

Draft

National emission reduction plan of major pollutants from the large combustion plants

Kyiv, ~~27-30 June~~ October 2014

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1. The purpose of the document

This paper outlines the National emission reduction plan of major pollutants from the large combustion plants (hereinafter - NERP) to reduce emissions from large combustion plants with a rated thermal input of 50 MW or more, which were granted permission for emissions prior to 31/12/2015. For each combustion plant included in the NERP, this document specifies the timing to achieve requirements of Directive 2010/75/EU¹ for the following pollutants: nitrogen oxides (NOx), sulfur dioxide (SO₂) and dust (substances in the form of suspended solids, undifferentiated by their composition). For operators that operate combustion plant and their groups, the NERP includes limits of the overall annual emissions of at least one of the following pollutants: nitrogen oxides (NOx), sulfur dioxide (SO₂) and dust.

The current state of existing combustion plants equipment and limited financial resources of the Ukrainian power sector will not allow Ukraine to meet the requirements of Directive 2001/80/EC before the deadline. In accordance with Item 11 of the Conclusions of the Ministerial Council of the Energy Community of 24.10.2013,² – “at the request of Ukraine, the Council of Ministers will seek to review a decision based on Article 24 of the Energy Community Treaty and take into account the specific situation of the Contracting Party concerning the implementation of the *acquis communautaire* to reduce emissions from existing large combustion plants.” This document should present the intentions of Ukraine to reduce emissions of large combustion plants to justify its request to expand the flexibility within the Energy Community.

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions³ (Directive 2010/75/EU) introduces a number of very significant changes to the current EU legislation on integrated environmental protection and reduction of pollution. One of the most significant changes include *substantial stricter limit values enhancement of the requirements regarding emission limit values* of sulfur dioxide, nitrogen oxides and dust generated by the combustion plants⁴.

According to Directive 2010/75/EU, starting from 1 January 2016 *in the EU*, demands *a especially stringent* were increased on emission limit values that should be followed, both for

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¹ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17).

² Decision of the Ministerial Council of the Energy Community of 24 October 2013 D/2013/05/MG-EnC

³ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17).

⁴ “Combustion plant” means any technical apparatus in which fuels are oxidised in order to use the heat thus generated (Article 3(25) of Directive 2010/75/EU).

~~existing new combustion plants⁵ and new combustion plants~~, with requirements for new combustion plants those requirements being particularly stringent.

~~A large proportion of existing combustion plants can not meet the limit emission values specified in Directive 2001/80/EC and Directive 2010/75/EU. Such plants (without development and implementation of the NERP with the appropriate derogation mechanism) should be closed because of their failure to comply with environmental law. This, in turn, would mean reducing the current power output and reduction of energy and heat production. Therefore, the time limit of their operation is set in the period of the derogation mechanism action. The possibility to broadly use the mechanism of derogation from the requirements of Directive 2010/75/EU is extremely important for Ukraine in terms of security of supply.~~

~~Participation in NERP is voluntary. The NERP includes combustion plant operators which have decided to participate in this derogation mechanism from the immediate fulfillment of the requirements on limit emission values as specified in Directive 2010/75/EU.~~

On the other hand, Directive 2010/75/EU adopted the mechanism, by which the possibility is provided to combustion plants to use derogation that allows their deferring from the obligation to implement new requirements on emissions of sulfur dioxide, nitrogen oxides and dust emissions. According to these principles, the existing combustion plants are provided with opportunity, in course of the definite period of time, to raise investments, directed on adaptation to the technical requirements, which increased so significantly (e.g., the time required for the construction of DeSOx and DeNOx equipment). Another rationale for the mechanism of derogation is to enjoy by existing installation a temporary exemption from having obligation to comply with new emission requirements, in cases where additional upgrade of installation is not feasible (e.g., having in view the plants' decommissioning).

Ukraine became the member of the Energy Community Treaty as of 01/02/2011, which encourages the country to fulfill the requirements for combustion plants regulated by statements of Directive 2001/80/EC, starting from 31/12/2017. However, the current state of existing combustion plants equipment and limited financial resources of the Ukrainian power sector will not allow Ukraine to meet the requirements of Directive 2001/80/EC before the deadline, not even talking about the implementation of Directive 2010/75 before 31/12/2015. Therefore, following the principles of Directive 2010/75/EU, in accordance with the terms of

⁵ ~~Directive 2010/75 / EU does not define the terms "new plant" or "existing plant", however, it makes a clear distinction between the two categories of plants in accordance with the date on which the permit was issued to them in Article 30. The first category of plants is subject to implementation of limit emission values in Part 1 of Annex V to Directive 2010/75 / EU and the second one is the subject of more stringent Part 2 of that Annex. The date of distinction between the plants, subject to Part 2 (to which more stringent emission limit values are applied) and the plants, subject to Part 1 (which enables to implement less stringent emission limit values) is thus the 7 January 2013, when they become new plants. The concepts of an existing and a new combustion plant are not legal concepts in the light of Directive 2010/75/EU. The existing combustion plants may be considered those combustion plants for which an emission permit was granted before 31 December 2013. The plants for which an emission permit was granted or which were put into operation after those dates, shall be the new plants.~~

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Article 32 of the Directive it will be allowed for existing combustion plants in Ukraine to work with a derogation from the emission requirements set out in Part 1 of Annex V to Directive 2010/75/EU, between January 1, 2020, to comply with the time specified by this Directive no later than 31 December 2033.

~~A large proportion of existing combustion plants can not meet the value of emission standards specified in Directive 2010/75/EU. Such plants (without implementation of the derogation mechanism) should be closed because of their failure to comply with emission standards. This, in turn, would mean reducing the current (electric and thermal) power output and reduction of energy production. Therefore, the time limit of their operation is set in the period of the derogation mechanism action. Possibility to use mechanism of derogation from the requirements of Directive 2010/75/EU is extremely important not only in terms of taking into account the interests of operators of equipment, but also in terms of security of supply.~~

~~The NERP for Ukraine shall take effect on January 1, 2018 and is valid until December 31, 2033. Plants included in the NERP shall provide linear decrease in gross pollutant emissions from all combustion plants Ukraine each year, beginning on January 1, 2018 until December 31, 2033 during the term of the NERP and fulfill obligations to comply with the limit emission values under Directive 2010/75 / EU after the timing defined in the plan. The combustion plant must be able to operate during the NERP term until the specified period, complying with the limit emission values under Directive 2010/75 / EU under the permit, valid for December 31, 2015. Upon termination of the NERP period, the combustion plants that used the effect of this mechanism must comply with the emission limit values set out in Directive 2010/75 / EU. This document is a national plan to reduce emissions of major pollutants from large combustion plants (hereinafter – NERP), and concerns emission reduction targets for existing combustion plants with a rated thermal input of 50 MW or more, which were granted permission for emissions before 31/12/2015. For each combustion plant included in NERP, this document specifies the timing to achieve requirements of Directive 2010/75/EU for the following pollutants: nitrogen oxides (NO_x), sulfur dioxide (SO₂) and dust. For operators that operate combustion plant and their groups, NERP includes limits of the overall annual emissions of at least one of the following pollutants: nitrogen oxides (NO_x), sulfur dioxide (SO₂) and dust.~~

~~National emissions reduction plan (or Transitional national plan) is a flexible mechanism that makes it possible to delay the need to enforce existing combustion plants to fulfill the emission limit values of SO₂, NO_x and dust under Directive 2010/75/EU specified in Part 1 of Annex V thereto.~~

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~~Participation in NERP is voluntary and is a subject to the conditions as specified in Directive 2010/75/EU and in Commission's Decision 2012/115/EU of 10 February 2012 concerning NERP⁶ (Decision).~~

~~NERP includes combustion plant operators which have decided to participate in this derogation mechanism from the immediate fulfillment of the requirements on emissions limit values. Rules of participation in NERP further described herein.~~

~~National emissions reduction plan shall enter into force on 1 January 2016 and is valid until December 31, 2033. Units included in NERP should provide in aggregate a linear decrease in gross emissions of pollutant(s) from all combustion plants in Ukraine every year starting from 01/01/2020 until 31/12/2033, during the term of the plan, and to fulfill obligations to comply with the emission limit values as stated in Directive 2010/75/EU in terms defined by the Plan. Combustion plant must have a possibility to work during the term of NERP to a certain time in compliance with the emission limit values stated in a permit issued on 31 December 2015.~~

~~Upon termination of NERP, combustion plants, which used the application of this derogation mechanism, have to comply with the emission standards on general principles referred to in Directive 2010/75/EU.~~

2. The scope of ~~application of the NERP~~ application

The basis for the development of NERP principles is governed by Article 32 of Directive 2010/75/EU and Decision 2012/115/EU⁷.

2.1 Plants that can participate in NERP

Below the basic rules on the conditions for participation in the 2020-2033 NERP are presented.

In NERP, the following combustion plants ~~can~~ould participate: existing plants with the installed thermal capacity of at least 50 MW which were granted ~~with the~~ permit on emissions before 31 December 2015.

~~In addition, in accordance with Article 29 of Directive 2010/75/EU, in NERP may participate only combustion plants in general, whose boilers are connected to common stack, or all boilers in accordance with Article 29 (2) of the Directive.~~

⁶ ~~Commission Implementing Decision (2012/115/EU) of 10 February 2012 laying down rules concerning the transitional national plans referred to in Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (OJ L 52, 24.2.2012, p. 12).~~

⁷ COMMISSION IMPLEMENTING DECISION of 10 February 2012 laying down rules concerning the transitional national plans referred to in Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions – Decision 2012/115/EU (OJ L 52/12, 24.2.2012).

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~~When preparing this document, a common stack approach as used in accordance with the provisions of Directive 2001/80/EC and Directive 2010/75/EU Combustion plants can apply to participate in NERP according to the interpretation of Article 3 (25) and Article 29 of Directive 2010/75/EU. For example, when a group of boilers that forms a combustion plant, in accordance with the provisions of Directive 2010/75/EU, discharge flue gas into the atmosphere through a common stack, the submittal application for participation may cover the whole combustion plant (the whole group of boilers).~~

2.2 Plants that can-not apply for participation in NERP

~~Plants that use the derogation from the requirements due to the limitation of the term of service (Article 33 of Directive 2010/75 / EU), i.e. those plants for which the operator agrees, in a written declaration submitted to the competent authority no later than the 31 December 2015, not to operate the plant over 40,000 operating hours, starting from the 1 January 2018 but not later than the 31 December 2033. Combustion plants belonging to one of five groups of plants referred to in 2nd paragraph of Article 32 (1) of Directive 2010/75/EU and Decision 2012/115/EU, namely:~~

~~1. Plants that use the derogation from the requirements due to the limitation of the term of service (Article 33 of Directive 2010/75/EU), i.e. those plants for which:~~

~~a) combustion plant whose operator in a written declaration submitted at the latest by 1 January 2016 to the competent authority notifies the termination of operation of the plant after maximum 40,000 hours, starting from 1 January 2020 and ending no later than December 31, 2033,~~

~~b) combustion plant operator will present each year to the competent authority records on working hours from 1 January 2020 to 31 December 2033,~~

2.3. Combustion plants not covered in 2.1 and 2.2

~~Combustion plants not covered in 2.1 and 2.2, must comply with the emission limit values in accordance with Directive 2010/75 / EU, starting on January 1, 2018. The new plants must comply with the requirements of Chapter III and Annex V of Directive 2010/75 / EU, starting on January 1, 2018~~

~~c) emission limit values of sulfur dioxide, nitrogen oxides and dust, as set out in the resolution on the combustion plant applicable on 31 December 2015, respectively, are observed at least for the lifetime remaining for combustion plants.~~

~~2. Combustion plants operating within refineries firing low calorific gases from the gasification of refinery residues or the distillation and conversion residues from the refining of crude oil for own consumption, alone or with other fuels;~~

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~~3. Also, plants which are not operated by a refinery operator, but are located within the refinery and use the above-mentioned fuels.~~

~~4. Combustion plants for which Article 35 applies of Directive 2010/75/EU, which simultaneously fulfill the following conditions:~~

~~a) total nominal heat output is not exceeding 200 MW;~~

~~b) permit on emissions is issued before 31 December 2015;~~

~~c) at least 50% of the plants useful heat, as a moving average over a period of 5 years, comes in the form of steam or hot water to the public network for district heating; and~~

~~d) the emission limit values of sulfur dioxide, nitrogen oxides and dust laid down in the permit applicable at 31 December 2015 are kept up to a certain time, when the combustion plant reaches requirements of Directive 2010/75/EU, but not later than 31 December 2033.~~

~~5. Combustion plants which were granted an exemption from fulfilling the requirements referred to in Article 32 of Directive 2010/75/EU, for a period of 40 000 hours, starting from 01/01/2020 and ending at 12/31/2033. This applies to plants that were commissioned before 31 December 2012. They are not required to meet the requirements of Directive 2001/80/EC for a period of 40,000 hours. At the end of this period, these combustion plants should be decommissioned.~~

2.3. Combustion plants not covered in 2.1 and 2.2

~~Combustion plants not covered in 2.1 and 2.2, including new plants, shall comply with the requirements of Directive 2010/75 on 31/12/2017.~~

3. Rules limiting the total emissions values

~~Total emissions limit values are set out in accordance with the principles and provisions of Directive 2010/75/EU determined based on the average number of flue gas emissions during years 2011-2012, multiplied by the appropriate emission limit values. For 2020 emission standard limit is calculated in accordance with Annex C, which is included in the Annex to Decision 2012/115/EU. For 2033 emission standard limit is calculated in accordance with Appendix D, which is included in the Annex to Decision 2012/115/EU. Limit values for 2023, 2026, 2029 and 2032 should be set out so as to provide a linear reduction of total emissions between 2020 and 2033 for operators and their groups.~~

~~Emission limit values for each operator or their groups are given in Appendix 2. Limit value for each operator contributes to the overall emissions limit for all group NERP members (Table 1).~~

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~~Combustion plant may participate in NERP for the following pollutants: sulfur dioxide, nitrogen oxides and dust.~~

~~For the purpose of calculating the limit values of total emissions for the period 2020-2033, for energy companies limit the amount of emissions from combustion plant was laid out according to the type of fuel and thermal input rate of combustion plants as of 31 December 2012, the combined aggregate per one stack through to which these boilers discharge the flue gases:~~

~~Limit load reductions for individual combustion plants should be set based on multiplying the average number of flue gases and the accepted norms of emission limits. In addition, the following assumptions are made:~~

~~▲ Average number of flue gas from a source refers to the work during the period 2008-2012; for the period from 1 January 2020 to 31 December 2033 an average flow of flue gases should be taken into consideration.~~

~~▲ Emission limit value for the purposes of calculating the ceiling in 2020 must be introduced in accordance with Annex C, which is included in the Annex to Decision 2012/115/EU.~~

~~▲ Emission limit values for the purpose of calculating the limits in the year 2033 must be introduced in accordance with Appendix D, which is included in the Annex to Decision 2012/115/EU.~~

~~▲ Emission limit values for 2021-2033 should be set so as to provide a linear reduction between 01.01.2020 and 31.12.2033.~~

~~▲ Emission levels for 2020 and 2033 is calculated as follows:~~

~~**Emissions ceiling limit (Mg/year) = the average generation of flue gas (nm³/year) x emission limit values (mg/nm³)/10⁹**~~

~~▲ At the stage of calculating ceilings of emissions for the NERP purposes, total thermal input rate of the combustion plant should be taken into account.~~

~~▲ For plants that burn several types of fuel, emission rates are calculated by summing the standards (norms) for these fuels, multiplied by a weighting factor based on the maximum contribution of thermal power for the fuel to the total thermal input rate of combustion plant. For each type of fuel, the rate is calculated by setting the total thermal capacity of the entire combustion plant.~~

~~▲ For the purpose of calculation, into account should be taken the average (mean) amount of fuel in 2011-2012 for a given plant.~~

~~▲ For the purpose of calculations, light-up fuel should not be taken into account.~~

Consumption of the flue gas is calculated using the method based on data on the weight of the fuel burned and its calorific value. After the calculation of flue gas generated per unit of the chemical energy, contained in fuel, for each source the specified volume of flue gas emitted should be indicated.

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Average generation of flue gas (nm³/year) = M_{fuel} (Mg/year) x W_{ef} (GJ/Mg) x V_{ig} (nm³/GJ)

where:

M_{fuel} (Mg/year) is the average (mean) amount of fuel burned during 2008-2012;

W_{ef} (GJ/Mg) is the average heating value during 2008-2012;

V_{ig} (nm³/GJ) – the values of specific volume of flue gas (nm³/GJ).

The average amount of fuel used is calculated as the sum of the annual amounts of this type of fuel used, divided by the number of years considered.

Due to the similar chemical composition and heating value of fuel combusted in the following sources were standardized indicators rated to the values for the volume of flue gas (V_{ig}), which were taken to be as follows:

– 360 nm³/GJ for coal;

– 420 nm³/GJ for lignite, biomass, coal fines and other solid fuels with a calorific value less than 16,000 kJ/kg;

– 270 nm³/GJ for liquid and gaseous fuels

– 850 nm³/GJ for natural gas in gas turbines

– 443 nm³/GJ for gas after the steel furnaces and blast furnace gas.

For plants burning multiple fuels, flue gas volumes for individual fuels should be combined.

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3. Approach to determining emission volumes in 2033.

1. Possible specific fuel consumption (b) were determined for every 1 kWh of electricity released in 2033. It was assumed that for new coal-fired thermal power plants, it will be 330 g/kWh, and for the existing renovated ones : 370 g/kWh.

2. The heat of fuel combustion (LHV) is assumed to be 5500 kcal/kg (23.03 MJ/kg).

3. The specific volume of dry flue gas (FG) V_{fg} is 8,405 m³/kg coal. The specific volume of

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dry FG is calculated as

$$V_{fg} (m^3/kg) = LHV (MJ/kg) \times 0.365 \text{ (stat. coefficient)} (m^3/kg)$$

4. The emission limit values (ELV) for sulfur and nitrogen oxides in the year 2033 in coal-fired new combustion plants will be 150 mg/m³ and in the reconstructed ones: 200 mg / m³.

The dust emission limit values for new combustion plants will be 10 mg/m³, and for reconstructed ones ; 20 mg/m³.

5. The specific mass emissions of pollutant **b (pol)**

$$b(pol) (g/kg) = ELV (mg/m^3) \times V_{fg} (m^3/kg) / 1000$$

6. The specific fuel consumption for 1 kWh released **b(nat)** is determined as

$$b(nat) (kg/kWh) = b (kg/kWh) \times 29,31 (MJ/kg) / LHV (LJ/kg)$$

7. The specific pollutant emission for 1 kWh released **b(p)**:

$$b(p) (g/kWh) = b(pol) \text{ (item 5)} \times b(nat) \text{ (item 6)}.$$

The value of the specific emissions per 1 kWh of electricity released for the existing combustion plants under Directive 2010/75 / EU in the year 2033 is given in Table 1.

Table 1. Specific emissions of pollutants, g/kWh

Fuel	Heat capacity, MW	Pollutant	Emission limit value, mg/nm ³	Specific emission
Coal	50-100	SO _x	400	1.6
	100-300		300	1.2
	> 300		200	0.8
Coal	50-100	NO _x	300	1.2
	>100		200	0.8
Coal	50-100	Dust	30	0.06
	100-300		25	0.05
	> 300		20	0.04
Natural gas	> 50	NO _x	100	0.4
Liquid fuel	50-100	SO ₂	350	1.4
	100-300		250	1.0
	> 300		200	0.8
Liquid fuel	50-100	NO _x	450	1.8
	100-300		200	0.8
	> 300		150	0.6
Рідке паливо	50-100	Пил	30	0.06
	100-300		25	0.05
	> 300		20	0.04

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8. By multiplying the corresponding values of specific emissions (Table 1) by the volume of electricity supply given in Appendix 1, we obtain the value of gross emissions from thermal power plants, which are presented in the Table in Annex 3 to the draft NERP.

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For the CHP, which simultaneously release electrical and thermal energy, the value of specific pollutant emissions (g / kWh of electricity released) must be multiplied by 1.5.

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The combustion plants included in the NERP must ensure linear decrease in total gross pollutant emissions from large combustion plants Ukraine each year, starting on January 1, 2018 to December 31, 2033 during the NERP term and for compliance with the obligations of emission limit values as defined in Directive 2010/75 / EC within the terms stated in the Plan.

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4. Plants operation during action of NERP

Combustion plants covered by NERP should not follow obligation to observe the emission limit values during the period 2020-2033, laid down in ~~Directive 2001/80/EC and~~ Directive 2010/75/EU (Part I of ~~Schedule Annex~~ V). These plants must comply with the emission limit values of sulfur dioxide (SO₂), nitrogen oxides (NO_x) and dust laid down in the permit for emissions, which is valid until December 31, 2015. In addition, the plants have to ensure the compliance with the maximum annual gross emissions (SO₂, NO_x and dust) at the national level in accordance with the limits established in the NERP for at all combustion plants of Ukraine in aggregate, as discussed in NERP, by the implementation period (2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032 and 2033).

~~The rules that establish a basis for developing NERP and conditions for participation therein do not imply any restrictions on plants which were granted with permit on derogation from the requirements. Thus, the position was adopted, making the use of certain deviations arising from the Treaty of Accession⁸ which does not exclude the possibility of participating in NERP, even where deviations from the Contract shall apply to nitrogen oxides. In this case, to establish emission standards can be guided by the rule, according to which the use of derogation under this Agreement shall not deteriorate the legal status of a legal entity from the use of derogation from the Treaty concerning the possibility of using flexible instruments provided for by Directive 2010/75/EU.~~

⁸ ~~Treaty of Accession of 16 April 2003 (OJ L 236, 23.9.2003, p. 17).~~

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Participation in NERP does not require termination of the plant operation after the NERP implementation term if this plant is brought in 31 December 2033, or its re-registration and compliance with requirements of Directive 2010/75/EU regulations, such as those used for the new plants as specified in Part II of Annex V of Directive 2010/75/EU.

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5. Estimated emissions and reporting on NERP

5.1 Evaluation and monitoring of emissions limits

~~According to the principles of Article 41 of Directive 2010/75/EU relevant rules of implementation should be adopted, i.e. the principles of Decision 2012/115/EU concerning the transitional national plans, including rules of setting emission limits and appropriate monitoring and reporting.~~

~~Basing on the analysis of these policies and the requirements of Directive 2010/75/EU, estimation of the emissions should be acceptable for a wider group of entities involved in NERP. In absence of the detailed rules in Directive 2010/75/EU and Decision 2012/115/EU, assessment principles, rules and scope of evaluation shall be governed by the relevant rules of domestic national law. In light of these rules:~~

- Accounting of annual emissions of pollutants shall be performed in accordance with the calculation of the limit of total emissions. The volume of emissions is calculated based on the amount of burned fuel, quantity of flue gases emitted, calculated on the basis of the same factors as for the calculation of limiting emissions and establishing actual average concentrations of emissions. Moreover, the actual concentration are determined for:

- _____ • plants with continuous control of emissions based on monthly average concentrations, averaged for one year,

- _____ • plants without constant monitoring, from periodic measurements.

- _____ • for the metering of emissions, all primary fuels burned by the plant must be taken into account in a given year.

- The volume of burned fuel is determined on the basis of reports on fuel consumption, and its quality is determined on the basis of reports of CO₂ emissions in this financial year.

- ~~• scope of fuel burned is based on reports of CO₂ emissions in a given year.~~

- Accounting of the gross emissions of pollutants from the large combustion plants in the current year is performed according to the state accounting form 2ТП air.

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Additional (supporting) fuel is not taken into account for accounting scope of emissions.

Emissions ceiling and actual emissions are determined with an accuracy of 0.01 mg.

Verification of the amount of emissions is carried out each year during the term of NERP, by comparing reports of emissions from combustion plants of the operator or of a group of operators, based on the ceiling for emissions for the operator or the group of operators.

In order to fulfill its obligations under limitation of total emissions, operators, or their group, during the year may exchange the amount of emissions between each other, subject that the national gross emission level, as set out in NERP is not exceeded. It is not allowed to transfer part of the scope of emissions for the next reporting year, or earlier use in reporting years to further use in subsequent years.

Failure to comply with requirements for emissions ceiling in the base year should be penalized, or administrative sanctions should be provided in the case of such violation.

5.2 Changes to NERP

The suspension ~~or closing of the operation~~ of the plant, which is covered by NERP or exclusion of such a plant ~~by the requirements of the principles of Directive 2010/75/EU~~, does not provide for an increase in the total annual gross emissions. In this case, an updated list of the plants involved in NERP is necessary, as well as the updated data on limit values of all pollutants.

~~In the event of termination of operation of the combustion plant or boiler of the combustion plant, correction of emissions ceiling should be performed, registered for this combustion plant within the power company.~~

Application of the combustion plant operator for inclusion in the NERP shall not exclude the possibility of removing from the list after installation settings after submission of the basic conditions for the use of mechanisms of derogation of the requirements. Thus, combustion plants should be excluded from the NERP after the competent authority has been notified by the combustion plant operator about the decision. The decision to use alternative mechanisms regarding the NERP derogation can be taken during a period when NPSV is evaluated of the Energy Community Secretariat, ie until the end of 2015. derogation from the requirements under NERP should not preclude the possibility of extraction procedures for the plants, as set out in Article 33 or Article 35 of Directive 2010/75/EU, after the submittal of the general conditions for the use of these mechanisms on the derogation. Combustion plants in this case should be excluded from NERP, after the competent authority has been notified by the operator of the plant on its decision on derogation, as stated in Article 33 or Article 35 of Directive 2010/75/EU.

~~The decision to use by the operator of the combustion plant any alternative mechanism of derogation from NERP can be taken at a time when NERP is subjected for assessment of the Energy Community Secretariat.~~

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In the period of NERP action, combustion plant may be excluded from NERP by the decision of the operator. Readiness to refuse from participation in NERP should be reported to the Ministry of Environment before 01 June of the year preceding the year of ~~the~~ when the plant does not wish to participate in NERP. Exiting the NERP means that the operation of the plant will be in accordance with the principles of the Directive 2010/75/EU, ~~without any derogation~~. This plant shall be required to comply with the emission limit values in accordance with Part 1 of Annex V of Directive 2010/75/EU.

The plant, which was excluded from NERP ~~by decision of operator, or some other reason~~, may not re-join the NERP.

Data on emissions limit ~~values from the operators~~ values from the operators ~~ceilings by energy companies~~, lists of combustion plants involved in NERP, as well as data on the operator of combustion plants, is a subject for annual renewal.

Change of the operator of any combustion plant which participates in NERP does not release a new owner from the obligations to obey NERP for this combustion plant

5.3 Reporting to the Energy Community Treaty

It is planned to draw up an annual report on implementation of the NERP and to send it to the Energy Community Treaty within 12 months of the end of the year covered by the report. The report will contain:

- a list of the participating plants;
- a comparison between the emission ceilings and actual emissions for the year;
- a description of any penalties imposed on plants that failed to comply with their obligations;
- a description of any investments made in flue gas cleaning equipment in the participating plants;
- a list of the plants excluded from the NERP and the reasons for exclusion;
- a list of updated technical data and ceilings for plants remaining in the NERP;
- a summary.

6. List of measures to be applied in order to ensure the NERP execution

~~After the NERP term implementation is finished, From 31 December 2023, combustion plants participating in the NERP~~ will have to comply with the standards laid down in Annex V to Directive 2010/75/EU. These standards will be transposed into Ukrainian law by means of an amendment to the provisions on emission standards for large combustion plants.

These provisions will lay down:

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1. Standards for emissions into the air from plants of gases or dust, differing according to the type of activity, the technological process or technical operation, the date of entry into operation of the plant, the date of closure or the further total period of operation.
2. Situations justifying transitional derogations from the standards and the limits on derogations.
3. Conditions for emission standards to be deemed to have been met.
4. Requirements concerning the use of specific technical solutions to ensure that emissions are reduced.
5. Procedures in the event of disruption in technological processes or technical operations relating to the running of the installation.
6. Types of disruption requiring the installation to be shut down.
7. Preventive measures to be taken by the installation operator.
8. Cases in which the installation operator should inform the provincial environmental protection inspector of disruptions, the deadline for such notification and the form it must take.

While the NERP is in force and after it has come to an end, the ~~participating-combustion~~ plants will be required to comply with all other provisions of Ukrainian law, in particular those laid down in the Environmental Protection Act of Ukraine and its implementing regulations. Such plants will also be required to comply with the operating conditions laid down in the permits. In accordance with these provisions, the integrated permits will have to include detailed operating conditions for each plant participating in the NERP. ~~The Environmental Protection Act lays down detailed rules on the liability of installation operators who fail to comply with the integrated permit conditions. Such plants will also be required to comply with the operating conditions laid down in the emission permits. In accordance with these provisions, the emission permits will have to include detailed operating conditions for each plant participating in the NERP.~~ The Environmental Protection Act lays down detailed rules on the liability of plant operators who fail to comply with the emission permit conditions.

Any party operating the plant that requires an emission permit must comply not only with the emission requirements laid down therein – and environmental protection requirements based on best available techniques, as well as environmental quality standards – but also the emission standards laid down in the applicable provisions on installation emission standards. These requirements will thus also have to be met by plants participating in the NERP.

The applicable provisions include specific rules on liability in the event of failure to comply with the environmental protection requirements. There are three different types of liability – civil, criminal and administrative. The forms of liability in this field are set out in particular in the Environmental Protection Act. With regard to administrative liability in respect of combustion plants, the provisions include rules under which the installation may be shut down and fines

may be imposed, for example, for failure to comply with the integrated permits in terms of the quantities or types of gases or dust released into the air. These fines are subject to the same enforcement procedures as tax debts.

Procedures for the issue of such decisions by the local environmental protection inspector may be launched at the inspector's own initiative.

Therefore, the above-mentioned measures will be able to be applied to all combustion plants covered by the NERP in order to ensure that those plants comply, by 31 December 2033 at the latest, with the emission limit values as set out in Annex V to Directive 2010/75/EU. In Ukraine, control of compliance with the environmental requirements, including the conditions as set out in integrated permits, is entrusted to specialised environmental inspection authorities.

7. Total emission ceilings, and the means of achieving the objectives as set out in the NERP

Implementation of the NERP will lead to a very significant reduction in the emissions of sulphur dioxide, nitrogen oxides and dust for the group of all participating plants. Implementation of both the current objectives of the NERP and the main objective, namely adaptation of plants to the requirements of Directive 2010/75/EU, shall be a combination of control monitoring and technical measures involving retrofitting of the combustion plants.

As regards the technical measures for achieving the objectives of the NERP, the following are envisaged:

- modernization of existing combustion plants to improve energy efficiency of fuel;
- modernization of installations for dust cleaning of flue gases;
- co-firing of biomass with solid fuel (coal) in boilers;
- ~~• the use of the full technical capabilities of existing and planned for construction the flue gas desulphurization plants (increasing operating time of combustion plants with flue gas desulphurization, full and effective use of these facilities)~~
- construction of additional desulfurization facilities:
 - o for the units with thermal input of 50 ~~to~~ $P \leq$ 500 MW coal should be used with low sulfur content, or build a semi-dry or wet flue gas desulfurization, depending on specific conditions
 - o facilities for thermal power $P > 500$ MW it is advisable to use a wet install desulphurization of flue gases

Ukraine – National emission reduction plan

- improving fuel combustion to reduce emissions of nitrogen oxides and dust collecting systems modernization (regime-technological measures - speed supply air and fuel, low emission burners, flue gas recirculation and a combination thereof);

• ~~Recommendations for building CFB boilers;~~

- construction of flue gas cleaning plants from nitrogen oxides – technology of selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR) depending on the individual terms SCR and SNCR.

• ~~co-combustion of biomass with traditional solid fuel (coal) in the boilers,~~

• ~~retrofitting of the existing boilers, involving adaptation of incinerator furnaces to 100% biomass incineration.~~

Table 12 presents an overview of emission ceilings for all participants in the NERP for the **2020-2033** period (Table B.3 in Decision 2012/115/EU).

Table 1. Combined emission ceilings ~~[Mg]~~ for NERP participants combustion plants in Ukraine (tons)

	<u>31.12.2018</u>	<u>31.12.2022</u>	<u>31.12.2027</u>	<u>31.12.2030</u>	<u>31.12.2032</u>	<u>31.12.2033</u>
<u>SO₂</u>	<u>1110 590</u>	<u>820 170</u>	<u>457 150</u>	<u>229 080</u>	<u>89 780</u>	<u>20 130</u>
<u>NO_x</u>	<u>178 030</u>	<u>138 530</u>	<u>89 160</u>	<u>59 540</u>	<u>39 790</u>	<u>29. 10</u>
<u>Dust</u>	<u>156 710</u>	<u>115 480</u>	<u>63 930</u>	<u>33 010</u>	<u>12 390</u>	<u>2 080</u>
-	<u>01.01.2020</u>	<u>01.01.2023</u>	<u>01.01.2026</u>	<u>01.01.2029</u>	<u>01.01.2032</u>	<u>31.12.2033</u>
<u>SO₂</u>	<u>1 210 000</u>	<u>963 915</u>	<u>717 830</u>	<u>471 745</u>	<u>225 660</u>	<u>61 600</u>
<u>NO_x</u>	<u>188 200</u>	<u>163 130</u>	<u>138 055</u>	<u>112 985</u>	<u>87 915</u>	<u>71 200</u>
<u>Dust</u>	<u>114 000</u>	<u>90 000</u>	<u>66 000</u>	<u>42 000</u>	<u>18 000</u>	<u>6 000</u>

8. Funding measures to reduce emissions of pollutants from large combustion plants

This section contains cost estimates for installation of gas cleaning equipment for large combustion plants. These data are based on estimates for installation of modern gas cleaning equipment and are the "upper bound" costs that the large combustion plant operators must bear to ensure compliance with the requirements of Directive 2010/75 / EU.

Initial data for calculating the cost of gas-cleaning equipment for energy combustion plants operating for the output of electrical energy at condensation thermal plants is presented in Table 3. For the CHP, these values should be increased by 1.5.

Table 3. Assessment of specific capital costs of establishing modern gas cleaning equipment at condensing units

Pollutant	Cost, €/kW of electric capacity
SO ₂	80 – 200
NO _x	20 – 80
Dust	30 – 50

Table 4 shows the estimated specific capital costs for construction of gas-cleaning plants per 1 ton of steam per hour (1 Gcal / h).

Table 4. Evaluation of specific capital costs for installation of modern gas cleaning equipment on steam boilers

Pollutant	Cost, €/t h of steam
SO ₂	24000 – 60000
NO _x	6000 – 24000
Пил	9000 – 15000

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Ukraine – National emission reduction plan

Table 5 shows the forecast growth in capacity of desulfurization and denitrification installations at coal thermal power plants under the NERP. 8.1 GW of modernized coal units at condensing thermal power plants have to be equipped with modern desulfurization and denitrification installations.

Table 5. Forecast growth of gas cleaning equipment capacity at existing coal-fired thermal power plants

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
DeSOx, GW	0.0	1.3	1.9	3.1	3.7	4.2	4.7	5.9	6.5	7.1	7.6	8.1	8.1	8.1	8.1	8.1
DeNOx, GW	0.0	0.6	1.2	2.4	3.2	4.4	5.0	5.6	6.2	6.9	7.5	7.5	7.8	7.8	8.1	8.1

In case if the wet limestone desulfurization is installed at all facilities, the total cost is 1.62 billion €. Whereas, installing modern facilities denitrification installations using selective catalytic reduction (SCR) costs about 6.5 billion €. The dust cleaning system which complies with ceiling output concentration of 50 mg/m³ is usually included in the scope of reconstruction of boilers and turbines. Evaluation of specific costs for such reconstruction is about 300 € / kW of electrical power.

For coal-fired CHP (0.33 GW), which will be reconstructed and run until 2033, some 100 million € have to be invested in desulfurization and 40 million € in denitrification.

For gas-and-oil fired boilers installed at condensation TPP and CHP to be in compliance with Directive 2010/75/EU, technological measures have to be implemented to reduce NO_x (speed air supply, low-emission burners, flue gas recirculation, etc.). This will require some 76 million. € for gas-and-oil fired boilers at condensing TPP (3.8 GW), and 129 million € at gas CHP (4.3 GW).

Total demand for funds invested in gas cleaning systems reaches 2.615 billion €.

Funding sources of environmental measures in the energy sector include:

- Public funds
- Payment returns to the power plants (over 770%) for emissions aimed at environmental projects
- Own funds of enterprises and investment funds
- International loans

It should be noted that 16.38 billion €. is required for construction of new coal-fired thermal power plants where the specific capital investments are of 1800 € / kW. New coal CHP need some 4.6 billion €.

Thus, the total cost of a large-scale modernization of the Ukrainian power system will exceed 23.5 billion €.

Estimated reduction of total emissions under the NERP for the energy companies and large combustion plants operators is shown below at Diagrams 1 and 2.

98. Annexes to NERP

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Ukraine – National emission reduction plan

Annex 1 – Forecasted energy production in Ukraine

Annex ~~12~~ – Environmental effects of the ~~application of the~~ NERP implementation

Annex ~~23~~ – Emission ceilings [Mg] of total pollutant emissions for operators of the large combustion plants

Annex ~~43~~ – List of large combustion plants in Ukraine with at least 50 MW of heat capacity (basic data)

Annex ~~54~~ – List of large combustion plants in Ukraine with at least 50 MW of heat capacity covered by the National emission reduction plan (basic data)

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Annex 1 to the National emissions reduction plan

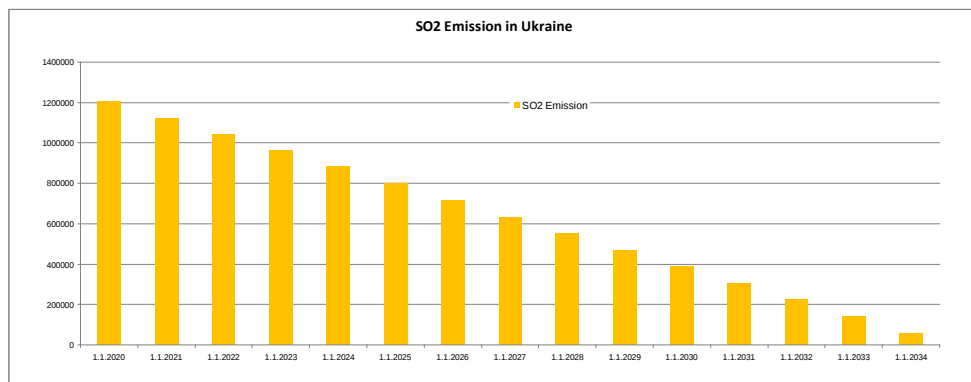
Forecasted energy production in Ukraine~~Environmental effects of
implementing the NERP~~

Ukraine – National emission reduction plan

Below the charts are given showing the reduction in gross emissions of pollutants during the implementation of the National emission reduction plan. This document laid the sharp reduction at the end of 2033, compared with 2020 emissions. The value of total emissions in 2033 is based on compliance with the requirements of Directive 2010/75EU.

As a result of introduction of the clean coal technologies in the energy sector of Ukraine, total sulfur dioxide emissions is planned to reduce by almost fifty times (Figure 1). The level of total emissions in 2020 is defined as the average over the period 2008-2012. Because of the large capital costs of the construction of desulphurization facilities and their long construction time, commissioning should be expect no earlier than in 2020. The value of total emissions by the end of 2033 is calculated based on the emission limit values from Directive 2010/75EU and output forecast and installed capacity of power system of Ukraine, according to the Energy Strategy.

Figure 1. Ceiling values of total SO₂ emissions for large combustion plants.



Combustion installations included in NERP should during this period to achieve the emission limit values of SO₂, set out in a given Directive. In the intervening years between 2020 and 2033 linear decrease is planned of total gross emissions of sulfur dioxide from combustion plants in Ukraine. This will be implemented through the construction of desulphurization facilities, construction of new power plants, gas cleaning systems equipped with modern flue gas cleaning systems and via closure of existing combustion plants, for which the deadline of 40 000 operating hours is set.

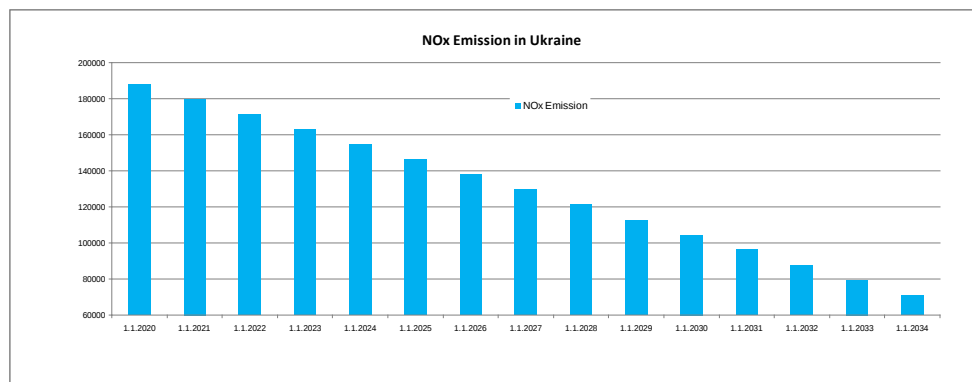
The level of total emissions of nitrogen oxides in 2020 is based on the average emission in the period 2008-2012. As the majority of boilers in power sector of Ukraine has a liquid slag removal, this restricts the use of primary measures to decrease generation of nitrogen oxides. Given the lack of experience in construction and operation of the combustion plants with

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~~selective catalytic reduction and high capital costs, reduction of nitrogen oxides should be expected not earlier than in 2020. Figure 2 shows the ceiling values of nitrogen oxides emissions for all combustion plants for the NERP duration.~~

Figure 2. Ceiling values of total NOx emissions for large combustion plants.



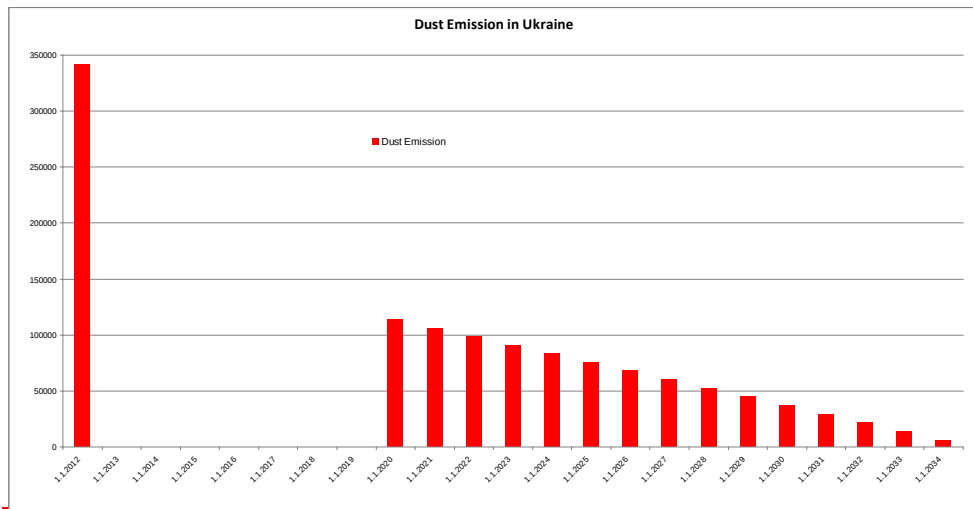
~~Combustion installations included in NERP should during this period to achieve the emission limit values of NOx, set out in Directive 2010/75/EU. In the intervening years between 2020 and 2033 linear decrease is planned of total gross emissions of nitrogen oxides from combustion plants in Ukraine. This will be implemented through the construction of DeNOx facilities at existing combustion plants, construction of new power plants, equipped with modern flue gas cleaning systems and via closure of existing combustion plants, for which the deadline of 40 000 operating hours is set.~~

~~Existing combustion plants in Ukraine were equipped only with dust cleaning systems. During 2010-2020 the replacement will be carried out of the existing dust collectors with new with the output dust concentrations below 50 mg/Nm³, as required by Directive 2001/80/EC. Therefore, the level of dust emissions in 2020 is defined as one third of the average for the period 2008-2012. In 2033, all combustion plants shall comply with the requirements of Directive 2010/75/EU. During the period of implementation of NERP, gross dust emissions will be reduced by 19 times, as shown in Figure 3. It will be implemented through the construction of modern dedusting installation, by using wet desulphurization units, and input into degree of fineness of dust cleaning, construction of new power plants, equipped with modern gas cleaning systems and through the closure of existing combustion plants for which the limit is specified for their lifetime of 40 000 hours.~~

~~Thus, the execution of the National emissions reduction plan will allow to significantly reduce emissions of SO₂ and NOx and to reduce their negative environmental~~

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Figure 3. Ceiling values of total dust emissions for large combustion plants of Ukraine.



The Energy Strategy of Ukraine until 2030, approved by the Cabinet of Ministers of Ukraine of 24.07.2013 No.1071r, the baseline scenario assumes that in 2030 the installed power capacity of all thermal power plants will reach 29.8 GW, of which coal-fired condensing power TPP will account for 19.7 GW, the gas-and-oil fired TPP units for 3.8 GW, and CHP and CHP at industrial enterprises for 6.3 GW. According to the forecast, in 2030, the capacity of new coal combustion plants as for thermal capacity is 9.1 GW, and the capacity of the existing reconstructed ones is 10.6 GW. At the same time, until 2030, 13.7 GW of TPP, which underwent reconstruction of coal TPP, should be reconstructed. Thus, by 2030, 3.1 GW of thermal power capacity should be replaced, which will be reconstructed between 2011 and 2015. Fig. 1.1 shows the forecasted installed power capacity of coal thermal power plants until 2033. The blue colour shows capacity of thermal power plants, which have not undergone reconstruction, and the green colour shows the total capacity of new units.

Ukraine – National emission reduction plan

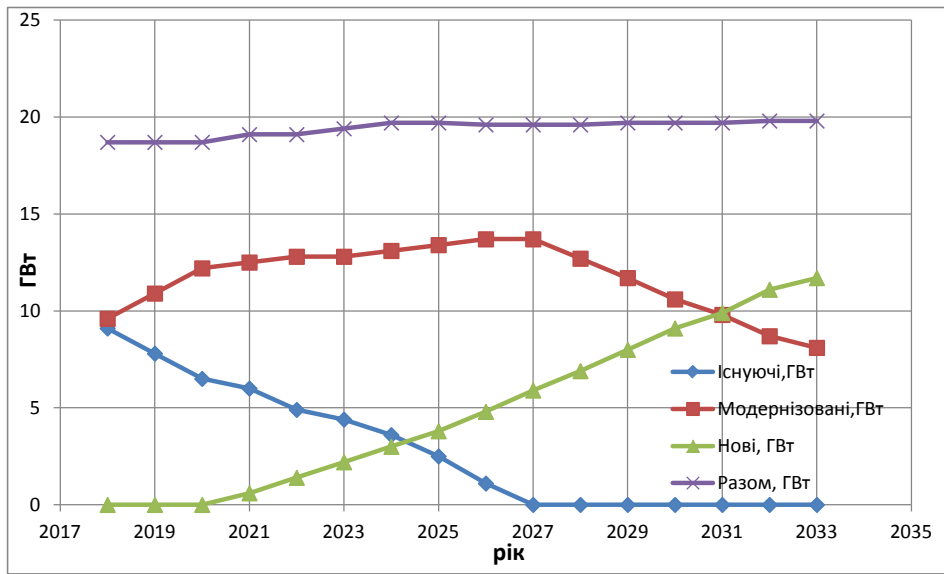


Fig. 1.1. Forecasted changes in coal TTP capacity until 2033.

In addition, the energy production by condensing thermal power plants in the baseline scenario in 2030 will reach 91 billion KWh. Less own needs, the electricity output of coal TPP will roughly be about 83.7 billion KWh, including 46.4 billion KWh produced by new units 37.3 billion KWh produced by reconstructed units. New capacities and their output will grow after 2030. Fig. 1.2 shows forecasted electricity production by coal thermal power plants in Ukraine until 2033.

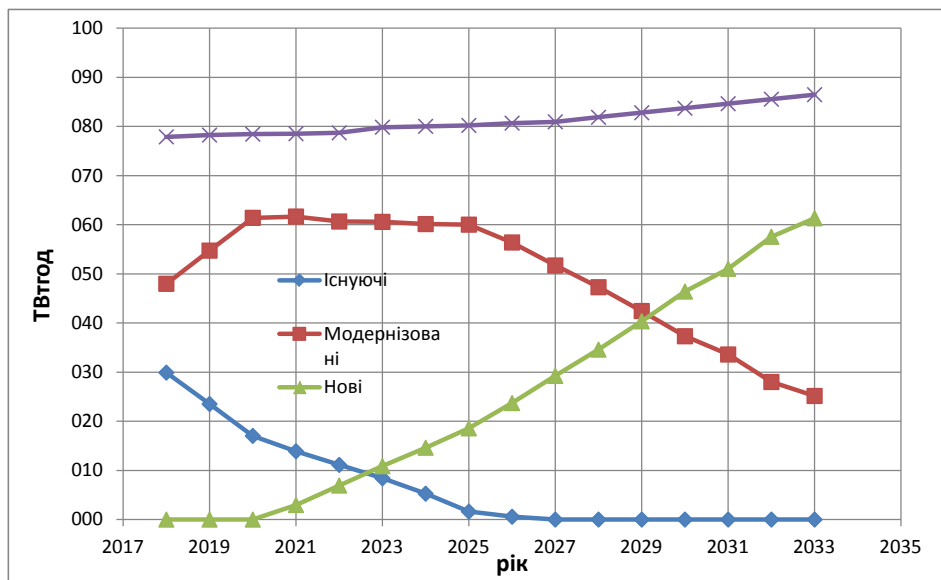


Fig. 1.2. Forecasted electricity production by coal TPP until 2033.

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Ukraine – National emission reduction plan

Table 1.1 shows the forecasted changes in capacities of old, upgraded and new coal-fired units between 2018 and 2027, when the 2.1 GW of old thermal power capacities will operate 40,000 h without implementation of measures to reduce pollutant emissions. Upgraded plants must be fully covered by the NERP. Forecasted electricity output by these units is also shown.

Table 1.1. Forecasted changes in capacity and electricity output by coal fired units at TPP in Ukraine between 2018 and 2027

Parameter	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Capacity of old TPP units, GW	9.1	7.8	6.5	6	4.9	4.4	3.6	2.5	1.1	0.0
Capacity of old TPP units in NERP, GW	7	5.7	4.4	3.9	2.8	2.3	1.8	0.9	0.3	0.0
Capacity of upgraded TPP units, GW	9.6	10.9	12.2	12.5	12.8	12.8	13.1	13.4	13.7	13.7
Capacity of new TPP units, GW	0.0	0.00	0.0	0.6	1.4	2.2	3	3.8	4.8	5.9
Total capacity, GW	18.7	18.7	18.7	19.1	19.1	19.4	19.7	19.7	19.6	19.6
Energy output of old units, TWh	29.91	23.52	17.03	13.90	11.13	8.40	5.27	1.63	0.58	0.00
Energy output of old units in NERP, TWh	23.01	17.19	11.53	9.03	6.36	4.39	2.63	0.59	0.16	0.00
Energy output of upgraded units, TWh	47.99	54.74	61.41	61.68	60.66	60.59	60.14	60.03	56.40	51.72
Energy output of new units, TWh	0.00	0.00	0.00	2.96	6.92	10.87	14.63	18.57	23.71	29.24
Total energy output, TWh	77.90	78.26	78.44	78.53	78.72	79.86	80.04	80.22	80.68	80.96
Total electricity output, TWh	85.6	86.0	86.2	86.3	86.5	86.8	87.0	87.2	87.7	88.0

The gas-and-oil fired units 800 and 300 MW, installed at TPP, which consume the natural gas, will have in 2018, according to the strategy, the total capacity of 3.8 GW. It will not increase until 2033. Their electricity output will exceed 2 billion KWh per year. With 5% own energy consumption, NOx emissions in 2033 will amount to 760 tons.

The total electric capacity of heating and industrial CHP in 2018 will reach 6.3 GW, which will not change until 2030. Their electricity production in 2018 will reach 19 billion KWh. It is expected that in 2030 the CHP output will be 21 billion KWh. The share of own energy consumption is assumed to be 8%.

Today, most CHP run on natural gas. By 2033, it has been planned to transfer the following CHP to coal combustion: Severodonetsk, Kherson, Odessa, Mykolaiv, Dnipropetrovsk, Bila Tserkva and Pivdenmash with the total capacity of 0.98 GW. Only 7 CHP (Cherkasy, Chernihiv, Darnytsa, Kharkiv-2, Kalush, Sumy and Kramatorsk) with the total installed electric capacity of 1.03 GW are burning and will burn coal in coming years. According to preliminary data, 70% of capacity (0.7 GW) of coal-fired CHP will be replaced with new ones until 2033, and on the other hand, gas-cleaning installations should be built in compliance with Directive 2010/75/EU.

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Annex 2 to the National emissions reduction plan

Environmental effects of the application of the NERP implementation
Emission ceilings [Mg] of total pollutant emissions for operators of the large combustion plants

Ukraine – National emission reduction plan

Below the charts are given showing the reduction in gross pollutant emissions during the implementation of the National emission reduction plan. This document lays the sharp reduction at the end of 2033, compared to 2018 emissions. The value of gross emissions in 2033 is based on compliance with the requirements of Directive 2010/75EU.

As a result of introduction of the clean coal technologies in the energy sector of Ukraine, the reduction of gross pollutant emissions is planned for the combustion plants that are included in the NERP (Figure 2.1). The level of gross emissions in 2018 is based on the 2012 data. Because of the large capital costs of building desulphurization and denitrification facilities and their long building period, commissioning should be expected no earlier than in 2018. The value of gross emissions by the end of 2033 is calculated based on the emission limit values laid in Directive 2010/75EU and the output forecast and installed capacity of power system of Ukraine, according to the Energy Strategy.

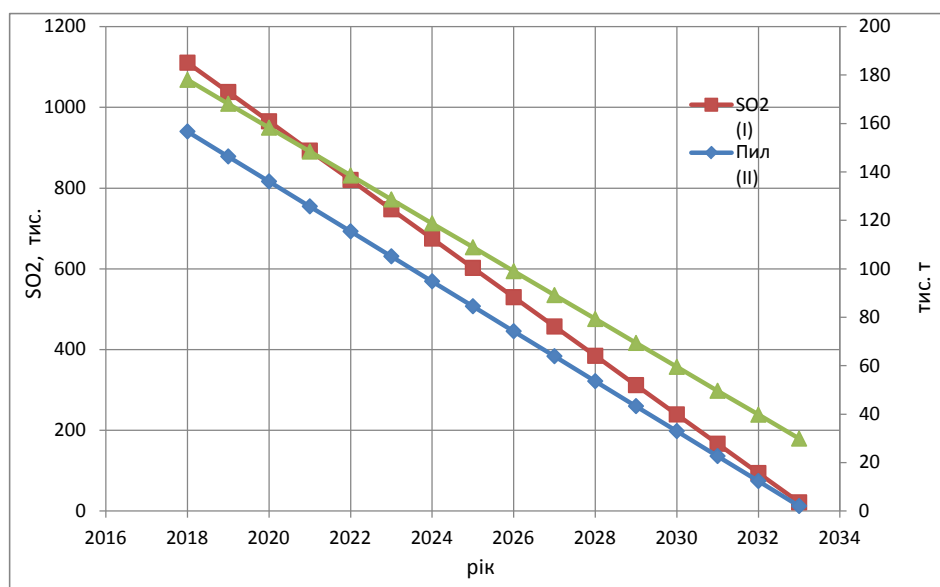


Figure 2.1. Ceiling values of gross emissions between 2018 and 2033 for the combustion plants included in the NERP

The combustion installations included in the NERP should achieve, during this period, the emission limit values of pollutants, set out in the Directive. In the interim years between 2018 and 2033, a linear decrease is planned for total gross emissions of sulfur dioxide from combustion plants in Ukraine. This will be implemented by building of desulphurization facilities, new power units equipped with modern gas cleaning systems and closure of the existing combustion plants, for which the deadline of 40 000 operating hours is set.

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Annex 3 to the National emissions reduction plan

**Emission ceilings [Mg] of total pollutant emissions for operators of
the large combustion plants**

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Ukraine – National emission reduction plan

Dust

Operator	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
DTEK Skhidenergo	46.41	43.36	40.31	37.26	34.21	31.16	28.11	25.06	22.02	18.97	15.92	12.87	9.82	6.77	3.72	0.67
DTEK Dniproenergo	20.53	19.18	17.83	16.48	15.13	13.78	12.44	11.09	9.74	8.39	7.04	5.69	4.34	3.00	1.65	0.30
DTEK Zakhidenergo	17.02	15.90	14.78	13.67	12.55	11.43	10.31	9.19	8.08	6.96	5.84	4.72	3.60	2.48	1.37	0.25
Centrenergo	29.21	27.29	25.37	23.46	21.54	19.62	17.70	15.78	13.86	11.94	10.02	8.10	6.18	4.26	2.34	0.42
Donbassenergo	25.27	23.61	21.95	20.29	18.63	16.97	15.31	13.65	11.99	10.33	8.67	7.01	5.35	3.69	2.03	0.37
JSC Evro-Rekonstrukcia (Darnytsa CHP)	2.01	1.88	1.74	1.61	1.48	1.34	1.21	1.08	0.94	0.81	0.68	0.54	0.41	0.27	0.14	0.008
DPZD Ukrinterenergo (Kalush TPP)	1.83	1.71	1.58	1.46	1.34	1.22	1.10	0.98	0.86	0.74	0.61	0.49	0.37	0.25	0.13	0.007
JSC Kramatorskteploenergo (Kramatorsk TPP)	1.64	1.54	1.43	1.32	1.21	1.10	0.99	0.88	0.77	0.66	0.55	0.44	0.33	0.22	0.12	0.006
JSC Symyteploenergo (Sumy TPP)	1.83	1.71	1.58	1.46	1.34	1.22	1.10	0.98	0.86	0.74	0.61	0.49	0.37	0.25	0.13	0.007
JSC DV Naftohazovydobuvna kompania (Kharkiv TPP-2)	3.65	3.41	3.17	2.93	2.68	2.44	2.20	1.96	1.71	1.47	1.23	0.98	0.74	0.50	0.26	0.014
Cherkassy Khimvolokno VP (Cherkassy TPP)	3.65	3.41	3.17	2.93	2.68	2.44	2.20	1.96	1.71	1.47	1.23	0.98	0.74	0.50	0.26	0.014
JSC TekhNova KEP (Chernihiv TPP)	3.65	3.41	3.17	2.93	2.68	2.44	2.20	1.96	1.71	1.47	1.23	0.98	0.74	0.50	0.26	0.014
TOTAL	156.71	146.40	136.09	125.78	115.48	105.17	94.86	84.55	74.24	63.93	53.62	43.32	33.01	22.70	12.39	2.08

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Operator	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
DTEK Skhidenergo	249.28	232.98	216.67	200.37	184.06	167.76	151.45	135.15	118.85	102.54	86.24	69.93	53.63	37.32	21.02	4.71
DTEK Dniproenergo	278.52	260.30	242.09	223.87	205.65	187.43	169.22	151.00	132.78	114.57	96.35	78.13	59.92	41.70	23.48	5.26
DTEK Zakhidenergo	229.28	214.28	199.28	184.29	169.29	154.29	139.30	124.30	109.31	94.31	79.31	64.32	49.32	34.33	19.33	4.33
Centrenergo	223.27	208.66	194.06	179.46	164.85	150.25	135.65	121.05	106.44	91.84	77.24	62.63	48.03	33.43	18.82	4.22
Donbassenergo	84.56	79.03	73.50	67.97	62.44	56.91	51.38	45.85	40.32	34.78	29.25	23.72	18.19	12.66	7.13	1.60
JSC Evro-Rekonstrukcia (Darnytsa CHP)	5.18	4.84	4.51	4.17	3.84	3.50	3.17	2.83	2.49	2.16	1.82	1.49	1.15	0.82	0.48	0.15
DPZD Ukrinterenergo (Kalush TPP)	1.37	1.28	1.19	1.10	1.01	0.93	0.84	0.75	0.66	0.57	0.48	0.39	0.30	0.22	0.13	0.04
JSC Kramatorskteploenergo (Kramatorsk TPP)	3.13	2.93	2.72	2.52	2.32	2.12	1.91	1.71	1.51	1.30	1.10	0.90	0.70	0.49	0.29	0.09
JSC Symyteploenergo (Sumy TPP)	2.22	2.08	1.93	1.79	1.64	1.50	1.36	1.21	1.07	0.93	0.78	0.64	0.49	0.35	0.21	0.06
Kharkiv TPP-5	0.15	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
JSC DV Naftohazovydobuvna kompania (Kharkiv TPP-2)	2.22	2.08	1.93	1.79	1.64	1.50	1.36	1.21	1.07	0.93	0.78	0.64	0.49	0.35	0.21	0.06
Cherkassy Khimvolokno VP (Cherkassy TPP)	0.15	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
JSC TekhNova KEP (Chernihiv TPP)	5.92	5.54	5.15	4.77	4.39	4.00	3.62	3.23	2.85	2.47	2.08	1.70	1.32	0.93	0.55	0.17
TOTAL	1110.59	1037.99	965.38	892.78	820.17	747.57	674.96	602.36	529.75	457.15	384.54	311.93	239.33	166.72	94.12	21.51

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Ukraine – National emission reduction plan

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Operator	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
DTEK Skhidenergo	32.67	30.80	28.93	27.06	25.19	23.32	21.45	19.58	17.71	15.85	13.98	12.11	10.24	8.37	6.50	4.63
DTEK Dniproenergo	52.28	49.29	46.30	43.31	40.32	37.33	34.34	31.34	28.35	25.36	22.37	19.38	16.39	13.40	10.40	7.41
DTEK Zakhidenergo	14.52	13.69	12.86	12.03	11.20	10.37	9.53	8.70	7.87	7.04	6.21	5.38	4.55	3.72	2.89	2.06
Centenergo	25.58	24.12	22.65	21.19	19.73	18.26	16.80	15.34	13.87	12.41	10.94	9.48	8.02	6.55	5.09	3.63
Donbassenergo	16.94	15.97	15.00	14.03	13.06	12.09	11.12	10.15	9.19	8.22	7.25	6.28	5.31	4.34	3.37	2.40
JSC Evro-Rekonstrukcia (Darnytsa CHP)	1.33	1.25	1.17	1.09	1.01	0.93	0.85	0.77	0.69	0.61	0.54	0.46	0.38	0.30	0.22	0.14
DPZD Ukrinterenergo (Kalush TPP)	1.20	1.12	1.05	0.98	0.91	0.84	0.77	0.70	0.62	0.55	0.48	0.41	0.34	0.27	0.20	0.12
JSC Kramatorskeploenergo (Kramatorsk TPP)	1.06	1.00	0.94	0.87	0.81	0.75	0.68	0.62	0.56	0.49	0.43	0.36	0.30	0.24	0.17	0.11
JSC Symyeploenergo (Sumy TPP)	0.53	0.50	0.47	0.44	0.40	0.37	0.34	0.31	0.28	0.25	0.21	0.18	0.15	0.12	0.09	0.06
JSC DV Naftohazovydobuvna kompania (Kharkiv TPP-2)	1.33	1.25	1.17	1.09	1.01	0.93	0.85	0.77	0.69	0.61	0.54	0.46	0.38	0.30	0.22	0.14
Cherkassy Khimvolokno VP (Cherkassy TPP)	5.45	5.12	4.80	4.47	4.15	3.82	3.50	3.17	2.85	2.52	2.19	1.87	1.54	1.22	0.89	0.57
Poltavaoblenergo (Kremenchuk TPP)	1.12	1.07	1.02	0.98	0.93	0.88	0.84	0.79	0.74	0.69	0.65	0.60	0.55	0.51	0.46	0.41
Kvivenergo	4.66	4.46	4.27	4.07	3.88	3.68	3.48	3.29	3.09	2.90	2.70	2.50	2.31	2.11	1.92	1.72
JSC Brok Energiia (Okhtyrka TPP)	0.09	0.09	0.08	0.08	0.08	0.07	0.07	0.06	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.03
Kharkiv heat networks (TPP-3)	0.32	0.31	0.29	0.28	0.27	0.25	0.24	0.23	0.21	0.20	0.18	0.17	0.16	0.14	0.13	0.12
Kharkiv TPP-5	0.67	0.64	0.61	0.58	0.56	0.53	0.50	0.47	0.44	0.42	0.39	0.36	0.33	0.30	0.28	0.25
LVIV TPP-1	0.60	0.57	0.55	0.52	0.50	0.47	0.45	0.42	0.40	0.37	0.35	0.32	0.30	0.27	0.25	0.22
Lisichansk refinery TPP	0.80	0.77	0.73	0.70	0.67	0.63	0.60	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.30
Alchevsk Iron and Steel works TPP	0.50	0.48	0.46	0.44	0.42	0.39	0.37	0.35	0.33	0.31	0.29	0.27	0.25	0.23	0.21	0.18
Makiivka engineering plant power plant	0.50	0.48	0.46	0.44	0.42	0.39	0.37	0.35	0.33	0.31	0.29	0.27	0.25	0.23	0.21	0.18
Avdiivka chemical plant TPP	0.80	0.77	0.73	0.70	0.67	0.63	0.60	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.30
Mariupol TPP-1	0.30	0.29	0.27	0.26	0.25	0.24	0.22	0.21	0.20	0.19	0.17	0.16	0.15	0.14	0.12	0.11
Mariupol TPP-2	0.80	0.77	0.73	0.70	0.67	0.63	0.60	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.30
Mariupol TPP	0.80	0.77	0.73	0.70	0.67	0.63	0.60	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.30
MBNVO Frunze	0.60	0.57	0.55	0.52	0.50	0.47	0.45	0.42	0.40	0.37	0.35	0.32	0.30	0.27	0.25	0.22
Pervomaysk Energokhimprom TPP	0.60	0.57	0.55	0.52	0.50	0.47	0.45	0.42	0.40	0.37	0.35	0.32	0.30	0.27	0.25	0.22
Energiia Novyi Rozdil TPP	0.44	0.42	0.41	0.39	0.37	0.35	0.33	0.31	0.29	0.28	0.26	0.24	0.22	0.20	0.18	0.16
Nadvira refinery TPP	0.46	0.44	0.42	0.40	0.38	0.36	0.34	0.32	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.17
Zorya Mashproiekt NPKG	0.45	0.43	0.41	0.39	0.37	0.36	0.34	0.32	0.30	0.28	0.26	0.24	0.22	0.20	0.19	0.17
Kryvorozhstal TPP	2.85	2.73	2.61	2.49	2.37	2.25	2.13	2.01	1.89	1.77	1.65	1.53	1.41	1.29	1.17	1.05
Zaporizhstal TPP	2.85	2.73	2.61	2.49	2.37	2.25	2.13	2.01	1.89	1.77	1.65	1.53	1.41	1.29	1.17	1.05
DniproAzot TPP	2.55	2.44	2.34	2.23	2.12	2.01	1.91	1.80	1.69	1.58	1.48	1.37	1.26	1.16	1.05	0.94
TOTAL	178.03	168.16	158.28	148.41	138.53	128.66	118.78	108.91	99.04	89.16	79.29	69.41	59.54	49.66	39.79	29.91

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Opetator	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
DTEK Skhidenergo	264750	246799	228847	210896	192944	174993	157041	139090	121139	103187	85236	67284	49333	31381	13430

Ukraine – National emission reduction plan

DTEK-Dniproenergo	295800	275674	255549	235423	215297	195171	175046	154920	134794	114669	94543	74417	54291	34166	14040
DTEK-Zakhidenergo	243500	227018	210536	194054	177571	161089	144607	128125	111643	95161	78679	62196	45714	29232	12750
Centrenergo	237120	221054	204989	188923	172857	156791	140726	124660	108594	92529	76463	60397	44331	28266	12200
Donbassenergo	89810	83721	77631	71542	65453	59364	53274	47185	41096	35006	28917	22828	16739	10649	4560
CHP-Association	79020	73706	68391	63077	57763	52449	47134	41820	36506	31191	25877	20563	15249	9934	4620
TOTAL	1210000	1127971	1045943	963914	881886	799857	717829	635800	553771	471743	389714	307686	225657	143629	61600

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Opetator	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
DTEK-Skhidenergo	37800	36170	34535	32955	31270	29640	28200	26375	24740	23110	21480	19845	18220	16580	14950
DTEK-Dniproenergo	60500	57400	54300	51160	48095	44995	41900	38795	35695	32595	29495	26390	23290	20190	17090
DTEK-Zakhidenergo	16800	16210	15620	15050	14140	13850	13260	12670	12080	11490	10900	10310	9720	9130	8540
Centrenergo	29600	28300	26700	25700	24395	23095	21795	20495	19195	17895	16590	15290	13990	12690	11390
Donbassenergo	19600	18910	18225	17515	16850	16160	15475	14785	14095	13410	12720	12035	11345	10660	9970
CHP-Association	23900	22855	21810	20750	19715	18670	17425	16580	15535	14485	13445	12395	11350	10305	9260
TOTAL	188200	179845	171485	163130	154770	146415	138055	129700	121345	112985	104630	96270	87915	79555	71200

Ukraine – National emission reduction plan

Dust

Opetator	2012	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
DTEK-Skhidenergo	105800	35265	32845	30425	28005	25585	23165	20745	18325	15905	13480	11060	8640	6220	3800	1380
DTEK-Dniproenergo	46800	15600	14580	13560	12540	11520	10500	9480	8460	7440	6420	5400	4380	3360	2340	1320
DTEK-Zakhidenergo	38800	12935	12070	11205	10340	9480	8615	7750	6890	6025	5160	4295	3430	2570	1705	840
Centrenergo	66600	22200	20700	19200	17700	16200	14700	13200	11700	10200	8700	7200	5700	4200	2700	1200
Donbassenergo	57600	19200	17880	16560	15240	13920	12600	11280	9960	8640	7320	6000	4680	3360	2040	720
CHP-Association	26400	8800	8210	7620	7030	6440	5850	5260	4670	4080	3490	2900	2310	1720	1130	540
TOTAL	342000	114000	106285	98570	90855	83145	75430	68075	60005	52290	44570	36855	29140	21430	13715	6000

Annex 3 to the National emissions reduction plan

List of large combustion plants in Ukraine with at least 50 MW of
heat capacity
(basic data)

Ukraine – National emission reduction plan

A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO ₂ emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
1	Zuivska TPP (power units 1, 2,3, 4)	м. Зугрес Донецької області	DTEK Skhidenergo	1982	3276.5 3290	8760	85439	7946	4316
2	Luhanska TPP (power units 9,10,11)	м. Щастя Луганської області	DTEK Skhidenergo	1963	1747.6 1748	8760	30380	9822	16091
3	Luhanska TPP (power units 13,14,15)	м. Щастя Луганської області	DTEK Skhidenergo	1965	1747.6 1748	8760	36030	11035	16045
4	Kurakhivska TPP (power units 3,4,5)	м. Курахове Донецької області	DTEK Skhidenergo	1971	1671.7 1670	8760	44863	3882	22063
5	Kurakhivska TPP (power units 6,7,8,9)	м. Курахове Донецької області	DTEK Skhidenergo	1974	2228.9 2230	8760	46643	4059	24316
6	Myronivska TPP	сел. Миронівське м. Дебальцеве Донецької обл.	DTEK Skhidenergo	1956	814.7 1250	8760	3693.3	1167.9	418.55
6	Zaporizka TPP (power units 1,2,3,4)	м. Енергодар Запорізької ТРР	DTEK Dniproenergo	1975	3140.25 3140	8760	76087	23222	6315
7	Zaporizka TPP (power units 5,6,7,8)	м. Енергодар Запорізької ТРР	DTEK Dniproenergo	1982	5875 5875	120	75.6	75.6	75.6
8	Prydniprovskai TPP (power units 7,8,9,10)	м. Дніпропетровськ	DTEK Dniproenergo	1961	1797.6 1800	8760	27481.3	8326.1	8396.8
9	Prydniprovskai TPP (power units 11,12)	м. Дніпропетровськ	DTEK Dniproenergo	1963	1624 1612	4500	15451.53	4077.864	4941.263
10	Prydniprovskai TPP (power units 13,14)	м. Дніпропетровськ	DTEK Dniproenergo	1965	812 812	3400	11707.8	3208.747	4033.858
11	Kryvorizka TPP (power units 1,2)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo	1964	1535.7 1535	6200	55229.2	5830.5	9139.4
12	Kryvorizka TPP (power units 3,4)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo	1966	1535.7 1535	5300	34682.7	3671.6	1131.2

Ukraine – National emission reduction plan

A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO ₂ emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
13	Kryvorizka TPP (power units 5,6)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo	1968	1602.6 1535	5450	39006.2	3853.4	6066.5
14	Kryvorizka TPP (power units 5,450 7)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo	1969	801.4 999	0			
15	Kryvorizka TPP (power units 8,9,10)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo	1971	2382.2 1800	8760	46557.9	4907.3	7663.2
16	Burshtynska TPP (power units 1,4,9,10,11,12)	м. Бурштин Галицького р-ну Івано-Франківської обл.	DTEK Zakhidenergo	1968	3401.1 2800	8760	83336.8	7937.0	9690.5
17	Burshtynska TPP (power units 2,3)	м. Бурштин Галицького р-ну Івано-Франківської обл.	DTEK Zakhidenergo	1964	1133.7 1050	8760	17575.9	1393.9	5101.9
18	Burshtynska TPP (power units 5,6,7,8)	м. Бурштин Галицького р-ну Івано-Франківської обл.	DTEK Zakhidenergo	1967	2267.4 2090	8760	37784.4	3482.0	6711.1
19	Dobrotvirska (boilers 5,6,7,8,9,10)	с. Добротвір Кам'яно-Бузького р-ну Львівської обл.	DTEK Zakhidenergo	1956	1018.1 680	8760	13958.5	1226.8	1771.2
20	Dobrotvirska (power units 7,8)	с. Добротвір Кам'яно-Бузького р-ну Львівської обл.	DTEK Zakhidenergo	1962	889.4 880	8760	21493.7	2672.2	6838.1
21	Ladyzhynska TPP (power units 1,2,3)	м. Ладижин Вінницької обл.	DTEK Zakhidenergo	1971	2381.2 2700	8760	36164.2	4694.0	2702.6
22	Ladyzhynska TPP (power units 4,5,6)	м. Ладижин Вінницької обл.	DTEK Zakhidenergo	1972	2381.2 2700	8760	22270.4	2793.9	5085.7
23	Vuglegirska TPP (power units 1,2,3,4)	м. Світлодарськ Донецької обл.	Centrenergo	1972-1973 1977	3056 3140	8760	143208.4	12341.45	7062.626

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A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO ₂ emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
24	Vuglegirska TPP (power units 5,6,7)	м. Світлодарськ Донецької обл.	Centrenerg	1975-1977 1982	6225 5875	05			
25	Zmiivska TPP (power units 1,2)	Комсомольське Зміївського р-ну Харківської обл.	Centrenerg	1960-1961 1960	998 880	8760	15 604	1 142	7 959
26	Zmiivska TPP (power units 3,4)	Комсомольське Зміївського р-ну Харківської обл.	Centrenerg	1962-1963 1962	1026 880	8760	16 679	1 242	8 509
27	Zmiivska TPP (power units 5,6)	Комсомольське Зміївського р-ну Харківської обл.	Centrenerg	1964-1965 1963	1054 880	8760	15 329	1 144	7 945
28	Zmiivska TPP (power units 7,8)	Комсомольське Зміївського р-ну Харківської обл.	Centrenerg	1966-1967 1971	1682 1580	8760	31 844	2 479	6 978
29	Zmiivska TPP (power units 9,10)	Комсомольське Зміївського р-ну Харківської обл.	Centrenerg	1969 1973	1636 1570	8760	20 276	2 277	9 966
30	Trypilska TPP (power units 1,2,3,4)	м. Українка Київської обл.	Centrenerg	1969-1970 1969	2924 3140	8760	68 155	17 703	22 379
31	Trypilska TPP(power units 5,6)	м. Українка Київської обл.	Centrenerg	1971-1972 1972	1498 1570	8760		12	
32	Slovianska TPP (power unit 7)	С Миколаївка м. Слов'янськ Донецької обл..	Donbassenergo	1971	1965	8760	35247.0	5081.0	12741.0
33	Starobeshivska TPP (power unit 4)	с. Новий Світ Донецької обл.	Donbassenergo	2009	458	8760	367.8	284.1	36.3
34	Starobeshivska TPP (power units 5,6,7)	с. Новий Світ Донецької обл.	Donbassenergo	1963	1350	8760	20712.0	4755.4	16288.1

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A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO ₂ emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
35	Starobeshivska TPP (енергоблок 8,9,10)	с. Новий Світ Донецької обл.	Donbassenergo	1965	1350	8760	19385,0	4359,0	15730,0
36	Starobeshivska TPP (power units 11,12,13)	с. Новий Світ Донецької обл.	Donbassenergo	1967	1350	8760	16976,8	3731,6	13741,9
37	Bilotserkivska CH _P	м. Біла Церква Київської обл.	CHP Association	1971 ⁵	430 ⁸⁵⁰	8760			-
38	Darnitska CHP	м. Київ	CHP Association	1954	366 ⁴⁵⁰	8760	0	0	0
39	Darnitska CHP	м. Київ	CHP Association	1954	590 ⁴⁵⁰	8760	3722,529	929,229	1485,200
39	Darnitska CHP	м. Київ	Darnitska CHP	1954	776	8760	1457,198	447,247	669,987
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	42,7 ¹⁰⁵⁰	3588 ⁷⁶⁰	0	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	42,7	491	0	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	86,7	0	-	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	86,7	0	-	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	118,7	115	0	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	118,7	1924	-	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	118,7	904	0	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	118,7	1276	0	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	118,7	0	-	-	-
40	Dniprodzerzhinska CHP	м. Дніпродзержинськ Дніпропетровської обл.	CHP Association	1965	158,3	0	-	-	-

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A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO ₂ emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
41	Kaluska CHP	м. Калуш Івано-Франківської обл.	CHP Association	1968	185	8760	1373.1	230.08	279.13
42	Kyivska CHP 5	м. Київ	CHP Association	1970	900	8760	50.46	834.668	1.29
43	Kyivska CHP-5	м. Київ	CHP Association	1973	16501650	8760	1	1742.11	1
44	Kyivska CHP-6	м. Київ	CHP Association	1976	691650	8760	1	1348.298	1
44	Kyivska CHP-6	м. Київ	CHP Association	1981	1650	8760	1	935.123	1
45	Kramatorska CHP	м. Краматорськ Донецької обл..	CHP Association	19761971	418480	78748760	3134.1	895.7	1690.4
46	Krementchutska CHP	м. Кременчук Полтавської обл.	CHP Association	1972	1565.8590	8760	86.781	1116.592	0.952
47	Kryvorizka HP	м. Кривий Ріг Дніпропетровської обл.	CHP Association	1952	460	8760			:-
48	Lvivska CHP-1	м. Львів	CHP Association	1952	350	8760			:-
49	Mykolaivska CHP	м. Миколаїв	CHP Association	19641964	898480	43008760	1	98.914	1
50	Odessa CHP	м. Одеса	CHP Association	19541962	768450	42008760			:-
50	Odessa CHP	м. Одеса	CHP Association	1974	349	1300			
51	Okhtyrka CHP	м. Охтирка Сумської обл.	CHP Association	19741972	349290	13008760	1	90.689	1
52	Severodonetska CHP	м. Северодонецьк Луганської обл.	CHP Association	19721975	265650	87608760	0	68.98	0
52	Severodonetska CHP	м. Северодонецьк Луганської обл.	CHP Association	1975	600	4939	1	68.98	1
53	Sumska CHP	м. Суми	CHP Association	1974	130.9350	84158760	2219	454	2441

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Ukraine – National emission reduction plan

A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO ₂ emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
53	Sumska CHP	м. Суми	CHP Association	1974	414.4				
54	Kharkivska CHP-5	с. Підвірки Дергачівського р-ну Харківської обл..	CHP Association	1990	2262815	8760	152.42	569.14	4.743
55	Kharkivska CHP-2	сел. Есхар Чугувівського р-ну Харківської обл.	CHP Association	1963	490	8760			-
56	Khersonska CHP	м. Херсон	CHP Association	1967	1956 (1978-81) 450	738,2 8760		112.93	
57	Cherkasska CHP	м. Черкаси	CHP Association	1971	850	8760			
58	Chernihivska CHP	м. Чернігів	CHP Association	1966	650	8760			
57	Cherkassy Khimvolokno Cherkassy TPP (1)	Cherkassy	Cherkassy Khimvolokno Cherkassy TPP	1971	303	8760			
57	Cherkassy Khimvolokno Cherkassy TPP (2)	Cherkassy	Cherkassy Khimvolokno Cherkassy TPP		758				
57	Cherkassy Khimvolokno Cherkassy TPP (3)	Cherkassy	Cherkassy Khimvolokno Cherkassy TPP		116,3				
57	Cherkassy Khimvolokno Cherkassy TPP (4)	Cherkassy	Cherkassy Khimvolokno Cherkassy TPP		116,3				
57	Cherkassy Khimvolokno Cherkassy TPP (5)	Cherkassy	Cherkassy Khimvolokno Cherkassy TPP		116,3				
57	Cherkassy Khimvolokno Cherkassy TPP (KPR)	Cherkassy	Cherkassy Khimvolokno Cherkassy TPP		174				
58	JSC TekhNova KEP Chernihiv TPP (boiler 1)	Chernihiv	JSC TekhNova KEP Chernihiv	1966	39,25	5169			

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Ukraine – National emission reduction plan

A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO ₂ emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
			TPP						
58	JSC TekhNova KEP Chernihiv TPP (boiler 2)	Chernihiv	JSC TekhNova KEP Chernihiv TPP		39.25	5574			
58	JSC TekhNova KEP Chernihiv TPP (boiler 3)	Chernihiv	JSC TekhNova KEP Chernihiv TPP		39.25	5482			
58	JSC TekhNova KEP Chernihiv TPP (boiler 4)	Chernihiv	JSC TekhNova KEP Chernihiv TPP		39.25	6097			
58	JSC TekhNova KEP Chernihiv TPP (boiler 5)	Chernihiv	JSC TekhNova KEP Chernihiv TPP		78.5	3949			
59	Shostka TPP	Shostka	Kharkivenergo mont		16.3		1.2	2.7	0
60	Lisichansk refinery TPP				369.92				
					137.5				
61	Alchevsk Iron and Steel works TPP				107.5				
62	Makiivka engineering plant power plant				62.5				
63	Avdiivka chemical plant TPP				112.5				
64	Mariupol TPP-1				50				

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Ukraine – National emission reduction plan

A	B	C	Ca	D	F	G	I	J	K
Number	Name of Plant	Location	Operator	Commission year	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	SO2 emissions 2012 Mg	Nox emissions 2012 Mg	Dust emissions 2012 Mg
65	Mariupol TPP-2				60				
66	Mariupol TPP				77.5				
67	MBNVO Frunze	Kharkiv		▲	52				
68	Pervomaysk Energokhimprom TPP	Первомайське, Харків ?		▲	62.5				
69	Energoia Novvi Rozdil TPP	Західна ЕС			45				
70	Nadvirna refinery TPP	Надвірна			38.125				
71	Zorya Mashproiekt NPKG	Очаків			232.5				
72	Kryvorozhstal TPP	Кривий Ріг			342.5				
73	Zaporizhstal TPP	Запорізька обл.			75				
74	DniproAzot TPP	Дніпропетровськ			62.5				
75	Pn mash bud TPP			▲	108.75				

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Annex 4 to the National emissions reduction plan

List of large combustion plants in Ukraine with at least 50 MW of heat capacity covered by the National emission reduction plan
(basic data)

A	B	C	Ca	D	E	F	G	H
Number	Name of Plant	Location	Operator	Commission year	Any extension by at least 50 MW of the total rated thermal input of the combustion plant, (total extension in MW);	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	Pollutant(s) (SO ₂ , NO _x , dust) for which the plant concerned is not covered by NERP
1	Zuivska TPP (power units 1, 2,3, 4)	м. Зугрес Донецької області	DTEK Skhidenergo					—
2	Luhanska TPP (power units 9,10,11)	м. Щастя Луганської області	DTEK Skhidenergo					—
3	Luhanska TPP (power units 13,14,15)	м. Щастя Луганської області	DTEK Skhidenergo					-
4	Kurakhivska TPP (power units 6,7,8,9)	м. Курахове Донецької області	DTEK Skhidenergo					-
5	Zaporizka TPP (power units 1,2,3,4)	м. Енергодар Запорізької ТРП	DTEK Dniproenergo					-
6	Zaporizka TPP (power units 5,6,7)	м. Енергодар Запорізької ТРП	DTEK Dniproenergo					-
7	Prydniprovskai TPP (power units 11,12)	м. Дніпропетровськ	DTEK Dniproenergo					-
8	Prydniprovskai TPP (power units 13,14)	м. Дніпропетровськ	DTEK Dniproenergo					-
9	Kryvorizka TPP (power units 1,2)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo					-
10	Kryvorizka TPP (power units 3,4)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo					-

A	B	C	Ca	D	E	F	G	H
Number	Name of Plant	Location	Operator	Commission year	Any extension by at least 50 MW of the total rated thermal input of the combustion plant, (total extension in MW);	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	Pollutant(s) (SO ₂ , NO _x , dust) for which the plant concerned is not covered by NERP
11	Kryvorizka TPP (power units 5,6)	м. Зеленодольськ Апостолівського р-ну Дніпропетровської обл.	DTEK Dniproenergo					-
12	Burshtynska TPP (power units 9,10,11,12)	м. Бурштин Галицького р-ну Івано-Франківської обл.	DTEK Zakhidenergo					-
13	Burshtynska TPP (power units 5,6,7,8)	м. Бурштин Галицького р-ну Івано-Франківської обл.	DTEK Zakhidenergo					-
14	Dobrotvirska (power units 7,8)	с. Добротвір Кам'яно-Бузького р-ну Львівської обл.	DTEK Zakhidenergo					
15	Ladyzhynska TPP (power units 1,2,3)	м. Ладизин Вінницької обл.	DTEK Zakhidenergo					SO ₂
16	Ladyzhynska TPP (power units 4,5,6)	м. Ладизин Вінницької обл.	DTEK Zakhidenergo					-
17	Vuglegirska TPP (power units 1,2,3,4)	м. Світлодарськ Донецької обл.	Centrenergo					NO _x
18	Vuglegirska TPP (power units 5,6,7)	м. Світлодарськ Донецької обл.	Centrenergo					-
19	Zmiivska TPP (power units 1,2)	Комсомольське Зміївського р-ну Харківської обл.	Centrenergo					-
20	Zmiivska TPP (power units 7,8)	Комсомольське Зміївського р-ну Харківської обл.	Centrenergo					-

A	B	C	Ca	D	E	F	G	H
Number	Name of Plant	Location	Operator	Commission year	Any extension by at least 50 MW of the total rated thermal input of the combustion plant, (total extension in MW);	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	Pollutant(s) (SO ₂ , NO _x , dust) for which the plant concerned is not covered by NERP
21	Zmiivska TPP (power units 9,10)	Комсомольське Зміївського р-ну Харківської обл.	Centrenergo					-
22	Trypil'ska TPP	м. Українка Київської обл.	Centrenergo					-
23	Slovianska TPP (енергоблок 7)	С Миколаївка м. Слов'янськ Донецької обл..	Donbassenergo					
24	Starobeshivska TPP (енергоблок 4)	с. Новий Світ Донецької обл.	Donbassenergo					
25	Starobeshivska TPP (енергоблок 8,9,10)	с. Новий Світ Донецької обл.	Donbassenergo					
26	Starobeshivska TPP (power units 11,12,13)	с. Новий Світ Донецької обл.	Donbassenergo					
27	Darnitska CHP	м. Київ	CHP Association					
28	Kaluska CHP	м. Калуш Івано-Франківської обл.	CHP Association					-
29	Kyivska CHP 5	м. Київ	CHP Association					-
30	Kyivska CHP-5	м. Київ	CHP Association					-
31	Kyivska CHP-6	м. Київ	CHP Association					-
32	Kramatorska CHP	м. Краматорськ Донецької обл..	CHP Association					-
33	Krementchutska CHP	м. Кременчук Полтавської обл.	CHP Association					-
34	Okhtyr'ska CHP	м. Охтирка Сумської обл.	CHP Association					-
35	Sum'ska CHP	м. Суми	CHP Association					-
35	Sum'ska CHP	м. Суми	CHP Association					

A	B	C	Ca	D	E	F	G	H
Number	Name of Plant	Location	Operator	Commission year	Any extension by at least 50 MW of the total rated thermal input of the combustion plant, (total extension in MW);	Total thermal input rate on 31.12.2012 (MW)	Annual number of operating hours (average 2008-2012)	Pollutant(s) (SO ₂ , NO _x , dust) for which the plant concerned is not covered by NERP
36	Kharkivska CHP-5	с. Підвірки Дергачівського р-ну Харківської обл..	CHP Association					-
37	Cherkasska CHP	м. Черкаси	CHP Association					
48	Chernihivska CHP	м. Чернігів	CHP Association					-