consumer information campaigns, tendering for flexibility, redistribution of excess congestion revenue to consumers, and state-aid support for businesses. To apply the revenue limitation for certain electricity producers as set out in the emergency Regulation, Sweden introduced a tax on excess revenues from electricity which limits the revenues of certain electricity generators between 1 March and 30 June 2023. However, the plan does not indicate whether some or all of the emergency measures to address high energy prices will be continued in the mid-term planning towards 2030.

Regarding future resource, the draft updated NECP provides a detailed overview of the expected increase in electricity demand, the changing patterns of electricity flows in the Nordic region and the resulting risks for electricity security of supply. Sweden has a power reserve since 2003 which will be in place until March 2025 in order to deal with peaks in electricity supply in winter. The Transmission System Operators ('TSO') is currently tasked with proposing a design of capacity mechanisms to replace the power reserve and ensure resource adequacy after March 2025 in accordance with a new stronger reliability standard that has been set for Sweden.

On energy poverty, Sweden does not report specifically on the number of households currently affected by energy poverty. Furthermore, no national objective to reduce energy poverty nor concrete timeline for developing specific measures are included in the plan. While the draft updated NECP does not detail the policies and measures addressing energy poverty, some instruments to support vulnerable households are referred to. These include financial assistance to pay electricity and natural gas bills and support to mitigate the effects of current energy prices. A general scheme was rolled out between November and December 2022 to mitigate the effects of high energy prices by compensating household electricity costs. Sweden has defined vulnerable customers who are eligible to receive financial support for energy bills and are protected from disconnection.

Finally, the plan does not explore synergies between measures to develop demand response, accelerate building renovations and energy savings in a targeted manner which would have direct effect on households in energy poverty and empower vulnerable consumers.

3.5 Research, innovation, competitiveness and skills dimension

3.5.1 Research and innovation

Sweden does not report on the national target and spending for research and innovation (R&I) in specific clean energy technologies for 2030 and 2050. Although R&I spendings are included in the plan through two 10-year research programmes (2018-2028) - one on climate and one on sustainable community building - those are not detailed per clean energy technology and there is no measurable target set for the expenditure. Energy R&I

is expected to contribute to the general research policy objective of Sweden, namely to be one of the world's leading R&I countries and a leading knowledge hub.

The Swedish government finances R&I and business development in the field of energy through dedicated funds allocated by the Swedish Energy Agency, amounting to SEK 1.4 billion, 3.8% of the Government funding for research and development in 2022. Energy R&I is funded by universities, higher education institutions, and state or private institutions and foundations. One of the highlighted actions by the Energy Agency is to promote the commercialisation and dissemination of research results. The draft updated NECP does not clarify the period linked to the above energy R&I related spendings, nor does it indicate the share of public and private funds for the R&I spending targets.

The draft updated NECP reports that Sweden is at the forefront of research to make energy-intensive industries more energy and resource efficient, and ultimately carbon neutral. To support this transition, the government launched “Industriklivet”, a long-term initiative to reduce industry's greenhouse gas emissions by supporting businesses from R&I projects to demonstration and full-scale facilities. It provided a total of approximately SEK 1,354 million in funding in 2023 and can finance projects running until 2030. The draft updated NECP lists several existing R&I projects in the field of low-carbon technologies, i.e., efficient biofuels for low-carbon energy transition, forestry and bioenergy; Hydrogen Breakthrough Ironmaking Technology; Future electricity system research programme (2022-2027); Research and demonstration in the transport sector (2018-2023). However, Sweden does not provide information on any future projects, nor does the country indicate specific targets, measures or trends in R&I in low carbon technologies.

With its particular responsibility to fund research on climate change, in 2017 Sweden's Research Council was mandated to implement 10-year research programmes on climate and sustainable community building. The aim of the 10-year national research programme on climate is to contribute to achieving Sweden's objective of being a fossil-free welfare society and its ambition to be at the forefront of global efforts to achieve the Paris Agreement objectives. In 2018, the programme allocated approximately SEK 75 million, and from 2021 the programme's budget amounts to approximately SEK 230 million per year. The 10-year national research programme for sustainable community building will foster knowledge to develop new solutions across all sectors of society to create a safe, secure, sustainable and inclusive society. In the coming years, the programme's funding is estimated at around SEK 125 million annually. However, the draft updated NECP does not indicate the energy related R&I funding figures within the two programmes, nor the share of the above 10-year programmes in the overall R&I spendings for the same period.

Cooperation with other Member States in the field of energy R&I is well explained in Sweden's draft updated NECP. It is implemented through Horizon Europe, the SET Plan and international fora such as the International Energy Agency programmes and Mission Innovation. In addition, there is good regional cooperation taking place between Sweden and the Nordic countries. Sweden participates in the Nordic Energy Research (NEF), which facilitates joint energy research and analysis under the Nordic Council of Ministers. One of the recent calls for proposals (Hydrogen Valleys as Energy Hubs – by 2030 and 2040) will use the equivalent of NOK 170 million for Nordic cooperation projects on hydrogen, ammonia and electro-fuels.

Sweden is active in many SET Plan Implementation Working Groups, linking the elements of the national research programmes to the joint objectives in ocean energy, smart solutions

for energy consumers, smart cities, energy systems, energy efficiency in buildings, energy efficiency in industry, batteries for e-mobility, bioenergy and renewable fuels, and carbon capture, use and storage (CCUS). Swedish stakeholders also participate in the following EU technology and innovation platforms: Bioenergy; Ocean energy; Renewable Heating and Cooling; and Smart Networks for Energy Transition. The draft updated NECP does not elaborate detailed national objectives for cooperation within the SET Plan.

In addition, Sweden together with Austria, is leading the Horizon Europe Clean Energy Transition Partnership. Sweden is also involved in the Driving Urban Transitions (DUT) partnership programme launched under Horizon Europe in 2022, aimed at driving urban development towards a sustainable future.

3.5.2 Competitiveness

Sweden recognises the importance of strengthening competitiveness of clean energy technologies and industry. The draft updated NECP reports that in line with the Swedish climate policy framework, it is possible to reconcile the climate transition with welfare and good competitiveness. In addition, the objective of enterprise policy is to strengthen Sweden's competitiveness and create the conditions for more jobs in more and growing companies. However, Sweden has not put in place specific objectives and funding targets for 2030 to support competitiveness.

In 2016 Sweden launched the “Fossil-free Sweden” initiative, with the objective of strengthening the state's dialogue with business, municipalities, other public actors and civil society. More than 20 so called ‘fossil-free competitiveness roadmaps’ were developed through the initiative as well as cross-sector and cross-industry strategies such as Strategy for a Sustainable Battery Value Chain, Hydrogen Strategy, Biostrategy, Financing Strategy and an Energy efficiency Strategy. The plan reports that in 2023, the focus was on implementation, while work on a CCS/bio-CCS strategy was launched.

Sweden promotes its central role in the electrification of transport. The NECP provides information on the current support (SEK 146 million 2018-2023) to a large-scale lithium-ion batteries manufacturing pilot project in Västerås, which will also act as an R&I centre for sustainable and flexible battery production. This pilot project is described as a major step towards the establishment of a European battery manufacturing supply chain, creating the conditions for an ecosystem of Swedish companies throughout the battery value chain – from raw materials to battery systems. However, the future investment needs for the project are not provided.

The draft updated NECP lacks information on investments for the manufacturing or deployment of other net-zero technologies and components in the different industrial ecosystems. The plan does not provide further information on how Sweden will ensure the resilience of its supply chains to reach its energy and climate targets if there is not enough domestic production of these components or equipment.

The plan includes a description on circular economy policies and actions in different sectors and recognises the importance of circularity for industry and competitiveness. However, it does not include an assessment of the investments needed to advance the circular economy.

The draft updated NECP does not provide information related to the Digitalisation of Energy System EU Action Plan, although electrification and the grid related challenges are important in the Swedish R&I and competitiveness agenda.

3.5.3 Skills

The draft updated NECP does not identify skill shortages for the development of strategic sectors but mentions efforts to establish a battery manufacturing supply chain. Overall, it lacks information on skills from the R&I, digitalisation of the energy system, circular economy, and competitiveness angle in terms of identification of possible skills gaps and national objectives, targets, measures and investments to address them and boost European competitiveness in clean energy technologies, equipment and components. The plan does not make a connection to, for instance, the SET Plan revision, relevant European Year of Skills initiatives, Pact for Skills large scale partnerships, and the New Innovation Agenda in this regard.

4 JUST TRANSITION

Just transition is addressed in the draft updated NECP in a very limited manner. Overall, the plan lacks information on and quantification of social, employment and skills impact of the climate and energy transition, including distributional impacts on vulnerable groups. In addition, it does not provide sufficient information for the preparation of the Social Climate Plans, as assessed in Chapter 7.

The draft updated NECP lacks quantifiable targets, objectives, and detailed measures to address **employment, and education, retraining and lifelong learning** in a comprehensive way. With regards to skills, it only refers to reskilling and upskilling of workers in the carbon intensive industries in the three regions covered by the Territorial Just Transition Plans (TJTTPs). Sweden states that work towards a just transition is carried out through its general welfare policy and includes only very generic information on **social measures**. Furthermore, the plan does not elaborate how social policies, including social protection measures, will protect vulnerable households (see section 3 on energy poverty) and ensure affordable essential services for all. In addition, the plan does not elaborate much on the role of fair tax-benefit systems. While the plan presents financial measures to support public transport, it does not detail how Sweden aims to increase access to sustainable public transport and its overall affordability. Finally, it does not detail the resources specifically devoted to supporting a just transition in addition to the Just Transition Fund.

5 REGIONAL COOPERATION

The draft updated NECP explains the work conducted by Sweden under the high-level groups of the North Seas Energy Cooperation (NSEC) and Baltic Energy Market Interconnection Plan (BEMIP) on energy infrastructure and offshore wind. The plan does not however include a specific measure or initiative in the area of renewables, e.g., as concluded in the margins of these high-level groups.

Sweden has signed a solidarity arrangement for gas supply with Denmark, which is a welcome achievement. However, the draft updated NECP does not contain any detailed

information on how Sweden is working in the regional Risk Groups established in the Regulation (EU) 2017/19938 on the security of gas.

6 INTERNAL COHERENCE AND POLICY INTERACTIONS WITHIN THE DRAFT UPDATED NECP

The draft updated NECP reflects key synergies within and between some of the 5 dimensions of the Energy Union, including the impact of increasing flexibility and demand response measures on the penetration of renewable energy, as well as on the integration of the internal energy market. Similarly, the interaction of key objectives of diversification of energy sources is directly related to the deployment of renewable sources. This includes the deployment of biomass, which also contributes to the reduction of fossil greenhouse gas emissions. However, the draft updated NECP lacks a more thorough analysis of consistency of policies and measures in each dimension and a quantitative analysis of interactions of certain objectives. The plan also fails to mention the energy efficiency first principle.

7 STRATEGIC ALIGNMENT WITH OTHER PLANNING INSTRUMENTS

Sweden formally submitted a modified **RRP and REPowerEU chapter** on 25 August 2023, which was adopted by the Council on 9 November 2023. The Swedish RRP includes 13 climate relevant measures (9 investments 100% climate tracked, and 4 investments 40% climate tracked). No milestones, targets nor support from the Recovery and Resilience Facility itself are mentioned in the draft updated NECP.

The draft updated NECP for Sweden does not cover the links with the main reforms and investments of the RRP that contribute to implementing the objectives, targets, and contributions of the plan. While acknowledging the relatively small size of the RRP, the consistency between the draft updated NECP and the RRP is not described. The plan only includes vague references to the RRP reforms and investment, and only some reforms and investments of the RRP can be identified in the draft updated NECP, however, with a low level of granularity and consistency.

The draft updated NECP spells out clearly the potential for synergies and trade-offs between clean air and climate policies and presents the air pollutant projections as submitted under Directive 2016/2284. It does not explain very clearly how the updates of the NECP and of the **National Air Pollution Control Programme (NAPCP)** are aligned, and how Sweden intends to deal with the recognised challenge of pollutant emissions from bioenergy use.

The draft updated NECP is fully consistent with the **Territorial Just Transition Plans (TJTPs)** although it is not explained how the Just Transition Fund fits with its objectives and investment needs.

The draft updated NECP does not provide an adequate 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. It contains some measures that could, with the correct targeting, be eligible for funding under the Social

Climate Fund (SCF), such as support for recharging and hydrogen refuelling infrastructure. However, it lacks any detailed mention of both the Social Climate Fund (SCF) and of the new ETS2. The draft updated NECP does not provide any assessment of the number of households in transport poverty, and it has not provided the methodology and indicators to identify the future recipients of the SCF, taking into account the distributional effects arising from the future ETS2. In addition, it does not outline reforms and policy framework for the future SCP, nor does it explain how the SCP will build on the NECP update and how the consistency between the two plans will be ensured.

In the draft updated plan, Sweden 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 **National Adaptation Strategy (NAS)**, the plan is less detailed and less ambitious on the respective actions.

Swedish draft updated NECP addresses that work is carried out by Sweden which is partly aligned with the latest **European Semester Country Specific Recommendations (CSRs)** and partly reflects the challenges to be addressed by the country. The draft updated plan could, however, be more explicit in the descriptions of the work on the CSR's.

8 FINANCING THE ENERGY AND CLIMATE TRANSITIONS

8.1 Investment needs

The draft updated NECP includes partial information on the expected investment needs to implement the planned policies and measures for the five dimensions of the Energy Union. It includes estimates of current and future investment flows in electricity generation (still the same as in the 2019 NECP) and transmission networks but lacks a more comprehensive assessment of the investment needs to meet the climate targets, including specific estimates for industry and transport sectors. However, the draft updated plan mentions that the investment needs section has not been updated since the 2019 NECP and will be updated in the final version of the updated NECP.

8.2 Funding sources

The draft updated NECP outlines some of the main sources of financing (national funding, CEF, ERDF, JTF and Horizon Europe) used to implement several of the planned key policies and measures proposed in the plan. However, there is no consolidated overview at plan level. It is therefore not possible to identify potential gaps in terms of funding. The plan does not explain the contribution of the different sources, nor does it distinguish public (EU and national) and private funding sources and specify the lifetime of the measures. There is no overview table gathering all the budgetary information of the different policies and measures.

The plan does not include innovative financing schemes such as competitive bidding. The contribution of the RRF is not fully reflected in the draft updated NECP as some RRP measures are missing. Furthermore, the plan does not include a quantitative indication of

the contribution of the RRF 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 a quantitative analysis, and the methodologies for the projections with-existing-measures (WEM) are to some extent overall clearly referenced. However, some explanations on the methodologies are not sufficiently detailed (e.g., “Lower electrification scenario” mentioned in Section 4.1.3). The WEM scenario is based on agreed policy instruments until 30 June 2022, but the entire Chapter will be adjusted before finalising the update of the NECP as they do not take into account political decisions and revisions of EU directives after that date.

The analysis is based on the TIMES-Nordic energy system model and the EMEC General Equilibrium model, and mostly relies on the parameters recommended by the Commission, except for GDP and population levels. The described top-down analysis is complemented by a bottom-up analysis of energy savings and energy cooperation in the North Sea, which is focused on the estimation of short- and long-term price elasticities.

An ETS/ESR split is lacking and the draft updated NECP does neither include with-additional-measures (WAM) projections for GHG emissions, nor assesses the expected impact of planned policies and measures. Hence, it is not possible to assess the expected impacts of the additional measures included in the plan. The new ETS for buildings, road transport and additional sectors (ETS 2) has not been considered in projection scenarios.

A quantitative analysis of the expected impacts of targets and policies on health, air pollution, biodiversity or the environment in general is missing. There is no macro-economic assessment.