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**Subject: State Aid SA.63177 (2022/N) – Germany
Federal support for efficient heat networks**

Excellency,

1. PROCEDURE

- (1) Following pre-notification contacts, on 21 June 2022, Germany notified a support scheme (the “scheme” or the “notified measure”) for the promotion of efficient district heating, pursuant to Article 108(3) of the Treaty on the Functioning of the European Union (TFEU).
- (2) Germany provided updated information on the notified measure on 01 July 2022, 13 July 2022 and 14 July 2022.
- (3) The Commission requested clarifications on the notified measure on 11 July 2022 and on 20 July 2022. Germany provided these clarifications respectively on 12 July 2022 and 22 July 2022.
- (4) By letter dated 12 May 2022, Germany agreed to exceptionally waive its rights deriving from Article 342 TFEU in conjunction with Article 3 of Regulation 1/1958¹ and to have the present decision notified and adopted in English.

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

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2. DETAILED DESCRIPTION OF THE MEASURE

2.1. Background and objectives of the notified scheme

- (5) The heating and cooling sector plays a crucial role in the EU's ambition to transition into a clean and carbon-neutral economy by 2050, as it accounts for about half of the EU's final energy consumption. The construction or the upgrade of district heating and cooling systems that meet ambitious energy efficiency and sustainability targets make a positive contribution to decarbonisation and environmental protection.
- (6) Germany has committed to achieve EU's climate goals, setting the objective to achieve net-zero greenhouse gas emissions in the energy and heating sector by 2045. To reach this goal, Germany's National Energy and Climate Plan includes interim targets to increase to 25% the share of renewable energy and waste heat in the heating and cooling networks by 2025 and to further increase this share to 30% by the end of 2030.
- (7) In this context, Germany notified a nation-wide scheme to support efficient district heating based on renewable energy and waste heat. The notified measure aims at incentivising the construction of new district heating systems with a share of renewable energy and waste heat of at least 75% and the decarbonisation of existing district heating systems.
- (8) The scheme proposed by Germany will provide support for district heating systems under three modules:
 - (a) Module 1: Support for feasibility studies and transformation plans
 - (b) Module 2: Systemic support for investment and operating costs
 - (c) Module 3: Investment support for individual measures
- (9) The notified measure is expected to support the installation of approximately 681 MW of renewable heat generation capacity per year, reducing greenhouse gas emissions by approximately 4 million tonnes of CO₂ per year. Therefore, the scheme is expected to have a positive contribution on the implementation of Germany's National Energy and Climate Plan and on the European climate targets.

2.2. National legal basis

- (10) Support under the notified measure will be granted on the basis of sections 23 and 44 of the Federal Budget Code (Bundeshaushaltsordnung) and of the General Ancillary Conditions for Grants for Project Support (ANBest-P, ANBest-Gk and ANBest-P-Kosten).

2.3. Beneficiaries and allocation process

- (11) The beneficiaries of the scheme are undertakings of any size, municipalities carrying out economic activities, municipal undertakings, municipal associations, registered associations and registered cooperatives. Contractors are also eligible

for aid provided that they fulfil certain conditions and obligations to avoid double funding².

- (12) In order to receive support, beneficiaries shall submit a written application to the Federal Office for Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA), in charge of administering the support, before the start of the project.
- (13) The application shall include the applicant's name and a description of the project to be supported. The latter shall include the location of the project, the expected dates for the start and end of the works and the amount of aid necessary to carry it out and, if applicable, to enable an economic operation over the lifetime of the installation, identified on the basis of a funding gap analysis.
- (14) Before granting aid under the notified measure, BAFA shall verify that the start of works on the projects did not take place prior to the application for aid.
- (15) Support under the scheme is granted by BAFA on a "first-come, first-served" basis of the project applications.

2.4. Form of aid and level of support

2.4.1. Module 1: Support for feasibility studies and transformation plans

- (16) Under this module, support is provided for feasibility studies for the construction of new district heating networks, and transformation plans for existing networks.
- (17) Feasibility studies examine the feasibility and cost-effectiveness of the construction of new district heating networks based on renewable energy, and provide for a project plan for the construction phase.
- (18) Transformation plans assess the current state of a district heating network and set out concrete measures for it to fully operate on the basis of renewable heat sources at the latest by 2045. Those plans should include the necessary resources and the timeline required for existing district heating systems to transition to the use of renewable heat.
- (19) In order to be eligible for support, feasibility studies and transformation plans should identify the potential for the use of renewable energy and waste heat in the area they supply and include the indicative shares those energy sources will represent in heat generation in 2030, 2035 and 2040. In addition, transformation plans should include a pathway for the phase-out of fossil-based heat production and for the complete avoidance of greenhouse gas emissions from non-biogenic waste by 2045.
- (20) According to the data collected by Germany, the costs of preparing a feasibility study or a transformation plan can vary on the basis of the size of the district

² In particular, under the notified measure contractors would need to submit as part of the application for funding the documentation relating to the contractual relation that links them to the contracting party. This should include a waiver by the contracting party on any claim for support for the same eligible costs for the project. In addition, the documentation should include a declaration of the contractor and the contracting party that the former has informed the latter of the use of funding.

heating system, the number of fossil fuel based heat generators connected to the heating network, the availability of renewable heat sources and other parameters. Table 1 includes an estimation of the average costs for different length of the district heating system.

Table 1 - Cost of feasibility studies and transformation plans

Length of the district heating system (Km)	Total cost (EUR)
0 - 50	40 000 - 80 000
50 - 150	60 000 - 200 000
Above 150	150 000 - 400 000

- (21) Feasibility studies and transformation plans can contribute the cost-effective transition of the district heating sector in Germany as they allow market operators to plan and prioritise intervention on district heating systems in a long-term systemic perspective. However, the preparation of those studies and plans does not represent a necessary step to undertake investments in district heating. In fact, according to Germany, data from the Energy Efficiency Association for Heating, Cooling and CHP (AGFW) demonstrate that due to the fact that feasibility studies and transformation plans are capable of generating indirect economic benefits only at a point in time in the future, market players do not have an economic incentive to carry them out. Therefore, in the absence of support market operators would likely forgo this step, resulting in suboptimal investment planning.
- (22) In order to incentivise market operators to undertake feasibility studies and transformation plans, the notified measure provides support in the form of a non-repayable grant covering up to 50% of their costs, including potential planning services required for the preparation of transformation plans and feasibility studies. To ensure support for a wide range of projects, support for feasibility studies and transformation plan is limited to a maximum amount of EUR 2 000 000 per application.
- (23) Germany explained that the use of other policy instruments to incentivise the uptake of feasibility studies and transformation plans was discarded due to their low effectiveness. In fact, the temporal misalignment between the costs and the indirect economic benefits that feasibility studies and transformation plans can bring, lowers the incentive that instruments other than aid in the form of non-repayable grants can provide. On this basis, Germany considered this form of State aid the most appropriate policy and aid instrument to incentivise the cost-effective planning of the construction and upgrade of district heating systems.

2.4.2. *Module 2: Systemic support for investment and operating costs*

- (24) This module covers systemic support for investment and operating costs, namely support for all measures from the installation of generation facilities to the distribution of heat to the supplied buildings, provided that they contribute to the decarbonisation and efficiency of the heating network. In particular, this module of the notified measure covers:

- (a) Investment aid in new district heating networks with a share of renewable energy and waste heat of at least 75%;
 - (b) Investment aid for the decarbonisation of existing district heating networks;
 - (c) Investment aid for renewable heat generation facilities, heat pumps and for the integration of waste heat in district heating systems;
 - (d) Operating support for the generation of renewable heat through solar thermal installations and heat pumps with a minimum Seasonal Coefficient of Performance (SCOP) of 2.5. The minimum SCOP aims at ensuring that the full amount of energy captured by the supported heat pumps can be considered as renewable on the basis of the methodology laid down in Annex VII of Directive (EU) 2018/2001 of the European Parliament and of the Council³.
- (25) In addition, support under this module of the notified measure is available for measures to optimise network operations, including the installation of heat reservoirs, of instruments for increasing and maintaining the pressure in the heating network, of measurement, regulation and control technology and of components for the digitalisation of the heating network.
- (26) Furthermore, this module covers support for environmental measures, including the construction of heating centres and of installations for securing the integration of new installations with climate-friendly energy sources.
- (27) Support under this module is conditional on the submission of a feasibility study or a transformation plan by aid applicants. However, it is not required that the feasibility study or transformation plan has benefitted from support under module 1 for an investment to be eligible to receive support under this module.
- (28) In order to receive support, the aid applicants should demonstrate the need for aid based on a quantification of the funding gap. The quantification should take into account all the relevant costs and revenues over the lifetime of the installation compared to a counterfactual scenario.
- (29) Prior to granting aid, BAFA shall verify the need for support on the basis of the funding gap quantification submitted by aid applicants and ensure that the aid granted under the notified measure does not exceed the funding gap.
- (30) Germany explained that a regulatory restriction on fossil energy as a possible alternative to State aid was assessed, however, due to the current higher heating costs of renewable energy and waste heat it was concluded that it would undermine the economic viability of district heating and thus jeopardise its continued existence and expansion. On this basis, Germany considered State aid the most appropriate policy instrument to incentivise the cost-effective decarbonisation of district heating sector through the construction of new district heating systems and the transformation of existing ones.

³ 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 (OJ L 328, 21.12.2018, p. 82).

2.4.2.1. Module 2.1: Investment aid

- (31) This sub-module covers investment support for the construction of heat generation facilities and new district heating networks as well as for the extension and decarbonisation of existing district heating networks.
- (32) In particular, investment aid is provided for the construction of new district heating networks connecting more than 16 buildings or more than 100 residential units. To be eligible for support, new district heating networks should have at least 75% of their annual amount of heat fed from renewable and waste heat.
- (33) The extension of an existing district heating network to new supply areas does not fall within the definition of a new network as long as significant shares of the heat supply of the newly developed supply area come from the existing heat network⁴. By way of derogation, extensions of heat networks powered entirely by renewable energy and/or waste heat are considered as new networks irrespective of the share of heat production from the existing heat network.
- (34) For the purpose of calculating the share of renewable and waste heat in the annual amount of heat, heat produced by biomass installations which comply with the sustainability criteria laid down in Article 29 of Directive (EU) 2018/2001 authorised before the entry into force of the scheme may be counted if the fuels used are in line with the German First Federal Immission Control Ordinance (Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes - 1. BImSchV)⁵, and other biomasses in line with the operating licence, irrespective of the size of the installation. Heat produced by biomass installations authorised after the entry into force of the scheme may be counted towards the share of renewable and waste heat only subject to strict fuel requirements that ensure compliance with the sustainability criteria set out in the German Regulation on Requirements for Sustainable Production of Biomass for Electricity Production (BiomassestromNachhaltigkeitsverordnung - BioSt-NachV)⁶. Irrespective of the date of authorisation of the biomass installation, a maximum share of biomass in the annual amount of heat produced in the grid is set at 35% for networks from 20 up to 50 km and 25% for longer networks. By 2045 a maximum share of biomass in the annual amount of heat production of 25% for networks from 20 up to 50 km and of 15 % must not be exceeded.
- (35) Support under this module shall be granted for the construction of new and the extension of existing district heating networks, i.e. transmission or distribution networks, and not for the energy generation which is covered in recitals (44) et seq. Germany explained that supported networks will have to have a maximum

⁴ Where a share equal or greater to 20% of the annual average of the heat supply of a newly developed supply area comes from the existing heat network, an extension of said network does not qualify as a new network.

⁵ The 1. BImSchV regulates the construction, composition and operation of combustion plants that do not require immission control approval according to the Federal Immission Control Act. This also includes combustion plants that use biomass as fuel.

⁶ The BioSt-NachV implements the requirements of Directive (EU) 2018/2001 regarding sustainability criteria and greenhouse gas savings in the promotion of electricity generation from biomass. The notified measure applies the provisions of the BioSt-NachV to district heating, integrating them into the criteria for eligibility to receive support.

level of heat fed from gas or oil-fired installation other than cogeneration of 10%. In addition, Germany confirmed that the support for new district heating networks will not incentivise increased generation from fossil fuels such as coal or oil.

- (36) Germany provided an estimation of the costs and revenues for a reference project for the construction of a district heating network in a medium-sized town of approximately 150 000 inhabitants. Those values were calculated on the basis of data on the current district heating market in Germany collected by the Energy Efficiency Association for Heating, Cooling and CHP (AGFW) and by the Fraunhofer Institute for Manufacturing Technology and Advanced Materials (IFAM). The project lifetime of the district heating pipelines was assumed to be 30 years, whereas that of the substations 20 years.
- (37) The present values included in Table 2 were obtained using a weighted average cost of capital of 8% estimated on the basis of a value of equity of 40% and a value of debt of 60%. This reflects the specificities of the investors, which are expected to be mainly municipal utilities with limited possibility to contract debt. The cost of equity was assumed to be 14% and the cost of debt 4%. The cost of equity reflects the risk associated with the investment in heat networks and, in particular, the uncertainties regarding the rate of new connections that can be achieved in the long term.

Table 2 - Funding gap for a reference project for the district heating network

Type of cost	Present value (EUR)
Investment costs	22 509 596
Supply lines	17 858 836
Door-to-door heating pipelines	2 724 114
Door-to-door heating substations	1 926 646
Operating costs	9 521 014
Planning costs	1 575 672
Operation and maintenance costs	5 559 923
Insurance costs	795 140
Administration costs	1 590 279
Revenues	22 045 931
Consumer contribution for the installation of transfer stations	1 926 646
Revenue from heat supply	20 119 285
Funding gap	9 984 678
Net investment cost	20 582 950
Investment aid	8 233 180

- (38) Germany explained that in the absence of aid, no new investment would be undertaken and, therefore, that a counterfactual investment for the district heating network does not exist. On this basis, the funding gap for the reference project consists of the negative net present value (NPV) of the factual scenario over its lifetime.

- (39) Support for the construction of new district heating networks is provided in the form of a non-repayable grant covering up to 40% of the net-investment costs, obtained by subtracting from the investment costs the portion of transfer station in buildings paid by heat consumers, up to a maximum amount of EUR 100 000 000 per application. As mentioned in recital (29), the granting authority shall ensure that the aid granted does not exceed the funding gap submitted by the aid applicants.
- (40) As shown in Table 2, investment support does not exceed the funding gap for the reference project. In fact, even accounting for investment aid, the costs for the construction and operation of a district heating network exceed its revenues by € 1 751 498.
- (41) Investment aid is also available under this sub-module for measures for the transformation of existing district heating networks identified in the transformation plans. Those may include, for example, the installation of leakage monitoring systems or heat reservoirs.
- (42) With respect to existing district heating networks covered by the scheme, Germany committed to ensure that the upgrade necessary to meet the definition of “efficient district heating and cooling” provided in Directive 2012/27/EU⁷ will start within three years after the start of the works on the upgrade of the distribution network.
- (43) Support for the decarbonisation of existing district heating network is granted under the same condition as for the construction of new district heating networks (see recital (39)).
- (44) Furthermore, support under this sub-module is available for the integration of industrial, commercial or other forms of waste heat in district heating systems and for the construction of heat generation installations using one of the following technologies:
- (a) Solar thermal and photovoltaic thermal collectors;
 - (b) Heat pumps for the use of ambient heat, geothermal energy and waste heat;
 - (c) Deep geothermal installations;
 - (d) Small and medium sized biomass combustion plants in line with the German First Federal Immission Control Ordinance (Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes, 1. BImSchV);
 - (e) Larger biomass combustion plants, above 1 MW of thermal input, subject to some restrictions on the use of untreated residual wood, waste wood from industrial processing and sawn wood in line with the German

⁷ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1).

Regulation on Requirements for Sustainable Production of Biomass for Electricity Production (BioSt-NachV);

- (f) Installations using gaseous biomass, provided that the transformation plan demonstrates compliance with the German Regulation on Requirements for Sustainable Production of Biomass for Electricity Production (BioSt-NachV).
- (45) For each of the generation technologies covered under this module, Germany provided estimations of investment and operating costs for a reference project. Those values were calculated on the basis of data collected by the economic research centre Prognos AG. The project lifetime of the generation facilities was assumed to be 20 years.
- (46) The present values included in Table 3 were obtained using a discount rate of 6% estimated on the basis of a value of equity of 40% and a value of debt of 60%. The cost of equity was assumed to be 9% and the cost of debt 4%. The cost of equity reflects the risk associated with investments in heat generation, lower with respect to the one used for district heating networks due to the lower level of uncertainty that characterises those types of investments. For example, the risk related to the rate of new connections (see recital (37)) affects the generation component of district heating systems less than the district heating network.
- (47) Germany explained that in the absence of aid, new investments in heat generation would reflect the current energy mix in the district heating sector, characterised by a similar share of gas boilers and cogeneration installations. In fact, Germany submitted that fossil fuels have a cost advantage over renewable and waste heat generation technologies, even taking into account the carbon price under the EU Emission Trading System (ETS). While the current conditions of the energy market have seen an exceptional increase in the cost of fossil-based technologies, in a medium term perspective, it is likely that the cost advantage of fossil fuels over more environmentally friendly technologies will remain. Therefore, the estimations of investment and operating costs for the counterfactual scenario are calculated as a mathematical average between the costs of a gas boiler and the costs of a cogeneration installation (50% gas boiler, 50% cogeneration installation).
- (48) Table 4 includes the assumptions used for the calculation of the costs for the counterfactual scenario. The value included in the table was estimated on the basis of Prognos AG data on electricity and gas prices, taking into account the cost of CO₂ allowances under the EU ETS and the EEG-surcharge⁸ applicable to electricity.

⁸ The EEG or Erneuerbare Energien Gesetzes surcharge is a levy established in the German Renewable Energy Sources Act with the aim to finance the expansion of renewable energy sources in Germany. The surcharge is calculated by the German Transmission System Operator on the basis of the electricity consumed by each user.

Table 3 - Estimate of the cost for reference projects supported under the scheme

Technology	Heat production (MWh/year)	Total investment cost (EUR)	Present value of operating costs (EUR)
Solar thermal energy flat collector	4 000	3 150 000	424 387
Solar thermal vacuum tube collector	5 000	4 050 000	516 146
Deep geothermal energy	60 000	33 630 000	16 374 878
Heat pump, SCOP 2	40 000	11 178 611	44 867 923
Heat pump, SCOP 2.5	40 000	11 178 611	36 536 654
Heat pump, SCOP 3.0	40 000	11 178 611	30 982 475
Heat pump, SCOP 3.5	40 000	11 178 611	27 015 204
Heat pump, SCOP 4.0	40 000	11 178 611	24 039 751
Heat pump, SCOP 4.0 in combination with geothermal energy	40 000	12 794 954	25 760 239
Biomass boiler wood chips	35 000	7 000 000	16 043 995
Biomass boiler landscape residues	35 000	7 000 000	13 955 881
Electrode boilers	2 500	880 000	3 228 795

Table 4 - Counterfactual investment assumptions

Type of cost	Gas boiler	Cogeneration installation
Investment costs	4 EUR/MWh	0 EUR/MWh New CHP units receive investment support under the CHP Law (KWKG-Vergütung), resulting in the net investment costs being on average zero.
Fixed operating costs	0.5 EUR/MWh	N/A
Variable operating costs	Estimated on the basis of the expected costs of natural gas and of EU ETS allowances with a 93% efficiency factor.	Estimated on the basis of the expected costs of electricity with a 20% electricity loss factor.

- (49) Germany also explained that a nation-wide market price for heat does not exist due to the fragmentation of the heat market, which is characterised by 86% of the heat being produced locally by heat consumers. Therefore, Germany estimated the revenues for heat generation on the basis of the final consumer price for district heating. In particular, all the costs and charges that do not constitute revenues for the production of heat (including heat losses, distribution costs and overhead costs) were subtracted from the consumer price to obtain the heating price received by the heat producer. In this way the price to the heat producer was

estimated in the range between 28 and 33 EUR/MWh depending on the size of the district heating system. This price was used to calculate the revenues both for the generation technologies supported under the scheme and for the counterfactual investment.

- (50) On the basis of those assumptions, and in consideration of the fact that the revenues in the factual and in the counterfactual scenario were assumed to be the same, Germany calculated the average present cost of the production of 1 MWh of heat in the reference projects supported under the notified measure and in the counterfactual investment (Table 5).
- (51) Investment aid for heat generation installations is granted under the same condition as for the construction of new district heating networks (see recital (39)).

Table 5 - Average present cost of the reference projects and of the counterfactual investment

Technology	Average present cost (EUR/MWh)	Average present cost after investment support (EUR/MWh)	Average present cost of counterfactual scenario (EUR/MWh)
Solar thermal energy flat collector	77.9	50.4	43.3
Solar thermal vacuum tube collector	79.6	51.4	43.1
Deep geothermal energy	72.7	53.1	43.1
Heat pump, SCOP 2	122.2	112.4	43.1
Heat pump, SCOP 2.5	104.0	94.3	43.1
Heat pump, SCOP 3.0	91.9	82.1	43.1
Heat pump, SCOP 3.5	83.2	73.5	43.1
Heat pump, SCOP 4.0	76.8	67.0	43.1
Heat pump, SCOP 4.0 in combination with geothermal energy	84.0	72.9	43.1
Biomass boiler wood chips	58.9	51.8	43.0
Biomass boiler landscape residues	53.6	46.4	43.0
Electrode boilers	143.3	131.0	43.1

- (52) Table 5 shows that the average present cost for MWh of heat in each of the reference projects exceeds the cost in the counterfactual investment. This remains true if investment aid is accounted for. Therefore, according to Germany, the investment support provided under the scheme does not exceed the funding gap between the factual and counterfactual scenario.
- (53) In order to ensure proportionality of the aid granted under this sub-module of the notified measure, Germany committed to verify the funding gap calculations for each of the supported projects before granting aid. In addition, Germany will ensure that the total level of investment aid granted to a project is limited to the

funding gap, obtained comparing all the relevant costs and revenues of the factual and counterfactual scenario.

2.4.2.2. Module 2.2: Operating aid

- (54) Operating aid under this scheme is available for the production of renewable heat from solar thermal installations and from electricity-powered heat pumps with a SCOP level of at least 2.5.
- (55) Germany explained that a funding gap for those technologies exists even after investment aid is accounted for (Table 5). In the absence of operating support, this would result in higher costs being passed on to heat consumers. However, as district heating in Germany is in competition with decentralised gas-based heat generation, this option would not be feasible as consumers would switch to gas-based heat generation. On this basis, Germany explained the need for operating support to reduce the funding gap for solar thermal installations and electricity-powered heat pumps and to incentivise their efficient operation and integration in the district heating system.
- (56) Operating aid is granted for the first 10 years of operation of the heat generation installations. In fact, Germany explained that it is expected that the CO₂ price will increase in the next years, causing fossil based heat production to be priced out of the market. In particular, according to the projections submitted by Germany, the price for EU ETS allowances will reach the level of 105 EUR/MWh by 2031, which is considered the 10th year of operation for the reference projects, and continue to increase afterwards. Therefore, heat generated through solar thermal installations and heat pumps will be competitive even without operating support after the first 10 years of operation.
- (57) In order to receive operating support, aid applicants should demonstrate the need for aid based on a quantification of the funding gap, taking into account all the relevant costs and revenues over the lifetime of the installation compared to a counterfactual scenario. Operating support is determined annually on the basis of the data provided by the aid applicants.
- (58) In particular, operating aid amounts are defined as follows:

- (a) for solar thermal installations feeding heat into the grid, operating aid is fixed at $1 \frac{\text{Cent}}{\text{kWh}_{\text{th}}}$;
- (b) for the share of ambient or waste heat harnessed by heat pumps using electricity from the grid or from a closed distribution network, operating aid is calculated as follow:

$$\left[5.5 \frac{\text{Cent}}{\text{kWh}_{\text{Ambient or waste heat}}} - \left(6.8 - \frac{17}{\text{SCOP}} \right) * 0.75 \frac{\text{Cent}}{\text{kWh}_{\text{Ambient or waste heat}}} \right] * \left(\frac{\text{SCOP}}{\text{SCOP} - 1} \right)$$

in this case, operating aid is limited to 90% of the electricity costs actually incurred in by the aid applicants and the capped at $9.2 \frac{\text{Cent}}{\text{kWh}_{\text{Ambient or waste heat}}}$;

- (c) for the share of heat generated by heat pumps using electricity from renewable energy installations without transmission to the grid, operating aid is calculated as follows:

$$3 \frac{\text{Cent}}{\text{kWh}_{\text{th}}} - \left(\frac{8}{2.5} - \frac{8}{\text{SCOP}} \right) * 0.75 \frac{\text{Cent}}{\text{kWh}_{\text{th}}}$$

in this case, operating aid is limited to the electricity costs actually incurred in by the aid applicants and capped at the level of $3 \frac{\text{Cent}}{\text{kWh}_{\text{th}}}$.

- (59) Table 6 provides an estimation of the average present cost per MWh of heat generated in the reference projects, taking into account both investment and operating aid. Even when both forms of aid are provided, the average present cost of heat for solar thermal installations and heat pumps exceeds the average present cost of heat of the counterfactual scenario (50% gas boiler, 50% cogeneration).

Table 6 - Average present cost of the reference projects and of the counterfactual investment

Technology	Average present cost (EUR/MWh)	Average present cost after investment and operating support (EUR/MWh)	Average present cost of counterfactual scenario (EUR/MWh)
Solar thermal energy flat collector	77.9	44.0	43.3
Solar thermal vacuum tube collector	79.6	45.0	43.1
Heat pump, SCOP 2.5	104.0	59.0	43.1
Heat pump, SCOP 3.0	91.9	52.3	43.1
Heat pump, SCOP 3.5	83.2	47.6	43.1
Heat pump, SCOP 4.0	76.8	44.0	43.1
Heat pump, SCOP 4.0 in combination with geothermal energy	84.0	49.9	43.1

- (60) In order to ensure that operating aid is limited to what is needed to incentivise the efficient operation of solar thermal installations and heat pumps, Germany confirmed that undertakings exercising economic activities that will benefit from operating aid under the notified measure will be explicitly required to pay the full share of their heating costs, at least equivalent to their cheapest alternative heating source which was identified as a mathematical average of the costs to generate heat through a gas boiler and a cogeneration installation.
- (61) The amount of operating support under the notified measure is subject to annual monitoring to ensure that the total level of support (investment and operating) does not exceed the funding gap between the project funded and the counterfactual investment. Germany committed to update the amount of operating aid granted on the basis of the annual monitoring to ensure proportionality.

2.4.3. *Module 3: Investment support for individual measures*

- (62) In addition to systemic measures, a number of specific measures are eligible to receive support under the notified scheme. In particular, the construction of the following would be considered as an individual measure eligible for investment and operating support:
- (a) Solar thermal installations;
 - (b) Heat pumps;
 - (c) Biomass boilers;
 - (d) Heat reservoirs;
 - (e) Heat transfer stations;
 - (f) Pipelines for connecting renewable energy producers, integrating waste heat and extending heat networks.
- (63) The quantification of the funding gap for these investments reflects the one included in Table 2 and Table 5 above.
- (64) Support under this module is provided in the form of a non-repayable grant covering up to 40% of the investment costs of the specific measures, up to a maximum amount of EUR 100 000 000 per application.
- (65) Germany committed to verify the funding gap quantification for each aid application to ensure that the total level of aid is limited to the funding gap.

2.5. Duration of the support

- (66) The envisaged duration of the scheme is from 01 September 2022 until 30 August 2028. Investment support will be granted for a period of four years (a one-time extension of two years is possible), while operating support will be granted for 10 years. The typical average lifetime of the installations covered by the scheme is 20 years.
- (67) Germany confirmed that the entry into force of the notified measure is subject to its approval under State aid rules by the European Commission.

2.6. Cumulation

- (68) Germany confirmed that support under the scheme may be cumulated with aid for the same project only insofar as the support concerns different identifiable eligible costs.
- (69) Germany committed to recover the aid provided under the notified scheme in full in the event of a breach of the cumulation rules.

2.7. Budget and financing

- (70) The total budget of the notified measure for its entire duration is EUR 2 980 000 000. The notified measure will be financed through a special investment fund for

energy and climate (Sondervermögen Energie- und Klimafonds), which includes the proceeds of the EU ETS along with contributions from the Federal Budget.

2.8. Transparency

- (71) Germany will ensure compliance with the transparency requirements laid down in points 58 to 62 of the CEEAG. The relevant data of the notified measure will be published on a national website that will link to the Commission's transparency register.

2.9. Evaluation

- (72) In view of the large aid budget and of the novel characteristics of the notified measure, Germany submitted an evaluation plan to assess the scheme's outputs, its direct and indirect effects (both positive and negative), as well as the proportionality of the aid and the appropriateness of the chosen aid instrument.
- (73) The evaluation will verify how many actors take up the different modules of the notified measure across district heating system sizes and federal states. The direct effects of the scheme will be assessed through an analysis of the district heating projects supported against those not receiving aid. This analysis will provide information as to the incentive effect of the aid on the uptake of renewable and waste heat based district heating systems.
- (74) The indirect effects of the aid will be assessed by analysing whether the aid had any effect on the (increase in the) share of renewable and waste heat production in the German energy mix. The evaluation will also assess the effects of the scheme on the CO₂ emission in the district heating sector and the costs of CO₂ reductions potentially achieved. In addition, the evaluation will analyse the impacts of the aid on competition, especially by looking at the costs of district heating across different generation technologies and at the market concentration in the district heating sector.
- (75) The evaluation will analyse the proportionality and appropriateness of the scheme by assessing whether the aid granted through the scheme is proportionate to the market failure it tackles, i.e. the lack of competitiveness of renewable and waste heat based district heating systems.
- (76) For the purpose of the evaluation of the scheme, Germany will use a range of result indicators connected to the evaluation questions listed above. For the direct effects, the key result indicators will be the number of district heating projects supported per federal state and the supported renewable and waste heat capacity.
- (77) For the indirect effects, the key result indicators will be: the share of renewable and waste heat production in the German energy mix and level of CO₂ emission in the district heating sector.
- (78) Finally, the key indicator to assess proportionality and appropriateness will be the evolution of the costs for the production of one MWh of heat across technologies over time, including both the investment and operating costs.
- (79) To evaluate the direct effects of the scheme, Germany committed to apply, to the extent possible given data availability, counterfactual impact evaluation methods

in line with the Commission Staff Working Document on Common methodology for State aid evaluation⁹.

- (80) In particular, Germany will rely on Regression Discontinuity Analysis, Difference-in-Difference analysis and Propensity Score Matching. Where available, the analyses will be performed on the basis of data at the level of the district heating network. Where this will not be possible, due to a limited network data availability, firm level data will be used along with the information on the counterfactual scenario that aid applicants are required to submit to receive support under the notified measure. Germany will supplement the counterfactual analyses with additional methods to evaluate the impact of the scheme. These will include numerical modelling and descriptive analyses.
- (81) In order to perform the evaluation, the granting authority BAFA, will collect data on the outcomes of the aid scheme and on the aid beneficiaries. Data collection will take place at the time of the submission of the application for aid, at the time of project commissioning and also during the first years of operation of the plant or, in the case of operating aid, throughout the funding period.
- (82) The evaluation will integrate the above data at the level of the aid beneficiaries with data on the district heating sector in Germany and on the development of renewable energy in the country. This data is already collected by the German Federal Statistical Office (StBA), the Renewable Energy Statistics Working Group (AGEE-Stat), the Energy Efficiency Association for Heating, Cooling and CHP (AGFW) and the Federal Ministry for Economic Affairs and Climate Action (BMWK).
- (83) Surveys of undertakings active in the district heating sector in Germany will be used for the evaluation in case the data collected through the previous means will be insufficient to carry out an econometric analysis on the causal effects of the notified measure. The surveys will seek to collect both quantitative information on the characteristics of district heating networks and qualitative information on the need to support renewable and waste heat based district heating systems in Germany.
- (84) In addition to the above data collection methodologies, Germany committed to develop a nationwide heat grid register including data on all heat generation assets in Germany, to ensure availability of data for the causal analyses foreseen in the evaluation plan.
- (85) Germany committed to submit an interim evaluation report to the Commission by the end of August 2025 and a final evaluation report by the end of December 2027. The timeline for the submission of the final evaluation report is justified by the extensive scope of the measure which covers the entire German territory and a large number of beneficiaries. In fact, in order to collect the data necessary to carry out a comprehensive ex-post evaluation of the measure, which could effectively inform the design of future support schemes for district heating and

⁹ Commission Staff Working Document on Common methodology for State aid evaluation, Brussels, 28.5.2014, SWD(2014) 179 final.

cooling, it is considered justified to allow for a longer timeline for the submission of the final evaluation report after the intermediate report in August 2025.

- (86) The evaluation will be conducted by an external independent evaluator to be selected by the Federal Office for Energy Efficiency (BfEE) through a public procurement procedure. In the selection of the evaluator, Germany committed to duly consider the qualifications and experience of the applicants in the field of evaluation.
- (87) The evaluation report will be published on the website of the BMWK (www.bmwk.de). The data for the evaluation will be collected respecting all conditions of possible business secrets and confidential information (Communication of the Commission on professional secrets in State aid decisions C (2003) 4582 OJ C 297) and the General Data Protection Regulation¹⁰. The data will be made available to the European Commission for the purpose of transparency and replicability of the evaluation results.

3. ASSESSMENT OF THE MEASURE

3.1. Presence of state aid

- (88) Article 107(1) TFEU states 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'*.
- (89) Therefore, in order for a measure to constitute State aid within the meaning of Article 107(1) TFEU it has to fulfil four cumulative conditions. First, the aid must be imputable to the State and financed through State resources. Second, the measure must confer a selective advantage to certain undertakings or the production of certain goods. Third, the measure must be liable to affect trade between Member States. Fourth, the measure must distort or threaten to distort competition in the internal market.
- (90) The notified measure is established by a federal act and financed through an investment fund which includes the proceeds of the EU ETS along with contributions from the German Federal Budget. In addition, support under the scheme is granted by a German federal agency, BAFA. On this basis, the Commission concludes that the notified measure is imputable to the State as support is provided by a German public authority through funds which are under its control and, therefore, constitute State resources.
- (91) The scheme confers an advantage to the beneficiaries by compensating for costs they would have borne under normal market conditions. While the scheme is open to undertakings of any size, municipalities carrying out economic activities, municipal undertakings, municipal associations, registered associations and

¹⁰ Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (OJ L 119, 4.5.2016, p. 1).

registered cooperatives, it is reasonable to consider that not all district heating projects and alternative heat sources will receive aid. In particular, for what concerns the network component of district heating systems, investment aid is provided for the construction of new district heating networks connecting more than 16 buildings or more than 100 residential units. In addition, support for the generation component is limited to a set of technologies identified in recital (44). The measures would, therefore, provide a selective advantage to the beneficiaries.

- (92) The heating market is characterised by the presence of a variety of possible heat sources that consumers could choose from, including various types of individual domestic boilers. Since the notified measure would provide support only to district heating systems with certain features, it has the potential to distort competition and affect trade between Member States.
- (93) Based on the above, the Commission considers that the notified measure constitutes State aid in the meaning of Article 107(1) TFEU.

3.2. Compatibility of the aid

- (94) The Commission has assessed the compatibility of the notified aid scheme on the basis of Article 107(3)(c) TFEU. The notified scheme aims at promoting economic activities in a manner that reduces greenhouse gas emissions and increases the level of environmental protection, as described in Section 2.1 of the Guidelines on State aid for climate, environmental protection and energy 2022 (CEEAG)¹¹. Therefore, the supported activities fall within the scope of the CEEAG, more specifically under the category of aid for district heating and cooling and aid for studies and consultancy services on matters relating to climate, environmental protection and energy (see points 16(k) and 16(n) of the CEEAG).
- (95) The Commission has, therefore, assessed the notified measure as support for efficient district heating based on renewable energy and waste heat under the general compatibility provisions in Section 3 CEEAG where applicable, as well as the specific compatibility criteria for district heating and cooling and for studies and consultancy services on matters relating to climate, environmental protection and energy laid down in respectively in Sections 4.10 and 4.13 CEEAG.

3.2.1. Module 1

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

3.2.1.1.1. Contribution to the development of an economic activity

- (96) Article 107(3)(c) TFEU provides that the Commission may declare compatible *'aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest'*. Therefore, compatible aid under that

¹¹ OJ C 80, 18.2.2022, p.1.

provision of the Treaty must contribute to the development of certain economic activities.¹² 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.

- (97) As indicated in recital (22), Germany explained that module 1 of the notified measure supports, via non-repayable grants, the preparation of studies on matters relating to climate, environmental protection and energy directly linked to projects covered by CEEAG. The supported studies are aimed at ensuring the feasibility of investments in new district heating systems based on renewable energy and waste heat and at identifying the potential decarbonisation pathways for existing district heating systems. Therefore, module 1 of the notified scheme contributes to the development of economic activities in district heating and other related sectors.
- (98) On the basis of the above, the Commission considers that the notified scheme facilitates the development of certain economic activities as required by Article 107(3)(c) TFEU and point 23 CEEAG.

3.2.1.1.2. Incentive effect

- (99) 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 not otherwise occur without the aid.¹³
- (100) In order to demonstrate the presence of an incentive effect, point 28 CEEAG requires the factual scenario and the likely counterfactual scenario in the absence of aid to be identified.
- (101) Germany stated that in the factual scenario investors are expected to carry out feasibility studies and transformation plans and, therefore, plan in a systemic perspective the necessary measures for the construction of new district heating systems with high shares of renewable energy and for the decarbonisation of existing ones.
- (102) Germany identified the counterfactual scenario in the absence of aid as the case in which investors would not prepare feasibility studies and transformation plans prior to investments in new district heating systems or in the decarbonisation of existing ones (see recital (21)). This would result in a less cost-effective transition of district heating systems to renewable energy, as investments would not be planned in a long-term systemic perspective.
- (103) As without the aid, the economic activity supported would not be carried out, the Commission considers that requirements in point 28 CEEAG are fulfilled.

¹² Judgment of 22 September 2020, *Austria v Commission*, C-594/18 P, EU:C:2020:742, paragraphs 20 and 24.

¹³ Section 3.1.2 CEEAG, and judgment of 22 September 2020, *Austria v Commission*, C-594/18 P, EU:C:2020:742, paragraphs 20 and 24.

- (104) Point 29 CEEAG stipulates that aid does not normally present an incentive effect in cases where works on the project started prior to the aid application. The Commission notes that activities which started before the submission of the application for aid are not eligible for aid (see recital (14)). Therefore, the requirements in point 29 CEEAG are fulfilled.
- (105) Point 32 CEEAG stipulates that aid granted merely to cover the cost of adapting to Union standards has, in principle, no incentive effect. However, with respect to the studies covered by module 1 of the notified scheme, there are no Union standards applicable. Therefore, the requirements of point 32 CEEAG are fulfilled.
- (106) Finally, point 451 CEEAG excludes the presence of an incentive effect for aid for mandatory energy audits required by Directive 2012/27/EU. As the feasibility studies and transformation plans covered by module 1 of the notified measure do not constitute mandatory energy audits, the requirements of CEEAG point 451 are fulfilled.
- (107) The Commission, therefore, considers that the aid granted under this module of the notified measure has an incentive effect.

3.2.1.1.3. No breach of any relevant provision of Union law

- (108) 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.¹⁴ However, with respect to the studies covered by module 1 of the notified scheme, there is no relevant Union law and, in any event, the Commission has not identified a breach of any relevant provision of Union law. Therefore, the requirements of point 33 CEEAG are fulfilled.

3.2.1.1.4. Conclusion

- (109) The Commission therefore concludes that the notified measure fulfils the first (positive) condition of the compatibility assessment, i.e. that the aid facilitates the development of an economic activity pursuant to the requirements set out in Section 3.1 CEEAG.

3.2.1.2. Negative condition: the aid must not affect trading conditions to an extent contrary to the common interest

3.2.1.2.1. The need for State intervention and appropriateness of the aid

- (110) Point 34 CEEAG explains that the proposed State aid measure must be targeted towards a situation where it can bring about a material development that the market alone cannot deliver. In order to demonstrate the necessity of aid, point 38 CEEAG explains that the Member State must show that the reference project(s)

¹⁴ CEEAG point 33, and Judgment of 22 September 2020, *Austria v Commission*, C-594/18 P, EU:C:2020:742, paragraph 44.

would not be carried out without the aid, taking into account the counterfactual situation, as well as relevant costs and revenues.

- (111) As show in Table 1, the estimated costs for carrying out feasibility studies and transformation plans depend on the size of the district heating system examined. In particular, the costs can range between EUR 40 000 for networks up to 50 Km to EUR 400 000 for networks above 150 Km.
- (112) Germany indicated that, in the absence of aid, feasibility studies and transformation plans would not be carried out, potentially leading to suboptimal investments in the construction of new district heating systems and in the upgrade of existing district heating systems.
- (113) The Commission considers the proposed counterfactual scenario realistic as the investments directly linked to the feasibility studies and transformation plan could be undertaken in the absence of said studies and plans.
- (114) On the basis of the above, the Commission considers that the notified measure is necessary to support the targeted economic activity in a manner that increases environmental protection.
- (115) Points 39 and 43 CEEAG require the proposed aid measures to be an appropriate policy and aid instrument to achieve the intended objective of the aid, that is to say there must not be a less distortive policy and aid instrument capable of achieving the same results.
- (116) As explained in recital (23), Germany examined the possibility to use alternative instrument to State aid to incentivise market participants to carry out feasibility studies and transformation plans. However, that option was discarded due to the low effectiveness of those instrument on the uptake of the economic activities supported under module 1 of the scheme.
- (117) The Commission considers that non-repayable grants are an appropriate aid instrument for support to feasibility studies and transformation plans as they can positively contribute to reducing the cost of these activities and are unlikely to have a considerable distortive effect, in consideration of the costs supported.
- (118) On this basis, the Commission considers that the aid in the notified measure is an appropriate instrument to support the targeted economic activity in a manner that increases environmental protection.

3.2.1.2.2. Eligibility

- (119) Points 448 and 449 CEEAG explain that studies relating to climate, environmental protection and energy are eligible for aid insofar as they are directly linked to projects or activities covered by CEEAG and they do not constitute a continuous or periodic activity nor relate to the undertaking's usual operating costs. Germany confirmed compliance with this point.
- (120) The Commission therefore considers that the eligibility for module 1 of the notified measure is in line with the CEEAG.

3.2.1.2.3. The proportionality of the aid (aid limited to the minimum necessary to attain its objective) including cumulation

- (121) According to point 452 CEEAG, the eligible costs for the support of studies and consultancy services on matters relating to climate, environmental protection and energy are the costs relating to projects or activities covered by CEEAG. As the studies supported under module 1 of the notified scheme are aimed at testing the feasibility of investments in new district heating systems based on renewable energy and waste heat and at identifying decarbonisation measures for existing district heating systems covered by CEEAG, the full costs of the studies is considered to be eligible.
- (122) Point 453 CEEAG states that State aid is considered to be proportionate if the aid amount per beneficiary does not exceed 60% of the eligible costs. The aid intensity can be increased where the beneficiary of the aid is a small- or medium-sized enterprise, in line with point 454 CEEAG. As explained in section 2.4.1, support under module 1 of the notified scheme is limited to 50% of the costs of each feasibility study and transformation plan.
- (123) Point 56 CEEAG explains that when aid under one measure is cumulated with aid under other measures, Member States must specify the method used to ensure 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 the CEEAG. As explained in section 2.6, Germany has confirmed that support under the scheme may be cumulated with aid for the same project only insofar as the support concerns different identifiable eligible costs.
- (124) On the basis of the conclusions in recitals (121), (122) and (123), the Commission considers that aid granted under module 1 of the notified measure is proportionate.

3.2.1.2.4. The transparency of the aid

- (125) Germany confirmed that its authorities will ensure compliance with the transparency requirements laid down in points 58 to 62 CEEAG (recital (71)). The relevant data of the notified measure will be published on a national website that will link to the Commission's transparency register.

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

- (126) Point 63 CEEAG explains that the Commission may declare aid to facilitate the development of certain economic activities compatible with the internal market only where such aid does not adversely affect trading conditions to an extent contrary to the common interest.
- (127) The potential distortive effect on competition of aid under module 1 of the notified measure is limited due to the specific nature of the activities covered. In fact, investments related to district heating systems can be carried out in the absence of feasibility studies and transformation plans. Therefore, it is unlikely that aid covering those activities will strengthen or maintain the market power of the beneficiaries.

(128) Point 70 CEEAG explains that the Commission will approve measures under these guidelines for a maximum period of 10 years. As stated in section 2.5, the scheme will run for six years, from September 2022 to August 2028.

(129) On the basis of the conclusions presented above, the Commission considers that aid granted under the notified measure avoids undue negative effects on competition and trade.

3.2.1.3. Weighing up the positive and negative effects of the aid
(see Section 3.3)

(130) Points 71 and 72 CEEAG explain that the Commission will balance the identified negative effects on competition and trading conditions of the notified measure (see section 3.2.1.2) with the positive effects of the planned aid on the supported economic activities including its contribution to the achievement of European climate goals (see section 3.2.1.1). As indicated in point 73 CEEAG, the Commission will consider an aid measure compatible with the internal market only where the positive effects outweigh the negative effects.

(131) Point 74 CEEAG indicates that measures involving direct or indirect support to fossil fuels are unlikely to create positive environmental effects and, therefore, that a positive outcome of the balancing test is unlikely. The same applies to investments involving new investments in natural gas unless it is demonstrated that there is no lock-in effect.

(132) Aid under module 1 of the notified measure will promote investments in feasibility studies and transformation plans, therefore contributing to the cost-effective decarbonisation of the district heating sector in Germany and to the achievement of national and European climate goals.

(133) The negative effects of the aid under this module are considered to be limited due to the nature of the aid itself, as detailed in section 3.2.1.2.5. In addition, in the assessment of the module 1 of the notified measure, the Commission did not find elements of non-compliance with the “Do not significant harm principle”.

(134) The Commission concludes that the aid facilitates the development of an economic activity and does not adversely affect trading conditions to an extent contrary to the common interest. Therefore, the Commission considers the aid compatible with the internal market based on Article 107(3)(c) TFEU and on the relevant provisions of CEEAG.

3.2.2. *Modules 2 and 3*

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

3.2.2.1.1. Contribution to the development of an economic activity

(135) Article 107(3)(c) TFEU provides that the Commission may declare compatible ‘aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest’. Therefore, compatible aid under that

provision of the Treaty must contribute to the development of certain economic activities.¹⁵ 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.

- (136) Germany explained that the notified scheme supports, via investment and operating support, the construction of new district heating systems with a share of renewable energy and waste heat of at least 75% and the decarbonisation of existing district heating systems, therefore contributing to the development of economic activities in this sector and other related sectors.
- (137) The Commission, therefore, considers that the notified scheme facilitates the development of certain economic activities as required by Article 107(3)(c) TFEU and point 23 CEEAG.

3.2.2.1.2. Incentive effect

- (138) 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 not otherwise occur without the aid.¹⁶
- (139) In order to demonstrate the presence of an incentive effect, point 28 CEEAG requires the factual scenario and the likely counterfactual scenario in the absence of aid to be identified.
- (140) With respect to the network component of district heating systems, Germany explained that the factual scenario is represented by investments in new networks and substations connecting a growing number of users.
- (141) In this case, the counterfactual scenario is identified in the lack of investments. In fact, Germany indicated that in the absence of aid, new district heating network or the extension of existing networks are unlikely to be built due to the high costs that characterise this type of investments and the low revenues that can be obtained in the market. Therefore, the funding gap is represented by the difference between the costs and revenues of the factual scenario (see Table 2).
- (142) For what concerns the generation component of district heating systems, Germany stated that in the factual scenario market operators are expected to invest in heat generation technologies based on waste heat and renewable energy, including solar thermal installations, heat pumps and deep geothermal installations.
- (143) Germany also explained that in the absence of aid, new investments in heat generation would be based on fossil fuels and reflect the current energy mix in the district heating sector. Germany submitted that fossil fuels have a cost advantage

¹⁵ Judgment of 22 September 2020, *Austria v Commission*, C-594/18 P, EU:C:2020:742, paragraphs 20 and 24.

¹⁶ Section 3.1.2 CEEAG, and judgment of 22 September 2020, *Austria v Commission*, C-594/18 P, EU:C:2020:742, paragraphs 20 and 24.

over renewable and waste heat generation technologies, even taking into account the carbon price under the EU ETS. Germany, therefore, identified as a counterfactual investment a mathematical average of the costs of a gas boiler and a cogeneration installation.

- (144) Based on the quantification of the funding gap provided by Germany with respect to heat generation in district heating systems (see Table 5), those assumptions appear reasonable and the Commission considers that investment support under module 2 and 3 of the notified measure has the potential to incentivise beneficiaries to invest in a more environmentally friendly activity than they would in the absence of aid.
- (145) In addition, based on the funding gap quantifications for solar thermal installations and heat pumps (see recital (59) and Table 6), which exceed the aid intensity foreseen for investment support under module 2 and 3 of the notified scheme, the Commission considers that operating aid under module 2 has the potential to facilitate a more environmentally friendly operation of heat generation facilities based on renewable energy and unavoidable waste, compared to the situation in the absence of aid.
- (146) As without the aid, the economic activity supported, both in relation to the generation and to the networks component of district heating system, would not be carried out, the Commission considers that requirements in point 28 CEEAG are fulfilled.
- (147) Point 29 CEEAG stipulates that aid does not normally present an incentive effect in cases where works on the project started prior to the aid application. The Commission notes that activities which started before the submission of the application for aid are not eligible for aid (see recital (14)). Therefore, the requirements in point 29 CEEAG are fulfilled.
- (148) Finally, point 32 CEEAG stipulates that aid granted merely to cover the cost of adapting to Union standards has, in principle, no incentive effect. Since there are no Union standards applicable to the district heating sector, the requirements of point 32 CEEAG are considered to be fulfilled.
- (149) The Commission, therefore, considers that for the notified measure the aid has an incentive effect.

3.2.2.1.3. No breach of any relevant provision of Union law

- (150) 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.¹⁷
- (151) Germany confirmed that support under module 2 and 3 of the notified measure would not entail a violation of Union law. In fact, aid is granted for the construction of new efficient district heating systems in line with the definition

¹⁷ CEEAG point 33, and Judgment of 22 September 2020, *Austria v Commission*, C-594/18 P, EU:C:2020:742, paragraph 44.

included in Directive 2012/27/EU and for the upgrade of existing district heating systems to meet the definition of efficient district heating and cooling provided in the directive. In addition, aid for the generation component of the district heating systems is limited to renewable energy sources in line with the definition provided in Directive (EU) 2018/2001.

- (152) In light of the above, the Commission considers that the notified aid measure does not infringe relevant Union law, and that the requirements of point 33 CEEAG are fulfilled.

3.2.2.1.4. Conclusion

- (153) The Commission concludes that the notified measure fulfils the first (positive) condition of the compatibility assessment i.e. that the aid facilitates the development of an economic activity pursuant to the requirements set out in Section 3.1 CEEAG.

3.2.2.2. Negative condition: the aid must not affect trading conditions to an extent contrary to the common interest

3.2.2.2.1. The need for State intervention and appropriateness of the aid

- (154) Point 391 CEEAG explains that the proposed State aid measure can contribute to addressing market failures by triggering the investment costs needed for the creation, extension or upgrade of efficient district heating systems.
- (155) As explained in section 3.2.2.1.2, the notified measure contributes to the uptake of investments in district heating systems based on renewable energy and waste heat. In fact, support under module 2 and 3 of the measure aims at tackling the residual market failure resulting from the application of the EU ETS, which only partially contributes to the internalisation of the CO₂ emissions generated by fossil fuels based district heating. In particular, the notified measure aims at reducing the funding gap between district heating based on renewable and waste heat and district heating based on fossil fuels, thus contributing to addressing the market failure.
- (156) Point 392 CEEAG states that Member States must demonstrate that operating costs cannot be passed on to heat consumers without undermining environmental protection. Where it is demonstrated that operating aid is necessary to ensure a high level of environmental protection, Member States should ensure that heat consumers which are undertakings exercising economic activities pay the full share of heating costs, at least equivalent to their cheapest alternative heating source.
- (157) Operating support under module 2 of the notified measure is limited to solar thermal installation and heat pumps with a SCOP level of at least 2.5. Therefore, it contributes to the realisation of environmental benefit, in terms of reduction of CO₂ emissions compared to the counterfactual investment.
- (158) The funding gap quantifications provided by Germany for the reference projects supported under module 2 of the notified measure, which appear to be based on reasonable assumptions, show that even with investment support, the cost to

generate heat with solar thermal installations and heat pumps exceeds the cost to generate heat through conventional sources, namely gas boilers and cogeneration installations (see Table 6). Without operating aid, this would result in a higher heating price for consumers connected to district heating systems based on solar thermal installations and heat pumps.

- (159) However, as explained in recital (55) since decentralised natural gas-based heat generation is an alternative to district heating in most areas in Germany, due to the extensive gas distribution network present on the territory, increasing the heating price for consumers to pass on the additional cost related to the renewable heat generation is not a feasible solution. In fact, this would result in worsening the competitive position of district heating systems compared to conventional heating systems.
- (160) To ensure compliance with point 392 confirmed that undertakings exercising economic activities benefitting from operating aid under the module 2 of the scheme will have to pay the full share of their heating costs, at least equivalent to their cheapest alternative heating source which was identified as a mathematical average of the costs to generate heat through a gas boiler and a cogeneration installation (see recital (60)).
- (161) Point 393 of CEEAG requires State aid for efficient district heating and cooling systems using waste as input fuel not to circumvent the waste hierarchy principle. However, support under module 2 and 3 of the notified measure does not cover district heating systems using waste as input fuel.
- (162) In relation to the appropriateness of the aid, Germany examined the possibility to address the need for the decarbonisation of the district heating sector through regulatory restriction on fossil energy as an alternative to aid (see recital (30)). However, it was considered that this instrument could have undermined the economic viability of district heating and jeopardise its continued existence and expansion.
- (163) The Commission, therefore, considers that support granted under module 2 and 3 of the notified measure is necessary for the decarbonisation of the district heating sector in Germany. Furthermore, the Commission concludes that investment and operating aid are an appropriate instrument to support the targeted economic activity in a manner that increases environmental protection, in line with point 391 CEEAG.

3.2.2.2.2. Eligibility

- (164) Points 388 and 389 CEEAG explain that aid for the construction, upgrade and operation of district heating and cooling generation plants is eligible under section 4.10 CEEAG where it supports the use of renewable energy, waste heat or highly efficient cogeneration, including thermal storage solutions. Similarly, support for the construction, upgrade and operation of district heating networks is covered by section 4.10 CEEAG where it contributes to the increase in efficiency or to the reduction of losses.
- (165) With respect to the upgrade of district heating and cooling systems that do not meet the definition of efficient district heating and cooling provided in Directive 2012/27/EU of the European Parliament and of the Council, point 390 CEEAG

requires Member States to ensure that aid beneficiaries start the works to reach said definition within three years following the network upgrade works.

- (166) As described in section 2.4, module 2 and 3 of the notified measure provide support for the construction of new district heating systems with a share of renewable energy and waste heat of at least 75%. This is in line with the definition of efficient district heating and cooling systems included in Directive 2012/27/EU, which requires the renewable and waste heat content of district heating systems to be at least 50%.
- (167) For what concerns heat pumps, as indicated in recital (24), support under the notified measure will be limited to installations with a SCOP level of at least 2.5. This minimum requirement guarantees that the entire amount of energy captured by the heat pumps supported can be considered as fully renewable on the basis of the methodology laid down in Annex VII of Directive (EU) 2018/2001.
- (168) In addition, as detailed in recital (44) and (54), support for the generation of heat under the notified measure is not granted to installation using waste as fuel.
- (169) For what concerns the decarbonisation of existing district heating networks, Germany explained that support under module 2 and 3 of the notified measure aims at ensuring that the definition of efficient district heating and cooling is met and that full decarbonisation of the existing heating networks is achieved by 2045 at the latest. In addition, as explained in recital (42), Germany committed to ensure that the works to reach the definition of efficient district heating and cooling systems are to begin within three years from the moment in which support for the upgrade of the systems is provided.
- (170) In light of the above, the Commission considers that the eligibility for support under module 2 and 3 of the notified measure is in line with points 388 to 390 CEEAG.

3.2.2.2.3. The proportionality of the aid (aid limited to the minimum necessary to attain its objective) including cumulation

- (171) Point 48 CEEAG explains that State aid is considered to be proportionate if the aid amount per beneficiary is limited to the net extra cost necessary to meet the objective of the aid measure compared to the counterfactual scenario in the absence of aid. Point 51 CEEAG requires Member States to determine the net extra cost based on a comparison between the profitability of the factual and the counterfactual scenario, taking into account all the main costs and revenues, the estimated weighted average cost of capital of the beneficiaries and the net present value of the project cash flows over its lifetime.
- (172) As explained in section 2.4, Germany has provided the estimations of the funding gap for a set of reference projects that could receive support under module 2 and 3 of the notified measure.
- (173) For the network component of district heating systems, Table 2 provides an estimation of the costs and revenues for a reference project. As Germany explained that the counterfactual scenario consists in a situation where no other comparable investment would be undertaken, the difference between the costs

and revenues of the reference project amount to the funding gap. This is in line with point 390 CEEAG which establishes that a counterfactual scenario where the project would not take place is considered realistic for investments in the construction, upgrade and operation of district heating distribution networks.

- (174) The assumptions used to calculate revenues, costs as well as net present values for the reference project for the network component of district heating system (as set out in recitals (36) and (37)) are reasonable and acceptable. Therefore, on the basis of the values included in Table 2, which show that investment support granted under the notified measure reduces the funding gap without fully closing it, it can be concluded that investment support for the district heating network does not exceed the funding gap.
- (175) For what concerns the heat generation component, Table 5 and Table 6 show that even taking into consideration investment and operating support, the average present cost of heat produced in the reference projects supported under the notified measure exceeds the average present cost of heat in the counterfactual investment. The elements provided by Germany on the assumptions used to calculate revenues, costs as well as net present values (as set out in recitals (45), (46) and (47)) are sufficient to conclude that the estimates are reasonable and acceptable. Therefore, aid under module 2 and 3 of the notified measure does not exceed the funding gap for heat generation technologies.
- (176) As aid under the notified measure is defined on the basis of an aid intensity, Germany committed to verify that for each of the supported projects the total amount of support, considering both investment and operating aid, does not exceed the funding gap. In this way, Germany will ensure proportionality of the aid for each of the projects supported.
- (177) Point 56 CEEAG explains that when aid under one measure is cumulated with aid under other measures, Member States must specify the method used to ensure 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 the CEEAG.
- (178) As explained in section 2.6, Germany confirmed that support under the scheme will not be cumulated with aid in relation to the same eligible costs and that, in the event of a breach of the cumulation rules, it will recover the aid provided under the notified scheme in full.
- (179) On the basis of the conclusions in recitals (172) to (176) and (178), the Commission considers that aid granted under module 2 and 3 of the notified measure is proportionate.

3.2.2.2.4. The transparency of the aid

- (180) Germany will ensure compliance with the transparency requirements laid down in points 58 to 62 CEEAG (recital (71)). The relevant data of the notified measure will be published on a national website that will link to the Commission's transparency register.

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

- (181) Point 396 CEEAG explains that the support for the upgrade, construction or operation of district heating and cooling systems which rely on the most polluting fossil fuels have negative effects on competition and trade which are unlikely to be offset unless (i) the aid is limited to investments on the distribution network, (ii) the distribution network already enables the transport of heat and cooling generated from renewable energy sources, waste heat or carbon neutral sources, (iii) the aid does not result in increased generation of energy from the most polluting fossil fuels, and (iv) there is a clear timeline involving firm commitments for transitioning away from the most polluting fossil fuels, in view of the Union's climate targets. These conditions should be cumulatively met for support to district heating and cooling systems based on the most polluting fossil fuels to achieve a positive balance between its positive and negative effects.
- (182) Point 397 of the CEEAG requires Member States to explain how measures that incentivise new investments in, or operation of energy generation assets based on natural gas contribute to achieving the Union's climate targets and, in particular, how lock-in of the gas fired generation will be avoided and how cleaner alternative already available in the market will not be displaced.
- (183) In addition, point 398 CEEAG states that *'in analysing the impact of State aid for district heating and cooling systems on competition, the Commission will carry out an assessment balancing the benefits of the project in terms of energy efficiency and sustainability against the negative effects on competition and in particular the possible negative impact on alternative technologies or providers of heating and cooling services and networks'*.
- (184) As explained in section 2.4 of this decision, the notified measure supports only investments in district heating systems which contribute to the achievement of national and European climate objectives. In particular, support for heat generation under module 2 and 3 of the scheme is not provided for technologies using fossil fuels including natural gas. Therefore, support for the generation component of district heating systems under the notified measure does not impede the deployment of clean technologies and their use.
- (185) With respect to investment in the construction of district heating networks, support under module 2 and 3 of the notified measure is granted only where there is no increase in heat produced in coal-fired plants. In addition, support for the decarbonisation of existing district heating network is granted for investments aimed at ensuring that the network fully operates on the basis of renewable and waste heat sources at the latest by 2045.
- (186) On this basis, the Commission concludes that modules 2 and 3 of the notified measure comply with the requirements in point 396 and 397 CEEAG.
- (187) Germany submitted elements related to the promotion of energy-efficiency and sustainability of energy sources through the scheme, which would exclude any relevant negative effects on competition, in line with the requirement of point 398 CEEAG. In fact, the scheme aims at supporting the construction of new district heating systems based on renewable energy and waste heat and the decarbonisation of existing heating networks, thereby, contributing to the

achievement of benefits in terms of environmental protection. On the other hand, negative effects on competition are minimised as support is granted through a scheme open to a wide range of beneficiaries and technologies based on their individual funding gap. This includes operators not currently providing district heating services, which are eligible to receive support under the notified measure. Considering that support is granted through a scheme of this breadth, the Commission considers it unlikely that it will lead to market concentration.

- (188) In the analysis of module 2 and 3 of the notified measure, the Commission did not find obvious indications of non-compliance with the “do no significant harm” principle.
- (189) With respect to operating aid for heat generation in district heating and cooling systems, where aid is required to cover variable short-term costs, point 122 CEEAG requires Member States to monitor the production costs and update the aid amount at least once per year. In addition, point 123 CEEAG explains that aid should be designed to prevent undue distortions to the efficient functioning of markets. Point 126 CEEAG also requires incentives not to be provided for the generation of energy that would displace less polluting forms of energy.
- (190) As described in section 2.4.2.2, operating aid under the notified measure is provided only for the generation of heat through solar thermal installations and heat pumps. In particular, the amount of operating support is subject to annual monitoring to ensure that the level of support does not exceed the funding gap between the project funded and the counterfactual investment (see recital (61)). For heat pumps, the annual monitoring of operating aid will also take into account changes in electricity input costs. On the basis of the annual monitoring, the amount of operating aid granted will be updated to ensure proportionality of the aid and avoid undue negative effects on competition and trade.
- (191) On the basis of the conclusions presented above, the Commission considers that aid granted under module 2 and 3 of the notified measure avoids undue negative effects on competition and trade.

3.2.2.3. Weighing up the positive and negative effects of the aid (see Section 3.3)

- (192) Points 71 and 72 CEEAG explain that the Commission will balance the identified negative effects on competition and trading conditions of the notified measure (see section 3.2.2.2) with the positive effects of the planned aid on the supported economic activities including its contribution to the achievement of European climate goals (see section 3.2.2.1). As indicated in point 73 CEEAG, the Commission will consider an aid measure compatible with the internal market only where the positive effects outweigh the negative effects.
- (193) Point 74 CEEAG indicates that measures involving direct or indirect support to fossil fuels are unlikely to create positive environmental effects and, therefore, that a positive outcome of the balancing test is unlikely. The same applies to investments involving new investments in natural gas unless it is demonstrated that there is no lock-in effect.
- (194) Module 2 and 3 of the notified measure aim at supporting the construction of new district heating systems with a share of renewable energy and waste heat of at

least 75% and the decarbonisation of existing district heating systems by addressing the residual market failure resulting from the application of the EU ETS, which only partially contributes to the internalisation of the CO₂ emissions generated by fossil fuels based district heating. Therefore, it can be concluded that the notified measure contributes to the achievement of national and European climate goals.

- (195) As analysed in section 3.2.2.2.5, module 2 and 3 of the notified measure do not involve support for the heat generation based on fossil fuels and natural gas. For what concerns investments in the construction of new district heating networks, support under the notified measure can only be granted where there is no increase in heat produced in coal-fired plants. In addition, support is subject to the requirement that said networks transport a share of renewable and waste heat of 75%. It is considered that this minimum requirement ensures that the construction of new heating networks will not lead to an increase in the production of heat from natural gas, on the contrary it will facilitate the development and the use of cleaner technologies already available on the market. Finally, with respect to the decarbonisation of existing district heating networks, the investments supported by the notified measures are aimed at increasing the level of renewable and waste heat transported, therefore, reducing the use of fossil fuels and natural gas. On this basis, the Commission considers that module 2 and 3 of the notified measure do not involve support to fossil fuels or natural gas.
- (196) In addition, as explained in recital (183) the Commission in the assessment of the module 2 and 3 of the notified measure did not find elements of non-compliance with the “Do not significant harm principle”.
- (197) Therefore, the Commission concludes that the aid facilitates the development of an economic activity and does not adversely affect trading conditions to an extent contrary to the common interest. Therefore, the Commission considers the aid compatible with the internal market based on Article 107(3)(c) TFEU and on the relevant provisions of CEEAG.

3.2.3. *Evaluation plan*

- (198) Point 456 CEEAG requires an ex-post evaluation for aid scheme with a total duration exceeding three years from 1 January 2022 and with a State aid budget or accounted expenditures exceeding EUR 150 million in any given year or EUR 750 million over the total duration of the scheme. The notified measure fulfils the criteria for the ex-post evaluation requirement.
- (199) The scope and modalities of the evaluation have been defined, taking into account the Commission Staff Working Document on Common methodology for State aid evaluation, in an evaluation plan that Germany notified together with the aid scheme and whose main elements are described in section 2.9 above.
- (200) The Commission considers that the notified evaluation plan contains the necessary elements: the objectives of the aid scheme to be evaluated, the evaluation questions, the result indicators, the envisaged methodology to conduct the evaluation, the data collection requirements, the proposed timing of the evaluation including the date of submission of the final evaluation report, the description of the independent body conducting the evaluation or the criteria that

will be used for its selection and the modalities for ensuring the publicity of the evaluation.

- (201) The Commission notes that the scope of the evaluation is defined in an appropriate way. It comprises a list of evaluation questions with matched result indicators. Data sources are individually defined for each question. Moreover, the evaluation plan sets out and explains the main methods that will be used in order to identify the impacts of the scheme, and discusses why these methods are likely to be appropriate for the scheme in question.
- (202) The Commission acknowledges the commitments made by Germany that the evaluation will be conducted according to the notified evaluation plan by an independent evaluation body. The procedures envisaged for selecting such evaluation body are appropriate in terms of independence and skills. Moreover, the proposed modalities for the publication of the evaluation results are adequate to ensure transparency.
- (203) The Commission notes the commitment made by Germany to submit an interim evaluation report by the end of August 2025 and a final evaluation report by the end of December 2027.
- (204) Furthermore, the Commission notes the commitment made by Germany to take into account the evaluation results for the design of any subsequent aid measure with a similar objective.
- (205) The Commission reminds that the notified scheme has to be suspended if the final evaluation report is not submitted in good time and sufficient quality.

4. 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) of the Treaty on the Functioning of the European Union.

Yours faithfully,

For the Commission

Margrethe VESTAGER
Executive Vice-President