

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**

**NATIONAL TECHNICAL UNIVERSITY  
«KHARKIV POLYTECHNIC INSTITUTE»**

Department	Power stations
Specialty	141 «Electric Power Engineering, Electrical Engineering and Electromechanics»
Educational program	Electric Power Engineering (141.01 – «Electric Power Stations», 141.05 – «Energy Management and Energy Efficient Technologies»)
Form of education	Full-time
Academic discipline	Ecological Aspects of Power Industry
Semester	2

**INDIVIDUAL ASSIGNMENTS**

Number of tickets \_\_\_\_\_

Approved at the meeting of the department  
Protocol № \_\_\_\_\_ from \_\_\_\_\_ 20 \_\_\_\_ .

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Examiner  
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In accordance with the variant:

1. Assess the pollutant emission from the given fossil fuel fired at a thermal power plant.
2. Calculate the height of the chimney for the pollutant emissions at the power plant.
3. Determine the buffer zone and its territorial composition for the power plant.
4. Assess the annual ecological tax for the pollutant emissions.

The initial data for the computations are given in table 1.

Table 1 – Initial data for pollutant emissions assessment and chimney height

<b>N<sub>o</sub></b>	<b>N<sub>rated</sub>, MW</b>	<b>T<sub>0</sub>, hrs</b>	<b>b<sub>e</sub>, t.o.e./kWh</b>	<b>Fuel1</b>	<b>Fuel2</b>	<b>Fuel3</b>	<b>D<sub>SG</sub>. t/hrs/per unit</b>	<b>η<sub>FAC</sub></b>	<b>η<sub>SOx</sub></b>	<b>ω<sub>FG</sub>. m/s</b>	<b>Flue gas collector/furnace type</b>
1.	2x150	2520	0.246	84% coal1	10% fuel oil 1	6% NG1	547	0.985	0.91	26	Cyclone+Ventury tube (alkaline hardness 10%) / slag-tap furnace
2.	4x100	3060	0.257	30% coal2	63% coal3	7% NG2	419	0.989	0.92	28	Ventury tube (alkaline hardness 5%)
3.	3x250	2390	0.254	35% coal1	55% coal4	10% NG3	749	0.988	0.84	27	ESP / dry bottom furnace
4.	6x60	2940	0.259	25% coal 3	70% coal4	5% fuel oil 1	254	0.975	0.87	25	Scrubber+Ventury tube (alkaline hardness 5%) / slag-tap furnace
5.	2x300	1970	0.251	90% coal 3	3% fuel oil 1	7% NG4	924	0.982	0.82	29	ESP / dry bottom furnace
6.	3x125	2520	0.258	78% coal1	12% fuel oil2	10% NG2	516	0.979	0.88	26	Ventury tube (alkaline hardness 10%) / slag-tap furnace
7.	2x120	3164	0.252	45% coal1	50% coal3	5% NG5	485	0.987	0.86	27	Scrubber+Ventury tube (alkaline hardness 10%) / slag-tap furnace

8.	4x60	2691	0.249	52% coal2	37% coal 3	11% fuel oil1	215	0.978	0.81	25	Cyclone+Ventury tube (alkaline hardness 5%) / dry bottom furnace
9.	6x180	2160	0.241	35% coal3	60% coal1	5% NG2	689	0.989	0.85	28	ESP / dry bottom furnace
10.	4x180	2448	0.253	85% coal3	8% fuel oil2	7% NG4	745	0.987	0.84	29	ESP / dry bottom furnace

Table 2 – Wind frequency in the wind rose for buffer zone

№	Wind frequency in different cardinal directions, %						
	N->NE->E->SE->S->SW->W->NW						
1.	17>20>12>7>9>10>14>11						
2.	9>13>11>16>14>12>15>10						
3.	12>11>14>10>9>6>17>21						
4.	8>7>15>19>14>20>12>5						
5.	15>18>7>8>6>11>16>20						
6.	7>14>11>18>15>9>12>14						
7.	10>9>11>13>16>14>15>12						
8.	9>14>11>16>15>10>12>13						
9.	12>16>14>11>10>13>8>16						
10.	21>17>12>11>14>9>6>10						

Table 3 – Type of territory in the buffer zone, %

№	Type of territory					Power plant location
1.	64% industrial zone	7% forest	22% agriculture area	6% garden area	1% residential area	Regional city, 511 thousand population

2.	76% industrial zone	19% garden area	4% recreation area	1% residential area		Resort town, 161 thousand population.
3.	62% industrial zone	20% agriculture area	10% forest	6% garden area	2% residential area	County town, 12 thousand population
4.	70% industrial zone	21% forest	6% garden area	3% residential area		Regional city, 2 mln. population
5.	55% industrial zone	30% agriculture area	5% forest	7% recreation area	3% residential area	County town, 102 thousand population
6.	65% industrial zone	20% garden area	10% garden area	5% residential area		Regional city, 620 thousand population
7.	76% industrial zone	15% forest	5% garden area	4% residential area		Resort town 170 thousand population
8.	68% industrial zone	22% forest	8% recreation area	2% residential area		Resort town, 69 thousand population.
9.	71% industrial zone	19% agriculture area	7% garden area	3% residential area		County town, 102 thousand population.
10.	70% industrial zone	19% forest	7% garden area	3% recreation area	1% residential area	Regional city, 250 thousand population.