Support to four CHP installations: Lausward F, Berlin Mitte, München GuD2, and Niehl 3

Sir,

1. **PROCEDURE**

(1) On 10 November 2016, following pre-notification contacts, the German authorities notified, pursuant to Article 108(3) of the Treaty on the Functioning of the European Union (TFEU), support measures for four combined heat and power generation ("CHP") installations, namely the Lausward F installation (notified under case SA.45826), the Berlin Mitte installation (notified under case SA.45827), the München GuD2 installation (notified under case SA.46003), and the Niehl 3 installation (notified under case SA.46004). The Commission sent requests for information to the German authorities on 14 October 2016, 17 and 25 November 2016. Germany sent replies on 10, 16 and 28 November 2016.

(2) The measures were notified as individual operating aids for cogeneration granted under an aid scheme, in accordance with paragraph 20(d) of the Guidelines on...
State aid for environmental protection and energy 2014-2020\(^1\) ("EEAG"). Each of the four CHP installations has a cogeneration electricity capacity exceeding the notification threshold of 300 MW.

(3) The four projects are similar, differing only in certain technical aspects. Two of them concern new CHP installations, the remaining two concern existing, depreciated CHP installations, as further described hereunder. The proposed projects are therefore assessed together in one single decision, against the additional conditions for individually notifiable aid under the EEAG.

(4) On 1 December 2016, Germany waived its right under Article 342 TFEU in conjunction with Article 3 of Council Regulation (EEC) No 1/1958\(^2\) to have the decision adopted in German and agreed that the decision be adopted and notified in English.

2. **Detailed description of the aid**

2.1. **Background: the approved German aid scheme for cogeneration**

(5) By decision of 24 October 2016 in case SA.42393 (2016/C) (ex 2015/N) ("the KWKG decision\(^3\)"), the Commission approved Germany’s support scheme to CHP installations, the Combined Heat and Power Generation Act ("KWKG"). The KWKG aims at improving the energy efficiency of energy production in Germany by increasing the net electricity production from CHP installations to 110 TWh/year by 2020 and to 120 TWh/year by 2025, as compared to the current yearly production of 96 TWh. Under the KWKG, support is granted to new and to existing highly efficient CHP installations and to various fuels (except coal and lignite). It is open to various cogeneration technologies. As per Section 2(8) KWKG, CHP installations qualify as highly efficient if they comply with the high-efficiency criteria of Directive 2012/27/EU of the European Parliament and of the Council\(^4\) (the “Energy Efficiency Directive”).

(6) The support is paid as a premium (the "CHP-support") on top of the market price by the network operator to which the installation is connected. The KWKG decision distinguishes notably between the CHP-support granted for new installations and the CHP-support granted for existing (depreciated) installations.

(7) Pursuant to recital (21) of the KWKG decision, new installations with a capacity of more than 2 MW are entitled to a CHP-support of 3,1 euro cents/kWh which is paid for CHP electricity injected into the public grid for 30 000 full load hours as of the moment the installation enters into operation (recital (19) thereof). In accordance with recital (27) of the KWKG decision, an additional premium of 0,3 euro cents/kWh is granted under Section 7(5) of the KWKG for CHP facilities subject to the Greenhouse Gas Emission Trading Law (TEHG) as they face higher costs compared to CHP installations not subject to the ETS system.

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2. Council Regulation No 1 of 15 April 1958 determining the languages to be used by the European Economic Community (OJ 017, 6.10.1958, p. 385).
As stated in recital (29) of the KWKG decision, operators of existing (depreciated) high-efficiency gas-fired CHP plants with an electrical CHP capacity of more than 2 MW can obtain a CHP-support of 1.5 euro cents/kWh on top of the market price, subject to certain conditions. The support is limited in time (until 31 December 2019) and full-load hours (up to 16,000).

In the context of the notification of the KWKG, Germany has submitted Levelized Cost Of Electricity (LCOE) calculations for the production of cogenerated electricity in a series of representative CHP installations, based on the following formula:

\[ LCOE = \frac{I_0 + \sum_{t=1}^{n} \frac{A_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{M_{t,therm}}{(1+i)^t}} \]

Where:
- LCOE: Levelized cost of electricity
- \( I_0 \): Investment in Euro
- \( A_t \): Annual total costs in Euro in the year \( t \)
- \( M_{t,therm} \): Volume of electricity produced in the concerned year in kWh
- \( i \): Discount factor in %
- \( n \): Economic lifetime of the installation in years
- \( t \): Year considered during the economic lifetime

The same formula has been used in the framework of the four individual notifications assessed in this decision in order to determine the LCOE of the four individual plants.

2.2. Description of the four notified individual projects

All four notified projects concern highly efficient cogeneration installations with an electric cogeneration capacity of more than 300 MW each, requiring individual approval by the European Commission under paragraph 20(d) of the EEAG.

Each cogeneration installation must be highly efficient in the meaning of Article 2(34) and Annex II of the Energy Efficiency Directive to be eligible for the support. Whether this is the case will be verified again by the German Federal Office for Economic Affairs and Export Control (BAFA) before the aid can be paid out.

Each of the four projects relates to gas-fired cogeneration installations used to provide heat for district heating purposes.

2.2.1. CHP installation Niehl 3

The Niehl 3 project concerns a new highly efficient cogeneration installation which started operating on 30 April 2016 at the already existing Cologne-Niehl site. It feeds into Cologne's Innenstadt/Deutz' public power grid and district heating network together with another gas and steam turbine installation at the same site and one heat boiler and one steam generator in Cologne Südstadt. The plant uses the water of the Rhine as cooling, which renders the electrical efficiency of the plant particularly high.
(15) Operated by RheinEnergie AG, the Niehl 3 plant is a gas and steam turbine installation of condensing type with district heat extraction. It uses exclusively natural gas as fuel. It has a net electrical capacity of approximately 450 MW_el (in condensing mode) and a maximum net heat capacity of 265 MW_th. The plant has, in pure condensing mode, a net efficiency of 60% and in cogeneration mode the fuel efficiency can reach up to 88%. The plant is flexible and can be switched on within two hours.

(16) With the synergies made possible by the use of existing infrastructure at the site (use of the existing cooling water supply system, the cooling tower, the treatment installations for district heating water, the existing control room, the workshops and the social and administrative building), some project investment costs could be mitigated or avoided.

(17) Being a new plant in the meaning of Sections 6 and seq. KWKG, the Niehl 3 installation is entitled to a fixed premium of 3,4 euro cents/kWh (3,1 euro cents/kWh pursuant to Section 7(1)(5) and 0,3 euro cents/kWh pursuant to Section 7(5) thereof) for the cogenerated electricity fed into the public grid during a maximum of 30,000 full load hours.

(18) The German authorities explained that the decision to invest in the new CHP plant Niehl 3 was taken at a time when the 2012 CHP Act was in force, providing for a support of 21 EUR/MWh. After that, electricity prices dropped sharply: from 43 EUR/MWh in 2012 to 28 EUR/MWh in 2016.\(^5\) Germany explained that the increased CHP-support is making the completion of the Niehl 3 project possible, as with the perspective of obtaining an increased aid at the time of the application for the individual aid and of the reform of the CHP Act (end of 2015), completion of the project was the most economically viable option. The opportunity cost of not operating existing units for district heating amounted to EUR [...]\(^(*)\) million while the net present value of the Niehl project was at the same time (end of 2015) EUR [...] million. In addition, until the end of 2015, the project had generated EUR [...] million costs for the erection of the CHP plant and its connection to the grid. In the event of project termination, these costs could not have been covered by any revenues from the operation of the plant. The CHP-support therefore substantially improves the net present value of the project by lowering the gap between the LCOE and the market price.

(19) Based on the figures provided by Germany and on the method for calculating the LCOE approved in the KWKG decision (see recital (10) above), the LCOE for Niehl 3 – without CHP-support – corresponds to [...] EUR/MWh, i.e. significantly higher than the average, discounted market price of electricity, corresponding to [...] EUR/MWh\(^6\). The figures communicated by Germany show that notwithstanding the share of free allocated CO\(_2\) certificates and the efficiency of the plant, the production costs remain higher than the market price for electricity.

\(^{*}\) Confidential information

\(^{5}\) See Table 9 and recital 51 of the KWKG decision.

\(^{6}\) The LCOE for the Niehl 3 project is expected to be [...] times the discounted market price of electricity anticipated over the lifetime of the project.
2.2.2. CHP installation Lausward F

(20) The Lausward F project concerns a new highly efficient cogeneration installation which started commercial operations on 22 January 2016, at the Lausward site. The plant feeds into Düsseldorf’s power grid and district heating network, together with the Flingern site (producing mainly heat but also electricity).

(21) Operated by Stadtwerke Düsseldorf AG, the Lausward F plant is a natural gas-fired combined cycle plant with heat extraction. It has a maximum net electrical capacity of 596 MW\textsubscript{el} and a maximum net heat capacity of 300 MW\textsubscript{th}. It can reach an electrical efficiency of up to 61.3\% and a total cogeneration efficiency of 85\%, with maximum share of electrical CHP production of up to 422 MW\textsubscript{el}. Due to the technical specificities of the plant, the CHP production share is part of the total electrical output, so that in practice the CHP production is calculated by means of a technically adequate formula verified by the BAFA (i.e. the Federal Office for Economic Affairs and Export Control), a superior federal authority subordinated to the Federal Ministry for Economic Affairs and Energy (BMWi)) in charge of verifying that only eligible operators obtain the support.

(22) At the Lausward site, a CCGT plant with 100 MW\textsubscript{el} and 80 MW\textsubscript{th} capacities (Block A), a CCGT plant with 420 MW\textsubscript{el} and 140 MW\textsubscript{th} capacities (Block E), and three boilers, each with 60 MW\textsubscript{th} capacity, were already in operation. With the synergies made possible by the use of existing infrastructure at the site (use of the existing cooling water supply system, the gas and electricity connection, the existing control room, the workshops and the social and administrative building), the project investment costs for Lausward F amounted to a discounted value of EUR […] million, using an interest rate of 8\%.

(23) The plant is expected to operate for 20 years.

(24) Being a new plant in the meaning of Sections 6 and seq. KWKG, the Lausward F installation is entitled to a fixed premium of 3.4 euro cents/kWh (3.1 euro cents/kWh pursuant to Section 7(1)(5) and 0.3 euro cents/kWh pursuant to Section 7(5) thereof) for the cogenerat\textit{ed} electricity fed into the public grid during a maximum of 30 000 full load hours.

(25) The decision to invest in the Lausward F project was taken on 7 December 2012 under the previous version of the CHP Act, i.e. more than three years before the plant entered into operation. At the time the final investment decision was made, support under the German CHP Act was lower (21 EUR/MWh) but electricity wholesale prices and thus profit margins were significantly higher than under the current market conditions (the electricity wholesale price was 43 EUR/MWh in 2012 against 28 EUR/MWh in 2016\textsuperscript{7}).

(26) Based on the LCOE calculation method laid down in the KWKG (see recital (9)-(10) above), the LCOE for the Lausward F project is […] EUR/MWh without CHP-support. The average, discounted market price of electricity anticipated over the lifetime of the project amounts to […] EUR/MWh\textsuperscript{8}. The revenues from the electricity generated are expected to increase over the lifetime of the installation.

\textsuperscript{7} See Table 9 and recital 51 of the KWKG decision.
\textsuperscript{8} The LCOE for the Lausward F project is expected to be […] times the discounted market price of electricity anticipated over the lifetime of the project.
thanks to a foreseen increase in electricity prices in the medium to long-term, nevertheless both gas and CO$_2$ certificates prices are also expected to increase (the free allocated CO$_2$ certificates being more than offset by the increase in price of the purchased ones), so that the LCOE should remain significantly higher than the market price over the operational lifetime of the plant. The gap is mainly resulting from the high costs for investment which cannot be offset due to the low capacity utilisation of the plant.

2.2.3. CHP installation München GuD2

(27) The München GuD2 project concerns an existing, highly efficient cogeneration installation, which has been in operation since 8 December 2004. The plant, located in the South of Munich, feeds into Stadtwerke München's district heating network which comprises five hot water networks and one steam network, all hydraulically connected to each other. Its power is exclusively fed into the 110 kV power grid of SWM Infrastruktur GmbH & Co.KG, a grid of public supply.

(28) Operated by SWM, the München GuD2 plant is a gas and steam turbine installation fired with natural gas. The maximum net electrical capacity of the GuD2 plant amounts to 399,9 MW$_{el}$ and is made up of the capacity of two gas turbines of 139,3 MW$_{el}$ each and a steam turbine of 131,3 MW$_{el}$ minus internal consumption (10 MW). The steam turbine capacity is achieved with the aid of auxiliary firing in the waste heat recovery boiler.

(29) The München GuD2 installation contributes a high share of the district heating in Munich, however in the last years, due to the tense price situation, the plant, despite being classified a system-relevant power plant by the grid operator Tennet, has been frequently pushed back and the production of heat was accordingly shifted to heat boilers also operated by SWM. The full-load utilization hours of the plant have halved over the last 6 years, from [...] hours in 2010 down to [...] hours in 2015.

(30) Being an existing plant in the meaning of Article 13 KWKG, the München GuD 2 installation is entitled to receive between 1.1.2016 and 31.12.2019 a fixed premium of 1,5 euro cents/kWh for the cogenerated electricity fed into the public grid during a maximum of 16 000 full load hours.

(31) The calculations provided by Germany for the München GuD2 project show a LCOE of [...] EUR/MWh exceeding the expected average market price of [...] EUR/ MWh for the period 2016-2019 when the plant is entitled to the CHP-support. The LCOE calculation for the München GuD2 project does not include the initial investments costs as the plant is an existing, depreciated installation. Nevertheless, the revenues from heating and power generation are expected not to offset the increasing generation costs.

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9 Over the next four years, prices are expected to remain at a low level. Price increases are expected only after that period.

10 The LCOE for the München GUD2 project is expected to be [...] times the discounted market price of electricity anticipated over 2016-2019.
2.2.4. CHP installation Berlin Mitte

(32) The Berlin Mitte project concerns an existing, highly efficient cogeneration installation which has been in operation since 30 December 1996. It feeds into Berlin's public power grid and district heating network together with other generation plants using lignite, coal and gas.

(33) Operated by Vattenfall Europe Wärme AG, the Berlin Mitte plant is a gas and steam turbine installation featuring two gas turbines with waste heat boiler and a steam backpressure turbine. It has a maximum net electrical capacity of 444 MW\(_{\text{el}}\) and a maximum net heat capacity of 440 MW\(_{\text{th}}\).

(34) Since the plant was commissioned, its capacity has been increased considerably and its efficiency optimised. Nevertheless, utilisation of the plant has fallen sharply in recent years, from […] GWh\(_{\text{el}}\) in 2011 to […] GWh\(_{\text{el}}\) in 2014 and from […] GWh\(_{\text{th}}\) in 2011 to […] GWh\(_{\text{th}}\) in 2014.

(35) Being an existing plant in the meaning of Article 13 KWKG, the Berlin Mitte plant is entitled to receive between 1.1.2016 and 31.12.2019 a fixed premium of 1.5 euro cents/kWh for the cogenerated electricity fed into the public grid during a maximum of 16 000 hours full load hours.

(36) Based on the calculations provided by Germany, the Berlin Mitte project is characterized by a LCOE without CHP-support ([…] EUR/MWh) which exceeds the anticipated average market price of electricity over the next four years ([…] EUR/MWh)\(^{11}\). The LCOE calculations for the existing Berlin Mitte CHP plant were done without taking the former investment costs of the plant into account. The outcome is thus a comparison of the discounted generation costs and the discounted, average market price of electricity, rather than a rate of return. The German authorities anticipate that the revenues of the plant will decrease, due to an anticipated decrease in production over the period 2016-2019. The costs of the plant, including CO\(_2\) certificates costs, are however expected to increase over the period. The free ETS allowances granted to the plant for its heat supply would not make up for the total CO\(_2\) emissions of the plant. Therefore the difference between the total CO\(_2\) emissions and the free ETS allowances account for the need to buy CO\(_2\) allowances on the market. The net CO\(_2\) allowances multiplied by the ETS allowance price – which is expected to increase – result in increasing CO\(_2\) certificate costs. Therefore, in the coming four years given the low electricity prices and despite the free allocation of allowances in the ETS system and the energy efficiency of the installations, the market would not cover the costs of generation of CHP plant Berlin Mitte. Germany indicated that Berlin Mitte cannot maintain its production level anymore; without support, Berlin Mitte would have to consider several measures to reduce costs: new low load technology, bypass of steam turbine, replacing the CHP heat for absorption cooling and finally decommissioning of a gas turbine (i.e. decommissioning of part of the CHP installation).

\(^{11}\) The LCOE for the Berlin Mitte project is expected to be […] times the discounted market price of electricity anticipated over 2016-2019
2.3. Impact of the CHP-support on the operation of each respective installation

Table 1 hereunder summarizes for each respective installation the expected contribution of the CHP-support in terms of increased operational time and electricity production as well as avoided CO\textsubscript{2} emissions and primary energy savings, compared to the situation where each installation would not receive any aid.

**Table 1: Impact of the CHP-support on production levels, environmental protection and energy efficiency**

<table>
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<tr>
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<th>Niehl</th>
<th>Lausward F</th>
<th>München</th>
<th>Berlin</th>
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<tbody>
<tr>
<td>Annual CO\textsubscript{2} emissions savings (in tonnes) of the plant with CHP-support compared to no support scenario</td>
<td>474 000</td>
<td>255 000</td>
<td>353 188</td>
<td>1 200 000</td>
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<tr>
<td>Annual primary energy savings (in MWh) with CHP-support compared to no support scenario</td>
<td>1 310 000</td>
<td>684 000</td>
<td>847 256</td>
<td>2 400 000</td>
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<tr>
<td>Annual full load hours in no support scenario</td>
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<tr>
<td>Annual full load hours with CHP-support</td>
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<td>Annual volume of electricity generated (in MWh) in no support scenario</td>
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<tr>
<td>Annual volume of electricity generated (in MWh) with CHP-support</td>
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</table>

Germany has explained that the figures provided for Niehl correspond solely to the CHP production of the plant given that the CHP-support is only granted for each MWh of cogenerated power injected to the grid. However due to the specificities of the plant as set out in recital (15), when the CHP unit is functioning, the condensation unit is producing as well. The indirect contribution of the CHP-support to CO\textsubscript{2} emission savings and primary energy savings is therefore larger than the savings from the CHP production alone because the electricity production resulting from the CHP installation and the gas-fired condensation unit is displacing electricity from coal-fired power plants. If the whole plant is taken into account, it is expected that 541 700 tonnes CO\textsubscript{2} emissions would be saved annually. With the CHP-support, the plant would produce annually […] MWh\textsubscript{el} during […] full load hours instead of […] MWh\textsubscript{el} during […] full load hours in the no aid scenario.

Also the figures for the Lausward F plant correspond solely to the CHP production of the plant, the CHP-support being only granted for each MWh of
cogenerated power injected to the grid. For the reasons set out in recital (21) above, the indirect contribution of the CHP-support to CO₂ emission savings and primary energy savings is however larger than the savings from the CHP production alone. In practice, both the generation of condensing power and of CHP power trump the production of electricity from coal and therefore indirectly increase the environmental benefit of the CHP-support. When the whole plant is taken into account, it is expected that 434 000 tonnes CO₂ emissions and 1 060 000 MWh of primary energy sources would be saved annually. With the CHP-support, the plant would produce annually [...] MWh during [...] full load hours instead of [...] MWh during [...] full load hours in the no aid scenario.

(40) The German authorities explained that the München GuD2 project will displace power generation from coal plants and heating generation from heat boilers.

(41) The German authorities explained that the support will make it possible to maintain the current level of CHP production in Berlin Mitte ([...] full load hours) and even increase it to [...] full load hours. During those production hours, Berlin Mitte will displace heat-only boilers and electricity production mainly by hard coal power plants and a small share of lignite and gas power plants during typical heating times. As mentioned under recital (36), in the absence of CHP-support, several technical measures would be envisaged, with, in the most drastic scenario, the decommissioning of a gas turbine. All these measures, to a variable extent, would result in a sharp decline of CHP power and heat volumes, with their corresponding negative environmental effects.

3. DESCRIPTION OF THE MARKET

(42) The beneficiaries of the support measures are all active in the district heating sector and deliver heat to final consumers in the cities of Cologne, Düsseldorf, Munich and Berlin respectively.

(43) To deliver the heat to their customers, the beneficiaries have different production means at their disposal. They are equipped with programs constantly verifying from which equipment the heat can be produced at the least cost. When it is not economical to produce the heat from the cogeneration unit, it is then produced from heat boilers owned by the beneficiaries.

(44) The beneficiaries are also active on the electricity market. All of them sell their electricity on the market.

(45) Table 2 below provides information on the market share of the installations and their operators on the German electricity market.
Table 2: Shares of the installations and their operators on the German electricity market

<table>
<thead>
<tr>
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<th>Niehl</th>
<th>Lausward F</th>
<th>München</th>
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<td>Market share of</td>
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<td>Market share of</td>
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<td>the operator</td>
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<td>of the installation on the German electricity market</td>
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4. ASSESSMENT OF THE MEASURE

4.1. Existence of aid

(46) A measure constitutes State aid in the meaning of Article 107(1) TFEU if it is "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 […] in so far as it affects trade between Member States".

(47) In recitals (122) and seq. of the KWKG decision, the Commission has found both the support to the production of CHP electricity in new highly efficient CHP installations and the support to the production of CHP electricity in existing highly efficient gas-fired CHP installations of the district heating sector granted under the KWKG to constitute State aid.

(48) Support to the four installations assessed in this decision is granted under the KWKG. As stated in the KWKG decision, aid under the scheme constitutes an advantage that operators would not have obtained under normal market conditions. It is also selective given that it is granted only to a certain sub-sector, i.e. CHP electricity production (recital (123) of the KWKG decision). The Commission further concluded in recital (135) of the KWKG decision that the CHP-support is imputable to the State and financed from State resources as it remains under State control for the following reasons: the CHP surcharge is established by the law, it is calculated and allocated as provided for by the law; for certain users, it is set directly in the law (KWKG 2016), it is collected by network operators, and has to be placed on a separate account so that the regulator can verify the absence of cross-subsidies between the various activities of the network operators. In addition, the law limits the budget of the support scheme and requires that the invoicing between transmission network operators be controlled by an auditor or a chartered accountant. As stated in recital (139) of the KWKG decision, aid under the scheme also has the potential to distort competition between electricity producers and to affect trade on electricity markets across the EEA. Therefore, the same reasoning as in the KWKG decision applies mutatis mutandis to the individual measures notified by the German

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12 Each of the four installations has a market share on the German electricity market of less than 1%.

13 For each installation, the relevant operator has a market share on the German electricity market of less than 2%.
authorities in support of the four CHP installations, which therefore each constitute aid.

4.2. Legality of aid

(49) Germany has notified the support measures to the four CHP installations and has subjected the granting of the CHP-support to the respective installations to the approval by the Commission. Germany has thus fulfilled its obligations under Article 108(3) TFEU.

4.3. Compatibility of aid

4.3.1. Objective of common interest

(50) The Commission acknowledged in recitals (148), (149) and (152) of the KWKG decision that the scheme, under which these individual measures are granted, is aimed at increasing the level of environmental protection through promoting electricity from highly energy-efficient cogeneration and thus contributes to the objective of common interest in the form of energy efficiency and CO₂ reductions.

(51) As the four individually notified measures are based on the approved scheme, they also aim in general at incentivizing production of electricity and heat in highly energy-efficient cogeneration plants.

(52) Nevertheless, in the framework of individual notifications, the concrete contribution of individual aids towards an increased level of environmental protection needs to be further demonstrated in quantifiable terms, in accordance with paragraph 33 of the EEAG. The Commission therefore has examined the energy savings induced by the aid as well as the amount of greenhouse gases permanently avoided as a result of the notified aid measures.

(53) As set out in Table 1 above, the CHP-support to the Niehl 3 project will allow significant CO₂ emission savings (estimated in approximately 474 000 tonnes CO₂ in the first four years of operation for the CHP part alone and 541 700 tonnes CO₂ for Niehl 3 as a whole, i.e as a result of the coupling between the CHP unit and the gas-fired condensation unit (see recital (38) above). By displacing the electricity production from coal plants to the Niehl 3 high efficiency CHP plant, the CHP-support is expected to account for more than 1,3 GWh of annual primary energy savings over the first four years of operation.

(54) As set out in Table 1 above, the CHP-support to the Lausward F project will allow substantial CO₂ emission savings, reaching 255 000 tonnes per year and 684 000 Mwh of yearly primary energy savings compared to the situation where no aid is granted. These savings are even higher when taking into account the coupling between the CHP installation and the gas-fired condensation unit, reaching 434 000 tonnes of CO₂ emission savings (see recital (39) above).

(55) As set out in Table 1 above, the CHP-support to the München GuD2 project, by displacing power generation from coal plants and heating generation from heat boilers (see recital (39) above), will result in average CO₂ emission savings of 353 188 tonnes CO₂ per year over the years 2016-2019 when the plant will be eligible to receive the CHP-support. It is also expected that the plant makes it
possible to save nearly 850 000 MWh of primary energy annually over the same period.

(56) As set out in Table 1 above, the CHP-support to the Berlin Mitte project will have a critical contribution to environmental protection. Compared to the situation where the plant would shut down\(^{14}\), the granting of the CHP support will allow some 1 200 000 tonnes of avoided CO\(_2\) emissions annually and 2 400 000 MWh of yearly primary energy savings considering that it will displace production mainly by hard coal power plants and a small share of lignite and gas power plants during typical heating times (see recital (41) above). Therefore, also support to that project will bring a concrete and positive contribution to the environmental protection objective.

(57) The Commission thus considers that the four measures clearly contribute to the common objective of energy efficiency and CO\(_2\) reductions. In the absence of CHP-support for the two new and the two existing installations, the utilisation of the plants would be much lower and significant CO\(_2\) emission reductions and primary energy savings would be lost.

\[4.3.2. \text{Need for State intervention and appropriate instrument}\]

(58) At recital (153) of the KWKG decision, the Commission stated that the residual market failure resulting from the inability of the market and the ETS system to cover the extra costs borne by highly efficient CHP installations can be addressed through aid to promote energy efficiency.

(59) For individually notifiable aid, the Commission further assesses the specific need for aid in the case at hand. It is for the Member State to demonstrate that there is a market failure which is still not addressed with regards to the specific activity supported by the aid and that the aid is effectively targeted to address that market failure (cf. paragraph 38 of the EEAG). Paragraphs 131 (a) and (b) of the EEAG provide that the aid per unit of energy shall not exceed the difference between the total LCOE and the market price. The Commission has conducted this assessment for each of the four individually notified measures, using the LCOE calculation method already assessed in the KWKG decision (see recitals (178) and (179) thereof and recital (9) above).

(60) In all four notified projects, the Commission has verified the relevance of the underlying hypothesis, and has verified that the LCOE, despite free allocation of allowances under the ETS and energy efficiency, is higher than the market price and that the electricity market and the free allocation of allowances would not make operation of these high-efficient plants sufficiently viable (see recitals (19), (26), (31) and (36) above, respectively).

(61) The Commission therefore considers that market alone and the free allocation of allowances under the ETS system cannot deliver sufficient incentives to keep the plants in operation or at least maintain the same level of production. Without the aid, the four installations would not be sufficiently financially viable, as their costs for generating heat and electricity and, for the new installations, their investment costs, would remain much higher than the income they would get from the sale of the heat and electricity generated. The Commission thus

\(^{14}\) See recital (36).
considers that a residual market failure exists which justifies the need for State intervention.

(62) In line with recital (159) of the KWKG decision, the Commission considers that a premium on top of market price, such as the CHP-support, constitutes an appropriate aid instrument to compensate the four CHP plants for the higher production costs of electricity resulting from highly efficient cogeneration, as they target the additional cost element that is not covered by the market.

4.3.3. Incentive effect

(63) As per paragraph 49 of the EEAG, an aid must have the effect of incentivising the beneficiaries to change their behaviour in line with the objective of common interest pursued. As provided for by paragraph 58 of the EEAG, for measures subject to individual notification, the Member States must fully demonstrate to the Commission the incentive effect of the aid. As regards the four individually notified CHP projects, the Commission has verified the additional number of full load hours that the CHP-support will bring about, as well as the additional quantity of electricity produced and CO₂ emissions savings resulting therefrom (see Table 1 above).

(64) For all four installations, the German authorities have indicated a substantial number of additional full load hours during which the installations would operate, compared with the counterfactual scenario in which they are not granted any CHP-support.

(65) Given that the calculations provided by Germany show that the notified aids improve the rates of return or the profitability of the projects but do not offset entirely production costs, the Commission has verified, in compliance with paragraph 65 of the EEAG, that the CHP-support nevertheless made the projects sufficiently profitable, granting enough incentive to nevertheless pursue the objective of common interest.

Niehl 3

(66) As can be inferred from Table 1 above, the CHP-support to the Niehl 3 project would significantly change the behaviour of the operator. Indeed, the CHP-support would almost double the utilization of the plant and the quantity of electricity it generates.

(67) In addition, the German authorities explained that the decision to invest in the new CHP plant Niehl 3 was taken at a time when the 2012 CHP Act was in force, providing for a support of 21 EUR/MWh (see recital (18) above). The CHP-support under KWKG 2016 therefore did not trigger the investment in Niehl 3. Nevertheless, Germany demonstrated that the market failure critically worsened after 2012 due to a sharp fall in electricity prices, which required a significant increase of the funding rates to allow for continuous operation of highly efficient CHP plants to contribute to the climate protection and energy efficiency targets. The CHP-support does not fully bridge the gap between the forecasted market price and the LCOE of the Niehl 3 plant, and a significant funding gap would still remain after payment of the CHP-support. Nevertheless, Germany demonstrated that at the time of the application for the individual aid and the reform of the CHP Act (end of 2015) the completion of the Niehl 3 project was the most
economically viable option. The opportunity cost of not operating existing units for district heating amounted to EUR [...] million while the net present value of the Niehl project was at the same time (end of 2015) EUR [...] million. In addition, until the end of 2015, the project had generated EUR [...] million costs for the erection of the CHP plant and its connection to the grid. In the event of project termination, those costs could not have been covered by any revenues from the operation of the plant (see recital (18) above). The CHP-support therefore substantially improves the net present value of the project by lowering the gap between the LCOE and the market price.

(68) The Commission therefore concludes that the CHP-support has an incentive effect in that it changes the behaviour of the beneficiary (maintaining the project and increasing the number of full load hours).

(69) The German authorities have successfully demonstrated the incentive effect of the increased level of the CHP-support under the 2016 KWKG on the Niehl 3 project. The higher funding rates will, as demonstrated by the German authorities, substantially improve the profitability of the project in the context of worsened market conditions.

Lausward F

(70) As can be inferred from Table 1 above, the CHP-support to the Lausward F project will allow the plant to produce 2.7 times the quantity of electricity that it would produce without any support. The German authorities showed that the decision to invest in the Lausward F project was taken on 7 December 2012 under the previous version of the CHP Act, i.e. more than three years before the plant entered into operation. The decision to invest was therefore taken at a time when the lower funding rates under the German CHP Act applied (21 EUR/ MWh) but when electricity wholesale prices and therefore profit margins were significantly higher than under the current market condition (see recital (25) above). The German authorities have successfully demonstrated the incentive effect of the increased level of the CHP-support under the 2016 KWKG on the Lausward project, which was already at an advanced stage of development at the point in which the new CHP Act came into force. In the absence of CHP-support the present net value of the project would be EUR [...] million. The higher support rates substantially improve the profitability of the project in the context of worsened market conditions and make it possible to maintain the project.

München GuD2

(71) The German authorities have further demonstrated that the CHP-support to the München GuD2 project will induce a clear change in the plant operator's behaviour. As a result of the CHP-support, the operation of the plant over the next four years will be made profitable in an increased number of hours as payment of the CHP-support is expected to considerably reduce the difference between the LCOE and the market price. As a consequence, the plant is expected to record 52 % higher production compared to the counterfactual scenario without aid (see Table 1 above). Payment of the CHP-support will therefore make a considerable contribution to the utilization of the plant and its contribution to CO₂ and primary energy savings as can be inferred from Table 1.
(72) As it can be inferred from Table 1 above, the CHP-support to the Berlin Mitte project will have a decisive effect of stabilising the production, and even achieve approximately 15% of additional production. In the absence of aid, the production of the CHP unit would have been further reduced and in the worst case the plant would have been shut down (see recital (36) above).

(73) The Commission thus concludes that the payment of the CHP-support to the existing installations on the one hand and to the new installations on the other hand has a clear incentive effect on their respective operators. It will induce a clear change in their behaviour, allowing them to operate for a much longer period of time each year and will noticeably narrow the gap between operating costs and electricity market prices.

4.3.4. Proportionality

(74) None of the four projects raises problems of proportionality of aid as in each respective project, the of the gap between the median market price and the power production costs can only be partially compensated by the CHP-support, as detailed below.

(75) For the Niehl 3 project, the average revenues from the CHP-support of […] EUR/MWh\(^{15}\) improves the rate of return of the project compared with the counterfactual scenario in the absence of aid. However, added to the discounted average wholesale market price of electricity of […] EUR/MWh, the average CHP-support is not sufficient to reach the discounted LCOE ([…]) EUR/MWh of the project (see recital (19) above). The CHP-support does not therefore yield any overcompensation.

(76) As for the Lausward F project, the figures show a remaining gap of […] EUR/MWh between the LCOE of the project ([…]) EUR/MWh) on one side and the sum of the average wholesale electricity market price ([…]) EUR/MWh) and the average revenues from the CHP-support\(^{16}\) on to the total electricity capacity of the plant ([…]) EUR/MWh) on the other side (see recital (26) above). The CHP-support does not therefore yield any overcompensation.

(77) According to the data provided by the German authorities, the GuD2 München project’s LCOE corresponds to […] EUR/MWh, as compared to an average discounted wholesale market price of electricity of […] EUR/MWh over the period 2016-2019. The resulting gap of […] EUR/MWh can be only partially compensated by the fix CHP-support of 15 EUR/MWh (see recital (30) and (31) above). The CHP-support does not therefore yield any overcompensation.

(78) With regard to the Berlin Mitte project, the LCOE is expected to be of […] EUR/MWh, i.e. higher than the sum of the average discounted market price of […] EUR/MWh and the fix CHP-support of […] EUR/MWh (see recital (35) and (36) above). With a remaining gap of […] EUR/MWh, the CHP-support does not therefore yield any overcompensation.

\(^{15}\) The CHP-support is granted on the CHP electricity only. The average revenues from CHP-support correspond to the ratio between the discounted value of the CHP-support revenues and the discounted volume of electricity generated over the operation period.

\(^{16}\) See footnote 9.
Based on these elements, the Commission notices that the generation costs of each of the four CHP plants assessed in this decision are higher than the reference electricity market price and that the CHP-support paid never exceeds the difference between the LCOE and the market price, in compliance with point 131(a) of the EEAG. Compliance with paragraphs 131(b), (c) and (d) of the EEAG has been assessed in recitals (176) to (194) of the KWKG decision. In particular, in the KWKG decision, the Commission has assessed that a rate of return of 8% as embedded in the LCOE calculations corresponds to the normal rate of return of the district heating sector (recital (183) of the KWKG decision), in compliance with paragraph 131(b) of the EEAG. In recital (209) the KWKG decision, the Commission concluded that the evolution of costs is monitored on an annual basis to verify that the operating costs are still higher than the market price of energy, which renders the scheme compliant with paragraphs 131(c) and 133(c) of the EEAG. Moreover, the Commission has found it appropriate to use the criteria applicable to existing biomass plants after depreciation as guidance for the assessment of the proportionality of aid to depreciated gas-fired highly efficient CHP installations (see recital (195) of the KWKG decision). Therefore, paragraph 131(d) of the EEAG does not apply. As the same principles apply mutatis mutandis to the four measures assessed in this decision, the Commission concludes that proportionality of the aid is ensured.

4.3.5. Distortion of competition and balancing test

In the context of the assessment of individually notifiable aid, paragraph 101 of the EEAG requires not only to demonstrate that the negative effects of the aid on competition and trade are limited, but also to verify, among others, that the individual aid does not lead to supporting inefficient production and creating or enhancing market power.

The Commission notes, first, that distortions of competition caused by the aids under assessment on the heat market will remain quite limited. In the four district heating systems concerned, the company which operates the respective CHP installation also owns the heat boilers towards which heat production would be displaced in the absence of CHP-support (see recital (43) above). Therefore, these companies determine within their own portfolio the heat generation mix based on which the production is the least costly for the company. The subsidy will thus essentially impact the type of installation that is used rather than influencing the company that will provide the heat. The measures will therefore neither distort competition on the district heating market nor create or enhance the market power of the beneficiaries therein.

The Commission further notes that the aid has a significant positive impact in terms of CO₂ emission reductions and primary energy savings (see Table 1 above), while the market shares of the beneficiaries on the electricity market remain rather limited (see Table 2). Therefore, also on the electricity market the distortion of competition brought about by the measures remains limited and the measures do not contribute to creating or enhancing the market power of the beneficiaries on that market either.

Finally, the Commission notes that the aids will not support inefficient production modes. On the contrary, all plants have a high energy efficiency. In addition, the new CHP installations have made use of already existing infrastructure allowing for important cost reductions, they also have built-in synergies with other
equipment that further indirectly increase the CO\textsubscript{2} emission reductions and primary energy savings that can be achieved with the support. For instance, the Niehl 3 project minimized the investment costs by using the existing water cooling system including the cooling tower, the workshop and social buildings, the treatment plant for the district heating water as well as the control room (see recital (16) above). Synergies with existing infrastructure were also made possible in the Lausward F project which shares with the existing plants the already existing cooling water supply system, the grid connection for gas and power, the control room as well as the workshop and administrative and social buildings (see recital (22) above). In both projects, those synergies helped reduce significantly the investment costs, contributing to their positive economic and environmental effects.

(84) The Commission therefore concludes that the distortion of competition both on the heat and on the electricity markets remains limited in comparison with the positive effects for the environment, and that the individual aids do not lead to supporting inefficient production nor to creating or enhancing the market power of the beneficiaries on either of the relevant markets.

5. AUTHENTIC LANGUAGE

(85) As set out in recital (4) above, Germany has waived its right to have the decision adopted and notified in German. The authentic language of this decision will therefore be English.

6. CONCLUSION

The Commission has accordingly decided not to raise objections to the four individually notified aids on the grounds that they are granted in line with the requirements set out in the KWKG decision and in line with the EEAG, in particular Sections 3.2.1.2, 3.2.2.2, 3.2.4.2, 3.2.5.3 and 3.2.6.3 thereof applicable to individually notifiable aid, and are therefore compatible with the internal market pursuant to Article 107 (3)(c) of the Treaty on the Functioning of the European Union.

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Yours faithfully
For the Commission

Margrethe VESTAGER
Member of the Commission