



Ministry of Energy and Coal Industry
of Ukraine



Draft NERP – Ukraine

35-th PERMANENT HIGH LEVEL GROUP

Vienna, 17 December 2014





Structure of NERP

Basic text + *annexes*

Annex 1: Forecasted energy production in Ukraine

Annex 2: List of large combustion plants (LCPs) in Ukraine

(Part 1: Basic data, Part 2: Current emissions)

Annex 3: List of large combustion plants in Ukraine covered by the NERP

(Part 1: Basic data, Part 2: Emissions of sulphur dioxide 2018-2029, Part 3: Emissions of nitrogen oxides 2018-2033, Part 4: Emissions of dust 2018-2029)

Annex 4: List of LCPs in Ukraine covered by the NERP – Planned measures to reduce emissions

Annex 5: List of planned newly built large combustion plants

Annex 6: List of LCPs operating less than 40000 hours in the period 2018-2033





Basic information – Timing

General timing: 1 January 2018 – 31 December 2033

NO_x : 1 January 2018 – 31 December 2033

SO_2 : 1 January 2018 – 31 December 2029

Dust: 1 January 2018 – 31 December 2029

This time period is based on the decision by the Ukrainian Government from 2012 on complete reconstruction of the whole energy sector in the country.

However, to remain at the safe side in energy supply, it has been assessed that, from the total of 90 power units of Ukrainian TPPs to be retrofitted or replaced, ***no more than 5 power units can be phased out temporarily for retrofit or for replacement at the same time.***

In addition, so far the United Power System of Ukraine is not synchronized with ENTSO-E, except for the Burshtyn island





Basic information – governing EU legislation

The basis for development of NERP is governed by Article 4 of Directive 2001/80/EC

However, as the time period of NERP is proposed for 16 years starting from 2018, **Ukraine proposes to comply with the emission limit values and other requirements of the Directive 2010/75/EU as from 31 December 2034** directly without intermediate compliance with the Directive 2001/80/EC





Energy sector in Ukraine – LCPs included in NERP

At present, **147** LCPs with total rated thermal input of **108.57 GW**

52 LCPs with total rated thermal input of **62.30 GW** are expected to be included into NERP and to introduce emission abatement measures

Details of planned emission abatement measures (type of measure, date of implementation) are available for **32** LCPs with total rated thermal input of **47.17 GW**

37 existing plants with total thermal input of **21.84 GW** are planned to be phased out by the end of 2033 and replaced with new coal combustion plants

27 new plants with total rated thermal output of **21.97 GW** are planned at present to be built before 2033





Plants which can participate in NERP

- **With only one exception** (CFB boiler at power unit 4 at Starobeshivska TPP with rated thermal input 558 MW), **all existing LCPs in Ukraine had been permitted before 01.07.1992**
- **No new LCP is expected to be permitted before 2019**





Emissions 2018

Emissions in 2018 were calculated on the basis of statistical data for 2008-2012 provided by the operators of large combustion plants included into NERP

In the case of dust emissions, plans for reconstruction of certain large combustion plants included into NERP were taken into account. As a part of new dust abatement techniques will be introduced by 2018, dust concentrations in flue gas will thus *not exceed 50 mg/m³*





Emissions 2018

Total emissions of sulfur dioxide and nitrogen oxides in 2018 is defined as the average over 2008-2012 for the combustion plants included into NERP

Emissions of pollutants for the years 2008-2012 were determined by calculation based on the data on the fuel consumption in the combustion plants, heat of fuel combustion and emission factors of pollutants, which are determined by the type of fuel and characteristics of the fuel-burning equipment in accordance with the methodology outlined in the **guidelines CORINAIR and IPCC**





Emissions 2033

According to the Energy Strategy of Ukraine, significant increase in production of electricity and heat by 2030 is not expected. Therefore, the annual consumption of fuel energy is assumed as the average consumption in 2008-2012 (TJ/year).

For new combustion plant, the capacity factor is assumed to be equal to 0.8. Their annual consumption of fuel energy is determined as the product of the nominal thermal capacity **N**, MW, for the time of the plant operation **Time**, h/year, and the number of seconds in an hour according to the formula:

$$P \text{ (TJ/year)} = N \text{ (MW)} \times \text{Time} \text{ (h/year)} \times 3600 \text{ (sec/h)} \times 0.8 \times 10^{-6}$$





Emissions in the last year of NERP implementation

1. The emission limit values (ELVs) in the last year of NERP implementation for existing combustion plants are selected according to Part 1 of Annex V to Directive 2010/75/EU:
2. The ELVs in the last year of NERP implementation for new combustion plants are selected according to Part 2 of Annex V to Directive 2010/75/EU:
3. The pollutant emissions of the combustion plant is determined according to the formula

$$E_{FG} [\text{t/year}] = V_{FG} [\text{m}^3/\text{year}] \times \text{ELV} [\text{mg}/\text{m}^3] \times 10^{-9}$$

where V_{FG} (volume of flue gas) is determined by the formulas:

$$V_{FG} = 10^6 (P_{solid} \times 0.358 + P_{liq} \times 0.342 + P_{gas} \times 0.336) \quad (\text{for coal combustion plants})$$

$$V_{FG} = 10^6 (P_{liq} \times 0.285 + P_{gas} \times 0.280) \quad (\text{for gas and fuel oil combustion plants})$$





Aggregated emission ceilings for all existing large combustion plants included in NERP [1000 t]



| | 31.12.2018 | 31.12.2029 | 31.12.2033 |
|-----------------------|------------|------------|------------|
| SO₂ | 853.5 | 39.5 | 39.5 |
| NO_x | 273.0 | 107.3 | 47.0 |
| Dust | 109.1 | 3.9 | 3.9 |





Operation of plants during the NERP implementation period

- Operators of existing LCPs must comply with the emission limit values for sulfur dioxide (SO_2), nitrogen oxides (NO_x) and dust set out in the permit for emissions issued before December 31, 2015.
- Operators of plants must in total ensure compliance with the annual national emission ceilings for SO_2 , NO_x and dust as laid down by NERP for its implementation period 2018-2033.





Operation of plants during the NERP implementation period

- In order to fulfill its obligations on limitation of total emissions, operators, or their group, during the year may exchange the amount of emissions between each other, provided that the national emission ceiling, as set out in NERP is not exceeded.
- It is not allowed to transfer part of emissions to the next reporting year, or earlier use of future emission reduction in current reporting years.





Operation of plants after the NERP implementation period (2034+)

- Participation in NERP does not require operators to terminate plant operation after the expiration of the NERP implementation period, provided that their plant will be in compliance with the requirements of *Directive 2010/75/EU* for existing installations (Part I of Annex V of the Directive) as from 31 December 2033





Emission reduction measures

- modernisation of existing combustion plants to improve energy efficiency of fuel conversion;
- installation of new devices for flue gases dust cleaning (electrostatic precipitators, fabric filters);
- co-firing of biomass with solid fuel (coal) in boilers;
- for the coal plants with rated thermal input of 50 to 500 MW fuel with low sulfur content should be used, or semi-dry or wet flue gas desulfurization should be introduced, depending on specific conditions of the plant;





Emission reduction measures

- for the plants with rated thermal input > 500 MW it is advisable to use wet desulphurisation of flue gases;
- introduction of primary measures to reduce emissions of nitrogen oxides (technological regime measures – air and fuel staging, low emission burners, flue gas recirculation, reburning and a combination there of);
- introduction of secondary measures to reduce emissions of nitrogen oxides – selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR), depending on the conditions of combustion plant operation.





**THANK YOU
FOR ATTENTION**

**S.Kuznetsov
I. Volchyn**

**Ministry of Energy and Coal
Industry**

