

National emission reduction plan of major pollutants from large combustion plants

Draft

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1. The purpose of the document

This document provides the outline of a national emission reduction plan (hereinafter: NERP) to reduce emissions of major pollutants from large combustion plants, 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 December, 2015. For each combustion plant included in the NERP, this document specifies the timing to achieve the requirements of Directives 2010/75/EU¹ for sulphur dioxide (SO₂) nitrogen oxides (NO_x), 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: SO₂, NO_x and dust.

The current state of existing combustion plants as well as the limited financial resources of the Ukrainian power sector will not allow Ukraine to meet the requirements of Directive 2001/80/EC before the deadline. According to item 11 of the Conclusions of the Ministerial Council of 2013, "Upon request of Ukraine, the Ministerial Council will endeavor to consider a decision based on Article 24 of the Energy Community Treaty to take into account the specific situation of this Contracting Party as concerns the implementation of acquis on reduction of emissions from existing large combustion plants." This document intends to present Ukraine's ambitions to reduce the emissions of large combustion plants to underline its plea for extended flexibility under the Energy Community framework.

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (Directive 2010/75/EU) introduces significant changes to the current EU legislation on integrated environmental protection. One of the most important changes include substantial enhancement of the emission limit values of sulfur dioxide, nitrogen oxides and dust generated by large combustion plants².

According to Directive 2010/75/EU, the EU requirements were increased both for existing³ and new combustion plants starting from 1 January 2016. The requirements for new combustion plants are the ones that are particularly stringent.

A large proportion of existing Ukrainian combustion plants cannot meet the value of emission standards specified in Directive 2001/80/EC and/or Directive 2010/75/EU. Such plants (without

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

³ Directive 2010/75/EU does not define the terms "new plant" or "existing plant", however, it makes a clear distinction between two categories of plants according to the date on which a permit was issued for them in its Article 30. The first category of plants is subject to the emission limit values in Part 1 of Annex V of Directive 2010/75/EU while the second is subject to the stricter ones of Part 2 of the same Annex. The cut-off date between plants subject to Part 2 (that have to meet the more stringent emission limit values) and plants subject to Part 1 (having the possibility to meet less stringent emission limit values) is thus 7 January 2013 be the new plants.

the development and implementation of a NERP with an extended derogation mechanism) should be opted out 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. For Ukraine, the possibility to make use of an extended flexibility mechanism under Directive and 2010/75/EU is an extremely important issue in the context of security of supply.

Participation in the NERP is voluntary. The NERP includes combustion plants the operators of which have decided to participate in this derogation mechanism from immediate compliance with the emission limit values of Directive 2010/75/EU.

The NERP for Ukraine shall enter into force on 1 January 2018 and it is suggested that its implementation should be completed until 31 December 2033 for Ukraine. Units included in the NERP should provide in aggregate a linear decrease in gross emissions of pollutant(s) from large combustion plants in Ukraine every year starting from 1 January 2018 until 31 December 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

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

2.1 Plants that can participate in NERP

The basic rules on the conditions for participation in the 2018-2033 NERP are presented below.

The following combustion plants can participate in the NERP: existing plants with a rated thermal input of at least 50 MW which permits are valid to date 31 December 2015.

In the preparation of this document, the common stack approach has been used in accordance with the requirements of Directive 2001/80/EC and 2010/75/EU. Therefore, when a group of boilers discharge flue gases into the atmosphere through a common stack, submittal for participation may cover the whole combustion plant (whole group of boilers).

2.2 Plants that can not apply for participation in NERP

Plants that make use of the limited lifetime derogation option from the requirements due to the limitation of the term of service (Article 33 of Directive 2010/75/EU), i.e. those plants in the case of which the operator undertakes, in a written declaration submitted by 31 December 2015 at the latest to the competent authority not to operate the plant for more than 40000 operational hours, starting from 1 January 2018 and ending no later than 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 shall comply with the emission limit values included in Directive 2010/75/EU as of 1 January 2016. New plants shall comply with the requirements of Chapter III and Annex V of Directive 2010/75/EU as of 1 January 2016.

3. Approach to the determination rules limiting the total emissions values in 2033

1. Presumable specific consumption of coal equivalent fuel was defined per 1 kWh in 2033. It was assumed that for new coal-fired plants the consumption shall be 330 gram of coal equivalent fuel/kWh, and for reconstructed existing the consumption shall be 370 g.c.e.f./kWh.
2. Low calorific value of the fuel (LHV) is considered to be equal to 5500 kcal/kg.
3. Specific volume of dry flue gas consumption is 8.405 m³ per kg of coal.

Specific volume of dry flue gas (Vfg) was calculated as:

$$\mathbf{Vfg = LHV (MJ/kg) \times 0.365 (statistical\ coefficient) = FG\ quantity (m^3/kg)}$$

4. The standard for emissions of sulfur and nitrogen oxides in 2033 for new combustion plants will be 150 mg/m³, and 200 mg/m³ for reconstructed plants; Standard for dust emission for new combustion plants will be 10 mg/m³, and 20 mg/m³ for the reconstructed plants.
5. Emissions per mass of fuel burnt is calculated as follows:

$$\mathbf{Emissions\ per\ kg\ of\ fuel = Standard (mg/m^3) \times FG\ quantity (m^3/kg) = the\ value\ of\ emission\ quantity (g/kg)}$$

6. Consumption of natural fuel per kWh is calculated as follows:

$$\mathbf{Consumption\ of\ natural\ fuel\ per\ 1\ kWh = specific\ fuel\ consumption (in\ kg\ of\ coal\ equivalent\ fuel/kWh) \times 7000 (kcal/kg) / LHV (kcal/kg) = the\ quantity\ of\ fuel (kg/kWh)}$$

7. Emissions of pollutant per kWh is then:

$$\mathbf{Emissions\ per\ kWh = emission\ per\ kg\ of\ fuel (item\ 5) \times Consumption\ of\ natural\ fuel\ per\ 1\ kWh (item\ 6) = the\ quantity\ of\ emissions (g/kWh)}$$

8. In the Energy Strategy of Ukraine till 2030, according to the baseline scenario, in 2030 the installed capacity of new coal fuel combustion units at thermal power plants will be 9.1 GW and 10.7 GW of the reconstructed plants. The output of thermal power plants in the baseline scenario in 2030 will be 91 billion KWh. Net of electricity own needs for TPP, it will be approximately 84 billion KWh, while output of new combustion plants will be 38.6 billion KWh, and 45.4 billion KWh from the reconstructed plants.

9. Multiplying these volumes of output by specific emissions quantity defined under item 7 above, one obtains the values of total emissions from thermal power plants, which are listed in the tables of Annex 2 to the draft NERP of Ukraine.

Combustion plants included in the NERP should provide in aggregate a linear decrease in gross emissions of pollutant(s) from large combustion plants in Ukraine every year starting from 1 January 2018 until 31 December 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.

4. Plants operation during the implementation phase of the NERP

Combustion plants covered by NERP are not obliged to meet, on a plant-by-plant basis, the emission limit values laid down in Directive 2010/75/EU (Part I of Annex V) during the implementation phase of the NERP. 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. Plants covered by the NERP have to ensure overall compliance with the maximum annual emissions of SO₂, NO_x and dust at national level according to the ceilings established by the NERP during its implementation period (2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032 and 2033).

Participation in the NERP does not exclude the continuation of a plant's operation after the end of the NERP's implementation period, provided that such a plant is brought into compliance with the requirements of Directive 2010/75/EU for new plants as specified in Part II of its Annex V.

5. Estimated emissions and reporting on NERP

5.1 Evaluation and monitoring of emissions

Where applicable, the evaluation and monitoring of emissions from plants covered by the NERP should be done based on continuous measurements as required by Directive 2010/75/EU. In absence of such measurements, 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.
- Quantity of fuel burned is defined based on the reports of fuel consumption and its quality, or 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.

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 of the operation or the permanent shutdown of a plant covered by the NERP or the exclusion of such a plant should not provide for an increase in the total annual gross emissions. In this case, an update of the list of plants covered by the NERP accompanied with an update to the emission ceilings for all pollutants is necessary.

An application by operator to include a combustion plant in the NERP should not preclude the possibility to remove it from the list of plants later on 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

The decision to use any alternative mechanism of derogation from NERP can be taken at a time when NERP is subjected for assessment of the Energy Community Secretariat, i.e. by end 2015.

During the implementation period of the NERP, a combustion plant may be excluded from the NERP following a decision of the operator. Readiness to refuse from participation in NERP should be reported to the Ministry of Environment before 1 June of the year preceding the year when the plant does not wish to participate in the NERP any longer. Exiting the NERP means that the operation of the plant will be in accordance with the principles of the Directive 2010/75/EU and the plant will be required to comply with the emission limit values of Part 1 of Annex V of Directive 2010/75/EU.

A plant that was excluded from the NERP may not re-join the NERP.

Data on emissions limiting 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

An annual report on the implementation of the NERP should be drawn up and sent to the Energy Community Secretariat 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 end of the implementation period of the NERP, 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:

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 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:

- 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:
 - for the units with thermal input of $50 <R \leq 500$ MW coal should be used with low sulfur content, or build a semi-dry or wet flue gas desulfurization, depending on specific conditions

- facilities for thermal power $P > 500$ MW it is advisable to use a wet install desulphurization of flue gases
- improving combustion to reduce emissions of nitrogen oxides and dust collecting systems modernization
- Recommendations for building CFB boilers;
- construction of flue gas cleaning plants from nitrogen oxides – 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 1 presents an overview of emission ceilings for all participants in the NERP for the **2018-2033** period (Table B.3 in Decision 2012/115/EU).

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

	01.01.2018	01.01.2022	01.01.2026	01.01.2030	01.01.2032	31.12.2033
SO ₂	1 210 000	922 900	635 780	348 660	205 100	61 600
NO _x	188 200	158 980	129 720	100 400	85 820	71 200
Dust	114 000	87 055	60 075	33 085	19 585	6 000

8. Annexes to NERP

Annex 1 – Environmental effects of the application of the NERP

Annex 2 – Emission ceilings [Mg] of total pollutant emissions for operators of the large combustion plants

Annex 3 – List of large combustion plants in Ukraine

Annex 4 – List of large combustion plants in Ukraine covered by the National emission reduction plan

Annex 1 to the National emissions reduction plan

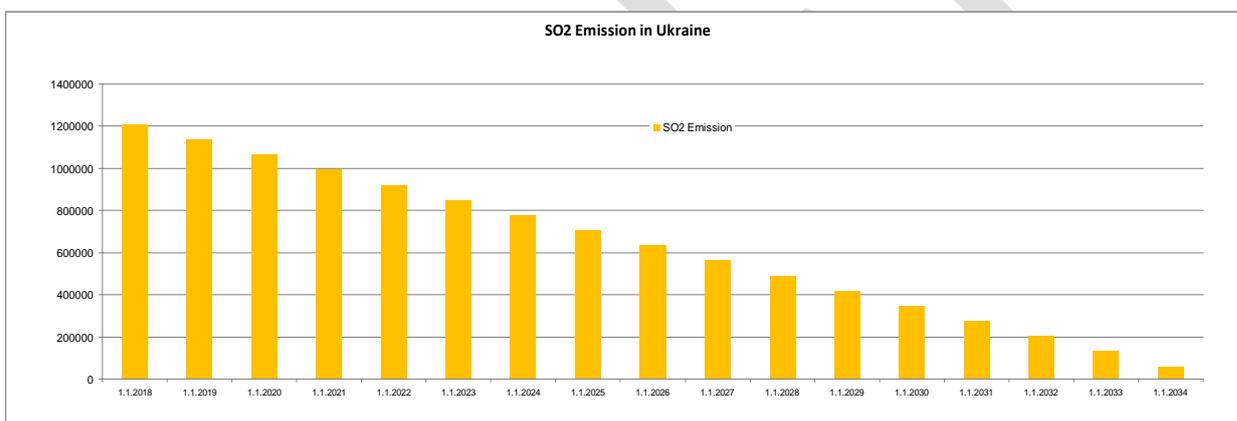
Environmental effects of implementing the NERP

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The below charts are provided to present the reduction in gross emissions of pollutants during the implementation of the NERP. This document laid the sharp reduction at the end of 2033, compared with 2018 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 2018 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 2018. 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.

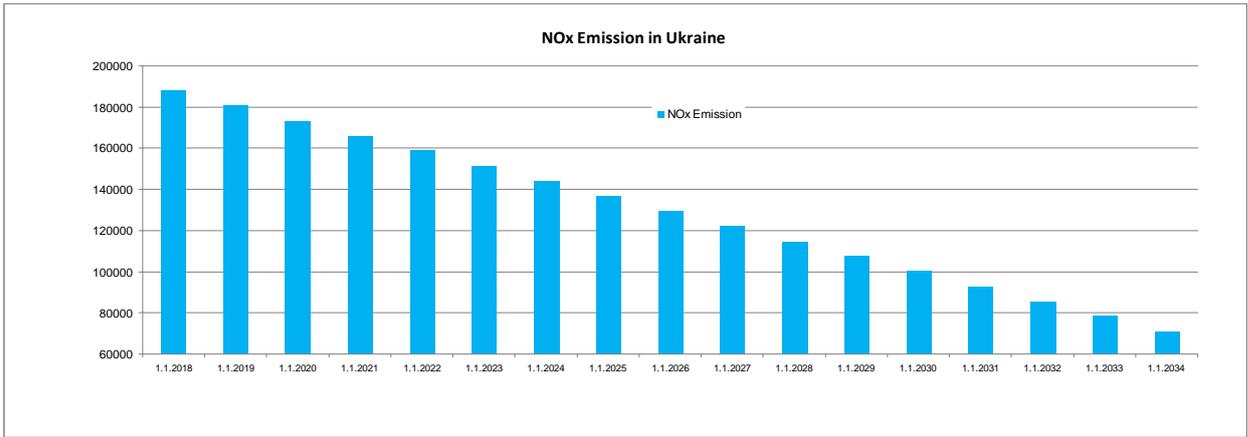
Figure 1. Dynamics of gross emission reduction of SO₂ during the 2018-2033 period.



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 2018 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 .

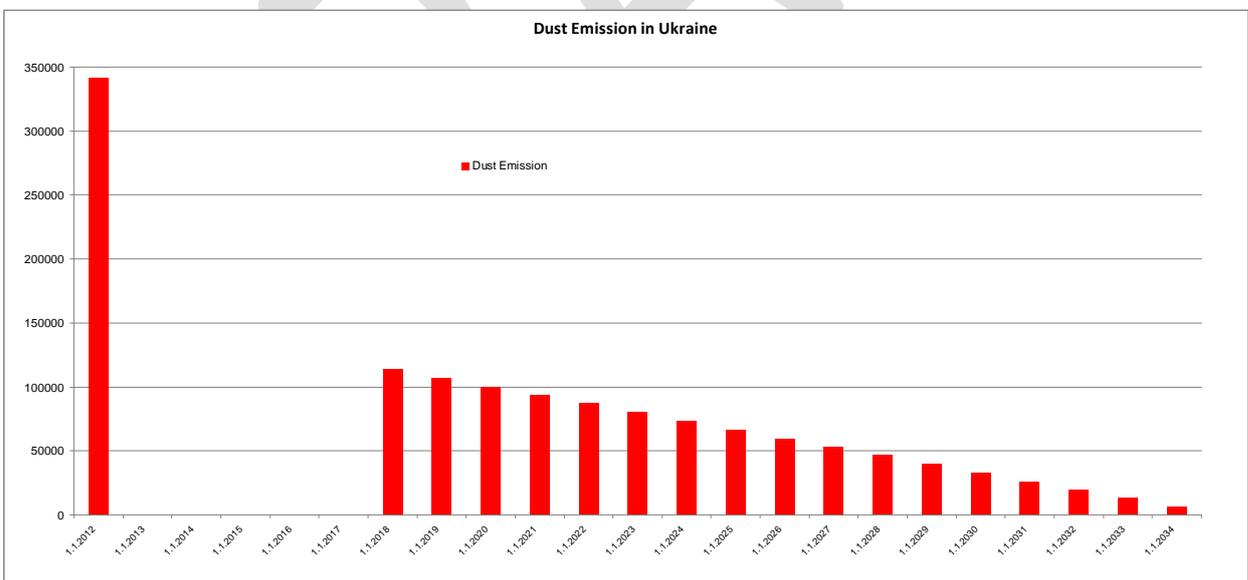
The level of total emissions of nitrogen oxides in 2018 is based on the average emission in the period 2008-2012. As the majority of boilers in power sector of Ukraine use liquid slag removal, this restricts the use of primary measures to decrease generation of nitrogen oxides. Given the lack of experience in construction and operation of the combustion plants with selective catalytic reduction and high capital costs, reduction of nitrogen oxides should be expected not earlier than in 2018. 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 2018 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 40000 operating hours is set.

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



Existing combustion plants in Ukraine were equipped only with dust cleaning systems. During 2010-2017 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 2018 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 NO_x and to reduce their negative environmental effect.

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Annex 2 to the National emissions reduction plan

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

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SO₂

Opetator	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
DTEK Skhidenergo	264750	249050	233350	217640	201930	186220	170510	154800	139090	123380	107670	91960	76250	60540	44830	29120	13430
DTEK Dniproenergo	295800	278190	260580	242970	225360	207750	190140	172530	154920	137310	119700	102090	84480	66870	49260	31650	14040
DTEK Zakhidenergo	243500	229080	214660	200240	185820	171400	156980	142560	128140	113720	99300	84880	70460	56040	41620	27200	12750
Centrenergo	237120	223060	209000	194940	180880	166820	152760	138700	124640	110580	96520	82460	68400	54340	40280	26220	12200
Donbassenergo	89810	84480	79150	73820	68490	63160	57830	52500	47170	41840	36510	31180	25850	20520	15190	9860	4560
Total for CHP	79020	74370	69720	65070	60420	55770	51120	46470	41820	37170	32520	27870	23220	18570	13920	9270	4620
TOTAL	1210000	1138230	1066460	994680	922900	851120	779340	707560	635780	564000	492220	420440	348660	276880	205100	133320	61600

NO_x

Opetator	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
DTEK Skhidenergo	37800	36380	34960	33530	32100	30670	29240	27810	26380	24950	23520	22090	20660	19230	17800	16370	14950
DTEK Dniproenergo	60500	57790	55080	52370	49660	46945	44230	41515	38800	36085	33370	30655	27940	25225	22510	19795	17090
DTEK Zakhidenergo	16800	16285	15770	15255	14740	14225	13710	13195	12680	12165	11650	11135	10620	10100	9580	9060	8540
Centrenergo	29600	28460	27320	26180	25040	23900	22760	21620	20480	19340	18200	17060	15920	14780	13640	12500	11390
Donbassenergo	19600	19000	18400	17800	17200	16600	16000	15400	14800	14200	13600	13000	12400	11800	11200	10600	9970
Total for CHP	23900	22985	22070	21155	20240	19325	18410	17495	16580	15665	14750	13835	12920	12005	11090	10175	9260
TOTAL	188200	180900	173600	166290	158980	151665	144350	137035	129720	122405	115090	107775	100460	93140	85820	78500	71200

Dust

Opetator	2012	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
DTEK Skhidenergo	105800	35265	32845	35265	32845	30425	28005	25585	23165	20745	18325	15905	13480	11060	8640	6220	3800	1380
DTEK Dniproenergo	46800	15600	14580	15600	14580	13560	12540	11520	10500	9480	8460	7440	6420	5400	4380	3360	2340	1320
DTEK Zakhidenergo	38800	12935	12070	12935	12070	11205	10340	9480	8615	7750	6890	6025	5160	4295	3430	2570	1705	840
Centrenergo	66600	22200	20700	22200	20700	19200	17700	16200	14700	13200	11700	10200	8700	7200	5700	4200	2700	1200
Donbassenergo	57600	19200	17880	19200	17880	16560	15240	13920	12600	11280	9960	8640	7320	6000	4680	3360	2040	720
Total for CHP	26400	8800	8210	8800	8210	7620	7030	6440	5850	5620	4670	4080	3490	2900	2310	1720	1130	540
TOTAL	342000	114000	106285	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
(basic data)**

(Missing data will be provided later)

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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	NO _x Emissions 2012	Dust Emissions 2012
							Mg	Mg	Mg
1	Zuivska TPP (power units 1, 2,3, 4)	Zugres, Donetsk region	DTEK Skhidenergo	1982	3276.5	8760	85439	7946	4316
2	Luhanska TPP (power units 9,10,11)	m. Shchastia, Luhansk region	DTEK Skhidenergo	1963	1747.6	8760	30380	9822	16091
3	Luhanska TPP (power units 13,14,15)	m. Shchastia, Luhansk region	DTEK Skhidenergo	1965	1747.6	8760	36030	11035	16045
4	Kurakhivska TPP (power units 3,4,5)	Kurakhove, Donetsk region	DTEK Skhidenergo	1971	1671.7	8760	44863	3882	22063
5	Kurakhivska TPP (power units 6,7,8,9)	Kurakhove, Donetsk region	DTEK Skhidenergo	1974	2228.9	8760	46643	4059	24316
6	Myronivska TPP	Myronivske, Donetsk region	DTEK Skhidenergo	1956	814.7	8760			
6	Zaporizka TPP (power units 1,2,3,4)	Energodar, Zaporizhzhia region	DTEK Dniproenergo	1975	3140.25	8760	76087	23222	6315
7	Zaporizka TPP (power units 5,6,7)	Energodar, Zaporizhzhia region	DTEK Dniproenergo	1982	5875	120	-	75,6	-
8	Prydniprovskai TPP (power units 7,8,9,10)	Dnipropetrovsk	DTEK Dniproenergo	1961	1797.6	8760	27481,3	8326,1	8396,8
9	Prydniprovskai TPP (power units 11,12)	Dnipropetrovsk	DTEK Dniproenergo	1963	1624	4500	15451,53	4077,864	4941,263
10	Prydniprovskai TPP (power units 13,14)	Dnipropetrovsk	DTEK Dniproenergo	1965	812	3400	11707,8	3208,747	4033,858

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	NO _x Emissions 2012	Dust Emissions 2012
							Mg	Mg	Mg
11	Kryvorizka TPP (power units 1,2)	Zelenodolsk, Dnipropetrovsk region	DTEK Dniproenergo	1964	1535.7	6200	55229,2	5830,5	9139,4
12	Kryvorizka TPP (power units 3,4)	Zelenodolsk, Dnipropetrovsk region	DTEK Dniproenergo	1966	1535.7	5300	34682,7	3671,6	1131,2
13	Kryvorizka TPP (power units 5,6)	Zelenodolsk, Dnipropetrovsk region	DTEK Dniproenergo	1968	1602.6	5450	39006,2	3853,4	6066,5
14	Kryvorizka TPP (power unit 7)	Zelenodolsk, Dnipropetrovsk region.	DTEK Dniproenergo	1969	801.4	0	-	-	-
15	Kryvorizka TPP (power units 8,9,10)	Zelenodolsk, Dnipropetrovsk region	DTEK Dniproenergo	1971	2382.2	8760	46557,9	4907,3	7663,2
16	Burshtynska TPP (power units 1,4,9,10,11,12)	Burshtyn, Ivano-Frankivsk region	DTEK Zakhidenergo	1968	3401.1	8760	83336,8	7937,0	9690,5
17	Burshtynska TPP (power units 2,3)	Burshtyn, Ivano-Frankivsk region	DTEK Zakhidenergo	1964	1133.7	8760	17575,9	1393,9	5101,9
18	Burshtynska TPP (power units 5,6,7,8)	Burshtyn, Ivano-Frankivsk region	DTEK Zakhidenergo	1967	2267.4	8760	37784,4	3482,0	6711,1
19	Dobrotvirska (boilers number 5,6,7,8,9,10)	Dobrotvir, Lviv region	DTEK Zakhidenergo	1956	1018.1	8760	13958,5	1226,8	1771,2
20	Dobrotvirska (power units, boilers number 11,12)	Dobrotvir, Lviv region	DTEK Zakhidenergo	1962	889.4	8760	21493,7	2672,2	6838,1

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	NO _x Emissions 2012	Dust Emissions 2012
							Mg	Mg	Mg
21	Ladyzhynska TPP (power units 1,2,3)	Ladyzhyn, Vinnytsia region	DTEK Zakhidenergo	1971	2381.2	8760	36164,2	4694,0	2702,6
22	Ladyzhynska TPP (power units 4,5,6)	Ladyzhyn, Vinnytsia region	DTEK Zakhidenergo	1972	2381.2	8760	22270,4	2793,9	5085,7
23	Vuglegirska TPP (power units 1,2,3,4)	Svitlodarsk, Donetsk region	Centrenergo	1972-1973	3140.25	8760	143208,4	12341,45	7062,626
24	Vuglegirska TPP (power units 5,6,7)	Svitlodarsk, Donetsk region	Centrenergo	1975-1977	7950	0	-	-	-
25	Zmiivska TPP (power units 1,2)	Komsomolske, Kharkiv region	Centrenergo	1960-1961	880 ?	8760	15 604	1 142	7 959
26	Zmiivska TPP (power units 3,4)	Komsomolske, Kharkiv region	Centrenergo	1962-1963	880 ?	8760	16 679	1 242	8 509
27	Zmiivska TPP (power units 5,6)	Komsomolske, Kharkiv region	Centrenergo	1964-1965	880 ?	8760	15 329	1 144	7 945
28	Zmiivska TPP (power units 7,8)	Komsomolske, Kharkiv region	Centrenergo	1966-1967	1580- ?	8760	31 844	2 479	6 978
29	Zmiivska TPP (power units 9,10)	Komsomolske, Kharkiv region	Centrenergo	1969	1570- ?	8760	20 276	2 277	9 966
30	Trypilska TPP (power units 1,2,3,4)	Ukrainka, Kyiv region	Centrenergo	1969-1970	3140- ?	8760	68 155	17 703	22 379
31	Trypilska TPP (power units 5,6)	Ukrainka, Kyiv region	Centrenergo	1971-1972	1570- ?	8760	-	12	-

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	NOx Emissions 2012	Dust Emissions 2012
							Mg	Mg	Mg
32	Slovianska TPP (power unit 7)	Sloviansk, Donetsk region	Donbassenergo	1971	1965	8760	35247,0	5081,0	12741,0
33	Starobeshivska TPP (power unit 4)	Novyi Svit, Donetsk region.	Donbassenergo	2009	458	8760	367,8	284,1	36,3
34	Starobeshivska TPP (power units 5,6,7)	Novyi Svit, Donetsk region	Donbassenergo	1963	1350	8760	20712,0	4755,4	16288,1
35	Starobeshivska TPP (енергоблок 8,9,10)	Novyi Svit, Donetsk region	Donbassenergo	1965	1350	8760	19385,0	4359,0	15730,0
36	Starobeshivska TPP (power units 11,12,13)	Novyi Svit, Donetsk region	Donbassenergo	1967	1350	8760	16976,8	3731,6	13741,9
37	Bilotserkivska CHP	Bila Cerква, Kyiv region	CHP Association	1971	430	8760			-
38	Darnitska CHP	Kyiv	CHP Association	1954	620	8760			
39	Darnitska CHP	Kyiv	CHP Association	1954	570	8760	11721,5	2846,8	4223,4
40	Dniprodzerzhinska CHP	Dniprodzerzhinsk, Dnipropetrovsk region	CHP Association	1965	1050	8760			
41	Kaluska CHP	Kalush, Ivano- Frankivsk region	CHP Association	1968	1120	8760	1373,1	230,08	279,13
42	Kyivska CHP 5	Kyiv	CHP Association	1971	1202	8760	50,46	834,668	1,29
43	Kyivska CHP-5	Kyiv	CHP Association	1974	1841	8760		1742,11	
44	Kyivska CHP-6	Kyiv	CHP Association	1976	1650	8760			
45	Kramatorska CHP	Kramatorsk, Donetsk region	CHP Association	1976	418	7874	3134,1	895,7	1690,4
46	Kremenchutska CHP	Kremenchuk, Poltava region	CHP Association	1972	590	8760			-

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	NOx Emissions 2012	Dust Emissions 2012
							Mg	Mg	Mg
47	Kryvorizka HP	Kryvyi Rih, Dnipropetrovsk region	CHP Association	1952	460	8760			-
48	Lvivska CHP-1	Lviv	CHP Association	1952	350	8760			-
49	Mykolaivska CHP	Mykolaiv	CHP Association	1964	898	4300		98,914	
50	Odesska CHP	Odessa	CHP Association	1962	450	8760			
51	Okhtyrka CHP	Okhtyrka, Sumy region	CHP Association	1972	265	8760	-	90,689	-
52	Severodonetska CHP	Severodonetsk, Luhansk region	CHP Association	1975	650	8760			
53	Sumska CHP	Sumy	CHP Association	1974	350	8760			
54	Kharkivska CHP-5	Pidvirky, Kharkiv region	CHP Association	1990	815	8760			
55	Kharkivska CHP-2	Eskhar, Kharkiv region	CHP Association	1963	490	8760			
56	Khersonska CHP	Kherson	CHP Association	1967	450	8760			
57	Cherkasska CHP	Cherkassy	CHP Association	1971	850	8760			
58	Chernihivska CHP	Chernihiv	CHP Association	1966	650	8760			
59	Schostska CHP	Shostka, Sumy region	Kharkivenergomont		369,9				
60	Lysytchansk refinery CHP	Lysytchansk, Luhansk region			137.5				
61	Alchevsk Metallurgical plant CHP	Alchevsk, Luhansk region			107.5				

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	NOx Emissions 2012	Dust Emissions 2012
							Mg	Mg	Mg
62	Makiivka Metallurgical plant CHP	Makiivka, Donetsk region			62.5				
63	Avdiivka coke plant CHP	Avdiivka, Donetsk region			112.5				
64	Mariupol CHP-1 (Metallurgical plant)	Mariupol, Donetsk region			50				
65	Mariupol CHP-2 (Metallurgical plant)	Mariupol, Donetsk region			60				
66	Mariupol CHP (Metallurgical plant)	Mariupol, Donetsk region			77.5				
67	Frunze machinery plant CHP	Sumy			52				
68	Pervomaisk EnergoChemProm CHP	Pervomaiske, Kharkiv region			62.5				
69	CHP of Energia-Novy Rozdil plant	Novy Rozdil, Lviv region			45				
70	Nadvirna refinery CHP	Nadvirna, Ivano-Frankivsk region			38.125				
71	Zoria-MachProekt CHP	Mykolaiv			232,5				
72	Kryvorizhstal CHP	Kryvyj Rih, Dnipropetrovsk region			342,5				

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	NOx Emissions 2012	Dust Emissions 2012
							Mg	Mg	Mg
73	Zaporizhstal CHP	Zaporizhzhia			75				
74	DniproAzot CHP	Dniprodzerzhinsk, Dnipropetrovsk region			62,5				
75	YuzhMash CHP	Dnipropetrovsk			108.75				

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**Annex 4
to the National emissions reduction plan**

**List of large combustion plants in Ukraine covered by the National
emission reduction plan**

(To be completed after filling data in Annex 3)

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 TPP	DTEK Dniproenergo					-
6	Zaporizka TPP (power units 5,6,7)	м. Енергодар Запорізької TPP	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. Ладижин Вінницької обл.	DTEK Zakhidenergo					SO ₂
16	Ladyzhynska TPP (power units 4,5,6)	м. Ладижин 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.	Centrenergо					-
22	Trypil'ska TPP	м. Українка Київської обл.	Centrenergо					-
23	Slovianska TPP (енергоблок 7)	С Миколаївка м. Слов'янськ Донецької обл..	Donbassenergо					
24	Starobeshiv'ska TPP (енергоблок 4)	с. Новий Світ Донецької обл.	Donbassenergо					
25	Starobeshiv'ska TPP (енергоблок 8,9,10)	с. Новий Світ Донецької обл.	Donbassenergо					
26	Starobeshiv'ska TPP (power units 11,12,13)	с. Новий Світ Донецької обл.	Donbassenergо					
27	Darnitska CHP	м. Київ	CHP Association					
28	Kaluska CHP	м. Калуш Івано-Франківської обл.	CHP Association					-
29	Kyiv'ska CHP 5	м. Київ	CHP Association					-
30	Kyiv'ska CHP-5	м. Київ	CHP Association					-
31	Kyiv'ska 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	Sumska 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					-