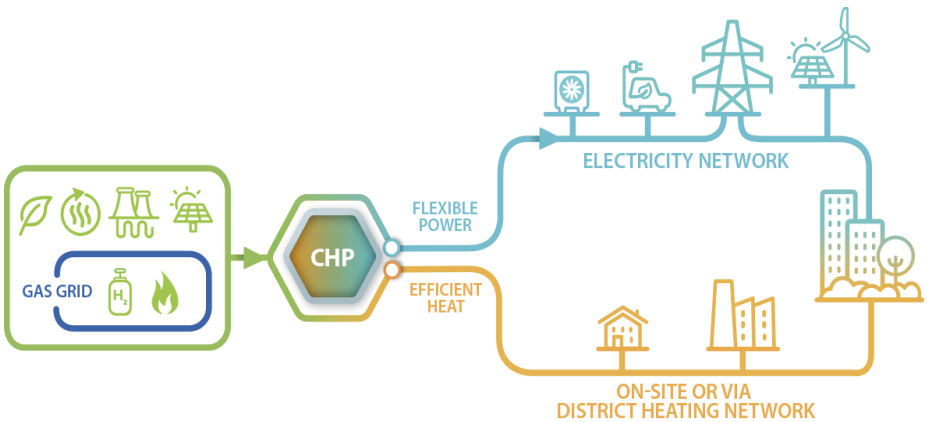
Position Paper

COGEN Europe response to the draft Guidelines on State aid for climate, environmental protection and energy 2022

COGEN Europe welcomes the draft proposal for Guidelines on State aid for climate, environmental protection and energy 2022 (CEEAG). State aid rules are key in fostering clean energy uptake across the EU, ensuring investor certainty and providing a clear signal to energy consumers on their path to decarbonisation.

The role of high efficiency cogeneration will remain important towards 2050, given its multiple benefits[1]:

- ✔ delivering highest efficiency for the thermal generation needed in the energy mix, over a range of increasingly low carbon and renewable energy sources
- ✔ reducing the consumption of fossil fuels and maximising the use of renewable energy sources in the energy mix
- ✔ providing efficient and flexible thermal generation to cover both heat demand and residual electricity load (at times when intermittent renewable sources are insufficent to cover power demand)
- ✔ complementing electrification and supporting the efficient integration of renewable energy
- ✔ avoiding carbon lock-in by designing CHP plants that can be retrofitted to run on hydrogen and renewable gases
- ✔ avoiding operational lock-in by designing integrated projects that can optimise CHP, heat storage and electricity-based heating (either via a boiler or heat pumps) to quickly adapt to changing conditions



[1] Artelys, 2020. Towards an efficient, integrated and cost-effective net-zero energy system in 2050. The role of cogeneration

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While the proposed CEEAG already takes a comprehensive, balanced and flexible approach, further improvement is needed to fully recognise cogeneration as a key efficiency principle and a system integration solution.

In particular, CHP is an important technology to increase the energy efficiency of thermal generation used on-site or for district heating (both in terms of primary and final energy savings). In addition, it supports electricity grids and foster energy systems integration at local level. Therefore, we propose the following changes to the existing definitions and other aid categories to better take into account all the benefits of the cogeneration.

Mainstreaming energy efficiency: Beyond the undeniable necessity of reducing GHG emissions (as underlined in Section 3.2), achieving the EU's decarbonisation in the most resource-efficient manner will be of utmost importance. As also highlighted within the proposed energy efficiency directive recast proposal[2] and the Green Deal communication[3], the aim is to transform the EU into a "[…] *fair and prosperous society, with a modern, resource-efficient and competitive economy[…]*".

- In view of its enormous potential in both primary and final energy savings, high efficiency CHP should be recognised as an energy efficiency solution across all end use sectors and at system level, coupled with its contribution in cutting GHG.
- Cogeneration should therefore be featured as a best available technique for energy efficiency improvements in relation to district heating (Section 4.10), industry (Section 4.1) and buildings (Section 4.3).

Promoting smart and efficient system integration: CHP is a technology producing significant positive externalities in terms of reinforced grid stability. It does so by: 1) reducing power grid losses ; 2) reducing the need to invest building new power lines; 3) providing flexible generation and firm capacity to ensure power supply and demand is balanced at all times. These CHP benefits are not usually monetised or promoted. To improve this, the CEEAG should :

- Incentivise the flexible operation of cogeneration systems to complement intermittent renewables and support electrification.
- Prioritise lowest carbon and highest efficiency dispatchable generation for system adequacy, including firm capacity and other services. In this respect, the emissions performance standard (EPS) of 550 g of CO2/kWh of electricity in the Electricity Regulation (EU) 2019/943 is a first step in excluding coal based power production.
- **Moreover, references to the EPS in Article 22 of Regulation 2019/943 should not be applied to assess CHP emissions, because the "net electricity efficiency" methodology unfairly allocates all CHP emissions to electricity and no emissions are allocated to cogenerated heat**[4]. Instead of the EPS in Regulation 2019/943, gas based cogeneration should be eligible to receive support for system adequacy if compliant with the « high efficiency » cogeneration methodology in the Energy Efficiency Directive.

[2] EC, 2021: Proposal for a Directive of the European Parliament and of the Council on energy efficiency (recast)

[3] EC, 2019: Communication from the Commission – The European Green Deal

[4] Regulation (EU) 2019/943 requires the EPS to be based on net electrical efficiency, which is not adapted to CHP. The simplistic "net electrical efficiency" approach allocates all CHP emissions (electricity and heat) to electricity, as it only takes into account the CHP electrical efficiency (e.g. 35-60%) and assumes all fuel input is used to produce electricity. Instead, a proper methodology should split total emissions into electricity and heat emissions respectively.

Triggering renewable energy switch & RES -readiness

- The hydrogen readiness of generation equipment should be recognised as eligible for support under CEEAG and GBER, in addition to support for hydrogen production, transmission and distribution infrastructure.
- Whit a view to addressing the broad scope of policy options to support the transformation of the heat market, the **text should clarify that operating aid for renewable heating will be part of the options available to member States to address the competitive gap between sustainable solutions and fossil fuels**.

Accelerating and maximising decarbonisation efforts across the entire economy

- The **CEEAG should feature support for both the direct and indirect decarbonisation of industry. Section 4.1 (par. 100)** of the proposed guidelines is limited to the support for the reduction of direct emissions for industry. As such, there is currently no possibility to receive aid for the reduction of indirect emissions. Depending on industrial processes, this could exclude certain industrial sectors, compromising their decarbonization efforts, including the potential to adopt highly efficient CHP solutions. Designing support schemes that avoid double compensation is outright possible, without a priori excluding support for the reduction of indirect emissions.

Providing a flexible framework for targeted and cost-effective support

- COGEN Europe welcomes the intention to simplify current rules and allow for faster procedure for operators to obtain aid. We also believe it is important that future rules leave at Member State discretion the possibility to deviate from the default approach, including from the format of competitive bidding process by developing dedicated schemes for specific options such as high efficiency Combined Heat and Power[5] .
- Deviation from the competitive bidding requirement for small scale cogeneration should be linked to the small scale cogeneration and micro-cogeneration definitions in the Energy Efficiency Directive, rather than meeting the threshold in Article 5 of Regulation (EU) 2019/943, which applies to small scale renewable generation.
- Article 12 (6) of Regulation (EU) 2019/943 specifically provides for the **continuous use** of priority dispatch for power-generating facilities that use renewable energy or high-efficiency cogeneration, commissioned before 4 July 2019. Furthermore, based on Art 6 of the 2018/2001 Renewable Energy Directive Member States must ensure that the support schemes for renewable energy projects are **not** revised in a way negatively affecting the economic viability of projects that already benefit from support. Therefore, it is crucial that the proposed guidelines ensure and further promote the stability of support schemes for energy efficiency including for cogeneration technologies along with the **grandfathering** clauses for the continuous use of priority dispatch.

[5] The format of the competitive bidding process might not be always adapted for high efficiency CHP installations which supply two products simultaneously. This issue is documented in the case law - SA 42393 'Reform of support for cogeneration in Germany', 2016.

COGEN Europe specific comments on CEEAG provisions:

COGEN Europe proposals	Justification
(29) 'District heating and cooling systems', consisting of heat generation facilities (heating/cooling production plants, **including cogeneration plants**), the heating/cooling storage and distribution network (both 'primary'- or transmission- and 'secondary' network of pipelines to supply heat to consumers). Reference to district heating is to be interpreted as district heating and/or cooling systems, depending on whether the networks supply heat or cooling jointly or separately'.	Today, between 50-70% of DHC heat relies on high efficiency cogeneration. Relevant 2050 net zero emissions scenarios, recognise the continued role of cogeneration in DHC heat supply (see Annex I for an overview)
After (62) **new 'waste heat and cold' means unavoidable heat or cold generated as by-product in industrial or power generation installations, or in the tertiary sector, which would be dissipated unused in air or water without access to a district heating or cooling system, where a cogeneration process has been used or will be used or where cogeneration is not feasible, as defined in RED article 2 point (9) of Directive 2018/2001.**	The definition of waste heat outlined in the Renewable Energy Directive should be reiterrated in the CEEAG. It highlights that waste heat should be promoted only after the CHP potential is realised (i.e. avoiding the waste of heat via cogeneration, before having to recover waste heat).
(74) This Section lays down the compatibility rules for aid measures primarily aimed at reducing greenhouse gas emissions, including aid for the production of renewable and low carbon energy, aid for energy efficiency including high-efficiency cogeneration, **and energy performance contracting**, aid for carbon capture, storage and use, and aid for the reduction or avoidance of emissions resulting from industrial processes (....). **It also covers measures aimed at creating favorable conditions for the development of low-carbon and renewable gases, as well as the renewables readiness of gas technologies, that member states will have to put in place in order to ensure a possibility of a swift transition from natural gas-based infrastructures.**	In order to avoid natural gas lock-in, the availability and affordability of renewable and decarbonised gases must be fostered. Along the uptake of renewable and decarbonised gases, renewables-readiness of gas-based technologies should be part of the CEEAG.
(92) Exceptions from the requirement to allocate aid and determine the aid level through a competitive bidding process can be justified where evidence, including that gathered in the public consultation, is provided that one of the following applies:	The Energy Efficiency Directive provides definitions for small scale and micro-cogeneration, which should be used as a reference for small scale cogeneration projets.

(a) there is insufficient potential supply to ensure competition; in that case, the Member State must demonstrate that it is not possible to increase competition by reducing the budget or expanding the eligibility of the scheme; (b) beneficiaries are small projects, defined as follows: (i) for electricity generation or storage projects – projects below the threshold in Article 5 of Regulation (EU) 2019/943; **(ii) for cogeneration projects – projects comply with the small scale cogeneration and micro-CHP definitions in the Energy Efficiency Directive 2012/27/EU** (iii) for electricity consumption – projects with a maximum demand less than 400kW; (iv) for heat generation and gas production technologies – projects below 400kW installed capacity	
100. To avoid the risk of double subsidies and ensure the verification of the greenhouse gas emissions reductions, aid for the decarbonisation of industrial activities must reduce the emissions directly resulting from that industrial activity **or indirectly, as long as Member States can demonstrate that the measure is not subject to double subsidies.** Aid for improvements of the energy efficiency of industrial activities must improve energy efficiency of the beneficiaries' activities	Only allowing direct emission reductions to be supported may undermine the decarbonization efforts of certain industrial sectors, compromising their decarbonization efforts, including the potential to adopt highly efficient CHP solutions. Designing support schemes that avoid double compensation is outright possible, without a priori excluding support for the reduction of indirect emissions. When a CHP plant is installed on-site, replacing a less efficient heat-only boiler, direct emissions may slightly increase because additional energy input will be use. Yet, this is compensated by the avoided electricity consumption from the grid, which is predominantly based on less efficient and higher intensity sources.

(107) To avoid undermining the objective of the measure or other Union environmental protection objectives, **incentives for energy production should take into account the emissions intensity of the energy displaced, ensuring that the curtailment of renewable electricity is minimised, while not compromising security of heat and power supply**. For example, where cogeneration based on non-renewable sources is supported, ~~**or where biomass is supported**~~, they must not receive incentives to generate electricity or heat at times when this would mean zero air pollution renewable energy sources would be curtailed, **unless its (cogeneration) displacement/lack of support would mean that less efficient or more polluting heat-only solutions (e.g. boilers) are being deployed**.	COGEN Europe agrees that a systems approach should be taken in supporting low carbon energy production, taking into account the marginal energy mix displaced or utilised and ensuring that incentives are not provided for very polluting generation. For cogeneration, this is delivered by virtue of the merit order on the electricity side and through the production of highly efficient heat compared to heat only boilers. High efficiency cogeneration, both renewable and non-renewable based, has higher maginal cost than intermittent renewable sources, and will generally be dispacthed after these zero pollution electricity is dispatched. This is also ensured through the implementation of Article 13 of the Electricity Regulation, which requires that renewable electricity is curtailed last. CHP electricity only benefits for priority of dispacth under Article 12 of the Electricity Regulation, for small scale projects and for plants installed before 4 July 2019. This is generally the case for industrial CHPs which cannot curtail electricity production because high temperature heat supply must be continuously ensured, which overall saves significante emissions. Conversely, if cogeneration based on non renewable sources (e.g. gas) stops generating e.g. heat, the existing heat demand will need to be covered by (usually more polluting and more inefficient) boilers, hence netting off any benefit from using electricity just from RES. Paragraph 107 of the CEEAG should therefore not undermine existing provisions in the Electricity Regulation.

After 107 new **Where cogeneration is supported, additional support should be allocated for the flexible operation of the cogeneration system to quickly ramp up generation at times of positive residual load (when electricity demand is higher than intermittent renewable energy sources) and ramp down generation at times of negative residual load.**	In the past, cogeneration projects have been designed to maximise energy efficiency, sizing the system and optimising its operation to suit the heat customer needs (either and industrial site, a district heating network or a building). As the energy system evolves, flexibilising cogeneration systems should be incentivised on top of the support offered for environmental benefits. To operate more flexibly, CHP systems would need to be coupled with storage and electric boilers, as well as smart controls.
(110) Similarly, measures that incentivise new investments in energy or industrial production based on natural gas may reduce greenhouse gas emissions and other pollutants in the short term but aggravate negative environmental externalities in the longer term, compared to alternative investments. For investments in natural gas to be seen as having positive environmental effects, Member States must explain how they will ensure that the investment contributes to achieving the Union's 2030 climate target and 2050 climate neutrality target, **as well as how it complies with « energy efficiency first » principle in the Governance Regulation.** In particular, the Member States should explain how a lock in ~~of this gas-fired energy generation or gas-fired production equipment~~ **unabated natural gas fired energy generation will be avoided**. For example, this may include binding commitments by the beneficiary to implement **energy efficiency equipment like cogeneration that is renewables/decarbonised sources ready**, decarbonisation technologies such as CCS/CCU or substitute natural gas by renewable or low carbon gas or to close the plant on a timeline consistent with the Union's climate targets[64].	The role of gas in the decarbonisation of the energy system has multiple dimensions. Firstly, the switch natural gas will deliver significante missions reductions in regions reliant on coal. Secondly, the efficient use of natural gas in cogeneration mode, delivers additional emissions reductions by reducing further reduction of fossil fuel use. Thirdly, the switch to renewable and decarbonised gases along with renewables-ready gas technologies will ensure that a lock into fossil fuels is avoided.
(116) This aid may be combined with aid for any or all of the following measures: • (a) the installation of integrated on-site renewable energy installations generating electricity, heat or cold, **including small scale**	Heating and cooling in buildings represents more than 70% of the energy consumption in buildings. Inefficient boilers deliver more than 75% of the heating and cooling in buildings. Electrification of heat and transport will help decarbonise

and micro-CHP, as defined in Directive 2012/27/EU; • (b) the installation of equipment for the storage of the energy generated by on-site renewable energy installations, • (c) the construction and installation of recharging infrastructure for use by the building users, and related infrastructure, such as ducting, where the car park is located either inside the building or it is physically adjacent to the building; • (d) the installation of equipment for the on-site digitalisation of the building, in particular to increase its smart readiness**, including smart substations and other digital solutions related to district energy, when efficient district heating is connected (and not covered under 4.10 category)**; • Eligible investments may include interventions limited to passive in-house wiring or structured cabling for data networks and, if necessary, the ancillary part of the passive network on the private property outside the building. Wiring or cabling for data networks outside the private property is excluded; • (e) other investments that improve the energy or environmental performance of the building, including investments **in improvement of indoor air quality**, in green roofs and equipment for the recovery of rain water; (d) **non-material investments (e.g. staff training, consumer behavior, deployment of new software, project costs).**	demand, but i twill at the same time put a strain on the wider electricity system. At the same time, the European building stock is diverse and requires a mix of solutions to address these challenges. Small scale and micro-CHP is one of the solutions which can help improve the efficiency of buildings and reduce emissions. CHP in buildings generate electricity and heat at the same time as electricity peak demand, supporting grid stability and making buildings active contibutors to energy systems integration. Fuel cell micro-CHP have the added benefit of reducing air pollution, as it involves no combustion. Installing micro-CHP sysems, as gas grids decarbonise, will deliver significant benefits for power grids, estimated at 2000 EUR/kW (see ene.field project report below). https://pace-energy.eu/ Benefits of Widespread Deployment of Fuel Cell
(118 a) (...) in the case of renovation of existing buildings, energy performance improvements leading to a reduction in primary energy demand of at least 20 % as compared to the situation prior to the investment (....) where the improvement is part of a staged renovation, the latter must lead to an overall reduction in primary energy demand of at least 30 % as compared to the situation prior to the investment, ~~over a period of 3 years~~.	

(134) Measures that incentivise new investments in natural gas-fired equipment aimed at improving the energy efficiency of buildings may lead to a reduction in energy demand in the short run but aggravate negative environmental externalities in the longer run, compared to alternative investments. Moreover, aid for the installation of natural gas fired equipment**, which is not energy efficient, renewables-ready and/or hydrogen ready,** may unduly distort competition where it displaces investments into cleaner alternatives that are already available on the market, or where it locks in certain technologies, hampering the wider development of a market for and the use of cleaner technologies. The Commission considers that the positive effects of measures that create such a lock-in effect are unlikely to outweigh their negative effects. As part of its assessment, the Commission will consider whether natural gas-fired equipment replaces energy equipment using the most polluting fossil fuels, such as oil and coal, **or, in the case of on-site high efficiency cogeneration, the self-generated and self-consumed electricity displaces higher carbon and less efficient marginal power generation, and weather the connection to high efficient district heating a viable option given the existence of regional/national heating and cooling strategies.**	The role of gas in the decarbonisation of the energy system has multiple dimensions. Firstly, the switch natural gas will deliver significante missions reductions in regions reliant on coal. Secondly, the efficient use of natural gas in cogeneration mode, delivers additional emissions reductions by reducing further reduction of fossil fuel use. Thirdly, the switch to renewable and decarbonised gases along with renewables-ready gas technologies will ensure that a lock into fossil fuels is avoided.

(299) In its assessment, the Commission will take account of the following elements to be provided by the Member State: (a) an assessment of the impact of variable generation, including that originating from neighbouring systems; **(new a) an assessment of the impact of end use electrification on seasonal, weekly and daily peak demand** (b) an assessment of the impact of demand-side participation **and distributed high efficiency cogeneration** including a description of measures to encourage demand side management; (c) an assessment of the actual or potential existence of interconnectors and major transmission grid infrastructure, including a description of projects under construction and planned; an assessment of any other element which might cause or exacerbate the security of electricity supply problem, such as caps on wholesale prices or other regulatory or market failures. Where required under Regulation (EU) 2019/943, the implementation plan referred to in Article 20 (3) of that Regulation must be subject to a Commission opinion before aid can be granted. The implementation plan and opinion will be taken into account in the necessity assessment.	Electricity system adequacy will not only depend on the uptake and operation of intermittent renewable electricity, but also on the increasing demand for electricity determined by electrification. The impact of electrification of transport will likely be more evenly distributed, creating daily and weekly peaks. Meanwhile, the electrification of heat will lead to significant seasonal peaks, given that heat demand is several times higher in winter than current electricity demand. The mismatch between renewable power generation and increasing peak demand will need to be more thoroughly assessed to ensure feasible solutions are deployed to address the challenge. In terms of solutions, cogeneration can play an important role in generating high efficiency electricity at times of insufficient intermittent renewables. While main producer cogeneration plants connected to district heating are well recognised in this respect, on-site cogeneration installed in industry (which generated behind the meter) are often ignored in such assessments. They do provide firm capacity and can operate more flexibly, participating in demand response schemes. Alternatively, their decommissioning will mean a significant additional burden on the electricity grid, which will be required to compensate for the loss of firm capacity.
(301) Member States should primarily consider alternative ways of achieving security of electricity supply, in particular more efficient electricity market design that can alleviate the market failures that undermine security of electricity supply. For instance, improving the functioning of electricity imbalance settlement, better integrating variable generation, incentivising **high efficient cogeneration** and integrating demand response and storage, enabling	CHP can provide security of supply, while maintaining high efficiency, lowering emissions and reliably covering the heat demand of industry, buildings and districts.

efficient price signals, removing barriers to cross-border trade, and improving infrastructure including interconnection. Aid may be found appropriate for security of supply measures where, despite appropriate improvements to market design and investments in network assets, whether already implemented or planned, a security of supply concern remains	
(304) Member States ~~are encouraged to~~ **can** introduce additional criteria or features in their security of supply measures to promote the participation of greener technologies, **such as high efficiency cogeneration** ~~(or reduce the participation of polluting technologies)~~ necessary to support the delivery of the Union's environmental protection objectives. Such additional criteria or features must be objective, transparent and non-discriminatory in relation to clearly identified environmental protection objectives, and must not result in the overcompensation of beneficiaries.	CHP can provide security of supply, while maintaining high efficiency, lowering emissions and reliably covering the heat demand of industry, buildings and districts.
(318) Incentives must not be provided for generation of energy that would displace less polluting forms of energy**, taking into account the local electricity mix and the marginal displaced or consumed electricity.**	In order to properly implement such a measure, the local marginal energy mix should be taken into account. Only by taking a « displacement mix » approach the emissions intensity of the The FFE study below outlines the key principles to assess the emissions intensity of CHP produced electricity : https://www.ffe.de/attachments/article/797/EU%20Displacement%20Mix.pdf
(320) Security of supply measures must meet any relevant design conditions in Article 22 of Regulation (EU) 2019/943. **For cogeneration, the "high efficiency cogeneration" methodology in Directive 2012/27/EU and subsequent revisions must be appplied to assess and allocate emissions to both heat and electricity**	The 550 g EPS outlined in Article 22 of the Electricity Regulation, aims to exclude coal based generation. For high efficiency cogeneration, the EPS in Article 22 of Regulation 2019/943 artificially allocates all emissions (including heat emissions) to the electricity output, rather than allocating emissions evenly between heat and electricity. Meanwhile, CHP projects are increasingly being designed to provide security of supply, along generating heat for multiple applications.

	To fix this inconsistency in the methodology, the standard applicable to CHP should follow the dedicated EED methodology and thresholds, taking into account that EC's proposal for the 2021 revision of the EED features a specific EPS for CHP, amounting to 270 g of CO2/kWh of total energy output.
(324) To avoid undermining incentives for demand response**, including via self-production and self-consumption,** and exacerbating the market failures that lead to the need for security of supply measures, and to ensure the security of supply intervention is as limited in size as possible, the costs of a security of supply measure should be borne by the market participants who contribute to the need for the measure. For example, this may be achieved by allocating the costs of a security of supply measure to electricity consumers in periods of peak electricity demand.	Self-consumption of electricity produced on site should be reconised as relevant form of demand response.
(325) The Commission considers that certain aid measures have negative effects on competition and trade that are unlikely to be offset. In particular, certain aid measures may aggravate market failures, creating inefficiencies to the detriment of consumer and social welfare. For instance, measures – including network reserves and interruptibility schemes – that do not respect the emissions threshold applicable to capacity mechanisms set out in Article 22 of Regulation (EU) 2019/943 **or the high efficiency cogeneration standard in Directive 2012/27/EU** and that may incentivise new investments in energy based on the most polluting fossil fuels, such as coal, diesel, lignite, oil, peat and oil shale increase the negative environmental externalities in the market.	The 550 g EPS outlined in Article 22 of the Electricity Regulation, aims to exclude coal based generation. Applied to natural gas power-only plants, it excludes very inefficient gas plants (ie with efficiencies below 38%). For high efficiency cogeneration, the EPS in Article 22 of Regulation 2019/943 artificially allocates all emissions (including heat emissions) to the electricity output, rather than allocating emissions evenly between heat and electricity. Meanwhile, CHP projects are increasingly being designed to provide security of supply, along generating heat for multiple applications. To fix this methodology inconsistency, the standard applicable to CHP should follow the dedicated EED methodology and thresholds, taking into account that EC's proposal for the 2021 revision of the EED features a specific EPS for CHP, amounting to 270 g of CO2/kWh of total energy output.

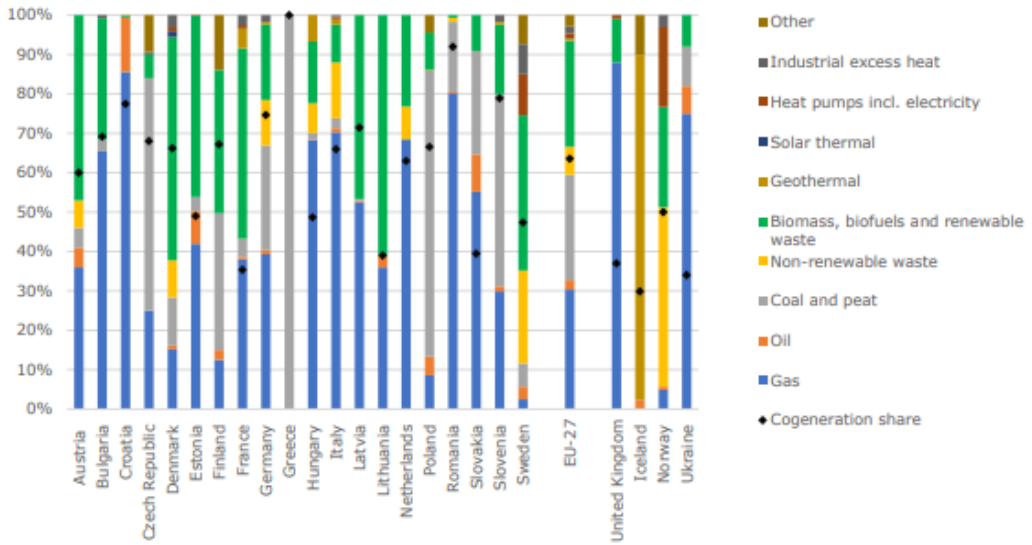
(326) Measures that incentivise new investments in energy generation based on natural gas may support security of electricity supply but aggravate negative environmental externalities in the longer term, compared to alternative investments in non-emitting technologies. To enable the Commission to verify that the negative effects of such measures can be offset by positive effects in the balancing test, Member States should explain how they will ensure that such investment contributes to achieving the Union's 2030 climate target and 2050 climate neutrality target. In particular, the Member States should explain how **all gaseous fuels, and natural gas in particular, is utilised efficiently with priority in high efficiency cogeneration, as well as how** a lock-in of this gas-fired energy generation **into natural gas** will be avoided. For example, this may include binding commitments **to install technology ready for the use with renewable and climate-neutral gases (for example, "hydrogen-ready" technology) and ensure the substitution of natural gas by renewable or low carbon gas, to use high efficiency cogeneration and/or** ~~**by the beneficiary**~~ to implement decarbonisation technologies such as CCS/CCU**,** ~~**and/or substitute natural gas by renewable or low carbon gas**~~ or to close the plant on a timeline consistent with the Union's climate targets.	Gas grids are critical for the security of electricity supply, given the flexibility that gas generation can provide at lowest cost and lowest emissions. To avoid lock in to natural gas, investments in gas based generation should be both renewables ready and as efficient as possible. High efficiency cogeneration has the advantage that in most cases it can do the job of a power-only plant in terms of security of supply, while delivering higher efficiency, lower emissions and lower use of resources. CHP systems can flexibly meet power grid needs (either by ramping up and down to meet residual demand or by providing firm capacity), while also generating heat for immediate or later use. Moreover, new CHP technologies can avoid fossil fuel lock in by being renewables-ready. Therefore, support for security of supply should comply both with ambitious energy efficiency and renewable-readiness criteria.
(342) Such aid measures typically cover the construction or upgrade of the generation unit to use renewable energy, waste heat, **and/**or highly efficient cogeneration **or** ~~**including**~~ thermal storage solutions, **power-to-heat solutions** or the upgrade **and extension** of the distribution network to reduce losses and increase efficiency, including through smart and digital solutions. **Heating and cooling equipment within customer premises referred to under point 117 can also be covered.**	
(343) Where a Member State ~~**invests**~~ **grants** aid for ~~**in**~~ the upgrade of a district heating and cooling system **which does not fulfill the definition of Efficient DHS, as defined in article 2 point (41) of Directive 2012/27 on energy efficiency** ~~**without meeting the standard of energy efficiency**~~, it needs **to require the** commit**ment of the operator** to start the works to	

reach that **status** ~~standard~~ within three years following the upgrade works, **where appropriate**.	
(344) Sections 3.2.1.1. and 3.2.1.2. do not apply to aid to district heating or cooling. The Commission considers that State aid can contribute to addressing market failures by triggering the investment needed for the creation, **expansion and upgrade** of ~~energy~~ efficient district heating and cooling systems. In addition, State aid for ~~energy~~ efficient district heating and cooling systems using waste~~, including waste heat,~~ as input fuel can make a positive contribution to environmental protection, provided that they do not circumvent the waste hierarchy principle1	
(348) As regards the construction or upgrade of district heating generation installations, measures that incentivise new investments in energy based on natural gas may reduce greenhouse gas emissions in the short run but aggravate negative environmental externalities in the longer run, compared to alternative investments. For those investments in natural gas to be seen as having positive environmental effects, Member States must explain how they will ensure that the investment contributes to achieving the Union's 2030 climate target and 2050 climate neutrality target and, in particular, how a lock-in of **unabated natural gas**-fired energy generation or **unabated natural-gas**-fired production equipment will be avoided, **as well as how energy efficient cogeneration is prioritised to reduce the consumption of natural gas**. For example, this may include binding commitments by/from the beneficiary to implement CCS/CCU or substitute natural gas (**provided a suitable framework for the deployment of renewable low carbon fuels in being set up at both EU and national levels), implementing flexibility enablers like heat storage and by investing in facilities ready to use climate-neutral fuels when they are available,** or to close the plant on a timeline consistent with the Union's climate targets.	More than 30% of district heating relies today on gas networks for heat and power supply, via cogeneration. An increase in gas based CHP that is connected to DHC can be expected as part of many countries coal exit strategies. To avoid natural gas lock in, state aid should encourage the uptake of renewable and decarbonised gases fro district heating, as the efficient use of all gaseous fuels via cogeneration. High efficiency CHP is a key solution for DHC, as it fulfills multiple functions in the energy transition: 1) supplies efficient heat; 2) can meet residual power demand flexibly, when coupled with heat srotage (instead of installing a separate gas power plant for this purpose); 3) offers seasonal storage and security of supply for intermittent renewables, by efficiently utilising renewable hydrogen when available. Future proof CHP +DHC projects are already being developed : Hassfurt City : H2-ready CHP Kiel's Intelligent Energy Solution Szlachęcin (Poland) : Waste heat, heat pumps and CHP working together

(349) In analysing the impact of State aid for district heating and cooling systems on competition and in balancing it against the supported economic activity, the Commission will carry out a case-by-case 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, **taking into account regional/national strategies for the decarbonization of heating and cooling (including comprehensive assessments under Directive on energy efficiency 2012/27),** ~~security of supply issues and other relevant aspects.~~ **Where the district heating system fulfils the definition of Efficient DHC according to Directive 2012/27 the Commission will typically assume that negative effects on competition are outweighed by positive environmental effects.**	The comprehensive assessments for efficient and renewable heating and cooling can provide a solid basis in terms of the potential of DHC and its positive enironemntal impact given the specific national circumstances.

Annex I : CHP role in DHC

Figure 14 - District heating fuel mix and cogeneration share in 2018 (Source: Study by Tilia under ENER/C1/2018-496)



Source: [Fit for 55/Renewable Energy Directive Recast Impact Assessment, 2021]

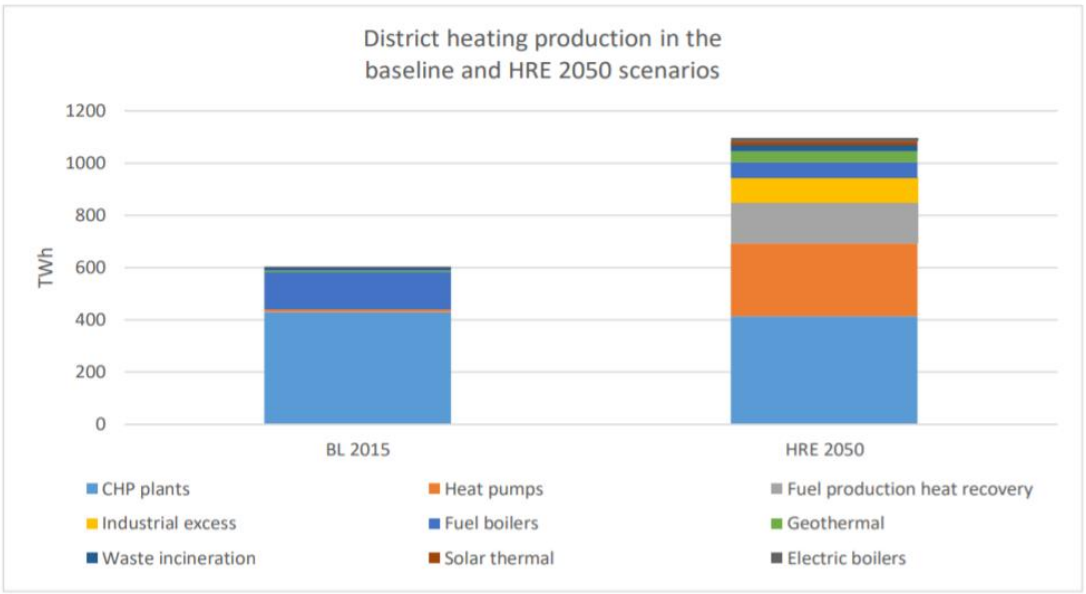


Figure 3-2 Annual district heating production in the baseline and HRE 2050 scenarios

Source: [Heat Roadmap Europe, 2019]