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In the published version of this decision, some information has been omitted, pursuant to articles 30 and 31 of Council Regulation (EU) 2015/1589 of 13 July 2015 laying down detailed rules for the application of Article 108 of the Treaty on the Functioning of the European Union, concerning non-disclosure of information covered by professional secrecy. The omissions are shown thus […]		PUBLIC VERSION This document is made available for information purposes only.

Subject: **State Aid SA.107009 (2024/N) – *Sweden***
Swedish biogenic CCS auction

Excellency,

1. PROCEDURE

(1) Following pre-notification contacts, on 9 April 2024 Sweden notified pursuant to Article 108(3) of the Treaty on the Functioning of the European Union (TFEU) a scheme to support investments in the carbon capture and storage of biogenic ([1]) carbon dioxide ('CO_2') ('biogenic CCS') (the 'measure' or the 'scheme').

(2) The Commission requested additional information on the measure on 8 May 2024, Sweden replied to the request for information on 23 May 2024. In addition, a meeting on the measure between the Commission and the Swedish authorities took place on 13 June 2024.

([1]) Biogenic CO_2 means CO_2 created through the combustion, digestion, fermentation, decomposition or processing of non-fossil fuels or feedstock.

Utrikesminister Tobias Billström
Utrikesdepartementet
Arvfurstens palats
Gustav Adolfs torg 1
SE-111 52 Stockholm
SVERIGE

(3) Sweden agreed to exceptionally waive its rights deriving from Article 342 TFEU in conjunction with Article 3 of Regulation 1/1958 ([2]) and to have the present decision adopted and notified in English.

2. DETAILED DESCRIPTION OF THE MEASURE

2.1. Background and objectives of the measure

(4) The EU has set an ambitious climate protection target of reducing greenhouse gas emissions by at least 55 % by 2030, with a view to becoming climate neutral by 2050 ([3]). The European Climate Law includes a commitment to negative emissions after 2050.

(5) In December 2021, the Commission adopted a Communication on Sustainable Carbon Cycles ([4]) that aims to establish sustainable and climate-resilient carbon cycles. It lists key actions to support industrial capture, use and storage of CO_2, including the assessment of cross-border CO_2 infrastructure deployment needs at EU, regional and national levels until 2030 and beyond. On 30 November 2022, the European Commission adopted a proposal for an EU-wide voluntary framework to certify carbon removals ([5]).

(6) In February 2024, the Commission recommended reducing the EU's net greenhouse gas emissions by 90% by 2040 relative to 1990, to set the path for after 2030 towards climate neutrality by 2050 ([6]). Furthermore, the Commission adopted the Industrial Carbon Management strategy ([7]), which recognises the important role that CCS can play in the path to the 2040 climate target and the 2050 climate neutrality objective.

(7) CO_2 removals, including through CCS, are expected to be instrumental in achieving climate neutrality by 2050. Indeed, they will complement mitigation efforts for hard-to-abate emissions and allow to achieve negative emissions after 2050 ([8]). CCS of biogenic CO_2 emissions originated from the combustion of

([2]) Regulation No 1 determining the languages to be used by the European Economic Community (OJ 17, 6.10.1958, p. 385).

([3]) Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'), OJ L 243, 9.7.2021, p. 1.

([4]) Communication from the Commission to the European Parliament and the Council 'Sustainable Carbon Cycles' (COM(2021) 800 final).

([5]) Proposal for a Regulation of the European Parliament and of the Council establishing a Union certification framework for carbon removals (COM/2022/672 final).

([6]) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society' (COM/2024/63 final) ('2040 Climate Target Communication').

([7]) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Towards an ambitious Industrial Carbon Management for the EU' (COM/2024/62 final).

([8]) Ibid.

biomass to produce energy or from the processing of biomass in industrial applications will contribute significantly to those objectives. International organisations, such as the Intergovernmental Panel on Climate Change and the International Energy Agency have underlined the need for negative emissions, and the potential of biogenic CCS to contribute to the net zero emissions target and to the objective of the Paris Agreement of striving for a maximum of 1.5 ºC global temperature increase ([9]).

(8) By 2045 at the latest, Sweden is set to reach net zero emissions of greenhouse gases into the atmosphere and thereafter achieve negative emissions. The climate policy framework adopted by the Swedish parliament (*Sveriges Riksdag*) states that the main contribution will come from decreasing the greenhouse gas emissions by at least 85%, with a baseline of emissions from year 1990. Maximum 15% can be achieved through so called supplementary measures, including measures to remove greenhouse gases from the atmosphere (sometimes also referred to as negative emission technologies). These supplementary measures will be needed to compensate for residual emissions from agriculture, forestry, and industry, which are particularly difficult to eliminate also in the long term.

(9) Biogenic CCS is one of few possible measures for removal of CO_2 (negative emissions) on a sufficient scale to contribute to the Swedish net-zero greenhouse gas target and EU's climate neutrality target ([10]).

(10) Sweden has a large potential for biogenic CCS from large emission point sources. These emission point sources are mainly found in the pulp and paper industry, where emissions originate in the wood used as raw material (i.e., the combustion of by-products of the pulping process), and in the energy sector, including cogeneration and district heating, where there are emissions from combustion of residues from forestry and pulp production. These emission point sources are expected to remain also in the long term, as in Sweden there is a considerable supply of sustainable biomass. According to Sweden, the potential for biogenic

([9]) See, for example, chapter six concerning the interlinkages between desertification, land degradation, food security and GHG fluxes: Synergies, trade-offs and integrated response options of the Intergovernmental Panel on Climate Change's Special report on climate and land of June 2019, (available here: https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_Chapter_6.pdf), pp. 580-583, and the International Energy Agency's ('IEA') publication Net Zero by 2050: A Roadmap for the Global Energy Sector of October 2021 (available here: https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf#page=64), and IEA report on Bioenergy with Carbon Capture and Storage of September 2022 (available here: https://www.iea.org/reports/bioenergy-with-carbon-capture-and-storage) and the IEA's World Energy Outlook 2022 (available here: https://iea.blob.core.windows.net/assets/c282400e-00b0-4edf-9a8e6f2ca6536ec8/WorldEnergyOutlook2022.pdf#page=126).

([10]) In Sweden a government inquiry (SOU 2020:4, The pathway to a climate-positive future – strategy and action plan for achieving negative greenhouse gas emissions after 2045 (*Vägen till en klimatpositiv framtid*) has investigated the potential for supplementary measures that can be used to compensate for residual emissions in order to reach the national net-zero emissions target. The inquiry focused on three measures: natural carbon sinks, biogenic CCS and verified international measures (i.e., Article 6 of the Paris Climate Agreement). The inquiry argues that all measures will be necessary, but that the option having largest feasible potential, and with the greatest level of permanence for Sweden is biogenic CCS.

CCS in Sweden amounts to least 10 million tons per year in a 2045-perspective. Sweden thus has good conditions for a large-scale implementation of biogenic CCS that will result in CO_2 removal (negative emissions).

(11) However, even though biogenic CCS is considered an efficient and important tool for achieving Sweden's greenhouse gas emission target, there are currently no financial incentives for owners of facilities with biogenic emissions to capture and geologically store biogenic CO_2, due to high costs and no (or highly uncertain) revenues for sales of carbon removal credits. Government support and public funding are therefore necessary to establish a biogenic CCS value chain. This is why the Swedish Energy Agency has proposed a scheme in the form of a 'reverse auction' for state aid for biogenic CCS in Sweden ([11]).

(12) The scheme is motivated by the urgency of the climate crisis and the timeframes of the Swedish climate targets (net zero greenhouse gas emissions by 2045) and the EU's climate target of a climate neutral economy by 2050. The current lack of incentives to invest in biogenic CCS implies that fully private-funded investments will not take place in a foreseeable future. The State aid is expected to enable an establishment of biogenic CCS that otherwise would not take place, or alternatively, would develop much later in time. Therefore, the measure ensures that more biogenic CO_2 would be captured and geologically stored before 2045 than without the measure.

(13) The primary objective of the scheme is to achieve in a cost-effective manner negative greenhouse gas emissions that can be counted as supplementary measures towards the Swedish climate target. Negative emissions should be achieved through capture and geological storage of biogenic CO_2 from Swedish emission sources. The scheme is also expected to result in other beneficial side effects. In particular, the State aid is expected to benefit the development of technology, infrastructure and business models for biogenic CCS, as well as for CCS more generally. This includes more extensive knowledge related to, e.g., technologies, processes, and organisational needs in all steps of the biogenic CCS value chain. Developed technologies, infrastructure, knowledge, and growing markets for carbon removal credits are expected to reduce risks and costs for investment and operation of biogenic CCS also for non-beneficiaries.

(14) The Swedish authorities submit that a State aid scheme exists in Sweden that can support projects concerning CCS (including fossil-based CCS as well as biogenic CCS), notably the Industrial Leap ([12]). The Industrial Leap is an aid scheme exempted under Regulation (EU) No 651/2014 ('GBER') ([13]), under which aid

([11]) By 'reverse auction', the Swedish authorities refer to an auction where those companies requesting the lowest amount of support per tonne of biogenic CO_2 removed win the auction and are awarded the financial support for investment and operating costs, according to their bids.

([12]) The Industrial Leap (*Industriklivet*) is a long-term initiative by the government to support the green transition of the industrial sector in Sweden. Since its launch in 2018, a total amount of SEK 1 586 million has been set aside to support Swedish industry in the transition towards net zero emissions of greenhouse gases. Approximately, SEK 450 million has been allocated to about 50 projects focusing on CCS, bioenergy CCS (BECCS) and carbon, capture and use (CCU).

([13]) Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty (OJ L 187, 26.6.2014, p. 1).

can be granted for research, development, demonstration, and deployment of CCS and biogenic CCS. As it is a GBER scheme, the maximum aid amount is capped, as per article 4 of GBER. However, as it is a GBER scheme, the Swedish authorities submit that the Industrial Leap scheme is not sufficient to facilitate the development of biogenic CCS projects at large commercial scale.

2.2. National legal bases

(15) The national legal bases for the measure are:

(a) ordinance on State aid for carbon capture and storage of CO_2 of biogenic origin ('*Förordning om statligt stöd till avskiljning, transport och geologisk lagring av koldioxid med biogent ursprung*') ('ordinance'). Sweden submitted a draft thereof to the Commission; the ordinance will be adopted by Sweden after the notification of the Commission decision approving the scheme; and

(b) the Swedish Energy Agency's implementing regulation on State aid for carbon capture and storage of carbon dioxide of biogenic origin ('*Statens energimyndighets föreskrifter om statligt stöd till avskiljning, transport och geologisk lagring av koldioxid med biogent ursprung*') ('implementing regulation'), which the Swedish Energy Agency will adopt on the basis of the ordinance; Sweden submitted a draft of the implementing regulation to the Commission.

(16) Based on the ordinance and the implementing regulation and in line with the conditions set out therein, the Swedish Energy Agency will adopt one or more calls for proposals, setting out the conditions for the auction. Sweden submitted a draft call for proposal as part of the notification of the scheme.

2.3. Administration of the measure

(17) The aid granting authority for the measure is the Swedish Energy Agency. The Swedish Energy Agency is a government agency responsible for matters relating to the supply and use of energy in Sweden, and for granting support for energy and environmental objectives ([14]).

2.4. Beneficiaries

(18) The potential beneficiaries of the aid under the scheme will be undertakings carrying out an activity in Sweden which emit biogenic CO_2, and which implement biogenic CCS projects leading to negative CO_2 emissions with a capacity to capture and store over 50 000 tonnes of biogenic CO_2 per year.

([14]) The Swedish Energy Agency conducts its activities on the basis of appropriation directions issued on a yearly basis by the Government Offices of Sweden, which set out the objectives of the agencies' activities and the budget available to them.

(19) Aid cannot be granted under the scheme to undertakings in difficulty as defined by the Commission Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty ([15]).

(20) Aid cannot be granted under the scheme to undertakings that are subject to an outstanding recovery order following a previous Commission decision declaring an aid illegal and incompatible with the internal market ([16]).

2.5. Form of aid and level of support

(21) The aid granted under the scheme will be paid in the form of a subsidy per tonne of captured and stored CO_2.

(22) The Swedish authorities will select projects and quantify the maximum aid amounts through a competitive bidding process (Section 2.9.4.2). The aid will be paid out after the CO_2 is stored, on the basis of 15-year contracts with the Swedish authorities.

2.6. Duration

(23) Aid may be granted under the scheme until 31 December 2028.

(24) The aid will be granted through one or more auction rounds. The Swedish authorities expect that the first auction would be open for applications in 2024.

2.7. Territorial scope

(25) The measure applies to the entire national territory of Sweden.

2.8. Budget and financing

(26) The total maximum budget of the scheme is SEK 36 billion ([17]), to be disbursed by the Swedish Energy Agency during the period 2026–2046.

(27) The measure is financed through the general budget of the State.

2.9. Basic elements of the measure

2.9.1. Supported activity

(28) Aid is granted under the measure for the capture and storage of biogenic CO_2 that would otherwise be released in the atmosphere.

(29) According to the Swedish authorities, without the aid, the beneficiaries would not have sufficient economic, market or regulatory incentives to invest in the

([15]) Communication from the Commission – Guidelines on State aid for rescuing and restructuring non-financial undertakings in difficulty (OJ C 249, 31.7.2014, p. 1). This is provided in § 5 of the draft ordinance.

([16]) This is provided in § 36 of the draft ordinance.

([17]) Corresponding to approximately EUR 3.14244 billion based on an exchange rate of SEK 1 = EUR 0.08729, applicable on 9 April 2024.

capturing and storage of biogenic CO_2. In the counterfactual scenario without the aid, undertakings that generate biogenic CO_2 when conducting their activities (district heating, waste management, pulp and paper production) would continue to emit it in the atmosphere.

(30) First, the Swedish authorities explain that biogenic CCS projects are affected by a market failure, as they provide benefits in terms of increased level of environmental protection for the society at large while they are costly to build and run, and hardly bring any direct revenues for the operators implementing the technology.

(31) Second, there are no other measures, including market-based measures, addressing – in full or in part – the above-mentioned market failure. In particular, industrial carbon removals based on the capture of biogenic CO_2 from power plants or industrial processes are not currently covered by the EU Emission Trading System ('EU ETS') Directive ([18]) nor the Effort Sharing Regulation ([19]) or the Land Use, Land Use Change and Forestry ('LULUCF') Regulation ([20]). Since the EU ETS does not recognise negative emissions, biogenic CCS projects are not incentivised by the EU compliance carbon market price. Thus, by imposing a CO_2 price on fossil-based CO_2 emissions, the EU ETS economically promotes a transition from fossil fuels to biofuels in line with the market-based principles, but not the capture and storage of biogenic CO_2 to achieve negative emissions.

(32) Third, no Union standards exist requiring undertakings emitting biogenic CO_2 to reduce their CO_2 emissions. Therefore, investments in biogenic CCS projects would not be incentivised by obligations set out in the EU regulatory framework.

(33) Fourth, undertakings would lack economic reasons to invest, as the capturing, transport and storage of biogenic CO_2 is associated on the one hand with high investment and operating costs, and on the other, with no or highly uncertain additional revenues. With regard to costs, as mentioned in recital (31), biogenic CCS projects currently do not lead to cost savings, since the EU ETS does not currently set a price on biogenic CO_2 emissions ([21]). As concerns revenues, the Swedish authorities explain that the only potential revenue stream of biogenic

([18]) Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC (OJ L 275, 25.10.2003, p. 32). The carbon dioxide emissions of biogenic origin, that are covered by the ETS Directive, do not require a surrender of emission allowances. The emission factor for the burning of biomass is set to zero (specified in Part A of Annex IV), which means that the EU ETS does not set a price on the emissions of biogenic carbon dioxide.

([19]) Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999 (OJ L 111, 26.4.2023, p. 1).

([20]) 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).

([21]) Part A of Annex IV to the EU ETS Directive sets only the emission factor for the burning of biomass to zero.

CCS projects is related to the sale of carbon removal credits. The voluntary market for carbon removal credits is currently immature, and the future demand and prices are highly uncertain. While such market could potentially provide opportunities to create revenues for the biogenic CCS projects in the future, it is still very small, immature, and associated with significant uncertainty regarding certification, demand, and pricing of different types of carbon removal credits. As also recognised in the Commission's Industrial Carbon Management Strategy, investment decisions for negative emissions mainly rely on state subsidies and voluntary carbon markets. The voluntary EU carbon removal certification framework, accounting for life cycle emissions of carbon removals activities, will help mobilise financing while ensuring the environmental integrity of carbon removals but it is not expected to provide sufficient incentives by itself ([22]). According to Sweden, the fact that previous agreements on sales and purchases of carbon removal credits generated from bio-CCS projects are connected to projects that also secured public funding indicates that these voluntary markets are not yet sufficient to stimulate investments on their own.

(34) Additionally, the potential beneficiaries are not expected to have incentives to invest in creating negative emissions through other technologies, such as the use of biochar as a carbon sink or DACCS. This is because while ploughed-in biochar and DACCS are carbon sinks, they do not avoid the release of biogenic CO_2 from the industrial installations of the beneficiaries.

(35) To demonstrate the necessity and the incentive effect of aid for biogenic CCS projects, the Swedish authorities also submitted information estimating the costs of capturing and storing biogenic CO_2 and the profitability of such investments. In particular, the Swedish authorities submitted that previous consultations with plant owners indicated total costs, encompassing investment costs and operating costs, of SEK 1 100-2 000 per tonne of stored CO_2 ([23]), corresponding to approximately EUR 96-175 per tonne of stored CO_2 ([24]). Other research studies suggest that biogenic CCS projects require incentives of at least EUR 100 per tonne of CO_2, or more likely in the range of EUR 150 to 200 per tonne of CO_2 in the short term, before adequate experience is gained ([25]); or estimate a total cost for CCS applied to Swedish CHP plants in the range of EUR 75–180 per tonne of CO_2, with similar cost ranges for large industrial plants ([26]).

(36) The Swedish authorities explain that biogenic CCS projects are mostly associated with costs and only to a limited extent with additional revenues. This implies that the cost ranges referred to in recital (35) can be directly translated into a negative net present value, thus a funding gap. The Swedish authorities also submit that is

([22]) See the Commission's Industrial Carbon Management strategy, Section 4.3.

([23]) Energimyndigheten (2021), Första, andra, tredje… Förslag på utformning av ett stödsystem för bio-CCS. Section 2.7, ER 2021:31.

([24]) Based on an exchange rate of SEK 1 = EUR 0.08729, applicable on 9 April 2024.

([25]) Zetterberg, L., Johnsson, F., Möllersten, K. (2021). Incentivizing BECCS – A Swedish Case Study. Frontiers in Climate, 3. http://dx.doi.org/10.3389/fclim.2021.685227.

([26]) Beiron, J., Normann, F., Johnsson, F. (2022) A techno-economic assessment of CO2 capture in biomass and waste-fired combined heat and power plants – A Swedish case study. https://doi.org/10.1016/j.ijggc.2022.103684.

expected that the contract periods of potential carbon removal credit purchase agreements will not be long enough to provide the necessary security for an investment decision. Consequently, even when considering the possibility for projects to generate revenues from sales of carbon removal credits, a funding gap is expected to remain.

(37) The Swedish authorities confirm that if an auction takes place more than three years after the entry into force of the measure, they will update the analysis of average costs and revenues linked to biogenic CCS projects. For this purpose, the Swedish authorities will use the information collected as part of the previous auction round(s).

(38) Therefore, the measure grants aid as a guaranteed remuneration for stored biogenic CO_2, to limit the exposure to negative scenarios in the development of the biogenic CCS value chain (i.e. scenarios with low prices and/or demand for carbon removal credits generated from the biogenic CCS project).

(39) The Swedish authorities indicate that aid can be granted under the scheme to projects in relation to which work have not started ([27]) before (i) the submission of an application for aid ([28]); or (ii) the publication by the national authorities of a notice of their intention to establish the scheme, conditional upon the Commission's approval of the measure as required by Article 108(3) of the TFEU. The Swedish authorities submitted that a notice was published on 22 May 2024 on the Swedish Energy Agency's website ([29]), and provided the Commission with a copy thereof. The notice contains the following information:

(a) It informs the public about the Swedish authorities' intention to set up the scheme and indicates that the scheme remains subject to the Commission approval.

(b) It describes the type of projects that the Swedish authorities propose to support under the scheme. In particular, the notice explains that the planned measure will support actors with facilities in Sweden that can contribute to negative emissions of CO_2 through biogenic CCS. It also lists the main eligibility conditions for the aid.

(c) It states the point in time from which Sweden intends to consider such projects eligible, i.e. 22 May 2024.

([27]) For this purpose, 'start of works' is defined as 'the first firm commitment (for example, to order equipment or start construction) that makes an investment irreversible. The buying of land and preparatory works such as obtaining permits and conducting preliminary feasibility studies are not considered as start of works'.

([28]) An aid application must include, the applicant's name and bid, the name and location of the installation generating biogenic CO_2 emissions, information about project's costs and other public support associated with the activity generating biogenic CO_2 emissions. Together with the aid application, the applicants must submit an implementation plan showing how the applicant intends to carry out their projects.

([29]) Information kring den omvända auktionen (energimyndigheten.se)

(d) It invites interested companies to inform the granting authority prior to the start of works that the proposed aid measure is considered a condition for the investment decisions, and provides an email address for that purpose ([30]).

(40) The Swedish authorities confirmed that neither the measure nor the conditions attached to it entail a violation of relevant Union law.

2.9.2. Eligible technologies and projects

(41) According to the Swedish authorities, biogenic CCS projects are expected to have the potential to make an important and cost-effective contribution to reach long-term climate targets as negative emissions are needed to reach them. The Swedish authorities further explain that focussing on biogenic CCS only instead of encompassing all technologies that can deliver negative emissions (such as carbon sinks) makes the scheme more effective, thus leading to lower costs to achieve the targets.

(42) The Swedish authorities explain further that while fossil-based CCS may also play a role in the decarbonisation of Sweden and the EU's economies, they believe that biogenic CCS could make an important contribution to deep decarbonisation in the future. As acknowledged in the Industrial Carbon Management Strategy, the deployment of carbon removal, and in particular industrial carbon removal, solutions is indispensable to achieve climate neutrality. In the longer term, carbon removals will play a growing role and become the main focus of action after climate neutrality is achieved and when negative emissions will be needed to stabilise the Earth's temperature increase. The Swedish authorities explain that the measure was designed to address the fact that the regulatory and market-based incentives created by the EU ETS, do not apply to undertakings that emit biogenic CO_2 (recitals (31) and (33)). By contrast, as the EU ETS applies to most fossil-based greenhouse gas emissions, it can incentivise fossil-based CCS. The fact that the CCS of biogenic CO_2, as opposed to CCS of fossil CO_2, is not incentivised by the EU ETS while it leads to an unremunerated positive externality by resulting in net removal of CO_2 emissions, calls for a separate scheme targeting carbon removals. Thus, Sweden submits that focusing on biogenic CCS instead of CCS more broadly will ensure that innovative technologies for achieving negative emissions receive the necessary support to develop and become cost-effective.

(43) Moreover, the scheme only covers aid for industrial carbon removals through biogenic CCS. Consequently, other technologies for CO_2 removals, such as the use of biochar as a carbon sink ([31]) or direct air capture and storage ('DACCS') are not eligible for support. The Swedish authorities' decision to limit the aid to biogenic CCS projects is based on the results of public inquiries through which they assessed the benefits, effectiveness and challenges of the different technologies.

([30]) The notice indicates that the beneficiary must inform the granting authority prior to the start of works that the proposed measure is a pre-condition for the beneficiary's decision to undertake the project.

([31]) Biochar refers to a type of charcoal which is created through the thermo-chemical conversion (pyrolysis) of biomass.

(44) As regards the use of biochar, in 2020, a public inquiry ([32]) (public inquiry from 2020) presented a strategy and action plan for achieving net negative greenhouse gas emissions in Sweden after 2045. The public inquiry from 2020 concluded that the use of biochar as a method for long-term carbon sequestration and simultaneous soil improvement could achieve a carbon sink of 1 million tonnes of CO_2 per year until 2050 if incentives are put in place. However, the public inquiry from 2020 also notes that additional research, tests and analysis are required to evaluate the carbon sink effectiveness of using biochar. A later public inquiry conducted by the Swedish Energy Agency assessed the option to include projects leading to negative emissions through the use of biochar in the scope of the scheme ([33]). The conclusion was that a number of factors make biogenic CCS the most cost-effective and mature technology allowing to deliver negative emissions in the shortest time frame. As regards biochar, the public inquiry allowed to conclude that:

(a) Biochar displays significantly lower climate benefits (in terms of CO_2 removal) per unit of biomass compared to biogenic CCS, thereby leading to a lower yield on biomass resource.

(b) The specific amount of CO_2 removals in the process is difficult to assess.

(c) The inclusion of biochar projects would lead to a significant heterogeneity among potential beneficiaries, caused by the relatively lower carbon removal per unit of biomass compared to biogenic CCS (see letter (44)(a)), which would generate a high risk of strategic bidding and thus negatively affect competition and the effectiveness of the auction ([34]).

(45) As regards DACCS, the public inquiry from 2020 also assessed the potential for DACCS to contribute to negative emissions in Sweden. The conclusion was that DACCS most likely will continue to be more expensive and more energy-consuming than biogenic CCS in Sweden. Therefore, that technology was not judged to be able to make a significant contribution to the achievement of Sweden's climate target.

(46) The measure only applies to biogenic CCS projects with a capacity to capture and store above 50 000 tonnes of biogenic CO_2 per year. The reason why the Swedish authorities have decided to exclude small-scale biogenic CCS projects is that due to significant efficiencies of scale, smaller projects are expected to be less cost-effective. According to information submitted by the Swedish authorities, the capture, transport and storage of CO_2 is generally associated with economies of scale, i.e., the cost per tonne of CO_2 stored is lower for facilities with capacity to

([32]) SOU 2020:4, The pathway to a climate-positive future – strategy and action plan for achieving negative greenhouse gas emissions after 2045 (Vägen till en klimatpositiv framtid), https://www.regeringen.se/contentassets/1c43bca1d0e74d44af84a0e2387bfbcc/vagen-till-en-klimatpositiv-framtid-sou-20204/

([33]) Energimyndigheten (2021), Första, andra, tredje… Förslag på utformning av ett stödsystem för bio-CCS, Chapter 9. ER 2021:31.

([34]) Including a different technology, with a significantly different cost structure and unclear CO_2 removal potential could increase the risk of strategic bidding by potentially providing the possibility for bidders to bid higher than the minimum amount needed.

handle and capture larger volumes of CO_2. Even if certain applications exist, where the biogenic CO_2 can be captured cost-effectively also in small scale (e.g., from biogas or bioethanol processes), other costs along the CCS value chain, such as transport and storage, would still be significantly higher for these projects. The Swedish authorities expect that excluding small-scale projects will result in a higher cost-effectiveness of the scheme.

(47) The Swedish authorities confirmed that they will keep under review the eligibility rules to ensure that these are still justified in the face of new technology development and data availability. As regards data availability, the Swedish authorities will use information from the previous auction rounds, as well as information submitted by beneficiaries as part of their annual reporting on the project's costs and revenues. On that basis, the Swedish authorities will also review the costs and revenues of biogenic CCS projects before a potential second round of competitive bidding under the scheme is carried out, with a view to determining a fixed ceiling for the second auction, as further explained in recital (84).

2.9.3. Public consultation

(48) The Swedish Energy Agency was tasked to submit a proposal for the design of a system of operating support, in the form of reverse auction or fixed storage fee, for biogenic CCS, on 17 December 2020. The final proposal was delivered in a report to the Swedish Government on the 15 November 2021 ([35]).

(49) In the preparation of the final proposal, the Swedish Energy Agency collected information from various stakeholders.

(50) First, the Swedish authorities gathered stakeholders' views from the referral procedure of the public governmental inquiry called 'The pathway to a climate-positive future – strategy and action plan for achieving negative greenhouse gas emissions after 2045' ([36]).

(51) Second, the Swedish authorities conducted dialogue meetings with stakeholders, notably Swedenergy (a non-profit industry and special interest organisation for energy companies), the Swedish Forest Industries Federation, as well as around 20 individual stakeholders and authorities.

(52) Third, on 22 December 2021, the Ministry of the Environment distributed the proposal of a scheme for biogenic CCS projects for a referral procedure to 53 respondents. The respondents were asked to submit their feedback to the Ministry by 31 March 2022. In total, the referral procedure lasted for 12 weeks. This first

([35]) Energimyndigheten (2021), *Första, andra, tredje… Förslag på utformning av ett stödsystem för bio-CCS*. ER 2021:31.

([36]) SOU 2020:4, The pathway to a climate-positive future – strategy and action plan for achieving negative greenhouse gas emissions after 2045 (*Vägen till en klimatpositiv framtid*), https://www.regeringen.se/contentassets/1c43bca1d0e74d44af84a0e2387bfbcc/vagen-till-en-klimatpositiv-framtid-sou-20204/.

public consultation and the summary of the responses were published on a dedicated page of the Swedish government's public website ([37]).

(53) The report published for the purpose of consulting on the proposed scheme contained the key information on the scheme's design, notably concerning eligibility under the scheme (letter (a)), the necessity and incentive effect of the aid (letter (b)), the measure's target in terms of biogenic CO_2 captured and stored as a result of the aid (letter (c)), and the proposed use of a competitive bidding process to select the projects and allocate the aid, and its main parameters (letter (d)):

(a) As regards eligibility, the support system was proposed to target biogenic CCS specifically, as State aid is needed to stimulate and support the creation of geologically stored negative emissions with continuity and permanence. Biochar and fossil-based CCS projects are excluded from the scheme.

(b) With regard to the necessity and incentive effect of the measure, the report identified the main assumptions informing the quantification used to demonstrate the incentive effect, necessity and proportionality of the aid. In particular, the report described the lack of an existing business case and the significant financial risk characterising biogenic CCS projects and provided an estimate of costs of biogenic CCS per tonne of biogenic CO_2, on the basis of comparative analysis of different studies executed in the public governmental inquiry referred to in recital (50). The report also referred to the fact that the full value chain for biogenic CCS still has to be developed, as an element that adds uncertainty to the business case. As regards the assumption on the duration of the projects, based on the dialogue meetings with stakeholders, the report deemed the support for investment and operational costs necessary during at least 15 years to make projects economically feasible taking into account the level of risk and the time required for a market to develop.

(c) As concerns the measure's target in terms of biogenic CO_2 captured and stored, the report refers to the public inquiry from 2020 which demonstrated the feasibility of achieving a target of 2 million tonnes of biogenic CO_2 captured and stored per year by 2030. According to the report, the potential for biogenic CCS in Sweden is estimated to be significantly larger, namely at least 10 million tonnes of biogenic CO_2 per year in a 2045 perspective. Beyond that, the technical potential is even higher as there are about seventy facilities in Sweden whose total biogenic CO_2 emissions exceed 30 million tonnes CO_2 combined.

(d) Finally, with regard to the aid allocation method and its main parameters, in the report, the Swedish Energy Agency identified the method to select projects and allocate the aid, including the main award criterion, the type of costs that can be covered, as well as the existence of an indicative target

([37]) Remiss av Energimyndighetens rapport "Första, andra, tredje… Förslag på utformning av ett stödsystem för bio-CCS - Regeringen.se.

volume and a secret ceiling price. In particular, the report proposed to select projects in a competitive bidding process and more specifically through a so-called reverse auction where the companies offering carbon removals at the lowest cost (in SEK per tonne of biogenic CO_2) win the auction and are awarded financial support for their investment and operating costs according to their bids. The report explains that bidders will be ranked from lowest to highest bid per tonne of CO_2 up to the auctioned volume. The report also indicated that with an indicative auction volume, bids that are sufficiently cost-effective can be awarded aid within the indicative auction volume limit but under a secret ceiling price, which was proposed to be made public after the end of the auction.

(54) Fourth, on 20 December 2023 the Swedish authorities opened a second public consultation on the draft ordinance and the implementing regulation, which were accompanied by an impact assessment. The consultation documents were published on the Swedish Energy Agency's website, together with an invitation to comment ([38]). Stakeholders were invited to submit their views on those acts throughout a six-week period, until 31 January 2024.

(55) The second public consultation documents contained among others information on eligible projects (letter (a)), the necessity and incentive effect of the aid (letter (b)), and the proposed use of a competitive bidding process to select the projects and allocate the aid, and its main parameters (letter (c)):

(a) As regards eligibility, the public consultation documents clarify that the objective of the scheme is to achieve negative emissions as a supplementary measure for Sweden to reach net zero by 2045 at the latest and negative emissions thereafter to counterbalance hard-to-abate emissions. The public consultation documents also make it clear that the scheme was proposed to target biogenic CCS specifically, to the exclusion of other technologies;

(b) As regards the necessity and incentive effect of the aid, the impact assessment noted that as biogenic CO_2 emissions are not sufficiently addressed by existing measures, such as the EU ETS, there is no financial incentive for undertakings to generate negative emissions. Furthermore, the draft regulation explains that aid would be granted under the measure for a maximum period of 15 years from the first biogenic CO_2 storage by the beneficiary;

(c) As regards the proportionality of the aid, the public consultation documents explained that projects would be selected and the aid amount determined in a competitive bidding process, with cost-effectiveness (in terms of SEK per tonne of biogenic CO_2 stored) as the sole award criterion. The consultation documents also made clear that bids had to be accompanied by financial information, and that the aid amount would be reduced taking into account additional public support received, as well as the revenues from the project.

([38]) https://www.energimyndigheten.se/nyhetsarkiv/2023/remissen-om-statligt-stod-for-bio-ccs-har-skickats-ut/.

(56) Thirty-eight entities submitted answers to the second public consultation that took place between 20 December 2023 and 31 January 2024. The responses were published on the website ([39]) of the Swedish Energy Agency on 9 February 2024, together with a press release summarising the results of the consultation and explaining the following steps. The main issues covered in the submitted answers were the following:

(a) The system, as presented in the public consultation, did not create sufficient incentives for external financing of biogenic CCS projects and did not support the creation of a voluntary carbon market.

(b) The competitive bidding process should be based on 'net bids', i.e. on the amount of aid requested, net of other support and of the revenues generated by the project, rather than on 'full costs' of the project. This ensures that possible revenues linked to the projects potentially secured by applicants already at the time of the auction would be taken into account in the ranking, thereby displaying the projects' actual funding gap. The Swedish authorities took this recommendation partially into account and amended the competitive bidding design accordingly to take revenues into account (recitals (67) to (70)). However, when ranking the bids, public support received from other sources will be added to the aid requested, to avoid giving an undue advantage in the bidding process to bidders having already secured other types of support (recital (74)).

(c) More flexibility would be necessary. In particular, (i) the implementation deadline – initially proposed at three years from the aid granting decision – would have to be extended to four or five years; and (ii) the measure should allow for yearly variations in the amount of stored biogenic CO_2, notably by allowing an excess amount of stored CO_2 in a given year to be credited and accounted for in the following year. Both comments were taken into account and the measure was amended accordingly (recitals (63)(b) and (73)).

(d) Regarding proportionality, some actors argued that a deduction of 90% of the total revenues generated through the sale of carbon removal credits is excessive. Others suggested that additional revenues should not lead to a reduction in the aid amount.

(e) Concerning eligibility, certain replies to the public consultation argued that certain technologies (for example, biogas production and ethanol production) would be excluded due to the minimum bid limit of 50 000 tonnes of CO_2 per year. The impact assessment explains the rationale behind the exclusion of biogenic CCS projects with a capacity to capture and store up to 50 000 tonnes of biogenic CO_2 per year. In particular, as explained in recital (46), biogenic CCS projects with a capacity to capture and store up to 50 000 tonnes of biogenic CO_2 per year were excluded from the measure's scope in view of the expected lower cost-effectiveness of those projects. Furthermore, the Swedish authorities explain that the

([39]) https://www.energimyndigheten.se/klimat/ccs/statligt-stod-for-bio-ccs/inkomna-remissvar-omvand-auktion/.

exclusion of biogenic CCS projects with a capacity to capture and store up to 50 000 tonnes of biogenic CO_2 per year aims to avoid too large heterogeneity regarding the size of projects to reduce the risk of strategic bidding and the reduction of administrative burden on bidders and on the Swedish authorities that could be perceived as excessive comparatively to the environmental protection.

2.9.4. Aid allocation procedure and maximum aid amounts

(57) The Swedish authorities will grant aid under the measure to eligible projects selected in a competitive bidding process.

2.9.4.1. Eligibility conditions

(58) Projects and the related bids are assessed and ranked based on the conditions explained in Section 2.9.4.2, if they comply with the following eligibility conditions.

(59) First, the application in the competitive bidding process must be valid and complete.

(60) Second, the applicant must be the point emitter (e.g., the pulp and paper manufacturer or the energy company emitting biogenic CO_2), and its production and/or cogeneration plant must emit biogenic CO_2 and be located in Sweden. However, the measure does not require the CO2 to be stored in Sweden.

(61) Third, the biomass used in the main production and/or cogeneration plant must be sustainable in accordance with the Swedish sustainability framework that implements Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources ([40]).

(62) Fourth, the main production and/or cogeneration plant must have been already built when submitting the application. Additionally, the necessary permits for the operation of the main (production and/or cogeneration) plant must be in place. Those conditions aim to ensure that the aid is not granted to implement CCS at a plant which has solely been built with the objective to generate carbon removal credits.

(63) Fifth, projects must be sufficiently mature to allow for their swift implementation. To this end, the scheme requires that:

(a) the application includes a realisable implementation plan including a financial plan, preferably on the basis of a prior implementation of a pre-study, pilot project or demonstration project; and

(b) the applicant confirms its ability to start permanent storage of biogenic CO_2 based on the supported biogenic CCS project at the latest three years after the date of issuance of the individual grant decision. Based on a written request from the aid beneficiary, the Swedish Energy Agency may

([40]) OJ L 328, 21.12.2018, p. 82.

extend the deadline by a maximum of two years. The request must be motivated and reach the Swedish authorities no later than three years from the date of the individual grant decision. In case the aid beneficiary requests a further extension of the deadline, the Swedish Energy Agency may by exception extend the deadline beyond the two-year extension if it is due to exceptional circumstances beyond the control of the aid beneficiary, that could not reasonably have been foreseen.

(64) The Swedish authorities explain that any deviation from the time plan in the implementation plan will be closely monitored by the Swedish Energy Agency, and addressed to ensure that the biogenic CCS project will start operating in line with the target date set out in the individual grant decision. If a requirement has not been met or if the objective of the aid measure is jeopardised, the Swedish Energy Agency may decide not to disburse the aid, in full or in part, or to revoke or alter the granting decision ([41]).

(65) Aid under the scheme cannot be granted for: (i) investments in biogenic CCS at a plant which has been built with the sole purpose of generating carbon removal credits, (ii) the geological storage of CO_2 used for enhanced oil recovery, and (iii) any measure or investment that the undertakings may be obliged to carry out in order to comply with legal obligations.

2.9.4.2. Competitive bidding process

(66) The Swedish authorities will select the beneficiaries among eligible applicants and projects (Sections 2.4, 2.9.2 and 2.9.4.1) and award them aid under the measure on the basis of a competitive bidding process.

(67) The Swedish authorities explain that under the measure, applicants will be requested to submit as part of their bids the information described in recitals (68) to (72).

(68) First, applicants will have to indicate the amount of aid needed under the scheme (in terms of SEK per tonne of biogenic CO_2).

(69) Second, applicants will have to submit financial calculations underlying their bid. In particular, these shall include:

(a) an estimate of the project's investment costs and operational costs for carbon capture, transport and storage;

(b) other public support granted for the same project (irrespective of whether it covers capital expenditure or operating costs, and whether it qualifies as State aid);

([41]) The decision not to disburse the aid in part could be based on the beneficiaries having submitted incorrect information that has caused a previous amount of aid to be disbursed incorrectly. The decision to revoke the aid could be a consequence of serious delays by the beneficiaries during the construction phase, or of repeated underperformance on their targeted amount of verified biogenic CO_2 stored.

(c) other financing and revenues linked to the project, such as those from the sale of carbon removal credits.

Costs, other public support and revenues have to be indicated in SEK per tonne of biogenic CO_2.

(70) The scheme provides that bids that, together with other public support for the same project and 90% of the expected revenues, exceed the total costs for CCS as detailed in the financial calculation submitted in their application will be rejected.

(71) The Swedish authorities explain that currently, limited information is available on the precise costs associated with CCS and the different parts of the value chain. Therefore, the competitive bidding process organised under the measure to select projects also aims at 'price discovery' and will provide Sweden with information on the costs of the full CCS value chain, encompassing the capturing, transport and storage of biogenic CO_2. The Swedish authorities will use financial information thereby collected as part of the first auction to (i) verify the necessity of the measure (recital (37)) and (ii) refine the competitive bidding design in subsequent auctions (recital (84)).

(72) Third, applicants will be requested to indicate the volume of biogenic CO_2 planned to be stored per calendar year ('project's annual volume target'). The beneficiaries will not receive payments for captured and stored CO_2 exceeding the project's annual volume target in any given year. Thus, the aid per tonne of CO_2 as indicated in the aid granting act, multiplied by the projected CO_2 volume over 15 years constitutes the total maximum aid payment for each beneficiary.

(73) However, the scheme provides for the possibility to use any surplus of geologically stored biogenic CO_2 for meeting the project's annual volume target in the following year. In particular, the measure includes a flexibility mechanism pursuant to which if in a given year, except for the last year, a beneficiary captures and stores more biogenic CO_2 than the annual volume target, as indicated in the aid granting decision, it would be able to use the biogenic CO_2 captured in excess of the annual volume target to meet the project's annual volume target in the following year.

(74) The Swedish authorities explain that the sole criterion for ranking the bids is cost-effectiveness of the project, i.e. the amount of public support needed by the applicant to capture, transport and geologically store biogenic CO_2, expressed in SEK per tonne of biogenic CO_2. The project requesting the lowest amount of public support per tonne of biogenic CO_2 stored would be ranked highest. To ensure that bidders receiving other public support for the project do not obtain an undue advantage compared to those that have not secured such additional funding and in order to ensure cost-effectiveness, the measure provides that when ranking the bids, the Swedish authorities will consider the total amount of public support that the bidders would receive for the same eligible costs. This includes State aid requested by the applicant under the measure, State aid granted for the same project under other measures, as well as other public support not qualifying as State aid.

(75) According to the Swedish authorities, the effectiveness and competitiveness of the bidding process under the measure is ensured by several elements of the auction design.

(76) First, the bidding process is open, clear, transparent and non-discriminatory, and based on objective criteria defined ex ante having regard to the objective of the scheme. The Swedish authorities indicate that the selection criteria for ranking the bids will be openly and clearly communicated ahead of the auction. The ranking of bids will be based on their cost-effectiveness, so that the most cost-effective bid(s) will be selected. The Swedish authorities will also clearly communicate how the amount of aid requested in the bid, in combination with costs, revenues and other public support reported during the project, will be used to determine the aid payments. Relevant information is included in the legal bases of the measure, as well as in the draft call for projects. The principles of the auction, such as those concerning the ranking and evaluation of bids and the quantification of the aid amount, will also be explained in other types of communication materials, such as guidance documents.

(77) Second, the criteria are published sufficiently far in advance of the deadline for submitting applications. The Swedish authorities explain that once an auction is announced, undertakings will have a maximum of six months to submit bids; during that period, all the relevant information (e.g., terms and conditions) will be available for the applicants.

(78) Third, the bidding process includes a target volume of stored biogenic CO_2 which is set to be lower than the expected total volume proposed to be stored by applicants entering the auction. In the first auction, it is expected that […] bidders will participate, with a total volume of […] tonnes of biogenic CO_2 per year ([42]). The target volume for the first auction is set to come as close as possible to […] tonnes of stored biogenic CO_2 per year. The overall target for the scheme is to reach 2 million tonnes of stored biogenic CO_2 per year; this target may be achieved with successive auctions (recital (24)). The bidding process will be capped by an overall budget of SEK 36 million, introducing an additional constraint to the bidding process. Bids will be accepted only in so far, they fit within the budget. Given the estimated costs of capture, transport and storage per ton of CO_2 and the target volume, Sweden expects the budget to exert an additional constraint in the different rounds.

(79) Fourth, as an additional safeguard, all bids will be subject to a secret ceiling price. […]. The ceiling price is set taking into account the following: (i) the analysis of the costs and revenues of biogenic CCS projects (see recital (35)); (ii) the objective to ensure that the fixed ceiling price would be high enough not to interfere with the additional safeguard mechanism referred to in recital (80); and (iii) the need to avoid the exclusion of projects displaying higher costs than those resulting from the studies because of inflation, size and cost increases observed in the energy market.

([42]) Due to the large heterogeneity in volumes among the potential bidders, the Swedish authorities explain that the expected volumes are more relevant than the number of bidders.

(80) The […] will be also subject […] to a dynamic ceiling price […]. This safeguard mechanism provides that […]. According to that mechanism, a project will only be awarded aid if the bid ensures an efficient use of the budget with a view to achieving the overall target of […]. To this end, the Swedish authorities will set […], on the basis of the following formula:

[...]

where:

[…] ([43]).

(81) […].

(82) The Swedish authorities explain that the need to introduce such a dynamic ceiling price rather than only fixed ceiling price is linked to the fact that there is a large heterogeneity in volume of biogenic CO_2 that can be stored by potential participants despite the minimum storage volume required to participate in the bidding process. Their potential volumes range from 50 000 to over 1 million tonnes of biogenic CCS per year and there are uncertainties regarding how many and which categories of players will participate. The dynamic ceiling price allows to define the maximum average bid that can be accepted in the first auction depending on the total volume of accepted bids ([44]).

(83) The safeguards set out in recitals (79) and (80) are complementary and aim to limit the maximum bid from individual bidders and avoid excessively high bids. The necessity of those safeguards is linked to the fact that there is uncertainty as to how many, or which, of the possible participants will ultimately decide to enter the auction. Since there are large differences in the volume that can be offered by the potential participants, the uncertainty as regards the possible participants means that the expected total volume entering the auction is also highly uncertain. On this basis, the Swedish authorities submit that a target volume or budget, by themselves might not be able to ensure a sufficient competitive pressure. The fixed ceiling price applies in a non-discriminatory manner to all bidders in the auction. While it is not expected to come into play in the most probable scenario in which the auction would be oversubscribed, it provides a safeguard for unlikely scenarios of low-volume bids. The mechanism described in recital (80) (i.e., the dynamic ceiling) acts as a safeguard for cost effectiveness of the measure, i.e. against the risk to spend too much of the budget without obtaining a sufficient level of environmental benefits (in terms of amount of biogenic CO_2 stored). In particular, the dynamic ceiling price ensures that if the first ranking bid is as high as the fixed ceiling price, the other bids will not be accepted thereby saving the budget for possible future auction rounds, where more cost-effective bids would be submitted. Additionally, it would contribute to ensuring the competitiveness of the bidding process, in particular in case of an undersubscribed bidding process, where the volume target referred to in recital (78) would not constitute a sufficient safeguard. The safeguard has explicitly and unambiguously been defined ahead of the auction, to ensure objectivity.

([43]) […].

([44]) […].

(84) In subsequent auctions, the safeguard described in recitals (80) to (83) will most likely no longer apply as the remaining budget is expected to become a binding constraint ([45]). A fixed ceiling price is anticipated to replace the dynamic ceiling, and will be determined by the Swedish authorities ahead of each auction round, on the basis of updated estimates of the costs and revenues of biogenic CCS projects. The information collected as part of the previous auction rounds, as well as the update of the calculation of cost and revenues for biogenic CCS projects, as referred to in recital (37), will form the basis for setting the fixed ceiling price.

(85) When developing the auction design, the Swedish authorities took into account the risk of strategic bidding in a relatively small and known group of potential bidders and put forward safeguards to minimise such risk. First, the exact values of certain parameters in the auction model will not be disclosed until after the auction closes. This refers notably to the target volume of stored biogenic CO_2 (recital (78)) and the threshold value for the dynamic ceiling price (recital (80)). Their existence and applicability are however explicitly referred to in the call for projects. Second, to incentivise bidders to bid taking into account their true net costs, the Swedish authorities have set up a mechanism adjusting the aid amount in case of significant deviations from the projected net costs of the projects (Section 2.9.4.3).

2.9.4.3. Aid amount

(86) The Swedish authorities explain that following the ranking of the bids, the Swedish authorities will grant an aid amount corresponding to the level of aid requested per tonne of biogenic CO_2 captured and geologically stored.

(87) The Swedish authorities state that there will be no upfront payments. The aid will be disbursed following the beneficiary's request for payment, which must include evidence of the amount of geologically stored biogenic CO_2.

(88) To ensure that the aid remains proportionate throughout the 15-year contracts' duration, and as a further safeguard against the risk of strategic bidding, the scheme provides that the beneficiaries regularly report to the Swedish authorities as regards: (i) the project's costs, encompassing investment and operating costs throughout the value chain, (ii) other public support received for the same project (encompassing other State aid and any support from Union funds), and (iii) other financing than public support as well as revenues related to the project, notably those stemming from the sale of carbon emission credits. Beneficiaries will be requested to submit the first report at the latest on 1 April the year after the first

([45]) After the first auction, it will be known how much budget remains. Before a second auction is announced there will be an evaluation of which, and how many, bidders are expected to take part in the second auction, and whether their total volume make it likely that the auction will not be undersubscribed. Since the second auction most likely will be constrained by the remaining budget, this sum will be compared to scenarios with potential bidders and their volumes and cost estimates. If the remaining budget is deemed to be higher than approximations of the asked budget from likely participants, the whole remaining budget should not be used in the second auction, and some may instead be saved for an additional, third auction. If the first or second auction is undersubscribed there will also be an inquiry as to why fewer participants than expected chose to participate, to identify whether there are other factors of the auction design that need to be adjusted to increase participation in subsequent auctions.

storage of biogenic CO_2 and then annually thereafter. These reports will provide the Swedish authorities with regular updates regarding the costs and revenues linked to biogenic CCS projects, thereby allowing to ensure the continued necessity of the measure.

(89) Based on the progress report, the Swedish authorities will adjust the amount of State aid for future aid payments, taking into account possible additional public funding received, actual revenues beyond the expectations at the time of the bid and significant deviations in costs. In particular, to limit the risks of strategic bidding and overcompensation, the measure provides that:

(a) Additional public support granted after the granting of aid under the measure and not taken into account in the bid is deducted from the aid amount granted in full;

(b) Additional financing as well as revenues generated by the project will be deducted from the aid amount granted by 90%, to preserve the beneficiaries' incentives to operate efficiently;

(c) In case of significant deviations regarding the project's costs, payments will also be revised downward. This will be done by deducting from the aid amount 90% of the cost savings in excess of 20% of the total costs as submitted in the auction ([46]). The aid amount is not adjusted as long as the discrepancies are limited and correspond to normal fluctuations in energy prices.

(90) In practice, the Swedish authorities will make preliminary payments based on latest aid amount decided ([47]). The correctness of the preliminary payments will be confirmed based on the projects' actual financial information for the same year. If the preliminary payments have been too high, future aid payments will be adjusted downwards, while they can be adjusted upwards (up to the level of the bid) again when higher costs are reported. The aid amount can though never be higher than the bid. Furthermore, the Swedish authorities explain that the ranking and selection of projects is based exclusively on the initial bid, and cannot be adjusted or altered following the receipt of actual financial information of the project.

(91) The Swedish authorities commit to gather stakeholders' views on the safeguard described in recitals (88) to (90) through a public consultation, before launching a possible second auction round under the measure.

([46]) If the costs in terms of SEK per tonne of biogenic CO2 in one year are higher than 20% compared to the costs in terms of SEK per tonne of biogenic CO2 projected at the time of the bid, then savings beyond the 20% threshold are deducted by 90%. Reduction in costs up to 20% will not result in a downward adjustment of the aid amount.

([47]) This will correspond to the aid amount set out in the bid for the first year, and the aid amount resulting from the adjustments based on the progress report of the previous year in the second and following years.

2.9.5. Greenhouse gas emission reduction and abatement cost calculation

(92) The Swedish authorities explain that aided projects will reduce direct greenhouse gas emissions of the beneficiaries by capturing and permanently storing biogenic CO_2 that would otherwise be released in the atmosphere.

(93) As regards indirect emissions, the Swedish authorities assessed the expected CO_2 emissions generated along the CCS chain. On that basis, the Swedish authorities expect that the implementation of biogenic CCS will lead to indirect emissions, mainly related to the energy consumed to capture CO_2 and the transport of biogenic CO_2 to the geological storage location. However, as explained in recitals (94) to (96), such indirect emissions are expected to be significantly lower than the direct CO_2 emissions avoided thanks to the aid.

(94) According to Sweden, based on available studies and completed projects ([48]), the total emissions for the CCS value chain can be expected to make up around 5% of the CO_2 emissions which are geologically stored at the storage site. That share of emissions is dominated by the emissions from CO_2 transportation from the point where it is captured to the geological storage. This may be done by truck, rail, ship or pipeline transport (or a combination of any of those).

(95) As regards emissions linked to the use of energy for the operation of CCS project, the Swedish authorities explain that installing CO_2 capturing equipment at energy generating plants, such as cogeneration plants, affects the energy demand or production at that plant ([49]). However, possible additional greenhouse gas emissions linked to that further energy demand are expected to remain limited:

(a) Emissions associated with additional heat production are estimated to be in the range of -0.02 to +0.03 tonne CO_2e per tonne captured CO_2.

(b) Emissions associated with net changes in electricity production are estimated to be negligible. This is because, based on the public inquiry from 2020 ([50]), the capture and geological storage of about 2 million tonnes of biogenic CO_2 was expected to lead to a net reduction in available grid electricity of 0.4 TWh, or 0.2 MWh/tonne of stored CO_2. When multiplying that additional electricity demand by the current CO_2 intensity of the Swedish electricity production mix (6.62 g

([48]) Vinnova project: Methodology development for accounting of negative emissions via BECCS - case study CHP. https://www.vinnova.se/en/p/methodology-development-for-accounting-of-negative-emissions-via-beccs---case-study-chp/; Energiforsk: Bio-CCS i Fjärrvärmesektorn – Syntes. Rapport 2022:842. 2021. https://energiforsk.se/media/30931/bio-ccs-i-fjarrvarmesektorn-syntes-energiforskrapport-2022-842.pdf.

([49]) In particular, based on two reference plants for combined heat and power plants in Sweden, adding a CO_2 capture process with a 90% capture rate results, in case of CCS based on monoethanolamine (MEA) in a 19% reduction in electricity production and a 31% decrease in district heating production; and in case of CCS using hot potassium carbonate (HPC) in a 67% decrease in electricity production and an increase of 25% in district heating production Energiforsk: Bio-CCS i Fjärrvärmesektorn – Syntes. Rapport 2022:842. 2021, available at: https://energiforsk.se/media/30931/bio-ccs-i-fjarrvarmesektorn-syntes-energiforskrapport-2022- 842.pdf.

([50]) SOU 2020:4, The pathway to a climate-positive future – strategy and action plan for achieving negative greenhouse gas emissions after 2045 (Vägen till en klimatpositiv framtid), p. 757.

CO2e/kWh ([51])), the resulting CO_2 emissions associated with electricity for CO_2 capture and compression is estimated to 1.3 tonne of CO_2 per million tonne of CO_2 captured.

(96) As regards compression, electricity consumption can be estimated to be in the range 80-120 kWh/tonne CO_2 ([52]). When multiplied by the Swedish electricity production mix, this leads to additional 0.0005-0.0007 tonne CO_2 /tonne CO_2 captured, which can be considered negligible. As regards electricity use related to intermediate storage, it can be assumed to be even lower than those from compression and hence also negligible ([53]).

(97) The Swedish authorities submitted an estimation of the aid per tonne of CO_2 equivalent emissions avoided. According to that estimate, the subsidy per tonne of CO_2 equivalent emissions is estimated to be in the range of SEK 1 150-2 100 per tonne of CO_2. This is based on the following assumptions:

(a) that aid will cover the full cost of the biogenic CCS chain (i.e., that the beneficiary will have no other revenues);

(b) that costs per tonne of stored biogenic CO_2 will be in the range of SEK 1 100-2 000 per tonne of CO_2 (recital (35));

(c) that the CO_2 equivalent emissions (including indirect emissions) resulting from the CCS chain (from capture to injection for geological storage) make up approximately 5% of the captured and stored biogenic CO_2 (recital (94)).

2.10. Cumulation

(98) The Swedish authorities indicate that aid under the measure can be cumulated with other State aid or centrally managed Union funds for the same project, up to the amount of aid indicated in the bid.

(99) As regards cumulation of aid under the measure with other State aid or Union funds already granted for the same project, the Swedish authorities will ensure that the overall public support does not lead to overcompensation by ensuring that the level of aid requested together with 100% of any other public support granted for the same project, such as State aid or Union funding not constituting State aid, and 90% of revenues referring to the capture, transport and geological storage of the same amount of biogenic carbon dioxide cannot exceed the total costs specified in the application. This will be verified based on the information that

([51]) Association of Issuing Bodies, European Residual Mixes - Results of the calculation of Residual Mixes for the calendar year 2022, p. 18. Source: https://www.aib-net.org/sites/default/files/assets/facts/residual-mix/2022/AIB_2022_Residual_Mix_Results_.pdf

([52]) The precise level of electricity demand depends on the chosen pressure level. The two main options are considered at this point which is compression to 7 barg (gauge pressure) and a temperature of -50°C and 15 barg at -28°C.

([53]) The Swedish authorities refer to S Jackson and E Brodal (2018), A comparison of the energy consumption for CO2 compression process alternatives. IOP Conf. Ser.: Earth Environ. Sci. 167 012031.

applicants will be requested to submit as part of their bid, and notably any other public support awarded in relation to the same project (recitals (69)(b) and (70)).

(100) As regards cumulation of aid under the measure with other State aid or Union funds for the same project granted during the project's operation, the Swedish authorities explain that the bids are assumed to provide a reliable estimate of the minimum amount of support required by potential beneficiaries to undertake the project. The actual aid amount disbursed will be adjusted throughout the 15-year support period, among others to take into account of any possible new aid or Union funding awarded to the beneficiary for the same eligible costs. This will ensure that the aid amount paid under the measure together with other State aid or Union funding does not result in the total amount of public support exceeding the project's funding gap, as approximated by the amount of the bid. This will be verified by the Swedish Energy Agency based on the information that applicants will be requested to submit as part of their annual reports (recital (88)), under which the beneficiaries are obliged to provide information to the Swedish Energy Agency on the costs of their project and any additional public support or revenues received.

2.11. Transparency

(101) The Swedish authorities will ensure compliance with the transparency requirements laid down in points 58 to 61 of the Guidelines on State aid for climate, environmental protection and energy 2022 ('CEEAG') ([54]). The relevant data of the measures will be published on national websites (www.tillvaxtanalys.se/statsstod and www.energimyndigheten.se).

2.12. Ex-post evaluation

(102) The Swedish authorities notified, together with the scheme, a draft evaluation plan for the measure, taking into account the best practices recalled in the Commission Staff Working Document on a Common methodology for State aid evaluation ([55]). The main elements of the evaluation plan are described below.

(103) The evaluation plan describes the objectives of the scheme subject to evaluation and comprises evaluation questions that address the direct effects of the scheme, the proportionality and appropriateness of the aid, and a number of indirect effects.

(104) As regards direct effects, the plan investigates the capability of the scheme to meet the objectives of the scheme to contribute through the creation of negative emissions to the Swedish net zero emissions target by 2045. This includes in particular the target of storing approximately 2 million tonnes of biogenic CO_2 per year over the period 2026-2045. As regards indirect effects, the plan assesses the positive effects of the schemes, such as the development of technology and infrastructure for biogenic CCS and of a market for carbon removal credits, as

([54]) Communication from the Commission – Guidelines on State aid for climate, environmental protection and energy 2022 (OJ C 80, 18.2.2022, p. 1).

([55]) Commission Staff Working Document on Common methodology for State aid evaluation, 28.5.2014, SWD (2014) 179 final.

well as the scheme's potential distortive effects on competition and possible negative effects on the electricity sector.

(105) With regard to the proportionality and appropriateness of the aid, the plan proposes to assess them by checking whether the bidding processes carried out under the scheme were sufficiently competitive and whether overcompensation of certain categories of projects was effectively avoided. The Swedish authorities commit to assess as part of the ex post evaluation, the effects on the measure's effectiveness of including in the competitive bidding design the safeguard described in recitals (88) to (90).

(106) The evaluation plan identifies and describes the result indicators that will be used to assess the degree of achievement of the scheme's objectives, and which are matched with the evaluation questions. These include, for instance, the amount of geological storage of CO_2 enabled by the aid and the ratio between planned and realised storage of biogenic CO_2.

(107) The evaluation plan also describes the methodology that will be applied to evaluate the scheme. The Swedish authorities intend to apply a quantitative quasi-experimental evaluation design based on the 'Difference-in-Difference' (DID) approach ([56]) to be applied, if possible, based on two different control groups. This will be combined with qualitative data and assessments of independent experts to enable a valid and reliable evaluation. The Swedish authorities explain that the choice of the methodology is based on the open nature of the measure, which makes a randomised experiment not be possible, as well as the nature of the intervention and the biogenic CCS context, which would be inadequate for a comprehensive quantitative evaluation.

(108) The Swedish authorities committed to submit an interim evaluation report to the Commission by 16 November 2026. The interim evaluation report will contain the available early data and statistics on the implementation of the scheme, notably the analysis of the auctions carried out in years 2024-2026.

(109) The final evaluation report will be submitted to the Commission by 27 March 2028, i.e. 9 months before the expiry of the scheme. This report will include a summary of the analysis of the scheme's implementation in the years 2024-2026, the analysis of the possible additional auctions occurred in the period 2026-2028, and the feasibility study for the additional ex post evaluation referred to in recital (110).

(110) On 15 November 2032, the Swedish authorities will submit an additional ex post evaluation, assessing the effects of the scheme following the entry into operation of the biogenic CCS projects.

(111) The Swedish authorities confirmed that the evaluation plan and the final evaluation reports will be published on the Swedish Energy Agency's website ([57]).

([56]) As described in the abovementioned Commission Staff Working Document, pages 22 to 25.

([57]) https://www.energimyndigheten.se/klimat/ccs/statligt-stod-for-bio-ccs/

(112) The Swedish authorities confirmed that the evaluation will be conducted by an independent evaluation body in accordance with the criteria laid down in the evaluation plan and further developed in the interim evaluation report.

(113) The Swedish authorities committed to inform the Commission of any difficulty identified during the evaluation process that could significantly affect the implementation of the agreed evaluation plan, in order to identify and agree on possible solutions.

3. ASSESSMENT OF THE MEASURE

3.1. Existence of state aid

(114) Article 107(1) TFEU provides that *'any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods, shall, in so far as it affects trade between Member States, be incompatible with the common market'*.

(115) In the present case, the measure is imputable to the State, since it is granted by the Swedish Energy Agency (recital (17)) and it is established in national law (recital (15)). Moreover, it is financed through State resources, more specifically the general budget of the Swedish State (recital (27)).

(116) The measure confers an advantage to the beneficiaries, in the form of a premium for the storage of biogenic CO_2 (recital (21)), which varies according to the volume of CO_2 stored. Without the measure, this premium would not be available on the market. The measure thus confers on those beneficiaries an advantage which they would not have had under normal market conditions.

(117) The advantage conferred by the measure is selective, since it is awarded only to certain undertakings, i.e. undertakings meeting the requirements set out in Sections 2.9.2 and 2.9.4.1., excluding the undertakings not emitting CO_2 emissions or undertakings emitting only fossil CO_2 emissions. It is neither available for all undertakings proposing to capture and store greenhouse gas emissions, nor to all providers of negative emissions, not to all emitters of biogenic CO_2. It particular, it will only be granted to those ultimately selected in the competitive bidding process described in Section 2.9.4.2.

(118) The measure is liable to distort competition, since it strengthens the competitive position of its beneficiaries vis-à-vis their competitors not receiving State aid. It is also liable to affect trade between Member States, as it is open to undertakings that are active in sectors for which intra-Union trade exists (paper and pulp, energy, see recital (10)).

(119) Therefore, the Commission concludes that the notified measure constitutes State aid in the meaning of Article 107(1) TFEU.

3.2. Lawfulness of the aid

(120) The ordinance and the implementing regulation will be adopted by the Swedish government after the notification of the Commission decision approving the

scheme (recital (15)). Furthermore, aid will be granted under the measure following one or more auctions to be conducted based on the ordinance and the implementing regulation and in line with the conditions set out therein (recital (16). Thus, Sweden has complied with the stand-still obligation set out in Article 108(3) TFEU.

3.3. Compatibility of the aid

(121) The Commission has assessed the compatibility of the measure on the basis of Article 107(3), point (c) TFEU. This provision states that aid to facilitate the development of certain economic activities or of certain economic areas may be considered to be compatible with the internal market where such aid does not adversely affect trading conditions to an extent contrary to the common interest. Thus, in order to be capable of being considered compatible with the internal market under that provision, State aid must meet two conditions, the first being that it must be intended to facilitate the development of certain economic activities or of certain economic areas and the second, expressed in negative terms, being that it must not adversely affect trading conditions to an extent contrary to the common interest ([58]).

(122) In the present case, as described in Section 2, the scheme aims at promoting economic activities in a manner that reduces greenhouse gas emissions and increases the level of environmental protection. The supported activities thus fall within the scope of the CEEAG, more specifically, the category of aid for the reduction and removal of greenhouse gas emissions.

(123) The Commission has therefore assessed the measure under Article 107(3), point (c) TFEU, as interpreted by the general compatibility provisions of Section 3 CEEAG and the specific compatibility criteria of Section 4.1 CEEAG.

3.3.1. Positive condition: the aid must facilitate the development of an economic activity

3.3.1.1. Identification of the economic activities being facilitated

(124) In order to be compatible under Article 107(3), point (c) TFEU, aid must contribute to the development of a certain economic activity (or of a certain economic area) ([59]). In accordance with this, point 23 CEEAG states that, when notifying aid, Member States must identify the economic activities that will be facilitated as a result of the aid and how the development of those activities is supported. Moreover point 25 CEEAG provides that Member States must also describe if and how the aid will contribute to the achievement of objectives of Union climate policy, environmental policy and energy policy and more specifically, the expected benefits of the aid in terms of its material contribution to environmental protection, including climate change mitigation, or the efficient functioning of the internal energy market.

([58]) Judgment of 22 September 2020, *Austria v Commission*, C-594/18P, EU:C:2020:742, paragraphs 18 and 19.

([59]) Judgment of 22 September 2020, *Austria* v *Commission*, C-594/18 P, EU:C:2020:742, paragraphs 20 and 24.

(125) In the present case, the Swedish authorities explain that the measure supports the capture and storage of biogenic CO_2 by undertakings carrying out an activity in Sweden which emits biogenic CO_2 (recital (28)). This includes undertakings operating in the pulp and paper industry, where emissions originate in the wood used as raw material (i.e., the combustion of by-products of the pulping process), as well as undertakings in the energy sector, including cogeneration and district heating (recital (10)).

(126) The measure will therefore contribute to the development of economic activities in a manner that reduces greenhouse gas emissions and increases the level of environmental protection. The measure will contribute to the EU climate neutrality goal (recitals (4) and (7)) as it will support the capturing and storage of biogenic CO_2 that would otherwise be emitted in the atmosphere. By incentivising investments in carbon capture, the measure will also support the development of the CCS value chain and thereby contribute to the objectives of EU policies on carbon management such as the Communication on Sustainable Carbon Cycles (recital (5)), and the Industrial Carbon Management strategy (recital (7)).

(127) Therefore, the measure complies with points 23 and 25 CEEAG. The Commission therefore considers that the measure facilitates the development of certain economic activities as required by Article 107(3), point (c) TFEU.

3.3.1.2. Incentive effect

(128) As stated in point 26 CEEAG, State aid can only be considered to facilitate an economic activity if it has an incentive effect. An incentive effect occurs when the aid induces the beneficiary to change its behaviour towards the development of an economic activity pursued by the aid, and if this change in behaviour would otherwise not occur without the aid ([60]). The aid must not support the costs of an activity that the aid beneficiary would anyhow carry out and must not compensate for the normal business risk of an economic activity (point 27 CEEAG).

(129) In order to demonstrate the presence of an incentive effect, point 28 CEEAG requires Member States to identify the factual scenario and the likely counterfactual scenario in the absence of aid. Furthermore, points 28 and 38 CEEAG require the incentive effect of aid to be demonstrated through a quantification of the net extra costs necessary to meet the objective of the measure.

(130) Moreover, in accordance with point 32 CEEAG, the Commission considers that aid granted merely to cover the cost of adapting to Union standards has, in principle, no incentive effect. As a general rule, only aid to go beyond Union standards can have an incentive effect. In cases where the relevant Union standard has already been adopted but is not yet in force, aid can have an incentive effect if it incentivises the investment to be implemented and finalised at least 18 months before the standard enters into force, unless otherwise indicated in the Sections 4.1 to 4.13 CEEAG.

([60]) See in that sense Section 3.1.2 CEEAG, as well as judgment of 22 September 2020, *Austria* v *Commission*, C-594/18 P, EU:C:2020:742, paragraphs 20 and 24.

(131) The Swedish authorities explained that by supporting the costs of capturing, transporting and permanently storing biogenic CO_2, the measure will incentivise undertakings to capture biogenic CO_2 that would otherwise be released in the atmosphere and thereby reduce the actual CO_2 footprint of the beneficiaries' activities (recitals (28) and (92)).

(132) The Swedish authorities also explained that without the aid, the beneficiaries would not have sufficient economic, market or regulatory incentives to invest in the capturing and storage of biogenic CO_2 and would therefore continue to emit in the atmosphere the biogenic CO_2 generated during their activities (recital (29)).

(133) The Commission considers that the counterfactual which the Swedish authorities submitted is credible, for the following reasons.

(134) First, as the Swedish authorities explained, biogenic CCS projects are affected by a market failure. In particular, currently, biogenic CO_2 emissions are not adequately priced, that is to say, the undertakings concerned do not face the full cost of the greenhouse gas emissions they release (recital (30)).

(135) Second, other measures, including market-based mechanisms such as the EU ETS, are not sufficient to fully address the above-mentioned market failure. In particular, existing measures cannot provide on their own sufficient incentives to reduce biogenic CO_2 emissions from power plants or industrial processes. Indeed, such emissions are not covered by the EU ETS, the Effort Sharing Regulation or the LULUCF Regulation. Since the EU ETS does not recognise negative emissions, those measures and the EU compliance carbon market price cannot incentivise biogenic CCS projects (recital (31)).

(136) Third, the applicable regulatory framework is not sufficient, on its own, to incentivise undertakings to reduce biogenic CO_2 emissions or avoid that they are released in the atmosphere. This is because currently, no Union standards exist requiring undertakings emitting biogenic CO_2 to reduce their CO_2 emissions (recital (32)).

(137) Fourth, the information submitted by the Swedish authorities suggests that on its own, the market would not provide sufficient incentives to invest in the capturing and permanent storage of biogenic CO_2. While a voluntary market for carbon removal credits could potentially provide opportunities to create revenues for the biogenic CCS projects in the future, in Sweden and the EU it is still in its infancy, and it is not effectively functioning (recital (33)).

(138) The Swedish authorities also submitted an estimation of the costs of capturing and storing biogenic CO_2 and the profitability of such investments, based on previous consultations with plant operators as well as research studies (recital (35)). According to that information, biogenic CCS projects are associated with high costs, in a range of EUR 75 to 200 per tonne of stored CO_2 with no or limited revenues. This makes biogenic CCS projects unprofitable, i.e. resulting in a funding gap (recital (36)). On this basis, the Commission considers that without the aid, the beneficiaries would be unlikely to invest in biogenic CCS projects.

(139) The Commission considers that without support under the measure, and in the absence of further regulatory measures, the beneficiaries would lack the incentives to undertake investments in biogenic CCS projects or other projects to

avoid the release of biogenic CO_2 emissions. Therefore, the requirements set out in points 27 and 28 CEEAG are fulfilled.

(140) Point 29 CEEAG stipulates that aid does not normally present an incentive effect in cases where works on the projects started prior to the aid application. Point 31 CEEAG provides that in certain exceptional cases, aid can have an incentive effect even for projects which started before the aid application. In particular, that can be the case where the national authorities have published, before the start of works, a notice of their intention to establish the proposed aid measure, conditional upon the Commission's approval of the measure as required by Article 108(3) of the TFEU.

(141) The Commission notes that aid can be granted under the scheme to (i) projects that have submitted, before the start of works, an aid application; or (ii) projects which have informed the granting authority, prior to the start of works, that the measure is a pre-condition for their decision to undertake the project, based on a notice of the Swedish Energy Agency of 22 May 2024 (recital (39)). In relation to the latter option, the Commission notes that:

(a) The notice was made available on a publicly available website, namely the Swedish Energy Agency's website (recital (39));

(b) It stated the type of projects that the Swedish authorities proposed to support under the scheme (recital (39)(b));

(c) It indicated the point in time from which Sweden intends to consider such projects eligible, i.e. 22 May 2024 (recital (39)(c));

(d) The Swedish authorities submitted to the Commission a copy of the notice and the link to the website on which it was published (recital (39)).

(e) The notice also made clear that applicants intending to start works before submitting the aid application had to give prior notice of that to the granting authorities and indicated which authority to inform thereof (recital (39)(d)).

(142) Based on the considerations in recitals (128) to (141), the Commission therefore considers that the measure has an incentive effect.

3.3.1.3. Compliance with relevant provisions of EU law

(143) Point 33 CEEAG states that State aid cannot be declared compatible with the internal market if the supported activity, the aid measure, or the conditions attached to it entail a violation of relevant Union law ([61]).

(144) The Swedish authorities confirmed that neither the measure nor the conditions attached to it entailed a violation of relevant Union law (recital (40)). In particular, the scheme requires as an eligibility condition that the biomass used in the main production and/or cogeneration plant be sustainable in accordance with

([61]) See point 33 CEEAG, and Judgment of 22 September 2020, *Austria v Commission*, C-594/18 P, EU:C:2020:742, paragraph 44.

the Swedish sustainability framework that implements Directive (EU) 2018/2001 (recital (61)). Based on the information submitted by the Swedish authorities, the Commission has no reason to consider that the measures would involve any breach of relevant Union law.

(145) Therefore, the Commission considers that the measure does not infringe relevant Union law, and that the requirements of point 33 CEEAG are fulfilled.

3.3.1.4. Conclusion

(146) The Commission therefore concludes that the measure fulfils the first (positive) condition of the compatibility assessment under Article 107(3), point (c) TFEU, i.e. that the aid facilitates the development of an economic activity pursuant to the requirements set out in Section 3.1 CEEAG.

3.3.2. Negative condition: the aid cannot unduly affect trading conditions to an extent contrary to the common interest

3.3.2.1. Necessity of the aid

(147) To demonstrate the necessity of the aid, point 90 CEEAG explains that the Member State should demonstrate that aid is needed for the proposed activities as required under point 38 CEEAG ([62]), taking into account the counterfactual situation, as well as relevant costs and revenues including those linked to measures identified in point 89 CEEAG. Point 89 CEEAG states that the Member State must identify the policy measures already in place to reduce greenhouse gas emissions and that the costs of greenhouse gas emissions may not yet be fully internalised despite the implementation of measures to that effect, such as the EU ETS and other related measures or policies. In order to demonstrate the necessity of aid, point 90 CEEAG explains that the Member State should demonstrate that aid is needed for the proposed activities as required under point 38 CEEAG (i.e., that the supported activity would not be carried out without the aid), taking into account the counterfactual situation, as well as relevant costs and revenues including those linked to measures identified in point 89 CEEAG. Point 91 CEEAG explains that where the Member State demonstrated that there is a need for aid, the Commission presumes that a residual market failure remains, which can be addressed through aid for decarbonisation, unless it has evidence to the contrary.

(148) The Swedish authorities identified the policy measures already in place to reduce the release in the atmosphere of biogenic CO_2 emissions. As observed in recitals (134) to (136), the current regulatory framework does not allow to internalise the costs of biogenic CO_2 emissions. This is because biogenic CO_2 emissions are not adequately priced, that is to say, the undertakings concerned do not face the full cost of the greenhouse gas emissions they release. The Commission therefore considers that point 89 CEEAG is complied with.

([62]) Point 38 CEEAG provides that to demonstrate the necessity of aid, the Member State must show that, in the case of schemes, the reference project, would not be carried out without the aid. The Commission will assess this based on the quantification referred to in Section 3.2.1.3 or specific evidence-based analysis submitted by the Member State showing the necessity of the aid.

(149) The Swedish authorities submitted a counterfactual scenario where the undertakings that generate biogenic CO_2 when conducting their activities would continue to emit it in the atmosphere (recital (29)). As explained in recitals (35), (36) and (139), the Swedish authorities submitted an estimate demonstrating that biogenic CCS projects are associated with high costs with no or little revenues, which make them unprofitable. The Swedish authorities also clarified that existing policy measures have no impact on such calculations, as the EU ETS does not currently set a price on biogenic CO_2 emissions (recitals (31) and (135)). The Commission recalls its analysis in recitals (134) to (139) and its conclusion that the counterfactual submitted by the Swedish authorities is credible (recital (133)). Therefore, the requirements in point 90 CEEAG are fulfilled. As the Swedish authorities demonstrated that aid under the measures is necessary, in line with point 91 CEEAG, the Commission considers that a residual market failure remains and that it can be adequately addressed by the measure.

(150) To ensure that the aid remains necessary for each eligible category of beneficiary, the Member States must update their analysis of relevant costs and revenues at least every three years for schemes that run longer than that, as set out in point 92 CEEAG. Point 92 CEEAG specifies that where aid is no longer required for a category of beneficiary, that category should be removed before further aid is granted. The Swedish authorities indicated that if an auction takes place three years after the entry into force of the measure, they will update the analysis of average costs and revenues linked to biogenic CCS projects (recital (37)). For this purpose, the Swedish authorities will use the information collected as part of the previous auction round(s). The Commission also notes that the Swedish authorities will assess the continued necessity of the aid on the basis of the information that beneficiaries will submit as part of their annual reports. Those will provide information on updated projects' costs and revenues, including from the sale of carbon emission credits (recital (88)). The Commission therefore considers that point 92 CEEAG is complied with.

(151) Based on the considerations in recitals (147)-(150), the Commission concludes that the measure is necessary to support the targeted economic activities in a manner that increases environmental protection.

3.3.2.2. Appropriateness

(152) Point 93 CEEAG states that the Commission presumes the appropriateness of State aid for achieving decarbonisation goals provided all other compatibility conditions are met. It further sets out that, given the scale and urgency of the decarbonisation challenge, a variety of instruments, including direct grants, may be used.

(153) Since, as explained in Sections 3.3.1, 3.3.2.1 and 3.3.2.3 to 3.3.2.7, all other compatibility conditions are met, the Commission considers that aid granted under the measure is an appropriate instrument to support the targeted economic activity in a manner that increases environmental protection.

3.3.2.3. Eligibility

(154) Point 95 CEEAG explains that decarbonisation measures targeting specific activities which compete with other unsubsidised activities can be expected to

lead to greater distortions of competition, compared to measures open to all competing activities. As such, the Member State should give reasons for the measures that do not include all technologies and projects that are in competition. Furthermore, the Member State must regularly review eligibility rules and any rules related thereto to ensure that reasons provided to justify a more limited eligibility continue to apply for the lifetime of each scheme, as set out in point 97 CEEAG.

(155) As explained by the Swedish authorities, aid is granted under the measure to undertakings carrying out an activity in Sweden which emits biogenic CO_2, and which implement biogenic CCS projects leading to negative CO_2 emissions (recital (18)).

(156) In relation to the scope of the measure, the Commission notes that:

(a) the measure is open to undertakings operating in all sectors, provided that they emit biogenic CO_2; this includes for instance the pulp and paper sector, as well as the energy sector (e.g., cogeneration and district heating) (recitals (10) and (28));

(b) the measure is limited to projects concerning the capturing and storage of biogenic CO_2, while fossil-based CCS projects are not eligible (recital (42));

(c) the measure is limited to industrial carbon removals through biogenic CCS, to the exclusion of other technologies for CO_2 removals, such as the use of biochar as a carbon sink or DACCS (recital (43)); and

(d) the measure excludes projects with a capacity to capture and store up to 50 000 tonnes of biogenic CO_2 per year (recital (46)).

(157) As the measure does not include all technologies and projects that are in competition, the Commission has assessed whether the Swedish authorities have provided objective reasons to justify a more limited eligibility.

(158) The Commission notes that Sweden provided objective reasons justifying why the measure is targeted to biogenic CCS projects, and that those relate to the need to focus on innovative technologies have the potential to make an important and cost-effective contribution to environmental protection and deep decarbonisation in the longer term, as per point 96(d) CEEAG.

(159) With regard to the measure's limitation to biogenic CCS projects, the Commission notes that excluding fossil-based CCS projects is necessary to achieve the measure's primary objective to achieve in a cost-effective manner negative greenhouse gas emissions (recital (13)). First, negative emissions through carbon removals are needed to complement mitigation efforts for hard-to-abate emissions and contribute to the EU's climate neutrality target and the Swedish net-zero greenhouse gas target by 2045 (recitals (7) and (8)). In this respect, the Commission notes that, as recognised in the 2040 Climate Target Communication, CO_2 removals, including through CCS, are expected to be needed to achieve climate neutrality by 2050 and negative emissions thereafter. The need for negative emissions has also been underlined by international organisations, such as the Intergovernmental Panel on Climate Change and the

International Energy Agency (recital (7)). Therefore, biogenic CCS has the potential to make an important contribution to environmental protection and deep decarbonisation in the longer term. Second, the measure was designed to address the specificities and challenges of undertakings that emit biogenic CO_2, and to which, therefore, the regulatory and market-based incentives created by the EU ETS, do not apply (recitals (31) and (33)). By contrast, as the EU ETS applies to most fossil-based greenhouse gas emissions, it can incentivise fossil-based CCS. The specificities and challenges of undertakings that emit biogenic CO_2 therefore call for a separate scheme targeting carbon removals. The Commission therefore considers that by focusing on biogenic CCS instead of CCS more broadly, the measure aims to ensure that innovative technologies for achieving negative emissions receive the necessary support to develop and become cost-effective (recital (42)).

(160) With regard to the measure's limitation to industrial carbon removals through biogenic CCS, to the exclusion of other technologies for CO_2 removals, the Swedish authorities concluded on the measure's scope after conducting public inquiries and assessing the benefits, effectiveness and challenges of the different technologies. The Commission notes that, based on the results of those analyses, it emerged that biogenic CCS is the most cost-effective and mature technology allowing to deliver negative emissions in the shortest time frame. Indeed, on the one hand the use of biochar as a carbon sink displays lower and more uncertain environmental benefits (recital (44)); on the other hand, DACCS are expected to be more expensive and more energy-consuming than biogenic CCS in Sweden (recital (45)). Including these less mature, possibly less effective and more expensive technologies in the scheme and in particular in the bidding process risks reducing the cost effectiveness of the bidding process. The more targeted scope of the scheme can therefore be expected to lead to lower costs of environmental protection (point 96(f) CEEAG).

(161) Finally, with regard to the limitation of the measure to projects with a capacity to capture and store more than 50 000 tonnes of biogenic CO_2 per year, the Commission notes that such limitation is also linked to the objective to focus on projects that can make a cost-effective contribution to environmental protection and deep decarbonisation, as also explained in the impact assessment (recital (56)(e)). The Swedish authorities explained that projects below that scale are expected to be significantly more expensive than projects above the threshold. Including such small-scale projects in the same bidding process disproportionately increases the heterogeneity of the bidding process, increases the risk of strategic bidding while imposing an administrative burden on participants that could be perceived as too heavy comparatively to the environmental protection that would result from small-scale projects (recital (46)). While certain replies to the public consultation argued that the minimum bid limit of 50 000 tonnes of CO_2 per year effectively excludes certain technologies (for example, biogas production and ethanol production), the Commission notes that the Swedish authorities provided justifications for maintaining it ([63]).

([63]) Based on the information provided by Sweden, this was the main comment submitted in the public consultations on the measure regarding eligibility.

(162) Having assessed those reasons, the Commission concludes that the limited eligibility under the measure does not unduly distort competition.

(163) The Swedish authorities confirmed that they will keep under review the eligibility rules to ensure that these are still justified in the face of new technology development and data availability (recital (47)). The Commission notes that for this purpose, the Swedish authorities will have the possibility to review information from the previous auction rounds, as well as information submitted by beneficiaries as part of their annual reporting on the project's costs and revenues, allowing for a comparison with other CO_2 removal technologies. The Swedish authorities will also review on the basis of that information the costs and revenues of biogenic CCS projects before a potential second round of competitive bidding under the scheme is carried out, with a view to determining a fixed ceiling for the second auction (recitals (47) and (84)).

(164) The measure therefore complies with points 95 to 97 CEEAG.

3.3.2.4. Public consultation

(165) As of 1 July 2023, point 99 CEEAG requires Member States to consult publicly on the competition impacts and proportionality of the proposed measures, prior to the notification of aid.

(166) Point 99(a) CEEAG states that for aid measures, where the average annual aid to be granted is at least EUR 150 million, the public consultation must last at least six weeks and cover the following topics: (i) eligibility; (ii) method and estimate of subsidy per tonne of CO2 equivalent emissions avoided (per project or reference project); (iii) proposed use and scope of competitive bidding processes and any proposed exceptions; (iv) main parameters for the aid allocation process including for enabling competition between different types of beneficiaries; (v) main assumptions informing the quantification used to demonstrate the incentive effect, necessity and proportionality; (vi) where new investments in natural gas-based generation or industrial production may be supported, proposed safeguards to ensure compatibility with the Union's climate targets.

(167) According to point 101 CEEAG, consultation questionnaires must be published on a public website. The Member State must also publish a response to the consultation, which summarises and addresses the received input and explains how the possible negative impacts on competition have been minimised through the scope or eligibility of the proposed measure. They must also provide a link to their response to the consultation as part of the notification.

(168) The Commission notes that the Swedish authorities consulted stakeholders on the measure through various means. First, in 2020, Sweden gathered stakeholders' views from the referral procedure of the public governmental inquiry called 'The pathway to a climate-positive future – strategy and action plan for achieving negative greenhouse gas emissions after 2045' (recital (50)). Second, the Swedish authorities conducted dialogue meetings with stakeholder (recital (51)). Third, between 22 December 2021 and 31 March 2022, the Swedish authorities consulted stakeholders on a proposal for a scheme for biogenic CCS projects ('first public consultation') (recital (52)); furthermore, between 20 December 2023 and 31 January 2024, the Swedish authorities invited stakeholders to submit

their views on the draft regulation, the draft ordinance and an impact assessment ('second public consultation') (recital (54)).

(169) With regard to the two public consultations on the measure, the Commission notes that both consultations ran for periods of 6 weeks each (i.e., the first consultation ran between 22 December 2021 and 31 March 2022 and the second consultation ran between 20 December 2023 and 31 January 2024). The Commission also notes that the two public consultations covered, and gave an opportunity to stakeholders to comment on, all the relevant elements set out in point 99(a) CEEAG:

(a) Both sets of consultation documents described the eligibility of projects under the measure. In particular, the consultation documents clarified that the scheme would target biogenic CCS specifically, and that biochar and fossil-based CCS projects, as well as projects with a capacity to capture and store up to 50 000 tonnes of biogenic CO_2 per year would be excluded (recitals (53)(a) and (55)(a));

(b) The consultations explained that aid would be granted under the measure on the basis of a competitive bidding process, using cost-effectiveness as the sole award criterion (recital (53)(d) and (55)(c)). The competitive bidding process applies to all eligible undertakings and projects, with no exceptions. The Swedish authorities also referred to the existence of a target volume as well as a secret ceiling price to be made public after the closure of the auction (recital (53)(d)), as well as to the applicability of an adjustment mechanism (recital (55)(c));

(c) The consultations also provided explanations regarding the main assumptions informing the quantification used to demonstrate the incentive effect, necessity and proportionality of the aid. Notably they described the lack of an existing business case mainly due to (i) the lack of financial incentive for undertakings to generate negative emissions; (ii) the significant financial risk characterising biogenic CCS projects; and (iii) the need to demonstrate the full biogenic CCS value chain. Furthermore, the consultation documents provided an estimate of costs of biogenic CCS per tonne of biogenic CO_2, on the basis of comparative analysis of different studies executed in the public governmental inquiry referred to in recital (50) (recital (53)(b)). Moreover, stakeholders had a possibility to comment on the conclusion that aid would be necessary during a period of 15 years (recitals (53)(b) and (55)(b));

(d) Finally, the first stakeholder consultation referred to the measure's target in terms of biogenic CO_2 captured and stored of 2 million tonnes of biogenic CO_2 captured and stored per year by 2030 (recital (53)(c)). While the two public consultations did not specifically cover the estimate of subsidy per tonne of CO_2 equivalent emissions avoided, the Commission notes that the subsidy per tonne of CO_2 would be used as the sole award criterion, hence not consulting on this element contributed to minimise the risk of collusion. In any event, the consultations also provided explanations regarding the main assumptions informing the quantification used per tonne of biogenic CCS, potentially coming close to the needed subsidy per tonne of biogenic CO2 avoided.

(170) The Commission notes that both public consultations (i.e. the consultation that ran between 22 December 2021 and 31 March 2022 and the one that ran between 20 December 2023 and 31 January 2024) were published on the competent Swedish authorities' websites (recitals (52) and (54)). The Swedish authorities also published the responses to the consultation, together with a press release summarising the results of the consultation and explaining the following steps (recitals (52) and (56)). The Commission also notes that the Swedish authorities took into account the comments received in the finalisation of the measure's design, thereby addressing most of the concerns raised (recital (55).

(171) Based on the considerations in recitals (168) to (170), the Commission concludes that the measure complies with points 99 to 101 CEEAG.

3.3.2.5. Proportionality of the aid, including cumulation

(172) Point 47 CEEAG explains that State aid is considered to be proportionate if the aid amount per beneficiary is limited to the minimum needed for carrying out the aided project or activity. Point 48 CEEAG clarifies that aid is considered as limited to the minimum needed for carrying out the aided project or activity if the aid corresponds to the net extra costs necessary to meet the objective of the measure, compared to the counterfactual scenario in the absence of aid.

(173) Point 49 CEEAG states that when the aid amounts are determined through a competitive bidding process, the result of that process will provide a reliable estimate of the minimum aid required so that detailed assessments of the net extra costs necessary for carrying out the investment will not be required. It further provides the criteria that must be fulfilled so that the aid is deemed proportionate:

(a) The bidding process is open, clear, transparent and non-discriminatory, based on objective criteria, defined *ex ante* in accordance with the objective of the measure and minimising the risk of strategic bidding;

(b) The criteria are published sufficiently far in advance of the deadline for submitting applications to enable effective competition;

(c) The budget or volume related to the bidding process is a binding constraint in that it can be expected that not all bidders will receive aid, the expected number of bidders is sufficient to ensure effective competition, and the design of undersubscribed bidding processes during the implementation of a scheme is corrected to restore effective competition in the subsequent bidding processes or, failing that, as soon as appropriate; and

(d) *Ex post* adjustments to the bidding process outcome are avoided as they may undermine the efficiency of the process's outcome.

(174) Point 104 CEEAG further sets out that the bidding process should, in principle, be open to all eligible beneficiaries to enable a cost-effective allocation of aid and reduce competition distortions.

(175) The Commission notes that the aid under the scheme is allocated through a competitive bidding process open to all eligible undertakings and projects (recital (66) as well as Sections 2.4, 2.9.2 and 2.9.4.1). In particular, the competitive bidding process is open to all undertakings carrying out an activity in Sweden

which emits biogenic CO_2, and which implement biogenic CCS projects leading to negative CO_2 emissions. Except for undertakings in difficulty (recital (19)) and undertakings subject to an outstanding recovery order (recital (20)), all undertakings are allowed to participate in the competitive bidding process.

(176) Having assessed the design of the bidding process that Sweden plans to use under the measure, the Commission considers that it is competitive and complies with points 49 and 50 CEEAG.

(a) First, as explained in recital (76), the bidding process is open, clear, transparent and non-discriminatory, and it is based on objective criteria defined ex ante having regard to the objective of the scheme. While the exact values of certain parameters in the auction model will not be disclosed until after the auction closes (i.e., the target volume of stored biogenic CO2 and the threshold value for the dynamic ceiling price), the Commission considers this justified to minimise the risk of strategic bidding (recital (85)).

The Swedish authorities will adjust the amount of aid paid out to take into account of market developments (e.g., significantly lower costs, higher revenues or additional public support) (recital (90)). This cost transparency mechanism combined with a reduction of the aid in case of significant cost decrease further reduces the risk of strategic bidding.

Therefore, the measure complies with point 49(a) CEEAG.

(b) Second, the criteria are published sufficiently far in advance of the deadline for submitting applications. In particular, once an auction is announced, undertakings will have six to seven months to submit their bids (recital (77)). Therefore, the measure complies with point 49(b) CEEAG.

(c) Third, the the bidding process includes a budget combined to a target volume of stored biogenic CO_2 which is set to be lower than the expected total volume proposed to be stored by applicants entering the auction and the level of net costs associated to these volumes. In addition, the bidding process includes a mechanism to ensure that the target volume and the budget of the first round also constitute binding constraints: In particular, the target volume for the first auction is set to come as close as possible to […]tonnes of stored biogenic CO_2 per year, while a total volume of […] tonnes of biogenic CO_2 per year is expected to enter the first auction. In addition, certain bids in the first round will be subject to a dynamic ceiling price […]. Therefore, the volume and the budget constitute binding constraints in that it can be expected that not all bidders will receive aid. Furthermore, while a limited number of beneficiaries is expected to participate in the first auction […], the Commission notes that the volume expected to enter the first auction exceeds the volume target; therefore, the bidding process can be expected to be competitive (recital (78)). Therefore, the measure complies with point 49(c) CEEAG.

(d) Fourth, there will be no *ex-post* adjustments to the bidding process outcome. While the Swedish authorities will adjust the amount of aid paid

out to take into account of market developments (e.g., significantly lower costs, higher revenues or additional public support), this will not result in changes of the projects' ranking (recital (90)) and thus of the outcome of the bidding process.

(177) The Commission also assessed the additional safeguards introduced by the Swedish authorities, notably the fixed and dynamic ceiling prices. As regards to the fixed ceiling price, the Commission notes that the Swedish authorities determined it taking into account the estimate of biogenic CCS projects' costs and profitability, based on consultations with stakeholders and research studies (recital (35)), and at a level which is sufficiently high to be triggered only in exceptional cases (recital (79)). As regards to the dynamic ceiling price, the Swedish authorities have submitted to the Commission the formula and relevant value for its application, and have justified the need for its inclusion (recitals (80) to (83)). On that basis, the Commission concludes that the dynamic ceiling price can constitute an appropriate safeguard to ensure undistorted competition in the bidding process and minimise the risk of strategic bidding in view of the large heterogeneity of projects' sizes and the limited availability of financial information for the Swedish authorities. Finally, the Commission observes that the Swedish authorities will ensure that the dynamic ceiling price will only be maintained if it is strictly necessary. After the first auction, in view of the more limited risk of undersubscription and the higher availability of financial information, the dynamic ceiling will most likely no longer apply and only a fixed ceiling price will apply, to be set on the basis of the information collected as part of the previous auction rounds, as well as the update of the calculation of cost and revenues for biogenic CCS projects (recital (84)).

(178) With regard to the selection criteria used for ranking bids, the Commission notes that the sole criterion for ranking the bids is cost-effectiveness of the project, i.e. the amount of public support needed by the applicant to capture, transport and geologically store biogenic CO_2, expressed in SEK per tonne of biogenic CO_2 (recital (73)). Therefore, the measure complies with point 50 CEEAG.

(179) Finally, point 56 CEEAG explains that aid may be awarded concurrently under several aid schemes or cumulated with ad hoc or *de minimis* aid in relation to the same eligible costs, provided that the total amount of aid for a project or an activity does not lead to overcompensation or exceed the maximum aid amount allowed under these guidelines. Aid under the measure can be cumulated with other State aid or centrally managed Union funds for the same project, up to the to the project's funding gap, as approximated by the amount of the bid. The Swedish authorities have explained that, as regards cumulation of aid under the measure with other State aid or Union funds already granted for the same project, the Swedish authorities will ensure that the overall public support does not lead to overcompensation by ensuring that the level of aid requested together with 100% of any other State aid or Union funding and 90% of revenues referring to the capture, transport and geological storage of the same amount of biogenic carbon dioxide cannot exceed the total costs specified in the application (recital (99)). As regards cumulation of aid under the measure with other State aid or Union funds for the same project granted during the project's operation, the Swedish authorities explain that aid can be cumulated up to the project's funding gap, as approximated by the amount of the bid. To this end, the actual aid amount disbursed will be adjusted throughout the 15-year support period, among others to

take into account possible new aid or Union funding awarded to the beneficiary for the same project (recital (100)). Therefore, the requirements in points 56 and 57 CEEAG are fulfilled.

(180) In light of the above, the Commission considers that the aid granted under the measures is proportionate.

3.3.2.6. Transparency

(181) Sweden will ensure compliance with the transparency requirements laid down in points 58 to 61 CEEAG. The relevant data of the measures will be published on a national website ([64]) and on the Commission's transparency register ([65]) (recital (101)).

3.3.2.7. Avoidance of undue negative effects of the aid on competition and trade

(182) Point 70 CEEAG explains that the Commission will approve measures under the CEEAG for a maximum period of 10 years. Aid can be granted under the measure until 31 December 2028 (recital (23)). Therefore, the requirement in point 70 CEEAG is therefore respected.

(183) Point 115 CEEAG requires Member States to provide an estimation of subsidy per tonne of CO_2 equivalent emissions avoided and provide the assumptions and methodology for that calculation. To the extent possible, that estimation should identify the net emissions reduction from the activity, taking into account life-cycle emissions created or reduced. Moreover, short and long-term interactions with any other relevant policies or measures, including the EU ETS should be considered. The Swedish authorities provide an estimate of the subsidy per tonne of CO_2 equivalent emissions avoided in a range of SEK 1 150-2 100 per tonne of CO_2, together with the underlying assumptions (recital (97)). The Commission also notes that other policies or measures, including the EU ETS, are not sufficient to incentivise investments in biogenic CCS projects and thus achieve negative emissions (recitals (31) and (33)). Therefore, the Commission considers that the quantification required by point 115 CEEAG already takes into account interactions with other relevant policies and measures. Point 115 CEEAG is therefore complied with.

(184) Point 116 CEEAG explains that the aid must not merely displace the emissions from one sector to another and must deliver overall greenhouse gas emissions reductions. In addition, pursuant to point 117 CEEAG, aid for the decarbonisation of industrial activities must reduce the emissions directly resulting from that industrial activity. Furthermore, point 127 CEEAG provides that the Commission will verify that the aid measure does not stimulate or prolong the consumption of fossil-based fuels and energy and requires Member States to explain how they intend to avoid the risk of aid eventually stimulating or prolonging the consumption of fossil-based fuels and energy. The Commission notes that aided projects will reduce direct greenhouse gas emissions of the beneficiaries by

([64]) www.tillvaxtanalys.se/statsstod and www.energimyndigheten.se

([65]) https://webgate.ec.europa.eu/competition/transparency/public?lang=en

capturing and permanently storing biogenic CO_2 that would otherwise be released in the atmosphere (recital (92)). The Commission also notes that the Swedish authorities submitted an estimate of the indirect greenhouse gas emissions associated with biogenic CCS projects, according to which total emissions for the CCS value chain can be expected to make up around 5% of the CO_2 emissions which are geologically stored at the storage site (recital (94) to (96)).

(185) The calculations submitted by the Swedish authorities also demonstrate that the aid measure does not stimulate or prolong the consumption of fossil-based fuels and energy. On the one hand, the Commission notes that the scheme does not incentivise new investments in energy or industrial production process based on fossil fuels, given that (i) the measure only applies to biogenic CCS projects; and (ii) projects are only eligible if among others the main production and/or cogeneration plant must have been already built when submitting the application, meaning that the measure will not in itself incentivise new CO_2-emitting plants (recital (62)). On the other hand, the Commission notes that by incentivising the capturing, transport and storage of CO_2, the measure may indirectly incentivise the use of fossil-based fuels and energy necessary to transport CO_2 (notably, when the transport occurs by truck or ship). In that respect, the Commission notes that while trucks or ships transporting CO_2 to the storage site could be powered by fossil-based fuels, the measure does not prevent the use of cleaner technologies to transport CO_2, such as clean vehicles. As such, the scheme does not hamper the development of cleaner alternatives for the transport of CO_2. Furthermore, the information submitted by Sweden shows that the total emissions linked to the CCS value chain – including, but not limited to transport – represent only 5% of the CO_2 emissions which are geologically stored at the storage site. Hence, the potential use of fossil-based fuels to transport the CO_2 to the storage site does not significantly reduce the overall environmental benefit of the investment. With regard to the emissions associated with net changes in electricity production, the Commission notes that those are estimated to be very limited (i.e., 1.3 tonne of CO_2 per million tonne of CO_2 captured, based on the current CO_2 intensity of the Swedish electricity production mix, corresponding to 6.62 g CO_2e/kWh) (recitals (93) to (96)).

(186) The measure will thus deliver significant overall greenhouse gas emissions reductions and will also not displace investments into cleaner alternatives already available on the market. In light of the above, the Commission considers that the measure complies with points 116, 117 and 127-129 CEEAG.

(187) Point 120 CEEAG explains that the Member States must demonstrate that reasonable measures will be taken to ensure that projects which were granted aid will actually be developed. The Swedish authorities will take various measures to ensure that projects will be actually developed. First, the measure provides for a deadline for the beneficiaries to start storing biogenic CO_2, i.e. three years from the date of issuance of the individual grant decision, which can be extended by up to two years in duly justified cases (recital (63)(b)). Second, the measure provides that projects must demonstrate to be sufficiently mature, by including a realisable implementation plan on the basis of a prior implementation of a pre-study, pilot project or demonstration project a pre-study (recital (63)(a)). Third, the Swedish authorities will closely monitor the implementation plan and intervene to ensure that the biogenic CCS project will start operating in line with the target date set out in the individual grant decision. If a requirement has not been met or if the

objective of the aid measure is jeopardised, the Swedish Energy Agency may decide not to disburse the aid, in full or in part, or to revoke or alter the granting decision (recital (64)). Finally, the Commission notes that payment of aid will only take place once it is demonstrated that the CO_2 has been captured and stored (recital (87)). Therefore, point 122 CEEAG is complied with.

(188) Point 121 CEEAG explains that the aid may take various forms but when it covers costs mostly linked to operation rather than investment, Member States should demonstrate that the aid is designed so that it results in more environmentally friendly operating decisions. The Commission notes that the scheme allows covering both investment costs (for instance, costs linked to the installation of the capturing equipment) and operating costs (for instance, costs linked to the transport and storage of the biogenic CO_2 linked to the biogenic CCS projects). As explained by the Swedish authorities, biogenic CCS projects are mostly associated with costs and only to a limited extent with additional revenues. In addition to investment costs linked to the installation of the capturing equipment, operating costs – for instance, those relating to the transport and storage of CO_2, as well as the additional electricity consumption linked to the capturing – are also significant and cannot be covered by additional revenues, nor by cost savings linked to the project (recital (33)). In such a situation, aid covering exclusively investment costs would not create sufficient incentives to store biogenic CO_2. This is because if the aid were to only cover investment costs, the projects' funding needs would remain in part unaddressed. In such a scenario, it can be expected that beneficiaries would cease to capture, transport and store carbon emissions to prevent incurring financial losses and instead emit CO_2 into the atmosphere. By contrast, a subsidy that is paid as a function of the CO_2 stored will incentivise the beneficiaries to store the CO_2 up to the project's annual volume target. The aid provided under the scheme therefore ensures more environmentally-friendly operating decisions in line with point 121 CEEAG.

(189) Point 122 CEEAG states that where aid is primarily required to cover short-term costs that may be variable, Member States should confirm that the production costs on which the aid amount is based will be monitored and the aid amount updated at least once per year. The Commission notes that under the measure, the beneficiaries will be requested to regularly submit to the Swedish authorities information as regards the projects' cost and revenues, as well as other public support. In particular, the first report will have to be submitted no later than one month after the first storage of biogenic CO_2 and then annually thereafter (recital (88)). Based on the progress report, the Swedish authorities will adjust the amount of State aid before each payment, taking into account possible additional funding received, actual revenues beyond the expectations at the time of the bid and significant deviations in costs (recitals (89) and (90)).

(190) Based on the considerations in recitals (182) to (189), the Commission therefore considers that aid granted under the measures avoids undue negative effects on competition and trade.

(191) Point 123 CEEAG states that the aid must be designed to prevent any undue distortion to the efficient functioning of markets and, in particular, preserve efficient operating incentives and price signals. For instance, beneficiaries should remain exposed to price variation and market risk, unless this undermines the attainment of the objective of the aid. The Commission notes that the scheme's

design ensures that efficient operating incentives are preserved. In particular, the adjustment mechanism. In particular, the adjustment mechanism described in recitals (88) to (90) allows beneficiaries to maintain the level of aid unchanged in case of cost savings of up to 20% of the total cost projected at the time of the bid. Furthermore, the adjustment mechanism provides that additional revenues generated by the project will be deducted from the aid amount granted by only 90%. By contrast, cost overruns will not be compensated. These aspects preserve the beneficiaries' incentives to operate efficiently and respond to price signals.

(192) Lastly, point 132 CEEAG states that Member States should demonstrate that the proposed measure will not lead to distortions of competition, for example through increased market power, should the measure be expected to benefit a particularly limited number of beneficiaries. The scheme is not intended to benefit only a limited number of beneficiaries. It is open to undertakings carrying out an activity in Sweden which emits biogenic CO_2, and which implement biogenic CCS projects leading to negative CO_2 emissions (recital (18)). The Commission notes that according to information submitted by the Swedish authorities, various undertakings are expected to participate in the bidding process – i.e. […] (recital (77)), and potentially more in the following one(s). The scheme aims to reach the target volume of 2 million tonnes of stored biogenic CO_2 (recital (77)); that volume cannot be achieved by one project alone and it cannot be predicted how many undertakings will receive aid to meet the volume target given the large heterogeneity in volume of biogenic CO_2 that can be stored by potential participants (ranging from 100 000 to 1 million tonnes of biogenic CCS per year) (recital (82)).

3.3.3. Ex-post evaluation plan as part of the compatibility assessment

(193) The CEEAG enable the Commission to require that notifiable aid schemes be subject to ex-post evaluation, and they stipulate that ex-post evaluation should be required where the potential distortions of competition and trade stemming from the scheme at hand are particularly high. In particular, ex-post evaluation is required for (1) schemes with State aid budgets or accounted expenditures exceeding EUR 150 million in any given year or EUR 750 million over the total duration of the scheme, (2) schemes with novel characteristics, and (3) schemes in areas where significant market, technology or regulatory changes are foreseen. The ex-post evaluation requirement only applies for aid schemes with a total duration exceeding three years, starting from 1 January 2022.

(194) The Commission considers that the schemes qualify for ex-post evaluation, as they each fulfil the CEEAG criteria of (i) a duration exceeding three years, (ii) novel characteristics, being among the first schemes supporting investments in biogenic CCS based on a competitive bidding process, and (iii) a State aid budget exceeding EUR 150 million in any given year and EUR 750 million over the total duration of the scheme.

(195) As indicated in recital (102), the Swedish authorities submitted an evaluation plan for the measures as an integral part of the notification.

(196) The objective of the evaluation plan is to demonstrate, by means of both quantitative and qualitative analyses, the direct effects of the schemes, the

proportionality and appropriateness of the aid, as well as a number of indirect effects including potential distortive effects on competition.

(197) The Commission considers that the notified evaluation plan contains all the necessary elements: the objectives of the schemes to be evaluated, the evaluation questions, the result indicators, the envisaged methodology to conduct the evaluation, the proposed timing of the evaluation including the date of submission of the evaluation reports and the modalities for ensuring the publicity of the evaluation (Section 2.12). The Commission notes that:

(a) The scope of the evaluation is defined in an appropriate way. It comprises a list of relevant evaluation questions with matched result indicators (recitals (103) to (106)). Moreover, the evaluation plan identifies and explains the main methods that will be used in order to identify the effects of the scheme (recital (107)); finally, the evaluation will also cover the design of the auction, to evaluate to what extent the novel design encouraged or discouraged participation in the auction;

(b) The Swedish authorities committed, in accordance with the Commission's requirements, that the evaluation will be conducted by an independent evaluation body in accordance with the criteria laid down in the evaluation plan and further developed in the interim evaluation report (recital (112));

(c) Sweden committed to submit to the Commission an interim evaluation report by 16 November 2026, a final evaluation report 27 March 2028 and an additional ex post evaluation on 15 November 2032 (recitals (108) to (110));and

(d) The proposed modalities for the publication of the evaluation results are adequate to ensure transparency (recital (111)).

(198) Moreover, the Commission notes Sweden's commitment to communicate to the Commission any difficulty that could significantly affect the agreed evaluation in order to work out possible solutions (recital (113)).

(199) The Commission reminds the Swedish authorities that the application of the measure must be suspended with immediate effect if the final evaluation reports are not submitted in time and sufficient quality or are otherwise not in compliance with the approved evaluation plan ([66]), and that any subsequent aid measure with a similar objective must take into account the results of the evaluation ([67]).

3.3.4. Weighing up the positive and negative effects of the aid

(200) Point 134 CEEAG states that, provided that all other compatibility conditions are met, the Commission will typically find that the balance for decarbonisation measure is positive (that is to say, distortions to the internal market are outweighed by positive effects) in light of their contribution to meeting Union

([66]) See point 457 CEEAG.

([67]) See point 463 CEEAG.

energy and climate objectives, as long as there are no obvious indications of non-compliance with the 'do no significant harm' principle.

(201) As indicated in recitals (125) and (126), the measure contributes to the development of certain economic activities and will contribute to the decarbonisation objective by capturing and storing biogenic CO_2. Based on the information submitted by the Swedish authorities, the Commission has not identified any indications of non-compliance with the 'do no significant harm' principle.

(202) Based on the assessment conducted in Sections 3.3.1 and 3.3.2, and considering that all compatibility conditions are met and there are no obvious indications of non-compliance with the 'do no significant harm' principle (recital (201)), the Commission concludes that the measure complies with point 134 CEEAG and that the positive effects of the measures outweigh the negative effects on the internal market.

4. AUTHENTIC LANGUAGE

(203) As mentioned in recital (2), Sweden has accepted to have the decision adopted and notified in English. The authentic language will therefore be English.

5. CONCLUSION

The Commission has accordingly decided not to raise objections to the aid on the grounds that it is compatible with the internal market pursuant to Article 107(3), point (c) of the Treaty on the Functioning of the European Union.

If this letter contains confidential information which should not be disclosed to third parties, please inform the Commission within fifteen working days of the date of receipt. If the Commission does not receive a reasoned request by that deadline, you will be deemed to agree to the disclosure to third parties and to the publication of the full text of the letter in the authentic language on the Internet site: https://competition-cases.ec.europa.eu/search?caseInstrument=SA.

Your request should be sent electronically to the following address:

European Commission,
Directorate-General Competition
State Aid Greffe
B-1049 Brussels
Stateaidgreffe@ec.europa.eu

Yours faithfully,

For the Commission

Margrethe VESTAGER
Executive Vice-President