EUROPEAN
COMMISSION

Brussels, XXX
[…](2022) XXX draft

ANNEX

ANNEX

to the

amending Commission Delegated Regulation (EU) 2015/2402 as regards the review of harmonised efficiency reference values for separate production of electricity and heat in application of Directive (EU) 2012/27/EU of the European Parliament and of the Council, as amended by Directive (EU) 2018/2002 and repealing Commission Implementing Decision 2011/877/EU

[mandatory element]

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ANNEX I

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Harmonised efficiency reference values for separate production of electricity (referred to in Article 1)

In the following table, the harmonised efficiency (%) reference values for separate production of electricity are based on net calorific value and standard ISO conditions (15 °C ambient temperature, 1,013 bar, 60% relative humidity):

	Category	Energy source	Year of construction		
			Before 2016	2016-2023	From 2024
Solids	S1	Hard coal including anthracite, bituminous coal, sub-bituminous coal, coke, semi-coke, pet coke	44,2	44,2	53,0
	S2	Lignite, lignite briquettes, oil shale	41,8	41,8	53,0
	S3	Peat, peat briquettes	39,0	39,0	53,0
	S4	Dry biomass including wood and other solid biomass including wood pellets and briquettes, dried woodchips, clean and dry waste wood, nut shells and olive and other stones	33,0	37,0	37,0
	S5	Other solid biomass including all wood not included under S4 and black and brown liquor.	25,0	30,0	30,0
	S6	Municipal and industrial waste (non-renewable, of non-biological origin such as plastics, rubber and other synthetic materials) and renewable/bio-degradable waste	25,0	25,0	25,0
Liquids	L7	Heavy fuel oil, gas/diesel oil, other oil products	44,2	44,2	53,0
	L8	Bio-liquids including bio-methanol, bioethanol, bio-butanol, biodiesel, other biofuels, bioliquids and all e-liquids	44,2	44,2	44,2
	L9	Waste liquids including biodegradable and non-renewable waste (including tallow, fat and spent grain).	25,0	29,0	29,0
Gaseous	G10	Natural gas, LPG, LNG and biomethane	52,5	53,0	53,0
	G11A	Traded hydrogen [1]	44,2	44,2	53,0
	G11B	Refinery gases, synthesis gas, hydrogen (by-product), e-gases[2]	44,2	44,2	44,2
	G12	Biogas produced from anaerobic digestion, landfill, and sewage treatment	42,0	42,0	42,0
	G13	Coke oven gas, blast furnace gas, mining gas, and other recovered gases (excluding refinery gas)	35,0	35,0	35,0
Other	O14A	Waste heat, including process exhaust gases, product from exothermic chemical reactions (input temperature > 200°C)		30,0	30,0
	O14B	Waste heat, including process exhaust gases, product from exothermic chemical reactions (input temperature < 200°C)		30,0	20,0
	O15	Nuclear		33,0	33,0

	O16	Solar thermal		30,0	30,0
	O17	Geothermal		19,5	19,5
	O18	Other fuels not mentioned above		30,0	30,0

[1] Hydrogen sold from its supplier to a cogeneration unit operator.

[2] E-gases are understood as gaseous synthetic fuel originating from renewable hydrogen and carbon dioxide captured either from a concentrated source, such as flue gases from an industrial site, or from the air.

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ANNEX II

Harmonised efficiency reference values for separate production of heat
(referred to in Article 1)

In the following table the harmonised efficiency (%) reference values for separate production of heat are based on net calorific value and standard ISO conditions (15 °C ambient temperature, 1,013 bar, 60% relative humidity):

| Category | Energy source | Year of construction | | | | | | | | |
| | | Before 2016 | | | 2016-2023 | | | From 2024 | | |
		Hot water	Steam ([1])	Direct use of exhaust gases ([2])	Hot water	Steam ([1])	Direct use of exhaust gases ([2])	Hot water	Steam ([1])	Direct use of exhaust gases ([2])
Solids S1	Hard coal including anthracite, bituminous coal, sub-bituminous coal, coke, semi-coke, pet coke	88	83	80	88	83	80	92	87	84
S2	Lignite, lignite briquettes, oil shale	86	81	78	86	81	78	92	87	84
S3	Peat, peat briquettes	86	81	78	86	81	78	92	87	84
S4	Dry biomass including wood and other solid biomass including wood pellets and briquettes, dried woodchips, clean and dry waste wood, nut shells and olive and other stones	86	81	78	86	81	78	86	81	78
S5	Other solid biomass including all wood not included under S4 and black and brown liquor.	80	75	72	80	75	72	80	75	72
S6	Municipal and industrial waste (non-renewable,	80	75	72	80	75	72	80	75	72

		of non-biological origin such as plastics, rubber and other synthetic materials) and renewable/bio-degradable waste									
Liquids	L7	Heavy fuel oil, gas/diesel oil, other oil products	89	84	81	85	80	77	92	87	84
	L8	Bio-liquids including bio-methanol, bioethanol, bio-butanol, biodiesel, other biofuels, bioliquids and all e-liquids	89	84	81	85	80	77	85	80	77
	L9	Waste liquids including biodegradable and non-renewable waste (including tallow, fat and spent grain).	80	75	72	75	70	67	75	70	67
Gaseous	G10	Natural gas, LPG, LNG and biomethane	90	85	82	92	87	84	92	87	84
	G11A	Traded hydrogen	89	84	81	90	85	82	92	87	84
	G11B	Refinery gases, synthesis gas, hydrogen (by-product), e-gases	89	84	81	90	85	82	90	85	82
	G12	Biogas produced from anaerobic digestion, landfill, and sewage treatment	70	65	62	80	75	72	80	75	72
	G13	Coke oven gas, blast furnace gas, mining gas, and other recovered gases	80	75	72	80	75	72	80	75	72

		(excluding refinery gas)									
Other	O14A	Waste heat, including process exhaust gases, product from exothermic chemical reactions (input temperature > 200°C)	—	—	—	92	87	—	92	87	—
	O14B	Waste heat, including process exhaust gases, product from exothermic chemical reactions (input temperature < 200°C)	—	—	—	92	87	—	92	87	—
	O15	Nuclear	—	—	—	92	87	—	92	87	—
	O16	Solar thermal	—	—	—	92	87	—	92	87	—
	O17	Geothermal	—	—	—	92	87	—	92	87	—
	O18	Other fuels not mentioned above	—	—	—	92	87	—	92	87	—

(^{1}) Where steam plants do not account for the condensate return in their calculation of CHP heat efficiencies, the steam efficiencies set out in the table should be increased by 5 percentage points.

(^{2}) Values for direct heat should be used where the temperature reaches 250 °C or higher.';

ANNEX II

Correction factors for avoided grid losses for the application of the harmonised efficiency reference values for separate production of electricity

(referred to in Article 2(2))

Connection voltage level	Correction factor (Off-site)	Correction factor (On-site)
≥ 345 kV	1	0,976
≥ 200 - < 345 kV	0,972	0,963
≥ 100 - < 200 kV	0,963	0,951
≥ 50 - < 100 kV	0,952	0,936
≥ 12 - < 50 kV	0,935	0,914
≥ 0,45 - < 12kV	0,918	0,891
< 0,45 kV	0,888	0,851

Example:

A 100 kWel cogeneration unit with a reciprocating engine driven with natural gas generates electricity at 380 V. Of this, 85 % is used for own consumption and 15 % is fed into the grid. The plant was constructed in 2020. The annual ambient temperature is 15 °C (so no climatic correction is necessary).

After the grid loss correction the resulting efficiency reference value for the separate production of electricity in this cogeneration unit would be, on the basis of the weighted mean of the factors in this Annex:

Ref Eη = 53 % × (0,851 × 85 % + 0,888 × 15 %) = 45,4 %'.'.